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**Datasheet for the decision
of 7 November 2019**

Case Number: T 0195/16 - 3.5.05

Application Number: 08012611.3

Publication Number: 2015504

IPC: H04L5/00, H04L1/00

Language of the proceedings: EN

Title of invention:

Transmission of a CCFI or of PCFICH in a wireless communication system

Applicant:

Samsung Electronics Co., Ltd.

Headword:

Generation of codebooks/SAMSUNG

Relevant legal provisions:

EPC Art. 56, 13(1)

Keyword:

Inventive step - main request (no): obvious alternative solution

Admission of auxiliary request filed prior to oral proceedings - (no): fresh case



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Case Number: T 0195/16 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 7 November 2019

Appellant: Samsung Electronics Co., Ltd.
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Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 27 July 2015
refusing European patent application
No. 08012611.3 pursuant to Article 97(2) EPC**

Composition of the Board:

Chair A. Ritzka
Members: K. Bengi-Akyuerek
A. Jimenez

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division to refuse the present European patent application for lack of clarity (Article 84 EPC) and lack of inventive step (Article 56 EPC), having regard to the disclosure of

D1: Samsung: "Cat0 Transmission Structure", 3GPP TSG RAN WG1 Meeting #49, draft R1-072601, pp. 1-5, May 2007,

combined with *inter alia* the teaching of

D2: Samsung: "Coding for CCFI Transmission", 3GPP TSG RAN WG1 Meeting #49bis, draft R1-073098, pp. 1-3, June 2007.

II. With its statement setting out the grounds of appeal, the appellant re-filed the set of claims underlying the appealed decision as main request and submitted amended sets of claims according to first to third auxiliary requests. It requested that the examining division's decision be set aside and that a patent be granted on the basis of any of those claim requests.

III. In a communication annexed to the summons to oral proceedings pursuant to Article 15(1) RPBA, the board gave its preliminary opinion on the appeal. In particular, it raised objections under Article 123(2) EPC with respect to the main request, indicated that the claims of the first auxiliary request lacked inventive step (Article 56 EPC) in light of document D2 combined with document D1, and expressed concerns about the admissibility of the second and third auxiliary requests under Article 12(4) RPBA on the grounds that

they appeared to amount to a fresh case.

- IV. By a letter of reply dated 8 October 2019, the appellant submitted amended claims according to a new main request and a new auxiliary request, replacing the former main and auxiliary requests on file, together with counter-arguments to the objections raised in the board's communication under Article 15(1) RPBA.
- V. Oral proceedings were held on 7 November 2019, during which the allowability of the main request and the admissibility of the auxiliary request on file were discussed.

The appellant's final requests were that the decision under appeal be set aside and that a patent be granted on the basis of the main request, or alternatively on the basis of the auxiliary request, both filed with letter dated 8 October 2019.

At the end of the oral proceedings, the board's decision was announced.

- VI. Claim 1 of the **main request** reads as follows:

"A method for transmitting a control channel format indicator, CCFI, the method comprising the steps of:

mapping a plurality of two-bit CCFI into one selected from a first codebook and a second codebook, with the plurality of CCFI being selected from a group consisting of "00", "01", "10" and "11", and with the first codebook comprising codewords selected from a group consisting of component codewords "000", "011", "101" and "110" corresponding to a designated CCFI and the second codebook comprising codewords selected from

a component codeword group consisting of component codewords "111", "100", "010" and "001" corresponding to the designated CCFI;

generating a sequence of codewords selected from either the first codebook or the second codebook by repeating the selected component codeword for predetermined times, with the predetermined times being determined by a flooring of quotient $\lfloor 4K/3 \rfloor$, where K is a number of resource units occupying one orthogonal frequency division multiplexing, OFDM, symbol and two neighboring subcarriers;

generating a codeword by concatenating the sequence of the selected component codewords with the original designated CCFI bits; and

when CCFI has four states consisting [sic] "00", "01", "10" and "11", further comprising a step of generating a third codebook comprising four codewords by concatenating the sequence of component codewords selected from the second codebook with the designated CCFI to which the selected component codeword corresponds and the four codewords being "111 111 111 111 111 111 111 111 00", "100 100 100 100 100 100 100 100 01", "010 010 010 010 010 010 010 010 10" and "001 001 001 001 001 001 001 001 11" with the four codewords being corresponding [sic] the designated CCFI;

and transmitting a codeword of the third codebook carrying information of CCFI."

