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

**Xiamen, China, October 9th – 13th, 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **38.304** | **CR** | **draft** | **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 |  | Core Network |  |

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| ***Title:*** | Introduction of eMBS to TS 38.304 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | CATT | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_MBS\_enh-Core | | | | |  | ***Date:*** | | | 2023-10-17 |
|  |  | | | |  | |  | | |  |
| ***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-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | This CR introduces the enhancements specified for the MBS in Rel-18. | | | | | | | | |
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| ***Summary of change:*** | | Introduction of the enhancement on multicast reception in RRC\_INACTIVE in Rel-18. | | | | | | | | |
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| ***Consequences if not approved:*** | | The behaviours of UE configured to receive MBS multicast services in RRC\_INACTIVE is missing in TS 38.304. | | | | | | | | |
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| ***Clauses affected:*** | | 4.1, 5.2.4.1, 5.2.5, 6.2 | | | | | | | | |
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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:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

*Start of Change*

4.1 Overview

The RRC\_IDLE state and RRC\_INACTIVE state tasks can be subdivided into three processes:

- PLMN selection (for UE not operating in SNPN access mode) or SNPN selection (for UE operating in SNPN access mode);

- Cell selection and reselection;

- Location registration and RNA update.

PLMN selection, SNPN selection, cell reselection procedures, and location registration are common for both RRC\_IDLE state and RRC\_INACTIVE state. RNA update is only applicable for RRC\_INACTIVE state. When UE selects a new PLMN or SNPN, UE transitions from RRC\_INACTIVE to RRC\_IDLE, as specified in TS 24.501 [14].

When a UE is switched on, a public land mobile network (PLMN) or a SNPN is selected by NAS. For the selected PLMN/SNPN, associated RAT(s) may be set, as specified in TS 23.122 [9]. The NAS shall provide a list of equivalent PLMNs, if available, that the AS shall use for cell selection and cell reselection.

With cell selection, the UE searches for a suitable cell of the selected PLMN or selected SNPN, chooses that cell to provide available services, and monitors its control channel. This procedure is defined as "camping on the cell".

The UE shall, if necessary, then register its presence, by means of a NAS registration procedure, in the tracking area of the chosen cell. As an outcome of a successful Location Registration, the selected PLMN/SNPN then becomes the registered PLMN/SNPN, as specified in TS 23.122 [9].

If the UE finds a more suitable cell, according to the cell reselection criteria, it reselects onto that cell and camps on it. If the new cell does not belong to at least one tracking area to which the UE is registered, location registration is performed. In RRC\_INACTIVE state, if the new cell does not belong to the configured RNA, an RNA update procedure is performed.

If necessary, the UE shall search for higher priority PLMNs at regular time intervals as described in TS 23.122 [9] and search for a suitable cell if another PLMN has been selected by NAS.

For UE not operating in SNPN access mode, search of available CAGs may be triggered by NAS to support manual CAG selection. The AS shall report available CAG-ID(s) together with their HRNN (if broadcast) and PLMN(s) to the NAS.

NAS may also provide the network slice(s) and Network Slice AS Group (NSAG) information, which contains NSAG(s), their applicable TA(s) if present and their priorities, to be considered by the UE during cell reselection (as specified in TS 23.501 [10], TS 24.501 [14]).

If the UE loses coverage of the registered PLMN/SNPN, either a new PLMN/SNPN is selected automatically (automatic mode), or an indication of available PLMNs/SNPNs is given to the user so that a manual selection can be performed (manual mode). As part of manual SNPN selection, the AS shall report available SNPN identifiers together with their HRNN (if broadcast) to the NAS.

Registration is not performed by UEs only capable of services that need no registration.

The UE may perform NR sidelink communication and/or V2X sidelink communication while in-coverage or out-of-coverage for sidelink, as specified in clause 8.

