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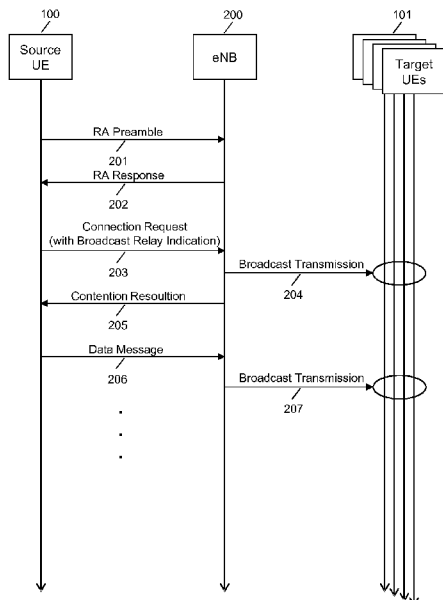


Fig. 2

(57) Abstract: A radio device (100) establishes a connection to a base station (200) of a cellular network. In a message (203) for establishing the connection, the radio device (100) sends an indication to the base station (200) that data transmitted via the connection to the base station (200) is to be relayed by broadcast transmission from the base station (200). Further, the radio device (100) sends the data to be relayed via the connection to the base station (200).

TITLE OF THE INVENTION

Connection establishment triggered broadcast relay

5 FIELD OF THE INVENTION

The present invention relates to methods of radio transmission in a cellular network and to corresponding devices.

10 BACKGROUND OF THE INVENTION

In cellular networks, e.g., as specified by 3GPP (3rd Generation Partnership Project), enhanced support for certain services may be provided by supplementing radio devices, also referred to as UE (User Equipment) and network components, such as base station, with corresponding dedicated functionalities. For example, in 3GPP TR 36.885 V0.4.0, it is discussed how V2X communication may be supported in the LTE (Long Term Evolution) technology. V2X communication may be defined as including any communication between vehicles, pedestrians and infrastructure, which may include V2V (vehicle-to-vehicle), V2P (vehicle-to-pedestrian), and V2I (vehicle-to-infrastructure) communication.

One scenario which is mentioned in 3GPP TR 36.885 involves using a base station, in the LTE technology referred to as eNB ("evolved Node B") as a relay node for conveying a V2X message from one vehicle to multiples other vehicles.

In 3GPP meeting contribution, S2-160536, SA WG2 Meeting #113, 25 - 29 January 2016, Saint Kitts, KN by LG Electronics, a solution is proposed in which a Road Side Unit (RSU) is implemented in the form of an eNB and

implements a local MBMS (Multimedia Broadcast Multicast Service) architecture which allows for broadcast based routing of V2X messages to UEs. However, implementing the local MBMS architecture may add significant complexity to the eNB and may result in unsatisfactory latency performance.

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Accordingly, there is a need for techniques that allow for efficiently performing radio transmissions from one radio device to multiple other radio devices, e.g., in a V2X communication scenario aiming at low latency transmission of a V2X message from a vehicle to multiple recipients in a certain coverage range around the vehicle.

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SUMMARY OF THE INVENTION

According to an embodiment, a method of radio transmission in a cellular network is provided. According to the method, a radio device establishes a connection to a base station of the cellular network. In a message for establishing the connection, the radio device sends an indication to the base station that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station. Further, the radio device sends the data to be relayed via the connection to the base station.

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According to a further embodiment, a method of radio transmission in a cellular network. According to the method a base station of the cellular network establishes a connection to a radio device. In a message for establishing the connection, the base station receives an indication from the radio device that data received via the connection from the radio device is to be relayed by broadcast transmission from the base station. Further, the base station receives the data to be relayed via the connection and relays the received data by broadcast transmission.

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According to a further embodiment, a radio device is provided. The radio device comprises a radio interface for connecting to a cellular network. Further, the radio device comprises one or more processors configured to:

- establish a connection to a base station of the cellular network;
 - 5 - in a message for establishing the connection, send an indication to the base station that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station; and send the data to be relayed via the connection to the base station.
- 10 In particular, the at least one processor of the radio device may be configured to perform the steps as performed by the radio device in the above-mentioned method.

According to a further embodiment, a base station for a cellular network is provided. The base station comprises a radio interface. Further, the base station comprises one or more processors configured to:

- establish a connection to a radio device;
- in a message for establishing the radio connection, receive an indication from the radio device that data received via the connection from the radio
- 20 device is to be relayed by broadcast transmission from the base station;
- receive the data to be relayed via the connection; and
- relay the received data by broadcast transmission.

In particular, the at least one processor of the base station may be configured to perform the steps as performed by the base station in the above-mentioned method.

In embodiments of the above methods, radio device, or base station, the message may be a message requesting establishment of the connection.

30 For example, this message can be a message of an RRC (Radio Resource Control) protocol, e.g., an RRCConnectionRequest message. The message

may be a message of a random access procedure for establishing the connection, e.g., a first scheduled message transmitted immediately after sending a random access preamble to the base station and receiving a random access response from the base station.

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The message may comprise a field indicating a cause for establishing the connection, and this field may comprise the indication that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station. Further, the message may comprise at least

10 a part of the data to be relayed.

Further, for relaying the data transmitted on the connection, the base station may comprise a relay module implemented on a second layer of a communication protocol stack. The relay module may be implemented by the

15 above-mentioned one or more processors of the base station.

Further, the radio device may be vehicle based and the data may comprise a V2X message. The base station may implement a road-side unit of a V2X communication system.

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The above and further embodiments of the invention will now be described in more detail with reference to the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

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Fig. 1 schematically illustrates a communication scenario according to an embodiment of the invention.

Fig. 2 shows an example of procedures according to an embodiment of the

30 invention.

Figs. 3 shows an exemplary communication protocol layer stack according to an embodiment of the invention.

Fig. 4 shows a flowchart for illustrating a method according to an embodiment of the invention.

