**3GPP TSG RAN WG1 Meeting #103-e R1-200xxxx**

e-Meeting, October 26th – November 13th, 2020

Source: CATT

Title: Feature lead summary #1 on AI 7.2.4.3 Sidelink synchronization mechanism

Agenda Item: 7.2.4

Document for: Discussion and Decision

# Introduction

According to the timelines of the chairman’s guideline on feature lead summary, it can be referred as:

* Preparation phase (10.19-10.23):
* 10.19-10.20: Feature leads to prepare summary.
* 10.21-10.23: FLs to lead the discussion identifying the set of email threads. How to allocate the 7 email threads to each topic will be determined.
* Official e-meeting phase for all LSs and maintenance (10.26-11.6):
* Deadline time reference: UTC 4:59pm
* Quiet Period
* 72 hours: UTC 12am (10.30) – UTC 11:59pm (11.1)
* 72 hours: UTC 12am (11.6) – UTC 11:59pm (11.8)

# Sidelink synchronization issue list

This feature lead summary document captures the remaining issues of sidelink synchronization mechanism aspects for Rel-16 NR V2X based on the submitted contributions [1]-[8]. The issue list with priorities can be found as following subsection.

## Issue list

**High priority**

* Issue 1: Indication/derivation of TDD configuration
	+ Issue 1-1: TDD configuration derivation
	+ Issue 1-2: TDD configuration for OoC UEs
	+ Issue 1-3: Indication of the non-TDD case in PSBCH
* Issue 3: Timing determination for NR V2X (will be discussed during CR preparation phase)

**Low priority**

* Issue 2: PSBCH content in intra/inter-RAT case
* Issue 4: S-SSB power control
* Issue 5: Offset of S-SSB in SL-BWP
* Issue 6: Timing offset between eNB and gNB
* Issue 7: S-SSB periodicities in RRC specification
* Issue 8: Editorial changes

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| **Issue#** | **Descriptions** | **Tdocs** |
| 1 | Indication/derivation of TDD configuration | [LGE] [ZTE, Sanechips] [Sharp] [vivo] |
| 2 | PSBCH content in intra/inter-RAT case | [vivo] |
| 3 | Timing determination for NR V2X | [LGE] [Huawei, HiSilicon] |
| 4 | S-SSB power control | [vivo] |
| 5 | Offset of S-SSB in SL-BWP | [CATT] |
| 6 | Timing offset between eNB and gNB | [CATT] |
| 7 | S-SSB periodicities in RRC specification | [Ericsson] |
| 8 | Editorial changes | [CATT] [Ericsson] |

# Indication/derivation of TDD configuration

## TDD configuration derivation

This issue was discussed during last meeting but did not reach any consensus. The uncertainty part is whether the TDD configuration derivation can be aligned between Tx side and Rx side. Some companies thought it can be avoided by network implementation, while some other companies proposed to have further enhancement on the derivation equations to guarantee the alignment. During last meeting, the following potential options as candidates were discussed. The discussion during this meeting can start with the following options.

* Option 1: The ambiguous issue between InC and OoC UEs can be eliminated up to network implementation.
* Option 2: Tx UEs (InC) and Rx UEs (OoC) use the same UL slots resources indicated by PSBCH.
* Option 3: To restrict the number of UL slots configured in tdd-UL-DL-ConfigCommon as integer multiple of granularity *w*.

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| **Options** | **Supportive companies** |
| Option 1 | [LGE] |
| Option 2 | [vivo] |
| Option 3 | [ZTE, Sanechips] |

***FL Proposal:***

* ***For derivation of UL slots from TDD configuration indication, the ambiguous issue between InC and OoC UEs can be eliminated up to network implementation.***

**Contribution Proposals:**

[ZTE, Sanechips]

From Rx UE side, the interpretation of UL slot indication could lead to mis-alignment of resource pool and consequent communication issues; It is proposed to specify the Rx side formula to ensure a common set of {$Δ\_{1}$, $Δ\_{2}$}shared by Tx and Rx UE.

