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**Datasheet for the decision
of 4 December 2009**

Case Number: T 0202/07 - 3.5.02

Application Number: 00301303.4

Publication Number: 1030455

IPC: H03M 13/27

Language of the proceedings: EN

Title of invention:

Interleaving method, interleaving apparatus, turbo encoding method, and turbo encoder

Patentee:

NTT Mobile Communications Network Inc.

Opponent:

QUALCOMM Incorporated

Headword:

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Relevant legal provisions:

EPC Art. 100(c), 123(2)

RPBA Art. 12(2), 13(1)

Relevant legal provisions (EPC 1973):

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Keyword:

"Added subject-matter (yes - main request and first to fifth auxiliary requests)"

"Admissibility of late filed request (no - sixth auxiliary request)"

Decisions cited:

-

Catchword:

See Reasons 4.



Case Number: T 0202/07 - 3.5.02

DECISION
of the Technical Board of Appeal 3.5.02
of 4 December 2009

Appellant: (Opponent) QUALCOMM Incorporated
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Decision under appeal: Decision of the Opposition Division of the
European Patent Office posted 13 October 2006
rejecting the opposition filed against European
patent No. 1030455 pursuant to Article 102(2)
EPC 1973.

Composition of the Board:

Chairman: M. Ruggiu
Members: R. Lord
E. Lachacinski

Summary of Facts and Submissions

- I. This is an appeal of the opponent against the decision of the opposition division rejecting the opposition filed against the European patent No. 1 030 455. The opposition division held *inter alia* that the amendments introduced in the independent claim 1 as granted did not introduce subject-matter extending beyond the content of the application as originally filed in the sense of Article 123(2) EPC.
- II. In a communication dated 20 July 2009, accompanying the summons to oral proceedings, the board indicated *inter alia* its preliminary opinion that two of the amendments introduced in the independent claim 1 as granted contravened Article 123(2) EPC.

With a letter of reply to that communication, dated 3 November 2009, the respondent filed amended sets of claims according to first to fifth auxiliary requests. He also indicated a further auxiliary request that the board consider combinations of those requests, for example a combination of the fourth and fifth auxiliary requests.

- III. Oral proceedings before the board took place on 4 December 2009.

The appellant (opponent) requested that the decision under appeal be set aside and that the patent be revoked.

The respondent (patent proprietor) requested that the appeal be dismissed (main request), or subsidiarily

that the decision under appeal be set aside and the patent be maintained in amended form on the basis of the claims of the first, second, third, fourth or fifth auxiliary request filed with the letter of 3 November 2009 or on the basis of the claims of the sixth auxiliary request filed during the oral proceedings.

IV. Claim 1 of the patent in suit as granted reads as follows:

"An interleaving method which interleaves K bits of data by using an interleaver having a buffer arranged in a two-dimensional matrix, characterized in comprising the steps of:

- (a) generating a prime number P based on the number K of bits of data and the number N of rows of the interleaver so that the number of columns of the interleaver is determined by the prime number P;
- (b) permuting data in each of the N rows of the interleaver in accordance with a sequence permutation table generated specifically for each of the N rows, based on powers of a primitive root of the prime number P;
- (c) permuting the N rows based on a predetermined inter-permutation pattern; and
- (d) reading out data from the buffer in the column direction of the two-dimensional matrix."

Claim 1 according to the respondent's first auxiliary request differs from that as granted only in that in paragraph (a) the word "and" in the expression "*the number K of bits of data and the number N of rows*" is replaced by the words "*divided by*".

Claim 1 according to the respondent's second auxiliary request differs from that as granted only in that in paragraph (a) the expression "*determined by*" is replaced by "*equal to*".

Claim 1 according to the respondent's third auxiliary request includes both of the differences indicated above for the first and second auxiliary requests (with no further amendment).

Claim 1 according to the respondent's fourth auxiliary request differs from that as granted only in that in paragraph (a) the words "*a prime number P based on the number K of bits of data and the number N of rows*" are replaced by the words "*a prime number P being the lowest prime number greater than the number K of bits of data divided by the number N of rows*".

