**3GPP TSG RAN WG1 #108-e R1-2202565**

**e-Meeting, 21 February – 03 March, 2022**

**Source: Moderator (OPPO)**

**Title:** **FL summary for AI 8.11.1.1 – NR sidelink resource allocation for power saving (EOM)**

**Agenda item: 8.11.1.1**

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

Introduction

In the latest version of Rel-17 [WID](http://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_90e/Docs/RP-202846.zip) for NR sidelink enhancement, the objective for enhancing resource allocation (RA) to reduce UE power consumption in mode 2 is captured as followed.

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| 2. Resource allocation enhancement:   * Specify resource allocation to reduce power consumption of the UEs [RAN1, RAN2]   + Baseline is to introduce the principle of Rel-14 LTE sidelink random resource selection and partial sensing to Rel-16 NR sidelink resource allocation mode 2.   + Note: Taking Rel-14 as the baseline does not preclude introducing a new solution to reduce power consumption for the cases where the baseline cannot work properly.   + This work should consider the impact of sidelink DRX, if any. |

This contribution provides a summary of the submitted contributions, email discussion topics and outcomes during RAN1#106bis-e meeting. Note that, all past outcomes including agreements, conclusions and working assumptions reached during this WI are captured in Section 5 (5 Appendix) of this document.

Collection of agreements / conclusion in RAN1#108-e

Agreement reached during February 22nd GTW session

**Agreement**

The lower bound of *M* value for CPS in the case of periodic transmission (*contiguousSensingWindowPeriodic*) for both resource (re)selection and re-evaluation / pre-emption checking is a non-zero value (lower bound for *M* is 5)

Note: CATT indicated that they do not agree to the technical benefits of this agreement

**Agreement**

When a UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n* and the minimum *M* slots for CPS cannot be guaranteed,

* UE senses in all available slots starting from the resource (re)selection trigger slot of the same TB to  slots earlier than .
  + The UE re-evaluation and pre-emption checking is based on all available sensing results after n-T0

Outcome reached during February 24th GTW session

**Conclusion**

The existing Step 5 and 5a are applicable for UE configured for partial sensing by its higher layer.

Topics for email discussion

[108-e-R17-Sidelink-01] Email discussion on resource allocation for power saving– Kevin (OPPO)

* 1st check point: February 25
* Final check point: March 3

## Topic #1: Finalization of selection/reporting of subset of candidate resources within RX-UE's SL DRX active time

**Background**: In RAN1#107-e, the group made an agreement to proceed with the following Option 2 (*PHY layer selects and reports candidate resources in which at least a subset of the candidate resources is within the indicated active time of the RX UE*) on the issue of restricting candidate resources to be reported to MAC layer when PHY is indicated with sidelink DRX active time of the RX UE.

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| **Agreement**  When SL DRX active time of Rx-UE is provided by the higher layer for candidate resource selection (including resource (re)selection and re-evaluation/pre-emption checking), the following working assumption is confirmed with option 2 as agreement (with modification in RED)  **Working Assumption (RAN1#106bis-e)**  When PHY layer is indicated with an active time of RX UE from MAC layer for candidate resource selection, a restriction is applied in PHY layer so that at least a subset of candidate resources reported to MAC layer is located within the indicated active time of the RX UE. The following options will be further discussed in RAN1 to restrict resources for candidate resource selection taking into account the indicated active time from MAC layer:   * ~~Option 1: PHY layer selects and reports candidate resources only within the indicated 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 the indicated active time of the RX UE   + FFS: Details on when the number of subsets of candidate resource is less than the threshold   + FFS: The subset of candidate resource outside of the active time should consider each inactive time period   + FFS: UE selection of resource selection window to overlap with indicated RX UE active time   + FFS: Whether it is up to UE implementation to report candidate resources only within the indicated active time of the RX UE * ~~Option 3: PHY layer selects and reports an additional candidate resource set of candidate resources within the indicated active time of the RX UE~~ |

During the RAN1#107bis-e meeting, out of all the proposed solutions in the submitted contributions and the discussions held, the following latest version of combined/refined solution was proposed by the FL for agreement. Unfortunately, it was not accepted by the group. Specifically, the main issue was there is no consensus to specify a solution in L1 to realize the above agreed Option 2 as some claimed that it should be achieved by purely UE implementation.

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| **Proposal 2-1 (VII):**  When SL DRX active time of RX UE is provided by the higher layer for candidate resource selection,   |  | | --- | | ·     At least ~~the first~~ *N* slots of *Y* or *Y’* candidate slots are to be selected within the provided SL DRX active time when partial sensing is configured in the UE by higher layer, where *N* is (pre-)configurable from a range of 1 to [10]. |  * + ~~FFS: whether~~ This does not apply to re-evaluation and pre-emption checking (e.g. number of remaining *Y* or *Y’* candidate slots is less than *N*)   + Note (not to be captured in the spec): it is possible that the whole set of *Y* or *Y’* candidate slots are selected within the provided SL DRX active time (e.g., when the provided SL DRX active time covers the entire remaining PDB)  |  | | --- | | ·     *T2* is selected by UE implementation such that at least ~~the first~~ *N* slots of RSW are ~~to be selected~~ within the provided SL DRX active time when full sensing is configured in the UE by higher layer, where *N* is (pre-)configurable from a range of 1 to [10]. |  * + ~~FFS: whether~~ This does not apply to re-evaluation and pre-emption checking   + Note (not to be captured in the spec): it is possible that the whole RSW is within the provided SL DRX active time (e.g., when the provided SL DRX active time covers the entire remaining PDB)  |  | | --- | | ·     The same (pre-)configured *N* parameter applies to both partial sensing and full sensing cases.  ·     The reported subset of the candidate resources within the provided SL DRX active time of RX UE shall satisfy a threshold. |  * + Option 1: The same higher layer parameter (*sl-TxPercentageList*) is reused for the ratio / threshold That is,  number of candidate single-slot resources remaining within the SL DRX active time of the initialized set  in Step 4) is to be met by using the RSRP threshold increment ~~only for the SL DRX active time~~ in Step 7, where the  is the total number of candidate single-slot resources of the set  within the SL DRX active time.     - The UE shall satisfy this new threshold in addition to the remaining minimum  number of candidate single-slot resources threshold for the whole set  in Step 7. |

Based on the submitted contribution in this meeting, a summary of this topic can be found in Section 4.1 of this document, there is an overwhelming preference / view from 19 contributions that there is a need to specify a solution to guarantee a subset of candidate resources is selected and reported by L1 that does not potentially degrade system performance due to high interference.

To this end, the following question is asked to determine whether there is a consensus within the group to specify a L1 solution to guarantee a subset of candidate resources is selected and reported by L1 when SL DRX active time is provided by the higher layer.

**Question 1:**

Should RAN1 make further agreement(s) on how a UE reports a subset of candidate resources that are within the indicated SL DRX active time of RX UE (Yes/No)?

* + - * If Yes, which one of the following options should be adopted to guarantee UE reporting a subset of candidate resources that are within the indicated SL DRX active time of RX UE?
        + Solution 1: Based on the above Proposal 2-1 (VII) from RAN1#107bis-e. That is,

UE selecting *N* number of slots within the DRX active time and ensuring *X · Ntotal* number of candidate resources remaining within the SL DRX active time of the initialized set *SA* by RSRP threshold increment in Step 7, where the *N* number of slots is a higher layer parameter and the value is determined by UE implementation.

* + - * + Solution 2: Same as Solution 1 but without specifying UE selecting *N* number of slots within the DRX active time. That is, only ensuring *X · Ntotal* number of candidate resources remaining within the SL DRX active time of the initialized set *SA* by RSRP increment in Step 7.
        + Solution 3: Similar to Solution 2, replace *X · Ntotal* with *Z* number of candidate resources remaining, where the *Z* number of resources is a higher layer parameter and the value is determined by UE implementation.
      * If No, how to reflect / capture the above existing agreement in the specification (TS38.214) or completely up to the specification editor?
        + For example, “If the number of remaining candidate single-slot resources within the indicated SL DRX active time in the set *SA* after step 7 is less than *N*, the UE based on its implementation selects and includes additional candidate single-slot resources such that the minimum *N* candidate single-slot resources is met, where *N* is a higher layer parameter and the value is determined by UE implementation.”

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| **Company** | | **Yes/No** | **Comments** |
| NTT DOCOMO | | Yes | Solution 1.  In our understanding, “YES” for the question means that RAN1 should consider non-smart UE that does not handle this issue by UE implementation. With this understanding, full UE behavior should be agreed. It seems that solution 2/3 is not aligned with the assumption. |
| ZTE,Sanechips | Comment | | The solution should be complete and avoid RRC impact to the largest extent, alternatively no further agreement needs to be pursued, a sentence as the following to 8.1.4. in TS 38.214 after step 7 as follows should serve well the purpose in case no further agreement is achieved.  The UE shall report set IMG_256 to higher layers wherein a subset includes up to implementation the resources within the SL DRX active time.  Solution 1 can be reformulated and completed in the wording below (from pervious meeting) for better clarity   * Option 1: The same higher layer parameter (sl-TxPercentageList) is reused for the ratio / threshold That is, number of candidate single-slot resources remaining within the SL DRX active time of the initialized set in Step 4) is to be met by using the RSRP threshold increment in Step 7, where the is the total number of candidate single-slot resources of the set within the SL DRX active time.   + - ***The UE shall satisfy this new threshold in addition to the remaining minimum number of candidate single-slot resources threshold for the whole set in Step 7.***     - ***The UE shall ensure the RSRP threshold increment in Step 7 is not larger than a RSRP threshold upper bound or maximum number of increments provided by higher layer***     - ***If***  *or*  ***is less than thresholds provided by higher layer, UE performs random selection in exceptional resource pool.***   We can support the reformulated solution 1 |
| Apple | | Yes | Solution 1 or Solution 4.  Without specifying that UE selecting N number of slots within the DRX active time, we cannot guarantee that the reported candidate resources have overlap in Rx UE’s DRX active time. Note if there is no overlap between candidate slots and Rx UE’s DRX active time, then *Ntotal* is 0, which means Step 7 passes while all the reported candidate resources are not in DRX active time.  We are also fine with Solution 4 as a combination of Solution 3 and Solution 1.  Solution 4: Similar to Solution 1, replace *X · Ntotal* with *Z* number of candidate resources remaining, where the *Z* number of resources is a higher layer parameter and the value is determined by UE implementation. |
| MediaTek | | Comment | First part of Proposal 2-1 (VII) should be agreed without threshold definition.  It should be specified that UE should select at least the first N slots within the active time. This is necessary for alignment with past RAN2 agreement. This should be applicable to both partial-sensing and full-sensing UE. The threshold definition is not necessary and it can be left to UE implementation.  In brief, we support the first half of Proposal 2-1 (VII) without the last main bullet (i.e., without the threshold-related part for Step-7). |
| Futurewei | | Comments | Our view is that we do not agree to define a new RRC parameter N as in solution 1 or the example given for the “No” branch case. We prefer solution 2 by adding *Ntotal* >=1 for clarification or the "No" branch without a new RRC parameter N.  Note that similar to ZTE mentioned, some aspects of solution 1 are not so clear. For example, we are not clear what is the difference between N and Ntotal now as Ntotal definition is missing (also missing in other solutions). Would N be the minimum number of slots within Rx active time? |
| OPPO | | Yes | We support Solution 1.  We don’t think it is acceptable to up to UE implementation to guarantee there is a subset within SL DRX active time in S\_A. in that case, the UE may perform random selection and the interference to other UEs is uncontrollable. |
| Lenovo&MotM | |  | Based on UE implementation to select resource is preferred. Also, solution 1 could be accepted to us, it has less spec effort. |
| Xiaomi | | comments | We have already agreed that by UE implementation to select Y or Y’ number of candidate slots. Therefore, we do not think further agreement to select candidate slots within DRX active duration is necessary. It can be up to UE implementation.  Even if we need to define UE behaviour, additional higher layer parameter N is not needed. We can simply say that “UE selecting at least 1 candidate slot within the DRX active time by its implementation”.  The same comment applies to the number of candidate resources to be reported to MAC layer. To comply with RAN2 agreement, it would be enough to just say that “ensuring *at least 1* candidate resource remaining within the SL DRX active time of the initialized set *SA* by RSRP threshold increment in Step 7”. |
| CMCC | | Yes | Solution 1.  PHY shall make sure that there are some overlapping parts between candidate slots and Rx UE’s DRX active time, otherwise, no candidate resources within Rx UE’s DRX active time can be reported. And also, the number of reported available candidate resources shall be guaranteed for MAC layer’s resource selection at least for initial transmission. |
| LGE | | Yes | Additional agreement is certainly needed to capture the agreement in RAN1#107-e in the specification.  Among the options, we’re fine with the solution 2 or 3 because selecting N slots in the solution 1 can be UE implementation for ensuring X\*Ntotal candidate slots in the indicated active time.  One clarification is needed. Either solution 2 or 3 should be only applied to the indicated active time so that the existing candidate resources selected outside the active time are unchanged and protected from unnecessary interference by incrementing RSRP threshold. Changing the candidate resources outside the active time is not a part of the existing agreement.  Another clarification is that the solution 2 or 3 operation should be performed after performing all the existing steps up to step 7. It’s for minimizing any impact on the existing procedure. We suggest to add the following clarification to the overall proposal.   * + - * + The operations for ensuing a subset of candidate resources in the indicated active time are performed after step 7). |
| InterDigital | | Yes | We support solution 1.  Solution 1 can help to gurantee that the UE can have enough resources (i.e., at least to select during the active time of the Rx UE. Moreover, selecting at least N slots within the active time of the Rx UE allows the Tx UE to have enough resources to perform random selection in the subset of candidate resources at MAC layer. This solution has been proved from LTE to NR time to reduce resource collision among the UE selecting transmission resources at similar time. |
| Panasonic | | Yes | We are ok with the solution 1 that has been discussed in last meeting. |
| CATT/GOHIGH | | No | Based on UE implementation to select resource is preferred. |
| Fujitsu | | Yes | It is necessary to specify how a UE reports candidate resources within the active time. Furthermore, Solution 2 is preferred. |
| Samsung | | Yes | We are OK with solution 1, but we may need to specify a solution for aperiodic transmission (*P*rsvp\_TX*=*0) according to RAN2 working assumption for periodic transmission as follows:  Working assumption: slots associated with the announced periodic transmissions by the TX UE are considered as SL active time of the RX UE. |
| Ericsson | | Yes. Option 1 | The procedure should try to ensure as much as possible that the reported resources are within the SL-DRX active time of the Rx UE. |
| Spreadtrum | | Yes | We prefer solution 1.  In order to ensure that there are sufficient candidate resources in Rx UE’s DRX active time, N number of slots within the DRX active time should be specified. In solution 2 and solution 3, if *Ntotal* is 0 or a very small value, UE may obtain candidate resources with poor quality or even no candidate resource in Rx UE’s DRX active time after RSRP measurement. |
| Intel | | Yes | We would like to use the same resource percentages defined for the case without SL DRX and add a condition in step 7 of clausa 8.1.4 in 38.214 to increment the RSRP threshold if the defined percentage of resource within SL DRX active is not met. |
| vivo | | Yes | We are ok with solution1. |
| NEC | | Yes | Solution 1. Additional agreement is needed to make sure that there is a subset of resource within receiver’s active time. Among the three solutions, solution 1 is a kind of reusing exiting procedure and could be adopted. |
| Huawei, HiSilicon | | Yes | The agreement does not define how the subset is defined. Based on TS38.214, the sensing and resource exclusion can result in the case that all resource within the indicative SL-DRX active time are excluded. Thus specification is needed to ensure the non-empty subset which can allow RAN2 to select initial transmission within the indicative SL-DRX active time.  Regarding solution 1/2/3, there were already intensive discussion during RAN1#107-e, given that Y candidate slots is selected by UE implementation, solution 2 can achieve same effect as solution 1 assuming good UE implementation. We are fine to either solution as way forward and modify the “option 1” part of Proposal 2-1 (VII) as following.  **Proposal 2-1 (VII):**  **…**   * The reported subset of the candidate resources within the provided SL DRX active time of RX UE shall satisfy a threshold.   + Option 1: The same higher layer parameter (*sl-TxPercentageList*) is reused for the ratio / threshold That is,  number of candidate single-slot resources remaining within the SL DRX active time of the initialized set  in Step 4) is to be met by using the RSRP threshold increment only for the SL DRX active time in Step 7, where the is the total number of candidate single-slot resources of the set within the SL DRX active time”.   …  The reason to have such modification is the motivation to increase RSRP threshold is to satisfy the threshold of candidate resources within active time of RX UE. RSRP threshold of resources within inactive time of RX UE are unnecessary to be increased.  Solution 3 seem not always feasible since the number of candidate resource also rely on how many slots overlapped between RSW and DRX active time. If a fix number Z is applied, it may exceed the total number of candidate slots within the overlapping slots. |
| Sony | | yes | We support option 1. The candidate resource set S\_A should contain a subset of resource in RX UE’s DRX active time. |

### Proposal for Week 1 Tuesday GTW

Summary of responses:

* + - * Whether further agreement(s) is necessary in RAN1 on how a UE reports a subset of candidate resources that are within the indicated SL DRX active time of RX UE:
        + Yes/acceptable (23): DCM (S1), ZTE/Sanechips (S1), Apple (S1/S3), MediaTek (first half of S1), Futurewei (S2), OPPO (S1), Lenovo/MotM (S1), CMCC (S1), LGE (S2, S3), IDC (S1), Panasonic (S1), Fujitsu (S2), Samsung (S1), Ericsson (S1), Spreadtrum (S1), Intel (S1, S2), vivo (S1), NEC (S1), Huawei/HiSilicon (S1), Sony (S1)
        + Comments:

Modification to solution 1:

[ZTE/Sanechips] Adding new sub-bullets:

“The UE shall ensure the RSRP threshold increment in Step 7 is not larger than a RSRP threshold upper bound or maximum number of increments provided by higher layer.”

“If or is less than thresholds provided by higher layer, UE performs random selection in exceptional resource pool.”

* + - * + No/UE implementation (7): ZTE/Sanechips, Lenovo/MotM, Xiaomi, CATT/GOHIGH

ZTE/Sanechips: “The UE shall report set *SA* to higher layers wherein a subset includes up to implementation the resources within the SL DRX active time.”

Xiaomi: “UE selecting at least 1 candidate slot within the DRX active time by its implementation”

FL comments:

* + - * It should be noted that in the above-described solutions for this meeting, there is no new RRC parameters. *N* is a higher layer parameter with a value to be determined by UE implementation.
      * Based on the above summary, there is a clear majority of companies prefer to make further agreement(s) in RAN1 on how a UE reports a subset of candidate resources that are within the indicated SL DRX active time of RX UE. For ZTE/Sanechips and Lenovo/MotM, they seem to be fine to go with Solution 1 (based on Proposal 2-1 (VII) from RAN1#107bis-e).
      * Therefore, FL propose the following to be a way forward and down-select to one of the solutions in the remainder of this meeting.

**Proposal 1:**

When SL DRX active time of RX UE is provided by the higher layer for candidate resource selection, down-select to one of the followings in RAN1#108-e. Note, it is possible to make further modifications to the following solutions.

* Solution 1: Based on Proposal 2-1 (VII) from RAN1#107bis-e. That is,
  + UE selecting *N* number of slots within the DRX active time and ensuring *X · Ntotal* number of candidate resources remaining within the SL DRX active time of the initialized set *SA* by RSRP threshold increment in Step 7, where the *N* number of slots is a higher layer parameter and the value is determined by UE implementation.
* Solution 2: Same as Solution 1 but without specifying UE selecting *N* number of slots within the DRX active time. That is, only ensuring *X · Ntotal* number of candidate resources remaining within the SL DRX active time of the initialized set *SA* by RSRP increment in Step 7.
* Solution 3: Similar to Solution 2, replace *X · Ntotal* with *Z* number of candidate resources remaining, where the *Z* number of resources is a higher layer parameter and the value is determined by UE implementation.
* Solution 4: Only the first half of Proposal 2-1 (VII) without the last main bullet (i.e., without the threshold-related part for Step-7).

