3GPP TSG-RAN WG2 Meeting #126 R2-2405703

Fukuoka, Japan, May 20th-24th, 2024

**Agenda item: 9.3**

**Source: Session Chair (ZTE Corporation)**

**Title: Report from Break-out session on NR-NTN and IoT-NTN**

**Document for: Approval**

Organizational

1. All organization emails and notes will be shared over the following email discussion throughout the meeting:

* [AT126][300] Organizational – NR-NTN and IoT-NTN session

Scope:

* + - Share plans for the meeting and list of ongoing email discussions for the sessions related to NR-NTN and IoT-NTN
    - Share meetings notes and agreements for review and endorsement

Schedule/Plan

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Main room** | **Brk 1 room** | **Brk 2 room** | **Brk 3 room** |
| **Monday** | | | | |
| 09:00 – 10:30 | [**1], [2], [3],**  **[7.0] R18 common (Diana)**  **[7.0.1][7.0.2]**  **[7.0.3] ASN.1 Review common**  **Break out of ASN.1 Review**  **[7.0.4][7.0.5]**  **@NR151617 UP (Diana)** | Breakout to start after common session including ASN.1 review  **NRR1617 SL (Kyeongin)**  **NR18 SL (Kyeongin)** | Breakout to start after common session including ASN.1 review:  **Rel-18 MUSIM (Erlin)**  **NR18 MIMO evo** |  |
| 11:00 – 13:00 |
| 14:30 – 16:30 | **Rel-18 UAV (1hr)**  **NR18 TEI (Diana)**  **SDT, including MT-SDT and related TEI18** | **NR R18 SL** | **14:30-15:30 NR18 fCovEnh (Eswar)**  **NRLTE1516 Pos (Nathan)**  **NR17 Positioning and SL Relay (Nathan)** |
| 17:00 – 19:00 | **NR18 URLLC (Diana)**  **NR18 Network Energy Saving (Diana)** | **NR18 Mobile IAB (Johan)**  **NR18 feMob (Johan)** | NR18 Pos |  |
|  |  |
| **Tuesday** | | | | |
| 08:30 – 10:30 | **NR18 feMob (Johan)** | **NR19 XR [1] (Dawid)** | **EUTRA&NR151617 (Mattias)** |  |
| 11:00 – 13:00 | **NR18 XR (Diana)** | **NR18 NTN NR /IoT(Sergio)**  - all AIs in 7.7  - all AIs in 7.6 | **NR18 Pos (Nathan)** |
| 14:30 -16:30 | **NR19 AI/ML PHY [2] (Diana)** | **NR19 feMob [2] (Kyeongin)** | NR17/18 Relay (Nathan) |  |
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| 17:00– 19:00 | **Rel-19 Ambient IoT [2] (Diana)** | **Rel- 19 NR NTN [1]**  - 8.8.1  - 8.8.2  - 8.8.4 | **NR 18 MBS (Dawid)**  **NR18 eQoE (Dawid)** |  |
|  |
| **Wednesday** | | | | |
| 08:30 – 10:30 | **NR19 Network Energy Saving [1] (Kyeongin)** | **NR19 NTN IoT**  - 8.9.1  - 8.9.2  - 8.9.3 | **EUTRA&NR151617 (Mattias)**  **NR18 Redcap (Mattias)** |  |
|  |
|  |
| 11:00 – 13:00 | **NR Other (Diana)**  **TEI18 (Diana)** | **NR19 XR [1] (Dawid)** | **NR18 SONMDT (Mattias)**  **NR19 SONMDT [0.5] (Mattias)** |  |
|  |
| 14:30 – 16:30 | **AI/ML Mobility [2] (Diana)** | **Rel-19 LP-WUS [1](Erlin)** | **NR18 Pos (Nathan)** |  |
|  |
|  |
| 17:00 – 19:00 | **AI/ML PHY [2] (Diana)** | **NR19 feMob [2] (Kyeongin)** | **Positioning or SL relay offlines for Rel-18** |  |
| **Thursday** | | | | |
| 08:30 – 10:30 | **CB TBD Johan/Diana/Eswar** | **R18 NR/IoT NTN CB (Sergio)**  - outcome of [301], [302], [303]  - other issues marked CB Thursday  **[R19 IoT CB]**  - 8.9.3: R2-2405110 | CB Kyeongin  Comebacks SL  [R19 NES CB] |  |
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| 11:00 – 13:00 | **Rel-19 Ambient IoT [2] (Diana)** | **Rel-19 NTN NR [1] (Sergio)**  - 8.8.5  - 8.8.6 | CB Dawid:  - R18 QoE. MBS  [R19 XR CB] |  |
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|  |
| 14:30 – 16:30 | **CB Diana**  **UAV**  **NES**  **XR**  **[R19 AI/ML PHY CB]** | CB Johan  - mIAB  - feMob | CB Nathan |  |
|  |
| 17:00 – 19:00 | **AI/ML Mobilitly [2] (Diana)** | CB Erlin  R18 CBs  [R19 LP-WUS CB]  CB Eswar | CB Nathan |  |
|  |
|  |
| **Friday** | | | | |
| 08:30 – 10:30 | CB Johan TBD  CB Diana  TEI 18 CBs  NR Others CBs  [R19 AI/ML Mobility]? | CB TDB | CB Mattias  TBD |  |
| 11:00 – 13:00 | CB Diana  [R19 Ambient IoT]?  ASN.1 Review common session  Reports from breakout sessions  EoM | **R18 NR/IoT NTN CB (Sergio)**  - outcome of [304]  - TBD  **[R19 NR/IoT NTN CB]**  - outcome of [305]  - outcome of [306] | TBD? |
| 14:30 – 16:00 |  |  |  |
| 16:00 – 17:00 |  |  |  |  |

List and details of [AT126] offline discussions

NOTE: No offline email discussions will be kicked off before Monday May 20th, 09:00 local time

* [AT126][301][NR NTN Enh] SMTC impacts for soft satellite switch (Sequans)

Scope: discuss the impact on SMTC adjustment for soft satellite switch and possible impact on decision for H115

Intended outcome: report of offline discussion

Deadline for companies' feedback: Wednesday 2024-05-22 20:00 (but F2F discussion is invited)

Deadline for rapporteur's summary (in R2-2405757): Thursday 2024-05-23 08:00

* [AT126][302][IoT NTN Enh] T390 issues (Samsung)

Scope: discuss T390 issues (based on the proposals in R2-2405151, R2-2405499, R2-2405440, R2-2404157, R2-2404653, R2-2405526, R2-2404594)

Intended outcome: report of offline discussion

Deadline for companies' feedback: Wednesday 2024-05-22 20:00 (but F2F discussion is invited)

Deadline for rapporteur's summary (in R2-2405760): Thursday 2024-05-23 08:00

* [AT126][303][IoT NTN Enh] MAC issues (Ericsson)

Scope: Discuss the N\_TA issue and p1 from R2-2405451(and other similar proposals)

Intended outcome: report of offline discussion

Deadline for companies' feedback: Wednesday 2024-05-22 20:00 (but F2F discussion is invited)

Deadline for rapporteur's summary (in R2-2405761): Thursday 2024-05-23 08:00

* [AT126][304][NR NTN Enh] MAC CR (Interdigital)

Scope: Discuss how to clarify / restructure the change in R2-2405374

Intended outcome: agreeable MAC CR

Deadline for rapporteur's CR (in R2-2405754): Friday 2024-05-24 08:00

* [AT126][305][R19 NR NTN] LS to RAN1 (CMCC)

Scope: draft an LS to RAN1 based on meeting agreements. Can consider additional questions if there is support (if there is no consensus we just stick to the questions agreed online)

Intended outcome: Approved LS

Deadline for rapporteur's summary (in R2-2405762): Friday 2024-05-23 08:00

* [AT126][305][R19 IoT NTN] LS to RAN1/4 (ZTE)

Scope: draft an LS to RAN1 based on meeting agreements. Can consider additional questions if there is support (if there is no consensus we just stick to the questions agreed online)

Intended outcome: Approved LS

Deadline for rapporteur's summary (in R2-2405763): Friday 2024-05-23 08:00

## 7.6 IoT NTN enhancements

(IoT\_NTN\_enh-Core; leading WG: RAN1; REL-18; WID: [RP-223519](http://ftp.3gpp.org/tsg_ran/TSG_RAN/TSGR_98e/Docs/RP-223519.zip))

Time budget: 0 TU

Tdoc Limitation: 2 tdocs

### 7.6.1 Organizational

LSs, rapporteur inputs and other organizational documents.

Editorials/clarifications should not be included in any tdoc but sent to the WI spec rapporteurs, who can submit a rapporteur CR as part of this AI.

Rapporteur inputs and other pre-assigned documents in this AI do not count towards the tdoc limitation.

Rapporteur CRs

[R2-2405452](file:///C:\Data\3GPP\Extracts\R2-2405452%20-%2036300_CR1402_(Rel-17)%20-%20IoT%20NTN%20Kmac%20correction.docx) IoT NTN Kmac correction Ericsson CR Rel-17 36.300 17.7.0 1402 - F LTE\_NBIOT\_eMTC\_NTN-Core

* To be handled in AI 4.1.1 (if anything is agreed for R17, then a R18 Cat A mirror CR needs to be agreed as well, while only R18-specific changes should be kept in a separate R18 Cat F CR)

[R2-2405453](file:///C:\Data\3GPP\Extracts\R2-2405453%20-%2036300_CR1401r1_(Rel-18)%20-%20IoT%20NTN%20Kmac%20and%20measurment%20corrections.docx) IoT NTN Kmac and measurment corrections Ericsson, Huawei CR Rel-18 36.300 18.1.0 1401 1 F IoT\_NTN\_enh-Core R2-2403776

(R18 IPA CR subject to changes if a R17 Cat F CR with a mirror R18 Cat A CR will be agreed)

* Revised in R2-2405752 to only keep the R18-specific changes (as a R17 CR will be agreed, with a corresponding R18 Cat A mirror CR, for changes that are applicable from R17)

R2-2405752 IoT NTN Kmac and measurment corrections Ericsson, Huawei CR Rel-18 36.300 18.1.0 1401 2 F IoT\_NTN\_enh-Core R2-2405453

[R2-2405128](file:///C:\Data\3GPP\Extracts\R2-2405128%20Corrections%20to%20IoT%20NTN.docx) Corrections to IOT NTN Huawei, HiSilicon CR Rel-18 36.331 18.1.0 5021 - F IoT\_NTN\_enh-Core

* Revised in R2-2405758 to take into account further agreements this week

R2-2405758 Corrections to IOT NTN Huawei, HiSilicon CR Rel-18 36.331 18.1.0 5021 1 F IoT\_NTN\_enh-Core

[R2-2405129](file:///C:\Data\3GPP\RAN2\Docs\R2-2405129.zip) IOT NTN ASN1 RIL List Huawei, HiSilicon report Rel-18 IoT\_NTN\_enh-Core

* H005, S068, E805 and E806 are still ToDo and need to be finalized at this meeting

[R2-2404954](file:///C:\Data\3GPP\Extracts\R2-2404954%2036.321%20CR1585r2%20R18%20IoT%20NTN.docx) Corrections on UE behaviour on DRX for IoT NTN MediaTek CR Rel-18 36.321 18.1.0 1585 2 F IoT\_NTN\_enh-Core R2-2404007

* HW thinks the change “when downlinkHARQ-FeedbackDisabledDCI is configured” is not needed
* Remove the change “when downlinkHARQ-FeedbackDisabledDCI is configured”
* Revised in R2-2405759 for editorial changes and to take into account further agreements this week

R2-2405759 Corrections on UE behaviour on DRX for IoT NTN MediaTek CR Rel-18 36.321 18.1.0 1585 3 F IoT\_NTN\_enh-Core R2-2404007

Moved here from 7.6.4

[R2-2405534](file:///C:\Data\3GPP\Extracts\R2-2405534-IoT-NTN-Correction.docx) Miscellaneous correction for IoT-NTN Nokia CR Rel-18 36.304 18.1.0 0873 2 F IoT\_NTN\_enh-Core R2-2403768

* Agreed

[R2-2405302](file:///C:\Data\3GPP\Extracts\36306_CR1889_(Rel-18)_R2-2405302%20UE%20capability.docx) Corrections on terminology fixed cell Qualcomm Incorporated CR Rel-18 36.306 18.1.0 1889 - F IoT\_NTN\_enh-Core

* Agreed (might come back this week if further changes are agreed for 306)

Withdrawn

R2-2404687 Corrections on terminology fixed cell Qualcomm Incorporated CR Rel-18 36.331 18.1.0 5018 - F IoT\_NTN\_enh-Core Withdrawn

### 7.6.2 Stage 2 corrections

[R2-2404593](C:\\Data\\3GPP\\Extracts\\R2-2404593 GNSS operation.doc" \o "C:\Data\3GPP\Extracts\R2-2404593 GNSS operation.doc) Discussion on GNSS operation for IoT NTN OPPO discussion Rel-18 IoT\_NTN\_enh-Core

Proposal 1 The Differential Koffset is cleared when UE is performing GNSS measurement.

* Google thinks this is not needed. QC and Nokia agree with Google
* Oppo thinks the issues is the same as during HO. Nokia thinks this is different from HO as in this case the network can predict when this happens

Proposal 2 Adopt the above TP in stage-2 spec if proposal 1 is agreed.

Proposal 3 UE capability of GNSS measurements during C-DRX inactive time is not reported to the network.

* Already agreed in the last meeting

[R2-2405117](file:///C:\Data\3GPP\Extracts\R2-2405117%20Remaining%20issues%20on%20GNSS%20operation.docx) Remaining issues on GNSS operation Huawei, HiSilicon discussion Rel-18 IoT\_NTN\_enh-Core

* Whether UE goes to IDLE

Proposal 1: Update the wording in Stage 2 to cover the autonomous GNSS measurement cases as follows “Upon outdated GNSS position the UE shall move to idle mode, unless GNSS acquisition was triggered or being performed or uplink transmission extension is active.”

- ZTE thinks this is not necessary as existing text (was triggered) already covers also UE autonomous trigger

Proposal 2: Upon GNSS validity expiry, UE doesn’t move to idle mode if UE is performing autonomous GNSS measurement during C-DRX inactive time.

- Samsung does not agree with this

* Whether UE triggers RACH

Proposal 3: RACH is not triggered for the GNSS Validity Duration report if there is no UL resource available for the case of autonomous GNSS measurement in C-DRX inactive time.

- Nokia thinks this could be left to UE implementation

- QC is fine with p3. Google agrees.

- Ericsson thinks the UE shall trigger RACH but it’s up to the UE when to do it

- Apple thinks we could have a note

* Continue the discussion in [303]

[R2-2405152](file:///C:\Data\3GPP\Extracts\R2-2405152%20Stage%202%20corrections%20related%20to%20NTN%20measurements.docx) Stage 2 corrections related to NTN measurements Samsung discussion Rel-18 IoT\_NTN\_enh-Core

Proposal 1: Agree Stage 2 text proposal in Section 5.1 on measuring NTN cells in a terrestrial network.

Proposal 2: If none of the satellite IDs for a specific frequency in SIB3/SIB5 are present in SIB33, it is up to UE implementation to measure the frequency.

Proposal 3: Agree Stage 2 correction text.

### 7.6.3 RRC Corrections

T390

* [S068] (T390 behaviour for HO/CHO)

[R2-2405151](file:///C:\Data\3GPP\Extracts\R2-2405151%20%5bS068%5d%20Handling%20GNSS%20uplink%20transmission%20extension%20during%20handovers.docx) [S068] Handling GNSS uplink transmission extension during handover Samsung, ZTE, Google discussion Rel-18 IoT\_NTN\_enh-Core

Observation 1: Release 17 IoT NTN never specified requirements for UE to perform GNSS measurement during a handover.

Proposal 1: Any solution shall ensure that a handover execution to target cell does not occur if UE does not have a valid GNSS position fix.

Proposal 2: RAN2 considers the following solutions:

- A) Network does not trigger handover while T390 is running

- B) A GNSS position fix is performed before the handover execution if T390 is running.

Proposal 3: If B) in P2 is agreed, agree the text proposal in Section 5.

* [AT126][302][IoT NTN Enh] T390 issues (Samsung)

Scope: discuss T390 issues (based on the proposals in R2-2405151, R2-2405499, R2-2405440, R2-2404157, R2-2404653, R2-2405526, R2-2404594)

Intended outcome: report of offline discussion

Deadline for companies' feedback: Wednesday 2024-05-22 20:00 (but F2F discussion is invited)

Deadline for rapporteur's summary (in R2-2405760): Thursday 2024-05-23 08:00

R2-2405760 Summary of [AT116][302][IoT NTN Enh] T390 issues Samsung discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2405499](file:///C:\Data\3GPP\Extracts\R2-2405499%20%5bS068%5d%20UE%20behaviors%20on%20T390%20upon%20handover%20or%20CHO.DOCX) [S068] UE behaviours on T390 upon handover or CHO Huawei, HiSilicon discussion Rel-18 IoT\_NTN\_enh-Core

Observation 1: In handover and CHO, target cell can know whether UE has started T390 based on the absence of gnss-ValidityDuration in the RRC connection reconfiguration complete message.

