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(54) METHODS AND APPARATUSES FOR SUPPORTING DTX

VERFAHREN UND VORRICHTUNGEN ZUM UNTERSTÜTZEN VON DTX

PROCÉDÉS ET DISPOSITIFS ADAPTÉS POUR PRENDRE EN CHARGE UNE TRANSMISSION DISCONTINUE (DTX)

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- **"Universal Mobile Telecommunications System (UMTS); Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRAN); Overall description; Stage 2 (3GPP TS 36.300 version 8.5.0 Release 8); ETSI TS 136 300" ETSI STANDARD, EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE (ETSI), SOPHIA ANTIPOLIS CEDEX, FRANCE, vol. 3-R2, no. V8.5.0, 1 July 2008 (2008-07-01), XP014042193**

EP 2 428 068 B9

Description

TECHNICAL FIELD

[0001] The present invention relates to a method and an arrangement in a first base station, a method and an arrangement in a second base station and a method and an arrangement in a user equipment. In particular, it relates to for supporting Discontinuous Transmission (DTX) for power saving.

BACKGROUND

[0002] In a typical cellular system, also referred to as a radio communications system, wireless terminals, also known as mobile stations and/or User Equipment units (UEs) communicate via a Radio Access Network (RAN) to one or more core networks. The wireless terminals can be mobile stations or user equipment units such as mobile telephones also known as "cellular" telephones, and laptops with wireless capability, e.g., mobile termination, and thus can be, for example, portable, pocket, hand-held, computer-included, or car-mounted mobile devices which communicate voice and/or data with radio access network.

[0003] The radio access network covers a geographical area which is divided into cell areas, with each cell area being served by a base station, e.g., a Radio Base Station (RBS), which in some networks is also called "NodeB" or "B node" and which in this document also is referred to as a base station. A cell is a geographical area where radio coverage is provided by the radio base station equipment at a base station site. Each cell is identified by an identity within the local radio area, which is broadcast in the cell. The base stations communicate over the air interface operating on radio frequencies with the user equipment units within range of the base stations.

[0004] In some versions of the radio access network, several base stations are typically connected, e.g., by landlines or microwave, to a Radio Network Controller (RNC). The radio network controller, also sometimes termed a Base Station Controller (BSC), supervises and coordinates various activities of the plural base stations connected thereto. The radio network controllers are typically connected to one or more core networks.

[0005] The Universal Mobile Telecommunications System (UMTS) is a third generation mobile communication system, which evolved from the Global System for Mobile Communications (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 wideband code division multiple access for user equipment units (UEs). The Third Generation Partnership Project (3GPP) has undertaken to evolve further the UTRAN and GSM based radio access network technologies.

[0006] Being "green" has quickly gone from just a marketing hype to a key requirement for customers. This is true today for almost all sectors in society and the telecom market is no exception. The world today is facing a global energy crisis as people start to realize that our carbon based economy is no longer sustainable. Two areas that will become significant parts of a future sustainable economy are energy savings and telecommunications. Energy savings are by far the quickest and cheapest way of reducing carbon dioxide emissions to the atmosphere and telecommunication can significantly reduce the need for physical transportation of people and services. In 3rd Generation Partnership Project (3GPP) the work on the first release of the 3G Long Term Evolution (LTE) system, denoted LTE Rel-8 in 3GPP jargon, was finalized during 2008. The specifications of the next releases (denoted LTE Rel-9 and LTE Rel-10) are expected to be available 2009 and 2010 respectively. In LTE Rel-8 the maximum bandwidth is 20 MHz while in Rel-10 support for aggregation of multiple component carriers resulting in a total bandwidth of up to 100MHz is expected to be specified, which LTE Rel-8 system and later releases of the LTE system all consume power.

[0007] In "Universal Mobile Telecommunications System (UMTS); Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (3GPP TS 36.300 version 8.5.0 Release 8); ETSI TS 136 300", ETSI STANDARD, EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE (ETSI), SOPHIA ANTIPOLIS CEDEX, FRANCE, vol. 3-R2, no. V8.5.0, 1 July 2008 (2008-07-01), XP014042793, a method in a base station for supporting DTX is disclosed.

[0008] US 2007/066273 A1 discloses a wireless terminal for use with a multi-mode base station that supports a transmit standby mode and an active mode. In this document a transmit standby mode of a base station operation is a low power/low interference level of operation as compared to active mode.

SUMMARY

[0009] In accordance to the present invention, methods as set forth in claims 1, 9 and 15 and apparatuses as set forth in claims 17-19 are provided. Embodiments of the invention are claimed in the dependent claims.

[0010] It is therefore an objective of the present solution to provide a mechanism enabling power saving base station operation based on DTX.

[0011] According to a first aspect of the present disclosure, the object is achieved by a method in a first base station for supporting Discontinuous Transmission (DTX). The first base station serves a first cell. The first cell is in an active mode. The first base station communicates with a user equipment within the first cell over a radio carrier. The first base station is comprised in a radio communications system. The radio communications sys-

tem further comprises the user equipment and a second base station serving a second cell. The second cell state is in a non observable mode. The first base station sends to the second base station, a request to switch the second cell from a non observable mode to an observable mode for said user equipment 120. The first base station further sends to the equipment or to the second base station, a request to perform signalling between the user equipment and the second base station for quality measurements. The first base station then obtains information that handover is feasible. The information is based on quality measurement of the performed signalling. Upon receiving this information, the first base station sends to the second base station, a request to prepare handover of the user equipment from the first cell to the second cell. The first base station then sends to the user equipment, a command to perform handover to the second cell.

[0012] According to a second aspect of the present disclosure, the object is achieved by a method in a second base station for supporting DTX. The second base station serves a second cell. The second cell is in a non observable mode. The second base station is comprised in a radio communications system. The radio communications system further comprises a first base station communicating with a user equipment over a radio carrier being active. After receiving from the first base station, a request to switch the second cell state from a non observable mode to an observable mode for said user equipment 120, the second base station switching the second cell state to an observable mode for said user equipment 120. After receiving from the first base station, a request to perform signalling between the user equipment and the second base station for quality measurements, the second base station signals to or from the user equipment. The second base station receives from the first base station, a request to prepare a handover of the user equipment from the first cell to the second cell. The handover request is based on quality measurement performed on said signalling. When the second cell state is in observable mode the second base station switches the second cell state to active mode, and prepares handover of the user equipment from the first cell to the second cell.

[0013] In some embodiments, base station DTX is performed within the second base station, when the second cell is in a non observable mode.

[0014] According to a third aspect of the present disclosure, the object is achieved by a method in a user equipment for supporting DTX. The user equipment is present in a first cell communicating over a radio carrier with a first base station serving the first cell. The first cell is set in an active mode. The user equipment and the first base station are comprised in a radio communications system. The radio communications system further comprises a second base station serving a second cell. The second cell is set in a non observable mode. The user equipment receives from the first base station, a request to perform channel sounding signalling to be observed by the second base station for quality measurements. The second base station has been requested by the first base station to switch the second cell state from a non observable mode to an observable mode for said user equipment 120. The user equipment then signals channel sounding to be observed by the second base station for quality measurements. After receiving from the first base station, a command to perform handover to the second cell, the user equipment performs the commanded handover from the first cell to the second cell. The handover command is based on quality measurement performed by the second base station on the signalled channel sounding observed by the second base station.

[0015] According to a forth aspect of the present disclosure, the object is achieved by an arrangement in a first base station for supporting DTX. The first base station serves a first cell. The first cell is adapted to be in an active mode. The first base station is arranged to communicate with a user equipment within the first cell over a radio carrier. The first base station is comprised in a radio communications system. The radio communications system further comprises the user equipment and a second base station serving a second cell. The second cell is adapted to be in an non observable mode. The first base station arrangement comprises a sending unit configured to send to the second base station, a request to switch the second cell state from a non observable mode to an observable mode for said user equipment 120. The sending unit is further configured to send to the user equipment or to the second base station, a request to perform signalling between the user equipment and the second base station for quality measurements. The first base station arrangement further comprises an obtaining unit configured to obtain information that handover is feasible, based on quality measurement of the performed signalling. The sending unit is further configured to send to the second base station, a request to prepare handover of the user equipment from the first cell to the second cell. The sending unit is further configured to send to the user equipment a command to perform handover to the second cell.

[0016] According to a fifth aspect of the present disclosure the object is achieved by an arrangement in a second base station for supporting DTX. The second base station serves a second cell. The second cell is adapted to be in an non observable mode. The second base station is comprised in a radio communications system. The radio communications system further comprises a first base station arranged to communicate with a user equipment over a radio carrier being active. The second base station arrangement comprises a receiving unit configured to receive from the first base station, a request to switch the second cell state from a non observable mode to an observable mode for said user equipment 120. The second base station arrangement further comprises a switching unit configured to switch the second cell state from a non observable mode to an observable mode for

said user equipment 120. The receiving unit is further configured to receive from the first base station, a request to perform signalling between the user equipment and the second base station for quality measurements. The second base station arrangement further comprises a signalling unit configured to signal to or from the user equipment, which signal is to be used for quality measurement. The receiving unit is further configured to receive from the first base station, a request to prepare a handover of the user equipment from a first cell served by the first base station to a second cell served by the second base station. The handover request is based on quality measurement on said signalling. The switching unit is further configured to switch the second cell state from observable mode to active mode, when the second cell state is in observable mode. The second base station arrangement further comprises a preparing unit configured to prepare handover of the user equipment from the first cell to the second cell.

[0017] According to a sixth aspect of the disclosure, the object is achieved by an arrangement in a user equipment for supporting DTX. The user equipment is arranged to be in a first cell and is adapted to communicate over a radio carrier with a first base station serving the first cell. The first cell is adapted to be in active mode. The user equipment and the first base station are comprised in a radio communications system. The radio communications system further comprises a second base station adapted to serve a second cell, the second cell being arranged to be in an non observable mode. The user equipment arrangement comprises a signalling unit configured to receive from the first base station, a request to perform channel sounding signalling to be observed by the second base station for quality measurements. The second base station has been requested by the first base station to switch the second cell state from a non observable mode to observable mode. The signalling unit is further configured to signal channel sounding to be observed by the second base station for quality measurements. The signalling unit is further configured to receive from the first base station a command to perform handover to the second cell. The handover command is based on quality measurement performed by the second base station on the signalled channel sounding observed by the second base station. The user equipment arrangement further comprises a performing unit configured to perform a handover from the first cell to the second cell.

[0018] Since the first base station requests the second base station switch the second cell state from a non observable mode to an observable mode for said user equipment 120, and a requests the second base station or the user equipment to perform signalling between the user equipment and the second base station for quality measurements, handover to the second cell can be performed in spite of the second base station initially being in non observable mode, in which non observable mode power saving base station operation based on DTX is enabled.

[0019] An advantage with the present solution is that a network element can remain in low power consuming mode for a longer time. Without then present solution, a base station in DTX will have to periodically or pseudo randomly leave DTX mode to enable non-served user equipments to measure.

[0020] A further advantage with the present solution is that the time to switch up from a DTX mode to an active mode will be significantly shorter with the present solution. Since, with the present solution, the mode switch of the second base station is event triggered there is no need to wait for a periodic or pseudorandom timer to expire before entering an observable mode. Instead the second base station can switch to an observable mode for said user equipment 120 immediately after a request is received from the first base station. To enable a fast switching time with a state of the art timer based solution periodic or pseudorandom the DTX time would need to be reduced significantly and that would limit the potential energy savings.

[0021] Also with the current invention it can be avoided that the second cell unnecessarily enters an observable mode, i.e. non DTX mode, or an observing mode, i.e. non DRX mode. Each time the second cell becomes observable or starts to observe cost must paid in terms of increased energy consumption. When a handover measurement is required then that cost is well motivated, but if the second base station would enter an observable mode, i.e. non DTX mode, or an observing mode, i.e. non DRX mode periodically as in state of the art solutions then it will often be wasted energy by transmitting signals from the second base station that no user terminal is measuring on or by performing measurements in the second base station even though no user terminal is transmitting anything for the second base station to measure on.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022] The invention is described in more detail with reference to attached drawings illustrating exemplary embodiments of the invention and in which:

Figure 1 is a schematic block diagram illustrating a radio frame according to prior art.

Figure 2 is a schematic block diagram illustrating embodiments of a radio communications system.

Figure 3 is a schematic block diagram illustrating embodiments of a radio communications system.

Figure 4 is a combined schematic block diagram and flowchart depicting embodiments of a method.

Figure 5 is a combined schematic block diagram and flowchart depicting embodiments of a method.

Figure 6 is a flowchart depicting embodiments of a method in a first base station.

Figure 7 is a schematic block diagram illustrating embodiments of a first base station arrangement.

Figure 8 is a flowchart depicting embodiments of a method in a second base station.

Figure 9 is a schematic block diagram illustrating embodiments of a second base station arrangement.

Figure 10 is a flowchart depicting embodiments of a method in a user equipment.

Figure 11 is a schematic block diagram illustrating embodiments of a user equipment arrangement.

DETAILED DESCRIPTION

[0023] As part of the present solution a problem will firstly be defined and discussed. To introduce energy saving features, increased support for eNB Discontinuous Transmission (DTX) is required in LTE Rel-10. Several different types of downlink DTX could be considered. In the context of LTE 3 types of Down Link (DL) DTX modes could be defined: Short DTX could be defined as DTX that is fully backwards compatible with LTE Rel-8. Basically short DL DTX is then limited to one or a few OFDM symbols in which no cell specific reference symbols need to be transmitted. Medium DTX could be defined as DTX that is non backwards compatible with Rel-8, e.g. a DTX duration longer than one sub-frame (1 ms) but shorter than a radio frame (10 ms). Finally long DTX could be defined as a DTX duration that makes a carrier invisible also for Rel-10 UEs e.g. a DTX duration equal to one or several radio frames. The long DL DTX might also be denoted eNB sleep.

[0024] At a first glance it seems rather straightforward to introduce support for medium or long eNB DTX in LTE Rel-10. Figure 1 shows a LTE radio frame with 72 center sub carriers, introducing eNB DTX for four ms in sub-frame no. 1, 2, 3, 4, 6, 7, 8 and 9. For example, the LTE Rel-10 specification may be slightly changed so that when there is little or no user plane data traffic, the eNB does not have to transmit Cell Specific Reference Symbols (CSRS) in every subframe. In this example, CSRS may only be mandatory in sub-frames 0 and 5 where also Primary Synchronization Signals (PSS) and Secondary Synchronization Signals (SSS) and Broadcast CHannel (BCH) are transmitted. CSRS also needs to be transmitted in those sub-frames that carry System Information Blocks, (SIBs). SIB1 is transmitted in the fifth sub-frame of every radio frame, SIBx where x>2 is configurable with very low duty cycle. In order for this to be allowed the UE behavior that the standard specifies may for example be changed so that UEs are only allowed to perform mobility measurements during sub-frames 0 and 5.

