

**Internal distribution code:**

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

**Datasheet for the decision  
of 17 June 2010**

**Case Number:** T 1625/06 - 3.5.05

**Application Number:** 03724276.5

**Publication Number:** 1497942

**IPC:** H04L 1/00

**Language of the proceedings:** EN

**Title of invention:**

An adaptive air interface waveform

**Applicant:**

Powerwave Cognition, Inc.

**Headword:**

Adaptive air interface waveform/POWERWAVE

**Relevant legal provisions:**

EPC Art. 83, 113(1)  
EPC R. 42(1)(e), 115(2)  
RPBA Art. 15(3)(6)

**Relevant legal provisions (EPC 1973):**

EPC Art. 106, 107, 108

**Keyword:**

"Oral proceedings held in absence of appellant"  
"Sufficiency of disclosure (no)"

**Decisions cited:**

J 0010/07, T 1110/03

**Catchword:**

-



Case Number: T 1625/06 - 3.5.05

**D E C I S I O N**  
of the Technical Board of Appeal 3.5.05  
of 17 June 2010

**Appellant:** Powerwave Cognition, Inc.  
21 Continental Boulevard  
Merrimack  
NH 03054 (US)

**Representative:** Lawrence, John  
Barker Brettell LLP  
138 Hagley Road  
Edgbaston  
Birmingham B16 9PW (GB)

**Decision under appeal:** Decision of the Examining Division of the  
European Patent Office posted 11 April 2006  
refusing European application No. 03724276.5  
pursuant to Article 97(1) EPC 1973.

**Composition of the Board:**

**Chair:** A. Ritzka  
**Members:** P. Corcoran  
F. Blumer

## Summary of Facts and Submissions

I. This is an appeal against the decision of the examining division dispatched 11 April 2006 refusing the European patent application No. 03 724 276.5, published as No. 1 497 942 and originally filed as international application PCT/US03/13065.

II. The application was refused on the basis of a main request comprising claims 1-31 filed with the letter dated 22 August 2005. The grounds for the refusal were that the application did not satisfy the requirements of Article 83 EPC. According to the impugned decision, the description disclosed the invention mainly in terms of ideas and desired outcomes while failing to disclose concrete technical embodiments which would enable the skilled person to put the invention into practice. It was additionally objected that the amendments to claim 1 of the main request infringed Article 123(2) EPC.

Invoking its discretionary power under Rule 86(3) EPC 1973, the examining division refused to admit an auxiliary request comprising claims 1-31 as filed with the letter dated 28 March 2006 on the grounds that the request was late-filed and that it did not overcome the objection under Article 83 EPC.

III. Notice of appeal was received by telefax at the EPO on 21 June 2006 and the appeal fee was paid on the same date. A written statement setting out the grounds of appeal and received by telefax at the EPO on 21 August 2006 requested that the decision under appeal be set aside and that a patent be granted on the basis of the

claims of a main request, a first auxiliary request or a second auxiliary request annexed to the written statement. An unsigned copy of an affidavit was included as a further annex, referred to by the appellant as "Annex 4". A signed copy of the affidavit was submitted subsequently with the confirmation copy of the written statement received at the EPO on 7 November 2006. The written statement also included a precautionary request for oral proceedings.

IV. In a communication accompanying a summons to oral proceedings to be held on 17 June 2010 the board gave its preliminary opinion that none of the applicant's requests were allowable. In particular, the board was of the opinion that the application failed to comply with the requirements of Article 83 EPC. This objection was considered to apply to all requests on file. The board also noted objections under Article 123(2) EPC against independent claims 1 and 31 of the main and first auxiliary requests and under Article 84 EPC against independent claims 1, 11, 21 and 31 of all requests. Further objections were raised in relation to certain dependent claims.

V. In the aforementioned communication the board made reference to the following documents:

D3: Defense Advanced Research Projects Agency (DARPA), News Release: "DARPA Releases neXt Generation (XG) Communications Requests for Comment", 23 June 2003;

D4: Yücek T. and Arslan H.: "A survey of spectrum sensing algorithms for cognitive radio applications", IEEE Communications Surveys &

Tutorials, pp. 116-130, Vol. 11, Issue 1, First Quarter 2009, 4 March 2009, ISSN: 1553-877X.

