**3GPP TSG-RAN WG2 Meeting #123bis *R2-231xxxx***

**Chicago, USA, 13 – 13 Oct, 2023**

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.304** | **CR** | **-** | **rev** | **-** | **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 mobile IAB for NR | | | | | | | | | |
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| ***Source to WG:*** | Intel Corporation | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_mobile\_IAB-Core | | | | |  | ***Date:*** | | | 2023-11-20 |
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| ***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)* | |
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| ***Reason for change:*** | | Introduction of the support of Rel-18 mobile IAB | | | | | | | | |
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| ***Summary of change:*** | | * §5.2.4.1: cell reselection freuqency priority rules for mobile IAB * §5.2.4.10: clarification for CAG cell reselection and mobile IAB cell reselection | | | | | | | | |
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| ***Consequences if not approved:*** | | Rel-18 mobile IAB feature is not completed. | | | | | | | | |
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| ***Clauses affected:*** | | 5.2.4.1, 5.2.4.10 | | | | | | | | |
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|  | | **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:*** | |  | | | | | | | | |
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| ***This CR's revision history:*** | |  | | | | | | | | |

1. ***Modified section***

#### 5.2.4.1 Reselection priorities handling

Absolute priorities of different NR frequencies or inter-RAT frequencies may be provided to the UE in the system information, in the *RRCRelease* message, or by inheriting from another RAT at inter-RAT cell (re)selection. In the case of system information, an NR frequency or inter-RAT frequency may be listed without providing a priority (i.e. the field *cellReselectionPriority* is absent for that frequency). If any fields with *cellReselectionPriority* or *nsag-CellReselectionPriority* are provided in dedicated signalling, the UE shall ignore any fields with *cellReselectionPriority* and *nsag-CellReselectionPriority* provided in system information.

When UE is in camped normally state, if it supports slice-based cell reselection and has received the network slice(s) and NSAG information from NAS to be used for cell reselection, UE shall derive reselection priorities according to clause 5.2.4.11.

NOTE 00: UE derives reselection priorities according to clause 5.2.4.11 also in case *SIB16* (see TS 38.331 [3]) is not broadcast in the camped cell.

If UE is in *camped on any cell* state, UE shall only apply the priorities provided by system information from current cell, and the UE preserves priorities provided by dedicated signalling and *deprioritisationReq* received in *RRCRelease* unless specified otherwise. When the UE in camped normally state, has only dedicated priorities other than for the current frequency, the UE shall consider the current frequency to be the lowest priority frequency (i.e. lower than any of the network configured values). When the HSDN capable UE is in High-mobility state, the UE shall always consider the HSDN cells to be the highest priority (i.e., higher than any other network configured priorities). When the HSDN capable UE is not in High-mobility state, the UE shall always consider HSDN cells to be the lowest priority (i.e., lower than any other network configured priorities). If the UE is configured to perform both NR sidelink communication and V2X sidelink communication, the UE may consider the frequency providing both NR sidelink communication configuration and V2X sidelink communication configuration to be the highest priority. If the UE is configured to perform NR sidelink communication and not perform V2X communication, the UE may consider the frequency providing NR sidelink communication configuration to be the highest priority. If the UE is configured to perform V2X sidelink communication and not perform NR sidelink communication, the UE may consider the frequency providing V2X sidelink communication configuration to be the highest priority.

A UE on a vehicle with a mobile IAB-cell may consider the frequency for which a mobile IAB cell is the best cell to be the highest priority. The UE identifies a mobile IAB cell by the mIAB-cell type indicator in SIB1 (see TS 38.331 [3]). The UE may narrow its search scope for mobile IAB cell(s) by assistance information (frequency and PCI list) if broadcasted in SIB4 (see TS 38.331 [3]). A non-mIAB cell may be excluded from mobile IAB frequency prioritization for up to 300 seconds.

NOTE 0a: The frequency only providing the anchor frequency configuration should not be prioritized for V2X service during cell reselection, as specified in TS 38.331[3].

NOTE 0b: When UE is configured to perform NR sidelink communication or V2X sidelink communication performs cell reselection, it may consider the frequencies providing the intra-carrier and inter-carrier configuration have equal priority in cell reselection.

NOTE 0c: The prioritization among the frequencies which UE considers to be the highest priority frequency is left to UE implementation unless otherwise stated.

NOTE 0d: The UE is configured to perform V2X sidelink communication or NR sidelink communication, if it has the capability and is authorized for the corresponding sidelink operation.

NOTE 0e: When UE is configured to perform both NR sidelink communication and V2X sidelink communication, but cannot find a frequency which can provide both NR sidelink communication configuration and V2X sidelink communication configuration, UE may consider the frequency providing either NR sidelink communication configuration or V2X sidelink communication configuration to be the highest priority.

