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Datasheet for the decision of 22 May 2012

Case Number: T 2185/08 - 3.5.03

Application Number: 02757280.9

Publication Number: 1436903

IPC: H04B 1/38, H04L 1/00

Language of the proceedings: EN

Title of invention:
Asymmetric adaptive modulation in a wireless communication system

Applicant:
WI-LAN, Inc.

Headword:
Asymmetric adaptive modulation/WI-LAN

Relevant legal provisions:
EPC Art. 56

Keyword:
"Main request - admissible (yes); inventive step (no)"
"Auxiliary request - only to be considered if main request not admissible"

Decisions cited:
-

Catchword:
-

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Case Number: T 2185/08 - 3.5.03

D E C I S I O N
of the Technical Board of Appeal 3.5.03
of 22 May 2012

Appellant: (Applicant)
WI-LAN, Inc.
11 Holland Avenue, Suite 608
Ottawa ON K1Y 4S1 (CA)

Representative:
Harding, Richard Patrick
Marks & Clerk LLP
4220 Nash Court
Oxford Business Park South
Oxford OX4 2RU (GB)

Decision under appeal:
Decision of the Examining Division of the European Patent Office posted 23 June 2008 refusing European patent application No. 02757280.9 pursuant to Article 97(2) EPC.

Composition of the Board:

Chairman: A. S. Clelland
Members: T. Snell
M.-B. Tardo-Dino

Summary of Facts and Submissions

I. This appeal is against the decision of the examining division refusing European patent application No. 02757280.9, with international publication number WO-A-03/019805. The decision was based on the ground that the subject-matter of the claims of a main request and two auxiliary requests did not meet the requirement of inventive step under Article 56 EPC having regard to the disclosure of the document

D1 WO-A-00/76109

II. In an earlier communication issued by the examining division dated 21.03.2007, the following documents relevant to the board's decision were cited:

D5: Pearce et al: "Comparison of counter-measures against slow Rayleigh fading for TDMA systems", IEE Colloquium on Advanced TDMA Techniques and Applications, 28 October 1996;

D6: Blogh et al: "Dynamic Channel Allocation Techniques Using Adaptive Modulation and Adaptive Antennas", IEEE Journal on selected areas in communications, Vol. 19, No. 2, February 2001.

III. In the notice of appeal the appellant requested that the decision "be cancelled in its entirety". The appellant maintained the main and auxiliary requests on file, and conditionally requested oral proceedings.

IV. With the statement of grounds of appeal the appellant filed claims of a main request and an auxiliary request

intended to replace the requests on file. The appellant also submitted "an executed affidavit in support of the Appeal" in the name of Jung Yee, said to be Chief Technical Officer of Wi-LAN Inc (ie the applicant/appellant).

V. In a communication pursuant to Rule 100(2) EPC, the board introduced, *inter alia*, the following document by virtue of its power under Article 114(1) EPC:

D10: EP-A-0903883.

The board gave a preliminary opinion that the subject-matter of claims 1 and 7 of both requests was not new with respect to the disclosure of document D10 (Articles 52(1) and 54 EPC).

VI. In response to the board's communication, the appellant submitted an amended main request and withdrew the auxiliary request.

VII. In a communication accompanying a summons to oral proceedings the board gave a preliminary opinion that the subject-matter of claims 1 and 7 of the sole request did not involve an inventive step (Article 52(1) and 56 EPC). The board considered that the reasoning set out by the examining division in the communication dated 21.03.2007, which made reference to documents D5 and D6, also applied when starting out from document D10 instead of document D1.

VIII. In response to the summons, the appellant indicated that it would not attend the oral proceedings. Instead the appellant submitted written comments on the board's

inventive step objection together with an amended main request. As an auxiliary request, in case the board decided not to admit the new main request, the appellant requested that the decision be "based on the original main request".

IX. Oral proceedings were held on 22 May 2012 in the absence of the appellant. The board understood from the written proceedings that the appellant requested that the decision be set aside and a patent granted on the basis of the main request filed with the letter dated 2 April 2012. In the event that the Board decided not to admit the proposed amendments to the main request, the appellant requested that the decision be "based on the original main request". After deliberation, the board's decision was announced at the end of the oral proceedings.

