**3GPP TSG RAN WG1 #114** **R1-230xxxx**

**Toulouse, France, August 21st – 25th, 2023**

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| *CR-Form-v12.2* |
| **DRAFT CHANGE REQUEST** |
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|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **17.6.0** |  |
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| *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 | **x** | Radio Access Network | **x** | Core Network |  |

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| ***Title:***  | Introduction of NR NTN enhancements  |
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| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_NTN\_enh-Core |  | ***Date:*** | 2023-09-01 |
|  |  |  |  |  |
| ***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 canbe 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 NR NTN enhancements. |
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| ***Summary of change:*** |  Introduce enhancements for NR NTN operation.  |
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| ***Consequences if not approved:*** | No support of enhancements for NR NTN operation. |
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| ***Clauses affected:*** | 7.1.1, 9.2.6 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** | **x** |  |  Other core specifications  | TS 38.331 |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

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

### 7.1.1 UE behaviour

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

- is the bandwidth of the PUSCH resource assignment expressed in number of resource blocks for PUSCH transmission occasion on active UL BWP of carrier of serving cell and is a SCS configuration defined in [4, TS 38.211]

- is a downlink pathloss estimate in dB calculated by the UE using reference signal (RS) index for the active DL BWP, as described in clause 12, of carrier of serving cell

- If the UE is not provided *PUSCH-PathlossReferenceRS* and *enableDefaultBeamPL-ForSRS*,or before the UE is provided dedicated higher layer parameters, the UE calculates

- using a RS resource from an SS/PBCH block with same SS/PBCH block index as the one the UE uses to obtain *MIB*

- if the UE is provided *ntn-RACH-LessHO* in *ReconfigurationWithSync*, using a RS resource from an SS/PBCH block with same SS/PBCH block index as the one with same quasi co-location properties as for PDCCH receptions, as described in Clause 10.1, in *controlResourceSetZero* provided in *ServingCellConfigCommon* of *ReconfigurationWithSync* - If the UE is configured with a number of RS resource indexes, up to the value of *maxNrofPUSCH-PathlossReferenceRSs*, and a respective set of RS configurations for the number of RS resource indexes by *PUSCH-PathlossReferenceRS*, the set of RS resource indexes can include one or both of a set of SS/PBCH block indexes, each provided by *ssb-Index* when a value of a corresponding *pusch-PathlossReferenceRS-Id* maps to a SS/PBCH block index, and a set of CSI-RS resource indexes, each provided by *csi-RS-Index* when a value of a corresponding *pusch-PathlossReferenceRS-Id* maps to a CSI-RS resource index. The UE identifies a RS resource index in the set of RS resource indexes to correspond either to a SS/PBCH block index or to a CSI-RS resource index as provided by *pusch-PathlossReferenceRS-Id* in *PUSCH-PathlossReferenceRS*

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

### 9.2.6 PUCCH repetition procedure

A UE that does not have dedicated PUCCH resource configuration and indicates a capability to transmit with repetitions a PUCCH with HARQ-ACK information [11, TS 38.321], determines a number of slots for repetitions of a PUCCH transmission with HARQ-ACK information based on an indication by *numberOfPUCCHforMsg4HARQACK-RepetitionsList*. If *numberOfPUCCHforMsg4HARQACK-RepetitionsList* provides more than one values, the DAI field in a DCI format 1\_0 with CRC scrambled by a TC-RNTI scheduling a PDSCH reception that includes a UE contention resolution identity indicates from the more than one values. The UE transmits each repetition of the PUCCH using frequency hopping as described in Clause 9.2.1.

In the remaining of this clause, a UE without dedicated PUCCH resource configuration determines a value of a parameter, if applicable, according to Table 9.2.1-1 and/or as specified above in this clause for a PUCCH transmission with repetitions from the UE.