Fig. 5 shows a flowchart for illustrating a further method according to an embodiment of the invention.

Fig. 6 schematically illustrates a processor-based implementation of a radio device according to an embodiment of the invention.

Fig. 7 schematically illustrates a processor-based implementation of a base station according to an embodiment of the invention.

DETAILED DESCRIPTION OF EMBODIMENTS

In the following, exemplary embodiments of the invention will be described in more detail. It has to be understood that the following description is given only for the purpose of illustrating the principles of the invention and is not to be taken in a limiting sense. Rather, the scope of the invention is defined only by the appended claims and is not intended to be limited by the exemplary embodiments described hereinafter.

The illustrated embodiments relate to a scenario in which a source radio device needs to send data to multiple target radio devices. An example of such scenario is shown in Fig. 1. Specifically, Fig. 1 shows a V2V communication scenario in which multiple vehicles may communicate with each other via a RSU, by way of example, the RSU shown as being implemented as part of a traffic light. The RSU is assumed to be implemented by

an eNB of the LTE technology. However, it is to be understood that the concepts as illustrated below could be applied in a corresponding manner to other V2X communication scenarios, e.g., V2P or V2I communication or even non-V2X scenarios.

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In the illustrated concepts, transmission of data from the source radio device to the multiple target radio devices may be accomplished by triggering a broadcast relay functionality of the eNB when establishing a connection between the source radio device and the eNB. The broadcast relay functionality is triggered by a broadcast relay indication which is sent from the
10 source radio device to the eNB, in a message used for establishing the connection, e.g., a request for establishing the connection. Accordingly, the relay functionality of the eNB may be associated with the specific connection and implemented without requiring higher layer functionalities of the LTE
15 MBMS architecture, such as an MBMS-GW (MBMS Gateway) or a BM-SC (Broadcast Multicast Service Centre). Further, the eNB also does not need to implement application layer functionalities, such as a V2X application server. Rather, the data provided by the source target radio device may be mapped on lower protocol layers to a multicast channel transmitted by the
20 eNB.

In the illustrated example, the eNB is assumed to be provided with a L2 (layer 2) relay functionality, e.g., implemented on the level of MAC (Medium Access Control), RLC (radio link control), and/or PDCCP (Packet Data Con-
25 vergence Protocol). In this case, data received from the source radio device on a UL-SCH (Uplink Shared Channel), which is an uplink transport channel defined on the physical layer, i.e., L1 (layer 1), may be transferred directly on L2 to an MTCH (Multicast Traffic Channel) to be then broadcasted to the
target radio devices through a MCH (Multicast Channel), which is a point-
30 to-multipoint transport channel defined on the physical layer. A corresponding configuration of the MTCH and MCH may be preconfigured in the eNB

or may be controlled by higher protocol layers. Accordingly, on L1 and L2, MBMS mechanisms may be utilized for broadcasting the relayed data.

For MBMS, control information is conveyed in system information broadcasted by the eNB in SIB13 ("System Information Block 13"). This information may be used by the target radio devices to acquire information concerning the scheduling of multicast traffic, i.e., information defining radio resources on which multicast traffic may be scheduled. In the case of relaying V2X traffic, a default V2X TMGI (Temporary Multicast Group Identity) could be defined for identifying MBMS transmissions including the V2X traffic. Since the V2X traffic may be regarded as being high priority, the target radio devices may constantly monitor the radio resources on which the V2X traffic may be scheduled.

Fig. 2 illustrates exemplary procedures of transmitting data, e.g., a V2X message, involving the above-mentioned triggering of the broadcast relay functionality of the eNB at connection establishment. The procedures of Fig. 2 involve a source UE 100, an eNB 200, and multiple target UEs 101. The source UE 100 and the target UEs 101 may each correspond to the vehicle based radio devices, e.g., arranged in the vehicles 10 of Fig. 1. However, each of the source UE 100 and the target UEs 101 could also correspond to another kind of UE, e.g., an infrastructure-based radio device, such as an RSU, or a radio device carried by a pedestrian. The eNB 200 may for example be implemented as an RSU, such as the RSU 20 of Fig. 1.

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In the example of Fig. 2 it is assumed that the source UE 100 needs to transmit data and thus establishes a connection to the eNB 200. For this purpose, the UE 100 performs a random access procedure with the eNB 200, e.g., a random access procedure as defined in 3GPP TS 36.300 V13.2.0, section 10.1.5.1. As illustrated, the random access procedure involves that the UE 100 sends an RA (random access) preamble 201 to the

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eNB 200, to which the eNB 200 responds by sending an RA response 202. The UE 100 then proceeds by sending a first scheduled message 203 to the eNB 200 (sometimes also referred to as “msg3”). In the illustrated example, the first scheduled message 203 is an RRCConnectionRequest message, e.g., as defined in 3GPP TS 36.331 V13.0.0.

The RRCConnectionRequest message includes an information field referred to as “EstablishmentCause”, which may be used by the UE 100 to indicate the purpose of establishing the connection. In the example of Fig. 2, the UE 100 sets a value of the “EstablishmentCause” field to indicate that data transmitted on the established connection is to be relayed by broadcast transmissions from the eNB 200, to thereby activate the broadcast relay functionality of the eNB 200. By way of example, the value of the “EstablishmentCause” field could be set to “High Priority Local Broadcast”. Accordingly, the UE 100 uses the “EstablishmentCause” field to send the broadcast relay indication to the eNB 200.

The scheduled message 203 may also include a part of the data to be relayed to the target UEs 101. If this is the case, the eNB 200 may relay this data to the using a broadcast transmission 204. Accordingly, the data can be relayed with very low latency. However, in some cases limitations of the first scheduled message 203 may prevent transmission of the entire data in the first scheduled message 203. For example, if the data corresponds to a V2X message which may have a size of up to 500 byte, transmission of the entire data in the first scheduled message 203 may not be possible. In such cases, at least a part of the data to be relayed may be transmitted in a later message from the source UE 100 to the eNB 200. For example, the data could be transmitted after completion of the random access procedure, by transmission of a contention resolution message 205 from the eNB 200 to the source UE 100. In the example of Fig. 2, a remaining part of the data to

be relayed or all of the data to be relayed can be transmitted in a data message 206 sent after completion of the random access procedure. The data message 206 can be transmitted on an SRB (Signalling Radio Bearer) or on a DRB (Data Radio Bearer) established through the random access procedure.