D3 is a news release from the Defense Advanced Research Projects Agency (DARPA) relating to the public release of technical descriptions for key aspects of the neXt Generation (XG) Communications program. D4 is a review article relating to spectrum sensing algorithms which is considered to reflect the state of the art in the relevant technical field at the date of its publication, i.e. 4 March 2009.

- VI. With a letter of reply filed electronically and received at the EPO on 16 June 2010, the board was notified of appellant's intention not to attend the oral proceedings. The appellant did not submit any substantive response concerning the issues raised in the board's communication. Neither were any amendments made to the requests on file.
- VII. The appellant has requested that the decision under appeal be set aside and that a patent be granted on the basis of the main request, the first auxiliary request or the second auxiliary request as filed with the written statement setting out the grounds of appeal.
- VIII. Claim 1 of the main request reads as follows:

"A system for generating an adaptive air interface waveform, the system comprising:

a sensing unit operable to identify spectrum use and availability;

an adaptive multi-carrier organization and signaling component operable to generate a waveform

having a multi-carrier organization comprising a variable carrier frequency and variable bandwidth signal that comprises one or more subcarriers that are dynamically assigned based on spectrum use and availability and placeable over a range of frequencies to avoid or minimize interference with transmissions of existing spectrum uses, each subcarrier being separately modulated according to a direct sequence (DS) spread spectrum (SS) modulation technique for variable spreading and coding gain against interfering cooperative, non-cooperative, and threat signals, the waveform having an embedded pilot usable to optimize one or more spectrum efficiencies of the waveform; and

an adaptive multi-level bandwidth-efficient coding and modulation (BECM) component operable to receive the waveform from the adaptive multi-carrier organization and signaling component, the BECM component operable to map user data to the one or more assigned subcarriers through adaptation of a modulation constellation, a code rate, and a code length of the waveform by matching available spectrum and one or more varying conditions of the subcarrier identified by the embedded pilot in order to provide the waveform as an adaptive air interface waveform."

Claim 1 of the first auxiliary request reads as follows:

"A system for generating an adaptive air interface waveform, the system comprising:

an adaptive multi-carrier organization and signaling component operable to generate a waveform having a multi-carrier organization comprising a variable carrier frequency and variable bandwidth

signal that comprises one or more subcarriers that are dynamically placeable over a range of frequencies, each subcarrier being separately modulated according to a direct sequence (DS) spread spectrum (SS) modulation technique, the waveform having an embedded pilot usable to optimize one or more spectrum efficiencies of the waveform; and

an adaptive multi-level bandwidth-efficient coding and modulation (BECM) component operable to receive the waveform from the adaptive multi-carrier organization and signaling component, the BECM component operable to adapt a modulation constellation, a code rate, and a code length of the waveform according to an available spectrum and one or more varying conditions of the subcarrier identified by the embedded pilot in order to provide the waveform as the adaptive air interface waveform."

Claim 1 of the second auxiliary request reads as follows:

"A system for generating an adaptive air interface waveform, the system comprising:

an adaptive multi-carrier organization and signaling component operable to generate a waveform comprising a variable carrier frequency and variable bandwidth signal that comprises one or more subcarriers that are dynamically placeable over a range of frequencies, each subcarrier being separately modulated according to a direct sequence (DS) spread spectrum (SS) technique, the waveform having an embedded pilot usable to optimize one or more spectrum efficiencies of the waveform; and

an adaptive multi-level bandwidth-efficient coding and modulation (BECM) component operable to adapt a modulation constellation, a code rate, and a code length of the generated waveform according to an available spectrum and one or more sub-carrier conditions."

Each request includes three further independent claims: an independent method claim (claim 11), an independent claim directed towards a computer readable medium including code for generating an adaptive air interface waveform (claim 21) and a second independent system claim (claim 31).

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

Description, pages:

1-4, 6-10, 12-18 as published;

5, 11 as annexed to the International Preliminary Examination Report.

