

# 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/US2017/044094

International filing date (day/month/year)  
27.07.2017

Priority date (day/month/year)  
30.09.2016

International Patent Classification (IPC) or both national classification and IPC  
INV. H04L1/08 H04L1/00

Applicant  
INTEL IP CORPORATION

**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

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**Box No. I Basis of the opinion**

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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:

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**Box No. II Priority**

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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:

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**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**

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1. Statement

Novelty (N)	Yes: Claims	<u>3, 4, 7, 9, 15, 20</u>
	No: Claims	<u>1, 2, 5, 6, 8, 10-14, 16-19, 21-24</u>
Inventive step (IS)	Yes: Claims	
	No: Claims	<u>1-24</u>
Industrial applicability (IA)	Yes: Claims	<u>1-24</u>
	No: Claims	

2. Citations and explanations

see separate sheet

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**Box No. VI Certain documents cited**

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1. Certain published documents (Rules 43bis.1 and 70.10)

and / or

2. Non-written disclosures (Rules 43bis.1 and 70.9)

see form 210

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**Box No. VII Certain defects in the international application**

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

see separate sheet

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**Box No. VIII Certain observations on the international application**

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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 V**

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

1.1 Reference is made to the following documents:

- D1 EP 2 919 534 A1 (PANASONIC IP CORP AMERICA [US]) 16 September 2015 (2015-09-16)
- D2 MEDIATEK INC: "Discussion on CSI report in coverage enhancement",  
3GPP DRAFT; R1-140241 DISCUSSION ON CSI REPORT IN COVERAGE ENHANCEMENT, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ;  
,  
vol. RAN WG1, no. Prague, Czech Republic; 20140210 - 20140214 9 February 2014 (2014-02-09), XP050735794,  
Retrieved from the Internet:  
URL:[http://www.3gpp.org/ftp/Meetings\\_3GPP\\_SYNC/RAN/RAN1/Docs/](http://www.3gpp.org/ftp/Meetings_3GPP_SYNC/RAN/RAN1/Docs/)  
[retrieved on 2014-02-09]
- D3 INTEL CORPORATION: "Repetition headroom reporting for FeMTC",  
3GPP DRAFT; R4-167283 FEMTC REP HEADROOM, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE  
,  
vol. RAN WG4, no. Ljubljana, Slovenia; 20161010 - 20161014 30 September 2016 (2016-09-30), XP051165985,  
Retrieved from the Internet:  
URL:[http://www.3gpp.org/ftp/tsg\\_ran/WG4\\_Radio/TSGR4\\_80Bis/Docs/](http://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_80Bis/Docs/)  
[retrieved on 2016-09-30]
- D4 WO 2017/160351 A1 (INTEL IP CORP [US]) 21 September 2017 (2017-09-21)

## 1.2 Independent claims

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

Document **D1** discloses, in the wording of **claim 1** (references in parenthesis):

An apparatus for a base station (**see D1: par. 0100**, "[...] the configuration of the repetition level for uplink and downlink will be performed by the base station [...]"), comprising baseband circuitry having: a radio frequency (RF) interface; and one or more processors configured to (**implicit**, since it is clear that a base station for wireless communications contains a baseband circuitry, a RF interface (**see Fig. 1,2**) and at least one processor):

determine repetition level (RL) thresholds (since this expression is not clear (see also section 4.2), it can be interpreted as any kind of separating different RL with particular thresholds. Therefore, **D1 (see par. 0100**, "[...] a particular transmission is repeated several times, such as 10,20, 50, 80 [...]") already discloses the use of thresholds to distinguish different RL and transmission scenarios.);

allocate downlink resources, wherein the downlink resources include a repetition level (RL) and the RL thresholds (**implicit**, since D1 deals with LTE systems, it is clear that the eNB allocates resources for DL before sending the actual data. Further, it is implicit that the amount of data to be sent (and therefore also the allocation of resources) is dependent on the RL and the used thresholds.);

send downlink data to the RF interface for transmission to a user equipment (UE) according to the RL (**see D1: par. 0208**, "[...] eNB will begin with a high number of downlink repetitions [...] eNB may transmit [...] many repetitions [...]". This paragraph discloses that the downlink data is transmitted according to the previously determined (high) RL.);

receive repetition feedback from the RF interface based on the transmission to the UE (**see D1: par. 0208**, "[...] UE determines how many of the repetitions were actually used until finally decoding the downlink transmission successfully [...] The UE shall thus monitor the number of downlink transmission repetition that were needed [...]" and **Fig. 13** ("transmit PHR to BS").); and

update the allocation of downlink resources based on the repetition feedback (**see D1: par. 0221**, "[...] The eNB can derive the [...] determined number of downlink transmission repetition (level) from the received PHR [...] The eNB may use same to properly determine the repetition configuration [...] downlink [...]").

