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- (81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.
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[Continued on next page]

(54) Title: SYSTEM AND METHOD TO COMPENSATE FOR ARBITRARY OPTICAL FIBER LEAD-INS IN AN OPTICAL FREQUENCY DOMAIN REFLECTOMETRY SYSTEM

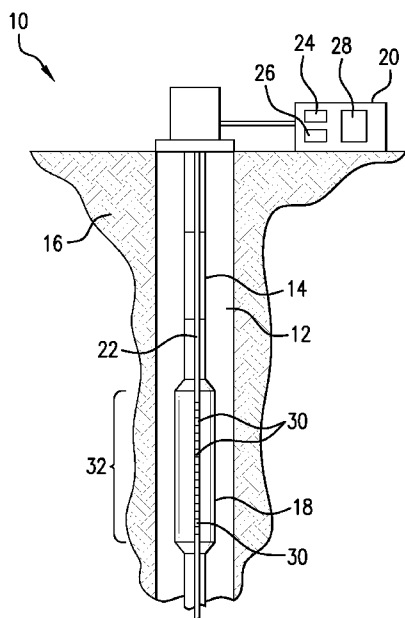


FIG. 1

(57) Abstract: A method for estimating a parameter includes: generating an optical signal, the optical signal modulated via a modulation signal having a variable modulation frequency over a period of time; transmitting the modulated optical signal from a light source into an optical fiber, the optical fiber including at least one sensing location configured to reflect light; receiving a reflected signal including light reflected from the at least one sensing location; and demodulating the reflected signal with a reference signal, the reference signal including a time delay relative to the modulation signal based on a distance between the light source and the at least one sensing location.

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**Declarations under Rule 4.17:**

- *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii))*
- *as to the applicant's entitlement to claim the priority of the earlier application (Rule 4.17(iii))*

- *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:**  
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**A. CLASSIFICATION OF SUBJECT MATTER****G01V 8/16(2006.01)i, E21B 47/00(2006.01)i**

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)

G01V 8/16; G01V 1/24; E21B 47/00; G01V 1/22; H04B 10/12; G01V 8/00; H01J 40/14; G01B 9/02

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) &amp; Keywords: modulator, demodulator, fiber, time delay

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 05070483 A (BERNI; ALBERT J.) 03 December 1991 See column 4, line 46-58; column 18, line 1-24; column 19, line 39-45; claims 1, 2, 4, 5, and figs. 3, 4.	1-20
A	US 7876644 B2 (HALL DAVID B. et al.) 25 January 2011 See column 2, line 58-column 3, line 17; column 3, line 19-35; column 3, line 19-35; claims 1, 2, 4, and figs. 1, 2, 3, 4.	1-20
A	US 2007-0215795 A1 (KAMEYAMA, SHUNPEI et al.) 20 September 2007 See abstract, paragraphs 24, 77, claims 1, 2, 5, and figs. 1, 2.	1-20
A	US 7703514 B2 (CHEE SOON SEONG et al.) 27 April 2010 See abstract, claims 1, 8, 11, 12, and figs. 1, 2.	1-20

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

\* Special categories of cited documents:

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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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"&amp;" document member of the same patent family

Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

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Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 05070483 A	03.12.1991	GB 2243968 A US 05070483 A	13.11.1991 03.12.1991
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