Claim 1 according to the respondent's fifth auxiliary request differs from that as granted only in that the phrase "*arranged in an order of values of exponent parts of a power notation of the primitive root*" is added at the end of paragraph (b).

Claim 1 according to the respondent's sixth auxiliary request differs from that according to his fourth auxiliary request only in that the phrase "*arranged in a consecutive order of values of exponent parts of a power notation of the primitive root*" is added at the end of paragraph (b).

V. The appellant's arguments, as far as they are relevant to the present decision, are essentially as follows:

The amendment to paragraph (a) of claim 1 in the patent as granted defining that the prime number P is "*based on the number K of bits of data and the number N of rows of the interleaver*", and the amendment to paragraph (b) in that claim both represented undisclosed intermediate generalisations of the teaching of the application as originally filed, since both defined levels of generalisation between the broad disclosure of the original claim 1 and the narrower disclosure of the specific embodiments, and because the application as originally filed provided no suggestion that the embodiments could be generalised in this manner. Concerning the first of these amendments, this was particularly evident when considering that the only concrete teaching in the application as filed as to how to determine the prime number P was to divide the number K of bits of data to be interleaved by the number N of rows of the interleaver, resulting in a value n , and then select as P the prime number greater than and closest to n , and that one of the technical problems posed in the introductory part of the description was to reduce the amount of data to be pruned away at the output of the interleaver. Concerning the second, the only concrete example given in the application as filed (page 11, line 6 onwards) for obtaining the sequence permutation table made clear that, in mathematical terms, the permutation sequences for all of the rows were based on raising a primitive root of the Galois field to the power of consecutive elements of that field. This was also clear from feature (c) of original independent claim 2. The fact

that the amendments led to a restriction of the scope of protection of the claims was not relevant to this objection. Thus the ground for opposition under Article 100(c) EPC prejudiced the maintenance of the patent as granted.

None of the respondent's first to fifth auxiliary requests addressed both of these objections. Moreover the amendment to claim 1 in the first auxiliary request represented merely a different undisclosed intermediate generalisation from that of the main request, and the amendment to claim 1 of the fifth auxiliary request did not clearly address the objection raised with respect to paragraph (b) in claim 1 of the main request. These requests therefore all contravened the requirements of Article 123(2) EPC.

The respondent's sixth auxiliary was late-filed and did not clearly address the objections raised with respect to the previous requests, and therefore should not be admitted into the proceedings. The manner in which the respondent had filed his auxiliary requests was clearly not consistent with Articles 12(2) and 13(1) of the Rules of Procedure of the Boards of Appeal.

VI. The relevant arguments of the respondent can be summarised as follows:

The skilled person would have interpreted the application as originally filed, when correctly considering the application as a whole, as disclosing the amendments in paragraphs (a) and (b) of the patent as granted, and would not have considered the disclosure of the selection of the prime number P and

the generation of the permutation sequence on the basis of powers of the primitive root of that prime number to be restricted to the specific methods used in the embodiments. That the permutation need not be based on consecutive elements of the Galois field was evident from the fact that the permutations for the rows other than the first used a different sequence. The limitations in these amendments would have been considered by the skilled person to be implicit in the original claims. Moreover, these amendments did not disadvantage third parties, since they restricted the scope of protection of the claims.

His first to fifth auxiliary requests addressed the objections raised in the preliminary opinion of the board individually, and he could not have been expected to file these requests earlier, since the preliminary opinion of the board was the first occasion on which he had received a negative opinion from the Office.

His sixth auxiliary request was based on the further auxiliary request identified in his reply to that opinion, and was further amended merely to address objections raised for the first time during the oral proceedings. Thus the manner of filing his auxiliary requests represented an expedient means of addressing the various objections raised during the procedure, so that also his sixth auxiliary request met the requirements to be admitted into the proceedings.

Reasons for the Decision

1. The appeal is admissible.

Added subject-matter (Article 100(c) EPC) - main request

2. Two of the amendments introduced in the independent claim 1 as granted result in the subject-matter of the claim extending beyond the content of the application as originally filed.

