**3GPP TSG RAN WG1 #109-e** **R1-22xxxxx**

**e-Meeting, May 9th – 20th, 2022**

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| *CR-Form-v12.2* |
| **DRAFT CHANGE REQUEST** |
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|  | **38.213** | **CR** |  | **rev** |  | **Current version:** | **17.1.0** |  |
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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:***  | Corrections on the introduction of UEs with reduced capabilities in NR |
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| ***Source to WG:*** | Samsung |
| ***Source to TSG:*** | R1 |
|  |  |
| ***Work item code:*** | NR\_redcap-Core |  | ***Date:*** | 2022-05-24 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-17 |
|  | *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:*** | 1. Misalignment of RRC parameter names with those in TS 38.331 in clause 17.1.
2. Ambiguous SS/PBCH blocks colliding with transmissions by a HD-UE in clause 17.2.
3. The case of a “non-cell-defining” SS/PBCH block is not considered in the handling of collisions for a HD-UE in clause 17.2.
4. The case of collisions among Type A repetitions of a PUSCH and SS/PBCH blocks, and the associated slot counting for the repetitions, are missing in clause 17.2.
5. The case of collisions among Type B repetitions of a PUSCH and SS/PBCH blocks is missing in clause 17.2.
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| ***Summary of change:*** | 1. Align RRC parameter names and descriptions of IEs with those in TS 38.331 in clause 17.1.
2. Clarify that SS/PBCH blocks colliding with transmissions by a HD-UE are in the active DL BWP of the HD-UE in clause 17.2.
3. Include “non-cell-defining” SS/PBCH block and handle collisions in a same manner as for a “cell-defining” SS/PBCH block in clause 17.2.
4. Capture collisions and associated slot counting among Type A repetitions of a PUSCH and SS/PBCH blocks, including dependence on *AvailableSlotCounting*, in clause 17.2.
5. Capture collisions among Type B repetitions of a PUSCH and SS/PBCH blocks in clause 17.2
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| ***Consequences if not approved:*** | Incomplete support for UEs with reduced capabilities in NR. |
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| ***Clauses affected:*** | 17.1, 17.2 |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  |  |  Other core specifications  | 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 text is omitted \*\*\*

# 17 UE with reduced capabilities

A UE with reduced capabilities (RedCap UE) supports all Layer-1 UE features that are mandatory without capability signalling.

## 17.1 RedCap UE procedures

Procedures for a RedCap UE are same as described for a UE in all other clauses of this document unless stated otherwise. In this clause, the term 'UE' refers to a RedCap UE.

A UE expects the initial DL BWP and the active DL BWP after the UE (re)establishes dedicated RRC connection to be smaller than or equal to the maximum DL bandwidth that the UE supports. A UE can be provided a DL BWP by *initialDownlinkBWP-RedCap* in *DownlinkConfigCommonSIB*, and an UL BWP by *initialUplinkBWP-RedCap* in *UplinkConfigCommonSIB*. If *initialUplinkBWP* in *UplinkConfigCommonSIB* indicates an UL BWP that is larger than a maximum UL BWP that a UE supports, the UE expects to be provided an UL BWP by *initialUplinkBWP-RedCap* in *UplinkConfigCommonSIB*.

A UE can be provided by *BWP-DownlinkDedicated* a DL BWP, other than the initial DL BWP. A UE can be provided by *BWP-UplinkDedicated* an UL BWP, other than the initial UL BWP, that is smaller than or equal to the maximum UL bandwidth that the UE supports.

If a UE is provided an UL BWP by *initialUplinkBWP-RedCap* in *UplinkConfigCommonSIB* and is provided *rach-ConfigCommon* or *msgA-ConfigCommon* in *BWP-UplinkCommon* for the UL BWP, the UE uses corresponding parameters to perform the procedures in clauses 8.1, 8.1A, and 8.3; otherwise, the UE uses corresponding parameters from *rach-ConfigCommon* or *msgA-ConfigCommon* in *BWP-UplinkCommon* for the UL BWP provided by *initialUplinkBWP*.

