in the LTE system of bandwidth branch carrier after polymerization, indicating the LTE system, resource allocation branch carrier after polymerization include: According to resource allocation granularity bandwidth LTE system branch carrier after polymerization, the bandwidth of the resource block of each branch carrier comprises one or more resource blocks into groups; The bandwidth of the resource block groups including all branches carriers into N resource block group subsets, and <Img class = "EMIRef" id = "102441406-ifm0001" /> Where N is the number of resource block group subset, P is assigned the branch carrier aggregation LTE system after a bandwidth resource granularity, k is an integer of 0; Use bitmap indication of the resource block groups each subset allocation of resource blocks.

[7]

7. The method according to claim 1, characterized in that the system is compatible with the granularity of the resource allocation, to determine the evolution of the system in accordance with a resource allocation granularity after acquired, comprising: Backward compatible with the system, each branch carrier bandwidth granularity resource allocation after obtaining; The particle size distribution of each branch of the system is compatible with the bandwidth resources based carrier after determining the evolution of the system, each branch carrier bandwidth granularity of resource allocation; According to the evolution of the system resource allocation size, indicating the evolution of the system of allocation of resources, including: the resource allocation size evolution system each branch carrier bandwidth, indicating the evolution of the system, the distribution of resources each branch carrier.

[8]

8. The method according to claim 7, characterized in that, after the resource allocation according to the particle size of the carrier is compatible with the system bandwidth of each branch, determining the evolution of the system, each branch carrier is calculated bandwidth granularity of resource allocation: $P = k \times P1$, or, $P = 0.5 \times k \times P1$; wherein the compatible system a branch carrier bandwidth resource allocation granularity, P is the resource allocation granularity LTE system the branch carrier bandwidth P1 after, k is an integer of 2, for $P = 0.5 \times k \times P1$ need to satisfy $(k \times P1) \bmod 2 = 0$.

[9]

9. The method according to claim 7, characterized in that, according to the granularity of the resource allocation in the LTE system of bandwidth each branch carrier, indicating the LTE system, resource allocation of each branch carrier comprising: Evolution of particle size distribution in accordance with a system branch carrier

bandwidth resources, resource blocks of the bandwidth of the LTE system is divided into a branch carrier comprises one or more resource block groups; The set of the resource block into N resource block group subset, and <Img class = "EMIRef" id = "102441406-ifm0002" /> Where N is the number of resource block group subset, P is the evolution of the system allocation granularity of the branch carrier bandwidth, k is an integer of 0; Use bitmap indication of the resource block groups each subset allocation of resource blocks.

[10]

10. The method according to claim 6 or claim 9, characterized in that the indication of the use of a bit map for each resource block group subset allocation of resource blocks comprising: a resource block group subset, with a bit indicating that the resource block group subset allocation of a plurality of resource blocks.

[11]

11. The method according to claim 1, characterized by further comprising: By agreement in a way that static configuration terminal determines the evolution of system resource allocation granularity; Alternatively, by way of unicast allocation granularity transmitted to the terminal evolution system each branch carrier bandwidth resources; Alternatively, by way of radio resource allocation granularity evolution system each branch carrier bandwidth to the terminal.

[12]

12. A network device, characterized by comprising: Resource determination unit for the particle size distribution of resources in the system to be compatible in accordance with acquired after determining the evolution of the system of resource allocation granularity; Resource allocation means for determining resource allocation based on the unit size determined by the evolution of resources in the system, indicating the evolution of the system of allocation of resources.

[13]

13. The network apparatus according to claim 12, characterized in that, The resource determination unit comprises: Get module for a compatible system, the branch carrier bandwidth granularity resource allocation after obtaining; Determining module, according to the particle size distribution for a compatible system to obtain

branch of the module carrier obtained bandwidth resources, determine the evolution of the system, bandwidth resources branch carrier aggregation after allocation granularity; The resource allocation unit comprises: indicating module for resource allocation granularity bandwidth determination module obtained evolution system branch carrier after polymerization, indicating the evolution of the system, the distribution of resources branch carrier after polymerization.

[14]

14. The apparatus of claim 13, wherein: said determining module according to the specific system backwards compatible carriers in all branches of the bandwidth allocation granularity of the resource, determining the evolution of the system, the bandwidth allocation of resources after a branch carrier aggregation particle size; or to determine the configuration of the terminal branches of the carrier in all branches of carriers, the resource allocation size allocated to the terminal branch of the bandwidth of the carrier to determine the LTE system, resource allocation granularity bandwidth branch carrier after polymerization.

[15]

15. The apparatus of claim 13, wherein: The indication module is specifically configured according to the resource allocation granularity bandwidth LTE system carrier aggregation branch after branch resource blocks of bandwidth carriers include one or more resource blocks are divided into groups; each resource block group with a bit indicates ; or the full amount of each resource block groups with a bit indicating the resource block groups in all branches of the carrier is not in full union with a bit indication; or The specific indication module for allocating resources according to bandwidth granularity evolution system after the branch carrier aggregation, resource blocks of bandwidth each branch carrier included into one or more resource block groups; bandwidth carriers include all branches of resource block into N resource block group subset of groups, and <Img class = "EMIRef" id = "10244146-ifm0003" /> Where N is the number of resource blocks subset group, P is the resource allocation granularity bandwidth evolution system branch carrier after polymerization, k is an integer of 0; using a bit map indicating the way each resource block group subsets resources distribution block.

[16]

16. The network apparatus according to claim 12, characterized in that, The resource determination unit comprises: Obtaining module, configured to be compatible system, each branch carrier bandwidth granularity After obtaining the resource allocation; Determining module, the module for obtaining distribution obtained according to the compatibility of the carrier system, each branch of the bandwidth resource granularity,

determining the evolution of the system, each branch carrier bandwidth granularity of resource allocation; The resource allocation unit comprises: indicating module for particle size distribution determination module obtained according to the evolution of the system in each branch carrier bandwidth resources, indicating the evolution of the system, the distribution of resources each branch carrier.

[17]

17. The apparatus of claim 16, wherein: said indication module for resource allocation according to the specific size of a branch carrier LTE system bandwidth, the bandwidth of the LTE system resource block that branch into a carrier comprising or more resource block groups; the group resource block into N resource block group subset, and <Img class = "EMIRef" id = "102441406-ifm0004" /> Where N is the number of resource blocks subset group, P is the evolution of the system allocation granularity of the branch carrier bandwidth, k is an integer of 0; using a bit map indicating the way each resource block group subset of resource blocks assignments.

[18]

18. The apparatus according to claim 12, characterized by further comprising: Notification module, the way for agreement by static configuration or unicast mode, or broadcast, the resource determination module obtained evolution system of resource allocation granularity notification to the terminal.

[19]

19. A radio system comprising: Network equipment for after-compatible system according to the branch of the carrier bandwidth granularity of resource allocation, to determine the evolution of the system, bandwidth resources branch carrier particle size distribution after polymerization, indicating the LTE system, resource allocation branch carrier after polymerization; or, according to the resource allocation size after the system is compatible with the bandwidth of each branch of the carrier to determine the evolution of the system, each branch carrier resource allocation granularity bandwidth indicates the evolution of the system, the distribution of resources each branch carrier.

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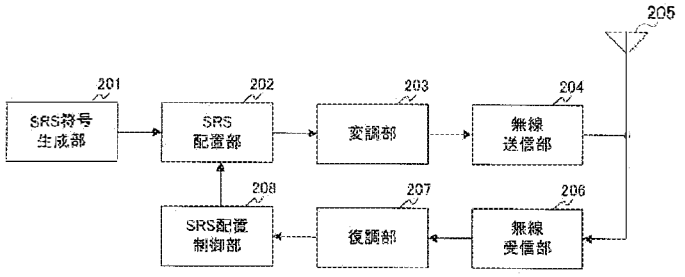
(54) Title: RADIO COMMUNICATION DEVICE AND RADIO COMMUNICATION METHOD

(54) 発明の名称: 無線通信装置及び無線通信方法

[図6]



201 SRS CODE GENERATION UNIT
202 SRS ARRANGEMENT UNIT
203 MODULATION UNIT
204 RADIO TRANSMISSION UNIT
208 SRS ARRANGEMENT CONTROL UNIT
207 DEMODULATION UNIT
206 RADIO RECEPTION UNIT

(57) **Abstract:** Provided is a radio communication device which can prevent interference between SRS and PUCCH when the PUCCH transmission bandwidth fluctuates and suppress degradation of CQI estimation accuracy by the band where no SRS is transmitted. The device includes: an SRS code generation unit (201) which generates an SRS (Sounding Reference Signal) for measuring uplink line data channel quality; an SRS arrangement unit (202) which frequency-multiplexes the SRS on the SR transmission band and arranges it; and an SRS arrangement control unit (208) which controls SRS frequency multiplex so as to be uniform in frequency without modifying the bandwidth of one SRS multiplex unit in accordance with the fluctuation of the reference signal transmission bandwidth according to the SRS arrangement information transmitted from the base station and furthermore controls the transmission interval of the frequency-multiplexed SRS.

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— 国際調査報告書

(57) 要約: ＰＵＣＣＨ送信帯域幅が変動する場合に、ＳＲＳとＰＵＣＣＨとの干渉を防止しつつ、ＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる無線通信装置。この装置において、ＳＲＳ符号生成部（２０１）は、上り回線データチャネルの品質を測定するためのＳＲＳ(Sounding Reference Signal)を生成し、ＳＲＳ配置部（２０２）は、ＳＲＳをＳＲ送信帯域に周波数多重して配置し、ＳＲＳ配置制御部（２０８）は、基地局から送信されるＳＲＳ配置情報に基づき、参照信号送信帯域幅の変動に応じて、ＳＲＳの１多重単位の帯域幅を変更せずに、周波数的に均等となるようにＳＲＳの周波数多重を制御し、さらに周波数多重されたＳＲＳの送信間隔を制御する。

明 細 書

無線通信装置及び無線通信方法

技術分野

[0001] 本発明は、無線通信装置及び無線通信方法に関する。

背景技術

[0002] 現在、３ＧＰＰ ＲＡＮ ＬＴＥ(Third Generation Partnership Project Radio Access Network Long Term Evolution)では、上り回線のSounding Reference Signal(ＳＲＳ)が検討されている。ここで、Soundingとは回線品質を推定することを称し、ＳＲＳは主に、上り回線データチャネルのＣＱＩ(Channel Quality Indicator)推定、および基地局と移動局との間のタイミングオフセット推定を行うために、特定のタイムスロットにおいて時間多重されて送信される。

[0003] また、ＳＲＳの送信方法として、特定のタイムスロットで広帯域で送信し、一度に広帯域にわたるＣＱＩを推定する方法と、周波数帯をずらしながら（周波数ホッピング）狭帯域のＳＲＳを複数のタイムスロットで送信し、数回に分けて広帯域のＣＱＩを推定する方法とが提案されている。

[0004] 一般的に、セル境界付近に存在するＵＥ(User Equipment)は、パスロスが大きく、また最大送信電力が限られている。そのため、広帯域にＳＲＳ送信すると、単位周波数あたりの基地局受信電力が低くなり、受信ＳＮＲ(Signal to Noise Ratio)が低くなるため、その結果、ＣＱＩ推定精度が劣化する。従って、セル境界付近のＵＥは、限られた電力を所定の周波数帯域に絞って送信する狭帯域ＳＲＳ送信方法をとる。逆に、セル中央付近のＵＥは、パスロスが小さくて、広帯域にＳＲＳを送信しても、単位周波数あたりの基地局受信電力は十分確保可能であるため、広帯域ＳＲＳ送信方法をとる。

[0005] 一方、ＳＲＳを送信するもう１つの目的は、基地局と移動局との間のタイミングオフセット推定のためである。従って、定められたタイミング推定精度Δｔを確保するためには、１送信単位（１周波数多重単位）のＳＲＳの帯

域幅は、１／Δｔ以上とする必要がある。すなわち、１送信単位のＳＲＳの帯域幅は、ＣＱＩ推定精度とタイミング推定精度との両方を満足させる必要がある。

[0006] また、ＬＴＥにおいて、上り回線制御チャネルであるＰＵＣＣＨ(Physical Uplink Control Channel)は、システム帯域の両端に周波数多重される。従って、ＳＲＳはシステム帯域から上記ＰＵＣＣＨを除いた帯域で送信される

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[0007] さらに、ＰＵＣＣＨの送信帯域幅(１チャネルのＰＵＣＣＨの帯域幅のチャネル数倍)は、制御データの収容数に応じて変動する。つまり、制御データの収容数が少ない場合は、ＰＵＣＣＨ送信帯域幅が狭く（チャネル数が少なく）なり、逆に制御データの収容数が多い場合は、ＰＵＣＣＨ送信帯域幅が広く（チャネル数が多く）なる。従って、図１に示すように、ＰＵＣＣＨ送信帯域幅が変動するとＳＲＳ送信帯域幅も変動する。図１において、横軸は周波数軸を示し、縦軸は時間軸を示す（以下同様）。なお、以下では、１チャネルのＰＵＣＣＨの帯域幅を単にＰＵＣＣＨ帯域幅と省略し、ＰＵＣＣＨ帯域幅にチャネル数を乗じた帯域幅をＰＵＣＣＨ送信帯域幅と称す。同様に、１送信単位のＳＲＳの帯域幅を単にＳＲＳ帯域幅と省略し、複数送信単位のＳＲＳの帯域幅をＳＲＳ送信帯域幅と称す。

非特許文献1：3GPP R1-072229, Samsung, “Uplink channel sounding RS structure”, 7th-11th May 2007

発明の開示

発明が解決しようとする課題

[0008] ＰＵＣＣＨ送信帯域幅が変動する場合の狭帯域ＳＲＳ送信方法として、非特許文献１には、図２に示すような方法が開示されている。非特許文献１記載のＳＲＳ送信方法においては、図２に示すようにＳＲＳ送信帯域幅を、ＰＵＣＣＨ送信帯域幅が最大となるときのＳＲＳ送信帯域幅に固定し、ＰＵＣＣＨ送信帯域幅が変動してもＳＲＳ送信帯域幅を変更しない。また、図２に示すように、ＳＲＳを狭帯域で送信する際には、ＳＲＳを周波数ホッピング

して送信する。非特許文献１記載の方法によれば、図２下段に示すようにＰＵＣＣＨ送信帯域幅が最大値未満である場合には、ＳＲＳが送信されない帯域が生じ、周波数領域におけるＣＱＩ推定精度が著しく劣化する。

[0009] また、図３Ａに示すように、ＳＲＳ送信帯域幅を、ＰＵＣＣＨ送信帯域幅が最小の時のＳＲＳ送信帯域幅に固定すると、図３Ｂに示すようにＰＵＣＣＨ送信帯域幅が増加した場合には、ＳＲＳとＰＵＣＣＨとの間で干渉が生じ、ＰＵＣＣＨの受信性能が劣化する。

[0010] ＰＵＣＣＨ送信帯域幅が増加した場合に、図３Ｂに示したようなＳＲＳとＰＵＣＣＨとの干渉を防止するためには、図４Ｂに示すように、ＰＵＣＣＨと干渉が生じるＳＲＳの送信を停止する方法が考えられる。ここで、図４Ａは図３Ａと同様であり、説明を明確にするために重複して示した図である。ただし、この方法によれば、ＳＲＳが送信されない帯域が生じてしまい、周波数領域におけるＣＱＩ推定精度が劣化する。

[0011] 本発明の目的は、狭帯域ＳＲＳの送信において、ＰＵＣＣＨ送信帯域幅が変動する場合に、ＳＲＳとＰＵＣＣＨとの干渉を防止しつつ、ＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる無線通信装置および無線通信方法を提供することである。

課題を解決するための手段

[0012] 本発明の無線通信装置は、上り回線データチャネルの品質を測定するための参照信号を生成する生成手段と、前記参照信号を送信する参照信号送信帯域に、前記参照信号を周波数多重して配置する配置手段と、前記参照信号送信帯域幅の変動に応じて、前記参照信号の１多重単位の帯域幅を変更せずに、周波数的に均等となるように前記周波数多重の多重位置を制御する制御手段と、を具備する構成を採る。

[0013] 本発明の無線通信方法は、上り回線データチャネルの品質を推定するための参照信号を生成するステップと、前記参照信号を送信する参照信号送信帯域に、前記参照信号を周波数多重して配置するステップと、前記参照信号送信帯域幅の変動に応じて、前記参照信号の１多重単位の帯域幅を変更せずに

、周波数的に均等となるように前記周波数多重の多重位置を制御するステップと、を有するようにした。

発明の効果

[0014] 本発明によれば、狭帯域ＳＲＳの送信において、ＰＵＣＣＨ送信帯域幅が変動する場合に、ＳＲＳとＰＵＣＣＨとの干渉を防止しつつ、ＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる。

図面の簡単な説明

[0015] [図1]ＰＵＣＣＨ送信帯域幅が変動に応じてＳＲＳ送信帯域幅が変動する様子を示す図（従来）

[図2]ＰＵＣＣＨ送信帯域幅が変動する場合の狭帯域ＳＲＳ送信方法を示す図（従来）

[図3A]ＰＵＣＣＨ送信帯域幅が変動する場合の狭帯域ＳＲＳ送信方法のバリエーションを示す図（従来）

[図3B]ＰＵＣＣＨ送信帯域幅が変動する場合の狭帯域ＳＲＳ送信方法のバリエーションを示す図（従来）

[図4A]ＰＵＣＣＨ送信帯域幅が変動する場合の狭帯域ＳＲＳ送信方法のバリエーションを示す図（従来）

[図4B]ＰＵＣＣＨ送信帯域幅が変動する場合の狭帯域ＳＲＳ送信方法のバリエーションを示す図（従来）

[図5]本発明の実施の形態１に係る基地局の構成を示す図

[図6]本発明の実施の形態１に係る移動局の構成を示す図

[図7]本発明の実施の形態１に係るＳＲＳ配置決定部における処理手順を示すフロー図

[図8A]本発明の実施の形態１に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図8B]本発明の実施の形態１に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図9]本発明の実施の形態２に係るＳＲＳ配置決定部における処理手順を示す

フロー図

[図10A]本発明の実施の形態２に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図10B]本発明の実施の形態２に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図11A]本発明の実施の形態３に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図11B]本発明の実施の形態３に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図12A]本発明の実施の形態４に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図12B]本発明の実施の形態４に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図13A]本発明の実施の形態５に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図13B]本発明の実施の形態５に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図

[図14A]本発明に係るＲＳ配置決定部のバリエーションにおいて決定されたＳＲＳの配置を例示する図（その一）

[図14B]本発明に係るＲＳ配置決定部のバリエーションにおいて決定されたＳＲＳの配置を例示する図（その一）

[図15A]本発明に係るＲＳ配置決定部のバリエーションにおいて決定されたＳＲＳの配置を例示する図（その二）

[図15B]本発明に係るＲＳ配置決定部のバリエーションにおいて決定されたＳＲＳの配置を例示する図（その二）

[図16]本発明に係るＳＲＳ配置定義テーブルの一例を示す図

[図17A]本発明に係るＲＳ配置決定部のバリエーションにおいて決定されたＳＲＳの配置を例示する図（その三）

[図17B]本発明に係るＲＳ配置決定部のバリエーションにおいて決定されたＳＲＳの配置を例示する図（その三）

[図18A]本発明に係るＲＳ配置決定部のバリエーションにおいて決定されたＳＲＳの配置を例示する図（その四）

[図18B]本発明に係るＲＳ配置決定部のバリエーションにおいて決定されたＳＲＳの配置を例示する図（その四）

発明を実施するための最良の形態

[0016] 以下、本発明の実施の形態について、添付図面を参照して詳細に説明する。

[0017] （実施の形態１）

本発明の実施の形態１に係る基地局１００の構成を図５に示し、本発明の実施の形態１に係る移動局２００の構成を図６に示す。

[0018] なお、説明が煩雑になることを避けるために、図５では、本発明と密接に関連するＳＲＳの受信に係わる構成部を示し、上り回線データおよび下り回線データの送受信等に係わる構成部の図示及び説明を省略する。同様に、図６では、本発明と密接に関連するＳＲＳの送信に係わる構成部を示し、上り回線データおよび下り回線データの送受信等に係わる構成部の図示及び説明を省略する。

[0019] 図５に示す基地局１００において、ＳＲＳ配置決定部１０１は、ＰＵＣＣＨチャネル数に基づき周波数／時間領域においてＳＲＳの配置を決定し、決定したＳＲＳ配置に関する情報（以下、ＳＲＳ配置情報と称す）を制御信号生成部１０２およびＳＲＳ抽出部１０８に出力する。なお、ＳＲＳ配置決定部１０１における処理の詳細については後述する。制御信号生成部１０２は、ＳＲＳ配置情報を含む制御信号を生成し、変調部１０３に出力する。変調部１０３は、制御信号を変調し無線送信部１０４に出力する。無線送信部１０４は、変調信号に対しＤ／Ａ変換、アップコンバート、増幅等の送信処理を施し、アンテナ１０５から無線送信する。

[0020] 無線受信部１０６は、アンテナ１０５を介して無線受信した移動局２００

からのＳＲＳに対しダウンコンバート、Ａ／Ｄ変換等の受信処理を施し、復調部１０７に出力する。復調部１０７は、受信したＳＲＳを復調しＳＲＳ抽出部１０８に出力する。ＳＲＳ抽出部１０８は、ＳＲＳ配置決定部１０１からのＳＲＳ配置情報に基づき、周波数／時間領域に配置されたＳＲＳを抽出し、ＣＱＩ/タイミングオフセット推定部１０９に出力する。ＣＱＩ/タイミングオフセット推定部１０９は、ＳＲＳからＣＱＩおよびタイミングオフセットを推定する。

[0021] 図６に示す移動局２００において、ＳＲＳ符号生成部２０１は、上り回線データチャネルの品質を測定するためのＳＲＳとして用いられる符号系列、すなわちＳＲＳ符号を生成しＳＲＳ配置部２０２に出力する。ＳＲＳ配置部２０２は、ＳＲＳ配置制御部２０８の指示に従って、ＳＲＳ符号を周波数／時間領域のリソース上に配置し変調部２０３に出力する。変調部２０３は、ＳＲＳ符号を変調し無線送信部２０４に出力する。無線送信部２０４は、変調信号に対しＤ／Ａ変換、アップコンバート、増幅等の送信処理を施し、アンテナ２０５から無線送信する。

