

Internal distribution code:

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

**Datasheet for the decision
of 7 April 2014**

Case Number: T 1880/12 - 3.5.02

Application Number: 05778539.6

Publication Number: 1829222

IPC: H03M13/05, H03M13/11

Language of the proceedings: EN

Title of invention:

Structured LDPC Design With Vector Row Grouping

Applicant:

Motorola Mobility LLC

Relevant legal provisions:

EPC Art. 54, 56, 84, 123(2)

Keyword:

Amendments - added subject-matter (no)

Claims - clarity after amendment (yes)

Novelty - (yes)

Inventive step - (yes)



**Beschwerdekammern
Boards of Appeal
Chambres de recours**

European Patent Office
D-80298 MUNICH
GERMANY
Tel. +49 (0) 89 2399-0
Fax +49 (0) 89 2399-4465

Case Number: T 1880/12 - 3.5.02

D E C I S I O N
of Technical Board of Appeal 3.5.02
of 7 April 2014

Appellant: Motorola Mobility LLC
(Applicant) 600 North US Highway 45
Libertyville, IL 60048 (US)

Representative: Openshaw, Paul Malcolm
Openshaw & Co.
8 Castle Street
Farnham
Surrey GU9 7HR (GB)

Decision under appeal: **Decision of the Examining Division of the European Patent Office posted on 12 March 2012 refusing European patent application No. 05778539.6 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chairman: M. Ruggiu
Members: R. Lord
P. Mühlens

Summary of Facts and Submissions

I. This is an appeal of the applicant against the decision of the examining division to refuse European patent application No. 05 778 539.6. The reason given for the refusal was that the claims then on file were not clear (Article 84 EPC) and that the subject-matter of those claims was not new (Articles 52(1) and 54 EPC).

II. The following document of the prior art cited during the procedure before the examining division is relevant for this decision:

D1: R. Xu et al, "High girth LPDC [sic] coding for OFDMA PHY", IEEE 802.16 Broadband Wireless Access Working Group <<http://ieee802.org/16>>, submission date 3 November 2004.

III. With letter dated 26 February 2014 the appellant implicitly requested that the decision under appeal be set aside and that a patent be granted on the following basis:

Description:

Pages 1 to 3, 6, 9 and 10 as originally filed,
Pages 4, 4a, 4b, 5, 7, 8 and 11 as filed with letter dated 26 February 2014,

Claims:

Nos. 1 to 13 as filed with letter dated 26 February 2014,

Drawings:

Pages 1/3 to 3/3 as originally filed.

IV. Claim 1 according to the appellant's sole request reads as follows:

"A method for operating a transmitter that generates parity-check bits $\mathbf{p}=(p_0, \dots, p_{m-1})$ based on a current symbol set $\mathbf{s}=(s_0, \dots, s_{k-1})$, the method comprising the steps of:

receiving the current symbol set $\mathbf{s}=(s_0, \dots, s_{k-1})$;
using a matrix \mathbf{H} to determine the parity-check bits; and

transmitting the parity-check bits along with the current symbol set;

wherein \mathbf{H} is an expansion of a base matrix \mathbf{H}_b via a model matrix \mathbf{H}_{bm} ,

wherein \mathbf{H}_b comprises m_b rows, a section \mathbf{H}_{b1} and a section \mathbf{H}_{b2} , and \mathbf{H}_{b2} comprises column \mathbf{h}_b having weight $w_h \geq 3$ and \mathbf{H}'_{b2} having a dual-diagonal structure with matrix elements at row i , column j equal to 1 for $i=j$, 1 for $i=j+1$, and 0 elsewhere;

characterised in that 1's of \mathbf{h}_b and \mathbf{H}_{b1} are arranged such that m_b/q groups of the rows of \mathbf{H}_{bm} each group having q rows can be formed so that within each group the rows of \mathbf{H}_{bm} have at most a single non-negative entry within a column."

Claim 9 according to the appellant's request defines the complementary method for operating a receiver, and claims 5 and 12 define the apparatuses corresponding to the methods of claims 1 and 9 respectively. Claims 2 to 4, 6 to 8, 10, 11 and 13 are dependent claims.

V. The appellant essentially argued as follows:

The claims met the requirements of Article 84 EPC because the meaning of the term "non-intersecting" had

been clarified, and because the skilled person would have understood that the definition of the matrix as an expansion of a base matrix meant that it had the characteristics which a matrix would have had if it were an expansion of such a base matrix via a model matrix as defined in the claim.

The model matrices of document D1 did not have the "non-intersecting" property as defined in the characterising portions of the independent claims. That difference gave rise to the technical advantage of enabling increased pipelining of the logic operations involved in encoding and decoding, as described on pages 6 and 7 of the application. That advantage was not suggested anywhere in the prior art. Therefore the claimed subject-matter involved an inventive step.

