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ZHANG, Guodong [CN/US]; 14 Walnut Drive, Syosset, New York 11791 (US).

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(74) Agent: **HUQ, Abhik A.**; Volpe and Koenig, P.C., 30 South 17th Street United Plaza, Suite 1600, Philadelphia, Pennsylvania 19103 (US).

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(71) Applicant (for all designated States except US): **INTER-DIGITAL PATENT HOLDINGS, INC.** [US/US]; 3411 Silverside Road Concord Plaza, Suite 105 Hagley Building, Wilmington, Delaware 19810 (US).

(72) Inventors; and

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(75) Inventors/Applicants (for US only): **PAN, Kyle, Jung-Lin** [US/US]; 43 Avalon Circle, Smithtown, New York 11787 (US). **GAUVREAU, Jean-Louis** [CA/CA]; 115 Paradis, La Prairie, Québec J5R 6G7 (CA). **PIETRASKI, Philip J.** [US/US]; 7 Talbot Place, Huntington Station, New York 11746 (US). **TERRY, Stephen E.** [US/US]; 15 Summit Avenue, Northport, New York 11768 (US).

[Continued on next page]

(54) Title: ASPECTS OF UPLINK AND DOWNLINK IN CARRIER AGGREGATION

⁷⁰⁰ (57) Abstract: Methods of mapping, indicating, encoding and transmitting uplink (UL) grants and downlink (DL) assignments for wireless communications for carrier aggregation are disclosed. Methods to encode and transmit DL assignments and UL grants and map and indicate the DL assignments to DL component carriers and UL grants to UL component carriers are described. Methods include specifying the mapping rules for DL component carriers that transmit DL assignment and DL component carriers that receive physical downlink shared channel (PDSCH), and mapping rules for DL component carriers that transmit UL grants and UL component carriers that transmit physical uplink shared channel (PUSCH) when using separate coding/separate transmission schemes.

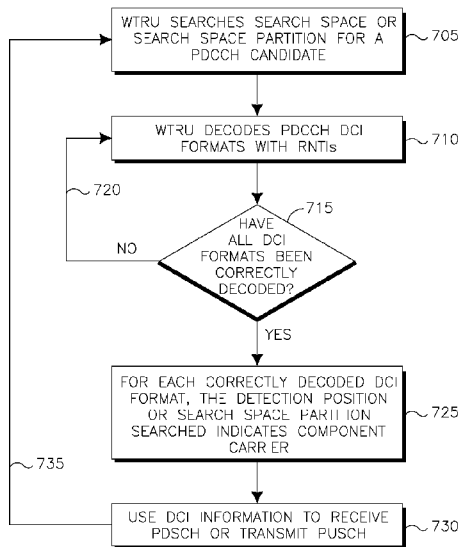


FIG. 7

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INTERNATIONAL SEARCH REPORT

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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) H04W		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched		
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C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	LG ELECTRONICS: "Considerations on DL/UL Transmission in Asymmetric Carrier Aggregation" 3GPP DRAFT; R1-090211, 7 January 2009 (2009-01-07), XP050318142 Ljubljana chapter 2; fig. 1 chapter 3.1 and 3.2 chapter 4	1-9,30
X	HUAWEI: "PDCCH design for carrier aggregation" 3GPP DRAFT R1-090127, 7 January 2009 (2009-01-07), XP050318065 Ljubljana	28
A	chapter 1, 2.1 and 3 ----- -/--	1-9,30
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input type="checkbox"/> See patent family annex.		
* Special categories of cited documents :		
"A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier document 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	
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Kahl, Marcus	

