3GPP TSG-RAN WG2 Meeting #123bis R2-2311273

Xiamen, China, Oct 9-13, 2023

**Agenda item: 8.1**

**Source: Vice Chairman (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:

* [AT123bis][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 October 9** | | | | |
| 09:00 – 10:30 | [1], [2], [3],  [7.0] R18 common (Diana)  NR18 Network Energy Saving [1] (Diana) | Breakout to start after coffee break | Breakout to start after formal opening of meeting in main room:  NRLTE1516 Pos (Nathan)  NR17 Pos (Nathan)  NR17 SL Relay if time (Nathan) |  |
| 11:00 – 13:00 | MUSIM [1] (Erlin) |
| 14:30 – 16:30 | NR151617 (Mattias) | 14:30-15:00 - NR18 MIMO evo [0.75]  NR151617 UP (Diana)  NR18 Closed WIs early items  NR18 MT-SDT(Diana)  IDC (Yi) (email discussion only)  NCR(Sasha) (email discussion only) | NRLTE1516 V2X/SL (Kyeongin)  NR17 SL (Kyeongin) |
| 17:00 – 19:00 | NR151617 (Mattias) | NR18 eQoE [1] (Dawid)  NR18 fCovEnh [0.5] (Eswar) | NR18 SL evolution [1] (Kyeongin) |
| **Tuesday October 10** | | | | |
| 08:30 – 10:30 | NR18 feMob [2] (Johan) | NR 18 MBS [0.5] (Dawid)  MBS TEI 18 | NR18 SL Relay [1.5] (Nathan)  - 7.9.1 Organizational  - 7.9.2 UE-to-UE  - 7.9.3 Service continuity if time |  |
| 11:00 – 13:00 | NR18 Mobile IAB [0.5] (Johan)  NR18 LP WUS [0.5] (Johan) | NR18 UAV [1] (Diana) | NR17 SL Relay (Nathan) |
| 14:30 -16:30 | NR18 XR [2] (Diana) | NR17 NTN Maint (Sergio)  - 4.2  - 6.3  NTN Self evaluation (Sergio)  - 7.25.4: Report of [Post123][102]  NR18 NTN enh [1] (Sergio)  - 7.7.1  - 7.7.2 (also depending on progress in the common session)  - 7.7.3 | NR18 Pos [2] (Nathan)  - 7.2.1 Organizational  - 7.2.3 RAT-dependent integrity  - 7.2.4 LPHAP  - 7.2.5 RAN1-led objectives if time |
| 17:00– 19:00 | NR18 Other [2] Diana | NR18 NTN enh [1] (Sergio)  - 7.7.4.1.1  - 7.7.4.1.2  - 7.7.4.2 | NR18 Pos [2] (Nathan)  - 7.2.5 RAN1-led objectives  - 7.2.2 SL positioning |
| **Wednesday October 11** | | | | |
| 08:30 – 10:30 | NR18 feMob [2] (Johan) | NR18 eQoE [1] (Dawid)  17:00-17:30 EUTRA17+ | NR18 SL relay [1.5] (Nathan)  - 7.9.3 Service continuity  - 7.9.4 Multi-path  TEI Relay/POS (Nathan)  - Relay cause value issues (R2-2309684 and R2-2309795)  - Positioning for remote UEs (R2-2310544, R2-2310855) |  |
| 11:00 – 13:00 | NR18 URLLC [0.5] (Diana)  NR18 Network Energy Saving [1] (Diana) | NR17 (Mattias) | NR17 SONMDT (HuNan) |
| 14:30 – 16:30 | NR18 XR [2] (Diana) | R18 IoT-NTN [1] (Sergio)  - 7.6.1  - 7.6.2.1  - 7.6.2.2  - 7.6.3.2 | NR18 SONMDT [1] (HuNan) |
| 17:00 – 19:00 | NR18 AIML [1] (Diana) | NR18 RedCap [1] (Mattias) | NR18 MIMO evo [0.75] (Erlin) |
| **Thursday October 12** | | | | |
| 08:30 – 10:30 | CB NR151617 (Mattias) | CB Sergio  NR18 NTN Enh  - 7.7.2; CB on LCID extension  - 7.7.3: Report of [304]  - 7.7.4.2: Report of [306], [307]  - 7.7.4.1.2: CB for [R2-2311228](file:///C:\Data\3GPP\Extracts\R2-2311228%20-%20Cell%20reselection%20enhancements.docx) | CB Kyeongin |  |
| 11:00 – 13:00 | NR18 TEI [1] (Diana) | CB Sergio (1h)  R18 IoT NTN Enh  - 7.6.3.1  - 7.6.4  CB Erlin  MU-SIM | CB Kyeongin |
| 14:30 – 16:30 | NR18 Other [2] (Diana) | CB Dawid  MBS  QoE | CB Nathan |
| 17:00 – 19:00 | CB Diana  XR  UAV  NES | CB Johan  feMob  mIAB | CB Nathan |
| **Friday October 13** | | | | |
| 08:30 – 10:30 | CB Mattias  R17 | CB Eswar Cov. Enhc.  CB Johan | CB Nathan, Kyeongin TBD |  |
| 11:00 – 13:00 | CB Diana | CB Sergio (only ~30 min??)  NR18 NTN Enh  - 7.7.4.1.1: Report of [305]  NTN Self Ev  - Report of [303]  R18 IoT NTN Enh  - 7.6.2.1: Report of [308]  - 7.6.2.2: Report of [309]  - 7.6.3.2: Report of [310] | CB Hunan |
| 14:30 – 16:00 |  |  |  |
| 16:00 – 17:00 | [8] Reports from parallel sessions CB and conclusion (Diana) |  |  |  |

List and status of offline discussions

NOTE: No offline email discussions will be kicked off before Monday Oct 9th, 09:00 local time

* [AT123bis][301][IoT-NTN] Koffset handling during handover (Huawei)

Scope: discuss Stage 2 CRs

Intended outcome: 36.300 and 38.300 CRs

Deadline for rapporteur's CRs (in R2-2311311 and R2-2311312): Friday 2023-10-13 08:00

Status: ongoing

* [AT123bis][302][NR-NTN] Notes in the RRC release procedure (Google)

Scope: discuss the need and possible wording for the second note

Intended outcome: revised CR

Deadline for rapporteur's CR (in R2-2311313): Friday 2023-10-13 08:00

Status: ongoing

* [AT123bis][303][NTN Self Ev] CPUP latency (Ericsson)

Scope: continue the discussion on the TP also based on input papers

Intended outcome: updated TP and draft LS to RAN1

F2F schedule: FFS

Deadline for updated TP and LS (in R2-2311314 and R2-2311315): Friday 2023-10-13 08:00

Status: ongoing

* [AT123bis][304][NR-NTN Enh] NW verified UE location failure during cell change (Qualcomm)

Scope: discuss NW verified UE location failure occurred during change of cell

Intended outcome: offline summary

F2F schedule: Wednesday 2023-10-11 10:00-10:30 Brk3

Deadline for rapporteur's summary (in R2-2311316): Thursday 2023-10-12 08:00

Status: closed

* [AT123bis][305][NR-NTN Enh] Support of NTN neighbor cell info in TN cell (Ericsson)

Scope: discuss the details of how broadcast NTN neighbor cell info in a TN cell

Intended outcome: offline summary

F2F schedule: FFS

Deadline for rapporteur's summary (in R2-2311317): Friday 2023-10-14 08:00

Status: ongoing

* [AT123bis][306][NR-NTN Enh] RACH-less HO (Interdigital)

Scope: continue the discussion on RACH-less HO

Intended outcome: offline summary

No formal F2F offline is expected: the rapporteur will check offline with as many interested companies as possible and prepare an updated list of proposals for online discussion in the Thursday CB session

Deadline for rapporteur's summary (in R2-2311318): Thursday 2023-10-12 08:00

Status: closed

* [AT123bis][307][NR-NTN Enh] Unchanged PCI (Apple)

Scope: continue the discussion on unchanged PCI aspects (marked for offline discussion in 307)

Intended outcome: offline summary

F2F schedule: Wednesday 2023-10-11 10:30-11:00 Brk3

Deadline for rapporteur's summary (in R2-2311319): Thursday 2023-10-12 08:00

Status: closed

* [AT123bis][308][IoT-NTN Enh] HARQ enhancements (Oppo)

Scope: continue the discussion on remaining proposals from [R2-2309527](file:///C:\Data\3GPP\Extracts\R2-2309527%20-%20Discussion%20on%20HARQ%20enhancement%20for%20IoT%20NTN.doc) and possibly other urgent issues

Intended outcome: offline summary

F2F schedule: FFS

Deadline for rapporteur's summary (in R2-2311320): Friday 2023-10-13 08:00

Status: ongoing

* [AT123bis][309][IoT-NTN Enh] GNSS Enhancements (Mediatek)

Scope: continue the discussion on GNSS enhancements

Intended outcome: offline summary

F2F schedule: FFS

Deadline for rapporteur's summary (in R2-2311321): Friday 2023-10-13 08:00

Status: ongoing

* [AT123bis][310][IoT-NTN Enh] LS to CT1 (Inmarsat)

Scope: discuss the content of a possible LS to CT1 (to/cc SA2)

Intended outcome: draft LS

Deadline for draft LS (in R2-2311322): Friday 2023-10-13 08:00

Status: ongoing

## 4.2 NB-IoT and eMTC support for NTN Rel-17

(LTE\_NBIOT\_eMTC\_NTN; leading WG: RAN1; REL-17; WID: [RP-211601](http://ftp.3gpp.org/tsg_ran/TSG_RAN/TSGR_92e/Docs/RP-211601.zip))

Tdoc Limitation: 1 tdocs

This Agenda Item is treated in the Breakout session that includes NTN

A single CR per TS with miscelaneous corrections is encouraged. Small editorial corrections should be sent directly to rapporteur. Big open issues can be discussed with contributions with CR in the appendix of the contribution

[R2-2310835](file:///C:\Data\3GPP\Extracts\R2-2310835%2036331(R17)_Clarification%20on%20ul-SyncValidityDuration%20in%20SIB31.docx) Clarification on ul-SyncValidityDuration in SIB31 ZTE Corporation, Sanechips CR Rel-17 36.331 17.6.0 4962 - F LTE\_NBIOT\_eMTC\_NTN-Core

* ZTE indicated that “ntn-UlSyncValidityDuration” needs to be updated to the actual name for IoT-NTN in the field description
* Vivo thinks the version in the coversheet should be 17.6.0
* Revised in R2-2311310

R2-2311310 Clarification on ul-SyncValidityDuration in SIB31 ZTE Corporation, Sanechips CR Rel-17 36.331 17.6.0 4962 1 F LTE\_NBIOT\_eMTC\_NTN-Core

* Agreed in principle

[R2-2310716](file:///C:\Data\3GPP\Extracts\R2-2310716%20Koffset%20handling%20during%20handover.docx) Koffset handling during handover Huawei, HiSilicon discussion Rel-17 LTE\_NBIOT\_eMTC\_NTN

Proposal 1: Clarify that UE specific Koffset should be cleared during MAC reset.

- Oppo agrees with the problem and thinks it should be fixed

- LG thinks the same applies to NR

- Lenovo does not think this is an essential issue (and it also applies to NR NTN)

- QC don’t think this is not needed and if we clarify something we should not refer to MAC reset but refer to HO. Samsung agrees

- Ericsson thinks it would be a strange UE implementation to use this after HO, but is ok to clarify that that differential Koffset should be cell specific

* Introduce a clarification in Stage2 for both IoT NTN and NR NTN that UE specific Koffset should be cleared during HO (exact wording FFS)
* Draft corresponding CRs for 36.300 and 38.300
* [AT123bis][301][IoT-NTN] Koffset handling during handover (Huawei)

Scope: discuss Stage 2 CRs

Intended outcome: 36.300 and 38.300 CRs

Deadline for rapporteur's CRs (in R2-2311311 and R2-2311312): Friday 2023-10-13 08:00

## 6.3 NR Non-Terrestrial Networks (NTN)

(NR\_NTN\_solutions-Core; leading WG: RAN2; REL-17; WID: [RP-211557](http://ftp.3gpp.org/tsg_ran/TSG_RAN/TSGR_92e/Docs/RP-211557.zip))

Tdoc Limitation: 1 tdocs

A single CR per TS with miscellaneous corrections is encouraged. Small editorial corrections should be sent directly to rapporteur. Big open issues can be discussed with contributions with CR in the appendix of the contribution

[R2-2309533](file:///C:\Data\3GPP\Extracts\R2-2309533-Correction%20on%20Event%20D1.docx) Correction on Event D1 OPPO CR Rel-17 38.331 17.6.0 4306 - F NR\_NTN\_solutions-Core

* MTK and QC don’t think the CR is needed
* HW thinks the UE will report the latest information and think the existing text is ok
* Not pursued

[R2-2309652](file:///C:\Data\3GPP\Extracts\R2-2309652_CR0931_38306%20Correction%20on%20the%20Capability%20of%20TA%20Reporting.docx) Correction on the Capability of TA Reporting vivo CR Rel-17 38.306 17.6.0 0931 1 F NR\_NTN\_solutions-Core [R2-2307113](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2307113.zip)

* QC thinks this is not needed. Ericsson agrees with QC. MTK also agrees
* Not pursued

[R2-2310757](file:///C:\Data\3GPP\Extracts\38331_CR4351_(Rel-17)_R2-2310757%20Notes%20in%20the%20RRC%20release%20procedure%20for%20NR-NTN.docx) Notes in the RRC release procedure for NR-NTN Google Inc. CR Rel-17 38.331 17.6.0 4351 - F NR\_NTN\_solutions-Core

* Samsung that the first note was suggested in Rel-15 and was not agreed at that time
* QC thinks the notes reflect the expected UE behaviour.
* Ericsson thinks the notes are not needed as this the expected UE behaviour anyway and if we add these notes for these cases we would need to add other similar notes as well
* ZTE thinks the first note is common for NR, not for NR NTN. The second note mention HARQ disabled but this is not suitable for RRC spec
* Intel thinks both notes are not needed. Apple agrees
* Ericsson think the IoT NTN case is different, due to repetitions, for NR NTN is a corner case we don’t need to clarify
* Discuss offline if (a revision of) the second note can be agreeable
* [AT123bis][302][NR-NTN] Notes in the RRC release procedure (Google)

Scope: discuss the need and possible wording for the second note

Intended outcome: revised CR

Deadline for rapporteur's CR (in R2-2311313): Friday 2023-10-13 08:00

[R2-2310715](file:///C:\Data\3GPP\Extracts\R2-2310715%20Triggering%20of%20TA%20Report%20during%20handover.docx) Triggering of TA Report during handover Huawei, HiSilicon discussion Rel-17 NR\_NTN\_solutions-Core

Observation 1: The current spec is not clear about UE behaviour when offsetThresholdTA is included in handover command while ta-report is not.

