3GPP TSG-RAN WG2 Meeting #121-bis electronic R2-2xxxxxx

April 17-26, 2023

**Source: Session Chair (Apple)**

**Title: Report from NC Repeater breakout session**

**Status of At-Meeting Email Discussions**

*This subclause is not an Agenda Item. It contains a running summary of the email discussions assigned to take place during the meeting weeks. This section will be moved to an appendix in the final version of the report.*

**[AT121bis-e][700][NCR] Organisational Sasha – NCR (Apple)**

Scope: Organisational discussions and announcements, as needed throughout the meeting weeks

Intended outcome: Well-informed participants

**[Pre121bis-e][701][NCR] Summary of agenda item 7.1.2 on signalling for SCI (ZTE)**

Scope: Summary of agenda item 7.1.2

Intended outcome: Report in R2-2304411

**[Pre121bis-e][702][NCR] Summary of agenda item 7.1.3 on other RAN2 aspects for NCR (Nokia)**

Scope: Summary of agenda item 7.1.3

Intended outcome: Report in [R2-2304412](./Docs/R2-2304412.zip)

## 7.1 NR network-controlled repeaters

(NR\_NetConRepeater; leading WG: RAN1; REL-18; WID: [RP-230175)](./Docs/RP-230175).zip)

Time budget: 0.5 TU

Tdoc Limitation: 2 tdocs

### 7.1.1 Organizational

Including LSs and any rapporteur inputs.

[R2-2302414](./Docs/R2-2302414.zip) LS to RAN2 on the RRC and MAC CE parameters for NCR ([R1-2302227](./Docs/R1-2302227.zip); contact: ZTE) RAN1 LS in Rel-18 NR\_netcon\_repeater To:RAN2

ZTE: already taken into account in the running CRs, but some parameters are still under discussion in RAN1 and we expect to get another LS after the May meeting.

Noted

[R2-2304113](./Docs/R2-2304113.zip) 38.300 Running CR for NCR Ericsson draftCR Rel-18 38.300 17.4.0 B NR\_netcon\_repeater

* [AT121bis-e][703][NCR] NCR stage-2 running CR (Ericsson)

Scope: Implement agreements from the meeting

Intended outcome: draft CR in R2-2304413

Deadline: NCR CB session

[R2-2303289](./Docs/R2-2303289.zip) RRC running CR for R18 NCR ZTE Corporation draftCR Rel-18 38.331 17.4.0 B NR\_netcon\_repeater

* [AT121bis-e][704][NCR] NCR RRC running CR (ZTE)

Scope: Implement agreements from the meeting

Intended outcome: draft CR in R2-2304414

Deadline: NCR CB session

[R2-2303445](./Docs/R2-2303445.zip) Introducing support for Network Controlled Repeaters to 38.321 Samsung CR Rel-18 38.321 17.4.0 1554 1 B NR\_netcon\_repeater-Core [R2-2301520](./Docs/R2-2301520.zip)

* [AT121bis-e][705][NCR] NCR MAC running CR (Samsung)

Scope: Implement agreements from the meeting

Intended outcome: draft CR in R2-2304415

Deadline: NCR CB session

[R2-2303901](./Docs/R2-2303901.zip) 38.304 running CR for R18 NCR CATT draftCR Rel-18 38.304 17.4.0 B NR\_netcon\_repeater

* [AT121bis-e][706][NCR] NCR 38.304 running CR (CATT)

Scope: Implement agreements from the meeting

Intended outcome: draft CR in R2-2304416

Deadline: NCR CB session

[R2-2302789](./Docs/R2-2302789.zip) Draft 306 CR of Network controlled repeater UE capability Intel Corporation draftCR Rel-18 38.306 17.4.0 B NR\_netcon\_repeater

[R2-2302790](./Docs/R2-2302790.zip) Draft 331 CR of Network controlled repeater UE capability Intel Corporation draftCR Rel-18 38.331 17.4.0 B NR\_netcon\_repeater

* [AT121bis-e][707][NCR] NCR capability running CRs (Intel)

Scope: Implement agreements from the meeting

Intended outcome: draft CRs in R2-2304417, R2-2304418

Deadline: NCR CB session

### 7.1.2 Signalling for side control information

Signalling and procedures for for side control information, based on RAN1 agreements.

