**3GPP TSG RAN WG1 #112bis-e** **R1-230xxxx**

**e-Meeting, April 17th – 26th, 2023**

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| *CR-Form-v12.2* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **18.0.0** |  |
|  | | | | | | | | |
| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network |  | Core Network |  |

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| ***Title:*** | Introduction of Network Controlled Repeaters | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Samsung | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_NCR | | | | |  | ***Date:*** | | | 2023-04-20 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | B |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)* | |
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| ***Reason for change:*** | | Introduction of network controlled repeaters (NCR) in NR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Introduce support for NCR in NR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | No support for NCR in NR. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 3.3, 20 (new clause) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  |  | Other core specifications | | | | TS 38.321, TS 38.331 | | |
| ***affected:*** | |  |  | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  |  | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

\*\*\* Unchanged parts are omitted \*\*\*

## 3.3 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in [1, TR 21.905].

\*\*\* Unchanged parts are omitted \*\*\*

MBS Multicast broadcast services

MCG Master cell group

MCS Modulation and coding scheme

NCR Network controlled repeater

NCR-FWD NCR forwarding

NCR-MT NCR mobile termination NDI New Data Indicator

NE-DC E-UTRA NR dual connectivity with MCG using NR and SCG using E-UTRA

NR-DC NR NR dual connectivity

PBCH Physical broadcast channel

\*\*\* Unchanged parts are omitted \*\*\*

# 20 Network controlled repeater

An NCR includes an NCR-MT entity and an NCR-FWD entity. The NCR-MT communicates with a serving cell via a control link based on the Uu interface. The NCR-FWD provides a communication link between a serving cell and UEs via the backhaul link for signalling between the serving cell and the NCR-FWD, and the access link for signalling between the NCR-FWD and the UEs.

Throughout this specification, unless otherwise noted, statements using the term "UE" in Clauses 4 through 13 are equally applicable to the NCR-MT.

A procedure for the NCR-MT to perform cell search, system information acquisition, random access procedure, UCI reporting, or PDCCH monitoring is same as a corresponding one for a UE. A procedure for the NCR-MT to perform PDSCH reception, CSI-RS measurements and CSI determination, PUSCH transmission, or SRS transmission is same as a corresponding one for a UE as described in [6, TS 38.214].

The NCR-FWD transmits or receives only after the NCR-MT receives an indication for one or more beams [20, TS 38.106] for the NCR-FWD to use for transmissions or receptions over corresponding one or more time resources on the control link. In the following, a beam is associated with QCL parameters for transmission by the NCR-FWD or the NCR-MT, or with QCL parameters for reception by the NCR-FWD or the NCR-MT.

When the NCR-MT performs a link recovery procedure as described in Clause 6, the NCR-FWD does not transmit or receive until the link recovery procedure is complete [11 TS 38.321].

The reception timing on the backhaul link and on the control link is same.

The NCR can be provided, through the NCR-MT, *tdd-UL-DL-ConfigurationCommon* and, additionally, *tdd-UL-DL-ConfigurationDedicated*. The NCR-FWD receives on the backhaul link or transmits on the access link only in symbols indicated as downlink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated*. The NCR-FWD receives on the access link or transmits on the backhaul link only in symbols indicated as uplink by *tdd-UL-DL-ConfigurationCommon* or *tdd-UL-DL-ConfigurationDedicated*.

When the NCR simultaneously receives via both the control link and the backhaul link in a set of symbols, a TCI state for receptions on the backhaul link is same as a TCI state for receptions on the control link in the set of symbols. When the NCR simultaneously transmits via both the control link and the backhaul link in a set of symbols, a spatial filter for transmissions on the backhaul link is same as a spatial filter for transmissions on the control link in the set of symbols.

When the NCR does not simultaneously receive on the control link and the backhaul link

- if the NCR does not support determination of a TCI state for receptions on the backhaul link based on an indication of a TCI state by the serving cell, or if the NCR does not receive an indication of a TCI state, for receptions on the backhaul link [11, TS 38.321]

- if the NCR does not receive an indication of a unified TCI state for receptions by the NCR-MT, receptions on the backhaul link use same QCL parameters as the ones for PDCCH receptions in a CORESET with the lowest *controlResourceSetId*

- else, receptions on the backhaul link use the QCL parameters provided by an indicated unified TCI state for receptions by the NCR-MT

- else receptions on the backhaul link use QCL parameters provided by a TCI state in a MAC CE [11, TS 38.321].

When the NCR does not simultaneously transmit on the control link and the backhaul link

- if the NCR does not support determination of a spatial filter for transmissions on the backhaul link based on an indication of a unified TCI state or SRI by the serving cell, or if the NCR-MT does not receive an indication of a unified TCI state or SRI for determining a spatial filter, for transmissions on the backhaul link

- if the NCR does not receive an indication of a unified TCI state for transmissions by the NCR-MT, transmissions on the backhaul link use a same spatial filter as the one associated with the PUCCH resource with the smallest *pucch-ResourceId* in *PUCCH-ResourceSet*

- else, transmissions on the backhaul link use a spatial filter corresponding to an indicated unified TCI state for transmissions by the NCR-MT.

