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

**e-Meeting, October 11th – 19th, 2021**

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**Source:** Moderator (LG Electronics)

**Title:** [Post-106-e-Rel17-RRC-11] Sidelink enhancement

**Document for:** Discussion and information

1. **Email discussion (1st round)**

According to the following Chairman’s guideline, let’s have 1st round email discussion to collect companies’ views on the draft of RRC parameter list that I’ve shared (i.e., Version 00). After this discussion, we will have additional discussions to reflect the necessary modifications/corrections and check if there are no problems with such modifications/corrections.

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| Dear all,  As announced during RAN1#106-e, there will be a number of email threads on Rel-17 RRC parameters. For each Rel-17 work item, the work item rapporteur will kick off the email thread. The email discussions on RRC parameters will start from September 1 until September 10 (of course excluding the weekend). The purpose of these email discussions is to initiate our preparations to send the first LS to RAN2 on Rel-17 RRC parameters in October (e.g. tabulate agreed RRC parameters so far and identify ones that RAN1 should discuss whether or not to define).  Please note that RAN1 will NOT be making any decision with regards to the Rel-17 RRC parameters during the email discussions. Intention is to have the work item rapporteurs provide their initial assessment and collect company views if there are any. I am hoping that this discussion will help companies better prepare for RAN1#106bis-e. For each email thread, the rapporteur is to provide a tdoc collecting company views along with a draft list of RRC parameter at the end of the email discussion.  The email threads and moderators are as follows:  […]  - [Post-106-e-Rel17-RRC-11] Sidelink enhancement – to be moderated by Seungmin (LGE)  [..]  For the remaining topics (1024QAM, SDT, TX switching), we can pick them up in RAN1#106bis-e. Note some of the work items will not be able to provide much detail on RRC signalling at this point. We do what we can for now and update later based on the progress we make in RAN1#106bis-e.  Moderators, please trigger your email threads when you are ready (after September 1, 9AM UTC).  Best regards,  Younsun. |

Please provide inputs, if any, on the draft of RRC parameter list (i.e., Version 00). The deadline for companies to provide inputs is **September 6th 4:59am UTC**.