Drawings, sheets:

1/4-4/4 as published.

X. Oral proceedings were held as scheduled in the absence of the appellant. After deliberation, the chair announced the board's decision at the conclusion of the proceedings.



## Reasons for the Decision

### 1. *Admissibility*

The appeal complies with the provisions of Articles 106 to 108 EPC 1973 which are applicable according to J 10/07, point 1 (cf. Facts and Submissions, item III. above). Therefore it is admissible.

### 2. *Non-attendance at oral proceedings*

2.1 In the present case, the board decided that it was appropriate to proceed by holding the oral proceedings as scheduled in the absence of the appellant (cf. Rule 115(2) EPC) particularly in view of the fact that the appellant had not withdrawn the precautionary request for oral proceedings but had merely notified the board of its intention not to attend the proceedings.

2.2 The appellant could reasonably have expected that during the oral proceedings the board would consider the objections and issues raised in the communication annexed to the summons to oral proceedings (cf. point IV. above) which form the basis for the present decision. In deciding not to attend the proceedings, the appellant effectively chose not to avail of the opportunity to present its observations and counter-arguments orally but instead to rely on its written case (cf. Article 15(3) RPBA). In view of the fact that no substantive response was submitted in reply to the board's communication, the appellant's written case corresponds to that presented in the written statement setting out the grounds of appeal.

2.3 In the present case, the board was in a position to announce a decision at the conclusion of the oral proceedings as foreseen by Article 15(6) RPBA. The reasons on which this decision was based do not constitute a departure from grounds or evidence previously put forward which would require that the appellant be given a further opportunity to comment.

3. *Article 83 EPC*

3.1 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. Rule 42(1)(e) EPC further prescribes that the description shall describe in detail at least one way of carrying out the claimed invention, using examples where appropriate and referring to the drawings, if any.

4. *Observations concerning deficiencies in the application*

4.1 The board concurs with the observations of the examining division to the effect that the description of the present application discloses the invention mainly in terms of ideas and desired outcomes while failing to disclose concrete technical embodiments which would enable the skilled person to put the invention into practice (cf. Facts and Submissions, item II above). The following deficiencies in the application are found to be of particular relevance for the purpose of assessing compliance with the requirements deriving from Article 83 and Rule 42(1)(e) EPC.

- 4.2 With reference to the "adaptive multi-carrier organization and signaling component", the description fails to disclose any examples of rules or algorithms specifying how the dynamic carrier assignment is to be carried out. According to the passages of the description relating to this component (cf. published application: p.5, l.15-18), a variable carrier frequency and variable bandwidth signal is configured into one or many sub-carriers that are dynamically placed over a span of up to 250 MHz to avoid or minimize interference with transmissions of existing spectrum users. This is, however, merely the statement of an aim to be achieved. In the board's judgement, the description contains no identifiable technical teaching as to how the stated aim is to be achieved in practice.
- 4.3 With respect to the "bandwidth-efficient coding and modulation component", the description states that spectral efficiency is maximised by adapting the modulation constellation, code rate and code length to match the available spectrum and sub-carrier conditions (cf. application: p.5, l.29-32). This is, likewise, merely the statement of an aim to be achieved. In the board's judgement, the description contains no identifiable technical teaching as to how the stated aim is to be achieved in practice.
- 4.4 The determination of spectrum use and availability including the detection of "spectrum holes" across multiple dimensions of the signal space (cf. for example, description: p.2, l.23-25) constitutes an essential prerequisite for the claimed invention to be put into practice. However, in the board's judgement, the description contains no identifiable technical teaching

concerning the determination of spectrum use and availability or the determination of "spectrum holes" across multiple dimensions of the signal space.

4.5 In the board's judgement, no enabling disclosure has been provided in respect of the aforementioned aspects of the invention.

5. *Further observations*

5.1 The acronym "XG" is used throughout the application, for example in the following contexts:

next generation (XG) appliqué, cf. p.4, l.25;

non-XG users, cf. p.7, l.17;

non-XG and XG transmissions, cf. p.7, l.22, Figs 2 and 5D;

non-XG signals, cf. p.7, l.28;

XG spectral efficiency, cf. p.7, l.31;

XG platform, cf. p.9, l.13;

XG radio, cf. p.10, l.7;

XG systems, cf. p.13, l.1.

