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Datasheet for the decision of 27 November 2013

Case Number: T 2305/10 - 3.5.03

Application Number: 95302876.8

Publication Number: 680168

IPC: H04J13/00, H04J4/00, H04J13/02, H04L5/02, H04B7/26

Language of the proceedings: EN

Title of invention:
System and method for optimizing spectral efficiency using time-frequency-code slicing

Patent Proprietor:
AT&T Corp.

Opponent:
Digital Telecoms Solutions UK Limited

Headword:
Time-frequency-code slicing/AT&T

Relevant legal provisions:
EPC Art. 123(2)

Keyword:
"Added subject-matter (all requests) - yes"

Decisions cited:

Catchword:

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Case Number: T 2305/10 - 3.5.03

D E C I S I O N
of Technical Board of Appeal 3.5.03
of 27 November 2013

Appellant: (Patent Proprietor)	AT&T Corp. 32 Avenue of the Americas New York, NY 10013-2412 (US)
Representative:	Suckling, Andrew Michael Marks & Clerk LLP Fletcher House Heatley Road The Oxford Science Park Oxford OX4 4GE (GB)
Respondent: (Opponent)	Digital Telecoms Solutions UK Limited Da Vinci House Basing View Basingstoke Hampshire RG21 4EQ (GB)
Representative:	Foster, Mark Charles Mathisen & Macara LLP Communications House South Street Staines-upon-Thames Middlesex, TW18 4PR (GB)
Decision under appeal:	**Decision of the Opposition Division of the European Patent Office posted on 14 September 2010 revoking European patent No. 680168 pursuant to Article 101(3)(b) EPC.**

Composition of the Board:

Chairman: F. van der Voort
Members: T. Snell
M.-B. Tardo-Dino

Summary of Facts and Submissions

I. This appeal was lodged by the proprietor against the decision of the opposition division revoking European patent No. EP 680168 principally on the ground that claim 1 of a main request and first to ninth auxiliary requests respectively did not comply with Article 123(2) EPC. Further grounds of opposition based on Articles 100(a) and (b) EPC were not dealt with in the decision.

II. In the notice of appeal, the appellant stated that the decision was "appealed in its entirety". In the subsequently filed statement of grounds of appeal, the appellant stated that the main request on file was maintained. Claims of first to seventh auxiliary requests were filed with the statement of grounds.

In a response to the appeal, the opponent (respondent) requested that the decision of the opposition division revoking the patent be upheld. Alternatively, should the appeal be successful, remittal to the opposition division was requested for consideration of the grounds of opposition under Articles 100(a) and (b) EPC.

Both parties conditionally requested oral proceedings.

III. In a communication accompanying a summons to attend oral proceedings, the board gave a preliminary opinion agreeing with the opposition division that independent claims 1 and 7 of the main request infringe Article 123(2) EPC. This opinion was also said to apply, at least in part, to the independent claims of the auxiliary requests.

IV. In a response to the board's communication, the appellant submitted arguments in respect of claims 1 and 7 of the main request, which was maintained. In addition, claims of first to ninth auxiliary requests were filed replacing the auxiliary requests on file.

V. Oral proceedings took place on 27 November 2013.

The appellant (patent proprietor) requested that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of a main request as filed with the letter dated 4 June 2010, or, in the alternative, on the basis of one of first to ninth auxiliary requests as filed with the letter dated 28 October 2013.

The respondent (opponent) requested that the appeal be dismissed, and, alternatively, that should the appeal be successful as regards Articles 100(c) and 123 EPC the case be remitted to the first instance for consideration of the opposition grounds under Article 100(a) and (b) EPC.

At the conclusion of the oral proceedings, after due deliberation, the chairman announced the board's decision.

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

"A system for optimising spectral use of a communications transmission medium by a plurality of users of varying user-application and access rates, the system comprising:
means for slicing the communications transmission medium along at least first and second dimensions, where the first and second dimensions are taken from a

set that comprises frequency, code, and time slots, thereby forming an at least two-dimensional matrix of transmission capacity units; and
a scheduler adapted to schedule a user of said plurality of users, when at least one other user has previously been scheduled, to two or more transmission capacity units having different values of an index along the first dimension and a selected value of an index along the second dimension without regard as to whether another user is scheduled for said value of the index along the second dimension for other values of the index along the first dimension, or to schedule said user, when at least one other user has previously been scheduled, to two or more transmission capacity units having different values of the index along *[sic]* second dimension and a selected value of the index along the first dimension without regard as to whether another user is scheduled for said value of the index along the first dimension for other values of the index along the second dimension."