* Observation 1: Current spec. description is not sufficient to always ensure the receive UE retrieves the UL slot numbers in two patterns from the PSBCH payload as that indicated in TDD-UL-DL-ConfigCommon.
* Proposal 1: To adapt the following TP for section 16.1 in 38.213

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| **16.1 Synchronization procedures****<Unchanged parts are omitted>**$a\_{5}, a\_{6}, a\_{7},a\_{8}, a\_{9}, a\_{10}, a\_{11}$ are the 7th to 1st LSBs of $u\_{slots}^{SL}$, respectively- for $a\_{0}=0$, $u\_{slots}^{SL}=u\_{slots}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{1}$- for $a\_{0}=1$, $$\begin{array}{c} \\u\end{array}\_{slots}^{SL}=\left⌊\frac{u\_{slots,2}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym,2}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{2}}{w}\right⌋\*\left⌈\frac{P\*2^{μ}+1}{w}\right⌉+\left⌊\frac{u\_{slots}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{1}}{w}\right⌋$$where- $L$ is the number of symbols in a slot: $L=12$ if *cyclicPrefix-SL* = "ECP"; else,$L=14$- $I\_{1}$ is 1 if $u\_{sym}\*2^{μ-μ\_{ref}} mod L\geq L-Y$, else $I\_{1}$ is 0- $I\_{2}$ is 1 if $u\_{sym,2}\*2^{μ-μ\_{ref}} mod L\geq L-Y$, else $I\_{2}$ is 0 - $Y$ is the sidelink starting symbol index provided by *sl-StartSymbol*- $w$ is the granularity of slots indication as described in Table 16.1-2- $μ\_{ref}$, $u\_{slots}$, $u\_{sym}$, $u\_{slots,2}$, $u\_{sym,2}$ are described in Clause 11.1- $μ=0, 1, 2, 3$ corresponds to SL SCS as defined in [4, TS 38.211]- $mod\left(u\_{slots,2}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym,2}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{2}, w\right)=0$- $mod\left(u\_{slots}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{1}, w\right)=0$**<Unchanged parts are omitted>** |

 [LGE]

* Observation 1: It is guaranteed by network implementation that the SL slots derived from sl-TDD-Config field carried by PSBCH and the SL slots derived from sl-TDD-Configuration or tdd-UL-DL-ConfigurationCommon are identical. No further specification work is needed.
* Observation 2: For partial coverage scenario, sl-TDD-Config provided by PSBCH needs to be used for deriving slots available for SL which may belong to a resource pool.
* Proposal 3: To derive the set of slots which can belongs to a resource pool, the TDD pattern is derived as follows:
* For in-coverage UE,
	+ If the UE is provided tdd-UL-DL-ConfigurationCommon, the higher layer parameter tdd-UL-DL-ConfigurationCommon of the serving cell is used.
* For out-of-coverage UE,
	+ If the UE has a selected SyncRef UE,
		- sl-TDD-Config provided by the received PSBCH is used.
	+ Else
		- If the UE is provided sl-TDD-Configuration, the higher layer parameter sl-TDD-Configuration provided by pre-configuration is used.

Adopt the following TP for 38.214

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| 8 Physical sidelink shared channel related proceduresA UE can be configured by higher layers with one or more sidelink resource pools. A sidelink resource pool can be for transmission of PSSCH, as described in Clause 8.1, or for reception of PSSCH, as described in Clause 8.3 and can be associated with either sidelink resource allocation mode 1 or sidelink resource allocation mode 2.In the frequency domain, a sidelink resource pool consists of *sl-NumSubchannel* contiguous sub-channels. A sub-channel consists of *sl-SubchannelSize* contiguous PRBs, where *sl-NumSubchannel* and *sl-SubchannelSize* are higher layer parameters.The set of slots that may belong to a sidelink resource pool is denoted by $(t\_{0}^{SL},t\_{1}^{SL},\cdots ,t\_{T\_{max}-1}^{SL})$ where- $0\leq t\_{i}^{SL}<10240×2^{μ}, 0\leq i<T\_{max},$ - the slot index is relative to slot#0 of the radio frame corresponding to SFN 0 of the serving cell or DFN 0,- the set includes all the slots except the following slots, - $N\_{S\\_SSB}$ slots in which S-SS/PSBCH block (S-SSB) is configured,- $N\_{nonSL}$ slots in each of which at least one of *Y-th*, *(Y+1)-th*, …, *(Y+X-1)-th* OFDM symbols are not semi-statically configured as UL as per the higher layer parameter *tdd-UL-DL-ConfigurationCommon* of the serving cell if provided or *sl-TDD-Configuration* if provided or *sl-TDD-Config* of the received PSBCH if provided, where *Y* and *X* are set by the higher layer parameters *sl-StartSymbol* and *sl-LengthSymbols*, respectively.***<Unchanged part is omitted>*** |

[vivo]

* Proposal 4: Both Tx and Rx UE derive the resource pool based on the contents of PSBCH.

