

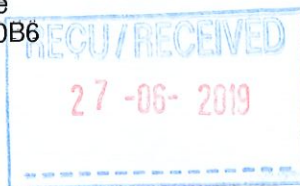
PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

CARTIER, François
ERICSSON CANADA INC.
8275 Route Transcanadienne
Saint-Laurent, Québec H4S 0B6
CANADA



NOTIFICATION OF TRANSMITTAL OF THE INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(PCT Rule 71.1)

Date of mailing
(day/month/year)

21.06.2019

Applicant's or agent's file reference
P72327WO1

IMPORTANT NOTIFICATION

International application No.
PCT/IB2018/054478

International filing date (day/month/year)
18.06.2018

Priority date (day/month/year)
16.06.2017

Applicant
Telefonaktiebolaget LM Ericsson (Publ)

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary report on patentability and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary report on patentability. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

Name and mailing address of the international preliminary examining authority:



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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference P72327WO1		FOR FURTHER ACTION	See Form PCT/PEA/416
International application No. PCT/IB2018/054478	International filing date (day/month/year) 18.06.2018	Priority date (day/month/year) 16.06.2017	
International Patent Classification (IPC) or national classification and IPC INV. H04L27/26			
Applicant Telefonaktiebolaget LM Ericsson (Publ)			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of <u>4</u> sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. ☒ (sent to the applicant and to the International Bureau) a total of <u>8</u> sheets, as follows: ☒ sheets of the description, claims and/or drawings which have been amended and/or sheets containing rectifications authorized by this Authority, unless those sheets were superseded or cancelled, and any accompanying letters (see Rules 46.5, 66.8, 70.16, 91.2, and Section 607 of the Administrative Instructions). ☐ sheets containing rectifications, where the decision was made by this Authority not to take them into account because they were not authorized by or notified to this Authority at the time when this Authority began to draw up this report, and any accompanying letters (Rules 66.4bis, 70.2(e), 70.16 and 91.2). ☐ superseded sheets and any accompanying letters, where this Authority either considers that the superseding sheets contain an amendment that goes beyond the disclosure in the international application as filed, or the superseding sheets were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in item 4 of Box No. I and the Supplemental Box (see Rule 70.16(b)). b. ☐ (sent to the International Bureau only) a total of (Indicate type and number of electronic carrier(s)) , containing a sequence listing, in the form of an Annex C/ST.25 text file, as indicated in the Supplemental Box Relating to Sequence Listing (see paragraph 3ter of Annex C of the Administrative Instructions).			
4. This report contains indications relating to the following items: ☒ Box No. I Basis of the report ☐ 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 Article 35(2) with regard to novelty, inventive step or 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			
Date of submission of the demand 16.04.2019		Date of completion of this report 21.06.2019	
Name and mailing address of the international preliminary examining authority:  European Patent Office Gitschiner Str. 103 D-10958 Berlin Tel. +49 30 25901 - 0 Fax: +49 30 25901 - 840		Authorized officer González Gutiérrez Telephone No. +49 30 25901-497	



**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/IB2018/054478

Box No. I Basis of the report

1. With regard to the **language**, this report is based on
- ☒ 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 (under Rules 12.3(a) and 23.1(b))
 - ☐ publication of the international application (under Rule 12.4(a))
 - ☐ international preliminary examination (under Rules 55.2(a) and/or 55.3(a) and (b))
2. With regard to the **elements*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):*

Description, Pages

1-24 as originally filed

Claims, Numbers

1-22 filed on

23-05-2019

Drawings, Sheets

1/15-15/15 as originally filed

- ☐ a sequence listing - see Supplemental Box Relating to Sequence Listing.

3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since either they are considered to go beyond the disclosure as filed, or they were not accompanied by a letter indicating the basis for the amendments in the application as filed, as indicated in the Supplemental Box (Rules 70.2(c) and (c-bis)):
- ☐ the description, pages
 - ☐ the claims, Nos.
 - ☐ the drawings, sheets/figs
 - ☐ the sequence listing (*specify*):
5. ☐ This report has been established:
- ☐ taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91 (Rules 66.1(d-bis) and 70.2(e)).
 - ☐ without taking into account the **rectification of an obvious mistake** authorized by or notified to this Authority under Rule 91(Rules 66.4bis and 70.2(e)).

