

**Internal distribution code:**

- (A) [ - ] Publication in OJ
- (B) [ - ] To Chairmen and Members
- (C) [ - ] To Chairmen
- (D) [ X ] No distribution

**Datasheet for the decision  
of 10 November 2017**

**Case Number:** T 2107/13 - 3.5.03

**Application Number:** 06127342.1

**Publication Number:** 1940049

**IPC:** H04B7/26

**Language of the proceedings:** EN

**Title of invention:**

Scheduling method for wireless multihop relay communication system and system thereof

**Patent Proprietor:**

Acer Incorporated

**Opponent:**

Telefonaktiebolaget L M Ericsson (publ)

**Headword:**

Multi-hop communication/ACER

**Relevant legal provisions:**

EPC Art. 56

RPBA Art. 13(1)

**Keyword:**

Inventive step - (no)

Late-filed request - justification for late filing (no)



**Beschwerdekammern**  
**Boards of Appeal**  
**Chambres de recours**

Boards of Appeal of the  
European Patent Office  
Richard-Reitzner-Allee 8  
85540 Haar  
GERMANY  
Tel. +49 (0)89 2399-0  
Fax +49 (0)89 2399-4465

Case Number: T 2107/13 - 3.5.03

**D E C I S I O N**  
**of Technical Board of Appeal 3.5.03**  
**of 10 November 2017**

**Appellant:** Telefonaktiebolaget L M Ericsson (publ)  
(Opponent) 164 83 Stockholm (SE)

**Representative:** Schwarz, Markku  
Kraus & Weisert  
Patentanwälte PartGmbH  
Thomas-Wimmer-Ring 15  
80539 München (DE)

**Respondent:** Acer Incorporated  
(Patent Proprietor) 8F, No. 88, Sec. 1  
Hsin Tai Wu Road  
Hsichih  
Taipei Hsien 221 (TW)

**Representative:** Michalski Hüttermann & Partner  
Patentanwälte mbB  
Speditionstraße 21  
40221 Düsseldorf (DE)

**Decision under appeal:** **Interlocutory decision of the Opposition**  
**Division of the European Patent Office posted on**  
**25 July 2013 concerning maintenance of European**  
**patent No. 1940049 in amended form.**

**Composition of the Board:**

**Chairman** F. van der Voort  
**Members:** B. Noll  
S. Fernández de Córdoba

## **Summary of Facts and Submissions**

- I. An opposition was filed against European patent No. 1940049 on the grounds pursuant to Article 100(a) and (b) EPC.
  
- II. The opposition division decided that, taking into consideration the amendments made by the patent proprietor during the opposition proceedings according to an auxiliary request, the patent and the invention to which it related met the requirements of the Convention.
  
- III. An appeal against this decision was lodged by the opponent (appellant). In the statement of grounds of appeal, it argued that the patent as amended failed to meet the requirements of Articles 84 and 123(2) EPC, that the invention as claimed was insufficiently disclosed (Article 83 EPC) and that the claimed subject-matter lacked novelty and inventive step (Articles 52(1), 54 and 56 EPC).

The appellant referred to the following documents among others:

- 03: D.C. Schultz et al.: "Fixed and Planned Relay Based Radio Network Deployment Concepts", Proceedings of the 10th Wireless World Research Forum, 27-28 October 2003, New York, pages 1 to 6; and
- 07: EP 1 589 776 A1.

- IV. With the reply to the appeal, the patent proprietor (respondent) filed claims of a first auxiliary request and requested that the patent be maintained with the claims as upheld by the opposition division, i.e. that

the appeal be dismissed, or, in the alternative, that the patent be maintained on the basis of the first auxiliary request.

- V. In a communication accompanying a summons to oral proceedings, the board indicated the issues to be discussed at the oral proceedings, i.e. clarity of the claims, added subject-matter, sufficient disclosure, and patentability.
- VI. With a letter dated 13 October 2017 the respondent filed claims of a second auxiliary request.
- VII. Oral proceedings were held on 10 November 2017.

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

The respondent requested that the appeal be dismissed (main request) or, in the alternative, that the decision under appeal be set aside and that the patent be maintained in amended form on the basis of the claims of the first auxiliary request as filed with the reply to the appeal, or on the basis of the claims of the second auxiliary request as filed with the letter dated 13 October 2017.

