**[101-e--NR-5G\_V2X\_NRSL-SYNC-03]**

**Email discussion regarding**

* **Issue 12: Collision between S-SSB and DL slots**
* **Issue 14: (Pre-)configuration of SL BWP**
* **Issue 18: S-SSB RSRP measurement**

**Till 5/28. If consensus can be reached, any follow-up TP by 6/3 – Teng (CATT)**

**Issue 12 Collision between S-SSB and DL slots**

From the email responses 5/25-5/26, the views are clearly explained. First of all, the principle behind the proposal is agreeable that S-SSB Tx/Rx slots cannot overlap with DL/Flexible slots in Uu. Provided by many companies, a previous agreement has already concluded the intention of the FL proposal. There is no necessary to have redundant agreement on the same issue. But in the agreement, there is “at least” which is understood in different ways.

About the issue that not enough UL resources in one pattern for 64 S-SSBs. The S-SSBs can be distributed into multiple patterns within 160ms, which is mentioned by Nokia.

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| RAN1#99Agreements:* NR supports SL transmissions at least in cell-specific UL resources in Uu.
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| **Alternatives** | **FL proposal on collision exclusion** | **Supportive companies** |
| Alt 1 | Support | [Huawei, HiSilicon] [Intel] [MediaTek] [ZTE, Sanechips] [Nokia, NSB] [ITRI] [LGE] |
| Alt 2 | NOT support | [vivo] |
| Alt 3 | NOT necessary | [Ericsson] [CATT] [Qualcomm] [Futurewei] [Samsung] [Spreadtrum] |

In order to make it clear to everyone, I suggest having the following proposal:

***FL proposal:***

* ***S-SSB transmission/reception slots are in cell-specific UL resources in Uu.***

**Comments 5/27-5/28**

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| **Company** | **Views** |
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**Email responses 5/25-5/26**

*FL Proposal: S-SSB transmission/reception slots are not supposed to overlap with DL slots.*

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| **Company** | **Views** |
| Huawei, HiSilicon | Agree. The phrasing should be more formally:* S-SSB transmission/reception slots are assumed to be configured not to include any DL slot.

The same principle has been captured in LTE-V.  |
| Intel | Our understanding is that on a given carrier all SL resources are configured on UL resources only. Therefore, our proposal is: “SL transmissions on a given carrier do not overlap with DL and FL slots.” |
| MediaTek | Agree with FL’s proposal. Also support Intel’s proposal since we only use indicated UL slots for the potential SL operation, i.e., FL slots are precluded. |
| OPPO | In LTE-V2X, SL transmission can only happen on UL resources. This mechanism can be reused in NR-V2X. we have the following agreement till now. To align with LTE-V2X mechanism, we can limit SL transmissions on UL resources only. Otherwise, there will be misalignment of the SL resources for IC and OOC UE because only UL slot is indicated by PSBCH.Proposal: * SL transmissions use only cell-specific UL resources in Uu.