**INTERNATIONAL PRELIMINARY REPORT
ON PATENTABILITY**

International application No.
PCT/IB2018/054478

6. ☒ With regard to top-up searches (Rules 66.1 *ter* and 70.2(f)):
- ☒ A top-up search was carried out by this Authority on 03.06.2019 (all discovered documents are listed in the Supplemental Box Relating to Top-up Search).
 - ☐ Additional relevant documents have been discovered during the top-up search.
 - ☐ No top-up search was carried out by this Authority because it would serve no useful purpose.
7. ☐ Supplementary international search report(s) from Authority(ies) has/have been received and taken into account in establishing this report (Rule 45bis.8(b) and (c)).

* If item 4 applies, some or all of those sheets may be marked "superseded".

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	<u>1-22</u>
	No: Claims	
Inventive step (IS)	Yes: Claims	<u>1-22</u>
	No: Claims	
Industrial applicability (IA)	Yes: Claims	<u>1-22</u>
	No: Claims	

2. Citations and explanations (Rule 70.7):

see separate sheet

Re Item V

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

- 1 The application relates to a method and device for selecting one waveform from two or more waveforms for an upcoming uplink transmission to the radio network node (**claims 1, 9, 13 and 19**) and their corresponding computer program product (**claims 11 and 21**).
- 2 Such a device is disclosed by document:
 - D1 US 2016/269212 A1 (VILAIPOORNSAWAI USA [CA] ET AL) 15 September 2016 (2016-09-15)
- 3 The essential difference between the subject-matter of the independent claims and D1 is that the selection is based at least in part on the format of the downlink control message and on a radio resource control, RRC, configuration of the UE. In this manner, another criterion is added to RRC signaling (D1: [0055]), i.e., the format of the downlink control message.
- 4 The problem solved by this new feature can be regarded as how to avoid uncertainty about the waveform used by the UE.
- 5 The combination of these new features are neither disclosed nor rendered obvious by any of the documents cited in the search report. The requirements of Article 33 PCT with respect to novelty and inventive step are met.
- 6 **Claims 2-8, 10, 12, 14-18, 20, 22** are dependent on claims 1, 9, 11, 13, 19 and 21, respectively and as such also meet the requirements of the PCT with respect to novelty and inventive step.



IN THE EUROPEAN PATENT OFFICE
ACTING AS
INTERNATIONAL PRELIMINARY EXAMINATION AUTHORITY

May 16, 2019

International Application No.: PCT/IB2018/054478
International Filing Date: June 18, 2018
Owner: Telefonaktiebolaget LM Ericsson (publ)
Title: WAVEFORM INDICATION IN WIRELESS
COMMUNICATION NETWORKS
ERICSSON Ref: P72327 WO1

European Patent Office
Munich

Dear Sir,

RESPONSE TO WRITTEN OPINION

In response to the outstanding Written Opinion dated September 17, 2018, Applicant respectfully requests favourable reconsiderations in view of the presently submitted amendments and remarks.

IN THE CLAIMS

Please replace the claim pages presently on file with currently submitted claim pages 25 to 28 containing claims 1 to 22.

**REMARKS*****Item V – Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement***

Claims 1, 16, 18, 20, 33, 35, 37, and 41 are rejected under Art. 33(2) PCT for lacking novelty in view of document D1 (US 2016/0269212). Claims 1 to 44 are rejected under Art. 33(3) for lacking inventiveness in view of document D1.

Notably, claims 2-15, 17, 19, 21-32, 34, 36, 38-40, 42-44 are not rejected under Art. 33(2) PCT for lacking novelty in view of document D1. As such, Applicant understands that claims 2-15, 17, 19, 21-32, 34, 36, 38-40, 42-44 are considered novel.

First, to expedite prosecution, and without admission whatsoever, Applicant has cancelled claims 37 to 44 without prejudice. The rejection of claims 37 to 44 under Art. 33(2) and/or (3) PCT is now moot.