The U2N Remote UE, the U2N Relay UE, or both may perform sidelink discovery transmissions while in-coverage for the purpose of sidelink relay operations, as specified in clause 8. In addition, the U2N Remote UE can also perform sidelink discovery transmissions while out-of-coverage for the purpose of sidelink relay operations.

An L2 U2N Remote UE in RRC\_IDLE or in RRC\_INACTIVE may perform all the relevant procedures (e.g., acquiring system information and paging message) via the L2 U2N Relay UE. An L2 U2N Remote UE may choose not to perform any procedures related to cell selection and reselection.

The UE may perform NR sidelink discovery transmissions while in-coverage or out-of-coverage for the purpose of sidelink non-relay operations, as specified in clause 8.

The purpose of camping on a cell in RRC\_IDLE state and RRC\_INACTIVE state is as follows:

a) It enables the UE to receive system information from the PLMN or the SNPN.

b) When registered and if the UE wishes to establish an RRC connection or resume a suspended RRC connection, it can do this by initially accessing the network on the control channel of the cell on which it is camped.

c) If the network needs to send a message or deliver data to the registered UE, it knows (in most cases) the set of tracking areas (in RRC\_IDLE state) or RNA (in RRC\_INACTIVE state) in which the UE is camped. It can then send a "paging" message for the UE on the control channels of all the cells in the corresponding set of areas. The UE will then receive the paging message and can respond.

d) It enables the UE to receive ETWS and CMAS notifications.

e) It enables the UE to receive MBS broadcast services.

f) It enables the UE to receive MBS multicast services in RRC\_INACTIVE.

When the UE is in RRC\_IDLE state, upper layers may deactivate AS layer when MICO mode is activated as specified in TS 24.501 [14]. When MICO mode is activated, the AS configuration (e.g. priorities provided by dedicated signalling) is kept and all running timers continue to run but the UE need not perform any idle mode tasks. If a timer expires while MICO mode is activated it is up to the UE implementation whether it performs the corresponding action immediately or the latest when MICO mode is deactivated. When MICO mode is deactivated, the UE shall perform all idle mode tasks.

*Next Change*

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.

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.

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.

NOTE 4: The network may assign dedicated cell reselection priorities to UEs which are configured to receive MBS multicast services in RRC\_INACTIVE.

*Next Change*

5.2.5 Camped Normally state

This state is applicable for RRC\_IDLE and RRC\_INACTIVE state.

When camped normally, the UE shall perform the following tasks:

- monitor the paging channel of the cell as specified in clause 7 according to information broadcast in *SIB1*;

- monitor Short Messages transmitted with P-RNTI over DCI as specified in clause 6.5 in TS 38.331 [3];

- monitor relevant System Information as specified in TS 38.331 [3];

- perform necessary measurements for the cell reselection evaluation procedure;

- execute the cell reselection evaluation process on the following occasions/triggers:

1) UE internal triggers, so as to meet performance as specified in TS 38.133 [8];

2) When information on the BCCH used for the cell reselection evaluation procedure has been modified.

3) When the network slice(s) and/or NSAG information received from NAS changes.

NOTE: For a UE receiving multicast in RRC\_INACTIVE, the RSRP/RSRQ measurement for the cell reselection evaluation is reused to resume the RRC connection when the serving cell becomes lower than the threshold configured by network,as specified in 38.331 [3].

*Next Change*

6.2 Reception of MBS

A UE receiving or interested to receive MBS broadcast services shall apply the MCCH information acquisition procedure as specified in TS 38.331 [3] to receive the MCCH information. A UE interested to receive MBS broadcast services identifies if a service that it is interested to receive is started or ongoing by receiving the MCCH information, and then receives a MTCH(s) configured using the Broadcast MRB establishment procedure as specified in TS 38.331 [3] and using the DL-SCH reception and MBS broadcast DRX procedure as specified in TS 38.321 [19].

