

**Internal distribution code:**

- (A) [ - ] Publication in OJ
- (B) [ - ] To Chairmen and Members
- (C) [ - ] To Chairmen
- (D) [ X ] No distribution

**Datasheet for the decision  
of 27 August 2019**

**Case Number:** T 1199/16 - 3.5.05

**Application Number:** 13167292.5

**Publication Number:** 2627048

**IPC:** H04L25/02, H04L25/03, H04B7/06,  
H04B7/26, H04L1/06, H04L1/00,  
H04W88/04

**Language of the proceedings:** EN

**Title of invention:**

Spatial interference mitigation schemes for wireless communication

**Applicant:**

Qualcomm Incorporated

**Headword:**

Inter-cell feedback III/QUALCOMM

**Relevant legal provisions:**

EPC Art. 56, 84

**Keyword:**

Clarity - main request (no)  
Inventive step - auxiliary requests 1, 2, 2a (no):  
reformulation of objective problem necessary - auxiliary  
request 3 (yes)

**Decisions cited:**

T 1639/07



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 1199/16 - 3.5.05

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.05**  
**of 27 August 2019**

**Appellant:** Qualcomm Incorporated  
(Applicant) 5775 Morehouse Drive  
San Diego, CA 92121-1714 (US)

**Representative:** Wegner, Hans  
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 16 December  
2015 refusing European patent application  
No. 13167292.5 pursuant to Article 97(2) EPC**

**Composition of the Board:**

**Chair** A. Ritzka  
**Members:** K. Bengi-Akyuerek  
F. Blumer

## **Summary of Facts and Submissions**

I. The appeal is against the decision of the examining division to refuse the present European patent application (divided from its parent application EP 09747718.6 underlying appeal case T 1441/16) for lack of clarity (Article 84 EPC) with respect to the claims of a main request and for lack of inventive step (Article 56 EPC) with respect to the claims of first to fifth auxiliary requests, having regard to the disclosure of

**D4:** US-A-2003/0020651.

II. In its statement setting out the grounds of appeal, the appellant requested that the examining division's decision be set aside and that a patent be granted on the basis of the main request or one of the first to fifth auxiliary requests underlying the appealed decision.

III. In a communication annexed to the summons to oral proceedings pursuant to Article 15(1) RPBA, the board gave its preliminary opinion on the appeal. It introduced the following prior-art document into the appeal proceedings in reaction to the appellant's arguments:

**D10:** US-A-2007/0230373.

In particular, it indicated that claim 1 of the main request was unclear (Article 84 EPC), while claim 1 of the first to fifth auxiliary requests lacked an inventive step (Article 56 EPC), mainly having regard to prior-art document D10.

- IV. With a letter of reply dated 8 July 2019, the appellant submitted amended claims according to three further auxiliary requests (auxiliary requests 2a, 3a and 5a), and provided counter-arguments on the objections raised in the board's communication under Article 15(1) RPBA.
- V. Oral proceedings were held on 27 August 2019, during which the appellant filed a further set of claims as a new "auxiliary request 3" replacing the former one on file.

The appellant's final request was that the decision under appeal be set aside and that a patent be granted on the basis of any one of the following claim requests:

- main request filed with the letter of 14 February 2014 during the examination proceedings
- auxiliary request 1 filed with the letter of 29 September 2015 during the examination proceedings
- auxiliary request 2: claim 1 quoted as "claim 1 of the Second Auxiliary Request" on page 6 of the decision under appeal
- auxiliary request 2a filed with the letter of 8 July 2019
- auxiliary request 3 filed during the oral proceedings before the board
- auxiliary request 3a filed with the letter of 8 July 2019
- auxiliary request 4 filed with the letter of 29 September 2015 during the examination proceedings
- auxiliary request 5 filed with the letter of 29 September 2015 during the examination proceedings

- auxiliary request 5a filed with the letter of 8 July 2019.