Proposal 1: RAN2 to discuss whether and when TA report is triggered to the target cell, if offsetThresholdTA is included in handover command while ta-report is not.

* Lenovo wonders if this is a valid case. Nokia agrees
* Vivo thinks the current MAC spec is clear and no clarification is needed.
* No need to further discuss this, it should be up to NW implementation

[R2-2311241](file:///C:\Data\3GPP\RAN2\Docs\R2-2311241.zip) UTC reference point in NR NTN R17 Ericsson discussion Rel-17 NR\_NTN\_solutions

Observation 1 Usefulness of the broadcasted/dedicated signalled UTC is much less in NR where UEs are assumed to have simultaneous capability to transmit/receive and measure GNSS.

Proposal 1 Align the IoT NTN UTC reference point and the NR NTN reference point.

* Nokia agrees with observation 1 so is not sure whether we need p1 now, we can add it in the future if needed
* QC agrees with p1
* Vivo agrees with the intention but think that Redcap for NTN is not supported in this release and we should postpone this. QC does not agrees with this statement : Redcap can be supported in NTN
* Sequans agrees with QC and supports p1
* Apple supports the observation but thinks we can have this in the next release.
* QC thinks that if we only have it in R18 there would be inter-operability issues. Oppo thinks this is not the case
* Come back to this in the next meeting (for possible inclusion also in Rel-17)

## 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: 1 TU

Tdoc Limitation: 4 tdocs

### 7.6.1 Organizational

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

Incoming LSs

[R2-2309416](file:///C:\Data\3GPP\Extracts\R2-2309416_R1-2308520.docx) LS on Rel-18 RAN1 UE features list for LTE after RAN1#114 (R1-2308520; contact: NTT DOCOMO, AT&T) RAN1 LS in Rel-18 IoT\_NTN\_enh To:RAN2 Cc:RAN4

* Noted

Running CRs

[R2-2310180](file:///C:\Data\3GPP\Extracts\36306_CRxxxx_(Rel-18)_R2-2310180%20UE%20capability%20running%20CR.docx) Running CR for TS 36.306 for Rel-18 IoT NTN Qualcomm Incorporated draftCR Rel-18 36.306 17.4.0 B IoT\_NTN\_enh-Core

* Used as a starting point for the discussion on UE caps

[R2-2310410](file:///C:\Data\3GPP\Extracts\R2-2310410%2036331%20running%20CR%20for%20IOT%20NTN.docx) 36331 running CR for IOT NTN Huawei, HiSilicon draftCR Rel-18 36.331 17.6.0 B IoT\_NTN\_enh-Core

* Used as a baseline for further updates

[R2-2311070](file:///C:\Data\3GPP\Extracts\R2-2311070%20Draft%20Running%20CR%20MAC_36.321_IoT-NTN.docx) Stage-3 running CR for TS 36.321 for Rel-18 IoT-NTN MediaTek Inc. draftCR Rel-18 36.321 17.6.0 F IoT\_NTN\_enh-Core

* Used as a baseline for further updates

[R2-2311194](file:///C:\Data\3GPP\Extracts\R2-2311194-Running-CR-36304-IoT-NTN.docx) 36304 Running CR for IoT-NTN Nokia Solutions & Networks (I) draftCR Rel-18 36.304 17.4.0 IoT\_NTN\_enh-Core

* Used as a baseline for further updates

[R2-2311244](file:///C:\Data\3GPP\Extracts\R2-2311244%20-%2036300_CR1387_(Rel-18)%20-%20Introduction%20of%20IoT%20NTN%20enhancements.docx) Introduction of IoT NTN enhancements Ericsson CR Rel-18 36.300 17.5.0 1387 - B IoT\_NTN\_enh-Core

* Used as a baseline for further updates

[R2-2311245](file:///C:\Data\3GPP\Extracts\R2-2311245%20-%2036300_(Rel-18)%20-%20Rapporteur%20input%20on%2036%20300.docx) Rapporteur input on 36.300 Ericsson draftCR Rel-18 36.300 17.5.0 B IoT\_NTN\_enh-Core

* QC supports the additional changes. MTK also supports
* Content can be considered in the next update of the running CR

Other

[R2-2309532](file:///C:\Data\3GPP\Extracts\R2-2309532%20IoT%20NTN%20capability.doc) Discussion on R18 IoT NTN UE capabilities OPPO discussion Rel-18 IoT\_NTN\_enh-Core

### 7.6.2 Performance Enhancements

#### 7.6.2.1 HARQ enhancements

[R2-2309527](file:///C:\Data\3GPP\Extracts\R2-2309527%20-%20Discussion%20on%20HARQ%20enhancement%20for%20IoT%20NTN.doc) Discussion on HARQ enhancement for IoT NTN OPPO discussion Rel-18 IoT\_NTN\_enh-Core

< DRX for single TB scheduling >

Proposal 1 For NB-IoT UEs configured with two HARQ processes and at least one of them is configured with HARQ feedback disabled, RAN2 does not change the operation on drx-InactivityTimer for single-TB scheduling case.

* QC supports this. MTK agrees
* ZTE agrees with the principle
* Agreed

Proposal 2 For a HARQ process configured as HARQ feedback disabled by RRC and further reversed to HARQ feedback enabled by DCI, UE behaviour on DRX follows the case when HARQ feedback is disabled.

* QC agrees that DCI enabling/disabling should not impact DRX and then supports the proposal. MTK also supports
* Agreed

< Multiple TB scheduling >

< support for mixed HARQ mode >

Observation 1 For both DCI-based direct indication and DCI-based overridden indication for enabling/disabling HARQ feedback, all the TBs scheduled by a single DCI are configured with HARQ feedback enabled or HARQ feedback disabled, which is simple for DCI design.

Observation 2 For RRC-based enabling/disabling HARQ feedback configuration (without DCI-based overridden indication), it would be more flexible to support mixed HARQ feedback enabled/disabled configuration.

Observation 3 For UL, only RRC-based HARQ mode configuration is supported.

Proposal 3 For multiple UL TBs scheduling, it is up to network implementation to configure multiple TBs using HARQ processes in the same or different HARQ modes.

* Ericsson agrees. Samsung agrees
* MTK agrees for eMTC but for NB-IoT it does not make sense to have different HARQ modes
* QC thinks all the HARQ processes should use the same HARQ mode
* Nokia and vivo agree with QC. ZTE also agrees with QC
* HW thinks that we can align to DL and allow both options up to NW implementation. Xiaomi also supports
* For multiple UL TBs scheduling, it is up to network implementation to configure multiple TBs using HARQ processes in the same or different HARQ modes. Start time for UL HARQ RTT timer for mode A will not change

< impact on drx-InactivityTimer >

Proposal 4 If a NB-IoT UE receives a PDCCH indicating the transmission for multiple DL TBs, UE stop drx-InactivityTimer as legacy, regardless of the enabling/disabling HARQ feedback configuration for each of the multiple scheduled TB.

Proposal 5 For a NB-IoT UE configured with two HARQ processes, if PDCCH indicates the transmission is for multiple TBs and if at least one DL HARQ process is configured with disabled HARQ feedback, UE starts drx-InactivityTimer in the subframe containing the last repetition of the PDSCH corresponding to the last scheduled TB plus 12 subframes plus deltaPDCCH.

Proposal 6 If a NB-IoT UE receives a PDCCH indicating the transmission for multiple UL TBs, UE stop drx-InactivityTimer as legacy, regardless of the HARQ mode configuration for each of the multiple scheduled TB.

Proposal 7 For a NB-IoT UE configured with two HARQ processes, if PDCCH indicating the transmission is for multiple TBs and if at least one HARQ process is configured with HARQ mode B, UE starts drx-InactivityTimer in the subframe containing the last repetition of the PUSCH corresponding to the last scheduled TB plus 1 subframe plus deltaPDCCH.

< impact on HARQ RTT Timer >

Proposal 8 For multiple TB scheduling with the same HARQ feedback enabled/disabled configuration, HARQ RTT Timer is calculated as legacy.

* For multiple TB scheduling with the same HARQ feedback enabled/disabled configuration (by RRC/DCI), HARQ RTT Timer for HARQ process with HARQ feedback enabled is calculated as legacy (can further check in offline 308)

Proposal 9 For multiple TB scheduling with mixed HARQ feedback enabled/disabled configuration, if HARQ-ACK bundling is configured, HARQ RTT Timer is calculated as legacy (i.e. as in Rel-17)

* For multiple TB scheduling with mixed HARQ feedback enabled/disabled configuration (by RRC), if HARQ-ACK bundling is configured, HARQ RTT Timer for HARQ process with HARQ feedback enabled is calculated as legacy.

Proposal 10 For multiple TB scheduling with mixed HARQ feedback enabled/disabled configuration, if HARQ-ACK bundling is not configured, HARQ RTT Timer is calculated based on the number of scheduled TBs with DL HARQ feedback enabled.

* QC thinks this might not work in all cases and thinks we should not change
* Huawei thinks p10 aligns with RAN1 understanding and then supports it. Ericsson agrees. Nokia also agrees
* Continue in offline 308

< PUR >

Proposal 11 Don’t introduce HARQ mode configuration for PUR in IoT NTN.

* HARQ mode configuration is not applicable for PUR in IoT NTN

Agreements:

1. For NB-IoT UEs configured with two HARQ processes and at least one of them is configured with HARQ feedback disabled, RAN2 does not change the operation on drx-InactivityTimer for single-TB scheduling case.
2. For a HARQ process configured as HARQ feedback disabled by RRC and further reversed to HARQ feedback enabled by DCI, UE behaviour on DRX follows the case when HARQ feedback is disabled.
3. For multiple UL TBs scheduling, it is up to network implementation to configure multiple TBs using HARQ processes in the same or different HARQ modes. Start time for UL HARQ RTT timer for mode A will not change
4. For multiple TB scheduling with the same HARQ feedback enabled/disabled configuration (by RRC/DCI), HARQ RTT Timer for HARQ process with HARQ feedback enabled is calculated as legacy (can further check in offline 308)
5. For multiple TB scheduling with mixed HARQ feedback enabled/disabled configuration (by RRC), if HARQ-ACK bundling is configured, HARQ RTT Timer for HARQ process with HARQ feedback enabled is calculated as legacy.
6. HARQ mode configuration is not applicable for PUR in IoT NTN

* [AT123bis][308][IoT-NTN Enh] HARQ enhancements (Oppo)

Scope: continue the discussion on remaining proposals from [R2-2309527](file:///C:\Data\3GPP\Extracts\R2-2309527%20-%20Discussion%20on%20HARQ%20enhancement%20for%20IoT%20NTN.doc) and possibly other urgent issues

Intended outcome: offline summary

F2F schedule: FFS

Deadline for rapporteur's summary (in R2-2311321): Friday 2023-10-13 08:00

[R2-2309657](file:///C:\Data\3GPP\Extracts\R2-2309657%20Remaining%20Issues%20on%20HARQ%20Enhancement%20for%20IoT%20NTN.docx) Remaining Issues on HARQ Enhancement for IoT NTN vivo discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309701](file:///C:\Data\3GPP\Extracts\R2-2309701%20Remaining%20issues%20of%20HARQ%20enhancement.DOCX) Remaining issues of HARQ enhancement Huawei, Turkcell, HiSilicon discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309752](file:///C:\Data\3GPP\Extracts\R2-2309752%20Discussion%20on%20HARQ%20enhancements%20in%20IoT%20NTN.docx) Discussion on HARQ enhancements in IoT NTN CATT discussion Rel-18

[R2-2309758](file:///C:\Data\3GPP\Extracts\R2-2309758%20Discussion%20on%20HARQ%20enhancement.doc) Discussion on HARQ enhancement Xiaomi discussion Rel-18

[R2-2309781](file:///C:\Data\3GPP\Extracts\R2-2309781%20On%20Disabling%20HARQ%20Feedback%20in%20IoT-NTN.docx) On Disabling HARQ Feedback in IoT-NTN MediaTek Inc. discussion

[R2-2309956](file:///C:\Data\3GPP\Extracts\R2-2309956%20Views%20on%20some%20remaining%20issues%20for%20HARQ%20in%20IoT%20NTN.docx) Views on some remaining issues for HARQ in IoT NTN Lenovo discussion Rel-18

[R2-2310181](file:///C:\Data\3GPP\Extracts\R2-2310181%20IoT%20HARQ%20process.doc) DCI-based HARQ feedback overriding solution Qualcomm Incorporated discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310269](file:///C:\Data\3GPP\Extracts\R2-2310269%20Discussion%20on%20the%20HARQ%20enhancement%20for%20IoT-NTN.docx) Discussion on the HARQ enhancement for IoT-NTN CMCC discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310651](file:///C:\Data\3GPP\Extracts\R2-2310651%20Further%20discussion%20on%20HARQ%20enhancements%20for%20IoT%20NTN.docx) Further discussion on HARQ enhancements for IoT NTN Nokia, Nokia Shanghai Bell discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310805](file:///C:\Data\3GPP\Extracts\R2-2310805%20(R18%20IoT-NTN%20WI%20AI%207.6.2.1)%20-%20disabling%20HARQ%20feedback.docx) Disabling HARQ feedback for IoT-NTN Interdigital, Inc. discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310820](file:///C:\Data\3GPP\Extracts\R2-2310820%20Remaining%20issues%20of%20HARQ%20enhancements.docm) Remaining issues of HARQ enhancements ZTE Corporation, Sanechips discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2311243](file:///C:\Data\3GPP\Extracts\R2-2311243%20-%20R18%20IoT%20NTN%20HARQ%20enhancements.docx) R18 IoT NTN HARQ enhancements Ericsson discussion Rel-18 IoT\_NTN\_enh-Core

#### 7.6.2.2 GNSS operation enhancements

[R2-2309782](file:///C:\Data\3GPP\Extracts\R2-2309782%20Enhancements%20on%20GNSS%20operation.docx) Enhancements on GNSS operation MediaTek Inc. discussion

< GNSS measurement reporting >

Proposal 1a: If GNSS measurement is completed within the measurement gap, upon measurement completion GNSS validity duration report MAC CE may trigger SR.