A UE configured to receive MBS multicast services in RRC\_INACTIVE shall apply the multicast MCCH information acquisition procedure as specified in TS 38.331 [3] to receive the multicast MCCH information when UE is in RRC\_INACTIVE and the MCCH is configured in the cell. A UE configured to receive MBS multicast services in RRC\_INACTIVE identifies whether a service is active by receiving the indication in *RRCRelease*, multicast MCCH, or group notification in paging message, and then receives the multicast MTCH(s) in RRC\_INACTIVE using the multicast MRB configuration procedure as specified in TS 38.331 [3] and using the DL-SCH reception and MBS multicast DRX procedure as specified in TS 38.321 [19].

UEs which have joined a multicast session(s) and are in RRC\_IDLE/RRC\_INACTIVE state shall apply the reception of the paging message procedure as specified in TS 38.331 [3] when the UE expects MBS group notification as specified in clause 16.10.5.2 in TS 38.300 [2].

*End of Change*

Annex - RAN2 agreements

**RAN2#119 agreements**

**In Rel-18, multicast reception for UEs in INACTIVE supports at least the following scenarios, with the assumption that the UE already has a valid PTM configuration:**

**- Scenario 1: a UE has been receiving multicast in CONNECTED, and it enters INACTIVE and continues the multicast reception.**

**- Scenario 2: a UE has joined a multicast session and has been directed to INACTIVE, the UE starts to receive the multicast session**

**FFS for state changes, e.g. due to service being not provided in INACTIVE anymore etc.**

* It is up to gNB to decide whether a multicast session may be received by UE(s) in INACTIVE. FFS what information gNB may be provided to form such decision (related to SA2 discussion).
* It is supported that gNB transmit one multicast session to both UEs in CONNECTED and INACTIVE in the same cell. FFS how the gNB configures this.
* It is assumed the network can choose which UEs receive in RRC INACTIVE and which in RRC Connected and can move UEs between the states for Multicast service reception.
* The following is taken as baseline: we assume the same PDCCH/PDSCH resources (e.g. resources used for MTCH) can be used for all UEs (including UEs in CONNECTED and/or INACTIVE states) for receiving the same multicast session. Different configuration/resources are not precluded as well. FFS what exactly can be common and what not (e.g. HARQ, SPS etc.) and what is needed in addition (to legacy PTM config).
* For PTM configuration delivery, RAN2 further investigates the following solutions:

Option 1: Dedicated signalling

Option 2: Solution based on SIB+MCCH

We do not preclude some “mix” of the options

* HARQ feedback and PTP are not supported for multicast reception in RRC\_INACTIVE.
* Multicast service continuity after cell reselection in RRC\_INACTIVE state (i.e. without resuming RRC connection) will be supported (if the configuration of the new cell is available for the UE). FFS whether there are cases where the UE needs to resume the connection. FFS RAN3 impacts due to inter-gNB mobility.
* Upon cell reselection to neighbour cells during active multicast session, if the configuration of the session is not available for the new cell for UEs in INACTIVE, then the UE is required to resume RRC connection to get the Multicast MRB configuration.

**RAN2#119bis agreements**

* The following general description is taken as baseline for PTM configuration delivery Option 1:

(1-a) PTM configuration(s) (i.e., configurations used for multicast reception in RRC\_INACTIVE) of one or more multicast sessions for at least one cell are provided via dedicated RRC signaling to a UE.

(1-b) The RRC message for this includes RRCReconfiguration and/or RRCRelease and/or RRCResume (details FFS)

(1-c) UE stores the received configurations while it is in RRC\_INACTIVE, and if there is a need to update some or all the configurations, the UE is notified of such changes and may trigger RRC connection resume to obtain the updated configurations. In case of mobility in RRC\_INACTIVE, the UE triggers RRC connection resume if the configuration of the session is not available for the new cell.

