

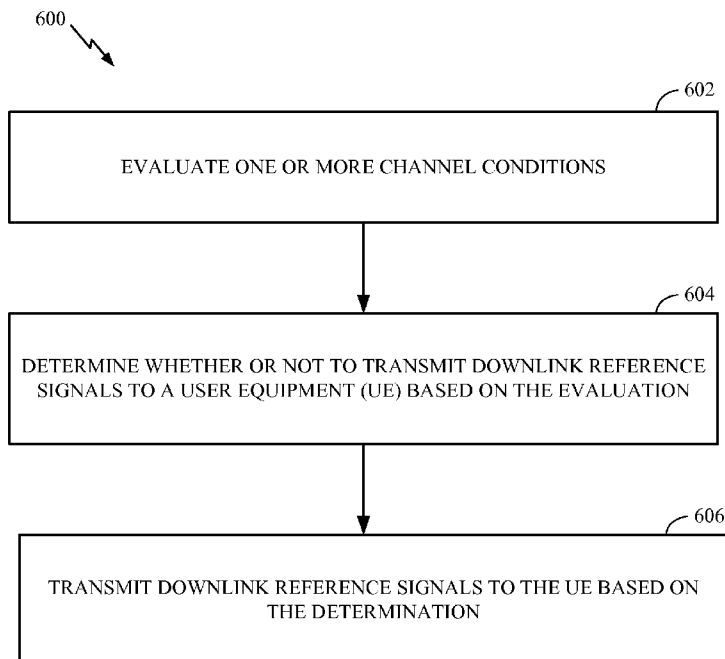


- (51) **International Patent Classification:**  
*H04W 72/08* (2009.01)    *H04W 84/04* (2009.01)
- (21) **International Application Number:**  
PCT/US2013/031997
- (22) **International Filing Date:**  
15 March 2013 (15.03.2013)
- (25) **Filing Language:** English
- (26) **Publication Language:** English
- (30) **Priority Data:**  
61/620,332            4 April 2012 (04.04.2012)            US  
13/826,426            14 March 2013 (14.03.2013)            US
- (71) **Applicant: QUALCOMM INCORPORATED** [US/US];  
ATTN: International IP Administration, 5775 Morehouse Drive, San Diego, California 92121-1714 (US).
- (72) **Inventors: MALLIK, Siddhartha**; 5775 Morehouse Drive, San Diego, California 92121 (US). **BHUSHAN, Naga**; 5775 Morehouse Drive, San Diego, California 92121 (US). **DAMNJANOVIC, Aleksandar**; 5775 Morehouse Drive, San Diego, California 92121 (US). **SOMASUNDARAM, Kiran**; 5775 Morehouse Drive, San Diego, California 92121 (US). **STAMOULIS, Anastasios**; 5775 Morehouse Drive, San Diego, California 92121 (US).

- (74) **Agents: READ, Randol W.** et al.; Patterson & Sheridan, L.L.P./Qualcomm, 3040 Post Oak Blvd., Suite 1500, Houston, Texas 77056-6582 (US).
- (81) **Designated States** (*unless otherwise indicated, for every 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, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PA, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
- (84) **Designated States** (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) **Title:** PROCEDURES TO ACTIVATE OPPORTUNISTIC RELAYS



(57) **Abstract:** Aspects of the present disclosure relate to techniques for activating opportunistic relays. A combination of uplink and downlink pilots may be used to switch on user equipment relays (UeNBs) in an effort to make more accurate measurements in an effort to enable handovers. According to aspects of the present disclosure, a relay may evaluate one or more channel conditions, determine whether or not to transmit downlink reference signals to a UE based on the evaluation, and transmit downlink reference signals to the UE based on the determination. According to aspects, a relay may determine a set of resources reserved for transmission of uplink pilots by UEs, monitor the set of resources to detect transmission of uplink pilots, and report, to an eNB, a power at which the uplink pilots were received.

WO 2013/151746 A3



**Published:**

**(88) Date of publication of the international search report:**

19 December 2013

- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2013/031997

A. CLASSIFICATION OF SUBJECT MATTER  
INV. H04W72/08 H04W84/04  
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)  
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	US 2010/069110 A1 (LEE YONG-SU [KR] ET AL) 18 March 2010 (2010-03-18)  the whole document	1-3,6, 17-19, 22, 33-35, 38, 49-51,54
X	US 2012/015662 A1 (ZHANG YINGYU [CN] ET AL) 19 January 2012 (2012-01-19)  the whole document	1-3,6, 17-19, 22, 33-35, 38, 49-51,54

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  25 October 2013	Date of mailing of the international search report  04/11/2013
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  Jaskolski, Jaroslaw