Proposal 1: Clarify in the spec that UE only includes gnss-ValidityDuration in the RRC connection reconfiguration complete message when it has a valid GNSS. There is no need to specify the stop of T390 upon handover or CHO.

- Apple wonders if the UE can actually connect to the target cell in this case and this

Proposal 2: Clarify in the spec that T390 is stopped if UE autonomously starts GNSS measurements during C-DRX non-active periods.

Proposal 3: Adopt the TP in the Annex.

[R2-2405440](file:///C:\Data\3GPP\Extracts\R2-2405440%20On%20left%20open%20issues%20for%20T390%20handling.docx) On left open issues for T390 handling Nokia, Nokia Shanghai Bell discussion Rel-18 IoT\_NTN\_enh-Core

* T390 behavior for HO/CHO

Observation 1: If the UE stops T390 when handing over to the target cell the UE will be regarded as uplink un-synchronized.

Observation 2: The target cell is not aware whether T390 is running in a UE performing handover to the cell.

Observation 3: For normal handover, the source cell can inform the UE’s T390 status to the target cell via inter-node message.

Observation 4: For conditional handover, the UE can report the UE’s T390 status to the target cell via Uu interface after CHO execution.

Proposal 1: For HO/CHO, the UE shall report the UE’s T390 status (e.g., the remaining value of the T390) to the target cell in the RRCConnectionReconfigurationComplete message.

Proposal 2: If Proposal1 is agreed, RAN2 to adopt the below text proposal for TS 36.331.

* T390 behavior for for C-DRX non-active periods

Observation 5: The UE and cell must have a common understanding of the T390 status to avoid the cell assumes an autonomous GNSS measurement has started or UE has moved to RRC Idle.

Proposal 3: The UE stops the T390 when it receives an acknowledgement of the cell receiving the new remaining GNSS validity duration, when the UE performed a successful GNSS measurement during a C-DRX non-active period.

Proposal 4: If Proposal3 is agreed, RAN2 to adopt the below text proposal for TS 36.331.

[R2-2404157](C:\\Data\\3GPP\\Extracts\\R2-2404157 Further Discussion on T390.docx" \o "C:\Data\3GPP\Extracts\R2-2404157 Further Discussion on T390.docx) Further Discussion on T390 vivo discussion Rel-18 IoT\_NTN\_enh-Core

Observation 1: There is no requirement that UE may need to acquire the valid GNSS position before HO or CHO, which is different than the RRC re-establishment case.

Observation 2: For HO or CHO, if T390 is stopped upon starting handover, the out-of-date GNSS position will be used to synchronize to the target cell, and UE does not have the opportunity to acquire a new valid GNSS position.

Observation 3: For HO or CHO, if T390 is not stopped upon starting handover, although the out-of-date GNSS position is used to synchronize to the target cell before T390 expiration, UE would have the opportunity to acquire a new valid GNSS position after T390 expiration.

Observation 4: Network implementation can ensure T390 not running and UE has a valid GNSS position during the handover procedure.

Proposal 1: T390 is not stopped upon starting HO or CHO (no spec changed).

[R2-2404653](file:///C:\Data\3GPP\Extracts\R2-2404653_IoT%20NTN%20T390.doc) T390 handling during mobility [S067][S068] Apple discussion Rel-18 IoT\_NTN\_enh-Core

Observation 1: If T390 expires when UE is performing GNSS acquisition, UE would go to RRC idle before RRC re-establishment is initiated.

Proposal 1: For RRC re-establishment procedure, T390 is stopped once GNSS acquisition is initiated.

Observation 2: In handover procedure, target cell cannot inherit network UL timing correction from source cell during T390.

Observation 3: When UE performs initial access to target cell, UE location is required for UE to perform pre-compensation on timing and frequency.

Proposal 2: RAN2 to down-select one of the two options on T390 handling during handover and CHO.

- Option 1: Network initiates GNSS measurement before handover and CHO to guarantee UE has a valid GNSS upon handover and CHO initiation.

- Option 2: UE should acquire GNSS location upon initiating handover and CHO if T390 is running.

Proposal 3: If Option 2 above is selected, T390 is stopped once GNSS acquisition is initiated during handover and CHO.

[R2-2405526](file:///C:\Data\3GPP\Extracts\R2-2405526%20Corrections%20on%20the%20conditions%20for%20stopping%20T390.docx) Corrections on the conditions for stopping T390 Google Inc. discussion Rel-18 36.331

Proposal 1 UE stops T390 (if it is running) upon performing the GNSS measurement, no matter whether the GNSS measurement is triggered by the network, performed by the UE using an autonomous gap, or performed by the UE using available idle periods.

Proposal 2 Replace the changes relevant to the conditions for stopping T390 in R2-2403774 with the text proposal in Section 3.

Proposal 3 RAN2 to discuss the exceptions (e.g., a very short GNSS position fix duration) that allow UE to remain in RRC\_CONNECTED when UE’s GNSS position becomes outdated, even if the UE is neither configured with autonomous GNSS measurement nor provided with an aperiodic GNSS measurement gap.

* RACH triggering during T390

[R2-2404594](file:///C:\Data\3GPP\Extracts\R2-2404594%20T390.doc) Discussion on RACH triggering during T390 running OPPO discussion Rel-18 IoT\_NTN\_enh-Core

Neighbour Satellite information in MO

[R2-2404896](file:///C:\Data\3GPP\Extracts\R2-2404896%20Redundant%20ephemeris%20info%20and%20other%20issues%20in%20MO%20for%20IoT%20NTN.docx) Redundant ephemeris info and other issues in MO for IoT NTN ZTE Corporation, Sanechips, Apple, Samsung discussion Rel-18 IoT\_NTN\_enh-Core

Proposal 1: To remove IE ephemerisInfo-r18 from MeasObjectEUTRA and keep the IE satelliteId-r18 as it is.

Proposal 2: To clarify in the field description of IE epochTime-r18 in MeasObjectEUTRA that this IE is only assiocaited with IE referenceLocation-r18, not applicable to ephemeris information. And the previous description “configured in the associated ReportConfigEUTRA” for reference location is no longer correct and can be removed.

Proposal 3: To clarify that the condition “OPTIONAL -- Cond Moving” for the IE epochTime-r18 and referenceLocation-r18 in MeasObjectEUTRA means the corresponding field is only mandatory present if EventD2 or condEventD2 is configured. Otherwise the field is not present.

Proposal 4: To clarify the description of Event D2 and CondEvent D2 that the referenceLocation's corresponding satellite ephemeris information is the one indicated by the satellite ID. Also to editorially align the description of Ml2 and Thresh2 with that of Event D2 and CondEvent D2.

* CB Thursday

[R2-2404592](file:///C:\Data\3GPP\Extracts\R2-2404592%20ephemeris%20for%20EMC%20neighbor%20cells.docx) Removing ephemeris from dedicated signaling for EMC neighbor cells OPPO CR Rel-18 36.331 18.1.0 5017 - F IoT\_NTN\_enh-Core

Summary of change: Remove the ephemerisInfo-r18 from measObjectEUTRA.

[R2-2404209](file:///C:\Data\3GPP\Extracts\R2-2404209%20On%20the%20necessity%20of%20satellite%20assistance%20information%20for%20measurement%20in%20IoT%20NTN.docx) On the necessity of satellite assistance information for measurement in IoT NTN CATT discussion

Observation 1: Different from NR NTN, IoT NTN does not support SMTC based mechanism for RRM measurement; thus a UE does not need to adjust the measurement timing window with the variation of PDD. This makes it questionable on whether/how the satellite assistance information of neighbour cell is useful/necessary for RRM measurements in RRC\_IDLE/INACTIVE or in RRC\_CONNECTED.

Proposal 1: RAN2 clarifies how/why the satellite assistance information is necessary/useful for RRM measurement in IoT NTN. If no necessity is identified, remove the satellite ID list in SIB3, SIB5 and MeasObjectEUTRA.

[H005]

[R2-2405498](file:///C:\Data\3GPP\Extracts\R2-2405498%20%5bH005%5d%20Start%20of%20autonomous%20GNSS%20measurements.docx) [H005] Start of autonomous GNSS measurements Huawei, HiSilicon discussion Rel-18 IoT\_NTN\_enh-Core

Proposal 1: Update the start condition of autonomous GNSS gap in clause 5.3.3.21 and 5.5.9: UE may re-acquire GNSS (when configured by the network) in the GNSS measurement timer, if eNB does not trigger UE to make GNSS measurement within duration T, where T is latest reported remaining GNSS validity duration plus UL transmission extension duration X (if any).

Proposal 2: Adopt the TP in the Annex.

* CB Thursday

Misc

Moved here from 7.6.4

[R2-2404408](file:///C:\Data\3GPP\Extracts\R2-2404408%20Remaining%20issues%20on%20GNSS%20operation%20in%20IoT%20NTN.docx) Remaining issues on GNSS operation in IoT NTN CATT discussion

Proposal 1: No need to reset the value of N\_TA before resuming UL operation after GNSS is fixed.

Proposal 2: Add the start condition "when indication from lower layers to extend UL transmission is received" for T390 in Clause 7.3.1.

Proposal 3: Add the stop condition "when the UE starts GNSS measurement" for T318 in Clause 7.3.1.

Proposal 4: Adopt the TP in Appendix.

[R2-2405528](file:///C:\Data\3GPP\Extracts\R2-2405528%20Further%20RRC%20corrections%20on%20IoT%20NTN.docx) Further RRC corrections for IoT NTN Samsung discussion Rel-18 IoT\_NTN\_enh-Core

Observation 1: With current implementation UE cannot signal feature for both GSO and NGSO.

Proposal 1: Agree H005.

Proposal 2: Agree E805 and E806.

### 7.6.4 Other Stage 3 corrections

*Corrections related to other specs, e.g. 36.321, 36.304, 36.306.*

MAC issues

Moved here from 7.6.3

[R2-2404686](file:///C:\Data\3GPP\Extracts\R2-2404686%20GNSS%20extension.doc) Remaining issues on out-of-date GNSS fix Qualcomm Incorporated discussion Rel-18 IoT\_NTN\_enh-Core

Proposal 1 UE resets the value of N\_TA before resuming UL operation after GNSS is fixed. Text proposal is provided above.

Proposal 2 Add stop criteria for timer T390 as “upon receiving indication that new GNSS is valid”.

Proposal 3 If the UE receives GNSS measurement trigger too early (i.e., remaining GNSS validity is still x minutes), the UE is allowed not to trigger the GNSS measurement but trigger the GNSS Validity Duration Report. Text proposal is provided above.

[R2-2404900](file:///C:\\Data\\3GPP\\Extracts\\R2-2404900%20Remaining%20issues%20of%20MAC%20spec%20for%20IoT%20NTN.docx" \o "C:Data3GPPExtractsR2-2404900 Remaining issues of MAC spec for IoT NTN.docx) Remaining issues of MAC spec for IoT NTN ZTE Corporation, Sanechips discussion Rel-18 IoT\_NTN\_enh-Core

Proposal 1: RAN2 assume the exiting way for maintaining N\_TA after GNSS is fixed is enough, no enhancement is needed.

Proposal 2: It’s no need to enhance the process for the UE to report remaining GNSS Validity Duration after successful GNSS measurement during C-DRX.

Moved here from 7.6.3

[R2-2405198](file:///C:\Data\3GPP\Extracts\R2-2405198%20NTA%20handling%20after%20GNSS%20fix%20v1.docx) NTA handling after GNSS fix NEC discussion Rel-18 IoT\_NTN\_enh-Core

Proposal: reset NTA to 0 after GNSS fix

[R2-2405441](file:///C:\Data\3GPP\Extracts\R2-2405441%20Further%20discussion%20on%20UE%20behaviour%20after%20successful%20GNSS%20acquistion.docx) Further discussion on UE behaviour after successful GNSS acquisition Nokia, Nokia Shanghai Bell discussion Rel-18 IoT\_NTN\_enh-Core

Observation 1: The value of N\_TA is not clear after a UE has completed the GNSS measurement successfully.

Observation 2: If the UE transmits on PUSCH resources to the network after a GNSS measurement, the following PUSCH transmissions may cause interference to other UEs until the NW corrects any potential TA errors after sending multiple Timing Advance Commands MAC CE.

Observation 3: The network can correct large TA errors via the Random Access Response message.

Proposal 1: After a successful GNSS measurement /autonomous GNSS measurement, the UE shall perform the Random Access procedure for UL synchronization using N\_TA = 0.

Proposal 2: Up to UE implementation to decide when to report the GNSS Validity Duration Report MAC CE after a successful GNSS measurement during C-DRX inactive time.

Proposal 3: Add a Note to indicate when the UE should report the new remaining GNSS validity duration to NW after a successful GNSS measurement in C-DRX inactive time.

Proposal 4: If Proposal 3 is agreed, adopt the Note to TS 36.331.

[R2-2405451](file:///C:\Data\3GPP\Extracts\R2-2405451%20-%20R18%20IoT%20NTN%20GNSS%20extension.docx) R18 IoT NTN GNSS extension Ericsson discussion Rel-17 IoT\_NTN\_enh-Core

Observation 1 The UE shall trigger GNSS measurement reporting every time upon completing GNSS fix operation.

Observation 2 The GNSS Duration Report MAC CE shall not trigger SR; instead CBRA shall be used.

Observation 3 If the UE has a grant for new transmission, it will send the GNSS validity duration report MAC CE on that grant.

Observation 4 The current MAC spec does not always trigger CBRA to report the GNSS validity duration.

Proposal 1 Correct the MAC procedure to make it clear that a triggered GNSS validity duration report always trigger CBRA in line with the RAN2 agreements.

* Continue in offline [303]

Proposal 2 Consider the MAC text proposal in section 3.1

Observation 5 The network use NTA to compensate for errors due to estimation of UE and satellite’s position/common TA.

Observation 6 Setting NTA=0 after GNSS reacquisition is not optimal as the NTA value, configured by the network, may compensated for more than the UE position error.

Observation 7 Alt A, C and D do not provide optimal performance.

Observation 8 The UE can calculate the timing error due to inaccurate UE position by comparing the values of N"TA,adjUE" based on its previous GNSS position and its new GNSS position after GNSS reacquisition, i.e., Terror\_UE\_position=N"TA,adjUE"-N"TA,adj[OLD]UE" .

Proposal 3 After a new GNSS position fix, set NTA=NTA\_old-Terror\_UE\_position where Terror\_UE\_position=N"TA,adj UE"-N"TA,adj[OLD]UE" is the timing error due to inaccurate UE position and is calculated from N"TA,adj [OLD]UE" based on the previous GNSS position and N"TA,adjUE" based on the new GNSS position.

Proposal 4 Consider the MAC text proposal in section 3.2.

* [AT126][303][IoT NTN Enh] MAC issues (Ericsson)

Scope: Discuss the N\_TA issue and p1 from R2-2405451(and other similar proposals)

Intended outcome: report of offline discussion

Deadline for companies' feedback: Wednesday 2024-05-22 20:00 (but F2F discussion is invited)

Deadline for rapporteur's summary (in R2-2405761): Thursday 2024-05-23 08:00

R2-2405761 Summary of [AT116][303][IoT NTN Enh] MAC issues Ericsson discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2405454](file:///C:\Data\3GPP\Extracts\R2-2405454%20-%2036321_CR1586_(Rel-18)%20-%20IoT%20NTN%20MAC%20corrections.docx) IoT NTN MAC corrections Ericsson CR Rel-18 36.321 18.1.0 1586 - F IoT\_NTN\_enh-Core

[E805][E806]

[R2-2404843](file:///C:\Data\3GPP\Extracts\R2-2404843%20-%20%5bE805%5d%5bE806%5d%20Revert%20implementation%20of%20UE%20capability%20for%20HARQ%20and%20GNSS.docx) [E805][E806] Revert implementation of UE capability for HARQ and GNSS Ericsson discussion Rel-18 NR\_NTN\_enh-Core

Observation 1 RIL [H002] proposed to modify the capability for HARQ and GNSS to distinguish between GSO and NGSO cases.

Observation 2 In RAN2#125, RAN2 swiftly agreed to implement the change with the only rationale to align with Rel-17 design and latest agreements reflected in the “UE Feature list”,, without due consideration.

Observation 3 RAN2’s decision to modify the UE capability for HARQ and GNSS contradicts RAN1 consensus without technical justification nor appropriate communication.

Proposal 1 Revert the implementation of [H002] and send an LS to RAN1 to communicate this correction.

* CB Thursday

Withdrawn

R2-2405530 Miscellaneous correction for IoT-NTN Nokia, Nokia Shanghai Bell CR Rel-18 36.304 18.1.0 0875 - F IoT\_NTN\_enh-Core Withdrawn

## 7.7 NR NTN enhancements

(NR\_NTN\_enh -Core; leading WG: RAN1; REL-18; WID: RP-232669)

Time budget: 0 TU

Tdoc Limitation: 2 tdocs

### 7.7.1 Organizational

LSs, rapporteur inputs and other organizational documents.

