

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		
	Filing Date		2015-03-05
	First Named Inventor	Erik Dahlman	
	Art Unit		TBA
	Examiner Name	TBA	
	Attorney Docket Number		4015-9121 / P24241-US3

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5	20060034245	A1	2006-02-16	Nguyen	
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	2	SAMSUNG. "Draft text proposal capturing agreements on system information." 3GPP TSG-RAN2 Meeting #58, Tdoc R2-072205, Kobe, Japan, May 7-11, 2007, pages 1-8.	<input type="checkbox"/>
	3	ERICSSON. "Transmission of dynamic system information." TSG-RAN2 #58bis, R2-072543, Orlando, FL, US, June 25-29, 2007, pages 1-4.	<input type="checkbox"/>
	4	ERICSSON. "Transmission of dynamic system information." 3GPP TSG-RAN2 Ad-hoc Meeting, Tdoc R2-075559, Vienna, Austria, December 13-14, 2007, pages 1-4.	<input type="checkbox"/>
	5	3RD GENERATION PARTNERSHIP PROJECT. "3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (Release 8)." 3GPP TS 36.300, V8.0.0, March 2007, Sophia Antipolis Valbonne, France, pages 1-82.	<input type="checkbox"/>

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- See attached certification statement.
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Signature	/David E. Bennett, Reg. No. 32,194/	Date (YYYY-MM-DD)	2015-03-05
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(54) **Mapping of broadcast system information to transport channels in a mobile communication system**

(57) The present invention relates to a method and transmission apparatus for transmitting broadcast system information in a mobile communication system. Further, the invention relates to a method and mobile terminal receiving the broadcast system information. To provide an improved method for broadcasting broadcast system information the invention suggests mapping dif-

ferent partitions of broadcast system information to a shared transport channel or a broadcast transport channel for transmission. The mapping may take into account parameters inherent to the mobile terminals to which the broadcast system information is to be transmitted and/or parameters inherent to the different partitions of broadcast system information.

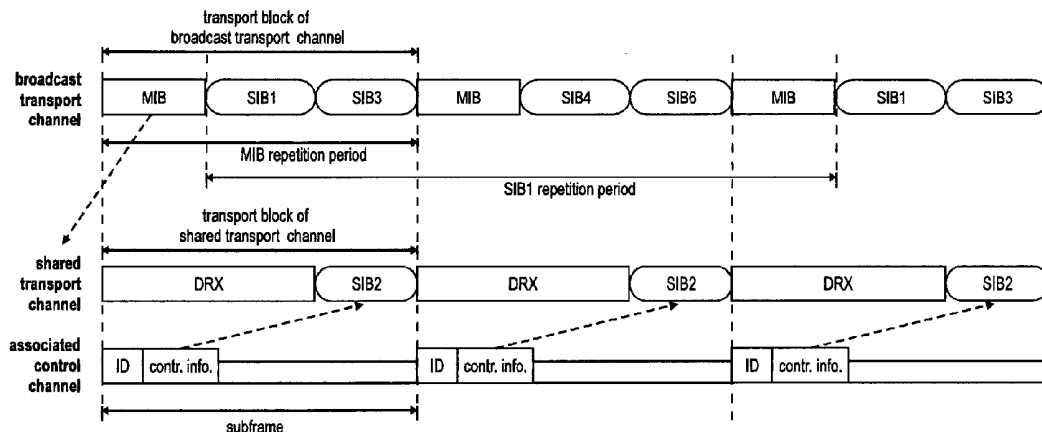


Fig. 10

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Description**FIELD OF THE INVENTION**

5 [0001] The present invention relates to a method and transmission apparatus for transmitting broadcast system information in a mobile communication system. Further, the invention relates to a method and mobile terminal receiving the broadcast system information.

TECHNICAL BACKGROUND

10 [0002] W-CDMA (Wideband Code Division Multiple Access) is a radio interface for IMT-2000 system (International Mobile Telecommunication system), which was standardized for use as the 3rd generation wireless mobile telecommunication system. It provides a variety of services such as voice services and multimedia mobile communication services in a flexible and efficient way. The standardization bodies in Japan, Europe, USA, and other countries have jointly
15 organized a project called the 3rd Generation Partnership Project (3GPP) to produce common radio interface specifications for W-CDMA.

[0003] The standardized European version of IMT-2000 is commonly called UMTS (Universal Mobile Telecommunication System). The first release of the specification of UMTS has been published in 1999 (Release 99). In the mean time several improvements to the standard have been standardized by the 3GPP in Release 4, Release 5 and Release
20 6. A discussion on further improvements is ongoing under the scope of Release 7 and Study Item on Evolved UTRA and UTRAN.

UMTS Architecture

25 [0004] The high level Release 99/4/5 architecture of Universal Mobile Telecommunication System (UMTS) is shown in Fig. 1 (see 3GPP TR 25.401: "UTRAN Overall Description", incorporated herein by reference, available from <http://www.3gpp.org>). The UMTS system consists of a number of network elements each having a defined function. Though the network elements are defined by their respective function, a similar physical implementation of the network elements is common but not mandatory.

30 [0005] The network elements are functionally grouped into the Core Network (CN) 101, the UMTS Terrestrial Radio Access Network (UTRAN) 102 and the User Equipment (UE) 103. The UTRAN 102 is responsible for handling all radio-related functionality, while the CN 101 is responsible for routing calls and data connections to external networks. The interconnections of these network elements are defined by open interfaces (Iu, Uu). It should be noted that UMTS system is modular and it is therefore possible to have several network elements of the same type.

35 [0006] In the sequel two different architectures will be discussed. They are defined with respect to logical distribution of functions across network elements. In actual network deployment, each architecture may have different physical realizations meaning that two or more network elements may be combined into a single physical node.

[0007] Fig. 2 illustrates the current architecture of UTRAN. A number of Radio Network Controllers (RNCs) 201, 202 are connected to the CN 101. Functionally, the RNC 201, 202 owns and controls the radio resources in its domain and typically terminates the Radio Resource Control protocol on the access network side. Each RNC 201, 202 controls one
40 or several base stations (Node Bs) 203, 204, 205, 206, which in turn communicate with the user equipments. An RNC controlling several base stations is called Controlling RNC (C-RNC) for these base stations. A set of controlled base stations accompanied by their C-RNC is referred to as Radio Network Subsystem (RNS) 207, 208. For each connection between User Equipment and the UTRAN, one RNS is the Serving RNS (S-RNS). It maintains the so-called Iu connection with the Core Network (CN) 101. When required, the Drift RNS 302 (D-RNS) 302 supports the Serving RNS (S-RNS) 301 by providing radio resources as shown in Fig. 3. Respective RNCs are called Serving RNC (S-RNC) and Drift RNC (D-RNC). It is also possible and often the case that C-RNC and D-RNC are identical and therefore abbreviations S-RNC or RNC are used. Commonly, a Drift RNS 302 is used for soft handovers of UEs between different RNS.
45

General Description of the Protocol Model of the UTRAN Terrestrial Interfaces

[0008] Fig. 4 shows an overview of the protocol model of the UTRAN in an UMTS network. For a better understanding, only a brief description is provided herein; further details may be found in Holma et al., "WCDMA for UMTS", Third Edition, Wiley & Sons, Inc., October 2004, Chapter 5, incorporated herein by reference.

55 [0009] On the horizontal plane, the protocol model can be split into the radio network layer and the transport network layer. All UTRAN-related issues are visible and handled on the radio network layer, while transport network layer typically represents standard transport technology that is selected to be used for data transport for the UTRAN without any UTRAN-specific changes.

5 [0010] On the vertical plane, the protocol model can be split into control plane and user plane. The control plane is used for UMTS-specific control signaling (i.e. signaling related to radio and transport interfaces) and includes the Application Protocol (AP), e.g. RANAP on the lu interfaces, RNSAP on the lur interfaces, NBAP on the lub and RRC on Uu interfaces. The control plane functions and Application Protocol allows setting up traffic radio bearers to the UEs via so-called signaling radio bearers.

[0011] While the control plane protocols are responsible for the UMTS-specific control signaling, the user plane transports the data streams sent by and sent to the users, such as voice calls, streaming data, packets of packet-switched services, etc. For transport, the user plane contains the so-called traffic radio bearers (also sometimes referred to as Data Bearers).

10 [0012] The transport network control plane is used for control signaling within the transport network layer and does not include any radio network layer related information. The transport network control plane includes the ALCAP protocol, which is used to set up the traffic bearers for exchanging user plane information and the signaling bearers required for communicating ALCAP protocol messages. Due to the presence of the transport network control plane, it is possible that the Application Protocol within the control plane may operate completely independent from the technology selected for data transport on the traffic radio bearers in the user plane. The transport network control plane controls the operation of the transport network user plane.

UTRA Radio Interface Protocol architecture

20 [0013] An overview of the radio interface protocol architecture of the UTRAN is shown in Fig. 5. Generally, the radio interface protocol architecture of the UTRAN implements Layers 1 to 3 of the OSI protocol stack. The protocols terminated in the UTRAN are also referred to as the access stratum (protocols). In contrast to the access stratum, all protocols not terminated in the UTRAN are typically also referred to as the non-access stratum protocols.

25 [0014] As has been discussed with respect to Fig. 4, the vertical split of the protocols into user plane and control plane is illustrated. The Radio Resource Control (RRC) protocol is a Layer 3 protocol of the control plane which controls the protocols in the lower layers of the UTRA Radio Interface (Uu).

30 [0015] The RRC protocol is typically terminated in the RNC of the UTRAN, however other network elements have also been considered for terminating the RRC protocol in the UTRAN, e.g. the Node Bs. The RRC protocol is used for signaling of control information to control access to radio resources of the radio interface to the UEs. Further, there is also the possibility that the RRC protocol encapsulates and transports non-access stratum messages, which are usually related to control within the non-access stratum.

[0016] In the control plane, the RRC protocol relays the control information to Layer 2, i.e. the Radio Link Control (RLC) protocol, via signaling radio bearers through Service Access Points (SAPs). In the user plane the non-access stratum protocol entities may use traffic radio bearers to directly access Layer 2 via SAPs. The access may be made to the RLC directly or to the Packed Data Convergence Protocol which in turn provides its PDUs to the RLC protocol entity.

35 [0017] The RLC offers the SAPs to the higher layers. The RRC configuration defines how RLC will handle the packets, e.g. whether RLC is operating in transparent, acknowledged or unacknowledged mode. The service provided to the higher layers in the control plane and user plane by the RRC or PDCP are also referred to as signaling radio bearer and traffic radio bearer, respectively.

40 [0018] The MAC/RLC layer in turn offers its services to the RLC layer by means of so-called logical channels. The logical channels essentially define what kind of data is transported. The physical layer offers its services to the MAC/RLC layer, the so-called transport channels. The transport channels define how and with which characteristics the data received from the MAC layer are transmitted via the physical channels.

45 Logical and Transport Channels in UTRAN

[0019] In this section the mapping between logical channels and transport channels will be outlined referring for exemplary purposes to the UMTS architecture. The mapping of logical channels to transport channels may be utilized for some of the signaling messages within a RRC connection establishment procedure.

50 [0020] The characteristics and mapping of logical and transport channels for UTRA and E-UTRA are summarized in the following tables. Logical channels are mainly described by data type to be transmitted whereas transport channels are mainly described by respective transmission types and identification method.

[0021] The table below contains a description of logical and transport channels for UTRA and E-UTRA, respectively.

55

Table 1

Logical (LCH) or Transport Channel (TrCH) type vs. channel characteristic and mapping		Channel characteristic				Mapping (LCH -> TrCH)
		Data Type	Transmission Type	Direction: Uplink (UL) or Downlink (DL)	Identification method	
LCH	BCCH (Broadcast Control Channel)	system information (broadcast)	N/A	DL	N/A	BCCH -> BCH
	CCCH (Common Control Channel)	common service control (unicast)	N/A	UL or DL	N/A, Note: this logical channel is mainly used for transmission of control plane information prior to identifier assignment to UE by radio access network	CCCH -> FACH, RACH
	DCCH (Dedicated Control Channel)	dedicated service control (unicast)	N/A	UL or DL	N/A	DCCH -> FACH, RACH, DCH
TrCH	BCH (Broadcast Channel)	N/A	Common channel with static configuration	DL	N/A due to broadcast data type	N/A
	FACH (Forward Access Channel)	N/A	Common channel with semi-static configuration	DL	Layer 2 inband when carrying DCCH, N/A otherwise	N/A
	RACH (Random Access Channel)	N/A	Common channel with semi-static configuration and contention-based access	UL	Layer 2 inband when carrying DCCH, N/A otherwise	N/A
	DCH (Dedicated Channel)	N/A	Dedicated channel with semi-static configuration	UL or DL	N/A since this is dedicated transport channel	N/A

[0022] Please note that mapping of DCCH in the table above may be possible on a Fractional Dedicated Channel in downlink direction for UMTS Release 6 and on Enhanced Dedicated Transport Channel in uplink for UMTS Release 6 of the Evolved UTRA. These options have however not been considered in the table for the sake of simplicity.

[0023] For UTRA, identification of transport channels as shown in the table above is Layer 2 inband. Layer 2 inband identification means that header of a Layer 2 MAC PDU contains UE identifier pointing at a specific UE as a destination or source of information for downlink or uplink direction, respectively. Consequently, for mapping of logical channels

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containing data of system information and common service control type identification is not needed. Identification is applicable only to common transport channels (RACH and FACH) apart from broadcast common transport channel (BCH).
[0024] The following table shows an exemplary description of logical channels and transport channels in the Evolved UTRA (E-UTRA).

5

Table 2

Logical (LCH) or Transport Channel (TrCH) type vs. channel characteristic and mapping	Channel characteristic				Mapping (LCH -> TrCH)	
	Data Type	Transmission Type	Direction: Uplink (UL) or Downlink (DL)	Identification method		
LCH	BCCH (Broadcast Control Channel)	system information (broadcast)	N/A	DL	N/A	BCCH -> Evolved-BCH
	CCCH (Common Control Channel)	common service control (unicast)	N/A	UL or DL	N/A, Note: this logical channel is mainly used for transmission of control plane information prior to identifier assignment to UE by radio access network	CCCH -> SDCH (in downlink direction only), CACH
	DCCH (Dedicated Control Channel)	dedicated service control (unicast)	N/A	UL or DL	N/A	DCCH-> SDCH, SUCH
TrCH	Evolved-BCH (Evolved Broadcast Channel)	N/A	Common channel with static configuration	DL	N/A due to broadcast data type	N/A
	CACH (Contention Access Channel)	N/A	Common channel with semi-static configuration and contention-based access	UL	Layer 2 inband when carrying DCCH, N/A otherwise	N/A
	SDCH (Shared Downlink Channel)	N/A	Shared channel with dynamic configuration and scheduled access	DL	Layer 1 outband	N/A
	SUCH (Shared Uplink Channel)	N/A	Dedicated channel with semi-static configuration	UL	Layer 1 outband	N/A

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[0025] It can be noted that legacy FACH is not used and that shared channels are used instead of legacy DCH. It is assumed that associated physical channels in downlink direction are used for both SDCH and SUCH. An example of associated physical channel could be Shared Control Signaling CHannel (SCSCH).

[0026] The transmission types description in the respective column of the table above should be understood as follows. A static configuration means that the transport format attributes of the channel, e.g. modulation, forward error correction scheme etc. are system-specific and are not subject to change by the network. In a semi-static configuration the transport format attributes of the channel, e.g. modulation, forward error correction scheme etc. are subject to change by reconfiguration procedure. The procedure is fairly slow introducing latency of the order of 100 ms. Finally, in a dynamic configuration the transport format attributes of the channel, e.g. modulation, forward error correction scheme etc. are subject to change by signaling on associated control channels. The procedure is fairly fast relative to semi-static reconfiguration and may introduce a delay of the order of several sub-frames (1 sub-frame - 0.5 ms). Dynamic configuration may be carried out so as to optimally match transmission format to temporal variations of radio channel in which case it may be referred to as link adaptation.

Information that may be transmitted by this channel is given in the table below:

[0027]

Table 3

	Control signaling for downlink	Control signaling for uplink
Physical control	<ul style="list-style-type: none"> ➤ Demodulation • Chunk allocation information • Data modulation • Transport block size 	<ul style="list-style-type: none"> ➤ Transmission power control bits ➤ Transmission timing control bits ➤ ACK/NACK bit for the reservation channel and fast access channel
L2 control	<ul style="list-style-type: none"> ➤ Scheduling • UE identity ➤ H-ARQ • H-ARQ process information • Redundancy version • New data indicator 	<ul style="list-style-type: none"> ➤ Scheduling • UE identity • Chunk allocation information • Data modulation • Transport block size ➤ H-ARQ • ACK/NACK

[0028] It can be seen from the table that UE identification information is contained in both downlink and uplink directions. Thus, by virtue of Layer 1 outband identification, having decoded the data on the SCSCH and having determined that the identifier transmitted on the associated physical channel corresponds to the identifier assigned to the UE during the RRC connection establishment procedure, the UE can receive physical channels on which respective shared transport channels are mapped and further process Layer 2 PDUs (Protocol Data Units) corresponding to SDCH and SUCH shared transport channels. Identification for CACH transport channel is analogous to the identification for RACH transport channel in E-UTRA. It can be concluded that identification is applicable to common and shared transport channels (CACH, SDCH and SUCH) apart from evolved broadcast common transport channel (Evolved-BCH). Identification for said common transport channels is of L2 inband type, while the identification for shared transport channels is of Layer 1 outband type.

[0029] From the definitions of "Layer 2 inband" and "Layer 1 outband" identification one could infer that there is one and only one identifier per UE. Hence, once a Signaling Radio Bearer has been established, the UE has been assigned identifier that can be used for Traffic Radio Bearer as well. However, it is possible that multiple identifiers per UE are defined and used per configured transport channel.

Spectrum allocation

[0030] With respect to stand-alone operation of the mobile terminals spectrum allocations of different sizes (e.g. 1.25 MHz, 2.50 MHz, 5.00 MHz, 10.00 MHz, 15.00 MHz and 20.00 MHz) have been suggested in 3GPP TR 25.912, "Requirements for Evolved UTRA (E-UTRA) and Evolved UTRAN (E-UTRAN)", version 7.1.0 (available at <http://www.3gpp.org>). It can be shown that data rate of evolved Primary Common Control Physical Channel (P-CCPCH - in legacy system, the BCH transport channel is mapped to the P-CCPCH) varies depending on size of spectrum allocation (as indicated in the table below), assuming that configuration of Evolved Broadcast Transport Channel is semi-static.

Table 4

[MHz]	1.25	2.50	5.00	10.00	15.00	20.00
[kbps]	4.00	8.00	16.00	32.00	48.00	64.00,

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[0031] It can be concluded that the UE reading time for reading a predetermined amount of data from the physical channels depends upon spectrum allocation. Therefore, for smaller spectrum allocations, the UE reading time and thereby power consumption is increased. Furthermore, when the data size implies the transmission of the data over several transmission time intervals (TTIs), the UE has to power its receiver to receive data at all TTIs in which the data is provided. For larger spectrum allocations, the UE reading time is decreased, but if several data portions are sent in one TTI, UE may need to decode irrelevant portions in that TTI, since the receivers may typically only be tuned to receive data of a complete TTI. This may also lead to unnecessarily increased UE power consumption.

[0032] The potential shortcomings outlined above are illustrated in Fig. 8 and 9 for the transmission of broadcast system information (BSI), which is typically partitioned into system information blocks (SIBs) in UMTS (Fig. 7). From Fig. 8, it can be recognized that for a spectrum allocation size of 5.00 MHz, the UE has to receive contents of the broadcast control channel BCCH over two successive TTIs to acquire information contained in SIB8, even though possibly MIB (at a given time instant) and SIB7/9/10 may not be of interest for the UE. Also, for larger spectrum allocations, e.g. of the size 10.00 MHz, as shown in Fig. 4, the UE decodes the master information block MIB and SIB1. In addition, the UE also decodes SIB2 and SIB3 even though the contents of these information blocks may not be necessary for system access or elementary mobility functions.

SUMMARY OF THE INVENTION

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[0033] The object of the invention is to suggest an improved method for broadcasting broadcast system information.

[0034] The object is solved by the subject matter of the independent claims. Advantageous embodiments of the invention are subject matters to the dependent claims.

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[0035] According to an aspect of the invention, different partitions of broadcast system information are mapped to a shared transport channel or a broadcast transport channel for transmission. According to an embodiment of the invention, the mapping may take into account parameters inherent to the mobile terminals to which the broadcast system information is to be transmitted and/or parameters inherent to the different partitions of broadcast system information.

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[0036] In an embodiment of the invention, a method for transmitting broadcast system information in a radio access network of a mobile communication system is provided. According to the method, system information blocks of a broadcast control logical channel is mapped to a shared transport channel or a broadcast transport channel depending on a property of a respective system information block or the mobile terminals to receive the broadcast system information, and the system information blocks are transmitted via the shared transport channel and the broadcast transport channel, respectively.

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[0037] For example, the intrinsic property of a system information block may be at least one of the temporal variability of the information contained in the system information block, the size of the system information block, the necessity of the information comprised in the system information block for system access, and the necessity of the information comprised in the system information block for tracking user location within the mobile communication system.

[0038] Examples for an intrinsic property of the mobile terminals may be a capability to support an optional feature within the mobile communication system.

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[0039] In another embodiment of the invention, a master information block of a broadcast control logical channel is transmitted periodically via the broadcast transport channel. The master information block may comprise control information associated to a respective one of the system information blocks. The associated control information may indicate whether a respective system information block is mapped to the broadcast transport channel or the shared transport channel.

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[0040] In case a system information block is mapped to the shared transport channel, in a variation of the embodiment, the associated control information comprises transmission format and timing of a respective system information block transmitted via the shared transport channel.

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[0041] In a further variation, the associated control information specifies at least the position of the respective system information block on the broadcast transport channel, the time interval at which the respective system information block is transmitted and a timer value- or value tag-based update mechanism to be utilized to update the information of the respective system information block.

[0042] In a further embodiment of the invention the control information is transmitted on a control channel associated to the shared data channel. The control information may indicate to the transmission format and timing of a respective

system information block transmitted via the shared transport channel.

[0043] In a variation of the embodiment, the control information further comprises identification of the logical channel-to-transport channel mapping.

[0044] In another embodiment of the invention part of control information is transmitted in the headers of shared transport channel packets and comprises an identification of the logical channel to transport channel mapping.

[0045] In both embodiments above, the identification of the logical channel-to-transport channel mapping may be made by including a plurality of configured or default identifiers to the control information as transmitted on master information block.

[0046] In a further embodiment of the invention the system broadcast information comprises information on the configuration of at least one shared transport channel of a neighboring radio cell.

[0047] Another embodiment of the invention relates to the reception of broadcast system information in a radio access network of a mobile communication system by a mobile terminal. The mobile terminal may receive a master information block of a broadcast control logical channel via a broadcast transport channel. The master information block may comprise control information associated to a respective one of a plurality of system information blocks used to convey the broadcast system information. Further, the associated control information may indicate to the mobile terminal whether a respective system information block of a plurality of system information blocks conveying the broadcast system information is mapped to the broadcast transport channel or a shared transport channel. The mobile terminal may receive system information blocks of a broadcast control logical channel on a shared transport channel or a broadcast transport channel according to the indication in the master information block.

[0048] In case a system information block is to be received via the shared transport channel, a variation of the embodiment foresees comprising a configuration of the shared transport channel to which the system information block is mapped, further associated control information in the master information block, and identifying the shared transport channel on which the system information block is mapped among a plurality of shared transport channels based on the indication in the associated control information of the master information block to receive the system information block via the identified shared channel and transmitted configured or default identifier. The configuration may for example be a set of transmission format parameters. The indication of the mapping of individual SIBs to the shared transport channel may for example be made by using configured or default identifiers, each identifying an associated transport channel in the system.

[0049] In another embodiment of the invention the mobile terminal may receive control information on a physical control channel associated to the shared data channel. The associated control information may indicate the transmission format and timing of a respective system information block transmitted via the shared transport channel. The mobile terminal may utilize the indicated transmission format and timing for receiving the respective system information block via the shared transport channel.

[0050] Further, in an embodiment of the invention, the system broadcast information received by the mobile terminal may also comprise information on the configuration of at least one shared transport channel of a neighboring radio cell and the mobile terminal may use the information on the configuration of at least one shared transport channel of a neighboring radio cell for receiving broadcast system information in the neighboring radio cell, in case the mobile terminal is handed over to the neighboring radio cell.

[0051] Another embodiment of the invention provides a transmission apparatus in a radio access network for transmitting broadcast system information in the radio access network of a mobile communication system. The transmission apparatus may comprise a processor to map system information blocks of a broadcast control logical channel to a shared transport channel and a broadcast transport channel depending on a property of a respective system information block or the mobile terminals to receive the broadcast system information. Further, it may comprise a transmitter to transmit the system information blocks via the shared transport channel and the broadcast transport channel, respectively.

[0052] In a variation of the embodiment, the transmission apparatus is configured to perform the steps of the method for transmitting broadcast system information according to one of the various embodiments and variations described herein.

[0053] A further embodiment of the invention relates to a mobile terminal for receiving broadcast system information in a radio access network of a mobile communication system. According to this exemplary embodiment the mobile terminal comprises a receiver for receiving a master information block of a broadcast control logical channel via a broadcast transport channel. Moreover, the mobile terminal may be configured with a processor for obtaining control information from the master information block. This control information is associated to a respective one of a plurality of system information blocks used to convey the broadcast system information and may indicate whether a respective system information block is mapped to the broadcast transport channel or a shared transport channel. The receiver may further receive system information blocks of a broadcast control logical channel on a shared transport channel or a broadcast transport channel according to the indication in the master information block.

[0054] The mobile terminal according to another embodiment of the invention may be configured to perform the steps of the method for receiving broadcast system information according to one of the different embodiments and variations

described herein.

5 [0055] Other embodiment of the invention relates to the implementation of the different aspects of the invention in software. Therefore, an embodiment of the invention provides a computer-readable medium storing instructions that, when executed by a processor of a transmission apparatus, causes the transmission apparatus to transmit broadcast system information in a radio access network of a mobile communication system. In this embodiment, the transmission apparatus is caused to transmit broadcast system information by mapping system information blocks of a broadcast control logical channel to a shared transport channel or a broadcast transport channel depending on a property of a respective system information block or the mobile terminals to receive the broadcast system information, and by transmitting the system information blocks via the shared transport channel and the broadcast transport channel, respectively.

10 [0056] The computer-readable medium according to another embodiment of the invention may further store instructions that cause the processor of the transmission apparatus to execute the steps of the method for transmitting broadcast system information according to one of the embodiments and variants described herein.

15 [0057] A further embodiment of the invention provides a computer-readable medium storing instructions that, when executed by a processor of a mobile terminal, causes the mobile terminal to receive broadcast system information in a radio access network of a mobile communication system.

[0058] The mobile terminal may be caused to receive broadcast system information by receiving a master information block of a broadcast control logical channel via a broadcast transport channel and by receiving system information blocks of a broadcast control logical channel on a shared transport channel or a broadcast transport channel according to the indication in the master information block. The master information block may comprise control information associated to a respective one of a plurality of system information blocks used to convey the broadcast system information. The associated control information indicates whether a respective system information block is mapped to the broadcast transport channel or a shared transport channel.

20 [0059] The computer-readable medium in another embodiment of the invention further stores instructions causing the processor of the mobile terminal to execute the steps of the method for receiving broadcast system information according to one of the various embodiment and variants thereof described herein.

BRIEF DESCRIPTION OF THE FIGURES

30 [0060] In the following the invention is described in more detail in reference to the attached figures and drawings. Similar or corresponding details in the figures are marked with the same reference numerals.

- Fig. 1 shows the high-level architecture of UMTS,
- 35 Fig. 2 shows the architecture of the UTRAN according to UMTS R99/4/5,
- Fig. 3 shows a Drift and a Serving Radio Subsystem in a UMTS network,
- Fig. 4 shows an overview of the protocol model of the UTRAN in an UMTS network,
- 40 Fig. 5 shows an overview of the radio interface protocol architecture of the UTRAN,
- Fig. 6 shows the structure of a Master Information Block (MIB),
- 45 Fig. 7 to 9 show examples of transmissions of Broadcast System Information (BSI) in System Information Blocks (SIBs) at different using different channel bandwidths,
- Fig. 10 shows an exemplary mapping of system information blocks of broadcast system information to a broadcast transport channel and a shared transport channel using Layer 1 outband identification according to an embodiment of the invention,
- 50 Fig. 11 shows an exemplary format of a Master Information Block used in the mapping of system information blocks in Fig. 10 according to an embodiment of the invention,
- 55 Fig. 12 shows an exemplary mapping of system information blocks of broadcast system information to a broadcast transport channel and a shared transport channel using Layer 2 inband identification according to an embodiment of the invention,
- Fig. 13 shows an exemplary format of a Master Information Block used in the mapping of system information

blocks in Fig. 12 according to an embodiment of the invention,

5 **Fig. 14 to 17** show different examples of mapping of system information blocks to a shared transport channel and a broadcast transport channel based on different criteria according to different embodiments of the invention, and

10 **Fig. 18** shows a mapping of system information blocks of broadcast system information comprising information on a shared transport channel in a neighboring radio cell to a broadcast transport channel and a shared transport channel and a handover of a mobile terminal to the neighboring radio cell according to an embodiment of the invention.

DETAILED DESCRIPTION OF THE INVENTION

15 **[0061]** The following paragraphs will describe various embodiments of the invention. For exemplary purposes only, most of the embodiments are outlined in relation to a UMTS communication system and the terminology used in the subsequent sections mainly relates to the UMTS terminology, as the invention may be advantageously used in this type of communication system. However, the terminology used and the description of the embodiments with respect to a UMTS system is not intended to limit the principles and ideas of the invention to such system.

20 **[0062]** Also the detailed explanations given in the Technical Background section above are intended to better understand the mostly UMTS specific exemplary embodiments described in the following and should not be understood as limiting general ideas underlying the invention to the described specific implementations of processes and functions in a mobile communication network.

25 **[0063]** According to one aspect of the invention, it is proposed to map broadcast system information of logical channels to a shared transport channel and/or to a broadcast transport channel. Broadcast system information may for example be information transmitted over a broadcast control logical channel.

30 **[0064]** In an embodiment of the invention, the mapping of different portions of the broadcast system information, also referred to as system information blocks herein, to either one of the two transport channels is based on a certain criterion or certain criteria. For example, criteria that may be used as a basis for the mapping decision may be intrinsic property of a system information block or an intrinsic property of the mobile terminals to which the system information is to be broadcast.

35 **[0065]** Examples for an intrinsic property of a system information block may be temporal variability of the information contained in the system information block or the size of the system information block. Another intrinsic property of a system information block is for example the necessity of the information comprised in the system information block for system access or the necessity of the information comprised in the system information block for tracking user location within the mobile communication system.

[0066] An intrinsic property of the mobile terminals may for example be the capability of terminals to support feature (s) defined optional within the mobile communication system.

40 **[0067]** The mapping of system information blocks to a shared or broadcast transport channel can be advantageous in that the acquisition of this information by mobile terminals in terms of terminal processing time and power consumption may be optimized. Other advantages that may be achieved when applying the invention may be improved reading time for broadcast system information of mobile terminals for all sizes of standalone spectrum allocations, greater flexibility of operators in configuring transport channels for broadcast and increased scheduling efficiency of system information, which may be a result from mapping system information to a shared transport channel.

45 **[0068]** Another aspect of the invention is the behavior of the mobile terminals to receive the broadcast system information. According to another embodiment of the invention, the mobile terminals will receive a master information block on the broadcast transport channel, which indicates the mapping of individual SIBs to either the broadcast transport channel or the shared transport channel. Based on the indication of the mapping used, the mobile terminals will receive the SIBs either on the broadcast control channel or the shared control channel. In another embodiment of the invention, Layer 1 outband or Layer 2 inband identification is used for providing the mobile terminals with control information necessary to appropriately receive the SIBs, as will be outlined in more detail below.

50 **[0069]** In the following the structure of system broadcast information and their allocation to different System Information Blocks (SIBs) according to an exemplary embodiment of the invention is outlined considering a UMTS system. The structure of the information transmitted on the broadcast control channel - a logical channel - may be tree-like. A so-called Master Information Block (MIB) forms the root of the tree structure, whereas the so-called System Information Blocks (SIBs) represent its branches. The MIB information may be transmitted less frequently than the SIBs carrying the broadcast system information. The information in the MIB may also not need to be read by the individual terminals each time the MIB information is transmitted.

55 **[0070]** The structure of the information on the BCCH is shown for exemplary purpose in Fig. 6. One part of MIB may

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for example be reserved for information upon each System Information Block. The control information associated to a respective SIB and comprised in the reserved parts may have the following structure. Each control information associated to a SIB may indicate the position of SIB on the broadcast transport channel on which it is transmitted relative to common timing reference. Further, a repetition period of SIB may be indicated. This repetition period indicates the periodicity at which the respective SIB is transmitted. The control information may further include a timer value for timer-based update mechanism or, alternatively, a value tag for tag-based update of the SIB information.

[0071] For SIBs whose reference in MIB contains timer value, a mobile terminal may update system information after expiry of value indicated in timer field of MIB. For SIBs whose reference in MIB contains value tag, a mobile terminal may update system information after the value of tag as indicated in respective field of MIB has been changed with respect to the value from the previous update. Respective exemplary MIB formats according to different embodiments of the invention will be described with reference to Fig. 11 and 13 below.

[0072] The table below shows an exemplary overview of the categorization and types of system information blocks in an UMTS legacy system (see 3GPP TS 25.331, "Radio Resource Control (RRC)", version 6.7.0, section 8.1.1, incorporated herein by reference; available at <http://www.3gpp.org>) that may be used in the different embodiments of the invention described herein. In this example, the classification of the system broadcast information into the different SIBs is based on the content and temporal variability.

Table 5

SIB	Content	Temporal Variability
SIB1	NAS info, UE timers/counters	low
SIB2	URA identity	low
SIB3	Cell selection parameters	low
SIB4	Cell selection par. for connected mode	low
SIB5	Common physical channels configuration	medium
SIB6	Common physical channels configuration	medium
SIB7	Interference/ dynamic persistence level	high
SIB11	Measurement control	medium
SIB12	Measurement control information for connected mode	medium
SIB13	ANSI-41 info	low
SIB14	Outer loop power control information	medium
SIB15	Positioning information	low
SIB16	Preconfiguration	medium
SIB17	Configuration of shared physical channels in connected mode	high
SIB18	PLMN IDs of neighboring cells	low

[0073] The contents of the table illustrated above should be only considered as one possible example of the contents and classification of the broadcast system information. Also the classification of the frequency at which the different portions of the system information is broadcast and its classification into the different SIBs is intended to serve only for exemplary purposes and is not intended to limit the invention to this example. It is recognized that in the ongoing development and improvement of existing mobile communication systems, the content, format, periodicity of transmission, etc. may change.

[0074] Fig. 10 shows an exemplary mapping of system information blocks of broadcast system information to a broadcast transport channel and a shared transport channel using Layer 1 outband identification according to an embodiment of the invention. In Fig. 10, the data mapped to three different channels, a broadcast transport channel, a shared transport channel and a physical control channel associated to the shared transport channel, is shown. The control channel is associated to the shared transport channel in that it contains control information describing transmission format and timing of the data on the shared transport channel. In another embodiment of the invention the parameters describing transmission format may define the format for an OFDMA based radio access as described in Tdoc R1-050604 of the 3GPP TSG RAN WG #1 ad hoc, "Downlink Channelization and Multiplexing for EUTRA", June 2005 (available at <http://www.3gpp.org>), incorporated herein by reference).

[0075] Further, the mobile terminal (or, equivalently, logical to transport channel mapping) to receive the system information may be designated by respective Layer 1 outband identification as discussed previously. Accordingly, the logical-to-transport channel mapping is indicated on the associated physical control channel (e.g. SCSCCH).

[0076] The broadcast system information provided on the broadcast control logical channel (e.g. the BCCH in UMTS), is mapped to the shared transport channel and the broadcast transport channel of Fig. 10.

[0077] For the broadcast transport channel, three transport blocks are shown in Fig. 10. In the exemplary embodiment, a Master Information Block (MIB) is transmitted periodically (MIB repetition period). For example, the MIB may be transmitted at the beginning of each transport block or after a predetermined time span, such as a given number of transmission time intervals (TTIs). Further, a transport block may comprise one or more System Information Blocks (SIBs). A SIB comprises a portion of the system broadcast information to be transmitted. For example, each SIB may comprise a predetermined or configurable set of information of a certain category as exemplified in the Table 5.

[0078] The MIB used in the exemplary embodiment shown in Fig. 10 is illustrated in Fig. 11 in further detail. The structure of system broadcast information according to this embodiment of the invention is also tree-like, as has been outlined above. The MIB comprises different partitions of control information each of these partitions being associated to a respective SIB.

[0079] For those SIBs that are mapped to the broadcast transport channel for transmission, the control information associated to a respective SIB may have the following structure. Each control information associated to a SIB (pointer to SIB #n) indicates the position of the SIB on the broadcast transport channel on which it is transmitted relative to common timing reference. Further, a repetition period of SIB indicating the periodicity at which the respective SIB is transmitted may be indicated. In the exemplary embodiment shown in Fig. 10, the control information in the MIB associated to SIB1, SIB3, SIB 4 and SIB6 have this structure.

[0080] In contrast to SIB1, SIB3, SIB 4 and SIB6, SIB2 is transmitted via the shared transport channel. The MIB control information relating to SIB2 has a different structure than the control information for the set of SIBs. According to the exemplary embodiment, the control information for SIB2 in the MIB comprises an indication of the shared transport channel on which SIB2 is transmitted. This indication is illustrated by the dashed arrow pointing from the MIB to the shared transport channel in Fig. 10.

[0081] Based on the control information in the MIB, the mobile terminals may recognize which SIBs are transmitted and to which channel they are mapped. I.e. in the exemplary embodiment, the mobile terminals determine that SIB1, SIB3, SIB4 and SIB6 are mapped to and transmitted on the broadcast transport channel, while SIB2 is mapped to and transmitted on the shared transport channel.

[0082] As indicated above, Layer 1 outband identification is used for indicating the logical channel-to-transport channel mapping to the receiving mobile terminals. For this purpose and identification of the mapping is transmitted on the associated control channel (see "ID"). This identification may for example use default or configured identifiers of the logical channel to which a respective transport channel is to be mapped on the receiving side. These identifiers may be transmitted by in the MIB.

[0083] The identifiers may for example be HEX-values:

■ 0x0000 00FF logical channel BCCH (Broadcast Control Channel) is mapped upon SDCH,

■ 0x0100 01 FF logical channel PCCH (Paging Control Channel) is mapped upon SDCH and

■ 0x0200 FFFF logical channel DCCH/DTCH (Dedicated Control Channel/ Dedicated Transport Channel) is mapped upon SDCH

[0084] The identifiers used may be default values or may be configured by the system.

[0085] The control channel associated to the shared transport channel comprises control information, which indicates the scheduling of the SIB on the shared transport channel. The control information may at least indicate temporal position of the SIB(s) mapped to the shared channel on that channel for a respective SIB. In another embodiment of the invention the control information on the associated control channel is scheduling information as shown in Table 3 above and may comprise information on chunk allocation, data modulation and transport block size. According to an embodiment of the invention the transmission format parameters may be defined as in in Tdoc R1-050604 3GPP TSG RAN WG1 ad hoc "Downlink Channelisation and Multiplexing for EUTRA". mentioned above,

[0086] Hence, in the exemplary embodiment shown in Fig. 10, the MIB control information indicate to the mobile terminal that SIB2 has been mapped to the shared transport channel, while the control information for SIB on the associated control channel indicates the temporal position of SIB2 on the shared channel to a receiving mobile terminal and transmission format.

[0087] According to one embodiment of the invention, the temporal position can be given as dynamically changing scheduling information with respect to common system timing reference. An exemplary implementation is for example

described in the TS 25.331 "Radio Resource Control (RRC)" mentioned above. As explained above, the transmission format may indicate at least chunk allocation, data modulation and transport block size. Finally, although not explicitly mentioned, a configuration of the associated physical control channel (e.g. SCSCCH) may also be necessary.

5 [0088] Returning to the transmission of broadcast system information in UMTS systems for exemplary purposes only, Layer 1 outband identification and transmission of scheduling information are specific for shared downlink transport channel while scheduling information of system information blocks conveyed via broadcast transport channel is transmitted within the Master Information Block of the broadcast transport channel, that is within Layer 2 transport blocks. The configuration of the broadcast transport channel may be for example semi-static, while the configuration of the shared downlink transport channel may be semi-static or dynamic. The flexibility of dynamic configuration of the shared transport channel in this embodiment of the invention may be advantageous from radio resource utilization perspective since fast scheduling of broadcast system information could be efficiently supported.

10 [0089] In an exemplary embodiment of the invention, the shared transport channel may be the Shared Downlink CHannel (SDCH) of a UMTS system, while the broadcast transport channel may be the Broadcast CHannel (BCH); the control channel associated to the SDCH may be the Shared Control Signaling Channel (SCSCH).

15 [0090] Fig. 12 shows another exemplary mapping of system information blocks of broadcast system information to a broadcast transport channel and a shared transport channel using Layer 2 inband identification according to another embodiment of the invention.

[0091] In the exemplary embodiment illustrated in Fig. 12, a shared channel is used without the need of an associated (physical) control channel for identification. As in the embodiment of the invention described with respect to Fig. 10 and 20 11, also in the embodiment shown in Fig. 12 broadcast system information is mapped to a broadcast transport channel and a shared transport channel. The identifier ("ID" indicating the logical channel-to-transport channel mapping and semi-static configuration information (timing and transmission format) of the shared channel (e.g. SDCH) and configuration of associated physical control channel (e.g. SCSCCH) are transmitted inband. This means that both pieces of information are transmitted at Layer 2. For example, the identification ("ID") may be provided within the header of Layer 25 2 packets of the shared transport channel, while the configuration information of shared channel may be provided within MIB.

[0092] The identifier ID may be a default identifier or may be configured/assigned through MIB of the broadcast transport channel, as described above. Fig. 13 shows an exemplary format of a Master Information Block used in the mapping of system information blocks in Fig. 12. The structure of the control information for SIBs mapped to the broadcast transport channel is similar to that in the MIB shown in Fig. 11. The MIB control information of the SIBs mapped to the shared transport channel may in addition comprise an indication of the shared transport channel to which they have been mapped respectively.

[0093] In the following paragraphs the mapping of the system information blocks transporting the individual portions of the broadcast system information of the broadcast control logical channel according to different embodiments will be described. In the following embodiments of the invention described with respect to Fig. 14 to 18, the broadcast system information is transmitted in system information blocks that are mapped to a broadcast transport channel or a shared transport channel using either Layer 1 outband identification (Fig. 10 and 11) or Layer 2 inband identification (Fig. 12 and 13). As will be explained in the following, the mapping may be based for example on a property / properties inherent to a respective SIB or the mobile terminals to receive the SIBs.

40 [0094] Fig. 8 and 9 show the transmission of broadcast information over broadcast transport channel on a time axis. Fig. 8 is plotted for spectrum allocation of 5 MHz and broadcast data rate of 16 kbps. Fig. 9 is plotted for spectrum allocation of 10 MHz and broadcast data rate of 32 kbps.

[0095] In Fig. 14 to 18, the spectrum allocation of either 5 MHz or 10 MHz is assumed and respective data rates of 16 or 32 kbps are (usually unevenly) distributed between broadcast and shared transport channel. By mapping broadcast system information to broadcast and shared transport channels a more flexible transmission scheme for broadcast system information may be in comparison to cases where broadcast system information is mapped only to a broadcast transport channel. For example, in Fig. 15 the data rate of broadcast and shared transport channel is divided in ratio 3: 1 since the resulting data rate on the shared channel is sufficient to transmit SIB1 over the shared transport channel in one TTI, as will be explained below.

50 [0096] It should be noted that the actual resource utilization is not precisely plotted in Fig. 8, 9 and 14 to 18.

[0097] According to one embodiment of the invention, a criterion based on which the mapping of SIBs to either a shared transport channel or a broadcast transport channel is decided, may be the importance of the information of a respective SIB for mobile terminals.

55 [0098] Information important for mobile terminals may for example be system information that is necessary to be received, stored and kept up-to-date by mobile terminal in order to perform system access and elementary mobility procedures.

[0099] Considering for exemplary purposes only a UMTS system, system access may designate the procedure aimed at establishing signaling connection (signaling radio bearer). Hence, in this exemplary scenario the important information

is information necessary for the mobile terminal to establish a signaling connection. Elementary mobility procedures on the other hand designate the procedures aimed at tracking user location by the network on tracking area level - without established signaling connection - and on cell level - with established signaling connection.

5 **[0100]** Following the definition of important information and considering the exemplary classification of broadcast system information as shown in Table 5, SIB1, SIB2, SIB3, SIB5, SIB6, SIB17 and SIB18 may be classified as information important for mobile terminals, since they are necessary for performing system access and elementary mobility procedures. On the other hand, for example SIB13 and SIB15 may be classified as information not important (optional) for mobile terminals since they are not necessary for performing system access and elementary mobility procedures.

10 **[0101]** Fig. 14 shows an exemplary mapping of system information blocks to a shared transport channel having a 5 MHz spectrum allocation and a data rate of 8 kbps and a broadcast control channel also having a 5 MHz spectrum allocation and a data rate of 8 kbps according to an embodiment of the invention. Fig. 14 proposes a mapping overcoming the problems discussed with respect to Fig. 8, where the mobile terminal had to receive two successive TTIs to obtain the important SIB8. In Fig. 14, SIB8 is now mapped to the shared transport channel, which allows transmitting SIB8 in a single TTI, thereby reducing power consumption of the mobile terminal. Further, the MIB can be transmitted simultaneously (i.e. in the same TTI) as SIB8 which allows the mobile terminal to acquire the important information in SIB8 faster compared to the scenario in Fig.8.

15 **[0102]** In the exemplary embodiment shown in Fig. 14, the mapping of SIB8 to the shared channel has been based on the importance of the information contained in SIB8 for the mobile terminals. Another criterion may be the size of the SIBs. For example, SIBs larger than a predetermined threshold may be mapped to the shared transport channel. For example, this option may be of advantage, if several TTIs would be required for the transmission of the SIB of broadcast transport channel and/or the shared transport channel can be sent with higher data rate than that used for the broadcast transport channel.

20 **[0103]** Fig. 15 shows an exemplary mapping of system information blocks to a shared transport channel having a 10 MHz spectrum allocation and a data rate of 24 kbps and a broadcast control channel also having a 10 MHz spectrum allocation and a data rate of 8 kbps according to an embodiment of the invention. This exemplary embodiment illustrates an improvement of the system information allocation in Fig. 9, where SIB1 has been the only SIB containing information relevant for the mobile terminal (the MIB may not be read every time it is transmitted). Though the mobile terminal may only be interested in the content of SIB1 of Fig. 9, it would need to read the whole content broadcast on the broadcast transport channel within a TTI, since receivers may typically only be tuned to receive data within a whole TTI.

25 **[0104]** According to the embodiment illustrated in Fig. 15, the SIB(s) comprising information important for the mobile terminals are mapped to the shared transport channel, while SIBs carrying optional information, i.e. information not important for the mobile terminals are mapped to the broadcast transport channel. Assuming that the content of SIB2 and SIB3 in Fig. 15 is optional information and that the mobile terminal may not need to read the MIB in this TTI, the mobile terminal may only read the shared transport channel carrying SIB1 from the shared transport channel and may save power by not reading the broadcast transport channel in that TTI.

30 **[0105]** Further, considering that the data rates on shared transport channel and broadcast transport channel may vary from each other, another benefit of the mapping of SIBs to a shared transport channel offering a lower data rate than the broadcast transport channel may be an increase in the reliability of the transmitted information in the SIBs transmitted on the shared transport channel. Since a lower data rate may also imply a lower coding rate and/or a lower order modulation scheme being used compared to the configuration of the broadcast control channel, the information transmitted via the shared transport channel may have a higher reliability. In UMTS systems, the configuration of the broadcast transport channel may be static and hence its data rate may not be changed.

35 **[0106]** Another criterion that may be considered for mapping of SIBs to a shared transport channel or a broadcast transport channel may be the features supported by the mobile terminals within a certain cell. For example, if none of the mobile terminals currently present in a cell are supporting positioning based on GPS (Global Positioning System), the related SIB may be omitted from broadcast on the broadcast transport channel and may be instead transmitted via a shared transport channel. Advantageously, the SIB may be transmitted during discontinuous reception (DRX) periods on the shared transport channel, if mobile terminals supporting GPS connect / are handed over to the cell. Hence resources can be dynamically shared with user plane data.

40 **[0107]** Fig. 16 shows a mapping of SIBs to a shared or broadcast transport channel based on the variability of the information in the respective SIB according to an embodiment of the invention. SIBs that comprise broadcast system information of high variability may be mapped to the shared transport channel. Considering a classification of broadcast system information as shown in Table 5 above, e.g. physical channel configuration, interference and dynamic persistence level may be considered SIBs comprising information undergoing frequent changes. Further, as indicated above, depending on the data rate distribution between the broadcast transport channel and the shared transport channel, the transmission of frequently changing SIBs via the shared transport channel may allow for lower repetition periods or alternatively increase the reliability of the transmission of the respective SIBs.

45 **[0108]** To generically classify information according to temporal variability, rates f_1 and f_2 ($f_1 < f_2$) describing frequency

of change of this information may be considered. For example, an information (SIB) may be classified to be of low temporal variability, if its rate of change f relates to f_1 as $f \leq f_1$. Analogously, information may be of high temporal variability, if its rate of change f relates to f_2 as $f \geq f_2$. Finally, information is of medium temporal variability, if its rate of change f relates to f_1 and f_2 as $f_1 < f < f_2$.

5 **[0109]** Another possible mapping of SIBs to a shared transport channel and a broadcast transport channel according to a further embodiment of the invention is shown in Fig. 17. In this exemplary embodiment only optional information (i.e. information not important for the mobile terminals) is mapped upon shared channel. The optional information may for example be ANSI 42 information or GPS information. This mapping may be beneficial in that the mobile terminals would only need to acquire necessary information from broadcast transport channel and without reading shared transport channel. Only if a mobile terminal would support a feature for which the optional information is needed, it may read the
10 respective SIBs from the shared transport channel.

[0110] In another embodiment of the invention, the configuration of shared transport channel used for the transmission of broadcast system information in neighboring cells may be broadcast to the mobile terminals of a cell. Accordingly, Fig. 18 shows a mapping of system information blocks of broadcast system information comprising information on a
15 shared transport channel in a neighboring radio cell to a broadcast transport channel and a shared transport channel and a handover of a mobile terminal to the neighboring radio cell according to an embodiment of the invention. In the exemplary embodiment, it may be assumed that the shared transport channel in a respective cell is used to provide system broadcast information to the mobile terminals that is important information, i.e. information necessary to perform system access and elementary mobility procedures.

20 **[0111]** In Fig. 18, at the time instant $n+1$ (the time instants are given by the number of TTIs having past since a given starting time) the mobile terminal starts receiving the MIB via the broadcast transport channel. Further it may be assumed that SIB8 in each radio cell comprises information necessary to perform system access and elementary mobility procedures. The dashed blocks are intended to indicate, that the mobile terminal receiving the information is located in a source cell, when receiving the information. The MIB received in the TTI following time instant $n+1$ may comprise an
25 indication to the shared transport channel at which SIB8 is broadcast in a neighboring cell(s). Alternatively, a SIB containing this information may be specified by the MIB (for example SIB3 read by the mobile terminal at the TTI starting at time instant n).

[0112] Upon the time instant $n+2$, the mobile terminal is handed over from its source cell to another cell, the target cell. Since it has already acquired the control information necessary to receive SIB8 on the shared transport channel, the mobile terminal may already read SIB8 from the shared transport channel of the target cell at time instant $n+2$.
30 Hence, the mobile terminal may not need to receive the first MIB in the target cell transmitted at time instant $n+3$ on the broadcast transport channel to be able to read SIB8 from the shared transport channel at time instant $n+4$.

[0113] More generally, information on the configuration of the neighboring cells (including the target cell) may be provided as part of the broadcast system information within a cell. The configuration information on the neighboring cells
35 may be for example included in a system information block or may be provided as part of the MIB to the mobile terminals of a radio cell. The configuration information may depend on the respective mapping used for transmission of the broadcast system information via the shared transport channel and the broadcast transport channel in a respective neighboring cell.

[0114] If a configuration as shown in Fig. 10 is used, the MIB may comprise chunk allocation and possibly modulation format, transport block size etc. of the control physical channel associated to the shared transport channel in the neighboring cell(s). The associated physical control channel in the neighboring cell then contains chunk allocation, modulation
40 format, transport block size etc. for the shared transport channel in the neighboring cell. This information may be changed on a dynamic basis in the neighboring cell.

[0115] Alternatively, when using a configuration as shown in Fig. 12, the MIB in the source cell may comprise chunk allocation, modulation format, transport block size etc. for the shared transport channel in the neighboring cell(s). This
45 information may for example be changed on semi-static basis in the neighboring cell.

[0116] In Fig. 10 to 18 illustrating various exemplary embodiments of the invention, the different SIBs have been distinguished by different numbers (SIB1, SIB2, SIB3, etc.). These numbers are merely intended to exemplarily indicate different information comprised by the respective SIB. However, in another embodiment of the invention the numbering
50 of SIBs may indicate their respective content as indicated e.g. in Table 5.

[0117] Another embodiment of the invention relates to the implementation of the above described various embodiments using hardware and software. It is recognized that the various embodiments of the invention above may be implemented or performed using computing devices (processors). A computing device or processor may for example be general purpose processors, digital signal processors (DSP), application specific integrated circuits (ASIC), field programmable gate arrays (FPGA) or other programmable logic devices, etc. The various embodiments of the invention may also be
55 performed or embodied by a combination of these devices.

[0118] Further, the various embodiments of the invention may also be implemented by means of software modules, which are executed by a processor or directly in hardware. Also a combination of software modules and a hardware

implementation may be possible. The software modules may be stored on any kind of computer readable storage media, for example RAM, EPROM, EEPROM, flash memory, registers, hard disks, CD-ROM, DVD, etc.