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| **Company** | **Comment** |
| Vivo | **1.Row9 periodicSensingOccasionList=SEQUENCE( SIZE(1…16) OF ENUMERATED{1,…,16}**  The integer type is more commonly used in this case, we suggest using integer: periodicSensingOccasionList=SEQUENCE( SIZE(1…16) OF INTEGER (1,…,16}  **2.Row10 *additionalPeriodicSensingOccasion*= SEQUENCE( SIZE(11.…16) OF ENUMERATED{enabled}**  we would like to ask for clarification first. It seems that this IE is per pool configured, and the intention is that each ENUMERATED{enabled} in the sequence corresponds to a Preserve value, and thus only one additional occasion is allowed to be enabled for a given Preserve. For example, if there are 16 reservation periodicities in *sl-ResourceReservePeriodList* but only 2 of them are included in the set of Preserve, then the size of *additionalPeriodicSensingOccasion* is 2, in other words, in this case, *additionalPeriodicSensingOccasion* contains two ENUMERATED{enabled}. Is this correct understanding?  1) since each element in the sequence can only be set to {enabled}, the IE does not seem to allow NW/pre-configuration to only enable the last occasion before the most recent occasion for some of the Presrve values, which means, UE is either configured to monitor the last occasion before the most recent occasion+most recent occasion for all Preserve values by this IE or only monitor the most recent occasion for all Prserve values by default. But from our understanding, the additional occasion should be per Preserve configured.  2) This IE is to enable/disable only one additional occasion, which contradicts the previous agreement, which explicitly states that the set of values is **‘configured’**. Moreover, as companies indicated in this meeting that the 'at least one value' in the previous agreement already allowed a (pre-)configuration of multiple occasions for monitoring(which is also our interpretation of the agreement), some companies thought that multiple occasions can be configured by the indication of a value corresponding to the earliest occasion that needs to be detected, on the other hand, some companies wanted to restrict the sensing occasions to be the last two occasions. However, no conclusion was reached in this meeting. Give this situation, we suggest using a List of bitstring rather than a sequence of enumerators to indicate the occasions as bit string is feasible to cover the above three interpretations. The length of the bit string can remain FFS until we finally determine how many values can be configured.  So, we suggest modifying the IE as following,  *additionalPeriodicSensingOccasionList*= SEQUENCE( SIZE(1…16) OF BIT STRING (SIZE (FFS))  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.   **Vivo2:** For mode2 enhancement  the RRC parameter for Inter-UE coordination for Mode 2 enhancements should be discussed after confirming the WA. |
| **Huawei, HiSilicon** | The individual sensing types shouldn’t be included here from RAN1 – the first row is sufficient. RAN2 will (probably!) include IEs which define what each entry of the (proposed!) sequence means, and explain those in RRC descriptive text. But that structuring is up to them. All we need to do is indicate the operation of what we have agreed for configurability (each, or any, sensing type in this case) of the parameter and the supporting agreement, and then we leave RAN2 to work out the ASN.1 coding. It’s a good example why we shouldn’t even be including the type of the IE from RAN1 (we’re not the authority group to choose it, and don’t have a clean way to handle it), and instead express as:   |  |  |  | | --- | --- | --- | | allowedResourceSelectionConfig | Indicates the allowed resource selection mechanism(s), i.e. full sensing only, partial sensing only, random resource selection only, or any combination(s) thereof. | full sensing only; partial sensing only; random resource selection only; any combination(s) thereof. |   Likewise in rows 9 and 10: RAN1 should not attempt to prescribe the signaling coding in such detail – the xls only asks us for the *value range*, not for how to signal it bit-by-bit. Clarification of constraints, etc. on how to use the range are the work of the description and the agreements. Better to leave these two fields blank for now, in case we do reach any formal agreement on what the signaling needs to look like – and revisit in future if needed. If you really want to write something immediately, it can be:  For row 9: value range = “Any periodicity values(s) from sl-ResourceReservePeriodList”  For row 10: value range = “Monitored; not monitored”.  (Note that I deliberately avoid seeming to represent it in ASN.1).  Please also remove all entries in column E. RAN1 does not tell RAN2 what to call parent IEs – and we can save ourselves the time of debating what they are, what they contain, and what they are called. This column E and F are used later by RAN2 to inform us in RAN1 of how they have *actually* structured the ASN.1 code to help us align specs – we leave them blank from RAN1. |
| ZTE,Sanechips | 1. One question on the IE *additionalPeriodicSensingOccasion,* there seems to be two understanding towards how this parameter shall be used depending on different interpretation of the agreement,  Interpretation #1 As currently listed and explained by FL, this parameter can further tune the additionalPeriodicalSensingOccasion for a given sub-set of periodicities. For example, if the UE is configured to monitor all the periodicities by default, the agreement and the IE shall allow UE to monitor additional sensing occasions for a subset of periodicities.  Interpretation #2 Our understanding is that actually the agreement implies that if this additional sensing functionality is enforced, additional sensing shall be performed for all the sensing occasions. Moreover, if the working assumption is further confirmed, potentially the parameter can include values such as {1,2} but there is no need to make dedicated values for different up to 16 periodicities.  We would like to check whether we missed anything in following interpretation#2. Alternatively, it's suggested that we drop this parameter for now and come back for clarification later after the clarification is done and the working assumption is discussed.   * 2. For the parameter ueAscheme2, we prefer not to have it for now and include this after the working assumption is discussed/confirmed   3. For the conditions triggering partial sensing, there is supposed to be both the RP configuration and UE higher layer configuration. Is it correct understanding that we shall discuss UE higher layer configuration later? |
| CATT, GOHIGH | Regarding the RRC parameter, we have following comments:   * Row 9, the RRC parameter name may cause some confusion, this parameter is used to determined the reservation period list for partial sensing, so it would be better to change it as “periodicSensingOccasionReservePeriodLis” * Row 10, from our understanding, this additional occasion configuration is a general configuration for all the period values in the row 9, not a periodicity-specific configuration. since it is working assumption, we tend to remove it at current stage. * Row 12, since it is working assumption, we tend to remove it at current stage. |
| **Futurewei** | **On Row 10: additionalPeriodicSensingOccasion**  The additional periodic sensing occasions other than the default one, the most recent sensing occasion for a given reservation periodicity are still in discussion. The WA on the last sensing occasion prior to the most recent one is yet to be confirmed. There are also several remaining FFS’s to be discussed. Therefore, we suggest the following changes on description of this item. As for the value range, we are ok with vivo’s change.   |  |  | | --- | --- | | additionalPeriodicSensingOccasion | Indicates the periodic sensing occasion(s) ~~whether~~ the UE additionally monitors ~~the last periodic sensing occasion~~ prior to the most recent one, per periodicity value used to determine periodic sensing occasions in periodic-based partial sensing. If not configured, the UE monitors the most recent sensing occasion per periodicity value used to determine periodic sensing occasions in periodic-based partial sensing. | |
| **OPPO** | We are fine with the current RRC parameter list from the rapporteur in v02 and the suggestions from HW. But we do not agree to update the RRC parameter list based on some FFS points that we may or may not agree in the future. Everything should be based on existing agreements and working assumptions (as this is a normal / common practice in RAN1). |

1. **Email discussion (2nd round)**

During 1st round email discussion, there were companies’ inputs that further discussion/agreement is still necessary to finalize the following RRC parameters in Version 02. Considering this situation, I remove these RRC parameters, and the updated version of RRC parameter list is uploaded with Version 03.