[R2-2304411](./Docs/R2-2304411.zip) Summary of agenda item 7.1.2 on signalling for SCI (ZTE)

**Proposal 1** RAN2 confirms that the NCR Access Link Beam Indication MAC CE can optionally provide the update beam indexes for semi-persistent beam indication, if not provided, the UE applies the beam indication configuration provided by RRC.

**Proposal 2** To discuss whether to keep the C-field in NCR Access Link Beam Indication MAC CE.

Huawei: length can be used instead

Samsung: in some cases it C-field may be needed and it is a cleaner approach which follows IAB design for example

ZTE: agree with Samsung

Intel: same view

**Proposal 3** To discuss whether to support update of partial beam indexes in NCR Access Link Beam Indication MAC CE.

Samsung: we should not support partial update, the original intention of RAN1 was to support full update

ZTE, Apple, Huawei: support Samsung

**Proposal 4** If P3 is supported, to further discuss the following options:

- Option a: introduce a length field and a beam index list

- Option b: introduce a extend bit and a beam index list

- Option c: introduce a bitmap and a beam index list

- Option d: introduce length indicator, bitmap and a beam index list.

Proposal 5 To discuss whether there’s a need to introduce an optional UE capability to indicate whether NCR-MT supports beam index update in Access Link Beam Indication MAC CE.

Proposal 6 Update the field name of the “Resource set ID” to “Downlink TCI state ID” and “Uplink TCI state ID or SRI”, respectively in the NCR Downlink Backhaul Link Beam Indication and NCR Uplink Backhaul Link Beam Indication.

(Note: the name for Uplink MAC CE may be further updated if Proposal 7 is agreed.)

**Proposal 7** To discuss whether to introduce unified TCI state ID in NCR Uplink Backhaul Link Beam Indication MAC CE.

ZTE: we prefer not to introduce unified TCI state ID, we can stick to the existing mechanism.

Samsung: this was the RAN1 intention.

Huawei: agree with ZTE, as we agreed in the last meeting two MAC CEs are OK. RAN1 indicated this is in RAN2 domain.

Samsung: we do not intend to introduce a new MAC CE

ZTE: the original intention in RAN1 was to introduce three separate MAC CEs, one separate for unified TCI release-17 mechanism, but in RAN2 we agreed to go with two MAC CEs

* To be continued offline

**Proposal 8** RAN2 confirms that the name to be used for a new dedicated RNTI value for NCR-MT is NCR-RNTI.

**Proposal 9** RAN2 confirms that NCR-RNTI is used to scramble the PDCCHs that carrying side control information and C-RNTI is used to scramble the PDSCHs that carrying side control information via RRC and MAC CE.

Proposal 10 RAN2 confirms that the one-octet eLCID space should be used for the new NCR MAC CEs, as per R2-2303445. RAN2 understands that the final values chosen from this space may differ from the ones in the final version of the NCR MAC CatB CR, due to potential alignment across different Rel-18 WIs.

Proposal 11 Update Clause 3 of the MAC spec with NCR definitions and abbreviations, once a stable version of the stage-2 CR is available. Existing definition of “NR backhaul link” (as used in IAB) should be noted.

Proposal 12 Keep the current field description of priorityFlag in RRC running CR.

Proposal 13 Wait for RAN1 inputs about the value range of ncr-periodicity for periodic and semi-persistent time resource, and redefine the slotOffsetPeriodic-r18 and slotOffsetSemiPersistent-r18 fields as CHOICE structure.

Proposal 14 Update the field names contained in NCR-FwdConfig-r18, i.e. remove “ncr-”, change “Resource” into “Rsrc”, and keep the IE definitions and Multiplicities as they are.

