**3GPP TSG-WG1 Meeting #106bR1-21xxxxx**

**e-meeting, October 11 – 19, 2021**

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
|  |
|  | **38.202** | **CR** | **xxx** | **rev** | **x** | **Current version:** | **16.2.0** |  |
|  |
| *For* [***HE******LP***](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 multicast and broadcast services |
|  |  |
| ***Source to WG:*** | Qualcomm |
| ***Source to TSG:*** |  |
|  |  |
| ***Work item code:*** | NR\_NR\_MBS-Core |  | ***Date:*** | 2021-10-28 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
|  |  |
| ***Reason for change:*** | Introduction of multicast-broadcast services (MBS) in NR. |
|  |  |
| ***Summary of change:*** | Add description related to MBS support including the:* RNTIs used to be monitored MBS
* New Downlink "Reception Types" for MBS
* New combinations of physical channels that can be received simultaneously by one UE
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|  |  |
| ***Consequences if not approved:*** | Incomplete support for MBS in NR. |
|  |  |
| ***Clauses affected:*** | 6.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** | **X** |  |  Other core specifications  | 38.212, 38.213, 38.214  |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

# 6 Simultaneous transmission and reception of physical channels and physical signals

This clause describes the requirements from the UE to send and receive multiple physical channels and physical signals simultaneously depending on the capabilities and service requirements. The following notation is used between both the uplink and downlink clauses below.

*- p* is the number of uplink carriers configured for the UE on which physical channels can be transmitted

*- p'* is the number of uplink carriers configured for the UE on which SRS can be transmitted

*- q* is the number of downlink carriers configured for the UE

*- j* is the number of cell groups configured for the UE.

*- k* is the number of PUCCH groups configured for the UE.

## 6.1 Uplink

The tables 6.1-1 and 6.1-2 describe the possible combinations of physical channels and SRS that can be sent in simultaneously in the uplink by one UE. Table 6.1-1 introduces notation for a "Transmission Type" which represents a physical channel or sounding reference signal, and any associated transport channel. Table 6.1-2 describes the combinations of these "Transmission Types" which are supported by the UE depending on capabilities [8, TS 38.306], and enumerates how many of each can be transmitted simultaneously.

Table 6.1-1: Uplink "Transmission Types"

|  |  |  |  |
| --- | --- | --- | --- |
| "Transmission Type" | Physical Channel or SRS | AssociatedTransport Channel | Comment |
| A | PRACH | RACH | Note 1, Note 3 |
| B | PUCCH | N/A |  |
| C | PUSCH | UL-SCH | Note 2, Note 3 |
| D | SRS | N/A |  |
| Note 1: RACH corresponds to contention based.Note 2: UCI on PUSCH without UL-SCH is possible. Note 3: For SCell, MsgA PRACH and MsgA PUSCH is not supported. |

Table 6.1-2: Uplink "Transmission Type" combinations

|  |  |
| --- | --- |
| Supported Combinations  | Comment |
| *j* x A | Note 1 |
| *k* x B | Note 2 |
| *p* x C | Note 3, Note 4 |
| *p'* x D | Note 3, Note 5 |
| $\tilde{j}×$ A + $\tilde{k}×$B | Note 6 |
| $\tilde{j}×$ A + $\tilde{p}×$C | Note 6 |
| $\tilde{j}×$ A + $\tilde{p}'×$D | Note 6 |
| $\hat{k}×$ B + $\hat{p}×$C | Note 8 |
| $\tilde{k}×$ B + $\tilde{p}'×$D | Note 7 |
| $\tilde{p}×$ C + $\tilde{p}'×$D | Note 7 |
| Note 1: The number of cell groups *j* in the supported combination is subject to UE capability.Note 2: The number of PUCCH groups *k* in the supported combination is subject to UE capability. Note 3: The number of carriers *p,* and *p'* in the supported combinations are subject to UE capability. Note 4: In the case there is one SUL carrier, then *p*-1 would be supported.Note 5: UE may be configured with *p'* but may also have capability to simultaneously sound less than this number. Note 6: Simultaneous PRACH with PUCCH (or PUSCH or SRS) is supported only in the case of inter-band CA, with $\tilde{j}\leq j$, $\tilde{k}\leq k$, $\tilde{p}\leq p$, and $\tilde{p}'\leq p$' depending on the configuration, and subject to UE capability for parallel transmission.Note 7: Simultaneous SRS with PUCCH (or PUSCH) is supported only in the case of inter-band CA, with $\tilde{k}\leq k$, $\tilde{p}\leq p$, and $\tilde{p}'\leq p$' depending on the configuration, and subject to UE capability for parallel transmission. Note 8: Simultaneous PUCCH and PUSCH(s) is supported only in the case that multiple PUCCH groups are configured and the respective PUCCH and PUSCH(s) are transmitted in the different PUCCH groups, with $\hat{k}<k$ and $\hat{p}\leq p$. $k$ and $p$ are subject to UE capability for supported number of PUCCH groups and UL carriers, respectively. $\hat{k}$ and $\hat{p}$ depend on configuration. |