[0022] 無線受信部２０６は、アンテナ２０５を介して無線受信した基地局１００からの制御信号に対しダウンコンバート、Ａ／Ｄ変換等の受信処理を施し、復調部２０７に出力する。復調部２０７は、受信した制御信号を復調しＳＲＳ配置制御部２０８に出力する。ＳＲＳ配置制御部２０８は、復調された制御信号に含まれるＳＲＳ配置情報に従って、ＳＲＳ配置部２０２を制御する。

[0023] 次に、基地局１００のＳＲＳ配置決定部１０１における処理について詳述する。

[0024] 図７は、ＳＲＳ配置決定部１０１における処理手順を示すフロー図である。

[0025] まず、ステップ（以下、「ＳＴ」と記す）１０１０において、ＳＲＳ配置決定部１０１は、所要ＣＱＩ推定精度および所要タイミングオフセット推定精度に基づきＳＲＳ帯域幅を決定する。

[0026] 次いで、ＳＴ１０２０において、ＳＲＳ配置決定部１０１は、システム帯域幅、ＰＵＣＣＨチャネル数、およびＳＲＳ帯域幅に基づき、ＳＲＳの周波数領域での多重数を算出する。具体的に、ＳＲＳの周波数領域での多重数は、システム帯域幅からＰＵＣＣＨ送信帯域幅を除いたＳＲＳ送信帯域幅に、ＳＴ１０１０で１送信単位の帯域幅が決定されたＳＲＳが多重可能な最大数である。すなわち、ＳＲＳの周波数領域での多重数は、ＳＲＳ送信帯域幅を、ＳＴ１０１０で決定されたＳＲＳ帯域幅で除算して得られる商の整数部分となる。ここで、ＰＵＣＣＨ送信帯域幅は、ＰＵＣＣＨチャネル数により決まり、制御データの収容数に応じて変動するものである。

[0027] 次いで、ＳＴ１０３０において、ＳＲＳ配置決定部１０１は、ＳＲＳがＳＲＳ送信帯域幅において所定の時間間隔で周波数ホッピング（周波数多重）するように、ＳＲＳ配置を決定する。具体的には、ＳＲＳ配置決定部１０１は、周波数領域では、ＣＱＩ推定対象となる周波数帯域を均等にカバーするように、時間領域では所定の時間間隔となるように、ＳＲＳを周波数／時間領域に配置すると決定する。

[0028] 図８Ａおよび図８Ｂは、ＳＲＳ配置決定部１０１において決定されたＳＲＳの配置を例示する図である。なお、図８Ａは、ＰＵＣＣＨチャネル数が２である場合を示し、図８Ｂは、ＰＵＣＣＨチャネル数が４である場合を示す。

[0029] 図８Ａおよび図８Ｂにおいて、ＳＲＳ帯域幅は、所要ＣＱＩ推定精度および所要タイミングオフセット推定精度を満たすように決定されたものであり、ＰＵＣＣＨチャネル数、ＳＲＳ送信帯域幅が変動してもＳＲＳ帯域幅を変更しない。

[0030] また、図８Ａおよび図８ＢそれぞれにおけるＰＵＣＣＨチャネル数が異なるため、ＳＲＳ送信帯域幅がそれぞれ異なり、ＳＲＳ送信帯域幅をＳＲＳ帯域幅で除算して得られるＳＲＳ周波数多重数、すなわちＳＲＳホッピング数もそれぞれ異なる。図８ＡにおいてＰＵＣＣＨチャネル数が２である場合には、ＳＲＳ周波数多重数が４となり、図８ＢにおいてＰＵＣＣＨチャネル数

が４である場合には、ＳＲＳ周波数多重数が３となる。

[0031] そして図８に示すように、ＳＲＳ送信帯域においてＳＲＳが周波数多重される位置は、ＳＲＳがＳＲＳ送信帯域、すなわちＣＱＩ推定対象となる周波数帯域を均等にカバーするような位置となる。これにより、ＳＲＳが送信されない帯域は、帯域幅がより小さく数がより多くの帯域に分割されるため、つまり、特定の広い範囲の帯域にわたってＳＲＳが送信されない状況が回避されるため、ＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる。

[0032] このように、本実施の形態によれば、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ帯域幅を固定としたまま、ＣＱＩ推定帯域幅を均等にカバーするようにＳＲＳの配置を変更するため、ＰＵＣＣＨ送信帯域幅が変動する場合に、ＣＱＩ推定精度およびタイミングオフセット推定精度を維持しつつ、ＳＲＳとＰＵＣＣＨとの間の干渉を防止することができ、さらにＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる。

[0033] （実施の形態２）

本発明の実施の形態２に係る基地局および移動局は、実施の形態１に係る基地局および移動局と基本的に同様な構成をとり、基本的に同様な動作を行う。従って、ここではブロック図を図示せず、詳細な説明を省略する。本実施の形態に係る基地局、移動局と、実施の形態１に係る基地局、移動局との相違点は基地局のＳＲＳ配置決定部のみにある。なお、本実施の形態に係る基地局が備えるＳＲＳ配置決定部は、実施の形態１に係る基地局が備えるＳＲＳ配置決定部１●１と一部の処理のみにおいて相違する。

[0034] 以下、本実施の形態に係るＳＲＳ配置決定部の処理について説明する。

[0035] 図９は、本実施の形態に係るＳＲＳ配置決定部における処理手順を示すフロー図である。なお、図９に示す手順は、図７に示した手順と基本的に同様なステップを有しており、同一のステップには同一の符号を付し、その説明を省略する。図９に示す手順は、ＳＴ１０３０の代わりにＳＴ２０３０を有する点のみにおいて、図７に示した手順と相違する。

[0036] ＳＴ２０３０において、ＳＲＳ配置決定部は、まず、下記の式（１）に従ってＳＲＳを周波数／時間領域に配置する時間間隔を算出する。式（１）に従って算出される時間間隔τ（c_{PUCCH}）を用いてＳＲＳが送信されると、ＰＵＣＣＨチャネル数が変動した場合でも、ＣＱＩ推定対象帯域に対するＣＱＩ推定期間が一定となる。

$$\tau(c_{PUCCH}) \fallingdotseq T / n(c_{PUCCH}) \quad \cdots (1)$$

[0037] 式（１）において、Ｔは、ＣＱＩ推定対象帯域に対するＣＱＩ推定期間を示し、c_{PUCCH}はＰＵＣＣＨチャネル数を示す。ｎ（c_{PUCCH}）は、ＰＵＣＣＨチャネル数がc_{PUCCH}である場合のＳＲＳ周波数多重数、すなわち周波数ホッピング数を示す。なお、送信間隔タイムスロットを単位とするため、τ（c_{PUCCH}）は式（１）の右辺の値をタイムスロットに合わせた結果となる。

[0038] また、ＳＴ２０３０において、ＳＲＳ配置決定部は、ＳＲＳがＳＲＳ送信帯域幅において、算出した時間間隔τで周波数多重するように、ＳＲＳ配置を決定する。すなわち、ＳＲＳ配置決定部は、周波数領域ではＣＱＩ推定対象となる周波数帯域を、時間領域ではＣＱＩ推定期間Ｔを均等にカバーするようにＳＲＳを配置すると決定する。

[0039] 図１０Ａおよび図１０Ｂは、本実施の形態に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図である。なお、図１０は図８と基本的に同様であり、重複な説明は省略する。

[0040] 図１０Ａおよび図１０Ｂにおいて、ＳＲＳ送信帯域幅の変動に伴い、ＳＲＳ帯域幅は変更せず、ＳＲＳはＳＲＳ送信帯域を均等にカバーするように周波数多重される。

[0041] また、図１０Ａにおいては、時間間隔τ（２）を用いてＳＲＳを配置し、図１０Ｂにおいては、時間間隔τ（４）を用いてＳＲＳを配置する。すなわち、本実施の形態においては、ＰＵＣＣＨチャネル数が小さくなる場合には、ＳＲＳ送信間隔を短くし、ＰＵＣＣＨチャネル数が大きくなる場合には、ＳＲＳ送信間隔を長くする。これにより、ＰＵＣＣＨチャネル数が変動しても、ＣＱＩ推定期間Ｔは変動しない。

[0042] このように、本実施の形態によれば、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ帯域幅を固定としたまま、ＣＱＩ推定帯域幅を均等にカバーするようにＳＲＳの配置を変更する。このため、ＰＵＣＣＨ送信帯域幅が変動する場合に、ＣＱＩ推定精度およびタイミングオフセット推定精度を維持しつつ、ＳＲＳとＰＵＣＣＨとの間の干渉を防止することができ、さらにＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる。

[0043] さらに、本実施の形態によれば、ＰＵＣＣＨチャネル数が小さくなる場合には、ＳＲＳ送信間隔を短くし、ＰＵＣＣＨチャネル数が大きくなる場合には、ＳＲＳ送信間隔を長くする。このため、ＰＵＣＣＨ送信帯域幅が変動する場合に、ＣＱＩ推定期間を一定に維持することができ、ＣＱＩ推定精度の劣化を防止することができる。

[0044] （実施の形態３）

本発明の実施の形態３に係る基地局および移動局は、実施の形態１に係る基地局および移動局と基本的に同様な構成をとり、基本的に同様な動作を行う。従って、ここではブロック図を図示せず、詳細な説明を省略する。本実施の形態に係る基地局、移動局と、実施の形態１に係る基地局、移動局との相違点は基地局のＳＲＳ配置決定部のみにある。なお、本実施の形態に係る基地局が備えるＳＲＳ配置決定部は、実施の形態１に係る基地局が備えるＳＲＳ配置決定部１０１と一部の処理のみにおいて相違する。

[0045] 以下、本実施の形態に係るＳＲＳ配置決定部において決定されたＳＲＳの配置について説明する。

[0046] 図１１Ａおよび図１１Ｂは、本実施の形態に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図である。なお、図１１は図１０と基本的に同様であり、重複な説明を省略する。

[0047] 図１１Ａおよび図１１Ｂにおいて、ＳＲＳ送信帯域幅の変動に伴い、ＳＲＳ帯域幅は変更せず、ＳＲＳはＳＲＳ送信帯域を均等にカバーするように周波数多重される。

[0048] また、図１１Ａおよび図１１Ｂに示すように、ＳＲＳ周波数多重数は、Ｐ

ＵＣＣＨチャネル数の増減にかかわらず、ＰＵＣＣＨチャネル数が最大の時のＳＲＳ周波数多重数である。ここでは、ＰＵＣＣＨチャネル数の最大値を４とし、ＳＲＳ周波数多重数は３となる。

[0049] また、図１１Ａおよび図１１Ｂに示すように、ＳＲＳの送信間隔は、ＰＵＣＣＨチャネル数の増減にかかわらず、ＰＵＣＣＨチャネル数が最大の時の送信間隔である。ここでは、ＰＵＣＣＨチャネル数の最大値を４とし、送信間隔はτ（４）で表される。図１１に示すような方法によれば、ＰＵＣＣＨチャネル数が変動する度に送信間隔を算出する必要がなく、ＳＲＳ配置の決定処理を簡略化できる。

[0050] このように、本実施の形態によれば、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ帯域幅を固定としたまま、ＣＱＩ推定帯域幅を均等にカバーするようにＳＲＳの配置を変更する。このため、ＰＵＣＣＨ送信帯域幅が変動する場合に、ＣＱＩ推定精度およびタイミングオフセット推定精度を維持しつつ、ＳＲＳとＰＵＣＣＨとの間の干渉を防止することができ、さらにＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる。

[0051] さらに、本実施の形態によれば、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ周波数多重数およびＳＲＳ送信間隔を変化せずＳＲＳを配置するため、ＳＲＳ配置処理を簡略化することができる。

[0052] （実施の形態４）

本発明の実施の形態４においては、ＰＵＣＣＨ送信帯域の変動に伴い、複数の移動局からのＳＲＳの配置方法について説明する。

[0053] 本発明の実施の形態４に係る基地局および移動局は、実施の形態１に係る基地局および移動局と基本的に同様な構成をとり、基本的に同様な動作を行う。従って、ここではブロック図を図示せず、詳細な説明を省略する。本実施の形態に係る基地局、移動局と、実施の形態１に係る基地局、移動局との相違点は基地局のＳＲＳ配置決定部のみにある。なお、本実施の形態に係る基地局が備えるＳＲＳ配置決定部は、実施の形態１に係る基地局が備えるＳＲＳ配置決定部１０１と一部の処理のみにおいて相違する。

[0054] 以下、本実施の形態に係るＳＲＳ配置決定部において決定されたＳＲＳの配置について説明する。

[0055] 図１２Ａおよび図１２Ｂは、本実施の形態に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図である。なお、図１２は図８と基本的に同様であり、重複な説明を省略する。

[0056] 図１２Ａおよび図１２Ｂにおいて、ＳＲＳ送信帯域幅の変動に伴い、ＳＲＳ帯域幅は変更せず、ＳＲＳはＳＲＳ送信帯域を均等にカバーするように周波数多重される。

[0057] また、図１２Ａおよび図１２Ｂに示すように、本実施の形態に係るＳＲＳ配置決定部は、ＰＵＣＣＨ送信帯域の変動に伴い、所定の周波数帯域におけるＳＲＳのホッピングパターンを変更せず、ＳＲＳを配置する。逆に、変更となるＳＲＳ配置は、異なるホッピングパターン間で同じ帯域となるように制御する。具体的には、ＰＵＣＣＨ送信帯域幅の増減に応じて、特定の帯域に配置したＳＲＳの送信をＯＮ／ＯＦＦすることによって、その他の帯域のホッピングパターンを変更しなくてもすむ。

[0058] このように、本実施の形態によれば、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ帯域幅を固定としたまま、ＣＱＩ推定帯域幅を均等にカバーするようにＳＲＳの配置を変更する。このため、ＰＵＣＣＨ送信帯域幅が変動する場合に、ＣＱＩ推定精度およびタイミングオフセット推定精度を維持しつつ、ＳＲＳとＰＵＣＣＨとの間の干渉を防止することができ、さらにＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる。

[0059] さらに、本実施の形態によれば、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳのホッピングパターンを変更せず、ＳＲＳを周波数／時間領域に配置するため、ＰＵＣＣＨ送信帯域幅が変動する場合に、移動局多重数、および各移動局のＣＱＩ推定対象帯域に対するＣＱＩ推定期間を維持することができる。

[0060] （実施の形態５）

本発明の実施の形態５に係る基地局および移動局は、実施の形態１に係る

基地局および移動局と基本的に同様な構成をとり、基本的に同様な動作を行う。従って、ここではブロック図を図示せず、詳細な説明を省略する。本実施の形態に係る基地局、移動局と、実施の形態１に係る基地局、移動局との相違点は基地局のＳＲＳ配置決定部のみにある。なお、本実施の形態に係る基地局が備えるＳＲＳ配置決定部は、実施の形態１に係る基地局が備えるＳＲＳ配置決定部１０１と一部の処理のみにおいて相違する。

[0061] 以下、本実施の形態に係るＳＲＳ配置決定部において決定されたＳＲＳの配置について説明する。

[0062] 図１３Ａおよび図１３Ｂは、本実施の形態に係るＳＲＳ配置決定部において決定されたＳＲＳの配置を例示する図である。

[0063] 図１３Ａおよび図１３Ｂにおいて、ＳＲＳ送信帯域幅の変動に伴い、ＳＲＳ帯域幅は変更せず、ＳＲＳはＳＲＳ送信帯域を均等にカバーするように周波数多重される。

[0064] また、図１３Ａおよび図１３Ｂにおいて、ＳＲＳ周波数多重数は、ＰＵＣＣＨチャネル数が最小の時のＳＲＳ周波数多重数であり、ＰＵＣＣＨチャネル数の増減にかかわらず固定となる。図１３Ａおよび図１３Ｂにおいて、ＰＵＣＣＨチャネル数の最小値は２であり、ＳＲＳ周波数多重数は４である。

[0065] また、図１３Ａおよび図１３Ｂにおいて、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ送信帯域が変動するものの、ＳＲＳ周波数多重数が固定となるため、複数のＳＲＳの一部が重なるようにＳＲＳを周波数領域に配置する。

[0066] また、図１３Ａおよび図１３Ｂにおいて、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ周波数多重数が変動しないため、ＳＲＳ送信間隔も変動しない。

[0067] このように、本実施の形態によれば、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ帯域幅を固定としたまま、ＣＱＩ推定帯域幅を均等にカバーするようにＳＲＳの配置を変更する。このため、ＰＵＣＣＨ送信帯域幅が変動する場合に、ＣＱＩ推定精度およびタイミングオフセット推定精度を維持しつつ、ＳＲＳとＰＵＣＣＨとの間の干渉を防止することができ、さらにＳＲＳが

送信されない帯域によるＣＱＩ推定精度の劣化を抑えることができる。

[0068] さらに、本実施の形態によれば、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳ周波数多重数を変更せず、周波数多重されるＳＲＳの一部の帯域が重なるようにＳＲＳを配置するため、ＣＱＩ推定精度をさらに向上し、ＳＲＳが送信されない帯域によるＣＱＩ推定精度の劣化を防止することができる。

[0069] 以上、本発明の実施の形態について説明した。

[0070] なお、上記各実施の形態においてあげられたＰＵＣＣＨチャネル数、例えば２、または４は、例としてあげられたものであり、これに限定するものではない。

[0071] また、上記各実施の形態では、ＳＲＳ送信帯域はシステム帯域からＰＵＣＣＨ送信帯域を除いた帯域である場合を例にとって説明したが、本発明はこれに限定されず、ＳＲＳ送信帯域はＰＵＣＣＨチャネル数の増減に応じて変動する特定の帯域でも良い。

[0072] また、上記各実施の形態では、ＰＵＣＣＨチャネル数の増減に伴いＳＲＳ帯域幅を変更せず、ＳＲＳがＳＲＳ送信帯域に周波数多重される位置を変更する場合を例にとって説明したが、本発明はこれに限定されず、ＰＵＣＣＨチャネル数の増減に伴い、ＳＲＳがＳＲＳ送信帯域に多重される位置を変更し、さらにＳＲＳ帯域幅を変更しても良い。ただし、ＳＲＳ帯域幅の変動は、ＣＱＩ推定精度、タイミングオフセット推定精度の劣化が無視できる範囲内において、例えば±１～２ＲＢ以内において限定される必要があり、この限定によってＣＱＩ推定精度の劣化を抑えることができる。ここで、ＲＢ(Resource Block)とは、無線リソース上の特定の範囲を表す単位である。図１４Ａは、所定範囲内においてＳＲＳ帯域を拡張する場合を例示する図であり、図１４Ａにおいて拡張される帯域の範囲は１ＲＢ以下である。また、ここでＳＲＳ帯域幅の拡張、および短縮は、ＣＡＺＡＣ(Constant Amplitude Zero Auto-Correlation)系列、またはＣＡＺＡＣと同様な性質を有する系列のcyclic extension、およびtruncationにしても良い。

[0073] また、上記各実施の形態で、狭帯域ＳＲＳでＣＱＩ推定できなかった上り

回線データチャネルを、広帯域ＳＲＳを送信している移動局に優先的に割り当てることが考えられる。図１４Ｂは、狭帯域ＳＲＳでＣＱＩ推定できなかった上り回線データチャネルを、広帯域ＳＲＳを送信している移動局に優先的に割り当てる場合を説明するための図である。上記、パケット割当方法により、周波数スケジューリング効果の低下を防止することが可能となる。

[0074] また、図１５Ａに示す通り、ＳＲＳの配置は、ＰＵＣＣＨと隣接させても良い。さらに、図１５Ｂに示す通り、ホッピング周期毎に異なるＳＲＳ配置としても良い。

[0075] また、ＳＲＳは、単にパイロット信号、参照信号、リファレンス信号などと呼ばれる場合がある。

[0076] また、ＳＲＳに使用する既知信号としては、ＣＡＺＡＣ系列、またはＣＡＺＡＣと同様な性質を有する系列を用いて良い。

[0077] また、上記各実施の形態に係る基地局において得られたＳＲＳ配置情報は、Ｌ１／Ｌ２control channelであるＰＤＣＣＨ(Physical Downlink Control Channel)を用いて移動局に通知されても良く、またはＬ３ messageとしてＰＤＳＣＨ(Physical Downlink Shared Channel)を用いて移動局に通知されても良い。

[0078] また、上記各実施の形態において、上り回線は、ＬＴＥで用いられているＤＦＴ－ｓ－ＯＦＤＭ (Discrete Fourier Transform-s-Orthogonal Frequency Division Multiplexing) 構成をとっても良い。

[0079] また、上記各実施の形態において、下り回線は、ＬＴＥで用いられているＯＦＤＭ構成をとっても良い。

[0080] また、上記各実施の形態に係るＳＲＳ配置情報は、報知チャネル、例えば、ＢＣＨ(Broadcast Channel)で通知されるＰＵＣＣＨ構成情報と一意的に予め関連付けられても良い。これにより、ＵＥ毎にＳＲＳ配置情報を送信する必要がなくなるため、シグナリングオーバヘッド(Signaling Overhead)が低減される。例えば、以下のように、ＰＵＣＣＨチャネル数から各ＵＥがＳＲＳ配置を算出しても良い。

[0081] 以下、ＰＵＣＣＨチャネル数からＳＲＳ配置を算出する算出式の一例を示す。

[0082] ＳＲＳの周波数領域の配置開始サブキャリアを$k_{\bullet}$とすると、k_0は下記の式（２）のように表される。

[数1]

$$k_0 = k_{RB}(n) \cdot N_{SC}^{RB} \quad \cdots (2)$$

[0083] 式（２）において、ｎは周波数領域でのＳＲＳ多重番号を示し、N_{sc}^{RB}は、１ＲＢあたりのサブキャリア(sub-carrier)数を示す。また、k_{RB}（ｎ）は、周波数多重番号ｎのＳＲＳが配置されるＲＢの番号を示し、下記の式（３）または（４）で表される。

