**3GPP TSG-RAN WG2 Meeting #109-e *R2-2002263***

**E-meeting, February 24-28, March 2-6, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.300** | **CR** | **1271** | **rev** | **-** | **Current version:** | **16.0.0** |  |
|  | | | | | | | | |
| *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 | **X** | Radio Access Network | **X** | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | Introduction of 5G V2X with NR Sidelink | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | LG Electronics Inc. | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_V2X\_NRSL | | | | |  | ***Date:*** | | | 2020-03-02 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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 can be 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-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | 5G V2X with NR sidelink is introduced in REL-16. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | RAN2#107:   * New references are added to 2 * New definitions are added to 3.1. * NR sidelink transmission and reception are added to RRC states in 7.2 * New SIB for NR sidelink is added to 7.4 * NR sidelink communication is added for support of V2X service in 23.14.1.0 * E-UTRAN control for NR sidelink communication is added to 23.14.1.x * Support of V2X sidelink communication and NR sidelink communication in E-UTRA connected to 5GC is added in 24.x   RAN2#109-e:   * All editor’s notes are deleted | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | 5G V2X with NR Sidelink will not be introduced in Rel-16. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 2, 3.1, 7.2, 7.4, 23.14.1.0, 23.14.1.x, 24.x | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.300 CR 0204, TS 37.340 CR 0187 | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

START OF THE CHANGE

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TR 25.913: "Requirements for Evolved UTRA (E-UTRA) and Evolved UTRAN (E-UTRAN)".

[3] 3GPP TS 36.201: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; General description".

[4] 3GPP TS 36.211:"Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Channels and Modulation".

[5] 3GPP TS 36.212: "Evolved Universal Terrestrial Radio Access (E-UTRA); Multiplexing and channel coding".

[6] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer procedures".

[7] 3GPP TS 36.214: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical layer; Measurements".

[8] IETF RFC 4960 (09/2007): "Stream Control Transmission Protocol".

[9] 3GPP TS 36.302: "Evolved Universal Terrestrial Radio Access (E-UTRA); Services provided by the physical layer".

[10] Void

[11] 3GPP TS 36.304: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) procedures in idle mode".

[12] 3GPP TS 36.306: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio access capabilities".

[13] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC) protocol specification".

[14] 3GPP TS 36.322: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Link Control (RLC) protocol specification".

[15] 3GPP TS 36.323: "Evolved Universal Terrestrial Radio Access (E-UTRA); Packet Data Convergence Protocol (PDCP) specification".

[16] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC) protocol specification".

[17] 3GPP TS 23.401: "Technical Specification Group Services and System Aspects; GPRS enhancements for E-UTRAN access".

[18] 3GPP TR 24.801: "3GPP System Architecture Evolution (SAE); CT WG1 aspects".

[19] 3GPP TS 23.402: "3GPP System Architecture Evolution: Architecture Enhancements for non-3GPP accesses".

[20] 3GPP TS 24.301: "Non-Access-Stratum (NAS) protocol for Evolved Packet System (EPS); Stage 3".

[21] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); "Requirements for support of radio resource management".

[22] 3GPP TS 33.401: "3GPP System Architecture Evolution: Security Architecture".

[23] 3GPP TS 23.272: "Circuit Switched Fallback in Evolved Packet System; Stage 2".

[24] Void.

[25] 3GPP TS 36.413: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); S1 Application Protocol (S1AP)".

[26] 3GPP TS 23.003: "Numbering, addressing and identification".

[27] 3GPP TR 25.922: "Radio Resource Management Strategies".

[28] 3GPP TS 23.216: "Single Radio voice Call continuity (SRVCC); Stage 2".

[29] 3GPP TS 32.421: "Subscriber and equipment trace: Trace concepts and requirements".

[30] 3GPP TS 32.422: "Subscriber and equipment trace; Trace control and configuration management".

[31] 3GPP TS 32.423: "Subscriber and equipment trace: Trace data definition and management".

[32] Void.

[33] 3GPP TS 22.220: "Service Requirements for Home NodeBs and Home eNodeBs".

[34] 3GPP TS 22.268: "Public Warning System (PWS) Requirements".

[35] IETF RFC 3168 (09/2001): "The Addition of Explicit Congestion Notification (ECN) to IP".

[36] 3GPP TS 25.446: "MBMS synchronisation protocol (SYNC)".

