**3GPP TSG-RAN WG2 Meeting #116b Electronic R2-22xxxxx**

**Online Meeting, January, 2022**

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| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
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|  | **38.321** | **CR** |  | **rev** | **-** | **Current version:** | **16.7.0** |  |
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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:***  | Running CR of TS 38.321 for Sidelink enhancement |
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| ***Source to WG:*** | LG Electronics Inc. |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_SL\_enh-Core |  | ***Date:*** | 2022-01-11 |
|  |  |  |  |  |
| ***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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
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| ***Reason for change:*** | This CR introduces the support of Rel17 features for SL DRX and resource allocation enhancements. |
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| ***Summary of change:*** | This version of a running CR was drafted based on RAN1/2 agreements considering the structure and procedural texts of NR sidelink parts in 38.321.RAN2#112-e:* SL data reception during the SL DRX Active Time.

RAN2#113-e:* SL Data reception during SL DRX Active Time.
* UE behaviour during the SL DRX Inactive Time.
* PDCCH monitoring for SL mode 1.
* SL DRX Command MAC CE.

RAN2#113b-e:* SL DRX inactivity timer for UC/GC.
* SL DRX HARQ RTT timer and SL DRX Retransmission timer for GC.
* support DRX parameters (i.e., *sl-drx-StartOffset, sl-drx-LongCycle, sl-drx-onDurationTimer, and sl-drx-SlotOffset*).
* Start point of SL DRX inactivity timer for UC.
* Granularity (Slot/Symbol/Subframe) of SL DRX Cycle.
* Definition of the SL DRX Active Time.
* sl-drx-onDurationTimer & sl-drx-SlotOffset.
* Start of the SL DRX HARQ RTT timer.
* Dropping the PSFCH transmission due to UL/SL prioritization.
* Starts Retransmission timer upon expiry of the HARQ RTT timer.
* Timer maintenance of Tx UE regarding the RX UE's SL DRX Active Time.
* Starts SL DRX Inactivity timer of Tx UE.

RAN2#114-e:* Uu DRX for SL Mode 1: *drx-HARQ-RTT-TimerSL*, *drx-RetransmissionTimerSL*.
* Uu DRX for SL Mode 1: Start *drx-HARQ-RTT-TimerSL* after PUCCH transmission.
* Uu drx-InactivityTimer for monitoring the PDCCH indicating a new SL transmission.
* For GC/BC, sl-drx-startoffset is set based on DST L2 ID.

RAN2#115-e:* Uu DRX for SL Mode 1: PUCCH dropping.
* For GC, Rx UE maintain separate inactivity timer for each L2 Destination ID.
* Resource Selection considering the Rx UE's Active Time.
* SL DRX Command MAC CE.

RAN2#116-e:* Priority value (e.g., fixed value “1”) of the Sidelink DRX Command MAC CE.
* The granularity (slot) of starting time of *sl-drx-HARQ-RTT-Timer/sl-drx-RetransmissionTimer*.
* the working assumption: “SL HARQ RTT timer can be derived from the retransmission resource timing when the SCI indicates a retransmission resource”.
* The granularity (symbol) of starting time of *drx-HARQ-RTT-TimerSL/drx-RetransmissionTimerSL*.
* Confirm the WA: The slots when the UE is expected CSI report following a CSI request is considered as SL active time.
* For the issue that a mode-1 SL grant being provided by network to Tx-UE yet it is not in SL active time of any destination that has data to be sent, for initial transmission/retransmission, drop the grant.
* MAC indicates the active time information to PHY.
* Formula for SL DRX cycle
* Down-selecdtion of *sl-drx-InactivityTimer*

RAN2#116b-e:* The priority order of Sidelink DRX Command MAC CE is between Sidelink CSI Reporting MAC CE and data from any STCH.
* When an Rx UE receives SL DRX command MAC CE from a TX UE, the Rx UE can stop the running onduration timer and inactivity timer associated with a unicast link.
* For the same pair of L2 SRC/DST ID, the SL DRX command MAC CE can be transmitted alone or with data in the MAC PDU.
* RAN2 does not define a separate SR configuration for SL DRX Command MAC CE.
* drx-HARQ-RTT-TimerSL is supported in case PSFCH is configured in resource pool and sl-PUCCH-Config is not configured. NW can set value as zero or any other value.
* UE uses configured sl-drx-HARQ-RTT-Timer value when the resource assignment information for the next re-transmission does not exist in the SCI regardless of whether HARQ feedback is enabled or disabled.
* TX/RX UE determines the DRX cycle applied for groupcast/broadcast transmissions associated with a specific L2 destination ID as the minimum DRX cycle configured for any of the QoS profiles associated with that L2 destination ID.
* Tx UE should select a destination associated with an Rx UE that is in SL active time for the SL transmission occasion in SL LCP.
* drx-RetransmissionTimerSL is started after expiring drx-HARQ-RTT-TimerSL when the PUCCH (NACK) transmission is dropped.
* Following RAN2 agreement is also applied to GC NACK only. “If the RX UE does not transmit PSFCH for a HARQ enabled transmission (e.g. due to UL/SL prioritization or ACK) the RX UE still starts the HARQ RTT timer in the symbol/slot following the end of PSFCH resource.”
* For unicast, sl-drx-RetransmissionTimer is started after expiring sl-drx-HARQ-RTT-Timer when the PSFCH (NACK) transmission is dropped. FFS for ACK transmission dropping.
* Addition of the section of Inter-UE Coordination MAC CE
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| ***Consequences if not approved:*** | Rel17 features for sidelink are not supported in NR |
|  |  |
| ***Clauses affected:*** | 5.7, 5.22.1.1, 5.22.1.4.1.3, 5.x, 5.x.1, 5.x.2, 6.1.3.x, 6.2.4, 6.1.3.x, 5.22.1.3.1, 6.1.3.y, 5.22.1.5, 5.22.1.8, 5.22.1.4.1, 5.22.1.4.1.2 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ... |
| ***affected:*** |  | **x** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **x** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

START OF THE CHANGE

## 5.7 Discontinuous Reception (DRX)

The MAC entity may be configured by RRC with a DRX functionality that controls the UE's PDCCH monitoring activity for the MAC entity's C-RNTI, CI-RNTI, CS-RNTI, INT-RNTI, SFI-RNTI, SP-CSI-RNTI, TPC-PUCCH-RNTI, TPC-PUSCH-RNTI, TPC-SRS-RNTI, AI-RNTI, SL-RNTI, SLCS-RNTI and SL Semi-Persistent Scheduling V-RNTI. When using DRX operation, the MAC entity shall also monitor PDCCH according to requirements found in other clauses of this specification. When in RRC\_CONNECTED, if DRX is configured, for all the activated Serving Cells, the MAC entity may monitor the PDCCH discontinuously using the DRX operation specified in this clause; otherwise the MAC entity shall monitor the PDCCH as specified in TS 38.213 [6].

RRC controls DRX operation by configuring the following parameters:

- *drx-onDurationTimer*: the duration at the beginning of a DRX cycle;

- *drx-SlotOffset*: the delay before starting the *drx-onDurationTimer*;

- *drx-InactivityTimer*: the duration after the PDCCH occasion in which a PDCCH indicates a new UL or DL transmission for the MAC entity;

- *drx-RetransmissionTimerDL* (per DL HARQ process except for the broadcast process): the maximum duration until a DL retransmission is received;

- *drx-RetransmissionTimerUL* (per UL HARQ process): the maximum duration until a grant for UL retransmission is received;

- *drx-LongCycleStartOffset*: the Long DRX cycle and *drx-StartOffset* which defines the subframe where the Long and Short DRX cycle starts;

- *drx-ShortCycle* (optional): the Short DRX cycle;

- *drx-ShortCycleTimer* (optional): the duration the UE shall follow the Short DRX cycle;

- *drx-HARQ-RTT-TimerDL* (per DL HARQ process except for the broadcast process): the minimum duration before a DL assignment for HARQ retransmission is expected by the MAC entity;

- *drx-HARQ-RTT-TimerUL* (per UL HARQ process): the minimum duration before a UL HARQ retransmission grant is expected by the MAC entity;

- *drx-RetransmissionTimerSL* (per HARQ process): the maximum duration until a grant for SL retransmission is received;

- *drx-HARQ-RTT-TimerSL* (per HARQ process): the minimum duration before a SL retransmission grant is expected by the MAC entity;

- *ps-Wakeup* (optional): the configuration to start associated *drx-onDurationTimer* in case DCP is monitored but not detected;

- *ps-TransmitOtherPeriodicCSI* (optional): the configuration to report periodic CSI that is not L1-RSRP on PUCCH during the time duration indicated by *drx-onDurationTimer* in case DCP is configured but associated *drx-onDurationTimer* is not started;

- *ps-TransmitPeriodicL1-RSRP* (optional): the configuration to transmit periodic CSI that is L1-RSRP on PUCCH during the time duration indicated by *drx-onDurationTimer* in case DCP is configured but associated *drx-onDurationTimer* is not started.

