**3GPP TSG-RAN WG2 Meeting #116bis electronic R2-22xxxxx**

**Online, 17 – 25 January 2022**

**Source: vivo**

**Title:** **Summary of [POST116bis-e][706][V2X/SL] Open issues on power-saving resource allocation, Phase 1**

**Agenda Item:** **8.15.3**

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

# Introduction

This contribution summarizes the Phase-1 discussion on open issue list review of the following email discussion:

* [POST116bis-e][706][V2X/SL] Open issues on power-saving resource allocation (vivo)

**Scope:** 1st phase: Make an open issue lists with the proposed candidate options or rapporteur suggestion. Open issue lists can include pre-identified issues (e.g. FFS, not decided or skipped from previous offline/email discussion) and new issues raised in company contributions at RAN2#116bis. For new issues that have not discussed before, rapporteur can collect companies’ inputs (e.g. whether it is essential issue that need to be considered and closed in Rel-17) and based on that, determine whether to be included in the open issue list or not.

2nd phase: email discussion on the identified open issues with collecting companies’ inputs on the candidate options or rapporteur’s suggestion.

**Intended outcome:** Open issue list with the proposed candidate options or rapporteur’s suggestion from 1st phase (in R2-2201806). Discussion summary for the identified open issues from 2nd phase.

**Deadline:** 1st phase (1/21 – 1/28 UTC), 2nd phase (2/9 – 2/14 UTC)

The discussion is focusing on the Phase-1 open issue list review according to the principle set by the Chairman’s in [1]. Since there has already been related initial discussions in [AT116b-e][704][V2X/SL] [2], the following discussions take the related conclusions, i.e. list of identified issues by Proposal 1 in [2], as the baseline.

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# Review on open issue list for power-saving resource allocation

The Proposal 1 in [2] sets the scope of the RAN2 specific issues that need to be discussed for WI completion. In this section, the open issues for power-saving resource allocation are further specified at a more detailed level based on the scope set by [2]. Companies are invited to provide views on whether each issue is essential to be concluded in RAN2 #117-e and the suggested way of treatment/handling for each of them (i.e. Company input into Pre117-e-offline, Company tdocs invited, CR rapporteur handled issue, Other [1]).

## 2.1 Need of upper layer configuration for power saving resource allocation (Item “H” in P1 [2])

### [Issue 1] Should the resource allocation scheme(s) applicable in UE’s AS depend on the type of NR SL transmission configured by the upper layers? If yes, how such configuration should be reflected in the AS Spec (e.g. P2X vs. non-P2X as in LTE)?

**[Rapp’s remarks]** As explained in detail in [3], related procedures of LTE V2X SL transmission depend on “*if the UE is configured with P2X related or non-P2X related V2X sidelink communication*”, including resource pool configuration, resource pool selection and resource allocation scheme selection procedures (referencing 5.10.13.1, 5.10.13.1a and 5.10.13.2 in TS 36.331). If this LTE principle is followed, the specific type of NR SL communication configured by the upper layers, i.e. NR SL communication using power-saving resource allocation or not (or the said “power saved SL” in [4]), may be needed to control the resource allocation methods able to be used in AS. An alternative way may be no longer inheriting such upper layer configuration from LTE V2X SL, but depending on completely UE capability to decide the applicable resource allocation scheme(s) in UE’s AS. Basically, the issue is to check whether NR SL resource allocation scheme(s) are still subject to upper layer control (based on e.g. service type, authorization, etc.) as in LTE, or are now alternatively fully up to the AS itself to decide.

But regardless of whether way to go and in which Spec related procedures are captured, this issue needs to be concluded; otherwise RRC or MAC rapporteur cannot decide whether to specify the corresponding procedures based on upper layer configuration or directly based on UE AS capability.

**[Suggested WF] Issue 1 is an essential open issue that needs to be closed in RAN2 #117-e. Suggest to handle this issue based on “Company input into Pre117-e-offline”.**

**Companies’ views are invited on the suggested WF above for the handling of [Issue 1].**

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| **Company** | **Agree with the suggested WF? (Y/N)** | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **OPPO** | **Y** |  |
| vivo | Y |  |
| Huawei, HiSilicon | Y |  |
| Ericsson | Y |  |
| Intel | Y |  |
| Sharp | Y |  |
| InterDigital | Y |  |

