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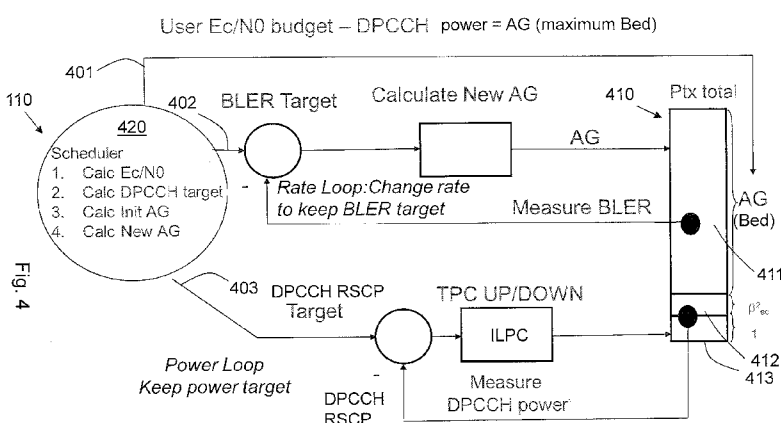
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(54) Title: ADAPTING UPLINK TRANSMISSIONS IN A WIRELESS TELECOMMUNICATIONS NETWORK



(57) Abstract: Methods in a node in a telecommunications network are provided. A method in a node in a telecommunications network may include providing a grant value for transmission to a wireless terminal. Moreover, the method may include determining a power target value for the wireless terminal, in coordination with providing the grant value for transmission to the wireless terminal. Related nodes are also provided.



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ADAPTING UPLINK TRANSMISSIONS IN A WIRELESS TELECOMMUNICATIONS NETWORK

TECHNICAL FIELD

[0001] The present disclosure is directed to communications and, more particularly, to wireless communications.

BACKGROUND

[0002] Communication devices such as User Equipments, UE, are also known as, e.g., mobile terminals, wireless terminals, wireless devices and/or mobile stations. User equipments are enabled to communicate wirelessly in a wireless communication(s) system, sometimes also referred to as a cellular radio system or a cellular network. The communication may be performed, e.g., between two user equipments, between a user equipment and a regular telephone and/or between a user equipment and a server via a Radio Access Network, RAN, and possibly one or more core networks, comprised within the wireless communications system.

[0003] User equipments may further be referred to as mobile telephones, cellular telephones, or laptops with wireless capability, just to mention some further examples. The user equipments in the present context may be, for example, portable, pocket-storable, hand-held, computer-comprised, or vehicle-mounted mobile devices, enabled to communicate voice and/or data, via the RAN, with another entity, such as another user equipment or a server.

[0004] The wireless communications system covers a geographical area which is divided into cell areas, wherein each cell area being served by a base station, e.g., a Radio Base Station, RBS, which sometimes may be referred to as, e.g., “eNB”, “eNodeB”, “NodeB”, “B node”, or BTS, Base Transceiver Station, depending on the technology and terminology used. The base stations may be of different classes such as, e.g., macro eNodeB, home eNodeB or pico base station, based on transmission power and thereby also cell size. A cell is a geographical area where radio coverage is provided by the base station at a base station site. One base station, situated on the base station site, may serve one or several cells. Further, each base station may support one or several communication

technologies. The base stations communicate over the air interface operating on radio frequencies with the user equipments within range of the base stations.

[0005]In some RANs, several base stations may be connected, e.g., by landlines or microwave, to a radio network controller, e.g., a Radio Network Controller, RNC, in Universal Mobile Telecommunications System, UMTS, and/or to each other. The radio network controller, also sometimes termed a Base Station Controller, BSC, e.g., in GSM, may supervise and coordinate various activities of the plural base stations connected thereto. GSM is an abbreviation for Global System for Mobile Communications.

[0006]In 3rd Generation Partnership Project, 3GPP, Long Term Evolution, LTE, base stations, which may be referred to as eNodeBs or even eNBs, may be directly connected to one or more core networks.

[0007]UMTS is a third generation mobile communication system, which evolved from the GSM, and is intended to provide improved mobile communication services based on Wideband Code Division Multiple Access, WCDMA, access technology. UMTS Terrestrial Radio Access Network, UTRAN, is essentially a radio access network using WCDMA for user equipments.

[0008]High-Speed Packet Access, HSPA, is a mobile communication technology that further extends and improves the performance of UMTS. Two standardized solutions, High-Speed Downlink Packet Access, HSDPA, and High-Speed Uplink Packet Access, HSUPA, have been established. The latter, HSUPA, may also be referred to as HSPA Enhanced Uplink, HSPA EUL, or simply as Enhanced Uplink, EUL. The purpose of the EUL is in general to improve the performance of uplink dedicated transport channels, so as to increase capacity and throughput and reduce delay.

[0009]A UE which has been scheduled to use EUL basically uses three uplink dedicated physical channels: DPCCH, E-DPDCH and E-DPCCH. DPCCH, Dedicated Physical Control CHannel, is used to transmit known pilot bits used by the Node B for synchronization and channel estimation. In addition, the DPCCH may comprise, e.g., power control commands to be used in the downlink. E-DPDCH, Enhanced-Dedicated CHannel (E-DCH) Dedicated Physical Data Channel, carries the actual user data. E-DPCCH, E-DCH Dedicated Physical Control Channel, carries information about the format of the actual user data sent on the E-DPDCH.

[0010] These uplink dedicated physical channels may comprise information, such as, e.g., an E-DCH Transport Format Combination Identifier, ETFCI, which may comprise information about the transport block set size, from which the Node B may determine the number of information bits, spreading factors and modulation used in the transmission; a Retransmission Sequence Number, RSN, which informs the Node B about which coded bits are sent; or a bit, commonly referred to as a “happy bit”, which may indicate to the Node B that the UE would like to transmit at a higher rate.

[0011] For the EUL and the uplink dedicated physical channels therein, some of the important aspects relate to power control and bit rate adaptation.

[0012] Fast uplink power control is an important feature of all CDMA systems, since a number of users typically share the same air interface resource. The operation of the so-called Inner and Outer Loop Power Control, ILPC and OLPC, is illustrated in Figure 1. Figure 1 shows loops of the ILPC and the OLPC in a baseline scheme.

[0013] The ILPC is based on Transmit Power Control, TPC, commands. The TPC commands are transmitted from the Node B to the UE each slot, i.e., $2/3$ ms, and orders the UE to increase or decrease the power of the DPCCH channel. The power of the other dedicated physical channels, E-DPDCH and E-DPCCH, and also, e.g., HS-DPCCH, are defined in relation to DPCCH. This may be seen in Figure 2.

[0014] Hence, TPC commands serve normally to increase the total transmit power of the UE. The TPC commands are typically used to control the Signal to Interference plus Noise Ratio, SINR, to a level at which control and data channels may be reliably detected in order to achieve a certain Block Error Rate, BLER, for the E-DPDCH. The control of the BLER is performed by an outer loop wherein the OLPC algorithm changes the Signal-to-Interference Ratio, SIR, target based on measured BLER. This is also indicated and may be seen in Figure 1.

[0015] The bitrate of a UE is controlled by the Node B by sending an Absolute Grant, AG, which may be relative, to the UE. This may be performed at most once per Transmit Time Interval, TTI, which may be each 2ms or 10ms for EUL. The value of AG provides the UE with an allowed power offset on the E-DPDCH channel relative to the DPCCH power. In addition, the value of AG may be used in determining the maximum bit rate that the UE may use.

[0016] In the WCDMA uplink, the received power in the Node B is the shared resource. Hence, the Node B will attempt to control the so-called Rise-over-Thermal, RoT, power. The RoT is the total received power divided by the thermal noise power in the Node B. The higher the RoT becomes, the less stable the system will become. Therefore, the scheduling in the Node B takes into account the maximum allowed RoT when it determines the AG and DPCCH power for each UE. Based on the available power for the UE, the Node B sends an AG to the UE. As the AG are sent on a TTI basis by the Node B, the total loop delay is considerably longer than the Inner Loop Power Control, ILPC, delay. The total loop delay is at least 6 ms longer, but could in practice be much longer. The scheduling in the Node B may measure the actual total received power of the UE and check if it is within a target power. If the actual total received power of the UE is too large, the AG may be decreased. Otherwise, the AG may, e.g., be increased.

[0017] However, this procedure may lead to RoT stability problems for many reasons. For example, the measured SINR depends, e.g., on the type of receiver that is deployed. If, e.g., a so-called Interference Suppression, IS, receiver is used, then the resulting SINR depends in a complicated manner on the combination of the own and other UEs propagation channels and powers. For a UE transmitting at high rates, which is equivalent to high SINRs and high power offset between E-DPDCH and DPCCH, the so-called self-interference also starts to influence the SINR. This is illustrated and may be seen in Figure 2, which depicts SINR levels mapped to received power, S , at the Node B.

[0018] As may be seen in Figure 2, above a certain power level, A , an increase in the total received power does not result in increased SINR, but rather flattens out the SINR. If the SINR target is above this level, then a power rush will occur. This power rush will then cause all other UEs in the cell, and also to some extent UEs in neighboring cells, to increase their powers in order to reach their SINR targets. This kind of power rush may also occur when a UE, perhaps located in a different cell, suddenly starts to transmit at a high rate, thus creating an instantaneous increased RoT.

[0019] Eventually scheduling, e.g., via a scheduler, in the Node B may detect that the RoT has surpassed the target, and may then transmit new reduced AGs for the UEs that are within the Node B's control. However, as the granting mechanism in the Node B is much slower, e.g., around at least 10 times slower, than the ILPC, this is not easily performed.

