

(19) World Intellectual Property Organization  
International Bureau



(43) International Publication Date  
11 December 2008 (11.12.2008)

PCT

(10) International Publication Number  
**WO 2008/148569 A3**

(51) International Patent Classification:

*H01Q 1/38* (2006.01)      *H01Q 21/06* (2006.01)  
*H01Q 5/00* (2006.01)      *H01Q 21/24* (2006.01)  
*H01Q 9/04* (2006.01)

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(21) International Application Number:

PCT/EP2008/004539

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(22) International Filing Date: 6 June 2008 (06.06.2008)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:

07011177.8      6 June 2007 (06.06.2007)      EP  
60/943,612      13 June 2007 (13.06.2007)      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, BR, BW, BY, BZ, CA,  
CH, 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, 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.

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(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, HR, HU, IE, IS, IT, LT, LU, LV, MC, MT, NL,  
NO, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG,  
CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

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[Continued on next page]

(54) Title: DUAL-POLARIZED RADIATING ELEMENT, DUAL-BAND DUAL-POLARIZED ANTENNA ASSEMBLY AND DUAL-POLARIZED ANTENNA ARRAY

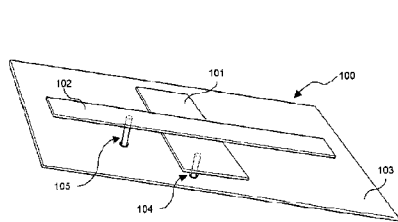


Fig. 1a

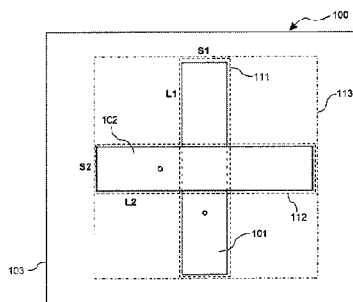


Fig. 1b

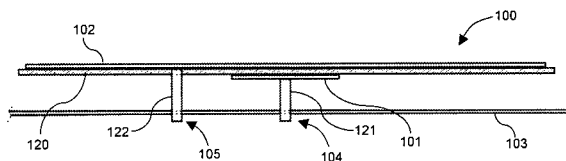


Fig. 1c

(57) Abstract: The invention refers to a dual-polarized radiating element (100) with: a first patch (101) provided for radiating in a first polarization and a second patch (102) provided for radiating in a second polarization which is substantially- orthogonal to the first polarization, wherein the first patch (101) and the second patch (102) overlap. Further the invention relates to a dual-band dual-polarized antenna assembly (500) comprising at least one patch antenna elements and/or one set of patch antenna elements (501,502) and to corresponding antenna arrays.



WO 2008/148569 A3



**Published:**

- *with international search report*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

**(88) Date of publication of the international search report:**  
19 February 2009

**INTERNATIONAL SEARCH REPORT**

International application No  
PCT/EP2008/004539

**A. CLASSIFICATION OF SUBJECT MATTER**  
 INV. H01Q1/38 H01Q5/00 H01Q9/04 H01Q21/06 H01Q21/24

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)  
 H01Q

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 practical, 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	EP 0 735 611 A (DAEWOO ELECTRONICS CO LTD [KR]) 2 October 1996 (1996-10-02) column 4, lines 25-42; figures 4,6 column 5, line 38 - column 6, line 50; figures 5a,5b	1-3,5-16
X	US 5 510 803 A (ISHIZAKA HIRONORI [JP] ET AL) 23 April 1996 (1996-04-23) column 4, line 19 - column 5, line 41; figures 2,3 figures 7a,8a,9a	1-3,5-16
X	US 2003/058171 A1 (UMEHARA NAKO [JP] ET AL) 27 March 2003 (2003-03-27) page 3, paragraph 36-44; figures 1-3 page 4, paragraph 0050-0055	1-3,5-16

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	*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
*E* earlier document but published on or after the international filing date	*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
*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)	*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.
*O* document referring to an oral disclosure, use, exhibition or other means	*Z* document member of the same patent family
*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  <b>19 September 2008</b>	Date of mailing of the international search report  <b>19/12/2008</b>
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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  <b>Ribbe, Jonas</b>
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# INTERNATIONAL SEARCH REPORT

International application No.  
PCT/EP2008/004539

## 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.: 20-55  
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:  
see FURTHER INFORMATION sheet PCT/ISA/210
  
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 allsearchable 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.:

1-3, 5-16

### 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

Continuation of Box II.2

Claims Nos.: 20-55

1 Clarity

The application does not meet the requirements of Article 6 PCT, because the claims are not clear.

1.1 Conciseness

First of all, the application contains no less than 5 independent claims, namely claims 1, 20, 21, 38 and 40, in the same category, as well as no less than 50 dependent claims. The independent claims have a very different level of detail and different scope, partially overlapping, partially going in different directions: Claim 40 is clearly ridiculous and anticipated by the full IC class symbol H01Q21/24. Claim 21 adds to claim 40 the feature of dual band and that of at least one patch antenna element, however one could imagine several separate patch antennas working on different bands and polarizations. Claim 1 concerns no dual band but instead a more precise positioning of two patches for dual polarization. Claim 20 seems to be a more specific version of claim 1. Already because of this, the claims lack conciseness. Additionally, the claims do not respect R. 6.4(a) PCT, since some claim(s) could be drafted as dependent claim(s).

Secondly, almost all dependent claims refer back to all or to a large group of previous claims, thus creating together an enormous number of possible claim combinations.

Thirdly, several claims have multiple alternatives: For example, claim 5 contains 90, 85, 80 or 75° and 0, 5, 10 or 15° (thus 16 combinations); and claim 8 contains 50, 40, 30 or 25% and 2, 5, 10 or 15% (thus also 16 combinations). Already the combination of claims 1, 5 and 8 therefore leads to 256 different combinations of subject-matter. Also claims 22, 28, 29 and 34 contain a large number of alternatives. Even worse is the situation in claims 43, 44, 50, 53 and 54, the combination of claims 43 and 44, for example, leading to an incredible number of more than 3000 combinations. This fact, together with the large number of claim combination possibilities, creates an enormous amount of different subject-matter.

1.2 Incomplete search

As a conclusion, there are so many independent and dependent claims, and they are drafted in such a way, that the claims as a whole are not in compliance with the provisions of clarity and conciseness of Article 6 PCT, as they erect a smoke screen in front of the skilled reader when assessing what should be the subject-matter to search. The non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search (PCT Guidelines 9.19).

The extent of the search was consequently limited, because of clarity reasons, to claims 1-19, i.e. independent claim 1 together with

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

its dependent claims, which appear to comprise a more reasonable definition of what is understood to be the invention for which protection is sought.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2)PCT declaration be overcome.

**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, 5-16

Patch details  
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2. claims: 4,17-19

Parasitic elements or coupling patches  
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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2008/004539

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
EP 0735611	A	02-10-1996	CN 1138759 A	25-12-1996
			JP 8288738 A	01-11-1996
			US 5717407 A	10-02-1998
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US 5510803	A	23-04-1996	NONE	
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US 2003058171	A1	27-03-2003	CN 1411158 A	16-04-2003
			JP 2003101340 A	04-04-2003
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