[37] 3GPP TS 22.168: "Earthquake and Tsunami Warning System (ETWS) requirements; Stage 1".

[38] Void.

[39] Void.

[40] 3GPP TS 29.274: "Tunnelling Protocol for Control Plane (GTPv2-C); Stage 3".

[41] 3GPP TS 29.061: "Interworking between the Public Land Mobile Network (PLMN) supporting packet based services and Packet Data Networks (PDN)".

[42] 3GPP TS 36.423: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 Application Protocol (X2AP)".

[43] 3GPP TS 37.320: "Universal Terrestrial Radio Access (UTRA) and Evolved Universal Terrestrial Radio Access (E-UTRA); Radio measurement collection for Minimization of Drive Tests (MDT); Overall description; Stage 2".

[44] 3GPP TS 36.443: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); M2 Application Protocol (M2AP)".

[45] 3GPP TS 36.444: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); M3 Application Protocol (M3AP)".

[46] 3GPP TS 36.420: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 general aspects and principles".

[47] 3GPP TS 29.281: "General Packet Radio System (GPRS) Tunnelling Protocol User Plane (GTPv1-U)"

[48] 3GPP TS 23.246: "Multimedia Broadcast/Multicast Service (MBMS); Architecture and functional description"

[49] 3GPP TS 26.346: "Multimedia Broadcast/Multicast Service (MBMS); Protocols and codecs"

[50] 3GPP TR 36.816: "Evolved Universal Terrestrial Radio Access (E-UTRA); Study on signalling and procedure for interference avoidance for in-device coexistence".

[51] 3GPP TS 36.305: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); Stage 2 functional specifications of User Equipment (UE) positioning in E-UTRAN".

[52] 3GPP TS 36.101: "Evolved Universal Terrestrial Radio Access (E-UTRA); User Equipment (UE) radio transmission and reception".

[53] 3GPP TS 33.320: "Security of Home Node B (HNB) / Home evolved Node B (HeNB)".

[54] 3GPP TS 23.251: "Technical Specification Group Services and System Aspects; Network Sharing; Architecture and functional description".

[55] 3GPP TS 23.139: "3GPP system – fixed broadband access network interworking".

[56] 3GPP TS 23.007: "Technical Specification Group Core Network and Terminals; Restoration procedures".

[57] 3GPP TS 23.682: "Architecture enhancements to facilitate communications with packet data networks and applications".

[58] 3GPP TS 24.312: "Access Network Discovery and Selection Function (ANDSF) Management Object (MO)".

[59] 3GPP TR 36.842: "Study on Small Cell enhancements for E-UTRA and E-UTRAN; Higher layer aspects"

[60] 3GPP TR 36.932: "Scenarios and Requirements for Small Cell Enhancements for E-UTRA and E-UTRAN".

[61] 3GPP TS 36.425: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN); X2 interface user plane protocol".

[62] 3GPP TS 23.303: "Technical Specification Group Services and System Aspects; Proximity-based services (ProSe)"

[63] 3GPP TS 36.314: "Evolved Universal Terrestrial Radio Access (E-UTRA); Layer 2 - Measurements".

[64] 3GPP TR 36.889: "Study on Licensed-Assisted Access to Unlicensed Spectrum".

[65] IEEE 802.11, Part 11: "Wireless LAN Medium Access Control (MAC) and Physical Layer (PHY) specifications, IEEE Std.".

[66] 3GPP TS 36.360: "LTE-WLAN Aggregation Adaptation Protocol (LWAAP) specification".

[67] 3GPP TS 24.302: "Access to the 3GPP Evolved Packet Core (EPC) via non-3GPP access networks".

[68] 3GPP TS 36.361: "LTE/WLAN Radio Level Integration Using IPsec Tunnel (LWIP) encapsulation; Protocol specification".

[69] 3GPP TS 36.463: "Evolved Universal Terrestrial Radio Access Network (E-UTRAN) and Wireless LAN (WLAN); Xw application protocol (XwAP)".

[70] 3GPP TS 33.402: "3GPP System Architecture Evolution (SAE); Security aspects of non-3GPP accesses".

[71] 3GPP TS 22.185: "Service requirements for V2X services; Stage 1".

[72] 3GPP TS 23.285: "Technical Specification Group Services and System Aspects; Architecture enhancements for V2X services".

[73] IETF RFC 7567 "IETF Recommendations Regarding Active Queue Management".