### Proposal for Week 1 Thursday GTW

FL comments:

* + - * Based on the comments raised during Week 1 Tuesday GTW session for sidelink power saving, I have tried to reflect them in the following Proposal 1 (II). It is a very long proposal, simply because I want to be precise and accurate so that we are clear what each solution is referring to.
      * For solution 1, I tried to do some text simplification to the original Proposal 2-1 (VII) from the last meeting.
      * For solution 1, 2 and 3, since they are all based on RSRP threshold increment to meet a certain threshold, I have incorporated the suggestion of adding two bullets in the end from ZTE/Sanechips.
  + @ZTE/Sanechip, I did some modifications to the second bullet that you suggested because *X · Ntotal* and *Ntotal* are calculated value in L1, they not provided by higher layer. Also, I incorporate the thinking from Xiaomi that it would be sufficient for the MAC layer as long as there is a resource within the DRX active time in SA. If this is not met, then random resource selection. Let’s see what other company’s views on this.
    - * Solution 4 is kept based on MediaTek’s comment.
      * Solution 5 is included for a complete proposal to take into account of Qualcomm and Xiaomi’s comments.
      * Please indicate your preference on the solutions and provide comments/suggestion for modification if needed.

**Proposal 1 (II):**

When SL DRX active time of RX UE is provided by the higher layer for candidate resource selection, down-select to one of the followings.

* Solution 1: Based on Proposal 2-1 (VII) from RAN1#107bis-e. That is,
  + When partial sensing is configured with partial sensing by its higher layer, a minimum of N slots of the selected Y or Y’ candidate slots are to be within the provided DRX active time of RX UE.
    - This does not apply in re-evaluation and pre-emption checking
  + When full sensing is configured with partial sensing by its higher layer, *T2* is selected such that a minimum of *N* slots of the RSW are within the provided DRX active time of RX UE.
    - This does not apply in re-evaluation and pre-emption checking
  + *N* is a higher layer parameter and the value is determined by UE implementation.
  + The reported subset of the candidate resources within the provided SL DRX active time of RX UE shall satisfy a threshold.
    - The same higher layer parameter (*sl-TxPercentageList*) is reused for the ratio threshold. That is, *X · Ntotal* number of candidate single-slot resources remaining within the SL DRX active time of set *SA* is to be met by using the RSRP threshold increment only for the SL DRX active time in Step 7, where *Ntotal* is the total number of candidate single-slot resources within the SL DRX active time of the initialized set *SA* in Step 4).
      * The UE shall satisfy this new threshold in addition to the existing minimum *X · Mtotal* number of candidate single-slot resources threshold for the whole set *SA* in Step 7.
      * The UE shall ensure the RSRP threshold increment in Step 7 is not larger than a RSRP threshold upper bound or maximum number of RSRP increments provided by higher layer.
        + If no candidate single-slot resource remained within the SL DRX active time of the set *SA* after the RSRP increments, UE performs random selection in exceptional resource pool.
* Solution 2: Same as Solution 1 but without specifying UE selecting *N* number of slots within the DRX active time. That is,
  + The reported subset of the candidate resources within the provided SL DRX active time of RX UE shall satisfy a threshold.
    - The same higher layer parameter (*sl-TxPercentageList*) is reused for the ratio threshold. That is, *X · Ntotal* number of candidate single-slot resources remaining within the SL DRX active time of set *SA* is to be met by using the RSRP threshold increment only for the SL DRX active time in Step 7, where *Ntotal* is the total number of candidate single-slot resources within the SL DRX active time of the initialized set *SA* in Step 4).
      * The UE shall satisfy this new threshold in addition to the existing minimum *X · Mtotal* number of candidate single-slot resources threshold for the whole set *SA* in Step 7.
      * The UE shall ensure the RSRP threshold increment in Step 7 is not larger than a RSRP threshold upper bound or maximum number of RSRP increments provided by higher layer.
        + If no candidate single-slot resource remained within the SL DRX active time of the set *SA* after the RSRP increments, UE performs random selection in exceptional resource pool.
* Solution 3: Similar to Solution 2, replace *X · Ntotal* with a minimum *Z* number of candidate resources remaining. That is,
  + The reported subset of the candidate resources within the provided SL DRX active time of RX UE shall satisfy a threshold.
    - UE ensures *Z* number of candidate single-slot resources within the SL DRX active time of the set *SA* is met by using the RSRP threshold increment only for the SL DRX active time in Step 7, where *Z* is a higher layer parameter and the value is determined by UE implementation.
      * The UE shall satisfy this new threshold in addition to the existing minimum *X · Mtotal* number of candidate single-slot resources threshold for the whole set *SA* in Step 7.
      * The UE shall ensure the RSRP threshold increment in Step 7 is not larger than a RSRP threshold upper bound or maximum number of RSRP increments provided by higher layer.
        + If no candidate single-slot resource remained within the SL DRX active time of the set *SA* after the RSRP increments, UE performs random selection in exceptional resource pool.
* Solution 4: Only the first half of Proposal 2-1 (VII) without the last main bullet (i.e., without the threshold-related part for Step-7). That is,
  + When partial sensing is configured with partial sensing by its higher layer, a minimum of N slots of the selected Y or Y’ candidate slots are to be within the provided DRX active time of RX UE.
    - This does not apply in re-evaluation and pre-emption checking
  + When full sensing is configured with partial sensing by its higher layer, *T2* is selected such that a minimum of *N* slots of the RSW are within the provided DRX active time of RX UE.
    - This does not apply in re-evaluation and pre-emption checking
  + *N* is a higher layer parameter and the value is determined by UE implementation.
* Solution 5: Up to UE implementation
  + If there is no candidate single-slot resource remained within the indicated SL DRX active time in the set *SA* after Step 7, the UE based on its implementation selects and includes at least one candidate single-slot resources within the indicated SL DRX active time in the set *SA*.

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| **Company** | **Solution (1, 2, …, 5)** | **Comments** |
| ZTE,Sanechips | Solution 1 | Thanks to FL's modification, the FFS from 107-e is addressed.   * Option 2: PHY layer selects and reports candidate resources in which at least a subset of the candidate resources is within the indicated active time of the RX UE   + FFS: Details on when the number of subsets of candidate resource is less than the threshold |
| Apple | Solution 1 or 4 or other | 1. In Solutions 1/2/3, we do not think “only for the SL DRX active time” is needed. In our understanding, both condition X\*Mtotal and condition X\*Ntotal need to be satisfied jointly before exiting the resource selection procedure. 2. We proposed a compromised solution between Solution 1 and Solution 4 in last round, which is not captured. In both solution 1 and Solution 4, N is a high layer parameter based on UE implementation. Similar approach could be applied to X\*Ntotal: i.e., replacy X\*Ntotal by another high layer parameter Z based on UE implementation. This is similar to Solution 3, but based on Solution 1.   Solution 3’: Similar to Solution 1, replace X · Ntotal with a minimum Z number of candidate resources remaining.   1. We may specify that N > 0 and Z>0 in the solutions. |
| MediaTek | Solution 4 or 5 | Given that the value of N is to be determined by UE implementation (i.e., no new RRC parameter), we don’t see a clear benefit of introducing a complex RSRP threshold-based procedure into the spec.  We are OK with solution 4 or solution 5. |
| InterDigital | Solution 1 | In general, we support the proposal, and we prefer Solution 1.  Regarding the bullet for full sensing, it should be modified as follow:   * + When full sensing is configured ~~with partial sensing~~ by its higher layer, *T2* is selected such that a minimum of *N* slots of the RSW are within the provided DRX active time of RX UE.   We also agree with Apple that N, Z, and Ntotal shall be positive. |
| Futurewei | Solution 2  Can accept 5 | We are not clear the technical merit or intentions of solutions 1, 3 and, 4, where minimum of N slots is introduced and but by UE implementation. If it is by UE implementation, setting a minimum of N slots semi-statically is not necessary. Solution 2 allows dynamic selection of number of slots in Rx active time, which is more flexible for UE design/implementation given that the number of slots in Rx active time can be dynamic.  We prefer solution 2, but option 5 is also acceptable (and the default if no agreement). |
| OPPO | Solution 1, can accept solution 4 | We share similar view as Apple that ““only for the SL DRX active time” is not needed. |
| Xiaomi | Solution 5 | 1) In Solution 1 and 4, N is selected by UE implementation, but there is no limitation on the range of N. If N=0, how can the solutions take effect? If N is selected such that the UE cannot find enough candidate slots in DRX active time satisfying this requirement of N, how should UE proceed? If N is arbitrarily set by UE implementation, basically UE can do anything without setting this higher layer parameter. Then what is the meaning to agree to set this parameter? The solution may create more issues than it tries to solve.  2) the solution 2 and 3 introduce new RRC parameters “RSRP threshold upper bound or maximum number of RSRP increments” which is not necessary from our point of view. According to the Chair guidance, we should try to avoid this when there exists other workable solutions.  3) We think solution 5 is simple, workable and guarantee to satisfy RAN2 agreement without introducing any RRC parameters. Therefore it is preferred. |
| LGE | 3, 5, (1), (2) | From guaranteed candidate resources in the active time perspective, we do not support solution 4. It just ensure N candidate slots for resource selection, so it’s possible that there is no remaining candidate resources after step 7.  Other options can be supported in general. But from simplicity and core operation point of view, we support option 3 and 5. Selecting N candidate slots can be just up to UE implementation, in order to select a subset of candidate resources in the active time. So it’s not a core part of the proposal.  Option 3 is the simplest proposal among the approach based on the RSRP threshold based resource selection. Option 5 is by far the simplest one, which leaves every procedures up to UE implementation. We slightly prefer option 3, but we’re also fine with option 5. |
| Nokia, NSB | Solution 4 or Solution 5 | The text “*N* is a higher layer parameter and the value is determined by UE implementation” needs clarification. If *N* is a higher parameter, how can it is determined by UE implementation? Shall we indicate minimum N?  Other than this, we are okay with Solution 4 or Solution 5. |
| NEC | 1 and 4 | We are fine with either option 1 or 4. Besides, In “when partial sensing is configured with partial sensing by its higher layer” and “when full sensing is configured with partial sensing by its higher layer”, “with partial sensing” seems redundant. |
| vivo | Solution 4, [solution1] | We support the bullet to ensure the N overlapping slots between active time and the selected Y or Y’ candidate slots.  Regarding the newly added bullets for RSRP upper bound in solution1, would it require a new RRC parameter? Or is it determined by the UE implementation? We would like to avoid new RRC parameter at this stage , and if this value is up to UE implementation, wouldn’t the first sub-bullet ‘UE shall satisfy…’ be sufficient?   * The UE shall satisfy this new threshold in addition to the existing minimum *X · Mtotal* number of candidate single-slot resources threshold for the whole set *SA* in Step 7. * The UE shall ensure the RSRP threshold increment in Step 7 is not larger than a RSRP threshold upper bound or maximum number of RSRP increments provided by higher layer. |
| Samsung | Solution 1 or 2, [or 4] | For the solutions we have the following preferences:   * We have strong concern on Solution 5. It may be needed to specify a solution for aperiodic transmission (*P*rsvp\_TX*=*0) according to RAN2 working assumption for periodic transmission as:   *Working assumption: slots associated with the announced periodic transmissions by the TX UE are considered as SL active time of the RX UE.*   * If the majority can accept higher layer impact on this topic, our first preference is solution 1. But we can also accept solution 4 for its simplicity. * If the majority want to avoid higher layer impact, our second preference is solution 2. |
| CATT/GOHIGH | 5 or modified 4 | Solution 5 is preferred.  Solution 4 in principle ok but needs some re-wording:   * When partial sensing is configured ~~with partial sensing by its higher layer~~, a minimum of N slots of the selected Y or Y’ candidate slots are to be within the provided DRX active time of RX UE.   + This does not apply in re-evaluation and pre-emption checking * When full sensing is configured with partial sensing by its higher layer, *T2* is selected such that a minimum of *N* slots of the RSW are within the provided DRX active time of RX UE.   + This does not apply in re-evaluation and pre-emption checking   + *N* is a higher layer parameter and the value is determined by UE implementation. |
| Qualcomm | Solution 3 (with modification) or Solution 5 | Both solutions are similar and achieve the desired outcome of having at least one or Z resources within the receiver’s active time.  In solution 3, using the exceptional resource doesn’t bring any benefit since the receiver is either awake and can receive the signal in any pool or is in inactive state and cannot. Therefore, we propose to remove the last sub-bullet or replace it with leaving behavior up to UE implementation in that case. |
| Lenovo | Solution 5 | We think solution 5 and current agreement(s) can solve this issue. It is not necessary to define a new RSRP threshold. |
| Spreadtrum | Solution 2 or solution 5 | If N is determined by UE implementation, we cannot see the benefit of introducing N. Solution 5 is relatively simple and can be considered as a compromise. We are fine with solution 2 and solution 5. |
| Ericsson | Sol 1 or Sol 4 | We are supportive of Alt. 1 but we can also accept Sol 4 since in our view the main issue that needs to be solved is that the Tx UE selects as many resources as possible during the Rx UE active time. |
| Panasonic | Solution 1, also ok with solution 4. | We share similar view with apple the “only for SL DRX active time” is not needed. |
| CMCC | Solution 1 | We also share the similar view with Apple, that is, using the RSRP threshold increment only for the SL DRX active time in Step 7 may not always be able to satisfy X\*Mtotal, so it may be necessary to do RSRP threshold increment in step 7 for both active and inactive time in this case to satisfy X\*Ntotal and X\*Mtotal simultaneously. |
| Sony | Solution 1 can accept 5 | We prefer solution1 with N shall be positive added and can accept solution 5. |
| Huawei, HiSilicon | Solution 1 or 2 | We can support solution 1 or 2, and we think the part “only for the SL DRX active time” in the solutions is important, it is not necessary to raise the RSRP threshold out of active time which could bring higher level of interference.  On solution 5, we don't think leave to UE implementation on resource selection is reasonable. If sensing behaviour is not specified, this will much affect the entire mode 2 RA. Especially, without a definite common principle, each UE would intend to select a resource best for itself, e.g. the earliest resource, which may cause unexpected collision and degrade system performance.  Solution 4 alone does not solve the problem substantially that current procedure in TS38.214 can excluded all these resources on all the N slots of the selected Y or Y’ candidate slots, that’s why step 7 has to be modified so that there can be sufficient number of resource within indicated SL-DRX active time in any case.  Option 3 is slightly not preferred, due to that UE high layer may not always know the overlapping situation in the PHY layer, i.e. how many overlapping slots between RSW and indicated active time. If the indicated value of Z is larger than the total number of candidate resources within the active time as well as RSW, the Z never be satisfied. |

Summary of inputs:

* Solution 1: 13 + [2]
  + Support: ZTE/Sanechips, Apple, IDC, OPPO, [LGE], NEC, [vivo], Samsung, Ericsson, Panasonic, CMCC, Sony, HW/HiSi
    - Apple, OPPO, Panasonic, CMCC: remove “only for SL DRX active time”
    - vivo, Xiaomi: is new RRC parameter required for the RSRP upper bound? Suggested to remove
    - Apple, IDC, Xiaomi: *N* and *Ntotal* shall be positive
* Solution 2: 5 +[2]
  + Support: Futurewei, [LGE], Samsung, Spreadtrum, Huawei/HiSi
* Solution 3: 3
  + Support: Apple (merge with S1), LGE, QC (no exceptional pool)
* Solution 4: 11 + [1]
  + Support: Apple, MTK, OPPO, Nokia/NSB, NEC, vivo, [Samsung], CATT/GOHIGH, Ericsson, Panasonic
  + Strong concern: LGE, HW/HiSi
* Solution 5: 12
  + Support: MTK, Futurewei, Xiaomi, LGE, Nokia/NSB, CATT/GOHIGH, QC, Lenovo, Spreadtrum, Sony
  + Strong concern: Samsung, HW/HiSi

FL responses:

* @Apple, OPPO, Panasonic, CMCC, the intention of increasing RSRP threshold “only for the SL DRX active time” is that when *X\*Mtotoal* requirement is satisfied for the whole set of *SA* but *X\*Ntotal* is not satisfied for the DRX active time portion, then we should only include more candidate resources for the SL DRX active time portion only. That’s why we should only apply RSRP threshold increment only for the SL DRX active time. If the RSRP threshold increment is applied to the whole set *SA*, then more candidate resources will be included in the DRX inactive time portion, which will create more interference to the newly included resources when they are selected.
* @Apple, I understand the intention in your suggested solution (merge S1 and S3) in the last round, which in my view is very similar to S3. Technically this can work, I can include this merged solution in the next round if S3 is preferred by the majority, which is using *Z* number of resources as the requirement (instead of ratio threshold). Right now, using *Z* number of candidate resources is only proposed by small number of companies who do not like to specify a complex solution (or only based on UE implementation).
* @Futurewei, one reason why *N* or *Z* (in solution 1, 3, 4) is to be determined by UE implementation is that we cannot introduce new RRC parameters in this meeting anymore. Another reason (perhaps more important) is that by UE selecting its own *N* or *Z* values (not semi-statically) these values can be better adapted to the actual situation dynamically (as also preferred by you). For example, for an aperiodic transmission with very limiting DRX active time slots are within the RSW, then the UE would be able to dynamically select an appropriate *N* or *Z* value in this situation. If *N* or *Z* values are semi-statically (pre-)configured, in some extreme cases the UE may not be able to satisfy this requirement.
* @ZTE/sanechip, vivo, Xiaomi, on RSRP upper bound in Solution 1, we can also make this to be a UE internal parameter based on its implementation.
* @All, based on the above summary, due to number of supporters it is safe to eliminate Solution 2 and 3 from now on. Please find below an updated set of proposal 1 for Solution 1, 4, and 5, addressing some of expressed concerns.

**Proposal 1 (III):**

When SL DRX active time of RX UE is provided by the higher layer for candidate resource selection, down-select to one of the followings.

* Solution 1: Based on Proposal 2-1 (VII) from RAN1#107bis-e. That is,
  + When partial sensing is configured with partial sensing by its higher layer, a minimum of *N* slots of the selected *Y* or *Y’* candidate slots are to be within the provided DRX active time of RX UE.
    - This does not apply in re-evaluation and pre-emption checking
  + When full sensing is configured with partial sensing by its higher layer, *T2* is selected such that a minimum of *N* slots of the RSW are within the provided DRX active time of RX UE.
    - This does not apply in re-evaluation and pre-emption checking
  + *N* is a higher layer parameter and the value is determined by UE implementation to be larger than zero.
  + The reported subset of the candidate resources within the provided SL DRX active time of RX UE shall satisfy a threshold.
    - The same higher layer parameter (*sl-TxPercentageList*) is reused for the ratio threshold. That is, *X · Ntotal* number of candidate single-slot resources remaining within the SL DRX active time of set *SA* is to be met by using the RSRP threshold increment only for the SL DRX active time in Step 7, where *Ntotal* is the total number of candidate single-slot resources within the SL DRX active time of the initialized set *SA* in Step 4).
      * The UE shall satisfy this new threshold in addition to the existing minimum *X · Mtotal* number of candidate single-slot resources threshold for the whole set *SA* in Step 7.
      * The UE shall ensure the new RSRP threshold increment in Step 7 to satisfy the new *X · Ntotal* requirement is not larger than a ~~RSRP threshold upper bound or~~ maximum number of RSRP increments provided by higher layer, where the maximum number of RSRP increments is decided by UE implementation.
        + If no candidate single-slot resource remained within the SL DRX active time of the set *SA* after the RSRP increments, UE performs random selection in exceptional resource pool.
* Solution 4:
  + When partial sensing is configured with partial sensing by its higher layer, a minimum of *N* slots of the selected *Y* or *Y’* candidate slots are to be within the provided DRX active time of RX UE.
    - This does not apply in re-evaluation and pre-emption checking
  + When full sensing is configured with partial sensing by its higher layer, *T2* is selected such that a minimum of *N* slots of the RSW are within the provided DRX active time of RX UE.
    - This does not apply in re-evaluation and pre-emption checking
  + *N* is a higher layer parameter and the value is determined by UE implementation to be larger than zero.
* Solution 5:
  + If there is no candidate single-slot resource remained within the indicated SL DRX active time in the set *SA* after Step 7, the UE based on its implementation selects and includes at least one candidate single-slot resources within the indicated SL DRX active time in the set *SA*.