[0025] The fact that the CSRS are not transmitted in every sub-frame may also likely affect the Channel Quality Indicator (CQI) measurements. However already in Rel-8 it is possible to specify when in time the CQI measurements are to be performed. In Rel-8 the CQI measurements are performed 4 sub-frames before the UE are scheduled to report the CQI. No time domain filtering of CQI estimates are performed in the UE. It might be necessary to reconsider if this mechanism is sufficient also for Rel-10 or if some more flexibility is required.

[0026] In case UEs measure the CQI in sub-frames other than 0 and 5 then they can not assume that there is any frequency correlation since the eNB may not always transmit CSRS in all resource blocks. Alternatively the UEs could detect an "all zero CQI" measurement as an indication that the eNB does not need any CQI report from the UE.

[0027] UE channel estimation is also affected. A slight degradation in channel estimation accuracy is expected since UEs can not utilize time and frequency correlation between resource blocks (unless they are adjacent to subframe 0 or 5). This however is already the case for TDD, where one cannot do interpolation between all subframes as some subframes are UL subframes. Hence this is not a fundamental problem.

[0028] There are many alternatives to the solution outlined in Figure 1. UE mobility measurements can be limited to

- the centre 6 resource blocks; and/or
- a single antenna port (e.g. antenna port 0) and/or
- the PSS and SSS signals only; and/or
- subframe 0 only, i.e. not both sub-frame 0 and 5 as in Figure 1.

[0029] It is also possible that a future non legacy LTE release (e.g. Rel-10) defines a new set of reference symbols for non backwards compatible extension carriers. Current discussions in 3GPP mention two new sets of reference symbols: demodulation reference symbols (DM-RS) and channel state information reference symbols (CSI-RS). If new reference symbols are defined (e.g. a new set of mobility measurement reference signals of the DM-RS or CSI RS mentioned above) then it is likely that UE mobility measurements are defined on a sub-set of the new reference symbols.

[0030] To enable DTX periods longer than 4 ms one could imagine that an eNB sleep mode is also defined for LTE Rel-9 or LTE Rel-10. Periodically a sleeping eNB could transmit all signals needed for UEs to measure and attach to the cell, i.e. PSS, SSS, BCH, SIB1, SIB2, CSRS

during a short active period duration such as e.g. 50 ms. The active period is then followed by a much longer inactive period such as e.g. 450 ms where nothing is transmitted from the eNB. The active period can be compatible with LTE Rel-8 or a later release, e.g. LTE Rel-10.

[0031] The problem with the energy saving solutions discussed above is that a user equipment can not access a cell being in DTX mode since a cell being in a DTX mode is invisible to this user equipment, and the serving base station will not receive any handover measurements from the user equipment that can trigger a handover.

[0032] It is therefore a further objective of the present solution to provide the means required to making it possible for a user equipment to access a cell being in a non observable cell state and therefore is not transmitting anything, or access a cell in a DTX mode not supported by the user equipment.

[0033] **Figure 2** depicts a radio communications system 100, such as e.g. the E-UTRAN, also known as LTE, LTE-Adv, 3rd Generation Partnership Project (3GPP) WCDMA system, Global System for Mobile communications/Enhanced Data rate for GSM Evolution (GSM/EDGE), Wideband Code Division Multiple Access (WCDMA), Worldwide Interoperability for Microwave Access (WiMax), or Ultra Mobile Broadband (UMB). The radio communications system 100 supports different releases of a standardized radio specification such as a standardized LTE specification or a standardized High Speed Packet Access (HSPA) specification.

[0034] The radio communications system 100 comprises a first base station 110 serving a first cell 115. The first base station 110 may be a base station such as a NodeB, an eNodeB or any other network unit capable to communicate with a user equipment being present in the fist cell over a radio carrier. The first base station 110 communicates with a user equipment 120 being present within the first cell 115 over a radio carrier 125. The first cell 115 is in an **active mode**, this means that the radio carrier 125 in the first cell 115 is up and running e.g. with a DTX mode supported by the user equipment 120. With active mode in this context is meant that the transmission mode of the serving cell, i.e. the first cell 115 is such that data communication is possible between the user equipment 120 and the first cell 115. Thus, as seen from the perspective of the user equipment 120, only the serving cell, i.e. the first cell 115 can be in active mode and a non serving cell, i.e. the second cell 135 can not. However a non serving cell, i.e. the second cell 135 can be in a DTX mode that is either observable or non observable for the user equipment. In the example of Figure 2 and only for illustration, the first base station 110 further communicates with other user equipments 127 in the first cell 115 over other radio carriers 129. The user equipment 120 may be a mobile phone, a Personal Digital Assistant (PDA), or any other network unit capable to communicate with a base station over a radio channel.

[0035] The radio communications system 100 further comprises a second base station 130 serving a second cell 135. The second base station 130 may be a base station such as a NodeB, an eNodeB or any other network unit capable to communicate with a user equipment present in the second cell 135, over a radio carrier when the cell state is in active mode. However, in Figure 2 the second cell is not in an active mode but in a non observable mode which means that the carrier within the second cell 135, seen from the user equipment 120 perspective, is not transmitting anything or it is in a DTX mode not supported by the user equipment 120. Note that it is possible to consider the case that a new DTX mode is introduced in a new release of a standardized system specification, such as 3GPP LTE. In that case only user equipments that comply with the new standard release will be able to observe a cell that is operating using the new DTX mode. Thus a DTX mode that is observable for one user equipment may be non observable for another user equipment.

[0036] The general idea of the present solution will now be described. In an exemplary scenario referred to in Figure 2, the user equipment 120 would be better served by second base station 130 and the second cell 135. The second cell 135 being in a non observable mode is not visible for the user equipment 120.

[0037] To start a hand over procedure to hand over the user equipment 120 to the second cell 135, the first base station 110 requests the second base station 130 to switch the second cell state from a non observable mode to an observable mode for said user equipment 120. An observable mode means that from the perspective of the user equipment 120, the carrier in the second cell 135 is temporarily transmitting with a DTX mode supported by the user equipment 120 for the sole purpose of allowing mobility measurements. But neither the user equipment 120 nor any other user equipments present within the second cell 135 are actively receiving user plane data on the carrier.

[0038] The second base station 130 switches the second cell state to an observable mode for said user equipment 120. This switch makes the second cell 135 visible to the user equipment 120.

[0039] The first base station 110 then requests the user equipment 120 or the second base station 130 to perform signalling between the user equipment 120 and the second base station 130 for quality measurements.

[0040] The first base station 110 obtains information that handover is feasible, based on quality measurement of the performed signalling.

[0041] The first base station 110 then requests the second base station 130 to prepare handover of the user equipment 120 to the second cell 135, and commands the user equipment 120 to perform handover to the second cell 135.

[0042] The handover to the second cell is performed by the user equipment 110 ending up in the scenario illustrated in Figure 3. The second base station 130 switches to active mode. The user equipment 110 and

the second base station 130 may then start communicating with each other over a radio carrier.

[0043] As a consequence of the present solution in methods described above and below, a cell may request that a non observable neighboring cell becomes observable.

[0044] So e.g. when load is high a base station serving a cell may check if any neighboring cells can take over some of the traffic.

[0045] In the present solution, the mode terminology is defined from the user equipment 120 point of view. Therefore it is only the serving cell, i.e. the first cell 115 that can be in an "active" mode. A non serving cell, i.e. the second cell 135, can only be "observable" or "non observable" as far as this user equipment 120 is concerned. The second cell 135 may also be "observing" but it can not be "active", at least not until the user equipment 120 has performed a handover to the second cell 130 after which the second cell 135 is no longer referred to as the second cell 135. Furthermore, note that the term "observable" denotes that the characteristics of the radio channel between the user equipment 120 and the second base station 130 may be determined. Thus the term "observable" is used to describe both the case that the second cell 135 transmits a reference signal on which said user equipment 120 can perform mobility measurements; as well as the case that the second cell 135 is prepared for performing measurements needed for mobility decisions on a reference signal transmitted by said user equipment 120.

[0046] The user equipment 120 that is served by the first cell 115, i.e. the first cell 115 is thus in "active" mode, does not care if the second cell 135 happens to actively serve some other user equipments 127 or not. That the second cell 135 is in active mode is irrelevant unless we assume that any cell that is in active mode is automatically also observable for all user equipments in neighboring cells. That might not be the case since the second cell 135 might serve a LTE Rel-10 user equipment using a Rel-10 transmission format, hence it is in active mode as seen from this user equipment, and the user equipment in the neighboring cell might be a Rel-8 user equipment that is not capable of measuring on this format, hence the second cell is non observable as seen from this user equipment. So when reading "observable" and "non observable" it is from the viewpoint of the user equipment 120. What is observable for one user equipment (e.g. a Rel-10 user equipment) can be non observable for another user equipment (e.g. a Rel-8 user equipment). The term "observable" also refers to measuring on a specific signal that the second cell knows is being transmitted from the user equipment 120 served by the first cell 115.

[0047] Thus...

"active mode" is used to describe the mode of the cell currently serving the user equipment.

"non observable" or "observable" mode is used to describe if the characteristics of the radio channel between the user equipment 120 and the second base station 130 can be determined or not.

[0048] In case the second cell 135 is "non observable" the it can either be requested to become "observable" i.e. start to send reference signals according to a format that the user equipment 120 can measure on; or be prepared to measure on channel sounding transmissions from the user equipment 120. It does not matter whether the second cell 135 is "active" or not until the user equipment 120 enters the second cell 135.

[0049] Note that for the sake of simplifying the description of this invention, only the case when each cell transmits a single carrier described. In case several carriers are transmitted from a base station then it is possible to view that arrangement as several cells with one carrier allocated to each cell. Alternatively one the multicarrier arrangement can be viewed as a single cell with several carriers that are allocated to it. In the present solution, it is chosen to adopt the commonly used nomenclature that a cell transmit only one carrier'and in case having multiple carrier arrangements then the additional carriers are viewed as additional cells.

[0050] Currently carrier aggregation is being defined by 3GPP as a component technology for LTE Rel-10. The idea is that a Rel-10 user equipment shall be able to aggregate several component carriers transmitted from the same base station. In that case it is not decided yet in 3GPP if a Rel-10 user equipment will view the component carriers as one cell or several cells. In case the component carriers are visible to a Rel-8 user equipments they will however be viewed as different cells by the Rel-8 user equipments. Therefore, the present solution also covers a multicarrier arrangement where a cell has several carriers assigned to it.

[0051] Cell state changes may be exchanged for example directly between the first base station 110 and the second base station 130 e.g. over X2/S1 or over an O&M interface e.g. according to a Listener/Reporter pattern. The X2 interface is, as defined in 3GPP, a direct logical interface between two eNodeBs; the S1 interface is the interface between the eNodeB and the mobility management entity (MME); the O&M interface is the interface between the eNodeB and the operation and support system (OSS). Thus a decision to enter a non observable mode may be taken locally in the base station but when the non observable mode of a carrier is changed to an observable mode for said user equipment 120, all neighboring cells, i.e. all listeners may be informed by this transmission by the first cell 135, i.e. the reporter. Also component carrier state information such as e.g. legacy / short DTX / long DTX may be exchanged between the first base station 110 and the second base station 130 and other base stations in case there are several component carriers in the first base station 110 and/or second base station 130.

[0052] Some embodiments of the present solution will now be described.

[0053] A method according to some first embodiments

is depicted in the combined flowchart and signaling diagram in **Figure 4**. The user equipment 120 may probably be better served by the second base station 130 and the second cell 135. The second cell 135 being in a non observable mode is not visible for the user equipment 120.

[0054] The method steps below must not be taken in the order described below, but may be taken in any suitable order.

Step 401

[0055] The first base station 110 requests the second base station 130 to switch to observable mode to be able to start sending reference signals. This may be performed at the same time as the next step, or implicitly be performed by the next step. This step may e.g. be triggered by information received that the user equipment 120 requires a service that not is provided by the first base station 110. This step may also e.g. be triggered by high traffic load, such as the traffic load exceeding a predetermined threshold value.

Step 402

[0056] The second base station switches to an observable mode for said user equipment 120.

Step 403

[0057] The first base station 110 further requests the second base station 130 to perform signaling between the user equipment 120 and the second base station 130 for quality measurements. In these first embodiments this is performed by requesting the second base station 110 to start transmitting reference signals such as e.g. pilot signals.

Step 404

[0058] The second base station 130 sends reference signals.

Step 405

[0059] The user equipment 110 listens to the reference signals sent by the second base station 130 and performs quality measurements on said signals. These measurements are in LTE denoted reference signal received power (RSRP) measurements and they are used to perform handover decisions.

Step 406

[0060] When the user equipment 110 decides that handover to the second cell is feasible based on said measurements in step 404, it sends a hand over request to the first base station 110.

Step 407

[0061] The first base station 110 then requests the second base station 130 to prepare handover of the user equipment 120 to the second cell.

Step 408

[0062] The first base station 110 then commands the user equipment 120 to perform handover to the second cell 135.

Step 409

[0063] The user equipment 120 performs handover to the second cell 135 and may then start to communicate with the second base station 130.

[0064] A method according to some second embodiments is depicted in the combined flowchart and signaling diagram in **Figure 5**. Also in these embodiments, the user equipment 120 may be better served by the second base station 130 and the second cell 135. The second cell 135 being in a non observable mode is not visible for the user equipment 120.

[0065] The method steps below must not be taken in the order described below, but may be taken in any suitable order.

Step 501

[0066] The first base station 110 requests the second base station 130 to switch to observable mode to be able to start sending reference signals. In these second embodiments this may be performed by requesting the second base station 110 to start measuring on channel sounding transmission e.g. on a particular channel sounding which is signalled by the user equipment 120. This may be performed at the same time as the next step, or implicitly be performed by the next step. This step may e.g. be triggered by information received that the user equipment 120 requires a service that not is provided by the first base station 110. This step may also e.g. be triggered by high traffic load, such as the traffic load exceeding a predetermined threshold value.

[0067] Channel Sounding Reference Signal (SRS) transmission are defined in LTE for the purpose of probing the uplink radio channel from the user equipment to the base station. The purpose of introducing SRS in LTE is to enable channel dependent scheduling also in the uplink.

Step 502

[0068] The second base station 130 switches to an observable mode for said user equipment 120, that in this case represented by an observing mode.

Step 503

[0069] The first base station 110 further requests the user equipment 120 to perform signaling between the user equipment 120 and the second base station 130 for quality measurements. In these embodiments this may be performed by commanding the user equipment 120 to transmit channel sounding signals.

Step 504

[0070] The user equipment 120 transmits channel sounding signals.

Step 505

[0071] The second base station 130 listens to the channel sounding sent by the user equipment 120 and performs quality measurements on said channel sounding signals. The received power on the channel sounding reference signal transmission from the user equipment 120 may be measured and the resulting measurement value is used by the radio network for evaluating if the user equipment 120 shall perform a handover to the second base station 130 or not.

Step 506

[0072] The second base station 130 sends measurement reports to the first base station 110, regarding the results of the quality measurements on said channel sounding signals.

