**3GPP TSG-RAN WG2 Meeting #118-e *R2-220xxxx***

**Electronic, 9th May – 20th May 2022**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **36.300** | **CR** |  | **rev** | **0** | **Current version:** | **17.0.0** |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  | IoT NTN Stage 2 Corrections |
|  |  |
| ***Source to WG:*** | Ericsson, Eutelsat |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | LTE\_NBIOT\_eMTC\_NTN |  | ***Date:*** | 2022-05-16 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-17 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)* |
|  |  |
| ***Reason for change:*** | Corrections of NB-IoT/eMTC support for Non-Terrestrial Networks |
|  |  |
| ***Summary of change:*** | This correction CR captures Stage 2 fixes for support of NTN in NB-IoT and eMTC. Changes includes: - Minor editorials- Section 23.21: Rewording of text introduced by RAN1 and RAN3, including: - Erroroneous text - Removal of text that is too Stage 3-like and is anyways present in RAN1 specifications.  - Updates to erronous figureThe following two Stage 2 CRs received from RAN3 is inlcuded:\* R2-2206731 / R3-223892 36.300 CR1227 Stage 2 Correction on NB-IoT and eMTC Support for NTN\* R2-2206737 / R3-224012 36.300 CR1229 Clarifications for NB-IOT UE |
|  |  |
| ***Consequences if not approved:*** | NB-IoT/eMTC for Non-Terrestrial Networks does not have proper stage 2 description.  |
|  |  |
| ***Clauses affected:*** | 3.1, 4.12, 23.21, Annex P |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **Y** |  |  Other core specifications  | TS … CR … |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

Next change

## 3.1 Definitions

For the purposes of the present document, the following terms and definitions apply.

**Access Control:** the process that checks whether a UE is allowed to access and to be granted services in a closed cell.

**Aerial UE communication**: functionality enabling Aerial UE function as defined in 23.17.

**Anchor carrier**: in NB-IoT, a carrier where the UE assumes that NPSS/NSSS/NPBCH/SIB-NB for FDD or NPSS/NSSS/NPBCH for TDD are transmitted.

**Carrier frequency**: center frequency of the cell.

**Cell:** combination of downlink and optionally uplink resources. The linking between the carrier frequency of the downlink resources and the carrier frequency of the uplink resources is indicated in the system information transmitted on the downlink resources.

**Cell Group**: in dual connectivity, a group of serving cells associated with either the MeNB or the SeNB.

**CHO candidate cell: a** candidate cell for CHO, for which UE has been configured with a CHO configuration.

**Conditional Handover (CHO): a** handover procedure that is executed only when execution condition(s) are met.

**Control plane CIoT 5GS Optimisation**: Enables support of efficient transport of user data (IP, Ethernet and Unstructured) or SMS messages over control plane via the AMF without triggering user-plane resource establishment, as defined in TS 24.501 [91]. In the context of this specification, a NB-IoT UE that only supports Control plane CIoT 5GS Optimisation is a UE that does not support User plane CIoT 5GS Optimisation and NG-U data transfer but may support other CIoT 5GS Optimisations.

**Control plane CIoT EPS optimisation**: Enables support of efficient transport of user data (IP, non-IP or SMS) over control plane via the MME without triggering data radio bearer establishment, as defined in TS 24.301 [20]. In the context of this specification, a NB-IoT UE that only supports Control plane CIoT EPS optimisation is a UE that does not support User plane CIoT EPS optimisation and S1-U data transfer but may support other CIoT EPS optimisations.

**CSG Cell:** a cell broadcasting a CSG indicator set to true and a specific CSG identity.

**CSG ID Validation:** the process that checks whether the CSG ID received via handover messages is the same as the one broadcast by the target E-UTRAN.

**CSG member cell:** a cell broadcasting the identity of the selected PLMN, registered PLMN or equivalent PLMN and for which the Permitted CSG list of the UE includes an entry comprising cell's CSG ID and the respective PLMN identity.