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| Agreements:  RAN2 confirms that the NCR Access Link Beam Indication MAC CE can optionally provide the updated beam indexes for semi-persistent beam indication, and if not provided, the UE applies the beam indication configuration provided by RRC.  To keep the C-field in NCR Access Link Beam Indication MAC CE.  RAN2 confirms that the name to be used for a new dedicated RNTI value for NCR-MT is NCR-RNTI.  RAN2 confirms that NCR-RNTI is used to scramble the PDCCHs that carrying side control information and C-RNTI is used to scramble the PDSCHs that carrying side control information via RRC and MAC CE.  RAN2 will not support update of partial beam indexes in NCR Access Link Beam Indication MAC CE.  RAN2 confirms that the one-octet eLCID space should be used for the new NCR MAC CEs, as per R2-2303445. RAN2 understands that the final values chosen from this space may differ from the ones in the final version of the NCR MAC CatB CR, due to potential alignment across different Rel-18 W |

* The remianing untreated proposals will be taken as part of the MAC and RRC running CRs email discussions.

The following contributions will not be treated individually due to lack of time.

[R2-2303446](./Docs/R2-2303446.zip) Outstanding MAC issues Samsung R&D Institute UK discussion

[R2-2302927](./Docs/R2-2302927.zip) Further issues related to NCR ON/OFF behaviour and side control configuration Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_netcon\_repeater

[R2-2303237](./Docs/R2-2303237.zip) Remaining issues for side control information Lenovo discussion Rel-18

[R2-2303263](./Docs/R2-2303263.zip) MAC CE Design for Semi-Persistent Beam Configuration vivo discussion Rel-18

[R2-2303290](./Docs/R2-2303290.zip) Remaining issues in NCR RRC running CR ZTE Corporation, Sanechips discussion Rel-18 NR\_netcon\_repeater

[R2-2303772](./Docs/R2-2303772.zip) Considerations on signalling for side control information China Telecom discussion

[R2-2303973](./Docs/R2-2303973.zip) Discussion on MAC issues for NCR Huawei, HiSilicon discussion Rel-18 NR\_netcon\_repeater

### 7.1.3 Other RAN2 aspects

Other RAN2 aspects, including: SI impacts, RRC states, RRM, capabilities and others not covered by 8.1.2.

[R2-2303288](./Docs/R2-2303288.zip) Report of [Post121][703][NCR] Open issues on NCR RRC ZTE Corporation report Rel-18 NR\_netcon\_repeater

**Proposal 1** From RAN2 perspective, NAS spec already specifies the behaviour for the case when NCR-MT selects a suitable cell after it was camping on acceptable cell or no cell was found. No need to specify new mechanism for this scenario. (can be revisited if company identifies problem)

Huawei: NCR-MT should go CONNECTED when it selects a suitable cell

Intel, ZTE: NAS will initiate the connection immediately.

=>RAN2 understands that NCR-MT will initiate connection immediately when it selects a suitable cell from an acceptable cell.

**Proposal 2**: The NCR-Fwd is switched OFF if the NCR-MT in RRC\_INACTIVE detects no suitable cell.

**Proposal 3** To further discuss the following 2 options.

* (6/12)Option 1: To define “wake-up timer” IE in RRCRelease message;
* (6/12)Option 2: Do not define “wake-up timer” IE in RRCRelease message, if needed, it can be done via OAM (no specification impact).

Samsung: support option 1

E///: one concern with option 2 is that it requires DRB which is optional

Intel: if we there is a wake up timer we need to specify what happens when it expires and we don’t have time for this

Huawei: it is still unclear when the timer is needed

CATT: prefer option 2 as it has less standardization impact

Nokia: we cannot assume OAM is not supported because DRB is optional, support option 2

QCOM: support option 2 because the trigger is not just time

Apple: support option 2 for simplicity

NEC: we may also need to define the behavior while the timer is running

* To be continued offline

**Proposal 4** (9/12)NCR-Fwd is OFF when NCR-MT is in RRC\_IDLE state.

Samsung: RRC\_IDLE may be needed for NCR

QCOM, Intel, HW: agree with the proposal

E///: agree with Samsung, but no strong view; what if NCR doesn’t support INACTIVE?

ZTE: agree with E/// about INACTIVE, but it doesn’t mean IDLE will be used

Proposal 5 For NCR-MT in RRC\_INACTIVE state, the periodic beam indication configuration (if configured and not removed) is applied for NCR-Fwd ON/OFF.