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2013/031997

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 2 247 143 A1 (NTT DOCOMO INC [JP]) 3 November 2010 (2010-11-03) the whole document	1,17,33, 49
X	----- US 2010/002656 A1 (JI TINGFANG [US] ET AL) 7 January 2010 (2010-01-07) the whole document	1,17,33, 49
A	----- WO 2006/034577 A1 (NORTEL NETWORKS LTD [CA]; TONG WEN [CA]; MA JIANGLEI [CA]; JIA MING [C] 6 April 2006 (2006-04-06)  the whole document	1-3,6, 17-19, 22, 33-35, 38, 49-51,54
X	----- EP 1 734 705 A2 (SAMSUNG ELECTRONICS CO LTD [KR]) 20 December 2006 (2006-12-20)  abstract paragraph [0009] paragraph [0022] - paragraph [0026] paragraph [0030] - paragraph [0032] paragraph [0040] - paragraph [0042] paragraph [0049] paragraph [0055] - paragraph [0068] paragraph [0077] - paragraph [0079]; claims 1-14,19-24,31-34,38-48; figures 1a,1b,2-4	1,2,5, 17,18, 21,33, 34,37, 49,50,53
X	----- US 2008/108369 A1 (VISOTSKY EUGENE [US] ET AL) 8 May 2008 (2008-05-08)  abstract paragraph [0016] - paragraph [0040]; figures 5,6 paragraph [0048] - paragraph [0105] paragraph [0117] - paragraph [0142] paragraph [0249] - paragraph [0253]  ----- -/--	1,2, 7-12,17, 18, 23-28, 33,34, 39-44, 49,50, 55-60

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2013/031997

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 2011/039970 A1 (SONY CORP [JP]; KIMURA RYOTA [JP]) 7 April 2011 (2011-04-07)</p> <p>abstract  paragraph [0030]  paragraph [0040] - paragraph [0046]  paragraph [0093]  paragraph [0098] - paragraph [0106]  paragraph [0112] - paragraph [0116]  paragraph [0119]; figures 1,4  figures 10a-10c  figures 12-14</p> <p style="text-align: center;">-----</p>	<p>1,2,4,  7-12,17,  18,20,  23-28,  33,34,  36,  39-44,  49,50,  52,55-60</p>
X	<p>US 2009/285112 A1 (LEE YONG-SU [KR] ET AL)  19 November 2009 (2009-11-19)</p> <p>abstract; figures 4-6  paragraph [0004]  paragraph [0012] - paragraph [0013]  paragraph [0020] - paragraph [0039];  claims 1,5,6</p> <p style="text-align: center;">-----</p>	<p>1,2,17,  18,33,  34,49,50</p>
X	<p>US 2010/157826 A1 (YU KAI [SE] ET AL)  24 June 2010 (2010-06-24)</p> <p>paragraph [0010]  paragraph [0031] - paragraph [0035]  paragraph [0037]  paragraph [0040] - paragraph [0044]</p> <p style="text-align: center;">-----</p>	<p>1,7-12,  17,  23-28,  33,  39-44,  49,55-60</p>
X	<p>EP 2 403 297 A1 (ALCATEL LUCENT [FR])  4 January 2012 (2012-01-04)</p> <p>abstract  paragraph [0006] - paragraph [0007]  paragraph [0028] - paragraph [0029]  paragraph [0040] - paragraph [0055]</p> <p style="text-align: center;">-----</p> <p style="text-align: center;">-/--</p>	<p>1,7-12,  17,  23-28,  33,  39-44,  49,55-60</p>

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2013/031997

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>WO 2008/011717 A1 (NORTEL NETWORKS LTD [CA]; ZHANG HANG [CA]; ZHU PEIYING [CA]; TONG WEN) 31 January 2008 (2008-01-31)</p> <p>page 15, line 19 - line 32 page 18, line 3 - page 19, line 4 page 21, line 17 - page 24, line 5; figure 1 figures 7-14</p> <p>-----</p>	<p>1,7-12, 17, 23-28, 33, 39-44, 49,55-60</p>
X	<p>US 2004/235489 A1 (KWON CHANG-YEUL [KR]) 25 November 2004 (2004-11-25)</p> <p>paragraphs [0010], [0013], [0018], [0020], [0038], [0050], [0057]; figures 6,7</p> <p>-----</p>	<p>1,13,17, 29,33, 45,49,61</p>
A	<p>EP 1 379 033 A1 (SIEMENS MOBILE COMM SPA [IT]) 7 January 2004 (2004-01-07)</p> <p>abstract paragraph [0013] - paragraph [0014] paragraphs [0017], [0020]; figure 8</p> <p>-----</p>	<p>1,13,17, 29,33, 45,49,61</p>
Y	<p>US 2008/009241 A1 (DO MI-SUN [KR] ET AL) 10 January 2008 (2008-01-10)</p> <p>abstract paragraph [0003] - paragraph [0064]; figures 4-6</p> <p>-----</p>	<p>14-16, 30-32, 46-48, 62-64</p>
Y	<p>EP 1 892 969 A1 (SIEMENS CORP RES INC [US]) 27 February 2008 (2008-02-27)</p> <p>abstract paragraph [0007] - paragraph [0024]; figures 1,2</p> <p>-----</p>	<p>14-16, 30-32, 46-48, 62-64</p>

