**Proposal for email thread topics for Rel-16 5G V2X maintenance**

Thread #1

* Issue SY-1: Timing misalignment between eNB/gNB, gNB/gNB
* Issue PS-1: Logical or physical slots in RS sequence generation and mapping

Thread #2

* Issue M1-1-1: dci-FormatsExt vs dci-FormatsSL

Thread #3

* Issue M1-2-1: For Type 1, the number of PSSCH slots associated with the same PSFCH slot could be smaller than the PSFCH resource period
* Issue M1-2-2: How to operate with multiple resource pools with different PSFCH periods

Thread #4

* Issue M2-1: Infinite loop due to excessive resource exclusion in step 5)
* Issue M2-2: Resource exclusion/selection for multiple transport blocks

Thread #5

* Issue PP-1: How SL HARQ-ACK report is piggybacked on PUSCH

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| Company | Comments |
| LG Electronics | First of all, we think that M2-1 and M 2-2 were already discussed during the past preparation phase/technical discussion but failed to be selected as critical remaining issues or reach agreements. In this sense, our preference is to remove M2-1 and M 2-2 and rather include PP-2 or PS-2 which has never been discussed before but needs clarification. Secondly, in our understanding, there was no consensus in Rel-16 feature discussion to have further optimization for SL communication between UEs having different timing synchronization sources. So, SY-1 should be removed.  |
| OPPO | For M2-1: The infinite loop issue should be discussed because it is a logical error of current mode 2 procedure.For M2-2: The collision between multiple TBs has been discussed by both RAN1 and RAN 2 already in the past, and neither group is able to reach any consensus. In R16, we see this as an optimization as the collision/conflict can be resolved by UE implementation. However, we are open to discuss this in R17 as this can have performance impact (e.g. for the selection of Y candidate slots in partial sensing so that UE does not perform sensing in slots that are not necessary and limiting its selection of resources).For M1-3-2: It is an essential issue in our view and it should be addressed. It is already agreed that SL transmission does not use SL HARQ feedback is supported in RAN2, but how a UE report ACK/NACK to gNB on PUCCH is not captured in the spec. In RAN1, we already made the following agreement in RAN1#100bis-e and it should be reflected in the spec. Otherwise, the UE behavior of how to report ACK/NACK to gNB is not defined when SL transmission does not use SL HARQ feedback.Agreements:* The working assumption (as in proposal 4 in the summary) from RAN1#100-e is confirmed.
	+ If the SL transmission does not use SL HARQ feedback (if supported by RAN2), the UE reports NACK to request further resources for blind retransmission and ACK otherwise.
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| NTT DOCOMO | We are OK to discuss other than SY-1 and M2-2.For SY-1, we understand the issue, while discussion for this topic in current phase seems difficult.For M2-2, we think either up to RAN2 or up to UE implementation is fine. It is unclear why further RAN1 discussion is needed.Regarding other topics, we would like to ask the following:* Mode 1: For issue 3 in group 3, exactly RAN1 has discussed. However, current spec seems that UE does not report any information in that case. Is it common understanding and is the behavior is OK? If each company have different understanding, at least some clarification is necessary.
* Procedure: Could I ask to capture TP2/TP3 in our contribution x3556 into the summary of procedure? Or they are labeled as editorial one? In this case, do you have a plan to handle editorial inputs? Any can be handled, or some list will be prepared?
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| Sharp | Regarding Thread #1, the proponent of SY-1 seems to assume that a UE#1, when performing SL reception in a RX pool, knows the exact sync source used by a corresponding TX UE (e.g. UE#2), and then determines e.g. that there is a SFN offset between that sync source and the one used by UE#1 for SL transmission. We don’t think this is possible in the framework of NR SL, and we don’t think there is any problem to solve as stated in SY-1. We propose to remove SY-1 from Thread #1.Regarding thread#4 on Mode 2, we share same view with LGE that M2-1/2-2 were both discussed before without consensus and should be removed. We suggest to add M2-7. From our perspective, since slots with PSFCH resources when *sl-LengthSymbols*≤9 are not available for PSSCH transmission and accordingly should be removed from the candidate resources and this is essential clarification, instead of an optimization.For QS-1, as mentioned in the FL summary, the first value in the CBR range configuration, i.e. CBR=0%, is already clearly stated in RRC specs, and it seems no one believes this is superfluous. For a similar reason we think the spec is lack of clarity if the last value in the CBR range configuration, i.e. 100%, is missing in the spec. We cannot find any text in the current specs implying that a CBR range configuration should necessarily come with a last value being 100%, thus, we think this issue should be addressed. |
| ASUSTeK | We are fine to discuss issue M2-1 and M2-2.- For M2-1, we share the same view as OPPO that such excessive resource exclusion should be avoided.- For M2-2, although there is no consensus before, we think it still needs clarification on how to handle it, e.g., RAN2 solution, or RAN1 solution (even in R17). Otherwise, intra-UE resource collision and dropping will induce further resource reselection and potential latency, especially with multiple sidelink connections.Moreover, we also think PP-2 should be discussed to clarify how to perform DL pathloss-based sidelink power control in case of beam failure or T310 is running.Last, we also have same question as DOCOMO regarding how to handle editorial inputs? Will they be included in above 5 threads?  |
| Intel | For Thread #2, the single issue does not seem deserve a separate thread. Suggest combining with other Mode-1 in a single thread.For Thread #4, we are fine with both M2-1 and M2-2. M2-1 was not discussed in the context of the infinite loop situation. M2-2 was discussed extensively in RAN1#103-e, but the open issue is still very much valid. If there is a consensus between companies that it needs to be fixed by specification, we support it.We also prefer including PP-5, which mitigates the half-duplex problem with NACK-only groupcast feedback. Since R17 scope discussion did not include reliability enhancements other than inter-UE coordination, we think this reliability issue has to be solved directly in R16 by CR. |
| vivo | We are generally fine with the proposed list, with the following comments:**Thread#2:**We agree to discuss the issue M1-1-1, but we think *M1-1-2* can be discussed together – they are both related to the issue of PDCCH monitoring for DCI format 3-0. Noted that *M1-1-2* is a fundamental clarification on how UE locates the PDCCH candidates in the CORESET for DCI 3-0, which is critical for mode-1 operation.**Thread#4:**We share the view as LG and other companies that M2-1 and M2-2 were discussed before without consensus. Thus, we suggest to discuss M2-4 or PP-2 instead, which have not been discussed and should be resolved. Regarding M2-4, we don’t think it is an optimization; instead, it is to make the UE behaviors aligned between mode-1 and mode-2, according to the following mode-1 agreement:Agreements:* If the time between PSFCH reception and next scheduled PSCCH/PSSCH retransmission is less than Tprep + delta, the UE is allowed to drop the PSCCH/PSSCH retransmission with SL HARQ feedback enabled.
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| Huawei, HiSilicon | As a general note, like with previous meetings, we deprecate the combining of unconnected technical issues in one thread, due to the explosion of workload it causes.Thread #1SY-1 can be discussed, due to the more complex synchronization environment on NR SL than in LTE SL.PS-1 should not be included. RS generation is currently specified on physical slots. In addition, slots in a resource pool are determined relative to SFN#0 in clause 8 TS 38.214, i.e. using either one, physical or logical, does not cause ambiguity.Thread #2 – ok to fix this.Thread #3M1-2-1: Should not be included. The issue does not cause misunderstanding between gNB and UE. Although UE may report the HARQ information for a PSSCH in two PSFCH occasions, the crucial point is that both UE and gNB have a common understanding on how many HARQ bits will be present. There is no unexpected behavior. The current specification works properly without change, and it should not be discussed.M1-2-2 is not necessary. When there are multiple resource pools configured, a UE knows which resource pool is used for PSCCH/PSSCH transmission (including PSFCH, as PSFCH is associated with its PSSCH) given that “resource pool index” field is indicated in DCI and CG. There is no multiplexing of different resource pools for SL transmission/receptions, thus the SL HARQ feedback on UL is only associated to a given resource pool. Thread #4Both issues are OK to discuss this meeting, but they are not connected. Since there is no need to discuss the current proposals for Thread #3, one of the thread #4 issues can be taken in thread #3 instead.Thread #5 – ok to finish this issue. But the scope has to be kept carefully limited. |
| ZTE, Sanechips | We are OK with the current threads except for SY- 1 or M2-2SY-1: We don't think the timing needs to be aligned between two UEs and the PSFCH should be transmitted using the timing corresponding to the receiving RP where the PSFCH Tx takes place.M2-2: We think this discussion would better be handled in RAN2.  |
| Samsung | We are generally O.K for FL’s proposal except M2-2. M2-2 was discussed in RAN1#103-e extensively, but RAN1 understanding was that it can be handled by UE implementation or RAN2. It is not a critical issue to be discussed at this stage.  |
| Ericsson | Thread 1: Like many others, we do not think that SY-1 should be discussed. It is likely that operation in some deployments with some choices of timing, configuration, etc. is not possible. Such configurations should be avoided.Threads 2, 3, 4: okThread 5: we share the concern by Huawei. The different contributions address somewhat different aspects and have different solutions. We think it is necessary to focus on essential aspects and simple solutions. |
| Nokia, NSB | Overall, OK with the proposed email discussions, however:Issue SY-1: OK to discuss, but probably a bit late to make new agreementsIssue M1-2-1: no need to include this, we don’t see a problem that needs to be solved.Issue M2-2: OK to discuss, but that does not mean that the issue needs to be solved by RAN1. |
| NEC | We are generally fine to discuss the proposed issues. While we think the possible workload in current thread#2 is somewhat smaller compared with current thread#3, proper adjustment is necessary. |
| CATT, GOHIGH | SY-1: OK to discuss, since eNB and gNB have same sync priority, if there is a timing offset between eNB and gNB but unknown by UE, it will diverse the sidelink timing. PS-1: No need for discussion. From our understanding, UE should know the SFN0 for each resource pool configuration. There is no ambiguous issue by physical slot index. Thread #2: OK to discussThread #3: OK to discussThread #4: OK to discussThread #5: OK to discussWe also prefer to include backward indication discussion in this meeting, the reason is that the backward indication could be beneficial of partial sensing in R17, it can provide as more resource reservation information as possible when UE performing partial sensing. In order to avoid potential backward compatible issue, it would be better to further discuss whether backward indication is specified or not in R16.The tie-break issue for PSFCH Tx and PSFCH Rx should be also discussed, since the current spec is not clear on this issue.  |
| Qualcomm | SY1: as others mentioned, this issue doesn’t need to be discussed since the gNB/eNB issues is known and can be addressed by network implementation or configuration in some cases.M1-2-2: doesn’t need to be discussed in our view either. The issue only comes up in very specific configurations and could be avoided by using proper configuration.PP-1: There are still open issues related to the topic of prioritization and multiplexing in the eURLLC discussion. In our view, it’s best to delay discussing it in the context of SL until the related eURLLC discussion concludes.M2-1: this is a logical flaw in the Mode 2 procedure as others mentioned and is important to address. Prior discussion was only during preparation phase.PP-5: We share Intel’s view that this is an important topic to discuss considering the conclusion in RAN plenary. Minimum number of retransmissions is important to address half-duplex in Mode 2. |
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**Topics in each FL summary**

**Physical layer structure**

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

* [R1-2103708, Ericsson]: reference of number of layers (ʋ) determined according to the 'Number of DMRS port' field

Issue PS-1: Logical or physical slots in RS sequence generation and mapping

* For RS sequence generation, whether the slot number is logical slot index or physical slot index considering in-coverage scenario with different serving cells.
* [R1-2103213, Samsung], [R1-2103375, LG]

Issue PS-2: SL BWP and UL BWP relationship

* How to generate OFDM baseband signal for NR sidelink considering the center frequency/RB boundary of UL BWP.
* [R1-2103375, LG]

Issue PS-3: Clarifying multiple PSFCH transmission

* It may need to fix the description in simultaneous PSFCH transmission/reception.
* [R1-2103466, Sharp]

Issue PS-4: PSSCH reserved bit definition

* Whether to clarify a UE assumption on the number of reserved bits for PSSCH
* [R1-2103709, Ericsson]

**Synchronization**

Issue SY-1: Timing misalignment between eNB/gNB, gNB/gNB [R1-2102591, CATT, GOHIGH] [R1-2102795, OPPO]

Issue SY-2: NR SL-TDD-Config in the coverage of eNB [R1-2102942, vivo]

Issue SY-3: Indication of the non-TDD case in sl-TDD-Config [R1-2103468, Sharp]

Issue SY-4: Clarification of the notation of “u\_slots^SL” [R1-2103468, Sharp]

**Mode 1**

Issue M1-1: DCI-related aspects

Issue M1-1-1: dci-FormatsExt vs dci-FormatsSL (see Nokia+NSB (P2, P3), vivo (P2, P3), LGE (P1)

Issue M1-1-2: Value of n\_CI (see vivo (TP1))

Issue M1-1-3: For size alignment, include DCI formats for other purposes (see vivo (TP2))

Issue M1-2: Codebook construction

Issue M1-2-1: For Type 1, the number of PSSCH slots associated with the same PSFCH slot could be smaller than the PSFCH resource period

Issue M1-2-2: How to operate with multiple resource pools with different PSFCH periods

Issue M1-2-3: TX power

Issue M1-3: SL HARQ-ACK reports to gNB

Issue M1-3-1: Change RRC parameter values

Issue M1-3-2: SL HARQ-ACK reporting in UL when the SL transmission (scheduled by DG/CG) does not use SL HARQ feedback

Issue M1-3-3: Report ACK when DG is not used

Issue M1-3-4: Slot offset between PSFCH and HARQ-ACK reporting (i.e., k>0 always)

Issue M1-3-5: Some companies discuss actions for a potential reply by RAN2 to LS R1-2102176. In all cases, they suggest waiting for a reply LS

Issue M1-4: Editorial

• TS 38.211

O 8.4.1.2.2: See OPPO

• TS 38.212

O 7.3.1.4.1: DCI format 3\_0 clarification that the configuration index is reserved for DG scheduling a retransmission for CG (see ASUSTeK (TP5), Sharp (TP2))

• TS 38.213

O 10.1:

 Remove ‘a SL-RNTI, a SL-CS-RNTI, or a SL-L-CS-RNTI’ (see Sharp (TP4-1 and TP4-2))

 Other editorial (see Sharp (TP1-1))

O 16.5:

 Clarify that the UE does not expect to multiplex SL HARQ and Uu UCI on PUCCH or PUSCH (see vivo (P9))

 “One bit” (see Sharp (TP6))

 Other editorial (see Sharp (TP1-1))

• TS 38.214

O 8.1.2:

 Clause number (see ASUSTeK (TP3), Sharp (TP1-2))

O 8.1.2.1:

 2xTypo (see vivo (P5))

 RRC parameter name (see ASUSTeK (TP3))

O 8.1.4: ASUSTeK (TP3)

O 8.2.1: See OPPO

**Mode 2**

Issue M2-1 – Infinite loop due to excessive resource exclusion in step 5)

Issue M2-2 – Resource exclusion/selection for multiple transport blocks

Issue M2-3 – Backward indication

Issue M2-4 – Introduce a dropping condition when HARQ RTT time gap is not met

Issue M2-5 – HARQ RTT time gap capturing issue in MAC, send LS

Issue M2-6 – ‘sl-ThresPSSCH-RSRP-List’ to ‘sl-Thres-RSRP-List’ replacement

Issue M2-7 – Exclude the slots with PSFCH when sl-LengthSymbols≤9 in the identification of candidate resources in the sensing procedure

Issue M2-8 – Clarification on timing relation between re-evaluation moment and initial selection moment

Issue M2-9 – Correction to step 6) to include slots within Tproc0

Issue M2-10 – Replacing ‘sl-ResourceReservePeriod1’ by ‘sl-ResourceReservePeriodList’ in 213, clause 16.4

**Physical layer procedure**

Issue PP-1: How SL HARQ-ACK report is piggybacked on PUSCH [vivo,3] [Apple,4] [LG,5] [Huawei,6] [DCM,8]

* Aspects on which PUSCH transmission is used to convey SL HARQ-ACK reporting
* Aspects on scheduling restriction avoiding certain overlapping case(s)

Issue PP-2: Further clarification on reference RS used for pathloss derivation [vivo,3] [ASUSTeK,9]

* Aspects on which serving cell is the reference cell for pathloss derivation
* Aspects on beam failure case

Issue PP-3: Additional prioritization rule

* Issue #3-1: Tie-break for prioritization between PSFCH TX and PSFCH RX [CATT,1]
* Issue #3-2: Prioritization rule between PUSCH carrying SL HARQ-ACK reports and SL transmission [Fujitsu,2] [vivo,3]

Issue PP-4: UE procedure for overlapping UL TX and SL RX [ZTE,7]

Issue PP-5: Minimum number of retransmissions for groupcast with SL HARQ-ACK feedback Option 1 [Intel,10]

**QoS**

Issue QS-1: UE behaviour if highest CBR in CBR range configuration is less than 100 %