**3GPP TSG-RAN WG2 Meeting #111-e *draft2R2-200xxxx***

**Online, 17 – 28 August 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  | **36.321** | **CR** | **1485** | **rev** | **3** | **Current version:** | **16.1.0** |  |
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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 to 5G V2X with NR Sidelink | | | | | | | | | |
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| ***Source to WG:*** | LG Electronics Inc. | | | | | | | | | |
| ***Source to TSG:*** | R2 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | 5G\_V2X\_NRSL | | | | |  | ***Date:*** | | | 2020-08-21 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *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-12 (Release 12) Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
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| ***Reason for change:*** | | **In section 5.4.2.2**   1. RAN2 agreed to specify the case that LTE SL transmission is prioritized while NR SL transmission is not prioritized, and apply the existing prioritization rules to the case. 2. RAN2 agreed to specify the case that NR SL transmission is prioritized while LTE SL transmission is not prioritized, and apply the existing prioritization rules to the case.   **In section 5.14.1.2.2**   1. In case *sl-Prioritizationthres* is not configured by the network, UL is always prioritized over LTE SL TX. This behaviour has been not clearly specified. | | | | | | | | |
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| ***Summary of change:*** | | **In section 5.4.2.2**   1. Specify the case that LTE SL transmission is prioritized while NR SL transmission is not prioritized. 2. Specify the case that NR SL transmission is prioritized while LTE SL transmission is not prioritized.   **In section 5.14.1.2.2**   1. Clarify that if *sl-Prioritizationthres* is configured and if the value of the highest priority of logical channel(s) and or a MAC CE in the MAC PDU is lower than *sl-PrioritizationThres*, V2X sidelink transmission can be prioritized over uplink transmission. Thus, if *sl-Prioritizationthres* is not configured, uplink transmission is always prioritized over sidelink transmission.   **Impact analysis**  Impacted 5G architecture options:  (NG)EN-DC, NR SA, NE-DC, and NR-DC  Impacted functionality:  V2X sidelink communication, NR sidelink communication, PUSCH transmission  Inter-operability:   1. If the UE is implemented according to this CR but the network is not, no interoperability problems are foreseen. 2. If the network is implemented according to this CR but the UE is not, no interoperability problems are foreseen. | | | | | | | | |
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| ***Consequences if not approved:*** | | UE performing sidelink transmission will not correctly perform UL/SL prioritization. | | | | | | | | |
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| ***Clauses affected:*** | | 5.4.2.2, 5.14.1.2.2 | | | | | | | | |
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|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS 38.321 CRxxxx | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

START OF THE CHANGE

#### 5.4.2.2 HARQ process

Each HARQ process is associated with a HARQ buffer.

For synchronous HARQ, each HARQ process shall maintain a state variable CURRENT\_TX\_NB, which indicates the number of transmissions that have taken place for the MAC PDU currently in the buffer, and a state variable HARQ\_FEEDBACK, which indicates the HARQ feedback for the MAC PDU currently in the buffer. When the HARQ process is established, CURRENT\_TX\_NB shall be initialized to 0.

The sequence of redundancy versions is 0, 2, 3, 1. The variable CURRENT\_IRV is an index into the sequence of redundancy versions. This variable is up-dated modulo 4. For serving cells configured with *pusch-EnhancementsConfig*, BL UEs or UEs in enhanced coverage see clause 8.6.1 in TS 36.213 [2] for the sequence of redundancy versions and redundancy version determination. For NB-IoT UEs see clause 16.5.1.2 in TS 36.213 [2] for the sequence of redundancy versions and redundancy version determination. For an SPS configuration with *totalNumberPUSCH-SPS-STTI-UL-Repetitions* or *totalNumberPUSCH-SPS-UL-Repetitions* (TS 36.331 [8]), the redundancy version for each transmission within a bundle are determined by *rv-SPS-STTI-UL-Repetitions* or *rv-SPS-UL-Repetitions* in the SPS configuration (TS 36.331 [8]).

For NB-IoT UEs, BL UEs or UEs in enhanced coverage for UL\_REPETITION\_NUMBER for Mode B operation, the same redundancy version is used multiple times before cycling to the next redundancy version as specified in clauses 16.5.1.2, 8.6.1 and 7.1.7.1 in TS 36.213 [2].

New transmissions are performed on the resource and with the MCS indicated on PDCCH or Random Access Response. Adaptive retransmissions are performed on the resource and, if provided, with the MCS indicated on PDCCH. Non-adaptive retransmission is performed on the same resource and with the same MCS as was used for the last made transmission attempt.

For synchronous HARQ, the MAC entity is configured with a maximum number of HARQ transmissions and a maximum number of Msg3 HARQ transmissions by RRC: *maxHARQ-Tx* and *maxHARQ-Msg3Tx* respectively. For transmissions on all HARQ processes and all logical channels except for transmission of a MAC PDU stored in the Msg3 buffer, the maximum number of transmissions shall be set to *maxHARQ-Tx*. For transmission of a MAC PDU stored in the Msg3 buffer, the maximum number of transmissions shall be set to *maxHARQ-Msg3Tx*.

For autonomous HARQ, each HARQ process shall maintain a state variable HARQ\_FEEDBACK, which indicates the HARQ feedback for the MAC PDU currently in the buffer, and a timer *aul-RetransmissionTimer* which prohibits new transmission or retransmission for the same HARQ process on the configured autonomous uplink when the timer is running.

When the HARQ feedback is received for this TB, the HARQ process shall:

- set HARQ\_FEEDBACK to the received value;

- if running, stop the *aul-RetransmissionTimer*.

When an uplink grant addressed to C-RNTI is received for this HARQ process and if the UL HARQ operation is autonomous, the HARQ process shall:

- if running, stop the *aul-RetransmissionTimer*.

When PUSCH transmission is performed for this TB and if the uplink grant is a configured grant for the MAC entity's AUL C-RNTI, the HARQ process shall:

- start or restart the *aul-RetransmissionTimer*.

If the HARQ entity requests a new transmission, the HARQ process shall:

- if UL HARQ operation is synchronous:

- set CURRENT\_TX\_NB to 0;

- set HARQ\_FEEDBACK to NACK;

- set CURRENT\_IRV to 0;

- else:

- if UL HARQ operation is autonomous asychronous:

- set HARQ\_FEEDBACK to NACK.

- if the uplink grant was addressed to the AUL C-RNTI:

- set CURRENT\_IRV to 0.

- else:

- set CURRENT\_IRV to the index corresponding to the redundancy version value provided in the HARQ information;

- store the MAC PDU in the associated HARQ buffer;

- store the uplink grant received from the HARQ entity;

- generate a transmission as described below.

If the HARQ entity requests a retransmission, the HARQ process shall:

- if UL HARQ operation is synchronous:

- increment CURRENT\_TX\_NB by 1;

- if the HARQ entity requests an adaptive retransmission:

- store the uplink grant received from the HARQ entity;

- set CURRENT\_IRV to the index corresponding to the redundancy version value provided in the HARQ information;

- if UL HARQ operation is synchronous; or

- if UL HARQ operation is autonomous:

- set HARQ\_FEEDBACK to NACK;

- generate a transmission as described below.

- else if the HARQ entity requests a non-adaptive retransmission:

- if UL HARQ operation is asynchronous or HARQ\_FEEDBACK = NACK:

- if both *skipUplinkTxSPS* and *fixedRV-NonAdaptive* are configured and the uplink grant of the initial transmission of this HARQ process was performed on a configured grant and UL HARQ operation is not autonomous; or

- if the uplink grant is a preallocated uplink grant:

- set CURRENT\_IRV to 0;

- else if UL HARQ operation is autonomous:

- set CURRENT\_IRV to the index corresponding to the redundancy version value selected by the UE implementation.

- generate a transmission as described below.

NOTE 1: When receiving a HARQ ACK alone, the MAC entity keeps the data in the HARQ buffer.

