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Title of invention:
Demodulation reference signals (DM-RS) for PHICH or PDCCH based retransmission in LTE-A wireless communication

Applicant:
Qualcomm Incorporated

Headword:
Triggering retransmissions/QUALCOMM

Relevant legal provisions:
EPC Art. 56, 116(1)

Keyword:
Oral proceedings - held by videoconference upon request
Inventive step - (no)

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Case Number: T 1979/16 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 29 October 2020

Appellant: (Applicant)	Qualcomm Incorporated International IP Administration 5775 Morehouse Drive San Diego, CA 92121 (US)
Representative:	Bardehle Pagenberg Partnerschaft mbB Patentanwälte Rechtsanwälte Prinzregentenplatz 7 81675 München (DE)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 14 March 2016 refusing European patent application No. 11730835.3 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	K. Bengi-Akyürek
Members:	K. Schenkel
	N. Obrovski

Summary of Facts and Submissions

I. This appeal concerns the decision of the examining division refusing the present European patent application. The grounds for refusal were *inter alia* lack of inventive step (Article 56 EPC) having regard to prior-art documents

D5: SAMSUNG: "HARQ handling in UL MIMO", 3GPP DRAFT; R1-102209 ULHARQ, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA ANTIPOLIS CEDEX ; FRANCE; vol. RAN WG1, no. Beijing, China; 20100412, 6 April 2010,

and

D6: PANASONIC: "UL HARQ behaviour with dynamic adaptive/non-adaptive operation", 3GPP DRAFT; R2-074854, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA ANTIPOLIS CEDEX ; FRANCE; vol. RAN WG2, no. Jeju; 12 November 2007.

II. Oral proceedings before the board were held on 29 October 2020 by videoconference, in accordance with the appellant's request.

The appellant's final requests were that the decision under appeal be set aside and that a patent be granted on the basis of the set of claims of a single claim request (filed as auxiliary request with letter of 23 October 2020).

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

III. Claim 1 of the single claim request reads as follows (labelling by the board):

(a) "A method for wireless communications, the method being performed by a user equipment, UE, and comprising:

(b) transmitting (602) first and second codewords according to an initial transmission rank;

(c) receiving (604) a downlink transmission indicating at least one of the first and second codewords to be retransmitted, wherein the downlink transmission includes

(d) one physical hybrid automatic retransmission request indicator channel, PHICH, indicating an acknowledgment, ACKs, for the at least one codeword to be retransmitted, together with a physical downlink control channel, PDCCH, grant scheduling adaptive retransmission;

(e) constructing (606) a demodulation reference signal, DM-RS, to be sent with the at least one codeword to be retransmitted, wherein the DM-RS is constructed based at least in part on information in the PHICH and information in the PDCCH grant; and

(f) retransmitting (608) the at least one codeword with the DM-RS according to a retransmission rank only when the received PDCCH grant is valid and decoded and the received PHICH indicates the ACK."

Reasons for the Decision

1. Subject-matter of the invention

The present invention relates to the wireless transmission of codewords and in particular to the uplink retransmission of codewords from a mobile terminal (UE) to a base station (eNB). The codeword to be retransmitted is indicated by a PHICH (Physical Hybrid Automatic Retransmission Request Indicator Channel) and a PDCCH (Physical Downlink Control Channel) grant transmitted together in a downlink transmission by the base station. A DM-RS (demodulation reference signal) sent, by the UE, with the codeword to be retransmitted, is generated based on information conveyed in the PHICH and the PDCCH grant. The codeword is only retransmitted when a valid PDCCH grant is decoded and when the PHICH indicates an acknowledgement signal (ACK).

2. Claim 1 - inventive step (Article 56 EPC)

2.1 Prior-art documents

Prior-art document **D5** is a 3GPP standard document relating to hybrid automatic repeat requests (HARQ) for uplink multiple-input multiple-output (UL MIMO) systems (see e.g. its title). The document discloses three alternatives for handling the uplink retransmission of a first and a second codeword, out of which "Alternative 3" employs two acknowledgements on the PHICH and two new data indicators (NDI) on the PDCCH (see page 1, section 1 and page 4, "Alternative 3").

Before addressing the details of the alternatives, it is first to be noted that **D5** discloses general statements which are considered to apply to all alternatives and which disclose that the method may be used in *adaptive* HARQ operations, in which case the PDCCH is used to signal changes of the transmission property (pages 1 and 2, section 2).

Prior-art document **D6** is a 3GPP standard document relating to error handling in the context of uplink HARQs (cf. title and page 1, section 2, third paragraph).

2.2 In more detail, **D5** discloses (board's underlining and strikethrough)

(a) a method for wireless communications, the method being performed by a UE and comprising (uplink transmissions are handled by the UE):

(b) transmitting first and second codewords according to an initial transmission rank (cf. page 4, "Alternative 3", third paragraph; MIMO implies an initial transmission rank for the transmission of codewords);

(c) receiving a downlink transmission indicating at least one of the first and second codewords to be retransmitted (page 4, "Alternative 3", third paragraph; Figure 4), wherein the downlink transmission includes

(d) one PHICH, indicating a NACK, for the at least one codeword to be retransmitted together with a PDCCH grant scheduling adaptive retransmission (page 4, "Alternative 3" and Figure 4 disclose the

transmission of a NACK for a codeword to be retransmitted in conjunction with page 2, first paragraph, disclosing that "[i]n addition to the PHICH triggered retransmission, eNB can transmit PDCCH ... to grant retransmissions ... when it wants to change a transmission property");

(e) constructing a DM-RS to be sent with the at least one codeword to be retransmitted, wherein the DM-RS is constructed based at least in part on information in the PHICH and information in the PDCCH grant (see page 1, last paragraph: "... by transmitting PDCCH, the eNB can change a set of transmission properties such as ... DM-RS cyclic shift ...");

(f) retransmitting the at least one codeword with the DM-RS according to a retransmission rank ~~only~~ when the received PDCCH grant is valid and decoded or ~~and~~ the received PHICH indicates the NACK (page 4, "Alternative 3", first paragraph).

