**3GPP TSG-RAN WG2 Meeting #126 *R2-240***

**Fukuoka, Japan, 20th - 24th May., 2024**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
|  |
|  | **38.321** | **CR** | 1844 | **rev** | **1** | **Current version:** | **18.1.0** |  |
|  |
| *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:***  | Rapporteur MAC CR for R18 positioning |
|  |  |
| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | R2 |
|  |  |
| ***Work item code:*** | NR\_pos\_enh2 |  | ***Date:*** | 2024-05-20 |
|  |  |  |  |  |
| ***Category:*** | F |  | ***Release:*** | Rel-18 |
|  | *Use one of the following categories:****F*** *(correction)****A*** *(mirror corresponding to a change in an earlier release)****B*** *(addition of feature),* ***C*** *(functional modification of feature)****D*** *(editorial modification)*Detailed explanations of the above categories canbe found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | *Use one of the following releases:Rel-8 (Release 8)Rel-9 (Release 9)Rel-10 (Release 10)Rel-11 (Release 11)…Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)Rel-19 (Release 19)Rel-20 (Release 20)* |
|  |  |
| ***Reason for change:*** | **Issue#1**: Change the following wording to align with the other specs:SL-PRS shared resource pool=> shared SL-PRS resource poolSL-PRS dedicated resource pool=> dedicated SL-PRS resource pool==================update after RAN2#125bis====================**Issue#2**Within RAN1 LS R2-2402106, the following has been agreed in RAN1:

|  |  |
| --- | --- |
| * ***Question 2 (RAN2):***
	+ *When SL-PRS is transmitted on a SL-PRS shared resource pool where PSFCH is configured, if the associated PSSCH transmission is positively acknowledged, should the UE continue to perform SL-PRS retransmission?*
* ***RAN1’s response:***
	+ Since there is no notion of Layer 1 feedback in response to SL PRS transmission, a positive acknowledgement for an associated PSSCH may not be interpreted to indicate successful reception of SL PRS (see RAN1 conclusion from RAN1 #113 below). Accordingly, a Tx UE may continue to perform SL PRS retransmissions if it has been provided with multiple resources for (re-)transmission by the MAC layer, subject to any restrictions on the maximum number of retransmissions.

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| --- |
| **Conclusion**Do not support ACK/NACK feedback for SL-PRS or lower-layer feedback-based retransmissions in Release 18. |

 |

The issue has also been addressed by the tdoc R2-2402650 during RAN2#125bis.**Issue#3**:The following has been agreed during RAN2#125bis:Agreements:In shared pool, there is no additional limitation on how many SL-PRS the UE can transmit (the data limitations apply to SL-PRS transmitted together with PSSCH). Spec impact to be checked in rapporteur CR.In dedicated pool, the UE’s ability to transmit multiple SL-PRS (e.g., for different SL positioning sessions) is left to UE implementation. If the UE is asked to transmit more SL-PRS than it can handle, it will be unable to comply.From the rapporteur’s point of view, the current spec seems fine due to the current wording “associated with the Sidelink HARQ entity”.A NOTE is added for the scenarios with dedicated SL-PRS resource pool**Issue#4**The following field has been updated in the RRC spec for the bandwidth request in the RRC message.

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| --- |
|  sl-PRS-Bandwidth-r18 ENUMERATED {mhz5, mhz10, mhz15, mhz20, mhz25, mhz30, mhz35, mhz40, mhz45, mhz50, mhz60, mhz70, mhz80, mhz90, mhz100, spare 17, spare16,  spare15, spare14, spare13, spare12, spare11, spare10, spare9, spare8,  spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL, ... |

With the change above, the corresponding field within the MAC CE also needs to be updated, and it needs to be clarified how does the codepoint is mapped to the RRC fields.================UPDATE BEFORE RAN2#126===================**Issue#5**On the time gap between the PSSCH and PSFCH transmission, RAN1 agreement shows that no new RRC parameter is needed in R1-2401949However, the previous description still needs to be updated================UPDATE AFTER RAN2#126====================The following agreements have been reached during RAN2#126* One MAC CE can activate/deactivate only one aggregated combination within 32 aggregated combinations.
* Introduce a 5 bit field for aggregated combination in the new MAC CE.
* Include the aggregation indication in the new MAC CE, where the aggregation indication is to activate/deactivate specific carriers within each aggregated combination.
* The currently designed SRS BW aggregation MAC CE can be used for RRC\_CONNECTED and RRC\_INACTIVE.
* The aggregation indication in the MAC CE is 3 bits, in order to indicate the following conditions:
	+  1 carrier out of a 2-carrier-RRC-linkage;
	+  2 carriers out of a 2-carrier-RRC-linkage;
	+  1 carrier out of a 3-carrier-RRC-linkage;
	+  2 carriers out of a 3-carrier-RRC-linkage;
	+  3 carriers out of a 3-carrier-RRC-linkage.
* Aggregation structure will be reviewed in the RRC CR to make sure the three bits can map to a sequence of carriers in the combination as signalled in the RRC.
* The new MAC CE does not contain a A/D field separate from the 3-bit activation indication; the bitmap indicates the activation or deactivation of the corresponding carriers, i.e., using ‘1’ as activation or ‘0’ as deactivation. Deactivation is idempotent, i.e., deactivating an already deactivated carrier leaves it still in deactivated state.
* Adopt up to 16 Spatial Relation for Resource IDi fields in the new MAC CE.
* In the IE description of Spatial Relation for Resource IDi field, clarify that the SRS resource ID of the spatial relation comes from the first linked SRS resource set in this MAC CE. Other Spatial Relation for Resource IDi field design should remain as legacy.
* The UE is expected to determine which resources can be aggregated based on the RRC configuration and the criteria defined by RAN1. This decision can be revisited based on contributions to determine if the expected UE behaviour is possible to simplify.
* “to the peer UE” to be changed to “of the peer UE” in accordance with the TP for P4 from R2-2405420. To be implemented in rapporteur CR.
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| ***Summary of change:*** | Change per above. |
|  |  |
| ***Consequences if not approved:*** | Several issues left un-resolved for MAC spec |
|  |  |
| ***Clauses affected:*** | 3.1, 5.18.1, 5.18.xx (new), 5.22, 5.28, 6.1.3.xx (new), 6.2.1 |
|  |  |
|  | **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 ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

# 3 Definitions, symbols and abbreviations

## 3.1 Definitions

For the purposes of the present document, the terms and definitions given in TR 21.905 [1] and the following apply. A term defined in the present document takes precedence over the definition of the same term, if any, in TR 21.905 [1].

**A2X communication**: A communication to support A2X services leveraging PC5 reference points, as defined in TS 23.256 [31]. A2X services are realized by various types of A2X applications, e.g., BRID or DAA.

**Air to Ground network:** An NG-RAN consisting of ground-based gNBs, which provide cell towers that send signals up to an aircraft's antenna(s) of onboard ATG terminal, with typical vertical altitude of around 10,000 m and take-off/landing altitudes down to 3000 m.

**BWP for SRS for positioning Tx frequency hopping**:For SRS for positioning Tx frequency hopping, separate BWP configuration outside BWP configuration for data transmission.

**Dormant BWP**:The dormant BWP is one of downlink BWPs configured by the network via dedicated RRC signaling. In the dormant BWP, the UE stop monitoring PDCCH on/for the SCell, but continues performing CSI measurements, Automatic Gain Control (AGC) and beam management, if configured.

**DRX group**: A group of Serving Cells that is configured by RRC and that have the same DRX Active Time.

**eRedCap UE**: A UE with enhanced reduced capabilities as specified in clause 4.2.22.1 of TS 38.306 [25].

**HARQ information**: HARQ information for DL-SCH, for UL-SCH, or for SL-SCH transmissions consists of New Data Indicator (NDI), Transport Block Size (TBS), Redundancy Version (RV), and HARQ process ID.

**IAB-donor**: gNB that provides network access to UEs via a network of backhaul and access links.

**IAB-node**: RAN node that supports NR access links to UEs and NR backhaul links to parent nodes and child nodes.

**Listen Before Talk**: A procedure according to which transmissions are not performed if the channel is identified as being occupied, see TS 37.213 [18].

**LTM candidate cell**: A candidate cell configured for LTM as defined in TS 38.331 [5].

**Msg3**: Message transmitted on UL-SCH containing a C-RNTI MAC CE or CCCH SDU, submitted from upper layer and associated with the UE Contention Resolution Identity, as part of a Random Access procedure.

**Multi-path**: Mode of operation of a UE in RRC\_CONNECTED configured with one direct path on which the UE connects to gNB using NR Uu, and one indirect path on which the UE connects to the same gNB via another UE using PC5 unicast link or non-3GPP connection (N3C).

**Multi-PUSCH configured grant**: A configured grant configuration that includes multiple consecutive configured uplink grants within a single periodicity.

**N3C indirect path:** In Multi-path, the indirect path using Non-3GPP Connection between remote UE and relay UE.

**NCR-Fwd**: NCR-node function, which performs amplifying-and-forwarding of UL/DL RF signals between gNB and UE. The behavior of the NCR-Fwd is controlled according to the side control information received by the NCR-MT from a gNB.

**NCR-MT**: NCR-node entity which communicates with a gNB via a control link to receive side control information. The control link is based on NR Uu interface.

**NCR-node**: RAN node comprising NCR-MT and NCR-Fwd.

**Non-terrestrial network**: An NG-RAN consisting of gNBs, which provide non-terrestrial NR access to UEs by means of an NTN payload embarked on an airborne or space-borne NTN vehicle and an NTN Gateway.

**NR backhaul link**: NR link used for backhauling between an IAB-node and an IAB-donor, and between IAB-nodes in case of a multi-hop backhauling.

**NR sidelink communication**: AS functionality enabling at least V2X Communication as defined in TS 23.287 [19] and ProSe communication (including ProSe non-Relay, UE-to-Network Relay and UE-to-UE Relay communication (including ProSe UE-to-UE Relay communication with integrated discovery)) as defined in TS 23.304 [26], between two or more nearby UEs, using NR technology but not traversing any network node.

**NR sidelink discovery**: AS functionality enabling ProSe non-Relay discovery, ProSe UE-to-Network Relay discovery and ProSe UE-to-UE Relay discovery for Proximity based Services as defined in TS 23.304 [26], between two or more nearby UEs, using NR technology but not traversing any network node.

**NR sidelink transmission**: Any NR Sidelink-based transmission, including transmission for NR sidelink discovery, transmission for NR sidelink communication, transmission for Ranging/Sidelink Positioning, and transmission for A2X communication.

**PDCCH occasion**: A time duration (i.e. one or a consecutive number of symbols) during which the MAC entity is configured to monitor the PDCCH.

**Positioning SRS Bandwidth Aggregation**: Transmission of positioning SRS on multiple carriers in RRC\_CONNECTED and RRC\_INACTIVE where the positioning SRS resources are linked in RRC configuration as defined in TS 38.331 [5].

**PRS Processing Window**: A time window during which UE may perform PRS measurement inside the active DL BWP with the same numerology as the active DL BWP without measurement gap.

**Ranging/Sidelink Positioning**:AS functionality enabling ranging-based services and sidelink positioning as specified in TS 23.586 [30].

**RB set**: A RB set refers to a contiguous set of resource blocks (RBs) on which a channel access procedure is performed in shared spectrum as defined in TS 37.213 [18].

**RedCap UE**: A UE with reduced capabilities as specified in clause 4.2.21.1 in TS 38.306 [25].

**Serving Cell**: A PCell, a PSCell, or an SCell in TS 38.331 [5].

**Sidelink transmission information**: Sidelink transmission information included in an SCI for an SL-SCH transmission or SL-PRS transmission with or without SL-SCH transmission on Shared SL-PRS resource pool as specified in clause 8.3 and 8.4 of TS 38.212 [9] consists of Sidelink HARQ information including NDI, RV, Sidelink process ID, HARQ feedback enabled/disabled indicator, Sidelink identification information including cast type indicator, Source Layer-1 ID and Destination Layer-1 ID, and Sidelink other information including CSI request, SL-PRS request, SL-PRS resource ID, a priority, a communication range requirement and Zone ID.

**SL-PRS delay budget**: Delay budget before which the SL-PRS is expected to be transmitted by the Tx UE.

**Dedicated SL-PRS resource pool**:A sidelink resource pool which can be used for the transmission of SL-PRS and cannot be used for the transmission of PSSCH.

**Shared SL-PRS resource pool**:A sidelink resource pool which can be used for the transmission of both SL-PRS and PSSCH.

**SL-PRS transmission information on Dedicated SL-PRS resource pool**:SL-PRS transmission information on Dedicated SL-PRS resource pool is included in an SCI for an SL-PRS transmission on Dedicated SL-PRS resource pool, as specified in TS 38.212 [9], consisting of

- SL-PRS identification information, including cast type indicator, source ID and destination ID;

- SL-PRS transmission other information, including SL-PRS priority, SL-PRS request, SL-PRS resource ID and resource reservation period.

**SRS for positioning Tx frequency hopping**: Transmit frequency hopping of positioning SRS in RRC\_INACTIVE and RRC\_CONNECTED.

**SRS positioning validity area**:An area consisting of a list of cells within which the corresponding positioning SRS configuration is considered as valid.

**Special Cell**: For Dual Connectivity operation the term Special Cell refers to the PCell of the MCG or the PSCell of the SCG depending on if the MAC entity is associated to the MCG or the SCG, respectively. Otherwise the term Special Cell refers to the PCell. A Special Cell supports PUCCH transmission and contention-based Random Access, and is always activated.

**Timing Advance Group**: A group of Serving Cells that is configured by RRC and that, for the cells with a UL configured, using the same timing reference cell and the same Timing Advance value. A Timing Advance Group containing the SpCell of a MAC entity is referred to as Primary Timing Advance Group (PTAG), whereas the term Secondary Timing Advance Group (STAG) refers to other TAGs.

**UE-gNB RTT**: For non-terrestrial networks, the sum of the UE's Timing Advance value (see TS 38.211 [8] clause 4.3.1) and *kmac*.

**V2X sidelink communication**: AS functionality enabling V2X Communication as defined in TS 23.285 [20], between nearby UEs, using E-UTRA technology but not traversing any network node.

NOTE 1: A timer is running once it is started, until it is stopped or until it expires; otherwise it is not running. A timer can be started if it is not running or restarted if it is running. A Timer is always started or restarted from its initial value. The duration of a timer is not updated until it is stopped or expires (e.g. due to BWP switching). When the MAC entity applies zero value for a timer, the timer shall be started and immediately expire unless explicitly stated otherwise.

NOTE 2: In this version of the specification, the SRS in the procedural description includes Positioning SRS except for the Positioning SRS for transmission in RRC\_INACTIVE as in clause 5.26. Positioning SRS except for the Positioning SRS for transmission in RRC\_INACTIVE is treated the same as SRS by the UE unless explicitly stated otherwise.

## 3.2 Abbreviations

For the purposes of the present document, the abbreviations given in TR 21.905 [1] and the following apply. An abbreviation defined in the present document takes precedence over the definition of the same abbreviation, if any, in TR 21.905 [1].

A2X Aircraft-to-Everything

AP Aperiodic

BFR Beam Failure Recovery

BRID Broadcast Remote Identification

BSR Buffer Status Report

BWP Bandwidth Part

CE Control Element

CG Cell Group

CG-SDT Configured Grant-based SDT

CI-RNTI Cancellation Indication RNTI

CSI Channel State Information

CSI-IM CSI Interference Measurement

CSI-RS CSI Reference Signal

CS-RNTI Configured Scheduling RNTI

DAA Detect And Avoid

DAPS Dual Active Protocol Stack

DCP DCI with CRC scrambled by PS-RNTI

DL-PRS DownLink-Positioning Reference Signal

DSR Delay Status Report

DTX Discontinuous Transmission

G-CS-RNTI Group Configured Scheduling RNTI

G-RNTI Group RNTI

IAB Integrated Access and Backhaul

INT-RNTI Interruption RNTI

LBT Listen Before Talk

LCG Logical Channel Group

LCP Logical Channel Prioritization

LTM L1/L2 Triggered Mobility

MBS Multicast/Broadcast Services

MCCH MBS Control Channel

MCCH-RNTI MBS Control Channel RNTI

MCG Master Cell Group

MO-SDT Mobile Originated SDT

MPE Maximum Permissible Exposure

MTCH MBS Traffic Channel

MT-SDT Mobile Terminated SDT

N3C Non-3GPP Connection

NCD-SSB Non Cell Defining SSB

NCR Network-Controlled Repeater

NSAG Network Slice AS Group

NUL Normal Uplink

NZP CSI-RS Non-Zero Power CSI-RS

PDB Packet Delay Budget

PEI-RNTI Paging Early Indication RNTI

PHR Power Headroom Report

PQI PC5 QoS Identifier

PS-RNTI Power Saving RNTI

PSI PDU Set Importance

PTAG Primary Timing Advance Group

PTM Point to Multipoint

PTP Point to Point

QCL Quasi-colocation

PPW PRS Processing Window

PRS Positioning Reference Signal

RA-SDT Random Access-based SDT

RRH Remote Radio Head

RS Reference Signal

SCG Secondary Cell Group

SDT Small Data Transmission

SFI-RNTI Slot Format Indication RNTI

SI System Information

SL-PRS-CS-RNTI SL-PRS Configured Scheduling RNTI

SL-PRS-RNTI SL-PRS RNTI

SL-CS-RNTI Sidelink Configured Scheduling RNTI

SL-PRS Sidelink PRS

SL-RNTI Sidelink RNTI

SpCell Special Cell

SP Semi-Persistent

SP-CSI-RNTI Semi-Persistent CSI RNTI

SPS Semi-Persistent Scheduling

SR Scheduling Request

SRI SRS Resource Indicator

SS Synchronization Signals

SSB Synchronization Signal Block

STAG Secondary Timing Advance Group

STx2P Simultaneous Transmission with 2 Panels

SUL Supplementary Uplink

TAG Timing Advance Group

TCI Transmission Configuration Indicator

TPC-SRS-RNTI Transmit Power Control-Sounding Reference Signal-RNTI

TRIV Time Resource Indicator Value

TRP Transmit/Receive Point

TRS CSI-RS for tracking

U2N UE-to-Network

U2U UE-to-UE

UCI Uplink Control Information

UTO-UCI Unused Transmission Occasion - UCI

UTW Uplink Time Window

V2X Vehicle-to-Everything

ZP CSI-RS Zero Power CSI-RS

# 5 MAC procedures

## 5.18 Handling of MAC CEs

### 5.18.1 General

This clause specifies the requirements upon reception or transmission of the following MAC CEs:

- SP CSI-RS/CSI-IM Resource Set Activation/Deactivation MAC CE;

- Aperiodic CSI Trigger State Subselection MAC CE;

- TCI States Activation/Deactivation for UE-specific PDSCH MAC CE;

- TCI State Indication for UE-specific PDCCH MAC CE;

- SP CSI reporting on PUCCH Activation/Deactivation MAC CE;

- Enhanced SP CSI reporting on PUCCH Activation/Deactivation MAC CE;

- SP SRS Activation/Deactivation MAC CE;

- PUCCH spatial relation Activation/Deactivation MAC CE;

- Enhanced PUCCH spatial relation Activation/Deactivation MAC CE;

- SP ZP CSI-RS Resource Set Activation/Deactivation MAC CE;

- Recommended Bit Rate MAC CE;

- Enhanced SP/AP SRS Spatial Relation Indication MAC CE;

- SRS Pathloss Reference RS Update MAC CE;

- PUSCH Pathloss Reference RS Update MAC CE;

- Serving Cell set based SRS Spatial Relation Indication MAC CE;

- SP Positioning SRS Activation/Deactivation MAC CE;

- Timing Delta MAC CE;

- Guard Symbols MAC CEs;

- Positioning Measurement Gap Activation/Deactivation Command MAC CE;

- PPW Activation/Deactivation Command MAC CE;

- PUCCH spatial relation Activation/Deactivation for multiple TRP PUCCH repetition MAC CE;

- PUCCH Power Control Set Update for multiple TRP PUCCH repetition MAC CE;

- Unified TCI States Activation/Deactivation MAC CE;

- Differential Koffset MAC CE;

- Case-7 Timing advance offset MAC CE;

- DL TX Power Adjustment MAC CEs;

- Child IAB-DU Restricted Beam Indication MAC CE;

- Timing Case Indication MAC CE;

- PSI-Based SDU Discard Activation/Deactivation MAC CE;

- BFD-RS Indication MAC CE;

- IAB-MT Recommended Beam Indication MAC CE;

- UL PSD range adjustment for IAB MAC CE;

- Case-6 Timing Request MAC CE;

- NCR Backhaul Link Beam Indication MAC CEs;

- NCR Access Link Beam Indication MAC CE;

- Enhanced Unified TCI States Activation/Deactivation MAC CE;

- LTM Cell Switch Command MAC CE;

- Candidate Cell TCI States Activation/Deactivation MAC CE;

- Aggregated SP Positioning SRS Activation/Deactivation MAC CE.

