**3GPP TSG-RAN WG2 Meeting #124 *R2-231xxxx***

**Chicago, US, 13th – 17th Nov., 2023**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.304** | **CR** | **0369** | **rev** | **1** | **Current version:** | **17.6.0** |  |
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| *For* [***HE******LP***](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 Network energy savings for NR | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Apple | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | Netw\_Energy\_NR-Core | | | | |  | ***Date:*** | | | 2023-09-27 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *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-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)*  *Rel-19 (Release 19)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduction of the support of legacy UE barring mechanism in Rel-18 Network Energy saving | | | | | | | | |
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| ***Summary of change:*** | | RAN2 #123 meeting made below agreements:  - One single bit in SIB1 is introduced for controlling all “NES-capable UEs” to access a cell. FFS what “NES capable UE” bit means. The NES UE always follows the NES bit used for barring, if present. If not present the UE shall follow legacy barring.  - No new cell baring techniques for non-NES UEs will be specified.  - No new cell re-selection techniques will be considered in this Rel-18  RAN2 #123b meeting made below agreements:  **Agreements for cell reselection:**   1. For NES-capable UEs, introduce single code point, meaning not barred. 2. A NES-capable UE in the cell barring context is at least UE supporting cell DTX/DRX. FFS if other NES features will need to be included only if legacy impact is found. FFS how we capture it in the CR in terms of wording 3. If the NES UE is barred in the NES cell and the IntraFreqReselection field of the MIB is set to ‘Not Allowed’, the UE cannot reselect to another cell of the same frequency as the barred cell. If it is set to “Allowed” UE follows intra frequency reselection bit in the MIB.   RAN2 #124 meeting made below agreements:  **Agreements on RRC open issues:**   1. Confirm no other features have legacy impact (for cell selection and reselection purposes) 2. Refer to UE capability of cell DTX/DRX (NES Cell DTX/DRX)   Based on above agreements, add new barring behavior for NES-capable UE. | | | | | | | | |
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| ***Consequences if not approved:*** | | Legacy UE barring mechanism of Rel-18 Network Energy saving feature is not supported. | | | | | | | | |
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| ***Clauses affected:*** | | 3.1, 3.2, 5.3.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... 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:*** | |  | | | | | | | | |

1. ***Modified section***

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

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

**Acceptable Cell:** A cell that satisfies certain conditions as specified in 4.5.

**Allowed CAG list:** A per-PLMN list of CAG Identifiers the UE is allowed to access (see TS 23.501 [10])**.**

**Available PLMN(s):** One or more PLMN(s) for which the UE has found at least one cell and read its PLMN identity(ies).

**Available SNPN(s):** One or more SNPN(s) for which the UE has found at least one cell and read its SNPN identity(ies).

**Barred Cell**: A cell a UE is not allowed to camp on.

**CAG cell**: A cell broadcasting at least one Closed Access Group Identifier.

**Camped on a cell:** UE has completed the cell selection/reselection process and has chosen a cell. The UE monitors system information and (in most cases) paging information.

**Camped on any cell**: UE is in idle mode and has completed the cell selection/reselection process and has chosen a cell irrespective of PLMN identity.

**Closed Access Group Identifier**: Identifier of a CAG within a PLMN.

**Commercial Mobile Alert System:** Public Warning System that delivers *Warning Notifications* provided by *Warning Notification Providers* to CMAS capable UEs.

**eCall Only Mode:** A UE configuration option that allows the UE to register at 5GC and register in IMS to perform only eCall Over IMS, and a non-emergencyIMS call for test and/or terminal reconfiguration services.

**EHPLMN:** Any of the PLMN entries contained in the Equivalent HPLMN list TS 23.122 [9].

**Equivalent PLMN list:** List of PLMNs considered as equivalent by the UE for cell selection, cell reselection, and handover according to the information provided by the NAS.

**Home PLMN:** A PLMN where the Mobile Country Code (MCC) and Mobile Network Code (MNC) of the PLMN identity are the same as the MCC and MNC of the IMSI.

**HSDN cell**: A cell that has higher priority than other cells for cell reselection for HSDN capable UE in a High-mobility state.

**NES-capable UE:** a UE that supports NES Cell DTX/DRX as specified in clause 4.2.6 in TS 38.306 [24].

**Network Identifier**: Identifier of an SNPN in combination with a PLMN ID (TS 23.501 [10]).

**Non-Public Network:** A network deployed for non-public use, as defined in TS 22.261 [12].

**Non-terrestrial network**: An NG-RAN consisting of gNBs, which provides non-terrestrial NR access to UEs by means of an NTN payload embarked on an airborne or space-borne NTN vehicle and an NTN Gateway.