The same objection also applies to **claims 18 and 21**. Further this objection also applies mutatis mutandis to the corresponding UE **claims 12 and 23**.

It is worth mentioning that also document D2, which discloses coverage enhancement in a 3GPP system and suggests a new CQI metric which is used to signal the recommended repetition levels from the UE to the BS also discloses all technical features of the aforementioned claims (**see D2: sections 1, 2 and 3**). This document could therefore also be used for a similar novelty objection as above.

### 1.3 **Dependent claims**

Dependent **claims 2-11, 13-17, 19, 20, 22 and 24** do not appear to contain any additional features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step, the reasons being as follows:

1.3.1 **Claim 2:** not new, since D1 already discloses feedback on the number of repetitions (**see D1: par. 0208 and Fig. 13**).

The same objection also applies to **claim 13**.

1.3.2 **Claims 3 and 4:** not inventive. D1 does not explicitly mention an RL increment / decrement threshold. However, it discloses the monitoring of the number of required repetitions to successfully decode the data and further the transmission of a report based on this value (**see D1: par. 0208 and Fig. 13**).

Since the use of thresholds in order to "quantize" a specific range into a smaller number of possible subsets in order to save signalling overhead is common in the art of wireless communication systems, a skilled person would also consider this concept. Therefore the subject-matter of the aforementioned claims does not appear to involve an inventive step.

The same objection also applies to **claim 15**.

- 1.3.3 **Claim 5:** not new, since it is implicit that the MCS and the subcarrier spacing have to be considered in LTE systems in order to allocate resources and that these parameters have to be scheduled.
- 1.3.4 **Claim 6:** not new, since D1 already discloses the adjustment of the RL based on the feedback (**see D1: par. 0221**).
- 1.3.5 **Claim 7:** D1 does not explicitly mention that the base station takes the prior feedback into account when determining the RL. However, D1 suggests that the UE may average multiple downlink repetition reports before sending and therefore discloses that the temporal history of required repetitions should be taken into account (**see D1: par. 0104**).

Since it is obvious that this consideration of the temporal history could also be done at the base station instead of at the UE, the subject-matter does not appear to involve an inventive step.

The same objection also applies to **claim 20**.

- 1.3.6 **Claim 8:** not new, since D1 already discloses to determine the change of the RL based on the feedback (**see D1: par. 0221**). Further, since the number of required repetitions for successfully decoding and therefore the amount of change of the RL is at least also partly based on the channel conditions, the subject-matter of **claim 10** appears to be not new.

Additionally, since it is common practice in 3GPP systems that several transmission parameters are scheduled (or configured) by the network through higher layers, the subject-matter of **claim 9** does not appear to involve an inventive step.

- 1.3.7 **Claim 11:** not new, since D1 already discloses that the base station is an eNB (**see Fig. 1, 2**).
- 1.3.8 **Claim 14:** not new, since D1 already discloses the averaging of multiple required repetition values (**see D1: par. 0104**).

1.3.9 **Claims 16 and 17:** not new. Since D1 deals with LTE systems, it is implicit that the eNB allocates resources for DL before sending the actual data. Further, it is clear that the allocation has to be changed if the RL (and therefore also the amount of data to be sent) is adapted. Similarly, it is also implicit, that the UE has to receive the allocated resources in order to be able to receive the actual DL data.

The same objection also applies to **claims 22 and 24.**

1.3.10 **Claim 19:** not new. Since the expression "RL threshold" is not clear (see section 4.2 ), it can be interpreted as any kind of separating different RL with particular thresholds. Therefore, **D1 (see par. 0100, "[...] a particular transmission is repeated several times, such as 10,20, 50, 80 [...]" )** already discloses the determination of thresholds to distinguish different RL and transmission scenarios.