5 **Claims**

1. A method for transmitting broadcast system information in a radio access network of a mobile communication system, the method comprising the following steps performed by a transmission apparatus:
 - 10 mapping system information blocks of a broadcast control logical channel to a shared transport channel or a broadcast transport channel depending on a property of a respective system information block or the mobile terminals to receive the broadcast system information, and transmitting the system information blocks via the shared transport channel and the broadcast transport channel, respectively.
 - 15 2. The method according to claim 1, wherein the property of a system information block is at least one of the temporal variability of the information contained in the system information block, the size of the system information block, the necessity of the information comprised in the system information block for system access, and the necessity of the information comprised in the system information block for tracking user location within the mobile communication system.
 - 20 3. The method according to claim 1 or 2, wherein the property of the mobile terminals is at least one of the capability to support an optional feature within the mobile communication system.
 - 25 4. The method according to one of claims 1 to 3, further comprising the step of transmitting a master information block of a broadcast control logical channel periodically via the broadcast transport channel, wherein the master information block comprises control information associated to a respective one of the system information blocks, wherein the associated control information indicates whether a respective system information block is mapped to the broadcast transport channel or the shared transport channel.
 - 30 5. The method according to claim 4, wherein in case a system information block is mapped to the shared transport channel, the associated control information comprises transmission format and timing of a respective system information block transmitted via the shared transport channel.
 - 35 6. The method according to claim 4 or 5, wherein in case a system information block is mapped to the broadcast transport channel, the associated control information specifies at least the position of the respective system information block on the broadcast transport channel, the time interval at which the respective system information block is transmitted and a timer value- or value tag-based update mechanism to be utilized to update the information of the respective system information block.
 - 40 7. The method according to one of claims 1 to 6, further comprising the step of transmitting control information on a control channel associated to the shared data channel, wherein the control information indicates to the transmission format and timing of a respective system information block transmitted via the shared transport channel.
 - 45 8. The method according to the claim 7, wherein the control information further comprises identification of the logical channel to transport channel mapping.
 9. The method according to one of claims 1 to 8, further comprising the step of transmitting control information via the shared transport channel, wherein the control information comprises an identification of the logical channel to transport channel mapping.
 - 50 10. The method according to claim 8 or 9, wherein the identification of the logical channel to transport channel mapping is one of a plurality of configured or default identifiers.
 - 55 11. The method according to claim 4, wherein the associated control information specifies at least the position of the respective system information block on the broadcast transport channel, the time interval at which the respective system information block is transmitted and a value- or value tag-based update mechanism to be utilized to update the information of the respective system information block.

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12. The method according to one of claims 1 to 11, wherein the system broadcast information comprises information on the configuration of at least one shared transport channel of a neighboring radio cell.
- 5 13. A method for receiving broadcast system information in a radio access network of a mobile communication system, the method comprising the following steps performed by a mobile terminal:
- receiving a master information block of a broadcast control logical channel via a broadcast transport channel, wherein the master information block comprises control information associated to a respective one of a plurality of system information blocks used to convey the broadcast system information, wherein the associated control information indicates whether a respective system information block is mapped to the broadcast transport channel or a shared transport channel, and
- 10 receiving system information blocks of a broadcast control logical channel on a shared transport channel and a broadcast transport channel according to the indication in the master information block.
- 15 14. The method according to claim 13, wherein in case a system information block is to be received via the shared transport channel, the associated control information in the master information block comprises a configuration of the shared transport channel to which the system information block is mapped, and the method further comprises the step of identifying the shared transport channel on which the system information block is mapped among a plurality of shared transport channels based on the indication in the associated control information of the master information block to receive the system information block via the identified shared channel.
- 20 15. The method according to claim 13 or 14, further comprising the step of receiving control information on a control channel associated to the shared data channel, wherein the control information indicates the transmission format and timing of a respective system information block transmitted via the shared transport channel, wherein the mobile terminal utilizes the indicated transmission format and timing for receiving the respective system information block on the shared transport channel.
- 25 16. The method according to one of claims 13 to 15, wherein the system broadcast information received by the mobile terminal comprises information on the configuration of at least one shared transport channel of a neighboring radio cell and the method further comprises the step of utilizing the information on the configuration of at least one shared transport channel of a neighboring radio cell for receiving broadcast system information in the neighboring radio cell, in case the mobile terminal is handed over to the neighboring radio cell.
- 30 17. A transmission apparatus in a radio access network for transmitting broadcast system information in the radio access network of a mobile communication system, the apparatus comprising:
- a processor for mapping system information blocks of a broadcast control logical channel to a shared transport channel and a broadcast transport channel depending on a property of a respective system information block or the mobile terminals to receive the broadcast system information, and
- 40 a transmitter for transmitting the system information blocks via the shared transport channel and the broadcast transport channel, respectively.
18. The apparatus according to claim 17, wherein the apparatus configured to perform the steps of the method according to one of claims 2 to 12.
- 45 19. A mobile terminal for receiving broadcast system information in a radio access network of a mobile communication system, the mobile terminal comprising:
- 50 a receiver for receiving a master information block of a broadcast control logical channel via a broadcast transport channel,
- a processor for obtaining control information from the master information block, the control information being associated to a respective one of a plurality of system information blocks used to convey the broadcast system information, wherein the associated control information indicates whether a respective system information block is mapped to the broadcast transport channel or a shared transport channel, and
- 55
- wherein the receiver is further adapted to receive system information blocks of a broadcast control logical channel on a shared transport channel and a broadcast transport channel according to the indication in the master information

block.

20. The mobile terminal according to claim 19, wherein the apparatus configured to perform the steps of the method according to one of claims 13 to 16.

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21. A computer-readable medium storing instructions that, when executed by a processor of a transmission apparatus, causes the transmission apparatus to transmit broadcast system information in a radio access network of a mobile communication system, by:

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mapping system information blocks of a broadcast control logical channel to a shared transport channel or a broadcast transport channel depending on a property of a respective system information block or the mobile terminals to receive the broadcast system information, and transmitting the system information blocks via the shared transport channel and the broadcast transport channel, respectively.

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22. The computer-readable medium according to claim 21, further storing instructions causing the processor of the transmission apparatus to execute the steps of the method according to one of claims 1 to 12.

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23. A computer-readable medium storing instructions that, when executed by a processor of a mobile terminal, causes the mobile terminal to receive broadcast system information in a radio access network of a mobile communication system, by:

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receiving a master information block of a broadcast control logical channel via a broadcast transport channel, wherein the master information block comprises control information associated to a respective one of a plurality of system information blocks used to convey the broadcast system information, wherein the associated control information indicates whether a respective system information block is mapped to the broadcast transport channel or a shared transport channel, and receiving system information blocks of a broadcast control logical channel on a shared transport channel or a broadcast transport channel according to the indication in the master information block.

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24. The computer-readable medium according to claim 23, further storing instructions causing the processor of the mobile terminal to execute the steps of the method according to one of claims 13 to 16.

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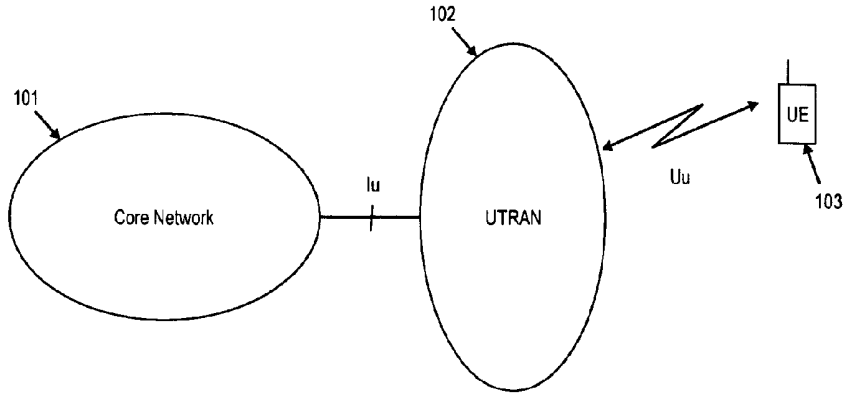


Fig. 1

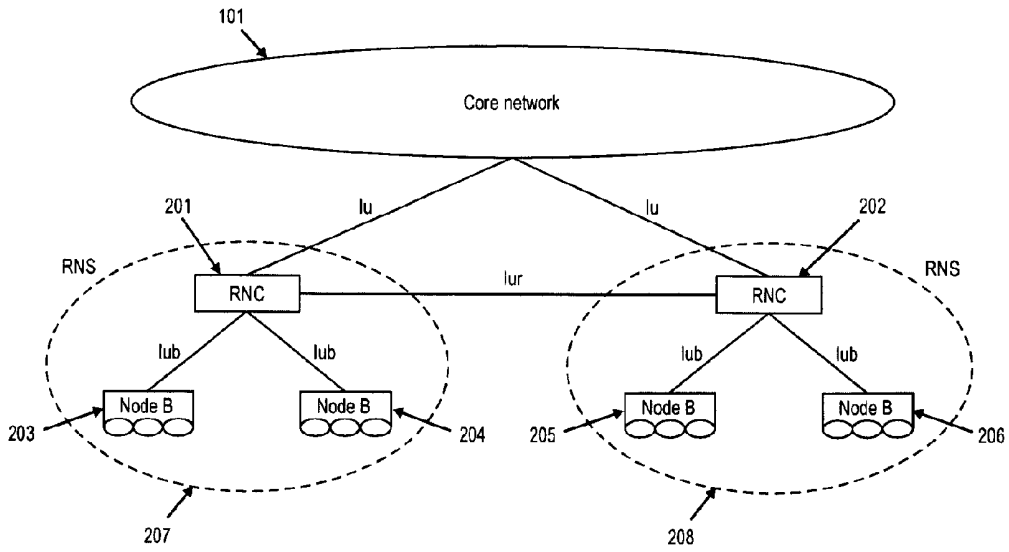


Fig. 2

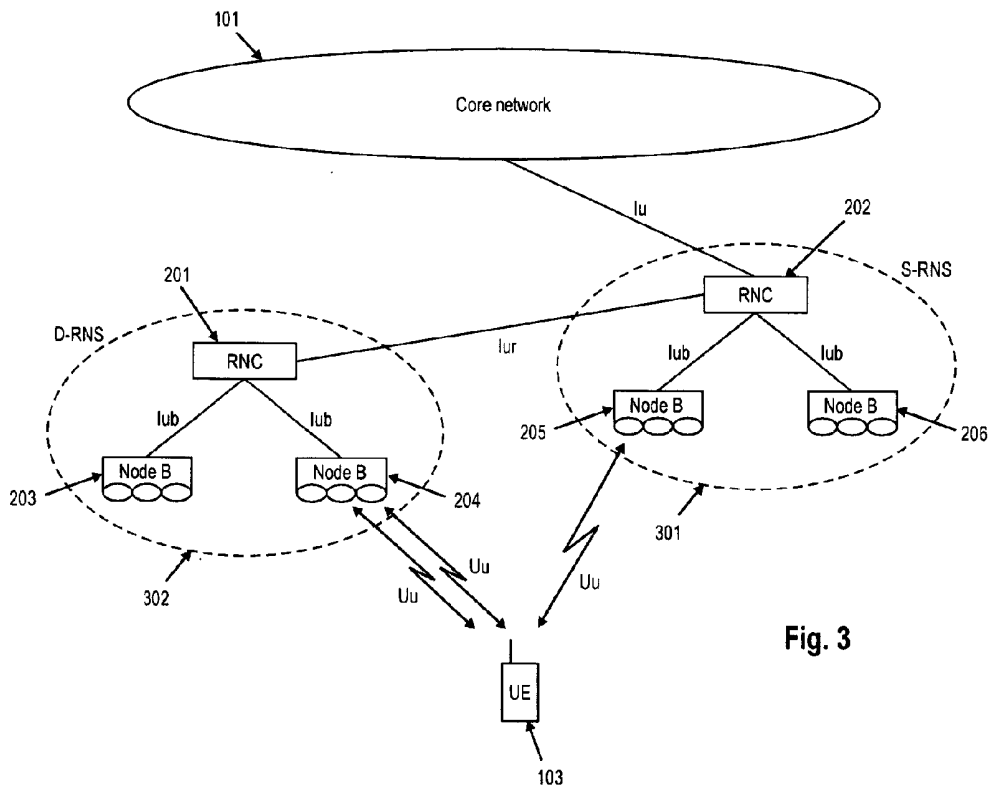


Fig. 3

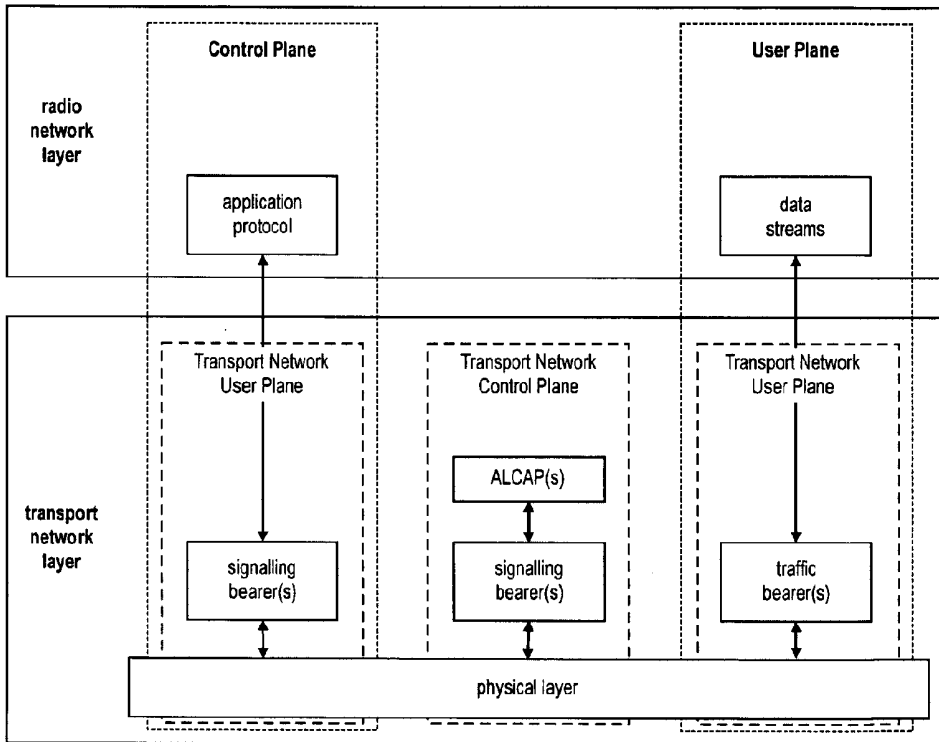


Fig. 4

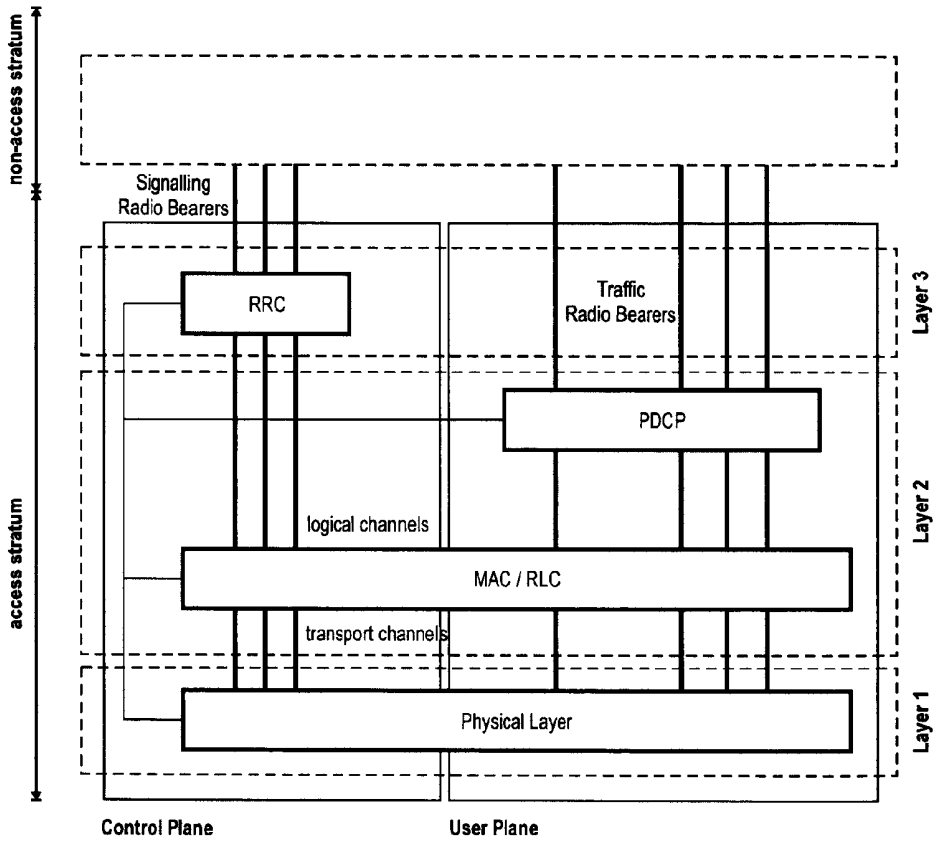


Fig. 5

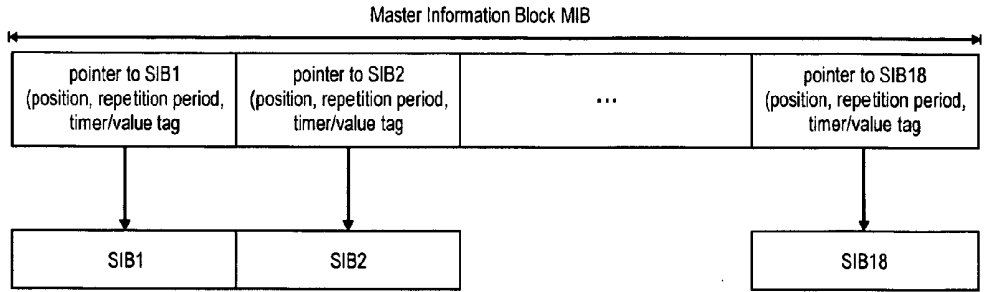


Fig. 6

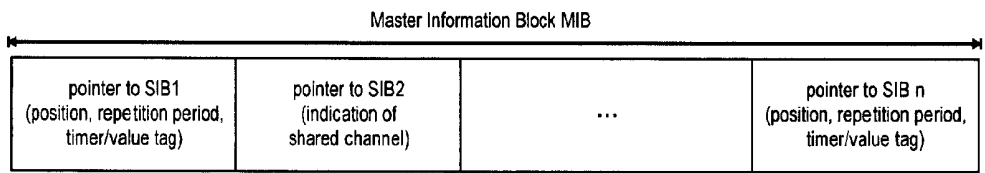


Fig. 11

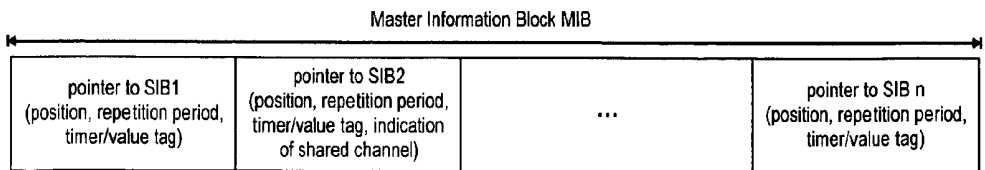


Fig. 13

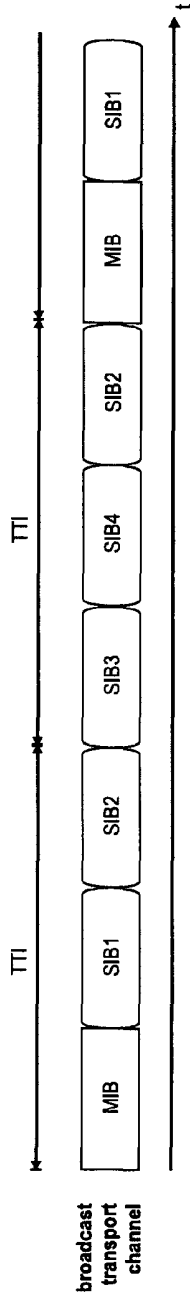


Fig. 7

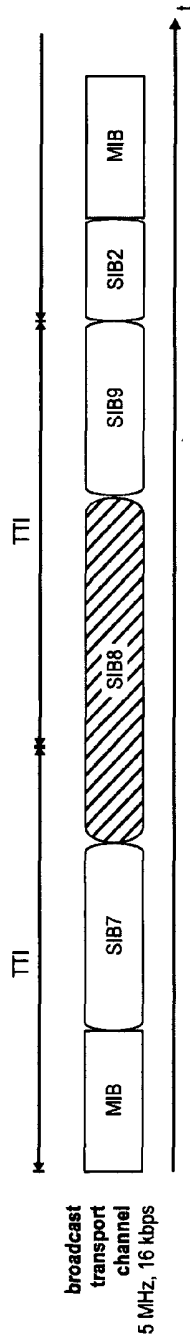


Fig. 8

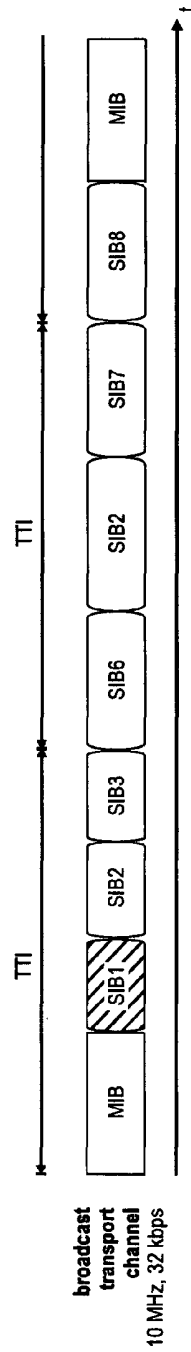


Fig. 9

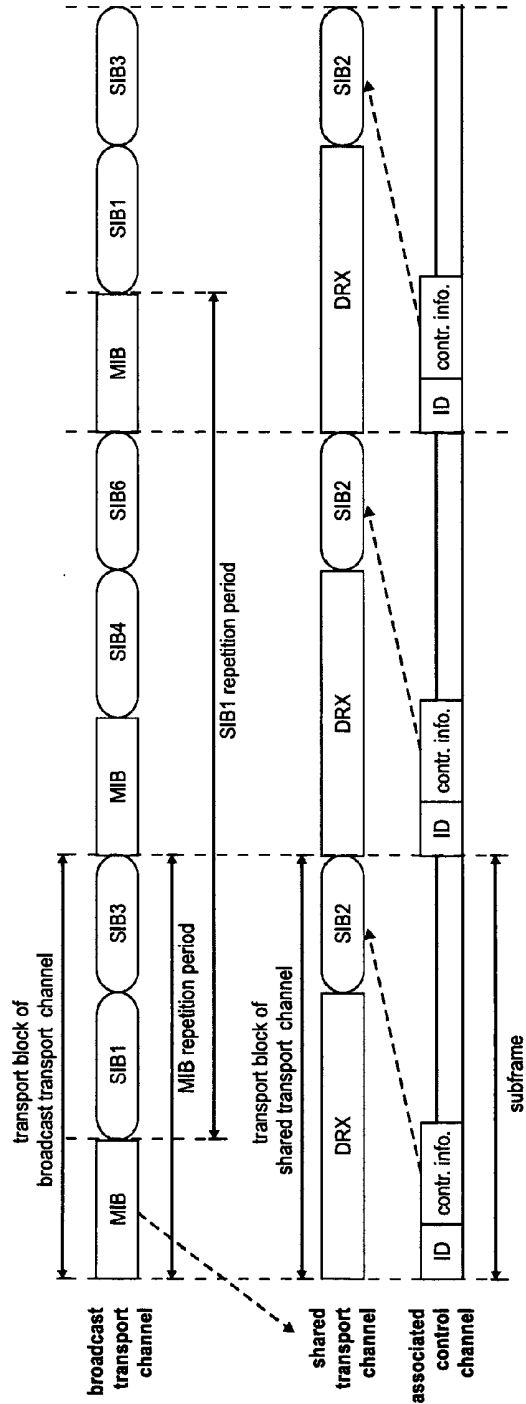


Fig. 10

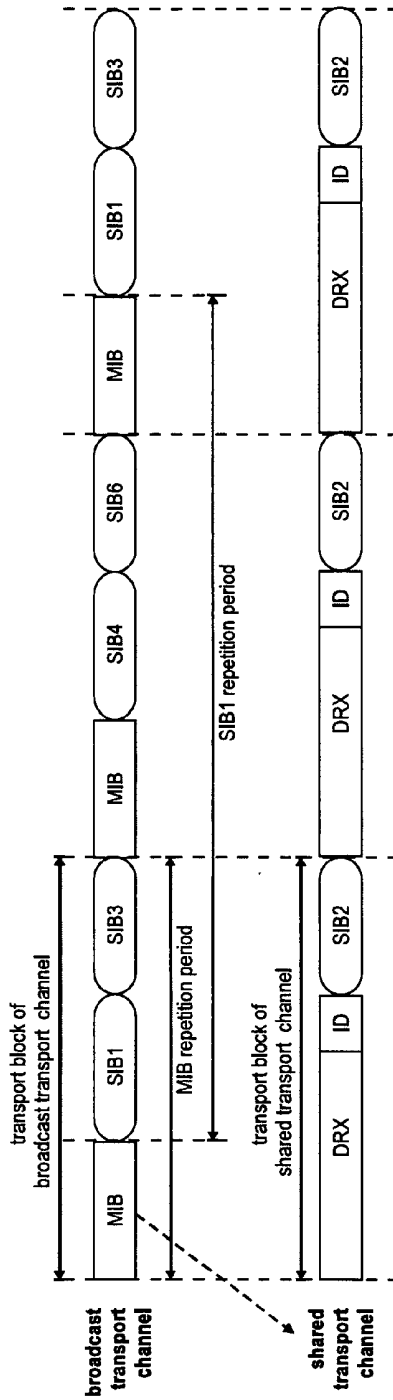


Fig. 12

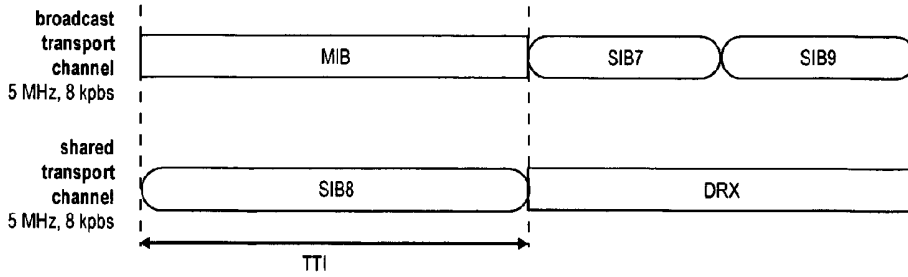


Fig. 14

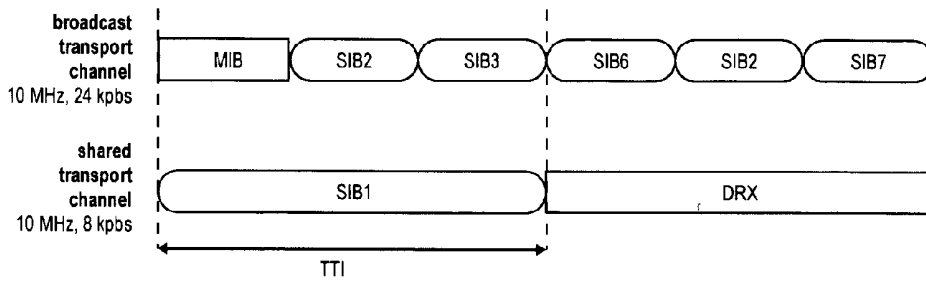


Fig. 15

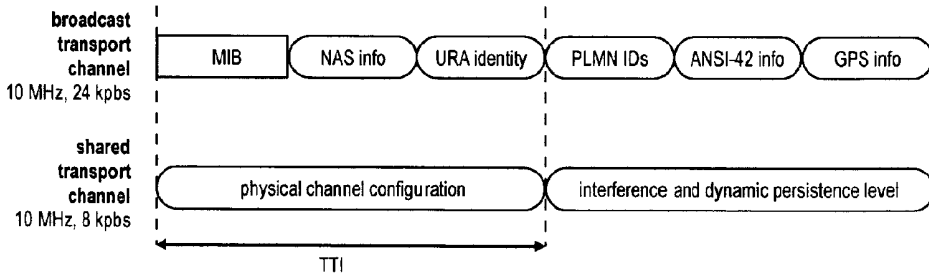


Fig. 16

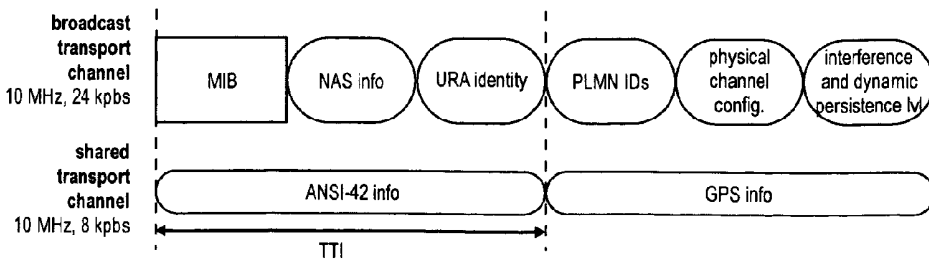


Fig. 17

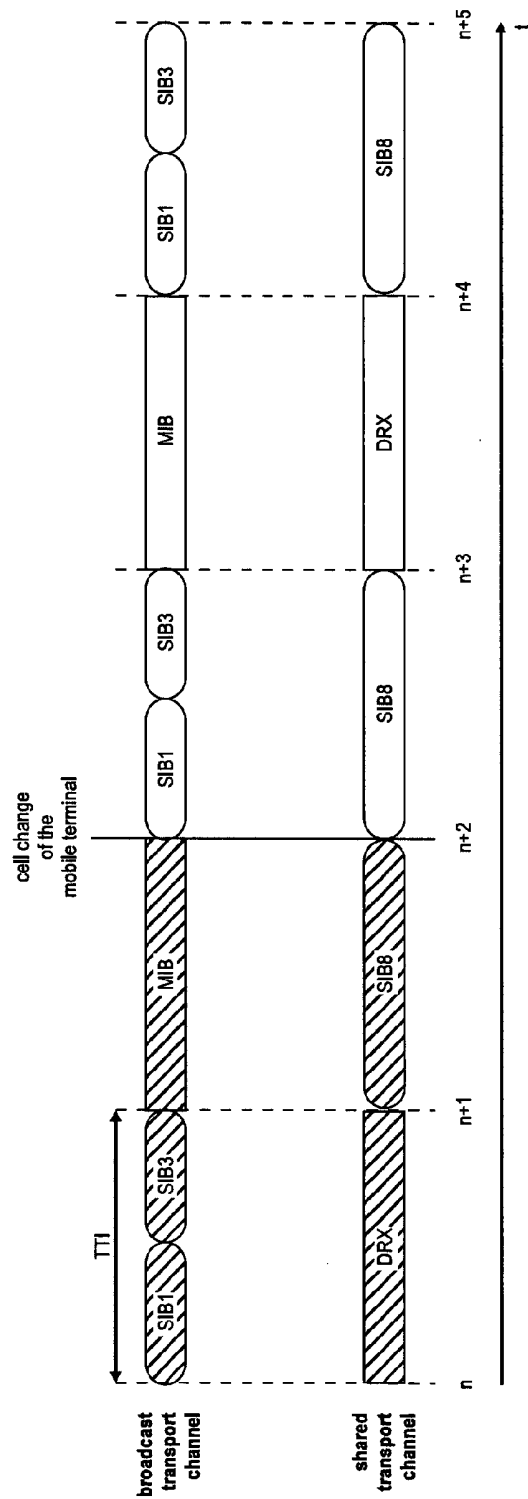


Fig. 18



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A	----- US 2005/041681 A1 (LEE YOUNG DAE ET AL) 24 February 2005 (2005-02-24) * paragraphs [0038] - [0053] * -----	1-24	TECHNICAL FIELDS SEARCHED (IPC) H04Q
The present search report has been drawn up for all claims			
Place of search Munich		Date of completion of the search 15 May 2006	Examiner Goedhart, A
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**ANNEX TO THE EUROPEAN SEARCH REPORT
ON EUROPEAN PATENT APPLICATION NO.**

EP 05 02 7214

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15-05-2006

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For more details about this annex : see Official Journal of the European Patent Office, No. 12/82

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(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
10 May 2007 (10.05.2007)

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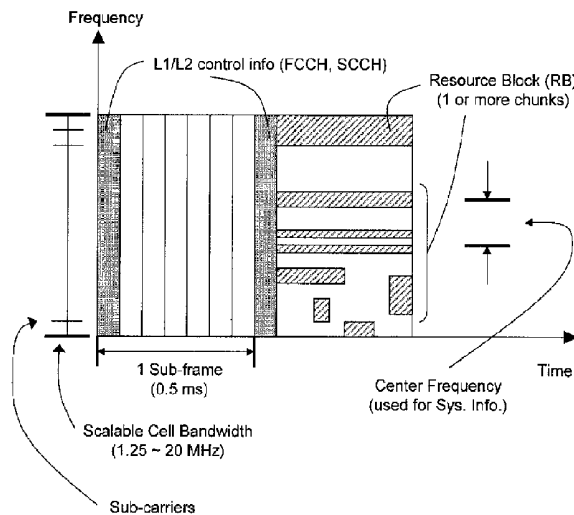
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- (84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SI, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: METHOD FOR PROCESSING PAGING INFORMATION IN A WIRELESS MOBILE COMMUNICATION SYSTEM



(57) Abstract: In a wireless mobile communications system, a method for processing paging information allows the operations of a mobile terminal to be simplified and permits efficient use of resources for the mobile terminal. The network instructs in advance, the transmission of control information, such as a particular paging message, a notification message, system information and the like, via a single indicator channel. The mobile terminal receives this single indicator channel and uses the indicator information that was transmitted via the indicator channel in order to receive the control information.

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Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

Description

METHOD FOR PROCESSING PAGING INFORMATION IN A WIRELESS MOBILE COMMUNICATION SYSTEM

Technical Field

- [1] The present invention relates to wireless (radio) mobile communication systems, and in particular, relates to a method for processing paging information allows the operations of a mobile terminal to be simplified and permits efficient use of resources for the mobile terminal

Background Art

- [2] To support broadband wireless (e.g., WiMAX) access, there are different types of broadband wireless air interfaces, such as cellular 3G technologies (e.g., UMTS, WCDMA, etc.), and multi-carrier based multiple access techniques (e.g., OFDMA, OFDM-TDMA, OFDM-CDMA, etc.). Frequency division multiplexing involves sub-channelization, of which at least four types (OFDM, Flash OFDM, sOFDMA and OFDMA) exist.
- [3] Orthogonal Frequency Division Multiplexing (OFDM) involves the splitting of a radio signal into multiple smaller sub-signals that are then transmitted simultaneously at different frequencies to a receiver. OFDM refers to a form of multi-carrier transmission where all the sub-carriers are orthogonal to each other. Certain IEEE standards and 3GPP standards are related to various aspects of OFDM.
- [4] Figures 1 and 2 show a typical frame that is used in OFDM. One frame has a time duration of 10 ms (milliseconds) and consists of 20 sub-frames, each having a time duration of 0.5 ms. Each sub-frame may consist of a resource block (RB) that contains data or information, and a cyclic prefix (CP) that is a guard interval needed for conventional OFDM modulation (but not needed for OFDM with pulse shaping, i.e., OFDM/OQAM). The sub-frame duration corresponds to the minimum downlink TTI (Transmission Time Interval).
- [5] Figure 3 shows a basic downlink reference-signal structure consisting of known reference symbols. Namely, a mapping of physical channel symbols in frequency domain is shown. In other words, channel-coded, interleaved, and data-modulated information (i.e., Layer 3 information) is mapped onto OFDM time/frequency symbols. The OFDM symbols can be organized into a number (M) of consecutive sub-carriers for a number (N) of consecutive OFDM symbols.
- [6] Here, it is assumed that 7 OFDM symbols exist per sub-frame (when the CP length is short). In case of a long CP or a different frame structure, this basic downlink reference-signal structure would be slightly different.

- [7] Reference symbols (i.e., first reference symbols) are located in the first OFDM symbol of every sub-frame assigned for downlink transmission. This is valid for both FDD and TDD, as well as for both long and short CP. Additional reference symbols (i.e., second reference symbols) are located in the third last OFDM symbol of every sub-frame assigned for downlink transmission. This is the baseline for both FDD and TDD, as well as for both long and short CP. However, for FDD, an evaluation of whether the second reference symbols are need should be made.
- [8] Figure 4 shows an exemplary structure of an Evolved Universal Mobile Telecommunications System (E-UMTS). The E-UMTS system is a system that has evolved from the UMTS system, and its standardization work is currently being performed by the 3GPP standards organization.
- [9] The E-UMTS network generally comprises at least one mobile terminal (i.e., user equipment: UE), base stations (i.e., Node Bs), a control plane server (CPS) that performs radio (wireless) control functions, a radio resource management (RRM) entity that performs radio resource management functions, a mobility management entity (MME) that performs mobility management functions for a mobile terminal, and an access gateway (AG) that is located at an end of the E-UMTS network and connects with one or more external networks. Here, it can be understood that the particular names of the various network entities are not limited to those mentioned above.
- [10] The various layers of the radio interface protocol between the mobile terminal and the network may be divided into L1 (Layer 1), L2 (Layer 2), and L3 (Layer 3) based upon the lower three layers of the Open System Interconnection (OSI) standard model that is known the field of communication systems. Among these layers, a physical layer that is part of Layer 1 provides an information transfer service using a physical channel, while a Radio Resource Control (RRC) layer located in Layer 3 performs the function of controlling radio resources between the mobile terminal and the network. To do so, the RRC layer exchanges RRC messages between the mobile terminal and the network. The functions of the RRC layer may be distributed among and performed within the Node B, the CPS/RRM and/or the MME.
- [11] Figures 5 and 6 show an exemplary architecture of the radio interface protocol between the mobile terminal and the UTRAN (UMTS Terrestrial Radio Access Network). The radio interface protocol of Figures 5 and 6 is horizontally comprised of a physical layer, a data link layer, and a network layer, and vertically comprised of a user plane for transmitting user data and a control plane for transferring control signaling. The radio interface protocol layer of Figures 5 and 6 may be divided into L1 (Layer 1), L2 (Layer 2), and L3 (Layer 3) based upon the lower three layers of the Open System Interconnection (OSI) standards model that is known the field of communication systems.

- [12] Particular layers of the radio protocol control plane of Figure 5 and of the radio protocol user plane of Figure 6 will be described below. The physical layer (i.e., Layer 1) uses a physical channel to provide an information transfer service to a higher layer. The physical layer is connected with a medium access control (MAC) layer located thereabove via a transport channel, and data is transferred between the physical layer and the MAC layer via the transport channel. Also, between respectively different physical layers, namely, between the respective physical layers of the transmitting side (transmitter) and the receiving side (receiver), data is transferred via a physical channel.
- [13] The MAC layer of Layer 2 provides services to a radio link control (RLC) layer (which is a higher layer) via a logical channel. The RLC layer of Layer 2 supports the transmission of data with reliability. It should be noted that the RLC layer in Figures 5 and 6 is depicted in dotted lines, because if the RLC functions are implemented in and performed by the MAC layer, the RLC layer itself may not need to exist. The PDCP layer of Layer 2 performs a header compression function that reduces unnecessary control information such that data being transmitted by employing Internet protocol (IP) packets, such as IPv4 or IPv6, can be efficiently sent over a radio (wireless) interface that has a relatively small bandwidth.
- [14] The radio resource control (RRC) layer located at the lowermost portion of Layer 3 is only defined in the control plane, and handles the control of logical channels, transport channels, and physical channels with respect to the configuration, re-configuration and release of radio bearers (RB). Here, the RB refers to a service that is provided by Layer 2 for data transfer between the mobile terminal and the UTRAN.
- [15] As for channels used in downlink transmission for transmitting data from the network to the mobile terminal, there is a broadcast channel (BCH) used for transmitting system information, and a shared channel (SCH) used for transmitting user traffic or control messages. As for channels used in uplink transmission for transmitting data from the mobile terminal to the network, there is a random access channel (RACH) used for transmitting an initial control message, and a shared channel (SCH) used for transmitting user traffic or control messages.
- [16] One function implemented in 3GPP systems is a paging procedure. The paging procedure is necessary for converting the UE from idle mode into active mode. This procedure is implemented via a paging control channel (PCCH), a paging channel (PCH), a secondary common control physical channel (S-CCPCH), and a paging indicator channel (PICH). The paging procedure utilizes two different types of data (or signals), namely, a paging indicator (PI) and substantive paging data. The PI is sent on a paging indicator channel (PICH) in advance of the substantive paging data. The substantive paging data is sent on a separate paging channel (PCH), which is

transported by a Secondary Common Control Physical Channel (SCCPCH).

Disclosure of Invention

Technical Problem

- [17] Before sending data to a particular mobile terminal, the network transmits a paging message on the downlink in order to determine the particular cell that the UE is located in. In the related art paging message transmitting method, an indicator (which informs in advance that a paging message will be transmitted) is transmitted through a separate (distinct) channel, such as a paging indicator channel. Additionally, an indicator (which informs in advance that a notification message for a multicast and broadcast service will be transmitted) is also transmitted through a separate (distinct) channel. In addition to these channels, the mobile terminal must also receive other channels, such as a broadcast channel used to periodically transmit system information. As there are a large total number of channels that a mobile terminal should receive due to transmissions through separate (distinct) channels according to each type of purpose, problems related to more complicated mobile terminal operations and a waste of mobile terminal resources occur.

Technical Solution

- [18] The present invention has been developed in order to solve the above described problems of the related art. As a result, the present invention provides a method for processing paging information such that the operations of a mobile terminal can be simplified and permits efficient use of resources for the mobile terminal.

[19]

Brief Description of the Drawings

- [20] Figure 1 shows an exemplary structure of one frame used in OFDM.
- [21] Figure 2 shows an exemplary structure of one sub-frame within the frame of Figure 1.
- [22] Figure 3 shows an example of how data and reference symbols for OFDM may be expressed in the frequency domain and the time domain.
- [23] Figure 4 shows an overview of a E-UMTS network architecture.
- [24] Figures 5 and 6 show an exemplary structure (architecture) of a radio interface protocol between a mobile terminal and a UTRAN according to the 3GPP radio access network standard.
- [25] Figure 7 is a diagram to explain the features of the present invention by showing where the control information and resource blocks may be located within each sub-frame with respect to frequency and time.
- [26] Figure 8 is a diagram used to explain a control information transmission and reception method according to an exemplary embodiment of the present invention.

[27] Figure 9 is a diagram used to explain a control information transmission and reception method according to another exemplary embodiment of the present invention.

[28] Figure 10 is a diagram used to explain a control information transmission and reception method according to another exemplary embodiment of the present invention.

[29] Figure 11 is a diagram used to explain a control information transmission and reception method according to another exemplary embodiment of the present invention.

[30] Figure 12 is a diagram used to explain constituting information of an FCCH according to an exemplary embodiment of the present invention.

Mode for the Invention

[31] One aspect of the present invention is the recognition by the present inventors regarding the problems and drawbacks of the related art described above and explained in more detail hereafter. Based upon such recognition, the features of the present invention have been developed.

[32] In the related art, it can be said that the system information is always fixed or non-flexible. Such fixed format allows a mobile terminal to easily detect and properly read the system information transmitted from the network.

[33] In contrast, the features of the present invention allow at least some portions of the system information to be dynamically (or flexibly) changed. Appropriate indicators are included such that a mobile terminal can properly detect and read the dynamic (flexible) system information. As a result, further system information may be added as desired in order to support technical evolution and advancements, which thus allows for future enhancements or continued expansion of currently used system information.

[34] It should be noted that the features of the present invention are related to issues regarding the long-term evolution (LTE) of the 3GPP standard. As such, the 3GPP TS 25.813 (LTE TR) and its related sections or portions thereof, as well as various developing enhancements thereof pertain to the present invention. Such enhancements and evolution have resulted in the use of a particular prefix (the letter E) when labeling various network entities (e.g., eNode B), protocol layers, channels, and the like. However, it can be clearly understood that such labeling and other terminology are merely exemplary and thus may be altered (or later clarified) as a result of ongoing or future discussions.

[35] First, with respect to the features of the present invention, certain aspects regarding the paging procedure will be explained below.

[36] In idle mode, the UE needs to complete a periodical supervision procedure in order

to monitor the paging channel. Upon receiving paging information related to the UE itself, the UE then changes into active mode and receives paging from the network. The monitoring in the periodical supervision procedure is realized through the monitoring of a paging indicator (PI). The paging indicator is sent once via paging indicator channel (PICH) in every cycle.

- [37] When the RRC layer of the UE and the RRC layer of the UTRAN are connected to transmit and receive an RRC message between one another, the UE is considered to be in an RRC connected state. When they are not connected, the UE is considered to be in an idle state.
- [38] When in the RRC-connected state, the UE can be divided into a URA_PCH state, a CELL_PCH state, a CELL_FACH state, and/or a CELL_DCH state. In particular, when the UE is in idle state (in addition to the URA_PCH state and the CELL_PCH state), it wakes up only at each discontinuous reception (DRX) cycle to receive a PICH (Paging Indicator Channel) transmitting paging information, in order to reduce power consumption.
- [39] When in URA_PCH state or CELL_PCH state, the UE receives and stores a UTRAN specific DRX cycle length, and discontinuously receives the PICH according to the UTRAN specific DRX cycle length.
- [40] In addition, in idle state, the UE receives and stores a CN domain specific DRX cycle length, and discontinuously receives the PICH according to the CN domain specific DRX cycle length.
- [41] The UE further obtains and uses a DRX cycle length corresponding to its state through system information broadcast by the RRC layer of the UTRAN.
- [42] The PICH is a physical channel used for transmitting a Paging Indicator (PI), and has a fixed data rate of SF 256. The PICH is always used in association with an S-CCPCH (Secondary Common Control Physical Channel) to which the PCH (Paging Channel) is mapped.
- [43] The UTRAN periodically transmits information including the PI through the PICH to the UE. The UE then periodically checks whether the PICH has a PI related to it. More specifically, the UE in idle state periodically wakes up to check the PICH. If a PI is received through the PICH, the UE receives the S-CCPCH to which the PCH is mapped, to thereby receive corresponding paging information.
- [44] The UTRAN periodically transmits system information through a BCH (Broadcast Channel) to the UE. More specifically, the UTRAN transmits an SIB (System Information Block) which is a group of information for constituting a channel and a protocol, using the BCH and transmits information for updating each type of system information to the UE based on the radio environment, which may undergo constant changes.

- [45] Figure 7 is a diagram to explain the features of the present invention by showing where the control information and resource blocks may be located within each sub-frame with respect to frequency and time.
- [46] The structure (format) of a sub-frame in relation to the frequency domain and the time domain can be understood from Figure 7. Namely, a single sub-frame has a time duration of 0.5 ms with 7 OFDM symbols (portions) therein.
- [47] In the first portion of the sub-frame, control information (i.e., L1/L2 control information, FCCH, SCCH, etc.) is included, while resource blocks (RBs) that may be in the form of one or more chunks may be located in the remaining portion of the sub-frame. Here, a resource block may occupy the entire time duration of the sub-frame (excluding the time duration for the control information) or some partial time duration thereof. Also, each resource block (RB) may use a particular frequency range (i.e., a particular number of sub-carriers).
- [48] The frequency axis can be referred to as a scalable cell bandwidth, which typically has a frequency range of 1.25 ~ 20 MHz. A plurality of sub-carriers exists in the scalable cell bandwidth. Of this frequency range, a so-called center frequency (of approximately 10 MHz) is mainly used in transmitting system information.
- [49] In the related art, such system information is considered to be fixed. Although this allows the terminal to easily read the system information, addition of new system information is not possible. In contrast, the present invention allows for at least part of the system information to be flexible (or dynamic).
- [50] To do so, the present invention divides (or separates or distinguishes) the system information into primary system information (e.g., Master Information Block: MIB) and non-primary (or secondary) system information (e.g., System Information Block: SIB).
- [51] The MIB is transmitted in a static manner (e.g., via a BCH for fixed manner transmission), while the SIB is transmitted in a dynamic manner (e.g., via a downlink SCH for dynamic manner transmission). Here, transmission in a dynamic manner means that different frequency ranges and time durations can be used.
- [52] For each frame, the MIB contains information about where each SIB is located. Namely, the particular frequency range (i.e., sub-carriers) and particular time duration (i.e., symbols) for each SIB is specified to allow the terminal (UE) to properly read the appropriate SIBs. For example, the MIB may indicate that a particular UE (e.g., UE #11) should read a particular resource block (e.g., RB #3). Here, the RB #3 can also be expressed as the information located at certain sub-carriers and certain symbols (e.g., at sub-carriers #13~60 and symbols #3~5).
- [53] In a similar manner, for each sub-frame within one frame, the control information (located in the first portion) contains information about where each resource block (RB) is located. Namely, the frequency range and particular time duration for each RB

is specified to allow the terminal (UE) to properly read the appropriate RBs.

[54] The above concepts generally depicted in Figure 7 will be explained in more detail in the following description with reference to Figures 8 through 12.

[55] Figure 8 is a diagram used to explain a control information transmission and reception method according to an exemplary embodiment of the present invention. The network transmits a frame control channel (FCCH) at every particular period (i.e., a first period). Hereafter, the particular period is referred to as a frame.

[56] It should be noted that the FCCH may also be described in different terms. Namely, the control information transmitted by the network may be called L1/L2 control information, FCCH, SCCH, or the like. Hereafter, such control information will mostly be referred to as FCCH, merely for the sake of explanation (although control information and SCCH are also described).

[57] As shown in Figure 8, a MIB (Master Information Block) is repetitively transmitted at every second period, which is different that the above-mentioned first period. The MIB includes scheduling information for a SIB (System Information Block) that transmits system information, a paging message, and a notification message. Namely, the MIB provides scheduling information related to which frequency and what time is used to transmit each type of control information, such as multiple SIBs, multiple paging messages, multiple notification messages, and the like. The second period may set to be greater than the first period. The MIB may be transmitted in the first frame of the period in which the MIB is to be transmitted.

[58] Here, the FCCH that is transmitted in each frame can inform about whether the data transmitted in the corresponding time duration (frame) is a common control message, a control message dedicated for a particular mobile terminal, common data, or data dedicated for a particular mobile terminal. Also, the FCCH informs about which frequency and what time within the frame that a control message or data of the control information is transmitted.

[59] The mobile terminal periodically receives the FCCH at every first period. If the FCCH of a particular frame indicates the transmission of a MIB, the mobile terminal receives the MIB at the corresponding frequency and time in accordance with the scheduling information included in the indicator information transmitted through the FCCH. By referring to the MIB, the mobile terminal can obtain scheduling information for particular paging messages, particular notification messages, particular indicator messages, and the like. Through such scheduling information, the mobile terminal can determine which frequency and what time was used to transmit a particular SIB, a particular paging message, a particular notification message or the like. According to such scheduling information, the mobile terminal can receive a notification message with respect to the SIB, the paging message, and the subscribed service that is should

receive.

- [60] The MIB may include either a mobile terminal identifier or a service identifier, or may include an indicator that indicates such an identifier.
- [61] Figure 9 is a diagram used to explain a control information transmission and reception method according to another exemplary embodiment of the present invention. Referring to Figure 9, the network periodically transmits a PN-MAP (i.e., a Paging and Notification MAP) that informs about indicator information for a paging message or a notification message, and about scheduling information. Here, the PN-MAP may be labeled differently. Namely, the PN-MAP is merely one type of L1/L2 control information that may be transmitted by the network. In fact, an MIB may be used instead of the PN-MAP in order to provide information about paging or notification messages and about scheduling.
- [62] Also, it can be understood that paging is provided on a per UE (terminal) basis, while notification is provided on a per service basis. Thus, the concepts related to paging with respect to UEs, can be applied to notification with respect to services.
- [63] The PN-MAP may be transmitted during the first frame of a paging period or of a notification period. Here, the paging period and the notification period may be the same or may be different. The FCCH that is transmitted in each frame indicates whether the data transmitted in the corresponding time duration (frame) is a paging message, a notification message, or a PN-MAP. Also, the FCCH informs about the scheduling information that indicates which frequency and what time within the frame that each message or data of the control information is transmitted.
- [64] The mobile terminal receives the PN-MAP at every paging period or at every notification period. Here, the mobile terminal can determine whether or not a corresponding frame contains a PN-MAP upon receiving the FCCH. Accordingly, the mobile terminal obtains the PN-MAP via the corresponding frame only when the transmission of the PN-MAP is informed by the FCCH.
- [65] By using the received PN-MAP, the mobile terminal obtains the scheduling information of a particular paging message or a particular notification message. The mobile terminal uses the scheduling information to determine which frequency and what time the particular paging message or the particular notification message was transmitted. The mobile terminal can receive its corresponding paging message according to the determined transmission information, and can receive a notification message with respect to the service it subscribed to. The PN-MAP may include either a mobile terminal identifier or a service identifier, or may include an indicator that indicates such an identifier.
- [66] Figure 10 is a diagram used to explain a control information transmission and reception method according to another exemplary embodiment of the present

invention. Referring to Figure 10, the network transmits a paging message or a notification message of multiple mobile terminals at every paging period. A paging message (for a particular mobile terminal), which is transmitted during one paging period, is transmitted through a particular frame that is mapped to an identifier of the mobile terminal. Also, a notification message (for a particular service), which is transmitted during one notification period, may be transmitted through a particular frame that is mapped to an identifier of the service. Here, the paging period and the notification period may be the same or may be different. The FCCH that is transmitted in each frame indicates whether the data transmitted in the corresponding time duration (frame) is a paging message or a notification message. Also, the FCCH informs about which frequency and what time within the frame that each message or data is transmitted.

[67] The mobile terminal periodically receives (according to the paging period) a particular frame that is mapped to its identifier, in order to obtain a paging message for itself. Also, the mobile terminal periodically receives (according to the notification period) a particular frame that is mapped to an identifier of a service it wishes to receive, in order to obtain a notification message for the service. Here, before receiving the particular frame, the mobile terminal receives the FCCH of the corresponding frame, and only if the FCCH indicates the transmission of the paging message or the notification message, the paging message or the notification message is obtained via the frame.

[68] Accordingly, it can be said that the L1/L2 control information (i.e., system information, MIB, PN-MAP, etc.) serves the purpose of a PICH. Namely, a UE can monitor the L1/L2 control information to determine the location of a particular resource block (RB) with respect to the time and frequency domains in order to obtain the necessary paging message.

[69] Figure 11 is a diagram used to explain a control information transmission and reception method according to another exemplary embodiment of the present invention. A cell that supports broadband frequencies with a bandwidth of 10 or 20 MHz, can provide a system bandwidth of narrowband frequencies for a mobile terminal operating in narrowband frequencies such as 1.25 MHz, 2.5 MHz, or the like. In this case, as shown in Figure 11, a central bandwidth of the broadband frequencies is typically used for the system bandwidth. Here, the MIB or PN-MAP, the paging messages, the notification messages, the SIBs, and the like should all be transmitted in the system bandwidth. However, SIBs that transmit particular system information may be transmitted outside of the system bandwidth.

