

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**
(PCT Rule 43*bis*.1)

To:

see form PCT/ISA/220

Date of mailing
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/US2018/044103

International filing date (day/month/year)
27.07.2018

Priority date (day/month/year)
31.07.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H04L27/26 H04W12/12 H04L25/02 H04L29/06

Applicant
QUALCOMM INCORPORATED

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 43*bis*.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 usually 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 66.1*bis*(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:




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Date of completion of this opinion

see form
PCT/ISA/210

Authorized Officer

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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 43bis.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 13ter.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 13ter.1(a)).
 - on paper or in the form of an image file (Rule 13ter.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:

Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of

the entire international application

claims Nos. 4-17, 20-24, 30

because:

the said international application, or the said claims Nos. relate to the following subject matter which does not require an international search (*specify*):

the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):

the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed (*specify*):

no international search report has been established for the whole application or for said claims Nos. 4-17, 20-24, 30

a meaningful opinion could not be formed without the sequence listing; the applicant did not, within the prescribed time limit:

furnish a sequence listing in the form of an Annex C/ST.25 text file, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

furnish a sequence listing on paper or in the form of an image file complying with the standard provided for in Annex C of the Administrative Instructions, and such listing was not available to the International Searching Authority in the form and manner acceptable to it; or the sequence listing furnished did not comply with the standard provided for in Annex C of the Administrative Instructions.

pay the required late furnishing fee for the furnishing of a sequence listing in response to an invitation under Rule 13ter.1(a) or (b).

See Supplemental Box for further details

Box No. IV Lack of unity of invention

1. In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has, within the applicable time limit:
- paid additional fees
 - paid additional fees under protest and, where applicable, the protest fee
 - paid additional fees under protest but the applicable protest fee was not paid
 - not paid additional fees
2. This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- complied with
 - not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- all parts.
 - the parts relating to claims Nos. 1-3, 18, 19, 25-29

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

1. Statement
- | | | |
|-------------------------------|-------------|---------------------------|
| Novelty (N) | Yes: Claims | <u>1-3, 18, 19, 25-29</u> |
| | No: Claims | |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | <u>1-3, 18, 19, 25-29</u> |
| Industrial applicability (IA) | Yes: Claims | <u>1-3, 18, 19, 25-29</u> |
| | No: Claims | |
2. Citations and explanations
- see separate sheet**

Box No. VI Certain documents cited

1. Certain published documents (Rules 43*bis*.1 and 70.10)
and / or
2. Non-written disclosures (Rules 43*bis*.1 and 70.9)
see form 210

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

see separate sheet

Re Item IV

Lack of unity of invention

The International Searching Authority considers that the present application does not meet the requirements of unity of invention as defined in Rule 13 (1) and (2) of the PCT and contains four potential inventions. This observation is based on the following reasons:

1 The following documents are referred to in this communication; the numbering will be adhered to in the rest of the procedure:

D1 US 2016/020842 A1 (LI JUNYI [US] ET AL) 21 January 2016 (2016-01-21)

D2 Qualcomm: "5G Waveform & Multiple Access Techniques", , 4 November 2015 (2015-11-04), pages 1-46, XP055348124, Retrieved from the Internet:
URL:<https://www.qualcomm.com/media/documents/files/5g-research-on-waveform-and-multiple-access-techniques.pdf> [retrieved on 2017-02-21]

2 Document D1 discloses (the references in parentheses applying to this document)

A method for wireless communication, comprising:

identifying a ~~ranging measurement~~ signal comprising a cyclic prefix for transmission to a wireless device (Fig. 3, 306 and par. 50, l. 10-12);
generating a modified ~~ranging measurement~~ signal comprising a modified cyclic prefix for transmission in a ~~ranging measurement~~ frame, wherein the modified cyclic prefix is not a repeated portion of the modified ~~ranging measurement~~ signal (Fig. 3, 310 and par. 50, last 2 lines); and
transmitting the modified ~~ranging measurement~~ signal in the ~~ranging measurement~~ frame (Fig. 3),

from which the subject-matter of claim 1 differs in that the transmitted signal is a ranging measurement signal and the frame is a ranging measurement frame.

Since it is obvious for a skilled person that the signal in D1 could be any signals, including a ranging measurement signal, the subject-matter of claim 1 cannot be considered as inventive.

- 3 Document D1 further discloses (the references in parentheses applying to this document)
A method for wireless communication, comprising:
receiving, from a wireless device, a ~~ranging measurement~~ signal in a ~~ranging measurement~~ frame including a cyclic prefix, wherein the cyclic prefix is a zeroed-out cyclic prefix (Fig. 5 and Fig. 6);
determining a channel estimation technique that accounts for the zeroed-out cyclic prefix (implicit from par. 55, 56); and
estimating a channel from the ranging measurement frame based at least in part on the channel estimation technique (implicit from par. 55, 56),
from which the subject-matter of claim 18 also differs in that the received signal is a ranging measurement signal and the frame is a ranging measurement frame.
- Thus, due to the same reasoning as mentioned in point 2, the subject-matter of claim 18 cannot be regarded as inventive.
- 4 Similar reasoning applies to independent claims 25, 28, which are corresponding claims of claims 1, 18, respectively, in another category. Thus, the subject-matter of claims 25, 28 is not inventive either.
- 5 The additional features of claims 2, 19, 26, 29 are already disclosed in D1 (see Fig. 5 or Fig. 6). Thus, the subject-matter of these claims is not inventive either.
- 6 All objections mentioned above can also be raised with D2 as the prior art (see p. 12).
- 7 Thus, all the features claimed in claims 1, 2, 18, 19, 25, 26, 28, 29 cannot be regarded as "special technical features" according to Rule 13(2) PCT. They, therefore, can not be considered to represent the common general inventive concept for the different groups of claims.
- 8 Considering the disclosure of D1 or D2 and Rule 13(2) PCT, the following new technical features of the first group of claims 3, 27 are considered to be "special technical features":
- determining a pseudo random sequence to modulate the cyclic prefix, wherein the modified cyclic prefix consists of a sequence of symbols modulated with the pseudo random sequence.