Step 507

[0073] The first base station 110 reads the measurement reports from the second base station 130 and decides when it is feasible to perform handover based on the measurement report, i.e. information is obtained that it is feasible to perform handover.

Step 508

[0074] When decided that it is feasible to perform handover of the user equipment 120 to the second cell 135, the first base station 110 requests the second base station 130 to prepare handover of the user equipment 120 to the second cell.

Step 509

[0075] The first base station 110 then commands the user equipment 120 to perform handover to the second cell 135.

Step 510

[0076] The user equipment 120 performs handover to the second cell 135 and may then start to communicate with the second base station 130.

[0077] The method steps in the first base station 110 for supporting DTX, according to some embodiments will now be described with reference to a flowchart depicted in **Figure 6**. As mentioned above the first base station 110 serves the first cell 115. The first cell 115 is in active mode. The first base station 110 communicates with the user equipment 120 within the first cell 115 over a radio carrier. The first base station 110 is comprised in a radio communications system, which radio communications system further comprises the user equipment 120 and the second base station 130 serving the second cell 135. The second cell state is in a non observable mode.

[0078] The method comprising the following steps, which steps may as well be carried out in another suitable order than described below:

Step 601

[0079] This is an optional step. The first base station 110 may in some embodiments detect or receive information from the user equipment 120, that the user equipment 120 requires a service that not is provided by the first base station 110. It may e.g. include subscription information such as e.g. that only high paying user equipments can wake up a micro cell.

Step 602

[0080] This step is the first step, if optional step 601 is not performed. The first base station 110 sends to the second base station 130, a request to switch the second cell state from a non observable mode to an observable mode for said user equipment 120.

[0081] In some embodiments, this step is triggered when the traffic load within the first cell exceeds a predetermined threshold value.

[0082] In some embodiments, wherein the optional step 601 is performed, this step is triggered upon receiving the information that the user equipment 120 requires a service that not is provided by the first base station 110.

Step 603

[0083] In this step the second base station 130 sends to the user equipment 120 or to the second base station, a request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements.

[0084] In some first embodiments, the request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements, is sent to the second base station 130, and is represented by a request to send reference signals to be measured on by the user equipment 120.

[0085] In some second embodiments, the request to perform signalling between the user equipment 120 and

the second base station 130 for quality measurements is represented by a request to the user equipment 120 to transmit channel sounding signals, and a request to the second base station 130 to measure on said channel sounding signal transmission.

Step 604

[0086] The second base station then obtains information that handover is feasible, based on quality measurement of the performed signalling.

[0087] The obtained information that handover is feasible based on quality measurement of the performed signalling, may in the first embodiments be represented by a handover request from the user equipment 120 based on quality measurement of the reference signal by the user equipment 120 .

[0088] In the other embodiments, the obtained information that handover is feasible based on quality measurement of the performed signalling, may be represented by receiving from the second base station 130 a measurement report based on quality measurement performed by the second base station 130 on the channel sounding signals.

Step 605

[0089] After receiving the information, the first base station 110 sends to the second base station 130, a request to prepare handover of the user equipment 120 from the first cell 115 to the second cell 135.

Step 606

[0090] The first base station 110 also sends to the user equipment 120, a command to perform handover to the second cell 135. The present method may end when this step and step 605 are performed.

Step 607

[0091] This is an optional step. In this step the first base station 110 may send to the second base station 130, information about the current first cell state, and /or receive from the second base station 110, information about the current second cell state.

[0092] To perform the method steps above for supporting DTX, the first base station 110 comprises an arrangement 700 depicted in Figure 7. As mentioned above, the first base station 110 serves the first cell 115. The first cell state is adapted to be in active mode. The first base station 110 is arranged to communicate with the user equipment 120 within the first cell 115 over a radio carrier. The first base station 110 is comprised in the radio communications system 100. The radio communications system 100 further comprises the user equipment 120 and the second base station 130 serving the second cell 135. The sate of the second cell 135 is adapted to be in a non observable mode for the user equipment 120.

[0093] The first base station arrangement 700 comprising a sending unit 710 configured to send to the second base station 130, a request to switch the second cell state from a non observable mode to an observable mode for said user equipment 120.

[0094] The sending unit 710 is further configured to send to the user equipment 120 or to the second base station 130, a request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements.

[0095] According to some first embodiments, the request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements is represented by a request to the second base station 130 to send reference signals to be measured on by the user equipment 120.

[0096] According to some second embodiments, the request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements is represented by a request to the user equipment 120 to transmit channel sounding signals, and a request to the second base station 130 to measure on said channel sounding signal transmission.

[0097] The sending unit 710 is further configured to send to the second base station 130, a request to prepare handover of the user equipment 120 from the first cell 115 to the second cell 135.

[0098] The sending unit 710 is further configured to send to the user equipment 120 a command to perform handover to the second cell 135.

[0099] In some embodiments, the sending unit 710 may further be configured to send to the second base station 130 information about the current first cell state.

[0100] The sending unit 710 may further be configured to be triggered to send to the second base station 130, the request to switch the second cell state from a non observable mode to observable mode, when the traffic load within the first cell exceeding a predetermined threshold value.

[0101] The first base station arrangement 700 further comprises an obtaining unit 720 configured to obtain information that handover is feasible, based on quality measurement of the performed signalling.

[0102] According to the first embodiments, the obtained information that handover is feasible based on quality measurement of the performed signalling, may be represented by a handover request from the user equipment 120 based on quality measurement of the reference signal by the user equipment 120 .

[0103] According to the second embodiments, the obtain of information that handover is feasible based on quality measurement of the performed signalling, is represented by a measurement report, based on quality measurement performed by the second base station 130 on the channel sounding signals.

[0104] The first base station arrangement 700 may further comprise a receiving unit 730 configured to receive

from the second base station 130 information about the current second cell state.

[0105] In some embodiments, the receiving unit 730 further is configured to receive from the user equipment 120, information that the user equipment 120 requires a service that not is provided by the first base station 110. In these embodiments, the sending unit 710 may further be configured to be triggered to send to the second base station 130, the request to switch the second cell state from a non observable mode to observable mode, said information.

[0106] The method steps in the second base station 130 for supporting DTX according to some embodiments will now be described with reference to a flowchart depicted in Figure 8. As mentioned above, the second base station 130 serves the second cell 135. The cell second cell 135 is in a non observable mode. The second base station may perform DTX, when the second cell state is in non observable mode. The second base station 130 is comprised in the radio communications system 100. The radio communications system 100 further comprises the first base station 110 communicating with the user equipment 120 over a radio carrier being active.

[0107] The method comprises the following steps that may as well be carried out in another suitable order than described below:

Step 801

[0108] The second base station 130 receives from the first base station 110, a request to switch the second cell state from a non observable mode to an observable mode for said user equipment 120.

Step 802

[0109] The second base station 130 switches the second cell state from a non observable mode to an observable mode for said user equipment 120.

Step 803

[0110] The second base station 130 receives from the first base station 110, a request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements.

[0111] In some first embodiments the request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements, is represented by a request to send reference signals to be measured on by the user equipment 120.

[0112] In some second embodiments, the request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements is represented by a request to the second base station 130 to measure on said channel sounding signal transmission.

Step 804

[0113] The second base station 130 signals with, i.e. to or from the user equipment 120. The signal is to be used by the user equipment 120 for quality measurement.

[0114] In the first embodiments, the signalling to or from the user equipment 120, may be represented by sending the requested reference signals.

Step 805

[0115] This is an optional step relating to the second embodiments. The second base station may measure the quality on channel sounding signals observed from the user equipment 120.

Step 806

[0116] This is an optional step relating to the second embodiments. The second base station 130 sends to the first base station 110, a measurement report based on the quality measurement performed on the channel sounding signals.

Step 807

[0117] The second base station 130 receives from the first base station 110, a request to prepare a handover of the user equipment 120 from a first cell 115 served by the first base station 110 to the second cell 135 served by the second base station 130. The handover request is based on quality measurement on said signalling.

Step 808

[0118] When the second cell state is in observable mode, the second base station 130 switches the second cell state from observable mode to active mode.

Step 809

[0119] As requested, the second base station prepares handover of the user equipment 120 from the first cell 115 to the second cell 135. The present method may end at this step.

Step 810

[0120] This is an optional step. The second base station 130 may send to the first base station 110 information about the current second cell state. The present method may end at this step.

Step 811

[0121] This is also an optional step. The second base station 130 may receive from the first base station 110,

information about the current first cell state. The present method may end at this step.

[0122] To perform the method steps above for supporting DTX, the second base station 130 comprises an arrangement 900 depicted in **Figure 9**. As mentioned above, the second base station 130 serves the second cell 135. The second cell 135 is adapted to be in a non observable mode for the user equipment 120. Base station DTX may be arranged to be performed within the second base station 130, when the second cell state is in a non observable mode. The second base station 130 is comprised in a radio communications system 100. The radio communications system 100 further comprises the first base station 110 arranged to communicate with the user equipment 120 over a radio carrier being active.

[0123] The second base station arrangement 900 comprises **a receiving unit 910** configured to receive from the first base station 110, a request to switch the second cell state from a non observable mode to an observable mode for said user equipment 120.

[0124] The receiving unit 910 is further configured to receive from the first base station 110, a request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements.

[0125] According to some first embodiments, the request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements may be represented by a request to send reference signals to be measured on by the user equipment 120.

[0126] According to some second embodiments, the request to perform signalling between the user equipment 120 and the second base station 130 for quality measurements, may be represented by a request to the second base station 130 to measure on said channel sounding signal transmission.

[0127] The receiving unit 910 is further configured to receive from the first base station 110, a request to prepare a handover of the user equipment 120 from a first cell 115 served by the first base station 110 to a second cell 135 served by the second base station 130. The handover request is based on quality measurement on said signalling.

[0128] The second base station arrangement 900 further comprising a switching unit 920 configured to switch the second cell state from a non observable mode to an observable mode for said user equipment 120.

[0129] The switching unit 920 is further configured to switch the second cell state from observable mode to active mode, when the second cell state is in observable mode.

[0130] The second base station arrangement 900 further comprises a signalling unit 930 configured to signal to or from the user equipment 120, which signal is to be used for quality measurement.

[0131] According to the second embodiments, the signalling to or from the user equipment 120, may be represented by sending the requested reference signals.

[0132] The signalling unit 930 may further be configured to send to the first base station 110, information about the current second cell state.

[0133] The signalling unit 930 may further be configured to receive from the first base station 110, information about the current first cell state.

[0134] The second base station arrangement 900 further comprises a preparing unit 940 configured to prepare handover of the user equipment 120 from the first cell 115 to the second cell 135.

[0135] According to some of the second embodiments, the second base station arrangement 900 further comprises a measuring unit 950 configured to measure the quality on channel sounding signals observed from the user equipment 120.

[0136] In these embodiments, the signalling unit 930 may further be configured to send to the first base station 110, a measurement report based on the quality measurement performed on the channel sounding signals.

[0137] The method steps in the user equipment 120 supporting DTX according to some embodiments, will now be described with reference to a flowchart depicted in **Figure 10**. As mentioned above, the user equipment 120 is present in the first cell 115 and communicates over a radio carrier with the first base station 110. The first base station 110 serves the first cell 115. The first cell 115 is in an active mode. The user equipment 120 and the first base station 110 are comprised in a radio communications system 100. The radio communications system 100 further comprises the second base station 130 serving the second cell 135. The second cell 135 is in a non observable mode. The method comprises the following steps that may as well be carried out in another suitable order than described below:

Step 1001

[0138] This step is optional. According to a first embodiment, the user equipment 120 may send to the first base station 110, information that the user equipment 120 requires a service that not is provided by the first base station 110.

Step 1002

[0139] If optional step 1001 is not performed, this step starts the present method. The user equipment receives from the first base station 110, a request to perform channel sounding signalling to be observed by the second base station 130 for quality measurements. The second base station 130 has been requested by the first base station 110 to switch the second cell state from a non observable mode to observable mode.

[0140] According to the first embodiment, this step may be a response to the reception of the information received in step 1001.

Step 1003

[0141] The user equipment 120 signals channel sounding to be observed by the second base station 130 for quality measurements.

Step 1004

[0142] The user equipment 120 receives 1004 from the first base station 110 a command to perform handover to the second cell 135, which handover command is based on quality measurement performed by the second base station 130 on the signalled channel sounding observed by the second base station 130.

Step 1005

[0143] The user equipment 120 performs the commanded handover from the first cell 115 to the second cell 135.

[0144] To perform the method steps above for supporting DTX, the user equipment 120 comprises an arrangement 1100 depicted in **Figure 11**. As mentioned above. The user equipment 120 is arranged to be in the first cell 115. The user equipment is adapted to communicate over a radio carrier with a first base station 110 serving the first cell 115.The first cell 115 is adapted to be in active mode. The user equipment 120 and the first base station 110 are comprised in a radio communications system 100. The radio communications system 100 further comprises the second base station 130 adapted to serve the second cell 135. The second cell 135 is arranged to be in a non observable mode for the user equipment 120.

[0145] The user equipment arrangement 1100 comprises a signalling unit 1110 configured to receive from the first base station 110, a request to perform channel sounding signalling to be observed by the second base station 130 for quality measurements. The second base station 130 has been requested by the first base station 110 to switch the second cell state from a non observable mode to observable mode.

[0146] The signalling unit 1110 is further configured to signal channel sounding to be observed by the second base station 130 for quality measurements.

[0147] The signalling unit 1110 is further configured to receive from the first base station 110 a command to perform handover to the second cell 135. The handover command is based on quality measurement performed by the second base station 130 on the signalled channel sounding observed by the second base station 130.

[0148] In one embodiment, the signalling unit 1110 may further be configured to send to the first base station 110, information that the user equipment 120 requires a service that not is provided by the first base station 110.

[0149] The user equipment arrangement 1100 further comprises a performing unit 1120 configured to perform a handover from the first cell 115 to the second cell 135.

[0150] The present mechanism for supporting DTX, may be implemented through one or more processors, such as a processor 740 in the first base station arrangement 700 depicted in Figure 7, a processor 960 in the second base station arrangement 900 depicted in Figure 9, or a processor 1130 in the user equipment arrangement 1100 depicted in Figure 11, together with computer program code for performing the functions of the present solution. The program code mentioned above may also be provided as a computer program product, for instance in the form of a data carrier carrying computer program code for performing the present solution when being loaded into the first base station 110, the second base station 130 or the user equipment 120. One such carrier may be in the form of a CD ROM disc. It is however feasible with other data carriers such as a memory stick. The computer program code can furthermore be provided as pure program code on a server and downloaded to the first base station 110, the second base station 130 or the user equipment 120 remotely.

[0151] When using the word "comprise" or "comprising" it shall be interpreted as nonlimiting, i.e. meaning "consist at least of".