2.3 In view of the above, the method of claim 1 differs from the method of D5 in that a codeword is only retransmitted if an ACK in the PHICH is received together with a valid grant received in the PDCCH grant.

2.4 As to the technical effect of that distinguishing feature, given that an ACK in PHICH in absence of a PDCCH grant would trigger a retransmission according to the method of D5, this difference reduces the risk of an erroneous retransmission in the event that the PDCCH signal is lost. Thus, the associated objective technical problem may be framed as "how to adapt the method of D5 to the realistic case that the

retransmission grant, i.e. PDCCH grant, is possibly missed".

2.5 Faced with that objective problem, the skilled person in the field of 3GPP-based mobile telecommunication networks would have consulted document **D6** since it discloses error handling strategies employed by the UE in UL HARQ schemes including adaptive retransmission and also touches upon the issue of missed PDCCH grants ("UL grants").

2.6 Document **D6** draws up different scenarios of how the UE could react to the detection or misdetection of the signals on PHICH and PDCCH (cf. Table 1). The last two scenarios in this table relate to a missed grant, the retransmission being fully dependent on the ACK/NACK conveyed in PHICH. The last entry in this table discloses the problematic case where the grant is missed and the retransmission is triggered due to a NACK in PHICH which could lead to interferences. However, Table 1 also discloses in its first line a scenario where the retransmission is triggered by a PDCCH grant and an ACK in PHICH in view of the fact that the UE in case of conflicting signals on PHICH and PDCCH gives priority to the latter.

The skilled person would have therefore recognised that, by inhibiting the scenario of the last line of the list of possible UE actions, retransmissions can be handled while, at the same time, avoiding the risk of a retransmission in the case of a misdetected PDCCH grant leading to interferences. In order to exclude the problematic scenario, it is obvious that retransmitting a codeword has to be made dependent on a valid PDCCH grant together with an ACK in PHICH.

The skilled person would, starting out from "Alternative 3" of **D5** and applying the teaching of **D6**, have arrived at a method which includes all the features of present claim 1, without exercising any inventive skill.

2.7 The appellant argued that the objective technical problem was different, namely "how to trigger the retransmission".

The board does not agree with such a problem because the method of **D5** already provides a solution for triggering the retransmission. Further, it is noted that the appellant, in their latest submission of 23 October 2020 on page 12, rather referred to "improving retransmissions in a wireless network" as being the objective technical problem.

2.8 According to the appellant, the disclosure of **D5** was to be seen differently since it included clear statements that the PHICH was not used together with PDCCH. In support of this argument, it was stated that using both channels consumes much more resources and it was referred to Figure 1 on page 2 of D5. Hence, D5 taught against using PHICH together with PDCCH.

The board, however, notes that **D5** discloses on page 2, first paragraph, that the eNB can transmit PDCCH "[i]n addition" to the PHICH if it is desired to change a transmission property "at the expense of PDCCH signalling overhead". Thus, the possibility of transmitting both channels while accepting explicitly an increased signalling overhead is already disclosed. According to page 4, "Alternative 3", first paragraph, "HARQ operations can be handled by either PHICH or PDCCH" which, in the board's view, is to be understood

as meaning that the retransmission can be triggered by either one of both channels without excluding the use of both. This paragraph further states that, if the transmission properties are to be changed, PDCCH is transmitted, again tolerating the resulting signalling overhead, and that PHICH is transmitted without PDCCH if just a retransmission is to be handled. The transmission of PDCCH together with PHICH is not excluded for the case where the transmission properties are to be changed.

2.9 The appellant also submitted that document **D6** taught that the PHICH was not necessary at all and that it would be easier to leave out ACK/NACK altogether (see page 1, section 2, third paragraph: "... When the UE detects an UL grant ..., the UE (re)transmits UL data (initial or reTX) with the indicated format regardless of ACK/NACK detection result ...").

The board however holds that the paragraph referred to only expresses that the PDCCH is more reliable than the PHICH and that in case of contradicting information on both channels the PDCCH is given more credibility. It is further noted in this respect that **D6** itself lists in Table 1 scenarios where the PHICH is transmitted together with the PDCCH (see point 2.6 above).

2.10 It was further argued that **D6** disclosed the first scenario in Table 1 only by chance without the intention to handle the case of a missed PDCCH grant. In that regard, the board holds that this first scenario points to the solution of the objective technical problem underlying the present invention and that it does not matter whether or not this is by intention as long as a skilled person can recognise the pointer.

2.11 In view of the above, the board concludes that the method of claim 1 lacks an inventive step. The present application is therefore not allowable under Article 56 EPC.

3. In the absence of an allowable claim request, the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

B. Brückner K. Bengi-Akyürek

Decision electronically authenticated