Claim 1 of the **auxiliary request** reads as follows (amendments vis-à-vis claim 1 of the main request underlined by the board):

"A method for transmitting a control channel format indicator, CCFI, the method comprising the steps of:

mapping a plurality of two-bit CCFI into one selected from a first codebook and a second codebook, with the plurality of CCFI being selected from a group consisting of "00", "01", "10" and "11", and with the first codebook comprising codewords selected from a group consisting of component codewords "000", "011", "101" and "110" corresponding to a designated CCFI and the second codebook comprising codewords selected from a component codeword group consisting of component codewords "111", "100", "010" and "001" corresponding to the designated CCFI;

generating a sequence of codewords selected from either the first codebook or the second codebook by repeating the selected component codeword for predetermined times, with the predetermined times being determined by a flooring of quotient $\lfloor 4K/3 \rfloor$, where K is a number of resource units occupying one orthogonal frequency division multiplexing, OFDM, symbol and two neighboring subcarriers;

generating a codeword by concatenating the sequence of the selected component codewords with the original designated CCFI bits; and

when CCFI has four states consisting [sic] "00", "01", "10" and "11", further comprising

- i) a step of generating a third codebook comprising four codewords by concatenating the sequence of component codewords selected from the second codebook with the designated CCFI to which the selected component codeword corresponds and the four codewords being "111 111 111 111 111 111 111 111 111 111 00", "100 100 100 100 100 100 100 100 100 100 01", "010 010 010 010 010 010 010 010 010 10" and "001 001 001 001 001 001 001 11" with the four codewords being corresponding [sic] the designated CCFI; and
- ii) a step of generating a permutation of each of the four codewords by mapping a leading K repetitions of

the three-bit component codeword in the four codewords to the number of K resource units respectively with one bit of each of resource units being open and mapping remaining K bits of each of the four codewords separately to the open bit of each of the number of K resource units thereby generating a fourth codebook having four codewords and the four codewords being "1111 1111 1111 1111 1111 1111 1110 1110", "1001 1000 1000 1001 1000 1000 1000 1001", "0100 0101 0100 0100 0101 0100 0101 0100" and "0010 0010 0011 0010 0010 0011 0011 0011" with the four codewords being corresponding [sic] the designated CCFI;

and transmitting a codeword of the fourth codebook carrying information of CCFI."

Reasons for the Decision

1. *The present application*

The present application is concerned with coding and transmission of so-called "Category 0 (Cat0)" bits or "control channel format indicator, CCFI" bits in a 3GPP-based OFDM wireless system. The proposed coding scheme is based on mapping two-bit CCFI codes to three-bit component codewords as a (3,2,2) code according to a pre-selected (3,2) codebook C_n . A "final channel bit sequence" to be transmitted is then generated by repeating the selected component codewords of a codebook $C_1=\{111, 100, 010, 001\}$ or $C_2=\{000, 011, 101, 110\}$ $4K/3$ times (K: number of available resource units, RUs) and then concatenating the original CCFI bits (for the generation of so-called codebooks A and C; see page 11, line 23 to page 12, line 11 and page 12, line 27 to page 13, line 4 of the application as filed) and, optionally, performing column-wise

permutation in addition (for the generation of so-called codebooks B and D; see page 12, lines 15-26 and page 13, lines 5-8 of the application as filed). Hence, the present application describes essentially four embodiments.

According to the present description, the technical problem to be solved by the application is "to provide a simple and efficient transmission and reception diversity scheme that is enable[d] to capture both spatial and frequency diversity in the channel" (see page 10, lines 11-15 as filed) and "to provide a CCFI coding method in a case where the length of a coded CCFI is not an integer multiple of three" (see page 3, lines 22-24 as filed).

2. MAIN REQUEST

Claim 1 of the main request comprises the following limiting features (as labelled and highlighted by the board):

A method for transmitting a control channel format indicator (CCFI), the method comprising the steps of:

- A) mapping a plurality of two-bit CCFI into one selected from a **first codebook** ("codebook C₂" according to the underlying description) and a **second codebook** ("codebook C₁" according to the underlying description),
- B) wherein the plurality of CCFI is selected from a group consisting of "00", "01", "10" and "11",
- C) wherein the first codebook comprises codewords selected from a group consisting of component codewords "000", "011", "101" and "110" corresponding to a designated CCFI and the **second codebook** comprises codewords selected from a