[0152] The present invention is not limited to the above described preferred embodiments. Various alternatives, modifications and equivalents may be used. Therefore, the above embodiments should not be taken as limiting the scope of the invention, which is defined by the appending claims.

Claims

1. A method in a first base station (110) for supporting Discontinuous Transmission "DTX", the first base station (110) serving a first cell (115), the first cell (115) being in an active mode, the first base station (110) communicating with a user equipment (120) within the first cell (115) over a radio carrier, the first base station (110) being comprised in a radio communications system (100) which radio communications system further comprises the user equipment (120) and a second base station (130) serving a second cell (135), the second cell (135) being in a non observable mode for the user equipment (120), the method comprising:

sending (602) to the second base station (130), a request to switch the second cell state from non observable mode to an observable mode for said user equipment (120),

sending to the user equipment (120) a request to transmit channel sounding signals and sending to the second base station (130) a request to measure on said channel sounding signal transmission,

obtaining (604) information that handover is feasible, based on quality measurement of the performed signalling,

sending (605) to the second base station (130), a request to prepare handover of the user equipment (120) from the first cell (115) to the second cell (135), and
sending (606) to the user equipment (120) a command to perform handover to the second cell (135).

2. Method according to claim 1, further comprising:

sending (607) to the second base station (130) information about the current first cell state.

3. Method according to any of the claims 1-2, further comprising:

receiving (607) from the second base station information about the current second cell state.

4. Method according to any of the claims 1-3, wherein the step of sending (602) to the second base station (130), a request to switch the second cell state from a non observable mode to an observable mode for said user equipment (120) is triggered when the traffic load within the first cell (115) exceeds a predetermined threshold value.

5. Method according to any of the claims 1-3, wherein the step of sending (602) to the second base station (130), a request to switch the second cell state from a non observable mode to an observable mode is triggered upon:

receiving (601) from the user equipment (120) information or detecting that the user equipment (120) requires a service that not is provided by the first base station (110).

6. Method according to any of the claims 1-5, wherein the request to perform signalling between the user equipment (120) and the second base station (130) for quality measurements, is sent to the second base station (130), and is represented by a request to send reference signals to be measured by the user equipment (120).

7. Method according to claim 6, wherein the obtained information that handover is feasible based on quality measurement of the performed signalling, is represented by a handover request from the user equipment (120) based on quality measurement of the reference signal by the user equipment (120).

8. Method according to claim 1, wherein the obtained information that handover is feasible based on quality measurement of the performed signalling, is represented by receiving from the second base station (130) a measurement report based on quality measurement performed by the second base station (130) on the channel sounding signals.

9. A method in a second base station (130) for supporting Discontinuous Transmission DTX the second base station (130) serving a second cell (135), the second base station (130) being comprised in a radio communications system (100), which radio communications system (100) further comprises a first base station (110) communicating with a user equipment (120) over a radio carrier being active, the second cell (135) being in an non observable mode for the user equipment (120), the method comprising:

receiving (801) from the first base station (110), a request to switch the second cell state from non observable mode to an observable mode for said user equipment 120,
switching (802) the second cell state from a non observable mode to an observable mode for said user equipment (120),
receiving (803) from the first base station (110), a request to measure on a channel sounding signal transmission of the user equipment (120) and measuring (805) the quality on channel sounding signals observed from the user equipment (120),
signalling (804) to or from the user equipment (120), which signal is to be used for quality measurement,
receiving (807) from the first base station (110), a request to prepare a handover of the user equipment (120) from the first cell (115) served by the first base station (110) to the second cell (135) served by the second base station (130), which handover request is based on quality measurement on said signalling,
switching (808) the second cell state from observable mode to active mode, and
preparing (809) handover of the user equipment (120) from the first cell (115) to the second cell (135).

10. Method according to claim 9, wherein base station DTX is performed within the second base station (130), when the second cell state is in the non observable mode.

11. Method according to any of the claims 9-10, further comprising:

sending (810) to the first base station (110) information about the current second cell state.

12. Method according to any of the claims 9-11, further comprising:

receiving (811) from the first base station (110)

information about the current first cell state.

13. Method according to any of the claims 9-12, wherein the request to perform signalling between the user equipment (120) and the second base station (130) for quality measurements, is represented by a request to send reference signals to be measured on by the user equipment (120), and wherein the signalling (804) to or from the user equipment (120), is represented by sending the requested reference signals.

14. Method according to claim 9, further comprising:

sending (806) to the first base station (110), a measurement report based on the quality measurement performed on the channel sounding signals.

15. A method in a user equipment (120) for supporting Discontinuous Transmission ,"DTX", the user equipment (120) being in a first cell (115) communicating over a radio carrier with a first base station (110) serving the first cell (115), the first cell (115) being in an active mode, the user equipment and the first base station (110) being comprised in a radio communications system (100), which radio communications system (100) further comprises a second base station (130) serving a second cell (135), the second cell (135) being in a non observable mode, the method comprising:

receiving (1002) from the first base station (110), a request to perform channel sounding signalling to be observed by the second base station (130) for quality measurements, which second base station (130) has been requested by the first base station (110) to switch the second cell state from the non observable mode to an observable mode for said user equipment (120),
signalling (1003) channel sounding to be observed by the second base station (130) for quality measurements,
receiving (1004) from the first base station (110) a command to perform handover to the second cell (135), which handover command is based on quality measurement performed by the second base station (130) on the signalled channel sounding observed by the second base station (130), and
performing (1005) the commanded handover from the first cell (115) to the second cell (135).

16. Method according to claim 15, wherein the request to perform channel sounding signalling is sent by the first base station as a response to:

sending (1001) to the first base station (110) information that the user equipment (120) requires a service that is not provided by the first base station (110).

17. A first base station (110) comprising an arrangement (700) for supporting Discontinuous Transmission, DTX, the first base station (110) serving a first cell (115), the first cell (115) is adapted to be in an active mode, the first base station (110) being arranged to communicating with a user equipment (120) within the first cell (115) over a radio carrier, the first base station (110) being comprised in a radio communications system (100) which radio communications system (100) further comprises the user equipment (120) and a second base station (130) serving a second cell (135),
the first base station arrangement (700) comprising an obtaining unit (720) configured to obtain information that handover is feasible, based on quality measurement of the performed signalling,
the first base station arrangement further comprising a sending unit (710) further being configured to send to the second base station (130), a request to prepare handover of the user equipment (120) from the first cell (115) to the second cell (135), and
the sending unit (710) further is configured to send to the user equipment (120) a command to perform handover to the second cell (135)
characterised in that the second cell (135) is adapted to be in a non observable mode,
the sending unit of the first base station arrangement (700) is configured to send to the second base station (130), a request to switch the second cell state from the non observable mode to an observable mode for said user equipment (120), and
which sending unit (710) further is configured to send to the user equipment (120) a request to transmit channel sounding signals and sending to the second base station (130) a request to measure on said channel sounding signal transmission.

18. A second base station (130) comprising an arrangement (900) for supporting Discontinuous Transmission, DTX the second base station (130) serving a second cell (135), the second base station (130) being comprised in a radio communications system (100), which radio communications system (100) further comprises a first base station (110) arranged to communicate with a user equipment (120) over a radio carrier being active,
the second base station arrangement (900) comprising a switching unit (920) configured to switch the second cell state from a non observable mode to an observable mode for said user equipment (120),
the second base station arrangement (900) further comprising a signalling unit (930) configured to signal to or from the user equipment (120), which signal is to be used for quality measurement,

the second base station arrangement (900) comprising a receiving unit (910) further being configured to receive from the first base station (110), a request to prepare a handover of the user equipment (120) from a first cell (115) served by the first base station (110) to a second cell (135) served by the second base station (130), which handover request is based on quality measurement on said signalling,
the switching unit (920) further being configured to switch the second cell state from observable mode to active mode, when the second cell state is in observable mode,
the second base station arrangement (900) further comprising a preparing unit (940) configured to prepare handover of the user equipment (120) from the first cell (115) to the second cell (135),
characterized in that the second cell (135) is adapted to be in an non observable mode,
wherein the receiving unit (910) is configured to receive from the first base station (110), a request to switch the second cell state from a non observable mode to an observable mode for said user equipment (120),
wherein the receiving unit (910) further is configured to receive from the first base station (110), a request to measure on said channel sounding signal transmission, and
wherein the second base station arrangement (900) further comprises a measuring unit (950) configured to measure the quality on channel sounding signals observed from the user equipment (120).

19. A user equipment (120) comprising an arrangement (1100) for supporting Discontinuous Transmission , DTX, the user equipment (120) is arranged to be in a first cell (115) and is adapted to communicate over a radio carrier with a first base station (110) serving the first cell (115), the first cell (115) is adapted to be in active mode, the user equipment 120 and the first base station (110) being comprised in a radio communications system (100), which radio communications system (100) further comprises a second base station (130) adapted to serve a second cell (135),
the user equipment arrangement (1100) comprising a signalling unit (1110) configured to signal channel sounding to be observed by the second base station (130) for quality measurements,
the signalling unit (1110) further being configured to receive from the first base station (110) a command to perform handover to the second cell (135), which handover command is based on quality measurement performed by the second base station (130) on the signalled channel sounding observed by the second base station (130),
the user equipment arrangement (1100) comprising a performing unit (1120) configured to perform a handover from the first cell (115) to the second cell (135)
characterised in that the second cell (135) is arranged to be in an non observable mode,
wherein the signalling unit (1110) configured to receive from the first base station (110), a request to perform channel sounding signalling to be observed by the second base station (130) for quality measurements, and
which second base station (130) has been requested by the first base station (110) to switch the second cell state from the non observable mode to an observable mode for said user equipment (120),

Patentansprüche

1. Verfahren in einer ersten Basisstation (110) zum Unterstützen einer diskontinuierlichen Übertragung ("Discontinuous Transmission" - DTX), wobei die erste Basisstation (110) eine erste Zelle (115) bedient, wobei die erste Zelle (115) in einem aktiven Modus ist, wobei die erste Basisstation (110) mit einem Anwendergerät (120) innerhalb der ersten Zelle (115) über einen Funkträger kommuniziert, wobei die erste Basisstation (110) in einem Funkkommunikationssystem (100) enthalten ist, wobei das Funkkommunikationssystem des Weiteren das Anwendergerät (120) und eine zweite Basisstation (130) umfasst, die eine zweite Zelle (135) bedient, wobei die zweite Zelle (135) in einem für das Anwendergerät (120) nicht beobachtbaren Modus ist, wobei das Verfahren umfasst:

Senden (602) einer Anfrage an die zweite Basisstation (130), den Zustand der zweiten Zelle aus dem nicht beobachtbaren Modus in einen für das Anwendergerät (120) beobachtbaren Modus zu schalten,
Senden eine Anfrage, Kanalmesssignale zu übertragen, an das Anwendergerät (120) und Senden einer Anfrage, die Messsignalübertragung auf dem Kanal zu messen, an die zweite Basisstation (130),
Erhalten (604) von Informationen, dass eine Übergabe durchführbar ist, auf der Basis einer Qualitätsmessung der durchgeführten Signalleitung,
Senden (605) einer Anfrage an die zweite Basisstation (130), eine Übergabe des Anwendergeräts (120) von der ersten Zelle (115) zur zweiten Zelle (135) vorzubereiten, und
Senden (606) eines Befehls an das Anwendergerät (120), eine Übergabe an die zweite Zelle (135) durchzuführen.

2. Verfahren nach Anspruch 1, des Weiteren umfassend:

Senden (607) von Informationen über den aktuellen Zustand der ersten Zelle an die zweite Basisstation (130).

3. Verfahren nach einem der Ansprüche 1 bis 2, des Weiteren umfassend:

Empfangen (607) von Informationen über den aktuellen Zustand der zweiten Zelle von der zweiten Basisstation.

4. Verfahren nach einem der Ansprüche 1 bis 3, wobei der Schritt des Sendens (602) einer Anfrage an die zweite Basisstation (130), den Zustand der zweiten Zelle aus dem nicht beobachtbaren Modus in einen für das Anwendergerät (120) beobachtbaren Modus zu schalten, ausgelöst wird, wenn die Verkehrslast innerhalb der ersten Zelle (115) einen vorgegebenen Schwellenwert übersteigt.

5. Verfahren nach einem der Ansprüche 1 bis 3, wobei der Schritt des Sendens (602) einer Anfrage an die zweite Basisstation (130), den Zustand der zweiten Zelle aus dem nicht beobachtbaren Modus in einen beobachtbaren Modus zu schalten, ausgelöst wird beim:

Empfangen (601) von Information vom Anwendergerät (120) oder Erfassen, dass das Anwendergerät (120) einen Dienst benötigt, der von der ersten Basisstation (110) nicht bereitgestellt wird.

6. Verfahren nach einem der Ansprüche 1 bis 5, wobei die Anfrage, eine Signalleitung zwischen dem Anwendergerät (120) und der zweiten Basisstation (130) für Qualitätsmessungen durchzuführen, zur zweiten Basisstation (130) gesendet wird und durch eine Anfrage dargestellt ist, Referenzsignale zu senden, die vom Anwendergerät (120) gemessen werden.

7. Verfahren nach Anspruch 6, wobei die erhaltenen Informationen, dass eine Übergabe basierend auf einer Qualitätsmessung der durchgeführten Signalleitung durchführbar ist, durch eine Übergabeanfrage vom Anwendergerät (120) dargestellt ist, die auf einer Qualitätsmessung des Referenzsignals durch das Anwendergerät (120) basiert.

8. Verfahren nach Anspruch 1, wobei die erhaltenen Informationen, dass eine Übergabe basierend auf einer Qualitätsmessung der durchgeführten Signalleitung durchführbar ist, durch einen Empfang eines Messberichts basierend auf einer Qualitätsmessung, die von der zweiten Basisstation (130) an den Kanalmesssignalen durchgeführt wurde, von der zweiten Basisstation (130) dargestellt ist.

9. Verfahren in einer zweiten Basisstation (130) zum Unterstützen einer diskontinuierlichen Übertragung (DTX), wobei die zweite Basisstation (130) eine zweite Zelle (135) bedient, wobei die zweite Basisstation (130) in einem Funkkommunikationssystem (100) enthalten ist, wobei das Funkkommunikationssystem (100) des Weiteren eine erste Basisstation (110) umfasst, die mit einem Anwendergerät (120) über einen Funkträger kommuniziert, der aktiv ist, wobei die zweite Zelle (135) in einem für das Anwendergerät (120) nicht beobachtbaren Modus ist, wobei das Verfahren umfasst:

Empfangen (801) einer Anfrage von der ersten Basisstation (110), den Zustand der zweiten Zelle aus einem nicht beobachtbaren Modus in einen für das Anwendergerät (120) beobachtbaren Modus zu schalten,
Umschalten (802) des Zustandes der zweiten Zelle aus einem nicht beobachtbaren Modus in einen für das Anwendergerät (120) beobachtbaren Modus,
Empfangen (803) einer Anfrage von der ersten Basisstation (110), auf einem Kanal eine Messsignalübertragung des Anwendergeräts (120) zu messen, und Messen (805) der Qualität von Kanalmesssignalen, die vom Anwendergerät (120) beobachtet werden,
Signalleitung (804) zum oder vom Anwendergerät (120), welches Signal für eine Qualitätsmessung verwendet wird,
Empfangen (807) einer Anfrage von der ersten Basisstation (110), eine Übergabe des Anwendergeräts (120) von der ersten Zelle (115), die von der ersten Basisstation (110) bedient wird, zur zweiten Zelle (135), die von der zweiten Basisstation (130) bedient wird, vorzubereiten, wobei die Übergabeanfrage auf einer Qualitätsmessung der Signalleitung basiert,
Umschalten (808) des Zustandes der zweiten Zelle von einem beobachtbaren Modus in einen aktiven Modus und
Vorbereiten (809) einer Übergabe des Anwendergeräts (120) von der ersten Zelle (115) zur zweiten Zelle (135).