* (2/12)FFS whether aperiodic beam indication configuration (if activated by DCI before RRCRelease) can be applied;
* (3/12)FFS whether semi-persistent indication configuration (if activated by MAC CE before RRCRelease) can be applied;

Proposal 6 Regarding whether/when to discard the received beam indication configuration (i.e. NCR-FwdConfig-r18), to discuss the following options:

* (8/12)Option 1: The NCR-MT in RRC\_INACTIVE discards the configuration when it initiates RRC resume procedure in a cell different from the released cell (this implies delta configuration is supported only in the released cell).
* Option 2: The NCR-MT in RRC\_INACTIVE does not discard the configuration autonomously (this implies delta configuration is supported in any cell).

Proposal 7 To discuss whether the NCR-MT indicates the NCR-Fwd to resume forwarding when the NCR-MT reselects back to the serving cell on which side control configuration was received.

**Proposal 8** To discuss how to resume NCR-Fwd when RRC re-establishment is succeed:

* Option 1: Wait for the new configuration/indication (RRC/MAC CE/DCI) from the network.
* Option 2: When RRC re-establishment is succeed, the NCR-MT indicates to NCR-Fwd to resume forwarding following the last configuration received before RLF.

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| NCR-Fwd is OFF when NCR-MT is in RRC\_IDLE state |

* The remaining proposals can be discussed in the RRC running CR discussion

[R2-2302788](./Docs/R2-2302788.zip) Summary of [Post121][702][NCR] capabilities running CR for NCR (Intel) Intel Corporation discussion Rel-18 NR\_netcon\_repeater

Proposal 1: Below features are conditional mandatory supported by NCR-MT:

* “Timer based SDU discard” in “1-0 Basic PDCP procedures”
* “SDU discard” in “2-0 Basic RLC procedures”
* “counter check” in “9-2 RRC processing time”

Proposal 2: Other handover related features, e.g. CHO, DAPS, CPAC, etc, are not supported by NCR-MT.

Proposal 3: Long SN bit (i.e. PDCP 18bit SN length and RLC AM 18bit SN length) is optional for NCR-MT.

Proposal 4: CA, MR-DC are not supported by NCR-MT, at least in R18.

Proposal 5: SDAP related features, and other layer 2 and layer 3 mandatory features in TS 38.822 are optional for NCR-MT.

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| Agreements:  Below features are conditional mandatory supported by NCR-MT:  - “Timer based SDU discard” in “1-0 Basic PDCP procedures”  - “SDU discard” in “2-0 Basic RLC procedures”  - “counter check” in “9-2 RRC processing time”  Other handover related features, e.g. CHO, DAPS, CPAC, etc, are not supported by NCR-MT.  Long SN bit (i.e. PDCP 18bit SN length and RLC AM 18bit SN length) is optional for NCR-MT.  CA, MR-DC are not supported by NCR-MT, at least in R18.  SDAP related features, and other layer 2 and layer 3 mandatory features in TS 38.822 are optional for NCR-MT. |

[R2-2304412](./Docs/R2-2304412.zip) Summary of agenda item 7.1.3 on other RAN2 aspects for NCR (Nokia)

Proposal 1: If “wake-up timer” IE is agreed: The NCR-MT shall stop the wake-up timer when it performs cell reselection in RRC\_IDLE state.

Proposal 4: RAN2 should discuss how NCR-MT in RRC\_IDLE can initiate RRC setup request when there is no existing trigger from NAS (e.g. registration request/update).

NOTE: MO data can be considered as an option, but RAN2 should take into account that DRB is optional for NCR-MT.

NOTE: If RAN2 decides a new NAS trigger is necessary (possibly based on indication from RRC of the NCR-MT to NAS of the NCR-MT), then RAN2 shall inform CT1. FFS if establishmentCause impacts within RRCSetupRequest.

Intel: can be discussed together with the idle timer

Proposal 2: If “wake-up timer” IE is agreed: RAN2 should discuss how an NCR-MT not supporting DRB shall initiate connection setup:

* Option 1: RRC of NCR-MT sends a notification to NAS of NCR-MT, and NAS of the NCR-MT transmits a NAS message. RAN2 sends LS to CT1 to inform the decision.
* Option 2: Leave it to implementation within “upper layers”.
* FFS if establishmentCause impacts within RRCSetupRequest.

