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(71) Applicant (for all designated States except US): **NOKIA SIEMENS NETWORKS OY** [FI/FI]; Karaportti 3, FI-02610 Espoo (FI).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SKOV, Peter** [DK/CN]; Zizhuyuan Lu 1-3-1303, Beijing, 100044 (CN). **WANG, Chunye** [CN/CN]; LiuXing HuanYuan A1-7-301, Huilongguan, Beijing, 102208 (CN). **ZHANG, Li** [CN/CN]; Room 704, 8# students' dormitory, BUPT, Beijing (CN).

(74) Agent: **RUUSKANEN, Juha-Pekka**; Page White and Farrer, Bedford House, John Street, London Greater London WC1N 2BF (GB).

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(54) Title: POINT TO MULTIPOINT TRANSMISSION CONTROL

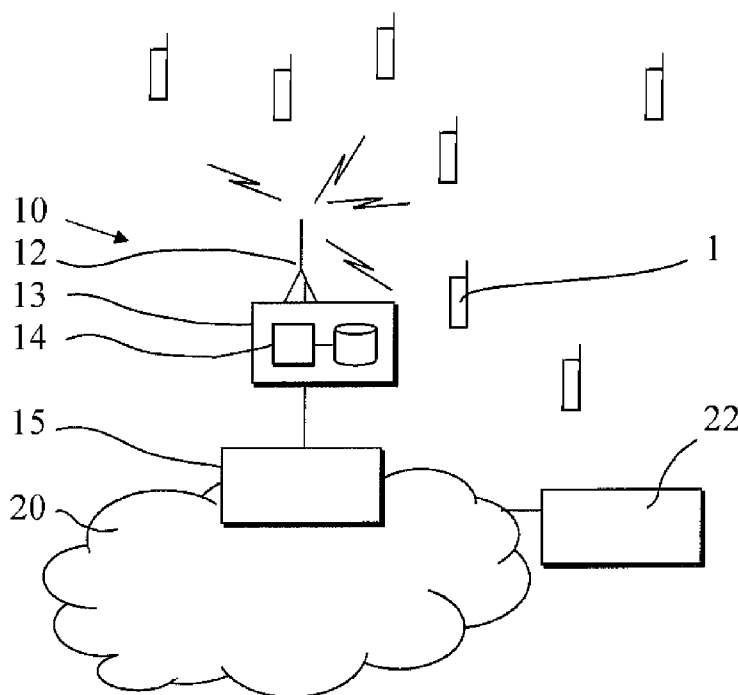


Fig. 1

(57) Abstract: An apparatus and method for controlling a point to multipoint transmission from a transmitting station is disclosed. The apparatus is configured to determine based on service quality information and a threshold if there are receiving stations within the coverage area of the transmitting station whose service quality is below an acceptable level. If such stations are detected, they can be treated differently from stations whose service quality is on acceptable level.



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Point to multipoint transmission control

The invention relates to control of point to multipoint transmissions.

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Point to multipoint transmissions can be provided in a communication system for example to broadcasting or multicasting content and other data and/or signals to a plurality of users. A communication system can be seen as a facility that enables communication sessions between two or more entities such as mobile communication devices and/or other stations associated with the communication system. Examples of communication systems include fixed line communication systems, such as a public switched telephone network (PSTN), local area networks (LAN) and wireless communication systems, such as a public land mobile network (PLMN), satellite based systems and different wireless local networks such as wireless local area networks (WLAN). In a wireless communication system wireless or over the air communication signals may be transmitted between transmitting and receiving stations.

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A user can access the communication system by means of an appropriate communication device. A communication device of a user is often referred to as user equipment (UE). A communication device is provided with an appropriate signal receiving and transmitting arrangement for enabling communications with other parties. Typically a communication device is used for enabling the users thereof to receive and transmit communications such as speech and data. In wireless systems a communication devices provides a transceiver station that can communicate with e.g. a base station of an access network and/or another communications device. Depending on the context, a communication device or user equipment may also be considered as being a part of a communication system. In certain applications, for example in adhoc networks, the communication system can be based on use of a plurality of user equipment capable of communicating with each other.

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The communication may comprise, for example, communication of data for carrying communications such as voice, electronic mail (email), text message, multimedia and so on. Users may thus be offered and provided numerous services via their communication devices. Non-limiting examples of these services include two-way or multi-way calls, data communication or multimedia services or simply an access to a data communications network system, such as the Internet. User may also be provided broadcast or multicast content. Non-limiting examples of such content include television and radio programs, videos, advertisements, various alerts and other information that is advantageous to be sent to multiple receivers at the same time.

Communications between stations may be provided as point-to-point communications or point-to-multipoint communications. Point-to-point communications are known as unicasting. Point-to-multipoint communications are typically provided by means of multicasting or broadcasting. The distinction between these two forms of point to multipoint communications is rather vague but a view is that multicasting requires the user to join a group whereas broadcasting is provided without any interaction between the end-user and an entity responsible for sending the content. Regardless the type of the point-to-multipoint services, a common feature of them is that a shared stream of data can be simultaneously transmitted to a multiple of communication devices. That is, a number of receiving stations can receive the same data transfer flow.

Several possibilities for delivering a point to multipoint service exist. An example is known as Multimedia Broadcast Multicast Service (MBMS). According to the MBMS proposals a communication system may be provided with a point-to-multipoint service entity such as a multimedia broadcast/multicast service (MBMS) server, which is able to broadcast or multicast information to multiple participants over a geographical area. The server can provide an entry point for multicast/broadcast transmissions of a content provider providing broadcast or multicast data to communication devices situated in a geographical area served by the server.

Use of the MBMS for point to multipoint transmissions is defined e.g. in the context what is known as 'long term evolution' (LTE) radio access network as specified by the 3rd Generation Partnership Project (3GPP). For example, in accordance with a possibility point to multi-point transmission is provided in an area and any communication device in the area can receive the broadcast. In accordance with another example a single cell point to multi-point transmission is provided such that each sector of a sector cell broadcasts independently from each other, and any communication device in a sector can receive the broadcast in that sector.

