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**Datasheet for the decision
of 15 May 2012**

Case Number: T 1459/08 - 3.5.05
Application Number: 03003603.2
Publication Number: 1337062
IPC: H04L 1/00, H04L 27/26
Language of the proceedings: EN

Title of invention:

Method and system for link adaption in high-speed communications depending on link quality, thus reducing cross-talk and avoiding bridged taps

Applicant:

Broadcom Corporation

Headword:

Method and system for link adaption/BROADCOM

Relevant legal provisions:

EPC Art. 83
EPC R. 42(1)(e)
RPBA Art. 12(2), 12(4), 13(1)

Keyword:

"Admissibility of the requests (second and third auxiliary request: no)"
"Sufficiency of disclosure (main, first and fourth auxiliary request: no)"

Decisions cited:

T 0171/84

Catchword:

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Case Number: T 1459/08 - 3.5.05

D E C I S I O N
of the Technical Board of Appeal 3.5.05
of 15 May 2012

Appellant: Broadcom Corporation
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Decision under appeal: Decision of the Examining Division of the
European Patent Office posted 23 January 2008
refusing European patent application
No. 03003603.2 pursuant to Article 97(2) EPC.

Composition of the Board:

Chair: A. Ritzka
Members: P. Corcoran
D. Prietzel-Funk

Summary of Facts and Submissions

- I. This appeal is against the decision of the examining division to refuse the European patent application no. 03 003 603.2, publication no. EP 1 337 062. The decision was announced during oral proceedings on 6 December 2007 and the written reasons were dispatched on 23 January 2008.
- II. The decision under appeal was based on a request comprising a set of claims 1 to 4 filed with the letter of 6 November 2007.
- III. The examining division found that claims 1, 2 and 4 of said request did not meet the requirements of Article 123(2) EPC because they contained subject-matter that extended beyond the content of the application as originally filed.
- IV. Notice of appeal was received at the EPO on 19 March 2008 with the appropriate appeal fee being paid on the same date. A written statement setting out the grounds of appeal was received at the EPO on 2 June 2008. Two new requests were filed with said written statement: a main request and an auxiliary request, each of said requests comprising claims 1 to 4.
- V. Claim 1 of the main request filed with the written statement setting out the grounds of appeal reads as follows:
- "A method for improving communications performance between high speed communications devices, comprising the steps of:

- (a) establishing (505) a communications link between a central office, CO, modem (102) and a customer premise equipment, CPE, modem (106), wherein said communications link uses a default upstream carrier frequency;
- (b) evaluating (510) the performance of said communications link by measuring a signal-to-noise ratio;
- (c) identifying (515) cross-talk on said communications link based upon the measured signal-to-noise ratio;
- (d) reducing said identified cross-talk by determining (520) an adjusted upstream carrier frequency; and
- (e) establishing (525) an adjusted communications link between said CO modem (102) and said CPE modem (106), wherein said adjusted communications link uses said adjusted upstream carrier frequency."

Claim 4 of the request is a further independent claim directed towards a corresponding system.

VI. Claim 1 of the auxiliary request filed with the written statement setting out the grounds of appeal reads as follows:

"A method for improving communications performance between high speed communications devices, comprising the steps of:

- (a) establishing (505) a communications link between a central office, CO, modem (102) and a customer premise equipment, CPE, modem (106), wherein said communications link uses a default upstream carrier frequency;

(b) evaluating (510) the performance of said communications link by measuring a signal-to-noise ratio, the signal-to-noise ratio based upon an output power of the CPE modem and losses in said communications link;

(c) identifying (515) cross-talk on said communications link based upon the measured signal-to-noise ratio;

(d) reducing said identified cross-talk by determining (520) an adjusted upstream carrier frequency; and

(e) establishing (525) an adjusted communications link between said CO modem (102) and said CPE modem (106), wherein said adjusted communications link uses said adjusted upstream carrier frequency."

Claim 4 of the request is a further independent claim directed towards a corresponding system.

VII. In said written statement, the appellant made submissions to the effect that the originally filed claim 1 and paragraphs [0047] and [0048] of the originally filed description provided a basis for claim 1 of the main request and that the additional features of claim 1 of the auxiliary request were likewise supported by paragraphs [0047] and [0048] of the originally filed description. On this basis, it was argued that the new requests complied with Article 123(2) EPC. The appellant additionally made submissions contesting the relevance of D1 to the subject-matter claimed of said requests.

