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Datasheet for the decision of 5 December 2014

Case Number: T 1666/13 - 3.5.05

Application Number: 10177736.5

Publication Number: 2259527

IPC: H04L27/26

Language of the proceedings: EN

Title of invention:
Multi carrier apparatus and method for communicating a data block with a PAPR reduction identification sequence superimposed thereon

Applicant:
BlackBerry Limited

Headword:
PAPR reduction in OFDM-based system/BLACKBERRY

Relevant legal provisions:
EPC Art. 56

Keyword:
Inventive step - (no)
Oral proceedings - held in absence of appellant

Decisions cited:

Catchword:

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Case Number: T 1666/13 - 3.5.05

D E C I S I O N
of Technical Board of Appeal 3.5.05
of 5 December 2014

Appellant: (Applicant)	BlackBerry Limited 2200 University Avenue East Waterloo, ON N2K 0A7 (CA)
Representative:	Roberts, Gwilym Vaughan Kilburn & Strode LLP 20 Red Lion Street London WC1R 4PJ (GB)
Decision under appeal:	**Decision of the Examining Division of the European Patent Office posted on 26 February 2013 refusing European patent application No. 10177736.5 pursuant to Article 97(2) EPC.**

Composition of the Board:

Chair	A. Ritzka
Members:	P. Cretaine
	D. Prietzel-Funk

Summary of Facts and Submissions

I. The appeal is against the decision of the examining division, posted 26 February 2013, to refuse European patent application No. 10177736.5 on the grounds of lack of inventive step (Article 56 EPC), having regard to the disclosure of

D5: US 2004/0093545,

with respect to a main request and a first auxiliary request.

II. Notice of appeal was received on 26 April 2013 and the appeal fee was paid on the same day. The statement setting out the grounds of appeal was received on 5 July 2013. The appellant requested that the decision of the examining division under appeal be set aside and that a patent be granted on the basis of a main request or any of first to third auxiliary requests filed with the statement setting out the grounds of appeal. The claims of the main and first auxiliary requests were identical to the claims of the main and first auxiliary requests, respectively, on which the decision was based. Oral proceedings were requested should the main request not be allowed.

III. A summons to oral proceedings scheduled for 5 December 2014 was issued on 19 September 2014. In an annex to this summons, the board gave its preliminary opinion on the appeal pursuant to Article 15(1) RPBA. Objections were raised under Article 56 EPC with respect to all the requests on file, having regard to the disclosure of D5.

IV. With a letter dated 5 November 2014, the appellant filed a fourth auxiliary request and provided arguments in support of inventive step of all the requests on file. By letter of 27 November 2014 the appellant announced that they would not be attending the oral proceedings.

V. Oral proceedings were held as scheduled on 5 December 2014 in the absence of the appellant. After due deliberation on the basis of the pending requests and the written submissions, the decision of the board was announced at the end of the oral proceedings.

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

"Apparatus for a communication station operable pursuant to a Multi Carrier Modulation communication scheme, said apparatus comprising:
an altered data block generator (28) configured to generate an altered data block comprising a selected power indicium formed of a transformed combination of an input data block and a selected scrambling sequence, the altered data block generator further including a cyclic prefix part padder (56) configured to prepend a cyclic prefix to the transformed combination of the input data block and selected scrambling sequence; and
a combiner (32) configured to add together the altered data block and prepended cyclic prefix directly with an identification sequence that is of a length equal to the transformed combination of the input data block and selected scrambling sequence with the cyclic prefix prepended thereto and that identifies the selected scrambling sequence, thereby to combine the identification sequence directly with the altered data block to form a summed sequence, the summed sequence, when transmitted, transmitting together the altered

data block and the identification sequence without a reserved subcarrier for the identification sequence".

The main request comprises further independent claims for a corresponding method (claim 7) and a corresponding receiving apparatus (claim 12).

Claim 1 of the **first auxiliary request** appends to claim 1 of the main request the final feature "wherein said combiner (32) is configured to add together the altered data block and prepended cyclic prefix directly with the identification sequence by superimposing the identification sequence upon the altered data block and prepended cyclic prefix".

The first auxiliary request comprises further independent claims for a corresponding method (claim 6) and a corresponding receiving apparatus (claim 10).