**Companies are invited to provide initial inputs on the candidate options for [Issue 1] (if any).**

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| **Company** | **Candidate options (if any)** | **Justification on the options provided (if any)** |
| vivo | Option 1: Yes. A UE can be configured to perform NR SL transmission using power-saving resource allocation or NR SL transmission using non-power-saving resource allocation.  Option 2: Yes. A UE can be configured to perform P2X related NR SL transmission or non-P2X related NR SL transmission (as in LTE).  Option 3: No. A UE decides which resource allocation scheme can be used in the AS completely based on UE capability. | Option 1 is based on the consideration that NR SL communication is not limit to the support of V2X services, so looks more comprehensive than Option 2.  Option 3 is another way out, if companies in NR decide to no more rely on upper layer control of the applicable resource allocation schemes. |
| OPPO | **No need for the upper layer configuration** on resource allocation, besides UE capability and resource pool configuration, leave it to UE implementation to select the resource allocation scheme. | Although we see issue 1 as an attempt to copy LTE, we are a bit reluctant since  1) **additional SA/CT work** cannot be avoided;  2) according to our RAN1 colleagues, even **a VUE has power saving needs**, i.e., when the battery is low, which cannot be reflected by service type.  Therefore, considering the **difference between LTE and NR**, in order to **accomplish the WI in time**, besides the resource pool configuration and UE capability agreed by RAN1, we prefer to leave it to UE implementation to decide the resource allocation schemes. |
| Ericsson | **Agree with OPPO** | Agree with justification raised by OPPO. Also, RAN2 has limited TU for this objective in the WID, therefore, RAN2 shall not introduce minimize standardization efforts for this objective in order to complete the WI on time. |
| Intel | **Ok with OPPO’s suggestion** | We also think that considering the limited time, we can agree to not introduce additional specification work for handling this and rely on UE implementation for this |
| Sharp | The AS layer of the UE can determine which resource allocation scheme to use, without the need to depend on upper layer configurations. | Any Rel-17 UE should be able to reap the benefit of power-saving resource allocation schemes specified in Rel-17. The UE capable of multiple resource allocation schemes should be allowed to switch between power saving resource allocation and non-power-saving resource allocation. |
| InterDigital | **Leave to UE implementation** | We also agree with the others that we can leave this to UE implementation given the limited time. |

## 2.2 Report of the type of NR SL transmission for RRC\_CONNECTED UE (Item “D” in P1 [2])

### [Issue 2]: Is there a case that an RRC\_CONNECTED UE needs to report the actual type of NR SL transmission it is configured to perform to the gNB (e.g. due to authorization allowing both power-saving and non-power saving resource allocation schemes)?

**[Rapp’s remarks]** As explained in detail in [3], this issue exists in LTE V2X SL communication when a UE is authorized as both a P-UE and a V-UE. Though such authorization information also exists in NR PC5 SA2 Spec TS 23.287, it is not clear whether it is of a similar use for NR SL communication as in LTE V2X SL. If a similar case holds in NR SL as well, an RRC\_CONNECTED UE may need to report the type of NR SL communication it is really configured to perform to the gNB, in order for the gNB to judge whether to provide resource configurations for power-saving resource allocation or those for non-power-saving resource allocation. In LTE V2X SL, this purpose (related to authorization) was supported by the parameter *p2x-CommTxType* in SUI.

Note that this issue has also dependency on the conclusion of Issue 1: if in NR we alternatively depend on UE capability only to decide the applicable resource allocation scheme in the AS (i.e. out of control from upper layer authorization/configuration), the gNB can simply provide the resource configurations based on UE capability signalling on resource allocation schemes supported. With above situations, it is worth checking companies’ views on which way to go, and make a corresponding agreement to be reflected in the Spec.

**[Suggested WF] Issue 2 is an essential open issue that needs to be closed in RAN2 #117-e. Suggest to handle this issue based on “Company input into Pre117-e-offline”.**

**Companies’ views are invited on the above suggested WF for the handling of [Issue 2].**

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| **Company** | **Agree with the suggested WF? (Y/N)** | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **OPPO** | **N to authorization part, Y to the report** | **Firstly, we do not think the authorization is needed, which does not exist in LTE and everything works well, so it does not seem a critical issue on the table;**  **Secondly, we understand the source of the report considering LTE solution, although we are not in favour of upper layer configuration as commented in Issue 1;** |
| vivo | Y | This issue can be discussed together with Issue 1. Also, as commented by OPPO above, OK to remove the part “(e.g. due to authorization allowing both power-saving and non-power saving resource allocation schemes)” from the question and keep the reporting part only, to avoid any ambiguity. |
| Huawei, HiSilicon | Y | From gNB’s perspective, whether to provide resource configurations for power saving or those for non-power saving should depends on the reported UE capability, no need to report the actual type of NR SL transmission. Note in LTE we also did not adopt this kind of mechanism.  *11. There is no need for including resource selection method in P-UE SidelinkUEinformaiton message to eNB, because P-UE has already indicated this in UE Capability* |
| Ericsson | Y | Agree with HW, there is no need to introduce additional report mechanism. It is sufficient for gNB to rely on UE capability. |
| Intel | Y |  |
| InterDigital | Y | Agree with Huawei, there is no need to introduce a reporting mechanism. |

**Companies are invited to provide initial inputs on candidate options for [Issue 2] (if any).**

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| **Company** | **Candidate options (if any)** | **Justification on the options provided (if any)** |
| vivo | Option 1: Yes, it reports whether it is configured to perform NR SL communication using power-saving or NR SL communication using non-power-saving resource allocation.  Option 2: Yes, it reports whether it is configured to perform P2X or non-P2X NR SL communication (as in LTE).  Option 3: No, RAN decides what resource allocation scheme to use based on UE capability only. | Options here need respectively correspond to the options for Issue 1. |
| OPPO | No need for UE report on SL communication type, NW can know based on UE capability. | we see this report is not needed **only if there is a UE type that is capable of both full-sensing and partial/random selection**, and in that case, **network implementation can work well** (by configuring resource pool(s) supporting all/any of the scheme(s) that UE is capable of) since NW already knows the UE capability.  [Rapp] As commented above, if no upper layer control/configuration is needed, RAN can decide resource pool configurations, along with the allowed resource allocation schemes, completely based on UE capability. |
| **Ericsson** | Based on UE capability only | RAN2 has limited TU for this objective in the WID, therefore, RAN2 shall not introduce minimize standardization efforts for this objective in order to complete the WI on time. |
| **InterDigital** | Based on UE capability only |  |