* ZTE disagree and CBRA should be used. Ericsson agrees
* Nokia supports the proposal
* Samsung agrees with the intention of the proposal and thinks we should remove “may”
* QC thinks we should probably discuss this related to the TAT

Proposal 1b: If GNSS measurement is completed after the measurement gap, upon measurement completion GNSS validity duration report MAC CE will trigger SR.

* ZTE thinks this would be a failure case

Proposal 2a: For UE autonomous GNSS measurement trigger, if GNSS measurement is completed within the measurement timer, upon measurement completion GNSS validity duration report MAC CE may trigger SR.

Proposal 2b: For UE autonomous GNSS measurement trigger, if GNSS measurement is completed after the measurement timer, upon measurement completion GNSS validity duration report MAC CE will trigger SR.

Proposal 3: For UE autonomously trigger during the DRX inactivity time, upon GNSS measurement completion GNSS validity duration report MAC CE may trigger SR.

Proposal 4: RAN2 will introduce a new duration D after the measurement gap/time. If UE cannot complete random access before the end of duration D after measurement gap/timer, UE moves to idle. FFS for the value of duration D.

* Nordic Semiconductor supports it. Google also supports. ZTE also supports
* QC thinks this is not needed. Ericsson and Nokia also think this is not needed. Oppo also thinks this is not needed. Samsung/HW also agree.

< Configurations >

Proposal 5: GNSS Measurement Command MAC CE contains 4-bit GNSS measurement gap with component values: [1,2,3,4,5,6,7,13,19,25,31].

* Ericsson thinks we should have it RRC configured with a 0 size MAC CE. Oppo thinks the Ericsson proposal would not work for the CP solution
* QC agrees with Ericsson on the RRC configuration but not on the 0 size MAC CE
* Nokia agrees with p5.
* ZTE thinks this is for NW triggered measurement and is ok to support this
* QC thinks this configuration is not needed for CP solution.

Proposal 6: A new RRC timer T3xx is configured by RRC signaling, where UE can re-acquire the GNSS position fix autonomously.

Proposal 7: The component values of the RRC timer T3xx configuration are: [1,2,3,4,5,6,7,13,19,25,31].

< AS operation suspend/resume >

Proposal 8a: The UE AS operation should be resumed upon completion of UE’s GNSS measurement, at least within the measurement gap.

Proposal 8b: The UE AS operation should be suspended when UE is performing GNSS measurement during the GNSS measurement timer.

Proposal 8c: The UE AS operation should be resumed upon UE completing GNSS measurement, at least within the GNSS measurement timer.

< Duration X/Y >

Proposal 9: A new RRC parameter is introduced in dedicated RRC signalling to enable/disable duration X.

* Oppo wonders how this works for NB-IoT CP solution (how can the NW provide this before msg5?)
* Agreed

Proposal 10: A new RRC parameter is introduced in dedicated RRC signalling to configure duration Y when timeAlignmentTimer is infinity.

* Agreed

< Other >

Proposal 11: UE does not report GNSS position fix time duration when the remaining GNSS validity duration is infinity.

* Nokia thinks this is not correct

Agreements:

1. A new RRC parameter is introduced in dedicated RRC signalling to enable/disable duration X.
2. A new RRC parameter is introduced in dedicated RRC signalling to configure duration Y when timeAlignmentTimer is infinity.

* [AT123bis][309][IoT-NTN Enh] GNSS Enhancements (Mediatek)

Scope: continue the discussion on GNSS enhancements

Intended outcome: offline summary

F2F schedule: FFS

Deadline for rapporteur's summary (in R2-2311321): Friday 2023-10-13 08:00

[R2-2310821](file:///C:\Data\3GPP\Extracts\R2-2310821%20Remaining%20issues%20of%20GNSS%20enhancements.docx) Remaining issues of GNSS enhancements ZTE Corporation, Sanechips discussion Rel-18 IoT\_NTN\_enh-Core

< When and how to report the GNSS validity duration MAC CE >

Observation 1: Even the GNSS position fix time duration can kept unchanged during the whole connection, as there are some large values in the value range of GNSS position fix time duration, it still can be assumed that the reported GNSS position fix time duration and also the configured gap may be possibly aggressive, e.g., (much) longer than the time period that the UE actually needs to perform the GNSS measurement. Then it may be highly possible for UE to finish GNSS measurement earlier than the end of measurement gap.

Proposal 1a: If a remaining GNSS validity duration report is triggered and there are no available UL-SCH resources, contention based Random Access procedure can be initiated by the UE to request UL resource to send this report.

Proposal 1b: No SR is triggered for the remaining GNSS validity duration report.

< whether another duration D is needed >

Proposal 2a: After successful GNSS measurement, UE should finish the remaining GNSS validity duration report before the end of a duration D after the end of the measurement gap (aperiodic GNSS measurement gap or the autonomous GNSS measurement timer).

Proposal 2b: UE should go to IDLE or trigger RLF if the remaining GNSS validity duration is not reported before end of duration D.

Proposal 2c: The duration D is configured by eNB.

< Duration X and extension of original GNSS validity duration >

Proposal 3a: If timeAlignmentTimer is infinity, a duration X can be configured via RRC signaling, e.g., in Msg4 for IoT UE using CP solution or in Msg4/RRC reconfiguration message for IoT UE using UP solution.

Proposal 3b: Upon receiving the indication that the GNSS position becomes out-of-date, UE would apply duration X (if configured), e.g., to keep UL transmission without GNSS re-acquisition.

< Configuration for measurement gap >

Proposal 4: Only one common measurement gap is configured via RRC, e.g., Msg4. And this common measurement gap can be applied to both NW-triggered GNSS measurement and autonomous GNSS measurement.

< Granularity of reported GNSS validity duration >

Proposal 5: RAN2 needs to introduce finer values, e.g., in unit of milliseconds, for the value range of UE remaining GNSS validation duration report during connected mode.

< Enable/disable of autonomous GNSS reacquisition >

Proposal 6: The eNB can enable autonomous GNSS reacquisition in UE side via Msg4. The following disable or (re)enable configuration can be provided via RRC reconfiguration message for UE using UP solution.

< Can the position be maintained during duration X? >

Proposal 7: RAN2 further discuss whether other features related UE location, e.g., location-based connected mode mobility, can still be feasible in duration X.

[R2-2309531](file:///C:\Data\3GPP\Extracts\R2-2309531%20GNSS%20operation.doc) Discussion on GNSS operation for IoT NTN OPPO discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309658](file:///C:\Data\3GPP\Extracts\R2-2309658%20Discussion%20on%20GNSS%20Operation%20for%20IoT%20NTN.docx) Discussion on GNSS Operation for IoT NTN vivo discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309702](file:///C:\Data\3GPP\Extracts\R2-2309702%20Discussion%20on%20the%20impact%20of%20GNSS%20measurement.doc) Discussion on the impact of GNSS measurement Huawei, Turkcell, HiSilicon discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309751](file:///C:\Data\3GPP\Extracts\R2-2309751%20Discussion%20on%20GNSS%20operation%20enhancements.docx) Discussion on GNSS operation enhancements CATT discussion Rel-18

[R2-2309757](file:///C:\Data\3GPP\Extracts\R2-2309757%20Discussion%20on%20GNSS%20operation%20enhancement.doc) Discussion on GNSS operation enhancement Xiaomi discussion Rel-18

[R2-2309957](file:///C:\Data\3GPP\Extracts\R2-2309957%20Views%20on%20some%20remaining%20issues%20for%20GNSS%20operations%20%20in%20IoT%20NTN.docx) Views on some remaining issues for GNSS operations in IoT NTN Lenovo discussion Rel-18

[R2-2309997](file:///C:\Data\3GPP\Extracts\R2-2309997%20Remaining%20issues%20on%20the%20GNSS%20opeartion.docx) Remaining issues on the GNSS operation Google Inc. discussion Rel-18

[R2-2310184](file:///C:\Data\3GPP\Extracts\R2-2310184%20GNSS%20operation.doc) GNSS fix in RRC\_CONNECTED Qualcomm Incorporated discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310270](file:///C:\Data\3GPP\Extracts\R2-2310270%20Discussion%20on%20GNSS%20enhancement%20for%20IoT-NTN.docx) Discussion on GNSS enhancement for IoT-NTN CMCC discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310323](file:///C:\Data\3GPP\Extracts\R2-2310323.doc) Concluding critical issues in improved GNSS operation Apple discussion Rel-18 IoT\_NTN\_enh

[R2-2310650](file:///C:\Data\3GPP\Extracts\R2-2310650_GNSS%20validity%20reporting.docx) GNSS Validity duration Reporting Nordic Semiconductor ASA discussion

* Revised in R2-2311258

[R2-2311258](file:///C:\Data\3GPP\RAN2\Docs\R2-2311258.zip) GNSS Validity duration Reporting Nordic Semiconductor ASA discussion

[R2-2310652](file:///C:\Data\3GPP\Extracts\R2-2310652%20Further%20discussion%20on%20GNSS%20operation%20enhancement%20in%20Rel-18%20IoT%20NTN.docx) Further discussion on GNSS operation enhancement in Rel-18 IoT NTN Nokia, Nokia Shanghai Bell discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310806](file:///C:\Data\3GPP\Extracts\R2-2310806%20(R18%20IoT-NTN%20WI%20AI%207.6.2.2)%20GNSS%20enhancements.docx) GNSS acquisition and reporting for IoT NTN Interdigital, Inc. discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2311036](file:///C:\Data\3GPP\Extracts\R2-2311036%20On%20improved%20GNSS%20operation%20for%20IoT%20NTN.docx) On improved GNSS operation for IoT NTN Samsung Electronics Polska discussion Rel-18 IoT\_NTN\_enh

[R2-2311086](file:///C:\Data\3GPP\Extracts\R2-2311086.docx) Discussion of GNSS operation enhancements SHARP Corporation discussion [R2-2308617](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2308617.zip) Late

[R2-2311242](file:///C:\Data\3GPP\Extracts\R2-2311242%20-%20R18%20IoT%20NTN%20GNSS%20operation%20enhancements.docx) R18 IoT NTN GNSS operation enhancements Ericsson discussion Rel-18 IoT\_NTN\_enh-Core

### 7.6.3 Mobility Enhancements

[R2-2309958](file:///C:\Data\3GPP\Extracts\R2-2309958%20Views%20on%20some%20remaining%20issues%20for%20mobility%20in%20IoT%20NTN.docx) Views on some remaining issues for mobility in IoT NTN Lenovo discussion Rel-18

#### 7.6.3.1 Enhancements for neighbour cell measurements

[R2-2310628](file:///C:\Data\3GPP\Extracts\R2-2310628%20On%20enhancements%20for%20neighbour%20cell%20measurements.docx) On enhancements for neighbour cell measurements Samsung Electronics Polska discussion Rel-18 IoT\_NTN\_enh

< Measurement configuration and configuration >

Proposal 1: t-ServiceStartNeigh is per neighbour cell.

Proposal 2: To indicate an intra or inter-frequency (cell) having the same ephemeris as serving cell, either explicit indication in SIB3 and SIB5, or implicit via pre-defined satelliteId=0 value is introduced.

Proposal 3: Upon absence of satellite IDs for intra-frequency, the UE assumes Rel-17 behavior for intra-frequency measurements, i.e measurement according to UE implementation.

Proposal 4: Upon absence of satellite IDs for inter-frequency, the UE assumes Rel-17 behavior for inter-frequency measurements, i.e measurement according to UE implementation.

Proposal 5: If SIBxx is present, then satellite IDs in either SIB3, SIB5 or both SIB3 and SIB5 shall be present.

Observation 1: To integrate NTN with a terrestrial network, an inter or intra-frequency should be able to be NTN, TN or both NTN and TN.

Proposal 6: Enable signaling that an inter or intra-frequency is NTN, TN or both TN and NTN.

Proposal 7: Introduce choice structure in inter and intra-frequency signaling to indicate that the frequency is NTN, TN or both NTN and TN.

Proposal 8: Agree TP in appendix A1 and A2.

< Acquiring New SIB >

Observation 2: Without specified rules on how to acquire T318, there will be restrictions on how network can schedule SIBxx.

Proposal 9: If UE is acquiring SIBxx, the T318 is not stopped when SIB31 is succesfully acquired. T318 expiry does not trigger RLF if SIBxx is being acquired (as in Appendix A3).

Proposal 10: Current condition on triggering SIBxx acquiry as in Running CR is sufficient.

Proposal 11: RAN2 to discuss how UE acquires target cell neighbour cell assistance information during handovers.

< Neighbour cell measurements triggering >

Proposal 12: RAN2 to consider use case-based / traffic-based conditions for not performing neighbour cell measurements.

< RLF procedures >

Proposal 13: Allow sending UE context in advance for faster RLF procedures.

[R2-2310411](file:///C:\Data\3GPP\Extracts\R2-2310411%20Remaining%20issues%20on%20mobility%20enhancements.docx) Remaining issues on mobility enhancements Huawei, HiSilicon, Turkcell discussion Rel-18 IoT\_NTN\_enh-Core

< SIB aspects >

Proposal 1: Satellite assistance information is provided per frequency, and not associated with PCIs. The satellite IDs for intra-frequency measurements are in SIB3 as in the current running CR (no need to place them into SIB4).

Proposal 2: Introduce satellite ID for serving satellite (in SIB31) as well. RAN2 does not consider implicitly reusing serving satellite assistance information.

Proposal 3：t-ServiceStartNeigh is set as the earliest start time among all neighbour cells across different frequencies, or set per frequency or per satellite, not per neighbour cell.

Proposal 4：RAN2 discuss how to solve the case where T318 is stopped before successful acquisition of SIBxx.

1) Solution 1:UE stops T318 when both SIB31 and SIBxx have been acquired;

2) Solution 2: Add a new timer for SIBxx acquisition. When UE acquires SIB31, T318 is stopped as in legacy, and if SIBxx is not obtained, UE start the new timer, and goes to RRC\_IDLE if SIBxx is not acquired upon the expiry of the new timer.

Proposal 5: Separate reference locations are introduced for earth-quasi fixed cells and earth-moving cells.