[0020] Therefore, typically, other emergency measures must be used, such as, e.g., temporarily overriding the ILPC and forcing down the UE transmit powers before the new AGs have been received by the UEs. After the RoT has been reduced, the scheduling in the Node B again needs to upgrant the UEs, i.e., increase the AGs again. If this is performed in an aggressive manner, then the system is de facto operating in an on/off mode or manner. Alternatively, the scheduling in the Node B may also be configured to act in an overly conservative way and only upgrant the UEs very slowly so as to reduce/avoid power rushes. However, neither of these alternatives appear to use the full potential of the air interface.

[0021] The approaches described in this Background section could be pursued, but are not necessarily approaches that have been previously conceived or pursued. Therefore, unless otherwise expressly stated herein, the approaches described in this Background section are not prior art to the claims in this application and are not admitted to be prior art by inclusion in this section.

SUMMARY

[0022] Various embodiments provide a method in a node in a telecommunications network. The method includes adjusting a grant value for transmission to a wireless terminal, based on a Block Error Rate, BLER, target value. Moreover, the method includes adjusting a power target value for the wireless terminal, in coordination with adjusting the grant value for transmission to the wireless terminal.

[0023] A node in a telecommunications network, according to various embodiments, is provided. The node includes radio circuitry configured to provide communications with a wireless terminal. The node includes a network interface configured to provide communications with a Radio Network Controller. Moreover, the node includes processing circuitry coupled to the radio circuitry and the network interface. The processing circuitry is configured to adjust a grant value for transmission to the wireless terminal, based on a Block Error Rate, BLER, target value. Moreover, the processing circuitry is configured to adjust a power target value for the wireless terminal, in coordination with adjusting the grant value for transmission to the wireless terminal.

[0024] A method in a node in a telecommunications network, according to various embodiments, is provided. The method includes signalling an adjustment for a grant value

to a base station for transmission to a wireless terminal. The adjustment for the grant value is based on a Block Error Rate, BLER, target value. Moreover, the method includes receiving an updated value of a power target value for the wireless terminal from the base station, in coordination with signalling the adjustment for the grant value to the base station.

[0025] A node in a telecommunications network, according to various embodiments, is provided. The node includes a network interface configured to provide communications with a base station. The node includes processing circuitry coupled to the network interface. The processing circuitry is configured to signal an adjustment for a grant value through the network interface to a base station for transmission from the base station to the wireless terminal. The adjustment for the grant value is based on a Block Error Rate, BLER, target value. Moreover, the processing circuitry is configured to receive an updated value of a power target value for the wireless terminal from the base station through the network interface, in coordination with signalling the adjustment for the grant value to the base station.

[0026] Various embodiments described herein may improve uplink transmissions from a user equipment in a wireless telecommunications system. For example, operations described herein may be performed by a network node to adapt the power and bit rate of transmissions received from a user equipment in a wireless telecommunications network. The network node may adapt the maximum bit rate for transmissions to be received from the user equipment based on a threshold value of the allowed power offset for transmissions from the user equipment. This may be performed by the network node, while the network node may maintain a determined level of at least one received power of the transmissions from the user equipment.

[0027] By maintaining at least one received power level at the network node of the transmissions received from a user equipment at a certain level, and adapting the maximum bit rate based a threshold target value of the allowed power offset for transmissions from the user equipment, fluctuating power levels, or power rushes, in unstable user equipments may be reduced/avoided. This may improve the power control and bit rate adaptation in uplink transmissions from a user equipment, and may lead to a more predictable and stable wireless telecommunications system.

[0028]Hence, uplink transmissions from a user equipment in a wireless telecommunications system may be improved. For example, some embodiments described herein may avoid/reduce excessive power rushes or fluctuating power levels by using a base station to maintain a received uplink (UL) power level by adapting an allowed maximum UL bitrate based on received UL BLER, and updating a UE with adapted values. Moreover, using the base station to maintain the received UL power level may include adapting a Target DPCCH RSCP based on measured DPCCH power, and updating a UE with adapted values. The adaption schemes described herein may not require 3GPP standard changes and may not require UE modifications.

BRIEF DESCRIPTION OF THE DRAWINGS

[0029]Features and advantages of the embodiments will become readily apparent to those skilled in the art by the following detailed description of exemplary embodiments thereof with reference to the accompanying drawings.

[0030]Figure 1 is a schematic flow diagram depicting loops of the ILPC and the OLPC in a baseline scheme.

[0031]Figure 2 is a schematic diagram depicting SINR levels mapped to received power, S , at the network node.

[0032]Figure 3 is a schematic block diagram illustrating embodiments in a wireless communications network.

[0033]Figure 4 is a schematic flow diagram illustrating the power control and bit rate adaptation according to some exemplary embodiments.

[0034]Figure 5 is a block diagram depicting embodiments of a network node.

[0035]Figure 6 is a block diagram depicting embodiments of a user equipment.

DETAILED DESCRIPTION

[0036]The figures are schematic and simplified for clarity, and they merely show details which may be useful/essential to the understanding of the embodiments presented herein, while other details have been left out. Throughout, the same reference numerals are used for identical or corresponding parts or steps.

[0037]Figure 3 depicts a telecommunications system 100 in which embodiments herein may be implemented. The cellular communications system 100 is a wireless

communication network such as an HSPA, WCDMA, GSM network, or any similar cellular network or system.

[0038]The telecommunications system 100 comprises a network node 110, which may be a base station. The network node 110 serves a cell 115. The network node 110 may in this example, e.g., be an Node B, B node, an eNB, an eNodeB, or a Home Node B, a Home eNode B, a femto Base Station (BS), a pico BS or any other network unit capable to serve a user equipment or a machine type communication device which are located in the cell 115 in the telecommunications system 100.

[0039]A user equipment 121 is located within the cell 115. The user equipment 121 is configured to communicate within the telecommunications system 100 via the network node 110 over a radio link 130 when the user equipment 121 is present in the cell 115 served by the network node 110. The user equipment 121 may, e.g., be a mobile terminal, a wireless terminal, a mobile phone, a computer such as, e.g., a laptop, a Personal Digital Assistant (PDA) or a tablet computer with wireless capability, a device equipped with a wireless interface, such as a printer or a file storage device or any other radio network unit capable of communicating over a radio link in a telecommunications system.

[0040]The network node 110 may be connected to a Radio Network Controller 140, RNC, in the telecommunications system 100. The RNC 140 may control a large number of network nodes connected to it, such as, e.g., the network node 110. The RNC may, for example, perform radio resource management and some mobility management functions for these network nodes. The RNC connects the network node 110 to the core network of the telecommunications system 100. The RNC 140 may also be referred to as a network node.

[0041]As part of the developing of the embodiments described herein, a problem will first be discussed in more detail.

[0042]First, it should be noted that rate adaptation or bit rate adaptation is commonly used to denote a family of methods designed for stabilizing the EUL uplink performance in HSPA/WCDMA systems in order to reduce/avoid excessive power rushes or fluctuating power levels.

[0043]Existing methods for power control and bit rate adaptation may include granting a certain bit rate the user equipment. Then, the SIR target for the transmissions from the user equipment is adapted to achieve a certain BLock Error Rate, BLER, level at

the granted bit rate. In this rate adaptation, the bit rate is granted in order to provide a certain BLER level given a total power budget for the transmissions from the user equipment.

[0044] However, the methods all require changes to the standard. Particularly, changes in the standard for the user equipments. Due to the long-term implementation periods for these changes to come into effect in the user equipments, this means that the full system gains of such methods may be perceived only many years ahead, i.e., it may take a long time before any real system gains may be seen.

[0045] Furthermore, the operation of these existing methods in soft handover, i.e., a soft handover procedure of the user equipment, is difficult and complicated.

[0046] This problem is addressed in some embodiments described herein by maintaining a received power level at the network node 110, 140 of the transmissions received from the user equipment 121 at a certain level, and adapting the maximum bit rate based on a threshold target value of the allowed power offset for transmissions from the user equipment 121. Thus, fluctuating power levels, or power rushes, in unstable user equipments in the wireless telecommunications system 100 may be reduced/avoided.

[0047] This may improve the power control and bit rate adaptation in uplink transmissions from a user equipment, and lead to a more predictable and stable wireless telecommunications system. Hence, uplink transmissions from a user equipment in a wireless telecommunications system may be improved.

[0048] It should be noted that the embodiments described herein may provide a bit rate adaptation which works for all existing Enhanced Uplink, EUL, user equipments. This means that the bit rate adaptation may be implemented without any changes to the user equipment or the standard for the user equipment. This will enable full system gains immediately upon implementation.

[0049] Further, at least some of the embodiments described herein may provide an operation in soft handover which is greatly simplified as compared to the complicated existing rate adaptation method described above.

[0050] Furthermore, some of the embodiments described herein may require some changes in network signalling, either proprietary or by defining new signalling in the 3GPP standard.

[0051]It should also be noted that the embodiments herein may provide an improved WCDMA uplink, i.e., the Enhanced Uplink, EUL. The embodiments provided herein may achieve higher uplink bit rates, while maintaining system stability.

[0052]According to the embodiments herein, the network node 110, 140 adapts the power and bit rate of transmissions received from a user equipments 121 in a wireless telecommunications network 100. This is performed by the network node 110, 140 by adapting the maximum bit rate for transmissions to be received from the user equipment 121 based on a threshold value of the allowed power offset for transmissions from the user equipment 121, while maintaining a determined level of at least one received power of the transmissions from the user equipment 121.

[0053]In some embodiments, the maximum bit rate may be adapted, or determined, by the network node 110, 140 by determining a grant value. This grant value may also be referred to as a grant, an Absolute Grant value, or an AG value.

[0054]Alternatively, the maximum bit rate may be adapted, or determined, by the network node 110, 140 by determining an offset of a grant value. This offset of a grant value may also be referred to as a grant offset, a grant offset value, an Absolute Grant offset value, or an AG offset value.

[0055]In some embodiments, the threshold value of the allowed power offset for transmissions from the user equipment 121 may be a threshold value, or a target value, for the Block Error Rate, BLER, of the transmissions from the user equipment 121. This means that the determining of the grant value or offset grant value may be performed based on BLER statistics in the network node 110, 140.