[数2]

$$k_{RB}(n) = n \cdot N_{SRS}^{BASE} + \left\lfloor (n+1) \cdot \frac{N_{RB}^{UL} - N_{RB}^{PUCCH} - N_{SRS}^{BASE} \cdot N_{SRS}}{N_{SRS}+1} \right\rfloor + \left\lfloor \frac{N_{RB}^{PUCCH}}{2} \right\rfloor \quad n = 0,1,\ldots,N_{SRS}-1$$

$$\cdots (3)$$

[数3]

$$k_{RB}(n) = n \cdot N_{SRS}^{BASE} + \left\lfloor (2n+1) \cdot \frac{N_{RB}^{UL} - N_{RB}^{PUCCH} - N_{SRS}^{BASE} \cdot N_{SRS}}{2N_{SRS}} \right\rfloor + \left\lfloor \frac{N_{RB}^{PUCCH}}{2} \right\rfloor \quad n = 0,1,\ldots,N_{SRS}-1$$

$$\cdots (4)$$

[0084] 式（３）および式（４）において、N_{SRS}はＳＲＳ周波数多重数を示し、下記の式（５）で表される。

[数4]

$$N_{SRS} = \left\lfloor \frac{N_{RB}^{UL} - N_{RB}^{PUCCH}}{N_{SRS}^{BASE}} \right\rfloor \quad \cdots (5)$$

[0085] 式（３）、（４）、および（５）において、N_{RB}^{PUCCH}は、ＰＵＣＣＨ送信帯域に含まれるＲＢ数を示し、N_{RB}^{UL}は、システム帯域に含まれるＲＢ数を示す。N_{SRS}^{BASE}は、ＳＲＳ帯域幅に含まれるＲＢ数を示す。

[0086] 上記パラメータのうち、N_{RB}^{PUCCH}以外はシステムパラメータであるため、一度シグナリング、あるいは報知されれば、固定的に用いることができる。従って、移動局はN_{RB}^{PUCCH}が与えられれば、上記の式（２）～式（５）

に従ってＳＲＳ配置を導出することができる。ここで、N_{RB}^{PUCCH}はＰＵＣＣＨチャネル数により決まるパラメータであるため、移動局は、基地局からＰＵＣＣＨチャネル数が与えられればＳＲＳ配置を導出し、ＳＲＳを送信することができる。

[0087] また、移動局は、上記の式（２）～式（５）の代わりに、ＳＲＳ配置定義テーブルを参照して、ＰＵＣＣＨチャネル数からＳＲＳ配置を得て、ＳＲＳを送信しても良い。図１６は、ＳＲＳ配置定義テーブルの一例を示す図である。図１６に示すＳＲＳ配置定義テーブルは、ＰＵＣＣＨチャネル数が１、および４の場合のＳＲＳ配置ＲＢ番号を定義したテーブルである。また、ｔはホッピング周期における送信タイミングを示す。また、図１６に示すように、異なるＳＲＳ多重番号ｎに応じて、ホッピングパターンも異なる。また、テーブル中の「－」はＳＲＳを割り当てないことを示す。移動局は、ＳＲＳ配置定義テーブルを保持することにより、基地局からＰＵＣＣＨチャネル数が与えられればＳＲＳ配置を得て、ＳＲＳを送信することができる。

[0088] また、ＰＵＣＣＨ構成情報と一意的に予め関連付けられる情報として、ＳＲＳ配置情報の他に、上記ＳＲＳ帯域幅の可変情報や、ＳＲＳ系列情報といった他のＳＲＳ構成情報でも良い。

[0089] また、上記各実施の形態では、１つのＳＲＳ送信帯域幅に対して、狭帯域のＳＲＳ帯域幅を周波数領域において均等にカバーする例を挙げて説明した。しかし本発明はこれに限定されない。本発明では、１つのＳＲＳ送信帯域幅を複数のより帯域幅の小さなＳＲＳ送信帯域幅（以下、ＳＲＳサブバンドと称す）に分割し、それぞれのＳＲＳサブバンドの帯域幅に対して、狭帯域のＳＲＳ帯域幅を周波数領域において均等にカバーするように配置しても良い。

[0090] １つのＳＲＳ送信帯域幅に対して２つのＳＲＳサブバンド１，２を設け、各サブバンドに３つのＳＲＳが配置される場合の例を図１７Ａおよび図１７Ｂに示す。

[0091] 図１７Ａに示す例のように、ＳＲＳサブバンド１内に配置されるＳＲＳの

配置および間隔は、ＳＲＳサブバンド１の帯域幅の変動に対応してＳＲＳサブバンド１内でＣＱＩ推定帯域幅を均等にカバーするように変更される。同様にＳＲＳサブバンド２内に配置されるＳＲＳの配置および間隔は、ＳＲＳサブバンド２の帯域幅の変動に対応してＳＲＳサブバンド２内でＣＱＩ推定帯域幅を均等にカバーするように変更される。

[0092] また、図１７Ｂに示す例のように、ＳＲＳサブバンドの帯域幅がそれぞれ異なっていても良い。この場合は、ＳＲＳサブバンド内のＳＲＳの配置および間隔を、ＳＲＳサブバンド毎に、ＣＱＩ推定帯域幅を均等にカバーするように変更すると良い。

[0093] なお、図１７Ａおよび図１７ＢではＳＲＳサブバンド数が２の場合を一例に挙げた。しかし本発明では、ＳＲＳサブバンド数は３以上であっても良い。また、図１７Ａおよび図１７ＢではＳＲＳサブバンド内のＳＲＳ数が３の場合を一例に挙げた。しかし本発明では、ＳＲＳサブバンド内に３以外の複数のＳＲＳが配置されても良い。

[0094] また、上記各実施の形態では、ＳＲＳ送信帯域幅内においてＳＲＳと隣り合うＳＲＳの周波数間隔も均等になるような配置例を挙げて説明した。しかし実際のシステムにおいては、ＳＲＳ帯域幅やＳＲＳの周波数割当位置は離散的な値をとる。したがって、ＳＲＳ送信帯域幅が１つのＳＲＳ帯域幅で割り切れない場合が発生する。このような場合、割り切れずに残る端数の周波数割当単位を利用せずに、割り切れる範囲の周波数領域にＣＱＩ推定帯域幅を均等にカバーするようにＳＲＳを配置しても良い（図１８Ａ）。または、割り切れずに残る端数の周波数割当単位を各ＳＲＳの間に１つずつ割り当てる構成をとるようにしても良い（図１８Ｂ）。

[0095] ここで、図１８Ａおよび図１８ＢのＲＢ（Resource Block）は周波数領域における割当単位を表す。図１８Ａおよび図１８Ｂは、ＳＲＳ帯域幅を４ＲＢ、ＳＲＳ送信帯域幅を１８ＲＢとした場合の一例である。

[0096] また、上記各実施の形態では、ＳＲＳがＳＲＳ送信帯域幅において所定の時間間隔で周波数ホッピング（周波数多重）する場合について説明した。し

かし本発明はこれに限定されない。本発明は、周波数ホッピングを行わない場合においても、上記各実施の形態で述べた効果と同様の効果を得ることができる。

[0097] 上記各実施の形態におけるＳＲＳの配置は、ＲＢ単位でも、サブキャリア単位でも良く、いずれかに限定されるものではない。

[0098] また、回線品質情報を示すＣＱＩは、ＣＳＩ(Channel State Information)などと表されることがある。

[0099] また、基地局装置は、Node B、移動局装置はＵＥと表現されることもある。

[0100] また、上記各実施の形態では、本発明をハードウェアで構成する場合を例にとって説明したが、本発明はソフトウェアで実現することも可能である。

[0101] また、上記各実施の形態の説明に用いた各機能ブロックは、典型的には集積回路であるＬＳＩとして実現される。これらは個別に１チップ化されても良いし、一部または全てを含むように１チップ化されても良い。ここでは、ＬＳＩとしたが、集積度の違いにより、ＩＣ、システムＬＳＩ、スーパーＬＳＩ、ウルトラＬＳＩと呼称されることもある。

[0102] また、集積回路化の手法はＬＳＩに限るものではなく、専用回路または汎用プロセッサで実現しても良い。ＬＳＩ製造後に、プログラムすることが可能なＦＰＧＡ(Field Programmable Gate Array)や、ＬＳＩ内部の回路セルの接続や設定を再構成可能なリコンフィギュラブル・プロセッサーを利用しても良い。

[0103] さらには、半導体技術の進歩または派生する別技術によりＬＳＩに置き換わる集積回路化の技術が登場すれば、当然、その技術を用いて機能ブロックの集積化を行っても良い。バイオ技術の適用等が可能性としてありえる。

[0104] ２００７年８月１４日出願の特願２００７－２１１５４８および２００８年２月５日出願の特願２００８－０２５５３５の日本出願に含まれる明細書、図面および要約書の開示内容は、すべて本願に援用される。

産業上の利用可能性

[0105] 本発明は、移動体通信システム等に適用することができる。

請求の範囲

[1] 上り回線データチャネルの品質を測定するための参照信号を生成する生成手段と、

前記参照信号を送信する参照信号送信帯域に、前記参照信号を周波数多重して配置する配置手段と、

前記参照信号送信帯域幅の変動に応じて、前記参照信号の１多重単位の帯域幅を変更せずに、周波数的に均等となるように前記周波数多重の多重位置を制御する制御手段と、

を具備する無線通信装置。

[2] 前記制御手段は、

前記参照信号送信帯域幅の変動に応じて前記参照信号の周波数多重数を変更する、

請求項１記載の無線通信装置。

[3] 前記制御手段は、

さらに前記周波数多重された前記参照信号の全体的な送信期間を一定とし、前記参照信号が時間的に均等に送信されるように送信間隔を制御する、

請求項１記載の無線通信装置。

[4] 前記制御手段は、

前記参照信号の周波数多重数および前記送信間隔を、前記参照信号送信帯域幅の変動にかかわらず、前記参照信号送信帯域幅が最小時の値に固定する、

請求項３記載の無線通信装置。

[5] 前記制御手段は、

前記参照信号の周波数多重数および前記送信間隔を、前記参照信号送信帯域幅の変動にかかわらず、前記参照信号送信帯域幅が最大時の値に固定し、周波数多重される前記参照信号の一部の帯域が重なるように制御を行う、

請求項３記載の無線通信装置。

[6] 前記制御手段は、

前記参照信号送信帯域幅の変動にかかわらず、周波数／時間領域における前記参照信号の所定の帯域のホッピングパターンを変更しない、

請求項１記載の無線通信装置。

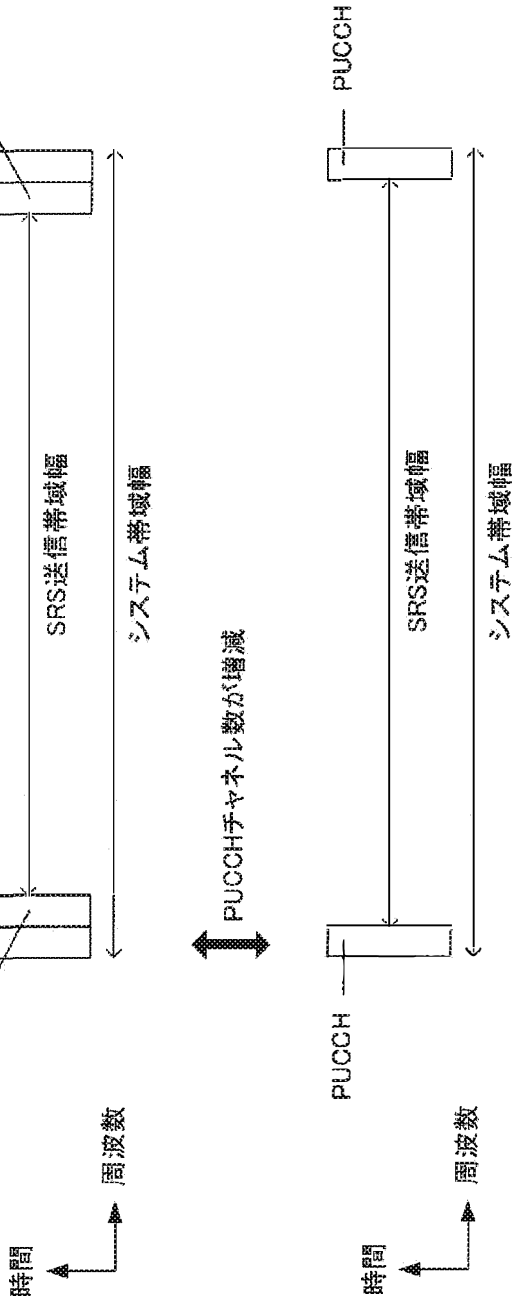
[7] 上り回線データチャネルの品質を推定するための参照信号を生成するステップと、

前記参照信号を送信する参照信号送信帯域に、前記参照信号を周波数多重して配置するステップと、

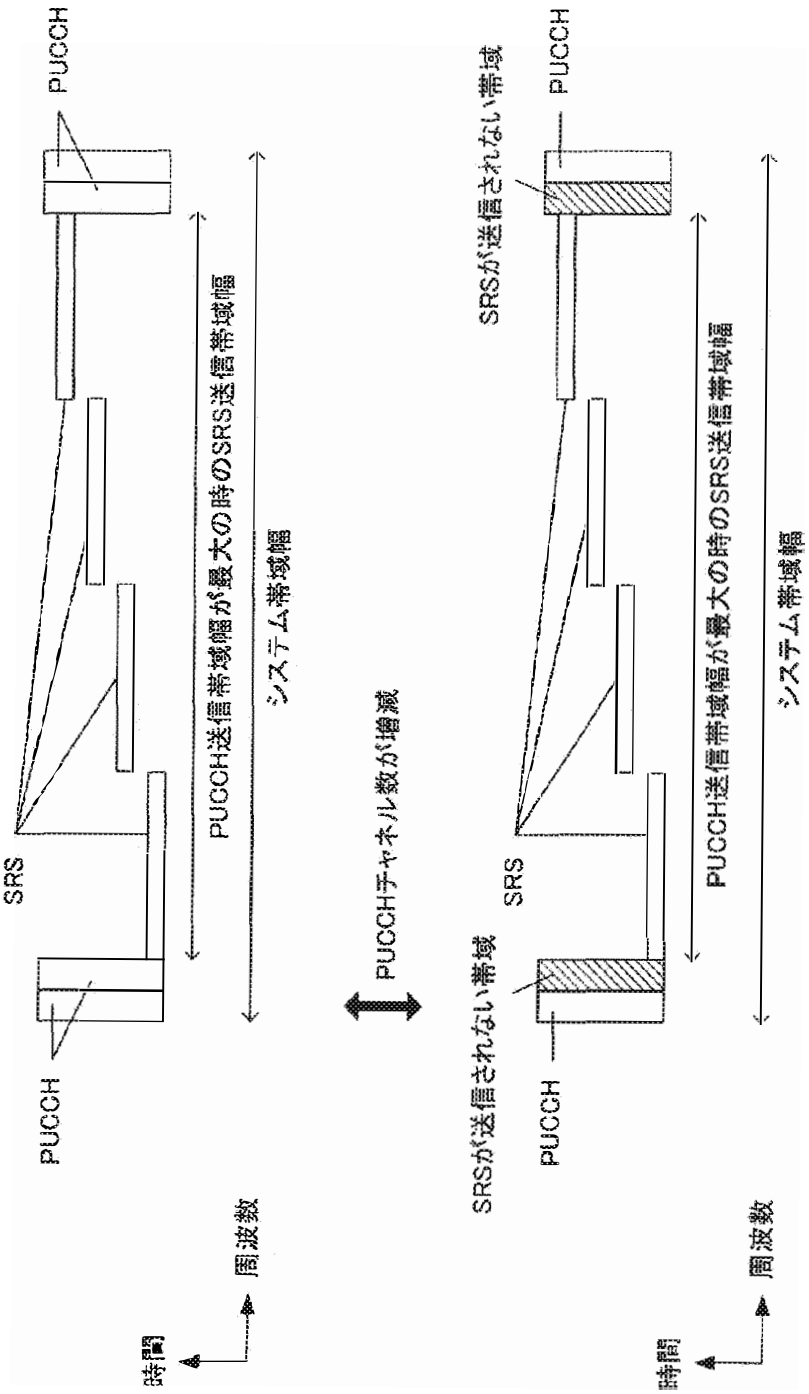
前記参照信号送信帯域幅の変動に応じて、前記参照信号の１多重単位の帯域幅を変更せずに、周波数的に均等となるように前記周波数多重の多重位置を制御するステップと、

を具備する無線通信方法。

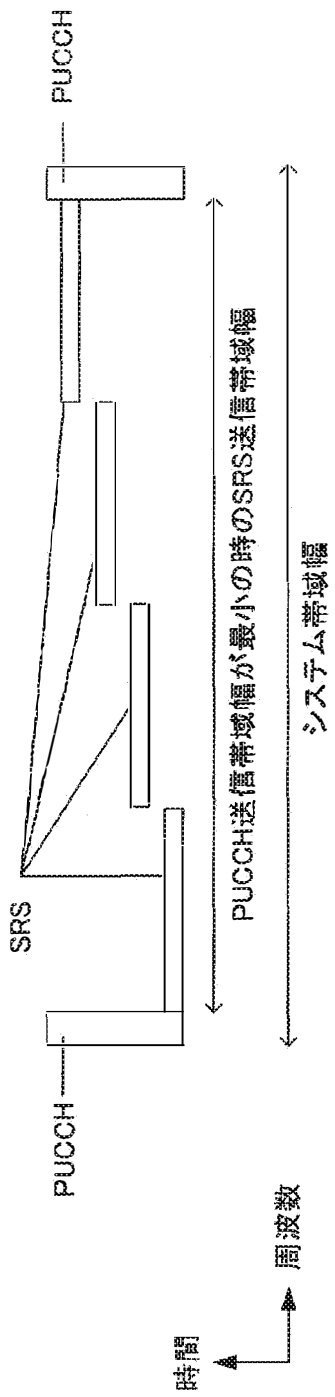
[図1]


PUCCH
SRS送信帯域幅
システム帯域幅
PUCCH
PUCCHチャネル数が増減
PUCCH
SRS送信帯域幅
システム帯域幅
PUCCH
時間
周波数
時間
周波数

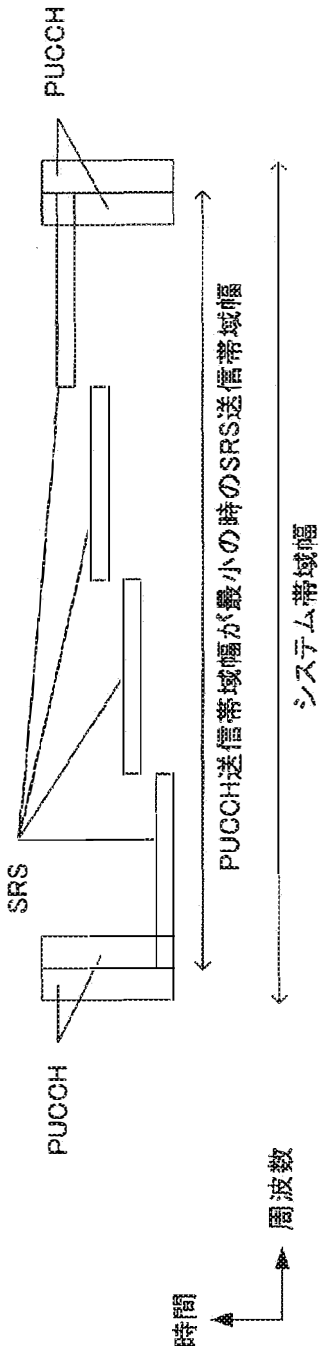
[図2]



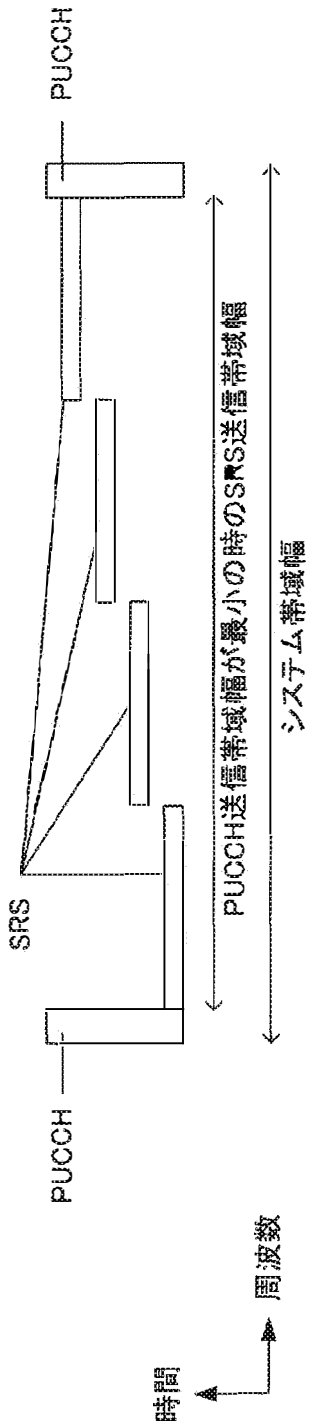
[図3A]



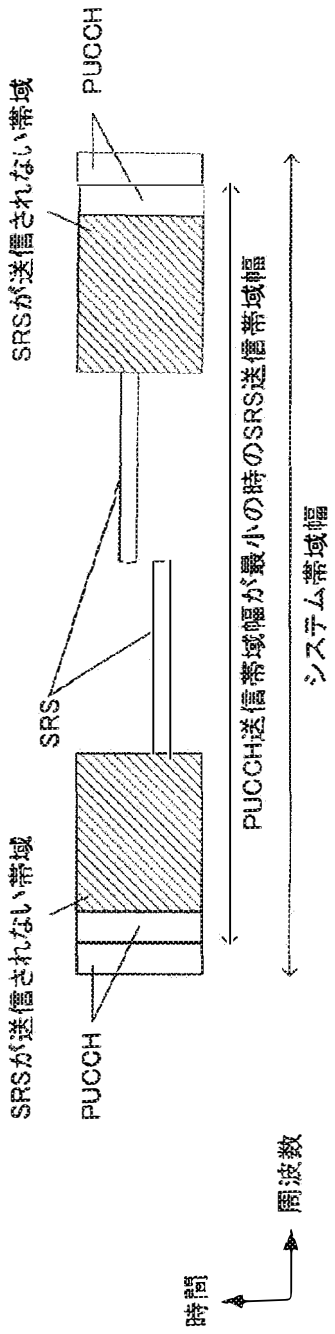
[図3B]