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

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

"A method of sending data in a wireless communication network (100), comprising:  
sending a resource request from a user equipment (120a - 120d) to a first cell (110a, 110b);  
receiving spatial feedback information sent by a second cell (110a, 110b) to the user equipment (120a - 120d), the user equipment (120a - 120d) not communicating with the second cell (110a, 110b); and  
sending a data transmission from the user equipment (120a - 120d) to the first cell (110a, 110b) based on the spatial feedback information to reduce interference to the second cell (110a, 110b)."

Claim 1 of **auxiliary request 1** reads as follows (amendments to claim 1 of the main request highlighted by the board):

"A method of sending data in a wireless communication network (100), comprising:  
sending a resource request from a user equipment (120a - 120d) to a first cell (110a, 110b) serving the user equipment (120a - 120d);  
receiving spatial feedback information sent by a second cell (110a, 110b) to the user equipment (120a - 120d), the user equipment (120a - 120d) not ~~communicating with~~ being served by the second cell (110a, 110b); and  
sending a data transmission from the user equipment (120a - 120d) to the first cell (110a, 110b) based on

the spatial feedback information to reduce interference to the second cell (110a, 110b)."

Claim 1 of **auxiliary request 2** reads as follows (amendments to claim 1 of auxiliary request 1 highlighted by the board):

"A method of sending data in a wireless communication network (100), comprising:  
sending a resource request from a user equipment (120a - 120d) to a first cell (110a, 110b) serving the user equipment (120a - 120d);  
receiving spatial feedback information sent by a second cell (110a, 110b) to the user equipment (120a - 120d), the user equipment (120a - 120d) not being served by the second cell (110a, 110b); and  
sending a data transmission from the user equipment (120a - 120d) to the first cell (110a, 110b) based on spatial nulling information contained in the spatial feedback information to reduce interference to the second cell (110a, 110b)."

Claim 1 of **auxiliary request 2a** reads as follows (amendments to claim 1 of auxiliary request 1 highlighted by the board):

"A method of sending data in a wireless communication network (100), comprising:  
sending a resource request from a user equipment (120a - 120d) to a first cell (110a, 110b) serving the user equipment (120a - 120d);  
receiving precoding information from the first cell (110a, 110b);  
receiving spatial feedback information sent by a second cell (110a, 110b) to the user equipment (120a - 120d), the user equipment (120a - 120d) not being served by

the second cell (110a, 110b);  
selecting a precoding matrix, based on spatial nulling information contained in the spatial feedback information and precoding information from the first cell (110a, 110b); and  
sending a data transmission from the user equipment (120a - 120d) to the first cell (110a, 110b) ~~based on the spatial feedback information,~~ using the selected precoding matrix to reduce interference to the second cell (110a, 110b)."

Claim 1 of **auxiliary request 3** reads as follows:

"A method of sending data in a wireless communication network (100), comprising:  
sending a resource request from a user equipment (120a - 120d) to a first cell (110a, 110b) serving the user equipment (120a - 120d);  
receiving spatial feedback information sent by a second cell (110a, 110b) to the user equipment (120a - 120d), the user equipment (120a - 120d) not being served by the second cell (110a, 110b); and  
sending a data transmission from the user equipment (120a - 120d) to the first cell (110a, 110b) based on the spatial feedback information to reduce interference to the second cell (110a, 110b);  
further comprising:  
sending a spatial feedback information request from the user equipment (120a - 120d) to the second cell (110a, 110b), and wherein the spatial feedback information is sent by the second cell (110a, 110b) to the user equipment (120a - 120d) in response to the spatial feedback information request."

In view of the decision of the board, there is no need to reproduce the claims of the further auxiliary



requests on file.

## **Reasons for the Decision**

### 1. *The present invention*

The present application is concerned with spatial interference mitigation in 3GPP-based cellular wireless networks in the presence of a "serving cell" and an "interfering cell", based on using channel feedback information from both a first user (UE1) served by a certain base station BS1 (i.e. by a serving cell) and a second user (UE2) served by another base station BS2 (i.e. by an interfering cell). In that context, mitigation techniques such as "spatial nulling" (using spatial feedback information, SFI, such as channel direction indicator, CDI, or precoding matrix indicator, PMI) or "receiver spatial processing" may be used.

