3GPP TSG RAN WG1 #104-e Meeting R1-210xxxx

e-Meeting, January 25th – February 5th, 2021

**Agenda item:** 7.2.4

**Source:** Moderator (Samsung)

**Title:** Feature lead summary#1 for Physical layer structure for sidelink

**Document for:** Discussion and Decision

# Introduction

This document is to list the topics to be discussed in RAN1#104-e. This first FL summary is to discuss for determination of email discussion topics. In RAN1#104-e, total 6 email discussion topics will be selected for the entire Rel-16 V2X.

 This summary provides a brief introduction of the issues related to physical layer structure in sidelink.

The followings are recommended to discuss in RAN1#104-e.

* Thread#1: Issue#1
* Thread#2: Issue#2

# Issues to be discussed

***Issue#Editorial: Whether/how to capture in the specifications will be discussed in Editor CR phase.***

* [4, Intel]: FD-OCC
* [6, Sharp]: CSI-RS resources
* [8, Nokia, NSB], [44, CATT, GOHIGH]: Reference in SCI fields
* (If agreed in MIMO session for UL PT-RS) [3, LG] MCS threshold for SL PT-RS

🡪 The above issues are recommended to be directly handled in Editor CR phase.

***Issue#1: Confirm the overhead values for SL max data rate***

* [5, Samsung], [7, Ericsson]
* In TS38.306, there are brackets for the overhead value in calculation of SL max data rate. RAN1 needs to confirm those values.

***Issue#2: Receiving PSCCH***

* [3, LG]
* There is no description of receiving PSCCH.

***Issue#3***: Logical slots in RS sequence generation and mapping

* [3, LG]
* Whether to change “slot number” in logical slots

***Issue#4***: SL BWP and UL BWP relationship

* [3, LG]
* How to support SL BWP and UL BWP simultaneously.

***Issue#5***: Clarifying multiple PSFCH transmission

* [6, Sharp]
* It may need to fix the description in simultaneous PSFCH transmission/reception.

***Issue#6***: Additional DMRS patterns or restriction on PSFCH resources

* [1, OPPO], [44, CATT, GOHIGH]
* In order to utilize the resource more efficiently, new DMRS patters are proposed for smaller number of PSSCH symbols.

# Reference

1. R1-2100135 Draft TP on physical strucutre for NR sidelink OPPO
2. R1-2100410 Maintenance on physical layer structure for NR sidelink vivo
3. R1-2100514 Discussion on essential corrections in physical layer structure LG Electronics
4. R1-2100629 Correction to FD-OCC for PSCCH Intel Corporation
5. R1-2101174 Maintenance for NR Sidelink Physical Layer Structure Samsung
6. R1-2101532 Remaining issues on physical layer structure and procedures for NR sidelink Sharp
7. R1-2101709 Draft\_CR\_TS38.306 Ericsson
8. R1-2101760 Remaining details for Physical layer structure for sidelink Nokia, Nokia Shanghai Bell
9. R1-2100136 Remaining open issues and corrections for physical layer procedure OPPO
10. R1-2100335 Discussion and TPs on physical layer procedures in NR V2X CATT, GOHIGH
11. R1-2100516 Discussion on essential corrections in physical layer procedure LG Electronics
12. R1-2100631 Corrections to sidelink procedures Intel Corporation
13. R1-2100735 Remaining issues on physical layer procedures for NR sidelink Fujitsu
14. R1-2100800 Remaining issues on sidelink physical layer procedure Spreadtrum Communications
15. R1-2101344 Remaining Issues of Sidelink Physical Layer Procedures Apple
16. R1-2101438 Remaining Issues in Physical Layer Procedure Qualcomm Incorporated
17. R1-2101583 Maintenance for sidelink physical layer procedure NTT DOCOMO, INC.
18. R1-2101649 Remaining issues on type-1 HARQ-ACK codebook considering multiple sidelink reosurce pools ASUSTeK
19. R1-2101650 Remaining issues on sidelink procedure ASUSTeK
20. R1-2101733 Correction on determination of PSFCH resources based on a set of configured PRBs Huawei, HiSilicon
21. R1-2100137 Remaining open issues and corrections for mode 1 and mode 2 RA OPPO
22. R1-2100204 Remaining details of sidelink resource allocation mode 2 Huawei, HiSilicon
23. R1-2100334 Discussion and TPs on resource allocation in NR V2X CATT, GOHIGH
24. R1-2100411 Maintenance on resource allocation mechanisms for NR sidelink vivo
25. R1-2100515 Discussion on essential corrections in resource allocation for Mode 1 and 2 LG Electronics
26. R1-2100630 Corrections to Mode-2 resource allocation Intel Corporation
27. R1-2100734 A remaining issue on Mode-1 resource allocation for NR sidelink Fujitsu
28. R1-2100799 Remaining issues in NR sidelink mode 2 resource allocation Spreadtrum Communications
29. R1-2100937 Remaining issues on mode1 ZTE, Sanechips
30. R1-2100938 The slot set for SL resource allocation procedure ZTE, Sanechips
31. R1-2100945 Remaining issues on resource allocation mode 2 NEC
32. R1-2101073 Remaining issues on resource allocation mode 2 for NR V2X ETRI
33. R1-2101175 Draft CR on Sidelink Physical Duration to Logical Slot Conversion Samsung
34. R1-2101176 Maintenance for NR Sidelink Mode 2 Operation Samsung
35. R1-2101345 Remaining Issue of Mode 1 Resource Allocation Apple
36. R1-2101346 Remaining Issues of Mode 2 Resource Allocation Apple
37. R1-2101436 Remaining Issues in Mode 1 Resource Allocation Qualcomm Incorporated
38. R1-2101437 Remaining Issues in Mode 2 Resource Allocation Qualcomm Incorporated
39. R1-2101533 Remaining issues on resource allocation for NR sidelink Sharp
40. R1-2101571 Remaining issues on sidelink mode 2 ASUSTeK
41. R1-2101581 Maintenance for resource allocation mechanism mode 1 NTT DOCOMO, INC.
42. R1-2101582 Maintenance for sidelink synchronization and mode 2 NTT DOCOMO, INC.
43. R1-2101759 Remaining details for Resource allocation for sidelink - Mode 2 Nokia, Nokia Shanghai Bell
44. R1-2100333 Discussion and TPs on sidelink synchronization mechanism and physical layer structure in NR V2X CATT, GOHIGH
45. R1-2100412 Maintenance on NR sidelink synchronization and procedures vivo
46. R1-2100936 Remaining issues on sidelink synchronization ZTE, Sanechips
47. R1-2101534 Remaining issues on synchronization mechanism for NR sidelink Sharp
48. R1-2101732 Correction on PSBCH payload generation Huawei, HiSilicon
49. R1-2101707 Draft\_CR\_TS38.212 Ericsson
50. R1-2101708 Draft\_CR\_TS38.213 Ericsson

# **Appendix: Previous agreements**

## Agreements in RAN1#94

Agreements**:**

* At least PSCCH and PSSCH are defined for NR V2X. PSCCH at least carries information necessary to decode PSSCH.
	+ Note: PSBCH will be discussed in the synchronization agenda.
* RAN1 continues study on the necessity of other channels.
* Further study on
	+ Whether/which sidelink feedback information is carried by PSCCH or by another channel/signal.
	+ Whether/which information to assist resource allocation and/or schedule UE’s transmission resource(s) is carried by PSCCH or by another channel/signal.
	+ PSCCH format(s) and content(s) for unicast, groupcast, and broadcast

Agreements:

* RAN1 to continue study on the physical channel considering at least the following aspects:
* Waveform
	+ Candidates: CP-OFDM, DFT-s-OFDM
	+ Proposals from companies:
		- CP-OFDM only
		- Support both
	+ Consideration points:
		- Different channel can have different waveform?
		- Benefit and impact of supporting only one waveform and supporting both waveforms
* Subcarrier spacing
	+ Candidates for further study are:
		- FR1: 15 kHz, 30 kHz, 60 kHz, 120 kHz
		- FR2: 30 kHz, 60 kHz, 120 kHz, 240 kHz
	+ Companies are encouraged to consider the potential issues and benefit of introducing new subcarrier spacing.
* CP length
* RS design
	+ Candidates are:
		- DM-RS
			* DM-RS defined in Rel-15 NR Uu is the starting point.
		- PT-RS
		- CSI-RS
		- SRS
		- AGC training signal
* Channel coding
	+ For data, channel coding defined for data in Rel-15 NR Uu is the starting point.
	+ For control, channel coding defined for control in Rel-15 NR Uu is the starting point.
* Modulation
* RE mapping and rate-matching
* Scrambling

Agreements:

* RAN1 continues study on the necessity, benefits and relationship between bandwidth part and resource pool.

