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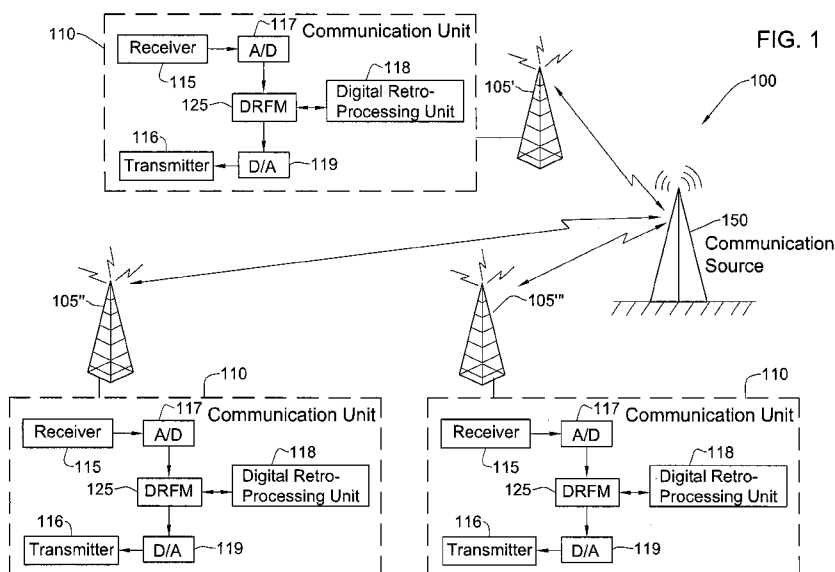
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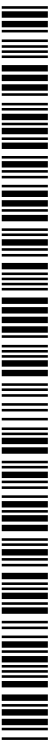
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- Published:
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19 August 2010

(54) Title: DIGITAL RETRO-DIRECTIVE COMMUNICATION SYSTEM AND METHOD THEREOF



(57) Abstract: The present invention relates to a digital retro-directive system and method thereof for receiving incoming signals from a transmitting source by means of at least two antennas and transmitting outgoing signals back, substantially simultaneously, towards said transmitting source through said at least two antennas irrespective of the location of one antenna with respect to another and without calculating phase differences between said outgoing signals.



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INTERNATIONAL SEARCH REPORT

International application No

PCT/IL2009/001166

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H01Q3/00 H01Q3/26
 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)
 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

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	LOADMAN C ET AL: "A retrodirective array using direct down-conversion and fixed point DSP for duplex digital communications" RADIO AND WIRELESS SYMPOSIUM, 2006 IEEE SAN DIEGO, CA, USA 2006, PISCATAWAY, NJ, USA, IEEE, 1 January 2006 (2006-01-01), pages 335-338, XP010906537 ISBN: 978-0-7803-9412-4	9,12-18, 48,50-56
Y	page 335, paragraph 1 - page 337, paragraph 3; figures 1,2	4-8,10, 11, 22-26, 29-40, 43-47, 49, 59-61, 63-73
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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

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INTERNATIONAL SEARCH REPORT

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PCT/IL2009/001166

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 02/05436 A2 (TELECOM ITALIA LAB SPA [IT]; GREGO GIORGIO [IT]) 17 January 2002 (2002-01-17)	1,41
Y	page 3 - page 10; figures 3,4	2-8,35, 42-47, 72,73
A	----- GOMES J ET AL: "Time-reversed OFDM communication in underwater channels" SIGNAL PROCESSING ADVANCES IN WIRELESS COMMUNICATIONS, 2004 IEEE 5TH WORKSHOP ON LISBON, PORTUGAL 11-14 JULY 2004, PISCATAWAY, NJ, USA, IEEE LNKD-DOI:10.1109/SPAWC.2004.1439321, 11 July 2004 (2004-07-11), pages 626-630, XP010805978 ISBN: 978-0-7803-8337-1 paragraph [Abstract] - paragraph [Introduction]	14,15, 50,51
Y	----- GOMES J ET AL: "Wavefront segmentation in phase-conjugate arrays for spatially modulated acoustic communication" OCEANS, 2001. MTS/IEEE CONFERENCE AND EXHIBITION NOV. 5-8, 2001, PISCATAWAY, NJ, USA, IEEE, vol. 4, 5 November 2001 (2001-11-05), pages 2236-2243, XP010566783 ISBN: 978-0-933957-28-2	2,10,20, 28,42, 49,58
A	paragraphs [000I], [0III]	14,15
Y	----- US 2008/266152 A1 (DURTSCHI ROGER DEAN [US]) 30 October 2008 (2008-10-30) paragraphs [Abstract], [002]; figure 1	3,11,21
A	----- US 2006/098746 A1 (CANDY JAMES V [US] ET AL) 11 May 2006 (2006-05-11) paragraph [0036]	15,51
X	----- US 5 254 997 A (COHN MARVIN [US]) 19 October 1993 (1993-10-19)	19,57
Y	column 4, paragraph Abstract - column 5; figures 1,2A,2B	20-26, 58-61
X	----- DIDOMENICO L D ET AL: "DIGITAL COMMUNICATIONS USING SELF-PHASED ARRAYS" IEEE TRANSACTIONS ON MICROWAVE THEORY AND TECHNIQUES, IEEE SERVICE CENTER, PISCATAWAY, NJ, US, vol. 49, no. 4, PART 01, 1 April 2001 (2001-04-01), pages 677-684, XP001093384 ISSN: 0018-9480	27,62
Y	paragraph I - page 680, paragraph III; figures 1,4,5	28-40, 63-71

INTERNATIONAL SEARCH REPORT

International application No.
PCT/IL2009/001166

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.:

1-9, 11-48, 50-73(completely); 10, 49(partially)

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: 1-8, 41-47(completely); 72, 73(partially)

Generating the conjugated carrier phase term of a retrodirective array by inverting the sampling order of the received carrier term

2. claims: 9, 48(completely); 10, 49, 72, 73(partially)

Digital retro-directive communication system whereby the transmitted signal is an accoustic or seismic signal

3. claims: 10, 49(all partially)

Digital retro-directive communication system whereby the transmitted signal is a photonic signal

4. claim: 11

Application of a Digital Radio Frequency Memory (DRFM) as digital memory unit

5. claims: 12-18, 50-56

Generating the conjugated carrier phase term of a retrodirective array by applying a Fast Fourier Transformation FFT

6. claims: 19-26, 57-61(completely); 72, 73(partially)

A retrodirective system using a corner reflector

7. claims: 27-40, 62-71(completely); 72, 73(partially)

MIMO system without consideration of the location of one antenna with respect to another and without calculating phase differences between outgoing signals

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No PCT/IL2009/001166

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 0205436	A2	17-01-2002	AT 470997 T 15-06-2010
		AU 6942501 A	21-01-2002
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US 2008266152	A1	30-10-2008	US 2008268806 A1 30-10-2008
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			US 5387916 A 07-02-1995