NOTE 0f: Void.

NOTE 0x: How the UE determines itself to be on a vehicle with a mobile IAB-cell is left to the UE’s implementation.

The UE shall only perform cell reselection evaluation for NR frequencies and inter-RAT frequencies that are given in system information and for which the UE has a priority provided.

If the MBS broadcast capable UE is receiving or interested to receive an MBS broadcast service(s) and can only receive this MBS broadcast service(s) by camping on a frequency on which it is provided, the UE may consider that frequency to be the highest priority during the MBS broadcast session as specified in TS 38.300 [2] as long as the two following conditions are fulfilled:

1) SIB1 scheduling information of the cell reselected by the UE due to frequency prioritization for MBS contains SIB20;

2) Either:

- One or more MBS FSAI(s) of that frequency is indicated in SIB21 of the serving cell and the same MBS FSAI(s) is also indicated for this MBS broadcast service in MBS User Service Description (USD) as specified in TS 26.346 [20], or

- SIB21 is not provided in the serving cell and that frequency is included in the USD of this service, or

- SIB21 is provided in the serving cell but does not provide the frequency mapping for the concerned service, and that frequency is included in the USD of this service.

NOTE 0g: It is up to UE implementation which frequency to select, when the USD provides multiple frequencies for the service the UE is interested in.

If the MBS broadcast capable UE is receiving or interested to receive an MBS broadcast service, the UE may consider cell reselection candidate frequencies at which it cannot receive the MBS broadcast service to be of the lowest priority during the MBS broadcast session as specified in TS 38.300 [2], as long as SIB1 scheduling information of the cell contains SIB20 on the MBS frequency which the UE monitors and as long as the condition 2) above is fulfilled for the serving cell.

NOTE 0h: Example scenarios in which such down-prioritisation may be needed include the cases where camping is not possible for the UE on the MBS broadcast frequency (e.g. the MBS broadcast frequency belongs to a PLMN different from UE's registered PLMN) while the UE can receive the MBS broadcast service when camped on another frequency than the MBS broadcast frequency or current frequency.

NOTE 0i: The frequency prioritization for MBS broadcast, NR sidelink communication, or V2X sidelink communication may override the re-selection priorities for slice-based cell reselection.

In case UE receives *RRCRelease* with *deprioritisationReq*, UE shall consider current frequency and stored frequencies due to the previously received *RRCRelease* with *deprioritisationReq* or all the frequencies of NR to be the lowest priority frequency (i.e. lower than any of the network configured values) while T325 is running irrespective of camped RAT. The UE shall delete the stored deprioritisation request(s) when a PLMN selection or SNPN selection is performed on request by NAS (TS 23.122 [9]).

NOTE 1: UE should search for a higher priority layer for cell reselection as soon as possible after the change of priority. The minimum related performance requirements specified in TS 38.133 [8] are still applicable.

NOTE 1a: The UE does not consider MBS broadcast, NR sidelink communication or V2X sidelink communication functionality to replace cell reselection priorities caused by HSDN or *deprioritisationReq* functionality.

The UE shall delete priorities provided by dedicated signalling when:

- the UE enters a different RRC state; or

- the optional validity time of dedicated priorities (T320) expires; or

- the UE receives an *RRCRelease* message with the field *cellReselectionPriorities* absent; or

- a PLMN selection or SNPN selection is performed on request by NAS (TS 23.122 [9]).

NOTE 2: Equal priorities between RATs are not supported.

The UE shall not consider any exclude-listed cells as candidate for cell reselection.

The UE shall consider only the allow-listed cells, if configured, as candidates for cell reselection.

The UE in RRC\_IDLE state shall inherit the priorities provided by dedicated signalling and the remaining validity time (i.e. T320 in NR and E-UTRA), if configured, at inter-RAT cell (re)selection.

NOTE 3: The network may assign dedicated cell reselection priorities for frequencies not configured by system information.

***2nd modified section***

#### 5.2.4.10 Cell reselection with CAG cells

In addition to normal cell reselection, a UE may optionally use an autonomous search function to detect CAG cells on serving and non-serving frequencies. However UE shall follow the cell reselection criteria based on dedicated frequency priorities and only follow the autonomous cell search result if the result fulfils also the existing cell reselection criteria based on dedicated frequency priorities.

NOTE 0y: Mobile IAB reselection priorities handling is applicable for a mobile IAB-cell irrespective of whether this cell is a CAG cell or not.

# Running CR Annex: Meeting Agreements

Highlighted below are the meeting agreements that have been considered for the CR.