=====================================NEXT CHANGE===================================

### 5.18.XX Activation/Deactivation of Aggregated Semi-Persistent Positioning SRS

The network may activate and deactivate the configured aggregated resource sets of Semi-Persistent Positioning SRS by sending the Aggregated SP Positioning SRS Activation/Deactivation MAC CE described in clause 6.1.3.XX. The configured aggregated SP positioning SRS resource sets are initially deactivated upon (re-)configuration by upper layers and after reconfiguration with sync.

The MAC entity shall:

1> if the MAC entity receives an Aggregated SP Positioning SRS Activation/Deactivation MAC CE:

2> indicate to lower layers the information regarding the Aggregated SP Positioning SRS Activation/Deactivation MAC CE.

==============================================NEXT CHANGE==========================

## 5.22 SL-SCH Data transfer and SL-PRS transmission

### 5.22.1 SL-SCH Data and SL-PRS 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 may 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. The MAC entity may have a sidelink grant on the Shared SL-PRS resource pool of an active BWP to determine a set of PSCCH durations(s) in which transmission of SCI occurs and a set of SL-PRS transmission occasion(s) and PSSCH duration(s) in which transmission of SL-PRS and SL-SCH associated with the SCI occur. The MAC entity may have a sidelink grant on the Dedicated SL-PRS resource pool of an active BWP to determine a set of PSCCH duration(s) in which transmission of SCI occurs and a set of SL-PRS transmission occasion(s) in which transmission of SL-PRS associated to the SCI occurs. A sidelink grant addressed to SL-CS-RNTI with NDI = 1 is considered as a dynamic sidelink grant. A sidelink grant addressed to SL-PRS-CS-RNTI with Activation/Release indication = 1 as in clause 7.3.1.4.3 in TS 38.212 [9] 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] or if the MAC entity has been configured with Sidelink resource allocation scheme 1 as indicated in TS 38.331 [5] and PDCCH is received for resource allocation on Shared SL-PRS resource pool, 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) and SL-PRS transmission occasion(s), if available, 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] and SL-PRS according to clause 8.1.4 of TS 38.214 [7].

2> else:

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

NOTE 0: When SL-PRS is transmitted on Shared SL-PRS resource pool, the PSSCH duration(s) and SL-PRS transmission occasion(s) are determined only after the LCP procedure in clause 5.22.1.4.1.

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

2> if PDCCH contents indicate retransmission(s) for the identified 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) and SL-PRS transmission occasion(s), if available, for one or more retransmissions of a single MAC PDU and SL-PRS 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] and the set of SL-PRS transmission occasions for transmission of multiple SL-PRS according to clause of 8.2.4 of TS 38.214 [7], if available.

1> if a dynamic 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:

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

If the MAC entity has been configured with Sidelink resource allocation scheme 1 as in TS 38.331 [5] and PDCCH is received for resource allocation on Dedicated SL-PRS resource pool, the MAC entity shall for each PDCCH occasion:

1> if a sidelink grant has been received on the PDCCH for the MAC entity's SL-PRS-RNTI: (i.e., dynamic grant)

2> use the received sidelink grant to determine the PSCCH duration(s) and the corresponding SL-PRS occasion(s) for the transmission of SL-PRS.

1> else if a sidelink grant has been received on the PDCCH for MAC entity's SL-PRS-CS-RNTI: (i.e., configured sidelink grant type 2)

2> if the PDCCH content indicates the configured grant Type 2 activation for a configured sidelink grant:

3> store the configured sidelink grant;

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

3> initialise or re-initialise the configured sidelink grant to determine the set of PSCCH duration(s) and the corresponding SL-PRS occasion for the transmission of SL-PRS.

2> else if the PDCCH content indicates the configured Type 2 deactivation for a configured sidelink grant:

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

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

NOTE 0A: For SL-PRS transmission by Sidelink resource allocation scheme 2 on Dedicated SL-PRS resource pool, partial sensing is not supported.

NOTE 1: If the MAC entity is configured with Sidelink resource allocation mode 2 or Sidelink resource allocation scheme 2 to transmit using a pool of resources in one or multiple carriers 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 partial sensing, or full sensing only after releasing configured sidelink grant(s), if any.

NOTE 2: For each carrier configured by upper layers associated with the concerned sidelink logical channel, 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*.

NOTE 2A: For the transmission of Sidelink Inter-UE Coordination Request MAC CE, the MAC entity selects the TX pool of resource where the IUC resource set is required. For the transmission of Sidelink Inter-UE Coordination Information MAC CE, the MAC entity selects the TX pool of resource where the IUC resource set is located.

NOTE 2B: For dynamic co-channel coexistence of LTE sidelink and NR sidelink, when the same TB or different TBs are transmitted on the NR SL slots overlapping with the LTE SL subframe, it is up to UE implementation how to avoid transmitting NR PSCCH/PSSCH only in the subsequent NR SL slot overlapping with an LTE SL subframe for NR PSCCH/PSSCH transmissions of 30kHz SCS.

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; or

1> if the MAC entity has selected to create a selected sidelink grant corresponding to transmission(s) of multiple SL-PRS(s), which have been triggered by the upper layer or by the reception of a SCI from a peer UE:

NOTE 2B1: The multiplicity/singularity of SL-PRS transmission and the reservation period for multiple SL-PRS transmission is determined by the UE's own upper layers by implementation within the service layer requirement for the Ranging/Sidelink positioning.

2> if the MAC entity has not selected a pool of resources allowed for the logical channel or SL-PRS transmission:

3> if single carrier frequency is configured:

4> if SL data is available in the logical channel for NR sidelink discovery:

5> if *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon* is configured according to TS 38.331 [5]:

6> select the *sl-DiscTxPoolSelected* configured in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon* for the transmission of NR sidelink discovery message.

5> else:

6> select any pool of resources among the configured pools of resources except for Dedicated SL-PRS resource pool, if configured.

4> else if SL data is available in the logical channel for BRID for A2X communication:

5> if *sl-A2X-Service* in *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* indicates *brid* or *bridAndDAA* according to TS 38.331 [5]:

6> select the *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* for the transmission of SL data for A2X communication.

5> else:

6> select any pool of resources among the configured pools of resources except for Dedicated SL-PRS resource pool, if configured.

4> else if SL data is available in the logical channel for DAA for A2X communication:

5> if *sl-A2X-Service* in *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* indicates *daa* or *bridAndDAA* according to TS 38.331 [5]:

6> select the *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* for the transmission of SL data for A2X communication.

5> else:

6> select any pool of resources among the configured pools of resources except for Dedicated SL-PRS resource pool, if configured.

NOTE 2C: The MAC entity identifies the logical channel(s) for BRID or DAA based on the QoS information associated to BRID or DAA, i.e. PQI(s), from upper layers.

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

5> select any pool of resources configured with PSFCH resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig*, *sl-BWP-DiscPoolConfigCommon*, *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X*, if configured or Dedicated SL-PRS resource pool, if configured.

4> else if SL-PRS is pending for transmission:

5> select any resource pool among the resource pool(s) allowing for SL-PRS transmission.

4> else:

5> select any pool of resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig*, *sl-BWP-DiscPoolConfigCommon*, *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X*, if configured or Dedicated SL-PRS resource pool, if configured.

3> else (i.e. multiple carrier frequencies are configured):

4> trigger the TX carrier (re-)selection procedure as specified in clause 5.22.1.11.

2> if Sidelink consistent LBT failure is detected as specified in clause 5.31.2 in all RB sets of the selected resource pool, if single carrier frequency is configured:

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 except the pool(s) in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon*, if configured and the pool(s) in which all RB sets had Sidelink consistent LBT failure detected and not cancelled.

3> else:

4> select any pool of resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon*, if configured and the pool(s) in which all RB sets had Sidelink consistent LBT failure detected and not cancelled.

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

NOTE 2D: It is up to UE implementation how to select a resource pool that has at least one RB set in which SL consistent LBT failure was not detected.

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 *sl-lbt-FailureRecoveryConfig* is configured in the SL BWP:

4> indicate to the physical layer RB set information for which Sidelink consistent LBT failure was detected and not cancelled as specified in clause 5.31.2.

3> if the TX carrier (re-)selection procedure was triggered in above and one or more carriers have been (re-)selected in the TX carrier (re-)selection according to clause 5.22.1.11:

4> determine the order of the (re-)selected carriers, according to the decreasing order based on the highest priority of logical channels which are allowed on each (re-)selected carrier, and perform the resource selection procedure as specified in this clause for each Sidelink process on each (re-)selected carrier according to the order.

3> if one or multiple SL DRX(s) is configured in the destination UE(s) receiving SL-SCH data:

4> indicate to the physical layer SL DRX Active time in the destination UE(s) receiving SL-SCH data, as specified in clause 5.28.2.

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 or remaining SL-PRS delay budget. The value of the SL-PRS delay budget is provided by the UE's own upper layers by implementation.

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> if the selected resource pool is not Dedicated SL-PRS resource pool:

4> 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;

4> 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) and pending SL-PRS transmission(s), if available, 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 or the corresponding *sl-DefaultCBR-PartialSensing* configured by RRC if partial sensing is selected and CBR measurement results are not available, or the corresponding *sl-DefaultCBR-RandomSelection* configured by RRC if random selection is selected and CBR measurement results are not available in case the *sl-TxPoolExceptional* is not used;

NOTE 3A0: The priority of SL-PRS is provided by the UE's own upper layers by implementation within the service layer requirement of the Ranging/Sidelink Positioning.

NOTE 3Aa: For Multi-consecutive slots transmission as specified in clause 8.1.4 of TS 38.214 [7], during resource (re)selection, leave it to UE implementation, regarding whether to calculate the number of HARQ retransmissions from the allowed numbers based on the number of MCSt transmissions, or the number of slot(s) within Multi-consecutive slots transmission.

NOTE: When transmission is performed on Shared SL-PRS resource pool, the selected number of HARQ retransmissions also corresponds to the number of SL-PRS transmissions.

4> select an amount of frequency resources within the range, if 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) and pending SL-PRS transmission(s), if available, 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 or the corresponding *sl-DefaultCBR-PartialSensing* configured by RRC if partial sensing is selected and CBR measurement results are not available, or the corresponding *sl-DefaultCBR-RandomSelection* configured by RRC if random selection is selected and CBR measurement results are not available in case the *sl-TxPoolExceptional* is not used;

3> else if the selected resource pool is Dedicated SL-PRS resource pool:

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

4> select the number of SL-PRS retransmissions from the allowed numbers, if configured by RRC, in *sl-PRS-MaxNum-Transmissions* included in *sl-CBR-SL-PRS-TxConfigList*.

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is not configured by RRC:

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

5> if the selected resource pool is not Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resource pool which occur within the SL DRX Active time, if configured, as specified in clause 5.28.2 of the destination UE selected for indicating to the physical layer the SL DRX Active time above, and the pool(s) in which all RB sets had Sidelink consistent LBT failure detected and not cancelled are excluded, if configured, according to the amount of selected frequency resources, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier.

NOTE 3Ab: When there are both SL data available in the logical channel(s) and SL-PRS pending for transmission, the resources are selected based on the shorter one of the corresponding remaining PDB and the corresponding remaining SL-PRS delay budget.

5> else if the selected resource pool is Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resource pool as specified in clause 5.28.2, according to the remaining SL-PRS delay budget of the SL-PRS transmission(s).

4> else:

5> if *sl-NRPSSCH-EUTRA-ThresRSRP-List* is configured by the RRC:

6> 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;

7> when SCS of NR SL is (pre-)configured as *μ* = 1:

8> select the time and frequency resources in the first of NR SL slots overlapping with an LTE SL subframe;

8> may additionally select the time and frequency resources in the subsequent NR SL slot overlapping with the LTE SL subframe.

5> else if the selected resource pool is not Dedicated SL-PRS resource pool:

6> 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] which occur within the SL DRX Active time, if configured, as specified in clause 5.28.2 of the destination UE selected for indicating to the physical layer the SL DRX Active time above, according to the amount of selected frequency resources, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier.

5> else if the selected resource pool is Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by physical layer as clasue 8.2.4 of TS 38.214 [7] as specified in clause 5.28.2, according to the remaining SL-PRS delay budget of the SL-PRS transmission(s).

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and preferred resource set is not received from a UE:

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

5> if the selected resource pool is not Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resources pool excluding all RB sets had Sidelink consistent LBT failure detected and not cancelled, if configured, according to the amount of selected frequency resources, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier.

5> else if the selected resource pool is Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resource pool which as specified in clause 5.28.2, according to the remaining SL-PRS delay budget of the SL-PRS transmission(s).

4> else:

5> if the selected resource pool is not Dedicated SL-PRS resource pool:

6> 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, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier.

5> else if the selected resource pool is Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by physical layer as clause 8.2.4 of TS 38.214 [7], according to the remaining SL-PRS delay budget of the SL-PRS transmission.

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE does not have its own sensing result as specified in clause 8.1.4 of TS 38.214 [7] and if a preferred resource set is received from a UE and if the selected resource pool is not Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resources for one transmission opportunity from the resources belonging to the received preferred resource set for SL-SCH data to be transmitted to the UE providing the preferred resource set, according to the amount of selected frequency resources and the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier.

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE has its own sensing result as specified in clause 8.1.4 of TS 38.214 [7] and if a preferred resource set is received from a UE and if the selected resource pool is not Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resources for one transmission opportunity within the intersection of the received preferred resource set and the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] for an SL-SCH data to be transmitted to the UE providing the preferred resource set, according to the amount of selected frequency resources, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier.

4> if there are no resources within the intersection that can be selected as the time and frequency resources for the one transmission opportunity 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.

5> 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, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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, PSSCH and SL-PRS corresponding to the number of transmission opportunities of MAC PDUs or SL-PRSs determined in TS 38.214 [7].

3> if one or more SL-PRS retransmissions are selected and the selected resource pool is Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resources for one or more transmission opportunities from the available resources, according to the selected number of retransmissions and the remaining SL-PRS delay budget 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];

4> use the randomly selected resource to select a set of periodic resources spaced by the resource reservation interval for transmissions of PSCCH and SL-PRS corresponding to the number of retransmission opportunities of SL-PRS;

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

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

3> else if one or more HARQ retransmissions are selected and the selected resource pool is not Dedicated SL-PRS resource pool:

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is not configured by RRC:

5> if transmission based on full sensing or partial 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

5> 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:

6> if *sl-NRPSSCH-EUTRA-ThresRSRP-List* is configured by the RRC:

7> 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].

8> when SCS of NR SL is (pre-)configured as *μ* = 1:

9> select the time and frequency resources in the second of NR SL slots of NR SL slots overlapping with an LTE SL subframe to which the selected initial transmission resources belongs, or at least select the time and frequency resources in the first of NR SL slots overlapping with an LTE SL subframe.

6> else:

7> randomly select the time and frequency resources for one or more transmission opportunities from the available resources which occur within the SL DRX Active time, if configured, as specified in clause 5.28.2 of the destination UE selected for indicating to the physical layer the SL DRX Active time above, and the pool(s) in which all RB sets with Sidelink consistent LBT failure detected and not cancelled are excluded, if configured, according to the amount of selected frequency resources, the selected number of HARQ retransmissions, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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].

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and preferred resource set is not received from a UE:

5> if transmission based on full sensing or partial 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

5> 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:

6> randomly select the time and frequency resources for one or more transmission opportunities from the available resources excluding all RB sets had Sidelink consistent LBT failure detected and not cancelled, if configured according to the amount of selected frequency resources, the selected number of HARQ retransmissions, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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].

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE has own sensing result as specified in clause 8.1.4 of TS 38.214 [7] and if a preferred resource set is received from a UE:

5> if there are available resources left in the intersection of the received preferred resource set and the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] for more transmission opportunities:

6> randomly select the time and frequency resources for one or more transmission opportunities from the available resources within the intersection for SL-SCH data to be transmitted to the UE providing the preferred resource set, according to the amount of selected frequency resources, the selected number of HARQ retransmissions, the remaining PDB of SL data available in the logical channel(s) , and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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> if the number of time and frequency resources that has been maximally selected for one or more transmission opportunities from the available resources within the intersection is smaller than the selected number of HARQ retransmissions and there are available resources left in the resources indicated by the physical layer for more transmission opportunities:

6> randomly select the time and frequency resources for the remaining transmission opportunities except for the selected resources within the intersection from the available resources outside the intersection but left in the resources indicated by the physical layer according to clause 8.1.4 of TS 38.214 [7], according to the amount of selected frequency resources, the selected number of HARQ retransmissions, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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].

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE does not have own sensing result as specified in clause 8.1.4 of TS 38.214 [7] and if a preferred resource set is received from a UE; and

4> if there are available resources left in the received preferred resource set for more transmission opportunities:

5> randomly select the time and frequency resources for one or more transmission opportunities from the available resources belonging to the received preferred resource set for SL-SCH data to be transmitted to the UE providing the preferred resource set, according to the amount of selected frequency resources, the selected number of HARQ retransmissions, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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].

4> use the randomly selected resource to select a set of periodic resources spaced by the resource reservation interval for transmissions of PSCCH, PSSCH, if available and SL-PRS, if available corresponding to the number of retransmission opportunities of the MAC PDUs determined in TS 38.214 [7] or SL-PRS(s);

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

4> 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 and the set of SL-PRS transmission occasion(s), if available, according to TS 38.214 [7] if the selected resource pool is not Dedicated SL-PRS resource pool or to determine the set of PSCCH durations and SL-PRS transmission occasion(s) if the selected resource pool is Dedicated SL-PRS resource pool 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 or SL-PRS(s) determined in TS 38.214 [7] with the resource reservation interval to determine the set of PSCCH durations, the set of PSSCH durations, and the pending SL-PRS transmission(s), if available, 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 an SL-CSI reporting is triggered, or a Sidelink DRX Command indication is triggered or a Sidelink Inter-UE Coordination Information reporting is triggered, or a Sidelink Inter-UE Coordination Request is triggered; or

1> if the MAC entity has selected to create a selected sidelink grant corresponding to transmission of a single SL-PRS, which has been triggered by the upper layer or by the reception of a SCI from a peer UE:

2> if single carrier frequency is configured:

3> if SL data is available in the logical channel for NR sidelink discovery:

4> if *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon* is configured according to TS 38.331 [5]:

5> select the *sl-DiscTxPoolSelected* configured in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon* for the transmission of NR sidelink discovery message.

