

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 November 2014**

Case Number: T 1940/11 - 3.5.05

Application Number: 01932381.5

Publication Number: 1192750

IPC: H04L1/00, H04L1/18

Language of the proceedings: EN

Title of invention:

Data transmission apparatus and method for an HARQ data communication system

Applicant:

Samsung Electronics Co., Ltd.

Headword:

HARQ-based retransmission/SAMSUNG

Relevant legal provisions:

EPC 1973 Art. 83, 84

EPC Art. 123(2)

RPBA Art. 12(4)

Keyword:

Support by the description - (no)

Sufficiency of disclosure - (no)

Admission of second auxiliary request - (no)

Decisions cited:

Catchword:



**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 1940/11 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 7 November 2014

Appellant: Samsung Electronics Co., Ltd.
(Applicant) 129, Samsung-ro
Yeongtong-gu
Suwon-si, Gyeonggi-do, 443-742 (KR)

Representative: Grünecker, Kinkeldey,
Stockmair & Schwanhäusser
Leopoldstrasse 4
80802 München (DE)

Decision under appeal: **Decision of the Examining Division of the
European Patent Office posted on 11 April 2011
refusing European patent application
No. 01932381.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair A. Ritzka
Members: K. Bengi-Akyuerek
G. Weiss

Summary of Facts and Submissions

- I. The appeal is against the decision of the examining division, posted on 11 April 2011, to refuse European patent application No. 01932381.5 on the grounds of added subject-matter (Article 123(2) EPC) and lack of clarity (Article 84 EPC) in respect of a main and first auxiliary request as well as lack of clarity (Article 84 EPC) and insufficiency of disclosure (Article 83 EPC) with regard to a second auxiliary request.

- II. Notice of appeal was received on 21 June 2011. The appeal fee was paid on the same day. With the statement setting out the grounds of appeal, received on 18 August 2011, the appellant filed new sets of claims according to a main request and three auxiliary requests. It requested that the decision of the examining division be set aside and that a patent be granted on the basis of the main request or one of the auxiliary requests.

- III. A summons to oral proceedings scheduled for 7 November 2014 was issued on 16 June 2014. In an annex to this summons, the board expressed its preliminary opinion on the appeal pursuant to Article 15(1) RPBA. In particular, it raised objections under Articles 84 and 83 EPC 1973, indicated that it was minded not to admit the second auxiliary request into the appeal proceedings under Article 12(4) RPBA, and made general observations with respect to the question of novelty and inventive step under Article 52(1) EPC.

- IV. With a letter of reply dated 7 October 2014, the appellant maintained the main, first and second auxiliary requests, and submitted amended third and

fourth auxiliary requests alongside counter-arguments on the objections raised in the board's communication under Article 15(1) RPBA, and requested that a patent be granted on the basis of the main request or one of the auxiliary requests.

- V. Oral proceedings were held as scheduled on 7 November 2014, during which all the pending requests were discussed.

The appellant's final request was that the decision under appeal be set aside and that a patent be granted on the basis of amended claims according to one of a main request (claims 1 to 7), a first auxiliary request (claims 1 to 15), a second auxiliary request (claim 1), all submitted with the statement setting out the grounds of appeal, a third auxiliary request (claims 1 to 11) and a fourth auxiliary request (claims 1 to 11), both requests filed with letter dated 7 October 2014, and a description to be adapted thereto.

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

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

"A method for transmitting a sequence of information bits and sequences of parity bits to an HARQ (Hybrid Automatic Repeat Request) receiver in an HARQ transmission system including a turbo encoder for receiving a[sic] L input information bits and generating a coded data, the L information bits and part of M sequences of parity bits for the information bits, wherein M is determined depending on a transmission code rate, the method comprising the steps of:

determining an initial transmission code rate depending on the transmission code rate and a possible retransmission number during initial transmission, and including the sequence of information bits in an initial data block transmitted at the determined initial transmission code rate; and

upon every receipt of a retransmission request from the HARQ receiver, determining a retransmission code rate depending on the initial transmission code rate, a possible transmission number and a retransmission-attempted number, and uniformly including non-transmitted parity bits out of parity bits provided from each sequence of the parity bits in a data block retransmitted at the determined retransmission code rate."