Agreements:

Agree the following assumptions as tentative assumptions for the simulation at least till RAN1#94bis

* AGC
	+ Up to [15] us in FR1. Up to [10] us in FR2.
* TX/RX switching time
	+ [13] us in FR1 and [7] us in FR2
* Time error
	+ Up to [0.4] us between a UE and its synchronization reference
* Frequency error
	+ Up to [0.1] PPM between a UE and its synchronization reference

Agreements:

RAN1 to continue study on multiplexing physical channels considering at least the above aspects:

* Multiplexing of PSCCH and the associated PSSCH (here, the “associated” means that the PSCCH at least carries information necessary to decode the PSSCH).
	+ Study further the following options:
		- Option 1: PSCCH and the associated PSSCH are transmitted using non-overlapping time resources.
			* Option 1A: The frequency resources used by the two channels are the same.
			* Option 1B: The frequency resources used by the two channels can be different.
		- Option 2: PSCCH and the associated PSSCH are transmitted using non-overlapping frequency resources in the all the time resources used for transmission. The time resources used by the two channels are the same.
		- Option 3: A part of PSCCH and the associated PSSCH are transmitted using overlapping time resources in non-overlapping frequency resources, but another part of the associated PSSCH and/or another part of the PSCCH are transmitted using non-overlapping time resources.

Illustration of the above options:



## Agreements in RAN1#94bis

Agreements:

* NR sidelink supports the SCSs supported by Uu in a given frequency range, i.e., {15, 30, 60 kHz} in FR1 and {60, 120 kHz} in FR2.
	+ FFS the supported CP length
	+ Baseline is that a UE is not required to receive sidelink transmissions using different SCSs simultaneously in a given carrier.
		- FFS if this applies to sidelink synchronization signals/channels
	+ Baseline is that a UE is not required to transmit sidelink transmissions using different SCSs simultaneously in a given carrier.
		- FFS if this applies to sidelink synchronization signals/channels

Continue discussion on the waveform till next meeting – companies are encouraged to perform more analysis/evaluations.

Agreements:

For PSCCH and associated PSSCH multiplexing

* At least one of Option 1A, 1B, and 3 is supported.
	+ FFS whether some options require transient period between PSCCH and PSSCH.
* FFS whether to support Option 2

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Agreements:

* Sidelink control information (SCI) is defined.
	+ SCI is transmitted in PSCCH.
	+ SCI includes at least one SCI format which includes the information necessary to decode the corresponding PSSCH.
		- NDI, if defined, is a part of SCI.
* Sidelink feedback control information (SFCI) is defined.
	+ SFCI includes at least one SFCI format which includes HARQ-ACK for the corresponding PSSCH.
		- FFS whether a solution will use only one of “ACK,” “NACK,” “DTX,” or use a combination of them.
	+ FFS how to include other feedback information (if supported) in SFCI.
	+ FFS how to convey SFCI on sidelink in PSCCH, and/or PSSCH, and/or a new physical sidelink channel
* FFS in the context of Mode 1:
	+ whether/how to convey information for SCI on downlink
	+ whether/how to convey information of SFCI on uplink

Agreements:

* At least resource pool is supported for NR sidelink
	+ Resource pool is a set of time and frequency resources that can be used for sidelink transmission and/or reception.
		- FFS whether a resource pool consists of contiguous resources in time and/or frequency.
		- A resource pool is inside the RF bandwidth of the UE.
		- FFS how gNB and other UEs know the RF bandwidth of the UE
	+ FFS if BWP (if defined) can be used to in defining at least part of resource pool
	+ FFS if the numerology of a resource pool is indicated as a part of (pre-)configuration for resource pool, carrier, band, or BWP (if defined)
	+ UE assumes a single numerology in using a resource pool.
	+ Multiple resource pools can be configured to a single UE in a given carrier.
		- FFS how to use multiple resource pools when (pre-)configured.
* FFS BWP is supported for NR sidelink
	+ FFS whether RAN1 can assume that at most one BWP is configured in a carrier from the system perspective.
	+ It is RAN1 understanding that, in some cases, the entire system bandwidth is covered by a single BWP.
	+ FFS the details of BWP configurations, including the possibility of restricting the number of BWPs
	+ FFS whether BWP for TX and RX is separated or a common BWP applied to both TX and RX
	+ There is at most one activated sidelink BWP for a UE in a given carrier as in the Uu case
		- Further study the feasibility, benefit, and impact of sidelink BWP switching
	+ Aim to conclude in RAN1#95
		- Companies are encouraged to provide more analysis, including checking current Rel-15 specification regarding BWP related text

## Agreements in RAN1#95

Agreements:

* At least CP-OFDM is supported.
* Continue study on whether to support DFT-S-OFDM including the potential issues and the following potential benefit:
	+ Synchronization coverage enhancement
	+ PSCCH coverage enhancement, e.g., with Option 2 of PSCCH/PSSCH multiplexing with the restriction that PSCCH and PSSCH use adjacent frequency resources
	+ Feedback channel coverage enhancement
* A single waveform is used in all the sidelink channels in a carrier.
	+ Note: A sequence based channel can be supported in any waveform.
	+ (Pre-)configuration will be used to determine the used waveform if the specification supports multiple waveforms.

Agreements:

* For PSCCH/PSSCH in FR1, NR V2X supports normal CP for 15kHz, 30kHz, 60kHz, and extended CP for 60kHz.
	+ FFS extended CP for 30 kHz in FR1.
* FFS CP for PSCCH/PSSCH in FR2
	+ E.g., NR V2X supports normal CP for 60kHz and 120kHz, and extended CP for 60kHz
		- FFS extended CP for 120 kHz in FR2.
* Only one combination of CP length and SCS is used in a carrier at a given time for NR V2X UEs communicating with each other using SL

Agreements:

* BWP is defined for NR sidelink.
	+ In a licensed carrier, SL BWP is defined separately from BWP for Uu from the specification perspective.
		- FFS the relation with Uu BWP.
	+ The same SL BWP is used for both Tx and Rx.
	+ Each resource pool is (pre)configured within a SL BWP.
	+ Only one SL BWP is (pre)configured for RRC idle or out of coverage NR V2X UEs in a carrier.
	+ For RRC connected UEs, only one SL BWP is active in a carrier. No signalling is exchanged in sidelink for activation and deactivation of SL BWP.
		- Working assumption: only one SL BWP is configured in a carrier for a NR V2X UE
			* Revisit in the next meeting if significant issues are found
	+ Numerology is a part of SL BWP configuration.

Note: This does not intend to make restriction in designing the sidelink aspects related to SL BWP.

Note: This does not preclude the possibility where a NR V2X UE uses a Tx RF bandwidth the same as or different than the SL BWP.