### Proposal for Week 2 Wednesday GTW

**Proposal 1 (XI):**

When SL DRX active time of RX UE is provided by the higher layer for candidate resource selection

* Solution 6 (compromised): If there are less than *Z* candidate single-slot resources remained within the indicated SL DRX active time in the set *SA* after completing the iterations from step 4) to 7) to fulfil , for the reported subset of the candidate resources, the UE applies the RSRP threshold increment in Step 7 and continues the procedure from step 4) to 7) *only* for resources within *the SL DRX active time* with replacingby *Z*, where *Z* is determined by UE implementation within a range of 0 < *Z* ≤ and is the total number of candidate single-slot resources within the SL DRX active time of the initialized set *SA* in Step 4)*.*
* FFS whether the UE shall ensure the RSRP threshold increment in Step 7) is not larger than a RSRP threshold upper bound or maximum number of RSRP increments provided by higher layer.
  + If no more than *Z* candidate single-slot resource remained within the SL DRX active time of the set *SA* after the RSRP increments, UE performs random selection in exceptional resource pool.
* Solution 5 (up to UE implementation): If there is no candidate single-slot resource remained within the indicated SL DRX active time in the set *SA* after completing the iterations from step 4) to 7) to fulfil , the UE based on its implementation selects and includes at least one candidate single-slot resources within the indicated SL DRX active time in the set *SA*.

## Topic #2: Finalization of re-evaluation and pre-emption checking for aperiodic transmission

**Background**: In the last RAN1 meeting (#107bis-e), the group reached an agreement on the solution design for re-evaluation and pre-emption checking in case of aperiodic transmission, which is mainly based on the solution for the periodic transmission case. However, one key difference in the case of aperiodic transmission is that the minimum *M* slots for CPS cannot be guaranteed due to unpredictable traffic arrival timing. It was agreed to further study a solution for this issue until this meeting.

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| **Agreement**  When UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n*,   * The candidate resource set (*SA*) is initialized to the remaining *Y’* candidate slots that starts from slot and ends at the last slot of the *Y’* candidate slots.   + is the first candidate slot after slot *n+T3*. * UE may perform PBPS for periodic sensing occasions after the resource (re)selection when *sl-MultiReserveResource* is enabled for the mode 2 Tx resource pool   + It is up to UE implementation * UE performs CPS starting from at least *M* consecutive logical slots earlier than to  slots earlier than .   + FFS: When the minimum *M* slots for CPS cannot be guaranteed, * All available sensing results not earlier than *n–T0* for the resource pool indicated by higher layer are applied for re-evaluation and pre-emption checking procedures |

Based on discussions and proposals included in the submitted contributions to this meeting (a summary can be found in Section 4.2 in this document), the majority of companies have a view that the UE should sense all available / as much as possible the slots before re-evaluation/pre-emption triggering slot (i.e., until  slots earlier than ). Based on the majority view, the following is proposed from the FL.

**Proposal 2:**

When a UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n* and the minimum *M* slots for CPS cannot be guaranteed,

* UE performs CPS starting from the resource (re)selection trigger slot of the same TB to  slots earlier than .

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| **Company** | **Comments** |
| NTT DOCOMO | Support. |
| ZTE,Sanechips | This solution wold mandate the CPS for aperiodic transmission to be done from the resource selection triggering always, i.e. T\_A =0. We don’t think this solution is good from power saving perspective. We think the proposal below makes better sense from technical perspective.   * When collision of re-evaluation or pre-emption is detected but the minimum M slots for CPS cannot be guaranteed, UE performs random resource selection in an exceptional resource pool |
| Apple | Support. We should try the best to enhance the resource re-evaluation/pre-emption performance. |
| MediaTek | Support. |
| Sharp | Support. |
| Futurewei | Since in the initial selection when the minimum M slots for CPS cannot be guaranteed, RRS is one of options, we may need to specify them separately. If UE performs option A, the proposed CPS is supported. If UE performs option B RRS, UE does not perform re-evaluation and pre-emption. The proposal is updated as  When a UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n* and the minimum *M* slots for CPS cannot be guaranteed,   * If UE performs option A in the initial resource selection, UE performs CPS starting from the resource (re)selection trigger slot of the same TB to  slots earlier than . * If UE performs option B random resource selection in the initial resource selection, UE does not perform re-evaluation/pre-emption at all. |
| OPPO | Support |
| Lenovo | We support this proposal. This sensing occasion for re-evaluation and pre-emption checking is necessary. |
| Xiaomi | Generally support. We suggest to revise the wording of sub-bullet as :  UE senses in all available slots starting from the resource (re)selection trigger slot of the same TB to until  slots earlier than  We think “available” is needed here as UE may need to transmit in some slots so it may not be able to do sensing in all the slots. |
| CMCC | Support |
| Qualcomm | We support the proposal |
| LGE | Not support.  If we adopt the proposal, then defining the minimum M slots for CPS is not necessary because UE is anyway allowed to use available sensing results as much as possible. Following the definition and the rationale for min. M slots, such operation should not be allowed.  On the other hand, in periodic transmission case, UE operation is defined over the same case as follows.   * + - When the minimum *M* slots for CPS cannot be guaranteed, support both       * Option A, the UE ensures the *Y’min* criterion is fulfilled       * Option B: UE performs random resource selection       * When the UE performs Option A or Option B is up to UE implementation   Considering the aperiodic transmission, the option A cannot be guaranteed. So the only feasible option is the option B. We don’t understand why UE should operate differently from the periodic transmission case.  We suggest the following proposal.  **Proposal 2-I:**  When a UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n* and the minimum *M* slots for CPS cannot be guaranteed,   * UE performs random resource selection. |
| InterDigital | We support the proposal.  In our view, if M cannot be guaranteed, the UE should start CPS right after resource (re)selection trigger to obtain as much sensing result as possible. |
| Panasonic | Support |
| CATT/GOHIGH | Support |
| Fujitsu | We are supportive of the proposal. |
| Samsung | We also think the proposal implies that UE always perform CPS from slot n, i.e. TA=0, which is not power efficient way. In our view, for the case of M cannot being guaranteed, UE can perform sensing on all available slots and use existing sensing results as much as possible, including:   * Performing sensing after last SL transmission. E.g. the UE performs a SL transmission in slot , and when M slots for candidate slot cannot be guaranteed, UE performs sensing from slot (note: this is different with “resource (re)selection trigger slot of the same TB”) to  slots earlier than . * UE can reuse sensing results on the slots sensed for , if they are within the M logical slots window before slot * In addition, UE can perform sensing between slot and slot in anticipation for the case the subsequent candidate slots are needed for re-evaluation/pre-emption checking   In addition, we think that when is the case of M cannot being guaranteed needs further clarification. In our view, it can be either of: 1) the logical slots between slot and slot (additionally subject to processing time restriction) are less than M slots; 2) the gap in 1) plus existing sensing result (e.g. for ) within the CPS window of slot are less than M slots. |
| Ericsson | In our view, if the minimum number of slots M cannot be guaranteed, the information from the CPS operation will likely not provide an accurate situation of the resource pool, i.e., in term of available resources. Therefore, we propose to perform PBPS only when if the value M cannot be guaranteed if there are PBPS occasion available.  Nevertheless, due to the periodicity of the PBPS it could also be possible that none of the PBPS occasion fall within the resource re-selection window, i.e., prior to . In this case, only CPS can be used. Therefore, we propose the following modification to the proposal:  **Proposal 2:**  When a UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n* and the minimum *M* slots for CPS cannot be guaranteed,   * If there are PBPS occasions available for (re-)evaluation)/pre-emption prior to the UE does not perform CPS and uses the PBPS occasions. * If there are no PBPS occasions available for (re-)evaluation)/pre-emption prior to , the UE performs CPS starting from the resource (re)selection trigger slot of the same TB to  slots earlier than . |
| Spreadtrum | Support. |
| Intel | Support |
| vivo | Support.  If there are some CPS slots for re-evaluation/pre-emption checking but do not meet the M limit, UE should be allowed to still use the CPS results for resource exclusion to minimize the possibility of collision, which is also in line with option A for CPS in the resource selection stage.  But if there are no CPS slots, e.g., when T\_A=T\_B, UE can only perform random selection.  **Proposal 2:**  When a UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n* and the minimum *M* slots for CPS cannot be guaranteed,   * UE performs CPS starting from the resource (re)selection trigger slot of the same TB to  slots earlier than .   + If there are no CPS slots between the range from resource (re)selection trigger slot of the same TB to  slots earlier than  , UE performs random selection |
| NEC | Support |
| Huawei, HiSilicon | For resource (re)selection procedure for aperiodic transmission (Prsvp\_TX=0), no matter the case that minimum M slots for CPS cannot be guaranteed, or a (pre-)configured threshold Y’min cannot be ensured, the design principle is basically up to UE implementation.  Similarly, for re-evaluation and pre-emption checking for aperiodic transmission, it can be also left as UE implementation on how to use available sensing results including performing sensing slots until. Thus we prefer to leave UE implementation on determine CPS results. |
| Sony | Support |

### Proposal for Week 1 Tuesday GTW

Summary of inputs:

* Support (21): DCM, Apple, MediaTek, Sharp, Futurewei, OPPO, Lenovo, Xiaomi (small modification), CMCC, Qualcomm, IDC, Panasonic, CATT/GOHIGH, Fujitsu, Ericsson (subject to PBPS), Spreadtrum, Intel, vivo, NEC, Sony
* Not support (6): ZTE/Sanechips (random), LGE (random), Samsung (sensing from slot ), Huawei/HiSilicon (up to UE implementation)

FL comments:

* @ZTE/Sanechips, regarding your proposed solution to use random resource selection in an exceptional pool, please clarify how a collision is detected during re-evaluation or pre-emption since the UE would need to perform some sensing in order to detect any collision?
* @Futurewei, for option B, we have tried discussing this issue in the last meeting (RAN1#107bis-e) but could not reached a conclusion/agreement. In my understanding, it is now up to RAN2 or leave it to UE implementation. So, I don’t think we need to specify anything here.
* @LGE, the *M* number of slots is a minimum value for CPS. If *M* slots can be guaranteed, then the UE only needs to perform CPS according to this (pre-)configured value. It serves as a guide. The suggestion to use random resource selection is a bit contradicting to me. The intention of re-evaluation and pre-emption is to check if there is a collision with another UE’s reservation. How is random selection is applied without any sensing to check if there is a collision in the first place?
* @Samsung, I think we should first clarify the scenario where the minimum M slots cannot be guaranteed. In my understanding, this will happen only for resources that are pre-selected / reserved early in time, i.e., close to the resource (re)selection triggering slot *n*. Due to aperiodic transmission, UE cannot do early / pre-sensing to ensure there are at least *M* slots for CPS. And these are the resources that we are trying to resolve in my understanding. For other pre-selected/reserved resources that are more than M logical slots from the initial resource (re)selection triggering slot *n*, this FFS problem would not exist. I hope this clarify the intention / scenario for which the solution is trying to address.
* @Ericsson, the UE could be performing aperiodic transmission in a resource pool that does not allow periodic reservation. In this case, the UE does not perform PBPS.
* @vivo, I think the direction seems reasonable. But in case the UE does have corresponding the PBPS results, it would still make sense to perform re-evaluation and pre-emption checking based on all available sensing results that the UE has.
* Based on all received inputs, FL suggestion to go with the majority.

**Proposal 2 (II):**

When a UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n* and the minimum *M* slots for CPS cannot be guaranteed,

* UE senses in all available slots starting from the resource (re)selection trigger slot of the same TB to  slots earlier than .
  + If there are no CPS slots between the resource (re)selection trigger slot of the same TB to  slots earlier than , it is up to UE implementation to perform random selection or re-evaluation/pre-emption checking based on all available sensing results not earlier than *n–T0*.

## Topic #3: Finalization of (pre-)configured M value range in CPS for periodic transmission

**Background**: For periodic transmissions, it was agreed that when UE performs contiguous partial sensing, the UE monitors *M* logical slots earlier than slot (in case of resource (re)selection) or earlier than slot (in case of re-evaluation and pre-emption checking) based on the following two past agreements. However, the lower bound of the *M* value in the RRC (pre-)configuration has not been settled in RAN1 so far. In the last RAN1 meeting (#107bis-e), the group agreed as a working assumption that the lower bound for the *M* value in the case of aperiodic transmission can be 0 (some see as a way for disabling CPS). The group also attempted to find if there is a way to disable CPS for the case of periodic transmission in the last RAN1#107bis-e meeting, but it was unsuccessful and no conclusion was reached.

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| --- |
| **Agreement (from RAN1#106bis-e)**  When UE performs periodic-based and contiguous partial sensing schemes in a mode 2 Tx pool with periodic reservation for another TB (*sl-MultiReserveResource*) enabled,   * For a resource (re)selection procedure triggered by periodic transmission () in slot *n*, *TA* and *TB* for the CPS monitoring window is defined according to one of the followings:   + *n*+*T*A is *M* logical slots earlier than slot , and *n*+*T*B is slots earlier than , where is the first slot of the selected *Y* candidate slots of PBPS, and , are in units of physical time/slots.     - By default, *M* is 31 unless (pre-)configured with another value.   **Agreement (from RAN1#107-e)**  When UE is triggered to perform re-evaluation and pre-emption checking for periodic transmission (*P*rsvp\_TX*≠0*) in slot *n*,   * During the *q*th reservation period (*q*=0,1,2,…, *Cresel*-1), candidate resource set (*SA*) is initialized to the remaining *Y* candidate slots starts from slot and ends at the last slot of the *Y* candidate slots, where the slot indices of the remaining *Y* candidate slots are equal to [*q* x *Prsvp\_Tx* + ], where is a slot index of *Y* candidate slots used in the initial resource (re)selection.   + is the first candidate slot after slot *n+T3*.   + FFS whether/how to handle the case when number of the remaining *Y* candidate slots is less than *Ymin*. * Scheme 1:   + UE performs PBPS for the remaining *Y* candidate slots according to, whereis a slot belong to the remaining *Y* candidate slots, and *k* and *Preserve* are the same as resource (re)selection.   + UE performs CPS starts from *M* logical slots earlier than to  slots earlier than .     - By default, *M* is 31 unless (pre-)configured with another value. |

Since this is a critical issue that RAN1 must finalize RRC parameters and corresponding values within the first week of RAN1#108-e (i.e., this meeting), based on contributions submitted to this meeting (a summary is provided in Section 4.3 of this document) the FL propose for the lower bound of M to be a non-zero value (4 or 5).

**Proposal 3:**

The lower bound of *M* value for CPS in the case of periodic transmission (*contiguousSensingWindowPeriodic*) for both resource (re)selection and re-evaluation / pre-emption checking is a non-zero value.

* Choose between 4 or 5 for the lower bound

|  |  |
| --- | --- |
| **Company** | **Comments** |
| NTT DOCOMO | OK with 5 (or larger).  Smallest value of is 4, so if the lower bound is 4, it equals 0 (i.e. no CPS). There is no reason to agree 4 rather than 0 if possibility of no-CPS is preferred. |
| ZTE,Sanechips | We believe this can be made the same as WA in the ‘at least CPS case’, lower bound can be 0 |
| Apple | OK with the proposal. |
| MediaTek | Support value 5 or longer. |
| Futurewei | We support 5 (or larger) as we do not have agreement that CPS can be disabled for periodic traffic. |
| OPPO | OK with the proposal. |
| Lenovo&MotM | We cannot see obvious difference between 4 and 5, Either one of them is acceptable to us. |
| Xiaomi | We are fine with 5. |
| CMCC | We support 5 or larger value. |
| Qualcomm | Same view on ZTE to use 0, matching the WA on the CPS case. |
| LGE | Support in general with the comments.  First, we think the lower bound of M should be applied for both periodic and aperiodic transmission case.  Second, the minimum UE processing time across all the SCS values is 4 slots if our understanding is correct. So the value 4 means that the effective CPS window is zero, which allows no CPS. We don’t support to disable CPS for periodic or aperiodic case, so the value 4 should not be allowed.  Depending on SCS, the network can configure M not to be effectively zero in CPS window size. In this sense, we support the value 5 as a lower bound of M value.  **Proposal 3-I:**  The lower bound of *M* value for CPS for both periodic transmission (*contiguousSensingWindowPeriodic*) and aperiodic transmission (*contiguousSensingWindowAperiodic*) case for both resource (re)selection and re-evaluation / pre-emption checking is a non-zero value.   * Choose ~~between 4 or~~ 5 for the lower bound |
| InterDigital | We prefer to confirm the WA made in the last meeting (i.e., RAN1 #107bis). We may consider that CPS is being disabled whenever . |
| Panasonic | We are ok with the proposal. |
| CATT/GOHIGH | Oppose. This should be aligned with aperiodic case   * + The range of (pre-)configured *M* is from 0 (working assumption) to 30   Also, it should be clarified that the range of M and disabling CPS are two separate issues. Configure a non zero value for M does not mean UE has to perform CPS. |
| Fujitsu | We are supportive of the proposal. |
| Samsung | We prefer that M starts from zero for both periodic and aperiodic cases as it provides more flexibility. |
| Ericsson | We are not supportive of this proposal. In our view, it is better to have a unified design for both periodic and aperiodic transmissions. There is not a critical issue to have the periodic window to be defined as we have done for aperiodic transmissions. Therefore, we propose that the CPS window for periodic transmission can be zero.  **Proposal 3:**  The lower bound of *M* value for CPS in the case of periodic transmission (*contiguousSensingWindowPeriodic*) for both resource (re)selection and re-evaluation / pre-emption checking is ~~a non~~-zero value.   * ~~Choose between 4 or 5 for the lower bound~~ |
| Spreadtrum | We are ok with 5, if CPS cannot be disabled. |
| Intel | We are fine with either of the values |
| vivo | Not support.  We share similar view as ZTE that this case should be aligned with WA for aperiodic transmission case.  **Agreement**  When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure and re-evaluation/pre-emption checking triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*,   * For minimum size M of the CPS monitoring window [*n*+*T*A, *n*+*T*B]:   + By default, *M* is 31 unless (pre-)configured with another value   + The range of (pre-)configured *M* is from 0 (working assumption) to 30   Regarding DOCOMO's comments, we have a different understanding of the intent of setting M = 0 to 4. If M is set to 0~4, it means that the UE can definitely select a CPS window that satisfies the M limit and may contain more than M slots, so in this case the CPS can always be performed, we do not see any problem with configuring M=0~4. |
| NEC | OK with 5 as the lower bound. |
| Huawei, HiSilicon | n + TA is defined in logical value, whilst n + TB is based on processing time which is a physical value, based on current agreement. This may result in a case wheren + TA > n + TB for a given M value depending on how logical slots are defined in a resource pool. However, in order to have a valid CPS result and guarantee n + TA < n + TB in any cases, the lower bound of M value for CPS should be a non-zero value. Given the minimum value of is 4, M≥4 can work in all cases without conditions.  We also see the similar issue on resource selection and re-evaluation/pre-emption checking triggered by aperiodic transmission (Prsvp\_TX=0). Although a working assumption is made in the last meeting that M can be zero, it cannot be still guaranteed that UE has available sensing slots. So the range of M should be updated to [4, 30] as well and the WA should be reverted. |

### Proposal for Week 1 Tuesday GTW

Summary of inputs:

* Lower bound for M is zero (8): ZTE/Sanechips, Qualcomm, IDC, CATT/GOHIGH, Ericsson, vivo
* Lower bound for M is non-zero (17): DCM (5 or larger), Apple, MediaTek (5 or larger), Futurewei (5 or larger), OPPO, Lenovo/MotM, Xiaomi (5), CMCC (5 or larger), LGE (5 for periodic and aperiodic), Panasonic, Fujitsu, Spreadtrum (5), Intel, NEC (5), Huawei/HiSilicon (4)

**Proposal 3 (II):**

The lower bound of *M* value for CPS in the case of periodic transmission (*contiguousSensingWindowPeriodic*) for both resource (re)selection and re-evaluation / pre-emption checking is a

* Alt 1: non-zero value (lower bound for *M* is 5)
* Alt 2: zero value (lower bound for *M* is 0)

## Topic #4: Update of resource exclusion in step 6

**Background**: Different from R14 partial sensing and R16 NR-V2X, the timing reference point for performing the resource exclusion step 6c is changed for the partial sensing scheme in R17 and it is no longer the resource (re)selection triggering slot *n* as agreed for PBPS since the periodic sensing occasions between slot n and the first slot of *Y* candidate slots should be also monitored as part of resource (re)selection. Furthermore, different also from R14 partial sensing, the periodic sensing occasion has also been extended to include the second most recent one when *additionalPeriodicSensingOccasion* is (pre-)configured. That means, candidate resources should be excluded from the set *SA* based on two reservation periods earlier in the detected SCI. This behaviour is also different from the resource exclusion principle in R16. As such, some companies proposed to make the following updates to Step 6c.

