BESCHWERDEKAMMERN DES EUROPÄISCHEN PATENTAMTS

BOARDS OF APPEAL OF THE EUROPEAN PATENT OFFICE

CHAMBRES DE RECOURS DE L'OFFICE EUROPEEN DES BREVETS

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

Datasheet for the decision of 13 October 2010

Case Number: T 0105/07 - 3.5.05

Application Number: 03291809.6

Publication Number: 1499059

IPC: H04L 1/20

Language of the proceedings: EN

Title of invention:
Method and device for determining the link quality in an OFDM network

Patentee:
MOTOROLA, INC.

Headword:
Determining link quality in an OFDM network/MOTOROLA

Relevant legal provisions (EPC 1973):
EPC Art. 83, 84, 106, 107, 108, 111(1)

Keyword:
"Clarity and support by the description (yes - after amendment)"
"Sufficiency of disclosure - (yes)
"Remittal to the department of first instance for further prosecution"

Decisions cited:
J 0010/07

Catchword:
-

Europäisches Patentamt | European Patent Office | Office européen des brevets

Beschwerdekammern | Boards of Appeal | Chambres de recours

Case Number: T 0105/07 - 3.5.05

D E C I S I O N
of the Technical Board of Appeal 3.5.05
of 13 October 2010

Appellant: MOTOROLA, INC.
1303 East Algonquin Road
Schaumburg, IL 60196 (US)

Representative: Cross, Rupert Edward Blount
Boult Wade Tennant
Verulam Gardens
70 Gray's Inn Road
London WC1X 8BT (GB)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted 17 October 2006 refusing European patent application No. 03291809.6 pursuant to Article 97(1) EPC 1973.**

Composition of the Board:

Chairman: A. Ritzka
Members: P. Corcoran
G. Weiss

Summary of Facts and Submissions

I. This is an appeal against the decision of the examining division to refuse the European patent application no. 03 291 809.6, publication no. 1 499 059. The decision was announced in oral proceedings held on 4 October 2006 and written reasons were dispatched on 17 October 2006.

II. The decision under appeal was based on a sole request comprising a set of claims 1 to 10 filed with the letter dated 16 November 2005.

According to said decision, claims 1, 4, 6-8 and 10 of the appellant's request did not comply with the requirements of Article 84 EPC in respect of clarity and support by the description. It was also found that the application did not meet the requirements of Article 52(1) EPC because the subject-matter of claims 1-4 and 9-10, insofar as it could be understood, lacked novelty over the following document:

Dl: US 2002/0110138 A.

III. In the decision it was further stated that the application failed to disclose the invention in a manner sufficiently clear and complete to comply with the requirements of Article 83 EPC.

In this regard it was submitted that the description failed to disclose a way of determining the average signal power because the formula provided on p.6 of the description as filed would only be valid in the case

where the transmitted signal were considered to be of unit amplitude (cf. decision: item II.1.4(a)).

It was further submitted that it was not clear how the subtraction of the pilot subcarrier from a dimensionless channel coefficient as disclosed in the equations on p.7 of the application as filed could lead to an estimate of noise and interference (cf. decision: item II.3.1).

It was also submitted that whereas the Signal to Noise and Interference Ratio (SNIR) should be a dimensionless ratio, the calculation of the SNIR as disclosed in the first paragraph on p.8 would lead to a quantity having the dimension of [sec^{-1}] because it was based on calculating the ratio of average signal power to average energy for the pilot signal noise and interference (cf. decision: item II.3.2).

IV. Notice of appeal was received on 13 December 2006 with the appropriate fee being paid on the same date. The statement setting out the grounds of appeal was submitted with the notice of appeal. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 10 of an amended set of claims appended to the statement setting out the grounds of appeal.

V. In a communication accompanying a summons to oral proceedings to be held on 13 October 2010 the board gave its preliminary opinion that the appellant's request was not allowable. Objections were raised *inter alia* under Articles 84 EPC 1973 and 52(1) EPC.