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

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

"A scheduling method for a wireless multi-hop relay communication system, wherein the wireless communication system comprises at least one base

station (805) dominating a plurality of relay stations, the scheduling method being characterized by:

separating the relay stations (801-804) into N groups according to intensity of potential interference level between the relay stations (801-804), wherein N is an integer greater than 1, wherein the step of separating the relay stations (801-804) into N groups comprises:

measuring intensity of potential interference level from other relay stations (801-804) and base stations (805) by each of the relay stations (801-804), wherein the potential interference level is measured by measuring the data signal transmitted by the relay stations (801-804) and base stations (805);

reporting the measurement results to the base station (805) by each of the relay stations (801-804); and

separating the relay stations (801-804) into N groups by the base station (805) according to the measurement results reported by the relay stations (801-804),

whereby the base station (805) separates those relay stations (801-804), which may potentially go beyond a tolerable interference threshold, into different groups;

dividing a service period into N phases by the base station (805);

serving the relay stations (801-804) in a  $j^{\text{th}}$  group during an  $i^{\text{th}}$  phase by the base station (805); and

serving the users and the subordinated relay stations (801-804) within service areas of the relay stations

(801-804) not in the  $j^{\text{th}}$  group during the  $i^{\text{th}}$  phase by the relay stations (801-804) not in the  $j^{\text{th}}$  group."

IX. Claim 1 of the first auxiliary request is identical to claim 1 of the main request.

X. Claim 1 of the second auxiliary request differs from claim 1 of the main request in that it includes the following additional features:

"and serving users not in the direction of the relay stations (801-804) in the  $j^{\text{th}}$  group but having line of sight (LOS) condition to the base station (805) with appropriate power control by lower transmission power during the  $i^{\text{th}}$  phase using the base station (805);

wherein the lower transmission power allows an interference generated by the base station (805) to the relay stations (801-804) to be lower than a tolerable threshold."

## **Reasons for the Decision**

### 1. *The patent in suit*

The patent relates to multi-hop wireless communication. A multi-hop wireless communication system has a base station and a number of relay stations. When not located within the coverage range of the base station, a mobile station may still communicate with the base station through "hops" via one or more relay stations.

Figs 2 and 6 of the patent in suit show the following prior-art arrangements for a base station and relay stations in a fixed and planned network which is

specifically designed for a "Manhattan-like environment":

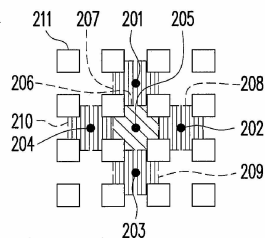


FIG. 2 (PRIOR ART)

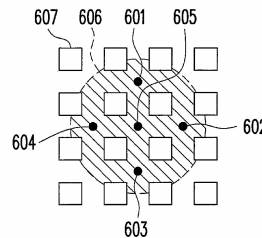


FIG. 6 (PRIOR ART)

A "Manhattan-like environment" indicates a specific topographic environment in which streets are arranged in the form of a rectangular grid and blocks between streets are covered by buildings. Radio signals propagate straight along the streets, i.e. the "line of sight" (LOS) but not across blocks, i.e. a "non line of sight" (NLOS). The network is fixed and planned because the base station and the relay stations are located at planned fixed positions in the scenario, i.e. the base station (205, 605) at a crossing and associated relay stations (201-204, 601-604) one at each adjacent crossing north, south, west and east from the base station.

An extension of the base station's coverage range by the relay stations is achieved at the cost of an increased use of frequency resources, since a single connection between a mobile station and the base station is allocated with as many communication channels as there are hops. Therefore, channel or frequency re-use across the stations of a multi-hop network is an issue. In this context, the specification states (cf. paragraph [0014]):

*"Regardless of the first layout or the second layout that all serving stations are equipped with omni-*



*directional antennas, all the base station and the relay stations are idled for some time in the frame structure, thus, the transmission efficiency thereof is not ideal."*

Concerning the technical problem and its proposed solution, the specification further states (see paragraph [0016]):

*"Accordingly, the present invention is directed to a transmission scheduling method for a wireless multi-hop relay communication system, wherein relay stations are disposed within the coverage area of a base station for serving users with poor link quality to the base station. In the present invention, base stations and relay stations are equipped with directional antennas or sector antennas to further exploit the advantage of spatial separations inherited in the environment, and through the mechanism of grouping and permutation of transmission scheduling, interference inside a single cell and between adjacent cells is reduced, accordingly, the capacity of the system is improved."*

