

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

To:
 100044
 China 2026, Tower A, Finance & Fourtune Center No.
 18, Xizhimenwai Street, Xicheng District, Beijing

 SEA INTELLECTUAL PROPERTY LAW FIRM

PCT

WRITTEN OPINION OF THE
 INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Applicant's or agent's file reference 18PC00016THU		Date of mailing (day/month/year) 07 January 2019
FOR FURTHER ACTION See paragraph 2 below		
International application No. PCT/CN2018/107510	International filing date (day/month/year) 26 September 2018	Priority date (day/month/year) 28 September 2017
International Patent Classification (IPC) or both national classification and IPC G01S 19/32(2010.01)i		
Applicant TSINGHUA UNIVERSITY		

1. This opinion contains indications relating to the following items:

- Box No. I Basis of the opinion
- Box No. II Priority
- Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- Box No. IV Lack of unity of invention
- Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement
- Box No. VI Certain documents cited
- Box No. VII Certain defects in the international application
- Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

Name and mailing address of the ISA/ National Intellectual Property Administration, PRC China 6, Xitucheng Rd., Jimen Bridge, Haidian District, Beijing 100088	Date of completion of this opinion 26 December 2018	Authorized officer YANG, Shilin
Facsimile No. (86—10) 62019451	Telephone No. 86- (010) -62085717	

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.

PCT/CN2018/107510

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established 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)).
2. This opinion has been established taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rule 43*bis*.1(a)).
3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, this opinion has been established on the basis of a sequence listing:
 - a. forming part of the international application as filed:
 - in the form of an Annex C/ST.25 text file.
 - on paper or in the form of an image file.
 - b. furnished together with the international application under PCT Rule 13*ter*.1(a) for the purposes of international search only in the form of an Annex C/ST.25 text file.
 - c. furnished subsequent to the international filing date for the purposes of international search only:
 - in the form of an Annex C/ST.25 text file (Rule 13*ter*.1(a)).
 - on paper or in the form of an image file (Rule 13*ter*.1(b) and Administrative Instructions, Section 713).
4. In addition, in the case that more than one version or copy of a sequence listing has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that forming part of the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
5. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/CN2018/107510

Box No. II Priority

1. The validity of the priority claim has not been considered because the International Searching Authority does not have in its possession a copy of the earlier application whose priority has been claimed or, where required, a translation of that earlier application. This opinion has nevertheless been established on the assumption that the relevant date (Rules 43*bis*.1 and 64.1) is the claimed priority date.
2. This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.
3. Additional observations, if necessary:
 [1] By verification, the priority is valid.

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/CN2018/107510

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step and industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims	<u>1-23</u>	YES
	Claims	<u>None</u>	NO
Inventive step (IS)	Claims	<u>1-23</u>	YES
	Claims	<u>None</u>	NO
Industrial applicability (IA)	Claims	<u>1-23</u>	YES
	Claims	<u>None</u>	NO

2. Citations and explanations :

- [1] The following document is cited in the communication:
- [2] D1: US2014191903 A1, 10 July 2014 (10.07.2014).
- [3] 1. Novelty (PCT 33 (2))
- [4] 1.1 D1 discloses a radionavigation signal tracking device (see the description, paragraphs [0009]-[0064]). The device comprises a first tracking stage of a first radionavigation signal contained in an incoming signal to be applied to the device, the first radionavigation signal comprising a first carrier at a first frequency modulated by a first spreading waveform, said first tracking stage comprising a first carrier phase-locked loop with a mixer configured to multiply the incoming signal with a local replica of the first carrier, the first carrier phase-locked loop comprising a phase discriminator of the first carrier configured to produce a first error signal arising from a first phase difference between the first carrier and the local replica of the first carrier, the first carrier phase-locked loop being configured to adjust the phase of the local replica of the first carrier on the basis of the first error signal; a second tracking stage of a second radionavigation signal contained in the incoming signal, the second radionavigation signal comprising a second carrier at a second frequency, different from the first frequency, modulated by a second spreading waveform, the second tracking stage comprising a second carrier phase-locked loop with a mixer configured to multiply the incoming signal with a local replica of the second carrier, wherein the second carrier phase-locked loop comprises a phase discriminator of a beat between the first carrier and the second carrier configured to produce a second error signal arising from a difference between the first phase difference and a second phase difference between the second carrier and the local replica of the second carrier; and wherein the second phase-locked loop is configured to adjust the phase of the local replica of the second carrier on the basis of the first and second error signals. The first and second radionavigation signals are selected from among Galileo E1, E5 and E6 signals or among GPS L5, L2C and L1 signals or among GLONASS L3, G2 and G1 signals.
- [5] D1 does not disclose the following technical features of the claims 1 and 12: calculating a frequency estimation of a virtual wideband navigation signal constructed based on the first navigation signal and the second navigation signal, wherein the virtual wideband navigation signal is an asymmetric BOC-like navigation signal having a virtual carrier and a virtual sub-carrier. Therefore, the claims 1 and 12 are novel.
- [6] 1.2 The dependent claims 2-11, 13-21 are also novel respectively because claims 1 and 12 are novel.
- [7] 1.3 Claims 22 and 23 are novel because claims 1-21 are novel.
- [8] 2. Inventive Step (PCT 33 (3))
- [9] 2.1 According to the above item 1.1, the problem to be solved by claims 1 and 12 may be regarded as how to improve bandwidth gain and the ranging precision. However, the different technical features are neither known from, nor rendered obvious by, the available prior art. Therefore, claims 1 and 12 involve inventive steps.
- [10] 2.2 The dependent claims 2-11, 13-21 also involve inventive steps respectively because claims 1 and 12 involve inventive steps.
- [11] 2.3 Claims 22 and 23 also involve inventive steps respectively because claims 1-21 involve inventive steps.
- [12] 3. Industrial Applicability (PCT 33 (4))

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**

International application No.

PCT/CN2018/107510

Box No. V

**Reasoned statement under Rule 43*bis*.1(a)(i) with regard to novelty, inventive step and industrial applicability;
citations and explanations supporting such statement**

[13] The claims 1-23 can be used or made in industry, therefore claims 1-23 are industrially applicable.