- component codeword group consisting of component codewords **"111", "100", "010" and "001"** corresponding to the designated CCFI;
- D) generating a sequence of codewords selected from either the first codebook or the second codebook by repeating the selected component codeword for predetermined times, with the predetermined times being determined by a flooring of quotient $\lfloor 4K/3 \rfloor$, where K is a number of resource units occupying one OFDM symbol and two neighbouring sub-carriers;
 - E) generating a codeword by concatenating the sequence of the selected component codewords with the original designated CCFI bits;
 - F) when CCFI has four states consisting [of] "00", "01", "10" and "11", further comprising a step of generating a **third codebook** ("codebook C" according to the underlying description) comprising four codewords by concatenating the sequence of component codewords selected from the **second codebook** with the designated CCFI to which the selected component codeword corresponds and the four codewords being "111 111 111 111 111 111 111 111 111 111 00", "100 100 100 100 100 100 100 100 100 100 01", "010 010 010 010 010 010 010 010 010 010 10" and "001 001 001 001 001 001 001 001 001 001 11" with the four codewords corresponding [to] the designated CCFI;
 - G) transmitting a codeword of the third codebook carrying information of CCFI.

2.1 *Clarity (Article 84 EPC)*

- 2.1.1 The examining division held that claim 1 then on file was not clear, since it suggested that there were "further codebook generating steps", contrary to the

present description (see appealed decision, point 11).

2.1.2 However, the board is satisfied that present features D) to F) of claim 1 specify in a sufficiently clear way how the third codebook ("codebook C") is generated, namely by concatenating the sequence of the component codewords selected from the second codebook with the original two CCFI bits. Hence, this objection under Article 84 EPC is considered to be overcome.

2.2 *Inventive step (Article 56 EPC)*

The board judges that the subject-matter of claim 1 is new (Article 54 EPC) but does not involve an inventive step (Article 56 EPC), for the reasons set out below.

2.2.1 The board concurs with the appellant that prior-art document **D2** constitutes the most suitable starting point for the assessment of inventive step. Document D2 discloses all the features of present claim 1 except for the generation of the specific codewords of the third codebook based on a second codebook according to feature F). This is because D2 teaches the generation of four specific "final length-32 codewords" (cw1 to cw4), i.e. with lengths that are not a multiple of three, of a "Codebook A" on the basis of a codebook consisting of the codewords {000, 011, 101, 110} (see D2, page 1, Table 1) corresponding to the first codebook C2 according to the claimed invention.

The appellant conceded at the oral proceedings before the board that there was no doubt that codebooks C₁ and C₂ were known and had the same effect. However, the skilled person was not prompted to apply the codebook generation scheme taught in D2 to another codebook such as a codebook consisting of the codewords {111, 100,

010, 001}.

2.2.2 As regards the objective technical problem associated with the above distinguishing feature, the appellant argued that claim 1 represented "an alternative solution of the problem of providing a CCFI coding method for a case wherein the length of a coded CCFI is not a multiple of three" (see appellant's letter dated 8 October 2019, page 2, second paragraph). The board accepts this formulation of the objective problem.

2.2.3 The board, however, finds that the person skilled in the field of 3GPP-based mobile networks, starting from D2 and faced with the above objective problem, would certainly have known that also other (3,2) codebooks are available in the context of CCFI coding in 3GPP-based standardisation documents (see e.g. **D1**, page 1, section 2, item 2: "... codebook C={111, 100, 010[,] 001}" that is identical to the "second codebook" as claimed). Consequently, the skilled person would have applied exactly the same codebook generation method as described in the last paragraph of page 1 of D2 to the alternative codebook of D1 as the input data, namely repeating the three-bit component codewords from that (3,2) codebook for predetermined times (such as e.g. ten times), in order to arrive at an alternative solution to the problem of providing a CCFI coding method in the event that the length of a coded CCFI is not a multiple of three.

2.2.4 In this regard, the appellant argued that D2 did not disclose "length-4 component codewords".

The board notes, however, that the present application fails to teach the use of "length-4 component codewords". Rather, the application as filed teaches

the use of "length-3 component codewords" (see e.g. page 4, lines 3-4) or, at most, the use of codebooks (C_1 or C_2) of size four (see page 3, lines 7-11).

- 2.2.5 At the oral proceedings before the board, the appellant further submitted that the skilled person would not have deviated from a standard-based solution as proposed by D2 that solely relied upon the use of a codebook made up of elements {000, 011, 101, 110}.

The board is not persuaded by this argument either. Firstly, D2 specifically states "we assume the (3,2) codebook is $C_1=\{000, 011, 101, 110\}$ " (see page 1, section 2, second sentence; emphasis added). Secondly, D1 is palpably related to the same standardisation working group (i.e. "3GPP TSG RAN WG1") and expressly points to the possible use of the codebook as claimed (see D1, page 1, section 2, item 2: "A (3,2) code ... is applied to map the 2 Cat0 information bits to a 3 bit codeword. One example of such a codebook C is ... $C=\{111, 100, 010[,] 001\}$ ").

