

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
27 December 2007 (27.12.2007)

PCT

(10) International Publication Number  
**WO 2007/148232 A3**

(51) International Patent Classification:  
**H04J 11/00** (2006.01)

(21) International Application Number:  
PCT/IB2007/002836

(22) International Filing Date: 19 March 2007 (19.03.2007)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
60/783,058 17 March 2006 (17.03.2006) US

(71) Applicant and

(72) Inventor: AULIN, Jocelyn [CA/SE]; Telecommunication  
Theory Group, Dept. Of Computer Engineering, Chalmers  
University Of Technology, SE-412 96 Goteborg (SE).

(74) Agents: ROBINSON, J., Christopher et al.; Smart &  
Biggar, Box 11560, Vancouver Centre, 650 W. Georgia St.,  
Suite 2200, Vancouver, British Columbia V6B 4N8 (CA).

(81) Designated States (unless otherwise indicated, for every  
kind of national protection available): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH,  
CN, CO, CR, CU, CZ, DE, DK, DM, 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, PG, PH, PL, PT, RO,  
RS, RU, SC, SD, SE, SG, SK, SL, SM, SV, SY, TJ, TM,  
TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

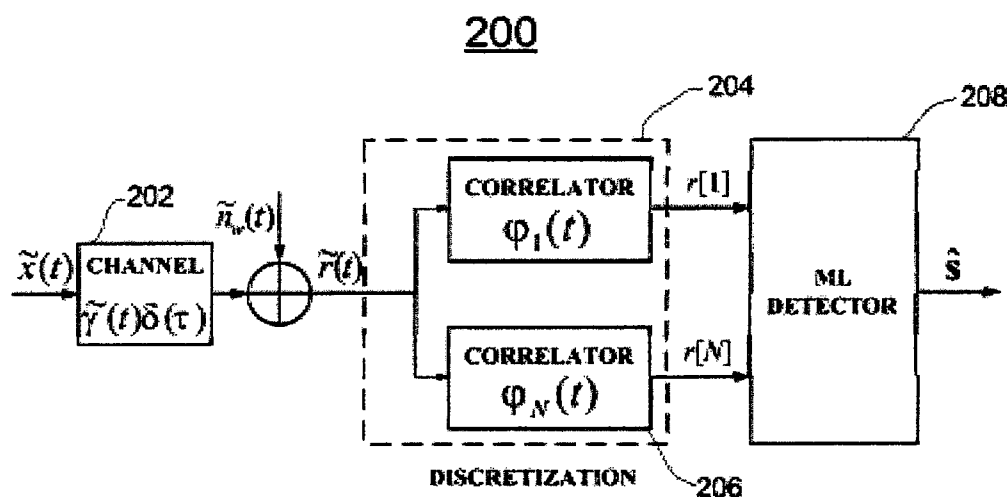
(84) Designated States (unless otherwise indicated, for every  
kind of regional protection available): ARIPO (BW, GH,  
GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM,  
ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),  
European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI,  
FR, GB, GR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL, PL,  
PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM,  
GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:  
— with international search report

(88) Date of publication of the international search report:  
10 July 2008

(15) Information about Correction:  
Previous Correction:  
see Notice of 29 May 2008

(54) Title: OFDM IN FAST FADING CHANNEL



(57) Abstract: Detection of OFDM symbols generates an equivalent vector which represents the sufficient statistics (SS) which are subsequently processed using a maximum likelihood (ML) algorithm. The algorithms and implementations are described. Both examples of implementation using the A\* (ML) algorithm and a near-ML trellis search algorithm for a time-varying finite state machine model of the received vector of SS are described.

WO 2007/148232 A3

# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/IB2007/002836

## A. CLASSIFICATION OF SUBJECT MATTER

IPC: **H04J 11/00** (2006.01)

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)

IPC: **H04J 11/00** (2006.01) in combination with keywords

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

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

Canadian Patent Database, USPTO, Questel•Orbit QPAT, Delphion, IEEE-online, Google

Keywords: statistics, fading, detect, vector, Euclid

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category* | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                        | Relevant to claim No. |
|-----------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| P, X      | CHOW et al.: "Diversity Benefits of OFDM in Fast Fading", WLC37-3<br>Global Telecommunications Conference, 2006. GLOBECOM '06. IEEE<br>Nov. 2006, pages 1-6<br>ISSN: 1930-529X<br>ISBN: 1-4244-0356-1<br>see whole article, and especially section "Conclusion" on page 6 | 1-24                  |
| X         | HANSSON et al.: "Aspects on Single Symbol Signaling on the Frequency Flat<br>Fading Channel"                                                                                                                                                                              | 1-5, 7-16, 18-24      |
| Y         | IEEE Trans. Commun., vol. 47, no. 6, pp. 874-883, June 1999.<br>see abstract, page 874 section I to page 876, left column, line 10.                                                                                                                                       | 6, 17                 |
| Y         | US6154489 (KLEIDER et al.)<br>28 November, 2000 (28-11-2000)<br>see col. 3, lines 1-4 and 42-53, and col. 4, lines 13-16                                                                                                                                                  | 6, 17                 |

[x] Further documents are listed in the continuation of Box C.

[ x ] See patent family annex.

|                                                                                                                                                                         |                                                                                                                                                                                                                                                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| * Special categories of cited documents :                                                                                                                               | "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                                              |
| "A" document defining the general state of the art which is not considered to be of particular relevance                                                                | "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                                                                     |
| "E" earlier application or patent but published on or after the international filing date                                                                               | "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 |
| "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) | "&" document member of the same patent family                                                                                                                                                                                                    |
| "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                                                                  |                                                                                                                                                                                                                                                  |

Date of the actual completion of the international search

1 February 2008 (01-02-2008)

Date of mailing of the international search report

28 February 2008 (28-02-2008)

Name and mailing address of the ISA/CA  
Canadian Intellectual Property Office  
Place du Portage I, C114 - 1st Floor, Box PCT  
50 Victoria Street  
Gatineau, Quebec K1A 0C9  
Facsimile No.: 001-819-953-2476

Authorized officer

Corneliu Remes 819- 934-2675

**INTERNATIONAL SEARCH REPORT**International application No.  
**PCT/IB2007/002836**

| C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT |                                                                                                                                                                                                                                                                                                                                                                                                            |                       |
|-------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| Category*                                             | Citation of document, with indication, where appropriate, of the relevant passages                                                                                                                                                                                                                                                                                                                         | Relevant to claim No. |
| A                                                     | HANSSON, U.: "Efficient Digital Communication over the Time Continuous Rayleigh Fading Control", chapter 3, Goteborg, Sweden, 1997<br>doctoral thesis available at:<br><a href="http://www.ce.chalmers.se/research/group/tct/publications/theses/UH_phd.pdf">http://www.ce.chalmers.se/research/group/tct/publications/theses/UH_phd.pdf</a><br>and accessed on Feb. 1, 2008<br>see especially pages 19-24 | 1-24                  |

## INTERNATIONAL SEARCH REPORT

International application No.

| Patent Document<br>Cited in Search Report | Publication<br>Date | Patent Family<br>Member(s) | Publication<br>Date |
|-------------------------------------------|---------------------|----------------------------|---------------------|
| US6154489                                 | 28-11-2000          | NONE                       |                     |