## 6.2 Downlink

The tables 6.2-1, 6.2-2 describe the possible combinations of physical channels that can be received simultaneously in the downlink by one UE. Table 6.2-1 introduces notation for a "Reception Type" which represents a physical channel and any associated transport channel. Table 6.2-2 describes the combinations of these "Reception Types" which are supported by the UE depending on capabilities [8, TS 38.306], and enumerates how many of each can be received simultaneously. The UE shall be able to receive all TBs according to the indication on PDCCH. Any subset of the combinations specified in table 6.2-2 is also supported.

Table 6.2-1: Downlink "Reception Types"

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| "Reception Type" | Physical Channel(s) | MonitoredRNTI | AssociatedTransport Channel | Comment |
| A | PBCH | N/A | BCH |  |
| B | PDCCH+PDSCH | SI-RNTI | DL-SCH | Note 1 |
| C0 | PDCCH | P-RNTI | N/A | Note 1, Note 2 |
| C1 | PDCCH+PDSCH | P-RNTI | PCH | Note 1 |
| D0 | PDCCH+PDSCH | RA-RNTI or Temporary C-RNTI or MsgB-RNTI | DL-SCH | Note 3 |
| D1 | PDCCH+PDSCH | C-RNTI, CS-RNTI, MCS-C-RNTI | DL-SCH |  |
| D2 | PDCCH | C-RNTI, CS-RNTI, MCS-C-RNTI | DL-SCH |  |
| D3 | PDCCH+PDSCH | G-RNTI, G-CS-RNTI | DL-SCH | Note 6 |
| D4 | PDCCH | G-CS-RNTI | N/A | Note 7 |
| D5 | PDCCH+PDSCH | MCCH-RNTI | DL-SCH | Note 8 |
| D6 | PDCCH+PDSCH | G-RNTI | DL-SCH | Note 9 |
| E | PDCCH | C-RNTI | N/A | Note 4 |
| F0 | PDCCH | Temporary C-RNTI | UL-SCH | Note 3 |
| F1 | PDCCH | C-RNTI, CS-RNTI, MCS-C-RNTI | UL-SCH |  |
| G | PDCCH | SFI-RNTI  | N/A |  |
| H | PDCCH | INT-RNTI  | N/A |  |
| J0 | PDCCH | TPC-PUSCH-RNTI | N/A |  |
| J1 | PDCCH | TPC-PUCCH-RNTI | N/A |  |
| J2 | PDCCH | TPC-SRS-RNTI | N/A |  |
| K | PDCCH | SP-CSI-RNTI | N/A |  |
| L0 | PDCCH | SL-RNTI | SL-SCH |  |
| L1 | PDCCH | SL-CS-RNTI | SL-SCH |  |
| M | PDCCH | SL Semi-Persistent Scheduling V-RNTI | SL-SCH | Note 5 |
| N | PDCCH | PS-RNTI | N/A |  |
| O | PDCCH | AI-RNTI | N/A |  |
| Note 1: These are received from PCell only.Note 2: In some cases UE is only required to monitor the short message within the DCI for P-RNTI.Note 3: These are received from PCell or PSCell.Note 4: This corresponds to PDCCH-ordered PRACH. Note 5: This corresponds to PDCCH scheduling LTE PC5.Note 6: This is for multicast in RRC connected state iNote 7: This corresponds to DL Semi-Persistent Scheduling release for multicast in RRC connected state.Note 8: This is for broadcast MCCH Note 9: This is for broadcast MTCH |