**DAPS Handover:** a handover procedure that maintains the source eNB connection after reception of RRC message for handover and until releasing the source cell after successful random access to the target eNB.

**DCN-ID:** DCN identity identifies a specific dedicated core network (DCN).

**Dual Connectivity**: mode of operation of a UE in RRC\_CONNECTED, configured with a Master Cell Group and a Secondary Cell Group.

**Early Data Forwarding**: data forwarding that is initiated before the UE executes the handover.

**en-gNB**: as defined in TS 37.340 [76].

**Ephemeris:** a set of parameters that describe the movement of an NTN node over time.

**E-RAB:** an E-RAB uniquely identifies the concatenation of an S1 Bearer and the corresponding Data Radio Bearer. When an E-RAB exists, there is a one-to-one mapping between this E-RAB and an EPS bearer of the Non Access Stratum as defined in [17].

**Feeder link:** wireless link between the NTN Gateway and the NTN payload.

**Frequency layer**: set of cells with the same carrier frequency.

**FeMBMS:** further enhanced multimedia broadcast multicast service.

**FeMBMS/Unicast-mixed cell**: cell supporting MBMS transmission and unicast transmission as SCell.

**Geosynchronous Orbit:** Earth-centred orbit at approximately 35,786 kilometres in altitude above Earth's surface and synchronised with Earth's rotation. A geostationary orbit is a non-inclined geosynchronous orbit, i.e in the Earth's equator plane.

**Handover**: procedure that changes the serving cell of a UE in RRC\_CONNECTED.

**Hybrid cell**: a cell broadcasting a CSG indicator set to false and a specific CSG identity. This cell is accessible as a CSG cell by UEs which are members of the CSG and as a normal cell by all other UEs.

**Late Data Forwarding**: data forwarding that is initiated after the source eNB knows that the UE has successfully accessed a target eNB.

**Local Home Network**: as defined in TS 23.401 [17].

**LTE bearer**: in LTE-WLAN Aggregation, a bearer whose radio protocols are located in the eNB only to use eNB radio resources only.

**LWA bearer**: in LTE-WLAN Aggregation, a bearer whose radio protocols are located in both the eNB and the WLAN to use both eNB and WLAN resources.

**LWAAP PDU**: in LTE-WLAN Aggregation, a PDU with DRB ID generated by LWAAP entity for transmission over WLAN.

**Make-Before-Break HO/SeNB change**: maintaining source eNB/SeNB connection after reception of RRC message for handover or change of SeNB before the initial uplink transmission to the target eNB during handover or change of SeNB.

**Mapped Cell ID**: in NTN, it corresponds to a fixed geographical area.

**Master Cell Group**: in dual connectivity, a group of serving cells associated with the MeNB, comprising of the PCell and optionally one or more SCells.

**Master eNB**: in dual connectivity, the eNB which terminates at least S1-MME.

**MBMS-dedicated cell**: cell dedicated to MBMS transmission.

**MBMS/Unicast-mixed cell**: cell supporting both unicast and MBMS transmissions.

**MCG bearer**: in dual connectivity, a bearer whose radio protocols are only located in the MeNB to use MeNB resources only.

**Membership Verification:** the process that checks whether a UE is a member or non-member of a hybrid cell.

**Multi-Connectivity**: Mode of operation whereby a multiple Rx/Tx UE in the connected mode is configured to utilise radio resources amongst E-UTRA and/or NR provided by multiple distinct schedulers connected via non-ideal backhaul.

**NB-IoT:** NB-IoT allows access to network services via E-UTRA with a channel bandwidth limited to 200 kHz.

**NB-IoT UE**: a UE that uses NB-IoT.

**ng-eNB:** node providing E-UTRA user plane and control plane protocol terminations towards the UE, and connected via the NG interface to the 5GC.

**Non-anchor carrier**: in NB-IoT, a carrier where the UE does not assume that NPSS/NSSS/NPBCH/SIB-NB for FDD or NPSS/NSSS/NPBCH for TDD are transmitted.