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2013/031997

## 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, 3, 6, 17, 19, 22, 33, 35, 38, 49, 51, 54(completely);  
2, 18, 34, 50(partially)

evaluating link quality between a relay and an UE

---

2. claims: 1, 17, 33, 49(completely); 2, 18, 34, 50(partially)

evaluating link quality between a relay and a donor base station

---

3. claims: 1, 4, 17, 20, 33, 36, 49, 52

evaluating a type of an uplink reference signal and link quality between an eNB and one or more relays

---

4. claims: 1, 5, 17, 21, 33, 37, 49, 53

evaluating link quality of an UE and one or more relays and encoding link quality information in an uplink reference signal

---

5. claims: 1, 7-11, 17, 23-27, 33, 39-43, 49, 55-59

selecting a reference signal configuration and transmitting reference signals accordingly

---

6. claims: 1, 7, 12, 17, 23, 28, 33, 39, 44, 49, 60

receiving an assigned reference signal configuration from an eNB

---

7. claims: 1, 13, 17, 29, 33, 45, 49, 61

ceasing transmission of downlink reference signals if an activity timer expires

---

8. claims: 14-16, 30-32, 46-48, 62-64

reporting to an eNB power at which uplink pilots of user equipment were received

---



## INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2013/031997

Patent document cited in search report	Publication date	Patent family member(s)	Publication date	
US 2010069110	A1	18-03-2010	EP 2080292 A1 KR 20080040545 A US 2010069110 A1	22-07-2009 08-05-2008 18-03-2010
US 2012015662	A1	19-01-2012	CN 101795169 A US 2012015662 A1 WO 2010087209 A1	04-08-2010 19-01-2012 05-08-2010
EP 2247143	A1	03-11-2010	CN 101978739 A EP 2247143 A1 JP 5038924 B2 JP 2009177628 A KR 20100113568 A US 2010304665 A1 WO 2009093406 A1	16-02-2011 03-11-2010 03-10-2012 06-08-2009 21-10-2010 02-12-2010 30-07-2009
US 2010002656	A1	07-01-2010	CN 102084707 A CN 103338520 A EP 2301291 A2 EP 2375841 A2 JP 2011527168 A KR 20110031964 A TW 201018285 A US 2010002656 A1 WO 2010003098 A2	01-06-2011 02-10-2013 30-03-2011 12-10-2011 20-10-2011 29-03-2011 01-05-2010 07-01-2010 07-01-2010
WO 2006034577	A1	06-04-2006	US 2008095223 A1 WO 2006034577 A1	24-04-2008 06-04-2006
EP 1734705	A2	20-12-2006	CN 1897758 A EP 1734705 A2 JP 2006352894 A KR 20060132422 A US 2006285505 A1	17-01-2007 20-12-2006 28-12-2006 21-12-2006 21-12-2006
US 2008108369	A1	08-05-2008	US 2008108369 A1 US 2010296475 A1	08-05-2008 25-11-2010
WO 2011039970	A1	07-04-2011	AU 2010302182 A1 CA 2774684 A1 CN 102550076 A EP 2471304 A1 JP 2011077987 A KR 20120090994 A RU 2012111261 A US 2012176962 A1 WO 2011039970 A1	19-04-2012 07-04-2011 04-07-2012 04-07-2012 14-04-2011 17-08-2012 27-09-2013 12-07-2012 07-04-2011
US 2009285112	A1	19-11-2009	KR 20080041593 A US 2009285112 A1	13-05-2008 19-11-2009
US 2010157826	A1	24-06-2010	EP 2377340 A1 JP 2012513155 A US 2010157826 A1 WO 2010071544 A1	19-10-2011 07-06-2012 24-06-2010 24-06-2010
EP 2403297	A1	04-01-2012	EP 2403297 A1 TW 201210395 A	04-01-2012 01-03-2012

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/US2013/031997
---

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
-----			
		WO 2012000707 A1	05-01-2012
-----			
WO 2008011717	A1	31-01-2008	EP 2050306 A1
			US 2009252065 A1
			US 2013010604 A1
			WO 2008011717 A1
-----			
US 2004235489	A1	25-11-2004	CN 1575027 A
			KR 20040100701 A
			US 2004235489 A1
-----			
EP 1379033	A1	07-01-2004	NONE
-----			
US 2008009241	A1	10-01-2008	KR 20070120798 A
			US 2008009241 A1
-----			
EP 1892969	A1	27-02-2008	EP 1892969 A1
			US 2008049678 A1
-----			