[70] The FCCH (or other type of system information like L1/L2 control information, SCCH, etc.) transmitted in each frame indicates whether the data transmitted in the

corresponding time duration (frame) is a MIB or PN-MAP, a paging message, a notification message, an SIB, or the like. Also, the FCCH informs about which frequency and what time within the frame that each message or data is transmitted. The FCCH may be transmitted upon being divided into an FCCH for system bandwidth and an FCCH for non-system bandwidth. Accordingly, a mobile terminal that only receives the system bandwidth may receive the FCCH for system bandwidth to obtain information of each data or message that is transmitted via the system bandwidth. Also, a mobile terminal that receives the non-system bandwidth may receive the FCCH for non-system bandwidth to obtain information of each data or message that is transmitted via the non-system bandwidth.

- [71] In other words, the concepts shown in Figure 11 are for handling the situation for mobile terminals in idle mode.
- [72] The network (system) supports the cell bandwidth of 20 MHz, while a mobile terminal typically can only support a 10 MHz bandwidth range. Thus, the L1/L2 control information needs to be transmitted in certain units (a frequency range) such as, a range of 10 MHz, 5 MHz, or the like. As a result, there may be three scenarios for the frequency ranges used by the mobile terminal for reading data. Namely, of the 20 MHz scalable cell bandwidth, the mobile terminal may read one of three frequency ranges, i.e., the lower 10 MHz, the upper 10 MHz, or a middle (intermediate) 10 MHz thereof.
- [73] For mobile terminals in RRC connected mode, because the particular cell in which the connected mode mobile terminal is located is known, any one of the three 10 MHz ranges and appropriate switching among these three 10 MHz ranges is possible. However, for a mobile terminal in idle mode, because the particular cell in which the terminal is located cannot be known, only one of these three 10 MHz ranges can be used (typically, the intermediate 10 MHz range is used). Meanwhile, the bandwidth outside the intermediate 10 MHz range can be used for transmitting and receiving resource blocks for mobile terminals in connected mode.
- [74] Here, although the above exemplary embodiment with reference to Figure 11 is described for 10 MHz ranges, it is contemplated that the 20MHz scalable cell bandwidth could also be divided up into 5 MHz units.
- [75] Figure 12 is a diagram used to explain constituting information of control information (i.e., an FCCH) according to an exemplary embodiment of the present invention. The FCCH provides to the mobile terminal, various types of control information related to data and control messages transmitted during the corresponding period (i.e., during the corresponding frame). Here, the FCCH is shown to be comprised of five different FCCH portions. However, this is merely exemplary, and the number of FCCH portions may vary accordingly.
- [76] Referring to Figure 12, the first FCCH portion is a FCCH MAP that informs about

the frequency and time of the FCCH transmission, a length of the FCCH information, radio resource parameters needed for receiving the FCCH information, and the like. Such FCCH MAP may be always included in each frame. In the present invention, each frame may include all types of FCCH or may include only portions thereof. The FCCH MAP may inform about whether or not the remaining four types of FCCH portions (excluding the FCCH MAP) are transmitted in the corresponding frame.

- [77] The second FCCH portion is a FCCH Idle Mode (DL) that includes control information needed on order to receive downlink control information when the mobile terminal is in idle mode. This second FCCH portion may be included in a corresponding frame when control information to be transmitted on the downlink exists in the frame. The control information related to common control messages such as the MIB, SIB, paging message, notification message, PN-MAP, etc. may be included in this second FCCH portion. Also, the MIB, SIB, paging message, notification message, PN-MAP, etc. may be included in this second FCCH portion.
- [78] The third FCCH portion is a FCCH Idle Mode (UL) that includes control information needed in order to transmit uplink control information when the mobile terminal is in idle mode. This third FCCH portion may include information that is needed for uplink random access transmissions. When the mobile terminal transmits a random access message, the network may transmit a response to the random access message via this third FCCH portion. Also, the third FCCH portion can be used to inform that a response to the random access message is being transmitted in the frame that is used to transmit the third FCCH portion, and to do so, the third FCCH portion includes control information related to such response to the random access message.
- [79] The fourth FCCH portion includes control information needed in order to receive downlink control information when the mobile terminal is in active mode. This fourth FCCH portion may include control information of an downlink shared channel (SCH) that is transmitted in a corresponding frame.
- [80] The fifth FCCH portion includes control information needed in order to transmit uplink control information when the mobile terminal is in active mode. This fifth FCCH portion may include control information of an uplink shared channel (SCH) that is transmitted in a corresponding frame.
- [81] The mobile terminal periodically receives the FCCH MAP and may check to see whether the corresponding frame contains any data or information that it wishes to receive. After receiving the FCCH MAP, when the mobile terminal is in idle mode, only the second and third FCCH portions are received. When the mobile terminal is in active mode, only the fourth and fifth FCCH portions are received.
- [82] In order to inform about the control information that is needed for multicast and broadcast transmissions, the network may add and transmit other FCCH portions as

needed.

[83] It should be noted that Figures 1 through 12 show exemplary embodiments for a 10 ms frame having twenty 0.5 ms sub-frames. However, the features of the present invention are clearly applicable to other techniques that employ other frame sizes. For example, a frame size of 5 ms may be used, and to support LTE (Long Term Evolution) techniques, a frame size of 0.5 ms may be used.

[84] Regarding the effects of the present invention, the wireless network can, in advance, inform (through a single indicator channel) about the transmission of common control information (such as particular paging messages, notification messages, system information, or the like). A radio mobile terminal can periodically receive the single indicator channel to thus receive the common control information by using the control information of the indicator channel. By using such procedures, the operations of the mobile terminal may be simplified and the mobile terminal resources can be more efficiently used.

[85] Additionally, as the present invention provides information about where each resource block (RB) is located with respect to the frequency and time domains, system information, control information, and the like can be processed in a dynamic and flexible manner, to thus support various enhanced capabilities. Also, when frequency selective scheduling is performed, improved adaptation to channel changes can be achieved.

[86] The present disclosure provides a method of reception of paging information for a mobile terminal in a mobile communications system, the method comprising: receiving control information in a periodic manner; if the received control information is relevant to the mobile terminal, receiving paging information using scheduling information that indicates time and frequency information of the paging information.

[87] The control information includes either a mobile terminal identifier or a service identifier, or an indicator that indicates a mobile terminal identifier or service identifier. The received control information and paging information are in the same sub-frame. The method further comprising: receiving primary system information in a static manner, the primary system information containing the scheduling information that is used for receiving the paging information; and receiving non-primary system information in a dynamic manner, the non-primary information containing the control information. The scheduling information indicates at least one of a time characteristic and a frequency characteristic of the non-primary system information. The time characteristic and the frequency characteristic indicate a location of the non-primary system information to be read by the particular terminal. The primary system information further comprises an indicator for indicating a particular terminal. The indicator comprises: at least one of a terminal identifier, a service identifier, and a

logical channel identifier. The time characteristic relates to symbols and the frequency characteristic relates to sub-carriers. The paging information is in the form of at least one resource block. The control information related to paging and notification, and other resource blocks are received via a center frequency among broadband frequencies used for a system bandwidth. The control information is for a mobile terminal in idle mode.

- [88] Also, the present disclosure provides a method of downlink transmission of paging information for a mobile terminal in a mobile communications system, the method comprising: transmitting control information in a dynamic manner to a group of cells, wherein the control information comprises scheduling information that indicates time and frequency information; and transmitting paging information according to the control information.
- [89] The control information includes either a mobile terminal identifier or a service identifier, or an indicator that indicates a mobile terminal identifier or service identifier. The transmitted control information and paging information are in the same sub-frame. The group of cells is related to a tracking area. The method further comprising: receiving primary system information in a static manner, the primary system information containing the scheduling information that is used for receiving the paging information; and receiving non-primary system information in a dynamic manner, the non-primary information containing the control information. The scheduling information indicates at least one of a time characteristic and a frequency characteristic of the non-primary system information. The time characteristic and the frequency characteristic indicate a location of the non-primary system information to be read by the particular terminal. The primary system information further comprises an indicator for indicating a particular terminal. The indicator comprises: at least one of a terminal identifier, a service identifier, and a logical channel identifier. The time characteristic relates to symbols and the frequency characteristic relates to sub-carriers. The paging information is in the form of at least one resource block. The control information related to paging and notification, and other resource blocks are received via a center frequency among broadband frequencies used for a system bandwidth. The control information is for a mobile terminal in idle mode.
- [90] Additionally, the present disclosure provides a method for processing system information for a mobile terminal, the method comprising: receiving primary system information in a static manner; receiving non-primary system information in a dynamic manner based on the primary system information, the non-primary system information comprising control information that includes separate information for idle mode and active mode; and reading actual data by using the received control information according to whether the mobile terminal is operating in idle mode or active mode. The

static primary system information includes scheduling information that indicates time and frequency information of the non-primary system information.

[91] Furthermore, the present disclosure provides a method for processing system information for a network, the method comprising: transmitting primary system information in a static manner; transmitting non-primary system information in a dynamic manner based on the primary system information, the non-primary system information comprising control information that includes separate information for idle mode and active mode; and transmitting actual data to be read by a mobile terminal that uses the control information according to its operation in idle mode or active mode. The static primary system information includes scheduling information that indicates time and frequency information of the non-primary system information.

[92] This specification describes various illustrative embodiments of the present invention. The scope of the claims is intended to cover various modifications and equivalent arrangements of the illustrative embodiments disclosed in the specification. Therefore, the following claims should be accorded the reasonably broadest interpretation to cover modifications, equivalent structures, and features that are consistent with the spirit and scope of the invention disclosed herein.

Claims

- [1] A method of reception of paging information for a mobile terminal in a mobile communications system, the method comprising:
receiving control information in a periodic manner;
if the received control information is relevant to the mobile terminal, receiving paging information using scheduling information that indicates time and frequency information of the paging information.
- [2] The method of claim 1, wherein the control information includes either a mobile terminal identifier or a service identifier, or an indicator that indicates a mobile terminal identifier or service identifier.
- [3] The method of claim 1, wherein the received control information and paging information are in the same sub-frame.
- [4] The method of claim 1, further comprising:
receiving primary system information in a static manner, the primary system information containing the scheduling information that is used for receiving the paging information; and
receiving non-primary system information in a dynamic manner, the non-primary information containing the control information.
- [5] The method of claim 4, wherein the scheduling information indicates at least one of a time characteristic and a frequency characteristic of the non-primary system information.
- [6] The method of claim 5, wherein the time characteristic and the frequency characteristic indicate a location of the non-primary system information to be read by the particular terminal.
- [7] The method of claim 6, wherein the primary system information further comprises an indicator for indicating a particular terminal.
- [8] The method of claim 7, wherein the indicator comprises: at least one of a terminal identifier, a service identifier, and a logical channel identifier.
- [9] The method of claim 5, wherein the time characteristic relates to symbols and the frequency characteristic relates to sub-carriers.
- [10] The method of claim 1, wherein the paging information is in the form of at least one resource block.
- [11] The method of claim 1, wherein the control information related to paging and notification, and other resource blocks are received via a center frequency among broadband frequencies used for a system bandwidth.
- [12] The method of claim 11, wherein the control information is for a mobile terminal in idle mode.

- [13] A method of downlink transmission of paging information for a mobile terminal in a mobile communications system, the method comprising:
transmitting control information in a dynamic manner to a group of cells,
wherein the control information comprises scheduling information that indicates time and frequency information; and
transmitting paging information according to the control information.
- [14] The method of claim 13, wherein the control information includes either a mobile terminal identifier or a service identifier, or an indicator that indicates a mobile terminal identifier or service identifier.
- [15] The method of claim 14, wherein the transmitted control information and paging information are in the same sub-frame.
- [16] The method of claim 13, wherein the group of cells is related to a tracking area.
- [17] The method of claim 13, further comprising:
receiving primary system information in a static manner, the primary system information containing the scheduling information that is used for receiving the paging information; and
receiving non-primary system information in a dynamic manner, the non-primary information containing the control information.
- [18] The method of claim 17, wherein the scheduling information indicates at least one of a time characteristic and a frequency characteristic of the non-primary system information.
- [19] The method of claim 18, wherein the time characteristic and the frequency characteristic indicate a location of the non-primary system information to be read by the particular terminal.
- [20] The method of claim 19, wherein the primary system information further comprises an indicator for indicating a particular terminal.
- [21] The method of claim 20, wherein the indicator comprises: at least one of a terminal identifier, a service identifier, and a logical channel identifier.
- [22] The method of claim 18, wherein the time characteristic relates to symbols and the frequency characteristic relates to sub-carriers.
- [23] The method of claim 13, wherein the paging information is in the form of at least one resource block.
- [24] The method of claim 13, wherein the control information related to paging and notification, and other resource blocks are received via a center frequency among broadband frequencies used for a system bandwidth.
- [25] The method of claim 24, wherein the control information is for a mobile terminal in idle mode.
- [26] A method for processing system information for a mobile terminal, the method

comprising:

receiving primary system information in a static manner;

receiving non-primary system information in a dynamic manner based on the primary system information, the non-primary system information comprising control information that includes separate information for idle mode and active mode; and

reading actual data by using the received control information according to whether the mobile terminal is operating in idle mode or active mode.

[27] The method of claim 26, wherein the static primary system information includes scheduling information that indicates time and frequency information of the non-primary system information.

[28] A method for processing system information for a network, the method comprising:

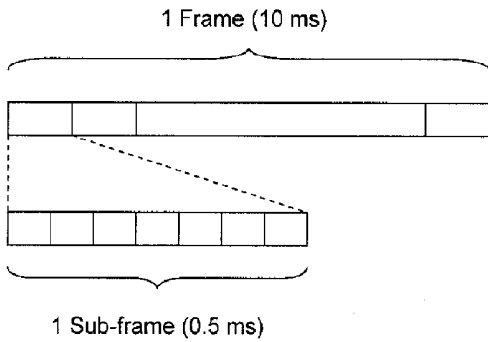
transmitting primary system information in a static manner;

transmitting non-primary system information in a dynamic manner based on the primary system information, the non-primary system information comprising control information that includes separate information for idle mode and active mode; and

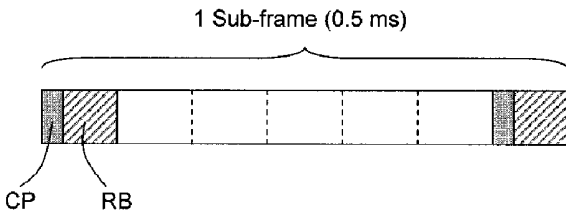
transmitting actual data to be read by a mobile terminal that uses the control information according to its operation in idle mode or active mode.

[29] The method of claim 28, wherein the static primary system information includes scheduling information that indicates time and frequency information of the non-primary system information.

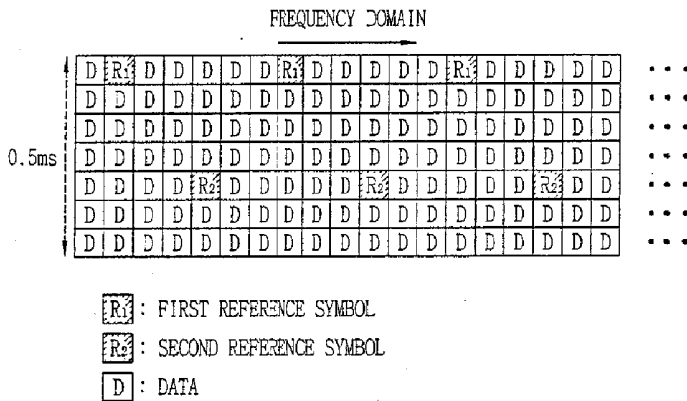
[Fig. 1]



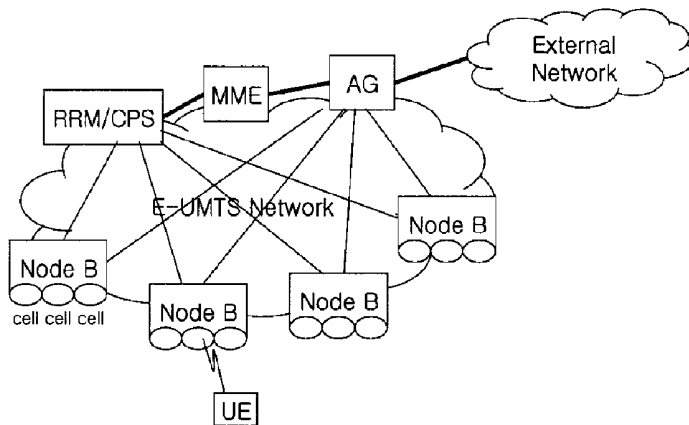
[Fig. 2]



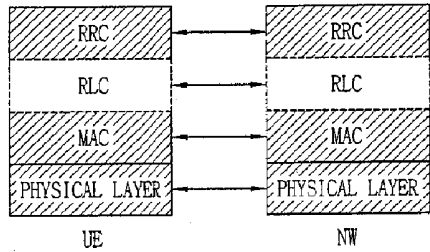
[Fig. 3]



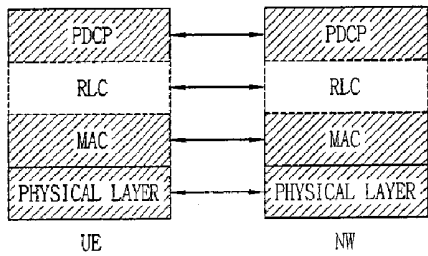
[Fig. 4]



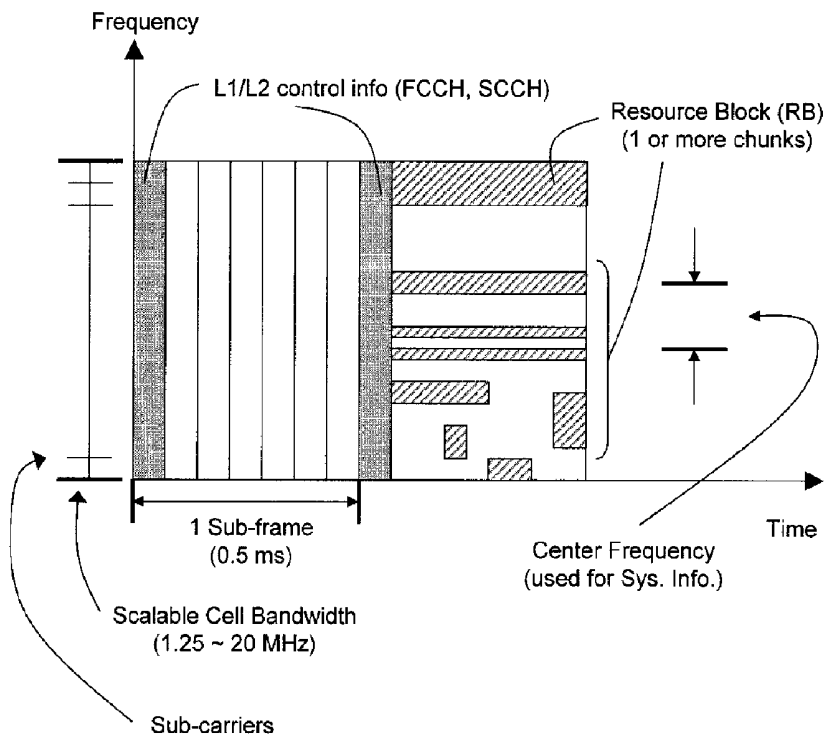
[Fig. 5]



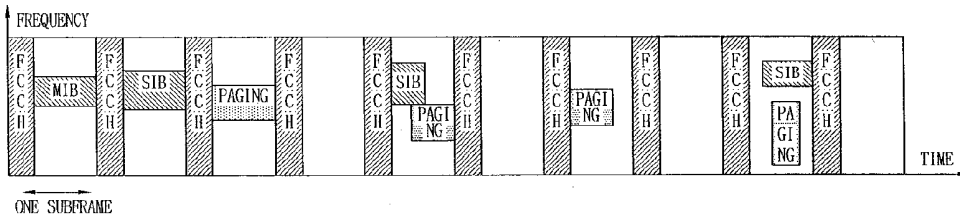
[Fig. 6]



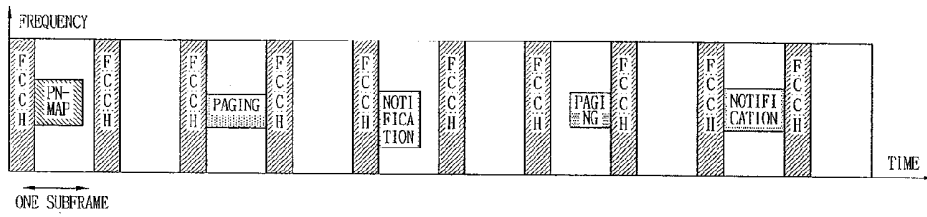
[Fig. 7]



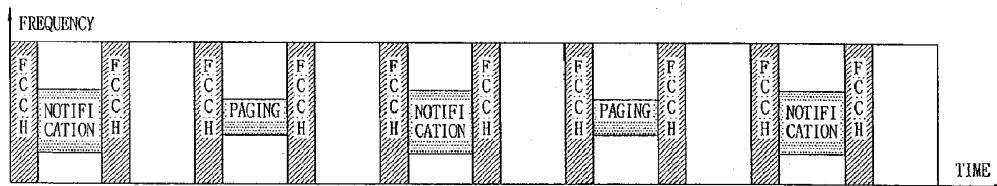
[Fig. 8]



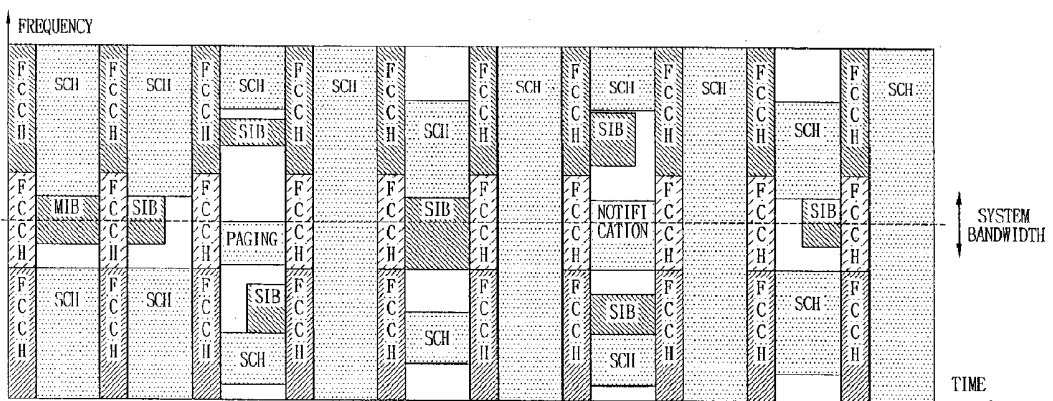
[Fig. 9]



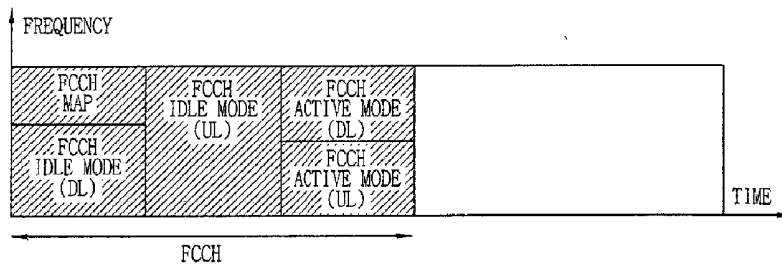
[Fig. 10]



[Fig. 11]



[Fig. 12]



PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PALGIC06673	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/KR2006/004371	International filing date (<i>day/month/year</i>) 25 OCTOBER 2006 (25.10.2006)	(Earliest) Priority Date (<i>day/month/year</i>) 31 OCTOBER 2005 (31.10.2005)
Applicant LG ELECTRONICS INC. et al		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of :

the international application in the language in which it was filed

a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. **Certain claims were found unsearchable** (See Box No. II)

3. **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the **drawings** to be published with the abstract is Figure No. 7

as suggested by the applicant.



because the applicant failed to suggest a figure.

because this figure better characterizes the invention.

b. none of the figure is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2006/004371

A. CLASSIFICATION OF SUBJECT MATTER		
<i>H04L 12/28(2006.01)i</i>		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC8: G06F, H04L		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean Patents and applications for inventions since 1975 Korean Utility models and applications for Utility models since 1975 Japanese Utility models and application for Utility models since 1975		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EKIPASS (KIPO internal), IEEE xplore		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6628946 B1 (Ericsson, Sep. 30, 2003) See the abstract, lines 5-22 in col. 3, lines 26-40 in col.11	1-3, 10-12
A	US 2005/0177623 A1 (M-Stack Limited, Aug. 11, 2005) See the abstract, figs. 1-5, and claims 1, 6	1 - 29
A	'Control channel structure for TDMA mobile radio systems', Onoe, S.; Tajima, J.; Utano, T.; Umeda, N.; Vehicular Technology Conference, 1990 IEEE 40th, 6-9 May 1990 Page(s):270 - 275	1 - 29
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 13 FEBRUARY 2007 (13.02.2007)		Date of mailing of the international search report 13 FEBRUARY 2007 (13.02.2007)
Name and mailing address of the ISA/KR  Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer JUN, Young Sang Telephone No. 82-42-481-5653 

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2006/004371

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US6628946B1	30.09.2003	AU200051192A1	12.12.2000
		AU200051192B2	12.12.2000
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		AU770705B2	26.02.2004
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		W00072609A1	30.11.2000
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		US2005177623AA	11.08.2005
		US2006281456AA	14.12.2006

Electronic Patent Application Fee Transmittal

Application Number:				
Filing Date:				
Title of Invention:	TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL			
First Named Inventor/Applicant Name:	Erik Dahlman			
Filer:	David E. Bennett/Donna Donovan			
Attorney Docket Number:	4015-9121/p24241-US3			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Utility application filing	1011	1	280	280
Utility Search Fee	1111	1	600	600
Utility Examination Fee	1311	1	720	720
Pages:				
Claims:				
Claims in Excess of 20	1202	5	80	400
Independent claims in excess of 3	1201	2	420	840
Miscellaneous-Filing:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Late Filing Fee for Oath or Declaration	1051	1	140	140
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				2980

Electronic Acknowledgement Receipt

EFS ID:	21683395
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	David E. Bennett/Donna Donovan
Filer Authorized By:	David E. Bennett
Attorney Docket Number:	4015-9121/p24241-US3
Receipt Date:	05-MAR-2015
Filing Date:	
Time Stamp:	12:22:23
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	\$2980
RAM confirmation Number	9600
Deposit Account	
Authorized User	

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Application.pdf	69602 467fc614806c24f4215ce5de0313e5168f77832	yes	14
Multipart Description/PDF files in .zip description					
	Document Description		Start		End
	Specification		1		9
	Claims		10		13
	Abstract		14		14
Warnings:					
Information:					
2	Drawings-only black and white line drawings	Drawings.pdf	100000 516dcd26e0b3f743db734755bfd2e47ebac39854	no	6
Warnings:					
Information:					
3	Application Data Sheet	ADS.pdf	1301286 8080667b186b3f6d26d470f35c8202c142740873	no	7
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4	Miscellaneous Incoming Letter	WO2008156412.pdf	747769 f1ee67074d9e6bb9af3b4c73443076d5790d05c5	no	19
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Information:					
5	Information Disclosure Statement (IDS) Form (SB08)	IDS.pdf	523213 962efe3c70ab271348641ef1ce53f2988550f3a2	no	5
Warnings:					
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A U.S. Publication Number Citation is required in the Information Disclosure Statement (IDS) form. You may remove the form to add the required data in order to correct the Informational Message or if you chose not to, the image of the form will be processed and be made available within the Image File Wrapper (IFW) system. However, no data will be extracted from this form. Any additional data such as Foreign Patent Documents or Non Patent Literature will be manually reviewed and keyed into USPTO systems.					

6	Foreign Reference	EP1799003.pdf	3910491	no	31
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Warnings:					
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7	Foreign Reference	WO2007052917.pdf	3427520	no	27
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8	Non Patent Literature	SAMSUNG-3GPPTS GRAN2.pdf	67550	no	6
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9	Non Patent Literature	SAMSUNG-3GPPTS G-RAN2.pdf	101276	no	8
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12	Non Patent Literature	3GPPTS36-300.pdf	924535	no	82
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Total Files Size (in bytes):			11338887		

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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL

RELATED APPLICATION

[0001] The present application is a continuation of U.S. Patent Application No. 12/664,347, which was filed on December 11, 2009, which claims priority to PCT/SE2008/050407, which was filed on April 10, 2008, which claims priority to U.S. Provisional Patent Application No. 60/944,628, which was filed on June 18, 2007, all of which are incorporated by reference herein in their entirety.

TECHNICAL FIELD

[0002] The present invention generally relates to wireless communication networks, and particularly relates to the transmission of system information to user equipment (UE) operating in such networks, such as the transmission of system information by radio base stations in a wireless communication network configured according to 3GPP E-UTRA (evolved Universal Terrestrial Radio Access) standards, also referred to as 3GPP LTE (Long Term Evolution).

BACKGROUND

[0003] In the 3GPP LTE, downlink user-data transmission is carried out on the Downlink Shared Channel (DL-SCH) transport channel. In LTE, the time dimension is divided into radio frames of length 10 ms, where each radio frame consists of 10 subframes, each of length 1 ms corresponding to 14 OFDM (orthogonal frequency-division multiplexing) symbols. Each subframe consists of two slots, each of length 0.5 ms or seven OFDM symbols. Note that, in case of Time Division Duplex (TDD), only a subset of the subframes of one frame is available for downlink transmission. On the other hand, in case of Frequency Division Duplex (FDD), all subframes on a downlink carrier are available for downlink transmission.

[0004] In LTE, the overall time/frequency-domain physical resource is divided into resource blocks, where each resource block consists of twelve OFDM subcarriers during one slot. DL-SCH transmission to a UE is carried out using a set of such resource blocks during one subframe. Layer 1 / Layer 2 (L1/L2) control signaling, also known as the Physical Downlink Control Channel

(PDCCH), is transmitted at the beginning of each subframe. The L1/L2 control channel is typically used to inform a UE about various items. For example, the L1/L2 control channel may identify whether the DL-SCH carries data to the UE in the given subframe. More specifically, the L1/L2 control channel then includes the RNTI (Radio Network Temporary Identifier) associated with the UE for which the DL-SCH carries data in the given subframe. The L1/L2 control channel then also identifies the physical resource, more specifically the specific set of resource blocks that is used for the DL-SCH transmission to the specific UE in the given subframe. Moreover, the L1/L2 control channel then identifies the transport format (e.g. the modulation scheme and coding rate) used for DL-SCH transmission to the specific UE in the given subframe. Separate DL-SCH transmissions, using different physical resources (different resource blocks), can be carried out to different UEs during the same subframe. In this case there are multiple L1/L2 control channels, one for each UE that is to receive DL-SCH transmission in the given subframe.

[0005] In addition to user data, system information is also transmitted on the downlink within each cell. The system information may, e.g., include: public Land Mobile Network (PLMN) identity/identities, identifying the operator(s) to which the cell “belongs”; Neighbor-cell list, i.e. a list of the cells that are neighbors to the current cell; and different parameters used by the user terminal when accessing the system, e.g. random-access parameters and cell-access restrictions. The system information can be divided into two parts, one part being fixed and the other part being dynamic. The fixed part of the system information is transmitted on a pre-determined physical resource, i.e. a specific set of OFDM subcarriers during a specific time interval, using a pre-determined transport format. There is thus no flexibility in the amount of information in the fixed part of the system information. There is also no flexibility in the transmission structure (the physical resource and the transport format) used for the fixed part of the system information. In LTE, the fixed part of the system information is transmitted using the BCH (broadcast control channel) transport channel. Furthermore, for LTE it is currently assumed that the BCH is transmitted in the six centre resource blocks in subframe #0 of each frame.

[0006] The dynamic part of the system information is assumed to be transmitted using the DL-SCH, or at least a DL-SCH-like transport channel, similar to normal data transmission as described

above. New UEs continuously “enter” the cell, either entering from a neighbor cell, due to power-on, or upon return from out-of-service, and the UEs must quickly acquire the system information. Thus the system information (both the fixed part on the BCH and the dynamic part on the DL-SCH or a DL-SCH-like channel) should be repeated regularly.

[0007] As an example, in LTE the fixed part of the system information (transmitted using the BCH) is assumed to be repeated every 40 ms. Also the dynamic part of the system information should be repeated more or less regularly. However, different portions of the dynamic part of the system information are more or less time critical, in the sense of how quickly the UE must acquire it, and thus need to be repeated more or less often. This can be described so that the dynamic part of the system information is divided into different so-called scheduling units, also referred to as System Information Messages. In general, information corresponding to scheduling unit number n should be repeated more often than information corresponding to scheduling unit number $n+1$. As an example, scheduling unit #1 (SU-1) may be repeated (approximately) once every 80 ms, scheduling unit #2 (SU-2) may be repeated (approximately) once every 160 ms, scheduling unit #3 (SU-3) may be repeated (approximately) once every 320 ms, etc.

SUMMARY

[0008] The invention described below allows for transmission of the dynamic part of the system information fulfilling these requirements and desirable properties while, at the same time, allowing for low UE complexity. One aspect of the teachings presented herein is to transmit system information in regularly occurring (system information) windows, with specific RNTIs indicating the presence of system information in a subframe, and with another specific RNTI indicating the end of system information transmission. This enables UEs to stop receiving, demodulating and decoding subframes when no more system information is expected during the current window.

[0009] In one embodiment, a method of transmitting system information on a downlink shared channel structured as successive subframes includes transmitting system information in regularly occurring time windows, each time window spanning some number of successive subframes. The

method further includes indicating to receiving user equipment which subframes within a given time window carry system information.

[0010] Of course, the present invention is not limited to the above features and advantages. Indeed, those skilled in the art will recognize additional features and advantages upon reading the following detailed description, and upon viewing the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] Figure 1 is a block diagram of an embodiment of a wireless network that overlays or otherwise defines a recurring sequence of time windows for the transmission of dynamic system information using subframes falling within the defined time windows.

[0012] Figure 2 is a diagram of an embodiment of different system-information time windows having different repetition periods.

[0013] Figure 3 is a diagram of an embodiment of overlaying or otherwise defining a recurring sequence of time windows for the transmission of dynamic system information using subframes falling within the defined time windows.

[0014] Figure 4 is a flow diagram of an embodiment of program logic for overlaying or otherwise defining a recurring sequence of time windows for the transmission of dynamic system information using subframes falling within the defined time windows.

[0015] Figure 5 is a flow diagram of an embodiment of program logic for processing recurring system-information time windows containing dynamic system information included in subframes falling within the defined time windows.

[0016] Figure 6 is a diagram of an embodiment of variably sized recurring system-information time windows for the transmission of system information.

[0017] Figure 7 is a diagram of an embodiment of different system-information time windows.

DETAILED DESCRIPTION

[0018] Figure 1 illustrates an embodiment of a wireless network 100 including one or more network transmitters 110 such as a radio base station which services one or more UEs 120. The

network transmitter 110 includes a baseband processor 130 for generating one or more scheduling units 132 (also referred to as System Information Messages) including dynamic parts of the system information. The network transmitter 110 sends the scheduling units 132 to the UE 120 using different system-information windows. In one embodiment, the system-information windows occur with a period corresponding to the repetition period of the most frequently occurring scheduling unit 132 as shown in Figure 2 where "SU-n" refers to the nth scheduling unit 132. System information corresponding to the most frequently occurring scheduling unit 132 is transmitted within each system-information window while less frequently-occurring scheduling units 132 are transmitted only within a sub-set of the system-information windows, where system information is shown as a shaded area in Figure 2. For illustrative purposes only, system information corresponding to a second one of the scheduling units 132 could be transmitted within every second window, system information corresponding to a third one of the scheduling units 132 could be transmitted within every fourth window, and so on.

[0019] In one embodiment, the transmission timing corresponding to each scheduling unit 132 can be pre-specified when a limited amount of transmission periods are employed by the network 100. In another embodiment, the window transmission timing can be signaled to the UE 120, e.g. when more specific values for transmitted scheduling units 132 are specified. Either way, a variable window size can be used if the amount of system information is not the same in each window. In one embodiment, the window size is increased when system information from additional scheduling units 132 is transmitted.

[0020] Figure 3 illustrates one embodiment of transmitting the dynamic (possibly changing) system information within regularly occurring windows with well-defined starting points (specific subframes) and of a certain size in number of (consecutive) subframes. In the illustration, the system-information windows, more generally regarded as recurring time windows defined for the transmission of system information, start at subframe #5 of the frame with frame number $8 \cdot k$ and have a size of 13 subframes. The network transmitter 110 only transmits the dynamic part of the system information within these windows. Moreover, the window occurs (is repeated) often enough to fulfill the repetition rate of the most often repeated system information (in LTE

terminology, system information corresponding to the first scheduling unit 132, as described above).

[0021] In one or more embodiments, within each recurring time window, the transmission of system information is carried out similar to the transmission of user data on DL-SCH (dynamic resource and transport format with signaling on L1/L2 control channel), with some exceptions. Instead of using an RNTI of a specific UE 120, a specific System-Information RNTI (SI-RNTI), indicating that system information to be read by all UEs 120 is being transmitted, is included in the corresponding L1/L2 control signaling. Also, for the last piece of system information to be transmitted within the window, the SI-RNTI is replaced with an End-of-System-Information RNTI (ESI-RNTI). The reception of an ESI-RNTI informs the UE 120 that no more system information is transmitted within the window. The UE 120 can stop demodulating and decoding the L1/L2 control channel when there is no more system information to be transmitted in the window, thus improving UE power-saving performance.

[0022] Moreover, the system information does not have to be transmitted in consecutive subframes. This way, the network transmitter 110 can dynamically avoid transmitting system information in certain subframes when a more pressing need for subframes arises, e.g., when a subframe is needed for high priority downlink data transmission or for uplink transmission in case of TDD. In addition, the set of subframes in which system information is actually transmitted does not have to be the same between consecutive windows. Furthermore, the network transmitter 110 can dynamically vary the number of subframes used to carry system information without prior knowledge of the UE 120 (i.e., prior to the UE 120 reading the L1/L2 control channel).

[0023] As non-limiting examples, the teachings presented herein for transmitting system information yields several desirable properties. For example, there are several requirements and desired properties for the transmission of the dynamic part of the system information. From a UE power-consumption point of-view, it is desirable to transmit the different parts of the system information as close in time as possible to each other, in the ideal case in a set of consecutive subframes. This enables the UE 120 to receive the maximum amount of system information during a minimum reception time, reducing UE reception time and UE power consumption.

[0024] The teachings herein also allow system information to be transmitted in recurring time windows, where the particular subframes within each window used for carrying system information are selectable. If current conditions, e.g., competing transmission priorities permit, the system information can be transmitted in a contiguous set of subframes within the time window.

[0025] It is also desirable to have flexibility in terms of exactly where the system information is transmitted, i.e., exactly which set of subframes within a given time window carries the system information. Some subframes, depending on the situation, may not be available for transmitting system information. For example, some TDD subframes may not be available for downlink transmission. In another example, for latency reasons there may, in some situations, be a benefit to not having too many consecutive subframes used for transmission of system information, thus making them unavailable for downlink user data transmission. As such, it is also desirable to dynamically (with low delay) decide in exactly what subframes the system information is to be transmitted.

[0026] Further, it is desirable to have flexibility in the rate by which different parts of the system information is repeated. In this way, a higher repetition rate (shorter repetition period) can be used, e.g. in the case of wider overall transmission bandwidth, when the overhead of the system-information transmission is less of a concern. It is desirable to have flexibility in the number of subframes used to transmit the system information. As an example, in case of smaller overall bandwidth or larger cells, more subframes may be needed to transmit a given set of system information. Moreover, the amount of system information, e.g. neighbor lists and PLMN lists may be of different sizes for different cells.

[0027] The teachings presented herein provide for methods and apparatuses where system information is transmitted within recurring time windows, but with flexible selection of which subframes within those windows are used to carry system information. Figure 4 illustrates one embodiment of program logic for transmitting system information from the network transmitter 110 to the UE 120. According to this embodiment, the baseband processor 130 included in the network transmitter 110 initializes the first subframe in the system-information window (Step 400). The baseband processor 130 then determines whether the current subframe is to be used for

transmission of system information (Step 402). If so, the baseband processor 130 determines whether the current subframe is the last subframe in the window (Step 404). If the current subframe is the last subframe, the RNTI of the L1/L2 control channel is set to ESI-RNTI for indicating to the UE 120 that the subframe is the last subframe in the window containing system information. (Step 406). Otherwise, the control channel RNTI is set to SI-RNTI for indicating to the UE 120 that the subframe contains system information, but is not the last subframe. (Step 408). The corresponding system information is transmitted on the DL-SCH within the current subframe (Step 410). The baseband processor 130 determines whether the last window subframe has been transmitted (Step 412). If not, Steps 402 – 412 are repeated for the next subframe within the window. The system information transmission process ends when the last subframe is transmitted (Step 416).

[0028] Figure 5 illustrates one embodiment of program logic carried out by the UE 120 for processing the system information transmitted by the network transmitter 110. According to this embodiment, the UE 120 includes a baseband processor 140 for demodulating and decoding received subframes. A window detection and evaluation unit 150 included in or associated with the baseband processor 140 begins the window reception process by initializing the first subframe received within the window (Step 500). The baseband processor 150 then demodulates and decodes the L1/L2 control channel of the current subframe (Step 502). The window detection and evaluation unit 150 determines whether either SI-RNTI or ESI-RNTI is detected for the current subframe (Step 504). If so, the baseband processor 140 demodulates and decodes the corresponding DL-SCH transport block to retrieve the system information provided therewith (Step 506). The window detection and evaluation unit 150 then determines whether the current subframe is the last subframe in the window or the last subframe containing system information, e.g., whether the RNTI of the control channel is ESI-RNTI (Step 508). If neither condition exists, Steps 502 – 508 are repeated for the next subframe within the window (Step 510). The baseband processor 140 stops demodulating and decoding DL-SCH transport blocks when either the last subframe or ESI-RNTI is detected, indicating no more system information is forthcoming (Step 512). Thus, the UE 120 demodulates and decodes the control channel starting with the first

subframe in the system information window and checks for specific system information RNTIs until either the ESI-RNTI is detected or the last window subframe is received.

[0029] As discussed above, some parts of the system information (corresponding to the scheduling units 132) may not need to be repeated as often as some other parts of the system information, implying that certain windows will include more data (more scheduling units 132) than other windows. Thus, the window size may be of varying length, with a longer window at the time instances where more system information (more scheduling units 132) is to be transmitted.

Figure 6 provides an illustration of a variable-length window embodiment.

[0030] Note that the window size can be specified in either the radio-access specification or be configurable. In case of a configurable window size, the UE 120 can use a default (large) window size before it is informed (via the system information) about the actual window size. Moreover, the RNTI may indicate more than just system information such as more details about the system information. In one embodiment, several different SI-RNTIs could be used, e.g., SI-RNTI1, SI-RNTI2, SI-RNTI3, ..., with corresponding multiple ESI-RNTIs, e.g., ESI-RNTI1, ESI-RNTI2, ESI-RNTI3, etc.

[0031] In one embodiment, the scheduling units 132 transmitted at the same time use the same system-information window as shown in the upper part of Figure 7. Alternatively, the scheduling units 132 are transmitted using different system-information windows as shown in the lower part of Figure 7. In either embodiment, system information is transmitted in regularly occurring system-information windows, with specific RNTIs indicating the presence of system information in a subframe, and with another specific RNTI indicating the end of system information transmission.

[0032] Of course, other variations are contemplated. Thus, the foregoing description and the accompanying drawings represent non-limiting examples of the methods and apparatus taught herein for the transmission of system information. As such, the present invention is not limited by the foregoing description and accompanying drawings. Instead, the present invention is limited only by the following claims and their legal equivalents.

CLAIMS

What is claimed is:

1. A method of transmitting system information on the downlink of a wireless communication network comprising:
 - transmitting system information in recurring time windows overlaid on a sequence of transmit channel subframes;
 - dynamically selecting which subframes within a given time window are to be used for carrying the system information; and
 - including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information.
2. The method of claim 1, wherein dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting a contiguous set of subframes within the given time window.
3. The method of claim 1, wherein dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting a non-contiguous set of subframes within the given time window.
4. The method of claim 1, wherein dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting which subframes to use for transmitting system information in view of competing transmission priorities associated with other control or data signaling.
5. The method of claim 1, wherein including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information comprises using an RNTI (Radio Network Temporary Identifier) to denote that the subframe carries system information.
6. The method of claim 1, wherein including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information includes using an end-of-system-information indicator in a last subframe of the given time window that carries system information.
7. The method of claim 1, further comprising varying window sizes of the recurring time windows.

8. The method of claim 1, further comprising dynamically configuring a window size for the recurring time windows.
9. The method of claim 1, wherein including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information includes using different indicators corresponding to different types of system information, such that the indicator used for a particular subframe indicates the type of system information carried in that subframe.
10. A network transmitter comprising a baseband processor configured to:
 - generate system information in recurring time windows overlaid on a sequence of transmit channel subframes;
 - dynamically select which subframes within a given time window are to be used for carrying system information; and
 - include an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information.
11. The network transmitter of claim 10, wherein the network transmitter comprises a radio base station configured for operation in accordance with 3GPP E-UTRA standards.
12. A method of transmitting system information on a downlink shared channel structured as successive subframes, the method comprising:
 - transmitting system information in regularly occurring time windows, each time window spanning some number of successive subframes; and
 - indicating to receiving user equipment which subframes within a given time window carry system information.
13. The method of claim 12, wherein indicating to receiving user equipment which subframes within a given time window carry system information includes indicating the last subframe within the given time window that carries system information, thereby allowing the receiving user equipment to cease monitoring for system information within the given time window.
14. The method of claim 12, further comprising dynamically selecting which subframes within a given time window are to be used for carrying system information.
15. A method for a mobile station to receive system information from a supporting wireless communication network, the method comprising:

beginning monitoring for the receipt of system information at the start of each time window in a succession of recurring time windows used for the transmission of system information, each said time window spanning a number of signal subframes; within each time window, monitoring each signal subframe for an indication of system information and reading system information from the signal subframe if such information is present; and terminating monitoring at least at the end of the time window.

16. The method of claim 15, further comprising recognizing an end-of-system-information indicator in a signal subframe received within the time window and terminating monitoring for the time window in response.

17. The method of claim 15, further comprising adapting to changing or configurable window sizes used for the time window.

18. The method of claim 15, further comprising storing a default window size for monitoring for system information transmissions.

19. The method of claim 18, further comprising monitoring for system information transmissions based on a specified window size indicated in received information rather than the default window size.

20. The method of claim 15, further comprising recognizing different types of system information based on recognizing different system information indicators in different signal subframes.

21. A mobile station comprising a baseband processor operable to:
begin monitoring for the receipt of system information at the start of each time window in a succession of recurring time windows used for the transmission of system information, each said time window spanning a number of signal subframes;
within each time window, monitor each signal subframe for an indication of system information and reading system information from the signal subframe if such information is present; and
terminate monitoring at least at the end of the time window.

22. The mobile station of claim 21, wherein the baseband processor is operable to recognize an end-of-system-information indicator in a signal subframe received within the time window and terminate monitoring for the time window in response.

23. The mobile station of claim 21, wherein the baseband processor is operable to adapt to changing or configurable window sizes used for the time window.

24. The mobile station of claim 21, wherein the baseband processor is operable to monitor for system information transmissions based on a specified window size indicated in received information rather than a default window size.

25. The mobile station of claim 21, wherein the baseband processor is operable to recognize different types of system information based on different system information indicators detected in different signal subframes.

ABSTRACT

In one embodiment, a method of transmitting system information on a downlink shared channel structured as successive subframes includes transmitting (400 – 416) system information in regularly occurring time windows, each time window spanning some number of successive subframes. The method further includes indicating (406 / 408) to receiving user equipment (120) which subframes within a given time window carry system information. The method and variations of it are applied, for example, to the transmission of dynamic system information on the downlink shared channel or other downlink channel in a 3GPP E-UTRA wireless communication network (100).