4> else:

5> select any pool of resources among the configured pools of resources except for Dedicated SL-PRS resource pool, if configured.

3> else if SL data is available in the logical channel for BRID for A2X communication:

4> if *sl-A2X-Service* in *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* indicates *brid* or *bridAndDAA* according to TS 38.331 [5]:

5> select the *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* for the transmission of SL data for A2X communication.

4> else:

5> select any pool of resources among the configured pools of resources except for Dedicated SL-PRS resource pool, if configured.

3> else if SL data is available in the logical channel for DAA for A2X communication:

4> if *sl-A2X-Service* in *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* indicates *daa* or *bridAndDAA* according to TS 38.331 [5]:

5> select the *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* for the transmission of SL data for A2X communication.

4> else:

5> select any pool of resources among the configured pools of resources except for Dedicated SL-PRS resource pool, if configured.

NOTE 3Ac: The MAC entity identifies the logical channel(s) for BRID or DAA based on the QoS information associated to BRID or DAA, i.e. PQI(s), from upper layers.

3> else if SL data for NR sidelink communication is available in the logical channel:

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

5> select any pool of resources configured with PSFCH resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig*, *sl-BWP-DiscPoolConfigCommon*, *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X*, if configured or Dedicated SL-PRS resource pool, if configured.

4> else:

5> select any pool of resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig*, *sl-BWP-DiscPoolConfigCommon*, *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X*, if configured or Dedicated SL-PRS resource pool, if configured.

3> else if SL-PRS is pending for transmission:

4> select any resource pool among the resource pool(s) allowing for SL-PRS transmission.

3> else if an SL-CSI reporting or a Sidelink DRX Command or a Sidelink Inter-UE Coordination Request or a Sidelink Inter-UE Coordination Information is triggered:

4> select any pool of resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig*, *sl-BWP-DiscPoolConfigCommon*, *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X*, if configured or Dedicated SL-PRS resource pool, if configured.

2> else (i.e. multiple carrier frequencies are configured):

3> trigger the TX carrier (re-)selection procedure as specified in clause 5.22.1.11.

2> if Sidelink consistent LBT Failure is detected as specified in clause 5.31.2 in all RB sets of the selected resource pool for the logical channel, if single carrier frequency is configured:

3> clear the selected sidelink grant on the selected pool of resources.

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 except the pool(s) in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon*, if configured and the pool(s) including all RB sets for which Sidelink consistent LBT failures were detected.

3> else:

4> select any pool of resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon*, if configured and the pool(s) including all RB sets for which Sidelink consistent LBT failures were detected.

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 *sl-lbt-FailureRecoveryConfig* is configured in the SL BWP:

4> indicate to the physical layer RB set information for which Sidelink consistent LBT failure was detected as specified in clause 5.31.2.

3> if the TX carrier (re-)selection procedure was triggered in above and one or more carriers have been (re-)selected in the Tx carrier (re-)selection according to clause 5.22.1.11:

4> determine the order of the (re-)selected carriers, according to the decreasing order based on the highest priority of logical channels which are allowed on each (re-)selected carrier, and perform the resource selection procedure as specified in this clause for each Sidelink process on each (re-)selected carrier according to the order.

3> if one or multiple SL DRX(s) is configured in the destination UE(s) receiving SL-SCH data:

4> indicate to the physical layer SL DRX Active time in the destination UE(s) receiving SL-SCH data, as specified in clause 5.28.2.

3> if the selected resource pool is not Dedicated SL-PRS resource pool:

4> 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) and pending SL-PRS transmission(s), if available 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 or the corresponding *sl-DefaultCBR-PartialSensing* configured by RRC if partial sensing is selected and CBR measurement results are not available, or the corresponding *sl-DefaultCBR-RandomSelection* configured by RRC if random selection is selected and CBR measurement results are not available in case the *sl-TxPoolExceptional* is not used;

NOTE 3Ad: For Multi-consecutive slots transmission as specified in clause 8.1.4 of TS 38.214 [7], during resource (re)selection, leave it to UE implementation, regarding whether to calculate the number of HARQ retransmissions from the allowed numbers based on the number of MCSt transmissions, or the number of slot(s) within Multi-consecutive slots transmission.

4> select an amount of frequency resources within the range, if 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) and pending SL-PRS transmission(s), if available 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 or the corresponding *sl-DefaultCBR-PartialSensing* configured by RRC if partial sensing is selected and CBR measurement results are not available, or the corresponding *sl-DefaultCBR-RandomSelection* configured by RRC if random selection is selected and CBR measurement results are not available in case the *sl-TxPoolExceptional* is not used;

3> if the selected resource pool is Dedicated SL-PRS resource pool:

4> select the number of SL-PRS retransmissions from the allowed numbers, if configured by RRC, in *sl-PRS-MaxNum-Transmissions* included in *sl-CBR-SL-PRS-TxConfigList*.

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is not configured by RRC:

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

5> if the selected resource pool is not Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resources pool which occur within the SL DRX Active time, if configured, as specified in clause 5.28.2 of the destination UE selected for indicating to the physical layer the SL DRX Active time above, and the pool(s) in which all RB sets had Sidelink consistent LBT failure detected and not cancelled, if configured, according to the amount of selected frequency resources, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier, and the latency requirement of the triggered SL-CSI reporting.

5> if the selected resource pool is Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resource pool as specified in clause 5.28.2, according to the remaining SL-PRS delay budget of the SL-PRS transmission.

4> else:

5> if *sl-NRPSSCH-EUTRA-ThresRSRP-List* is configured by the RRC:

6> 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;

7> when SCS of NR SL is (pre-)configured as *μ* = 1:

8> select the time and frequency resources in the first of NR SL slots overlapping with an LTE SL subframe;

8> may additionally select the time and frequency resources in the subsequent NR SL slot overlapping with the LTE SL subframe.

5> else if the selected resource pool is not Dedicated SL-PRS resource pool:

6> 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] which occur within the SL DRX Active time, if configured, as specified in clause 5.28.2 of the destination UE selected for indicating to the physical layer the SL DRX Active time above, according to the amount of selected frequency resources, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier, and/or the latency requirement of the triggered SL-CSI reporting.

5> if the selected resource pool is Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by physical layer as clasue 8.2.4 of TS 38.214 [7] as specified in clause 5.28.2, according to the remaining SL-PRS delay budget of the SL-PRS transmission.

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and preferred resource set is not received from a UE:

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

5> if the selected resource pool is not Dedicated SL-PRS resource pool:

6> randomly select the time and frequency resources for one transmission opportunity from the resources pool excluding all RB sets had Sidelink consistent LBT failure detected and not cancelled, if configured according to the amount of selected frequency resources and the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier, and/or the latency requirement of the triggered SL-CSI reporting.

4> else:

5> if the selected resource pool is not Dedicated SL-PRS resource pool:

6> 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, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier, and/or the latency requirement of the triggered SL-CSI reporting.

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE does not have own sensing result as specified in clause 8.1.4 of TS 38.214 [7] and if a preferred resource set is received from a UE and if the selected resource pool is not Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resources for one transmission opportunity from the resources belonging to the received preferred resource set for a MAC PDU to be transmitted to the UE providing the preferred resource set, according to the amount of selected frequency resources, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier, and/or the latency requirement of the triggered SL-CSI reporting.

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE has own sensing result as specified in clause 8.1.4 of TS 38.214 [7] and if a preferred resource set is received from a UE and if the selected resource pool is not Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resources for one transmission opportunity within the intersection of the received preferred resource set and the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] for a MAC PDU to be transmitted to the UE providing the preferred resource set, according to the amount of selected frequency resources, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier, and/or the latency requirement of the triggered SL-CSI reporting;

4> if there are no resources within the intersection that can be selected as the time and frequency resources for the one transmission opportunity 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.

5> 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, the remaining PDB of SL data available in the logical channel(s), and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, allowed on the carrier, and/or the latency requirement of the triggered SL-CSI reporting.

3> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE determines the resources for Sidelink Inter-UE Coordination Information transmission upon explicit request from a UE:

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, 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 and the latency requirement of the Sidelink Inter-UE Coordination Information transmission, and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available.

3> if one or more SL-PRS retransmissions are selected and the selected resource pool is Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resources for one or more transmission opportunities from the available resources, according to the selected number of retransmissions and the remaining SL-PRS delay budget 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];

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

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

3> else if one or more HARQ retransmissions are selected and the selected resource pool is not Dedicated SL-PRS resource pool:

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is not configured by RRC:

5> if transmission based on full sensing or partial 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

5> 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:

6> if *sl-NRPSSCH-EUTRA-ThresRSRP-List* is configured by the RRC:

7> 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 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];

8> when SCS of NR SL is (pre-)configured as *μ* = 1:

9> select the time and frequency resources in the second of NR SL slots of NR SL slots overlapping with an LTE SL subframe to which the selected initial transmission resources belongs, or at least select the time and frequency resources in the first of NR SL slots overlapping with an LTE SL subframe.

6> else:

7> randomly select the time and frequency resources for one or more transmission opportunities from the available resources which occur within the SL DRX Active time, if configured, as specified in clause 5.28.2 of the destination UE selected for indicating to the physical layer the SL DRX Active time above, and the pool(s) in which all RB sets with Sidelink consistent LBT failure detected and not cancelled are excluded, if configured, 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 reporting, and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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];

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and preferred resource set is not received from a UE:

5> 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

5> 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:

6> randomly select the time and frequency resources for one or more transmission opportunities from the available resources excluding all RB sets had Sidelink consistent LBT failure detected and not cancelled, if configured 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 reporting, and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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].

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE has own sensing result as specified in clause 8.1.4 of TS 38.214 [7] and if a preferred resource set is received from a UE:

5> if there are available resources left in the intersection of the received preferred resource set and the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] for more transmission opportunities:

6> randomly select the time and frequency resources for one or more transmission opportunities from the available resources within the intersection for a MAC PDU to be transmitted to the UE providing the preferred resource set, 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 reporting, and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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> if the number of time and frequency resources that has been maximally selected for one or more transmission opportunities from the available resources within the intersection is smaller than the selected number of HARQ retransmissions and there are available resources left in the resources indicated by the physical layer for more transmission opportunities:

6> randomly select the time and frequency resources for the remaining transmission opportunities except for the selected resources within the intersection from the available resources outside the intersection but left in the resources indicated by the physical layer according to clause 8.1.4 of TS 38.214 [7], 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 reporting, and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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].

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE does not have own sensing result as specified in clause 8.1.4 of TS 38.214 [7] and if a preferred resource set is received from a UE; and

4> if there are available resources left in the received preferred resource set for more transmission opportunities:

5> randomly select the time and frequency resources for one or more transmission opportunities from the available resources belonging to the received preferred resource set for a MAC PDU to be transmitted to the UE providing the preferred resource set, 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 reporting, and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available, 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].

4> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and when the UE determines the resources for Sidelink Inter-UE Coordination Information transmission upon explicit request from a UE:

5> 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, 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 and the latency requirement of the Sidelink Inter-UE Coordination Information transmission, and the remaining SL-PRS delay budget of the SL-PRS transmission(s), if available.

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

4> 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) and the SL-PRS transmission occasion(s), if available, according to TS 38.214 [7] if the selected resource pool is not Dedicated SL-PRS resource pool or to determine the PSCCH duration(s) and SL-PRS transmission occasion(s) if the selected resource pool is Dedicated SL-PRS resource pool according to TS 38.214 [7].

NOTE 3Ae: MAC entity, based on UE implementation, decides whether to indicate the number of consecutive slots for Multi-consecutive slots transmission as specified in clause 8.1.4 of TS 38.214 [7] larger than 1.

NOTE 3Af: MAC entity, based on UE implementation, decides the value of the number of consecutive slots for Multi-consecutive slots transmission if it decides the number of consecutive slots for Multi-consecutive slots transmission larger than 1, as long as it meets the CAPC maximum COT duration requirement as specified in TS 37.213 [18].

NOTE 3Ag: When the MAC entity selects the time and frequency resources from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7], it is up to the UE implementation whether to randomly select resources for transmission opportunities from the resources indicated by the physical layer or to select resources in consecutive slots by UE implementation from the resources indicated by the physical layer.

NOTE 3Ah: For a resource pool configured with PSFCH resource, UE cannot select consecutive slots for SL transmissions of a single TB for Multi-consecutive slots transmission.

NOTE 3Ai: UE may avoid selection of N consecutive resource(s) before a reserved resource of its own, where the selection of N is up to UE implementation from {0,1,2}. UE may avoid selection of M consecutive resource(s) after a reserved resource of its own, where the selection of M is up to UE implementation (at least including 0).

NOTE 3Aj: If configured, UE may avoid selection of N consecutive resource(s) before a reserved resource of other UE when the L1 SL priority value for the transmission is higher than the L1 SL priority value of the reserved resource, where the selection of N is up to UE implementation from {0,1,2}. UE may avoid selection of M consecutive resource(s) after a reserved resource of other UE when the transmitting symbols of the reserved resource overlap with LBT of its own selected resource, where the selection of M is up to UE implementation from {0,1,2}. It is up to UE implementation how the physical layer reports detected reserved resources to MAC layer.

NOTE 3Ak: If configured, if transmission in slot(s) at least $T\_{proc,0}^{SL}$ before a reserved resource of other UE is able to share its initiated COT to the reservation, UE may prioritize/select resource(s) in the slot(s) for transmission. It is up to UE implementation how the physical layer reports detected reserved resources to MAC layer.

NOTE 3Al: MAC entity, based on UE implementation, decides how to determine COT sharing cast type, COT sharing additional ID and remaining COT duration specified in TS 37.213 [18].

NOTE 3A1: If *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and if multiple preferred resource sets are received from the same UE, it is up to UE implementation to use one or multiple of them in its resource (re)selection.

NOTE 3B1: 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.

NOTE 3B2: When the UE receives both a single preferred resource set and a single non-preferred resource set from the same peer UE or different peer UEs, when the UE has own sensing results, it is up to the UE implementation to use the preferred resource set in its resource (re)selection for transmissions to the peer UE providing the preferred resource set.

NOTE 3B3: The UE is not required to use any resource from the preferred resource set in its resource (re-)selection if that resource is earlier than ($T\_{proc,0}^{SL}$+$T\_{proc,1}^{SL}$+$T\_{proc,2}^{SL}$) after the resource of Inter-UE Coordination Information transmission, where $T\_{proc,2}^{SL}$ is equal to ($T\_{proc,0}^{SL}$+$T\_{proc,1}^{SL}$) when only MAC CE is used for inter-UE Coordination Information transmission, or $T\_{proc,2}^{SL}$ is equal to $T\_{proc,0}^{SL}$ when MAC CE and SCI format 2-C are both used for Inter-UE Coordination Information transmission. The case when $T\_{proc,2}^{SL}$ is equal to $T\_{proc,0}^{SL}$ is assuming that SCI format 2-C is received. $ T\_{proc,0}^{SL}$ and $T\_{proc,1}^{SL}$ are specified in clause 8.1.4 of TS 38.214 [7].

NOTE 3B4: For Inter-UE Coordination Information triggered by an explicit Inter-UE Coordination Request in Scheme 1, whether or not to transmit the Inter-UE Coordination Information upon the Inter-UE Coordination Request reception is determined by UE implementation subject to Release-16 procedure of UL/SL prioritization, LTE SL/NR SL prioritization, and congestion control.

NOTE 3B5: If configured by RRC, *sl-IUC-Explicit* set to *enabled* and an SL-IUC request is received for the Source Layer-2 ID and Destination Layer-2 ID pair of a unicast, MAC layer indicates to physical layer the resource selection window, resource set type (i.e., preferred resource set), L1 priority, the number of sub-channels to be used for the PSSCH/PSCCH transmission and the resource reservation period for preferred resource set. If configured by RRC, *sl-IUC-Explicit* set to *enabled* and an SL-IUC request is received for the Source Layer-2 ID and Destination Layer-2 ID pair of a unicast, MAC layer indicates to physical layer resource set type (i.e., non-preferred resource set) and the resource selection window for non-preferred resource set.

NOTE 3B6: If either *sl-IUC-Explicit* or *sl-IUC-Condition* is configured as *enabled*,UE considers the reception of preferred and non-preferred resource is enabled.

NOTE 3B7: When *sl-TriggerConditionCoordInfo* is set to value 0, for groupcast or broadcast of Inter-UE Coordination Information triggered by a condition in Scheme 1, which Destination Layer-2 ID (and the corresponding cast-type) a UE selects among Destination Layer-2 IDs that are already used or interested in NR sidelink transmission is up to the UE implementation.

1> if a selected sidelink grant is available for retransmission(s) of a MAC PDU which has been positively acknowledged as specified in clause 5.22.1.3.1a, except a positive acknowledgement to Multi-consecutive slots transmission (i.e., multiple TBs case) of the MAC PDU and there is remaining slot(s) for this MAC PDU:

2> clear the PSCCH duration(s) and PSSCH duratio n(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

- For SL operation with shared spectrum channel access, the 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 last 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.

NOTE4A: For the minimum time gap requirement on shared SL-PRS resource pool, the last symbol of a PSSCH transmission might be mapped to SL-PRS.

The MAC entity shall for each PSSCH duration not on Dedicated SL-PRS resource pool:

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

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 or Sidelink resource allocation Scheme 1 for SL-PRS transmission on Shared SL-PRS resource pool:

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 if the MAC entity has been configured with Sidelink resource allocation mode 2 or Sidelink resource allocation Scheme 2 for SL-PRS transmission on Shared SL-PRS resource pool:

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 or pending SL-PRS transmission(s), if available, 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 or the corresponding *sl-DefaultCBR-PartialSensing* configured by RRC if partial sensing is selected and CBR measurement results are not available, or the corresponding *sl-DefaultCBR-RandomSelection* configured by RRC if random selection is selected and CBR measurement results are not available in case the *sl-TxPoolExceptional* is not used;

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.

The MAC entity shall for each PSCCH duration on Dedicated SL-PRS resource pool:

1> if the MAC entity is not configured with multiple SL-PRS transmissions with Sidelink resource allocation scheme 2; or

1> if the MAC entity is configured with Sidelink resource allocation scheme 1:

2> set the resource reservation period to 0.

1> else if the MAC entity is configured with multiple SL-PRS transmission with Sidelink resource allocation scheme 2:

2> set the resource reservation period to the selected value.

1> 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:

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

2> determine that this SL-PRS transmission occasion is used for initial transmission.

1> process the sidelink grant according to clause 5.22.1.3.4 with the corresponding SL-PRS transmission information.

For configured sidelink grants not on Dedicated SL-PRS resource pool, the HARQ Process ID associated with the first slot of an SL transmission is derived from the following equation:

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

For configured sidelink grant on Dedicated SL-PRS resource pool, the SL-PRS Process ID associated with the first slot of an SL transmission is derived from the following equation:

 SL-PRS Process ID = [floor(CURRENT\_slot / *PeriodicitySL*)] modulo *[nrOfSL-PRSProc]*

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

#### 5.22.1.2 TX resource (re-)selection check

If the TX resource (re-)selection check procedure is triggered on the selected pool of resources for a Sidelink process according to clause 5.22.1.1, the MAC entity shall for the Sidelink process:

1> if PSCCH duration(s) and 2nd stage SCI on PSSCH for all transmissions of a MAC PDU of any selected sidelink grant(s) are not in SL DRX Active time as specified in clause 5.28.3 of the destination that has data to be sent; or

1> 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 above the probability configured by RRC in *sl-ProbResourceKeep*; or

1> if the pool of resources is configured or reconfigured by RRC; or

1> if there is no selected sidelink grant on the selected pool of resources; or

1> if neither transmission nor retransmission has been performed by the MAC entity on any resource indicated in the selected sidelink grant during the last second; or

1> if *sl-ReselectAfter* is configured and the number of consecutive unused transmission opportunities on resources indicated in the selected sidelink grant, which is incremented by 1 when none of the resources of the selected sidelink grant within a resource reservation interval is used, is equal to *sl-ReselectAfter*; or

1> if the selected sidelink grant cannot accommodate a RLC SDU by using the maximum allowed MCS configured by RRC in *sl-MaxMCS-PSSCH* associated with the selected MCS table and the UE selects not to segment the RLC SDU; or

NOTE 1: If the selected sidelink grant cannot accommodate the RLC SDU, it is left for UE implementation whether to perform segmentation or sidelink resource reselection.

1> if transmission(s) with the selected sidelink grant cannot fulfil the remaining PDB of the data in a logical or the remaining SL-PRS delay budget for SL-PRS transmission, if available channel, and the MAC entity selects not to perform transmission(s) corresponding to a single MAC PDU or SL-PRS transmission; or

1> if Sidelink consistent LBT failure is detected as specified in clause 5.31.2 in some RB set(s) of the selected resource pool that spans multiple RB sets for the logical channel, if single carrier frequency is configured; or

1> if a MAC PDU is not transmitted (i.e. initial transmission or retransmission) in any of the resources for this MAC PDU that are associated with the sidelink process for Multi-consecutive slots transmission due to the Sidelink LBT failure:

NOTE 2: If the remaining PDB is not met, it is left for UE implementation whether to perform transmission(s) corresponding to single MAC PDU or sidelink resource reselection.

NOTE 3: It is left for UE implementation whether to trigger the TX resource (re-)selection due to the latency requirement of the MAC CEs triggered according to clause 5.22.1.7 and clause 5.22.1.10.1.

2> if multiple carrier frequencies are configured:

3> trigger the TX carrier (re-)selection procedure as specified in clause 5.22.1.11.

2> clear the selected sidelink grant associated to the Sidelink process, if available;

2> trigger the TX resource (re-)selection.

NOTE 4: Void.

NOTE 5: Void.

#### 5.22.1.2a Re-evaluation and Pre-emption

A resource(s) of the selected sidelink grant for a MAC PDU to transmit from multiplexing and assembly entity or for a SL-PRS transmission is re-evaluated by physical layer at *T3* before the slot where the SCI indicating the resource(s) is signalled at first time as specified in clause 8.1.4 of TS 38.214 [7].

A resource(s) of the selected sidelink grant which has been indicated by a prior SCI for a MAC PDU to transmit from multiplexing and assembly entity or for a SL-PRS transmission could be checked for pre-emption by physical layer at *T3* before the slot where the resource(s) is located as specified in clause 8.1.4 of TS 38.214 [7].

NOTE 1: It is up to UE implementation to re-evaluate or pre-empt before 'm – *T3*' or after 'm – *T3*' but before 'm'. For re-evaluation, m is the slot where the SCI indicating the resource(s) is signalled at first time as specified in clause 8.1.4 of TS 38.214. For pre-emption, m is the slot where the resource(s) is located as specified in clause 8.1.4 of TS 38.214.

If the MAC entity has been configured with Sidelink resource allocation mode 2 or Sidelink resource allocation scheme 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 or for each SL-PRS transmission:

1> if a resource(s) of the selected sidelink grant which has not been identified by a prior SCI is indicated for re-evaluation by the physical layer as specified in clause 8.1.4 of TS 38.214 [7];

2> remove the resource(s) from the selected sidelink grant associated to the Sidelink process or SL-PRS transmission;

2> if the selected resource pool is not Dedicated SL-PRS resource pool:

3> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] for either the removed resource or the dropped resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s), and the remaining SL-PRS delay budget for SL-PRS transmission, if available, by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9];

2> else if the selected resource pool is Dedicated SL-PRS resource pool:

3> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in clause 8.2.4 of TS 38.214 [7] for either the removed resource or the dropped resource, according to the selected number of SL-PRS retransmissions and the remaining SL-PRS delay budget for SL-PRS transmission and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.2 of TS 38.212 [9].

2> replace the removed or dropped resource(s) by the selected resource(s) for the selected sidelink grant.

1> if any resource(s) of the selected sidelink grant which has been indicated by a prior SCI is indicated for pre-emption by the physical layer as specified in clause 8.1.4 of TS 38.214 [7]:

2> remove the resource(s) from the selected sidelink grant associated to the Sidelink process;

2> if one or multiple SL DRX is configured:

3> if the selected resource pool is not Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resource from the resources later than the resources for either the removed resource or the dropped resource indicated by a prior SCI, from the resource indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] which occur within the SL DRX active time as specified in clause 5.28.3 of the destination UE selected for indicating to the physical layer the SL DRX active time above, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and the remaining SL-PRS delay budget for SL-PRS transmission, if available, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9].

2> else:

3> if the selected resource pool is not Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] for either the removed resource or the dropped resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and the remaining SL-PRS delay budget for SL-PRS transmission, if available, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9].

3> else if the selected resource pool is Dedicated SL-PRS resource pool:

4> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in clause 8.2.4 of TS 38.214 [7] for either the removed resource or the dropped resource, according to the selected number of SL-PRS retransmissions and the remaining SL-PRS delay budget for SL-PRS transmission and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9].

NOTE 2: 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.

2> replace the removed or dropped resource(s) by the selected resource(s) for the selected sidelink grant.

NOTE 3: It is left for UE implementation to reselect any pre-selected but not reserved resource(s) other than the resource(s) indicated for pre-emption or re-evaluation by the physical layer during reselection triggered by re-evaluation or pre-emption indicated by the physical layer.

NOTE 4: It is up to UE implementation whether to set the resource reservation interval in the re-selected resource to replace pre-empted resource.

NOTE 5: It is up to UE implementation whether to trigger resource reselection due to de-prioritization as specified in clause 16.2.4 of TS 38.213 [6], clause 5.14.1.2.2 of TS 36.321 [22] and clause 5.22.1.3.1a.

NOTE 6: For the selected sidelink grant corresponds to transmissions of multiple MAC PDU, it is up to UE implementation whether to apply re-evaluation check to the resources in non-initial reservation period that have been signalled neither in the immediate last nor in the current period.

#### 5.22.1.2b Re-selection for using a received resource conflict indication

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

1> if *sl-interUECoordinationScheme2* enabling reception/transmission of a resource conflict indication is configured by RRC; and

1> if the next resource of the selected sidelink grant which has been indicated by a prior SCI is overlapped with conflict resource(s) indicated by the physical layer as specified in clause 16.3.1 of TS 38.213 [6]:

2> remove the resource from the selected sidelink grant associated to the Sidelink process;

2> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] excluding the conflict resource(s) for the removed resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s), and the remaining SL-PRS delay budget for SL-PRS transmission, if available, by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9];

NOTE 1: If retransmission resource cannot be selected by ensuring that the resource can be indicated by the time resource assignment of a prior SCI, how to select the time and frequency resource for 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.

2> replace the removed resource by the selected resource for the selected sidelink grant.

NOTE 2: It is left for UE implementation to reselect any pre-selected but not reserved resource(s) other than the resource overlapping with the conflict resource(s) indicated by the physical layer during reselection triggered by the conflict resource(s) indicated by the physical layer.

NOTE 3: It is up to UE implementation whether and how to set the resource reservation interval in the re-selected resource to replace the resource overlapping with the conflict resource(s) indicated by the physical layer.

#### 5.22.1.2c Resource re-selection from SL LBT Failure indication

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:

1> if SL LBT failure indication is received from lower layers:

2> for the resource(s) where SL LBT failure is detected from the selected sidelink grant associated to the Sidelink process:

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 resource pool excluding all RB sets for which Sidelink consistent LBT failures were detected and not cancelled, if configured 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) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources.

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, the selected number of HARQ retransmissions and the remaining PDB of SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources.

#### 5.22.1.3 Sidelink HARQ operation and SL-PRS transmission

##### 5.22.1.3.1 Sidelink HARQ Entity

The MAC entity is configured by upper layers to transmit using pool(s) of resources on one or more carriers as indicated in clause 5.8.8 of TS 38.331 [5]. For each carrier, 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.

NOTE: For SL-PRS transmission on Dedicated SL-PRS resource pool, the maximum number of SL-PRS the UE should support is left to UE implementation.

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 an *sl-PeriodCG* of the configured sidelink grant; or

1> if the sidelink grant is a dynamic sidelink grant or selected sidelink grant and no MAC PDU has been obtained in the previous sidelink grant when PSCCH duration(s) and 2nd stage SCI on PSSCH of the previous sidelink grant is not in SL DRX Active time as specified in clause 5.28.3 of any destination that has data to be sent:

NOTE 1: Void.

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

2> if all PSCCH duration(s) and PSSCH duration(s) for initial transmission of a MAC PDU of the dynamic sidelink grant or the configured sidelink grant is not in SL DRX Active time as specified in clause 5.28.3 of the destination that has data to be sent:

3> ignore the sidelink grant.

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

2> else:

3> obtain the MAC PDU and SL-PRS, if any, 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> if the MAC PDU is for NR sidelink discovery:

6> set the cast type indicator to broadcast.

5> else:

6> 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 MAC CE(s), if included, in the MAC PDU and SL-PRS, if any;

NOTE 3A: When determining Sidelink transmission information, the priority of the Sidelink Inter-UE Coordination Information MAC CE is the value configured in RRC parameters *sl-PriorityCoordInfoCondition* when triggered by a condition, or *sl-PriorityCoordInfoExplicit* when triggered by an explicit request. When determining Sidelink transmission information, the priority of the Sidelink Inter-UE Coordination Request MAC CE is the value configured in RRC parameter *sl-PriorityRequest*. When determining Sidelink transmission information, the priority of the Sidelink Inter-UE Coordination Information MAC CE is the value indicated in Priority field in the Sidelink Inter-UE Coordination Request MAC CE provided by the UE when triggered by an explicit request, if *sl-PriorityCoordInfoExplicit-r17* is not configured. When determining Sidelink transmission information for performing sensing and candidate resource selections in PHY, the priority value of the Sidelink Inter-UE Coordination Information MAC CE triggered under a condition is up to UE implementation, if *sl-PriorityCoordInfoCondition-r17* is not configured. When determining Sidelink transmission information for performing sensing and candidate resource selections in PHY, the priority value of Sidelink Inter-UE Coordination Request MAC CE is the same as that of a TB to be transmitted by the UE, if *sl-PriorityRequest-r17* is not configured.

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 in a slot 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.

6> else:

7> select negative-only acknowledgement.

NOTE 5: UE operating in SL unlicensed does not use negative-only acknowledgement for groupcast HARQ feedback.

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].

5> set the Redundancy version to the selected value.

5> if the upper layers triggers the SL-PRS transmission of the peer UE identified by the Destination layer-2 ID:

6> set the SL-PRS request to *request*.

5> set the SL-PRS resource ID, if SL-PRS is available, within Sidelink transmission information.

NOTE 6: The SL-PRS resource ID(s) for initial transmission and retransmission(s) are determined by the UE's own upper layers by implementation.

4> deliver the MAC PDU, the SL-PRS, if available, 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 dynamic sidelink grant or the configured sidelink grant is not in SL DRX Active time as specified in clause 5.28.3 of the 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> set the SL-PRS resource ID, if SL-PRS is available, within Sidelink transmission information;

4> deliver the sidelink grant and the Sidelink transmission information of the MAC PDU and the SL-PRS, if available, to the associated Sidelink process;

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

##### 5.22.1.3.1a Sidelink process not associated with Dedicated SL-PRS resource pool

The Sidelink process is associated with a HARQ buffer.

New transmissions and retransmissions are performed on the resource indicated in the sidelink grant as specified in clause 5.22.1.1 and with the MCS selected as specified in clause 8.1.3.1 of TS 38.214 [7] and clause 5.22.1.1.

If the Sidelink process is configured to perform transmissions of multiple MAC PDUs with Sidelink resource allocation mode 2, the process maintains a counter *SL\_RESOURCE\_RESELECTION\_COUNTER*. For other configurations of the Sidelink process, this counter is not available.

Priority of a MAC PDU and SL-PRS, if available, is determined by the highest priority of the logical channel(s), MAC CE(s) in the MAC PDU or SL-PRS.

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

1> store the MAC PDU in the associated HARQ buffer;

1> store the sidelink grant received from the Sidelink HARQ Entity;

1> generate a transmission as described below.

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

1> store the sidelink grant received from the Sidelink HARQ Entity;

1> generate a transmission as described below.

To generate a transmission, the Sidelink process shall:

1> if there is no uplink transmission; or

1> if the MAC entity is able to simultaneously perform uplink transmission(s) and sidelink transmission at the time of the transmission; or

1> if the other MAC entity and the MAC entity are able to simultaneously perform uplink transmission(s) and sidelink transmission at the time of the transmission respectively; or

1> if there is a MAC PDU to be transmitted for this duration in uplink, except a MAC PDU obtained from the Msg3 buffer, the MSGA buffer, or prioritized as specified in clause 5.4.2.2, and the sidelink transmission is prioritized over uplink transmission:

2> instruct the physical layer to transmit SCI according to the stored sidelink grant with the associated Sidelink transmission information;

2> instruct the physical layer to generate a transmission according to the stored sidelink grant;

2> if HARQ feedback has been enabled for the MAC PDU according to clause 5.22.1.4.2:

3> instruct the physical layer to monitor PSFCH for the transmission and perform PSFCH reception as specified in clause 5.22.1.3.2.

2> if *sl-PUCCH-Config* is configured by RRC for the stored sidelink grant:

3> determine transmission of an acknowledgement on the PUCCH as specified in clause 5.22.1.3.2.

1> if this transmission corresponds to the last transmission of the MAC PDU and SL-PRS, if available:

2> decrement *SL\_RESOURCE\_RESELECTION\_COUNTER* by 1, if available.

NOTE 1: If the number of HARQ retransmissions selected by the MAC entity has been reached, or if a positive acknowledgement to a transmission of the MAC PDU has been received, or if a negative-only acknowledgement was enabled in the SCI and no negative acknowledgement was received for the transmission of the MAC PDU, the MAC entity determines this transmission corresponds to the last transmission of the MAC PDU for Sidelink resource allocation mode 2. How to determine the last transmission in other cases is up to UE implementation.

1> if *sl-MaxTransNum* corresponding to the highest priority of the logical channel(s) in the MAC PDU has been configured in *sl-CG-MaxTransNumList* for the sidelink grant by RRC and the number of transmissions of the MAC PDU has been reached to *sl-MaxTransNum*; or

1> if a positive acknowledgement to this transmission of the MAC PDU was received according to clause 5.22.1.3.2, except a positive acknowledgement to Multi-consecutive slots transmission (i.e., multiple TBs case) of the MAC PDU and there is remaining slot(s) for this MAC PDU; or

1> if negative-only acknowledgement was enabled in the SCI and no negative acknowledgement was received for this transmission of the MAC PDU according to clause 5.22.1.3.2:

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

The transmission of the MAC PDU or SL-PRS, if available, is prioritized over uplink transmission(s) of the MAC entity or the other MAC entity if the following conditions are met:

1> if the MAC entity is not able to perform this sidelink transmission simultaneously with all uplink transmission(s) at the time of the transmission, and

1> if none of the uplink transmission(s) is prioritized by upper layer according to TS 23.287 [19], and

1> if none of the NR uplink MAC PDU(s) includes any MAC CE prioritized as described in clause 5.4.3.1.3, and

1> if *ul-PrioritizationThres* is configured and if the value of the highest priority of logical channel(s) of all the NR uplink transmission(s) is not lower than *ul-PrioritizationThres*, and

1> if *sl-PrioritizationThres* is configured and if the value of the highest priority of logical channel(s) or MAC CE(s) in the MAC PDU is lower than *sl-PrioritizationThres*.

NOTE 2: If the MAC entity is not able to perform this sidelink transmission simultaneously with all uplink transmissions as specified in clause 5.4.2.2 of TS 36.321 [22] at the time of the transmission, and prioritization-related information is not available prior to the time of this sidelink transmission due to processing time restriction, it is up to UE implementation whether this sidelink transmission is performed.

##### 5.22.1.3.2 PSFCH reception

The MAC entity shall for each PSSCH transmission:

1> if an acknowledgement corresponding to the PSSCH transmission in clause 5.22.1.3.1a is obtained from the physical layer:

2> deliver the acknowledgement to the corresponding Sidelink HARQ entity for the Sidelink process;

1> else:

2> deliver a negative acknowledgement to the corresponding Sidelink HARQ entity for the Sidelink process;

1> if the PSSCH transmission occurs for a pair of Source Layer-2 ID and Destination Layer-2 ID corresponding to a PC5-RRC connection which has been established by upper layers:

2> perform the HARQ-Based Sidelink RLF Detection procedure as specified in clause 5.22.1.3.3.

If *sl-PUCCH-Config* is configured by RRC, the MAC entity shall for a PUCCH transmission occasion:

1> if the *timeAlignmentTimer*, associated with the TAG containing the Serving Cell on which the HARQ feedback is to be transmitted, is stopped or expired, and the Serving Cell is not configured with two TAGs; or

1> if the Serving Cell on which the HARQ feedback is to be transmitted is configured with two TAGs and if the *timeAlignmentTimer* of the TAG, associated with the TCI state(s) used for transmitting the HARQ feedback, is stopped or expired:

2> not instruct the physical layer to generate acknowledgement(s) of the data in this TB.

1> else if all PSCCH duration(s) and PSSCH duration(s) for initial transmission of a MAC PDU of the dynamic sidelink grant or the configured sidelink grant is not in SL DRX Active time as specified in clause 5.28.3 of the destination that has data to be sent and the sidelink grant is ignored according to clause 5.22.1.3.1:

2> instruct the physical layer to signal a positive acknowledgement corresponding to the transmission on the PUCCH according to clause 16.5 of TS 38.213 [6].

1> else if a MAC PDU has been obtained for a sidelink grant associated to the PUCCH transmission occasion in clause 5.22.1.3.1, the MAC entity shall:

2> if the most recent transmission of the MAC PDU was not prioritized as specified in clause 5.22.1.3.1a:

3> instruct the physical layer to signal a negative acknowledgement on the PUCCH according to clause 16.5 of TS 38.213 [6].

2> else if HARQ feedback has been disabled for the MAC PDU and next retransmission(s) of the MAC PDU is not required:

3> instruct the physical layer to signal a positive acknowledgement corresponding to the transmission on the PUCCH according to clause 16.5 of TS 38.213 [6].