10. Verfahren nach Anspruch 9, wobei die Basisstation DTX innerhalb der zweiten Basisstation (130) durchgeführt wird, wenn der Zustand der zweiten Zelle im nicht beobachtbaren Modus ist.

11. Verfahren nach einem der Ansprüche 9 bis 10, des Weiteren umfassend:

Senden (810) von Informationen über den aktuellen Zustand der zweiten Zelle zur ersten Basisstation (110).

12. Verfahren nach einem der Ansprüche 9 bis 11, des Weiteren umfassend:

Empfangen (811) von Informationen über den aktuellen Zustand der ersten Zelle von der ersten Basisstation (110).

13. Verfahren nach einem der Ansprüche 9 bis 12, wobei die Anfrage, eine Signalleitung zwischen dem Anwendergerät (120) und der zweiten Basisstation (130) für Qualitätsmessungen durchzuführen, durch eine Anfrage, zu messende Referenzsignale von dem Anwendergerät (120) zu senden, dargestellt ist und wobei die Signalleitung (804) zum oder vom Anwendergerät (120) durch Senden der angefragten Referenzsignale dargestellt ist.

14. Verfahren nach Anspruch 9, des Weiteren umfassend:

Senden (806) eines Messberichts basierend auf der Qualitätsmessung, die an den Kanalmesssignalen durchgeführt wurde, zur ersten Basisstation (110).

15. Verfahren in einem Anwendergerät (120) zum Unterstützen einer diskontinuierlichen Übertragung (DTX), wobei sich das Anwendergerät (120) in einer ersten Zelle (115) befindet, die über einen Funkträger mit einer ersten Basisstation (110) kommuniziert, die die erste Zelle (115) bedient, wobei die erste Zelle (115) in einem aktiven Modus ist, wobei das Anwendergerät und die erste Basisstation (110) in einem Funkkommunikationssystem (100) enthalten sind, wobei das Funkkommunikationssystem (100) des Weiteren eine zweite Basisstation (130) umfasst, die eine zweite Zelle (135) bedient, wobei die zweite Zelle (135) in einem nicht beobachtbaren Modus ist, wobei das Verfahren umfasst:

Empfangen (1002) einer Anfrage von der ersten Basisstation (110), eine Kanalmesssignalleitung, die von der zweiten Basisstation (130) zu Qualitätsmessungen beobachtet wird, durchzuführen, wobei von der ersten Basisstation (110) eine Anfrage an die zweite Basisstation (130) gestellt wurde, den Zustand der zweiten Zelle aus dem nicht beobachtbaren Modus in einen für das Anwendergerät (120) beobachtbaren Modus zu stellen,

Kanalmesssignalleitung (1003), die von der zweiten Basisstation (130) für Qualitätsmessungen beobachtet wird,

Empfangen (1004) eines Befehls von der ersten Basisstation (110), eine Übergabe zur zweiten Zelle (135) durchzuführen, wobei der Übergabebefehl auf einer Qualitätsmessung basiert, die von der zweiten Basisstation (130) an den Kanalmesssignalen durchgeführt wurde, die von der zweiten Basisstation (130) beobachtet wurden, und

Durchführen (1005) der befohlenen Übergabe von der ersten Zelle (115) an die zweite Zelle (135).

16. Verfahren nach Anspruch 15, wobei die Anfrage, eine Kanalmesssignalleitung durchzuführen von der ersten Basisstation als Reaktion auf
das Senden (1001) von Informationen an die erste Basisstation (110), dass das Anwendergerät (120) einen Dienst benötigt, der von der ersten Basisstation (110) nicht bereitgestellt wird,
gesendet wird.

17. Erste Basisstation (110), die eine Anordnung (700) zum Unterstützen einer diskontinuierlichen Übertragung (DTX) umfasst, wobei die erste Basisstation (110) eine erste Zelle (115) bedient, wobei die erste Zelle (115) dazu ausgebildet ist, in einem aktiven Modus zu sein, wobei die erste Basisstation (110) zur Kommunikation mit einem Anwendergerät (120) innerhalb der ersten Zelle (115) über einen Funkträger angeordnet ist, wobei die erste Basisstation (110) in einem Funkkommunikationssystem (100) enthalten ist, wobei das Funkkommunikationssystem (100) des Weiteren das Anwendergerät (120) und eine zweite Basisstation (130) umfasst, die eine zweite Zelle (135) bedient,
wobei die erste Basisstationsanordnung (700) eine Gewinnungseinheit (720) umfasst, die zum Gewinnen von Informationen konfiguriert ist, dass eine Übergabe durchführbar ist, basierend auf einer Qualitätsmessung der durchgeführten Signalleitung,
wobei die erste Basisstationsanordnung des Weiteren eine Sendeeinheit (710) umfasst, die des Weiteren zum Senden einer Anfrage zur zweiten Basisstation (130), eine Übergabe des Anwendergeräts (120) von der ersten Zelle (115) zur zweiten Zelle (135) vorzubereiten, konfiguriert ist, und
die Sendeeinheit (710) des Weiteren zum Senden eines Befehls zum Anwendergerät (120), die Übergabe zur zweiten Zelle (135) durchzuführen, konfiguriert ist,
dadurch gekennzeichnet, dass die zweite Zelle (135) dazu ausgebildet ist, in einem nicht beobachtbaren Modus zu sein,
wobei die Sendeeinheit der ersten Basisstationsanordnung (700) zum Senden einer Anfrage zur zweiten Basisstation (130), den Zustand der zweiten Zelle aus einem nicht beobachtbaren Modus in einen für das Anwendergerät (120) beobachtbaren Modus umzuschalten, konfiguriert ist und
wobei die Sendeeinheit (710) des Weitern zum Senden einer Anfrage an das Anwendergerät (120), Kanalmesssignale zu senden, sowie zum Senden einer Anfrage an die zweite Basisstation (130), die Messsi-

gnalübertragung auf dem Kanal zu messen, konfiguriert ist.

18. Zweite Basisstation (130), die eine Anordnung (900) zum Unterstützen einer diskontinuierlichen Übertragung (DTX) umfasst, wobei die zweite Basisstation (130) eine zweite Zelle (135) bedient, wobei die zweite Basisstation (130) in einem Funkkommunikationssystem (100) enthalten ist, wobei das Funkkommunikationssystem des Weiteren eine erste Basisstation (110) umfasst, die dazu ausgebildet ist, mit einem Anwendergerät (120) über einen Funkträger zu kommunizieren, der aktiv ist,
wobei die zweite Basisstationsanordnung (900) eine Schalteinheit (920) umfasst, die zum Umschalten des Zustandes der zweiten Zelle aus einem nicht beobachtbaren Modus in einen für das Anwendergerät (120) beobachtbaren Modus konfiguriert ist,
wobei die zweite Basisstationsanordnung (900) des Weiteren eine Signalleitungseinheit (930) umfasst, die zur Signalleitung zum oder vom Anwendergerät (120) konfiguriert ist, wobei das Signal für eine Qualitätsmessung verwendet wird,
wobei die zweite Basisstationsanordnung (900) eine Empfangseinheit (910) umfasst, die des Weiteren zum Empfangen einer Anfrage von der ersten Basisstation (110), eine Übergabe des Anwendergeräts (120) von der ersten Zelle (115), die von der ersten Basisstation (110) bedient wird, zur zweiten Zelle (135), die von der zweiten Basisstation (130) bedient wird, vorzubereiten, konfiguriert ist, wobei die angefragte Übergabe auf einer Qualitätsmessung der Signalleitung basiert,
wobei die Schalteinheit (920) des Weiteren zum Umschalten des Zustandes der zweiten Zelle aus einem beobachtbaren Modus in einen aktiven Modus konfiguriert ist, wenn der Zustand der zweiten Zelle im beobachtbaren Modus ist,
wobei die zweite Basisstationsanordnung (900) des Weiteren eine Vorbereitungseinheit (940) umfasst, die zum Vorbereiten einer Übergabe des Anwendergeräts (120) von der ersten Zelle (115) zur zweiten Zelle (135) konfiguriert ist,
dadurch gekennzeichnet, dass die zweite Zelle (135) dazu ausgebildet ist, in einem nicht beobachtbaren Modus zu sein,
wobei die Empfangseinheit (910) zum Empfangen einer Anfrage von der ersten Basisstation (110), den Zustand der zweiten Zelle aus einem nicht beobachtbaren Modus in einen für das Anwendergerät (120) beobachtbaren Modus umzuschalten, konfiguriert ist,
wobei die Empfangseinheit (910) des Weiteren zum Empfangen einer Anfrage von der ersten Basisstation (110), auf dem Kanal die Messsignalübertragung zu messen, konfiguriert ist, und
wobei die zweite Basisstationsanordnung (900) des Weiteren eine Messeinheit (950) umfasst, die zum Messen der Qualität von Kanalmesssignalen konfiguriert ist, die vom Anwendergerät (120) beobachtet werden.

19. Anwendergerät (120) umfassend eine Anordnung (1100) zum Unterstützen einer diskontinuierlichen Übertragung (DTX), wobei das Anwendergerät (120) so angeordnet ist, dass es sich in einer ersten Zelle (115) befindet, und zum Kommunizieren über einen Funkträger mit einer ersten Basisstation (110) ausgebildet ist, die die erste Zelle (115) bedient, wobei die erste Zelle (115) dazu ausgebildet ist, in einem aktiven Modus zu sein, wobei das Anwendergerät (120) und die erste Basisstation (110) in einem Funkkommunikationssystem (100) enthalten sind, wobei das Funkkommunikationssystem (100) des Weiteren eine zweite Basisstation (130) umfasst, die dazu ausgebildet ist, eine zweite Zelle (135) zu bedienen, wobei die Anwendergerätanordnung (1100) eine Signalleitungseinheit (1110) umfasst, die zum Leiten von Kanalmesssignalen, die von der zweiten Basisstation (130) für Qualitätsmessungen beobachtet werden, konfiguriert ist,
wobei die Signalleitungseinheit (1110) des Weiteren zum Empfangen eines Befehls von der ersten Basisstation (110), eine Übergabe an die zweite Zelle (135) durchzuführen, konfiguriert ist, wobei der Übergabebefehl auf Qualitätsmessungen basiert, die von der zweiten Basisstation (130) an den Kanalmesssignalen durchgeführt werden, die von der zweiten Basisstation (130) beobachtet werden,
wobei die Anwendergerätanordnung (1100) eine Durchführungseinheit (1120) umfasst, die zum Durchführen einer Übergabe von der ersten Zelle (115) zur zweiten Zelle (135) konfiguriert ist,
dadurch gekennzeichnet, dass die zweite Zelle (135) so angeordnet ist, dass sie in einem nicht beobachtbaren Modus ist,
wobei die Signalisierungseinheit (1110) zum Empfangen einer Anfrage von der ersten Basisstation (110), eine Kanalmesssignalisierung durchzuführen, die von der zweiten Basisstation (130) für Qualitätsmessungen beobachtet wird, konfiguriert ist, und
wobei an die zweite Basisstation (130) eine Anfrage von der ersten Basisstation (110) gestellt wurde, den Zustand der zweiten Zelle aus dem nicht beobachteten Modus in einen für das Anwendergerät (120) beobachtbaren Modus umzuschalten.

Revendications

1. Procédé destiné à prendre en charge, dans une première station de base (110), une transmission discontinue, DTX pour « Discontinuous Transmission », la première station de base (110) desservant une première cellule (115), la première

cellule (115) étant en mode actif, la première station de base (110) communiquant avec un équipement utilisateur (120) dans la première cellule (115) par l'intermédiaire d'une porteuse radio, la première station de base (110) faisant partie d'un système de communication radio (100), lequel système de communication radio comprenant en outre un équipement utilisateur (120) et une seconde station de base (130) desservant une seconde cellule (135), la seconde cellule (135) étant dans un mode non observable pour l'équipement utilisateur (120), le procédé comprenant :

l'envoi (602) à la seconde station de base (130) d'une demande de commutation de l'état de la seconde cellule du mode non observable à un mode observable pour ledit équipement utilisateur (120),
l'envoi à l'équipement utilisateur (120) d'une demande de signaux de sondage de canal de transmission et l'envoi à la seconde station de base (130) d'une demande de mesure portant sur ladite transmission d'un signal de sondage de canal,
l'obtention (604) d'informations indiquant qu'un transfert est réalisable sur la base de la mesure de qualité de la signalisation effectuée,
l'envoi (605) à la seconde station de base (130) d'une demande de préparation du transfert de l'équipement utilisateur (120) de la première cellule (115) à la seconde cellule (135), et
l'envoi (606) à l'équipement utilisateur (120) d'une commande d'exécution du transfert à la seconde cellule (135).

2. Procédé selon la revendication 1, comprenant en outre :

l'envoi (607) à la seconde station de base (130) d'informations concernant l'état courant de la première cellule.

3. Procédé selon l'une quelconque des revendications 1 et 2, comprenant en outre :

la réception (607), en provenance de la seconde station de base, des informations concernant l'état courant de la seconde cellule.

4. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel l'étape d'envoi (602) à la seconde station de base (130) d'une demande de commutation de l'état de la seconde cellule d'un mode non observable à un mode observable pour ledit équipement utilisateur (120), est déclenchée lorsque la charge de trafic dans la première cellule (115) dépasse une valeur de seuil prédéterminée.

5. Procédé selon l'une quelconque des revendications 1 à 3, dans lequel l'étape d'envoi (602) à la seconde station de base (130) d'une demande de commutation de l'état de la seconde cellule d'un mode non observable à un mode observable, est déclenchée lors :

de la réception (601) en provenance de l'équipement utilisateur (120) d'informations ou de la détection du fait que l'équipement utilisateur (120) nécessite un service qui n'est pas fourni par la première station de base (110).

6. Procédé selon l'une quelconque des revendications 1 à 5, dans lequel la demande d'une signalisation entre l'équipement utilisateur (120) et la seconde station de base (130) pour des mesures de qualité, est envoyée à la seconde station de base (130) et est représentée par une demande d'envoi de signaux de référence devant être mesurés par l'équipement utilisateur (120).