- 10 In a conventional broadcast channel arrangement a modulation and coding scheme (MCS) is provided such that coverage over the whole sector or another defined area is ensured, including any coverage limited areas. That is, the modulation and coding is adapted by selecting a scheme such that all receiving stations in the area will be covered and are thus provided with a satisfactory service. However, this may cause capacity and/or and efficiency issues. For example, there can be occasions where there are no receiving stations in a coverage-limited region. In such case resources would be wasted because even the worst receiving station listening to the broadcast could have supported a higher layer modulation and coding scheme (MCS) and the network could have delivered the service using less resources.

- 25 Communication devices connected to an entity such as the MBMS can provide feedback information, for example service quality information in association with Hybrid Automatic Repeat Request (HARQ) mechanism and link adaptation functions. For example, the latter information may be provided for the purposes of the adaptive modulation and coding (AMC). These two functions can provide improvement in the spectral efficiency of the broadcast channel. This can be especially the case if there are only a few mobile communication devices in an area, for example in a sector of a base station, and those communication devices are located close to the base station.

However, when functionalities such as AMC and HARQ are used for a broadcast channel, the spectral efficiency varies depending on the channel conditions of the

different communication devices. If a communication device is located in relatively poor coverage conditions and it attempts to connect to a multimedia broadcast/multicast service (MBMS), this can result low spectral efficiency. This can be so in particular because the communication device would in all likelihood be requesting for several retransmissions and a low, if not the lowest, available modulation and coding scheme (MCS). It would thus be advantageous to avoid situations where the spectral efficiency is unnecessarily made low.

It is noted that these issues are not limited to any particular communication environment, but may occur in any appropriate communication system providing point to multipoint services.

Embodiments of the invention aim to address one or several of the above issues.

In accordance with an embodiment there is provided an apparatus for controlling a point to multipoint transmission from a transmitting station, the apparatus being configured to determine based on service quality information and a threshold if there are receiving stations within the coverage area of the transmitting station whose service quality is below an acceptable level, and to treat receiving stations whose service quality is determined to be below the acceptable level differently from stations whose service quality is on acceptable level.

In accordance with another embodiment there is provided an apparatus for providing admission control for point to multipoint transmissions from a transmitting station, the apparatus being configured to determine, based on service quality information associated with a receiving station within the coverage area of the transmitting station and a threshold whether the receiving station is allowed to access the transmitting station.

In accordance with another embodiment there is provided a method for controlling a point to multipoint transmission, comprising transmitting a point to multipoint transmission from a transmitting station, determining based on service quality information and a threshold if there are receiving stations within the coverage area

of the transmitting station whose service quality is below an acceptable level, and treating receiving stations whose service quality is determined to be below the acceptable level differently from stations whose service quality is on acceptable level.

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In accordance with yet another embodiment there is provided a method for providing admission control for point to multipoint transmissions from a transmitting station, comprising providing service quality information associated with a receiving station within the coverage area of the transmitting station, and determining, based
10 at least partially on the service quality information, and a threshold whether the receiving station is allowed to access the transmitting station.

In accordance with a more specific embodiment the point to multipoint transmission control is provided such that information that is associated with
15 receiving stations whose service quality is determined to be below the acceptable level is discarded.

In accordance with another more specific embodiment at least one request for retransmission is received, and requests for retransmission are discarded from
20 stations whose service quality is determined as being below the acceptable level.

The service quality information can be based on at least one of feedback information, channel quality indicator (CQI), signal interference to noise ratio (SINR), long term signal interference to noise ratio, and Hybrid Automatic Repeat
25 Request (HARQ) messages. The determination can be based on information regarding the need of individual stations to report service quality.

In certain embodiments the spectral efficiency of a radio access system is controlled. For example, the spectral efficiency is maintained above a predefined
30 limit.

In some embodiments it is determined whether a communication device is allowed to access a particular service at a given moment. It can also or alternatively be

determined whether a station belongs to a group of communication devices that are considered for control decisions or whether the communication device belongs to a group of non-considered communication devices.

- 5 An appropriate modulation and coding scheme (MCS) may be selected.

The threshold can be adjustable. A dynamic trade off between spectral efficiency and coverage may be provided by means of the adjustable threshold. The adjustment can take into account at least one of a relative proportion of stations
10 that are receiving a defined minimum level of service, congestion, and changes in signaling condition.

The apparatus may be provided in a base station. The operation may be provided by means of a computer program comprising program code means adapted to
15 perform the required steps. The computer program may be provided on an appropriate computer readable medium. Execution thereof on at least one processor can require interaction with at least one memory.

Various other aspects and further embodiments are described in the following
20 detailed description and in the attached claims.

The invention will now be described in further detail, by way of example only, with reference to the following examples and accompanying drawings, in which:

25 Figure 1 shows an example of a communication system in which the embodiments of the invention may be implemented;

Figure 2 shows a communication device;

Figure 3 shows a different access system to than of Figure 1;

Figure 4 is a flowchart illustrating an embodiment; and

30 Figures 5 and 6 show results of simulations where an embodiment was tested.

In the following certain exemplifying embodiments are explained with reference to wireless or mobile communication systems. Before explaining in detail the certain exemplifying embodiments, certain general principles of a wireless communication system and mobile communication devices are briefly explained with reference to
5 Figures 1 and 2 to assist in understanding the embodiments.

A communication device can be used for accessing various services and/or applications provided via a communication system. In wireless or mobile communication systems the access is provided via an access interface between
10 mobile communication devices 1 and an appropriate wireless access system 10. A mobile device 1 can typically access wirelessly a communication system via at least one base station 12 or similar wireless transmitter and/or receiver node. Non-limiting examples of appropriate access nodes are a base station of a cellular system, a base station of a wireless local area network (WLAN) and/or WiMax
15 (Worldwide Interoperability for Microwave Access). Each mobile device 1 may have one or more radio channels open at the same time and may receive signals from more than one base station and/or other communication device.