[0056]In some embodiments, the network node 110, 140 is a Radio Network Controller, RNC 140. In this case, the network node 140 is configured to perform an Outer Loop Power Control, OLPC, of the transmissions from the user equipment 121. In which OLPC, the network node 140 may convert, or replace, the resulting SIR target value into, or with, a grant value or a grant offset value. In other words, an adaptation algorithm may be implemented that may be identical to the current OLPC algorithm and reside in the RNC 140. However, in these embodiments, the SIR target is replaced by a AG value, or an offset to a grant value. Thereby, this rate adaptation algorithm would also work well in a soft handover situation of the user equipments.

[0057] The grant value or a grant offset value, or information indicating the grant value or grant offset value, may then be transmitted by the network node 140 to the serving Node B 110, i.e., the Node B 110 currently serving the user equipment 121. Upon receiving the grant value or the grant offset value, the Node B 110 may then subtract the grant value or the grant offset value from the current threshold value for the amount of reliably detected transmissions from the user equipment 121, i.e., the currently used grant value or offset of a grant value. This may then be rounded off to the nearest integer by the Node B 110.

[0058] If this calculated grant value or offset of a grant value is different from the currently used grant value or offset of a grant value, the Node B 110 may transmit the calculated grant value or offset of a grant value to the user equipment 121. This may, e.g., be performed on an E-AGCH, Enhanced-Absolute Grant CHannel, channel.

[0059] In some embodiments, the network node 110, 140 is a Node B 110. In this case, the network node 110 may be configured to receive a SIR target value from a Radio Network Controller, RNC 140. The network node 110 may then interpret, i.e., convert or replace, the received SIR target value as, into or with, a grant value or a grant offset value. In other words, in some embodiments, the network node 110 may utilize the existing OLPC algorithm, but re-interpret the SIR target command as a bit rate adaptation command.

[0060] In some embodiments, wherein the network node 110, 140 is a Node B, the network node 110 may be configured to maintain a determined level of the total received power of the transmissions from the user equipment 121 by adapting, or determining, the total received power of the transmissions from the user equipment 121 on a slot basis, also referred to as a time slot basis, by using TPC commands, such as, e.g., TPC UP/DOWN commands. This may be performed by the network node 110 by applying or using an Inner Loop Power Control ILPC of the transmissions from the user equipment 121.

[0061] In some embodiments, the total received power of the transmissions from the user equipment 121 may be determined, or estimated, by the network node 110, 140 based on the received or estimated powers on the uplink dedicated physical channels of the Enhanced Uplink, EUL.

[0062] In some embodiments, the received or estimated powers on the uplink dedicated physical channels of the EUL may be determined by measuring the received

power of the DPCCH, and determining the received power used on the E-DPCCH and E-DPDCH based on the determined or adapted grant value (or the determined or adapted grant offset value). The latter may also be determined by using further signaled parameters from the user equipment 121.

[0063] Then, the network node 110, 140 may determine, or estimate, the total received power of the transmissions from the user equipment 121 based on the measured and determined powers of, or used on, e.g., the DPCCH, the E-DPCCH and the E-DPDCH.

[0064] In some embodiments, the network node 110, 140 may initially determine a power-over-thermal-noise target value, E_c/N_0 , for the transmissions from the user equipment 121. This power-over-thermal-noise target value, E_c/N_0 , may also be referred to as a E_c/N_0 target or E_c/N_0 target value. The E_c/N_0 target may be based on the available air interface load or headroom for the transmissions from the user equipment (121). Here, the network node 110, 140 may be a Node B 110.

[0065] Also, in some embodiments, the network node 110, 140 may initially determine an initial threshold value for the amount of reliably detected transmissions from the user equipment 121, i.e., an initial grant value or offset of a grant value. Here, the network node 110, 140 may take into account, e.g., the buffer status of the user equipment 121, the available E_c/N_0 target for the transmissions from the user equipment 121 and the desired SIR target value on the control channel.

[0066] Examples illustrating some embodiments are described in more detail below with reference to Figure 4 below. Figure 4 shows a schematic flow diagram illustrating the power control and bit rate adaptation according to some embodiments.

[0067] In this example, the network node 110 may comprise a scheduler 420, or scheduling unit, which may be configured to perform the Actions 1-4 described below in any suitable order. Also, here, P_{tx} 410 denotes the received DPCCH power of the transmissions from the user equipment 121. Here, the relative powers allocated to E-DPDCH 411, E-DPCCH 412, and DPCCH 413, respectively. The area 411, or AG maximum Bed, may thus be seen as corresponding to the power offset of the E-DPDCH relative to the DPCCH power.

[0068] Action 1 - Calculate E_c/N_0

[0069]In Figure 4, the Node B 110, determines an E_c/N_0 target, may also be referred to as User Load budget, for transmissions from the user equipment 121 based on, e.g., available air interface load/headroom in the Node B 110.

[0070]Action 2 - Calculate DPCCH target

[0071]In the lower part of Figure 4, an Inner Loop Power Control, ILPC 403, is depicted. The ILPC performed in the Node B 110 may adapt at least one received power level of transmissions from the user equipment 121 on a slot basis using the standardized TPC UP/DOWN commands. The at least one received power of the transmissions from the user equipment 121 may, e.g., be the received power used on the DPCCH, the total received power of the transmissions from the user equipment 121, or both.

[0072]For example, the received power of the DPCCH may be measured by the Node B 110, e.g., by using the known pilots on the DPCCH. The received power of the DPCCH may then be compared to a DPCCH power target value in the Node B 110. The DPCCH power target value, i.e., DPCCH target, may also be referred to as Received Signal Code Power target, RSCP, or RSCP target. The DPCCH target is typically determined in the serving node, here, Node B 110. The DPCCH target is also typically based on a desired DPCCH SIR target (see, e.g., Eq.3 for a calculation example). The DPCCH power target value may then be transmitted to the RNC 140 by the Node B 110. The RNC 140 may then forward the DPCCH target to the non-serving cells, e.g., non-serving Node B's. Thus, the DPCCH power target, i.e., RSCP target, may be known in all cells, i.e., by all serving and non-serving Node B's, served by the RNC 140. The DPCCH target may subsequently be updated by the serving Node B and the new target signalled to RNC 140 and to non-serving Node B's.

[0073]In other words, the serving NodeB 110 may signal an initial RSCP target to the RNC 140. The RNC 140 may then distribute the RSCP target to the serving and non-serving cells, i.e., by all serving and non-serving Node B's served by the RNC 140.

[0074]Furthermore, the serving Node B 110 may subsequently update the RSCP target in the RNC 140, i.e., transmit a new RSCP target to the RNC 140, e.g., when the AG changes in the serving cell. The RNC 140 may then distribute the new RSCP target to the serving and non-serving cells.

[0075]In Figure 4, it may be seen that the bit rate of the transmission from the user equipment 121 is decoupled from the power control after the initial setting via the access

grant. This means that the bit rate of the transmissions from the user equipment 121 is independently controlled.

[0076]Action 3 - Calculate initial AG

[0077]The network node 110 may also calculate an initial Absolute Grant, AG, for the user equipment 121. This calculation may take into account, e.g., the buffer status of the user equipment 121, the available E_c/N_0 and the desired SIR target on the control channel. An example of how the E_c/N_0 target and grant value can be determined or calculated is given in the following. However, it should be noted that this is only a single example wherein other variants are possible. This initial grant value calculation 401 is shown in upper part of Figure 4.

[0078]Action 4 - Calculate new AG

[0079]In the middle part of Figure 4, the grant calculation 402 may be performed in the network node 110, 140, i.e., either in the Node B 110 alone or by combining information from the Node B 110 and the RNC 140.

[0080]In any case the grant calculation 402 may be based on BLER statistics. If BLER is higher than the desired BLER target, then the grant may be lowered. If the BLER is lower than the desired BLER target, then the grant may be increased. The network node 110 may then transmit the new grant to the user equipment 121.

[0081]Then, the user equipment 121 may lower/increase the bit rate of its transmissions, and, e.g., change the ratio between E-DPDCH and DPCCH. However, since the total power of the transmission from the user equipment 121 is still maintained by the ILPC 403 in the network node 140, the effect is that the network node 110 will receive more/less energy per information bit. This means that the BLER value may be kept close to its desired BLER target by the network node 110.

[0082]Example of how the grant or grant offset calculation may be performed in the network node 110

[0083]In this example, the network node is a Node B 110. In this example, for every Time-Transmit Interval, TTI, a received data block is decoded by the network node 110. A Cyclic Redundancy Check, CRC, performed by the network node 110 tells if the received data block was correctly decoded or if a HARQ re-transmission is needed. If the received data block was an initial transmission from the user equipment 121, then the following grant offset update may be made by the network node 110:

```

if CRC OK
Grant Offset = Grant Offset +0.1
else
Grant Offset = Grant Offset +0.9
End

```

[0084] The network node 110 may then finally subtract the grant offset from the AG value, and round off to the nearest lower integer. If this determined or calculated AG value is different from the currently used AG value, then the network node 110 may transmit this determined or calculated AG value to the user equipment 121 in an E-AGCH physical channel.

[0085] Note that this is a simplified example for the purpose of illustrating an example of some embodiments. When actually implementing embodiments according to this example, the network node 110 may take into account, e.g., the loop delay in the granting process in order to reduce/avoid grant oscillations.

[0086] In the case of when the user equipment 121 is involved in a soft handover, the grant offset calculation may be performed in the RNC 140. This is because only the RNC 140 has the full knowledge about the HARQ retransmission performance from all cells in the active set of cells. Therefore, an interesting implementation alternative is to utilize the existing procedure for OLPC, since the OLPC procedure in the RNC 140 is essentially based on changing power, i.e., by changing the SIR target, based on HARQ retransmission statistics. Therefore, in this way, the RNC 140 may not need to be aware of that the user equipment 121 is operating in rate adaptation mode. In this case, the Node B 110 may, however, interpret the SIR target it receives from the RNC 140 as rate change commands instead.