Proposal 6: A new t-Service IE is introduced in SIB3-NB to indicate RRC\_CONNECTED UEs to initiate the neighbour cell measurements before that t-Service (to differentiate from the R17 t-Service to be used for measurements initiation in RRC\_IDLE).

< Measurement aspects >

Proposal 7: For both RRC\_CONNECTED and RRC\_IDLE, time/Location based neighbour cell measurement triggering can be configured together with the existing RSRP based triggering. If configured jointly, the UE starts measure neighbour cell when either of the triggering condition is met.

Proposal 8: Regarding Connected mode measurement initiation for eMTC UEs, time-based configuration is in SIB3, location-based configuration is in SIB31, legacy RSRP-based configuration (s-Measure) is in measObject. No signalling optimisation is introduced.

[R2-2309528](file:///C:\Data\3GPP\Extracts\R2-2309528%20-%20Discussion%20on%20mobility%20enhancement%20for%20IoT%20NTN.doc) Discussion on mobility enhancement for IoT NTN OPPO discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309762](file:///C:\Data\3GPP\Extracts\R2-2309762%20Discussion%20on%20UE%20behavior%20when%20serving%20cell%20t-service%20expires.doc) Discussion on UE behavior when serving cell t-service expires Xiaomi discussion Rel-18

[R2-2309783](file:///C:\Data\3GPP\Extracts\R2-2309783%20Enhancements%20on%20neighbour%20cell%20measurement.docx) Enhancements on neighbor cell measurement MediaTek Inc. discussion

[R2-2310183](file:///C:\Data\3GPP\Extracts\R2-2310183%20IoT%20mobility.doc) Measurement and Mobility enhancements Qualcomm Incorporated discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310271](file:///C:\Data\3GPP\Extracts\R2-2310271%20Discussion%20on%20mobility%20enhancements%20for%20IoT-NTN.docx) Discussion on mobility enhancements for IoT-NTN CMCC discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310324](file:///C:\Data\3GPP\Extracts\R2-2310324.doc) Neighbour cell measurements before RLF for eMTC-NTN Apple, MediaTek Inc. discussion Rel-18 IoT\_NTN\_enh

[R2-2310807](file:///C:\Data\3GPP\Extracts\R2-2310807%20(R18%20IoT-NTN%20WI%20AI%207.6.3.1)%20-%20RLF%20enhancement%20discontinuous%20coverage.docx) Fast RLF and re-establishment in the discontinuous coverage scenario Interdigital, Inc. discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310822](file:///C:\Data\3GPP\Extracts\R2-2310822%20Remaining%20issues%20of%20mobility%20enhancements.docx) Remaining issues of mobility enhancements ZTE Corporation, Sanechips discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2311012](file:///C:\Data\3GPP\Extracts\R2-2311012-IoT-NTN-Mobility-Enhancements-V1.docx) On Remaining issues for IoT-NTN Mobility Enhancements Nokia, Nokia Shanghai Bell discussion

[R2-2311069](file:///C:\Data\3GPP\Extracts\R2-2311069%20-%20Discussion%20on%20gaps%20for%20neighbour%20cell%20measurements%20in%20IoT%20NTN.docx) Discussion on gaps for neighbour cell measurements in IoT NTN Ericsson discussion Rel-18 IoT\_NTN\_enh-Core [R2-2308811](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2308811.zip)

[R2-2311240](file:///C:\Data\3GPP\RAN2\Docs\R2-2311240.zip) Discussion on triggering RA for RRC connection re-establishment in IoT NTN Ericsson discussion Rel-18 IoT\_NTN\_enh-Core Late

#### 7.6.3.2 Other

[R2-2310192](file:///C:\Data\3GPP\Extracts\R2-2310192%20-%20NB-IoT%20NTN%20Coarse%20UE%20location%20reporting%20v5.docx) NB-IoT NTN Coarse UE location reporting Inmarsat, Viasat, Sateliot, Novamint, ESA, Thales discussion Rel-18 IoT\_NTN\_enh-Core

Observation 1: UE location reporting to the network is a fundamental requirement for NTN to support:

- Basic Regulatory Compliance

- Efficient Radio Resource Management and Cell Mapping

- Efficient Mobility Management

Observation 2: RRC CoarseLocationInfo mechanism was introduced in Release-17 IoT NTN for eMTC but not for NB-IoT NTN, due to lack of AS security and no alternative solution was provided.

Observation 3: In practice, we have to recognize that majority of NB-IoT NTN devices will focus on CP CIoT Optimizations with Data over NAS, thus AS security cannot be assumed to be in place.

Observation 4: Methods relying on LPP cannot be relied upon, if anything because LPP is not supported by most NB-IoT UE implementations. This is already affecting Release-17 UE and it’s clear that we must identify a different solution.

Observation 5: It is difficult to justify privacy concerns when reporting Coarse UE location at a level of granularity equivalent to the size of a terrestrial cell (e.g. 5 km or larger), given that such concerns with knowledge of the UE location by an external observer within the granularity of a cell do not exist in terrestrial networks.

Proposal 1: Specify a Release-18 mechanism for UE location reporting as early as possible during the initial access procedure for NB-IoT NTN devices, including those devices with support for CP CIoT EPS Optimization only.

• At least coarse UE location on the order of 50-100 km shall be supported;

• Coarse UE location on the order of 5-10 km is desirable.

• Specify a method to broadcast the request for Coarse UE Location to a group of UE or to all UE within a cell.

• AS security should not be assumed. SA3 should consider an exception, if necessary.

• Consider specifying support for full UE location reporting over NAS with NAS security activated.

* Inmarsat reports that also Gatehouse, Echostar, Skylo support this proposal
* MTK thinks we have no time to address this in Rel-18 at this stage
* Samsung thinks we can try to do something or this, without necessarily involving SA3
* HW thinks that considering all the constraints the best we can do is to think of a NAS based solution and involve CT1 and SA2
* Ericsson would oppose asking CT1 to work on a NAS based solution but would be fine to go for a RAN2 based solution,
* ZTE thinks that a NAS based solution would be feasible but we cannot decide on this in RAN2
* MTK thinks we cannot have a RAN2 based solution without AS security. Apple agrees
* Continue in offline 310 to check the content of a possible LS to CT1 (to/cc SA2) asking whether it’s possible to have a NAS based solution for UE location reporting for NB-IoT in Rel-18
* [AT123bis][310][IoT-NTN Enh] LS to CT1 (Inmarsat)

Scope: discuss the content of a possible LS to CT1 (to/cc SA2)

Intended outcome: draft LS

Deadline for draft LS (in R2-2311322): Friday 2023-10-13 08:00

[R2-2309659](file:///C:\Data\3GPP\Extracts\R2-2309659%20Discussion%20on%20CHO%20Enhancement%20for%20IoT%20NTN.docx) Discussion on CHO Enhancement for IoT NTN vivo discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310325](file:///C:\Data\3GPP\Extracts\R2-2310325.doc) Mobility enhancement in IoT NTN Apple discussion Rel-18 IoT\_NTN\_enh

[R2-2310629](file:///C:\Data\3GPP\Extracts\R2-2310629%20On%20other%20mobility%20enhancements%20for%20IoT%20NTN.docx) On other mobility enhancements for IoT NTN Samsung Electronics Polska discussion Rel-18 IoT\_NTN\_enh

### 7.6.4 Enhancements to discontinuous coverage

[R2-2310919](file:///C:\Data\3GPP\Extracts\R2-2310919.docx) Enhancements to discontinuous coverage Samsung Electronics Iberia SA discussion Rel-18 IoT\_NTN\_enh-Core

< Out-of-coverage information for discontinuous coverage >

Observation 1: The notion of “idle mode tasks related to NTN” can be enhanced in Release 18.

Proposal 1: Measurement assistance information can be provided to control how the UE shall perform idle mode tasks (i.e. whether a UE can power down specific frequencies during discontinuous coverage) in a discontinuous coverage NTN.

(related to proposal below?

From [R2-2311232](file:///C:\Data\3GPP\Extracts\R2-2311232%20-%20Measurement%20information%20to%20assist%20cell%20search%20after%20a%20coverage%20gap.docx): Proposal 1: Provide carrier frequency of the next cell(s) in SIB32 to facilitate cell selection and reduce service interruption after an NTN coverage gap.

)

< Establishing a connection with discontinuous coverage network >

Proposal 2(a): The UE verifies whether it has enough time to finish a given RRC procedure before the start of the discontinuous coverage.

Proposal 2(b): The UE may not initiate a given RRC procedure, or wait for the next available satellite coverage period, if there is not enough time for the UE to finish the procedure.

Proposal 3: RAN2 to agree the TP for running CR for TS 36.331 in Annex A in this document.

< RRC release for discontinuous coverage >

Observation 2: RAN2 is considering two options for RRC connection enhancements; (1) explicit RRC Release using a new cause, and (2) UE Autonomous release upon the UE detection of a coverage gap.

Observation 3: both explicit RRC release with a new cause value and UE autonomous release may be considered for releasing the UE upon detection of discontinuous coverage.

Proposal 4: Explicit RRC Release using a new RRC Release cause for discontinuous coverage is introduced to ensure better alignment between the network and the UE on the UE release due to discontinuous coverage.

Proposal 5: Certain idle mode procedures are paused if a UE receives an RRC release with the new RRC release cause.

Proposal 6: The new RRC release cause is used to re-direct a UE from a non-discontinuous coverage network to a discontinuous coverage network.

Proposal 7: Discontinuous coverage-related information is provided in a re-direct message when being re-directed to a discontinuous coverage network.

[R2-2309660](file:///C:\Data\3GPP\Extracts\R2-2309660%20Discussion%20on%20Discontinuous%20Coverage.docx) Discussion on Discontinuous Coverage vivo discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309703](file:///C:\Data\3GPP\Extracts\R2-2309703%20Remaining%20issues%20of%20discontinuous%20coverage.doc) Remaining issues of discontinuous coverage Huawei, Turkcell, HiSilicon discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309753](file:///C:\Data\3GPP\Extracts\R2-2309753%20Discussion%20on%20discontinuous%20coverage%20enhancement.docx) Discussion on discontinuous coverage enhancement CATT discussion Rel-18

[R2-2309882](file:///C:\Data\3GPP\Extracts\R2-2309882%20Discussion%20on%20TN%20coverage%20for%20discontinuous%20coverage.docx) Discussion on TN coverage for discontinuous coverage ASUSTeK discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2309959](file:///C:\Data\3GPP\Extracts\R2-2309959%20Views%20on%20some%20remaining%20issues%20for%20discontinuous%20coverage%20in%20IoT%20NTN%20(Revision%20of%20R2-2308009).docx) Views on some remaining issues for discontinuous coverage in IoT NTN Lenovo discussion Rel-18

[R2-2310021](file:///C:\Data\3GPP\Extracts\R2-2310021%20Discussion%20on%20enhancement%20to%20discontinuous%20coverage%20for%20IoT%20NTN.docx) Discussion on enhancement to discontinuous coverage for IoT NTN Transsion Holdings discussion Rel-18

[R2-2310071](file:///C:\Data\3GPP\Extracts\R2-2310071%20Considerations%20on%20Supporting%20Discontinuous%20Coverage.docx) Considerations on Supporting Discontinuous Coverage NEC discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310182](file:///C:\Data\3GPP\Extracts\R2-2310182%20DC%20enhancement.doc) RRC release procedure in discontinuous coverage Qualcomm Incorporated discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310808](file:///C:\Data\3GPP\Extracts\R2-2310808%20(R18%20IoT-NTN%20WI%20AI%207.6.4)%20-%20discontinuous%20coverage.docx) RRC Release in discontinuous coverage Interdigital, Inc. discussion Rel-18 IoT\_NTN\_enh-Core

[R2-2310826](file:///C:\Data\3GPP\Extracts\R2-2310826%20Remaining%20issues%20of%20discontinuous%20coverage.docx) Remaining issues of discontinuous coverage ZTE Corporation, Sanechips discussion Rel-18 IoT\_NTN\_enh-Core [R2-2307590](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2307590.zip)

[R2-2311013](file:///C:\Data\3GPP\Extracts\R2-2311013-Discontinuous%20coverage%20for%20IoT%20NTN.docx) Discussion on discontinuous coverage Enhancements Nokia, Nokia Shanghai Bell discussion

[R2-2311232](file:///C:\Data\3GPP\Extracts\R2-2311232%20-%20Measurement%20information%20to%20assist%20cell%20search%20after%20a%20coverage%20gap.docx) Measurement information to assist cell search after a coverage gap Ericsson discussion Rel-18 IoT\_NTN\_enh-Core [R2-2306466](file:///C:\Data\3GPP\archive\RAN2\RAN2%23122\Tdocs\R2-2306466.zip)

## 7.7 NR NTN enhancements

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

Time budget: 1 TU

Tdoc Limitation: 4 tdocs

### 7.7.1 Organizational

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

Incoming LSs

[R2-2309407](file:///C:\Data\3GPP\Extracts\R2-2309407_C1-236567.docx) LS on the service requirement of restricting satellite access RAT type (C1-236567; contact: Google) CT1 LS in Rel-18 5GSAT\_Ph2 To:SA1 Cc:SA2, RAN2

* Noted

[R2-2309421](file:///C:\Data\3GPP\Extracts\R2-2309421_R1-2308566.docx) Reply LS to RAN2 on unchanged PCI (R1-2308566; contact: CATT) RAN1 LS in Rel-18 NR\_NTN\_enh-Core To:RAN2

* Noted

[R2-2309422](file:///C:\Data\3GPP\Extracts\R2-2309422_R1-2308568.docx) Reply LS on RACH-less Handover (R1-2308568; contact: Samsung) RAN1 LS in Rel-18 NR\_NTN\_enh-Core To:RAN2

* CATT wonders if the answer to Q3 means that RAN2 should not discuss power control anymore. Samsung thinks this is the case, unless RAN1 comes back to us for this
* Noted

[R2-2309438](file:///C:\Data\3GPP\Extracts\R2-2309438_R3-234664.docx) Reply LS on Common Signaling in (C)HO (R3-234664; contact: Qualcomm) RAN3 LS in Rel-18 NR\_NTN\_enh-Core To:RAN2