2.1 Paragraph (a) of claim 1 as granted includes the definition that the prime number P is "*based on the number K of bits of data and the number N of rows of the interleaver*". The claims as originally filed on the other hand contained no definition as to how the prime number P was determined. The broadest explicit disclosure in the description as originally filed as to how this prime number should be determined is that of page 8, lines 18 to 22, which states that P is the prime number which "*is greater than n and closest to n*", where n is (using the terminology of the present claim) the result obtained by dividing K by N. The application as originally filed does not contain any suggestion that the prime number P could be determined from K and N in any manner other than that specified in this passage. Thus claim 1 as granted defines a degree of generalisation of the determination of P which is intermediate between the broad disclosure of the original claims and the narrower disclosure of the description of the embodiments, which intermediate generalisation has no clear and unambiguous basis in the application as originally filed.

2.2 Paragraph (b) of claim 1 as granted includes the definition that the sequence permutation table is generated "*based on powers of a primitive root of the*

prime number P", in which context the board interprets the expression "*primitive root of the prime number P*" as being merely an abbreviated form of the mathematically more exact expression "primitive root of the Galois field of characteristic P".

2.2.1 This definition is more restricted than the broadest disclosure of the application as originally filed, namely that of original claim 1 and the citation of that claim in the introductory part of the description (page 4, lines 15 to 17), which stated that the sequence permutation data were generated by "*performing a given operation on elements of a Galois field of a characteristic P*", without mentioning that this operation involved powers of the primitive root of the field.

2.2.2 The definition in the present claim is however less restricted than the more specific disclosure of the operation carried out on the elements of the Galois field, which can be found in original claim 2 (as well as claims 3 to 5 and the corresponding apparatus claims), the citation of those claims in the introductory part of the description, and the detailed description of "Step S1" on page 11, line 6 onwards, from each of which it is clear that the specific operation required is that a primitive root of the field should be raised to the power of each of the elements of that field consecutively. This is explicit from the equation on page 11 of the description defining the mapping sequence for intra-row permutation in accordance with "Step S1", but is also clear from the text preceding that equation and from feature (c) of claim 2. Thus, compared to this disclosure of the

original application, the present claim lacks the features that the powers to which the primitive root is raised are the elements of the Galois field, that this operation is carried out with all of those elements, and that this is done in consecutive order of those elements.

2.2.3 The application as originally filed did not contain any suggestion that the permutation sequence could be based on the primitive root in any other way than that disclosed in claim 2 and the description on page 11. Hence, the definition in the present claim 1 that it can be based in an unspecified manner on powers of that primitive root represents an intermediate generalisation of the disclosure cited above which has no basis in the application as originally filed.

2.3 The board does not find the respondent's counter-arguments concerning his main request to be convincing for the following reasons.

2.3.1 The respondent's argument that the application should not be interpreted narrowly based solely on the specific embodiments is not sufficient to establish that the skilled person would consider the intermediate generalisations discussed in sections 2.1 and 2.2 above to have been disclosed, because the skilled person would nonetheless interpret the application on the basis of the whole disclosure, and would thus, when considering the possible generalisation of the embodiments, take into account the statements in the introductory part of the description concerning the technical problems addressed. He would thus note that the selection of the prime number P is related to the

third technical problem identified on page 3 of the description of the original application, and would recognise that the selection of any prime number larger than the specific one disclosed at page 8, lines 18 to 22, although technically plausible, would result in increased computational complexity because of the additional data to be pruned, and so should be avoided. Similarly, he would recognise that if the permutation sequence were generated by an operation on the primitive root which did not involve raising that root to the power of each element of the Galois field consecutively, then it could not be guaranteed that the required permutation of the data would be achieved, so that he would consider this aspect of the disclosed operation to be essential. For this reason, and contrary to the respondent's argumentation, the board does not consider that the skilled person would learn from the application as originally filed that the only essential aspect of the generation of the permutation sequence is that it is based on a primitive root of the Galois field. Therefore, in the absence of any explicit indication in the application as originally filed that the specific embodiments could be generalised in the manner defined in paragraphs (a) and (b) of claim 1 as granted, the skilled person would not consider those generalisations to have been disclosed.