## 2.3 Resource pool configuration for power-saving resource allocation (Item “A” in P1 [2])

This issue was raided by several contributions, e.g. [3], [[4](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201591.docx)], [[5](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200317_Resource%20Allocation%20Enhancements.docx)], [[6](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200375-%20Discussion%20on%20resource%20allocation%20enhancement.docx)], [[7](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200379%20RAN2%20aspects%20on%20resource%20allocation%20enhancements%20for%20Rel-17%20eSL.docx)], [[8](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201457_RA-PowerReduction.docx)], [9]. There are three sub-level issues that need to be checked among companies: resource pool configuration IE, per-pool allowed resource allocation scheme configuration and CBPS vs. PBS configuration. Related issues are provided for companies’ review as follows.

### [Issue 3a] Is a separate pool configuration IE needed specifically for the power-saving resource allocation than the existing Rel-16 resource pool configuration IE?

### [Issue 3b] How should the per-pool allowed resource allocation scheme(s) be configured (which is related to the implementation of L1 RRC parameter *allowedResourceSelectionConfig*)?

**[Rapp’s remarks]** Issues 3a was mentioned by [[3](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200379%20RAN2%20aspects%20on%20resource%20allocation%20enhancements%20for%20Rel-17%20eSL.docx)], [[6](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200375-%20Discussion%20on%20resource%20allocation%20enhancement.docx)] and [[7](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201457_RA-PowerReduction.docx)]. Issue 3b was mentioned by [5], [[8](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200317_Resource%20Allocation%20Enhancements.docx)] and [9]. They are, however, having some coupling with each other. On the one hand, the field description of parameter *allowedResourceSelectionConfig* in RAN1 RRC parameter list [10] is “Indicates the allowed resource selection mechanism(s), i.e. full sensing only, partial sensing only, random resource selection only, or *any combination(s) thereof*”. If this “*… any combination(s) thereof*” is strictly followed in any case, there cannot be a separate power-saving specific resource pool configuration, as these pools do not allow full sensing to be configured. On the other hand, paper in [[6](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200375-%20Discussion%20on%20resource%20allocation%20enhancement.docx)] raised a valid point to avoid interference caused by Rel-16 full-sensing UEs to Rel-17 power-saving UEs in the legacy pool configurations. At least from signalling design point of view, RAN2 needs to have a conclusion on how such configuration aspect should be; otherwise, how to capture such per-pool configuration on allowed resource allocation schemes would be unclear.

**[Suggested WF] Issue 3a and Issue 3b are essential open issues that need to be closed in RAN2 #117-e. Suggest to handle them based on “Company input into Pre117-e-offline”.**

