3GPP TSG RAN WG1 #116bis R1-2403430

Changsha, Hunan Province, China, April 15th – 19th, 2024

Agenda item: 8.5.1

**Source:** Moderator (NTT DOCOMO, INC.)

**Title:**  Summary on UE features for NR sidelink evolution

**Document for:** Discussion and Decision

# Introduction

This document summarizes contributions submitted to AI 8.5.1 regarding UE features for NR sidelink evolution.

According to the updated UE features list agreed in RAN1#116 [13], there are following feature groups for NR sidelink evolution.

* FGs for NR sidelink on unlicensed spectrum
	+ 47-k1 SL channel access for dynamic channel access mode
	+ 47-k2 SL multi-channel access for dynamic channel access mode
	+ 47-k3 Receiving UE to UE COT sharing information
	+ 47-k4 Transmitting UE to UE COT sharing information
	+ 47-k5 Resource allocation for multi-consecutive slots transmission
	+ 47-k6 Type1 LBT blocking Option 1
	+ 47-k7 Type1 LBT blocking Option 2
	+ 47-k8 CW autonomous update for SL transmission without HARQ feedback
	+ 47-k9 Sidelink mode 1 resource allocation in shared spectrum
	+ 47-m1 Interlace RB-based SL transmission/reception
	+ 47-m3 Transmitting PSCCH/PSSCH from 2nd starting symbol in a slot
	+ 47-m4 Receiving PSCCH/PSSCH from 2nd starting symbol in a slot
	+ 47-m5 Multiple PSFCH occasions per PSCCH/PSSCH
	+ 47-m6 Transmitting SSB repetitions within one RB set
	+ 47-m8 Transmitting S-SSB on additional S-SSB occasion(s)
	+ 47-m9 Receiving S-SSB on additional S-SSB occasion(s)
	+ 47-m10 Contiguous RB-based PSCCH/PSSCH transmission
	+ 47-m11 PSFCH transmissions in multiple contiguous RB sets
	+ 47-m11a PSFCH transmissions in multiple non-contiguous RB sets
	+ 47-m12 S-SSB transmissions in multiple contiguous RB sets
	+ 47-m12a S-SSB transmissions in multiple non-contiguous RB sets
	+ 47-m13 Transmissions/receptions of multiple dedicated PRBs in interlace-based PSFCH
* FGs for co-channel coexistence for LTE sidelink and NR sidelink
	+ 47-s1 Transmission/Reception using dynamic resource pool sharing
* FGs for SL CA operation
	+ 47-v1 NR SL communication with SL CA
	+ 47-v2 NR Synchronization for SL CA
	+ 47-v3 PSFCH for SL CA

# FGs for NR sidelink on unlicensed spectrum

In [13], FGs for NR sidelink on unlicensed spectrum are captured as below.

## FG for channel access

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| 47. NR\_SL\_enh2 | 47-k1 | SL channel access for dynamic channel access mode | UE supports1. SL Type 1 channel access and contention window size adjustment2. SL Type 2A channel access3. SL Type 2B channel access4. SL Type 2C channel access5. 20MHz LBT bandwidth6. CP extension up to 1 symbol in 15kHz SCS if the UE supports 15 kHz SCS7. CP extension up to 2 symbols in 30kHz SCS8. CP extension up to 2 symbols if the UE supports 60kHz SCS | At least one of {15-25, 15-3, [32-4, 32-4a]} | Yes | No | UE does not support channel access for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Component 8 is applicable in regions without OCB requirements.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR SL in shared spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported |
| 47. NR\_SL\_enh2 | 47- k2 | SL multi-channel access for dynamic channel access mode | 1. UE supports multi-channel access procedures for PSCCH/PSSCH/S-SSB/PSFCH transmission(s) in multiple RB sets in a slot2. UE supports Type A and Type B multi-channel access procedures for PSFCH transmissions in multiple RB sets in a slot4) UE supports multi-channel access procedure on N channel(s) with 20MHz LBT bandwidth for each channel. Candidate values of N: {2, 3, 4, 5} | 47-k1 | Yes | [No] | UE does not support multi-channel access in dynamic channel access mode for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Support of S-SSB/PSFCH transmission(s) in multiple RB-sets in a slot is according to the support of {47-m11, 47-m11a} and {47-m12, 47-m12a} | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116bis meeting.

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| [1] | HW/HiSi | The brackets of prerequisites can be removed because SL channel access is also applicable to partial sensing and random selection.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k1 | SL channel access for dynamic channel access mode | UE supports1. SL Type 1 channel access and contention window size adjustment2. SL Type 2A channel access3. SL Type 2B channel access4. SL Type 2C channel access5. 20MHz LBT bandwidth6. CP extension up to 1 symbol in 15kHz SCS if the UE supports 15 kHz SCS7. CP extension up to 2 symbols in 30kHz SCS8. CP extension up to 2 symbols if the UE supports 60kHz SCS | At least one of {15-25, 15-3, ~~[~~32-4, 32-4a~~]~~} | Yes | No | UE does not support channel access for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Component 8 is applicable in regions without OCB requirements.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR SL in shared spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported |

FG 47-k2 is not limited to unicast so it should not depend on exchange between UEs. The bracket for “No” should be removed.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k2 | SL multi-channel access for dynamic channel access mode | 1. UE supports multi-channel access procedures for PSCCH/PSSCH/S-SSB/PSFCH transmission(s) in multiple RB sets in a slot2. UE supports Type A and Type B multi-channel access procedures for PSFCH transmissions in multiple RB sets in a slot4) UE supports multi-channel access procedure on N channel(s) with 20MHz LBT bandwidth for each channel. Candidate values of N: {2, 3, 4, 5} | 47-k1 | Yes | ~~[~~No~~]~~ | UE does not support multi-channel access in dynamic channel access mode for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Support of S-SSB/PSFCH transmission(s) in multiple RB-sets in a slot is according to the support of {47-m11, 47-m11a} and {47-m12, 47-m12a} | Optional with capability signalling |

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| [2] | vivo | The other remaining issues are the UE FG reporting to network/UE. Firstly, it seems worthwhile to clarify that a UE FG can be exchanged between UEs does not mean or restrict that this FG can only be used in unicast. For example, in Rel-17 a UE FG “***drx-OnSidelink-r17***” is introduced to indicate whether a UE supports sidelink DRX, which is defined as below:

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| drx-OnSidelink-r17Indicates whether UE supports sidelink DRX for unicast, groupcast and broadcast. | UE | No | No | No |

It is obvious that this FG is applicable for all the cast types. Moreover, this FG should be reported to the network, and exchanged between UEs to indicate the support of DRX capability, as defined in TS 38.306:

|  |
| --- |
| 38.306…omitted…Annex A.4 specifies for each sidelink related capability, in which interface (i.e., *UECapabilityInformation* in Uu RRC and *UECapabilityInformation*Sidelink in PC5 RRC) a UE supporting sidelink shall report the concerned capability:-   *UECapabilityInformation*: the concerned sidelink capability is reported within *UECapabilityInformation*;-   UECapabilityInformationSidelink: the concerned sidelink capability is reported within UECapabilityInformationSidelink;…omitted… |

|  |  |  |
| --- | --- | --- |
| Sidelink Parameter | UECapabilityInformation | UECapabilityInformationSidelink |
| drx-OnSidelink | X | X |

Thus, it should be clear that a UE FG that is applicable to the capability exchanging between UEs does not mean that this FG is only applicable to unicast. Regarding the agreed UE FGs, in our view, FG 47-k2, 47-k3, 47-k4, 47-m4, 47-m11, and 47-m11a, should be reported to peer UE.For the multi-channel access case, a UE should be aware of whether the peer UE supports multiple RB sets (and multi-channel access), especially for PSFCH, so that it transmits a TB over multiple RB sets and is expected to correctly receive the PSFCH that may span multiple channels. If the target UE does not support FG 47-k2, the Tx UE should avoid reserving and transmitting multiple TBs on multiple RB sets to that UE, otherwise, some or all the PSFCHs may be dropped.For the COT sharing case, the UE-A should be aware that the peer UE-B is capable of receiving COT SI, so that it may determine to share the COT to the peer UE. Otherwise, the UE-A can simply not share the COT, or share the COT with another UE-C that supports sharing the COT.Similarly, regarding the 47-m4, a UE should be aware that the peer UE is capable of receiving SL transmission from the 2nd starting symbol in a slot, so that it may determine to transmit the TB to that UE from the 2nd starting symbol when LBT failed in the 1st starting symbol but succeeded before the 2nd starting symbol.Proposal 8: The UE FG 47-k2, 47-k3, 47-k4, 47-m4, 47-m11, and 47-m11a should be reported to peer UE.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k2 | SL multi-channel access for dynamic channel access mode | 1. UE supports multi-channel access procedures for PSCCH/PSSCH/S-SSB/PSFCH transmission(s) in multiple RB sets in a slot2. UE supports Type A and Type B multi-channel access procedures for PSFCH transmissions in multiple RB sets in a slot4) UE supports multi-channel access procedure on N channel(s) with 20MHz LBT bandwidth for each channel. Candidate values of N: {2, 3, 4, 5} | 47-k1 | Yes | ~~[No]~~ Yes | UE does not support multi-channel access in dynamic channel access mode for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Support of S-SSB/PSFCH transmission(s) in multiple RB-sets in a slot is according to the support of {47-m11, 47-m11a} and {47-m12, 47-m12a} | Optional with capability signalling |

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| [3] | FLs |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k1 | SL channel access for dynamic channel access mode | UE supports1. SL Type 1 channel access and contention window size adjustment2. SL Type 2A channel access3. SL Type 2B channel access4. SL Type 2C channel access5. 20MHz LBT bandwidth6. CP extension up to 1 symbol in 15kHz SCS if the UE supports 15 kHz SCS7. CP extension up to 2 symbols in 30kHz SCS8. CP extension up to 2 symbols if the UE supports 60kHz SCS9. SL Type 1 and Type 2 channel access for multiple starting positions in a slot | At least one of {15-25, 15-3, [32-4, 32-4a]} | Yes | No | UE does not support channel access for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Component 8 is applicable in regions without OCB requirements.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR SL in shared spectrum when shared spectrum channel access must be used, UE must indicate this FG is supported |
| 47. NR\_SL\_enh2 | 47- k2 | SL multi-channel access for dynamic channel access mode | 1. UE supports multi-channel access procedures for PSCCH/PSSCH/S-SSB/PSFCH transmission(s) in multiple RB sets in a slot2. UE supports Type A and Type B multi-channel access procedures for PSFCH or S-SSB transmissions in multiple RB sets in a slot4) UE supports multi-channel access procedure on N channel(s) with 20MHz LBT bandwidth for each channel. Candidate values of N: {2, 3, 4, 5} | 47-k1 | Yes | ~~[No]~~ Yes | UE does not support multi-channel access in dynamic channel access mode for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Support of S-SSB/PSFCH transmission(s) in multiple RB-sets in a slot is according to the support of {47-m11, 47-m11a} and {47-m12, 47-m12a} | Optional with capability signalling |

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| [4] | CATT/CICTCI | Regarding FG47-k1, since the SL channel access will be used for all the SL resource allocation modes, we prefer to remove the bracket of the prerequisites for 32-4 and 32-4a.Regarding FG47-k2, considering that multiple channel access can be used for broadcast/groupcast/unicast, we prefer to keep No for the column of “Applicable to the capability signalling exchange between UEs”. If companies want to optimize unicast, one alternative could be added another new FG for unicast only. Regarding the component 2) of FG47-k2(Type A and Type B multi-channel procedures), there are potential cases that only subset of target RB sets will be LBT successful, it will introduce additional UE complexity to prepare multiple waveforms based on multiple hypotheses of LBT success. From this point of view, it is preferred to make component 2) as a separate FG. Additionally, it has been agreed in RAN1#115 meeting that Type A and Type B multiple channel access are support for S-SSB transmission. Proposal 5: For FG47-k1, it is preferred to remove the bracket of 32-4 and 32-4a on prerequisites column.Proposal 6: For FG47-k2, * “Applicable to the capability signalling exchange between UEs” is No.
* Remove the component 2) in FG47-k2.
* Component 2) is separated to a new FG, which additionally includes Type A and Type B multiple channel access for S-SSB transmission.
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| [5] | Samsung | For 47-k2, we do not see the need for a UE to signal this to a neighboring UE and thus we suggest to remove the brackets around the [No]. The reason is that this information will not necessarily be used for the COT sharing decision. Proposal 1: For 47-k2,* This feature is not applicable to capability signaling exchange between UEs.
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| [6] | Nokia |

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| 47. NR\_SL\_enh2 | 47-k1 | SL channel access for dynamic channel access mode | UE supports1. SL Type 1 channel access and contention window size adjustment2. SL Type 2A channel access3. SL Type 2B channel access4. SL Type 2C channel access5. 20MHz LBT bandwidth6. CP extension up to 1 symbol in 15kHz SCS if the UE supports 15 kHz SCS7. CP extension up to 2 symbols in 30kHz SCS8. CP extension up to 2 symbols if the UE supports 60kHz SCS | At least one of {15-25, 15-3, 32-4, 32-4a} | Yes | No | UE does not support channel access for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Component 8 is applicable in regions without OCB requirements.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR SL in shared spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported |
| 47. NR\_SL\_enh2 | 47- k2 | SL multi-channel access for dynamic channel access mode | 1. UE supports multi-channel access procedures for PSCCH/PSSCH/S-SSB/PSFCH transmission(s) in multiple RB sets in a slot2. UE supports Type A and Type B multi-channel access procedures for PSFCH transmissions in multiple RB sets in a slot4) UE supports multi-channel access procedure on N channel(s) with 20MHz LBT bandwidth for each channel. Candidate values of N: {2, 3, 4, 5} | 47-k1 | Yes | No | UE does not support multi-channel access in dynamic channel access mode for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Support of S-SSB/PSFCH transmission(s) in multiple RB-sets in a slot is according to the support of {47-m11, 47-m11a} and {47-m12, 47-m12a} | Optional with capability signalling |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips |  |
| [9] | Apple | For FG 47-k1, type 1 and type 2A/2B/2C channel access are used with mode 1 and mode 2 resource selection procedure. Therefore the “prerequisite feature groups” should include either mode 1 or mode 2 with full sensing, partial sensing, or random selection. **Proposal 2:** For FG 47-k1, the prerequisite feature groups include at least one of the 15-25, 15-3, 32-4 and 32-4a.  |
| [10] | QC |

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| 47. NR\_SL\_enh2 | 47-k1 | SL channel access for dynamic channel access mode | UE supports1. SL Type 1 channel access and contention window size adjustment2. SL Type 2A channel access3. SL Type 2B channel access4. SL Type 2C channel access5. 20MHz LBT bandwidth6. CP extension up to 1 symbol in 15kHz SCS if the UE supports 15 kHz SCS7. CP extension up to 2 symbols in 30kHz SCS8. CP extension up to 2 symbols if the UE supports 60kHz SCS | At least one of {15-25, 15-3, 32-4, 32-4a} | Yes | No | UE does not support channel access for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Component 8 is applicable in regions without OCB requirements.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR SL in shared spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported |
| 47. NR\_SL\_enh2 | 47- k2 | SL multi-channel access for dynamic channel access mode | 1. UE supports multi-channel access procedures for PSCCH/PSSCH/S-SSB/PSFCH transmission(s) in multiple RB sets in a slot2. UE supports Type A and Type B multi-channel access procedures for PSFCH/S-SSB transmissions in multiple RB sets in a slot4) UE supports multi-channel access procedure on N channel(s) with 20MHz LBT bandwidth for each channel. Candidate values of N: {2, 3, 4, 5} | 47-k1 | Yes | No | UE does not support multi-channel access in dynamic channel access mode for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Support of S-SSB/PSFCH transmission(s) in multiple RB-sets in a slot is according to the support of {47-m11, 47-m11a} and {47-m12, 47-m12a} | Optional with capability signalling |

Multi-channel access based on NR-U DL procedures (partial transmissions allowed in procedure for Type A and Type B are specified in TS 37.213) is supported for PSFCH and S-SSB. If no additional UE features are specified, one interpretation could be that all UEs need to support the following for PSFCH waveform preparation, that is undesirable:* Preparing multiple waveforms for transmission on a subset of the target set of RB sets based on multiple hypotheses of LBT success (for minimal capability of 4 PSFCH in one slot, if these are spread on 4 RB sets, it requires 15 hypotheses for waveforms).
* Preparing waveforms spanning non-contiguous RB sets.

Transmitting a subset of a broader set of RB sets based on the outcome of channel access on individual RB sets ($20 MHz channel$) might require a new UE feature. Transmitting on a non-contiguous set of RB sets might require a new UE feature.Proposal 2: UE features for SL-U (FG 47-k2bis) for transmitting on a subset of the intended number of RB sets based on the outcome of channel access on individual RB sets are defined per band. Proposal 3: UE features for SL-U (FG 47-m10) include a new component for contiguous RB-based PSCCH/PSSCH reception. Proposal 4: UE features for SL-U (FG 47-m10bis) for contiguous RB-based PSFCH transmission/reception are defined per band.

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| 47. NR\_SL\_enh2 | 47-k2bis | Transmission of PSFCHs or S-SSBs on a subset of the target set of RB sets based on channel access outcome | 1. UE supports transmitting different PSFCHs or S-SSBs on a subset of the RB sets on which Type A or Type B channel access is performed based on the channel access outcome on each RB set.  | 47-k1, 47-k2 | No | No | UE only support transmitting on all the RB sets according to a multi-channel access procedure. |  | n/a | n/a |  | The FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

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| [11] | DCM | For pre-requisite, whether 32-4 (mode 2 RA with partial sensing) / 32-4a (mode 2 RA with random selection) are necessary as well as 15-25 (mode 1 RA based on different Uu carrier) and 15-3 (mode 2 RA with full sensing) is the remaining issue. Based on SL-U discussion so far, there seems to be no intention to preclude partial sensing and random selection from SL-U, therefore, these FGs should also be kept here.Proposal 1: Update FG 47-k1.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k1 | SL channel access for dynamic channel access mode | UE supports1. SL Type 1 channel access and contention window size adjustment2. SL Type 2A channel access3. SL Type 2B channel access4. SL Type 2C channel access5. 20MHz LBT bandwidth6. CP extension up to 1 symbol in 15kHz SCS if the UE supports 15 kHz SCS7. CP extension up to 2 symbols in 30kHz SCS8. CP extension up to 2 symbols if the UE supports 60kHz SCS | At least one of {15-25, 15-3, ~~[~~32-4, 32-4a~~]~~} | Yes | No | UE does not support channel access for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Component 8 is applicable in regions without OCB requirements.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR SL in unlicensed spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported |

For report to UE, ‘No’ would be OK; we do not see any motivation to report this FG to other UEs.Proposal 2: Update FG 47-k2 as follows.

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| 47. NR\_SL\_enh2 | 47- k2 | SL multi-channel access for dynamic channel access mode | 1. UE supports multi-channel access procedures for PSCCH/PSSCH/S-SSB/PSFCH transmission(s) in multiple RB sets in a slot2. UE supports Type A and Type B multi-channel access procedures for PSFCH transmissions in multiple RB sets in a slot4) UE supports multi-channel access procedure on N channel(s) with 20MHz LBT bandwidth for each channel. Candidate values of N: {2, 3, 4, 5} | 47-k1 | Yes | ~~[~~No~~]~~ | UE does not support multi-channel access in dynamic channel access mode for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: Support of S-SSB/PSFCH transmission(s) in multiple RB-sets in a slot is according to the support of {47-m11, 47-m11a} and {47-m12, 47-m12a} | Optional with capability signalling |

 |
| [12] | Sharp |  |

### Proposal 2.1-1:

* Prerequisite FG of FG47-k1 is “32-4, 32-4a”
* Add a new component “9. SL Type 1 and Type 2 channel access for multiple starting positions in a slot” to FG47-k1

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| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-k1
	+ Prerequisite
		- YES for 32-4/32-4a: HW, Nokia, Apple, CATT, QC, DCM
	+ Others
		- Add a new component “9. SL Type 1 and Type 2 channel access for multiple starting positions in a slot”: FLs
 |
| vivo | Not support.First bullet:1. As commented before, 32-4 is per FG 32-4 is defined per-FS, while the candidate inherited FG is per band, which does not follow the RAN2’s guidelines

Avoid defining capabilities with pre-requisite on a finer granularity1. Technically we don’t understand why it is critical to break the RAN2’s guideline here. Even if 32-4 is removed, it does not prevent the UE to support partial sensing. On the other hand, given the current formulation (at least one of {…}), including the 32-4 here does not impose UE to support FG 32-4.