* The following general description is taken as baseline for PTM configuration delivery Option 2:

(2-a) PTM configurations (i.e., configurations used for multicast reception in RRC\_INACTIVE) are provided via an MCCH-like channel (same or different as used for MBS broadcast), and information regarding MCCH scheduling is provided via SIB, FFS dedicated signalling

(2-b) UE can receive such configurations when it is in RRC\_INACTIVE, FFS whether it is allowed/needed to also receive when UE is in RRC\_CONNECTED

(2-c) If there is a need to update some or all the received configurations, UE does not need to resume RRC connection but is notified of such changes (e.g. via MCCH DCI) and obtains the updated configurations via MCCH.

* Dedicated RRC signalling (i.e. RRC release message with suspendConfig) is used for switching a multicast receiving UE from RRC\_CONNECTED to RRC\_INACTIVE and continue multicast reception (details FFS).
* For both option 1 and option 2, as a baseline, group paging can be used to switch UEs receiving multicast from RRC\_INACTIVE to RRC\_CONNECTED, and UEs continue the multicast reception in CONNECTED. FFS if there is any potential issue if Rel-17 group paging is reused. FFS if there are other cases when UE triggers resume. FFS if MCCH can also be used in case of option 2.
* FFS whether to introduce PTM configuration applicable area, i.e., the mechanism that the PTM configurations, once acquired by a UE, may apply to a certain area (i.e., a set of cells instead of a single cell).
* Rel-18 UE in INACTIVE can be informed when the session is activated (Details FFS).
* As a baseline, group paging can be used to inform Rel-18 UE(s) about the session activation (Details FFS, e.g., UE behavior when receiving such group notification).
* If a UE is in RRC\_INACTIVE and is configured to receive a multicast session in RRC\_INACTIVE, the UE may be notified when the multicast session is deactivated. FFS how (e.g., informed via group paging, MCCH, or other ways).
* Rel-17 mechanism (NAS-based indication) is applicable for multicast session release. FFS if any enhancement is needed.
* FFS how UE determines whether it can receive the multicast session in RRC\_INACTIVE or not when the session is activated, taking into account the following solutions (can further update the descriptions if needed, and several solutions may be needed, some solutions may apply only for certain configuration options)

1. When the multicast session is activated, UE can receive the multicast session in RRC\_INACTIVE if the PTM configuration used in RRC\_INACTIVE for the session is available to the UE and the UE has joined the session already (e.g., configuration provided to UE via dedicated RRC signaling or via MCCH), otherwise it goes back to RRC\_CONNECTED to receive the multicast session.

2. When the multicast session is activated, UE is indicated by group paging whether it can receive the multicast session in RRC\_INACTIVE or not (detailed signaling FFS).

3. UE is configured "whether it can receive the multicast session in RRC\_INACTIVE" by dedicated signaling before UE is released. When the multicast session is activated, UE stays in RRC\_INACTIVE or resumes RRC connection accordingly (detailed signaling FFS).

* If option 1 is supported for PTM configuration

As a baseline, group paging may be used to inform the UE when network changes the PTM configurations, and UE upon reception triggers RRC connection resume procedure to obtain the updated configurations (details of group paging can be FFS).

FFS whether and how to solve the issue in signalling/system load when a large number of UEs in the cell need PTM configuration update.

* FFS if there is an issue that a UE can obtain all the PTM configurations for a multicast service via Option 2 without/before joining the multicast session on the condition that security is enabled by service layer. And if yes FFS how to solve the issue (e.g., dedicated configuration + MCCH).

