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[Continued on next page]

(54) Title: APPARATUS AND METHOD FOR INCREASED DATA RATES IN UNDERWATER COMMUNICATIONS USING ORBITAL ANGULAR MOMENTUM

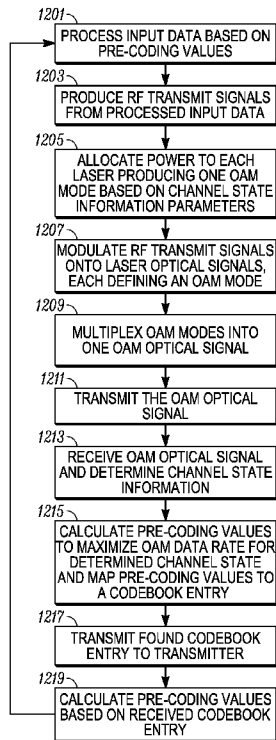


FIG. 12

(57) Abstract: A system for providing underwater communication using orbital angular momentum (OAM) includes a transmitter that processes input data to be transmitted using pre-coding information based on current transmission channel conditions to maximize data rate based on channel conditions. A receiver receives a transmitted multiplexed OAM optical signal and analyzes the received signal for channel state information. The channel state information is used to determine a set of pre-coding values that allow the transmitter to pre-code the input data to maximize the data rate based on current channel conditions. The pre-coding values are mapped to a codebook entry which identifies the pre-coding values. The codebook entry is transmitted from the receiver to the transmitter. The transmitter uses the received codebook entry to identify pre-coding values used to process subsequent input data to be transmitted in order to enhance data rate across the transmit channel.



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A. CLASSIFICATION OF SUBJECT MATTER**H04J 14/00(2006.01)i, H04J 11/00(2006.01)i**

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B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

H04J 14/00; H04Q 11/00; A61B 5/055; H04J 14/06; H04B 10/155; G01R 33/26; H04B 10/12; H04J 14/04; G02B 5/32; H04J 11/00

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

Korean utility models and applications for utility models

Japanese utility models and applications for utility models

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

eKOMPASS(KIPO internal) & keywords: optical, transmitter, receiver, orbital angular momentum (OAM), water, multiplex, demultiplex

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2015-024595 A1 (TELEFONAKTIEBOLAGET L M ERICSSON (PUBL)) 26 February 2015 See page 27, line 12 - page 28, line 19; figure 1; and claim 1.	1,2,7,8,10,12-14
Y		9
A		3-6,11,15-22
Y	EP 1909413 B1 (ALCATEL LUCENT) 29 December 2010 See paragraph [0014].	9
A	US 2010-0317959 A1 (DANIEL R. ELGORT et al.) 16 December 2010 See paragraphs [0028]-[0032]; figure 1; and claims 1, 2.	1-22
A	US 2013-0027034 A1 (DANIEL R. ELGORT et al.) 31 January 2013 See paragraphs [0023]-[0035]; and figures 1, 2.	1-22
A	US 2012-0263466 A1 (IVAN B. DJORDJEVIC et al.) 18 October 2012 See claims 1-3.	1-22

 Further documents are listed in the continuation of Box C. See patent family annex.

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"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2015-024595 A1	26/02/2015	EP 3036854 A1 US 2016-212510 A1	29/06/2016 21/07/2016
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