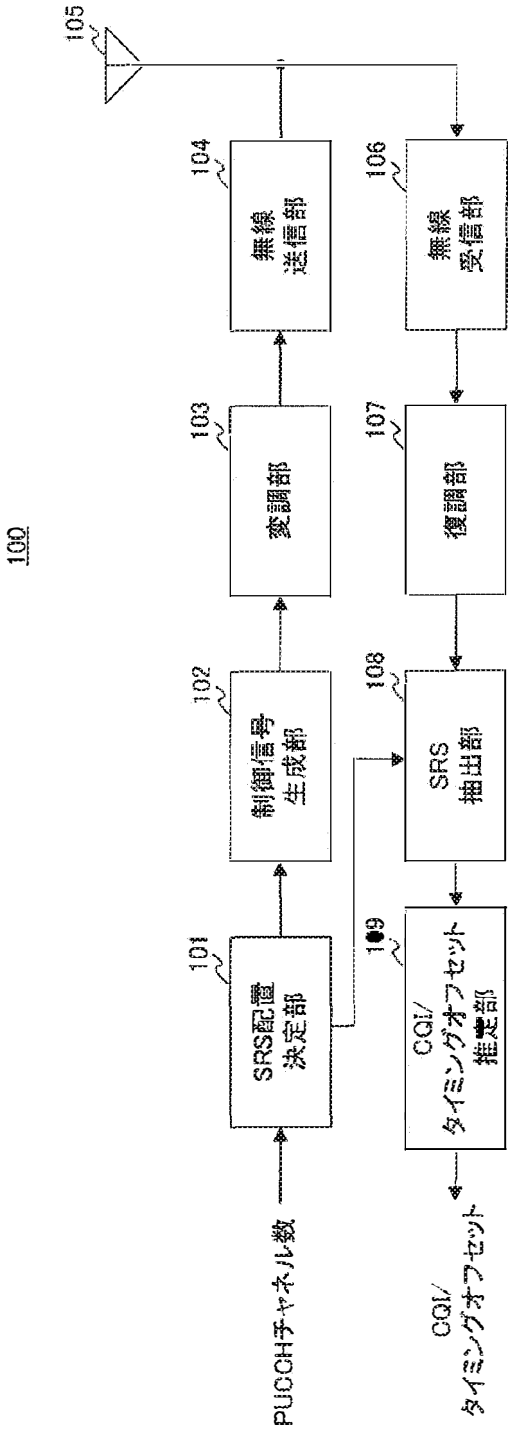
[図4A]



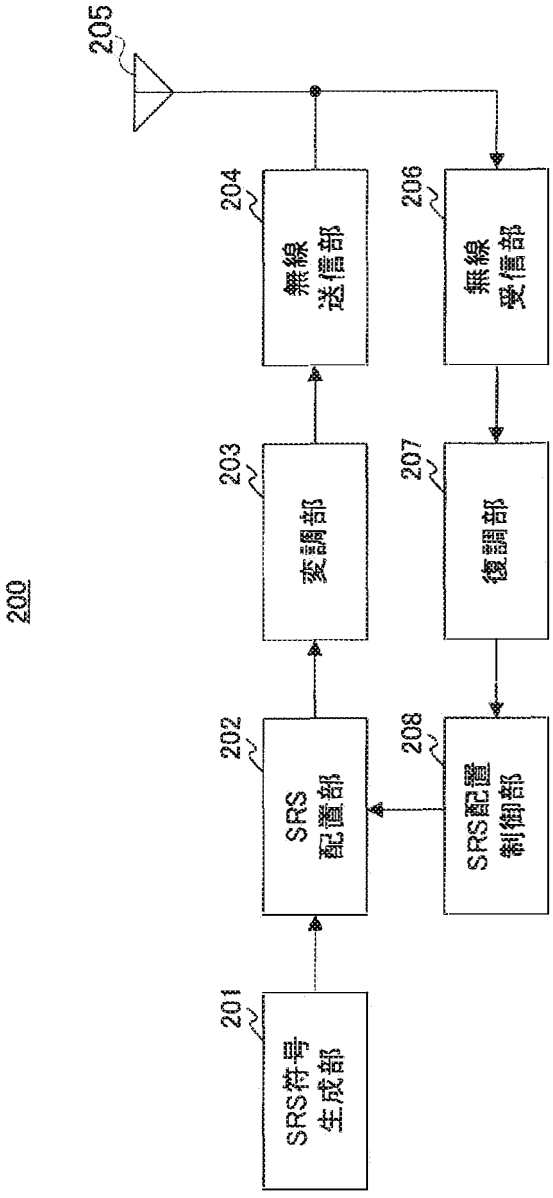
[図4B]


PUCCH
SRSが送信されない帯域
SRS
PUCCH送信帯域幅が最小の時のSRS送信帯域幅
システム帯域幅
SRSが送信されない帯域
PUCCH
時間
周波数

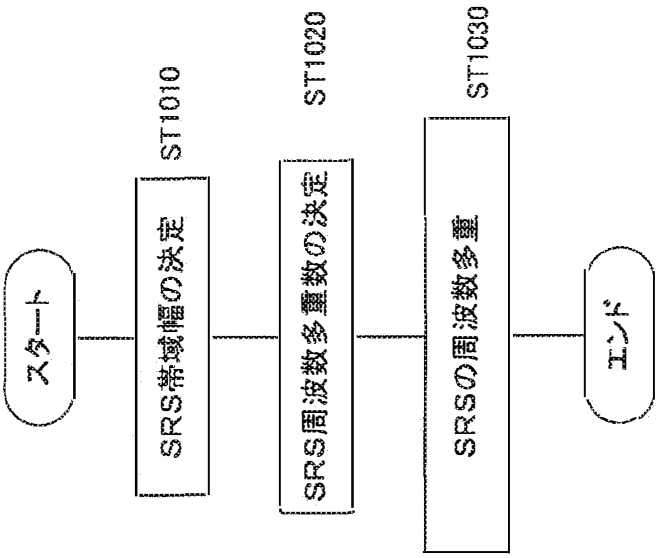
[図5]


100
105
104
無線送信部
106
無線受信部
103
変調部
107
復調部
102
制御信号生成部
108
SRS抽出部
101
SRS配置決定部
109
CQI/タイミングオフセット推定部
PUCCHチャネル数
CQI/タイミングオフセット

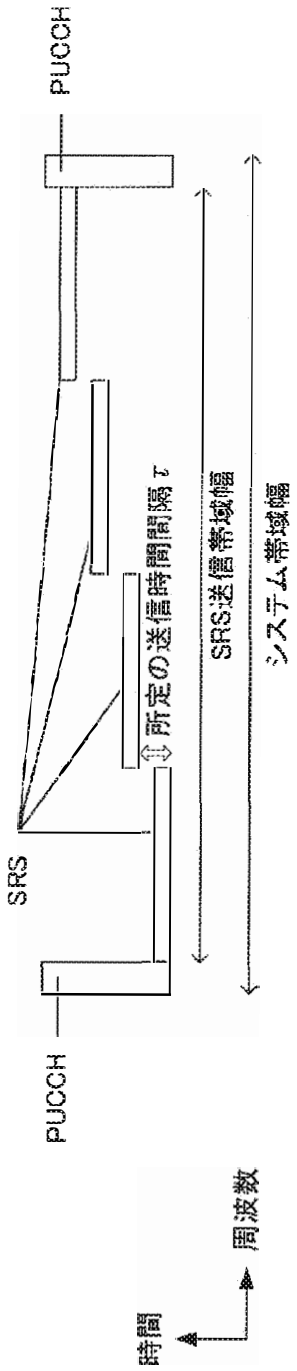
[図6]


200
205
204
無線送信部
206
無線受信部
203
変調部
207
復調部
202
SRS配置部
208
SRS配置制御部
201
SRS符号生成部

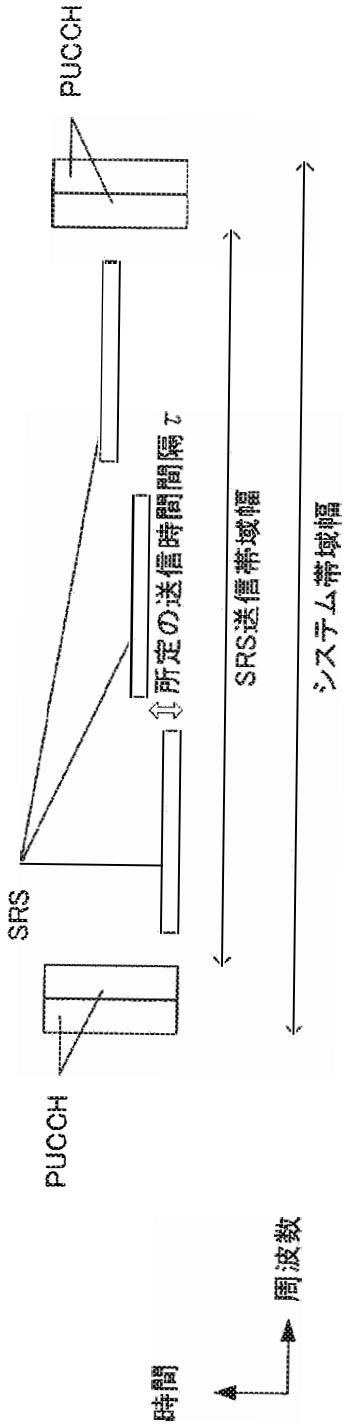
[図7]


スタート
ST1010
SRS帯域幅の決定
ST1020
SRS周波数多重数の決定
ST1030
SRSの周波数多重
エンド

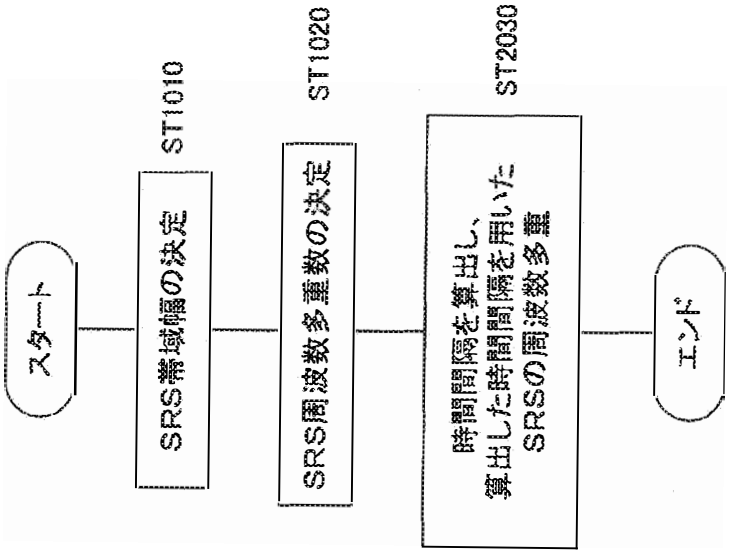
[図8A]



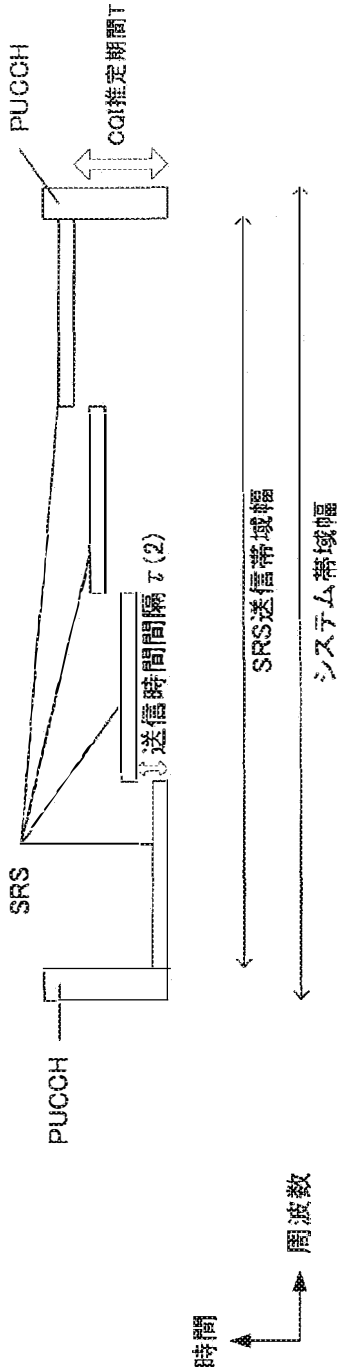
[図8B]



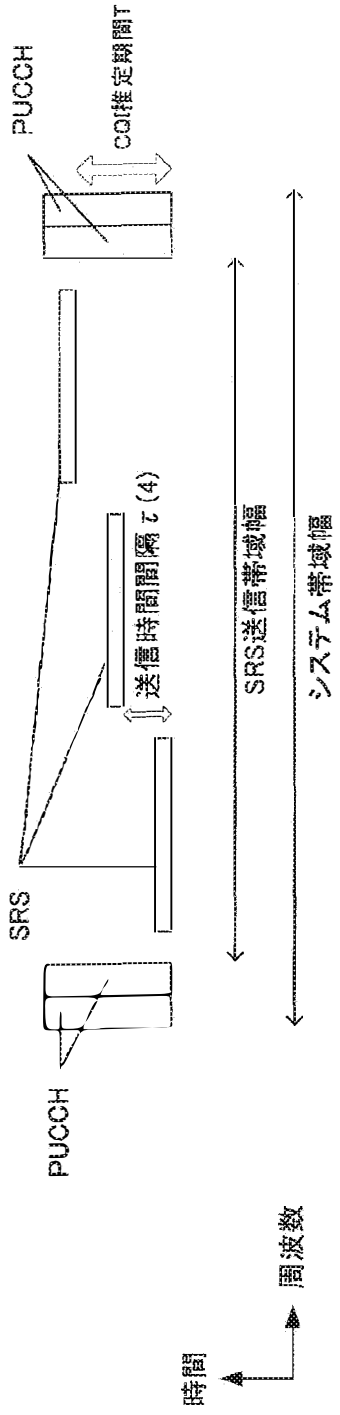
[図9]


スタート
ST1010
SRS帯域幅の決定
ST1020
SRS周波数多重数の決定
ST2030
時間間隔を算出し、
算出した時間間隔を用いた
SRSの周波数多重
エンド

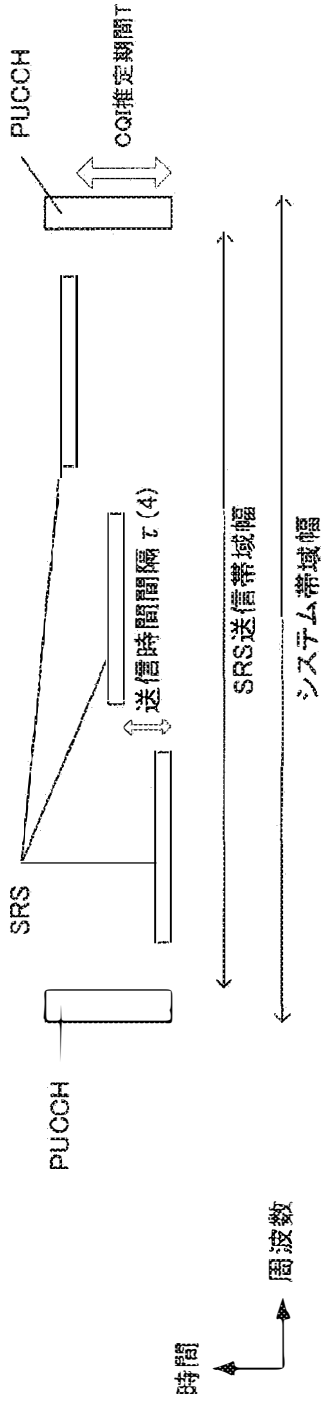
[図10A]



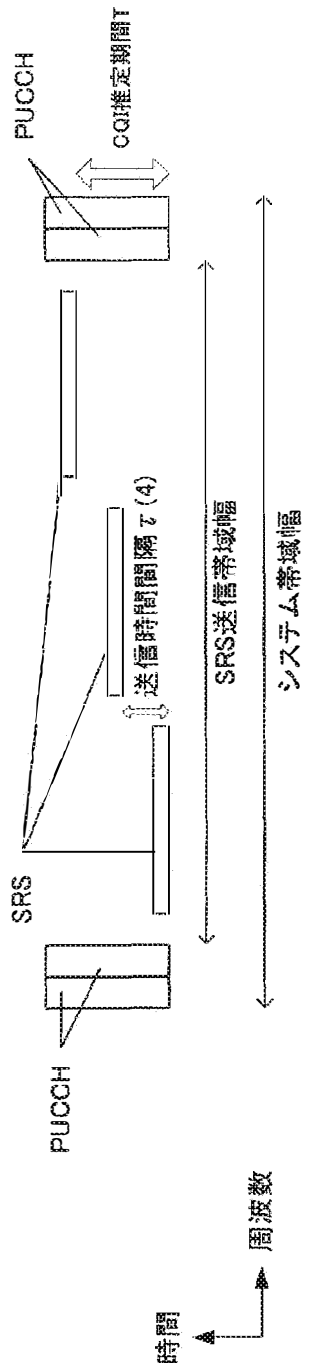
[図10B]



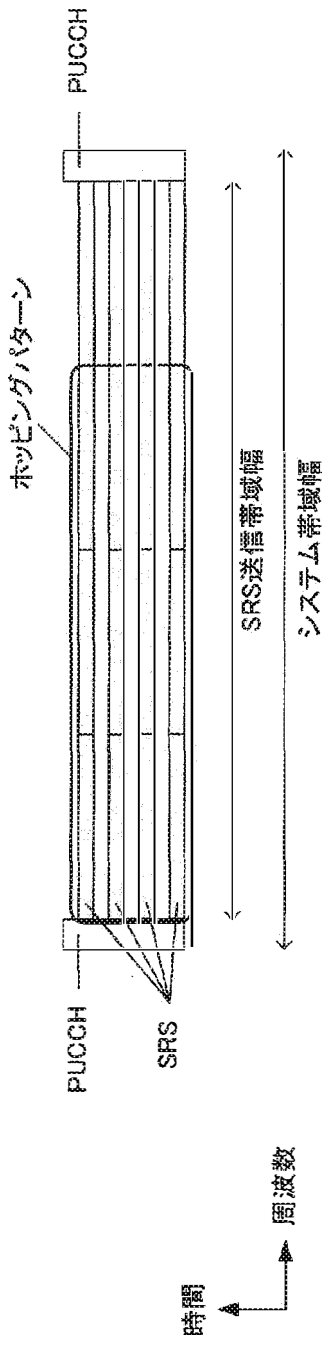
[図11A]



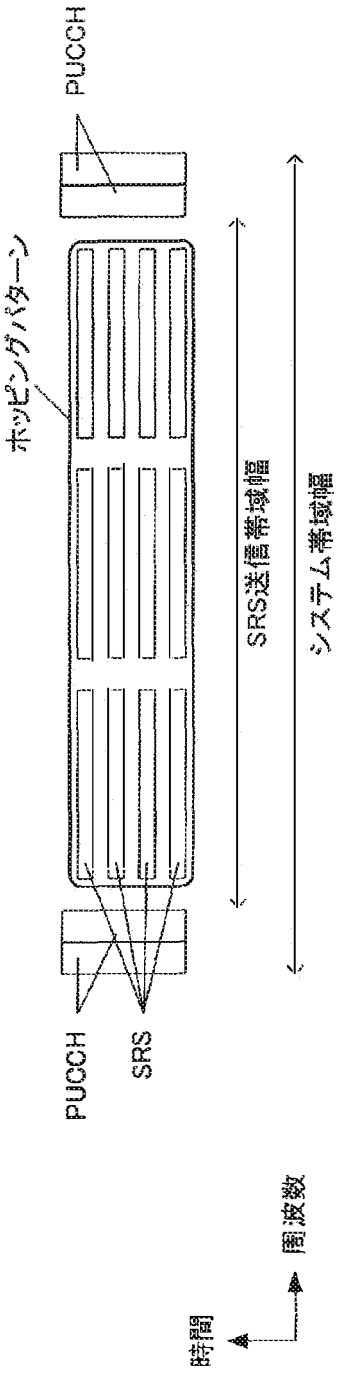
[図11B]



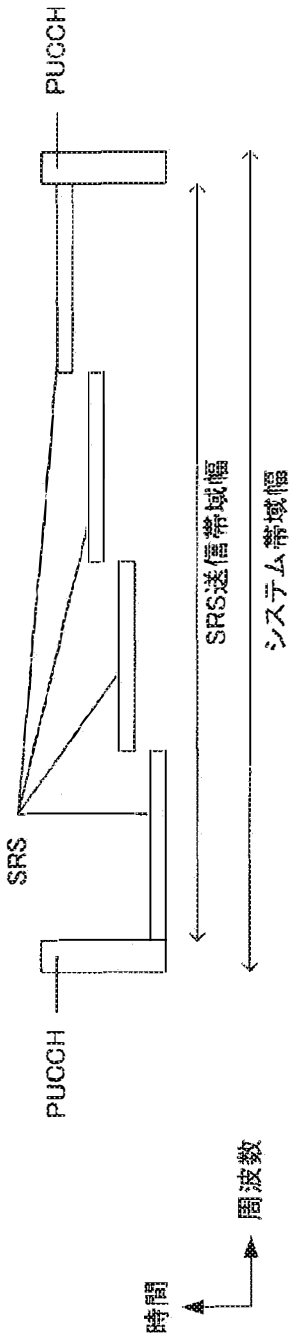
[図12A]