The patent describes a single specific embodiment (see Figs 8 to 10 and paragraphs [0036] to [0046] of the specification). Paragraph [0037] reads:

*"The base station 805 uses four directional antennas or a four-sector antenna for transmitting data to users in the streets in four directions and the relay stations 801~804, and the relay stations 801~804 use two directional antennas or two-sector antennas for data transmission with users within the NLOS of the base station 805. In other words, the base station 805 and four relay stations 801~804 serve all users within the coverage area 811 of a cell. Wherein users within the*

*LOS of the base station can have single-hop links to the base station, while users outside of the LOS of the base station can establish multi-hop links to the base station through the relay stations."*

A channel re-use pattern obtained by this embodiment is shown in Figs 9 and 10:

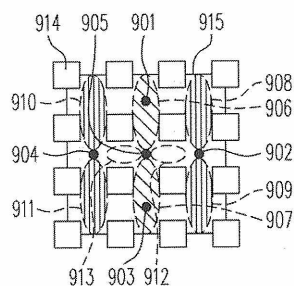


FIG. 9

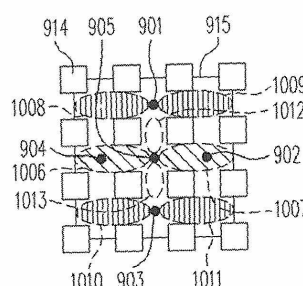


FIG. 10

The skilled reader would understand that in this embodiment re-use of channels is achieved by providing, at the base station and each relay station, directional or sector antennas having appropriate directivity characteristics and by grouping and permuting the transmission scheduling such that the base station selectively serves the relay stations located north and south (or east and west) whilst at the same time the east and west (or north and south) relay stations selectively serve north and south (or east and west) mobile stations. Hence, the skilled reader would understand that the combination of antenna directivity characteristics, the given Manhattan-like environment, and the appropriate scheduling results in improved system performance as regards channel re-use.

- 2. *Claim 1 of the main request - inventive step (Article 56 EPC)*

2.1 O3 represents the most relevant prior art. In particular, Fig. 2 of O3 shows an arrangement including a base and relay stations which is identical to that in Fig. 2 of the patent in suit.

Using the language of claim 1, O3 discloses a scheduling method for a wireless multi-hop relay communication system having a base station and relay stations (cf. the abstract). The communication system includes at least one base station (Fig. 2, "AP") and a plurality of relay stations (FRS#1 to FRS#4). O3 further discloses grouping the relay stations into  $N = 2$  groups according to the intensity of the potential interference level between the relay stations (cf. page 3, left-hand column, last paragraph: "*Spatial independency in this case means that the cell areas of two or more FRSs are fully shadowed from each other as shown in Fig. 2 for, e.g., FRS#1 and FRS#2 or FRS#2 and FRS#3, etc. In the case of spatial independent "forwarding cells" neither, e.g., FRS#1 nor any MT [Mobile Terminal] in the cell of FRS#1 will cause any interference to the cell of FRS#2 and vice versa*").

As shown in Fig. 4 of O3, the four relay stations are separated into two groups, namely a first group comprising FRS#1 and FRS#2 and a second group comprising FRS#3 and FRS#4. It is further apparent from Fig. 4 that, during a service period, i.e. a "time frame" within the wording of O3, all relay stations are served by the base station, and all users and subordinate relay stations, i.e. "terminals" within the wording of O3, are served by their corresponding relay station or by the base station itself.

2.2 Claim 1 further includes the features of the relay stations in a  $j^{\text{th}}$  group being served during an  $i^{\text{th}}$  phase by the base station, and the users and the subordinated relay stations within the service areas of the relay stations not in the  $j^{\text{th}}$  group being served during the  $i^{\text{th}}$  phase by the relay stations not in the  $j^{\text{th}}$  group.

The respondent argued that these features implied a simultaneousness of services, namely that users within the service areas of relay stations not in the  $j^{\text{th}}$  group were served at the same time as relay stations in the  $j^{\text{th}}$  group were served by the base station. This, it argued, was not disclosed in O3, which merely disclosed that the relay stations were served by the base station sequentially and that users were served by relay stations only after the base station had finished serving all relay stations.