**Companies’ views are invited on the above suggested WF for the handling of [Issue 3a] and [Issue 3b].**

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| **Company** | **Agree with the suggested WF? (Y/N)** | | **Comments if any** |
| **For issue 3a** | **For issue 3b** |
| **OPPO** | **Y** | **N** | **Our understanding is these 2 issues are already concluded by RAN1.**  **For issue 3a, we understand there could be different view, so OK to discuss it. Our understdning is according to RAN1 agreement/RRC parameter (allowedResourceSelectionConfig), the resource pool can be configured to support full sensing only; partial sensing only; random resource selection only; any combination(s) thereof. Which means a separate pool configuration IE is needed since the full sensing cannot be disabled in legacy(R16) resource pool, i.e., the partial sensing only, partial sensing+random selection pool cannot be supported W/O R17 specific resource pool;**  **For issue 3b, we think this is concluded by RAN1, and it is straightforward to implement the RRC parameter list as concluded by R1, so not sure what is to be discussed.**  **Therefore, we think we can follow RAN1 agreements directly.**  [Rapp] Just to understand: are the above comments meaning that in case a separate Rel-17 pool configuration IE is introduced, the *allowedResourceSelectionConfig* can only be included in the Rel-17 pools (i.e. no impact on the existing Rel-16 pool configuration)?  **[OPPO] The *allowedResourceSelectionConfig* can also be included in the Rel-16 pools, but Rel-16 pools can only be (pre-)configured to enable full sensing only, or in combination with partial sensing and/or random resource selection. And Rel-16 UE will ignore this *allowedResourceSelectionConfig*, so no impact to legacy UE.** |
| vivo | Y | No strong view with a comment | For Issue 3b, if a separate pool configuration IE is agreed, perhaps better to check whether *allowedResourceSelectionConfig* can only impact Rel-17 pools w/o any impact on Rel-16 legacy pools. But perhaps this question can be checked together with Issue 3a. |
| Huawei, HiSilicon | See comments | See comments | We think both 3a and 3b relates how to implement the RRC parameter *allowedResourceSelectionConfig* and how to ensure there is no backward compatibility issue for Rel-16 pool selection. These two issues can be discussed together and we think can be handled as “CR rapporteur handled issue” during running CR discussion.  For issue 3a, generally we tend to agree with OPPO that separate resource pool for Rel-17 is needed, as it is not feasible for a Rel-16 resource pool to support partial sensing only/random selection only/partial sensing +random selection.  However regarding whether to issue 3b, we think there are three options as listed below:  Option 1: the *allowedResourceSelectionConfig* can only be included in the Rel-17 pools. Values configured to Rel-17 pools can be set to full sensing only, partial sensing only, random selection only or any combinations. For this option, Rel-17 pool supporting full sensing cannot be configured to Rel-16 UEs since this new indication is not visible to legacy UEs, which of course decreases the resource utilization.  Option 2: the *allowedResourceSelectionConfig* can be included in both the Rel-16 pools and the Rel-17 pools. Values configured to Rel-17 pools can only be set to partial sensing only, random selection only or partial sensing + random selection. For this option, only Rel-16 pools support full sensing, so Rel-17 UEs is allowed to select Rel-16 pool for full sensing and Rel-16/Rel-17 pool for partial sensing and/or random selection. No impact for legacy UE on Rel-16 pool selection.  Option 3: the *allowedResourceSelectionConfig* can be included in both the Rel-16 pools and the Rel-17 pools. Values configured to Rel-17 pools can be set to full sensing only, partial sensing only, random selection only or any combinations. For this option, similar as option 1, Rel-17 pool supporting full sensing cannot be configured to Rel-16 UEs, but maybe not as serious as option 1.  [Rapp] Thanks to Huawei, HiSilicon for the very detailed analyses and the comprehensive options provided. From Rapp point of view, this issue could be to align companies’ understanding on a feature agreed by RAN1, although the final impact will be embodied via signalling. Perhaps it’s better to get alignment among companies first before directly going into the signalling details. But let’s see companies’ views on this point. |
| Ericsson |  |  | We agree with OPPO and Huawei, a separate configuration IE for R17 is needed. for both issues, it may be sufficient to leave to “CR rapporteur handled issue” during running CR discussion. |
| Intel | Y | See comment | As mentioned by OPPO, for 3a), a separate pool config IE may be needed. For 3b, we do not have a strong view and think we can discuss different options as proposed by Huawei |
| InterDigital | Y |  | We think CR rapporteur can handle this issue. |

**Companies are invited to provide initial inputs on candidate options for [Issue 3a] and [Issue 3b] (if any).**

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| **Company** | **Candidate options for Issue 3a (if any)** | **Candidate options for Issue 3b (if any)** | **Justification on the options provided (if any)** |
| vivo | Option 1: Yes, a separate pool configuration IE which is only visible to Rel-17 UEs is introduced for power saving resource allocation.  Option 2: No, reuse existing Rel-16 pool configuration IE. | Option 1: In the separate pool configuration specific for power saving resource allocation, “partial sensing only”, “random selection only” or “both” can be configured (as in LTE P2X).  Option 2: In a pool, any combination among “partial sensing allowed”, “random sensing allowed” and full “sensing allowed” can be configured (totally 7 possible combinations). | Options for Issue 3b need respectively correspond to the options for Issue 3a. |
| OPPO | As replied in the above question, we think the separate resource pool is already a RAN1 conclusion. | As replied in the above question, we think it is already a RAN1 conclusion, there is no need to deviate from R1 RRC parameter list due to the discussion for 3a. |  |
| Huawei, HiSilicon | We also think separate Rel-17 pool is needed. | Option 1: the *allowedResourceSelectionConfig* can only be included in the Rel-17 pools.  Option 2: the *allowedResourceSelectionConfig* can be included in both the Rel-16 pools and the Rel-17 pools. Values configured to Rel-17 pools can only be set to partial sensing only, random selection only or partial sensing + random selection.  Option 3: the *allowedResourceSelectionConfig* can be included in both the Rel-16 pools and the Rel-17 pools. Values configured to Rel-17 pools can be set to full sensing only, partial sensing only, random selection only or any combinations. | For option 1: Rel-17 pool supporting full sensing cannot be configured to Rel-16 UEs since this new indication is not visible to legacy UEs, which of course decreases the resource utilization.  For option 2, only Rel-16 pools support full sensing, so Rel-17 UEs is allowed to select Rel-16 pool for full sensing and Rel-16/Rel-17 pool for partial sensing and/or random selection. No impact for legacy UE on Rel-16 pool selection.  For option 3, similar as option 1, Rel-17 pool supporting full sensing cannot be configured to Rel-16 UEs, but maybe not as serious as option 1. |
| Ericsson | Separate R17 pool configuration is needed. | Prefer Option 3 in Huawei proposed options |  |
| Intel | Need separate pool configuration IE | Option 3 as proposed by Huawei seems the most preferable to use |  |
| Sharp | We believe there is a misunderstanding here: RAN1 definitely did NOT conclude on whether “a separate pool configuration IE” is needed or not (it is a RAN2 issue and RAN1 never discussed it).  It is true, though, that according to RAN1 agreements, a pool can be configured to only allow e.g. partial sensing, in which case the pool should never be added to the list of TX pools for a Rel-16 UE.  We don’t actually have a strong view on whether to have “a separate pool configuration IE”, but our understanding is that technically RAN1’s agreements can be fully implemented even without such a new IE, for example, with vivo’s Option 2, where the legacy field *sl-TxPoolSelectedNormal* is used for both Rel-16 and Rel-17 UEs, and a new field (with a list of pools not configured with “full sensing only”) is added only for Rel-17 UEs. | Fine to proceed with discussions on options proposed by vivo and Huawei. |  |
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### [Issue 3c] For a resource pool enabled with “partial sensing”, is it needed to further configure whether it is the CPS or PBPS or both that is enabled?