[0087] Alternatively, new signalling could be defined between RNC 140 and NodeB 110 to carry the grant offset from the RNC 140 to the Node B 110. In this case, the RNC 140 would convert or replace the SIR target resulting from the OLPC procedure into or with a corresponding grant or grant offset. This is so since the OLPC uses a step type of algorithm to determine the SIR target in a manner similar to how the rate offset can be calculated. SIR target and Granted powers are both expressed in dBs so that a 1dB step increase in SIR target can be interpreted as a request to lower the grant by 1dB. The RNC starts the OLPC control with an initial SIR target value. One may then initialize the grant

offset to 0. Then, the grant offset can be calculated as the difference between the initial SIR target and the currently used SIR target (note the sign difference between grant offset and SIR target change since we assume that the grant offset is added to the grant. A definition where Rate Offset is subtracted from the grant would of course work equally well.

[0088]In either case, the grant offset calculation may be slightly modified, since the RNC 140 is not immediately informed about when the NodeB 110 decoding fails, e.g., when the CRC is not OK. Instead, the Node B 110 may notify the RNC 140, once the Node B 110 has correctly received the data block, and thereby adding information to RNC 140 about how many HARQ transmissions that were needed for the data block. Thus, when a data block is received in the RNC 140, the RNC 140 may check how many HARQ transmissions were needed. The RNC 140 then compares the actual number with the target number of transmissions. Note that the target number of transmission may be larger than 1 in the general case. Also, note that this procedure may be used in the Node B 110 implementation as an alternative. This may be illustrated the following grant offset update in the RNC 140:

If the number of re-transmissions was larger than the target number of re-transmissions, then

Grant Offset = Grant Offset -0.9

else

Grant Offset = Grant Offset+0.1

End

[0089]Here, the grant offset is signalled by the RNC 140 to the serving Node B 110. In the serving Node B 110, the grant offset is subtracted from the current AG value and rounded to the nearest lower integer. If the calculated AG value is different from the currently used AG value, then the serving Node B 110 may transmit the new AG value to the user equipment 121 in an E-AGCH physical channel.

[0090]Note that in this embodiment, the non-serving cells are not informed about the used grant offset. This is because the non-serving cells are not aware of the AG value in the first place, and rely on the decoding of the E-DPCCH to find out the actual bit rate and power offsets used by the user equipment 121.

[0091] Thus, even though the ILPC 403 is based on received total power of the transmissions from the user equipment 121, the SINR on the control channels needs to be monitored by the Node B 110 to ensure a minimum quality. This may be referred to as “SINR guard”, which works as a safety net.

[0092] The SINR guard in the Node B 110 may work such that when the SINR goes below a certain level, then the Node B 110 may override the grant calculation and lower the grant such that the DPCCH power increases. Since the grant signalling takes longer time to reach the user equipment 121, the Node B 110 may also increase the E_c/N_0 target value in the ILPC 403 temporarily before the new grant has taken effect.

[0093] Also, the Node B 110 may notify the RNC 140, so that the RNC 140 stops updating the grant offset during the time the SINR guard is active. The RNC 140 may also implement a reset/restart-mechanism for the grant offset in combination with SINR guard operation.

[0094] It should be noted that this SINR guard is only necessary in the serving cell, i.e., in the serving Node B 110:

- If the user equipment 121 is in soft handover, since the serving cell may need to protect its HS-DPCCH channel, which is only decoded in the serving cell.
- If the user equipment is not in soft handover, since then all channels in the serving cell need to be protected by the SINR guard.

[0095] Example of determining or calculating an initial grant value and E_c/N_0 target in the network node 110

[0096] In the following an example is given on how an initial E_c/N_0 target and an AG can be calculated. In reality the Node B has to take a number of additional constraints into account so the following should be viewed as an example. To start, it is assumed that the network node 110 operates toward a RoT target and by allocating a grant for a new user equipment 121, the network node 110 strives to reach the RoT target. This gives the condition according to Eq. 1:

$$\text{RoTtarget} = (E_c + \text{RTWP})/N_0 \quad (\text{Eq. 1})$$

wherein E_c is the power allocated to the user, RTWP is the total received wideband power in the Node B, and N_0 is the thermal noise power.

[0097] This provides the condition according to Eq. 2:

$$(E_c/N_0) = (R_o T_{\text{target}} - R_o T) \quad (\text{Eq. 2})$$

[0098] For the scheduling grant, the desired SIR target on the control channel may be modelled by the network node 110 as in Eq. 3:

$$\text{initialSIR} = E_{\text{dpcch}} / (RTWP - E_c) * SF(\text{DPCCH}) * N_{\text{rx}} \quad (\text{Eq. 3})$$

from which the network node 110 may derive the desired E_{dpcch} .

[0099] At the next step, the network node 110 may calculate the power of E-DPCCH. The minimum power of E-DPCCH may easily be obtained using the parameter Δ_{EDPCCH} . This power may be denoted $E_{\text{edpcch-min}}$.

[0100] If E-DPCCH boosting is used, this gives the condition according to Eq. 4:

$$E_{\text{edpdch}} / (E_{\text{dpcch}} + E_{\text{edpcch}}) = T2TP \quad (\text{Eq. 4})$$

[0101] From which Eq. 5 follows:

$$E_{\text{edpcch}} = E_c / (1 + T2TP) - E_{\text{dpcch}} \quad (\text{Eq. 5})$$

[0102] If this power is lower than $E_{\text{edpcch-min}}$, then this gives the condition according to Eq. 6:

$$E_{\text{edpcch}} = E_{\text{edpcch-min}} \quad (\text{Eq. 6})$$

[0103] The E-DPDCH power may now be determined by the network node 110 as in Eq. 8:

$$E_{\text{e-dpdch}} = E_c - E_{\text{dpcch}} - E_{\text{edpcch}} \quad (\text{Eq. 8})$$

and finally the absolute grant (AG) may be determined by the network node 110 as the ratio between E_{edch} and E_{dpch} , which gives Eq. 9:

$$AG = E_{edch}/E_{dpch} \quad (\text{Eq. 9})$$

[0104] The embodiments presented herein may be utilized in a radio network, which may further comprise network nodes, such as, a base station 110, as illustrated in Figures 3 and 5. The radio network may also comprise a user equipment 121, as illustrated in Figures 3 and 6. It should be appreciated that the examples provided in Figures 5 and 6 are shown merely as non-limiting examples. According to the example embodiments, the network node 110 and user equipment 121 may be any other node as described in the examples provided in the above sections.

[0105] As shown in Figure 5, the example network node 110 may comprise processing circuitry 503, a memory 502, radio circuitry 501, and at least one antenna. The processing circuitry 503 may comprise RF circuitry and baseband processing circuitry. In particular embodiments, some or all of the functionality described above as being provided by a mobile base station, a base station controller, a relay node, a NodeB, an enhanced NodeB, positioning node, and/or any other type of mobile communications node may be provided by the processing circuitry 503 executing instructions stored on a computer-readable medium, such as the memory 502 shown in Figure 5. Alternative embodiments of the network node 110 may comprise additional components responsible for providing additional functionality, comprising any of the functionality identified above and/or any functionality necessary to support the solution described above. In other example embodiments, a network node may be not equipped with a radio interface or radio circuitry 501.

[0106] It should also be appreciated that the processing circuitry, or any other hardware and/or software unit configured to execute operations and/or commands, of the network node 110 illustrated in Figure 5 may be configured to adapt the maximum bit rate for transmissions to be received from the user equipment 121 based on a threshold value for the amount of reliably detected transmissions from the user equipment 121, while

maintaining a determined level of at least one received power of the transmissions from the user equipment 121 as described in the exemplary embodiments provided above.

[0107]Also, the processing circuitry 503 may comprise the scheduler or scheduling unit 420 described in some of the embodiments above.

[0108]An example of a user equipment 121 is provided in Figure 6. The example user equipment 121 may comprise processing circuitry 602, a memory 603, radio circuitry 601, and at least one antenna. The radio circuitry 601 may comprise RF circuitry and baseband processing circuitry. In particular embodiments, some or all of the functionality described above as being provided by mobile communication devices or other forms of wireless device may be provided by the processing circuitry 602 executing instructions stored on a computer-readable medium, such as the memory 603 shown in Figure 6. Alternative embodiments of the user equipment 121 may comprise additional components responsible for providing additional functionality, comprising any of the functionality identified above and/or any functionality necessary to support the solution described above.

[0109]It should be appreciated that the processing circuitry (or any other hardware and/or software unit configured to execute operations and/or commands) of the user equipment 121 may be configured to receive the calculated grant value or offset of a grant value, e.g., on an E-AGCH channel. Based on this received calculated grant value or offset of a grant value, the user equipment 121 may be configured to adapt or determine, i.e., lower/increase, the bit rate of its transmissions to the network node 110, and, e.g., change the ratio between E-DPDCH and DPCCH. The user equipment 121 may further be configured to perform any of the exemplary operations described above for the user equipment 121.

[0110]Examples of embodiments in a node (110)

[0111]According to some embodiments, a method in a node (110) in a telecommunications network (100) may be provided. The method may include adjusting (402) a grant value for transmission to a wireless terminal (121), based on a Block Error Rate, BLER, target value. Moreover, the method may include adjusting (403) a power target value for the wireless terminal (121), in coordination with adjusting (402) the grant value for transmission to the wireless terminal (121).

[0112]The method may include transmitting (403) the power target value to a Radio Network Controller (140) for transmission to a non-serving base station, and the node (110) may be a serving base station (110).