A UE can be indicated to transmit a PUCCH over slots using a PUCCH resource, where

- if the PUCCH resource is indicated by a DCI format and includes *pucch-RepetitionNrofSlots*, is provided by *pucch-RepetitionNrofSlots*

- otherwise, is provided by *nrofSlots*

If the UE is provided *subslotLengthForPUCCH*, a slot for a PUCCH transmission with repetitions over slots includes a number of symbols indicated by *subslotLengthForPUCCH*.

For ,

- the UE repeats the PUCCH transmission with the UCI over slots

- a repetition of the PUCCH transmission in each of the slots has a same number of consecutive symbols, as provided by *nrofSymbols*

- a repetition of the PUCCH transmission in each of the slots has a same first symbol, as provided by *startingSymbolIndex* if *subslotLengthForPUCCH* is not provided; otherwise mod(*startingSymbolIndex*, *subslotLengthForPUCCH*)

- the UE is configured by *interslotFrequencyHopping* whether or not to perform frequency hopping for repetitions of the PUCCH transmission in different slots

- if the UE is configured to perform frequency hopping for repetitions of a PUCCH transmission across slots and the UE is not provided *pucch-DMRS-Bundling* = 'enabled'

- the UE performs frequency hopping per slot

- the UE transmits the PUCCH starting from a first PRB, provided by *startingPRB*, in slots with even number and starting from a second PRB, provided by *secondHopPRB*, in slots with odd number. The slot indicated to the UE for the first repetition of the PUCCH transmission has number 0 and each subsequent slot until the UE transmits the PUCCH in slots is counted regardless of whether or not the UE transmits the PUCCH in the slot

- the UE does not expect to be configured to perform frequency hopping for a repetition of the PUCCH transmission within a slot

- if the UE is configured to perform frequency hopping for repetitions of a PUCCH transmission across slots and the UE is provided *pucch-DMRS-Bundling* = 'enabled'

- the UE performs frequency hopping per interval of consecutive slots, that start from a slot indicated to the UE and where the UE would transmit a first repetition of the PUCCH, where is the value of *pucch-FrequencyHoppingInterval*, if provided; otherwise, is the value of *pucch-TimeDomainWindowLength*

- the UE transmits the PUCCH over intervals until the UE transmits the PUCCH in slots, where the first interval has number 0 and each subsequent interval is counted regardless of whether or not the UE transmits the PUCCH in a slot

- the UE transmits the PUCCH starting from a first PRB, provided by *startingPRB*, in intervals with even number and starting from a second PRB, provided by *secondHopPRB*, in intervals of frequency hopping intervals with odd number

- the UE does not expect to be configured to perform frequency hopping for a repetition of the PUCCH transmission within a slot

- if the UE is not configured to perform frequency hopping for repetitions of a PUCCH transmission across slots and the UE is configured to perform frequency hopping for a repetition of the PUCCH transmission within a slot, the frequency hopping pattern between the first PRB and the second PRB is same within each slot

If the UE determines that, for a repetition of a PUCCH transmission in a slot, the number of symbols available for the PUCCH transmission is smaller than the value provided by *nrofSymbols* for the corresponding PUCCH format, the UE does not transmit the PUCCH repetition in the slot.

A SS/PBCH block symbol is a symbol of an SS/PBCH block with candidate SS/PBCH block index corresponding to the SS/PBCH block index indicated to a UE by *ssb-PositionsInBurst* in *SIB1* or *ssb-PositionsInBurst* in *ServingCellConfigCommon* or by *NonCellDefiningSSB* if provided or, if the UE is not provided *dl-OrJointTCI-StateList*, by *ssb-PositionsInBurst* in *SSB-MTCAdditionalPCI* associated to physical cell ID with active TCI states for PDCCH or PDSCH, or for a set of symbols of a slot corresponding to SS/PBCH blocks configured for L1 beam measurement/reporting.