- 2.3.2 The respondent has also argued that the amendment to paragraph (a) does not result in added subject-matter because the restriction resulting from the amendment defining that P is based on N and K was implicit in the original claim, since the skilled person would have considered it inherent that P must be based on the number of rows and columns of the matrix. Moreover he

argued that the amended claim was consistent with the teaching of the description, since the skilled person would also have considered it implicit that the value of P had to be selected to be large enough to enable the permutation to be carried out. The board does not find these arguments convincing because, although the skilled person would recognise that these considerations are significant, he would nonetheless interpret the application as a whole as disclosing that the only manner in which P should be selected on the basis of N and K is that defined on page 8, lines 18 to 22, since only that selection addresses the technical problem identified on page 3, as indicated in the paragraph 2.3.1 above.

2.3.3 The board does not agree with the respondent's further argument that these two amendments were allowable because they result in a restriction of the scope of the claims so that third parties would not be disadvantaged, for two reasons. Firstly, Article 100(c) EPC is not concerned with a possible extension of the scope of protection of the claims, this being addressed only in Article 123(3) EPC. Secondly, a restriction to an undisclosed intermediate generalisation can affect third parties, since, as was argued by the appellant, they might then not be able to derive from the application as originally filed which options are open to the applicant or proprietor for subsequent amendment of the claims.

2.3.4 Concerning the respondent's specific argument that the permutation need not be based on consecutive elements of the Galois field, since the original application described that the permutation sequences generated for

rows other than the first result from a non-consecutive sampling of the elements, the board notes that the description in the application (from page 13, line 26) and patent of "Step S4" makes clear that such a sampling is mathematically equivalent to a consecutive sampling based on a different primitive root of the Galois field. Thus the application as originally filed disclosed that each of the different permutation sequences is generated on the basis of consecutive powers of a primitive root of the Galois field.

- 2.4 Therefore, in respect of each of the amendments discussed in sections 2.1 and 2.2 above, the subject-matter of the patent as granted extends beyond the content of the application as originally filed, so that the ground for opposition under Article 100(c) EPC prejudices the maintenance of the patent.

Added subject-matter (Article 123(2) EPC) - first to fifth auxiliary requests

3. None of the respondent's first to fifth auxiliary requests overcomes both of the deficiencies discussed in sections 2.1 and 2.2 above.
- 3.1 In the second and fifth auxiliary requests, the definition of the generation of the prime number P in paragraph (a) of claim 1 has not been amended with respect to the main request, so that the deficiency of section 2.1 above has not been addressed by these requests.

- 3.2 In the first to fourth auxiliary requests, paragraph (b) of claim 1 has not been amended with respect to the main request, so that the deficiency of section 2.2 above has not been addressed by these requests.
- 3.3 The amendment in paragraph (a) of claim 1 of each of the first and third auxiliary requests also does not overcome the deficiency discussed in section 2.1 above, since it defines only that the prime number is based on "*the number K of bits divided by the number N of rows*", without defining how it is based on that ratio. As indicated in section 2.1, the original application contained no disclosure in this respect other than that P was the prime number greater than, but closest to that ratio. The observation in section 2.3.1 above concerning the third problem identified on page 3 of the application applies also to this amendment.
- 3.4 It is moreover not clear that the amendment to paragraph (b) in claim 1 of the fifth auxiliary request addresses the deficiency discussed in section 2.2 above, in particular since in the expression "*in an order of values of exponent parts*" it is not clear what the "exponent parts" are, because these have no precedent in the claim. More specifically, it is apparent that this claim does not define that these exponent parts are the elements of the Galois field of characteristic P, the use of Galois field arithmetic being at most implicit in the definition of the primitive root, but not in the definition of the exponent parts.