* Oppo thinks that RAN2 can still discuss the intra-gNB case
* Noted

[R2-2309476](file:///C:\Data\3GPP\Extracts\R2-2309476_S2-2310013.docx) Reply LS on time-based trigger condition in NG HO for NR NTN (S2-2310013; contact: Samsung) SA2 LS in Rel-18 5GSAT\_Ph2, NR\_NTN\_enh-Core To:RAN3 Cc:RAN2

* Noted

Rapporteurs input

[R2-2310084](file:///C:\Data\3GPP\Extracts\R2-2310084%20open%20issues%20on%20NR%20NTN%20enh%20(Thales).docx) Remaining Issues on NR Non-Terrestrial Networks (NTN) THALES discussion Rel-18 NR\_NTN\_enh

* Noted

[R2-2310085](file:///C:\Data\3GPP\Extracts\R2-2310085%20WP%20RAN2.docx) R18 WI NR-NTN-enh work plan at RAN1, 2 and 3 THALES Work Plan Rel-18 NR\_NTN\_enh

* Noted

[R2-2310841](file:///C:\Data\3GPP\Extracts\R2-2310841%20Remaining%20UP%20open%20issues_post%20123.docx) MAC open issues in NTN InterDigital discussion Rel-18 NR\_NTN\_enh-Core

* Noted

Running CRs

[R2-2310157](file:///C:\Data\3GPP\Extracts\R2-2310157__38.306%20draftCR%20-%20NR%20NTN%20Enh%20-%20UE%20capabilities.docx) UE Capabilities for Rel-18 NR NTN Enh. WI Intel Corporation draftCR Rel-18 38.306 17.6.0 NR\_NTN\_enh-Core

* Endorsed as a basis for further updates

[R2-2310158](file:///C:\Data\3GPP\Extracts\R2-2310158__38.331%20draftCR%20-%20NR%20NTN%20Enh%20-%20UE%20capabilities.docx) UE Capabilities for Rel-18 NR NTN Enh. WI Intel Corporation draftCR Rel-18 38.331 17.6.0 NR\_NTN\_enh-Core

* Endorsed as a basis for further updates

[R2-2310552](file:///C:\Data\3GPP\Extracts\R2-2310552_Stage%203%20running%2038.304%20CR%20for%20NTN.docx) Stage 3 running 38.304 CR for NTN ZTE Corporation, Sanechips draftCR Rel-18 38.304 17.6.0 NR\_NTN\_enh-Core

* Used as a basis for further updates

[R2-2310840](file:///C:\Data\3GPP\Extracts\R2-2310840%20NTN%20MAC%20running%20CR_post%20123.docx) Stage 3 NTN running CR for 38.321 - RAN2#123 InterDigital draftCR Rel-18 38.321 17.6.0 B NR\_NTN\_enh-Core R2-2309345

* Used as a basis for further updates

[R2-2311230](file:///C:\Data\3GPP\Extracts\R2-2311230%20-%2038331_CR4387_(Rel-18)%20-%20Stage%203%20Running%20RRC%20CR%20for%20NR%20NTN%20Rel-18.docx) Stage 3 Running RRC CR for NR NTN Rel-18 Ericsson CR Rel-18 38.331 17.6.0 4387 - B NR\_NTN\_enh-Core R2-2309341

* Endorsed as a basis for further updates

[R2-2311231](file:///C:\Data\3GPP\Extracts\R2-2311231%20-%20Rapporteur%20s%20input%20to%2038%20331%20regarding%20TN%20area%20information.docx) Rapporteur s input to 38.331 regarding TN area information Ericsson discussion Rel-18 NR\_NTN\_enh-Core

* Noted

[R2-2311255](file:///C:\Data\3GPP\Extracts\R2-2311255%20Stage%202%20running%2038.300%20CR%20for%20NTN%20was%20R2-2309329.docx) Stage-2 running CR for TS 38.300 for Rel-18 NTN enhancements Thales draftCR Rel-18 38.300 17.6.0 NR\_NTN\_enh-Core Late

* Used as a basis for further updates

### 7.7.2 Coverage Enhancements

\*\*\* Intermediate conclusion from F2F offline discussion [002] \*\*\*

* Usage of first R bit LCID extension only applied to UL CCCH/CCCH1 controlled by network.

[R2-2309529](file:///C:\Data\3GPP\Extracts\R2-2309529%20-%20Discussion%20on%20PUCCH%20enhancement%20for%20Msg4%20HARQ-ACK%20in%20NR%20NTN.doc) Discussion on PUCCH enhancement for Msg4 HARQ-ACK in NR NTN OPPO discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1 Indicating request or capability report for PUCCH repetition for Msg4 HARQ-ACK in Msg3 only applies to random access procedure triggered by RRC connection establishment, RRC connection re-establishment or RRC connection resume.

* CATT agrees these cases should be considered but wonders if random access during RRC connected should also be covered. Ericsson thinks this is not needed
* Ericsson also think RAN2 removed the reference to request. Nokia agrees with Ericsson that RAN1 now only consider the capability, not the request anymore
* QC thinks RAN1 is also considering the request case. Vivo agrees
* Indicating request or capability report for PUCCH repetition for Msg4 HARQ-ACK in Msg3 only applies to random access procedure triggered by RRC connection establishment, RRC connection re-establishment or RRC connection resume, i.e. to CCCH/CCCH1 (FFS if this also applies to random access during RRC connected)
* CB Thursday
* Nokia, Huawei, Oppo think that RAN1 discussion is not considering Connected mode
* Updated agreement after CB session: RAN2 continues to focus on a solution to address PUCCH repetition for Msg4 HARQ-ACK in Msg3 for random access procedure triggered by RRC connection establishment, RRC connection re-establishment or RRC connection resume, i.e. to CCCH/CCCH1 (in the future we can consider random access during RRC connected, depending on RAN1)

[R2-2310559](file:///C:\Data\3GPP\Extracts\R2-2310559%20Consideration%20on%20coverage%20enhancements.doc) Consideration on coverage enhancements ZTE Corporation, Sanechips discussion Rel-18

Proposal 1: Postpone the decision on which higher layer signalling to indicate UE’s capability/request for PUCCH repetition for Msg4 ACK until progress has been made on LCID extension discussion in the main session.

Proposal 2: Provided Msg3 signalling to report its capability/request for PUCCH repetition for Msg4 HARQ-ACK is confirmed, UE decides whether to report its capability/request for PUCCH repetition for Msg4 HARQ-ACK bases on implicit indication (e.g., number of repetition, RSRP configuration in SIB), no explicit indication is needed to enable this behavior.

* No explicit NW indication to enable/disable PUCCH repetition for Msg4 HARQ-ACK besides the needed signalling for number of repetition, RSRP configuration in SIB (meaning that if these parameters are signalled, PUCCH repetition for Msg4 HARQ-ACK is enabled)

Proposal 3: An relative RSRP value to rsrp-ThresholdMsg3 is signalled for PUCCH repetition for Msg4 HARQ-ACK.

[R2-2310000](file:///C:\Data\3GPP\Extracts\R2-2310000%20Higher%20layer%20signalling%20for%20PUCCH%20repetition%20for%20Msg4%20HARQ-ACK.doc) Higher layer signalling for PUCCH repetition for Msg4 HARQ-ACK Huawei, HiSilicon discussion Rel-18 NR\_NTN\_enh-Core

Agreements:

1. RAN2 continues to focus on a solution to address PUCCH repetition for Msg4 HARQ-ACK in Msg3 for random access procedure triggered by RRC connection establishment, RRC connection re-establishment or RRC connection resume, i.e. to CCCH/CCCH1 (in the future we can consider random access during RRC connected, depending on RAN1)
2. No explicit NW indication to enable/disable PUCCH repetition for Msg4 HARQ-ACK besides the needed signalling for number of repetition, RSRP configuration in SIB (meaning that if these parameters are signalled, PUCCH repetition for Msg4 HARQ-ACK is enabled)

### 7.7.3 Network verified UE location

[R2-2310560](file:///C:\Data\3GPP\Extracts\R2-2310560%20Consideration%20on%20NW%20verified%20UE%20location.doc) Consideration on NW verified UE location ZTE Corporation, Sanechips discussion Rel-18

Observation 1: There are could be different failure causes leading to multi-RTT measurements failure during change of NTN cell, which can be well addressed by legacy failure procedure defined in LPP and NRPPa specs, while a simple indication to indicate failure due to change of NTN cell maybe too ambiguous.

Observation 2: UE Rx-Tx time difference measurement with offset to calibrate the timing drift due to precompensation will be captured in RAN1 specs with no RAN2 impacts.

Observation 3: Newly agreed offset as defined by RAN1 shall be included as part of the UE Rx-Tx time difference measurements in NR-Multi-RTT-SignalMeasurementInformation, also indication from NW is needed to inform UE it is a task for NW verified UE location so that UE can take necessary adaptions.

Observation 4: It is sufficient for NW to provide the satellite ephemeris together with the time information to LMF to derive position of satellite, no need for UE to provide duplicated information to LMF.

Observation 5: The satellite ephemeris information maybe available in OAM or gNB in different NTH deployment, it is up to RAN3 to discuss the details on how NW provide such information to LMF.

Proposal 1: Current failure procedure defined in LPP and NRPPa protocol can be reused to handle NW verified UE location failure occurred during change of cell, no additional specs work is needed.

* QC thinks that especially in the moving cell case this would be a problem. Relying on legacy procedure would add extra delay. RAN needs a way to react quickly and proactively send information to LMF
* Ericsson agrees with QC
* Continue in offline 304

Proposal 2: Add in NR-Multi-RTT-SignalMeasurementInformation the measurements relevant to RAN1 agreed offset (e.g., the actual index difference between subframe j and subframe i and the DL timing drift due to Doppler over the service link associated with the UE RX-TX time difference measurement period) with detailed definition referred to RAN1 agreements.

* Agreed

Proposal 3: Add indication indicating the requested positioning measurements (e.g.,multi-RTT measurement) is for NW verified UE location in the LPP configuration (e.g, RequestLocationInformation) from location server to UE.

* QC is not sure this is needed. Capability should be sufficient
* Ericsson also thinks this is not really needed

Proposal 4: ephemeris and corresponding time information (e.g., epochTime) is provided to LMF only by gNB, with details up to RAN3 (e.g., on whether OAM or gNB to provide such information).

- Lenovo thinks the UE could use a different ephemeris than the gNB and then it should be reported back by the UE. ZTE thinks this is not common case we need to address here.

* Ephemeris and corresponding time information (e.g., epochTime) is not provided by the UE. How this is provided to the LMF is up to RAN3 (can come back to see whether the problem that the UE could use a different ephemeris – and then should report it back to the gNB – is a valid case to consider)

Proposal 5: Only one capability (i.e., FG 44-3) is defined for UE’s capability to support the feature of network verified UE location in NR NTN.

* Ericsson thinks a new capability would be needed.
* QC thinks that FG 44-3 should not be an RRC capability but an LPP one.
* RAN2 assumes that FG 44-3 should be an LPP capability to be reported to the LMF (no need for other capabilities)

[R2-2309700](file:///C:\Data\3GPP\Extracts\R2-2309700%20Handling%20of%20UE%20location%20verification%20during%20handover.doc) Handling of UE location verification during handover Huawei, Turkcell, HiSilicon discussion Rel-18 NR\_NTN\_enh-Core

Observation 1: If handover occurs between two TX-RX difference measurement procedures, there is no impact on the verification of UE location.

Proposal 1: If handover occurs when the Tx-Rx difference is being measured, the gNB should inform LMF of the handover, same as legacy.

Proposal 2: Send an LS to RAN3 if RAN2 agrees to reuse the legacy mechanism to inform LMF of the handover.

[R2-2310176](file:///C:\Data\3GPP\Extracts\R2-2310176%20Multi%20RTT.doc) Single satellite Multi-RTT based positioning Qualcomm Incorporated discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1 Add a new LPP capability by extending the current multi-RTT positioning capability NR-Multi-RTT-ProvideCapabilities-r16.

Proposal 2 A new flag in NRPPa message (e.g., POSITIONING INFORMATION UPDATE) is introduced to indicate TN-NTN switch, satellite switch with PCI unchanged, Handover success.

Proposal 3 Source sends the flag in NRPPa message (e.g., POSITIONING INFORMATION UPDATE) to LMF before path switch, i.e., receiving end marker.

Proposal 4 Clarify that LMF will start enquiring UE capability upon handover between TN and NTN and send LS to RAN3 to inform potential change in NRPPa signaling.

Proposal 5 To resolve mirror point, LMF sends indication to gNB asking to configure connected mode measurements of neighbor cells in such a way that can resolve the mirror point. Send LS to RAN3 for possible impact to NRPPa message to carry indication.

* Nokia agrees that sending the LS to RAN3 would be beneficial
* Ericsson thinks this is up to RAN3 and we don’t need an LS for this.
* RAN2 understands that to solve the mirror point issue, the measurements reported by RAN should include the information of the cells on the opposite side

Agreements:

1. Add in NR-Multi-RTT-SignalMeasurementInformation the measurements relevant to RAN1 agreed offset (e.g., the actual index difference between subframe j and subframe i and the DL timing drift due to Doppler over the service link associated with the UE RX-TX time difference measurement period) with detailed definition referred to RAN1 agreements.
2. Ephemeris and corresponding time information (e.g., epochTime) is not provided by the UE. How this is provided to the LMF is up to RAN3 (can come back to see whether the problem that the UE could use a different ephemeris – and then should report it back to the gNB – is a valid case to consider)
3. RAN2 assumes that FG 44-3 should be an LPP capability to be reported to the LMF (no need for other capabilities)
4. RAN2 understands that to solve the mirror point issue, the measurements reported by RAN should include the information of the cells on the opposite side

* [AT123bis][304][NR-NTN Enh] NW verified UE location failure during cell change (Qualcomm)

Scope: discuss NW verified UE location failure occurred during change of cell

Intended outcome: offline summary

F2F schedule: Wednesday 2023-10-11 10:00-10:30 Brk3

Deadline for rapporteur's summary (in R2-2311316): Thursday 2023-10-12 08:00

[R2-2311316](file:///C:\Data\3GPP\RAN2\Inbox\R2-2311316.zip) Report of [304][NR-NTN Enh] NW verified UE location failure during cell change Qualcomm Incorporated discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1 send LS to RAN3 clarifying the scenarios of satellite switch cases (except CHO) and ask them how to handle it. Ask question whether existing cause value can be used to handle the satellite switch specially in case of RAN node has not changed.