7. Procédé selon la revendication 6, dans lequel les informations obtenues selon lesquelles un transfert est réalisable sur la base de la mesure de qualité de la signalisation effectuée, sont représentées par une demande de transfert provenant de l'équipement utilisateur (120) sur la base d'une mesure de qualité du signal de référence par l'équipement utilisateur (120).

8. Procédé selon la revendication 1, dans lequel les informations obtenues selon lesquelles un transfert est réalisable sur la base d'une mesure de qualité de la signalisation effectuée, sont représentées par la réception en provenance de la seconde station de base (130) d'un rapport de mesure basé sur une mesure de qualité effectuée par la seconde station de base (130) sur les signaux de sondage de canal.

9. Procédé destiné à prendre en charge, dans une seconde station de base (130), une transmission discontinue, DTX pour « Discontinuous Transmission », la seconde station de base (130) desservant une seconde cellule (135), la seconde station de base (130) faisant partie d'un système de communication radio (100), lequel système de communication radio (100) comprenant en outre une première station de base (110) communiquant avec un équipement utilisateur (120) par l'intermédiaire d'une porteuse radio qui est active, la seconde cellule (135) étant dans un mode non observable pour l'équipement utilisateur (120), le procédé comprenant :

la réception (801) en provenance de la première station de base (110) d'une demande de commutation de l'état de la seconde cellule d'un mo-

de non observable à un mode observable pour ledit équipement utilisateur (120),
la commutation (802) de l'état de la seconde cellule d'un mode non observable à un mode observable pour ledit équipement utilisateur (120),
la réception (803) en provenance de la première station de base (110) d'une demande de mesure portant sur une transmission de signaux de sondage de canal à l'équipement utilisateur (120) et la mesure (805) de la qualité sur les signaux de sondage de canal observés en provenance de l'équipement utilisateur (120),
la signalisation (804) vers ou en provenance de l'équipement utilisateur (120) du signal devant être utilisé pour la mesure de qualité,
la réception (807) en provenance de la première station de base (110) d'une demande de préparation d'un transfert de l'équipement utilisateur (120) de la première cellule (115) desservie par la première station de base (110) à la seconde cellule (135) desservie par la seconde station de base (130), laquelle demande de transfert est basée sur la mesure de qualité portant sur ladite signalisation,
la commutation (808) de l'état de la seconde cellule d'un mode observable à un mode actif, et
la préparation (809) du transfert de l'équipement utilisateur (120) de la première cellule (115) à la seconde cellule (135).

10. Procédé selon la revendication 9, dans lequel une DTX de station de base est effectuée dans la seconde station de base (130) lorsque l'état de la seconde cellule est le mode non observable.

11. Procédé selon l'une quelconque des revendications 9 et 10, comprenant en outre :

l'envoi (810) à la premières station de base (110) d'informations concernant l'état courant de la seconde cellule.

12. Procédé selon l'une quelconque des revendications 9 à 11, comprenant en outre :

la réception (811) en provenance de la première station de base (110) d'informations concernant l'état courant de la première cellule.

13. Procédé selon l'une quelconque des revendications 9 à 12, dans lequel la demande d'exécution d'une signalisation entre l'équipement utilisateur (120) et la seconde station de base (130) pour effectuer des mesures de qualité, est représentée par une demande d'envoi de signaux de référence devant être mesurés par l'équipement utilisateur (120), et dans lequel la signalisation (804) vers ou en provenance de l'équipement utilisateur (120) est représentée par l'envoi des signaux de référence demandés.

14. Procédé selon la revendication 9, comprenant en outre :

l'envoi (806) à la première station de base (110), d'un rapport de mesure basé sur la mesure de qualité effectuée sur les signaux de sondage de canal.

15. Procédé destiné à prendre en charge, dans un équipement utilisateur (120), une transmission discontinue, DTX pour « Discontinuous Transmission », l'équipement utilisateur (120) étant dans une première cellule (115) communiquant par l'intermédiaire d'une porteuse radio avec une première station de base (110) desservant la première cellule (115), la première cellule (115) étant dans un mode actif, l'équipement utilisateur et la première station de base (110) faisant partie d'un système de communication radio (100), lequel système de communication radio (100) comprenant en outre une seconde station de base (130) desservant une seconde cellule (135), la seconde cellule (135) étant dans un mode non observable, le procédé comprenant :

la réception (1002) en provenance de la première station de base (110) d'une demande d'exécution d'une signalisation de sondage de canal devant être observée par la seconde station de base (130) pour des mesures de qualité, laquelle seconde station de base (130) a reçu de la première station de base (110) une demande de commutation de l'état de la seconde cellule du mode non observable à un mode observable pour ledit équipement utilisateur (120),
la signalisation (1003) du sondage de canal devant être observé par la seconde station de base (130) pour des mesures de qualité,
la réception (1004) en provenance de la première station de base (110) d'une commande d'exécution d'un transfert vers la seconde cellule (135), ladite commande de transfert étant basée sur une mesure de qualité effectuée par la seconde station de base (130) sur le sondage de canal signalisé observé par la seconde station de base (130), et
l'exécution (1005) du transfert ordonné de la première cellule (115) à la seconde cellule (135).

16. Procédé selon la revendication 15, dans lequel la demande d'exécution d'une signalisation de sondage de canal est envoyée par la première station de base en réponse à :

l'envoi (1001) à la première station de base (110) d'informations indiquant que l'équipement utilisateur (120) nécessite un service qui n'est

pas fourni par la première station de base (110).

17. Station de base (110) comprenant un agencement (700) destiné à prendre en charge une transmission discontinue, DTX pour « Discontinuous Transmission », la première station de base (110) desservant une première cellule (115), la première cellule (115) étant apte à être en mode actif, la première station de base (110) étant conçue pour communiquer avec un équipement utilisateur (120) dans la première cellule (115) par l'intermédiaire d'une porteuse radio, la première station de base (110) faisant partie d'un système de communication radio (100), lequel système de communication radio (100) comprenant en outre l'équipement utilisateur (120) et une seconde station de base (130) desservant une seconde cellule (135),
le premier agencement de station de base (700) comprenant une unité d'obtention (720) configurée pour obtenir des informations indiquant qu'un transfert est réalisable, sur la base d'une mesure de qualité de la signalisation effectuée,
le premier agencement de station de base comprenant en outre une unité d'envoi (710) qui est en outre configurée pour envoyer à la seconde station de base (130) une demande de préparation d'un transfert de l'équipement utilisateur (120) de la première cellule (115) à la seconde cellule (135), et
l'unité d'envoi (710) est en outre configurée pour envoyer à l'équipement utilisateur (120) une commande d'exécution d'un transfert à la seconde cellule (135),
caractérisée en ce que la seconde cellule (135) est conçue pour être dans un mode non observable,
l'unité d'envoi du premier agencement de station de base (700) est configurée pour envoyer à la seconde station de base (130) une demande de commutation de l'état de la seconde cellule du mode non observable à un mode observable pour ledit équipement utilisateur (120), et
laquelle unité d'envoi (710) est en outre configurée pour envoyer à l'équipement utilisateur (120) une demande de transmission de signaux de sondage de canal et pour envoyer à la seconde station de base (130) une demande de mesure portant sur ladite transmission de signaux de sondage de canal.

18. Seconde station de base (130) comprenant un agencement (900) destiné à prendre en charge une transmission discontinue, DTX pour « Discontinuous Transmission », la seconde station de base (130) desservant une seconde cellule (135), la seconde station de base (130) faisant partie d'un système de communication radio (100), lequel système de communication radio (100) comprenant en outre une première station de base (110) conçue pour communiquer avec un équipement utilisateur (120) par l'intermédiaire d'une porteuse radio qui est active,
le second agencement de station de base (900) comprenant une unité de commutation (920) configurée pour commuter l'état de la seconde cellule d'un mode non observable à un mode observable pour ledit équipement utilisateur (120),
le second agencement de station de base (900) comprenant en outre une unité de signalisation (930) configurée pour effectuer une signalisation vers ou en provenance de l'équipement utilisateur (120), lequel signal doit être utilisé pour la mesure de qualité,
le second agencement de station de base (900) comprenant une unité de réception (910) qui est en outre configurée pour recevoir de la première station de base (110) une demande de préparation d'un transfert de l'équipement utilisateur (120) d'une première cellule (115) desservie par la première station de base (110) à une seconde cellule (135) desservie par la seconde station de base (130), laquelle demande de transfert est basée sur une mesure de qualité portant sur ladite signalisation,
l'unité de commutation (120) étant en outre configurée pour commuter l'état de la seconde cellule du mode observable à un mode actif lorsque l'état de la seconde cellule est le mode observable,
le second agencement de station de base (900) comprenant en outre une unité de préparation (940) configurée pour préparer un transfert de l'équipement utilisateur (120) de la première cellule (115) à la seconde cellule (135),
caractérisée en ce que la seconde cellule (135) est apte à être dans un état non observable,
dans laquelle l'unité de réception (910) est configurée pour recevoir de la première station de base (110) une demande de commutation de l'état de la seconde cellule d'un mode non observable à un mode observable pour ledit équipement utilisateur (120),
dans laquelle l'unité de réception (910) est en outre configurée pour recevoir de la première station de base (110), une demande de mesure portant sur ladite transmission du signal de sondage de canal, et
dans laquelle le second agencement de station de base (900) comprend en outre une unité de mesure (950) configurée pour mesurer la qualité de signaux de sondage de canal observés depuis l'équipement utilisateur (120).

19. Équipement utilisateur (120) comprenant un agencement (1100) destiné à prendre en charge une transmission discontinue, DTX pour « Discontinuous Transmission », l'équipement utilisateur (120) étant conçu pour être dans une première cellule (115) et étant apte à communiquer par l'intermédiaire d'une porteuse radio avec une première station de base (110) desservant la première cellule (115), la première cellule (115) étant apte à être en mode actif, l'équipement utilisateur (120) et la première station de base (110) faisant partie d'un

système de communication radio (100), lequel système de communication radio (100) comprenant en outre une seconde station de base (130) apte à desservir une seconde cellule (135),

l'agencement d'équipement utilisateur (1100) comprenant une unité de signalisation (1110) configurée pour signaliser un sondage de canal devant être observé par la seconde station de base (130) pour des mesures de qualité,

l'unité de signalisation (1110) étant en outre configurée pour recevoir de la première station de base (110) une commande d'exécution d'un transfert vers la seconde cellule (135), laquelle commande de transfert étant basée sur une mesure de qualité effectuée par la seconde station de base (130) sur le sondage de canal signalisé observé par la seconde station de base (130),

l'agencement d'équipement utilisateur (1100) comprenant une unité d'exécution (1120) configurée pour exécuter un transfert de la première cellule (115) à la seconde cellule (135),

caractérisé en ce que la seconde cellule (135) est conçue pour être dans un mode non observable,

dans lequel l'unité de signalisation (1110) est configurée pour recevoir de la première station de base (110) une demande d'exécution d'une signalisation de sondage de canal devant être observée par la seconde station de base (130) pour des mesures de qualité, et

laquelle seconde station de base (130) a reçu de la première station de base (110) une demande de commutation de l'état de la seconde cellule du mode non observable à un mode observable pour ledit équipement utilisateur (120).

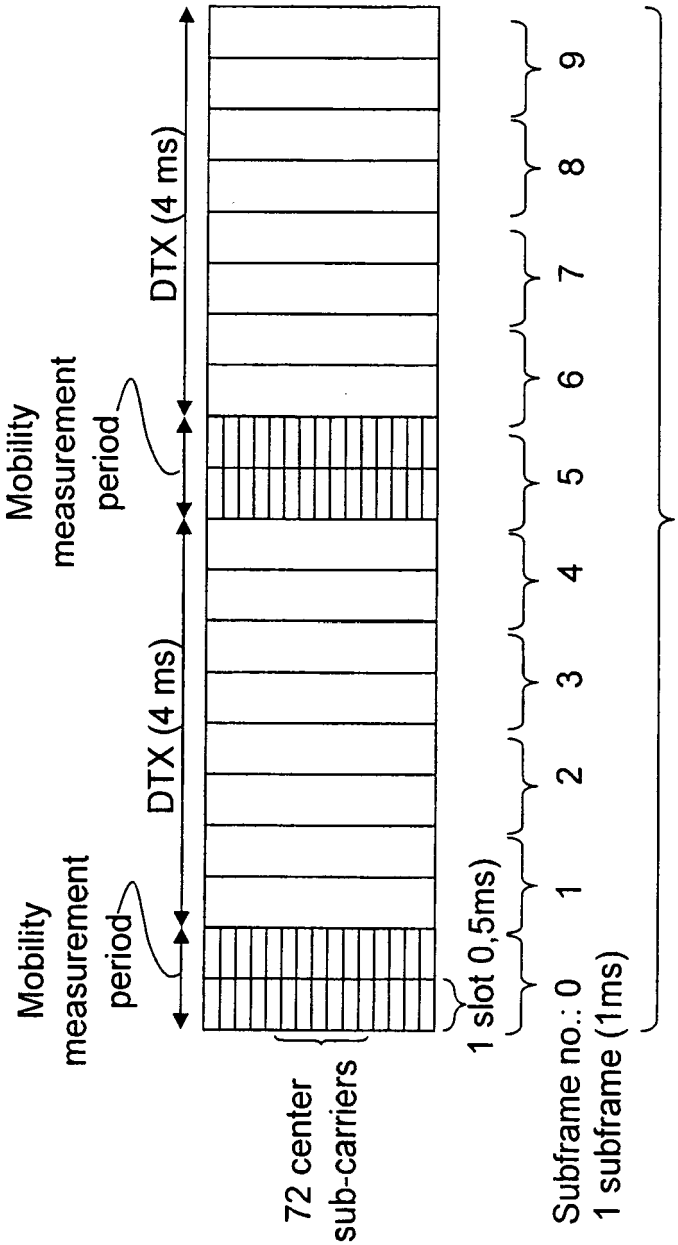
Mobility measurement period
DTX (4 ms)
Mobility measurement period
DTX (4 ms)
72 center sub-carriers
1 slot 0,5ms)
Subframe no.: 0 1 2 3 4 5 6 7 8 9
1 subframe (1ms)
1 radio frame (10ms)