As illustrated, after receiving the data 206 from the source UE 100, the eNB 200 may then relay the data by broadcast transmission to the target UEs 101.

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Fig. 3 schematically illustrates a protocol layer architecture which may be used in the eNB 200. As illustrated, the protocol layer architecture includes a first layer 310, also referred to as Layer 1 (L1), corresponding to the physical layer, a second layer 320, also referred to as Layer 2 (L2), including MAC, RLC, and PDCP functionalities, and one or more higher layers 330. The second layer 320 includes a relay module 325 which implements the above-mentioned broadcast relay functionality. As illustrated, the relay module 325 may operate by receiving data on a UL-SCH from the source UE 100 and feeding the received data to the MCH. Depending on the implementation of the relay module 325, this may be accomplished through intermediate structures, such as a broadcast queue for temporarily storing the data to be relayed by broadcast transmission or an L2 traffic channel, such as the MTCH. The eNB 200 may apply priority control on the broadcast queue, and allow high priority for a broadcast message with critical latency requirements.

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Fig. 4 shows a flowchart illustrating a method of controlling radio transmissions in a cellular network, by which a radio device, e.g., the above-mentioned UE 100, may implement concepts as described above. If a processor based implementation of the radio device is utilized, at least a part of the

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steps of the method may be performed and/or controlled by one or more processors of the radio device.

At step 410, the radio device establishes a connection to a base station of the cellular network. The base station may for example correspond to an eNB, such as the above-mentioned eNB 200. The process of establishing the connection may involve exchanging one or more messages with the base station, such as the messages of the random access procedure illustrated in Fig. 2.

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At step 420, the radio device sends an indication to the base station that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station, e.g., by one or more MBMS transmissions. This indication is sent in a message for establishing the connection. The message may be a message requesting establishment of the connection, e.g., as transmitted in a random access procedure. For example, the message may be an RRCConnectionRequest message. An example of such indication is the above-mentioned broadcast relay indication.

The message may include a field indicating a cause for establishing the connection and this field may include the indication that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station. For example, this field may correspond to the EstablishmentCause field defined in 3GPP TS 36.331 for the RRCConnectionRequest message.

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For relaying the data transmitted on the connection, the base station may be provided with a relay module implemented on a second layer of a communication protocol stack, such as the above-mentioned relay module 325.

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At step 430, the radio device sends the data to be relayed via the established connection to the base station.

5 In some scenarios, at least a part of the data to be relayed may be included in the message which also includes the indication that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station. Alternatively or in addition, at least a part of the data to be relayed may be included in a message which is transmitted later from the radio device to the base station, e.g., after completion of the random access procedure.

10 In some scenarios, the radio device may not only act as a source radio device which provides data to be relayed by broadcast transmission to other radio devices, but may also act as a target radio device which receives data relayed by broadcast transmission. Accordingly, at optional step 440, the radio device may receive a broadcast transmission with relayed data from the base station. The relayed data may for example include a V2X message.

20 The radio device may be vehicle based, e.g., be mounted onboard of one of the vehicles 10, and the data to be relayed may include a V2X message. The base station may implement an RSU of a V2X communication system, such as the above-mentioned RSU 20. However, the method of Fig. 4 could also be implemented in other scenarios involving transmission of data from one UE to multiple other UEs.

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Fig. 5 shows a flowchart illustrating a method of controlling radio transmissions in a cellular network, by which a base station of the cellular network, e.g., an eNB such as the above-mentioned eNB 200, may implement concepts as described above. If a processor based implementation of the base station is utilized, at least a part of the steps of the method may be performed and/or controlled by one or more processors of the base station.

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At step 510, the base station establishes a connection to a radio device, e.g., to the above-mentioned UE 100. The process of establishing the connection may involve exchanging one or more messages with the radio device, such as the messages of the random access procedure illustrated in Fig. 2. It is noted that the process of establishing the connection may actually be initiated by the radio device, such as by sending the random access preamble of Fig. 2.

At step 520, the base station receives an indication from the radio device that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station, e.g., by one or more MBMS transmissions. This indication is received in a message for establishing the connection. The message may be a message requesting establishment of the connection, e.g., as transmitted in a random access procedure. For example, the message may be an RRCConnectionRequest message. An example of such indication is the above-mentioned broadcast relay indication. The base station may also verify that the message originates from a radio device that is authorized to send data to be relayed by broadcast transmission. This verification may for example be based on an identity and/or category of the radio device.

The message may include a field indicating a cause for establishing the connection and this field may include the indication that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station. For example, this field may correspond to the EstablishmentCause field defined in 3GPP TS 36.331 for the RRCConnectionRequest message.

For relaying the data transmitted on the connection, the base station may be provided with a relay module implemented on a second layer of a communication protocol stack, such as the above-mentioned relay module 325.

- 5 At step 530, the base station receives the data to be relayed via the established connection from the radio device.

In some scenarios, at least a part of the data to be relayed may be included in the message which also includes the indication that data transmitted via
10 the connection to the base station is to be relayed by broadcast transmission from the base station. Alternatively or in addition, at least a part of the data to be relayed may be included in a message which is transmitted later from the radio device to the base station, e.g., after completion of the random access procedure.

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The radio device may be vehicle based, e.g., be mounted on board of one of the vehicles 10, and the data to be relayed may include a V2X message. The base station may implements an RSU of a V2X communication system, such as the above-mentioned RSU 20. However, the method of Fig. 4 could
20 also be implemented in other scenarios involving transmission of data from one UE to multiple other UEs.