Claim 1 of the **first auxiliary request** reads as follows:

"A method for transmitting a sequence of information bits and sequences of parity bits in an HARQ (Hybrid Automatic Repeat Request) transmission system including a turbo encoder for receiving L input information bits and generating coded data, the L information bits and M, where $M \geq 2$, sequences of L parity bits for the input information bits, the method comprising the steps of:

determining an initial code rate for transmission, and including the sequence of information bits in an initial data block transmitted at the determined initial code rate for transmission; and

transmitting the L information bits and part of sequences of the parity bits, the part determined by

one of the two integers closer to $(N1-L)/M$, where $N1$ indicates the number of bits transmitted given when the initial code rate for transmission of the turbo encoder is below 1 during initial transmission; and

upon every receipt of a retransmission request from the HARQ receiver, determining a code rate for retransmission depending on the initial code rate for transmission, the number of the transmission and the number of the retransmission, and uniformly including non-transmitted parity bits out of parity bits provided from each sequence of the parity bits in a data block retransmitted at the determined code rate for retransmission.[sic]

at the receiver's retransmission request due to failure to receive the information bits transmitted during the initial transmission, transmitting part of sequences of the parity bits determined by one of the two integers closer to $N2/M$ where $N2$ indicates the number of the bits transmitted given when a retransmission code rate of the turbo encoder is below 1."

Claim 1 of the **second auxiliary request** reads as follows:

"A method for transmitting a sequence of information bits and sequences of parity bits in an HARQ (Hybrid Automatic Repeat Request) transmission system including a turbo encoder, comprising sequences of coded symbols, X , Y , Z , referring to systematic information bits, and parity bits from a first and second encoder, where X indicates the number of systematic information bits, Y indicates the number of parity bits from the first encoder, Z indicates the number of parity bits from the second encoder, the method comprising:

determining a size of a first transmitted coded data block for a source data packet to be transmitted, its associated code rate and coding scheme, and determine a size of a data block used during each retransmission, its associated code rate and coding scheme;

selecting redundancy bits, redundancies, to be retransmitted under the conditions:

puncturing the coded symbols output from the encoder using a uniform, in particular periodic pattern, and minimizing the number of puncturing bits;

repeating the coded symbols from the encoder using a uniform, in particular a periodic pattern and minimizing the repetition period;

maximizing the number of repetition bits;

in case a first transmission code rate, R_1 , is equal to 1, transmitting systematic symbols corresponding to the input information words during initial transmission;

in case R_1 is less than 1, transmitting a data block during initial transmission including all possible systematic symbols corresponding to the information word, and the remaining part including the redundancies;

for each retransmission, transmitting the redundancies uniformly mixed before retransmission;

in case R_1 is less than 1, determining R_1 by the maximum throughput of the turbo code."

Claim 1 of the **third auxiliary request** reads as follows:

"A method for transmitting a sequence of information bits and sequences of parity bits in an HARQ (Hybrid Automatic Repeat Request) transmission system including a turbo encoder for receiving a [sic] L input information bits and generating a coded data, the L information bits and $M \geq 2$ sequences of L parity bits for the input information bits, the method comprising the steps of:

transmitting the L information bits and part of sequences of the parity bits determined by one of two integers closer to $(N_1 - L)/M$ where N_1 indicates a number of transmission bits given when an initial transmission code rate of the turbo encoder is below 1 during initial transmission; and

at a receiver's retransmission request due to failure to receive the information bits transmitted during the initial transmission, transmitting part of sequences of parity bits determined by one of two integers closer to N_2/M where N_2 indicates a number of the transmission bits given when a retransmission code rate of the turbo encoder is below 1."

