**3GPP TSG RAN meeting #109 RP-250xxx**

**Beijing, China, September 15-18, 2025**

## Status Report to TSG

**Agenda item:** 10.3.1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **WI / SI Name** | Non-Terrestrial Networks (NTN) for Internet of Things (IoT) Phase 3 | | | | |
| included in this status report | Study Item:  No | Core part:  Yes | Performance part:  Yes | | Testing part:  No |
| **Acronym** | IoT\_NTN\_Ph3 | | | | |
| **Unique ID** | 1020096 | | | | |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-250472 | | | | |
| **Target Completion Date**  **(indicate if changed)** | Study Item:  N/A | Core part:  09/2025 | Performance part:  03/2026 | Testing part: N/A | |
| **Overall** **Completion level** | Study Item:  N/A | Core part:  100%  RAN1: 100%  RAN2: 100%  RAN3: 100%  RAN4: 100% | Performance Part:  50% | Testing part: N/A | |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |  |
| --- | --- | --- |
| **Leading WG** | | RAN WG2 |
| **Rapporteur** | **Name** | Chun-Fan (Felix) Tsai |
| **Company** | MediaTek Inc. |
| **Email** | Chun-Fan.tsai@mediatek.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.  
 One time unit (TU) corresponds to ~ 2 hours in the meeting.  
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.  
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

**RAN1#122, Aug’25**

**Agreement**

TP\_4\_2\_1v4 below is endorsed for TS36.211.

|  |  |
| --- | --- |
| **TP\_4\_2\_1v4**  TS36.211 clause 10.1.4.1.1.2 | |
| ***Spec*** | **TS36.211** |
| ***Reason for change:*** | Ambiguous mapping of between reference signal sequence and OCC sequence for 3.75kHz SCS. Unnecessary text included in the specification. |
| ***Summary of change:*** | Definition of reference signal sequence linked directly to the OCC sequence.  Text on start time and postponement of NPUSCH transmission that is a duplicate of text in TS36.213 is removed.  Redundant text that replicates the main definition of reference signal sequence removed. |
| ***Consequences if not approved:*** | The mapping between reference signal sequence and OCC sequence would be ambiguous.  Specifications would include replicated text. |
| ***Clauses affected:*** | **10.1.4.1.1.2** |
| 10.1.4.1.1.2 OCC reference signal sequence for with  For a UE communicating over NTN, the OCC reference signal sequence for is defined by  where  -  -  -  - if the DCI indicates OCC sequence , and otherwise. | |

**Agreement**

TP\_4\_3\_1v4 in section 5 of R1-2506530 is endorsed for TS36.212.

**Agreement**

TP\_4\_5\_1v4 in section 5 of R1-2506530 is endorsed for TS36.211.

**Agreement**

TP\_4\_7\_1v4 in section 5 of R1-2506530 is endorsed for TS36.211.

**Agreement**

TP\_4\_7\_2v4 in section 5 of R1-2506530 is endorsed for TS36.212.

**Agreement**

TP\_4\_8\_1v4 in section 5 of R1-2506530 is endorsed for TS36.211 with the following update to the summary of change:

|  |  |
| --- | --- |
| ***Summary of change:*** | Following postponement due to an NPRACH occasion, the NPUSCH transmission restarts in the first slot that |

**Agreement**

The TP below is endorsed for TS36.213 clause 16.5.1.

|  |  |
| --- | --- |
| TS36.213 clause 16.5.1 | |
| ***Spec*** | **TS36.213** |
| ***Reason for change:*** | The interleaved pattern for multi-TB NPUSCH transmission is contradictory with the OCC group of slots. |
| ***Summary of change:*** | When OCC is activated, the interleaved TB for multi-TB NPUSCH format1 is transmitted in the unit of . |
| ***Consequences if not approved:*** | OCC is not supported when the NPUSCH transmission with multi-TB is configured with interleaved mode. |
| ***Clauses affected:*** | **16.5.1** |
| ============================ Unchanged Text Omitted ===================================  - For ,  - if the UE is configured with higher layer parameter *npusch-MultiTB-Config* set to '*interleaved'*, and NPUSCH corresponding to a NPDCCH with DCI CRC scrambled by C-RNTI, and where for , otherwise.  - NB-IoT UL slots with are associated with TB*r+*1 ,. if and the UE is configured with higher layer parameter *npusch-OCC-Enabled*, and OCC enabled is indicated in the corresponding DCI Format N0, otherwise.  - otherwise,  - NB-IoT UL slots with are associated with TB*r+*1 ,.  ============================ Unchanged Text Omitted =================================== | |

**Agreement**

The TP below is endorsed for TS36.211 clause 10.1.3.1.

|  |  |
| --- | --- |
| TS36.211 clause 10.1.3.1 | |
| ***Spec*** | **TS36.211** |
| ***Reason for change:*** | Incorrect or ambiguous definition of scrambling sequence reinitialization times for OCC. |
| ***Summary of change:*** | The scrambling sequence for OCC is reinitialized after xtransmissions of the codeword, as shown in the figure below, where the scrambling sequence S1 is reinitialized for each transmission of a codeword that is spread by a factor . The mapped symbols X in RU1 are identical to the mapped symbols Y in RU2.  A diagram of a virus  AI-generated content may be incorrect. |
| ***Consequences if not approved:*** | Scrambling sequence when OCC is applied is incorrect or ambiguous. |
| ***Clauses affected:*** | **10.1.3.1** |
| -------------------- start of TP#1 for 36.211 --------------------  **10.1.3.1 Scrambling**  \*\*\* Unchanged parts are omitted \*\*\*  Scrambling shall be done according to clause 5.3.1. For a UE communicating over NTN in FDD operation and if the higher layer parameter *npusch-OCC-Enabled* is configured, OCC is indicated as enabled in DCI Format N0 as described in [3], and , the scrambling sequence shall be reinitialized with  after every xtransmissions of the codeword with and set to the first slot and the frame, respectively, used for the transmission of the repetition. The quantity is given by clause 10.1.3.6. Otherwise the scrambling sequence generator shall be initialised with  where  is the first slot of the transmission of the codeword. In case of NPUSCH repetitions, the scrambling sequence shall be reinitialised according to the above formula after every  transmissions of the codeword with  and  set to the first slot and the frame, respectively, used for the transmission of the repetition. The quantity  is given by clause 10.1.3.6.  \*\*\* Unchanged parts are omitted \*\*\*  -------------------- end of TP#1 --------------------------------- | |

**Conclusion**

OCC for RRC IDLE mode cases, e.g. PUR/EDT/Msg3 are not supported in Rel-19.

**Agreement**

RAN1 reply to Q1#1:

* RAN1 sees no issue with the RAN2 agreement that HARQ feedback resource information is included in the CB-Msg4
* RAN1 also notes that using 2 bits for “HARQ ACK resource offset” in eMTC allows multiplexing only up to 4 users in the same response.

**Agreement**

RAN1 reply to Q2:

* RAN1 has no issue on TAC in MSG4 (i.e., CB-msg3 response).

**Agreement**

RAN1 reply to Q5:

RAN1 confirms that for CB-Msg3 EDT for eMTC, n1PUCCH-AN and pucch-NumRepetitionCE-Format1 can be reused.

**Agreement**

RAN1 reply to Q8:

RAN1 does not see any issue for RAN2 on the introduction of a new RNTI (i.e. CB-RNTI) for CB-Msg4 monitoring and CB-Msg3 scrambling. Additionally, from RAN1 perspective, ack-NACK-NumRepetitions-r16 can be supported to configure number of repetitions for HARQ-ACK feedback corresponding to the NPDSCH carrying CB-msg4.

**Agreement**

The draft LS reply to RAN2 is endorsed in R1-2506552. Final LS in R1-2506553.

**RAN1#121, May’25**

**Agreement**

Confirm the following working assumption from RAN1#120 Athens:

“For 3.75kHz SCS OCC for NPUSCH format 1, support TDM DMRS over 4 slots where DMRS are transmitted in the first 2 slots and DMRS REs are blanked in the next 2 slots, or vice-versa, where the DMRS REs are as in legacy NB-IoT and the guard period within the slot is as in legacy NB-IoT.”

**Agreement**

The total number of slots in the NPUSCH transmission after OCC is applied is , where the parameters have the legacy definitions in TS36.211 and .

**Agreement**

For 3.75kHz SCS, the TDM DMRS positions that are activated within the TDM DMRS pattern are associated at least with the OCC sequence index.

**Agreement**

When the OCC is configured by RRC, if the number of repetitions of NPUSCH Format 1 is equal to 1, the DCI is interpreted as per legacy, otherwise:

* For 15kHz SCS:
  + the reserved states in the subcarrier indication field are used to indicate the location of subcarriers, OCC sequence index and OCC activation / deactivation
* For 3.75kHz SCS:
  + The redundancy version field is repurposed to indicate [OCC activation / deactivation or OCC sequence index]
  + Down-select between:
    - Option 1: The fields “subcarrier indication” and “modulation and coding scheme” are jointly encoded to indicate the location of the subcarriers, the value of ITBS and [OCC activation / deactivation or OCC sequence index]
    - Option 2: the MSB bit of “modulation and coding scheme” is used to indicate [OCC activation / deactivation or OCC sequence index]

**Agreement**

For 3.75kHz SCS OCC for NPUSCH format 1, the following mappings between DMRS sequence samples and active TDM DMRS slots is applied:

* Option 1: Sequential mapping of samples of the original DMRS sequence to active DMRS slots

**Agreement**

For the TDM DMRS positions that are activated within the TDM DMRS pattern:

For an NPUSCH format 1 with 3.75kHz SCS allocated to start in slot m, the NPUSCH is postponed to start in the next slot, whose index satisfies (SFN \* 5 + ns) mod 4 = 0. The UE transmits TDM DMRS in the *n*th slot after the start of its NPUSCH transmission according to:

|  |  |  |
| --- | --- | --- |
| Criterion | DMRS activity | |
| OCC sequence index 0 [1 1] | OCC sequence index 1 [1 -1] |
| n mod 4 = 0 | ON | OFF |
| n mod 4 = 1 | ON | OFF |
| n mod 4 = 2 | OFF | ON |
| n mod 4 = 3 | OFF | ON |

**Agreement**

For 3.75kHz SCS:

* RV indicates activation / deactivation.
  + The UE initiates NPUSCH format 1 transmission with

**Agreement**

For 3.75kHz SCS:

* The fields “subcarrier indication” and “modulation and coding scheme” are jointly encoded to indicate the location of the subcarriers, the value of ITBS and OCC sequence index. The joint encoding does not support indication of ITBS = 10.

**Agreement**

For NPUSCH Format1, Symbol-level OCC applied to 3.75kHz SCS single tone and Slot-level OCC applied to 15kHz SCS single-tone, the same RV value is used within an OCC group for slots, where *M* is the OCC length. RV cycling is performed across the OCC groups.

Note: the number of RVs is /M.

Note: the RV sequence is as in legacy specifications.

**Agreement**

The draft LS in R1-2504904 is endorsed with the following revisions:

* Title: Draft Reply LS on ~~on~~ CB Msg3 EDT for IoT NTN Ph3
* Response to: R1-2503613/R2-2503175
* From RAN1 perspective, the MPDCCH PUR configuration can be reused, with the following modifications:

Final LS in R1-2504905

**Reply to Q1**

* RAN1 has not evaluated the potential performance of power ramping for CB-msg3-EDT, and it is likely that there will not be sufficient time to evaluate this topic within the R19 timeframe
* For open loop power control the following UL power control parameters can be reused for CB-msg3-EDT
  + p0-UE-NPUSCH-r16 and alpha-r16 for NB-IoT NTN
  + p0-UE-PUSCH-r16 and alpha-r16 for eMTC NTN

**Reply to Q2**

From RAN1 perspective, the MPDCCH PUR configuration can be reused, with the following modifications:

* The TDD parameters are not needed.
* The search space will be a common search space (CSS) instead of UE-specific search space (USS).
* There is no consensus in RAN1 on the need to define the set of narrowbands as a set.
* mpdcch-FreqHopping-r16 is not needed

**Reply to Q3**

From RAN1 perspective:

* pusch-NB-MaxTBS-r16 and pusch-CyclicShift-r16 are not needed to be signaled.
* prb-AllocationInfo should be defined as a “set” format with intention to provide a set of shared frequency-domain resources
* pur-PUSCH-FreqHopping-r16 is not needed
* RAN1 wonders whether RAN2 intends to support multi-PRB allocation or sub-PRB allocation or both

**Reply to Q4**

From RAN1 perspective:

* pur-PDSCH-FreqHopping and pur-PDSCH-maxTBS are not needed to be signaled.

**Reply to Q6**

RAN1 agrees to re-use pur-PhysicalConfig-r16 configuration for CB-msg3-EDT as baseline. RAN1 discussed the following fields in CB-msg3-EDT configuration for NB-IoT NTN:

* The following parameters can be supported:
  + npusch-NumRUsIndex-r16
  + npusch-NumRepetitionsIndex-r16
  + npusch-SubCarrierSetIndex-r16 (but defining this as a set)
  + npusch-MCS-r16

Note: To be confirmed by RAN2 whether to support both singleTone and multitone, or singleTone only for HL parameter npusch-MCS-r16.