**RAN2#120 agreements**

* We will have a mixed approach and we start with the following:
  + 1. When NW configures UE to continue the multicast reception in INACTIVE state, NW provides the PTM configuration for the activated multicast session via the RRC dedicated signalling, at least for the serving cell (FFS other cases).
    2. **MCCH is used in case there is a need to indicate a PTM configuration in case there is a need for change in PTM config or during mobility beyond serving cell / gNB. FFS session status change and other indications.**
    3. **We assume that the UE can only receive multicast service after it joined the session.**
    4. **FFS whether MCCH configuration is initially provided to the UE via dedicated signalling.**

**RAN2#121 agreements**

* UE shall join in the multicast session before receiving multicast in RRC INACTIVE.
* If network finds it useful, the PTM configuration for the (single) serving cell can be configured to UE before the session activation, and UE stores the configuration. When session is activated, UE can receive multicast in INACTIVE state by applying the configuration without going back to RRC\_CONNECTED, if not updated by MCCH after being configured.
* When network configures UE to receive multicast in INACTIVE state, RRCRelease message with suspendconfig can be used to deliver the PTM configuration. Other dedicated RRC messages will not be used to provide PTM configuration for MBS multicast for INACTIVE.
* We introduce a new MCCH logical channel for multicast in INACTIVE (different from broadcast MCCH)
* Multicast MCCH configuration is provided via new SIB.
* Optionally, Multicast MCCH configuration for the serving cell can also be provided in dedicated signalling. Understanding is we are not optimizing mobility case because of this.
* Serving cell will not provide the PTM configuration of neighbour cells from other gNBs.
* FFS whether the network can provide PTM configuration for intra-gNB cells.