* additionalPeriodicSensingOccasion
* ueAscheme2

Please provide inputs, if any, on the updated version of RRC parameter list (i.e., Version 04). The deadline for companies to provide inputs is **September 9th 4:59am UTC**.

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| **Company** | **Comment** |
| ZTE, Sanechips | Support Rapporteur's suggested change. |
| Vivo | Support the changes suggested by Rapporteur in general.  Regarding row#4: minNumCandidateSlots, this limit is agreed for the set of Y slots of a triggered **PBPS process**, we would like to have it reflected in the field description as following:  *Indicates the minimum number of slots that are included in the possible candidate resources corresponding to periodic-based partial sensing process.* |
| Huawei, HiSilicon | It is not appropriate to remove the entry relating to the following agreed bullet – it is fully agreed. There are some details in the working assumption, but they also have to captured because (as always) RAN1 works according to the assumption while it stands. Without this entry, the list is incorrect.  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.     - *…(etc omitted)…* |
| Futurewei | Since we already have an agreement on the (pre-)configuration of the sensing occasions and RRC parameter is needed, the row for *additionalPeriodicSensingOccasion* should be added back. Our update on the description in previous round was sufficiently general to cover the agreed bullet on the (pre-)configuration of sensing occasions. |
| OPPO | On row 4 in the Description field, we think it can be further updated according to the agreement to make it clear as:  “*Indicates the minimum number of Y slots that are included in the possible candidate resources.*”  So strong preference on the suggested update from vivo.  Regarding to the previous row 10 for “*additionalPeriodicSensingOccasion*”, I think HW is right that we should still capture this RRC parameter as per RAN1 agreement and the working assumption as it stands. This is just a normal practice in RAN1. As per the existing FFS bullet in the agreement, we acknowledge that currently there is still a possibility that other possible periodic sensing occasions could be included later (beside the current one in the WA). Then a way forward could be, we include the value range as suggested by HW in the 1st round and further inform RAN2 in the comment column P with the following note clarifying the current status of this discussion. This should be an accurate representation of the current status in RAN1.  “*Note,* s*ubject to further RAN1 agreement, other additional periodic sensing occasions could be added later.*” |

1. **Email discussion (3rd round)**

During 2nd round email discussion, there were comments from companies on the following two parameters. Please see my explanation below on how to update the excel file of RRC parameter list.

* minNumCandidateSlots
* Comment to add “corresponding to periodic-based partial sensing process”
  + As the wording of “process” was not used for describing the sensing operation in Rel-14/15 LTE V2X and Rel-16 NR V2X and its exact meaning/definition is also not clear, I added only the wording of “corresponding to periodic-based partial sensing".
* additionalPeriodicSensingOccasion
* I think that if this parameter is described by reusing the wording of the current agreement/working assumption as much as possible, an unnecessary ambiguity can be removed. Additionally, as commented by OPPO, a note of “subject to further RAN1 agreement, other additional periodic sensing occasions could be added later” is added to column P in order to accurately inform RAN2 of the discussion status of RAN1. I hope that this way can be acceptable to companies.

Please provide inputs, if any, on the updated version of RRC parameter list (i.e., Version 04). The deadline for companies to provide inputs is **September 9th 4:59am UTC**.

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| **Company** | **Comment** |
| ZTE, Sanechips | Support Rapporteur’s suggested change for progress. We would like to point out that setting the value range as ‘monitored’ ‘non-monitored’ is the best we can achieve based on the agreement and company’s initiative to reflect the agreement for now. |
| Futurewei | We support the change that added back the parameter *additionalPeriodicSensingOccasion*. However, the description is different from previous version or what we suggested. We still prefer the simpler and general description we had provided (updated over the description in v2 excel spreadsheet and copied below).  Indicates the periodic sensing occasion(s) ~~whether~~ the UE additionally monitors ~~the last periodic sensing occasion~~ prior to the most recent one, per periodicity value used to determine periodic sensing occasions in periodic-based partial sensing. If not configured, the UE monitors the most recent sensing occasion per periodicity value used to determine periodic sensing occasions in periodic-based partial sensing.  But if the text added back is according to the agreements and other companies prefer this direction, we are also ok with this. However, it has to better use the language in the agreements. This means that simply monitor/not monitor is not correct as the configuration is for a given reservation periodicity, or the equivalent to the description in v2 excel file before on per periodicity value. Second, some other parts of the agreement were skipped, namely: UE additionally monitors periodic sensing occasions that correspond to *a set of values*. Therefore, the description of the parameter should be updated as  Indicates that UE additionally monitors periodic sensing occasions that correspond to a set of values. The values include at least the last periodic sensing occasion prior to the most recent one for the given periodicity used to determine periodic sensing occasions in periodic-based partial sensing. If not configured, the UE monitors the most recent sensing occasion for the given periodicity used to determine periodic sensing occasions in periodic-based partial sensing.  And the value range should be updated as  Monitored; not monitored (per periodicity value) |
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1. **Appendix**