Reply to Q7

NPDCCH-ConfigDedicated-NB-r13 IE can be used as baseline for NPDCCH configuration for indication of msg4 on NPDSCH for CB-msg3-EDT. RAN1 assumes this configuration will be provided over broadcast RRC signalling.

**RAN1#120bis, April’25**

**Agreement**

For the 3.75kHz SCS symbol-based OCC scheme, the granularity of spreading for data is one symbol.

**Agreement**

Dynamic activation / deactivation of OCC is supported by DCI.

* FFS: details of signalling by DCI

**Conclusion**

RAN1 assumes no specification change to support pairing UEs with different modulation orders.

**Agreement**

For 3.75kHz SCS OCC for NPUSCH format 1, RAN1 down selects between the following mappings between DMRS sequence samples and active TDM DMRS slots:

* Option 1: Sequential mapping of samples of the original DMRS sequence to active DMRS slots
* Option 2: Dropping of samples of the original DMRS sequence in blanked slots

**Agreement**

For NPUSCH Format 1 single-tone 15kHz SCS, for CDM DMRS with legacy pattern:

* DMRS symbols are spread before the OCC is applied
  + Option 1\_1: according to the formula:

, *m*=0, …, *M*-1

Where: M is the OCC length, q is the assigned OCC codeword for the UE, is the reference signal sequence defined in TS36.211 section 10.1.4.1.1 and X is the total number of slots in the NPUSCH transmission after OCC is applied

**Agreement**

The OCC sequence index is signalled using DCI format N0.

**Agreement**

The RRC parameters for IoT-NTN UL capacity enhancements are:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **RAN2 Parent IE** | **Parameter name in the spec** | **New or existing?** | **Description** | **Value range** | **UE-specific or Cell-specific** |
| NPUSCH-ConfigDedicated-NB | npusch-OCC-Enabled | new | The parameter is used to enable OCC for NPUSCH format 1 single tone. | ENUMERATED {‘true’} | UE-specific |

**Agreement**

For indicating OCC sequence index and activation / deactivation, the following fields may be repurposed or constrained to be not present in the DCI:

* Modulation and coding scheme
* Repetition number
* Redundancy version
* Number of scheduled TB for Unicast
* Subcarrier indication
* Resource reservation

**RAN1#120, Feb’25**

Agreement

For the support of OCC length 2 for NPUSCH Format 1 single-tone with 3.75 kHz SCS and 15 kHz SCS, the orthogonal sequences are [1 1; 1 -1].

Working assumption

For 3.75kHz SCS OCC for NPUSCH format 1, support TDM DMRS over 4 slots where DMRS are transmitted in the first 2 slots and DMRS REs are blanked in the next 2 slots, or vice-versa, where the DMRS REs are as in legacy NB-IoT and the guard period within the slot is as in legacy NB-IoT.

Send LS to RAN4 asking whether there would be any issue (e.g. phase continuity) for supporting such TDM DMRS for IoT NTN.

Agreement

Send the following LS to RAN4:

**Overall description**

RAN1 has made the following working assumption on the DMRS pattern for OCC for 3.75kHz SCS OCC for NPUSCH format 1:

For 3.75kHz SCS OCC for NPUSCH format 1, support TDM DMRS over 4 slots where DMRS are transmitted in the first 2 slots and DMRS REs are blanked in the next 2 slots, or vice-versa, where the DMRS REs are as in legacy NB-IoT and the guard period within the slot is as in legacy NB-IoT.

**Question:**

1. From a RAN4 perspective, is it feasible to introduce support of TDM DMRS, as per the description above, in Rel-19?

Agreement

For CONNECTED mode, UE-specific RRC signalling is used for enabling of the OCC feature.

**Conclusion**

RAN1 did not reach consensus on whether OCC for NPRACH is beneficial or not. RAN1 will not specify support for OCC for NPRACH in Rel-19 IoT NTN.

Agreement

Response to RAN2 LS, to be sent to RAN plenary as well:

From RAN1 perspective, it may be possible to find solutions with specification impact for supporting NB-IoT UEs in RRC connected mode monitor PWS notifications, while some companies expressed concerns due to increased implementation complexity, power consumption at UE side and timely delivery of PWS notifications in NTN context. However, the amount of RAN1 workload for specifying this may not fit in the Rel-19 TU allocation for NTN. RAN1 would like to ask RAN plenary to decide whether RAN1 should work on specifying support of NB-IoT UEs in RRC connected mode monitor PWS notifications in Rel-19.

**RAN1#119, Nov’24**

Agreement

For 3.75kHz SCS OCC for NPUSCH format 1, the maximum OCC length is 2 for connected mode.

Agreement

For single tone 15kHz SCS Slot-level OCC for NPUSCH format 1, OCC length larger than 2 is not supported.

Agreement

For NPUSCH Format 1 single-tone 15kHz SCS, RAN1 studies at least the following options for CDM DMRS with legacy pattern for down-selection:

* Option 1: DMRS symbols are spread before the OCC is applied, e.g. according to the formula:



Where: M is the OCC length, q is the assigned OCC codeword for the UE and is the reference signal sequence defined in TS36.211 section 10.1.4.1.1



* Option 2: DMRS symbols are not spread before the OCC is applied.
  + Option 2\_1: OCC is applied to the legacy complex-valued DMRS symbol used in slot 1 and slot 2, e.g. according to the formula:



* + Option 2\_2: OCC is applied to the complex-valued DMRS symbol used in slot 1 and slot 2. Depending on the OCC codeword, different DMRS sequence is used.
* Option 3: DMRS symbols are not spread and OCC is not applied.
  + Legacy complex-valued DMRS symbol is used in slots corresponding to an OCC codeword of NPUSCH. Different DMRS sequences are used for multiplexed UEs.

Agreement

For NPUSCH Format 1 single-tone 15kHz SCS, the slot-level scheme for non-DMRS symbols is that spreading is performed in the unit of one slot.

* Note: whether RU length is extended or not after applying OCC is a separate discussion.

Agreement

For support of single-tone OCC for NPUSCH format 1 for connected mode, the parameters that need to be signalled are:

* OCC sequence index
* Enabling of OCC feature
* FFS: whether signaling is explicit or implicit

**RAN1#118bis, Oct’24**

Agreement

At least the following schemes are supported for single-tone:

* For 3.75kHz SCS OCC for NPUSCH format 1:
  + OCC length 2, Symbol-level
    - FFS: DMRS pattern(s)
* For 15kHz SCS OCC for NPUSCH format 1:
  + OCC length 2, Slot-level, CDM DMRS with legacy pattern
    - FFS: CDM details, e.g. with or without spreading

Agreement

For NPRACH transmission, inter-symbol group OCC is not further studied.

Agreement

For support of single-tone OCC for NPUSCH format 1, RAN1 studies:

* The parameters that need to be signalled, considering the following:
  + OCC codeword
  + Enabling of OCC feature
  + FFS: other parameters
* For dynamic grant in RRC CONNECTED, study which and whether any parameters are signalled via DCI and which and whether any parameters are signalled by RRC
* FFS: whether/how to support cases other than dynamic grant in RRC CONNECTED, e.g. Msg3, PUR, CB Msg3 EDT

**RAN1#118, Aug’24**

Agreement

RAN1 studies whether the following types of UL transmission gap will impact the design of OCC for IoT-NTN when considering e.g. phase continuity

* UL gaps for synchronization (from Rel-13)
* Gaps around NPRACH occasions
* UL timing adjustment gaps and segmentation for IoT-NTN (from Rel-17)
* TDM DMRS that are muted
* Guard periods for 3.75kHz UL transmissions

Agreement

The following combinations are considered for further simulation in RAN1 for 3.75kHz SCS OCC for NPUSCH format 1:

* Option 1: OCC2, Symbol-level, TDM DMRS
* Option 2: OCC2, Symbol-level, CDM DMRS with new pattern
* Option 3: OCC2, Slot-level, TDM DMRS
* Option 4: OCC2, Slot-level, CDM DMRS with legacy pattern
* Option 6: OCC4, Symbol-level, CDM DMRS with new pattern

The following combinations are considered for further simulation in RAN1 for 15kHz SCS OCC for NPUSCH format 1:

* Option 1: OCC2, Symbol-level, TDM DMRS
* Option 3: OCC2, Slot-level, TDM DMRS
* Option 4: OCC2, Slot-level, CDM DMRS with legacy pattern
* Option 5: OCC4, Symbol-level, TDM DMRS
* Option 7: OCC4, Slot -level, TDM DMRS
* Option 8: OCC4, Slot-level, CDM DMRS with legacy pattern

Note 1: For TDM, the legacy DMRS pattern, with DMRS symbols appropriately muted/blanked is used. Companies to report their assumption on whether spreading is applied to the legacy DMRS pattern for 15 kHz SCS.

Note 2: Companies to report DMRS sequence applied.

Agreement

For 3.75kHz SCS, NPUSCH format 1 simulations are performed using an appropriate MCS with SNR at least in the range of -8dB to 0dB.

**RAN1#117, May’24**

Agreement

For 3.75kHz single-tone OCC for NPUSCH format 1, RAN1 supports either symbol-level OCC or slot-level OCC. Other OCC schemes are not pursued.

For 15kHz single-tone OCC for NPUSCH format 1, RAN1 supports either symbol-level OCC or slot-level OCC. Other OCC schemes are not pursued.

Agreement

Inter-repetition OCC for NPRACH is not studied further in RAN1.

Agreement

* For the time-domain DMRS pattern (including blanked DMRS, if any):
  + For 15kHz single-tone, RAN1 strives to reuse the Rel-17 DMRS pattern
  + For 3.75kHz single-tone
    - RAN1 studies
      * Rel-17 DMRS pattern
      * A new DMRS pattern
  + The DMRS overhead (including blanked DMRS, if any) for OCC is the same as for Rel-17

Agreement

The Rel-17 guard period locations and length for NB-IoT 3.75kHz UL slot are preserved when OCC is applied to NPUSCH format 1.

**RAN1#116bis, Apr’24**

Agreement

For the NPUSCH evaluation assumptions, update the DMRS configuration, as follows:

|  |  |  |
| --- | --- | --- |
| DMRS configuration | For baseline evaluations:  OS#4 per slot for 3.75kHz  OS#3 per slot for 15kHz  For OCC evaluations:  Up to proponent | For baseline evaluations:  OS#3 per slot for 15kHz  For OCC evaluations:  Up to proponent |

Agreement

At least the following NPRACH OCC schemes are considered by RAN1 for study:

* Intra-symbol group OCC
* Inter-symbol group(s) OCC
* Inter-repetition OCC

Agreement

The study of OCC for NPRACH does not consider NPRACH format 2.

Agreement

The following evaluation assumptions are used for the study of OCC for NPRACH:

|  |  |  |
| --- | --- | --- |
|  | Parameter | value |
| Scenario | Orbit and elevation angle | GEO at 12.5 degrees; LEO600 at 30 degrees |
| Channel and impairments | carrier frequency | 2GHz |
|  | Channel model | NTN-TDL-C  The channels from different UE are independent. |
|  | Frequency error | Uniform random selection from [-0.1 ppm, +0.1 ppm] for all UEs  Variation of frequency error is negligible. |
|  | Timing error | Uniform random selection from [-97Ts, +97Ts] for all UEs  Timing drift 80us/s for LEO600 and 0 for GEO. |
|  | Power imbalance | Uniformly distributed between +Pimb and -Pimb for all UEs  Proponent to report the value of Pimb (can be zero) and justification for the chosen value |
| Transmitter | NPRACH format | 1 or 0 |
|  | MIMO scheme | SISO |
|  | Number of repetitions () | Up to proponent |
|  | OCC length | Up to proponent |
|  | OCC sequence | Up to proponent |
|  | Number of UE | Up to proponent |
|  | Velocity of UE | 3km/h |
|  | Total NPRACH time / frequency resource utilisation | To be reported by proponent. |
| KPI | Target detection probability | 99% |
|  | Target false alarm probability | 0.1% |
|  | SNR operating point | Report SNR where target detection probability and false alarm probability are reached for baseline and OCC schemes |

Agreement

OCC multiplexing is not supported between a UE using NPUSCH format 1 with 3.75kHz SCS and another UE using NPUSCH format 1 with 15kHz SCS.

Agreement

For OCC of NPUSCH format 1, RAN1 will not consider multiplexing more than 4 UEs.

