

## PATENT COOPERATION TREATY

From the  
INTERNATIONAL SEARCHING AUTHORITY

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# PCT

WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

Date of mailing  
(day/month/year)

29 MAR 2018

Applicant's or agent's file reference  
425360689

**FOR FURTHER ACTION**

See paragraph 2 below

International application No.

PCT/US 17/68707

International filing date (day/month/year)

28 December 2017 (28.12.2017)

Priority date (day/month/year)

International Patent Classification (IPC) or both national classification and IPC

IPC(8) - H04M 1/00; H04W 72/00 (2018.01)  
CPC - H04W 16/14; H04W 88/06; H04W 72/04

Applicant INTEL IP CORPORATION

I. 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/US  
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Facsimile No. 571-273-8300

Date of completion of this opinion

16 March 2018

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**Box No. 1**      **Basis of this 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:

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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**

## 1. Statement

Novelty (N)	Claims	<u>2-13, 14/(2-3), 15/(2-3), 17-21, 22/(17), 24, 25</u>	YES
	Claims	<u>1, 14/(1), 15/(1), 16, 22/(16) and 23</u>	NO
Inventive step (IS)	Claims	<u>5-13, 18-20, 24, 25</u>	YES
	Claims	<u>1-4, 14, 21-23</u>	NO
Industrial applicability (IA)	Claims	<u>1-25</u>	YES
	Claims	<u>None</u>	NO

## 2. Citations and explanations:

Claims 1, 14/(1), 15/(1), 16, 22/(16) and 23 lack novelty under PCT Article 33(2) as being anticipated by US 2015/0327001 A1 to APPLE INC. (hereinafter APPLE).

Regarding claim 1, Apple discloses a Bluetooth master device ("Bluetooth wireless communication protocol can specify that a single piconet can include up to eight wireless devices (one master and seven slaves)," para. [0046]), comprising: a transceiver ("The apparatus 2500 can further include the transceiver 2508," para. [0150]); and a processor (computer program product comprising computer readable program instructions stored on a computer readable medium, e.g., the memory 2506, and executed by a processing device, e.g., the processor 2504," para. [0151]) configured to enable the Bluetooth master device to perform mixed mode communication with a Bluetooth slave device by the processor ("The BT communication modes listed in column 402 can include BT communication modes that are specified by a Bluetooth wireless communication protocol (e.g., BT legacy communication modes), such as a basic rate (BR) GFSK mode, an Enhanced Data Rate (EDR) pi/4+DQPSK modulation mode, and an EDR 8-DPSK modulation mode, which are specified for the Bluetooth v2.X+EDR wireless communication protocols (and for subsequent Bluetooth 3.X and 4.X wireless communication protocols)," para. [0052]) being configured to: control the transceiver to transmit to the Bluetooth slave device a data packet based on a Bluetooth Basic Rate/Enhanced Data Rate (BR/EDR) protocol ("Bluetooth wireless communication protocol (e.g., BT legacy communication modes), such as a basic rate (BR) GFSK mode, an Enhanced Data Rate (EDR)," para. [0052]; "Bluetooth BR packet format 600, Bluetooth EDR packet format 608," para. [0058]); and receive from the Bluetooth slave device via the transceiver an acknowledgement packet (ACK) based on a Bluetooth Low Energy (BLE) protocol ("a final acknowledgement (from the master to the slave) can provide for protecting the connection establishment," para. [0075]; FIG. 21A illustrates an exemplary BUX LE packet format 2100 that can be used for BUX mode communication in a Bluetooth LE mode of operation," para. [0114]).

Regarding claim 14/(1), APPLE discloses the Bluetooth master device of claim 1, and APPLE further discloses wherein the processor is configured to: initiate the mixed mode communication ("Either the first wireless device 102 or the second wireless device 104 can initiate communications in the BUX communication mode, e.g., by sending a BUX coded message to the other peer wireless device," para. [0051]; "a BUX LE capable wireless device operating as an Initiator," para. [0121]).

Regarding claim 15/(1), APPLE discloses the Bluetooth master device of claim 1, and APPLE further discloses wherein the mixed mode communication is initiated by the Bluetooth slave device ("FIG. 14C illustrates a flow chart 1430 of an example method for activating a BUX mode initiated by a slave device in accordance with some embodiments. In this regard, FIG. 14C illustrates steps that can be performed by the second wireless device 104 to initiate the BUX mode with the first wireless device 102 in accordance with various embodiments," para. [0080]).

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

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

Claim 6 is written as depending on itself. For the purposes of this search and opinion, claim 6 will be treated as depending on claim 5 because claim 5 provides the antecedent basis for "the aggregation window".

Claim 18 is written as depending on "of any of claims 17-17". This is assumed to be "claims 16-17" since claims 16 and 17 precede claim 18.