**[Rapp’s remarks]** This issue was raised by [[4](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201591.docx)]. RAN2 needs to reach common understanding based on RAN1’s progress, in order to decide whether any further signalling is needed.

**[Suggested WF] Issue 3c is an essential open issue that needs to be closed in RAN2 #117-e. Suggest to handle this issue based on “Company input into Pre117-e-offline”.**

**Companies’ views are invited on the above suggested WF for the handling of [Issue 3c].**

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| **Company** | **Agree with the suggested WF? (Y/N)** | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **OPPO** | **N** | **Although we understand there might be a proposal behind 3c, we do not see it is a critical issue considering it goes against R1 conclusion, so should not be on the table for discussion here.**  **RAN1 has made clear conclusion on the condition of performing PBPS and CPS, we don’t think there is a need to introduce additional L2 condition/indication for differentiation of CPS and PBPS.** |
| vivo | No strong view. | In the description of *allowedResourceSelectionConfig*, RAN1 only mentions “partial sensing” w/o further distinction on CPS vs. PBPS, and as OPPO mentioned above, selection between PBPS and CPS are based on conditions specified by RAN1, rather than a configuration. |
| Huawei, HiSilicon | See comments | If the question is to discuss the RRC configuration indication to enable CPS or PBPS, we think this is already RAN1 agreement and can be handled as “CR rapporteur handled issue” during running CR discussion based on the RAN1 parameter list.  If the question is to discuss the condition to enable CPS or PBPS or both, we think this is totally up to RAN1 and RAN1 has already have conclusion on the condition to enable CPS only or PBPS only, but no conclusion on the condition to enable both. Anyway this is RAN1 issue, should not be discussed by RAN2. |
| Ericsson | No | Agree with OPPO, VIVO and Huawei, this issue is in RAN1 domain, no need to be discussed in RAN2. |
| Intel | No | Same comment as Ericsson |
| Sharp | No |  |
| InterDigital | No | Same view as OPPO, Vivo, Huawei…. |

**Companies are invited to provide initial inputs on candidate options for [Issue 3c] (if any).**

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| **Company** | **Candidate options (if any)** | **Justification on the options provided (if any)** |
| vivo | Option 1: Yes, new signalling is needed to differentiate CPS and PBPS in a per-pool manner.  Option 2: No, RAN1 has not introduced a configuration parameter to make such differentiation in a pool. |  |
| OPPO | No need for differentiate CPS and PBPS in (resource pool) configuration, stick to R1 RRC parameter list. |  |
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## 2.4 Resource pool selection and resource allocation scheme selection (Item “B” in P1 [2])

The issues on pool selection and resource application scheme selection were discussed in [[3](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200379%20RAN2%20aspects%20on%20resource%20allocation%20enhancements%20for%20Rel-17%20eSL.docx)], [[4](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201591.docx)], [[5](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200317_Resource%20Allocation%20Enhancements.docx)], [[6](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200375-%20Discussion%20on%20resource%20allocation%20enhancement.docx)] and [9]. RAN1 has no conclusion on these aspects, and thus RAN2 needs to conclude these issues. Actually, in LTE V2X SL and NR SL, pool selection and resource allocation scheme selection were all concluded by RAN2, and reflected in RAN2 Specs.

### [Issue 4a] Is it agreeable that as in LTE, it is up to UE implementation to select a TX resource pool by taking into account the pool-specific resource allocation scheme(s) configured?

### [Issue 4b] Is it agreeable that as in LTE, it is up to UE implementation to select the resource allocation scheme finally used in the selected resource pool (if the selected pool allows multiple resource allocation schemes the UE is configured/capable to perform)?

**[Rapp’s remarks]** The two issues are coupled, as when the UE is configured with multiple mode-2 transmission pools, the UE needs to first select a resource pool, and in the selected pool, further selects the resource allocation scheme to be eventually used, if the selected pool allows more than one resource allocation schemes. Considering the limited time left, the issues are formulated to directly check companies’ views on whether the implemented-specific method as in LTE V2X SL can be reused. No matter whether finally the implementation-specific way is concluded or not, there needs to be related agreements on these issues, so as for the running CR rapporteurs (RRC or MAC) to reflect them in the corresponding Spec in a proper way. Note that the “configured/capable to perform” in above Issue 4b depends on the outcome of Issue 1 regarding whether an upper layer configuration is needed.

