

PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

PCT

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.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/US2018/047492

International filing date (day/month/year)
22.08.2018

Priority date (day/month/year)
06.09.2017

International Patent Classification (IPC) or both national classification and IPC
INV. H04L1/18 H04L5/00

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 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 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 66.1bis(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:



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Date of completion of
this opinion

see form
PCT/ISA/210

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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. 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>4, 5, 9-14, 18, 19, 23-27</u>
	No: Claims	<u>1-3, 6-8, 15-17, 20-22, 28-30</u>
Inventive step (IS)	Yes: Claims	<u>10, 11, 24, 25</u>
	No: Claims	<u>1-9, 12-23, 26-30</u>
Industrial applicability (IA)	Yes: Claims	<u>1-30</u>
	No: Claims	

2. Citations and explanations

see separate sheet

Box No. VII Certain defects in the international application

The following defects in the form or contents of the international application have been noted:

see separate sheet

Reference is made to the following documents:

- D1 SEQUANS: "CBG based HARQ-Ack/Nack",
3GPP DRAFT; R1-1713299 - CBG BASED HARQ, 3RD GENERATION
PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ;
650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ;
FRANCE
vol. RAN WG1, no. Prague, P.R. Czechia; 20170821 - 20170825 20
August 2017 (2017-08-20), XP051316106,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/
[retrieved on 2017-08-20]
- D2 NTT DOCOMO ET AL: "HARQ-ACK multiplexing",
3GPP DRAFT; R1-1713957, 3RD GENERATION PARTNERSHIP
PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE
DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE
vol. RAN WG1, no. Prague, Czechia; 20170821 - 20170825 20 August
2017 (2017-08-20), XP051316749,
Retrieved from the Internet:
URL:http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN1/Docs/
[retrieved on 2017-08-20]

Re Item V

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

1 Interpretation of the claims

1.1 Independent claim 1

The expressions "transport block" or "code block group" are broad as the claims are not limited to any technology where these expressions would have a well-defined meaning. Therefore these expressions must be interpreted broadly as any type of data units. Moreover, a set or a subset in a mathematical sense can also have only one element or be empty. This has been considered in this opinion. Adding the "3GPP" technology to the claims would unambiguously define what these expressions represent.

1.2 Dependent claims 7, 8, 21 and 22

The features "bit map in the bit sequence that identifies the first subset of TBs" in claims 7 and 21 and the features "index in the bit sequence that identifies the first subset of TBs" are broad and are disclosed for instance by sending feedback TBs in the "first subset" as the claims fail to disclose any specific use for the "bit map" or the "index", respectively.

2 **Independent claim 1**

The present application does not meet the criteria of Article 33(2) PCT, because the subject-matter of claim 1 is not new. D1 discloses:

A method for wireless communication, comprising:

receiving a set of transport blocks, each of the TBs comprising one or more code block groups (Fig 1: multiple TBs containing a plurality of CBGs are received);

generating a bit sequence providing CBG-level feedback on a first subset of TBs in the set of TBs and TB-level feedback on at least a second subset of TBs in the set of TBs (p 2, l 19-20: "A two-level Ack/Nack design is proposed with high level bits to give a TB-level feedback and low level bits to give a detailed feedback"; p 2, l 1: "support TB-level HARQ-Ack for the CBG based HARQ-Ack/Nack"), the first subset differing from the second subset (p 2, l 32-33 "Only TTIs i and $i+5$ need to be further refined by the low level Ack/Nack bits" so only 2 TBs out of 5 will also have CBG-level feedback whereas all the TBs will have TB-based feedback; see also point 1.1 above)

transmitting the bit sequence (Fig 1; p 2, l 19: "As shown in Figure 1, Ack/Nack bits of all 6 TTIs are transmitted in UCI 0").

2.1 Document D2

The subject-matter of claim 1 also anticipated by document D2 (33(2) PCT). See some signalling options in the passages mentioned in the international search report.

2.2 Independent claims 15, 28 and 30

These claims contain features corresponding to the features of claim 1. The reasoning applied above to claim 1 applies therefore mutatis mutandis to independent claims 15, 28 and 30, which therefore lack novelty over the disclosure of D1 or D2 (Art. 33(2) PCT).

3 Dependent claims

3.1 Dependent claims 2, 16 and 29 (Art. 33(2) PCT)

Document D1 discloses also the additional features of these claims (p 2, l 32-33 "Only TTIs i and $i+5$ need to be further refined by the low level Ack/Nack bits" so only 2 TBs out of 5 will also have CBG-level feedback whereas all the TBs will have TB-based feedback; see also point 1.1 above).

3.2 Dependent claims 3 and 17 (Art. 33(2) PCT)

Document D1 discloses also the additional features of these claims (p 2, l 1: "support TB-level HARQ-Ack for the CBG based HARQ-Ack/Nack"; p 2, l 21: "Depending on the number of available Ack/Nack bits of the configured PUCCH format, the low level bits").

3.3 Depending claims 4 and 18 (Art. 33(3) PCT)

These claims contain a multitude of options for selecting the TBs for which CBG-based feedback is additionally provided that the skilled person would consider implementing when being limited by the size of the CBG feedback resource. Hence these claims lack an inventive step.

3.4 Dependent claims 5 and 19 (Art. 33(3) PCT)

Document D1 discloses also the additional features of these claims (p 4, l 2-3: "If the number of produced Ack/Nack bits is smaller than this preconfigured size, filler bits can be added" and this happens when the number of unsuccessfully received TBs is smaller than a certain value and hence CBG feedback needs to be transmitted for a smaller number of TBs).

3.5 Dependent claims 6 and 20 (Art. 33(2) PCT)

Document D1 discloses also the additional features of these claims (Fig 1: the HARQ process number represents the feedback identifier for each TB).

3.6 Dependent claims 7, 8, 21 and 22 (Art. 33(2) PCT)

Document D1 discloses also the additional features of these claims (Fig 2: the CBG-based feedback represents the "bit map" or the "index"; see also point 1.2 above).

3.7 Dependent claims 9 and 23 (Art. 33(3) PCT)

The person skilled in the art faced with the problem of informing the transmitter side of the dynamic content of composed TB-based and CBG-based feedback for a plurality of TBs would consider sending this information together with the feedback itself in order to enable fast feedback processing. Hence these claims lack an inventive step.

3.8 Dependent claims 12, 13, 26 and 27 (Art. 33(3) PCT)

The person skilled in the art having to transmit a mixed feedback of TB-based and CBG-based bits for a plurality of TBs would consider signalling the subsets for which the different feedback should be provided, such as the number of bits, to the user equipment as this is a common design procedure used in the 3GPP networks. Hence these claims lack an inventive step.

3.9 Depending claim 14 (Art. 33(3) PCT)

This claim contains a multitude of options for selecting the TBs for which CBG-based feedback is additionally provided that the skilled person would consider implementing when being limited by the size of the CBG feedback resource in order to optimise the to-be-used retransmission resources. Hence this claim lacks an inventive step.

Re Item VII

Certain defects in the international application

- 4 The claims features are not provided with reference signs placed in parentheses (Rule 6.2(b) PCT). The terms in brackets are acronyms and not references to figures in the sense of Rule 6.2(b) PCT.
- 5 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1 is not mentioned in the description, nor is this document identified therein.