Claim 1 of the **second auxiliary request** replaces in claim 1 of the main request the wording "directly with an identification sequence" by the wording "directly with a bipolar identification sequence one to one corresponding to the selected scrambling sequence and".

The second auxiliary request comprises further independent claims for a corresponding method (claim 7) and a corresponding receiving apparatus (claim 12).

Claim 1 of the **third auxiliary request** replaces in claim 1 of the main request the wording "directly with an identification sequence that is" by the wording "directly with a bipolar identification sequence one to one corresponding to the selected scrambling sequence, each element of the identification sequence comprising a value of x or minus x where x is a positive real

number or a complex number and the identification sequence being".

The third auxiliary request comprises further independent claims for a corresponding method (claim 7) and a corresponding receiving apparatus (claim 12).

Claim 1 of the **fourth auxiliary request** inserts in claim 1 of the main request, after the wording "a selected scrambling sequence," the wording "wherein if a first altered data block formed of a first selected scrambling sequence and the input data block does not lead to a Peak-To-Average Power Ratio of an acceptable level, at least one successive iteration is performed with different selected scrambling sequences until an altered data block is formed that leads to an acceptable Peak-To-Average Power Ratio, or no remaining scrambling sequences are available, wherein an altered data block having a best-available Peak-To-Average Power Ratio is selected;".

The fourth auxiliary request comprises further independent claims for a corresponding method (claim 7) and a corresponding receiving apparatus (claim 12).

Reasons for the Decision

1. The appeal is admissible.

2. Inventive step:

2.1 Prior art

D5 discloses a Peak-To-Average Power Ratio (PAPR) reduction scheme for OFDM, wherein scrambling sequences

are summed with a CRC coded data input sequence to generate scrambled sequences. For each scrambled sequence, the PAPR value after Inverse Fourier Transform is calculated and the sequence presenting the smallest PAPR is determined and selected for transmission (see Figure 12 and the related passages). At the receiver, the scrambling sequence which has been selected for transmission is identified using syndrome detection based on the CRC. Moreover, **D5** acknowledges as prior art a scheme illustrated in Figure 11, wherein the selected scrambling sequence is identified at the receiver by a sequence index sent as side information to the transmitted sequence. This prior art acknowledged in **D5** has been identified in the decision under appeal as the closest prior art.

2.2 Main request

The claims of the main request are identical to the claims of the main request on which the impugned decision was based.

The only differences between the subject-matter of claim 1 and the disclosure of **D5** with respect to Figure 11 are that:

a) a cyclic prefix part padder is configured to prepend a cyclic prefix to the transformed combination of the input data block and selected scrambling sequence;

b) the identification sequence is of a length equal to the length of the sequence formed of the transformed combination of the input data block and the selected scrambling sequence with the cyclic prefix prepended thereto, and the identification sequence is directly added to said sequence.

As to feature a), the use of a cyclic prefix appended to a digital sequence is a common measure in the field of multi carrier communication (see also D5, Figure 5).

The technical effect of the distinguishing feature b) is that no separate frequency band is needed on the antenna air interface for transmitting the identification sequence, as required by the scheme of D5, Figure 11. The board agrees in that respect with the examining division that the bandwidth of the summed sequence may well be larger than the bandwidth of the altered data block (see the decision under appeal, Reasons 1.4.1.2, 5.2 and 5.3). In the board's view, the summed sequence can have the same bandwidth as the altered data block only if the identification sequence has the same length and the same time spacing as the altered data block with prepended cyclic prefix. Since the application does not define the constraint of identical time spacing on the identification sequence, bandwidth saving is not necessarily achieved, contrary to what the appellant argued.

Therefore, the objective technical problem can be defined as how to find an alternative for transmitting the identification of the scrambling sequence to the receiver.

In the scheme described in D5 with reference to Figure 11, the side information channel 127 and the processing path for issuing the altered data block to the output 129 are clearly delimited. The frequency channel conveying the side information and the frequency channel conveying the selected altered data block are thus superposed, in the frequency domain, just before their superposition being sent by the transmitting

antenna. It is however well known in the data communication field that adding data sequences in the time domain before modulation on a frequency channel for transmission represents an alternative to transmitting the sequences after modulation on respective frequency channels. The skilled person, when looking for an alternative for transmitting the side information, would thus, in the board's view, consider a direct summation of the two data sequences in the time domain before the modulation on a frequency channel as an obvious alternative.