VII. Claim 1 of the **first auxiliary request** is identical to claim 1 of the main request except that in the second clause "frequency, code and time slots" is replaced by "frequency and time slots".

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

"A system for optimising spectral use of a communications transmission medium by a plurality of users of varying user-application and access rates, the system comprising:
means for slicing the communications transmission medium along at least first and second dimensions, where the first and second dimensions are taken from a

set that consists of frequency and time slots, thereby forming a two-dimensional matrix of unit slices of the communications transmission medium; and
a scheduler adapted to schedule a previously unscheduled user of said plurality of users, when at least one other user has previously been scheduled, to two or more unit slices not already allocated to the at least one other user;
wherein the scheduler is adapted to schedule said user to two or more unit slices having different values of an index along the first dimension and a selected value of an index along the second dimension without regard as to whether another user is scheduled for said value of the index along the second dimension for other values of the index along the first dimension, or to schedule said user to two or more unit slices having different values of the index along *[sic]* second dimension and a selected value of the index along the first dimension without regard as to whether another user is scheduled for said value of the index along the first dimension for other values of the index along the second dimension."

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

"A system for optimising spectral use of a communications transmission medium by a plurality of users of varying user-application and access rates, the system comprising:
means for slicing the communications transmission medium along at least first and second dimensions, where the first and second dimensions are taken from a set that consists of frequency and time slots, thereby forming a two-dimensional matrix of unit slices of the communications transmission medium; and

a scheduler adapted to schedule a previously unscheduled user of said plurality of users, when at least one other user has previously been scheduled, to two or more unit slices not already allocated to the at least one other user;
wherein the scheduler is adapted to schedule said previously unscheduled user to two or more unit slices having different values of an index along the first dimension and a selected value of an index along the second dimension without regard as to whether the or any previously scheduled user has been scheduled for said value of the index along the second dimension for other values of the index along the first dimension, or to schedule said previously unscheduled user to two or more unit slices having different values of the index along *[sic]* second dimension and a selected value of the index along the first dimension without regard as to whether the or any previously scheduled user has been scheduled for said value of the index along the first dimension for other values of the index along the second dimension."

X. Claim 1 of the **fourth auxiliary request** reads as follows:

"A system for optimising spectral use of a communications transmission medium by a plurality of users of varying user-application and access rates, the system comprising:
means for slicing the communications transmission medium along at least first and second dimensions, where the first and second dimensions are taken from a set that consists of frequency and time slots, thereby forming a two-dimensional matrix of unit slices of the communications transmission medium; and

a scheduler adapted to schedule a previously unscheduled user of said plurality of users, when at least one other user has previously been scheduled, to two or more unit slices having different values of an index along the first dimension and a selected value of an index along the second dimension, wherein the previously scheduled user, or one of the previously scheduled users, has been scheduled for said value of the index along the second dimension for other values of the index along the first dimension and the scheduler is adapted to schedule said previously unscheduled user without regard as to whether the previously scheduled user, or the one of the previously scheduled users, has been scheduled for said value of the index along the second dimension for said other values of the index along the first dimension, or to schedule said previously unscheduled user, when at least one other user has previously been scheduled, to two or more unit slices having different values of the index along *[sic]* second dimension and a selected value of the index along the first dimension, wherein the previously scheduled user, or one of the previously scheduled users, has been scheduled for said value of the index along the first dimension for other values of the index along the second dimension and the scheduler is adapted to schedule said previously unscheduled user without regard as to whether the previously scheduled user, or the one of the previously scheduled users, has been scheduled for said value of the index along the first dimension for said other values of the index along the second dimension."

XI. For reasons of conciseness, claim 1 of the **fifth to ninth auxiliary requests** respectively are not reproduced in entirety. They differ from claim 1 of the main and first to fourth auxiliary requests

respectively in that they include the following additional feature added to the end the claim:

"wherein said system permits, in use, users that are assigned transmission capacity units that are adjacent to each other in any of said at least first and second dimensions to utilize said adjacent units without use of a guard band between said adjacent units, thereby to improve utilization of the assigned capacity units".

Reasons for the Decision

1. General

1.1 The patent relates generally to a method for scheduling users of a communications medium by "slicing" the medium in time, frequency and code domains. For the purposes of the present discussion, the medium is assumed to consist only of time and frequency domains, although in fact not all claims of the various requests are so limited. However, this aspect is not relevant to the board's decision. A time-frequency sliced medium is illustrated for example in Figure 5 of the patent, which shows a fully scheduled medium in terms of a matrix in which a plurality of users are allocated one or more "unit slices" of the time-frequency spectrum, also called "transmission capacity units" in the claims of some requests. Both terms are given here the same meaning.