The objective problem solved by these special technical features is to provide a method such that a cyclic prefix cannot be detected by an unauthorized device as a repeated portion of a following OFDM symbol.

- 9 Considering the disclosure of D1 or D2 and Rule 13(2) PCT, the following new technical features of the second group of claims 4-6 are considered to be "special technical features":

- identifying a restricted modulation and coding scheme MCS for the ranging measurement frame, wherein the ranging measurement frame is transmitted according to the restricted MCS.

The objective problem solved by these technical features is to modulate and encode the ranging measurement frame.

- 10 Considering the disclosure of D1 or D2 and Rule 13(2) PCT, the following new technical features of the third group of claims 7-17, 22-24 are considered to be "special technical features":

- encrypting a channel estimation training sequence of the ranging measurement frame, wherein the transmitted ranging measurement frame includes the encrypted channel estimation training sequence.

The objective problem solved by these technical features is to securely transmit a channel estimation training sequence.

- 11 Considering the disclosure of D1 or D2 and Rule 13(2) PCT, the following new technical features of the fourth group of claims 20, 21, 30 are considered to be "special technical features":

- modeling the channel as a finite impulse response FIR filter and determining a system of equations based at least in part on the FIR filter.

The objective problem solved by these technical features is to perform channel estimation at a receiver.

- 12 The above analysis shows that the "special technical features" of the 4 different groups of claims are neither the same nor corresponding to each other. A comparison of the objective problems related to the different groups of claims, all seen in the light of the description and the drawings of the application, shows that they are different and have no corresponding technical effect. Consequently, the requirements of Unity of Invention (Rule 13 (1) and (2) PCT) are not fulfilled.

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

INVENTION 1

13 Further reference is made to the following document:

D3 CN 104 836 767 A (JIANGSU GIGARAY COMM SCIENCE & TECHNOLOGY CO LTD) 12 August 2015 (2015-08-12)

14 Art. 33(3) PCT

14.1 Document D3, which is considered to represent the most relevant state of the art for INVENTION 1, discloses (see Fig. 2 and par. 18)

A method for wireless communication, comprising:

identifying a ~~ranging measurement~~ signal comprising a cyclic prefix for transmission to a wireless device;

generating a modified ~~ranging measurement~~ signal comprising a modified cyclic prefix for transmission in a ~~ranging measurement~~ frame, wherein the modified cyclic prefix is not a repeated portion of the modified ~~ranging measurement~~ signal; and

transmitting the modified ~~ranging measurement~~ signal in the ~~ranging measurement~~ frame,

wherein generating the modified ~~ranging measurement~~ signal comprises determining a pseudo random sequence to modulate the cyclic prefix, wherein the modified cyclic prefix consists of a sequence of symbols modulated with the pseudo random sequence

from which the subject-matter of claim 3 also differs in that the transmitted signal is a ranging measurement signal and the frame is a ranging measurement frame.

Thus, due to the same reasoning as mentioned in point 2, the subject-matter of claim 3 cannot be regarded as inventive.

14.2 Similar reasoning applies to claim 27, which is the corresponding claim of claim 3 in another category. Thus, the subject-matter of claim 27 is not inventive either.

15 At present it seems that the first invention of the present application doesn't fulfill the requirements of Art. 33(1) PCT.

Re Item VI

Certain documents cited

- D5 QINGHUA LI (INTEL CORPORATION): "PHY-Level Security Protection",
IEEE DRAFT; 11-17-0795-02-00AZ-PHY-LEVEL-SECURITY-
PROTECTION, IEEE-SA MENTOR, PISCATAWAY, NJ USA
,
vol. 802.11az, no. 2 10 May 2017 (2017-05-10), pages 1-19,
XP068116085,
Retrieved from the Internet:
URL:[https://mentor.ieee.org/802.11/dcn/17/11-17-0795-02-00az-phy-
level-security-protection.ppt](https://mentor.ieee.org/802.11/dcn/17/11-17-0795-02-00az-phy-level-security-protection.ppt)
[retrieved on 2017-05-10]

Re Item VIII

Certain observations on the international application

INVENTION 1

- 16 The first invention of the application does not meet the requirements of Article 6 PCT, because claims 1, 3, 18, 25, 27 are not clear.
- 16.1 From the wording of claim 1 it seems that the modified ranging measurement signal is not interrelated with the ranging measurement signal claimed beforehand. This, however, is not consistent with the description.
- 16.2 The same objection applies to claim 25 as well.
- 16.3 From the wording of claims 3, 18, 27 it is not clear whether the "sequence of symbols" are interrelated with the ranging measurement signal or not.
- 16.4 The expression "the sequence of sample symbols" used in claim 18 has not been defined beforehand.