[0113]The power target value may be a Dedicated Physical Control Channel, DPCCH, power target value, and adjusting (403) the power target value may include adjusting the DPCCH power target value for the wireless terminal (121).

[0114]The node (110) may be a base station (110), and adjusting (402) the grant value may include providing an updated value of the grant value at the base station (110) for transmission to the wireless terminal (121). Determining (403) the power target value may include determining, at the base station (110), an updated value of the power target value for the wireless terminal (121). The method may include transmitting the updated value of the power target value for the wireless terminal (121) from the base station (110) to a Radio Network Controller (140).

[0115]Determining (403) the updated value of the power target value may include adjusting, at the node (110), the updated value of the power target value for the wireless terminal (121), in response to a change from the grant value to the updated value of the grant value. Alternatively, providing (402) the grant value may include transmitting the updated value of the grant value from the node (110) to the wireless terminal (121), in response to determining (403) the updated value of the power target value for the wireless terminal (121).

[0116]The method may include receiving (402) signalling from a Radio Network Controller (140) to adjust the grant value, and adjusting (402) the grant value may include adjusting the grant value in response to receiving the signalling from the Radio Network Controller (140).

[0117]The method may include transmitting the updated value of the grant value from the node (110) to the wireless terminal (121). Additionally or alternatively, the method may include calculating a grant offset value at the node (110), and adjusting (402) the grant value may include adjusting the grant value in response to calculating the grant offset value.

[0118]The method may include comparing (403) a value of received power of at least one transmission from the wireless terminal (121) with the power target value.

[0119]The grant value may indicate a power offset for the wireless terminal (121) and/or may include a value for providing an uplink data rate of the wireless terminal (121).

[0120]The method may include, before adjusting (403) the power target value (e.g., a DPCCCH power target value) in coordination with adjusting (402) the grant value, determining a target value for a total received power of transmissions from the wireless terminal (121), and determining the power target value (e.g., a DPCCCH power target value) for the wireless terminal (121). Moreover, the method may include calculating the grant value using the target value for the total received power of transmissions from the wireless terminal (121) and using the power target value (e.g., a DPCCCH power target value) for the wireless terminal (121).

[0121]According to some embodiments, a node (110) in a telecommunications network (100) may be provided. The node (110) may include radio circuitry (501) configured to provide communications with a wireless terminal (121). The node (110) may include a network interface (504) configured to provide communications with a Radio Network Controller (140). Moreover, the node (110) may include processing circuitry (503) coupled to the radio circuitry (501) and the network interface (504). The processing circuitry (503) may be configured to adjust (402) a grant value for transmission to the wireless terminal (121), based on a Block Error Rate, BLER, target value. Moreover, the processing circuitry (503) may be configured to adjust (403) a power target value for the wireless terminal (121), in coordination with adjusting (402) the grant value for transmission to the wireless terminal (121).

[0122]The processing circuitry (503) may be configured to transmit (403) the power target value to the Radio Network Controller (140) through the network interface (504) for transmission to a non-serving base station, and the node (110) may be a serving base station (110).

[0123]The node (110) may be a base station (110), and the processing circuitry (503) may be configured to provide (402) an updated value of the grant value at the base station (110) for transmission to the wireless terminal (121).

[0124]The processing circuitry (503) may be configured to determine, at the base station (110), an updated value of the power target value for the wireless terminal (121), in response to a change from the grant value to the updated value of the grant value.

[0125] The processing circuitry (503) may be configured to transmit the updated value of the grant value from the base station (110) through the radio circuitry (501) to the wireless terminal (121), in response to determining (403) an updated value of the power target value for the wireless terminal (121).

[0126] The processing circuitry (503) may be configured to receive signalling from a Radio Network Controller (140) through the network interface (504) to adjust the grant value, and the processing circuitry (503) may be configured to provide the updated value of the grant value in response to receiving the signalling from the Radio Network Controller (140) through the network interface (504).

[0127] Examples of embodiments in a node (140)

[0128] According to some embodiments, a method in a node (140) in a telecommunications network (100) may be provided. The method may include signalling (402) an adjustment for a grant value to a base station (110) for transmission to a wireless terminal (121). The adjustment for the grant value may be based on a Block Error Rate, BLER, target value. Moreover, the method may include receiving (403) an updated value of a power target value for the wireless terminal (121) from the base station (110), in coordination with signalling (402) the grant value to the base station (110).

[0129] The node (140) may be a Radio Network Controller (140), the base station (110) may be a serving base station (110), and the method may include transmitting (403) the updated value of the power target value for the wireless terminal (121) from the Radio Network Controller (140) to a non-serving base station.

[0130] Receiving (403) the updated value of the power target value may include receiving the updated value of the power target value for the wireless terminal (121) from the base station (110), in response to signalling (402) the adjustment for the grant value to the base station (110).

[0131] Signalling (402) the adjustment for the grant value may include signalling the adjustment for the grant value to the base station (110), in response to receiving (403) the updated value of the power target value for the wireless terminal (121) from the base station (110).

[0132] The updated value of the power target value may be an updated Dedicated Physical Control Channel, DPCCH, power target value, and receiving (403) the updated

value of the power target value may include receiving the updated DPCCH power target value for the wireless terminal (121) from the base station (110).

[0133] The grant value may indicate a power offset for the wireless terminal (121). Moreover, the grant value may be a value for providing an uplink data rate of the wireless terminal (121).

[0134] The node (140) may be a Radio Network Controller (140), and the method may include calculating an adjustment for the grant value at the Radio Network Controller (140) based on a quantity of retransmissions by the wireless terminal (121).

[0135] According to some embodiments, a node (140) in a telecommunications network (100) may be provided. The node (140) may include a network interface (504) configured to provide communications with a base station (110). The node (140) may include processing circuitry (503) coupled to the network interface (504). The processing circuitry (503) may be configured to signal (402) an adjustment for a grant value through the network interface (504) to a base station (110) for transmission from the base station (110) to the wireless terminal (121). The adjustment for the grant value may be based on a Block Error Rate, BLER, target value. Moreover, the processing circuitry (503) may be configured to receive (403) an updated value of a power target value for the wireless terminal (121) from the base station through the network interface (504), in coordination with signalling (402) the adjustment for the grant value to the base station (110).

[0136] The node (140) may be a Radio Network Controller (140), the base station (110) may be a serving base station (110), and the processing circuitry (503) may be configured to transmit (403) the updated value of the power target value for the wireless terminal (121) from the Radio Network Controller (140) to a non-serving base station through the network interface (504).

[0137] The processing circuitry (503) may be configured to receive (403) the updated value of the power target value for the wireless terminal (121) from the base station (110) through the network interface (504), in response to signalling (402) the adjustment for the grant value to the base station (110).

[0138] The processing circuitry (503) may be configured to signal (402) the adjustment for the grant value to the base station (110), in response to receiving (403) the updated value of the power target value for the wireless terminal (121) from the base station (110).

[0139] The description of the example embodiments provided herein has been presented for purposes of illustration. The description is not intended to be exhaustive or to limit example embodiments to the precise form disclosed, and modifications and variations are possible in light of the above teachings or may be acquired from practice of various alternatives to the provided embodiments. The examples discussed herein were chosen and described in order to explain the principles and the nature of various example embodiments and its practical application to enable one skilled in the art to utilize the example embodiments in various manners and with various modifications as are suited to the particular use contemplated. The features of the embodiments described herein may be combined in all possible combinations of methods, apparatus, modules, systems, and computer program products. It should be appreciated that the example embodiments presented herein may be practiced in any combination with each other.

[0140] It should be noted that the word “comprising” does not necessarily exclude the presence of other elements or steps than those listed and the words “a” or “an” preceding an element do not exclude the presence of a plurality of such elements. It should further be noted that any reference signs do not limit the scope of the claims, that the example embodiments may be implemented at least in part by means of both hardware and software, and that several “means”, “units” or “devices” may be represented by the same item of hardware.

[0141] A “device” as the term is used herein, is to be broadly interpreted to include a radiotelephone having ability for Internet/intranet access, web browser, organizer, calendar, a camera (e.g., video and/or still image camera), a sound recorder (e.g., a microphone), and/or global positioning system (GPS) receiver; a personal communications system (PCS) terminal that may combine a cellular radiotelephone with data processing; a personal digital assistant (PDA) that can include a radiotelephone or wireless communication system; a laptop; a camera (e.g., video and/or still image camera) having communication ability; and any other computation or communication device capable of transceiving, such as a personal computer, a home entertainment system, a television, etc.

[0142] Although the description is mainly given for a user equipment, as measuring or recording unit, it should be understood by the skilled in the art that “user equipment” is a non-limiting term which means any wireless device or node capable of receiving in

downlink and transmitting in uplink (e.g., PDA, laptop, mobile, sensor, fixed relay, mobile relay or even a radio base station, e.g., femto base station).

[0143] A cell is associated with a radio node, where a radio node or radio network node or eNodeB may be used interchangeably in the description of the embodiments, which may comprise in a general sense any node transmitting radio signals used for measurements, e.g., eNodeB, macro/micro/pico base station, home eNodeB, relay, beacon device, or repeater. A radio node herein may comprise a radio node operating in one or more frequencies or frequency bands. It may also be a single- or multi-RAT node. A multi-RAT node may comprise a node with co-located RATs or supporting multi-standard radio (MSR) or a mixed radio node.

[0145] The various example embodiments described herein are described in the general context of method steps or processes, which may be implemented in one aspect by a computer program product, embodied in a computer-readable medium, including computer-executable instructions, such as program code, executed by computers in networked environments. A computer-readable medium may include removable and non-removable storage devices including, but not limited to, Read Only Memory (ROM), Random Access Memory (RAM), compact discs (CDs), digital versatile discs (DVD), etc. Generally, program modules may include routines, programs, objects, components, data structures, etc. that perform particular tasks or implement particular abstract data types. Computer-executable instructions, associated data structures, and program modules represent examples of program code for executing steps of the methods disclosed herein. The particular sequence of such executable instructions or associated data structures represents examples of corresponding acts for implementing the functions described in such steps or processes.