**[Suggested WF] Issue 4a and Issue 4b are essential open issues that need to be closed in RAN2 #117-e. Suggest to handle them based on “Company input into Pre117-e-offline”.**

**Companies’ views are invited on the suggested WF for the handling of [Issue 4a] and [Issue 4b].**

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| **Company** | **Agree with the Suggested WF (Y/N)** | | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **For issue 4a** | **For issue 4b** |
| **OPPO** | **N** | **Y** | **We understand in LTE, the resource allocation scheme is not an input to pool selection, while only zone and sync source is the input for pool selection. So do not see 4a as an critical issue to solve at the current stage.** |
| vivo | No strong view. | Y | As OPPO mentioned, the pool-specific allowed resource allocation scheme is not a specified factor for pool selection in LTE. It is OK to not discuss Issue 4a, with the assumption that no technical problem exists even w/o any change to the legacy Rel-16 pool selection procedure. |
| Huawei, HiSilicon | Y | Y | We think it makes sense to discuss if the resource allocation scheme is taking as a factor or not when UE performs resource pool selection. If a UE would like to save power, then it should select a resource pool supporting power-saving resource allocation scheme. But anyway this can be up to UE implementation. |
| Ericsson | N | N | It is sufficient to fully up to UE implementation on how to select pools considering resource allocation scheme. Therefore, neither of both issues is critical. |
| Intel | Y | Y | Even if it is to be left to UE implementation, we think it would be good to address and resolve this aspect explicitly |
| Sharp | Y | Y | Determination of which resource allocation scheme to use can be up to UE implementation, i.e. we don’t need to specify how a UE choose between e.g. full sensing vs. partial sensing, but in Rel-16 the MAC spec says “*select any pool of resources among the pools of resources*” for HARQ-ACK disabled and “*select any pool of resources configured with PSFCH resources among the pools of resources*” for HARQ-ACK enabled, which is literally incorrect anymore here unless all pools are configured to allow all resource allocation schemes, e.g., similarly to the case of HARQ-ACK enabled, if a UE is using partial sensing, at least there is a restriction that it could only select a pool among the pools configured to allow partial sensing, otherwise the whole purpose of configuring the allowed resource allocation schemes in a pool is defeated. As another example, if no TX pool is configured to allow “partial sensing”, the UE is certainly not allowed to use partial sensing as a resource allocation scheme (and then “select any pool” to operate partial sensing). |
| InterDigital | N | N | We can keep LTE baseline and leave this to UE implementation. |

**Companies are invited to provide initial inputs on candidate options for [Issue 4a] and [Issue 4b] (if any).**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Candidate options for Issue 4a (if any)** | **Candidate options for Issue 4b (if any)** | **Justification on the options provided (if any)** |
| vivo | Option 1: Yes, no normative UE behaviour is needed.  Option 2: No, it needs to be specified that a UE can only select a pool that includes at least one of the resource allocation schemes it is capable/configured to perform. |  |  |
| OPPO | we do not see the need to have resource allocation scheme based pool selection. | Yes, no normative UE behaviour is needed. |  |
| Ericsson | Fully up to UE implementation. |  |  |
| InterDigital | Upto UE implementation |  |  |

## 2.5 Resource allocation scheme in the exceptional pool (Item “F” in P2 [X])

### [Issue 5] Is it agreeable that a UE only uses random resource selection in the exceptional pool?

**[Rapp’s remarks]** RAN1 did not conclude whether those power-saving resource allocation schemes apply to exceptional pool or not. In fact, nearly all exception pool handling has been concluded by RAN2 in both LTE V2X SL or NR SL. Therefore, RAN2 needs to make a decision.

**[Suggested WF] Issue 5 is an essential open issue that needs to be closed in RAN2 #117-e. Suggest to handle it based on “Company input into Pre117-e-offline”.**

**Companies’ views are invited on the above suggested WF for the handling of [Issue 5].**

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| --- | --- | --- |
| **Company** | **Agree with the suggested WF? (Y/N)** | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **OPPO** | **N** | **We fail to understand why this is an issue.** |
| vivo | No strong view. | Better to check companies’ views. But if companies think this is an issue too obvious to be discussed, no discussion on it is fine to us, with the assumption that no change needs to be done upon the existing procedure that allows only random selection in the exceptional pool. |
| Huawei, HiSilicon | N | This issue should be discussed by RAN1. |
| Ericsson | N | As Huawei mentioned, this needs to be addressed by RAN1. |
| Intel | No strong view | We can wait for RAN1 discussion |
| Sharp | N |  |
| InterDigital | N | We don’t think Rel17 has any impact on the assumptions on the exceptional pool that were made in Rel16. |

**Companies are invited to provide initial inputs on candidate options for [Issue 5] (if any).**

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| --- | --- | --- |
| **Company** | **Candidate option (if any)** | **Justification on the options provided (if any)** |
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## 2.6 Re-evaluation/Pre-emption in partial sensing case (Item “G” in P1 [2])

### [Issue 6] Are there any RAN1-led impacts to MAC spec on the re-evaluation and pre-emption related procedure for partial sensing?