* **Update 1: The time reference point for** 
  + Reason for change: The sensing occasions determined in PBPS and CPS may be located after slot *n* and such case doesn’t exist in R16 full sensing. Therefore, the reference point / definition for in step 6c should be updated.
  + Option A: if slot belongs to the set , otherwise, slot ’ is the first slot after slot belonging to the set .
  + Option B: if slot belongs to the set , otherwise, slot ’ is the first slot after slot belonging to the set .
* **Issue 2: Update of** 
  + Reason for change: When slot is determined based on slot rather than slot , should be set to the remaining selection window size.
  + Option C: converted to milliseconds
  + Option D: converted to milliseconds, where slot is the last slot of the *Y* or *Y’* candidate slots.
* **Issue 3: Update of calculation of value** 
  + Reason for change: For a periodic reservation detected in the most recent periodic sensing occasion, the reserved resource will be located within the selected *Y* or *Y’* candidate slots. But when the most recent two PSOs are to be sensed by the UE and a periodic reservation is detected in the second most recent PSO, it’s reserved resource will not fall within the selected *Y* or *Y’* candidate resources according to the existing *Q* formulation. And hence, it should be updated.
  + When *additionalPeriodicSensingOccasion* is (pre-)configured,
    - Option E: if and ; otherwise . is set to 2
    - Option F:  *+1 if* *and , otherwise*

Since this topic has been brought up in the last meeting, FL propose the followings

**Proposal 4:**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* if slot belongs to the set , otherwise, slot ’ is the first slot after slot belonging to the set .
* converted to milliseconds, where slot is the last slot of the *Y* or *Y’* candidate slots
* When *additionalPeriodicSensingOccasion* is (pre-)configured, *+1* if and *,* otherwise *.*

|  |  |
| --- | --- |
| **Company** | **Comments** |
| NTT DOCOMO | We understand the motivation.  Meanwhile, why is included in the updated version? n in Rel-16 is resource selection triggering timing. To align with this, might be correct one rather than the proposal? is the last slot of sensing slot, not the selection triggering timing. (Or Rel-16 full sensing is a bit not good...?) |
| Apple | We support the proposal.  We may add the sentence for first sub-bullet that “ is the first candidate slot of partial sensing.” |
| Sharp | We are fine with 1st sub-bullet.  For 2nd sub-bullet, in R16 NR V2X, it was agreed to use T\_scal as RSW(i.e. T2-T1), although the specs was kept as T2 (discussed in the preparation phase of R16 NR V2X in RAN1#108e). We think it is better to reuse the RSW with necessary change, i.e. end of sensing window is instead of slot n, thus, T\_scal is changed as T2-() as Option C implied.  For 3rd sub-bullet, we do not support the proposal. E.g. 4 periodicities (P1/P2/P3/P4) are configured for the resource pool and only one of them (P1) is configured for and the additional sensing occasion is configured. The periodicity in a received SCI (i.e. ) in the sensing occasion can be P2/P3/P4. In these cases, we fail to see why the condition needs to be multiplexed by ‘2’ for the right side. In our understanding, if the condition is applied, it seems the monitoring UE does not need to perform exclusion procedures for the default sensing occasion any longer, since it is already incorporated by the additional one, i.e. Q is increased by 1 compared to R16. Briefly saying, we don’t see the need to separate the case with or without the additional sensing occasion configured, i.e. change of Q is not needed. |
| Futurewei | We are not convinced that the updates are necessary. The sensing exclusions are for the resources Since there is no update on , updates are just for avoiding unnecessary check. On the other hand, for re-evaluation/pre-emption in R16, the sensing is also after slot n. But no update was needed for re-evaluation in R16. Therefore, we do not think this is essential. The proposal is not needed. |
| OPPO | Support this proposal.  Furthermore, we think this proposal is applicable to both initial resource selection and re-evaluation/pre-emption checking. When applied to re-evaluation or pre-emption, ty0 in the first and second sub-bullet should be replaced by tyi, where tyi is the first candidate slots after the re-evaluation or pre-emption trigger. |
| Lenovo&MotM | This proposal is acceptable to us. |
| Xiaomi | We are fine with the 1st sub-bullet.  For the second sub-bullet, we think using option C is more reasonable: converted to milliseconds.  For the last sub-bullet, we do not understand the intention. Even for full sensing UE may monitor multiple occasions in the sensing window for a given period, we are not sure why it needs to be specially treated. |
| CMCC | For the 1st sub-bullet, we agree DCM’s comment that should not be included to follow the same rule in Rel-16;  For the 2nd sub-bullet, we are OK;  For the 3rd sub-bullet, we agree with Sharp that such description seems to mean that the sensing result in the default occasion is omitted, thus, we propose to do following modification:   * When *additionalPeriodicSensingOccasion* is (pre-)configured,   + When, *+1* if *,* otherwise   + When, if *,* otherwise *.* |
| Qualcomm | It isn’t clear to us that the proposal is necessary. |
| LGE | Support in general with the comments.  For the 3rd bullet, we see the rationale of the proposal, but modifying Q value depending on the sensing occasion cannot be supported. It is totally different from Rel.16 procedure. In full sensing case, when the sensing occasion corresponds to the additional SO in partial sensing, UE does not perform the operation proposed in the 3rd bullet. We do not support what is deviated from Rel.16 rule.   * ~~When~~ *~~additionalPeriodicSensingOccasion~~* ~~is (pre-)configured,~~ *~~+1~~* ~~if and~~ *~~,~~* ~~otherwise~~ *~~.~~*   The first two bullets are supported. |
| Panasonic | We are ok with the proposal. |
| CATT/GOHIGH | For the 1st sub-bullet, we agree DCM’s comment.  For the 2nd sub-bullet, it seems Sharp’s proposal is more aligned with legacy spec.  For 3rd sub-bullet, not sure why it is needed. |
| Fujitsu | We are supportive of the first two sub-bullets. For the 3rd sub-bullet, we think the intention is to apply this only when a periodic reservation is detected in the second most recent PSO. In other words, if the reservation is detected in the most recent PSO, the 3rd sub-bullet does not apply. Therefore, the following is suggested.   * When *additionalPeriodicSensingOccasion* is (pre-)configured and slot is the second most recent periodic sensing occasion, *+1* if and *,* otherwise *.* |
| Samsung | 1st bullet: We think . Not sure whether it really needs to subtract . If we are to subtract something it is can be only .  2nd bullet: We think it is more reasonable to use converted to milliseconds.  3rd bullet: OK |
| Ericsson | We do not think that this modification is necessary. Anyway, this issue looks like a maintenance topic and we think that we should focus on other topics such as finalizing the random resource selection mechanism rather than on this. |
| Spreadtrum | For 1st bullet, we support .  For 2nd bullet, option C that converted to milliseconds is more suitable. |
| Intel | Issue 2: Benefits of treating it in this way is unclear. Thus, change seems not necessary.  Issue 3: Further details are need for this solution. We need to clarify that this is only for the additional sensing occasions for PBPS and not for any other resources that is part of partial sensing. We are also not sure that the first condition fulfils the requirement for excluding all resources inside the RSW of the additional sensing resource as in principle there can be multiple. In our understanding the original design target for Rel-16 full sensing was also to exclude resource that would lead to a collision in the next periodic transmission occasion. This should be the same for Rel-17 partial sensing. |
| Vivo | 1st sub-bullet: support, and it should be clarified that is the first slot of the set of Y or Y’ candidate slots  2nd sub-bullet: support.  3rd sub-bullet: support in general  It has been agreed that the 2nd most recent PSO for a given Preserve value should be monitored when *additionalPeriodicSensingOccasion* is (pre-)configured, and thus it should be ensured that UE can use the sensing results in the 2nd most recent PSO for resource exclusion at least according to the given Preserve, otherwise the sensing results and the energy used for monitoring 2nd most recent PSO would be wasted. It is true that indicated by a SCI in a sensing occasion maybe or may not be P1, but without the proposal, UE will never be able to use the results for exclusion even when .  we don’t understand why some companies think the default PSO will be omitted if the condition is applied. An example is as below, and Q=*+1=4*, q=1, 2, 3, 4, thus for a SCI received in a slot in 2nd most recent PSO(corresponding to ), UE can check if the corresponding slot is available, and for a SCI received in a slot the most recent PSO(corresponding to ), UE can check if the corresponding slot is available. Thus , the default PSO will still be used.    It is also ok to further clarify that the sub bullet is only for the 2nd recent PSO since there is no need to check for the SCI in the most recent PSO , changes from either CMCC or Fujitsu is fine   * + When, *+1* if *,* otherwise   When *additionalPeriodicSensingOccasion* is (pre-)configured and slot is the second most recent periodic sensing occasion, *+1* if and *,* otherwise *.* |
| NEC | Actually we share similar view as DCM. In our understanding, R16 spec regards the reference point as the resource selection trigger slot n This actually have some problems to not consider the T\_(proc,0)^SL slots between the last slot of sensing and trigger slot n, which was raised firstly in R1-2008081 by us. Therefore, To align with this, should be the one. |
| Huawei, HiSilicon | This issue does not require new technical decisions on introduction of new UE behaviours, and is more like a maintenance issue to correct specification based on existing agreements. We suggest to discuss this during Editor CR without consuming dedicated email discussion effort for WI and GTW. |
| Sony | We are ok with this proposal and agree with Apple that “ is the first candidate slot” should be added |
| ZTE, Sanechips | T\_{proc,0} can be deleted from the first and second subbullets. The second subbullet is not needed if it is controversial given nothing is broken without the subbullet. |

### Proposal for Week 1 Thursday GTW

FL responses:

* Regarding the need of treating this issue/topic in this meeting, I would like to point out we are already in the maintenance phase for this work item in RAN1 (Q1 of 2022). If there is a necessary change to the specification due to past agreements, then we should discuss this issue now rather than later (which would overlap with R18 SL evolution work). On the other hand, I am also aware of overall situation/progress of this R17 WI in RAN1. Therefore, I will not request to spend a lot of GTW time in treating this topic in this meeting. So far, I see most of companies are aware of this issue/topic and seemed fine with the first two bullets/changes. When they become stable, I will ask for agreement during the GTW session. For the 3rd bullet/change, it still seems more time is needed for some companies. Let’s further discuss this one and see if everyone is on the same page by the end of this meeting for agreement.
* Regarding the necessity of the changes in this proposal for step 6c,
  + @Futurewei, Qualcomm, Ericsson, Huawei/HiSilicon, in my understanding, the key reason is to follow the principle that resource exclusion in set *SA* should be based on the latest detected SCI with one RX reservation period. For example, if the reference time point is not updated, then the resource exclusion will be based on a detected SCI plus several RX reservation periods, which is generally against the principle. Another point is that the changes are reuse the R14 partial sensing principle.
* Regarding inclusion of both and in the first bullet/change for the time reference point,
  + @DCM, CMCC, CATT/GOHIGH, Samsung, Spreadtrum, NEC, ZTE/Sanechips, the reason why is during the time period () the UE does not perform sensing, and that’s why this time period should be excluded. As mentioned by NEC, they proposed to fix this in R16. According to my understanding, this error was a late discovery/proposal in R16 and hence it did not get adopted. Since we have a chance to fix this, I think that’s why the time period () was proposed in multiple contributions.
* Regarding the second bullet/change on ,
  + Option C () is preferred by Sharp, Xiaomi, CATT/GOHIGH, Samsung, Spreadtrum
  + In FL’s understanding, both Option C and D works. The reason why Option D was proposed because it is inline with LTE-V partial sensing and it has majority of support.
* Regarding the third bullet/change on Q formular,
  + @companies who oppose this change (quite many), please refer to my explanation in the background section and also the detailed description given by vivo in the above. I can understand this bullet/change will take time to consider in very detail and hence it is encouraged for companies to consider this further. Since we still have quite some time in this meeting and this issue has been postponed since RAN1#107bis-e, let’s continue the discussion.
  + @CMCC, Fujitsu, vivo, assuming *Preserve* has two values (50ms and 100ms). The second most recent PSO for *Preserve* = 50ms is the also the most recent PSO for *Preserve* = 100ms. In this case, when UE detects a SCI in that PSO it cannot distinguish whether is should be considered as the most recent PSO or the second most recent PSO. In my understanding, we should apply the same Q equation assuming it is the second most recent PSO as per proposal.
* @ALL, based on the above explanations, let’s collect another round of inputs with the following changes and split into two proposals.

**Proposal 4-1:**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* if slot belongs to the set , otherwise, slot ’ is the first slot after slot belonging to the set . Slot is the first slot of the selected set of *Y* or *Y’* candidate slots.
* converted to milliseconds, where slot is the last slot of the *Y* or *Y’* candidate slots

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| --- | --- |
| **Company** | **Comments** |
| ZTE,Sanechips | Ok for progress |
| Sharp | Fine with 1st sub-bullet.  We don’t support 2nd sub-bullet. Regarding FL’s response, to use the last slot of the candidate slots is inline with LTE-V partial sensing, which is incorrect in our views. Specifically, in LTE-V partial sensing, as discussed in R1-1704306 proposed by Huawei in RAN1#88bis, the motivation to use the last candidate subframe is mainly because the minimum interval between the sensing occasion and the corresponding candidate slot is P\_step (100ms) and smaller periodicity (i.e. 20ms/50ms) were introduced, which means to meet the former condition n’-m<=P\_step\*P\_rsvp for scaling of smaller periodicity, the candidate subframe must be within [n+80, n+100] (e.g. P\_rsvp as 20ms). This naturally means the exclusion procedures won’t work for candidate subframes within [n+T1, n+80]. While it isn’t the case for NR partial sensing, i.e. the minimum interval between the sensing occasion and the corresponding candidate slot is P\_reserve which is just the allowed reservation periodicity, thus issue as mentioned previously in LTE-V for smaller periodicity doesn’t exist. Briefly saying, Option C aligns with R16 NR V2X and does not need to be changed. |
| Apple | Support the proposal. |
| Futurewei | Thanks FL for the responses. However, we are still not convinced that the updates are necessary. The sensing exclusions are for the resources Since there is no update on , updates are just for avoiding unnecessary check.  We also have a question on the principle that resource exclusion in set *SA* should be based on the latest detected SCI with one RX reservation period. If that is the case, the second sensing occasion seems useless and then the introduced most recent sensing occasion concept does not make sense. Since the NR partial sensing is different from LTE, we do not think it is necessary to reuse such LTE design principle.  On the other hand, one key reason for the updates is that the sensing can be done after slot n. But for re-evaluation/pre-emption in R16, the sensing is also after slot n. But no update was needed for re-evaluation in R16. If we adopt the proposed update for partial sensing, one question is whether we also need to consider re-evaluation/pre-emption case where sensing is before for the updates. |
| OPPO | Support. UE utilizes only the most recent sensing result before the reference point for resource exclusion in LTE full sensing, LTE partial sensing and NR full sensing because the inequations (,  and have to be satisfied for small reservation period and Q is equal to 1 for large reservation period. If we don’t update the reference point in NR partial sensing, UE would use the SCI before slot n for resource exclusion but the same SCI (i.e. the latest sensing result) may be received again before the selected Y slots. |
| Xiaomi | Although we still think is more reasonable, we can accept this if this is the majority view. |
| LGE | Support.  For Tscal, should be used instead of T2 to be more precise on the procedure. If T2 is used, UE calculates unnecessary resource exclusion timing, which is useless for resource exclusion during the period from to T2. We don’t see why T2 is a better choice than . |
| NEC | Support. Thanks Kevin for the explanation, which makes sense to me. Let’s fix it in current R17 stage. |
| Vivo | Support |
| Samsung | We’re fine with the proposal. |
| CATT/GOHIGH | Similar view as Sharp. |
| Qualcomm | Thanks for the explanation. We now agree that the reference point needs to be shifted in order to implement the following agreement:  **Agreement**  In periodic-based partial sensing, UE monitoring of periodic sensing occasions between triggering slot n and the first slot of the selected Y candidate slots subject to processing time restriction is performed as part of resource (re)selection.  What isn’t clear yet is what value to use:   * , * , * , or something else.   Using the first two option would lead to being satisfied more often than the third option, making more often, and potentially excluding additional resources in the resource selection window. We’re not clear that this is the desired behavior.  On , our preference is to follow Rel-16 as closely as possible. |
| Ericsson | Thanks FL for the explanation. We now see the motivation and we think a change is needed. However, similar to QC’s view we are not completely sure that the proposed formulation is the best one. Why do we need to include Tproc,0?  Regarding the value of Tscal, we prefer to keep the value T2 instead of tyL since we do not see why T2 is a worst option, and it is aligned with the Rel-16 procedure. However, if majority of companies support this change, we can be OK with it. |
| Panasonic | We are ok with the proposal. |
| CMCC | Support |
| Sony | Ok with this proposal |
| Huawei, HiSilicon | We see the motivation, however, we think current spec in step 2) already covered the details for partial sensing, such as the determination of sensing occasions, and how to update step 6) can be also left to editor and discussed during draft CR discussion phase. |

**Proposal 4-2:**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* When *additionalPeriodicSensingOccasion* is (pre-)configured, *+1* if and *,* otherwise *.*

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| **Company** | **Comments** |
| Sharp | We don’t support the proposal. Regarding comment from vivo in the last round, the proposal only stands if the received SCI in the second most recent sensing occasion indicates P1 which is the very same periodicity as P\_reserve (in t\_y-k\*P\_reserve). For any other allowed periodicity in the list (e.g. P2, P3,…), it would cause the UE to perform extra exclusion procedures while some of the hypothetical t\_m+q\*P\_rsvp(RX) do not even locate within the RSW. Regarding another motivation from the proponents that once the additional sensing occasion is (pre-)configured, the exclusion procedures should be performed for the received SCI in that occasion. Note that in R16 NR V2X for full sensing, e.g. for a reservation period larger than T\_scal, if an SCI is received in the second most recent sensing occasion, Q is 1 which means q=1 and accordingly t\_m+1\*P\_rsvp(RX) (i.e. the most recent sensing occasion) is still outside RSW which certainly won’t overlap with R\_x,y. Once the UE does receive a periodical SCI in the most recent sensing occasion, the exclusion procedures in Step 6) shall work; Otherwise, the SCI received in the second most recent occasion doesn’t mean anything. In general, this is over optimization since w/o the change of Q, there is no big issue and for R16 NR V2X, there is no such optimization to increase Q. |
| Apple | We support the proposal.  This is to ensure the sensed periodic reservation in the second most recent sensing occasion could be extended to the resource selection window. |
| OPPO | Support. The higher layer parameter *additionalPeriodicSensingOccasion* is meaningless without such modification in Proposal 4-2 because UE cannot use the SCI received in the additional sensing occasion corresponding to a specific Preserve based on the current Step 6 c). |
| Xiaomi | We still do not see the necessity to introduce this revision. |
| LGE | Not support.  As explained in the previous round, using the equation in the current CR does not make the additional sensing useless.  If is larger than Tscal, the additional sensing provides meaningful sensing results for resource exclusion, as defined in Rel.16. But in FL proposal, it modifies the Rel.16 rule as make Q=2, which cannot be supported.  If is smaller than Tscal, the additional sensing results are not used for resource exclusion. Some companies insist that this makes the additional sensing useless, but the operation is perfectly in line with Rel.16 procedure. We don’t support increasing Q value without technical justification compared to Rel.16 procedure. |
| NEC | Support with modification.   1. For current proposal 4-2, when slot m is the most recent sensing occasion but can not fulfil, Q value should be 1 according to R16 spec. However, in current proposal 4-2, slot m can fulfil, Q value will be increased to 2, 3, 4…, which is not correct. 2. On the other hand, if we totally reuse the R16 spec, the reservation in the second most recent sensing occasion will be ignored because in this case, and Q value will be Q = 1, then only is checked. 3. The most second sensing occasion is configured to avoid the case that the most recent sensing occasion is missed. Hence, we share same view as CMCC, Fujitsu to modify it as:  * When *additionalPeriodicSensingOccasion* is (pre-)configured and slot is the second most recent periodic sensing occasion, *+1* if and *,* otherwise *.* * When *additionalPeriodicSensingOccasion* is not (pre-)configured, reuse current R16 spec procedure. |
| vivo | Support.  Regarding sharp’s first comment, if the hypothetical slots t\_m+q\*P\_rsvp(RX) with modified Q do not even locate within the RSW or candidate set, then they will have no impact on the resource exclusion, thus there is no problem with the modified Q. Regarding the comment that the exclusion procedures should be performed for the received SCI in the most recent occasion, this is only true for full sensing, and we disagree with argument that using SCI in the 2nd most recent PSO is useless. Monitoring 2nd most recent PSO is an important feature introduced for NR SL power saving, one of the reasons to support this feature is that this feature has been proved to be more beneficial compared to using the most recent PSO only by allowing resource exclusion based the 2nd most recent PSO. If resource exclusion based the 2nd most PSO is not allowed, then why *additionalPeriodicSensingOccasion* is agreed and (pre-)configured? |
| Samsung | We’re fine with the proposal. |
| CATT/GOHIGH | We don’t support this proposal |
| Ericsson | We do not support this proposal. We think that there is no need to change the formulation for partial sensing UEs and that using the one from Rel-16 for full sensing UEs work. |
| Panasonic | We are ok with the proposal. |
| CMCC | We think when we design this mechanism, we should consider the relationship b/w Preserve and the detected .  For example, for a PSO, assuming the corresponding Preserve= {P1(most recent), P2(2nd most recent)}, if the detected =P1, the formula in legacy text (… otherwise ) should be used ; if =P2, the formula in this proposal (+1… otherwise ) should be used.  However, as metioned by FL, the detected can also be P3 which is not included in the set of corresponding Preserve value for this PSO, to avoid over-exclusion we think the formula in legacy text (… otherwise ) should also be used in this case.  It should also be noted that even if the reserved resource is not located within the RSW, it also has the possiblity to cause resource collision when the current Tx is a periodic transmission. |
| Huawei, HiSilicon | Similar comments for proposal 4-1. |

### Proposal before Week 2 first GTW

Summary of inputs on Proposal 4-1 in Section 3.4.1:

* On defining the timing reference slot in partial sensing as ,
  + Support: ZTE/Sanechips, Sharp, Apple, Xiaomi, OPPO, LGE, NEC, vivo, CATT/GOHIGH, QC, Panasonic, CMCC, Sony (15)
  + Change is needed but unsure how: QC, Ericsson, HW/HiSi (4)
  + No change is needed: Futurewei (1)
* On defining the selection window for in partial sensing,
  + Option C: converted to milliseconds
    - Sharp, Xiaomi, CATT/GOHIGH (4)
  + Option D: converted to milliseconds, where slot is the last slot of the *Y* or *Y’* candidate slots
    - ZTE/Sanechips, Apple, OPPO, LGE, NEC, vivo, Panasonic, CMCC, Sony (10)
  + No change is needed ( converted to milliseconds)
    - Futurewei, QC (2)

FL responses on Proposal 4-1:

* @Sharp, CATT/GOHIGH, using for derivation in Option D to align with LTE-V is not intended to resolve the small periodicities problem in LTE-V. But since the value of will determine the number of times the detected SCI needs to be repeated (according to ) within the selection window, the larger the the more repetition will happen as can be seen by the Q equation (). If using Option C (aligning with R16 NR-V), the value of will be larger than that for Option D and the detected SCI will be repeated after the last slot of Y (), which is not really needed for the resource exclusion. Therefore, I think this is the reason why most company prefer Option D. Like I said before, both options will work. It is just that Option D is more accurate. In the future or for someone who doesn’t follow this discussion, it may cause some confusion to them as to why instead of .
* @Futurewei, need to work out the Q value to see the effect / difference to R16 full sensing case. By looking only at the term (), it does not tell the full story. In addition, in R16, the selection window for both the initial resource (re)selection and re-evaluation/pre-emption starts immediately after slot n. The key difference is that the “selection window” (which is the *Y* candidate slots in partial sensing) can start much later than the triggering slot during the initial resource (re)selection.
* @Qualcomm, the purpose of the timing reference point should be referring to the last possible slot where the UE performs sensing operation. If a detected SCI is in slot m, after adding one *Prsvp\_RX* and it falls after the timing reference point, it means the detected SCI is the last SCI in a periodic reservation. If *Tscal* does not change from R16 (i.e., keeping *T2*), effectively it means we will potentially repeat the received SCI more times that falls after the selected *Y* candidate slots or even after *n+T2*, which is not necessary.
* @HW/HiSi, thank you for recognizing something needs to be changed. But in this case, It will be hard for the editor to figure the right way since the resource exclusion procedure and formular is quite complicated. In the past, the exclusion step and procedure has always been determined by the delegates who design the sensing and reservation mechanism. We still have time within this meeting. Please take a look at this issue and try to achieve as much as possible without leaving everything to the CR phase (which will overlap with R18 SL work).
* @All, in the second round of discussion, more companies realized some changes are needed in step 6c for partial sensing. Based on the inputs in this round, still not all companies have looked into this topic in detail. Please take time to look into this in this meeting.

**Proposal 4-1 (unchanged from the last round):**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* if slot belongs to the set , otherwise, slot ’ is the first slot after slot belonging to the set . Slot is the first slot of the selected set of *Y* or *Y’* candidate slots.
* converted to milliseconds, where slot is the last slot of the *Y* or *Y’* candidate slots

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Sharp | Thanks FL for the further explanation. As FL’s responses, is used for LTE-V to resolve small periodicity problem, while in NR partial sensing, there are no such issue. Thus, it is not the reason to use for NR partial sensing.  Regarding Option D is more accurate from FL’s responses, we don’t think it is entirely right. Note that the determination of Q is based on physical time, i.e. ms, while the terminology is defined in logical slots, which means the time gap between and can be smaller than the time gap between the first and the last candidate slot, due to the scattering issue which is much discussed in R16 NR V2X. Specifically, since slots of a resource pool are configured via a bitmap, if there happens to be dense configuration of resource pool slots within the RSW, calculation of Q depending on is worse than n+T2. Below is an example for illustration, e.g. , , Q= and e.g. logical slots as determined in 8.1.7 of TS38.214. The ideal case should be 4\*2=8 logical slots within , while due to the scattering issue as discussed above, there might possibly 10 or more logical slots, as shown follows. In this case, Option C to increase Q as large as possible is safer to include the “missing periodical SCI” which may cause resource collision with the last candidate slot . Therefore, we think Option C is much safer way to resolve the scattering issue and aligns with the mechanism as in R16. |
| vivo | Support. |
| NEC | Agree. The most basic point is the reference point, it should be the first slot UE have no t monitored or end of the sensing occasion. Reference point in R16 full sensing spec (slot n) is not fully correct, we need to redefine it in R17. |
| Apple | Support. |
| CMCC | Support. |
| NTT DOCOMO | Support. |
| Xiaomi | We think the proposal is only applicable to initial resource selection. For re-evaluation and pre-emption, this proposal is not needed. |
| OPPO | Support FL’s proposal.  As for the issue proposed by Sharp, we think the same issue also exists in R16 full sensing due to the Q is determined based on the reservation period but the reserved slots are calculated within the resource pool. However, we finally agreed in R16 that Tscal is equal to T2 rather than the remaining PDB which may be much safer for resource exclusion. |
| Samsung | Our preference is that or , and .  But if majority view is converged with the proposal, we can support the it for progress. |
| LGE | Support.  We share the view with OPPO. |
| ZTE,Sanechips | With Sharp's explanation, we are fine to go with option C as well. Either works. |
| Lenovo | Support. |
| Ericsson | Support |
| MediaTek | Support. |
| Futurewei | Based on the follow-up comments from FL, we are ok with the proposal. |

Summary of inputs on Proposal 4-2:

* On defining the Q formular when *additionalPeriodicSensingOccasion* is (pre-)configured,
  + Support: Apple, OPPO, NEC (modification), vivo, Samsung, QC, Panasonic, CMCC (modification) (8)
  + Not support: Sharp, Xiaomi, LGE, CATT/GOHIGH, Ericsson (6)
  + Further consideration is needed: HW/HiSi (2)

FL comments on Proposal 4-2:

* @Sharp, Xiaomi, LGE, regarding the first part (P1, P2, P3), it is normal to receive different reservation periodicities within a PSO and it is reasonable to exclude resources according to all received SCI as long as the indicated resources fall within the Y candidate slots according to the Q formular. So, although a PSO is derived based on P1, in my understanding resource exclusion according to reservation periodicities that are different to P1 would be OK too. On the second point, if the R16 Q formular is reused for the second most recent PSO, the UE would not exclude resources based on the detected SCI because Q will be 1 (meaning it will only repeat once and the indicated resource will not fall within the selected Y candidate slots). Then nothing gets excluded. In the end, the UE spend processing power to monitor the second most recent PSO but nothing will be excluded from such sensing.
* @NEC, CMCC, as explained in the last round, a detected SCI in slot could be the first PSO for a Preserve value (e.g., 100ms) but it could also be the second PSO for another Preserve value (e.g., 50ms). Therefore, it is best to treat the SCI detected in slot as the second most recent PSO uniformly when *additionalPeriodicSensingOccasion* is (pre-)configured, although it may cause the reservation to repeat one additional time outside the selection window (i.e., *Y* candidate slots). But I agree with the new proposed bullet.
* @All, similar to Proposal 4-1, still not all companies have looked into this topic in detail. FL encourages the remaining companies to take a look at this by Week 2 GTW session.

**Proposal 4-2 (unchanged from the last round):**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* When *additionalPeriodicSensingOccasion* is (pre-)configured, *+1* if and *,* otherwise *.*

|  |  |
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| **Company** | **Comments** |
| Sharp | Thank you FL for the further explanation. While as commented by LGE in the last round, “nothing gets excluded” only applies for the PSO with P1, instead of P2/P3 and such optimization for P1 only as the proposal indicates is not really needed from our perspective. In our understanding, R16 NR V2X full sensing mechanism ensures the UE monitors 2nd 3rd 4th PSO, … within the sensing window, we do not see similar optimization since to monitor more slots certainly improves the performance, e.g. for P2/P3, aperiodic traffic, etc. Therefore, we don’t support the proposal and think no change is needed compared to R16 NR V2X in terms of determination of Q. |
| vivo | Support FL’s proposal.  We disagree that the proposal is an optimization, the modifications on Q is essential for completing the procedure of the 2nd most recent second PSO feature.  This feature is new for SL, and one of reasons of supporting the feature is that it can improve performance by excluding resources based on the additional sensing results. It is not appropriate to simply reuse the R16 procedure especially considering that the legacy Q formula actually does not allow the UE to achieve the benefits, it would make the whole feature incomplete and useless. |
| NEC | Thank you for explanation. We support it.  If we totally reuse the R16 spec formula, the reservation in the second most PSO will be ignored/useless because in this case, and Q value will be Q = 1, then only is checked. However, is the actually is first most PSO. |
| Apple | Support the proposal.  In the current specification, if and , the value *Q* is equal to ; otherwise, *Q=1*. The condition is to ensure the next periodic resource reserved at slot is before the reference slot , while the condition indicates the possibility of more than one periodic resource reserved at slot is within the resource selection window.  When the parameter *“additionalPeriodicSensingOccasion”* is (pre)configured, if and , then the value *Q* is equal to **+1**. Here, the condition is to ensure the second most recent sensing occasion for a given reservation periodicity is counted in the resource selection window, and the value *Q* is increased by 1 to compensate the additional reservation periodicity before the starting of the resource selection window.  This is illustrated in the following figure, where is the reference slot in Proposal 4-1. Consider the example of ms, slots and ms. If is at slot 0 and is at slot 14, then the range of are within the resource selection window. This implies that value of *Q* is extended by 1.  A screenshot of a computer screen  Description automatically generated with low confidence  For the other cases, the value of *Q* should also be extended by 2, to capture the second most recent sensing occasion for a given reservation periodicity. This is illustrated in following figure.  A picture containing application  Description automatically generated |
| CMCC | Support.  After reading the explanation from FL, now we agree that this proposal is a simplest way to make the sensing result in the 2nd most recent PSO available, just reusing R16 method does not make sense since it will make the configuration of *additionalPeriodicSensingOccasion* useless*.* |
| NTT DOCOMO | Support. |
| Xiaomi | We do not support the proposal. The value of Trsvp\_Rx can be totally different from the value of period to determine the sensing occasion(s). We still think the procedure of Rel-16 can work. |
| Samsung | Support. |
| Panasonic | Support |
| ZTE,Sanechips | Ok |
| Ericsson | Support. |
| MediaTek | Support |
| Futurewei | Based on the follow-up comments and explanations from FL, we are ok with the proposal. |

### Proposal before Week 2 second GTW

Summary of inputs on Proposal 4-1 in Section 3.4.2:

* On defining the timing reference slot in partial sensing as ,
  + Support: Sharp, vivo, NEC, Apple, CMCC, DCM, Xiaomi (initial selection only), OPPO, LGE, ZTE/Sanechips, Lenovo, Ericsson, MediaTek, Futurewei
  + Samsung: or , but OK with the majority
* On defining the selection window for in partial sensing,
  + Option C: converted to milliseconds
    - Sharp, ZTE/Sanechips (OK with option D)
  + Option D: converted to milliseconds, where slot is the last slot of the *Y* or *Y’* candidate slots
    - vivo, NEC, Apple, CMCC, DCM, Xiaomi (initial selection only), OPPO, LGE, ZTE/Sanechips, Lenovo, Ericsson, MediaTek, Futurewei
  + No change is needed ( converted to milliseconds)
    - Samsung (OK to go with majority)

FL responses on Proposal 4-1:

* @Sharp, I think there may have been some misunderstanding. In my last round’s response, I meant using for derivation in Option D to align with LTE-V is **NOT** intended to resolve the small periodicities problem in LTE-V. Nevertheless, I understand your preference to go with Option C now is due to the scattering problem described in this round.
* @All, to reflect Xiaomi’s comment, the proposal is updated in Proposal 4-1 (II) below.

**Proposal 4-1 (II):**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* if slot belongs to the set , otherwise, slot is the first slot after slot belonging to the set . Slot is the first slot of the selected set of *Y* or *Y’* candidate slots for the case of resource (re)selection.
* converted to milliseconds, where slot is the last slot of the *Y* or *Y’* candidate slots for the case of resource (re)selection.
* FFS: the case of re-evaluation and pre-emption checking

Summary of inputs on Proposal 4-2 in Section 3.4.2:

* On defining the Q formular when *additionalPeriodicSensingOccasion* is (pre-)configured,
  + Support: vivo, NEC, Apple, CMCC, DCM, Samsung, Panasonic, ZTE/Sanechips, Ericsson, MediaTek, Futurewei (12)
  + Not support: Sharp, Xiaomi (2)

FL responses on Proposal 4-2:

* @Sharp, Xiaomi, please refer to detailed explanation from Apple with diagram illustration.

**Proposal 4-2 (unchanged from the last round):**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* When *additionalPeriodicSensingOccasion* is (pre-)configured, *+1* if and *,* otherwise *.*

### Proposal for Week 2 Wednesday GTW

**Proposal 4-1 (III):**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* if slot belongs to the set , otherwise, slot is the first slot after slot belonging to the set .
* Option C: converted to milliseconds.
* Option D: converted to milliseconds, where slot is the last slot of the *Y* or *Y’* candidate slots.
* Slot is the first slot of the selected/remaining set of *Y* or *Y’* candidate slots.

**Proposal 4-2 (IV):**

In Step 6 c) of TS38.214 Section 8.1.4, when UE is configured with partial sensing by its higher layer, adopt the following changes:

* When *additionalPeriodicSensingOccasion* is (pre-)configured,
  + Option 1: *+1* if and;otherwise
  + Option 2:
    - Case 1: if and *;* *+1*
    - Case 2:if and *;* 2
    - Case 3:if and *;*
    - Case 4:Otherwise
  + Option 3:
    - if and *,*
    - else if , +*1*
    - else
  + Option 4: No update to the Q formular (i.e., existing R16 Q formular is reused)

## Topic #5: Handling of non-monitored slots in step 5

**Background**: In both the last RAN1#107bis-e and this RAN1#108-e meetings, it has been brought up by some companies that the issue of resource exclusion due to non-monitored slots in step 5/5a should be resolved in partial sensing. According to the latest 38.214 R17 specification, Step 5/5a is applied in the case of partial sensing. On the other hand, this is not applied in R14 LTE-V2X for partial sensing.

Back in RAN1#104-e meeting, this issue was already discussed. At that time, it was proposed for UE to avoid selecting *Y* candidate slots that would collide with UL and other SL transmissions. However, this proposal was removed based on comments and understanding that this can be done by UE implementation and there is no need to capture this in the spec as in R14. So, it implies that the issue of non-monitored slots would not exist based on UE careful selection of Y candidate slots. As such, the existing / R16 step 5/5a would not be needed.

In this meeting, it has been proposed by some companies to capture this as an agreement, so that it can be correctly reflected in TS 38.214. To this end, the FL propose the following:

**Proposal 5:**

* For Step 5 and 5a of TS38.214 Section 8.1.4, they are only applied for UE configured with full sensing by its higher layer.

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| --- | --- |
| **Company** | **Comments** |
| NTT DOCOMO | We are fine with this direction, but in this case, also step 2 needs to be updated, right? Or the sentence in step 2 of “The UE shall monitor slots which belongs to a sidelink resource pool within the sensing window except for those in which its own transmissions occur” is applied to partial sensing as well? The paragraph has a text “when the UE performs full sensing”, so we feel a bit ambiguous. |
| Sharp | We are fine with the proposal. |
| Futurewei | If it is by UE implementation to avoid selecting *Y* candidate slots that would collide with UL and other SL transmissions, the step 5 and 5a are ok for partial sensing too. Therefore, the proposal is not necessary. But removing steps 5 and 5a for partial sensing may have performance impact for UE with bad implementation. So, we do not support this proposal. |
| OPPO | OK with the proposal |
| Lenovo&MotM | This proposal is fine with us. |
| Xiaomi | When the issue was discussed in RAN1#104-e, it is still unclear whether UE may use sensing results after resource (re)selection is triggered. However later we agreed that UE may use sensing results before Y candidate slots but after slot n when resource (re)selection is triggered. This is different from LTE-V, where all the sensing results are available at slot n and thus UE can select only candidate slots without half-duplex issue. By allowing UE to use sensing results in the future, we can no longer assume that Y or Y’ candidate slots without half-duplex issue can be selected by UE implementation. UE cannot preclude future collisions when it determines the set of Y or Y’ candidate resource at slot n.  Therefore, we do not support this proposal. |
| CMCC | We are fine with this proposal to follow the principle in R14 LTE-V2X for partial sensing. |
| Qualcomm | It isn’t clear to us that the proposal is necessary. |
| LGE | Support.  Following the LTE-V2X partial sensing rule, and considering insufficient resources in partial sensing, we support not to apply step 5/5a in partial sensing. |
| InterDigital | We support the proposal |
| Panasonic | We are ok with the proposal. |
| CATT/GOHIGH | Not support. There is no need for this proposal, and it could also cause confusion. |
| Fujitsu | We are supportive of the proposal. |
| Samsung | We prefer to deprioritize the topic until other details of partial sensing becoming clear. |
| Ericsson | We do not think that this modification is necessary. Anyway this issue looks like a maintenance topic and we think that we should focus on other topics such as finalizing the random resource selection mechanism rather than on this. |
| Spreadtrum | We support the proposal. |
| Intel | Proposal seems does not cover all cases. For example, the case that for PBPS a PSO is not sensed due to the half duplex issue, we think the corresponding resource should be excluded. Proposed update to Step 5 and 5a would no longer be the case. Thus, further discussion how to handle these special cases is necessary. |
| vivo | Support as it follows the LTE V2X design |
| NEC | We support not to apply step5/5a following LTE principle. In the beginning of this WI, we proposed to not select slots associated with non-monitored slots when determining Y slot, and finally it was agreed as UE implementation, thus we assume this non-monitored associated slots will not be selected by UE. Hence, step5/5c is not needed. |
| Huawei, HiSilicon | We are ok with the proposal 5, which has same handling for partial sensing procedure in LTE-V. Step 5 and 5a are not needed in partial sensing given that selection of Y (Y’) is UE implementation. It is not reasonable to assume that a UE selects a slot which does not have corresponding sensing result due to half-duplex, i.e. a UE can avoid this by its UE implementation. |
| Sony | Ok with this proposal |
| ZTE,Sanechips | ok |

### Proposal for Week 1 Tuesday GTW

Summary of inputs:

* Support/accept: DCM, Sharp, OPPO, Lenovo/MotM, CMCC, LGE, IDC, Panasonic, Fujitsu, Spreadtrum, vivo, NEC, Huawei/HiSilicon, Sony, ZTE/Sanechips (18)
* Not needed/deprioritize: Futurewei, Xiaomi, Qualcomm, CATT/GOHIGH, Samsung, Ericsson, Intel (8)

FL comments:

* @DCM, the issue raised in Step 2) could be discussed separately. In my understanding, there would be cases when slots within the sensing window are used for UL or other SL transmissions when UE performs full sensing. In the case of partial sensing, if Y and Y’ candidate slots can be selected by UE implementation to avoid UL and other SL transmission slots, we may not need this sentence “*except for those in which its own transmissions occur*”.
* @All, based on the comments received, there seems to be two schools of thought. One being UE based on its own implementation is able to select Y/Y’ candidate slots with corresponding sensing slots that do not overlap with its own UL and other SL transmissions. The other one being UE is NOT able to, such that it is still necessary to perform step 5/5a for partial sensing. To this end, Futurewei brought up an interesting thought that if a UE is able to avoid selecting Y slots that will result in collision between sensing and UL/SL transmissions, then keeping step 5/5a would not make a difference to partial sensing. On the other hand, to guard from bad UE implementation, step 5/5a will be a good way to avoid Tx collision with others. Based on this, the FL propose the following conclusion.

**Proposed conclusion 5 (II):**

* The existing Step 5 and 5a are applicable for UE configured for partial sensing by its higher layer.
  + Note, no change is needed to the current Rel-17 38.214 Section 8.1.4 due to this conclusion.

### Proposal for Week 1 Thursday GTW

FL comments:

* Based on the comment received in the last GTW session, it is clear the proposed conclusion 5 (II) above will not be accepted by the majority of company.
* It is well understood based on the comments raised in the first round, there are different views. However, since we don’t have an explicit agreement in the past on whether step 5/5a is applicable and the current structure of the spec description (mixing full and partial sensing together) implies that step 5/5a should be applied also for partial sensing UEs, we still need to make a decision in one way or another.
* Technically, based on the comments from Xiaomi and Intel, the half-duplex issue can still happen to partial sensing UEs. And hence, the existing Step 5/5a should be applied. Based on this, I would like to gather more views/opinions from the group on this issue to make a right technical decision in the table below (assuming the same Proposed conclusion 5 (II)).
* If there is other better / compromised way forward, please feel free to make your suggestion.

**Proposed conclusion 5 (II) repeated:**

* The existing Step 5 and 5a are applicable for UE configured for partial sensing by its higher layer.
  + Note, no change is needed to the current Rel-17 38.214 Section 8.1.4 due to this conclusion.

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| **Company** | **Comments** |
| ZTE,Sanechips | ok |
| Sharp | In LTE-V partial sensing, as discussed in R1-1707868 (corresponding CR is in R1-1709332) in RAN1#89 proposed by Samsung, the reason to remove Step 5) for non-monitored case is “In partial sensing, for any candidate resource in subframe y within the set of Y subframes, UE must have sense at least subframe y-100\*k, which was the agreement in RAN1 and also captured in step 2) in 14.1.1.6 for partial sensing”. In our understanding, for PBPS in NR partial sensing, such reason still stands, which means UE shall at least monitor t\_y-k\*P\_reserve sensing occasion(s) corresponding to one candidate slot t\_y and current specs for R17 partial sensing is implemented in this way. For CPS, it can be treated like full sensing within a time duration and UE may have to perform SL transmissions within the time duration, thus, Step 5) is applicable for CPS. In general, we have the following proposal:   * Proposal: If UE is configured for partial sensing by its higher layer,   + For the SCI(s) monitored in the sensing occasions associated with PBPS (i.e. t\_y-k\*P\_reserve), Step 5 and 5a are removed.   + For the SCI(s) monitored in the sensing occasions associated with CPS, Step 5 and 5a are applicable.   [Sharp\_2]: After reading companies’ input, we are generally fine with the proposal for progress. Nevertheless, the sub-bullet for Note is incorrect from our perspective. If Step 5 is kept, it means UE may perform SL/UL transmission within the CPS sensing window, then the change similar as DCM proposed in 1st round for M consecutive slots in CPS of Step 2) is needed, i.e. “The UE shall monitor M consecutive slots which belongs to a sidelink resource pool except for those in which its own transmissions occur”. For sensing occasions of PBPS, i.e. t\_y-k\*Preserve, such description is not needed and specs does not need to be changed. |
| Apple | Fine with the proposal. |
| Futurewei | We support this proposal. Since partial sensing mechanism in NR is different from that in LTE, e.g., sensing occasions (the location of sensing slots for different periodicities) in PBPS, CPS, we do not think it is appropriate to directly use LTE solution (which does not have technical benefit) here. FL’s summary above clearly shows the technical merit of keeping the existing Step 5/5a. |
| OPPO | Support |
| Xiaomi | Agree |
| LGE | Support.  Considering the comments from other companies on half duplex issue, we agree to support that step 5/5a is necessary for partial sensing. It is so especially because NR V2X supports aperiodic transmission, different from LTE-V2X. |
| Nokia, NSB | Agree |
| NEC | We can accept this proposal for compromise. Also considering if UE already exclude the non-monitored associated slots from Y candidate slot, then step 5/5a will not exclude any slot. |
| vivo | we are ok with the proposal. |
| Samsung | We consider the conclusion may be pre-matured, but if it is accepted by the majority, we can compromise for progress.  However, we would like to remove the sub-bullet to not exclude the possibility of further modification if found necessary. In our understanding, it is a conclusion, thus even without the sub-bullet, it will also introduce no specification change for now. |
| CATT/GOHIGH | OK |
| Qualcomm | Support |
| Lenovo | This proposal is acceptable to us. |
| Spreadtrum | Support. |
| Ericsson | Support |
| Panasonic | Support |
| CMCC | We support the proposal from Sharp since PBPS occasion is determined earlier than slot *n* but CPS occasion can be later than slot *n*. |
| Sony | Ok with this proposal |
| Huawei, HiSilicon | Although we think the unmonitored slots due to half duplex can be avoid by UE implementation, we are fine to remain the step 5/5a if this is majority’s view. |

Summary of inputs:

* Support/accept: ZTE/Sanechips, Sharp (modification), Apple, Futurewei, Support, Xiaomi, LGE, Nokia/NSB, NEC, vivo, Samsung (acceptable, remove sub-bullet), CATT/GOHIGH, QC, Lenovo, Spreadtrum, Ericsson, Panasonic, CMCC (modification from Sharp), Sony, HW/HiSi (acceptable)

FL comments:

* @Sharp, CMCC, [DCM], for the proposed note/behaviour (“except for those in which its own transmissions occur”) in CPS, this type of behaviour handling between SL/SL and SL/UL transmission based on priority is already defined in R16 as part of SL procedure (in 38.213). Then in my understanding, we don’t need to capture this note in 38.214. All existing R16 SL procedures equally apply to R17 partial sensing in my understanding.

**Proposed conclusion 5 (III):**

* The existing Step 5 and 5a are applicable for UE configured for partial sensing by its higher layer.
  + ~~Note, no change is needed to the current Rel-17 38.214 Section 8.1.4 due to this conclusion.~~

## Topic #6: Random resource selection in pools with mixed RA schemes

**Background**: Continuing our discussion from the last meeting (RAN1#107bis-e), the latest status on this issue is that we have 3 main preferences of solution ways forward between Option 1 with no resource partitioning in resource pool, Option 1 with resource partitioning in resource pool, and Option 12.

* Option 1: A priority threshold value is (pre-)configured for the resource pool, below or equal to which random resource selection is allowed. Note, lower value means higher priority. The (pre-)configured priority threshold can be any of the 8 priority values.
* Option 12: No special consideration

As it has been instructed, we should try to resolve this issue within this meeting (i.e., during week 1 since it has RRC impact) by first collecting inputs from company. Based on the past discussions on this issue, it is well established the reasoning(s) behind the resource partitioning feature. Without any agreement/conclusion on this issue, the default outcome is Option 12. So, if we need to decide a solution, then it is between Option 1 with or without resource partitioning in a resource pool. Therefore, the following question is formulated. Please indicate your solution preference and any reasoning.

**Question 6:**

For random resource selection in a resource pool (pre-)configured with full/partial sensing and random resource selection,

* A priority threshold value can be (pre-)configured, below or equal to which random resource selection is allowed. Note, lower value means higher priority. The (pre-)configured priority threshold can be any of the 8 priority values.
  + Alt 1: Resource partitioning in the resource pool is not supported, and the priority threshold value is (pre-)configured for the resource pool.
  + Alt 2: Resource partitioning in the resource pool is supported, and the priority threshold value for each resource partition is (pre-)configured individually.

|  |  |  |
| --- | --- | --- |
| **Company** | **Alt 1 or 2** | **Comments** |
| ZTE | Comment | Option 12 no special consideration |
| MediaTek | Comment | Option 12 is preferred. |
| InterDigital | Alt 1 | We do not see the benefit of resource pool partitioning. |
| Futurewei | Alt 2 | We think configuring separate pools instead of applying the pool partition in a specific way could have some issues. It does not solve the pool overlapping issues and but introduce new issues. First, with separate pool configurations, the number of pools increases. We have maximum number of 8Tx pools.  Also due to many-to-one mapping between Tx and Rx pool, number of the combinations of Tx pools (to form a Rx pool) also increases. Second, with the pool partition, the full/partial sensing UE and the RRS with priority values access the resource pool with full flexibility. But with separate pools, the UE has to do a cross-pool scheduling for resource allocation to utilize resources in both pools. Currently, retransmissions are not allowed in different pools. In addition, with FDM separated pools, the number of subchannels in a resource pool becomes smaller which limits maximum number of TB size.  On the other hand, we think that the most important thing is to solve the problem, we prefer partitioning but can accept no partitioning, and we encourage Samsung to also be constructive if necessary. |
| OPPO | Comment | Option 12 no special consideration is preferred |
| Xiaomi | comment | Option 12 is preferred. |
| LGE | comment | As commented in the email thread, we think this issue should not be reopened and discussed again in this meeting. We don’t think it is a critical issue but an optimization issue, and we haven’t reach consensus on this issue during the last two meetings. We recommend to focus on other essential topics.  Apart from the necessity of discussion, the issue of resource pool partitioning has also been discussed several times, and no consensus was reached. We don’t support to introduce it in this proposal again. If the group really wants to spend some time for discussion, we don’t support Alt 2 in this regard. Alt 1 is preferred in this case. |
| Nokia, NSB | comment | We would preferred Option 12 of the original proposal. Also agree with LGE that this issue should not be reopened as there is no consensus during the last few meetings. |
| NEC | Alt 1 |  |
| Vivo | comment | We object alt2, it has been discussed for several meetings, but if the benefits of alt2 can be achieved by configurating multi-FDMed pools, then there is no motivation to consider resource partitioning |
| Samsung | Alt 2 | Alt1 does not work as it prevents low priority (high priority value) random selection UEs from being transmitted.  This proposal in its entirety has a big impact on RAN2. This is not just introducing new RRC parameters, it also requires changes to the MAC specifications. |
| Qualcomm | Comment | Our first preference is option 12 (no special consideration) but we would be ok with Alt 1 for progress. |
| Spreadtrum | Alt 1 | Resource partitioning is not necessary.  We can also accept option 12 to make progress. |
| Ericsson | Alt.2 | We are supportive of Alt. 2. |
| Panasonic | Alt 2 | We prefer alt 2. Alt 1 can also be accepted for progress. |
| CMCC | Comment | Option 12 is preferred. |
| Sony | Alt1 |  |
| Fraunhofer | Alt 2 | We feel that Alt 2 can provide flexibility in (pre-)configuring a resource pool with no partitioning when the priority threshold is set to 8, and can also be (pre-)configured to a lower value in order to enable partitioning. |
| Huawei, HiSilicon | Alt.1 | This is not an optimization issue because this is to avoid significant performance degradation to full-sensing UEs particular if there is overwhelming number of random selection UEs coming to the mixed resource pool.  It has been simulated with serious PRR impact to the full-sensing UE by companies, if there is no control of random selection UEs popping into a resource pool configured with mixed full-sensing and random selection UEs, i.e. a random selection UE with any priority including the least priority UE can pre-empt all full-sensing UEs, and full-sensing UE will not back-off from the pre-empted resources based on Rel-16 design subject to priority constraint. This is a very common urban scenario that vehicle UEs driving into intersection in a CBD area where there are P-UEs are generating P2V traffics with random selection, which seriously damage V2V PRR. So, we do not think option 12 “no special handling” is a reasonable way. |

### Proposal for Week 1 Thursday GTW

Summary of inputs:

* Option 1 without resource partitioning: 10
  + IDC, Futurewei, LGE, NEC, QC, Spreadtrum, Panasonic, Sony, Huawei, HiSilicon
* Option 1 with resource partitioning: 5
  + Futurewei, Samsung, Ericsson, Panasonic, Fraunhofer
  + Strong concern/objected by: vivo, LGE
* Option 12 (No special consideration): 11
  + ZTE/Sanechips, MediaTek, OPPO, Xiaomi, LGE, Nokia/NSB, QC, Spreadtrum, CMCC

FL comments:

* @All, after many rounds of discussion, the situation is more and less the same as in the last RAN1 meeting. Realistically, Alt 2 is not going to be accepted based on the latest inputs received in the last round. My suggestion is to make a quick decision in the Thursday’s GTW session between the following two options.

**Proposal 6:**

When UE performs random resource selection in a resource pool (pre-)configured with full/partial sensing and random resource selection,

* Option 1: A priority threshold value is (pre-)configured for the resource pool, below or equal to which random resource selection is allowed. The (pre-)configured priority threshold can be any of the 8 priority values.
  + Note 1, lower value means higher priority.
  + Note 2, resource pool partitioning is not supported for this case
* Option 12: No special consideration

## Topic #7: Confirming working assumption on the M value for CPS in the case of aperiodic transmission

**Background**: In RAN1#107bis-e, value zero was made as a working assumption for the lower bound of the (pre-)configured *M* value in CPS for a resource (re)selection procedure and re-evaluation/pre-emption checking triggered by aperiodic transmission. Based on this working assumption, the corresponding RRC parameter (*contiguousSensingWindowAperiodic*) has a value range of [0]..30 in the Excel sheet sent to RAN2 in the last meeting. In this meeting (i.e., within Week 1), we should finalize this lower bound value. In the last meeting M=0 has the majority of support (hence the WA), therefore, it is proposed in the following to confirm the working assumption.

**Proposal 7:**

The following working assumption on the lower bound for the (pre-)configured *M* value is confirmed.

|  |
| --- |
| **Agreement (from RAN1#107bis-e):**  When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure and re-evaluation/pre-emption checking triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*,   * For minimum size M of the CPS monitoring window [*n*+*T*A, *n*+*T*B]:   + By default, *M* is 31 unless (pre-)configured with another value   + The range of (pre-)configured *M* is from 0 (working assumption) to 30 |

|  |  |  |
| --- | --- | --- |
| **Company** | **Confirm WA (Yes / No)** | **Comments (if no, what is the reason and propose value)** |
| ZTE | Yes |  |
| InterDigital | Yes |  |
| Futurewei | Comment | We may need a clarification on the value of 0. If 0 is included as the minimum, it means CPS can be disabled. We then accept 0 as the lower bound of minimum size M. So we suggest to add a note:  When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure and re-evaluation/pre-emption checking triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*,   * For minimum size M of the CPS monitoring window [*n*+*T*A, *n*+*T*B]:   + By default, *M* is 31 unless (pre-)configured with another value   + The range of (pre-)configured *M* is from 0 (working assumption) to 30     - Note: M=0 indicates that CPS is disabled.   If CPS cannot be disabled, we suggest choosing the lower bound of minimum size M of the CPS being 5. |
| OPPO | Yes |  |
| Xiaomi | comment | We prefer to align the design of this minimum CPS window size for periodic and aperiodic transmission. We suggest to change the working assumption to 5 to align with our agreement on M value for periodic transmission. |
| LGE | No | As we agreed on the minimum M value for the periodic case, we prefer to take the same value also for the aperiodic case. There is no reason we should go different way for the aperiodic transmission case.  The range of (pre-)configured *M* is from 5 to 30 |
| Nokia, NSB | comment | Our preference will be the alignment to the minimum CPS window for periodic Tx, where we had an agreement with 5 as the minimum value. We support Xiaomi/LGE view on this. |
| NEC | Yes |  |
| vivo | Yes | We suggest adding a note that setting M to 0~4 does not mean that CPS is disabled, since we have no consensus on disabling CPS. |
| Samsung | Yes |  |
| Qualcomm | Yes |  |
| Spreadtrum | Yes |  |
| Ericsson | Yes |  |
| Panasonic | Yes |  |
| CMCC | comment | 5 is preferred for the lower bound. |
| Sony | Yes |  |
| Fraunhofer | Yes |  |
| Huawei, HiSilicon | No | We prefer to align the value for configuration on CPS, i.e. using 5 as the lower bound value, due to similar reason. For the case that UE is configured to perform partial sensing only in a partial sensing only resource pool, without valid CPS results, the performance is degraded as shown in our simulations. |

### Proposal for Week 1 Thursday GTW

Summary of inputs:

* Confirm the WA (lower bound for *M* is 0) from RAN1#107bis-e: 13
  + ZTE, IDC, Futurewei (with clarification), OPPO, NEC, vivo (with clarification), Samsung, QC, Spreadtrum, Ericsson, Panasonic, Sony, Fraunhofer
* Change the lower bound for *M* to 5: 8
  + Futurewei, Xiaomi, LGE, Nokia/NSB, CMCC, HW/HiSi

FL comments:

* @All, based on the summary of inputs, FL recommend to confirm the WA from the last meeting.

**Proposal 7 (repeated from last round):**

The following working assumption on the lower bound for the (pre-)configured *M* value is confirmed.

|  |
| --- |
| **Agreement (from RAN1#107bis-e):**  When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure and re-evaluation/pre-emption checking triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*,   * For minimum size M of the CPS monitoring window [*n*+*T*A, *n*+*T*B]:   + By default, *M* is 31 unless (pre-)configured with another value   + The range of (pre-)configured *M* is from 0 (working assumption) to 30 |

Contribution summary for power saving RA

## Selection/reporting of subset of candidate resources within RX-UE's SL DRX active time

* **Approach 1: Purely based on UE implementation (e.g., up to editor to capture existing agreement in 38.214)**
  + [2/Nokia, NSB]
  + Reasons:
    - Freedom for UE to choose and report candidate resources outside the indicated active time of the Rx UE. UE may have choice to report some candidate resources outside active time or to only report candidate resource inside active time.
* **Approach 2: Specify L1 solution in selecting and reporting of subset of candidate resources**
  + [1/HW, HiSi], [3/Futurewei], [5/OPPO], [7/Panasonic], [8/Fujitsu], [9/DCM], [10/IDC], [11/Spreadtrum], [13/ETRI], [15/Apple], [17/CMCC], [19/Xiaomi], [20/Samsung], [21/ MediaTek], [22/QC], [25/LGE], [26/E///], [28/ZTE, Sanechips], [30/HW, HiSi]
  + Possible mechanisms:
    - Option 0: A minimum *N* number of resources within DRX active time should be satisfied (e.g., higher layer indicates the value *N* ranges from 1 to 10)
    - Option 1: A minimum % threshold of resources within DRX active time should be satisfied (e.g., Proposal 2-1 (VII) from RAN1#107bis-e)
    - Option 2: UE first selects resources within the active time of the Rx UE. In case the number of resources is below a threshold X, it is up to UE implementation to select resources outside of the active time until fulfilling the threshold X.
  + Reasons:
    - Current sensing and resource selection procedures in 38.214 cannot ensure there is a subset of the candidate resources within the indicated active time of the RX UE.
    - Better power saving for the RX UE when more resources are included in the subset of the candidate resources, due to less time the RX UE needs to stay awake to receive retransmissions.