Editorials/clarifications should not be included in any tdoc but sent to the WI spec rapporteurs, who can submit a rapporteur CR as part of this AI.

Rapporteur inputs and other pre-assigned documents in this AI do not count towards the tdoc limitation.

Incoming LSs

[R2-2404127](file:///C:\Data\3GPP\Extracts\R2-2404127_R4-2406496.docx) LS on UE capability for NW verified location (R4-2406496; contact: Huawei) RAN4 LS in Rel-18 NR\_NTN\_enh-Core To:RAN1, RAN2

- ZTE thinks that RAN1 is still discussing based on this LS and then we could wait before introducing changes

* Noted

[R2-2404248](file:///C:\Data\3GPP\Extracts\R2-2404248%20Correction%20on%20NR%20NTN.docx) Correction on NR NTN CATT (Rapporteur) CR Rel-18 37.355 18.1.0 0504 - F NR\_NTN\_enh-Core

* CB Thursday after checking the status in RAN1, for change 1 and 3

[R2-2404146](file:///C:\Data\3GPP\Extracts\R2-2404146_S5-242198.doc) LS reply on OAM requirements for UE location verification (S5-242198; contact: CATT) SA5 LS in Rel-18 OAM\_NTN To:RAN3 Cc:SA2, RAN1, RAN2

* Noted

Rapporteur CRs

Moved here from 7.7.4

[R2-2404839](file:///C:\Data\3GPP\Extracts\R2-2404839%20-%20Proposed%20conclusions%20for%20NR%20NTN%20RILs%20Rel-18.docx) Proposed conclusions for NR NTN RILs Rel-18 Ericsson report Rel-18 NR\_NTN\_enh-Core

* E302, H010 and H115 are still ToDo and need to be finalized at this meeting
* S268 is Rejected
* S487 is Agreed

[R2-2404855](file:///C:\Data\3GPP\Extracts\R2-2404855%20-%2038331_CR4761r2_(Rel-18)%20-%20Miscellaneous%20corrections%20to%20Rel-18%20NR%20NTN.docx) Miscellaneous corrections to Rel-18 NR NTN Ericsson CR Rel-18 38.331 18.1.0 4761 2 F NR\_NTN\_enh-Core R2-2403772 Revised

* This IPA CR is revised in R2-2404863 to include further changes

[R2-2404863](file:///C:\Data\3GPP\Extracts\R2-2404863%20-%2038331_CR4761r3_(Rel-18)%20-%20Miscellaneous%20corrections%20to%20Rel-18%20NR%20NTN.docx) Miscellaneous corrections to Rel-18 NR NTN Ericsson CR Rel-18 38.331 18.1.0 4761 3 F NR\_NTN\_enh-Core [R2-2404855](file:///C:\Data\3GPP\Extracts\R2-2404855%20-%2038331_CR4761r2_(Rel-18)%20-%20Miscellaneous%20corrections%20to%20Rel-18%20NR%20NTN.docx)

* Revised in R2-2405753 to include other possible agreements this week (and to update the coversheet)

R2-2405753 Miscellaneous corrections to Rel-18 NR NTN Ericsson CR Rel-18 38.331 18.1.0 4761 4 F NR\_NTN\_enh-Core [R2-2404855](file:///C:\Data\3GPP\Extracts\R2-2404855%20-%2038331_CR4761r2_(Rel-18)%20-%20Miscellaneous%20corrections%20to%20Rel-18%20NR%20NTN.docx)

[R2-2405374](file:///C:\Data\3GPP\Extracts\R2-2405374%20NTN%20corrections%20for%20TS%2038.321.docx) Corrections for Non-terrestrial Networks InterDigital CR Rel-18 38.321 18.1.0 1858 - F NR\_NTN\_enh-Core

- IDC thinks that a clarification or restructuring of the change would be helpful

* Revised in R2-2405754

R2-2405754 Corrections for Non-terrestrial Networks InterDigital CR Rel-18 38.321 18.1.0 1858 1 F NR\_NTN\_enh-Core

* [AT126][304][NR NTN Enh] MAC CR (Interdigital)

Scope: Discuss how to clarify / restructure the change in R2-2405374

Intended outcome: agreeable MAC CR

Deadline for rapporteur's CR (in R2-2405754): Friday 2024-05-24 08:00

[R2-2404856](file:///C:\Data\3GPP\Extracts\R2-2404856_Terminology%20alignment%20in%2038.304%20for%20NR-NTN_final.docx) Terminology alignment in 38.304 for NR-NTN ZTE Corporation, Sanechips, Ericsson, CATT, Nokia, Intel, Huawei, HiSilicon CR Rel-18 38.304 18.1.0 0403 - F NR\_NTN\_enh-Core Revised

* Revised in R2-2405623

[R2-2405623](file:///C:\Data\3GPP\Extracts\R2-2405623_Terminology%20alignment%20in%2038.304%20for%20NR-NTN_final.docx) Terminology alignment in 38.304 for NR-NTN ZTE Corporation, Sanechips, Ericsson, CATT, Nokia, Intel, Huawei, HiSilicon CR Rel-18 38.304 18.1.0 0403 1 F NR\_NTN\_enh-Core [R2-2404856](file:///C:\Data\3GPP\Extracts\R2-2404856_Terminology%20alignment%20in%2038.304%20for%20NR-NTN_final.docx)

- Sasmung thinks there are a few other places where “system” needs to be changed to “cell”

* Revised in R2-2405755

R2-2405755 Terminology alignment in 38.304 for NR-NTN ZTE Corporation, Sanechips, Ericsson, CATT, Nokia, Intel, Huawei, HiSilicon CR Rel-18 38.304 18.1.0 0403 2 F NR\_NTN\_enh-Core

[R2-2404526](file:///C:\Data\3GPP\Extracts\R2-2404526__38306-FR2-Ref.docx) Add FR2 band reference to NTN related UE Capabilities Intel Corporation draftCR Rel-18 38.306 18.1.0 NR\_NTN\_Ph3-Core

- CATT thinks that further changes might be added to reflect the latest decision in RAN1

* CB Thursday

[R2-2405455](file:///C:\Data\3GPP\Extracts\R2-2405455%20-%2038331_CR4836_(Rel-17)%20-%20Terminology%20alignment%20for%20NR%20NTN.docx) Terminology alignment for NR NTN Ericsson, ZTE Corporation, Sanechips, Intel Corporation, CATT CR Rel-17 38.331 17.8.0 4836 - F NR\_NTN\_solutions-Core

* Revised in R2-2405714

[R2-2405714](file:///C:\Data\3GPP\RAN2\Docs\R2-2405714.zip) Terminology alignment for NR NTN , ZTE Corporation, Sanechips, Intel Corporation, CATT, Huawei, HiSilicon, Nokia, Nokia Shanghai Bell CR Rel-17 38.331 17.8.0 4836 1 F NR\_NTN\_solutions-Core

* To be handled in AI 6.1.3.1

[R2-2405456](file:///C:\Data\3GPP\Extracts\R2-2405456%20-%2038331_CR4837_(Rel-18)%20-%20Terminology%20alignment%20for%20NR%20NTN.docx) Terminology alignment for NR NTN Ericsson, ZTE Corporation, Sanechips, Intel Corporation, CATT CR Rel-18 38.331 18.1.0 4837 - F NR\_NTN\_enh-Core

* Revised in R2-2405715

[R2-2405715](file:///C:\Data\3GPP\RAN2\Docs\R2-2405715.zip) Terminology alignment for NR NTN , ZTE Corporation, Sanechips, Intel Corporation, CATT, Huawei, HiSilicon, Nokia, Nokia Shanghai Bell CR Rel-18 38.331 18.1.0 4837 1 F NR\_NTN\_enh-Core

* Revised in R2-2405751 to make it a Cat A mirror CR for R2-2405714 (R18-specific changes to be moved to the R18 RRC Rapporteur CR)

R2-2405751 Terminology alignment for NR NTN , ZTE Corporation, Sanechips, Intel Corporation, CATT, Huawei, HiSilicon, Nokia, Nokia Shanghai Bell CR Rel-18 38.331 18.1.0 4837 2 A NR\_NTN\_enh-Core

* To be handled in AI 6.1.3.1

### 7.7.2 Stage 2 corrections

[R2-2405243](file:///C:\\Data\\3GPP\\Extracts\\R2-2405243_CR%20Stage-2%20Corrections%20for%20NR_NTN.docx" \o "C:Data3GPPExtractsR2-2405243_CR Stage-2 Corrections for NR_NTN.docx) Stage-2 corrections on NR NTN THALES CR Rel-18 38.300 18.1.0 0858 1 F NR\_NTN\_enh-Core R2-2403773

- Nokia thinks there is a comment that should be removed and the coversheet should be updated

- Ericsson thinks that kmac changes should be done in Rel-17

* Revised in R2-2405756

R2-2405756 Stage-2 corrections on NR NTN THALES CR Rel-18 38.300 18.1.0 0858 2 F NR\_NTN\_enh-Core R2-2403773

[R2-2404890](file:///C:\Data\3GPP\Extracts\R2-2404890%20location-based%20only%20CHO.docx) Correction on Location-based CHO OPPO CR Rel-18 38.300 18.1.0 0863 - F NR\_NTN\_enh-Core

- QC and HW support the change and think there would be no need to update Stage 3

- Ericsson does not agree

* CB Thursday

### 7.7.3 RRC corrections

Rapporteur’s suggestions

[R2-2404844](file:///C:\Data\3GPP\Extracts\R2-2404844%20-%20Comments%20on%20remaining%20NR%20NTN%20RILs.docx) Comments on remaining NR NTN RILs Ericsson discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1 Accept E302 to align NR NTN and IoT NTN specification.

Proposal 2 Reject [H115]. UE re-acquires system information upon satellite switch with resynchronization.

Proposal 3 If P2 is not agreed, it is up to network implementation to secure that value tags are set consistently across cells upon satellite switch with resynchronization.

Proposal 4 Reject H010

* H010 is Rejected

Satellite switch with resync

* [H115]

[R2-2405501](file:///C:\Data\3GPP\Extracts\R2-2405501%20%5bH115%5d%20SIB19%20acquisition%20after%20satellite%20switching.docx) [H115] SIB19 acquisition after satellite switching Huawei, HiSilicon discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: Clarify in clause 5.2.2.2.1 that only SIB19 is re-acquired after satellite switching with re-sync. Add the UE behaviour of obtaining SIB19 in clause 5.2.2.4.21.

Proposal 2: Adopt the TP for [H115] in the Annex.

- Apple could be ok with the change in 5.2.2.2.1 only. HW is also fine

* CB Thursday after the outcome of [301]

[R2-2404685](file:///C:\Data\3GPP\Extracts\R2-2404685%20issue%20on%20PCI%20unchanged.docx) SIB acquisition after Satellite switch with re-sync Qualcomm Incorporated discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1 Unless the validity duration expires or UE receives paging notification of SI change, there is no need for UE to re-acquire the MIB, SIB1, SIB19 and other SIBs after satellite switch with resync.

- HW thinks SIB19 reacquisition is for neighbour satellite ephemeris

- QC thinks we don’t have to say that the UE has to acquire it immediately

- Ericsson wonders about SMTC updates. QC thinks that for UEs in idle mode is up to UE and for UEs in connected they can be reconfigured after switch

[R2-2405169](file:///C:\Data\3GPP\Extracts\R2-2405169.docx) Discussion on E302, H115 Samsung discussion Rel-18 NR\_NTN\_enh-Core

* [H010] related

[R2-2405672](file:///C:\Data\3GPP\Extracts\R2-2405672_%5bH010%5d%5bH115%5d%20and%20MIB%20acquisition.docx) [H010][H115] and skipping MIB acquisition Sequans Communications discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: If time offset is not clear enough, consider adding “with the same index”, or using “SSB half-frame” or “SSB burst”

- CATT thinks that attempts to clarify this were already rejected and should not be further considered

* We don’t attempt to clarify this further

Observation 1: During satellite switch with resync, cell is unchanged hence SI acquisition should not be required

Observation 2: If broadcasted SMTCs needs to be updated at satellite switch, it means configured SMTCs shall also be updated, killing the benefit of the feature

Proposal 2: RAN2 to discuss if any fields require updating, and why (particularly SMTCs)

* Continue the discussion in [301]

Observation 3: Omitting PBCH acquisition can reduce interruption time

Observation 4: It is beneficial for the UE to know if cell/SSB timing is unchanged (at gNB)

Proposal 3: Capture that in hard switch (t-serviceStart absent), cell timing/SSB location is unchanged (at gNB)

* RAN2 understands that in hard switch (t-serviceStart absent), cell timing/SSB location is unchanged (at gNB)

[R2-2405680](file:///C:\Data\3GPP\Extracts\R2-2405680_Soft%20switch%20SSB%20time%20offset%20and%20SMTC%20impact.docx) Soft satellite switch SSB time offset and SMTC impact Sequans Communications discussion Rel-18 NR\_NTN\_enh-Core

Observation 1: SMTC broadcasted/configured in neighbor cells for inbound mobility to an “unchanged PCI cell” may become erroneous at each satellite switch

Observation 2: SMTC broadcasted/configured in serving cells for outbound mobility from an “unchanged PCI cell” may become erroneous at each satellite switch

Observation 3: Synchronous “Shifted cell timing” implementation might alleviate the issue with additional changes, but may be only applicable to same satellite orbit cells

Observation 4: Synchronous “Shifted SSB location” implementation might alleviate the issue with additional changes, but may be only applicable to same satellite orbit cells

Proposal 1: Consider soft switch where SSB-timeOffset is applied only between t-serviceStart and t-service

- QC thinks there is no issue and we should not make further optimizations now

* Continue the discussion in [301]
* [AT126][301][NR NTN Enh] SMTC impacts for soft satellite switch (Sequans)

Scope: discuss the impact on SMTC adjustment for soft satellite switch and possible impact on decision for H115

Intended outcome: report of offline discussion

Deadline for companies' feedback: Wednesday 2024-05-22 20:00 (but F2F discussion is invited)

Deadline for rapporteur's summary (in R2-2405757): Thursday 2024-05-23 08:00

R2-2405757 Summary of [AT116][301][NR NTN Enh] SMTC impacts for soft satellite switch Sequans Communications discussion Rel-18 NR\_NTN\_enh-Core

* Other

[R2-2404158](file:///C:\Data\3GPP\Extracts\R2-2404158%20Further%20Discussion%20Satellite%20Switch%20with%20Resync.docx) Further Discussion on Satellite Switch with Resync vivo discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: Change the granularity of capabilities softSatelliteSwitchResyncNTN-r18 and hardSatelliteSwitchResyncNTN-r18 as per band level.

Proposal 2: RAN2 confirms that parallelMeasurementWithoutRestriction-r17 and/or simultaneousRxDataSSB-DiffNumerology is not the pre-requisite capability of softSatelliteSwitchResyncNTN-r18.

* CB Thursday

[R2-2405143](file:///C:\Data\3GPP\Extracts\R2-2405143%20On%20Reducing%20the%20NW%20Uncertainty%20in%20Satellite%20Switching%20with%20Resynchronization.docx) On Reducing the NW Uncertainty in Satellite Switching with Resynchronization Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_NTN\_enh-Core

[R2-2405273](file:///C:\Data\3GPP\Extracts\R2-2405273%20Discussion%20on%20beam%20management%20for%20satellite%20switch%20with%20re-sync.docx) Discussion on beam management for satellite switch with re-sync ETRI discussion Rel-18 NR\_NTN\_enh-Core

[R2-2405423](file:///C:\Data\3GPP\Extracts\R2-2405423%20Discussion%20on%20satellite%20switch%20with%20resync%20in%20RRC%20states%20other%20than%20RRC%20connected.docx) Discussion on satellite switch with resync in RRC states other than RRC connected ASUSTeK discussion Rel-18 NR\_NTN\_enh-Core

(Cond)Event D2

[R2-2405079](file:///C:\Data\3GPP\Extracts\R2-2405079%20Clarification%20on%20(cond)EventD2%20configuration.doc) Clarification on (cond)event D2 configuration ZTE Corporation, Sanechips discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: It is proposed to reject second changes ( i.e., optionally present part) proposed in RIL 302.

- QC agrees with the analysis of how this was implemented so far but sees the benefit of leaving this optional

- Nokia supports Ericsson and QC views

- Samsung is ok with E302 but not as an alignement to IoT NTN

* E302 is agreed

[R2-2404208](file:///C:\Data\3GPP\Extracts\R2-2404208%20Corrections%20on%20Event%20D2%20measurement%20reporting%20procedure.docx) Corrections on Event D2 measurement reporting CATT discussion

Observation 1: Current Spec does not specific how to derive the applicable cells for Event D2. This leads to the issue that when UE initiates measurement reporting procedure for Event D2, it can report nothing (including RRM measurement and PCI) about the neighbour cell that fulfils the reporting conditions.