From the reference on p.4, l.25 it may be inferred that "XG" is an acronym denoting "neXt Generation". However, no more detailed explanation of what this term is supposed to mean can be found in the application. Under the given circumstances, the technical implications of said term cannot be determined which, in the board's judgement, results in a lack of clarity and completeness in respect of the disclosure of the invention (cf. observations under 6.5 below).

5.2 A further objection due to lack of clarity and completeness in respect of the disclosure of the invention is found to apply to the drawings of the present application and the associated passages of the description.

5.2.1 Fig. 1 is said to be "a block diagram of a heteromorphic waveform function in accordance with the present invention within a next generation (XG) appliqué", (p.4, l.24-25). The meaning of the term "next generation (XG) appliqué" is, however, unclear in the given context as is the term "XG radio" used as a caption for the right-hand block shown in Fig. 1 (cf. observations under 5.1 above). Moreover, the passage of the description dealing with Fig. 1 contains no identifiable enabling disclosure relating to the various elements of the block diagram of Fig. 1, in particular those bearing the captions "SENSING", "CHARACTERISING" and "ADAPTING (CONTROL)".

5.2.2 Fig. 2 is evidently intended to provide an illustration of various aspects of "frequency agility". However, the passage of the description relating to Fig. 2 (cf. p.7, l.13 - p.8, l.2) provides no disclosure to explain how non-XG and XG transmissions can be distinguished. Nor is there any identifiable disclosure to explain how non-XG signals can be identified or how an acceptable SIR value for such signals can be determined as required by the proposed "microscopic frequency agility" embodiment described on p.7, l.26-28. Similar observations concerning the distinction between non-XG and XG transmissions apply to Figs. 3 and 5D.

5.2.3 Fig. 4 illustrates a waveform adaptation function residing in an XG radio (cf. p.10, 1.6-7). The figure includes an adaptive multi-carrier organisation and signalling section, an adaptive multi-level bandwidth-efficient coding and modulation section and an adaptive power control section. The technical function of the adaptive power control section is however not explained beyond the statement on p.10, 1.11-12 according to which the signal is adaptively power controlled resulting in the complete heteromorphic waveform bandwidth spanning up to 250 MHz. In the board's judgement, this statement is not sufficient to explain how the adaptive power control is to be implemented. Likewise, there is no identifiable disclosure which explains the technical function of the "ADAPTIVE MAC LAYER" element of Fig. 4.

5.2.4 In view of the foregoing, the board judges that the skilled person is not provided with a clear and complete disclosure relating to the aspects of the invention depicted in Figs. 1, 2, 3, 4 and 5D.

5.3 On p.6, 1.22-25 the following is stated: "An accurate assessment of overall spectral utilization efficiency requires consideration of the complex interaction of frequency/time/space reuse of the electromagnetic spectrum". The description does not contain any further specification as to what aspects of "the complex interaction of frequency/time/space reuse of the electromagnetic spectrum" are to be taken into account. Bearing in mind that it is a stated aim of the invention to increase spectral efficiency (cf. p.5, 1.9-10) and, in respect of particular embodiments, to increase spectrum utilization by up to a factor of twenty (cf. p.3, 1.29-30), the lack of specific technical details in relation

to these matters constitutes a further significant deficiency in the completeness of the disclosure.

6. *Common general knowledge and references to further documents*
  - 6.1 According to established EPO jurisprudence, it is permissible for the skilled person to use his common general knowledge to supplement the information contained in the application (cf. Case Law of the Boards of Appeal of the European Patent Office, Fifth Edition, II.A.2(a)). EPO jurisprudence likewise recognises that references to further documents contained in an application may also enable the skilled person to carry out an invention (*ibid.*, II.A.2(b)).
  - 6.2 The present application contains no identifiable references to other documents. Under these circumstances, the skilled person cannot be expected to rely on anything beyond his common general knowledge to supplement the information contained in the application because no further sources of information have been made available to him.
  - 6.3 In the present case the board sees no basis for concluding that the common general knowledge of the skilled person would have been sufficient to bridge the deficiencies in the disclosure, in particular those noted under 4. above. The affidavit submitted by the appellant is found to have no probative value in this regard (cf. observations under 7. below). Moreover, the appellant failed to submit any response to the observations

relating to this matter which were set forth in the board's communication.