A base station is typically controlled by at least one appropriate controller entity 13
20 so as to enable operation thereof and management of mobile communication devices in communication with the base station. The controller entity is typically provided with memory capacity and at least one data processor 14. The control entity can be interconnected with other control entities. In Figure 1 the base station node 12 is connected to a data network 20 via an appropriate gateway 15. A
25 gateway function between the access system and another network such as a packet data network may be provided by means of any appropriate gateway node, for example a packet data gateway and/or an access gateway. A communication system may thus be provided by one or more interconnect networks and the elements thereof, and one or more gateway nodes may be provided for
30 interconnecting various networks.

Furthermore, Figure 1 shows a point-to-multipoint service node 22 which is connected to the data network 20. Node 22 may be provided, for example, by a

multimedia broadcast multicast service server. In the example of Figure 1 communications between the mobile device 1 and the broadcast multicast service server 22 are routed via the data network 20, the gateway 15 and the base station system 12 and 13. However, a different arrangement may be provided for enabling
5 communications between a base station and a point to multipoint service node.

The point-to-multipoint service node 22 may be configured to provide content delivery functions for a Multimedia Broadcast/Multicast Service (MBMS) or similar. The service node 22 may be provided by a server which is configured to broadcast
10 or multicast information to multiple participants over a geographical area or a plurality of geographical areas. The service node 22 may serve as an entry point for transmissions of a content provider providing broadcast or multicast data to communication devices situated in a geographical area served by the service node 22.

15 Figure 2 shows a schematic, partially sectioned view of a communication device 1 that can be used for reception of broadcast or multicast content from at least one base station. Thus the communication device can provide a receiving station in a system of transmitting and receiving stations. An appropriate mobile communication device may be provided by any device capable of sending and
20 receiving radio signals 11. Non-limiting examples include a mobile station (MS), a portable computer provided with a wireless interface card or other wireless interface facility, personal data assistant (PDA) provided with wireless communication capabilities, or any combinations of these or the like.

25 The mobile communication device of Figure 2 may be used for various purposes. For example, the mobile communication device may be used for voice and video calls, for accessing service applications provided via the data network 20 and/or for receiving and displaying or otherwise presenting to the user broadcast or multicast
30 content. The mobile device 1 may receive signals via an appropriate radio receiver of the mobile device. In Figure 2 the receiver is designated schematically by block 7. The receiver may be provided for example by means of a radio part and associated antenna arrangement. The antenna arrangement may be arranged

internally or externally to the mobile device. The receiver arrangement of the mobile device may be configured for enabling tuning to different carrier frequencies. A mobile device is also typically provided with at least one data processing entity 3, at least one memory 4 and other possible components 9 for use in tasks it is designed to perform. The data processing, storage and other entities can be provided on an appropriate circuit board and/or in chipsets. This feature is denoted by reference 6. The user may control the operation of the mobile device by means of a suitable user interface such as key pad 2, voice commands, touch sensitive screen or pad, combinations thereof or the like. A display 5, a speaker and a microphone are also typically provided. Furthermore, a mobile device may comprise appropriate connectors (either wired or wireless) to other devices and/or for connecting external accessories, for example hands-free equipment, thereto.

The mobile communication device 1 can be configured to provide service quality related information and to communicate that information to the base station 10. For example, the mobile communication device can generate and communicate information relating to the quality of the received signals and/or data. The communication device may also be configured to generate and transmit messages in accordance with the Hybrid Automatic Repeat Request (HARQ) mechanism, for example ACK/NACK (acknowledged / not acknowledged) messages. The necessary measurement, generation and transmission operations can be controlled by the controller 3.

Figure 3 shows another access system scenario where the invention may be embodied. A base station 32 provides a plurality of sectors 35 to 38. The base station is controlled by a controller 33 such that each section can broadcast or multicast messages independently to mobile devices 1 within the area of the respective sector.

Certain embodiments of the invention will now be described in more detail with reference also to the flowchart of Figure 4.

At 100 a station transmits to a plurality of receiving stations within its coverage area. One or more of the receiving stations may be located in relatively bad signalling conditions, and thus the reception quality and service quality may not be on an acceptable level. Such stations can be identified at 102 based on a service quality threshold and information about the service quality the communications devices receive. Upon determination of existence of such stations information regarding them can be discarded from feedback information that is used as a basis of control decisions. Thus the subsequent control actions at 104 can be based on feedback information from such receiving stations only whose quality of service is determined as being good enough.

The control mechanism of this embodiment thus provides a point to multipoint system where different treatment of different receiving stations can be provided. For example, the control mechanism can be used to select an appropriate modulation and coding scheme (MCS) for a transmission and/or select communication devices that are to be used as basis of making a particular control decision. Such control mechanism can be advantageously employed to avoid unnecessary decrease in the overall spectral efficiency because it ignores receiving stations that would anyway not get good enough service but would nevertheless affect the service quality of other receiving stations and eat capacity from the base station for nothing. Thus the embodiment provides advantage in that the performance of the point to multipoint operation can be improved in terms of spectral efficiency.

In certain embodiments control of point to multipoint transmissions such as broadcasting or multicasting can be provided such that different control is applied to different receiving stations based on information from an uplink feedback mechanism. For example, a feedback mechanism provided in a point to multipoint system such as a multimedia broadcasting multicasting service (MBMS) or similar can be used to provide appropriate service quality information to be used a basis for decision making in this regard.

In accordance with a possibility the control is applied based on, at least partially, information that is associated with a feedback set maintained by the base station. A feedback set is a list of communication devices that need to report service quality. The list may be used e.g. such that communication devices in very good
5 conditions may not need to report at all. According to a possibility communication devices in good enough conditions, and not on the feedback set, can report quality with slower rate. If such communication devices are moving the base station can move them into the feedback set if their quality drops below a threshold. In the simplest form control can be such that communication devices on the list can be
10 treated differently than those that are not on the list. The devices not on the list but nevertheless in the 'slow reporting' scheme may also be treated differently that communication devices on the list and/or communication devices that do not need to report at all.

15 In the Figure 1 access system the control mechanism can be provided in association with the base station 10, and more particularly by the controller 13. In figure 3 the controller mechanism can be provided by means of the controller 33. The controller can be configured to handle at least the radio interface related aspects of the control function.