**[Rapp’s remarks]** The issue comes from contribution [8]. However, it actually only proposes that re-evaluation and pre-emption should apply for partial sensing as well. Rapporteur understands that till now there is no RAN1/2 conclusion to prohibit re-evaluation and pre-emption from being used for partial sensing. On the other hand, re-evaluation and pre-emption are both RAN1 designed features, and in Rel-16 the related procedures in the MAC were captured completely based on RAN1 agreements w/o any functional discussion in RAN2. Even if there is any impact that needs to be done to the MAC for partial sensing case, that should come from RAN1 agreements. RAN2 is unlikely to carry out any functional discussions for this feature. To this end, rapporteur thinks that the issue can be directly handled in the MAC running CR discussion regarding how to capture related RAN1 agreements (if really any).

**[Suggested WF] Issue 6 depends on whether any MAC Spec is needed based on the latest RAN1 progress. Suggest to handle it as a “CR rapporteur handled issue” during running CR discussion.**

**Companies’ views are invited on the above suggested WF for the handling of [Issue 6].**

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| --- | --- | --- |
| **Company** | **Agree with the suggested WF? (Y/N)** | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **OPPO** | **N** | **We did not see R1 attempt in this direction, so do not think this is a critical issue to solve now.** |
| Vivo | Y | We can leave it to MAC Rapp to decide whether any RAN1 agreements need to be included in the running CR. Anyway, no functional discussion in RAN2 is needed in this aspect. |
| Huawei, HiSilicon | Y | We agree with vivo. |
| Ericsson | Y | VIVO suggestion makes sense. |
| Intel | Ok to follow majority view | We think there invariably is going to be some impact to the MAC specification, but we are ok for the CR rapporteur to handle it |
| InterDigital | Y | It makes sense to have the rapporteur handle this as usual. |

## 2.7 CBR related (Item “E” in P1 [2])

### [Issue 7a] Is it common understanding that CBR measurement is NOT supported, when the UE is performing random resource selection?

**[Rapp’s remarks]** This simply impacts whether/how to add a restriction in the CBR measurement procedure in RRC to exclude UEs performing random selection. In LTE, there is a similar restriction to exclude P2X related V2X SL communication for CBR measurement (i.e. “The UE capable of CBR measurement when configured to transmit **non-P2X** related V2X sidelink communication shall:” in 5.5.3.1, TS 36.331). There was a RAN1 agreement in RAN1 #107e that “When UE performs random resource selection, LTE principle is reused:”. So intuitively, a similar restriction needs to apply to the UE performing random selection in NR SL. Note that the difference in NR SL is that unlike P2X in LTE, UE performing partial sensing may still need to perform CBR. Considering the already clear RAN1 agreement to reuse LTE principle, this issue can be treated as an open issue in the running CR discussion.

**[Suggested WF] Issue 7a depends on whether any RRC Spec is needed based on the latest RAN1 progress. Suggest to handle it as a “CR rapporteur handled issue” during running CR discussion.**

**Companies’ views are invited on the above suggested WF for the handling of [Issue 7a]**

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| **Company** | **Agree with the suggested WF? (Y/N)** | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **OPPO** | **Y** |  |
| vivo | Y |  |
| Huawei, HiSilicon | Y | We think this is RAN1 agreement and should be reflected in the RRC spec. In addition, we think for partial sensing, RAN1 also achieved agreement to support CBR measurement, we think this part should also be reflected in the RRC spec and can be treated as “CR rapporteur handled issue” and handled together with this issue during the CR discussion. |
| Ericsson | Y |  |
| Intel | Y |  |
| InterDigital | Y |  |

### [Issue 7b] Whether to reuse the existing parameter *sl-DefaultTxConfigIndex* or introduce a new parameter, whenever a (pre-)configured SL CBR is needed for partial sensing and random selection as per RAN1 agreements?

**[Rapp’s remarks]** There were several RAN1 agreements for both partial sensing and random selection, mentioning that “When no SL CBR measurement result is available, a (pre-)configured SL CBR value is used”. Also, in RAN1 #107b-e, there was a further RAN1 agreement for partial sensing that “If the number of SL RSSI measurement slots is below a (pre-)configured threshold, a (pre-)configured SL CBR value is used”. For partial sensing and random selection, one main use of the CBR value is to determine the parameters used for “CBR-priority” based link adaptation, and there has already been a (pre-)configured parameter set, i.e. via *sl-DefaultTxConfigIndex*, in the current RRC Spec to cope with this “no SL CBR available” case. Companies’ understanding needs to be checked on whether this existing parameter is already sufficient from a functional point of view based on related RAN agreements, so to decide whether to introduce a new parameter or not.