RAN2 #124 meeting agreements:

**For mIAB frequencies in SIB4:**

* If PCI-list, PCI-range is provided, for a frequency, then the UE is expected to consider only cells withing this list/range for this frequency for cell reselection evaluation for mIAB.
* If PCI-list, PCI-range is not provided, for a frequency, then the UE is expected to consider all cells for this frequency for cell reselection evaluation for mIAB.
* Assume no change to SIB1 reading at cell reselection, i.e. a UE implementation where the UE reads SIB1 only from the highest ranked cell right before cell reselection is a valid impl.
* The following TP is agreed: “A UE on a vehicle with a mobile IAB-cell may consider the frequency for which a mobile IAB cell is the best cell to be the highest priority. The UE identifies a mobile IAB cell by the mIAB-cell type indicator [ref 38.331] in SIB1. The UE may narrow its search scope for mobile IAB cell(s) by assistance information (frequency and PCI list) if broadcasted in SIB4. A non-mIAB cell may be excluded from mobile IAB frequency prioritization for up to 300 seconds.”
* The following note is agreed NOTE 0y: mIAB Frequency prioritization is applicable for a mobile IAB cell irrespective of whether the cell is a CAG cell or not. (can polish the wording)

RAN2 #123bis meeting agreements:

* P1: mIAB PCI list is optional present (i.e., not mandatory) for indicated mIAB frequency (confirming that mIAB PCI list is introduced)
* P7: it is left to UE implementation to determine an actual prioritized frequency among frequencies that can be prioritized for mIAB cell/HSDN/MBS/SL/V2X?
* P8: Existing Note 0c in TS 38.304 is applicable for the prioritization between mIAB cell/HSDN/MBS/SL/V2X. So, no or marginal additional specification work is needed.
* FFS:

P2: To discuss further  if mIAB PCI list is not necessarily exclusive, i.e., the PCI list may or may not include PCIs of non-mIAB cell.

P3: To discuss further if mIAB PCI list is not necessarily complete, i.e., the PCI list may or may not include all possible mIAB PCIs.

* From R2 perspective It is not supported that Rel-18 mobile IAB-node concurrently operate as a Rel-16/17 IAB-node, as e.g. mobile-IAB doesn’t support child IAB nodes.
* This means that there are restrictions for the network in configuring concurrent use of R-18 mIAB feature(s) and rel-16/17 IAB features (details FFS).
* FFS if an IAB-node may send both MSG5 indications to the network, and the network decides (or if the IAB-node should decide).

RAN2 #123 meeting agreements:

* Confirm the WA for inter-frequency cell reselection (scenarios: For a UE that is “on-board”, irrespective whether it is camped on the mobile IAB cell or a stationary cell, it can prioritize another frequency for which a mobile IAB cell is the best cell).
* No enhancement is needed for intra-frequency and equal-priority cell reselection.
* The procedure that UE searches and measure for mIAB cells on different frequencies is unspecified. RAN2 assumes that As assistance information, the NW can optionally provide inter-frequency mIAB list in SIB4, details FFS.
* It is left to UE implementation to determine whether the UE is physically on a moving vehicle and when it applies mobile IAB cell reselection prioritization for agreed scenarios.

RAN2 #122 meeting agreements:

* R2 considers that UEs can use the mIAB-cell indication, to prioritize (cell and/or freq) when the UE is camped on the mIAB cell, and FFS to prioritize when the UE is not yet camped on the mIAB cell. FFS if it can be specified the detailed condition for when to apply such prioritization (for either case), RAN2 considers condition based on cell dwelling timer or Mobility state.
* R2 direction (solution agreements at later stage, no other directions will be considered):

RAN2 acknowledges following two problems to be addressed for idle/inactive UEs:

- Problem 1: For a UE that is physically on a moving vehicle but not camped on its mobile IAB-cell yet (i.e. the UE is camped on a stationary cell), how to help such UE(s) to identify a neighbour mobile IAB-cell, prioritize mobile IAB-cell (frequency and cell) and to be “pulled” into this mobile IAB-cell, especially for inter-frequency scenario where the mobile IAB-cell’s frequency priority is low.

- Problem 2: After the UE physically on a moving vehicle is camped on the mobile IAB cell, how to avoid it reselecting other non-mIAB-(stationary) cells.

- Such UE may prioritize a highest ranked cell at a frequency, if it broadcasts a mIAB-cell type indicator in SIB1 for cell reselection. UE may use the SIB4 assistance information to identify the presence of such mobile IAB-cell(s), if broadcasted. A SIB4 assistance information may include mIAB-cell frequencies. FFS on stage-2/3 to clarify the UE in problem 1 and 2.