Agreement

For single-tone DMRS when OCC is applied to NPUSCH format 1, RAN1 considers at least the following for further study:

* TDM of DMRS. The time domain locations of DMRS for different UEs are different. No OCC is applied for the DMRS of different UEs.
  + FFS: Detailed mapping
* CDM of DMRS. The time domain locations of DMRS for different UEs are the same. Different OCCs are applied for the DMRS of different UEs.
  + FFS: Detailed mapping
* Other schemes are not precluded, including combinations of the above

Agreement

For the NPUSCH evaluation assumptions, update the frequency error assumption, as follows.

|  |  |
| --- | --- |
| Frequency error | Uniform random selection from [-0.1 ppm, +0.1 ppm] for all UEs  Variation of frequency error is negligible.  For GEO, the same frequency error is applied to each subframe of a transport block.  For LEO, the same frequency error is applied to each subframe of a segment (if applied in the evaluation). Companies to report their assumption on frequency error across segments. |

**RAN1#116, Feb’24**

Agreements on 9.11.4 IoT-NTN uplink capacity/throughput enhancement

Agreement

For single-tone NPUSCH format 1 transmissions with both 3.75kHz and 15kHz SCS, the following OCC schemes are considered by RAN1 for further study:

* Time domain OCC where OCC spreads across:
  + Symbol-level
  + Slot-level
  + Repetition-level
  + RV-level

For multi-tone NPUSCH format 1 transmissions, the following OCC schemes are considered by RAN1 for further study:

* Time domain OCC where OCC spreads across:
  + Symbol-level
  + Slot-level (including Nslot level)
  + Repetition-level
  + RV-level
* Intra-symbol pre-DFT spreading OCC

Agreement

The following evaluation assumptions are used for the study of OCC for NPUSCH format 1:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Parameter | value | | |
| scenario | orbit | GEO | LEO600 | |
| Elevation angle | 12.5 degree | 30degree | |
| Channel and impairments | carrier frequency | 2GHz | | |
| Channel model | NTN-TDL-C  The channels from different UE are independent. | | |
| Frequency error | Uniform random selection from [-0.1 ppm, +0.1 ppm] for all UEs  Variation of frequency error is negligible. | | |
| Timing error | Uniform random selection from [-97Ts, +97Ts] for all UEs  Timing drift 80us/s for LEO600 and 0 for GEO. | | |
| Power imbalance | Uniformly distributed between +Pimb and -Pimb for all UEs  Proponent to report the value of Pimb (can be zero) and justification for the chosen value | | |
| transmitter | SCS | 3.75KHz and 15KHz | 15kHz | |
| Number of tones | Single tone | Single tone and multi tone up to 12 tones | |
| Waveform | DFT-s-OFDM | | |
| Frequency hopping | w/o frequency hopping | | |
| MIMO scheme | SISO | | |
| DMRS configuration | For baseline evaluations:  OS#3 per slot for 3.75kHz  OS#4 per slot for 15kHz  For OCC evaluations:  Up to proponent | | For baseline evaluations:  OS#4 per slot for 15kHz  For OCC evaluations:  Up to proponent |
| Number of resource unit () | Up to proponent | | Up to proponent |
| Modulation order | Up to proponent | | Up to proponent |
| TBS () | Up to proponent | | Up to proponent |
| Number of repetitions () | Up to proponent | | |
| OCC length | Up to 4 | | |
| OCC sequence | Up to proponent | | |
| Number of UE | Up to 4 | | |
| Velocity of UE | 3km/h | | |
| receiver | Receiver algorithm | MMSE | | |
| Channel estimation | Real channel estimation | | |
| KPI | SNR at 10% BLER | Report for baseline and OCC schemes | | |
| Aggregated throughput | Total throughput of up to 4 UEs multiplexed | | |

#### 2.1.2 Remaining Open issues

No open issues remaining.

## 2.2 RAN2

#### 2.2.1 Agreements

**RAN2#131, Aug’25**

Organizational and running CR

Agreements:

1. The value ranges for all the RRC parameters can be further checked during the next CR review.

Agreements:

1. When the CB-Msg3ResponseTimer expires and the maximum number of re-attempts has been reached, the MAC indicates failure of CB-Msg3 transmission to the upper layer (i.e. RRC).

2. CB-Msg3 response window is modeled as a timer in MAC.

3. If the PDCCH is successfully decoded before CB-Msg3ResponseTimer expires, but the corresponding PDSCH is successfully decoded after the timer has expired, the MAC PDU is treated the same as the one successfully decoded before the timer expires.

Agreements:

1. nextHopChainingCount-r15 in RRC Release message is reused for CB-Msg3 EDT using UP solution (likely no spec impact)

2. From RAN2 perspective, PWS can be supported in NB-IoT Terrestrial Network. Inform SA1 (cc SA2) to consider whether requirements for PWS support in NB-IoT terrestrial networks should be added (FFS about support for acceptable cells)

* From RAN2 point of view the WI on IoT\_NTN\_Ph3 is completed

Support of Store & Forward

Agreements:

1. The UE forwards the S&F mode indication (e.g. sf-OperationMode) to upper layers upon acquiring it from SIB1(-NB). RAN2 to capture this UE behavior in 3GPP TS 36.331, sub-clause 5.2.2.7.

2. The S&F mode indication (i.e., sf-OperationMode) and the S&F mode transition time (i.e., t-ModeSwitching) of the neighbor satellite are signaled in SIB33 per neighbor satellite.

3. A Rel-19 UE may deprioritize the neighbor cells operating in the S&F mode (FFS on the detailed specification impact, i.e. whether a note is sufficient or some normative text. To be considered in the post meeting CR review)

4. We clarify the stage-2 description in 36.300 to state that the satellite identifier values used at the AS-level (e.g., satellite identifiers included in SIB messages) and the NAS-level (e.g. satellite identifiers included in the S&F Monitoring list) are set consistently, i.e. with the same value, when they refer to the same satellite (FFS on the actual wording)

5. We don’t increase the size of satellite ID and or define any new satellite ID as part of this Rel-19 WI

EDT enhancement

Agreements:

1. We don’t further work on the inclusion of OCC support for CB-Msg3-EDT as part of IoT\_NTN\_Ph3-Core in Rel19.

2. We try to define a simple power ramping scheme reusing existing mechanisms and then we inform RAN1 inviting them to respond if they find a problem

3. When the Msg4 monitoring window starts at the end of CB-Msg3-EDT transmission window plus UE-eNB RTT, there is no need to consider additional delays for NW/UE processing time.

4. We leave to UE implementation to decide in which order the conditions to trigger the different procedures are met.

5. When the RRC layer receives a CB-Msg3 EDT failure indication from the MAC layer the RRC procedure is re-initiated (how to avoid data loss is up to UE implementation). Which procedure (e.g. EDT, 4-step RACH, CB-Msg3-EDT) is initiated is up to UE implementation

6. We don’t support multiple TBSs per CE level for CB-Msg3 EDT

7. We introduce one additional value smaller than the smallest possible TBS size at the moment (328bits), i.e. 144bits (discuss further details when drafting the LS to RAN1).

8. We clarify that CQI reporting is not included in CB-Msg3 for CB-Msg3-EDT for non-anchor carrier but it can be included for anchor carrier (send LS to RAN4)

9. Upon receiving a matching Contention Resolution Identity and a C-RNTI in a CB-Msg4 without an RRC message, the UE considers UL transmission as successful but the UE does not consider the CB-Msg3-EDT procedure has ended and continues monitoring PDCCH.

10. Upon receiving a CB-Msg4 including a matching Contention Resolution Identity without including both an RRC message and a C-RNTI, the UE behaves as if it received an empty EarlyDataComplete message, terminates the CB-Msg3-EDT procedure and keeps in RRC\_IDLE.

11. Based on NW indication, it shall be possible for the UE to indicate during CB-Msg3-EDT procedure whether DL data following the UL data in CB-Msg3 is expected or not. RAI will be reused for this.

12. We don’t introduce support for network-indicated fallback to legacy RACH or EDT

13. CB-RNTI formula:

For eMTC

- floor (start SFN\_id of Tx window/WP) modulo (32) + 32\*CE\_level + 2401

- the CE\_level is the selected enhanced coverage level (0 <= CE\_level < 2)

For NB-IoT

- floor (start SFN\_id of Tx window/WP) modulo (32) + 32\*CE\_level + 96\*carrier\_id + 4097

- the CE\_level is the selected enhanced coverage level (0 <= CE\_level < 3)

- the carrier\_id is the index of the UL carrier associated with the selected UL grants (0 <= carrier\_id < 16). The carrier\_id of the anchor carrier is 0.

WP is the configured CB-MSG3 transmission window periodicity in unit of 10ms.

14. RAN2 to define two new RRC parameters for CB-Msg3 power ramping (i.e., powerRampingStep and cb-Msg3-InitialReceivedTargetPower), with the same value ranges as those defined for legacy Msg3 power ramping.

15. The UE applies power ramping when the CB-Msg3ResponseTimer has expired and the UE proceeds to the next CB-msg3 transmission, by reusing the CB\_MSG3\_TRANSMISSION\_COUNTER\_CE as defined in the MAC running CR.

16. The CB-Msg3 received target power can be calculated as below:

the CB-MSG3\_RECEIVED\_TARGET\_POWER is set to cb-Msg3-InitialReceivedTargetPower + (CB\_MSG3\_TRANSMISSION\_COUNTER\_CE – 1) \* powerRampingStep;

17. RAN2 confirms that both multi-PRB allocation and sub-PRB allocation are supported for CB-Msg3 (inform RAN1)

18. RAN2 confirms that both single-tone and multi-tone are supported for CB-Msg3, and intends to reuse the parameter npusch-MCS-r16 for CB-Msg3 (inform RAN1)

19. The UE shall use the cell specific Koffset for the CB-Msg3-EDT procedure, regardless of if it has a UE specific Koffset or not (not spec impact)

20. We configure 2 MPDCCH narrowbands as a set (inform RAN1)

21. The periodicity of (N)PUSCH resources for CB-Msg3 is not larger than H-SFN duration

PWS Reception

Agreements:

1. We don’t pursue the enhancement whereby the NW can choose to send the scheduling information of PWS SIBs in advance and indicate whether the PWS SIBs are being broadcast or not as part of this WI

2. We don’t support for continued reception of PWS message segments from different cells provided by the same eNB (inter-cell, intra-eNB case) as part of this WI.

3. Introduce an acceptable cell category for NB-IoT (at least for NTN) (FFS if a separate capability is needed for this)

**RAN2#130, May’25**

Support of Store & Forward

Agreements:

1. We don’t reuse the legacy t-Service to indicate the transition time from normal mode to S&F mode for R19 UEs

Agreements:

1. When the S&F operation indication is present, the agreed time information in SIB31 (i.e., t-ModeSwitching) indicates when the normal mode will start; otherwise, the agreed time information in SIB31 (i.e., t-ModeSwitching) indicates when the S&F mode will start.

2. In a S&F network deployment which also exhibits discontinuous coverage, existing mechanisms to handle discontinuous coverage can be leveraged (e.g. satellite assistance information, UE not needing to perform idle mode tasks when the UE determines that is out of coverage, etc.). There is no need to modify existing discontinuous coverage features due to the addition of S&F Satellite operation. FFS if we clarify in discontinuous coverage procedure in idle mode that the UE also takes into account the information about NAS configured S&F monitoring list.

3. Clarify in Stage 2 from Rel-18 (so in general, not only for S&F) that the values used in “satelliteId-r17” are expected to correspond to the values used in “satelliteId-r18” in other SIBs (e.g. the value used to identify the serving satellite in SIB33, SIB32 and SIB31 should be the same). Come back in the next meeting with an actual Rel-18 CR for this. FFS if in Rel-19 we need to say anything about the correspondence between the “satelliteId” IE and “S&F Monitoring List”.

Working Assumption:

1. In the neighbour cell list we introduce an indication whether the cell operates in S&F mode or not (FFS if we also include the transition time). This WA can only be confirmed if we converge on the corresponding UE behaviour.

EDT enhancement

Agreements:

1. The maximum TBS could be different for different CE levels.

2. Due to only CE mode A is supported for eMTC NTN, only 1 separate RSRP thresholds and 2 CE levels are supported (revised agreement)

3. Multiple contention resolution IDs could be included in CB-MSG4, the information related to multiple UEs can be multiplexed in the MAC PDU.

4. The number of Msg3 replies in one Msg4 can be left to eNB implementation. Expect no SPEC impact.

5. The HARQ feedback resource information can be included in the CB-Msg4 together with contention resolution ID which identity the specific UE. RAN2 could revisit this proposal if RAN1 has some concern.

6. Whether to send the HARQ feedback for CB-Msg4 can be controlled by NW. UE does not send HARQ NACK.

7. For NB-IoT, the SubCarrierSpacing of the HARQ feedback for CB-Msg4 is same as the CB-Msg3.

8. Reuse the existing format of HARQ ACK allocation signalling in the DCI. There is 2-bit HARQ ACK resource for eMTC and 4-bit HARQ ACK resource for NB-IoT. Reuse the meaning of DCI field in R1 SPEC. Send LS to RAN1 for information on all RAN2 decisions related to HARQ feedback

9. Introduce a new MAC PDU for CB-Msg4 including new types of MAC sub-header and a new type of MAC payload

10. The MAC PDU for CB-Msg4 consists of sub-header(s) followed by MAC payload and optional padding if needed.

11. Introduce a new CB BI MAC sub-header in CB-MSg4 for backoff parameter. There is 4 bits BI for backoff indication.

12. Introduce a new CB-Msg3 Response (CBR) MAC sub-header in CB-Msg4. It has 1bit E for sub-header/payload indication, 2 bits T for sub-header type, 1bit T2 for HARQ ACK resource present, 1 bit T3 for TAC present, 1 bit T4 for C-RNTI present and 2bit R for reservation (the field names and sub-header names in above agreements could be further changed during MAC running CR review)

Agreements – part 2:

1. The CB-Msg3-EDT configuration is configured per carrier (including anchor and non-anchor carrier). Within each carrier, the CB-Msg3-EDT could be configured per CE level

2. Regarding the mapping of NPUSCH resource to enhanced coverage levels, enhanced coverage levels are numbered from 0 and the mapping of NPUSCH resources to enhanced coverage levels are done in increasing [number of repetition] order (as legacy RACH)

3. For NB-IoT, when multiple carriers provide CB-Msg3-EDT resources for the same enhanced coverage level, the NB-IoT UE selects the carrier based on the probabilities of each carrier. A new probability parameter for anchor carrier is introduced in SIB22-NB. The remaining probability is evenly split among the non-anchor carriers.