Agreements:* NR supports SL transmissions at least in cell-specific UL resources in Uu.
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| Vivo | Disagree.We indeed agreed the SL transmission only takes place on cell-specific UL but this does not necessarily mean that S-SSB resources must be configured on cell-specific UL. It would be hard for NW to maintain all S-SSB slots being located at the cell-specific UL part in some cases. E.g. LS-SSB is 64 but there is no more than 64 UL slot in a TDD pattern. We need to define rules on how to handle the collision.  |
| ZTE/Sanechips | Agree with Intel/MediaTek that ‘flexible’ needs to be inserted to the FL proposal given SL impact on Uu transmission on flexible slots is undesired.***S-SSB transmission/reception slots are not supposed to overlap with DL/flexible slots.***To us, three alternatives could address potential collision issue between S-SSB transmission/reception slots with DL/flexible slots. We are fine to either of the alternatives. Alt 1. FL proposal, which is the NW configuration way. Restrictions on NR Uu configuration would be expected as Vivo clarified.Alt 2. Define validation rules to address the S-SSB slots in collision with flexible/DL slots.Alt 3. Clarify the interval is the interval measured by logical slots(i.e. UL slots). In this way collision between S-SSB and DL/flexible slots would not happen and no validation rules would be needed.  |
| Ericsson | We agree with the proposal but in our opinion, this has been already agreed. Agreements:* NR supports SL transmissions at least in cell-specific UL resources in Uu.
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| CATT | Agree with the proposal in principle.But if the agreement mentioned by OPPO/vivo/Ericsson is already clearly excluded the potential collision, there is no necessary for redundant clarification. |
| Nokia | We agree with the proposal. Regarding vivo’s comment on the S-SSB positions, we think that it should be possible to distribute the S-SSBs over multiple patterns in 160ms so that there would not be collision with DL slots. |
| Qualcomm | We don’t think the proposal is needed. RAN1 agreed to follow LTE procedure, which already covers this case. |
| ITRI | We agree the S-SSB and DL slots are not overlapped. |
| FUTUREWEI | Agree with the proposal. As commented by others, we also think that this agreement may have already been implicitly taken |
| Samsung | We don’t see the necessity of this proposal. We don’t need to revisit this issue which was already agreed as commented by Ericsson/Qualcomm. |
| LGE | Every other SL channel/signal is transmitted on the cell-specific UL resources according to the following agreement.*Agreements made in RAN1#99:**NR supports SL transmissions at least in cell-specific UL resources in Uu.*There is no reason not to apply the same rule for S-SSB transmission. That is, S-SSB should be transmitted on a cell-specific UL slot. The FL proposal is not clear on this point, as it may be read to allow a flexible slot for S-SSB transmission. We suggest the modified proposal below.***FL Proposal:*** ***S-SSB transmission/reception slots are the cell-specific UL slots.*** |
| Spreadtrum | Agree with the proposal. As commented by other companies, this has already been agreed. |

**Issue 14 (pre-)configuration of SL BWP**

From the email responses 5/25-5/26, the views can be divided into two parts for first and second bullet in the proposal.

For the first bullet, 8 companies agree with the proposal/principle behind the proposal, and they think a proper agreement/conclusion should be made. While 7 companies think it unnecessary because it is a common understanding, and proper (pre-)configuration can guarantee the alignment of BWP between RRC idle UEs and RRC connected UEs.

For the second bullet, 10 companies shared their views that it is not necessary, while 3 companies explained how the current spec can be explained. It is obvious that companies have different understanding on the current spec. There is not any clear agreement related to the sentence in current spec, and a clarification is needed. Samsung and LGE explained how a proper wording can be used to change the current spec.

**First bullet:**

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| **Alternatives** | **FL proposal on SL BWP** | **Supportive companies** |
| Alt 1 | Support | [Huawei, HiSilicon] [OPPO] [vivo] [ZTE, Sanechips] [CATT] [ITRI] [LGE] [Spreadtrum] |
| Alt 2 | NOT support | [Intel] [MediaTek] [Ericsson] [Nokia] [Qualcomm] [Futurewei] [Samsung] |

**Second bullet:**

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| Alternatives | FL proposal on SL BWP | Supportive companies |
| Alt 1 | Support | [Huawei, HiSilicon] [Samsung] [LGE] |
| Alt 2 | NOT support | [Intel] [OPPO] [MediaTek] [vivo] [ZTE, Sanechips] [Ericsson] [Nokia] [Qualcomm] [ITRI] [Futurewei] |

According to the discussion and views summary, I update the FL proposals. For the first bullet, at least a conclusion is needed in the chairman’s notes to clarify this issue. For the second bullet, by avoiding confusion, a clarification/agreement is necessary. I think the TP by Samsung is easy and clear, so I would like to have this TP as proposal.

***FL proposal for conclusion:***

* ***UE assumes that the same SL BWP is (pre-)configured for both RRC idle (or out of coverage) UEs and RRC connected UEs.***

***FL proposal for draft TP:***

------------------------------------------------------ Start of Draft TP of 38.213--------------------------------------------------

16.1 Synchronization procedures

<Unchanged parts omitted>

For reception of a S-SS/PSBCH block, a UE assumes a frequency location corresponding to the subcarrier with index 66 in the S-SS/PSBCH block [4, TS 38.211], is provided by absoluteFrequencySSB-SL. The UE assumes that a S-PSS symbol, a S-SSS symbol, and a PSBCH symbol have a same transmission power. The UE assumes a same numerology of the S-SS/PSBCH as for a SL BWP of the S-SS/PSBCH block reception, and that a bandwidth of the S-SS/PSBCH is within a bandwidth of the SL BWP. The UE assumes the subcarrier with index 0 in the S-SS/PSBCH block is aligned with a subcarrier with index 0 in a RB of the SL BWP.