Second bullet:1. This change makes the multiple starting symbol positions feature to be the basic FG. We don’t this feature should be mandatory.
 |
| DCM | OK for prerequisite.NO for new component. |
| CATT, CICTCI | We support the first bullet.Regarding to the second bullet on channel access for multiple starting position, it seems unnecessary, since the 2nd starting symbol has been defined as a FG.  |
| QC | Prerequisite: OK to AVOID as per Vivo’s commentAdditional component: NO |
| Huawei, HiSilicon | Ok for prerequisite.No need to introduce new component. |

### (H) Proposal 2.1-2:

* “Applicable to the capability signalling exchange between UEs” for FG47-k2 is No
* Add “S-SSB” to component 2
* Introduce separate capability for transmitting PSFCH/S-SSB on a subset of the intended number of RB sets based on the outcome of channel access on individual RB sets

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-k2
	+ Report to other UE
		- YES: vivo (mainly for PSFCH), FLs
		- NO: HW, CATT, SS, Nokia, QC, DCM
	+ Others
		- Add “S-SSB” to component 2: FLs, CATT, QC
		- Separate capability for transmitting PSFCH/S-SSB on a subset of the intended number of RB sets based on the outcome of channel access on individual RB sets: QC, [CATT]
 |
| vivo | Not support the first bullet. We provide the reason and use case why this reporting is important.For the multi-channel access case, a UE should be aware of whether the peer UE supports multiple RB sets (and multi-channel access), especially for PSFCH, so that it transmits a TB over multiple RB sets and is expected to correctly receive the PSFCH that may span multiple channels. If the target UE does not support FG 47-k2, the Tx UE should avoid reserving and transmitting multiple TBs on multiple RB sets to that UE, otherwise, some or all the PSFCHs may be dropped.Moreover, we are not sure on the comments related to broadcast and groupcast. A FG is applicable to be exchanged between UEs does not prevent this FG to be applied to broadcast/groupcast, as we show in our tDoc. If companies believe this is wrong, would companies provide the evidence? |
| DCM | OK for the first 2 bullets.We are open to discuss the third bullet. |
| CATT, CICTCI | We agree the proposal except the last bullet. From our understanding, it is better to remove the component 2 from the FG47-k2, and make it as a separate FG. Only type A and type B multiple channel access procedure will lead to subset of intended RB sets.  |
| ZTE | The proposal is OK to us. |
| QC | First bullet: Better to check for a common understanding on implications of UEtoUE capability signaling since some companies think that this would limit use of feature for unicast only, while others think that this limitation does not exist. Second bullet: YesThird bullet: Yes, we are open to harmonize with CATT (e.g. separate FG with additional component) |
| Huawei, HiSilicon | Seeing Vivo/QC’s comments, we feel it’s better to reach common understanding about the meaning of Yes/No for “Applicable to the capability signalling exchange between UEs”.We suggest to discuss following proposal first and down-select one Alt, then RAN1 can discuss Yes/No for “Applicable to the capability signalling exchange between UEs”.**Proposal: Regarding “Applicable to the capability signalling exchange between UEs”, it is RAN1 understanding that the meaning of “Yes” means following (down-select one):*** **Alt1 (unicast only): “Yes” means this FG is applicable to unicast only, since only unicast has PC5-RRC and can exchange this info.**
* **Alt2 (all cast types): “Yes” means this FG will be signaled in PC5-RRC in case of unicast. It does not limit the applicable cast type of this FG, i.e., this feature can still be used in groupcast and broadcast.**
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## FG for UE to UE COT sharing

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| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | [No] | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | [Optional with capability signalling][For UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported] |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | No | [No] | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| [1] | HW/HiSi | The columns with yellow highlights for FG 47-k3 can be updated as below:* Since the COT sharing operation is performed by UE, there is no need to report the FG to gNB.
* COT sharing is not limited to unicast and FG 47-k3 is a basic FG (see below), so it should not depend on exchange between UEs. Exchange between UEs should be “No”.
* Since it is unnecessary to report to gNB and exchange between UEs, FG 47-k3 is optional without capability signalling.
* There is no agreement to limit COT sharing to unicast only, so that receiving COT sharing information should be a basic FG. Otherwise, Tx UE is uncertain whether Rx UE is able to decode COT sharing information and may only send COT sharing information after capability exchange via PC5 RRC, which is only possible in unicast.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | ~~[~~No~~]~~ | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | ~~[~~Optional without capability signalling~~]~~~~[~~For UE supports NR SL in shared spectrum ~~where~~ and when shared spectrum channel access must be used, UE must indicate this FG is supported~~]~~ |

The columns with yellow highlights for FG 47-k4 can be updated as below:* Similar to the analysis of FG 47-k3, other highlighted parts are reasonable and can be confirmed.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | No | ~~[~~No~~]~~ | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

 |
| [2] | vivo | The other remaining issues are the UE FG reporting to network/UE. Firstly, it seems worthwhile to clarify that a UE FG can be exchanged between UEs does not mean or restrict that this FG can only be used in unicast. For example, in Rel-17 a UE FG “***drx-OnSidelink-r17***” is introduced to indicate whether a UE supports sidelink DRX, which is defined as below:

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| drx-OnSidelink-r17Indicates whether UE supports sidelink DRX for unicast, groupcast and broadcast. | UE | No | No | No |

It is obvious that this FG is applicable for all the cast types. Moreover, this FG should be reported to the network, and exchanged between UEs to indicate the support of DRX capability, as defined in TS 38.306:

|  |
| --- |
| 38.306…omitted…Annex A.4 specifies for each sidelink related capability, in which interface (i.e., *UECapabilityInformation* in Uu RRC and *UECapabilityInformation*Sidelink in PC5 RRC) a UE supporting sidelink shall report the concerned capability:-   *UECapabilityInformation*: the concerned sidelink capability is reported within *UECapabilityInformation*;-   UECapabilityInformationSidelink: the concerned sidelink capability is reported within UECapabilityInformationSidelink;…omitted… |

|  |  |  |
| --- | --- | --- |
| Sidelink Parameter | UECapabilityInformation | UECapabilityInformationSidelink |
| drx-OnSidelink | X | X |

Thus, it should be clear that a UE FG that is applicable to the capability exchanging between UEs does not mean that this FG is only applicable to unicast. Regarding the agreed UE FGs, in our view, FG 47-k2, 47-k3, 47-k4, 47-m4, 47-m11, and 47-m11a, should be reported to peer UE.For the multi-channel access case, a UE should be aware of whether the peer UE supports multiple RB sets (and multi-channel access), especially for PSFCH, so that it transmits a TB over multiple RB sets and is expected to correctly receive the PSFCH that may span multiple channels. If the target UE does not support FG 47-k2, the Tx UE should avoid reserving and transmitting multiple TBs on multiple RB sets to that UE, otherwise, some or all the PSFCHs may be dropped.For the COT sharing case, the UE-A should be aware that the peer UE-B is capable of receiving COT SI, so that it may determine to share the COT to the peer UE. Otherwise, the UE-A can simply not share the COT, or share the COT with another UE-C that supports sharing the COT.Similarly, regarding the 47-m4, a UE should be aware that the peer UE is capable of receiving SL transmission from the 2nd starting symbol in a slot, so that it may determine to transmit the TB to that UE from the 2nd starting symbol when LBT failed in the 1st starting symbol but succeeded before the 2nd starting symbol.Proposal 8: The UE FG 47-k2, 47-k3, 47-k4, 47-m4, 47-m11, and 47-m11a should be reported to peer UE.On the other hand, in our view, FG 47-k3, 47-k4, 47-k9 (obviously), 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the network for mode-1 scheduling. For the COT sharing case (i.e., 47-k3/k4), the gNB needs to know whether the two SL UEs support UE to UE COT sharing. Only when they support, the gNB can schedule two SL transmissions of these two UEs in a back-to-back manner in the unlicensed band, otherwise, the second SL transmission would always be dropped due to LBT failure if the first SL transmission occupied the channel. If these FGs are not reported to gNB, mode-1 scheduling would be very inefficient. The FG 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the gNB for proper S-SSB and PSFCH configurations.Proposal 9: The UE FG 47-k3, 47-k4, 47-k9, 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the network.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | ~~[No]~~ Yes | ~~[No]~~ Yes | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | [Optional with capability signalling][For UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported] |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | ~~[No]~~ Yes | ~~[No]~~ Yes | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [3] | FLs |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | ~~[No]~~ Yes | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | ~~[~~Optional with capability signalling~~]~~~~[~~For UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported~~]~~ |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | No | ~~[No]~~ Yes | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

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| [4] | CATT/CICTCI | For FG47-k3, considering that COT sharing can be used for broadcast/groupcast/unicast, the column of “Applicable to the capability signalling exchange between UEs” should be “No”. If this FG is not a basic feature, the COT sharing UE will not know whether its target UEs can receive the COT-SI or not, this will largely deteriorate the COT sharing performance, then it would be better to make FG47-k3 as basic FG.For both FG47-k3 and FG47-k4, considering the application scenario for broadcast/groupcast/unicast, “Applicable to the capability signalling exchange between UEs” is No. Regarding the column of “Need for the gNB to know if the feature is supported”, it preferred to keep No, since the COT sharing operation is performed by UE. Proposal 7: FG47-k3 is preferred to be a basic feature, and FG47-k4 is optional feature.Proposal 8: On “Need for the gNB to know if the feature is supported” column, both FG47-k3 and 47-k4 are preferred to be No.Proposal 9: On “Applicable to the capability signalling exchange between UEs” column, both FG47-k3 and 47-k4 are preferred to be No. |
| [5] | Samsung | FG 47-k3For feature 47-k3, one aspect to decide is whether a UE needs to notify neighboring UEs. However, if this feature is a basic FG, this simplifies the definition and the other UEs do not need to know this capability when performing COT sharing, thus simplifying PC5 signaling. For this reason, we prefer having 47-k3 as basic FG and remove the brackets around the notifying other UEs. Proposal 2: adopt 47-k3 as below and as basic FG

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | ~~[~~No~~]~~ | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | ~~[~~Optional with capability signalling~~]~~~~[~~For UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported~~]~~ |

 |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | No | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signallingFor UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | No | No | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips | Regarding FG 47- k3 and 47- k4 after RAN1#116, our views on the pending issues are as follows:1, The need for the gNB to know if the feature is supported: Since COT sharing operation is performed by Tx/Rx UE, there is no need to report the FGs to gNB.2, The capability signalling exchange between UEs: Considering COT sharing operation is helpful for broadcast, groupcast and unicast and should be applicable for all cast types, so there is no requirement for exchanging such FGs between UEs.3, Mandatory/Optional: For the receiving side, as FG 47- k3, UE to UE COT sharing information clearly helps it to increase the success rate of channel access, so for UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported. While for the transmitting side, as FG 47- k4, whether to transmit UE to UE COT sharing information to help others can be left to UE implementation.Based on above analysis, FG 47- k3 and FG 47- k4 should be updated as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | No | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signallingFor UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | No | No | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

 |
| [9] | Apple | COT sharing is an optional feature for sidelink transmission. Monitoring of SCI to read COT sharing information and transmitting in shared COT is optional. UE can always transmit on its own initiated COT. **Proposal 1:** FG47-k3 is optional with capability signaling, not the basic feature group.  |
| [10] | QC |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | No | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. |  | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | No | No | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. |  | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

 |
| [11] | DCM | Our view on FG 47-k3 is that this FG should also be a basic FG with the same description as in FG 47-k1. UE-to-UE COT sharing is a fundamental feature and if some UEs do not support this feature, COT initiating UE’s behaviors such as COT sharing for PSFCH TX or Type 1 LBT blocking Option 2 do not work well.For report to UE, if this FG is a basic FG in the specific scenarios, it can be ‘NO’; otherwise, ‘report to UE’ seems to be necessary for efficient UE-to-UE COT sharing in UC (while GC/BC is not the case due to ‘optional’).Proposal 3: Update FG 47-k3 as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | ~~[~~No~~]~~ | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | ~~[~~Optional without capability signalling~~]~~~~[~~For UE supports NR SL in unlicensed spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported~~]~~ |

For report to gNB/UE, both can be ‘NO’. No motivation to report this FG to gNB/UE can be found. For gNB scheduler, whether to share COT to other UE is up to COT initiating UE, which means that SL scheduling for multiple UEs assuming COT sharing may not work well. Based on this perspective, report to gNB would be meaningless. For other UE, no specific behavior corresponding to support of this FG is specified, and non-specified behavior performed by UE implementation will not be allowed.For mandatory/optional, this behavior is a fundamental one for efficient resource usage in SL-U. The same text as in FG 47-k1 is preferred.Proposal 4: Update FG 47-k4 as follows.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | No | ~~[~~No] | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signallingFor UE supports NR SL in unlicensed spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported |

 |
| [12] | Sharp | A controversial point as discussed in last RAN1#116 meeting is whether to treat the FGs 47-k3 and/or 47-k4 as basic FGs or not. Although supporting UL-to-DL COT sharing is not a basic FG in NR-U where only unicast PUSCH is supported, SL COT sharing is able to support transmitting a groupcast or broadcast PSCCH/PSSCH transmission carrying COT sharing information. In Rel-16, support of groupcast and broadcast are mandatory for all SL UEs, and it is therefore better for TX UE to consider that all associated RX UEs are capable of receiving the COT sharing information. Likewise, FG 47-k4 should also be considered as a basic FG. Otherwise, RX UE may misinterpret the value of the reserved bit in SCI format 1-A which yields to the complexity burden on decoding 2nd stage SCI. Therefore, we prefer to support both FGs 47-3 and 47-4 as basic FGs for SL-U. Regarding the need for the gNB to know if the feature is supported, it seems not necessary for gNB to know whether a UE is capable of indicating or receiving the COT sharing information if both FGs 47-3 and 47-4 are supported as basic FGs. Consequently, inter-UE block issue would not happen even if consecutive slots were allocated to different UEs for transmission.For the column of “applicable to the capability signalling exchange between UEs”, considering the functionality of the UE-to-UE COT sharing also supports broadcast and groupcast where no capability signalling exchange would be performed for broadcast and groupcast, it is better to support no capability signalling exchange between UEs in FGs 47-k3 and 47-k4.Proposal 1: FG 47-k3 can be updated with following:* Remove yellow highlight from the column of “Need for the gNB to know if the feature is supported”.
* Remove brackets of [No] from the column of “applicable to the capability signaling exchange between UEs”.
* FGs 47-k3 is considered as optional without capability signaling and basic FGs.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47- k3 | Receiving UE to UE COT sharing information | 1. UE supports monitoring SCI to read COT sharing information2. UE supports transmitting NR SL based on COT sharing information subject to COT sharing conditions | 47-k1 | No | ~~[~~No~~]~~ | UE does not support using UE-to-UE COT sharing information contained in SCI for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | ~~[~~Optional without capability signalling~~]~~~~[~~For UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported~~]~~ |

Proposal 2: FG 47-k4 can be updated with following:* Remove yellow highlight from the column of “Need for the gNB to know if the feature is supported”.
* Remove brackets of [No] from the column of “applicable to the capability signaling exchange between UEs”.
* FG 47-k4 are considered as optional without capability signaling and basic FGs.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k4 | Transmitting UE to UE COT sharing information | 1. UE supports using ue-toUE-COT-SharingED-Threshold for Type 1 channel access for UE to UE COT sharing2. UE supports indicating COT sharing information in SCI | 47-k1 | No | ~~[~~No~~]~~ | UE does not support transmitting UE-to-UE COT sharing information for sharing COT for NR sidelink operation in shared spectrum. | Per band | n/a | n/a |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signallingFor UE supports NR SL in shared spectrum where shared spectrum channel access must be used, UE must indicate this FG is supported |

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### (H) Proposal 2.2-1:

* Remove bracket and update to [For UE supports NR SL in shared spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported] for FG47-k3
* “Need for the gNB to know if the feature is supported” for FG47-k3 is No
* “Applicable to the capability signalling exchange between UEs” for FG47-k3 is No
* FG47-k3 is Optional without capability signaling
	+ Reporting granularity of FG47-k3 is not described
	+ Replace “signaling” by “FG” for “The signaling is only expected for a band where shared spectrum channel access must be used.” in the note of FG47-k3

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-k3
	+ Basic FG
		- YES: HW, FLs, CATT, Samsung, Nokia, ZTE, DCM, Sharp
		- NO: Apple, QC
	+ Report to gNB
		- YES: vivo
		- NO: HW, FLs, CATT, Samsung, Nokia, ZTE, QC, DCM, Sharp
	+ Report to other UE
		- YES: vivo, FLs
		- NO: HW, CATT, Samsung, Nokia, ZTE, QC, DCM, Sharp
 |
| vivo | Not support. We share the view that COT sharing is not a basic FG. In this case, we also provide the reason and use case why this reporting is important.For the COT sharing case, the UE-A should be aware that the peer UE-B is capable of receiving COT SI, so that it may determine to share the COT to the peer UE. Otherwise, the UE-A can simply not share the COT, or share the COT with another UE-C that supports sharing the COT.The gNB needs to know whether the two SL UEs support UE to UE COT sharing. Only when they support, the gNB can schedule two SL transmissions of these two UEs in a back-to-back manner in the unlicensed band, otherwise, the second SL transmission would always be dropped due to LBT failure if the first SL transmission occupied the channel. If these FGs are not reported to gNB, mode-1 scheduling would be very inefficient. |
| DCM | OK. |
| CATT, CICTCI | OK |
| ZTE | Support this proposal. |
| QC | First: No, note that if there is no indication the wording “UE must indicate” does not work. Also prefer to not have this sentence at all, even if it is good to have a UE doesn’t necessarily have to support receiving COT sharing information.Second/Third: May need to reach common understanding on implications of UEtoUE signaling of the capability.  |

### (H) Proposal 2.2-2:

* “Need for the gNB to know if the feature is supported” for FG47-k4 is No
* “Applicable to the capability signalling exchange between UEs” for FG47-k4 is No
* FG47-k4 is Optional without capability signaling
	+ Reporting granularity of FG47-k3 is not described
	+ Replace “signaling” by “FG” for “The signaling is only expected for a band where shared spectrum channel access must be used.” in the note of FG47-k4

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-k4
	+ Basic FG
		- YES: Sharp
		- NO: HW, CATT, Nokia, ZTE, QC, DCM
	+ Report to gNB
		- YES: vivo
		- NO: HW, FLs, CATT, Nokia, ZTE, QC, DCM, Sharp
	+ Report to other UE
		- YES: vivo, FLs
		- NO: HW, CATT, Nokia, ZTE, QC, DCM, Sharp
 |
| vivo | Not support, same comment as P2.2-1. |
| DCM | OK |
| CATT, CICTCI | OK |
| ZTE | Support this proposal. |
| QC | May need to reach common understanding on implications of UEtoUE signaling of the capability. |

## FG for multi-consecutive slots transmission

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, [32-4]} | [Yes] | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | [Per band] | N/A | N/A |  |  | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1] | HW/HiSi | The columns with yellow highlights can be updated as below:* A Note can be added: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.
* FG 47-k5 is a capability of resource (re-)selection performed by Tx UE itself. There is no need to report to gNB.
* Since it is unnecessary to report to gNB and exchange between UEs, FG 47-k5 is optional without capability signalling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, ~~[~~32-4~~]~~} | [Yes]No | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | [Per band] | N/A | N/A |  | Note: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs | Optional without capability signalling |

 |
| [2] | vivo |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, [32-4]} | [Yes] No | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | [Per band] | N/A | N/A |  |  | Optional ~~with~~ without capability signalling |

 |
| [3] | FLs |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, [32-4]} | ~~[~~Yes~~]~~ | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | ~~[~~Per band~~]~~ | N/A | N/A |  |  | Optional with capability signalling |

 |
| [4] | CATT/CICTCI | Regarding the prerequisite column, some companies want to add 32-4a. From our understanding, there is no new UE behavior for random selection, it is unnecessary to include 32-4a. so it is preferred to keep the current prerequisite and remove the bracket for 32-4.Regarding the “Need for the gNB to know if the feature is supported” column, it is preferred to be No since the resource selection is performed by UE, gNB needn’t know whether this feature is supported or not. Proposal 10: For FG47-k5:* The prerequisite is 15-3 and 32-4, remove the bracket of 32-4.
* “Need for the gNB to know if the feature is supported” is No.
 |
| [5] | Samsung | FG 47-k5Feature 47-k5 was agreed as below in the last RAN 1 meeting:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, [32-4]} | [Yes] | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | [Per band] | N/A | N/A |  |  | Optional with capability signalling |

Since this resource selection is done by the UE, then there is no need to notify the gNB as this feature will be mainly used for Mode 2 resource selection and the selection will be notified to other UEs through SCI signaling. We also propose to remove the brackets around per band. Proposal 3: For 47-k5,* This feature does not need to be signaled to the gNB.
* Support per band operation for 47-k5.
 |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, 32-4} | Yes | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | Per band | N/A | N/A |  |  | Optional with capability signalling |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips | Regarding 47-k5 after RAN1#116, our views on the pending issues are as follows:1, The need for the gNB to know if the feature is supported: Considering that $N\_{slot,MCSt}$ is only used for mode 2 sensing in Rel-18, there is no need to report this FG to gNB.2, The granularity for report: per band is preferred.3, Mandatory/Optional: Without MCS transmission, UE can also operate on shared spectrum, thus this FG is optional, and it is unnecessary to report to gNB and exchange between UEs.4, Other highlighted parts are reasonable.Based on above analysis, FG 47- k5 should be updated as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, [32-4]} | No | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | Per band | N/A | N/A |  |  | Optional without capability signalling |

 |
| [9] | Apple | For FG 47-k5, multiple consecutive PSCCH/PSSCH resource selection is supported for mode 2 resource selection. For mode 1, the DCI 3-0 is not enhanced for this multiple consecutive slots allocation. Therefore, the prerequisite feature groups should include different variation of mode 2 resource selection. **Proposal 3:** For FG 47-k5, the prerequisite feature groups include at least one of the 15-3, 32-4 and 32-4a.  |
| [10] | QC |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, 32-4} | Yes | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | Per band | N/A | N/A |  |  | Optional with capability signalling |

 |
| [11] | DCM | For pre-requisite, there seems to be no intention to preclude partial sensing from SL-U as mentioned for FG 47-k1.For report to gNB/UE, both can be ‘NO’. This behavior is performed in mode 2 RA, thus there is no need to report this to gNB. There is no specific behavior in UEs corresponding to other UE’s support of this FG.Proposal 5: Update FG 47-k5 as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k5 | Resource allocation for multi-consecutive slots transmission | UE supports resource (re-)selection for PSCCH/PSSCH transmission on multiple consecutive slots | at least one of {15-3, ~~[~~32-4~~]~~} | [Yes]No | No | UE does not support resource (re-)selection for multi-consecutive slots transmission | [Per band] | N/A | N/A |  |  | Optional without capability signalling |

 |
| [12] | Sharp |  |

### (H) Proposal 2.3-1:

* Prerequisite FG of FG47-k5 is “at least one of {15-3, 32-4}”
* “Need for the gNB to know if the feature is supported” for FG47-k5 is No
* FG47-k5 is Optional without capability signaling
	+ Reporting granularity of FG47-k5 is not described
* Add following note for FG47-k5
	+ Note: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.
	+ Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Prerequisite
	+ at least one of {15-3, 32-4}: HW, CATT, Nokia, QC, DCM
	+ at least one of {15-3, 32-4, 32-4a}: Apple
* Report to gNB
	+ YES
		- Per band: FLs, Nokia, QC
	+ NO: HW, vivo, CATT, Samsung, ZTE, DCM
* Note
	+ Update/Add: HW
		- HW: Note: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.
		- HW: Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs
 |
| vivo | Please see our view regarding the prerequisite of 32-4 in our responses to Proposal 2.1-1.Regarding the note, it seems to create confusion, at least for the FR2 part – if a UE does not support this FG in FR2 band, it does not report this FG for FR2 band. |
| DCM | OK |
| CATT, CICTCI | OK |
| QC | Ok |