Observation 2: According to the current ASN.1 structure of MeasObjectNR, one measID can be associated with multiple neighbour cells each of which is further associated with one reference location. When receiving measurement reporting from UE, the NW cannot know which cell fulfils the reporting condition due to Observation 1.

Observation 3: For Event D2, UE fulfils either the entering condition or leaving condition will initiate measurement reporting procedure. According to the current measurement reporting mechanism, the NW could not know whether the UE meets entering condition or leaving condition due to Observation 1.

Proposal 1: The measurement results reporting for event D2 should include the physCellId of the neighbour cells that fulfils the reporting conditions.

- CATT thinks we should solve the problem without reverting previous decisions

- CATT thinks that for D1 we don’t have the same problem

- Ericsson doesn’t see a problem with this and we could treat it as D1. QC agrees

- CATT thinks the issue is related to which cell is reported to the NW

- Samsung thinks this is common problem for D1 and D2

* CB Thursday to check whether any further clarification is needed, for D1 and D2

Proposal 2: One cellsTriggeredList should be kept for the measID which is associated with event D2:

- When the entering condition is fulfilled for one neighbour cell of the event D2, the UE includes this cell to the cellsTriggeredList for this measID and initiates measurement reporting procedure.

- When the leaving condition is fulfilled for one cell included in the cellsTriggeredList which is associated with event D2, the UE removes this cell from the cellsTriggeredList for this measID and initiates measurement report procedure.

Proposal 3: If Proposal 1 and Proposal 2 are agreed, adopt the TP in Annex.

Proposal 4: if Proposal 1 and Proposal 2 are agreed, RAN2 confirms the similar issues exists also in TS 36.331 and agrees to apply a similar way of change as in P1/2 in TS 36.331 as well.

FR2 capability

[R2-2405500](file:///C:\Data\3GPP\Extracts\R2-2405500%20Correction%20on%20NR%20NTN%20FR2%20capabilities.docx) Correction on NR NTN FR2 capabilities Huawei, HiSilicon CR Rel-18 38.331 18.1.0 4841 - F NR\_NTN\_enh-Core

* CB Thursday

Other

[R2-2404673](file:///C:\Data\3GPP\Extracts\R2-2404673_Open%20issues%20on%20NR%20NTN%20enhancements_v0.doc) Open issues on NR NTN enhancements Apple discussion Rel-18 NR\_NTN\_enh-Core

[R2-2404883](file:///C:\Data\3GPP\Extracts\R2-2404883%20Discussion%20on%20the%20leftover%20issues%20for%20NR-NTN.docx) Discussion on the leftover issues for NR-NTN Google Inc. discussion Rel-18

### 7.7.4 Other Stage 3 corrections

*Corrections related to other specs, e.g. 38.321, 38.304, 38.306.*

[R2-2405080](file:///C:\Data\3GPP\Extracts\R2-2405080%20Consideration%20on%20remaining%20FR2%20UE%20capability%20issues.doc) Consideration on remaining FR2 UE capability issues ZTE Corporation, Sanechips, Eutelsat Group discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: Update TS 38306 to allow indicate below UE capabilities for NTN FDD-FR2:

* SDT related: cg-SDT-r17, mt-CG-SDT-r18
* MBS related: maxDynamicSlotRepetitionForSPS-Multicast-r17, maxNumberG-CS-RNTI-r17, maxNumberG-RNTI-r17, multiPUCCH-HARQ-ACK-ForMulticastUnicast-r17, priorityIndicatorInDCI-Multicast-r17, priorityIndicatorInDCI-SPS-Multicast-r17, releaseSPS-MulticastWithCS-RNTI-r17, sps-MulticastMultiConfig-r17, re-LevelRateMatchingForMulticast-r17, twoHARQ-ACK-CodebookForUnicastAndMulticast-r17

Proposal 2: If P1 is agreed, RAN2 consider the corresponding TP in annex for CR implementation.

* CB Thursday

[R2-2405170](file:///C:\Data\3GPP\Extracts\R2-2405170.docx) Discussion on TAT handling in RACH-less CHO Samsung discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: For the start of TAT in RACH-less CHO, UE follows the procedure for RACH-less HO (i.e., no specification change).

Moved here from 7.0.4

[R2-2404666](file:///C:\Data\3GPP\Extracts\R2-2404666_Remaining%20issues%20on%20RACH-less%20HO.doc) Remaining issues on RACH-less HO Apple discussion Rel-18 NR\_mobile\_IAB-Core, NR\_Mob\_enh2-Core, NR\_NTN\_enh-Core, TEI18

Proposal 3: When UE initiates NTN RACH-less HO, UE is required to acquire the SFN timing information of target PCell and apply the DRX configuration.

* CB Thursday

[R2-2405118](file:///C:\Data\3GPP\Extracts\R2-2405118%20Correction%20on%20HARQ%20buffer%20flush%20during%20satellite%20switch%20with%20re-synchronization.docx) Correction on HARQ buffer flush during satellite switch with re-synchronization Huawei, HiSilicon CR Rel-18 38.321 18.1.0 1854 - F NR\_NTN\_enh-Core

[R2-2405142](file:///C:\Data\3GPP\Extracts\R2-2405142%20On%20Scheduling%20Restrictions%20in%20Satellite%20Soft%20Switching%20with%20Resynchronization%20–%20further%20view.docx) On Scheduling Restrictions in Satellite Soft Switching with Resynchronization – further view Nokia discussion Rel-18 NR\_NTN\_enh-Core R2-2403300

Proposal 1: In case the UE supports softSatelliteSwitchResyncNTN-r18, the UE shall also support parallelMeasurementWithoutRestriction.

Proposal 2: RAN2 is asked to reconsider the decision made at RAN2#125 regarding PDD during satellite switching.

Proposal 3: In case the UE supports softSatelliteSwitchResyncNTN-r18, the UE shall also support serviceLinkPropDelayDiffReporting-r17.

Proposal 4: If the decision regarding PDD is revised, confirm with RAN4 that service link propagation delay difference (PDD) helps in reducing the scheduling restriction duration during satellite soft-switching with resynchronization.

Proposal 5: If the LS to RAN4 is sent, RAN2 asks how early such measurements, calculations and reporting should be done.

Proposal 6: Adopt the 38.306 and 38.331 Text Proposals in the Annex A and B.

[R2-2405424](file:///C:\Data\3GPP\Extracts\R2-2405424%20Discussion%20on%20TA%20timer%20for%20satellite%20switch.docx) Discussion on TA timer for satellite switch ASUSTeK discussion Rel-18 38.321 NR\_NTN\_enh-Core

Proposal 1: RAN2 to discuss whether the TA timer is started or restarted upon satellite switch with resynchronization.

## 8.8 NTN for NR Ph3

(NR\_NTN\_Ph3-Core; leading WG: RAN2; REL-19; WID: RP-240775

LTE\_TN\_NR\_NTN\_mob, leading WG: RAN2, Rel-19 WID: RP-240846)

Time budget: 2 TU

Tdoc Limitation: 4 tdocs

### 8.8.1 Organizational

LS, Rapporteur input, including workplan, etc.

[R2-2404207](file:///C:\Data\3GPP\Extracts\R2-2404207%20Updated%20work%20plan%20for%20NR_NTN_Ph3.docx) Updated work plan for NR NTN Ph3 CATT, Thales Work Plan

* Noted

[R2-2404137](file:///C:\Data\3GPP\Extracts\R2-2404137_S2-2405600.docx) LS on Support of Regenerative-based Satellite Access (S2-2405600; contact: vivo) SA2 LS in Rel-19 FS\_5GSAT\_Ph3\_ARCH To:RAN3 Cc:RAN2

* Noted

### 8.8.2 Downlink coverage enhancements

Contributions should focus on RAN2 aspects of DL coverage enhancements (e.g. cell level / beam level DTX/DRX mechanism, etc.).

Applicable UE states / impact to legacy UEs

[R2-2405229](file:///C:\Data\3GPP\Extracts\R2-2405229%20Downlink%20coverage%20enhancements.docx) On the applicability of downlink coverage enhancements Nokia, Nokia Shanghai Bell discussion NR\_NTN\_Ph3-Core

Observation 1: having a switching on-off granularity different from cell level is very power inefficient.

Proposal 1: RAN2 to assume that the work on signalling for downlink coverage enhancement will be on cell level. Up to RAN1 whether a cell is covered by multiple beams or not.

Observation 2: Rel-18 NES allows for independent cell DTX/DRX to enhance power saving.

Observation 3: Legacy NES cell DTX/DRX is defined as RAN1’s “N2” state within the downlink coverage enhancement study, i.e. it is not allowed to impact idle mode operations, including SSB transmission of RACH occasions.

Observation 4: The existing framework of NES cannot be used to which cells completely off and new, non backwards compatible, signalling/procedures are required.

Observation 5: Utilising NTN downlink coverage enhancement suitable NES including turning SSB transmission off or increasing periodicity, will trigger a cell (re)selection procedure in legacy UEs and thus compromising energy consumption.

Observation 6: New signalling/procedures to handle UEs in RRC\_IDLE/ RRC\_INACTIVE will only work for Rel19 UEs and will not be backwards compatible, leading to potential increased energy consumption.

Proposal 2: It is RAN2s understanding that legacy UEs will not be compatible with any new DL coverage enhancement signalling procedures.

- Ericsson thinks we should also consider power sharing as part of this discussion. NEC agrees

- IDC thinks we first need to ask questions to RAN1 to get a number of clarifications before assessing the impact on legacy UEs

* Based on the solution being investigated in RAN1, RAN2 will further discuss whether/how legacy UEs might operate in a cell supporting DL coverage enhancements.

Proposal 3: RAN2 to agree that support of system level downlink coverage enhancements in Rel-19 will not be trivial as there will be high spec impact, including on legacy NES

Proposal 4: RAN2 to send the above conclusions in an LS to RAN1

[R2-2404204](file:///C:\Data\3GPP\Extracts\R2-2404204%20Discussion%20on%20Downlink%20Coverage%20Enhancements.docx) Discussion on downlink coverage enhancements CATT discussion

Observation 1: If the SSB periodicity is not extended, cell/beam level DTX/DRX mechanism cannot concentrate the beam energy to raise the EIRP of each beam, and thus does not help the DL coverage enhancements target as specified in the WID.

Observation 2: If the SSB periodicity is extended, there would be possibility to concentrate the beam energy to raise the EIRP of each beam which is the goal of the WID with potential beam active/inactive status applied. NES-like DTX/DRX mechanism could be used/adapted to implement the different cell/beam status.

Proposal 1: Ask RAN1 whether the existing SSB pattern for an NR cell (e.g. SSB position in burst, SSB index number, etc.) is changed in Rel-19 NR NTN, and whether the SSB periodicity is extended compared with existing TN values.

- CEWIT thinks that RAN1 is already working on this and they will inform us

* Ask RAN1 to keep us informed on their progress on whether the existing SSB pattern for an NR cell (e.g. SSB position in burst, SSB index number, etc.) is changed in Rel-19 NR NTN, and whether the SSB periodicity is extended compared with existing TN values.
* More in general, ask RAN1 whether/how the solution they are investigating is expected to impact common control signalling for UEs in RRC idle / RRC inactive
* Also remind RAN1 that satellite beams are currently not visible to UEs and any decision about different beam status will have to relate to beams visible to the UE (e.g. SSB beams)

Observation 3: Whether UL beam hopping that is separate from DL beam hopping is within the scope of WI needs to be clarified by RAN1, and this leads to impacts on whether RAN2 needs to consider a separate cell/beam DRX mechanism.

Proposal 2: Ask RAN1 whether UL beam hopping that is separate from DL beam hopping is within the scope of the WI (which relates to whether separate cell/beam DRX needs to be further considered by RAN2).

* Also ask RAN1 whether they are also working on UL beam hopping (and whether this is separate from DL beam hopping)

Proposal 3: RAN2 assumes that no matter whether the SSB periodicity is extended or not, the N1/N2/N3 state of beam footprint should not impact the periodic broadcast of SSB (i.e. N1 beam footprint should not cover any SSB transmission opportunities).

Proposal 4: RAN2 assumes that via proper NW configuration, the UE can determine the common search space (for paging/SI acquisition/RA) and PRACH occasions, and perform related IDLE/INACTIVE procedure based on legacy mechanisms. No impact to UE behaviour is foreseen.

Proposal 5: Ask RAN1 to confirm the assumption in Proposal 3/4.

Proposal 6: Cell/beam DTX/DRX mechanism is not supported for RRC\_IDLE/RRC\_INACTIVE.

Proposal 7: Send LS to RAN1 with the following questions for clarification:

- Whether the existing SSB pattern for an NR cell (e.g. SSB position in burst, SSB index number, etc.) is changed in Rel-19 NR NTN, and whether the SSB periodicity is extended compared with existing TN values.;

- Whether UL beam hopping that is separate from DL beam hopping is within the scope of Rel-19 NR NTN WI;

- RAN2 assumes that N1/N2/N3 states of beam footprint should not impact the periodic broadcast of SSB, and UE can determine the common search space (for paging/SI acquisition/RA) and PRACH occasions and perform related IDLE/Inactive procedure as in legacy. Whether RAN1 has any concern on this.

[R2-2404739](file:///C:\Data\3GPP\Extracts\R2-2404739%20Discussion%20on%20system%20level%20enhancement%20for%20downlink%20coverage%20enhancements%20for%20NTN.doc) Discussion on system level enhancement for downlink coverage enhancements for NTN Xiaomi discussion Rel-19 NR\_NTN\_Ph3-Core

Observation 1: For SI transmission alone, with legacy parameter of SI-SchedulingInfo, the total number of beam footprints can be reached by beam hopping within the SI periodicity for set1-1, set1-2 and set1-3.

Observation 2: For Paging alone, with legacy parameter of PCCH and PDCCH and SSB configuration, total number of beam footprints can be reached by beam hopping within the paging cycle for set1-1, set1-2 and set1-3.

Observation 3: When considering SSB, SI message and Paging transmission all together, the total number of beam footprint requirement for set 1-1 and set 1-3 (except set 1-2) can still be met with legacy parameter.

Proposal 1 Send LS to RAN1 to ask, for SSB/SI/paging, whether N1 off state is the period of time outside the configured periodic occasions for SSB/SI/paging broadcasting, resulting from the legacy SSB/SI/Paging occasion configuration (doesn't preclude the possibility of extending the value range of existing parameters). I.e. from UE point of view, satellite beam illumination plan is transparent to UE, and UE doesn't needs to know the dwell time and revisit time interval of beam illumination for SSB/SI/Paging across the coverage. Or, whether it is possible that new TDM pattern (except only extending periodicity) may be introduced for SSB/SI/Paging.

Proposal 2 Send LS to RAN1 to ask, whether the total number of beam footprints and the total number of simultaneously activated beam footprints of set 1-1, 1-2 and 1-3 only refers to satellite Tx beam, or refers to both Tx beam and Rx beam. If it is the first case, then if there is limitation on the total number of beam footprints and total number of simultaneously activated beam footprints for satellite Rx beam. If it is the latter case, what the ratio between them.

Observation 4: For random access, to support beam hopping, TDM pattern of beam illumination is better to be known to UE. And TDM pattern of beam illumination needs to be translated into NR cell or beam TDM pattern.

Proposal 3 For random access to support beam hopping, network is better to provide UE with TDM pattern of NR cell/ NR cell beam on/off representing TDM pattern of beam illumination hopping.

Proposal 4 For active traffic to support beam hopping, it shares the same TDM pattern of NR cell/ NR cell beam on/off as random access.

Proposal 5 Send LS to RAN1 to ask, whether the transition between N2 and N3 is automatic, i.e. based on whether currently there are users with ongoing active traffic, or, is based on network configuration.

More on mapping among cells / satellite beams / SSB beams and other questions to RAN1

[R2-2405124](file:///C:\Data\3GPP\Extracts\R2-2405124%20Discussion%20on%20DL%20coverage%20enhancements.docx) Discussion on DL coverage enhancements Huawei, HiSilicon, Turkcell discussion Rel-19 NR\_NTN\_Ph3-Core

Proposal 1: The UE can be configured with multiple DTX/DRX patterns associated to different beams, each pattern is characterized by active and non-active periods.

Proposal 2: The UE determines which pattern to apply based on the DL SSB beam.

Proposal 3: Similar to R18 NES, dynamic activation/deactivation mechanism via L1 signalling is introduced.

Proposal 4: Send an LS to RAN1 to confirm which DL signals/channels are affected or need to be determined by RAN2, e.g. SPS PDSCH, UE-specific PDCCH, Periodic/semi-persistent CSI-RS for CSI reporting, Group-common PDCCHs.

Proposal 5: Send an LS to RAN1 to ask whether cell/beam level DRX is needed in NTN and which UL signals/channels are affected or need to be determined by RAN2.

Proposal 6: Send an LS to RAN1 to ask how the common signaling design as a result of beam hopping would affect the beam level DTX/DRX design, e.g. whether a separate pattern for common signaling is needed.