Fig. 1

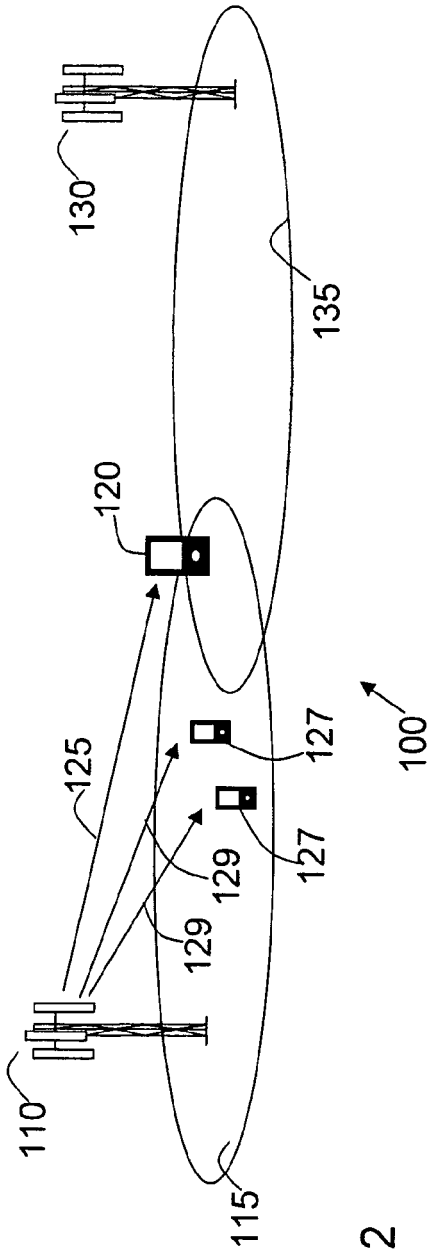
130
135
120
125
127
127
129
129
100
110
115

Fig. 2

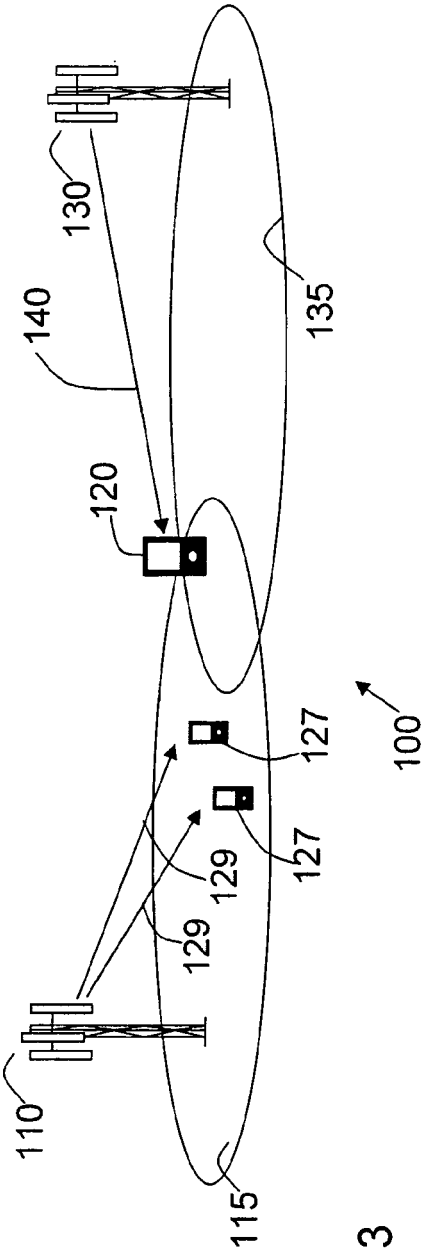
130
140
135
120
127
127
129
129
100
110
115

Fig. 3

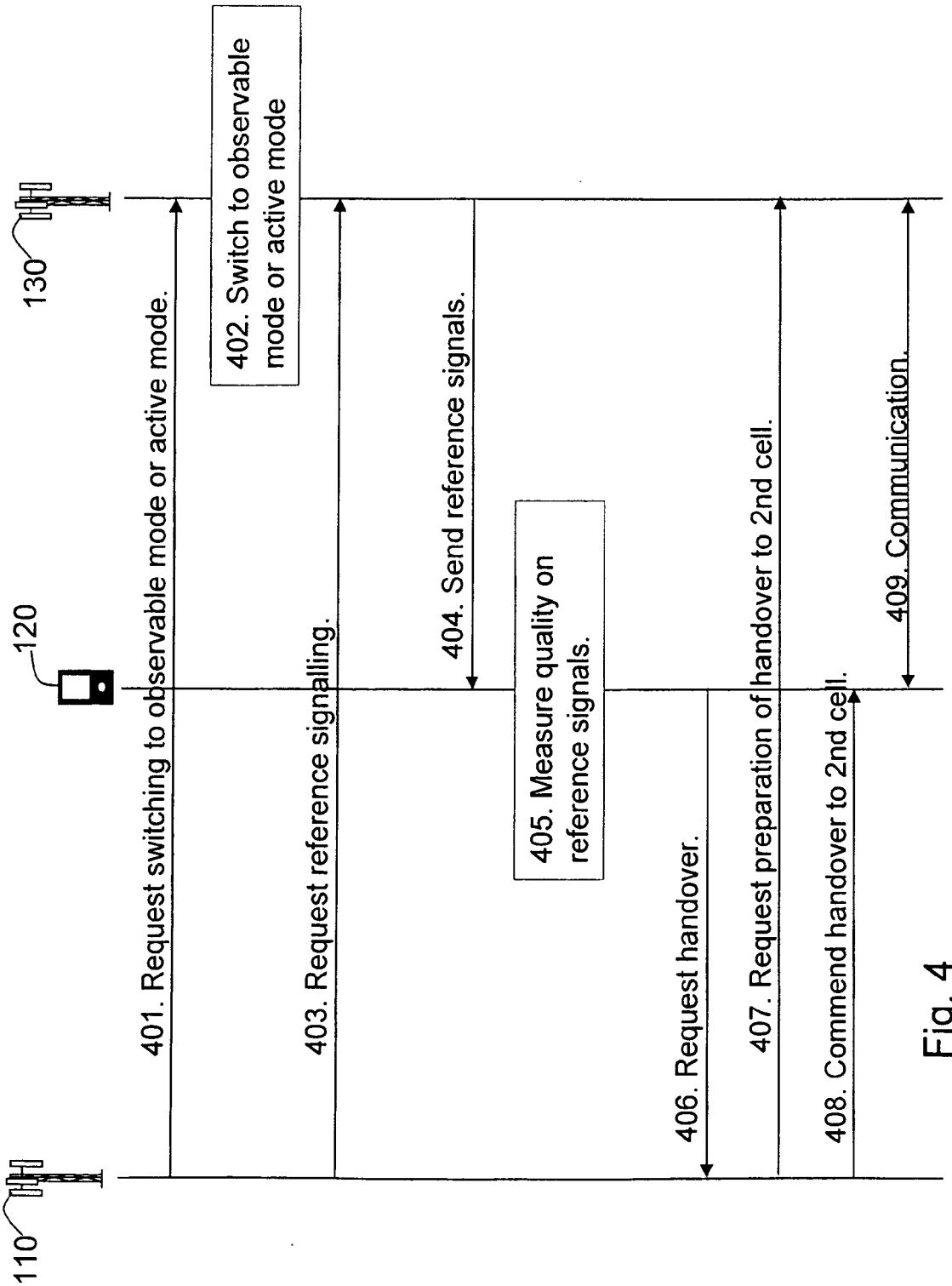
110
120
130
401. Request switching to observable mode or active mode.
402. Switch to observable mode or active mode
403. Request reference signalling.
404. Send reference signals.
405. Measure quality on reference signals.
406. Request handover.
407. Request preparation of handover to 2nd cell.
408. Commend handover to 2nd cell.
409. Communication.

Fig. 4

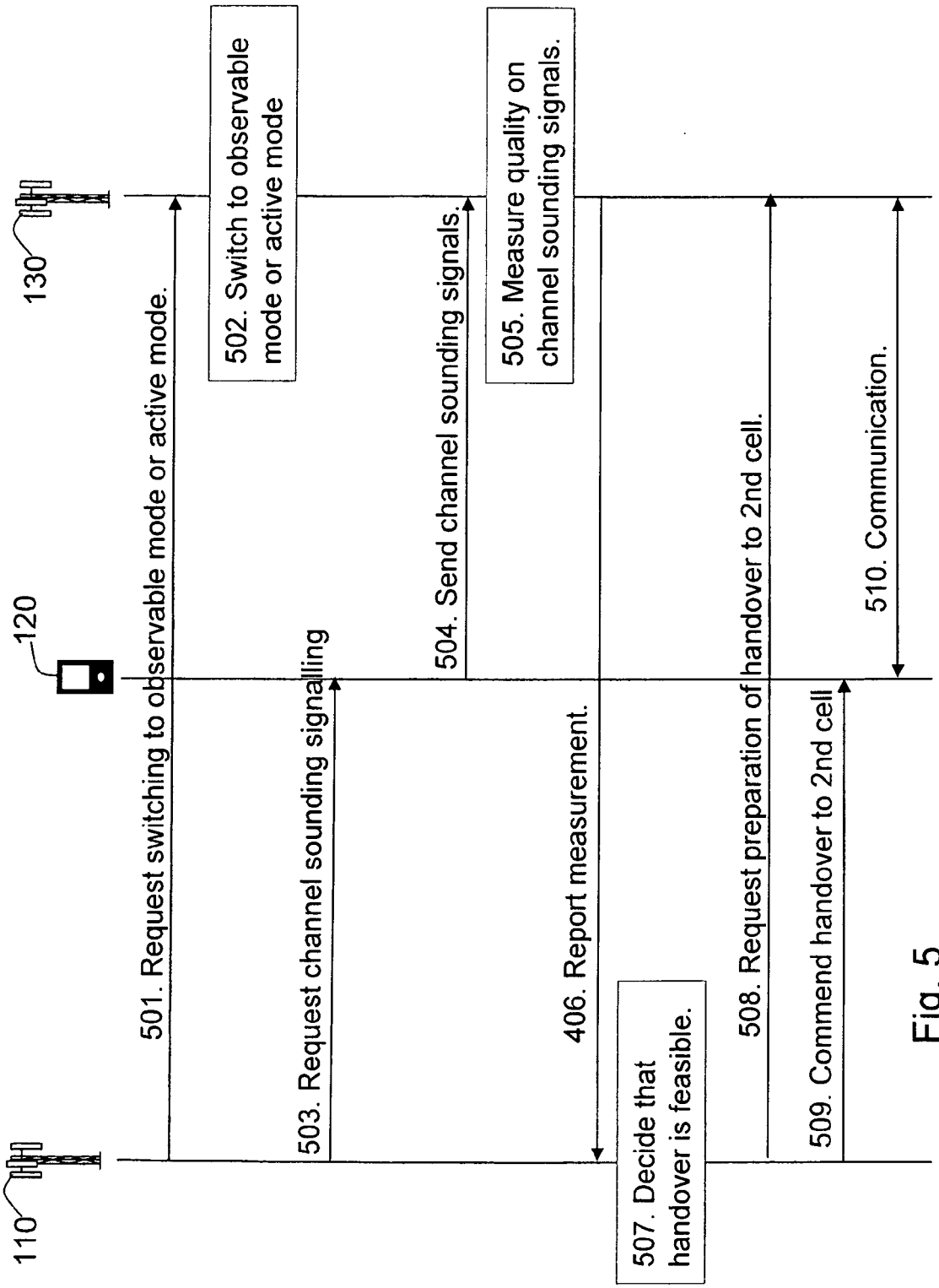
110
120
130
501. Request switching to observable mode or active mode.
502. Switch to observable mode or active mode
503. Request channel sounding signalling
504. Send channel sounding signals.
505. Measure quality on channel sounding signals.
406. Report measurement.
507. Decide that handover is feasible.
508. Request preparation of handover to 2nd cell.
509. Commend handover to 2nd cell
510. Communication.

Fig. 5

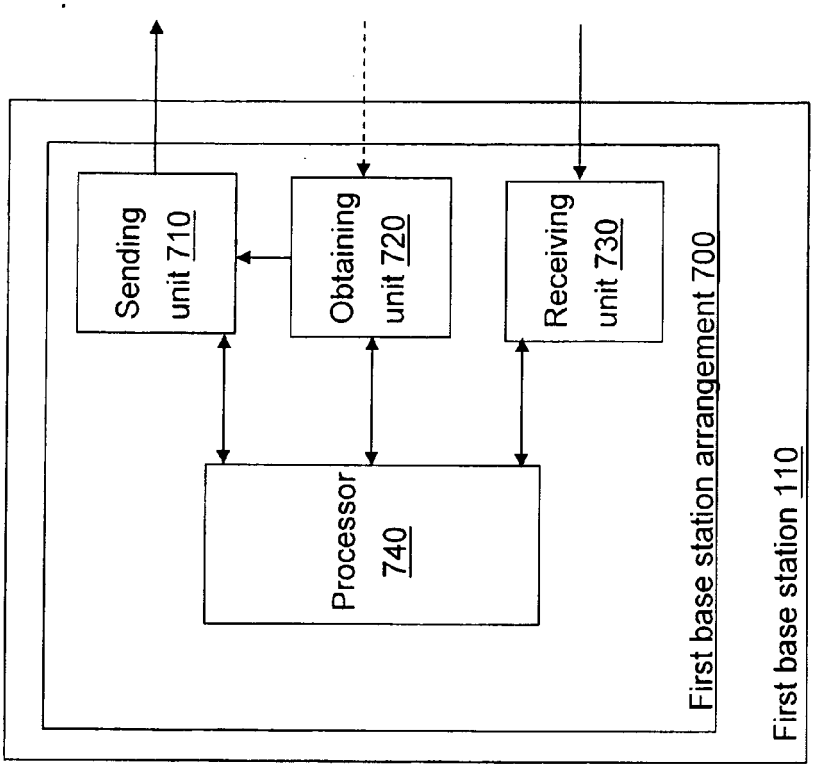
First base station 110
First base station arrangement 700
Sending unit 710
Obtaining unit 720
Receiving unit 730
Processor 740