---------------------------------------------------------- End of Draft TP of 38.213-------------------------------------------------------

**Comments 5/27-5/28**

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| **Company** | **Views** |
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**Email responses 5/25-5/26**

*FL Proposal:*

* *The same SL BWP should be (pre)configured for both RRC idle (or out of coverage NR V2X UEs) and RRC connected UEs.*
* *Not support that the UE assumes the subcarrier with index 0 in the S-SS/PSBCH block is aligned with a subcarrier with index 0 in the SL BWP.*

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| **Company** | **Views** |
| Huawei, HiSilihcon | Agree.For the first bullet, the UE supports only single active BWP in Uu link. In sidelink, the only way is make the SL BWP in RRC connected and idle/inactive state the same. The final form of the proposal needs to avoid the word “should”, e.g. “is”.For the second bulletin, the current specification wording cannot be supported by any agreements and contradicts the agreements that the S-SSB frequency location is configured by absoluteFrequencySSB-SL.  |
| Intel | We do not see the need for this proposal. |
| OPPO | For the first bullet: agree.For the second bullet: disagree.If the proposal is agreed, how to determine the frequency position of SL BWP? Additional RB offset between the first RB of S-SSB and RB#0 of SL BWP needs to be introduced? We don’t think that is good option at the last meeting of NR-V2X. |
| MediaTek | It seems no need of the proposals. For proposal 1, the early agreement of the single SL BWP should be enough. |
| vivo | For the first bullet, I think it is RAN1’s common understanding that for the same SL carrier, the configured SL BWP and pre-configured BWP should be the same, otherwise the IC and OoC UE may not be able to communicate with each other even if they are using the same/similar timing reference. We prefer to make it as a conclusion if needed.The assumption of ‘***the subcarrier with index 0 in the S-SS/PSBCH block is aligned with a subcarrier with index 0’*** in 38.213 is to preclude the floating sync case where S-SSB and PRB grid are not RB level aligned. I don’t see it has much relation to the argument on SL BWP (re)configuration in spreadtrum’s paper, and I am confused why this text is proposed to be deleted given floating sync is not supported in NR V2X. |
| ZTE/Sanechips | First bullet: agreedSecond bullet: we don’t get the motivation of this bullet |
| Ericsson | For the first bullet, we do not think there is need to specify it. It is up to the operator.For the second bullet, we believe everything needed is already agreed in the following table:Table 8.4.3.1-1: Resources within an S-SS/PSBCH block for S-PSS, S-SSS, PSBCH, and DM-RS.

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| **Channel or signal** | **OFDM symbol number** $l$**relative to the start of an S-SS/PSBCH block** | **Subcarrier number** $k$**relative to the start of an S-SS/PSBCH block** |
| S-PSS | 1, 2 | 2-128 |
| S-SSS | 3, 4 | 2-128 |
| Set to 0 | 1,2,3,4 | 0,1, 129,130,131 |
| PSBCH | 0, 5,6, …,$N\_{symb}^{S-SSB}-1$ | 0,1,…,131 |
| DM-RS for PSBCH | 0, 5,6, …,$N\_{symb}^{S-SSB}-1$ | 0, 4, 8, …., 128 |