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## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box No. V.2. Citations and Explanations:

Regarding claim 16, APPLE discloses a Bluetooth slave device ("Bluetooth wireless communication protocol can specify that a single piconet can include up to eight wireless devices (one master and seven slaves)," para. [0046]), comprising: a transceiver ("The apparatus 2500 can further include the transceiver 2508," para. [0150]); and a processor (computer program product comprising computer readable program instructions stored on a computer readable medium, e.g., the memory 2506, and executed by a processing device, e.g., the processor 2504," para. [0151]) configured to enable the Bluetooth slave device to perform mixed mode communication with a Bluetooth master device by the processor being ("The BT communication modes listed in column 402 can include BT communication modes that are specified by a Bluetooth wireless communication protocol (e.g., BT legacy communication modes), such as a basic rate (BR) GFSK mode, an Enhanced Data Rate (EDR) pi/4+DQPSK modulation mode, and an EDR 8-DPSK modulation mode, which are specified for the Bluetooth v2.X+EDR wireless communication protocols (and for subsequent Bluetooth 3.X and 4.X wireless communication protocols)," para. [0052]) configured to: receive from the Bluetooth master device via the transceiver a data packet based on a Bluetooth Basic Rate/Enhanced Data Rate (BR/EDR) protocol ("Bluetooth wireless communication protocol (e.g., BT legacy communication modes), such as a basic rate (BR) GFSK mode, an Enhanced Data Rate (EDR)," para. [0052]; "Bluetooth BR packet format 600, Bluetooth EDR packet format 608," para. [0058]); and control the transceiver to transmit to the Bluetooth master device an acknowledgement packet (ACK) based on a Bluetooth Low Energy (BLE) protocol ("a final acknowledgement (from the master to the slave) can provide for protecting the connection establishment," para. [0075]; FIG. 21A illustrates an exemplary BUX LE packet format 2100 that can be used for BUX mode communication in a Bluetooth LE mode of operation," para. [0114]).

Regarding claim 22/(16), APPLE discloses the Bluetooth slave device of claim 16, and APPLE further discloses wherein the processor is configured to control the transceiver to transmit the ACK without using an external power amplifier ("the second wireless device 104 can send to the first wireless device 102 a first "slave" packet (denoted as "S1"). The S1 packet can include an SEQN=1 and an ARQN=ACK," para. [0083]).

Regarding claim 23, APPLE discloses a communication method, comprising: establishing a Bluetooth Basic Rate/Enhanced Data Rate (BR/EDR) communication link between a master device and a slave device ("Bluetooth wireless communication protocol (e.g., BT legacy communication modes), such as a basic rate (BR) GFSK mode, an Enhanced Data Rate (EDR)," para. [0052]; "Bluetooth BR packet format 600, Bluetooth EDR packet format 608," para. [0058]; "Bluetooth wireless communication protocol can specify that a single piconet can include up to eight wireless devices (one master and seven slaves)," para. [0046]); enabling, by either the master device or the slave device, a mixed mode 595 communication based on a combination of the Bluetooth BR/EDR protocol and a Bluetooth Low Energy (BLE) protocol ("Bluetooth wireless communication protocol (e.g., BT legacy communication modes), such as a basic rate (BR) GFSK mode, an Enhanced Data Rate (EDR)," para. [0052]; "FIG. 20 shows an exemplary state transition diagram 2000 used to facilitate a connection between wireless devices operating in a Bluetooth low energy (LE) mode in accordance with a Bluetooth wireless communication protocol," para. [0113]); transmitting by the master device to the slave device a data packet based on the Bluetooth BR/EDR protocol ("The BT communication modes listed in column 402 can include BT communication modes that are specified by a Bluetooth wireless communication protocol (e.g., BT legacy communication modes), such as a basic rate (BR) GFSK mode, an Enhanced Data Rate (EDR) pi/4+DQPSK modulation mode, and an EDR 8-DPSK modulation mode, which are specified for the Bluetooth v2.X+EDR wireless communication protocols (and for subsequent Bluetooth 3.X and 4.X wireless communication protocols)," para. [0052]; and transmitting by the slave device to the master device an acknowledgement packet (ACK) based on the BLE protocol ("a final acknowledgement (from the master to the slave) can provide for protecting the connection establishment," para. [0075]; FIG. 21A illustrates an exemplary BUX LE packet format 2100 that can be used for BUX mode communication in a Bluetooth LE mode of operation," para. [0114]).

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## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of:  
Box No. V.2. Citations and Explanations:

Claims 2-4, 14/(2-3), 15/(2-3), 17, 21, and 22/(17) lack an inventive step under PCT Article 33(3) as being obvious over APPLE in view of US 2017/0134227 A1 to LG ELECTRONICS INC. (hereinafter LG).