**RAN2#121bis agreements**

* Similar to Rel-17 broadcast reception procedure, UE acquires new SIB and multicast MCCH to get PTM configuration after cell reselection.
* When a UE reselects to a cell for which PTM configuration is not available in multicast MCCH, the UE initiates RRC resumption procedure for an active multicast session it is interested to receive or continue receiving.
* UE may trigger RRC connection resumption if the reception quality of the multicast data is below a configured threshold, FFS how to specify the threshold/reception quality.
* Frequency prioritization may be provided to the UE for cell reselection for multicast reception in RRC\_INACTIVE, detailed mechanism on how to identify the frequency info (e.g., SAI, USD, or frequency info directly provided by network) is FFS.
* No need to define a mechanism other than the frequency prioritization, i.e., per cell based prioritization in cell re-selection, to help UE choose the right cell to camp on.
* The neighbor cell list mechanism for multicast reception in RRC\_INACTIVE may be configured e.g. it can be used by UE to resume RRC connection if service is not available in the re-selected cell by NCL, without reading MCCH in the re-selected cell, in some aspects similar to Rel-17 NCL mechanism in MBS broadcast.
* A "special UE" identified by MBS assistance information from 5GC can be released to RRC\_INACTIVE (e.g., when the session is deactivated). FFS how can network enable such UE to resume to RRC\_CONNECTED upon session activation
* Rel-18 UE can stay in RRC\_INACTIVE and start monitoring corresponding G-RNTI upon an enhanced group paging (e.g., upon session activation or data transmission resumed). Details FFS.
* For one UE already in RRC\_INACTIVE, it can stay in RRC\_INACTIVE and stop monitoring corresponding G-RNTI upon events like session deactivation/temporary no data.
* FFS which option to take: enhanced group paging or enhanced MCCH, to enable Rel-18 UE to stay in RRC\_INACTIVE and stop monitoring corresponding G-RNTI upon events like session deactivation/temporary no data.
* No additional enhancement (with regard to enhancements made for ‘deactivation/temp no data’) is needed specifically for enabling UE to stay in RRC\_INACTIVE and stop monitoring corresponding G-RNTI upon session release.
* Legacy group paging (i.e., Rel-17 group paging) can be used to resume UE to RRC\_CONNECTED state.
* Upon events like session activation/data transmission resumed, if PTM configuration is not available to UE, UE initiates RRC connection resumption.
* UE-specific paging (i.e. PagingRecordList) can be used to move specific MBS multicast UE(s) to RRC\_CONNECTED (i.e. legacy UE behavior).
* When both enhanced group paging and unicast paging are received by the UE (and targeted for this UE), the UE follows unicast Paging and goes to RRC CONNECTED.
* From the location&bandwidth and SCS configuration perspective,follow R17 MBS broadcast CFR principle (i.e. case A,C,E) to provide multicast CFR configuration in RRC\_INACTIVE.
* Multicast CFR in RRC\_INACTIVE and broadcast CFR can be configured differently. FFS whether we need to restrict that one CFR is completely contained within the other in this case (we should understand what the issue is otherwise).
* Case B and case D are not supported for multicast CFR in RRC\_INACTIVE;
* Whether multicast CFR in RRC\_CONNECTED and in RRC\_INACTIVE are different is up to NW implementation. FFS whether this causes some issues which need to be addressed.
* HARQ feedback related information in the DCI is not needed or can be ignored for multicast transmission to RRC\_INACTIVE UE.
* The HARQ operation for multicast reception in RRC\_INACTIVE is same as the operation without HARQ feedback in RRC\_CONNECTED state.
* The multicast transmission RRC\_INACTIVE is performed via beam sweeping based on SSB index like broadcast MBS (i.e. beam information is not need in DCI.
* For MTCH, RAN2 assumes to reuse the same DCI format of R17 multicast (i.e. DCI format 4-1/4-2) for dynamic scheduling of multicast in RRC INACTIVE. RAN2 assumes for MCCH scheduling, DCI format 4-0 is used. We will ask RAN1 to confirm whether it is feasible and whether both 4-1 and 4-2 are needed.
* We will also indicate other relevant agreements to RAN1 (e.g. on beam sweeping etc.)
* On support of multicast SPS in RRC\_INACTIVE, postpone RAN2 discussion to next meeting.
* On DRX operation for multicast in RRC\_INACTIVE, take the multicast DRX as baseline. FFS handling on PTM related HARQ RTT Timer and DRX Retransmission Timer.
* The common LCID space is used for multicast MRB and unicast DRB regardless of UE RRC state (i.e. no change on the LCID table for MTCH).
* Postpone the UP discussion on L2 operation during RRC state transition until the signaling design of PTM configuration in RRCRelease message is concluded.
* Postpone the discussion on L2 operation during mobility to next RAN2 meeting.
* Including the following two issues in LS to RAN1:
  + - Issue 1: RAN1 to confirm RAN2 understanding that PDSCH aggregation is supported for multicast MTCH in RRC\_INACTIVE (as that is supported in Rel-17 multicast MTCH in RRC\_CONNECTED as well as broadcast MTCH).
    - Issue 2: RAN1 to check the feasibility of following Rel-17 CSS design for multicast MTCH and MCCH: 1) reusing the same CSS for multicast MTCH in RRC\_INACTIVE (same as multicast MTCH in RRC\_CONNECTED); 2) separate CSS for MCCH and MTCH.
* Change the working agreement to the agreement below:

Agreement: The same CFR is used for multicast MCCH and MTCH. It can be revisited if there is any issue found, e.g. for RedCap UEs.

* UE in RRC CONNECTED state is not required to read multicast MCCH to be able to receive multicast MBS service i.e. the UE receives the PTM configuration via dedicated signalling. This can be revisited if issues with service continuity are identified.

**RAN2#122 agreements**

* The multicast MCCH configuration takes the broadcast MCCH configuration structure (i.e., mcch-Config-r17) as baseline.
* To notify the multicast MCCH change, change notification mechanism for Rel-17 broadcast MCCH is the baseline.
* Working assumption (to be confirmed by RAN1 via pending reply LS): One bit in the MCCH DCI is used to notify the change of the multicast MCCH. We reuse the bit used for MCCH change indication from Rel-17 MBS broadcast. This does not cover session deactivation which is FFS.
* It is not supported to provide the PTM configuration of intra-gNB neighbour cells in the dedicated signalling.
* For PTM configuration structure on the multicast MCCH, Rel-17 broadcast PTM configuration structure is taken as baseline.
* As a baseline, The PTM configuration in the RRCRelease message with suspendconfig has the same structure as the PTM configuration in multicast MCCH.
* FFS how existing MRBs are handled.
* Introduce a new indication per tmgi in the group paging which informs Rel-18 UEs having a valid PTM configuration to receive the multicast in RRC\_INACTIVE.
* MCCH is used for notifying MC session deactivation for multicast reception in RRC\_INACTIVE to enable Rel-18 UE to stay in RRC\_INACTIVE and stop monitoring corresponding G-RNTI.
* This is assumed to have no/minor impact on RAN1/PHY