At step 540, the base station relays the received data by broadcast transmission, e.g., using one or more MBMS transmissions. In some scenarios,
25 the broadcast transmission may be addressed to a certain group of radio devices, e.g., using a group identifier. For example, when performing the relaying by broadcast transmission on the basis of MBMS transmissions, such group identity could be a TMGI, e.g., a predefined TMGI or a TMGI received from the radio device. If the relayed data include a V2X message,
30 the base station may use a predefined TMGI for V2X broadcast. There could also be different TMGIs for public safety vehicles than for other vehicles.

The relaying of the data by broadcast transmission may involve feeding the received data from an uplink transport channel of the established connection, e.g., from a UL-SCH, to a multicast transport channel, e.g., to a MCH. The relayed data may then be received by multiple other radio devices.

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The radio device and/or the other radio devices may be vehicle based, e.g., be mounted onboard of one of the vehicles 10, and the data to be relayed may include a V2X message. The base station may implement an RSU of a V2X communication system, such as the above-mentioned RSU 20. However, the method of Fig. 5 could also be implemented in other scenarios involving transmission of data from one UE to multiple other UEs.

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It is to be understood that the methods of Figs. 4 and 5 may also be combined in a system including a base station operating according to the method of Fig. 5 and at least one radio device operating according to the method of Fig. 4.

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Fig. 6 shows a block diagram for schematically illustrating a processor based implementation of a radio device, e.g., the above-mentioned radio device 100, which may be utilized for implementing the above concepts. The radio device may for example correspond to a vehicle-based UE for supporting V2X communication.

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As illustrated, the radio device includes a radio interface 110. The radio device may utilize the radio interface 110 for connecting to a cellular network, e.g., through a base station of the cellular network, such as the eNB 200.

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Further, the radio device is provided with one or more processors 140 and a memory 150. The radio interface 110, and the memory 150 are coupled to the processor(s) 140, e.g., using one or more internal bus systems of the radio device.

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The memory 150 includes program code modules 160, 170 with program code to be executed by the processor(s) 140. In the illustrated example, these program code modules include a radio control module 160, and a
5 communication module 170.

The radio control module 160 may implement the above-described functionalities of establishing a connection to a base station and sending the indication that data transmitted via the connection to the base station is to be re-
10 layed by broadcast transmission from the base station. The communication module 170 may implement the above-described functionalities of sending the data to be relayed by broadcast transmission, which may for example involve sending a V2X message. The communication module may also implement functionalities of receiving relayed data in one or more broadcast
15 transmissions.

It is to be understood that the structures as illustrated in Fig. 6 are merely exemplary and that the radio device may also include other elements which have not been illustrated, e.g., structures or program code modules for im-
20 plementing known functionalities of a V2X UE or other type of UE.

Fig. 7 shows a block diagram for schematically illustrating a processor based implementation of a base station which may be utilized for implementing the above concepts. The base station may for example correspond
25 to an eNB, such as the 200 of Fig. 2.

As illustrated, the base station includes a radio interface 210. The base station may utilize the radio interface 210 for establishing connections to radio devices, such as the radio device 100.

Further, the base station is provided with one or more processors 240 and a memory 250. The radio interface 210, and the memory 250 are coupled to the processor(s) 240, e.g., using one or more internal bus systems of the base station.

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The memory 250 includes program code modules 260, 270 with program code to be executed by the processor(s) 240. In the illustrated example, these program code modules include a radio control module 260, and a broadcast relay module 270.

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The radio control module 260 may implement the above-described functionalities of establishing a connection to a radio device and sending the indication that data transmitted via the connection to the base station is to be relayed by broadcast transmission from the base station. The broadcast relay module 270 may implement the above-described functionalities of relaying the data received via the connection by broadcast transmission.

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It is to be understood that the structures as illustrated in Fig. 7 are merely exemplary and that the base station may also include other elements which have not been illustrated, e.g., structures or program code modules for implementing known functionalities of an eNB or other type of base station, and/or functionalities of an RSU.

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It is to be understood that the concepts as explained above are susceptible to various modifications. For example, the concepts could be applied in connection with various kinds of radio technologies and radio devices, without limitation to V2X UEs, or the LTE technology. Further, it is to be understood that the illustrated concepts could be applied in various scenarios where data needs to be transmitted from one UE to multiple other UEs.

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CLAIMS

1. A method of radio transmission in a cellular network, the method comprising:
 - 5 - a radio device (100) establishing a connection to a base station (200) of the cellular network;
 - in a message (203) for establishing the connection, the radio device (100) sending an indication to the base station (200) that data transmitted via the connection to the base station (200) is to be relayed by
10 broadcast transmission from the base station (200); and
 - the radio device (100) sending the data to be relayed via the connection to the base station (200).
2. The method according to claim 1,
15 wherein the message (203) is a message requesting establishment of the connection.
3. The method according to any one of the preceding claims,
20 wherein the message (203) is a message of a random access procedure for establishing the connection.
4. The method according to any one of the preceding claims,
25 wherein the message (203) comprises a field indicating a cause for establishing the connection; and
wherein the field indicating the cause for establishing the connection comprises the indication.
5. The method according to any one of the preceding claims,
30 wherein the message (203) comprises at least a part of the data to be relayed.

6. The method according to any one of the preceding claims,
wherein for relaying the data transmitted on the connection, the base
station (200) comprises a relay module (325) implemented on a sec-
ond layer of a communication protocol stack.
- 5
7. The method according to any one of the preceding claims,
wherein the radio device (100) is vehicle based; and
wherein the data comprise a V2X message.
- 10 8. The method according to any one of the preceding claims,
wherein the base station (200) implements a road-side unit (20) of a
V2X communication system.
9. A method of radio transmission in a cellular network, the method
15 comprising:
- a base station (200) of the cellular network establishing a connec-
tion to a radio device (100);
- in a message (203) for establishing the connection, the base station
(200) receiving an indication from the radio device (100) that data
20 received via the connection from the radio device (100) is to be re-
layed by broadcast transmission from the base station (200);
- the base station (200) receiving the data to be relayed via the con-
nection; and
the base station (200) relaying the received data by broadcast trans-
25 mission.
10. The method according to claim 9,
wherein the message (203) is a message requesting establishment
of the connection.
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11. The method according to claim 9 or 10,

wherein the message (203) is a message of a random access procedure for establishing the connection.

