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

**e-Meeting, October 11 –19, 2021**

**Source: Moderator (InterDigital)**

**Title: Moderator summary for [106bis-e-NR-R17-Sidelink-03] Reply LS to R1-2108710**

**Agenda item: 8.11.1**

**Document for:** **Discussion and Decision**

Introduction

This document provides discussion on the following approved email thread as part of RAN1#106bis-e Release 17 SL enhancement WI discussion.

[106bis-e-NR-R17-Sidelink-03] Discuss incoming LS on resource selection for a possible reply LS by October 18 – Moonil (InterDigital)

Collection of outcomes

To be collected once agreement / conclusion is reached.

Discussion on resource selection with DRX

## Round 1

**Background**: According to the received LS in [1], RAN2 made the following agreements in RAN2#115-e.

Agreements:

When data is available for transmission to one or more RX UE in DRX, TX UE selects the resources taking into account the active time (current or future) of the RX UE(s) determined by the timers maintained at the TX UE. Details are FFS. FFS whether RAN1 or RAN2 implement this restriction.

For unicast, the TX UE selects the resources for the initial transmission associated with any active time (e.g. on duration timer or inactivity timer, or retransmission timer) at the RX UE. How to handle cases when a transmission may cause these timers to be running at the RX UE is FFS. FFS on groupcast. FFS on whether any spec impact.

For unicast, the TX UE can select the resources for the retransmission associated with any active time (e.g. on duration timer or inactivity timer, or retransmission timer) at the RX UE. How to handle cases when a transmission may cause these timers to be running at the RX UE is FFS. FFS on groupcast. FFS on whether any spec impact.

For broadcast, the TX UE can select the resources for the initial transmission associated with any active time supported by broadcast (i.e. on duration) at the RX UE.

For broadcast, the TX UE can select the resources for the retransmission associated with any active time supported by broadcast (i.e. on duration) at the RX UE.

RAN2 also asked RAN1 to provide inputs whether/how to reflect the restriction for the resource selection with DRX [1]:

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| **ACTION:** RAN2 respectfully asks RAN1 to take the above agreements into account and inform RAN2 whether/how RAN1 intends to reflect the restriction in the following RAN2 agreement *“When data is available for transmission to one or more RX UE in DRX, TX UE selects the resources taking into account the active time (current or future) of the RX UE(s) determined by the timers maintained at the TX UE. Details are FFS. FFS whether RAN1 or RAN2 implement this restriction*  |

Based on reviewing the submitted contributions [2-15], we observed the following issues for the discussion to reply the LS:

* Issue #1: whether PHY layer to apply the restriction for resource selection with DRX active time of Rx UE?
	+ Alt-1: RAN1 replies that PHY layer should apply the restriction based on DRX active time of Rx UE provided by MAC layer [E///][Vivo][OPPO][Samsung][CATT][QC][IDCC]
		- If restriction is not performed in PHY layer, the reported candidate resource set may not include any resource within DRX active time of the RX UE
	+ Alt-2: RAN1 replies that PHY layer does not apply the restriction for the resource selection based on DRX active time of RX UE [ZTE][HW][LG][Nokia]
		- Not able to finish the work within the remaining time for Rel-17
		- Too much specification work for RAN1
		- The benefit of providing active time information of Rx UE to PHY layer is unclear
	+ Alt-3: RAN1 replies that both L1 and L2 based solutions may not work [Intel]
		- Both RAN1 and RAN2 solutions may not work if SL-DRX active time is not aligned with traffic generation

**Question #1: please provide preferred alternative. If preferred alternative is not listed, please add/describe in the following table:**

* **Alt-1: RAN1 replies that PHY layer should apply the restriction based on DRX active time of Rx UE provided by MAC layer**
* **Alt-2: RAN1 replies that PHY layer does not apply the restriction for the resource selection based on DRX active time of Rx UE**
* **Alt-3: RAN1 replies that both L1 and L2 based solutions may not work from RAN1 perspective**

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| Company | Alt-1/2/3 | Comments |
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* Issue #2: how PHY layer applies the restriction for resource selection with DRX active time of Rx UE (if supported)?
	+ Option 1: PHY layer selects and reports candidate resources only within active time of the RX UE [vivo][Samsung][QC][E///]
	+ Option 2: PHY layer selects and reports candidate resources in which at least a subset of the candidate resources is within active time of the RX UE [OPPO][IDCC]
	+ Option 3: PHY layer selects and reports an additional candidate resource set which includes candidate resources within active time of the RX UE [CATT]

**Question #2: please provide preferred option. If preferred option is not listed, please add/describe in the following table**