Lastly, claim 1 of the **fourth auxiliary request** reads as follows:

"A method for transmitting a data block in a transmitter of an HARQ, Hybrid Automatic Repeat Request, transmission system, the method comprising the

steps of:

receiving L input information bits, and generating a sequence of the L information bits and M, where $M \geq 2$, sequences of L parity bits based on code rate;

upon initial transmission, including the sequence of the L information bits in an initial data block, and transmitting the initial data block; and

upon every receipt of a retransmission request from the HARQ receiver, uniformly including non-transmitted parity bits out of parity bits provided from each sequence of the parity bits in a retransmission data block, and transmitting the retransmission data block;

characterised in that

if a code rate for transmission of the initial data block is an initial code rate, a code rate for transmission of the retransmission data block is determined depending on the initial code rate, a number of the transmission and a number of the retransmission, wherein the initial data block include the sequence of the L information bits and part of sequences of parity bits determined by one of the two integers closer to $(N1-L)/M$ where N1 indicates a number of transmission bits given when the initial code rate is below 1, and the retransmission data block include part of sequences of parity bits determined by one of the two integers closer to $N2/M$, where N2 indicates a number of transmission bits given when the code rate for transmission of the retransmission data block is below 1."

Reasons for the Decision

1. The appeal is admissible.
2. MAIN REQUEST

The claims of this request correspond to claims 5 to 11 as originally filed and differ from those of the main request underlying the appealed decision essentially in that

- A) the condition " $M \geq 2$ " has been removed from claim 1;
- B) the terms "number of the transmission" and "number of the retransmission" have been replaced by the expression "possible retransmission number" in claim 1;
- C) a retransmission code rate is now defined in claim 1;
- D) the conditions for determining the parity bits based on $(N1-L)/M$ and $N2/M$ have been shifted from claim 1 to dependent claims 2 and 4 respectively;
- E) the features of former claims 6 to 9 have been deleted.

As a result, claim 1 of the present main request comprises the following features:

A method for transmitting a sequence of information bits and sequences of parity bits to an HARQ receiver in an HARQ transmission system including a turbo encoder for receiving L input information bits and generating coded data, L information bits and part of M sequences of parity bits for the information bits

- a) wherein M is determined depending on a transmission code rate
- and the method comprises the following steps:
- b) determining an initial transmission code rate depending on the transmission code rate and a possible retransmission number during initial transmission;
 - c) including the sequence of information bits in an initial data block transmitted at the determined initial transmission code rate;
 - d) upon every receipt of a retransmission request from the HARQ receiver, determining a retransmission code rate depending on the initial transmission code rate, a possible transmission number and a retransmission-attempted number;
 - e) uniformly including non-transmitted parity bits out of parity bits provided from each sequence of the parity bits in a data block retransmitted at the determined retransmission code rate.

Moreover, dependent claims 2 and 4 of the main request add the following method steps to those of claim 1:

- f) initially transmitting a part of sequences of the parity bits determined by one of two integers closer to $(N1-L)/M$, where $N1$ indicates the number of bits transmitted given when the initial transmission code rate is below 1;
- g) retransmitting a part of sequences of the parity bits determined by one of two integers closer to $N2/M$, where $N2$ indicates a number of transmission bits given when a retransmission code rate of the turbo encoder is below 1 at the retransmission request.

2.1 Article 123(2) EPC

2.1.1 The examining division held that adding the feature that "a code rate for transmission of the retransmission data block is determined depending on the initial code rate, a number of the transmission and a number of the retransmission" in former claim 1 and omitting the features, in former dependent claims 7 and 8, that the number of the information bits transmitted is determined *inter alia* by the possible transmission number and that the initial code rate is determined depending *inter alia* on the retransmission-attempted number contravened Article 123(2) EPC (cf. appealed decision, sections II.1.1 and II.1.2).

2.1.2 By way of amendments B) and E), the board is satisfied that those objections no longer apply and that the claims of the new main request now comply with Article 123(2) EPC.