[74] 3GPP TS 26.114: "Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction".

[75] 3GPP TS 24.386: "User Equipment (UE) to V2X control function; protocol aspects; Stage 3".

[76] 3GPP TS 37.340: "Evolved Universal Terrestrial Radio Access (E-UTRA) and NR; Multi-connectivity".

[77] 3GPP TS 23.280: "Common functional architecture to support mission critical services; Stage 2".

[78] 3GPP TS 36.355: " Evolved Universal Terrestrial Radio Access (E-UTRA);LTE Positioning Protocol (LPP)".

[79] 3GPP TS 38.300: "NR; NR and NG-RAN Overall Description, Stage 2".

[80] 3GPP TS 37.324: "NR; Service Data Protocol (SDAP) specification".

[81] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) specification".

[82] 3GPP TS 23.501: "System Architecture for the 5G System; Stage 2".

[83] 3GPP TS 23.502: "Procedures for the 5G System; Stage 2".

[84] 3GPP TS 29.002: "Mobile Application Part (MAP) specification".

[85] 3GPP TS 25.412: "UTRAN Iu interface signalling transport".

[86] 3GPP TS 38.423: "NG-RAN; Xn Application Protocol (XnAP)".

[87] Void

[88] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[89] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".

[90] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access".

[xa] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[xx] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services ".

# 3 Definitions, symbols and abbreviations

## 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.

**Control plane CIoT EPS optimization**: 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 optimization is a UE that does not support User plane CIoT EPS optimization and S1-U data transfer but may support other CIoT EPS optimizations.

**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 CSG whitelist of the UE includes an entry comprising cell's CSG ID and the respective PLMN identity.

**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.

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

**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].

**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.

**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.

**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.

**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.

**NR:** NR radio access

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

**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.

**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 EPS optimization**: 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.

NEXT CHANGE

## 7.2 RRC protocol states & state transitions

RRC uses the following states:

- **RRC\_IDLE**:

- PLMN selection;

- DRX configured by NAS;

- Broadcast of system information;

- Paging;

- Cell re-selection mobility;

- The UE shall have been allocated an id which uniquely identifies the UE in a tracking area;

- No RRC context stored in the eNB (except for a UE that supports User Plane CIoT EPS optimizations, as specified in TS 24.301 [20], where a context may be stored for the resume procedure);

- Sidelink communication transmission and reception;

- Sidelink discovery announcement and monitoring;

- V2X sidelink communication transmission and reception;

- NR sidelink communication transmission and reception;

- EDT.

- **RRC\_CONNECTED**:

- UE has an E-UTRAN-RRC connection;

- UE has context in E-UTRAN;

- E-UTRAN knows the cell which the UE belongs to;

- Network can transmit and/or receive data to/from UE;

- Network controlled mobility (handover and inter-RAT cell change order to GERAN with NACC);

- Neighbour cell measurements;

- Sidelink communication transmission and reception;

- Sidelink discovery announcement and monitoring;

- V2X sidelink communication transmission and reception;

- NR sidelink communication transmission and reception;

- At PDCP/RLC/MAC level:

- UE can transmit and/or receive data to/from network;

- UE monitors control signalling channel for shared data channel to see if any transmission over the shared data channel has been allocated to the UE;

- UE also reports channel quality information and feedback information to eNB;

- DRX period can be configured according to UE activity level for UE power saving and efficient resource utilization. This is under control of the eNB.

E-UTRA connected to 5GC additionally supports RRC\_INACTIVE state, which has the same characteristics as RRC\_INACTIVE of NR connected to 5GC, as specified in TS 38.300 [79].

NEXT CHANGE

## 7.4 System Information

System information is divided into the *MasterInformationBlock* (MIB) and a number of *SystemInformationBlocks* (SIBs):

*- MasterInformationBlock* defines the most essential physical layer information of the cell required to receive further system information;

- *SystemInformationBlockPos* contains positioning assistance data;

- *SystemInformationBlockType1* and *SystemInformationBlockType1-BR* (for a BL UE or UE in enhanced coverage) contain information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information blocks;

- *SystemInformationBlockType2* contains common and shared channel information;

- *SystemInformationBlockType3* contains cell re-selection information, mainly related to the serving cell;

- *SystemInformationBlockType4* contains information about the serving frequency and intra-frequency neighbouring cells relevant for cell re-selection (including cell re-selection parameters common for a frequency as well as cell specific re-selection parameters);