1.2 The matter at issue in the present case is compliance with Article 123(2) EPC, ie whether the European patent has been amended in such a way that it contains subject-matter which extends beyond the content of the application as [originally] filed. The standard criterion for compliance with Article 123(2) EPC is that amendments should be directly and unambiguously derivable from the application documents as originally filed.

2. Claim 1 - main request

2.1 Claim 1 of the main request includes the following feature:

"a scheduler adapted to schedule a user of said plurality of users, when at least one other user has previously been scheduled, to two or more transmission capacity units having different values of an index along the first dimension and a selected value of an index along the second dimension *without regard as to whether another user is scheduled for said value of the index along the second dimension for other values of the index along the first dimension, or to schedule said user, when at least one other user has previously been scheduled, to two or more transmission capacity units having different values of the index along [sic] second dimension and a selected value of the index along the first dimension without regard as to whether another user is scheduled for said value of the index along the first dimension for other values of the index along the second dimension.*" (board's italics).

The wording in italics was added during the examination procedure.

2.2 The board interprets the wording in italics in the context of a time-frequency matrix, with a mind desirous of understanding the claim, to mean that the scheduler may allocate a new user to any free two or more time slots on a particular frequency at which other time slots may already be occupied by other users or any free two or more frequency slots in a particular time slot in which other frequency slots may already be occupied by other users. It has to be determined whether there is a direct and unambiguous basis for this feature in the application as filed.

2.3 The appellant made reference to the aforementioned Figure 5 for support together with paragraph [0022] of the description (for convenience, paragraph numbers in the following refer to the patent specification as the relevant passages are the same as those in the application as filed).

2.4 As regards Figure 5, the board notes that this shows a completely scheduled matrix. It is not possible from the figure alone to derive directly and unambiguously the criteria which were used by the scheduler when scheduling a new user to two or more transmission capacity units, in particular when the matrix was still largely empty.

2.5 Paragraph [0022] contains the following passages:

A: "One way to effect the slicing of the transmission medium 40 and to implement positioning of the users 46, 48, 50 within the medium is to provide a central control 100 to maintain or otherwise keep a lookup table containing the status of the availability of space within the medium 40 according to frequency band allocations 42 and time slots 44. The central control

100 may then award particular time-frequency slice 52 allocations to the individual users 46, 48, 50 based on such factors as the amount of the medium 40 requested by the users and/or the amount of medium 40 already allocated to users. Individual users may thus align themselves within their assigned time-frequency slices 52 through appropriate signal configuration and/or modulation."

B: "Based on the availability of the medium 40, central control 100 can thus allocate particular time-frequency slices 52 to a given user so as to anticipate "future" requests which will be made by users 46, 48, 50 so as to best optimize full use of the overall medium 40. The control 100 can anticipate such requirements, for instance, through use of probabalistic *[sic]* studies, historical or projected load requirements, and the like, as normally maintained by individual service providers."

C: "Another way to effect use spectrum of the medium 40 is through random assignments of users 46, 48, 50 to the available time-frequency slices 52."

D: "Other ways of effecting slicing and scheduling in accordance with the system and method of the invention can be readily envisioned or otherwise arrived at by those skilled in the art."

Passages A and B indicate positive criteria but do not provide unambiguous support for the (negative) feature that the scheduler is adapted to schedule the user to eg any two free time slots at a particular frequency of the matrix, at which frequency other users may have been scheduled, the choice of which particular free

time slots being made without regard to the position of the time slots already occupied.

Passage C does not provide support because claim 1 does not define a random assignment, since at least two transmission capacity units are scheduled at the same selected value of the index in the second dimension.

Passage D does not include any concrete technical features.

Hence, the board finds that paragraph [0022] does not provide support for claim 1.

2.6 The appellant referred at the oral proceedings to further passages of the description: In paragraph [0013], it is stated that the overall time-frequency domain can be maximized. In paragraphs [0023] and [0024] it is disclosed that multiple users can be scheduled on a given times-lot or frequency band. In the appellant's view, these passages provide sufficient support for the language of the claim.

However, the board notes that in Figure 5 the use of the time-frequency domain is maximized and multiple users are scheduled in a given time slot or frequency band. Hence these passages add nothing to Figure 5.