- VIII. In a communication accompanying a summons to oral proceedings, the board gave its preliminary opinion that the appeal was not allowable.
- IX. In its communication the board, *inter alia*, expressed reservations as to whether the claimed invention had been disclosed with sufficient clarity and completeness to comply with the requirements deriving from Article 83 and Rule 27(1)(e) EPC 1973 (corresponding to Rule 42(1)(e) EPC).

In particular, it was not immediately apparent on what basis the skilled person was supposed to be enabled to put into practice the claim feature of "identifying ... cross-talk on said communications link based upon the measured signal-to-noise ratio".

The board informed the appellant that it was of the opinion that the description neither provided any illustrative examples as to how particular types of impairments such as cross-talk or bridged taps were to be identified nor did it explicitly identify or otherwise indicate what general knowledge the skilled person was supposed to rely on in this regard.

It was further noted that, if it were to be assumed that the apparent deficiencies in the disclosure could be bridged by the skilled person on the basis of his general technical knowledge, the onus was on the appellant to submit appropriate evidence of the relevant general knowledge at the priority date of the application.

X. The appellant was further advised that, having regard to Article 13(1) RPBA, the admissibility of any further amendments to the claims would have to be considered, in particular should such amendments give rise to a substantially new situation compared to that prevailing during first instance proceedings.

XI. With a letter of reply dated 16 April 2012, the appellant filed *inter alia* a further auxiliary request comprising claims 1 to 3. Claim 1 of this request reads as follows:

"A method for improving communications performance between high speed communications devices, comprising the steps of:

(a) establishing a communications link between a central office, CO, modem (102) and a customer premise equipment, CPE, modem (106), wherein said communications link uses a default upstream carrier frequency;

(b) evaluating the performance of said communications link by measuring a signal-to-noise ratio;

(c) identifying one or more impairments on said communications link based upon comparing the measured signal-to-noise ratio with predetermined thresholds, wherein said one or more identified impairments comprise bridged taps;

(d) determining an adjusted upstream carrier frequency that reduces said identified impairments;
and

(e) establishing an adjusted communications link between said CO modem and said CBE [*sic*] modem, wherein said adjusted communications link uses said adjusted upstream carrier frequency."

Claim 3 of the request is a further independent claim directed towards a corresponding system.

- XII. In the letter of 16 April 2012, the appellant made submissions *inter alia* concerning the question of sufficiency of disclosure. In this regard, it was asserted that, based on the disclosure of the specification as originally filed, the skilled person would know how to use predefined signal-to-noise (SNR) thresholds to identify the presence of bridged taps or cross-talk based upon comparing a measured SNR with the predefined SNR thresholds.

According to the appellant it lay within the general technical knowledge of a person of skill in the art to know typical magnitudes of SNR values expected to be measured in the presence or absence of specific types of impairments (e.g. in the presence of bridged taps only, cross-talk only, cross talk plus bridged taps, or with neither cross talk nor bridged taps), in order to use or construct predetermined thresholds that would aid in the identification of such impairments.

- XIII. During the oral proceedings held as scheduled on 15 May 2012, the appellant submitted two further auxiliary requests, initially filed as "Auxiliary Request 4" and "Auxiliary Request 5".

- XIV. Claim 1 of "Auxiliary Request 4" filed during oral proceedings reads as follows:

"A method for improving communications performance between high speed communications devices, comprising the steps of:

- (a) establishing (505) a communications link between a central office, CO, modem (102) and a customer premise equipment, CPE, modem (106), wherein said communications link uses a default upstream carrier frequency;
- (b) evaluating (510) the performance of said communications link based on evaluating several parameters related to said communications link, including signal to noise ratio, automatic gain control levels, bit error rates, and input power;
- (c) identifying (515) bridged taps on said communications link based on comparing information generated during said evaluating based on said parameters to predetermined thresholds;
- (d) avoiding nulls of said identified bridged taps by determining (520) an adjusted upstream carrier frequency;
- (e) establishing (525) an adjusted communications link between said CO modem (102) and said CPE modem (106), wherein said adjusted communications link uses said adjusted upstream carrier frequency."

Claim 3 of the request is a further independent claim directed towards a corresponding system.