2> else if HARQ feedback has been disabled for the MAC PDU, and no sidelink grant is available for next retransmission(s) of the MAC PDU (including immediately after all PSSCH duration(s) in an *sl-PeriodCG* for the sidelink grant, the number of transmissions of the MAC PDU has not reached *sl-MaxTransNum* corresponding to the highest priority of the logical channel(s) in the MAC PDU, if configured in *sl-CG-MaxTransNumList* for the sidelink grant by RRC), if any; or

2> else if PSCCH duration(s) and PSSCH duration(s) for one or more retransmissions of a MAC PDU of the dynamic sidelink grant or the configured sidelink grant is not in SL DRX Active time as specified in clause 5.28.3 of the destination that has data to be sent:

3> instruct the physical layer to signal a negative acknowledgement corresponding to the transmission on the PUCCH according to clause 16.5 of TS 38.213 [6].

2> else:

3> instruct the physical layer to signal an acknowledgement corresponding to the transmission on the PUCCH according to clause 16.5 of TS 38.213 [6]

1> else:

2> instruct the physical layer to signal a positive acknowledgement on the PUCCH according to clause 16.5 of TS 38.213 [6].

##### 5.22.1.3.3 HARQ-based Sidelink RLF detection

For each carrier associated with a PC5-RRC connection, the HARQ-based Sidelink RLF detection procedure is used to detect Sidelink RLF based on a number of consecutive DTX on PSFCH reception occasions for a PC5-RRC connection.

RRC configures the following parameter to control HARQ-based Sidelink RLF detection:

- *sl-maxNumConsecutiveDTX*.

The following UE variable is used for HARQ-based Sidelink RLF detection.

- *numConsecutiveDTX*, which is maintained per carrier per PC5-RRC connection.

For each carrier associated with a PC5-RRC connection, the Sidelink HARQ Entity shall (re-)initialize *numConsecutiveDTX* to zero for each PC5-RRC connection which has been established by upper layers, if any, upon establishment of the PC5-RRC connection or (re)configuration of *sl-maxNumConsecutiveDTX*.

For each carrier associated with a PC5-RRC connection, the Sidelink HARQ Entity shall for each PSFCH reception occasion associated to the PSSCH transmission:

1> if PSFCH reception is absent on the PSFCH reception occasion:

2> increment *numConsecutiveDTX* by 1;

NOTE 1: For SL operation with shared spectrum channel access, UE increases the *numConsecutiveDTX* by 1 when the UE fails to detect the HARQ feedback on all the associated PSFCH resources according to clause 16.3.0 of TS 38.213 [6].

2> if more than one carrier selected as defined in clause 5.22.1.11 is considered as the carriers for HARQ-based Sidelink RLF detection:

3> if *numConsecutiveDTX* reaches *sl-maxNumConsecutiveDTX* for a carrier applied for HARQ-based Sidelink RLF detection:

4> trigger the TX carrier (re-)selection procedure as specified in clause 5.22.1.11;

4> indicate HARQ-based Sidelink carrier failure to upper layers.

3> if *numConsecutiveDTX* reaches *sl-maxNumConsecutiveDTX* for all carriers applied for HARQ-based Sidelink RLF detection:

4> indicate HARQ-based Sidelink RLF detection to upper layers.

2> else:

3> if numConsecutiveDTX reaches *sl-maxNumConsecutiveDTX*:

4> indicate HARQ-based Sidelink RLF detection to upper layers.

1> else:

2> re-initialize *numConsecutiveDTX* to zero.

5.22.1.3.4 Processing of sidelink grant on Dedicated SL-PRS resource pool

For each sidelink grant, the MAC 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 an *sl-PeriodCG* of the configured sidelink grant:

2> associate a Sidelink process to this sidelink grant;

2> set the Destination ID to the Destination layer-2 ID corresponding to the SL-PRS transmission;

2> if the length of the Source ID is configured to as 12 bit:

3> set the Source ID to the 12 LSB of the Source layer-2 ID corresponding to the SL-PRS transmission;

2> else if length of the Source ID is configured to as 24 bit:

3> set the Source ID to the Source layer-2 ID corresponding to the SL-PRS transmission;

2> set the cast type indicator to one of broadcast, groupcast and unicast as indiated by the upper layer;

2> set the SL-PRS priority as the value indicated by upper layer;

2> set the SL-PRS resource ID;

NOTE 1: The SL-PRS resource ID(s) for initial transmission and retransmission(s) are determined by the UE's own upper layers by implementation.

2> if the upper layer triggers SL-PRS transmission of the peer UE identified by the Destination layer-2 ID:

3> set the SL-PRS request to *request*;

2> deliver the SL-PRS transmission information to the Sidelink process;

2> instruct the associated Sidelink process to trigger a new transmission as defined in 5.22.1.3.5.

1> else (i.e., retransmission):

2> identify the Sidelink process associated with this grant;

2> if *sl-PRS-MaxNumTransmissions* is configured and the number of transmissions of the SL-PRS has not reached *sl-PRS-MaxNumTransmissions*:

3> set the SL-PRS resource ID;

3> deliver the SL-PRS transmission information to the Sidelink process;

3> instruct the associated Sidelink process to trigger a retransmission as defined in 5.22.1.3.5.

NOTE 2: For configured sidelink grant, the Sidelink process for retransmission is identified by the SL-PRS Process ID as specified in clause 5.22.1.3.1.

5.22.1.3.5 Sidelink process associated with Dedicated SL-PRS resource pool

If the Sidelink process is configured to perform transmissions of multiple SL-PRS with Sidelink resource allocation scheme 2, the process maintains a counter *SL\_RESOURCE\_RESELECTION\_COUNTER*. For other configurations of the Sidelink process, this counter is not available.For each SL-PRS new transmission or retransmission, the MAC entity shall:

1> if there is no uplink transmission; or

1> if there is uplink transmission and the sidelink transmission is prioritized over uplink transmission:

2> instruct the physical layer to transmit SCI of the SL grant with the associated SL-PRS transmission information on Dedicated SL-PRS resource pool;

2> instruct the physical layer to generate the SL-PRS on Dedicated SL-PRS resource pool.

1> if this transmission corresponds to the last transmission of the SL-PRS transmission:

2> decrement *SL\_RESOURCE\_RESELECTION\_COUNTER* by 1, if available.

The transmission of the SL-PRS is prioritized over uplink transmission(s) of the MAC entity or the other MAC entity if the following conditions are met:

1> if the MAC entity is not able to perform this sidelink transmission simultaneously with all uplink transmission(s) at the time of the transmission, and

1> if *ul-PrioritizationThres* is configured and if the value of the highest priority of logical channel(s) of all the NR uplink transmission(s) is not lower than *ul-PrioritizationThres*, and

1> if *sl-PrioritizationThres* is configured and if the value of SL-PRS priority is lower than *sl-PrioritizationThres*.

#### 5.22.1.4 Multiplexing and assembly

##### 5.22.1.4.0 General

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.

NOTE: Sidelink data for discovery and sidelink data for non-discovery transmitted by a UE cannot be multiplexed into the same TB because they are always associated with different destination L2 IDs (see TS 23.304 [26]).

##### 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 and SL-PRS

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

1> if *sl-BWP-DiscPoolConfig*, *sl-BWP-DiscPoolConfigCommon*, *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X* is configured according to TS 38.331 [5]; and

1> if COT sharing information has not been received from lower layers as specified in TS 37.213[18]; and

1> if the new transmission is not associated to a sidelink grant on Dedicated SL-PRS resource pool:

2> if the new transmission is associated to a sidelink grant in *sl-DiscTxPoolSelected* or *sl-DiscTxPoolScheduling* configured in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon*:

3> select a Destination associated with NR sidelink discovery as specified in TS 23.304 [26], that is in the SL Active time for the SL transmission occasion if SL DRX is applied for the destination, and among the logical channels that satisfy all the following conditions for the SL grant associated to the SCI:

4> SL data for NR sidelink discovery is available for transmission; and

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

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

4> *sl-AllowedCG-List*, if configured, includes the configured grant index associated to the SL grant.

2> else if the new transmission is associated to a sidelink grant in *sl-TxPoolSelectedNormal* configured in *sl-BWP-PoolConfigA2X* or *sl-BWP-PoolConfigCommonA2X*:

3> select a Destination associated with BRID if *sl-A2X-Service* in *sl-TxPoolSelectedNormal* indicates *brid* or *bridAndDAA* or select a Destination associated with DAA if *sl-A2X-Service* in *sl-TxPoolSelectedNormal* indicates *daa* or *bridAndDAA* as specified in TS 23.256 [31], and the logical channel with the highest priority, among the logical channels that satisfy all the following conditions for the SL grant associated to the SCI:

4> SL data for A2X communication is available for transmission; and

4> *SBj* > 0, in case there is any logical channel having *SBj* > 0.

2> else:

3> select a Destination associated to one of unicast, groupcast and broadcast (excluding the Destination(s) associated with NR sidelink discovery as specified in TS 23.304 [26]), that is in the SL Active time for the SL transmission occasion if SL DRX is applied for the destination, and having at least one of the MAC CE and the logical channel and pending SL-PRS transmission(s) with the highest priority, among the logical channels that satisfy all the following conditions and MAC CE(s), if any, and SL-PRS(s), if any for the SL grant associated to the SCI:

4> SL data for NR sidelink communication is available for transmission; and

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

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

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

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

4> allowed on the carrier where the SCI is transmitted, if the carrier is configured by upper layers according to TS 38.331 [5] and TS 23.287 [19], if multiple carrier frequencies are configured and if the MAC entity has been configured with Sidelink resource allocation mode 2; and

NOTE 0: A LCH is allowed in a carrier based on whether this selected carrier is within a subset of frequencies associated with all the PC5 QoS flows allowed to be mapped to this LCH based on RRC configuration.

4> having a priority whose associated *sl-threshCBR-FreqReselection* is no lower than the CBR of the carrier when the carrier is (re-)selected in accordance with clause 5.22.1.11, if multiple carrier frequencies are configured and if the MAC entity has been configured with Sidelink resource allocation mode 2.

1> else:

2> if COT sharing information has been received from lower layers as specified in TS 37.213[18]:

3> if resources used for initial transmission for the SL grant associated to the SCI are within the COT duration and MAC entity decides to use shared COT with type-2 LBT:

4> select a Destination associated to one of unicast, groupcast and broadcast that satisfy the following destination condition and CAPC condition, and 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 the MAC CE(s) that satisfies CAPC and destination requirement, if any, for the SL grant associated to the SCI:

5> if a Source Layer-1 ID and a Destination Layer-1 ID contained in the COT initiator's SCI or COT sharing information match to the corresponding Destination Layer-1 ID and a Source Layer-1 IDs relating to the transmission from the responding UE and the cast type indicator in the SCI is set to unicast; or if a Destination Layer-1 ID contained in the COT initiator's SCI or COT sharing information matches to a Destination Layer-1 ID relating to the transmission from the responding UE and the cast type indicator in the SCI is set to groupcast or broadcast; and

5> if a CAPC value of the SL data has an equal or smaller CAPC value than a CAPC value indicated in the COT sharing information; and

5> SL data is available for transmission; and

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

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

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

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

2> else if sl-BWP-DiscPoolConfig or sl-BWP-DiscPoolConfigCommon is not configured according to TS 38.331 [5]; and

2> if the new transmission is not associated to a sidelink grant on Dedicated SL-PRS resource pool:

3> select a Destination associated to one of unicast, groupcast and broadcast, that is in the SL Active time for the SL transmission occasion if SL DRX is applied for the destination, and having at least one of the MAC CE and the logical channel and pending SL-PRS transmission(s) with the highest priority, among the logical channels that satisfy all the following conditions and MAC CE(s), if any, and SL-PRS(s), if any, for the SL grant associated to the SCI:

4> SL data is available for transmission; and

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

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

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

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

4> allowed on the carrier where the SCI is transmitted, if the carrier is configured by upper layers according to TS 38.331 [5] and TS 23.287 [19], if multiple carrier frequencies are configured and if the MAC entity has been configured with Sidelink resource allocation mode 2; and

4> having a priority whose associated *sl-threshCBR-FreqReselection* is no lower than the CBR of the carrier when the carrier is (re-)selected in accordance with clause 5.22.1.11, if multiple carrier frequencies are configured and if the MAC entity has been configured with Sidelink resource allocation mode 2.

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.

1> else: (i.e., the sidelink grant is associated with Dedicated SL-PRS resource pool)

2> select a Destination corresponding to the cast type of the SL grant and having pending SL-PRS transmission(s) with the highest priority for the SL grant associated to the SCI.

1> select the logical channels satisfying all the following conditions among the logical channels belonging to the selected Destination when the new transmission is not associated to a sidelink grant on Dedicated SL-PRS resource pool:

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

2> allowed on the carrier where the SCI is transmitted, if the carrier is configured by upper layers according to TS 38.331 [5] and TS 23.287 [19], if multiple carrier frequencies are configured and if the MAC entity has been configured with Sidelink resource allocation mode 2; and

2> having a priority whose associated *sl-threshCBR-FreqReselection* is no lower than the CBR of the carrier when the carrier is (re-)selected in accordance with clause 5.22.1.11, if multiple carrier frequencies are configured if the MAC entity has been configured with Sidelink resource allocation mode 2; and

2> CAPC value of the SL data has an equal or smaller CAPC value than a CAPC value indicated in the COT sharing information if MAC decides to use the shared COT; and

2> *sl-HARQ-FeedbackEnabled* is set to the value that satisfies the following conditions:

3> if PSFCH is configured for the sidelink grant associated to the SCI and the UE is capable of PSFCH reception:

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: HARQ feedback enabled/disabled indicator is set to disabled for the transmission of a MAC PDU only carrying CSI reporting MAC CE or Sidelink DRX Command MAC CE or Sidelink Inter-UE Coordination Request MAC CE or Sidelink Inter-UE Coordination Information MAC CE.

###### 5.22.1.4.1.3 Allocation of sidelink resources

The MAC entity shall for each sidelink grant associated with Shared SL-PRS resource pool:

1> if there is SL-PRS pending for transmission for the selected destination:

2> derive Transport Block Size for a new transmission for SL-SCH assuming SL-PRS can be transmitted in the sidelink grant according to clause 8.1.3.2 in TS 38.214 [7].

2> if all the SL-SCH data within logical channel with higher priority than that of the SL-PRS can be allocated with resources:

3> determine that the pending SL-PRS can be transmitted in the sidelink grant.

2> else:

3> determine that the pending SL-PRRS cannot be transmitted in the sidelink grant;

3> derive the Transport Block Size for a new transmission for SL-SCH with no SL-PRS according to clause 8.1.3.2 in TS 38.214 [7].

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

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 1: 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; and

- there is no Sidelink DRX Command MAC CE generated for this PSSCH transmission as specified in clause 5.22.1.8; and

- there is no Sidelink Inter-UE Coordination Request MAC CE generated for this PSSCH transmission as specified in clause 5.22.1.9; and

- there is no Sidelink Inter-UE Coordination Information MAC CE generated for this PSSCH transmission as specified in clause 5.22.1.10; and

- the MAC PDU includes zero MAC SDUs and the MAC PDU is not associated with SL-PRS transmission on Shared SL-PRS resource pool.

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

- data from SCCH;

- Sidelink CSI Reporting MAC CE;

- Sidelink Inter-UE Coordination Request MAC CE and Sidelink Inter-UE Coordination Information MAC CE;

- Sidelink DRX Command MAC CE;

- data from any STCH or SL-PRS.

NOTE 2: The priority order between Sidelink Inter-UE Coordination Request MAC CE and Sidelink Inter-UE Coordination Information MAC CE is up to UE implementation.

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

The MAC entity shall multiplex MAC CEs 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-DRX Command indication. The Scheduling Request (SR) is also used for requesting SL-PRS resources for new transmission when triggered by SL-PRS resource request (clause 6.1.3.74). 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-DRX Command indication or for SL consistent LBT failure recovery or for SL-PRS Resource Request, 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) 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 and SL consistent LBT failure recovery 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 triggered by SL-CSI reporting corresponds to the value of the priority of the Sidelink CSI Reporting MAC CE. The SR configuration of the SL-CSI reporting is considered as corresponding SR configuration for the triggered SR of SL-DRX Command indication triggered according to 5.28.3. The value of the priority of the triggered SR triggered by SL-DRX Command indication corresponds to the value of the priority of the Sidelink DRX Command MAC CE. The SR configuration of the SL consistent LBT failure recovery triggered according to 5.31.2 is considered as corresponding SR configuration for the triggered SR (clause 5.4.4). The value of the priority of the triggered SR triggered by SL consistent LBT failure recovery corresponds to the value of the priority of the SL LBT failure MAC CE. SL-PRS resource request may be mapped to zero or one SR configuration, which is configured by RRC. The value of the priority of the triggered SR triggered by SL-PRS resource request corresponds to the value of the priority of the SL-PRS triggering the SL-PRS Resource Request 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 an 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 consistent LBT failure recovery (clause 5.31.2) shall be cancelled and each respective *sr-ProhibitTimer* shall be stopped when the MAC PDU is transmitted and this PDU includes an SL LBT failure MAC CE that indicates Sidelink consistent LBT failure or when all the triggered Sidelink consistent LBT failure(s) for an SL BWP is cancelled.

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.

If there is pending SR triggered by Sidelink consistent LBT failure recovery which has no corresponding SR configuration, MAC entity initiate a Random Access procedure (see clause 5.1) on the Serving Cell and cancel the pending SR.

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

All pending SR(s) triggered according to the SL-PRS Resource Request procedure (clause 5.22.1.12) 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 an SL-PRS Resource Request MAC CE which contains status of the pending SL-PRS transmission(s) up to (and including) the last event that triggered a SL-PRS Resource Request (see clause 5.22.1.12) prior to the MAC PDU assembly.

All pending SR(s) triggered according to the SL-PRS Resource Request procedure (clause 5.22.1.12) shall be cancelled and each respective *sr-ProhibitTimer* shall be stopped when the SL grant(s) can accommodate the all the pending SL-PRS transmission(s).

#### 5.22.1.6 Buffer Status Reporting

The Sidelink Buffer Status reporting (SL-BSR) procedure is used to provide the serving gNB with information about SL data volume in the MAC entity.

RRC configures the following parameters to control the SL-BSR:

- *sl-periodicBSR-Timer*, configured by *periodicBSR-Timer* in *sl-BSR-Config*;

- *sl-retxBSR-Timer*, configured by *retxBSR-Timer* in *sl-BSR-Config*;

- *sl-logicalChannelSR-DelayTimerApplied*;

- *sl-logicalChannelSR-DelayTimer*, configured by *logicalChannelSR-DelayTimer* in *sl-BSR-Config*;

- *sl-logicalChannelGroup*.

Each logical channel which belongs to a Destination is allocated to an LCG as specified in TS 38.331 [5]. The maximum number of LCGs is eight.

The MAC entity determines the amount of SL data available for a logical channel according to the data volume calculation procedure in TSs 38.322 [3] and 38.323 [4].

An SL-BSR shall be triggered if any of the following events occur:

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

2> SL data, for a logical channel which belongs to an LCG of a Destination, becomes available to the MAC entity; and either

3> this SL data belongs to a logical channel with higher priority than the priorities of the logical channels containing available SL data which belong to any LCG belonging to the same Destination; or

3> none of the logical channels which belong to an LCG belonging to the same Destination contains any available SL data.

in which case the SL-BSR is referred below to as 'Regular SL-BSR';

2> UL resources are allocated and number of padding bits remaining after a Padding BSR has been triggered is equal to or larger than the size of the SL-BSR MAC CE plus its subheader, in which case the SL-BSR is referred below to as 'Padding SL-BSR';

2> *sl-retxBSR-Timer* expires, and at least one of the logical channels which belong to an LCG contains SL data, in which case the SL-BSR is referred below to as 'Regular SL-BSR';

2> *sl-periodicBSR-Timer* expires, in which case the SL-BSR is referred below to as 'Periodic SL-BSR'.

1> else:

2> Sidelink resource allocation mode 1 is configured by RRC and SL data is available for transmission in the RLC entity or in the PDCP entity, in which case the Sidelink BSR is referred below to as 'Regular SL-BSR'.

For Regular SL-BSR, the MAC entity shall:

1> if the SL-BSR is triggered for a logical channel for which *sl-logicalChannelSR-DelayTimerApplied* with value *true* is configured by RRC:

2> start or restart the *sl-logicalChannelSR-DelayTimer*.

1> else:

2> if running, stop the *sl-logicalChannelSR-DelayTimer*.

For Regular and Periodic SL-BSR, the MAC entity shall:

1> if *sl-PrioritizationThres* is configured and the value of the highest priority of the logical channels that belong to any LCG and contain SL data for any Destination is lower than *sl-PrioritizationThres*; and

1> if *ul-PrioritizationThres* is configured and the value of the highest priority of the logical channels that belong to any LCG and contain UL data is equal to or higher than *ul-PrioritizationThres* according to clause 5.4.5:

2> prioritize the LCG(s) for the Destination(s).

1> if the Buffer Status reporting procedure determines that at least one BSR has been triggered and not cancelled according to clause 5.4.5 and the UL grant cannot accommodate an SL-BSR MAC CE containing buffer status only for all prioritized LCGs having data available for transmission plus the subheader of the SL-BSR according to clause 5.4.3.1.3, in case the SL-BSR is considered as not prioritized:

2> prioritize the SL-BSR for logical channel prioritization specified in clause 5.4.3.1;

2> report Truncated SL-BSR containing buffer status for as many prioritized LCGs having data available for transmission as possible, taking the number of bits in the UL grant into consideration.

1> else if the number of bits in the UL grant is expected to be equal to or larger than the size of an SL-BSR containing buffer status for all LCGs having data available for transmission plus the subheader of the SL-BSR according to clause 5.4.3.1.3:

2> report SL-BSR containing buffer status for all LCGs having data available for transmission.

1> else:

2> report Truncated SL-BSR containing buffer status for as many LCGs having data available for transmission as possible, taking the number of bits in the UL grant into consideration.

For Padding SL-BSR:

1> if the number of padding bits remaining after a Padding BSR has been triggered is equal to or larger than the size of an SL-BSR containing buffer status for all LCGs having data available for transmission plus its subheader:

2> report SL-BSR containing buffer status for all LCGs having data available for transmission;

1> else:

2> report Truncated SL-BSR containing buffer status for as many LCGs having data available for transmission as possible, taking the number of bits in the UL grant into consideration.

For SL-BSR triggered by *sl-retxBSR-Timer* expiry, the MAC entity considers that the logical channel that triggered the SL-BSR is the highest priority logical channel that has data available for transmission at the time the SL-BSR is triggered.

The MAC entity shall:

1> if the sidelink Buffer Status reporting procedure determines that at least one SL-BSR has been triggered and not cancelled:

2> if UL-SCH resources are available for a new transmission and the UL-SCH resources can accommodate the SL-BSR MAC CE plus its subheader as a result of logical channel prioritization according to clause 5.4.3.1:

3> instruct the Multiplexing and Assembly procedure in clause 5.4.3 to generate the SL-BSR MAC CE(s);

3> start or restart *sl-periodicBSR-Timer* except when all the generated SL-BSRs are Truncated SL-BSRs;

3> start or restart *sl-retxBSR-Timer*.

2> if a Regular SL-BSR has been triggered and *sl-logicalChannelSR-DelayTimer* is not running:

3> if there is no UL-SCH resource available for a new transmission; or

3> if UL-SCH resources are available for a new transmission and the UL-SCH resources cannot accommodate the SL-BSR MAC CE plus its subheader as a result of logical channel prioritization according to clause 5.4.3.1; or

3> if the set of Subcarrier Spacing index values in *sl-AllowedSCS-List*, if configured for the logical channel that triggered the SL-BSR, does not include the Subcarrier Spacing index associated to the UL-SCH resources available for a new transmission; or

3> if *sl-MaxPUSCH-Duration*, if configured for the logical channel that triggered the SL-BSR, is smaller than the PUSCH transmission duration associated to the UL-SCH resources available for a new transmission:

4> trigger a Scheduling Request.

NOTE 1: UL-SCH resources are considered available if the MAC entity has been configured with, receives, or determines an uplink grant. If the MAC entity has determined at a given point in time that UL-SCH resources are available, this need not imply that UL-SCH resources are available for use at that point in time.

A MAC PDU shall contain at most one SL-BSR MAC CE, even when multiple events have triggered an SL-BSR. The Regular SL-BSR and the Periodic SL-BSR shall have precedence over the padding SL-BSR.

The MAC entity shall restart *sl-retxBSR-Timer* upon reception of an SL grant for transmission of new data on any SL-SCH.

All triggered SL-BSRs may be cancelled when the SL grant(s) can accommodate all pending data available for transmission. All BSRs triggered prior to MAC PDU assembly shall be cancelled when a MAC PDU is transmitted and this PDU includes an SL-BSR MAC CE which contains buffer status up to (and including) the last event that triggered an SL-BSR prior to the MAC PDU assembly. All triggered SL-BSRs shall be cancelled, and *sl-retx-BSR-Timer* and *sl-periodic-BSR-Timer* shall be stopped, when RRC configures Sidelink resource allocation mode 2.

NOTE 2: MAC PDU assembly can happen at any point in time between uplink grant reception and actual transmission of the corresponding MAC PDU. SL-BSR and SR can be triggered after the assembly of a MAC PDU which contains an SL-BSR MAC CE, but before the transmission of this MAC PDU. In addition, SL-BSR and SR can be triggered during MAC PDU assembly.

#### 5.22.1.7 CSI Reporting

The Sidelink Channel State Information (SL-CSI) reporting procedure is used to provide a peer UE with sidelink channel state information as specified in clause 8.5 of TS 38.214 [7].

RRC configures the following parameters to control the SL-CSI reporting procedure:

- *sl-LatencyBoundCSI-Report*, which is maintained for each PC5-RRC connection.

The MAC entity maintains an *sl-CSI-ReportTimer* for each pair of the Source Layer-2 ID and the Destination Layer-2 ID corresponding to a PC5-RRC connection. *sl-CSI-ReportTimer* is used for an SL-CSI reporting UE to follow the latency requirement signalled from a CSI triggering UE. The value of *sl-CSI-ReportTimer* is the same as the‎ latency requirement of the SL-CSI reporting in *sl-LatencyBoundCSI-Report* configured by RRC.

The MAC entity shall for each pair of the Source Layer-2 ID and the Destination Layer-2 ID corresponding to a PC5-RRC connection which has been established by upper layers:

1> if the SL-CSI reporting has been triggered by an SCI and not cancelled:

2> if the *sl-CSI-ReportTimer* for the triggered SL-CSI reporting is not running:

3> start the *sl-CSI-ReportTimer*.

2> if the *sl-CSI-ReportTimer* for the triggered SL-CSI reporting expires:

3> cancel the triggered SL-CSI reporting.

2> else if the MAC entity has SL resources allocated for new transmission and the SL-SCH resources can accommodate the SL-CSI reporting MAC CE and its subheader as a result of logical channel prioritization:

3> instruct the Multiplexing and Assembly procedure to generate a Sidelink CSI Reporting MAC CE as defined in clause 6.1.3.35;

3> stop the *sl-CSI-ReportTimer* for the triggered SL-CSI reporting;

3> cancel the triggered SL-CSI reporting.

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

3> trigger a Scheduling Request.

NOTE 1: The MAC entity configured with Sidelink resource allocation mode 1 may trigger a Scheduling Request if transmission of a pending SL-CSI reporting with the sidelink grant(s) cannot fulfil the latency requirement associated to the SL-CSI reporting.

NOTE 2: Regardless of a carrier that receives an indicator triggering SL-CSI reporting in the SL Carrier Aggregation, it is up to UE implementation to decide which carrier the UE sends SL-CSI reporting MAC CE.

#### 5.22.1.8 Void

#### 5.22.1.9 IUC-Request transmission

The Sidelink Inter-UE Coordination Request transmission procedure is used to trigger a peer UE to transmit Sidelink Inter-UE Coordination Information.

RRC configures *sl-TransmissionStructureForPSCCHandPSSCH* parameter to control the inter-UE coordination request procedure. For a resource pool in a SL BWP where *sl-TransmissionStructureForPSCCHandPSSCH* is configured as *interlaceRB*, the Enhanced Inter-UE coordination Request MAC CE is used. Otherwise, the Inter-UE coordination Request MAC CE is used.

#### 5.22.1.10 IUC-Information Reporting

##### 5.22.1.10.1 General

The Sidelink Inter-UE Coordination Information reporting procedure is used to provide a peer UE with inter-UE coordination information as specified in clause 8.1.4 of TS 38.214 [7]. The Sidelink Inter-UE Coordination Information reporting procedure can be triggered by Sidelink Inter-UE Coordination Request MAC CE or condition (See TS 38.331 [5] and TS 38.214 [7]). Unicast for preferred resource set and non-preferred resource set and Groupcast/Broadcast for non-preferred resource set are supported for inter-UE coordination information transmission triggered by a condition other than explicit request reception. Unicast for preferred resource set and non-preferred resource set is supported for inter-UE coordination information transmission triggered by an explicit request.

RRC also configures *sl-TransmissionStructureForPSCCHandPSSCH* parameter to control the inter-UE coordination Information reporting procedure. For a resource pool in a SL BWP where *sl-TransmissionStructureForPSCCHandPSSCH* is configured as *interlaceRB*, the Enhanced Inter-UE coordination Information MAC CE is used. Otherwise, the Inter-UE coordination Information MAC CE is used.

RRC configures the following parameter to control the SL-IUC Information reporting procedure:

- *sl-LatencyBoundIUC-Report*, which is maintained for each PC5-RRC connection.

The MAC entity maintains an *sl-IUC-ReportTimer* for each pair of the Source Layer-2 ID and the Destination Layer-2 ID corresponding to a PC5-RRC connection. *sl-IUC-ReportTimer* is used for an SL-IUC Information reporting UE to follow the latency requirement signalled from an IUC-Information triggering UE. The value of *sl-IUC-ReportTimer* is the same as the‎ latency requirement of the SL-IUC Information in *sl-LatencyBoundIUC-Report* configured by RRC.

The MAC entity shall for each pair of the Source Layer-2 ID and the Destination Layer-2 ID corresponding to a PC5-RRC connection which has been established by upper layers:

1> if the SL-IUC Information reporting has been triggered by an SL-IUC Request MAC CE (and/or an SCI) and not cancelled:

2> if the *sl-IUC-ReportTimer* for the triggered SL-IUC Information reporting is not running:

3> start the *sl-IUC-ReportTimer*.

2> if the *sl-IUC-ReportTimer* for the triggered SL-IUC Information reporting expires:

3> cancel the triggered SL-IUC Information reporting.

2> else if the MAC entity has SL resources allocated for new transmission and the SL-SCH resources can accommodate the SL-IUC Information MAC CE and its subheader as a result of logical channel prioritization:

3> instruct the Multiplexing and Assembly procedure to generate a Sidelink Inter-UE Coordination Information MAC CE as defined in clause 6.1.3.53;

3> stop the *sl-IUC-ReportTimer* for the triggered SL-IUC Information reporting;

3> cancel the triggered SL-IUC Information reporting.

##### 5.22.1.10.2 Reception of IUC-Information Reporting

Upon the reception of SL-IUC Information MAC CE from another UE, the MAC entity shall:

1> if *sl-InterUE-CoordinationScheme1* enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC:

2> if the SL-IUC Information MAC CE contains a non-preferred resource set and if the UE is configured to use full sensing or partial sensing in the resource pool where the non-preferred resource set is located:

3> indicate the received non-preferred resource set to physical layer.

#### 5.22.1.11 TX carrier (re-)selection

The MAC entity shall consider a CBR of a carrier to be one measured by lower layers according to TS 38.215 [24] if CBR measurement results are available, or the corresponding *sl-defaultTxConfigIndex* configured by upper layers if CBR measurement results are not available.

If the TX carrier (re-)selection is triggered for a Sidelink process according to clause 5.22.1.1, 5.22.1.2 or 5.22.1.3.3, the MAC entity shall:

1> if there is no selected sidelink grant on any carrier allowed for the sidelink logical channel where data is available as indicated by upper layers (TS 38.331 [5] and TS 23.287 [19]):

2> for each carrier configured by upper layers associated with the concerned sidelink logical channel:

3> if the CBR of the carrier is below *sl-threshCBR-FreqReselection* associated with the priority of the sidelink logical channel:

NOTE 1: In the case of multiple resource pools configured on a carrier, which specific resource pool is used to determine the CBR of this carrier is up to UE implementation, taking into account of *sl-HARQ-FeedbackEnabled* for the sidelink logical channel.

4> consider the carrier as a candidate carrier for TX carrier (re-)selection for the concerned sidelink logical channel.

1> else:

2> for each sidelink logical channel, if any, where data is available and that are allowed on the carrier for which Tx carrier (re-)selection is triggered according to clause 5.22.1.1, if the CBR of the carrier is below *sl-threshCBR-FreqKeeping* associated with priority of the sidelink logical channel, for each sidelink logical channel, if any, where data is available and that are allowed on the carrier for which Tx carrier (re-)selection is triggered according to clause 5.22.1.1:

3> select the carrier and the associated pool of resources.

2> else:

3> for each carrier configured by upper layers on which the sidelink logical channel is allowed, if the CBR of the carrier is below *sl-threshCBR-FreqReselection* associated with the priority of the sidelink logical channel:

4> consider the carrier as a candidate carrier for TX carrier (re-)selection, for each carrier configured by upper layers on which the sidelink logical channel is allowed.;

The MAC entity shall:

1> if one or more carriers are considered as the candidate carriers for TX carrier (re-)selection:

2> if Tx carrier (re-)selection is triggered, for each sidelink logical channel allowed on the carrier where data is available:

3> select one or more carrier(s) among the candidate carriers with increasing order of CBR from the lowest CBR, and select the associated pool(s) of resources:

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

5> select one pool of resources configured with PSFCH resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon*, if configured.

4> else:

5> select any pool of resources among the pools of resources except the pool(s) in *sl-BWP-DiscPoolConfig* or *sl-BWP-DiscPoolConfigCommon*, if configured.

NOTE 2: It is left to UE implementation how many carriers to select based on UE capability.

NOTE 3: It is left to UE implementation to determine the sidelink logical channels among the sidelink logical channels where data is available and that are allowed on the carrier for which Tx carrier (re-) selection is triggered.

NOTE 4: It is left to UE implementation to determine whether the resource pool for CBR measurement is reused as the resource pool for SL grant creation.

#### 5.22.1.12 SL-PRS Resource Request

SL-PRS transmission can be triggered either by lower layer signalling from the peer UE or the UE's own upper layers. The SL-PRS Resource Request procedure is used to provide gNB with information about the triggered SL-PRS transmission.

The MAC entity shall, if Sidelink resource allocation scheme 1 for SL-PRS transmission is configured:

1> if aperiodic SL-PRS is triggered:

2> trigger the SL-PRS Resource Request.

1> else if periodic SL-PRS is triggered:

2> notify RRC to send SL-PRS Resource Request.

The MAC entity shall:

1> if SL-PRS Resource Request is triggered and not cancelled:

2> if UL-SCH resources are available for a new transmission and these UL-SCH resources can accommodate the SL-PRS Resource Request MAC CE plus its subheader as a result of logical channel prioritization:

3> instruct the Multiplexing and Assembly entity to generate the SL-PRS Resource Request MAC CE.

2> else:

3> trigger a Scheduling Request for the SL-PRS Resource Request MAC CE as specified in clause 5.4.4.

The SL-PRS Resource Request MAC CE may be cancelled when SL grant can accommodate all the pending SL-PRS transmissions. The SL-PRS Resource Request MAC CE shall be cancelled when a MAC PDU is transmitted and this PDU includes a SL-PRS Resource Request MAC CE that indicates request for all the pending SL-PRS transmission(s) since the last event the MAC CE is triggered.

### 5.22.2 SL-SCH Data and SL-PRS reception

#### 5.22.2.1 SCI reception

SCI indicates if there is a transmission on SL-SCH and provide the relevant HARQ information. SCI can also indicate if there is a SL-PRS transmission. An SCI for SL-SCH transmission with or without corresponding SL-PRS on Shared SL-PRS resource pool consists of two parts: the 1st stage SCI on PSCCH and the 2nd stage SCI on PSSCH as specified in clause 8.1 of TS 38.214 [7]. An SCI for SL-PRS transmission on Dedicated SL-PRS resource pool consists of a single part on PSCCH as specified in TS 38.212 [9].

The MAC entity shall:

1> for each PSCCH duration during which the MAC entity monitors PSCCH:

2> if a 1st stage SCI has been received on the PSCCH:

3> determine the set of PSSCH durations in which reception of a 2nd stage SCI and the transport block occur using the received part of the SCI;

3> if the 2nd stage SCI for this PSSCH duration has been received on the PSSCH:

4> store the SCI as a valid SCI for the PSSCH durations corresponding to transmission(s) of the transport block and SL-PRS, if available and the associated HARQ information and QoS information;

2> else if an SCI has been received on the PSCCH reception on Dedicated SL-PRS resource pool for SL-PRS transmission:

3> determine the SL-PRS transmission occasion corresponding to the SCI;

3> store the SCI as a valid SCI for the SL-PRS transmission and the corresponding SL-PRS transmission information on Dedicated SL-PRS resource pool.1> for each PSSCH duration for which the MAC entity has a valid SCI:

2> deliver the SCI and the associated Sidelink transmission information to the Sidelink HARQ Entity.

1> for each SL-PRS transmission occasion for which MAC entity has a valid SCI:

2> perform SL-PRS reception according to the SL-PRS transmission information within the SCI as in clause 5.22.2.2.2 for SL-PRS received on Shared SL-PRS resource pool and as in clause 5.22.2.4 for SL-PRS received on Dedicated SL-PRS resource pool.

#### 5.22.2.2 Sidelink HARQ operation and SL-PRS reception on Shared SL-PRS resource pool

##### 5.22.2.2.1 Sidelink HARQ Entity

There is at most one Sidelink HARQ Entity at the MAC entity for reception of the SL-SCH, which maintains a number of parallel Sidelink processes.

Each Sidelink process is associated with SCI in which the MAC entity is interested. This interest is determined by the Sidelink identification information of the SCI. The Sidelink HARQ Entity directs Sidelink transmission information and associated TBs received on the SL-SCH to the corresponding Sidelink processes.

The number of Receiving Sidelink processes associated with the Sidelink HARQ Entity is defined in TS 38.306 [5].

For each PSSCH duration, the Sidelink HARQ Entity shall:

1> for each SCI valid for this PSSCH duration:

2> if the NDI has been toggled compared to the value of the previous received transmission corresponding to the Sidelink identification information and the Sidelink process ID of the SCI or this is the very first received transmission for the pair of the Sidelink identification information and the Sidelink process ID of the SCI:

3> if there is a Sidelink process associated with the Sidelink identification information and the Sidelink process ID of the SCI:

4> consider the Sidelink process as unoccupied;

4> flush the soft buffer for the Sidelink process.

3> allocate the TB received from the physical layer and the associated Sidelink identification information and Sidelink process ID to an unoccupied Sidelink process;

3> associate the Sidelink process with the Sidelink identification information and the Sidelink process ID of this SCI and consider this transmission to be a new transmission.

NOTE 1: When a new TB arrives, the Sidelink HARQ Entity allocates the TB to any unoccupied Sidelink process. If there is no unoccupied Sidelink process in the Sidelink HARQ entity, how to manage receiving Sidelink processes is up to UE implementation.

NOTE 1a: If the NDI has not been toggled compared to the value of the previous received transmission corresponding to the Sidelink identification information and the Sidelink process ID of the SCI, and if there is no Sidelink process associated with the Sidelink identification information and the Sidelink process ID of the SCI, it is up to UE implementation to handle the corresponding TB.

1> for each Sidelink process:

2> if the NDI has not been toggled compared to the value of the previous received transmission corresponding to the Sidelink identification information and the Sidelink process ID of the SCI for the Sidelink process according to its associated SCI:

3> allocate the TB received from the physical layer to the Sidelink process and consider this transmission to be a retransmission.

NOTE 2: A single sidelink process can only be (re-)associated to a single combination of Sidelink identification information and Sidelink process ID at a time and a single combination of Sidelink identification information and Sidelink process ID can only be (re-)associated to a single sidelink process at a time.

##### 5.22.2.2.2 Sidelink process

For each PSSCH duration where a transmission takes place for the Sidelink process, one TB and the associated HARQ information is received from the Sidelink HARQ Entity.

For each received TB and SL-PRS, if available and associated Sidelink transmission information, the Sidelink process shall:

1> if this is a new transmission:

2> attempt to decode the received data.

1> else if this is a retransmission:

2> if the data for this TB has not yet been successfully decoded:

3> instruct the physical layer to combine the received data with the data currently in the soft buffer for this TB and attempt to decode the combined data.

1> if the sidelink transmission information in the SCI indicates SL-PRS transmission:

2> if the SL-PRS transmission is associated to unicast:

3> if the DST field of the decoded MAC PDU subheader is equal to the 8 MSB of any of the Source Layer-2 ID(s) of the UE for which the 16 LSB are equal to the Destination ID in the corresponding SCI; and

3> if the SRC field of the decoded MAC PDU subheader is equal to the 16 MSB of any of the Destination Layer-2 ID(s) of the UE for which the 8 LSB are equal to the Source ID in the corresponding SCI:

4> instruct the physical layer to perform SL-PRS reception.

2> else if the SL-PRS tnramission is associated with groupcast or broadcast:

3> if the DST field of the decoded MAC PDU subheader is equal to the 8 MSB of any of the Destination Layer-2 ID(s) of the UE for which the 16 LSB are equal to the Destination ID in the corresponding SCI:

4> instruct the physical layer to perform SL-PRS reception.

1> if the data which the MAC entity attempted to decode was successfully decoded for this TB; or

1> if the data for this TB was successfully decoded before:

2> if this is the first successful decoding of the data for this TB:

3> if this TB is associated to unicast and the DST field of the decoded MAC PDU subheader is equal to the 8 MSB of any of the Source Layer-2 ID(s) of the UE for which the 16 LSB are equal to the Destination ID in the corresponding SCI:

4> if the SRC field of the decoded MAC PDU subheader is equal to the 16 MSB of any of the Destination Layer-2 ID(s) of the UE for which the 8 LSB are equal to the Source ID in the corresponding SCI; or

4> if this TB is corresponding to the logical channel with LCID equal to 0 or 1 and determined to be the first TB:

5> deliver the decoded MAC PDU to the disassembly and demultiplexing entity.

3> if this TB is associated to groupcast or broadcast:

4> if the DST field of the decoded MAC PDU subheader is equal to the 8 MSB of any of the Destination Layer-2 ID(s) of the UE for which the 16 LSB are equal to the Destination ID in the corresponding SCI; or

4> if this TB is corresponding to the logical channel with LCID equal to 58, and the DST field of the decoded MAC PDU subheader is equal to the 8 MSB of any of the Source Layer-2 ID(s) of the UE for which the 16 LSB are equal to the Destination ID in the corresponding SCI:

5> deliver the decoded MAC PDU to the disassembly and demultiplexing entity.

NOTE: Whether the TB is the first TB can be determined based on the Source Layer-2 ID and Destination Layer-2 ID pair.

2> consider the Sidelink process as unoccupied.

1> else:

2> instruct the physical layer to replace the data in the soft buffer for this TB with the data which the MAC entity attempted to decode.

1> if HARQ feedback is enabled by the SCI:

2> if negative-only acknowledgement is indicated by the SCI according to clause 8.4.1 of TS 38.212 [9]:

3> if UE's location information is available and distance beteween UE's location and the central location of the nearest zone that is calculated based on the *Zone\_id* in the SCI and the value of *sl-ZoneLength* corresponding to the communication range requirement in the SCI as specified in TS 38.331 [5] is smaller or equal to the communication range requirement in the SCI; or

3> if none of *Zone\_id* and communication range requirement is indicated by the SCI; or

3> if UE's location information is not available:

4> if the data which the MAC entity attempted to decode was not successfully decoded for this TB and the data for this TB was not successfully decoded before:

5> instruct the physical layer to generate a negative acknowledgement of the data in this TB.

2> if negative-positive acknowledgement or unicast is indicated by the SCI according to clause 8.4.1 of TS 38.212 [9]:

3> if the data which the MAC entity attempted to decode was successfully decoded for this TB or the data for this TB was successfully decoded before:

4> instruct the physical layer to generate a positive acknowledgement of the data in this TB.

3> else:

4> instruct the physical layer to generate a negative acknowledgement of the data in this TB.

#### 5.22.2.3 Disassembly and demultiplexing

The MAC entity shall disassemble and demultiplex a MAC PDU as defined in clause 6.1.6.

#### 5.22.2.4 SL-PRS reception on Dedicated SL-PRS resource pool

For each SL-PRS transmission occasion on Dedicated SL-PRS resource pool, the MAC entity shall:

1> if this SL-PRS transmission is associated to unicast:

2> if the destination ID in the corresponding SCI is equal to the UE's source ID; and if the field *sl-SRC-ID-LenDedicatedSL-PRS-RP* is configured with the value of *12bit*:

3> if source ID in the corresponding SCI is equal to the 12 LSB of the UE's destination layer-2 ID:

4> instruct the physical layer to perform SL-PRS reception on the SL-PRS transmission occasion.

2> else if the destination ID in the corresponding SCI is equal to the UE's source ID, and if the field *sl-SRC-ID-LenDedicatedSL-PRS-RP* is configured with the value of *24bit*:

3> if source ID in the corresponding SCI is equal to the UE's destination layer-2 ID:

4> instruct the physical layer to perform SL-PRS reception on the SL-PRS transmission occasion.

1> else if this SL-PRS transmission is associated to broadcast or groupcast:

2> if the destination ID in the corresponding SCI is equal to the UE's destination layer-2 ID

3> instruct the physical layer to perform SL-PRS reception on the SL-PRS transmission occasion.

## 5.28 Sidelink Discontinuous Reception (DRX)

### 5.28.1 General

The MAC entity may be configured by RRC with an SL DRX functionality that controls the UE's SCI (i.e., 1st stage SCI and 2nd stage SCI) monitoring activity for unicast, 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.

Sidelink DRX and UE procedure on Dedicated SL-PRS resource pool are not applied at the same time.

RRC controls Sidelink DRX operation by configuring the following parameters:

- *sl-drx-onDurationTimer*/*sl-DRX-GC-BC-OnDurationTimer*: the duration at the beginning of an SL DRX cycle;

- *sl-drx-SlotOffset*: the delay before starting the *sl-drx-onDurationTimer*/*sl-DRX-GC-BC-OnDurationTimer*;

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

- *sl-drx-RetransmissionTimer*/*sl-DRX-GC-RetransmissionTimer* (per Sidelink process except for the SL broadcast process): the maximum duration until an SL retransmission is received;

- *sl-drx-StartOffset*: the slot where the SL DRX cycle starts;

- *sl-drx-Cycle*/*sl-DRX-GC-BC-Cycle*: the Sidelink DRX cycle;

- *sl-drx-HARQ-RTT-Timer*/*sl-DRX-GC-HARQ-RTT-Timer* (per Sidelink process except for the SL broadcast process): the minimum duration before an SL HARQ retransmission is expected by the MAC entity.

### 5.28.2 Behaviour of UE receiving SL-SCH Data

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

- *sl-drx-onDurationTimer*/*sl-DRX-GC-BC-OnDurationTimer* or *sl-drx-InactivityTimer*/*sl-DRX-GC-InactivityTimer* is running; or

- *sl-drx-RetransmissionTimer*/*sl-DRX-GC-RetransmissionTimer* 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 transmission of the request of SL-CSI reporting and the reception of the SL-CSI reporting MAC CE in case SL-CSI reporting MAC CE is received; or

- Slot(s) associated with the announced periodic transmission(s) by the UE transmitting SL-SCH Data; or

- the time between transmission/reception of Direct Link Establishment Request message (TS 24.587 [28]) or ProSe Direct Link Establishment Request message (TS 24.554 [29]) and reception of *RRCReconfigurationSidelink* message including initial DRX configuration or the link establishment procedure being aborted by upper layer; or

- the time between transmission of *RRCReconfigurationSidelink* message including initial DRX configuration and reception of corresponding *RRCReconfigurationCompleteSidelink* or *RRCReconfigurationFailureSidelink* message.

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

1> if a single *sl-DRX-GC-BC-Cycle* that is mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* or a single *sl-DRX-GC-BC-Cycle* that is configured in *sl-DefaultDRX-GC-BC* andcannot be mapped with any *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* is associated to a Destination and the associated cast type is groupcast or broadcast:

2> select the *sl-DRX-GC-BC-Cycle* that is mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* or the *sl-DRX-GC-BC-Cycle* configured in *sl-DefaultDRX-GC-BC* associated with the Destination.

1> else if multiple *sl-DRX-GC-BC-Cycle* that include one or multiple *sl-DRX-GC-BC-Cycle* that are mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* and, if applicable, one *sl-DRX-GC-BC-Cycle* that is configured in *sl-DefaultDRX-GC-BC* andcannot be mapped with any *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* are associated to a Destination Layer-2 ID and the associated cast type groupcast or broadcast:

2> select the *sl-DRX-GC-BC-Cycle* whose length is the shortest one among multiple *sl-DRX-GC-BC-Cycle* that are mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* and *sl-DRX-GC-BC-Cycle* configured in *sl-DefaultDRX-GC-BC* associated with the Destination Layer-2 ID.

1> if a single *sl-DRX-GC-BC-OnDurationTimer* that is mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* or a single *sl-DRX-GC-BC-OnDurationTimer* that is configured in *sl-DefaultDRX-GC-BC* andcannot be mapped with any *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* is associated to a Destination and the associated cast type is groupcast or broadcast:

2> select the *sl-DRX-GC-BC-OnDurationTimer* that is mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* or the *sl-DRX-GC-BC-OnDurationTimer* configured in *sl-DefaultDRX-GC-BC* associated with the Destination.

1> else if multiple *sl-DRX-GC-BC-OnDurationTimer* that include one or multiple *sl-DRX-GC-BC-OnDurationTimer* that are mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* and, if applicable, one *sl-DRX-GC-BC-OnDurationTimer* that is configured in *sl-DefaultDRX-GC-BC* andcannot be mapped with any *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* are associated to a Destination Layer-2 ID and the associated cast type is groupcast or broadcast:

2> select the *sl-DRX-GC-BC-OnDurationTimer* whose length is the longest one among multiple *sl-DRX-GC-BC-OnDurationTimer* that are mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* and *sl-DRX-GC-BC-Cycle* configured in *sl-DefaultDRX-GC-BC* associated with the Destination Layer-2 ID.

1> if a single *sl-DRX-GC-InactivityTimer* that is mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* or a single *sl-DRX-GC-InactivityTimer* that is configured in *sl-DefaultDRX-GC-BC* andcannot be mapped with any *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* is associated to a Destination and the associated cast type is groupcast:

2> select the *sl-DRX-GC-InactivityTimer* that is mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* or the *sl-DRX-GC-InactivityTimer* configured in *sl-DefaultDRX-GC-BC* associated with the Destination:

1> else if multiple *sl-DRX-GC-InactivityTimer* that include one or multiple *sl-DRX-GC-InactivityTimer* that are mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* and, if applicable, one *sl-DRX-GC-InactivityTimer* that is configured in *sl-DefaultDRX-GC-BC* andcannot be mapped with any *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* of a Destination Layer-2 ID and the associated cast type is groupcast:

2> select *sl-DRX-GC-InactivityTimer* whose length is the longest one among multiple *sl-DRX-GC-InactivityTimer* that are mapped with one or multiple *SL-QoS-Profile* in *sl-DRX-GC-BC-PerQoS-List* and *sl-DRX-GC-InactivityTimer* configured in *sl-DefaultDRX-GC-BC* associated with the Destination Layer-2 ID.

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

2> if the data of the corresponding Sidelink process was not successfully decoded or if the HARQ feedback (i.e., negative acknowledgement) is not transmitted for unicast due to UL/SL prioritization:

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

When the cast type is groupcast or broadcast as indicated by upper layer, or the cast type is unicast for the reception of Direct Link Establishment Request message [28] or ProSe Direct Link Establishment Request message [29] as indicated by upper layer, or for the reception of discovery message [26], the *sl-drx-StartOffset* and *sl-drx-SlotOffset* are derived from the following equations:

*sl-drx-StartOffset* (ms) = Destination Layer-2 ID modulo *sl-DRX-GC-BC-Cycle* (ms).

*sl-drx-SlotOffset* (ms) = (Destination Layer-2 ID modulo the number of slots in one subframe)
/ (the number of slots in one subframe) (ms).

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

2> start *sl-drx-onDurationTimer*/*sl-DRX-GC-BC-OnDurationTimer* after *sl-drx-SlotOffset* from the beginning of the subframe.

1> if an SL DRX is in Active Time:

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

2> if the SCI indicates a new SL transmission:

3> if Source Layer-1 ID of the SCI is equal to the 8 LSB of the intended Destination Layer-2 ID and Destination Layer-1 ID of the SCI is equal to the 16 LSB of the intended Source Layer-2 ID and the cast type indicator in the SCI is set to unicast:

4> start or restart *sl-drx-InactivityTimer* for the corresponding Source Layer-2 ID and Destination Layer-2 ID pair in the first slot after SCI reception.

3> if Destination Layer-1 ID of the SCI (i.e., 2nd stage SCI) is equal to the 16 LSB of the intended Destination Layer-2 ID and the cast type indicator in the SCI is set to groupcast:

4> start or restart *sl-DRX-GC-InactivityTimer* for the corresponding Destination Layer-2 ID in the first slot after SCI reception.

2> if the SCI indicates an SL transmission:

3> if a next retransmission opportunity is indicated in the SCI:

4> derive the *sl-drx-HARQ-RTT-Timer* from the retransmission resource timing of the next retransmission resource in the SCI.

3> else if PSFCH resource is configured for the SL grant associated to the SCI:

4> set the *sl-drx-HARQ-RTT-Timer* based on *sl-drx-HARQ-RTT-Timer1* configured by upper layer if the cast type associated with the SCI is unicast or *sl-DRX-GC-HARQ-RTT-Timer1* configured by upper layerif the cast type associated with the SCI is groupcast when HARQ feedback is enabled, or based on *sl-drx-HARQ-RTT-Timer2* configured by upper layer if the cast type associated with the SCI is unicast or *sl-DRX-GC-HARQ-RTT-Timer2* configured by upper layerif the cast type associated with the SCI is groupcast when HARQ feedback is disabled, for resource pool configured with PSFCH.

3> else (i.e., if PSFCH resource is not configured for the SL grant associated to the SCI):

4> set the *sl-drx-HARQ-RTT-Timer* as 0 slots.

3> if PSFCH resource is not configured for the SL grant associated to the SCI:

4> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the slot following the end of PSSCH transmission (i.e., currently received PSSCH).

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

4> if HARQ feedback is enabled by the SCI and the cast type associated with the SCI is unicast:

5> if *numPSFCHOccasions* is configured as specified in TS 38.331 [5]:

6> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the first slot after the end of corresponding PSFCH transmission carrying the SL HARQ Feedback when the SL HARQ feedback is successfully transmitted in one of PSFCH occasions from *numPSFCHOccasions*; or

6> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the first slot after the end of the last PSFCH occasion for the SL HARQ Feedback when the SL HARQ feedback is not transmitted in all PSFCH occasions from *numPSFCHOccasions*.

5> else:

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

6> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the first slot after the end of the corresponding PSFCH resource for the SL HARQ feedback when the SL HARQ feedback is not transmitted due to UL/SL prioritization or SL LBT failure.

4> if HARQ feedback is enabled by the SCI and the cast type associated with the SCI is groupcast and positive-negative acknowledgement is selected:

5> if *numPSFCHOccasions* is configured as specified in TS 38.331 [5]:

6> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the first slot after the end of the last PSFCH occasion for the SL HARQ Feedback.

5> else:

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

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

4> if HARQ feedback is enabled by the SCI and the cast type associated with the SCI is groupcast and 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 PSFCH transmission carrying the SL 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 PSFCH resource for the SL HARQ feedback when the SL HARQ feedback is not transmitted due to UL/SL prioritization; or

5> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the first slot after the end of the corresponding PSFCH resource for the SL HARQ feedback when the SL HARQ feedback is a positive acknowledgement.

4> if HARQ feedback is disabled by the SCI and the resource(s) for one or more retransmission opportunities is not scheduled in the SCI:

5> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the slot following the end of PSFCH resource.

4> if HARQ feedback is disabled by the SCI and the resource(s) for one or more retransmission opportunities is scheduled in the SCI:

5> start the *sl-drx-HARQ-RTT-Timer* for the corresponding Sidelink process in the slot following the end of PSSCH transmission (i.e., currently received PSSCH).

NOTE: Void.

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

1> if an SL DRX Command MAC CE is received for the Source Layer-2 ID and Destination Layer-2 ID pair of a unicast:

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

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

### 5.28.3 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 5.28.2.

Furthermore, the UE transmitting SL-SCH Data determines the SL DRX Active time based on SL DRX timers that are running (e.g., *sl-drx-onDurationTimer*/*sl-DRX-GC-BC-OnDurationTimer*, *sl-drx-InactivityTimer*/*sl-DRX-GC-InactivityTimer*, *sl-drx-RetransmissionTimer*/*sl-DRX-GC-RetransmissionTimer*) or will be running in the future (e.g., *sl-drx-onDurationTimer*/*sl-DRX-GC-BC-OnDurationTimer*, *sl-drx-InactivityTimer*/*sl-DRX-GC-InactivityTimer*, *sl-drx-RetransmissionTimer*/*sl-DRX-GC-RetransmissionTimer*) at the UE(s) receiving SL-SCH data. The UE may select resource for the initial transmission of groupcast within the time when *sl-DRX-GC-BC-OnDurationTimer* or *sl-DRX-GC-InactivityTimer* of the destination is running.

NOTE 1: A UE may assume that a resource for retransmission is in the Active time if an initial transmission causes the *sl-drx-RetransmissionTimer*/*sl-DRX-GC-RetransmissionTimer* to be started at the receiving UE.

NOTE 2: A UE may send SL DRX Command MAC CE to receiving UE for unicast and when to send SL DRX Command MAC CE is up to UE implementation.