The application describes basically two embodiments, a first embodiment relating to *downlink* transmissions from the base station to the UE (see paragraphs [0095] to [00102]; Figs. 5 to 8 as filed) and a second embodiment relating to *uplink* transmissions from the UE to the base station (see paragraphs [00103] to [00108]; Figs. 9 to 12 as filed). According to the description, the alleged technical problem to be solved is "to transmit data in a manner to achieve good performance even in the presence of strong non-serving base stations" (cf. paragraph [0005] as filed).

### 2. MAIN REQUEST

Claim 1 of the main request comprises the following

limiting features, as labelled by the board:

A method of sending data in a wireless communication network, comprising the steps of:

- A) sending a resource request from a user equipment (UE) to a first cell;
- B) receiving spatial feedback information (SFI) sent by a second cell to the UE,
- C) the UE not communicating with the second cell;
- D) sending a data transmission from the UE to the first cell based on the SFI to reduce interference to the second cell.

The above method steps are evidently performed by a mobile user (UE) served by a serving cell and relate to uplink data transmissions from the mobile user to the serving base station. It is apparent from the wording of the claim that feature A) is not interlinked in any way with the other features of claim 1.

## 2.1 *Clarity (Article 84 EPC)*

2.1.1 The board agrees with the finding of the decision under appeal that feature C) contradicts feature B) and that therefore present claim 1 does not comply with Article 84 EPC.

2.1.2 As to feature C), the appellant argued that its wording had to be understood as meaning ("after a very first glance", as the appellant put it) that the UE did not communicate with the interfering cell apart from receiving spatial feedback information from it.

2.1.3 The board is not convinced. Such an interpretation is in no way derivable from the wording of claim 1. Rather, the UE either communicates with the interfering

cell or does not communicate with it but cannot perform any combination thereof. The appellant did not provide any further comments on this at the oral proceedings before the board.

2.2 In conclusion, the main request is not allowable under Article 84 EPC.

3. AUXILIARY REQUEST 1

Claim 1 of this auxiliary request differs from claim 1 of the main request essentially in that it no longer includes feature C) and instead specifies that (emphasis added):

C') the UE is served by the first cell and not by the second cell.

The board is satisfied that new feature C') is supported e.g. by paragraph [0005] and Figure 1 of the present application as originally filed and that it thus complies with Article 123(2) EPC. Furthermore, claim 1 now complies with Article 84 EPC.

3.1 *Novelty and inventive step (Articles 54 and 56 EPC)*

The board judges that the subject-matter of present claim 1 is new but not inventive (Article 56 EPC) having regard to prior-art document D10, for the reasons set out below.

3.1.1 The board concurs with the appellant that document **D4** does not represent the most suitable starting point for assessing inventive step. Document D4 relates to interference management in wireless routing networks, based on exchanging wireless routing information (such

as transmission power levels, antenna pointing directions, transmission peaks/nulls, etc.) between interfering wireless routing devices. However, it is not concerned with the provision of feedback (routing) information by distinct interfering cells for uplink transmissions in a cellular system made up of 3GPP-based base stations and mobile UEs.

Rather, the board finds that prior-art document D10 is a more suitable starting point since it is concerned with inter-user interference management in wireless multi-user MIMO systems, including uplink transmissions, based on providing channel-state information from interfering mobile users.