[R2-2404159](file:///C:\Data\3GPP\Extracts\R2-2404159%20Discussion%20on%20Downlink%20Coverage%20Enhancements.docx) Discussion on Downlink Coverage Enhancements vivo discussion Rel-19 NR\_NTN\_Ph3-Core

Observation 1: In NR-NTN deployment, both option a) same PCI for several satellite beams and option b) one PCI per satellite beam are supported. It is up to NW implementation to adopt either option.

Observation 2: In the case one PCI per satellite beam, satellite beam “on”/”off” switching means cell “on”/”off” switching. Then, Rel-18 NES cell DTX techniques can be considered.

Observation 3: In the case same PCI for several satellite beams, the network may turn on/off all the satellite beams associated with the same cell simultaneously. Alternatively, it only activates a subset of satellite beams of a cell.

Proposal 1: RAN2 assumes the following satellite beam deployment options can be considered in system-level DL coverage enhancements:

- option a) same PCI for several satellite beams;

- option b) one PCI per satellite beam.

Proposal 2: Send an LS to check with RAN1 on RAN2's assumption of the satellite beam deployment options.

Proposal 3: RAN2 checks with RAN1 whether the case where only a subset of satellite beams belonging to the same cell are “on” while the other satellite beams are “off” is possible.

Proposal 4: RAN2 further discusses the DTX pattern is on a per beam or per cell basis (pending RAN1 input).

Proposal 5: The NW provides DTX information through SIB.

Proposal 6: RAN2 sends an LS to ask RAN1 the UE behaviour impacts on common message reception when a satellite beam is in N1 state (i.e. state “off”).

Proposal 7: For system-level DL coverage enhancements, RAN2 assumes both quasi-earth-fixed system and earth-moving system are considered.

- IDC thinks there is no need to ask this

* RAN2 assumes that both EFC and EMC are supported (no need to send this in the LS to RAN1)

Proposal 8: RAN2 to discuss and check with RAN1 whether any UL transmission is allowed when a satellite beam is in N1 state (i.e. state “off”).

Proposal 9: RAN2 to discuss and check with RAN1 whether UE dedicated UL transmission is allowed when a satellite beam is in N2 state (i.e. state “common messages only”).

Agreements;

1. Based on the solution being investigated in RAN1, RAN2 will further discuss whether/how legacy UEs might operate in a cell supporting DL coverage enhancements.
2. RAN2 assumes that both EFC and EMC are supported

* [AT126][305][R19 NR NTN] LS to RAN1 (CMCC)

Scope: draft an LS to RAN1 based on meeting agreements. Can consider additional questions if there is support (if there is no consensus we just stick to the questions agreed online)

Intended outcome: Approved LS

Deadline for rapporteur's summary (in R2-2405762): Friday 2024-05-23 08:00

R2-2405762 LS on DL coverage enhancements CMCC LS out LS out Rel-19 NR\_NTN\_Ph3-Core To:RAN1

[R2-2404354](file:///C:\Data\3GPP\Extracts\R2-2404354%20Discussions%20on%20beam%20and%20cell%20level%20DTX%20DRX.doc) Discussions on beam and cell level DTX DRX Fujitsu discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404582](file:///C:\Data\3GPP\Extracts\R2-2404582%20-%20Discussion%20on%20DL%20coverage%20enhancement%20for%20NTN.doc) Discussion on DL coverage enhancement in NTN OPPO discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404654](file:///C:\Data\3GPP\Extracts\R2-2404654_DL%20coverage%20enhancement.doc) DL coverage enhancement in NTN Apple discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404682](file:///C:\Data\3GPP\Extracts\R2-2404682%20Cell%20DTX.docx) Discussion on cell DTX/DRX Qualcomm Incorporated discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404797](file:///C:\Data\3GPP\Extracts\R2-2404797%20Downlink%20coverage%20enhancement%20in%20NTN.docx) Downlink coverage enhancement in NTN Lenovo discussion Rel-19

[R2-2405081](file:///C:\Data\3GPP\Extracts\R2-2405081%20Consideration%20on%20downlink%20coverage%20enhancements.doc) Consideration on downlink coverage enhancements ZTE Corporation, Sanechips discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405173](file:///C:\Data\3GPP\Extracts\R2-2405173.docx) Discussion on Downlink Coverage Enhancement Samsung discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405240](file:///C:\Data\3GPP\Extracts\R2-2405240%20NR%20NTN%20DL%20Coverage%20enhancements%20discussion_v2.docx) Discussion on RAN2 Aspects for Downlink Coverage Enhancements in NR NTN evolution THALES discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405299](file:///C:\Data\3GPP\Extracts\R2-2405299%20Questions%20identified%20to%20RAN1%20on%20Downlink%20Coverage%20Enhancement.docx) Questions identified to RAN1 on Downlink Coverage Enhancement CMCC discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405312](file:///C:\Data\3GPP\Extracts\R2-2405312_Coverage%20of%20NTN.doc) Downlink Coverage in NR NTN China Telecom discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405320](file:///C:\Data\3GPP\Extracts\R2-2405320%20Consideration%20on%20downlink%20coverage%20enhancement.docx) Consideration on downlink coverage enhancement NEC Corporation. discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405375](file:///C:\Data\3GPP\Extracts\R2-2405375%20(R19%20NR%20NTN%20WI%20AI%208.8.2)%20DL%20coverage.docx) Downlink coverage enhancement for NTN InterDigital discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405376](file:///C:\Data\3GPP\Extracts\R2-2405376%20DRAFT%20-%20LS%20on%20DL%20coverage%20enhancements.docx) [Draft] LS on DL coverage enhancements InterDigital LS out Rel-19 NR\_NTN\_Ph3-Core To:RAN1

[R2-2405449](file:///C:\Data\3GPP\Extracts\R2-2405449%20-%20Downlink%20coverage%20enhancements.docx) Downlink coverage enhancements Ericsson discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405613](file:///C:\Data\3GPP\Extracts\R2-2405613%20Downlink%20coverage%20enhancements%20for%20NTN.docx) Downlink coverage enhancements for NTN NERCDTV discussion

[R2-2405626](file:///C:\Data\3GPP\Extracts\R2-2405626-Discussion_for_DL_coverage_enhancement.docx) Discussion for DL coverage enhancement Sharp discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405636](file:///C:\Data\3GPP\Extracts\R2-2405636_discussion%20on%20downlink%20coverange%20enhancement%20in%20NTN.docx) Discussion on downlink coverage enhancements in NR NTN ETRI discussion Rel-19 NR\_NTN\_Ph3-Core

Withdrawn

R2-2405600 Downlink coverage enhancements for NTN NERCDTV discussion Withdrawn

### 8.8.3 Uplink Capacity/Throughput Enhancement

No contributions are expected for this AI at this meeting.

### 8.8.4 Support of Broadcast service

Contributions should address the signaling of the intended service area of a broadcast service.

[R2-2404841](file:///C:\Data\3GPP\Extracts\R2-2404841%20-%20Support%20for%20broadcast%20services%20in%20NR%20NTN.docx) Support for broadcast services in NR NTN Ericsson discussion Rel-19 NR\_NTN\_Ph3-Core

Proposal 1 For MBS broadcast service, both EFC and EMC are supported.

* Agreed

Proposal 2 Even if the intended MBS broadcast service area is limited to a portion of an NTN cell, the content of the service can be received within the whole cell.

* RAN2 will not define means for the NW to prevent the reception of the content of the service outside of the intended service area.

Proposal 3 A UE does not establish MRB(s) associated with a service limited to an intended service area when it is not located within the area.

- CATT thinks the UE behaviour would be up to UE implementation.

- Nokia is fine with p3 and p4 and thinks we should have a clear behaviour.

- HW thinks that the UE should not monitor MCCH/MTCH if the UE is outside the service area

- Ericsson thinks there is some normative text already now for the TN case about releasing MRBs when leaving the cell

* Come back next meeting to check whether a UE may not (or should not) establish MRB(s) associated with a service limited to an intended service area when it is not located within the area (up to UE implementation how the UE detects it’s not in the intended service area)

Proposal 4 A UE releases its established MRB(s) associated with a service limited to an intended service area when exiting the area.

* Come back next meeting to check whether a UE may (or should) release its established MRB(s) associated with a service limited to an intended service area when exiting the area (up to UE implementation how the UE detects it’s not in the intended service area)

Proposal 5 MBS broadcast intended service area is provided via system information.

* Agreed

Proposal 6 RAN2 considers the following possibilities for including the service area information: SIB20/ SIB21/ MBSBroadcastConfiguration.

- LG thinks we should consider the possibility of a new SIB

* For MBS broadcast RAN2 considers the following possibilities for including the service area information: SIB20/ SIB21/ MBSBroadcastConfiguration. FFS for ETWS

[R2-2405082](file:///C:\Data\3GPP\Extracts\R2-2405082%20Consieration%20on%20broadcast%20service%20ehancements.doc) Consideration on broadcast service enhancements ZTE Corporation, Sanechips discussion Rel-19 NR\_NTN\_Ph3-Core

Observation 1: It is difficult to adjust the satellite footprint in order to match the MBS broadcast service area, especially considering there could be multiple MBS broadcast service with different service area being provided simultaneously in the cell.

Proposal 1: RAN2 doesn’t pursue solution to limit the broadcast transmission to the intended service area only (i.e. no transmission happens outside of the intended service area).

Observation 2: TN coverage like service area could provide approximately coverage with less signalling overhead, and less specs impact, while geographical area information could better matches with the intended service area of MBS broadcast service area with higher signalling overhead

Observation 3:NW can based on implementation to configure either TN coverage and Geographical area information for different MBS service area to fit with different service requirement.

Proposal 2: Specify signalling support to allow indicating service area in either circles (like for TN coverage) or geographical area information, e.g. via polygons. Similar to TN coverage, an area identity is used to identify a geographical area.

Observation 4: Existing specs already allows provide MBS service over different cells if the MSB service area is a list of cells/TAIs, there is no need to provide additional information to UE.

Observation 5: No need to mix the discussion on how UE is provided with intended broadcast service area and how NW is provided with broadcast service area.

Observation 6: It is already legacy principle that the mapping between mapped cell id and fixed geographical area is only maintained at NW’s side, and NW can based on its implementation to provide suitable information over uu interface, e.g., service area, CGI.

Proposal 3: No need to provide intended service area in the format of cell list/TAI list or mapped cell id over uu interface .

Observation 7: Association between MBS broadcast session with broadcast service area is needed, so that UE can identify MBS services for its location, and select properly the MBS service.

Observation 8: There could be two different options to associated with intended service area (e.g., geographical area/TN coverage) with MBS session:

* Opt1: One intended service area (e.g., geographical area/TN coverage) is mapped to one or more MBS session
* Opt2: One or more intended service area (e.g., geographical area/TN coverage) is mapped to one MBS session

Proposal 4: When intended service area (e.g., geographical area/TN coverage) is provided for MBS broadcast service, it needs to be associated with MBS session.

* Agreed (FFS on the details)

Proposal 4a: RAN2 discusses and selects between below two options to allow mapping between broadcast service area information and MBS service session

* Opt1: One intended service area (e.g., geographical area/TN coverage) is mapped to one or more MBS session
* Opt2: One or more intended service area (e.g., geographical area/TN coverage) is mapped to one MBS session

Observation 9: Decision on whether new or existing SIBs are considered can be postpone to when RAN2 proceeds more on the details of the broadcast service contents.

Observation 10: It is beneficial to clarify UE behavior on MBS service reception when intended service area is provided.

Proposal 5: UE can take into account its location information together with the intended service area information when receiving/releasing MBS services, e.g., UE can not acquire or release the MBS service when its location is outside the intended service area of the MBS service.

Agreements:

1. For MBS broadcast service, both EFC and EMC are supported.
2. RAN2 will not define means for the NW to prevent the reception of the content of the service outside of the intended service area.
3. MBS broadcast intended service area is provided via system information
4. For MBS broadcast RAN2 considers the following possibilities for including the service area information: SIB20/ SIB21/ MBSBroadcastConfiguration. FFS for ETWS
5. When intended service area (e.g., geographical area/TN coverage) is provided for MBS broadcast service, it needs to be associated with MBS session (FFS on the details)

[R2-2404580](file:///C:\Data\3GPP\Extracts\R2-2404580%20Discussion%20on%20providing%20MBS%20service%20area%20in%20NTN%20network.docx) Discussion on providing MBS service area in NTN network OPPO discussion Rel-19 NR\_NTN\_Ph3-Core

Observation 1: if one cell covers a large area, different MBS sessions may be available in different sub-areas.

Proposal 1: If broadcast transmission is confirmed to be limited to the intended service area only, RAN2 to agree that different MBS sessions should be associated with different geographical areas, and such information should be indicated in the SIB.

Proposal 2: RAN2 to agree that ETWS in the NTN network could be associated with only certain geographical areas, and such areas could be indicated in associated SIBs, e.g., SIB6 or SIB7, if the satellite footprint consists of one cell or multiple cells with large coverage area.

Observation 2: for the NTN network where the satellite footprint consists of one cell or multiple cells and each of them covers a big area, regarding location dependent broadcast service, more than one contents for the same particular MBS session could be distributed in each cell.

Proposal 3: RAN2 to agree that, for the location dependent broadcast service, the area session ID of each distinguished content of the MBS session and the associated area range should be provided in the MBS configuration information.

Proposal 4: RAN2 to agree that, to support MBS services/contents in cells area of more than one NTN cells (or portions thereof), only the service area covering portions of cells need to be explicitly indicated.

Observation 3: it is common for a UE to receive broadcast service outside the intended service area, for example if its Rx performance is good, or unintended coverage extension of the NTN cell occurs.

Proposal 5: RAN2 to discuss how to capture in the spec for not letting UEs to receive MBS service outside the intended service area.

Proposal 6: RAN2 to agree to reuse the coverage area information included in the SIB25 to provide the information of the intended area for the MBS services and/or MBS session content for the NTN network in the SIB.

[R2-2404655](file:///C:\Data\3GPP\Extracts\R2-2404655_MBS%20over%20NTN.doc) Broadcast service support over NTN Apple discussion Rel-19 NR\_NTN\_Ph3-Core

Proposal 1: It is possible that the broadcast transmission is limited to the intended service area only.

Proposal 2: If UE outside of intended service area receives the broadcast service, RAN does not enforce any rule for UE to discard the broadcast data (leave to application layer to handle).

Proposal 3: The intended broadcast service area can be defined by one or multiple satellite beam(s) or by a geographical area represented by referenceLocation and radius.

Proposal 4: RAN2 to discuss how to enhance the service continuity matter with intended service area taken into account.

Proposal 5: RAN2 to discuss about service area specific MCCH/MTCH to replace cell specific MCCH/MTCH.