VI. With respect to Article 84 EPC 1973, the board noted that the term "distortion measurement" as used in claim 1 of the appellant's request did not appear to be used in the description as originally filed. Said term was evidently an attempt to generalise the SNIR calculation of the preferred embodiment of the invention. The board was not, however, inclined to accept that such a generalisation was permissible under the given circumstances.

In the board's opinion, neither conventional usage in the relevant technical field nor the particular terminology employed in the present application provided support for the premise that the term "distortion" was synonymous with or included within its scope the addition of noise and/or interference to a signal.

In support of its observations on this point the board made reference to the following extract from a technical dictionary:

D3: IEEE Standard Dictionary of Electrical and Electronics Terms, pages 36, 280, 391, 490-491, 617, 684, 899-900, 4th Ed., IEEE Inc., NY, US, 1988, ISBN: 1-55937-000-9.

VII. With respect to Article 52(1) EPC, the board noted its preliminary opinion that even if the other objections which it had raised were to be overcome, the subject-matter of claims 1 and 10 would lack novelty or at least an inventive step over D1.

VIII. With a letter of reply dated 21 September 2010, the appellant filed a new request comprising claims 1-10.

IX. At the oral proceedings held as scheduled on 13 October 2010, the appellant submitted an auxiliary request comprising claims 1 to 6.

X. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of claims 1 to 10 filed with the letter dated 21 September 2010 (main request) or in the alternative on the basis of claims 1 to 6 submitted at the oral proceedings of 13 October 2010 (auxiliary request).

The further documents on which the appeal is based, i.e. the text of the description and the drawings, are as follows:

Description, pages:

1, 3-9 as originally filed;

2, 2a, 2b, 2c, 10 as filed with the letter dated 13 December 2006.

Drawings, sheets:

1/1 as originally filed.

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

"A device for determining link quality of an OFDM communication link having a pilot sub-carrier, the device comprising means for determining a signal power of an OFDM signal transmitter [*sic*] over the OFDM communication link; and means for subtracting a characteristic of a pilot signal received on the pilot sub-carrier that is received with a received data symbol from a channel coefficient determined

from a training symbol received over the communication link to allow determination of a distortion measurement, wherein the distortion measurement provides a link quality determination for the communication link."

Claim 10 of the main request reads as follows:

"A method for determining link quality of an OFDM communication link having a pilot sub-carrier, the method comprising determining a signal power of an OFDM signal transmitted over the OFDM communication link; and comparing a characteristic of a pilot signal received on the pilot sub-carrier that is received with a received data symbol with a channel coefficient determined from a training symbol received over the communication link to allow determination of a distortion measurement, wherein the distortion measurement provides a link quality determination for the communication link."

XII. Claim 1 of the auxiliary request reads as follows:

"A device for determining link quality of an OFDM communication link having a pilot sub-carrier, the device comprising means for determining a signal power of an OFDM signal transmitter [*sic*] over the OFDM communication link; and means for calculating a noise and interference value for a pilot signal associated with a received data symbol by subtracting a pilot subcarrier $P_i(k)$ received with the received data symbol from a pilot subcarrier channel coefficient estimate H_i, wherein the pilot subcarrier $P_i(k)$ has been corrected for phase compensation; and

means for determining a modulation mode based upon the ratio of the signal power of the received data symbol to the noise and interference value."

Claim 6 of the auxiliary request reads as follows:

"A method for determining link quality of an OFDM communication link having a pilot sub-carrier, the method comprising determining a signal power of an OFDM signal transmitted over the OFDM communication link; calculating a noise and interference value for a pilot signal associated with a received data symbol by subtracting a pilot subcarrier $P_i(k)$ received with the received data symbol from a pilot subcarrier channel coefficient estimate H_i, wherein the pilot subcarrier $P_i(k)$ has been corrected for phase compensation; and determining a modulation mode based upon the ratio of the signal power of the received data symbol to the noise and interference value".