2.2 Articles 84 and 83 EPC 1973

The board judges that claims 1, 2 and 4 of the main request do not meet the requirements of Articles 84 and 83 EPC 1973 due to inconsistencies between their subject-matter and the description, for the following reasons:

2.2.1 As to claim 1, features a), b) and d) require that the determination of the number of parity-bit sequences M depends on the transmission code rate (R) , the determination of the initial transmission code rate (R_1) depends on the transmission code rate (R) and the possible retransmission number, and the determination of the retransmission code rate (R_2, R_3) depends on the initial transmission code rate (R_1) , the possible

transmission number and the retransmission-attempted number.

However, the present application is completely silent as to a coherent and deterministic teaching on such dependencies. As to the number of parity-bit sequences M , the application as originally filed implicitly teaches that M corresponds to the number of component turbo encoders (cf. page 13, line 34 to page 14, line 17 in conjunction with Fig. 3) rather than depending on the transmission code rate, i.e. the so-called mother code rate R .

As to the transmission and retransmission code rates R , R_1 , R_2 and R_3 , the skilled person in the field of HARQ systems is well aware that, generally, the code rate of the forward error correction code (FEC code) represents the ratio of the number of transmitted information bits (i.e. systematic bits) to the total number of transmitted information bits and parity bits (i.e. the redundancy data used for the FEC code), so that the lower the code rate the higher the number of redundancy bits (see also page 4, lines 9-20 of the description as filed). In this regard, the original application merely exemplifies that the HARQ system under consideration is supposed to retransmit each coded data block three times according to the so-called "triple-retransmission method" and that the code rate for each retransmission can be determined as shown in Table 1, i.e. $R_1=1$, $R_2=1/2$ and $R_3=1/3$, if the mother code has a code rate $R=1/3$ (cf. page 11, lines 8-19 and page 18, lines 7-18 in conjunction with Table 1 on page 5 of the description as filed). But the board cannot discern, in the entire application, any generic and conclusive relationship or dependency whatsoever between the individual code rates, in accordance with the decision

under appeal (cf. page 7, penultimate paragraph). Put differently, there is no clear and sufficient teaching about any dependency of the M parity-bit sequences (on the transmission code rate) according to feature a), the initial transmission code rate (on the transmission code rate and the possible retransmission number) by virtue of feature b), and the retransmission code rate (on the initial transmission code rate, the possible transmission number and the retransmission-attempted number) according to feature d) of claim 1.

In this context, at the oral proceedings before the board, the appellant contended that the skilled person would know how to derive the parameter M from the transmission code rate, and argued that the person skilled in the art would also readily infer the respective code rates from the scenarios covered by Table 2 on page 14 of the description as filed. However, it is apparent to the board that Table 2 referred to shows only an example for the distribution of the *absolute* numbers of redundancy bits selected from the corresponding M turbo encoders (cf. page 14, lines 6-7 and 15-17 of the description as filed) rather than providing any indication of the *relative* numbers of information and parity bits for determining the actual code rates. Thus, even if the board accepted that the skilled person could indeed manage to derive the parameter M from the transmission code rate using his common general knowledge, the original application at least does not disclose, by explicit statement or by implication, any deterministic relationship between the respective code rates.

2.2.2 As regards dependent claims 2 and 4 and its features f) and g), the original description does not include any general and conclusive teaching whatsoever as to the

selection of one of two (undefined) integers being closer to $(N1-L)/M$ and $N2/M$ for the purpose of parity determination, as required by features f) and g). Instead, the description as filed teaches that the respective parity bits (i.e. redundancies) from the two component turbo encoders are uniformly transmitted at exclusive positions until the second transmission and that the redundancies transmitted during each retransmission should have such a format that the redundancies output from the respective component decoders are uniformly transmitted (cf. page 15, lines 2-5 and page 12, "Condition 7" of the description as filed). Parameters "N1" and "N2" are not even mentioned in the entire description, except on page 8, line 31 to page 32, line 4 associated with the section headed "SUMMARY OF THE INVENTION", which typically reiterates the wording of the underlying claims.

