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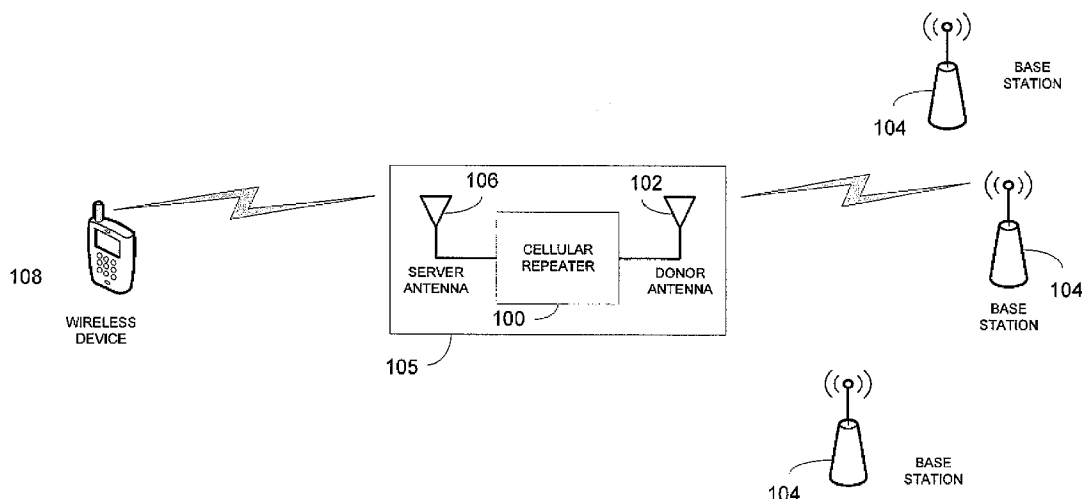
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(54) Title: VARIABLE GAIN ANTENNA FOR CELLULAR REPEATER



(57) Abstract: A cellular repeater (100) and method of operating a cellular repeater are disclosed. The cellular repeater (100) includes a variable-gain donor antenna (102) adapted to communicate with a base station (104) and a variable-gain server antenna (106) adapted to communicate with a mobile device (108). A signal from a selected base station selected from one or more available base stations that are available to the cellular repeater is measured at the donor antenna. The gain of the donor antenna is adapted to maximize a signal level of the signal received at the donor antenna from the selected base station. A calibration signal from the server antenna is measured at the donor antenna to determine a radio frequency isolation between the donor antenna and the server antenna. The gain of the server antenna is adapted to maximize the radio frequency isolation between the donor antenna and server antenna.



WO 2008/058155 A3

INTERNATIONAL SEARCH REPORT

International application No

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A. CLASSIFICATION OF SUBJECT MATTER
 INV. H04B7/155 H04B7/15
 ADD. H01Q21/06

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 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, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2003/143948 A1 (HAN GYU-DUK [KR] ET AL) 31 July 2003 (2003-07-31) page 2, paragraph 23 - paragraph 33 figures 1-3 abstract	1-5
A	US 6 934 511 B1 (LOVINGGOOD BRECK W [US] ET AL) 23 August 2005 (2005-08-23) column 4, line 11 - column 5, line 31 figures 2-8 abstract	1-5
X	JP 11 251987 A (KOKUSAI ELECTRIC CO LTD; NTT MOBIL COMMUN NETWORK INC) 17 September 1999 (1999-09-17) the whole document	1-21
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☒ 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 document 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

7 July 2008

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15/07/2008

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INTERNATIONAL SEARCH REPORT

International application No

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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 1 615 354 A (NTT DOCOMO INC [JP]) 11 January 2006 (2006-01-11) column 8, line 10 - column 13, line 44 figures 5-11 abstract -----	6-21
A	JP 01 004122 A (NIPPON ELECTRIC CO) 9 January 1989 (1989-01-09) figures 1-3 abstract -----	6-10
A	US 2004/110469 A1 (JUDD MANO D [US] ET AL) 10 June 2004 (2004-06-10) page 9, paragraph 173 - page 12, paragraph 199 figures 36-44 abstract -----	1-21
A	STEVENS P J: "Repeaters in PCN and mobile cellular networks" RADIO RECEIVERS AND ASSOCIATED SYSTEMS, 1995., SIXTH INTERNATIONAL CONFERENCE ON BATH, UK, LONDON, UK, IEE, UK, 1995, pages 154-157, XP006529495 ISBN: 0-85296-643-1 the whole document -----	1-21

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2007/083831

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 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 reportcovers 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: 1-5

Method of connecting a cellular repeater to a base station

2. claims: 6-21

Method and apparatus of controlling isolation between donor
and server antennas of a cellular repeater

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/US2007/083831

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