Serving Cells of a MAC entity may be configured by RRC in two DRX groups with separate DRX parameters. When RRC does not configure a secondary DRX group, there is only one DRX group and all Serving Cells belong to that one DRX group. When two DRX groups are configured, each Serving Cell is uniquely assigned to either of the two groups. The DRX parameters that are separately configured for each DRX group are: *drx-onDurationTimer*, *drx-InactivityTimer*. The DRX parameters that are common to the DRX groups are: *drx-SlotOffset*, *drx-RetransmissionTimerDL*, *drx-RetransmissionTimerUL*, *drx-LongCycleStartOffset*, *drx-ShortCycle* (optional), *drx-ShortCycleTimer* (optional), *drx-HARQ-RTT-TimerDL*, and *drx-HARQ-RTT-TimerUL*.

*Editor’s Note: Since a UE monitors PDCCH for Sidelink Mode 1 in one DRX group, drx-RetransmissionTimerSL/drx-HARQ-RTT-TimerSL is not added to common DRX parameters of DRX group.*

When DRX is configured, the Active Time for Serving Cells in a DRX group includes the time while:

- *drx-onDurationTimer* or *drx-InactivityTimer* configured for the DRX group is running; or

- *drx-RetransmissionTimerDL,* *drx-RetransmissionTimerUL* *or drx-RetransmissionTimerSL* is running on any Serving Cell in the DRX group; or

- *ra-ContentionResolutionTimer* (as described in clause 5.1.5) or *msgB-ResponseWindow* (as described in clause 5.1.4a) is running; or

- a Scheduling Request is sent on PUCCH and is pending (as described in clause 5.4.4 or 5.22.15); or

- a PDCCH indicating a new transmission addressed to the C-RNTI of the MAC entity has not been received after successful reception of a Random Access Response for the Random Access Preamble not selected by the MAC entity among the contention-based Random Access Preamble (as described in clauses 5.1.4 and 5.1.4a).

When DRX is configured, the MAC entity shall:

1> if a MAC PDU is received in a configured downlink assignment:

2> start the *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback;

2> stop the *drx-RetransmissionTimerDL* for the corresponding HARQ process.

1> if a MAC PDU is transmitted in a configured uplink grant and LBT failure indication is not received from lower layers:

2> start the *drx-HARQ-RTT-TimerUL* for the corresponding HARQ process in the first symbol after the end of the first transmission (within a bundle) of the corresponding PUSCH transmission;

2> stop the *drx-RetransmissionTimerUL* for the corresponding HARQ process at the first transmission (within a bundle) of the corresponding PUSCH transmission.

1> if a *drx-HARQ-RTT-TimerDL* expires:

2> if the data of the corresponding HARQ process was not successfully decoded:

3> start the *drx-RetransmissionTimerDL* for the corresponding HARQ process in the first symbol after the expiry of *drx-HARQ-RTT-TimerDL*.

1> if a *drx-HARQ-RTT-TimerUL* expires:

2> start the *drx-RetransmissionTimerUL* for the corresponding HARQ process in the first symbol after the expiry of *drx-HARQ-RTT-TimerUL*.

 1> if a *drx-HARQ-RTT-TimerSL* expires:

2> if a HARQ NACK feedback is transmitted on PUCCH; or

2> if a negative acknowledgement on the PUCCH is not transmitted due to UL/SL prioritization:

3> start the *drx-RetransmissionTimerSL* for the corresponding HARQ process in the first symbol after the expiry of *drx-HARQ-RTT-TimerSL*.

1> if a DRX Command MAC CE or a Long DRX Command MAC CE is received:

2> stop *drx-onDurationTimer* for each DRX group;

2> stop *drx-InactivityTimer* for each DRX group.

1> if *drx-InactivityTimer* for a DRX group expires:

2> if the Short DRX cycle is configured:

3> start or restart *drx-ShortCycleTimer* for this DRX group in the first symbol after the expiry of *drx-InactivityTimer*;

3> use the Short DRX cycle for this DRX group.

2> else:

3> use the Long DRX cycle for this DRX group.

1> if a DRX Command MAC CE is received:

2> if the Short DRX cycle is configured:

3> start or restart *drx-ShortCycleTimer* for each DRX group in the first symbol after the end of DRX Command MAC CE reception;

3> use the Short DRX cycle for each DRX group.

2> else:

3> use the Long DRX cycle for each DRX group.

1> if *drx-ShortCycleTimer* for a DRX group expires:

2> use the Long DRX cycle for this DRX group.

1> if a Long DRX Command MAC CE is received:

2> stop *drx-ShortCycleTimer* for each DRX group;

2> use the Long DRX cycle for each DRX group.

1> if the Short DRX cycle is used for a DRX group, and [(SFN × 10) + subframe number] modulo (*drx-ShortCycle*) = (*drx-StartOffset*) modulo (*drx-ShortCycle*):

2> start *drx-onDurationTimer* for this DRX group after *drx-SlotOffset* from the beginning of the subframe.

1> if the Long DRX cycle is used for a DRX group, and [(SFN × 10) + subframe number] modulo (*drx-LongCycle*) = *drx-StartOffset*:

2> if DCP monitoring is configured for the active DL BWP as specified in TS 38.213 [6], clause 10.3:

3> if DCP indication associated with the current DRX cycle received from lower layer indicated to start *drx-onDurationTimer*, as specified in TS 38.213 [6]; or

3> if all DCP occasion(s) in time domain, as specified in TS 38.213 [6], associated with the current DRX cycle occurred in Active Time considering grants/assignments/DRX Command MAC CE/Long DRX Command MAC CE received and Scheduling Request sent until 4 ms prior to start of the last DCP occasion, or during a measurement gap, or when the MAC entity monitors for a PDCCH transmission on the search space indicated by *recoverySearchSpaceId* of the SpCell identified by the C-RNTI while the *ra-ResponseWindow* is running (as specified in clause 5.1.4); or

3> if *ps-Wakeup* is configured with value *true* and DCP indication associated with the current DRX cycle has not been received from lower layers:

4> start *drx-onDurationTimer* after *drx-SlotOffset* from the beginning of the subframe.

2> else:

3> start *drx-onDurationTimer* for this DRX group after *drx-SlotOffset* from the beginning of the subframe.

NOTE 2: In case of unaligned SFN across carriers in a cell group, the SFN of the SpCell is used to calculate the DRX duration.

1> if a DRX group is in Active Time:

2> monitor the PDCCH on the Serving Cells in this DRX group as specified in TS 38.213 [6];

2> if the PDCCH indicates a DL transmission:

3> start the *drx-HARQ-RTT-TimerDL* for the corresponding HARQ process in the first symbol after the end of the corresponding transmission carrying the DL HARQ feedback;

NOTE 3: When HARQ feedback is postponed by PDSCH-to-HARQ\_feedback timing indicating a non-numerical k1 value, as specified in TS 38.213 [6], the corresponding transmission opportunity to send the DL HARQ feedback is indicated in a later PDCCH requesting the HARQ-ACK feedback.

3> stop the *drx-RetransmissionTimerDL* for the corresponding HARQ process.