**RAN2#123 agreements**

* For a UE receiving multicast in RRC\_INACTIVE, the UE resumes the RRC connection when the measured RSRP or RSRQ based on the existing measurement requirements (whichever is configured by the NW) of the serving cell becomes lower than the threshold configured by network. FFS whether/how we need to address ping-pong issue
* The threshold can be configured in PTM configuration per MBS session via RRCRelease or multicast MCCH message.
* Unless issues are identified with using one of existing resume causes, no new resume causes are introduced for UEs receiving MC in INACTIVE when they resume due to bad quality or lack of SIBx/PTM configuration
* Dedicated frequencies in RRCRelease can be used by the NW, as legacy
* FFS whether we need something more, e.g. frequency priorities in MCCH or a solution based on FSAI
* NW indicates which multicast service can be received in INACTIVE in suspendConfig of RRC Release. FFS how exactly this is indicated
* Unless blocking issues are identified, UE behaviour is not to suspend corresponding multicast MRBs and to keep using them in INACTIVE
* For “non-synchronised“ cell (in terms of PDCP COUNT), upon cell reselection, UE sets the initial PDCP count of the MRB for the multicast reception in RRC\_INACTIVE state based on the same mechanism as R17 MBS broadcast.
* One cell can indicate "synchronized", if by implementation, it follows a common QoS flow to MRB mapping rule and at the same time PDCP COUNT is set according to the MBS QoS Flow SN.
* FFS how the UE is indicated about cells being synchronized (i.e. what information the NW needs to provide to the UE)
* Solutions which require COUNT broadcasting via MCCH are not considered
* SPS is not supported for multicast reception in RRC\_INACTIVE.
* RAN2 enables RRC\_INACTIVE UE receiving multicast to also receive possible PTM retransmissions initiated by UEs receiving multicast in RRC\_CONNECTED.
* Allow configuration of drx-HARQ-RTT-TimerDL-PTM and drx-RetransmissionTimerDL-PTM for INACTIVE UEs (38.331).
* UE receiving MBS multicast in RRC\_INACTIVE should start drx-HARQ-RTT-TimerDL-PTM and drx-RetransmissionTimerDL-PTM when reception of the transport block has not been successful. FFS the details, e.g. when the timers are started exactly.
* This is optional UE capability

