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**Datasheet for the decision
of 17 December 2018**

Case Number: T 0602/14 - 3.5.03

Application Number: 11005004.4

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H04W28/06, H04W12/06, H04L5/02

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Title of invention:
Method and apparatus for data symbol and control symbol
multiplexing

Applicant:
Qualcomm Incorporated

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (no)



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Case Number: T 0602/14 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 17 December 2018

Appellant: Qualcomm Incorporated
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted on 31 October 2013
refusing European patent application No.
11005004.4 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman F. van der Voort
Members: B. Noll
P. Guntz

Summary of Facts and Submissions

- I. This appeal is against the decision of the examining division refusing European patent application No. 11005004.4. The refusal was based on the ground that the claimed subject-matter lacked inventive step (Article 56 EPC) having regard to the documents:

D1: "Scheduling and Multiplexing of CQI and ACK/NACK Feedback for Single Carrier FDMA in Evolved UTRA Uplink", InterDigital, TSG-RAN WG1 LTE Ad Hoc Meeting, No. R1-060155, 23 - 25 January 2006, pages 1 to 8; and

D2: 3GPP TR 25.814, V1.0.1 (2005-11), 3rd Generation Partnership Project, Technical Specification Group Radio Access Network, Physical Layer Aspects for Evolved UTRA (Release 7), pages 1 to 72.
- II. With the statement of grounds of appeal, the appellant filed claims 1 to 15 of an amended main request. Oral proceedings were conditionally requested.
- III. In a communication accompanying a summons to oral proceedings, the board gave a preliminary opinion on inventive step (Article 56 EPC).
- IV. With a letter dated 9 November 2018, the appellant filed a further set of claims of an auxiliary request.
- V. With a fax letter dated 12 December 2018, the appellant informed the board that it would not attend the oral proceedings.
- VI. Oral proceedings were held on 17 December 2018 in the absence of the appellant.

The appellant had requested in writing that the decision under appeal be set aside and that the case be remitted to the examining division with the order to grant a patent based on the main request as filed with the statement of grounds of appeal or, in the alternative, based on the auxiliary request as filed with the letter dated 9 November 2018.

At the end of the oral proceedings the chairman announced the board's decision.

VII. Claim 1 of the main request reads as follows:

"A method employed in a wireless communication system (100), the method comprising:

receiving first and second downlink data streams, wherein the first downlink data stream is received during a first sub-transmission time interval (sub-TTI) and the second downlink data stream is received during a second sub-TTI, and wherein the first sub-TTI and the second sub-TTI are included in a data TTI;

receiving scheduled resources for transmitting data code symbols (186) and control code symbols (183), wherein the scheduled resources comprise:

resources for transmitting the data code symbols (186), and

first and second orthogonal resources for transmitting the control code symbols (183) in response to receiving the first and second downlink data streams;

determining periodically whether the data code symbols

(186) and the control code symbols (183) are to be transmitted within a specific time interval;

multiplexing the data code symbols and the control code symbols (183) when the data code symbols (186) and the control code symbols (183) are to be transmitted within the specific time interval;

transmitting the multiplexed code symbols via the resources for transmitting the data code symbols (186); and

transmitting the control code symbols (183) via the resources for transmitting the control code symbols and transmitting the data code symbols (186) via the resources for transmitting the data code symbols when the data code symbols and the control code symbols are not to be transmitted within the specific time interval,

wherein the transmitting the control code symbols (183) via the resources for transmitting the control code symbols comprises transmitting a first acknowledgement/negative acknowledgement, ACK/NACK, and a second ACK/NACK via the first and second orthogonal resources, respectively, in response to receiving the first and second downlink data streams."

