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(12) **United States Patent**
Tan Bergström et al.

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(54) **WIRELESS TERMINALS, NODES OF WIRELESS COMMUNICATION NETWORKS, AND METHODS OF OPERATING THE SAME**

(56) **References Cited**

U.S. PATENT DOCUMENTS

8,730,829 B2 5/2014 Hwang et al.
8,798,663 B2 8/2014 Wang et al.
(Continued)

FOREIGN PATENT DOCUMENTS

EP 2317815 5/2011
EP 2693820 2/2014
(Continued)

OTHER PUBLICATIONS

Nokia Siemens Networks et al., "PHR remaining issues", Agenda Item 7.1.1.6, Document for: Discussion and Decision, 3GPP TSG-RAN WG2 Meeting #71 bis, R2-105379, Xian, China, Oct. 11-15, 2010, 8 pp.

(Continued)

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(57) **ABSTRACT**

According to one embodiment, a method of operating a wireless terminal may include configuring a first group of component carriers, and while configured with the first group of component carriers, communicating a first MAC CE including a first bit map having a first bit map size with bits of the first bit map corresponding to respective component carriers of the first group of component carriers. The method may also include configuring a second group of component carriers wherein the first and second groups of component carriers are different. While configured with the second group of component carriers, a second MAC CE may be communicated, wherein the second MAC CE includes a second bit map having a second bit map size with bits of the second bit map corresponding to respective component carriers of the second group of component carriers. Moreover, the first and second bit map sizes may be different.

40 Claims, 17 Drawing Sheets

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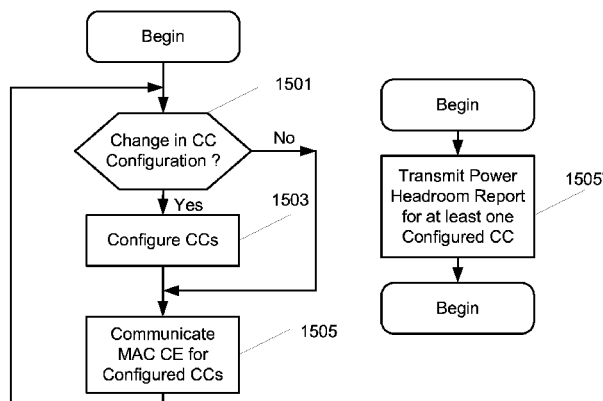
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H04W 52/36 (2009.01)
(Continued)

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(Continued)

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CPC ... H04L 5/001; H04L 1/1614; H04W 72/0413
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WO	WO 2012/165821	12/2012
WO	WO 2013/025547	2/2013
WO	WO 2013/115263	8/2013

OTHER PUBLICATIONS

- (60) Provisional application No. 62/149,899, filed on Apr. 20, 2015, provisional application No. 62/102,685, filed on Jan. 13, 2015.
- (51) **Int. Cl.**
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H04L 12/26 (2006.01)
H04L 29/12 (2006.01)
- (52) **U.S. Cl.**
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- (58) **Field of Classification Search**
 USPC 370/329, 336, 252; 455/509, 522, 422.1, 455/501, 450
 See application file for complete search history.

International Search Report and Written Opinion of the International Searching Authority, Application No. PCT/SE2015/051191, dated Feb. 25, 2016.

Ericsson, “Running MAC CR for Carrier Aggregation enhancements”, Change Request, 3GPP TSG-RAN WG2 Meeting #91 bis, R2-154910, Malmo, Sweden, Oct. 5-9, 2015, 75 pp.

3GPP, Technical Specification—“3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification (Release 12)”, 3GPP TS 36.331 V12.4.1 (Dec. 2014), 410 pp.

3GPP, Technical Specification—“3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification (Release 12)”, 3GPP TS 36.321 V12.3.0 (Sep. 2014), 57 pp.

3GPP, Technical Specification—“3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures (Release 12)”, 3GPP TS 36.213 V12.4.0 (Dec. 2014), 225 pp.

3GPP, Technical Specification—“3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management (Release 12)”, 3GPP TS 36.133 V12.6.0 (Dec. 2014), 992 pp.

3GPP, Technical Specification—“3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception (Release 12)”, 3GPP TS 36.101 V12.6.0 (Dec. 2014), 589 pp.

“MAC CE impact due to CA enhancements,” 3GPP TSG-RAN WG2 #89bis, Bratislava, Slovakia, Apr. 20-24, 2015, Agenda Item 7.2.3, Ericsson (Tdoc R2-151506) 6 pages.

“New format for Activation/Deactivation MAC Control Element,” 3GPP TSG RAN WG2 #89bis, Apr. 20-24, 2015, Bratislava, Slovakia, Agenda Item 7.2.3, Samsung (R2-151620) 2 pages.

Japanese Office Action dated Oct. 5, 2018, Application No. 2017-535645 (Japanese-language document, 3 pages) and English-language Summary of the Office Action, 2 pages.

Search Report (English-Language Translation) Russian Patent Application No. 20171284585/07 (049226) dated Mar. 6, 2018, 2 pages.