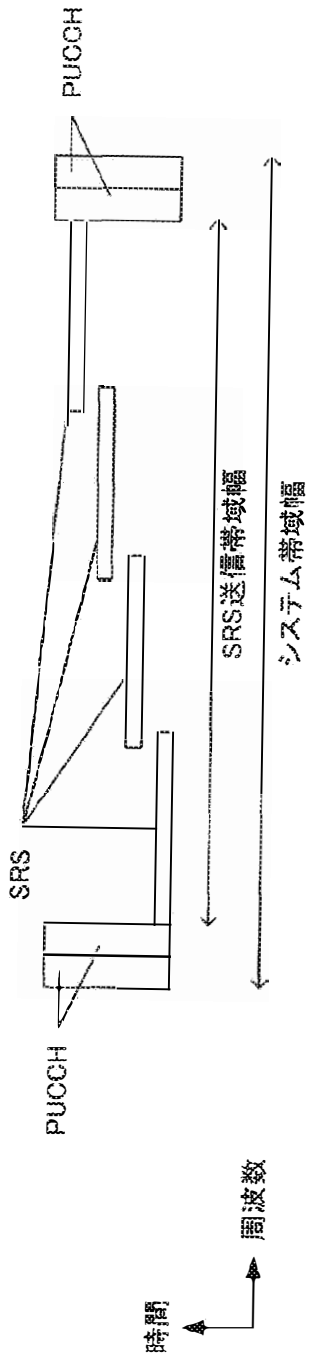
[図12B]



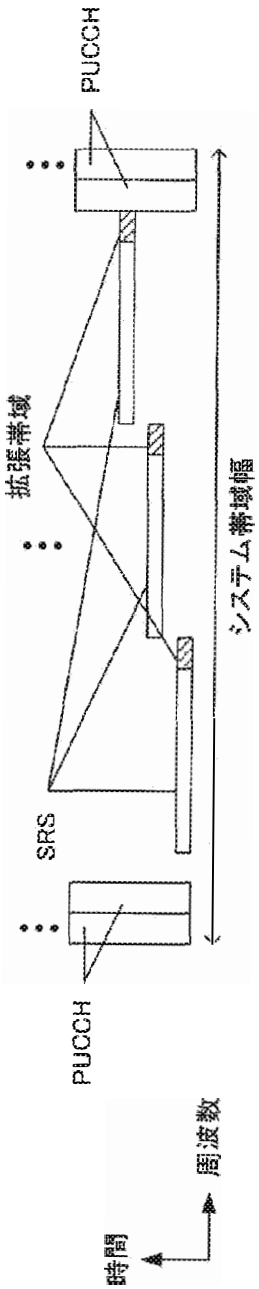
[図13A]



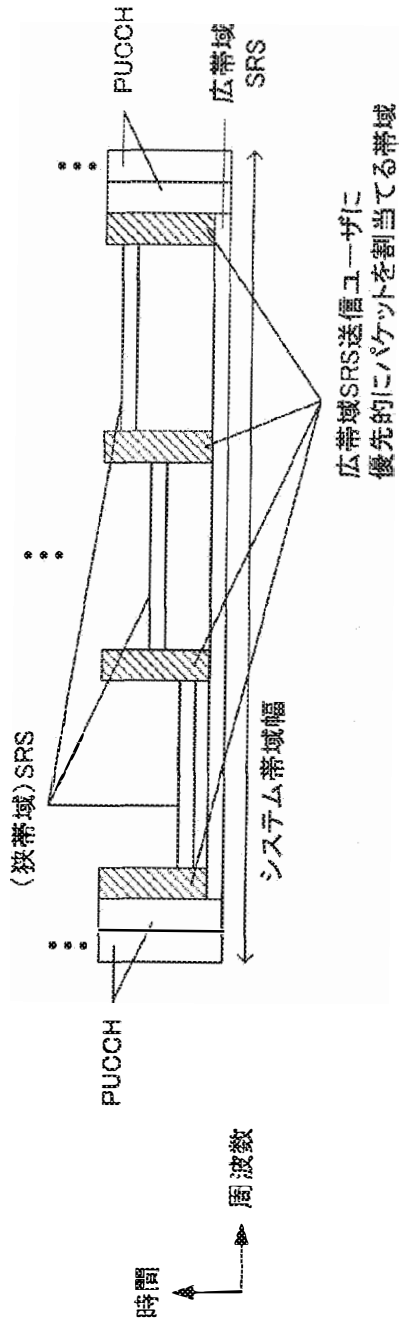
[図13B]



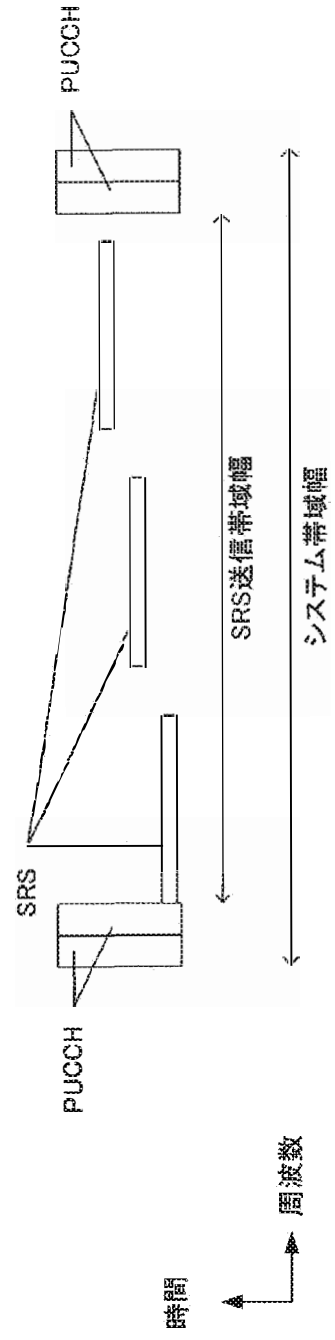
[図14A]



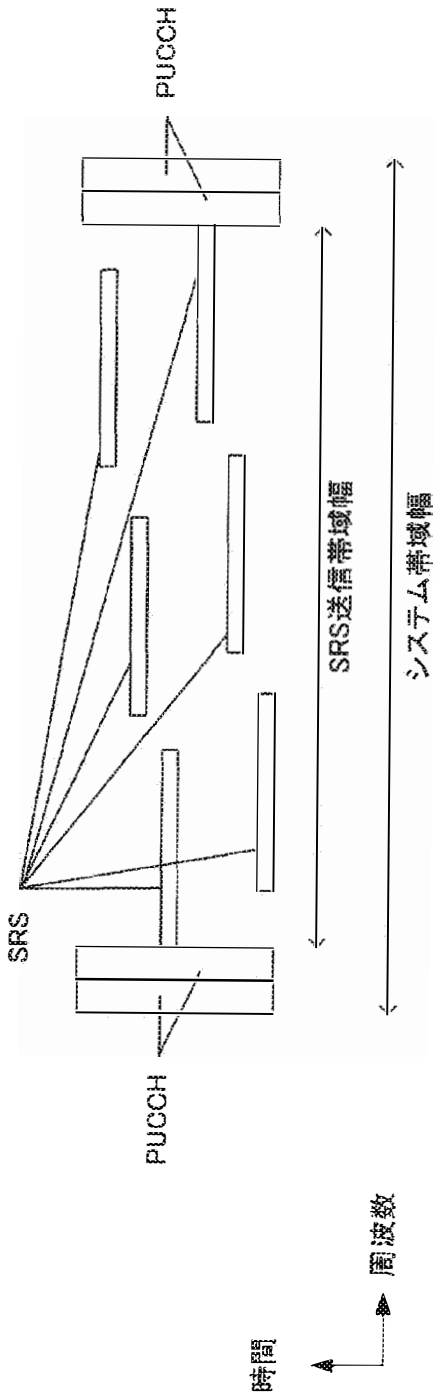
[図14B]


PUCCH
広帯域
SRS
広帯域SRS送信ユーザに
優先的にパケットを割当てる帯域
(狭帯域) SRS
システム帯域幅
PUCCH
周波数
時間

[図15A]



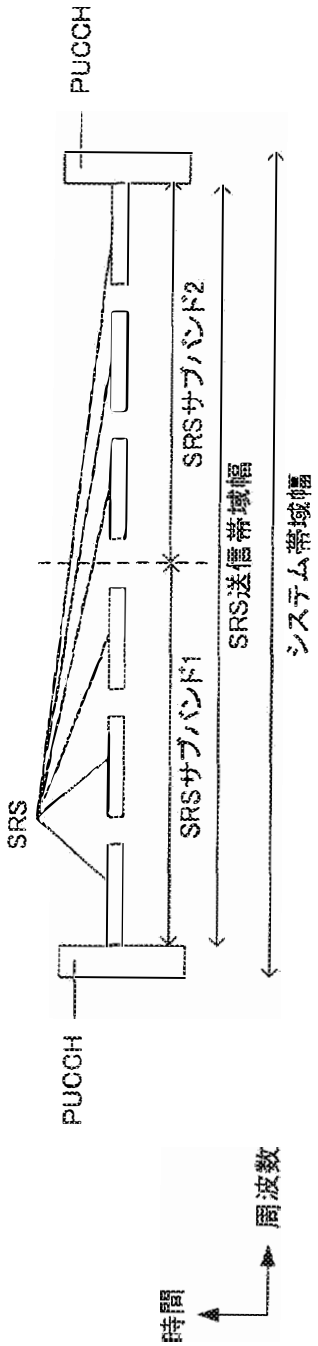
[図15B]



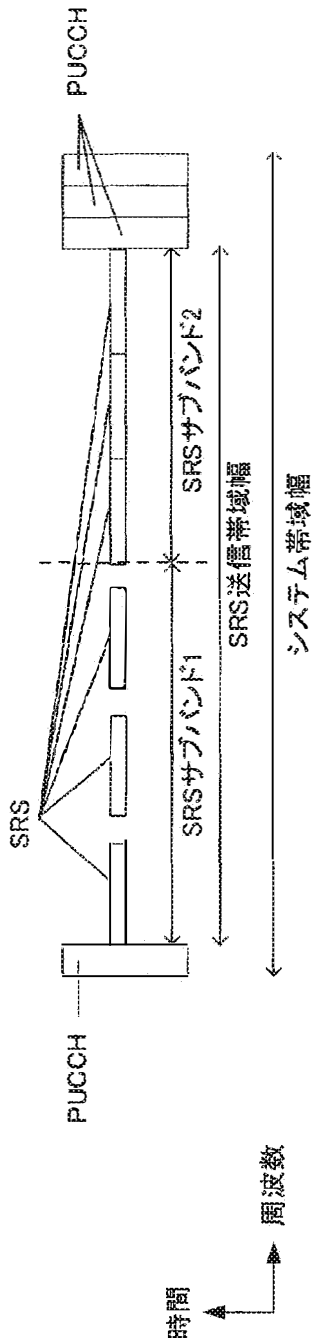
[図16]

PUCCHチャネル数	1				4			
SRS多重番号n	t=0	t=1	t=2	t=3	t=0	t=1	t=2	t=3
0	#0～#5	#6～#11	#12～#17	#18～#23	#2～#7	#9～#14	#16～#21	-
1	#6～#11	#12～#17	#18～#23	#0～#5	#9～#14	#16～#21	-	#2～#7
2	#12～#17	#18～#23	#0～#5	#6～#11	#16～#21	-	#2～#7	#9～#14
3	#18～#23	#0～#5	#6～#11	#12～#17	-	#2～#7	#9～#14	#16～#21

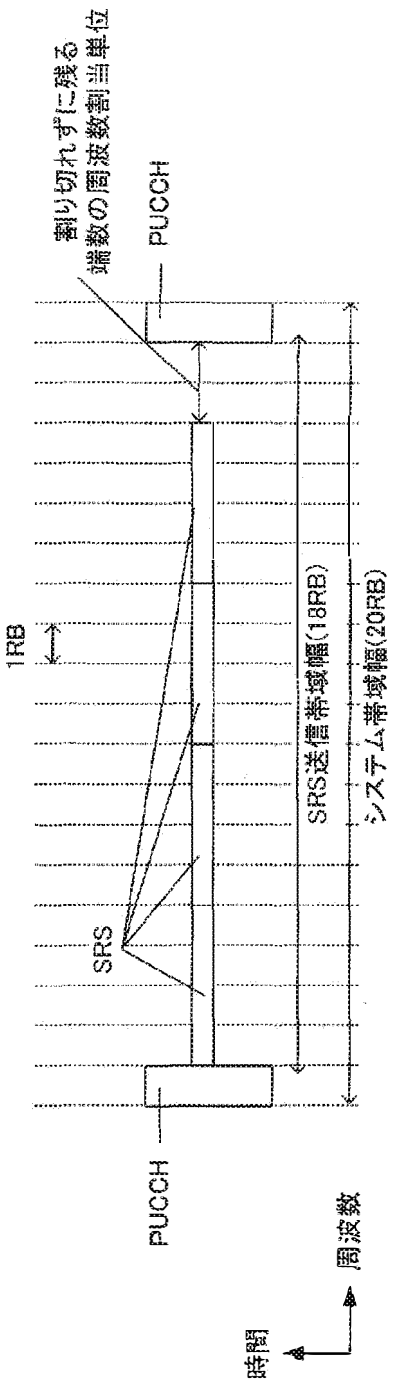
[図17A]


PUCCH
SRS
SRSサブバンド1
SRSサブバンド2
SRS送信帯域幅
システム帯域幅
PUCCH
周波数
時間

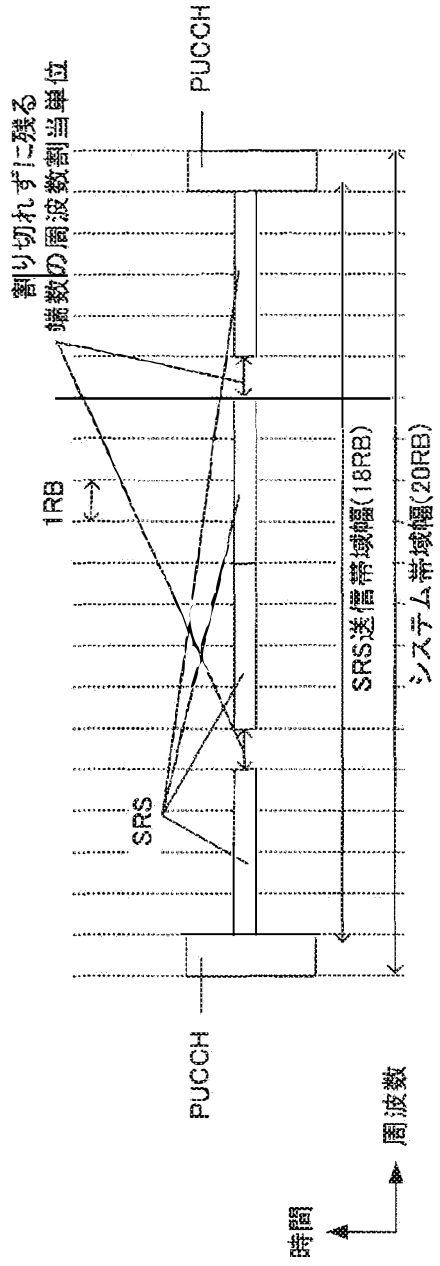
[図17B]


PUCCH
SRSサブバンド2
SRS送信帯域幅
システム帯域幅
SRSサブバンド1
SRS
PUCCH
周波数
時間

[図18A]


割り切れずに残る
端数の周波数割当単位
PUCCH
1RB
SRS
SRS送信帯域幅(18RB)
システム帯域幅(20RB)
PUCCH
周波数
時間

[図18B]


PUCCH
割り切れずに残る
端数の周波数割当単位
1RB
SRS
SRS送信帯域幅(18RB)
システム帯域幅(20RB)
PUCCH
周波数
時間

INTERNATIONAL SEARCH REPORT

International application No.
PCT/JP2008/002212

A. CLASSIFICATION OF SUBJECT MATTER
H04Q7/38(2006.01)i, *H04B1/713*(2006.01)i, *H04J1/00*(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)
H04B7/24-7/26, H04Q7/00-7/38

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Jitsuyo Shinan Koho 1922-1996 Jitsuyo Shinan Toroku Koho 1996-2008
Kokai Jitsuyo Shinan Koho 1971-2008 Toroku Jitsuyo Shinan Koho 1994-2008

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Huawei, 3GPP R1-072095, Multiplexing of E-UTRA Uplink Sounding Reference Signals, 2007.05, all pages	1-7
A	Freescale Semiconductor, 3GPP R1-072528, On the Need for Sounding RS Hopping, 2007.05, all pages	1-7

☐ 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 another 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	Date of mailing of the international search report
09 October, 2008 (09.10.08)	21 October, 2008 (21.10.08)
Name and mailing address of the ISA/ Japanese Patent Office	Authorized officer
Facsimile No.	Telephone No.

Form PCT/ISA/210 (second sheet) (April 2007)

国際調査報告　　国際出願番号　ＰＣＴ／ＪＰ２００８／００２２１２

Ａ．　発明の属する分野の分類（国際特許分類（ＩＰＣ））

Int.Cl.　H04Q7/38(2006.01)i, H04B1/713(2006.01)i, H04J1/00(2006.01)i

Ｂ．　調査を行った分野

調査を行った最小限資料（国際特許分類（ＩＰＣ））

Int.Cl.　H04B7/24-7/26, H04Q7/00-7/38

最小限資料以外の資料で調査を行った分野に含まれるもの

日本国実用新案公報	１９２２－１９９６年
日本国公開実用新案公報	１９７１－２００８年
日本国実用新案登録公報	１９９６－２００８年
日本国登録実用新案公報	１９９４－２００８年

国際調査で使用した電子データベース（データベースの名称、調査に使用した用語）

Ｃ．　関連すると認められる文献

引用文献のカテゴリー＊	引用文献名　及び一部の箇所が関連するときは、その関連する箇所の表示	関連する請求の範囲の番号
A	Huawei, 3GPP R1-072095, Multiplexing of E-UTRA Uplink Sounding Reference Signals, 2007.05, 全頁	1-7
A	Freescale Semiconductor, 3GPP R1-072528, On the Need for Sounding RS Hopping, 2007.05, 全頁	1-7

☐　Ｃ欄の続きにも文献が列挙されている。

☐　パテントファミリーに関する別紙を参照。

＊　引用文献のカテゴリー
「Ａ」特に関連のある文献ではなく、一般的技術水準を示すもの
「Ｅ」国際出願日前の出願または特許であるが、国際出願日以後に公表されたもの
「Ｌ」優先権主張に疑義を提起する文献又は他の文献の発行日若しくは他の特別な理由を確立するために引用する文献（理由を付す）
「Ｏ」口頭による開示、使用、展示等に言及する文献
「Ｐ」国際出願日前で、かつ優先権の主張の基礎となる出願の日の後に公表された文献
「Ｔ」国際出願日又は優先日後に公表された文献であって出願と矛盾するものではなく、発明の原理又は理論の理解のために引用するもの
「Ｘ」特に関連のある文献であって、当該文献のみで発明の新規性又は進歩性がないと考えられるもの
「Ｙ」特に関連のある文献であって、当該文献と他の１以上の文献との、当業者にとって自明である組合せによって進歩性がないと考えられるもの
「＆」同一パテントファミリー文献

国際調査を完了した日 ０９．１０．２００８	国際調査報告の発送日 ２１．１０．２００８
国際調査機関の名称及びあて先 日本国特許庁（ＩＳＡ／ＪＰ） 郵便番号１００－８９１５ 東京都千代田区霞が関三丁目４番３号	特許庁審査官（権限のある職員）　５Ｊ　４０５７ 佐藤　聡史 電話番号　０３－３５８１－１１０１　内線　３５３４

様式ＰＣＴ／ＩＳＡ／２１０（第２ページ）（２００７年４月）

Electronic Patent Application Fee Transmittal

Application Number:	12896993
Filing Date:	04-Oct-2010
Title of Invention:	PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced
First Named Inventor/Applicant Name:	David Astely
Filer:	Edward Milton Roney/Kenyatta Upchurch
Attorney Docket Number:	4015-6942 / P30138-US2

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($)
Miscellaneous:				
RCE- 2nd and Subsequent Request	1820	1	1700	1700
		Total in USD ($)		**1700**

Electronic Acknowledgement Receipt

EFS ID:	26112144
Application Number:	12896993
International Application Number:	
Confirmation Number:	1015
Title of Invention:	PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced
First Named Inventor/Applicant Name:	David Astely
Customer Number:	24112
Filer:	Edward Milton Roney/Kenyatta Upchurch
Filer Authorized By:	Edward Milton Roney
Attorney Docket Number:	4015-6942 / P30138-US2
Receipt Date:	20-JUN-2016
Filing Date:	04-OCT-2010
Time Stamp:	13:53:10
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	EFT
Payment was successfully received in RAM	$1700
RAM confirmation Number	062116INTEFSW13541200
Deposit Account	null
Authorized User	Kenyatta Upchurch

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	Request for Continued Examination (RCE)	P30138_US2_RCE_Transmittal.pdf	697932 3ae26281f7b246ca45f860e604195756870002ec	no	3
Warnings:					
Information:					
2		P30138_US2_Response_Amendment_accompanying_RCE.pdf	106601 c286ac46edfe6a16c69b6230b27019f3343ef45e	yes	16
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment Submitted/Entered with Filing of CPA/RCE		1	1	
	Claims		2	15	
	Applicant Arguments/Remarks Made in an Amendment		16	16	
Warnings:					
Information:					
3	Information Disclosure Statement (IDS) Form (SB08)	P30138_US2_Supplemental_IDS.pdf	1035799 0b8838ee159575bbc8c5e8e61ba3b51ea9533090	no	4
Warnings:					
Information:					
4	Foreign Reference	P30138_US2_CN101765208A_CN.pdf	24416952 0c8e2e60e6d4548a52d10b43964952afc6cb2d54	no	19
Warnings:					
Information:					
5	Foreign Reference	P30138_US2_CN101765208A_Machine_Translation.pdf	12917613 ca3e85bf90e31f81fd26cf40bd716c2c2be52de5	no	23
Warnings:					
Information:					
6	Foreign Reference	P30138_US2_WO2009022474A1_Part1.pdf	25856824 b2828076ecb4007559ec535afa6dc0ef190c45ed	no	30

Warnings:					
Information:					
7	Foreign Reference	P30138_US2_WO2009022474A1_Part2.pdf	8730449 436090c0354b5a884f1417e66daa381b1e940642	no	26
Warnings:					
Information:					
8	Non Patent Literature	P30138_US2_R1-093821.pdf	262701 1fea66e83b0e7a6254aeccd4c422f67dc231c638	no	9
Warnings:					
Information:					
9	Non Patent Literature	P30138_US2_R2-091165.pdf	192819 bdbda9fb2d15a27a697e6d26f9f4546877e5a251	no	2
Warnings:					
Information:					
10	Non Patent Literature	P30138_US2_R2-082485.pdf	194013 bbc482be8619fd052d465f00fd52cd48bbd81252	no	4
Warnings:					
Information:					
11	Fee Worksheet (SB06)	fee-info.pdf	30502 ae0d0bbc6266da1c89cbc6114a0a8c3eb3b86d92	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	74442205		

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.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
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 displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 12/896,993	Filing Date 10/04/2010	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	NUMBER EXTRA	RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A	
☐ 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 $ =	
☐ 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).			
☐ 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

		(Column 1)		(Column 2)	(Column 3)		
	06/20/2016	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	* 48	Minus	** 52	= 0	x $80 =	0
	Independent (37 CFR 1.16(h))	* 8	Minus	***8	= 0	x $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	**0**

		(Column 1)		(Column 2)	(Column 3)		
		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
AMENDMENT	Total (37 CFR 1.16(i))	*	Minus	**	=	x $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x $ =	
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						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 number found in the appropriate box in column 1.