XV. Claim 1 of "Auxiliary Request 5" filed during oral proceedings reads as follows:

"A method for improving communications performance between high speed communications devices, comprising the steps of:

- (a) establishing (505) a communications link between a central office, CO, modem (102) and a customer premise equipment, CPE, modem (106), wherein said

communications link uses a default upstream carrier frequency;

(b) evaluating (510) the performance of said communications link based on evaluating several parameters related to said communications link, including signal to noise ratio, automatic gain control levels, bit error rates, and input power;

(c) identifying (515) cross-talk and bridged taps on said communications link based on comparing information generated during said evaluating based on said parameters to predetermined thresholds;

(d) reducing said identified cross-talk and avoiding nulls of bridged taps by determining (520) an adjusted upstream carrier frequency;

(e) establishing (525) an adjusted communications link between said CO modem (102) and said CPE modem (106), wherein said adjusted communications link uses said adjusted upstream carrier frequency."

Claim 3 of the request is a further independent claim directed towards a corresponding system.

- XVI. The final requests are as follows. The appellant requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request filed with the statement setting out the grounds of appeal (cf. VI. above) or, subsidiarily, on the basis of one of the following auxiliary requests:
- (i) A first auxiliary request comprising claims 1 to 4, filed with the written statement setting out the grounds of appeal as "Auxiliary Request" (cf. VII. above);

- (ii) A second auxiliary request comprising claims 1 to 3, filed as with the letter of 16 April 2012 as "Auxiliary Request" (cf. XI. above);
- (iii) A third auxiliary request filed during the oral proceedings on 15 May 2012 as "Auxiliary Request 4" (cf. XIV. above);
- (iv) A fourth auxiliary request filed during the oral proceedings on 15 May 2012 as "Auxiliary Request 5" (cf. XV. above).

XVII. During the oral proceedings the board considered the appellant's requests and, in particular, raised questions concerning the admissibility of the second to fourth auxiliary requests. Insofar as it was prepared to admit the appellant's requests, the board expressed reservations as to whether the claimed subject-matter was disclosed in a manner sufficiently clear and complete to satisfy the requirements deriving from Article 83 and Rule 43(1)(e) EPC (formerly Rule 27(1)(e) EPC 1973).

XVIII. With respect to the question of admissibility, the board noted that the independent claims of the second to fourth auxiliary requests had been amended to incorporate subject-matter relating to bridged taps.

In the originally filed claims, independent claim 4 had been directed towards a general embodiment which specified "identifying one or more impairments". Claims 5 and 6 dependent thereon had been directed to particular embodiments in which the "impairments" of claim 4 were specified respectively as "bridged taps" (claim 5) and "cross-talk" (claim 6).

In the claims filed with the letter of 6 November 2007 on which the decision under appeal was based, the independent claims had been limited to the "cross-talk" embodiment. Subject-matter relating to the "bridged taps" embodiment, in particular claim 2 of the preceding claim set, i.e. as filed with the letter of 1 December 2005, had been deleted from the claims.

Thus, the subject-matter relating to the "bridged taps" embodiment had not been pursued to a final decision during examination proceedings. The appellant's case as filed with the written statement setting out the grounds of appeal gave no indication of an intention on the part of the appellant to pursue this subject-matter in the context of the appeal proceedings.

Referring to its discretionary powers under the Rules of Procedure of the Boards of Appeal, in particular Articles 12(4) and 13(1) RPBA, the board indicated that it had reservations about permitting the appellant to pursue the aforementioned requests at such a late point in the appeal proceedings.

- XIX. Concerning the question of sufficiency of disclosure, the board drew the appellant's attention to the observations made in this regard in its communication and noted that no evidence concerning the relevant general knowledge at the priority date of the application appeared to have been submitted.
- XX. The representative made oral submissions in support of the appellant's requests. The submissions of relevance to the main request and first and fourth auxiliary request are summarised as follows.

- (i) With respect to the main and first auxiliary request, it was submitted that [0046] of the published application disclosed the evaluation of the performance of the link by evaluating several parameters, including signal to noise ratio (SNR) and that [0049] further disclosed that once the communications link had been evaluated, the information generated could be compared to predetermined thresholds to determine the loop length and to identify any impairments on the link including cross-talk.