Regarding claim 2, APPLE discloses The Bluetooth master device of claim 1, but does not disclose wherein the processor is configured to: determine a time to enable the mixed mode communication; and at the enable time, enable the mixed mode communication. LG discloses a Bluetooth master device ("server device and the client device perform Bluetooth communication using a Bluetooth low energy (BLE) technology," para. [0047]; "client device 110 may also be called as master device," para. [0052]) wherein the processor is configured to: determine a time to enable the mixed mode communication; and at the enable time, enable the mixed mode communication ("present invention provides a method of activating and deactivating the relay function that forwards the data packet that the nodes receive in a Bluetooth mesh network," para. [0348], "the relay node that plays the role of relay in a Bluetooth mesh network may determine an activation or deactivation time of the relay function according to the number of times of the received data packet," para. [0379]; mixed mode - "in the BR/EDR, a dynamic channel is basically used, and a protocol service multiplexer, retransmission, streaming mode, and the like, are supported," para. [0141]). Thus, it would have been obvious to a person having ordinary skill in the art to enable mixed mode communication as taught by LG in the device of APPLE to activate and deactivate only the needed nodes for communication (see LG: para. [0378]-[0387]).

Regarding claim 3, APPLE as modified by LG discloses The Bluetooth master device of claim 2, and LG further discloses wherein the processor is configured to: after the mixed mode communication is enabled, expect to receive the ACK from the Bluetooth slave device via the transceiver within a period of time which is based on inter frame spacing of the BLE protocol ("In the case that the node is unable to receive ACK with respect to the data packet during a predetermined time after transmitting the data packet, the node retransmits the data packet on every specific period. For example, in the case that the source node is unable to receive ACK after the source node transmits the data packet on the time t, the source node retransmits the data packet after A time (step, S12010)," para. [0383]-[0384]; "packets defined in an Bluetooth interface will be briefly described. BLE devices use packets," para. [0218]).

Regarding claim 4, APPLE discloses the master device of claim 1, and APPLE as modified by LG discloses the Bluetooth master device of any of claims 2-3, and LG further discloses wherein the processor is configured to: determine whether the Bluetooth slave device supports the mixed mode communication ("in the BR/EDR, a dynamic channel is basically used, and a protocol service multiplexer, retransmission, streaming mode, and the like, are supported," para. [0141]; "The BLE slave does not share a common physical channel with the master. Each of the slaves communicates with the master through a separate physical channel," para. [0087]).

Regarding claim 14/(2-3), APPLE discloses the Bluetooth master device of claims 2-3, and APPLE further discloses wherein the processor is configured to: initiate the mixed mode communication ("Either the first wireless device 102 or the second wireless device 104 can initiate communications in the BUX communication mode, e.g., by sending a BUX coded message to the other peer wireless device," para. [0051]; "a BUX LE capable wireless device operating as an Initiator," para. [0121]).

Regarding claim 15/(2-3), APPLE discloses the Bluetooth master device of claim 2-3, and APPLE further discloses wherein the mixed mode communication is initiated by the Bluetooth slave device ("FIG. 14C illustrates a flow chart 1430 of an example method for activating a BUX mode initiated by a slave device in accordance with some embodiments. In this regard, FIG. 14C illustrates steps that can be performed by the second wireless device 104 to initiate the BUX mode with the first wireless device 102 in accordance with various embodiments," para. [0080]).

Regarding claim 17, APPLE discloses The Bluetooth slave device of claim 16, but does not disclose determine a time to request the mixed mode communication; and at the request time, request the mixed mode communication. LG discloses the Bluetooth slave device ("server device 120 may also be called as data service device, slave device," para. [0052]) wherein the processor is configured to: determine a time to request the mixed mode communication; and at the request time, request the mixed mode communication ("server device refers to a device which receives data from the client device and provides data to the client device in response when a corresponding request is received from the client device," para. [0054]). "present invention provides a method of activating and deactivating the relay function that forwards the data packet that the nodes receive in a Bluetooth mesh network," para. [0348], "the relay node that plays the role of relay in a Bluetooth mesh network may determine an activation or deactivation time of the relay function according to the number of times of the received data packet," para. [0379]; mixed mode - "in the BR/EDR, a dynamic channel is basically used, and a protocol service multiplexer, retransmission, streaming mode, and the like, are supported," para. [0141]). Thus, it would have been obvious to a person having ordinary skill in the art to enable mixed mode communication as taught by LG in the device of APPLE to activate and deactivate only the needed nodes for communication (see LG: para. [0378]-[0387]).

