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kind of national protection available): AE, AG, AL, AM,  
AO, AT, AU, AZ, BA, BB, BG, BH, BN, BR, BW, BY,  
BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM,  
DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT,  
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KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD,  
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TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW,  
ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: METHODS AND APPARATUS FOR DETERMINING HOW TO PERFORM OPERATIONS AFTER COMMUNICA-  
TION SUSPEND BASED ON INFORMATION BEFORE THE SUSPEND

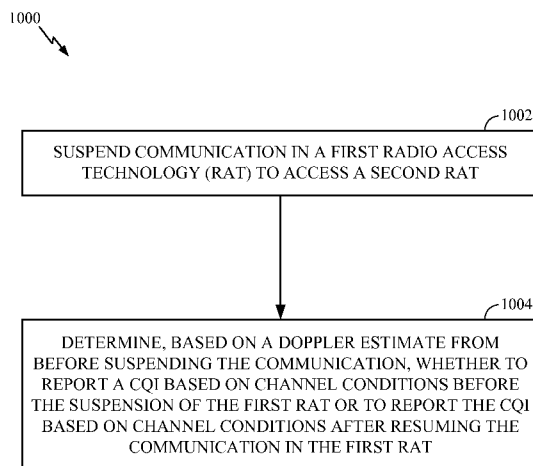


FIG. 10

(57) Abstract: Certain aspects of the present disclosure relate to methods and apparatus for Channel Quality Indicator (CQI) reporting after resumption of Long Term Evolution (LTE) after a temporary suspension. In certain aspects, in order to minimize performance penalty to LTE on resumption after an LTE tune away for example to service a different Radio Access Technology, information available from before the LTE tune away may be used in addition to one or more additional parameters for determining how to perform LTE CQI calculation/update after tuning back to LTE. In certain aspects, a decision regarding whether a User Equipment (UE) reports a CQI based on channel conditions before the LTE tune away or reports a CQI based on channel conditions after tuning back to LTE may be based on a value of the Doppler estimate, a time duration of the LTE tune away, or a combination thereof.

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# INTERNATIONAL SEARCH REPORT

International application No PCT/US2013/029522
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<b>A. CLASSIFICATION OF SUBJECT MATTER</b> INV. H04B7/04      H04B7/06      H04L1/00      H04L5/00 ADD. H04W24/10      H04W36/14				
According to International Patent Classification (IPC) or to both national classification and IPC				
<b>B. FIELDS SEARCHED</b>				
Minimum documentation searched (classification system followed by classification symbols) H04B 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, WPI Data				
<b>C. DOCUMENTS CONSIDERED TO BE RELEVANT</b>				
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.		
A	EP 1 761 097 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 7 March 2007 (2007-03-07) abstract paragraphs [0024], [0025], [0042] - [0045], [0055] - [0060], [0065] - [0083] paragraphs [0088] - [0120]; claim 20; figures 8,9a,9b -----	1-46		
A	EP 1 928 095 A2 (BROADCOM CORP [US]) 4 June 2008 (2008-06-04) abstract paragraphs [0026] - [0031], [0042] - [0046] ----- -/--	1-46		
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> See patent family annex.				
* Special categories of cited documents : <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none; vertical-align: top;"> " 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 </td> <td style="width: 50%; border: none; vertical-align: top;"> " 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  " &amp; " document member of the same patent family </td> </tr> </table>			" 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
" 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			
9 October 2013	16/10/2013			
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  Alonso Maleta, J			