- (ii) With respect to the fourth auxiliary request, the representative submitted that the independent claims of this request related to an embodiment of the invention in which both cross-talk and bridged taps were identified. From [0044] and [0049] of the published application, it was evident that the application envisaged identifying both types of impairment and taking appropriate measures to reduce their adverse effects on link performance.

- (iii) Concerning the question of sufficiency of disclosure, the representative made submissions concerning the documents D3 (EP 0 987 852 A) and D4 (WO 01/35610 A) which were cited as being illustrative of the relevant general knowledge of the skilled person.

- (iv) With respect to D3, it was submitted that this document disclosed a plurality of curves used to characterise a transmission line in terms of signal strength as a function of frequency. In particular.

Fig.4 of said document illustrated a "noise floor" and the effects of self-FEXT and plurality of loop performance curves for differing loop lengths. From D3 the skilled person could be expected to understand that it was possible to evaluate a communications link using a plurality of parameters such that measured parameter values could be compared to specific threshold values such as a "noise floor".

- (v) With respect to D4, the representative referred to p.16 of the description, in particular 1.27-30, according to which "various tests may be conducted to provide an indication of the loop length and quality, including noise generation, and signal attenuation and distortion characteristic of the local loop".

- (vi) The representative further submitted a printout which was likewise alleged to be illustrative of the relevant general knowledge of the skilled person. Said printout comprised three pages in total, including one page each from the internet sites "www.google.com" and "books.google.nl" and a third page purporting to be an extract from a textbook entitled "Design and Engineering of Intelligent Communication Systems" authored by S. V. Ahamed and V. B. Lawrence and published in 1997.

Particular reference was made to two paragraphs of said purported textbook extract, the text of which reads as follows:

"In the loop plant, an ideal equalizer totally undoes the subscriber line attenuation and

dispersion. However, the implementation of this subscriber line inversion device is nontrivial due to the shape of the loss curves for the four (26, 24, 22, and 19) AWG cables in the 10 to 100 kHz band. This transition in the shape of the loss curves is depicted in Figure 6.19 for three wire common wire gauges. In the earlier analog equalizers, designs based on \sqrt{f} loss-inversion algorithm were introduced since the loss curve approximately follows an \sqrt{f} relationship. While this may be the case when the frequency is over 150 kHz, it is not true for the lower band of frequencies of interest for the DSL and HDSL applications. This disparity is illustrated in Figure 6.20. The performance of such equalizers was relatively poor and their use was abandoned in the 1970s.

Subscriber lines can display a wide range of attenuation and dispersion characteristics due to two major reasons: (a) gauge discontinuities and their associated loss curves; and (b) the presence of bridged taps. Both of these are accurately tracked by most of the simulation software. One typical simulation environment is presented in Chapter 9."

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

Reasons for the Decision

1. The appeal is admissible. However, the board finds that the appeal is not allowable for the reasons given below.

Admissibility of the appellant's requests

2. *Articles 12 and 13 RPBA*

- 2.1 According to Article 12(2) RPBA, the statement of grounds of appeal shall contain a party's complete case and specify expressly all the facts, arguments and evidence relied on.

- 2.2 Article 12(4) RPBA refers to the power of the board to hold inadmissible facts, evidence or requests which could have been presented or were not admitted in the first instance proceedings.

- 2.3 Article 13(1) RPBA stipulates that any amendment to a party's case after it has filed its grounds of appeal may be admitted and considered at the board's discretion. It further provides that the discretion shall be exercised in view of, *inter alia*, the complexity of the new subject-matter submitted, the current state of the proceedings and the need for procedural economy.

3. *Main and first auxiliary request - admissibility*

- 3.1 The main and first auxiliary requests were filed with the written statement setting out the grounds of appeal and seek protection for substantially similar subject-matter to the request on which the impugned decision

was based. Accordingly, these requests are not open to objections concerning their admissibility.

4. *Second and third auxiliary request - admissibility*

4.1 The second auxiliary request was filed with the letter of 16 April 2012 and thus constitutes an amendment to the appellant's case submitted at a relatively late stage of the appeal proceedings.

4.2 The third auxiliary request was filed during oral proceedings on 15 May 2012 and thus constitutes an amendment to the appellant's case submitted at an even later stage of the appeal proceedings than the preceding auxiliary request.