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

Reasons for the Decision

1. *Admissibility*

1.1 The appeal complies with the provisions of Articles 106 to 108 EPC 1973 which are applicable according to J 0010/07, point 1 (cf. Facts and Submissions, item IV. above). Therefore it is admissible.

Main request

2. *Article 84 EPC 1973*

2.1 Claim 1 of the main request is directed towards a device for determining link quality of an OFDM communication link having a pilot sub-carrier. The claimed device comprises *inter alia* "means for subtracting a characteristic of a pilot signal received on the pilot sub-carrier that is received with a received data symbol from a channel coefficient determined from a training symbol received over the communication link". According to the wording of claim 1, the means for subtracting operates "to allow determination of a distortion measurement, wherein the distortion measurement provides a link quality determination for the communication link".

2.2 The term "distortion measurement" was not used in the description as originally filed. Whereas the amendments introduced with page 2a of the description provide formal, literal support for the term "distortion measurement", the apparent absence of any further use or explanation of the term in the description means there is no basis on which a clear definition of the

term and its implied technical limitation can be established. The board therefore finds that said term is inherently unclear in the given context.

2.3 The preferred embodiment of the invention is based on the calculation of a signal to noise/interference ratio (SNIR) as disclosed for example in [0032] of the published application. The SNIR is used to determine an appropriate modulation mode (cf. published application: [0035]). The term "distortion measurement" used in claim 1 is evidently an attempt to generalise the SNIR calculation of the preferred embodiment of the invention. The board is, however, unable to accept that the description provides a basis for such a generalisation for the reasons which follow.

2.4 In the technical field of telecommunications to which the subject-matter of the present application pertains, the term "distortion" conventionally denotes an undesired deformation of a signal due to the non-ideal response of the transmission channel. In this regard reference is made to D3 which is a Standard Dictionary of Electrical and Electronic Terms issued by the IEEE. The definition given in D3 under "distortion (1)" clearly relates to distortion in the context of data transmission (cf. D3: entry for "distortion", p.280, in particular "distortion (1)(data transmission)") and is therefore pertinent to the technical field of the present application. Common types of distortion are amplitude, frequency and phase distortion (cf. relevant entries on pages 36, 391 and 684 of D3).

The term "noise" is conventionally used in the relevant technical field to denote unwanted disturbances which

are superposed upon a desired signal and which tend to obscure its information content (cf. D3: entry for "noise", p.617, in particular "noise (2) (data transmission)(general)"). Such disturbances are typically of a random or unpredictable nature. The term "interference" is likewise conventionally used in the relevant technical field to denote an unwanted disturbance due to extraneous power which tends to interfere with the reception of the desired signal (cf. D3: entry for "interference", p.490-491, in particular "interference (1)(data transmission)").

"Interference" is sometimes considered as a particular type of "noise" (cf. D3: entry for "noise" p.617, items (2) and (3); entry for "signal-to-interference ratio", p.899). In this regard, reference is made to the background art disclosed in [0006] of D2 where the terms signal-to-noise ratio (SNR) and signal to noise/interference ratio (SNIR) are used as examples of values providing an indication of how much noise and/or interference is present in a system.

Although the terms "noise" and "interference" are conceptually related inasmuch as they both denote unwanted disturbances to a signal from extraneous sources, according to conventional usage in the relevant technical field the term "distortion" denotes a perturbation of a signal which is conceptually distinct from the addition of "noise" and "interference". An illustrative example of such conventional usage of the aforementioned terms can be found in [0075] of D1.

2.5 It is further noted in this regard that, consistent with the conventional usage discussed above, the present application itself also draws a distinction between "distortion" and "noise and/or interference". In particular, in [0005] of the published application, the following is stated (emphasis added):
"*During transmission and reception of an OFDM signal the signal will be attenuated and distorted by a frequency selective channel ... in addition to noise and/or interference being added to the signal on each sub-carrier. The combination of noise and/or interference defines the quality of a communication channel (i.e. communication link) and is called the link quality.*"

The above-cited passage of the description effectively draws a distinction between the attenuation and distortion of the signal on the one hand and the addition of noise and/or interference to the signal on the other hand.