The associated TP3 is provided below.

**------------------------------------------------------ Start of Draft TP3 of 214-------------------------------------------------**

 **<Unchanged parts omitted>**

The set of slots that may belong to a sidelink resource pool is denoted by $(t\_{0}^{SL},t\_{1}^{SL},\cdots ,t\_{T\_{max}-1}^{SL})$ where

- $0\leq t\_{i}^{SL}<10240×2^{μ}, 0\leq i<T\_{max},$

- the slot index is relative to slot#0 of the radio frame corresponding to SFN 0 of the serving cell or DFN 0,

- the set includes all the slots except the following slots,

- $N\_{S\\_SSB}$ slots in which S-SS/PSBCH block (S-SSB) is configured,

- $N\_{nonSL}$ slots in each of which at least one of *Y-th*, *(Y+1)-th*, …, *(Y+X-1)-th* OFDM symbols are not semi-statically configured as UL as per the higher layer parameter *SL-TDD-Config* described in clause 5.8.9.4.3 in [TS38.331]*~~tdd-UL-DL-ConfigurationCommon~~* ~~or~~ *~~sl-TDD-Configuration~~*, where *Y* and *X* are set by the higher layer parameters *sl-StartSymbol* and *sl-LengthSymbols*, respectively.

**--------------------------------------------------------- End of Draft TP3 -------------------------------------------------------**

## TDD configuration for OoC UEs

1 company proposed to consider the case when OoC UEs to obtain TDD configuration information, since there is no network for OoC UEs to receive *tdd-UL-DL-ConfigurationCommon*. A pre-configuration parameter is defined and used when UEs are OoC to derive TDD information.

***FL proposal:***

* ***For transmission of an S-SS/PSBCH block, sl-TDD-Configuration in SL-PreconfigurationNR can be used for sl-TDD-Config generation.***

**Contribution Proposals:**

[LGE]

* Proposal 2: For transmission of an S-SS/PSBCH block, *sl-TDD-Configuration* in *SL-PreconfigurationNR* can be used for sl-TDD-Config generation. Adopt the following TP for TS 38.213.

TP for TS 38.213

|  |
| --- |
| 16.1 Synchronization procedures<Unchanged parts omitted>For transmission of an S-SS/PSBCH block, a UE includes a bit sequence $a\_{0}, a\_{1}, a\_{2}, a\_{3}, …, a\_{11}$ in the PSBCH payload to indicate *sl-TDD-Config* and provide a slot format over a number of slots, where- $a\_{0}=0$ if *pattern1* is provided by *sl-TDD-Configuration or tdd-UL-DL-ConfigurationCommon*; $a\_{0}=1$ if both *pattern1* and *pattern2* are provided by *sl-TDD-Configuration* *or tdd-UL-DL-ConfigurationCommon* as described in Clause 11.1- $a\_{1}, a\_{2}, a\_{3},a\_{4}$ are determined based on- $P$ in *pattern1* as described in Table 16.1-1 for $a\_{0}=0$ - $P$ in *pattern1* and$P\_{2}$ *in pattern2* as described in Table 16.1-2 for $a\_{0}=1$where $P$ and $P\_{2}$ are as described in Clause 11.1- $a\_{5}, a\_{6}, a\_{7},a\_{8}, a\_{9}, a\_{10}, a\_{11}$ are the 7th to 1st LSBs of $u\_{slots}^{SL}$, respectively- for $a\_{0}=0$, $u\_{slots}^{SL}=u\_{slots}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{1}$- for $a\_{0}=1$, $u\_{slots}^{SL}=\left⌊\frac{u\_{slots,2}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym,2}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{2}}{w}\right⌋\*\left⌈\frac{P\*2^{μ}+1}{w}\right⌉+\left⌊\frac{u\_{slots}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{1}}{w}\right⌋$where- $L$ is the number of symbols in a slot: $L=12$ if *cyclicPrefix-SL* = “ECP”; else,$L=14$- $I\_{1}$ is 1 if $u\_{sym}\*2^{μ-μ\_{ref}} mod L\geq L-Y$, else $I\_{1}$ is 0- $I\_{2}$ is 1 if $u\_{sym,2}\*2^{μ-μ\_{ref}} mod L\geq L-Y$, else $I\_{2}$ is 0 - $Y$ is the sidelink starting symbol index provided by *sl-StartSymbol*- $w$ is the granularity of slots indication as described in Table 16.1-2- $μ\_{ref}$, $u\_{slots}$, $u\_{sym}$, $u\_{slots,2}$, $u\_{sym,2}$ are the parameters of TDD-UL-ConfigurationCommon as described in Clause 11.1, or the parameters of sl-TDD-Configuration as defined in [9.3, TS 38.331]- $μ=0, 1, 2, 3$ corresponds to SL SCS as defined in [4, TS 38.211] |

