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- (71) **Applicant:** **INTERDIGITAL PATENT HOLDINGS, INC.** [US/US]; 200 Bellevue Parkway, Suite 300, Wilmington, DE 19809 (US).
- (72) **Inventors:** **LEE, Moon-il**; 675 Conklin St., Apt. 26a, Farmingdale, NY 11735 (US). **TAMAKI, Nobuyuki**; 6 Wendell Ct., Melville, NY 11747 (US).
- (74) **Agents:** **ROCCIA, Vincent, J.** et al.; Condo Roccia Kop-tiw LLP, 1800 JFK Blvd., Suite 1700, Philadelphia, PA 19103 (US).
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- (88) **Date of publication of the international search report:**
27 November 2014

(54) **Title:** EPDCCH COMMON SEARCH SPACE DESIGN FOR ONE OR MORE CARRIER TYPES

(57) **Abstract:** Embodiments contemplate enhanced physical downlink control channel (EPDCCH). A user equipment (UE) or a wireless transmit/receive unit (WTRU) may receive a first type (e.g., type 1) EPDCCH common search space (CSS) subframe for example is a subset of subframes. The UE or WTRU may monitor first type downlink control information (DCI), for example perhaps within the first type EPDCCH CSS subframe, among other scenarios. A broadcast channel (e.g. MIB) may be received in the first type EPDCCH CSS. The UE or the WTRU may receive configuration information for a second type (e.g., type 2) EPDCCH CSS, for example from the first type EPDCCH CSS. A system information block (SIB) may be received in the second type EPDCCH CSS. The UE or the WTRU may monitor a second type DCI, for example perhaps in the second type EPDCCH CSS.



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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.:
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.:

1-15

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.

INTERNATIONAL SEARCH REPORT

International application No
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A. CLASSIFICATION OF SUBJECT MATTER
INV. H04L5/00 H04W48/10 H04W48/12
ADD.

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)
H04L H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	HUAWEI ET AL: "Considerations on the ePDCCH design", 3GPP DRAFT; R1-113655, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. San Francisco, USA; 20111114 - 20111118, 8 November 2011 (2011-11-08), XP050561796, 3.2 Search space addressing; page 3 - page 4	1,3,4,6, 9,12,14, 15
Y	----- -/-	2,5,7,8, 10,11,13



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

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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

Tejera, Pedro

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.
Y	ERICSSON ET AL: "ePDCCH fallback", 3GPP DRAFT; R1-122004 EPDCCH FALLBACK, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. Prague, Czech Republic; 20120521 - 20120525, 12 May 2012 (2012-05-12), XP050600296, 2. Discussion; page 1 -----	2
Y	ALCATEL-LUCENT ET AL: "Report on the offline discussion on the configuration of subframes for monitoring EPDCCH", 3GPP DRAFT; R1-124610 - EPDCCH SUBFRAME INDICATION - OFFLINE DISCUSSION V3, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CED , vol. RAN WG1, no. San Diego, USA; 20121008 - 20121012 12 October 2012 (2012-10-12), XP050662474, Retrieved from the Internet: URL: http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_70b/Docs/ [retrieved on 2012-10-12] 2 Discussion; page 1 -----	2
Y	CATT: "Design of E-PDCCH search space", 3GPP DRAFT; R1-113743, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. San Francisco, USA; 20111114 - 20111118, 9 November 2011 (2011-11-09), XP050562240, 2.2 Common search space; page 2 ----- -/--	5,7

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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.
Y	FUJITSU: "Consideration of reference signals on NCT for potential use case of Rel-12 EPDCCH", 3GPP DRAFT; R1-130168 FINAL CLEAN, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG1, no. St. Julian; 20130128 - 20130201 18 January 2013 (2013-01-18), XP050663338, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_72/Docs/ [retrieved on 2013-01-18] page 2	8
Y	----- INSTITUTE FOR INFORMATION INDUSTRY (III): "Signaling Solutions to Improve MIB Detection for Victim Cells under the 9dB bias", 3GPP DRAFT; R1-123670, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG1, no. Qingdao, China; 20120813 - 20120817 5 August 2012 (2012-08-05), XP050661544, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_70/Docs/ [retrieved on 2012-08-05] Approach E; page 2	10
Y	----- HUAWEI ET AL: "Discussion on ePDCCH Common search space", 3GPP DRAFT; R1-120997, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. Jeju, Korea; 20120326 - 20120330, 20 March 2012 (2012-03-20), XP050599308, Section 2; page 1 - page 2 ----- -/--	11
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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.
Y	INSTITUTE FOR INFORMATION INDUSTRY (III): "Signaling Solutions to Improve MIB Detection for Victim Cells under the 9dB bias", 3GPP DRAFT; R1-123857, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , vol. RAN WG1, no. Qingdao, China; 20120813 - 20120817 14 August 2012 (2012-08-14), XP050661731, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG1_RL 1/TSGR1_70/Docs/ [retrieved on 2012-08-14] Approach C; page 2 -----	13

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

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

1. claims: 1-15

Method providing configuration for two types of EPDCCH CSS simultaneously.

2. claims: 16-23

Method for monitoring an EPDCCH CSS.

3. claims: 24, 25

Method providing and monitoring an EPDCCH CSS in at least an MBSFN subframe.