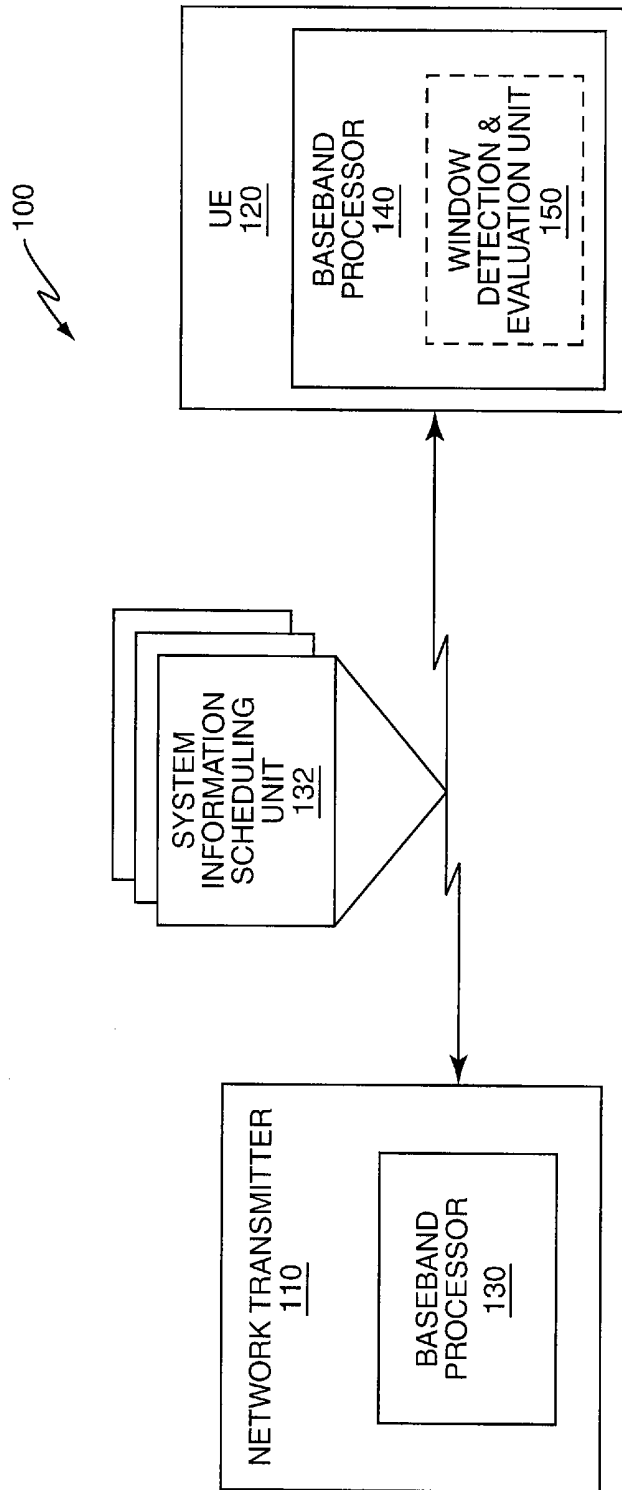


FIG. 1

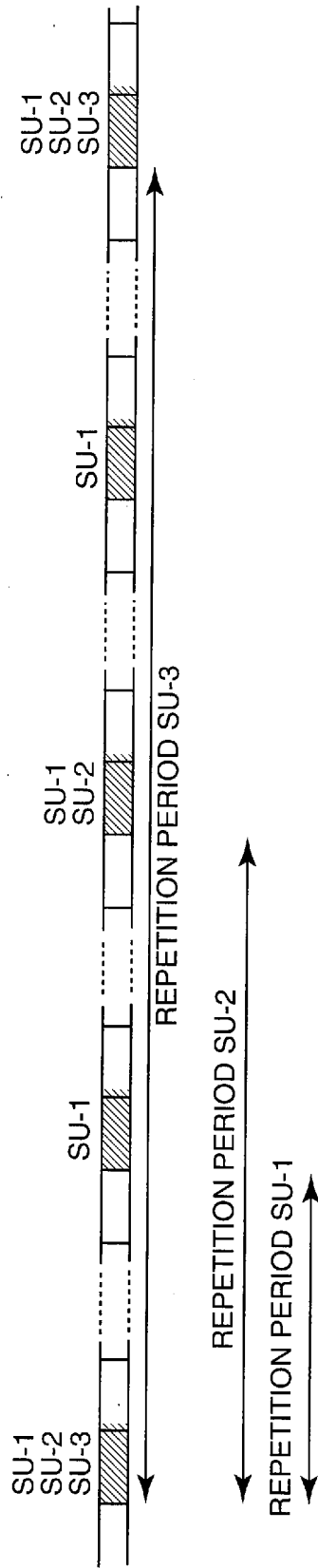


FIG. 2

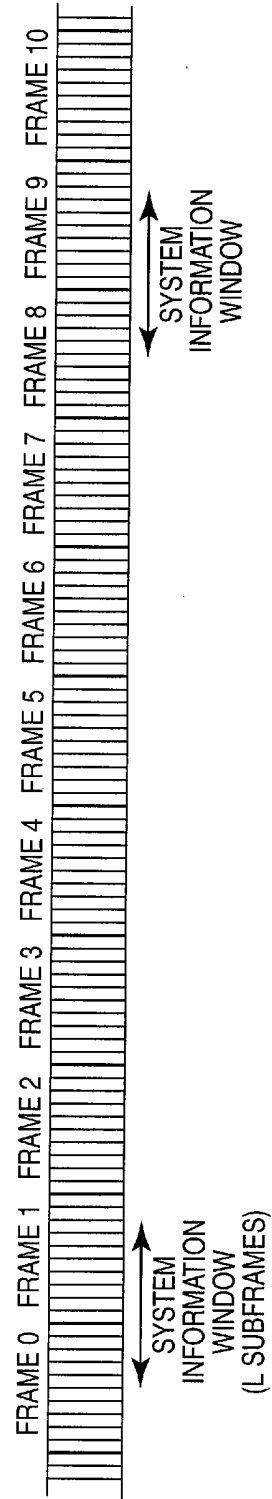


FIG. 3

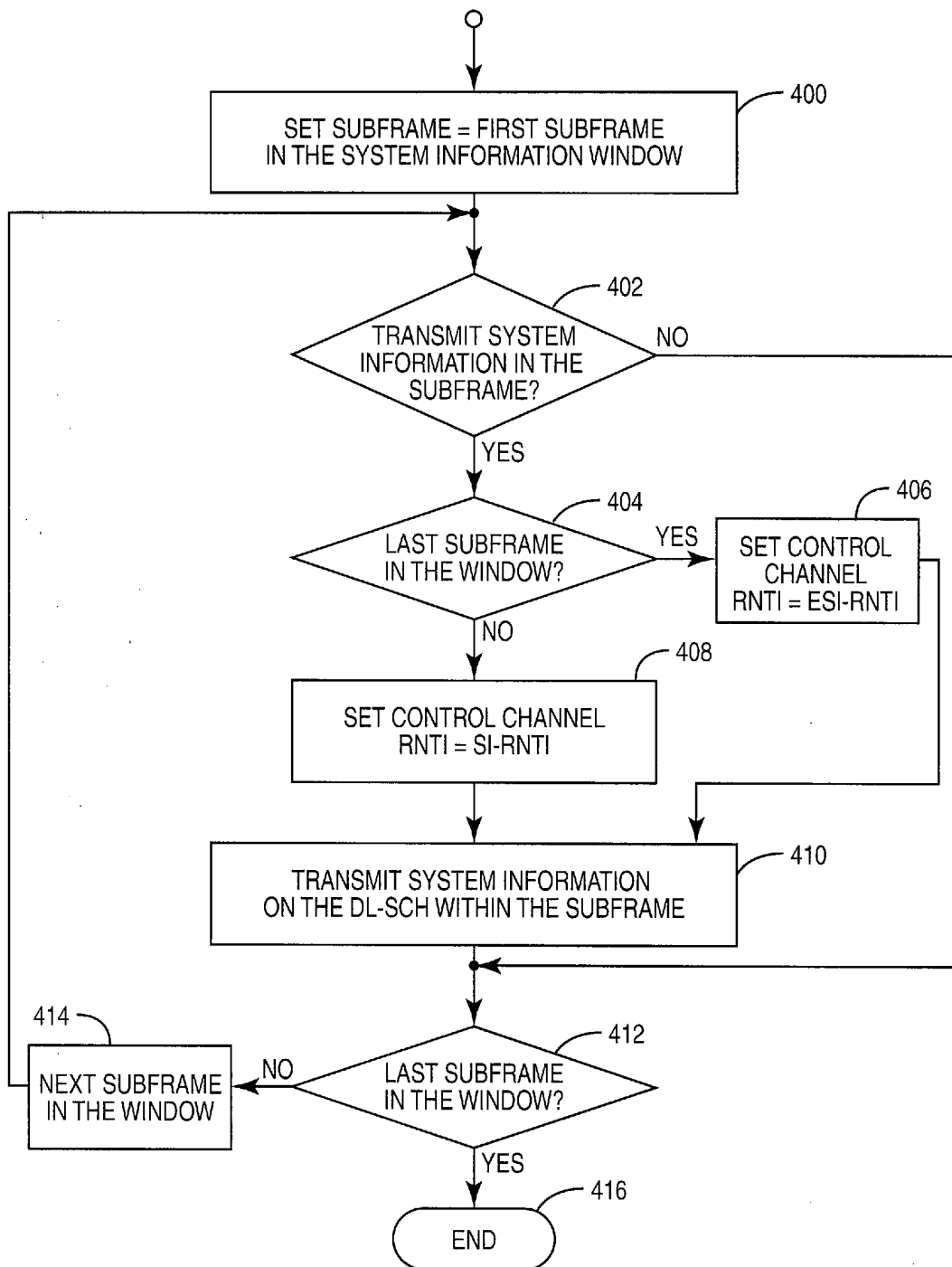


FIG. 4

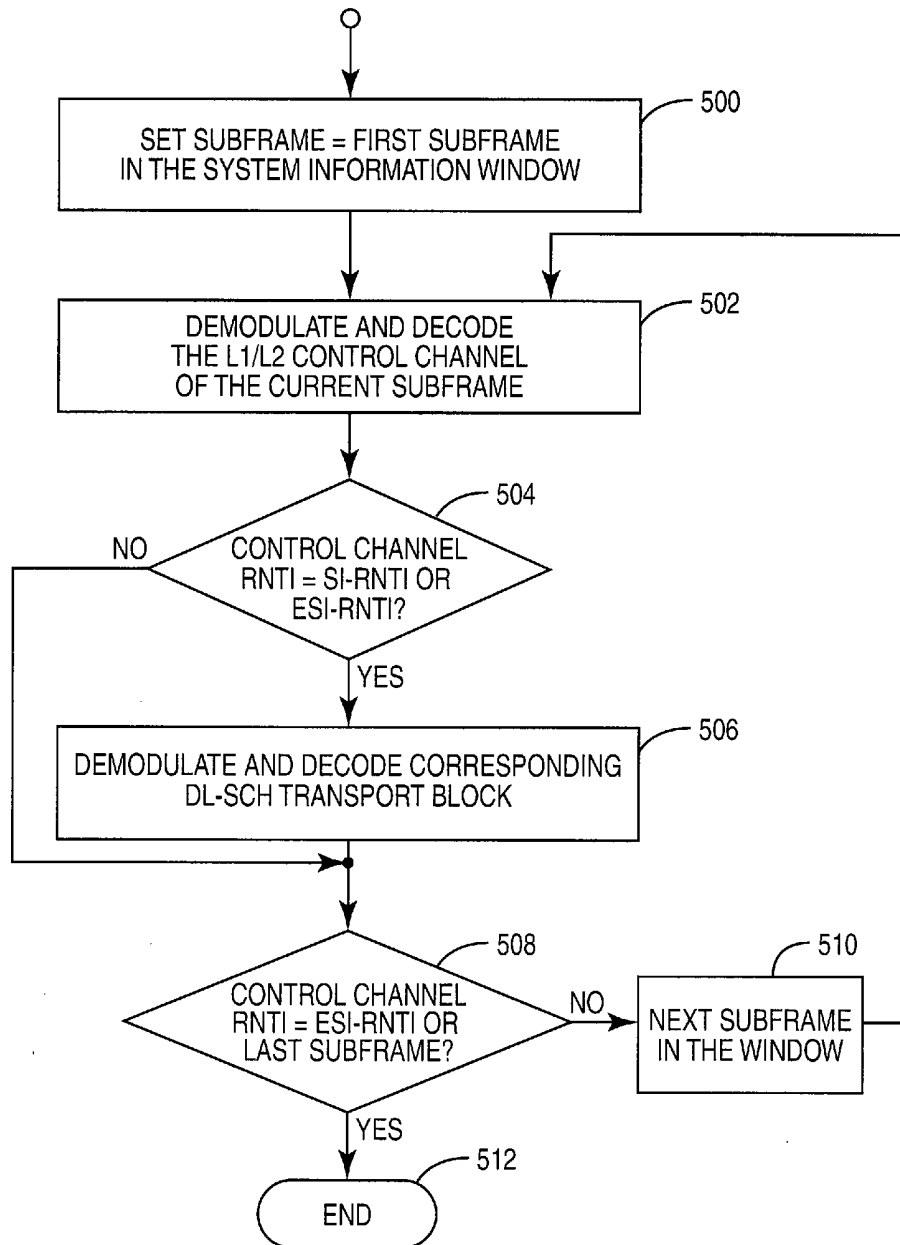


FIG. 5

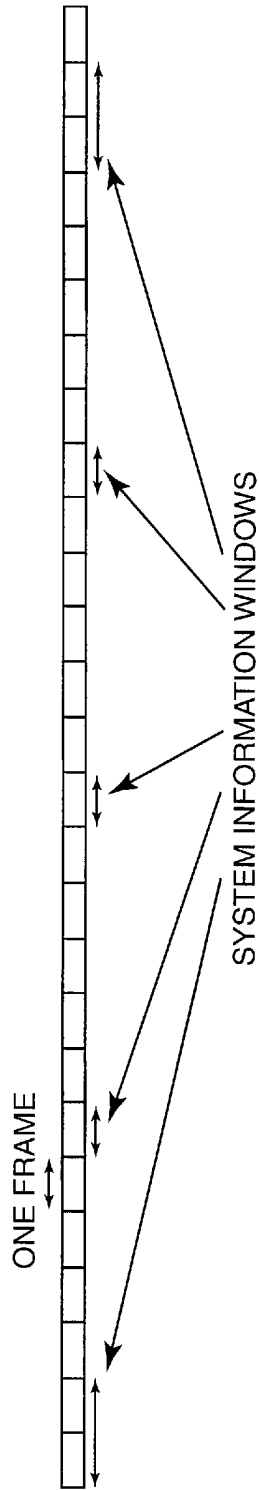


FIG. 6

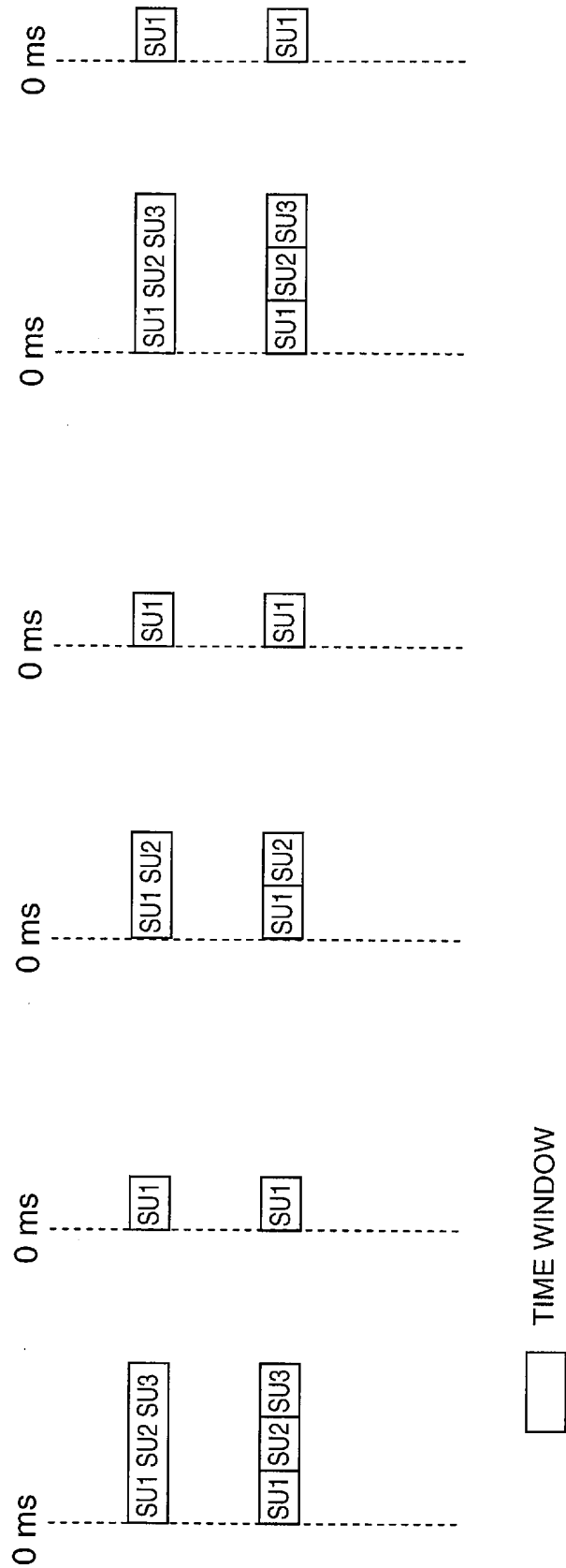


FIG. 7

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4015-6727/P24241-US3
		Application Number	
Title of Invention	Transmission of System Information on a Downlink Shared Channel		
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Attorney Docket Number	4015-6727/P24241-US3	Small Entity Status Claimed	<input type="checkbox"/>
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	4

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For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

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<p>This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.</p> <p><input type="checkbox"/> NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.</p>
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(54) Title: TRANSMISSION OF SYSTEM INFORMATION

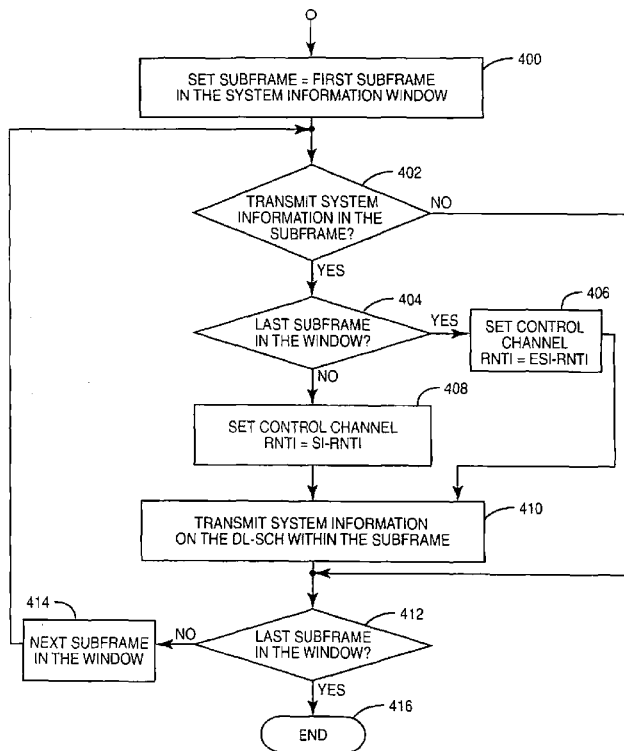


FIG. 4

(57) Abstract: In one embodiment, a method of transmitting system information on a down link shared channel structured as successive subframes includes transmitting (400 - 416) system information in regularly occurring time windows, each time window spanning some number of successive subframes. The method further includes indicating (406 / 408) to receiving user equipment (120) which subframes within a given time window carry system information. The method and variations of it are applied, for example, to the transmission of dynamic system information on the down link shared channel or other down link channel in a 3GPP E-UTRA wireless communication network (100).

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TRANSMISSION OF SYSTEM INFORMATION

BACKGROUND

Technical Field

The present invention generally relates to wireless communication networks, and particularly relates to the transmission of system information to user equipment (UE) operating in such networks, such as the transmission of system information by radio base stations in a wireless communication network configured according to 3GPP E-UTRA (evolved Universal Terrestrial Radio Access) standards, also referred to as 3GPP LTE (Long Term Evolution).

Background

In the 3GPP LTE, downlink user-data transmission is carried out on the Downlink Shared Channel (DL-SCH) transport channel. In LTE, the time dimension is divided into radio frames of length 10 ms, where each radio frame consists of 10 subframes, each of length 1 ms corresponding to 14 OFDM (orthogonal frequency-division multiplexing) symbols. Each subframe consists of two slots, each of length 0.5 ms or seven OFDM symbols. Note that, in case of Time Division Duplex (TDD), only a subset of the subframes of one frame is available for downlink transmission. On the other hand, in case of Frequency Division Duplex (FDD), all subframes on a downlink carrier are available for downlink transmission.

In LTE, the overall time/frequency-domain physical resource is divided into resource blocks, where each resource block consists of twelve OFDM subcarriers during one slot. DL-SCH transmission to a UE is carried out using a set of such resource blocks during one subframe. Layer 1 / Layer 2 (L1/L2) control signaling, also known as the Physical Downlink Control Channel (PDCCH), is transmitted at the beginning of each subframe. The L1/L2 control channel is typically used to inform a UE about various items. For example, the L1/L2 control channel may identify whether the DL-SCH carries data to the UE in the given subframe. More specifically, the L1/L2 control channel then includes the RNTI (Radio Network Temporary Identifier) associated with the UE for which the DL-SCH carries data in the given subframe. The L1/L2 control channel then also identifies the physical resource, more specifically the specific set of resource blocks that is used for the DL-SCH transmission to the specific UE in the given subframe. Moreover, the L1/L2 control channel then identifies the transport format (e.g. the modulation scheme and coding rate) used for DL-SCH transmission to the specific UE in the given subframe. Separate DL-SCH transmissions, using different physical resources (different resource blocks), can be carried out to different UEs during the same subframe. In this case there are multiple L1/L2 control channels, one for each UE that is to receive DL-SCH transmission in the given subframe.

In addition to user data, system information is also transmitted on the downlink within each cell. The system information may, e.g., include: public Land Mobile Network (PLMN) identity/identities, identifying the operator(s) to which the cell "belongs"; Neighbor-cell list, i.e. a list

of the cells that are neighbors to the current cell; and different parameters used by the user terminal when accessing the system, e.g. random-access parameters and cell-access restrictions. The system information can be divided into two parts, one part being fixed and the other part being dynamic. The fixed part of the system information is transmitted on a pre-determined physical resource, i.e. a specific set of OFDM subcarriers during a specific time interval, using a pre-determined transport format. There is thus no flexibility in the amount of information in the fixed part of the system information. There is also no flexibility in the transmission structure (the physical resource and the transport format) used for the fixed part of the system information. In LTE, the fixed part of the system information is transmitted using the BCH (broadcast control channel) transport channel. Furthermore, for LTE it is currently assumed that the BCH is transmitted in the six centre resource blocks in subframe #0 of each frame.

The dynamic part of the system information is assumed to be transmitted using the DL-SCH, or at least a DL-SCH-like transport channel, similar to normal data transmission as described above. New UEs continuously "enter" the cell, either entering from a neighbor cell, due to power-on, or upon return from out-of-service, and the UEs must quickly acquire the system information. Thus the system information (both the fixed part on the BCH and the dynamic part on the DL-SCH or a DL-SCH-like channel) should be repeated regularly.

As an example, in LTE the fixed part of the system information (transmitted using the BCH) is assumed to be repeated every 40 ms. Also the dynamic part of the system information should be repeated more or less regularly. However, different portions of the dynamic part of the system information are more or less time critical, in the sense of how quickly the UE must acquire it, and thus need to be repeated more or less often. This can be described so that the dynamic part of the system information is divided into different so-called scheduling units, also referred to as System Information Messages. In general, information corresponding to scheduling unit number n should be repeated more often than information corresponding to scheduling unit number $n+1$. As an example, scheduling unit #1 (SU-1) may be repeated (approximately) once every 80 ms, scheduling unit #2 (SU-2) may be repeated (approximately) once every 160 ms, scheduling unit #3 (SU-3) may be repeated (approximately) once every 320 ms, etc.

SUMMARY

The invention described below allows for transmission of the dynamic part of the system information fulfilling these requirements and desirable properties while, at the same time, allowing for low UE complexity. One aspect of the teachings presented herein is to transmit system information in regularly occurring (system information) windows, with specific RNTIs indicating the presence of system information in a subframe, and with another specific RNTI indicating the end of system information transmission. This enables UEs to stop receiving, demodulating and decoding subframes when no more system information is expected during the current window.

In one embodiment, a method of transmitting system information on a downlink shared channel structured as successive subframes includes transmitting system information in regularly occurring time windows, each time window spanning some number of successive subframes. The method further includes indicating to receiving user equipment which subframes within a given time window carry system information.

Of course, the present invention is not limited to the above features and advantages. Indeed, those skilled in the art will recognize additional features and advantages upon reading the following detailed description, and upon viewing the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a block diagram of an embodiment of a wireless network that overlays or otherwise defines a recurring sequence of time windows for the transmission of dynamic system information using subframes falling within the defined time windows.

Figure 2 is a diagram of an embodiment of different system-information time windows having different repetition periods.

Figure 3 is a diagram of an embodiment of overlaying or otherwise defining a recurring sequence of time windows for the transmission of dynamic system information using subframes falling within the defined time windows.

Figure 4 is a flow diagram of an embodiment of program logic for overlaying or otherwise defining a recurring sequence of time windows for the transmission of dynamic system information using subframes falling within the defined time windows.

Figure 5 is a flow diagram of an embodiment of program logic for processing recurring system-information time windows containing dynamic system information included in subframes falling within the defined time windows.

Figure 6 is a diagram of an embodiment of variably sized recurring system-information time windows for the transmission of system information.

Figure 7 is a diagram of an embodiment of different system-information time windows.

DETAILED DESCRIPTION

Figure 1 illustrates an embodiment of a wireless network 100 including one or more network transmitters 110 such as a radio base station which services one or more UEs 120. The network transmitter 110 includes a baseband processor 130 for generating one or more scheduling units 132 (also referred to as System Information Messages) including dynamic parts of the system information. The network transmitter 110 sends the scheduling units 132 to the UE 120 using different system-information windows. In one embodiment, the system-information windows occur with a period corresponding to the repetition period of the most frequently occurring scheduling unit 132 as shown in Figure 2 where "SU-n" refers to the nth scheduling unit 132. System

information corresponding to the most frequently occurring scheduling unit 132 is transmitted within each system-information window while less frequently-occurring scheduling units 132 are transmitted only within a sub-set of the system-information windows, where system information is shown as a shaded area in Figure 2. For illustrative purposes only, system information corresponding to a second one of the scheduling units 132 could be transmitted within every second window, system information corresponding to a third one of the scheduling units 132 could be transmitted within every fourth window, and so on.

In one embodiment, the transmission timing corresponding to each scheduling unit 132 can be pre-specified when a limited amount of transmission periods are employed by the network 100. In another embodiment, the window transmission timing can be signaled to the UE 120, e.g. when more specific values for transmitted scheduling units 132 are specified. Either way, a variable window size can be used if the amount of system information is not the same in each window. In one embodiment, the window size is increased when system information from additional scheduling units 132 is transmitted.

Figure 3 illustrates one embodiment of transmitting the dynamic (possibly changing) system information within regularly occurring windows with well-defined starting points (specific subframes) and of a certain size in number of (consecutive) subframes. In the illustration, the system-information windows, more generally regarded as recurring time windows defined for the transmission of system information, start at subframe #5 of the frame with frame number $8*k$ and have a size of 13 subframes. The network transmitter 110 only transmits the dynamic part of the system information within these windows. Moreover, the window occurs (is repeated) often enough to fulfill the repetition rate of the most often repeated system information (in LTE terminology, system information corresponding to the first scheduling unit 132, as described above).

In one or more embodiments, within each recurring time window, the transmission of system information is carried out similar to the transmission of user data on DL-SCH (dynamic resource and transport format with signaling on L1/L2 control channel), with some exceptions. Instead of using an RNTI of a specific UE 120, a specific System-Information RNTI (SI-RNTI), indicating that system information to be read by all UEs 120 is being transmitted, is included in the corresponding L1/L2 control signaling. Also, for the last piece of system information to be transmitted within the window, the SI-RNTI is replaced with an End-of-System-Information RNTI (ESI-RNTI). The reception of an ESI-RNTI informs the UE 120 that no more system information is transmitted within the window. The UE 120 can stop demodulating and decoding the L1/L2 control channel when there is no more system information to be transmitted in the window, thus improving UE power-saving performance.

Moreover, the system information does not have to be transmitted in consecutive subframes. This way, the network transmitter 110 can dynamically avoid transmitting system

information in certain subframes when a more pressing need for subframes arises, e.g., when a subframe is needed for high priority downlink data transmission or for uplink transmission in case of TDD. In addition, the set of subframes in which system information is actually transmitted does not have to be the same between consecutive windows. Furthermore, the network transmitter 110 can dynamically vary the number of subframes used to carry system information without prior knowledge of the UE 120 (i.e., prior to the UE 120 reading the L1/L2 control channel).

As non-limiting examples, the teachings presented herein for transmitting system information yields several desirable properties. For example, there are several requirements and desired properties for the transmission of the dynamic part of the system information. From a UE power-consumption point of-view, it is desirable to transmit the different parts of the system information as close in time as possible to each other, in the ideal case in a set of consecutive subframes. This enables the UE 120 to receive the maximum amount of system information during a minimum reception time, reducing UE reception time and UE power consumption.

The teachings herein also allow system information to be transmitted in recurring time windows, where the particular subframes within each window used for carrying system information are selectable. If current conditions, e.g., competing transmission priorities permit, the system information can be transmitted in a contiguous set of subframes within the time window.

It is also desirable to have flexibility in terms of exactly where the system information is transmitted, i.e., exactly which set of subframes within a given time window carries the system information. Some subframes, depending on the situation, may not be available for transmitting system information. For example, some TDD subframes may not be available for downlink transmission. In another example, for latency reasons there may, in some situations, be a benefit to not having too many consecutive subframes used for transmission of system information, thus making them unavailable for downlink user data transmission. As such, it is also desirable to dynamically (with low delay) decide in exactly what subframes the system information is to be transmitted.

Further, it is desirable to have flexibility in the rate by which different parts of the system information is repeated. In this way, a higher repetition rate (shorter repetition period) can be used, e.g. in the case of wider overall transmission bandwidth, when the overhead of the system-information transmission is less of a concern. It is desirable to have flexibility in the number of subframes used to transmit the system information. As an example, in case of smaller overall bandwidth or larger cells, more subframes may be needed to transmit a given set of system information. Moreover, the amount of system information, e.g. neighbor lists and PLMN lists may be of different sizes for different cells.

The teachings presented herein provide for methods and apparatuses where system information is transmitted within recurring time windows, but with flexible selection of which subframes within those windows are used to carry system information. Figure 4 illustrates one

embodiment of program logic for transmitting system information from the network transmitter 110 to the UE 120. According to this embodiment, the baseband processor 130 included in the network transmitter 110 initializes the first subframe in the system-information window (Step 400). The baseband processor 130 then determines whether the current subframe is to be used for transmission of system information (Step 402). If so, the baseband processor 130 determines whether the current subframe is the last subframe in the window (Step 404). If the current subframe is the last subframe, the RNTI of the L1/L2 control channel is set to ESI-RNTI for indicating to the UE 120 that the subframe is the last subframe in the window containing system information. (Step 406). Otherwise, the control channel RNTI is set to SI-RNTI for indicating to the UE 120 that the subframe contains system information, but is not the last subframe. (Step 408). The corresponding system information is transmitted on the DL-SCH within the current subframe (Step 410). The baseband processor 130 determines whether the last window subframe has been transmitted (Step 412). If not, Steps 402 – 412 are repeated for the next subframe within the window. The system information transmission process ends when the last subframe is transmitted (Step 416).

Figure 5 illustrates one embodiment of program logic carried out by the UE 120 for processing the system information transmitted by the network transmitter 110. According to this embodiment, the UE 120 includes a baseband processor 140 for demodulating and decoding received subframes. A window detection and evaluation unit 150 included in or associated with the baseband processor 140 begins the window reception process by initializing the first subframe received within the window (Step 500). The baseband processor 150 then demodulates and decodes the L1/L2 control channel of the current subframe (Step 502). The window detection and evaluation unit 150 determines whether either SI-RNTI or ESI-RNTI is detected for the current subframe (Step 504). If so, the baseband processor 140 demodulates and decodes the corresponding DL-SCH transport block to retrieve the system information provided therewith (Step 506). The window detection and evaluation unit 150 then determines whether the current subframe is the last subframe in the window or the last subframe containing system information, e.g., whether the RNTI of the control channel is ESI-RNTI (Step 508). If neither condition exists, Steps 502 – 508 are repeated for the next subframe within the window (Step 510). The baseband processor 140 stops demodulating and decoding DL-SCH transport blocks when either the last subframe or ESI-RNTI is detected, indicating no more system information is forthcoming (Step 512). Thus, the UE 120 demodulates and decodes the control channel starting with the first subframe in the system information window and checks for specific system information RNTIs until either the ESI-RNTI is detected or the last window subframe is received.

As discussed above, some parts of the system information (corresponding to the scheduling units 132) may not need to be repeated as often as some other parts of the system information, implying that certain windows will include more data (more scheduling units 132) than

other windows. Thus, the window size may be of varying length, with a longer window at the time instances where more system information (more scheduling units 132) is to be transmitted. Figure 6 provides an illustration of a variable-length window embodiment.

Note that the window size can be specified in either the radio-access specification or be configurable. In case of a configurable window size, the UE 120 can use a default (large) window size before it is informed (via the system information) about the actual window size. Moreover, the RNTI may indicate more than just system information such as more details about the system information. In one embodiment, several different SI-RNTIs could be used, e.g., SI-RNTI1, SI-RNTI2, SI-RNTI3, ..., with corresponding multiple ESI-RNTIs, e.g., ESI-RNTI1, ESI-RNTI2, ESI-RNTI3, etc.

In one embodiment, the scheduling units 132 transmitted at the same time use the same system-information window as shown in the upper part of Figure 7. Alternatively, the scheduling units 132 are transmitted using different system-information windows as shown in the lower part of Figure 7. In either embodiment, system information is transmitted in regularly occurring system-information windows, with specific RNTIs indicating the presence of system information in a subframe, and with another specific RNTI indicating the end of system information transmission.

Of course, other variations are contemplated. Thus, the foregoing description and the accompanying drawings represent non-limiting examples of the methods and apparatus taught herein for the transmission of system information. As such, the present invention is not limited by the foregoing description and accompanying drawings. Instead, the present invention is limited only by the following claims and their legal equivalents.

CLAIMS

What is claimed is:

1. A method of transmitting system information on the downlink of a wireless communication network comprising:
 - transmitting (410) system information in recurring time windows overlaid on a sequence of transmit channel subframes;
 - dynamically selecting (402) which subframes within a given time window are to be used for carrying the system information; and
 - including (406 / 408) an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information.
2. The method of claim 1, wherein dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting a contiguous set of subframes within the given time window.
3. The method of claim 1, wherein dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting a non-contiguous set of subframes within the given time window.
4. The method of claim 1, wherein dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting which subframes to use for transmitting system information in view of competing transmission priorities associated with other control or data signaling.
5. The method of claim 1, wherein including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information comprises using an RNTI (Radio Network Temporary Identifier) to denote that the subframe carries system information.
6. The method of claim 1, wherein including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information includes using an end-of-system-information indicator in a last subframe of the given time window that carries system information.
7. The method of claim 1, further comprising varying window sizes of the recurring time windows.

8. The method of claim 1, further comprising dynamically configuring a window size for the recurring time windows.
9. The method of claim 1, wherein including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information includes using different indicators corresponding to different types of system information, such that the indicator used for a particular subframe indicates the type of system information carried in that subframe.
10. A network transmitter (110) comprising a baseband processor (130) configured to:
 - generate system information in recurring time windows overlaid on a sequence of transmit channel subframes;
 - dynamically select which subframes within a given time window are to be used for carrying system information; and
 - include an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information.
11. The network transmitter of claim 10, wherein the network transmitter comprises a radio base station configured for operation in accordance with 3GPP E-UTRA standards.
12. A method of transmitting system information on a downlink shared channel structured as successive subframes, the method comprising:
 - transmitting (400 – 416) system information in regularly occurring time windows, each time window spanning some number of successive subframes; and
 - indicating (406 / 408) to receiving user equipment which subframes within a given time window carry system information.
13. The method of claim 12, wherein indicating to receiving user equipment which subframes within a given time window carry system information includes indicating the last subframe within the given time window that carries system information, thereby allowing the receiving user equipment to cease monitoring for system information within the given time window.
14. The method of claim 12, further comprising dynamically selecting which subframes within a given time window are to be used for carrying system information.

15. A method for a mobile station to receive system information from a supporting wireless communication network, the method comprising:
- beginning monitoring (500 and 502) for the receipt of system information at the start of each time window in a succession of recurring time windows used for the transmission of system information, each said time window spanning a number of signal subframes;
 - within each time window, monitoring (504 – 510) each signal subframe for an indication of system information and reading system information from the signal subframe if such information is present; and
 - terminating monitoring (512) at least at the end of the time window.
16. The method of claim 15, further comprising recognizing an end-of-system-information indicator in a signal subframe received within the time window and terminating monitoring for the time window in response.
17. The method of claim 15, further comprising adapting to changing or configurable window sizes used for the time window.
18. The method of claim 15, further comprising storing a default window size for monitoring for system information transmissions.
19. The method of claim 18, further comprising monitoring for system information transmissions based on a specified window size indicated in received information rather than the default window size.
20. The method of claim 15, further comprising recognizing different types of system information based on recognizing different system information indicators in different signal subframes.
21. A mobile station (120) comprising a baseband processor (140) operable to:
- begin monitoring for the receipt of system information at the start of each time window in a succession of recurring time windows used for the transmission of system information, each said time window spanning a number of signal subframes;
 - within each time window, monitor each signal subframe for an indication of system information and reading system information from the signal subframe if such information is present; and
 - terminate monitoring at least at the end of the time window.

22. The mobile station of claim 21, wherein the baseband processor is operable to recognize an end-of-system-information indicator in a signal subframe received within the time window and terminate monitoring for the time window in response.
23. The mobile station of claim 21, wherein the baseband processor is operable to adapt to changing or configurable window sizes used for the time window.
24. The mobile station of claim 21, wherein the baseband processor is operable to monitor for system information transmissions based on a specified window size indicated in received information rather than a default window size.
25. The mobile station of claim 21, wherein the baseband processor is operable to recognize different types of system information based on different system information indicators detected in different signal subframes.

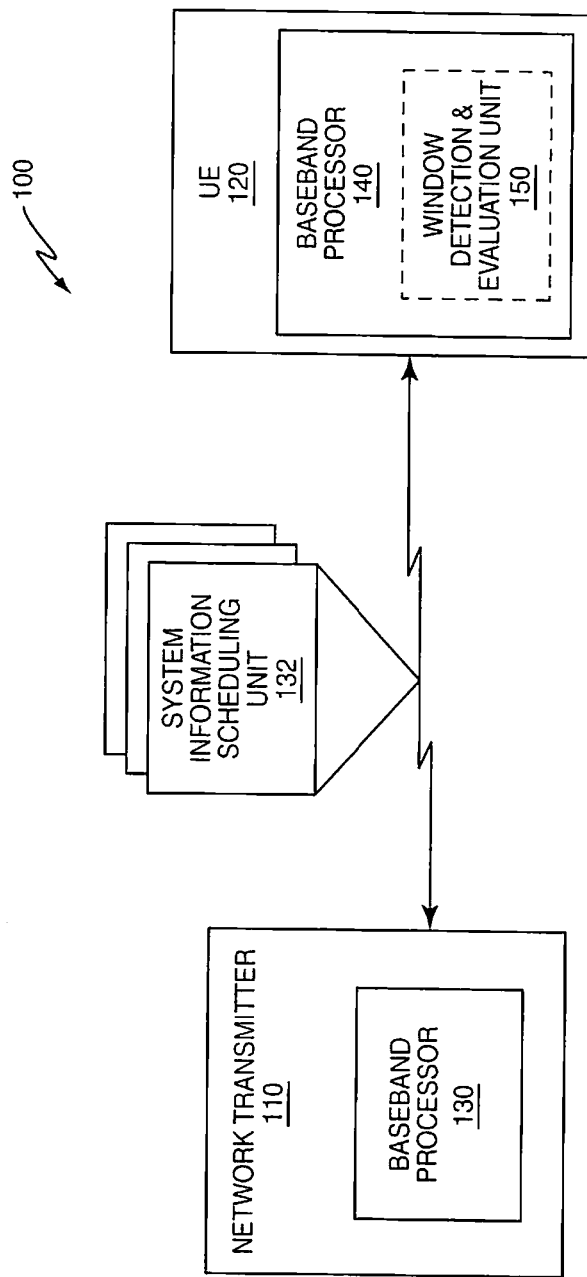


FIG. 1

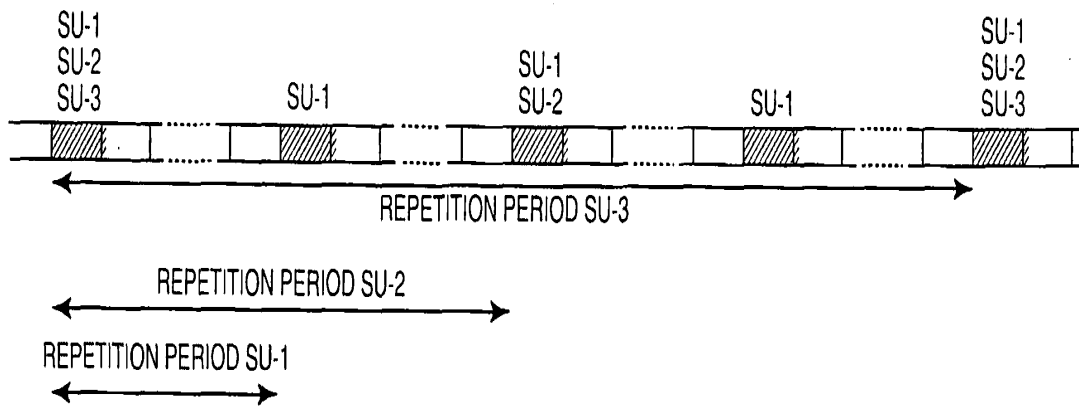


FIG. 2

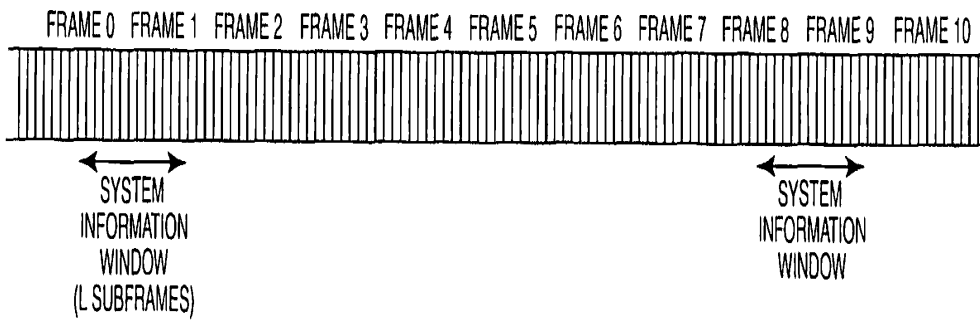


FIG. 3

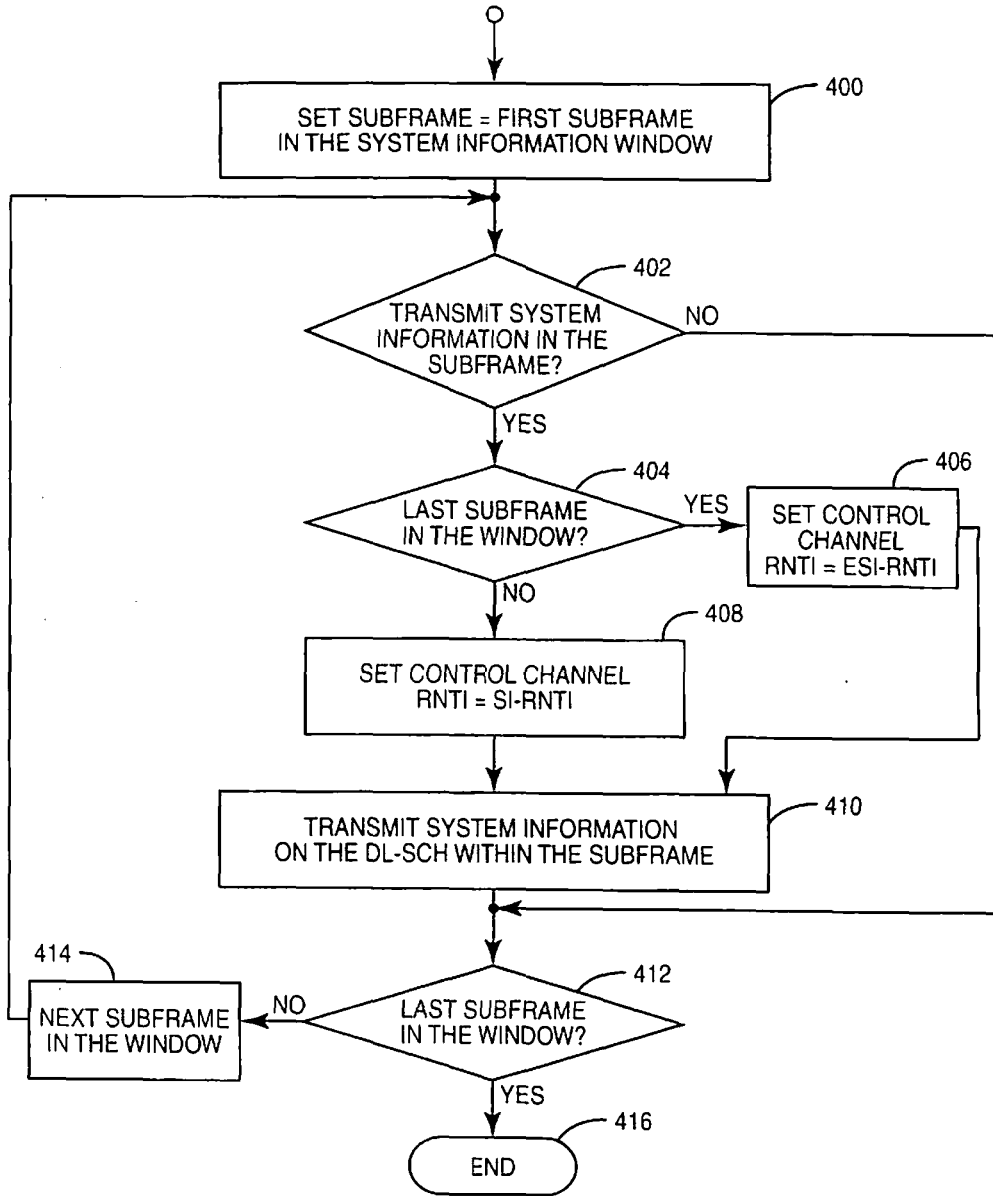


FIG. 4

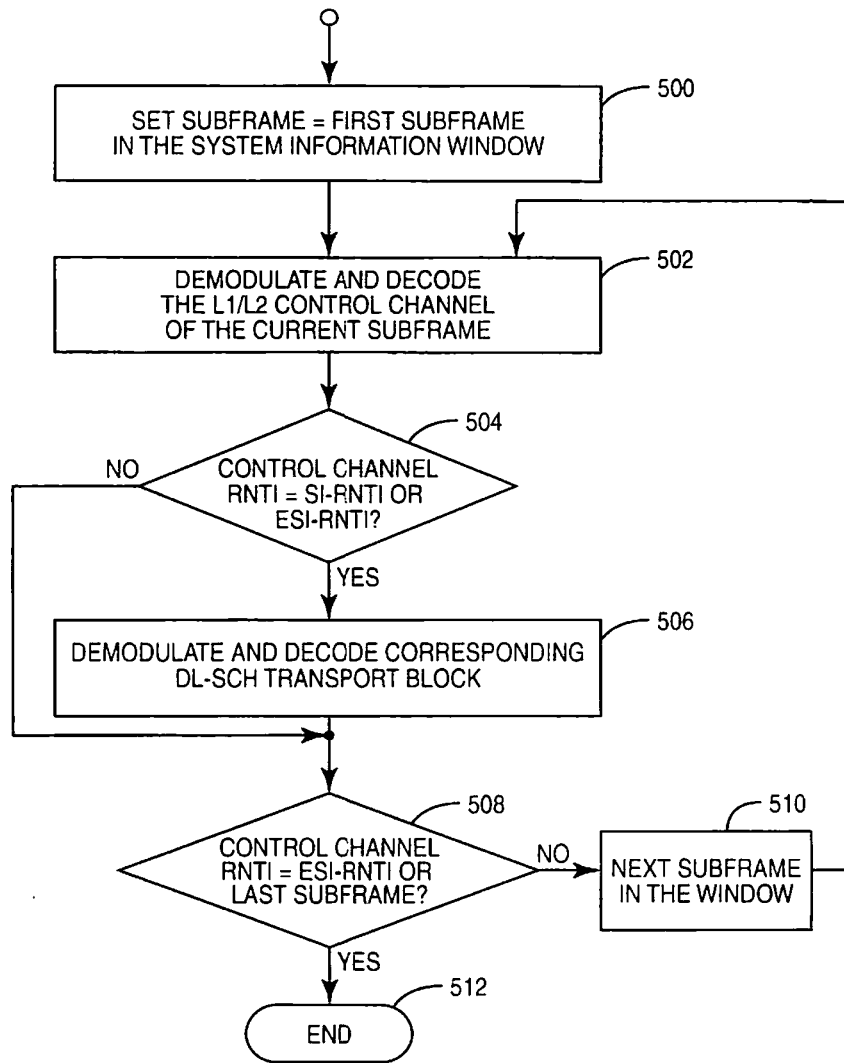


FIG. 5

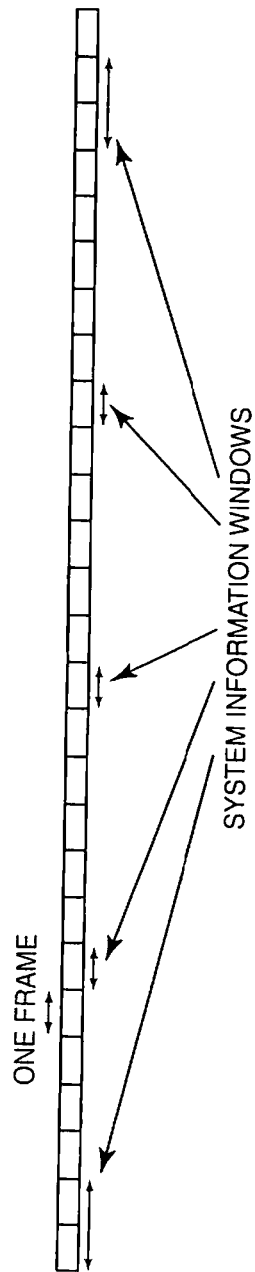


FIG. 6

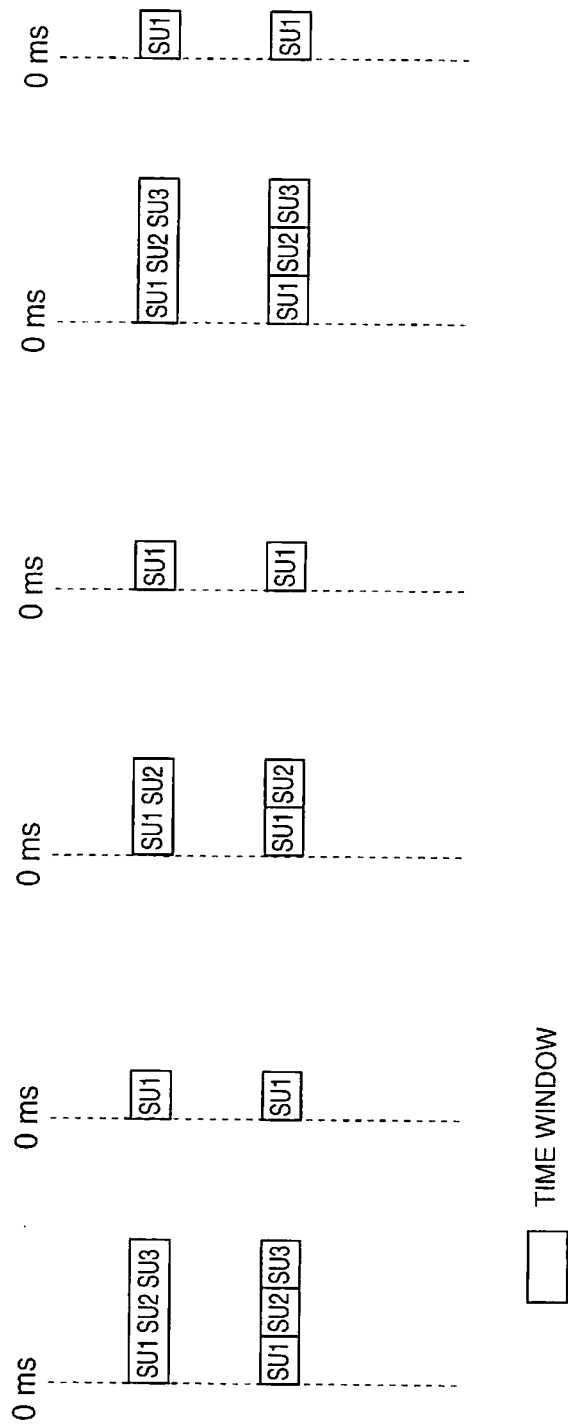


FIG. 7



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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/639,287	03/05/2015	Erik Dahlman	4015-6727/P24241-US3 CONFIRMATION NO. 7111

24112
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

NOTICE



Date Mailed: 03/17/2015

INFORMATIONAL NOTICE TO APPLICANT

Applicant is notified that the above-identified application contains the deficiencies noted below. No period for reply is set forth in this notice for correction of these deficiencies. However, if a deficiency relates to the inventor's oath or declaration, the applicant must file an oath or declaration in compliance with 37 CFR 1.63, or a substitute statement in compliance with 37 CFR 1.64, executed by or with respect to each actual inventor no later than the expiration of the time period set in the "Notice of Allowability" to avoid abandonment. See 37 CFR 1.53(f).

The item(s) indicated below are also required and should be submitted with any reply to this notice to avoid further processing delays.

- A properly executed inventor's oath or declaration has not been received for the following inventor(s):
Erik Dahlman
Vera Vukajlovic Kenehan

PATENT APPLICATION FEE DETERMINATION RECORD
Substitute for Form PTO-875

Application or Docket Number
14/639,287

APPLICATION AS FILED - PART I

(Column 1)		(Column 2)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
FOR	NUMBER FILED	NUMBER EXTRA	RATE(\$)	FEE(\$)		RATE(\$)	FEE(\$)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	280
SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A			N/A	600
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	720
TOTAL CLAIMS (37 CFR 1.16(i))	25 minus 20 = *	5			OR	x 80 =	400
INDEPENDENT CLAIMS (37 CFR 1.16(h))	5 minus 3 = *	2				x 420 =	840
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2840

APPLICATION AS AMENDED - PART II

(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT A	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	* Minus **	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	* Minus ***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))					OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR		
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE		
(Column 1)		(Column 2)	(Column 3)	SMALL ENTITY		OR	OTHER THAN SMALL ENTITY	
AMENDMENT B	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE(\$)	ADDITIONAL FEE(\$)		RATE(\$)	ADDITIONAL FEE(\$)
	Total (37 CFR 1.16(i))	* Minus **	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	* Minus ***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))					OR		
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					OR		
			TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE		

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
 ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
 *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".
 The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.



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Table with 7 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY.DOCKET.NO, TOT CLAIMS, IND CLAIMS. Row 1: 14/639,287, 03/05/2015, 2414, 2980, 4015-6727/P24241-US3, 25, 5

CONFIRMATION NO. 7111

FILING RECEIPT



24112
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

Date Mailed: 03/17/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections

Inventor(s)

Erik Dahlman, Bromma, SWEDEN;
Vera Vukajlovic Kenehan, Stockholm, SWEDEN;

Applicant(s)

Telefonaktiebolaget LM Ericsson (PUBL), Stockholm, SWEDEN

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 12/664,347 12/11/2009 PAT 8995357

Foreign Applications for which priority is claimed (You may be eligible to benefit from the Patent Prosecution Highway program at the USPTO. Please see http://www.uspto.gov for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper Authorization to Permit Access to Application by Participating Offices (PTO/SB/39 or its equivalent) has been received by the USPTO.

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The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US 14/639,287

Projected Publication Date: 06/25/2015

Non-Publication Request: No

Early Publication Request: No

Title

Transmission of System Information on a Downlink Shared Channel

Preliminary Class

370

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

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For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

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Table with 4 columns: APPLICATION NUMBER, FILING OR 371(C) DATE, FIRST NAMED APPLICANT, ATTY. DOCKET NO./TITLE

14/639,287

03/05/2015

Erik Dahlman

4015-9121 / P24241-US3

CONFIRMATION NO. 7111

24112
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

PUBLICATION NOTICE



Title:Transmission of System Information on a Downlink Shared Channel

Publication No.US-2015-0181600-A1

Publication Date:06/25/2015

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently http://pair.uspto.gov/. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

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CONFIRMATION NO. 7111

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Inventor(s)

Erik Dahlman, Bromma, SWEDEN;
Vera Vukajlovic Kenehan, Stockholm, SWEDEN;

Applicant(s)

Telefonaktiebolaget LM Ericsson (PUBL), Stockholm, SWEDEN

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 12/664,347 12/11/2009 PAT 8995357 371 of PCT/SE2008/050407 04/10/2008 which claims benefit of

60/944,628 06/18/2007

Foreign Applications for which priority is claimed (You may be eligible to benefit from the Patent Prosecution Highway program at the USPTO. Please see http://www.uspto.gov for more information.) - None.

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Projected Publication Date: 06/25/2015

Non-Publication Request: No

Early Publication Request: No

Title

Transmission of System Information on a Downlink Shared Channel

Preliminary Class

370

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

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SUPPLEMENTAL Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4015-6727/P24241-US3
		Application Number	
Title of Invention	Transmission of System Information on a Downlink Shared Channel		
The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76. This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.			

Secrecy Order 37 CFR 5.2

<input type="checkbox"/>	Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)
--------------------------	---

Inventor Information:

Inventor 1					<input type="button" value="Remove"/>
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Erik		Dahlman		
Residence Information (Select One) <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
City	Bromma	Country of Residenceⁱ	SE		
Mailing Address of Inventor:					
Address 1	Tackjärnsvägen 12				
Address 2					
City	Bromma	State/Province			
Postal Code	SE-168 68	Countryⁱ	SE		
Inventor 2					<input type="button" value="Remove"/>
Legal Name					
Prefix	Given Name	Middle Name	Family Name	Suffix	
	Vera	Vukajlovic	Kenehan		
Residence Information (Select One) <input type="radio"/> US Residency <input checked="" type="radio"/> Non US Residency <input type="radio"/> Active US Military Service					
City	Stockholm	Country of Residenceⁱ	SE		
Mailing Address of Inventor:					
Address 1	Frejgatan 45				
Address 2					
City	Stockholm	State/Province			
Postal Code	SE-113 49	Countryⁱ	SE		
All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the Add button.					<input type="button" value="Add"/>

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Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4015-6727/P24241-US3
	Application Number	
Title of Invention	Transmission of System Information on a Downlink Shared Channel	

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

An Address is being provided for the correspondence information of this application.

Customer Number	24112		
Email Address	ddonovan@coatsandbennett.com	<input type="button" value="Add Email"/>	<input type="button" value="Remove Email"/>

Application Information:

Title of the Invention	Transmission of System Information on a Downlink Shared Channel		
Attorney Docket Number	4015-6727/P24241-US3	Small Entity Status Claimed	<input type="checkbox"/>
Application Type	Nonprovisional		
Subject Matter	Utility		
Total Number of Drawing Sheets (if any)	6	Suggested Figure for Publication (if any)	4

Filing By Reference :

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

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Request Early Publication (Fee required at time of Request 37 CFR 1.219)

Request Not to Publish. I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

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Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32). Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer number will be used for the Representative Information during processing.

Please Select One:	<input checked="" type="radio"/> Customer Number	<input type="radio"/> US Patent Practitioner	<input type="radio"/> Limited Recognition (37 CFR 11.9)
Customer Number	24112		

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Application Data Sheet 37 CFR 1.76		Attorney Docket Number	4015-6727/P24241-US3
		Application Number	
Title of Invention	Transmission of System Information on a Downlink Shared Channel		

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this information in the application data sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.

When referring to the current application, please leave the application number blank.