20 The network operator can use the control mechanisms to tradeoff between spectral efficiency and coverage of the point to multipoint service.

The functionality of the control mechanism can be viewed as a trade-off between
25 spectral efficiency and coverage. The embodiments are based on the notion that communication devices with poor connection can be sacrificed because it would cost too much resources to try to cover also them, and even then these communication devices might not be served with satisfactory quality.

30 In accordance with an embodiment a parameter associated with the service quality of a mobile communication device is used as a basis in controlling which communications devices should be allowed to access the MBMS service at a given moment. The parameter may be, for example, a long term signal interference to

noise ratio (SINR). For example, if the SINR is drops during a MBMS session the base station can move the communication device from the group of considered communication devices to the group of non-considered communication devices, or vice versa. The long term SINR can be measured and determined by the communications devices or be based on measurements by the communication devices. The SINR can be reported to the base station on request, periodically, or based on a trigger by a predefined event.

In accordance with an embodiment, the threshold is adjustable. By adjusting the threshold, a dynamic trade off between spectral efficiency and coverage can be achieved. For example, the adjustment can take into account factors such as the relative proportion of communication devices that are receiving a defined minimum level of service, congestion, changes in signaling condition and so on.

In accordance with an embodiment a point to multipoint service facilitating a single-cell point-to-multipoint broadcasting supports adaptive modulation and Hybrid Automatic Repeat Request (HARQ). Similar control mechanism as described above can be used in association with link adaptation and Hybrid Automatic Repeat Request (HARQ) decisions to discard feedback information from communications devices whose geometry or other feedback information parameter describing the quality of service is found to be below a predefined threshold.

In an example above the decision making was based to information of the signal interference to noise ratio. Other information can also be used as the basis. For example, any appropriate service quality feedback information can be used, at least partially, as the basis. Service quality information can comprise parameters such as Channel Quality Indicator (CQI) and/or information messages sent in association with the Hybrid Automatic Repeat Request (HARQ) mechanism, for example ACK/NACK (acknowledged / not acknowledged) messages.

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The Channel Quality Indicator (CQI) is a short term signal interference to noise ratio (SINR) measurement. A communication device can create the Channel Quality Indicator (CQI) and report it in uplink (UL) on a control channel. The CQI is

typically reported with a rate of one report per 5-500 ms. CQI can be used by the controller as a basis of determination of an appropriate control action, for example selection of an appropriate modulation and coding scheme (MCS) for the transmission. The controller can also use the CQI as a basis to determine whether
5 a communication device should be considered in the MCS selection procedure or not. If the CQI is used as a sole parameter in the determination, the controller can simply check if the CQI is below or above a CQI threshold.

If HARQ information is utilized, the control mechanism may, for example, detect
10 that a particular receiving station has sent or stations within a particular section of a base station coverage area have sent a predefined number of NACK (not acknowledged) messages within a predefined time period. This indicates that the one or more stations are not receiving the data transmission on a good enough service level. For example, the threshold can be set such that 10 NACK messages
15 for 20 transmissions would result a determination that the service quality is not acceptable. The mechanism could also work other way around, and consider that those receiving stations that do not positively acknowledge all, or a certain amount of the data packet, say at least 95% of the data packets, are not served properly, and shall be treated differently.

20

In accordance with another embodiment similar principles are applied to admission control. That is, a station such as a communication device can be allowed to access an access system only if the service quality it receives satisfies a predetermined criteria. For example, if the signal interference to noise ratio (SINR)
25 of a communication device is below a threshold the communication device is not allowed to access the system because it would reduce the spectral efficiency below a limit set by the operator while it may still not receive a satisfactory service quality. This can provide advantage in point to multipoint systems where the modulation and coding scheme (MCS) can be adjusted in accordance with the
30 active receiving stations.

Admission control for the pint to multipoint transmissions may be provided entirely by the access system. However, it is also possible to distribute the control so that

is provided at least partly by the receiving stations. For example, a transmitting station of a radio access network may transmit a threshold to the user equipments. The threshold can be sent to the user equipments for example in a broadcast channel.

5

System level simulations have been conducted to test the invention. The simulations showed that, for example, for a case where there was 10 user equipment in a sector of a cell a gain in spectral efficiency of up to 25% could be observed while at the same time the predefined coverage requirement was satisfied. It was also observed that the gain that is achievable by the control mechanisms increases as the number of MBMS users increases beyond 10. For example, up to 35% gain appears obtainable in case of 30 user equipment. The parameters used in the simulations are shown in table 1 below.

15

Traffic Model	
User distribution	Uniform, Balanced, 10/30 Users per sector
Data generation	Full Buffer
Radio Network Model	
Distance attenuation	$L = 128.1 + 37.6 \cdot \log(d)$, d = distance in km
Fast fading	Typical Urban 20 taps
Cell layout	Hexagonal grid, 3-sector sites, 19 cells, 57 sectors
Interference calculation	Only users in centre cell is simulated, other base stations simply act as static interference sources
Inter site distance	1732 m, Macro case3 TU20
Penetration loss	20 dB
Wrap around	Off
Shadow fading model	Log-normal, 8dB standard deviation
Site/sector correlation	0.5/1.0
UE mobility	3 Km/h
Simulation Configurations	
Warm up time	0.05s

Simulation time	200 runs, 2s per run
Bandwidth	50 PRB, 10 MHz
PRB size	12 sub-carriers per PRB, total 600 sub-carriers
Sub-carrier spacing	15 KHz
Max antenna gain	15dBi
Antenna scheme	2 transmit antenna by 2 receive antennas, STTD
BTS max tx power	46 dBm
Link adaptation	Sector-specific fast AMC
BLER target on first transmission	50 %
Lowest MCS	QPSK 1/5 or QPSK 1/3
CQI scheme	Full bandwidth reporting
HARQ	Sector-specific HARQ, chase combining
Maximum transmission number	2/3
Geometry thresholds for feedback	-4, -5, -6 dB
Coverage requirement	More than 95%

TABLE 1

- 5 The simulation results are illustrated by the graphs of Figures 5 and 6.