LIE
/KAREN VESTAL/

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 07/07/2016
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

EXAMINER	
TALUKDER, MD K	
ART UNIT	PAPER NUMBER
2648	

DATE MAILED: 07/07/2016

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/896,993	10/04/2010	David Astely	4015-6942 / P30138-US2	1015

TITLE OF INVENTION: PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced

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	10/07/2016

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.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

24112 7590 07/07/2016
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

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.

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.
12/896,993	10/04/2010	David Astely	4015-6942 / P30138-US2	1015

TITLE OF INVENTION: PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced

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	10/07/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
TALUKDER, MD K	2648	455-509000

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,
(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.
1 _____
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 — 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.
- ❑ Applicant asserting small entity status. See 37 CFR 1.27 — 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.
- ❑ Applicant changing to regular undiscounted fee 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

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
12/896,993	10/04/2010	David Astely	4015-6942 / P30138-US2	1015

24112 7590 07/07/2016
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

EXAMINER	
TALUKDER, MD K	

ART UNIT	PAPER NUMBER
2648	

DATE MAILED: 07/07/2016

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. 12/896,993	Applicant(s) ASTELY ET AL.	
	Examiner MD TALUKDER	Art Unit 2648	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 *06/20/2016.*

   ☐ 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 *1-17,19-25,27-34,36 and 38-52.* 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. ☒ Notice of References Cited (PTO-892)
2. ☒ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date _____ .
5. ☐ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/MD TALUKDER/
Primary Examiner, Art Unit 2648

Notice of References Cited	Application/Control No. 12/896,993	Applicant(s)/Patent Under Reexamination ASTELY ET AL.	
	Examiner MD TALUKDER	Art Unit 2648	Page 1 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2002/0160784 A1	10-2002	Kuwahara, Soichi	H04W28/26	455/452.1
*	B	US-2010/0003997 A1	01-2010	KOYANAGI; Kenichiro	H04L1/0003	455/450
*	C	US-2010/0098012 A1	04-2010	Bala; Erdem	H04L5/001	370/329
*	D	US-2010/0208679 A1	08-2010	Papasakellariou; Aris	H04L1/1614	370/329
*	E	US-2010/0232373 A1	09-2010	Nory; Ravikiran	H04W72/1289	370/329
*	F	US-2010/0271970 A1	10-2010	Pan; Kyle Jung-Lin	H04L1/0026	370/252
*	G	US-2010/0285809 A1	11-2010	Lindstrom; Magnus	H04L5/001	455/450
*	H	US-2010/0296389 A1	11-2010	Khandekar; Aamod Dinkar	H04L5/0007	370/216
*	I	US-2010/0322173 A1	12-2010	Marinier; Paul	H04W76/048	370/329
*	J	US-2011/0007695 A1	01-2011	Choi; Hyung-Nam	H04L5/0007	370/329
*	K	US-2011/0007699 A1	01-2011	Moon; Sung Ho	H04L5/0053	370/329
*	L	US-2011/0081913 A1	04-2011	Lee; Jung A.	H04L5/003	455/450
*	M	US-2011/0081932 A1	04-2011	Astely; David	H04L5/001	455/509

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	CPC Classification
	N					
	O					
	P					
	Q					
	R					
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NON-PATENT DOCUMENTS

*		Include as applicable: Author, Title Date, Publisher, Edition or Volume, Pertinent Pages)
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Dates in MM-YYYY format are publication dates. Classifications may be US or foreign.

Notice of References Cited	Application/Control No. 12/896,993	Applicant(s)/Patent Under Reexamination ASTELY ET AL.	
	Examiner MD TALUKDER	Art Unit 2648	Page 2 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-2011/0243039 A1	10-2011	PAPASAKELLARIOU; Aris	H04L1/1861	370/280
*	B	US-2011/0310856 A1	12-2011	Hariharan; Priya	H04L1/1607	370/336
*	C	US-2012/0020317 A1	01-2012	Ishii; Hiroyuki	H04L1/1854	370/329
*	D	US-2012/0051306 A1	03-2012	Chung; Jae Hoon	H04L1/1893	370/329
*	E	US-2012/0082125 A1	04-2012	Huang; Yada	H04L5/0007	370/329
*	F	US-2012/0140708 A1	06-2012	Choudhury; Sayantan	H04W72/082	370/328
*	G	US-8,265,030 B2	09-2012	Miki; Nobuhiko	H04W72/1257	370/330
*	H	US-2012/0314675 A1	12-2012	Vujcic; Dragan	H04L5/001	370/329
*	I	US-2013/0010721 A1	01-2013	Aiba; Tatsushi	H04W72/0406	370/329
*	J	US-2013/0003700 A1	01-2013	Zhang; Jian	H04W76/028	370/331
*	K	US-2013/0034073 A1	02-2013	Aiba; Tatsushi	H04L1/0026	370/329
*	L	US-8,447,343 B2	05-2013	Gerstenberger; Dirk	H04W52/10	370/248
*	M	US-2013/0136084 A1	05-2013	ZHANG; Yuantao	H04W72/0413	370/329

FOREIGN PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Country	Name	Classification
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Notice of References Cited	Application/Control No. 12/896,993	Applicant(s)/Patent Under Reexamination ASTELY ET AL.	
	Examiner MD TALUKDER	Art Unit 2648	Page 3 of 3

U.S. PATENT DOCUMENTS

*		Document Number Country Code-Number-Kind Code	Date MM-YYYY	Name	CPC Classification	US Classification
*	A	US-8,472,368 B2	06-2013	Baldemair; Robert	H04L5/0053	370/318
*	B	US-8,634,358 B2	01-2014	Damnjanovic; Jelena M.	H04L1/1861	370/329
*	C	US-8,792,830 B2	07-2014	Lim; Suhwan	H04L25/02	375/260
	D	US-				
	E	US-				
	F	US-				
	G	US-				
	H	US-				
	I	US-				
	J	US-				
	K	US-				
	L	US-				
	M	US-				

FOREIGN PATENT DOCUMENTS

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BIB DATA SHEET

CONFIRMATION NO. 1015

SERIAL NUMBER	FILING or 371(c) DATE / RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
12/896,993	10/04/2010	455	2648	4015-6942 / P30138-US2

APPLICANTS

INVENTORS

David Astely, Bromma, SWEDEN;
Robert Baldemair, Solna, SWEDEN;
Dirk Gerstenberger, Stockholm, SWEDEN;
Daniel Larsson, Solna, SWEDEN;
Lars Lindbom, Karlstad, SWEDEN;
Stefan Parkvall, Stockholm, SWEDEN;

**** CONTINUING DATA ***************************

This appln claims benefit of 61/248,661 10/05/2009

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

10/18/2010

Foreign Priority claimed	35 USC 119(a-d) conditions met	Verified and Acknowledged	Met after Allowance	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
☐ Yes ☑ No	☐ Yes ☑ No	/MD K TALUKDER/ Examiner's Signature	☐ Initials	SWEDEN	12	48 ~~38~~	6

ADDRESS

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

TITLE

PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced

FILING FEE RECEIVED	FEES: Authority has been given in Paper	
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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12896993
Filing Date	2010-10-04
First Named Inventor	David Astely et al.
Art Unit	2648
Examiner Name	Md K. Talukder
Attorney Docket Number	4015-6942 / P30138-US2

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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	20120147847	A1	2012-06-14	Matsumoto et al.	Corresponds to WO2009022474A1

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	1	101765208	CN	A	2010-06-30	Huawei Technologies Co., Ltd	Machine Translation Included	
	2	2009022474	WO	A1	2009-02-19	Panasonic Corp.	Corresponds to US2012/0147847A1	

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INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12896993 12896993 - GAU: 2648
Filing Date	2010-10-04
First Named Inventor	David Astely et al.
Art Unit	2648
Examiner Name	Md K. Talukder
Attorney Docket Number	4015-6942 / P30138-US2

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	ZTE (source), "ACK/NACK Design for LTE-Advanced,"TSG-RAN WG1 #58bis, R1-093821, Miyazaki, Japan, October 12-16, 2009.	
	2	Infineon Technologies (source), "Clarification of UL DPCCH slot format information usage in IE 'DTX-DRX Information'","3GPP TSG-RAN WG2 Meeting #65, Tdoc R2-091165, Athens, Greece February 9-13, 2009.	
	3	NTT DocCoMo, Inc. (source), "UL ACK/NACK resource allocation for DL semi-persisent scheduling," 3GPP TSG RAN WG2 #62, R2-082485 (resubmission of R2-081857), Kansas City, Missouri, USA, May 5-9, 2008.	

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EXAMINER SIGNATURE

Examiner Signature	/Md Talukder/	Date Considered	06/24/2016

*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.

Receipt date: 06/20/2016

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	12896993 12896993 - GAU: 2648
Filing Date	2010-10-04
First Named Inventor	David Astely et al.
Art Unit	2648
Examiner Name	Md K. Talukder
Attorney Docket Number	4015-6942 / P30138-US2

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	/Edward M. Roney/	Date (YYYY-MM-DD)	2016-06-20
Name/Print	Edward M. Roney	Registration Number	62048

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.**

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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:

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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.

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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.

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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.

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Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12896993	ASTELY ET AL.
	Examiner	**Art Unit**
	MD TALUKDER	2648

CPC						
Symbol					**Type**	**Version**
H04L		5	/	0053	F	2013-01-01
H04L		5	/	0005	A	2013-01-01
H04L		5	/	001	I	2013-01-01
H04L		5	/	0094	I	2013-01-01
H04W		8	/	24	A	2013-01-01
H04W		28	/	26	A	2013-01-01
H04W		48	/	16	A	2013-01-01
H04W		72	/	0453	A	2013-01-01
H04W		72	/	1273	A	2013-01-01
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CPC Combination Sets							
Symbol					**Type**	**Set**	**Ranking**	**Version**
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NONE		**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	48	
/MD TALUKDER/ Primary Examiner.Art Unit 2648	06/24/2016	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	10

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12896993	ASTELY ET AL.
	Examiner	**Art Unit**
	MD TALUKDER	2648

US ORIGINAL CLASSIFICATION		INTERNATIONAL CLASSIFICATION										
CLASS	SUBCLASS	CLAIMED					NON-CLAIMED					
455	509	H	0	4	B	7 / 00 (2006.01.01)						

CROSS REFERENCE(S)					
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)				
455	522	456.6	137	103	
370	329	331			

NONE		Total Claims Allowed:	
(Assistant Examiner)	(Date)	48	
/MD TALUKDER/ Primary Examiner.Art Unit 2648	06/24/2016	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	10

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12896993	ASTELY ET AL.
	Examiner	**Art Unit**
	MD TALUKDER	2648

☒ **Claims renumbered in the same order as presented by applicant** ☐ **CPA** ☐ **T.D.** ☐ **R.1.47**

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
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15	15	31	33	47	51										
16	16	32	34	48	52										

NONE (Assistant Examiner)	(Date)	**Total Claims Allowed:** 48	
/MD TALUKDER/ Primary Examiner.Art Unit 2648 (Primary Examiner)	06/24/2016 (Date)	O.G. Print Claim(s) 1	O.G. Print Figure 10

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	2	("20120147847").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 21:17
L2	21	455/$.ccls. and ((first 1st) adj6 component adj3 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 21:58
L3	33	("20120127950" | "20110310819" | "20120275395" | "20120287828" | "20120039291" | "20100271970" | "20120307781" | "20110286436" | "20120224535" | "20120140708" | "20110310820" | "20120163288" | "20110299486" | "20100098012" | "20120082125 " | "20120294273" | "20110268048").pn.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 22:03
L7	13	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources) same component adj carrier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/24 22:18
S1	1	"12896993"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/10 17:09
S2	367	((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/10 19:04
S3	176	S2 and (radio near3 resource)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/10 19:09
S4	28	S2 and (radio near3 resource) and (component with carrier)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/10 19:09
S5	173	(downlink near3 carrier) and (uplink near3 (primary first initial) near3 carrier) and ((second	US-PGPUB; USPAT;	OR	ON	2012/12/11 09:04

		2nd other next) with (channel resource)) and (control with information)	USOCR; DERWENT; IBM_TDB			
S6	137	S5 and (scheduling)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 09:04
S7	36	("20120263121" | "20110310856" | "20120127950" | "20110310819 " | "20120275395" | "20120287828" | "20120039291" | "20100271970" | "20120307781" | "20110286436" | "20120224535" | "20120140708" | "20110310820" | "20120163288" | "20110299486" | "20100098012" | "20120082125 " | "20120294273" | "20110268048" | "20120113910").pn.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 09:15
S8	127	(downlink near3 carrier) and (uplink near3 (primary first initial) near3 carrier) and ((second 2nd other next) with (channel resource)) and (carrier adj aggregation)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 10:16
S9	2	"20110292887"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 11:17
S11	25	((first 1st) adj6 component adj3 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 11:22
S12	1718	((first 1st) adj6 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 11:47
S13	66	(carrier near3 aggregation) and ((first 1st) adj6 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 11:47
S14	10842	455/509,522,456.6,137,103,575.ccls.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 13:41
S15	28232	370/329,252,331.ccls.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 13:41
S16	102	(S14 S15) and (downlink near3 carrier) and (uplink near3 (primary first initial) near3 carrier) and ((second 2nd other next) with (channel resource)) and (control with information)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 13:42
S17	1	"13140333"	US-PGPUB; USPAT;	OR	ON	2012/12/11 14:18

			USOCR; DERWENT; IBM_TDB			
S18	82	"20110310856"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 14:18
S19	938	((first 1st) adj6 component adj3 carrier) same ((radio resource frame)) and ((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 14:31
S20	38	(((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and ((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 14:31
S21	27	(((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and ((2nd second) adj6 component adj3 carrier) same ((2nd second other another) adj4 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 14:32
S22	38	(((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and ((2nd second) adj6 component adj3 carrier) same ((2nd second other another) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 14:32
S23	24	(carrier adj aggregation) and (schedul$3 near3 (downlink DL) with ((first primary initial) near6 (resource radio frequency frame)))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 14:48
S24	8	("7551898" | "7649960" | "7656843" | "7773699").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 15:14
S25	2	"20110292900"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 15:36
S26	2	"20100271970"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 15:37
S27	3	"8050202"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 15:38
S28	1	"20120307689"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 15:45
S29	2	"8160017"	US-PGPUB; USPAT;	OR	ON	2012/12/11 15:48

			USOCR; DERWENT; IBM_TDB			
S30	2	"20100232373"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 15:48
S31	2	"20090016278"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 17:16
S32	2	"8265030"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 17:19
S33	3	"2008139923"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2012/12/11 18:17
S34	14	("20100098012" | "20100232373" | "20110310856" | "20120020317" | "20120082125" | "20120140708" | "8265030").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/05/29 17:19
S35	7	"455"/$.ccls. and (carrier adj aggregation) and (schedul$3 near3 (downlink DL) with ((first primary initial) near6 (resource radio frequency frame)))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/05/29 17:22
S36	9	"455"/$.ccls. and (((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and (((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/05/29 21:37
S38	4	("20070053294" | "20100290405").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/05/30 12:42
S39	16	("7596114" | "20050013279" | "20030219028" | "20070217406" | "20020105970" | "20060050664" | "20090303938" | "20070064669").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/05/30 12:42
S40	290	(first 1st) with (component near2 carrier) with down$1link	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 10:07
S41	114	(first 1st) with (component near2 carrier) with down$1link and receiv$3 near3 control near3 information	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 10:09
S42	47	(first 1st) near3 (radio adj resource) and (second other another 2nd) near3 (radio adj	US-PGPUB; USPAT;	OR	ON	2013/06/17 12:29

		resource) and component adj carrier	USOCR; DERWENT; IBM_TDB			
S43	26	S42 and (carrier adj aggregation) and (schedul$3 near3 (down$link DL reverse$1link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:31
S44	5	(first 1st) near3 (radio adj resource) and (second other another 2nd) near3 (radio adj resource) same (carrier adj aggregation) and (schedul$3 near3 (down$link DL reverse$1link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:46
S45	26	(first 1st) near3 (radio adj resource) and (second other another 2nd) near3 (radio adj resource) and (carrier adj aggregation) and (schedul$3 near3 (down$link DL reverse$1link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:47
S46	31	(second other another 2nd) near3 (radio adj resource) and (carrier adj aggregation) and (schedul$3 near3 (down$link DL reverse$1link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:49
S47	0	@ad<"20091003" and (second other another 2nd) near3 (radio adj resource) and (carrier adj aggregation) and (schedul$3 near3 (down$link DL reverse$1link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:51
S48	0	@ad<"20091003" and (second other another 2nd) near3 (radio adj resource) and (carrier adj component) and (schedul$3 near3 (down$link DL reverse$1link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:52
S49	1	@ad<"20091003" and (second other another 2nd) near3 (radio adj resource) and (carrier adj component) and ((down$link DL reverse$1link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:53
S50	1	@ad<"20091005" and (second other another 2nd) near3 (radio adj resource) and (carrier adj component) and ((down$link DL reverse$1link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:55
S51	1	@ad<"20091003" and (second other another 2nd) near3 (radio adj resource) and (carrier adj component)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 12:56
S52	20	(second other another 2nd) near3 (radio adj resource) and (carrier adj component)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 13:31
S53	16	(set near3 radio near3 resource) same component adj carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 14:14
S54	27	(set near3 ((radio near3 resource) (resource adj block))) same component adj carrier	US-PGPUB; USPAT;	OR	ON	2013/06/17 14:19

			USOCR; DERWENT; IBM_TDB			
S55	755	(((radio near3 resource) (resource adj block))) same component adj carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 14:25
S56	70	((second 2nd other) with ((radio near3 resource) (resource adj block))) same component adj carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 14:26
S57	327	(((radio near3 resource) (resource adj block))) same component adj carrier and (schedul$3 near3 downlink reverse)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 14:27
S58	29	((second 2nd other) with ((radio near3 resource) (resource adj block))) same component adj carrier and (schedul$3 near3 down$1link reverse$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 14:27
S59	24	((second 2nd other) with ((radio near3 resource) (resource adj block))) same (component adj carrier) same (down$1link reverse$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 14:31
S60	10	("20090097447" | "20110081856" | "20090116427" | "20100232373" | "8331307").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 14:49
S61	2562	(schedul$3 near3 downlink) and ((radio adj resource) (resource adj block)) and component	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 15:16
S62	739	(schedul$3 near3 downlink) and ((radio adj resource) (resource adj block)) and component adj carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 15:17
S63	259	(schedul$3 near3 downlink) same ((radio adj resource) (resource adj block)) and component adj carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 15:17
S64	39	(schedul$3 near3 downlink) same ((radio adj resource) (resource adj block)) same (component adj carrier)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 15:18
S65	1	@ad<"20091005" and (schedul$3 near3 downlink) same ((radio adj resource) (resource adj block)) same (component adj carrier)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 15:18
S66	1	@ad<"20091005" and (schedul$3 near3 downlink) same ((radio adj resource) (resource	US-PGPUB; USPAT;	OR	ON	2013/06/17 15:20

		adj block)) same (CC (component adj carrier))	USOCR; DERWENT; IBM_TDB			
S67	47	(schedul$3 near3 downlink) same ((radio adj resource) (resource adj block)) same (CC (component adj carrier))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 15:20
S68	356	"455"/$.ccls. and ((radio adj resource) (resource adj block)) same (CC (component adj carrier))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 17:10
S70	19	"455"/$.ccls. and (carrier near3 aggregation) and ((first 1st) adj6 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/17 17:17
S71	0	("2013/0107855").URPN.	USPAT	OR	ON	2013/06/18 09:15
S72	0	("2013/0107855").URPN.	US-PGPUB; USPAT	OR	ON	2013/06/18 09:16
S73	408	set near3 (radio frequency) near2 (resource band) same downlink and component	US-PGPUB; USPAT	OR	ON	2013/06/18 09:18
S74	17	set near3 (radio frequency) near2 (resource band) same downlink same (component adj carrier)	US-PGPUB; USPAT	OR	ON	2013/06/18 09:19
S75	19	(set group Cluster) near3 (radio frequency) near2 (resource band) same downlink same (component adj carrier)	US-PGPUB; USPAT	OR	ON	2013/06/18 09:21
S76	12	("8457060" | "20110310819" | "20100271970" | "20130034073" | "20100098012" | "20110310856" | "20110317653" | "20130083742" | "20130083741" | "20120114021" | "20120275395" | "20110317645" | "20110310856").pn.	US-PGPUB; USPAT	OR	ON	2013/06/18 09:31
S77	200	(DL down$link) with (1st first first primary initia) near3 (set group) near6 (radio resource)	US-PGPUB; USPAT	OR	ON	2013/06/18 10:37
S78	2911	(UL up$link) with (set group) near6 (radio resource)	US-PGPUB; USPAT	OR	ON	2013/06/18 10:38
S79	110	S77 and S78	US-PGPUB; USPAT	OR	ON	2013/06/18 10:38
S80	3	(DL down$link) with (1st first first primary initia) near3 (set group) near6 (radio resource) and (DL down$link) with (set group) near6 (radio resource) with (2nd second other another) near2 component	US-PGPUB; USPAT	OR	ON	2013/06/18 10:47
S81	28	(DL down$link) with (1st first first primary initia) near3 (set group) near6 (radio resource) and (DL down$link) with (component near3 carrier)	US-PGPUB; USPAT	OR	ON	2013/06/18 11:17
S82	5	(DL down$link) with (1st first first primary initia) near3 (set group) near6 (radio resource) and (DL down$link) with (second 2nd) near3 (component near3 carrier)	US-PGPUB; USPAT	OR	ON	2013/06/18 11:20
S83	4	(1st first first primary initia) near3 (set group) near6 (radio resource) with (DL down$link) near3 (component near3 carrier)	US-PGPUB; USPAT	OR	ON	2013/06/18 13:50
S84	3	(set group) near6 (radio resource) with (2nd	US-PGPUB;	OR	ON	2013/06/18

		second other another) near6 (DL down$link) near3 (component near3 carrier)	USPAT			13:52
S85	42	(set group) near6 (radio resource) with (DL down$link) near3 (component near3 carrier)	US-PGPUB; USPAT	OR	ON	2013/06/18 13:58
S86	30	(set group) near3 ((radio resource)(resource near2 block)) with (DL down$link) near3 (component near3 carrier)	US-PGPUB; USPAT	OR	ON	2013/06/18 14:07
S87	2	(second 2nd) near3 (down$1link DL) with ((component near3 carrier) CC) same (set group) with ((radio near2 resource) (resource near2 block))	US-PGPUB; USPAT	OR	ON	2013/06/18 14:14
S88	21	reserv$3 with component near3 carrier and (second near2 (radio frequency band))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/25 15:31
S89	36	"739528"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 09:34
S90	30	"5754138"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 09:35
S91	2046	(carrier near3 aggregation) and up$1link with down$1link	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 10:24
S92	1052	(carrier near3 aggregation) and (component near3 carrier) same up$1link with down$1link	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 10:26
S93	110	(carrier near3 aggregation) and (component near3 carrier) same up$1link with associat$3 with down$1link	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 10:27
S95	17	("370"/$.ccls "455"/$.ccls.) and (aggregation) and (CC (component near3 carrier)) same up$1link with associat$3 with down$1link	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 15:22
S96	67	370/329,341,348,395.4.ccls. and (carrier near3 aggregation) and (component near3 carrier) same up$1link with associat$3 with down$1link	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 15:26
S97	345368	schedule (DL (down adj link) down$1link) and (carrier near3 aggregation) and ((UL up$link) adj6 associat$4 near4 (DL down$link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 16:45
S98	9	schedule near3 (DL (down adj link) down$1link) and (carrier near3 aggregation) same((UL up$link) adj6 associat$4 near4 (DL down$link))	US-PGPUB; USPAT; USOCR;	OR	ON	2013/06/26 16:46