* **Option 1: PHY layer selects and reports candidate resources only within active time of the RX UE**
* **Option 2: PHY layer selects and reports candidate resources in which at least a subset of the candidate resources is within active time of the RX UE**
* **Option 3: PHY layer selects and reports an additional candidate resource set which includes candidate resources within active time of the RX UE**

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| Company | Option 1/2/3 | Comments |
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* Issue #3: whether RAN1 provides preference on which DRX active time should be taken into account for the resource selection (e.g., current active time and/or future active time)
	+ ***[LG]: From the point of view of RAN1, it is preferred that the mechanism for TX UE to select the resources taking into account both the current and future active time of RX UE is supported and the relevant procedure is specified in the RAN2 specification.***

**Question #3: should RAN1 provide preference on which active time has to be taken into account for the resource selection (e.g., current active time vs. current and future active time)?**

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| Company | Yes/No | Comments |
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## Round 2

[TBD]

LS reply to R2-2108997 (R1-2108710) based on outcome of Section 3

Summary of contributions

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| Company | Observations and Proposals |
| Nokia [2] | **Observation 1: It is possible to apply Rx UE active time information into the L1 resource selection procedure.****Observation 2: Tx UE will depend on higher layers to provide the information about Rx UE active time.****Proposal 1: Further study the benefit of introducing new information about Rx UE active time into the L1 resource selection procedure.** |
| ZTE, Sanechips [3] | ***Proposal 1: The restriction on resource selection with DRX should be done by RAN2 instead of RAN1.*** |
| LG [4] | ***Observation 1: When discussing the answer to RAN2’s question, RAN1 should consider the following two cases, and if RAN1 can tell RAN2 which one is preferred, it would be helpful for RAN2 to proceed with the related work.**** ***Case 1: TX UE selects the resources taking into account only the current active time of RX UE***
* ***Case 2: TX UE selects the resources taking into account both the current and future active time of RX UE***

***Observation 2: If the resource selection of TX UE is performed considering both the current and future active time of RX UE, it would be beneficial in terms of satisfying the service-related QoS requirement (e.g., by reducing the probability of occurrence of packet drop/decoding failure).******Observation 3: The following can be considered as options for specifying RAN2 agreement-related restriction:**** ***Option 1: Specify the mechanism to support RAN2 agreement-related restriction in both the RAN1 and RAN2 specifications***
* ***Option 2: Specify the restriction related to RAN2 agreement in the RAN2 specification, i.e., from the point of view of PHY layer, the procedure of TX UE for the packet transmission to RX UE that does not perform the SL DRC operation is reused***