- 3.5 Therefore the subject-matter of each of the respondent's first to fifth auxiliary requests extends beyond the content of the application as originally filed, so that they contravene Article 123(2) EPC.

Admissibility of late-filed amendments - sixth auxiliary request

4. The respondent's sixth auxiliary request was filed only during the course of the oral proceedings before the board. Claim 1 of this request differs from that of the fourth auxiliary request only in that the phrase "*arranged in a consecutive order of values of exponent parts of a power notation of the primitive root*" is added at the end of paragraph (b).

- 4.1 The request represents an attempt to address both of the objections discussed in sections 2.1 and 2.2 above. Since these objections were both raised in the appellant's statement of grounds of appeal, and since the board indicated in the communication accompanying the summons to oral proceedings that it was of the preliminary opinion that both of the amendments concerned in claim 1 as granted resulted in the claim defining subject-matter extending beyond the content of the application as originally filed, the respondent was already at the time when he received that communication aware of these objections and the board's preliminary opinion concerning them. Therefore, in the light of Articles 12(2) and 13(1) of the Rules of Procedure of the Boards of Appeal (RPBA), the filing of this request only during the oral proceedings before the board is considered to represent late-filing.

4.2 The amendment introduced in paragraph (b) of the claim merely results in the claim defining a different undisclosed intermediate generalisation from that defined in the fourth auxiliary request, since the amended paragraph, although further restricted in scope, still does not correspond to the disclosure of original claim 2 and page 11 as discussed in section 2.2.2 above. In particular, although the claim defines that the powers of the primitive root are arranged in consecutive order of the exponent parts, it does not define what those exponent parts are, whereas the original disclosure was only of such an arrangement in which the exponent parts are the elements of the Galois field of characteristic P . Thus the amendment does not clearly overcome the objection previously raised against the request on which it was based, indeed it is not clearly and unambiguously derivable from the content of the application as originally filed.

4.3 The respondent argued that this request should nonetheless be admitted, because it represented an attempt to address objections raised only during the oral proceedings before the board (specifically, the issue noted in paragraph 3.4 above), and that since he was justified in not having filed any amendments until after receiving the preliminary opinion of the board because that was the first negative opinion he had received in this case, it followed that he should be allowed to make further amendments to those requests to address additional objections arising during the oral proceedings. These arguments are however not consistent with the RPBA, in particular since Article 12(2) RPBA requires that a respondent present his entire case in his reply to the grounds of appeal. That this should

not be dependent on his receiving a preliminary opinion from the board is immediately apparent from the fact that the board is not obliged to provide such an opinion before the oral proceedings.

4.4 The respondent further argued that his sixth auxiliary request should be admitted, because the sequence in which he had filed his requests, i.e. the five auxiliary requests filed with his letter of 3 November 2009 individually addressing the points raised in the preliminary opinion of the board, and accompanied by a further auxiliary request to consider those requests in combination (in particular the combination of the fourth and fifth), followed at the oral proceedings by the request at issue (representing a clarified version of that specific combination request), represented an expedient way to address the different issues raised in the preliminary opinion of the board. The board is however of the opinion that this argument is not applicable to appeal proceedings, as is apparent from the above-cited articles of the RPBA, so that it cannot justify the filing during oral proceedings before the board of a request which still does not clearly address the objections raised against the previous requests.

4.5 Therefore, following the case law as described in "Case Law of the Boards of Appeal of the European Patent Office", 5th Edition, 2006, section VII.D.14.2, concerning late-filed amendments which do not clearly overcome the previously-raised objections, the board decides not to admit the respondent's sixth auxiliary request into the appeal proceedings.

Request to referral to Enlarged Board of Appeal

5. The legal question underlying the appellant's request for a referral to the Enlarged Board of Appeal, which was presented on page 6 of the appellant's letter of 4 November 2009, namely the question as to how to apply the decision G 1/93, is not at issue in this decision, so that the need for this referral does not arise.

Order

For these reasons it is decided that:

The decision under appeal is set aside.

The patent is revoked.

The Registrar:

The Chairman:

U. Bultmann

M. Ruggiu