			DERWENT; IBM_TDB			
S99	35	(schedule allocat$4) near3 (DL (down adj link) down$1link) and (carrier near3 aggregation) same((UL up$link) adj6 associat$4 near4 (DL down$link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 16:48
S100	0	(1st first) near3 (radio band resource frequency) with (1st first) near3 (CCcomponent adj carrier)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 17:14
S101	216	(1st first) near3 (radio band resource frequency) with (1st first) near3 (CC (component adj carrier))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 17:14
S102	43	(1st first) near3 (radio band resource frequency) with (reserv$3 schedul$3 allocat$3) with (1st first) near3 (CC (component adj carrier))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/26 17:15
S103	22	("20100142455" | "20120009923" | "20100254329" | "20100091678" | "20110194501" | "20130010619" | "20080310359" | "20060274712" | "20100227569" | "20120208583" | "20110267978").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/27 09:57
S104	10	("20100254329" | "20100195624" | "20100023282" | "20090274100" | "20080316957").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2013/06/27 10:15
S105	50	("20100322173" | "20110081913" | "20130010721" | "20120140708" | "20100271970" | "20100285809" | "20110007699" | "20130003700" | "20100232373" | "20120051306" | "20120082125" | "20100098012" | "20100003997" | "20100208679" | "20110310856" | "20120082125" | "20120140708" | "20130136084" | "8265030" | "20120020317" | "8265030" | "20110007695" | "20110081932" | "20120314675" | "20110310856" | "20100232373" | "20100296389" | "20120020317" | "20100098012" | "20130034073" | "8447343" | "8472368").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:25
S106	13348	(H04W88/08, H04W72/044, H04W72/042).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:40
S107	4330	(H04W52/367, H04W52/12, H04W52/40).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:42
S108	4200	(H04L29/08657, G01S5/0252, G01S5/02).cpc.	US-PGPUB; USPAT;	OR	ON	2014/04/22 13:43

			USOCR; DERWENT; IBM_TDB			
S109	3823	(H04B1/3833, H04M1/0247, H04M1/0237).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:44
S110	6130	(H03F3/211, H04B7/0617, H04B7/0669).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:44
S111	370	(S106 S107 S108 S109 S110) and (schedul$4 near3 down$1link) and (component near3 carrier)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:45
S112	365	(S106 S107 S108 S109 S110) and (schedul$4 near3 down$1link) and (component near3 carrier) and (control with information)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:46
S113	357	(S106 S107 S108 S109 S110) and (schedul$4 near3 down$1link) and (component near carrier) and (control with information)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:47
S114	13	(S106 S107 S108 S109 S110) and (DL down$link) with (1st first first primary initia) near3 (set group) near6 (radio resource) and (DL down$link) with (component near3 carrier)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 13:47
S115	40	(H03F3/211, H04B7/0617, H04B7/0669, H04B1/3833, H04M1/0247, H04M1/0237, H04L29/08657, G01S5/0252, G01S5/02, H04W52/367, H04W52/12, H04W52/40, H04W88/08, H04W72/044, H04W72/042).cpc. and (carrier near3 aggregation) and (component near3 carrier) same up$1link with associat$3 with down$1link	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/22 14:17
S116	8750	(H04W88/08, H04W72/044, H04W72/042l).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/26 14:21
S117	4336	(H04W52/367, H04W52/12, H04W52/40).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/26 14:22
S118	4205	(H04L29/08657, G01S5/0252, G01S5/02).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/26 14:23
S119	4144	(H04L29/08657, G01S19/14, G01S5/02).cpc.	US-PGPUB; USPAT; USOCR; DERWENT;	OR	ON	2014/04/26 14:23

			IBM_TDB			
S120	3826	(H04B1/3833, H04M1/0247, H04M1/0237).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/26 14:24
S121	47	(H04W88/08, H04W72/044, H04W72/042).cpc. and (1st first) near3 (radio band resource frequency) with (1st first) near3 (CC (component adj carrier))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/26 14:27
S122	25	(S116 S117 S118 S119 S120).cpc. and (1st first) near3 (radio band resource frequency) with (1st first) near3 (CC (component adj carrier))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/26 15:35
S123	13432	(H04W88/08, H04W72/044, H04W72/042).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:04
S124	4341	(H04W52/367, H04W52/12, H04W52/40).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:04
S125	4208	(H04L29/08657, G01S5/0252, G01S5/02).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:04
S126	3833	(H04B1/3833, H04M1/0247, H04M1/0237).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:04
S127	6154	(H03F3/211, H04B7/0617, H04B7/0669).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:04
S128	98	(S123 S124 S125 S126 S127) and (schedul$4 near3 down$1link) and (component near3 carrier) and single with carrier same (plurality multiple several) with (DL down$1link) with carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:04
S129	52	(S123 S124 S125 S126 S127) and (schedul$4 near3 down$1link) and (component near3 carrier) and single near6 carrier same (plurality multiple several) near3 (DL down$1link) with carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:04
S130	4	(S123 S124 S125 S126 S127) and (schedul$4) with component near3 carrier and (single near3 (DL down$1link)) with (first with resource) and (multiple plurality several) near3 (DL downlink) with second with resource	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:37
S131	2	(up$1link UL) and (schedul$4) with component near3 carrier same (single near3 (DL down$1link)) with (first with resource) same (multiple plurality several) near3 (DL downlink)	US-PGPUB; USPAT; USOCR; DERWENT;	OR	ON	2014/04/30 11:40

		with second with resource	IBM_TDB			
S132	2	(schedul$4) with component near3 carrier same (single near3 (DL down$1link)) with (first with resource) same (multiple plurality several) near3 (DL downlink) with second with resource	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:42
S133	2	(schedul$4) same (single near3 (DL down$1link)) with (first with resource) same (multiple plurality several) near3 (DL downlink) with second with resource	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:44
S134	2	(schedul$4) same (single near3 (DL down$1link)) with (first with (frequency resource block)) same (multiple plurality several) near3 (DL downlink) with second with (frequency block resource)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:45
S135	16	(single near3 (DL down$1link)) with (first with (frequency resource block)) same (multiple plurality several) near3 (DL downlink) with second with (frequency block resource)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 11:45
S136	1	allocation with (PUSCH PUCCH UL (up$1link)) and "20100232373"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 14:19
S137	1	allocation and (PUSCH PUCCH UL (up$1link)) and "20100232373"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 14:21
S138	2	"20100271970"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/04/30 14:32
S139	54	("20100322173" | "20110081913" | "20130010721" | "8634358" | "20120140708" | "20100271970" | "20100285809" | "20110007699" | "20130003700" | "20100232373" | "20120051306" | "20120082125" | "20100098012" | "20100003997" | "20100208679" | "20110310856" | "20120082125" | "20120140708" | "20130136084" | "8265030" | "20110243039" | "20120020317" | "8265030" | "20110007695" | "20110081932" | "20120314675" | "20110310856" | "20100232373" | "20100296389" | "20120020317" | "20100098012" | "20130034073" | "8447343" | "8472368").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 11:49
S140	15049	(H04W88/08, H04W72/044, H04W72/042).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 13:44
S141	4737	(H04W52/367, H04W52/12, H04W52/40).cpc.	US-PGPUB; USPAT; USOCR; DERWENT;	OR	ON	2014/10/15 13:44

			IBM_TDB			
S142	4341	(H04L29/08657, G01S5/0252, G01S5/02).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 13:44
S143	4030	(H04B1/3833, H04M1/0247, H04M1/0237).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 13:44
S144	6785	(H03F3/211, H04B7/0617, H04B7/0669).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 13:44
S145	96	(S140 S141 S142 S143 S144) and (schedul$4 near3 down$1link) and (component near3 carrier) and single with carrier same (plurality multiple several) with (DL down$1link) with carrier same (frequency resources)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 13:44
S146	1	"13315135"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 13:54
S147	2	"20080151845"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 14:58
S148	41	"455"/$.ccls. and (carrier near3 aggregation) and ((first 1st) adj6 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 15:45
S149	3	"455"/451,452.1.ccls. and (carrier near3 aggregation) and ((first 1st) adj6 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/15 18:01
S150	33889	455/451,452.1,509,456.1,522,137,103,575.ccls.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/23 11:25
S151	0	455/451,452.1,509,456.1,522,137,103,575.ccls. and (control$4) with (resource frequency channel Bin) same (sererv$4 sav$4) near3 (other 2nd second another) adj3 (resource frequency channel Bin)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/23 11:32
S152	0	455/451,452.1,509,456.1,522,137,103,575.ccls. and (control$4) with (resource frequency channel Bin) same (rererv$4 sav$4) near3 (other 2nd second another) adj3 (resource frequency channel Bin)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/23 11:33
S153	4	455/451,452.1,509,456.1,522,137,103,575.ccls. and (control$4) with (resource frequency channel Bin) same (reserv$4 sav$4) near3 (other 2nd second another) adj3 (resource	US-PGPUB; USPAT; USOCR; DERWENT;	OR	ON	2014/10/23 11:34

		frequency channel Bin)	IBM_TDB			
S154	3	455/451,452.1,509,456.1,522,137,103,575.ccls. and (control$4) with (resource frequency channel Bin) same (reserv$4 sav$4) near3 (other 2nd second another) adj3 (resource frequency channel Bin) and (CC component)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/23 11:37
S155	4	"455"/$.ccls. and (((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and ((2nd second) adj6 component adj3 carrier) same ((2nd second other another) adj6 (radio resource frame)) and (reserv$4 sav$4 us$3) near3 (other 2nd second another) adj3 (resource frequency channel Bin) and (CC component)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/23 11:39
S156	15	("20050013279" | "20030219028" | "20070217406" | "20020105970" | "20060050664" | "20090303938" | "20070064669").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/23 12:07
S157	10	"455"/$.ccls. and (schedul$3 near3 downlink) same ((radio adj resource) (resource adj block)) same (CC (component adj carrier))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/23 12:07
S158	0	455/451,452.1,509,456.1,522,137,103,575.ccls. and (control$4) with (resource frequency channel) same (rererv$4 sav$4) near3 (other 2nd second another) adj3 (resource frequency channel Bin)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/31 15:22
S161	15374	(H04W88/08, H04W72/044, H04W72/042).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/31 17:18
S162	4758	(H04W52/367, H04W52/12, H04W52/40).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/31 17:18
S163	4377	(H04L29/08657, G01S5/0252, G01S5/02).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/31 17:18
S164	4042	(H04B1/3833, H04M1/0247, H04M1/0237).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/31 17:18
S165	6867	(H03F3/211, H04B7/0617, H04B7/0669).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/10/31 17:18
S167	1	"14170939"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/17 09:46
S168	499	(component near2 carrier) with (primary near2	US-PGPUB;	OR	ON	2014/11/18

		cell)	USPAT; USOCR; DERWENT; IBM_TDB			14:07
S169	401	"370"/$.ccls. and (component near2 carrier) with (primary near2 cell)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/18 14:07
S170	378	"370"/$.ccls. and (component adj2 carrier) with (primary adj2 cell)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/18 14:07
S171	185	"370"/$.ccls. and (component adj2 carrier) with (primary adj2 cell) with (DL down$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/18 14:08
S172	4	"370"/$.ccls. and single near3 (CC (component adj2 carrier)) with (primary adj2 cell) with (DL down$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/18 14:17
S173	4	single near4 (CC (component adj2 carrier)) with (primary adj2 cell) with (DL down$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/18 14:19
S174	287	"370"/$.ccls. and (CC (component adj2 carrier)) with (primary adj2 cell) with (DL down$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/18 14:21
S175	1	@ad<"20091004" and "370"/$.ccls. and (CC (component adj2 carrier)) with (primary adj2 cell) with (DL down$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/18 14:22
S176	287	"370"/$.ccls. and (CC (component adj2 carrier)) with (primary adj2 cell) with (DL down$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2014/11/18 14:22
S177	29	("20100322173" | "20110081913" | "20130010721" | "8634358" | "20120140708" | "20100271970" | "20100285809" | "20110007699" | "20130003700" | "20100232373" | "20120051306" | "20120082125" | "20100098012" | "20100003997" | "20100208679" | "20110310856" | "20120082125" | "20120140708" | "20130136084" | "8265030" | "20110243039" | "8792830" | "20120020317" | "8265030" | "20110007695" | "20110081932" | "20120314675" | "20020160784" | "20110310856" | "20100232373" | "20100296389" | "20120020317" | "20100098012" | "20130034073" | "8447343" | "8472368").PN.	US-PGPUB; USPAT	OR	OFF	2015/10/01 11:34

S178	21250	(H04W88/08, H04W72/044, H04W72/042).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 17:24
S179	5857	(H04W52/367, H04W52/12, H04W52/40).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 17:24
S180	5079	(H04L29/08657, G01S5/0252, G01S5/02).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 17:24
S181	4391	(H04B1/3833, H04M1/0247, H04M1/0237).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 17:24
S182	8620	(H03F3/211, H04B7/0617, H04B7/0669).cpc.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 17:24
S183	221	(S178 S179 S180 S181 S182) and (schedul$4 near3 down$1link) and (component near3 carrier) and single with carrier same (plurality multiple several) with (DL down$1link) with carrier same (frequency)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 17:24
S184	552	((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in. and ericsson.as.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 17:56
S185	1	S183 and S184	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 17:56
S186	21	455/$.ccls. and ((first 1st) adj6 component adj3 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/01 18:11
S187	24	("20100322173" | "20110081913" | "20130003700" | "20100232373" | "20120051306" | "20120082125" | "20100098012" | "20100003997" | "20100208679" | "20110310856" | "20120082125" | "20120140708" | "20130136084" | "8265030" | "20110243039" | "8792830" | "20120020317" | "8265030" | "20110007695" | "20110081932" | "20120314675" | "20020160784" | "20110310856" | "20100232373" | "20100296389" | "20120020317" | "20100098012" | "20130034073" | "8447343" | "8472368").PN.	US-PGPUB; USPAT	OR	OFF	2015/10/02 12:23
S188	1	"14030298"	US-PGPUB;	OR	OFF	2015/10/02

			USPAT			15:41
S189	198	((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/03 16:15
S190	1	"14102508"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:17
S191	0	"14158378"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:17
S192	1	"14097736"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:17
S193	2	"14006545"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:17
S194	1	"13875620"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:18
S195	1	"13905342"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:18
S196	1	"13477988"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:18
S197	2	"13293245"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:18
S198	1	"13875620"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:19
S199	2	"13993807"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:19
S200	1	"13898465"	US-PGPUB; USPAT; USOCR; DERWENT;	OR	ON	2015/10/13 14:19

			IBM_TDB			
S201	1	"13883792"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:19
S202	1	"13996405"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:19
S203	1	"13883002"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:20
S204	0	"14812058"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:20
S205	7	"8915660"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:20
S206	1	"13909538"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:21
S207	1	"13924238"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:22
S208	1	"13898465"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:23
S209	2	"13993807"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:23
S210	58	("20100322173" | "20110081913" | "20130010721" | "8634358" | "20120140708" | "20100271970" | "20100285809" | "20110007699" | "20130003700" | "20100232373" | "20120051306" | "20120082125" | "20100098012" | "20100003997" | "20100208679" | "20110310856" | "20120082125" | "20120140708" | "20130136084" | "8265030" | "20110243039" | "8792830" | "20120020317" | "8265030" | "20110007695" | "20110081932" | "20120314675" | "20020160784" | "20110310856" | "20100232373" | "20100296389" | "20120020317" |	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:25

		"20100098012" | "20130034073" | "8447343" | "8472368").PN.				
S211	1	"13906370"	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:38
S212	58	("20100322173" | "20110081913" | "20130010721" | "8634358" | "20120140708" | "20100271970" | "20100285809" | "20110007699" | "20130003700" | "20100232373" | "20120051306" | "20120082125" | "20100098012" | "20100003997" | "20100208679" | "20110310856" | "20120082125" | "20120140708" | "20130136084" | "8265030" | "20110243039" | "8792830" | "20120020317" | "8265030" | "20110007695" | "20110081932" | "20120314675" | "20020160784" | "20110310856" | "20100232373" | "20100296389" | "20120020317" | "20100098012" | "20130034073" | "8447343" | "8472368").PN.	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:51
S213	0	(H04W88/08, H04W72/044, H04W72/042).cpc. and (H04W52/367, H04W52/12, H04W52/40).cpc. and (H04L29/08657, G01S5/0252, G01S5/02).cpc. and (H04B1/3833, H04M1/0247, H04M1/0237).cpc.	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:55
S214	36289	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc.	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:56
S215	3	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and single near3 (CC (component adj2 carrier)) with (primary adj2 cell) with (DL down$1link)	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 14:56
S216	553	((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in. and ericsson.as.	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 17:05
S217	553	(((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in.) and ericsson.as.	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 17:05
S218	131	(((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in.) and ericsson.as. and carrier adj aggregation	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 17:07
S219	48	"455"/$.ccls. and (carrier near3 aggregation) and ((first 1st) adj6 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 carrier) same ((2nd second) adj6 (radio resource frame)) and carrier adj aggregation	US-PGPUB; USPAT USOCR; DERWENT; IBM_TDB	OR	ON	2015/10/13 17:27
S220	48	(H04W88/08, H04W72/044, H04W72/042).cpc.	US-PGPUB;	OR	ON	2016/03/09

		and ((first 1st) adj6 component adj3 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	USPAT; USOCR; DERWENT; IBM_TDB			15:13
S221	15	(set group) near6 (radio resource) with (2nd second other another) near6 (DL down$link) near3 (component near3 carrier)	US-PGPUB; USPAT	OR	ON	2016/03/09 15:26
S222	35	455/509,522,456.6,137,103,575.ccls. and (downlink near3 carrier) and (uplink near3 (primary first initial) near3 carrier) and ((second 2nd other next) with (channel resource)) and (carrier adj aggregation)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/09 15:45
S223	0	(H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and ((2nd second) adj6 component adj3 carrier) same ((2nd second other another) adj4 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/09 15:48
S224	0	(((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in.) and ericsson.as. and single near3 (CC (component adj2 carrier)) with (primary adj2 cell) with (DL down$1link)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/09 16:14
S225	32	(((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in.) and ericsson.as. and (CC (component adj2 carrier)) with (primary adj2 cell)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/09 16:14
S226	130	455/$.ccls. and (downlink near3 carrier) and (uplink near3 (primary first initial) near3 carrier) and ((second 2nd other next) with (channel resource)) and (control with information)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/09 17:02
S227	30	("20120127950" | "20110310819" | "20120275395" | "20120287828" | "20120039291" | "20100271970" | "20120307781" | "20110286436" | "20120224535" | "20120140708" | "20120163288" | "20110299486" | "20100098012" | "20120082125 " | "20120294273").pn.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/09 18:32
S228	10	(carrier adj aggregation) and (schedul$3 near3 (downlink DL) with ((first primary initial) near6 (resource radio frequency frame))) and ((first 1st) adj6 component adj3 carrier) same ((1st first) adj6 (radio resource frame)) and ((2nd second) adj6 component adj3 carrier) same ((2nd second) adj6 (radio resource frame))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/09 20:46
S229	3	"20070030661"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/09 21:31
S230	76	370/329,252,331.ccls. and (((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and ((2nd second) adj6 component adj3 carrier) same ((2nd second other another)	US-PGPUB; USPAT; USOCR; DERWENT;	OR	ON	2016/03/10 09:26

		adj4 (radio resource frame))	IBM_TDB			
S231	0	(H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/16 11:49
S233	0	(H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near6 carrier	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/03/16 11:54
S234	18	(H04L5/0053, H04L5/001, H04L5/0094, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/16 11:59
S235	18	(H04L5/0053, H04L5/001, H04L5/0094, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/16 12:04
S236	7	(H04L5/0053, H04L5/001, H04L5/0094, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/16 12:06
S237	0	455/509,522,456.6,137,103,575.ccls. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/03/16 12:31
S238	7	(A01B12/006, H04L5/0053, H04L5/001, H04L5/0094, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/03/16 12:39
S239	4	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/03/16 12:47
S240	0	((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in. and ericsson.as. and (schedul$3 assigin$3) with (primary adj cell) same2	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	ON	2016/03/16 13:28