NOTE 2: When no UL-SCH transmission can be made due to the occurrence of a measurement gap or a Sidelink Discovery Gap for Transmission, or prioritization of V2X sidelink communication transmission described in clause 5.14.1.2.2, no HARQ feedback can be received and a non-adaptive retransmission follows.

NOTE 3: For asynchronous HARQ operation, UL retransmissions are triggered only by adaptive retransmission grants, except for retransmissions within a bundle.

To generate a transmission, the HARQ process shall:

- if the MAC PDU was obtained from the Msg3 buffer; or

- if Sidelink Discovery Gaps for Transmission are not configured by upper layers, and there is no measurement gap at the time of the transmission and, in case of retransmission, the retransmission does not collide with a transmission for a MAC PDU obtained from the Msg3 buffer in this TTI; or

- if Sidelink Discovery Gaps for Transmission are configured by upper layers, and there is no measurement gap at the time of the transmission and, in case of retransmission, the retransmission does not collide with a transmission for a MAC PDU obtained from the Msg3 buffer, and there is no Sidelink Discovery Gap for Transmission in this TTI; or

- if Sidelink Discovery Gaps for Transmission are configured by upper layers, and there is no measurement gap at the time of the transmission and, in case of retransmission, the retransmission does not collide with a transmission for a MAC PDU obtained from the Msg3 buffer, and there is a Sidelink Discovery Gap for Transmission, and there is no configured grant for transmission on SL-DCH in this TTI:

- if there is neither transmission of V2X sidelink communication on SL-SCH nor transmission of NR sidelink communication in this TTI; or

- if the transmission of the MAC PDU is prioritized over sidelink transmission:

- instruct the physical layer to generate a transmission according to the stored uplink grant with the redundancy version corresponding to the CURRENT\_IRV value;

- increment CURRENT\_IRV by 1 if UL HARQ operation is not autonomous;

- if UL HARQ operation is synchronous and there is a measurement gap or Sidelink Discovery Gap for Reception at the time of the HARQ feedback reception for this transmission and if the MAC PDU was not obtained from the Msg3 buffer:

- set HARQ\_FEEDBACK to ACK at the time of the HARQ feedback reception for this transmission.

After performing above actions, if UL HARQ operation is synchronous the HARQ process then shall:

- if CURRENT\_TX\_NB = maximum number of transmissions – 1:

- flush the HARQ buffer;

The transmission of the MAC PDU is prioritized over sidelink transmission or can be performed simultaneously with sidelink transmission if one of the following conditions is met:

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- if there are both a configured grant for transmission of V2X sidelink communication on SL-SCH in this TTI and a sidelink grant for transmission of NR sidelink communication as described in clause 5.22.1.1 of TS 38.321 [24] at the time of the transmission, and the MAC entity is able to perform this UL transmission simultaneously with both the transmissions of V2X sidelink communication which are prioritized as described in clause 5.14.1.2.2 and the transmission of NR sidelink communication which is prioritized as described in clause 5.22.1.3.1a of TS 38.321 [24]; or

- if there is only configured grant(s) for transmission of V2X sidelink communication on SL-SCH in this TTI, and either none of the transmissions of V2X sidelink communication is prioritized or the MAC entity is able to perform this UL transmission and the transmissions of V2X sidelink communication which are prioritized as described in clause 5.14.1.2.2 simultaneously; or

- if there is only a sidelink grant for transmission of NR sidelink communication in this TTI as described in clause 5.22.1.1 of TS 38.321 [24], and either no transmission of NR sidelink communication is prioritized as described in clause 5.22.1.3.1a of TS 38.321 [24] or the MAC entity is able to perform this UL transmission simultaneously with the transmission of NR sidelink communication which is prioritized as described in clause 5.x.1.3.2 of TS 38.321 [24] simultaneously:

- if there are both a configured grant for transmission of V2X sidelink communication on SL-SCH in this TTI and a sidelink grant for transmission of NR sidelink communication as described in clause 5.22.1.1 of TS 38.321 [24] at the time of the transmission, and either only the transmissions of V2X sidelink communication is not prioritized as described in clause 5.14.1.2.2 or only the transmission of NR sidelink communication is not prioritized as described in clause 5.22.1.3.1a of TS 38.321 [24] or both:

NOTE 4: Among the UL transmissions where the MAC entity is able to perform all transmissions of V2X sidelink communication prioritized simultaneously, if there are more than one UL transmission which the MAC entity is not able to perform simultaneously, it is up to UE implementation whether this UL transmission is performed.