**RAN2#123bis agreements**

* For multicast in INACTIVE, the capability for PTM retransmission reception with HARQ disabled (i.e. starting drx-HARQ-RTT-TimerDL-PTM and drx-RetransmissionTimerDL-PTM) is signalled per UE, no FDD-TDD DIFF, and no FR1-FR2 DIFF.
* RAN2 assumes to support FDMed between multicast MCCH and PBCH in a slot (check with RAN1).
* Introduce an explicit indication in the multicast MCCH/RRCRelease(i.e., in the IE MBSMulticastConfiguration) for the UE to stop G-RNTI monitoring. It is used for notification triggered by the multicast session deactivation or the temporary no data.
* UE in RRC\_INACTIVE does not need to monitor multicast MCCH DCI in the current cell until next group paging is received if UE is notified “the stop of G-RNTI monitoring” for all the joined multicast sessions, including the following cases,
* Case 1: UE is receiving multicast in RRC\_INACTIVE and then is notified about the session deactivation via MCCH.
* Case 2: UE transits from RRC\_CONNECTED to RRC\_INACTIVE, and “the stop of G-RNTI monitoring” is indicated in RRCRelease message.
* If UE receives PTM configuration of multicast session(s) in RRCRelease and “the stop of G-RNTI monitoring” is indicated for the corresponding session(s) and then UE selects the same cell as on which it received RRCRelease, UE starts to monitor MCCH DCI upon receiving group paging that indicates to allow the multicast reception in RRC\_INACTIVE.
* If “the stop of G-RNTI monitoring” for a session is indicated in RRCRelease message and the PTM configuration of the corresponding multicast session is not included in same message , UE reads multicast MCCH(if present) upon receiving group paging that indicates to allow the multicast reception in RRC\_INACTIVE.
* If the whole Rel-18 multicast related configuration is absent in RRC Release, UE behaves the same as Rel-17 MBS UE.
* If the session is active and UE receives PTM configuration in RRCRelease message and then UE selects the same cell as it received RRCRelease, UE does not perform Multicast MCCH information acquisition immediately but starts to monitor MCCH DCI for possible change notification after transiting to INACTIVE.
* FFS UE in RRC\_INACTIVE reads MCCH(if present) on the reselected cell after cell reselection to acquire the PTM configuration session if UE received“the stop of G-RNTI monitoring” indication for the session.
* FFS If UE receives PTM configuration of multicast session(s) in RRCRelease and “the stop of G-RNTI monitoring” is indicated for the corresponding session(s) and then UE selects the same cell as on which it received RRCRelease, UE acquires the PTM configuration from MCCH (if present) upon receiving group paging that indicates to allow the multicast reception in RRC\_INACTIVE. FFS if the UE uses the configuration from RRCRelease until having read the one from MCCH
* FFS whether there can be case where MCCH is not present
* If UE in RRC\_INACTIVE received “the stop of G-RNTI monitoring” indication for the session in the source cell, the UE reads MCCH(if present) in the reselected cell after cell reselection.
* If UE receives PTM configuration of multicast session(s) in RRCRelease and “the stop of G-RNTI monitoring” is indicated for all of the the corresponding session(s) and if UE selects the same cell as on which it received RRCRelease, UE acquires the PTM configuration from MCCH (if present) upon receiving group paging that indicates to allow the multicast reception in RRC\_INACTIVE.
* UE can use the PTM configuration from RRCRelease until having read the one from MCCH.
* Multicast MCCH can be optionally present for a cell providing multicast reception in RRC\_INACTIVE. We do not optimize for this in RAN2, e.g. we are targeting a single cell scenario without mobility and without PTM configuration update for optional MCCH.
* The RSRP/RSRQ measurement as specified in TS 38.304 are reused (i.e. no new measurements and measurement requirements).
* No TTT is introduced
* All MRBs corresponding to the same multicast session to be received in RRC\_INACTIVE should be continued.
* MRB ID is not configured in PTM configuration for multicast in INACTIVE. FFS if anything is needed.
* mt-Access is selected for multicast reception when it is applicable to the legacy mt-Access use case (i.e. it is not applicable to access identities 1, 2 and 11-15).
* UE selects '0' as the Access Category when the resumption of the RRC connection is triggered for multicast reception.
* A UE starts the drx-HARQ-RTT-TimerDL-PTM for the corresponding HARQ process in the first symbol after the end of the corresponding multicast transmission.
* Potential agreement: A 1-bit indication on cell PDCP COUNT synchronization for an MBS service is present with the INACTIVE MRB PTM configuration provided in RRCRelease/MCCH. FFS whether the indication is for RNA or another area.
* Offline ZTE to understand whether there are concerns with the above and clarify how it works in detail
* A 1-bit indication on cell PDCP COUNT synchronization for an MBS service is present with the INACTIVE MRB PTM configuration provided in RRCRelease, and cells in the RNA area are synchronized for PDCP COUNT.