X. Claim 1 of the appellant's main request reads as follows:

"A wireless communication system (100) including a base station (102) and at least one customer premises equipment (CPE) (104), wherein a downlink (110) is established between a base station and the CPE(s), and wherein an uplink (112) is established between the CPE(s) (104) and the base station (102), and wherein the wireless communication system (100) comprises:

a first modem (108) in the CPE(s) (104) configured to measure a first link quality based on downlink data received at the CPE(s) (104);

a second modem (108) at the base station (102) configured to measure a second link quality based on uplink data received at the base station (102);

a first processor (210) located at the CPE(s) (104) for determining a modulation scheme; and

a second processor (210) located at the base station (102) for determining a modulation scheme;

characterized in that:

the first processor (210) is configured to receive the first link quality and periodically during a communication adaptively select a downlink modulation scheme (Ml, M2, M3, M4) from a plurality of modulation schemes of different degrees of robustness and having defined relationships with respective first link qualities, and wherein a transition from a less robust modulation scheme to a more robust downlink modulation scheme occurs when the first link quality falls below a first threshold and a transition from the more robust modulation scheme to the less robust modulation scheme occurs when the first link quality rises above a second threshold, which is higher than the first threshold;

the CPE (104) is configured to send a request identifying the selected downlink modulation scheme to the base station (102);

the second processor (210) is configured to receive the second link qualities and periodically during a communication adaptively select an uplink modulation scheme from a plurality of modulation schemes of different degrees of robustness and having defined relationships with respective second link qualities, and wherein a transition from a less robust modulation scheme to a more robust modulation scheme occurs when the second link quality falls below a third threshold and a transition from the more robust modulation scheme to the less robust modulation scheme occurs when the second link quality rises above a fourth threshold, which is higher than the third

threshold, and wherein the third and fourth thresholds are different from the first and second thresholds;

the base station (102) is configured to send a request identifying the selected uplink modulation scheme to the CPE(s) (104);

wherein the base station (102) employs the downlink modulation scheme (Ml, M2, M3,) for the CPE(s) determined by the first processor, and
wherein the CPE(s) (104) employ(s) the uplink modulation scheme determined by the second processor (108); and

whereby each of the plurality of uplink and downlink modulation schemes used by each of the CPE(s) (104) can be asymmetric such that the uplink modulation scheme for each CPE may be different from the downlink modulation scheme."

XI. For the reasons given below, it is not necessary to reproduce claims of the auxiliary request.

Reasons for the Decision

1. *Admissibility of the request filed with the letter dated 2 April 2012*

The board introduced document D10 into these appeal proceedings (Article 114(1) EPC). It was therefore fair and equitable that the appellant be able to amend the claims in response to the citing of this document, which the appellant did in response to the board's communication under Rule 100(2) EPC. The further amendment filed in response to the summons to oral proceedings did not introduce any procedural or

technical complexity preventing the board's dealing with the request at the oral proceedings. Hence, the board decided to admit the request (cf. Article 13(1) RPBA).

2. *Article 113(1) EPC*

The board discussed the issue of inventive step in its two communications. The appellant submitted arguments in writing on this issue, stated that it would not attend the oral proceedings, and requested that a decision be reached based on the written submissions. Given that the present decision is based on the prior art discussed in the board's communication, the appellant's right to be heard has been respected in accordance with Article 113(1) EPC.

3. *Inventive step (Articles 52(1) and 56 EPC)*

3.1 The board regards document D10 as representing the closest prior art.

3.2 Using the language of claim 1, document D10 discloses a wireless communication system (Fig. 3) including a base station (26) and at least one customer premises equipment (CPE) ("mobile station 38"), wherein a downlink (48) is established between a base station and the CPE(s), and wherein an uplink (50) is established between the CPE(s) and the base station, and wherein the wireless communication system (100) comprises:
a first modem ("Adaptive channel decoder and demodulator 62" combined with "Channel quality measurement 100") in the CPE(s) configured to measure a

