**3GPP TSG RAN WG1 #106-e R1-21xxxxx**

**e-Meeting, May 16 –27, 2021**

**Source: Moderator (Ericsson)**

**Title: Summary of Discussion on R1-2108140:** **[Draft] Correction on synchronization procedure for sidelink transmission**

**Agenda Item: 7.2.4**

**Document for: Discussion and Decision**

# Introduction

This document provides a summary of the discussion on a draft CR [1] regarding corrections on the synchronization procedure for sidelink transmissions and collects the companies’ views on whether the draft CR should be included in the specification.

The discussion for this CR can be found in the following email thread: [106-e-NR-5G\_V2X-07] Discussion on R1-2108140: [Draft] Correction on synchronization procedure for sidelink transmission by August 18 - Jose (Ericsson)

# Summary of the discussion on R1-2108140

The following CR is proposed in [1] to correct the synchronization procedure for sidelink in order to also include the scenario when no serving cell is available. The reason for this change is that without this correction the synchronization procedure will not work when there is no serving cell. The proposed text change is the following:

## 16.1 Synchronization procedures

A UE receives the following SL synchronization signals in order to perform synchronization procedures based on S-SS/PSBCH blocks: SL primary synchronization signals (S-PSS) and SL secondary synchronization signals (S-SSS) [4, TS 38.211].

A UE assumes that reception occasions of a physical sidelink broadcast channel (PSBCH), S-PSS, and S-SSS are in consecutive symbols [4, TS 38.211] and form a S-SS/PSBCH block.

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 *sl-AbsoluteFrequencySSB*. 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 an RB of the SL BWP.

A UE is provided, by *sl-NumSSB-WithinPeriod*, a number $N\_{period}^{S-SSB}$ of S-SS/PSBCH blocks in a period of 16 frames. The UE assumes that a transmission of the S-SS/PSBCH blocks in the period is with a periodicity of 16 frames. The UE determines indexes of slots that include S-SS/PSBCH block as $N\_{offset}^{S-SSB}$+$\left(N\_{interval}^{S-SSB}+1\right)⋅i\_{S-SSB}$, where

- index 0 corresponds to a first slot in a frame with SFN of the serving cell satisfying $(SFN mod 16)=0$ or DFN satisfying (DFN mod 16) = 0

- $i\_{S-SSB}$ is a S-SS/PSBCH block index within the number of S-SS/PSBCH blocks in the period, with $0\leq i\_{S-SSB}\leq N\_{period}^{S-SSB}-1$

- $N\_{offset}^{S-SSB}$ is a slot offset from a start of the period to the first slot including S-SS/PSBCH block, provided by *sl-TimeOffsetSSB*

- $N\_{interval}^{S-SSB}$ is a slot interval between S-SS/PSBCH blocks, provided by *sl-timeInterval*

**<Unchanged parts omitted>**

## 2.1 Company views

**Q1: Do you agree with the issue identified in R1-2108140?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Reply (Yes/No)** | **Comments** |
| OPPO | Yes |  |
| Intel | Yes |  |
| NTT DOCOMO | Yes |  |
| vivo | Yes |  |
| ZTE,Sanechips | Yes |  |
| Qualcomm | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |
| Sharp | Yes |  |
| LG | Yes |  |
| Huawei, HiSilicon | Yes |  |
| CATT, GOHIGH | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |
| NEC | Yes |  |

**Q2: Do you agree to adopt the text proposal from R1-2108140 (also captured in Section 2)?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Reply (Yes/No)** | **Comments** |
| OPPO | Yes in principle | One clarification/comment on “of the serving cell”:SFN can imply that it is the case of “serving cell available”, while DFN implies “serving cell is not available”. Maybe we can just say as follows:\*\*\*\*\*\*\*\*\*\*\*- index 0 corresponds to a first slot in a frame with SFN ~~of the serving cell~~ satisfying $(SFN mod 16)=0$ or DFN satisfying (DFN mod 16) = 0\*\*\*\*\*\*\*\*\*\*\* |
| Intel | Yes |  |
| NTT DOCOMO | Yes |  |
| vivo | Yes | Changes from OPPO are fine. |
| ZTE,Sanechips | Yes with comments | Changes from OPPO are fine. |
| Qualcomm | Yes |  |
| Apple | Yes |  |
| Samsung | Yes |  |
| Sharp | Yes in principle | In our understanding, if UE has a serving cell and is configured to use GNSS as sync source, UE shall derive DFN while UE still knows SFN. It seems in this case with the corrections, whether index=0 corresponds to SFN or DFN is not clear enough. If companies do not think so, we don’t have strong opinion and support the changes from OPPO. |
| LG | Yes | We have similar view with Sharp. When GNSS is synch source, DFN will be used. Meanwhile, as in the spec description for resource pool configuration, we can simply say “(SNF mod 16) of the serving cell or (DFN mod 16)“ as proposed by Ericsson. Following is relevnat description for reousrce pool:- the slot index is relative to slot#0 of the radio frame corresponding to SFN 0 of the serving cell or DFN 0, |
| Huawei, HiSilicon | Yes with modification | The serving cell may not be the synchronization source if GNSS is prioritized. To treat this issue, we suggest to make the following modification as:- index 0 corresponds to a first slot in a frame with SFN of the synchronized serving cell satisfying $(SFN mod 16)=0$; otherwise, ~~or~~ DFN satisfying (DFN mod 16) = 0 |
| CATT, GOHIGH | Yes | We are fine with Huawei’s modification.  |
| Nokia, Nokia Shanghai Bell | Yes |  |
| NEC | Yes | Huawei’s modification seems fine. |