## FG for resource allocation mode 1

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k9 | Sidelink mode 1 resource allocation in shared spectrum | 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH on a shared band]2. UE supports reporting NACK to gNB when transmitting PSCCH/PSSCH on scheduled resource(s) is failed due to LBT failure | TBD | Yes | No | UE does not perform interlaced RB-based PSCCH/PSSCH based on mode 1 resource allocation. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1] | HW/HiSi | The columns with yellow highlights can be updated as below:* The prerequisites include 15-25 except Component 3 and 4 in 15-2. The components which should be excepted can be reflected in the notes.
* Other highlighted parts are reasonable.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k9 | Sidelink mode 1 resource allocation in shared spectrum | 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH on a shared band]2. UE supports reporting NACK to gNB when transmitting PSCCH/PSSCH on scheduled resource(s) is failed due to LBT failure | ~~TBD~~47-k1, 15-25 | Yes | No | UE does not perform interlaced RB-based PSCCH/PSSCH based on mode 1 resource allocation. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs | Optional with capability signalling |

 |
| [2] | vivo | Firstly, the FG 47-k9 should be introduced to indicate the support of mode-1 resource allocation for SLU. It seems some companies think that the Rel-16 FG 15-2 can be reused. However, it should be noted that the Rel-16 UE FG for mode-1 transmission (i.e., FG 15-2) requires that the Uu and SL are in the same band (i.e., the 4th component, “UE can monitor DCI format 3\_0 for NR sidelink dynamic scheduling and configured grant type 2 on the same carrier as sidelink”), which is not aligned with the Rel-18 WID objective where the SLU mode-1 resource allocation is supported with the restriction that Uu operation for mode 1 is limited to licensed spectrum only. Besides, the FG 15-25 (“Transmitting NR sidelink mode 1 scheduled by NR Uu on a different carrier”) cannot be used either, as it requires FG 15-2 as the prerequisite feature. One alternative is to modify the FG 15-2, e.g., by clarifying that component 4 is not applicable to unlicensed bands. However, it requires changing a legacy Rel-16 FG which is not acceptable. Therefore, the UE feature 47-k9 indicating the support of NR SL mode-1 should be introduced.Proposal 1: The UE capability 47-k9 should be introduced to indicate the support of NR SL mode-1 scheduling SL transmission on an unlicensed band.Moreover, given that this feature expects to receive a DCI in a licensed band other than the unlicensed band, the UE should indicate in which band it can receive the DCI scheduling the SL transmission. In other words, the granularity of FG 47-k9 should be per BC instead of per Band. No prerequisite is needed for 47-k9.Proposal 2: The granularity of UE capability 47-k9 should be per BC. No prerequisite is needed for 47-k9.On the other hand, in our view, FG 47-k3, 47-k4, 47-k9 (obviously), 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the network for mode-1 scheduling. For the COT sharing case (i.e., 47-k3/k4), the gNB needs to know whether the two SL UEs support UE to UE COT sharing. Only when they support, the gNB can schedule two SL transmissions of these two UEs in a back-to-back manner in the unlicensed band, otherwise, the second SL transmission would always be dropped due to LBT failure if the first SL transmission occupied the channel. If these FGs are not reported to gNB, mode-1 scheduling would be very inefficient. The FG 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the gNB for proper S-SSB and PSFCH configurations.Proposal 9: The UE FG 47-k3, 47-k4, 47-k9, 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the network.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k9 | Sidelink mode 1 resource allocation in shared spectrum | 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH on a shared band]2. UE supports reporting NACK to gNB when transmitting PSCCH/PSSCH on scheduled resource(s) is failed due to LBT failure | TBD | Yes | No | UE does not perform interlaced RB-based PSCCH/PSSCH based on mode 1 resource allocation. | Per ~~band~~ BC | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [3] | FLs |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k9 | Sidelink mode 1 resource allocation in shared spectrum | 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH ~~on~~ in a shared ~~band]~~ spectrum2. UE supports reporting NACK to gNB when transmitting PSCCH/PSSCH on scheduled resource(s) is failed due to LBT failure | ~~TBD~~ 47-k1 | Yes | No | UE does not perform interlaced RB-based PSCCH/PSSCH based on mode 1 resource allocation. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [4] | CATT/CICTCI | Regarding the component part, we have following comments:* For component 1, since there is new UE behavior for monitoring DCI format 3\_0 when interlaced-RB based transmission is used. We support this component.
* For component 2, we think this is not necessary, since it is straightforward behavior, no need to be captured as capability.

Regarding to the prerequisite, since the FG mainly focus on interlaced-RB based SL transmission, FG47-m1 should be included. Proposal 11: For FG47-k9:* Remove component 2).
* The prerequisite should include 47-m1.
* “Need for the gNB to know if the feature is supported” is Yes.
* “Applicable to the capability signalling exchange between UEs” is No.
* FG47-k9 is optional.
 |
| [5] | Samsung | We support this feature and believe it is essential for Mode 1 operation in shared spectrum. We suggested 47-k1 as a pre-requisite for this FG since LBT sensing is still essential for shared spectrum. In the Rel-18 WID, it was clearly mentioned that if Mode 1 is supported in shared spectrum then the downlink control information will be sent in the licensed spectrum. Hence, it is essential that the UE is able to report to the gNB its ability to receive scheduling for Mode 1 operation in shared spectrum. Proposal 4: For 47-k9,* Support feature 47-k1 as a pre-requisite to 47-k9.
 |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k9 | Sidelink mode 1 resource allocation in shared spectrum | 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH on a shared band]2. UE supports reporting NACK to gNB when transmitting PSCCH/PSSCH on scheduled resource(s) is failed due to LBT failure | TBD | Yes | No | UE does not perform interlaced RB-based PSCCH/PSSCH based on mode 1 resource allocation. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips | Regarding 47-k9 after RAN1#116, our views on the pending issues are as follows:1, Prerequisite feature groups: In Rel-18, gNB cannot perform channel access instead of UE, so UE operates on unlicensed spectrum, at least FG 47-k1 should be one of prerequisites.2, Other highlighted parts are reasonable.Based on above analysis, FG 47- k9 should be updated as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k9 | Sidelink mode 1 resource allocation in shared spectrum | 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH on a shared band]2. UE supports reporting NACK to gNB when transmitting PSCCH/PSSCH on scheduled resource(s) is failed due to LBT failure | 47-k1 | Yes | No | UE does not perform interlaced RB-based PSCCH/PSSCH based on mode 1 resource allocation. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [9] | Apple | In SL-U, a UE can have the capability of either mode 1 resource allocation or mode 2 resource allocation or both. It is necessary for a UE to report its resource allocation capability. For example, if a UE reports its capability of mode 2 resource allocation, network will not send DCI 3\_0 to this UE. Additionally, for the case of interlace RB-based PSCCH/PSSCH, the resource indication format is different from Rel-16 NR sidelink. Hence, it is expected that UE will receive DCI in a different format from Rel-16 NR sidelink DCI format 3\_0 to indicate the allocated sidelink resources for interlace RB-based PSCCH/PSSCH. This DCI applies to both dynamic scheduling and configured grant type 2 scheduling. In other words, the existing FG 15-25 does not fully fit in the sidelink operations on unlicensed spectrum. Hence, we think the FG 47-k9 of sidelink mode 1 resource allocation in shared spectrum should be kept. Specifically, the feature name and components of FG 47-k9 should be kept. The prerequisite of FG 47-k9 should be FG 15-25. Here, a note could be added to indicate if UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.**Proposal 4:** Keep FG 47-k9 with the same feature name and components.* The prerequisite of FG 47-k9 is FG 15-25.
 |
| [10] | QC |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k9 | Sidelink mode 1 resource allocation in shared spectrum | 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH on a shared band2. UE supports reporting NACK to gNB when transmitting PSCCH/PSSCH on scheduled resource(s) is failed due to LBT failure |  | Yes | No | UE does not perform interlaced RB-based PSCCH/PSSCH based on mode 1 resource allocation. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [11] | DCM | At the last meeting, this FG was proposed but there was no agreement due to time limitation. In our view, two additional mechanism was agreed for mode 1 resource allocation: 1) DCI 3\_0/CG type 1 for SL-U, 2) SL HARQ feedback on UL based on LBT failure. A new FG for them is necessary. For the details, the existing descriptions above seem to be OK except for pre-requisite part, which should ‘FG 47-k1’ as in other FGs.Proposal 6: Introduce FG 47-k9 as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-k9 | Sidelink mode 1 resource allocation in shared spectrum | 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH on a shared band2. UE supports reporting NACK to gNB when transmitting PSCCH/PSSCH on scheduled resource(s) is failed due to LBT failure | 47-k1 | Yes | No | UE does not perform interlaced RB-based PSCCH/PSSCH based on mode 1 resource allocation. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [12] | Sharp |  |

### (H) Proposal 2.4-1:

* FG47-k9 is kept, i.e., remove yellow highlight
* Component for FG47-k9 is kept with following update for component 1
	+ UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH ~~on~~ in a shared ~~band]~~ spectrum
* Prerequisite FG of FG47-k9 is 47-k1
* “Need for the gNB to know if the feature is supported” for FG47-k9 is Yes
* “Applicable to the capability signalling exchange between UEs” for FG47-k9 is No
* FG47-k9 is Optional with capability signaling
* “Consequence if the feature is not supported by the UE” for FG47-k9 is kept as it is
* Reporting granularity of FG47-k9 is Per band
* Note for FG47-k9 is kept as it is

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES: HW, vivo, CATT, Samsung, Nokia, ZTE, Apple, QC, DCM
* Component
	+ OK/Keep: HW, vivo, Nokia, ZTE, Apple, QC(?), DCM
	+ Update/Add: FLs
		- FLs: 1. UE can monitor DCI format 3\_0 on a licensed band for NR sidelink dynamic scheduling and configured grant type 2 for transmitting interlaced RB-based PSCCH/PSSCH ~~on~~ in a shared ~~band]~~ spectrum
	+ Remove: CATT
		- CATT: Remove component 2
* Prerequisite
	+ 47-k1: HW, FLs, Samsung, ZTE, DCM
	+ 15-25: HW (with notes), Apple
		- HW: Note: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.
		- HW: Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs
	+ 47-m1: CATT
	+ None: vivo, QC
* Report to gNB
	+ YES: HW, vivo, CATT, Samsung, Nokia, ZTE, QC, DCM
* Report to other UE
	+ NO: HW, vivo, CATT, Nokia, ZTE, QC, DCM
* Consequence if not supported
	+ OK/Keep: HW, Nokia, ZTE, QC, DCM
* Reporting granularity
	+ Band: HW, vivo, Nokia, ZTE, QC, DCM
* Note
	+ OK/Keep: HW, vivo, Nokia, ZTE, QC, DCM
* Mandatory/optional
	+ Optional: HW, vivo, CATT, Nokia, ZTE, QC, DCM
 |
| vivo | We support the FL proposal, except the prerequisite. In the case where the channel access is not required for the shared band, a UE can support mode-1 RA by this FG but not required to support 47-k1 (for channel access). |
| DCM | OK |
| CATT, CICTCI | For pre-requisite, since the FG mainly focus on interlaced-RB based SL transmission, FG47-m1 should be included.For component 2, from our side, we think it is not necessary, since it is straightforward behavior, no need to be captured as capability. If most of companies want to introduce this component, we can accept it.Others are OK for us. |

## FG for interlace RB-based structure

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m1 | Interlace RB-based SL transmission/reception | 1. UE supports interlace RB-based SL transmissions for the physical layer channels that it is capable of transmit2. UE supports interlace RB-based SL receptions for the physical layer channels that it is capable of receive | At least one of {15-25, 15-3, [32-4, 32-4a]} | Yes | No | UE does not support Interlace RB-based PSCCH/PSSCH/PSFCH transmission/reception | Per band | N/A | N/A |  | This is the basic FG for NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation, UE must indicate this FG is supported. |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1] | HW/HiSi | The brackets of prerequisites can be removed because SL interlaced transmission/reception are applicable to partial sensing and random selection.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m1 | Interlace RB-based SL transmission/reception | 1. UE supports interlace RB-based SL transmissions for the physical layer channels that it is capable of transmit2. UE supports interlace RB-based SL receptions for the physical layer channels that it is capable of receive | At least one of {15-25, 15-3, ~~[~~32-4, 32-4a~~]~~} | Yes | No | UE does not support Interlace RB-based PSCCH/PSSCH/PSFCH transmission/reception | Per band | N/A | N/A |  | This is the basic FG for NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation, UE must indicate this FG is supported. |

 |
| [2] | vivo |  |
| [3] | FLs |  |
| [4] | CATT/CICTCI |  |
| [5] | Samsung |  |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m1 | Interlace RB-based SL transmission/reception | 1. UE supports interlace RB-based SL transmissions for the physical layer channels that it is capable of transmit2. UE supports interlace RB-based SL receptions for the physical layer channels that it is capable of receive | At least one of {15-25, 15-3, 32-4, 32-4a} | Yes | No | UE does not support Interlace RB-based PSCCH/PSSCH/PSFCH transmission/reception | Per band | N/A | N/A |  | This is the basic FG for NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation, UE must indicate this FG is supported. |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips |  |
| [9] | Apple | FG 47-m1 was introduced for interlace RB-based SL transmission/reception. This includes the transmission and reception of PSCCH/PSSCH/PSFCH. The current prerequisites of FG 47-m1 are FG 15-25 and FG 15-3. However, we think the prerequisite of FG 15-25 should be replaced by FG 47-k9, and the prerequisite of FG 15-3 should be replaced by FG 47-k10, since FG 47-k9 and FG 47-k10 are RB set based mode 1 and mode 2 resource allocation. Also, it is open whether FG 32-4 and FG 32-4a could be prerequisite of FG 47-m1. In our view, partial sensing and random resource selection could be used for sidelink operations on unlicensed spectrum. Hence, we propose to keep one of FG 32-4 and FG 32-4a as prerequisite of FG 47-m1. **Proposal 7:** For the prerequisites of FG 47-m1, * replace FG 15-25 by FG 47-k9
* replace FG 15-3 by FG 47-k10
* keep FG 32-4 and FG 32-4a.
 |
| [10] | QC |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m1 | Interlace RB-based SL transmission/reception | 1. UE supports interlace RB-based SL transmissions for the physical layer channels that it is capable of transmit2. UE supports interlace RB-based SL receptions for the physical layer channels that it is capable of receive | At least one of {15-25, 15-3, 32-4, 32-4a} | Yes | No | UE does not support Interlace RB-based PSCCH/PSSCH/PSFCH transmission/reception | Per band | N/A | N/A |  | This is the basic FG for NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation, UE must indicate this FG is supported. |

 |
| [11] | DCM | For pre-requisite, there seems to be no intention to preclude partial sensing and random selection from SL-U as mentioned for FG 47-k1.Proposal 7: Update FG 47-m1 as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m1 | Interlace RB-based SL transmission/reception | 1. UE supports interlace RB-based SL transmissions for the physical layer channels that it is capable of transmit2. UE supports interlace RB-based SL receptions for the physical layer channels that it is capable of receive | At least one of {15-25, 15-3, ~~[~~32-4, 32-4a~~]~~} | Yes | No | UE does not support Interlace RB-based PSCCH/PSSCH/PSFCH transmission/reception | Per band | N/A | N/A |  | This is the basic FG for NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signallingFor UE supports NR sidelink in shared spectrum, where PSD and/or OCB requirements are defined by regulation, UE must indicate this FG is supported. |

 |
| [12] | Sharp |  |

### Proposal 2.5-1:

* Prerequisite FG of FG47-m1 is At least one of {15-25, 15-3, 32-4, 32-4a}

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Prerequisite
	+ At least one of {15-25, 15-3, 32-4, 32-4a}: HW, Nokia, QC, DCM
	+ At least one of {47-k9, 47-k10, 32-4, 32-4a}: Apple
 |
| vivo | Please see our view regarding the prerequisite of 32-4 in our responses to Proposal 2.1-1. |
| DCM | OK |
| CATT, CICTCI | OK |
| QC | Prerequisite: OK to AVOID as per Vivo’s comment |

## FG for 2nd starting symbol of PSCCH/PSSCH

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m3 | Transmitting PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports transmitting PSCCH/PSSCH from 2nd starting symbol in a slot in addition to the first starting symbol | At least one of {15-25, 15-3, [32-4, 32-4a]} | No | No | UE transmits PSCCH/PSSCH only from 1st starting symbol in a slot |  |  |  |  | Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGsThe FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | [15-1 except Component 5] | No | No | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot | Per band | N/A | N/A |  | [This is the basic FG for NR sidelink in shared spectrum.]The value X is the same as the reported value in FG 15-1 | [Optional without capability signalling][For UE supports NR sidelink in shared spectrum, UE must indicate this FG is supported.] |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1] | HW/HiSi | The columns with yellow highlights for FG 47-m3 can be updated as below:* The current prerequisites are reasonable and we suggest to remove the bracket.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m3 | Transmitting PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports transmitting PSCCH/PSSCH from 2nd starting symbol in a slot in addition to the first starting symbol | At least one of {15-25, 15-3, ~~[~~32-4, 32-4a~~]~~} | No | No | UE transmits PSCCH/PSSCH only from 1st starting symbol in a slot |  |  |  |  | Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGsThe FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

The columns with yellow highlights for FG 47-m4 can be updated as below:* The current prerequisites are reasonable and we suggest to remove the bracket. The components which should be excepted can be reflected in the notes.
* If receiving PSCCH/PSSCH from 2nd starting symbol in a slot is not a basic FG, Tx UE is uncertain whether Rx UE is able to receive from 2nd starting symbol. One way is that UE may transmit from 2nd starting symbol after capability exchange via PC5 RRC, which is only possible in unicast. However, there is no agreement to limit 2 starting symbol to unicast only. Thus, FG 47-m4 is basic and no need to exchange between UEs.
* Since it is unnecessary to report to gNB and exchange between UEs, FG 47-m4 is optional without capability signalling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | [15-1 except Component 5] | No | No | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot | Per band | N/A | N/A |  | ~~[~~This is the basic FG for NR sidelink in shared spectrum.~~]~~The value X is the same as the reported value in FG 15-1Note: If UE supports 15-1, the UE is not required to support Component 5.Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs | ~~[~~Optional without capability signalling~~]~~~~[~~For UE supports NR sidelink in unlicensed spectrum, UE must indicate this FG is supported.~~]~~ |

 |
| [2] | vivo | For FG 47-m4, the capability of receiving PSCCH/PSSCH at the 2nd starting symbol requires much higher hardware processing capability and cost, thus should not be a basic FG. Regarding the prerequisite, we don’t think FG 15-1 is needed, and even if FG 15-1 is considered, the statement of “except Component 5” is not needed because anyway 47-m4 is not expected to report in FR2 band.Proposal 5: The UE capability 47-m4 is not a basic FG and is defined per band.The other remaining issues are the UE FG reporting to network/UE. Firstly, it seems worthwhile to clarify that a UE FG can be exchanged between UEs does not mean or restrict that this FG can only be used in unicast. For example, in Rel-17 a UE FG “***drx-OnSidelink-r17***” is introduced to indicate whether a UE supports sidelink DRX, which is defined as below:

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| drx-OnSidelink-r17Indicates whether UE supports sidelink DRX for unicast, groupcast and broadcast. | UE | No | No | No |

It is obvious that this FG is applicable for all the cast types. Moreover, this FG should be reported to the network, and exchanged between UEs to indicate the support of DRX capability, as defined in TS 38.306:

|  |
| --- |
| 38.306…omitted…Annex A.4 specifies for each sidelink related capability, in which interface (i.e., *UECapabilityInformation* in Uu RRC and *UECapabilityInformation*Sidelink in PC5 RRC) a UE supporting sidelink shall report the concerned capability:-   *UECapabilityInformation*: the concerned sidelink capability is reported within *UECapabilityInformation*;-   UECapabilityInformationSidelink: the concerned sidelink capability is reported within UECapabilityInformationSidelink;…omitted… |

|  |  |  |
| --- | --- | --- |
| Sidelink Parameter | UECapabilityInformation | UECapabilityInformationSidelink |
| drx-OnSidelink | X | X |

Thus, it should be clear that a UE FG that is applicable to the capability exchanging between UEs does not mean that this FG is only applicable to unicast. Regarding the agreed UE FGs, in our view, FG 47-k2, 47-k3, 47-k4, 47-m4, 47-m11, and 47-m11a, should be reported to peer UE.For the multi-channel access case, a UE should be aware of whether the peer UE supports multiple RB sets (and multi-channel access), especially for PSFCH, so that it transmits a TB over multiple RB sets and is expected to correctly receive the PSFCH that may span multiple channels. If the target UE does not support FG 47-k2, the Tx UE should avoid reserving and transmitting multiple TBs on multiple RB sets to that UE, otherwise, some or all the PSFCHs may be dropped.For the COT sharing case, the UE-A should be aware that the peer UE-B is capable of receiving COT SI, so that it may determine to share the COT to the peer UE. Otherwise, the UE-A can simply not share the COT, or share the COT with another UE-C that supports sharing the COT.Similarly, regarding the 47-m4, a UE should be aware that the peer UE is capable of receiving SL transmission from the 2nd starting symbol in a slot, so that it may determine to transmit the TB to that UE from the 2nd starting symbol when LBT failed in the 1st starting symbol but succeeded before the 2nd starting symbol.Proposal 8: The UE FG 47-k2, 47-k3, 47-k4, 47-m4, 47-m11, and 47-m11a should be reported to peer UE.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | [15-1 except Component 5] | No | ~~No~~ Yes | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot | Per band | N/A | N/A |  | [This is the basic FG for NR sidelink in shared spectrum.]The value X is the same as the reported value in FG 15-1 | [Optional without capability signalling][For UE supports NR sidelink in shared spectrum, UE must indicate this FG is supported.] |

 |
| [3] | FLs |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | [15-1 except Component 5] | No | No | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot | Per band | N/A | N/A |  | [This is the basic FG for NR sidelink in shared spectrum.]The value X is the same as the reported value in FG 15-1Note: If UE supports 15-1, the UE is not required to support Component 5.Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs | [Optional without capability signalling][For UE supports NR sidelink in shared spectrum, UE must indicate this FG is supported.] |

 |
| [4] | CATT/CICTCI | Regarding whether FG47-m4 to be a basic FG, since additionally receiving from the 2nd starting symbol will significantly increase the UE processing capability, and we have agreed that it is up to UE implementation to monitor 1 or 2 AGC symbol(s) in a slot. Therefore, this FG is not necessary to be a basic FG.Proposal 12: FG47-m4 is optional.  |
| [5] | Samsung | For 47-m4, receiving PSSCH/PSCCH from second candidate symbol, supporting this feature as a basic FG for NR sidelink requires demanding UE implementation (especially for the Rx case) and thus this component should not be part of the basic FG since this capability creates a significant burden on UEs especially in case of reception. In addition, it was agreed that it is up to UE implementation to monitor 1 or 2 AGC symbol(s) in a slot and thus this feature does not need to be a basic FG.Proposal 5: * 47-m4 is not a basic FG.
 |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m3 | Transmitting PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports transmitting PSCCH/PSSCH from 2nd starting symbol in a slot in addition to the first starting symbol | At least one of {15-25, 15-3, 32-4, 32-4a} | No | No | UE transmits PSCCH/PSSCH only from 1st starting symbol in a slot |  |  |  |  | Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGsThe FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | 15-1 except Component 5 | No | No | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot | Per band | N/A | N/A |  | This is the basic FG for NR sidelink in shared spectrum.The value X is the same as the reported value in FG 15-1 | Optional without capability signallingFor UE supports NR sidelink in shared spectrum, UE must indicate this FG is supported. |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips | Regarding 47-m4 after RAN1#116, our views on the pending issues are as follows:1, Prerequisite feature groups: the listed prerequisite seems reasonable, so the bracket can be removed.2, The capability signalling exchange between UEs: Considering that for broadcast and groupcast, Tx UE has no knowledge about whether Rx UE is able to receive from 2nd starting symbol, so there is no requirement for exchanging such FG between UEs.3, Mandatory/Optional: Considering that UE has the capability of receiving PSCCH/PSSCH from 1st starting symbol in a slot by default, whether to receive PSCCH/PSSCH from 2nd starting symbol in a slot additionally can be up to UE implementation, i.e. FG 47-m4 can be optional without capability signalling. 4, Other highlighted parts are reasonable.Based on above analysis, FG 47- m4 should be updated as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | 15-1 except Component 5 | No | No | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot | Per band | N/A | N/A |  | The value X is the same as the reported value in FG 15-1 | Optional without capability signalling |

 |
| [9] | Apple | It was agreed to support maximum 2 candidate starting symbols in a slot for a PSCCH/PSSCH transmission. The PSCCH/PSSCH slot structure in this case are different from Rel-16 NR sidelink. Subsequently, FG 47-m3 and FG 47-m4 are defined for transmitting and receiving PSCCH/PSSCH from 2nd starting symbol in a slot, respectively. In our view, to transmit PSCCH/PSSCH from 2nd starting symbol in a slot, UE needs to resource allocation mode 1 or mode 2 in unlicensed spectrum. Hence, at least one of FG 47-k9, FG 47-k10, FG 47-k11, FG 32-4, FG 32-4a is the prerequisite of FG 47-m3. **Proposal 9:** The prerequisites of FG 47-m3,* replace FG 15-25 by FG 47-k9
* replace FG 15-3 by FG 47-k10 and FG 47-k11
* keep FG 32-4 and FG 32-4a.