Proposal 6: RAN2 should discuss backhaul beam monitoring by NCR-MT in RRC\_INACTIVE:

* Option 1: NCR-MT in RRC\_INACTIVE state may perform backhaul beam monitoring. FFS if anything further to be specified or if left to implementation.
* Option 2: NCR-MT in RRC\_INACTIVE state may not perform backhaul beam monitoring. gNB may perform link monitoring for the backhaul link by implementation when NCR-MT is in RRC\_INACTIVE state.

NOTE: If Option 1 is agreed, the following proposals can also be considered:

* Proposal 6-1: The NCR-FWD switches OFF if the NCR-MT in RRC\_INACTIVE mode detects beam failure.
* Proposal 6-2: The NCR-MT in RRC\_INACTIVE resumes connection to receive updated side control configuration if it reselects a new beam of the same camped cell.

Proposal 8: Cells in forbidden cell list (if configured) are considered as barred for NCR-MT. Cells not in allowed cell list (if configured) are considered as barred for NCR-MT.

Proposal 7: NCR-MT supports RRC release with redirection. If NCR-MT reselects a new cell due to redirection, NCR-Fwd is OFF.

* The proposals can be discussed in the MAC and the RRC running CRs respectively.

The following contributions will not be treated individually due to lack of time.

[R2-2302787](./Docs/R2-2302787.zip) Discussion on NCR remaining open issues Intel Corporation discussion Rel-18 NR\_netcon\_repeater

[R2-2302893](./Docs/R2-2302893.zip) Beam reselection by RRC\_INACTIVE NCR Qualcomm Inc. discussion Rel-18 NR\_netcon\_repeater

[R2-2302928](./Docs/R2-2302928.zip) RRC release with redirection for NCR Nokia, Nokia Shanghai Bell discussion Rel-18 NR\_netcon\_repeater

[R2-2302944](./Docs/R2-2302944.zip) Discussion on releasing NCR-MT to RRC\_IDLE Fujitsu discussion Rel-18 NR\_netcon\_repeater

[R2-2302947](./Docs/R2-2302947.zip) Further discussion on remaining open issues when NCR-MT is in RRC Inactive and RRC idle NEC discussion Rel-18 NR\_netcon\_repeater

[R2-2303238](./Docs/R2-2303238.zip) Discussion on RRC states for NCR-MT Lenovo discussion Rel-18

[R2-2303264](./Docs/R2-2303264.zip) Remaining Issues of Side Control Information Signaling vivo discussion Rel-18

[R2-2303276](./Docs/R2-2303276.zip) Remaining issues on NCR Kyocera discussion Rel-18

[R2-2303291](./Docs/R2-2303291.zip) Discussion on NCR remaining issues ZTE Corporation, Sanechips discussion Rel-18 NR\_netcon\_repeater

[R2-2303387](./Docs/R2-2303387.zip) Discussion on remaining issues for NCR-MT in IDLE/INACTIVE Apple discussion Rel-18

[R2-2303775](./Docs/R2-2303775.zip) Discussion on remaining issues for NCR China Telecom discussione

[R2-2303944](./Docs/R2-2303944.zip) Cell selection for NR network-controlled repeaters AT&T discussion

[R2-2303974](./Docs/R2-2303974.zip) Discussion on CP issues for NCR Huawei, HiSilicon discussion Rel-18 NR\_netcon\_repeater

[R2-2304004](./Docs/R2-2304004.zip) Handling of NCR failure and reestablishment Samsung R&D Institute UK discussion

[R2-2304015](./Docs/R2-2304015.zip) Further considerations on NCR procedures and Stage 2 corrections Samsung R&D Institute UK discussion Rel-18 NR\_netcon\_repeater

[R2-2304114](./Docs/R2-2304114.zip) Remaining issues for NCR Ericsson discussion Rel-18 NR\_netcon\_repeater

[R2-2304115](./Docs/R2-2304115.zip) Transitioning from IDLE to CONNECTED Ericsson discussion Rel-18 NR\_netcon\_repeater

### 7.1.4 Repeater management

RAN2 aspects of repeater management (if any).

Note: this AI is assumed to be handled in RAN3, it will be treated with lower priority (may not be treated at all) in RAN2.