4.3 The independent claims of the second and third auxiliary request relate to a particular embodiment of the invention in which the communication link impairments that are to be identified are "bridged taps".

4.4 The independent claims of these requests seek protection for subject-matter which was no longer present in the claim set on which the decision under appeal is based, i.e. claims 1 to 4 filed with the letter of 6 November 2007, due to the deletion of subject-matter relating to the "bridged tap" embodiment from said claim set (cf. Facts and Submissions, item XVIII. above).

4.5 The second and third auxiliary request are requests which are limited to seeking protection for a particular embodiment of the invention and which could

have been, but were not, presented in the first instance proceedings (Article 12(4) RPBA). The actions of the appellant during first instance proceedings were such that it effectively chose not to pursue requests limited to the aforementioned particular embodiment with a view to obtaining a reasoned decision.

4.6 It is further noted in this regard that the written statement setting out the grounds of appeal contained no indication that the appellant intended to pursue such requests during the appeal proceedings (cf. Article 12(2) RPBA).

4.7 These requests, if admitted, would thus give rise to an unexpected shift in the focus of the appeal proceedings at a late stage of said proceedings. In the board's judgment, it would run counter to the need for procedural economy in the present case to admit such late-filed requests directed to a particular embodiment of the invention which had not been pursued during first instance proceedings (cf. 4.4 above).

4.8 The appellant advanced no convincing reasons as to why it should be permitted to introduce requests of this kind for the first time at such a late stage of the appeal proceedings.

4.9 In view of the foregoing, the board, exercising its discretion under Articles 12(4) and 13(1) RPBA, decided against admitting the second and third auxiliary request into the proceedings.

5. *Fourth auxiliary request - admissibility*

5.1 The fourth auxiliary request was also filed during oral proceedings on 15 May 2012 and likewise constitutes an amendment to the appellant's case submitted at a late stage of the appeal proceedings.

5.2 Although the independent claims of the fourth auxiliary request include subject-matter relating to the identifying of "bridged taps", this subject-matter is not claimed separately from but rather in combination with the identifying of "cross-talk". Given that the independent claims of the appellant's initial requests during appeal proceedings included features specifying the identifying of "cross-talk", the board takes the view that the fourth auxiliary request effectively constitutes a limitation of said initial requests rather than a substantially new request directed towards a separate embodiment of the invention which had not been pursued during first instance proceedings.

5.3 It is further noted that the fourth auxiliary request did not give rise to any issues which could not be dealt with without an adjournment of the oral proceedings.

5.4 In view of the foregoing, the board, exercising its discretion under Articles 12(4) and 13(1) RPBA, decided to admit the fourth auxiliary request into the proceedings despite the lateness of its filing.

Allowability of admitted requests

6. *Article 83 EPC and Rule 43(1)(e) EPC*

6.1 Article 83 EPC stipulates that the European patent application shall disclose the invention in a manner sufficiently clear and complete for it to be carried out by a person skilled in the art.

6.2 According to the associated Implementing Regulation, viz. Rule 43(1)(e) EPC (corresponding to the previous Rule 27(1)(e) EPC), the description shall describe in detail at least one way of carrying out the invention claimed, using examples where appropriate and referring to the drawings, if any.

6.3 The board finds that, having regard to the aforementioned requirements of the EPC, the admitted requests are not allowable for the reasons given below.

7. *Preliminary observations re the disclosure*

7.1 The present application relates to a method and system for link adaptation in high-speed communication links. The description discloses various types of "impairments" which can impede the performance of DSL modems used to establish such high-speed communication links (cf. published application: [0032]). Particular types of impairments mentioned in this regard are "cross-talk" and "bridged taps".

7.2 With respect to "cross-talk", the description discloses that it occurs in two forms (cf. published application: [0033] to [0038]): Far-End Cross-Talk (FEXT) and Near-

End Cross-Talk (NEXT). FEXT occurs when a significant number of modems are deployed in the same location and NEXT occurs when one modem receives the signals being transmitted by a neighbouring modem.