In our view, to receive PSCCH/PSSCH from 2nd starting symbol in a slot, UE needs to have the capability of receiving NR sidelink. Hence, FG 47-m1 can be the prerequisite FG for FG 47-m4. **Proposal 10:** The prerequisite of FG 47-m4 is FG 47-m1.  |
| [10] | QC |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m3 | Transmitting PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports transmitting PSCCH/PSSCH from 2nd starting symbol in a slot in addition to the first starting symbol | At least one of {15-25, 15-3, 32-4, 32-4a} | No | No | UE transmits PSCCH/PSSCH only from 1st starting symbol in a slot |  |  |  |  | Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGsThe FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | 15-1 except Component 5 | No | No | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot |  | N/A | N/A |  | The value X is the same as the reported value in FG 15-1 | Optional without capability signalling.] |

 |
| [11] | DCM | For pre-requisite, there seems to be no intention to preclude partial sensing and random selection from SL-U as mentioned for FG 47-k1.Proposal 8: Update FG 47-m3 as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m3 | Transmitting PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports transmitting PSCCH/PSSCH from 2nd starting symbol in a slot in addition to the first starting symbol | At least one of {15-25, 15-3, ~~[~~32-4, 32-4a~~]~~} | No | No | UE transmits PSCCH/PSSCH only from 1st starting symbol in a slot |  |  |  |  | Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGsThe FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

At first, on whether this FG is basic cap for SL-U, we believe that this reception behavior should be mandatory in SL-U; otherwise, availability of the 2nd starting symbol becomes meaningless (e.g., data transmission is ignored by RX UE(s)) or rather may lead to performance degradation compared to a RP without the 2nd starting symbol (e.g., reservation information is ignored by other UE(s)). In this case, report to UE is correspondingly unnecessary. This is our strong preference. However, if this FG is not a basic FG, as the second preference, report to UE should be defined so that at least unicast data transmission UE can know whether the reception UE can receive TX from the 2nd starting symbol and can decide whether TX from the 2nd starting symbol is performed or not.For pre-requisite, the reception capability FG 15-1 should be kept and notes to exclude unrequired part can be added.Proposal 9: Update FG 47-m4 as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | [15-1 except Component 5] | No | No | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot | Per band | N/A | N/A |  | [This is the basic FG for NR sidelink in shared spectrum.]The value X is the same as the reported value in FG 15-1Note: If UE supports 15-1, the UE is not required to support Component 5Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs | ~~[~~Optional without capability signalling~~]~~[For UE supports NR sidelink in shared spectrum, UE must indicate this FG is supported.]For UE supports NR SL in unlicensed spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported |

 |
| [12] | Sharp | Similar to what have been agreed in last meeting for FG 47-m3, add “The FG is only expected for a band where shared spectrum channel access must be used.” in note column such that “per band” could be removed. Regarding the prerequisite feature groups for 47-m4, similar to what have been done on 47-k1, there is no need to explicitly mention the removal of exception components in order to simplify the prerequisite feature groups. Instead, it can be specified in notes that UEs do not support those exception components. Then the final decision is up to RAN2 whether/how to implement the notes and whether/how to update the prerequisite FGs for FG 47-m4. For the column of “applicable to the capability signalling exchange between UEs” in FG 47-m4, since the support of 2 candidate starting symbols within a slot is not limited to unicast transmission but also extends to groupcast and broadcast transmissions, no capability signalling exchange between UEs is beneficial in the context of supporting groupcast and broadcast transmissions.The FG 47-m3 regarding transmitting PSCCH/PSSCH from 2nd starting symbol in a slot is optional without capability signalling. Likewise, the FG 47-m4 regarding receiving PSCCH/PSSCH from 2nd starting symbol should be optional without capability signalling as well. Otherwise, since there is no capability signalling exchange between UEs for groupcast and broadcast transmission, TX UE cannot ascertain whether the RX UEs are capable of receiving PSCCH/PSSCH from 2nd starting symbol in a slot and eventually transmitting PSCCH/PSSCH from 2nd starting symbol in a slot for groupcast and broadcast transmissions may not be implemented. Proposal 3: FG 47-m4 can be updated with following:* Remove the exception component in prerequisite FGs and instead add Note 1 to document it, with leaving final decision to RAN2.
* Add note: The FG is only expected for a band where shared spectrum channel access must be used.
* Support No for the column of “applicable to the capability signaling exchange between UEs”.
* Consider FG 47-m4 as optional without capability signaling.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m4 | Receiving PSCCH/PSSCH from 2nd starting symbol in a slot  | 1. UE supports receiving PSCCH/PSSCH transmitted from 2nd starting symbol in a slot in addition to the first starting symbol2. UE can monitor a total up to X PSCCHs in a slot in the 1st and 2nd starting symbols | [15-1 except Component 5] | No | No | UE receives PSCCH/PSSCH transmitted only from 1st starting symbol in a slot | Per band | N/A | N/A |  | ~~[~~This is the basic FG for NR sidelink in shared spectrum.~~]~~The value X is the same as the reported value in FG 15-1Note1: If UE supports 15-1, the UE is not required to support Component 5 in 15-1.Note: It is up to RAN2 whether/how to implement the above Note 1 and whether/how to update the prerequisite FGs. The FG is only expected for a band where shared spectrum channel access must be used. | ~~[~~Optional without capability signalling~~]~~[For UE supports NR sidelink in unlicensed spectrum, UE must indicate this FG is supported.] |

 |

### Proposal 2.6-1:

* Prerequisite FG of FG47-m3 is At least one of {15-25, 15-3, 32-4, 32-4a}

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-m3
	+ Prerequisite
		- At least one of {15-25, 15-3, 32-4, 32-4a}: HW, Nokia, QC, DCM
		- At least one of {47-k9, (47-k10 and 47-k11), 32-4, 32-4a}: Apple
 |
| vivo | Please see our view regarding the prerequisite of 32-4 in our responses to Proposal 2.1-1. |
| DCM | OK |
| CATT, CICTCI | OK |
| QC | Prerequisite: OK to AVOID as per Vivo’s comment |

### (H) Proposal 2.6-2:

* Remove bracket and update to [For UE supports NR SL in shared spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported] for FG47-m4
	+ Remove “[This is the basic FG for NR sidelink in shared spectrum.]” from note of FG47-m4
* “Applicable to the capability signalling exchange between UEs” for FG47-m4 is No
* FG47-m4 is Optional without capability signaling
	+ Reporting granularity of FG47-m4 is not described
	+ Add “The FG is only expected for a band where shared spectrum channel access must be used.” in note of FG47-m4
* Prerequisite FG of FG47-m4 is 15-1, and following notes are added
	+ Note: If UE supports 15-1, the UE is not required to support Component 5
	+ Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-m4
	+ Mandatory/optional
		- Basic FG: HW, FLs, Nokia, DCM, Sharp
		- Optional: vivo, CATT, Samsung, ZTE, QC
	+ Prerequisite
		- 15-1: HW (with note), FLs (with note), Nokia, ZTE, vivo, QC, DCM (with note), Sharp (with note)
			* HW, FLs, DCM: Note: If UE supports 15-1, the UE is not required to support Component 5.
			* HW, FLs, DCM: Note: It is up to RAN2 whether/how to implement the above Note and whether/how to update the prerequisite FGs
		- 47-m1: Apple
	+ Report to other UE
		- YES
			* Cap per band: vivo
		- NO: HW, FLs, Nokia, ZTE, QC, DCM, Sharp
			* Moderator observation: This may be dependent on ‘Mandatory/optional’ discussion
	+ Note
		- Add “The FG is only expected for a band where shared spectrum channel access must be used.”: Sharp
 |
| vivo | We don’t think this FG should be a basic FG – it obviously requires higher processing capability.And it should be reported to UE, because a UE should be aware that the peer UE is capable of receiving SL transmission from the 2nd starting symbol in a slot, so that it may determine to transmit the TB to that UE from the 2nd starting symbol when LBT failed in the 1st starting symbol but succeeded before the 2nd starting symbol. |
| DCM | OK |
| CATT, CICTCI | We have concern on the first bullet, we prefer to remove the bracket text. Since additionally receiving from the 2nd starting symbol will significantly increase the UE processing capability, and we have agreed that it is up to UE implementation to monitor 1 or 2 AGC symbol(s) in a slot. |
| ZTE | 47-m4 should not be a basic FG, so [For UE supports NR SL in shared spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported] should be removed for FG47-m4. |
| QC | No [For UE supports NR SL in shared spectrum and when shared spectrum channel access must be used, UE must indicate this FG is supported]. Again, not that the wording wouldn’t work if no signaling is introduced for this FG (“UE must indicate”).We are open to reporting between UEs, again, pending the discussion on the common understanding for usability of FG for groupcast/broadcast when this UEtoUE reporting is “Yes”. |

## FG for Multiple PSFCH occasions per PSCCH/PSSCH

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m5 | Multiple PSFCH occasions per PSCCH/PSSCH | 1. UE supports PSFCH transmission/reception on N PSFCH occasion(s) per PSCCH/PSSCH | 15-11 | Yes | No | UE supports only one PSFCH occasion per PSCCH/PSSCH transmission | Per band | N/A | N/A |  | Candidate values for N are {1,2,3,4}The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1] | HW/HiSi | The columns with yellow highlights can be updated as below:* Per band is sufficient. Because concurrent transmission/reception on multiple bands, e.g. inter-band CA, is not included in the scope in Rel-18 SL-U.
* Since SL-U is limited to n46 and n96/n102, the need of FDD/TDD differentiation and FR1/FR2 differentiation is N/A.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m5 | Multiple PSFCH occasions per PSCCH/PSSCH | 1. UE supports PSFCH transmission/reception on N PSFCH occasion(s) per PSCCH/PSSCH | 15-11 | Yes | No | UE supports only one PSFCH occasion per PSCCH/PSSCH transmission | Per band | N/A | N/A |  | Candidate values for N are {1,2,3,4}The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [2] | vivo |  |
| [3] | FLs |  |
| [4] | CATT/CICTCI |  |
| [5] | Samsung |  |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m5 | Multiple PSFCH occasions per PSCCH/PSSCH | 1. UE supports PSFCH transmission/reception on N PSFCH occasion(s) per PSCCH/PSSCH | 15-11 | Yes | No | UE supports only one PSFCH occasion per PSCCH/PSSCH transmission | Per band | N/A | N/A |  | Candidate values for N are {1,2,3,4}The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [7] | xiaomi | In the higher layer parameter, the number of the candidate PSFCH occasions per PSSCH is configured per resource pool, so we prefer to the granularity of the capability signalling for the multiple PSFCH occasions is per resource pool. In the last meeting, it has been agreed that the prerequisite FG of FG47-m5 is 15-11. Meanwhile, UE needs support the channel access on SL-U and performs the LBT procedure before PSFCH transmission, so FG 47-k1 is the also prerequisite.Proposal 1: The prerequisites of FG 47-m5 is FG 47-k1.Proposal 2: The columns with yellow highlights of FG 47-m5 can be updated as below:* Per resource pool
 |
| [8] | ZTE/Sanechips |  |
| [9] | Apple | It was agreed to support multiple PSFCH occasions per PSCCH/PSSCH. Subsequently, the FG 47-m5 was introduced. It was agreed that the prerequisite of FG 47-m5 is FG 15-11. However, FG 15-11 is a single PRB based PSFCH, which is not applicable to sidelink operations in unlicensed spectrum. Hence, we propose to replace FG 15-11 by FG 47-m1. **Proposal 11:** For the prerequisite of FG 47-m5, replace FG 15-11 by FG 47-m1.  |
| [10] | QC |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m5 | Multiple PSFCH occasions per PSCCH/PSSCH | 1. UE supports PSFCH transmission/reception on N PSFCH occasion(s) per PSCCH/PSSCH | 15-11 | Yes | No | UE supports only one PSFCH occasion per PSCCH/PSSCH transmission | Per band | N/A | N/A |  | Candidate values for N are {1,2,3,4}The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [11] | DCM | For cap per X, per band would be OK.Proposal 10: Update FG 47-m5 as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m5 | Multiple PSFCH occasions per PSCCH/PSSCH | 1. UE supports PSFCH transmission/reception on N PSFCH occasion(s) per PSCCH/PSSCH | 15-11 | Yes | No | UE supports only one PSFCH occasion per PSCCH/PSSCH transmission | Per band | N/A | N/A |  | Candidate values for N are {1,2,3,4}The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [12] | Sharp |  |

### (H) Proposal 2.7-1:

* Reporting granularity of FG47-m5 is Per band

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Reporting granularity
	+ Band: HW, Nokia, QC, DCM
	+ Resource pool: xiaomi
* Prerequisite
	+ 47-k1: xiaomi
	+ 47-m1: Apple (with removal of 15-11)
 |
| DCM | OK |
| CATT, CICTCI | OK |
| QC | Ok |

## FG for Contiguous RB-based SL transmission

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m10 | Contiguous RB-based PSCCH/PSSCH transmission | 1. UE supports contiguous RB-based PSCCH/PSSCH transmission2. UE supports resource (re-)selection for contiguous RB-based PSCCH/PSSCH transmissionFFS whether/how to define the capabilities for reception and/or PSFCH | At least one of {15-25, 15-3, [32-4, 32-4a]} | Yes | No | UE does not support contiguous RB-based PSCCH/PSSCH transmission | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1] | HW/HiSi | The columns with yellow highlights can be updated as below:* Only new Tx behaviour is introduced, and the Rx behaviour is same as legacy NR SL. No need to define Rx capability.
* The UE Tx/Rx behaviour for contiguous RB-based PSFCH in SL-U are the same to that in Rel-16/Rel-17. Thus, no need to define capability of contiguous RB-based PSFCH.
* The brackets of prerequisites can be removed because contiguous RB-based PSCCH/PSSCH transmission is also applicable to partial sensing and random selection.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m10 | Contiguous RB-based PSCCH/PSSCH transmission | 1. UE supports contiguous RB-based PSCCH/PSSCH transmission2. UE supports resource (re-)selection for contiguous RB-based PSCCH/PSSCH transmissionFFS whether/how to define the capabilities for reception and/or PSFCH | At least one of {15-25, 15-3, ~~[~~32-4, 32-4a~~]~~} | Yes | No | UE does not support contiguous RB-based PSCCH/PSSCH transmission | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signalling |

 |
| [2] | vivo |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m10 | Contiguous RB-based PSCCH/PSSCH transmission | 1. UE supports contiguous RB-based PSCCH/PSSCH transmission2. UE supports resource (re-)selection for contiguous RB-based PSCCH/PSSCH transmissionFFS whether/how to define the capabilities for reception and/or PSFCH | At least one of {15-25, 15-3, [32-4, 32-4a]} | Yes | No | UE does not support contiguous RB-based PSCCH/PSSCH transmission | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signalling |

 |
| [3] | FLs |  |
| [4] | CATT/CICTCI | Regarding the FFS part on whether/how to define the capabilities for reception and/or PSFCH, we have following comments:* For PSCCH/PSSCH reception, it may require new UE behavior on inter-cell guradband processing, it would be better to introduce a component on reception.
* For PSFCH, there is no UE behavior, no need to introduce PSFCH capability in this FG.

Proposal 13: For FG47-m10:* Add a new component on contiguous RB-based PSCCH/PSSCH reception.
* Remove the FFS part.
 |
| [5] | Samsung |  |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m10 | Contiguous RB-based PSCCH/PSSCH transmission | 1. UE supports contiguous RB-based PSCCH/PSSCH transmission2. UE supports resource (re-)selection for contiguous RB-based PSCCH/PSSCH transmissionFFS whether/how to define the capabilities for reception and/or PSFCH | At least one of {15-25, 15-3, 32-4, 32-4a} | Yes | No | UE does not support contiguous RB-based PSCCH/PSSCH transmission | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signalling |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips |  |
| [9] | Apple | FG 47-m10 was introduced for contiguous RB-based SL transmission/reception. This includes the transmission and reception of PSCCH/PSSCH. The current prerequisites of FG 47-m10 are FG 15-25 and FG 15-3. However, we think the prerequisite of FG 15-3 should be replaced by FG 47-k11, since FG 47-k11 supports mode 2 resource selection with the consideration of intra-cell guardband. Also, it is open whether FG 32-4 and FG 32-4a could be the prerequisites of FG 47-m10. In our view, partial sensing and random resource selection could be used for sidelink operations on unlicensed spectrum. Hence, we propose to keep one of FG 32-4 and FG 32-4a as prerequisite of FG 47-m10. **Proposal 8:** For the prerequisites of FG 47-m10,* replace FG 15-3 by FG 47-k11
* keep FG 32-4 and FG 32-4a.
 |
| [10] | QC | Multi-channel access based on NR-U DL procedures (partial transmissions allowed in procedure for Type A and Type B are specified in TS 37.213) is supported for PSFCH and S-SSB. If no additional UE features are specified, one interpretation could be that all UEs need to support the following for PSFCH waveform preparation, that is undesirable:* Preparing multiple waveforms for transmission on a subset of the target set of RB sets based on multiple hypotheses of LBT success (for minimal capability of 4 PSFCH in one slot, if these are spread on 4 RB sets, it requires 15 hypotheses for waveforms).
* Preparing waveforms spanning non-contiguous RB sets.

Transmitting a subset of a broader set of RB sets based on the outcome of channel access on individual RB sets ($20 MHz channel$) might require a new UE feature. Transmitting on a non-contiguous set of RB sets might require a new UE feature.Proposal 2: UE features for SL-U (FG 47-k2bis) for transmitting on a subset of the intended number of RB sets based on the outcome of channel access on individual RB sets are defined per band. Proposal 3: UE features for SL-U (FG 47-m10) include a new component for contiguous RB-based PSCCH/PSSCH reception. Proposal 4: UE features for SL-U (FG 47-m10bis) for contiguous RB-based PSFCH transmission/reception are defined per band.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m10 | Contiguous RB-based PSCCH/PSSCH transmission/reception | 1. UE supports contiguous RB-based PSCCH/PSSCH transmission2. UE supports resource (re-)selection for contiguous RB-based PSCCH/PSSCH transmission3. UE supports contiguous RB-based PSCCH/PSSCH reception | At least one of {15-25, 15-3, 32-4, 32-4a} and 15-1 | Yes | No | UE does not support contiguous RB-based PSCCH/PSSCH transmission/reception | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m10bis | Contiguous RB-based PSFCH transmission/reception | 1. UE supports contiguous RB-based PSFCH transmission2. UE supports contiguous RB-based PSFCH reception |  | Yes | No | UE does not support contiguous RB-based PSCCH/PSSCH transmission/reception | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [11] | DCM | For the FFS part, reception capability can be included in this FG as in FG 47-m1. We do not see any motivation to discuss PSFCH here; the existing/newly-added PSFCH capabilities are sufficient.For pre-requisite, there seems to be no intention to preclude partial sensing and random selection from SL-U as mentioned for FG 47-k1.Proposal 11: Update FG 47-m10 as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m10 | Contiguous RB-based PSCCH/PSSCH transmission/reception | 1. UE supports contiguous RB-based PSCCH/PSSCH transmission and reception2. UE supports resource (re-)selection for contiguous RB-based PSCCH/PSSCH transmissionFFS whether/how to define the capabilities for reception and/or PSFCH | At least one of {15-25, 15-3, ~~[~~32-4, 32-4a~~]~~} | Yes | No | UE does not support contiguous RB-based PSCCH/PSSCH transmission | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Note1: If UE supports 15-25, the UE is not required to support Component 3 and 4 in 15-2.Note2: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note: It is up to RAN2 whether/how to implement the above Notes 1/2 and whether/how to update the prerequisite FGs | Optional with capability signalling |

 |
| [12] | Sharp |  |

### (H) Proposal 2.8-1:

* Add “reception” for FG name, component 1, consequence columns for FG47-m10
* Remove “FFS whether/how to define the capabilities for reception and/or PSFCH” from FG47-m10
* Prerequisite FG of FG47-m10 is At least one of {15-25, 15-3, 32-4, 32-4a}

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Cap for RX
	+ YES: CATT, QC, DCM
	+ NO: HW, vivo
* Cap for PSFCH
	+ YES: QC
	+ NO: HW, vivo, CATT, DCM
* Prerequisite
	+ At least one of {15-25, 15-3, 32-4, 32-4a}: HW, Nokia, QC, DCM
	+ 15-1: QC
	+ At least one of {15-25, 47-k11, 32-4, 32-4a}: Apple
 |
| vivo | Please see our view regarding the prerequisite of 32-4/15-25 in our responses to Proposal 2.1-1. |
| DCM | OK |
| CATT, CICTCI | OK |
| QC | Generally ok, may need to check on Vivo’s comment. |

## FG for SL transmission in multiple contiguous/non-contiguous RB sets

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m11 | PSFCH transmissions in multiple contiguous RB sets | UE supports PSFCH transmissions in multiple contiguous RB sets | TBD | [No] | [No] | UE does not support PSFCH transmissions in multiple contiguous RB sets | [Per band] | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m11a | PSFCH transmissions in multiple non-contiguous RB sets | UE supports PSFCH transmissions in multiple non-contiguous RB sets | TBD | [No] | [No] | UE does not support PSFCH transmissions in multiple non-contiguous RB sets | [Per band] | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m12 | S-SSB transmissions in multiple contiguous RB sets | UE supports S-SSB transmissions in multiple contiguous RB sets | TBD | [No] | [No] | UE does not support S-SSB transmissions in multiple contiguous RB sets | [Per band] | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m12a | S-SSB transmissions in multiple non-contiguous RB sets | UE supports S-SSB transmissions in multiple non-contiguous RB sets | TBD | [No] | [No] | UE does not support S-SSB transmissions in multiple non-contiguous RB sets | [Per band] | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| [1] | HW/HiSi | UE can transmit PSFCH/S-SSB over multiple RB sets in 2 cases including initiating COT to transmit via multiple channel access procedure (FG 47-k2) and transmitting in shared COT via single channel access procedure in each RB set (FG 47-k1). * FG 47-m11: For PSFCH, both cases are supported. Thus, the prerequisites include at least one of {47-k1, 47-k2}, 15-11.
* FG 47-m11a: It is not reasonable that a UE supports only PSFCH transmission over non-contiguous RB sets but not PSFCH transmission over contiguous RB sets. FG for transmission over contiguous RB sets should be pre-requisite of FG for transmission over non-contiguous RB sets. Thus, the prerequisite of FG 47-m12 includes FG 47-m11.
* FG 47-m12: For S-SSB, multiple channel access is not supported. Thus, the prerequisites include 47-k1, 15-4.
* FG 47-m12a: Similar as the analysis of FG 47-m11a, the prerequisite of FG 47-m12a includes FG 47-m12.

The columns with yellow highlights for FG 47-m11/m11a/m12/m12a can be updated as below:* The behaviours are performed by UE itself and has no impact on Rx behaviour, the need of report to gNB and exchange between UEs are No.
* Since it is unnecessary to report to gNB and exchange between UEs, these FGs are optional without capability signalling.
* Other highlighted parts are reasonable.

In addition, if SL-BWP includes multiple RB sets, FG 47-m11 should be supported as a basic capability to ensure the performance of PSFCH. There are two approaches to reflect this and either is ok as long as RAN1 has the same understanding.* Approach1: Add a note in FG 47-m11 that this is the basic FG for NR sidelink in shared spectrum, when SL-BWP includes multiple RB sets.
* Approach2: Do not introduce FG 47-m11, which means that PSFCH transmissions in multiple contiguous RB sets is the basic FG for NR sidelink in shared spectrum.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m11 | PSFCH transmissions in multiple contiguous RB sets | UE supports PSFCH transmissions in multiple contiguous RB sets | ~~TBD~~ At least one of {47-k1, 47-k2}, 15-11 | ~~[~~No~~]~~ | ~~[~~No~~]~~ | UE does not support PSFCH transmissions in multiple contiguous RB sets |  |  |  |  | The signaling is only expected for a band where shared spectrum channel access must be used.This is the basic FG for NR sidelink in shared spectrum, when SL-BWP includes multiple RB sets. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m11a | PSFCH transmissions in multiple non-contiguous RB sets | UE supports PSFCH transmissions in multiple non-contiguous RB sets | ~~TBD~~47-m11 | ~~[~~No~~]~~ | ~~[~~No~~]~~ | UE does not support PSFCH transmissions in multiple non-contiguous RB sets |  |  |  |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m12 | S-SSB transmissions in multiple contiguous RB sets | UE supports S-SSB transmissions in multiple contiguous RB sets | ~~TBD~~47-k1, 15-4 | ~~[~~No~~]~~ | ~~[~~No~~]~~ | UE does not support S-SSB transmissions in multiple contiguous RB sets |  |  |  |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m12a | S-SSB transmissions in multiple non-contiguous RB sets | UE supports S-SSB transmissions in multiple non-contiguous RB sets | ~~TBD~~47-m12 | ~~[~~No~~]~~ | ~~[~~No~~]~~ | UE does not support S-SSB transmissions in multiple non-contiguous RB sets |  |  |  |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

 |
| [2] | vivo | For FG 47-m11/11a/12/12a, they can be defined per band, and the prerequisite, if needed, can be FG 47-k2.Proposal 6: The granularity of UE capability 47-m11/11a/12/12a is per band, and the prerequisite (if necessary) can be FG 47-k2.The other remaining issues are the UE FG reporting to network/UE. Firstly, it seems worthwhile to clarify that a UE FG can be exchanged between UEs does not mean or restrict that this FG can only be used in unicast. For example, in Rel-17 a UE FG “***drx-OnSidelink-r17***” is introduced to indicate whether a UE supports sidelink DRX, which is defined as below:

| Definitions for parameters | Per | M | FDD-TDDDIFF | FR1-FR2DIFF |
| --- | --- | --- | --- | --- |
| drx-OnSidelink-r17Indicates whether UE supports sidelink DRX for unicast, groupcast and broadcast. | UE | No | No | No |

It is obvious that this FG is applicable for all the cast types. Moreover, this FG should be reported to the network, and exchanged between UEs to indicate the support of DRX capability, as defined in TS 38.306:

|  |
| --- |
| 38.306…omitted…Annex A.4 specifies for each sidelink related capability, in which interface (i.e., *UECapabilityInformation* in Uu RRC and *UECapabilityInformation*Sidelink in PC5 RRC) a UE supporting sidelink shall report the concerned capability:-   *UECapabilityInformation*: the concerned sidelink capability is reported within *UECapabilityInformation*;-   UECapabilityInformationSidelink: the concerned sidelink capability is reported within UECapabilityInformationSidelink;…omitted… |

|  |  |  |
| --- | --- | --- |
| Sidelink Parameter | UECapabilityInformation | UECapabilityInformationSidelink |
| drx-OnSidelink | X | X |

Thus, it should be clear that a UE FG that is applicable to the capability exchanging between UEs does not mean that this FG is only applicable to unicast. Regarding the agreed UE FGs, in our view, FG 47-k2, 47-k3, 47-k4, 47-m4, 47-m11, and 47-m11a, should be reported to peer UE.For the multi-channel access case, a UE should be aware of whether the peer UE supports multiple RB sets (and multi-channel access), especially for PSFCH, so that it transmits a TB over multiple RB sets and is expected to correctly receive the PSFCH that may span multiple channels. If the target UE does not support FG 47-k2, the Tx UE should avoid reserving and transmitting multiple TBs on multiple RB sets to that UE, otherwise, some or all the PSFCHs may be dropped.For the COT sharing case, the UE-A should be aware that the peer UE-B is capable of receiving COT SI, so that it may determine to share the COT to the peer UE. Otherwise, the UE-A can simply not share the COT, or share the COT with another UE-C that supports sharing the COT.Similarly, regarding the 47-m4, a UE should be aware that the peer UE is capable of receiving SL transmission from the 2nd starting symbol in a slot, so that it may determine to transmit the TB to that UE from the 2nd starting symbol when LBT failed in the 1st starting symbol but succeeded before the 2nd starting symbol.Proposal 8: The UE FG 47-k2, 47-k3, 47-k4, 47-m4, 47-m11, and 47-m11a should be reported to peer UE.On the other hand, in our view, FG 47-k3, 47-k4, 47-k9 (obviously), 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the network for mode-1 scheduling. For the COT sharing case (i.e., 47-k3/k4), the gNB needs to know whether the two SL UEs support UE to UE COT sharing. Only when they support, the gNB can schedule two SL transmissions of these two UEs in a back-to-back manner in the unlicensed band, otherwise, the second SL transmission would always be dropped due to LBT failure if the first SL transmission occupied the channel. If these FGs are not reported to gNB, mode-1 scheduling would be very inefficient. The FG 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the gNB for proper S-SSB and PSFCH configurations.Proposal 9: The UE FG 47-k3, 47-k4, 47-k9, 47-m11, 47-m11a, 47-m12, and 47-m12a should be reported to the network.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m11 | PSFCH transmissions in multiple contiguous RB sets | UE supports PSFCH transmissions in multiple contiguous RB sets | TBD | ~~[No]~~ Yes | ~~[No]~~ Yes | UE does not support PSFCH transmissions in multiple contiguous RB sets | [Per band] | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m11a | PSFCH transmissions in multiple non-contiguous RB sets | UE supports PSFCH transmissions in multiple non-contiguous RB sets | TBD | ~~[No]~~ Yes | ~~[No]~~ Yes | UE does not support PSFCH transmissions in multiple non-contiguous RB sets | [Per band] | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m12 | S-SSB transmissions in multiple contiguous RB sets | UE supports S-SSB transmissions in multiple contiguous RB sets | TBD | ~~[No]~~ Yes | [No] | UE does not support S-SSB transmissions in multiple contiguous RB sets | [Per band] | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m12a | S-SSB transmissions in multiple non-contiguous RB sets | UE supports S-SSB transmissions in multiple non-contiguous RB sets | TBD | ~~[No]~~ Yes | [No] | UE does not support S-SSB transmissions in multiple non-contiguous RB sets | [Per band] | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [3] | FLs |  |
| [4] | CATT/CICTCI | Regarding the pre-requisite of the above 4 FGs, FG47-k2 (SL multi-channel access for dynamic channel access mode) should be the pre-requisite of the above 4 FGs for W-SSB/PSFCH transmission in multiple RB sets.Regarding the “Need for the gNB to know if the feature is supported” column, for FG47-m11 and FG47-m11a, gNB may need to consider the UE’s PSFCH capability to schedule the PSCCH/PSSCH transmission, then they could be Yes. For FG47-m12 and FG47-m12a, the S-SSB transmission is performed only by UE, gNB doesn’t need to control S-SSB transmission, then they could be No.Regarding the “Applicable to the capability signalling exchange between UEs” column, all of these four FGs is No.Proposal 14: For FG47-m11, FG47-m11a, FG47-m12 and FG47-m12a:* “Need for the gNB to know if the feature is supported” is Yes for FG47-m11 and FG47-m11a.
* “Need for the gNB to know if the feature is supported” is No for FG47-m12 and FG47-m12a.
* “Applicable to the capability signalling exchange between UEs” is No for these four FGs.
* All of these four FGs should be optional.
 |
| [5] | Samsung |  |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m11 | PSFCH transmissions in multiple contiguous RB sets | UE supports PSFCH transmissions in multiple contiguous RB sets | TBD | No | No | UE does not support PSFCH transmissions in multiple contiguous RB sets | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m11a | PSFCH transmissions in multiple non-contiguous RB sets | UE supports PSFCH transmissions in multiple non-contiguous RB sets | TBD | No | No | UE does not support PSFCH transmissions in multiple non-contiguous RB sets | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m12 | S-SSB transmissions in multiple contiguous RB sets | UE supports S-SSB transmissions in multiple contiguous RB sets | TBD | No | No | UE does not support S-SSB transmissions in multiple contiguous RB sets | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m12a | S-SSB transmissions in multiple non-contiguous RB sets | UE supports S-SSB transmissions in multiple non-contiguous RB sets | TBD | No | No | UE does not support S-SSB transmissions in multiple non-contiguous RB sets | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips | Regarding 47-m11, 47-m11a, 47-m12, 47-m12a after RAN1#116, our views on the pending issues are as follows:1, Prerequisite feature groups: To transmit PSFCH/S-SSB on the shared spectrum, at least FG 47-k1 should be one of the prerequisites. In addition, PSFCH/S-SSB can be transmitted on multiple channels, so FG 47-k2 should be included too.2, The need for the gNB to know if the feature is supported: PSFCH/S-SSB transmission has no impact on gNB, so it is unnecessary to be reported to gNB.3, The capability signalling exchange between UEs: Considering that PSFCH/S-SSB transmission is a matter for the transmitting side and has nothing to do with the receiver. So there is no requirement for exchanging such FGs between UEs.4, The granularity for report: per band is preferred.5, Mandatory/Optional: Considering that there is no need to report to gNB or exchange capability information between UEs, so this FG should be optional without capability signalling. 6, Other highlighted parts are reasonable.Based on above analysis, 47-m11, 47-m11a, 47-m12, 47-m12a should be updated as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m11 | PSFCH transmissions in multiple contiguous RB sets | UE supports PSFCH transmissions in multiple contiguous RB sets | FG 47-k1, FG 47-k2 | No | No | UE does not support PSFCH transmissions in multiple contiguous RB sets | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m11a | PSFCH transmissions in multiple non-contiguous RB sets | UE supports PSFCH transmissions in multiple non-contiguous RB sets | FG 47-k1, FG 47-k2 | No | No | UE does not support PSFCH transmissions in multiple non-contiguous RB sets | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m12 | S-SSB transmissions in multiple contiguous RB sets | UE supports S-SSB transmissions in multiple contiguous RB sets | FG 47-k1, FG 47-k2 | No | No | UE does not support S-SSB transmissions in multiple contiguous RB sets | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m12a | S-SSB transmissions in multiple non-contiguous RB sets | UE supports S-SSB transmissions in multiple non-contiguous RB sets | FG 47-k1, FG 47-k2 | No | No | UE does not support S-SSB transmissions in multiple non-contiguous RB sets | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

 |
| [9] | Apple | Two new FGs (FG 47-m11 and FG 47-m11a) were introduced to support the multiple PSFCH transmissions over multiple RB sets. It is open on the prerequisite of these two FGs.In our view, to transmit multiple PSFCH over multiple RB sets, UE needs to support PSFCH transmission capability. Hence, FG 47-m1 is the prerequisite.**Proposal 12:** The prerequisite of FG 47-m11 and FG 47-m11a is FG 47-m1. Two new FGs (i.e., FG 47-m12 and FG 47-m12a) were introduced to support the multiple S-SSB transmissions over multiple RB sets. It is open on the prerequisite of these two FGs.In our view, to transmit multiple S-SSB over multiple RB sets, UE needs to support S-SSB transmission capability. Hence, FG 47-m6 is the prerequisite. **Proposal 14:** The prerequisite of FG 47-m12 and FG 47-m12a is FG 47-m6.  |
| [10] | QC |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m11 | PSFCH transmissions in multiple contiguous RB sets | UE supports PSFCH transmissions in multiple contiguous RB sets |  | No | No | UE does not support PSFCH transmissions in multiple contiguous RB sets |  | N/A | N/A |  | The FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m11a | PSFCH transmissions in multiple non-contiguous RB sets | UE supports PSFCH transmissions in multiple non-contiguous RB sets |  | No | No | UE does not support PSFCH transmissions in multiple non-contiguous RB sets |  | N/A | N/A |  | The FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m12 | S-SSB transmissions in multiple contiguous RB sets | UE supports S-SSB transmissions in multiple contiguous RB sets |  | No | No | UE does not support S-SSB transmissions in multiple contiguous RB sets |  | N/A | N/A |  | The FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m12a | S-SSB transmissions in multiple non-contiguous RB sets | UE supports S-SSB transmissions in multiple non-contiguous RB sets |  | No | No | UE does not support S-SSB transmissions in multiple non-contiguous RB sets |  | N/A | N/A |  | The FG is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

 |
| [11] | DCM | At the previous meeting, these FGs have been introduced newly for PSFCH based on discussion in SL-U agenda. Each yellow part is discussed as below:For pre-requisite, FG 47-k2 can be included.For report to gNB/UE, at least YES for gNB. gNB scheduler may consider destination UE’s capability. For cap per X, ‘per band’ would be OK as in other FGs.For the other columns, the existing texts can be agreed without any modification.Proposal 12: Update FG 47-m11/m11a as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m11 | PSFCH transmissions in multiple contiguous RB sets | UE supports PSFCH transmissions in multiple contiguous RB sets | TBD47-k2 | [No]Yes | [No] | UE does not support PSFCH transmissions in multiple contiguous RB sets | ~~[~~Per band~~]~~ | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-m11a | PSFCH transmissions in multiple non-contiguous RB sets | UE supports PSFCH transmissions in multiple non-contiguous RB sets | TBD47-k2 | [No]Yes | [No] | UE does not support PSFCH transmissions in multiple non-contiguous RB sets | ~~[~~Per band~~]~~ | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional with capability signalling |

At the previous meeting, these FGs have been introduced newly for S-SSB based on discussion in SL-U agenda. Each yellow part is discussed as below:For pre-requisite, FG 47-k2 can be included.For report to gNB/UE, both can be ‘NO’. These capabilities will not have any impact on gNB/other UE behavior.Proposal 13: Update FG 47-m12/12a as follows.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m12 | S-SSB transmissions in multiple contiguous RB sets | UE supports S-SSB transmissions in multiple contiguous RB sets | TBD47-k2 | ~~[~~No~~]~~ | ~~[~~No~~]~~ | UE does not support S-SSB transmissions in multiple contiguous RB sets |  |  |  |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |
| 47. NR\_SL\_enh2 | 47-m12a | S-SSB transmissions in multiple non-contiguous RB sets | UE supports S-SSB transmissions in multiple non-contiguous RB sets | TBD47-k2 | ~~[~~No~~]~~ | ~~[~~No~~]~~ | UE does not support S-SSB transmissions in multiple non-contiguous RB sets |  |  |  |  | The signaling is only expected for a band where shared spectrum channel access must be used. | Optional without capability signalling |

 |
| [12] | Sharp |  |

### (H) Proposal 2.9-1:

* “Need for the gNB to know if the feature is supported” for FG47-m11 is No
* “Applicable to the capability signalling exchange between UEs” for FG47-m11 is No
* FG47-m11 is Optional without capability signaling
	+ Reporting granularity of FG47-m11 is not described
	+ Replace “signaling” by “FG” for “The signaling is only expected for a band where shared spectrum channel access must be used.” in the note of FG47-m11
* Prerequisite FG of FG47-m11 is 47-k2
* “Consequence if the feature is not supported by the UE” for FG47-m11 is kept as it is
* Note for FG47-m11 is kept as it is

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-m11
	+ Prerequisite
		- At least one of {47-k1, 47-k2}, 15-11: HW
		- 47-k2: vivo, ZTE, DCM
		- 47-k1: ZTE
		- 47-m1: Apple
		- None: QC
	+ Report to gNB
		- YES
			* Per band: vivo, [CATT], DCM
		- NO: HW, Nokia, ZTE, QC
	+ Report to other UE
		- YES:
			* Per band: vivo, DCM
		- NO: HW, CATT, Nokia, ZTE, QC
	+ Consequence if not supported
		- OK/Keep: HW, Nokia, ZTE, QC, DCM
	+ Note
		- OK/Keep: HW, Nokia, ZTE, DCM
		- Update/Add: QC
			* QC: ‘signaling’ to ‘FG’
	+ Mandatory/optional
		- Basic FG: HW
		- Optional: CATT, Nokia, ZTE, QC, DCM
 |
| vivo | We think this proposal is related to P2.1-2 on whether to report to other UE, which should be discussed first. |
| DCM | OK |
| CATT, CICTCI | From our understanding, reported to gNB should support, otherwise gNB has no knowledge on the capability of transmission of multiple RB set. |
| QC | Generally ok, but we may need to hold on to the prerequisite until the discussion on 47-k2 is resolved (new FG for either TypeA/B or on TX on subset of RB sets based on LBT outcome) |

### (H) Proposal 2.9-2:

* “Need for the gNB to know if the feature is supported” for FG47-m11a is No
* “Applicable to the capability signalling exchange between UEs” for FG47-m11a is No
* FG47-m11a is Optional without capability signaling
	+ Reporting granularity of FG47-m11a is not described
	+ Replace “signaling” by “FG” for “The signaling is only expected for a band where shared spectrum channel access must be used.” in the note of FG47-m11a
* Prerequisite FG of FG47-m11a is 47-k2
* “Consequence if the feature is not supported by the UE” for FG47-m11a is kept as it is
* Note for FG47-m11a is kept as it is

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-m11a
	+ Prerequisite
		- 47-m11: HW
		- 47-k2: vivo, ZTE, DCM
		- 47-k1: ZTE
		- 47-m1: Apple
		- None: QC
	+ Report to gNB
		- YES:
			* Per band: vivo, [CATT], DCM
		- NO: HW, Nokia, ZTE, QC
	+ Report to other UE
		- YES:
			* Per band: vivo
		- NO: HW, CATT, Nokia, ZTE, QC, DCM
	+ Consequence if not supported
		- OK/Keep: HW, Nokia, ZTE, QC, DCM
		- Update:
	+ Note
		- OK/Keep: HW, Nokia, ZTE, DCM
		- Update/Add: QC
			* QC: ‘signaling’ to ‘FG’
	+ Mandatory/optional
		- Basic FG
		- Optional: HW, CATT, Nokia, ZTE, QC, DCM
 |
| vivo | We think this proposal is related to P2.1-2 on whether to report to other UE, which should be discussed first. |
| DCM | OK |
| CATT, CICTCI | Similar comments as proposal 2.9-2. Prefer to reported to gNB. |
| QC | Generally ok, but we may need to hold on to the prerequisite until the discussion on 47-k2 is resolved (new FG for either TypeA/B or on TX on subset of RB sets based on LBT outcome) |

### (H) Proposal 2.9-3:

* “Need for the gNB to know if the feature is supported” for FG47-m12 is No
* “Applicable to the capability signalling exchange between UEs” for FG47-m12 is No
* FG47-m12 is Optional without capability signaling
	+ Reporting granularity of FG47-m12 is not described
	+ Replace “signaling” by “FG” for “The signaling is only expected for a band where shared spectrum channel access must be used.” in the note of FG47-m12
* Prerequisite FG of FG47-m12 is 47-k2
* “Consequence if the feature is not supported by the UE” for FG47-m12 is kept as it is
* Note for FG47-m12 is kept as it is

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-m12
	+ Prerequisite
		- 47-k1: HW, ZTE
		- 15-4: HW
		- 47-k2: vivo, ZTE, DCM
		- 47-m6: Apple
		- None: QC
	+ Report to gNB
		- YES:
			* Per band: vivo
		- NO: HW, CATT, Nokia, ZTE, QC, DCM
	+ Report to other UE
		- NO: HW, vivo, CATT, Nokia, ZTE, QC, DCM
	+ Consequence if not supported
		- OK/Keep: HW, Nokia, ZTE, QC, DCM
	+ Note
		- OK/Keep: HW, Nokia, ZTE, DCM
		- Update/Add: QC
			* QC: ‘signaling’ to ‘FG’
	+ Mandatory/optional
		- Optional: HW, CATT, Nokia, ZTE, QC, DCM
 |
| DCM | OK |
| CATT, CICTCI | OK |
| QC | Generally ok, but we may need to hold on to the prerequisite until the discussion on 47-k2 is resolved (new FG for either TypeA/B or on TX on subset of RB sets based on LBT outcome) |

### (H) Proposal 2.9-4:

* “Need for the gNB to know if the feature is supported” for FG47-m12a is No
* “Applicable to the capability signalling exchange between UEs” for FG47-m12a is No
* FG47-m12a is Optional without capability signaling
	+ Reporting granularity of FG47-m12a is not described
	+ Replace “signaling” by “FG” for “The signaling is only expected for a band where shared spectrum channel access must be used.” in the note of FG47-m12a
* Prerequisite FG of FG47-m12a is 47-k2
* “Consequence if the feature is not supported by the UE” for FG47-m12a is kept as it is
* Note for FG47-m12a is kept as it is

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* 47-m12a
	+ Prerequisite
		- 47-m12: HW
		- 47-k2: vivo, ZTE, DCM
		- 47-k1: ZTE
		- 47-m6: Apple
		- None: QC
	+ Report to gNB
		- YES:
			* Per band: vivo
		- NO: HW, CATT, Nokia, ZTE, QC, DCM
	+ Report to other UE
		- NO: HW, vivo, CATT, Nokia, ZTE, QC, DCM
	+ Consequence if not supported
		- OK/Keep: HW, Nokia, ZTE, QC, DCM
	+ Note
		- OK/Keep: HW, Nokia, ZTE, DCM
		- Update/Add: QC
			* QC: ‘signaling’ to ‘FG’
	+ Mandatory/optional
		- Optional: HW, CATT, Nokia, ZTE, QC, DCM
 |
| DCM | OK |
| CATT, CICTCI | OK |
| QC | Generally ok, but we may need to hold on to the prerequisite until the discussion on 47-k2 is resolved (new FG for either TypeA/B or on TX on subset of RB sets based on LBT outcome) |

## FG for Transmissions/receptions of multiple dedicated PRBs in interlace-based PSFCH

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m13 | Transmissions/receptions of multiple dedicated PRBs in interlace-based PSFCH | 1. UE can transmit PSFCH(s) on up to a total of K dedicated PRBs in a slot.2. UE can receive PSFCH(s) on up to a total of L dedicated PRBs in a slot | TBD | No | No | UE does not support multiple transmissions/receptions of common interlace-based PSFCH. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Candidate values for K are FFSCandidate values for L are FFS | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1] | HW/HiSi | The columns with yellow highlights can be updated as below:* The prerequisite includes FG 47-k1 and 15-11. If the prerequisites do not include 47-k1, in order to clarify the applicable scenario of the FG, it should be noted that the signaling is only expected for a band where shared spectrum channel access must be used.
* The total number of PSFCH that UE can transmit/receive means the number of channels rather than the number of PRBs. For example, if a UE can transmit M PSFCH, it can transmit M PSFCH regardless of how many RBs each PSFCH occupies. Thus,
	+ Candidate values for K are M\*K3, where M is the same for each carrier and is reported by FG 15-11 component 3, and K3 is the number of dedicated PRBs of each PSFCH.
	+ Candidate values for L are N\*K3, where N is the same for each carrier and is reported by FG 15-11 component 2, and K3 is the number of dedicated PRBs of each PSFCH.
* Other highlighted parts are reasonable.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m13 | Transmissions/receptions of multiple dedicated PRBs in interlace-based PSFCH | 1. UE can transmit PSFCH(s) on up to a total of K dedicated PRBs in a slot.2. UE can receive PSFCH(s) on up to a total of L dedicated PRBs in a slot | ~~TBD~~47-k1, 15-11 | No | No | UE does not support multiple transmissions/receptions of common interlace-based PSFCH. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Candidate values for K are ~~FFS~~ M\*K3, where M is the same for each carrier and is reported by FG 15-11 component 3, and K3 is the number of dedicated PRBs of each PSFCH.Candidate values for L are ~~FFS~~ N\*K3, where N is the same for each carrier and is reported by FG 15-11 component 2, and K3 is the number of dedicated PRBs of each PSFCH. | Optional without capability signalling |

 |
| [2] | vivo | Secondly, regarding whether to introduce the FG 47-m13, the essential issue here is how to determine the maximum number of simultaneous PSFCH transmissions in SLU.In R16/17 SL, UE may drop some PSFCHs based on the number of PSFCH(s) resources that the UE can transmit/receive in a slot indicated in UE’s capability. Since each PSFCH occupies one PRB in R16/17 SL, there is no ambiguity about the number of PSFCH resources and the number of PSFCHs. However, regarding R18 SLU, it is not clear how to perform PSFCH prioritization, especially to determine the simultaneous PSFCH transmissions based on UE’s capability, since both types of PSFCH transmission occupy more than one PRB. Therefore, a clarification of the UE’s capability about the UE can transmit/receive PSFCHs in a slot is needed in SLU.Option 1: the UE’s capability indicates the number of PSFCH(s) PRBs that the UE can transmit/receive in a slot.Option 2: the UE’s capability indicates the number of PSFCH(s) interlaces that the UE can transmit/receive in a slot.Option 3: the UE’s capability indicates the number of PSFCH resources with valid HARQ-ACK information in response to a PSSCH reception or with conflict information that the UE can transmit/receive in a slot.In option 1, the number of simultaneous PSFCHs transmissions is subject to the PSFCH(s) PRB numbers. As the PRB number of each PSFCH transmission increases, the number of simultaneous PSFCH transmission decreases. It is noted that each PSFCH interlace contains 10/11 PRBs, thus the number of simultaneous HARQ-ACK or IUC transmission is approximately 1/10 compared with Rel-16. When the UE’s capability is 20 PRBs, the number of PSFCH transmissions is shown in Table 1. The decreased number of simultaneous PSFCH transmission may result in a decline in system performance.

|  |  |  |
| --- | --- | --- |
| Rel-16: 20 PSFCHs | Alt 1-1b: 2 PSFCHs(20 PSFCH RBs) | Alt 2-3a: 2 PSFCHs(20 PSFCH RBs) |
|  |  |  |

Table 1 the number of PSFCH transmissions when UE’s capability is 20 PRBsFor Alt 2-3a, option 2 implies that the number of simultaneous PSFCH transmission is equal to the interlace number indicated in UE’s capability. However, in Alt 1-1b, each interlace may contain multiple sets of dedicated K3 PRBs, resulting in the number of simultaneous PSFCH transmission being much more than the interlace number indicated in UE’s capability. For example, UE can transmit 20 different HARQ-ACK/IUC in 3 interlaces (including common interlace) when K3 is equal to 1. When the UE’s capability is 3 interlaces, the number of PSFCH transmissions is shown in Table 2. In this case, the processing complexity will be dramatically increased compared with Rel-16.

|  |  |  |
| --- | --- | --- |
| Rel-16: 30 PSFCHs | Alt 1-1b: 20 PSFCHs(K3=1) | Alt 2-3a: 3 PSFCHs |
|  |  |  |

Table 2 the number of PSFCH transmissions when UE’s capability is 3 interlacesIn Option 3, the number of PSFCH resources is determined excluding the common interlace, and the number of simultaneous PSFCH transmission is equal to the indication in UE’s capability. The processing complexity slightly increases due to the PRB repetition of the PSFCH transmission compared with Rel-16. When the UE’s capability is 3 PSFCH resources, the number of PSFCH transmissions is shown in Table 3. Moreover, since the UE may drop the PRB of common interlace in Alt 1-1a, it is reasonable that the UE performs PSFCH prioritization based on the PSFCH resource without common interlace. Therefore, option 3 is preferred.

|  |  |  |
| --- | --- | --- |
| Rel-16: 3 PSFCHs | Alt 1-1b: 3 PSFCHs | Alt 2-3a: 3 PSFCHs |
|  |  |  |

Table 3 the number of PSFCH transmissions when UE’s capability is 3 interlacesProposal 3: The UE’s capability of the supported number of PSFCH indicates the number of PSFCH resources with valid HARQ-ACK information in response to a PSSCH reception or with conflict information that the UE can transmit/receive in a slot.With this understanding, it seems not necessary to introduce the FG 47-m13. Proposal 4: The UE capability 47-m13 is not necessary. |
| [3] | FLs |  |
| [4] | CATT/CICTCI | In RAN1#116 meeting, the FG on PSFCH transmission with 1 common interlace and K3 dedicated PRBs were discussed, and FL provide the following proposal for this FG[2].

|  |
| --- |
| Proposal 2.14-1:* FG47-m13 is kept, i.e., remove yellow highlight
* Component for FG47-m13 is updated as follows
	+ 1. UE can transmit up to K PSFCH(s) in a slot, where each PSFCH transmission occupy K3 dedicated PRBs.
	+ 2. UE can receive up to L PSFCH(s) in a slot, where each PSFCH reception occupy K3 dedicated PRBs
* Prerequisite FG of FG47-m13 is 47-k1
* “Need for the gNB to know if the feature is supported” for FG47-m13 is No
* “Applicable to the capability signalling exchange between UEs” for FG47-m13 is No
* FG47-m13 is Optional without capability signaling
* “Consequence if the feature is not supported by the UE” for FG47-m13 is kept as it is
* Reporting granularity of FG47-m13 is Per band
* Note for FG47-m13 is updated as follows
	+ The signaling is only expected for a band where shared spectrum channel access must be used.
	+ Candidate values for K are {4, 8, 16}
	+ Candidate values for L are {5, 15, 25, 32, 35, 45, 50, 64}
 |

Generally, we support FL’ s proposal, and the PSFCH transmission and reception capability is defined in PSFCH resource granularity. Regarding to the prerequisite, we think FG47-m1 should be the prerequisite, since this FG is only applied when inter-based SL transmission is performed. Other items of the FL’s proposal are fine.Proposal 15: It is preferred to introduce FG47-m13, and the prerequisite of FG47-m13 is FG47-m1.  |
| [5] | Samsung | For this FG, we support to limit the number of dedicated PRBs that can be used/monitored by the UE at any given slot similar to the case of Rel-16 NR sidelink. In other words, sending an ACK/NACK feedback over *K* dedicated PRBs will still require the UE to send *K* Zadoff-Chu sequences and will require the power to be distributed among the dedicated PRBs. Similarly, in case of RX, a UE will need to monitor *L* dedicated PRBs for ACK/NACK feedback. Hence, we would like to maintain the limit on the number of PSFCH transmissions from FG 15-11 on *K* and *L*. In this case, the candidate values for *K* are {4, 8, 16} and for L are {5, 15, 25, 32, 35, 45, 50, 64}. Finally, we suggest to have FG 47-k1 as a pre-requisite for this FG. Proposal 6: * Support FG 47-m13 to bound the number of PRBs that need to be monitored for PSFCH transmission/reception in shared spectrum.
* Support the following candidate values for K
	+ {4, 8, 16}
* Support the following candidate values for L
	+ {5, 15, 25, 32, 35, 45, 50, 64}
 |
| [6] | Nokia |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m13 | Transmissions/receptions of multiple dedicated PRBs in interlace-based PSFCH | 1. UE can transmit PSFCH(s) on up to a total of K dedicated PRBs in a slot.2. UE can receive PSFCH(s) on up to a total of L dedicated PRBs in a slot | TBD | No | No | UE does not support multiple transmissions/receptions of common interlace-based PSFCH. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Candidate values for K are FFSCandidate values for L are FFS | Optional with capability signalling |

 |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips | 47-m13 Transmissions/receptions of multiple dedicated PRBs in interlace-based PSFCHFor the definition of UE's capability to transmit/receive PSFCH, FG 47-m13 was discussed in RAN1#116, in our view, this FG is essential for a UE to transmit/receive PSFCH. And our views on the pending issues are as follows:1, Prerequisite feature groups: To transmit PSFCH on the shared spectrum, at least FG 47-k1 should be one of the prerequisites. Besides, PSFCH is used for ACK/NACK feedback of PSSCH, so FG 47-m1 should be one of the prerequisites. In addition, PSFCH can be transmitted on multiple channels, so FG 47-k2 should be included too.2, The need for the gNB to know if the feature is supported: SL feedback is supported on Uu, but it is not combined with SL feedback on sidelink, so it is unnecessary to be reported to gNB.3, The capability signalling exchange between UEs: Considering that SL HARQ is supported for unicast and groupcast, in groupcast, PSSCH Tx UE has no knowledge about whether Rx UE is able to transmit PSFCH or not, so there is no requirement for exchanging such FGs between UEs.4, Mandatory/Optional: Considering that there is no need to report to gNB or exchange capability information between UEs, so this FG should be optional without capability signalling. 5, Other highlighted parts are reasonable.Based on above analysis, FG 47- m13 should be updated as follows:

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m13 | Transmissions/receptions of multiple dedicated PRBs in interlace-based PSFCH | 1. UE can transmit PSFCH(s) on up to a total of K dedicated PRBs in a slot.2. UE can receive PSFCH(s) on up to a total of L dedicated PRBs in a slot | 47-k1, 47-k2, 47-m1 | No | No | UE does not support multiple transmissions/receptions of common interlace-based PSFCH. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Candidate values for K are FFSCandidate values for L are FFS | Optional without capability signalling |

 |
| [9] | Apple | For PSFCH, to meet the OCB requirements, each PSFCH transmission is composed of either a dedicated interlace or a common interlace plus K3 dedicated PRBs. Like in FG 15-11, we should define the total number of PSFCH receptions and the total number of PSFCH transmissions in a slot. These total numbers could be defined, in terms of the number of PRBs. To transmit PSFCH composed of a common interlace and multiple dedicated PRBs, UE needs to support PSFCH transmission capability. Hence, FG 47-m1 is the prerequisite, and we have the following proposal for transmitting/receiving interlace RB-based PSFCH. **Proposal 13:** Keep FG 47-m13 with the existing components, and the prerequisite of FG 47-m13 is FG 47-m1.  |
| [10] | QC |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m13 | Transmissions/receptions of multiple dedicated PRBs in interlace-based PSFCH | 1. UE can transmit PSFCH(s) on up to a total of K dedicated PRBs in a slot.2. UE can receive PSFCH(s) on up to a total of L dedicated PRBs in a slot |  | No | No | UE does not support multiple transmissions/receptions of common interlace-based PSFCH. |  | N/A | N/A |  | The FG is only expected for a band where shared spectrum channel access must be used.Candidate values for K are FFSCandidate values for L are FFS | Optional with capability signalling |

 |
| [11] | DCM | At the last meeting, this FG was proposed but there was no agreement due to time limitation. In our view, this aspect on the newly introduced PSFCH structure is not covered in any other FG and thus this FG is necessary.For components, ‘dedicated PRBs’ should be modified to ‘resources in dedicated PRB(s)’ since one dedicated PRB can include multiple resources with different CSs.For pre-requisite, this feature is relative to interlaced structure, which means that FG 47-m1 should be prerequisite here.For cap per X, ‘per band’ would be OK as in other FGs.For report to gNB/UE, ‘report to gNB’ can be YES and ‘report to UE’ can be NO, as in FG 47-m1.For the other columns, the existing texts can be agreed without any modification except for the candidate values. Candidate values defined in FG 15-11 (basic PSFCH TX/RX) can be reused, i.e., {5, 15, 25, 32, 45, 50, 64} for L and {4, 8, 16} for K.Proposal 14: Introduce FG 47-m13 as follows.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-m13 | Transmissions/receptions of multiple resources in dedicated PRB(s) in interlace-based PSFCH | 1. UE can transmit PSFCH(s) on up to a total of K resources in dedicated PRB(s) in a slot.2. UE can receive PSFCH(s) on up to a total of L resources in dedicated PRB(s) in a slot | 47-m1 | Yes | No | UE does not support multiple transmissions/receptions of common interlace-based PSFCH. | Per band | N/A | N/A |  | The signaling is only expected for a band where shared spectrum channel access must be used.Candidate values for K are {4, 8, 16}Candidate values for L are {5, 15, 25, 32, 45, 50, 64} | Optional with capability signalling |

 |
| [12] | Sharp |  |

### (H) Proposal 2.10-1:

* FG47-m13 is kept, i.e., remove yellow highlight
* Component for FG47-m13 is updated as follows
	+ 1. UE can transmit up to K PSFCH(s) in a slot, where each PSFCH transmission occupy K3 dedicated PRBs.
	+ 2. UE can receive up to L PSFCH(s) in a slot, where each PSFCH reception occupy K3 dedicated PRBs
* “Need for the gNB to know if the feature is supported” for FG47-m13 is No
* “Applicable to the capability signalling exchange between UEs” for FG47-m13 is No
* FG47-m13 is Optional without capability signaling
	+ Reporting granularity of FG47-m13 is not described
	+ Replace “signaling” by “FG” for “The signaling is only expected for a band where shared spectrum channel access must be used.” in the note of FG47-m13
* “Consequence if the feature is not supported by the UE” for FG47-m13 is kept as it is
* Prerequisite FG of FG47-m13 is 47-m1
* Note for FG47-m13 is updated as follows
	+ The FG is only expected for a band where shared spectrum channel access must be used.
	+ Candidate values for K are {4, 8, 16}
	+ Candidate values for L are {5, 15, 25, 32, 35, 45, 50, 64}

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES: HW. CATT, Samsung, Nokia, ZTE, Apple, QC, DCM
	+ NO: vivo
* Component
	+ OK/Keep: HW, Nokia, ZTE, Apple, QC, DCM
* Prerequisite
	+ 47-k1: HW, ZTE
	+ 47-k2: ZTE
	+ 15-11: HW
	+ 47-m1: CATT, ZTE, Apple, DCM
	+ None: QC
* Report to gNB
	+ NO: HW, Nokia, ZTE, Apple, QC, DCM
* Report to other UE
	+ NO: HW, Nokia, ZTE, Apple, QC, DCM
* Consequence if not supported
	+ OK/Keep: HW, Nokia, ZTE, Apple, QC, DCM
* Note
	+ Candidate for K
		- Candidate values for K are M\*K3, where M is the same for each carrier and is reported by FG 15-11 component 3, and K3 is the number of dedicated PRBs of each PSFCH.: HW
		- {4, 8, 16}: Samsung, DCM
	+ Candidate for L
		- Candidate values for L are N\*K3, where N is the same for each carrier and is reported by FG 15-11 component 2, and K3 is the number of dedicated PRBs of each PSFCH.: HW
		- {5, 15, 25, 32, 35, 45, 50, 64}: Samsung, DCM
	+ Update/Add: QC
		- QC: ‘signaling’ to ‘FG’
* Mandatory/optional
	+ Optional: HW, Nokia, ZTE, Apple, QC
 |
| vivo | In our view it depends on how to interpret the maximum number of PSFCH defined in the spec in Rel-18 for dedicate PRB. If we can reinterpret it in Rel-18, a new FG is not needed. Otherwise, we need to define a new FG.We can discuss this first.  |
| DCM | OK |
| CATT, CICTCI | OK |
| ZTE | About prerequisite, interlace-based PSFCH can only be used on the shared spectrum, so at least one of FG 47-k1 or 47-k2 should be the prerequisites in addition to FG 47-m1. Others are OK to us. |
| QC | NoThe intention of this FG was to limit the number of dedicated PRBs that can be transmitted/received in a slot when the waveform with K3 dedicated PRBs is used. In 15-11, the capability range is for PSFCHs that use a single PRB each. With a range of K3={1,2,5}, if K3=5 the legacy capability is greatly augmented, which is not preferred due to the burden it poses on UE implementation (e.g., under current proposal 64 PSFCH with K3=5 PRBs each could be received, that is 320 PRBs, much more than the 64 PRBs in 15-11). We propose to keep the definition of K and L unmodified, and suggest a range of K,L PRBs that largely comply the PRBs intended in 15-11, to do so we should consider the ranges of N,M in 15-11 and consider the min/max values of K3, e.g. K={4, 8, 16, 20} and L={5, 10, 15, 25, 30, 32, 35, 45, 50, 64, 70, 75}. The red values are extensions that we can be ok with to capture some additional combinations ok K3 and N/M (e.g., 20=(M=4)x(K3=5), 70=(N=35)x(K3=2), and 75=(N=25)x(K3=3)). Prerequisite: can add 15-11 |

## Others

Following inputs are provided in contributions for the RAN1#116bis meeting.

|  |  |  |
| --- | --- | --- |
| [1] | HW/HiSi |  |
| [2] | vivo | One general remaining issue is whether the prerequisite can include FG 32-4. Although it seems reasonable to include the partial sensing capability together with the full sensing case, it has a problem that FG 32-4 is defined per-FS, while the candidate inherited FG is per band, which does not follow the below RAN2’s guidelines in [2]:

|  |
| --- |
| 1 Avoid defining capabilities with pre-requisite on a finer granularityUsually UE capabilities with pre-requisite are defined in the same or finer granularity than its pre-requisite. When such UE capabilities are defined in a coarser granularity than its pre-requisite, it becomes ambiguous on where the coarser capability can be supported. One example is *harqACK-jointMultiDCI-MultiTRP-r16* (defined per UE), which has as pre-requisite *multiDCI-MultiTRP-r16* (defined per FSPC). Previously it was discussed that RAN2 understands that for the features with prerequisite in a finer granularity, UE shall indicate support of the pre-requisite for at least one band/component carrier in at least one band combination. But such logic risks to not be in line for every future capability added, and rather than having special handling for each of those cases, it would be simpler to define UE capabilities in the same or finer granularity than its pre-requisite. |

Although RAN2 had some further discussion on whether to reconsider this guideline in RAN2#124 meeting, they didn’t approach to revert that guideline in the end. In this sense, RAN1 should still follow this guideline.Proposal 7: RAN1 avoids defining capabilities with a prerequisite on a finer granularity, i.e., defining the per-FS FG 32-4 as the prerequisite of the per-band FSs (e.g., 47-k1, 47-k5, etc.). |
| [3] | FLs |  |
| [4] | CATT/CICTCI | For PSFCH transmission in SL-U, there are two types PSFCH transmission when interlaced-RB based transmission is required, one is the PSFCH transmission with 1 common interlace and K3 dedicated PRBs, another is the PSFCH transmission with one dedicated interlace. Since the PSFCH transmission and reception capability for 1 common interlace and dedicated K3 PRBs has been discussed and introduce FG47-m13, it would be better to introduce one FG on PSFCH transmission and reception capability for dedicated interlace.Proposal 16: It is preferred to introduce a new FG on PSFCH transmission and reception capability for dedicated interlace. |
| [5] | Samsung |  |
| [6] | Nokia |  |
| [7] | xiaomi |  |
| [8] | ZTE/Sanechips |  |
| [9] | Apple | The mode 2 resource selection operations in interlace RB-based PSCCH/PSSCH are different from Rel-16 NR sidelink. For example, a candidate resource for interlace RB-based PSCCH/PSSCH is in terms of sub-channel indexes in an RB set, RB set indexes and slot index. The prerequisite of this FG is FG 15-3. Hence, we have the following proposal for transmitting interlace RB-based PSCCH/PSSCH in mode 2 resource allocation. **Proposal 5:** Introduce a new FG (e.g., FG 47-k10) as “Sidelink mode 2 resource allocation for interlace RB-based PSCCH/PSSCH transmission”, * with the components of
* UE can perform mode 2 sensing and resource selection operations for interlace RB-based PSCCH/PSSCH.
* UE can transmit interlace RB-based PSCCH/PSSCH.
* with prerequisite of FG 15-3.

For PSCCH/PSSCH, it was agreed that both contiguous RB-based and interlace RB-based transmissions are supported. For contiguous RB-based PSCCH/PSSCH, a sub-channel is defined and indexed in a similar way as Rel-16 NR sidelink. The main difference is related to the handling of intra-cell guard band. It was agreed that for a sub-channel including intra-cell guard band PRBs, it cannot be used for PSCCH transmission and can be used for PSSCH transmission. Subsequently, the mode 2 resource selection procedure is modified such that a candidate resource whose lowest sub-channel includes intra-cell guardband PRBs is excluded. The prerequisite of this FG is FG 15-3. Hence, we have the following proposal. **Proposal 6:** Introduce a new FG (e.g., FG 47-k11) as “Sidelink mode 2 resource allocation for contiguous RB-based PSCCH/PSSCH transmission”, * with the components of
* UE can perform mode 2 sensing and resource selection operations considering intra-cell guardband.
* UE can transmit contiguous RB-based PSCCH/PSSCH.
* with prerequisite of FG 15-3.

In RAN1 #114bis meeting and RAN1 #115 meeting, it was agreed to support both inter-UE coordination scheme (IUC) 1 and inter-UE coordination scheme 2 in SL-U. Hence, the corresponding UE features for IUC schemes in SL-U should be examined. To support IUC scheme 1 in interlace RB-based PSCCH/PSSCH transmissions in SL-U, the SCI format 2-C field is updated to include RB set related information. For IUC information, SCI format 2-C has a new field of “lowest RB set indices” and a modified “resource combinations” field. Hence, a new FG should be introduced for a UE to support the reception of IUC information over 2nd SCI in interlace RB-based PSCCH/PSSCH. The prerequisites of this FG include FG 47-m1 and FG 32-6-1. **Proposal 15:** Introduce a new FG of “Reception of scheme 1 inter-UE coordination information over 2nd SCI in interlace RB based PSCCH/PSSCH”, * with component of “UE can receive Scheme 1 inter-UE coordination transmission over 2nd SCI that is used in addition to the MAC-CE carrying the same inter-UE coordination information in the same transmission, in interlace RB based PSCCH/PSSCH.”
* with prerequisites of FG 47-m1 and FG 32-6-1.

For IUC request, SCI format 2-C has a new field of “number of RB sets”. Hence, a new FG should be introduced for a UE to support the reception of IUC request over 2nd SCI in interlace RB-based PSCCH/PSSCH. The prerequisites of this FG include FG 47-m1 and FG 32-6-2. **Proposal 16:** Introduce a new FG of “Reception of scheme 1 explicit request over 2nd SCI in interlace RB based PSCCH/PSSCH”, * with component of “UE can receive an explicit request for inter-UE coordination information of both preferred resource set and non-preferred resource set over 2nd SCI that is used in addition to the MAC-CE carrying the explicit request in the same transmission, in interlace RB based PSCCH/PSSCH.”
* with prerequisites of FG 47-m1 and FG 32-6-2.
 |
| [10] | QC |  |
| [11] | DCM |  |
| [12] | Sharp |  |

### Question 2.11-1:

* Companies are encouraged to provide views on whether new FG for PSFCH transmission and reception capability for dedicated interlace [4].

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES: CATT/CICTCI
	+ NO: DCM

Moderator’s comment: Please add your company name on above summary |
| vivo | In our view it depends on how to interpret the maximum number of PSFCH defined in the spec in Rel-18. If we can reinterpret it in Rel-18, a new FG is not needed. Otherwise, we need to define a new FG.This question also relates to Proposal 2.10-1 |
| CATT, CICTCI | We supported to define this FG, at least for the maximum number of PSFCH Tx/Rx for dedicated interlaced RB based PSFCH type. |
| QC | No, seems to be captured in 47-m13 |

### Question 2.11-2:

* Companies are encouraged to provide views on whether new FG for Sidelink mode 2 resource allocation for interlace RB-based PSCCH/PSSCH transmission [9].

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES:
	+ NO: vivo, DCM

Moderator’s comment: Please add your company name on above summary |
| QC | Ok to discuss |
|  |  |

### Question 2.11-3:

* Companies are encouraged to provide views on whether new FG for Sidelink mode 2 resource allocation for contiguous RB-based PSCCH/PSSCH transmission [9].

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES:
	+ NO: vivo, DCM

Moderator’s comment: Please add your company name on above summary |
| QC | Ok to discuss |
|  |  |

### Question 2.11-4:

* Companies are encouraged to provide views on whether new FG for Reception of scheme 1 inter-UE coordination information over 2nd SCI in interlace RB based PSCCH/PSSCH [9].

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES:
	+ NO: vivo, DCM

Moderator’s comment: Please add your company name on above summary |
| QC | Ok to discuss |
|  |  |

### Question 2.11-5:

* Companies are encouraged to provide views on whether new FG for Reception of scheme 1 explicit request over 2nd SCI in interlace RB based PSCCH/PSSCH [9].

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES:
	+ NO: vivo, DCM

Moderator’s comment: Please add your company name on above summary |
| QC | Ok to discuss |
|  |  |

# FGs for co-channel coexistence for LTE sidelink and NR sidelink

In [13], FGs for co-channel coexistence for LTE sidelink and NR sidelink are captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Features | Index | Feature group | Components | Prerequisite feature groups | Need for the gNB to know if the feature is supported | Applicable to the capability signalling exchange between UEs (Sidelink WI only)”. | Consequence if the feature is not supported by the UE | Type(the ‘type’ definition from UE features should be based on the granularity of 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC) | Need of FDD/TDD differentiation | Need of FR1/FR2 differentiation | Capability interpretation for mixture of FDD/TDD and/or FR1/FR2 | Note | Mandatory/Optional |
| 47. NR\_SL\_enh2 | 47-s1 | Transmission/Reception using dynamic resource pool sharing  | 1) Avoidance of NR PSCCH/PSSCH/PSFCH overlapping with EUTRA SL resources in dynamic resource pool sharing using LTE sidelink resource reservation information in NR mode2 resource (re)selection2) UE supports NR sidelink TXs and RXs in a resource pool in 15kHz and 30kHz SCSs and uses the SCS that is (pre)configured for a SL BWP.  | 15-3, 15-6, 15-11 | Yes | No | UE does not support transmission/reception using dynamic resource pool sharing | Per band | N/A | N/A |  | Component 2 does not imply that two different SCSs can be (pre)configured simultaneously in a SL BWP | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116 meeting.

|  |  |  |
| --- | --- | --- |
| [1] | HW | - |
| [2] | vivo | Moreover, the co-channel coexistence of LTE and NR with different SCSes (i.e., assuming simultaneous transmission and reception using different SCSes in the same channel for a SL UE), is not considered even for TDM-based semi-static resource pool partitioning.Therefore, a UE cannot be assumed to mandatorily support the TDM-based co-channel coexistence. A separate UE capability should be defined to indicate whether the UE supports TDM-based semi-static resource pool partitioning for co-channel coexistence.Proposal 10: A capability of TDM-based semi-static resource pool partitioning for co-channel coexistence of LTE sidelink and NR sidelink with different SCS(es), e.g., 15kHz SCS for LTE SL and 30kHz SCS for NR SL, is introduced.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-s2 | TDM-based semi-static resource pool partitioning for co-channel coexistence of LTE sidelink and NR sidelink with mix SCSes | 1. UE supports TDM-based semi-static resource pool partitioning for co-channel coexistence between LTE sidelink and NR sidelink with 15 kHz SCS and/or 30kHz SCSs. Candidate value sets: {[15KHz, 30kHz, both]}.
2. Combination A (Mode 2 NR SL with Mode 4 LTE SL) is supported.
3. Device type A (the NR SL module uses the sensing and resource reservation information shared by the LTE SL module) is supported.
 | None | Yes | No |  | Per band | N/A | N/A |  |  | Optional with capability signalling.  |

 |
| [3] | FLs | - |
| [4] | CATT |  |
| [5] | SS | - |
| [6] | Nokia | - |
| [7] | xiaomi | - |
| [8] | ZTE |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-s1 | Transmission/Reception using dynamic resource pool sharing  | 1) Avoidance of NR PSCCH/PSSCH/PSFCH overlapping with EUTRA SL resources in dynamic resource pool sharing using LTE sidelink resource reservation information in NR mode2 resource (re)selection2) UE supports NR sidelink TXs and RXs in a resource pool in 15kHz and 30kHz SCSs and uses the SCS that is (pre)configured for a SL BWP. 3) UE supports using higher or equal power for the first slot of transmission of NR PSCCH/PSSCH than the subsequent slots overlapping with an LTE subframe with 30kHz subcarrier spacing. | 15-3, 15-6, 15-11 | Yes | No | UE does not support transmission/reception using dynamic resource pool sharing | Per band | N/A | N/A |  | Component 2 does not imply that two different SCSs can be (pre)configured simultaneously in a SL BWP | Optional with capability signalling |

 |
| [9] | Apple | - |
| [10] | QC | The support of in-device coexistence-based NR-LTE prioritization is not necessary for DRPS, only the exchange of priority and time for Tx and Rx is needed. FG 15-6 should be removed from the pre-requisite list of FG 47-s1 Proposal 5: FG 15-6 should be removed from the pre-requisite list of FG 47-s1. |
| [11] | DCM | - |
| [12] | Sharp | - |

### Question 3-1:

* Companies are encouraged to provide views on whether new FG for TDM-based semi-static resource pool partitioning for co-channel coexistence of LTE sidelink and NR sidelink with mix SCSes should be introduced or not [2].

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES: vivo
	+ NO:

Moderator’s comment: Please add your company name on above summary |
| Qualcomm | No. TDM resource pool partitioning is supported by R16 UE and there is no need to define additional FG for this. |
|  |  |

### Question 3-2:

* Companies are encouraged to provide views on whether new component for “UE supports using higher or equal power for the first slot of transmission of NR PSCCH/PSSCH than the subsequent slots overlapping with an LTE subframe with 30kHz subcarrier spacing” should be added or not [8].

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES:
	+ NO:

Moderator’s comment: Please add your company name on above summary |
| vivo | Open to discuss |
| Qualcomm | No, there is no specification text to support this feature. |

### Question 3-2:

* Companies are encouraged to provide views on whether 15-6 needs to be removed from prerequisite of FG47-s1 or not [10].

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views:* Support or not
	+ YES:
	+ NO:

Moderator’s comment: Please add your company name on above summary |
| Qualcomm | Yes. UE supporting FG 15-6 supports in-device coexistence with LTE SL. Dynamic resource pool sharing is supported in the specifications even when the SL UE does not support in-device coexistence. In fact, in-device coexistence and DRPS are alternatives for co-channel coexistence and a UE should have the flexibility to support one or the other. |
| DCM2 | We have similar view with Qualcomm. |

# FGs for SL CA operation

In [13], FGs for SL CA are captured as below.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-v1 | NR SL communication with SL CA | 1) UE supports transmitting/receiving PSCCH/PSSCH/PSFCH simultaneously over multiple X SL carriers:* 1-1) Maximum number of simultaneous PSCCH/PSSCH TX, equal to X and 1 per carrier
* 1-2) For the number of PSCCH decodes:
	+ UE can receive Z\* floor (NRB,*i* /10 RBs) PSCCH in a slot on carrier *i* of the X carriers.
* 1-3) For the number of non-overlapped PRBs over aggregated SL carriers:
	+ UE can attempt to decode NRB,i non-overlapping RBs in a slot on carrier i of the X carriers.

2) UE can adjust the transmission power of the PSCCH/PSSCH/PSFCH across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | [15-3, 15-11] | Yes | No |  | Per band | N/A | N/A |  | Component 1: Candidate value of X = {2, 3, 4, 5, 6, 7, 8}, FFS on some BW restrictionComponent 1-2 candidate value set: Z={1, 2}NRB,*i* is the number of RBs defined per channel bandwidth of carrier *i* by RAN4 in 38.101-1 Table 5.3.2-1 for FR1 | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v2 | Synchronization for SL CA | 1-1) UE supports transmitting S-SSB on one selected or all candidate synchronization carriers with the same sync reference from Set-B1-2) UE supports receiving S-SSB from all candidate synchronization carriers with the same sync reference from Set-B2) UE can adjust the transmission power of the S-SSB across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | 47-v1, [15-4] | Yes | No |  | Per band | N/A | N/A |  | Note: Option of UE selection of one selected SL synchronization carrier with the same sync reference from Set-B is not based on limited Tx capabilityNote: Component 1-2 does not require simultaneous reception of S-SSB on all candidate synchronization carriers with the same sync reference from Set-B | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v3 | PSFCH for SL CA | 1) UE supports receiving X PSFCH resources in a slot over all aggregated SL carriers* 1-1) UE is capable of receiving at least one PSFCH resource on each of the aggregated carriers in a slot

2) UE supports transmitting Y PSFCH resources in a slot over all aggregated SL carriers according to PSFCH procedures* 2-1) UE is capable of transmitting at least one PSFCH resource on each of the aggregated carriers

[3) UE can adjust the transmission number of PSFCH across aggregated carriers such that its total transmission number does not exceed the maximum transmission power.]FFS whether/how to merge FG for SL-CA | 47-v1, [15-11] | Yes | No |  | Per band | N/A | N/A |  | Candidate values for X are {FFS}Candidate values for Y are {FFS}Note: for component 1-1, it is up to UE implementation which PSFCH(s) to receive | Optional with capability signalling |

Following inputs are provided in contributions for the RAN1#116 meeting.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| [1] | HW | Proposal 1: Support UE feature list in Appendix 1 for R18 NR SL.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-v1 | NR SL communication with SL CA | 1) UE supports transmitting/receiving PSCCH/PSSCH/PSFCH simultaneously over multiple X SL carriers:* 1-1) Maximum number of simultaneous PSCCH/PSSCH TX, equal to X and 1 per carrier
* 1-2) For the number of PSCCH decodes:
	+ UE can receive Z\* floor (NRB,*i* /10 RBs) PSCCH in a slot on carrier *i* of the X carriers.
* 1-3) For the number of non-overlapped PRBs over aggregated SL carriers:
	+ UE can attempt to decode NRB,i non-overlapping RBs in a slot on carrier i of the X carriers.

2) UE can aggregate carriers up to total bandwidth B~~2~~3) UE can adjust the transmission power of the PSCCH/PSSCH/PSFCH/S-SSB across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA4-1) UE supports transmitting S-SSB on one selected or all candidate synchronization carriers with the same sync reference from Set-B4-2) UE supports receiving S-SSB from all candidate synchronization carriers with the same sync reference from Set-B5) UE supports receiving X1 PSFCH resources in a slot over all aggregated SL carriers* 5-1) UE is capable of receiving at least one PSFCH resource on each of the aggregated carriers in a slot

6) UE supports transmitting Y1 PSFCH resources in a slot over all aggregated SL carriers according to PSFCH procedures* 6-1) UE is capable of transmitting at least one PSFCH resource on each of the aggregated carriers
 | ~~[~~15-3, 15-11, 15-4~~]~~ | Yes | No |  | Per band | N/A | N/A |  | Component 1: Candidate value of X = {2, 3, 4, 5, 6, 7, 8}~~, FFS on some BW restriction~~Component 1-2 candidate value set: Z={1, 2}Component 2 candidate value set: B = {20Mhz, 40MHz, 70MHz, FFS other values}NRB,*i* is the number of RBs defined per channel bandwidth of carrier *i* by RAN4 in 38.101-1 Table 5.3.2-1 for FR1Note: Option of UE selection of one selected SL synchronization carrier with the same sync reference from Set-B is not based on limited Tx capabilityNote: Component 4-2 does not require simultaneous reception of S-SSB on all candidate synchronization carriers with the same sync reference from Set-BCandidate values for X1 are {5, 15, 25, 32, 35, 45, 50, 64}Candidate values for Y1 are {4, 8, 16}Note: for component 5-1, it is up to UE implementation which PSFCH(s) to receiveNote1: If UE supports 15-3, the UE is not required to support Component 3 in 15-3, and FR2 parts of Component 7 in 15-3.Note2: It is up to RAN2 whether/how to implement the above Note 1 and whether/how to update the prerequisite FGsNote 3: For components 5 and 6, the values of X and Y override the values of N and M, respectively, signaled in 15-11. |

 |
| [2] | vivo | Proposal 11: FG 47-v1, FG 47-v2 and FG 47-v3 should be separated FGs.Regarding 47-v1, considering that in the case of unicast, whether CA is supported needs to be known between peer UEs, this FG should also be reported to UE. Regarding the prerequisites, in our view, the CA capability can be standalone without prerequisites. If the prerequisites are really necessary, the acceptable compromise could be 15-3.Proposal 12: FG 47-v1 should be reported between UEs, and the candidate value of supported SL carriers can be {2, 3, 4, 5}.Proposal 13: Prerequisite is not necessary for FG 47-v1. If it is really desirable, the acceptable compromise could be 15-3.Regarding the prerequisites of 47-v2, similar to the discussion above for 47-v1, additional prerequisites beyond 47-v1 are not necessary.Proposal 14: Additional prerequisite beyond 47-v1 is not necessary for FG 47-v2.Regarding 47-v3, one remaining issue is the candidate number of PSFCH transmission and reception, i.e., X and Y. For the single carrier case, a UE can report up to M={4, 8, 16} PSFCH transmissions and up to N={5, 15, 25, 32, 35, 45, 50, 64} PSFCH receptions. In the CA case, up to K={2, 3, 4, 5, 6, 7, 8} carriers can be supported. Thus, the candidate number of X and Y can be X=K\*N, Y=K\*M, where the value K is the number of SL carriers that the UE supports.Proposal 15: For FG 47-v3, the candidate number of PSFCH receptions X and PSFCH transmission Y can be X=K\*N, Y=K\*M, where the value K is the number of SL carriers that the UE supports.Regarding the prerequisites of 47-v2, additional prerequisites beyond 47-v1 are not necessary.Proposal 16: Additional prerequisite beyond 47-v1 is not necessary for FG 47-v3.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-v1 | NR SL communication with SL CA | 1) UE supports transmitting/receiving PSCCH/PSSCH/PSFCH simultaneously over multiple X SL carriers:* 1-1) Maximum number of simultaneous PSCCH/PSSCH TX, equal to X and 1 per carrier
* 1-2) For the number of PSCCH decodes:
	+ UE can receive Z\* floor (NRB,*i* /10 RBs) PSCCH in a slot on carrier *i* of the X carriers.
* 1-3) For the number of non-overlapped PRBs over aggregated SL carriers:
	+ UE can attempt to decode NRB,i non-overlapping RBs in a slot on carrier i of the X carriers.

2) UE can adjust the transmission power of the PSCCH/PSSCH/PSFCH across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | [15-3, 15-11] | Yes | ~~No~~ Yes |  | Per band | N/A | N/A |  | Component 1: Candidate value of X = {2, 3, 4, 5, 6, 7, 8}, ~~FFS on some BW restriction~~Component 1-2 candidate value set: Z={1, 2}NRB,*i* is the number of RBs defined per channel bandwidth of carrier *i* by RAN4 in 38.101-1 Table 5.3.2-1 for FR1 | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v2 | Synchronization for SL CA | 1-1) UE supports transmitting S-SSB on one selected or all candidate synchronization carriers with the same sync reference from Set-B1-2) UE supports receiving S-SSB from all candidate synchronization carriers with the same sync reference from Set-B2) UE can adjust the transmission power of the S-SSB across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | 47-v1, [15-4] | Yes | No |  | Per band | N/A | N/A |  | Note: Option of UE selection of one selected SL synchronization carrier with the same sync reference from Set-B is not based on limited Tx capabilityNote: Component 1-2 does not require simultaneous reception of S-SSB on all candidate synchronization carriers with the same sync reference from Set-B | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v3 | PSFCH for SL CA | 1) UE supports receiving X PSFCH resources in a slot over all aggregated SL carriers* 1-1) UE is capable of receiving at least one PSFCH resource on each of the aggregated carriers in a slot

2) UE supports transmitting Y PSFCH resources in a slot over all aggregated SL carriers according to PSFCH procedures* 2-1) UE is capable of transmitting at least one PSFCH resource on each of the aggregated carriers

~~[~~3) UE can adjust the transmission number of PSFCH across aggregated carriers such that its total transmission number does not exceed the maximum transmission power.~~]~~FFS whether/how to merge FG for SL-CA | 47-v1, [15-11] | Yes | No |  | Per band | N/A | N/A |  | Candidate values for X are ~~{FFS}~~K\*{5, 15, 25, 32, 35, 45, 50, 64}, where the value K is the number of SL carriers that the UE supportsCandidate values for Y are ~~{FFS}~~K\*{4, 8, 16}, where the value K is the number of SL carriers that the UE supportsNote: for component 1-1, it is up to UE implementation which PSFCH(s) to receive | Optional with capability signalling |

 |
| [3] | FLs |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-v1 | NR SL communication with SL CA | 1) UE supports transmitting/receiving PSCCH/PSSCH/PSFCH simultaneously over multiple X SL carriers:* 1-1) Maximum number of simultaneous PSCCH/PSSCH TX, equal to X and 1 per carrier
* 1-2) For the number of PSCCH decodes:
	+ UE can receive Z\* floor (NRB,*i* /10 RBs) PSCCH in a slot on carrier *i* of the X carriers.
* 1-3) For the number of non-overlapped PRBs over aggregated SL carriers:
	+ UE can attempt to decode NRB,*i* non-overlapping RBs in a slot on carrier *i* of the X carriers
* 1-4) UE can aggregate up to total bandwidth Y MHz

2) UE can adjust the transmission power of the PSCCH/PSSCH/PSFCH across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | ~~[~~15-3, [15-11] | Yes | ~~No~~Yes |  | Per band | N/A | N/A |  | Note: SL CA operation is supported only in a band indicated with the PC5 interface in 38.101-1 Table 5.2E.1A-1 for FR1Component 1: Candidate value of X = {2, 3, 4, 5, 6, 7, 8}~~, FFS on some BW restriction~~Component 1-2 candidate value set: Z={1, 2}NRB,*i* is the number of RBs defined per channel bandwidth of carrier *i* by RAN4 in 38.101-1 Table 5.3.2-1 for FR1Component 1-4 candidate value set: Y={20, 30, 40, 50, 60, 70, 80, 100} | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v2 | Synchronization for SL CA | 1-1) UE supports transmitting S-SSB on one selected or all candidate synchronization carriers with the same sync reference from Set-B1-2) UE supports receiving S-SSB from all candidate synchronization carriers with the same sync reference from Set-B2) UE can adjust the transmission power of the S-SSB across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | 47-v1, [15-4] | Yes | No |  | Per band | N/A | N/A |  | Note: Option of UE selection of one selected SL synchronization carrier with the same sync reference from Set-B is not based on limited Tx capabilityNote: Component 1-2 does not require simultaneous reception of S-SSB on all candidate synchronization carriers with the same sync reference from Set-B | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v3 | PSFCH for SL CA | 1) UE supports receiving X PSFCH resources in a slot over all aggregated SL carriers* 1-1) UE is capable of receiving at least one PSFCH resource on each of the aggregated carriers in a slot

2) UE supports transmitting Y PSFCH resources in a slot over all aggregated SL carriers according to PSFCH procedures* 2-1) UE is capable of transmitting at least one PSFCH resource on each of the aggregated carriers

[3) UE can adjust the transmission number of PSFCH across aggregated carriers such that its total transmission number does not exceed the maximum transmission power.]FFS whether/how to merge FG for SL-CA | 47-v1, [15-11] | Yes | No |  | Per band | N/A | N/A |  | Candidate values for X are {5, 15, 25, 32, 35, 45, 50, 64, FFS other values}Candidate values for Y are {4, 8, 16, FFS other values}Note: for component 1-1, it is up to UE implementation which PSFCH(s) to receive | Optional with capability signalling |

 |
| [4] | CATT | For NR SL-CA FGs, regarding whether to merge the three FGs for SL-CA, it is preferred to separate the three FGs, since they are for different functionalities. And it is also preferred to make these three FGs as basic FGs for NR SL-CA. Proposal 1: Regarding the FGs for SL-CA, it is preferred to separate the three FGs, and make these three FGs as basic FGs for NR SL-CA.On the pre-requisites of the above three FGs, we have following comments:* For FG47-v1, since component 3 has power control for PSFCH, both 15-3 and 15-11 should be included.
* For FG47-v2, besides FG47-v1, it is preferred to additionally include 15-4.
* For FG47-v3, since 15-11 has been included into FG47-v1, it is preferred to only include FG47-v1.

Proposal 2: For pre-requisites of SL-CA FGs, the following changes are preferred:* For FG47-v1, 15-3 and 15-11 should be included.
* For FG47-v2, 15-4 should be included.
* For FG47-v3, 15-11 should be removed.

For FG47-v1(NR SL communication with SL CA), regarding “Applicable to the capability signalling exchange between UEs”, it is preferred to be No, since this FG should be used for broadcast/groupcast/unicast all. If this field is Yes, it means that only unicast is supported. If companies want to further optimize the SL-CA for unicast, one alternative could be added another new FG for unicast only. Proposal 3: “Applicable to the capability signalling exchange between UEs” for FG47-v1 is No. Regarding FG47-v3(PSFCH for SL CA), we have following comments:* For the X and Y value of PSFCH TX and RX, it is preferred to introduce additional candidate values besides the candidate values in 15-11.
	+ Candidate values for X are {5, 15, 25, 32, 35, 45, 50, 64, 100, 128}
	+ Candidate values for Y are {4, 8, 16, 32, 64}
* For component 3, it is preferred to remove it, since it has been defined in component in FG47-v1

Proposal 4: Regarding FG47-v3(PSFCH for SL CA):* For the X and Y value of PSFCH TX and RX, it is preferred to introduce additional candidate1 values besides the candidate values in 15-11.
* For component 3, it is preferred to remove it, since it has been defined in component in FG47-v1.
 |
| [5] | SS | Proposal 7: for 47-v1,* Remove the FFS on the merge between SL-CA FGs.

Proposal 8: for 47-v2,Remove the FFS on the merge between SL-CA FGs. Proposal 9: for 47-v3,* Support the following candidate values for X
	+ X\_i\*{5, 15, 25, 32, 35, 45, 50, 64}, where X\_i is the number of supported carriers.
* Support the following candidate values for Y
	+ X\_i \*{4, 8, 16}, where X\_i is the number of supported carriers.
* Remove the FFS on the merge between SL-CA FGs.
 |
| [6] | Nokia | Proposal 1: Adopt the proposed revisions for Rel-18 SL enhanced features in Table 1.

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| 47. NR\_SL\_enh2 | 47-v1 | NR SL communication with SL CA | 1) UE supports transmitting/receiving PSCCH/PSSCH/PSFCH simultaneously over multiple X SL carriers:* 1-1) Maximum number of simultaneous PSCCH/PSSCH TX, equal to X and 1 per carrier
* 1-2) For the number of PSCCH decodes:
	+ UE can receive Z\* floor (NRB,*i* /10 RBs) PSCCH in a slot on carrier *i* of the X carriers.
* 1-3) For the number of non-overlapped PRBs over aggregated SL carriers:
	+ UE can attempt to decode NRB,i non-overlapping RBs in a slot on carrier i of the X carriers.

2) UE can adjust the transmission power of the PSCCH/PSSCH/PSFCH across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | 15-3, 15-11 | Yes | No |  | Per band | N/A | N/A |  | Component 1: Candidate value of X = {2, 3, 4, 5, 6, 7, 8}, FFS on some BW restrictionComponent 1-2 candidate value set: Z={1, 2}NRB,*i* is the number of RBs defined per channel bandwidth of carrier *i* by RAN4 in 38.101-1 Table 5.3.2-1 for FR1 | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v2 | Synchronization for SL CA | 1-1) UE supports transmitting S-SSB on one selected or all candidate synchronization carriers with the same sync reference from Set-B1-2) UE supports receiving S-SSB from all candidate synchronization carriers with the same sync reference from Set-B2) UE can adjust the transmission power of the S-SSB across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | 47-v1, 15-4 | Yes | No |  | Per band | N/A | N/A |  | Note: Option of UE selection of one selected SL synchronization carrier with the same sync reference from Set-B is not based on limited Tx capabilityNote: Component 1-2 does not require simultaneous reception of S-SSB on all candidate synchronization carriers with the same sync reference from Set-B | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v3 | PSFCH for SL CA | 1) UE supports receiving X PSFCH resources in a slot over all aggregated SL carriers* 1-1) UE is capable of receiving at least one PSFCH resource on each of the aggregated carriers in a slot

2) UE supports transmitting Y PSFCH resources in a slot over all aggregated SL carriers according to PSFCH procedures* 2-1) UE is capable of transmitting at least one PSFCH resource on each of the aggregated carriers

3) UE can adjust the transmission number of PSFCH across aggregated carriers such that its total transmission number does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | 47-v1, 15-11 | Yes | No |  | Per band | N/A | N/A |  | Candidate values for X are {FFS}Candidate values for Y are {FFS}Note: for component 1-1, it is up to UE implementation which PSFCH(s) to receive | Optional with capability signalling |

 |
| [7] | xiaomi | - |
| [8] | ZTE |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 47. NR\_SL\_enh2 | 47-v3 | PSFCH for SL CA | 1) UE supports receiving X PSFCH resources in a slot over all aggregated SL carriers* 1-1) UE is capable of receiving at least one PSFCH resource on each of the aggregated carriers in a slot

2) UE supports transmitting Y PSFCH resources in a slot over all aggregated SL carriers according to PSFCH procedures* 2-1) UE is capable of transmitting at least one PSFCH resource on each of the aggregated carriers
 | 47-v1, [15-11] | Yes | No |  | Per band | N/A | N/A |  | Candidate values for X are {FFS}Candidate values for Y are {FFS}Note: for component 1-1, it is up to UE implementation which PSFCH(s) to receive | Optional with capability signalling |

 |
| [9] | Apple | FG 47-v1 describes the PSCCH/PSSCH/PSFCH transmissions and receptions over multiple SL carriers, which discusses the simultaneous PSCCH/PSSCH/PSFCH transmissions and receptions, as well as the power control of PSCCH/PSSCH/PSFCH, over multiple SL carriers. FG 47-v3 describes the maximum number of simultaneous PSFCH transmissions and receptions over multiple SL carriers. In our view, these two FGs can be merged. The merged FG should have the prerequisite of FG 15-3 and FG 15-11. **Proposal 17:** Merge FG 47-v3 into FG 47-v1, with the FG name as “NR SL communication with SL CA” and with the prerequisites of FG 15-3 and FG 15-11. FG 47-v2 describes the S-SSB transmissions and receptions over multiple SL carriers. Hence, we prefer not to merge it with FG 47-v1 and FG 47-v3. Also, this FG is based on the UE capability of S-SSB transmissions and receptions on a single carrier. Hence, the prerequisites of this FG are FG 47-v1 and FG 15-4. **Proposal 18:** Keep FG 47-v2 as a separate FG, with the prerequisites of FG 47-v1 and FG 15-4.  |
| [10] | QC | NR sidelink Rel. 18 intra-band carrier aggregation is supported in the n47 band. Based on RAN 1 progress, a UE supporting FG 47-v1 may support 2 to 8 component carries in the band. To completely characterize the processing capability of a SL UE, the maximum supported bandwidth should also be signalled.Proposal 6: A NR SL UE supporting SL carrier aggregation indicates the maximum bandwidth supported in the band along with the maximum number of component carriers. For SL unicast communications, the peer UE-s in a unicast link will need to be aware of each other’s carrier aggregation capabilities. Hence, the SL CA UE capability should be a part of the capability exchange information.Proposal 7: FG 47-v1 is included in the sidelink capability exchange messages.

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| 47. NR\_SL\_enh2 | 47-v1 | NR SL communication with SL CA | 1) UE supports transmitting/receiving PSCCH/PSSCH/PSFCH simultaneously over multiple X SL carriers:* 1-1) Maximum number of simultaneous PSCCH/PSSCH TX, equal to X and 1 per carrier
* 1-2) For the number of PSCCH decodes:
	+ UE can receive Z\* floor (NRB,*i* /10 RBs) PSCCH in a slot on carrier *i* of the X carriers.
* 1-3) For the number of non-overlapped PRBs over aggregated SL carriers:
	+ UE can attempt to decode NRB,i non-overlapping RBs in a slot on carrier i of the X carriers.
* 1-4) the UE can Tx/Rx on a total aggregated BW of Y MHz across all SL carriers

2) UE can adjust the transmission power of the PSCCH/PSSCH/PSFCH across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | [15-3, 15-11] | Yes | No Yes |  | Per band | N/A | N/A |  | Component 1: Candidate value of X = {2, 3, 4, 5, 6, 7, 8}, ~~FFS on some BW restriction~~Component 1-3 candidate vales set: Y = {20, 30, 40, 50, 60, 70, 80, 100}Component 1-2 candidate value set: Z={1, 2}NRB,*i* is the number of RBs defined per channel bandwidth of carrier *i* by RAN4 in 38.101-1 Table 5.3.2-1 for FR1 | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v2 | Synchronization for SL CA | 1-1) UE supports transmitting S-SSB on one selected or all candidate synchronization carriers with the same sync reference from Set-B1-2) UE supports receiving S-SSB from all candidate synchronization carriers with the same sync reference from Set-B2) UE can adjust the transmission power of the S-SSB across aggregated carriers such that its total transmission power does not exceed the maximum transmission power.FFS whether/how to merge FG for SL-CA | 47-v1, [15-4] | Yes | No |  | Per band | N/A | N/A |  | Note: Option of UE selection of one selected SL synchronization carrier with the same sync reference from Set-B is not based on limited Tx capabilityNote: Component 1-2 does not require simultaneous reception of S-SSB on all candidate synchronization carriers with the same sync reference from Set-B | Optional with capability signalling |
| 47. NR\_SL\_enh2 | 47-v3 | PSFCH for SL CA | 1) UE supports receiving X PSFCH resources in a slot over all aggregated SL carriers* 1-1) UE is capable of receiving at least one PSFCH resource on each of the aggregated carriers in a slot

2) UE supports transmitting Y PSFCH resources in a slot over all aggregated SL carriers according to PSFCH procedures* 2-1) UE is capable of transmitting at least one PSFCH resource on each of the aggregated carriers

[3) UE can adjust the transmission number of PSFCH across aggregated carriers such that its total transmission number does not exceed the maximum transmission power.]FFS whether/how to merge FG for SL-CA | 47-v1, [15-11] | Yes | No |  | Per band | N/A | N/A |  | Candidate values for X are {5, 15, 25, 32, 35, 45, 50, 64}Candidate values for Y are {4, 8, 16}Note: for component 1-1, it is up to UE implementation which PSFCH(s) to receive | Optional with capability signalling |

 |
| [11] | DCM |  |
| [12] | Sharp | - |

### (H) Proposal 4-1:

* Remove “FFS whether/how to merge FG for SL-CA” from component of FG47-v1/v2/v3

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views. * Merge or not
	+ Merge: HW, DCM
	+ Not: vivo, SS, MTK, QC, FLs
	+ Merge v1/v3 into an FG: Apple
 |
| CATT, CICTCI | OK |
| QC | Agree, we support having separate features. |
| DCM | OK |
|  |  |

### (H) Proposal 4-2:

* “Applicable to the capability signalling exchange between UEs” for FG47-v1 is Yes
* “FFS on some BW restriction” in note of FG47-v1 is removed and following updates are made
	+ Add “1-4) UE can aggregate up to total bandwidth Y MHz” in component
	+ Add “Component 1-4 candidate value set: Y={20, 30, 40, 50, 60, 70, 80, 100}” in note
* Prerequisite FG of FG47-v1 is kept as it is, i.e., 15-3, 15-11
* Add “Note: SL CA operation is supported only in a band indicated with the PC5 interface in 38.101-1 Table 5.2E.1A-1 for FR1” in note of FG47-v1

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views. * 47-v1
	+ Prerequisite
		- Nokia, CATT: 15-3, 15-11
		- FLs: 15-3, [15-11]
		- Vivo: N/A or one of {15-3, 15-11, 32-4, 32-4a}
	+ Report to other UE
		- Yes: ~~CATT,~~ vivo (with X={2,3,4,5}), QC, FLs
		- No: Nokia, DCM, CATT/CICTCI
	+ FFS on BW restriction
		- Report CA-BW: HW, QC, FLs
			* HW: {20, 40, 70Mhz, FFS}
			* FLs, QC: {20, 30, 40, 50, 60, 70, 80, 100MHz}
		- No: DCM, vivo(?)
	+ Add note in FG 47-v1
		- FLs: Note: SL CA operation is supported only in a band indicated with the PC5 interface in 38.101-1 Table 5.2E.1A-1 for FR1
 |
| CATT, CICTCI | We correct our position on the FL summary.We have concern on the first bullet. Since this FG should be used for broadcast/groupcast/unicast all, “Applicable to the capability signalling exchange between UEs” is preferred to be No. |
| Qualcomm | Yes. |
| DCM | We prefer to define candidate values about BW restriction as {20, 30, 40, 50, 60, 70} because the total BW of ITS band is 70Mhz.We can live with the current proposal with the note that “SL CA operation is supported only in a band indicated with the PC5 interface in 38.101-1 Table 5.2E.1A-1 for FR1”. |

### Proposal 4-3:

* Prerequisite FG of FG47-v2 is kept as it is, i.e., 47-v1, 15-4

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views. * 47-v2
	+ Prerequisite
		- Nokia, CATT: 47-v1, 15-4
		- FLs: 47-v1, [15-4]
		- Vivo: 47-v1, or one of {one of FG {15-3, 15-11, 32-4, 32-4a}
 |
| CATT, CICTCI | OK |
| Qualcomm | OK |
| DCM | Support |

### (H) Proposal 4-4:

* Prerequisite FG of FG47-v3 is 47-v1
* Component 3 in FG47-v3 is removed
* Candidate values for X in component 1 of FG47-v3 are {5, 15, 25, 32, 35, 45, 50, 64, 100, 128}
* Candidate values for Y in component 2 of FG47-v3 are {4, 8, 16, 32, 64}

|  |  |
| --- | --- |
| Company | Comment |
| Moderator | Summary of companies’ views. * 47-v3
	+ Prerequisite
		- Nokia: 47-v1, 15-11
		- FLs: 47-v1, [15-11]
		- Vivo, CATT: 47-v1
	+ PSFCH TX/RX# (X/Y) across carriers
		- Same# as a single carrier: HW, QC
		- # should be enhanced: vivo, CATT, SS, DCM, [FLs]
			* Vivo, SS: K\*candidate values in a single carrier (N, M), where the value K is the number of SL carriers that the UE supports.
			* DCM: X={N, floor(5N/4), floor(3N/2), floor(7N/4)}, Y={M, floor(5M/4), floor(3M/2), floor(7M/4)},
			* FLs:
				+ Candidate values for X are {5, 15, 25, 32, 35, 45, 50, 64, FFS other values}
				+ Candidate values for Y are {4, 8, 16, FFS other values }
			* CATT:
				+ Candidate values for X are {5, 15, 25, 32, 35, 45, 50, 64, 100, 128}
				+ Candidate values for Y are {4, 8, 16, 32, 64}
	+ PSFCH# checking feature as a component in FG 47-v3?
		- No: HW, CATT, DCM, FLs
 |
| CATT, CICTCI | OK |
| Qualcomm | Do not agree to adding additional values to the list of candidate values for X and Y. Existing candidate values of X and Y are sufficient to support SL CA in the ITS bands. In particular, the number of simultaneously transmitted PSFCHs is an RF restriction that has no relation to CA, only to total bandwidth and should be the same regardless whether CA is used or not.* Candidate values for X in component 1 of FG47-v3 are {5, 15, 25, 32, 35, 45, 50, 64, ~~100, 128~~}
* Candidate values for Y in component 2 of FG47-v3 are {4, 8, 16, ~~32, 64~~}
 |
| DCM | Prefer to have additional candidate values for X and Y, given the Qualcomm’s comments, the possible total bandwidth of CA (70Mhz) is larger than the max of the legacy (40Mhz). Therefore, the current proposal which is twice of the legacy value is reasonable. From our perspective, at least 128 for X and 32 for Y should be supported, 100 for X and 64 for Y are nice to have. |

# Conclusions

To be updated

# References

[1] R1-2402022 UE features for NR sidelink evolution Huawei, HiSilicon

[2] R1-2402227 Discussion on UE features for NR SL evoluation vivo

[3] R1-2402313 UE features list for Rel-18 NR sidelink evolution WI OPPO, Huawei, HiSilicon, LG Electronics

[4] R1-2402364 Remaining issues on UE features for NR sidelink evolution CATT, CICTCI

[5] R1-2402451 UE features for NR sidelink evolution Samsung

[6] R1-2402603 Remaining issues of NR sidelink evolution UE features Nokia

[7] R1-2402645 Maintenance on UE features for NR sidelink evolution Xiaomi

[8] R1-2402776 UE features for NR sidelink evolution ZTE, Sanechips

[9] R1-2402867 UE Features for Rel-18 NR Sidelink Evolution Apple

[10] R1-2403179 UE Features for Sidelink Evolution Qualcomm Incorporated

[11] R1-2403229 Discussion on UE features for NR SL evolution NTT DOCOMO, INC.

[12] R1-2403298 Discussion on UE feaures for Rel-18 NR sidelink evolution Sharp

[13] R1-2401709 Updated RAN1 UE features list for Rel-18 NR after RAN1#116 Moderators (AT&T, NTT DOCOMO, INC.)