## Indication of the non-TDD case in *PSBCH*

1 company pointed out that the current spec TS 38.213 is still not correctly captured the case of shared SL carrier and SUL carrier, since this case should be also treated in the same way as other “non-TDD” cases.

***FL Proposal:***

* ***IN case of shared SL carrier and SUL carrier, the sl-TDD-Config bits are set as follows,***
* $\left(a\_{0}, a\_{1}, a\_{2}, a\_{3},a\_{4}, a\_{5}, a\_{6}, a\_{7},a\_{8}, a\_{9}, a\_{10}, a\_{11}\right)=(1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1)$

**Contribution Proposals:**

[Sharp]

* Proposal 1: In case of shared SL carrier and SUL carrier, the *sl-TDD-Config* bits are set as follows,
* $\left(a\_{0}, a\_{1}, a\_{2}, a\_{3},a\_{4}, a\_{5}, a\_{6}, a\_{7},a\_{8}, a\_{9}, a\_{10}, a\_{11}\right)=(1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1)$.

# PSBCH content in intra/inter-RAT case

## PSBCH content in intra-RAT case

1 contribution consider about PSBCH content in intra-RAT case. According to the current TS 38.331, if a UE is out of coverage and/or it selects GNSS or its local timing as the synchronization source for synchronization, it should derive *sl-TDD-Config* based on the *sl-TDD-Configuration-r16* in *sl-PreconfigGeneral*. However, TS 38.213 only specifies the conversion from *tdd-UL-DL-ConfigurationCommon* to *sl-TDD-Config*.

**Contribution Proposals:**

[vivo]

* Proposal 1: Agree on TP1 to include the determination of sl-TDD-Config based on pre-configuration.

**------------------------------------------------------ Start of Draft TP1 of 213-------------------------------------------------**

 **<Unchanged parts omitted>**

**16.1 Synchronization procedures**

For transmission of an S-SS/PSBCH block, a UE includes a bit sequence $a\_{0}, a\_{1}, a\_{2}, a\_{3}, …, a\_{11}$ in the PSBCH payload to indicate *sl-TDD-Config-r16* and provide a slot format over a number of slots.

For paired spectrum, or if *tdd-UL-DL-ConfigurationCommon* and *sl-TDD-Configuration-r16* are not provided for a spectrum indicated with only PC5 interface in Table 5.2E.1-1 in [TS 38.101-1],

- $a\_{0}, a\_{1}, a\_{2}, a\_{3},a\_{4}, a\_{5}, a\_{6}, a\_{7},a\_{8}, a\_{9}, a\_{10}, a\_{11}$ are set to '1';

else

- when UE determines *sl-TDD-Config* based on *tdd-UL-DL-ConfigurationCommon* or *sl-TDD-Configuration-r16* according to clause 5.8.9.4.3 in [TS 38.331]

- $a\_{0}=0$ if *pattern1* is provided by *tdd-UL-DL-ConfigurationCommon* or *sl-TDD-Configuration-r16*; $a\_{0}=1$ if both *pattern1* and *pattern2* are provided by *tdd-UL-DL-ConfigurationCommon* or *sl-TDD-Configuration-r16* ~~as described in Clause 11.1~~

**--------------------------------------------------------- End of Draft TP1 -------------------------------------------------------**

## PSBCH content in inter-RAT case

1 contribution also analysis the case of PSBCH content in inter-RAT case. For inter-RAT deployment where LTE eNB controls NR sidelink operation, the SL configuration is provided by eNB, and an NR UE in the coverage of eNB should use the LTE TDD configuration for PSBCH determination. In this case, it is unclear how to determine the *SL-TDD-Config* in PSBCH. Therefore, the rules for UE to determine the PSBCH content in inter-RAT case should be discussed.