Prior Application Status	Pending	<input type="button" value="Remove"/>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
	Continuation of	12664347	2009-12-11
Prior Application Status	<u>Expired</u>	<input type="button" value="Remove"/>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
12664347	a 371 of international	PCT/SE2008/050407	2008-04-10
Prior Application Status	<u>Expired</u>	<input type="button" value="Remove"/>	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)
PCT/SE2008/050407	Claims benefit of provisional	60944628	2007-06-18

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55(d). When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX)ⁱ the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(h)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

<input type="button" value="Remove"/>			
Application Number	Country ⁱ	Filing Date (YYYY-MM-DD)	Access Code ⁱ (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4015-6727/P24241-US3
	Application Number	
Title of Invention	Transmission of System Information on a Downlink Shared Channel	

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

<p>This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.</p> <p><input type="checkbox"/> NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.</p>
--

Authorization to Permit Access:

<p><input checked="" type="checkbox"/> Authorization to Permit Access to the Instant Application by the Participating Offices</p>
<p>If checked, the undersigned hereby grants the USPTO authority to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the World Intellectual Property Office (WIPO), and any other intellectual property offices in which a foreign application claiming priority to the instant patent application is filed access to the instant patent application. See 37 CFR 1.14(c) and (h). This box should not be checked if the applicant does not wish the EPO, JPO, KIPO, WIPO, or other intellectual property office in which a foreign application claiming priority to the instant patent application is filed to have access to the instant patent application.</p> <p>In accordance with 37 CFR 1.14(h)(3), access will be provided to a copy of the instant patent application with respect to: 1) the instant patent application-as-filed; 2) any foreign application to which the instant patent application claims priority under 35 U.S.C. 119(a)-(d) if a copy of the foreign application that satisfies the certified copy requirement of 37 CFR 1.55 has been filed in the instant patent application; and 3) any U.S. application-as-filed from which benefit is sought in the instant patent application.</p> <p>In accordance with 37 CFR 1.14(c), access may be provided to information concerning the date of filing this Authorization.</p>

Applicant Information:

<p>Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.</p>
--

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4015-6727/P24241-US3
	Application Number	
Title of Invention	Transmission of System Information on a Downlink Shared Channel	

Applicant 1			
If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.			
<input type="button" value="Clear"/>			
<input checked="" type="radio"/> Assignee	<input type="radio"/> Legal Representative under 35 U.S.C. 117	<input type="radio"/> Joint Inventor	
<input type="radio"/> Person to whom the inventor is obligated to assign.		<input type="radio"/> Person who shows sufficient proprietary interest	
If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:			
Name of the Deceased or Legally Incapacitated Inventor : <input type="text"/>			
If the Applicant is an Organization check here. <input checked="" type="checkbox"/>			
Organization Name	Telefonaktiebolaget LM Ericsson (PUBL)		
Mailing Address Information For Applicant:			
Address 1	SE-164 83		
Address 2			
City	Stockholm	State/Province	
Country	SE	Postal Code	
Phone Number		Fax Number	
Email Address			
Additional Applicant Data may be generated within this form by selecting the Add button.			

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.	
Assignee 1	
Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.	
If the Assignee or Non-Applicant Assignee is an Organization check here. <input type="checkbox"/>	

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	4015-6727/P24241-US3
	Application Number	
Title of Invention	Transmission of System Information on a Downlink Shared Channel	

Prefix	Given Name	Middle Name	Family Name	Suffix

Mailing Address Information For Assignee including Non-Applicant Assignee:				
Address 1				
Address 2				
City		State/Province		
Country ⁱ	Postal Code			
Phone Number		Fax Number		
Email Address				
Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.				

Signature:

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications.					
Signature	/David E. Bennett, Reg. No. 32,194/			Date (YYYY-MM-DD)	2015-03-05
First Name	David	Last Name	Bennett	Registration Number	32194
Additional Signature may be generated within this form by selecting the Add button.					

This collection of information is required by 37 CFR 1.76. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 23 minutes to complete, including gathering, preparing, and submitting the completed application data sheet form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	22827221
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	Transmission of System Information on a Downlink Shared Channel
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	David E. Bennett/Robin Nunalee
Filer Authorized By:	David E. Bennett
Attorney Docket Number:	4015-9121 / P24241-US3
Receipt Date:	06-JUL-2015
Filing Date:	05-MAR-2015
Time Stamp:	12:49:17
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
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Multipart Description/PDF files in .zip description			
	Document Description	Start	End
	Transmittal Letter	1	1
	Request for Corrected Filing Receipt	2	4

Warnings:

Information:

2	Application Data Sheet	4015-9121_SuppADS1.pdf	84308	no	7
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Warnings:

Information:

This is not an USPTO supplied ADS fillable form

Total Files Size (in bytes):	527574
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Dahlman et al.)	
)	
Serial No.: 14/639,287)	
)	
Filed: March 5, 2015)	
	)	Group Art Unit: 2413
For: Transmission of System Information on a)	
Downlink Shared Channel	)	Confirmation No.: 7111
)	
Docket No: 4015-9121)	
)	
)	
)	

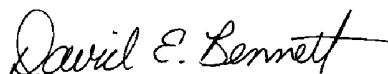
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL APPLICATION DATA SHEET

Applicant requests entry of the **Supplemental Application Data Sheet** and issuance of a **corrected filing receipt** reflecting the changes indicated therein.

A copy of the Filing Receipt with the changes marked thereon is attached.

Respectfully submitted,
COATS & BENNETT, P.L.L.C.



David E. Bennett
Registration No.: 32,194
Telephone: (919) 854-1844

Dated: July 6, 2015



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Table with 7 columns: APPLICATION NUMBER, FILING or 371(c) DATE, GRP ART UNIT, FIL FEE REC'D, ATTY.DOCKET.NO, TOT CLAIMS, IND CLAIMS. Row 1: 14/639,287, 03/05/2015, 2413, 2980, 4015-9121 / P24241-US3, 25, 5

CONFIRMATION NO. 7111
CORRECTED FILING RECEIPT



24112
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

Date Mailed: 07/08/2015

Receipt is acknowledged of this non-provisional patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF APPLICANT, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection. Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections

Inventor(s)

Erik Dahlman, Bromma, SWEDEN;
Vera Vukajlovic Kenehan, Stockholm, SWEDEN;

Applicant(s)

Telefonaktiebolaget LM Ericsson (PUBL), Stockholm, SWEDEN;

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 12/664,347 12/11/2009 PAT 8995357
which is a 371 of PCT/SE2008/050407 04/10/2008
which claims benefit of 60/944,628 06/18/2007

Foreign Applications for which priority is claimed (You may be eligible to benefit from the Patent Prosecution Highway program at the USPTO. Please see http://www.uspto.gov for more information.) - None.

Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access - A proper Authorization to Permit Access to Application by Participating Offices (PTO/SB/39 or its equivalent) has been received by the USPTO.

If Required, Foreign Filing License Granted: 03/17/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is US 14/639,287

Projected Publication Date: Not Applicable

Non-Publication Request: No

Early Publication Request: No
Title

Transmission of System Information on a Downlink Shared Channel

Preliminary Class

370

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at <http://www.uspto.gov/web/offices/pac/doc/general/index.html>.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, <http://www.stopfakes.gov>. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER
Title 35, United States Code, Section 184
Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign Assets Control, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit <http://www.SelectUSA.gov> or call +1-202-482-6800.

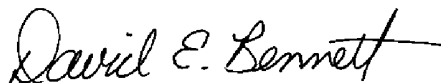
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Dahlman et al.)	
Serial No.: 14/639,287	)	Examiner: Siming Liu
Filed: March 5, 2015	)	Group Art Unit: 2413
For: Transmission of System Information on a Downlink Shared Channel	)	Confirmation No.: 7111
Docket No: 4015-9121)	

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Please find enclosed the signed Declaration for Patent Application. If any fees are required, please deduct from the Coats & Bennett, P.L.L.C. Deposit Account No. 18-1167.

Respectfully submitted,
COATS & BENNETT, P.L.L.C.



Dated: July 30, 2015

David E. Bennett
Registration No.: 32,194
Telephone: (919) 854-1844

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention: **TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL**

As the below named inventor, I hereby declare that:

This declaration is directed to:

- The attached application, or
 United States application number 14/639,287 filed on 3/5/2015
or PCT international application _____ filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in the declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I hereby state that I have reviewed and understand the contents of the above-identified application, including the claims.

I hereby acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

LEGAL NAME OF INVENTOR:

Inventor: Erik Dahlman

Signature: 

Date: 2015-05-06

**DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN
APPLICATION DATA SHEET (37 CFR 1.76)**

Title of Invention: **TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL**

As the below named inventor, I hereby declare that:

This declaration is directed to:

- The attached application, or
 United States application number 14/639,287 filed on 3/5/2015
 or PCT international application _____ filed on _____

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in the declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

I hereby state that I have reviewed and understand the contents of the above-identified application, including the claims.

I hereby acknowledge the duty to disclose information which is material to patentability as defined in 37 C.F.R. 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the national or PCT international filing date of the continuation-in-part application.

LEGAL NAME OF INVENTOR:

Inventor: Vera Vukajlovic Kenehan

Signature: *Vera Kenehan* Date: 06/24/2015

Electronic Acknowledgement Receipt

EFS ID:	23067587
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	Transmission of System Information on a Downlink Shared Channel
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	David E. Bennett/Robin Nunalee
Filer Authorized By:	David E. Bennett
Attorney Docket Number:	4015-9121 / P24241-US3
Receipt Date:	30-JUL-2015
Filing Date:	05-MAR-2015
Time Stamp:	11:39:11
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	4015-9121_TransmittalLetter.pdf	16251 <small>221b314c73249ae3b6984ed449e2543ce4d bb0e3</small>	no	1

Warnings:

Information:

2	Oath or Declaration filed	4015-9121_Declaration.pdf	1290719	no	2
			0b07980b79780ff25184ac2eae680106cc983d32		

Warnings:

Information:

Total Files Size (in bytes):	1306970
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

POWER OF ATTORNEY

The undersigned, being duly authorized representatives of **TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)** (hereinafter referred to as "Ericsson") having its registered office at SE-164 83 Stockholm, Sweden, does hereby authorize **Coats & Bennett P.L.L.C. practitioners associated with United States Patent and Trademark Office Customer Number 24112** to represent Ericsson before the United States Patent and Trademark Office in any and all matters regarding patents or patent applications filed by Ericsson or wherein Ericsson is the assignee of the entire interest thereto.


This Power of Attorney shall include the right for **Coats & Bennett P.L.L.C. practitioners associated with United States Patent and Trademark Office Customer Number 24112** to sign and submit in Ericsson's name and on Ericsson's behalf any document, notification, filing, petition or request in connection with any patent applications or patents owned by or assigned to Ericsson.

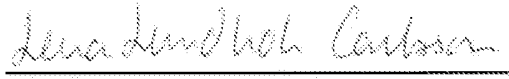
This Power of Attorney does not include the right to appoint substitutes but only the persons associated with the above United States Patent and Trademark Office Customer Number.

We hereby revoke all previous authorization, if any made, in respect of same matter or proceeding. This Power of Attorney shall be valid for **five (5) years** from the date hereof unless earlier revoked. This Power of Attorney may be revoked at any time by Ericsson.

Stockholm, Sweden on

TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)

By: 
Mr. John Han
Vice President, Patent Development

By: 
Mrs. Lena Lundholm Carlsson
CST Manager and PPO

Date: *January 18th, 2012*

Date: *January 18th, 2012*

I, the undersigned, Anne-Marie Bonde, Notary Public of the City of Stockholm

hereby certify that

John Han and Lena Lundholm Carlsson


duly authorized to sign for

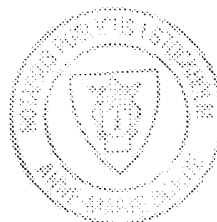
TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)

have issued and signed the foregoing document

Fee 400 :- Stockholm [Date] 20.01.2012

Crowns Ex officio:


Signature: Notary Public of the City of Stockholm



Electronic Acknowledgement Receipt

EFS ID:	23189990
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	Transmission of System Information on a Downlink Shared Channel
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	David E. Bennett/Robin Nunalee
Filer Authorized By:	David E. Bennett
Attorney Docket Number:	4015-9121 / P24241-US3
Receipt Date:	12-AUG-2015
Filing Date:	05-MAR-2015
Time Stamp:	15:13:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no
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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Assignee showing of ownership per 37 CFR 3.73	4015-9121_Statement373.pdf	118295 <small>37bb27e30d1b7e45ad6818102b412b93ba a72e2b</small>	no	3

Warnings:

Information:

2	Power of Attorney	4015-9121_POA.pdf	928866	no	1
			14b6b4233b2a18fcd51a2328d677b989af27fa5		

Warnings:

Information:

Total Files Size (in bytes):	1047161
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

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New International Application Filed with the USPTO as a Receiving Office

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Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Telefonaktiebolaget L M Ericsson (publ)
Application No./Patent No.: 14/639287 Filed/Issue Date: 2015-03-05
Titled: Transmission of System Information on a Downlink Shared Channel
Telefonaktiebolaget L M Ericsson (publ), a Corporation
(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

- 1. The assignee of the entire right, title, and interest.
- 2. An assignee of less than the entire right, title, and interest (check applicable box):
 - The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest **must be submitted** to account for 100% of the ownership interest.
 - There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest **must be submitted** to account for the entire right, title, and interest.

- 3. The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

Additional Statement(s) by the owner(s) holding the balance of the interest **must be submitted** to account for the entire right, title, and interest.

- 4. The recipient, via a court proceeding or the like (e.g., bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

- A. An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 036215, Frame 0294, or for which a copy thereof is attached.

- B. A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

[Page 1 of 2]

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at
Reel _____, Frame _____, or for which a copy thereof is attached.

Additional documents in the chain of title are listed on a supplemental sheet(s).

As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/David E. Bennett, Reg. No. 32194/

2015-08-12

Signature

Date

David E. Bennett

32194

Printed or Typed Name

Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
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Address: COMMISSIONER FOR PATENTS
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www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
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14/639,287

03/05/2015

Erik Dahlman

4015-9121 / P24241-US3

CONFIRMATION NO. 7111

POA ACCEPTANCE LETTER

24112
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518



Date Mailed: 08/20/2015

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 08/12/2015.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at (571) 272-4000 or (571) 272-4200 or 1-888-786-0101.

/dtdinh/



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/639,287	03/05/2015	Erik Dahlman	4015-9121 / P24241-US3	7111
24112	7590	11/04/2015	EXAMINER	
COATS & BENNETT, PLLC 1400 Crescent Green, Suite 300 Cary, NC 27518			LIU, SIMING	
			ART UNIT	PAPER NUMBER
			2413	
			MAIL DATE	DELIVERY MODE
			11/04/2015	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 14/639,287	Applicant(s) DAHLMAN ET AL.	
	Examiner SIMING LIU	Art Unit 2413	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) Responsive to communication(s) filed on 03/05/2015.
 A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
- 2a) This action is **FINAL**. 2b) This action is non-final.
- 3) An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
- 4) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

- 5) Claim(s) 1-25 is/are pending in the application.
5a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 6) Claim(s) _____ is/are allowed.
- 7) Claim(s) 1-25 is/are rejected.
- 8) Claim(s) _____ is/are objected to.
- 9) Claim(s) _____ are subject to restriction and/or election requirement.

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.

Application Papers

- 10) The specification is objected to by the Examiner.
- 11) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

- 12) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) All b) Some** c) None of the:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) Notice of References Cited (PTO-892)
- 2) Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b)
Paper No(s)/Mail Date _____.
- 3) Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 4) Other: _____.

The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Double Patenting

1. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the “right to exclude” granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory double patenting rejection is appropriate where the claims at issue are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of

activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit <http://www.uspto.gov/forms/>. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to <http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-l.jsp>.

2. Claims 1-25 are rejected on the ground of nonstatutory double patenting as being unpatentable over claims 1-24 of U.S. Patent No. 8,995,357. Although the claims at issue are not identical, they are not patentably distinct from each other because Claims 1-24 of U.S. Patent No. 8,792,519 disclose all the limitations recited in Claims 1-25 of the instant application.

Claim Rejections - 35 USC § 103

3. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1-4 and 7-12, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Draft Text Proposal Capturing Agreements on System Information” (R2-072205) in view of Arundale et al (US 7675852 B1, Arundale) and Dimou et al (US 2009/0131057 A1, Dimou).

5. Regarding claim 1, R2-072205 teaches a method of transmitting system information on the downlink shared channel of a wireless communication network (sec 7.4 downlink system) comprising: transmitting system information in recurring time windows (fig. x: SU-1, SU-2 and SU-3 are in a same subframe and are recurring); dynamically selecting which subframes within a given time window are to be used for carrying the system information (sec 7.4 – An SU may be segmented, in which case segments are scheduled... eNB may schedule more than one SU in a subframe); and including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information (sec 7.4 – SB value tag in each SU).

R2-072205 may not have explicitly shown “each time window spanning a plurality of subframes.” Arundale shows each time window spanning a plurality of subframes (fig. 3 subframes 315 in window 320; col. 8 lines 58-61). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the window to accommodate a plurality of subframes as taught by Arundale in the downlink shared channel transmitting method in R2-072205 to determine the sizes and number of frames to include in each window.

Dimou teaches *dynamically* select which subframes within a given time window are to be used for carrying system information ([0039]: this resource block allocation is valid for a time window and Node Bs can allocate resources dynamically (e.g. even at a sub-frame level) to their users). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the dynamic selection of subframe as taught by Dimou to the downlink shared channel transmitting method in R2-072205/Arundale to allow system throughput being maximized or users not using the same resource blocks.

6. Regarding claim 10, R2-072205 teaches a network transmitter for transmitting system information on a downlink shared channel in a wireless communications network, the network transmitter configured to comprising a baseband processor (fig. 5.4.1.2) generate system information in recurring time windows (fig. x: SU-1, SU-2 and SU-3 are in a same subframe and are recurring), the network transmitter comprising a baseband processor configured to: include an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information (sec 7.4 – SB value tag in each SU).

R2-072205 *may not have explicitly* shown “each time window spanning a plurality of subframes.” Arundale shows each time window spanning a plurality of subframes (fig. 3 subframes 315 in window 320; col. 8 lines 58-61). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the window to accommodate a plurality of subframes as taught by Arundale in the downlink shared

channel transmitting method in R2-072205 to determine the sizes and number of frames to include in each window.

R2-072205, modified by Arundale, *may not have explicitly* mentioned “*dynamically* select which subframes within a given time window are to be used for carrying system information.

Dimou teaches *dynamically* select which subframes within a given time window are to be used for carrying system information ([0039]: this resource block allocation is valid for a time window and Node Bs can allocate resources dynamically (e.g. even at a sub-frame level) to their users). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the dynamic selection of subframe as taught by Dimou to the downlink shared channel transmitting method in R2-072205/Arundale to allow system throughput being maximized or users not using the same resource blocks.

7. Regarding claim 12, R2-072205 teaches a method of transmitting system information on a downlink shared channel structured as successive subframes (fig. 5.4.1.2 and fig. x), the method comprising: transmitting system information in regularly occurring time windows (fig. x: SU-1, SU-2 and SU-3 are in a same subframe and are recurring), (fig. x: SU-1, SU-2 and SU-3 are in a same subframe and are recurring); and indicating to receiving user equipment which subframes within a given time window carry system information (sec 7.4 – SB value tag in each SU).

R2-072205 *may not have explicitly* shown “each time window spanning a plurality of

successive subframes.” Arundale shows each time window spanning a plurality of subframes (fig. 3 subframes 315 in window 320; col. 8 lines 58-61). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the window to accommodate a plurality of subframes as taught by Arundale in the downlink shared channel transmitting method in R2-072205 to determine the sizes and number of frames to include in each window.

R2-072205, modified by Arundale, may not have explicitly depicted “*dynamically* selecting which subframes within a given time window are to be used for carrying system information.”

Dimou teaches *dynamically* select which subframes within a given time window are to be used for carrying system information ([0039]: this resource block allocation is valid for a time window and Node Bs can allocate resources dynamically (e.g. even at a sub-frame level) to their users). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the dynamic selection of subframe as taught by Dimou to the downlink shared channel transmitting method in R2-072205/Arundale to allow system throughput being maximized or users not using the same resource blocks.

8. Regarding claim 2. R2-072205 further teaches dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting a contiguous set of subframes within the given time window (fig. x: subframes 3 and 131).

9. Regarding claim 3. R2-072205 further teaches dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting a non-contiguous set of subframes within the given time window (fig. x: subframes 19 and 67).

10. Regarding claim 4. R2-072205 further teaches dynamically selecting which subframes within a given time window are to be used for carrying system information comprises selecting which subframes to use for transmitting system information in view of competing transmission priorities associated with other control or data signaling (fig. x: SIB).

11. Regarding claim 7. R2-072205 further teaches varying window sizes of the recurring time windows (fig. x: SU-1, SU-2 and SU-3 have different sizes).

12. Regarding claim 8. R2-072205 R2-072205 further teaches dynamically configuring a window size for the recurring time windows (sec. 7.4 – MIB paragraph).

13. Regarding claim 9. R2-072205 R2-072205 further teaches including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information includes using different indicators corresponding to different types of system information (sec 7.4 – MIB paragraph), such that the indicator used for a particular subframe indicates the type of system information carried in that subframe (sec 7.4 – SIB).

14. Regarding claim 11, R2-072205 further teaches the network transmitter comprises a radio base station configured for operation in accordance with 3GPP E-UTRA standards (3GPP TSG-RAN2).

15. Regarding claim 14, R2-072205 further teaches dynamically selecting which subframes within a given window are to be used for carrying system information (fig. X:: SIB).

16. Claims 15, 18, 21 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Draft Text Proposal Capturing Agreements on System Information” (R2-072205) in view of Arundale et al (US 7675852 B1, Arundale), and Dimou et al (US 2009/0131057 A1, Dimou) and Love et al (US 2004/0219917 A1, Love).

17. Regarding claim 15, R2-072205 teaches a method for a mobile station for receiving system information on a downlink shared channel from a network transmitter in a wireless communication network (fig. 5.4.1.2: UE), the method comprising: beginning monitoring for the receipt of system information in recurring time windows used for the transmission of system information (fig. x: SU-1, SU-2 and SU-3 are in a same subframe and are recurring); within each time window, monitoring each subframe for an indication of system information and reading system information from the signal subframe if such information is present (sec 7.4 – SB value tag in each SU); and terminating monitoring at least at the end of the time window (if there are no more subframes to be monitored, it is only reasonable to terminate monitoring).

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R2-072205 *may not have explicitly* shown “each time window spanning a plurality of successive subframes.” Arundale shows each time window spanning a plurality of subframes (fig. 3 subframes 315 in window 320; col. 8 lines 58-61). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the window to accommodate a plurality of subframes as taught by Arundale in the downlink shared channel transmitting method in R2-072205 to determine the sizes and number of frames to include in each window.

R2-072205, modified by Arundale, may not have explicitly depicted “*dynamically* selecting which subframes within a given time window are to be used for carrying system information.”

Dimou teaches *dynamically* select which subframes within a given time window are to be used for carrying system information ([0039]: this resource block allocation is valid for a time window and Node Bs can allocate resources dynamically (e.g. even at a sub-frame level) to their users). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the dynamic selection of subframe as taught by Dimou to the downlink shared channel transmitting method in R2-072205/Arundale to allow system throughput being maximized or users not using the same resource blocks.

While R2-072205/Arundale/Dimou mention said system information, they *may not have explicitly* mentioned “presence indication” of said system information.

Love mentions presence indication of system information in subframe ([0071]: one TFCI bit (EU indication bit) out of one of the slots per frame or sub-frame is used to indicate the

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presence or absence of the EU field while the other bits in each TFCI field of the remaining slots per frame or sub-frame are still used to represent the TFCI). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the presence indication of system information as taught by Love to the downlink shared channel information subframe of R2-072205/Arundale/Dimou for soft handoff.

18. Regarding claim 21. R2-072205 teaches a mobile station comprising a baseband processor (fig. 5.4.1.2: UE) operable to: begin monitor for the receipt of system information at the start of each time window in a succession of recurring time windows used for the transmission of system information, each said time window spanning a number of signal subframes_(fig. x: SU-1, SU-2 and SU-3 are in a same subframe and are recurring); within each time window, monitor each subframe for an indication of system information and reading system information from the signal subframe if such information is present (fig. x: SIB); and terminate monitoring at least at the end of the time window (if there are no more subframes to be monitored, it is only reasonable to terminate monitoring).

R2-072205 *may not have explicitly* shown “each time window spanning a plurality of successive subframes.” Arundale shows each time window spanning a plurality of subframes (fig. 3 subframes 315 in window 320; col. 8 lines 58-61). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the window to accommodate a plurality of subframes as taught by Arundale in the downlink

shared channel transmitting method in R2-072205 to determine the sizes and number of frames to include in each window.

R2-072205, modified by Arundale, may not have explicitly depicted “*dynamically* selecting which subframes within a given time window are to be used for carrying system information.”

Dimou teaches *dynamically* select which subframes within a given time window are to be used for carrying system information ([0039]: this resource block allocation is valid for a time window and Node Bs can allocate resources dynamically (e.g. even at a sub-frame level) to their users). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the dynamic selection of subframe as taught by Dimou to the downlink shared channel transmitting method in R2-072205/Arundale to allow system throughput being maximized or users not using the same resource blocks.

While R2-072205/Arundale/Dimou mention said system information, they *may not have explicitly* mentioned “presence indication” of said system information.

Love mentions presence indication of system information in subframe ([0071]: one TFCI bit (EU indication bit) out of one of the slots per frame or sub-frame is used to indicate the presence or absence of the EU field while the other bits in each TFCI field of the remaining slots per frame or sub-frame are still used to represent the TFCI). It would have been obvious to one of ordinary skill in the art when the invention was made to implement the presence indication of system information as taught by Love to the

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downlink shared channel information subframe of R2-072205/Arundale/Dimou for soft handoff.

19. Regarding claim 18. R2-072205 further teaches comprising storing a default window size for monitoring for system information transmissions (fig. x: SU-1, SU-2 and SU-3 have default sizes).

20. Regarding claim 25. R2-072205 further teaches the baseband processor is operable to recognize different types of system information based on different system information indicators detected in different subframes (fig. x: SIB-a,b,c,d,e).

21. Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over “Draft Text Proposal Capturing Agreements on System Information” (R2-072205) in view of Arundale et al (US 7675852 B1, Arundale), Dimou et al (US 2009/0131057 A1, Dimou), applied to claim 1, and in further view of “System Information Scheduling and Change Notification” (R2-071912).

22. Regarding claim 5. R2-072205 etc. teaches the method of claim 1, wherein including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information; R2-072205 etc. does not very explicitly show it comprises using an RNTI (Radio Network Temporary Identifier) to denote that the subframe carries system information. R2-071912 explicitly teaches subframes indicators are in RNTI format (page 3 bottom). It would have been obvious to

one of ordinary skill in the art when the invention was made to understand that both R2 documents refer to the same 3GPP systems information techniques and the R2-072205 (primary reference), while being silent on its application to the indications, also uses RNTI.

23. Claims 17, 19, 20, 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Draft Text Proposal Capturing Agreements on System Information” (R2-072205) in view of Arundale et al (US 7675852 B1, Arundale), Dimou et al (US 2009/0131057 A1, Dimou) and Love et al (US 2004/0219917 A1, Love); and in further view of Marinier et al (US 2008/0225765 A1, Marinier).

24. Regarding claim 17. R2-072205 teaches the method of claim 15; R2-072205 may not have explicitly mentioned further comprising adapting to changing or configurable window sizes used for the time window. Marinier teaches changing or configurable window sizes used for the time window ([0457]). It would have been obvious to one of ordinary skill in the art when the invention was made to modify the method in R2-072205 to allow configurable window sizes to facilitate reordering procedure.

25. Regarding claim 19. R2-072205 etc. teaches the method of claim 18; R2-072205 etc. does not explicitly mention further comprising monitoring for system information transmissions based on a specified window size indicated in received information rather than the default window size. Marinier teaches monitoring for system information transmissions based on a specified window size indicated in received information rather

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than a default window size ([0457]: if window size is changed for reordering purpose, then it is only reasonable that the changing window sizes are monitored). It would have been obvious to one of ordinary skill in the art when the invention was made to modify the method in R2-072205 etc. to allow configurable window sizes to facilitate reordering procedure.

26. Regarding claim 20, R2-072205 etc. teaches the method of claim 15; R2-072205 etc. does not explicitly mention further comprising recognizing different types of system information based on recognizing different system information indicators in different signal subframes. Marinier teaches recognizing different types of system information based on recognizing different system information indicators in different signal subframes ([0457]: if window size is changed for reordering purpose, then it is only reasonable that the changing window sizes are recognized). It would have been obvious to one of ordinary skill in the art when the invention was made to modify the method in R2-072205 etc. to allow configurable window sizes to facilitate reordering procedure.

27. Regarding claim 23, R2-072205 etc. teaches the mobile station of claim 21; R2-072205 etc. may not have explicitly mentioned wherein the baseband processor is operable to adapt to changing or configurable window sizes used for the time window. Marinier teaches changing or configurable window sizes used for the time window ([0457]). It would have been obvious to one of ordinary skill in the art when the invention was made to modify the method in R2-072205 etc. to allow configurable window sizes to facilitate reordering procedure.

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28. Regarding claim 24. R2-072205 etc. teaches the mobile station of claim 21; R2-072205 etc. does not explicitly mention wherein the baseband processor is operable to monitor for system information transmissions based on a specified window size indicated in received information rather than a default window size. Marinier teaches monitoring for system information transmissions based on a specified window size indicated in received information rather than a default window size ([0457]: if window size is changed for reordering purpose, then it is only reasonable that the changing window sizes are monitored). It would have been obvious to one of ordinary skill in the art when the invention was made to modify the method in R2-072205 etc. to allow configurable window sizes to facilitate reordering procedure.

29. Claims 6, 13, 16 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over “Draft Text Proposal Capturing Agreements on System Information” (R2-072205) in view of Arundale et al (US 7675852 B1, Arundale), and in further view of Dimou et al (US 2009/0131057 A1, Dimou) (hereinafter R2-072205 etc.); and in further view of Kashima et al (US 2007/0217362 A1, Kashima).

30. Regarding claim 6. R2-072205 etc. teaches the method of claim 1, wherein including an indicator in each of the selected subframes to indicate to receiving user equipment that the subframe carries system information; R-072205 etc. do not explicitly shows it includes using an end-of-system-information indicator in a last subframe of the given time window that carries system information. Kashima teaches an end-of-system-

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information indicator in a last subframe of the given time window that carries system information (0069 and 0072). It would have been obvious to one of ordinary skill in the art when the invention was made to program an end-of-system information function as taught by Kashima to the indicator method in R2-072205 etc. to maintain flexibility of scheduling.

31. Regarding claim 13. R2-072205 etc. teaches the method of claim 12; R-072205 etc. does not explicitly shows wherein indicating to receiving user equipment which subframes within a given time window carry system information includes indicating the last subframe within the given time window that carries system information, thereby allowing the receiving user equipment to cease monitoring for system information within the given time window. Kashima teaches an end-of-system-information indicator in a last subframe of the given time window that carries system information so to cease monitoring within a given time (0069 and 0072). It would have been obvious to one of ordinary skill in the art when the invention was made to program an end-of-system information function as taught by Kashima to the indicator method in R2-072205 etc. for flexibility of scheduling subframes.

32. Regarding claim 16. R2-072205 etc. teaches the method of claim 15; R-072205 etc. does not explicitly shows it further comprising recognizing an end-of-system-information indicator in a signal subframe received within the time window and terminating monitoring for the time window in response. Kashima teaches an end-of-system-information indicator in a last subframe of the given time window that carries system information (0069 and 0072). It would have been obvious to one of ordinary skill

in the art when the invention was made to program an end-of-system information function as taught by Kashima to the indicator method in R2-072205 to maintain flexibility of scheduling.

33. Regarding claim 22. R2-072205 etc. teaches the mobile station of claim 21; R-072205 etc. does not explicitly shows wherein the baseband processor is operable to recognize an end-of-system-information indicator in a signal subframe received within the time window and terminate monitoring for the time window in response. Kashima teaches an end-of-system-information indicator in a last subframe of the given time window that carries system information (0069 and 0072). It would have been obvious to one of ordinary skill in the art when the invention was made to program an end-of-system information function as taught by Kashima to the indicator method in R2-072205 etc. to maintain flexibility of scheduling.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to SIMING LIU whose telephone number is (571)270-3859. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Un Cho can be reached on (571)272-7919. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/SIMING LIU/
Primary Examiner, Art Unit 2413

Notice of References Cited	Application/Control No. 14/639,287	Applicant(s)/Patent Under Reexamination DAHLMAN ET AL.	
	Examiner SIMING LIU	Art Unit 2413	Page 1 of 1

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*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
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*	B	US-2007/0217362 A1	09-2007	Kashima; Tsuyoshi	H04W72/04	370/330
*	C	US-7,675,852 B1	03-2010	Arundale; Gregory A.	H04B7/18506	370/229
*	D	US-2004/0219917 A1	11-2004	Love, Robert T.	H04L1/1671	455/436
*	E	US-2008/0225765 A1	09-2008	Marinier; Paul	H04L1/1841	370/310
*	F	US-8,995,357 B2	03-2015	Dahlman; Erik	H04L1/08	370/311
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
*	U	SAMSUNG. "Draft text proposal capturing agreements on system information." 3GPP TSG-RAN2 Meeting #58, Tdoc R2-072205, Kobe, Japan, May 7-11, 2007, pages 1-8.
*	V	SAMSUNG. "System information scheduling and change notification." 3GPP TSG-RAN2 Meeting #58, Tdoc R2-071912, Kobe, Japan, May 7-11, 2007, pages 1-6.
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	Examiner SIMING LIU	Art Unit 2413

CPC- SEARCHED		
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H04L1/08, 2001/0093; H04W48/12, 72/0446;	11/2/2015	SL

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SEARCH NOTES		
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CPC class search	11/2/2015	SL

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US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

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14639287 - GAI-2413

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	Filing Date		2015-03-05
	First Named Inventor	Erik Dahlman	
	Art Unit		TBA
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	Attorney Docket Number		4015-9121 / P24241-US3

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	1	7675852	B1	2010-03-09	Arundale et al.	
	2	7680507	B2	2010-03-16	Cheng et al.	

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	1	20040219917	A1	2004-11-04	Love et al.	
	2	20090131057	A1	2009-05-21	Dimou	
	3	20080225765	A1	2008-09-18	Marinier et al.	
	4	20070217362	A1	2007-09-20	Kashima et al.	

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	First Named Inventor	Erik Dahlman		
	Art Unit	TBA		
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5	20060034245	A1	2006-02-16	Nguyen	
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	1	1799003	EP	A1	2007-06-20	Matsushita Electric Industrial Co., Ltd.		<input type="checkbox"/>

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	Art Unit	TBA		
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	2	2007052917	WO	A1	2007-05-10	LG Electronics Inc.	<input type="checkbox"/>
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	1	SAMSUNG. "System information scheduling and change notification." 3GPP TSG-RAN2 Meeting #58, Tdoc R2-071912, Kobe, Japan, May 7-11, 2007, pages 1-6.	<input type="checkbox"/>
	2	SAMSUNG. "Draft text proposal capturing agreements on system information." 3GPP TSG-RAN2 Meeting #58, Tdoc R2-072205, Kobe, Japan, May 7-11, 2007, pages 1-8.	<input type="checkbox"/>
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	Art Unit		TBA
	Examiner Name	TBA	
	Attorney Docket Number		4015-9121 / P24241-US3

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Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

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- See attached certification statement.
- The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/David E. Bennett, Reg. No. 32,194/	Date (YYYY-MM-DD)	2015-03-05
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6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.L./

EFS Web 2.1.17

EAST Search History**EAST Search History (Prior Art)**

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L2	1	"8995357"	USPAT	OR	OFF	2015/11/02 14:20
S3	2824	H04L1/08.cpc.	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:13
S4	2296	H04L2001/0093.cpc.	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:14
S5	2696	H04W48/12.cpc.	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:14
S6	3336	H04W72/0446.cpc.	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:14
S7	174	((Erik) near2 (Dahlman)).INV.	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:14
S8	17	((Vera) near2 (Vukajlovic)).INV.	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:14
S9	6	(repetitive or repeat) near3 window and RNTI	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:16
S10	47	(repetitive or repeat) near3 window and system adj information	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:17
S11	48	(overlap\$3 or overlaid) with window and RNTI	US-PGPUB; USPAT	OR	OFF	2015/11/02 13:17

EAST Search History (Interference)

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11/ 2/ 2015 2:28:54 PM**C:\Users\sliu3\Documents\EAST\Workspaces\14639287.wsp**


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BIB DATA SHEET
CONFIRMATION NO. 7111

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.	
14/639,287	03/05/2015	370	2413	4015-9121 / P24241-US3	
APPLICANTS Telefonaktiebolaget LM Ericsson (PUBL), Stockholm, SWEDEN; INVENTORS Erik Dahlman, Bromma, SWEDEN; Vera Vukajlovic Kenehan, Stockholm, SWEDEN; ** CONTINUING DATA ***** This application is a CON of 12/664,347 12/11/2009 PAT 8995357 which is a 371 of PCT/SE2008/050407 04/10/2008 which claims benefit of 60/944,628 06/18/2007 ** FOREIGN APPLICATIONS ***** ** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ** 03/17/2015					
Foreign Priority claimed <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No 35 USC 119(a-d) conditions met <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No Verified and Acknowledged <u>/SIMING LIU/</u> Examiner's Signature	<input type="checkbox"/> Met after Allowance Initials _____	STATE OR COUNTRY SWEDEN	SHEETS DRAWINGS 6	TOTAL CLAIMS 25	INDEPENDENT CLAIMS 5
ADDRESS COATS & BENNETT, PLLC 1400 Crescent Green, Suite 300 Cary, NC 27518 UNITED STATES					
TITLE Transmission of System Information on a Downlink Shared Channel					
FILING FEE RECEIVED 2980	FEES: Authority has been given in Paper No. _____ to charge/credit DEPOSIT ACCOUNT No. _____ for following:		<input type="checkbox"/> All Fees <input type="checkbox"/> 1.16 Fees (Filing) <input type="checkbox"/> 1.17 Fees (Processing Ext. of time) <input type="checkbox"/> 1.18 Fees (Issue) <input type="checkbox"/> Other _____ <input type="checkbox"/> Credit		

Index of Claims 	Application/Control No. 14639287	Applicant(s)/Patent Under Reexamination DAHLMAN ET AL.
	Examiner SIMING LIU	Art Unit 2413

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant			<input type="checkbox"/> CPA			<input type="checkbox"/> T.D.			<input type="checkbox"/> R.1.47		
CLAIM		DATE									
Final	Original	11/02/2015									
	1	✓									
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Dahlman et al.)	
)	
Serial No.: 14/639,287)	
	)	Examiner: Siming Liu
Filed: March 5, 2015)	
	)	Group Art Unit: 2413
For: Transmission of System Information on a Downlink Shared Channel	)	Confirmation No.: 7111
)	
Docket No: 4015-9121/P24241-US3)	

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION

This paper is being filed in response to the Office Action mailed November 4, 2015, having a reply due date of February 4, 2016. Reconsideration is respectfully requested in light of the amendments and/or remarks below.

Electronic payment for excess claim fees and a two-month extension of time is submitted herewith. The Office is hereby authorized to charge any other fees required for entry of this paper to Deposit Account 18-1167.

CLAIMS LISTING

1. (Currently Amended) A method of transmitting system information on ~~a the~~ downlink shared channel of a wireless communication network comprising:
transmitting system information on the downlink shared channel in recurring time windows, each time window spanning one or more overlaid on a sequence of transmit channel subframes[[:]]
dynamically selecting which, wherein a set of subframes out of the one or more subframes within a ~~given~~ time window is are to be used for carrying the system information; and
~~including~~ using an indicator in each of ~~the selected~~ subframe[[s]] in the set of subframes that is used for carrying the system information to indicate to receiving ~~mobile station~~ user equipment that the subframe carries system information, wherein the indicator is a System Information Radio Network Temporary Identifier (SI-RNTI).
2. (Currently Amended) The method of claim 1, wherein ~~dynamically selecting which the set of~~ subframes within ~~a given the~~ time window ~~are to be used for carrying system information~~ comprises selecting is a contiguous set of subframes within the ~~given~~ time window.
3. (Currently Amended) The method of claim 1, wherein ~~dynamically selecting which the set of~~ subframes within ~~a given the~~ time window ~~are to be used for carrying system information~~ comprises selecting is a non-contiguous set of subframes within the ~~given~~ time window.
4. (Currently Amended) The method of claim 1, wherein ~~dynamically selecting which the set of~~ subframes within ~~a given the~~ time window ~~are to be~~ used for carrying the system information ~~comprises selecting which subframes to use for transmitting system information is~~ dynamically selected in view of competing transmission priorities associated with other control or data signaling.
5. (Cancelled)

6. (Currently Amended) The method of claim 1, wherein ~~using~~ including an indicator in each ~~of the selected~~ subframe[[s]] in the set of subframes that is used for carrying the system information to indicate to receiving user equipment ~~mobile station~~ that the subframe carries system information includes using an end-of-system-information indicator in a last subframe of the ~~given~~ time window that carries system information.

7. (Original) The method of claim 1, further comprising varying window sizes of the recurring time windows.

8. (Original) The method of claim 1, further comprising dynamically configuring a window size for the recurring time windows.

9. (Currently Amended) The method of claim 1, wherein ~~including~~ using an indicator in each ~~of the selected~~ subframe[[s]] in the set of subframes that is used for carrying the system information to indicate to receiving user equipment ~~mobile station~~ that the subframe carries system information includes using different indicators corresponding to different types of system information, such that the indicator used for a particular subframe indicates the type of system information carried in that subframe.

10. (Currently Amended) A network transmitter comprising a baseband processor configured to:

generate system information for transmission on a downlink shared channel in recurring time windows, each time window spanning one or more overlaid on a sequence of transmit channel subframes, wherein a set of [[:]]
~~dynamically select which~~ subframes out of the one or more subframes within a given time window ~~is~~ are to be used for carrying the system information; and ~~use include~~ an indicator in each ~~of the selected~~ subframe[[s]] in the set of subframes that is used for carrying the system information to indicate to receiving user equipment ~~mobile station~~ that the subframe carries system information, wherein the indicator is a System Information Radio Network Temporary Identifier (SI-RNTI).

11. (Original) The network transmitter of claim 10, wherein the network transmitter comprises a radio base station configured for operation in accordance with 3GPP E-UTRA standards.
12. (Currently Amended) A method of transmitting system information on a downlink shared channel structured as successive subframes, the method comprising:
transmitting system information in regularly occurring time windows, each time window spanning some number of successive subframes; and
indicating to receiving user equipment ~~mobile station~~ which subframes within a ~~given~~ the time windows carry system information, by using an indicator in each subframe within the time windows that carries system information.
13. (Cancelled)
14. (Currently Amended) The method of claim 12, further comprising dynamically selecting which subframes within a ~~given~~ the time windows are ~~to be~~ used for carrying system information.
15. (Currently Amended) A method for a ~~mobile station~~ user equipment to receive system information from a supporting wireless communication network, the method comprising:
~~beginning~~ monitoring, by the user equipment, at least one subframe within a time window for an indication of presence of system information in the at least one subframe, the time window being one of a set of receipt of system information at the start of each time window in a succession of recurring time windows used for the transmission of the system information, each of said recurring time windows spanning a number of signal subframes, and said indication being present in each subframe where system information is present;
~~within each time window, monitoring each signal subframe for an indication of system information and reading, by the user equipment, system information from the at least one signal-subframe if such~~ when said indication information is present in the at least one subframe [[:and]] , wherein the indication is a System Information Radio Network Temporary Identifier (SI-RNTI).

~~terminating monitoring at least at the end of the time window.~~

16. (Currently Amended) The method of claim 15, further comprising recognizing an end-of-system-information indicator in a ~~signal~~ subframe received within the time window and terminating monitoring for within the time window in response.

17. (Original) The method of claim 15, further comprising adapting to changing or configurable window sizes used for the time window.

18. (Original) The method of claim 15, further comprising storing a default window size for monitoring for system information transmissions.

19. (Original) The method of claim 18, further comprising monitoring for system information transmissions based on a specified window size indicated in received information rather than the default window size.

20. (Currently Amended) The method of claim 15, further comprising recognizing different types of system information based on recognizing different system information indicators in different ~~signal~~ subframes.

21. (Currently Amended) A ~~mobile station~~ user equipment comprising a baseband processor ~~operable to~~ configured to:

~~begin monitor~~[[ing]] at least one subframe within a time window for an indication of presence of system information in the at least one subframe, the time window being one of a set of receipt of system information at the start of each time window~~a succession of recurring time windows used for the transmission of the system information, each of said recurring time windows spanning a number of signal subframes, and said indication being present in each subframe where system information is present;~~

~~within each time window, monitor each signal subframe for an indication of system information and read~~[[ing]] system information from the signal at least one subframe when said indication if such information is present in the at least one

subframe, wherein the indication is a System Information Radio Network Temporary Identifier (SI-RNTI); and

~~terminate monitoring at least at the end of the time window.~~

22. (Currently Amended) The ~~mobile station~~ user equipment of claim 21, wherein the baseband processor is ~~operable to~~ configured to recognize an end-of-system-information indicator in a ~~signal~~ subframe received within the time window and terminate monitoring within ~~for~~ the time window in response.
23. (Currently Amended) The ~~mobile station~~ user equipment of claim 21, wherein the baseband processor is ~~operable to~~ configured to adapt to changing or configurable window sizes used for the time window.
24. (Currently Amended) The ~~mobile station~~ user equipment of claim 21, wherein the baseband processor is ~~operable to~~ configured to monitor for system information transmissions based on a specified window size indicated in received information rather than a default window size.
25. (Currently Amended) The ~~mobile station~~ user equipment of claim 21, wherein the baseband processor is ~~operable to~~ configured to recognize different types of system information based on different system information indicators detected in different ~~signal~~ subframes.
26. (New) The method of claim 12, wherein the indicator is a System Information Radio Network Temporary Identifier (SI-RNTI).
27. (New) A network transmitter for transmitting system information on a downlink shared channel structured as successive subframes, the network transmitter comprising a baseband processor configured to:
- transmit system information in regularly occurring time windows, each time window spanning some number of successive subframes; and

indicate to receiving user equipment which subframes within the time windows carry system information, by using an indicator in each subframe within the time windows that carries system information.

28. (New) The network transmitter of claim 27, wherein the indicator is a System Information Radio Network Temporary Identifier (SI-RNTI).

29. (New) The network transmitter of claim 27, wherein the network transmitter is configured for operation in an Orthogonal Frequency Division Multiplexing (OFDM) based wireless communication network.

30. (New) A method for a user equipment to receive system information transmitted in recurring time windows from a supporting wireless communication network, the method comprising:

monitoring, by the user equipment, in a time window spanning a number of subframes, for an indication of presence of system information in a subframe within the time window, wherein said indication is a System Information Radio Network Temporary Identifier (SI-RNTI) that is present in the subframe if the subframe comprises system information; and

reading, by the user equipment, system information from the subframe when the SI-RNTI is present in the subframe.

31. (New) The method of claim 30, wherein the wireless communication network is an Orthogonal Frequency Division Multiplexing (OFDM) based wireless communication network.

32. (New) A user equipment for receiving system information transmitted in recurring time windows from a supporting wireless communication network, the user equipment comprising a baseband processor configured to:

monitor in a time window spanning a number of subframes, for an indication of presence of system information in a subframe within the time window, wherein said indication is a System Information Radio Network Temporary Identifier (SI-RNTI)

that is present in the subframe if the subframe comprises system information;
and
read system information from the subframe when the SI-RNTI is present in the
subframe.

33. (New) The user equipment of claim 32, wherein the wireless communication network is an Orthogonal Frequency Division Multiplexing (OFDM) based wireless communication network.

34. (New) The method of claim 1, wherein the wireless communication network is an Orthogonal Frequency Division Multiplexing (OFDM) based wireless communication network.

35. (New) The network transmitter of claim 10, wherein the network transmitter is configured for operation in an Orthogonal Frequency Division Multiplexing (OFDM) based wireless communication network.

36. (New) The method of claim 12, wherein the method is performed in an Orthogonal Frequency Division Multiplexing (OFDM) based wireless communication network.

37. (New) The method of claim 15, wherein the wireless communication network is an Orthogonal Frequency Division Multiplexing (OFDM) based wireless communication network.

38. (New) The user equipment of claim 21, wherein the user equipment is configured for operation in an Orthogonal Frequency Division Multiplexing (OFDM) based wireless communication network.

REMARKS

Claims 1-38 are pending. Independent claims 1, 10, 12, 15, and 21 are amended. Dependent claims 2-4, 6, 9, 14, 16, 20, and 22-25 are amended; and dependent claims 5 and 13 are canceled in view of the amendments to the independent claims. New claims 26-38 are added. Support for these amendments and additions can be found throughout the specification, and in particular in paragraphs [0005], [0008]-[0010], [0022], [0024], [0028], [0030]-[0031]. No new matter is added by the amendments. Applicant respectfully submits that all pending claims are in condition for allowance.

Overview

The claimed invention relates to transmission of system information on a downlink shared channel of a wireless communication network. The claims recite a recurring time window spanning one or more subframes during which the system information is transmitted. A set of subframes in each time window carries system information. In some embodiments, the set of subframes that carry the system information may be dynamically selected and vary between time windows. In this case, the user equipment may not know a priori which subframes in the time window carry the system information. The network transmitter, e.g. a base station, uses an indicator in each subframe carrying system information to indicate to receiving user equipment that the subframe carries system information. The use of the indicator in each subframe carrying system information enables the base station to dynamically select the subframes within a time window used for transmitting the system information.

103 Rejection of Independent Claims 1 and 10

Independent claims 1 and 10 are directed to a network transmitter. Claims 1 and 10 recite transmitting system information on a downlink shared channel in recurring time windows that span one or more subframes. A set of subframes in each time window is used to carry system information. Claims 1 and 10 further recite using an indicator in the form of a SI-RNTI in each subframe within a time window that carries the system information to indicate to receiving user equipment that the subframe carries system information.

Independent claims 1 and 10 stand rejected under 35 U.S.C §103 as being obvious over R2-072205 (“**R2**”) in view of Arundale *et al.* (US 7675852) (“**Arundale**”) and further in view of Dimou (US 20090121057) (“**Dimou**”). Applicant respectfully submits that the prior art fails to

teach all of the limitations recited in the claims. For example, the prior art fails to disclose a network transmitter that uses an indicator in each subframe within a recurring time window that is used for carrying system information, so as to indicate to receiving user equipment that the subframe carries system information. Further, the prior art fails to teach using an SI-RNTI to indicate which subframes in a time window carry system information.

R2 discloses a method of transmitting system information on a downlink shared channel. The system information is divided into scheduling units (SUs). Each SU has a fixed periodicity and includes one or more System Information Blocks (SIBs) with the same periodicity. The most frequently occurring SU, SU-1 has a fixed periodicity of 80ms and includes the scheduling information (i.e., the periodicity) of the other SUs. SU-1 includes a mapping indicating the SUs in which each SIB is contained. The user equipment in R2 knows a priori the starting location for SU-1, which in turn provides the starting locations for the remaining SUs.

Arundale is unrelated to transmission of system information. Arundale discloses a sliding time window spanning multiple subframes. Col. 8, lines 55-61.

The teachings of Dimou relate to allocation of resource blocks for uplink transmission. A radio resource manager in a radio network node allocates resource blocks to mobile stations. ¶ [0039]. The allocated resource blocks are used for uplink transmission of reference signals to the radio node. ¶ [0035].

The claimed invention differs from the cited prior art in several respects. First, claims 1 and 10 recite that the network transmitter uses an indicator in each subframe within a time window that is used for carrying system information to indicate to receiving user equipment that the subframe carries system information. As mentioned above, the use of the indicator in each subframe containing system information enables dynamic selection of the subframes within the time window that are used for carrying system information.

In R2, system information blocks (SIBs) or a group of SIBs (SU) are transmitted on a fixed schedule based on a fixed periodicity. For instance, SU-1 is on a fixed schedule with a periodicity of 80ms. The system information in SU-1 includes a SIB called the scheduling block (SB) that contains scheduling information for the other SUs. Thus, user equipment receiving the system information rely on SU-1 having a fixed, non-varying location. The user equipment uses the scheduling information in SU-1 to determine the fixed schedule of the other SUs. Because the transmissions of SUs in R2 occur on a fixed schedule, the user equipment in R2 know, a priori, which subframes include SU-1, which then provides the subframes for other SUs. Thus,

there is no need in R2 for an indicator in each subframe that carries system information to indicate to the user equipment which subframes carry the system information..

In the Office Action, the Examiner equates the value tag in R2 with an indicator in each of the subframes that carry system information. Office Action, p. 4. Applicant respectfully disagrees. While R2 teaches that the system information may include a value tag, R2 fails to explain the purpose of the value tag. However, the document titled "System Information Scheduling and Change Notification" (R2-071912), which has been cited by the Examiner, describes the purpose of the value tags. More specifically, R2-071912 teaches that the value tags are included with the scheduling information to indicate modifications to the system information. Thus, a user equipment can avoid reading system information if the value tag in the scheduling information indicates that the system information has not changed since the last time the system information was read. The value tags are not used to indicate which subframes contain system information. Rather, the value tags indicate when the system information has changed.

Further, it is clear from a reading of R2 that value tags are not included in each subframe that carries system information as recited in claims 1 and 10. Rather, R2 teaches that the value tags may be included in either the Master Information Block (MIB) which is transmitted on the Broadcast Channel (BCH), or in SU-1. Thus, even if there is a value tag for each SU, it would only be carried within the MIB or SU-1 and not within other SUs, e.g., SU-2, SU-3, etc., transmitted in different subframes. Thus, the value tags disclosed in R2 are not present in each subframe that is used for carrying system information as recited in claims 1 and 10.

Claims 1 and 10 further recite that the indicator comprises a System Information Radio Network Temporary Identifier (SI-RNTI). The Patent Office acknowledges that R2 does not disclose indicating which subframes carry system information using a SI-RNTI. Office Action, p. 13. However, the Examiner cites R2-071912 for disclosing the use of an RNTI to indicate subframes that carry system information. Applicant respectfully disagrees. R2-071912 discloses using an RNTI to indicate when modifications to system information are made, not to indicate the subframes containing the system information. The purpose of the RNTI in R2-071912 is to let the user equipment know when there is a need to read the system information, i.e., when system information is changed. The RNTI is not used in R2-071912 to indicate the subframes that carry the system information.

The remaining references fail to cure the deficiencies of R2. Neither Arundale nor Dimou relate to the transmission of system information. Neither Arundale nor Dimou disclose the recited indicator in each subframe that carries system information to indicate to user equipment that the subframe contains system information. The radio node in Dimou indicates to the mobile station which resource blocks the mobile station should use to transmit reference signals to the radio node. Thus, the indication is not in the selected resource blocks, but rather is in a separate scheduling message. Further, it would not be obvious to combine Arundale's sliding time windows with R2's SUs that do not slide, but rather have a fixed periodicity.