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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	MOTOROLA: "Control Signalling Design for Supporting Carrier Aggregation" 3GPP DRAFT; R1-090792, 3 February 2009 (2009-02-03), XP050318649 Athens, Greece	23-27,33
A	----- chapters 1, 2, 2.1	1-9,30
A	PANASONIC: "PHICH Linkage for asymmetric carrier aggregation" 3GPP DRAFT; R1-090683, 3 February 2009 (2009-02-03), XP050318556 Athens, Greece chapter 2.2	1-9,30
X	ROBERT LOVE ET AL: "PHY 32-1 - Downlink Control Channel Design for 3GPP LTE" WIRELESS COMMUNICATIONS AND NETWORKING CONFERENCE, 31 March 2008 (2008-03-31), pages 813-818, XP031243734 EEE, PISCATAWAY, NJ, USA ISBN: 978-1-4244-1997-5 * abstract page 813, right column, last sentence - page 814, left column, first paragraph of chapter III	10-18,31
A	----- Nortel Networks: "Control channel design for the support of wider bandwidth for LTE-Advanced" 3GPP TSG RAN1 56 - R1-090759 4 February 2009 (2009-02-04), XP002597044 Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_56/Docs/ [retrieved on 2010-08-17] page 3 - page 4	10-18,31
T	----- PHILIPS: "PDCCH for Carrier Aggregation" 3GPP DRAFT; R1-093552, 19 August 2009 (2009-08-19), XP050351808 Shenzhen, China	14
T	----- Qualcom Europe: "Multicarrier Control for LTE-Advanced" 3GPP TSG RAN WG1 56bis, R1-091460 18 March 2009 (2009-03-18), XP002597045 Seoul, Korea Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_56b/Docs/ [retrieved on 2010-08-17] chapter 2.1, 2.2	17,18
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INTERNATIONAL SEARCH REPORT

International application No
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C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ERICSSON: "Uplink Power Control for E-UTRA - Comments on Open Issues" 3GPP RAN WG1 DRAFT; R1-074378, 2 October 2007 (2007-10-02), XP050107893 Shanghai, China page 2 - page 3 -----	19-22, 32
T	Motorola: "Common PDCCH Design for Carrier Aggregation" 3GPP TSG RAN 1 56bis - R1-091327 18 March 2009 (2009-03-18), XP002597046 Retrieved from the Internet: URL: http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_56b/Docs/ [retrieved on 2010-08-17] the whole document -----	23
T	Motorola: "Comparison of PDCCH Structures for Carrier Aggregation" 3GPP TSG RAN1 - R1-091326 18 March 2010 (2010-03-18), XP002597047 Retrieved from the Internet: URL: http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_56b/Docs/ [retrieved on 2010-08-17] the whole document -----	28
T	LG Electronics: "PDCCH structure for multiple component carriers in LTE-Advanced" 3GPP TSG RAN WG1 - R1-091203 17 March 2009 (2009-03-17), XP002597048 Retrieved from the Internet: URL: http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_56b/Docs/ [retrieved on 2010-08-17] the whole document -----	1

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2010/027310

Box No. II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:

2. Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

3. Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.
2. As all searchable claims could be searched without effort justifying an additional fees, this Authority did not invite payment of additional fees.
3. As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
1-28, 30-33
4. No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

- The additional search fees were accompanied by the applicant's protest and, where applicable, the payment of a protest fee.
- The additional search fees were accompanied by the applicant's protest but the applicable protest fee was not paid within the time limit specified in the invitation.
- No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-9, 30

A method for processing uplink (UL) grants and downlink (DL) assignments for component carriers, comprising: defining a mapping between an assigned DL component carrier and a DL component carrier that transmits the DL assignment; defining a mapping between at least one granted UL component carrier and at least one DL component carrier that transmits an UL grant; encoding the UL grant and DL assignment; and transmitting the UL grant and DL assignment.

2. claims: 10-18, 31

A method for processing uplink (UL) grants and downlink (DL) assignments for component carriers, comprising: searching for a control channel matching a predetermined identifier; detecting the control channel; and determining DL assignment and UL grant mapping based on a predetermined detection aspect.

3. claims: 19-22, 32

A method for power control for component carriers, comprising: searching for a control channel with a transmit power control (TPC) RNTI; decoding a DCI format with the TPC RNTI; determining an UL component carrier based on the TPC RNTI; and adjusting a transmit power of an uplink channel in the uplink component carrier with TPC command received in the DCI format.

4. claims: 23-27, 33

A method for indicating a component carrier, comprising: searching a dedicated search space for a control channel matching a predetermined identifier; decoding at least one DCI format for the detected control channel; and determining the component carrier based on the dedicated search space.

5. claim: 28

A method for configuring search space, comprising: partitioning the search space to reduce blind decoding complexity; and designating the partitioned search space to a component carrier.

6. claim: 29

FURTHER INFORMATION CONTINUED FROM PCT/SA/ 210

A method for configuring search space, comprising: expanding a dedicated search space to reduce blocking probability; and designating the dedicated search space to a component carrier.