4. When max re-attempt number for current CE level has been reached, the UE does not move to the next CE level (FFS on the details of the failure behaviour)

5. The TAC is optionally used in the CB-Msg3 response.

6. RAN2 assumes that NTA=0 for initial CB-msg3 transmission. Include this in the LS to RAN1 and RAN4

7. RAN2 assumes the length of the TAC field is 6 bits (we can revisit this if there is major R1 impact on TA calculation)

Agreements – part 3:

1. Introduce a new CB Data MAC sub-header in CB-MSg4 for MAC SDU for logical channel data. It has 1 bit E for subhead/payload indication, 2 bits T for subhead type, 5 bits LCID, 7 bits or 15 bits L for MAC SDU length, 1 bit F for 15 bits L indication. There is one L field per CB Data sub-header except for the last sub-header.

2. Introduce a new CB-Msg3 Response (CBR) with variable length. It has 48-bit contention resolution ID, optional HARQ ACK, optional TAC, optional 16-bit C-RNTI.

Agreements:

1. HARQ process 0 is used to transmit all the CB-Msg3 replicas in the transmission window (RV0 is used to transmit the first repetition of each CB-Msg3 replica in the transmission window)

2. We do not specify another way of starting Msg4 monitoring window, i.e. it is confirmed that the Msg4 monitoring window always starts at the end of CB-Msg3-EDT transmission window plus UE-eNB RTT (FFS NW/UE processing time is needed or not)

3. A CB-Msg4 without RRC message (but with contention resolution identity) is allowed as the complete response to the CB-Msg3 in CP solution.

Working Assumption:

The formula for RNTI for mMsg4 monitoring is:

RNTI=X + Msg3\_W\_index modulo (Y) + Y\*CE\_level + 3\*Y\*carrier\_id.

• X is the starting RNTI for Msg4 reception, which can be defined by RAN2 e.g. X=2401 for eMTC or 4097 for NB-IoT,

• Msg3\_W\_index is the index of Msg3 transmission window within a periodicity of 1024 SFNs and index 0 corresponds to the Msg3 transmission window starts at the SFN defined by IE startSFN-r19,

• Y is ceil (Msg4\_WS/Msg3\_WP),

• CE\_level is the CE level, 0 <= CE\_level < 3

• carrier\_id is the index of the UL carrier of the CB-Msg3 resources, anchor carrier has index 0,

0 <= carrier\_id < 16

Can come back to check if the NW can also simply configure RNTI = X

Agreements – part 2:

1. The value of X is 4097 for NB-IoT and 2401 for eMTC

2. The value of Msg4\_WS is the maximum Msg4 window size

3. The value of Msg3\_WP is the minimum Msg3 window periodicity

PWS Reception

Agreements:

1. A UE should be able to camp on an NB-IoT cell (at least for NTN) for the purpose of receiving PWS broadcast, without the cell being a part of UEs PLMNs. Come back in the next meeting to discuss the exact solution to make this possible (i.e. not necessarily introducing an acceptable cell category for NB-IoT)

2. Regarding support continued reception of PWS segmentation of a message from different cells, can come back in the next meeting with an actual TP. In any case we will not target other scenarios than the intra-gNB case

**RAN2#129bis, April’25**

Organizational

Agreements;

1. We tentatively refer to the new procedure as CB-msg3-EDT in the specs (can come back)

Support of Store & Forward

Agreements:

1. For UEs supporting S&F, the UE AS indicates the information on transition time (if any) from current "S&F operation mode" to "normal mode" (if received) to the upper layers. Whether/how it is used by the upper layers is up to CT1.

2. We introduce an indication in system information for the normal mode to S&F mode transition, at least for NAS use. FFS on the details (e.g. whether we can link this to other existing information). The information on transition time for the normal mode to S&F mode transition is sent from AS to NAS

3. We don’t introduce any new release cause related to S&F operation

EDT enhancement

Agreements;

1. Both SA and DSA are mandatorily supported by UEs supporting CB-msg3-EDT

2. We will specify one single procedure to support both DSA and SA, i.e. SA is a special setting (k=1) of the overall procedure

3. For CB-msg3-EDT, the transmission window can be configured by the network with a starting point (e.g. H-SFN offset), a window length, and a window periodicity (window length and periodicity could be the same).

4. We don’t introduce support for eMTC CE mode B case (it will not be possible to signal resources to be used for this case)

5. We specify support for NB-IoT with 15kHz with no specific enhancements, leaving to NW implementation whether to implement this or not, accepting potential performance degradation.

6. If we will decide to support OCC for CB-msg3-EDT, separate resources will be used for non-OCC and OCC based transmission.

7. The start of CB-msg3 EDT transmission window is aligned with the start of time domain (N)PUSCH resource.

8. The CB-msg3 EDT transmission window length and periodicity may be different. FFS on possible signalling optimization in case the length and periodicity are the same.

9. RAN2 assumes power ramping should be supported for CB-msg3-EDT (for both eMTC and NB-IoT) should be supported and will ask RAN1 for confirmation and in case which parameters should apply

(CB-Msg3-EDT configuration for eMTC)

10. For eMTC, introduce a new IE (e.g. CB-Msg3-ConfigSIB-r19) for shared resources configuration of CB-Msg3 in SIB2.

11. For eMTC, introduce MPDCCH configuration in shared resources configuration. The fields in IE PUR-MPDCCH-Config-r16 could be reused as baseline. Confirm with RAN1 on the detail parameters (e.g. whether additional narrow band is needed).

12. We will not support TDD related parameters.

13. For eMTC, introduce PUSCH configuration in shared resources configuration. The fields in IE PUR-PUSCH-Config-r16 could be reused as baseline. Confirm with RAN1 on the detail parameters. (e.g. whether pusch-CyclicShift-r16, pusch-NB-MaxTBS-r16 are needed, whether prb-AllocationInfo should be defined as a “set” format with intention to provide a set of shared frequency-domain resources).

14. For eMTC, check with RAN1 if anything is needed for PDSCH configuration in shared resources configuration

15. For eMTC, introduce PUCCH configuration in shared resources configuration. The fields in IE PUR-PUCCH-Config-r16 could be reused as baseline. Confirm with RAN1 on the detail parameters.

(CB-Msg3 configuration for NB-IoT)

16. For NB-IoT, introduce a new IE (e.g. CB-Msg3-ConfigSIB-NB-r19) for shared resources configuration of CB-Msg3 in SIB2-NB and SIB22-NB for non-anchor carrier.

17. For NB-IoT, introduce below physical layer parameters in shared resources configuration as below:

- Number of resource units for NPUSCH (as in npusch-NumRUsIndex-r16)

- Number of repetitions for NPUSCH (as in npusch-NumRepetitionsIndex-r16)

- Set of subcarriers (similar to npusch-SubCarrierSetIndex but change it to a “set”), FFS whether subcarriers are provided as a contiguous set.

- MCS configuration for NPUSCH (as in npusch-MCS-r16).

- PDCCH parameters (as in NPDCCH-ConfigDedicated-NB-r13)

- The non-anchor carrier index for monitoring Msg4. If this field is absent, anchor carrier is assumed to be used.

NOTE: confirm with RAN1 is needed

18. For NB-IoT, FFS whether periodicity of CB-Msg3 resource may be larger than H-SFN duration

Agreements (part 2):

1. For CB-msg3-EDT we adopt a Single Msg4 monitoring window and Single RNTI (the RNTI is derived on the transmit resource for the transmission window).

2. The lengths of the Msg3 transmission and Msg4 monitoring windows are configured by the network (in case of k=1 it will be possible to configure the parameters in a way to have the same behaviour as for normal Random Access procedure)

3. The Msg4 monitoring starts at the end of CB-Msg3-EDT transmission window plus UE-eNB RTT (FFS NW/UE processing time is needed or not).

4. FFS it will also be possible for the NW to configure that the Msg4 monitoring window starts in the subframe containing the last (N)PUSCH repetition of the first replica plus UE-eNB RTT (FFS NW/UE processing time). To possibly resolve the FFS it needs to be clarified what happens if the Msg4 monitoring window is overlapping with replica, i.e. whether the UE prioritize the replica transmission or monitoring

Agreements (part3):

1. The CB-msg3-EDT configuration (e.g., number of replicas, number of time resources and number of frequency resources) is CE level specific.

2. The Msg4 monitoring window configuration (e.g. length) is CE level specific

3. RAN2 confirms the working assumption that one CB-Msg4 can target multiple UEs simultaneously. FFS how the multiplexing is organized.

4. RAN2 confirms that existing UP-EDT and CP-EDT RRC message procedures shall be applicable for CB-Msg3-EDT

- For UP solution, after RRCConnectionResumeRequest, network may reply with RRCConnectionResume, RRCConnectionSetup, RRCConnectionRelease and RRCConnectionReject

- For CP solution, after RRCEarlyDataRequest, the network can respond with RRCEarlyDataComplete, RRCConnectionSetup or RRCConnectionReject.

5. RAN2 also intends to support CB-msg3-EDT for MT cases

6. The C-RNTI is included in CB-Msg4 if the UE is expected to receive additional RRC messages or data from the network after CB-Msg4 (FFS how to include the C-RNTI)

7. Introduce a new RNTI (i.e. CB-RNTI) for CB-Msg4 monitoring and CB-Msg3 scrambling. We include this agreement in the LS to RAN1

8. The timing alignment information (FFS reusing TAC MAC-CE) can be included in the CB-Msg4.

9. Parameter for maximum re-attempt number per CE level is introduced and UE can re-attempt in the same CE level due to contention resolution failure until the max re-attempt number has been reached.

10. Backoff information could be included in CB-Msg4.

11. L1 ACK as the Msg4 for the CB-Msg3-EDT is not supported.

12. HARQ feedback is adopted to acknowledge Msg4. FFS for the detail (e.g., how the HARQ feedback is used for each response in Msg4 when there is multiplexing in Msg4.).

PWS Reception

Agreements:

1. In case of PWS notification the network may release a RRC\_CONNECTED UE to idle, in case the UE reports the capability to receive PWS in idle (no other spec impact other than the introduction of a UE capability for supporting PWS reception in idle)

**RAN2#129, Feb’25**

Support of Store & Forward

Agreements:

1. RAN2 currently assumes that a S&F mode changes does not necessarily imply a MME change
2. The already agreed time information on transition from S&F operation mode to normal mode is provided in SIB31 (can work on signalling optimizations in case the new time information and T-service would carry the same information)
3. Use absolute UTC time to broadcast the (S&F-> normal mode) time information. When this information is broadcast and indicates a time in the future the UE can assume the NW is currently operating in S&F mode (until the indicated S&F-> normal mode transition time).
4. A change to the (S&F-> normal mode) time indication shall not result in system information change notification. Legacy rules for acquiring SIB31 apply

Reduce the necessary signaling to complete an Early Data Transmission

Agreements:

1. It is FFS if separate CB-msg3 resources would be needed for CB-msg-3 using OCC or if the same CB-msg3 resources could be used

2. RAN2 assumes that one possibility to take power imbalance under control is to define RSRP ranges that need to be respected to transmit CB-msg3 using OCC

3. RAN2 assumes that at least the following will be part of the shared resources configuration for CB-msg3 (FFS on other aspects)

- Time domain resources for (N)PUSCH occasions: periodicity and start time (e.g., start subframe, start SFN)

- Frequency domain resources for (N)PUSCH occasions

- repetition number

- (N)PDCCH resource

- MCS

4. For CB-msg3 transmission, for eMTC NTN, up to three separate RSRP thresholds (on top of the minimum RSRP threshold and possibly different from the thresholds for PRACH) can be supported for achieving at most 4 CE levels; for NB-IoT NTN, up to two separate RSRP thresholds (on top of the minimum RSRP threshold possibly different from the thresholds for PRACH) can be supported for achieving at most 3 repetition levels.

5. The UE shall at most have one ongoing CB EDT procedure at any time.

6. The CB EDT Config has one minimum RSRP threshold (as agreed in RAN2#128) to use CB EDT.

7. The CB EDT Config has two RSRP thresholds for NB-IoT for the three CE levels.

8. CB EDT Config has three RSRP thresholds for eMTC for the four CE levels.

7. As Signalling design Baseline RAN2 assumes the PUR config and the NPRACH config for shared (N)PUSCH config can be used and some of the parameters can be included in a new CB EDT config.

8. RAN2 consider a new CBEDT-ConfigSIB-NB IE for configuring the CB EDT feature

Working assumption:

1. One CB-MSG4 can target multiple UEs simultaneously (FFS on the details)
2. For CB-MSG3, the Transmission window is configured by the network with a starting point (e.g. H-SFN offset), a window length, and a window periodicity (window length and periodicity could be the same). For k=1 the window length can be equal to 1: same behaviour as today

The UE first selects the next DSA transmission window and then randomly select K replicasinside the window.