Second, Applicant has amended independent claims 1, 16, 18, 20, 33, and 35 to replace "downlink transmission" by "downlink control message", to replace "the downlink transmission having at least one characteristic" by "the downlink control message having a format", and to replace "the at least one characteristic of the downlink transmission" by "the format of the downlink control message and on a radio resource control, RRC, configuration of the UE". The amendments to claims 1, 16, 18, 20, 33, and 35 are supported by dependent claims 2, 10, 21, and 29, and by, e.g., par. [0099] of the description.

In view of the amendments to claims 1, 16, 18, 20, 33, and 35, Applicant has cancelled claims 2, 4-8, 10, 21, 23-27, and 29, and has amended the remaining claims to reflect the amendments to claims 1, 16, 18, 20, 33, and 35 (e.g., updated claim number, updated claim dependency, updated wording, etc.).

Applicant submits that amended claims 1, 16, 18, 20, 33, and 35 are both novel and inventive and thus compliant with Art. 33(2) and (3) PCT.

With respect to novelty, amended claims 1, 16, and 18 now recite the limitations of claims 2 and 10 which were considered novel, and claims 20, 33, and 35 now recite the limitations



of claims 21 and 29 which were also considered novel. Hence, Applicant believes that amended claims 1, 16, 18, 20, 33, and 35 are novel.

With respect to inventiveness, document D1 does not teach or suggest that a waveform used for an upcoming uplink transmission to a radio network node is selected by a UE from two or more waveforms based at least in part on both the format of a downlink control message (sent by the radio network node to the UE) and on an RRC configuration of the UE. Document D1 is completely silent as to using the format of a downlink control message as a criterion to select a waveform to be used for an uplink transmission.

Notably, by adding another criterion, i.e., the format of the downlink control message, to RRC signalling to select a waveform for an uplink transmission, uncertainty about the waveform used by the UE may be avoided (see par. [0072] of the present application).

Hence, in view of the amendments to claims 1, 16, 18, 20, 33, and 35 and in view of the above arguments, Applicant submits that amended claims 1, 16, 18, 20, 33, and 35 are both novel and inventive and thus compliant with Art. 33(2) and (3) PCT.

As for the remaining dependent claims, that is claims 3, 9, 11-15, 17, 19, 22, 28, 30-32, 34, and 36, each of these claims depends directly or indirectly from a patentable claim. Consequently, dependent claims 3, 9, 11-15, 17, 19, 22, 28, 30-32, 34, and 36 are patentable at least by virtue of their dependency from a patentable claim, as discussed above. Still, Applicant reserves the right to further address the rejections of claims 3, 9, 11-15, 17, 19, 22, 28, 30-32, 34, and 36 in the future, if needed.

Notably, in view of the cancellation of claims 2, 4-8, 10, 21, 23-27, and 29, the claim set now contains claims 1 to 22.

Item VI – Certain documents cited

Applicant takes notes of the existence of document D3 (US 2017/0311296). Applicant will address document D3 in the future, if needed.

**Conclusion**

In view of the foregoing, Applicant submits that the present international application is now in condition for favourable action. As such, Applicant respectfully requests that the Examiner issue a favourable IPRP.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "François Cartier", written over a horizontal line.

François Cartier
Patent Agent

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CLAIMS

We claim:

1. A method in a user equipment, UE, the method comprising:
 - 5 receiving a downlink control message from a radio network node, the downlink control message having a format;
selecting one waveform from two or more waveforms for an upcoming uplink transmission to the radio network node, the waveform being selected based at least in part on the format of the downlink control message and on a radio resource control, RRC,
10 configuration of the UE;
transmitting the uplink transmission to the radio network node using the selected waveform.
2. The method of claim 1, wherein the downlink control message comprises an uplink grant.
3. The method of claim 1 or 2, wherein the waveform is selected further based, at least in part,
15 on a radio network temporary identifier, RNTI, used to scramble the downlink control message.
4. The method of any of claims 1 to 3, further comprising selecting one resource allocation from two or more resource allocations for the uplink transmission based at least in part on the format of the downlink control message and on the RRC configuration of the UE, and wherein
20 transmitting the uplink transmission to the radio network node is further performed using the selected resource allocation.
5. The method of any of claims 1 to 4, further comprising obtaining an identification of the two or more waveforms.
6. The method of claim 5, wherein obtaining an identification of the two or more waveforms
25 comprises receiving an identification of at least one of the two or more waveforms via RRC signaling received from the radio network node.
7. The method of any of claims 1 to 3, further comprising:
determining a first waveform from system information;
determining a second waveform from the RRC configuration of the UE;