12. The method according to any one of claims 9 to 11,
5 wherein the message (203) comprises a field indicating a cause for establishing the connection; and
wherein the field indicating the cause for establishing the connection comprises the indication.
- 10 13. The method according to any one of claims 9 to 12,
wherein the message (203) comprises at least a part of the data to be relayed.
14. The method according to any one of claims 9 to 13,
15 wherein for relaying the data transmitted on the connection, the base station (200) comprises a relay module (325) implemented on a second layer of a communication protocol stack.
15. The method according to any one of claims 9 to 14,
20 wherein the radio device (100) is vehicle based; and
wherein the data comprise a V2X message.
16. The method according to any one of claims 9 to 15,
25 wherein the base station (200) implements a road-side unit of a V2X communication system.
17. A radio device (100) for a cellular radio network, the radio device (100) comprising:
a radio interface (110) for connecting to the cellular network; and
30 one or more processors (140) configured to:
-establish a connection to a base station (200) of the cellular network;

- in a message (203) for establishing the connection, send an indication to the base station (200) that data transmitted via the connection to the base station (200) is to be relayed by broadcast transmission from the base station (200); and
- 5 send the data to be relayed via the connection to the base station (200).
18. The radio device (100) according to claim 17,
 wherein the at least one processor (140) is configured to perform the
10 steps of a method according to any one of claims 1 to 8.
19. A base station (200) for a cellular network, the base station (200)
 comprising:
 a radio interface (210); and
15 one or more processors (240) configured to:
 - establish a connection to a radio device (100);
 - in a message (203) for establishing the radio connection, receive
 an indication from the radio device (100) that data received via the
 connection from the radio device (100) is to be relayed by broadcast
20 transmission from the base station (200);
 - receive the data to be relayed via the connection; and
 - relay the received data by broadcast transmission.
20. The base station (200) according to claim 19,
25 wherein the at least one processor (240) is configured to perform the
 steps of a method according to any one of claims 9 to 16.

