



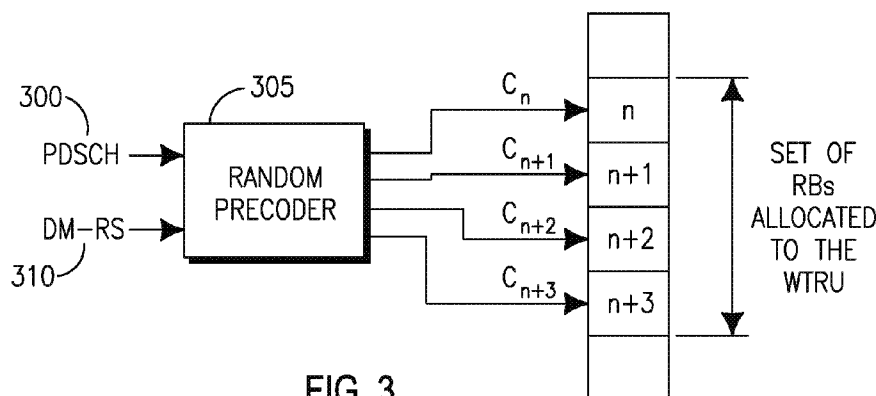
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**Published:**

- 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))

- (88) **Date of publication of the international search report:**  
31 January 2013

(54) **Title:** OPEN LOOP SPATIAL PROCESSING**FIG. 3**

(57) **Abstract:** Methods and apparatus for multiple-input multiple-output (MIMO) transmissions are disclosed. A base station may precode wireless transmit/receive unit (WTRU)-specific reference signals and data that are transmitted to a WTRU using a randomly selected precoder. The precoder may be selected based on a predefined precoder selection sequence or by the base station. A different precoder may be applied to different resource blocks (RBs). In addition, a large delay cyclic delay diversity (CDD) or discrete Fourier transform (DFT) spreading may be applied on the WTRU-specific reference signals and the data. For heterogeneous deployed antennas, spatial diversity gain is achieved by dynamically scheduling resources between transmission points. A hopping scheme may be applied across the transmission points as the resources are dynamically partitioned between the transmission points. A different randomly selected precoder may be applied to each RB transmitted from a different transmission point.

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2012/035239

A. CLASSIFICATION OF SUBJECT MATTER  
INV. H04B7/04 H04B7/02  
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)  
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

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                    | Relevant to claim No. |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| X         | QUALCOMM INCORPORATED: "Remaining aspects of PRB bundling",<br>3GPP DRAFT; R1-105572 PRB BUNDLING, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE,<br>vol. RAN WG1, no. Xi'an; 20101011, 6 October 2010 (2010-10-06), XP050450752, [retrieved on 2010-10-06] | 1-5,9,<br>10,18-20    |
| Y         | the whole document                                                                                                                                                                                                                                                                                                                                    | 6-8,16                |
| Y         | -----<br>WO 2010/048129 A1 (INTERDIGITAL PATENT HOLDINGS [US]; BALA ERDEM [US]; SHIN SUNG-HYUK [US] 29 April 2010 (2010-04-29) paragraph [0037] - paragraph [0057]                                                                                                                                                                                    | 6-8                   |
| A         | -----<br>-/-                                                                                                                                                                                                                                                                                                                                          | 1-5,9,<br>10,18-20    |



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

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Date of mailing of the international search report

30/11/2012

Name and mailing address of the ISA/

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## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2012/035239

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                                                                                                                                                  |                           |
|------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|
| Category*                                            | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                               | Relevant to claim No.     |
| X<br>A                                               | US 2010/091905 A1 (KHAN FAROOQ [US])<br>15 April 2010 (2010-04-15)<br>paragraph [0006] - paragraph [0007]<br>paragraph [0051]; figure 2B<br>paragraph [0076]<br>paragraph [0087] - paragraph [0090];<br>figures 12,15,16<br>paragraph [0094]; figure 17<br>----- | 1-5,9,<br>10,18-20<br>6-8 |
| X                                                    | WO 2010/050718 A2 (SAMSUNG ELECTRONICS CO<br>LTD [KR]; HAN JIN KYU [KR]; CHO JOON YOUNG<br>[KR]) 6 May 2010 (2010-05-06)                                                                                                                                         | 11-13,<br>15,17           |
| Y                                                    | paragraph [0017] - paragraph [0019];<br>figure 4<br>paragraph [0043] - paragraph [0046];<br>figure 5<br>-----                                                                                                                                                    | 14,16                     |
| Y                                                    | US 2011/051835 A1 (YUAN JUN [CA] ET AL)<br>3 March 2011 (2011-03-03)                                                                                                                                                                                             | 14                        |
| A                                                    | paragraph [0009]<br>paragraph [0059] - paragraph [0061]<br>paragraph [0068]<br>claims 1,9<br>-----                                                                                                                                                               | 1-13,<br>15-17            |
| X<br>A                                               | EP 2 312 886 A1 (SHARP KK [JP])<br>20 April 2011 (2011-04-20)<br>paragraph [0001] - paragraph [0002]<br>paragraph [0095]; figure 3<br>paragraph [0105] - paragraph [0109]<br>paragraph [0114]<br>paragraph [0117]<br>-----                                       | 11-13,<br>15,17<br>14,16  |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/035239

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s)                                              | Publication<br>date                                  |
|-------------------------------------------|---------------------|-------------------------------------------------------------------------|------------------------------------------------------|
| WO 2010048129 A1                          | 29-04-2010          | AR 073834 A1<br>TW 201125304 A<br>WO 2010048129 A1                      | 01-12-2010<br>16-07-2011<br>29-04-2010               |
| US 2010091905 A1                          | 15-04-2010          | KR 20100041662 A<br>US 2010091905 A1                                    | 22-04-2010<br>15-04-2010                             |
| WO 2010050718 A2                          | 06-05-2010          | KR 20100046338 A<br>US 2011211487 A1<br>WO 2010050718 A2                | 07-05-2010<br>01-09-2011<br>06-05-2010               |
| US 2011051835 A1                          | 03-03-2011          | NONE                                                                    |                                                      |
| EP 2312886 A1                             | 20-04-2011          | CN 101645729 A<br>EP 2312886 A1<br>US 2011134875 A1<br>WO 2010016607 A1 | 10-02-2010<br>20-04-2011<br>09-06-2011<br>11-02-2010 |

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2012/035239

## 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: 1-10, 18-20

Random selection of precoder in MIMO transmission.

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2. claims: 11-17

Dynamic resource scheduling in MIMO transmission.

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