**3GPP TSG RAN WG1 Meeting #104-e R1-210xxxx**

**E-meeting, January25 – February 5, 2021**

**Agenda Item: 8.11**

**Source: Moderator (ZTE, Sanechips)**

**Title: Discussion on [104-e-NR-R17-SL-LS-01]**

**Document for: Discussion and Decision**

1. **Introduction**

This contribution provides discussion on reply LS to R1-2100021 within the thread [104-e-NR-R17-SL-LS-01].

1. **Discussions (Phase 1 until 27th Jan)**

RAN2 sent the following LS body:

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| |  | | --- | | Working assumption:  SL DRX should take PSCCH monitoring also for sensing (in addition to data reception) into account if SL DRX is used. |   RAN2 has made the following working assumption on sidelink DRX:  In addition, RAN2 has made the following agreements related to sidelink DRX:   |  | | --- | | Agreements on SL DRX:  1: Sidelink DRX needs to support sidelink communications for both in-coverage and out-of-coverage scenarios.  2: Support SL DRX for all casting types.  3: If a UE is in SL active time, UE should monitor PSCCH. FFS on PSSCH. FFS for sensing impacts.  4: As baseline, for Sidelink DRX for SL unicast, it is proposed to inherit and use timers similar to what are used in Uu DRX. FFS for SL broadcast/groupcast. FFS on detailed timers.  5: Support of long DRX cycle for SL unicast should be assumed as a baseline. FFS on the need of short DRX cycle.  6: Deprioritize SL WUS (Wake-Up Signal) from RAN2 point of view in Rel-17.  7： RAN2 will prioritize normal use case without consideration of relay UE use case in Rel-17.  8： RAN2 is not going to introduce SL paging and SL PO for SL DRX. |   Note: From RAN2 perspective, the partial coverage case has not been precluded by the first agreement in the above box.  To RAN WG1: RAN2 kindly asks RAN1 to provide feedback if there is any concern on the working assumption and take the above information into their future works. |

Therefore, in the following, the interpretation of RAN2’s working assumption, as well as any related details would be discussed in this section.

## Potential interpretation on working assumption

In moderator’s understanding, RAN2’s working assumption can be understood through the following two alternatives:

**Alt1**: When UE is configured with sidelink DRX, UE’s configured sidelink DRX cycle will impact the two mentioned actions, i.e., sidelink data reception and (partial) sensing, i.e. UE should decide whether it can perform (partial) sensing and data reception referring to its configured DRX cycle.

**Alt2**: When whichever entity (network or UE’s upper layer) is performing sidelink DRX configuration, it should take (partial) sensing impact and data reception into account.

Tentative consideration for each understanding alternative:

For Alt1: If the working assumption is understood in alternative 1, that means PSCCH monitoring for (partial) sensing should be limited to the active duration of SL DRX. It will cause impact to RAN1’s (partial) sensing principle, i.e. configured (partial) sensing window will be impacted by sidelink DRX configuration, where the design complexity and spec impact should be considered.

For Alt2: If the working assumption is understood in alternative 2, moderator understands that whichever entity(network or UE’s upper layer) is taking the responsibility of setting up sidelink DRX configuration, it should take (partial) sensing related impact into account by acquiring (partial) sensing related parameters, therefore, it can be assumed that sidelink DRX configuration and (partial) sensing configuration is strived to be aligned by the aforementioned entity. Correspondingly, moderator thinks that PHY layer can follow (partial) sensing mechanism irrespective of sidelink DRX configuration in any case that mis-alignment between sidelink DRX cycle and (partial) sensing window happened, i.e. PSCCH monitoring for (partial) sensing cannot be limited to the active duration of SL DRX.

Q1: Please share your views and whether Alt1 or Alt 2 of the above moderator consideration is agreeable.