2.6 In the board's judgement neither conventional usage in the relevant technical field nor the particular terminology employed in the present application would lead the skilled person to conclude that the term "distortion" is synonymous with or includes within its scope the addition of noise and/or interference to a signal. The board therefore finds that the use of the term "distortion measurement" in claim 1 results in a characterisation of the invention in terms which are not supported by the description.

2.7 In view of the foregoing the board finds that claim 1 of the main request fails to comply with the

requirements of Article 84 EPC 1973 in respect of clarity and support by the description (cf. in particular 2.2 and 2.6 above). This finding likewise applies to claim 10 of the request.

Auxiliary request

3. *Article 84 EPC 1973*

3.1 Claim 1 of the auxiliary request differs from claim 1 of the main request in that the "means for subtracting" has been replaced by "means for calculating a noise and interference value for a pilot signal associated with a received data symbol by subtracting a pilot subcarrier $P_i(k)$ received with the received data symbol from a pilot subcarrier channel coefficient estimate H_i, wherein the pilot subcarrier $P_i(k)$ has been corrected for phase compensation" and in that claim 1 of the auxiliary request additionally specifies "means for determining a modulation mode based on the ratio of the signal power of the received data symbol to the noise and interference value".

3.2 In view of the fact that claim 1 of the auxiliary request no longer uses the disputed term "distortion measurement" but refers more specifically to a "noise and interference value", the board finds that the amendments to said claim overcome the objections detailed under 2. above.

3.3 The board is further satisfied that the amendments to claim 1 of the auxiliary request are supported by the description. The requisite support can be found, for

example, in [0029] and [0035] of the published application.

3.4 It is noted that claim 1 as currently worded specifies "means for determining a signal power of an OFDM signal transmitter [*sic*] over the OFDM communication link". Referring to the amendment previously made in this respect to claim 1 of the claim set submitted with the notice and grounds of appeal (cf. Grounds of Appeal: item 3) and likewise to the wording of claim 6 of the present request, the use of the word "transmitter" instead of "transmitted" in the present claim 1 evidently constitutes a minor typographical error arising from the amendment of the claims during the appeal proceedings. Given that this error can be readily recognised and corrected the board takes the view that, under the given circumstances, it does not impair the clarity of the claimed subject-matter.

3.5 In view of the foregoing, the board finds that claim 1 of the auxiliary request complies with the requirements of Article 84 EPC 1973. Claim 6 of the request is also found to comply with these requirements.

4. *Article 83 EPC 1973*

4.1 Referring to the objections raised under Article 83 EPC 1973 in the decision under appeal (cf. Facts and Submissions, item III), the board does not concur with these objections for the reasons which follow.

4.2 Concerning the objection to the effect that the description fails to disclose a way of determining the average signal power, the board notes that the equation

disclosed for estimating the average signal power (cf. published application: [0026]) appears to be substantially the same as equation (1) disclosed in [0085] of D1. On this basis the board judges that the method of determining the average signal power disclosed in the application corresponds to conventional practice in the relevant technical field as evidenced by D1.

Even if, as submitted by the examining division, the equation of [0026] were only to be considered valid in the case of a transmitted signal of unit amplitude, then it would effectively represent the unit average signal power, i.e. a normalised value. In the present case, the board judges that the skilled person would not require the exercise of inventive skill to modify the disclosed equation to suit the particular circumstances in which it is to be applied.