RAN2 assumes that a pointer solution is not needed in Rel-19

Support of PWS Reception

Agreements:

1. Introduce geographic information in ETWS messages for geo-fencing in IoT NTN cells
2. Introduce the Warning Area Coordinates IE for ETWS to describe an emergency area in system information.
3. Introduce the Warning Area Coordinates IE to existing ETWS SIBs, i.e., SIB10-NB/11-NB, without introducing the need for segmentation of SIB10-NB
4. We don’t introduce a new SIB for carrying geographical information for emergency areas

**RAN2#128, Nov’24**

Support of Store & Forward

Agreements:

1. Time information can be broadcasted to indicate when the current satellite operation mode will transit from “S&F operation” mode to real-time/normal mode. RAN2 assumes that a R19 UE could use this information at least to delay some NAS procedures until the feeder link is resumed (FFS what we specify in RAN2 specs for this and if we differentiate the behaviour for R19 UEs supporting and not supporting S&F mode, also considering the relation to the Wait Timer). FFS which SIB is used (SIB1 or SIB31). FFS if absolute or relative time is used. FFS on the opposite transition (i.e. whether to indicate when the “S&F operation” will start)

2. It is FFS whether we need to introduce a new release cause when the NW wants to release a R19 UE to RRC idle because the feeder link becomes unavailable

3. “S&F operation” indication is provided in SIB1

4. RAN2 assumes that AS signalling is not needed to indicate the architecture option (Split MME or Full CN).

5. RAN2 waits for further progress in SA2, if any, before working on RAN2 aspects of a CIoT-UP solution for SF operation

6. RAN2 understands that the UE configured with a satellite ID list by MME is not prevented to camp on a satellite operating in normal IoT NTN mode (i.e. with feeder-link connection), and perform subsequent access and data/signalling communication with that satellite

7. RAN2 understands the UE configured with a satellite ID list by MME is not prevented to camp on, attempt to access to and communicate with a satellite which is not included in the MME-configured satellite list.

Reduce the necessary signaling to complete an Early Data Transmission

Agreements:

1. Only system Information is used to provide cell-specific CB-Msg3 PUSCH resources (FFS if anything is needed in dedicated signalling for the TA validation parameters, if needed, for the case of 15kHz SCS NB-IoT and eMTC CE mode B)

2. Reuse the existing CE level selection procedure for CB-Msg3, at least for the initial selection. FFS whether we can reuse the same thresholds. FFS on the number of levels

3. The UE triggers CB-Msg3 only if the size of pending UL data is less than the configured maximum TBS (FFS if the maximum TBS is same or different for different CE levels)

4. There will be a RSRP threshold that determines whether CB-Msg3 can be used (if the RSRP is below such threshold, PRACH will have to be used) (FFS if we need a separate set of thresholds, including a different minimum threshold, in case CB-msg3 EDT is combined with OCC)

5. The number of replicas for DSA will be configured by the NW: 1 (SA), 2, 3, 4. The configuration of the number of replicas is CE-level specific

6. There will be a configurable time window for DSA CB-Msg3 occasion selection. FFS on the details (e.g. when the time window starts)

7. For SA case (single replica), after the end of all repetition of CB-Msg3 PUSCH transmission, UE starts a window for response reception taking UE-eNB RTT into account. FFS if we need to consider additional delay e.g. for the processing time

8. For DSA case, FFS if we only have one or multiple PDCCH monitoring window(s) (i.e. one window per each replica) for response reception. FFS when the window(s) is/are started (or restarted) and stopped. FFS on the window length. FFS if the UE needs to monitor only one RNTI or multiple RNTIs)

9. The UE stops the PDCCH monitoring window(s) once it receives a CB-msg4 containing a matching Contention Resolution Identity (FFS if there is no RRC message together with the CB-msg4)

10. Assuming that there will be scenarios where it’s possible to receive a CB-msg4 before the UE transmits some replicas, a UE stops transmitting the remaining replicas if it has received a CB-msg4 containing a matching Contention Resolution Identity (FFS if there is no RRC message together with the CB-msg4)

11. Within the configured time window, the UE shall select randomly different time domain occasions for transmitting different replicas. And for each time domain occasion, the UE shall select randomly a frequency domain resource.

12. RAN2 understands that, for DSA, once the eNB successfully decodes one of the multiple replicas, it may respond without waiting for the remaining replica(s) (FFS when the response window(s) is/are started)

Support of PWS Reception

Agreements:

1. We will clarify in 36.300 section 4.10 that in general a NB-IoT UE may not support all PWS requirements.

2. We will extend the existing ETWS/CMAS notification RRC procedures for eMTC to NB-IoT. FFS if SIB1-NB acquisition is needed

3. Add the following PWS indication in Paging-NB:

- etws-Indication;

- cmas-Indication.

**RAN2#127bis, Oct’24**

Support of Store & Forward

Agreements:

1. The dynamic indication that “the cell is operating in S&F mode” is called “S&F operation” indication (we can come back on the exact name when putting this in the spec, if needed)

2. RAN2 assumes that if an indication that “the cell is operating in S&F mode” is not provided in a NTN cell, the UE should assume that the NTN cell is operating in real-time mode (i.e. default/normal/”not-S&F” mode). RAN2 assumes there should be no distinction between the case that the UE is served by a NTN cell that do not support S&F capability and the case that the UE is served by a NTN cell that does support S&F capability but indication that “the cell is operating in S&F mode” is not provided.

3. An S&F explicit capability indication by the serving cell, conceived as a static indication of whether the S&F capability is supported or not by a specific satellite/NTN-cell, in addition to the indication that “the cell is operating in S&F mode”, is not needed

4. If the “S&F operation” indication is not broadcast, a Rel-19 UE (regardless whether supporting S&F or not) shall follow the legacy barring procedure

5. When present, the “S&F operation” indication has two possible settings:

‘1’: the cell is operating in S&F mode for all UEs (Rel-19 UEs supporting S&F are allowed to access the cell)

‘0’: the cell is operating in S&F mode for UEs in Connected mode (which are not required to monitor the “S&F indication”), but idle Rel-19 UEs supporting S&F are barred (Rel-19 UEs not supporting S&F will follow legacy barring procedure).

Reduce the necessary signaling to complete an Early Data Transmission

Agreements:

1. RAN2 will introduce support for DSA (i.e. the possibility to transmit more than one replica of CB-msg3, if configured by the NW). RAN2 does not intend to work on CRDSA in Rel-19.

2. RAN2 will continue their work on CB-msg3 assuming that OCC2 might also apply to CB-msg3 transmission (“CB-NPUSCH”) (final decision whether this is feasible is up to RAN1). FFS whether an LS to indicate this to RAN1 is needed.

3. At least system Information is used to provide CB-msg3 EDT cell-specific PUSCH resources for Msg3 transmission. FFS on signalling details.

4. CB-msg3 EDT cell specific PUSCH resources for Msg3 transmission are provided per CE level (FFS whether we have a CE level specific configuration for DSA)

5. RAN2 assumes that CB-msg3 EDT cell specific PUSCH resources are associated with number of repetitions, RSRP selection threshold to determine the CE level and largest TBS for Msg3 transmission, but this has to be confirmed by RAN1. FFS if there is an RSRP threshold that determines whether CB-msg3 EDT cannot be used (the UE will have to use 4-step RA)

6. At least in the cases confirmed by RAN1/RAN4, a running TAT is not needed to initiate a CB-msg3 EDT transmission

7. The RNTI used at least to schedule Msg4 transmission is derived based on the resource associated to the PUSCH occasion used for contention based Msg3 EDT transmission (FFS on the details. FFS how this is impacted by DSA)

8. CB-msg3 EDT procedures and any Msg4 enhancement are only introduced for IoT NTN.

Support of PWS Reception

Agreements:

1. RAN2 confirms the understanding that this WID objective covers all PWS services, including ETWS and CMAS

2. The support for PWS introduced for NB-IoT NTN can also be made applicable for NB-IoT in TN, if this does not require additional NB-IoT TN specific changes.

3. For NB-IoT NTN PWS, introduce the following new SIBs, taking the content within the corresponding LTE SIBs as a baseline (but also checking whether we can have some optimization/ skip some unnecessary fields):

- SystemInformationBlockType10-NB for primary ETWS notification;

- SystemInformationBlockType11-NB for secondary ETWS notification;

- SystemInformationBlockType12-NB for CMAS notification.

4. Add the following PWS indication in direct indication information for NB-IoT (Come back in the next meeting on whether this is also added in Paging-NB):

- etws-Indication;

- cmas-Indication.

5. Upon receiving the PWS notification from NB-IoT cell, the PWS-capable NB-IoT UE acquires the corresponding PWS message immediately (can come back to clarify further what immediately means)

6. Clarify in the spec (and at least in 36.300) that for NB-IoT the ETWS, CMAS, PWS requirement may not be met in some scenarios, e.g. when the UE is in eDRX (can come back to further clarify the specific cases)

**RAN2#127, Aug’24**

Support of Store & Forward

Agreements:

1. RAN2 adopts the SA2 study conclusions on the possible S&F architectures as the baseline for further discussion (RAN2 will only consider the full CN and spit-MME payload options)

2. RAN2 will consider both single satellite pass and multiple satellite pass scenarios

3. RAN2 will consider both MO and MT data within scope

4. UE is informed whether its serving satellite is currently operating in S&F via System Information broadcast (FFS if we also need a static indication that in general the NW supports the feature)

5. RAN2 does not further discuss whether legacy UEs will always need to be barred in a S&F network, at least not before further progress in SA2 discussion. If there will be a need for this, mechanisms to bar legacy UEs are already in place and no further impact on RAN2 specs in expected.

7. RAN2 agrees there will be a way to bar legacy UEs (using legacy cellBarred and/or cellBarred-NTN bit) and still allow R19 S&F capable UEs. FFS on the exact solution (e.g. new barring bits or whether this is linked to some other indication)

Reduce the necessary signaling to complete an Early Data Transmission

Agreements:

1. RAN2 will continue working on a CB-msg3 EDT-like mechanism

2. RAN2 assumes that a DSA based scheme would not have RAN1 impacts, while RAN2 thinks that a CRDSA based scheme would necessarily have RAN1 impacts

3. In the next meeting continue the comparison (e.g. in terms of packet loss ratio, usage of UL/DL radio resources) between existing CB mechanism (Slotted Aloha) and other mechanisms (DSA, CRDSA, others) and try to decide on which way to go and in case whether/what to ask to RAN1.

4. For DSA and CRDSA, RAN2 can consider in the evaluation how to integrate them with repetition.

**RAN2#126, May’24**

Support of Store & Forward

Agreements:

1. For the uplink/downlink messages transmission for MO, from RAN2 perspective the following steps are taken as baseline for S&F satellite operation (in case only eNB is on the satellite):

1) The UE sends uplink data signalling to eNB when service link is available and the eNB stores it.

2) When feeder link is available, the eNB sends the uplink data/NAS signalling to the CN.

3) The eNB (same or different) receives the downlink data/NAS signalling from the CN and stores it when feeder link is available (and service link is not available).

4) The eNB (same or different) sends the downlink data/signalling to the UE when service link is available again

2. S&F indication can be provided by SIB (FFS on the details). RAN2 assumes that no NAS indication is needed

3. RAN2 understands legacy UEs may be barred by legacy cellBarred and cellBarredNTN

Reduce the necessary signaling to complete an Early Data Transmission

Agreements:

1. RAN2 focusses the study on contention-based Msg3 transmission to complete an EDT-like transaction (FFS on the details of Msg3. FFS on the procedural steps, e.g. how much we reuse of EDT and PUR procedures. FFS on allocation of resources).
2. RAN2 can continue the discussion on Diversity Slotted ALOHA (DSA) and Contention Resolution Diversity Slotted Aloha (CRDSA) for Msg3-EDT transmissions without msg1/ RAR, evaluating possible impacts on the specification, in the next RAN2 meeting (RAN2 might send an LS to RAN1 later on this)
3. If an IoT NTN UE in IDLE state is to use the new R19 contention-based procedure, the UE needs to verify/update the uplink synchronization (e.g. get GNSS fix, acquire TA) just before sending msg3.

**RAN2#125bis, April’24**

Support of Store & Forward

RAN2 assumptions:

1. S&F implies that at least the full eNB will be onboard
2. An IoT NTN network shall be able to inform UE(s) whether S&F Satellite operation is applied, either via NAS or AS (wait for SA2 progress on this)

3. The S&F satellite operation is common for NB-IoT and eMTC.

4. The S&F satellite operation is applied to both CP solution and UP solution (for the UP solution pending on SA2 conclusions on the architecture)

Reduce the necessary signaling to complete an Early Data Transmission

Agreements:

1. Both NB-IoT and eMTC are within scope of uplink capacity enhancements
2. Both C-plane and U-plane solutions are within scope of uplink capacity enhancements.
3. Only CIoT EPS is within scope of uplink capacity enhancements

#### 2.2.2 Remaining Open issues

No remaining open issues.

## 2.3 RAN3

#### 2.3.1 Agreements

**RAN3#129, Aug’25**

N/A

**RAN3#128, May’25**

Common understanding:

No support on the multiple SCTP association for IoT NTN.

**RAN3#127, Feb’25**

Agreement:

Introduce stage 2 description of Store and Forward operation.

Introduce stage2 description of full eNB as regenerative payload.

Introduce the S1 Removal procedure.

**RAN3#126, Nov’24**

N/A

**RAN3#125, Aug’24**

Agreement:

RAN3 decides to work on Split MME architecture and Full CN on board architecture. Whether eNB only on board architecture is feasible or not can be discussed later

#### 2.3.2 Remaining Open issues

No remaining open issues.