- *SystemInformationBlockType5* contains information about other E‑UTRA frequencies and inter-frequency neighbouring cells relevant for cell re-selection (including cell re-selection parameters common for a frequency as well as cell specific re-selection parameters);

- *SystemInformationBlockType6* contains information about UTRA frequencies and UTRA neighbouring cells relevant for cell re-selection (including cell re-selection parameters common for a frequency as well as cell specific re-selection parameters);

- *SystemInformationBlockType7* contains information about GERAN frequencies relevant for cell re-selection (including cell re-selection parameters for each frequency);

- *SystemInformationBlockType8* contains information about CDMA2000 frequencies and CDMA2000 neighbouring cells relevant for cell re-selection (including cell re-selection parameters common for a frequency as well as cell specific re-selection parameters);

- *SystemInformationBlockType9* contains a home eNB name (HNB name);

- *SystemInformationBlockType10* contains an ETWS primary notification;

- *SystemInformationBlockType11* contains an ETWS secondary notification;

- *SystemInformationBlockType12* contains a CMAS warning notification;

- *SystemInformationBlockType13* contains MBMS-related information;

- *SystemInformationBlockType14* contains information about Extended Access Barring for access control;

- *SystemInformationBlockType15* contains information related to mobility procedures for MBMS reception;

- *SystemInformationBlockType16* contains information related to GPS time and Coordinated Universal Time (UTC );

- *SystemInformationBlockType17* contains information relevant for traffic steering between E-UTRAN and WLAN;

- *SystemInformationBlockType18* contains information related to sidelink communication;

- *SystemInformationBlockType19* contains information related to sidelink discovery;

- *SystemInformationBlockType20* contains information related to SC-PTM;

- *SystemInformationBlockType21* contains information related to V2X sidelink communication;

- *SystemInformationBlockType24* contains information about NR frequencies and NR neighbouring cells relevant for cell re-selection (including cell re-selection parameters common for a frequency);

- *SystemInformationBlockType25* contains information about UAC parameters;

- *SystemInformationBlockType26* contains additional information related to V2X sidelink communication;

- *SystemInformationBlockTypeXX* contains information related to NR sidelink communication.

System information for NB-IoT is divided into the *MasterInformationBlock-NB* (MIB-NB) and a number of *SystemInformationBlocks-NB* (SIBs-NB):

- *MasterInformationBlock-NB* defines the most essential information of the cell required to receive further system information;

- *SystemInformationBlockType1-NB* contains information relevant when evaluating if a UE is allowed to access a cell and defines the scheduling of other system information blocks;

- *SystemInformationBlockType2-NB* contains common radio resource configuration information;

- *SystemInformationBlockType3-NB* contains cell re-selection information for intra-frequency, inter-frequency;

- *SystemInformationBlockType4-NB* contains neighboring cell related information relevant for intra-frequency cell re-selection;

- *SystemInformationBlockType5-NB* contains neighboring cell related information relevant for inter-frequency cell re-selection;

- *SystemInformationBlockType14-NB* contains information about access barring;

- *SystemInformationBlockType15-NB* contains information related to mobility procedures for MBMS reception;

- *SystemInformationBlockType16-NB* contains information related to GPS time and Coordinated Universal Time (UTC);

- *SystemInformationBlockType20-NB* contains information related to SC-PTM;

- *SystemInformationBlockType22-NB* contains common radio resource configuration information for paging and random access procedure on non-anchor carriers;

- *SystemInformationBlockType23-NB* contains common additional radio resource configuration information for random access procedure on anchor and non-anchor carriers.

On MBMS-dedicated cell, only system information relevant for receiving MBMS service is broadcasted. *MasterInformationBlock-MBMS* (MIB-MBMS) and *SystemInformationBlockType1-MBMS* (SIB1-MBMS) are used instead of MIB and SIB1 respectively:

*- MasterInformationBlock-MBMS* defines the most essential physical layer information of the cell required to receive further system information on MBMS-dedicated cell;

*- SystemInformationBlockType1-MBMS* contains information relevant for receiving MBMS service and defines the scheduling of other system information blocks on MBMS-dedicated cell;