Working assumption:

* Regarding PSCCH / PSSCH multiplexing, at least option 3 is supported for CP-OFDM.
	+ RAN1 assumes that transient period is not needed between symbols containing PSCCH and symbols not containing PSCCH in the supported design of option 3.
	+ FFS how to determine the starting symbol of PSCCH and the associated PSSCH
	+ FFS for other options. e.g. whether some of them are supported to increase PSCCH coverage.

Send an LS to RAN4 to ask the following for options 1A/1B/3 (adding details of 1A/1B/3 in the LS) – **R1-1814089,** which is endorsed with the following updates:

* Fixing email address
* “identified” to “are studying”

Final LS in R1-1814165

Working assumption:

* For RAN1 evaluation purpose only, until RAN4 response on AGC and switching time, it is assumed that one symbol is used for AGC and another one symbol is used for TX/RX switching.

Note: TX/RX switching includes transition in the power amplifier.

## Agreements in RAN1AH-1901

**Conclusion:**

* + No extended CP is supported for 30 kHz in FR1 in Rel-16
	+ No extended CP is supported for 120 kHz in FR2 in Rel-16

Agreements:

* Confirm the working assumption
	+ Working assumption: only one SL BWP is configured in a carrier for a NR V2X UE

Agreements:

* Configuration for SL BWP is separated from Uu BWP configuration signalling.
	+ UE is not expected to use different numerology in the configured SL BWP and active UL BWP in the same carrier at a given time.
		- FFS the time scale
		- FFS relation to DL BWP including initial Uu BWP
		- FFS relation in terms of frequency location and bandwidth

Agreements:

* For time domain resources of a resource pool for PSSCH,
	+ Support the case where the resource pool consists of non-contiguous time resources
		- FFS details including granularity
* For frequency domain resources of a resource pool for PSSCH,
	+ Down select following options:
		- Option 1: The resource pool always consists of contiguous PRBs
		- Option 2: The resource pool can consist of non-contiguous PRBs

Agreements:

* Multiple DMRS patterns in time domain are supported for PSSCH
	+ FFS: Whether a DMRS pattern is selected based on the subcarrier spacing
	+ FFS: Single or multiple DMRS pattern(s) per a resource pool
	+ FFS: How TX UE and RX UE can be aligned in terms of the DMRS pattern used for PSSCH
	+ FFS: RE mapping, sequence generation
* Continue to study DMRS pattern in frequency domain for PSSCH
	+ E.g. Whether multiple patterns are supported, whether PDSCH/PUSCH DMRS configuration 1 or 2 is reused.

Agreements:

* Support PT-RS for PSSCH for FR2

**Conclusion**:

RAN1 to conclude on the need of physical channel for discovery in RAN1#96.

## Agreements in RAN1#96

Agreements:

* Rel-16 NR sidelink supports CP-OFDM only.

Agreements:

* For PSCCH/PSSCH in FR2, NR V2X supports normal CP for 60 kHz, 120 kHz, and extended CP for 60 kHz.
* Note: it is understood that PSFCH follows the same CP as PSCCH/PSSCH

Agreements:

* For the operation regarding PSSCH, a UE performs either transmission or reception in a slot on a carrier.
* NR sidelink supports for a UE:
	+ A case where all the symbols in a slot are available for sidelink.
	+ Another case where only a subset of consecutive symbols in a slot is available for sidelink
		- Note: this case is not intended to be used for the ITS spectra, if there is no forward-compatibility issue. Finalize in the WI phase whether there is such an issue or not
		- The subset is NOT dynamically indicated to the UE
		- FFS the supported slot configuration(s)
		- FFS whether/how to operate it in partial coverage scenarios

Agreements:

* At least for sidelink HARQ feedback, NR sidelink supports at least a PSFCH format which uses last symbol(s) available for sidelink in a slot.

Agreements:

* RAN1 concludes that no additional physical channel needs to be defined for the purpose of discovery in Rel-16.

Agreements:

* (Pre-)configuration indicates the time gap between PSFCH and the associated PSSCH for Mode 1 and Mode 2.

Agreements:

* In mode 1 for unicast and groupcast, it is supported for the transmitter UE via Uu link to report an indication to gNB to indicate the need for retransmission of a TB transmitted by the transmitter UE.
	+ FFS the format of the indication, e.g., in the form of HARQ ACK/NACK, or in the form of SR/BSR, etc.
* RAN1 continues discussion on whether to support report from the receiver UE
	+ No inter-BS communication will be considered.

To discuss aspects related to 1st sub-bullet & 2nd bullet during this week -revisit later

Agreements:

* Sidelink HARQ ACK/NACK report from UE to gNB is not supported in Rel-16.

Agreements:

* For unicast RX UEs, SL-RSRP is reported to TX UE
* For sidelink open loop power control for unicast for the TX UE, TX UE derives pathloss estimation
	+ Revisit during the WI phase w.r.t. whether or not there is a need regarding how to handle pathloss estimation for OLPC before SL-RSRP is available for a RX UE

Agreements:

* TPC commands for SL PC are not supported

[**R1-1903597**](file:///D%3A%5CStandards%20Docs%5C1.%20WG_RAN1%5CTSGR1_96%5CDocs%5CR1-1903597.zip)

Agreements:

* For sidelink groupcast, it is supported to use TX-RX distance and/or RSRP in deciding whether to send HARQ feedback.
	+ Details to be discussed during WI phase, including whether the information on TX-RX distance is explicitly signaled or implicitly derived, whether/how this operation is related to resource allocation, accuracy of distance and/or RSRP, the aspects related to “and/or”, etc.
	+ This feature can be disabled/enabled

Working assumption:

* For unicast, the following CSI reporting is supported based on non-subband-based aperiodic CSI reporting mechanism assuming no more than 4-port:
	+ CQI
	+ RI
	+ PMI
* CSI reporting can be enabled and disabled by configuration.
	+ It is supported to configure a subset of the above metric for CSI reporting.
* There is no standalone RS transmission dedicated to CSI reporting in Rel-16
* NR sidelink CSI strives to reuse the CSI framework for NR Uu.
	+ Discuss details during WI phase

Agreements:

* RAN1 concludes the following regarding beam management:
	+ Beam management is beneficial
	+ RAN1 has conducted limited study on the beam management.
	+ In FR1, it is feasible to support V2X use cases without beam management.
	+ In FR2, it is feasible to support some V2X use cases without beam management in some scenarios.
		- Panel selection is necessary to improve the communication range in FR2.

**Conclusion:**

* There is no consensus in supporting beam management for normative work for NR V2X in Rel-16.

## Agreements in RAN1#96bis

Agreements**:**

* Polar code adopted for Rel-15 NR DCI is applied to PSCCH.
* LDPC codes used for Rel-15 NR DL-SCH is applied to a transport block delivered by PSSCH.

Agreements**:**

* The starting symbol and the number of symbols for a PSCCH are assumed to be known to the receiving UE before decoding the PSCCH.

Agreements:

* For the purpose of evaluation of PSCCH design, RAN1 assumes 60 bits, 90 bits, 120 bits as the total SCI sizes including 24 bits CRC.
	+ Other sizes are not precluded.

Agreements:

* + QPSK is used for PSCCH.

Working assumption:

* + Transmission of 1 TB with up to 2 layers in a PSSCH is supported.

Agreements:

* At least for transmission perspective of a UE in a carrier, at least TDM between PSCCH/PSSCH and PSFCH is allowed for a PSFCH format for sidelink in a slot.
	+ FFS the details of the corresponding PSFCH format
	+ FFS whether it is also applicable from system/resource pool perspective or not
	+ i.e., in this case, there is no simultaneous transmission of PSCCH and PSFCH and there is no simultaneous transmission of PSSCH and PSFCH.
	+ FFS FDM between PSCCH/PSSCH and a PSFCH format which uses last symbol(s) available for sidelink in a slot
	+ FFS TDM/FDM between PSCCH/PSSCH and other PSFCH format(s), if supported, which is/are different from the PSFCH format which uses last symbol(s) available for sidelink in a slot

## Agreements in RAN1#97

Agreements**:**

* A sequence-based PSFCH format with one symbol (not including AGC training period) is supported.
	+ This is applicable for unicast and groupcast including options 1/2.
	+ Sequence of PUCCH format 0 is the starting point.
	+ FFS: 1 PRB or multiple PRBs is/are used for this PSFCH format
	+ FFS: feasible number of HARQ-ACK bits, mapping of HARQ-ACK bit
* FFS whether to support the following formats
	+ X-symbol PSFCH format with a repetition of the one-symbol PSFCH format (not including AGC training period).
		- E.g. X=2
	+ A PSFCH format based on PUCCH format 2
	+ A PSFCH format spanning all available symbols for sidelink in a slot

Agreements**:**

* Transmission of PSSCH is mapped onto contiguous PRBs only

Agreements:

* Sub-channel size is (pre)configurable.
	+ FFS details (e.g., possible sizes, a minimum size etc.)

**Conclusion:**

* If two-stage SCI is supported, the following details are used.
	+ Information related to channel sensing is carried on 1st-stage.
	+ 2nd-stage is decoded by using PSSCH DMRS.
	+ Polar coding used for PDCCH is applied to 2nd-stage
	+ Payload size for 1st-stage in two-stage SCI case is the same for unicast, groupcast, and broadcast in a resource pool.
	+ After decoding the 1st-stage, the receiver does not need to perform blind decoding of 2nd-stage.
	+ FFS other details
* Companies are encouraged to perform analysis (e.g., flexibility, complexity, forward compatibility, overhead, spec impact, latency, robustness, reliability, etc.)/evaluations with details of the SCI contents comparing single-stage vs. two-stage SCI. Aim to conclude in RAN1#98

Working assumption:

* Rel-15 PDSCH DMRS Configuration type 1 and/or type 2 are reused for frequency-domain pattern of PSSCH DMRS.
	+ FFS whether to support either one or both types
	+ FFS details on multiplexing of different ports for PSSCH DMRS

## Agreements in RAN1#98

Agreements:

* In physical layer perspective, a (pre-)configured resource pool can be used for all of unicast, groupcast, and broadcast for a given UE.
	+ There is no (pre-)configuration to inform which cast types are used for the resource pool.

Agreements:

* (Pre-)configuration of one or more PSSCH DMRS pattern(s) in time domain per a resource pool is supported.
* Exact DMRS pattern is indicated by SCI
	+ FFS details, including whether or not to have the indication bit in case of one (pre)configured DMRS pattern
* For Mode 2, DMRS pattern is chosen by the transmitter UE from the (pre)configured patterns for the resource pool.
	+ FFS: case for Mode 1
	+ FFS: whether/how to use restrictions for choice of DMRS pattern
* FFS on details on time-domain pattern
* FFS the number of possible DMRS patterns
* Note: it is not intended to specify DM-RS based resource pool selection

Agreements**:**

* Support 2-stage SCI
	+ 1st SCI is carried in PSCCH.
	+ FFS: other details

## Agreements in RAN1#98bis

Agreements:

* A slot is the time-domain granularity for resource pool configuration.
	+ To down-select:
		- Alt 1. Slots for a resource pool is (pre-)configured with bitmap, which is applied with periodicity
		- Alt 2. Slots for a resource pool is (pre-)configured, where the slots are applied with periodicity.
	+ FFS: signaling details
	+ FFS: how to apply the above bitmap signaling, e.g., to all slots or only to a set of slots
	+ FFS: symbols for sidelink in the slot, how to indicate for the case when not all symbols are for SL

Agreements:

* Support (pre-)configuration of a resource pool consisting of contiguous PRBs only

Agreements:

* For the number of bits of L1 IDs,
	+ Layer-1 destination ID: 16 bits
	+ Layer-1 source ID: 8 bits

Agreements:

* 256QAM is supported for SL.
	+ Support of 256QAM by a UE is FFS between mandatory vs. based on UE capability from the Rx perspective
	+ Support of 256QAM is based on UE capability from the Tx perspective
	+ 64QAM is mandatory

Agreements:

* Three MCS tables supported in Rel-15 NR Uu CP-OFDM are also used for SL.
	+ Support of the the low-spectral efficiency 64QAM MCS table is an optional UE feature in SL as in the Uu link
* For each resource pool, at least one MCS table is (pre)-configured
	+ FFS whether or not to introduce a case where the MCS table can be overwritten by PC5 RRC or indicated in SCI
* Each resource pool is only configured with one 1st stage SCI PSCCH format

Agreements:

* Rel-15 NR PDCCH DMRS pattern is reused for PSCCH DMRS pattern.
	+ For frequency-domain pattern for PSCCH DMRS, reuse Rel-15 NR PDCCH DMRS, i.e., comb-4 fixed RE mapping for PSCCH DMRS.
	+ (Working assumption) For time-domain pattern for PSCCH DMRS, every symbol of PSCCH has PSCCH DMRS REs.
	+ FFS: how to initialize DMRS sequence generator

Agreements**:**

* PSCCH for 1st stage SCI with 2 and 3 symbols is supported in Rel-16.
	+ FFS: other length(s) of symbols (e.g., all symbols)
	+ The number of symbols above excludes AGC symbols if any
* The number of PSCCH symbols is explicitly (pre-)configured per Tx/Rx resource pool

Agreements:

* Resource mapping of SL CSI-RS is performed by using one SL CSI-RS pattern in an RB, where the possible patterns in an RB are a subset of NR Uu CSI-RS time-frequency/CDM resource mapping patterns in an RB
	+ The subset is to be pre-defined by spec
	+ FFS how the one pattern is determined (but not part of SCI)
	+ FFS which subset

Agreements:

* SL CSI-RS is transmitted by a UE only if:
	+ when the corresponding PSSCH is transmitted (as agreed before) by the UE, and,
	+ when SL CQI/RI reporting is enabled by higher layer signaling, and
	+ when enabled, if the corresponding SCI by the UE triggers the SL CQI/RI reporting

Agreements**:**

* The 2nd stage SCI is carried within the resource of the corresponding PSSCH.
* Scrambling operation for the 2nd stage SCI is applied separately with PSSCH

Agreements:

* Support 1st stage SCI in PSCCH in one subchannel only.
	+ Within one subchannel, there is at most one 1st stage SCI, except for spatial re-use
* For RE mapping of the 2nd stage SCI, frequency-first mapping within the PSSCH is used. To down-select:
	+ Alt 1. The REs for the 2nd SCI are not interlaced with (localized in) PSSCH data RE.
		- Alt 1-1. only RBs in the subchannel having the corresponding 1st stage SCI can be possibly used for mapping the 2nd stage SCI
		- Alt 1-2. only RBs in the all sub-channels for the scheduled PSSCH can be possibly used for mapping the 2nd stage SCI.
	+ Alt 2. The REs for the 2nd stage SCI can be interlaced with (distributed in) PSSCH data RE.
	+ Whether to allow mapping with the same symbol of PSSCH DMRS
* For modulation order of the 2nd stage SCI, to down-select:
	+ Alt 1. Fixed as QPSK
	+ Alt 2. Same as PSSCH
* The same PSSCH DM-RS port(s) is used for transmitting the 2nd stage SCI.
	+ When PSSCH is 2-layer, FFS how to map the 2nd stage SCI modulation symbols to the two layers, to down-select:
		- Alt 1: when PSSCH is 2-layer, the same modulation symbol of the 2nd stage SCI is mapped to the two layers
		- Alt 2: when PSSCH is 2-layer, different modulation symbols of the 2nd stage SCI are mapped to the two layers
		- A combination thereof

Agreements**:**

* Support {10, 15, 20, 25, 50, 75, 100} PRBs for possible sub-channel size.
	+ FFS other values (e.g., 4, 5, 6, etc.)
* One value of the above set is (pre)configured for the sub-channel size for the resource pool.
* Size of PSCCH: X
	+ X ≤ N, where N is the number of PRBs of the subchannel
	+ X is (pre)-configurable with values FFS, X

Note: Huawei considers the above agreements are a mistake

Agreements [98b-NR-09]

* For the agreed sequence-based PSFCH format with one symbol (not including AGC training period),
	+ 1-PRB is used
	+ Only 1 bit can be carried for the case of N = 1, where N denotes the period of slot having PSFCH resource in a resource pool
	+ FFS: for the case of N = 2, 4
* Note: Each company is encouraged to discuss on how to handle AGC issue for the agreed sequence-based PSFCH format with one symbol (not including AGC training period) to decide whether/how to support 2-symbol PSFCH format.

Agreements [98b-NR-10]

* Support that the lowest PRB of a PSCCH is the same as lowest PRB of the corresponding PSSCH.
	+ FFS: Also support that the highest PRB of a PSCCH is the same as highest PRB of the corresponding PSSCH
* For the starting symbol of PSCCH in a slot, 2nd SL symbol in the slot is used.
	+ FFS: which signal/channel(s) is mapped in the 1st SL symbol in the slot. It is not precluded to map certain portion of PSCCH to the 1st SL symbol in a slot.
* FFS: whether/how to support that PSSCH DMRS and PSCCH are mapped in the same OFDM symbol
	+ If RAN1 decides to support mapping PSSCH DMRS and PSCCH in the same OFDM symbol, then this mapping within a single sub-channel is only supported for sub-channel sizes >= 20 PRBs.
		- Note: This might not have specification impact, pending the outcome of other discussions in RAN1#99.
		- Note: This does not imply that PSSCH DMRS and PSCCH are mapped in the same OFDM symbol within the same sub-channel for other cases and within the different sub-channels.

Agreements [98b-NR-11]

For FR2,

* Sidelink PT-RS RE patterns are the same as Rel-15 NR Uu
* Support multiple densities in time and frequency domains, as Uu
	+ The equivalent of *PTRS-UplinkConfig* giving the bandwidth and MCS thresholds for setting the densities is (pre-)configured per resource pool
* RE offset is determined based on a (pre-)configured resourceElementOffset value
* RB offset is down-selected in RAN1#99.
	+ Alt 1. Fixed as 0.
	+ Alt 2. Determined based on L1 destination ID.
	+ Alt 3. Determined based on L1 source ID.
	+ Alt 4. Determined based on CRC of PSCCH.
* Association with one or two of the DMRS port(s) is used, down select in RAN1#99 among:
	+ Alt 1. The number of PT-RS antenna ports is the same as the number of DMRS antenna ports.
	+ Alt 2. The number of PT-RS antenna ports and the association between DM-RS port and PT-RS port are (pre)configured.
	+ Alt 3. One PT-RS port is supported and the PT-RS port is associated with the lowest DMRS port index.
* Sidelink PT-RS are not mapped to 1st stage SCI REs and SL CSI-RS REs.
* Sidelink PTRS symbols are not mapped to PSSCH symbols carrying PSSCH DMRS.
* The Rx UE does not perform blind de-rate matching of 2nd stage SCI REs
	+ FFS Details

## Agreements in RAN1#99

Agreements:

* Regarding the previous agreement that RE mapping of the 2nd stage SCI, frequency-first mapping within the PSSCH is used:
	+ The REs for the 2nd SCI are not interlaced with (localized in) PSSCH data RE.
	+ The 2nd stage SCI is mapped in frequency first with RB granularity, and then mapped in the next symbol(s).
		- The mapping is done by mapping to all RBs in the all sub-channels for the scheduled PSSCH in one symbol first before moving on the next symbol, except possibly the following:
			* FFS whether to allow FDM between the 2nd stage SCI and PSCCH or not
			* FFS whether to allow FDM between the 2nd stage SCI and PSSCH DM-RS REs
* For modulation order of the 2nd stage SCI, QPSK is used.
* FFS the case of standalone SCI (if supported)

Agreements:

* For RE mapping of the 2nd stage SCI, FDM between 2nd stage SCI and PSSCH DMRS in the same symbol is allowed.

Agreements:

* When PSSCH is 2-layer, the same modulation symbol of the 2nd stage SCI is mapped to the two layers.
	+ X(0)(i)=d(0)(i), X(1)(i)=d(0)(i)
	+ Note: it does not mean that precoding cycling is required

Agreements:

* Repetition of PSFCH format 0 (one-symbol PSFCH format agreed in RAN1#97) to two consecutive symbols is used.
	+ This implies that, two consecutive symbols are always used for transmission of PSFCH format 0.
	+ Note: The first symbol can be used for AGC training.

Agreements:

* (working assumption) PSSCH DMRS can be FDMed with PSCCH when the number of PSSCH DMRS symbols is larger than 1.
* In a symbol containing PSSCH DMRS, every RB used for PSSCH contains PSSCH DMRS.
* FFS whether one symbol PSSCH DMRS is supported

Agreements:

* L1 source ID is carried in 2nd SCI.

Agreements:

In the 1st stage SCI, there are [2] reserved bits (for future compability) where a Rel-16 Tx UE shall set the bits to all zeros while a Rel-16 Rx UE does not make any assumption about these bits

* + ~~To down-select:~~
		- ~~Alt 1: Some additional explicit bits (e.g., [2-4] bits) in the 1~~~~st~~ ~~stage SCI to indicate part of L1 destination ID while the remaining is indicated in the 2~~~~nd~~ ~~stage SCI~~
			* ~~This implies that the 16-bit destination ID is not carried in the 1~~~~st~~ ~~stage SCI~~
			* ~~FFS the additional explicit bits can be further (pre)-configured~~
		- ~~Alt 2:~~ all 16-bit L1 destination ID is indicated by 2nd stage SCI
	+ FFS whether or not the number of reserved bits can be further (pre)-configured

Agreements:

* One symbol is used for gap right after PSSCH transmission.
* One symbol is used for gap right after PSFCH transmission.
* FFS more gap symbols are defined in order to handle timing advance for shared carrier for Uu operation.
* FFS whether to additionally support:
	+ For 15/30 kHz SCS,
		- Half symbol is used for gap right after PSSCH transmission.
		- Half symbol is used for gap right after PSFCH transmission.

Agreements

* Resource mapping patterns of Rel-15 NR Uu CSI-RS with 1 or 2 antenna port(s) with only density 1 are used for SL CSI-RS.
	+ This means that Rows 2 and 3 of Table 7.4.1.5.3-1 (TS 38.211) with only density 1 are used for SL CSI-RS.

Agreements

* NR PUSCH DMRS for CP-OFDM sequence is the baseline for PSSCH DMRS sequence at least with the following modification.
	+ n\_SCID is fixed as 0.
	+ n\_ID^{N\_SCID} is determined by the 16-bit LSB of CRC of the corresponding 1st SCI.

Agreements:

* NR CSI-RS sequence is the baseline for SL CSI-RS sequence at least with the following modification.
	+ n\_ID is determined by the 10~~6~~-bit LSB of CRC of the corresponding 1st SCI.

Agreements:

* 1st SCI includes at least
	+ Priority (QoS value),
	+ PSSCH resource assignment (frequency/time resource for PSSCH),
	+ Resource reservation period (if enabled),
	+ PSSCH DMRS pattern (if more than one patterns are (pre-)configured),
	+ 2nd SCI format (e.g. information on the size of 2nd SCI),
	+ [2]-bit information on amount of resources for 2nd SCI (e.g. beta offset or aggregation level)
	+ Number of PSSCH DMRS port(s)
	+ 5-bit MCS
	+ FFS on some part of destination ID

Agreements:

* For Rel-16, (normal CP)
	+ Support 7, 8, 9,…, 14 symbols in a slot without SL-SSB for SL operation
		- Target reusing Uu DM-RS patterns for each of the symbol-length, with modifications as necessary
			* No other additional spec impact is expected for supporting 7, 8, …, 13
			* # of DM-RS symbols
				+ 2, 3, 4
		- For a dedicated carrier, only 14-symbol is mandatory
* There is a single (pre-)configured length of SL symbols in a slot without SL-SSB per SL BWP.
* There is a single (pre-)configured starting symbol for SL in a slot without SL-SSB per SL BWP.

Working assumption:

* The DM-RS patterns on slides 3-10 in [R1-1913576](file:///D%3A%5CStandards%20Docs%5C1.%20WG_RAN1%5CTSGR1_99%5CDocs%5CR1-1913576.zip) are supported
	+ Except the one marked with a red circle on slide 3

[99-NR-05]

Working assumption:

* For 4-symbol DMRS with 12 symbol PSSCH except AGC symbol, no shift is used, like NR Uu.
	+ This means that all the DM-RS patterns on slides 3-10 in R1-1913576 are supported.

Working assumption:

* + Candidate numbers of PRBs for 2-symbol and 3-symbol PSCCH are
		- {10, 12 15, 20, 25}

[99-NR-06]

Agreement:

* For Rel-16 NR sidelink, only wideband precoding is assumed for PSSCH transmission.
	+ Note: This implies that PRG size equal to scheduled PSSCH BW is assumed in Rel-16.
	+ TX UE behavior for wideband precoding cycling is not specified
	+ The number of reserved bits in the 1st stage SCI is configurable
		- [2-4] bits

Agreements:

* + For PSCCH mapping,
		- Frequency-first mapping is used.

Agreements

* + For AGC purposes,
		- 1st SL symbol in a slot is a copy of
			* 2nd SL symbol of the slot.
	+ For the starting symbol of PSSCH in a slot, 2nd SL symbol in the slot is used.

[99-NR-07]

Agreements

* NR PDCCH DMRS sequence is the baseline for PSCCH DMRS sequence at least with the following modification.
* n\_ID is determined by a (pre-)configured value per resource pool
* Frequency-domain OCC is applied, one of the [2 or 3 or 4] OCCs is randomly selected by the Tx UE.
* Note: there is no (pre-)configuration on the number of OCCs.

[99-NR-08]

Agreements

* For determination of the number of coded bits, the determination of coded modulation symbols of HARQ-ACK with UL-SCH in Rel-15 NR is a baseline.
	+ (Working assumption) The number of coded modulation symbols per layer for 2nd SCI is determined as follows.
		- $Q\_{SCI2}^{'}=min\left\{\left⌈\frac{\left(O\_{SCI2}+L\_{SCI2}\right)∙β\_{offset}^{SCI2}∙\sum\_{l=0}^{N\_{symbol}^{PSSCH}-1}M\_{sc}^{SCI2}(l)}{\sum\_{r=0}^{C\_{SL-SCH}-1}K\_{r}}\right⌉, \left⌈α\sum\_{l=0}^{N\_{symbol}^{PSSCH}-1}M\_{sc}^{SCI2}(l)\right⌉\right\}+γ$
			* $O\_{SCI2}$ is the number of the 2nd SCI bits
			* $L\_{SCI2}$ is the number of CRC bits for 2nd SCI, LSCI2 value is FFS
			* $β\_{offset}^{SCI2}$ is indicated by the corresponding 1st SCI.
			* $α$ is (pre-)configured per resource pool.
			* $N\_{symbol}^{PSSCH}$ is the number of allocated symbols for the PSSCH except AGC symbol.
			* $M\_{sc}^{SCI2}(l)$ is the number of REs that can be used for transmission of the 2nd SCI.
			* $γ$ is determined to ensure that there is no remaining RE in the RB having the last coded symbol of the SCI 2 after mapping the SCI2.
			* $K\_{r}$ is the r-th code block size for SL-SCH of the PSSCH transmission.
			* $C\_{SL-SCH}$ is the number of code blocks for SL-SCH of the PSSCH transmission.
* The first symbol that can be used for 2nd SCI mapping is the first PSSCH DMRS symbol.
	+ Note: This symbol is not the symbol for AGC training. However, since the first SL symbol in a slot is a copy of the second SL symbol in the slot, the first SL symbol may have REs for the 2nd SCI.

[99-NR-09]

Agreements

* For NR SL PT-RS, RB offset is determined based on the 16-bit LSB of CRC of the corresponding 1st SCI.
	+ The expressions of NR Uu PT-RS is reused with substituting $n\_{RNTI}$  by $n\_{CRC}$
		- $n\_{CRC}$ is the decimal representation of 16-bit LSB CRC of 1st SCI
* For NR SL PT-RS, association with one or two of the DMRS port(s) is used, where the number of PT-RS antenna ports is the same as the number of DMRS antenna ports and where the association between a PT-RS antenna port and a DMRS antenna port is fixed.

## Agreements in RAN1#100-e

Agreements:

* For sidelink TBS determination, the procedure steps 2), 3), and 4) in 5.1.3.2 Transport block size determination of TS38.214 are reused.

Another proposal to check on 3/4 – update on 3/4, updated proposal, check on 3/5.

Agreements:

For sidelink TBS determination, N\_RE’ and/or N\_RE are calculated based on the procedure step 1) in 5.1.3.2 Transport block size determination of TS38.214 with the following considerations.

n For the number of PSSCH symbols,

u  AGC symbol and GP symbol in the end of slot are excluded.

n PSCCH overhead

u  The exact number of REs for PSCCH (including PSCCH DMRS) is considered

n 2nd SCI overhead

u  FFS: How to consider the 2nd SCI

u  ~~This is not intended to revert the existing agreement on the 2nd SCI mapping~~ FFS: How to handle the relationship between PSSCH TBS determination and 2nd stage SCI modulated symbols determination.

n FFS: how to consider PSFCH, PSSCH DMRS, GP symbols before PSFCH, SL PT-RS, SL CSI-RS

                     u  **FFS:** N\_oh^PRB is introduced or not ~~(pre-)configured per resource pool.~~

~~u  The overhead for SL PT-RS and SL CSI-RS is considered as already included in N\_oh^PRB.~~

~~u  FFS: The number of candidiate values for N\_oh^PRB is 8.~~

nIt is RAN1’s understanding that a UE is not expected to receive a retransmission with a TB size that is different from the last valid TB size signalled for this TB.

    u  Note: The design will be such that the TBS is the same between a transmission and its re-transmission(s).

Email thread is closed.

Agreements:

* For resource pool configuration, slots for a resource pool is (pre-)configured with bitmap, which is applied with periodicity.

Agreements:

For derivation of the set of slots to be included in the resource pool, the baseline is the derivation with bitmap and periodicity based on Subclause 14.1.5 of TS36.213 with the following modifications.

* FFS:  Periodicity and L\_bitmap value
* The slot index is relative to slot#0 of the radio frame corresponding to SFN 0 of the serving cell if serving cell timing reference is in use, or DFN 0 otherwise
* The following procedure is used.
	+ The set includes all the slots except the following slots:
		- Slots in which SLSS resource is configured,
		- ***(Working assumption)*** slots not having at least Y-th, (Y+1)-th, ....., (Y+X-1)-th symbols in a slot semi-statically for UL as indicated in TDD-UL-DL-ConfigCommon, where
			* X is sl-LengthSymbols
			* Y is sl-StartSymbol
		- ***(Working assumption)***  reserved slots which are determined by the similar steps in Subclause 14.1.5 of TS36.213

***Working assumption***

* For the number of PRBs for resource pool, allow configuration of all  number of PRBs in a SL BWP.
* FFS until RAN1#100bis-e whether/how to deal with remaining PRBs if the configured PRBs for resource pool is not a multiple of subchannel size.

Email thread is closed.

Agreements

* For frequency domain DMRS pattern for PSSCH, support only DMRS configuration type 1.
* The "Number of DMRS ports" field in 1st stage SCI indicates DMRS port(s) of PSSCH with one bit.
	+ "0" means to use a port 1000 and "1" means to use tow ports 1000/1001.
* Both PSSCH antenna ports are defined to be CDM group 0.
	+ Note: how to capture this is up to editors.
* PSSCH is rate-matched around PSSCH DMRS REs within a resource block used for transmission of PSSCH
	+ Note: The REs not used for DMRS in the DMRS symbol will be used for PSSCH, PSCCH, or 2nd SCI mapping.

To endorse TP on 3/3.

Update on 3/3 – to check on 3/4 – to further check on 3/5: TP is endorsed (R1-2001400) email thread is closed.

## Agreements in RAN1#100bis-e

Agreements:

For 2nd SCI overhead in the TBS determination, the actual number of REs occupied by the 2nd SCI is used.

Agreements:

* For PSFCH overhead in the TBS determination, use the number of PSFCH symbols indicated by SCI.
* For PSSCH DMRS overhead in the TBS determination, the reference number of REs occupied by PSSCH DMRS is used, where the reference number of REs is the average number of DMRS REs among (pre-)configured patterns.
* For CSI-RS and PT-RS overheads in the TBS determination, a new higher layer parameter, e.g., *sl-xOverhead*, is introduced per resource pool.

Agreements:

* The MCS table is indicated by 1st SCI, the number of MCS tables is (pre-) configured per resource pool.
	+ 64QAM table is (pre-)configured as default.
	+ Zero, one or two additional can be additionally (pre-)configured. Tables
		- Using the 256QAM and/or low-SE MCS tables
	+ The number of bits in the 1st SCI for the indication is determined based on the number of MCS tables (pre)-configured for the resource pool
		- 0, 1, or 2 bits
	+ Over-writing the (pre-)configured MCS table(s) by PC5-RRC is NOT supported
	+ A UE is not required to decode the 2nd SCI or the PSSCH associated with a 1st SCI if the 1st SCI indicates an MCS table that the UE does not support

TP? 4/29? – latest TP is endorsed. (in [R1-2003034](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_100b%5CDocs%5CR1-2003034.zip), revised to R1-2003135).

## Agreements in RAN1#101-e

Agreements:

* For indication of PSFCH overhead in PSSCH TBS determination, one bit is used for N=2 or N=4 while no bit is used for N=0 or N=1.

Agreements:

* For PSSCH TBS determination, the following is used.
	+ N\_RE’ = N\_sc^PRB (N\_symb^sh - N\_symb^PSFCH) - N\_oh^PRB– N\_RE’^DMRS
		- N\_sc^PRB = 12
		- N\_symb^sh: the number of sidelink symbols within the slot, excluding one gap symbol and one first SL symbol (i.e, a total of two symbosls) in a slot
		- N\_symb^PSFCH: 3 if indicated as “1” by SCI for PSFCH overhead, 0 if indicated as “0” by SCI for PSFCH overhead
			* For N=0, N\_symb^PSFCH=0
			* For N=1, N\_symb^PSFCH=3
		- N\_oh^PRB as (pre-)configured by xOverhead
		- N\_RE’^DMRS: the averaged DMRS overhead per PRB in PSSCH resource over a set of DMRS patterns as (pre-)configured for the resource pool by sl-PSSCH-DMRS-TimePattern
			* Discuss further interaction with PSCCH & PSFCH indication (if any)
	+ N\_RE = N\_RE’ \* n\_PRB – N\_RE^SCI1 – N\_RE^SCI2
		- n\_PRB: total number of allocated PRBs for the PSSCH
		- N\_RE^SCI1: total number of REs allocated for the corresponding PSCCH
		- N\_RE^SCI2: total number of REs allocated for 2nd SCI

Agreements:

* The higher layer parameter sl-xOverhead for PSSCH TBS determination is (pre-)configured among {0, 3, 6, 9}.
	+ How to handle the value of 0 as part of the signalling is up to RAN2

Agreements:

* For average DMRS overhead, interaction of PSCCH and PSFCH indication
	+ Alt 1. Consider PSFCH indication: averaged over only possible DMRS patterns as PSFCH indication.
	+ Alt 2. Not consider PSFCH indication: averaged over all (pre-)configured patterns
	+ Alt 2-1. Consider PSCCH resource
	+ Alt 2-2. Not consider PSCCH resource

Take Alt 2 + Alt 2-2 above.

Agreements:

* For the intermediate number of information bits (N\_info) is obtained by N\_info=N\_RE\*R\*Qm\*v, NR sidelink follows the conclusion of [101-e-NR-7.1CRs-11] in RAN1#101-e in calculation of N\_info.

Agreements:

Use N\_RE’^DMRS as below.

|  |  |
| --- | --- |
| sl-PSSCH-DMRS-TimePattern | N\_RE’^DMRS  |
| {2} | 12 |
| {3} | 18 |
| {4} | 24 |
| {2,3} | 15 |
| {2,4} | 18 |
| {3,4} | 21 |
| {2,3,4} | 18 |

Agreements:

The 1st stage SCI indicates the PSFCH overhead for PSSCH TBS determination.

The latest TPs (38.212, 38.214) are endorsed, as in R1-2005018.

Agreements:

* The periodicity of resource pool bitmap is 10240 ms.
* The (pre-)configured length of the bitmap (L\_bitmap) can be one among 10, 11, 12, …, 160.

Agreements:

* The following WA made in RAN1#100-e is confirmed.
	+ For derivation of the set of slots to be included in the resource pool, the set includes all the slots except the following slots:
		- …
		- (Working assumption) reserved slots which are determined by the similar steps in Subclause 14.1.5 of TS36.213

 Agreements:

* Regarding the number of PRBs configured for a resource pool, all PRBs: UE is not expect to use the remaining PRBs (i.e., not large enough for a full subchannel) in Rel-16
* Introduce a single subchannel size {12} PRBs.

The latest TPs (38.211 &38.214) are endorsed, as in R1-2005019

Agreement:

* The CRC length for 2nd SCI is 24 bits.

Agreements:

* Duplication and discontinuous scrambling sequence for 2-layer mapping of the 2nd SCI is fixed in TS38.211 and 212.
	+ How to fix it is up to editors

Agreements:

W.r.t. Qm and beta offset for 2nd SCI mapping

* + Alt 1-1: Qm = 2
	+ Alt 1-2: Qm as indicated by MCS
	+ Alt 2-1: beta offset value range as NR Uu for HARQ-ACK
	+ Alt 2-2: define beta offset value set per Qm

Take {Alt 1-1 + Alt 2-1}

Agreements:

* W.r.t. number of layers for 2nd SCI mapping:
	+ Not using the number of layers in the equation, where Q'\_SCI is defined as "the number of coded modulation symbols generated for 2nd-stage SCI transmission (prior to duplication for the 2nd layer, if present)"

Agreements:

Indication of beta offset in 1st SCI among 4 (pre-)configured values (2 bits)

* The possible values for beta offset refer to the same table as for Uu in Table 9.3-2 of TS38.213
* A UE is configured with a single set of beta values, applicable to both singel-layer and two-layer PSSCH transmissions

Note: Futurewei has strong concerns of adopting a signle set, and believes that two sets provide better performance with minimal RAN2 impact

Agreements:

* Remove M\_sc^CSI-RS(l) in calculation of M\_sc^SCI2(l)

Agreements:

In Rel-16, a UE is not expected to have the number of bits after rate matching for 2nd SCI more than K = [2048 or 4096]

* To down-select one of the above two values in the next meeting

Agreements:

* The mapping for 2nd-stage SCI takes PSFCH overhead indication into account

The latest TPs are endorsed, as in R1-2005020.

**Conclusion:**

RAN1 down-selects one of the following options in RAN1#102.

* Option 1
	+ Gamma of 2nd SCI mapping for TBS determination is based on "really" 2nd SCI RE usage.
	+ The number of overlapped PT-RS and DMRS with 2nd SCI are taken into account for the gamma determination, although non-overlapped PT-RS and DMRS with 2nd SCI are not taken into account.
* Option 2
	+ Gamma of 2nd SCI mapping for TBS determination is assumed to be zero.
	+ The number of overlapped/non-overlapped PT-RS with 2nd SCI are not taken into account for the gamma determination for TBS purpose.
	+ The number of overlapped/non-overlapped DMRS with 2nd SCI are not taken into account for the gamma determination for TBS purpose.

**Agreement:**

**l  Use FBRM for PSSCH mapping.**

**Agreement:**

**l  For DMRS initialization for PSCCH, c\_init = (2^17 \* (N\_symb^slot \* n\_sf^mu + *l* + 1)\*(2\*N\_ID + 1) + 2\*N\_ID) mod 2^31 , where N\_ID in {0, 1, …, 65535} is given by the higher-layer parameter.**

Agreement:

**l  For SL-PT-RS sequence, the same NR Uu CP-OFDM UL PT-RS sequence mechanism is reused.**

* + **`**Note: if there is no agreements made in other email threads, the initialization of the sequence is included as well.
	+ Check offline whether there is an issue w.r.t. the first DM-RS symbol and if so, to address how to resolve it in the TP phase

Agreements

l  c\_init for scrambling initialization of PSCCH is

     - fixed as 1010.

Agreements:

l  c\_init = N\_ID \* X + Y is used for scrambling initialization of 2nd SCI or PSSCH with X and Y, where N\_ID is the decimal representation of 16 bits of the CRC of the 1st SCI associated with the PSSCH

* + X=2^15, Y=1010, 16 bit of the 24-bit CRC (LSB)

**Agreement:**

* A collision between SL-CSI-RS and the corresponding PSCCH is not expected
	+ Note: this implies that such a collision case is a mis-configuration

Agreements:

**-  SL-PT-RS is not mapped to the resources for PSCCH by puncturing SL-PT-RS (i.e., sequence & resource mapping).**

Agreements:

* A TX UE is not expected to transmit a SL CSI-RS in a same symbol with the 2nd SCI or PSSCH DMRS
	+ Note: this implies that it’s an error case if there is such a collision

Working assumption:

* The 2nd SCI is rate-matched around SL-PT-RS

Working assumption:

* The frequency-domain OCC length for PSCCH is {~~2,~~ 3~~, 4~~}
	+ The same LTE requirement and procedure for UE blind decoding (w.r.t. to OCC vs. LTE’s cyclic shifts) for PSCCH applies

Agreements:

 A TX UE is not expected to transmit a SL CSI-RS and a SL PT-RS which overlap

* Note: this implies that it’s an error case if there is such a collision (no puncturing, and the collision is avoided by the Tx UE)
* This imples a Rx UE is not expected to receive a SL CSI-RS and a SL PT-RS which overlap

Update on 6/8: the latest TPs (38.211/212/214) are endorsed, as in R1-2005021.

## Agreements in RAN1#102-e

Agreements:



Agreements:



Agreements:

* When a subchannel size is less than 20 PRBs and the size of PSCCH is less than the subchannel size, a TX UE is not expected to choose a PSSCH DMRS pattern to be transmitted in the same OFDM symbol with PSCCH.

**Conclusion:**

The 2nd SCI can be mapped from the first transmitted PSSCH DMRS symbol.

- No spec change is needed.

The latest TPs for 38.212 and 38.214 are endorsed (as in [R1-2007160](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2007160.zip)).

Agreements:

* The supported max data rate for SL is based on NR’s formula (based on BW, layer..) in Clause 4.1.2 of TS38.306
* The supported max data rate for SL is dependent on UE capability ~~(which is defined either per band or per band combinations or a combination thereof, to be decided by 08/20).~~
	+ Defined per band combinations
* RAN1 further discusses Qm, f, OH values.

Agreements:

* For NR SL, a UE is not expected to receive the MCS code points only indicating the modulation order.

Agreements:

* For max data rate for SL Tx (or Rx), v\_layers is the maximum number of supported layers for SL Tx (or Rx) according to UE capability.

Agreements:

* For max data rate for SL, Qm is determined:
	+ between 64QAM and 256QAM (based on the existing UE capability)

Agreements:

* For max data rate for SL, N\_PRB^BW is the maximum possible RB allocation in bandwidth BW for PSSCH, where BW is the UE supported maximum bandwidth in the given band or band combination.

Agreements:

* For max data rate for SL, OH value is determined as [0.23] for FR1 and [0.25] for FR2.

Agreements:

* In calculation of N^SCI,2\_RE of TBS calculation, gamma is assumed to be zero.

Agreements:

* The scaling factor, f, is determined among {1, 0.8, 0.75, 0.4} for max data rate of SL Tx and Rx, respectively.

Latest draft LS (with simplified description of scaling factor f) is approved (see [R1-2007348](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2007348.zip)), with final LS in [R1-2007353](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2007353.zip).

Agreements:

M^SCI2 = M^PSSCH – M^DMRS – M^PTRS – M^PSCCH (“\_sc” is omitted in each variable) is replaced with M^SCI2 = M^PSSCH– M^PSCCH

- This is applied commonly to TBS determination and actual 2nd SCI mapping.

Summary in [R1-2007161](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_102%5CDocs%5CR1-2007161.zip)

Agreements:

For group and sequence hopping for PSFCH, the following is used.

* u = n\_ID mod 30 and v = 0, where
* n\_ID is given by hoppingID\_PSFCH when (pre-)configured; if not (pre-)configured, n\_ID = 0

Agreements:

For PSFCH sequence generation, m\_int=0 is used.

Agreements:

For the initialization of c(i) for the calculation of n\_cs for PSFCH sequence, the following is used.

- C\_init = hoppingID\_PSFCH when (pre)-configured; if not (pre-)configured, c\_init=0

Agreements:

* The following TP is adopted

## Agreements in RAN1#103-e

Agreements:

For Clause 8.4.1.2 of TS 38.211, the following TP is adopted.

-          r(m) is given by clause 8.4.1.1.1 at the position of ~~a DM-RS symbol~~ the first PSSCH symbol carrying an associated DM-RS.

Second issue 11/3 🡪 made a suggestion 🡪 check 11/4

Draft CR till 11/4 🡪 the 38.211 draft CR is approved. Final CR in [R1-2009662](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_103%5CDocs%5CR1-2009662.zip)(38.211, CR0059)

Agreements:

* Endorse the TP to remove “sidelink CSI-RS”
	+ To be included in editor’s alignment CR

Agreements:

* The latest TPs to 38.213/38.211 as in Proposal 2-1 are endorsed
* No change is needed for time-domain location of PSSCH as discussed in Proposal 2-2
* As in Proposal 2-3:
	+ No change is needed for time-domain location of PSCCH.
	+ For frequency-domain location of PSCCH, the 38.213 TP is endorsed.
* Both the 38.211 draft CR and 38.213 draft CR are approved. Final CRs in [R1-2009663](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_103%5CDocs%5CR1-2009663.zip) (38.211, CR0060) and in [R1-2009674](file:///C%3A%5CUsers%5Cwanshic%5COneDrive%20-%20Qualcomm%5CDocuments%5CStandards%5C3GPP%20Standards%5CMeeting%20Documents%5CTSGR1_103%5CDocs%5CR1-2009674.zip) (38.213, CR0172).