- 7.3 With respect to "bridged taps", the description discloses that bridged tap creates a "null" or "dip" in the frequency spectrum due to the signal travelling along the cable being reflected back into the transmitter. The depth of the null depends primarily on the distance of the tap from the modem such that a dip created by a tap close to the modem will be deeper than one created by a tap placed further away (cf. published application: [0040]).
- 7.4 In [0043] it is explained that bridged taps can cause a loss of signal energy at the frequency of the null and an increase in noise due to signal energy being reflected back to the transceiver. Thus a bridged tap can lower the signal-to-noise ratio by either reducing the incoming signal power or increasing the noise floor, or both.
- 7.5 Fig.5 is a flowchart of a method of improving communications between high-speed communications devices. In the embodiments of the invention according to Fig.5 which are disclosed in [0045] to [0050] of the description, a CO modem transmits and creates a communications link with a CPE modem during an initialization process in which the upstream carrier frequency is situated at a default position (cf. [0045]). After establishing the link, the CO modem then evaluates the performance of the link by evaluating several parameters, including for example, signal to

noise ratio (SNR), automatic gain control (AGC) levels, bit error rates, and input power (cf. [0046]).

Once the communications link has been evaluated, the information generated can be compared to predetermined thresholds by the CO modem to determine the loop length and to identify impairments on the link such as cross-talk or bridged taps (cf. [0049]). After identifying the impairments, the CO modem determines what adjustments the CPE modem should make to improve the performance of the communications link. In a preferred embodiment, the CO modem dictates a new carrier frequency for the upstream band (cf. [0050]).

Main request

8. *Claim 1*

8.1 Claim 1 relates to an embodiment of the invention according to Fig.5. The associated passages of the description (cf. published application: [0045] to [0050]) disclose that a CO modem establishes a communications link with a CPE modem using an upstream carrier frequency situated at a default position. The CO modem then evaluates the performance of the link, identifies impairments on the link and determines what adjustments the CPE modem should make to improve the performance of the communications link such as using a new carrier frequency for the upstream band.

8.2 Step (b) of claim 1 specifies the evaluation of the performance of the communications link "by measuring a signal-to-noise ratio" and step (c) specifies

identifying cross-talk on said communications link
"based upon the measured signal-to-noise ratio".

8.3 In the board's judgement, the application as originally filed provides no enabling disclosure as to how cross-talk can be identified based upon a measured signal-to-noise ratio SNR as recited in claim 1.

8.4 Referring to [0046], the SNR is one of a list of exemplary parameters which it is said can be used for evaluating link performance. In [0049] it is stated that once the communications link has been evaluated "the information generated can be compared to predetermined thresholds ... to identify any impairments on the link such as cross-talk or bridged taps". The "predetermined thresholds" referred to in [0049] are, however, only mentioned in rather cursory terms without any indication as to how they are determined or to which specific technical characteristics of the communications link they relate. In particular, there is no disclosure directly associating the identification of cross-talk with the comparison of a measured signal-to-noise ratio to a predetermined threshold.

8.5 The board judges that the claim feature of "identifying cross-talk" is to be interpreted, in the given context, as a specification to the effect that noise whose presence is detected in the form of a measured signal-to-noise ratio is attributed to a particular type of impairment (i.e. cross-talk).

However, from a technical point of view, a signal-to-noise ratio only provides an indication of the presence

of noise and its relative magnitude compared to that of the signal. The board judges that, in the given context, a measured signal-to-noise ratio as recited in claim 1 would merely indicate to what extent noise was present but would not in itself be sufficient to allow the detected noise to be attributed to a particular type of impairment.

8.6 Notwithstanding the general statement in paragraph [0049] of the description to the effect that "[v]arious ways for identifying such impairments will be apparent to a person of ordinary skill in the relevant art(s) based on the descriptions provided herein", the board finds that the description does not provide any identifiable technical teaching or examples which would indicate to the skilled person how particular types of impairments such as cross-talk and bridged taps are to be identified on the basis of measured link parameters, in particular on the basis of a measured signal-to-noise ratio as recited in claim 1.

8.7 In view of the foregoing, the board finds that contrary to the requirements of Rule 43(1)(e) EPC (cf. 6.2 above) the description fails to describe in detail at least one way of carrying out the invention as claimed in claim 1 of the main request.

9. *Appellant's submissions re common general knowledge*

9.1 According to established case law, the skilled person may use his common general knowledge to supplement the information contained in the application.