For at least these reasons, claims 1 and 10 are patentable over the art of record.

103 Rejection of Independent Claim 12

Independent claim 12 as amended recites a method of transmitting system information on a downlink shared channel structured as successive subframes. The method comprises transmitting system information in regularly occurring time windows, each time window spanning some number of successive subframes. The system information may be carried in any one of the subframes of the time window, which is not known a priori to the user equipment. The method further comprises indicating to receiving user equipment which subframes within the time windows carry the system information, by using an indicator in each subframe within the time windows that carries system information.

Independent claim 12 has been rejected under 35 U.S.C §103 as being obvious over R2 in view of Arundale and further in view of Dimou. Applicant respectfully submits that the prior art fails to teach all of the limitations recited in claim 12. In particular, the R2-Arundale-Dimou combination fails to disclose indicating to receiving user equipment which subframes, within a time window spanning multiple subframes, carry system information, by using an indicator in each subframe within the time windows that carries system information.

As noted above, the SUs in R2 are transmitted periodically according to a fixed schedule. Thus, while the SUs in R2 occur at some periodic time interval, the SUs are always transmitted within the same subframe(s) of the fixed time interval. Therefore, there is no need for the base station in R2 to indicate which subframes in the time interval carry the system information.

Dimou and Arundale fail to cure the deficiencies of R2. Neither of these references are related to the transmission of system information. In Dimou, a radio node sends scheduling

information to indicate a resource allocation to the mobile station for uplink transmissions. The scheduling information has nothing whatsoever to do with system information. Arundale likewise fails to disclose anything about indicating which subframes carry system information. Further, it would not be obvious to combine Arundale's sliding time windows with R2's SUs that do not slide, but rather have a fixed periodicity.

Applicant further submits that claim 12 as amended further defines over the art of record. Claim 12 as amended further recites that the method comprises indicating to receiving user equipment which subframes within time windows carry system information by using an indicator in each subframe within the time windows that carry system information. For similar reasons as explained above, the R2-Arundale-Dimou combination fails to teach an indicator, that indicates subframes that carry system information, in each subframe that carries system information.

For at least these reasons, claim 12 is patentable over the art of record.

103 Rejection of Independent Claims 15 and 21

Claims 15 and 21 as amended are directed to a method and user equipment for receiving system information. Claim 15 recites recurring time windows, each spanning a number of subframes, in which system information is transmitted. The method comprises monitoring subframe(s) within a time window for an indication of presence of system information in subframe(s). The method comprises reading system information from the subframe(s) when the indication is present in the subframe(s). The indication is a System Information Radio Network Temporary Identifier (SI-RNTI). Claim 21 recites similar limitations in apparatus form.

Claims 15 and 21 stand rejected as obvious under 35 U.S.C §103 over R2 in view of Arundale, Dimou, and further in view of Love et al. (US 2004/0219917) ("**Love**"). Similar arguments for the patentability of claims 1, 10 and 12 apply to claims 15 and 21. For example, the combination fails to teach monitoring subframe(s) within a time window spanning a number of subframes for an indication of presence of system information in the subframe(s) and reading the system information from the subframe(s) when the indication is present in the subframe(s). Further, the combination fails to teach that the indication is a System Information Radio Network Temporary Identifier (SI-RNTI).

The Examiner cites Love for teaching a presence indication. Office Action, p. 10; see Love, ¶ [0071] (TFCI bit can be used to indicate if a DPCCH field called an EU field is present). However, the teachings of Love are unrelated to transmission of system information. Love

relates to a WCDMA system where an enhanced uplink dedicated transport channel (denoted E-DCH/EUDCH) is introduced. When the mobile station is scheduled for an uplink transmission on this channel, the base station needs to transmit ACK/NACK information to the mobile station to let the mobile station know whether or not the transmission on the UL has been received by the base station. In Love, a new field called the "EU" field is included in the DPCCH for ACK/NACK signaling and is used only when the mobile station is scheduled on the E-DCH. When the mobile station is not transmitting on the E-DCH, this field is unnecessary. In WCDMA systems, the base station uses a Transport Format Combination Indicators (TFCIs) to indicate the currently valid transport combination. The TFCI implicitly indicates what specific control information is included in a physical layer block so that the mobile station can properly decode the information. The teachings of Love are specific to signaling of control information in WCDMA systems and are not used for indicating whether a subframe in a time window includes system information. Further, Love fails to teach that the indication is a System Information Radio Network Temporary Identifier (SI-RNTI).

For at least these reasons, claims 15 and 21 are patentable over the art of record.

Dependent Claims

Claims 4 and 14 further recite dynamically selecting the subframes in a time window used to carry the system information. This limitation is not disclosed by the cited prior art. In R2, the subframes that carry the SUs are not dynamically selected. Rather, the SUs are transmitted on a fixed schedule based on a fixed periodicity. The remaining references fail to teach or suggest dynamically selecting subframes in a recurring time window to carry system information. Therefore, it is believed that claims 4 and 14 are patentable for this additional reason.

Claim 26 depends on claim 12 and therefore is patentable for reasons explained with respect to claim 12. Claim 26 further defines over the art of record because it recites that the indicator is a SI-RNTI.

Claim 27 is related to but not the same as claim 12. Whereas claim 12 is directed to a method of transmitting system information, claim 27 is directed to a transmitter that transmits system information. The art of record fails to teach a network transmitter as recited in claim 27 that comprises a baseband processor configured to indicate to receiving user equipment which subframes carry system information by using an indicator in each subframe within the time

windows that carry system information. The time windows are regularly occurring and span a number of successive subframes.

Claims 28-29 depend on claim 27 and are patentable for reasons explained with respect to claim 27.

Claim 30 is related to but not the same as claim 15. Claim 15 and claim 30 are both related to methods comprising monitoring for an indication of presence of system information in a subframe of a time window spanning a number of subframes, and reading that system information if the indication is present. Further, the indication is a SI-RNTI. Claim 30 and its dependent claim 31 are patentable for many of the reasons expressed with respect to claim 15.

Claim 32 is related to but not the same as claim 30. Whereas claim 30 is directed to a method for a UE to receive system information, claim 32 is directed to a UE for receiving system information. Similar arguments apply for the patentability of claim 32 and its dependent claim 33 as apply to claim 30.

Claims 34-38 dependent from independent claims 1, 10, 12, 15 and 21, respectively and therefore are patentable for similar reasons as apply to the independent claims.

Rejection of Claims 1-25 under Double Patenting

Claims 1-25 stand rejected under the ground of nonstatutory double patenting. Applicant respectfully requests reconsideration in view of the amendments to claims 1-4, 6, 9, 10, 12, 14-16, and 20-25.

Conclusion

All dependent claims include all limitations of their respective parent claim(s), and thus also are patentable over the art of record.

All rejections having been addressed, Applicant submits that all claims are in condition for allowance, and a notice to that effect is respectfully requested.

Respectfully submitted,

COATS & BENNETT, P.L.L.C.

/Brandee N. Woolard/

Dated: April 4, 2016

Brandee N. Woolard
Registration No.: 68,795
Telephone: (919) 854-1844

15

Electronic Patent Application Fee Transmittal

Application Number:	14639287
Filing Date:	05-Mar-2015
Title of Invention:	Transmission of System Information on a Downlink Shared Channel
First Named Inventor/Applicant Name:	Erik Dahlman
Filer:	Brandee N. Woolard/Laura Morey
Attorney Docket Number:	4015-9121 / P24241-US3

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Claims in Excess of 20	1202	11	80	880
Independent claims in excess of 3	1201	3	420	1260

Miscellaneous-Filing:

Petition:

Patent-Appeals-and-Interference:

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Extension - 2 months with \$0 paid	1252	1	600	600
Miscellaneous:				
Total in USD (\$)				2740

Electronic Acknowledgement Receipt

EFS ID:	25385377
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	Transmission of System Information on a Downlink Shared Channel
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	Brandee N. Woolard/Laura Morey
Filer Authorized By:	Brandee N. Woolard
Attorney Docket Number:	4015-9121 / P24241-US3
Receipt Date:	04-APR-2016
Filing Date:	05-MAR-2015
Time Stamp:	13:01:06
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	\$2740
RAM confirmation Number	10214
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:					
Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		4015-9121_Response_Apr4.pdf	80803 <small>ee9afb0dac626d991b9fd9227b28589b43ac86d</small>	yes	15
Multipart Description/PDF files in .zip description					
		Document Description	Start	End	
		Amendment/Req. Reconsideration-After Non-Final Reject	1	1	
		Claims	2	8	
		Applicant Arguments/Remarks Made in an Amendment	9	15	
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	33849 <small>4c272aab74cffabad2961afd0fd7d96c4fb03ebd</small>	no	2
Warnings:					
Information:					
Total Files Size (in bytes):			114652		
<p>This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.</p> <p><u>New Applications Under 35 U.S.C. 111</u> If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.</p> <p><u>National Stage of an International Application under 35 U.S.C. 371</u> If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.</p> <p><u>New International Application Filed with the USPTO as a Receiving Office</u> If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.</p>					

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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/639,287	Filing Date 03/05/2015	<input type="checkbox"/> To be Mailed
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ENTITY: LARGE SMALL MICRO

APPLICATION AS FILED – PART I

FOR	NUMBER FILED	NUMBER EXTRA	RATE (\$)	FEE (\$)
<input type="checkbox"/> BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
<input type="checkbox"/> SEARCH FEE (37 CFR 1.16(k), (l), or (m))	N/A	N/A	N/A	
<input type="checkbox"/> EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*	X \$ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X \$ =	
<input type="checkbox"/> APPLICATION SIZE FEE (37 CFR 1.16(s)) <div style="font-size: small; margin-left: 20px;">If the specification and drawings exceed 100 sheets of paper, the application size fee due is \$310 (\$155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).</div>				
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))				
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL	

APPLICATION AS AMENDED – PART II

AMENDMENT	(Column 1)	(Column 2)	(Column 3)	(Column 4)	RATE (\$)	ADDITIONAL FEE (\$)
	04/04/2016	CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total (37 CFR 1.16(i))	* 36	Minus ** 25	= 11	X \$80 =	880
	Independent (37 CFR 1.16(h))	* 8	Minus *** 5	= 3	X \$420 =	1260
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))					
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
					TOTAL ADD'L FEE	2140

AMENDMENT	(Column 1)	(Column 2)	(Column 3)	(Column 4)	RATE (\$)	ADDITIONAL FEE (\$)
		CLAIMS REMAINING AFTER AMENDMENT	HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		
	Total (37 CFR 1.16(i))	*	Minus **	=	X \$ =	
	Independent (37 CFR 1.16(h))	*	Minus ***	=	X \$ =	
	<input type="checkbox"/> Application Size Fee (37 CFR 1.16(s))					
	<input type="checkbox"/> FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))					
					TOTAL ADD'L FEE	

TOTAL ADD'L FEE

LIE
/TONI HAKIM/

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.
 ** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".
 *** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Doc Code: DIST.E.FILE Document Description: Electronic Terminal Disclaimer - Filed	PTO/SB/26 U.S. Patent and Trademark Office Department of Commerce
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Electronic Petition Request	TERMINAL DISCLAIMER TO OBTAIN A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT
Application Number	14639287
Filing Date	05-Mar-2015
First Named Inventor	Erik Dahlman
Attorney Docket Number	4015-9121 / P24241-US3
Title of Invention	Transmission of System Information on a Downlink Shared Channel

- Filing of terminal disclaimer does not obviate requirement for response under 37 CFR 1.111 to outstanding Office Action
- This electronic Terminal Disclaimer is not being used for a Joint Research Agreement.

Owner	Percent Interest
Telefonaktiebolaget LM Ericsson (publ)	100%

The owner(s) with percent interest listed above in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of prior patent number(s)

8995357

as the term of said prior patent is presently shortened by any terminal disclaimer. The owner hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the prior patent are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the owner does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the prior patent, "as the term of said prior patent is presently shortened by any terminal disclaimer," in the event that said prior patent later:

- expires for failure to pay a maintenance fee;
- is held unenforceable;
- is found invalid by a court of competent jurisdiction;
- is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
- has all claims canceled by a reexamination certificate;
- is reissued; or
- is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Terminal disclaimer fee under 37 CFR 1.20(d) is included with Electronic Terminal Disclaimer request.

I certify, in accordance with 37 CFR 1.4(d)(4), that the terminal disclaimer fee under 37 CFR 1.20(d) required for this terminal disclaimer has already been paid in the above-identified application.

Applicant claims the following fee status:

- Small Entity
- Micro Entity
- Regular Undiscounted

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

THIS PORTION MUST BE COMPLETED BY THE SIGNATORY OR SIGNATORIES

I certify, in accordance with 37 CFR 1.4(d)(4) that I am:

- An attorney or agent registered to practice before the Patent and Trademark Office who is of record in this application

Registration Number 68795
- A sole inventor
- A joint inventor; I certify that I am authorized to sign this submission on behalf of all of the inventors as evidenced by the power of attorney in the application
- A joint inventor; all of whom are signing this request

Signature	/Brandee N. Woolard/
Name	Brandee N. Woolard

*Statement under 37 CFR 3.73(b) is required if terminal disclaimer is signed by the assignee (owner).
Form PTO/SB/96 may be used for making this certification. See MPEP § 324.

Electronic Patent Application Fee Transmittal

Application Number:	14639287			
Filing Date:	05-Mar-2015			
Title of Invention:	Transmission of System Information on a Downlink Shared Channel			
First Named Inventor/Applicant Name:	Erik Dahlman			
Filer:	Brandee N. Woolard/Laura Morey			
Attorney Docket Number:	4015-9121 / P24241-US3			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Statutory or Terminal Disclaimer	1814	1	160	160
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				160

Doc Code: DISQ.E.FILE
Document Description: Electronic Terminal Disclaimer – Approved

Application No.: 14639287

Filing Date: 05-Mar-2015

Applicant/Patent under Reexamination: Dahlman et al.

Electronic Terminal Disclaimer filed on July 13, 2016

APPROVED

This patent is subject to a terminal disclaimer

DISAPPROVED

Approved/Disapproved by: Electronic Terminal Disclaimer automatically approved by EFS-Web

U.S. Patent and Trademark Office

Electronic Acknowledgement Receipt

EFS ID:	26334333
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	Transmission of System Information on a Downlink Shared Channel
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	Brandee N. Woolard/Laura Morey
Filer Authorized By:	Brandee N. Woolard
Attorney Docket Number:	4015-9121 / P24241-US3
Receipt Date:	13-JUL-2016
Filing Date:	05-MAR-2015
Time Stamp:	11:45:32
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	\$160
RAM confirmation Number	9192
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Electronic Terminal Disclaimer-Filed	eTerminal-Disclaimer.pdf	33495	no	2
			712939e033f38419a5532d60a0126a5047809de3		

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30413	no	2
			ef6a1920fa27f2d490d5ced69b135950fa96d00		

Warnings:

Information:

Total Files Size (in bytes):	63908
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New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	14639287
	Filing Date	2015-03-05
	First Named Inventor	Dahlman
	Art Unit	2413
	Examiner Name	Siming Liu
	Attorney Docket Number	4015-9121/P24241-US3

U.S.PATENTS							Remove
Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	
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Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	
	1	20100167750	A1	2010-07-01	Lee et al.		
	2	20030133431	A1	2003-07-17	Rudolf		

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS								Remove
Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	2007073079	WO	A1	2007-06-28	LG Electronics Inc.		
	2	2006136023	JP	A	2006-05-25	Interdigital Technology Corp.	English abstract attached Equivalent of US2003/0133431, cited herein	

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		14639287	
	Filing Date		2015-03-05	
	First Named Inventor	Dahlman		
	Art Unit	2413		
	Examiner Name	Siming Liu		
	Attorney Docket Number	4015-9121/P24241-US3		

3	2009512391	JP	A	2009-03-19	Lee et al.	Equivalent of US2010/0167750, cited herein
4						

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
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EXAMINER SIGNATURE

Examiner Signature		Date Considered	
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	14639287
	Filing Date	2015-03-05
	First Named Inventor	Dahlman
	Art Unit	2413
	Examiner Name	Siming Liu
	Attorney Docket Number	4015-9121/P24241-US3

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

- The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Brandee N. Woolard/	Date (YYYY-MM-DD)	2016-07-14
Name/Print	Brandee N. Woolard	Registration Number	68795

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
28 June 2007 (28.06.2007)

PCT

(10) International Publication Number
WO 2007/073079 A1

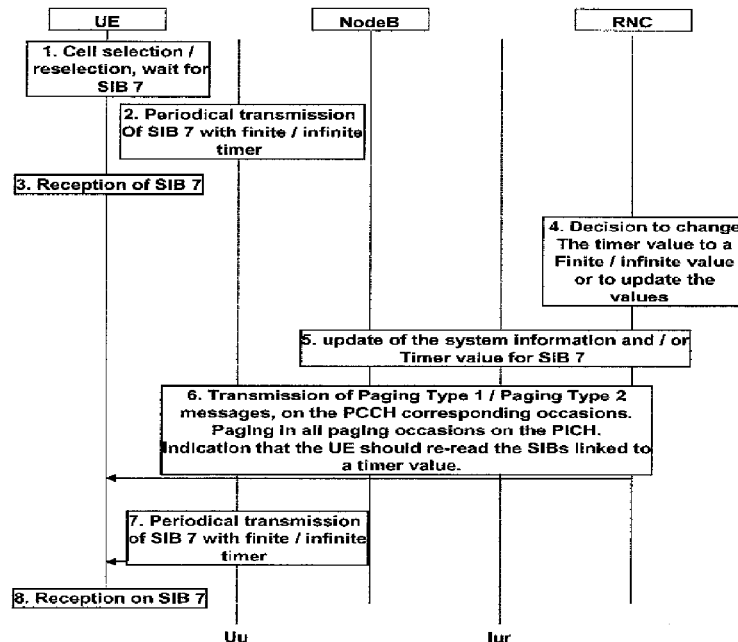
- (51) **International Patent Classification:**
H04B 7/26 (2006.01) *H04L 29/06* (2006.01)
H04Q 7/20 (2006.01)
- (21) **International Application Number:**
PCT/KR2006/005564
- (22) **International Filing Date:**
19 December 2006 (19.12.2006)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**
60/751,840 19 December 2005 (19.12.2005) US
- (71) **Applicant (for all designated States except US):** LG ELECTRONICS INC. [KR/KR]; 20, Yoido-Dong, Yongsungpo-gu, Seoul, 150-010 (KR).
- (72) **Inventor; and**
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(54) **Title:** METHOD FOR READING DYNAMIC SYSTEM INFORMATION BLOCKS



(57) **Abstract:** In a wireless mobile communications system, a method of controlling or updating system information included in system information blocks (SIBs). The mobile communication system allows the network (i.e., RNC) to trigger the terminal (i.e., UE) to apply new timer values and information values independently of whether the UE has read the timer and/or values of the SIBs based on a previous timer values.

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Description

METHOD FOR READING DYNAMIC SYSTEM INFORMATION BLOCKS

Technical Field

- [1] The present invention relates to a method for reading system information blocks (SIBs). In particular, the present invention is to allow a radio network controller (RNC) to trigger an user equipment (UE) for applying new timer values and information values independently of which the UE has read the timer values and/or values of the SIBs based on former timer values.

Background Art

- [2] The universal mobile telecommunications system (UMTS) is a third-generation mobile communications system evolving from the global system for mobile communications system (GSM), which is the European standard. The UMTS is aimed at providing enhanced mobile communications services based on the GSM core network and wideband code-division multiple-access (W-CDMA) technologies.
- [3] Figure 1 gives an overview of the UMTS network, including the UE, the UTRAN and the core network (CN). The UTRAN is composed of several radio network controllers (RNCs) and Node-Bs, which communicate via the Iub interface.
- [4] Each RNC controls several Node-Bs. Each RNC is connected via the IU interface to the core network (CN), specifically to the MSC (Mobile-services Switching Center) and the SGSN (Serving GPRS Support Node) of the CN. RNCs can be connected to other RNCs via the Iur interface. The RNC handles the assignment and management of radio resources and operates as an access point with respect to the core network.
- [5] The Node-Bs receive information sent by the physical layer of the terminal through an uplink transmission and transmit data to the terminal through a downlink transmission. The Node-Bs operate as access points of the UTRAN for the terminal.
- [6] The SGSN is connected via the G_i interface to the EIR (Equipment Identity Register), via the G_s interface to the MSC, via the G_N interface to the GGSN (Gateway GPRS Support Node) and via the G_R interface to the HSS (Home Subscriber Server). The EIR maintains lists of mobiles that are allowed to be used on the network.
- [7] The MSC controls the connection for circuit switch (CS) services. The MSC is connected to the MGW (Media Gateway) via the N_B interface, to the EIR via the F interface, and to the HSS via the D interface. The MGW is connected to the HSS via the C interface and to the PSTN (Public Switched Telephone Network). The MGW facilitates the adapting of the codecs between the PSTN and the connected RAN.
- [8] The GGSN is connected to the HSS via the G_c interface and to the Internet via the

G_I interface. The GGSN is responsible for routing, charging and separation of data flows into different radio access bearers (RABs). The HSS handles the subscription data of the users.

- [9] The UTRAN establishes and maintains a radio access bearer (an RAB) for communication between the terminal and the core network. The core network requests end-to-end quality of service (QoS) requirements from the RAB and the RAB supports the QoS requirements set by the core network. Accordingly, the UTRAN can satisfy the end-to-end QoS requirements by constructing and maintaining the RAB.
- [10] The services provided to a specific terminal are roughly divided into circuit switched (CS) services and packet switched (PS) services. For example, a general voice conversation service is a circuit switched service, while a Web browsing service via an Internet connection is classified as a packet switched (PS) service.
- [11] For supporting circuit switched services, the RNCs are connected to the mobile switching center (MSC) of the core network and the MSC is connected to the gateway mobile switching center (GMSC) that manages the connection with other networks. For supporting packet switched services, the RNCs are connected to the serving general packet radio service (GPRS) support node (SGSN) and the gateway GPRS support node (GGSN) of the core network. The SGSN supports the packet communications with the RNCs and the GGSN manages the connection with other packet switched networks, such as the Internet.
- [12] Figure 2 illustrates an architecture of a radio interface protocol between the terminal and the UTRAN according to the 3GPP radio access network standards. As shown in Figure 2, the radio interface protocol has vertical layers comprising a physical layer, a data link layer, and a network layer, and has horizontal planes comprising a user plane (U-plane) for transmitting user data and a control plane (C-plane) for transmitting control information.
- [13] The user plane handles traffic information with the user, such as voice or Internet protocol (IP) packets. The control plane handles control information for an interface with a network, maintenance and management of a call, and the like. The protocol layers in Figure 2 can be divided into a first layer (L1), a second layer (L2), and a third layer (L3) based on the three lower layers of an open system interconnection (OSI) standard model. The first layer (L1), or the physical layer, provides an information transfer service to an upper layer by using various radio transmission techniques. The physical layer is connected to an upper layer, called a medium access control (MAC) layer, via a transport channel.
- [14] The MAC layer and the physical layer exchange data via the transport channel. The second layer (L2) includes a MAC layer, a radio link control (RLC) layer, a broadcast/multicast control (BMC) layer and a packet data convergence protocol (PDCP) layer.

- [15] The MAC layer handles mapping between logical channels and transport channels and provides allocation of the MAC parameters for allocation and re-allocation of radio resources. The MAC layer is connected to an upper layer, called the radio link control (RLC) layer, via a logical channel.
- [16] Various logical channels are provided according to the type of information transmitted. In general, a control channel is used to transmit information of the control plane and a traffic channel is used to transmit information of the user plane.
- [17] A logical channel may be a common channel or a dedicated channel depending on whether the logical channel is shared. Logical channels include a dedicated traffic channel (DTCH), a dedicated control channel (DCCH), a common traffic channel (CTCH), a common control channel (CCCH), a broadcast control channel (BCCH) and a paging control channel (PCCH) or a Shared Channel Control Channel.
- [18] The BCCH provides information including information utilized by a terminal to access a system. The PCCH is used by the UTRAN to access a terminal.
- [19] The possible mapping between the logical channels and the transport channels from a UE perspective is given in Figure 3. The possible mapping between the logical channels and the transport channels from a UTRAN perspective is given in Figure 4.
- [20] The MAC-d sub-layer manages a dedicated channel (DCH), which is a dedicated transport channel for a specific terminal. The MAC-d sub-layer is located in a serving RNC (SRNC) that manages a corresponding terminal. One MAC-d sub-layer also exists in each terminal.
- [21] The RLC layer, depending of the RLC mode of operation, supports reliable data transmissions and performs segmentation and concatenation on a plurality of RLC service data units (SDUs) delivered from an upper layer. When the RLC layer receives the RLC SDUs from the upper layer, the RLC layer adjusts the size of each RLC SDU in an appropriate manner based upon processing capacity and then creates data units by adding header information thereto. The data units, called protocol data units (PDUs), are transferred to the MAC layer via a logical channel. The RLC layer includes a RLC buffer for storing the RLC SDUs and/or the RLC PDUs.
- [22] The BMC layer schedules a cell broadcast (CB) message transferred from the core network and broadcasts the CB message to terminals positioned in a specific cell or cells.
- [23] The PDCP layer is located above the RLC layer. The PDCP layer is used to transmit network protocol data, such as the IPv4 or IPv6, effectively on a radio interface with a relatively small bandwidth. For this purpose, the PDCP layer reduces unnecessary control information used in a wired network, by using a function called header compression.
- [24] The radio resource control (RRC) layer located at the lowest portion of the third

layer (L3) is only defined in the control plane. The RRC layer controls the transport channels and the physical channels in relation to setup, reconfiguration, and the release or cancellation of the radio bearers (RBs). Additionally the RRC handles user mobility within the RAN and additional services, such as location services.

- [25] The RB signifies a service provided by the second layer (L2) for data transmission between the terminal and the UTRAN. In general, the set up of the RB refers to the process of stipulating the characteristics of a protocol layer and a channel required for providing a specific data service, and setting the respective detailed parameters and operation methods.
- [26] The different possibilities that exist for the mapping between the radio bearers and the transport channels for a given UE are not all possible all the time. The UE and UTRAN deduce the possible mapping depending on the UE state and the procedure that the UE and UTRAN are executing. The different states and modes are explained in more detail below, as far as they concern the present invention.
- [27] The different transport channels are mapped onto different physical channels. For example, the RACH transport channel is mapped on a given PRACH, the DCH can be mapped on the DPCH, the FACH and the PCH can be mapped on the S-CCPCH, and the DSCH is mapped on the PDSCH. The configuration of the physical channels is given by RRC signaling exchanged between the RNC and the UE.
- [28] In UMTS, as described above, system information is usually broadcasted in system information blocks (SIBs) on a specific channel, and system information is separately sent in different SIBs in order to optimize the reading of the system information. When the different SIBs are transmitted, the transmitted SIBs are indicated in a master information block (MIB) or scheduling blocks. The MIB indicates a position of the scheduling blocks and value tags of the SIBs, and the scheduling blocks indicate scheduling information for the SIBs. The transmission of the MIB, SIB, and scheduling block is scheduled according to the timing of the PCCPCH. The MIB is always sent with a fixed offset related to the PCCPCH and with a fixed repetition period. Therefore, the UE is able to receive information via various channels when such information is needed to be received by the UE according to the fixed repetition period.
- [29] The system information which contains certain information, such as configuration of the cells and/or a GSM public land mobile network (PLMN) related information etc., is transported from the network to the UE. Some information is only valid in the cell where the SIB is transmitted, and some other information is valid in the entire network (i.e. PLMN). Therefore, depending upon the types of information, SIBs with information that is valid in the cell must be re-read each time the UE moves to another cell and SIBs with information that is valid in the entire network do not need to be re-

read each time the UE moves to a different cell.

[30] Generally, the SIBs can be linked to a timer if the system information changes frequently. These types of SIBs include a timer value such that once the UE has read the SIB, it knows the SIB needs to be re-read after the time indicated by the timer. These types of SIBs are only re-read by the UE when the timer expires. If the timer value is set to infinite, it means that the UE will never re-read those SIBs again after the UE has acquired those SIBs once.

[31] Therefore, in the conventional art, if the timer is set to a finite value, the UE will not re-read SIBs before the timer has expired. This causes an unnecessary time delay for updating the system information. Also, if the timer is set to an infinite value, it is not possible to update the system information stored in the UE unless the UE moves to the new cell or PLMN.

[32] For example, the UE needs to receive system information on the uplink interference in order to access the random access channel (RACH), and the UE uses persistence values during the RACH access. In these procedures, the system information is transmitted in the SIB 7 that is linked to a timer. Usually, this system information is subject to frequent changes, as such, it is necessary that the UE should read up-to-date system information frequently.

Disclosure of Invention

Technical Problem

[33] However, to avoid having the UE to read system information too often, the UE can be set to read system information only when a RACH access is requested, even if the UE does not need to perform a RACH update. Also, if the SIB 7 is scheduled with a certain time schedule for the transmission of a RACH message, the UE has to wait for the next time schedule. This also creates an unwanted time delay.

[34] Also, although the UE only needs to receive the SIB 7 once (i.e., at the time of cell entry), the stored system information of the UE can not be updated again when the timer is set to an infinite value. When the timer is set to an infinite value, the UE has to change the cell in order to update the system information.

Technical Solution

[35] Therefore, the present invention provides an improved method of reading system information blocks (SIBs) by allowing the network (i.e., RNC) to trigger the UE to read or re-read the SIBs for applying new timer values and information values effectively.

[36] To achieve this, if the system information needs to be changed or updated, the network may transmit an indication to the UE so that the UE may re-read all system information blocks (SIBs) that are related to a timer and/or a value tag.

[37]

Brief Description of the Drawings

[38] The invention will be described with reference to the drawings, in which:

[39] Figure 1 is a block diagram of a general UMTS network architecture.

[40] Figure 2 is a block diagram of a structure of a radio interface protocol between a terminal and a network based on 3GPP radio access network standards.

[41] Figure 3 illustrates the possible mapping between logical channels and transport channel from the UE perspective.

[42] Figure 4 illustrates the possible mapping between logical channels and transport channel from the UTRAN perspective.

[43] Figure 5 shows an exemplary diagram for the related art procedure of updating SIBs linked to a value tag.

[44] Figure 6 shows an exemplary diagram for updating of the SIBs linked to a value tag according to an exemplary embodiment of the present invention.

[45] Figure 7 shows an exemplary diagram for updating values of the SIB 7 by switching the SIB 7 timer between finite and infinite according to an exemplary embodiment of the present invention.

Mode for the Invention

[46] One aspect of the present invention relates to the recognition by the present inventors about the problems of the related art as described above, and further explained hereafter. Based upon this recognition, the features of the present invention have been developed.

[47] Although the present invention is shown to be implemented in a mobile communication system, such as a UMTS developed under 3GPP specifications, the present invention can also be applied to other communication systems operating in conformity with different standards and specifications.

[48] The present invention provides an improved method of reading system information blocks (SIBs) by allowing the RNC to trigger the UE to read or re-read the SIBs [i.e., SIB 7]. Namely, the UE may read or re-read the SIBs linked to a timer value and/or a value tag, upon reception of an indication from the RNC.

[49] Before each access to the RACH, the UE may need to read some up-to-date information regarding the interference and radio resource situation in a cell which is transmitted in the SIBs linked to a timer. This information may be adapted regularly, and the information may be only valid for a given time. Therefore, the duration for the validity may be given in order to update this information when it is broadcasted. Thus, the UE may consider the validity of the given time that is associated with timer when the UE reads the information. The UE will re-read the information after the validity of

the given time expires.

[50] However, if the validity according to the timer is set to infinity, it is impossible to initiate the UE to read this information again. Therefore, the present invention may include system information update procedure using SIBs linked to a timer including possibly SIBs linked to value tags.

[51] Here, the validity of system information, which read by the UE, may be controlled in different ways. The system information blocks (SIBs) may be linked to a value tag and/or a timer. In the case that the system information block is linked to a value tag which identifies the version of the information (i.e., system information) in the SIB, such value tag may be transmitted via the MIB. Thus, the UE may check whether SIBs from a given cell correspond to the version (i.e., value tag) of the SIB (i.e., the SIB has eventually stored for a given cell or PLMN) by just comparing the value tag of the stored block and the transmitted value tags in the MIB.

[52] The Node B or RNC may generate a content of the SIBs. When the content of the SIBs is generated in the Node B, the RNC may indicate the scheduling information, and optionally the Node B may update a message [i.e., empty message] with the value that is also generated in the Node B. The RNC may generate the messages including the scheduling information and then may send this information to the Node B when the RNC generates the scheduling information. The Node B may store the messages and may instantly transmit them with the scheduled time via an appropriate channel.

[53] In order to ensure that the UE has the most updated system information, the UE may need to read the MIB of a selected cell each time. When the UE moves to a new cell, the UE may need to check whether the SIBs of this new cell or network are valid based on the value tags. In order to allow the network to change the SIBs, the network may trigger the reading of the MIB by transmitting specific paging information to the UEs. As such, the UE may be triggered to read or re-read the MIB, and the UE may also compare the value tags of the SIB specified in the MIB with the stored SIBs of the UE.

[54] Figure 5 shows the related art diagram for updating SIBs linked to a value tag.

[55] As illustrated in Figure 5, the RNC may decide that the SIBs need to be changed or updated. (S1) The RNC may transmit the new and updated SIBs, MIBs and scheduling blocks to the Node B in order to provide the correct information to the Node B. (S2) Also, a paging message (i.e., paging type 1) may be transmitted to the UE in order to indicate that the system information with value tags needs to be updated. (S3) Here, the paging message which is transmitted on the PCCH channel may indicate that the SIBs linked to value tags have been updated. Therefore, the UE may read the MIB to check whether the SIBs need to be re-read. In addition, a certain indication may be transmitted first on the PICH channel before transmitting the paging message in order

to inform the UE that a paging message will be transmitted. By doing this, the UE may reduce its reading time by only reading the PCCH after the certain indication is transmitted on the PICH channel. Once the UE receives the paging message, the UE may receive a changed or updated MIB. (S4) Then, the UE may compare the value tags in the changed or updated MIB in order to check whether the SIBs need to be re-acquired. (S5) After this step, the UE may receive changed or updated SIBs that are linked to value tags. (S6)

[56] Figure 6 shows an exemplary diagram for updating of the SIBs linked to a timer value according to an exemplary embodiment of the present invention.

[57] As illustrated in Figure 6, the RNC may decide to change the SIB and/or the timer value related to the SIB. (S1) The RNC may decide that the update of the SIB needs to be indicated to all UEs such that the UEs are required to re-read the timer value. If necessary, the RNC may update the contents of the MIB and/or SIB (which includes the timer that is eventually updated) and/or the scheduling block. (S2) By using various types of messages [i.e., new messages, extended existing messages, etc.], the RNC may indicate to the UE that the SIBs linked to a timer need to be re-read or the timer value for the SIB linked to that timer needs to be re-read. So, the UE may re-read the SIBs linked to a timer when the UE receives such messages. For example, the UE may re-read the SIBs when a paging type 1 message transmitted on the PCH or PCCH is received and/or a paging type 2 message transmitted on the FACH. Here, the paging type 1 or type 2 messages may include a certain indication that the SIBs linked to a value tag need to be re-read. Also, the value tag may include an indication that the UE is required to re-read the SIBs linked to a timer. Further, the RNC may transmit a different message to indicate to the UEs that the UEs need to re-read the timer values and the other contents of the SIBs linked to a timer. It is possible that the paging type 1 messages may be transmitted to the UEs on the PCCH indicating that the UEs need to re-read all SIBs linked to a timer value, and all UEs may be ready to receive the paging message by setting all paging indications to 1. In addition, the RNC may transmit paging type 2 messages to indicate that the UEs need to re-read all SIBs linked to a timer value on the FACH to all UEs in Cell_FACH state. By receiving the paging type 1 or paging type 2 messages, the UE may re-read the MIB and/or SIBs linked to a timer value. Once the UE receives a changed MIB (S4), the UE may compare the value tags therein to the value tags of the SIBs stored in the memory (S5), and the UE may read or re-read the SIBs linked to timer values. Then, the UE may receive updated SIBs linked to the value tags. (S6)

[58] Figure 7 shows an exemplary diagram for updating values of the SIB 7 by switching the SIB 7 timer between finite and infinite settings (values) according to an exemplary embodiment of the present invention.

[59] As illustrated in Figure 7, the UE may listen to system information and may wait to receive the SIB (i.e., SIB 7) when the UE enters the cell. The Node B may periodically transmit the SIB to the UE including uplink interference, persistence values and a timer value. (S2) The timer value of the SIB may indicate for which time the SIB is valid. Here, this timer value may be set to a finite value or to an infinite value. The UE may receive the SIB, store the system information, and use the related timer value in order to check how long the received system information is valid before it needs to be re-read. (S3) As such, regarding to the information contained in the SIB, the UE may know whether the UE can use the stored information or whether such information needs to be re-read. The RNC may decide that the system information in the SIB or the related timer value needs to be updated. (S4) Then, optionally, the RNC may indicate to the Node B about the new system information and/or the related timer value. (S5) The RNC may indicate to the UE to re-read the system information by transmitting messages on the PCH or the FACH. (S6) As described above, various types of messages may be used to indicate that the system information should be re-read. It is also possible to trigger that all UEs read paging messages by setting their respective paging indicator on the PICH to 1. Since the Node B has been updated with the new/ updated system information values and the new timer value, the Node B may broadcast the new SIBs linked to a timer value and the new timer values periodically according to the scheduling information as shown in step 7. The UE may receive the new SIB, and then apply the new values and/or the related timer. (S8) After these procedures, the UEs that have no valid SIBs being stored, may be provided with valid SIBs with infinite timer values. Alternatively, the UEs that have SIBs with infinite timer values being stored, may be provided with the valid SIBs with timer validity information.

[60] It can be said that the present invention provides a method of transmitting system information included in system information blocks (SIBs), the method comprising: determining whether the system information is needed to be changed; and transmitting one or more messages to a UE via at least one transport channel, wherein the one or more messages indicate to the UE to read at least one SIB linked to a timer value; the system information is changed if the timer value related to the at least one SIB is changed; the one or more messages are new messages and/or extended existing messages; the one or more messages indicate to the UE to read the at least one SIB linked to the timer value and a value tag; the one or more messages indicate to the UE to read other contents of the at least one SIB linked to the timer value; the at least one transport channel is a paging channel (PCH) or a forward access channel (FACH); first type of messages are transmitted to the UEs via the PCH and/or second type of messages are transmitted to the UEs via the FACH; the first type of messages are ready to be triggered by the UE if all paging indicators on the PICH are set to 1; a validity of

the timer value is checked by using of a related timer value; the timer value is transmitted periodically to the UE; and the timer value is finite or infinite.

[61] The present invention also may provide a method of receiving system information included in system information blocks (SIBs), the method comprising: receiving one or more messages from a network via at least one transport channel; and reading at least one SIB linked to a timer value when the one or more messages are received; the system information is changed if the timer value related to the at least one SIB is changed; the one or more messages are new messages and/or extended existing messages; the one or more messages indicate to the UE to read the at least one SIB linked to the timer value and a value tag; the one or more messages indicate to read other contents of the at least one SIB linked to the timer value; the at least one transport channel is a paging channel (PCH) or a forward access channel (FACH); first type of messages are received via the PCH and/or second type of messages are received via the FACH; the first type of messages are triggered if all paging indicator on the PICH are set to 1; a validity of the timer value is checked by using of a related timer value; the timer value is periodically received; and the timer value is finite or infinite.

[62] Although the present invention is described in the context of mobile communications, the present invention may also be used in any wireless communication systems using mobile devices, such as PDAs and laptop computers equipped with wireless communication capabilities (i.e. interface). Moreover, the use of certain terms to describe the present invention is not intended to limit the scope of the present invention to a certain type of wireless communication system. The present invention is also applicable to other wireless communication systems using different air interfaces and/or physical layers, for example, TDMA, CDMA, FDMA, WCDMA, OFDM, EV-DO, Wi-Max, Wi-Bro, GSM, GPRS, EDGE, EGPRS, LTE, etc.

[63] The exemplary embodiments may be implemented as a method, apparatus or article of manufacture using standard programming and/or engineering techniques to produce software, firmware, hardware, or any combination thereof. The term "article of manufacture" as used herein refers to code or logic implemented in hardware logic (e.g., an integrated circuit chip, Field Programmable Gate Array (FPGA), Application Specific Integrated Circuit (ASIC), etc.) or a computer readable medium (e.g., magnetic storage medium (e.g., hard disk drives, floppy disks, tape, etc.), optical storage (CD-ROMs, optical disks, etc.), volatile and non-volatile memory devices (e.g., EEPROMs, ROMs, PROMs, RAMs, DRAMs, SRAMs, firmware, programmable logic, etc.).

[64] Code in the computer readable medium may be accessed and executed by a processor. The code in which exemplary embodiments are implemented may further be

accessible through a transmission media or from a file server over a network. In such cases, the article of manufacture in which the code is implemented may comprise a transmission media, such as a network transmission line, wireless transmission media, signals propagating through space, radio waves, infrared signals, etc. Of course, those skilled in the art will recognize that many modifications may be made to this configuration without departing from the scope of the present invention, and that the article of manufacture may comprise any information bearing medium known in the art.

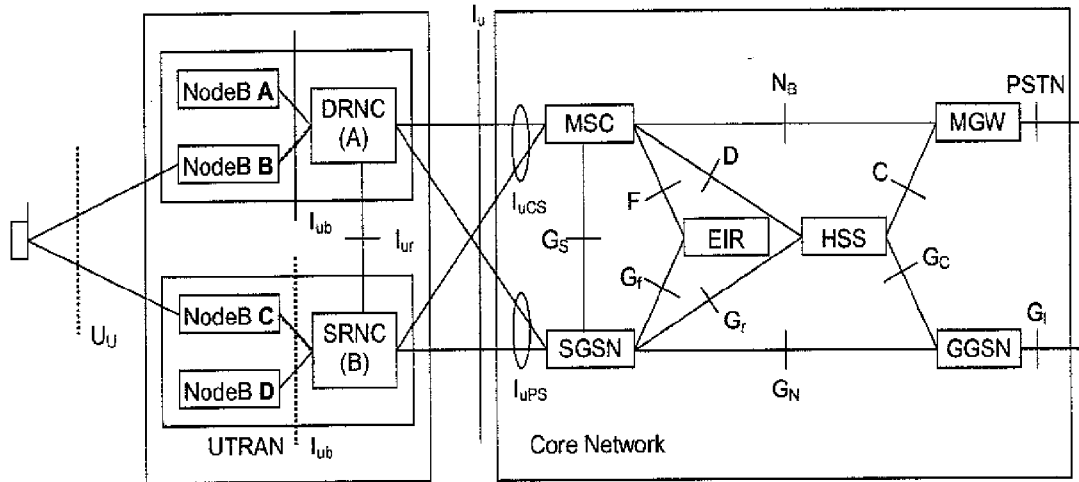
[65] As the present invention may be embodied in several forms without departing from the spirit or essential characteristics thereof, it should also be understood that the above-described embodiments are not limited by any of the details of the foregoing description, unless otherwise specified, but rather should be construed broadly within its spirit and scope as defined in the appended claims, and therefore all changes and modifications that fall within the metes and bounds of the claims, or equivalents of such metes and bounds are therefore intended to be embraced by the appended claims.

Claims

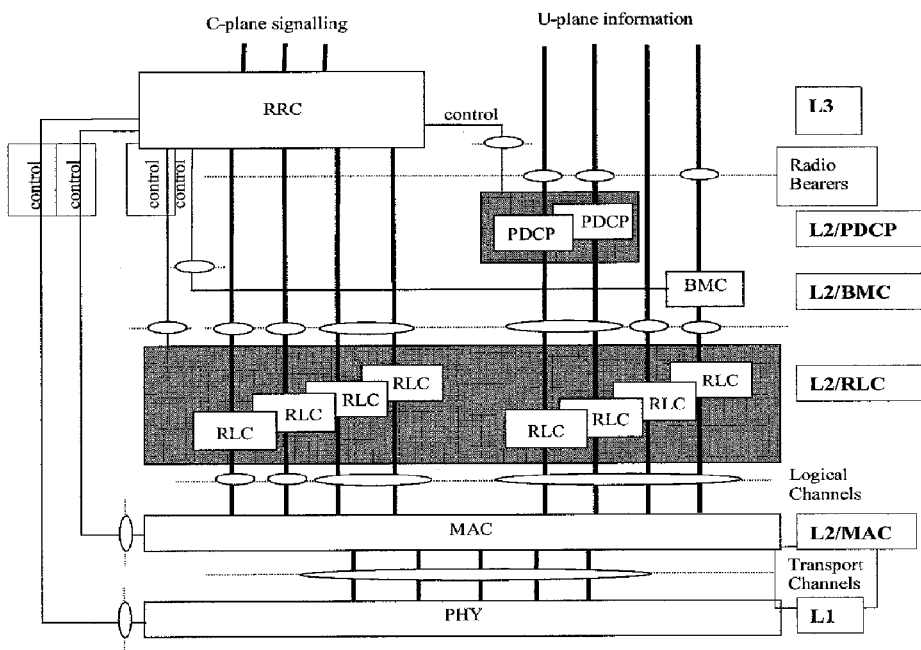
- [1] A method of transmitting system information included in system information blocks (SIBs), the method comprising:
determining whether the system information is needed to be changed; and
transmitting one or more messages to a UE via at least one transport channel, wherein the one or more messages indicate to the UE to read at least one SIB linked to a timer value.
- [2] The method of claim 1, wherein the system information is changed if the timer value related to the at least one SIB is changed.
- [3] The method of claim 1, wherein the one or more messages are new messages and/or extended existing messages.
- [4] The method of claim 1, wherein the one or more messages indicate to the UE to read the at least one SIB linked to the timer value and a value tag.
- [5] The method of claim 1, wherein the one or more messages indicate to the UE to read other contents of the at least one SIB linked to the timer value.
- [6] The method of claim 1, wherein the at least one transport channel is a paging channel (PCH) or a forward access channel (FACH).
- [7] The method of claim 6, wherein first type of messages are transmitted to the UEs via the PCH and/or second type of messages are transmitted to the UEs via the FACH.
- [8] The method of claim 7, wherein the first type of messages are ready to be triggered by the UE if all paging indicators on the PICH are set to 1.
- [9] The method of claim 1, wherein a validity of the timer value is checked by using of a related timer value.
- [10] The method of claim 1, wherein the timer value is transmitted periodically to the UE.
- [11] The method of claim 1, wherein the timer value is finite or infinite.
- [12] A method of receiving system information included in system information blocks (SIBs), the method comprising:
receiving one or more messages from a network via at least one transport channel; and
reading at least one SIB linked to a timer value when the one or more messages are received.
- [13] The method of claim 12, wherein the system information is changed if the timer value related to the at least one SIB is changed.
- [14] The method of claim 12, wherein the one or more messages are new messages and/or extended existing messages.

- [15] The method of claim 12, wherein the one or more messages indicate to the UE to read the at least one SIB linked to the timer value and a value tag.
- [16] The method of claim 12, wherein the one or more messages indicate to read other contents of the at least one SIB linked to the timer value.
- [17] The method of claim 12, wherein the at least one transport channel is a paging channel (PCH) or a forward access channel (FACH).
- [18] The method of claim 17, wherein first type of messages are received via the PCH and/or second type of messages are received via the FACH.
- [19] The method of claim 18, wherein the first type of messages are triggered if all paging indicator on the PICH are set to 1.
- [20] The method of claim 12, wherein a validity of the timer value is checked by using of a related timer value.
- [21] The method of claim 20, wherein the timer value is periodically received.
- [22] The method of claim 21, wherein the timer value is finite or infinite.

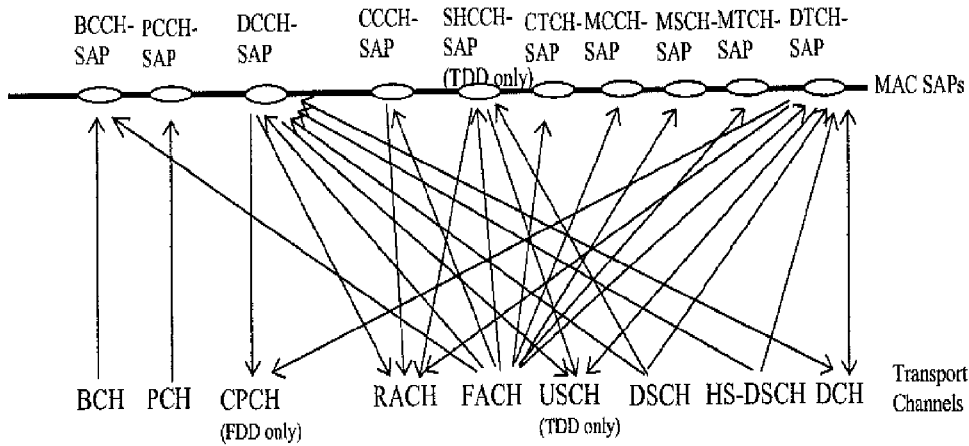
[Fig. 1]



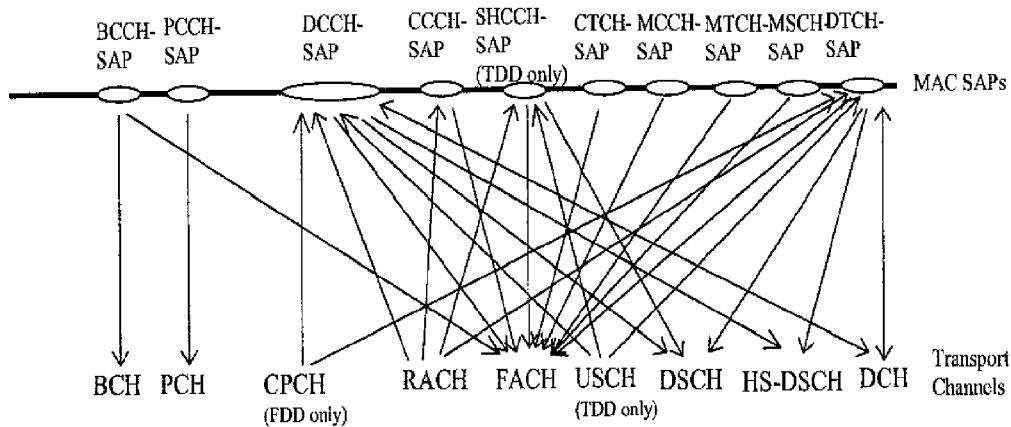
[Fig. 2]



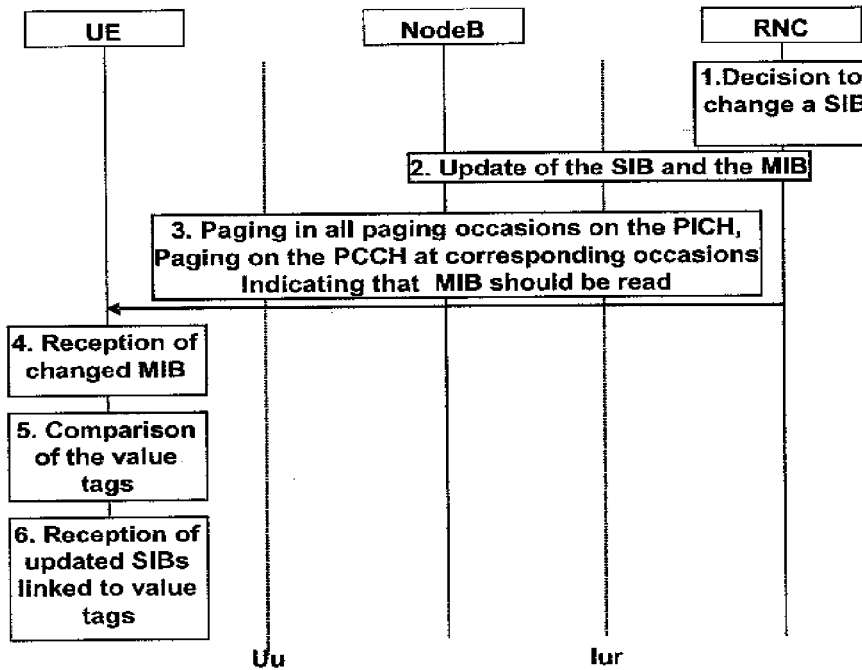
[Fig. 3]



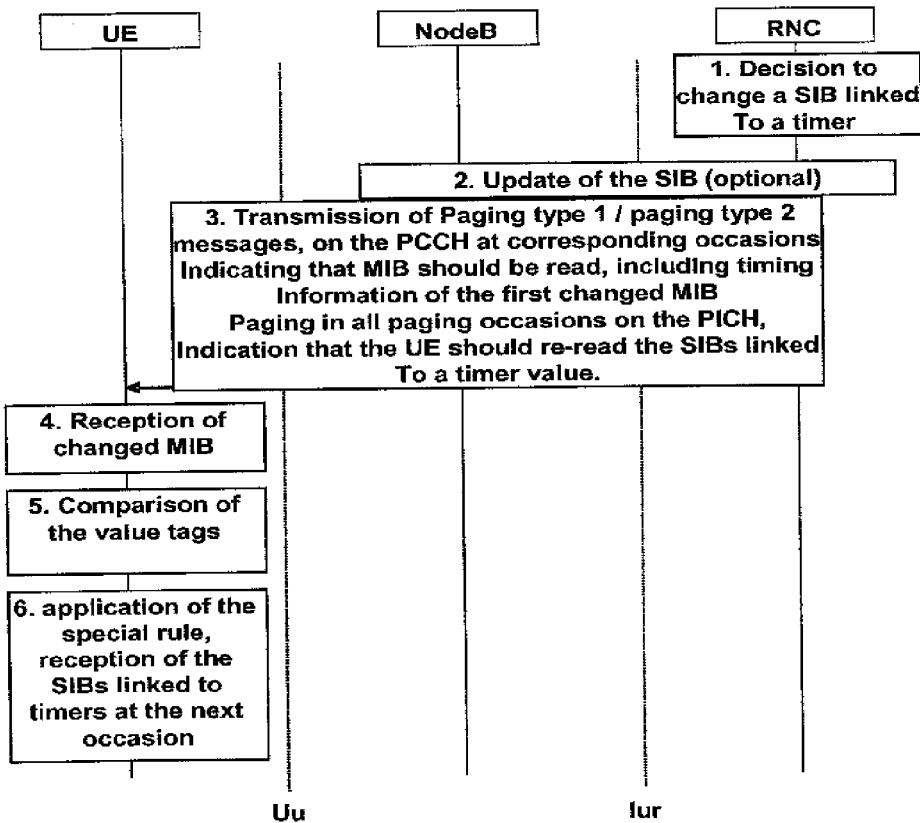
[Fig. 4]



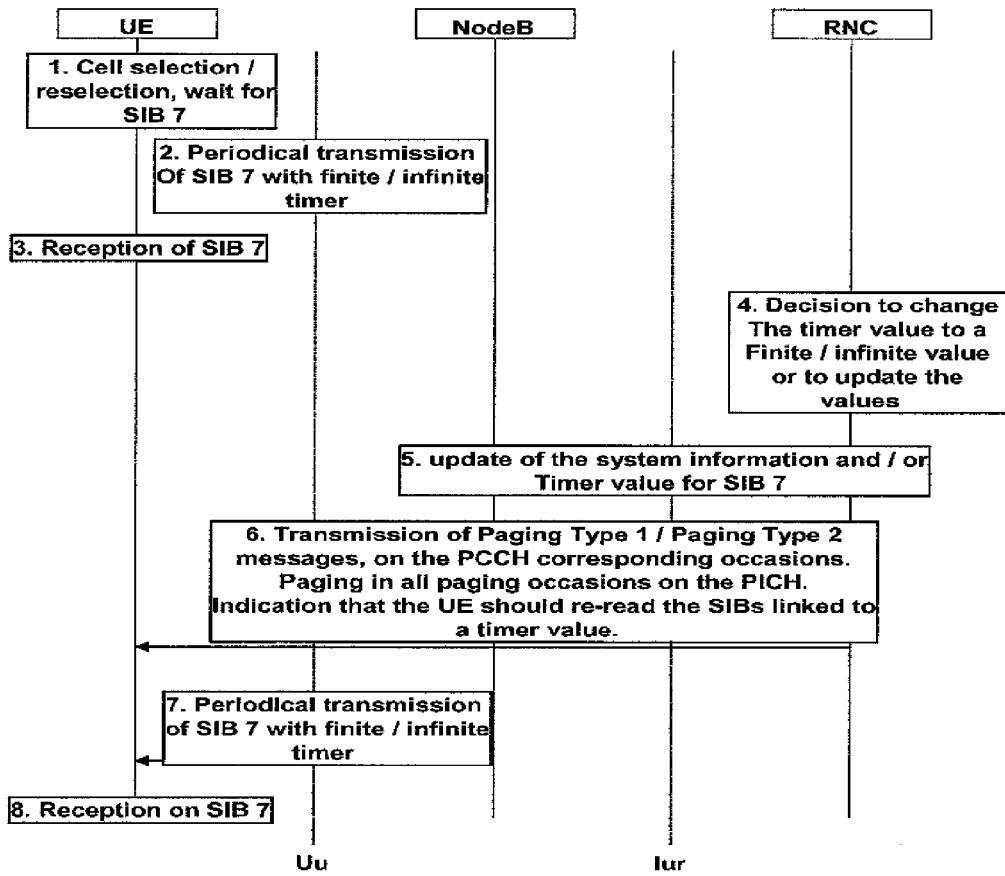
[Fig. 5]



[Fig. 6]



[Fig. 7]



INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2006/005564

A. CLASSIFICATION OF SUBJECT MATTER

H04B 7/26(2006.01)i, H04Q 7/20(2006.01)i, H04L 29/06(2006.01)i

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 8, H04B 7/26

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
KOREAN PATENTS AND APPLICATIONS FOR INVENTIONS SINCE 1975
KOREAN UTILITY MODELS AND APPLICATIONS FOR UTILITY MODELS SINCE 1975

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
cKIPASS(KIPO Internal) "(sib <and> information <and> system <and> block) <in> AB"

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US2005/0181801A1(M-Stack Limited) 18 August 2005 * paragraph [0010], paragraph [0023]	1-22
A	US 2004/097239A1(KIM HYOUNG-ROK) 20 May 2004 * paragraph [0011], paragraph [0024]	1-22

Further documents are listed in the continuation of Box C.