first link quality based on downlink data received at the CPE(s) (col. 7, lines 14-22);
a second modem ("Adaptive channel decoder and demodulator 78" combined with "Channel quality measurement 78") at the base station configured to measure a second link quality based on uplink data received at the base station (paragraph 0026);
a first processor (100) located at the CPE(s) for determining a modulation scheme ("channel type", cf. col. 7, lines 22-25 and col. 8, lines 6-18); and
a second processor (78) located at the base station for determining a modulation scheme (paragraph 0026);
wherein:
the first processor (100) is configured to receive the first link quality and periodically during a communication adaptively (cf. col. 3, lines 44-47) select a downlink modulation scheme (eg 4, 8 or 16-DPSK, cf. col. 8, lines 16-18) from a plurality of modulation schemes of different degrees of robustness and having defined relationships with respective first link qualities (col. 7, lines 19-29), and wherein a more robust modulation scheme ("4-DPSK") is selected if the first link quality falls below a first threshold (17dB; cf. col. 11, lines 39-50 and Fig. 7) and a less robust modulation scheme ("16-DPSK") is selected if the first link quality rises above a second threshold (23dB);
the CPE (38) is configured to send a request ("downlink channel type request control information") identifying the selected downlink modulation scheme to the base station (col. 7, lines 34-39);
the second processor is configured to receive the second link quality and periodically during a communication adaptively select an uplink modulation

scheme from a plurality of modulation schemes of different degrees of robustness and having defined relationships with respective second link qualities, and wherein a more robust modulation scheme is selected if the second link quality falls below a third threshold and a less robust modulation scheme is selected if the second link quality rises above a fourth threshold the base station (26) is configured to send a request identifying the selected uplink modulation scheme to the CPE(s) (cf. paragraph 0026);
wherein the base station (26) employs the downlink modulation scheme for the CPE(s) determined by the first processor (col. 5, lines 31-52; NB: see point 3.3 below), and
wherein the CPE(s) employ(s) the uplink modulation scheme determined by the second processor and
whereby each of the plurality of uplink and downlink modulation schemes used by each of the CPE(s) can be asymmetric such that the uplink modulation scheme for each CPE may be different from the downlink modulation scheme (implicit).

3.3 With regard to the feature that the base station (26) employs the downlink modulation scheme for the CPE(s) determined by the first processor, in accordance with document D10 the mobile station sends a request for a particular channel type ("downlink channel type request", cf. col. 5, line 33). This information is then used by the base station to perform a "downlink channel type designation" (cf. col. 5, line 37). Although according to the size of the transmission queue, the base station may designate a more robust channel type (cf. col. 5, line 52 - col. 6, line 1),

the skilled person would understand that normally the designated channel type would be the same as the requested channel type (cf. col. 5, lines 49-52), ie the one "determined by the first processor", as required by claim 1.

3.4 The appellant argued that it is not clear that document D10 discloses an asymmetric scheme. However, in the board's view the skilled person would regard this as implicit because in D10 separate and independent circuitry is provided for selecting a coding and modulation scheme for each direction of communication (cf. paragraph [0026]). Therefore, the downlink adaptive channel coder and modulator 60 will not necessarily select the same scheme as the corresponding uplink coder and modulator 76, since, for example, the respective channel quality measurements may be different. The appellant refers to paragraph [0014] which states that "The second path is symmetric to the first". However, in the board's view this only means that each path has the same circuit elements, not that the coding and modulation scheme is necessarily the same in each direction of communication.

3.5 The subject-matter of claim 1 differs from the disclosure of document D10 essentially in that the downlink and the uplink modulation schemes are selected such that, on the downlink, a transition from a less robust modulation scheme to a more robust modulation scheme occurs when the first link quality falls below a first threshold and a transition from the more robust modulation scheme to the less robust modulation occurs when the first link quality rises above a second threshold, which is higher than the first threshold,

and, on the uplink the same occurs with respect to a third threshold and a fourth threshold, whereby the first and second thresholds are different to the third and fourth thresholds.

3.6 Leaving aside for the time being the requirement that the first and second thresholds are different to the third and fourth thresholds, the effect of this distinguishing feature is that hysteresis is introduced into the switching behaviour in both directions of communication.