- 9.2 In its communication the board observed that the present application did not explicitly identify or otherwise indicate what general knowledge the skilled person was supposed to rely on in order to put the claimed invention into practice.
- 9.3 In the board's judgement, the appellant's written submissions in this regard (cf. Facts and Submissions, item XII. above) are effectively mere assertions to the effect that the skilled person would know how to use predefined signal-to-noise (SNR) thresholds to identify the presence of bridged taps or cross-talk based upon comparing a measured SNR with predefined SNR thresholds and that it would lie within the general knowledge of the skilled person to know typical magnitudes of SNR values expected to be measured in the presence or absence of particular types of impairments in order to use or construct predetermined thresholds to identify such impairments.
- 9.4 No evidence was submitted in support of these assertions. Neither does the description contain any identifiable details, in particular quantitative information, concerning the "predetermined thresholds" of [0049] or any illustrative examples relating to the identification of particular types of impairments using these thresholds which might be invoked in support of said assertions.
- 9.5 With respect to the appellant's oral submissions pertaining to D3 and D4 (cf. Facts and Submissions, item XX.(iii) to XX.(v) above), the board notes that these documents are patent applications which are not specifically referenced in the disclosure of the

present application nor did the appellant submit any evidence which would establish that they had become part of the common general knowledge in the relevant technical field at the claimed priority date. Under the given circumstances, such documents cannot be relied on to contribute to the sufficiency of the disclosure (cf. T 0171/84, OJ 1986, 95, point 5. of the Reasons).

Moreover, the board judges that the passages of D3 and D4 referred to in the aforementioned oral submissions disclose neither the general concept of identifying particular types of link impairments by comparing measured link parameters to predetermined thresholds nor the more specific concept of identifying cross-talk on the basis of a measured signal-to-noise ratio.

9.6 With respect to the appellant's oral submissions concerning the printout submitted during oral proceedings (cf. Facts and Submissions, item XX.(vi) above), the board notes that the publication date of the purported textbook extract cannot be established in a reliable manner on the basis of said printout. Having regard to the uncertainty concerning its publication date, the board finds that the printout is ineligible as evidence.

9.7 For the sake of completeness, it is noted that even if, as argued by the appellant, said printout were to be accepted as valid evidence of common general knowledge at the claimed priority date of the application, the purported textbook extract neither discloses the general concept of identifying particular types of link impairments by comparing measured link parameters to predetermined thresholds nor the more specific concept

of identifying crosstalk on the basis of a measured signal-to-noise ratio. Hence, in the board's judgement, this document provides no technical guidance of relevance to the issues in question which the skilled person could have relied on to put the claimed invention into practice.

9.8 The appellant's submissions thus failed to convince the board that the skilled person would have known as a matter of common general knowledge before the claimed priority date how to identify cross-talk on the basis of a measured signal-to-noise ratio or that he would have been otherwise able to supplement the information contained in the application in a manner which would have enabled him to put the claimed invention into practice.

10. The preceding observations and findings apply *mutatis mutandis* to claim 4 of the main request.

11. In view of the foregoing, the board finds that the application fails to disclose the invention as defined in the independent claims of the main request in a manner which complies with the requirements deriving from Article 83 and Rule 42(1)(e) EPC.

First auxiliary request

12. *Claim 1*

12.1 As in the case of claim 1 of the main request, claim 1 of the first auxiliary request specifies the evaluation of the performance of the communications link "by measuring a signal-to-noise ratio" (step (b)) and the

identification of cross-talk on said communications link "based upon the measured signal-to-noise ratio" (step (c)).

- 12.2 Claim 1 of the first auxiliary request differs from claim 1 of the main request in terms of an additional specification to the effect that the signal-to-noise ratio is determined based upon an output power of the CPE modem and losses in said communications link.
- 12.3 In the board's judgement, this additional specification merely relates to the manner in which the signal-to-noise ratio is determined. It does not overcome the objection relating to the lack of an enabling disclosure in respect of identifying cross-talk based upon a measured signal-to-noise ratio (cf. 8. above, in particular 8.3 to 8.6).
13. In view of the foregoing, the board finds that the preceding observations and findings with respect to the independent claims of the main request (cf. in particular 11. above) likewise apply *mutatis mutandis* to the corresponding claims of the first auxiliary request.