See patent family annex.


* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
- "&" document member of the same patent family

Date of the actual completion of the international search
16 MARCH 2007 (16.03.2007)

Date of mailing of the international search report
16 MARCH 2007 (16.03.2007)

Name and mailing address of the ISA/KR

 Korean Intellectual Property Office
 920 Dunsan-dong, Seo-gu, Daejeon 302-701,
 Republic of Korea
 Facsimile No. 82-42-472-7140

Authorized officer
 UHM, In Kwon
 Telephone No. 82-42-481-5712



INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2006/005564

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US2005181801A1	18.08.2005	NONE	
US2004097239A1	20.05.2004	CN1501727A	02.06.2004

Form PCT/ISA/210 (patent family annex) (April 2005)



Espacenet

Bibliographic data: JP2006136023 (A) — 2006-05-25

SYSTEM AND METHOD USING PRIMARY AND SECONDARY SYNCHRONIZATION CODES DURING CELL SEARCH

Inventor(s): RUDOLF MARIAN ± (RUDOLF MARIAN)

Applicant(s): INTERDIGITAL TECH CORP ± (INTERDIGITAL TECHNOLOGY CORP)

Classification: - **international:** H04B1/707; H04B1/7083; H04B7/26; H04J3/00; H04J3/06; H04Q7/32; H04Q7/36; H04Q7/38; H04B1/7077
- **cooperative:** H04B1/7083; H04B1/7077; H04B2201/70701; H04B2201/70702; H04B2201/70707

Application number: JP20060005065 20060112

Priority number (s): US20010334345P 20011129

Also published as: JP4204592 (B2) DE20218535 (U1) US2003133431 (A1) US7693123 (B2) WO03047117 (A2) more

Abstract of JP2006136023 (A)

PROBLEM TO BE SOLVED: To remarkably simplify a cell searching procedure and to improve cell search performance. ;SOLUTION: The system and method for improved cell searching includes: a subframe (Fig. 2) having a primary synchronization code (22), which is common to all Node Bs in the system and is used to indicate the positions of a set of secondary synchronization codes. This greatly simplifies the cell searching procedure and improves cell search performance. In one embodiment, the primary synchronization code (22) is sent in the PCCPCH (12) and the secondary synchronization codes are sent in the DwPTS (14) timeslot. ;COPYRIGHT: (C) 2006, JPO&NCIP!

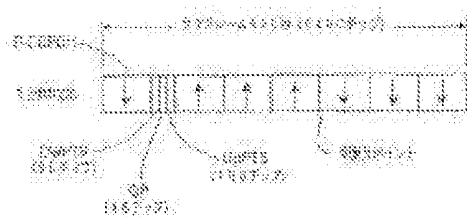


Fig. 1

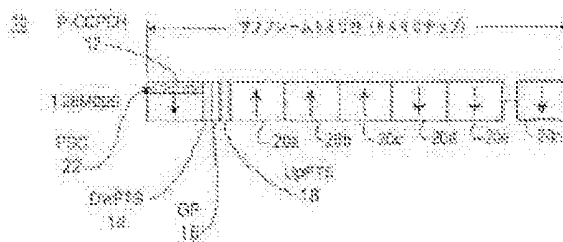


Fig. 2

(19) 日本国特許庁 (JP)

(12) 公開特許公報 (A)

(11) 特許出願公開番号

特開2006-136023

(P2006-136023A)

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HO4B 7/26 (2006.01)	HO4 B 7/26 N	5 K O 6 7
HO4Q 7/38 (2006.01)	HO4 B 7/26 1 O 9 N	

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原出願日 平成14年11月27日 (2002.11.27)
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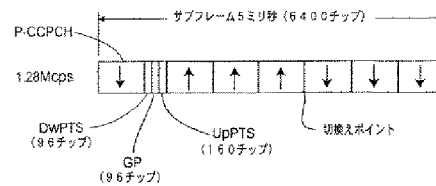
(54) 【発明の名称】 セルサーチ中に一次同期コードと二次同期コードを使用するシステム、および、方法

(57) 【要約】

【課題】 セルサーチ手順を大幅に簡素化し、セルサーチ性能を改善すること。

【解決手段】 改善されたセルサーチのシステムおよび方法は、そのシステムのすべてのノードBに対するコメントであり、一組の二次同期コードの位置を示すために使用される一次同期コード (22) を有するサブフレーム (図2) を含む。これは、セルサーチ手順を大幅に簡素化し、セルサーチ性能を改善する。一実施形態では、一次同期コード (22) はPCCPCH (12) で送信され、二次同期コードはDwPTS (14) タイムスロットで送信される。

【選択図】 図1



【特許請求の範囲】**【請求項1】**

複数のノードBを有するTDDシステムでセルサーチする方法であって、
前記複数のノードBのすべてに共通した一次同期コード(PSC)をサーチし、これと同期するステップと、
特定のノードBに一意の二次同期コード(SSC)を位置付けるためにPSCを使用するステップと、
前記SSCに同期するステップと
を具えたことを特徴とする方法。

【請求項2】

データは、プライマリ共通制御物理チャネル(P-CCPCH)およびダウンリンクパイロットタイムスロット(DwPTS)を含むサブフレーム内で送信され、
PSCは、P-CCPCHで送信され、
SSCは、DwPTSで送信されることを特徴とする請求項1記載の方法。

【請求項3】

前記PSCは、前記SSCの位置を示すことを特徴とする請求項2記載の方法。

【請求項4】

複数のノードBを有するTDDシステムでセルサーチする方法であって、
TDDシステムのすべてのノードBに共通した一次同期コード(PSC)をサーチするステップと、
前記PSCが検出された際に前記PSCと同期するステップと、
特定のノードBに一意の二次同期コード(SSC)に関してサーチパラメータの範囲を絞るために前記PSCを使用するステップと、
前記SSCを検出するステップと、
前記検出されたSSCと同期するステップと
を具えたことを特徴とする方法。

【請求項5】

前記PSCが第1のタイムスロットに位置付けられ、前記SSCが第2のタイムスロットに位置付けられることを特徴とする請求項4記載の方法。

【請求項6】

前記PSCおよび前記SSCが同じタイムスロット内に位置付けられることを特徴とする請求項5記載の方法。

【請求項7】

データは、プライマリ共通制御物理チャネル(P-CCPCH)およびダウンリンクパイロットタイムスロット(DwPTS)を含むサブフレーム内で送信され、
前記PSCは、前記P-CCPCHで送信され、
前記SSCは、前記DwPTSで送信されることを特徴とする請求項4記載の方法。

【請求項8】

前記PSCは、前記SSCの位置を示すことを特徴とする請求項7記載の方法。

【発明の詳細な説明】**【技術分野】****【0001】**

本発明は、無線通信の分野に関し、詳細には、時分割複信(TDD)システムのノードBでのセルサーチに関する。

【背景技術】**【0002】**

TDDシステムのノードBでの現在のセルサーチは、ダウンリンク同期(sync(同期))タイムスロットの使用に基づいている。10ミリ秒のフレームは、それぞれが5ミリ秒の持続時間を有する2つのサブフレームを含んでいる。1つのフレーム内のどちらのサブフレームも同じ全体構造を有する。サブフレームはLCR TDDシステムにおける

基本的な反復するアップリンク(UL)とダウンリンク(DL)の時間構造なので、「フレーム」の意味は原則的として低チップレート(LCR)TDDでは関連性が低い。

【0003】

図1は、サブフレームの構造を示す。

サブフレームは、プライマリ共通制御物理チャネル(P-CCPCH)、ダウンリンクパイロットタイムスロット(DwPTS)、ガード期間(GP)、およびアップリンクパイロットタイムスロット(UplPTS)を含む。このサブフレーム内の第1のタイムスロットは、報知チャネル(BCH)を搬送する(DL)P-CCPCH用に常に使用されている。DwPTSフィールドは同期信号として使用され、後に64チップのDL同期コードの続く32チップのガード期間を含む。

【0004】

TDD同期オペレーティングシステムではスクランプリングコードとミッドアンプル(middleamble)コードの間に1対1の対応関係があるので、ユーザ信号はN個のスクランプリングコードのうちの1個によってスクランブルされ、N個のベーシックミッドアンプルコードのうちの1個はバーストでのチャネル推定用に使用される。通常、Nは128に等しい。さらに、L個のスクランプリングコードベーシックミッドアンプルはM個のコードグループのうちの1個に属する。Mは通常32であり、 $L=N/M$ なので、この例では $L=4$ である。M個のコードグループのそれぞれはDwPTSフィールドの特定DL同期シーケンスによって示される。複数の隣接ノードBは異なるDL同期シーケンスをそれぞれのDwPTSフィールドで送る。

【0005】

セルサーチのタスクは、モバイルまたは固定ユーザ機器(UE)がノードBとの通信を確立するためにノードBによって送信されたDL同期コードを識別することである。例えば、典型的なセルサーチは、5ミリ秒のサブフレームの6400チップの位置のそれぞれをシステムの32個の実現可能なDL同期シーケンスのそれぞれと相関させることによって32DL同期シーケンスのうちの1個を識別する必要がある。一度、特定のDL同期シーケンスが識別されると(また、P-CCPCHは、それぞれが特定のベーシックミッドアンプルコードに関連する4個のスクランプリングコードのうちの1個を使用していることが知られているので)、4個の可能性のうちのそれぞれはP-CCPCHを復調し、その内容の閾値および/またはCRCと照合することによってテストされる。

【0006】

サブフレームのDwPTSフィールドに先行するDLタイムスロットおよびBCHインターリービング期間の開始においてP-CCPCHがあることは、DwPTSフィールドの4相位相偏移変調(QPSK)位相変調パターンによって示される。DL同期シーケンスは第1のタイムスロット(TS0)のミッドアンプル(m1)に関して変調される。DL同期シーケンスの4個の連続した位相(4相位相として知られている)は、後続の4個のサブフレームにP-CCPCHがあることを示すために使用される。P-CCPCHがあることが示された場合は、さらに次の後続サブフレームがインターリービング期間の第1のサブフレームである。DL同期シーケンスの変調のためにQPSKが使用されるので、位相 45° 、 135° 、 225° 、および 315° が使用される。異なる位相4重の合計数は、P-CCPCHごとに1個ずつの2個である(S1およびS2)。LCR TDDで、BCHは、通常、BCHデータ用に使用される同じタイムスロット(TS)の2個の拡散コードに対応する2個の物理チャネルにマップされている(すなわち、DwPTSフィールドに先行するDLタイムスロットのS1として知られているP-CCPCH1とS2として知られているP-CCPCH2)。LCR TDDの場合にこれらは実際には同じTSにある2個の物理チャネルを含むことができることが良く知られているとしても、これらは一般に「P-CCPCH」と総称される。4相は常に偶数のシステムフレーム番号($(SFN \bmod 2) = 0$)から開始される。

表1は、位相4重とそれらの意味を示す。

【0007】

【表1】

名称	位相4重	意味
S1	135°、45°、225°、135°	次の4個のサブフレームに1つのP-CCPCHがある
S2	315°、225°、315°、45°	次の4個のサブフレームにはP-CCPCHがない

【0008】

すべての64チップのDL同期シーケンスはQPSKシンボルを構成する。P-CCPCHのBCHは2個のフレーム(20ミリ秒)にわたってインターリーブされる。これら2個のフレームの4個の連続するサブフレームは、チェックすることのできるCRCで保護された1個のBCHセグメントを含んでいる。2個のフレーム内の4個のDL同期シーケンスは4個のQPSKシンボルを構成し、個々のQPSKシンボルはPCCPCHのミッドアンプルのようなある種の簡単に測定可能な参照と比較して個々に異なる位相オフセットを取る。完全なBCHセグメント(20ミリ秒のデータ)は、偶数のシステムフレーム番号(SFN)を有するフレームで開始することしかできない。フレーム番号nと番号n+1に含まれるDL同期シーケンス上のQPSK変調シーケンスS1がP-CCPCHの存在を示す場合、P-CCPCHはフレーム番号n+2とn+3に見つけることができる。さらに、このセグメントはフレーム番号n+2の第1のサブフレームで開始する。QPSK変調シーケンスは、UEがフレーム番号nとn+1のどのサブフレーム内に位置付けられるかを明白に決定することのできる方法で作成される。

【発明の開示】

【発明が解決しようとする課題】

【0009】

現在、DL同期シーケンスは、多くの拡散利得は提供しない64チップだけの長さを有する。UEはセルボーダーで確実に同期することができない場合がしばしばあり、その結果、セルサーチ性能は比較的低下品質になる。また、UEは、複数の隣接ノードBから時間的にオーバーラップする比較的短いDL同期シーケンスを受信するが、これは複数の異なるノードBからのDL同期シーケンス間に重大な相互相関を生じ、さらに検出性能を劣化させる。

【0010】

現在のセルサーチシステムの複雑性は非常に大きい。例えば、現在の32DL同期シーケンスは、相互相関が最適化される無作為に選んだシーケンスであると言われている。これらのそれぞれは完全な相関を必要とする(すなわち、64チップ長)。したがって、相関する6400チップの位置は、セルサーチのために5ミリ秒のサブフレームあたり6400×32×64=13,107,200動作を必要とする。これは面倒な処理要件である。

【課題を解決するための手段】

【0011】

改善されたLCR-TDDセルサーチのシステムおよび方法は、そのシステムのすべてのノードBに共通で、一組の二次同期コードの位置を示すために使用される一次同期コードを有するサブフレームを含む。これは、セルサーチ手順を大幅に簡素化し、セルサーチ性能を改善する。一実施形態では、一次同期コードはP-CCPCHで送信され、二次同期コードはDwPTSタイムスロットで送信される。

【発明を実施するための最良の形態】

【0012】

本発明を、全図面を通して類似の番号が類似の要素を示す各図面を参照して説明する。以下で詳細に説明するように、セルサーチプロセスの検出性能は、本システムのすべてのノードBに対して同じ一次同期コード(PSC)の導入によって改善される。PSCは、各ノードBに一意の一組の二次同期コード(SSC)の位置を示す。SSCはDwPTSタイムスロットで送信されることが好ましく、現在の32DL同期コードと同

一であってよい。

【0013】

PSCがノードBに導入されると、検出の複雑性は低減される。好ましい実施形態では、このPSCは、相関の複雑性が $O(L)$ ではなく $O(2 * \log(L))$ の階層的Golayコードのような相関の複雑性が低減されたコードであってよい。

【0014】

図2を参照すると、本発明によるサブフレーム10が示されている。サブフレーム10は、P-CCPCH12、DwPTS14、GP16、UpPTS18、および複数のデータタイムスロット20a~20nを含む。本発明のこの実施形態によれば、P-CCPCH12はPSC22を含む。これは図3にさらに詳細に示されている。PSC22はSSCの位置を示すが、PSC相関ピークはSSCのある単一の正確な時刻を示さず、PSC22に対するコードオフセットが幾つ存在するかに応じて可能性の数(16または32など)を示す。

【0015】

図に示すように、P-CCPCH12はガード期間を除く832チップ長のタイムスロットを含んでいる。PSCチップシーケンス{C0, C1, C2, C3, . . . , C831}は各P-CCPCHと同時に送信される。図4のトランスミッタ69に示すように、P-CCPCHの第1のタイムスロット(T0)に対応する時間間隔で、P-CCPCH1および2に対する拡散シーケンス70、72がPSCチップシーケンス64と共に送信される。これらのシーケンス70、72、74は、複合チップシーケンス78を生成するために加算器76によってチップ方向に追加される。コントローラ80は、適切なタイムスロット(T0)に複合シーケンス78を入れ、他のタイムスロットに適切な情報を入れる。トランスミッタ82は、すべてのタイムスロットにこの情報を含むデータストリームを送信する。

【0016】

図5を参照すると、レシーバ90は、データストリーム検出器91とデータ回復装置92とを含む。データストリーム検出器91は、送信されたデータストリームを受信する。データ回復装置92は、さらなる処理のために転送される3個のチップシーケンス70、71、72の分離を含めてデータを回復する。

【0017】

確実に送信信号を受信することができるために、レシーバは信号の特定量のエネルギーを検出する必要がある。エネルギーは電力と時刻期間の関数なので、レシーバに同量のエネルギーを送信するには、1) 短期間に高電力の信号を送信する、または2) 長期間に低電力の信号を送信する、という2つの基本的な選択肢がある。使用する拡散コードが長いほど拡散利得は高まるが、これはチャネルバリエーションに対する抵抗が大きいほどより有利であり、また使用する拡散信号が長いほどシステムの複数の他のノードBまたはUEに対して発生する干渉は減少する。本発明の好ましい実施形態により使用される832個のチップ長シーケンスは低電力、高拡散利得のシーケンスである。

【0018】

衝突が発生した場合、PSCの相関ピークは場合によっては互いに相殺し合い、フェージングを生じるので、複数の隣接ノードBから送信されるPSCの衝突は回避されるべきである。PSCの長さが長いので(832チップ)、異なる複数のノードBからのPSCはその時間領域で識別することができる。

【0019】

図6を参照すると、異なるセルの複数のノードBはベーシックPSCシーケンスを位相偏移することにより区別される。例えば、ノードB1に対してベースPSC26シーケンスは{C0, C1, C2, . . . , C831}である。ノードB2に対するPSC28は{C26, . . . , C831, C0, C1, C2, . . . , C25}であるが、これは26チップだけオフセットされていることを除いて、ノードB1に対するPSC26と同じである。

【0020】

本発明では832というPSC長を選んだが、これは上記の例に関する説明を簡略化するために選ばれたものであるということに留意されたい。アプリケーションおよびノードBの数に応じて、オフセットを増大または縮小させてより長いまたはより短いPSC長を使用することができる。さらに、オフセットのサイズは決定的な重要性を有するものではなく、各ノードBに対して同じである必要もない。

【0021】

一般にCDMAレシーバはチップクロック追跡用オーバーサンプリングとして知られる機能を実施するので、半チップのオフセットも可能である。2というオーバーサンプリングは、それらがチップ追跡のためにチップ n 、 $n+1/2$ 、 $n+1$ 、 $n+3/2$ 、 $n+2$ 、…で関連することを意味している。この関係は、システム内の異なるオフセット数を生じるためにPSCシーケンスの長さ全体がオフセット長により分割されるというものである。PSC長がオフセット長により均等に分割可能でない場合、そのオフセットのうちの1つを延長しても、短縮してもよい。したがって、ノードB2のPSC 28に対するシーケンスは{C26...C831, C0, C1, C2...C25}である。すなわち、複数の異なるノードBからのPSCシーケンスは、それらの相関ピークが時間的に連続して見えるので容易に区別される。等式1に示すように32セル($N=32$)に対する分離のために十分な時間(またはチップ)が存在する。

【0022】

$$\text{チップ分離} = (\text{PSCチップ長}) / N \quad \dots (1)$$

【0023】

この実施例では、PSCが832チップ長でありセル数が32である場合、26チップの分離となる。UEは、832チップのセグメントをスライドする際に定期的な相関を実行することによってPSCの検出を試みる。PSCは5ミリ秒ごとに見つけることができ、DwPTSのある場所の不確実性を $N=32$ の可能性まで低減する。本発明のこの実施形態を使用することにより、従来技術のシステムで現在規定されているDwPTSは持続し、DwPTSの現在の $N=32$ DL同期シーケンスは二次同期コード(SSC)として動作する。

【0024】

図7を参照すると、ノードB1に対する相関が実行され、832チップのスライディングウィンドウを使用してノードB2に対する相関が実行される。図5のこの実施例では、複数のノードBが1個の「タイムオフセット」により分離され、相関は26チップ間隔で発生する。当然ながら、複数の追加ノードは、図5の複数のノードB1および2に関して示した方法と同じ方法で時間領域で分離される。PSCは、簡素なDL同期シーケンスよりも $10 \times \log(832/64) = 11.1$ dBだけ高い拡散利得を有する。その長さのため、現在の短期DL同期シーケンスの場合よりも相互相関問題の可能性は遥かに低くなる。

【0025】

PSCに対する定期(すなわち、ラップアラウンド)相関を実行する必要があるので、PSCは確実に定期的に相関するよう設計することが好ましい。

【0026】

当業者に理解されたいことは、本明細書ではパラメータ N および M を具体的に特定の値で示しているが、これらは特定のアプリケーションに対して所望の通りに変更することができる。例えば、 $N=16$ は複数の隣接ノードBを分離するために十分であるべきだが、この値は所望の通りに上下させることができる。

【0027】

本発明を使用すると、PSCに対する完全な相関は5ミリ秒期間あたり $6400 \times 832 + 32 \times 32 \times 64 = 5,324,800 + 65,535 = 5,390,335$ の動作となるが、これは現在実行されている5ミリ秒期間あたり13,107,200の動作よりも2.5分の1少ない。16~32分の1だけ複雑性をさらに低減することのできる階

層ベースのコードのような複雑性を低減したPSCを可能にして、本発明によるセルサーチ方法およびシステムに対する全体的な複雑性は5ミリ秒期間あたり171,000~350,000の動作に低減することができる。

【0028】

図8を参照すると、本発明の第2の実施形態のサブフレーム50が示されている。このサブフレーム50は、P-CCPCH 52、DwPTS 54、GP 56、UpPTS 58、および複数のデータタイムスロット60a~60nを含む。この実施形態のサブフレーム50は、PSC 62を含むよう修正済みのDwPTS 54を含む。PSC 62は、この場合のPSCの方が短くなる（すなわち、64チップだけ）ことを除いて図4に示す方法と同様の方法でDwPTS 54に含まれる。次いでUEは、DwPTS 54でPSC 62とDL同期シーケンス（SSCとして）を受信する。この実施形態のDwPTS 54ではPSC 62に対して64チップしか使用可能ではないので、この実施形態は多少非効率的である。

【0029】

以上、本発明を好ましい実施形態に関して説明したが、首記の特許請求の範囲にその概要を記載した本発明の範囲に含まれる他の変更形態は、当業者に明らかになる。

【図面の簡単な説明】

【0030】

【図1】サブフレームの構造を示す図である。

【図2】本発明の第1の実施形態によるサブフレームの構造を示す図である。

【図3】PSCチップシーケンスを含む長さ832チップのDL P-CCPCHタイムスロットを示す図である。

【図4】送信前にPSCシーケンスをP-CCPCHと結合するトランスミッタを示すブロック図である。

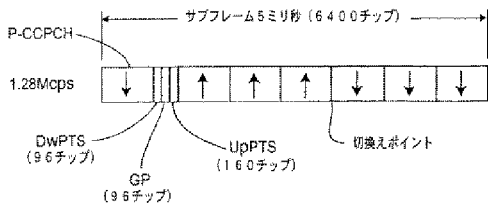
【図5】レシーバを示すブロック図である。

【図6】PSC検出のための2個のノードBを時間領域内で区別することを示す図である。

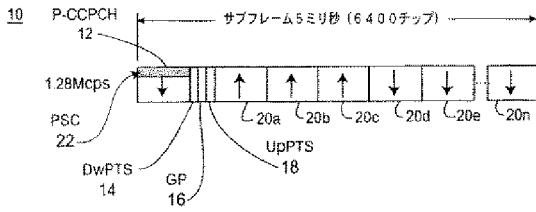
【図7】2個のノードBによって送信されるベーシックPSCシーケンスのUEによる相関を示す図である。

【図8】本発明の第2の実施形態によるサブフレームの構造を示す図である。

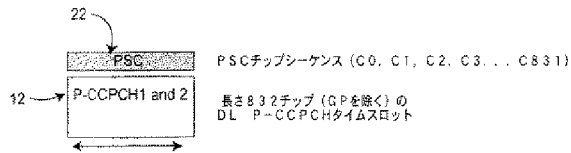
【図1】



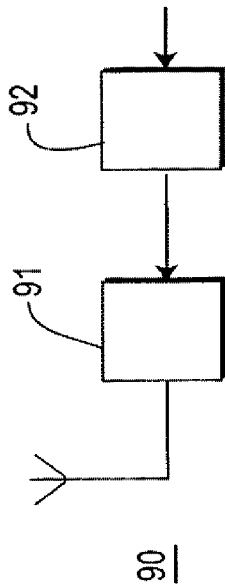
【図2】



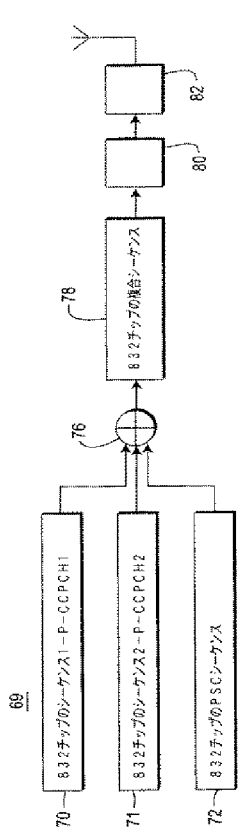
【図3】



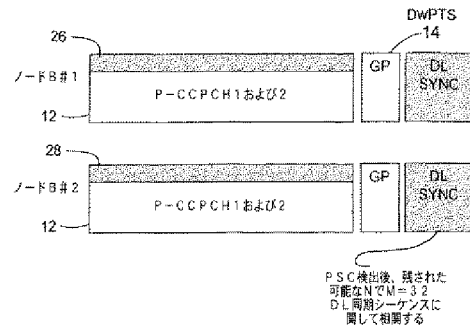
【図5】



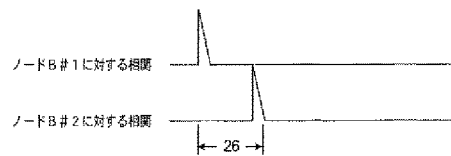
【図4】



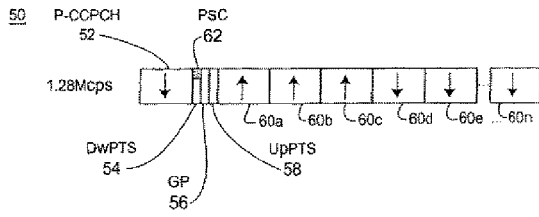
【図6】



【図7】



【図8】



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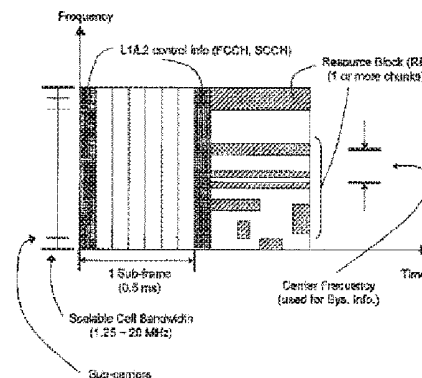
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(54) 【発明の名称】 無線移動通信システムにおけるページング情報処理方法

(57) 【要約】

無線移動通信システムにおけるページング情報処理方法は、移動端末の動作を単純化して移動端末のリソースをより効率的に使用できるようにする。ネットワークは、特定ページングメッセージ、通知メッセージ、システム情報などの制御情報の送信を、単一のインジケータチャネルで予め指示する。移動端末は、単一のインジケータチャネルを受信し、制御情報を受信するためにインジケータチャネルで送信されたインジケータ情報を利用する。



【特許請求の範囲】

【請求項1】

周期的な方式で制御情報を受信する段階と、
前記受信した制御情報が移動端末に関するものである場合、ページング情報の時間及び周波数情報を示すスケジューリング情報を利用して前記ページング情報を受信する段階と、
を含むことを特徴とする移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項2】

前記制御情報が、移動端末識別子もしくはサービス識別子を含むか、又は移動端末識別子もしくはサービス識別子を指示するインジケータを含むことを特徴とする請求項1に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項3】

前記受信した制御情報及びページング情報が同一のサブフレームに存在することを特徴とする請求項1に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項4】

前記ページング情報の受信に利用されるスケジューリング情報を含むプライマリシステム情報を静的な方式で受信する段階と、
前記制御情報を含むノンプライマリシステム情報を動的な方式で受信する段階と、
をさらに含むことを特徴とする請求項1に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項5】

前記スケジューリング情報が、前記ノンプライマリシステム情報の時間特性及び周波数特性の少なくとも一方を示すことを特徴とする請求項4に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項6】

前記時間特性及び周波数特性は、前記特定端末が読み取るべき前記ノンプライマリシステム情報の位置を示すことを特徴とする請求項5に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項7】

前記プライマリシステム情報が、特定端末を示すインジケータをさらに含むことを特徴とする請求項6に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項8】

前記インジケータが、端末識別子、サービス識別子、及び論理チャネル識別子の少なくとも1つを含むことを特徴とする請求項7に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項9】

前記時間特性がシンボルに関するものであり、前記周波数特性がサブキャリアに関するものであることを特徴とする請求項5に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項10】

前記ページング情報が、少なくとも1つのリソースブロックの形態で構成されることを特徴とする請求項1に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項11】

ページング及び通知に関する前記制御情報、並びに他のリソースブロックが、システム帯域幅に使用される広帯域周波数のうち中心周波数で受信されることを特徴とする請求項1に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項12】

前記制御情報がアイドルモードの移動端末のためのものであることを特徴とする請求項11に記載の移動通信システムにおける移動端末に関するページング情報の受信方法。

【請求項13】

時間及び周波数情報を示すスケジューリング情報を含む制御情報を動的な方式でセルグループに送信する段階と、
前記制御情報に応じてページング情報を送信する段階と、
を含むことを特徴とする移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項14】

前記制御情報が、移動端末識別子もしくはサービス識別子を含むか、又は移動端末識別子もしくはサービス識別子を示すインジケータを含むことを特徴とする請求項13に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項15】

前記送信された制御情報及びページング情報が同一のサブフレームに存在することを特徴とする請求項14に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項16】

前記セルグループが追跡領域に関連することを特徴とする請求項13に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項17】

前記ページング情報の受信に利用されるスケジューリング情報を含むプライマリシステム情報を静的な方式で受信する段階と、
前記制御情報を含むノンプライマリシステム情報を動的な方式で受信する段階と、
をさらに含むことを特徴とする請求項13に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項18】

前記スケジューリング情報が、前記ノンプライマリシステム情報の時間特性及び周波数特性の少なくとも一方を示すことを特徴とする請求項17に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項19】

前記時間特性及び周波数特性は、前記特定端末が読み取るべき前記ノンプライマリシステム情報の位置を示すことを特徴とする請求項18に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項20】

前記プライマリシステム情報が、特定端末を示すインジケータをさらに含むことを特徴とする請求項19に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項21】

前記インジケータが、端末識別子、サービス識別子、及び論理チャンネル識別子の少なくとも1つを含むことを特徴とする請求項20に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項22】

前記時間特性がシンボルに関するものであり、前記周波数特性がサブキャリアに関するものであることを特徴とする請求項18に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項23】

前記ページング情報が、少なくとも1つのリソースブロックの形態で構成されることを特徴とする請求項13に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項24】

ページング及び通知に関する前記制御情報、並びに他のリソースブロックが、システム帯域幅に使用される広帯域周波数のうち中心周波数で受信されることを特徴とする請求項13に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項25】

前記制御情報がアイドルモードの移動端末のためのものであることを特徴とする請求項24に記載の移動通信システムにおける移動端末に関するページング情報のダウンリンク送信方法。

【請求項26】

プライマリシステム情報を静的な方式で受信する段階と、
前記プライマリシステム情報に基づいて、アイドルモード及びアクティブモードのそれぞれに関する情報を含む制御情報を含むノンプライマリシステム情報を動的な方式で受信する段階と、
前記移動端末がアイドルモード又はアクティブモードで動作するか否かによって、前記受信した制御情報を利用して実際のデータを読み取る段階と、
を含むことを特徴とする移動端末におけるシステム情報処理方法。

【請求項27】

前記静的なプライマリシステム情報が、前記ノンプライマリシステム情報の時間及び周波数情報を示すスケジューリング情報を含むことを特徴とする請求項26に記載の移動端末におけるシステム情報処理方法。

【請求項28】

プライマリシステム情報を静的な方式で送信する段階と、
前記プライマリシステム情報に基づいて、アイドルモード及びアクティブモードのそれぞれに関する情報を含む制御情報を含むノンプライマリシステム情報を動的な方式で送信する段階と、
アイドルモード又はアクティブモードでの移動端末の動作に応じて、前記制御情報を利用する移動端末が読み取るべき実際のデータを送信する段階と、
を含むことを特徴とするネットワークにおけるシステム情報処理方法。

【請求項29】

前記静的なプライマリシステム情報が、前記ノンプライマリシステム情報の時間及び周波数情報を示すスケジューリング情報を含むことを特徴とする請求項28に記載のネットワークにおけるシステム情報処理方法。

【発明の詳細な説明】

【技術分野】

【0001】

本発明は無線移動通信システムに関し、特に移動端末の動作を単純化して移動端末が効率的にリソースを使用できるようにするページング情報処理方法に関する。

【背景技術】

【0002】

広帯域無線（例えば、WiMAX）接続をサポートするために、セルラー3G技術（例えば、UMTS、WCDMAなど）やマルチキャリアベースのマルチ接続技術（例えば、OFDMA、OFDM-TDMA、OFDM-CDMAなど）などの様々なタイプの広帯域無線エアインタフェースが存在する。周波数分割多重は、サブチャネル化（subchannelization）に関するもので、少なくとも4つのタイプが存在する（OFDM、フラッシュOFDM、sOFDM、及びOFDMA）。

【0003】

OFDM (Orthogonal Frequency Division Multiplexing) は、無線信号を、異なる周波数で同時にレシーバに伝送されるより小さい複数のサブ信号に分割することを必要とする。OFDMとは、全てのサブキャリアが互いに直交するマルチキャリア伝送の形態をいう。特定のIEEE標準及び3GPP標準がこのOFDMの様々な態様に関連する。

【0004】

図1及び図2はOFDMで使用される一般的なフレームを示している。1つのフレームは、10ms (milliseconds) の時間区間を有し、20のサブフレームから構成され、各サブフレームは0.5ms の時間区間を有する。各サブフレームは、データ又は情報を含むリソースブロック (ResourceBlock; RB) と、従来のOFDM変調に必要な (しかし、パルス整形を用いるOFDM (すなわち、OFDM/OQAM) には必要でない) ガードインターバルであるサイクリックプレフィックス (CyclicPrefix; CP) とから構成される。前記サブフレームの区間は最小のダウンリンクTTI (Transmission Time Interval) に該当する。

【0005】

図3は公知の基準シンボルから構成された基本的なダウンリンク基準信号構造 (basic downlink reference signal structure) を示している。すなわち、周波数ドメインにおける物理チャネルシンボルのマッピングを示している。つまり、チャネル符号化 (channel-coded) 情報、インターリーブ情報、及びデータ変調 (data-modulated) 情報 (すなわち、レイヤ3情報) は、OFDM時間/周波数シンボルにマッピングされる。前記OFDMシンボルは、連続するOFDMシンボルの番号 (N) に対する連続するサブキャリアの番号 (M) から構成できる。

【0006】

ここでは、(CPが短い場合) サブフレーム毎に7OFDMシンボルが存在すると仮定する。長いCP又は異なるフレーム構造の場合、このような基本的なダウンリンク基準信号構造は若干異なる。

【0007】

基準シンボル (すなわち、第1の基準シンボル) は、ダウンリンク伝送のために割り当てられた全てのサブフレームの第1のOFDMシンボルに位置する。これは、長いCP及び短いCPだけでなく、FDD及びTDDにおいても同様である。追加的な基準シンボル (すなわち、第2の基準シンボル) は、ダウンリンク伝送のために割り当てられた全てのサブフレームの最後の第3のOFDMシンボルに位置する。これは、長いCP及び短いCPだけでなく、FDD及びTDDのためのベースラインである。しかし、FDDの場合、前記第2の基準シンボルが要求されるか否かの評価が行われなければならない。

【0008】

図4はE-UMTS (Evolved Universal Mobile Telecommunications System) の構造の一例を示している。E-UMTSシステムは、UMTSシステムから進化したシステムであって、現在3GPP標準組織により標準化作業が行われている。

【0009】

一般的に、E-UMTSネットワークは、少なくとも1つの移動端末 (すなわち、UE)、基地局 (すなわち、NodeB)、無線制御機能を実行する制御プレーンサーバ (Control Plane Server; CPS)、無線リソース管理機能を実行する無線リソース管理 (RadioResource Management; RRM) エンティティ、移動端末の移動性管理機能を実行する移動性管理エンティティ (Mobility Management Entity; MME)、及びE-UMTSネットワークのエンドに位置して1つ又はそれ以上の外部ネットワークに接続するアクセスゲートウェイ (AccessGateway; AG) から構成される。ここで、様々なネットワークエンティティの特定名称が前述したものに限定されないことを理解できるであろう。

【0010】

移動端末とネットワーク間の様々な無線インタフェースプロトコル層は、通信システム分野で周知のOSI (Open System Interconnection) 標準モデルの下位3層に基づいて、第1層 (L1)、第2層 (L2)、及び第3層 (L3) に区分できる。そのうち、前記第1層の一部である物理層は、物理チャネルで情報伝送サービスを提供し、前記第3層に位置する無線リソース制御 (RadioResource Control; RRC) 層は、移動端末とネットワーク間で無線リソースを制御する機能を実行する。このために、前記RRC層は、前記移動端末と前記ネットワーク間のRRCメッセージの交換を可能にする。前記RRC層の機能

は、Node B、CPS/RRM及び/又はMMEに分配して実行できる。

【0011】

図5及び図6は移動端末とUTRAN (UMTS Terrestrial Radio Access Network) 間の無線インタフェースプロトコルの構造の一例を示している。図5及び図6に示す無線インタフェースプロトコルは、水平的には、物理層、データリンク層、及びネットワーク層からなり、垂直的には、ユーザデータの伝送のためのユーザプレーン、及び制御信号の伝送のための制御プレーンからなる。図5及び図6に示す無線インタフェースプロトコル層は、通信システム分野で周知のOSI標準モデルの下位3層に基づいて、第1層(L1)、第2層(L2)、及び第3層(L3)に区分できる。

【0012】

以下、図5に示す無線プロトコルの制御プレーン及び図6に示す無線プロトコルのユーザプレーンの特定層について説明する。物理層(すなわち、第1層)は、物理チャネルで上位層に情報伝送サービスを提供する。前記物理層は、上位にある媒体アクセス制御(Medium Access Control; MAC)層にトランスポートチャネルを介して接続され、前記トランスポートチャネルで前記物理層と前記MAC層間のデータ伝送が行われる。また、異なる物理層間、すなわち送信側(トランスミッタ)の物理層と受信側(レシーバ)の物理層間のデータ伝送は、前記物理チャネルで行われる。

【0013】

第2層のMAC層は、論理チャネルで上位層である無線リンク制御(Radio Link Control; RLC)層にサービスを提供する。前記第2層のRLC層は、信頼性のあるデータ伝送をサポートする。RLC機能が前記MAC層で実現されて該MAC層により実行される場合、前記RLC層自体が存在しなくてもよい。図5及び図6において前記RLC層は点線で示している。前記第2層のPDCP層は、IPv4やIPv6などのIP(Internet Protocol)パケットを用いて伝送されるデータを相対的に帯域幅の小さい無線インタフェースで効率的に伝送できるように、不要な制御情報を減らすヘッダ圧縮機能を実行する。

【0014】

第3層の最下位に位置するRRC層は、制御プレーンでのみ定義され、無線ベアラ(Radio Bearer)の設定、再設定、及び解除に関する論理チャネル、トランスポートチャネル、及び物理チャネルの制御を担当する。ここで、無線ベアラとは、移動端末とUTRAN間のデータ伝送のために第2層により提供されるサービスを意味する。

【0015】

ネットワークから移動端末にデータを伝送するダウンリンク伝送に使用されるチャネルとしては、システム情報の伝送に使用されるBCH(Broadcast Channel)、及びユーザトラフィック又は制御メッセージの伝送に使用されるSCH(Shared Channel)がある。移動端末からネットワークにデータを伝送するアップリンク伝送に使用されるチャネルとしては、初期制御メッセージの伝送に使用されるRACH(Random Access Channel)、及びユーザトラフィック又は制御メッセージの伝送に使用されるSCHがある。

【0016】

3GPPシステムで実行される1つの機能としてページング手順がある。このページング手順は、UEをアイドルモードからアクティブモードに移行させるために必要である。この手順は、PCCH(Paging Control Channel)、PCH(Paging Channel)、S-CCPCH(Secondary Common Control Physical Channel)、及びPICH(Paging Indicator Channel)で実行される。前記ページング手順は、異なる2つのタイプのデータ(又は信号)、すなわちページングインジケータ(Paging Indicator; PI)及び自立型(substantive)ページングデータを使用する。前記PIは、前記自立型ページングデータより先にPICHで伝送される。前記自立型ページングデータは、S-CCPCHにより伝送されるPCHで伝送される。

【発明の開示】

【発明が解決しようとする課題】

【0017】

ネットワークは、特定移動端末にデータを送信する前に、UEが位置する特定セルを判断するためにページングメッセージをダウンリンクで送信する。従来のページングメッセージ送信方法においては、(ページングメッセージの送信を予め通知する)インジケータが、ページングインジケータチャンネルなどの別個のチャンネルで送信される。また、(マルチキャスト/ブロードキャストサービスのための通知メッセージの送信を予め通知する)インジケータも、別個のチャンネルで送信される。前記移動端末は、このようなチャンネルに加えて、周期的なシステム情報の送信に使用される放送チャンネルなどの他のチャンネルをも受信しなければならない。目的のタイプに応じた異なるチャンネルによる送信により、移動端末が受信しなければならないチャンネルの数が非常に多いため、移動端末の動作が複雑になり、移動端末のリソースが浪費されるという問題があった。

【課題を解決するための手段】

【0018】

本発明は、このような従来技術の問題を解決するためになされたものである。その結果として、本発明は、移動端末の動作を単純化して移動端末が効率的にリソースを使用できるようにするページング情報処理方法を提供する。

【発明を実施するための最良の形態】

【0019】

本発明の一態様は、前述した従来技術の問題及び欠点に関する本発明者らの知見に基づくものであり、以下でさらに詳細に説明する。このような知見に基づいて本発明が完成された。

【0020】

従来技術においては、システム情報が常に固定されているか、又はフレキシブルでない。このような固定した形式は、移動端末がネットワークから送信されたシステム情報を容易に検出して適切に読み取れるようにする。

【0021】

これに対し、本発明の特徴は、システム情報の少なくとも一部分を動的に(又は、フレキシブルに)変更できるようにすることにある。移動端末が動的な(フレキシブルな)システム情報を適切に検出して読み取れるように、適切なインジケータが含まれる。その結果、技術の進歩と発展をサポートするために要求されてきたシステム情報をさらに追加することができ、これにより現在利用されているシステム情報のさらなる改善又は継続的な拡張が可能である。

【0022】

本発明の特徴は3GPP標準のLTE(Long-Term Evolution)に関する問題に関連する。従って、3GPP TS 25.813(LTE TR)及びその関連部分又は一部、並びにこれらの様々な開発向上が本発明に関連する。このような改善と進歩により、様々なネットワークエンティティ(例えば、eNodeB)、プロトコル層、チャンネルなどをラベリングする際、特定プレフィックス(文字E)を使用できるようになった。しかしながら、このようなラベリング及びその他の用語は、単に例示にすぎず、現在進行中の又は今後の論議の結果によって変更され得る(又は、後で明らかになる)ことを理解できる。

【0023】

まず、本発明の特徴によるページング手順の態様を以下に説明する。

【0024】

アイドルモードにおいて、UEは、ページングチャンネルをモニタリングするために、周期的な監視手順を完了しなければならない。UE自身に関するページング情報を受信すると、UEはアクティブモードに移行してネットワークからページングを受信する。前記周期的な監視手順でのモニタリングは、ページングインジケータ(PI)のモニタリングにより行われる。前記ページングインジケータは、各サイクルで1回ずつページングインジケータチャンネル(PICH)で伝送される。

【0025】

UEのRRC層とUTRANのRRC層とがRRCメッセージを送受信するために接続している場合、UEはRRC接続状態にあるといい、接続していない場合、UEはアイドル状態にあるという。

【0026】

RRC接続モードのUEは、URA_PCH状態、CELL_PCH状態、CELL_FACH状態、及び/又はCELL_DCH状態に分けられる。特に、(URA_PCH状態及びCELL_PCH状態にある場合だけでなく)アイドル状態にある場合、UEは、電力消費を減らすために、各不連続受信(Discontinuous Reception; DRX)サイクルでのみ起動し、ページング情報を送信するPICHを受信する。

【0027】

URA_PCH状態又はCELL_PCH状態のUEは、UTRAN固有DRXサイクル長(UTRAN specific DRX cycle length)を受信及び保存し、前記UTRAN固有DRXサイクル長に応じて前記PICHを不連続に受信する。

【0028】

また、アイドル状態のUEは、CNドメイン固有DRXサイクル長(CN domain specific DRX cycle length)を受信及び保存し、前記CNドメイン固有DRXサイクル長に応じて前記PICHを不連続に受信する。

【0029】

さらに、UEは、UTRANのRRC層がブロードキャストするシステム情報により、UEの状態に対応するDRXサイクル長を取得及び利用する。

【0030】

前記PICHは、ページングインジケータ(PI)の伝送に使用される物理チャネルであり、SF256の固定ビットレートを有する。前記PICHは、常にPCHがマッピングされるS-CCPCHに関連して使用される。

【0031】

UTRANは、前記PICHを介して、前記PIを含む情報を周期的にUEに送信する。前記UEは、前記PICHが関連PIを有するか否かを周期的に確認する。より詳細には、アイドル状態の前記UEは、前記PICHを確認するために周期的に起動する。前記PICHを介してPIを受信すると、前記UEは、前記PCHがマッピングされるS-CCPCHを受信し、該当ページング情報を受信する。

【0032】

前記UTRANは、BCHを介して、システム情報を周期的に前記UEに送信する。より詳細には、前記UTRANは、前記BCHを介して、チャネル及びプロトコルを構成するための1つのグループの情報であるSIB(System Information Block)を送信し、持続的に変化する無線環境に応じて各タイプのシステム情報をアップデートするための情報を前記UEに送信する。

【0033】

図7は本発明の特性を説明するために周波数及び時間に対する各サブフレームでの制御情報及びリソースブロックの位置を示す図である。

【0034】

図7から周波数ドメイン及び時間ドメインに関するサブフレームの構造(形式)を理解できるであろう。すなわち、1つのサブフレームは、0.5msの時間区間を有し、7つのOFDMシンボル(部分)を含む。

【0035】

前記サブフレームの第1部分には制御情報(すなわち、L1/L2制御情報、FCCCH、SCCHなど)が含まれ、1つ以上のチャンク(chunk)形式で存在するリソースブロック(RB)は前記サブフレームの残りの部分に位置する。ここで、1つのリソースブロックは、(前記制御情報のための時間区間を除いた)前記サブフレームの全ての時間区間を占めることもあり、一部の部分的な時間区間を占めることもある。また、前記各リソースブロック(RB)は、特定周波数範囲(すなわち、特定数のサブキャリア)を使用する

【0036】

前記周波数の軸は、一般的に1.25～20MHzの周波数範囲を有する可変セル帯域幅 (scalable cell bandwidth) ともいう。前記可変セル帯域幅内には複数のサブキャリアが存在する。このような周波数範囲のうち、いわゆる中心周波数 (約10MHz) は、主にシステム情報の伝送に使用される。

【0037】

従来技術においては、このようなシステム情報が固定したものとみなされる。これにより、端末は前記システム情報を容易に読み取れるが、新しいシステム情報の追加は不可能である。これに対し、本発明においては、システム情報の少なくとも一部分がフレキシブル (動的) である。

【0038】

このために、本発明は、前記システム情報をプライマリシステム情報 (例えば、MIB (Master Information Block)) とノンプライマリ (又は、セカンダリ) システム情報 (例えば、SIB) とに区分 (又は、区別、分類) する。前記MIBは静的な方式で (例えば、固定方式伝送のためのBCHで) 伝送され、前記SIBは動的な方式で (例えば、動的な方式伝送のためのダウンリンクSCHで) 伝送される。ここで、前記動的な方式伝送とは、異なる周波数範囲及び時間区間を利用できることを意味する。

【0039】

各フレームにおいて、前記MIBは各SIBの位置に関する情報を含む。すなわち、SIB毎に特定フレーム範囲 (すなわち、サブキャリア) 及び特定時間区間 (すなわち、シンボル) を明示する (specify) ことにより、端末 (UE) が適合するSIBを適切に読み取れるようにする。例えば、前記MIBは、特定UE (例えば、UE #11) が特定リソースブロック (例えば、RB #3) を読み取るべきことを示すことができる。ここで、前記RB #3は、所定のサブキャリア及び所定のシンボル (例えば、サブキャリア #13～60及びシンボル #3～5) に位置する情報として示すこともできる。

【0040】

同様に、1つのフレーム内の各サブフレームにおいて、(第1部分に位置する) 前記制御情報は、各リソースブロック (RB) の位置に関する情報を含む。すなわち、各RBに対する周波数範囲及び時間区間を明示することにより、端末 (UE) が適合するRBを適切に読み取れるようにする。

【0041】

以下、図7に一般的に示しているこのような概念について、図8～図12を参照してより詳細に説明する。

【0042】

図8は本発明の一実施形態による制御情報送受信方法を示す図である。ネットワークは特定周期 (すなわち、第1周期) 毎にFCCH (Frame Control Channel) を送信する。以下では、前記特定周期はフレームという。

【0043】

前記FCCHを異なる用語で説明できることに注意すべきである。すなわち、前記ネットワークから送信された制御情報は、L1/L2制御情報、FCCH、SCCHなどともいう。以下、(制御情報及びSCCHも説明するが、) 説明の便宜上、このような制御情報をFCCHという。

【0044】

図8に示すように、MIBは第2周期毎に繰り返し伝送され、第2周期は前述した第1周期とは異なる。前記MIBは、システム情報、ページングメッセージ、及び通知メッセージを伝送するSIBのためのスケジューリング情報を含む。すなわち、前記MIBは、複数のSIB、複数のページングメッセージ、複数の通知メッセージなどの各タイプの制御情報の伝送に使用される周波数及び時間に関するスケジューリング情報を提供する。前

記第2周期は前記第1周期より長く設定できる。前記MIBは該MIBが伝送される周期の第1フレームで伝送できる。

【0045】

ここで、各フレームで伝送されるFCCCHは、該当時間区間（フレーム）で伝送されたデータが共通制御メッセージ、特定移動端末のための専用制御メッセージ、共通データ、又は特定移動端末のための専用データのいずれであるかを通知することができる。また、前記FCCCHは、制御情報の制御メッセージ又はデータが伝送されるフレームの周波数及び時間を通知することもできる。

【0046】

移動端末は第1周期毎にFCCCHを周期的に受信する。特定フレームのFCCCHがMIBの伝送を示す場合、前記移動端末は、前記FCCCHで伝送されるインジケータ情報に含まれているスケジューリング情報に応じて、該当周波数で該当時間に前記MIBを受信する。前記移動端末は、前記MIBを参照して、特定ページングメッセージ、特定通知メッセージ、特定インジケータメッセージなどに関するスケジューリング情報を取得できる。このようなスケジューリング情報により、前記移動端末は、特定SIB、特定ページングメッセージ、特定通知メッセージなどの伝送に使用された周波数及び時間を判断できる。このようなスケジューリング情報により、前記移動端末は、受信すべきSIB、ページングメッセージ、及び加入したサービスに関する通知メッセージを受信できる。