* HW thinks we don’t need to explicitly need to radd expect CHO in the LS to RAN3
* Agreed (excluding the part on except CHO in the LS)

Proposal 2 Include RAN2 assumption that we expect no LPP impact (in HO/satellite switch except CHO). It is up to RAN3 to decide if any NRPPa signaling update is needed.

* Agreed (excluding the part on except CHO in the LS)

Proposal 3 FFS on CHO scenario.

R2-2311323 Draft LS on NW verified UE location failure during cell change Qualcomm Incorporated LS Out To: RAN3 Rel-18 NR\_NTN\_enh-Core

[R2-2309503](file:///C:\Data\3GPP\Extracts\R2-2309503%20Remaining%20issues%20on%20NW%20verification%20of%20UE%20location%20in%20R18%20NR%20NTN.docx) Remaining issues on NW verification of UE location in R18 NR NTN CATT discussion

[R2-2309989](file:///C:\Data\3GPP\Extracts\R2-2309989%20Views%20on%20some%20remaining%20issues%20for%20network%20verified%20UE%20location.docx) Views on some remaining issues for network verified UE location Lenovo Information Technology discussion Rel-18 NR\_NTN\_enh-Core

[R2-2309990](file:///C:\Data\3GPP\Extracts\R2-2309990.docx) Discussion on Network Verified UE Location TCL discussion [R2-2308706](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2308706.zip)

[R2-2309995](file:///C:\Data\3GPP\Extracts\R2-2309995%20Multiple-RTT%20positioning%20in%20NTN.docx) Multiple-RTT positioning in NTN Quectel discussion

[R2-2310037](file:///C:\Data\3GPP\Extracts\R2-2310037%20network%20verified%20UE%20location.docx) Discussion on network verified UE location in NR NTN THALES discussion Rel-18 NR\_NTN\_enh

[R2-2310133](file:///C:\Data\3GPP\Extracts\R2-2310133%20-%20discussion%20on%20network%20verified%20UE%20location.docx) Discussion on network verified UE location Ericsson discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310147](file:///C:\Data\3GPP\Extracts\R2-2310147%20Open%20issues%20on%20network%20verified%20UE%20location.docx) Open issues on Network verified location Nokia, Nokia Shanghai Bell discussion NR\_NTN\_enh-Core

[R2-2310245](file:///C:\Data\3GPP\Extracts\R2-2310245%20Discussion%20on%20the%20remaining%20issues%20for%20network%20verified%20UE%20location.doc) Discussion on the remaining issues for network verified UE location CMCC discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310418](file:///C:\Data\3GPP\Extracts\R2-2310418%20Discussion%20on%20network%20verified%20UE%20location.doc) Discussion on network verified UE location Xiaomi discussion

[R2-2310985](file:///C:\Data\3GPP\Extracts\R2-2310985_UE%20location%20verification%20by%20Network.docx) UE location verification by Network NEC Telecom MODUS Ltd. discussion [R2-2308450](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2308450.zip)

[R2-2311009](file:///C:\Data\3GPP\Extracts\R2-2311009.docx) Network Verified UE Location in NTN Samsung Electronics Iberia SA discussion NR\_NTN\_enh-Core

### 7.7.4 NTN-TN and NTN-NTN mobility and service continuity enhancements

#### 7.7.4.1 Cell reselection enhancements

[R2-2310046](file:///C:\Data\3GPP\Extracts\R2-2310046%20VSAT%20mobility%20enhancements.docx) Discussion on mobility enhancements for VSAT THALES discussion Rel-18 NR\_NTN\_enh

[R2-2310246](file:///C:\Data\3GPP\Extracts\R2-2310246%20Discussion%20on%20left%20issues%20for%20cell%20reselection.docx) Discussion on left issues for cell reselection CMCC discussion Rel-18 NR\_NTN\_enh-Core

##### 7.7.4.1.1 NTN-TN enhancements

Maximum number of TN coverage area IDs

[R2-2309862](file:///C:\Data\3GPP\Extracts\R2-2309862%20%5bNTN%5d%20Remaining%20issues%20on%20NTN-TN%20cell%20reselection%20enhancement.docx) Remaining issues on NTN-TN cell reselection enhancement LG Electronics France discussion Rel-18 38.331 NR\_NTN\_enh [R2-2307217](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2307217.zip)

Observation 1 A single TN coverage area information has a size of 64 bits.

Proposal 1 The maximum number of the TN coverage area information is 42. Accordingly, the maximum size of the TN coverage area ID is 6 bits.

* The maximum number of TN coverage area information is 32 (5 bits)

Proposal 2 Do not pursue TN-NTN/NTN-TN cell reselection enhancement in Rel-18.

Observation 2 Area information can be efficiently signalled if NW can describe an area having no TN coverage in case when TN coverage has concave shape.

Proposal 3 Allow NW to configure positive area information (TN coverage area) or negative area information (no TN coverage area).

[R2-2310842](file:///C:\Data\3GPP\Extracts\R2-2310842%20(R18%20NR%20NTN%20WI%20AI%207.7.4.1.1)%20NTN-TN%20mobility.docx) NTN-TN mobility and service continuity InterDigital discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: RAN2 considers the largest supported NTN cell (i.e., GEO with 3500km diameter) when determing the maximum number of TN coverage areas.

Proposal 2: The maximum number of TN coverage areas broadcast within SIBxx is 64.

Proposal 3: RAN2 will not specify restrictions on TN coverage description (i.e., description of TN coverage is left to NW implementation)

* RAN2 will not specify restrictions on TN coverage description (i.e., description of TN coverage is left to NW implementation). The signalled TN coverage can describe areas not currently covered by the satellite cell footprint (FFS how to reflect this in the specification)

Proposal 4: Confirm TN coverage information can be broadcast by both (quasi)earth-fixed and earth-moving cells

* Agreed

Proposal 5: Confirm the working assumption “We do not introduce new triggers making the UE reacquire the TN coverage information from SI” in Rel-18.

* Agreed

[R2-2309653](file:///C:\Data\3GPP\Extracts\R2-2309653%20Remaining%20Issues%20on%20Cell%20Reselection%20for%20Power%20Saving.docx) Remaining Issues on Cell Reselection for Power Saving vivo discussion Rel-18 NR\_NTN\_enh-Core

Proposal 3: Up to 16 TN coverage areas can be broadcast.

Whether the new SIB is an essential SIB / Update of TN coverage info / Broadcast of NTN information in TN cell

[R2-2309960](file:///C:\Data\3GPP\Extracts\R2-2309960%20Views%20on%20some%20remaining%20issues%20for%20NTN-TN%20mobility.docx) Views on some remaining issues for NTN-TN mobility Lenovo discussion Rel-18

Proposal 1: The new SIB including the TN coverage information is not an essential SIB for NTN. An NTN-capable UE does not need to consider the cell barred if it is unable to acquire the SIB when scheduled.

* Agreed

Proposal 2: The change of TN coverage information should neither result in system information change notifications nor in a modification of valueTag in SIB1.

* Samsung wonders how SIB should be updated in case of TN coverage areas change
* QC thinks that a change of information regarding a specific area ID should trigger a change notification, but not the additional/removal of area IDs
* Oppo wonders whether we need to introduce a validity duration for the information, maybe the legacy SI update procedure should be followed. ZTE agrees
* CMCC thinks the information should not change too frequently and then we could rely on legacy procedure
* CATT and Huawei support p2. Xiaomi as well
* Intel thinks we could leave the freedom to the NW to signal whether some changes are critical and then notify the UEs.
* Legacy SI update procedure will be used when the network updates the TN coverage information (can further check for moving cell case)

Agreements:

1. The maximum number of TN coverage area information is 32 (5 bits)
2. RAN2 will not specify restrictions on TN coverage description (i.e., description of TN coverage is left to NW implementation). The signalled TN coverage can describe areas not currently covered by the satellite cell footprint (FFS how to reflect this in the specification)
3. TN coverage information can be broadcast by both (quasi)earth-fixed and earth-moving cells
4. The working assumption “We do not introduce new triggers making the UE reacquire the TN coverage information from SI” in Rel-18 is confirmed
5. The new SIB including the TN coverage information is not an essential SIB for NTN. An NTN-capable UE does not need to consider the cell barred if it is unable to acquire the SIB when scheduled.
6. Legacy SI update procedure will be used when the network updates the TN coverage information (can further check for moving cell case)

Proposal 3: Broadcast of NTN information in TN cell is not pursued in this release.

[R2-2311229](file:///C:\Data\3GPP\Extracts\R2-2311229%20-%20NTN%20neighbour%20cell%20information%20in%20TN%20cells.docx) NTN neighbour cell information in TN cells Ericsson, Thales discussion Rel-18 NR\_NTN\_enh-Core

[Observation 1 In a terrestrial cell, neighbour cell information provided in system information (e.g., SIB3/4/5) is insufficient to measure an NTN neighbour cell and secure service continuity between TN and NTN in RRC\_IDLE/RRC\_INACTIVE modes.](#_Toc146877953)

[Observation 2 In RRC\_IDLE/RRC\_INACTIVE mode, service continuity from TN to NTN may be restricted because the network cannot provide UEs with the required satellite assistance information (e.g., ntn-Config-r17).](#_Toc146877954)

[Proposal 1 In TN cells, satellite assistance information, e.g., NTN-config-r17, for NTN neighbour cells can be provided in System Information.](#_Toc146877955)

[R2-2310306](file:///C:\Data\3GPP\Extracts\R2-2310306_NTN-TN%20cell%20reselection%20enhancement_v0.doc) NTN-TN cell reselection enhancement Apple discussion Rel-18 NR\_NTN\_enh-Core

Proposal 7: Support to provide the NTN neighbor cell info in TN cell.

* Huawei and Nokia thinks this is not essential for Rel-18 and we have no time to discuss this at this stage. LG agrees
* Sony supports the proposal
* Ericsson thinks this is a low hanging fruit for a real problem
* MTK/QC support the proposal
* China Telecom supports this proposal. DT also supports this proposal. NTT Docomo supports the proposal
* CATT does not support this
* Thales think this is important for service continuity.
* Samsung also support this.
* IDC thinks there is no convincing arguments not to have this.
* Continue in offline 305 to discuss the details of how broadcast NTN neighbor cell info in a TN cell (if we will have an agreement to support this in Rel-18)
* [AT123bis][305][NR-NTN Enh] Support of NTN neighbor cell info in TN cell (Ericsson)

Scope: discuss the details of how broadcast NTN neighbor cell info in a TN cell

Intended outcome: offline summary

F2F schedule: FFS

Deadline for rapporteur's summary (in R2-2311317): Friday 2023-10-14 08:00

Proposal 8: RAN2 to select one of the following two options to provide the NTN neighbor cell info in TN cell:

- Option 1: SIB19 can be broadcasted in TN cell in order to provide the NTN neighbor cell info;

- Option 2: NTN neigbhor cell info can be provided in SIB3 and/or SIB4 in TN cell.

[R2-2310065](file:///C:\Data\3GPP\Extracts\R2-2310065%20TN%20coverage%20info.docx) Open issues of cell reselection enhancement Samsung Research America discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310177](file:///C:\Data\3GPP\Extracts\R2-2310177%20TN%20coverage.doc) TN cell coverage info and measurement relaxation Qualcomm Incorporated discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310419](file:///C:\Data\3GPP\Extracts\R2-2310419%20Cell%20reselection%20enhancements%20for%20NTN-TN%20mobility.doc) Cell reselection enhancements for NTN-TN mobility Xiaomi discussion

[R2-2310626](file:///C:\Data\3GPP\Extracts\R2-2310626%20Discussion%20on%20TN%20Measurement%20Relaxation%20Issues.docx) Discussion on TN Measurement Relaxation Issues FGI discussion Rel-18

[R2-2310986](file:///C:\Data\3GPP\Extracts\R2-2310986_On%20the%20use%20of%20TN%20coverage%20signalling%20to%20indicate%20non-TN%20areas.docx) On the use of TN coverage signalling to indicate non-TN areas NEC Telecom MODUS Ltd. discussion

Withdrawn

R2-2309909 Discussion on TN Coverage Area Information Update Issues FGI discussion

##### 7.7.4.1.2 NTN-NTN enhancements

Measurements on neighbour cells during hard cell switch / feeder link switch

[R2-2310843](file:///C:\Data\3GPP\Extracts\R2-2310843%20(R18%20NR%20NTN%20WI%20AI%207.7.4.1.2)%20Earth%20moving%20cell.docx) Cell reselection enhancements for Earth moving cell InterDigital discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: For Earth-moving cells, multiple future reference location coordinates and associated timestamp information can be broadcast simultaneously.

Proposal 2: If multiple future reference location coordinates are supported, timestamp information for each future reference point is provided by broadcasting an offset to epochTime.

Proposal 3: RAN2 to discuss whether the UE can relax (e.g., not perform) measurements on neighbouring cell(s) originating from the same feeder-link about to be switched.

Proposal 4: If UE can relax (e.g., not perform) measurements on neighbouring cell(s) originating from the same feeder-link about to be switched, RAN2 to discuss how to distinguish when t-Service is due to feeder-link switch.

[R2-2311228](file:///C:\Data\3GPP\Extracts\R2-2311228%20-%20Cell%20reselection%20enhancements.docx) Cell reselection enhancements Ericsson discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1 In case of NTN cell hard switch, UE needs not to start neighbour cell measurements of the new cell before t-service expires.

Proposal 2 The network informs (either implicitly or explicitly) the UE whether the next NTN cell switch is a soft or a hard switch.

* Can come back to this

[R2-2310413](file:///C:\Data\3GPP\Extracts\R2-2310413%20Discussion%20on%20location-based%20measurement%20initiation%20in%20moving%20cells.doc) Discussion on location-based measurement initiation in moving cells Huawei, HiSilicon, Turkcell discussion Rel-18 NR\_NTN\_enh-Core

#### 7.7.4.2 Handover enhancements

RACH-less HO

[R2-2310844](file:///C:\Data\3GPP\Extracts\R2-2310844%20(R18%20NR%20NTN%20WI%20AI%207.7.4.2)%20CONN%20mobility%20enh.docx) NTN mobility enhancements for RRC\_CONNECTED InterDigital discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: For location-based CHO for earth-moving cells, re-use the procedure from cell reselection to derive the candidate cell’s reference location as the cell moves.

