

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference IS161704WPC	<b>FOR FURTHER ACTION</b> see Form PCT/ISA/220 as well as, where applicable, item 5 below.	
International application No. <b>PCT/US2018/045312</b>	International filing date ( <i>day/month/year</i> ) <b>06 August 2018 (06.08.2018)</b>	(Earliest) Priority Date ( <i>day/month/year</i> ) 11 August 2017 (11.08.2017)
Applicant <b>SCHLUMBERGER TECHNOLOGY CORPORATION et al.</b>		

This International search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

It is also accompanied by a copy of each prior art document cited in this report.

1. **Basis of the report**

a. With regard to the **language**, the international search was carried out on the basis of:

the international application in the language in which it was filed

a translation of the international application into \_\_\_\_\_, which is the language of a translation furnished for the purposes of international search (Rules 12.3(a) and 23.1(b))

b.  This international search report has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43.6bis(a)).

c.  With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2.  **Certain claims were found unsearchable** (See Box No. II)

3.  **Unity of invention is lacking** (See Box No. III)

4. With regard to the **title**,

the text is approved as submitted by the applicant.

the text has been established by this Authority to read as follows:

5. With regard to the **abstract**,

the text is approved as submitted by the applicant.

the text has been established, according to Rule 38.2, by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the **drawings** to be published with the abstract is Figure No. 7

as suggested by the applicant.

as selected by this Authority, because the applicant failed to suggest a figure.

as selected by this Authority, because this figure better characterizes the invention.

b.  none of the figures is to be published with the abstract.

**A. CLASSIFICATION OF SUBJECT MATTER****E21B 49/00(2006.01)i, G01V 3/32(2006.01)i, G01R 33/44(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)

E21B 49/00; E21B 47/00; G01R 33/20; G01R 33/34; G01R 33/44; G01R 33/48; G01R 33/56; G01V 3/00; G01V 3/32

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: nuclear magnetic resonance, magnet, transmitter, receiver, processor, pulse sequence, solid state pulse sequence, CPMG pulse sequence, solid, fluid, hydrogen, echo

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5539309 A (VAN WYK et al.) 23 July 1996 See column 1, lines 7-50, column 3, line 26 - column 4, line 67, claim 1, and figures 1, 2.	1-5, 18-28, 30-32
A		6-17, 29
Y	US 2015-0268323 A1 (SCHLUMBERGER TECHNOLOGY CORPORATION) 24 September 2015 See paragraphs [0013], [0034]-[0040] and figure 1A.	1-5, 18-28, 30-32
Y	EP 0478632 B1 (BRITISH TECHNOLOGY GROUP LIMITED) 26 February 1997 See paragraph [0002], claim 1, and figure 1.	4, 5, 24-26, 28, 30-32
A	US 4728892 A (VINEGAR et al.) 01 March 1988 See claim 1 and figure 2.	1-32
A	WO 2016-061335 A1 (SCHLUMBERGER CANADA LIMITED et al.) 21 April 2016 See paragraph [0068] and figure 3.	1-32

 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 application or patent 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

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

Date of the actual completion of the international search

13 November 2018 (13.11.2018)

Date of mailing of the international search report

**14 November 2018 (14.11.2018)**

Name and mailing address of the ISA/KR

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

LEE, Jong Kyung

Telephone No. +82-42-481-3360



**INTERNATIONAL SEARCH REPORT**

Information on patent family members

International application No.

**PCT/US2018/045312**

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5539309 A	23/07/1996	DE 69323054 T2 EP 0605948 A1 EP 0605948 B1	30/09/1999 13/07/1994 13/01/1999
US 2015-0268323 A1	24/09/2015	US 10031255 B2 WO 2015-148514 A1	24/07/2018 01/10/2015
EP 0478632 B1	26/02/1997	DE 69030002 T2 EP 0478632 A1 GB 2234594 A GB 2234594 B JP 04-505867 A JP 2882422 B2 US 5254949 A WO 91-00529 A1	12/06/1997 08/04/1992 06/02/1991 16/03/1994 15/10/1992 12/04/1999 19/10/1993 10/01/1991
US 4728892 A	01/03/1988	None	
WO 2016-061335 A1	21/04/2016	US 2016-0109612 A1 US 9915750 B2	21/04/2016 13/03/2018