- 2.2.6 In view of the above, the board concludes that the skilled person, having regard to D2 and D1, would have arrived at the solution of present claim 1, namely the specific generation of the third codebook according to feature F), using solely his/her routine skills and without the need for inventive skills.

- 2.3 In conclusion, the main request is not allowable under Article 56 EPC.

3. AUXILIARY REQUEST

Claim 1 of the auxiliary request differs from claim 1 of the main request basically in that it no longer

includes feature G) but instead comprises the steps of (emphasis added by the board):

- H) generating a permutation of each of the four codewords by mapping the leading K repetitions of the three-bit component codeword in the four codewords to the number of K resource units respectively with one bit of each of resource units being open and mapping the remaining K bits of each of the four codewords separately to the open bit of each of the number of K resource units;
- I) thereby generating a **fourth codebook** ("codebook D" according to the underlying description) having four codewords and the four codewords being "1111 1111 1111 1111 1111 1111 1111", "1001 1001 1001 1001 1001 1001 1001", "0100 0100 0100 0100 0100 0100 0100" and "0010 0010 0010 0010 0010 0010 0010" with the four codewords being corresponding [to] the designated CCFI;
- J) transmitting a codeword of the **fourth codebook** carrying information of CCFI.

3.1 *Admission into the proceedings (Article 13(1) RPBA)*

3.1.1 The claims of the auxiliary request were filed for the first time with the appellant's letter in response to the board's summons to oral proceedings (see point IV above). In appeal proceedings, the admissibility of submissions such as claim amendments filed *after* a party has submitted its statement setting out the grounds of appeal, which "shall contain a party's complete case" (Article 12(2) RPBA), is mainly governed by Article 13 RPBA. By virtue of Article 13(1) RPBA, a board's discretion in admitting any amendment to a party's case "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".

- 3.1.2 The appellant submitted that the present auxiliary request did not amount to "a principal change of the subject-matter claimed" since the subject-matter corresponded to claim 9 as originally filed that had been searched according to the respective European search report.
- 3.1.3 It is apparent from the history of the file that the combination of features H) to J), relating to the generation and transmission of "codebook D" on the basis of generated "codebook C" (see feature F) of present claim 1), was included in the originally filed claim set as dependent claims 4, 8 and 9. They had been omitted in the set of claims submitted by the then applicant on 5 August 2014 and had then be re-introduced - however in isolation (i.e. as dependent claims 4 and 6 that referred only to claim 1 but not to each other) - in the claim sets filed on 22 April 2015 underlying the appealed decision and re-filed with the statement of grounds of appeal (see e.g. dependent claims 4 and 6 of the then main request).
- 3.1.4 Consequently, the examining division *could* and *did* not decide on the patentability (in particular on novelty and inventive step) of any claim including those features, i.e. the specific generation of "codebook D" in dependence of a previously generated "codebook C". In particular, added features H) to J) embracing "column-wise permutation" and "RU mapping" are related to a different problem, namely how to fit the K 1x2 RU resource configuration and to map a full repetition to an RU (resource unit) as much as possible in fading

channels (see page 4, lines 14-23 and page 12, lines 15-25). Thus, they entail a "fresh case" giving rise to a shift of focus to new issues during the overall proceedings.

- 3.1.5 It is however contrary to the purpose of appeal proceedings to examine and decide on a fresh case for the first time during those appeal proceedings. In particular, the admission of such a claim request into the proceedings would add complexity to the case and arguably necessitate a remittal to the examining division for further prosecution, in particular for establishing the closest prior art for the new subject-matter together with a (possibly amended) objective technical problem arising from such prior art. This, however, would in turn clearly undermine procedural economy as mentioned in Article 13(1) RPBA. Therefore, the board holds that such an independent claim and thus the associated scope of protection sought could and should have been presented and pursued already in the examination proceedings, so that it would have been subject to an appealable decision.
- 3.2 Therefore, the board has decided not to admit the auxiliary request on file into the appeal proceedings under Article 13(1) RPBA.
4. Given that the main request is not allowable under Article 56 EPC and that the auxiliary request is not admitted into the proceedings under Article 13(1) RPBA, the appeal has to be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chair:



K. Götz-Wein

A. Ritzka

Decision electronically authenticated