* For location-based CHO for earth-moving cells, re-use the procedure from cell reselection as baseline to derive the candidate cell’s reference location as the cell moves (FFS on how to signal the needed parameters, e.g. ephemeris and Epoch time)

Proposal 2: Upon RACH-less HO failure, UE does not fallback to RACH-based HO.

* Oppo was not in favour of this but can accept it
* Upon T304 expiry, the UE does not fallback to RACH-based HO.
* Continue in offline discussion 306

Proposal 3: NW can send PDCCH/PDSCH addressed to C-RNTI to confirm RACH-less HO completion instead of UE Contention Resolution MAC CE (e.g., if DL data is available).

* Ericsson wonders how many mechanism we need
* Samsung thinks we can wait for the outcome of a similar discussion for mobility
* Continue in offline discussion 306

Proposal 4: UE starts the PTAG timeAlignmentTimer upon indication from upper layers (i.e., RRC) that UL synchronization is obtained for the target cell during RACH-less HO.

* Continue in offline discussion 306

Proposal 5: Combination of RACH-less HO with time-based CHO is not supported in Rel-18 NTN.

* Continue in offline discussion 306

Proposal 6: Preallocated UL grant must be configured with an associated RSRP threshold.

* Agreed

Agreements:

1. For location-based CHO for earth-moving cells, re-use the procedure from cell reselection as baseline to derive the candidate cell’s reference location as the cell moves (FFS on how to signal the needed parameters, e.g. ephemeris and Epoch time)
2. Upon T304 expiry, the UE does not fallback to RACH-based HO.
3. Preallocated UL grant must be configured with an associated RSRP threshold.

* [AT123bis][306][NR-NTN Enh] RACH-less HO (Interdigital)

Scope: continue the discussion on RACH-less HO

Intended outcome: offline summary

No formal F2F offline is expected: the rapporteur will check offline with as many interested companies as possible and prepare an updated list of proposals for online discussion in the Thursday CB session

Deadline for rapporteur's summary (in R2-2311318): Thursday 2023-10-12 08:00

[R2-2311318](file:///C:\Data\3GPP\RAN2\Inbox\R2-2311318.zip) Report of [306][NR-NTN Enh] RACH-less HO Interdigital discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: UE relies on T304 and RRC Re-establishment procedure to address RACH-less HO failure in Rel-18 NTN (as in LTE). No new NTN-specific enhancements are introduced.

* QC wonders what happens if TAT expires before T304: can we clarify that the NW should ensure this does not happen? Apple agrees with QC. Oppo thinks this is legacy issue not really related to NTN
* UE relies on T304 and RRC Re-establishment procedure to address RACH-less HO failure in Rel-18 NTN (as in LTE). No new NTN-specific enhancements are introduced. If TAT expires, the UE follows the legacy procedures, regardless of the RACH-less HO configuration
* RAN2 understands that the NW can ensure a proper configuration for TAT and T304 values (up to NW implementation, no need to capture this in the specs).

Proposal 2: Confirm the following agreement from eMob also applies to NTN:

For RACH-less LTM, the UE determines successful reception of its first UL data based on receiving a PDCCH addressing the UE’s C-RNTI in the target cell scheduling a new transmission as first UL transmission. Can be either DL assignment or UL grant addressed to same HARQ process for the “new transmission”

* Agreed
* Oppo wonders whether this deviates from the LTE baseline.
* RAN understands this does not exclude the possibility to use a Contention Resolution MAC CE but this will not be used as a determination of the RACH less HO completion

Proposal 3: Select one of the following options for when UE starts the PTAG timeAlignmentTimer in NTN RACH-less HO:

* We follow the LTE baseline for when UE starts the PTAG timeAlignmentTimer in NTN RACH-less HO (option 1 in R2-2311318)

Proposal 4: Combination of RACH-less HO with time-based CHO is supported in Rel-18 NTN.

* Oppo thinks this might not work for time-based CHO and dynamic scheduling. LG has the same view.
* Thales has sympathy for this but also has concerns about the completion of the WID and thinks we can consider this in the next release
* Ericsson is not sure about Oppo/LG concerns as in the scenarios we are considering there will not be multiple beams and the network can use this when it’s sure there are no problems with this.
* HW can accept this under the considering we introduce a threshold for dynamic grant
* Combination of RACH-less HO with time-based CHO is supported in Rel-18 NTN for both Configured and Dynamic Grant. For the Dynamic Grant case this should be configured by the NW only when the is no risk of confusion about which beam to use (up to NW implementation).
* Session chair indicates that contributions on a possible threshold for the dynamic grant case can be submitted to the next meeting

[R2-2310178](file:///C:\Data\3GPP\Extracts\R2-2310178%20RACH-less%20HO.doc) RACH-less handover for NTN Qualcomm Incorporated discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1 For dynamic grant, network can indicate the associated target cell index, i.e., ssb-IndexTarget-r18 in RACH-less configuration.

Proposal 2 While monitoring target cell PDCCH in RACH-less HO, HO failure timer T304 and TimeAlignmentTimer are sufficient to handle fallback to random access to the target cell.

Proposal 3 Confirm network can ask UE to fallback to RACH by PDCCH order when RACH-less HO is configured.

Proposal 4 Regardless of the pre-allocated grant occasions, HARQ process for pre-allocated UL grant belongs to HARQ mode A if UL HARQ mode is configured.

Proposal 5 Target cell specific Koffset is used to determine the very first pre-allocated UL grant after the reception of handover command.

Proposal 6 If RACH-less configuration is included in time-based CHO command, RACH-less handover configuration is valid only after T1 and is released after T2. TimeAlignmentTimer is started at T1.

[R2-2309501](file:///C:\Data\3GPP\Extracts\R2-2309501%20Discussion%20on%20RACH-less%20HO%20in%20NR%20NTN.docx) Discussion on RACH-less HO in NR NTN CATT discussion

[R2-2309655](file:///C:\Data\3GPP\Extracts\R2-2309655%20Remaining%20Issues%20on%20RACH-less%20for%20R18%20NR%20NTN.docx) Remaining Issue on RACH-less for R18 NR NTN vivo discussion Rel-18 NR\_NTN\_enh-Core

[R2-2309865](file:///C:\Data\3GPP\Extracts\R2-2309865.docx) Discussion on RACH-less HO TCL discussion

[R2-2309962](file:///C:\Data\3GPP\Extracts\R2-2309962%20Views%20on%20some%20remaining%20issues%20for%20RACH-less%20HO%20in%20NTN.docx) Views on some remaining issues for RACH-less HO in NTN Lenovo discussion Rel-18

[R2-2310178](file:///C:\Data\3GPP\Extracts\R2-2310178%20RACH-less%20HO.doc) RACH-less handover for NTN Qualcomm Incorporated discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310435](file:///C:\Data\3GPP\Extracts\R2-2310435.docx) Remaining issue on RACH-less HO for NTN ITL discussion Rel-18

[R2-2310637](file:///C:\Data\3GPP\Extracts\R2-2310637%20Final%20View%20on%20RACH-less%20HO%20in%20Rel-18%20NTN.docx) Final View on RACH-less HO in Rel-18 NTN Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310662](file:///C:\Data\3GPP\Extracts\R2-2310662%20Remaining%20issues%20of%20RACH-less%20(C)HO%20v1.docx) Remaining Issues of RACH-less (C)HO NEC discussion Rel-18 NR\_NTN\_enh-Core

[R2-2311019](file:///C:\Data\3GPP\Extracts\R2-2311019%20Remaining%20issues%20on%20RACH-less%20HO%20for%20NR%20NTN.docx) Remaining issues on RACH-less HO for NR NTN ETRI discussion Rel-18

Unchanged PCI

Whether / how to support Rel-17 UEs in unchanged PCI case

[R2-2311227](file:///C:\Data\3GPP\Extracts\R2-2311227%20-%20Handover%20enhancements.docx) Handover enhancements Ericsson discussion Rel-18 NR\_NTN\_enh-Core [R2-2308900](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2308900.zip)

Observation 9: In the unchanged PCI scenario, the use of regular handover to handle Rel-17 RRC\_CONNECTED UEs might pose implementation challenges.

Observation 10: In the unchanged PCI scenario, the only feasible option for legacy UEs not supporting time-based CHO is RLF and Re-establishment which will result in a significant increase of interruption time.

Proposal 10: Discuss how Rel-17 NTN UEs can use regular handover mechanism in the unchanged PCI service link switch.

* We don’t consider the impact on Rel-17 UEs behavior (or Rel-18 UEs not supporting unchanged PCI) when defining the Rel-18 unchanged PCI solution

[R2-2311223](file:///C:\Data\3GPP\Extracts\R2-2311223_) “Unchanged PCI” solution vs “PCI change only” solution Sequans Communications discussion Rel-18 NR\_NTN\_enh-Core [R2-2308753](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2308753.zip)

Observation 1: “Reusing PCI after satellite changes” would increase interruption time, contrary to initial motivation

Observation 2: “Reusing PCI after satellite changes” also increases interruption time for Rel-17 UEs

Observation 3: A Rel-17 UE may not correctly resync the target cell in case of same cell handover

Observation 4: The HO message to Rel-17 UE needs to be sent after any source cell SSB to prevent resync on the source cell

Observation 5: The “next NTN-config” of the serving cell to be used by the UE after the service link switch could be broadcasted to reduce IT, but this is useless to Rel-17 UEs

Unchanged PCI details

[R2-2310307](file:///C:\Data\3GPP\Extracts\R2-2310307_Satellite%20switching%20with%20unchanged%20PCI_v0.doc) Satellite switching with unchanged PCI Apple discussion Rel-18 NR\_NTN\_enh-Core

< Provision of target satellite information >

Observation 1: In order for UE to synchronize with the target satellite immediately after satellite switching, UE needs to acquire sync information of target satellite in advance.

Observation 2: According to existing RRC design, network can provide the sync information of target satellite in SIB19 only when the target satellite becomes the serving satellite and starts providing the service for the serving cell.

Observation 3: According to existing RRC design, UE can acquire the sync information of target satellite from SIB19 only after satellite switching without serving cell change.

Proposal 1: Network provides the sync information of target satellite in advance to UE before satellite switching via RRC signaling.

* Network provides the sync information of target satellite in advance to UE before satellite switching, via broadcast signalling

Proposal 2: Network can provide the multiple satellite information (including serving satellite and the target satellite) for the serving cell in SIB19 and RRC dedicated signaling.

* Continue in offline 307 on the details of information in broadcast signalling (e.g. for how many satellites)

< RACH-less satellite switching >

Proposal 3: It’s the optional UE capability to support the RACH-less satellite switching procedure.

Proposal 4: RACH-less satellite switching procedure is configured in SIB19.

Proposal 5: For RACH-less satellite switching, network may indicate the beam info for the dynamic grant reception in target satellite in SIB19, and UE starts monitoring the dynamic UL grant via the indicated beam after performing DL sync in the target satellite.

Proposal 6: For RACH-less satellite switching procedure, network may provide the configured grant and associated to beam info via RRC dedicated signaling, and UE selects the configured grant based on the detected SSB from the target satellite.

Proposal 7: For RACH-less satellite switching procedure, UE fallbacks to RACH-based satellite switching procedure if the beam associated to the UL grant in target satellite has RSRP value lower than a threshold.

Proposal 8: For RACH-less satellite switching procedure, network can set Nta value to 0 or same as source in SIB19.

Proposal 9: For RACH-less satellite switching procedure, UE resumes the UE dedicated transmission/reception via the 1st UL grant towards to target satellite.

< UE operation during satellite switching procedure >

Proposal 10: During satellite switching procedure, UE initiates PHR reporting after satellite switching.

Proposal 11: During satellite switching procedure, UE reinitiates all the serving cell related measurement, e.g. reset L3 filter for serving cell RRM measurement and reset the RLM.

Proposal 12: Introduced timer based failure detection mechanism for satellite switching procedure.

Proposal 13: When the satellite switching failure is detected, UE initiates the UE connection reestablishment procedure.

< Soft satellite switching >

Proposal 14: To support soft satellite switching, NW indicates the SSB for UE to detect the DL sync of target satellite in SIB19 in advance.

* Continue in offline 307

Proposal 15: Network should configure a switching duration for the soft satellite switching.

* Continue in offline 307

Proposal 16: Within the soft satellite switching duration, UE may keep on the transmission in source satellite till acquiring the target satellite’s DL sync.

* Continue in offline 307

Proposal 17: The soft switching duration can be derived based on T-service/T-stop of source satellite and T-start of target satellite.

* Continue in offline 307

< Coexistence with CHO/HO procedure>

Proposal 18: After satellite switching scheme is enabled, if UE receives the HO command before the switching period or switching point, UE will initiate the HO procedure immediately.

Proposal 19: Both CHO and satellite switching procedure can be configured simultaneously.

Proposal 20: When both CHO and satellite switching conditions are met, it's up to UE implementation to choose either one.

Agreements:

1. We don’t consider the impact on Rel-17 UEs behavior (or Rel-18 UEs not supporting unchanged PCI) when defining the Rel-18 unchanged PCI solution
2. Network provides the sync information of target satellite in advance to UE before satellite switching, via broadcast signalling

* [AT123bis][307][NR-NTN Enh] Unchanged PCI (Apple)

Scope: continue the discussion on unchanged PCI aspects (marked for offline discussion in 307)

Intended outcome: offline summary

F2F schedule: Wednesday 2023-10-11 10:30-11:00 Brk3

Deadline for rapporteur's summary (in R2-2311319): Thursday 2023-10-12 08:00

[R2-2311319](file:///C:\Data\3GPP\RAN2\Inbox\R2-2311319.zip) Report of [307][NR-NTN Enh] Unchanged PCI Apple discussion Rel-18 NR\_NTN\_enh-Core

<Provision of the target satellite information>

Proposal 0: Confirm satellite switching with unchanged PCI is only applicable on quasi-earth fixed system.

* Agreed

Proposal 1: Only 1 target satellite information (i.e. NTN-config) of serving cell is provided in SIB19.

* Nokia wonders how this is signalled
* HW this can be done implicitly by using the same PCI as the serving cell PCI in one of the neighbour cells signalled in SIB19
* Only 1 target satellite information (i.e. NTN-config) of serving cell is provided in SIB19. FFS on exact signalling

Proposal 2: SMTC configuration of target satellite needs further discussion:

o FFS on whether and how to provide the SMTC configuration of target satellite.

o FFS on how to handle the SMTC adjustment.