		(multiple several set) near3 component adj2 carrier	DERWENT; IBM_TDB			
S246	60	("20100322173" | "20110081913" | "20130010721" | "8634358" | "20110007699" | "8792830" | "20120140708" | "20100271970" | "20100285809" | "20110007699" | "20130003700" | "20100003997" | "20100232373" | "20130003700" | "8447343" | "8634358" | "20100232373" | "20120051306" | "20100296389" | "20120140708" | "20130010721" | "20130136084" | "20120082125" | "20020160784" | "20110081913" | "20110081932" | "20110243039" | "20120020317" | "20100098012" | "20100003997" | "20100208679" | "20110310856" | "20120082125" | "20120140708" | "20130136084" | "8265030" | "20110243039" | "8792830" | "20120051306" | "20120314675" | "8472368" | "20120147847" | "20120020317" | "8265030" | "20110007695" | "20110081932" | "20120314675" | "20020160784" | "20100271970" | "20100285809" | "20130034073" | "8265030" | "20110310856" | "20100232373" | "20100296389" | "20120020317" | "20100098012" | "20110310856" | "20120082125" | "20100098012" | "20130034073" | "8447343" | "8472368" | "20100208679" | "20100322173" | "20110007695").PN.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 11:47
S247	1	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	USPAT	OR	ON	2016/06/24 11:50
S248	7	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	ON	2016/06/24 11:51
S249	269	((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in. and 455/$.ccls.	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 11:55
S250	2	((david near2 astely) (robert near2 baldemair) (dirk near2 gerstenberger) (daniel near2 larsson) (lars near2 lindbom) (stefan near2 parkvall)).in. and (carrier adj aggregation) and (schedul$3 near3 (downlink DL) with ((first primary initial) near6 (resource radio frequency frame)))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 11:56

S251	5	455/451,452.1,509,456.1,522,137,103,575.ccls. and (control$4) with (resource frequency channel Bin) same (reserv$4 sav$4) near3 (other 2nd second another next) adj3 (resource frequency channel Bin) and (CC component)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 11:57
S252	1	"12896993"	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 12:05
S253	61	370/329,252,331.ccls. and (((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and ((2nd second) adj6 component adj3 carrier) same ((2nd second other another) adj4 (radio resource frame)) and (set group) near6 (radio resource)	US-PGPUB; USPAT	OR	ON	2016/06/24 12:21
S254	2	("20120147847").PN.	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/06/24 12:48
S257	29	455/509,522,456.6,137,103,575.ccls. and (schedul$3 assigin$3) with component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 14:30
S258	22	455/$.ccls. and (1st first) near3 (radio band resource frequency) with (reserv$3 schedul$3 allocat$3) with (1st first) near3 (CC (component adj carrier))	US-PGPUB; USPAT; USOCR; DERWENT; IBM_TDB	OR	ON	2016/06/24 14:32

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L4	14	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	USPAT	OR	ON	2016/06/24 22:15
L5	66	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT	OR	ON	2016/06/24 22:15
L6	13	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj	US-PGPUB; USPAT	OR	ON	2016/06/24 22:17

		cell) same2 (multiple several set) and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources) same component adj carrier				
S159	0	455/451,452.1,509,456.1,522,137,103,575.ccls. and (control$4) with (resource frequency channel) same (rerserv$4 sav$4) near3 (other 2nd second another) adj3 (resource frequency channel Bin)	US-PGPUB; USPAT	OR	ON	2014/10/31 15:24
S160	5	(DL down$link) with (1st first first primary initia) near3 (set group) near6 (radio resource) and (DL down$link) with (set group) near6 (radio resource) with (2nd second other another) near2 component	US-PGPUB; USPAT	OR	ON	2014/10/31 15:26
S241	0	(H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier	US-PGPUB; USPAT	OR	ON	2016/03/16 11:50
S242	7	(H04L5/0053, H04L5/001, H04L5/0094, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT	OR	ON	2016/03/16 12:38
S243	7	(A01B12/006, H04L5/0053, H04L5/001, H04L5/0094, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT	OR	ON	2016/03/16 12:39
S244	1	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	USPAT	OR	ON	2016/03/16 12:47
S245	4	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3 component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)	US-PGPUB; USPAT	OR	ON	2016/03/16 12:47
S255	7	(H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237).cpc. and (schedul$3 assigin$3) with (primary adj cell) same2 (multiple several set) near3	US-PGPUB; USPAT	OR	ON	2016/06/24 11:48

		component adj2 carrier and (control$4 adjust$3) near6 (DL (down$link)) and (second 2nd another other) near3 (radio frequency band resources)				
S256	61	370/329,252,331.ccls. and (((first 1st) adj6 component adj3 carrier) same ((radio resource frame))) and ((2nd second) adj6 component adj3 carrier) same ((2nd second other another) adj4 (radio resource frame)) and (set group) near6 (radio resource)	US-PGPUB; USPAT	OR	ON	2016/06/24 12:22

6/ 24/ 2016 10:20:46 PM
C:\ Users\ mtalukder\ Documents\ EAST\ Workspaces\ 12896993.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	12896993	ASTELY ET AL.
	Examiner	Art Unit
	MD TALUKDER	2648

CPC- SEARCHED

Symbol	Date	Examiner
H04W88/08, H04W72/044, H04W72/042	4/22/2014 & 4/30/2014 & 10/31/2014	
H04W52/367, H04W52/12, H04W52/40	4/22/2014 & 4/30/2014 & 10/31/2014	Talukder
H04L29/08657, G01S5/0252, G01S5/02	4/22/2014 & 4/30/2014 & 10/31/2014	Talukder
H04B1/3833, H04M1/0247, H04M1/0237	4/22/2014 & 4/30/2014	Talukder
H03F3/211, H04B7/0617, H04B7/0669	4/22/2014 & 4/30/2014	
H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237	10/13/2015	Talukder
H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237	3/16/2016	Talukder
H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237	6/24/2016	Talukder

CPC COMBINATION SETS - SEARCHED

Symbol	Date	Examiner

US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner
455	509,522,456.6,137,103,575	12/11/2012	Talukder
370	329,252,331	12/11/2012	Talukder
455	Text	6/17/2013	Talukder
370	329,341,348,395.4	6/26/2013	Talukder

US CLASSIFICATION SEARCHED

Class	Subclass	Date	Examiner
455	All	10/13/2015	Talukder
455	509,522,456.6,137,103,575	3/9/2016	Talukder
370	29,252,331	3/9/2016	Talukder
455	509,522,456.6,137,103,575	6/24/2016	Talukder
370	29,252,331	6/24/2016	Talukder
			Talukder

SEARCH NOTES

Search Notes	Date	Examiner
East Search	12/10/2012	talukder
East Search	12/11/2012	talukder
East Search	6/17/2013	talukder
East Search	6/18/2013	talukder
East Search	6/26/2013	talukder
East Search	6/27/2013	Talukder
East Search	4/22/2014 & 4/30/2014	Talukder
Text Srarched	10/31/2014	Talukder
Assignee Searched	10/13/2015	Talukder
Inventor Searched	10/13/2015	Talukder
East Searched	10/13/2015	Talukder
Assignee Searched	3/9/2016	Talukder
Inventor Searched	3/9/2016	Talukder
East Searched	3/9/2016	Talukder
Assignee Searched	6/24/2016	Talukder
Inventor Searched	6/24/2016	Talukder
East Searched	6/24/2016	Talukder
		Talukder

INTERFERENCE SEARCH

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

INTERFERENCE SEARCH			
US Class/ CPC Symbol	**US Subclass / CPC Group**	**Date**	**Examiner**
H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237		3/16/2016	Talukder
455	All	3/16/2016	Talukder
455	All	6/24/2016	Talukder
H04W88/08, H04W72/044, H04W72/042, H04W52/367, H04W52/12, H04W52/40, H04L29/08657, G01S5/0252, G01S5/02, H04B1/3833, H04M1/0247, H04M1/0237		6/24/2016	Talukder
			Talukder

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)

24112 7590 07/07/2016
COATS & BENNETT, PLLC
1400 Crescent Green, Suite 300
Cary, NC 27518

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.

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.
12/896,993	10/04/2010	David Astely	4015-6942 / P30138-US2	1015

TITLE OF INVENTION: PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced

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	10/07/2016

EXAMINER	ART UNIT	CLASS-SUBCLASS
TALUKDER, MD K	2648	455-509000

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,
(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.
1 Coats & Bennett, PLLC
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: Telefonaktiebolaget LM Ericsson (publ)
(B) RESIDENCE: (CITY and STATE OR COUNTRY): 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

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 18-1167 (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 — 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.
- ☐ Applicant asserting small entity status. See 37 CFR 1.27 — 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.
- ☐ Applicant changing to regular undiscounted fee 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 /Edward M. Roney/ Date 09/30/2016
Typed or printed name Edward M. Roney Registration No. 62048

Electronic Patent Application Fee Transmittal

Application Number:	12896993
Filing Date:	04-Oct-2010
Title of Invention:	PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced
First Named Inventor/Applicant Name:	David Astely
Filer:	Edward Milton Roney/Kenyatta Upchurch
Attorney Docket Number:	4015-6942 / P30138-US2

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:	27090416
Application Number:	12896993
International Application Number:	
Confirmation Number:	1015
Title of Invention:	PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced
First Named Inventor/Applicant Name:	David Astely
Customer Number:	24112
Filer:	Edward Milton Roney/Kenyatta Upchurch
Filer Authorized By:	Edward Milton Roney
Attorney Docket Number:	4015-6942 / P30138-US2
Receipt Date:	30-SEP-2016
Filing Date:	04-OCT-2010
Time Stamp:	15:24:12
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	100316INTEFSW15260500
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	Issue Fee Payment (PTO-85B)	P30138_US2_Issue_Fee_Transmittal.pdf	561313 dea8cc29f6c58856f88397e3ce3c483cbc702953	no	1
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	30556 bc803d57b83fa80ab4e28a90c763455d6c988fdf	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	591869		

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.
12/896,993	11/15/2016	9497004	4015-6942 / P30138-US2	1015

24112 7590 10/26/2016

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 612 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):

David Astely, Bromma, SWEDEN;
Robert Baldemair, Solna, SWEDEN;
Dirk Gerstenberger, Stockholm, SWEDEN;
Daniel Larsson, Solna, SWEDEN;
Lars Lindbom, Karlstad, SWEDEN;
Stefan Parkvall, Stockholm, SWEDEN;

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 9,497,004 B2

APPLICATION NO. : 12/896,993

ISSUE DATE : November 15, 2016

INVENTOR(S) : Astely, 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 Page 2, in Field (56), under "OTHER PUBLICATIONS", in Column 2, Line 19, delete "=Rance," and insert - - France. - -, therefor.

On Page 2, in Field (56), under "OTHER PUBLICATIONS", in Column 2, Line 24, delete "DPCCH" and insert - - PDCCH - -, therefor.

In Column 4, Line 48, delete "muitipath" and insert - - multipath - -, therefor.

In Column 7, Line 31, delete "or" and insert - - of - -, therefor.

In Column 7, Line 47, delete "as" and insert - - as: - -, therefor.

In Column 9, Line 1, delete "simuitaneousiy" and insert - - simultaneously - -, therefor.

In Column 10, Line 53, delete "Mapping" and insert - - mapping - -, therefor.

In Column 11, Line 8, delete "ion" and insert - - on - -, 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

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 9,497,004 B2

APPLICATION NO. : 12/896,993

ISSUE DATE : November 15, 2016

INVENTOR(S) : Astely, 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 11, Line 51, delete "downiink" and insert - - downlink - -, therefor.

In Column 14, Line 51, in Claim 17, delete "transmission," and insert - - transmissions, - -, therefor.

In Column 15, Line 2, in Claim 17, delete "on" and insert - - in - -, therefor.

In Column 15, Line 25, in Claim 22, delete "on said" and insert - - in said - -, therefor.

In Column 15, Line 64, in Claim 24, delete "on" and insert - - in - -, therefor.

In Column 16, Line 22, in Claim 29, delete "on" and insert - - in - -, therefor.

In Column 16, Line 36, in Claim 31, delete "transmission" and insert - - transmissions - -, therefor.

In Column 16, Line 46, in Claim 31, delete "transmission" and insert - - transmissions - -, 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

PTO/SB/44 (09-07)
Approved for use through 08/31/2013. OMB 0651-0033
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

(Also Form PTO-1050)

UNITED STATES PATENT AND TRADEMARK OFFICE
CERTIFICATE OF CORRECTION

PATENT NO. : 9,497,004 B2

APPLICATION NO. : 12/896,993

ISSUE DATE : November 15, 2016

INVENTOR(S) : Astely, 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 16, Line 49, in Claim 31, delete "on" and insert - - in - -, therefor.

In Column 17, Line 18, in Claim 32, delete "resources on" and insert - - resources on a - -, therefor.

In Column 17, Line 29, in Claim 32, delete "on" and insert - - in - -, therefor.

In Column 18, Line 39, in Claim 39, delete "on" and insert - - in - -, therefor.

In Column 19, Line 12, in Claim 40, delete "on" and insert - - in - -, 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

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:	12896993
Filing Date:	04-Oct-2010
Title of Invention:	PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced
First Named Inventor/Applicant Name:	David Astely
Filer:	Steven Ware Smith/Michelle Sanderson
Attorney Docket Number:	4015-6942 / P30138-US2

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	100	100

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**100**

Electronic Acknowledgement Receipt

EFS ID:	28027113
Application Number:	12896993
International Application Number:	
Confirmation Number:	1015
Title of Invention:	PUCCH Resource Allocation for Carrier Aggregation in LTE-Advanced
First Named Inventor/Applicant Name:	David Astely
Customer Number:	24112
Filer:	Steven Ware Smith/Michelle Sanderson
Filer Authorized By:	Steven Ware Smith
Attorney Docket Number:	4015-6942 / P30138-US2
Receipt Date:	10-JAN-2017
Filing Date:	04-OCT-2010
Time Stamp:	18:03:40
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$100
RAM confirmation Number	011117INTEFSW00004418501379
Deposit Account	501379
Authorized User	Michelle Sanderson

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

37 CFR 1.20 (Post Issuance fees)

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	P30138-US2_2017-01-10_CoC_Request_Letter.pdf	94634 ec5ec16201781d6ecd0b5dffbe5e1740f59fb1a2	no	4
Warnings:					
Information:					
2	Request for Certificate of Correction	P30138-US2_2017-01-10_CoC_PTO-1050.pdf	119656 255dbd5135f0eacd62d0442100ab928da2a7ea0b	no	4
Warnings:					
Information:					
3	Fee Worksheet (SB06)	fee-info.pdf	30206 712e02b7bc4ec59b75f6cde78599cafc83223f7a	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	244496		

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. 9,497,004

USPTO CONFIRMATION CODE: 1015

APPLICATION NO.: 12/896,993

FILED: October 4, 2010

EXAMINER: MD Talukder

GROUP ART UNIT: 2648

FOR: PUCCH RESOURCE ALLOCATION FOR CARRIER AGGREGATION IN LTE-ADVANCED

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 12/896,993, now Patent Number 9,497,004.

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 **$100.00** 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 Page 2, in Field (56), under "OTHER PUBLICATIONS", in Column 2, Line 19, delete "=Rance," and insert - - France. - -, therefor.
(LIST OF REFERENCES CITED BY APPLICANT AND CONSIDERED BY EXAMINER DATED MARCH 18, 2016, SHEET 2 (PAGE 242 OF FW), ENTRY 1, LINE 4)

On Page 2, in Field (56), under "OTHER PUBLICATIONS", in Column 2, Line 24, delete "DPCCH" and insert - - PDCCH - -, therefor.
(LIST OF REFERENCES CITED BY APPLICANT AND CONSIDERED BY EXAMINER DATED JULY 7, 2016, SHEET 2 (PAGE 17 OF FW), ENTRY 2, LINE 1)

In Column 4, Line 48, delete "muitipath" and insert - - multipath - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED OCTOBER 4, 2010, PAGE 7, PARAGRAPH [028], LINE 7)

In Column 7, Line 31, delete "or" and insert - - of - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED OCTOBER 4, 2010, PAGE 12, PARAGRAPH [043], LINE 4)

In Column 7, Line 47, delete "as" and insert - - as: - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED OCTOBER 4, 2010, PAGE 13, PARAGRAPH [045], LINE 4)

In Column 9, Line 1, delete "simuitaneousiy" and insert - - simultaneously - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED OCTOBER 4, 2010, PAGE 15, PARAGRAPH [052], LINE 8)

In Column 10, Line 53, delete "Mapping" and insert - - mapping - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED OCTOBER 4, 2010, PAGE 18, PARAGRAPH [058], LINE 9)

In Column 11, Line 8, delete "ion" and insert - - on - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED OCTOBER 4, 2010, PAGE 19, PARAGRAPH [060], LINE 3)

In Column 11, Line 51, delete "downiink" and insert - - downlink - -, therefor.
(ORIGINALLY FILED SPECIFICATION DATED OCTOBER 4, 2010, PAGE 20, PARAGRAPH [062], LINE 8)

In Column 14, Line 51, in Claim 17, delete "transmission," and insert - - transmissions, - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 6 OF 16, CLAIM 17, LINE 8)

In Column 15, Line 2, in Claim 17, delete “on” and insert - - in - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 6 OF 16, CLAIM 17, LINE 21)

In Column 15, Line 25, in Claim 22, delete “on said” and insert - - in said - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 7 OF 16, CLAIM 23, LINE 3)

In Column 15, Line 64, in Claim 24, delete “on” and insert - - in - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 8 OF 16, CLAIM 25, LINE 23)

In Column 16, Line 22, in Claim 29, delete “on” and insert - - in - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 9 OF 16, CLAIM 31, LINE 3)

In Column 16, Line 36, in Claim 31, delete “transmission” and insert - - transmissions - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 10 OF 16, CLAIM 33, LINE 5)

In Column 16, Line 46, in Claim 31, delete “transmission” and insert - - transmissions - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 10 OF 16, CLAIM 33, LINE 12)

In Column 16, Line 49, in Claim 31, delete “on” and insert - - in - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 10 OF 16, CLAIM 33, LINE 22)

In Column 17, Line 18, in Claim 32, delete “resources on” and insert - - resources on a - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 11 OF 16, CLAIM 34, LINES 9-10)

In Column 17, Line 29, in Claim 32, delete “on” and insert - - in - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 11 OF 16, CLAIM 34, LINE 24)

In Column 18, Line 39, in Claim 39, delete “on” and insert - - in - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 13 OF 16, CLAIM 43, LINE 23)

In Column 19, Line 12, in Claim 40, delete “on” and insert - - in - -, therefor.
(AMENDMENTS TO THE CLAIMS DATED JUNE 20, 2016, PAGE 14 OF 16, CLAIM 44, LINE 26)

The requested corrections are attached on Form PTO 1050.

Respectfully Submitted

, 2016

DATE

/Ronald J. Ward,Reg#54870/

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Attorney of Record

UNITED STATES PATENT AND TRADEMARK OFFICE

CERTIFICATE OF CORRECTION

PATENT NO. : 9,497,004 B2
APPLICATION NO. : 12/896993
DATED : November 15, 2016
INVENTOR(S) : Astely et al.

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

On Page 2, item (56), under "OTHER PUBLICATIONS", Column 2, Line 19, delete "=Rance," and insert -- France. --, therefor.

On Page 2, item (56), under "OTHER PUBLICATIONS", Column 2, Line 24, delete "DPCCH" and insert -- PDCCH --, therefor.

In the Specification

Column 4, Line 48, delete "muitipath" and insert -- multipath --, therefor.

Column 7, Line 31, delete "or" and insert -- of --, therefor.

Column 7, Line 47, delete "as" and insert -- as: --, therefor.

Column 9, Line 1, delete "simuitaneousiy" and insert -- simultaneously --, therefor.

Column 10, Line 53, delete "Mapping" and insert -- mapping --, therefor.

Column 11, Line 8, delete "ion" and insert -- on --, therefor.

Column 11, Line 51, delete "downiink" and insert -- downlink --, therefor.

In the Claims

Column 14, Line 51, Claim 17, delete "transmission," and insert -- transmissions, --, therefor.

Column 15, Line 2, Claim 17, delete "on" and insert -- in --, therefor.

Signed and Sealed this
Twenty-first Day of February, 2017

Michelle K. Lee

Michelle K. Lee
Director of the United States Patent and Trademark Office

Column 15, Line 25, Claim 22, delete “on said” and insert -- in said --, therefor.

Column 15, Line 64, Claim 24, delete “on” and insert -- in --, therefor.

Column 16, Line 22, Claim 29, delete “on” and insert -- in --, therefor.

Column 16, Line 36, Claim 31, delete “transmission” and insert -- transmissions --, therefor.

Column 16, Line 46, Claim 31, delete “transmission” and insert -- transmissions --, therefor.

Column 16, Line 49, Claim 31, delete “on” and insert -- in --, therefor.

Column 17, Line 18, Claim 32, delete “resources on” and insert -- resources on a --, therefor.

Column 17, Line 29, Claim 32, delete “on” and insert -- in --, therefor.

Column 18, Line 39, Claim 39, delete “on” and insert -- in --, therefor.

Column 19, Line 12, Claim 40, delete “on” and insert -- in --, therefor.