Fourth auxiliary request

14. *Claim 1*

- 14.1 Claim 1 of the fourth auxiliary request differs from claim 1 of the main request in the following respects:

- (i) Step (b) has been amended to specify that the evaluation of the performance of the

communications link is "based on evaluating several parameters related to said communications link, including signal to noise ratio, automatic gain control levels, bit error rates, and input power".

- (ii) Step (c) has been amended to specify identifying cross-talk and bridged taps "based on comparing information generated during said evaluating based on said parameters to predetermined thresholds".
- (iii) Step (d) has been amended to specify reducing the identified cross-talk and avoiding nulls of bridged taps by determining an adjusted upstream carrier frequency.

14.2 As a result of the amendments to step (b), the evaluation of the performance of the communications link is no longer based solely on measuring a signal-to-noise ratio but is now based on "evaluating several parameters related to said communications link, including signal to noise ratio, automatic gain control levels, bit error rates, and input power".

14.3 As a result of the amendments to step (c), the identifying of impairments is no longer limited to "cross-talk" but now includes both "cross-talk" and "bridged taps".

14.4 The board judges that the claim feature of "identifying cross-talk and bridged taps" is to be interpreted, in the given context, as requiring that two specific types of impairments, *viz.* cross-talk and bridged taps, are distinguished from one another. This interpretation is

supported by the wording of step (d) according to which further specifies that the identified cross-talk is reduced and that nulls of the bridged taps are avoided.

14.5 For the reasons which follow, the board finds that the amendments to claim 1 of the fourth auxiliary request do not overcome the objection that the application as originally filed fails to provide a sufficient disclosure of the claimed invention.

15. *Sufficiency of disclosure*

15.1 Claim 1 of the fourth auxiliary request specifies identifying "cross-talk" and additionally specifies identifying a further type of impairment, i.e. bridged taps.

15.2 According to step (c) of said claim, the identifying of the aforementioned impairments is not based solely on a measured signal-to-noise ratio (as in the case of claim 1 of the main request) but rather "based on comparing information generated during said evaluating based on said parameters to predetermined thresholds". The parameters in question are "parameters related to said communications link, including signal to noise ratio, automatic gain control levels, bit error rates, and input power" as recited in step (b) of the claim.

15.3 In the board's judgement, the description fails to provide an enabling disclosure concerning how the aforementioned parameters are to be used as a basis for identifying cross-talk and bridged taps.

- 15.4 Paragraph [0046] of the description simply lists the aforementioned parameters as illustrative examples of "parameters related to said communications link" which can be used to evaluate the link performance. No explanation is given concerning the specific function which each of said parameters is intended to have in identifying a particular type of impairment.
- 15.5 Paragraph [0049] goes on to state in a rather cursory manner that once the communications link has been evaluated, "the information generated can be compared to predetermined thresholds by the CO modem ... to identify impairments on the link such as cross-talk or bridged taps". No specific technical details are given concerning the "predetermined thresholds" (cf. observations under 8.4 above) and no details are provided as to what specific kinds of "generated information" they are to be compared to in order to identify a particular type of impairment.
- 15.6 Having regard to the foregoing, the board judges that the description does not describe in detail at least one way of carrying out the invention claimed contrary to the requirements of Rule 42(1)(e) EPC. In particular, it is not apparent from the description how the various parameters listed in [0046] are to be used in practice in combination with the "predetermined thresholds" of [0049] in order to identify the particular types of impairments referred to in claim 1, viz. cross-talk and bridged taps.
- 15.7 Under these circumstances, the board finds that the disclosure of the invention as claimed in claim 1

cannot be considered sufficiently clear and complete for the skilled person to put it into practice.

- 15.8 It is additionally noted in this regard that the appellant's submissions failed to convince the board that the skilled person would have been able to put the claimed invention into practice by supplementing the information contained in the application using his common general knowledge (cf. observations under 9. above).
16. The observations and findings under 15. above apply *mutatis mutandis* to claim 4 of the fourth auxiliary request.
17. In view of the foregoing, the board finds that the invention according to the independent claims of the fourth auxiliary request has not been disclosed in a manner which complies with the requirements deriving from Article 83 and Rule 42(1)(e) EPC.

Conclusions

18. The board therefore concludes that the admitted requests, *viz.* the main request and the first and fourth auxiliary request, are not allowable.
19. In the absence of an allowable request the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chair:

A. Vottner

A. Ritzka