- 3.1.2 More specifically, document **D10** teaches essentially that, for a requested data transmission ("beamformed data packet 92") in a certain coverage area ("basic service area"), channel feedback data ("beamforming matrix  $V_1$ ,  $V_2$ ") from different, interfering mobile users is utilised. Moreover, it is taught that this concept is applicable to both downlink and uplink data transmissions (see e.g. paragraphs [0022] and [0033] to [0038], in conjunction with Figs. 2 and 5).
- 3.1.3 Apparently, the subject-matter of present claim 1 differs from the disclosure of D10 in that the respective feedback data is sent by a second cell that does not serve the UE according to feature C'), rather than by an interfering mobile user).
- 3.1.4 The appellant submitted that the problem underlying the present invention was "to transmit data in a manner to achieve good performance even in the presence of strong non-serving base stations" or "to provide a more efficient way of communicating data in a coverage area

of multiple base stations" (see statement of grounds of appeal, sections III.9 and III.18) or "to reduce interference when transmitting data in densely populated wireless communication systems", as put forward at the oral proceedings before the board.

- 3.1.5 However, those problems cannot be considered to be valid objective problems. The board recalls that the objective technical problem must be derived from technical effects that are based on objectively established facts and that are directly and causally related to the technical features of the claimed invention (see e.g. T 1639/07, Reasons 2.5).
- 3.1.6 In the present case, the mere fact that data is sent from a mobile user to a serving cell on the basis of feedback information obtained from an interfering cell - without any details on how this information is actually utilised at the mobile user - cannot credibly ensure "good performance", a "more efficient way of communicating data" or "reduced interference". Rather, the UE performing the method steps of present claim 1 has no impact or control at all on whether the received feedback information stems from the same or another coverage area.
- 3.1.7 This is even more so since claim 1 fails to indicate any temporal relationship or coordination between the receipt of feedback data, by the UE, from the interfering cell and the actual data transmission to the serving cell. Hence, contrary to the appellant's allegation (see letter of 8 July 2019, section II.2), no interplay between the first cell, the mobile user and the second cell is properly reflected in claim 1. Consequently, the wording of present claim 1 encompasses even the case that entirely outdated SFI

data is utilised at the UE which would most likely entail severe system performance degradations. In other words, the desired technical effect cannot be achieved over the whole range claimed. Hence, the board holds that distinguishing feature C') has the mere technical effect that the SFI emanates from an interfering *cell* and thus relates solely to a different structural scenario in terms of the mobile network in question.

- 3.1.8 In view of the above, the objective problem to be solved by claim 1 may be framed - in a less ambitious way - as "how to adapt the interference management scheme of D10 to densely populated wireless communication systems".
- 3.1.9 Starting from the teaching of D10, that includes the scenario of uplink transmissions, the skilled person in the field of mobile communication networks would have been aware that if a second, interfering user is located in another coverage area, the associated feedback data must necessarily come from that different coverage area. Moreover, based on paragraph [0045] of D10 referring to cellular systems, the skilled person would also have known that wireless coverage areas (such as "service areas" in D10) could readily be mapped to "cells" of typical cellular systems.

Consequently, the skilled person would have applied the uplink-specific interference management scheme of D10 to a scenario where at least at some point in time channel information from another coverage area, such as another cell, is received. By doing so, the skilled person would have readily arrived at the solution of present claim 1 without the need of inventive skills.

3.2 In view of the above, auxiliary request 1 is not allowable under Article 56 EPC.

4. AUXILIARY REQUEST 2

Claim 1 of auxiliary request 2 differs from claim 1 of auxiliary request 1 basically in that it further specifies that (emphasis added by the board)

E) the data transmission is sent based on spatial nulling information contained in the spatial feedback information.

4.1 *Inventive step (Article 56 EPC)*

4.1.1 The feature analysis and reasoning outlined in point 3.1 above apply *mutatis mutandis* to claim 1 of the present auxiliary request.

4.1.2 As to added feature E), it relates merely to a certain type of spatial interference data, which - in the absence of any details on how such data type is actually considered in the preparation of the data transmission according to feature D) of claim 1 - has no credibly derivable technical effect.