**Contribution Proposals:**

[vivo]

* Observation 1: The uplink resources of LTE TDD configurations are not always placed at the end of the periodicity, therefore directly reusing the formulae agreed for NR TDD configuration conversion to determine SL-TDD-Config in the inter-RAT case is impossible.
* Proposal 2: The codepoints 9~15 of $a\_{1}, a\_{2}, a\_{3},a\_{4}$ when $a\_{0}=0$ can be used for LTE TDD configuration indication in PSBCH as follows,

Indication of LTE TDD Configuration (X=0)

|  |  |
| --- | --- |
| $$a\_{1},a\_{2}, a\_{3}, a\_{4}$$ | LTE TDD configuration |
| 1, 0, 0, 1 | 0 |
| 1, 0, 1, 0 | 1 |
| 1, 0, 1, 1 | 2 |
| 1, 1, 0, 0 | 3 |
| 1, 1, 0, 1 | 4 |
| 1, 1, 1, 0 | 5 |
| 1, 1, 1, 1 | 6 |

The associated TP2 is provided below.

**------------------------------------------------------ Start of Draft TP2 of 213-------------------------------------------------**

 **<Unchanged parts omitted>**

**16.1 Synchronization procedures**

For transmission of an S-SS/PSBCH block, a UE includes a bit sequence $a\_{0}, a\_{1}, a\_{2}, a\_{3}, …, a\_{11}$ in the PSBCH payload to indicate *sl-TDD-Config-r16* and provide a slot format over a number of slots.

For paired spectrum, or if *tdd-UL-DL-ConfigurationCommon* and *sl-TDD-Configuration-r16* are not provided for a spectrum indicated with only PC5 interface in Table 5.2E.1-1 in [TS 38.101-1],

- $a\_{0}, a\_{1}, a\_{2}, a\_{3},a\_{4}, a\_{5}, a\_{6}, a\_{7},a\_{8}, a\_{9}, a\_{10}, a\_{11}$ are set to '1';

else

- when UE determines *sl-TDD-Config* based on *tdd-UL-DL-ConfigurationCommon* or *sl-TDD-Configuration-r16* according to clause 5.8.9.4.3 in [TS 38.331]

- $a\_{0}=0$ if *pattern1* is provided by *tdd-UL-DL-ConfigurationCommon* or *sl-TDD-Configuration-r16*; $a\_{0}=1$ if both *pattern1* and *pattern2* are provided by *tdd-UL-DL-ConfigurationCommon* or *sl-TDD-Configuration-r16* ~~as described in Clause 11.1~~

- $a\_{1}, a\_{2}, a\_{3},a\_{4}$ are determined based on

- $P$ in *pattern1* as described in Table 16.1-1 for $a\_{0}=0$

- $P$ in *pattern1* and$P\_{2}$ *in pattern2* as described in Table 16.1-2 for $a\_{0}=1$

where $P$ and $P\_{2}$ are as described in Clause 11.1

- $a\_{5}, a\_{6}, a\_{7},a\_{8}, a\_{9}, a\_{10}, a\_{11}$ are the 7th to 1st LSBs of $u\_{slots}^{SL}$, respectively

- for $a\_{0}=0$, $u\_{slots}^{SL}=u\_{slots}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{1}$

- for $a\_{0}=1$, $u\_{slots}^{SL}=\left⌊\frac{u\_{slots,2}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym,2}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{2}}{w}\right⌋\*\left⌈\frac{P\*2^{μ}+1}{w}\right⌉+\left⌊\frac{u\_{slots}\*2^{μ-μ\_{ref}}+\left⌊\frac{u\_{sym}\*2^{μ-μ\_{ref}}}{L}\right⌋+I\_{1}}{w}\right⌋$

where

- $L$ is the number of symbols in a slot: $L=12$ if *cyclicPrefix-SL* = "ECP"; else,$L=14$

- $I\_{1}$ is 1 if $u\_{sym}\*2^{μ-μ\_{ref}} mod L\geq L-Y$, else $I\_{1}$ is 0

- $I\_{2}$ is 1 if $u\_{sym,2}\*2^{μ-μ\_{ref}} mod L\geq L-Y$, else $I\_{2}$ is 0