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/029522

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 1 569 492 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 31 August 2005 (2005-08-31) abstract paragraphs [0013] - [0019], [0025] - [0035], [0047] - [0050], [0063]; claims 1-3 -----	1-46
A	EP 1 986 349 A1 (SHARP KK [JP]) 29 October 2008 (2008-10-29) abstract paragraphs [0013], [0022], [0023], [0044] - [0048], [0054] - [0058] paragraphs [0061] - [0068]; claims 1,4,9,10,12 -----	1-46
A	EP 2 242 301 A1 (NTT DOCOMO INC [JP]) 20 October 2010 (2010-10-20) abstract paragraphs [0006] - [0008], [0042] - [0029], [0057], [0058], [0063] -----	1-46
X	EP 2 020 823 A1 (SHARP KK [JP]) 4 February 2009 (2009-02-04) abstract paragraphs [0007] - [0012], [0015] - [0022], [0027] - [0030], [0043] - [0051]; figure 7 -----	47-52
A	LOTT M ET AL: "Interworking of WLAN and 3G systems - WLAN systems and interworking", IEE PROCEEDINGS : COMMUNICATIONS, INSTITUTION OF ELECTRICAL ENGINEERS, GB, vol. 151, no. 5, 9 July 2004 (2004-07-09), pages 507-513, XP006022617, ISSN: 1350-2425, DOI: 10.1049/IP-COM:20040600 the whole document -----	47-52
A	EP 2 020 822 A1 (SHARP KK [JP]) 4 February 2009 (2009-02-04) abstract paragraphs [0011], [0021] - [0023], [0032], [0032], [0032], [0075], [0076], [0084] - [0094], [0099], [0100], [0105], [0106], [0115], [0116] -----	47-52
A	US 2008/274742 A1 (BI HAO [US]) 6 November 2008 (2008-11-06) abstract paragraphs [0005], [0006], [0019] - [0024] -----	47-52

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2013/029522

## 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.:

### 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: 1-46

Determination if CQI should be measured based on the CQI filter state before suspending the communication in a first RAT or after resuming the communication in a first RAT depending on the Doppler estimate from before suspending the communication

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2. claims: 47-52

Determination if at least one of Doppler estimation, channel estimation, automatic gain control, frequency tracking loop, DC estimation, SNR estimation or time tracking loop should be measured before suspending the communication in a first RAT or after resuming the communication in a first RAT depending on information obtained from before suspending the communication

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## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/029522

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
EP 1761097	A2	07-03-2007	CN 1972515 A	30-05-2007
			EP 1761097 A2	07-03-2007
			JP 2007068180 A	15-03-2007
			KR 20070027844 A	12-03-2007
			US 2007115796 A1	24-05-2007
EP 1928095	A2	04-06-2008	CN 101203047 A	18-06-2008
			EP 1928095 A2	04-06-2008
			HK 1120696 A1	28-10-2011
			KR 20080049686 A	04-06-2008
			TW 200841611 A	16-10-2008
			US 2008130711 A1	05-06-2008
			US 2011116585 A1	19-05-2011
EP 1569492	A2	31-08-2005	CN 1662097 A	31-08-2005
			EP 1569492 A2	31-08-2005
			JP 2005244991 A	08-09-2005
			KR 20050087374 A	31-08-2005
			US 2005191965 A1	01-09-2005
EP 1986349	A1	29-10-2008	EP 1986349 A1	29-10-2008
			JP 4975727 B2	11-07-2012
			WO 2007094415 A1	23-08-2007
EP 2242301	A1	20-10-2010	CN 101911753 A	08-12-2010
			EP 2242301 A1	20-10-2010
			JP 5202544 B2	05-06-2013
			KR 20100106437 A	01-10-2010
			US 2011009139 A1	13-01-2011
			WO 2009087924 A1	16-07-2009
EP 2020823	A1	04-02-2009	AU 2007252473 A1	29-11-2007
			EP 2020823 A1	04-02-2009
			JP 5031738 B2	26-09-2012
			JP 2012227945 A	15-11-2012
			US 2009135787 A1	28-05-2009
			WO 2007136070 A1	29-11-2007
EP 2020822	A1	04-02-2009	EP 2020822 A1	04-02-2009
			JP 4875071 B2	15-02-2012
			JP 5164049 B2	13-03-2013
			JP 2012050142 A	08-03-2012
			US 2009209256 A1	20-08-2009
			WO 2007132861 A1	22-11-2007
US 2008274742	A1	06-11-2008	CN 101743764 A	16-06-2010
			EP 2153685 A2	17-02-2010
			KR 20100002269 A	06-01-2010
			RU 2009144541 A	10-06-2011
			US 2008274742 A1	06-11-2008
			WO 2008137631 A2	13-11-2008