**Non-geosynchronous orbit**: Earth-centred orbit with an orbital period that does not match Earth's rotation on its axis. This includes Low Earth Orbit (LEO) and Medium Earth Orbit (MEO).

**Non-terrestrial networks:** an E-UTRAN consisting of eNBs, which provide non-terrestrial LTE access to UEs by means of an NTN payload embarked on a space-borne NTN vehicle and an NTN Gateway.

**NR:** NR radio access

**NR sidelink communication**: AS functionality enabling at least V2X Communication as defined in TS 23.287 [93], between two or more nearby UEs, using NR technology but not traversing any network node.

**NTN Gateway:** an earth station located at the surface of the earth, providing connectivity to the NTN payload using the feeder link. An NTN Gateway is a TNL node.

**NTN payload:** a network node, embarked on board a satellite, providing connectivity functions, between the service link and the feeder link. In the current version of this specification, the NTN payload is a TNL node.

**PLMN ID Check:** the process that checks whether a PLMN ID is the RPLMN identity or an EPLMN identity of the UE.

**Power saving mode**: mode configured and controlled by NAS that allows the UE to reduce its power consumption, as defined in TS 24.301 [20], TS 23.401 [17], TS 23.682 [57].

**Primary PUCCH group:** a group of serving cells including PCell whose PUCCH signalling is associated with the PUCCH on PCell.

**Primary Timing Advance Group**: Timing Advance Group containing the PCell. In this specification, Primary Timing Advance Group refers also to Timing Advance Group containing the PSCell unless explicitly stated otherwise.

**ProSe-enabled Public Safety UE:** a UE that the HPLMN has configured to be authorized for Public Safety use, and which is ProSe-enabled and supports ProSe procedures and capabilities specific to Public Safety. The UE may, but need not, have a USIM with one of the special access classes {12, 13, 14}.

**ProSe Per-Packet Priority:** a scalar value associated with a protocol data unit that defines the priority handling to be applied for transmission of that protocol data unit.

**ProSe UE-to-Network Relay:** a UE that provides functionality to support connectivity to the network for Remote UE(s).

**ProSe UE-to-Network Relay Selection:** Process of identifying a potential ProSe UE-to Network Relay, which can be used for connectivity services (e.g. to communicate with a PDN).

**ProSe UE-to-Network Relay Reselection:** process of changing previously selected ProSe UE-to-Network Relay and identifying potential a new ProSe UE-to-Network Relay, which can be be used for connectivity services (e.g. to communicate with PDN).

**Public Safety ProSe Carrier:** carrier frequency for public safety sidelink communication and public safety sidelink discovery.

**PUCCH group:** either primary PUCCH group or a secondary PUCCH group.

**PUCCH SCell:** a Secondary Cell configured with PUCCH.

**RACH-less HO/SeNB change**: skipping random access procedure during handover or change of SeNB.

**Receive Only Mode:** See TS 23.246 [48].

**Remote UE:** a ProSe-enabled Public Safety UE, that communicates with a PDN via a ProSe UE-to-Network Relay.

**Satellite:** a space-borne vehicle orbiting the Earth that carries the NTN payload.

**SCG bearer**: in dual connectivity, a bearer whose radio protocols are only located in the SeNB to use SeNB resources.

**Secondary Cell Group**: in dual connectivity, a group of serving cells associated with the SeNB, comprising of PSCell and optionally one or more SCells.

**Secondary eNB**: in dual connectivity, the eNB that is providing additional radio resources for the UE but is not the Master eNB.

**Secondary PUCCH group:** a group of SCells whose PUCCH signalling is associated with the PUCCH on the PUCCH SCell.

**Secondary Timing Advance Group**: Timing Advance Group containing neither the PCell nor PSCell.

**Service link:** wireless link between the NTN payload and the UE.

**Short Processing Time**: For 1 ms TTI length, the operation with short processing time in UL data transmission and DL data reception.