[R2-2404160](file:///C:\Data\3GPP\Extracts\R2-2404160%20Discussion%20on%20MBS%20Broadcast%20Provision%20in%20NTN.docx) Discussion on MBS Broadcast Provision in NTN vivo discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404206](file:///C:\Data\3GPP\Extracts\R2-2404206%20Discussion%20on%20support%20of%20broadcast%20service%20in%20NR%20NTN.docx) Discussion on support of broadcast service via NR NTN CATT discussion

[R2-2404282](file:///C:\Data\3GPP\Extracts\R2-2404282_discussion%20on%20support%20of%20broadcast%20service%20in%20NTN.docx) Discussion on support of a broadcast service in NR NTN ETRI discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404355](file:///C:\Data\3GPP\Extracts\R2-2404355%20Discussions%20on%20signaling%20of%20the%20intended%20service%20area%20of%20a%20broadcast%20service.doc) Discussions on signaling of the intended service area of a broadcast service Fujitsu discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404429](file:///C:\Data\3GPP\Extracts\R2-2404429.docx) Discussion on support of broadband services Continental Automotive discussion

[R2-2404621](file:///C:\Data\3GPP\Extracts\R2-2404621.docx) Discussion on MBS Broadcasting Control over NTN access TCL discussion

[R2-2404679](file:///C:\Data\3GPP\Extracts\R2-2404679%20MBS%20broadcast%20in%20NTN.docx) MBS broadcast service area information Qualcomm Incorporated discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404798](file:///C:\Data\3GPP\Extracts\R2-2404798%20On%20broadcast%20service%20area%20indication%20in%20NTN.docx) On broadcast service area indication in NTN Lenovo discussion Rel-19

[R2-2404853](file:///C:\Data\3GPP\Extracts\R2-2404853_area_config.docx) Discussions on the configuration of intended service areas ITRI discussion NR\_NTN\_Ph3-Core

[R2-2404854](file:///C:\Data\3GPP\Extracts\R2-2404854_limited_MBS.docx) Discussions on limiting broadcast service in the intended service areas ITRI discussion NR\_NTN\_Ph3-Core

[R2-2404916](file:///C:\Data\3GPP\Extracts\R2-2404916.docx) Broadcast service area signaling Sony discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404982](file:///C:\Data\3GPP\Extracts\R2-2404982%20Discussion%20on%20the%20support%20of%20broadcast%20service.docx) Discussion on the support of broadcast service HONOR discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405020](file:///C:\Data\3GPP\Extracts\R2-2405020%20Support%20of%20MBS%20broadcast%20service%20for%20NTN.docx) Support of MBS broadcast service for NTN CMCC discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405099](file:///C:\Data\3GPP\Extracts\R2-2405099.doc) Discussion on the service area of a broadcast service Xiaomi discussion

[R2-2405125](file:///C:\Data\3GPP\Extracts\R2-2405125%20Discussion%20on%20supporting%20MBS%20broadcast%20over%20NTN.docx) Discussion on supporting MBS broadcast over NTN Huawei, HiSilicon, Turkcell discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405147](file:///C:\Data\3GPP\Extracts\R2-2405147%20On%20the%20Signalling%20Aspects%20of%20MBS%20over%20Rel-19%20NR%20NTN.docx) On the Signalling Aspects of MBS over Rel-19 NR NTN Nokia discussion Rel-19 NR\_NTN\_Ph3 R2-2403306

[R2-2405174](file:///C:\Data\3GPP\Extracts\R2-2405174.docx) Discussion on Broadcast Service Area in NTN Samsung discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405204](file:///C:\Data\3GPP\Extracts\R2-2405204.docx) Discussions on MBS in Rel-19 NTN TOYOTA Info Technology Center discussion Rel-19

[R2-2405211](file:///C:\Data\3GPP\Extracts\R2-2405211%20%5bNTN%5d%20Discussion%20on%20support%20of%20broadcast%20service%20in%20NTN.docx) Discussion on support of broadcast service in NTN LG Electronics France discussion Rel-19 NR\_NTN\_Ph3 R2-2403121

[R2-2405239](file:///C:\Data\3GPP\Extracts\R2-2405239%20NR%20NTN%20MBS%20discussion_v3.docx) Discussion on MBS broadcast additional features for NR NTN Evolution THALES discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405277](file:///C:\Data\3GPP\Extracts\R2-2405277_Clarification%20on%20intended%20service%20area.docx) Clarification on intended service area NEC Telecom MODUS Ltd. discussion

[R2-2405377](file:///C:\Data\3GPP\Extracts\R2-2405377%20(R19%20NR%20NTN%20WI%20AI%208.8.4)%20Broadcast.docx) Support for broadcast service in NTN InterDigital discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405525](file:///C:\Data\3GPP\Extracts\R2-2405525.docx) Discussion on support of broadcast service ITL discussion Rel-19

[R2-2405627](file:///C:\Data\3GPP\Extracts\R2-2405627-Discussion_on_MBS_service_support_for_NR_NTN.docx) Discussion on MBS service support for NR NTN Sharp discussion Rel-19 NR\_NTN\_Ph3-Core

### 8.8.5 Support of regenerative payload

Contributions should focus on the needed updates for Stage 2 description and on whether any existing essential features would be affected - and potentially need any modifications - in a regenerative payload architecture.

Possibly impacted features (SDT, Re-establishment, satellite switch with resync, NW verified UE location)

[R2-2405156](file:///C:\Data\3GPP\Extracts\R2-2405156%20Regenerative%20payload%20for%20NR%20NTN.docx) Regenerative payload for NR NTN Samsung discussion Rel-19 NR\_NTN\_Ph3-Core

Proposal 2: RAN2 to study the issue of RRC re-establishment in a regenerative payload scenario.

Proposal 3: Do not optimize RA-SDT procedure for regenerative payload architecture.

Proposal 4: Satellite switch with resync feature is not supported in a regenerative payload architecture.

Proposal 5: Do not consider any optimization to network-verified location for regenerative payload.

[R2-2404799](file:///C:\Data\3GPP\Extracts\R2-2404799%20Considerations%20on%20regenerative%20payload%20in%20NTN.docx) Considerations on regenerative payload in NTN Lenovo discussion Rel-19

Proposal 1: RAN2 to discuss how to avoid RRC reestablishment to a gNB that cannot retrieve UE context from last serving gNB due to that no connection can be maintained between gNBs.

Proposal 2: RAN2 to discuss how to optimize for UE in RRC\_INACTIVE in case the UE context cannot be retrieved from last serving gNB due to that no connection can be maintained between gNBs.

[R2-2405126](file:///C:\Data\3GPP\Extracts\R2-2405126%20Discussion%20on%20support%20of%20regenerative%20payload.docx) Discussion on support of regenerative payload Huawei, HiSilicon, Turkcell discussion Rel-19 NR\_NTN\_Ph3-Core

Observation 1: There may not always be a DL SDT packet associated with the UL SDT transmission and the SDT procedure might be terminated by the network due to inactivity in the UL so that the UE stops monitoring PDCCH after sending the ACK for the contention resolution MAC CE and then misses the RRCRelease message.

Proposal 1: Add stage-2 description to clarify that the satellite switch with re-sync is not supported in the regenerative payload.

[R2-2405021](file:///C:\Data\3GPP\Extracts\R2-2405021%20Support%20of%20regenerative%20payload.docx) Support of regenerative payload CMCC discussion Rel-19 NR\_NTN\_Ph3-Core

Observation 1: PCI unchanged solution is beneficial for signaling overhead reduction in NTN system due to without L3 mobility.

Proposal 2: To support PCI unchanged for regenerative payload with gNB on board, keeping same security key between source satellite gNB and target satellite gNB based on ISL coordination is demanded.

Proposal 3: The following 2 options could be discussed for UE context transmission from source satellite gNB to target satellite gNB:

* Option 1: transmission whole UE context (PDCP/RLC/MAC/PHY related configuration information)
* Option 2: only transmission static part of UE context (PDCP/RLC/MAC/PHY related configuration information) and flush&reestablish dynamic part of UE context (e.g., HARQ buffer status in MAC, timer value, counter value in MAC, PHY related information)

Proposal 4: Both hard and soft satellite switch could be discussed or at least hard switch which is more simple in quasi-earth fixed cell case could be the starting point.

[R2-2405148](file:///C:\Data\3GPP\Extracts\R2-2405148%20On%20the%20feasibility%20of%20the%20existing%20NTN%20features%20over%20regenerative%20architecture.docx) On the feasibility of the existing NTN features over regenerative architecture Nokia discussion Rel-19 NR\_NTN\_Ph3

Observation 1: Satellite switching with resynchronization was specified in Rel-18 for transparent payloads to reduce radio signalling load.

Observation 2: In a regenerative architecture, satellite switching under the assumption of single gNB is no longer valid since gNBs are on board of the satellites.

Observation 3: In a regenerative architecture and regardless of the mobility procedure, the UE will frequently switch between gNBs on board of different satellites, triggering additional AMF/UPF signalling (e.g., for path switching).

Observation 4: Connected mobility with regenerative payloads is possible with existing mobility mechanisms, i.e. CHO and HO procedures.

Observation 5: During the satellite switching, the UE behaviour remains unchanged regardless of the NTN architecture (apart for the security config).

Observation 6: The source and target gNBs can use the same cell configuration.

Observation 7: Large part of the coordination between gNBs will be also required for conventional L3 mobility.

Observation 8: For satellite switching with regenerative payload, Rel-19 UE can benefit from similar gains as in transparent architecture while NW complexity may increase compared with regular L3 procedures (to be checked with RAN3 and SA3 for security issues).

Proposal 1: RAN2 to discuss the feasibility of the satellite switching with resync with regenerative payload.

Proposal 2: If satellite switching with resync with regenerative payload is found to be feasible, RAN2 to endorse Figure 4 as baseline for the satellite switching with regenerative payload.

Observation 9: NW may send scheduling resources over PDCCH for a UE that has not yet completed the satellite switching.

Observation 10: The RACH less handover feature works for regenerative architecture, while few optimisations are possible, like on informing the target gNB when the UE is present in the target cell.

Proposal 3: RAN2 to discuss optimisation to support RACH-less handover for regenerative architecture.

Observation 11: Network verified UE location works also under regenerative architecture as none of the assumptions for that feature to work have changed in this architecture option.

Proposal 4: RAN2 to conclude that network verified UE positioning is supported for regenerative architecture without adjustments.

[R2-2404680](file:///C:\Data\3GPP\Extracts\R2-2404680%20Regenerative%20payload.docx) Discussion on regenerative payload Qualcomm Incorporated discussion Rel-19 NR\_NTN\_Ph3-Core

Observation 1. The satellite switch with resync feature may be supported in regenerative payload architecture by network implementation of mirror satellite at t-Service.

Proposal 1 From RAN2 perspective, whether to indicate the support of satellite switch with resync for regenerative payload is left to network implementation. The only RAN2 specification impact is to clarify the +ve gap of satellite switch i.e., t-ServiceStart can occur after t-Service.

Proposal 2 For UE power saving when using RA SDT in regenerative payload, the PDCCH monitoring for further RRC message is delayed by UE-gNB RTT after sending HARQ feedback of the contention resolution MAC CE.

Proposal 3 RAN2 study if frequent gNB switch is an issue for network verified UE location.

[R2-2405196](file:///C:\Data\3GPP\Extracts\R2-2405196%20Timing%20relationship%20with%20Regenerative%20mode%20v1.docx) Support Regenerative Payload NEC discussion Rel-19 NR\_NTN\_Ph3-Core

Proposal 1: common TA is zero in case of regenerative mode with full gNB on board

Proposal 2a: RAN2 discuss if we support RP is not at gNB with regenerative mode, , i.e., Kmac can be configured as a non-zero value.

Proposal 2b: RAN2 send LS to RAN1 ask for any necessary RAN1 spec update in order to support RP not at gNB with regenerative mode

Stage 2 updates

[R2-2405448](file:///C:\Data\3GPP\Extracts\R2-2405448%20-%20Stage%202%20updates%20for%20regenerative%20payload.docx) Stage 2 updates for regenerative payload Ericsson discussion Rel-19 NR\_NTN\_Ph3-Core

Proposal 1 Clarify that the figure in 16.14.2.1 is for transparent payload and add on sentence “With regenerative payload, the network may configure Kmac and common TA to zero.”

Proposal 2 Consider the text proposal in section 4

[R2-2405100](file:///C:\Data\3GPP\Extracts\R2-2405100.doc) Discussion on the support of regenerative payload Xiaomi discussion

Proposal 1: We suggest remove the ISL in the section 16.14.1 and wait for the conclusion on ISL from RAN3.

Proposal 2: We suggest remove the Figure B.4-2 and wait for the RAN3 input for the figure on NTN based NG-RAN with regenerative NTN payload.

[R2-2404205](file:///C:\Data\3GPP\Extracts\R2-2404205%20Further%20discussion%20on%20regenerative%20payload.docx) Further discussion on regenerative payload CATT discussion

[R2-2405241](file:///C:\Data\3GPP\Extracts\R2-2405241%20NR%20NTN%20Regenerative%20TP_v6.docx) Regenerative NTN payload support in NR NTN Evolution THALES discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405313](file:///C:\Data\3GPP\Extracts\R2-2405313_Stage-2%20updates%20for%20regenerative%20payload.doc) Stage-2 updates for regenerative payload China Telecom discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404161](file:///C:\Data\3GPP\Extracts\R2-2404161%20Discussion%20on%20Mobility%20for%20Regerative%20Payload.docx) Discussion on Mobility with Regenerative Payload vivo discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404256](file:///C:\Data\3GPP\RAN2\Docs\R2-2404256.zip) Further discussion on regenerative payload for satellite switch with resync NTU discussion Rel-19 Late

[R2-2404590](file:///C:\Data\3GPP\Extracts\R2-2404590%20regenerative%20payload.doc) Discussion on satellite switch with resynch for regenerative payload OPPO discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404917](file:///C:\Data\3GPP\Extracts\R2-2404917.docx) Satellite switch with re-sync in regenerative payload Sony discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405083](file:///C:\Data\3GPP\Extracts\R2-2405083%20Consideration%20on%20regenerative%20payload%20support.doc) Consideration on support of regenerative payload ZTE Corporation, Sanechips discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405629](file:///C:\Data\3GPP\Extracts\R2-2405629-Discussion_for_regenerative_payload.docx) Discussion for regenerative payload Sharp discussion Rel-19 NR\_NTN\_Ph3-Core

Withdrawn

R2-2404622 Discussion on Support of NTN Regenerative Architecture TCL discussion Withdrawn

### 8.8.6 LTE to NR NTN mobility

Support for idle mode mobility between LTE and NR NTN.

[R2-2404211](file:///C:\Data\3GPP\Extracts\R2-2404211%20Support%20of%20Idle%20Mode%20Mobility%20from%20EUTRA%20TN%20to%20NR%20NTN.docx) Support of Idle Mode Mobility from EUTRA TN to NR NTN CATT discussion

Observation 1: Mobility from LTE to NR is not supported for NB-IoT UE and BL UE in the current Specs.

Proposal 1: For idle mode mobility from EUTRA TN to NR NTN, neither eMTC UEs nor NB-IoT UEs are considered in the scope.

Observation 2: The cell reselection from NR TN to NR NTN is already supported in NR Spec, and consists of the following key parts:

- Step 0: SI reception (cell reselection related information from SIB2/3/4 and satellite assistance information in SIB19);

- Step 1: Neighbor cell measurement initiation (based on RRM measurement results i.e. same as cell reselection to TN cells in legacy);

- Step 2: NTN neighbor cell measurement (with UE autonomous SMTC adjustment based on SMTC configuration in SIB2/4 and satellite assistance information in SIB19);

- Step 3: Cell reselection evaluation (as in legacy based on RRM measurement results).

Proposal 2: SIB24 is reused to provide the NR NTN cell reselection related information (e.g. frequency information, SMTC config, etc.).

Proposal 3: To support the idle mode mobility from EUTRA TN to NR NTN, the satellite assistance information for NR NTN neighbor cells is needed and should include the following parameters:

- Satellite ephemeris information

- TA common information

- k-Mac

- epoch time

- validity duration

- ntn-PolarizationDL.

Observation 3: Current satellite assistance information defined in SIB33 in TS36.331 does not include the ntn-PolarizationDL, which is needed for NR satellite.

Observation 4: Current satellite assistance information defined in SIB33 for IoT NTN has the same value range as that defined in TS38.331 for NR NTN, except for the TA common related configurations.

Proposal 4: The Ephemeris information/epoch time/k-mac/validity duration defined in SIB33 specified in TS36.331 should be reused for NR satellite assistance information.

Proposal 5: The ntn-PolarizationDL and TA common related configurations within NTN-Config specified in TS38.331 should be introduced in TS36.331 for NR satellite assistance information.

Proposal 6: The EUTRA cell provides the satellite assistance information for NR neighbor cell per satellite, as identified by the satellite ID. Introduce a satellite ID list in the SIB24 per frequency.

Proposal 7: RAN2 further down-selects the following options on how to provide the NR satellite assistance information:

- Option 1: Introduce a new SIB to include the NR satellite assistance information.

- Option 2: Define new IE for NR satellite assistance information and define separate neighbour satellite information list to provide the NR satellite information in SIB33.

- Option 3: Extend the NeighSatelliteInfo defined for IoT NTN to include the parameters needed for NR satellite, and reuse the neighSatelliteInfoList defined in SIB33 to provide either NR or IoT NTN information.

Proposal 8: NR NTN neighbor cell measurement initiation is performed as in legacy, i.e. based on RRM measurement as in cell reselection from EUTRA TN to NR TN. No spec impact is needed on cell reselection procedure in TS 36.304.

Proposal 9: Confirm the working assumption "WA: we don’t introduce multiple SMTCs in LTE".

Proposal 10: Introduce the clarification in the field description of measTimingConfig (configured via SIB24 in TS 36.331) that it is configured based on the assumption that the gNB-UE propagation delay equals to 0 ms, and UE can adjust the offset based on the actual propagation delay, when the corresponding frequency is associated with a satellite ID.

Proposal 11: NR NTN cell reselection evaluation is based on RRM measurements as legacy; no spec impact foreseen for EUTRA TN to NR NTN cell.

[R2-2404681](file:///C:\Data\3GPP\Extracts\R2-2404681%20mobility%20LTE%20to%20NR%20NTN.docx) Idle mode mobility from LTE to NR NTN Qualcomm Incorporated discussion Rel-19 NR\_NTN\_Ph3-Core

Proposal 1 eMTC UE and NB-IoT UE can also be considered to be in scope.

Proposal 2 Confirm that LTE to ATG NR cell mobility, i.e., broadcasting information of SIB22 is not in scope.

Proposal 3 Introduce satellite ID in SIB24 to indicate the NR frequency is associated with the satellite frequency.

Proposal 4 Introduce a new SIB to broadcast NR NTN satellite information.

Proposal 5 Confirm that multiple satellites associated with the same frequency can have different SMTC offsets.