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| **Source** | **Alt 1/ Alt 2** | **Comments (if any)** |
| OPPO | Alt1 | For the explanation of the WA from RAN2, we tend to understand it in the way of Alt1. While it does not mean that the sensing is limit within DRX on duration.  The WA just say that the SL DRX should take sensing (in addition to data reception) into account. There is no intension to combine sensing and SL DRX on duration.  SL DRX is designed for data reception. In our view, the DRX pattern of RX UE should be indicated by the TX UE so that it can well align with the traffic pattern of the TX UE. While sensing is the operation for resource selection for data transmission, it depends on the traffic pattern of the RX UE itself. If the sensing is limit within DRX on duration, that will put much limitation to the sensing operation, and will affect the accuracy of sensing operation, and will degrade PRR performance.  Furthermore, if sensing is limit within on duration, that will put limitation for the resource selection range, such as, the UE can only select the resource within on duration so that it can do re-evaluation/pre-emption check(based on sensing) to avoid potential collision . Otherwise, if UE selects resource within OFF duration, it can not do sensing so that it cannot do re-evaluation/pre-emption check. In that case, the traffic pattern of TX UE (which determines the DRX pattern of RX UE), and the traffic pattern of RX UE (which determines the resource selection range), should be well aligned, that is not reasonable |
| Fujitsu | Alt1 with the comments | In general, there are two time windows with different functions. One is defined as DRX On-duration, used for sidelink data reception, and the other is defined as (partial) sensing window, used to deduce the information in terms of periodic/retransmission reservations, resource reselection, and resource preemption, for resource selection. In nature, both should be independently configured/defined. Our interpretation towards Working Assumption is, Tx-UE could monitor PSCCH for sensing (in addition to data reception) in DRX On-duration, and meanwhile, Tx-UE should perform sensing in (partial) sensing window. This is because, performing a sensing in DRX On-duration can acquire more information for resource selection and improve the reliability. |
| Huawei, HiSilicon | Neither | RAN2 has not asked for our feedback on these two potential alternatives – only whether RAN1 has a concern. The agenda item for power saving is where to discuss issues such as this. |
| vivo | Alt1 with the comments | The question from moderator seems to ask which layer (PHY or MAC) makes the first decision (i.e., partial sensing configuration or DRX configuration), and which layer takes the second action to handle the impact.  If DRX is semi-statically (pre-)configured by higher layer, Alt1 seems to be a reasonable interpretation. However, in the current state with all the existing agreement, either way is not precluded from RAN1 perspective. If RAN1 is required to take such decision, further evaluation should be done. |
| Panasonic | Neither | Both alternative interpretations could be possible and not precluded in current stage. RAN1 may need further discuss in the SL RA agenda which alternative to be adopted. |
| CATT, GOHIGH | See comments | We tend to understand the working assumption in alt 1, but our understanding is different from moderator’s consideration. Alt 1 doesn’t mean that the sensing operation should limited into the DRX on duration.  If sensing operation is limited into the DRX on duration, the DRX cycle configuration should be aligned with the minimum configured resource reservation periods for partial sensing. This operation will have a strict restriction on SL DRX configuration and enlarge the DRX activation duration, and the power saving gain should be doubted comparing with partial sensing operation without limitation of SL-DRX. |
| Samsung | Neither | Our understanding is the same as HW and Panasonic. Both alternatives are possible at this stage and we need to discuss about this in this meeting. |
| Xiaomi |  | From our point of view, the major issue between the two alternatives is whether sensing should be limited in the on duration of DRX cycle, i.e. no sensing behaviour is expected out of the DRX on duration. RAN1 can make our own decision on this issue, but further discussion would be necessary. |
| NTT DOCOMO | Neither | Agree with HW/Panasonic/Samsung. Current RAN2 WA/agreements do not preclude any direction including alt 1 and alt 2. |
| Sony | Neither | Agree with HW/Panasonic/Samsung/docomo that both alternatives are possible from the current RAN2 agreements. RAN1 can discuss a relationship between sensing operation and SL-DRX configuration. |
| Ericsson | Neither | RAN2 is only asking to provide a reply in case of any concern regarding the WA. Since RAN1 has not yet decided which alternative to select there is no need to reply with an alternative.  In case a reply is sent to RAN2 indicating no concern on their agreements and WA, we can include a clarification regarding the third bullet in RAN2 agreements: RAN1 would like to inform RAN2 that a first stage Sidelink Control Information is transmitted in PSCCH and a second stage Sidelink Control Information is transmitted in PSSCH. |
| Fraunhofer | Neither | Agree with HW, Panasonic and others. Both alternatives are up for discussion in the RAN1 power saving AI, and agreements toward this topic are yet to be made. |
| FUTUREWEI | Neither | It is premature to reply that RAN1 has a concern. |
| ё | See comments | We suggest discussing details of partial sensing operation first, including UE behavior for semi-persistent and dynamic resource reservations. We have not discussed yet any solutions and have not agreed on any interpretations. In addition, there may be other ways to implement SL DRX from the physical layer perspective. Instead of discussing alternatives, it may be better to discuss L1 impacts on DRX and inform RAN2 as well as provide RAN1 feedback on working assumption made by RAN2. |
| InterDigital | Neither | The two alternatives listed are not clear to us at this point. Seems there are two topics are mixed together. The first topic is whether the sensing configuration will affect DRX configuration or DRX configuration will affect sensing configuration; and the second topic is whether sensing is allowed outside active time or not although these two topics are correlated each other.  We think RAN1 needs more time to digest the RAN2 agreements and investigate the potential options, and pros and cons of each options. |
| Apple | See comments | Our understanding of the two alternatives represents two-way impact. Alternative 1 discusses the impact of SL DRX on SL data reception/sensing, while alternative 2 discusses the impact of SL data reception/sensing on SL DRX configurations.  We think both alternatives are possible at this stage. In alternative 1, SL DRX is configured, then SL sensing and resource selection operations should be adapted. For example, a TX UE does not select a resource which is in RX UE’s DRX off duration. In alternative 2, if partial sensing is configured, then SL DRX should be configured to align with UE’s sensing occasions for power saving purpose. |

## Writing style of the reply LS

As mentioned above, the working assumption in RAN2’s LS can be understood in two different alternatives, thus, in moderator’s understanding, when constructing the reply LS, RAN1 also has three solutions:

**Solution 1**: Explain the two understanding alternatives of RAN2’s working assumption in a detailed way, and ask RAN2 to confirm which alternative is RAN2’s original intention.