**Short TTI:** TTI length based on a slot or a subslot.

**Sidelink**: UE to UE interface for sidelink communication, V2X sidelink communication and sidelink discovery. The Sidelink corresponds to the PC5 interface as defined in TS 23.303 [62].

**Sidelink Control period**: period over which resources are allocated in a cell for sidelink control information and sidelink data transmissions. The Sidelink Control period corresponds to the PSCCH period as defined in TS 36.213 [6].

**Sidelink communication**: AS functionality enabling ProSe Direct Communication as defined in TS 23.303 [62], between two or more nearby UEs, using E-UTRA technology but not traversing any network node. In this version, the terminology "sidelink communication" without "V2X" prefix only concerns PS unless specifically stated otherwise.

**Sidelink discovery**: AS functionality enabling ProSe Direct Discovery as defined in TS 23.303 [62], using E-UTRA technology but not traversing any network node.

**Split bearer**: in dual connectivity, a bearer whose radio protocols are located in both the MeNB and the SeNB to use both MeNB and SeNB resources.

**Split LWA bearer**: in LTE-WLAN Aggregation, a bearer whose radio protocols are located in both the eNB and the WLAN to use both eNB and WLAN radio resources.

**Switched LWA bearer**: in LTE-WLAN Aggregation, a bearer whose radio protocols are located in both the eNB and the WLAN but uses WLAN radio resources only.

**Timing Advance Group**: a group of serving cells that is configured by RRC and that, for the cells with an UL configured, use the same timing reference cell and the same Timing Advance value.

**User plane CIoT 5GS Optimisation**: Enables support for change from 5GMM-IDLE mode to 5GMM-CONNECTED mode without the need for using the Service Request procedure, as defined in TS 24.501 [91].

**User plane CIoT EPS optimisation**: Enables support for change from EMM-IDLE mode to EMM-CONNECTED mode without the need for using the Service Request procedure, as defined in TS 24.301 [20].

**V2X sidelink communication**: AS functionality enabling V2X Communication as defined in TS 23.285 [72], between nearby UEs, using E-UTRA technology but not traversing any network node.

**WLAN Termination**: the logical node that terminates the Xw interface on the WLAN side.

End of changes

Next change

## 4.12 Support of Non-Terrestrial Networks

E-UTRAN supports radio access over non-terrestrial networks for BL UEs, UEs in enhanced coverage and NB-IoT UEs. Support for non-terrestrial networks encompasses platforms that provide radio access through Geosynchronous orbits (GSO), Non-Geosynchronous Orbit (NGSO), which includes Low-Earth Orbit (LEO) and Medium Earth Orbit (MEO) or High Altitude Platform Systems (HAPS).

The Figure 4.12-1 below illustrates an example of a Non-Terrestrial Network (NTN) providing non-terrestrial access by means of an NTN payload and an NTN Gateway, depicting a service link between the NTN payload and a UE, and a feeder link between the NTN Gateway and the NTN payload.



Figure 4.12-1: Overall illustration of an NTN

NOTE: Figure 4.12-1 illustrates an NTN; RAN4 aspects are out of scope.

The NTN payload transparently forwards the radio protocol received from the UE (via the service link) to the NTN Gateway (via the feeder link) and vice-versa. The following connectivity is supported by the NTN payload:

- An eNB may serve multiple NTN payloads;

- An NTN payload may be served by multiple eNBs.

NOTE: In this release, the NTN-payload may change the carrier frequency, before re-transmitting it on the service link, and vice versa (respectively on the feeder link).

For NTN, the following applies in addition to Network entity related Identities as described in clause 8.2:

- A Tracking Area corresponds to a fixed geographical area. Any respective mapping is configured in the RAN;

- A Mapped Cell ID as specified in clause 23.21.5.