If a UE is provided *initialUplinkBWP-RedCap* in *UplinkConfigCommonSIB* and does not have dedicated PUCCH resource configuration, the UE transmits PUCCH with HARQ-ACK information as described in clause 9.2.1 using a PUCCH resource set provided by *pucch-ResourceCommonRedCap*, except that frequency hopping for the PUCCH transmission is disabled if *intra-SlotFH* is present in *PUCCH-ConfigCommon*. If frequency hopping of the PUCCH transmission is disabled then, for the PUCCH transmission, the UE determines the initial cyclic shift index in the set of initial cyclic shift indexes as and determines the PRB index as

- , if *BWP-part* = '*FromLowerEdge*'

- , otherwise

where is provided by *additional-RB-Offset*, if provided; otherwise,

For an initial DL BWP provided by *initialDownlinkBWP* in *DownlinkConfigCommonRedCapSIB*, if a UE monitors PDCCH according to a Type1-PDCCH CSS set and does not monitor PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP does not include SS/PBCH blocks or the CORESET with index 0. If the UE monitors PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP

- includes a SS/PBCH block and the CORESET with index 0 if the UE used the SS/PBCH block to obtain SIB1

- includes a SS/PBCH block and does not include the CORESET with index 0 if the initial DL BWP does not include the SS/PBCH block the UE used to obtain SIB1

For an active DL BWP provided by *BWP-DownlinkDedicated*, a UE assumes that the active DL BWP includes a SS/PBCH block, unless the UE indicates a capability to operate in the DL BWP without receiving an SS/PBCH block, and does not include the CORESET with index 0.

## 17.2 Half-Duplex UE in paired spectrum

A half-duplex UE (HD-UE) in paired spectrum is not capable of simultaneous transmissions and receptions on a serving cell with paired spectrum. This clause is applicable for communication of a HD-UE on a serving cell with paired spectrum.

A HD-UE does not expect to detect a DCI format scheduling a reception in a set of symbols and detect a DCI format scheduling a transmission in any symbol from the set of symbols.

If a HD-UE is configured by higher layers to receive a PDCCH, or PDSCH, or CSI-RS, or DL PRS in a set of symbols, the HD-UE receives the PDCCH, or PDSCH, or CSI-RS, or DL PRS if the HD-UE does not detect a DCI format that indicates to the HD-UE to transmit a PUSCH, or PUCCH, or PRACH, or SRS in at least one symbol of the set of symbols; otherwise, the HD-UE does not receive the PDCCH, or PDSCH, or CSI-RS, or DL PRS in the set of symbols.

If a HD-UE is configured by higher layers to transmit SRS, or PUCCH, or PUSCH in a set of symbols and the UE detects a DCI format indicating to the HD-UE to receive CSI-RS or PDSCH in a subset of symbols from the set of symbols, then

- the HD-UE does not expect to cancel the transmission of the PUCCH or PUSCH in the set of symbols if the first symbol in the set occurs within relative to a last symbol of a CORESET where the HD-UE detects the DCI format; otherwise, the HD-UE cancels the PUCCH, or the PUSCH, or an actual repetition of the PUSCH [6, TS38.214], determined from clauses 9 and 9.2.5 or clause 6.1 of [6, TS38.214].

- the HD-UE does not expect to cancel the transmission of SRS in symbols from the subset of symbols that occur within relative to a last symbol of a CORESET where the HD-UE detects the DCI format. The HD-UE cancels the SRS transmission in remaining symbols from the subset of symbols.

 is the PUSCH preparation time for UE processing capability 1 [6, TS 38.214] assuming and corresponds to the smallest SCS configuration between the SCS configuration of the PDCCH carrying the DCI format and the SCS configuration of the SRS, PUCCH, PUSCH.

A HD-UE does not expect to receive both dedicated higher layer parameters configuring transmission in a set of symbols and dedicated higher layer parameters configuring reception in the set of symbols. A HD-UE does not expect to receive both a Type-0/0A/1/2-PDCCH CSS set configuration for PDCCH reception in a set of symbols and dedicated higher layer parameters configuring transmission in the set of symbols.