[0146] The embodiments herein are not limited to the above described embodiments. Various alternatives, modifications and equivalents may be used. Therefore, the above embodiments should not be construed as limiting.

WHAT IS CLAIMED IS:

1. A method in a node (110) in a telecommunications network (100), the method comprising:
 - adjusting (402) a grant value for transmission to a wireless terminal (121), based on a Block Error Rate, BLER, target value; and
 - adjusting (403) a power target value for the wireless terminal (121), in coordination with adjusting (402) the grant value for transmission to the wireless terminal (121).
2. The method of claim 1,
 - further comprising transmitting (403) the power target value to a Radio Network Controller (140) for transmission to a non-serving base station,
 - wherein the node (110) comprises a serving base station (110).
3. The method of any one of claims 1 and 2,
 - wherein the power target value comprises a Dedicated Physical Control Channel, DPCCH, power target value, and
 - wherein adjusting (403) the power target value comprises adjusting the DPCCH power target value for the wireless terminal (121).
4. The method of any one of claims 1-3,
 - wherein the node (110) comprises a base station (110), and
 - wherein adjusting (402) the grant value comprises providing an updated value of the grant value at the base station (110) for transmission to the wireless terminal (121).
5. The method of any one of claims 1-4, wherein adjusting (403) the power target value comprises determining, at the node (110), an updated value of the power target value for the wireless terminal (121).
6. The method of claim 5, wherein the method further comprises transmitting the updated value of the power target value for the wireless terminal (121) from the node (110) to a Radio Network Controller (140).

7. The method of any one of claims 5 and 6, wherein determining the updated value of the power target value comprises:

determining, at the node (110), the updated value of the power target value for the wireless terminal (121), in response to a change from the grant value to an updated value of the grant value.

8. The method of any one of claims 5 and 6, wherein adjusting (402) the grant value comprises:

transmitting the updated value of the grant value from the node (110) to the wireless terminal (121), in response to determining (403) the updated value of the power target value for the wireless terminal (121).

9. The method of any one of claims 1-8,
wherein the method further comprises receiving (402) signalling from a Radio Network Controller (140) to adjust the grant value, and
wherein adjusting (402) the grant value comprises adjusting the grant value in response to receiving the signalling from the Radio Network Controller (140).

10. The method of any one of claims 1-8, further comprising calculating a grant offset value at the node (110), wherein adjusting (402) the grant value comprises adjusting the grant value in response to calculating the grant offset value.

11. The method of any one of claims 1-10, further comprising:
comparing (403) a value of received power of at least one transmission from the wireless terminal (121) with the power target value.

12. The method of any one of claims 1-11, wherein the grant value indicates a power offset for the wireless terminal (121) and/or comprises a value for providing an uplink data rate of the wireless terminal (121).

13. The method of any one of claims 1-12,

wherein the power target value comprises a Dedicated Physical Control Channel, DPCCH, power target value, and

wherein the method further comprises, before adjusting (403) the DPCCH power target value in coordination with adjusting (402) the grant value:

determining a target value for a total received power of transmissions from the wireless terminal (121);

determining the DPCCH power target value for the wireless terminal (121);

and

calculating the grant value using the target value for the total received power of transmissions from the wireless terminal (121) and using the DPCCH power target value for the wireless terminal (121).

14. A node (110) in a telecommunications network (100), the node (110) comprising:

radio circuitry (501) configured to provide communications with a wireless terminal (121);

a network interface (504) configured to provide communications with a Radio Network Controller (140); and

processing circuitry (503) coupled to the radio circuitry (501) and the network interface (504), wherein the processing circuitry (503) is configured to:

adjust (402) a grant value for transmission to the wireless terminal (121), based on a Block Error Rate, BLER, target value; and

adjust (403) a power target value for the wireless terminal (121), in coordination with adjusting (402) the grant value for transmission to the wireless terminal (121).

15. The node (110) of claim 14,

wherein the processing circuitry (503) is configured to transmit (403) the power target value to the Radio Network Controller (140) through the network interface (504) for transmission to a non-serving base station, and

wherein the node (110) comprises a serving base station (110).

16. The node (110) of any one of claims 14 and 15, wherein the node (110) comprises a base station (110), and wherein the processing circuitry (503) is configured to provide (402) an updated value of the grant value at the base station (110) for transmission to the wireless terminal (121).

17. The node (110) of claim 16, wherein the processing circuitry (503) is configured to determine, at the base station (110), an updated value of the power target value for the wireless terminal (121), in response to a change from the grant value to the updated value of the grant value.

18. The node (110) of claim 16, wherein the processing circuitry (503) is configured to transmit the updated value of the grant value from the base station (110) through the radio circuitry (501) to the wireless terminal (121), in response to determining (403) an updated value of the power target value for the wireless terminal (121).

19. The node (110) of any one of claims 16-18, wherein the processing circuitry (503) is configured to receive signalling from a Radio Network Controller (140) through the network interface (504) to adjust the grant value, and wherein the processing circuitry (503) is configured to provide the updated value of the grant value in response to receiving the signalling from the Radio Network Controller (140) through the network interface (504).

20. A method in a node (140) in a telecommunications network (100), the method comprising:

signalling (402) an adjustment for a grant value to a base station (110) for transmission to a wireless terminal (121), wherein the adjustment for the grant value is based on a Block Error Rate, BLER, target value; and

receiving (403) an updated value of a power target value for the wireless terminal (121) from the base station (110), in coordination with signalling (402) the adjustment for the grant value to the base station (110).

21. The method of claim 20,
wherein the node (140) comprises a Radio Network Controller (140),
wherein the base station (110) comprises a serving base station (110), and
wherein the method further comprises transmitting (403) the updated value of the power target value for the wireless terminal (121) from the Radio Network Controller (140) to a non-serving base station.

22. The method of any one of claims 20 and 21, wherein receiving (403) the updated value of the power target value comprises:

receiving the updated value of the power target value for the wireless terminal (121) from the base station (110), in response to signalling (402) the adjustment for the grant value to the base station (110).

23. The method of any one of claims 20 and 21, wherein signalling (402) the adjustment for the grant value comprises:

signalling the adjustment for the grant value to the base station (110), in response to receiving (403) the updated value of the power target value for the wireless terminal (121) from the base station (110).

24. The method of any one of claims 20-23,
wherein the updated value of the power target value comprises an updated Dedicated Physical Control Channel, DPCCH, power target value, and

wherein receiving (403) the updated value of the power target value comprises receiving the updated DPCCH power target value for the wireless terminal (121) from the base station (110).

25. The method of any one of claims 20-24,
wherein the grant value indicates a power offset for the wireless terminal (121), and
wherein the grant value comprises a value for providing an uplink data rate of the wireless terminal (121).

26. The method of any one of claims 20-25,
wherein the node (140) comprises a Radio Network Controller (140), and
wherein the method further comprises calculating the adjustment for the grant value at the Radio Network Controller (140) based on a quantity of retransmissions by the wireless terminal (121).

27. A node (140) in a telecommunications network (100), the node (140) comprising:

a network interface (504) configured to provide communications with a base station (110); and

processing circuitry (503) coupled to the network interface (504), wherein the processing circuitry (503) is configured to:

signal (402) an adjustment for a grant value through the network interface (504) to a base station (110) for transmission from the base station (110) to the wireless terminal (121), wherein the adjustment for the grant value is based on a Block Error Rate, BLER, target value; and

receive (403) an updated value of a power target value for the wireless terminal (121) from the base station through the network interface (504), in coordination with signalling (402) the adjustment for the grant value to the base station (110).

28. The node (140) of claim 27,
wherein the node (140) comprises a Radio Network Controller (140),
wherein the base station (110) comprises a serving base station (110), and
wherein the processing circuitry (503) is configured to transmit (403) the updated value of the power target value for the wireless terminal (121) from the Radio Network Controller (140) to a non-serving base station through the network interface (504).

29. The node (140) of any one of claims 27 and 28, wherein the processing circuitry (503) is configured to receive (403) the updated value of the power target value for the wireless terminal (121) from the base station (110) through the network interface

(504), in response to signalling (402) the adjustment for the grant value to the base station (110).

30. The node (140) of any one of claims 27-29, wherein the processing circuitry (503) is configured to signal (402) the adjustment for the grant value to the base station (110), in response to receiving (403) the updated value of the power target value for the wireless terminal (121) from the base station (110).