4.3 Concerning the objection to the effect that it is unclear how the disclosed subtraction of the pilot subcarrier from a dimensionless channel coefficient could lead to an estimate of noise and interference, the board notes that the channel coefficient estimate can evidently be used for determining the average signal power (cf. observations under 4.2 above). The board takes the view that in the given context the channel coefficient estimate can be considered to represent an estimated signal value, or at least a normalised form of such a value. The board therefore finds that the equations disclosed in [0029] and [0030] of the published application (corresponding to p.7 l.10-23 of the application as filed), provide a sufficient basis for calculating an estimate of noise

and interference on the pilot sub-carrier channels. In the present case, the board judges that the skilled person would not require the exercise of inventive skill to modify the disclosed equations to suit the particular circumstances in which they are to be applied.

4.4 Concerning the objection to the effect that the calculation of the Signal to Noise and Interference Ratio (SNIR)is based on calculating the ratio of average signal power to average energy for the pilot signal noise and interference which would lead to a quantity having the dimension of [sec^{-1}] whereas the SNIR should be a dimensionless ratio, the following is noted.

Whereas the term "power" is conventionally used to denote energy per unit time and the ratio of "power" to "energy" could generally be expected to have the dimension of [sec^{-1}], the board takes the view that under the given circumstances it is not appropriate to draw such a conclusion in respect of the SNIR value calculated in accordance with the equation disclosed in [0032] of the published application. Although the description states that SNIR is calculated as the ratio of the "average signal power" and the "average energy for the pilot signal noise and interference", the latter term appears to be a misnomer in the given context. The apparent intention is to denote the average noise and interference power associated with the pilot sub-carriers.

Given the squaring of the numerator values in the equations disclosed in [0026] and [0030] of the

published application, the board judges that it is reasonable to conclude that the values for the "average signal power" and the "average energy [*sic*] for the pilot signal noise and interference" calculated on the basis of said equations have the same dimensions.

For these reasons the board finds the aforementioned objection concerning the calculation of the SNIR to be without merit.

4.5 In view of the foregoing, the board is satisfied that the invention as defined by the independent claims of the auxiliary request has been disclosed in a manner sufficiently clear and complete to comply with the requirements of Article 83 EPC 1973.

5. *Remittal*

5.1 As indicated above, the board is satisfied that the independent claims of the auxiliary request comply with the requirements of Article 84 EPC 1973 and that the claimed invention is disclosed in a manner compliant with the requirements of Article 83 EPC 1973.

5.2 Claim 1 of the auxiliary request specifies the calculation of a noise and interference value for a pilot signal associated with a received data symbol by subtracting a pilot subcarrier $P_i(k)$ received with the received data symbol from a pilot subcarrier channel coefficient estimate H_i wherein the pilot subcarrier has been corrected for phase compensation. Claim 6 of the request has been amended in a corresponding manner.

5.3 The specification relating to the phase correction of the pilot subcarrier introduces subject-matter which was not previously incorporated into the independent claims. The board notes that the examining division expressed an opinion on a dependent claim comprising similar subject matter in an *obiter dictum* following the decision under appeal (cf. decision: III Further remarks, item 2.1, p.12). In support of its opinion the examining division made reference to following document:

D2: US 2003/076900 A.

As far as can be determined, the document D2 which was cited in the European Search Report was mentioned for the first time by the examining division in the aforementioned *obiter dictum* and had not been referred to in any preceding official communication. The board therefore finds that the opinion expressed by the examining division in said *obiter dictum* is not based on grounds or evidence on which the appellant had an opportunity to present comments during the first instance proceedings.

5.4 Under the given circumstances, the board considers it appropriate to exercise its discretion to remit the case to the department of first instance for further prosecution in accordance with Article 111(1) EPC 1973 in order to safeguard the appellant's right to have all outstanding matters concerning compliance with the requirements of the EPC, in particular the novelty and inventive step requirements, decided at two instances.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.

2. The case is remitted to the department of first instance for further prosecution on the basis of claims 1 to 6 submitted at the oral proceedings, i.e. the appellant's auxiliary request.

The Registrar: The Chair:

K. Götz A. Ritzka