If a HD-UE would transmit a PUSCH, or PUCCH, or SRS based on a configuration by higher layers and the HD-UE is indicated presence of SS/PBCH blocks within the active DL BWP by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or by *NonCellDefiningSSB*, the HD-UE does not transmit

- PUSCH or PUCCH if a last symbol of the PUSCH or PUCCH transmission would not be at least [4, TS 38.211] prior to a first symbol of the next earliest SS/PBCH block

- PUSCH or PUCCH if a first symbol of the PUSCH or PUCCH transmission would not be at least [4, TS 38.211] after a last symbol of the previous latest SS/PBCH block

- SRS in symbols that would not be at least prior to a first symbol of the next earliest SS/PBCH block

- SRS in symbols that would not be at least after a last symbol of the previous latest SS/PBCH block

For paired spectrum operation, if a HD-UE would transmit a PUSCH scheduled by a DCI format 0\_1/0\_2, or would transmit a configured grant PUSCH, with PUSCH repetitions Type A over slots and the HD-UE is indicated presence of SS/PBCH blocks within the active DL BWP by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or by *NonCellDefiningSSB* in a set of symbols

- if the HD-UE is provided *AvailableSlotCounting* = “enabled”

- if , the HD-UE does not count a slot in the number of slots if a PUSCH repetition in the slot would not start or end at least or , respectively, from the last or first symbol in the set of symbols

- if , the HD-UE does not transmit the PUSCH in the slot if the PUSCH transmission would not start or end at least or , respectively, from the last or first symbol in the set of symbols

- if the HD-UE is not provided *AvailableSlotCounting* or is provided *AvailableSlotCounting* = “disabled”, the HD-UE does not transmit a PUSCH in a slot if the PUSCH transmission would not start or end at least or , respectively, from the last or first symbol in the set of symbols

For paired spectrum operation, if a HD-UE would transmit a PUSCH with PUSCH repetitions Type B and the HD-UE is indicated presence of SS/PBCH blocks within the active DL BWP by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or by *NonCellDefiningSSB* in a set of symbols, the HD-UE considers as invalid symbols of a PUSCH repetition that are not at least or , respectively, from the last or first symbol in the set of symbols.

If a HD-UE would transmit a PRACH based on a detected DCI format, or PUSCH, or PUCCH, or SRS and the HD-UE is indicated presence of SS/PBCH blocks within the active DL BWP by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or by *NonCellDefiningSSB* in a set of symbols, the HD-UE does not transmit PUSCH or PUCCH or PRACH if a transmission would overlap with any symbol from the set of symbols and the HD-UE does not transmit SRS in the set of symbols.

If a HD-UE would transmit a PRACH or MsgA PUSCH triggered by higher layers in a set of symbols and would receive a PDCCH, or a PDSCH, or a CSI-RS, or a DL PRS, or is indicated presence of SS/PBCH blocks within the active DL BWP by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or by *NonCellDefiningSSB* in symbols that include any symbol from the set of symbols, the HD-UE can select based on its implementation whether to either transmit the PRACH or the MsgA PUSCH or receive the PDSCH, or the CSI-RS, or the PL RS, or the PDCCH, or the SS/PBCH blocks.

If a HD-UE would receive a PDCCH, or a PDSCH, or a CSI-RS, or a DL PRS based on a configuration by higher layers or is indicated presence of SS/PBCH blocks within the active DL BWP by *ssb-PositionsInBurst* in *SIB1* or in *ServingCellConfigCommon* or by *NonCellDefiningSSB* in a set of symbols, and the HD-UE would transmit PRACH or MsgA PUSCH triggered by higher layers starting or ending at a symbol that is earlier or later than or , respectively, from the last or first symbol in the set of symbols, the HD-UE can select based on its implementation whether to either transmit the PRACH or the MsgA PUSCH or receive the PDSCH, or the CSI-RS, or the DL PRS, or the PDCCH, or the SS/PBCH blocks.

\*\*\* Unchanged text is omitted \*\*\*