**Solution 2**: Explain the two understanding alternatives of RAN2’s working assumption, as well as showing RAN1’s consideration and preference for each of the understanding alternative.

**Solution 3**: If the consequence of Q1 is quite convergent to one understanding alternative, RAN1 can reply the LS based on that understanding alternative directly.

Q2: Please share your views and which solution of the above moderator consideration is agreeable for the way to construct the reply LS.

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| **Source** | **Solution option** | **Comments (if any)** |
| OPPO |  | The WA does not put much limitation to DRX and sensing. RAN1 can discuss the relationship between DRX and sensing firstly. Based on the discussion output, RAN1 can reply to RAN2 about the RAN1’s discussion/agreement. |
| Fujitsu |  | Solution 4: RAN1 understanding towards Working Assumption is as follows. DRX On-duration and (partial)sensing window are (pre)-configured independently. RAN1 will study the Tx-UE behavior, such that Tx-UE should mainly perform sensing in (partial) sensing window, and in addition, Tx-UE could monitor PSCCH for sensing (in addition to data reception) in DRX On-duration, as well. RAN1 will report the relevant RAN1’s agreements to RAN2. |
| Huawei, HiSilicon | None of the above. | Neither of the potential alternatives, nor any of the solutions derived here from it raise a concern with RAN2’s working assumption. That means we can answer that RAN1 has no such concern on the working assumption so far, but based on RAN1’s further discussions additional receptions may be assumed during DRX (e.g. PSFCH, etc).  If companies have the view that some deeper technical discussion is needed under the appropriate WI agenda items, then it may be feasible to take a bit longer to reply (e.g. next meeting), as RAN2 are not on pause waiting for an immediate response. |
| vivo |  | It is beneficial to clarify RAN2’s intention and understanding, but in order to provide RAN1’s consideration or preference, further evaluation is required. Then it seems hard to provide the response in this meeting. |
| Panasonic |  | We have similar view with HW/vivo that to respond it in the next meeting |
| CATT, GOHIGH |  | We also think it is better to discuss the relationship between SL-DRX and sensing operation firstly, and then reply the LS next meeting. |
| Samsung | None of the above | We have similar view with HW/vivo/Panasonic. We do not need to response for RAN2 LS. If RAN1 makes some agreements about sidelink DRX, then we can send LS to RAN2. |
| Xiaomi |  | We prefer to sending reply to RAN2 after RAN1 has further discussion on partial sensing, to understand the potential impact of partial sensing on DRX. |
| NTT DOCOMO |  | Same view as vivo/etc. LS would be unnecessary in this meeting.  Alternatively, we can ask RAN2’s intention with alt 1/2 as just example. |
| Sony |  | We also think that a LS reply is not necessary in this meeting. We can discuss a relationship between sensing operation and SL-DRX configuration in RAN1. |
| Ericsson |  | There is no need to reply in this meeting with a solution. |
| Fraunhofer |  | Since the topic is currently under discussion in RAN1, we can either defer it to either the next meeting, or provide an update based on the agreements made in this meeting via LS to RAN2, as stated by Samsung. |
| FUTUREWEI |  | No reply is needed in this meeting |
| Intel |  | We believe the reply is needed to (at least) provide feedback on working assumption and update RAN2 on the latest status of RAN1 discussion with respect to potential L1 impacts on SL DRX if those are discussed and agreed by RAN1 this meeting. |
| InterDigital | None of the above. | RAN1 needs further discussion on the relationship between SL DRX and resource allocation for power saving before sending LS to RAN2. |
| Apple |  | We think RAN1 could reply this LS in a later meeting, once the relationship between sensing and SL DRX is commonly understood. |

1. **Conclusions (Phase 2 until 1st Feb)**
2. **References**

[R1-2100311](file:///D:\Download\Docs\R1-2100311.zip) Discussion on LS from RAN2 on SL DRX design CATT, GOHIGH

[R1-2100513](file:///D:\Download\Docs\R1-2100513.zip) Draft reply LS on SL DRX design LG Electronics

[R1-2100923](file:///D:\Download\Docs\R1-2100923.zip) [draft]Reply LS to RAN2 on sidelink DRX ZTE, Sanechips

[R1-2101429](file:///D:\Download\Docs\R1-2101429.zip) Reply to RAN2 LS on SL DRX design Qualcomm Incorporated

[R1-2101151](file:///D:\Download\Docs\R1-2101151.zip) Draft relay LS on SL DRX design vivo

[R1-2101705](file:///D:\Download\Docs\R1-2101705.zip) [Draft] LS on SL DRX design Ericsson

[R1-2101736](file:///D:\Download\Docs\R1-2101736.zip) Discussion on RAN2 LS on DRX impact Huawei, HiSilicon