- 6.4 Referring to the post-published documents D3 and D4, the board notes that documents which provide a basis for an inference about matters such as the state of the art and common general knowledge may be admitted to the proceedings in the category of *post factum* evidence in relation to such matters even though they do not form part of the state of the art within the meaning of Article 54(2) EPC (cf. T 1110/03, OJ EPO 2005, 302: reasons point 2.).
- 6.5 In the context of the present application, the acronym "XG" which is used throughout the description (cf. 5.1 above) is understood by the board to refer to the "neXt Generation" communications program co-ordinated by the US Defense Advanced Research Projects Agency (DARPA). According to D3 which is a press release from DARPA dated 23 June 2003, the first in a series of technical descriptions for key aspects of the XG technology were made publicly available on 16 June 2003. On this basis, the board concludes that the technical details of XG technology did not form part of the common general knowledge of the skilled person at the earliest claimed priority date of 25 April 2002 or even at the filing date of 24 April 2003.
- 6.6 According to the document D4, multi-dimensional spectrum sensing techniques for dynamic spectrum allocation require powerful signal analysis techniques with additional computational complexity compared to traditional techniques for measuring spectral content



(cf. D4: I. Introduction, third paragraph). D4 refers to "conventional sensing methods" / "conventional spectrum sensing algorithms" which relate to sensing the spectrum in the three dimensions of frequency, time and space and states that these techniques are not adequate for the detection of spectrum usage across further dimensions of the spectrum space (D4: II. Multi-Dimensional Spectrum Awareness). D4 was published on 4 March 2009. In view of its publication date it is not evident that the "conventional sensing methods" to which it refers formed part of the skilled person's general knowledge at the claimed priority date of the present application, i.e. 25 April 2002. In any case, even if such techniques had been generally known at the claimed priority date, they would not have been adequate for the detection of spectrum usage across further dimensions of the spectrum space (cf. in particular, D4: II. Multi-Dimensional Spectrum Awareness).

D4 further states that "advanced spectrum sensing algorithms that offer awareness in multiple dimensions of the spectrum space should be developed", (D4: II. Multi-Dimensional Spectrum Awareness, final sentence). In the board's judgement, this statement implies that the "advanced spectrum sensing algorithms" referred to did not form part of the common general knowledge of the skilled person prior to the publication date of D4, i.e. 4 March 2009.

In view of the foregoing, the board concludes that spectrum sensing techniques of the kind which would be required to put the present invention into practice did not form part of the common general knowledge of the skilled person at the earliest claimed priority date of

the application, viz. 25 April 2002, or even at the filing date thereof, viz. 24 April 2003.

6.7 As noted in 5.3 above, the description contains no identifiable technical teaching relating to the particular aspects of the complex interaction of frequency/time/space reuse of the electromagnetic spectrum required to achieve an accurate assessment of overall spectral utilization efficiency. Neither has the appellant made any submissions which would establish that this particular subject-matter formed part of the common general knowledge of the skilled person at the claimed priority date.

7. *Observations concerning the affidavit ("Annex 4")*

7.1 With respect to the signed affidavit filed with the letter received on 7 November 2006 and referred to by the appellant as "Annex 4" the following observations are made.

7.2 In the board's communication, it was noted that when assessing the sufficiency of disclosure in the light of common general knowledge, the relevant knowledge is that of the average skilled addressee and the question was raised as to whether the deponent might not be too highly qualified to be regarded as a notional, i.e. average, skilled addressee. The appellant did not make any submissions or provide any further information which would have helped to clarify this matter.