Fig. 7

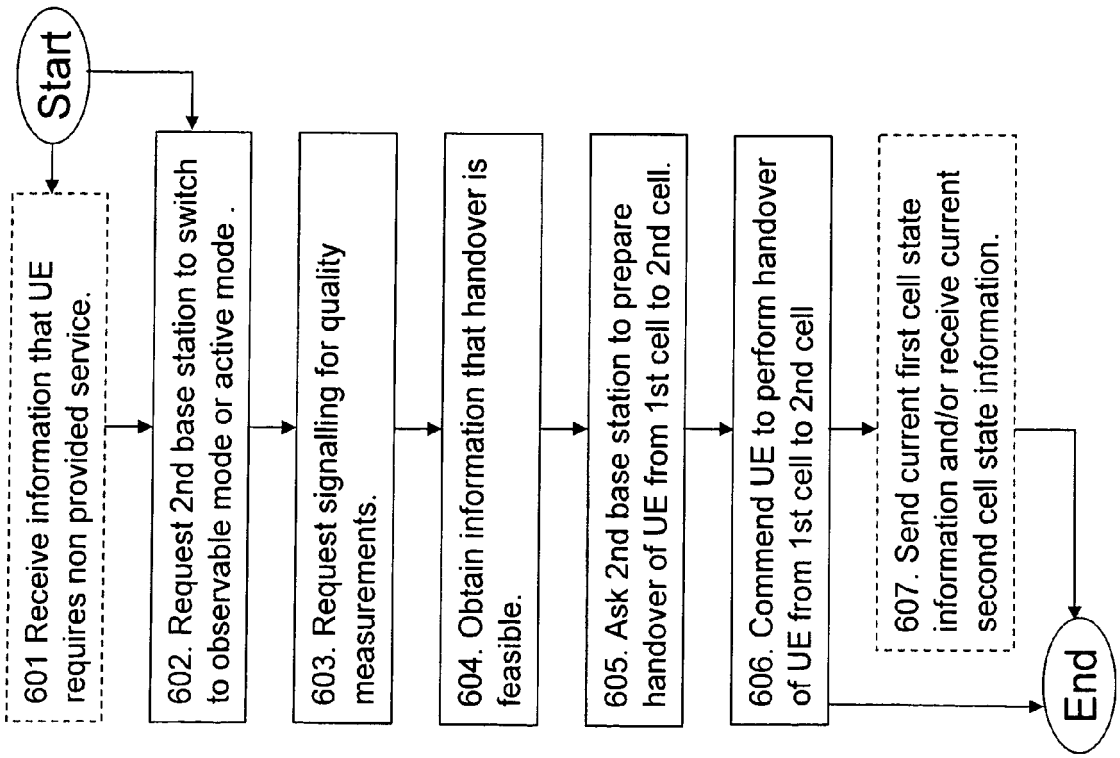
Start
601 Receive information that UE requires non provided service.
602. Request 2nd base station to switch to observable mode or active mode .
603. Request signalling for quality measurements.
604. Obtain information that handover is feasible.
605. Ask 2nd base station to prepare handover of UE from 1st cell to 2nd cell.
606. Commend UE to perform handover of UE from 1st cell to 2nd cell
607. Send current first cell state information and/or receive current second cell state information.
End

Fig. 6

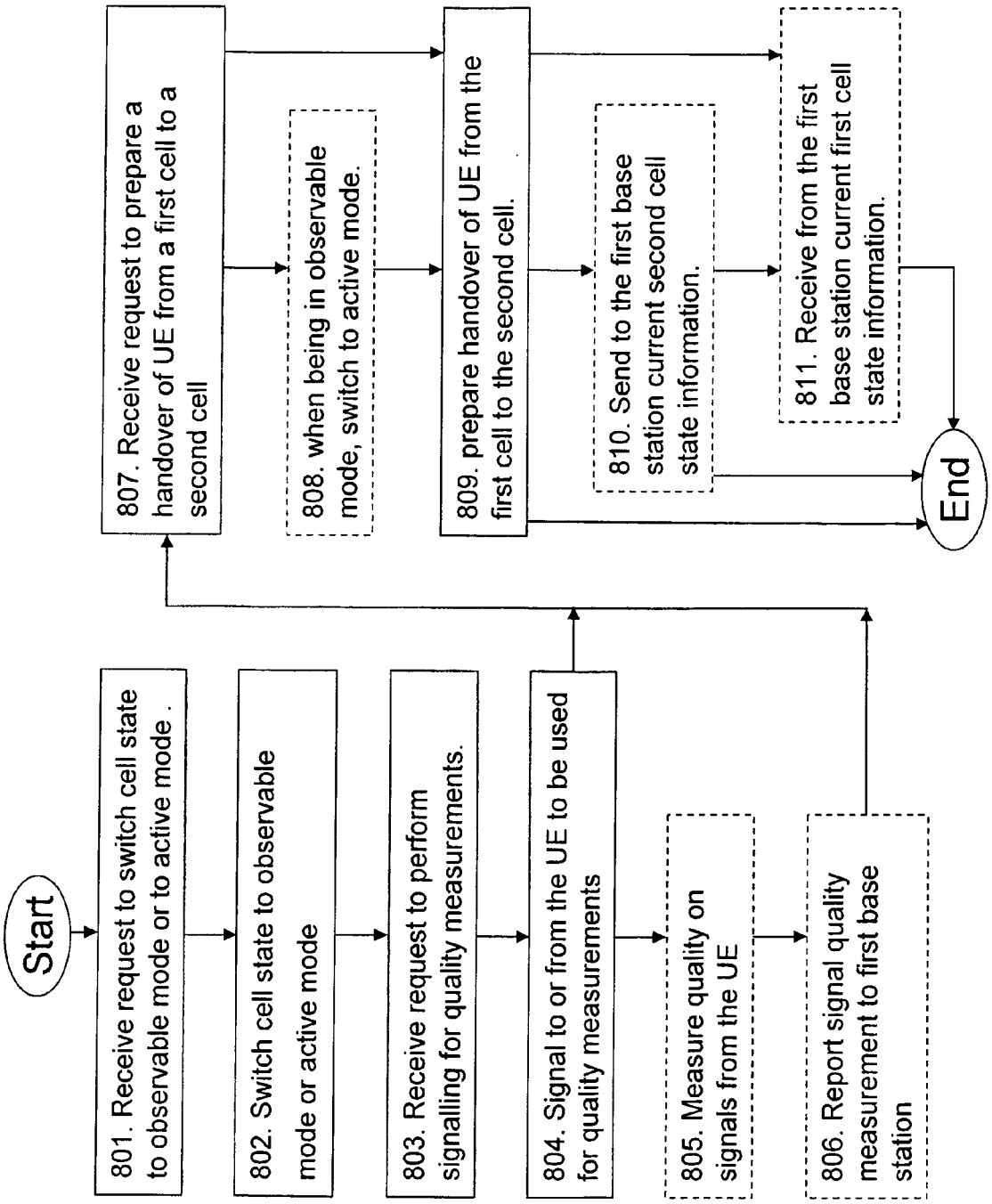
Start
801. Receive request to switch cell state to observable mode or to active mode .
802. Switch cell state to observable mode or active mode
803. Receive request to perform signalling for quality measurements.
804. Signal to or from the UE to be used for quality measurements
805. Measure quality on signals from the UE
806. Report signal quality measurement to first base station
807. Receive request to prepare a handover of UE from a first cell to a second cell
808. when being in observable mode, switch to active mode.
809. prepare handover of UE from the first cell to the second cell.
810. Send to the first base station current second cell state information.
811. Receive from the first base station current first cell state information.
End

Fig. 8

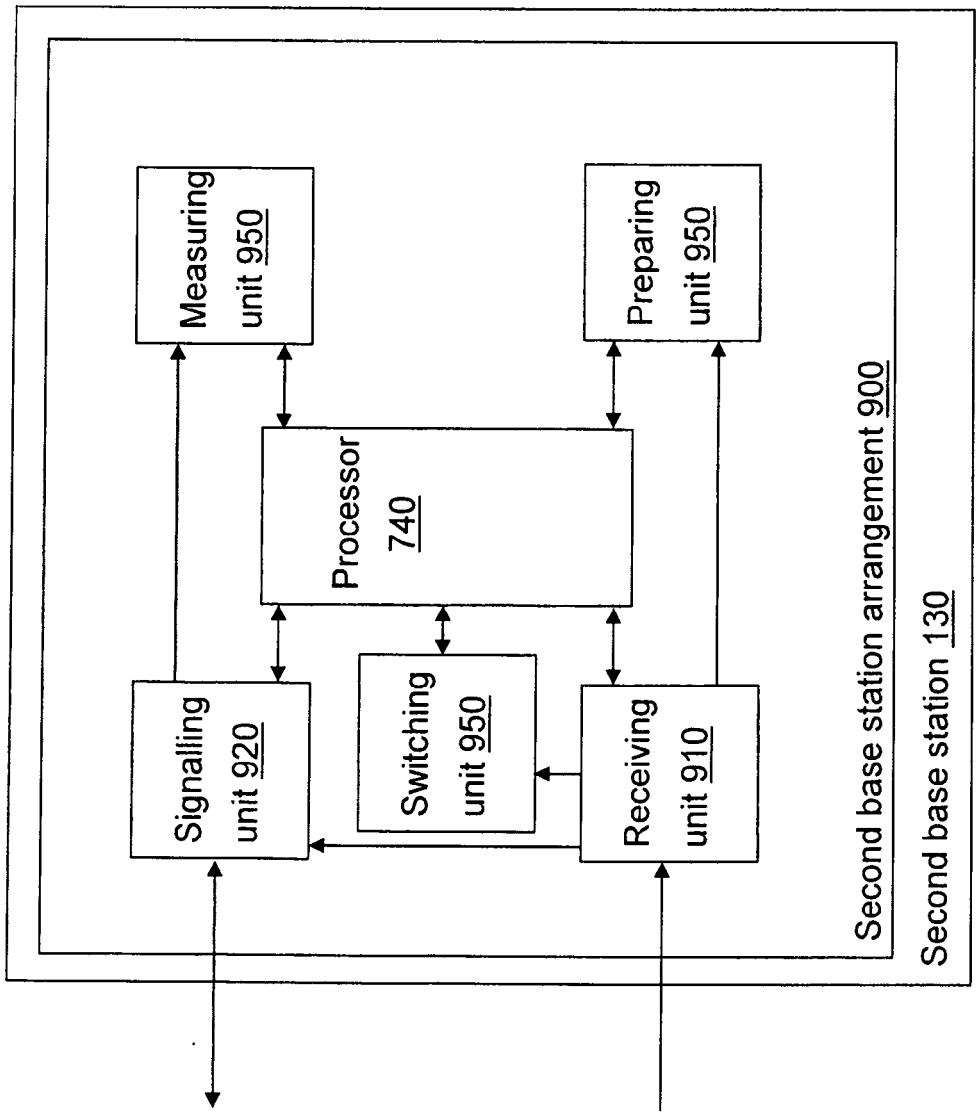
Second base station 130
Second base station arrangement 900
Measuring unit 950
Preparing unit 950
Processor 740
Signalling unit 920
Switching unit 950
Receiving unit 910

Fig. 9

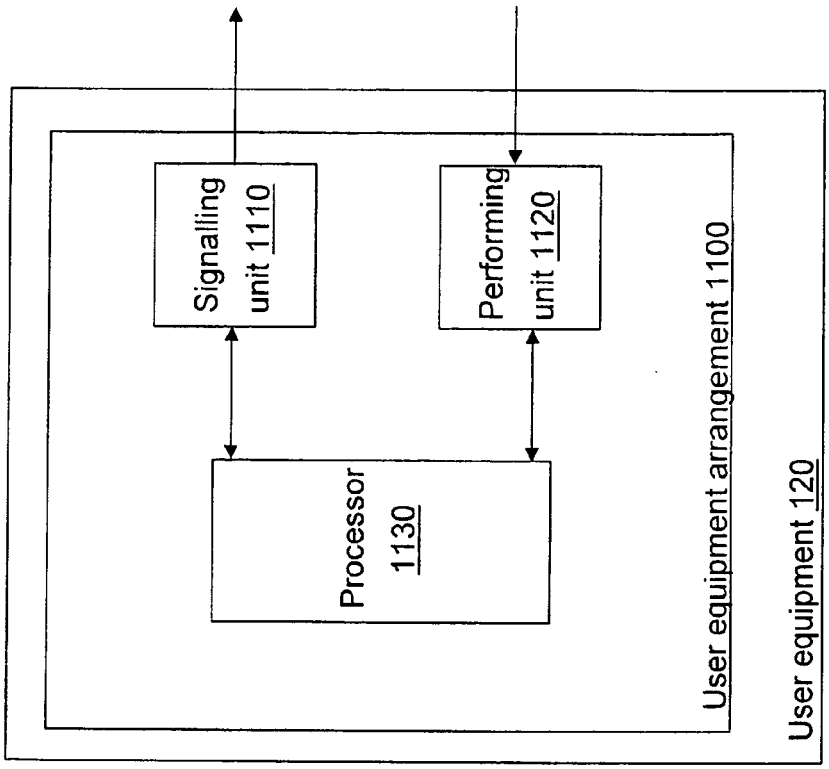
User equipment 120
User equipment arrangement 1100
Signalling unit 1110
Performing unit 1120
Processor 1130

Fig. 11

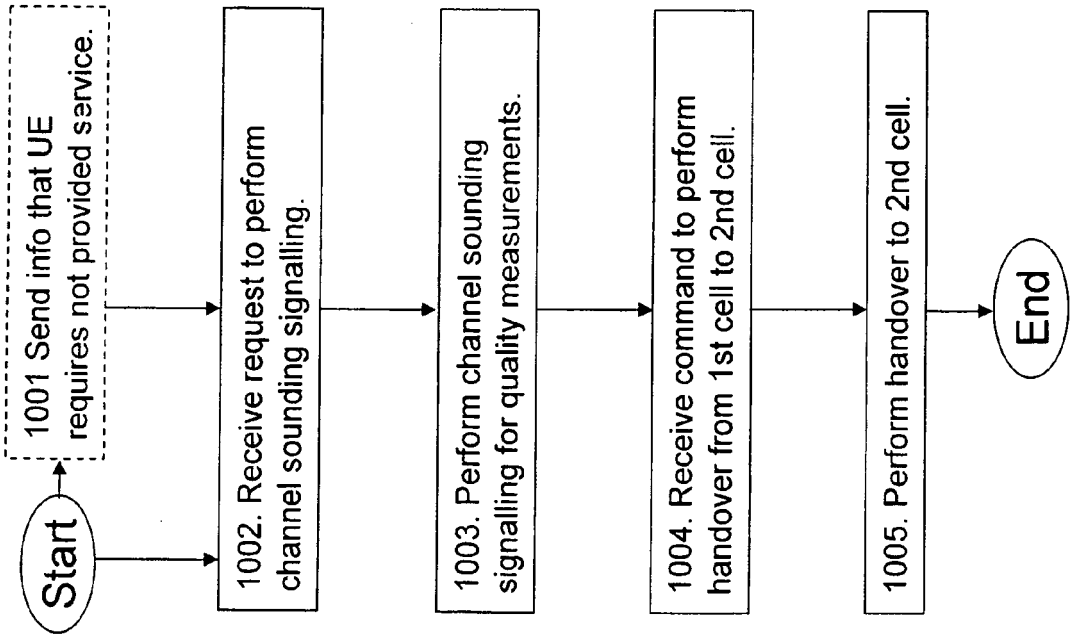
Start
1001 Send info that UE requires not provided service.
1002. Receive request to perform channel sounding signalling.
1003. Perform channel sounding signalling for quality measurements.
1004. Receive command to perform handover from 1st cell to 2nd cell.
1005. Perform handover to 2nd cell.
End

Fig. 10

REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

- US 2007066273 A1 **[0008]**

Non-patent literature cited in the description

- Universal Mobile Telecommunications System (UMTS); Evolved Universal Terrestrial Radio Access (E-UTRA) and Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Overall description; Stage 2 (3GPP TS 36.300 version 8.5.0 Release 8); ETSI TS 136 300. *ETSI STANDARD, EUROPEAN TELECOMMUNICATIONS STANDARDS INSTITUTE (ETSI,* 01 July 2008, vol. 3-R2 (V8.5.0 **[0007]**