Three types of service links are supported:

- Earth-fixed: provisioned by beam(s) continuously covering the same geographical areas all the time (e.g., the case of GSO satellites);

- Quasi-Earth-fixed: provisioned by beam(s) covering one geographic area for a limited period of time and a different geographic area during another period of time (e.g., the case of NGSO satellites generating steerable beams);

- Earth-moving: provisioned by beam(s) whose coverage area slides over the Earth surface (e.g., the case of NGSO satellites generating fixed or non-steerable beams).

With NGSO satellites, the eNB can provide either quasi-Earth-fixed cell coverage or Earth-moving cell coverage, while eNB operating with GSO satellites can provide Earth fixed cell coverage or quasi-Earth-fixed cell coverage.

End of changes

Next change

## 23.21 Support for BL UEs, UEs in enhanced coverage and NB-IoT UEs over Non-Terrestrial Networks

### 23.21.1 General

Support for BL UEs, UEs in enhanced coverage and NB-IoT UEs over Non-Terrestrial Networks (see clause 4.12) is only applicable to E-UTRA connected to EPC. UEs not supporting NTN are barred from accessing an NTN cell.

In NTN, only BL UEs, UEs in enhanced coverage and NB-IoT UEs with GNSS capability are supported in this release of the specification.

To accommodate long propagation delays in NTN, increased timer values and window sizes, or delayed starting times are supported for the physical layer and for higher layers.

UL segmented transmission is supported for UL transmission with repetitions. The UE shall apply UE pre-compensation per segment of UL transmission of PUSCH/PUCCH/PRACH for BL UEs or UEs in enhanced coverage and NPUSCH/NPRACH for NB-IoT UEs from one segment to the next segment.

### 23.21.2 Timing and synchronization

#### 23.21.2.1 Scheduling timing

DL and UL are frame aligned at the uplink time synchronization reference point (RP) with an offset given by .

To accommodate the long propagation delays in NTN, several timing relationships are enhanced by Common TA and two scheduling offsets: and illustrated in Figure 23.21.2.1-1:

- is a configured offset corresponding to the RTT between the RP and the NTN payload.

- is a configured scheduling offset approximately corresponding to the sum of the service link RTT and the common TA.

- is a configured offset approximately corresponding to the RTT between the RP and the eNB.



Figure 23.21.2.1-1 Timing relationship parameters

The scheduling offset is used to allow the UE sufficient processing time between a downlink reception until an uplink transmission, see TS 36.213 [6].

The offset is used in the application of downlink configuration indicated by a MAC CE on NPDSCH/PDSCH, see TS 36.213 [6], and to determine the UE-eNB RTT, see TS 36.321 [13].

#### 23.21.2.2 Pre-compensation by the UE

For the serving cell, the network broadcast ephemeris information and common Timing Advance (common TA) parameters.The UE shall have valid GNSS position as well as the satellite ephemeris and common TA before connecting to an NTN cell. To achieve synchronisation, before and during connection to a cell, the UE shall autonomously pre-compensate the Timing Advance (TTA, see TS 36.211 [4] clause 8.1), see Figure 23.21.2.2-1, as well as the frequency doppler shift by considering the common TA, UE position and the satellite position through the satellite ephemeris.

In connected mode, the UE shall continuously update the Timing Advance and frequency pre-compensation, but the UE is not expected to perform GNSS acquisition. Timers ensure that the UE does not perform any transmissions due to outdated satellite ephemeris, common TA or GNSS position. In connected mode, upon outdated satellite ephemeris and common Timing Advance, the UE re-acquires the broadcasted parameters and upon outdated GNSS position the UE moves to idle mode.

The UEs may be configured to report Timing Advance at initial access or in connected mode. In connected mode triggered reporting of the Timing Advance is supported.



Figure 23.21.2.2-1 Illustration of Uplink/Downlink Radio Frame Timing at the UE

While the pre-compensation of the instantaneous Doppler shift experienced on the service link is to be performed by the UE, the management of Doppler shift experienced over the feeder and transponder frequency error, whether introduced in Downlink or Uplink, is left to network implementation.