7.3 As far as the content of the affidavit is concerned, the board finds that it essentially comprises a series of

assertions to the effect that various technical requirements of the invention, in particular the identification of spectrum use and availability and the placement of subcarriers throughout a span of frequencies, could have been realised by the notional skilled person without undue burden. No further evidence has been offered in support of these assertions. As such, the content of the affidavit does not go beyond the mere expression of an opinion by the deponent that the application provides a sufficient disclosure for the invention to be put into effect (cf. affidavit: p.2, 1.7-8).

- 7.4 Even if it were to be accepted for the sake of argument that the deponent could properly be regarded as a person of average skill in the relevant technical field, the board takes the view that an affidavit which merely expresses the opinion of a single person concerning matters of general knowledge and sufficiency of disclosure cannot, under the given circumstances, be regarded as a satisfactory proof that specific technical information which would have to be read into the application to make it complete would have been readily available to those of ordinary skill in the art.
- 7.5 The board further notes that reference is made to "methods and systems for identifying spectrum use and availability" in the third paragraph of the affidavit. The techniques referred to are effectively limited to the determination of channel occupancy in the frequency domain. Thus, even if it were to be accepted for the sake of argument that such techniques were generally known at the priority date of the application, the board judges that they would not have been sufficient to enable the

sensing of spectrum holes over multiple dimensions of the signal space as required by the present invention (cf. observations under 6.6 above).

7.6 In view of the foregoing, the board concludes that the submitted affidavit lacks any probative value for the purpose of establishing compliance with the requirements of Article 83 EPC.

8. *Observations concerning appellant's written submissions*

8.1 With respect to the appellant's submissions contained in the written statement setting out the grounds of appeal the following observations are made.

8.2 In item 4.3 of the written statement, the appellant asserts that the detection and identification of spectrum use is well-known in the art and refers to the affidavit ("Annex 4") which allegedly demonstrates that the person skilled in the art would be able to determine without undue burden methods and systems for identifying spectrum use and availability. In item 4.10 of the written statement, the appellant further asserts that the submitted affidavit demonstrates that the skilled person has at his disposal adequate information leading necessarily and directly towards putting the invention into effect and claims that the specification is perfectly adequate at allowing the skilled person to put the invention into effect. As may be inferred from the observations set forth under points 4. to 7. above, the board does not concur with the appellant's submissions in this regard.

8.3 The appellant's written submissions have failed to convince the board that the application itself discloses the invention with sufficient clarity and completeness to allow the skilled person to put it into practice. Nor, in the board's judgement, are said submissions sufficient to establish that the additional technical information which would have been required to supplement the disclosure of the application was available to the skilled person as a matter of common general knowledge at the claimed priority date. It is further noted that the appellant made no attempt to rebut the observations set forth in the board's communication in relation to these matters.

*Main request*

9. In view of the foregoing, the board concludes that contrary to the requirements of Rule 42(1)(e) EPC the description does not describe in detail at least one way of carrying out the invention as defined in the independent claims of the main request and, more generally, that the application as originally filed fails to disclose said invention with sufficient clarity and completeness to meet the requirements of Article 83 EPC.

*First and second auxiliary requests*

10. In the case of the first and second auxiliary requests the invention as defined in the independent claims of said requests still depends on insufficiently disclosed elements of the application for its realisation (cf. in particular the deficiencies noted under 4. above). Hence, the differences in the claim wording over the main request do not overcome the aforementioned objections under Article 83 and Rule 42(1)(e) EPC.
11. In view of the foregoing, none of the appellant's requests are allowable. Under these circumstances, the appeal must be dismissed.

*Further observations*

12. Having regard to the findings noted under points 9. to 11. above it is not necessary to give further consideration to the additional issues raised in the board's communication, in particular the objections raised under Article 123(2) EPC and Article 84 EPC (cf. Facts and Submissions, item IV.). For the sake of completeness it is noted that in view of the fact that the appellant made no substantive response to the relevant observations set forth in the board's communication in relation to these matters the aforementioned objections still apply.

**Order**

**For these reasons it is decided that:**

The appeal is dismissed.

The Registrar:

The Chair:

K. Götz

A. Ritzka