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| CATT | Agree with the first bullet. |
| Nokia | On first bullet, while it is true that in order to communicate two UE’s should have common understanding on the assumed BWP, but beyond that we do not think there is need to specify it.For second bullet, if we assume that the SL BWP is preconfigured (based on PointA), and the S-SSB frequency locations is also preconfigured (based on ARFCN), there in principle does not need to be fixed linking between the S-SSB scs#0 and the SL BWP scs#0. I.e. UE would know the absolute frequency location of both and thereby any relation in between.  |
| Qualcomm | We don’t see the need for the proposal. Consistency between in-coverage and out-of-coverage UEs is a general problem and should be left to network to ensure.We don’t think the second bullet is needed either. |
| ITRI | First bullet: We agree a SL BWP can contain several resource pools that can be used for RRC idle and RRC connected UEs.Second bullet: Same view as OPPO. |
| FUTUREWEI | We do not really see the need for the proposal: the first bullet, as indicated by the ‘should’ is not normative anyway. For the second bullet, it is unclear why such an agreement would be needed |
| Samsung | **First bullet:** It is not necessary because it should be guaranteed by proper (pre-)configuration, which is a basic assumption on sidelink operation.**Second bullet:**For the second bullet, we echo vivo’s understanding that the intention is to clarify floating sync is not supported for S-SSB. TS 38.213 editor already clarified this point when drafting this sentence in the spec (there was a note associated with the sentence in the draft spec after Reno meeting). Since RAN1 has never discussed supporting floating sync for S-SSB, the RB grid of S-SSB should be aligned with the RB grid of the BWP. So it is true that there is no agreement supporting this sentence, but actually no agreement for floating sync is aligned with the intention with this sentence. A figure to illustrate floating sync is as below.  Moreover, we didn’t see intention from editor that this sentence is to introduce limitation on the RB level location of the S-SSB, so the “subcarrier with index 0” should not be understood as the lowest subcarrier of the BWP. The following modification could clarify this point, if the group has confusion on this point.  Note that it is not necessary to specify which RB in the BWP, since UE can derive it from absoluteFrequencySSB-SL.  “the subcarrier with index 0 in the S-SS/PSBCH block is aligned with a subcarrier with index 0 in a RB of the SL BWP” |
| LGE | The first sub-bullet may be slightly modified as the specification describes the UE operation.The second sub-bullet may be misleading. We have the following agreement.*Agreements:**The transmission bandwidth for S-SSB is within the BW of the (pre)-configured SL-BWP.*The only thing to be corrected in the current 38.213 text is to allow index 0 alignment between the S-SSB/PSBCH block and the SL BWP. This point is not clear with the second bullet. As a result, we propose to change the proposal as follows.***FL Proposal:**** ***UE assumes that the same SL BWP is (pre)configured for both RRC idle (or out of coverage NR V2X UEs) and RRC connected UEs.***
* ***S-SS/PSBCH block is located within the SL BWP.***

Then the modified proposal above is supported. To make the above proposal clear in 38.213, the following TP may be necessary16.1 Synchronization procedures(…)For reception of a S-SS/PSBCH block, a UE assumes a frequency location corresponding to the subcarrier with index 66 in the S-SS/PSBCH block [4, TS 38.211], is provided by *absoluteFrequencySSB-SL* such that the S-SS/PSBCH block is located within the SL BWP. The UE assumes that a S-PSS symbol, a S-SSS symbol, and a PSBCH symbol have a same transmission power. The UE assumes a same numerology of the S-SS/PSBCH as for a SL BWP of the S-SS/PSBCH block reception, and that a bandwidth of the S-SS/PSBCH is within a bandwidth of the SL BWP. ~~The UE assumes the subcarrier with index 0 in the S-SS/PSBCH block is aligned with a subcarrier with index 0 in the SL BWP.~~ |
| Spreadtrum  | We support the 1st bullet.For the 2nd bullet, by following Vivo and Samsung’s comments, if the original intention is to clarify floating sync is not supported for S-SSB and without putting restriction on the RB level location of the S-SSB, we are ok to keep this sentence in 213 16.1 and some clarification as suggested by Samsung is necessary to avoid confusion.  |

**Issue 18 S-SSB RSRP measurements**

From the email responses 5/25-5/26, 12 companies disagree with the FL proposal. Let me explain a bit more for clarification on this issue. The current spec 38.215 on S-SSB RSRP measurement is copied from LTE V2X, and there is not any agreement during Rel-16 NR V2X phase. The FL proposal is to ask whether NR Uu RSRP measurement mechanism can be reused here, which is also analyzed by MediaTek. To make it clear, I change the proposal as follows.

***FL proposal:***

* ***S-SSB RSRP is measured by reusing***
* ***Alt 1: NR Uu mechanism.***
* ***Alt 2: LTE V2X mechanism.***

**Comments 5/27-5/28**

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| **Company** | **Views** |
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**Email responses 5/25-5/26**

*FL Proposal: S-SSB RSRP is measured based on S-SSS. In addition, PSBCH-DMRS can be used for S-SSB RSRP measurement optionally.*

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| **Company** | **Views** |
| Huawei, HiSilicon | Disagree. The use of DM-RS has been captured already clearly in 38.215 as following.