Table 6.2-2: Downlink "Reception Type" combinations

|  |  |
| --- | --- |
| Supported Combinations  | Comment |
| PCell | PSCell | SCell |
| 1. RRC\_IDLE |
| A + (B and/or C1 and/or D0) + F0 |  |  | Note 1 |
| 2. RRC\_INACTIVE |
| A + (B and/or C1 and/or D0) + F0 |  |  | Note 1 |
| 3. RRC\_CONNECTED |
| (A + C0 + (B and/or (D0 or (m1\*D1+m2\*D2+[m3\*]D3+[m4\*]D4))) + E + F0 + n\*F1 + G + H + J0 + J1 + J2 + K + O + L0 + L1 + M + N)  | (A + (D0 or (m1\*D1+m2\*D2+[m3\*]D3+[m4\*]D4)) + E + F0 + n\*F1 + G + H + J0 + J1 + J2 + K + O + N)  | m1\*D1 + m2\*D2 +[m3\*D3+[m4\*D4] + E + n\*F1 + G + H + J0 + J1 + J2 + K + O + L0 + L1 + M | Note 2, Note 3, Note 4, Note 5, Note 6, Note 7, Note 8, Note 9 |
| Note 1: UE is not required to decode more than two PDSCH simultaneously, and decoding prioritization when more than two are received is up to UE implementation.Note 2: For PCell, UE is not required to decode SI-RNTI PDSCH simultaneously with C-RNTI PDSCH, unless in FR1.Note 3: Supported combinations are subject to UE capabilities for dual connectivity, carrier aggregation, receiving of group TPC commands, pre-emption indication and dynamic SFI monitoring.Note 4: The values of m2 ≥ 0 and n≥ 0 in the supported combinations are subject to the UE capability. Note 5: Support of monitoring PDCCH with SL-RNTI, SL-CS-RNTI, SL Semi-Persistent Scheduling V-RNTI are subject to UE capability. Note 6: The values of m1 ≥ 1 in the supported combinations are subject to the UE capability. Note 7: In Active time, a UE is not expected to monitor the DCI format for the PDCCH scrambled by PS-RNTI.Note 8: The PDCCH scrambled by PS-RNTI can only be configured on the PCell and PSCell.Note 9: The values of m3 ≥ 0 and m4≥0 are subject to UE capability and applicable to RRC connected UEs |

## 6.3 Sidelink

The tables 6.3-1 and 6.3-2 describe the possible combinations of physical channels that can be sent simultaneously in the sidelink by a UE. Table 6.3-1 introduces notation for a sidelink "Transmission Type" which represents a physical channel, and any associated transport channel. Table 6.3-2 describes the combinations of these "Transmission Types" which are supported by the UE depending on capabilities [8, TS 38.306], and enumerates how many of each can be transmitted simultaneously.

Table 6.3-1: Sidelink "Transmission Types"

|  |  |  |  |
| --- | --- | --- | --- |
| "Transmission Type" | Physical Channel | AssociatedTransport Channel | Comment |
| A | PSBCH | SL-BCH |  |
| B | PSSCH | SL-SCH |  |
| C | PSCCH | SL-SCH |  |
| D | PSFCH | N/A |  |
|  |

Table 6.3-2: Sidelink "Transmission Type" combinations

|  |  |
| --- | --- |
| Supported Combinations  | Comment |
| A |  |
| B |  |
| C |  |
| $N×$ D |  |
| B+C |  |
| Note: Depending on the UE capability, the UE may be able to perform simultaneous Uplink and Sidelink transmissions. If the simultaneous transmission of Sidelink and Uplink is beyond the UE capability, the one not prioritized can be dropped according to [TS 38.321. |

The tables 6.3-3 and 6.3-4 describe the possible combinations of physical channels that can be received simultaneously in the sidelink by a UE. Table 6.3-3 introduces notation for a sidelink "Reception Type" which represents a physical channel, and any associated transport channel. Table 6.3-4 describes the combinations of these "Transmission Types" which are supported by the UE depending on capabilities [8, TS 38.306], and enumerates how many of each can be received simultaneously.

Table 6.3-3: Sidelink "Reception Types"

|  |  |  |  |
| --- | --- | --- | --- |
| "Transmission Type" | Physical Channel | AssociatedTransport Channel | Comment |
| A | PSBCH | SL-BCH |  |
| B | PSSCH | SL-SCH |  |
| C | PSCCH | SL-SCH |  |
| D | PSFCH | N/A  |  |
|  |

Table 6.3-4: Sidelink "Reception Type" combinations

|  |  |
| --- | --- |
| Supported Combinations  | Comment |
| A |  |
| B | Note 1 |
| C | Note 1 |
| $M×$ D |  |
| B+C | Note 1 |
| Note 1: Corresponds to simultaneous reception within one sub-channel |