(56) **References Cited**

U.S. PATENT DOCUMENTS

8,811,322 B2	8/2014	Feuersanger et al.
9,210,671 B2	12/2015	Bostrom et al.
9,402,255 B2	7/2016	Lohr et al.
9,642,161 B2	5/2017	Wu et al.
2012/0083308 A1	4/2012	Wang
2012/0224552 A1	9/2012	Feuersanger
2013/0114576 A1	5/2013	Kwon et al.
2013/0215866 A1	8/2013	Ahn et al.
2013/0242790 A1*	9/2013	Kwon H04W 28/06 370/252
2016/0127107 A1*	5/2016	Zhang H04L 5/001 370/329

FOREIGN PATENT DOCUMENTS

JP	A 2013-179551	9/2013
JP	A 2015-516695	6/2015
RU	2510595 C2	3/2014
RU	2013102306 A	7/2014
WO	WO 2011/159222	12/2011
WO	WO 2012/111980	8/2012

* cited by examiner

FIGURE 1

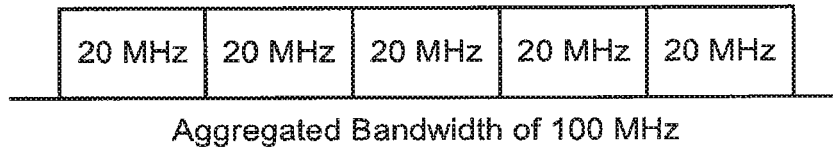


FIGURE 2A

Index	LCID values
00000	CCCH
00001-01010	Identity of the logical channel
01011-11000	Reserved
11001	Extended Power Headroom Report
11010	Power Headroom Report
11011	C-RNTI
11100	Truncated BSR
11101	Short BSR
11110	Long BSR
11111	Padding

FIGURE 2B

Index	LCID values
00000	CCCH
00001-01010	Identity of the logical channel
01011-11001	Reserved
11010	Long DRX Command
11011	Activation/Deactivation
11100	UE Contention Resolution Identity
11101	Timing Advance Command
11110	DRX Command
11111	Padding

FIGURE 2C

PH	Power Headroom Level
0	POWER_HEADROOM_0
1	POWER_HEADROOM_1
2	POWER HEADROOM 2
3	POWER HEADROOM 3
...	...
60	POWER_HEADROOM_60
61	POWER HEADROOM 61
62	POWER HEADROOM 62
63	POWER HEADROOM 63

FIGURE 3

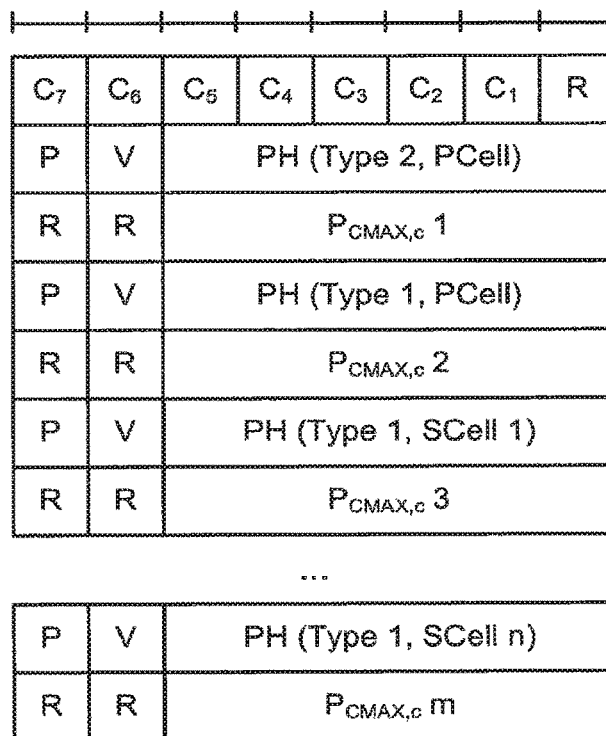
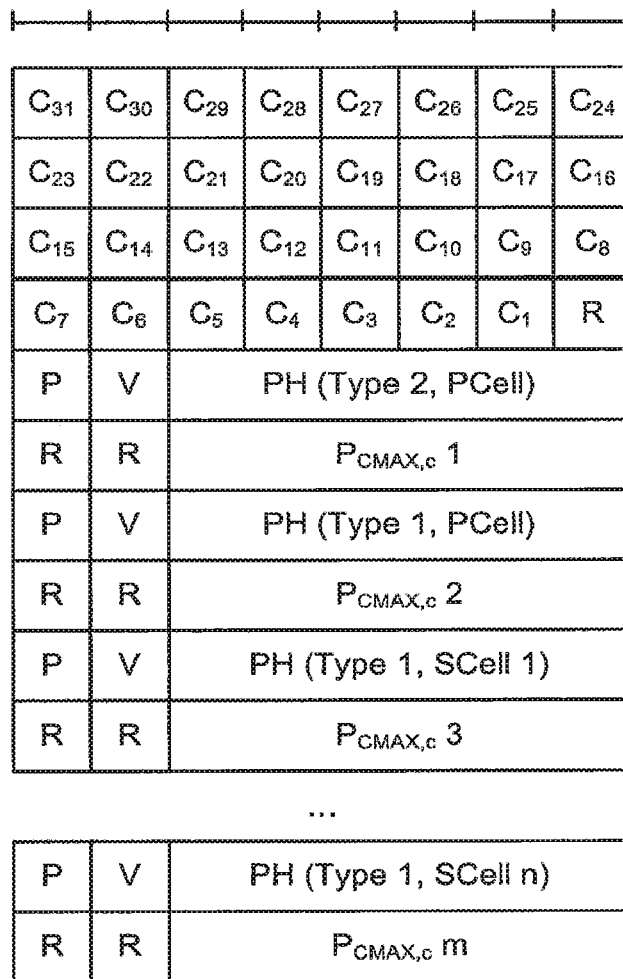


FIGURE 4



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