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Case Number: T 2729/17 - 3.5.05

Application Number: 11797482.4

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IPC: H04L1/06, H04L1/00, H04L5/00, H04L25/03

Language of the proceedings: EN

Title of invention:
Method and terminal for feeding back channel state information

Applicant:
ZTE Corporation

Headword:
Feeding back channel states/ZTE

Relevant legal provisions:
EPC Art. 123(2), 116(1)

Keyword:
Added subject-matter - (yes)
Right to be heard - intention not to attend the scheduled oral proceedings: cancellation of oral proceedings

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Case Number: T 2729/17 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 29 October 2019

Appellant: (Applicant)	ZTE Corporation ZTE Plaza, Keji Road South, Hi-Tech Industrial Park, Nanshan District, Shenzhen, Guangdong 518057 (CN)
Representative:	Mewburn Ellis LLP City Tower 40 Basinghall Street London EC2V 5DE (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 24 July 2017 refusing European patent application No. 11797482.4 pursuant to Article 97(2) EPC**

Composition of the Board:

Chair	A. Ritzka
Members:	K. Bengi-Akyuerek
	G. Weiss

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division to refuse the present European patent application for lack of conciseness and clarity (Article 84 EPC). Additionally, by way of an *obiter dictum*, it was further held that the lack of clarity was such that an assessment of patentability did not appear to be meaningful.

II. With the statement setting out the grounds of appeal, the appellant filed amended sets of claims according to a main request and an auxiliary request. It requested that the examining division's decision be set aside and that a patent be granted on the basis of either of the above claim requests. In addition, oral proceedings were requested as an auxiliary measure.

III. In a communication under Rule 100(2) EPC, the board gave its preliminary opinion on the appeal. In particular, it raised objections under Articles 123(2) and 84 EPC with respect to both claim requests.

IV. With a letter of reply dated 13 February 2019, the appellant submitted amended claims according to a new main request and a new auxiliary request replacing the former ones on file. It maintained its request for oral proceedings. Furthermore, it indicated that, if the objections under Articles 123 (2) and 84 EPC were overcome, the case could be remitted for further examination and that oral proceedings could then be avoided.

V. In a communication annexed to the summons to oral proceedings pursuant to Article 15(1) RPBA, the board indicated that its understanding was that the appellant

now was requesting that the examining division's decision be set aside and that the case be remitted to the examining division, on the basis of the above claim requests. As to the substance of the pending claim requests, it again raised objections under Articles 123(2) and 84 EPC. Moreover, it also noted that, provided that the raised objections were overcome, the board was minded to exercise its discretion under Article 111(1) EPC to remit the case to the examining division for further prosecution, on the basis of a set of claims that was at least allowable under Articles 123(2) and 84 EPC.

VI. In a letter of reply dated 30 September 2019, the appellant indicated that it would not be attending the oral proceedings scheduled on 25 October 2019. It did not submit any comments on the substance of the board's communication.

VII. The scheduled oral proceedings were cancelled. The board establishes from the file that the appellant's final requests are that the decision under appeal be set aside and that a patent be granted on the basis of the claims of either the main request or the auxiliary request, both filed with the letter of 13 February 2019.

VIII. Claim 1 of the **main request** reads as follows:

"A method for feeding back channel state information, characterized by comprising:

a piece of user equipment, UE, determining channel state information which comprises a first type of Precoding Matrix Indicator, PMI, and a second type of PMI, wherein the first type of PMI is used for indicating an index of a first precoding matrix in a

first precoding codebook, the first precoding matrix is used for mapping channel information of a wideband channel, or a long-term channel, or a wideband and a long-term channel, the second type of PMI is used for indicating an index of a second precoding matrix in a second precoding codebook, and the second precoding matrix is used for mapping channel information of a subband channel, or a short-term channel, or a subband channel and a short-term channel (S102); and

the UE feeding back the channel state information which comprises the first type of PMI and the second type of PMI on a Physical Uplink Shared Channel (PUSCH), to inform a base station about how to acquire channel information according to a predetermined function of the first precoding matrix and the second precoding matrix (S104);

wherein the channel state information further comprises Rank Indicator, RI, information;

wherein the step of the UE feeding back the channel state information which comprises the first type of PMI and the second type of PMI on the PUSCH comprises any of:

the UE feeding back the first type of PMI and the second type of PMI on the PUSCH using a wideband feedback mode;

the UE feeding back the first type of PMI and the second type of PMI on the PUSCH using a UE-selected subband feedback mode; or

the UE feeding back the first type of PMI and the second type of PMI using a high layer configured feedback mode;

wherein the UE feeding back the first type of PMI and the second type of PMI on the PUSCH using a wideband feedback mode comprises:

the UE selecting the first precoding matrix corresponding to a subband set from the first stored

precoding codebook and feeding back an index number of the selected first precoding matrix as the first type of PMI of the subband set; and