【0047】

前記MIBは、移動端末識別子もしくはサービス識別子を含むか、又はその識別子を示すインジケータを含むことができる。

【0048】

図9は本発明の他の実施形態による制御情報送受信方法を示す図である。図9に示すように、ネットワークは、ページングメッセージ又は通知メッセージに関するインジケータ情報及びスケジューリング情報を通知するPN-MAP (Paging and Notification MAP) を周期的に送信する。ここで、前記PN-MAPは異なるラベリングが行われる。すなわち、前記PN-MAPは、単にネットワークから送信可能なL1/L2制御情報の1タイプである。ちなみに、ページング又は通知メッセージ及びスケジューリングに関する情報を提供するために、前記PN-MAPの代わりにMIBを使用できる。

【0049】

また、ページングはUE（端末）を基準に提供される反面、通知はサービスを基準に提供される。従って、UEに対するページングに関する概念はサービスに対する通知に適用できる。

【0050】

前記PN-MAPは、ページング周期又は通知周期の第1フレームで伝送される。ここで、前記ページング周期及び通知周期は同一でもよく異なってもよい。各フレームで伝送されるFCCCHは、該当時間区間（フレーム）で伝送されたデータがページングメッセージ、通知メッセージ、又はPN-MAPのいずれであるかを示す。また、前記FCCCHは、前記制御情報の各メッセージ又はデータが伝送されるフレームの周波数及び時間を示すスケジューリング情報を通知する。

【0051】

前記移動端末は、ページング周期又は通知周期毎に前記PN-MAPを受信する。ここで、前記移動端末は、前記FCCCHの受信時、該当フレームにPN-MAPが含まれているか否かを判断できる。従って、前記移動端末は、前記FCCCHが前記PN-MAPの伝送を通知する場合にのみ、該当フレームで前記PN-MAPを取得する。

【0052】

前記移動端末は、前記受信したPN-MAPを利用して、特定ページングメッセージ又は特定通知メッセージのスケジューリング情報を取得する。前記移動端末は、前記スケジューリング情報を利用して、特定ページングメッセージ又は特定通知メッセージが送信された周波数及び時間を判断できる。前記移動端末は、前記判断された送信情報に応じて該

当ページングメッセージを受信し、加入したサービスに関する通知メッセージを受信することができる。前記PN-MAPは、移動端末識別子もしくはサービス識別子を含むか、又はその識別子を示すインジケータを含むことができる。

【0053】

図10は本発明のさらに他の実施形態による制御情報送受信方法を示す図である。図10に示すように、ネットワークは、ページング周期毎に複数の移動端末のページングメッセージ又は通知メッセージを送信する。1つのページング周期中に伝送される(特定移動端末のための)ページングメッセージは、前記移動端末の識別子にマッピングされる特定フレームで伝送される。また、1つの通知周期中に伝送される(特定サービスのための)通知メッセージは、前記サービスの識別子にマッピングされる特定フレームで伝送される。ここで、前記ページング周期及び通知周期は同一でもよく異なってもよい。各フレームで伝送されるFCCCHは、該当時間区間(フレーム)で伝送されたデータがページングメッセージ又は通知メッセージのいずれであるかを示す。また、前記FCCCHは、各メッセージ又はデータが伝送されるフレームの周波数及び時間を通知する。

【0054】

前記移動端末は、移動端末のためのページングメッセージを取得するために、移動端末の識別子にマッピングされる特定フレームを(ページング周期で)周期的に受信する。また、前記移動端末は、サービスのための通知メッセージを取得するために、受信しようとするサービスの識別子にマッピングされる特定フレームを(通知周期で)周期的に受信する。ここで、前記移動端末は、前記特定フレームを受信する前に該当フレームのFCCCHを受信するが、前記FCCCHが前記ページングメッセージ又は通知メッセージの伝送を示す場合のみ、前記フレームで前記ページングメッセージ又は通知メッセージを取得する。

これにより、L1/L2制御情報(すなわち、システム情報、MIB、PN-MAPなど)がPICHの目的を果たすことが分かる。すなわち、必要なページングメッセージを取得するために、UEは前記L1/L2制御情報をモニタリングすることにより、時間ドメイン及び周波数ドメインでの特定リソースブロック(RB)の位置を判断できる。

【0055】

図11は本発明のさらに他の実施形態による制御情報送受信方法を示す図である。10MHz又は20MHzの帯域幅を有する広帯域周波数をサポートするセルは、1.25MHz、2.5MHzなどの狭帯域周波数で動作する移動端末のための狭帯域周波数のシステム帯域幅を提供する。この場合、図11に示すように、一般的に広帯域周波数の中央帯域幅が前記システム帯域幅に使用される。ここで、前記MIBもしくはPN-MAP、ページングメッセージ、通知メッセージ、SIBなどは、全て前記システム帯域幅で伝送されなければならない。しかし、特定システム情報を伝送するSIBは、前記システム帯域幅外で伝送できる。

【0056】

各フレームで伝送されるFCCCH(又は、L1/L2制御情報、SCCHなどの他のタイプのシステム情報)は、該当時間区間(フレーム)で伝送されたデータがMIBもしくはPN-MAP、ページングメッセージ、通知メッセージ、又はSIBなどのいずれであるかを示す。また、前記FCCCHは、各メッセージ又はデータが伝送されるフレームの周波数及び時間を通知する。前記FCCCHは、システム帯域幅のためのFCCCHと非システム帯域幅のためのFCCCHとに分けて伝送できる。これにより、前記システム帯域幅のみを受信する移動端末は、前記システム帯域幅のためのFCCCHを受信し、前記システム帯域幅で伝送される各データ又はメッセージの情報を取得する。また、前記非システム帯域幅を受信する移動端末は、前記非システム帯域幅のためのFCCCHを受信し、前記非システム帯域幅で伝送される各データ又はメッセージの情報を取得する。

【0057】

つまり、図11に示す概念はアイドルモードの移動端末の状況の管理に関するものである。

【0058】

ネットワーク（システム）は20MHzのセル帯域幅をサポートし、移動端末は一般的に10MHzの帯域幅範囲のみをサポートできる。従って、前記L1/L2制御情報は、所定単位（周波数範囲）、例えば10MHz、5MHzなどの範囲で伝送されなければならない。結果的に、移動端末がデータを読み取るために使用する周波数範囲には3つのシナリオがある。すなわち、移動端末は、20MHzの変換セル帯域幅で、3つの周波数範囲、すなわち最低の10MHz、最高の10MHz、又は中間の10MHzのいずれか1つを読み取る。

【0059】

RRC接続モードの移動端末の場合、前記接続モードの移動端末が位置する特定セルが分かるので、前記3つの10MHzの範囲のいずれか1つを使用することもでき、前記3つの10MHzの範囲を適切にスイッチングすることもできる。しかし、アイドルモードの移動端末の場合、前記移動端末が位置する特定セルが分からないので、前記3つの10MHzの範囲のいずれか1つのみを使用できる（一般的に、中間の10MHzの範囲が使用される）。一方、前記中間の10MHzの範囲外の帯域幅は、接続モードの移動端末のためのリソースブロックの送受信に使用される。

【0060】

ここで、図11を参照する前記実施形態は10MHzの範囲を説明しているが、20MHzの変換セル帯域幅を5MHz単位で分けることも考慮することができる。

【0061】

図12は本発明の一実施形態による制御情報（すなわち、FCCH）の構成を示す図である。前記FCCHは、該当周期中に（すなわち、該当フレームで）伝送されるデータ及び制御メッセージに関する様々なタイプの制御情報を移動端末に提供する。ここで、前記FCCHは、異なる5つのFCCH部分から構成される。しかし、これは単に例示にすぎず、FCCH部分の数は変更可能である。

【0062】

図12に示すように、第1FCCH部分は、FCCH伝送の周波数及び時間、FCCH情報の長さ、FCCH情報の受信のために必要な無線リソースパラメータなどを通知するFCCHMAPである。このようなFCCHMAPは、常に各フレームに含まれる。本発明においては、各フレームに全てのタイプのFCCHが含まれることもあり、一部分のみ含まれることもある。前記FCCHMAPは、該当フレームで（前記FCCHMAPを除いた）残りの4タイプのFCCH部分が伝送されるか否かを通知することができる。

【0063】

第2FCCH部分は、移動端末がアイドルモードである場合、ダウンリンク制御情報を受信するために必要な制御情報を含むFCCHアイドルモード（DL）である。前記第2FCCH部分は、ダウンリンクで伝送される制御情報がフレームに存在する場合、該当フレームに含まれる。前記第2FCCH部分には、MIB、SIB、ページングメッセージ、通知メッセージ、PN-MAPなどの共通制御メッセージに関する制御情報が含まれる。また、前記第2FCCH部分には、MIB、SIB、ページングメッセージ、通知メッセージ、PN-MAPなどが含まれる。

【0064】

第3FCCH部分は、移動端末がアイドルモードである場合、アップリンク制御情報を送信するために必要な制御情報を含むFCCHアイドルモード（UL）である。前記第3FCCH部分は、アップリンクランダムアクセス伝送に必要な情報を含むことができる。前記移動端末がランダムアクセスメッセージを送信した場合、ネットワークは前記第3FCCH部分により前記ランダムアクセスメッセージに対する応答を送信できる。また、前記第3FCCH部分は、前記ランダムアクセスメッセージに対する応答が前記第3FCCH部分の送信に使用されるフレームで送信されていることを通知するのに利用できる。このために、前記第3FCCH部分は、前記ランダムアクセスメッセージに対する応答に関する制御情報を含む。

【0065】

第4 F C C H部分は、移動端末がアクティブモードである場合、ダウンリンク制御情報を受信するために必要な制御情報を含む。前記第4 F C C H部分は、該当フレームで伝送されるダウンリンク S C Hの制御情報を含むことができる。

【0066】

第5 F C C H部分は、移動端末がアクティブモードである場合、アップリンク制御情報を送信するために必要な制御情報を含む。前記第5 F C C H部分は、該当フレームで伝送されるアップリンク S C Hの制御情報を含むことができる。

【0067】

前記移動端末は、前記 F C C H M A Pを周期的に受信し、該当フレームが受信しようとするデータ又は情報を含むか否かを確認することができる。前記 F C C H M A Pを受信した後、前記移動端末がアイドルモードにある場合は、前記第2及び第3 F C C H部分のみ受信される。前記移動端末がアクティブモードにある場合は、前記第4及び第5 F C C H部分のみ受信される。

【0068】

前記ネットワークは、マルチキャスト及びブロードキャスト伝送に必要な制御情報を通知するために、必要であれば、他の F C C H部分をさらに追加して伝送することができる。

【0069】

図1～図12は、20つの0.5msのサブフレームを含む10msのフレームの一実施形態を示している。しかしながら、本発明の特徴は、他のフレームサイズを採用する他の技術にも明確に適用できる。例えば、5msのフレームサイズを使用することもでき、L T E技術をサポートするために、0.5msのフレームサイズを使用することもできる。

【0070】

本発明の効果として、無線ネットワークは、共通制御情報（例えば、特定ページングメッセージ、通知メッセージ、システム情報など）の送信に関して（単一のインジケータチャネルで）予め通知することができる。無線移動端末は、周期的に前記単一のインジケータチャネルを受信し、前記インジケータチャネルの制御情報を利用して前記共通制御情報を受信することができる。このような手順により、移動端末の動作を単純化して移動端末のリソースをより効率的に使用することができる。

【0071】

また、本発明は、周波数及び時間ドメインでの各リソースブロック（R B）に関する情報を提供することにより、システム情報、制御情報などを動的でフレキシブルな方式で処理ことができ、多様な改善された能力をサポートすることができる。さらに、周波数選択スケジューリング（frequency selective scheduling）の実行時、チャネル変更に対する適応性を向上させることができる。

【0072】

本発明は、周期的な方式で制御情報を受信する段階と、前記受信した制御情報が移動端末に関するものである場合、ページング情報の時間及び周波数情報を示すスケジューリング情報を利用して前記ページング情報を受信する段階とを含む、移動通信システムにおける移動端末に関するページング情報の受信方法を提供する。

【0073】

前記制御情報は、移動端末識別子もしくはサービス識別子を含むか、又は移動端末識別子もしくはサービス識別子を示すインジケータを含む。前記受信した制御情報及びページング情報は同一のサブフレームに存在する。前記方法は、前記ページング情報の受信に利用されるスケジューリング情報を含むプライマリシステム情報を静的な方式で受信する段階と、前記制御情報を含むノンプライマリシステム情報を動的な方式で受信する段階とをさらに含む。前記スケジューリング情報は、前記ノンプライマリシステム情報の時間特性及び周波数特性の少なくとも一方を示す。前記時間特性及び周波数特性は、前記特定端末

が読み取るべき前記ノンプライマリシステム情報の位置を示す。前記プライマリシステム情報は特定端末を示すインジケータをさらに含む。前記インジケータは、端末識別子、サービス識別子、及び論理チャネル識別子の少なくとも1つを含む。前記時間特性はシンボルに関するものであり、前記周波数特性はサブキャリアに関するものである。前記ページング情報は少なくとも1つのリソースブロックの形態で構成される。ページング及び通知に関する前記制御情報、並びに他のリソースブロックは、システム帯域幅に使用される広帯域周波数のうち中心周波数で受信される。前記制御情報はアイドルモードの移動端末のためのものである。

【0074】

また、本発明は、時間及び周波数情報を示すスケジューリング情報を含む制御情報を動的な方式でセルグループに送信する段階と、前記制御情報に応じてページング情報を送信する段階とを含む、移動通信システムにおける移動端末に関するページング情報のダウンロード送信方法を提供する。

【0075】

前記制御情報は、移動端末識別子もしくはサービス識別子を含むか、又は移動端末識別子もしくはサービス識別子を示すインジケータを含む。前記送信された制御情報及びページング情報は同一のサブフレームに存在する。前記セルグループは追跡領域 (tracking area) に関連する。前記方法は、前記ページング情報の受信に利用されるスケジューリング情報を含むプライマリシステム情報を静的な方式で受信する段階と、前記制御情報を含むノンプライマリシステム情報を動的な方式で受信する段階とをさらに含む。前記スケジューリング情報は、前記ノンプライマリシステム情報の時間特性及び周波数特性の少なくとも一方を示す。前記時間特性及び周波数特性は、前記特定端末が読み取るべき前記ノンプライマリシステム情報の位置を示す。前記プライマリシステム情報は特定端末を示すインジケータをさらに含む。前記インジケータは、端末識別子、サービス識別子、及び論理チャネル識別子の少なくとも1つを含む。前記時間特性はシンボルに関するものであり、前記周波数特性はサブキャリアに関するものである。前記ページング情報は少なくとも1つのリソースブロックの形態で構成される。ページング及び通知に関する前記制御情報、並びに他のリソースブロックは、システム帯域幅に使用される広帯域周波数のうち中心周波数で受信される。前記制御情報はアイドルモードの移動端末のためのものである。

【0076】

さらに、本発明は、プライマリシステム情報を静的な方式で受信する段階と、前記プライマリシステム情報に基づいて、アイドルモード及びアクティブモードのそれぞれに関する情報を含む制御情報を含むノンプライマリシステム情報を動的な方式で受信する段階と、前記移動端末がアイドルモード又はアクティブモードで動作するか否かによって、前記受信した制御情報を利用して実際のデータを読み取る段階とを含む、移動端末におけるシステム情報処理方法を提供する。前記静的なプライマリシステム情報は、前記ノンプライマリシステム情報の時間及び周波数情報を示すスケジューリング情報を含む。

【0077】

さらに、本発明は、プライマリシステム情報を静的な方式で送信する段階と、前記プライマリシステム情報に基づいて、アイドルモード及びアクティブモードのそれぞれに関する情報を含む制御情報を含むノンプライマリシステム情報を動的な方式で送信する段階と、アイドルモード又はアクティブモードでの移動端末の動作に応じて、前記制御情報を利用する移動端末が読み取るべき実際のデータを送信する段階とを含む、ネットワークにおけるシステム情報処理方法を提供する。前記静的なプライマリシステム情報は、前記ノンプライマリシステム情報の時間及び周波数情報を示すスケジューリング情報を含む。

【0078】

本明細書は本発明の様々な実施形態を記述している。本発明の範囲は本明細書に開示されている例示的实施形態の多様な変更及び均等物をも含むものである。従って、請求の範囲はここに開示されている本発明の思想及び範囲内で行われる変更、均等物、及び特徴を含むように広く解釈されるべきである。

【図面の簡単な説明】

【0079】

- 【図1】 OFDMで使用される1つのフレームの構造の一例を示す図である。
- 【図2】 図1のフレーム内の1つのサブフレームの一例を示す図である。
- 【図3】 OFDMのためのデータ及び基準シンボルが周波数ドメイン及び時間ドメインに示される方法の一例を示す図である。
- 【図4】 E-UMTSネットワーク構造を概念的に示す図である。
- 【図5】 3GPP無線アクセスネットワーク標準に準拠した、移動端末とUTRAN間の無線インタフェースプロトコルの構造の一例を示す図である。
- 【図6】 3GPP無線アクセスネットワーク標準に準拠した、移動端末とUTRAN間の無線インタフェースプロトコルの構造の一例を示す図である。
- 【図7】 本発明の特性を説明するために周波数及び時間に対する各サブフレームでの制御情報及びリソースブロックの位置を示す図である。
- 【図8】 本発明の一実施形態による制御情報送受信方法を示す図である。
- 【図9】 本発明の他の実施形態による制御情報送受信方法を示す図である。
- 【図10】 本発明のさらに他の実施形態による制御情報送受信方法を示す図である。
- 【図11】 本発明のさらに他の実施形態による制御情報送受信方法を示す図である。
- 【図12】 本発明の一実施形態によるF C C H情報の構成を示す図である。

【図1】

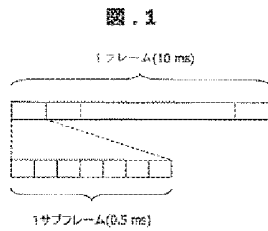


図 . 1

【図2】

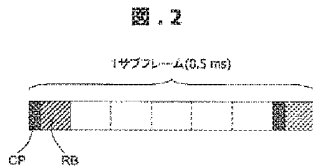


図 . 2

【図3】

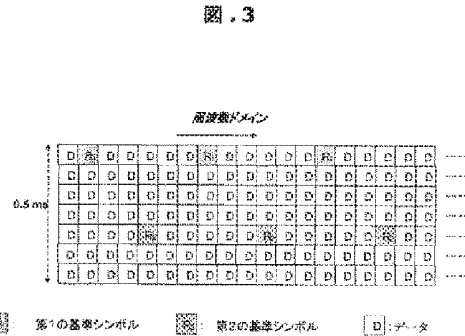


図 . 3

【図4】

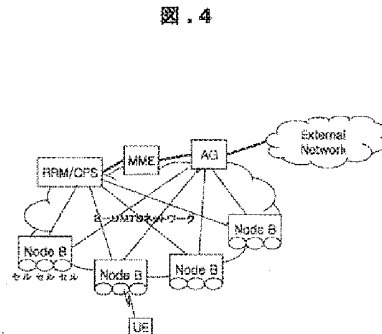
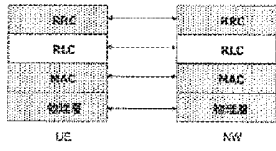


図 . 4

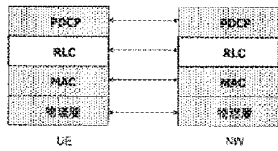
【図5】

図 . 5



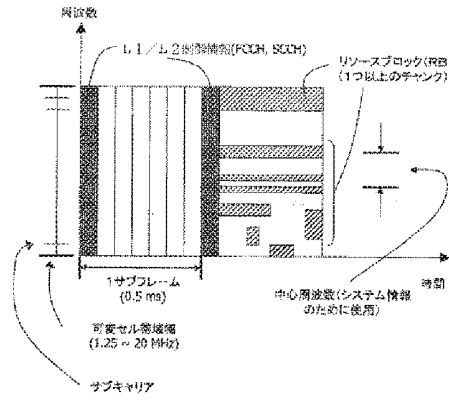
【図6】

図 . 6



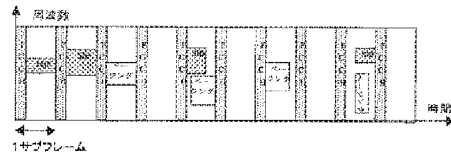
【図7】

図 . 7



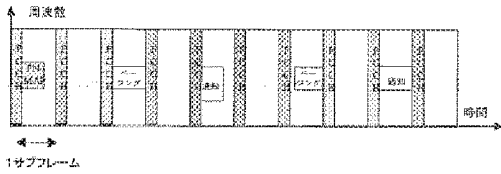
【図8】

図 . 8



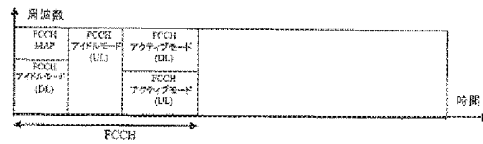
【図9】

図 . 9



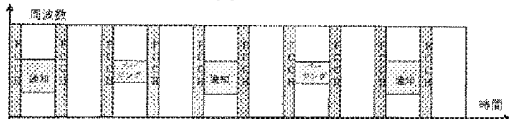
【図12】

図 . 12



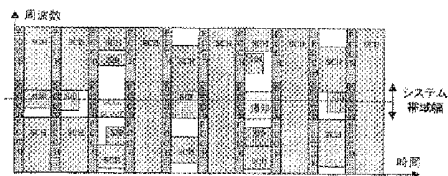
【図10】

図 . 10



【図11】

図 . 11



PCT/KR2006/004371

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference PAL/GIC06673	FOR FURTHER ACTION see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. PCT/KR2006/004371	International filing date (<i>day/month/year</i>) 25 OCTOBER 2006 (25.10.2006)	(Earliest) Priority Date (<i>day/month/year</i>) 31 OCTOBER 2005 (31.10.2005)
Applicant LG ELECTRONICS INC. et al		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.
 It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of :

the international application in the language in which it was filed

a translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I

2. **Certain claims were found unsearchable** (See Box No. II)

3. **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the **drawings**,

a. the figure of the **drawings** to be published with the abstract is Figure No. 7



as suggested by the applicant.

because the applicant failed to suggest a figure.

because this figure better characterizes the invention.

b. none of the figure is to be published with the abstract.

Form PCT/ISA/210 (first sheet) (April 2005)

INTERNATIONAL SEARCH REPORT		International application No. PCT/KR2006/004371
A. CLASSIFICATION OF SUBJECT MATTER		
<i>H04L 12/28(2006.01)</i>		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED		
Minimum documentation searched (classification system followed by classification symbols) IPC8: G06F, H04L		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean Patents and applications for inventions since 1975 Korean Utility models and applications for Utility models since 1975 Japanese Utility models and application for Utility models since 1975		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EKIPASS (KIPO internal), IEEE xplore		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6628946 B1 (Ericsson, Sep. 30, 2003) See the abstract, lines 5-22 in col. 3, lines 26-40 in col. 11	1-3, 10-12
A	US 2005/0177623 A1 (M-Stack Limited, Aug. 11, 2005) See the abstract, figs. 1-5, and claims 1, 6	1 - 29
A	'Control channel structure for TDMA mobile radio systems', Onoe, S.; Tajima, J.; Utano, T.; Umeda, N., Vehicular Technology Conference, 1990 IEEE 40th, 6-9 May 1990 Page(s):270 - 275	1 - 29
<input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.		
* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "B" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 13 FEBRUARY 2007 (13.02.2007)		Date of mailing of the international search report 13 FEBRUARY 2007 (13.02.2007)
Name and mailing address of the ISA/KR  Korean Intellectual Property Office 920 Dunsan-dong, Seo-gu, Daejeon 302-701, Republic of Korea Facsimile No. 82-42-472-7140		Authorized officer JUN, Young Sang Telephone No. 82-42-481-5653 

Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT Information on patent family members			International application No. PCT/KR2006/004371
Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US6628946B1	30.09.2003	AU200051192A1	12.12.2000
		AU200051192B2	12.12.2000
		AU200051192A5	12.12.2000
		AU770705B2	26.02.2004
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		JP15500950	07.01.2003
		JP2003500950T2	07.01.2003
		KR1020020000649	05.01.2002
		US6628946B1	30.09.2003
		US6628946BA	30.09.2003
W00072609A1	30.11.2000		
US2005/0177623A1	11.08.2005	US7079840B8	18.07.2006
		US2005177623AA	11.08.2005
		US2006281456AA	14.12.2006

Form PCT/ISA/210 (patent family annex) (April 2005)

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Fターム(参考) 5K022 AA00 DD01 DD13 DD19 DD21 DD31
5K067 AA21 CC02 CC12 DD17 EE02 JJ22

Electronic Patent Application Fee Transmittal

Application Number:	14639287			
Filing Date:	05-Mar-2015			
Title of Invention:	Transmission of System Information on a Downlink Shared Channel			
First Named Inventor/Applicant Name:	Erik Dahlman			
Filer:	Brandee N. Woolard/Laura Morey			
Attorney Docket Number:	4015-9121 / P24241-US3			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
Total in USD (\$)				180

Electronic Acknowledgement Receipt

EFS ID:	26357106
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	Transmission of System Information on a Downlink Shared Channel
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	Brandee N. Woolard/Laura Morey
Filer Authorized By:	Brandee N. Woolard
Attorney Docket Number:	4015-9121 / P24241-US3
Receipt Date:	14-JUL-2016
Filing Date:	05-MAR-2015
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Payment Type	Electronic Funds Transfer
Payment was successfully received in RAM	\$ 180
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Deposit Account	
Authorized User	

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1	Transmittal Letter	4015-9121_Letter_IDS.pdf	15973	no	1
			2d103848420e4ff3d01b09a51c5ecfec0e4461a3		
Warnings:					
Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	4015-9121_IDS_Jul14.pdf	1035481	no	4
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Warnings:					
Information:					
3	Foreign Reference	4015-9121_WO2007073079A1.pdf	1005661	no	20
			1516b25b45aa08df2a3d07a64e2d5f7c13c8d177		
Warnings:					
Information:					
4	Foreign Reference	4015-9121_JP2006136023A.pdf	427998	no	12
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Warnings:					
Information:					
5	Foreign Reference	4015-9121_JP2009512391A.pdf	1776756	no	20
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6	Fee Worksheet (SB06)	fee-info.pdf	30542	no	2
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If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of Dahlman et al.)	
)	
Serial No.: 14/639,287)	
	)	Examiner: Siming Liu
Filed: March 5, 2015)	
	)	Group Art Unit: 2413
For: Transmission of System Information on a Downlink Shared Channel	)	Confirmation No.: 7111
)	
Attorney's Docket No: 4015-9121/P24241-US3)	
)	

MS AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT

In accordance with 37 C.F.R. 1.56, counsel wishes to make of record the attached items of information for the Examiner's consideration in connection with this application. Enclosed is Form PTO/SB/08A and copies of the foreign patent documents cited therein for the Examiner's convenience in making such consideration of record. Inclusion herein of any particular item of information is not to be construed as an admission that same is prior art.

The Commissioner is hereby authorized to charge any fees that may be required or credit any overpayment to Deposit Account 18-1167.

Respectfully submitted,

COATS & BENNETT, P.L.L.C.

/Brandee N. Woolard/

Dated: July 14, 2016

Brandee N. Woolard
Registration No.: 68,795
Telephone: (919) 854-1844



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

24112 7590 08/15/2016
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

EXAMINER

LIU, SIMING

ART UNIT PAPER NUMBER

2413

DATE MAILED: 08/15/2016

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
14/639,287 03/05/2015 Erik Dahlman 4015-9121 / P24241-US3 7111

TITLE OF INVENTION: TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL

Table with 7 columns: APPLN. TYPE, ENTITY STATUS, ISSUE FEE DUE, PUBLICATION FEE DUE, PREV. PAID ISSUE FEE, TOTAL FEE(S) DUE, DATE DUE
nonprovisional UNDISCOUNTED \$960 \$0 \$0 \$960 11/15/2016

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.

PART B - FEE(S) TRANSMITTAL

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE
 Commissioner for Patents
 P.O. Box 1450
 Alexandria, Virginia 22313-1450
 or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24112 7590 08/15/2016
COATS & BENNETT, PLLC
 1400 Crescent Green, Suite 300
 Cary, NC 27518

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)
_____ (Signature)
_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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14/639,287 03/05/2015 Erik Dahlman 4015-9121 / P24241-US3 7111

TITLE OF INVENTION: TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
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nonprovisional UNDISCOUNTED \$960 \$0 \$0 \$960 11/15/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
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LIU, SIMING 2413 370-336000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) The names of up to 3 registered patent attorneys or agents OR, alternatively, 1 _____
- (2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 _____
- 3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE _____ (B) RESIDENCE: (CITY and STATE OR COUNTRY) _____

Please check the appropriate assignee category or categories (will not be printed on the patent): Individual Corporation or other private group entity Government

4a. The following fee(s) are submitted:

- Issue Fee
- Publication Fee (No small entity discount permitted)
- Advance Order - # of Copies _____

4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)

- A check is enclosed.
- Payment by credit card. Form PTO-2038 is attached.
- The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number _____ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- Applicant certifying micro entity status. See 37 CFR 1.29
- Applicant asserting small entity status. See 37 CFR 1.27
- Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Table with 5 columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
Row 1: 14/639,287, 03/05/2015, Erik Dahlman, 4015-9121 / P24241-US3, 7111
Row 2: 24112, 7590, 08/15/2016, COATS & BENNETT, PLLC, 1400 Crescent Green, Suite 300, Cary, NC 27518

EXAMINER

LIU, SIMING

ART UNIT PAPER NUMBER

2413

DATE MAILED: 08/15/2016

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 14/639,287	Applicant(s) DAHLMAN ET AL.	
	Examiner SIMING LIU	Art Unit 2413	AIA (First Inventor to File) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. This communication is responsive to amendment filed on 04/04/2015.
 A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.
2. An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.
3. The allowed claim(s) is/are 1-4,6-12 and 14-38. As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to PPHfeedback@uspto.gov.
4. Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

- a) All b) Some *c) None of the:
1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
- * Certified copies not received: _____.


Applicant has **THREE MONTHS FROM THE "MAILING DATE"** of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in **ABANDONMENT** of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. **CORRECTED DRAWINGS** (as "replacement sheets") must be submitted.
 including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.
Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. **DEPOSIT OF and/or INFORMATION** about the deposit of **BIOLOGICAL MATERIAL** must be submitted. Note the attached Examiner's comment regarding **REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL**.

Attachment(s)

- | | |
|--|---|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Examiner's Amendment/Comment |
| 2. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),
Paper No./Mail Date <u>07/14/2016</u> | 6. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| 3. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 7. <input type="checkbox"/> Other _____. |
| 4. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____. | |

/SIMING LIU/
Primary Examiner, Art Unit 2413

Search Notes 	Application/Control No. 14639287	Applicant(s)/Patent Under Reexamination DAHLMAN ET AL.
	Examiner SIMING LIU	Art Unit 2413

CPC- SEARCHED		
Symbol	Date	Examiner
H04L1/08, 2001/0093; H04W48/12, 72/0446; update: ABOVE	11/2/2015	SL
	7/11/2016	SL

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
East text search	11/2/2015	SL
East inventor name search	11/2/2015	SL
CPC class search	11/2/2015	SL
update: ABOVE	7/11/2016	SL

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner
see search printout		7/11/2016	SL

	/SIMING LIU/ Primary Examiner.Art Unit 2413
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Receipt date: 07/14/2016

14639287 - GAI-2413

Doc code: IDS

Doc description: Information Disclosure Statement (IDS) Filed

Approved for use through 07/31/2016. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	14639287
	Filing Date	2015-03-05
	First Named Inventor	Dahlman
	Art Unit	2413
	Examiner Name	Siming Liu
	Attorney Docket Number	4015-9121/P24241-US3

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code ¹	Issue Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1					

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code ¹	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear
	1	20100167750	A1	2010-07-01	Lee et al.	
	2	20030133431	A1	2003-07-17	Rudolf	

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number ³	Country Code ²	Kind Code ⁴	Publication Date	Name of Patentee or Applicant of cited Document	Pages, Columns, Lines where Relevant Passages or Relevant Figures Appear	T ⁵
	1	2007073079	WO	A1	2007-06-28	LG Electronics Inc.		
	2	2006136023	JP	A	2006-05-25	Interdigital Technology Corp.	English abstract attached Equivalent of US2003/0133431, cited herein	

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.L./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number		14639287	14639287 - GAU: 2413
	Filing Date		2015-03-05	
	First Named Inventor	Dahlman		
	Art Unit	2413		
	Examiner Name	Siming Liu		
	Attorney Docket Number	4015-9121/P24241-US3		

3	2009512391	JP	A	2009-03-19	Lee et al.	Equivalent of US2010/0167750, cited herein
4						

If you wish to add additional Foreign Patent Document citation information please click the Add button

NON-PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T ⁵
	1		

If you wish to add additional non-patent literature document citation information please click the Add button

EXAMINER SIGNATURE

Examiner Signature	/Siming Liu/	Date Considered	07/29/2016
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*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

¹ See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. ² Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). ³ For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. ⁴ Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. ⁵ Applicant is to place a check mark here if English language translation is attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.L./

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)	Application Number	14639287	14639287 - GAU: 2413
	Filing Date	2015-03-05	
	First Named Inventor	Dahlman	
	Art Unit	2413	
	Examiner Name	Siming Liu	
	Attorney Docket Number	4015-9121/P24241-US3	

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

- The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.
- A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Brandee N. Woolard/	Date (YYYY-MM-DD)	2016-07-14
Name/Print	Brandee N. Woolard	Registration Number	68795

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. **DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.L./

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The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these records.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.L./

EFS Web 2.1.17

EAST Search History

EAST Search History (Prior Art)


Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	3123	H04L1/08.cpc.	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47
L2	2457	H04L2001/0093.cpc.	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47
L3	3084	H04W48/12.cpc.	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47
L4	4913	H04W72/0446.cpc.	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47
L5	193	((Erik) near2 (Dahlman)).INV.	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47
L6	17	((Vera) near2 (Vukajlovic)).INV.	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47
L7	8	(repetitive or repeat) near3 window and RNTI	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47
L8	52	(repetitive or repeat) near3 window and system adj information	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47
L9	54	(overlap\$3 or overlaid) with window and RNTI	US-PGPUB; USPAT	OR	OFF	2016/07/11 14:47

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L11	0	(recurr\$3 time window system information with RNTI).clm.	US-PGPUB; USPAT	WITH	ON	2016/07/11 14:49
L12	4	(recurr\$3 time window system information).clm.	US-PGPUB; USPAT	WITH	ON	2016/07/11 14:49

7/ 11/ 2016 2:50:03 PM


C:\Users\sliu3\Documents\EAST\Workspaces\14639287.wsp

Issue Classification 	Application/Control No. 14639287	Applicant(s)/Patent Under Reexamination DAHLMAN ET AL.	
	Examiner SIMING LIU	Art Unit 2413	

CPC						
Symbol					Type	Version
H04W	72		0446		F	2013-01-01
H04W	48		12		I	2013-01-01


CPC Combination Sets								
Symbol					Type	Set	Ranking	Version

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	36	
/SIMING LIU/ Primary Examiner.Art Unit 2413	7/11/2016	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

Issue Classification 	Application/Control No. 14639287	Applicant(s)/Patent Under Reexamination DAHLMAN ET AL.
	Examiner SIMING LIU	Art Unit 2413

US ORIGINAL CLASSIFICATION						INTERNATIONAL CLASSIFICATION														
CLASS		SUBCLASS				CLAIMED					NON-CLAIMED									
						H	0	4	W	72 / 04										
CROSS REFERENCE(S)																				
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)																			

NONE		Total Claims Allowed:	
		36	
(Assistant Examiner)	(Date)		
/SIMING LIU/ Primary Examiner. Art Unit 2413	7/11/2016	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

Issue Classification 	Application/Control No. 14639287	Applicant(s)/Patent Under Reexamination DAHLMAN ET AL.
	Examiner SIMING LIU	Art Unit 2413

<input type="checkbox"/> Claims renumbered in the same order as presented by applicant																<input type="checkbox"/> CPA		<input checked="" type="checkbox"/> T.D.		<input type="checkbox"/> R.1.47	
Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original						
1	1	19	17	36	33																
2	2	20	18	9	34																
3	3	21	19	12	35																
4	4	22	20	16	36																
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18	16	35	32																		

NONE		Total Claims Allowed:	
		36	
(Assistant Examiner)	(Date)		
/SIMING LIU/ Primary Examiner. Art Unit 2413	7/11/2016	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	4

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), to: **Mail** Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
 or **Fax** (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

24112 7590 08/15/2016
COATS & BENNETT, PLLC
 1400 Crescent Green, Suite 300
 Cary, NC 27518

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

_____ (Depositor's name)
_____ (Signature)
_____ (Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/639,287	03/05/2015	Erik Dahlman	4015-9121 / P24241-US3	7111

TITLE OF INVENTION: TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	\$960	\$0	\$0	\$960	11/15/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
LIU, SIMING	2413	370-336000

<p>1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).</p> <p><input type="checkbox"/> Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.</p> <p><input type="checkbox"/> "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. Use of a Customer Number is required.</p>	<p>2. For printing on the patent front page, list</p> <p>(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,</p> <p>(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.</p> <p>1 <u>Coats & Bennett, P.L.L.C.</u></p> <p>2 _____</p> <p>3 _____</p>
--	--

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE	(B) RESIDENCE: (CITY and STATE OR COUNTRY)
Telefonaktiebolaget LM Ericsson (publ)	Stockholm, Sweden

Please check the appropriate assignee category or categories (will not be printed on the patent): Individual Corporation or other private group entity Government

<p>4a. The following fee(s) are submitted:</p> <p><input checked="" type="checkbox"/> Issue Fee</p> <p><input type="checkbox"/> Publication Fee (No small entity discount permitted)</p> <p><input type="checkbox"/> Advance Order - # of Copies _____</p>	<p>4b. Payment of Fee(s): (Please first reapply any previously paid issue fee shown above)</p> <p><input type="checkbox"/> A check is enclosed.</p> <p><input type="checkbox"/> Payment by credit card. Form PTO-2038 is attached.</p> <p><input checked="" type="checkbox"/> The director is hereby authorized to charge the required fee(s), any deficiency, or credits any overpayment, to Deposit Account Number <u>18-1167</u> (enclose an extra copy of this form).</p>
--	---

5. Change in Entity Status (from status indicated above)

Applicant certifying micro entity status. See 37 CFR 1.29

Applicant asserting small entity status. See 37 CFR 1.27

Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.

NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature: Brandee N. Woolard Date: November 15, 2016

Typed or printed name: Brandee N. Woolard Registration No. 68795

Electronic Patent Application Fee Transmittal

Application Number:	14639287			
Filing Date:	05-Mar-2015			
Title of Invention:	TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL			
First Named Inventor/Applicant Name:	Erik Dahlman			
Filer:	Brandee N. Woolard/Laura Morey			
Attorney Docket Number:	4015-9121 / P24241-US3			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
UTILITY APPL ISSUE FEE	1501	1	960	960

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				960

Electronic Acknowledgement Receipt

EFS ID:	27515804
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	Brandee N. Woolard/Laura Morey
Filer Authorized By:	Brandee N. Woolard
Attorney Docket Number:	4015-9121 / P24241-US3
Receipt Date:	15-NOV-2016
Filing Date:	05-MAR-2015
Time Stamp:	14:18:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	EFT
Payment was successfully received in RAM	\$960
RAM confirmation Number	111616INTEFSW14200400
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	4015-9121_Issue_Fee_Payment.pdf	979442 93abf70290dc7fcdd1550659b627dd6209af5398	no	1

Warnings:

Information:

2	Fee Worksheet (SB06)	fee-info.pdf	30705 071beae7032851b911a2cafce1859445a135e89	no	2
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Warnings:

Information:

Total Files Size (in bytes):	1010147
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/639,287	12/27/2016	9532355	4015-9121 / P24241-US3	7111

24112 7590 12/07/2016
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment is 0 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site <http://pair.uspto.gov> for additional applicants):

Erik Dahlman, Bromma, SWEDEN;
Telefonaktiebolaget LM Ericsson (PUBL), Stockholm, SWEDEN;
Vera Vukajlovic Kenehan, Stockholm, SWEDEN;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 1 of 2

PATENT NO. : 9,532,355 B2

APPLICATION NO. : 14/639,287

ISSUE DATE : December 27, 2016

INVENTOR(S) : Dahlman, et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Face Page, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 2, Line 1, delete “Arundale” and insert - - Arundale et al. - -, therefor.

On Page 2, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 1, Line 1, delete “Dahlman” and insert - - Dahlman et al. - -, therefor.

On Page 2, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 1, Line 4, delete “Love” and insert - - Love et al. - -, therefor.

On Page 2, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 1, Line 7, delete “Kashima” and insert - - Kashima et al. - -, therefor.

On Page 2, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 1, Line 9, delete “Marinier” and insert - - Marinier et al. - -, therefor.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

6300 Legacy, MS EVR 1-C-11
Plano, TX 75024
972-583-8656

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

UNITED STATES PATENT AND TRADEMARK OFFICE CERTIFICATE OF CORRECTION

Page 2 of 2

PATENT NO. : 9,532,355 B2

APPLICATION NO. : 14/639,287

ISSUE DATE : December 27, 2016

INVENTOR(S) : Dahlman, et al.

It is certified that an error appears or errors appear in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

In Column 1, Line 9, delete “2009,” and insert - - 2009, now Pat. No. 8,995,357, - -, therefor.

In Column 6, Line 7, delete “baseband processor 150” and insert - - baseband processor 140 - -, therefor.

In Column 8, Line 41, in Claim 18, delete “signal” and insert - - subframe - -, therefor.

In Column 9, Line 23, in Claim 28, delete “different signal” and insert - - different - -, therefor.

MAILING ADDRESS OF SENDER (Please do not use customer number below):

6300 Legacy, MS EVR 1-C-11
Plano, TX 75024
972-583-8656

This collection of information is required by 37 CFR 1.322, 1.323, and 1.324. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1.0 hour to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Attention Certificate of Corrections Branch, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Patent Application Fee Transmittal

Application Number:	14639287			
Filing Date:	05-Mar-2015			
Title of Invention:	TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL			
First Named Inventor/Applicant Name:	Erik Dahlman			
Filer:	Roger Scott Burleigh/Amber Rodgers			
Attorney Docket Number:	4015-9121 / P24241-US3			
Filed as Large Entity				
Filing Fees for Utility under 35 USC 111(a)				
Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Basic Filing:				
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
CERTIFICATE OF CORRECTION	1811	1	150	150

Description	Fee Code	Quantity	Amount	Sub-Total in USD(\$)
Extension-of-Time:				
Miscellaneous:				
Total in USD (\$)				150

Electronic Acknowledgement Receipt

EFS ID:	33444246
Application Number:	14639287
International Application Number:	
Confirmation Number:	7111
Title of Invention:	TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL
First Named Inventor/Applicant Name:	Erik Dahlman
Customer Number:	24112
Filer:	Roger Scott Burleigh/Amber Rodgers
Filer Authorized By:	Roger Scott Burleigh
Attorney Docket Number:	4015-9121 / P24241-US3
Receipt Date:	13-AUG-2018
Filing Date:	05-MAR-2015
Time Stamp:	10:33:09
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	\$150
RAM confirmation Number	081318INTEFSW00008727501379
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

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File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P24241-US3_2018-08-13_CoC_Request_Letter.pdf	144486	no	4
			e05aad697839166f04d9ec98a95f033fa7bfdc77		

Warnings:

Information:

2	Request for Certificate of Correction	P24241-US3_2018-08-13_CoC_PTO-1050.pdf	113632	no	3
			fbf6c0ce544092f2e9e2097c3cb5108c66bcc3b		

Warnings:

Information:

3	Fee Worksheet (SB06)	fee-info.pdf	30610	no	2
			158f1820a065a2248ae5e6ca9373f77e75ea9ffc		

Warnings:

Information:

Total Files Size (in bytes):	288728
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This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF: U.S. Patent No. 9,532,355

USPTO CONFIRMATION CODE: 7111

APPLICATION NO.: 14/639,287

FILED: March 5, 2015

EXAMINER: Siming Liu

GROUP ART UNIT: 2413

FOR: TRANSMISSION OF SYSTEM INFORMATION ON A DOWNLINK SHARED CHANNEL

37 CFR 1.322 & 37 CFR 1.323 REQUEST FOR CERTIFICATE OF CORRECTION
FOR USPTO AND/OR APPLICANT MISTAKE

HONORABLE COMMISSIONER OF PATENTS & TRADEMARKS

SIR:

The following is a request for a certificate of correction in Serial Number 14/639,287, now Patent Number 9,532,355.

A certificate of correction under 35 USC 254 is respectfully requested in the above-identified patent.

The errors were the fault of both the applicant and USPTO and, accordingly, please charge **\$150.00** to our Deposit Account No. 50-1379. In the event that a further fee is required, please charge the amount to the same Deposit Account.

The exact locations where the errors appear in the patent and patent application are as follows:

On the Face Page, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 2, Line 1, delete “Arundale” and insert - - Arundale et al. - -, therefor. (LIST OF REFERENCES CITED BY EXAMINER DATED NOVEMBER 4, 2015, PAGE 1 OF 1 (PAGE 130 OF FW), UNDER “U.S. PATENT DOCUMENTS”, ENTRY 3, LINE 1)

On Page 2, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 1, Line 1, delete “Dahlman” and insert - - Dahlman et al. - -, therefor. (LIST OF REFERENCES CITED BY EXAMINER DATED NOVEMBER 4, 2015, PAGE 1 OF 1 (PAGE 130 OF FW), UNDER “U.S. PATENT DOCUMENTS”, ENTRY 6, LINE 1)

On Page 2, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 1, Line 4, delete “Love” and insert - - Love et al. - -, therefor. (LIST OF REFERENCES CITED BY EXAMINER DATED NOVEMBER 4, 2015, PAGE 1 OF 1 (PAGE 130 OF FW), UNDER “U.S. PATENT DOCUMENTS”, ENTRY 4, LINE 1)

On Page 2, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 1, Line 7, delete “Kashima” and insert - - Kashima et al. - -, therefor. (LIST OF REFERENCES CITED BY EXAMINER DATED NOVEMBER 4, 2015, PAGE 1 OF 1 (PAGE 130 OF FW), UNDER “U.S. PATENT DOCUMENTS”, ENTRY 2, LINE 1)

On Page 2, in Field (56), under “U.S. PATENT DOCUMENTS”, in Column 1, Line 9, delete “Marinier” and insert - - Marinier et al. - -, therefor. (LIST OF REFERENCES CITED BY EXAMINER DATED NOVEMBER 4, 2015, PAGE 1 OF 1 (PAGE 130 OF FW), UNDER “U.S. PATENT DOCUMENTS”, ENTRY 5, LINE 1)

In Column 1, Line 9, delete “2009,” and insert - - 2009, now Pat. No. 8,995,357, - -, therefor. (ORIGINALLY FILED SPECIFICATION DATED MARCH 5, 2015, PAGE 1 (PAGE 243 OF FW), PARAGRAPH [0001], LINE 2)

In Column 6, Line 7, delete “baseband processor 150” and insert - - baseband processor 140 - -, therefor. (ORIGINALLY FILED SPECIFICATION DATED MARCH 5, 2015, PAGE 8 (PAGE 250 OF FW), PARAGRAPH [0028], LINE 6)

In Column 8, Line 41, in Claim 18, delete “signal” and insert - - subframe - -, therefor. (AMENDMENTS TO THE CLAIMS DATED APRIL 4, 2016, PAGE 5, CLAIM 16, LINE 2)

In Column 9, Line 23, in Claim 28, delete “different signal” and
insert - - different - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED APRIL 4, 2016, PAGE 6,
CLAIM 25, LINE 3)

The requested corrections are attached on Form PTO 1050.

Respectfully Submitted

, 2018

DATE

/Ronald J. Ward, Reg#54870/

Ronald J. Ward
Registration No. 54,870
Attorney of Record



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

Table with columns: APPLICATION NO., FILING DATE, FIRST NAMED INVENTOR, ATTORNEY DOCKET NO., CONFIRMATION NO.
Row 1: 14/639,287, 03/05/2015, Erik Dahlman, 4015-9121 / P24241-US3, 7111
Row 2: 24112, 7590, 08/29/2018, COATS & BENNETT, PLLC, 1400 Crescent Green, Suite 300, Cary, NC 27518
Row 3: EXAMINER, LIU, SIMING
Row 4: ART UNIT, PAPER NUMBER, 2413
Row 5: MAIL DATE, DELIVERY MODE, 08/29/2018, PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.



UNITED STATES PATENT AND TRADEMARK OFFICE

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

Patent No.: 9532355
Issue Date: 27 December 2016
Appl. No.: 14/639,287
Filed: 05 March 2015

PART (A) RESPONSE FOR CERTIFICATES OF CORRECTION

This is a decision on the Certificate of Correction request filed ____.

The request for issuance of Certificate of Correction for the above-identified correction(s) under the provisions of 37 CFR 1.322 and/or 1.323 is hereby:

(Check one)

Approved Approved in Part Denied

Comments: _____

PART (B) PETITION UNDER 37 CFR 1.324 OR 37 CFR 1.48

This is a decision on the petition filed ____ to correct inventorship under 37 CFR 1.324.

This is a decision on the request under 37 CFR 1.48, petition filed _____. In view of the fact that the patent has already issued, the request under 37 CFR 1.48 has been treated as a petition to correct inventorship under 37 CFR 1.324.

The petition is hereby: Granted Dismissed

Comment: _____

The patented filed is being forwarded to Certificate of Corrections Branch for issuance of a certificate naming only the actual inventor or inventors.

/UN C CHO/
Supervisory Patent Examiner, Art Unit 2413
Technology Center 2400
Phone: (571)272-7919

Certificates of Correction Branch email: CustomerServiceCoC@uspto.gov CoC Central Phone Number: (703) 756-1814

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 9,532,355 B2
APPLICATION NO. : 14/639287
DATED : December 27, 2016
INVENTOR(S) : Dahlman et al.

Page 1 of 1

It is certified that error appears in the above-identified patent and that said Letters Patent is hereby corrected as shown below:

On the Title Page

In Item (56), under "U.S. PATENT DOCUMENTS", in Column 2, Line 1, delete "Arundale" and insert -- Arundale et al. --, therefor.

On Page 2, in Item (56), under "U.S. PATENT DOCUMENTS", in Column 1, Line 1, delete "Dahlman" and insert -- Dahlman et al. --, therefor.

On Page 2, in Item (56), under "U.S. PATENT DOCUMENTS", in Column 1, Line 4, delete "Love" and insert -- Love et al. --, therefor.

On Page 2, in Item (56), under "U.S. PATENT DOCUMENTS", in Column 1, Line 7, delete "Kashima" and insert -- Kashima et al. --, therefor.

On Page 2, in Item (56), under "U.S. PATENT DOCUMENTS", in Column 1, Line 9, delete "Marinier" and insert -- Marinier et al. --, therefor.

In the Specification

In Column 1, Line 9, delete "2009," and insert -- 2009, now Pat. No. 8,995,357, --, therefor.

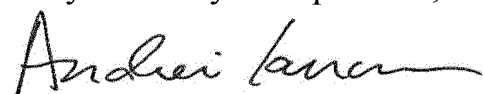
In Column 6, Line 7, delete "baseband processor 150" and insert -- baseband processor 140 --, therefor.

In the Claims

In Column 8, Line 41, in Claim 18, delete "signal" and insert -- subframe --, therefor.

In Column 9, Line 23, in Claim 28, delete "different signal" and insert -- different --, therefor.

Signed and Sealed this
Twenty-fifth Day of September, 2018



Andrei Iancu
Director of the United States Patent and Trademark Office

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court for the Eastern District of Texas on the following

Trademarks or Patents. (the patent action involves 35 U.S.C. § 292.);

DOCKET NO. 2:20-cv-00380-JRG	DATE FILED 12/11/2020	U.S. DISTRICT COURT for the Eastern District of Texas
PLAINTIFF ERICSSON INC. AND TELEFONAKTIEBOLAGET LM ERICSSON		DEFENDANT SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS AMERICA, INC., AND SAMSUNG RESEARCH AMERICA
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED 1/1/2021	INCLUDED BY <input checked="" type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1 8,102,805	1/24/2012	TELEFONAKTIEBOLAGET LM ERICSSON	
2 8,607,130	12/10/2013	TELEFONAKTIEBOLAGET LM ERICSSON	
3 9,949,239	4/17/2018	TELEFONAKTIEBOLAGET LM ERICSSON	
4 9,532,355	5/7/2013	TELEFONAKTIEBOLAGET LM ERICSSON	
5 10,454,655	10/22/2019	TELEFONAKTIEBOLAGET LM ERICSSON	

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
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Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court _____ for the Eastern District of Texas _____ on the following

Trademarks or Patents. (the patent action involves 35 U.S.C. § 292.)

DOCKET NO. 2:20-cv-00380-JRG	DATE FILED 12/11/2020	U.S. DISTRICT COURT for the Eastern District of Texas
PLAINTIFF ERICSSON INC. AND TELEFONAKTIEBOLAGET LM ERICSSON		DEFENDANT SAMSUNG ELECTRONICS CO., LTD., SAMSUNG ELECTRONICS AMERICA, INC., AND SAMSUNG RESEARCH AMERICA
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED 1/1/2021	INCLUDED BY <input checked="" type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading		
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK	
1 10,193,600	1/29/2019	TELEFONAKTIEBOLAGET LM ERICSSON	
2 10,425,817	9/24/2019	TELEFONAKTIEBOLAGET LM ERICSSON	
3 10,516,513	12/24/2019	TELEFONAKTIEBOLAGET LM ERICSSON	
4			
5			

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
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Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy



AO 120 (Rev. 08/10)

TO: Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
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In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Western District of Texas on the following

Trademarks or Patents. (the patent action involves 35 U.S.C. § 292.):

DOCKET NO. 6:22-cv-60	DATE FILED 1/17/2022	U.S. DISTRICT COURT Western District of Texas
PLAINTIFF ERICSSON INC., AND TELEFONAKTIEBOLAGET LM ERICSSON		DEFENDANT APPLE, INC
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1 8,102,805	1/24/2012	ERICSSON
2 9,532,355	12/26/2016	ERICSSON
3 10,425,817	9/24/2019	ERICSSON
4 11,139,872	10/5/2021	ERICSSON
5		

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY <input type="checkbox"/> Amendment <input type="checkbox"/> Answer <input type="checkbox"/> Cross Bill <input type="checkbox"/> Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
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In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
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Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
 Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy