**3GPP TSG-RAN2 Meeting #123 R2-230**

**Toulouse, France , 21st -25th August, 2023**

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| *CR-Form-v12.2* |
| **CHANGE REQUEST** |
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|  | **38.321** | **CR** | DraftCR | **rev** | **-** | **Current version:** | 17.5.0 |  |
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| *For* [***HELP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:***  |  Draft running MAC CR for the introduction of Sidelink Positioning |
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| ***Source to WG:*** | Huawei, HiSilicon |
| ***Source to TSG:*** | RAN2 |
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| ***Work item code:*** | NR\_pos\_enh2 |  | ***Date:*** | 2023-08-21 |
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| ***Category:*** | **B** |  | ***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)* |
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| ***Reason for change:*** | * **Issue1:** The following agreement has been made in RAN1 on the triggering of resource selection in Scheme2.
	+ Hence, there are two triggers for SL-PRS resource selection in scheme2 applicable for both shared and dedicated resource pool: (a) triggering from the UE’s own higher layers; (b) triggering from another UE by lower layer signaling

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| **Agreement**In Scheme 2, with regards to the triggering of SL-PRS, support one or both of the following options: * Option 1: Support SL-PRS triggering at the physical layer by the UE’s own higher layers.
	+ Note: this also includes higher layer triggering from another UE
* Option 2: Support UE-A to request UE-B to transmit SL-PRS via lower layer signaling sent by UE-A.
	+ FFS: Whether lower-layer signaling is SCI or SL MAC-CE

**Agreement**In Scheme 2, with regards to the triggering of SL-PRS, confirm the related WA for shared and dedicated resource pools.* With regards to the lower-layer signalling, support SCI associated with SL-PRS transmission
	+ FFS: whether this is enabled by (pre)configuration

FFS: to support also SL-PRS**R1#113****Agreement**In Scheme 2, with regards to the triggering of SL-PRS, confirm the related WA for shared and dedicated resource pools.* With regards to the lower-layer signalling, support SCI associated with SL-PRS transmission
	+ FFS: whether this is enabled by (pre)configuration

FFS: to support also SL-PRS |

* **Issue2:** The following agreement has been achieved for SL-PRS in shared RP. There might be impacts to MAC spec in two aspecs
	+ For Scheme1 scheduling, for the current MAC procedure, there is always data when a SCI is received. While for SL-PRS transmission in shared RP, it is possible that data is not transmitted while only SL-PRS is transmitted.
	+ For Scheme2 scheduling, for the current MAC spec, the resource selection is triggered by availability of data for transmission. While this no longer holds for SL-PRS transmission in shared RP without data

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| **Agreement**In a shared resource pool, SL-PRS, associated PSCCH and PSSCH scheduled by the PSCCH are included in the same slot:* The PSSCH is used for 2nd SCI and SL-SCH
	+ Note: the UE may not have data available for transmission. Up to RAN2 how to define the specification support for this case.
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* **Issue3:** for RA scheme 2 in dedicated resource pool, the following has been agreed in the RAN1#113 meeting.
	+ Priority
	+ Hence, based on this agreement, the reservation periodicity should be selected by the upper layer from the set of (pre-)configured set of values
	+ Also, as indicated in the agreement, re-evaluation and pre-emption for SL-PRS using R16 mechanism is supported as a starting point.

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| **Agreement**For Scheme 2, in a dedicated resource pool, * Multiple L1 SL-PRS priority are allowed in a resource pool
* A SL PRS resource within the resource selection window is used as a candidate resource
* with regards the reservation interval of SL-PRS, it is provided by UE’s higher layers with values TBD. The set of values is (pre-)configured.
	+ Use the periodicities available for legacy SL communication and the ones defined for DL-PRS as a starting point.
* with regards to the resource (re)-selection procedure
	+ support re-evaluation & pre-emption for SL-PRS using the Rel-16 re-evaluation and pre-emption respectively as a starting point.
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* **Issue4**: Regarding the cast mode of the SL-PRS tranmsission, the following has been agreed. So, it can be seent that broadcast/groupcast/unicast can be supported for PRS transmission in all schems and in any resource pool.
	+ Also, the agreement says that the UE can be configured with either RA Scheme1/2, but not both. This means that configured grant and resource allocation Scheme 2 cannot be configured together

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| **R1#112****Agreement*** A UE can be configured to perform either resource allocation Scheme 1 or Scheme 2, applicable to all resource pools (dedicated or shared resource pools).
* SL PRS unicast/groupcast/broadcast can occur in either a shared or a dedicated resource pool.
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* **Issue5**: the following agreement has been achieved for RA for scheme 1

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| **RAN1#112bis****Agreement**For Scheme 1 SL-PRS resource allocation, a transmitting UE can receive a SL-PRS resource allocation signaling from gNB through a* Dynamic grant
	+ FFS Reuse DCI format 3\_0 for signalling SL-PRS resource allocation or Support a new DCI format (3\_X) and consider DCI format 3\_0 as a starting point
* Configured grant type 1
	+ the SL-PRS transmission(s) follows the higher layer configuration
* Configured grant type 2
	+ Support activating and releasing the configured grant using a new DCI format 3\_X or 3\_0 (to be down-selected between the two DCI formats)
* The above mechanisms use NR Rel-16 mode-1 signaling as a starting point
* FFS: whether same/different DCI format(s) are applied for shared pool and dedicated pool.
* FFS: Further details

**Agreement**In dynamic grant type resource allocation in scheme 1,* For shared resource pool, DCI format 3\_0 is being used as a starting point, down-select between the two alternatives below:
	+ Alt. 1: Indication SL-PRS specific information is explicitly included in DCI
		- FFS: Which SL-PRS specific information
	+ Alt. 2: Indication SL-PRS specific information is not explicitly included in DCI
* FFS: Dedicated resource pool
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* **Issue6:** For the mode of resource allocation, the following has been agreed in RAN1. It can be seen that Partial sensing not supported and any combination of selection based on sensing or random selection are supported

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| **RAN1#112****Agreement**Confirm the working assumption: Sensing-based and random selection can be allowed in the same resource pool.* Note: It is possible to (pre-)configure a resource pool to exclusively use sensing-based resource allocation.

**Agreement**For the scheme 2 sensing-based resource allocation: * Alt. 2: Rel-16 resource (re)-selection procedure with periodic and without periodic reservations is the starting point for the design of SL-PRS in the dedicated resource pool.

Note: This means that Rel-17 partial sensing is not considered a starting point for the design |

* **Issue7:** for one-shot or periodic resource reservation, RAN1 has agreed on the following. Hence, both periodic and without periodic reservations are supported

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| **Agreement**For SL-PRS transmission, at least support the following* **SL-PRS transmissions with periodic reservation:** SL-PRS transmissions which are being reserved with a similar mechanism as the SL periodic resource reservation for another TB in legacy SL communication
	+ FFS: whether/what changes are needed
* **SL-PRS transmissions without periodic reservation**: SL-PRS transmissions in which the SL-PRS is transmitted at least once without periodic reservation, with a similar mechanism as in legacy SL communication with SL resource without periodic reservation.
	+ FFS: Maximum number of reservations and transmissions after triggering
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* **Issue8:** The following agreement has been reached regardin IUC

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| **Agreement**For the shared resource pool, reuse the existing IUC signaling of both Scheme 1 and Scheme 2.* SL-PRS transmissions are treated as any other legacy transmission for SL communication when considering IUC information exchanges.

**Conclusion**For Rel-18 sidelink positioning:* For the dedicated resource pool, IUC signalling is not supported
* Do not support that a UE can reserve a SL-PRS resource for the transmission of another UE
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* **Issue9:** voided
* **Issue10**:obviated by issue 23
* **Issue11:** For dedicated resource pool, the following has been agreed. Hence, a PSCCH is followed by SL-PRS and there is no PSSCH

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| **Agreement**For a dedicated resource pool for SL positioning, only a single stage SCI is used. PSCCH and associated SL-PRS are TDMed in the same slot.* FFS: whether SL-PRS can be transmitted in a slot without associated PSCCH

RAN1#113**Agreement**For a dedicated resource pool for SL positioning, SL-PRS cannot be transmitted in a slot without associated PSCCH.**Agreement**PSSCH is not included in dedicated resource pool for SL positioning. |

* **Issue12:** reagrding the SCI format, the following has been agreed that a new SCI format will be defined for the 2nd stage SCI for SCI trnasmision in shared RP.

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| R1#113**Agreement**With regards to the SCI signaling in a shared resource pool, * Support a new format for 2nd stage SCI.
	+ FFS how to indicate the new 2nd stage SCI format
* FFS: If a 2nd stage SCI indicates both SL-PRS and SL-SCH, the cast type, destination ID, source ID are shared.
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============UPDATE AFTER RAN2#123=======================* **Issue13:** The following has been agreed during RAN1#124 regarding the fields on the 2nd stage SCI for SL-PRS transmission on shared RP. With this agreement, the SL-PRS information on shared resource pool is the same as the legacy Sidelink Transmission Information. This can be reflected in the definition of the wording

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| AgreementIn a shared resource pool, with regards to the fields in SCI format 2-D, include the following fields: * SL PRS resource information indication of the current slot – ceiling(log2(#SL-PRS resources (pre-)configured in the resource pool) bits)
* SL PRS request – 0 or 1 bit
* Embedded SCI format – [X] bit(s)
	+ If the “Embedded SCI format” field is set to [0], the SCI 2-A fields are included with necessary padding
	+ If the “Embedded SCI format” field is set to [1], the SCI 2-B fields are included
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* **Issue14:** RAN1 has agreed on the following for the parameters on dedicated resource pool that should be indicated to the lower layer

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| AgreementFor Scheme 2, in dedicated resource pools, with regards to the procedure for determining the subset of resources to be reported to higher layers, when triggering the resource (re-)selection procedure, the higher layers provide the following parameters for candidate SL-PRS transmission(s):* resource pool from which to report SL-PRS resources
* Priority
* Delay budget
* Reservation period
* List of resources for pre-emption and re-evaluation
* Set of SL-PRS resource ID (s) which can include all (pre-)configured SL-PRS resource IDs
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* **Issue15:** The following has been agreed on the CBR measurment/priority and their relationship with parameters. It can be seen that (a) when the selected pool is shared resource pool, the legacy restrictions applies; while (b) when the selected pool is dedicated resource pool, the new restrictions apply.

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| AgreementIn Scheme 2, * For a dedicated resource pool for positioning,
	+ congestion control can restrict at least the following range of parameters for SL PRS configuration per resource pool by CBR and priority:
		- Maximum SL PRS transmission power
		- Maximum Number of SL PRS (re-)transmissions
		- Discuss further the following four SL PRS transmission parameters:
			* Minimum Periodicity of SL PRS
			* Maximum Number of SL PRS resources in a slot
			* Maximum comb-size of a SL PRS resource in a slot
			* Maximum Number of OFDM symbols of a SL PRS resource in a slot
	+ For congestion control similar to legacy, the CR limits are (pre)-configured per priority in a resource pool
		- Note: Similar to SL communication how to achieve the CR limit is left to UE implementation.
* For a shared resource pool for positioning, the SL PRS can share the same restriction of PSSCH without specific enhancement in addition to what is already specified.
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* **Issue16:** With resource allocation scheme 1, the following has been agreed during RAN2#123:

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| When aperiodic/one-shot SL-PRS transmission is triggered for UE configured with Scheme 1 SL-PRS resource allocation, at least for the case when LMF is not involved in giving the grant, design a new MAC CE for the UE to send to the gNB for SL-PRS resource request. At least when periodic SL-PRS transmission is triggered for UE configured with Scheme 1 SL-PRS resource allocation, at least for the case when LMF is not involved in giving the grant, the UE sends an RRC message to the gNB for providing the assistance information for CG configuration.  |

* **Issue17:** On the SL-PRS priority levels, the following have been agreed by RAN2:

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| Define 8 priority levels for SL-PRS priority, same as the number of priority levels for SL-SCH. Send a LS to RAN1 and SA2 on RAN2 agreement with the understanding that the SL-PRS priority levels are mapped from sidelink positioning/ranging QoS. The SL-PRS priority can be provided by the UE’s own high layer when it triggers the SL-PRS transmission. |

* **Issue18:** RAN1 has agreed on the following list of parameters for CG type 1

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| In resource allocation in scheme 1, for a dedicated resource pool* For configured grant type 1 resource allocation,
	+ RRC is used for indicating at least the following:
		- Info-1: the periodicity,
		- Info-2: the slot offset relative to a logical slot defined by Info-3,
		- Info-3: SFN used for determination of the slot offset,
		- Info-4: Resource pool index
		- Info-5: Time resource assignment for SL-PRS future reservation(s)
		- Info-6: SL-PRS resource ID (s) for the future 1 or 2 reservations
		- Info-7: SL-PRS resource ID for the first SL-PRS transmission
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* **Issue19:** voided
* **Issue20:** The following has been agreed in RAN1 for resource allocation scheme 1 on dedicated resource pool for DG

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| * in the DCI, introduce at least the following fields:
	+ Resource pool index – number of bits same to SL communications
	+ Time gap - 3 bits
	+ SCI format 1-B fields:
		- Time resource assignment for SL-PRS future reservation(s)
		- SL-PRS resource ID (s) for the future 1 or 2 reservations
	+ SL-PRS resource ID for the first SL-PRS transmission
	+ Configuration index – number of bits same to SL communications
	+ Padding bits, if required
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* **Issue21**: The following has been agreed in RAN1 regard the issue of PDB for SL-PRS. Hence, within the RAN2 spec, the “PDB” needs to be substitued with “Delay Budget for SL-PRS”

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| Working assumptionFor Scheme 2, in a dedicated resource pool, using Rel-16 resource (re)-selection procedure as the starting point, support the following modification:* **Modification 2:** For the resource selection window:
	+ Option 1: for the derivation of the window, using the legacy approach as a starting point, substitute the Packet Delay Budget (PDB) with a Delay Budget for SL-PRS

Send an LS to RAN2 asking RAN2 whether they can confirm RAN1’s working assumption, and if not let RAN2 decide an alternative solution. |

* **Issue22:** For dedicated RP, the SL-PRS bandwidth is the same as that of the resource pool. For shared RP, the SL-PRS bandwidth is the same as that of PSSCH

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| **Conclusion**For a dedicated resource pool, only the case where SL PRS bandwidth is the same as resource pool bandwidth is supported in Rel-18.**Agreement**For a shared resource pool, SL PRS bandwidth is same as the bandwidth indicated for PSSCH. |

* **Issue23:** SCI on dedicated resource pool can also indicate the retrnasmission resources for SL-PRS

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| AgreementIn the dedicated resource pool for positioning, with regards to the SCI for SL-PRS, information carried in SCI for SL-PRS should at least include:* Field 1: SL-PRS priority - 3 bits
* Field 2: Source ID – Up to resource pool (pre-)configuration 12 or 24 bits
* Field 3: Destination ID - 24 bits
* Field 4: Cast type – 2 bits
* Field 5: Resource reservation period - Ceil(log2(Number of candidate values in (pre-)configuration))
	+ Alt. 5.1: Up to 16 values
* Field 6: Time resource assignment for SL-PRS future reservations
	+ 1 or 2 max future slots within 32 slots – 5 bits or 9 bits, based on the maximum number of the (pre-)configured future reservations
* Field 7: SL-PRS resource ID (s) for the future 1 or 2 reservations
	+ Number of bits:
		- In case of max number of future reservations is (pre-)configured to 2: [2\*Ceil(log2(Number of SL-PRS resources in (pre-)configuration))]
		- In case of max number of future reservations is (pre-)configured to 1: Ceil(log2(Number of SL-PRS resources in (pre-)configuration))
* Field 8: SL-PRS request – 0 or 1 bit
* Field 9: Reserved bits – up to (pre-)configuration
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| ***Summary of change:*** | The following changes have been applied in the current CR* Change0: Generic changes made for the introduction of the feature
* Change1: The triggering of resource selection is by UE’s own higher layer and lower layer signaling
* Change2: The SL-PRS transmission can be transmitted without data
* Change3: For dedicated RP, L1 SL-PRS priority is needed
* Change3a: Reservation period is provided by the higher layer and selected from a pre-configured set of values
* Change3b: Re-evaluation and pre-emption are supported
* Change4: All cast modes are supported for SL-PRS transmissions in all the schemes and resource pool.
* Change5a: The SL-PRS occasion can be obtained by the UE in DG, CG type 1 and CG type 2
* Change5b: Configured grant type 2 activation/deactivation
* Change6: full sensing and random-selection can be supported for resource allocation mode 2; while partial sensing is not supported
* Change7: Both periodic and aperiodic reservation are supported for Scheme2.
* Change8: IUC is supported for SL-PRS transmission on shared RP, but not supported for dedicated RP
* Change9: voided
* Change10: SCI for SL-PRS transmission on dedicated resource pool
* Change11: For both shared and dedicated resource pool, both PSSCH and SL-PRS are transmitted. For SL-PRS on dedicated resource pool, PSSCH is not transmitted
* Change12: A new SCI format will be defiend for 2nd stage SCI transmission on shared resource pool. FFS the content of the SCI

=================UPDATE AFTER R2#123====================* Chagne13: Add SL-PRS in the definition of *Sidelink trasnmission information* for SL-PRS transmission information on shared resource pool
* Change14: List of parameters that the higher layer indicates to the lower layer
* Change15: MAC parameter selection based on CBR and priority
* Change16: SL-PRS resource request. Add new MAC CE for SL-PRS resource
* Change17: SL-PRS priority in the SCI for dedicated resource pool
* Change18: Sidelink configured grant configuration parameters
* Change19: Voided
* Change20: For SL grant reception, add the determination of SL grant based on DCI on dedicated resource pool
* Change21: Add SL-PRS delay budget to the spec
* Change22: Selection of BW for resource allocation Scheme 2
* Change23: SCI fields for SL transmission and also on the SL-PRS transmission information
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| ***Consequences if not approved:*** | The new feature sidelink positioning can not be well supported by the MAC spec |
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| ***Clauses affected:*** | 2, 3.1, 3.2, 5.4.2.2, 5.8.3, 5.15.2, 5.22.1, 5.22.1.1, 5.22.1.2, 5.22.1.2a, 5.22.1.2b, 5.22.1.3, 5.22.1.xx, 5.22.2, 5.22.2.1, 5.22.2.2, 5.22.2.x, 6.1.3.xx  |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** | Ver0 in RAN2#123: R2-2307125Ver1 in RAN2#123: R2-2309180Ver2 in RAN2#123: R2-230 |

====================================CHANGE BEGIN====================================

2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 38.300: "NR; Overall description; Stage 2".

[3] 3GPP TS 38.322: "NR; Radio Link Control (RLC) protocol specification".

[4] 3GPP TS 38.323: "NR; Packet Data Convergence Protocol (PDCP) protocol specification".

[5] 3GPP TS 38.331: "NR; Radio Resource Control (RRC); Protocol specification".

[6] 3GPP TS 38.213: "NR; Physical Layer Procedures for control".

[7] 3GPP TS 38.214: "NR; Physical Layer Procedures for data".

[8] 3GPP TS 38.211: "NR; Physical channels and modulation".

[9] 3GPP TS 38.212: "NR; Multiplexing and channel coding".

[10] Void.

[11] 3GPP TS 38.133: "NR; Requirements for support of radio resource management".

[12] 3GPP TS 36.133: "Evolved Universal Terrestrial Radio Access (E-UTRA); Requirements for support of radio resource management".

[13] 3GPP TS 26.114: "Technical Specification Group Services and System Aspects; IP Multimedia Subsystem (IMS); Multimedia Telephony; Media handling and interaction".

[14] 3GPP TS 38.101-1: "NR; User Equipment (UE) radio transmission and reception; Part 1: Range 1 Standalone".

[15] 3GPP TS 38.101-2: "NR; User Equipment (UE) radio transmission and reception; Part 2: Range 2 Standalone".

[16] 3GPP TS 38.101-3: "NR; User Equipment (UE) radio transmission and reception; Part 3: Range 1 and Range 2 Interworking operation with other radios".

[17] 3GPP TS 36.213: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical Layer Procedures".

[18] 3GPP TS 37.213: "Physical layer procedures for shared spectrum channel access".

[19] 3GPP TS 23.287: "Architecture enhancements for 5G System (5GS) to support Vehicle-to-Everything (V2X) services ".

[20] 3GPP TS 23.285: "Architecture enhancements for V2X services".

[21] 3GPP TS 36.331: "Evolved Universal Terrestrial Radio Access (E-UTRA); Radio Resource Control (RRC); Protocol specification".

[22] 3GPP TS 36.321: "Evolved Universal Terrestrial Radio Access (E-UTRA); Medium Access Control (MAC); Protocol specification".

[23] 3GPP TS 37.355: "Evolved Universal Terrestrial Radio Access (E-UTRA); LTE Positioning Protocol (LPP)".

[24] 3GPP TS 38.215: "NR; Physical layer measurements".

[25] 3GPP TS 38.306: "NR; User Equipment (UE) radio access capabilities".

[26] 3GPP TS 23.304: "Proximity based Services (ProSe) in the 5G System (5GS)".

[27] 3GPP TS 38.473: "NG-RAN; F1 Application Protocol (F1AP)".

[28] 3GPP TS 24.587: " Technical Specification Group Core Network and Terminals; Vehicle-to-Everything (V2X) services in 5G System (5GS)".

[29] 3GPP TS 24.554: "Technical Specification Group Core Network and Terminals; Proximity-services (ProSe) in 5G System (5GS) protocol".

[xx] 3GPP TS 23.586: "Technical Specification Group Services and System Aspects; Architectural Enhancements to support Ranging based services and Sidelink Positioning".

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

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].

**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.

**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].

**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.

**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 and UE-to-Network Relay communication) 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 and ProSe UE-to-Network 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 both transmission for NR sidelink discovery and transmission for NR sidelink 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.

**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 defined in TS 23.586 [xx].

**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 an SCI for an SL-PRS transmission on shared 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 transmission information on dedicated resource pool:** SL-PRS transmission information on dedicated resource pool is included in an SCI for an SL-PRS transmission on dedicated resource pool for SL-PRS, consist 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.

**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.

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

## 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].

AP Aperiodic

BFR Beam Failure Recovery

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

DAPS Dual Active Protocol Stack

DCP DCI with CRC scrambled by PS-RNTI

DL-PRS DownLink-Positioning Reference Signal

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

MBS Multicast/Broadcast Services

MCCH MBS Control Channel

MCCH-RNTI MBS Control Channel RNTI

MCG Master Cell Group

MPE Maximum Permissible Exposure

MTCH MBS Traffic Channel

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

PS-RNTI Power Saving RNTI

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

RS Reference Signal

SCG Secondary Cell Group

SDT Small Data Transmission

SFI-RNTI Slot Format Indication RNTI

SI System Information

SL-RNTI Sidelink RNTI

SLCS-RNTI Sidelink Configured Scheduling RNTI

SL-PRS Sidelink-PRS

SpCell Special Cell

SP Semi-Persistent

SP-CSI-RNTI Semi-Persistent CSI RNTI

SPS Semi-Persistent Scheduling

SR Scheduling Request

SS Synchronization Signals

SSB Synchronization Signal Block

STAG Secondary Timing Advance Group

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

UCI Uplink Control Information

V2X Vehicle-to-Everything

ZP CSI-RS Zero Power CSI-RS

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

### 5.4.2 HARQ operation

5.4.2.2 HARQ process

Each HARQ process is associated with a HARQ buffer.

New transmissions are performed on the resource and with the MCS indicated on PDCCH or indicated in the Random Access Response (i.e. MAC RAR or fallbackRAR), or signalled in RRC or determined as specified in clause 5.1.2a for MSGA payload. Retransmissions are performed on the resource and, if provided, with the MCS indicated on PDCCH, or on the same resource and with the same MCS as was used for last made transmission attempt within a bundle, or on stored configured uplink grant resources and stored MCS when *cg-RetransmissionTimer* or *cg-SDT-RetransmissionTimer* is configured. If *cg-RetransmissionTimer* is configured, retransmissions with the same HARQ process may be performed on any configured grant configuration if the configured grant configurations have the same TBS. If *cg-SDT-RetransmissionTimer* is configured, retransmission for the initial CG-SDT transmission with the same HARQ process may be performed on any configured grant configuration if the configured grant configurations have the same TBS.

When *cg-RetransmissionTimer* is configured and the HARQ entity obtains a MAC PDU to transmit and LBT failure indication is received from lower layer, the corresponding HARQ process is considered to be pending. For a configured uplink grant, configured with *cg-RetransmissionTimer*, each associated HARQ process is considered as not pending when:

- a transmission is performed on that HARQ process and LBT failure indication is not received from lower layers; or

- the configured uplink grant is initialised and this HARQ process is not associated with another active configured uplink grant; or

- the HARQ buffer for this HARQ process is flushed.

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

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

1> store the uplink grant received from the HARQ entity;

1> generate a transmission as described below.

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

1> store the uplink grant received from the HARQ entity;

1> generate a transmission as described below.

To generate a transmission for a TB, the HARQ process shall:

1> if the MAC PDU was obtained from the Msg3 buffer; or

1> if the MAC PDU was obtained from the MSGA buffer; or

1> if there is no measurement gap at the time of the transmission and, in case of retransmission, the retransmission does not collide with a transmission for a MAC PDU obtained from the Msg3 buffer or the MSGA buffer:

2> if there are neither NR sidelink transmission nor transmission of V2X sidelink communication at the time of the transmission; or

2> if the transmission of the MAC PDU is prioritized over sidelink transmission or can be simultaneously performed with sidelink transmission:

3> instruct the physical layer to generate a transmission according to the stored uplink grant.

If a HARQ process receives downlink feedback information, the HARQ process shall:

1> stop the *cg-RetransmissionTimer*, if running;

1> if acknowledgement is indicated:

2> stop the *configuredGrantTimer*, if running.

If the *configuredGrantTimer* expires for a HARQ process, the HARQ process shall:

1> stop the *cg-RetransmissionTimer*, if running;

1> stop the *cg-SDT-RetransmissionTimer*, if running.

1> if a PDCCH addressed to the MAC entity's C-RNTI has not been received after initial transmission for the CG-SDT with CCCH message to which the *configuredGrantTimer* corresponds:

2> indicate failure to perform SDT procedure to the upper layer.

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

Editor's NOTE: FFS prioritization between sidelink grant for SL-PRS transmission and transmission of MAC PDU on Uu.

- if there are both a sidelink grant for NR sidelink transmissionand configured grant(s) for transmission of V2X sidelink communication on SL-SCH as determined in clause 5.14.1.2.2 of TS 36.321 [22] at the time of the transmission, and neither the NR sidelink transmission is prioritized as determined in clause 5.22.1.3.1a nor the transmission(s) of V2X sidelink communication is prioritized as determined in clause 5.14.1.2.2 of TS 36.321 [22]; or

- if there are both a sidelink grant NR sidelink transmission and configured grant(s) for transmission of V2X sidelink communication on SL-SCH as determined in clause 5.14.1.2.2 of TS 36.321 [22] at the time of the transmission, and the MAC entity is able to perform this UL transmission simultaneously with the NR sidelink transmission and/or the transmission(s) of V2X sidelink communication; or

- if there is only configured grant(s) for transmission of V2X sidelink communication on SL-SCH as determined in clause 5.14.1.2.2 of TS 36.321 [22] at the time of the transmission, and either none of the transmission(s) of V2X sidelink communication is prioritized as determined in clause 5.14.1.2.2 of TS 36.321 [22] or the MAC entity is able to perform this UL transmission simultaneously with the transmission(s) of V2X sidelink communication; or

- if there is only a sidelink grant for NR sidelink transmission at the time of the transmission, and if the NR sidelink transmission is not prioritized as determined in clause 5.22.1.3.1a, or there is a sidelink grant for NR sidelink transmission at the time of the transmission and the MAC entity is able to perform this UL transmission simultaneously with the NR sidelink transmission; or

- if there are both a sidelink grant for NR sidelink transmission and configured grant(s) for transmission of V2X sidelink communication on SL-SCH as determined in clause 5.14.1.2.2 of TS 36.321 [22] at the time of the transmission, and either only the of NR sidelink transmission is prioritized as determined in clause 5.22.1.3.1a or only the transmission(s) of V2X sidelink communication is prioritized as determined in clause 5.14.1.2.2 of TS 36.321 [22] and the MAC entity is able to perform this UL transmission simultaneously with the prioritized NR sidelink transmission or the transmission of V2X sidelink communication:

NOTE 1: Among the UL transmissions where the MAC entity is able to perform the transmission of NR sidelink communication prioritized simultaneously, if there are more than one UL transmission which the MAC entity is not able to perform simultaneously, it is up to UE implementation whether this UL transmission is performed.

NOTE 2: Among the UL transmissions that the MAC entity is able to perform simultaneously with all transmission(s) of V2X sidelink communication prioritized, if there are more than one UL transmission which the MAC entity is not able to perform simultaneously, it is up to UE implementation whether this UL transmission is performed.

NOTE 3: Among the UL transmissions where the MAC entity is able to perform the NR sidelink transmission prioritized simultaneously with all transmission(s) of V2X sidelink communication prioritized, if there are more than one UL transmission which the MAC entity is not able to perform simultaneously, it is up to UE implementation whether this UL transmission is performed.

NOTE 4: If there is configured grant(s) for transmission of V2X sidelink communication on SL-SCH as determined in clause 5.14.1.2.2 of TS 36.321 [22] at the time of the transmission, and the MAC entity is not able to perform this UL transmission simultaneously with the transmission(s) of V2X sidelink communication, and prioritization-related information is not available prior to the time of the transmission due to processing time restriction, it is up to UE implementation whether this UL transmission is performed.

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

## 5.8 Transmission and reception without dynamic scheduling

5.8.3 Sidelink

There are two types of transmission without dynamic sidelink grant:

- configured grant Type 1 where an sidelink grant is provided by RRC, and stored as configured sidelink grant;

- configured grant Type 2 where an sidelink grant is provided by PDCCH, and stored or cleared as configured sidelink grant based on L1 signalling indicating configured sidelink grant activation or deactivation.

Type 1 and/or Type 2 are configured with a single BWP. Multiple configurations of up to 8 configured grants (including both Type 1 and Type 2, if configured) can be active simultaneously on the BWP.

RRC configures the following parameters when the configured grant Type 1 is configured, as specified in TS 38.331 [5] or TS 36.331 [21]:- *sl-ConfigIndexCG*: the identifier of a configured grant for sidelink;

- *sl-CS-RNTI*: SLCS-RNTI for retransmission;

- *sl-NrOfHARQ-Processes*: the number of HARQ processes for configured grant not configured on dedicated resource pool;

- *sl-PeriodCG*: periodicity of the configured grant Type 1;

- *sl-TimeOffsetCG-Type1*: Offset of a resource with respect to reference logical slot defined by *sl-TimeReferenceSFN-Type1* in time domain, referring to the number of logical slots in a resource pool;

- *sl-TimeResourceCG-Type1*: time resource location of the configured grant Type 1;

- *sl-CG-MaxTransNumList*: the maximum number of times that a TB can be transmitted using the configured grant;

*- sl-HARQ-ProcID-offset*: offset of HARQ process for configured grant Type 1 not configured on dedicated resource pool;

- *sl-PRS-ID*: SL-PRS configuration index for configured grant Type 1 configured on dedicated resource pool;

- *sl-TimeReferenceSFN-Type1*: SFN used for determination of the offset of a resource in time domain. If it is present, the UE uses the first logical slot of associated resource pool after the starting time of the closest SFN with the indicated number preceding the reception of the sidelink configured grant configuration Type 1 as reference logical slot. If it is absent, the indicated reference SFN is zero;

- *sl-ResourcePoolIndex*: the resource pool index of the dedicated resource pool where configuded grant Type 1 is configured.

Editor's NOTE: FFS whether mulitple CGs can be configued for SL-PRS transmission; whether sl-CS-RNTI can be used for retransmission; whether the number of maximum SL-PRS transmissions on dedicated resource pool with CG is needed; FFS the field name and alignment with RRC spec

RRC configures the following parameters when the configured grant Type 2 is configured, as specified in TS 38.331 [5]:

- *sl-ConfigIndexCG*: the identifier of a configured grant for sidelink;

- *sl-CS-RNTI*: SLCS-RNTI for activation, deactivation, and retransmission;

- *sl-NrOfHARQ-Processes*: the number of HARQ processes for configured grant not configured on dedicated resource pool;

- *sl-PeriodCG*: periodicity of the configured grant Type 2;

- *sl-CG-MaxTransNumList*: the maximum number of times that a TB can be transmitted using the configured grant;

*- sl-HARQ-ProcID-offset*: offset of HARQ process for configured grant Type 2 not configured on dedicated resource pool.

Upon configuration of a configured grant Type 1, the MAC entity shall for each configured sidelink grant:

1> store the sidelink grant provided by RRC as a configured sidelink grant;

1> initialise or re-initialise the configured sidelink grant to determine PSCCH duration(s) and PSSCH duration(s) and SL-PRS transmission occasions according to *sl-TimeOffsetCG-Type1* and *sl-TimeResourceCG-Type1*, and to reoccur with *sl-periodCG* for transmissions of multiple MAC PDUs and SL-PRSs according to clause 8.1.2 of TS 38.214 [7].

NOTE 1: If the MAC entity is configured with multiple configured sidelink grants, collision among the configured sidelink grants may occur. How to handle the collision is left to UE implementation.

After a sidelink grant is configured for a configured grant Type 1, the MAC entity shall consider sequentially that the first slot of the Sth sidelink grant occurs in the logical slot for which:

 CURRENT\_slot = (*sl-ReferenceSlotCG-Type1* + *sl-TimeOffsetCG-Type1* + S × *PeriodicitySL*) modulo T'max

where CURRENT\_slot refers to current logical slot in the associated resource pool,$ PeriodicitySL=\left⌈\frac{T'\_{max} }{10240 ms}×sl-PeriodCG\right⌉$and T'max is the number of slots that belongs to the associated resource pool as defined in clause 8 of TS 38.214[7]. *sl-ReferenceSlotCG-Type1* refers to reference logical slot defined by *sl-TimeReferenceSFN-Type1*.

After a sidelink grant is configured for a configured grant Type 2, the MAC entity shall consider sequentially that the first slot of Sth sidelink grant occurs in the logical slot for which:

 CURRENT\_slot = (*sl-StartSlotCG-Type2* + S × *PeriodicitySL*) modulo T'max

where *sl-StartSlotCG-Type2* refers to the logical slot of the first transmission opportunity of PSSCH where the configured sidelink grant was (re)initialised.

Editor's NOTE: Whether the above formula for determining the CG occasion for CG type 1 for SL-SCH can be reused for SL-PRS

When a configured sidelink grant is released by RRC, all the corresponding configurations shall be released and all corresponding sidelink grants shall be cleared.

The MAC entity shall:

1> if the configured sidelink grant confirmation has been triggered and not cancelled; and

1> if the MAC entity has UL resources allocated for new transmission:

2> instruct the Multiplexing and Assembly procedure to generate a Sidelink Configured Grant Confirmation MAC CE as defined in clause 6.1.3.34;

2> cancel the triggered configured sidelink grant confirmation.

For a configured grant Type 2, the MAC entity shall clear the corresponding configured sidelink grant immediately after first transmission of Sidelink Configured Grant Confirmation MAC CE triggered by the configured sidelink grant deactivation.

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

5.15 Bandwidth Part (BWP) operation

5.15.2 Sidelink

In addition to clause 16 of TS 38.213 [6], this clause specifies requirements on BWP operation for sidelink.

The MAC entity is configured with at most a single SL BWP where sidelink transmission and reception are performed.

For a BWP, the MAC entity shall:

1> if the BWP is activated:

2> transmit SL-BCH on the BWP, if configured;

2> transmit S-PSS and S-SSS on the BWP, if configured;

2> transmit PSCCH on the BWP;

2> transmit SL-PRS on the BWP;

2> transmit SL-SCH on the BWP;2> receive PSFCH on the BWP, if configured;

2> receive S-PSS and S-SSS on the BWP, if configured;

2> receive SL-BCH on the BWP, if configured;

2> receive PSCCH on the BWP;

2> receive SL-PRS on the BWP;

2> receive SL-SCH on the BWP;

2> transmit PSFCH on the BWP, if configured;

2> (re-)initialize any suspended configured sidelink grant of configured grant Type 1.

1> if the BWP is deactivated:

2> not transmit SL-BCH on the BWP, if configured;

2> not transmit S-PSS and S-SSS on the BWP, if configured;

2> not transmit PSCCH on the BWP;

2> not transmit SL-PRS on the BWP;

2> not transmit SL-SCH on the BWP;

2> not receive PSFCH on the BWP, if configured;

2> not receive SL-BCH on the BWP, if configured;

2> not receive S-PSS and S-SSS on the BWP, if configured;

2> not receive PSCCH on the BWP;

2> not receive SL-SCH on the BWP;

2> not receive SL-PRS on the BWP;

2> not transmit PSFCH on the BWP, if configured;

2> suspend any configured sidelink grant of configured grant Type 1;

2> clear any configured sidelink grant of configured grant Type 2;

2> cancel, if any, triggered Scheduling Request procedure for sidelink;

2> cancel, if any, triggered Sidelink Buffer Status Reporting procedure;

2> cancel, if any, triggered Sidelink CSI Reporting procedure;

2> cancel, if any, triggered Sidelink DRX Command MAC CE;

2> cancel, if any, triggered Sidelink IUC-Request transmission procedure;

2> cancel, if any, triggered Sidelink IUC-Information Reporting procedure.

=============================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 shall have a sidelink grant on an active SL BWP to determine a set of PSCCH duration(s) in which transmission of SCI occurs or a set of PSSCH duration(s) in which transmission of SL-SCH associated with the SCI occurs and/or SL-PRS occasions in which transmission of SL-PRS associated with the SCI occurs. A sidelink grant addressed to SLCS-RNTI with NDI = 1 is considered as a dynamic sidelink grant.

Editor's NOTE: FFS RNTI for transmission of SL-PRS by CG type2.

If the MAC entity has been configured with Sidelink resource allocation mode 1 as indicated in TS 38.331 or the MAC entity has been configured with resource allocation Scheme 1 and the PDCCH is received for the resource allocation on shared resource pool for SL-PRS transmission [5], the MAC entity shall for each PDCCH occasion and for each grant received for this PDCCH occasion:

Editor's NOTE: FFS harmonization of the wording “Sidelink resource allocation mode1/2” in legacy sidelink spec and the “resource allocation Scheme 1/2” in sidelink positioning for shared resource pool when both data and SL-PRS are transmitted.

Editor's NOTE: Whether SL-SCH is transmitted when no data in logical channel is trasnmitted along with SL-PRS transmission and whether HARQ operations are needed for this case.

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

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

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

2> else:

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

Editor's NOTE: FFS the DCI fields for shared resource pool for SL-PRS transmission in resource allocation Scheme 1.

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

2> if PDCCH contents indicate retransmission(s) for the 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) for one or more retransmissions of a single MAC PDU according to clause 8.1.2 of TS 38.214 [7].

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

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

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

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

3> store the configured sidelink grant;

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

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 and PDCCH is received for resource allocation on dedicated resource pool for SL-PRS transmission as in TS 38.331 [5], the MAC entity shall for each PDCCH occasion:

1> if a sidelink grant has been received on the PDCCH for the MAC entity's *[ffs-RNTI]*: (i.e., for dynamic grant)2> use the received sidelink grant to determine the PSCCH duration and the corresponding SL-PRS occasion for the transmission of SL-PRS.

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

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

3> store the configured sidelink grant;

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

Editor's NOTE: FFS configured sidelink grant confirmation after reception of activation/deactivatoin for CG type 2.

If the MAC entity has been configured with Sidelink resource allocation mode 2 or resource allocation Scheme 2 using pool(s) of resources in a carrier 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 and SL-PRS transmission:

NOTE 0: For SL-PRS transmission by resource allocation Scheme 2 on dedicated resource pool, partial sensing is not supported.

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

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

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.

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 multiple SL-PRS transmissions have been triggered by the upper layer or by the reception of a SCI from a peer UE:

Editor's NOTE: FFS the 2nd stage SCI format includes full source/destination ID or the MAC subheader needs to be transmitted with layer-2 Source/Destination ID.2> if the MAC entity has not selected a pool of resources allowed for the logical channel or SL-PRS transmission:

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.

3> else 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.

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.

Editor's NOTE: Resource pool selection with resource allocation scheme 2 on shared/dedicated resource pool.

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

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

Editor's NOTE: FFS whether the legacy conditions for Tx resource (re-)selection still hold for SL-PRS transmission

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

3> if one or multiple SL DRX(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.

Editor's NOTE: FFS DRX impacts to resource selection for SL-PRS transmission

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

Editor's NOTE: FFS selection of resource reservation period on shared resource pool for SL-PRS transmission.

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.

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;

Editor's NOTE: FFS applicability of the reselection counter for resource reservation of SL-PRS on dedicated resource pool.

3> if the selected resource pool is not dedicated resource pool for SL-PRS transmission:

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) 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 resource pool for SL-PRS transmission:

4> select the number of SL-PRS retransmissions;

Editor's NOTE: FFS the details of number of SL-PRS retransmissions selection based on CBR and L1 priority, including the exact RRC fields, etc

3> if the selected resource pool is not dedicated resource pool for SL-PRS 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) 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 *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 resource pool for SL-PRS transmission:

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, 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;

Editor's NOTE: FFS the resource selection on shared resource pool when both data corresponding to logical channel with PDB and SL-PRS with delay budget are transmitted; or when there is no data corresponding to logical channel and there is only SL-PRS delay budget. The same issue also applies in the following paragraphs.

5> else if the selected resource pool is dedicated resource pool for SL-PRS transmission:

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

4> else:

5> if the selected resource pool is not dedicated resource pool for SL-PRS transmission:

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 and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier;

5> else if the selected resource pool is dedicated resource pool for SL-PRS transmission:

6> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by physical layer as *[ffs RAN1 spec]* as specified in clause 5.28.2 of the destination UE selected, 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 resource pool for SL-PRS transmission:

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

5> else if the selected resource pool is dedicated resource pool for SL-PRS transmission:

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

4> else:

5> if the selected resource pool is not dedicated resource pool for SL-PRS transmission:

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;

5> else if the selected resource pool is dedicated resource pool for SL-PRS transmission:

6> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by physical layer as *[ffs RAN1 spec]* as specified in clause 5.28.2 of the destination UE selected, 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 resource pool for SL-PRS transmission:

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) allowed on the carrier.

Editor's NOTE: IUC is only applicable for shared RP, hence here does not need to consider the issue for dedicated RP. Still needs to consider the issue of PDB vs SL-PRS delay budget.

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 resource pool for SL-PRS transmission:

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 and the remaining PDB of SL data available in the logical channel(s) 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 and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier.

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

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

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

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

5> randomly select the time and frequency resources for one or more transmission opportunities from the available resources, according to the 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];

5> 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 resource pool for SL-PRS transmission: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> 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, 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].

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, 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].

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 and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier by ensuring the minimum time gap between any two selected resources in case that PSFCH is configured for this pool of resources and that a retransmission resource can be indicated by the time resource assignment of a prior SCI according to clause 8.3.1.1 of TS 38.212 [9].

5> 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 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 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].

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

4> consider the set as the selected sidelink grant.

3> use the selected sidelink grant to determine the set of PSCCH durations, SL-PRS transmission occasions and the set of PSSCH durations according to TS 38.214 [7].

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

3> clear the selected sidelink grant, if available;

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

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

1> if the MAC entity has selected to create a selected sidelink grant corresponding to transmission(s) of a single MAC PDU, and if SL data is available in a logical channel, or 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 a single SL-PRS transmission has been triggered by the upper layer or by the reception of a SCI from a peer UE:

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

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

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

3> else:

4> select any pool of resources among the configured pools of resources.

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

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

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

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.

2> 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:

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

Editor's NOTE: Resource pool selection with resource allocation scheme 1/2 and shared/dedicated resource pool.

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

Editor's NOTE: FFS whether the legacy conditions for Tx resource (re-)selection also hold for SL-PRS transmission

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

3> if one or multiple SL DRX(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 resource pool for SL-PRS transmission:

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) 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 resource pool for SL-PRS transmission:

4> select the number of SL-PRS retransmissions.

Editor's NOTE: FFS the details of number of SL-PRS retransmissions selection based on CBR and L1 priority

3> if the selected resource pool is not dedicated resource pool for SL-PRS 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) 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 *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 resource pool for SL-PRS transmission:

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, according to the amount of selected frequency resources and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier, and the latency requirement of the triggered SL CSI reporting.

Editor's NOTE: FFS the resource selection on shared resource pool when both data corresponding to logical channel with PDB and SL-PRS with delay budget are transmitted; or when there is no data corresponding to logical channel and there is only SL-PRS delay budget. The same issue applies in the following paragraphs.

5> if the selected resource pool is dedicated resource pool for SL-PRS transmission:

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

4> else:

5> if the selected resource pool is not dedicated resource pool for SL-PRS transmission:

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 if configured time 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 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

5> if the selected resource pool is dedicated resource pool for SL-PRS transmission:

6> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by physical layer as *[ffs RAN1 spec]* as specified in clause 5.28.2 of the destination UE selected, according to the remaining SL-PRS delay budget of the SL-PRS transmission.

Editor's NOTE: FFS the relation between resource selection and remaining PDB, latency requirement for SL-PRS transmission. The same FFS is applicable for the remaining of the clause.

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 resource pool for SL-PRS transmission:

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

5> if the selected resource pool is dedicated resource pool for SL-PRS transmission:

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

4> else:

5> if the selected resource pool is not dedicated resource pool for SL-PRS transmission:

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;

5> else if the selected resource pool is dedicated resource pool for SL-PRS transmission:

6> randomly select the time and frequency resources for one transmission opportunity from the resources indicated by physical layer as *[ffs RAN1 spec]* as specified in clause 5.28.2 of the destination UE selected, 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 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 resource pool for SL-PRS transmission:

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 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.

Editor's NOTE: IUC is only applicable for shared RP. Still needs to consider the issue of PDB vs SL-PRS delay budget.

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 resource pool for SL-PRS transmission:

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 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;

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 and the remaining PDB of SL data available in the logical channel(s) allowed on the carrier, and/or the latency requirement of the triggered SL CSI reporting.

3> if *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 and the latency requirement of the Sidelink Inter-UE Coordination Information transmission.

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

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

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

5> randomly select the time and frequency resources for one or more transmission opportunities from the available resources, according to the 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];

5> 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 resource pool for SL-PRS transmission:

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

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

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 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 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 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 and the latency requirement of the Sidelink Inter-UE Coordination Information transmission.

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), SL-PRS transmission occasions and PSSCH duration(s) according to TS 38.214 [7].

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-A's 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 5.22.1.3.3:

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

Editor's NOTE: FFS SL-PRS transmission on shared resource pool when the MAC PDU has been positively acked.

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

Editor's NOTE: how the MAC entity determines the SL-PRS delay budget.

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

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

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

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

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

Editor's NOTE: FFS 2nd stage SCI for SL-PRS transmission on shared resource pool for the spec impact for the SL-PRS request indication and SL-PRS resource index

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 resource allocation Scheme 1 for SL-PRS transmission:

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 resource allocation Scheme 2 for SL-PRS transmission:

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

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

1> if the MAC entity is configured with 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 resource allocation Scheme 2:

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

1> set the Source ID and Destination ID to the Source ID and Destination ID corresponding to the SL-PRS transmission;

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

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

1> set the SL-PRS resource ID;

Editor's NOTE: FFS how the SL-PRS ID is selected

1> if the higher layer triggers SL-PRS transmission to the peer UE identified by the Destination ID:

2> set the SL-PRS request to *true*.

1> instruct the lower layer to transmit SL-PRS and SCI associated to the SL-PRS transmission information on dedicated resource pool.

Editor's NOTE: Collision handling between SL and UL for SCI and SL-PRS transmission.

Editor’s NOTE: FFS the SL-PRS ID from upper layer and its impacts to MAC

Editor's NOTE: FFS SL-PRS priority provided by the peer UE that triggers the SL-PRS transmission with lower layer signaling

For configured sidelink grants not for SL-PRS transmission on dedicated 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*

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:

Editor's NOTE: FFS whether the legacy conditions for Tx resource (re-)selection also hold for SL-PRS transmission on shared and dedicated resource pool.

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 channel, and the MAC entity selects not to perform transmission(s) corresponding to a single MAC PDU:

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 CE triggered according to clause 5.22.1.7.

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 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 occasion;

2> if the selected resource pool is not dedicated resource pool for SL-PRS transmission:

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) 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 resource pool for SL-PRS transmission:

3> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in *[ffs\_RAN1\_spec]* 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 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].

Editor's NOTE: FFS the relation in resource selection between remaining PDB and the remaining SL-PRS delay budget on shared RP.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 or SL-PRS transmission;

2> if one or multiple SL DRX is configured:

3> if the selected resource pool is not dedicated resource pool for SL-PRS transmission:

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 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 resource pool for SL-PRS trasnmission:

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 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 resource pool for SL-PRS transmission:

4> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in *[ffs\_RAN1\_spec]* 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.

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.

Editor's NOTE: FFS applicability of DRX for SL-PRS on dedicated/shared RP

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 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 or SL-PRS transmission;

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) 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];

Editor's NOTE: FFS the relation in resource selection between remaining PDB and the remaining SL-PRS delay budget on shared RP.

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.

#### 5.22.1.3 Sidelink HARQ operation

##### 5.22.1.3.1 Sidelink HARQ Entity

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

The maximum number of transmitting Sidelink processes associated with the Sidelink HARQ Entity is 16. A sidelink process may be configured for transmissions of multiple MAC PDUs. For transmissions of multiple MAC PDUs with Sidelink resource allocation mode 2, the maximum number of transmitting Sidelink processes associated with the Sidelink HARQ Entity is 4.A delivered sidelink grant and its associated Sidelink transmission information are associated with a Sidelink process. Each Sidelink process supports one TB.

For each sidelink grant that is not for SL-PRS transmission on dedicated resource pool, 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 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;

Editor's NOTE: FFS priority when both SL-PRS and data from multiple logical channels (s) are transmitted on shared resource pool.

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. 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-PriorityCoordInfoCondition-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 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.

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 sidelink grant is associated with shared resource pool for SL-PRS transmission and higher layer requests to trigger the SL-PRS transmission of the peer UE identified by the Destination ID:

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

5> set the SL-PRS resource ID to the value of the field, if available, within Sidelink transmission information.

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

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

3> else:

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

1> else (i.e. retransmission):

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

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

2> if PSCCH duration(s) and PSSCH duration(s) for one or more retransmissions of a MAC PDU of the 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> deliver the sidelink grant of the MAC PDU to the associated Sidelink process;

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

##### 5.22.1.3.1a Sidelink process

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.

Editor's NOTE: if the counter is also applicable for SL-PRS transmission on dedicated resource pool, how the counter is maintained.

Priority of a MAC PDU is determined by the highest priority of the logical channel(s) or MAC CE(s) in the MAC PDU.

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:

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; 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 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*.

Editor's NOTE: FFS how the SL-PRS transmission on shared resource pool is prioritized/deprioritized with uplink transmission

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:

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

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; or

2> 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 any destination that has data to be sent:

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

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 for each 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*.

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;

2> if *numConsecutiveDTX* reaches *sl-maxNumConsecutiveDTX*:

3> indicate HARQ-based Sidelink RLF detection to RRC.

1> else:

2> re-initialize *numConsecutiveDTX* to zero.

#### 5.22.1.xx SL-PRS resource request

SL-PRS transmission can be triggered either by lower layer signalling from the peer UE or the UE’s own higher layer. The SL-PRS resource request procedure is used to provide gNB with information about the SL-PRS that the UE needs to transmit.

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

1> if aperiodic SL-PRS is triggered:

2> trigger the SL-PRS resource request MAC CE.

1> else if periodic SL-PRS is triggered:

2> notify RRC to send SL-PRS configuration request.

Editor's NOTE: FFS triggering of SR for SL-PRS resource request MAC CE when there is no enough UL-SCH resources to accommodate the MAC CE. FFS cancellation of the MAC CE

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

#### 5.22.2.1 SCI reception

SCI can indicate 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 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 resource pool consist 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 the associated HARQ information and QoS information;

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

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

4> store the SCI as a valid SCI for the SL-PRS transmission and the corresponding SL-PRS transmission information on dedicated 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 identification information.

#### 5.22.2.2 Sidelink HARQ operation

##### 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 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 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.x SL-PRS reception on dedicated resource pool

For each SL-PRS transmission occasion, 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 source ID in the corresponding SCI is equal to the UE's destination ID:

3> 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 ID

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

Editor's NOTE: FFS for unicast, if the source ID in the corresponding SCI is 12 bit, UE should compare the source ID in the corresponding SCI with the 12 LSB of the UE’s destination ID

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

#### 6.1.3.xx SL-PRS resource request MAC CE

The SL-PRS resource request MAC CE is identified by a MAC subheader with [eLCID/LCID] as specified in Table 6.2.1-1b.

Editor's NOTE: FFS LCID/eLCID is used for the MAC CE

===============================END OF CHANGE=====================================