

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

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| Applicant's or agent's file reference 18PC00016THU | FOR FURTHER ACTION | see Form PCT/ISA/220 as well as, where applicable, item 5 below. |
| International application No. PCT/CN2018/107510 | International filing date (<i>day/month/year</i>) 26 September 2018 | (Earliest) Priority Date (<i>day/month/year</i>) 28 September 2017 |
| Applicant TSINGHUA UNIVERSITY | | |

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 4 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. 1

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.

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

It is provided a joint receiver and receiving method for navigation signals located at adjacent frequencies. The joint receiving method includes: receiving a first navigation signal and a second navigation signal which are located at adjacent frequencies (S1); and calculating a frequency estimation of a virtual wideband navigation signal constructed based on the first navigation signal and the second navigation signal (S2), wherein the virtual wideband navigation signal is an asymmetric BOC-like navigation signal having a virtual carrier and a virtual sub-carrier. With the joint receiver and joint receiving method, not only power gain but also bandwidth gain can be obtained, and the ranging precision can be significantly improved.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2018/107510

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|--|---|--|
| A. CLASSIFICATION OF SUBJECT MATTER G01S 19/32(2010.01)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) G01S 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 practicable, search terms used) CNABS, CNTXT, CNKI, VEN, IEEEE, Baidu Scholar, USTXT, EPTXT, WOTXT: adjacent, close, frequenc+, joint, cooperat+, receiv+, acqui+, track+, captur+, GPS, GNSS, BD, L2C, L5, B1i, B1C, virtual | | |
| C. DOCUMENTS CONSIDERED TO BE RELEVANT | | |
| Category* | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
| PX | WANG, Chuhan et al. "Asymmetric Dual-Band Tracking Technique for Optimal Joint Processing of BDS B1I and B1C Signals." <i>Sensors</i> , Vol. 17, No. 10, 16 October 2017 (2017-10-16), pages 1-16 | 1-23 |
| A | US 2014191903 A1 (M3SYSTEMS) 10 July 2014 (2014-07-10) the description, paragraphs [0009]-[0064] | 1-23 |
| A | CN 104678411 A (胡辉) 03 June 2015 (2015-06-03) the whole document | 1-23 |
| A | HE, Wenting et al. "Research and Implementation of the Modernized GPS Signal L2C and L5." <i>2009 Second International Conference on Computer and Electrical Engineering</i> , 30 December 2009 (2009-12-30), pages 412-415 | 1-23 |
| <input type="checkbox"/> Further documents are listed in the continuation of Box C. <input checked="" type="checkbox"/> 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 "&" document member of the same patent family | | |
| Date of the actual completion of the international search 25 December 2018 | | Date of mailing of the international search report 07 January 2019 |
| Name and mailing address of the ISA/CN National Intellectual Property Administration, PRC 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088 China | | Authorized officer YANG, Shilin |
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INTERNATIONAL SEARCH REPORT
Information on patent family members

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| International application No. PCT/CN2018/107510 |
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| Patent document cited in search report | | | Publication date (day/month/year) | Patent family member(s) | | | Publication date (day/month/year) |
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| US | 2014191903 | A1 | 10 July 2014 | US | 9529070 | B2 | 27 December 2016 |
| | | | | FR | 3000806 | B1 | 20 February 2015 |
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| | | | | EP | 2755050 | A1 | 16 July 2014 |
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| CN | 104678411 | A | 03 June 2015 | None | | | |
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