The appellant argued that the system disclosed in D5, in particular in Figure 11, uses a CRC coding of the data before scrambling and that said CRC coding is essential to the fundamental operation of D5 because the identification of the selected scrambling sequence is based on the decoding of the CRC. The skilled person would thus be refrained from removing the CRC coding and would thus not arrive at the subject-matter of claim 1 when starting from D5 as closest prior art.

The board acknowledges that CRC coding is used in D5, in both schemes illustrated by Figures 11 and 12, respectively. However the system disclosed in relation to Figure 11 does not rely on the CRC decoding for identifying the selected scrambling sequence but rather, as in claim 1, on transmitted side information containing an identifier of the scrambling sequence. The skilled person would thus consider the CRC coding in Figure 11 as a feature which is not essential to the PAPR reduction scheme and which could be suppressed without jeopardizing said scheme. The board further notes that claim 1 actually also covers systems comprising a CRC coding upstream of the scrambling process.

The appellant further argued that the embodiment of D5, Figure 11, requires knowledge at the receiver of which scrambling sequence relates to the transmitted sequence number. Also the embodiment of D5, Figure 12, required at the receiver a mapping, such as a code book, between syndromes and scrambling sequences. For this reason, D5 would lead the skilled person away from the claimed subject-matter, which does not need any additional knowledge at the receiver.

However, the board does not regard this argument as persuasive, since the method according to the alleged invention itself requires the knowledge of additional information at the receiver, namely the knowledge of all the potential identification sequences.

Therefore the board judges that the subject-matter of claim 1 does not involve an inventive step (Article 56 EPC), having regard to the prior art disclosed in D5.

2.3 First auxiliary request

Claim 1 adds in substance to claim 1 of the main request the feature that the combiner adds the sequences by superimposing them. In the board's judgement, the term "superimposing" does not bring any new technical teaching with respect to the addition of the two sequences by the combiner. Therefore, claim 1 of the first auxiliary request does not meet the requirements of Article 56 EPC for the same reasons as set out in paragraph 2.2 above in respect of the main request.

2.4 Second auxiliary request

Claim 1 adds in substance to claim 1 according to the main request the feature that the identification sequence is bipolar and corresponds one-to-one to the selected scrambling sequence. In the board's view, this feature represents a common measure which, moreover, does not define that the identification sequence has the same time spacing as the altered data block. Therefore, the technical effect of bandwidth saving is not necessarily achieved, contrary to what the appellant argued. Thus claim 1 does not meet the requirements of Article 56 EPC.

2.5 Third auxiliary request

Claim 1 adds in substance to claim 1 according to the second auxiliary request the feature that each element of the identification sequence comprises a value of x or minus x, where x is a positive real number or a complex number. In the board's judgement, this feature represents a common measure which, moreover, does not define that the identification sequence has the same time spacing as the altered data block. Therefore the technical effect of bandwidth saving is not necessarily achieved, contrary to what the appellant argued. Thus, claim 1 does not meet the requirements of Article 56 EPC.

2.6 Fourth auxiliary request

Claim 1 adds to claim 1 of the main request the feature that for each input data block the scrambling sequence is selected by an iterative process until an acceptable PAPR level is reached, whereby when no remaining

scrambling sequence is available, an altered data block having a best available PAPR is selected.

In D5 in contrast, for each input data block, PAPR values are computed for several scrambling sequences and the minimum PAPR value is identified (see functional bloc 128 in Figures 11 and 12).

The appellant argued that, due to the use of an iterative process, the efficiency of the selecting process was increased.

The skilled person is however well aware of the advantages and drawbacks of an iterative selection process as compared with a parallel process as disclosed in D5, Figures 11 or 12. In particular, while an iterative process may involve fewer computations, it may also need more time than a parallel process. Taking further into account that D5 already discloses an embodiment (see Figure 3 and paragraphs [0082] and [0083]) using an iterative process on a signal constellation for searching an acceptable PAPR value, the board judges that the skilled person would consider using such an iterative process in the scheme of Figure 11 without the exercise of inventive activity.

Therefore, claim 1 does not meet the requirements of Article 56 EPC.

3. In conclusion, all the requests are not allowable for lack of inventive step (Article 56 EPC). In the absence of an allowable request the appeal must 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