Figure 5 illustrates Cumulative distribution function (CDF) of throughput with and without proposed mechanism in the case of 10 user equipment. The threshold was set to be -4, -5, and -6 dB, respectively. For example, the observed gain in
 10 throughput was 22% when the threshold was set to -5 dB.

Figure 6 illustrates the Cumulative distribution function (CDF) of Block Error Rate (BLER) with and without proposed mechanism in case of 10 user equipment. The

threshold was set to -4, -5, and -6 dB, respectively. It was noted that the coverage requirement was met when threshold was -5 dB.

5 The control mechanism proactively neglects such receiving communication devices in the coverage area which anyway would not have reached the quality target. A coverage target (e.g. 95 % of the communications devices should have 1 % residual Block Error Rate (BLER) or lower) can still be reached but the 5 % worst communication devices have much worse BLER compared to the case where this invention is not present.

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The communication devices can access the communication system based on various access techniques, such as code division multiple access (CDMA), or wideband CDMA (WCDMA), the latter technique being used by communication systems based on the third Generation Partnership Project (3GPP) specifications. 15 Other examples include time division multiple access (TDMA), frequency division multiple access (FDMA), space division multiple access (SDMA) and so on. In a wireless system a network entity such as a base station provides an access node for communication devices. It is noted that in certain systems, for example those based on the 3G WCDMA, a base station is called 'Node B'.

20

A non-limiting example of mobile architectures where the herein described principles may be applied is known as the Evolved Universal Terrestrial Radio Access (E-UTRA). An exemplifying implementation may therefore be in the context of an evolved Universal Mobile Telecommunications System (UMTS), 25 Terrestrial Radio Access Network (E-UTRAN). An Evolved Universal Terrestrial Radio Access Network (E-UTRAN) consists of E-UTRAN node Bs (eNBs) which are configured to provide both base station and control functionalities of the radio access network. The eNBs may provide E-UTRA features such as user plane Radio Link Control/Medium Access Control/Physical layer protocol 30 (RLC/MAC/PHY) and control plane Radio Resource Control (RRC) protocol terminations towards the mobile devices. Embodiments of the present invention may be used with the proposed LTE (Long term evolution) system suggested in

the 3GPP forum. For example, the above described control apparatus could be used in a packet scheduler of a LTE eNode-B.

The required data processing apparatus and functions of the control mechanism
5 and the communication device may be provided by means of one or more data processors. The data processor may be provided by means of, for example, at least one chip. Appropriate memory capacity can also be provided. Appropriate data processing may be provided in a processing unit provided in association with a base station of a mobile communication system. The data processing may be
10 distributed across several data processing modules. The above described functions may be provided by separate processors or by an integrated processor. An appropriately adapted computer program code product or products may be used for implementing the embodiments, when loaded on an appropriate data processing apparatus, for example in a processor apparatus 13 associated with
15 the case station 10 shown in Figure 1. The program code product for providing the operation may be stored on and provided by means of an appropriate carrier medium. An appropriate computer program can be embodied on a computer readable record medium. A possibility is to download the program code product via a data network.

20 It is noted that whilst embodiments have been described in relation to MBMS, similar principles can be applied to any other type of point to multipoint systems. It is also noted that although certain embodiments were described above by way of example with reference to certain exemplifying architectures for wireless networks,
25 technologies and standards, embodiments may be applied to any other suitable forms of communication systems than those illustrated and described herein.

It is also noted herein that while the above describes exemplifying embodiments of the invention, there are several variations and modifications which may be made to
30 the disclosed solution without departing from the scope of the present invention.

Claims

1. An apparatus for controlling a point to multipoint transmission from a transmitting station, the apparatus being configured to determine based on service quality information and a threshold if there are receiving stations within the coverage area of the transmitting station whose service quality is below an acceptable level, and to treat receiving stations whose service quality is determined to be below the acceptable level differently from stations whose service quality is on acceptable level.
2. An apparatus as claimed in claim 1, configured to control the point to multipoint transmission such that information that is associated with receiving stations whose service quality is determined to be below the acceptable level is discarded.
3. An apparatus for providing admission control for point to multipoint transmissions from a transmitting station, the apparatus being configured to determine, based on service quality information associated with a receiving station within the coverage area of the transmitting station and a threshold whether the receiving station is allowed to access the transmitting station.
4. An apparatus as claimed in any preceding claim, configured to receive at least one request for retransmission, and to discard requests for retransmission from stations whose service quality is determined as being below the acceptable level.
5. An apparatus as claimed in any of the preceding claims, wherein the service quality information is based on at least one of feedback information, channel quality indicator (CQI), signal interference to noise ratio (SINR), long term signal interference to noise ratio, and Hybrid Automatic Repeat Request (HARQ) messages.

6. An apparatus as claimed in any of the preceding claims, wherein the determination is based on information regarding the need of individual stations to report service quality.

5 7. An apparatus as claimed in any of the preceding claims, wherein the threshold comprises a value expressed in dB.

8. An apparatus as claimed in any of the preceding claims, configured to control the spectral efficiency of a radio access system.

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9. An apparatus as claimed in claim 8, configured to maintain the spectral efficiency above a predefined limit.

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10. An apparatus according to any of the preceding claims, configured to determine whether a communication device is allowed to access a particular service at a given moment.

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11. An apparatus according to any of the preceding claims, configured to determine whether a station belongs to a group of communication devices that are considered for control decisions or whether the communication device belongs to a group of non-considered communication devices.

25

12. An apparatus according to any of claims, configured to select a modulation and coding scheme (MCS).

13. An apparatus according to any of the preceding claims, wherein the threshold is adjustable.

30

14. An apparatus according to claim 13, configured to provide a dynamic trade off between spectral efficiency and coverage by means of the adjustable threshold.

15. An apparatus according to claim 13 or 14, wherein the adjustment takes into account at least one of the relative proportion of stations that are receiving a defined minimum level of service, congestion, and changes in signaling condition.

5 16. A base station comprising an apparatus according to any of the preceding claims.