## 2.4 RAN4

#### 2.4.1 Agreements

**RAN4#116, Aug’25**

RF

Topic #2: LS on Harmonised Standard for NTN capable UE (R4-2509023/SES(25)000071)

### Introduce Nominated BW concept to 3GPP NTN requirements

**Issue 2-0: Whether the discussion or agreements for the nominated bandwidth concept affects closure of WI IoT\_NTN\_Ph3.**

* Agreement: Issues 2-1 to 2-3 are out of WI IoT\_NTN\_Ph3 scope and shall not affect the closure of WI IoT\_NTN\_Ph3.

#### **Issue 2-1: Regarding meeting the ETSI SEM requirement for NB-IoT/NR NTN, whether the “nominated BW (Bn) concept” (e.g., guard-band, extended BW) is useful from 3GPP perspective.**

* Agreement:
  + The nominated channel bandwidth concept is considered to be useful to minimize NB-IoT/NR NTN UL power backoff (i.e., A-MPR) for meeting ETSI SEM requirements. The nominated channel bandwidth concept can be adopted to the 3GPP specifications with modifications, such as restriction on the possible extended guard-band size(s) and fixed symmetric extended guard-band values.
  + The utilization of the above concept would be under network's control to use it depending on the deployment.
  + 3GPP RAN WG4 aims to work on the design of this concept as a general framework.
  + Introduction of the concept is considered earliest in Release 19.

#### **Issue 2-2: If nominated BW concept (e.g., extended guard-band/extended BW) can be applicable to NB-IoT/NR NTN, then how to specify it.**

* Agreement:
  + For meeting ETSI SEM requirements, 3GPP can use fixed extended guard-band value such as 400kHz for meeting nominated BW concept for FR1 NB-IoT NTN band, e.g., apply additional 100 kHz guard band on both sides.
  + FFS on NR-NTN.

Topic #1: IoT\_NTN\_Ph3 RF core requirements

### CFO grouping to avoid frequency inaccuracy

#### **Issue 1-1:** **Regarding NW using CFO grouping to avoid frequency inaccuracy between OCC UEs, whether this could result in RF requirements impact.**

* Agreement:
  + There is no RF requirements impact when NW uses CFO grouping to avoid frequency inaccuracy between OCC UEs.

### Phase continuity and power consistency for the duration of OCC group

#### **Issue 1-2: Whether UE is required to maintain phase continuity and power consistency for the duration of OCC group.**

* Agreement:

For NB-IoT NTN OCC feature, phase continuity is expected for OCC2 feature, and the phase continuity and related side conditions for OCC2 are UE implementation specific. UE RF requirements are not specified.

#### **Issue 2-3: Introduction of extended guard bands for NTN IOT.**

* Agreement:
  + Introduce the following UE capability to be added to Rel-19 capability feature list based on RAN guidance:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Prerequisite feature groups** | **Field name in TS 36.331** | **Parent IE in TS 36.331** | **Need of FDD/TDD differentiation** | **Note** | **Mandatory**  **/Optional** |
| TBD |  | Extended guard band for A-MPR reduction | 1. Support of  extended guard-band feature |  | [*NTN-extendedGuardBand-A-MPR-r19*] | [*FeatureSetUplink-v1900*] | TBD | The feature can be supported in below scenarios:  RAN4 intends for the NTN IoT bands. | Optional with capability signalling |

RRM

**Issue 1-1: LS reply for TAC in CB-Msg3-EDT procedure**

Agreement:

* RAN4 has no concern on the agreements regarding TAC in MSG4.
  + Capture this sentence in the reply LS to RAN2.

**Issue 2-1: Test cases list**

Agreement:

* Define only TC1.

Background:

|  |  |  |
| --- | --- | --- |
| Random Access  (A.13.3.2) | A.13.3.2.X1 Contention Based Random Access Test for UE category NB1 UEs in Satellite Access - Standalone mode in normal coverage for CB-msg3-EDT | TC1 |

SAN Demod

# Topic #1 General

**Issue 1-1: Requirements applying under standalone and in-band**

* **Agreement:**
  + The same requirement for IOT NTN NPUSCH applies for both standalone and in-band operation.

# Topic #2 SAN demodulation requirements

**Issue 2-1: DMRS pattern for NPUSCH 3.75kHz SCS**

* **Agreement:**
  + Sequential mapping of samples of the original DMRS sequence to active DMRS slots.

**Issue 2-2: Whether needs to configure the co-schedule UE**

* **Agreement:**
  + Configure the co-scheduled UE for OCC2 NPUSCH format 1 demodulation requirements.

**Issue 2-3: Number of Repetition**

* **Agreement:**
  + Reuse the last meeting agreement: 2 for single tone with 3.75kHz and 8 for single tone with 15kHz.
  + And discuss how to capture the number of repetitions into specification during CR drafting stage.

**Issue 2-4: Power assumption for two co-schedule UEs**

* **Agreement:**
  + Assuming the same transmission power for two UEs.
  + Assuming the same receiving power for two UEs at gNB side.

**Issue 2-5: Test metric**

* **Agreement:**
  + Measure the NPUSCH format 1 throughput per UE.
    - UE1 uses OCC sequence index 0
    - UE2 uses OCC sequence index 1
  + Set the same SNR for NPUSCH format 1 from two UEs if there is no performance difference.
  + FFS how to write the specification, define NPUSCH format 1 demodulation requirements for each UE

**Issue 2-6: Tx Duration**

* **Agreement**
  + Tx Duration = 256ms for 15kHz.

**Issue 2-7: Frequency offset**

* **Agreement:**
  + 128Hz for 15kHz.

# Topic #3 Simulation assumptions

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Subcarrier spacing** | **Number of allocated subcarriers** | **Propagation conditions and correlation matrix (Annex D))** | **FRC** | **Frequency offset** | **TxDuration** | **Repetition number(*N*Rep in36.213 Table 16.5.1.1-3)** |
| 1 | 1 | 3.75KHz | 1 | NTN TDLA100-1 | A7-1 (Note 1) | 128 Hz | 256 | 2 |
| 1 | 2 | 3.75KHz | 1 | NTN TDLA100-1 | A7-1 (Note 1) | 128 Hz | 256 | 2 |
| 1 | 1 | 15KHz | 1 | NTN TDLA100-1 | A16-2 (Note 2) | 128 Hz | 256 | 8 |
| 1 | 2 | 15KHz | 1 | NTN TDLA100-1 | A16-2 (Note 2) | 128 Hz | 256 | 8 |

**RAN4#115, May’25**

RF

#### **Issue 1-1: CR to TS 36.108**

* Proposal:
  + CR to update TS 36.108 clauses 4.3.1 and 4.3.2 to capture correctly the support of regenerative payload with the satellite payload based on RAN4#114bis endorsed draft CR R4-2504715.
* Agreement:
  + Agree CR R4-2508637.

#### **Issue 2-1:** **Whether UE is required to maintain phase continuity and power consistency for the duration of OCC group.**

* Agreement:
  + FFS on UE RF requirements and whether related UE capabilities would be needed.
    - Take the NR-NTN DMRS bundling requirements as a starting point to evaluate the phase continuity requirements for IoT-NTN with slot level OCC.

#### **Issue 3-1: Regarding UE requirements of NB-IoT NTN operating** **in NR NTN in-band, study the principle of selected specification series.**

* Agreement:
  + It is proper to put UE requirement for NB-IoT NTN in-band operation in 36 series.
  + There is no need to create new 37 specification for NB-IoT NTN in-band operation within NR NTN at current stage unless request on additional case.

#### **Issue 3-2: Regarding SAN requirements of NB-IoT NTN operating in NR NTN in-band, study the principle of selected specification series.**

* Agreement:
  + It is proper to put SAN requirements for NB-IoT NTN in-band operation with NR NTN in 36 and 38 series.
  + There is no need to create new 37 specification for NB-IoT NTN in-band operation within NR NTN at current stage unless request on additional case.

RRM

**Issue 2-1: Test cases for CB-Msg3 - General**

Agreement:

* Define test cases for random access for CB-msg3-EDT, and the correct behaviour and transmit timing can be verified in the same test case.
* Further discuss whether to down-select the test cases:

|  |  |
| --- | --- |
| Random Access  (A.13.3.2) | A.13.3.2.X1 Contention Based Random Access Test for UE category NB1 UEs in Satellite Access - Standalone mode in **normal coverage** for CB-msg3-EDT |
| A.13.3.2.X2 Contention Based Random Access Test for UE category NB1 UEs in Satellite Access - Standalone mode in **Enhanced Coverage** for CB-msg3-EDT |
| A.13.3.2.X3 Contention Based Random Access on **Non-anchor Carrier Test** for UE category NB1 UEs Standalone mode in Enhanced Coverage for CB-msg3-EDT |

**Issue 2-2: Test cases for CB-Msg3 for eMTC**

Agreement:

* Not to introduce test cases for CE Mode A and mode B for CB-msg3-EDT

Demod

Sub-topic 1 Work plan

* Agreement:

|  |  |
| --- | --- |
| Meeting | Target |
| RAN4 115 (May 2025) | Discuss work scope and agree with initial simulation assumptions. |
| RAN4 116 (Aug 2025) | Further discuss general test cases and simulation assumptions for each test case.  Collect the initial simulation results for alignment. |
| RAN4 116-bis (Oct 2025) | Finalize the simulation assumption. Collect the simulation results.  Decide the CR work split. |
| RAN4 117 (Nov 2025) | Collect the simulation results.  Review the draft CRs. |
| RAN4 118 (Feb 2026) | CR review and agree on the formal CR. |

Sub-topic 2-1 NPUSCH format 1 demodulation requirements

**Whether to define NPUSCH format 1 demodulation requirements with OCC for Rel-19 IoT-NTN**

* Agreement:
  + Introduce NPUSCH format 1 demodulation requirements with OCC for Rel-19 IoT-NTN.

**SCS**

* Agreement:
  + Both 15kHz and 3.75kHz SCS with OCC.

**Number of allocated subcarriers**

* Agreement:
  + Prioritize the single tone for specifying NPUSCH format 1 requirement with OCC.

**OCC length**

* Agreement:
  + OCC length = 2.

**DMRS pattern**

* Agreement:
  + CDM DMRS is assumed for 15kHz SCS OCC and TDM work assumption is assumed for 3.75kHz SCS OCC.
  + RAN4 needs to follow RAN1’s conclusion of DMRS sequence mapping for TDM DMRS slots.

**Antenna configuration**

* Agreement:
  + 1Rx and 2Rx.

**Number of repetitions**

* Agreement:
  + 2 for single tone with 3.75kHz and 8 for single tone with 15kHz

**MCS**

* Agreement:
  + BPSK MCS 0 in Table 16.5.1.2-1 of TS 36.213.

**Propagation conditions**

* Agreement:
  + Only consider NTN TDLA100-1.

**Frequency offset**

* Agreement:
  + 128Hz for 3.75kHz SCS and 15kHz SCS.

**Tx Duration**

* Agreement:
  + 256 for 3.75kHz SCS and 128 for 15kHz.

**Test metric**

* Agreement:
  + 70% maximum throughput.

**Whether to define NPRACH demodulation requirements for Rel-19 IoT-NTN**

* Agreement:
  + No need to define NPRACH demodulation requirements for Rel-19 IoT-NTN.

Sub-topic 2-3 Simulation assumptions

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Number of TX antennas** | **Number of RX antennas** | **Subcarrier spacing** | **Number of allocated subcarriers** | **Propagation conditions and correlation matrix (Annex D))** | **FRC** | **Frequency offset** | **TxDuration** | **Repetition number** | **Fraction of maximum throughput** |
| 1 | 1 | 3.75KHz | 1 | NTN TDLA100-1 | A7-1 (Note 1) | 128 Hz | 256 | 2 | 70% |
| 1 | 2 | 3.75KHz | 1 | NTN TDLA100-1 | A7-1 (Note 1) | 128 Hz | 256 | 2 | 70% |
| 1 | 1 | 15KHz | 1 | NTN TDLA100-1 | A16-2 (Note 2) | 128 Hz | 128 | 8 | 70% |
| 1 | 2 | 15KHz | 1 | NTN TDLA100-1 | A16-2 (Note 2) | 128 Hz | 128 | 8 | 70% |
| Note 1: The MCS is defined in the Annex A.7.1 of TS 36.108.  Note 2: The MCS is defined in the Annex A.16.1 of TS 36.104. | | | | | | | | | |

**RAN4#114bis, April’25**

RF

**Issue 1-1: Draft CR to TS 36.108 for supporting regenerative payload with satellite payload**

* Agreement:
  + Agree the draft CR R4-2504715.

#### **Issue 2-1: Is it feasible to introduce support of TDM DMRS as per the description in R1-2501512?**

* Agreement:
  + It is feasible for the UE to maintain the phase continuity across the blank DMRS symbol in TDM DMRS scheme.
  + Further discuss potential need for requirements if TDM DMRS would be specified (e.g., the measurement time for frequency error requirement).

#### **Issue 2-2: Whether NW would need to use CFO grouping or resynchronization schemes to avoid frequency inaccuracy between a pair of OCC UEs and whether this will result in UE RF specification impacts.**

* Agreement:
  + FFS CFO group requirements for UE and gNB.
  + Other methods to ensure the CFO grouping performance are not precluded if time allowed.