2.7 The appellant argued in the statement of grounds that a scheduler must operate in one of four possible ways (cf. pages 2 and 3 of the statement of grounds):

"a) Once user I has been scheduled into the transmission capacity units (S3, F4) and (S3, F5), the scheduler does not schedule any other user into that time slot (S3) into which user I is scheduled, even

though there are unused frequency bands in that time slot;
b) Once user I has been scheduled into the transmission capacity units (S3, F4) and (S3, F5), the scheduler does not schedule any other user into those frequency bands (F4, F5) into which user I is scheduled, even though there are unused time slots in those frequency bands;
c) Both (a) and (b), that is once user I has been scheduled into the transmission capacity units (S3, F4) and (S3, F5), the scheduler does not schedule any other user into that time slot (S3) into which user I is scheduled nor into those frequency bands (F4, F5) into which user I is scheduled, even though there are unused frequency bands in that time slot and unused time slots in those frequency bands;
d) Neither (a) nor (b), that is once user I has been scheduled into the transmission capacity units (S3, F4) and (S3, F5), the scheduler may nevertheless still schedule one or more other users into frequency bands in time slot S3 that are not allocated to user I and so are still available (ie, frequency bands F0 to F3, F6 and F7 in time slot S3) and may still schedule one or more other users into time slots in frequency bands F4 and F5 that are not allocated to user I and so are still available (ie, time slots S0-S2 and S4-S6 in both frequency bands F4 and F5)."

It was argued that the results of Figure 5 could only be obtained by a scheduler which scheduled a subsequent user according to (d). This corresponded to a scheduling "without regard as to whether another user is scheduled .." as claimed. Hence Figure 5 directly and unambiguously provided support for claim 1. Claim 1 therefore complied with Article 123(2) EPC.

2.8 The board however disagrees, since, for example, the scheduler could plausibly arrive at Figure 5 by beginning scheduling using either approach (a), (b) or (c), or even take a still different approach such as using the same index in one dimension but leaving guard bands between the newly allocated "transmission capacity units" and those previously allocated, until these methods were no longer possible. These approaches all take account of "whether another user is scheduled for said value of the index along the second dimension [eg frequency] for other values of the index along the first dimension [eg time]". Considering Figure 5, only when the matrix has a very high level of occupancy could it be plausibly argued that scheduling must take place according to method (d), since there would be situations when the scheduler could not avoid this. However, claim 1 embraces the situation of scheduling a user to unallocated spectrum after only one other user ("at least one other user") has been previously scheduled.

2.9 The board concludes that claim 1 of the main request infringes Article 123(2) EPC.

3. Claim 1 - first to third auxiliary requests

3.1 Claim 1 of each of these requests is limited to a two-dimensional matrix of frequency and time slots. The board however assumed this to be the case when discussing the main request in the above. In addition, claim 1 of the second and third auxiliary requests respectively use the term "unit slice" instead of "transmission capacity unity". However, as already stated, the board interprets these two terms as meaning the same thing. These claims further use slightly amended language apparently in order to render explicit

that a previously unscheduled user is to be scheduled when another user has previously been scheduled. However, the board gave this meaning to claim 1 of the main request in any case.

3.2 It follows that claim 1 of each of these requests infringes Article 123(2) EPC for the same reasons as claim 1 of the main request.

4. *Claim 1 - fourth auxiliary request*

4.1 Claim 1 of the fourth auxiliary request includes further amendments which (cf. the appellant's letter of reply to the summons to oral proceedings) "[make] explicit what is believed to be already implicit in the earlier requests, namely that the claims relate to scheduling a user into two or more unit slices in a time slot (or frequency band or code slot) in which one (at least) other [user] is already scheduled".

Since the board in any case interpreted claim 1 of the earlier requests in this manner, it follows that the situation regarding compliance with Article 123(2) EPC is unaffected by these amendments.

4.2 The appellant also stated that the claims of the fourth auxiliary request are explicitly directed to the case of a "higher level of occupancy" of the transmission medium. However, the board can discern no limitation in the sense of a higher level of occupancy, *inter alia* since claim 1 embraces the case of there being only one previously scheduled user.

4.3 The board concludes that claim 1 of the fourth auxiliary request does not comply with Article 123(2) EPC either.

5. Claim 1 - fifth to ninth auxiliary requests

5.1 Claim 1 of these requests correspond to claim 1 of the main and the first to fourth auxiliary requests respectively, however with the addition of a further feature unrelated to the issue of compliance with Article 123(2) EPC (cf. point XI above). This was not disputed by the appellant.

5.2 It follows that these claims respectively do not comply with Article 123(2) EPC either.

6. Conclusion

As there is no allowable request, it follows that the appeal must be dismissed.

Order

For these reasons it is decided that:

The appeal is dismissed.

The Registrar: The Chairman:

G. Rauh F. van der Voort

Decision electronically authenticated