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- (71) **Applicant: SAMSUNG ELECTRONICS CO., LTD.**
[KR/KR]; 129, Samsung-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do 16677 (KR).
- (72) **Inventors: JEONG, Hong-sil;** 5301-1801, 23, Docheong-ro 17beon-gil, Yeongtong-gu, Suwon-si, Gyeonggi-do 16509 (KR). **KIM, Kyung-joong;** 403, 316, Digital-ro, Guro-gu, Seoul 08378 (KR). **MYUNG, Se-ho;** 706-102, 126, Heungdeok 2-ro, Giheung-gu, Yongin-si, Gyeonggi-do 16953 (KR).
- (74) **Agent: JEONG, Hong-sik;** 9th Floor, Shinduk Bldg., 343, Gangnamdaero, Seocho-gu, Seoul 06626 (KR).
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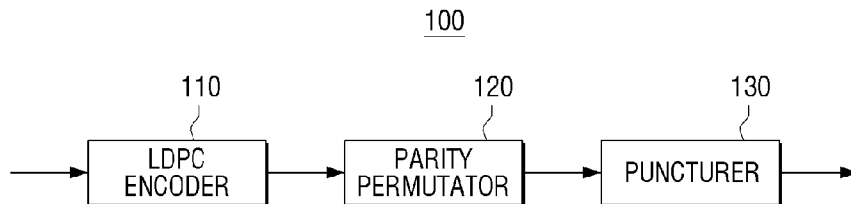
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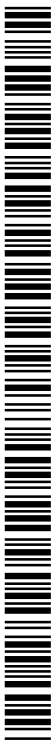
- *with international search report (Art. 21(3))*
- *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments (Rule 48.2(h))*

- (88) **Date of publication of the international search report:**
3 November 2016

(54) **Title:** TRANSMITTER AND PARITY PERMUTATION METHOD THEREOF



(57) **Abstract:** A transmitter is provided. The transmitter includes: a Low Density Parity Check (LDPC) encoder configured to encode input bits to generate parity bits; a parity permutator configured to perform parity permutation by interleaving the parity bits and group-wise interleaving a plurality of bit groups including the interleaved parity bits; and a puncturer configured to puncture some of the parity bits in the group-wise interleaved bit groups, wherein the parity permutator group-wise interleaves the bit groups such that some of the bit groups are positioned at predetermined positions, respectively, and a remainder of the bit groups are positioned without an order within the group-wise interleaved bit groups.



A. CLASSIFICATION OF SUBJECT MATTER**H03M 13/11(2006.01)i, H03M 13/27(2006.01)i**

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHEDMinimum documentation searched (classification system followed by classification symbols)
H03M 13/11; H03M 13/27; H04L 1/00; H03M 13/00; H04L 27/34Documentation 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 modelsElectronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & Keywords: LDPC(Low Density Parity Check), parity permutation, interleaving, encoder**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 2015-0039973 A1 (SAMSUNG ELECTRONICS CO., LTD.) 05 February 2015 See paragraphs [0124], [0131], [0140], [0143], [0155], [0170]; and figures 1, 3, 4.	1-3,5-7
Y		4,8
Y	WO 2009-107989 A2 (SAMSUNG ELECTRONICS CO., LTD.) 03 September 2009 See claims 1,7; and figure 9.	4,8
A	WO 2008-117994 A1 (LG ELECTRONICS INC.) 02 October 2008 See page 2, lines 7-14; page 5, line 21 - page 6, line 3; and figure 13.	1-8
A	US 2014-0310577 A1 (SAMSUNG ELECTRONICS CO., LTD.) 16 October 2014 See paragraphs [0035]-[0037]; and figure 1.	1-8
A	US 2014-0126672 A1 (MIHAIL PETROV) 08 May 2014 See paragraphs [0059]-[0073]; and figure 3.	1-8

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

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"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

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"&" document member of the same patent family

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International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea

Facsimile No. +82-42-481-8578

Authorized officer

KIM, Do Weon

Telephone No. +82-42-481-5560



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		
US 2015-0039973 A1	05/02/2015	KR 10-2015-0005426 A	14/01/2015		
		KR 10-2015-0005475 A	14/01/2015		
		KR 10-2015-0005853 A	15/01/2015		
		KR 10-2015-0032227 A	25/03/2015		
		KR 10-2015-0034668 A	03/04/2015		
		KR 10-2015-0040244 A	14/04/2015		
		US 2015-0082131 A1	19/03/2015		
		US 2015-0095744 A1	02/04/2015		
		US 2015-0128005 A1	07/05/2015		
		WO 2015-002507 A1	08/01/2015		
		WO 2015-002507 A9	03/03/2016		
		WO 2009-107989 A2	03/09/2009	AU 2009-217933 A1	03/09/2009
				AU 2009-217933 B2	06/06/2013
CN 102017427 A	13/04/2011				
CN 102017427 B	28/08/2013				
CN 103368584 A	23/10/2013				
CN 103401563 A	20/11/2013				
CN 103401633 A	20/11/2013				
DK 2096761 T3	02/12/2013				
DK 2584707 T3	07/09/2015				
EP 2096761 A1	02/09/2009				
EP 2096761 B1	11/09/2013				
EP 2096762 A1	02/09/2009				
EP 2584707 A2	24/04/2013				
EP 2584707 A3	12/06/2013				
EP 2584707 B1	24/06/2015				
EP 2584708 A2	24/04/2013				
EP 2584708 A3	29/05/2013				
ES 2439262 T3	22/01/2014				
ES 2547688 T3	08/10/2015				
JP 05440805 B2	12/03/2014				
JP 05644010 B2	24/12/2014				
JP 05644011 B2	24/12/2014				
JP 05644012 B2	24/12/2014				
JP 2011-514070 A	28/04/2011				
JP 2014-042335 A	06/03/2014				
JP 2014-042336 A	06/03/2014				
JP 2014-053941 A	20/03/2014				
KR 10-1503058 B1	18/03/2015				
KR 10-1503656 B1	17/03/2015				
KR 10-1554064 B1	17/09/2015				
KR 10-2009-0092196 A	31/08/2009				
PT 2096761 E	11/12/2013				
PT 2584707 E	16/10/2015				
RU 2010-135579 A	27/02/2012				
RU 2012-110390 A	27/09/2013				
RU 2012-110392 A	27/09/2013				
RU 2450443 C1	10/05/2012				

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR2016/002094

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
		RU 2520405 C2	27/06/2014
		RU 2520406 C2	27/06/2014
		SG 188820 A1	30/04/2013
		SI 2096761 T1	31/01/2014
		TW 200943739 A	16/10/2009
		TW 201330517 A	16/07/2013
		TW 201334426 A	16/08/2013
		TW I399928 B	21/06/2013
		TW I511469 B	01/12/2015
		TW I511470 B	01/12/2015
		US 2009-0217130 A1	27/08/2009
		US 8271846 B2	18/09/2012
		WO 2009-107989 A3	03/12/2009
WO 2008-117994 A1	02/10/2008	GB 2459828 A	11/11/2009
		GB 2469236 A	06/10/2010
		KR 10-1455978 B1	04/11/2014
		US 2010-0138719 A1	03/06/2010
		US 8689088 B2	01/04/2014
US 2014-0310577 A1	16/10/2014	EP 2790328 A1	15/10/2014
		KR 10-2014-0122161 A	17/10/2014
		WO 2014-168405 A1	16/10/2014
US 2014-0126672 A1	08/05/2014	CN 103597748 A	19/02/2014
		EP 2536030 A1	19/12/2012
		EP 2571173 A1	20/03/2013
		EP 2571173 A4	31/07/2013
		EP 2571173 B1	20/08/2014
		EP 2784941 A1	01/10/2014
		EP 2814181 A1	17/12/2014
		ES 2500056 T3	29/09/2014
		JP 05600806 B2	01/10/2014
		TW 201306494 A	01/02/2013
		US 08837618 B2	16/09/2014
		WO 2012-172804 A1	20/12/2012