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| PSBCH Reference Signal Received Power (PSBCH-RSRP) is defined as the linear average over the power contributions (in [W]) of the resource elements that carry demodulation reference signals associated with physical sidelink broadcast channel (PSBCH). |

No need to re-open the discussion. |
| Intel | Disagree. LTE V2X sync procedure was agreed to be reused. DMRS should be used for PSBCH RSRP measurements. |
| MediaTek | Agree with FL’s proposal. The current spec just copied/pasted the LTE spec without any agreement as checked with the editor. There is also no agreement and technical reasons to reuse LTE PSBCH-DMRS for NR V2X measurement. Actually, there is the fundamental change on the NR S-SSB structure with the length-127 sequence than length-63 sequence in LTE V2X. The total number of REs for S-SSS is increased to 254 REs, almost same as 264 REs of PSBCH-DMRS. So it is quite different than LTE V2X. Additionally, the gold-sequence based S-SSS has the better correlation performance compared to PSBCH-DMRS. According to our simulation results following RAN4 assumptions of defining RSRP absolute accuracy requirements, it shows the better performance for S-SSS than PSBCH-DMRS in AWGN and fading channels.

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| absolute accuracy @SINR=-6dB |
| Channel | type | 5% | 50% | 95% | absolute accuracy |
| AGWN | PSBCH | -0.691 | -0.36 | -0.043 | 0.691 |
| S-SSS | -0.17 | 0.15 | 0.5 | 0.5 |
| TDLC100ns-300Hz | PSBCH | -1.21 | -0.69 | -0.27 | 1.21 |
| S-SSS | -0.67 | -0.07 | 0.32 | 0.67 |
| TDLC30ns-1400Hz | PSBCH | -1.21 | -0.66 | -0.11 | 1.21 |
| S-SSS | -0.87 | -0.27 | 0.19 | 0.87 |

Besides, in the most cases for SL operation, UE can just measure S-SSS according to the priority indicated by SSS ID with no need of PSBCH decoding or PSBCH-DMRS measurement. However, PSBCH-DMRS measurement will mandate UE to perform PSBCH-DMRS measurement unnecessarily even with no need of PSBCH decoding, which causes the additional complexity for UE implementation.In NR uu, S-SSS than PSBCH-DMRS has been adopted for RSRP measurement and PSBCH-DMRS can be used optionally.So we prefer reusing the NR uu mechanism as proposed by FL to improve the performance while avoiding the unnecessary measurement and complexity. |
| OPPO | Agree with HW.  |
| vivo | Same view as HW |
| ZTE/Sanechips | Disagree. We prefer to reuse LTE V2X mechanism, i.e., PSBCH-DMRS is used. |
| Ericsson | We propose to keep the specification (38.215) as it is and maintain the LTE behavior and use PSBCH-DMRS. PSBCH-DMRS is transmitted in 8 symbols whereas SSS occupies only 2 symbols. This allows for better averaging over time, reducing time variations  |
| CATT | Agree with the proposal. Follow NR Uu design on the RSRP measurement is a simple way. |
| Nokia | We do not have a strong view, but it would seem most natural to re-use the NR-Uu definition for NR-SL. |
| Qualcomm | We share the view of keeping the current specifications using PSBCH DMRS |
| ITRI | Disagree. We think S-SSB RSRP should be measured by PSBCH-DMRS. |
| FUTUREWEI | Disagree. Use the current 38.215 measurement for PSBCH RSRP |
| Samsung | In general, we agree that S-SSS can achieve more accurate RSRP measurement than PSBCH-DMRS. However, this is an optimization issue and at this last stage, we don’t think that it is worthy to be specified. |
| LGE | Not supported.The LTE-V2X rule is the baseline for NR-V2X sync. Following the same principle, PSBCH-DMRS should be the baseline for S-SSB RSRP measurement. From a technical perspective, PSBCH-DMRS provide better RSRP measurement results than S-SSS. With these reason, RAN4 has already undertaken the simulation works for S-SSB RSRP measurement with PSBCH-DMRS. There is no reason to revert the LTE-V2X rule and makes RAN4 do their works again from the beginning.We propose the following.***FL Proposal:*** ***S-SSB RSRP is measured based on PSBCH-DMRS.*** |
| Spreadtrum | We share the same view of using PSBCH DMRS |