The board notes, however, that claim 1 does not require, either explicitly or implicitly, the services during the  $i^{\text{th}}$  phase to be simultaneous. The claim merely defines an  $i^{\text{th}}$  phase as the time during which a base station serves relay stations in the  $j^{\text{th}}$  group and during which relay stations not in the  $j^{\text{th}}$  group serve users in their service areas. Whether or not relay stations in the  $j^{\text{th}}$  group are simultaneously served by the base station and whether or not users in the service areas of relay stations not in the  $j^{\text{th}}$  group are served by their relay stations at the same time as the base station is serving the relay stations in the  $j^{\text{th}}$  group is left open in claim 1. Further, the claimed method is not limited to any number of relay stations, nor is it restricted to stations equipped with directional antennas or arranged in a specific topographic scenario, which might potentially have

implied simultaneous operation of the base station and relay stations of specific groups.

Accordingly, the time interval in Fig. 4 of O3 during which the fourth relay station FRS#4 is served by the base station and the relay stations FRS#1 and FRS#2 serve users in their service areas may be arbitrarily designated as an "i<sup>th</sup> phase" within the wording of claim 1. Further, the time interval during which the base station in O3 serves relay stations FRS#1 to FRS#3 may be arbitrarily designated as not being the "i<sup>th</sup> phase". Therefore, the above-mentioned features do not further distinguish the claimed method from the method disclosed in O3.

2.3 The claimed method thus differs from the method disclosed in O3 by the following features:

the intensity of the potential interference level from other relay stations and base stations is measured by each of the relay stations, wherein the potential interference level is measured by measuring the data signal transmitted by the relay stations and base stations;

the measurement results are reported to the base station by each of the relay stations; and

the relay stations are separated into N groups by the base station according to the measurement results reported by the relay stations, whereby the base station separates those relay stations which may potentially go beyond a tolerable interference threshold into different groups.

A technical effect associated with these features is that the relay stations are grouped according to a "real" level of interference and not, as in O3, as determined by the position of a station in a network planned for a given topographic scenario. Therefore, the method as claimed may be considered for grouping stations in networks other than fixed and planned ones, e.g. those comprising mobile relay stations. In this respect, the board notes that O3 explicitly mentions mobile relay stations (MRS) (page 1, right-hand column, lines 16 to 21).

Therefore, the technical problem starting from O3 may be formulated as providing efficient channel re-use scheduling which is independent from a fixed and planned communication network infrastructure.

- 2.4 The skilled person seeking a solution for this problem would consider O7, since this document relates to a method of allocating frequency resources for communication between a mobile station and a base station, which reduces co-channel interference from other stations and improves radio resource utilisation efficiency (paragraphs [0005] and [0009]). As taught by O7, the skilled person would consider measuring the intensity of interference from other stations (cf. column 9, lines 5 to 16: "*The mobile station 40 receives a number of signals 60 from surrounding base stations. As mentioned above, the signals 60 are preferably pilot signals, but other signals, e.g. containing user data, can also be utilised. The mobile station 40 comprises means 41 for measuring a quality measure of the signals 54, 60. This quality measure may be based on the signal powers, resulting in e.g. a path loss measure, a channel gain measure or different kinds of interference measures. The measurements are compiled*

*and transmitted 53 to the base station 20 in a measurement report.*"). The skilled person would thus envisage measuring the intensity of the potential interference level from all stations, including other relay stations and base stations which might interfere with the interference-measuring relay station, on the basis of the data signals transmitted by these stations. Further, the skilled person would be led by 07 to consider having the base station which evaluates the measurements determine those base stations which pose potential co-channel interference problems and select from a set of radio resources, including resources that are primarily assigned to other base stations outside a co-channel interference distance, the radio resources to be assigned to the mobile station (cf. column 9, lines 21 to 37). This selection and assignment of radio resources to a mobile station inherently implies a grouping of the stations, in the sense that stations which do not potentially interfere may be served by the same radio resources and therefore constitute one group of non-interfering stations, and stations which potentially interfere beyond a tolerable interference level and which will not be served by the same radio resources constitute another group.

Therefore, the skilled person, starting from 03 and taking into account the teaching of 07, would have arrived at the claimed method without exercising inventive skill (Article 56 EPC).

2.5 The respondent argued as follows:

(a) 03 stipulated a fixed and planned network infrastructure for a given topographic scenario, in which the base station and relay stations were at fixed locations and in which interference between stations

was solely determined by the topography of the service area. Hence, O3 would not motivate the skilled person to consider network infrastructures other than fixed and planned ones. Nor would it suggest to the skilled person grouping relay stations using any criteria other than the topography of the service area.