17. A communication system comprising an apparatus according to any of claims 1 to 15 or the base station of claim 16.

10

18. A method for controlling a point to multipoint transmission, comprising:
transmitting a point to multipoint transmission from a transmitting station;
determining based on service quality information and a threshold if there are receiving stations within the coverage area of the transmitting station whose
15 service quality is below an acceptable level; and

treating receiving stations whose service quality is determined to be below the acceptable level differently from stations whose service quality is on acceptable level.

20 19. A method as claimed in claim 18, wherein the different treatment comprises discarding information that is associated with receiving stations whose service quality is determined to be below the acceptable level in the control of a point to multipoint transmission.

25 20. A method for providing admission control for point to multipoint transmissions from a transmitting station, comprising
providing service quality information associated with a receiving station within the coverage area of the transmitting station; and
determining, based at least partially on the service quality information, and
30 a threshold whether the receiving station is allowed to access the transmitting station.

21. A method as claimed in any of claims 18 to 20, wherein the service quality information is based on at least one of feedback information, channel quality indicator (CQI), signal interference to noise ratio (SINR), long term signal interference to noise ratio, Hybrid Automatic Repeat Request (HARQ) messages,
5 and the need of individual stations to report service quality.
22. A method as claimed in any of claims 18 to 21, comprising
receiving at least one request for retransmission, and
discarding requests for retransmission from receiving stations whose
10 service quality is determined as being below the acceptable level.
23. A method as claimed in any of claims 18 to 22, comprising controlling the spectral efficiency of a radio access system.
- 15 24. A method as claimed in claim 23, comprising maintaining the spectral efficiency above a predefined limit.
25. A method as claimed to any of claims 18 to 24, comprising determining whether a communication device is allowed to access a particular service at a
20 given moment.
26. A method as claimed to any of claims 18 to 25, comprising determining whether a station belongs to a group of communication devices that are considered for control decisions or whether the communication device belongs to a
25 group of non-considered communication devices.
27. A method as claimed to any of claims 18 to 26, comprising selecting a modulation and coding scheme (MCS).
- 30 28. A method as claimed to any of claims 18 to 27, comprising adjusting the threshold.

29. A method as claimed in claim 28, comprising providing a dynamic trade off between spectral efficiency and coverage by means of the adjustable threshold.

30. A computer program comprising program code means adapted to perform
5 any of steps of any of claims 18 to 29 when the program is run on a processor means.