**NR sidelink communication**: AS functionality enabling at least V2X Communication as defined in TS 23.287 [16], and ProSe communication (including ProSe non-Relay and UE-to-Network Relay communication) as defined in TS 23.304 [22], between two or more nearby UEs, using NR technology but not traversing any network node.

**NR sidelink discovery**: AS functionality enabling ProSe non-Relay Discovery and ProSe UE-to-Network Relay discovery for Proximity based Services as defined in TS 23.304 [22] between two or more nearby UEs, using NR technology but not traversing any network node.

**Process:** A local action in the UE invoked by an RRC procedure or an RRC\_IDLE or RRC\_INACTIVE state procedure.

**Quasi-earth fixed cell:** An NTN cell fixed with respect to a certain geographic area on the earth during a certain time duration. This can be provisioned by beam(s) covering one geographic area for a limited period and a different geographic area during another period (e.g., the case of NGSO satellites generating steerable beams).

**Radio Access Technology:** Type of technology used for radio access, for instance NR or E-UTRA.

**RedCap UE:** A UE with reduced capabilities as specified in clause 4.2.21 in TS 38.306 [24].

**Registration Area**: (NAS) registration area is an area in which the UE may roam without a need to perform location registration, which is a NAS procedure.

**Registered PLMN:** This is the PLMN on which certain Location Registration outcomes have occurred, as specified in TS 23.122 [9].

**Registered SNPN**: This is the SNPN on which certain Location Registration outcomes have occurred, as specified in TS 23.122 [9].

**Reserved Cell**: A cell on which camping is not allowed, except for particular UEs, if so indicated in the system information.

**Selected PLMN:** This is the PLMN that has been selected by the NAS, either manually or automatically.

**Selected SNPN**: This is the SNPN that has been selected by the NAS, either manually or automatically.

**Serving cell:** The cell on which the UE is camped.

**Sidelink:** UE to UE interface for V2X sidelink communication defined in TS 23.287[16].

**SNPN Access Mode:** Mode of operation wherein UE only selects SNPNs (as defined in TS 23.501 [10]).

**SNPN identity**: An identifier of an SNPN comprising of a PLMN ID and an NID combination.

**Strongest cell:** The cell on a particular frequency that is considered strongest according to the layer 1 cell search procedure (TS 38.213 [4], TS 38.215 [11]).

**Suitable Cell:** This is a cell on which a UE may camp. For NR cell, the criteria are defined in clause 4.5, for E-UTRA cell in TS 36.304 [7].

**U2N Relay UE:** a UE that provides functionality to support connectivity to the network for U2N Remote UE(s).

**U2N Remote UE:** a UE that communicates with the network via a U2N Relay UE.

**V2X sidelink communication**: AS functionality enabling V2X Communication as defined in TS 23.285 [17], between nearby UEs, using E-UTRA technology but not traversing any network node.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

AS Access Stratum

CAG Closed Access Group

CAG-ID Closed Access Group Identifier

CMAS Commercial Mobile Alert System

CN Core Network

DCI Downlink Control Information

DRX Discontinuous Reception

eDRX Extended DRX

ETWS Earthquake and Tsunami Warning System

E-UTRA Evolved UMTS Terrestrial Radio Access

E-UTRAN Evolved UMTS Terrestrial Radio Access Network

GIN Group ID for Network selection

H-SFN Hyper System Frame Number

HRNN Human-Readable Network Name

HSDN High Speed Dedicated Network

IAB Integrated Access and Backhaul

IMSI International Mobile Subscriber Identity

L2 Layer-2

MBS Multicast/Broadcast Services

MBS FSAI MBS Frequency Selection Area Identity

MCC Mobile Country Code

MCCH MBS Control Channel

MICO Mobile Initiated Connection Only

MRB MBS Radio Bearer

MTCH MBS Traffic Channel

NAS Non-Access Stratum

NES Network Energy Savings

NID Network Identifier

NPN Non-Public Network

NR NR Radio Access

NSAG Network Slice AS Group

NTN Non-Terrestrial Network

PEI Paging Early Indication

PEI-O Paging Early Indication-Occasion

PH Paging Hyperframe

PLMN Public Land Mobile Network

PTW Paging Time Window

RAT Radio Access Technology

RNA RAN-based Notification Area

RNAU RAN-based Notification Area Update

RRC Radio Resource Control

SDT Small Data Transmission

SL Sidelink

SNPN Stand-alone Non-Public Network

TRS Tracking Reference Signal

U2N UE-to-Network

UAC Unified Access Control

UE User Equipment

UMTS Universal Mobile Telecommunications System

V2X Vehicle to Everything

***End of the 1st modified section***

***2nd Modified section***

### 5.3.1 Cell status and cell reservations

Cell status and cell reservations are indicated in the *MIB or SIB1* message as specified in TS 38.331 [3] by means of following fields:

- *cellBarred* (IE type: "barred" or "not barred")   
Indicated in *MIB* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is common for all PLMNs and NPNs. This field is ignored by UEs supporting NTN while *cellBarredNTN* is included in SIB1. This field is ignored by NES-capable UEs while *cellBarredNES* is included in SIB1.

- *cellBarredNES* (IE type: "not barred")  
Indicated in *SIB1* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is common for all PLMNs and NPNs. This field is only applicable to NES-capable UEs.

- *cellBarredNTN* (IE type: "barred" or "not barred")  
Indicated in SIB1 message. In case of multiple PLMNs indicated in *SIB1*, this field is common for all PLMNs. This field is ignored if the UE does not support NTN connectivity.

- *cellBarredRedCap1Rx* (IE type: "barred" or "not barred")  
Indicated in *SIB1* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is common for all PLMNs and NPNs. This field is only applicable to RedCap UEs.

- *cellBarredRedCap2Rx* (IE type: "barred" or "not barred")  
Indicated in *SIB1* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is common for all PLMNs and NPNs. This field is only applicable to RedCap UEs.

- *cellReservedForOperatorUse* (IE type: "reserved" or "not reserved")   
Indicated in *SIB1* message*.* In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is specified per PLMN or per SNPN.

- *cellReservedForOtherUse* (IE type: "true")   
Indicated in *SIB1* message. In case of multiple PLMNs indicated in *SIB1*, this field is common for all PLMNs.

*- cellReservedForFutureUse* (IE type: "true")   
Indicated in *SIB1* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is common for all PLMNs and NPNs.

NOTE 0: IAB-MT ignores the *cellBarred*, *cellReservedForOperatorUse, cellReservedForFutureUse,* and *intraFreqReselection* (i.e. treats *intraFreqReselection* as if it was set to *allowed*) as defined in TS 38.331 [3]. IAB-MT also ignores *cellReservedForOtherUse* for cell barring determination (i.e. NPN capable IAB-MT considers *cellReservedForOtherUse* for determination of an NPN-only cell) as defined in TS 38.331 [3].

- *halfDuplexRedCapAllowed* (IE type: "true")  
Indicated in *SIB1* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is common for all PLMNs and NPNs. This field is only applicable to RedCap UEs.

- *iab-Support* (IE type: "true")  
Indicated in *SIB1* message. In case of multiple PLMNs or NPNs indicated in *SIB1*, this field is specified per PLMN or per SNPN.

When cell status is indicated as "not barred" and "not reserved" for operator use and not "true" for other use and not "true" for future use,

- UEs shall treat this cell as candidate during the cell selection and cell reselection procedures.

When cell broadcasts any CAG-IDs or NIDs and the cell status is indicated as "not barred" and "not reserved" for operator use and "true" for other use, and not "true" for future use:

- All NPN-capable UEs shall treat this cell as candidate during the cell selection and cell reselection procedures, other UEs shall treat this cell as if cell status is "barred".

When cell status is indicated as "true" for other use, and either cell does not broadcast any CAG-IDs or NIDs or does not broadcast any CAG-IDs and the UE is not operating in SNPN Access Mode,

- The UE shall treat this cell as if cell status is "barred".

When cell status is indicated as "true" for future use,

- The UE shall treat this cell as if cell status is "barred".

When *cellBarredNES* is absent and *cellBarred* is set to"barred",

- The NES-capable UE shall treat this cell as if cell status is "barred".

When *cellBarredNTN* is not broadcast in this cell,

- For NTN access, the UE shall treat this cell as if cell status is "barred".

When *halfDuplexRedCapAllowed* is not broadcast in this cell,

- The RedCap UE only capable of operating in half-duplex for FDD shall treat this cell as if cell status is "barred".

When cell status is indicated as "not barred" and "reserved" for operator use for any PLMN/SNPN and not "true" for other use and not "true" for future use,

- UEs assigned to Access Identity 11 or 15 operating in their HPLMN/EHPLMN shall treat this cell as candidate during the cell selection and reselection procedures if the field *cellReservedForOperatorUse* for that PLMN set to "reserved".