3> if the PDSCH-to-HARQ\_feedback timing indicate a non-numerical k1 value as specified in TS 38.213 [6]:

4> start the *drx-RetransmissionTimerDL* in the first symbol after the (end of the last) PDSCH transmission (within a bundle) for the corresponding HARQ process.

2> if the PDCCH indicates a UL transmission:

3> start the *drx-HARQ-RTT-TimerUL* for the corresponding HARQ process in the first symbol after the end of the first transmission (within a bundle) of the corresponding PUSCH transmission;

3> stop the *drx-RetransmissionTimerUL* for the corresponding HARQ process.

2> if the PDCCH indicates a SL transmission:

3> if the PUCCH resource is configured:

4> start the *drx-HARQ-RTT-TimerSL* for the corresponding HARQ process in the first symbol after the end of the corresponding PUCCH transmission carrying the HARQ feedback; or

4> start the *drx-HARQ-RTT-TimerSL* for the corresponding HARQ process in the first symbol after the end of the PUCCH resource carrying the HARQ feedback when the PUCCH is not transmitted due to UL/SL prioritization;

4> stop the *drx-RetransmissionTimerSL* for the corresponding HARQ process.

3> if the PUCCH resource is not configured and PSFCH is configured for the SL grant:

4> start the *drx-HARQ-RTT-TimerSL* for the corresponding HARQ process in the first symbol after the end of the corresponding transmission carrying the HARQ feedback; or

4> stop the *drx-RetransmissionTimerSL* for the corresponding HARQ process.

2> if the PDCCH indicates a new transmission (DL, UL or SL) on a Serving Cell in this DRX group:

3> start or restart *drx-InactivityTimer* for this DRX group in the first symbol after the end of the PDCCH reception.

NOTE 3a: A PDCCH indicating activation of SPS, configured grant type 2, or configured sidelink grant of configured grant Type 2 is considered to indicate a new transmission.

2> if a HARQ process receives downlink feedback information and acknowledgement is indicated:

3> stop the *drx-RetransmissionTimerUL* for the corresponding HARQ process.

1> if DCP monitoring is configured for the active DL BWP as specified in TS 38.213 [6], clause 10.3; and

1> if the current symbol n occurs within *drx-onDurationTimer* duration; and

1> if *drx-onDurationTimer* associated with the current DRX cycle is not started as specified in this clause:

2> if the MAC entity would not be in Active Time considering grants/assignments/DRX Command MAC CE/Long DRX Command MAC CE received and Scheduling Request sent until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause:

3> not transmit periodic SRS and semi-persistent SRS defined in TS 38.214 [7];

3> not report semi-persistent CSI configured on PUSCH;

3> if *ps-TransmitPeriodicL1-RSRP* is not configured with value *true*:

4> not report periodic CSI that is L1-RSRP on PUCCH.

3> if *ps-TransmitOtherPeriodicCSI* is not configured with value *true*:

4> not report periodic CSI that is not L1-RSRP on PUCCH.

1> else:

2> in current symbol n, if a DRX group would not be in Active Time considering grants/assignments scheduled on Serving Cell(s) in this DRX group and DRX Command MAC CE/Long DRX Command MAC CE received and Scheduling Request sent until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause:

3> not transmit periodic SRS and semi-persistent SRS defined in TS 38.214 [7] in this DRX group;

3> not report CSI on PUCCH and semi-persistent CSI configured on PUSCH in this DRX group.

2> if CSI masking (*csi-Mask*) is setup by upper layers:

3> in current symbol n, if *drx-onDurationTimer* of a DRX group would not be running considering grants/assignments scheduled on Serving Cell(s) in this DRX group and DRX Command MAC CE/Long DRX Command MAC CE received until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause; and

4> not report CSI on PUCCH in this DRX group.

NOTE 4: If a UE multiplexes a CSI configured on PUCCH with other overlapping UCI(s) according to the procedure specified in TS 38.213 [6] clause 9.2.5 and this CSI multiplexed with other UCI(s) would be reported on a PUCCH resource either outside DRX Active Time of the DRX group in which this PUCCH is configured or outside the on-duration period of the DRX group in which this PUCCH is configured if CSI masking is setup by upper layers, it is up to UE implementation whether to report this CSI multiplexed with other UCI(s).

Regardless of whether the MAC entity is monitoring PDCCH or not on the Serving Cells in a DRX group, the MAC entity transmits HARQ feedback, aperiodic CSI on PUSCH, and aperiodic SRS defined in TS 38.214 [7] on the Serving Cells in the DRX group when such is expected.

The MAC entity needs not to monitor the PDCCH if it is not a complete PDCCH occasion (e.g. the Active Time starts or ends in the middle of a PDCCH occasion).

NEXT CHANGE

## 5.22 SL-SCH Data transfer

### 5.22.1 SL-SCH Data transmission

#### 5.22.1.1 SL Grant reception and SCI transmission

Sidelink grant is received dynamically on the PDCCH, configured semi-persistently by RRC or autonomously selected by the MAC entity. The MAC entity shall have a sidelink grant on an active SL BWP to determine a set of PSCCH duration(s) in which transmission of SCI occurs and a set of PSSCH duration(s) in which transmission of SL-SCH associated with the SCI occurs. A sidelink grant addressed to SLCS-RNTI with NDI = 1 is considered as a dynamic sidelink grant.

If the MAC entity has been configured with Sidelink resource allocation mode 1 as indicated in TS 38.331 [5], the MAC entity shall for each PDCCH occasion and for each grant received for this PDCCH occasion:

1> if a sidelink grant has been received on the PDCCH for the MAC entity's SL-RNTI:

2> if the NDI received on the PDCCH has not been toggled compared to the value in the previously received HARQ information for the HARQ Process ID:

3> use the received sidelink grant to determine PSCCH duration(s) and PSSCH duration(s) for one or more retransmissions of a single MAC PDU for the corresponding Sidelink process according to clause 8.1.2 of TS 38.214 [7].

2> else:

3> use the received sidelink grant to determine PSCCH duration(s) and PSSCH duration(s) for initial transmission and, if available, retransmission(s) of a single MAC PDU according to clause 8.1.2 of TS 38.214 [7].

2> if a sidelink grant is available for retransmission(s) of a MAC PDU which has been positively acknowledged as specified in clause 5.22.1.3.1a:

3> clear the PSCCH duration(s) and PSSCH duration(s) corresponding to retransmission(s) of the MAC PDU from the sidelink grant.

1> else if a sidelink grant has been received on the PDCCH for the MAC entity's SLCS-RNTI:

2> if PDCCH contents indicate retransmission(s) for the identifed HARQ process ID that has been set for an activated configured sidelink grant identified by *sl-ConfigIndexCG*:

3> use the received sidelink grant to determine PSCCH duration(s) and PSSCH duration(s) for one or more retransmissions of a single MAC PDU according to clause 8.1.2 of TS 38.214 [7].

2> else if PDCCH contents indicate configured grant Type 2 deactivation for a configured sidelink grant:

3> trigger configured sidelink grant confirmation for the configured sidelink grant.

2> else if PDCCH contents indicate configured grant Type 2 activation for a configured sidelink grant:

3> trigger configured sidelink grant confirmation for the configured sidelink grant;

3> store the configured sidelink grant;

3> initialise or re-initialise the configured sidelink grant to determine the set of PSCCH durations and the set of PSSCH durations for transmissions of multiple MAC PDUs according to clause 8.1.2 of TS 38.214 [7].

If the MAC entity has been configured with Sidelink resource allocation mode 2 to transmit using pool(s) of resources in a carrier as indicated in TS 38.331 [5] or TS 36.331 [21] based on sensing or random selection, the MAC entity shall for each Sidelink process:

NOTE 1: If the MAC entity is configured with Sidelink resource allocation mode 2 to transmit using a pool of resources in a carrier as indicated in TS 38.331 [5] or TS 36.331 [21], the MAC entity can create a selected sidelink grant on the pool of resources based on random selection or sensing only after releasing configured sidelink grant(s), if any.

NOTE 2: The MAC entity expects that PSFCH is always configured by RRC for at least one pool of resources in *sl-TxPoolSelectedNormal* and for the resource pool in *sl-TxPoolExceptional* in case that at least a logical channel configured with *sl-HARQ-FeedbackEnabled* is set to *enabled*.

1> if the MAC entity has selected to create a selected sidelink grant corresponding to transmissions of multiple MAC PDUs, and SL data is available in a logical channel:

2> if the MAC entity has not selected a pool of resources allowed for the logical channel:

3> if *sl-HARQ-FeedbackEnabled* is set to *enabled* for the logical channel:

4> select any pool of resources configured with PSFCH resources among the pools of resources;

3> else:

4> select any pool of resources among the pools of resources;

2> perform the TX resource (re-)selection check on the selected pool of resources as specified in clause 5.22.1.2;

NOTE 3: The MAC entity continuously performs the TX resource (re-)selection check until the corresponding pool of resources is released by RRC or the MAC entity decides to cancel creating a selected sidelink grant corresponding to transmissions of multiple MAC PDUs.

2> if the TX resource (re-)selection is triggered as the result of the TX resource (re-)selection check:

3> if one or multiple SL DRX is configured:

4> indicate SL DRX Active time of UE receiving SL-SCH data to the physical layer.

*Editor’s Note: What active time the MAC layer will deliver to the physical layer is FFS.*

3> select one of the allowed values configured by RRC in *sl-ResourceReservePeriodList* and set the resource reservation interval, $P\_{rsvp\\_TX}$, with the selected value;

NOTE 3A: The MAC entity selects a value for the resource reservation interval which is larger than the remaining PDB of SL data available in the logical channel.

3> randomly select, with equal probability, an integer value in the interval [5, 15] for the resource reservation interval higher than or equal to 100ms or in the interval $\left[5×\left⌈\frac{100}{max\left(20, P\_{rsvp\\_TX}\right)}\right⌉,15×\left⌈\frac{100}{max\left(20, P\_{rsvp\\_TX}\right)}\right⌉\right] $ for the resource reservation interval lower than 100ms and set *SL\_RESOURCE\_RESELECTION\_COUNTER* to the selected value;

3> select the number of HARQ retransmissions from the allowed numbers, if configured by RRC, in *sl-MaxTxTransNumPSSCH* included in *sl-PSSCH-TxConfigList* and, if configured by RRC, overlapped in *sl-MaxTxTransNumPSSCH* indicated in *sl-CBR-PriorityTxConfigList* for the highest priority of the logical channel(s) allowed on the carrier and the CBR measured by lower layers according to clause 5.1.27 of TS 38.215 [24] if CBR measurement results are available or the corresponding *sl-defaultTxConfigIndex* configured by RRC if CBR measurement results are not available;

3> select an amount of frequency resources within the range that is configured by RRC between *sl-MinSubChannelNumPSSCH* and *sl-MaxSubchannelNumPSSCH* included in *sl-PSSCH-TxConfigList* and, if configured by RRC, overlapped between *MinSubChannelNumPSSCH* and *MaxSubchannelNumPSSCH* indicated in *sl-CBR-PriorityTxConfigList* for the highest priority of the logical channel(s) allowed on the carrier and the CBR measured by lower layers according to clause 5.1.27 of TS 38.215 [24] if CBR measurement results are available or the corresponding *sl-defaultTxConfigIndex* configured by RRC if CBR measurement results are not available;

3> if transmission based on random selection is configured by upper layers:

4> randomly select the time and frequency resources for one transmission opportunity from the resources pool, according to the amount of selected frequency resources and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier.

3> else:

4> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7], according to the amount of selected frequency resources and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier.

3> use the randomly selected resource to select a set of periodic resources spaced by the resource reservation interval for transmissions of PSCCH and PSSCH corresponding to the number of transmission opportunities of MAC PDUs determined in TS 38.214 [7];

*Editor’s Note: The resource (re-)selection related text will be captured after completion of further discussion (e.g., resource selection of initial or retransmission for single MAC PDU transmission or multiple MAC PDU transmissions) with consideration for RX UE’s SL DRX active time.*

3> if one or more HARQ retransmissions are selected:

4> if transmission based on sensing is configured by upper layers and there are available resources left in the resources indicated by the physical layer according to clause 8.1.4 of TS 38.214 [7] for more transmission opportunities; or

4> if transmission based on random selection is configured by upper layers and there are available resources left in the resource pool for more transmission opportunities:

5> randomly select the time and frequency resources for one or more transmission opportunities from the available resources, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier by ensuring the minimum time gap between any two selected resources in case that PSFCH is configured for this pool of resources and that a retransmission resource can be indicated by the time resource assignment of a prior SCI according to clause 8.3.1.1 of TS 38.212 [9];

5> use the randomly selected resource to select a set of periodic resources spaced by the resource reservation interval for transmissions of PSCCH and PSSCH corresponding to the number of retransmission opportunities of the MAC PDUs determined in TS 38.214 [7];

5> consider the first set of transmission opportunities as the initial transmission opportunities and the other set(s) of transmission opportunities as the retransmission opportunities;

5> consider the sets of initial transmission opportunities and retransmission opportunities as the selected sidelink grant.

3> else:

4> consider the set as the selected sidelink grant.

3> use the selected sidelink grant to determine the set of PSCCH durations and the set of PSSCH durations according to TS 38.214 [7].

2> else if *SL\_RESOURCE\_RESELECTION\_COUNTER* = 0 and when *SL\_RESOURCE\_RESELECTION\_COUNTER* was equal to 1 the MAC entity randomly selected, with equal probability, a value in the interval [0, 1] which is less than or equal to the probability configured by RRC in *sl-ProbResourceKeep*:

3> clear the selected sidelink grant, if available;

3> randomly select, with equal probability, an integer value in the interval [5, 15] for the resource reservation interval higher than or equal to 100ms or in the interval $\left[5×\left⌈\frac{100}{max\left(20, P\_{rsvp\\_TX}\right)}\right⌉,15×\left⌈\frac{100}{max\left(20, P\_{rsvp\\_TX}\right)}\right⌉\right] $ for the resource reservation interval lower than 100ms and set *SL\_RESOURCE\_RESELECTION\_COUNTER* to the selected value;

3> reuse the previously selected sidelink grant for the number of transmissions of the MAC PDUs determined in TS 38.214 [7] with the resource reservation interval to determine the set of PSCCH durations and the set of PSSCH durations according to TS 38.214 [7].

1> if the MAC entity has selected to create a selected sidelink grant corresponding to transmission(s) of a single MAC PDU, and if SL data is available in a logical channel, or a SL-CSI reporting is triggered:

2> if SL data is available in the logical channel:

3> if *sl-HARQ-FeedbackEnabled* is set to *enabled* for the logical channel:

4> select any pool of resources configured with PSFCH resources among the pools of resources;

3> else:

4> select any pool of resources among the pools of resources;

2> else if a SL-CSI reporting is triggered:

3> select any pool of resources among the pools of resources.

2> perform the TX resource (re-)selection check on the selected pool of resources as specified in clause 5.22.1.2;

2> if the TX resource (re-)selection is triggered as the result of the TX resource (re-)selection check:

3> if one or multiple SL DRX is configured:

4> indicate SL DRX Active time of UE receiving SL-SCH data to the physical layer.

*Editor’s Note: What active time the MAC layer will deliver to the physical layer is FFS.*

3> select the number of HARQ retransmissions from the allowed numbers, if configured by RRC, in *sl-MaxTxTransNumPSSCH* included in *sl-PSSCH-TxConfigList* and, if configured by RRC, overlapped in *sl-MaxTxTransNumPSSCH* indicated in *sl-CBR-PriorityTxConfigList* for the highest priority of the logical channel(s) allowed on the carrier and the CBR measured by lower layers according to clause 5.1.27 of TS 38.215 [24] if CBR measurement results are available or the corresponding *sl-defaultTxConfigIndex* configured by RRC if CBR measurement results are not available;

3> select an amount of frequency resources within the range that is configured by RRC between *sl-MinSubChannelNumPSSCH* and *sl-MaxSubChannelNumPSSCH* included in *sl-PSSCH-TxConfigList* and, if configured by RRC, overlapped between *sl-MinSubChannelNumPSSCH* and *sl-MaxSubChannelNumPSSCH* indicated in *sl-CBR-PriorityTxConfigList* for the highest priority of the logical channel(s) allowed on the carrier and the CBR measured by lower layers according to clause 5.1.27 of TS 38.215 [24] if CBR measurement results are available or the corresponding *sl-defaultTxConfigIndex* configured by RRC if CBR measurement results are not available;

3> if transmission based on random selection is configured by upper layers:

4> randomly select the time and frequency resources for one transmission opportunity from the resources pool, according to the amount of selected frequency resources and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier, and the latency requirement of the triggered SL CSI reporting;

3> else:

4> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7], according to the amount of selected frequency resources and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier, and/or the latency requirement of the triggered SL-CSI reporting;

3> if one or more HARQ retransmissions are selected:

4> if transmission based on sensing is configured by upper layers and there are available resources left in the resources indicated by the physical layer according to clause 8.1.4 of TS 38.214 [7] for more transmission opportunities; or

4> if transmission based on random selection is configured by upper layers and there are available resources left in the resources pool for more transmission opportunities:

5> randomly select the time and frequency resources for one or more transmission opportunities from the available resources, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier, and/or the latency requirement of the triggered SL-CSI by ensuring the minimum time gap between any two selected resources in case that PSFCH is configured for this pool of resources, and that a retransmission resource can be indicated by the time resource assignment of a prior SCI according to clause 8.3.1.1 of TS 38.212 [9];

5> consider a transmission opportunity which comes first in time as the initial transmission opportunity and other transmission opportunities as the retransmission opportunities;

5> consider all the transmission opportunities as the selected sidelink grant;

3> else:

4> consider the set as the selected sidelink grant;

3> use the selected sidelink grant to determine PSCCH duration(s) and PSSCH duration(s) according to TS 38.214 [7].

NOTE 3B: If retransmission resource(s) cannot be selected by ensuring that the resource(s) can be indicated by the time resource assignment of a prior SCI, how to select the time and frequency resources for one or more transmission opportunities from the available resources is left for UE implementation by ensuring the minimum time gap between any two selected ‎resources in case that PSFCH is configured for this pool of ‎resources.

1> if a selected sidelink grant is available for retransmission(s) of a MAC PDU which has been positively acknowledged as specified in clause 5.22.1.3.3:

2> clear the PSCCH duration(s) and PSSCH duration(s) corresponding to retransmission(s) of the MAC PDU from the selected sidelink grant.

NOTE 3C: How the MAC entity determines the remaining PDB of SL data is left to UE implementation.

For a selected sidelink grant, the minimum time gap between any two selected resources comprises:

- a time gap between the end of the last symbol of a PSSCH transmission of the first resource and the start of the first symbol of the corresponding PSFCH reception determined by *sl-MinTimeGapPSFCH* and *sl-PSFCH-Period* for the pool of resources; and

- a time required for PSFCH reception and processing plus sidelink retransmission preparation including multiplexing of necessary physical channels and any TX-RX/RX-TX switching time.

NOTE 4: How to determine the time required for PSFCH reception and processing plus sidelink retransmission preparation is left to UE implementation.

The MAC entity shall for each PSSCH duration:

1> for each sidelink grant occurring in this PSSCH duration:

*Editor’s Note: The RAN2 agreements of the Tx profile will be captured after completion of further discussion (format, contents and UE’s behaviour).*

2> select a MCS table allowed in the pool of resource which is associated with the sidelink grant;

NOTE 4a: MCS table selection is up to UE implementation if more than one MCS table is configured.

2> if the MAC entity has been configured with Sidelink resource allocation mode 1:

3> select a MCS which is, if configured, within the range that is configured by RRC between *sl-MinMCS-PSSCH* and *sl-MaxMCS-PSSCH* associated with the selected MCS table included in *sl-ConfigDedicatedNR*;

3> set the resource reservation interval to 0ms.

2> else:

3> select a MCS which is, if configured, within the range, if configured by RRC, between *sl-MinMCS-PSSCH* and *sl-MaxMCS-PSSCH* associated with the selected MCS table included in *sl-PSSCH-TxConfigList* and, if configured by RRC, overlapped between *sl-MinMCS-PSSCH* and *sl-MaxMCS-PSSCH* associated with the selected MCS table indicated in *sl-CBR-PriorityTxConfigList* for the highest priority of the sidelink logical channel(s) in the MAC PDU and the CBR measured by lower layers according to clause 5.1.27 of TS 38.215 [24] if CBR measurement results are available or the corresponding *sl-defaultTxConfigIndex* configured by RRC if CBR measurement results are not available;

3> if the MAC entity decides not to use the selected sidelink grant for the next PSSCH duration corresponding to an initial transmission opportunity:

4> set the resource reservation interval to 0ms.

3> else:

4> set the resource reservation interval to the selected value.

NOTE 5: MCS selection is up to UE implementation if the MCS or the corresponding range is not configured by RRC.

2> if the configured sidelink grant has been activated and this PSSCH duration corresponds to the first PSSCH transmission opportunity within this *sl-PeriodCG* of the configured sidelink grant:

3> set the HARQ Process ID to the HARQ Process ID associated with this PSSCH duration and, if available, all subsequent PSSCH duration(s) occuring in this *sl-PeriodCG* for the configured sidelink grant;

3> determine that this PSSCH duration is used for initial transmission;

3> flush the HARQ buffer of Sidelink process associated with the HARQ Process ID.

2> deliver the sidelink grant, the selected MCS, and the associated HARQ information to the Sidelink HARQ Entity for this PSSCH duration.

For configured sidelink grants, the HARQ Process ID associated with the first slot of a SL transmission is derived from the following equation:

HARQ Process ID = [floor(CURRENT\_slot / *PeriodicitySL*)] modulo *sl-NrOfHARQ-Processes* + *sl-HARQ-ProcID-offset*

where CURRENT\_slot refers to current logical slot in the associated resource pool, and *PeriodicitySL* is defined in clause 5.8.3.

NEXT CHANGE

#### 5.22.1.3 Sidelink HARQ operation

##### 5.22.1.3.1 Sidelink HARQ Entity

The MAC entity includes at most one Sidelink HARQ entity for transmission on SL-SCH, which maintains a number of parallel Sidelink processes.

The maximum number of transmitting Sidelink processes associated with the Sidelink HARQ Entity is 16. A sidelink process may be configured for transmissions of multiple MAC PDUs. For transmissions of multiple MAC PDUs with Sidelink resource allocation mode 2, the maximum number of transmitting Sidelink processes associated with the Sidelink HARQ Entity is 4.

A delivered sidelink grant and its associated Sidelink transmission information are associated with a Sidelink process. Each Sidelink process supports one TB.

For each sidelink grant, the Sidelink HARQ Entity shall:

1> if the MAC entity determines that the sidelink grant is used for initial transmission as specified in clause 5.22.1.1; or

1> if the sidelink grant is a configured sidelink grant and no MAC PDU has been obtained in a *sl-PeriodCG* of the configured sidelink grant:

*Editor’s Note: For the issue that a mode-1 SL grant being provided by network to Tx-UE yet it is not in SL active time of any destination that has data to be sent, for initial transmission, drop the grant. FFS if any spec change.*

NOTE 1: Void.

2> (re-)associate a Sidelink process to this grant, and for the associated Sidelink process:

NOTE 1A: The Sidelink HARQ Entity will associate the selected sidelink grant to the Sidelink process determined by the MAC entity.

3> obtain the MAC PDU to transmit from the Multiplexing and assembly entity, if any;

3> if a MAC PDU to transmit has been obtained:

4> if a HARQ Process ID has been set for the sidelink grant:

5> (re-)associate the HARQ Process ID corresponding to the sidelink grant to the Sidelink process;

NOTE 1a: There is one-to-one mapping between a HARQ Process ID and a Sidelink process in the MAC entity configured with Sidelink resource allocation mode 1.

4> determines Sidelink transmission information of the TB for the source and destination pair of the MAC PDU as follows:

5> set the Source Layer-1 ID to the 8 LSB of the Source Layer-2 ID of the MAC PDU;

5> set the Destination Layer-1 ID to the 16 LSB of the Destination Layer-2 ID of the MAC PDU;

5> (re-)associate the Sidelink process to a Sidelink process ID;

NOTE 1b: How UE determine Sidelink process ID in SCI is left to UE implementation for NR sidelink.

5> consider the NDI to have been toggled compared to the value of the previous transmission corresponding to the Sidelink identification information and the Sidelink process ID of the MAC PDU and set the NDI to the toggled value;

NOTE 2: The initial value of the NDI set to the very first transmission for the associated Sidelink process is left to UE implementation.

NOTE 3: Void.

5> set the cast type indicator to one of broadcast, groupcast and unicast as indicated by upper layers;

5> if HARQ feedback has been enabled for the MAC PDU according to clause 5.22.1.4.2;

6> set the HARQ feedback enabled/disabled indicator to *enabled*.

5> else:

6> set the HARQ feedback enabled/disabled indicator to *disabled*.

5> set the priority to the value of the highest priority of the logical channel(s), if any, and a MAC CE, if included, in the MAC PDU;

5> if HARQ feedback is enabled for groupcast:

6> if both a group size and a member ID are provided by upper layers and the group size is not greater than the number of candidate PSFCH resources associated with this sidelink grant:

7> select either positive-negative acknowledgement or negative-only acknowledgement.

NOTE 4: Selection of positive-negative acknowledgement or negative-only acknowledgement is up to UE implementation.

5> set the Redundancy version to the selected value.

6> else:

7> select negative-only acknowledgement.

6> if negative-only acknowledgement is selected, UE's location information is available, and *sl-TransRange* has been configured for a logical channel in the MAC PDU, and *sl-ZoneConfig* is configured as specified in TS 38.331 [5]:

7> set the communication range requirement to the value of the longest communication range of the logical channel(s) in the MAC PDU;

7> determine the value of *sl-ZoneLength* corresponding to the communication range requirement and set Zone\_id to the value of Zone\_id calculated using the determined value of *sl-ZoneLength* as specified in TS 38.331 [5].

4> deliver the MAC PDU, the sidelink grant and the Sidelink transmission information of the TB to the associated Sidelink process;

4> instruct the associated Sidelink process to trigger a new transmission.

3> else:

4> flush the HARQ buffer of the associated Sidelink process.

1> else (i.e. retransmission):

2> if the HARQ Process ID corresponding to the sidelink grant received on PDCCH, the configured sidelink grant or the selected sidelink grant is associated to a Sidelink process of which HARQ buffer is empty; or

2> if the HARQ Process ID corresponding to the sidelink grant received on PDCCH is not associated to any Sidelink process; or

2> if PSCCH duration(s) and PSSCH duration(s) for one or more retransmissions of a MAC PDU of the configured sidelink grant is not in SL DRX Active time of any destination that has data to be sent:

3> ignore the sidelink grant.

2> else:

3> identify the Sidelink process associated with this grant, and for the associated Sidelink process:

4> deliver the sidelink grant of the MAC PDU to the associated Sidelink process;

4> instruct the associated Sidelink process to trigger a retransmission.

#### 5.22.1.4 Multiplexing and assembly

For PDU(s) associated with one SCI, MAC shall consider only logical channels with the same Source Layer-2 ID-Destination Layer-2 ID pair for one of unicast, groupcast and broadcast which is associated with the pair. Multiple transmissions for different Sidelink processes are allowed to be independently performed in different PSSCH durations.

##### 5.22.1.4.1 Logical channel prioritization

###### 5.22.1.4.1.1 General

The sidelink Logical Channel Prioritization procedure is applied whenever a new transmission is performed.

RRC controls the scheduling of sidelink data by signalling for each logical channel:

- *sl-Priority* where an increasing priority value indicates a lower priority level;

- *sl-PrioritisedBitRate* which sets the sidelink Prioritized Bit Rate (sPBR);

- *sl-BucketSizeDuration* which sets the sidelink Bucket Size Duration (sBSD).

RRC additionally controls the LCP procedure by configuring mapping restrictions for each logical channel:

- *sl-configuredGrantType1Allowed* which sets whether a configured grant Type 1 can be used for sidelink transmission;

- *sl-AllowedCG-List* which sets the allowed configured grant(s) for sidelink transmission;

- *sl-HARQ-FeedbackEnabled* which sets whether the logical channel is allowed to be multiplexed with logical channel(s) with *sl-HARQ-FeedbackEnabled* set to *enabled* or *disabled*.

The following UE variable is used for the Logical channel prioritization procedure:

- *SBj* which is maintained for each logical channel *j*.

The MAC entity shall initialize *SBj* of the logical channel to zero when the logical channel is established.

For each logical channel *j*, the MAC entity shall:

1> increment *SBj* by the product sPBR × T before every instance of the LCP procedure, where T is the time elapsed since *SBj* was last incremented;

1> if the value of *SBj* is greater than the sidelink bucket size (i.e. sPBR × sBSD):

2> set *SBj* to the sidelink bucket size.

NOTE: The exact moment(s) when the UE updates *SBj* between LCP procedures is up to UE implementation, as long as *SBj* is up to date at the time when a grant is processed by LCP.

###### 5.22.1.4.1.2 Selection of logical channels

The MAC entity shall for each SCI corresponding to a new transmission:

1> select a Destination associated to one of unicast, groupcast and broadcast, having at least one of the MAC CE and the logical channel with the highest priority, among the logical channels that satisfy all the following conditions and MAC CE(s), if any, for the SL grant associated to the SCI:

2> SL data is available for transmission; and

2> *SBj* > 0, in case there is any logical channel having *SBj* > 0; and

2> *sl-configuredGrantType1Allowed*, if configured, is set to *true* in case the SL grant is a Configured Grant Type 1; and

2> *sl-AllowedCG-List*, if configured, includes the configured grant index associated to the SL grant; and

2> *sl-HARQ-FeedbackEnabled* is set to *disabled*, if PSFCH is not configured for the SL grant associated to the SCI; or

2> *SL-DRX-Config,* if configured, includes sl-DRX-Config-GC-BC or SL-DRX-ConfigUC-Info and there is Active time as specified in clause 5.x.1 for the PSSCH transmission occasions.

NOTE 1: If multiple Destinations have the logical channels satisfying all conditions above with the same highest priority or if multiple Destinations have either the MAC CE and/or the logical channels satisfying all conditions above with the same priority as the MAC CE, which Destination is selected among them is up to UE implementation.

*Editor’s Note: FFS on destination selection considering SL DRX active time of RX UE. If specific RAN2 agreements related to LCP are made, the related text will be captured.*

1> select the logical channels satisfying all the following conditions among the logical channels belonging to the selected Destination:

2> SL data is available for transmission; and

2> *sl-configuredGrantType1Allowed*, if configured, is set to *true* in case the SL grant is a Configured Grant Type 1; and.

2> *sl-AllowedCG-List*, if configured, includes the configured grant index associated to the SL grant; and

3> if PSFCH is configured for the sidelink grant associated to the SCI:

4> *sl-HARQ-FeedbackEnabled* is set to *enabled*, if *sl-HARQ-FeedbackEnabled* is set to *enabled* for the highest priority logical channel satisfying the above conditions; or

4> *sl-HARQ-FeedbackEnabled* is set to *disabled*, if *sl-HARQ-FeedbackEnabled* is set to *disabled* for the highest priority logical channel satisfying the above conditions.

3> else:

4> sl-HARQ-FeedbackEnabled is set to disabled.

NOTE 2: *sl-HARQ-FeedbackEnabled* is set to disabled for the transmission of a MAC PDU only carrying CSI reporting MAC CE or DRX command MAC CE.

###### 5.22.1.4.1.3 Allocation of sidelink resources

The MAC entity shall for each SCI corresponding to a new transmission:

1> allocate resources to the logical channels as follows:

2> logical channels selected in clause 5.22.1.4.1.2 for the SL grant with *SBj* > 0 are allocated resources in a decreasing priority order. If the sPBR of a logical channel is set to *infinity*, the MAC entity shall allocate resources for all the data that is available for transmission on the logical channel before meeting the sPBR of the lower priority logical channel(s);

2> decrement *SBj* by the total size of MAC SDUs served to logical channel *j* above;

2> if any resources remain, all the logical channels selected in clause 5.22.1.4.1.2 are served in a strict decreasing priority order (regardless of the value of *SBj*) until either the data for that logical channel or the SL grant is exhausted, whichever comes first. Logical channels configured with equal priority should be served equally.

NOTE: The value of *SBj* can be negative.

The UE shall also follow the rules below during the SL scheduling procedures above:

- the UE should not segment an RLC SDU (or partially transmitted SDU or retransmitted RLC PDU) if the whole SDU (or partially transmitted SDU or retransmitted RLC PDU) fits into the remaining resources of the associated MAC entity;

- if the UE segments an RLC SDU from the logical channel, it shall maximize the size of the segment to fill the grant of the associated MAC entity as much as possible;

- the UE should maximise the transmission of data;

- if the MAC entity is given a sidelink grant size that is equal to or larger than 12 bytes while having data available and allowed (according to clause 5.22.1.4.1) for transmission, the MAC entity shall not transmit only padding;

- A logical channel configured with *sl-HARQ-FeedbackEnabled* set to *enabled* and a logical channel configured with *sl-HARQ-FeedbackEnabled* set to *disabled* cannot be multiplexed into the same MAC PDU.

The MAC entity shall not generate a MAC PDU for the HARQ entity if the following conditions are satisfied:

- there is no Sidelink CSI Reporting MAC CE generated for this PSSCH transmission as specified in clause 5.22.1.7;

- there is no Sidelink DRX Command MAC CE generated for this PSSCH transmission; and

- the MAC PDU includes zero MAC SDUs.

Logical channels shall be prioritised in accordance with the following order (highest priority listed first):

- data from SCCH;

- Sidelink CSI Reporting MAC CE

- Sidelink DRX Command MAC CE;

- data from any STCH.

*Editor’s Note: FFS on the priority order of the Sidelink DRX Command MAC CE.*

##### 5.22.1.4.2 Multiplexing of MAC Control Elements and MAC SDUs

The MAC entity shall multiplex a MAC CE and MAC SDUs in a MAC PDU according to clauses 5.22.1.4.1 and 6.1.6.

#### 5.22.1.5 Scheduling Request

In addition to clause 5.4.4, the Scheduling Request (SR) is also used for requesting SL-SCH resources for new transmission when triggered by the Sidelink BSR (clause 5.22.1.6) or the SL-CSI reporting (clause 5.22.1.7) or SL-DCM reporting (clause 5.22.1.8). If configured, the MAC entity performs the SR procedure as specified in this clause unless otherwise specified in clause 5.4.4. For a sidelink logical channel or for SL-CSI reporting or for SL-DCM reporting, at most one PUCCH resource for SR is configured per UL BWP.

The SR configuration of the logical channel that triggered the Sidelink BSR (clause 5.22.1.6) or Sidelink DRX Command (clause 5.22.1.8) (if such a configuration exists) is also considered as corresponding SR configuration for the triggered SR (clause 5.4.4). The value of the priority of the triggered SR corresponds to the value of priority of the logical channel that triggered the SR.

Each sidelink logical channel may be mapped to zero or one SR configuration, which is configured by RRC. If the SL-CSI reporting procedure is enabled by RRC, the SL-CSI reporting is mapped to one SR configuration for all PC5-RRC connections. The SR configuration of the SL-CSI reporting triggered according to 5.22.1.7 is considered as corresponding SR configuration for the triggered SR (clause 5.4.4). The value of the priority of the triggered SR corresponds to the value of the priority of the Sidelink CSI Reporting MAC CE.

All pending SR(s) triggered according to the Sidelink BSR procedure (clause 5.22.1.6) prior to the MAC PDU assembly shall be cancelled and each respective *sr-ProhibitTimer* shall be stopped when the MAC PDU is transmitted and this PDU includes a SL-BSR MAC CE which contains buffer status up to (and including) the last event that triggered a Sidelink BSR (see clause 5.22.1.4) prior to the MAC PDU assembly.

All pending SR(s) triggered according to the Sidelink BSR procedure (clause 5.22.1.6) shall be cancelled and each respective *sr-ProhibitTimer* shall be stopped when the SL grant(s) can accommodate all pending data available for transmission in sidelink.

The pending SR triggered according to the SL-CSI reporting for a destination shall be cancelled and each respective *sr-ProhibitTimer* shall be stopped when the SL grant(s) can accommodate the Sidelink CSI Reporting MAC CE or the Sidelink DRX Command MAC CE when the SL-CSI reporting or SL-DCM reporting that has been triggered but not cancelled or when the triggered SL-CSI reporting or SL-DCM reporting is cancelled due to latency non-fulfilment as specified in 5.22.1.7. All pending SR(s) triggered by either Sidelink BSR or Sidelink CSI report or Sidelink DRX Command report shall be cancelled, when RRC configures Sidelink resource allocation mode 2.

#### 5.22.1.8 DRX Command Reporting

The Sidelink DRX Command (SL-DCM) reporting procedure is used to indicate a peer UE to stop the running *sl-drx-onDurationTimer* or *sl-drx-InactivityTimer* as specified in clause 5.x.1.

NEXT CHANGE

## 5.x Sidelink Discontinuous Reception (DRX)

The MAC entity may be configured by RRC with a SL DRX functionality that controls the UE's SCI (i.e., 1st stage SCI and 2nd stage SCI) monitoring activity for the MAC entity's Source Layer-1 ID and Destination Layer-1 ID pair for one of unicast, Destination Layer-1 ID for groupcast and broadcast. When using SL DRX operation, the MAC entity shall also monitor SCI (i.e., 1st stage SCI and 2nd stage SCI) according to requirements found in other clauses of this specification.

RRC controls Sidelink DRX operation by configuring the following parameters:

- *sl-drx-onDurationTimer*: the duration at the beginning of a SL DRX cycle;

- *sl-drx-SlotOffset*: the delay before starting the *sl-drx-onDurationTimer*;

- *sl-drx-InactivityTimer*(except for the broadcast transmission): the duration after the fist slot of SCI (i.e., 1st stage SCI and 2nd stage SCI) reception in which a SCI indicates a new SL transmission for the MAC entity;

- *sl-drx-RetransmissionTimer* (per Sidelink process except for the broadcast transmission): the maximum duration until a SL retransmission is received;

- *sl-drx-StartOffset*: *sl-drx-StartOffset* which defines the [symbol/slot] where the SL DRX cycle starts

*Editor’s Note: FFS how the sl-drx-StartOffset is set based on Destination Layer-2 ID for SL groupcast and broadcast.*

- *sl-drx-Cycle*: the Sidelink DRX cycle;

- *sl-drx-HARQ-RTT-Timer* (per Sidelink process except for the broadcast transmission): the minimum duration before a SL HARQ retransmission is expected by the MAC entity;

### 5.x.1 Behaviour of UE receving SL-SCH Data

When SL DRX is configured, the Active Time includes the time while:

- *sl-drx-onDurationTimer* or *sl-drx-InactivityTimer* is running; or

- *sl-drx-RetransmissionTime is running* ; or

- period of *sl-LatencyBoundCSI-Report* configured by RRC in case SL-CSI reporting MAC CE is not received; or

- the time between the request of SL-CSI reporting is sent and reception of the SL-SCI reporting MAC CE in case SL-CSI reporting MAC CE is received.

*Editor’s Note: WA of announced periodic resources is confirmed, will be added in this clause.*

When one or multiple SL DRX is configured, the MAC entity shall:

1> if multiple SL DRX Cycles that are mapped to multiple *SL-QoS-Profiles* of Destination Layer-2 ID and interested cast type is associated to groupcast:

2> select *sl-drx-Cycle* whose length of the *sl-drx-cycle* is the shortest one among multiple SL DRX Cycles that are mapped to multiple *SL-QoS-Profiles* of the Destination Layer-2 ID:

*Editor’s Note: Text related to down-selection of onduration timer will be added after confirmation of the WA.*

1> if a *sl-drx-HARQ-RTT-Timer* expires:

2> if the data of the corresponding Sidelink process was not successfully decoded;

3> start the *sl-drx-RetransmissionTimer* for the corresponding Sidelink process in the first slot after the expiry of *sl-drx-HARQ-RTT-Timer*.

2> if HARQ feedback is enabled by the SCI and the cast type indicator in the SCI is set to unicast:

3> start the *sl-drx-RetransmissionTimer* for the corresponding Sidelink process in the first slot after the expiry of *sl-drx-HARQ-RTT-Timer* when the HARQ feedback (i.e., negative acknowledgement) is not transmitted due to UL/SL prioritization.

*Editor’s* Note: FFS for HARQ feedback (i.e., negative acknowledgement) is not transmitted due to UL/SL prioritization.

1> if the SL DRX cycle is used, and [(DFN × 10) + subframe number] modulo (*sl-drx-Cycle*) = *sl-drx-StartOffset*:

*Editor’s Note: For groupcast/broadcast, fomula for sl-drx-Startoffset will be added if WA is confirmed.*

2> start *sl-drx-onDurationTimer* after *sl-drx-SlotOffset* from the beginning of the subframe.

1> if a SL DRX is in Active Time:

2> monitor the SCI (i.e., 1st stage SCI and 2nd stage SCI) in this SL DRX.

2> if the SCI indicates a new SL transmission:

3> if Source Layer-1 ID and Destination Layer-1 ID of the SCI is equal to the intended Destination Layer-1 ID and Source Layer-1 ID pair and the cast type indicator in the SCI is set to unicast:

4> start or restart *sl-drx-InactivityTimer* for the corresponding Source Layer-1 ID and Destination Layer-1 ID pair after the fist slot of SCI reception.

3> if Destination Layer-1 ID of the SCI (i.e., 2nd stage SCI) is equal to the intended Destination Layer-1 ID and the cast type indicator in the SCI is set to groupcast:

4> select *sl-drx-InactivityTimer* whose length of the *sl-drx-InactivityTimer* is the largest one among multiple SL DRX Inactivity timers that are mapped to multiple *SL-QoS-Profiles* of Destination Layer-2 ID associated with the Destination Layer-1 ID of the SCI; and

4> start or restart *sl-drx-InactivityTimer* for the corresponding Destination Layer-1 ID after the fist slot of SCI reception.

2> if the SCI indicates a SL transmission:

3> if HARQ feedback is enabled by the SCI and the cast type indicator in the SCI is set to unicast;

4> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the first slot after the end of the corresponding transmission carrying the HARQ feedback; or

4> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the first slot after the end of the corresponding resource carrying the HARQ feedback when the HARQ feedback is not transmitted due to UL/SL prioritization;

3> if HARQ feedback is enabled by the SCI and the cast type indicator in the SCI is set to groupcast:

4> if positive-negative acknowledgement is selected:

5> start the sl-drx-HARQ-RTT-Timer for the corresponding Sidelink process in the first slot after the end of the corresponding transmission carrying the HARQ feedback; or

5> start the sl-drx-HARQ-RTT-Timer for the corresponding Sidelink process in the first slot after the end of the corresponding resource carrying the HARQ feedback when the HARQ feedback is not transmitted due to UL/SL prioritization;

4> if negative-only acknowledgement is selected:

5> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the first slot after the end of the corresponding resource carrying the HARQ feedback (i.e., positive acknowledgement) when the HARQ feedback is not transmitted due to UL/SL prioritization.

3> if HARQ feedback has been disabled for the MAC PDU:

4> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process.

NOTE : The *sl-drx-HARQ-RTT-Timer* is derived from the retransmission resource timing (i.e., immediately next retransmission resource indicated in a SCI) when a SCI indicates a retransmission resource. The UE uses the *sl-drx-HARQ-RTT-Timer* is configured as specified in TS 38.331 [5] when a SCI doesn’t indicate a retransmission resource.

*Editor’s Note: FFS when* the *sl-drx-HARQ-RTT-Timer is started.*

*Editor’s Note: FFS how HARQ feedback disabled MAC PDU transmission is supported for sl-drx-HARQ-RTT-Timer.*

3> stop the *sl-drx-RetransmissionTimer* for the corresponding Sidelink process.

1> if a SL DRX Command MAC CE is received for Source Layer-1 ID and Destination Layer-1 ID pair of a unicast:

2> stop *sl-drx-onDurationTimer* for Source Layer-1 ID and Destination Layer-1 ID pair of a unicast;

2> stop *sl-drx-InactivityTimer* for Source Layer-1 ID and Destination Layer-1 ID pair of a unicast.

NOTE : SL DRX Command MAC CE is only supported in Sidelink unicast.

### 5.x.2 Behaviour of UE transmitting SL-SCH Data

The UE transmitting SL-SCH Data should keep aligned with its intended UE receiving the SL-SCH Data regarding the SL DRX Active time as specified in clause 5.x.1.

NEXT CHANGE

### 6.1.3 MAC Control Elements (CEs)

#### 6.1.3.x Sidelink DRX Command MAC CE

The Sidelink DRX Command MAC CE is identified by a MAC subheader with LCID as specified in Table 6.2.4-1. The priority of the Sidelink DRX Command MAC CE is fixed to '1'.

It has a fixed size of zero bits.

#### 6.1.3.y Inter-UE Coordination MAC CE

*Editor’s Note: Related text will be captured after contents of the Inter-UE Coordination MAC CE is finialized by RAN1.*

NEXT CHANGE

### 6.2.4 MAC subheader for SL-SCH

The MAC subheader consists of the following fields:

- V: The MAC PDU format version number field indicates which version of the SL-SCH subheader is used. In this version of the specification, the V field is set to "0". The size of the V field is 4 bits;

- SRC: The SRC field carries the 16 most significant bits of the Source Layer-2 ID set to the identifier provided by upper layers as defined in TS 23.287 [19]. The length of the field is 16 bits;

- DST: The DST field carries the 8 most significant bits of the Destination Layer-2 ID set to the identifier provided by upper layers as defined in TS 23.287 [19]. The length of the field is 8 bits;

- LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE within the scope of one Source Layer-2 ID and Destination Layer-2 ID pair or padding as described in Tables 6.2.4-1 for SL-SCH. There is one LCID field per MAC subheader except for SL-SCH subheader. The size of the LCID field is 6 bits;

- L: The Length field indicates the length of the corresponding MAC SDU in bytes. There is one L field per MAC subheader except for SL-SCH subheader and subheaders corresponding to the fixed-sized MAC CE or padding. The size of the L field is indicated by the F field;

- F: The Format field indicates the size of the Length field. There is one F field per MAC subheader except for SL-SCH subheader and subheaders corresponding to the fixed-sized MAC CE or padding. The size of the F field is 1 bit. The value 0 indicates 8 bits of the Length field. The value 1 indicates 16 bits of the Length field;

- R: Reserved bit, set to 0.

The MAC subheader is octet aligned.

Table 6.2.4-1 Values of LCID for SL-SCH

|  |  |
| --- | --- |
| Index | LCID values |
| 0 | SCCH carrying PC5-S messages that are not protected |
| 1 | SCCH carrying PC5-S messages "Direct Security Mode Command" and "Direct Security Mode Complete" |
| 2 | SCCH carrying other PC5-S messages that are protected |
| 3 | SCCH carrying PC5-RRC messages |
| 4–19 | Identity of the logical channel |
| 20–[60] | Reserved |
| [61] | Sidelink DRX Command |
| 62 | Sidelink CSI Reporting |
| 63 | Padding |

END OF THE CHANGE