Reasons for the Decision

1. The appeal is admissible.
2. *Added subject-matter (Article 123(2) EPC)*

The amendments introduced in the present claim 1 compared to that originally filed consist of the introduction of the feature of original dependent claim 3, the introduction (from page 3, lines 32 to 34 of the description) of the definition of "non-intersecting" referred to in paragraph 3.3 below, and minor clarifications based on the description. Independent claim 5 is similarly based on original claim 8. Dependent claims 2 to 4 and 6 to 8 have a basis in the original claims 4, 6, 7 and 9. Present claims 9 to 13 define a method and an apparatus for receiving which

correspond to the method and apparatus for transmitting defined in claims 1 to 8, which were also clearly disclosed in the original application, since the description covered both encoding and decoding. The description has been amended only to acknowledge the prior art of D1 and to adapt it to the amended claims. Thus the present request meets the requirement of Article 123(2) EPC.

3. *Clarity (Article 84 EPC)*

3.1 According to the decision under appeal the fact that claim 1 of the application defines that "**H** is an expansion of a base matrix \mathbf{H}_b ..." implies that the claim is of the product-by-process type, and that since it was not clear what constraints on the product resulted from the process, the claim was not clear.

3.2 The board does not share this opinion. The board understands that the claim does indeed define the matrix **H** in terms of the manner by which it can be constructed, so that this is in a sense a product-by-process definition, and thus defines only that it must be possible to construct the matrix in the defined manner. However, the board also considers that the skilled person in the technical field of structured LDPC codes would have the necessary knowledge and tools to be able to determine whether a particular matrix has a structure which would result from the defined expansion technique, since the properties of such structured matrices form an essential part of that technical field. Therefore, the board does not consider this aspect of the claim to be unclear.

3.3 The board observes also that with the submission of 26 February 2014 the appellant has introduced into each

of the independent claims a clarification of the expression "non-intersecting" which appeared in the claims addressed in the decision under appeal, and to which the examining division had previously objected under Article 84 EPC.

3.4 In the light of these amendments, and the deletion of those of the previous dependent claims which were not consistent with the independent claims, the board concludes that the present set of claims meets the requirements of Article 84 EPC.

4. *Novelty and inventive step (Articles 54 and 56 EPC)*

4.1 The document D1 discloses methods and apparatuses according to the preambles of the present independent claims, but contains no disclosure of the feature defined in each of their characterising portions that the model matrix consists of groups of non-intersecting rows. The appellant has explained in the fifth paragraph on page 2 of the statement of grounds of appeal (letter dated 6 July 2012) that it is not possible to group the rows of the matrix in the "Rate 1/2" embodiment of that document to be non-intersecting, as defined in the present claims. That this is also not possible for the "Rate 2/3" and "Rate 3/4" embodiments is evident by inspection. Thus it follows that the subject-matter of the present claims is new with respect to D1. The board notes that an objection of lack of novelty based on PCT application WO 2004/102810 A1 (which has also been published as EP 1 521 372 A1) was raised with respect to some of the original claims in the Written Opinion of the International Search Authority during the international phase of the present application, but that the argument there relied on an interpretation of the claims which

is excluded by the present wording, because the matrix shown in Fig. 15 of that document corresponds to the full matrix **H** of the present application, not to the base matrix or the model matrix as defined in the present independent claims. The board therefore concludes that the subject-matter of the present independent claims is new according to Article 54 EPC.

4.2 Moreover, the available prior art contains no suggestion that the matrix should be structured in the manner defined in the characterising portions of the present independent claims 1, 5, 9 and 12. Since this structure gives rise to the technical advantage of enabling increased pipelining of the logic operations involved in encoding and decoding, as described on pages 6 and 7 of the application, the board concludes that the subject-matter of these claims involves an inventive step according to Article 56 EPC. Since claims 2 to 4, 6 to 8, 10, 11 and 13 are dependent on those claims, that conclusion applies also to these claims.

5. The board therefore concludes that the claims meet the relevant requirements of the EPC. Moreover, since the description has been modified so as to be consistent with the amended claims, and to acknowledge the prior art of document D1, the board concludes that the application in the form of the present request can proceed to grant.

Order

For these reasons it is decided that:

1. The decision under appeal is set aside.
2. The case is remitted to the department of first instance with the order to grant a patent on the following basis:

Description:

Pages 1 to 3, 6, 9 and 10 as originally filed,
Pages 4, 4a, 4b, 5, 7, 8 and 11 as filed with letter
dated 26 February 2014,

Claims:

Nos. 1 to 13 as filed with letter dated
26 February 2014,

Drawings:

Pages 1/3 to 3/3 as originally filed.

The Registrar:

The Chairman:



U. Bultmann

M. Ruggiu

Decision electronically authenticated