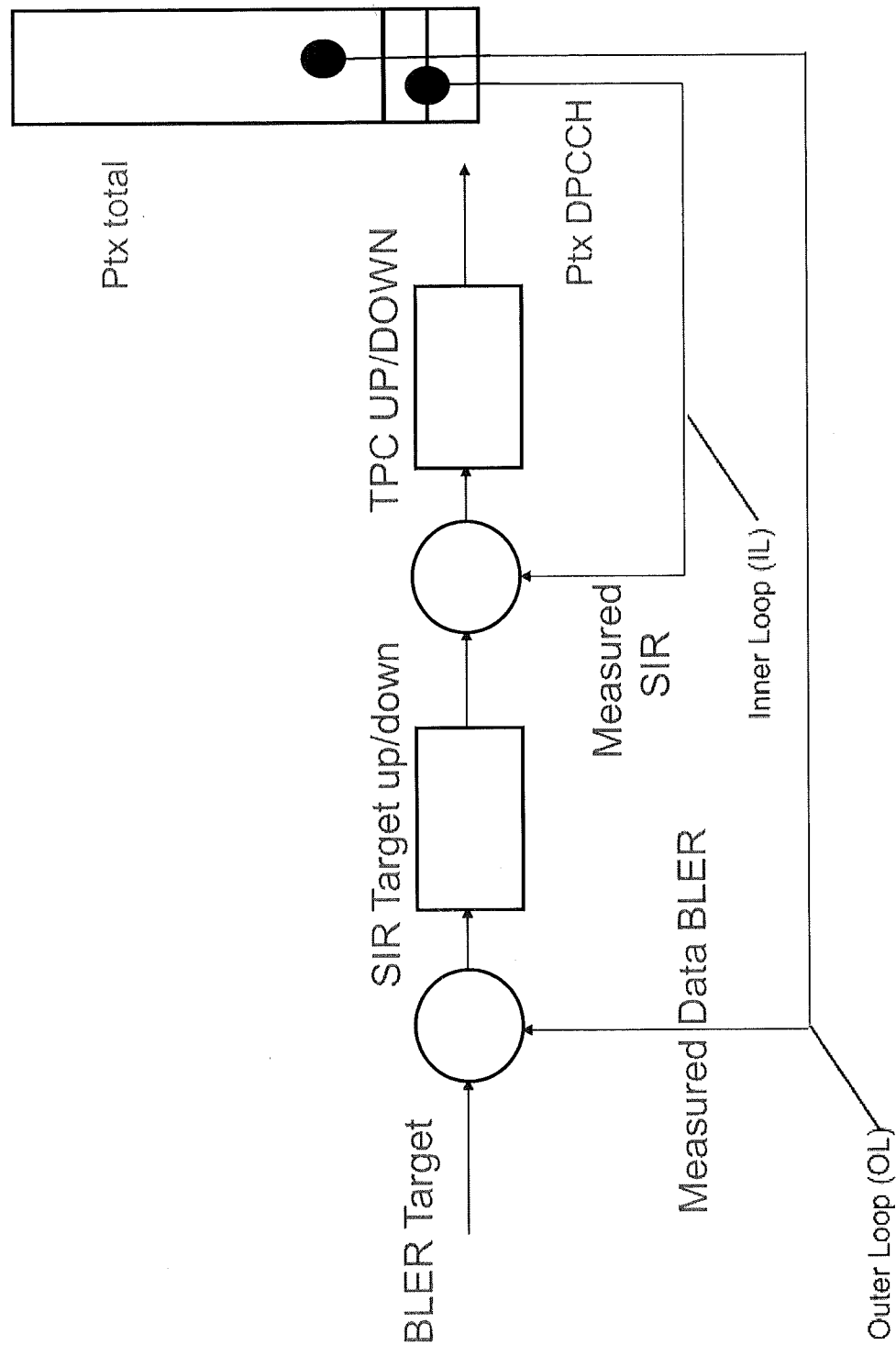


Fig. 1

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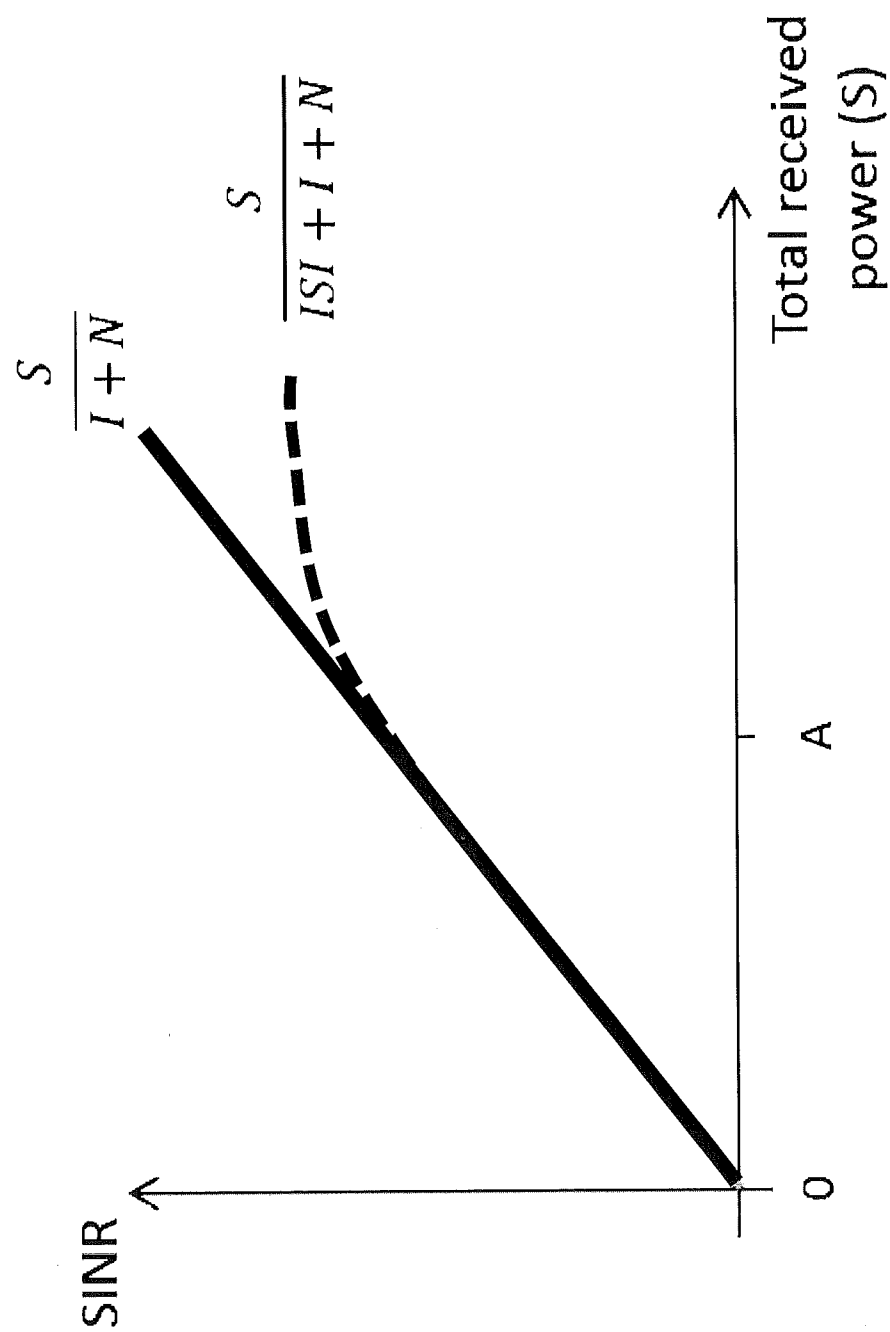


Fig. 2

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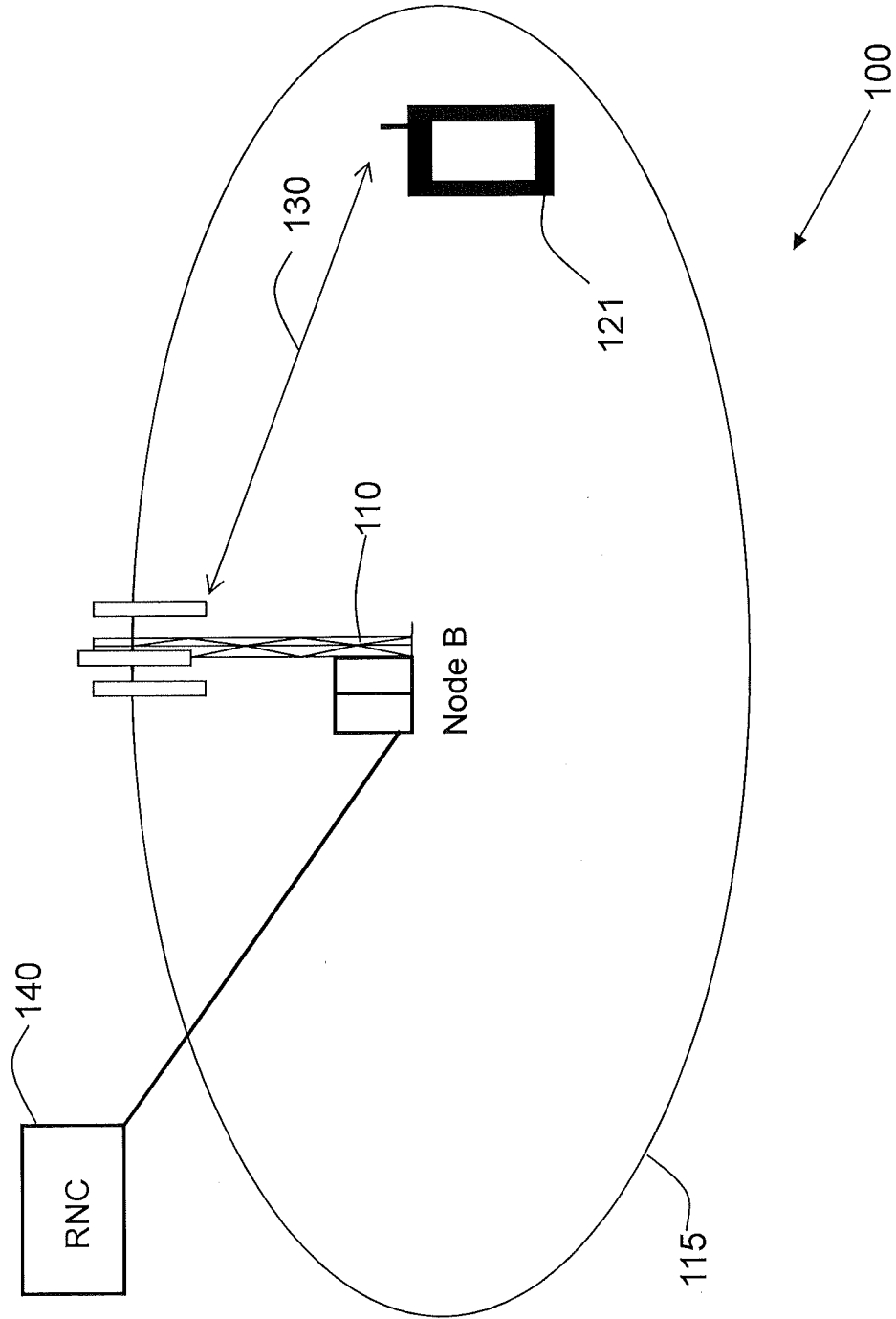