For unpaired spectrum, the UE determines the slots for a PUCCH transmission starting from a slot indicated to the UE as described in clause 9.2.3 for HARQ-ACK reporting, or a slot determined as described in clause 9.2.4 for SR reporting or in clause 5.2.1.4 of [6, TS 38.214] for CSI reporting and having

- an UL symbol, as described in clause 11.1, or flexible symbol that is not SS/PBCH block symbol provided by *startingSymbolIndex* as a first symbol, and

- consecutive UL symbols, as described in clause 11.1, or flexible symbols that are not SS/PBCH block symbols, starting from the first symbol, equal to or larger than a number of symbols provided by *nrofsymbols*

For paired spectrum or supplementary uplink band, the UE determines the slots for a PUCCH transmission as the consecutive slots starting from a slot indicated to the UE as described in clause 9.2.3 for HARQ-ACK reporting, or a slot determined as described in clause 9.2.4 for SR reporting or in clause 5.2.1.4 of [6, TS 38.214] for CSI reporting.

If a UE would transmit a PUCCH over a first number of slots and the UE would transmit a PUSCH with repetition Type A or with TB processing over multiple slots over a second number of slots, and the PUCCH transmission would overlap with the PUSCH transmission in one or more slots, and the conditions in clause 9.2.5 for multiplexing the UCI in the PUSCH are satisfied in the overlapping slots, the UE transmits the PUCCH and does not transmit the PUSCH in the overlapping slots.

If a UE would transmit a PUCCH over a first number of slots and the UE would transmit a PUSCH with repetition Type B over a second number of slots, and the PUCCH transmission would overlap with actual PUSCH repetitions in one or more slots, and the conditions in clause 9.2.5 for multiplexing the UCI in the PUSCH are satisfied for the overlapping actual PUSCH repetitions, the UE transmits the PUCCH and does not transmit the overlapping actual PUSCH repetitions.

A UE does not multiplex different UCI types in a PUCCH transmission with repetitions over slots. If a UE would transmit a first PUCCH over more than one slot and at least a second PUCCH over one or more slots, and the transmissions of the first PUCCH and the second PUCCH would overlap in a number of slots then, for each slot of the number of slots and with UCI type priority of HARQ-ACK > SR > CSI with higher priority > CSI with lower priority, the UE determines an earliest first PUCCH in a slot with the order of earliest starting symbol followed by longest duration and the second PUCCHs overlapping with the earliest first PUCCH, and then performs the following

- the UE does not expect more than one PUCCH from the first PUCCH and the second PUCCHs to start at a same slot and include a UCI type with same priority

- if more than one PUCCH from the first PUCCH and the second PUCCHs include a UCI type with the same highest priority, the UE transmits the PUCCH with the highest priority starting at an earliest slot and does not transmit the other PUCCHs, otherwise,

- the UE transmits the PUCCH that includes the UCI type with the highest priority and does not transmit the PUCCHs that include the UCI type with lower priority

The UE repeats the above procedure until there is no PUCCH overlapping with any PUCCH with repetitions in the slot.

When a PUCCH resource used for repetitions of a PUCCH transmission by a UE includes first and second spatial settings, or first and second sets of power control parameters, as described in [11, TS 38.321] and in clause 7.2.1, the UE

- uses the first and second spatial settings, or the first and second sets of power control parameters, for first and second repetitions of the PUCCH transmission, respectively, when ,

- alternates between the first and second spatial settings, or between the first and second sets of power control parameters, respectively, per repetitions of the PUCCH transmission, where if *mappingPattern* = 'cyclicMapping'; else, .

A UE does not expect a PUCCH that is in response to a DCI format detection to overlap with any other PUCCH that does not satisfy the corresponding timing conditions in clause 9.2.5.

If a UE would transmit a PUCCH over slots and the UE does not transmit the PUCCH in a slot from the slots due to overlapping with another PUCCH transmission in the slot, the UE counts the slot in the number of slots.

For DAPS operation, if a UE would transmit a PUCCH over slots on the source MCG and the UE does not transmit the PUCCH in a slot from the slots due to overlapping in time with UE transmission on the target MCG in the slot, the UE counts the slot in the number of slots.

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