Claim 1 of the auxiliary request differs from claim 1 of the main request in that the sixth paragraph reads:

"determining whether the data code symbols (186) and the control code symbols (183) are to be transmitted within a specific time interval, wherein the determination is performed periodically at times that are multiples of the specific time interval;"

Reasons for the Decision

1. *The application*

1.1 The application relates to the management of uplink data and control code transmission in a third generation long term evolution (3G LTE) mobile communication system. 3G LTE is designed for high-speed data rate and high-capacity wireless communication to provide subscribers with advanced, data-intensive services. The management of the radio resources available for optimising the bandwidth allocated to each user while guaranteeing low latency times requires a continuous exchange of control data between the user equipment and the network, in order to allocate appropriate radio resources to a user promptly when they are needed. Whilst a particular aspect of the description of the application is concerned with multiplexing ACK/NACK control information in the uplink data when transmission time intervals (TTI) for data and control information are disparate and uplink transmission is accomplished using single-carrier frequency division multiple access (SC-FDMA), the method of claim 1 of the pending requests is not restricted to a transmission of control and data information in disparate TTI or to a particular uplink transmission scheme.

2. *Claim 1 of the main request - inventive step (Article 56 EPC)*

2.1 D1 relates to a method of scheduling channels for uplink control signalling and accordingly multiplexing control signalling information for uplink transmission (sections 2 and 3). The control signalling information

within the meaning of D1 includes a channel quality indicator (CQI) and ACK/NACK feedback.

2.2 Using the wording of claim 1 of the main request, D1 discloses that downlink data is received (see the first sentence in section 2.2: "ACK/NACK reporting in UL should be associated with DL data transmission"), which implies that ACK/NACK control signalling is carried out in response to data being received. D1 further discloses that scheduled resources for transmitting data code symbols and control code symbols are received. The scheduled resources are defined in the three bullet points at the beginning of section 3 and include pre-defined downlink-associated shared time-frequency resources (TFR1), shared time-frequency resources for uplink shared data channel (TFR2) and shared TFR allocated at initial scheduling of CQI reporting (TFR3). TFR2 are resources for transmitting data code symbols within the meaning of claim 1; TFR1 are "primarily for transmission of ACK/NACK" and are therefore resources for transmitting control code symbols within the meaning of claim 1.

2.3 D1 further describes (see section 3.1) various methods (methods "A" to "D") for multiplexing ACK/NACK information with the uplink information. A particular method is selected according to whether or not uplink data is available in the user equipment in the respective TTI and whether or not downlink data was received in the previous interval (cases "1" to "4"). The selection is made on the basis of the "current TTI", from which the skilled reader infers that the selection is made for each TTI separately. Since the TTIs are arranged one after the other in time and have the same duration, the determination of whether data code symbols and control code symbols are to be

transmitted within a specific time interval is therefore inherently periodic and corresponds to the TTI period.

- 2.4 The appellant argued that the feature "determining periodically whether the data code symbols (186) and the control code symbols (183) are to be transmitted within a specific time interval" required three separate checks, i.e. whether data code symbols are to be transmitted, whether control symbols are to be transmitted, and whether the data and code control symbols are to be transmitted within "said" specific time interval. D1 did not disclose all three checks in combination.

The board does not agree. Since the selection of an appropriate method in D1 is based on whether data and/or control code symbols are to be transmitted and the selection is made for each TTI separately, these three checks are implicitly disclosed in D1.

- 2.5 D1 further describes that in the case of both uplink data and ACK which have to be transmitted in a TTI (case "4" in section 3.1, see page 3), ACK/NACK data are transmitted in TFR2. Using the wording of claim 1, this case relates to a transmission mode in which data code symbols and the control symbols are to be transmitted within the specific time interval, namely the current TTI, and are accordingly multiplexed and transmitted via the resources for transmitting the data code symbols. Further, in the "case 2" and "case 3" scenarios, in which either ACK/NACK or uplink data, but not both, is transmitted within a current TTI, D1 discloses that ACK/NACK is transmitted solely on the pre-defined TFR1 (see "Case 2", "Method C"), but not on TFR2. Accordingly, using the wording of claim 1, D1

discloses that control code symbols are transmitted via the resources for transmitting the control code symbols and data code symbols are transmitted via resources for transmitting the data code symbols.