## CPS monitoring window / disabling CPS for periodic Tx

* **Lower bound of *M* value in (pre-)configuration**
  + Lower bound for M
    - Zero: [25/LGE], [29/Samsung], [28/ZTE, Sanechips]
    - Non-zero (4 or 5): [1/HW, HiSi], [2/Nokia, NSB], [3/Futurewei], [5/OPPO], [9/DCM]

## Re-evaluation/pre-emption checking for aperiodic Tx

* **FFS: When the minimum M slots for CPS cannot be guaranteed**
  + Solution 1: UE sensing all available slots between initial resource selection and re-evaluation/pre-emption triggering slot (e.g., UE performs sensing until  slots earlier than  in a best effort way)
    - [5/OPPO], [6/CATT, GH], [9/DCM], [10/IDC], [11/Spreadtrum], [15/Apple], [17/CMCC], [20/Samsung], [21/ MediaTek]
  + Solution 2: Use all available sensing results
    - [2/Nokia, NSB]
  + Solution 3: UE performs PBPS after the resource (re)-selection triggering for resource (re-)evaluation and pre-emption checking
    - [26/E///]
  + Solution 3: UE performs random resource selection in an exceptional resource pool
    - [28/ZTE, Sanechips]

## Update of resource exclusion in step 6

* **Update 1: is to be determined based on slot or .**
  + [4/vivo], [5/OPPO], [15/Apple], [25/LGE]:
  + [23/Sharp]:
  + Reason:
    - The sensing occasions determined in PBPS and CPS may be located after slot *n* and such case doesn’t exist in R16 full sensing. Therefore, the reference point / definition for in step 6c should be updated.
  + No change is needed: [3/Futurewei] (step 6c is also used for re-evaluation and pre-emption where the sensing is performed after resource selection triggering slot n.)
* **Update 2: is updated according to:**
  + [5/OPPO], [20/Samsung]: slotminus slot in milliseconds
  + [4/vivo], [8/Fujitsu], [15/Apple], [25/LGE], [27/ITL]: , where slot is the last slot of the selected Y candidate slots.
  + Reason:
    - When slot is determined based on slot rather than slot , should be set to the remaining selection window size.
  + No change is necessary: [3/Futurewei] (The resource on is limited to the RSW of the sensing UE. Therefore, setting an appropriate Q value is just to find the resource conflict within the RSW for efficient check. With a larger Q, the unnecessary slots are included for resource overlap check but will not affect the outcome as is always within the candidate resources in RSW.)
* **Update 3: in step 6c should be calculated separately if *additionalPeriodicSensingOccasion* is (pre-)configured or not when UE is performing partial sensing.**
  + **When *additionalPeriodicSensingOccasion* is not configured, the possible values ofare same as R16 full sensing (i.e., include 1 and).**
  + **When *additionalPeriodicSensingOccasion* is configured:**
    - [4/vivo]: if and ; otherwise . is set to 2.
    - [5/OPPO], [15/Apple]:  *+1 if* *and , otherwise .*
  + Reason:
    - For a periodic reservation detected in the most recent periodic sensing occasion, the reserved resource will be located within the selected *Y* or *Y’* candidate slots. But when the most recent two PSOs are to be sensed by the UE and a periodic reservation is detected in the second most recent PSO, it’s reserved resource will not fall within the selected *Y* or *Y’* candidate resources according to the existing *Q* formulation. And hence, it should be updated.

## Random resource selection in pools with mixed RA schemes

* **Option 1: A priority threshold value or a range of priority levels is (pre-)configured for the resource pool, below or within which random resource selection is allowed. Note, lower value means higher priority. The (pre-)configured threshold can be any of the 8 priority values (including Option 12).**
  + **FFS whether resource pool partitioning can be additionally applied**
  + No resource partitioning: [1/HW, HiSi], [6/CATT, GH], [9/DCM], [10/IDC], [7/Panasonic], [11/ Spreadtrum], [12/Sony] (including 1-bit field in SCI), [17/CMCC], [27/ ITL]
  + With resource partitioning: [3/Futurewei], [20/Samsung], [7/Panasonic]
  + Reasons:
    - HW/HiSi results showed PRR performance degradation for mixed random selection and full sensing RA schemes in the same pool. By adopting Option 1 (priority threshold=2), PRR performance is close to dedicated RP
    - Samsung results showed as the number of groups that users are partitioned into increases, the randomness within each group is reduced leading to less collision and higher PRR.
* **Option 12: No special handling**
  + [2/Nokia, NSB], [20/Samsung] (if no partitioning in Option 1), [22/QC], [5/OPPO]
  + Reasons:
    - QC simulation result: The performance of full-sensing UEs in the system is not noticeably impacted when a proportion of UEs is replaced with ones that do not perform sensing.
    - Unequal interference to full/partial sensing UEs with different priority levels with Option 1. Higher priority UEs would be more impacted by this than lower priority ones.

## FFS: Full sensing UE performing sensing according to (pre-)configuration enabling/disabling for sensing during its DRX inactive time

* **Handling 1: This open issue does not need to be resolved (close the issue without any agreement)**
  + [2/Nokia, NSB], [4/vivo], [5/OPPO], [6/CATT, GH], [9/DCM], [13/ETRI], [14/Intel], [17/CMCC],
  + Reasons:
    - Unclear motivation why a full sensing UE (vehicle UE with continuous power supply) would only need to performing sensing in limited duration of time since the UE does not need to conserve power.
    - A UE configured with SL DRX for power saving for its own reception is not expected to use full sensing for SL transmission for this link
    - If a full sensing UE follows such (pre-)configuration, assuming the (pre-)configuration is “enabled”, it then behaves like a partial sensing UE and monitors only the most recent PSOs and M slots for CPS. When it is disabled, it does not perform any sensing at all during DRX inactive time. These behaviours are exactly the same as a partial sensing UE. When such (pre-)configuration IE is applied in a resource pool, all UE behaves like a partial sensing UE. There is no ‘true’ full sensing UEs at all in the resource pool.
    - No further optimization is needed for full sensing UE
* **Handling 2: Full sensing follows the same (pre-)configuration signalling for enabling/disabling**
  + [3/Futurewei] (when UE supports partial sensing), [15/Apple], [21/ MediaTek]
  + Reasons:
    - For power saving purpose

## How to handle non-monitored slots in partial sensing (e.g., Step 5)

* **Option 1: Step 5 does not apply to UE performing partial sensing**
  + [4/vivo], [5/OPPO], [23/Sharp]
  + Reasons:
    - When UE selects *Y* or *Y’* candidate slots, based on its implementation, the UE should avoid slots where UL / other SL transmission occurs.
    - Same handling as in R14 LTE-V2X
* **Option 2: A slot is excluded if all of the k sensing occasions for each Preserve were not monitored for this slot**
  + [14/Intel]
* **Option 3: This issue should at least be discussed**
  + [16/ASUSTeK]

References

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13. [R1-2201616](file:///C:\3GPP\RAN1_Meetings\Tdocs\2022\R1-2201616.zip) Discussion on resource allocation for power saving ETRI
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26. [R1-2202262](file:///C:\3GPP\RAN1_Meetings\Tdocs\2022\R1-2202262.zip) Remaining aspects of resource allocation procedures for power saving Ericsson
27. [R1-2202373](file:///C:\3GPP\RAN1_Meetings\Tdocs\2022\R1-2202373.zip) Remains on resource allocation for power saving in NR sidelink enhancement ITL
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29. [R1-2202033](file:///C:\3GPP\RAN1_Meetings\Tdocs\2022\R1-2202033.zip) Discussion on Sidelink Enhancement Samsung
30. [R1-2202446](file:///C:\3GPP\RAN1_Meetings\Tdocs\2022\R1-2202446.zip) Discussion on RAN2 LS on SL resource selection with DRX Huawei, HiSilicon

Appendix (outcomes of past meetings)

## RAN1#103-e (26/Oct – 13/Nov 2020)

**Conclusion**

* SL reception Type A and Type D should be used as the reference for evaluation and designing of SL power saving features in R17.
  + Type A: UE is not capable of performing reception of any SL signals and channels, FFS with exception of performing PSFCH and S-SSB reception (aim to conclude in RAN1#104-e)
  + Type D: UE is capable of performing reception of all SL signals and channels defined in R16. It does not preclude UE to perform reception of a subset of SL signals/channels
  + If there are evaluations with assumptions other than the above reference, the detailed assumptions need to be reported
  + Note: the types and the associated capability defined here are not intended to be defined as Rel-17 UE features as is.

Agreements:

* Partial sensing based RA is supported as a power saving RA scheme
  + FFS details
* Random resource selection is supported as a power saving RA scheme
  + FFS any changes or enhancement
  + FFS on conditions to apply random resource selection

Agreements:

* In R17, a SL Mode 2 Tx resource pool can be (pre-)configured to enable full sensing only, partial sensing only, random resource selection only, or any combination(s) thereof
  + FFS details, including usage, potential restrictions, whether/how any enhancement or condition is needed for the coexistence of full sensing and power saving RA scheme(s) in a same resource pool, etc.

Agreements:

* Re-evaluation and pre-emption checking are not supported by UEs that do not perform any sensing (i.e. PSCCH reception)
* Re-evaluation and pre-emption checking are supported by UEs that perform sensing
  + FFS details and any conditions(s) in which re-evaluation and pre-emption can be performed
* FFS whether/how re-evaluation and pre-emption can be supported by UEs performing random resource selection that do perform sensing
* Note: details about sensing in this context, including when it is performed, are not decided yet.

Agreements:

* Further study congestion control based on CBR and CR for power saving RA schemes
  + Identify necessary changes from R16 CBR/CR (if any), including transmission resource selection and transmission parameters that can be adjusted and applicable to power savings RA schemes
  + Note: this is not intended to require all UEs to perform sensing for the purpose of CBR measurement

## RAN1#104-e (25/Jan – 05/Feb 2021)

Agreements**:**

* Random resource selection is applicable to both periodic and aperiodic transmissions
  + FFS conditions for random resource selection

**Conclusion:**

* PSFCH reception is not included for Type A UE
* S-SSB reception is not included for Type A UE
* SL reception Type B is additionally added
  + Type B: Same as Type A with an exception of performing PSFCH and S-SSB reception
* Note: the same conditions as in RAN1#103-e regarding the context of the discussion of Type A and Type D still apply (also applicable to type B)

Agreements**:** In a resource pool (pre-)configured with at least partial sensing, if UE performs periodic-based partial sensing, at least when the reservation for another TB (when carried in SCI) is enabled for the resource pool and resource selection/reselection is triggered at slot n, it is up to UE implementation to determine a set of Y candidate slots within a resource selection window, where

* FFS condition(s) and timing(s) for which periodic-based partial sensing is performed by UE
* The resource selection window is [n+T1, n+T2]
  + As a baseline, T1 and T2 are defined in the same way as in R16 NR-V2X according to step 1 [TS 38.214 Sec. 8.1.4]
  + Further discuss whether or not to introduce a threshold to re-define T1 and T2 such that
    - T1≥ 0 (subject to processing time constraint Tproc, 1), and T2 ≤ remaining PDB
    - T2-T1 *≤* (pre-)configured threshold
* A minimum value for Y is (pre-)configured from a range of values, FFS details
* FFS any restriction to determine Y candidate slots (including its relationship with SL-DRX)
* FFS whether the resource selection window [n+T1, n+T2] should be confined within a set of periodic set of resources and its relationship with SL-DRX
* Note: The terminology “periodic-based partial sensing” is based on the “partial sensing” used in LTE-V and it is intended to be used for the design and discussion of partial sensing in Rel-17.

Agreements**:** In a resource pool (pre-)configured with at least partial sensing, if UE performs periodic-based partial sensing, at least when the reservation for another TB (when carried in SCI) is enabled for the resource pool and resource selection/reselection is triggered at slot n, the UE monitors slots of at least one ~~a set of~~ periodic sensing occasion~~s~~, where a periodic sensing occasion is a set of slots according to 

if tvSL is included in the set of Y candidate slots.

* *P*reserve is a periodicity value from the configured set of possible resource reservation periods allowed in the resource pool (*sl-ResourceReservePeriodList*). Down select to one:
  + Option 1: *P*reserve corresponds to all values from the configured set *sl-ResourceReservePeriodList*
  + Option 2:  *P*reserve corresponds to a subset of values from the configured set *sl-ResourceReservePeriodList*
    - FFS how to determine the subset (e.g., by (pre-)configuration, UE determination)
  + Option 3:  *P*reserve is a common divisor among values in the configured set *sl-ResourceReservePeriodList*
  + Option 4: FFS others
* k ~~equals to~~is selected according to (down select to one)
  + Option 1: Only the most recent sensing occasion ~~within sensing window~~ for a given reservation periodicity before the resource (re)selection trigger or the set of Y candidate slots subject to processing time restriction
  + Option 2: The two most recent sensing occasions ~~within sensing window~~ for a given reservation periodicity before the resource (re)selection trigger or the set of Y candidate slots subject to processing time restriction
  + Option 3: All possible sensing occasions after
  + Option 4: Only one periodic sensing occasion for one reservation period. The k value is up to UE implementation. Max value for k is (pre-)configured.
  + Option 5: k is (pre-)configured, including multiple values
  + Option 6: (pre-)configuration of a bitmap, same as in LTE-V
  + Option 7: FFS others
* FFS relationship between periodic sensing occasions and SL-DRX
* FFS condition(s) and timing(s) for which periodic-based partial sensing is performed by UE
* Note: companies are encouraged to show performance data for the down selections

Agreements:

* In a resource pool (pre-)configured with at least partial sensing, if UE performs contiguous partial sensing and resource (re-)selection is triggered in slot n, support the following option:
  + Option 1: For the purpose of resource (re-)selection, the UE monitors slots between [*n*+*T*A, *n*+*T*B] and performs identification of candidate resources, in or after slot *n*+*T*B, based on all available sensing results, including periodic-based partial sensing results (if applicable).
    - FFS *T*A, *T*B (including the possibility of equal to zero, positive or negative) and remaining details (in particular, whether there should be exclusion of slots, changes in TA/TB values for different purposes, etc.)
    - FFS whether n can be replaced by e.g., index of some of Y candidate slots
  + FFS condition(s) in which contiguous partial sensing is performed by UE
  + FFS interaction with SL-DRX, if any
  + FFS interaction with periodic-based partial sensing, if any
  + Other options are not precluded
  + Note: This option is not to replace random resource selection only without sensing or re-evaluation and pre-emption checking

## RAN1#104b-e (12 – 20 April 2021)

**Conclusion:**

* In periodic-based partial sensing,
  + It is not necessary to further discuss whether or not to introduce a threshold to re-define T1 and T2.

**Agreements:**

* In periodic-based partial sensing,
* For the set of *P*reserve values, down-select to one of the following in RAN1#105-e
  + - Alt.1: *P*reserve corresponds to all values from the configured set *sl-ResourceReservePeriodList*
    - Alt.2: A set of *P*reserve values is (pre-)configured and includes up to the full set of values from the configured set *sl-ResourceReservePeriodList*
      * FFS if support multiple sets of *P*reserve values based on one or more metrics
      * FFS whether/how to restrict the set of values
* For the k value, down-selection to one of the following in RAN1#105-e (further refinement of each of the alternatives is possible)
  + - * + Alt 1: Option 1 as in RAN1#104-e
        + Alt 2: A modified Option 5 as in RAN1#104-e, where the modification is such that it also includes option 1

FFS how to (pre-)configure (e.g. including bitmap), whether a maximum number of k values is needed, and whether it can be up to UE implementation to select a k value based on the (pre-)configuration

* + - * + FFS details, e.g., sensing before the resource (re)selection trigger or the first slot of the set of Y candidate slots subject to processing time restriction, etc.
      * Note: companies are encouraged to provide more evaluations

**Agreement:**

* When periodic-based partial sensing is potentially performed by UE in a mode 2 Tx resource pool provided by higher layer, at least all of the followings are met:
  + Periodic reservation for another TB (sl-MultiReserveResource) is enabled for the resource pool
  + The resource pool is (pre-)configured to enable partial sensing
  + Partial sensing configured by higher layer in the UE

## RAN1#105-e (10 – 27 May 2021)

Agreement:

* For the set of *P*reserve values in periodic-based partial sensing,
  + If no (pre-)configuration (i.e., by default), *P*reserve corresponds to all values from the (pre-)configured set *sl-ResourceReservePeriodList*.
  + Otherwise, a single set of *P*reserve values can be (pre-)configured, where the set of P*reserve* values are restricted to a subset of the (pre-)configured set *sl-ResourceReservePeriodList*
    - This is per mode 2 Tx resource pool (pre-)configuration
    - A UE by implementation may also monitor other *sl-ResourceReservePeriodList* values not part of the restricted subset
      * In particular, the UE may additionally monitor occasions corresponding to P\_RSVP\_Tx
        + FFS whether the monitoring can be mandatory

Agreement:

* In periodic-based partial sensing for resource (re)selection, the UE at least monitors in periodic sensing occasion(s) for a given reservation periodicity before the first slot of the selected Y candidate slots subject to processing time restriction for the identification of candidate resources.

  o   The processing time restriction includes *Tproc,0SL*  and *Tproc,1SL*.

  o   Aspects relating to sensing during SL DRX are to be discussed separately

* Relationship to re-evaluation and pre-emption operation for periodic-based partial sensing to be discussed separately
  + FFS details including whether monitoring of periodic sensing occasions between triggering slot n and the first slot of the selected Y candidate slots subject to processing time restriction is performed as part of resource (re)selection or re-evaluation and pre-emption checking

Agreement:

* For the k value in periodic-based partial sensing for resource (re)selection,
  + By default, the UE monitors the most recent sensing occasion for a given reservation periodicity before the resource (re)selection trigger slot n or the first slot of the set of Y candidate slots subject to processing time restriction.
  + If (pre-)configured, UE additionally monitors periodic sensing occasions that correspond to a set of values which can be (pre-)configured with at least one value
    - (Working assumption) Possible values correspond to the most recent sensing occasion for a given reservation periodicity before the resource (re)selection trigger slot n or the first slot of the set of Y candidate slots, and the last periodic sensing occasion prior to the most recent one for the given reservation periodicity are included.
    - FFS: whether/which other values and details of the (pre-)configuration (e.g. max number of values or sensing occasions)
    - FFS: whether a value denotes a specific occasion to monitor or the earliest occasion to start the monitoring.
  + FFS relationship between periodic-based partial sensing occasions and SL-DRX
  + Note:
    - This is for the case when the resource (re)selection triggering slot n is expected by UE

Agreement:

* For random resource selection,
  + Reuse the maximum distance separation of 32 logical slots for a HARQ retransmission resource reserved by a prior SCI for the same TB, which was defined in R16 for full sensing operation.
  + SL HARQ feedback enabled transmission is supported (FFS applicable conditions if any)
    - The minimum HARQ feedback time gap (Z) shall be respected between any two selected resources of a TB where a HARQ feedback for the first of these resources is expected.
* FFS the impact of resource collision when random resource selection is performed by a UE which does not perform sensing / re-evaluation and pre-emption checking in a resource pool with mixed RA schemes (e.g. for low priority or any priority transmissions).
  + Including study potential solution(s) if the impact is not negligible (e.g. threshold based, raising priority, minimum time gap, pattern based, a priori SCI reserving initial transmissions, resource pool partitioning, and etc.).

Agreement**:** In contiguous partial sensing for resource (re)selection, *TA* and *TB* values can be zero, positive or negative

* *TA* and *TB* values or range depend on different operating scenarios or conditions (e.g., periodic/aperiodic traffic, predictability of triggering slot n, remaining PDB, re-evaluation/pre-emption checking, HARQ feedback, CBR/CR parameter, power saving, etc)
  + FFS details
* FFS: details of how periodic-based partial sensing and contiguous partial sensing are used for re-evaluation and pre-emption checking. Including how to reduce UE’s power consumption (caused by additional sensing operation of re-evaluation/pre-emption) after its resource selection, with the considerations of different operating scenarios or conditions (e.g., pre-emption enabled/disabled, HARQ-ACK enabled/disabled, etc).

## RAN1#106-e (16 – 27 August 2021)

**Agreement**

In periodic-based partial sensing, UE monitoring of periodic sensing occasions between triggering slot n and the first slot of the selected Y candidate slots subject to processing time restriction is performed as part of resource (re)selection.

**Agreement**

Conditions in which contiguous partial sensing is performed by UE, when at least all of the followings are met:

* L1 [is expected to be or] is triggered by higher layer to report resources for resource (re-)selection in a mode 2 Tx pool
  + FFS: When the trigger will be received by L1
* The resource pool is (pre-)configured to enable partial sensing
* Partial sensing is configured by higher layer in the UE

**Agreement**

For a resource pool (pre-)configured with at least partial sensing and UE is configured by its higher layer for partial sensing,

* Periodic-based partial sensing and contiguous partial sensing schemes are supported for resource re-evaluation and pre-emption checking
  + FFS details of partial sensing for re-evaluation and pre-emption checking, including any restrictions / conditions on performing PBPS and CPS, subset of resources, timing, candidate resource set (*SA*) and etc
* Same as in Rel-16, the higher layer indicates a set of resources and/or a set of resources for re-evaluation and/or pre-emption checking, respectively
  + Pre-emption checking is enabled according to the Release-16 interpretation of *sl-PreemptionEnable.*
    - FFS: If additional enhancements are needed for enabling/disabling
* The triggering of re-evaluation and pre-emption checking is as in R16.