when RI > a0 and a0 is a positive integer which is greater than or equal to 2, the UE selecting the second precoding matrix, whose indices have a fixed value, corresponding to a subband set from the second stored precoding codebook and not feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set;

wherein the UE feeding back the first type of PMI and the second type of PMI on the PUSCH using a UE-selected subband feedback mode comprises:

when RI ≤ a0 and a0 is a positive integer which is greater than or equal to 2, the UE:

selecting the first precoding matrix corresponding to a positive integer number (M) of subbands from a subband set of the first stored precoding codebook, and feeding back an index number of the selected first precoding matrix as the first type of PMI of the M subbands, and

either selecting the second precoding matrix corresponding to M subbands from a subband set of the second stored precoding codebook, and feeding back an index number of the selected second precoding matrix as the second type of PMI of the M subbands, or selecting the second precoding matrix, whose indices have a fixed value, corresponding to a subband set of the second stored precoding codebook, and not feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set;

wherein the UE feeding back the first type of PMI and the second type of PMI using a high layer configured feedback mode comprises:

the UE selecting the first precoding matrix corresponding to a subband set from the first stored

precoding codebook, and feeding back an index number of the selected first precoding matrix as the first type of PMI of the subband set; and

either selecting the second precoding matrix corresponding to the subband set from the second stored precoding codebook, and feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set;

or selecting the second precoding matrix, whose indices have a fixed value, corresponding to the subband set from the second stored precoding codebook, and not feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set."

Claim 1 of the **auxiliary request** reads as follows:

"A method for feeding back channel state information, characterized by comprising:

a piece of user equipment, UE, determining channel state information which comprises a first type of Precoding Matrix Indicator, PMI, and a second type of PMI, wherein the first type of PMI is used for indicating an index of a first precoding matrix in a first precoding codebook, the first precoding matrix is used for mapping channel information of a wideband channel, or a long-term channel, or a wideband and a long-term channel, the second type of PMI is used for indicating an index of a second precoding matrix in a second precoding codebook, and the second precoding matrix is used for mapping channel information of a subband channel, or a short-term channel, or a subband channel and a short-term channel (S102); and

the UE feeding back the channel state information which comprises the first type of PMI and the second type of PMI on a Physical Uplink Shared Channel

(PUSCH), to inform a base station about how to acquire channel information according to a predetermined function of the first precoding matrix and the second precoding matrix (S104);

wherein the channel state information further comprises Rank Indicator, RI, information;

wherein the step of the UE feeding back the channel state information which comprises the first type of PMI and the second type of PMI on the PUSCH comprises the UE feeding back the first type of PMI and the second type of PMI on the PUSCH using a UE-selected subband feedback mode

wherein the UE feeding back the first type of PMI and the second type of PMI on the PUSCH using a UE-selected subband feedback mode comprises:

when RI ≤ a0 and a0 is a positive integer which is greater than or equal to 2, the UE:

selecting the first precoding matrix corresponding to a positive integer number (M) of subbands from a subband set of the first stored precoding codebook, and feeding back an index number of the selected first precoding matrix as the first type of PMI of the M subbands, and

either selecting the second precoding matrix corresponding to M subbands from a subband set of the second stored precoding codebook, and feeding back an index number of the selected second precoding matrix as the second type of PMI of the M subbands, or selecting the second precoding matrix, whose indices have a fixed value, corresponding to a subband set of the second stored precoding codebook, and not feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set."

Reasons for the Decision

1. *The present application*

The present application is concerned with providing channel-state information relating to a downlink channel (such as channel-quality indicator, CQI, for indicating the channel quality level; precoding matrix indicator, PMI, for indicating a so-called "precoding codebook"; rank indicator, RI, for indicating the rank of a channel-response matrix) from a mobile device ("UE") to a base station ("eNodeB") in an LTE-based mobile system, based on switching between single-user and multi-user multiple-input multiple-output (SU-MIMO; MU-MIMO). It describes several embodiments relating to different feedback modes, namely the "wideband feedback mode" (see page 13, line 19 to page 15, line 3 of the application as filed), the "UE-selected subband feedback mode" (page 15, line 4 to page 17, line 13 as filed) and the "high layer configured feedback mode" (see page 17, line 14 to page 18, line 4 as filed).

According to the description, the technical problem to be solved by the present application is to meet "the requirement for high precision of the channel state information under the transmission mode of dynamic switching between the SU-MIMO and the MU-MIMO" (see page 3, "Summary of the Invention", as filed).