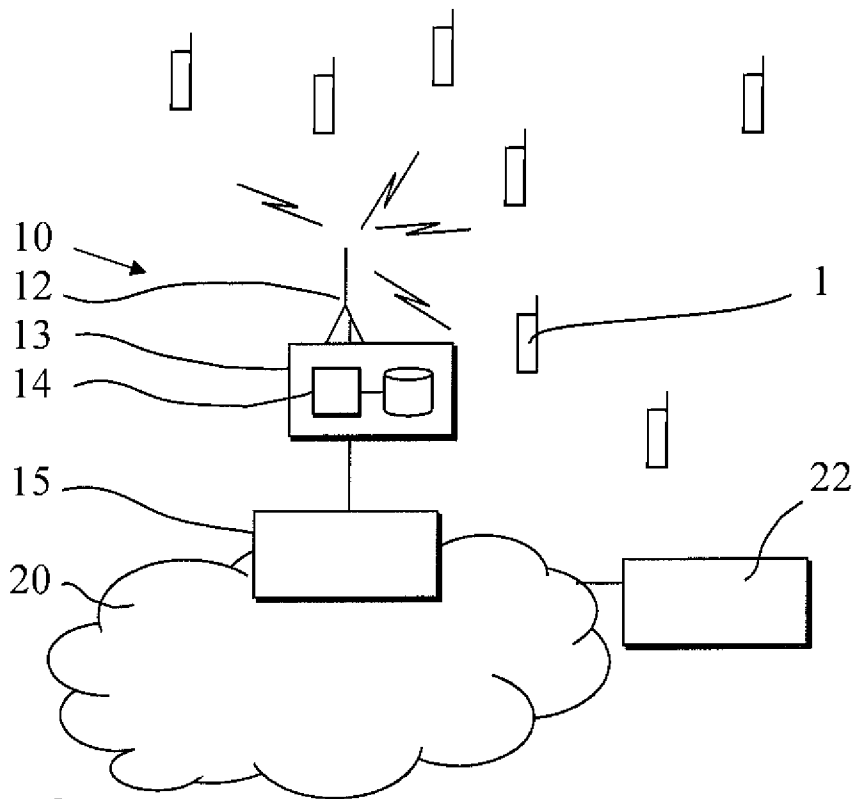


Fig. 1

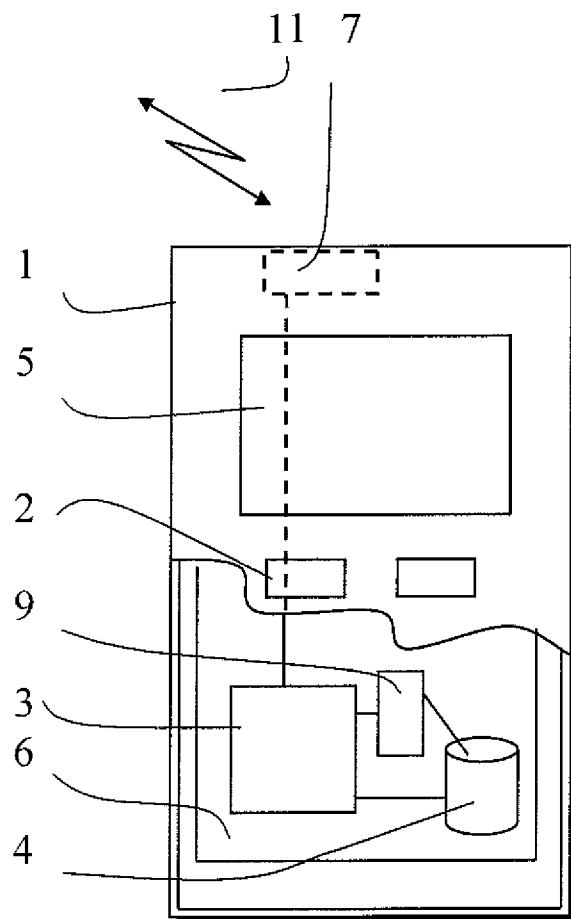


Fig. 2

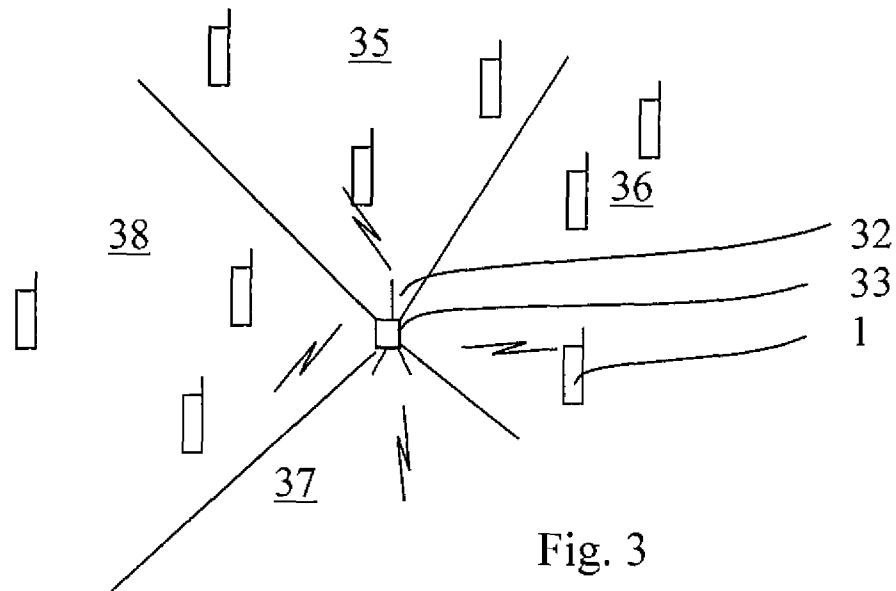


Fig. 3