### Re Item VI

#### 2 **Certain documents cited**

- 2.1 **D3 (XP051165985)** discloses feedback and adaptation of the RL based on this feedback in a coverage enhancement scenario and is a contribution to the 3GPP standardization procedure. It was published at the date of the priority of the current application and might become relevant for the assessment of novelty and inventive step in case the priority of the application turns out to be invalid.
- 2.2 **D4 (WO 2017/160351)** discloses RL feedback in a coverage enhancement scenario using ENRR and was published on the 21.09.2017, which is after the filing date of the current application. However, its priority date is the 15.03.2016, which is prior the effective filing data of the current application. Therefore this document might become relevant for assessment of novelty (if the priority of D4 turns out to be valid) or even for the assessment of inventive step (in case the priority of the application turns out to be invalid).

### Re Item VII

#### 3 **Certain defects in the international application**

- 3.1 Independent claims 1, 12, 18,21 and 23 are not in the two-part form in accordance with Rule 6.3(b) PCT, which in the present case would be appropriate, with those features known in combination from the prior art D1 and D2 being placed in the preamble (Rule 6.3(b)(i) PCT) and the remaining features being included in the characterising part (Rule 6.3(b)(ii) PCT).



- 3.2 Contrary to the requirements of Rule 5.1(a)(ii) PCT, the relevant background art disclosed in D1 and D2 is not mentioned in the description, nor are these documents identified therein.

**Re Item VIII**

**4 Certain observations on the international application**

The application does not meet the requirements of Article 6 PCT, because **claims 1, 2, 12, 13, 18, 21 and 23** are not clear. The reasons being as follows:

- 4.1 **Claim 1** does not meet the requirements of Article 6 PCT because the matter for which protection is sought is not clearly defined. It is neither clear how the RL thresholds are determined, nor what technical features are necessary in order to determine these thresholds. Therefore, the claim attempts to define the subject-matter in terms of the result to be achieved, which merely amounts to a statement of the underlying problem, without providing the technical features necessary for achieving this result.
- 4.2 The wording "RL thresholds" disclosed in **claim 1** is not clear, it is not apparent what kind of thresholds are used in order to distinguish different RL. Therefore, this expression can be interpreted as any kind of separating different RL with particular thresholds. In the light of the description (see par. 0090) however, it appears that this expression is supposed to specify increment and decrement thresholds. The UE compares the determined, tracked repetitions (repetitions necessary to correctly decode the DL data) to these thresholds and sends an indication to increase or decrease the RL to the BS. However, this meaning is not clear from the wording of the claim alone (see ISPE Guidelines 5.31).
- 4.3 It is clear from the description (especially Fig. 4 and par. 0105) that the feature of adjusting the RL based on the repetition feedback (claim 6) and transmitting the further data according to the adjusted RL is essential to the definition of the invention. Otherwise the whole concept of the invention, namely the adaptive RL adjustment would not be possible and the technical effect of balancing transmission efficiency and reliability could not be reached. Since independent **claim 1** does not contain this feature it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.

- 4.4 The wording "excess number of repetitions report (ENRR)" disclosed in **claim 2** has no well recognized meaning in the field of wireless communications and is therefore not clear. In the light of the description (par. 0083) it appears that this expression is supposed to specify a feedback sent from the UE to the BS which indicates that the number of repetitions necessary to correctly decode the DL data is lower or higher than certain defined (increment / decrement) thresholds (claims 3 and 4). However, this meaning is not clear from the wording of the claim alone (see ISPE Guidelines 5.31). Therefore this expression is interpreted as any kind of feedback from the UE to the BS.
- The same objection also applies to **claim 13**.
- 4.5 It is clear from the description (especially Fig. 4 and par. 0104) that the features of receiving the allocated DL resources (claim 16) and also the updated DL resources (claim 17) are essential to the definition of the invention. Otherwise the UE would not be able to receive and decode the DL data.
- Since independent **claim 12** does not contain this feature it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.
- 4.6 It is clear from the description (especially Fig. 4 and par. 0104) that the feature of updating the allocated DL resources based on the feedback is essential to the definition of the invention. Otherwise the UE would not be able to receive and decode the DL data which was transmitted using the new (or updated) RL.
- Since independent **claim 18** does not contain this feature it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.
- 4.7 Although **claims 21 and 1** and also **claims 23 and 12** have been drafted as separate independent claims, they appear to relate effectively to the same subject-matter and to differ from each other only with regard to the definition of the subject-matter for which protection is sought and/or in respect of the terminology used for the features of that subject-matter. The aforementioned claims therefore lack conciseness and as such do not meet the requirements of Article 6 PCT.