



(51) International Patent Classification:
H04W 72/12 (2009.01)

(21) International Application Number:
PCT/EP2012/054375

(22) International Filing Date:
13 March 2012 (13.03.2012)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
PCT/EP2011/055288 5 April 2011 (05.04.2011) EP

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

(72) Inventors; and

(75) Inventors/Applicants (for US only): **HOEHNE, Hans Thomas** [DE/FI]; Kanneltie 7 G 78, FIN-00420 Helsinki (FI). **SAYENKO, Alexander** [UA/FI]; Kuunsäde 6C 53, FIN-02210 Espoo (FI). **VESA, Hytonen** [FI/FI]; Deptm. of Mathematical Information Technology, Faculty of Information Technology Agora, Mattilanniemi 2, 40100 Jyväskylä, FIN-40014 University of Jyväskylä (FI). **PUCHKO, Oleksandr** [UA/FI]; Home address: Loukkukorventie 6C B 24, FIN-40640 Jyväskylä (FI). **CHAPMAN, Thomas** [GB/GB]; 68 Montgomery Road,

Bitterne, Southampton SO18 4RY (GB). **FRE-DERIKSEN, Frank** [DK/DK]; Hornbækvej 4, DK-9270 Klarup (DK).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AO, AT, AU, AZ, BA, BB, BG, BH, BR, BW, BY, BZ, CA, CH, CL, CN, CO, CR, CU, CZ, DE, DK, DM, DO, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, GT, HN, HR, HU, ID, IL, IN, IS, JP, KE, KG, KM, KN, KP, KR, KZ, LA, LC, LK, LR, LS, LT, LU, LY, MA, MD, ME, MG, MK, MN, MW, MX, MY, MZ, NA, NG, NI, NO, NZ, OM, PE, PG, PH, PL, PT, QA, RO, RS, RU, RW, SC, SD, SE, SG, SK, SL, SM, ST, SV, SY, TH, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LR, LS, MW, MZ, NA, RW, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Published:

— with international search report (Art. 21(3))

(54) Title: CHANNEL QUALITY INDICATION (CQI) REPORTING IN A COMMUNICATIONS NETWORK

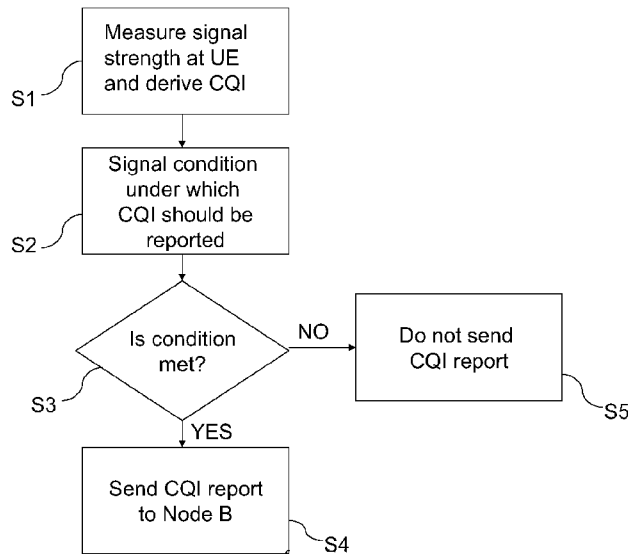


FIG. 5

(57) Abstract: Signal strength of a radio link is measured at a mobile station. A channel quality indicator of the radio link is obtained from the measured signal strength. A network node signals to the mobile station a condition according to which a report of the CQI should be sent by the mobile station to the network node.

WO 2012/136450 A1

CHANNEL QUALITY INDICATION (CQI) REPORTING IN A COMMUNICATIONS NETWORK

FIELD OF THE INVENTION

The invention generally relates to determining channel quality in a communications network. More particularly, the invention relates to mechanisms for reporting channel quality for different transmission schemes and radio links in a communications network.

BACKGROUND OF THE INVENTION

In a wireless communications network, for example a UMTS network, a mobile station or user equipment (UE) may receive from the serving cell where it is located. However, it may also receive from neighbouring cells, leading to a number of possible different radio links and corresponding interference situations, with resulting signal to noise and interference ratio (SINR) measurements.

There is currently no efficient way for the UE to report the channel quality indicator (CQI), which is derived from the SINR measurement, for these different interference situations.

SUMMARY OF THE INVENTION

Accordingly, embodiments of the invention provide a method, which includes measuring a signal strength of a radio link at a mobile station, obtaining a channel quality indicator of the radio link from the measured

signal strength, and signalling from a network node to the mobile station a condition according to which a report of the CQI should be sent by the mobile station to the network node.

The signal strength or Signal to Interference and Noise Ratio (SINR) of a radio link between a mobile station and a node of a communications network is measured by the mobile station. The mobile station then derives a channel quality indicator from the measured signal strength. The network node signals to the mobile station a condition or criteria according to which the mobile station should send a report of the channel quality indicator to the network node. Therefore the mobile station only sends the channel quality indicator report if this condition or criteria is met. In this way, interference is reduced and efficiency is increased as the mobile station does not send any unnecessary reports to the network node. This is especially advantageous in situations where a mobile station is required to report channel quality indicators for different interference situations, depending on which neighbouring cells are transmitting to the mobile station.

Preferably, the method further includes sending the CQI report if this condition is met. If the mobile station determines that the condition signalled to it by the network node is met, it then sends a report of the channel quality indicator to the network node. Alternatively, the mobile station may be triggered to send the channel quality indicator to the network node if the condition signalled by the network node is met.

Further, in the context of interference coordination at the network node it is desirable to create clarity at the network node about the time instances when the mobile station is taking measurements for its CQI reports. The purpose is to allow the network node to infer the actual interference situation of the mobile station from the mobile station's report and the network node's knowledge as to what has been transmitted in neighbouring cells.

In one embodiment, signalling includes signalling a duration of filtering for a CQI report, or signalling the time instance(s) of signal strength or SINR measurement(s) that are the basis for a CQI report. The signalling may happen in DL or in UL. Alternatively the time instances may be implicitly agreed upon by related configuration such as the CQI reporting period.

In another embodiment, the network node signals to the mobile station that the CQI report should only be sent if a predetermined threshold is equalled or exceeded.

In one embodiment, signalling comprises signalling a cell strength such that the CQI report is sent if the cell strength is equal to a predetermined threshold. In this case, the condition to be met under which the mobile station should send a CQI report to the network node is if the signal strength in a particular cell signalled by the network node to the mobile station is equal to or exceeds a predetermined threshold. The mobile station can be triggered to send a CQI report if the cell strength equals or exceeds the predetermined threshold.

In one embodiment, signalling includes signalling in a downlink connection that the CQI report should be sent according to a particular interference situation. The condition under which a CQI report should be sent by the mobile station in this case is that a particular interference or assistance situation is to be reported in the uplink, for example assist, DTx, normal, per neighbour cell. This uplink interference or assistance situation is signalled from the network node to the mobile station in the downlink.

Signalling may also include signalling in a downlink connection that the CQI report should be sent if a predetermined threshold in an uplink connection is reached. In this case, the network node signals in a downlink connection to the mobile station that it should send a CQI report only if this predetermined threshold in the uplink connection is reached. The mobile station can be triggered to send the CQI report if this predetermined threshold is reached.

The method may further include signalling that the CQI report of a requested interference situation is being sent. In this case, the mobile station signals the CQI report of a requested interference situation to the network node if this particular requested interference situation is occurring in the radio link.

A plurality of CQI reports may be time multiplexed. The mobile station may report the different channel quality indicators for different radio links and/or different conditions in a time multiplexed form. The

CQI reports can then be sent to the network node from the mobile station in a time-multiplexed fashion.

An interval at which the CQI reports are sent to the network node can be determined by a channel coherence time.

Alternatively, the interval at which the mobile station sends CQI reports to the network node can be determined by a transmission mode or modes that is/are active. As a further alternative, the reporting interval may be driven by signalling by the network node.

For example, when the network node signals the condition under which the CQI report should be sent, the signalling can determine an interval at which the CQI reports are sent to the network node. The network node can also communicate specific measurement times to the mobile station at which it should measure the signal strength or SINR to base the CQI reports on. Further, the network node may signal to the mobile station that it should measure CQI reports at specific times so that the mobile station only measures CQI reports at those specific times and not at any other time.

In one embodiment a cell or cells that the mobile station should monitor for the purposes of reporting the CQI is signalled.

The mobile station may monitor only a pilot channel in order to report the channel quality indicator, or may

alternatively or additionally monitor data and/or control channel(s).

Additional embodiments of the invention provide a network node, which includes a transmitter configured to signal to a mobile station a condition according to which a report of a CQI for a radio link should be sent by the mobile station to the network node. The network node signals to the mobile station a condition under which it should send a CQI report to the network node. If this condition is not fulfilled, the mobile station does not send a CQI report. In this way, unnecessary reporting by the mobile station is avoided, thereby reducing interference and increasing efficiency in the network.

The network node may be a base station or Node B, for example.

The network node preferably includes a receiver configured to receive the CQI report if this condition is met. Since the network node only receives a CQI report if a particular condition is fulfilled, this provides the advantage of reduced interference and increased efficiency in the network.

Further embodiments of the invention further provide a mobile station. The mobile station includes a measurement unit configured to measure the signal strength or SINR of a radio link. A processor is provided, which is configured to obtain a channel quality indicator of the radio link from the measured signal strength. A receiver is configured to receive

signalling from a network node indicating a condition according to which a report of the CQI should be sent by the mobile station to the network node.

The mobile station measures the signal strength or SINR of a radio link and from the signal strength can derive a channel quality indicator of the radio link. A report of the channel quality indicator is only sent by the mobile station to a network node if a certain condition or criteria is met. This condition is signalled to the mobile station by the network node. In this way, unnecessary reporting by the mobile station is avoided, which results in reduced interference and increased efficiency in the radio link(s).

Preferably, the mobile station further includes a transmitter configured to send the CQI report to the network node if the condition is met. If the mobile station determines that the condition signalled to it by the network node is met, it sends a channel quality indicator report to the network node. If, however, it is determined that the condition signalled by the network node is not met, the mobile station does not send a channel quality report to the network node. In this way, unnecessary reporting by the mobile station is avoided, thereby reducing interference. Furthermore, the transmitter of the mobile station may be triggered to send the channel quality indicator report if the condition signalled by the network node is met.

Embodiments of the invention further provide a computer program product including a program

comprising software code portions being arranged, when run on a processor, to perform measuring a signal strength of a radio link, obtaining a channel quality indicator of the radio link from the measured signal strength, and signalling a condition according to which a report of the channel quality indicator should be sent.

The computer program product may include a computer-readable medium on which the software code portions are stored, and/or wherein the program is directly loadable into a memory of the processor.

The invention will now be described, by way of example only, with reference to specific embodiments, and to the accompanying drawings, in which:

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a simplified schematic diagram of a communications network;

Figure 2 is a simplified schematic diagram of a network node in the communications network;

Figure 3 is a simplified schematic diagram of a mobile station;

Figure 4 is a simplified schematic diagram of a serving cell and neighbour cells in the communications network; and

Figure 5 is a flow diagram illustrating a method according to an embodiment of the invention.

DETAILED DESCRIPTION OF EXEMPLARY EMBODIMENTS

Present TTI-to-TTI reporting mechanisms allow only a summary of SINR-related values to be reported by the UE to the Node B. In order to cope with rapidly changing SINR situations, for example different interference situations where different neighbouring cells may be transmitting, measured values may be filtered at the UE and additionally the reported values may be filtered at the Node B.

In a transmission scheme such as "HS-DDTx" neighbouring cells may discontinue data transmission so as to lower the interference level in a particular TTI. Consequently, not only the SIR of the thereby assisted UE is improved, but also the UEs involved may measure and possibly report a better SIR situation for that situation.

As such, the Node B may handle these changing SIR reports by taking into account the transmission situations, and by inverse-filtering the SIR measurements and/or corresponding CQI values taken by the UE. Alternatively, the UE may report two CQI values; one corresponding to the SIR without DTx and one to the SIR with DTx. However, the UE may not know whether a neighbour cell is actually transmitting at full power or only control. Therefore it would be more

advantageous if signal levels of sectors for a certain TTI or defined range of TTIs could be reported.

In another transmission scheme "HS-SFN" the SIR reporting situation is analogous to the "HS-DDTx" scheme described above. In this case, the UE should report the SIR for receiving no assistance from the neighbouring cell and for receiving assistance from a neighbouring cell. The Node B would be provided with a less ambiguous information if it were to receive signal-strength reports, or corresponding CQIs of neighbouring cells.

In a scheme where HS-SFN and HS-DDTx are combined, the UE would need to report a number of CQIs, and the present invitation addresses an efficient manner in which to do this.

In a multi-point transmission scheme as "Multiflow" the UE may maintain separate links and the Node Bs may schedule independently. However in case a combined scheduler is employed, the same problems with CQI reporting will arise as for the other transmission schemes described above.

In dual-carrier systems the CQI reports two CQIs; one for each carrier. In MIMO systems the UE will report a CQI for every stream. The invention may operate by reporting channel state information per link and proposes a less ambiguous and more efficient way of arriving at the channel state information at the Node B.

Figure 1 shows a wireless communications network, which includes a base station or Node B 1, which may be controlled by a radio network controller (RNC) 2 over an Iub interface. A mobile station or user equipment (UE) 3 can access the network via the Node B 1 so that a radio link may be set up between the UE 2 and the Node B 1 over a Uu interface.

The Node B 1 is shown in more detail in Figure 3 and includes a transmitter 4 and a receiver 5 and provides access to a serving cell A of the network. The UE 3 includes a transmitter 6 and a receiver 7, as well as a measurement unit 8 and a processor 9.

The serving cell A to which the Node B 1 belongs has neighbour cells B and C, as illustrated in Figure 4.

The UE 3 is in the cell A and receives signals from the Node B 1 but may also receive from the cells B and C. This means that the following transmission/schemes reception schemes may occur:

- a) The UE 3 receives only from cell A, while B and C are transmitting to other users;
- b) The UE receives only from cell A, while B is not transmitting, but C is;
- c) The UE receives from cell A and B at the same time (HS-SFN mode), while C is on; and
- d) The UE receives from cell A and B at the same time (HS-SFN mode), while C is off.

For a signalling scheme where, for example, the UE 3 reports the estimated SIR or derived CQI, it would have to relay 5 different values to the Node B 1. For

UE filtering operations that are unknown at the Node B 1, the reported values cannot possibly be interpreted unambiguously by the Node B 1.

Figure 5 is a flow chart illustrating the method according to the invention, which avoids unnecessary reporting of CQIs by the UE 3, thereby reducing interference and allowing for efficient interpretation at the Node B 1.

In step S1, the UE 3 measures the signal strength or SINR of current radio links with the serving cell A and neighbouring cells B and C. In order to do this, the UE 3 may monitor only a pilot channel. Alternatively, or in addition, the UE 3 may monitor data and control channels. From the measured signal strength or SINR, the CQIs of the radio links are obtained. In step S2, the Node B 1 signals to the UE 3 the condition(s) according to which a report of the CQI(s) should be sent by UE 3 to the Node B 1.

The following conditions for sending CQI reports may be signalled in signalling messages from the Node B 1 to the UE 3.

- a) Signal (or agree on) the duration of filtering for a report prior to its sending;
- b) Signal which cells' strength shall be reported, or is being reported;
- c) Signal traditional CQIs for stand-alone and assisted or DDTx situation;
- d) Signal in the downlink which interference/assistance situation is to be reported

(e.g. assist, DTx, normal, per neighbour cell) in the uplink;

e) Signal in the downlink a threshold for reports to be delivered in the uplink;

f) Signal in UL the CQI(s) of the requested interference/assistance situations;

g) If thresholds are applied according to e) and not the full set of NodeB - requested CQIs is reported, also signal which of the possible interference/assistance are reported in f)

In Step S3, it is determined whether the signalled condition(s) has been met. If the condition is met, in Step S4, the UE 3 sends the relevant CQI report(s) to the Node B 1. The UE 3 may be triggered to send the CQI report(s) upon the relevant condition(s) being met. However, if the condition is not met or fulfilled, the UE 3 does not send any CQI report (Step S5).

By signalling the condition(s) under which the UE 3 should send a CQI report, the UE 3 may report to the Node B 1 without ambiguity, since the reporting filtering has been determined beforehand, and only needs to report 3 CQI values as configured by the Node B, for example:

- 1) stand-alone transmission;
- 2)DTx by B assisted transmission, and
- 3)HS-SFN assisted by B transmission.

For multiflow the three options for CQI reporting may be

- 1) standalone full interference,
- 2) DTx by B assisted transmission,

3) standalone by B, full interference

Furthermore, all 3 CQI values can be filtered over the coherence time and reported by the UE 3 to the Node B 1 in corresponding intervals without introducing significant accuracy impairments, as the Node B 1 is aware of the transmissions that had been occurring in the corresponding intervals.

A filtering configuration may be implemented by the Node B 1 specifying a contiguous time interval for SINR measurements to be taken by the UE 3. Alternatively, this may also be implemented, for example, by the UE 3 using equidistant time instances to take SINR measurement samples.

Coding of the CQI values may be implemented by reporting offsets of the second and third report with respect to the first, for example.

Alternatively, thresholds may be implemented, for example by sending report 2) or 3) only if the expected data rate of those particular transmission schemes is increased by a factor 2.

The UE 3 may send CQI reports concurrently, or alternatively time multiplexing of reports may be implemented by sending CQI reports in subsequent TTIs. Not sending a CQI report results in reduced system interference in both cases.

In one embodiment, a configuration message sent from the Node B 1 to the UE 3 to clarify the SINR measuring intervals to the UE 3 is

"avg period", meaning that reported values are based only on the last TTIs of length period.

Alternatively, if the UE 3 is configured for every n-th TTI reporting a configuration message may include

A) the same "average period" described above

B) that the UE 3 should report "TTIs used for measuring, last TTI" with an average period, or a "measurement cnt, interval length, last TTI" where measurements were taken, where the last TTI is explicit or implicit (e.g. current TTI-2)

A downlink configuration message indicating under which scenarios or conditions the UE 3 should send a CQI report may be as follows:

(scenario1, scenario2, scenario3,..) where

scenarioX = "mode, neighbour 1, neighbour 2, threshold", " where

- "mode" indicates which type of assistance (HS-SFN, HS-SFN with feedback, Multiflow) which selects an SINR estimation algorithm in the UE 3. This signalling require 1 or 2 bits, or can be omitted if there is only one type of assistance that the UE 3 is configured for.
- "neighbour x" is 1 bit indicating whether the neighbour transmissions are on off
- "threshold" indicates either a minimum CQI to achieve for this scenario or condition, or a factor by which this condition exceeds other conditions in the configuration list before reporting this CQI.

An uplink signalling message indicating the conditions under which CQIs are to be reported may be as follows: ...

(scenCQI1, scenCQI2 ...) where

"scenCQIx" is a reporting scheme which indicates a bit mask signalling the configuration followed by the reported CQI value. For example:

1. "scenCQIx" = "mode, neighbour 1, neighbour 2, CQI" = "0 1 0 1 yyy" may mean "condition is that serving cell is used, and first neighbour is not used - second gives assistance (hence the 1), UE can support a TBS of yyy", where the "yyy" value is referring to the normal 3GPP HSPA CQI reporting. And "mode, serving, neighbor 1, neighbor 2, CQI" = "1 1 1 0 yyy" may mean that "UE can support two cell operation (two-flow) condition that serving cell is used along with the first neighbor and there is no scheduling on second neighbor, and UE can support a TBS of yyy".

Alternatively the UE 3 may report

2. "scenCQI x" = "mode, CQI" where mode is an index into the list of possible conditions configured by the Node B;

or

3. "scenCQI x" = "mode, deltaCQI" where deltaCQI indicates by how much the achievable CQI exceeds the threshold configured for this CQI.

For the purpose of the present invention as described hereinabove, it should be noted that

- method steps likely to be implemented as software code portions and being run using a processor at a network control element or terminal (as examples of

devices, apparatuses and/or modules thereof, or as examples of entities including apparatuses and/or modules therefore), are software code independent and can be specified using any known or future developed programming language as long as the functionality defined by the method steps is preserved;

- generally, any method step is suitable to be implemented as software or by hardware without changing the idea of the embodiments and its modification in terms of the functionality implemented;

- method steps and/or devices, units or means likely to be implemented as hardware components at the above-defined apparatuses, or any module(s) thereof, (e.g., devices carrying out the functions of the apparatuses according to the embodiments as described above) are hardware independent and can be implemented using any known or future developed hardware technology or any hybrids of these, such as MOS (Metal Oxide Semiconductor), CMOS (Complementary MOS), BiMOS (Bipolar MOS), BiCMOS (Bipolar CMOS), ECL (Emitter Coupled Logic), TTL (Transistor-Transistor Logic), etc., using for example ASIC (Application Specific IC (Integrated Circuit)) components, FPGA (Field-programmable Gate Arrays) components, CPLD (Complex Programmable Logic Device) components or DSP (Digital Signal Processor) components;

- devices, units or means (e.g. the above-defined apparatuses and network devices, or any one of their respective units/means) can be implemented as individual devices, units or means, but this does not exclude that they are implemented in a distributed fashion throughout the system, as long as the functionality of the device, unit or means is preserved;

- an apparatus may be represented by a semiconductor chip, a chipset, or a (hardware) module comprising such chip or chipset; this, however, does not exclude the possibility that a functionality of an apparatus or module, instead of being hardware implemented, be implemented as software in a (software) module such as a computer program or a computer program product comprising executable software code portions for execution/being run on a processor;
- a device may be regarded as an apparatus or as an assembly of more than one apparatus, whether functionally in cooperation with each other or functionally independently of each other but in a same device housing, for example.

In general, it is to be noted that respective functional blocks or elements according to above-described aspects can be implemented by any known means, either in hardware and/or software, respectively, if it is only adapted to perform the described functions of the respective parts. The mentioned method steps can be realized in individual functional blocks or by individual devices, or one or more of the method steps can be realized in a single functional block or by a single device.

Generally, any method step is suitable to be implemented as software or by hardware without changing the idea of the present invention. Devices and means can be implemented as individual devices, but this does not exclude that they are implemented in a distributed fashion throughout the system, as long as the functionality of the device is preserved. Such and similar principles are to be considered as known to a skilled person.

The terms "user equipment (UE)" and "mobile station" described herein may refer to any mobile or stationary device including a mobile telephone, a portable computer, a mobile broadband adapter, a USB stick for enabling a device to access to a mobile network, etc.

The exemplary embodiments of the invention have been described above with reference to a 3GPP UMTS network. However, the above-described examples may be applied to any wireless communications network.

Although the invention has been described hereinabove with reference to specific embodiments, it is not limited to these embodiments, and no doubt further alternatives will occur to the skilled person, which lie within the scope of the invention as claimed.

LIST OF ABBREVIATIONS

CQI	channel quality indicator
DL	downlink
DTx	discontinuous transmission
HS-DDTx	HS-data discontinuous transmission
HS-SFNHS	single frequency network
SIR	signal to interference ratio
SINR	signal to interference and noise ratio
TTI	transmission time interval
tx	transmission
UE	user equipment
RNC	radio network controller

CLAIMS

1. A method, comprising measuring a signal strength of a radio link at a mobile station, obtaining a channel quality indicator of the radio link from the measured signal strength, and signalling from a network node to the mobile station a condition according to which a report of the channel quality indicator should be sent by the mobile station to the network node.

2. The method according to claim 1, further comprising sending the channel quality indicator report if said condition is met.

3. The method according to claim 1 or claim 2, wherein signalling comprises signalling a time instance at which said measuring should take place.

4. The method according to claim 1 or claim 2, wherein signalling comprises signalling a cell strength such that the channel quality indicator report is sent if the cell strength is equal to a predetermined threshold.

5. The method according to claim 1 or claim 2, wherein signalling comprises signalling in a downlink connection that the channel quality indicator report should be sent according to a particular interference situation.

6. The method according to claim 1 or claim 2, wherein signalling comprises signalling that the

channel quality indicator report should be sent if a predetermined threshold is reached.

7. The method according to claim 1 or claim 2, wherein signalling comprises signalling in an uplink connection that the channel quality indicator report of a requested interference situation is being sent.

8. The method according to any of claims 1 to 7, further comprising time multiplexing a plurality of channel quality indicator reports.

9. The method according to claim 8, further comprising sending the channel quality indicator reports to the network node in a time-multiplexed fashion.

10. The method according to claim 9, wherein an interval at which said channel quality indicator reports are sent to the network node is determined by a channel coherence time.

11. The method according to claim 9, wherein an interval at which said channel quality indicator reports are sent to the network node is determined by an active transmission mode.

12. The method according to claim 9, wherein the signalling determines an interval at which said channel quality indicator reports are sent to the network node.

13. The method according to any of claims 1 to 12, further comprising signalling a cell that the mobile

station should monitor in order to report the channel quality indicator.

14. The method according to any of claims 1 to 13, further comprising monitoring at the mobile station a pilot channel in order to report the channel quality indicator.

15. The method according to any of claims 1 to 14, further comprising monitoring at the mobile station a data and/or control channel in order to report the channel quality indicator.

16. A network node, comprising a transmitter configured to signal to a mobile station a condition according to which a report of a channel quality indicator for a radio link should be sent by the mobile station to the network node.

17. The network node according to claim 16, further comprising a receiver configured to receive the channel quality indicator report if said condition is met.

18. A mobile station, comprising a measurement unit configured to measure a signal strength of a radio link, a processor configured to obtain a channel quality indicator of the radio link from the measured signal strength, and a receiver configured to receive signalling from a network node indicating a condition according to which a report of the channel quality indicator should be sent by the mobile station to the network node.

19. The mobile station according to claim 18, further comprising a transmitter configured to send the channel quality indicator report to the network node if said condition is met.

20. A computer program product including a program comprising software code portions being arranged, when run on a processor, to perform measuring a signal strength of a radio link, obtaining a channel quality indicator of the radio link from the measured signal strength, and signalling a condition according to which a report of the channel quality indicator should be sent.

21. The computer program product according to claim 20, wherein the computer program product comprises a computer-readable medium on which the software code portions are stored, and/or wherein the program is directly loadable into a memory of the processor.

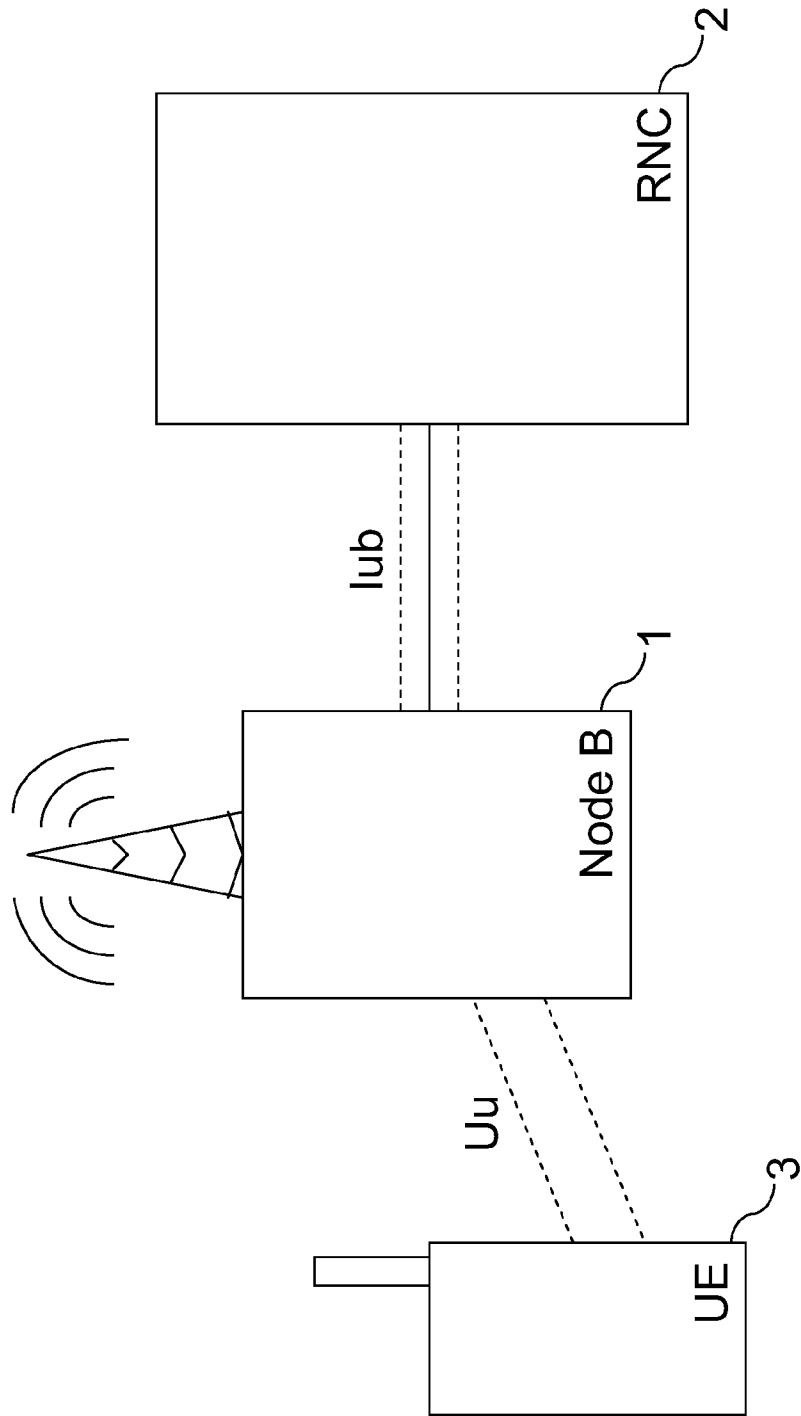


FIG. 1

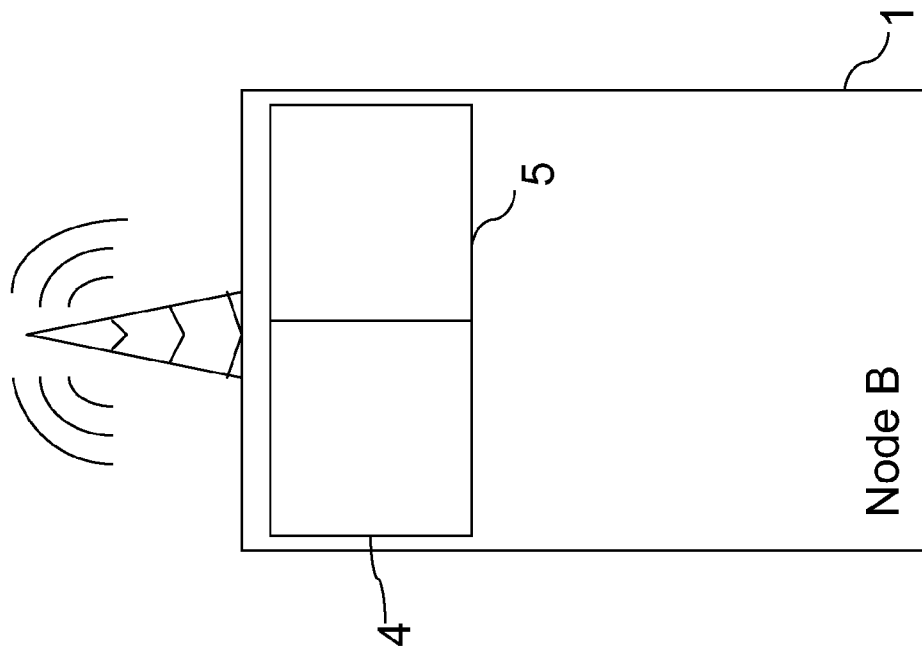


FIG. 2

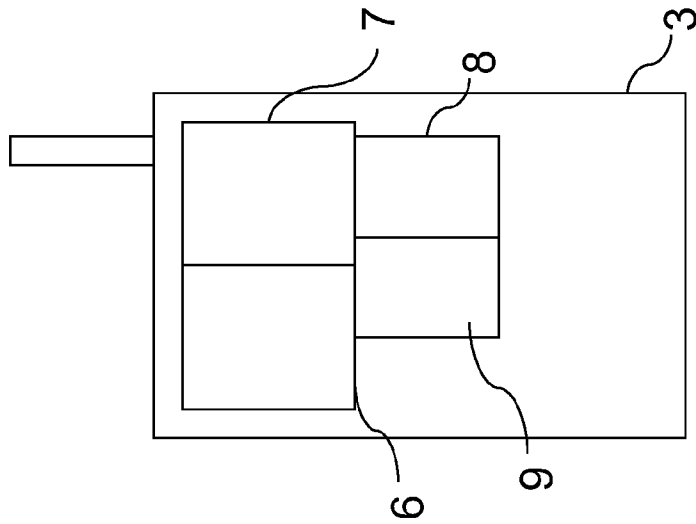


FIG. 3

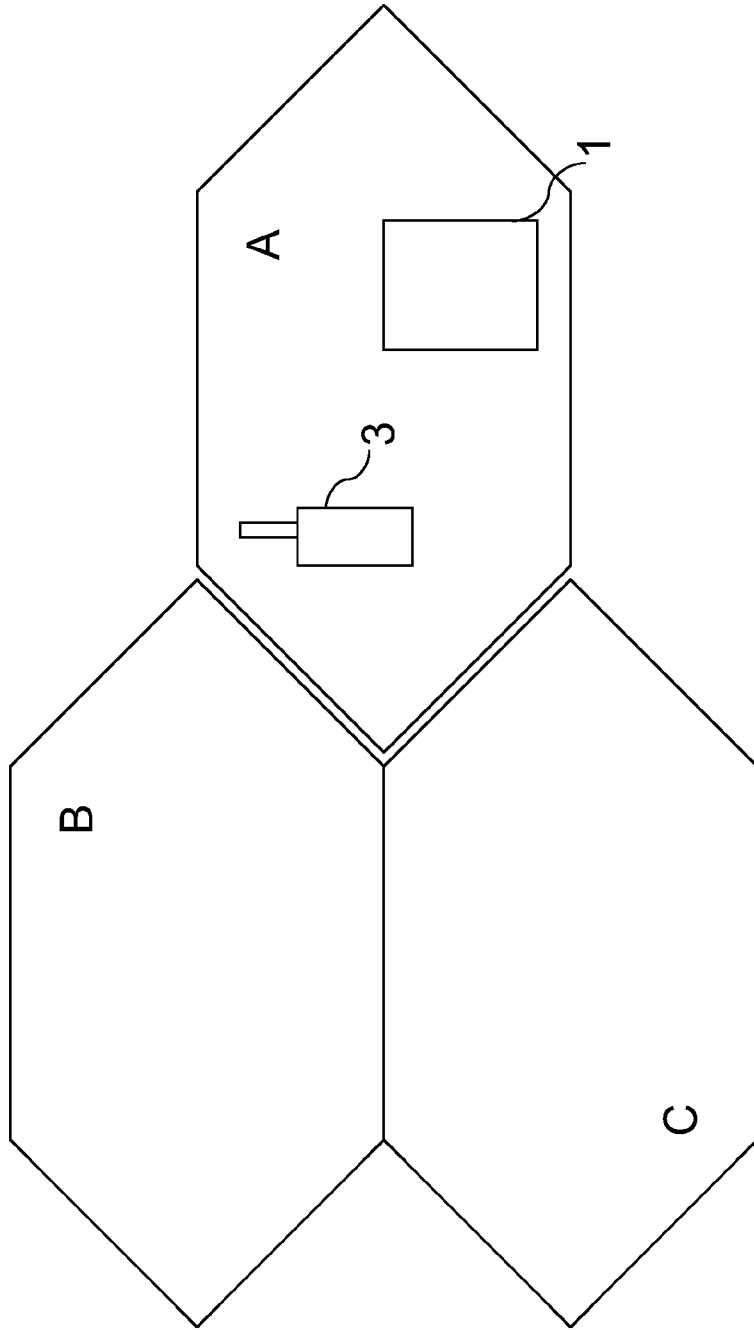


FIG. 4

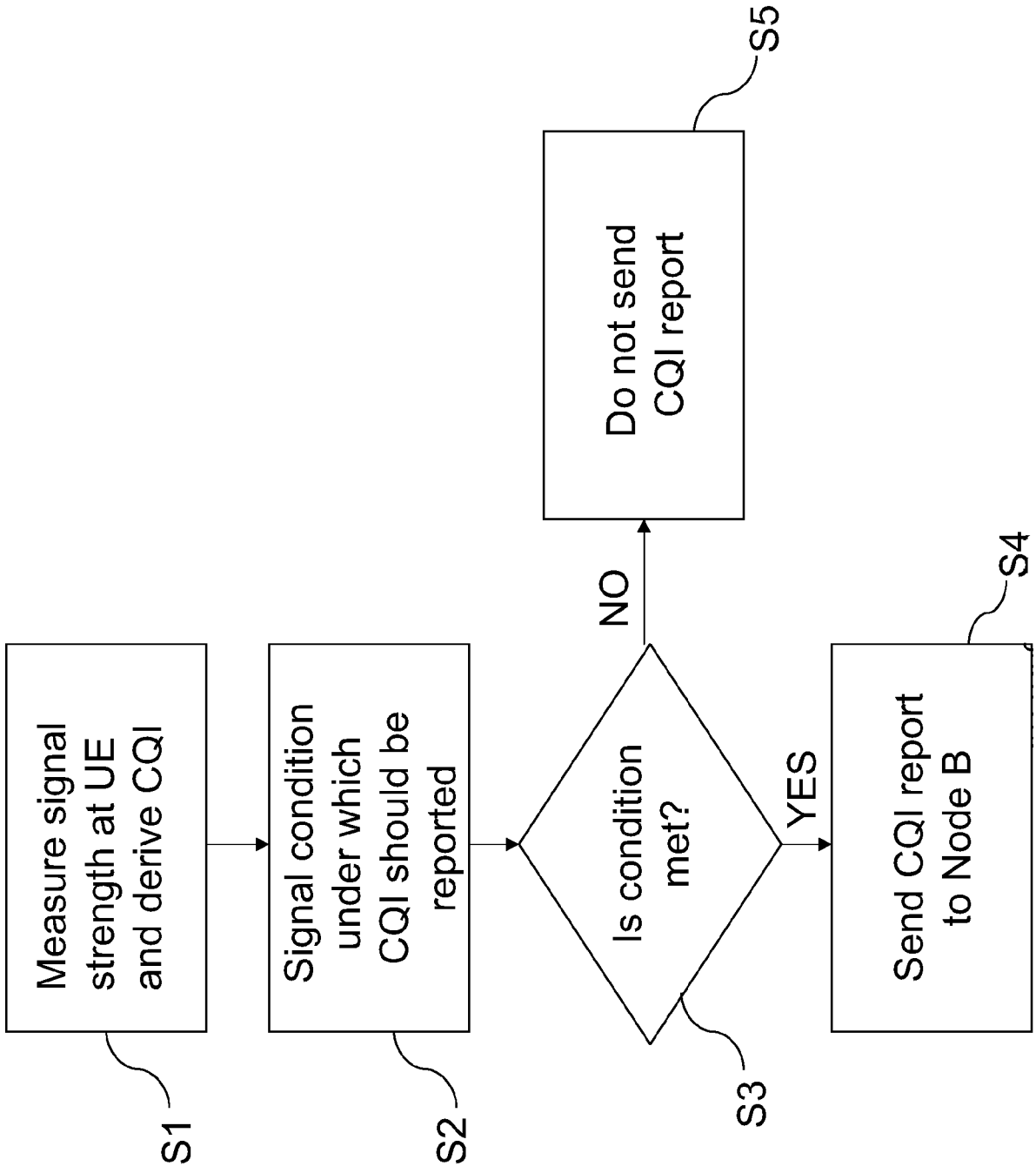


FIG. 5

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/054375

A. CLASSIFICATION OF SUBJECT MATTER
INV. H04W72/12
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 H04L

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, COMPENDEX, INSPEC, 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	WO 2009/082335 A1 (ERICSSON TELEFON AB L M [SE]; KAZMI MUHAMMAD [SE]; LIAO JINGYI [CN]; H) 2 July 2009 (2009-07-02)	1-6,12, 14-21
Y	page 1, line 26 - page 2, line 4 page 4, lines 19-22 page 8, line 32 - page 9, line 7 page 12, lines 19-20 page 13, lines 27-31 page 14, lines 12-13 page 14, lines 17-21 page 15, lines 3-5 page 15, lines 8-14 page 15, lines 22-23 page 15, line 31 - page 16, line 2 page 20, lines 28-31 figures 1-3,6 ----- -/--	8-10

Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

- "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- "X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- "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
- "&" document member of the same patent family

Date of the actual completion of the international search 25 May 2012	Date of mailing of the international search report 04/06/2012
--	--

Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Ruscitto, Alfredo
--	---

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2012/054375

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	"3rd Generation Partnership Project; Technical Specification Group Radio Access Network; Physical layer; Measurements (FDD) (Release 10)", 3GPP STANDARD; 3GPP TS 25.215, 3RD GENERATION PARTNERSHIP PROJECT (3GPP), MOBILE COMPETENCE CENTRE ; 650, ROUTE DES LUCIOLES ; F-06921 SOPHIA-ANTIPOLIS CEDEX ; FRANCE, no. V10.0.0, 29 March 2011 (2011-03-29), pages 1-23, XP050476516, [retrieved on 2011-03-29] paragraph 5.1.1 paragraph 5.1.3 paragraph 5.1.5	1-21
X	----- WO 2008/021573 A2 (INTERDIGITAL TECH CORP [US]; CHANDRA ARTY [US]; LU GUANG [CA]; ZHANG G) 21 February 2008 (2008-02-21) paragraph [0018] paragraph [0049] - paragraph [0051] paragraph [0053] - paragraph [0054] figure 5	1,16,18, 20
X	----- US 2008/057969 A1 (AGAMI GREGORY M [US] ET AL) 6 March 2008 (2008-03-06)	1,16,18, 20
Y	paragraph [0016] - paragraph [0019] paragraph [0027] - paragraph [0030] figure 4 -----	8-10

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2012/054375

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
WO 2009082335	A1	02-07-2009	AT 533320 T 15-11-2011
			CA 2710158 A1 02-07-2009
			CN 101904194 A 01-12-2010
			EP 2223554 A1 01-09-2010
			EP 2400684 A2 28-12-2011
			JP 2011508512 A 10-03-2011
			US 2009163199 A1 25-06-2009
			US 2012044831 A1 23-02-2012
			WO 2009082335 A1 02-07-2009

WO 2008021573	A2	21-02-2008	AR 062456 A1 12-11-2008
			AU 2007284378 A1 21-02-2008
			CA 2661151 A1 21-02-2008
			EP 2070373 A2 17-06-2009
			JP 2010502108 A 21-01-2010
			KR 20090055577 A 02-06-2009
			KR 20090055620 A 02-06-2009
			RU 2010121173 A 27-11-2011
			TW 200814610 A 16-03-2008
			US 2008045228 A1 21-02-2008
			WO 2008021573 A2 21-02-2008

US 2008057969	A1	06-03-2008	CN 101513094 A 19-08-2009
			KR 20090051120 A 20-05-2009
			US 2008057969 A1 06-03-2008
			WO 2008030684 A2 13-03-2008