- else transmissions on the backhaul link use a spatial filter corresponding to a TCI state or SRI provided by a MAC CE [11, TS 38.321].

The NCR-FWD uses a same beam for transmissions and receptions on the access link during respective time resources associated with the beam.

The NCR can be provided by *ncr-PeriodicFwdResourceSetToAddModList* a list of sets of resources for transmissions or receptions on the access link. A set of resources, from the list of sets of resources, is provided by *NCR-PeriodicFwdResourceSet* and occurs with a periodicity provided by *ncr-periodicity*. A resource from the set of resources is provided by *NCR-PeriodicFwdResource* and includes a pair of a time resource provided by *ncr-PeriodicTimeResource* and a beam [20, TS 38.106] with an index provided by *ncr-beamIndex*. The time resource starts at a slot that is offset by *slotOffsetPeriodic* slots from the start of the period for the set of resources and at a symbol that is offset by *symbolOffset* from the start of the slot, and has a duration provided by *durationInSymbols* for a SCS provided by *ncr-referenceSCS*.

The NCR can be provided by *ncr-SemiPersistentFwdResourceSetToAddModList* a list of sets of resources for transmissions or receptions on the access link and a MAC CE command can indicate a set of resources for the NCR to use or to stop using based on a corresponding identity provided by *ncr-SemiPersistentFwdResourceSetId* [11, TS 38.321]. The NCR uses or stops using the set of resources starting from the first slot that is after slot where is the slot where the NCR-MT would transmit a PUCCH with HARQ-ACK information associated with the PDSCH providing the MAC CE command and is the SCS configuration for the PUCCH transmission. The set of resources is provided by *NCR-SemiPersistentFwdResourceSet* and occurs with a periodicity provided by *ncr-periodicity*. A resource from the set of resources is provided by *NCR-SemiPersistentFwdResource* and includes a pair of a time resource provided by *ncr-SemiPersistentTimeResource* and a beam with an index provided by *ncr-beamIndex*, where *beamIndex* can be updated by the MAC CE command. The time resource starts at a slot that is offset by *slotOffsetSemiPersistent* slots from the start of the period for the set of resources and at a symbol that is offset by *symbolOffset* from the start of the slot, and has a duration provided by *durationInSymbols* for a SCS provided by *ncr-referenceSCS*.

The NCR-MT can be configured to monitor PDCCH according to USS sets for detection of a DCI format 5\_0 with CRC scrambled by an NCR-RNTI. A time resource and a corresponding beam index for transmissions or receptions on the access link are indicated by corresponding fields in DCI format 5\_0 [4, TS 38.212]. When the NCR detects more than one DCI formats 5\_0 that indicate beam indexes for time resources overlapping in a set of symbols, the NCR uses for the set of symbols a beam index that is indicated by a DCI format 5\_0 that the NCR-MT detects in a most recent PDCCH monitoring occasion. The time resource starts at a slot that is offset by *slotOffsetAperiodic* slots from a reference slot and at a symbol that is offset by *symbolOffset* from the start of the slot, and has a duration provided by *durationInSymbols* for a SCS provided by *ncr-referenceSCS*. The reference slot is a slot that is after a slot of a PDCCH reception that provides the DCI format 5\_0 by a number of slots indicated by XXX.

If

- a first time resource provided by *NCR-SemiPersistentFwdResourceSet* is indicated by a MAC CE command and is associated with a first beam index, and

- a second time resource is provided by *NCR-PeriodicFwdResourceSet* and is associated with a second beam index, and

- the first time resource overlaps with the second time resource in a set of symbols, and

the NCR applies the first beam index for transmissions or receptions on the access link in the set of symbols.

If

- a first time resource is provided by *NCR-PeriodicFwdResourceSet* or *NCR-SemiPersistentFwdResourceSet* and is associated with a first beam index, and

- a second time resource is indicated by DCI format 5\_0 and is associated with a second beam index provided by the DCI format 5\_0, and

- the first time resource overlaps with the second time resource in a set of symbols,

the NCR applies, for transmissions or receptions on the access link in the set of symbols,

- the first beam index if *NCR-PeriodicFwdResourceSet* or *NCR-SemiPersistentFwdResourceSet* includes *priorityFlag*, and

- the second beam index if *NCR-PeriodicFwdResourceSet* or *NCR-SemiPersistentFwdResourceSet* does not include *priorityFlag*.

The NCR does not expect overlapping time resources provided by either *NCR-PeriodicFwdResourceSet* or *NCR-SemiPersistentFwdResourceSet* to be associated with different beam indexes.