### 23.21.3 Support of discontinuous coverage

As a satellite moves on a specified orbit, for example in case of a NGSO satellite, the satellite beam(s) coverage area may move and cover different portions of a geographical area due to the orbital movement of the satellite. As a consequence, a UE located in the concerned geographical area may experience a situation of discontinuous coverage, due to e.g. a sparse satellite constellation deployment.

To enable the UE to save power during periods of no coverage, the network provides satellite assistance information (e.g. satellite ephemeris parameters, the start-time of upcoming satellite's coverage) to enable the UE to predict when coverage will be provided by upcoming satellites. Predicting out of coverage and in coverage is up to UE implementation. When out of coverage, the UE is not required to perform AS functions.

### 23.21.4 Mobility Management

#### 23.21.4.1 Mobility Management in ECM-IDLE

The principles described in clause 10.1.1 apply in NTN unless specified otherwise hereafter.

The network may broadcast more than one TAC per PLMN in a cell in order to reduce the signalling load at cell edge in NTN, in particular for Earth-moving cell coverage. The AS layer indicates all received TACs for the selected PLMN to the NAS layer. The network may update the UEs upon TAC removal. UEs may by UE implementation also check whether a TAC has been removed.

For quasi-Earth-fixed cells, timing information on when the cell is going to stop serving the area may be broadcast by the network. This may be used by the UE to start measurements on neighbour cells before the broadcast stop time of the serving cell, while the exact start of the measurements is up to UE implementation.

#### 23.21.4.2 Mobility Management in ECM-CONNECTED

Radio link failure and RRC connection re-establishment are supported in NTN. The principles described in clause 10.1.6 apply unless specified otherwise.

To enable mobility in NTN, the network provides target cell satellite parameters needed to access the NTN cell in the handover command.

Conditional handover is supported for BL UEs and UEs in enhanced coverage.

### 23.21.5 Switchover

#### 23.21.5.1 Definitions

A feeder link switchover is the procedure where the feeder link is changed from a source NTN Gateway to a target NTN Gateway for a specific NTN payload. The feeder link switchover is a Transport Network Layer procedure.

Both hard and soft feeder link switchover are applicable to NTN.

#### 23.21.5.2 Assumptions

A feeder link switchover may result in transferring the established connection for the affected UEs between two eNBs.

For soft feeder link switchover, an NTN payload is able to connect to more than one NTN Gateway during a given period i.e. a temporary overlap can be ensured during the transition between the feeder links.

For hard feeder link switchover, an NTN payload only connect to one NTN Gateway at any given time i.e. a radio link interruption may occur during the transition between the feeder links.

#### 23.21.5.3 Procedures

The NTN control function determines the point in time when the feeder link switchover between two eNBs is performed. For BL UEs and UEs in enhanced coverage, the transfer of the affected UEs' context between the two eNBs at feeder link switchover is performed by means of either S1 based or X2 based handover, and it depends on the eNBs' implementation and configuration information provided to the eNBs by the NTN Control function.

### 23.21.6 Signalling

The Cell Identity, as defined in TS 36.413 [25] and TS 36.423 [42], corresponds to a Mapped Cell ID, irrespective of the orbit of the NTN payload or the types of service links supported in the following cases:

- The Cell Identity indicated by the eNB to the Core Network as part of the User Location Information, or as E-UTRAN CGI in the related S1AP messages;

- The Cell Identity used for Paging Optimization in S1 interface;

- The Cell Identity used for PWS.

For a BL UE or a UE in enhanced coverage, the Cell Identity included within the target identification of the handover messages allows identifying the correct target cell.

The mapping between Mapped Cell ID(s) and geographical area(s) is configured in the RAN and Core Network.

NOTE 1: A specific geographical location may be mapped to multiple Mapped Cell ID(s), and such Mapped Cell IDs may be configured to indicate different geographical areas (e.g. overlapping and/or with different dimensions).

For a BL UE or a UE in enhanced coverage or a NB-IoT UE that supports S1-U data transfer or User Plane CIoT EPS optimisation, the eNB is responsible for constructing the Mapped Cell ID based on the UE location information received from the UE, if available. The mapping may be pre-configured (e.g., depending on operator's policy) or up to implementation.