The MIB is mapped on the BCCH and carried on BCH while all other SI messages are mapped on the BCCH and BR-BCCH, and carried on DL-SCH. Except for BL UEs, UEs in enhanced coverage and NB-IoT UEs, all other SI messages than the MIB which are dynamically carried on DL-SCH, can be identified through the SI-RNTI (System Information RNTI). Both the MIB and *SystemInformationBlockType1* (*SystemInformationBlockType1-BR* for BL UEs and UEs in enhanced coverage) use a fixed schedule with a periodicity of 40 and 80 ms respectively. The scheduling of other SI messages is flexible and indicated by *SystemInformationBlockType1* (*SystemInformationBlockType1-BR* for BL UEs and UEs in enhanced coverage, and *SystemInformationBlockType1-NB* for NB-IoT). For NB-IoT, the MIB-NB is mapped on the BCCH and carried on BCH while all other SI messages are mapped on the BCCH and carried on DL-SCH. Both the MIB-NB and *SystemInformationBlockType1-NB* use a fixed schedule with a periodicity of 640 and 2560 ms respectively. The MIB-NB contains all information required to acquire SIB1-NB and SIB1-NB contains all information required to acquire other SI messages.

On MBMS-dedicated cell, the MIB-MBMS and SIB1-MBMSuse a fixed schedule with a periodicity of 160 ms. Additionally, SIB1-MBMS may be scheduled in additional non-MBSFN subframes indicated in MIB-MBMS.

For NB-IoT, in TDD mode, the MIB-TDD-NB is transmitted on the same NB-IoT carrier as NPSS/NSSS, *SystemInformationBlockType1-NB* can be transmitted on NB-IoT carrier other than the MIB-NB, and the SI messages can be transmitted on a NB-IoT carrier other than the MIB-NB. At most two NB-IoT carriers are used to transmit the MIB-NB, *SystemInformationBlockType1-NB* and the SI messages.

Except for NB-IoT, the eNB may schedule DL-SCH transmissions concerning logical channels other than BCCH or BR-BCCH in the same subframe as used for BCCH or BR-BCCH. The minimum UE capability restricts the BCCH or BR-BCCH mapped to DL-SCH e.g. regarding the maximum rate.

The Paging message is used to inform UEs in RRC\_IDLE and UEs in RRC\_CONNECTED about a system information change. For NB-IoT UEs, BL UEs, and UEs in CE, the UE is not required to detect SIB changes when in RRC\_CONNECTED, and the network may release the NB-IoT UE, BL UE or UE in CE to RRC\_IDLE if it wants the NB-IoT UE, BL UE or UE in CE to acquire changed SIB(s).

Except for NB-IoT, system information may also be provided to the UE by means of dedicated signalling e.g. upon handover.

NEXT CHANGE

## 23.14 Support for V2X services

### 23.14.1 General

#### 23.14.1.0 Overview

Vehicular communication services, represented by V2X services, can consist of the following four different types: V2V, V2I, V2N and V2P, as specified in TS 22.185 [71].

V2X services can be provided by PC5 interface and/or Uu interface. Support of V2X services via PC5 interface is provided by V2X sidelink communication as specified in TS 23.285 [72] and/or NR sidelink communication as specified in TS 23.287 [xx], which are modes of communication whereby UEs can communicate with each other directly over the PC5 interface. Both communications mode may be supported when the UE is served by E-UTRAN and when the UE is outside of E-UTRA coverage. Only the UEs authorised to be used for V2X services can perform V2X sidelink communication and/or NR sidelink communications for V2X services. NR sidelink communication may be used to support other services than V2X services.

NEXT CHANGE

#### 23.14.1.x E-UTRAN control for NR sidelink communication

When the UE is served by E-UTRAN, if the UE supports and is authorized to perform NR sidelink communication in E-UTRAN, NR sidelink communication can be configured and controlled by E-UTRAN via dedicated signaling and/or system information, using the procedures specified for gNB in TS 38.300 [79], with the following restrictions to operation of NR sidelink communication controlled by E-UTRAN:

- Dynamic sidelink scheduling and the configured sidelink grant with type 2 are not supported for the UE served by E-UTRAN.

NEXT CHANGE

## 24.x Sidelink

E-UTRA connected to 5GC can support V2X sidelink communication and NR sidelink communication for UEs in RRC\_IDLE, RRC\_INACTIVE and RRC\_CONNECTED. The details of NR sidelink communication are defined in TS 38.300 [79].

END OF THE CHANGE