**[Suggested WF] Issue 7b is an essential open issue that needs to be closed in RAN2 #117-e. Suggest to handle it based on “Company input into Pre117-e-offline”.**

**Companies’ views are invited on the above suggested WF for the handling of [Issue 7b].**

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| **Company** | **Agree with the suggested WF? (Y/N)** | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **OPPO** | **N** | **We tend to believe this issue can be fully rely on R1 conclusion, not see the space for R2 discussion yet.** |
| vivo | Ok to not discuss this issue in RAN2 | As observed from [107bis-e-R17-RRC-Sidelink] (parameter 1.3 and 1.4), RAN1 is now discussing whether a new (pre)configured CBR value is needed for random selection and for partial sensing. RAN2 can therefore completely follow RAN1 final decision based on the L1 RRC parameter list to be received |
| Huawei, HiSilicon | N | Same view as OPPO. RAN2 can completely follow L1 RRC parameter list. |
| Ericsson | N | Agree with OPPO and Huawei. |
| Intel | N | Follow RAN1 discussion |
| InterDigital | N | Follow RAN1 |

**Companies are invited to provide initial inputs on candidate options for [Issue 7b] (if any).**

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| **Company** | **Candidate options (if any)** | **Justification on the options provided (if any)** |
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## 2.8 RAN2 impact on partial sensing due to SL DRX (Item “C” in P1 [2])

**[Rapp’s remarks]** Contributions discussing SL-DRX impacts on partial sensing mainly include references in [[6](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200375-%20Discussion%20on%20resource%20allocation%20enhancement.docx)], [[7](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201457_RA-PowerReduction.docx)], [11] and [[12](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201479%20-%20Interaction%20between%20partial%20sensing%20and%20DRX.docx)]. One of the issues raised by [[11](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201479%20-%20Interaction%20between%20partial%20sensing%20and%20DRX.docx)] and [12] is to confirm partial sensing is only performed by the UE during SL DRX active time. In fact, RAN1 already reached final conclusions on how UE performs partial sensing when SL DRX is configured in RAN1 #107b-e, and since sensing is a pure RAN1 functionality, with already RAN1 conclusions, RAN2 does not need to further make any conclusion on this issue. The other issue raised by all above contributions is about whether to support SL DRX configuration and PBPS configuration alignment, with the contributions in [7] and [[11](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201457_RA-PowerReduction.docx)] proposing such enhancements but the contribution in [[6](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2200375-%20Discussion%20on%20resource%20allocation%20enhancement.docx)] and [[12](file:///D:\3GPP%20RAN2\General\RAN2%20%23116bise\Tdoc%20Review\SL%20enh\success\R2-2201479%20-%20Interaction%20between%20partial%20sensing%20and%20DRX.docx)] indicating no need for it as an optimization. As sensing operation is a RAN1 feature and RAN1 did not conclude the necessity to introduce such a configuration alignment, it means that this feature is not essential from RAN1 perspective. Therefore, such an alignment should be regarded as optimizations in RAN2 as well.

Based on above survey on companies’ contributions, rapporteur understands that there may not be essential open issues that need to be discussed in RAN2 for this SL DRX impact on power-saving resource allocation. Also note that the *general* SL DRX impacts on resource allocation (instead of power-saving resource allocation specific aspects, e.g. LCP impact) have always been handled in SL DRX AI. This should be followed in the next meeting as well.

**[Suggested WF] No essential open issue from RAN2 perspective needs to be closed in RAN2 #117-e for SL-DRX impacts on power-saving resource allocation.**

**Companies’ views are invited on the above suggested WF for the handling of SL DRX impact on power-saving resource allocation**

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| --- | --- | --- |
| **Company** | **Agree with the suggested WF? (Y/N)** | **Comments, if any (e.g. need of discussion, suggested way of handling, etc.)** |
| **OPPO** | **Y** |  |
| vivo | Y |  |
| Huawei, HiSilicon | Y |  |
| Ericsson | Y |  |
| Intel | Y |  |
| Sharp | Y |  |
| InterDigital | Y |  |

## 2.9 Others

**Any essential RAN2 open issue is missing? Please provide input to the following table, if any.**

|  |  |
| --- | --- |
| **Company** | **Other critical RAN2 open issues identified (if any)** |
|  |  |
|  |  |
|  |  |

# Output Open Issue List and Recommendations

# References

1. R2-22xxxxx Coordinated Company Input For Rel-17 Open Issues Planning R2 117-e and impacts to R2 116bis-e RAN2 Chair
2. R2-2201804 Summary [AT116b-e][704][V2X/SL] Resource allocation enhancements LG Electronics Inc. (Rapporteur)
3. R2-2200379 RAN2 aspects on resource allocation enhancements for Rel-17 eSL vivo
4. R2-2201591 Resource allocation enhancements Samsung
5. R2-2200317 Consideration on Resource Allocation Enhancements CATT
6. R2-2200375 Discussion on resource allocation enhancement OPPO
7. R2-2201457 Power Reduction for Sidelink Mode 2 Resource Allocation Fraunhofer IIS, Fraunhofer HHI
8. R2-2200529 On resource allocation and inter-UE coordination Intel Corporation
9. R2-2110940 Resource pool configuration and selection of resource selection mechanism Samsung
10. R1-2112976 Consolidated higher layers parameter list for Rel-17 NR
11. R2-2107629 NR SL Resource allocations for Pedestrian UEs Apple
12. R2-2201479 Interaction between partial sensing and DRX Ericsson