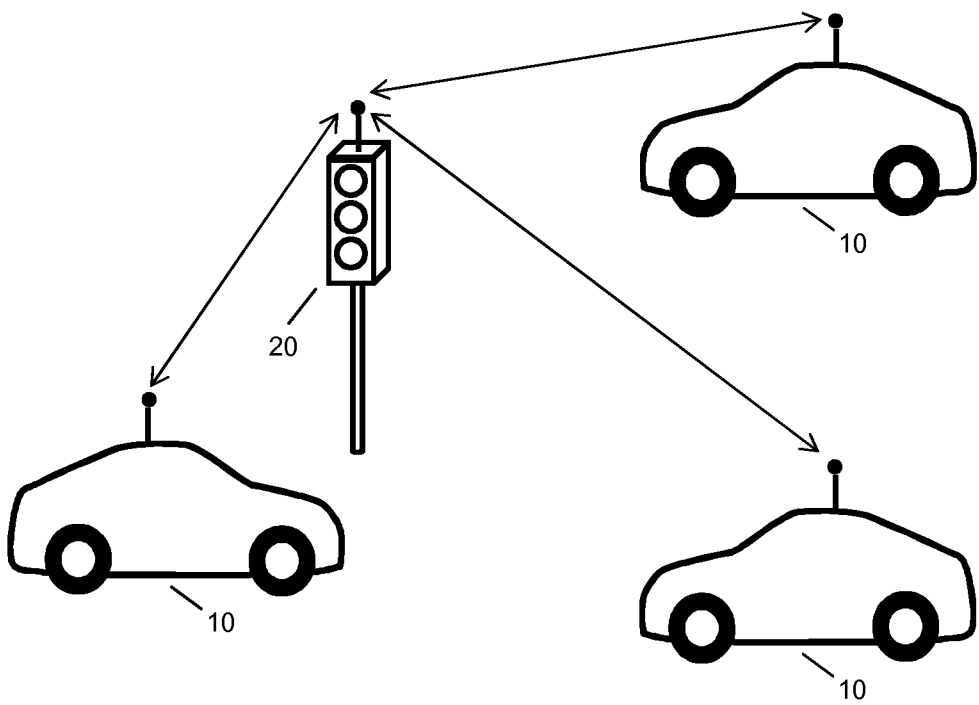


Fig. 1

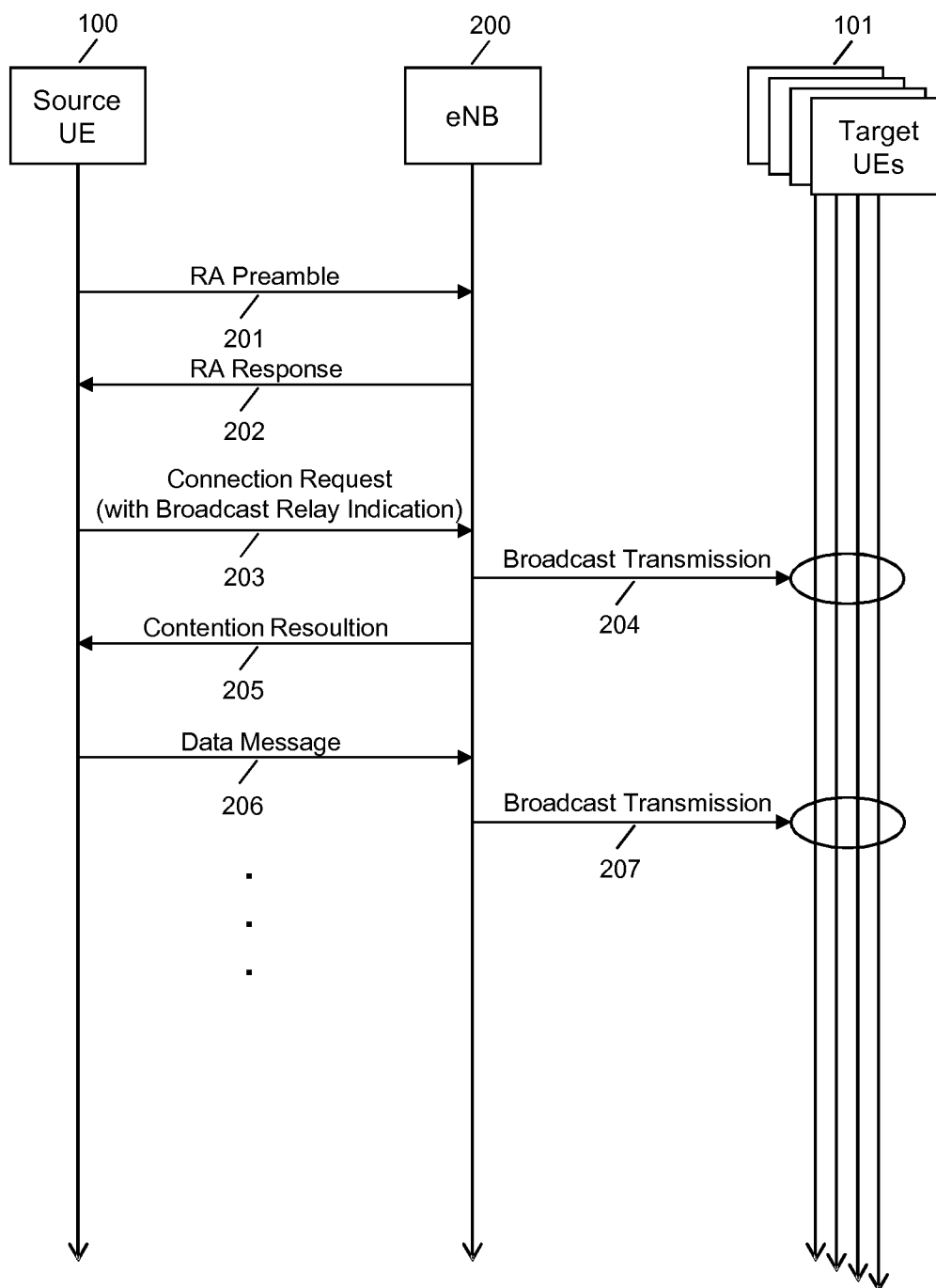


Fig. 2

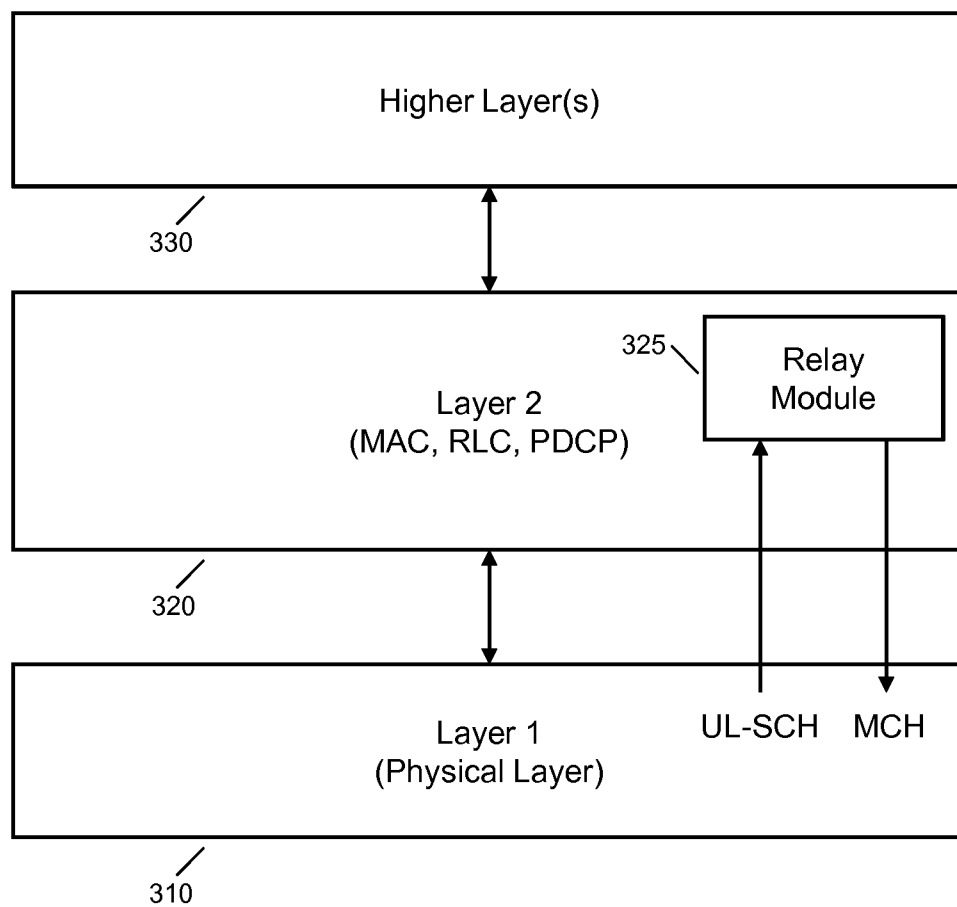


Fig. 3

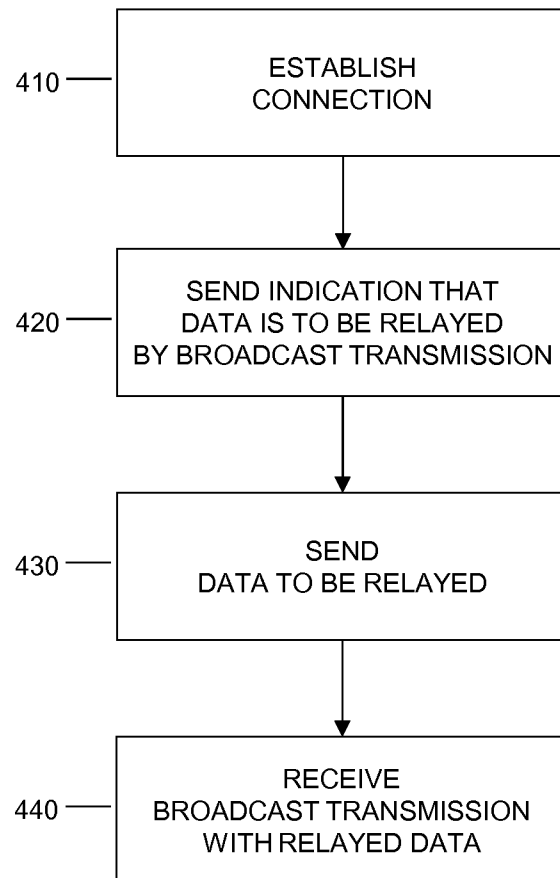


Fig. 4

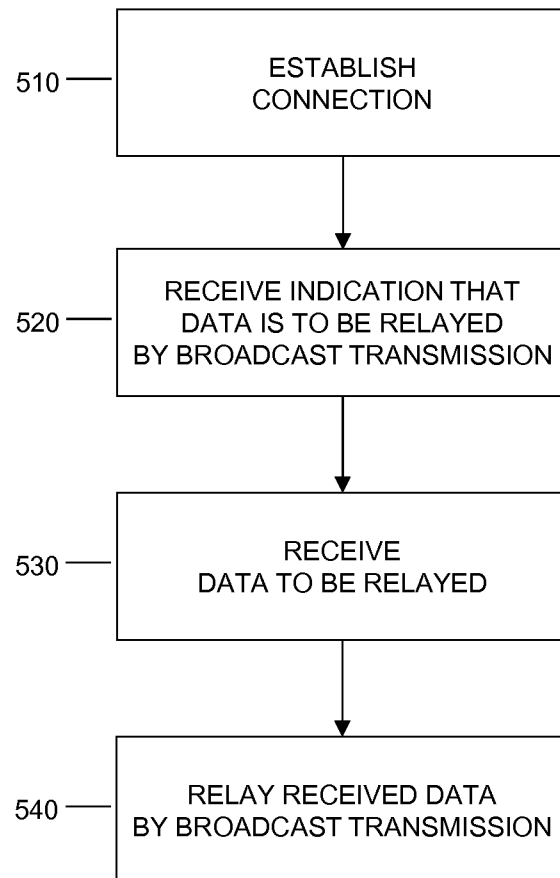


Fig. 5

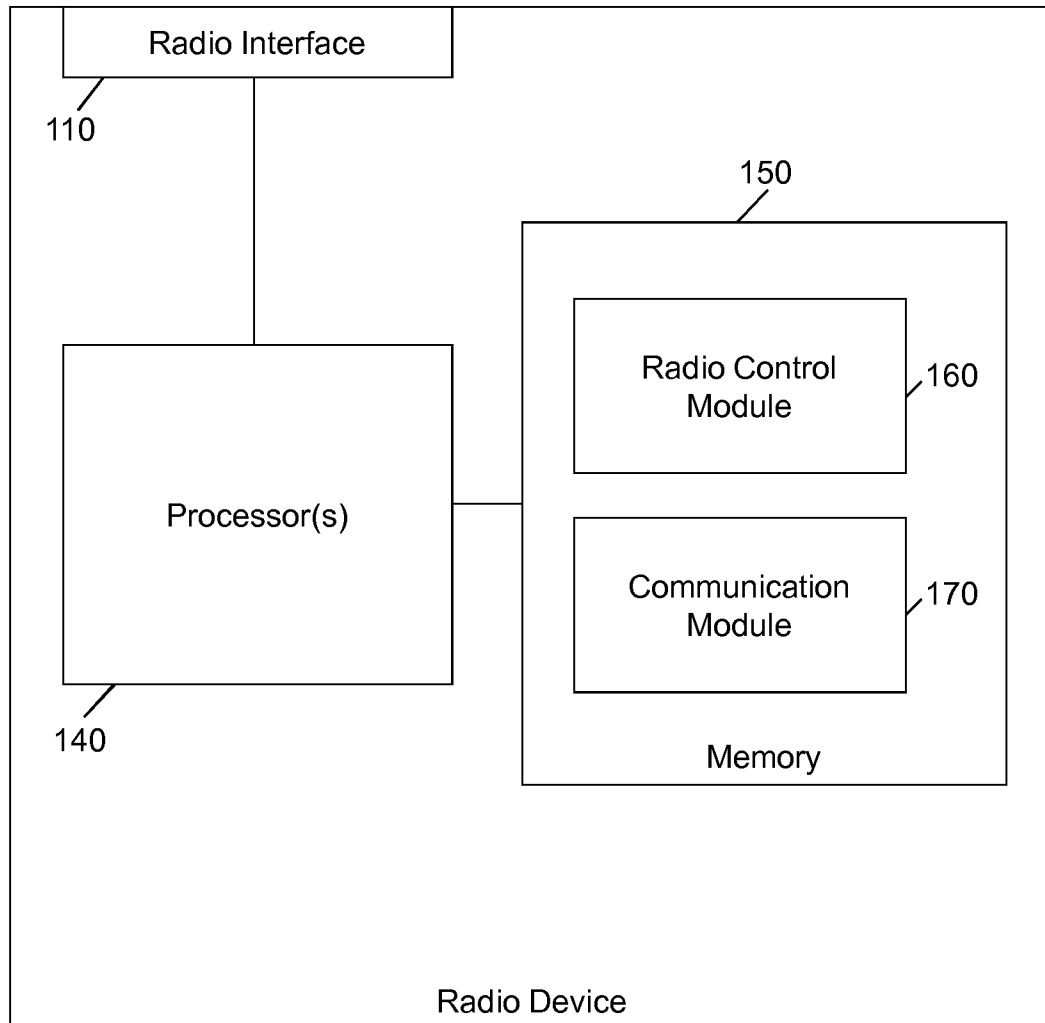


Fig. 6

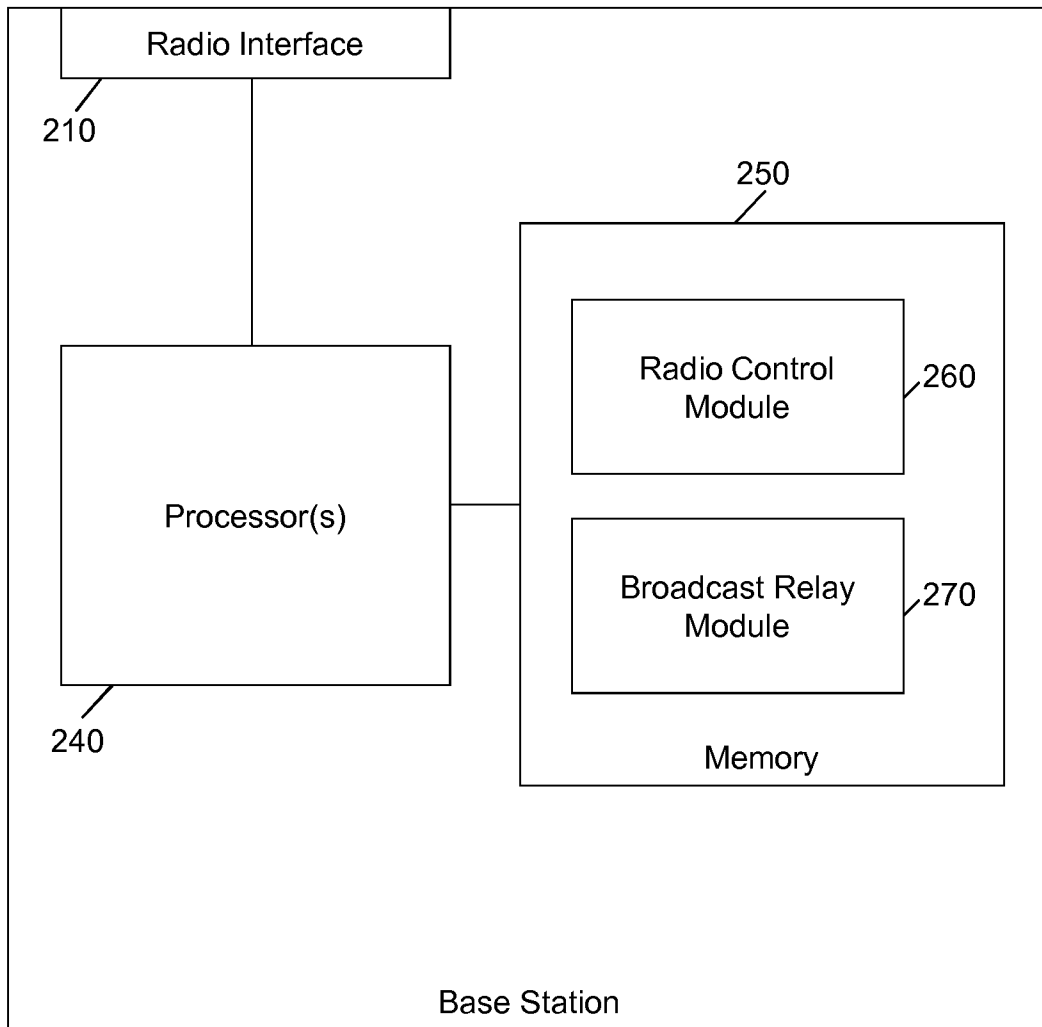


Fig. 7

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/056772A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W4/04
ADD.

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

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Study on LTE-based V2X Services; (Release 14)", 3GPP STANDARD; 3GPP TR 36.885, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, vol. RAN WG1, no. V1.0.0, 7 March 2016 (2016-03-07), pages 