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AMENDED SHEET

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- selecting one waveform from two or more waveforms further comprising selecting one waveform from the first and the second waveform for an upcoming uplink transmission to the radio network node, the waveform being selected based at least in part on the format of the downlink control message and on the RRC configuration of the UE; and
- 5 transmitting the uplink transmission to the radio network node using the selected waveform.
8. The method of claim 1, wherein one of the two or more waveforms is a Discrete Fourier Transform Spread orthogonal frequency division multiplexing, DFTS-OFDM, based waveform having Discrete Fourier Transform, DFT, precoding.
- 10 9. A user equipment, UE, comprising circuitry adapted to:
- receive a downlink control message from a radio network node, the downlink control message having a format;
- select one waveform from two or more waveforms for an upcoming uplink transmission to the radio network node, the waveform being selected based at least in part on the format of the downlink control message and on a radio resource control, RRC,
- 15 configuration of the UE;
- transmit the uplink transmission to the radio network node using the selected waveform.
10. The UE of claim 9, wherein the processing circuitry is further adapted to operate according to the method of any of claims 2 to 8.
- 20 11. A computer program product comprising a non-transitory computer readable storage medium having computer readable program code embodied in the medium, the computer readable program code comprising:
- computer readable program code to receive a downlink control message from a radio network node, the downlink control message having a format;
- 25 computer readable program code to select one waveform from two or more waveforms for an upcoming uplink transmission to the radio network node, the waveform being selected based at least in part on the format of the downlink control message and on a radio resource control, RRC, configuration of the UE;

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computer readable program code to transmit the uplink transmission to the radio network node using the selected waveform.

12. The computer program product of claim 11, wherein the computer readable program code further comprises computer readable program code to operate according to the method of any
5 of claims 2 to 8.
13. A method in a radio network node, the method comprising:
transmitting a downlink control message to a user equipment, the downlink control message having a format;
receiving an uplink transmission from the user equipment, the uplink transmission
10 using a waveform selected from two or more waveforms based at least in part on the format of the downlink control message and on a radio resource control, RRC, configuration of the UE.
14. The method of claim 13, wherein the downlink control message comprises an uplink grant.
15. The method of claim 13 or 14, wherein the waveform is selected further based, at least in part, on a radio network temporary identifier, RNTI, used to scramble the downlink control
15 message.
16. The method of any of claims 13 to 15, further comprising determining the format of the downlink control message based at least in part on the one of the two or more waveforms desired for the upcoming uplink transmission.
17. The method of any of claims 13 to 16, further comprising transmitting an identification of at
20 least one of the two or more waveforms to the UE.
18. The method of claim 17, wherein transmitting an identification of at least one of the two or more waveforms to the UE is performed via RRC signaling.
19. A radio network node comprising processing circuitry adapted to:
transmit a downlink control message to a user equipment, the downlink control
25 message having a format;
receive an uplink transmission from the user equipment, the uplink transmission using a waveform selected from two or more waveforms based at least in part on the format of the downlink control message and on a radio resource control, RRC, configuration of the UE.

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20. The radio network node of claim 19, wherein the processing circuitry is further adapted to operate according to the method of any of claims 14 to 18.

21. A computer program product comprising a non-transitory computer readable storage medium having computer readable program code embodied in the medium, the computer readable program code comprising:

computer readable program code to transmit a downlink control message to a user equipment, the downlink control message having a format;

computer readable program code to receive an uplink transmission from the user equipment, the uplink transmission using a waveform selected from two or more waveforms based at least in part on the format of the downlink control message and on a radio resource control, RRC, configuration of the UE.

22. The computer program product of claim 21, wherein the computer readable program code further comprises computer readable program code to operate according to the method of any of claims 14 to 18.

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