The MAC entity shall for each Destination Layer-2 ID associated with groupcast that is interested in NR sidelink transmision:

1> if the SCI indicates a new transmission where the cast type is set to groupcast is transmitted:

2> start or restart *sl-DRX-GC-InactivityTimer* for the corresponding Destination Layer-2 ID in the first slot after SCI transmission.

The MAC entity shall for each pair of the Source Layer-2 ID and the Destination Layer-2 ID corresponding to each PC5-RRC connection which has been established by upper layers:

1> if the SL DRX Command indication has been triggered by the UE:

2> if the MAC entity has SL resources allocated for new transmission and the SL-SCH resources can accommodate the SL DRX Command MAC CE and its subheader as a result of logical channel prioritization:

3> instruct the Multiplexing and Assembly procedure to generate a Sidelink DRX Command MAC CE as defined in clause 6.1.3.52;

3> cancel the triggered SL DRX Command indication.

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

3> trigger a Scheduling Request.

====================================NEXT CHANGE====================================

#### 6.1.3.74 SL-PRS Resource Request MAC CE

The SL-PRS Resource Request MAC CE is identified by a MAC subheader with eLCID as specified in Table 6.2.1-1b. It has the following fields:

- Destination index: The Destination Index field identifies the destination. The length of this field is 5 bits. The value is set to one index corresponding to SL destination identity associated to same destination reported in *sl-PosTxResourceReqList* if present. The value is indexed sequentially from 0 in the same ascending order of SL destination identity in *sl-PosTxResourceReqList* as specified in TS 38.331 [5]. When multiple lists are reported, the value is indexed sequentially across all the lists in the same order as presented in *SidelinkUEInformaitonNR* message;

- SL-PRS priority: Priority of pending SL-PRS transmission. The length of this field is 3 bits;

- SL-PRS Bandwidth: Requested minimum bandwidth of pending SL-PRS transmission. The length of this field is 5 bits. Encoding of this field is the same as *sl-PRS-Bandwidth* in IE *SL-PRS-QoS-Info* as specified in TS 38.331 [5] that codepoint value 0 corresponds to the value "mhz5" of the field *sl-PRS-Bandwidth*, codepoint value 1 corresponds to the value "mhz10" of the field *sl-PRS-Bandwidth*, and so on;

- R: Reserved bit, set to 0.



Figure 6.1.3.74-1: SL-PRS Resource Request MAC control element

#### 6.1.3.XX Aggregated SP Positioning SRS Activation/Deactivation MAC CE

The SP Aggregated Positioning SRS Activation/Deactivation MAC CE is identified by a MAC subheader with eLCID as specified in Table 6.2.1-1b. It has a variable size with following fields:

- Positioning SRS Aggregation ID: This field indicates one of the combinations of linked *srs-PosResourceSet* corresponding to *SRS-PosResourceSetAggBWCombinationList* or *SRS-PosRRC-AggBW-InactiveConfigList* specified in TS 38.331 [5]. Value 0 corresponds to the first entry within the list *SRS-PosResourceSetAggBWCombinationList* or *SRS-PosRRC-AggBW-InactiveConfigList*; value 1 corresponds to the second entry within the list *SRS-PosResourceSetAggBWCombinationList* or *SRS-PosRRC-AggBW-InactiveConfigList* and so on;

- C1, C2, C3: These fields indicate the activation/deactivation status of each *srs-PosResourceSet* that is linked for SRS for positioning bandwidth aggregation configured in *SRS-PosResourceSetAggBWCombinationList* or *SRS-PosRRC-AggBW-InactiveConfigList* specified in TS 38.331 [5]. C1 corresponds to the first entry in *SRS-PosResourceSetAggBWCombinationList* or *SRS-PosRRC-AggBW-InactiveConfigList*, C2 corresponds to the second one and so on.The Ci field is set to 1 to indicate that the *srs-PosResourceSet* corresponding to Ci shall be activated. The Ci field is set to 0 to indicate that the *srs-PosResourceSet* corresponding to Ci shall be de-activated;

- S: This field indicates whether the fields Spatial Relation for Resource IDi are present. If the field is set to 1, the fields Spatial Relation for Resource IDi are present; otherwise, they are absent;

- Spatial Relation for Resource IDi: The field Spatial Relation for Resource IDi is only present if MAC CE is used for activation, i.e. at least one of the C1, C2, and C3 is set to 1. There can be as many as 16 entries of Spatial Relation for Resource IDi depending on the RRC configuration. There are 4 types of Spatial Relation for Resource IDi, which is indicated by the F (F0 and F1) field within, defined as in Figure 6.1.3.36-2 to 6.1.3.36-5 in clause 6.1.3.36. Spatial Relation for Resource ID1 corresponds to the spatial relation of the first set of aggregated SRS resources corresponding to the indicated Positioning SRS aggregation ID*[ffs what is the first aggregated SRS resource]*;

- C: This field indicates whether the octets containing Resource Serving Cell ID field(s) and Resource BWP ID field(s) within the field Spatial Relation for Resource ID i are present, except for Spatial Relation Resource IDi with DL-PRS or SSB. If the combination of the liked SRS resource sets is configured by the field *SRS-PosResourceSetAggBWCombinationList* and this field is set to 1, the octets containing Resource Serving Cell ID field(s) and Resource BWP ID field(s) in the field Spatial Relation for Resource IDi are present, otherwise if this field is set to 0, they are not present; if the combination of the liked SRS resource sets is configured by the field *SRS-PosRRC-AggBW-InactiveConfigList*, this field shall be set to 0 and the octets containing Resource Serving Cell ID field(s) and Resource BWP ID field(s) in the field Spatial Relation for Resource IDi are not present;

- R: Reserved bit, set to 0.



Figure 6.1.3.XX-1: Aggregated SP Positioning SRS Activation/Deactivation MAC CE

=====================================NEXT CHANGE===================================

### 6.2.1 MAC subheader for DL-SCH and UL-SCH

The MAC subheader consists of the following fields:

- LCID: The Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE or padding as described in Tables 6.2.1-1 and 6.2.1-1c for the DL-SCH and Tables 6.2.1-2 and 6.2.1-2c for the UL-SCH. There is one LCID field per MAC subheader. The size of the LCID field is 6 bits. If the LCID field is set to 34 as in Table 6.2.1-1 or 6.2.1-2, one additional octet is present in the MAC subheader containing the eLCID field and follow the octet containing LCID field. If the LCID field is set to 33 as in Table 6.2.1-1 or 6.2.1-2, two additional octets are present in the MAC subheader containing the eLCID field and these two additional octets follow the octet containing LCID field;

NOTE 1: For MBS broadcast, a logical channel is identified based on G-RNTI and LCID if the same LCID is allocated for logical channels corresponding to different G-RNTIs.

- eLCID: The extended Logical Channel ID field identifies the logical channel instance of the corresponding MAC SDU or the type of the corresponding MAC CE as described in tables 6.2.1-1a, 6.2.1-1b, 6.2.1-2a and 6.2.1-2b for the DL-SCH and UL-SCH respectively. The size of the eLCID field is either 8 bits or 16 bits.

NOTE 2: The extended Logical Channel ID space using two-octet eLCID and the relevant MAC subheader format is used, only when configured, on the NR backhaul links between IAB nodes or between IAB node and IAB Donor, or for multicast MTCHs.

- L: The Length field indicates the length of the corresponding MAC SDU or variable-sized MAC CE in bytes. There is one L field per MAC subheader except for subheaders corresponding to fixed-sized MAC CEs, padding, and MAC SDUs containing UL CCCH. 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 subheaders corresponding to fixed-sized MAC CEs, padding, and MAC SDUs containing UL CCCH. 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;

- LX: The LCID extension field indicates the use of extended LCID space. The size of the LX field is 1 bit. The LX field set to 1 indicates the use of Table 6.2.1-2c, otherwise R bit is present instead (i.e. set to 0);

- R: Reserved bit, set to 0.

The MAC subheader is octet aligned.

Table 6.2.1-1: Values of LCID for DL-SCH

|  |  |
| --- | --- |
| Codepoint/Index | LCID values |
| 0 | CCCH |
| 1–32 | Identity of the logical channel of DCCH, DTCH and multicast MTCH |
| 33 | Extended logical channel ID field (two-octet eLCID field) |
| 34 | Extended logical channel ID field (one-octet eLCID field) |
| 35–46 | Reserved |
| 47 | Recommended bit rate |
| 48 | SP ZP CSI-RS Resource Set Activation/Deactivation |
| 49 | PUCCH spatial relation Activation/Deactivation |
| 50 | SP SRS Activation/Deactivation  |
| 51 | SP CSI reporting on PUCCH Activation/Deactivation |
| 52 | TCI State Indication for UE-specific PDCCH |
| 53 | TCI States Activation/Deactivation for UE-specific PDSCH |
| 54 | Aperiodic CSI Trigger State Subselection |
| 55 | SP CSI-RS/CSI-IM Resource Set Activation/Deactivation |
| 56 | Duplication Activation/Deactivation |
| 57 | SCell Activation/Deactivation (four octets) |
| 58 | SCell Activation/Deactivation (one octet) |
| 59 | Long DRX Command |
| 60 | DRX Command |
| 61 | Timing Advance Command |
| 62 | UE Contention Resolution Identity |
| 63 | Padding |

Table 6.2.1-1a: Values of two-octet eLCID for DL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to (216 – 1) | 320 to (216 + 319) | Identity of the logical channel |

Table 6.2.1-1b: Values of one-octet eLCID for DL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to 216 | 64 to 280 | Reserved |
| XX | YY | Aggregated SP Positioning SRS Activation/Deactivation MAC CE |
| 217 | 281 | Enhanced SP CSI reporting on PUCCH Activation/Deactivation MAC CE |
| 218 | 282 | Cross-RRH TCI State Indication for UE-specific PDCCH MAC CE |
| 219 | 283 | LTM Cell Switch Command MAC CE |
| 220 | 284 | Candidate Cell TCI States Activation/Deactivation MAC CE |
| 221 | 285 | PSI-Based SDU Discard Activation/Deactivation MAC CE |
| 222 | 286 | Enhanced Unified TCI state Activation/Deactivation MAC CE for Joint TCI States |
| 223 | 287 | Enhanced Unified TCI state Activation/Deactivation MAC CE for Separate TCI States |
| 224 | 288 | NCR Access Link Beam Indication MAC CE |
| 225 | 289 | NCR Downlink Backhaul Link Beam Indication MAC CE |
| 226 | 290 | NCR Uplink Backhaul Link Beam Indication MAC CE |
| 227 | 291 | Serving Cell Set based SRS TCI State Indication MAC CE |
| 228 | 292 | SP/AP SRS TCI State Indication MAC CE |
| 229 | 293 | BFD-RS Indication MAC CE |
| 230 | 294 | Differential Koffset |
| 231 | 295 | Enhanced SCell Activation/Deactivation MAC CE with one octet Ci field |
| 232 | 296 | Enhanced SCell Activation/Deactivation MAC CE with four octet Ci field  |
| 233 | 297 | Unified TCI States Activation/Deactivation MAC CE |
| 234 | 298 | PUCCH Power Control Set Update for multiple TRP PUCCH repetition MAC CE |
| 235 | 299 | PUCCH spatial relation Activation/Deactivation for multiple TRP PUCCH repetition MAC CE |
| 236 | 300 | Enhanced TCI States Indication for UE-specific PDCCH |
| 237 | 301 | Positioning Measurement Gap Activation/Deactivation Command |
| 238 | 302 | PPW Activation/Deactivation Command |
| 239 | 303 | DL Tx Power Adjustment |
| 240 | 304 | Timing Case Indication |
| 241 | 305 | Child IAB-DU Restricted Beam Indication |
| 242 | 306 | Case-7 Timing advance offset |
| 243 | 307 | Provided Guard Symbols for Case-6 timing |
| 244 | 308 | Provided Guard Symbols for Case-7 timing |
| 245 | 309 | Serving Cell Set based SRS Spatial Relation Indication |
| 246 | 310 | PUSCH Pathloss Reference RS Update |
| 247 | 311 | SRS Pathloss Reference RS Update |
| 248 | 312 | Enhanced SP/AP SRS Spatial Relation Indication |
| 249 | 313 | Enhanced PUCCH Spatial Relation Activation/Deactivation |
| 250 | 314 | Enhanced TCI States Activation/Deactivation for UE-specific PDSCH |
| 251 | 315 | Duplication RLC Activation/Deactivation |
| 252 | 316 | Absolute Timing Advance Command |
| 253 | 317 | SP Positioning SRS Activation/Deactivation |
| 254 | 318 | Provided Guard Symbols |
| 255 | 319 | Timing Delta |

Table 6.2.1-1c: Values of LCID for MBS multicast MCCH and MBS broadcast on DL-SCH

|  |  |
| --- | --- |
| Codepoint/Index | LCID values |
| 0 | Broadcast MCCH or multicast MCCH |
| 1–32 | Identity of the logical channel of broadcast MTCH |
| 33–63 | Reserved |

Table 6.2.1-2: Values of LCID for UL-SCH when the LX field is not present or is set to 0

|  |  |
| --- | --- |
| Codepoint/Index | LCID values |
| 0 | CCCH of size 64 bits, except for an (e)RedCap UE |
| 1–32 | Identity of the logical channel of DCCH and DTCH |
| 33 | Extended logical channel ID field (two-octet eLCID field) |
| 34 | Extended logical channel ID field (one-octet eLCID field) |
| 35 | CCCH of size 48 bits for a RedCap UE  |
| 36 | CCCH of size 64 bits for a RedCap UE |
| 37–42 | Reserved |
| 43 | Truncated Enhanced BFR (one octet Ci) |
| 44 | Timing Advance Report |
| 45 | Truncated Sidelink BSR |
| 46 | Sidelink BSR |
| 47 | Reserved |
| 48 | LBT failure (four octets) |
| 49 | LBT failure (one octet) |
| 50 | BFR (one octet Ci) |
| 51 | Truncated BFR (one octet Ci) |
| 52 | CCCH of size 48 bits, except for an (e)RedCap UE |
| 53 | Recommended bit rate query |
| 54 | Multiple Entry PHR (four octets Ci) |
| 55 | Configured Grant Confirmation |
| 56 | Multiple Entry PHR (one octet Ci) |
| 57 | Single Entry PHR |
| 58 | C-RNTI |
| 59 | Short Truncated BSR |
| 60 | Long Truncated BSR |
| 61 | Short BSR |
| 62 | Long BSR |
| 63 | Padding |
| NOTE: CCCH of size 48 bits and CCCH of size 64 bits are referred to as CCCH and CCCH1, respectively, in TS 38.331 [5]. |

Table 6.2.1-2a: Values of two-octet eLCID for UL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to (216 – 1) | 320 to (216 + 319) | Identity of the logical channel |

Table 6.2.1-2b: Values of one-octet eLCID for UL-SCH

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 to 218 | 64 to 282 | Reserved |
| 219 | 283 | Enhanced Multiple Entry PHR for multiple TRP STx2P (four octets Ci) |
| 220 | 284 | Enhanced Multiple Entry PHR for multiple TRP STx2P (one octets Ci) |
| 221 | 285 | Enhanced Single Entry PHR for multiple TRP STx2P |
| 222 | 286 | SL LBT Failure |
| 223 | 287 | Multiple Entry PHR with assumed PUSCH MAC CE (four octets Ci) |
| 224 | 288 | Multiple Entry PHR with assumed PUSCH MAC CE (one octets Ci) |
| 225 | 289 | Single Entry PHR with assumed PUSCH MAC CE |
| 226 | 290 | SL-PRS Resource Request |
| 227 | 291 | Refined Long BSR |
| 228 | 292 | Delay Status Report |
| 229 | 293 | Enhanced Multiple Entry PHR for multiple TRP (four octets Ci) |
| 230 | 294 | Enhanced Multiple Entry PHR for multiple TRP (one octets Ci) |
| 231 | 295 | Enhanced Single Entry PHR for multiple TRP |
| 232 | 296 | Enhanced Multiple Entry PHR (four octets Ci) |
| 233 | 297 | Enhanced Multiple Entry PHR (one octets Ci) |
| 234 | 298 | Enhanced Single Entry PHR |
| 235 | 299 | Enhanced BFR (one octet Ci) |
| 236 | 300 | Enhanced BFR (four octet Ci) |
| 237 | 301 | Truncated Enhanced BFR (four octet Ci) |
| 238 | 302 | Positioning Measurement Gap Activation/Deactivation Request |
| 239 | 303 | IAB-MT Recommended Beam Indication |
| 240 | 304 | Desired IAB-MT PSD range |
| 241 | 305 | Desired DL Tx Power Adjustment |
| 242 | 306 | Case-6 Timing Request |
| 243 | 307 | Desired Guard Symbols for Case 6 timing |
| 244 | 308 | Desired Guard Symbols for Case 7 timing |
| 245 | 309 | Extended Short Truncated BSR |
| 246 | 310 | Extended Long Truncated BSR |
| 247 | 311 | Extended Short BSR |
| 248 | 312 | Extended Long BSR |
| 249 | 313 | Extended Pre-emptive BSR |
| 250 | 314 | BFR (four octets Ci) |
| 251 | 315 | Truncated BFR (four octets Ci) |
| 252 | 316 | Multiple Entry Configured Grant Confirmation |
| 253 | 317 | Sidelink Configured Grant Confirmation |
| 254 | 318 | Desired Guard Symbols |
| 255 | 319 | Pre-emptive BSR |

Table 6.2.1-2c: Values of LCID for UL-SCH when the LX field is set to 1

|  |  |  |
| --- | --- | --- |
| Codepoint | Index | LCID values |
| 0 | (216 + 320) | CCCH of size 48 bits for an eRedCap UE  |
| 1 | (216 + 321) | CCCH of size 64 bits for an eRedCap UE |
| 2 | (216 + 322) | CCCH of size 48 bits for PUCCH repetition of Msg4 HARQ-ACK, except for an (e)RedCap UE |
| 3 | (216 + 323) | CCCH of size 64 bits for PUCCH repetition of Msg4 HARQ-ACK, except for an (e)RedCap UE |
| 4 | (216 + 324) | CCCH of size 48 bits for PUCCH repetition of Msg4 HARQ-ACK of a RedCap UE |
| 5 | (216 + 325) | CCCH of size 64 bits for PUCCH repetition of Msg4 HARQ-ACK of a RedCap UE |
| 6 | (216 + 326) | CCCH of size 48 bits for PUCCH repetition of Msg4 HARQ-ACK of an eRedCap UE |
| 7 | (216 + 327) | CCCH of size 64 bits for PUCCH repetition of Msg4 HARQ-ACK of an eRedCap UE |
| 8 to 63 | (216 + 328) to (216 + 383) | Reserved |
| NOTE 1: The MAC entity may use the code point corresponding to a given feature or feature combination in Table 6.2.1-2c only if network indicates support for the corresponding feature or feature combination.NOTE 2: CCCH of size 48 bits and CCCH of size 64 bits are referred to as CCCH and CCCH1, respectively, in TS 38.331 [5].NOTE 3: For UE capable of PUCCH repetition of Msg4 HARQ-ACK, the MAC entity uses the code points corresponding to PUCCH repetition of Msg4 HARQ-ACK if *numberOfMsg4-RepetitionsList* is configured, and if *rsrp-ThresholdMsg4* is configured, the RSRP of the downlink pathloss reference is less than *rsrp-ThresholdMsg4.* |

====================================END OF CHANGES==================================