1-88, XP051087871, [retrieved on 2016-03-07] abstract Section "4.2 Secenario 2" on pages 8-10 Sections "5.2 Uu interface" and "6.2 Uu interface" on page 19 ----- -/--	1-20



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

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Date of the actual completion of the international search

7 June 2016

Date of mailing of the international search report

14/06/2016

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Bub, Armin

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2016/056772

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	Jorge Cabrejas Penueles ET AL: "DEPARTAMENTO DE COMUNICACIONES Distributed Cooperative MIMO in Beyond 2020 Wireless Networks", 4 February 2016 (2016-02-04), XP055277843, Valencia Retrieved from the Internet: URL:https://riunet.upv.es/bitstream/handle/10251/63245/-Cabrejas - Distributed cooperative MIMO in beyond 2020 wireless networks..pdf?sequence=1 [retrieved on 2016-06-03] abstract Section "4.7 Integration of Grassmannian signaling for the future 5G communication" on pages 95-96	1-20
A	----- LG ELECTRONICS: "Solution for Key Issue#2 (direct between UEs)", 3GPP DRAFT; S2-160535 WAS0179 V2X SOLUTION FOR KI#2; DIRECT BTW UES V2, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; vol. SA WG2, no. Saint Kitts, KN; 20160125 - 20160129 29 January 2016 (2016-01-29), XP051072424, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_sa/WG2_Arch/TSGS2_113_St_Kitts/Docs/ [retrieved on 2016-01-29] the whole document -----	1-20