NOTE 5: Among the UL transmissions that the MAC entity is able to perform simultaneously with the transmission of NR sidelink communication prioritized, if there are more than one UL transmission which the MAC entity is not able to perform simultaneously, it is up to UE implementation whether this UL transmission is performed.

NOTE 6: Among the UL transmissions where the MAC entity is able to perform all transmissions of V2X sidelink communication prioritized simultaneously with the transmission of NR sidelink communication prioritized, if there are more than one UL transmission which the MAC entity is not able to perform simultaneously, it is up to UE implementation whether this UL transmission is performed.

NOTE 7: If there is a sidelink grant for transmission of NR sidelink communication in this TTI as described in clause 5.22.1.1 of TS 38.321 [24] and the MAC entity is not able to perform this UL transmission simultaneously with the transmission of NR sidelink communication, and prioritization-related information is not available prior to the time of the transmission due to processing time restriction, it is up to UE implementation whether this UL transmission is performed.

NEXT CHANGE

##### 5.14.1.2.2 Sidelink process

The Sidelink process is associated with a HARQ buffer.

The sequence of redundancy versions is 0, 2, 3, 1. The variable CURRENT\_IRV is an index into the sequence of redundancy versions. This variable is updated modulo 4.

New transmissions and retransmissions either for a given SC period in sidelink communication or in V2X sidelink communication are performed on the resource indicated in the sidelink grant as specified in clause 5.14.1.1 and with the MCS selected as specified in clause 5.14.1.1.

If the sidelink process is configured to perform transmissions of multiple MAC PDUs for V2X sidelink communication the process maintains a counter SL\_RESOURCE\_RESELECTION\_COUNTER. For other configurations of the sidelink process, this counter is not available.

If the Sidelink HARQ Entity requests a new transmission, the Sidelink process shall:

- set CURRENT\_IRV to 0;

- store the MAC PDU in the associated HARQ buffer;

- store the sidelink grant received from the Sidelink HARQ Entity;

- generate a transmission as described below.

If the Sidelink HARQ Entity requests a retransmission, the Sidelink process shall:

- generate a transmission as described below.

To generate a transmission, the Sidelink process shall:

- if there is no uplink transmission; or if the MAC entity is able to perform uplink transmissions and transmissions on SL-SCH simultaneously at the time of the transmission; or if there is a MAC PDU to be transmitted in this TTI in uplink, except a MAC PDU obtained from the Msg3 buffer, and transmission of V2X sidelink communication is prioritized over uplink transmission; and

- if there is no Sidelink Discovery Gap for Transmission or no transmission on PSDCH at the time of the transmission; or, in case of transmissions of V2X sidelink communication, if the MAC entity is able to perform transmissions on SL-SCH and transmissions on PSDCH simultaneously at the time of the transmission:

- instruct the physical layer to generate a transmission according to the stored sidelink grant with the redundancy version corresponding to the CURRENT\_IRV value.

- increment CURRENT\_IRV by 1;

- if this transmission corresponds to the last transmission of the MAC PDU:

- decrement SL\_RESOURCE\_RESELECTION\_COUNTER by 1, if available.

The transmission of the MAC PDU for V2X sidelink communication is prioritized over uplink transmissions if the following conditions are met:

- if the MAC entity is not able to perform all uplink transmissions and all transmissions of V2X sidelink communication simultaneously at the time of the transmission; and

- if uplink transmission is not prioritized by upper layer according to TS 24.386 [15]; and

- if *thresSL-TxPrioritization* is configured and the value of the highest priority of the sidelink logical channel(s) in the MAC PDU is lower than *thresSL-TxPrioritization*.

END OF THE CHANGE