[R2-2404162](file:///C:\Data\3GPP\Extracts\R2-2404162%20Discussion%20on%20LTE%20TN%20to%20NR%20NTN%20Mobility.docx) Discussion on LTE TN to NR NTN Mobility vivo discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404198](file:///C:\Data\3GPP\Extracts\R2-2404198.docx) Support for LTE to NR-NTN idle mode mobility Telit Communications S.p.A. ; Thales discussion R2-2403066

[R2-2404591](file:///C:\Data\3GPP\Extracts\R2-2404591%20LTE%20to%20NR%20NTN%20mobility.doc) Discussion on LTE to NR NTN idle mode mobility OPPO discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2404656](file:///C:\Data\3GPP\Extracts\R2-2404656_LTE%20TN%20to%20NTN%20mobility.doc) Mobility from LTE TN to NR NTN Apple discussion Rel-19 LTE\_TN\_NR\_NTN\_mob-Core

[R2-2404759](file:///C:\Data\3GPP\Extracts\R2-2404759%20E-UTRA%20TN%20to%20NR%20NTN%20Idle%20mobility.docx) Discussion on cell reselection from E-UTRA TN to NR NTN MediaTek Inc. discussion NR\_NTN\_Ph3-Core R2-2403226

[R2-2404800](file:///C:\Data\3GPP\Extracts\R2-2404800%20On%20LTE%20to%20NR-NTN%20IDLE%20mobility.docx) On LTE to NR-NTN IDLE mobility Lenovo discussion Rel-19

[R2-2404840](file:///C:\Data\3GPP\Extracts\R2-2404840%20-%20E-UTRAN%20TN%20to%20NR-NTN%20mobility.docx) E-UTRAN TN to NR-NTN mobility Ericsson discussion Rel-19 LTE\_TN\_NR\_NTN\_mob

[R2-2404986](file:///C:\Data\3GPP\Extracts\R2-2404986.doc) Further discussion on idle mode cell reselection form LTE to NR NTN Transsion Holdings discussion Rel-19

[R2-2405022](file:///C:\Data\3GPP\Extracts\R2-2405022%20Considerations%20on%20cell%20reselection%20enhancements%20from%20E-UTRAN%20TN%20to%20NR-NTN.docx) Considerations on cell reselection enhancements from E-UTRAN TN to NR-NTN CMCC discussion Rel-19 LTE\_TN\_NR\_NTN\_mob

[R2-2405084](file:///C:\Data\3GPP\Extracts\R2-2405084%20Consideration%20on%20idle%20mode%20mobility%20between%20LTE%20TN%20and%20NR%20NTN.doc) Consideration on idle mode mobility between LTE TN and NR NTN ZTE Corporation, Sanechips discussion Rel-19

[R2-2405101](file:///C:\Data\3GPP\Extracts\R2-2405101.doc) Discussion on the cell reselection from LTE to NR NTN Xiaomi discussion

[R2-2405108](file:///C:\Data\3GPP\Extracts\R2-2405108%20(R19%20NR%20NTN%20WI%20A8.8.6)%20LTE%20to%20NR%20NTN%20mobility.doc) Discussion on LTE to NR NTN mobility Interdigital, Inc. discussion Rel-19 LTE\_TN\_NR\_NTN\_mob

[R2-2405127](file:///C:\Data\3GPP\Extracts\R2-2405127%20Discussion%20on%20LTE%20to%20NR%20NTN%20mobility.docx) Discussion on LTE to NR NTN mobility Huawei, HiSilicon, Turkcell discussion Rel-19 LTE\_TN\_NR\_NTN\_mob-Core

[R2-2405146](file:///C:\Data\3GPP\Extracts\R2-2405146%20On%20How%20to%20Address%20E-UTRA%20TN%20to%20NR%20NTN%20Mobility%20in%20IDLE%20modeN%20Mobility%20in%20IDLE%20mode.docx) On How to Address E-UTRA TN to NR NTN Mobility in IDLE mode Nokia discussion Rel-19 NR\_NTN\_Ph3

[R2-2405155](file:///C:\Data\3GPP\Extracts\R2-2405155%20E-UTRAN%20TN%20to%20NR%20NTN%20mobility%20basic%20scenario%20and%20signalling.docx) E-UTRAN TN to NR NTN mobility basic scenario and signalling Samsung discussion Rel-19 LTE\_TN\_NR\_NTN\_mob-Core

[R2-2405210](file:///C:\Data\3GPP\Extracts\R2-2405210%20%5bNTN%5d%20Discussion%20on%20support%20of%20LTE%20to%20NR%20NTN%20cell%20reselection.docx) Discussion on support of LTE to NR NTN cell reselection LG Electronics France discussion Rel-19 LTE\_TN\_NR\_NTN\_mob R2-2403123

[R2-2405314](file:///C:\Data\3GPP\Extracts\R2-2405314_Consideration%20of%20LTE%20TN%20to%20NR%20NTN%20mobility.doc) Consideration of LTE TN to NR NTN mobility China Telecom discussion Rel-19 NR\_NTN\_Ph3-Core

[R2-2405630](file:///C:\Data\3GPP\Extracts\R2-2405630-Discussion_for_LTE_to_NR_NTN_mobility.docx) Discussion for LTE to NR NTN mobility Sharp discussion Rel-19 LTE\_TN\_NR\_NTN\_mob-Core

## 8.9 IoT NTN Ph3

(IoT\_NTN\_Ph3-Core; leading WG: RAN2; REL-19; WID: RP-240776)

Time budget: 1 TU

Tdoc Limitation: 2 tdocs

### 8.9.1 Organizational

LS, Rapporteur input, including workplan, etc.

[R2-2404144](file:///C:\Data\3GPP\Extracts\R2-2404144_S3-241567.docx) LS to SA2 and RAN2 on selected satellite architecture for Store and Forward (S3-241567; contact: InterDigital) SA3 LS in Rel-19 FS\_5GSAT\_Ph3\_SEC To:SA2, RAN2 Cc:SA, RAN3, SA3-LI

- Oppo and MTK think there is no need to reply to SA3 and also not to SA2

- HW thinks we can decide whether to send a reply LS based on the progress of this meeting. Nokia agrees.

- QC thinks we should send an LS to SA2

* Noted

[R2-2405378](file:///C:\Data\3GPP\Extracts\R2-2405378%20DRAFT%20-%20Reply%20LS%20on%20Store%20and%20Forward.docx) [Draft] Reply LS on selected satellite architecture for Store and Forward InterDigital LS out Rel-19 IoT\_NTN\_Ph3-Core To:SA3 Cc:SA2

* CB Friday

### 8.9.2 Support of Store & Forward

Contributions should focus on possible impacts to the radio interface.

[R2-2404321](file:///C:\Data\3GPP\Extracts\R2-2404321%20Overview%20of%20the%20Store%20and%20Forward%20satellite%20operation.docx) Overview of the Store and Forward satellite operation Huawei, HiSilicon, Turkcell discussion Rel-19 IoT\_NTN\_Ph3-Core

* Basic procedure for S&F satellite operation

Proposal 1: RAN2 can start from Modelling 1, i.e., after sending the RRC connection request, UE is served by the same satellite/eNB before being released to IDLE. Modelling 2 (involving change of serving eNB) can be discussed after sufficient progress is made in RAN3/SA2.

- MTK supports this

- ZTE wonders if this means we take single satellite as a baseline. HW thinks this is not the intention but think this is where we can start from, pending further progress in other groups

- Oppo and CATT think we first need to discuss when the UE will be sent to idle.

- ZTE thinks we should not discuss the Attach procedure but only on AS signalling.

- Nokia thinks this proposal does not assume a single satellite

Proposal 2: For the uplink/downlink messages transmission, the following steps are taken as baseline for S&F satellite operation:

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/signalling to the CN.

3) The eNB receives the downlink data/signalling from the CN and stores it when feeder link is available.

4) The eNB sends the downlink data/signalling to the UE when service link is available again.

- Apple thinks this is more for MO, what about MT?

- CATT supports this

* 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.

- S&F indication and access control

Proposal 3: S&F indication via AS is supported. FFS if any S&F indication via NAS is needed.

- Samsung thinks this is fine but it could be optional for the NW to signal this

- Oppo thinks we don’t need a NAS indication

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

Proposal 4: A new S&F barring indication is broadcasted in the SIB which can implicitly indicate the S&F satellite operation.

- Oppo supports p4 and wonders if this the same as the indication in p3. HW thinks this could be the same. Telit thinks it could be different

- Novamint thinks we should not have a barring indication

- Samsung supports p4 and thinks that when not in S&F mode the barring is not set

- ZTE thinks there is no need for a new barring indication for R19 UEs supporting this feature. IDC agrees. Xiaomi also agree

Proposal 5: Rel-19(+) UEs not supporting S&F should consider a cell performing S&F satellite operation as barred.

- vivo thinks we should check this with SA2

- Lenovo/Novamint think that SA2 is considering to support legacy UEs during S&F operation

- QC thinks this might also depend on whether (part of) the CN will also be on board or not

Proposal 6: Legacy UEs should be barred by cellBarred and cellBarredNTN in a cell performing S&F satellite operation.

* RAN2 understands legacy UEs may be barred by legacy cellBarred and cellBarredNTN

Proposal 7: RAN2 to discuss UE’s RRC state and the related behaviours when service link is not available for S&F satellite operation.

- ZTE thinks we can keep the existing UE RRC states

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

[R2-2405193](file:///C:\Data\3GPP\Extracts\R2-2405193-Store-Forward-RAN-Aspects.docx) Radio Interface Aspects for Store And Forward mode operation of IoT-NTN Nokia, Nokia Shanghai Bell discussion

* SF Mode indication

Proposal 1: SF mode indication via AS signalling (i.e system information) is considered as baseline. RAN2 to exclude NAS based signalling for SF mode indication.

Proposal 2: RAN2 to discuss the options for indication of mode transition (from SF to Normal and vice-versa) towards UE.

* Scenarios And Access Control

Proposal 3: RAN2 to identify the application scenarios that require specific changes for the radio interface operation in S&F mode.

Proposal 4: RAN2 to investigate access control and scheduling related changes for S&F operation.

* Multi-satellite Operation for SF IoT-NTN

Proposal 5: RAN2 to confirm multi-satellite operation as basis for further analysis of store & forward mode.

Proposal 6: Direct ISL between NTN-eNBs is not considered for multi-satellite operation in store & forward mode.

Proposal 7: RAN2 to consider paging enhancements in SF mode for delivering ACK for MO Traffic and MT Traffic towards IoT-NTN UE.

* Security Aspects

Proposal 8: For User Plane solution for IoT-NTN in S&F mode, security handling of same UE context across two successive NTN nodes without direct connectivity needs to be investigated further.

[R2-2404683](file:///C:\Data\3GPP\Extracts\R2-2404683%20store%20and%20forward.docx) S&F satellite operation with full eNB as regenerative payload Qualcomm Incorporated discussion Rel-19 IoT\_NTN\_Ph3-Core

Observation 1. eNB only onboard satellite solution has the issue of very long attach or TAU update delay in addition to MT data delivery/paging, roaming and security threat.

Proposal 1 Send LS to SA2 asking on any core network impacts and security threat of eNB only onboard satellite solution and also asking whether RAN2 can start working on the solution.

[R2-2404199](file:///C:\Data\3GPP\Extracts\R2-2404199.docx) Considerations on S&F operation from device perspective Telit Communications S.p.A. discussion Revised

* Revised in R2-2404979

[R2-2404979](file:///C:\Data\3GPP\Extracts\R2-2404979.docx) Considerations on S&F operation from device perspective Telit Communications S.p.A., Novamint, Sateliot discussion [R2-2404199](file:///C:\Data\3GPP\Extracts\R2-2404199.docx)

*Proposal 1: UE should receive an indication whether S&F is supported by the satellite.*

*Proposal 2: UE should receive an indication whether RT is momentarily supported by the satellite.*

*Proposal 3: For S&F Satellite operation expected maximum delivery time should be indicated to the UE.*

*Proposal 4: In case both transfer methods are available, UE should be able to decide/ indicate whether data transfer should be performed by S&F or RT.*

*Proposal 5: Satellite should be able to indicate (broadcast) whether S&F or RT operation are momentarily available or unavailable/barred.*

[R2-2404885](file:///C:\Data\3GPP\Extracts\R2-2404885%20Discussion%20on%20the%20store%20and%20forward%20operation.docx) Discussion on the store and forward operation Google Inc. discussion Rel-19

Proposal 1 The UE RRC should be able to identify a cell being in one of the following S&F scenarios:

S-1) The cell does not support the S&F satellite operation (i.e., feeder link is always available);

S-2) The cell supports the S&F satellite operation, and the feeder link is currently available;

S-3) The cell supports the S&F satellite operation, and the feeder link is currently not available.

Proposal 2 The legacy UE and the Rel-19 UE not supporting the S&F satellite operation shall refrain from accessing a cell under S-3 (i.e., a cell with no feeder link available).

Proposal 3 When the legacy NTN barring indication is set as ‘barred’, Rel-19 UEs need to check a new indication (in SIB1) reflecting the feeder link status to determine whether the cell can be accessed or not.

Proposal 4 Rel-19 UE can inform eNB of its capability in supporting the S&F satellite operation via MSG3.

Proposal 5 When the feeder link is not available, eNB can suspend UE’s RRC connection by transmitting an RRC Connection Release message to the UE supporting the S&F satellite operation. FFS whether a new release cause is needed.

[R2-2404589](file:///C:\Data\3GPP\Extracts\R2-2404589%20S&F%20operation.doc) Discussion on Store & Forward satellite operation OPPO discussion Rel-19 IoT\_NTN\_Ph3-Core

Observation 1: In S&F scenario, no inter-satellite link would be assumed otherwise when connecting with the UE via service link, serving satellite can still reach the ground network via other satellite’s forwarding operation and thus no storing operation at satellite is needed.

Proposal 1 For UP solution, UE only connects to its anchor satellite which stores UE’s context.

Proposal 2 Anchor satellite is identified by the satellite ID associated with the serving cell which releases UE to IDLE mode with suspend configuration.

Proposal 3 The legacy cellbarred-NTN should be set as barred in the cell with S&F satellite operation.

Proposal 4 Separate cellbarred indication is introduced in SIB for Rel-19 UEs supporting S&F operation.

[R2-2404163](file:///C:\Data\3GPP\Extracts\R2-2404163%20RAN2%20Aspect%20for%20S&F%20Operation.docx) RAN2 Aspects for Store & Forward vivo discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2404202](file:///C:\Data\3GPP\Extracts\R2-2404202%20Discussion%20on%20support%20of%20store%20and%20forward%20operation.docx) Discussion on support of store and forward operation CATT discussion

[R2-2404436](file:///C:\Data\3GPP\Extracts\R2-2404436_Elements_of_Store_and_Forward_Operation.docx) Elements of Store & Forward Operation PANASONIC discussion

[R2-2404657](file:///C:\Data\3GPP\Extracts\R2-2404657_Store%20and%20Forward.doc) Support of S&F operation in IoT NTN Apple discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2404801](file:///C:\Data\3GPP\Extracts\R2-2404801%20Store%20and%20Forward%20support%20in%20IoT%20NTN.docx) Store and Forward support in IoT NTN Lenovo discussion Rel-19

[R2-2404882](file:///C:\Data\3GPP\Extracts\R2-2404882%20RAN2%20impacts%20of%20supporting%20Store&Forward%20operation%20in%20IoT%20NTN.docx) RAN2 impacts of supporting Store&Forward operation in IoT NTN ZTE Corporation, Sanechips discussion Rel-19 IoT\_NTN\_Ph3-Core R2-2402380

[R2-2404987](file:///C:\Data\3GPP\Extracts\R2-2404987%20Support%20of%20Store%20&%20Forward%20for%20IoT-NTN%20.docx) Discussion on support of Store&Forward Transsion Holdings discussion Rel-19

[R2-2405012](file:///C:\Data\3GPP\Extracts\R2-2405012 Discussion on IoT NTN Store and Forward.docx) Discussion on IoT NTN Store and Forward CMCC discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405102](file:///C:\Data\3GPP\Extracts\R2-2405102.doc) Discussion on the support of store and forward satellite operation Xiaomi discussion

[R2-2405132](file:///C:\Data\3GPP\Extracts\R2-2405132%20RAN2%20impact%20on%20S&F%20mode.docx) RAN2 impact on S&F mode MediaTek Inc. discussion IoT\_NTN\_Ph3-Core R2-2402942

[R2-2405153](file:///C:\Data\3GPP\Extracts\R2-2405153%20On%20RAN2%20aspects%20on%20Store%20and%20Forward.docx) On RAN2 aspects of Store and Forward Samsung discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405197](file:///C:\Data\3GPP\Extracts\R2-2405197%20Support%20store%20and%20forward%20v1.docx) Support of Store and Forward NEC discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405242](file:///C:\Data\3GPP\Extracts\R2-2405242.doc) Considerations on Store & Forward Satellite Operation SHARP Corporation discussion Rel-19

[R2-2405315](file:///C:\Data\3GPP\Extracts\R2-2405315_The%20impact%20of%20access%20for%20Store%20&%20Forward%20in%20IoT%20NTN.doc) The impact of access for Store & Forward in IoT NTN China Telecom discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405429](file:///C:\Data\3GPP\Extracts\R2-2405429%20Discussion%20on%20information%20for%20Store%20&%20Forward.docx) Discussion on information for Store & Forward ASUSTeK discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405450](file:///C:\Data\3GPP\Extracts\R2-2405450%20-%20Support%20for%20store%20and%20forward.docx) Support for store and forward Ericsson discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405657](file:///C:\Data\3GPP\Extracts\R2-2405657.docx) Discussion of the Store and Forward satellite operation TCL discussion

Withdrawn

R2-2404409 Overview of the Store and Forward satellite operation Huawei, HiSilicon discussion Rel-19 IoT\_NTN\_Ph3-Core Withdrawn

### 8.9.3 Uplink Capacity Enhancement

At this meeting contributions should only focus on the possible enhancements to reduce the necessary uplink and downlink signaling to complete an EDT transaction (Msg3 transmission without msg1/RAR; efficient delivery of msg4 / RRCEarlyDataComplete).