- $Y$ is the sidelink starting symbol index provided by *sl-StartSymbol*

- $w$ is the granularity of slots indication as described in Table 16.1-2

- $μ\_{ref}$, $u\_{slots}$, $u\_{sym}$, $u\_{slots,2}$, $u\_{sym,2}$ are described in Clause 11.1

- $μ=0, 1, 2, 3$ corresponds to SL SCS as defined in [4, TS 38.211]

- if UE is provided *tdd-Config* described in [TS 36.331]

- $a\_{0}=0$;

- $a\_{1}, a\_{2}, a\_{3},a\_{4}$ are determined based on Table 16.1-3;

- $a\_{5}, a\_{6}, a\_{7},a\_{8}, a\_{9}, a\_{10}, a\_{11}$ are set to '1';

Table 16.1-1: Slot configuration period when one pattern is indicated

|  |  |
| --- | --- |
| $$a\_{1}, a\_{2}, a\_{3},a\_{4}$$ | Slot configuration period of *pattern1*$P$ (msec) |
| 0, 0, 0, 0 | 0.5 |
| 0, 0, 0, 1 | 0.625 |
| 0, 0, 1, 0 | 1 |
| 0, 0, 1, 1 | 1.25 |
| 0, 1, 0, 0 | 2 |
| 0, 1, 0, 1 | 2.5 |
| 0, 1, 1, 0 | 4 |
| 0, 1, 1, 1 | 5 |
| 1, 0, 0, 0 | 10 |
| Reserved | Reserved |

 **<Unchanged parts omitted>**

**Table 16.1-3: Indication of LTE TDD Configuration**

|  |  |
| --- | --- |
| $$a\_{1},a\_{2}, a\_{3}, a\_{4}$$ | **LTE TDD configuration** |
| 1, 0, 0, 1 | 0 |
| 1, 0, 1, 0 | 1 |
| 1, 0, 1, 1 | 2 |
| 1, 1, 0, 0 | 3 |
| 1, 1, 0, 1 | 4 |
| 1, 1, 1, 0 | 5 |
| 1, 1, 1, 1 | 6 |

**--------------------------------------------------------- End of Draft TP2 -------------------------------------------------------**

## UE pre-configuration in inter-RAT case

1 contribution discussed about UE pre-configuration in inter-RAT case. Since LTE TDD configuration is not compatible with NR TDD configuration, a conflict between NR TDD pattern and LTE TDD pattern can happen.

**Contribution Proposals:**

[vivo]

* Observation 2: If NR SL UE is operating on a LTE TDD carrier deployed with LTE TDD config 4~6, there is a conflict between the TDD pattern of NR sidelink preconfiguration (*SL-PreconfigurationNR*) and the TDD pattern of LTE Uu, since LTE TDD configuration information is not compatible with *TDD-UL-DL-ConfigCommon*.
* Proposal 3: *TDD-UL-DL-ConfigCommon* is replaced with *SL-TDD-Config* as the value of *sl-TDD-Configuration-r16* in *SL-PreconfigurationNR*.

# Timing determination for NR V2X

2 companies proposed to complement the timing determination in current spec 38.211 where it should have been captured. It was agreed that SL timing can follow DL timing, and SL timing is determined based on SL timing advance and offset which are configured by gNB. The definition can be captured in TS 38.211 based on the current description in TS 36.211.

***FL proposal:***

* ***Adding a proper TP in TS38.211 on timing determination for NR V2X.***

**Contribution Proposals:**

[LGE]

* Proposal 1: According to the agreement made in RAN1#101-e meeting, adopt the following TP for TS 38.211.

*Agreements:*

* *For sidelink transmission, when gNB/eNB is used as the synchronization reference, the timing determination mechanism in LTE V2X is reused in NR V2X, i.e. DL timing is used.*

TP for TS 38.211

|  |
| --- |
| 8.5 TimingTransmission of a sidelink radio frame number  from the UE shall start  seconds before the start of the corresponding timing reference frame at the UE. The UE is not required to receive the downlink transmissions in TDD configuration or the sidelink transmission earlier than $N\_{TAoffset}$ after the end of a sidelink transmission, where $N\_{TA offset}$ is given by [7.1.2, TS 38.133].If the UE has a serving cell fulfilling the S criterion according to [5.2.3.2, TS 38.304]- the timing of reference radio frame  equals that of downlink radio frame  in the cell with the same uplink carrier frequency as the sidelink and-  is given by [7.1.2, TS 38.133],otherwise - the timing of reference radio frame  is implicitly obtained from [TS 38.213] and- .Figure xxx: Sidelink timing relation.The quantity  equals 0. |

[Huawei, HiSilicon] Draft CR

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| 8.5 TimingTransmission of a sidelink radio frame number $i$ from the UE shall start $(N\_{TA,SL}+N\_{TA,offset})∙T\_{c}$ seconds before the start of the corresponding timing reference frame at the UE. The UE is not required to receive sidelink or downlink transmissions earlier than the value of $N\_{TA,offset}$, which is given in [TS 38.133], after the end of a sidelink transmission.For sidelink transmissions:If the UE has a serving cell fulfilling the S criterion according to clause 8.2 of [TS 38.304]- The timing of reference radio frame $i$ equals that of downlink radio frame $i$ in the cell with the same uplink carrier frequency as the sidelink and- $N\_{TA,offset}$ is given by clause 4.3.1 of [TS 38.211],Otherwise - The timing of reference radio frame  is implicitly obtained from clause 4.2 of [TS 38.213] and- $N\_{TA,offset}=0$.**Figure 8.5-1: Sidelink timing relation.**The quantity $N\_{TA,SL}$ equals to 0.**<Unchanged parts are omitted>** |

# S-SSB power control

1 contribution mentioned that in section 16.2.0 of current TS 38.213, the pathloss used for S-SSB power control is not specified. A straightforward way for pathloss calculation for S-SSB is to follow the same behavior as defined for PSFCH/PSSCH/PSCCH power control.

**Contribution Proposals:**

[vivo]

* Proposal 5: The reference signal used for pathloss measurement in S-SSB power control reuses that for PSFCH/PSSCH/PSCCH power control.

The associated TP4 is provided below.

**------------------------------------------------------ Start of Draft TP4 of 213-------------------------------------------------**

 **<Unchanged parts omitted>**

**16.2.0 S-SS/PSBCH blocks**

A UE determines a power $P\_{S-SSB}(i)$ for an S-SS/PSBCH block transmission occasion in slot $i$ as

 $P\_{S-SSB}(i)=min\left(P\_{CMAX},P\_{O,S-SSB}+10log\_{10}\left(2^{μ}∙M\_{RB}^{S-SSB}\right)+α\_{S-SSB}⋅PL\right)$ [dBm]

where

- $P\_{CMAX}$ is defined in [8-1, TS 38.101-1]

- $P\_{O,S-SSB}$ is a value of p0-DL-S-SSB if provided; else, $P\_{S-SSB}(i)=P\_{CMAX}$

- $α\_{S-SSB}$ is a value of alpha-DL-S-SSB, if provided; else, $α\_{S-SSB}=1$

- $PL=PL\_{b,f,c}(q\_{d})$ as described in Clause 7.1.1 except that

- the RS resource is the one the UE uses for determining a power of a PUSCH transmission scheduled by a DCI format 0\_0 when the UE is configured to monitor PDCCH for detection of DCI format 0\_0

- the RS resource is the one corresponding to the SS/PBCH block the UE uses to obtain MIB when the UE is not configured to monitor PDCCH for detection of DCI format 0\_0

- $M\_{RB}^{S-SSB}=11$ is a number of resource blocks for a S-SS/PSBCH block transmission with SCS configuration $μ$

**--------------------------------------------------------- End of Draft TP4 -------------------------------------------------------**

# Offset of S-SSB in SL-BWP

Based on the agreements, as UE assumes the subcarrier with index 0 in the S-SSB is aligned with a subcarrier with index 0 in a RB of the SL BWP, the S-SSB can be located in any RB within the SL BWP bandwidth but their subcarriers with index 0 should be aligned. Therefore, it looks like a new RRC parameter is needed to define the offset between the lowest PRB of S-SSB and the lowest PRB of SL-BWP.

**Contribution Proposals:**

[CATT]

* Proposal 1: A new RRC parameter is needed to define the offset between the lowest PRB of S-SSB and the lowest PRB of SL-BWP.