***Observation 4: In case when Case 2 is supported with Option 1, it is expected that the considerable time will be spent discussing the issues that should be addressed/resolved, which is not desirable given the limited time remaining until the end of Rel-17 item.******Proposal 1: The following is adopted as RAN1’s feedback to RAN2’s question in LS [1]:**** ***From the point of view of RAN1, it is preferred that the mechanism for TX UE to select the resources taking into account both the current and future active time of RX UE is supported and the relevant procedure is specified in the RAN2 specification.***
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| HW [5] | ***Observation 1: If RAN1 took the restriction from RAN2 for further design, quite a lot standard efforts would be needed on resource selection window determination, Y candidate slots selection, and candidate resource set determination, etc.******Observation 2: Since the SL DRX active time of RX UE is dynamically changing, PHY layer is difficult to adjust selection window and determine candidate resources precisely based on SL DRX active time of RX UE.*** ***Observation 3: It is more appropriate to reflect the restriction in MAC layer since both the trigger moment for resource selection in PHY layer and SL DRX active time of RX UE are known in MAC layer.******Proposal: Reply to RAN2 as follows:**** ***RAN1 considers that there are a lot of standard efforts and difficulties to reflect the restriction from RAN2 in RAN1 specifications. Considering the limited time budget in RAN1, RAN1 will not take the restriction into account for PHY layer design in Rel-17.***
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| Vivo [7] | it is RAN1’s understanding that MAC would provide the active time of the RX UE to PHY when it triggers resource selection procedure, so that PHY can select and report suitable candidate resources (i.e., within the active time of the RX UE) to MAC. |
| OPPO [8] | **Observation: If DRX restriction for resource selection is not considered at RAN1, it is possible that the reported candidate resource set does not included any resource located within RX UE’s DRX active duration so that higher layer cannot select resource within it.** **Proposal: DRX restriction for resource selection should be implemented at both RAN1 and RAN2.**  |
| CATT [10] | ***Observation 1: If the resource selection window of the TX UE does not include any candidate resource corresponding to the DRX active time of the RX UE(s), transmission reliability cannot be guaranteed.******Proposal 1:*** ***RAN1 can be responsible for implementing the restriction that TX UE selects the resources taking into account the active time (current or future) of the RX UE(s) by adjusting the resource selection window to at least partially overlap with the DRX active time of the Rx UE(s).******Proposal 2: Reply LS to RAN2.**** ***From RAN1’s perspective, RAN1 can be responsible for implementing the restriction that TX UE selects the resources taking into account the active time (current or future) of the RX UE(s)by adjusting the resource selection window to at least partially overlap with the DRX active time of the Rx UE(s).***
* ***Additionally, down-selection can be done between the following two resource selection methods:***
	+ ***RAN1 is responsible for determining the candidate resources corresponding to the DRX active time of the RX UE(s) by reporting an additional candidate resource set.***
	+ ***RAN2 is responsible for determining the candidate resources corresponding to the DRX active time of the RX UE(s) based on the information reported by PHY.***
* ***RAN1 respectfully asks RAN2 to take the above information into account***
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| Samsung [11] | **RAN1 reply on LS:** In order to avoid frequent resource (re-)selection at higher layer based on above RAN2 agreements, RAN1 can implement that the resource selection window of TX UE can be confined within slots corresponding current or future DRX active time of communicating RX UE(s) and specify UE behavior in PHY spec. |
| Qualcomm [13] | RAN1 discussed how the resource selection at the PHY layer should be performed by a Tx UE considering the DRX configuration of the RX UE; RAN1 concluded that the upper layer shall determine the set of slots coinciding with the DRX active time of the RX UE and inform the PHY layer about a set of allowed resources for selection. Consequently, the PHY layer only selects the resources from the intersection of the set of allowed resources indicated by the upper layer and its selection window. The resource selection restriction can be implemented by RAN1, while the signaling mechanism across the layers can be captured in the RAN2 specification.  |
| InterDigital [14] | *Observation 1: If the resource (re)selection window [n+T1, n+T2] extends beyond the active time of the Rx UE(s), providing the set of available resources only within the current active time (i.e., DRX ON duration) of the Rx UE(s) is not desirable since retransmission(s) are allowed outside of the current active time due to RAN2 DRX timers.**Observation 2: PHY layer needs to know the current active time of the Rx UE(s) in DRX to determine the set of available resources (i.e., Set A) to report to MAC layer.**Proposal 1: PHY layer provides a set of available resources (Set A) including at least a minimum number of resources within the current active time (e.g., DRX ON duration) of the Rx UE(s).**Proposal 2: Adopt the following answer to reply LS to RAN2:** *RAN1 consider that both PHY layer and MAC layer can apply the restriction as the following:*
	+ *PHY layer:*
		- *PHY layer provides a set of available resources (Set A) including at least a minimum number of resources within the current active time of the Rx UE(s).*
		- *PHY layer expects to receive the information related to the current active time of the Rx UE(s) from MAC layer to perform this restriction.*
	+ *MAC layer:*
		- *MAC layer selects the resources for at least initial transmission from the resources provided by PHY layer within the current active time.*
		- *MAC layer decides how many retransmission(s) can be made within the current active time of the RX UE(s).*
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References

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2. [R1-2108817](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2108817.zip) Discussion on RAN2 LS on RAN2 Agreements Related to Resource Selection Nokia, Nokia Shanghai Bell
3. [R1-2109735](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2109735.zip) Discussion on RAN2 LS on resource selection within DRX ZTE, Sanechips
4. [R1-2109859](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2109859.zip) Discussion on LS to RAN1 on RAN2 Agreements Related to Resource Selection LG Electronics
5. [R1-2110335](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2110335.zip) [Draft] Reply LS on RAN2 Agreements Related to Resource Selection Ericsson
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8. [R1-2109062](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2109062.zip) Discussion on the relationship between SL DRX and resource selection OPPO
9. [R1-2109063](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2109063.zip) Draft reply LS on LS about SL resource selection OPPO
10. [R1-2109181](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2109181.zip) Discussion on LS on RAN2 Agreements Related to Resource Selection CATT, GOHIGH
11. [R1-2109461](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2109461.zip) Draft Reply LS on RAN2 Agreements Related to Resource Selection Samsung
12. [R1-2109589](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2109589.zip) Response to RAN2 LS Related to Resource Selection Intel Corporation
13. [R1-2110156](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2110156.zip) Draft reply to RAN2 LS to RAN1 on RAN2 Agreements Related to Resource Selection Qualcomm Incorporated
14. [R1-2109882](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2109882.zip) Discussion on RAN2 LS on RA for transmission to Rx UEs in DRX InterDigital, Inc.
15. [R1-2110338](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_106b-e/Docs/R1-2110338.zip) DRX impacts on resource selection procedures Ericsson