2. MAIN REQUEST

Claim 1 of the main request comprises the following limiting features (as labelled and emphasised by the board):

A method for feeding back channel-state information, comprising:

A) a piece of user equipment (UE), determining channel-state information which comprises a first type of Precoding Matrix Indicator (PMI), and a second type of PMI,

B) wherein the first type of PMI is used for indicating an index of a first precoding matrix in a first precoding codebook and wherein the first precoding matrix is used for mapping channel information of a wideband channel or a long-term channel or a wideband and a long-term channel,

C) wherein the second type of PMI is used for indicating an index of a second precoding matrix in a second precoding codebook and wherein the second precoding matrix is used for mapping channel information of a subband channel, or a short-term channel or a subband channel and a short-term channel;

D) the UE feeding back the channel-state information which comprises the first type of PMI and the second type of PMI on a Physical Uplink Shared Channel (PUSCH), to inform a base station about how to acquire channel information according to a predetermined function of the first precoding matrix and the second precoding matrix;

E) wherein the channel-state information further comprises Rank Indicator (RI) information;

F) wherein the step of the UE feeding back the channel-state information which comprises the first type of PMI and the second type of PMI on the PUSCH comprises any of:

G) the UE feeding back the first type of PMI and the second type of PMI on the PUSCH using a **wideband feedback mode**

1) by selecting the first precoding matrix corresponding to a subband set from the first stored precoding codebook and feeding back an index number of the selected first precoding matrix as the first type of PMI of the subband set and
2) by selecting, when RI > a0 and a0 is a positive integer which is greater than or equal to 2, the second precoding matrix, whose indices have a fixed value, corresponding to a subband set from the second stored precoding codebook and not feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set;

H) the UE feeding back the first type of PMI and the second type of PMI on the PUSCH using a **UE-selected subband feedback mode**
1) by selecting, when RI ≤ a0 and a0 is a positive integer which is greater than or equal to 2, the first precoding matrix corresponding to a positive integer number (M) of subbands from a subband set of the first stored precoding codebook, and feeding back an index number of the selected first precoding matrix as the first type of PMI of the M subbands and
2) either selecting the second precoding matrix corresponding to M subbands from a subband set of the second stored precoding codebook, and feeding back an index number of the selected second precoding matrix as the second type of PMI of the M subbands,
3) or selecting the second precoding matrix, whose indices have a fixed value, corresponding to a subband set of the second

stored precoding codebook, and not feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set;

I) the UE feeding back the first type of PMI and the second type of PMI using a **high-layer configured feedback mode**

1) by selecting the first precoding matrix corresponding to a subband set from the first stored precoding codebook, and feeding back an index number of the selected first precoding matrix as the first type of PMI of the subband set and

2) either selecting the second precoding matrix corresponding to the subband set from the second stored precoding codebook, and feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set,

3) or selecting the second precoding matrix, whose indices have a fixed value, corresponding to the subband set from the second stored precoding codebook, and not feeding back an index number of the selected second precoding matrix as the second type of PMI of the subband set.

2.1 *Added subject-matter (Article 123(2) EPC)*

2.1.1 As regards features G2), H3) and I3) of claim 1, i.e. that the indices of the second precoding matrix may have a fixed value, the board cannot see any basis for those features in the entire application as originally filed.

The original application merely teaches the selection

of the second precoding matrix with a fixed value (see e.g. page 14, line 11; page 14, last line; page 16, lines 23-24; page 17, lines 10-11; page 18, first line; page 20, lines 1-2 and 17-18; page 23, lines 4-5, 12-13 and 20-21; page 24, lines 1-2; page 25, lines 8-9; claims 6, 9, 16, 18 and 22) or a "fixed-value second precoding matrix" (see page 23, line 27) or a "fixed second precoding matrix" (see page 24, lines 7-8 and 10-11; page 25, lines 14-15).

As put forward by the appellant, the original application indicates that "[t]he PMI is an index number of a precoding codebook fed back by the UE" and that "the second type of PMI is used for indicating an index of a second precoding matrix in a second precoding codebook" (see page 2, penultimate line and page 3, penultimate line to page 4, first line). However, the original disclosure is silent as to a matrix having indices let alone as to whether or not those indices are fixed.

2.1.2 Hence, present claim 1 includes an unallowable extension of the present application's original content.

2.1.3 The appellant did not provide any comments on this objection raised in the board's communication under Article 15(1) RPBA (see point VI above).

2.2 In conclusion, the main request is not allowable under Article 123(2) EPC.

3. AUXILIARY REQUEST

3.1 Claim 1 of this auxiliary request differs from claim 1 of the main request basically in that - besides

features A) to F) - it now includes only one of feature G), feature H) or feature I).

3.2 Hence, the objections under Article 123(2) EPC set out in point 2.1 above apply *mutatis mutandis* to claim 1 of the present auxiliary request.

3.3 Hence, the auxiliary request is not allowable under Article 123(2) EPC either.

4. *Oral proceedings*

4.1 In its letter dated 30 September 2019 in reply to the board's communication under Article 15(1) RPBA, the appellant indicated that it would not be attending the oral proceedings and did not submit further comments on the substance of the case (see point VI above).

4.2 The board considers that the appellant gave up the opportunity to be heard by absenting itself from the oral proceedings and that it may be treated as relying only on its written case. Under these circumstances, the scheduled oral proceedings was cancelled (see point VII above).

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chair:

K. Götz-Wein A. Ritzka

Decision electronically authenticated