2.6 Claim 1 of the main request (see point VII above) further includes the following features:

a) receiving first and second downlink data streams, wherein the first downlink data stream is received during a first sub-transmission time interval (sub-TTI) and the second downlink data stream is received during a second sub-TTI, and wherein the first sub-TTI and the second sub-TTI are included in a data TTI;

b) the scheduled resources comprise first and second orthogonal resources for transmitting the control code symbols in response to receiving the first and second downlink data streams; and

c) the transmission of the control code symbols via the resources for transmitting the control code symbols comprises transmitting a first acknowledgement/negative acknowledgement, ACK/NACK, and a second ACK/NACK via the first and second orthogonal resources, respectively, in response to receiving the first and second downlink data streams.

2.7 The appellant formulated the technical problem as how to provide an optimal quality of service and to more flexibly determine a multiplexing scheme. For the sake of argument, the board accepts this formulation.

2.8 The skilled person would understand from D1, point 3.1, that an individual acknowledgement ACK/NACK is to be provided for the shortest time unit for transmitting

data packets, which in the case of D1 corresponds to a single TTI.

Further, in order to have more flexibility for serving the channels appropriately by data rates actually required, the skilled person would consider document D2. This document teaches arranging multiple (small) sub-frames in a single (large) radio frame, in which a single sub-frame in D2 corresponds to the minimum TTI (see D2, page 18, first paragraph). Further, the skilled person would consider supplying a terminal by several, e.g. first and second, data streams arranged in respective sub-frames of a single radio frame as described in D2, in order to provide an optimum quality of services, when more than one service needs to be served within a short time as a result of an expected user behaviour whereby several services are used essentially at the same time.

The feature in claim 1 of the main request according to which the two sub-TTIs are included within a data TTI does not further limit the method, since the expression "data TTI" in the context of claim 1 is not given any more specific technical meaning.

Further, the skilled person would maintain the principle of reporting an acknowledgement ACK/NACK as established in D1 in the same way for each minimum TTI in D2 in order to guarantee a quick response and, therefore, to maintain an optimal quality of service. Since the received first and second downlink data streams inherently use orthogonal resources, the skilled person would transmit acknowledgements ACK/NACK relating to each downlink data stream as respective control code symbols in the uplink SC-FDMA data stream in corresponding sub-TTIs which are inherently

orthogonal.

Therefore, starting out from D1 and further considering the teaching of D2, the skilled person would have arrived at a method which includes all the features of the claimed method, without the exercise of inventive skill.

- 2.9 The appellant argued that the determination of whether data and control code symbols are to be transmitted within a specific time interval was made periodically, which created more flexibility for the decision as to whether or not control and data symbols were to be multiplexed. In D1, only a check was made if uplink data was present in the current TTI.
- 2.10 This argument is not convincing. In making this argument, the appellant may have had in mind a constellation of TTIs in which downlink TTI, uplink data TTI and uplink control information TTI have different lengths and wherein the respective starting points of a TTI do not coincide. However, the claimed method is not limited to such configuration. Further, a sequence of TTIs in D1 is already implicitly periodic. Therefore, the check of whether uplink data is present, which is made for each TTI, implies that this check is made periodically.
- 2.11 The board concludes that the subject-matter of claim 1 does not involve an inventive step (Articles 52(1) and 56 EPC). The main request is therefore not allowable.
3. *Claim 1 of the auxiliary request - inventive step (Article 56 EPC)*

- 3.1 The additional feature of claim 1 of the auxiliary request, i.e. that the determination is performed periodically at times that are multiples of the specific time interval, does not further distinguish the claimed method from the method of D1, since in D1 the determination is performed at each TTI. These points in time therefore also include the points in time which are a multiple of the time interval. The expression "specific" in the claim is not further defined and, hence, does not give the time interval a particular meaning.
- 3.2 The board concludes that the reasons given in respect of claim 1 of the main request equally apply to claim 1 of the auxiliary request. The auxiliary request is therefore not allowable either (Articles 52(1) and 56 EPC).
4. Since there is no allowable request, the appeal is to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chairman:



G. Rauh

F. van der Voort

Decision electronically authenticated