3.7 The board observes that when a hysteresis feature was added to the independent claims during the examining procedure (and subsequently removed), the examining division cited two new documents D5 and D6 and commented as follows (cf. the communication dated 21 March 2007, point 1):

> "The differences between the subject-matter of Dl and that of the claim is as indicated in the letter of the Applicant of 20.2.2007 that the threshold for switching between a first modulation scheme to a second modulation scheme is higher than the threshold for switching in the inverse direction (i.e. from the second to the first).
>
> The objective technical problem is dealing with the fading fluctuation around each switching threshold. Both this problem as well as the corresponding typical solution are well-known for the skilled person, not only in the particular case of switching between modulation

schemes but in all cases wherein a switch is performed in wireless communication (for instance the classic ping-pong effect when switching between base stations -i.e. handover-). For the particular case of adaptive modulation, D5 and D6 are provided as exemplary documents revealing the solution, i.e. the use of hysteresis (see D5, page "9/5", last line-page "9/6", first line; and D6, page 313, left-hand column, third paragraph, last sentence and page 314, left-hand column, 5-7), which is precisely what is being defined in the last two steps of the claim.

Therefore, the skilled person, departing from document D1 and employing common general knowledge (known for instance from either D5 or D6) would arrive without any inventive merit to *[sic]* the subject-matter of claim 1, which consequently is not allowable in view of the requirements or *[sic]* Article 56 EPC."

In the view of the board, the same argument applies, *mutatis mutandis*, when starting out from document D10 instead of D1. This point has not been contested by the appellant.

3.8 Claim 1 further requires that the first and second thresholds are different to the third and fourth thresholds.

The appellant argues that document D10 expressly states that the paths are symmetrical and that documents D5 and D6 relate to symmetrical systems. Hence, if D5 and

D6 were applied to D10, the natural result would be a symmetrical system employing the same thresholds in both directions. This argument is implicitly based on the fact that the third and fourth thresholds correspond to the first and second thresholds in that they relate to the switching between the same two modulation schemes. For the sake of argument, the board interprets the claim in the same way.

3.9 The appellant argues that interference powers are different on the uplink and downlink, and that base stations are not restrained by the same cost and space requirements as customer premises equipment, so that the base station can tolerate a less robust modulation scheme. Under these circumstances, the use of asymmetric thresholds provides for more accurate selection of the modulation scheme. The appellant also argues that "the objective technical problem in the light of D10 can therefore be stated as to how to maximize the efficiency of the communication system by maintaining maximum overall data throughput at all times in the system while at the same time preventing the modulation schemes from changing rapidly taking into account the different conditions in the two directions.... This problem is not recognized in the prior art. The recognition of the problem forms part of the inventive step".

However, these arguments in the board's view are based on unsupported assertions. The board notes that the use of different thresholds is only briefly mentioned in the description (cf. page 11, lines 3 to 5) without any explanation as to its significance or what problem is solved.

Moreover, the fact that a base station receiver would be designed to a higher specification and hence more robust than a receiver in a customer premises equipment is, in the board's view, obvious. This is corroborated by the affidavit of Mr Yee (cf. point 8), according to which it was well-known that mobile units or CPEs vary significantly in performance, implying that a given CPE receiver will not in general have precisely the same specification as a base station receiver.

In accordance with D10 the switching thresholds are based on curves of throughput versus signal-to-noise ratio for each modulation type (cf. Figs. 6 and 7 of D10). Given that these curves are implicitly dependent on the receiver specification, the skilled person would necessarily be led to use different thresholds in each direction of communication without having to exercise inventive skill. Hence the board finds the appellant's arguments unconvincing.

3.10 In the affidavit of Mr Yee it is further argued that "a significant advantage of the [invention] is that, because a receiver knows its own capabilities for a given channel quality, it can always select the modulation scheme best suited for that particular receiver". However, this is also the case with the system of document D10.

3.11 Therefore, the board concludes that the subject-matter of claim 1 does not involve an inventive step (Articles 52(1) and 56 EPC).

4. *Auxiliary request*

In response to the summons to oral proceedings, the appellant stated that "In the event that the Board decides not to admit the proposed amendments to the main request, we request that the decision is based on the original main request".

The board understands the wording "not to admit the proposed amendments to the main request" in the procedural sense of "not to consider claim 1 of the main request in respect of its substantive merits".

As the board decided to admit the main request, it follows that it is not necessary to consider the "original main request".

5. *Conclusion*

As claim 1 of the main request is not allowable, the main request as a whole is not allowable. As there are no other requests to be considered, it follows that the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Rauh A. S. Clelland