

(19) World Intellectual Property Organization
International Bureau



(43) International Publication Date
13 September 2001 (13.09.2001)

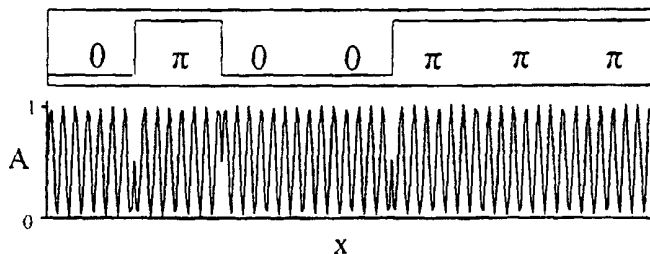
PCT

(10) International Publication Number
WO 01/67643 A3

- (51) International Patent Classification⁷: **G02B 6/16, 6/34**
 - (21) International Application Number: PCT/GB01/01076
 - (22) International Filing Date: 9 March 2001 (09.03.2001)
 - (25) Filing Language: English
 - (26) Publication Language: English
 - (30) Priority Data:
0005615.0 9 March 2000 (09.03.2000) GB
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 - (81) Designated States (national): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CR, CU, CZ, DE, DK, DM, DZ, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW.
 - (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).
- Published:**
— with international search report
- (88) Date of publication of the international search report:
27 December 2001
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*



(54) Title: OPTICAL CODE GENERATION AND DETECTION BY MEANS OF FIBER BRAGG GRATINGS



M7B-1

WO 01/67643 A3

(57) Abstract: Optical code division multiple access (OCDMA) coder: decoder gratings have been fabricated. The modulated refractive index profile that makes up the OCDMA coder: decoder grating incorporates changes in polarity between OCDMA chips by discrete phase shifts, thereby to provide bipolar coding through phase modulation. (In another embodiment quadrupolar coding is achieved). For NRZ modulation, each grating section is either in phase with, or has a predetermined phase shift relative to, the preceding grating section, depending on whether the OCDMA signature has a change in polarity between chips. RZ modulation is also possible. Results are presented from specific examples of bipolar OCDMA with NRZ modulation, which show higher data rates (10 Gbit/s), shorter chip-lengths (6.4ps) and far longer code sequences (63 bits) than previously demonstrated. Other embodiments relate to optical packet switching, for example using the Internet Protocol (IP) or Asynchronous Transfer Mode (ATM).

INTERNATIONAL SEARCH REPORT

Intern al Application No

PCT/GB 01/01076

A. CLASSIFICATION OF SUBJECT MATTER
 IPC 7 G02B6/16 G02B6/34

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)
 IPC 7 G02B H04J

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, PAJ, 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	WO 99 67668 A (TEMPLEX TECHNOLOGY INC) 29 December 1999 (1999-12-29) cited in the application	1,3-7
Y	page 10, line 35 -page 11, line 7	8,10, 12-15
X	EP 0 897 124 A (PHOTONICS RESEARCH ONTARIO) 17 February 1999 (1999-02-17) abstract; figure 3	1,2,4,7, 9
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Further documents are listed in the continuation of box C. Patent family members are listed in annex.

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<p>*A* document defining the general state of the art which is not considered to be of particular relevance</p> <p>*E* earlier document but published on or after the international filing date</p> <p>*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)</p> <p>*O* document referring to an oral disclosure, use, exhibition or other means</p> <p>*P* document published prior to the international filing date but later than the priority date claimed</p>	<p>*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</p> <p>*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</p> <p>*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.</p> <p>* & * document member of the same patent family</p>
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Date of the actual completion of the international search	Date of mailing of the international search report
3 September 2001	10/09/2001

Name and mailing address of the ISA European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Authorized officer Verbandt, Y
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INTERNATIONAL SEARCH REPORT

Intern. Patent Application No

PCT/GB 01/01076

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GRUNNET-JEPSEN A ET AL: "DEMONSTRATION OF ALL-FIBER SPARSE LIGHTWAVE CDMA BASED ON TEMPORAL PHASE ENCODING" IEEE PHOTONICS TECHNOLOGY LETTERS, IEEE INC. NEW YORK, US, vol. 11, no. 10, October 1999 (1999-10), pages 1283-1285, XP000880915 ISSN: 1041-1135 page 1284, column 1, line 5 - line 13 ---	1,4,7,9
X	WO 00 10038 A (TEMPLEX TECHNOLOGY INC) 24 February 2000 (2000-02-24)	1-3,7,11
Y	table 2 figure 8 ---	12-16
Y	US 5 963 586 A (BURBACH MARK ET AL) 5 October 1999 (1999-10-05) column 15, line 31 - line 33 column 29, line 31 - line 44 -----	8,10,16

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 01/01076

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 9967668 A	29-12-1999	EP 1119788 A US 6160656 A	01-08-2001 12-12-2000
EP 0897124 A	17-02-1999	JP 11174245 A	02-07-1999
WO 0010038 A	24-02-2000	EP 1112517 A	04-07-2001
US 5963586 A	05-10-1999	US 5648982 A CA 2199525 A EP 0806079 A IL 115083 A JP 10507323 T WO 9608077 A US 5692007 A US 5629956 A US 5627856 A US 5754584 A US 5610940 A US 5832028 A US 5659574 A US 5757847 A US 5680414 A US 5754585 A US 5856998 A US 5953370 A US 5881100 A	15-07-1997 14-03-1996 12-11-1997 19-03-2001 14-07-1998 14-03-1996 25-11-1997 13-05-1997 06-05-1997 19-05-1998 11-03-1997 03-11-1998 19-08-1997 26-05-1998 21-10-1997 19-05-1998 05-01-1999 14-09-1999 09-03-1999