**Agreement**

**When UE performs only contiguous partial sensing (CPS) in a mode 2 Tx pool with periodic reservation for another TB (*sl-MultiReserveResource*) disabled, and a resource (re)selection is triggered in slot n,**

* **The resource selection window (RSW) is [**n+T1**,** n+T2**] where** T2 **is defined based on step 1) of Rel-16 TS 38.214 Sec. 8.1.4**
  + FFS whether the resource selection window **[**n+T1**,** n+T2**]** should be confined within a set of periodic set of resources and its relationship with SL-DRX
* **On the sensing window [**n+TA**,** n+TB**] for CPS,**
  + Details of TA and TB values based on the agreements from previous RAN1 meetings
  + FFS whether and how to define a minimum CPS window size, including (pre-)configurability and the case when TB **-** TA **is smaller than the minimum CPS window size**
  + FFS whether and how to define a maximum value / upper bound for TB with respect at least to the minimum RSW size and the remaining PDB, including (pre-)configurability
* **FFS how a set of candidate resource (**SA**) is initialized** considering candidate single-slot resources, including
  + Whether and how to define a minimum size for the RSW (e.g., Rel-16 T2min), including (pre-)configurability
  + Whether the set SA is confined within a set of Y candidate slots within the RSW
* **UE performs resource exclusion from the set** SA **based on at least all available sensing results and based on step 6) and 7) of Rel-16 TS 38.214 Sec. 8.1.4**
* **Note, re-evaluation and pre-emption checking in a resource pool with periodic reservation for another TB (*sl-MultiReserveResource*) disabled is considered separately.**
* **FFS: Details on** T1

**Agreement**

For random resource selection in a resource pool (pre-)configured with full/partial sensing and random resource selection, down-select to one of the followings in RAN1#106bis-e

* Option 1: A priority threshold value or a range of priority levels is (pre-)configured for the resource pool, below or within which random resource selection is allowed
  + Note, lower value means higher priority
  + FFS whether resource pool partitioning can be additionally applied
* Option 2: Increase the priority for the transmission based on random selection and indicate the new priority value in the priority field in the 1st-stage SCI
  + FFS: An extra field is added in SCI for indicating the original priority value associated with QoS requirement,
  + FFS: A 1-bit field in the SCI indicates that the UE is performing random resource selection, or
  + FFS: An extra field is added in SCI for indicating the mapping to the original priority value associated with QoS requirement.
* Option 7: Exclude resources reserved by UE performing random selection without re-evaluation / pre-emption checking, regardless of their priorities. E.g. a 1-bit field in the SCI indicates that the UE is performing random resource selection and not performing re-evaluation and pre-emption checking
* Option 12: No special consideration

**Agreement**

When UE performs periodic-based and contiguous partial sensing schemes in a mode 2 Tx pool with periodic reservation for another TB (sl-MultiReserveResource) enabled,

* For a resource (re)selection procedure triggered by aperiodic transmission (Prsvp\_TX=0) in slot n,
  + The resource selection window (RSW) is [n+T1, n+T2], and T1 and T2 are defined in the same way according to step 1) of Rel-16 TS 38.214 Sec. 8.1.4
    - FFS whether UE determines a new set of Y candidate slots within the RSW and monitors corresponding periodic sensing occasions between slot n and the first slot of the new Y candidate slots subject to processing constraints
    - FFS how to initialize a set of candidate resource (SA) for the triggered resource (re)selection procedure and which partial sensing scheme(s) and results can be used for resource exclusion in the resource (re)selection procedure
    - FFS whether the resource selection window [n+T1, n+T2] should be confined within a set of periodic set of resources and its relationship with SL-DRX
* Note, re-evaluation and pre-emption checking based on periodic-based and contiguous partial sensing schemes is considered separately

**Agreement**

When UE performs periodic-based and contiguous partial sensing schemes in a mode 2 Tx pool with periodic reservation for another TB (sl-MultiReserveResource) enabled,

* For a resource (re)selection procedure triggered by periodic transmission (Prsvp\_TX≠0) in slot n
  + A set of candidate resource (SA) is initialized to the set of selected Y candidate slots of PBPS
    - UE performs contiguous partial sensing in [n+TA, n+TB] for resource exclusion from the initialized candidate resource set (SA)
      * FFS details of TA and TB based on the agreement(s) from previous RAN1 meetings
* Note, re-evaluation and pre-emption checking based on periodic-based and contiguous partial sensing schemes is considered separately

FFS: The condition under which UE performs periodic-based and contiguous partial sensing schemes in a mode 2 Tx pool with periodic reservation for another TB (sl-MultiReserveResource) enabled

## RAN1#106bis-e (11 – 19 October 2021)

**Working Assumption**

When PHY layer is indicated with an active time of RX UE from MAC layer for candidate resource selection, a restriction is applied in PHY layer so that at least a subset of candidate resources reported to MAC layer is located within the indicated active time of the RX UE. The following options will be further discussed in RAN1 to restrict resources for candidate resource selection taking into account the indicated active time from MAC layer:

* Option 1: PHY layer selects and reports candidate resources only within the indicated 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 the indicated active time of the RX UE
* Option 3: PHY layer selects and reports an additional candidate resource set of candidate resources within the indicated active time of the RX UE

**Agreement**

In the agreement from RAN1#105-e, the working assumption is confirmed and the FFS bullet (in RED) is closed without any agreement.

|  |
| --- |
| Agreement from RAN1#105-e:   * For the k value in periodic-based partial sensing for resource (re)selection,   + By default, the UE monitors the most recent sensing occasion for a given reservation periodicity before the resource (re)selection trigger slot n or the first slot of the set of Y candidate slots subject to processing time restriction.   + If (pre-)configured, UE additionally monitors periodic sensing occasions that correspond to a set of values which can be (pre-)configured with at least one value     - (Working assumption) Possible values correspond to the most recent sensing occasion for a given reservation periodicity before the resource (re)selection trigger slot n or the first slot of the set of Y candidate slots, and the last periodic sensing occasion prior to the most recent one for the given reservation periodicity are included.     - FFS: whether/which other values and details of the (pre-)configuration (e.g. max number of values or sensing occasions)     - FFS: whether a value denotes a specific occasion to monitor or the earliest occasion to start the monitoring.   + FFS relationship between periodic-based partial sensing occasions and SL-DRX   + Note:     - This is for the case when the resource (re)selection triggering slot n is expected by UE |

**Agreement**

When UE performs periodic-based and contiguous partial sensing schemes in a mode 2 Tx pool with periodic reservation for another TB (*sl-MultiReserveResource*) enabled,

* For a resource (re)selection procedure triggered by periodic transmission () in slot *n*, *TA* and *TB* for the CPS monitoring window is defined according to one of the followings:
  + *n*+*T*A is *M* logical slots earlier than slot , and *n*+*T*B is slots earlier than , where is the first slot of the selected *Y* candidate slots of PBPS, and , are in units of physical time/slots.
    - By default, *M* is 31 unless (pre-)configured with another value.

**Agreement**

For the periodic sensing occasion(s) (PSO(s)) that a UE needs to additionally monitored in PBPS, it shall be (pre-)configured jointly for all *Preserve* values.

* The UE is not required to monitor PSOs earlier than *n–T0* if the UE is triggered to do resource (re)selection in slot n, where *T0* is (pre-)configured

**Agreement**

When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*, *TA* and *TB* for CPS monitoring window and a candidate resource set (*SA*) is initialized according to potentially one of the following approaches (final decision in RAN1#107-e). Other approaches are not precluded and the details in each approach can still be updated.

* Approach 1: (*SA*is initialized based on at least slots with PBPS and/or CPS results and guarantee a minimum of *M* slots for CPS)
  + The UE selects a set of *Y’* candidate slots with corresponding PBPS and/or CPS results (if available) within the RSW.
    - FFS how to handle the case if the total number of *Y’* candidate slots is less than a (pre-)configured threshold *Y’min* without dropping the aperiodic transmission
    - FFS whether the Y’ candidate slots for aperiodic transmission is the same as the Y candidate slots in PBPS for periodic transmission of another TB(s)
    - FFS whether/how to prioritize/select resources based on partial sensing results.
    - FFS: How to select Y’ in case of CPS only
  + Candidate resource set (*SA*) is initialized to the set of all single-slot candidate resources in the selected *Y’* candidate slots.
  + For the CPS monitoring window [*n*+*T*A, *n*+*T*B]:
    - *TA* and *TB* are both selected such that UE has sensing results for a minimum of *M* consecutive logical slots before *ty0*, where *ty0* is the first slot of the selected *Y’* candidate slots.
      * FFS: By default, *M* is 31 unless (pre-)configured with another value, or M is (pre-)configured based on transmission priority
      * FFS the range of (pre-)configured *M* from a TBD lowest value up to 30
      * FFS: how to handle the case when the minimum *M* slots for CPS cannot be guaranteed
  + FFS: RSW in case of CPS only
* Approach 2: (*SA* is initialized based on all candidate single-slot resources and guarantee a minimum of *M* slots for CPS)
  + Candidate resource set (*SA*) is initialized to the set of all candidate single-slot resources in [*n+TB+Tproc,0+Tproc,1*, *n+T2*], where *TB* is selected by the UE such that length of [*n+TB+Tproc,0+Tproc,1*, *n+T2*] ≥ *T2min*.
    - *Tproc,0*, *Tproc,1* are in units of physical time/slots
    - FFS whether/how to prioritize/select resources based on partial sensing results (if PBPS is performed).
  + For the CPS monitoring window [*n*+*T*A, *n*+*T*B]:
    - *T*A = X
      * FFS value X for *TA* including X=1 and negative value
    - *TB* is selected such that UE has sensing results for a minimum of *M* consecutive logical slots before the start of (*n+TB+Tproc,0+Tproc,1*).
      * FFS: By default, *M* is 31 unless (pre-)configured with another value, or M is (pre-)configured based on transmission priority
      * FFS the range of (pre-) configured *M* from a TBD lowest value up to 30
      * FFS: how to handle the case when the minimum *M* slots for CPS cannot be guaranteed
* Approach 3: (independent approach for different case)
  + When UE additionally performs periodic-based partial sensing in the resource pool, the above Approach 1 applies.
  + When UE does not perform periodic-based partial sensing in a resource pool that does not allow resource reservation for another TB, the above Approach 2 applies.

**Working Assumption**

In a resource pool (pre-)configured to enable partial sensing, when UE is configured with partial sensing by its higher layer, the resources for which the UE performs re-evaluation and/or pre-emption checking are for the initial transmission and retransmissions of every TB according to Rel-16 specification based on partial sensing results.

* Same as in Rel-16, for periodic transmission, re-evaluation check is not applied to the resources that have been signalled in current period or previous periods, except that it is up to UE implementation whether to apply re-evaluation check to the resources in non-initial reservation period that have been signalled neither in the immediate last nor in the current period.
* The resource in the main bullet is the set of resources (*r*0, *r*1, *r*2, …) and/or the set of resources (*r*0', *r*1', *r*2', …)  for re-evaluation and/or pre-emption checking, respectively, which has been agreed in RAN1 #106-e.

## RAN1#107-e (11 – 19 November 2021)

**Agreement**

When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*, the general design framework in Approach 1 from RAN1#106bis-e in below is adopted. Note that, the details can still be updated.

* Approach 1: (*SA*is initialized based on at least slots with PBPS and/or CPS results and guarantee a minimum of *M* slots for CPS)
  + The UE selects a set of *Y’* candidate slots with corresponding PBPS and/or CPS results (if available) within the RSW.
    - FFS how to handle the case if the total number of *Y’* candidate slots is less than a (pre-)configured threshold *Y’min* without dropping the aperiodic transmission
    - FFS whether the Y’ candidate slots for aperiodic transmission is the same as the Y candidate slots in PBPS for periodic transmission of another TB(s)
    - FFS whether/how to prioritize/select resources based on partial sensing results.
    - FFS: How to select Y’ in case of CPS only
  + Candidate resource set (*SA*) is initialized to the set of all single-slot candidate resources in the selected *Y’* candidate slots.
  + For the CPS monitoring window [*n*+*T*A, *n*+*T*B]:
    - *TA* and *TB* are both selected such that UE has sensing results for a minimum of *M* consecutive logical slots before *ty0*, where *ty0* is the first slot of the selected *Y’* candidate slots.
      * FFS: By default, *M* is 31 unless (pre-)configured with another value, or M is (pre-)configured based on transmission priority
      * FFS the range of (pre-)configured *M* from a TBD lowest value up to 30
      * FFS: how to handle the case when the minimum *M* slots for CPS cannot be guaranteed
  + FFS: RSW in case of CPS only

**Agreement**

When SL DRX active time of Rx-UE is provided by the higher layer for candidate resource selection (including resource (re)selection and re-evaluation/pre-emption checking), the following working assumption is confirmed with option 2 as agreement (with modification in RED)

**Working Assumption (RAN1#106bis-e)**

When PHY layer is indicated with an active time of RX UE from MAC layer for candidate resource selection, a restriction is applied in PHY layer so that at least a subset of candidate resources reported to MAC layer is located within the indicated active time of the RX UE. The following options will be further discussed in RAN1 to restrict resources for candidate resource selection taking into account the indicated active time from MAC layer:

* ~~Option 1: PHY layer selects and reports candidate resources only within the indicated 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 the indicated active time of the RX UE
  + FFS: Details on when the number of subsets of candidate resource is less than the threshold
  + FFS: The subset of candidate resource outside of the active time should consider each inactive time period
  + FFS: UE selection of resource selection window to overlap with indicated RX UE active time
  + FFS: Whether it is up to UE implementation to report candidate resources only within the indicated active time of the RX UE
* ~~Option 3: PHY layer selects and reports an additional candidate resource set of candidate resources within the indicated active time of the RX UE~~

**Agreement**

When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*,

* The UE selects a set of *Y’* candidate slots with corresponding PBPS and/or CPS results (if available) within the RSW.
  + If the total number of *Y’* candidate slots is less than a (pre-)configured threshold *Y’min*,
    - How UE includes other candidate slots is up to UE implementation
* Candidate resource set (*SA*) is initialized to the set of all single-slot candidate resources in the selected *Y’* candidate slots.
* For the CPS monitoring window [*n*+*T*A, *n*+*T*B]:
  + *TA* and *TB* are both selected such that UE has sensing results starting at *M* consecutive logical slots before *ty0* and ending at *Tproc,0* + *Tproc,1* slots earlier than *ty0*.
    - FFS: By default, *M* is 31 unless (pre-)configured with another value, ~~or~~ where *M* is (pre-)configured based on transmission priority
    - FFS: The range of (pre-)configured *M* from a TBD lowest value up to 30
    - When the minimum *M* slots for CPS cannot be guaranteed, support both
      * Option A, the UE ensures the *Y’min* criterion is fulfilled
      * Option B: UE performs random resource selection
      * When the UE performs Option A or Option B is up to UE implementation

**Conclusion**

No additional triggering enhancement on top of existing Rel-16 mechanism in re-evaluation and pre-emption checking for partial sensing UEs in Rel-17, including enabling / disabling re-evaluation by (pre-)configuration.

* This does not restrict the triggering of re-evaluation and pre-emption checking due to inter-UE coordination message in scheme 2 (if agreed).

**Agreement**

When UE is triggered to perform re-evaluation and pre-emption checking for periodic transmission (*P*rsvp\_TX*≠0*) in slot *n*,

* During the *q*th reservation period (*q*=0,1,2,…, *Cresel*-1), candidate resource set (*SA*) is initialized to the remaining *Y* candidate slots starts from slot and ends at the last slot of the *Y* candidate slots, where the slot indices of the remaining *Y* candidate slots are equal to [*q* x *Prsvp\_Tx* + ], where is a slot index of *Y* candidate slots used in the initial resource (re)selection.
  + is the first candidate slot after slot *n+T3*.
  + FFS whether/how to handle the case when number of the remaining *Y* candidate slots is less than *Ymin*.
* Scheme 1:
  + UE performs PBPS for the remaining *Y* candidate slots according to, whereis a slot belong to the remaining *Y* candidate slots, and *k* and *Preserve* are the same as resource (re)selection.
  + UE performs CPS starts from *M* logical slots earlier than to  slots earlier than .
    - By default, *M* is 31 unless (pre-)configured with another value.

**Agreement**

When UE performs random resource selection, LTE principle is reused:

* The UE is not required to measure CBR.
* When no SL CBR measurement result is available, a (pre-)configured SL CBR value is used.

**Working assumption**

For UE performs partial sensing or random resource selection, Rel-16 SL CR evaluation is directly reused.

**Agreement**

For SL CBR measurement in partial sensing, select one option in the following:

* Option 1, 2, 3: SL RSSI is measured for slots in which the UE performs partial sensing and PSCCH/PSSCH reception over a SL CBR measurement window defined in Rel-16. The calculation of SL CBR is limited within the slots for which the SL RSSI is measured.
  + If the number of SL RSSI measurement slots is below a (pre-)configured threshold, FFS the following or other options.
* Option 1: a (pre-)configured SL CBR value is used.
* Option 2: the UE additionally measure a set of slots within the SL CBR measurement window to meet the threshold.
* Option 3: the UE measures an additional set of slots which can be extended outside the SL CBR measurement window to meet the threshold.
* FFS whether the set of slots in option 2/3 are (pre-) configured or selected by UE implementation.
  + Option 4: LTE principle is reused:
* The UE is not required to measure CBR.
* When no SL CBR measurement result is available, a (pre-)configured SL CBR value is used

## RAN1#107bis-e (17 – 25 January 2022)

**Agreement**

When UE is configured to perform partial sensing by a UE higher layer (including when SL DRX is configured), SL RSSI is measured in slots where the UE performs partial sensing and PSCCH/PSSCH reception over the SL CBR measurement window defined in Rel-16. The calculation of SL CBR is limited within the slots for which the SL RSSI is measured.

* If the number of SL RSSI measurement slots is below a (pre-)configured threshold, a (pre-)configured SL CBR value is used.

**Agreement**

When UE is triggered to perform re-evaluation and pre-emption checking for aperiodic transmission (*P*rsvp\_TX*=*0) in slot *n*,

* The candidate resource set (*SA*) is initialized to the remaining *Y’* candidate slots that starts from slot and ends at the last slot of the *Y’* candidate slots.
  + is the first candidate slot after slot *n+T3*.
* UE may perform PBPS for periodic sensing occasions after the resource (re)selection when *sl-MultiReserveResource* is enabled for the mode 2 Tx resource pool
  + It is up to UE implementation
* UE performs CPS starting from at least *M* consecutive logical slots earlier than to  slots earlier than .
  + FFS: When the minimum *M* slots for CPS cannot be guaranteed,
* All available sensing results not earlier than *n–T0* for the resource pool indicated by higher layer are applied for re-evaluation and pre-emption checking procedures

**Agreement**

When UE performs at least contiguous partial sensing in a mode 2 Tx pool for a resource (re)selection procedure and re-evaluation/pre-emption checking triggered by aperiodic transmission (*P*rsvp\_TX*=0*) in slot *n*,

* For minimum size M of the CPS monitoring window [*n*+*T*A, *n*+*T*B]:
  + By default, *M* is 31 unless (pre-)configured with another value
  + The range of (pre-)configured *M* is from 0 (working assumption) to 30

**Agreement**

**When UE performs only contiguous partial sensing (CPS) in a mode 2 Tx pool with periodic reservation for another TB (*sl-MultiReserveResource*) disabled, and a resource (re)selection is triggered in slot *n*,**

* T1 **is defined based on step 1) of Rel-16 TS 38.214 Sec. 8.1.4.**
  + No update to specification is necessary due to this agreement
* Note: The selected *Y’* slots do not overlap with the sensing window

**Agreement**

Whether UE performs SL reception of PSCCH and RSRP measurement for partial sensing on slots in SL DRX inactive time is enabled/disabled by (pre-)configuration per resource pool when partial sensing is configured in the UE by a higher layer.

* When it is enabled,
  + When UE performs periodic-based partial sensing for a given *Preserve*, UE monitors only the default periodic sensing occasion.
  + When UE performs contiguous partial sensing, UE monitors a minimum of *M* slots for CPS.
* Note, when it is disabled, the UE is not required to perform SL reception of PSCCH and RSRP measurement in SL DRX inactive time.
* Note: no further optimization on the resource (re)selection procedure with regard to SL DRX operation is specified in Rel.17.
* FFS the case when full sensing is configured in the UE by a higher layer