



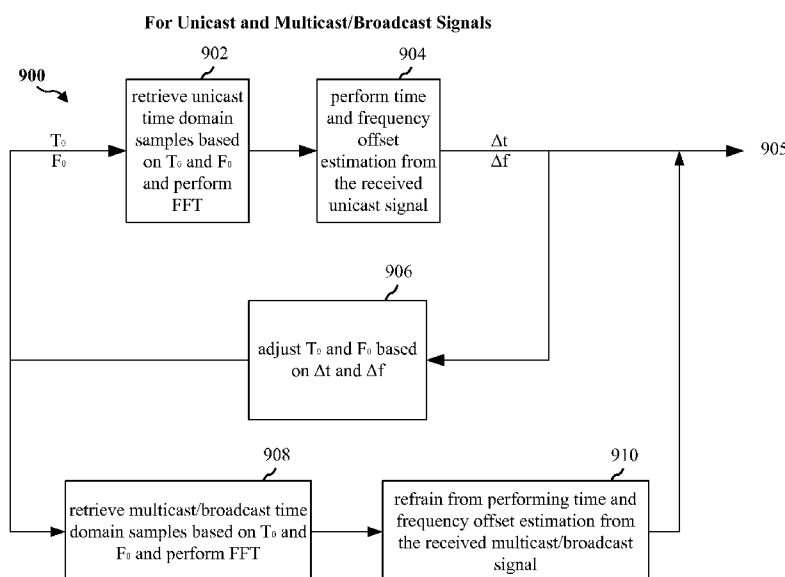
- (51) **International Patent Classification:**  
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- (81) **Designated States (unless otherwise indicated, for every kind of national protection available):** AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, 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, 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.
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**Declarations under Rule 4.17:**

— as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))

[Continued on next page]

(54) **Title:** TRACKING LOOP DESIGN FOR UNICAST AND MULTICAST/BROADCAST SIGNALS

**FIG. 9**

(57) **Abstract:** A method, an apparatus, and a computer program product for wireless communication are provided. In a first configuration, the apparatus maintains a first set of tracking loops associated with unicast signals and a second set of tracking loops associated with multicast/broadcast signals. In addition, the apparatus decoding at least one of a received unicast signal based on the first set of tracking loops or a received multicast/broadcast signal based on the second set of tracking loops. In a second configuration, the apparatus maintains a TTL and a FTL associated with unicast signals based only on received unicast signals. In addition, the apparatus receives a multicast/broadcast signal and decodes the received multicast/broadcast signal based on the TTL and the FTL maintained based only on the received unicast signals.



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- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))* (88) **Date of publication of the international search report:**  
21 March 2013

**Published:**

- *with international search report (Art. 21(3))*

## INTERNATIONAL SEARCH REPORT

International application No

PCT/US2012/040802

## A. CLASSIFICATION OF SUBJECT MATTER

INV. H04L27/26 H04L12/18  
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

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         | MOTOROLA: "UE Capability and MBSFN",<br>3GPP DRAFT; R2-073532, 3RD GENERATION<br>PARTNERSHIP PROJECT (3GPP), MOBILE<br>COMPETENCE CENTRE ; 650, ROUTE DES<br>LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX<br>; FRANCE,<br>vol. RAN WG2, no. Athens, Greece;<br>20070815, 15 August 2007 (2007-08-15),<br>XP050136227,<br>[retrieved on 2007-08-15]<br>paragraph [003.] | 1-11,13,<br>14,<br>16-31,<br>33,34,<br>36-51,<br>53,54,<br>56-58,<br>61,62 |
| Y         | -----<br>-/-                                                                                                                                                                                                                                                                                                                                                        | 12,15,<br>32,35,<br>52,55                                                  |



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

29 November 2012

Date of mailing of the international search report

06/12/2012

Name and mailing address of the ISA/

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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/US2012/040802

## 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.

## INTERNATIONAL SEARCH REPORT

International application No  
PCT/US2012/040802

| C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                                                                                                                                                                                                                                                                                                          |                       |
|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Category*                                            | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                                       | Relevant to claim No. |
| A                                                    | MOTOROLA: "MIMO RS Structure for Unicast/MBMS-Mixed Scenarios", 3GPP DRAFT; R1-071436 - MIMO RS STRUCTURE FOR UNICAST/MBMS-MIXED SCENARIOS, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. St. Julian; 20070403, 3 April 2007 (2007-04-03), XP050105374, [retrieved on 2007-04-03] paragraph [0001]<br>----- | 13,33,53              |
| Y                                                    | US 2009/141832 A1 (MUDULODU SRIRAM [US] ET AL) 4 June 2009 (2009-06-04) abstract paragraph [[0007]] paragraph [[0015]] paragraph [[0019]]<br>-----                                                                                                                                                                                                                                                                       | 15,35,55              |
| A                                                    | WO 2005/074305 A1 (WALTICAL SOLUTIONS INC FORMERL [US]; LI XIAODONG [US]; LO TITUS [US];) 11 August 2005 (2005-08-11) paragraph [[0003]] - paragraph [[0004]] paragraph [[0022]] - paragraph [[0023]] paragraph [[0033]] - paragraph [[0037]] paragraph [[0049]] - paragraph [[0050]]<br>-----                                                                                                                           | 1-62                  |
| Y                                                    | Erik Dahlman: "3G Evolution: HSPA and LTE for Mobile Broadband", 1 January 2008 (2008-01-01), Academic Press, Great Britain, XP002687953, pages 378-382, page 380<br>-----                                                                                                                                                                                                                                               | 12,32,52              |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2012/040802

| Patent document<br>cited in search report | Publication<br>date | Patent family<br>member(s) | Publication<br>date         |
|-------------------------------------------|---------------------|----------------------------|-----------------------------|
| US 2009141832                             | A1                  | 04-06-2009                 | NONE                        |
| -----                                     |                     |                            |                             |
| WO 2005074305                             | A1                  | 11-08-2005                 | CN 1879426 A 13-12-2006     |
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|                                           |                     |                            | US 2011299474 A1 08-12-2011 |
|                                           |                     |                            | WO 2005074305 A1 11-08-2005 |
| -----                                     |                     |                            |                             |

**FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210**

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

1. claims: 1-11, 13, 14, 16-31, 33, 34, 36-51, 53, 54, 56-58, 61, 62

Maintaining a first set of tracking loops associated with unicast signals and a second set of tracking loops associated with multicast/broadcast signals.

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2. claims: 12, 32, 52

The unicast control information is received in both MBSFN subframes and non-MBSFN subframes.

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3. claims: 15, 35, 55

The timing and frequency offset in the first set of tracking loops are composite offsets of the unicast signals received from a plurality of cells.

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