**2.1 Agreements on resource allocation for power saving**

**2.1.1 RAN1#103-e meeting**

* ***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*

**2.1.2 RAN1#104-e meeting**

* *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 periodic sensing occasions, where a periodic sensing occasion is a set of slots according to*

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

* + - *Preserve 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: Preserve corresponds to all values from the configured set sl-ResourceReservePeriodList*
      * *Option 2: Preserve 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: Preserve is a common divisor among values in the configured set sl-ResourceReservePeriodList*
      * *Option 4: FFS others*
    - *k is selected according to (down select to one)*
      * *Option 1: Only the most recent sensing occasion 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 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+TA, n+TB] and performs identification of candidate resources, in or after slot n+TB, based on all available sensing results, including periodic-based partial sensing results (if applicable).*
      * *FFS TA, TB (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*

**2.1.3 RAN1#104bis-e meeting**

* ***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 Preserve values, down-select to one of the following in RAN1#105-e*
      * *Alt.1: Preserve corresponds to all values from the configured set sl-ResourceReservePeriodList*
      * *Alt.2: A set of Preserve 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 Preserve 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*

**2.1.4 RAN1#105-e meeting**

* *Agreement:*
  + *For the set of Preserve values in periodic-based partial sensing,* 
    - *If no (pre-)configuration (i.e., by default), Preserve corresponds to all values from the (pre-)configured set sl-ResourceReservePeriodList.*
    - *Otherwise, a single set of Preserve values can be (pre-)configured, where the set of Preserve 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 PRSVP\_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.*
    - *The processing time restriction includes T SLproc,0  and T SLproc,1.*
    - *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,*
    - *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).*

**2.1.5 RAN1#106-e meeting**

* *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*
* *Agreement:*
  + *A UE can perform SL reception of PSCCH and RSRP measurement for sensing during its SL DRX inactive time.*
    - *FFS: When such reception and measurement is performed, whether it is subject to specification, or is up to UE implementation*
    - *FFS: Other details*

**2.2 Agreements on inter-UE coordination for Mode 2 enhancements**

**2.2.1 RAN1#103-e meeting**

* ***Conclusion****:*
  + *The schemes of inter-UE coordination in Mode 2 are categorized as being based on the following types of “A set of resources” sent by UE-A to UE-B:*
    - *UE-A sends to UE-B the set of resources preferred for UE-B’s transmission*
      * + *e.g., based on its sensing result*
    - *UE-A sends to UE-B the set of resources not preferred for UE-B’s transmission*
      * + *e.g., based on its sensing result and/or expected/potential resource conflict*
    - *UE-A sends to UE-B the set of resource where the resource conflict is detected*
    - *FFS: details of resource conflict, e.g., including type of resource conflict*
    - *FFS: details of sensing operation at UE-A side*
    - *FFS: which type(s) of resource set information is(are) beneficial/feasible to which cast type(s)*
    - *Note: these different types may be used in combination with each other*
  + *From RAN1 perspective, further study on the feasibility/benefit of inter-UE coordination is required*
  + *Send an LS to RAN plenary*
    - *Final LS in R1-2009841*
* ***Conclusion****:*
  + *For the schemes of inter-UE coordination identified as feasible/beneficial, at least the following aspects are further discussed.*
    - *How/when UE-A determines the contents of ”A set of resources”, including consideration of UL scheduling*
    - *When UE-A sends ”A set of resources” to UE-B, including which UE(s) sends it*
    - *How UE-A and UE-B are determined*
    - *How UE-A sends ”A set of resources” to UE-B, including container used for carrying it, implicitly or explicitly or both*
    - *How/when/whether UE-B receives “A set of resources” and takes it into account in the resource selection for its own transmission*
    - *How/whether to define the relationship between support/signaling of inter-UE coordination and cast type*