- UEs assigned to Access Identity 11 or 15 shall treat this cell as candidate during the cell selection and reselection procedures if the field *cellReservedForOperatorUse* for selected/registered SNPN is set to "reserved".

- UEs assigned to an Access Identity 0, 1, 2 and 12 to 14 shall behave as if the cell status is "barred" in case the cell is "reserved for operator use" for the registered PLMN/SNPN or the selected PLMN/SNPN.

- UEs assigned to Access Identity 3 shall behave as if the cell status is "barred" in case the cell is "reserved for operator use" for the registered PLMN or the selected PLMN.

NOTE 1: Access Identities 11, 15 are only valid for use in the HPLMN/ EHPLMN and registered/selected SNPN; Access Identities 12, 13, 14 are only valid for use in the home country and registered/selected SNPN as specified in TS 22.261 [12].

NOTE 1a: Access Identity 3 is only valid for PLMNs that indicate to potential Disaster Inbound Roamers that the UEs can access the PLMN as specified in TS 22.261 [12].

When cell status "barred" is indicated or to be treated as if the cell status is "barred",

- The UE is not permitted to select/reselect this cell, not even for emergency calls.

- The UE shall select another cell according to the following rule:

- If the cell is to be treated as if the cell status is "barred" due to being unable to acquire the *MIB*:

- the UE may exclude the barred cell as a candidate for cell selection/reselection for up to 300 seconds.

- the UE may select another cell on the same frequency if the selection criteria are fulfilled.

- else:

- If the UE is a RedCap UE, the UE shall acquire SIB1 and, in the remainder of this procedure, consider '*intraFreqReselection* in MIB' to be '*intraFreqReselectionRedCap* in SIB1', if available*.*

- If the cell is to be treated as if the cell status is "barred" due to being unable to acquire the SIB1:

- the UE may exclude the barred cell as a candidate for cell selection/reselection for up to 300 seconds.

- the UE may select another cell on the same frequency if the selection criteria are fulfilled.

- If the cell status "barred" is indicated in *MIB* but the UE is unable to acquire the SIB1; or

- If the cell is to be treated as if the cell status is "barred" due to not supporting RedCap UEs:

- the UE shall exclude the barred cell as a candidate for cell selection/reselection for 300 seconds.

- the UE may select another cell on the same frequency if re-selection criteria are fulfilled.

- If the UE is not a RedCap UE, or if the UE is a RedCap UE and *intraFreqReselectionRedCap* in SIB1 is available:

- If the field *intraFreqReselection* in *MIB* message is set to "allowed":

- the UE may select another cell on the same frequency if re-selection criteria are fulfilled;

- If the cell is to be treated as if the cell status is "barred" due to being unable to acquire the *SIB1*:

- the UE may exclude the barred cell as a candidate for cell selection/reselection for up to 300 seconds;

- else:

- the UE shall exclude the barred cell as a candidate for cell selection/reselection for 300 seconds.

- If the field *intraFreqReselection* in *MIB* message is set to "not allowed":

- If the cell is to be treated as if the cell status is "barred" due to being unable to acquire the *SIB1*:

- the UE may exclude the barred cell as a candidate for cell selection/reselection for up to 300 seconds;

- If the cell operates in licensed spectrum:

- the UE shall not re-select to another cell on the same frequency as the barred cell and exclude such cell(s) as candidate(s) for cell selection/reselection for 300 seconds;

- else:

- the UE may select to another cell on the same frequency if the reselection criteria are fulfilled.

- else:

- If the cell operates in licensed spectrum, or if this cell belongs to a PLMN which is indicated as being equivalent to the registered PLMN or the selected PLMN of the UE, or if this cell belongs to the registered SNPN or the selected SNPN of the UE:

- the UE shall not re-select to another cell on the same frequency as the barred cell and exclude such cell(s) as candidate(s) for cell selection/reselection for 300 seconds;

- else:

- the UE may select to another cell on the same frequency if the reselection criteria are fulfilled.

- the UE shall exclude the barred cell as a candidate for cell selection/reselection for 300 seconds.

The cell selection of another cell may also include a change of RAT.

NOTE 2: If barring of a cell is triggered by the condition of *trackingAreaCode* and *trackingAreaList* not being provided, as specified in TS 38.331 [3], the barring only applies to this PLMN and the UE can re-evaluate the barring condition again due to selection of another PLMN.

***End of the 2nd modified section***