#### **Issue 3-1: Whether any of the following measurement quantities, described in clause 5.2 of TS 36.214, are applicable for NB-IoT-based NTN and/or eMTC-based NTN:**

* 1. **DL RS TX power**
  2. **Received Interference Power**
  3. **Thermal Noise Power**
* Agreement:
  + All the quantities (i.e., DL RS TX power, received interference power, thermal noise power) above are applicable to NB-IoT/eMTC NTN SAN.

#### **Issue 3-2 The reference points for DL RS Tx power, received interference power and thermal noise power.**

* Agreement:
  + Agree the conclusion of R4-2504718.

#### **Issue 4-1: Regarding NB-IoT NTN operating in NR NTN in-band, study the principle of selected specification series:**

* Agreement:
  + The conclusion about the selected specification would be decided in RAN4#115.

RRM

**Issue 1-1: Subclauses in Random Access requirement for CB-Msg3**

Agreement:

* Include the following subclauses in Random Access requirement for CB-Msg3 in IoT NTN
  + Correct behavior when transmitting CB-Msg3.
  + Correct behavior when receiving CB-Msg4
  + Correct behavior when not receiving CB-Msg4
* The exact titles of the subclauses can be further updated to align with RAN2 specifications.

**Issue 1-4: CR work split**

Agreement:

Table 1. CR work split for CB-Msg3

|  |  |  |
| --- | --- | --- |
| Core requirement | Volunteer | Comment |
| 6.6A Random Access for UE category NB-IoT for Satellite Access | Nokia | New subclause for CB-Msg3 |
| 6.2.4A Random Access Requirements for Cat-M1 UEs with CB-Msg3 for Satellite Access | CMCC | New subclause for CB-Msg3  It appears that a separate new subclause is necessary. |
| 7.20A UE transmit timing for NB-IoT for Satellite Access | MediaTek | Revised to apply to CB-Msg3 |
| 7.24A UE transmit timing for Category M1 for Satellite Access |

**RAN4#114, Feb’25**

RF

**Issue 1-1: Draft CR to TS 36.108 for supporting regenerative payload**

* Agreement:
  + Postpone the draft CR R4-2502286.

#### **Issue 2-1: UE RF requirement impact from 15 kHz single-tone NPUSCH with slot-level OCC2**

* Agreement:
  + No RF impact on OCC2 for IoT NTN.

#### **Issue 2-2: Whether there would be** **UE RF requirement impact when OCC schemes would cross gap in UL transmission.**

* Agreement:
  + No RF impact for <1ms gap length.
  + FFS for longer gaps.

#### **Issue 2-3: Whether UE would need to re-synchronize its TX frequency periodically to avoid high and opposite frequency inaccuracy between a pair of OCC UEs.**

* Agreement:
  + Further discuss whether solutions (e.g., CFO grouping) for solving frequency inaccuracy between OCC UEs would have potential RF impact.

RRM

**Issue 1-1-1: Procedural requirements for CB-MSG3 transmission**

Agreement:

* Include procedural requirements for CB-MSG3 transmission in a new subclause of 6.6A in TS36.133.
  + Further discuss the content to include in the next meeting.

**RAN4#113, Nov’24**

RF

#### **Issue 1-1: UE RF requirement impact from 3.75 kHz single-tone NPUSCH with symbol-level OCC2**

* Agreement:
  + Keep following the RAN4#112 agreement of “No UE RF requirement impact from symbol-level for NPUSCH”.

#### **Issue 1-2: UE RF requirement impact from 3.75 kHz single-tone NPUSCH with slot-level OCC2/OCC4**

* Agreement:
  + RAN4 stops evaluating UE RF requirement impacts for slot-level OCC2/OCC4 of 3.75 kHz single-tone NPUSCH format 1 since RAN1 agreed to remove the options.

#### **Issue 1-3: UE RF requirement impact from 15 kHz single-tone NPUSCH with slot-level OCC4**

* Agreement:
  + RAN4 stops evaluating UE RF requirement impacts for slot-level OCC4 of 15 kHz single-tone NPUSCH format 1 since RAN1 agreed to remove this option.

#### **Issue 1-4: UE RF requirement impact from 15 kHz single-tone NPUSCH with slot-level OCC2**

* Agreement:
  + Pending on RAN1 progress of slot-level OCC2 resource mapping.

#### **Issue 1-5: Whether there would be UE RF requirement impact when OCC shemes would cross gap in UL transmission.**

* Agreement:
  + Whether to study the case that gap between OCC slots may affect RF requirement pending on RAN1.

#### **Issue 1-6: Whether UE would need to** **re-synchronize its TX frequency periodically to avoid high and opposite frequency inaccuracy between a pair of OCC UEs.**

* Agreement:
  + Further discuss whether UE would need to re-synchronize its TX frequency periodically to avoid high and opposite frequency inaccuracy between a pair of OCC UEs.

RRM

**Issue 1-1-1: RRM impact from** **CB-msg3 EDT**

Agreement:

* Clarify the “N\_TA” mentioned in the agreement R4-2416867 refers to “N\_TA\_Ref” as specified in clause 7.20A.2 and 7.24A.2 of TS 36.133 v18.7.0.

**RAN4#112bis, Oct’24**

RF

#### **Issue 1-1: UE RF requirement impact from 3.75 kHz single-tone NPUSCH with symbol-level OCC4**

* Agreement:
  + Encourage companies to reconfirm whether previous agreement would be still valid.
    - RAN4#112 R4-2413530: “Agreement: No UE RF requirement impact from symbol-level for NPUSCH”

#### **Issue 1-2: UE RF requirement impact from 3.75 kHz single-tone NPUSCH with slot-level OCC2/OCC4**

* Agreement:
  + Wait for further progress in RAN1 before further work on inter-slot OCC, if any.

#### **Issue 1-3: UE RF requirement impact from 15 kHz single-tone NPUSCH with slot-level OCC2**

* Agreement:
  + Encourage companies to study the potential RF impact.

#### **Issue 1-4: UE RF requirement impact from 15 kHz single-tone NPUSCH with slot-level OCC4**

* Agreement:
  + Encourage companies to study the potential RF impact.

#### **Issue 1-5: UE RF requirement impact from NPRACH with OCC2/OCC4 feature**

* Agreement:
  + Wait for further progress in RAN1 before further work on inter-symbol/inter-slot OCC, if any.

RRM

**Topic #2: LS reply for R1-2407548**

**Issue 2-1: Reply regarding the Note 1**

Agreement:

* Reply to RAN1 that RAN4 assumed that N\_TA is equal to 0, if there is no other procedure for NTA determination introduced by other WG. RAN4 will follow the conclusion of the other working groups in the future, if any.

**Issue 2-2: Reply regarding the Note 2**

Agreement:

* Confirm to RAN1 that NOTE 2 in R1-2407548 is valid.

Besides, the following LS is approved.

* R4-2416918 Reply LS to RAN1 on UL synchronization for contention based Msg3 transmission without Msg1/Msg2

**RAN4#112, Aug’24**

RF

# Topic #1: Work plan for Rel-19 IoT\_NTN\_Ph3

**Issue 1-1: Work plan for Rel-19 IoT\_NTN\_Ph3**

* Approve the workplan in R4-2413529

# Topic #2: RF core requirements

NOTE1: Enhancements to enable multiplexing of multiple UEs in a single 3.75 kHz or 15 kHz subcarrier via orthogonal cover codes (OCC) for NPUSCH format 1 and NPRACH.

#### **Issue 2-1:** **UE RF requirement impact for NPUSCH with OCC feature**

* Agreement:
  + No UE RF requirement impact from symbol-level for NPUSCH
  + FFS on UE RF requirement impact from slot-level for NPUSCH

#### **Issue 2-2: UE RF requirement impact for NPRACH with OCC feature**

* Agreement:
  + Wait RAN1 reach conclusions on OCC feature before RAN4 evaluates the UE RF impact.

#### **Issue 2-3: SAN RF requirement impact for NPUSCH/NPRACH with OCC feature**

* Agreement:
  + Wait RAN1 reach conclusions for OCC feature before RAN4 evaluates the SAN RF impact.

RRM

### Sub-Topic 1-1: RRM impact

The work scope of RRM for Rel-19 IoT NTN is to discuss whether and how to define timing requirements for Msg3 transmission without msg1/ Random Access Response (RAR).

* Note: It can be revisited if the RRM impact from other objectives has been identified.

Besides, the following LS is approved.

* R4-2414114 Reply LS to RAN2 on UL synchronization for contention based Msg3 transmission without Msg1/Msg2, ZTE

#### 2.4.2 Remaining Open issues

* No remaining open issues in core part.
* Performance part:
  + RRM test cases for NB-IoT
  + SAN demod requirements

## 2.5 RAN5

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

List of all related Tdocs in the affected WGs since last TSG.

## 4.1 RAN1

**RAN1#122, Aug’25:**

**R1-2506530 FL Summary #1 for Rel-19 IoT-NTN maintenance Moderator (Sony)**

**R1-2506588 FL Summary #2 for Rel-19 IoT-NTN maintenance Moderator (Sony)**

R1-2505219 Maintenance on UL capacity enhancements for IoT NTN Huawei, HiSilicon

R1-2505278 Maintenance on uplink capacity enhancements for IoT-NTN Ericsson

R1-2505318 Maintenance on IoT-NTN uplink capacity/throughput enhancement CATT

R1-2505390 Maintenance on IoT-NTN uplink capacity enhancement vivo

R1-2505498 IoT-NTN uplink capacity/throughput enhancement Xiaomi

R1-2505503 Remaining issues on UL capacity enhancement for IoT NTN ZTE Corporation, Sanechips

R1-2505555 Remaining issues on IoT-NTN uplink capacity/throughput enhancement Samsung

R1-2505656 Remaining issues on uplink capacity for IoT-NTN Quectel

R1-2505714 Discussion on IoT-NTN uplink capacity/throughput enhancement OPPO

R1-2505860 Maintenance on IoT-NTN uplink capacity enhancement Nokia, Nokia Shanghai Bell

R1-2505890 Remaining issues on IoT-NTN uplink capacity enhancement Apple

R1-2506085 Maintenance of IoT-NTN uplink capacity/throughput enhancement CMCC

R1-2506191 IOT-NTN uplink capacity/throughput enhancement Qualcomm Incorporated

R1-2506341 Discussion on IoT-NTN uplink capacity/throughput enhancement Google

**R1-2506430** Moderator summary #1: Reply LS on CB-msg3-EDT on IoT-NTN uplink capacity and throughput enhancements Moderator (MediaTek)

**R1-2506431** Moderator summary #2: Reply LS on CB-msg3-EDT on IoT-NTN uplink capacity and throughput enhancements Moderator (MediaTek)

**R1-2506617** Moderator summary #3: Reply LS on CB-msg3-EDT on IoT-NTN uplink capacity and throughput enhancements Moderator (MediaTek)

**R1-2506552** Draft reply LS on CB-msg3-EDT for IoT NTN Ph3 Moderator (MediaTek)

R1-2506553 Reply LS on CB-msg3-EDT for IoT NTN Ph3 RAN1, MediaTek

R1-2505119 LS on CB-msg3-EDT RAN2, Huawei

R1-2505221 Draft LS reply on CB-msg3-EDT Huawei, HiSilicon

R1-2505222 Discussion on remaining LS reply for CB-msg3-EDT Huawei, HiSilicon

R1-2505280 Discussion LS on CB-msg3-EDT Ericsson

R1-2505363 Draft reply LS on CB-msg3-EDT vivo

R1-2505364 Discussions on CB-msg3-EDT vivo

R1-2505496 Discussion on LS on CB-msg3-EDT Xiaomi

R1-2505528 Discussion on RAN2 LS on CB-msg3-EDT Samsung

R1-2505716 Discussion on LS on CB-msg3-EDT OPPO

R1-2505717 Draft Reply LS on CB-msg3-EDT OPPO

R1-2505867 Discussion on RAN2 LS on CB-msg3-EDT Apple

R1-2505868 Draft Reply LS to RAN2 on CB-msg3-EDT Apple

R1-2505862 Discussion on LS from RAN2 on CB-Msg3-EDT Nokia, Nokia Shanghai Bell

R1-2505942 Discussion on LS on CB-msg3-EDT ZTE Corporation, Sanechips

R1-2506039 CB-RNTI for CB-msg3-EDT in IoT NTN Ph3 MediaTek Inc.