[R2-2405202](file:///C:\Data\3GPP\Extracts\R2-2405202.docx) Discussion on Msg3-EDT enhancements ESA discussion Rel-19

Observation 1: DSA is improving the Msg3 EDT (without msg1) throughput by about a factor of 6 without any impacts on the current receiver implementation at the network, and minimal specification impact overall.

Observation 2 CRDSA is improving the legacy SA-based throughput of about a factor of 80 for balanced power packets and more than a factor of 100 for unbalanced packets power, which is highly relevant in NTN IoT scenarios.

Proposal 1: RAN2 to study enhanced random access techniques, such as Diversity Slotted ALOHA (DSA) and Contention Resolution Diversity Slotted Aloha (CRDSA), for improved random-access performance of Msg3-EDT transmissions without msg1/ Random Access Response (RAR).

- Xiaomi thinks this is interesting but more applicable for 6G and not only for IoT NTN

- Oppo thinks this should be discussed in RAN1

- vivo thinks we should first discuss whether to support contention based UL transmission

- Samsung thinks there is quite some gain and it’s worth continuing discussing this.

- Inmarsat welcomes this proposal, using a technique already used in satellite communication. Also thinks there is limited impact to the NW and almost no impact to the UE. Novamint agrees

- Ericsson strongly supports the proposal and suggests to continue the study

- ZTE thinks this is probably too new for R19 and cannot exclude RAN1 impacts. Also thinks this scheme might have drawbacks in terms of latency. Nokia agrees and thinks that in case we need to consult with RAN1

- QC thinks existing mechanism could eventually lead to even higher latency due to collisions (ESA agrees). Also thinks we could send an LS to RAN1 but we could also progress in RAN2 independently.

- Iridium thinks this has a lot of value and supports continuing studying this. Eutelsat Group agrees

- HW thinks more evaluation is needed in RAN1

- MTK thinks that RAN2 can continue the study on this and if needed send an LS to RAN1 later. ESA agrees

* Can continue the discussion on this proposal, evaluating possible impacts on the specification, in the next RAN2 meeting (we might send an LS to RAN1 later on this)

[R2-2404842](file:///C:\Data\3GPP\Extracts\R2-2404842%20-%20UL%20capacity%20enhancements%20objectives%20for%20IoT%20NTN.docx) UL capacity enhancements objectives for IoT NTN Ericsson discussion Rel-19 IoT\_NTN\_Ph3-Core

Observation 1 Enhancements to PUR are not with the Rel-19 IoT NTN WID’s scope.

Observation 2 Enhancing PUR for NTN may require substantial changes that could contradict legacy PUR enabling conditions, thereby increasing complexity.

Proposal 1 RAN2 prioritizes enhancements to the EDT procedure in Rel-19.

- Ericsson thinks that PUR has a lot of preconditions that might not be valid in NTN and then we should focus on EDT

- Xiaomi thinks this is more a terminology issue. QC has a similar view, the final solution could be a combination of EDT and PUR (maybe with a different name)

- Lenovo supports this proposal

- Although ZTE had a different proposal, thinks we could focus on the procedure rather than on the name of the feature

- Toyota thinks this is not only a matter of terminology, as PUR refers to pre-allocated resources

* 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).

[R2-2404884](file:///C:\Data\3GPP\Extracts\R2-2404884%20Consideration%20on%20enhanced%20early%20data%20transmission%20in%20IoT%20NTN.docx) Consideration on enhanced early data transmission in IoT NTN ZTE Corporation, Sanechips discussion Rel-19 IoT\_NTN\_Ph3-Core R2-2402381

Proposal 1: RAN2 clarify that the main task of the objective “to reduce the necessary uplink and downlink signaling to complete an Early Data Transmission (EDT) transaction” is to support contention-based Msg3 transmission or contention-based Shared PUR.

Proposal 2a: It’s suggested that, if an IoT NTN UE in IDLE state is activated to use R19 contention-based Shared PUR, the UE needs to verify/update the TA just before triggering PUR.

- vivo supports this and is ok to send an LS to RAN1/RAN4 on this if needed

- IDC wonders if this is applicable also for the CRDSA proposal. ESA confirms

- CATT is generally fine and is ok to check with RAN1/4. Thinks we should ask about NTA and UE specific TA

- Nokia is fine but thinks that an LS is needed

- QC wonders if we really need to send an LS

- ZTE thinks we can send the LS because the requirements for sending msg3 could be different than for msg1

* 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.
* Check offline if we need to send an LS to RAN1/RAN4 on this

Proposal 2b: If the proposal 2a can be agreed, RAN2 further discuss whether the pur-TimeAlignmentTimer is no longer needed.

Proposal 3: It’s suggested that, if contention-based Shared PUR is supported, when the UE changes the camping cell, the UE doesn’t need to stop using this enhanced PUR function.

Proposal 4a: With reference to legacy PUR configuration, RAN2 can take the following resources types as start point for the discussion on shared PUR resources configuration:

• Time domain resources, e.g., Periodicity, Offset, start time (H-SFN, frame, SFN etc.) of PUR occasion

• Frequency domain resources, e.g., Carrier, SubCarrier

• TBS

• PUR MPDCCH/NPDCCH search space window

• OCC resource

Proposal 4b: RAN2 is suggested to open discuss the following alternatives for configuring shared PUR resources:

• Alt1: To provide a common PUR resource configuration via SIB.

• Alt2: To provide shared PUR resources via dedicated signaling. It can be allowed to configure some different resources for different UEs while the other resources may be same for all the UEs.

• Alt3: To provide multiple sets of shared PUR resources via the SIB and NW can indicate index of the resource set for a specific UE via the dedicated signaling.

Proposal 5: The existing types of “Msg4” for normal PUR process, e.g., Physical layer L1 ACK, Timing Advance Command MAC CE, and RRCEarlyDataComplete/RRCConnectionRelease/RRCConnectionSetup/ RRCConnectionResume, need to be supported for shared PUR scheme. The very simple Physical layer L1 ACK can be used in suitable cases to achieve the expected more efficient Msg4 transmission.

Proposal 6: RAN2 is suggested to open discuss the following alternatives for RNTI design and for the scheduling of Msg4:

• Alt1: Common PUR-RNTI configured in the common PUR resources configuration.

• Alt2: UE-specific PUR-RNTI allocated by NW that is similar as the one for dedicated PUR.

• Alt3: Resource-specific PUR-RNTI which can be respectively calculated by UE and eNB according to the resources used/selected by the UE.

Proposal 7: The contention resolution scheme in legacy random access procedure can be reused for shared PUR, e.g., a UE Contention Resolution Identity can be included in the DL MAC PDU and UE checks whether the UE Contention Resolution Identity matches the 48 first bits of the CCCH SDU transmitted in Msg3.

Proposal 8: RAN2 is suggested to discuss the following other issues:

• Issue#1: How to handle the coexistence of PUR and contention-based shard PUR

• Issue#2: Whether a backoff scheme is needed when Msg3 collision occurs

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.

* [AT126][306][R19 IoT NTN] LS to RAN1/RAN4 (ZTE)

Scope: discuss the need and content of an LS to RAN1/RAN4 to confirm RAN2 agreement on the need to verify/update the uplink synchronization just before sending contention based msg3.

Intended outcome: draft LS (if needed)

Deadline for rapporteur's summary (in R2-2405763): Friday 2024-05-23 08:00

R2-2405763 LS on uplink synchronization for contention based msg3 transmission ZTE LS out LS out Rel-19 IoT\_NTN\_Ph3-Core To:RAN1,RAN4

[R2-2404581](file:///C:\Data\3GPP\Extracts\R2-2404581%20-%20Discussion%20on%20enhanced%20EDT%20for%20IoT%20NTN.doc) Discussion on enhanced EDT for IoT NTN OPPO discussion Rel-19 IoT\_NTN\_Ph3-Core

Observation 1 Compared to EDT, the feature of PUR can further improve the uplink transmission efficiency and save UE power consumption by skipping the random access procedure.

Observation 2 In legacy PUR, only dedicated uplink resource is supported, which is less resource efficient than shared uplink resource.

Proposal 1 RACH-less EDT, i.e. direct Msg3 transmission without Msg1/Msg2 is supported in Rel-19 IoT NTN.

Proposal 2 For RACH-less EDT, support shared uplink resource for Msg3 transmission, which are configured by eNB via system information.

Observation 3 Support of shared uplink resource for Msg3 transmission would bring the risk of collision among different UEs.

Proposal 3 RACH-less EDT can be enabled/disabled by network per UE via UE-specific signalling.

Proposal 4 For the shared Msg3 resource pool, support per CE level configuration.

Proposal 5 For each CE level, the shared Msg3 resource pool can be configured on anchor and/or non-anchor carriers.

Proposal 6 For each CE level, multiple Msg3 resource pools can be configured to support different numerologies (e.g. 3.75kHz and 15kHz SCS, single tone and multi-tone).

Proposal 7 An IDLE UE can initiate RACH-less EDT if all of the following conditions are fulfilled:

- RACH-less EDT is enabled for the UE in this cell

- the UE has a valid timing alignment value

- the upper layers request establishment or resumption of an RRC connection

- the establishment or resumption request is for mobile originating calls

- the size of the resulting MAC PDU is expected to be no larger the TBS configured for RACH-less EDT.

Proposal 8 UE performs Msg3 resource selection from the multiple resource pools. The following aspects needs to be considered.

- CE level determination

- numerology determination

- carrier selection

Observation 4 If the RNTI for Msg3 PUSCH scrambling is allocated by network, network needs to decode Msg3 blindly using all possible RNTIs, which would bring large complexity at network.

Proposal 9 In RACH-less EDT, the RNTI used for PUSCH/PDCCH/PDSCH scrambling is calculated based on the Msg3 PUSCH time-frequency resource.

Observation 5 For PUR, besides RRC response message, L1/L2 based ACK can also be used to terminate the PUR procedure, which could improve the performance of resource efficiency, UE power consumption as well as MO latency compared to EDT.

Proposal 10 L2 signalling can be used for acknowledging the reception of a transmission using EDT.

Proposal 11 The feature of Msg4 enhancement can be applied to both RACH based EDT and RACH-less EDT.

Proposal 12 RAN2 discusses the following fallback mechanism:

- For RACH-less EDT, fallback between different CE levels

- Fallback from PUR to RACH-less EDT

- Fallback from RACH-less EDT to RACH-based EDT

[R2-2405110](file:///C:\Data\3GPP\Extracts\R2-2405110%20(R19%20IoT-NTN%20AI%208.9.3)%20-%20EDT%20complete.docx) Efficient delivery (reduced overhead) of msg4 / RRCEarlyDataComplete Interdigital, Inc. discussion Rel-19 IoT\_NTN\_Ph3-Core

Proposal 1: Efficient delivery (reduced overhead) of msg4 / RRCEarlyDataComplete only applies to the C-plane solution.

Proposal 2: Confirm that it is already possible with the existing PUR feature to terminate the EDT procedure without using RRCEarlyDataComplete, by using Layer 1 ACK or Timing advance MAC CE, if eNB is aware that there is no pending downlink data or signalling.

Proposal 3: RAN2 to discuss how eNB knows that there is no pending downlink data from the application layer.

Proposal 4: Confirm that it is already possible with the existing PUR feature for UE to indicate in PURConfigurationRequest whether it expects a downlink response by RRCEarlyDataComplete.

Proposal 5: Confirm that the existing PUR feature may not be optimal in an NTN deployment as there is currently no mechanism for the eNB to determine whether UE expects a downlink application layer response unless the UE moves to RRC\_CONNECTED in every cell to perform dedicated PUR configuration.

Proposal 6: RAN2 to consider whether the following enhancements are beneficial:

1) Introducing network signalling so that PUR configuration request information to be transferred across cells.

2) Indication by the UE in RRCEarlyDataRequest an “rrc-ACK” parameter (whether UE expects a downlink application layer response)

3) Enabling EDT termination without any downlink ACK, or using a common ACK for multiple transmissions or UEs

* CB Thursday

[R2-2404164](file:///C:\Data\3GPP\Extracts\R2-2404164%20Discussion%20on%20EDT%20Enhancement%20for%20IoT-NTN.docx) Discussion on EDT Enhancement for IoT-NTN vivo discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2404203](file:///C:\Data\3GPP\Extracts\R2-2404203%20On%20signalling%20overhead%20reduction%20for%20EDT%20in%20IoT%20NTN.docx) On signalling overhead reduction for EDT in IoT NTN CATT discussion

[R2-2404322](file:///C:\Data\3GPP\Extracts\R2-2404322%20Overview%20of%20uplink%20capacity%20enhancement.docx) Overview of capacity enhancement for uplink Huawei, HiSilicon, Turkcell discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2404561](file:///C:\Data\3GPP\Extracts\R2-2404561%20Discussion%20on%20EDT%20optimisation%20in%20IoT-NTN.docx) Discussion on EDT optimisation in IoT-NTN HONOR discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2404658](file:///C:\Data\3GPP\Extracts\R2-2404658_PUR.doc) Uplink capacity enhancement in IoT NTN Apple discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2404684](file:///C:\Data\3GPP\Extracts\R2-2404684%20EDT%20enh.docx) Discussion on EDT enhancements Qualcomm Incorporated discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2404740](file:///C:\Data\3GPP\Extracts\R2-2404740%20Discussion%20on%20uplink%20capacity%20enhancements%20for%20IOT%20NTN.doc) Discussion on uplink capacity enhancements for IOT NTN Xiaomi discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2404802](file:///C:\Data\3GPP\Extracts\R2-2404802%20EDT%20for%20uplink%20capacity%20enhancement%20in%20NTN%20(Revision%20of%20R2-2402716).docx) EDT for uplink capacity enhancement in NTN Lenovo discussion Rel-19

[R2-2404922](file:///C:\Data\3GPP\Extracts\R2-2404922.doc) Uplink Capacity Enhancement for EDT transaction Spreadtrum Communications discussion Rel-19

[R2-2405023](file:///C:\Data\3GPP\Extracts\R2-2405023%20Considerations%20on%20EDT%20enhancements%20for%20IoT-NTN.docx) Considerations on EDT enhancements for IoT-NTN CMCC discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405109](file:///C:\Data\3GPP\Extracts\R2-2405109%20(R19%20IoT-NTN%20AI%208.9.3)%20-%20PUR%20resource%20enhancement.docx) Msg3 transmission without msg1/RAR Interdigital, Inc. discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405133](file:///C:\Data\3GPP\Extracts\R2-2405133%20Discussion%20on%20enhanced%20EDT.docx) Discussion on enhanced EDT MediaTek Inc. discussion IoT\_NTN\_Ph3-Core R2-2402943

[R2-2405154](file:///C:\Data\3GPP\Extracts\R2-2405154%20Scenarios%20and%20procedures%20for%20uplink%20capacity%20enhancements.docx) Scenarios and procedures for IoT NTN uplink capacity enhancements Samsung discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405201](file:///C:\Data\3GPP\Extracts\R2-2405201.docx) Efficient delivery of RRCEarlyDataComplete message TOYOTA Info Technology Center discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405321](file:///C:\Data\3GPP\Extracts\R2-2405321%20Consideration%20on%20EDT%20enhancement%20for%20IoT-NTN.docx) Consideration on EDT enhancement for IoT-NTN NEC Corporation. discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405442](file:///C:\Data\3GPP\Extracts\R2-2405442%20Discussion%20on%20UL%20capacity%20enhancement%20for%20IoT%20NTN.docx) Discussion on UL capacity enhancement for IoT NTN Nokia, Nokia Shanghai Bell discussion Rel-19 IoT\_NTN\_Ph3-Core

[R2-2405655](file:///C:\Data\3GPP\Extracts\R2-2405655.docx) Consideration on enhanced early data transmission in IoT NTN TCL discussion

Withdrawn

R2-2404410 Overview of capacity enhancement for uplink Huawei, HiSilicon discussion Rel-19 IoT\_NTN\_Ph3-Core Withdrawn

# Summary

Agreed CRs

NR-NTN

IoT-NTN

Approved LSs out

[Post126] Email discussions

Short

Long