Fig. 3

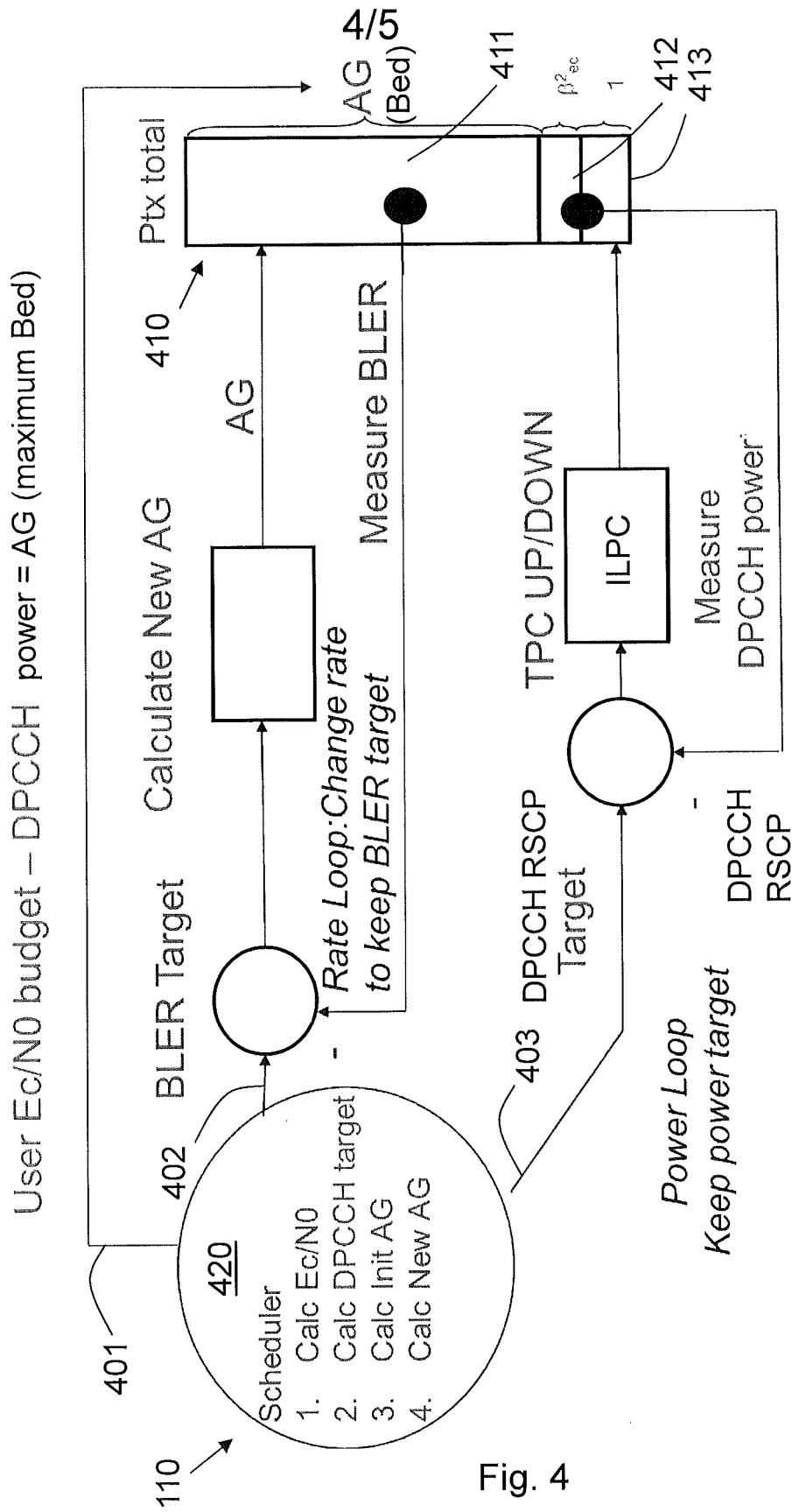


Fig. 4

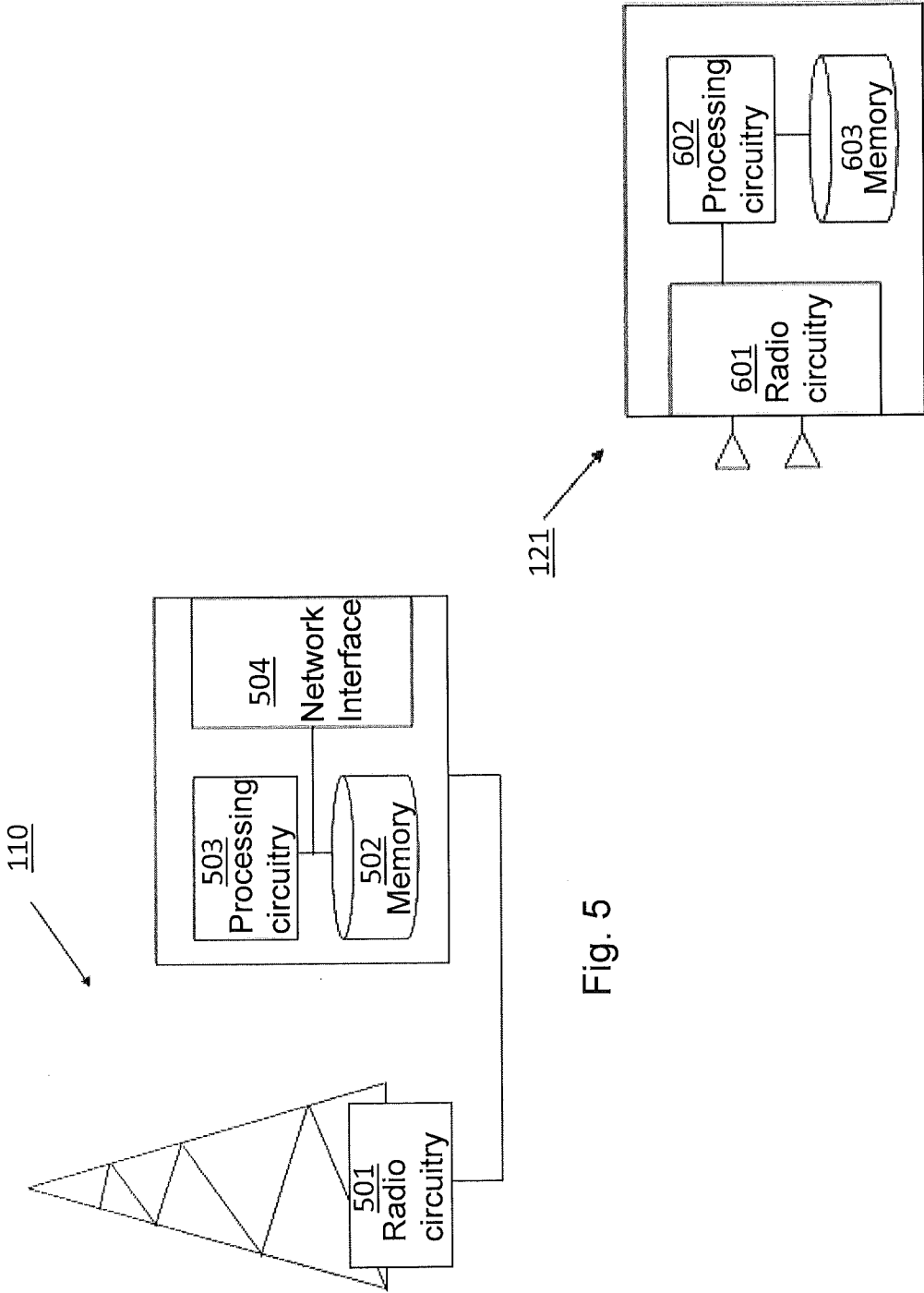


Fig. 5

Fig. 6

INTERNATIONAL SEARCH REPORT

International application No

PCT/SE2014/050498

A. CLASSIFICATION OF SUBJECT MATTER
 INV. H04W52/12
 ADD.

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
 H04W

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 2 433 383 A (MOTOROLA INC [US]) 20 June 2007 (2007-06-20) page 28, line 28 - page 31, line 27 -----	1-30
X	EP 1 928 105 A1 (ALCATEL LUCENT [FR]) 4 June 2008 (2008-06-04) paragraph [0034] - paragraph [0052] ----- -/--	1-30



Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents :

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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

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Date of the actual completion of the international search

25 August 2014

Date of mailing of the international search report

02/09/2014

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Baas, Gert-Jan

INTERNATIONAL SEARCH REPORT

International application No

PCT/SE2014/050498

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	ERICSSON ET AL: "Further Considerations for HSUPA Rate Adaptation", 3GPP DRAFT; R1-131558 FURTHER CONSIDERATIONS FOR HSUPA RATE ADAPTATION, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; , vol. RAN WG1, no. Chicago, USA; 20130415 - 20130419 6 April 2013 (2013-04-06), XP050697345, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_72b/Docs/ [retrieved on 2013-04-06] paragraph [0002] - paragraph [02.2] -----	1-30
X,P	"3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Study on Further Enhanced Uplink (EUL) enhancements (Release 12)", 3GPP DRAFT; 25700-C00, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE , 29 December 2013 (2013-12-29), XP050752642, Retrieved from the Internet: URL:http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/Specifications/201312_final_specs_after_RAN_62/ [retrieved on 2013-12-29] paragraph [05.7] - paragraph [5.7.4] -----	1-30
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INTERNATIONAL SEARCH REPORT

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International application No

PCT/SE2014/050498

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			WO 2008065190 A2 05-06-2008