R1-2506041 Discussion on LS from RAN2 on CB-Msg3-EDT CATT

R1-2506169 On CB-msg3-EDT Qualcomm Incorporated

## 4.2 RAN2

**RAN2#131, Aug’25:**

Organizational

R2-2505004 Reply LS on S&F mode indications to NAS (C1-254119; contact: CICT Mobile) CT1 LS in Rel-19 5GSAT\_Ph3\_ARCH, IoT\_NTN\_Ph3-Core To:RAN2 Cc:SA2

R2-2505021 Reply LS on CB Msg3 EDT for IoT NTN Ph3 (R1-2504905; contact: MediaTek) RAN1 LS in Rel-19 IoT\_NTN\_Ph3 To:RAN2

R2-2505026 Reply LS on CB Msg3 EDT for IoT NTN Ph3 (R1-2504959; contact: MediaTek) RAN1 LS in Rel-19 IoT\_NTN\_Ph3 To:RAN2

R2-2505056 Reply LS on stage 1 requirements for the support for PWS over satellite NGRAN in Rel-17 (S2-2505538; contact: Samsung) SA2 LS in Rel-19 IoT\_NTN\_Ph3-Core To:RAN2, CT1 Cc:SA3, RAN3, SA1

R2-2505145 Introduction of IoT NTN phase 3 Ericsson CR Rel-19 36.300 18.5.0 1425 - B IoT\_NTN\_Ph3-Core

R2-2505201 Introduction of IoT NTN enhancements phase 3 MediaTek Inc. CR Rel-19 36.321 18.4.0 1591 - B IoT\_NTN\_Ph3-Core R2-2504525

R2-2505246 Introduction of IoT NTN Ph3 Huawei, HiSilicon CR Rel-19 36.331 18.6.0 5137 - B IoT\_NTN\_Ph3-Core

R2-2505247 RRC open issue list for IoT NTN Huawei, HiSilicon discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505249 Running CR for IoT-NTN Rel-19 Idle mode procedures Nokia Solutions & Networks (I) CR Rel-19 36.304 18.4.0 0882 - B IoT\_NTN\_Ph3-Core

R2-2505540 UE capability Running CR for Rel-19 IoT NTN Qualcomm Inc. CR Rel-19 36.306 18.5.0 1912 1 B IoT\_NTN\_Ph3-Core R2-2504321

R2-2505541 UE capability draft RRC CR for Rel-19 IoT NTN Qualcomm Incorporated draftCR Rel-19 36.331 18.6.0 IoT\_NTN\_Ph3-Core

R2-2505542 Open issues on Rel-19 IoT NTN UE capabilities Qualcomm Incorporated discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505555 Remaining MAC open issues in IoT NTN MediaTek Inc. discussion Rel-19 IoT\_NTN\_Ph3-Core R2-2504526

R2-2505872 Rapporteur Summary TS36.304 Open Issues Nokia , Nokia Shanghai Bells discussion

R2-2506174 k-Mac extension for IoT NTN THALES, Samsung CR Rel-19 36.331 18.6.0 5153 - F IoT\_NTN\_Ph3-Core

R2-2506185 IoT NTN phase 3 open issues in Stage 2 Ericsson discussion Rel-19 IoT\_NTN\_Ph3-Core

Support of Store & Forward

R2-2505081 Remaining Issues on S&F Operation vivo discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505105 Discussion on Store and Forward operation Xiaomi discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505146 Store & Forward: Remaining Neighbour Cell Issues PANASONIC discussion

R2-2505178 Discussion on support of Store&Forward Transsion Holdings discussion Rel-19

R2-2505228 Discussion on cell reselection enhancement based on the S&F monitoring list CATT, Samsung, Google, Huawei, Thales, Sateliot discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505229 Discussion on relaxation of IDLE mode task based on the S&F monitoring list CATT, Samsung, Google, Thales discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505230 Discussion on leftover issues of S&F operation CATT discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505257 Remaining issues for S&F operation ZTE Corporation, Sanechips discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505294 Remaining consideration on Store & Forward operation DENSO CORPORATION discussion IoT\_NTN\_Ph3-Core

R2-2505370 Leftover issues on the satellite S&F operation Google discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505437 Further consideration on Store and Forward Huawei, HiSilicon, China Telecom discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505494 Remaining issues in S&F operation Apple discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505550 Discussion on Store & Forward satellite operation OPPO discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505567 RAN2 impact on S&F mode MediaTek Inc. discussion IoT\_NTN\_Ph3-Core R2-2504527

R2-2505690 Some remaining issues for S&F operation mode and transition time Lenovo discussion Rel-19

R2-2505798 Discussion on Paging and Mode Switching Toyota ITC discussion Rel-19 IoT\_NTN\_Ph3-Core R2-2504097

R2-2505823 Support for store and forward in IoT NTN Ericsson discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505871 Open issues for SF operation Nokia , Nokia Shanghai Bells discussion

R2-2505878 Remaining issues on Store and Forward satellite operation ETRI, Korea University discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505916 Open issues on Store and Forward operation Samsung discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505928 Remaining issues for Store & Forward satellite operation SHARP Corporation discussion

R2-2505962 Discussion on Store and Forward remaining issues CMCC discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2506033 Discussion on usage of time information for S&F ASUSTeK discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2506070 Discussion on the Store and Forward satellite operation HONOR discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2506151 On cell (re)selection and idle mode task relaxation for S&F Satellite operation Sateliot, Thales, Novamint discussion Rel-19 R2-2504617

R2-2506152 On Satellite ID aspects for S&F Satellite operation Sateliot, Thales, Novamint, CATT, Samsung, Ericsson, Nordic discussion Rel-19 R2-2504617

R2-2506156 Store and Forward open issues Interdigital, Inc. discussion Rel-19 IoT\_NTN\_Ph3-Core

EDT enhancement

R2-2505082 Remaining Issues on CB-Msg3 EDT Mechanism vivo discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505106 Discussion on uplink capacity enhancements for IoT NTN Xiaomi discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505179 Discussion on uplink capacity enhancement Transsion Holdings discussion Rel-19

R2-2505231 Discussion on open issues for CB-Msg3 EDT CATT discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505258 Remaining issues for CB-msg3-EDT ZTE Corporation, Sanechips discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505369 Leftover issues on CB-Msg3-EDT Google discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505493 Remaining issues in CB-Msg3 Apple discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505536 Support of OCC Qualcomm Incorporated, European Space Agency, German Aerospace Center discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505537 CB-Msg3-EDT and Msg4 multicast Qualcomm Incorporated discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505551 Discussion on CB-Msg3 EDT and Msg4 enhancement OPPO discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505571 Discussion on CB-Msg3 procedure MediaTek Inc. discussion IoT\_NTN\_Ph3-Core R2-2504528

R2-2505632 Remaining issues on UL capacity enhancement for IoT NTN Nokia, Nokia Shanghai Bell discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505691 EDT for uplink capacity enhancement in NTN Lenovo discussion Rel-19

R2-2505736 Further consideration on UL capacity enhancement Huawei, HiSilicon discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505917 On open issues for CB-Msg3-EDT Samsung discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505958 Discussion on remaining issues of uplink capacity enhancement for IoT-NTN CMCC discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2506157 Efficient delivery (reduced overhead) of msg4 / RRCEarlyDataComplete Interdigital, Inc. discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2506168 Support of OCC with CB UL in IoT NTN Aalyria, Qualcomm Incorporated discussion Rel-19 Withdrawn

R2-2506184 UL capacity enhancements for IoT NTN Ericsson discussion Rel-19 IoT\_NTN\_Ph3-Core

PWS Reception

R2-2505083 Remaining Issues on PWS Support for NB-IoT vivo discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505107 PWS support for NB-IoT over NTN Xiaomi discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505259 Remaining issues for PWS support ZTE Corporation, Sanechips discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505538 Discussion on PWS in NB-IoT NTN Qualcomm Incorporated discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505552 Discussion on PWS for NB-IoT OPPO discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505563 Remaining issues on PWS support for NB-IoT Huawei, HiSilicon, China Telecom discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505568 Remaining open issues of PWS for NB-IoT MediaTek Inc. discussion IoT\_NTN\_Ph3-Core

R2-2505633 On support of inter-cell PWS reception for NB-IoT NTN Nokia, Nokia Shanghai Bell, Google, Huawei discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505692 Further considerations on PWS broadcast support in IoT NTN Lenovo discussion Rel-19

R2-2505824 Enhancements to support PWS in NB-IoT NTN Ericsson discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505918 Open issues on PWS for NB-IoT NTN Samsung discussion Rel-19 IoT\_NTN\_Ph3-Core

R2-2505959 Remaining issues on support of PWS CMCC discussion Rel-19 IoT\_NTN\_Ph3-Core

## 4.3 RAN3

**RAN3#129, May’25:**

R3-255266 Remaining issues for IoT NTN ZTE Corporation other

R3-255294 (TP to BL CR for TS 36.300) Correction on S1 Removal Nokia, Nokia Shanghai Bell, Huawei, Ericsson, LG Electronics, Samsung other

R3-255295 (TP to BL CR for TS 36.413) Support of regenerative payload Nokia, Nokia Shanghai Bell, ZTE Corporation, CATT, Qualcomm, CMCC, Samsung, China Telecom, LG Electronics, Xiaomi other

R3-255311 (TP for TS 36.300) Support for Regenerative Payload for IoT NTN Qualcomm Incorporated, Nokia, Nokia Shanghai Bell, ZTE, CATT, China Telecom, CMCC, LG Electronics, Xiaomi other

R3-255312 Discussion on Support for IoT NTN for Regenerative Payload Qualcomm Incorporated discussion

R3-255381 Discussion on remaining issues for IoT NTN China Telecom discussion

R3-255443 (TP for TS 36.300) IoT-NTN Switchover (FLSO) & Store-and-Forward Principles Jio Platforms discussion

R3-255507 (TP for TS 36.413) S1 Removal completion Huawei, LG Electronics, Nokia, Nokia Shanghai Bell, Ericsson, Thales, Jio Platforms, CATT, Qualcomm Incorporated, Deutsche Telekom,Samsung other

R3-255509 (TP to BL CR for TS 36.300) Hard FLSO and MME management Huawei, Ericsson, Thales, Jio Platforms, Deutsche Telekom other

R3-255512 (TP for TS 36.300) Full eNB as Regenerative Payload - TNL aspetcs Huawei, Jio Platforms other

R3-255513 (TP for TS 36.300) Discussion on S&F mode transition Huawei, Jio Platforms, Ericsson other

R3-255514 (TP for TS 36.300) Provision of S&F Mode Indication of neighbour cell list Huawei, Ericsson, Jio Platforms other

R3-255515 Discussion on Reply LS to SA2 on support of Full eNB as Regenerative Payload Huawei, Jio Platforms, Ericsson other

R3-255516 [DRAFT] Reply LS on Support of Regenerative-based Satellite Access Huawei, Jio Platforms, Ericsson LS out

R3-255549 Downlink Transmission Suspend/Resume – Stage 2 TP Ericsson, Thales, Huawei, Jio Platforms, Airbus, ESA, Sateliot, Deutsche Telekom other

R2-255607 (TP to BLCR for TS 36.300) Left issues in IoT NTN CATT discussion

## 4.4 RAN4

**RAN4#116, Aug’25:**

Moderator summary and conclusions

R4-2509071 Topic summary for [116][228] IoT\_NTN\_Ph3 Moderator (MediaTek)

R4-2511460 Topic summary for [116][315] IoT\_NTN\_Ph3 Moderator (MediaTek)

R4-2511478 Topic summary for [116][332] IoT\_NTN\_Ph3\_demod Moderator (ZTE)

R4-2512668 LS reply to ETSI TC SES MediaTek

R4-2512173 LS reply on CB-msg3-EDT MediaTek

R4-2512148 WF on RRM requirements for IoT\_NTN\_Ph3 MediaTek

R4-2512688 Way Forward for [116][315] IoT\_NTN\_Ph3 MediaTek

R4-2512645 Way Forward for [116][332] IoT\_NTN\_Ph3\_demod ZTE

R4-2512552 Ad-hoc meeting minutes for [116][315] IoT\_NTN\_Ph3 MediaTek

General

R4-2510207 On reply to LS on Harmonised Standard for NTN capable UE Nordic Semiconductor ASA

R4-2511123 Proposals for LS Reply to ETSI on Nominated Bandwidth concept under Harmonised Standard for NTN capable UE THALES

RF

R4-2509939 OCC scheme on the RF requirements for IoT NTN Sony

R4-2511404 IoT NTN UL Capacity Enhancements Qualcomm Incorporated

R4-2511443 OCC RF imact for IoT NTN Ericsson

R4-2512537 (IoT\_NTN\_Ph3-Core) CR to TS 36.102 for TX OCC requirements (Rel-19) MediaTek (Hefei) Inc.

RRM

R4-2512174 BigCR for R19 IoT\_NTN\_Ph3-Core MediaTek inc.

R4-2512152 CR to TS 36.133 to include CB-MSG3 Requirements for NB-IoT Ues Nokia

R4-2512153 (IoT\_NTN\_Ph3-Core) draftCR Introduce CB-msg3 based random access requirement for Cat-M1 UE over IOT-NTN CMCC

R4-2512172 Modification on IoT NTN band groups for satellite access ZTE Corporation, Sanechips

R4-2510379 Discussion on RRM requirements of Non-Terrestrial Networks (NTN) for Internet of Things (IoT) Phase 3 Ericsson

R4-2510775 Draft LS reply regarding CB-msg3-EDT Ericsson

R4-2511575 On introducing requirements for CB-MSG3 in TS 36.133 Nokia

R4-2509225 Discussion on RRM performance requirements for IoT NTN phase 3 MediaTek inc.

R4-2510039 Discussion on test cases for IOT-NTN Phase 3 CMCC

R4-2511279 On test cases for CB-MSG3 in TS 36.133 Nokia

SAN demon

R4-2509111 Discussion on IoT NTN SAN demodulation performance Nokia

R4-2509397 Discussion and simulation results on demodulation requirement for IoT NTN Samsung

R4-2510838 SAN demodulation requirements for IoT-NTN Ericsson

R4-2510870 Discussion on IoT NTN Phase3 demodulation performance requirements Huawei,HiSilicon

R4-2510983 Discussion on SAN demodulation performance requirements for IoT-NTN ZTE Corporation, Sanechips