# Timing offset between eNB and gNB

Based on the current agreements, both gNB and eNB can be selected as synchronization sources for NR V2X UE. Moreover, as gNB and eNB have the same priority, RSRP is used for the selection of the synchronization source from gNB or eNB. However, the timing offset between gNB and eNB should be also considered since NR supports different timing between eNB and gNB. In order to let V2X UE derive a unified timing, the timing offset between gNB and eNB should be informed to V2X UE.

**Contribution Proposals:**

[CATT]

* Proposal 2: In order to let V2X UE derive a unified timing, the timing offset between gNB and eNB should be informed to V2X UE.

# S-SSB periodicities in RRC specification

**Contribution Proposals:**

[Ericsson]

* Observation: The periodicity values for each SCS indicated in the RRC specification for the IE SL-SyncConfig are not aligned with the RAN1 agreed values.

The necessary discussion on changes to RRC specification can be done in RAN2.

# Editorial changes

## TP for 38.211: Clarification on SL-SSID

**Contribution Proposals:**

[CATT]

* Proposal 3: Adopt the following text proposal for synchronization signals in 38.211.

|  |
| --- |
| *--------------------------------------------Start of Text Proposal for 38.211-----------------------------------------------*8.4.2 Synchronization signals8.4.2.1 Physical-layer sidelink synchronization identitiesThere are 672 unique physical-layer sidelink synchronization identities given by $N\_{ID}^{SL}=N\_{ID,1}^{SL}+336N\_{ID,2}^{SL}$where $N\_{ID,1}^{SL}\in \left\{0,1,…,335\right\}$ and $N\_{ID,2}^{SL}\in \left\{0,1\right\}$. The sequences are divided into two sets, id\_net consisting of $N\_{ID}^{SL}=0,1,…,335$ and id\_oon consisting of $N\_{ID}^{SL}=336,337,…,671$.*----------------------------------------------------End of Text Proposal -----------------------------------------------------* |

## TP for 38.212: Sub-clause title modification

**Contribution Proposals:**

[Ericsson]

* Proposal 9: Remove the clause 8.1.1 in TS 38.212 since the process does not apply to PSBCH and make some modifications to the text in 8.1 to address this issue.

|  |
| --- |
| **<Unchanged parts omitted>**8.1 Sidelink broadcast channelThe processing for SL-BCH transport channel follows the BCH according to clause 7.1, with the following changes:- Clause 7.1.1 for PBCH payload generation is not performed.- Clause 7.1.2 for scrambling is not performed.- In clause 7.1.5, the rate matching output sequence length E = 1386 when higher layer parameter *cyclicPrefix* is configured, otherwise, E = 1782.~~8.1.1 PSBCH payload generation~~8.2 Sidelink shared channel**<Unchanged parts omitted>** |

# References

* 1. R1-2007775, “Discussion on essential corrections in sidelink synchronization mechanism”, LGE, e-Meeting, 3GPP RAN1#103-e, October 26th – November 13th, 2020.
	2. R1-2007812, “Remaining issues on sidelink synchronization mechanism in NR V2X”, CATT, e-Meeting, 3GPP RAN1#103-e, October 26th – November 13th, 2020.
	3. R1-2007924, “Remaining issues of synchronization”, ZTE, Sanechips, e-Meeting, 3GPP RAN1#103-e, October 26th – November 13th, 2020.
	4. R1-2008334, “Correction on sidelink timing definition”, Huawei, HiSilicon, e-Meeting, 3GPP RAN1#103-e, October 26th – November 13th, 2020.
	5. R1-2008390, “Remaining issues on synchronization mechanism for NR sidelink”, Sharp, e-Meeting, 3GPP RAN1#103-e, October 26th – November 13th, 2020.
	6. R1-2008668, “Remaining issues on sidelink synchronization mechanism”, vivo, e-Meeting, 3GPP RAN1#103-e, October 26th – November 13th, 2020.
	7. R1-2008750, “Discussion paper on the remaining issues in Rel. 16 for NR V2X”, Ericsson, e-Meeting, 3GPP RAN1#103-e, October 26th – November 13th, 2020.
	8. R1-2008752, “Corrections to the SL-BCH processing and PSBCH payload generation”, Ericsson, e-Meeting, 3GPP RAN1#103-e, October 26th – November 13th, 2020.