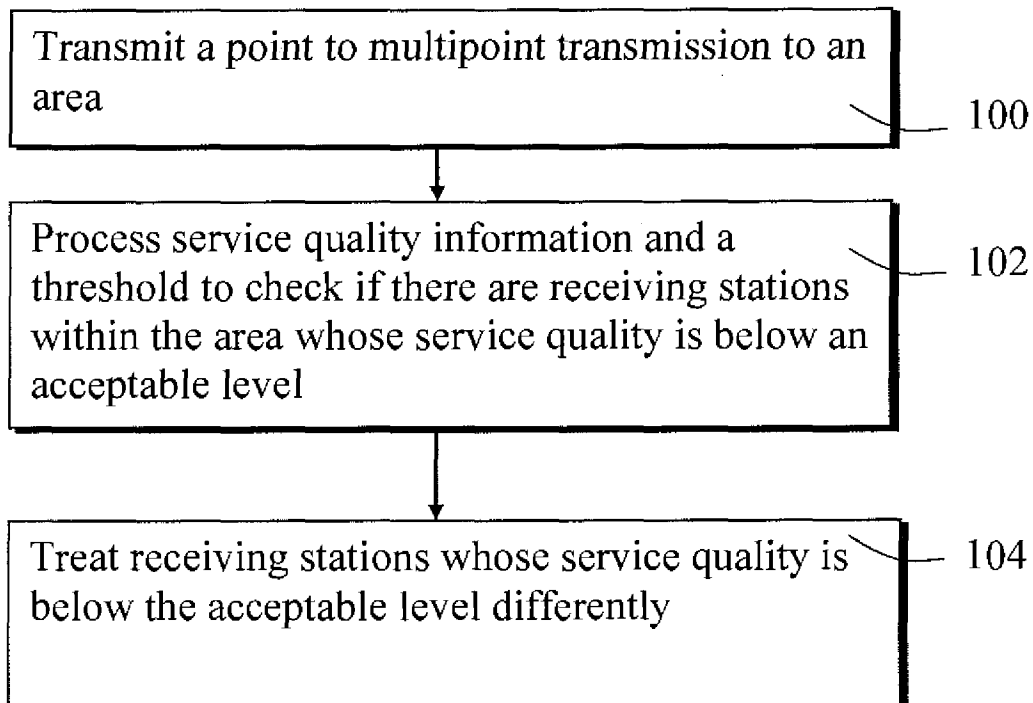


Fig. 4

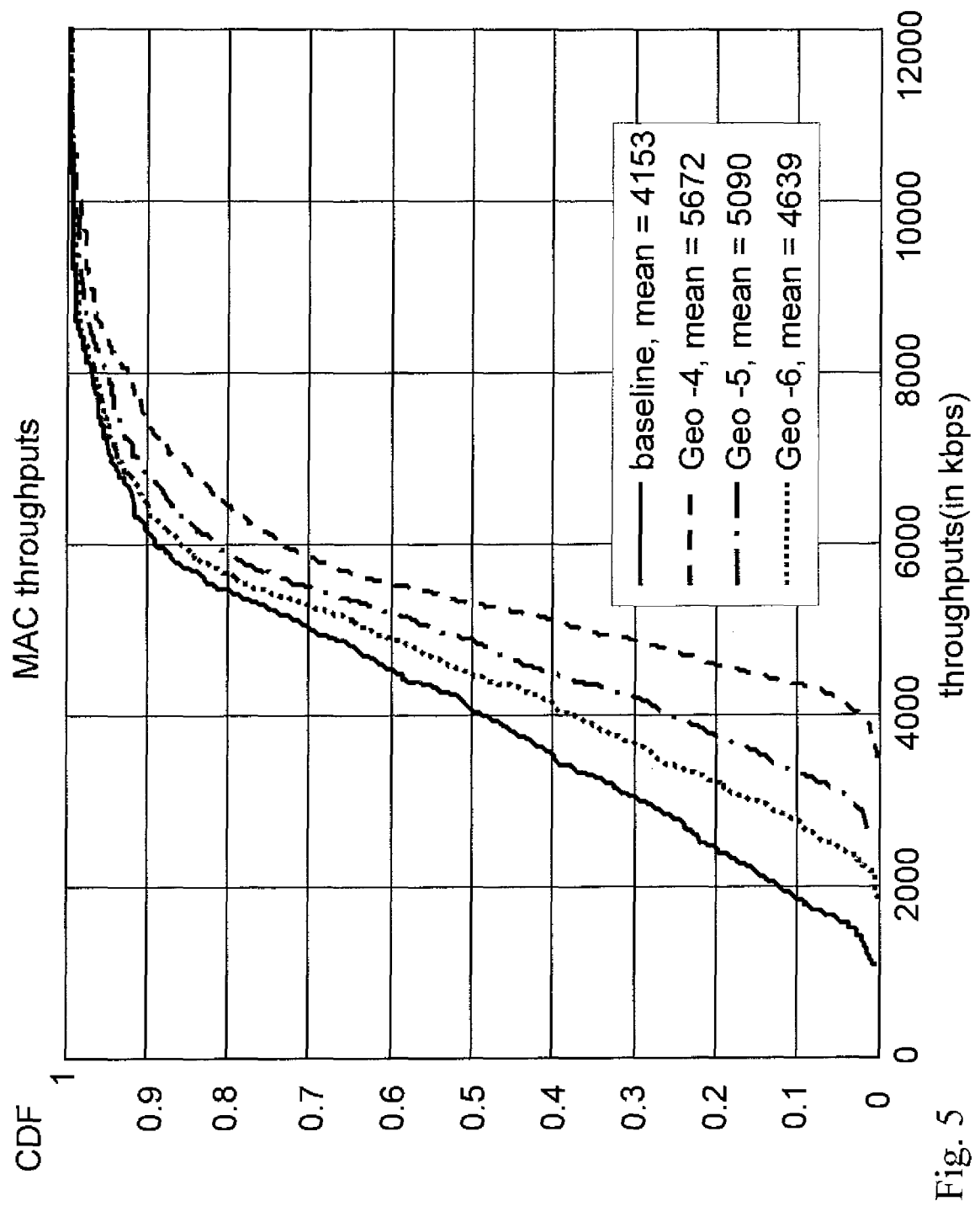


Fig. 5

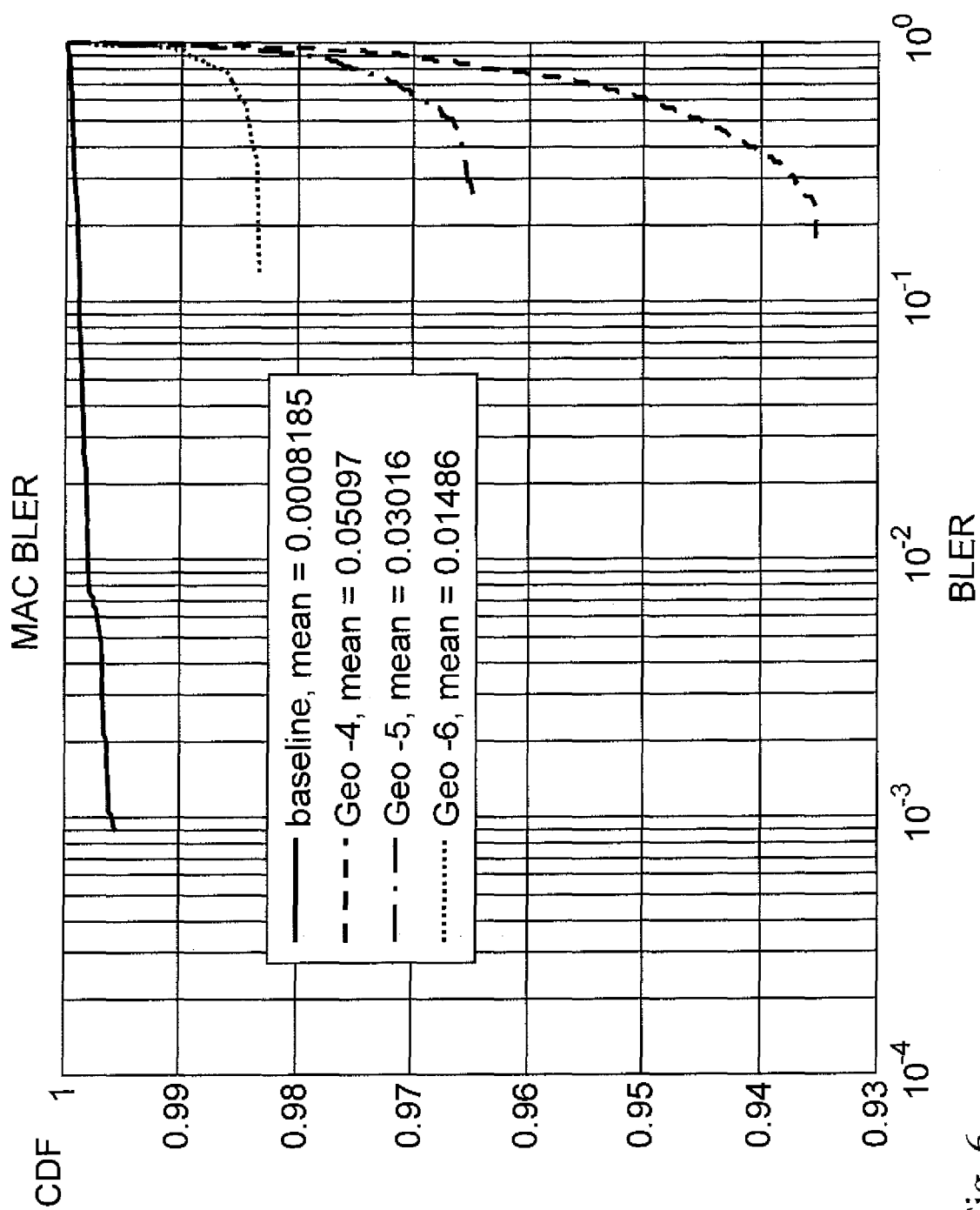


Fig. 6