* Agreed (we continue on this in the next meeting)

<Soft satellite switching>

Proposal 3: For soft satellite switching, network provides SSB information of target satellite to UE.

* We support soft satellite switching
* There will be an indication (FFS if explicit or implicit) whether hard switch or soft switch is used.
* At least soft satellite switching, network provides SSB information of target satellite to UE. FFS on the details: options include e.g. indicating a time offset/information or indicating a different SSB index for the target satellite (FFS for Hard satellite switch)

Proposal 3a: FFS on the details of the SSB information. Companies are invited to check with RAN1 internally.

Proposal 4: In soft satellite switching, UE can start synchronizing with target satellite before T-service of source satellite.

Proposal 5: In soft satellite switching, UE can start synchronizing with target satellite after target satellite starts transmitting the SSB (i.e., T-start).

NOTE: T-start of target satellite is earlier than T-service of source satellite.

* In soft satellite switching, UE can start synchronizing with target satellite before T-service of source satellite.
* We introduce a T-start which indicates the earliest occasion when the UE can start synchronizing with target satellite (actual signalling is FFS). In soft switch scenario, T-start of target satellite is earlier than T-service of source satellite (FFS if T-start is also used for hard satellite switch)
* For soft satellite switching, the exact time when the UE starts synchronizing with target satellite (between T-start and T-service) is up to UE implementation

Proposal 6: UE is not required to connect to source satellite if UE starts synchronizing with target satellite.

* UE is not required to connect to source satellite when the UE switches to target satellite.

[R2-2309502](file:///C:\Data\3GPP\Extracts\R2-2309502%20Discussion%20on%20unchanged%20PCI%20mechanism.docx) Discussion on unchanged PCI mechanism CATT discussion

[R2-2309656](file:///C:\Data\3GPP\Extracts\R2-2309656%20Further%20Discussion%20on%20Service%20Link%20Switching%20with%20Unchanged%20PCI.docx) Further Discussion on Service Link Switching with Unchanged PCI vivo discussion Rel-18 NR\_NTN\_enh-Core

[R2-2309784](file:///C:\Data\3GPP\Extracts\R2-2309784_HO%20enhancement%20in%20LEO-NTN_v2.0.docx) Handover Enhancement in LEO NTN: Unchanged PCI MediaTek Inc. discussion

[R2-2309864](file:///C:\Data\3GPP\Extracts\R2-2309864.docx) Discussion on unchanged PCI TCL discussion

[R2-2309884](file:///C:\Data\3GPP\Extracts\R2-2309884%20Discussion%20on%20remaining%20issue%20for%20unchanged%20PCI%20switch.docx) Discussion on remaining issue for unchanged PCI switch ASUSTeK discussion Rel-18 NR\_NTN\_enh-Core

[R2-2309961](file:///C:\Data\3GPP\Extracts\R2-2309961%20Views%20on%20some%20remaining%20issues%20for%20PCI%20unchanged%20scenario.docx) Views on some remaining issues for PCI-unchanged scenario Lenovo discussion Rel-18

[R2-2310022](file:///C:\Data\3GPP\Extracts\R2-2310022%20Discussion%20on%20NTN-NTN%20handover%20enhancements.doc) Discussion on remaining issues of PCI unchanged handover Transsion Holdings discussion Rel-18

[R2-2310034](file:///C:\Data\3GPP\Extracts\R2-2310034_t-start_t-gap_unchanged_PCI_scenario_timeAlignmentTimer.docx) Discussion on satellite switch with longer gap in conjunction with unchanged PCI PANASONIC R&D Center Germany discussion

[R2-2310179](file:///C:\Data\3GPP\Extracts\R2-2310179%20PCI%20unchanged.docx) Details on satellite switch with PCI unchange Qualcomm Incorporated discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310225](file:///C:\Data\3GPP\Extracts\R2-2310225_Aquisition%20of%20target%20satellite%20information%20with%20PCI%20unchanged.doc) Aquisition of target satellite information with PCI unchanged China Telecom discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310247](file:///C:\Data\3GPP\Extracts\R2-2310247%20Further%20discussion%20on%20PCI%20unchanged.docx) Further discussion on PCI unchanged CMCC discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310638](file:///C:\Data\3GPP\Extracts\R2-2310638%20On%20How%20To%20Resolve%20Remaining%20Issues%20for%20Unchanged%20PCI%20(Satellite%20Switching%20without%20L3%20Mobility).docx) On How To Resolve Remaining Issues for Unchanged PCI (Satellite Switching without L3 Mobility) Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310663](file:///C:\Data\3GPP\Extracts\R2-2310663%20Remaining%20details%20of%20unchanged%20PCI%20swtich%20v1.docx) Remaining Details of Unchanged PCI Switch NEC discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310696](file:///C:\Data\3GPP\Extracts\R2-2310696%20Remaining%20issues%20on%20the%20unchanged%20PCI%20satellite%20switch.docx) Remaining issues on the unchanged PCI satellite switch Google Inc. discussion Rel-18

[R2-2310697](file:///C:\Data\3GPP\Extracts\R2-2310697%20Discussion%20on%20the%20unchanged%20PCI%20scenario%20with%20optional%20random%20access.docx) Discussion on the unchanged PCI scenario with optional random access ETRI discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310845](file:///C:\Data\3GPP\Extracts\R2-2310845%20(R18%20NR%20NTN%20WI%20AI%207.7.4.2)%20same%20PCI.docx) Satellite switching without PCI change InterDigital discussion Rel-18 NR\_NTN\_enh-Core

CHO enhancements / Earth-moving cell reference locations

[R2-2309654](file:///C:\Data\3GPP\Extracts\R2-2309654%20Further%20Discussion%20on%20CHO%20Enhancements%20for%20NR%20NTN.docx) Further Discussion on CHO Enhancements for NR NTN vivo discussion Rel-18 NR\_NTN\_enh-Core

Proposal 1: For location-based CHO for earth-moving cells, UE derives the candidate cell’s reference location.

Proposal 2: For location-based CHO for earth-moving cells, the following information is included in CHO configuration:

- Ephemeris and epochTime;

- referenceLocation1 is reused to indicate the reference location at epochTime for the serving cell;

- referenceLocation2 is reused to indicate the reference location at epochTime for the corresponding candidate cell.

- Oppo and LG thinks we don’t need to provide information for the serving cell, as already contained in SIB19

- HW thinks that Ephemeris is already provided as part of the reconfiguration, so we only need to discuss about EpochTime

* Come back to this in the next meeting

Proposal 3: Delete the restriction that the network can not configure condEventD1 or condEventT1 independently (i.e., without a jointly configured measurement condition) in the field description of condExecutionCond in TS 38.331.

[R2-2309883](file:///C:\Data\3GPP\Extracts\R2-2309883%20Discussion%20on%20moving%20cell%20reference%20location%20for%20CHO.docx) Discussion on moving cell reference location for CHO ASUSTeK discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310066](file:///C:\Data\3GPP\Extracts\R2-2310066%20CHO.docx) CHO Enhancements for NTN Samsung Research America discussion Rel-18 NR\_NTN\_enh-Core

Common (C)HO configuration

[R2-2310636](file:///C:\Data\3GPP\Extracts\R2-2310636%20On%20Common%20HO%20Signalling%20for%20Rel-18%20NTN.docx) On Common HO Signalling for Rel-18 NTN Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_NTN\_enh-Core

Observation 1: As per the current HO signalling between the target and source cell, it is not possible to simply extract the servingCellConfigCommon and provide it within the source cell using broadcast signalling.

Observation 2: Enabling common signalling for NTN (C)HO requires specification work in RAN3 which, according to R3-234664 will not be pursued in Rel-18.

Proposal 1: Common signalling (e.g. using servingCellConfigCommon) for the purpose of (C)HO in NTN is not supported in Rel-18.

* Agreed
* Session chair thinks that enhancements for this can be considered in the discussion for R19 WIs, either NTN-specific or as part of R19 mobility enhancements

Proposal 2: RAN2 does not respond to R3-234664.

* Agreed

[R2-2309500](file:///C:\Data\3GPP\Extracts\R2-2309500%20Discussion%20on%20common%20(C)HO%20configuration.docx) Discussion on common (C)HO configuration CATT discussion

[R2-2310768](file:///C:\Data\3GPP\Extracts\R2-2310768.docx) Common handover signalling for NTN Sony discussion Rel-18 NR\_NTN\_enh

[R2-2310769](file:///C:\Data\3GPP\Extracts\R2-2310769.docx) Signaling overhead reduction during NTN-NTN HOs Sony discussion Rel-18 NR\_NTN\_enh

[R2-2311212](file:///C:\Data\3GPP\Extracts\R2-2311212_Common%20signalling%20of%20HO%20common%20information.docx) Common signalling of HO common information Sequans Communications discussion Rel-18 NR\_NTN\_enh-Core [R2-2308755](file:///C:\Data\3GPP\archive\RAN2\RAN2%23123\Tdocs\R2-2308755.zip)

All aspects

[R2-2309537](file:///C:\Data\3GPP\Extracts\R2-2309537%20NTN%20HO%20enh.doc) Discussion on handover enhancement for NR NTN OPPO discussion Rel-18 NR\_NTN\_enh-Core

[R2-2309863](file:///C:\Data\3GPP\Extracts\R2-2309863%20%5bNTN%5d%20Remaining%20issues%20on%20handover%20enhancements.docx) Remaining issues on handover enhancements LG Electronics France discussion Rel-18 38.331 NR\_NTN\_enh

[R2-2310067](file:///C:\Data\3GPP\Extracts\R2-2310067%20RACHless%20and%20PCI%20unchanged.docx) Open issues on NTN RACH-less HO and PCI unchanged switch Samsung Research America discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310308](file:///C:\Data\3GPP\Extracts\R2-2310308_%20NR%20NTN%20specific%20handover%20enhancement_v0.doc) NR NTN specific HO enhancement Apple discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310412](file:///C:\Data\3GPP\Extracts\R2-2310412%20Discussion%20on%20handover%20enhancements.docx) Discussion on handover enhancements Huawei, HiSilicon, Turkcell discussion Rel-18 NR\_NTN\_enh-Core

[R2-2310420](file:///C:\Data\3GPP\Extracts\R2-2310420%20Discussion%20on%20handover%20enhancements%20for%20NTN-NTN%20mobility.doc) Discussion on handover enhancements for NTN-NTN mobility Xiaomi discussion

[R2-2310561](file:///C:\Data\3GPP\Extracts\R2-2310561%20Consideration%20on%20remaining%20issues%20on%20NTN%20HO%20enhancements.docx) Consideration on remaining issues on NTN HO enhancements ZTE Corporation, Sanechips discussion Rel-18

[R2-2311144](file:///C:\Data\3GPP\Extracts\R2-2311144-NTN_Discussion_on_NTN_HO_enhancements.doc) Discussion on NTN HO enhancements Sharp discussion Rel-18 NR\_NTN\_enh-Core

### 7.25.4 Self-Evaluation NTN

(FS\_IMT-2020\_Sat\_eval; leading Group: TSG RAN; REL-18; WID: [RP-230736](file:///C:\Data\3GPP\archive\RAN\RAN%2399\Tdocs\RP-230736.zip))

This will be treated in NTN breakout session (Sergio).

Study on Self-Evaluation towards the 3GPP submission of a IMT-2020 Satellite Radio Interface Technology, including both NR NTN and IoT-NTN. Note that the time allocated will be very limited, and this is expected to be mostly an offline activity. Including outcome of [Post123][102][NTN Self Ev] CP/UP latency (Ericsson)

[R2-2309714](file:///C:\Data\3GPP\Extracts\R2-2309714.docx) Report of [Post123][102]NTN Self Ev] CPUP latency (Ericsson) Ericsson report Rel-18

Adopt the following assumptions for the delay calculation of UP and CP latencies.

* Agreed (assumption on processing time can be added)

Send an LS to RAN1 to inform about RAN2 progress and check the assumed delay values for UP and CP latency calculations.

* Agreed

Adopt the attached TP to TS 37.911 about mobility interruption time.

* Endorsed as a basis for further offline discussion during the week, also considering the input papers
* [AT123bis][303][NTN Self Ev] ] CPUP latency (Ericsson)

Scope: continue the discussion on the TP also based on input papers

Intended outcome: updated TP and draft LS to RAN1

F2F schedule: FFS

Deadline for updated TP and LS (in R2-2311314 and R2-2311315): Friday 2023-10-13 08:00

[R2-2310086](file:///C:\Data\3GPP\Extracts\R2-2310086%20Discussion%20self-evaluation%20latency.docx) Discussion on IMT-2020 Satellite self-evaluation for Latency THALES discussion Rel-18 NR\_NTN\_enh

[R2-2311112](file:///C:\Data\3GPP\Extracts\R2-2311112%20IMT-2020%20Satellite.docx) CP and UP latency evaluation TP Qualcomm Technologies Ireland discussion Rel-18 FS\_IMT2020\_SAT\_eval

[R2-2311215](file:///C:\Data\3GPP\Extracts\R2-2311215%20%5bDraft%5d%20LS%20to%20RAN1%20on%20RAN2%20progress%20of%20NTN%20Self%20Evaluation.docx) [Draft] LS to RAN1 on RAN2 progress of NTN Self Evaluation Huawei, HiSilicon LS out Rel-18 FS\_IMT2020\_SAT\_eval To:RAN1

* Used as a basis for the LS to RAN1 (to be discussed in offline 303)
* Revised in R2-2311315

R2-2311315 [Draft] LS to RAN1 on RAN2 progress of NTN Self Evaluation Huawei, HiSilicon LS out Rel-18 FS\_IMT2020\_SAT\_eval To:RAN1

[R2-2311233](file:///C:\Data\3GPP\Extracts\R2-2311233%20-%20Satellite%20IMT-2020%20self-evaluation%20CP%20latency.docx) Satellite IMT-2020 self-evaluation: CP latency Ericsson discussion Rel-18

[R2-2311234](file:///C:\Data\3GPP\Extracts\R2-2311234%20-%20Satellite%20IMT-2020%20self-evaluation%20UP%20latency.docx) Satellite IMT-2020 self-evaluation: UP latency Ericsson discussion Rel-18

# Summary

Agreed CRs

NR-NTN

IoT-NTN

Approved LSs out

[Post123bis] Email discussions

Short

Long