NOTE 2: As described in TS 23.401 [17], the User Location Information may enable the MME to determine whether the UE is allowed to operate at its present location. Special Mapped Cell IDs or TACs may be used to indicate areas outside the serving PLMN's country.

The eNB reports the broadcasted TAC(s) of the selected PLMN to the MME. In case the eNB knows the UE's location information, the eNB may determine the TAI the UE is currently located in and provide that TAI to the MME.

### 23.21.7 MME(Re-)Selection by eNB

The eNB implements the NAS Node Selection Function specified in TS 36.410 [95].

For a RRC\_CONNECTED UE, when the eNB is configured to ensure that the BL UE or the UE in enhanced coverage is using an MME that serves the country in which the UE is located. If the eNB detects that a BL UE or a UE in enhanced coverage is in a different country to that served by the serving MME, it should perform an S1 handover to change to an appropriate MME or initiate anUE Context Release Request procedure towards the serving MME (in which case the MME may decide to detach the UE).

For an RRC\_CONNECTED NB-IoT UE, when the eNB is configured to ensure that the NB-IoT UE is using an MME that serves the country in which the UE is located. If the eNB detects that the UE is in a different country to that served by the serving MME, it should initiate a UE Context Release Request procedure towards the serving MME (in which case the MME may decide to detach the UE).

### 23.21.8 O&M Requirements

The NTN related parameters shall be provided by O&M to the eNB providing non-terrestrial access, as specified in TS 38.300 [79].

End of changes

Next change

Annex P (informative):
Example implementation of Non-Terrestrial Networks

The following figure illustrates an example implementation of a Non-Terrestrial Network for transparent NTN payload:



Figure P-1: NTN based E-UTRAN

The eNB depicted in Figure P-1 may be subdivided into non-NTN infrastructure eNB functions and the NTN Service Link provisioning System. The NTN infrastructure may be thought of being subdivided into the NTN Service Link provisioning System and the NTN Control function. The NTN Service Link provisioning System may consist of one or more NTN payloads and NTN Gateways.

The NTN payload is embarked on a spaceborne vehicle, providing a structure, power, commanding, telemetry, attitude control for the satellite and possibly an appropriate thermal environment and radiation shielding.

The NTN Service Link provisioning System maps the Uu radio protocol over radio resources of the NTN infrastructure (e.g. beams, channels, Tx power).

The NTN control function controls the spaceborne vehicles as well as the radio resources of the NTN infrastructure (NTN payload(s) & NTN Gateway(s)). It provides control data, e.g. Ephemeris, to the non-NTN infrastructure eNB functions of the eNB.

Provision of NTN control data to the eNB is out of 3GPP scope.

NOTE: The transport of Uu protocol between the NTN Service Link provisioning system and the non-NTN infrastructure eNB functions is out of 3GPP scope.

At least the following NTN related parameters are expected to be provided by O&M to the eNB for its operation.

a) Earth fixed beams: for each beam provided by a given NTN-payload:

- The Cell identifier (S1 and Uu) mapped to the beam;

- The Cell's reference location (e.g. cell's center and range).

b) Quasi Earth fixed beams: for each beam provided by a given NTN-payload:

- The Cell identifier (S1 and Uu) and time window mapped to a beam;

- The Cell's/beam's reference location (e.g. cell's center and range);

- The time window of the successive switchovers (feeder link, service link);

- The identifier and time window of all serving satellites and NTN-Gateways.

c) Earth moving beams: for each beam provided by a given NTN-payload:

- The Uu Cell identifier mapped to a beam and mapping information to fixed geographical areas reported on NG, including information about the beams direction and motion of the beam's foot print on Earth;

- Its elevation with regard to NTN-payload;

- Schedule of successive serving NTN-Gateways/eNBs;

- Schedule of successive switchovers (feeder link, service link).

End of changes