# After 1st round of discussion

Based on the clear majority of the views, the issue for this CR needs to be addressed and the text proposal from R1-2108140 is a way forward to solve the issue. Some companies have indicated that some further modifications are needed. These modifications have been addressed in the following TP.

Therefore, the following is proposed as conclusion for this discussion:

**Moderator’s proposal: Adopt the following TP.**

## 16.1 Synchronization procedures

A UE receives the following SL synchronization signals in order to perform synchronization procedures based on S-SS/PSBCH blocks: SL primary synchronization signals (S-PSS) and SL secondary synchronization signals (S-SSS) [4, TS 38.211].

A UE assumes that reception occasions of a physical sidelink broadcast channel (PSBCH), S-PSS, and S-SSS are in consecutive symbols [4, TS 38.211] and form a S-SS/PSBCH block.

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 *sl-AbsoluteFrequencySSB*. 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 an RB of the SL BWP.

A UE is provided, by *sl-NumSSB-WithinPeriod*, a number $N\_{period}^{S-SSB}$ of S-SS/PSBCH blocks in a period of 16 frames. The UE assumes that a transmission of the S-SS/PSBCH blocks in the period is with a periodicity of 16 frames. The UE determines indexes of slots that include S-SS/PSBCH block as $N\_{offset}^{S-SSB}$+$\left(N\_{interval}^{S-SSB}+1\right)⋅i\_{S-SSB}$, where

- index 0 corresponds to a first slot in a frame with SFN of the serving cell used as synchronization satisfying $(SFN mod 16)=0$; otherwise index 0 corresponds to a first slot in a frame with DFN satisfying (DFN mod 16) = 0

- $i\_{S-SSB}$ is a S-SS/PSBCH block index within the number of S-SS/PSBCH blocks in the period, with $0\leq i\_{S-SSB}\leq N\_{period}^{S-SSB}-1$

- $N\_{offset}^{S-SSB}$ is a slot offset from a start of the period to the first slot including S-SS/PSBCH block, provided by *sl-TimeOffsetSSB*

- $N\_{interval}^{S-SSB}$ is a slot interval between S-SS/PSBCH blocks, provided by *sl-timeInterval*

**<Unchanged parts omitted>**

## 3.1 Company views

**Q1: Do you agree with the moderator’s proposal?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Reply (Yes/No)** | **Comments** |
| LG | No | We are supportive of the original changes proposed by the moderator. In our understanding, who is the synch source is specified in RAN2. As in resource pool configuration, RAN1 spec just need to list up possible references like following:- the slot index is relative to slot#0 of the radio frame corresponding to SFN 0 of the serving cell or DFN 0, |
| Qualcomm |  | We prefer the original wording.Separately, the new text seems to be missing a word:“of the serving cell used as a synchronization source” |
| OPPO |  | We think the target to capture a CR is to make the specification completed and precise.As Sharp/LG/Huawei,HiSi explained, index 0 corresponds to the synch source selected by UE. When GNSS is selected as the sync source, UE can still have SFN information (will not be used as index 0) if UE has a serving cell. Generally we are OK with either our previous suggested wording or new proposed wording by FL.If companies still have concerns on the new proposal, we may just go with the following one, which is our previous wording since it is not only simple but also minimized the change on current spec.\*\*\*\*\*\*\*\*\*\*\*- index 0 corresponds to a first slot in a frame with SFN ~~of the serving cell~~ satisfying $(SFN mod 16)=0$ or DFN satisfying (DFN mod 16) = 0\*\*\*\*\*\*\*\*\*\*\* |
| vivo |  | Smilar view as LG, sync source is specified in 331 only and is transparent to phy spec, we prefer the wording from OPPO |
| Samsung |  | Prefer the original change in section 2. |
| Huawei, HiSilicon | Yes | We support the updated version by the moderator, since it is more clear to address the issue that the serving cell may not be a synchronization source. The further refinement by Qualcomm also fine to us. |
| Sharp |  | We share same view with LG and vivo. |

# References

1. R1-2108140 [Draft] Correction on synchronization procedure for sidelink transmission,” Ericsson, RAN1 #106-e.