2.2.3 Accordingly, in view of the above-mentioned inconsistencies between claims 1, 2 and 4 and the present application's description, the board finds that features a), b) and d) of claim 1 and features f) and g) of claims 2 and 4 are not supported by the description, contrary to the requirements of Article 84 EPC 1973, and that the invention as defined *inter alia* by those features cannot be put into practice by the skilled person over the whole range claimed without undue burden, contrary to Article 83 EPC 1973.

2.3 In conclusion, the main request is not allowable under Articles 84 and 83 EPC 1973.

3. FIRST AUXILIARY REQUEST

Claim 1 of this request differs from claim 1 of the main request, apart from minor re-wordings, basically in that the terms "possible transmission number" and "retransmission-attempted number" have been replaced by the expressions "number of the transmission" and "number of the retransmission" respectively, and in that it no longer comprises features a) and b), i.e. that the M sequences depend on the transmission code rate and that the initial code rate depends on the transmission code rate and a possible retransmission number, but comprises features f) and g) instead.

Consequently, the observations set out in points 2.2.1 and 2.2.2 above regarding features d), f) and g) of claim 1 of the main request apply *mutatis mutandis* to claim 1 of this auxiliary request. In conclusion, the first auxiliary request is also not allowable under Articles 84 and 83 EPC 1973.

4. SECOND AUXILIARY REQUEST

This request, consisting of a single claim, differs substantially from the main request *inter alia* in that claim 1 as amended no longer comprises features a) to e) but now includes a large number of new features taken from the description.

4.1 *Admission into the appeal proceedings*

This auxiliary request was filed with the statement setting out the grounds of appeal. The admissibility of requests filed with the statement setting out the grounds of appeal is, in principle, subject to Article 12 RPBA. According to Article 12(4) RPBA, a board has the discretionary power "to hold inadmissible facts, evidence or requests which could have been

presented or were not admitted in the first instance proceedings".

The board has decided not to admit this request into the appeal proceedings in the exercise of its discretionary power under Article 12(4) RPBA, in view of the following facts:

- 1) the claims of this request had been filed for the first time in the first-instance proceedings on 13 September 2010 (as "Auxiliary Request 2") and were subsequently withdrawn during the oral proceedings before the examining division (see minutes of the first-instance oral proceedings held on 13 October 2010, item 9);
- 2) the amendments made in claim 1 of this request are directed to an entirely different subject-matter, namely the individual conditions for redundancy selection based on puncturing;
- 3) the subject-matter of claim 1 as amended constitutes a "shift of focus" which would arguably necessitate an additional search and examination, contrary to the principle of procedural economy.

The board concludes from the above facts that this request not only *could* but also *should* have been presented in the first-instance proceedings in the sense of Article 12(4) RPBA.

4.2 Therefore, the board did not admit the second auxiliary request into the appeal proceedings.

5. THIRD AUXILIARY REQUEST

Claim 1 of this request differs from claim 1 of the main request essentially in that it no longer comprises features a) to e), but now merely includes features f) and g).

Hence, the observations made in point 2.2.2 above regarding features f) and g) of claim 1 of the main request apply *mutatis mutandis* to claim 1 of this auxiliary request. In conclusion, the third auxiliary request is likewise not allowable under Articles 84 and 83 EPC 1973.

6. FOURTH AUXILIARY REQUEST

This request corresponds to the main request underlying the appealed decision and differs from the present main request basically in that amendments A) to E) listed in point 2 above have been reversed in claim 1.

Accordingly, the observations made in points 2.2.1 and 2.2.2 above regarding features d), f) and g) of claim 1 of the main request apply *mutatis mutandis* to claim 1 of this auxiliary request. In conclusion, the fourth auxiliary request is likewise not allowable (at least) under Articles 84 and 83 EPC 1973.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar:

The Chair:



K. Götz-Wein

A. Ritzka

Decision electronically authenticated