Regarding claim 21, APPLE discloses the slave device of claim 16, and APPLE as modified by LG discloses the Bluetooth slave device of claim 17, but does not disclose wherein the processor is configured to: initiate the mixed mode communication by sending a request to the master device requesting that the master device enable the mixed mode communication. LG discloses a slave device ("server device 120 may also be called as data service device, slave device, slave, server," para. [0052]) wherein the processor is configured to: initiate the mixed mode communication by sending a request to the master device requesting that the master device enable the mixed mode communication ("Either the first wireless device 102 or the second wireless device 104 can initiate communications in the BUX communication mode, e.g., by sending a BUX coded message to the other peer wireless device," para. [0051]; "a BUX LE capable wireless device operating as an Initiator," para. [0121]).

Regarding claim 22/(17), APPLE as modified by discloses the Bluetooth slave device of claim 17, and APPLE further discloses wherein the processor is configured to control the transceiver to transmit the ACK without using an external power amplifier ("the second wireless device 104 can send to the first wireless device 102 a first "slave" packet (denoted as "S1"). The S1 packet can include an SEQN=1 and an ARQN=ACK," para. [0083]).

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**Supplemental Box**

In case the space in any of the preceding boxes is not sufficient.

Continuation of:

Box No. V.2. Citations and Explanations:

Claims 5-13, 18-20, 24, and 25 meet the criteria set out in PCT Article 33(2)-(3) because the prior art does not teach or fairly suggest the subject matter as claimed.

Regarding claim 5, APPLE discloses the Bluetooth master device of claim 1, but does not disclose wherein the processor is configured to: receive from the Bluetooth slave device via the transceiver the ACK in accordance with an ACK aggregation scheme based on aggregating ACKs during an aggregation window. The prior art fails to teach or fairly suggest a Bluetooth master device wherein the processor is configured to: receive from the Bluetooth slave device via the transceiver the ACK in accordance with an ACK aggregation scheme based on aggregating ACKs during an aggregation window. Therefore, claim 5 meets the criteria set out in PCT Article 33(2)-(3).

Claims 6-12 depend on claim 5, and thus, meet the criteria set out in PCT Article 33(2)-(3), as well.

Regarding claim 13, APPLE discloses the Bluetooth master device of claim 1 and APPLE as modified by LG discloses the Bluetooth master device of claims 2-3, but does not disclose wherein a modulation rate of the Bluetooth BR/EDR protocol is higher than a modulation rate of the BLE protocol. The prior art fails to teach or fairly suggest a Bluetooth master device wherein a modulation rate of the Bluetooth BR/EDR protocol is higher than a modulation rate of the BLE protocol. Therefore, claim 13 meets the criteria set out in PCT Article 33(2)-(3).

Regarding claim 18, APPLE discloses the Bluetooth slave device of claim 16 and APPLE as modified by LG discloses the Bluetooth slave device of claim 17, but does not disclose wherein the processor is configured to: control the transceiver to transmit to the Bluetooth master device the ACK in accordance with an ACK aggregation scheme based on aggregating ACKs during an aggregation window. The prior art fails to teach or fairly suggest a Bluetooth slave device wherein the processor is configured to: control the transceiver to transmit to the Bluetooth master device the ACK in accordance with an ACK aggregation scheme based on aggregating ACKs during an aggregation window. Therefore, claim 18 meets the criteria set out in PCT Article 33(2)-(3).

Claims 19-20 depend on claim 18, and thus, meet the criteria set out in PCT Article 33(2)-(3), as well.

Regarding claim 24, APPLE discloses the communication method of claim 23. APPLE further discloses measuring a quality of a communication channel between the Bluetooth master device and the Bluetooth slave device ("the slave device can derive a BUX AC and can send the BUX AC to the master device during communication negotiation," para. [0060]; "For a link signal quality level equal to or exceeding a link signal quality threshold value of "A", the wireless devices can communicate at a data rate of 3 Mbps (e.g., using an EDR 8-PSK BT legacy communication mode)," see para. [0054]-[0056] for signal quality between A, B, C levels, "wireless device and a slave device is established, communication can be divided into non-overlapping connection events," para. [0119]); determine if the communication channel quality exceeds a predetermined channel quality threshold (signal quality of the wireless communication link 106 having values between link signal quality threshold values "A" and "B," see para. [0054]-[0056]). APPLE does not disclose if the communication channel quality exceeds a predetermined channel quality threshold, enabling an ACK aggregation scheme based on aggregating ACKs over an aggregation window. The prior art fails to teach or fairly suggest a communication method comprising: measuring a quality of a communication channel between the Bluetooth master device and the Bluetooth slave device; and if the communication channel quality exceeds a predetermined channel quality threshold, enabling an ACK aggregation scheme based on aggregating ACKs over an aggregation window. Therefore, claim 24 meets the criteria set out in PCT Article 33(2)-(3).

Claims 25 depend on claim 24, and thus, meets the criteria set out in PCT Article 33(2)-(3), as well.

Claims 1-25 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.