(b) Starting from O3, if the skilled person were faced with the technical problem of providing a schedule for improved frequency re-use, O3 solely suggested a solution in connection with a fixed and planned network architecture. Hence, the skilled person considering O3 would solely consider improving the planning of the network architecture. He would not consider O7, since this document was not concerned with the planning of frequency re-use in a planned and fixed network infrastructure.

(c) Even if O7 were considered, the skilled person would not have arrived at the claimed solution, since O7 is about dynamically allocating radio frequency resources to a mobile station which directly communicates with a base station. Hence, the skilled person would not consider the teaching of O7 to be suitable for an improved scheme of frequency re-use for a multi-hop communication network.

2.6 These arguments did not convince the board for the following reasons:

Re (a): O3 explicitly mentions that relay stations might be mobile relay stations (page 1, right-hand column, lines 16 to 21). The skilled person would therefore be motivated to seek a solution for frequency re-use in a multi-hop communication network system that might include mobile relay stations. Hence, the fact



that O3 mainly discusses frequency re-use in a fixed and planned communication network would not have directed the skilled person away from seeking a solution for a communication network including mobile relay stations.

Re (b): For the same reason, if the communications system were to include mobile relay stations, the skilled person would consider ways of improving frequency re-use in the communication network other than by improving the planning of the network infrastructure.

Re (c): Since a mobile relay station is a mobile station within the meaning of O7, the skilled person would take into consideration the suggestion in O7 to detect those sources of interference which impair the communication of the mobile station. This is irrespective of whether or not the mobile station is part of a multi-hop communication network.

2.7 The board concludes that the ground for opposition pursuant to Article 100(a) EPC prejudices the maintenance of the patent in amended form on the basis of the main request.

3. *The first auxiliary request*

Claim 1 of the first auxiliary request is identical to claim 1 of the main request. The board's finding in point 2 above that the subject-matter lacks inventive step therefore equally applies to claim 1 of the first auxiliary request.

The ground for opposition pursuant to Article 100(a) EPC therefore prejudices the maintenance of the patent

in amended form on the basis of the first auxiliary request.

4. *The second auxiliary request - admissibility*

4.1 The second auxiliary request was filed four weeks before the oral proceedings before the board.

4.2 The respondent argued that this request was filed as a response to the board's communication expressing its preliminary view that the patent in suit did not clearly and sufficiently disclose that the communication provided by a relay station was not impaired by interference from other relay stations for those cases in which the number of groups into which the relay stations were separated was higher than two (point 5.3 of the communication). The features added in claim 1 of the second auxiliary request aimed at overcoming this objection.

4.3 The board notes, however, that the objection relating to insufficient disclosure of how residual interference between relay stations is avoided when they are separated into three or more groups had already been raised in the appellant's statement of grounds of appeal, point V, "Insufficiency of disclosure"; see, in particular, page 10, lines 27 to 30: *"Accordingly, for scenarios with  $N > 2$ , the skilled person is faced with the problem of how to avoid interference among "the relay stations not in the  $j^{\text{th}}$  group" in order to achieve the desired reduction of interference, as intended according to paragraph [0018] of the patent."*. Hence, the request cannot be considered as a reaction to the board's communication.

4.4 Further, the board notes that the additional features in claim 1 (see point X above) do not contribute to a reduction in the interference between relay stations, since they only concern the lowering of interference generated by the base station.

The respondent argued in this respect that it would be obvious to the skilled person that the power management as specified in claim 1 for the base station could be applied to the relay stations in the same way. Accordingly, interference between the relay stations would be reduced.

The board does not accept this argument, since the additional features in claim 1 do not relate to power management of the relay stations. The board further notes that there is no indication in the patent specification that lowering the transmission power is to be applied to relay stations in the same way as to the base station.

4.5 In view of the above, the board, exercising its discretion pursuant to Article 13(1) RPBA, did not admit the second auxiliary request into the appeal proceedings.

5. Since there is no request on file on the basis of which the patent could be held to meet the requirements of the Convention, the patent is to be revoked.

## **Order**

### **For these reasons it is decided that:**

The decision under appeal is set aside.

The patent is revoked.

The Registrar:

The Chairman:



K. Götz-Wein

F. van der Voort

Decision electronically authenticated