4.2 In conclusion, auxiliary request 2 is likewise not allowable under Article 56 EPC.

5. AUXILIARY REQUEST 2a

Claim 1 of auxiliary request 2a differs from claim 1 of auxiliary request 2 substantially in that it further specifies that (emphasis added by the board):

- F) precoding information is received from the first cell;
- G) a precoding matrix is selected, based on the precoding information sent from the first cell and spatial nulling information sent from the second cell;
- H) a data transmission is sent to the first cell using the selected precoding matrix.

5.1 *Inventive step (Article 56 EPC)*

5.1.1 The feature analysis and reasoning outlined in points 3.1 and 4.1 above apply *mutatis mutandis* to claim 1 of the present auxiliary request.

5.1.2 As to added features F) to H), document D10 likewise discloses the selection of beamforming, i.e. precoding, matrices ("beamforming matrix  $V_2 \times V_1$ "), based on feedback data (" $V_1, V_2$ ") from different, interfering units for the purpose of sending beamformed data packets accordingly (see e.g. paragraphs [0033] to [0038]). Hence, on the basis of the reasoning set out above and, in particular, the fact that according to present claim 1 the UE has no control at all whether the received feedback information stems from the same or another coverage area (see point 3.1.6 above), those added features also cannot contribute to an inventive step.

5.2 Thus, auxiliary request 2a is likewise not allowable under Article 56 EPC.

6. AUXILIARY REQUEST 3

Claim 1 of auxiliary request 3 differs from claim 1 of



auxiliary request 1 substantially in that it further specifies that (emphasis added by the board):

- I) the SFI is sent by the second cell in response to a SFI request sent from the UE to the second cell.

Added feature I) is supported by paragraph [00103] and Figure 9, blocks 914 and 916, of the present application as originally filed (Article 123(2) EPC).

#### 6.1 *Inventive step (Article 56 EPC)*

6.1.1 The additional feature I) of claim 1 is not known from document D10. As a consequence, the subject-matter of present claim 1 now differs in features C') and I) from the disclosure of that prior-art document.

6.1.2 The board accepts that by virtue of added feature I) the claimed solution now yields the synergistic technical effect of reducing interference to an interfering cell when transmitting data from a mobile user to a serving cell (see also point 3.1.7 above). This is because by obtaining channel feedback data only when it was indeed *requested* at a certain point in time by the mobile user, the actual inter-cell interference situation can properly be taken into account when performing optimised uplink data transmissions. The objective problem to be solved by present claim 1 may thus now be formulated as "how to ensure an optimised inter-cell interference management for uplink transmissions in densely populated wireless communication systems".

6.1.3 Starting from the disclosure of D10, the skilled person would have noticed that there are no discernible

incentives to control interference mitigation by a mobile user. On the contrary, the skilled person would, when confronted with the above objective problem, have envisaged requesting feedback data relating to another interfering coverage area from the access point of its coverage area, since there it is the network which controls the interference management, e.g. by delivering sounding packets to the users, and not the users. This is true for both downlink and uplink data transmissions (see e.g. paragraphs [0024], [0037] and [0038]; Figs. 5 and 7). Thus, the skilled person would have realised that it would be entirely against the consistent teaching of D10 to shift the control over inter-cell interference management from the access point, i.e. the network side, to the mobile users. Given that the latter is likewise not disclosed in one of the other available prior-art documents, the board sees no reason why the skilled person would come up with the claimed solution, without the use of hindsight.

- 6.2 Hence, in the light of the cited prior art, the subject-matter of the only independent claim of auxiliary request 3 is held to involve an inventive step within the meaning of Article 56 EPC.
7. Since all the other requirements of the EPC are also found to be fulfilled, the board decides that a patent is to be granted on the basis of claims 1 to 7 according to **auxiliary request 3**. This auxiliary request being allowable, the remaining auxiliary requests need not be considered further.

## Order

### For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the examining division with the order to grant a patent on the basis of the claims of auxiliary request 3 as filed during the oral proceedings before the board and a description and drawings to be adapted.

The Registrar:

The Chair:



K. Götz-Wein

A. Ritzka

Decision electronically authenticated