**2.2.2 RAN1#104-e meeting**

* ***Conclusion****:*
  + *RAN1 concludes that the inter-UE coordination in Mode 2 is feasible, and is beneficial (e.g., reliability, etc.) compared to Rel-16 Mode 2 RA, and thus recommends specification of the feature.*
    - *The detailed observations can be found in the attachment of the LS*
* *Draft LS in R1-2102165, along with the attachment R1-2102166, is approved (with a typo fix)* 
  + *Final LS in R1-2102168*

**2.2.3 RAN1#104bis-e meeting**

* *Agreement:*
  + *Support the following schemes of inter-UE coordination in Mode 2:*
    - *Inter-UE Coordination Scheme 1:* 
      * *The coordination information sent from UE-A to UE-B is the set of resources preferred and/or non-preferred for UE-B’s transmission*
        + *FFS details including a possibility of down-selection between the preferred resource set and the non-preferred resource set, whether or not to include any additional information other than indicating time/frequency of the resources within the set in the coordination information*
      * *FFS condition(s) in which Scheme 1 is used*
    - *Inter-UE Coordination Scheme 2:* 
      * *The coordination information sent from UE-A to UE-B is the presence of expected/potential and/or detected resource conflict on the resources indicated by UE-B’s SCI*
        + *FFS details including a possibility of down-selection between the expected/potential conflict and the detected resource conflict*
      * *FFS condition(s) in which Scheme 2 is used*
* *Agreement:*
  + *Study further to determine the conditions for UEs to be UE-A(s)/UE-B(s) for inter-UE coordination:*
    - *Details include applicable scenario(s)/inter-UE coordination scheme(s)*
    - *E.g., only UE(s) among the intended receiver(s) of UE-B can be a UE-A, any UE can be a UE-A, high-layer configured, etc.*
      * *Including the possibility of being subject to certain conditions and/or capability*
* *Agreement:*
  + *When UE-B receives the inter-UE coordination information from UE-A, consider at least one of the following options (with details FFS including possibly down-selecting/merging one or more of the options below, applicable scenario(s)/condition(s) for each option, UE behavior) for UE-B’s to take it into account in the resource (re)-selection for its own transmission*
    - *For scheme 1:*
      * *Option 1-1: UE-B’s resource(s) to be used for its transmission resource (re)-selection is based on both UE-B’s sensing result (if available) and the received coordination information*
      * *Option 1-2: UE-B’s resource(s) to be used for its transmission resource (re)-selection is based only on the received coordination information*
      * *Option 1-3: UE-B’s resource(s) to be re-selected based on the received coordination information*
      * *Option 1-4: UE-B’s resource(s) to be used for its transmission resource (re)-selection is based on the received coordination information*
    - *For scheme 2:*
      * *Option 2-1: UE-B can determine resource(s) to be re-selected based on the received coordination information*
      * *Option 2-2: UE-B can determine a necessity of retransmission based on the received coordination information*

**2.2.4 RAN1#106-e meeting**

* *Agreement:*
  + *For scheme 1, the following inter-UE coordination information signalling from UE-A is supported. FFS details including condition(s)/scenario(s) under which each information is enabled to be sent by UE-A and used by UE-B.*
    - *Set of resources preferred for UE-B’s transmission*
    - *Set of resources non-preferred for UE-B’s transmission*
* *Agreement:*
  + *For scheme 2, the following inter-UE coordination information signalling from UE-A is supported. FFS details including condition(s)/scenario(s) under which each information is enabled to be sent by UE-A and used by UE-B*
    - *Presence of expected/potential resource conflict on the resources indicated by UE-B’s SCI*
      * *FFS: UE behaviour when the presence of expected/potential resource conflict is detected by the transmitter*
    - *FFS: Whether to additionally support the presence of detected resource conflict on the resources indicated by UE-B’s SCI*
* *Agreement:*
  + *In scheme 1, the following is supported for UE(s) to be UE-A(s)/UE-B(s) in the inter-UE coordination information transmission triggered by an explicit request in Mode 2:*
    - *A UE that sends an explicit request for inter-UE coordination information can be UE-B*
    - *A UE that received an explicit request from UE-B and sends inter-UE coordination information to the UE-B can be UE-A*
    - *(Working assumption) At least a destination UE of a TB transmitted by UE-B can be UE A*
    - *The above feature can be enabled or disabled or controlled by (pre-)configuration*
      * *FFS: Details on how to support this, including (pre-)configuration signaling granularity*
    - *FFS: Additional details and conditions on UE-A and UE-B*
  + *(Working Assumption) In scheme 1, the following is supported for UE(s) to be UE-A(s)/UE-B(s) in the inter-UE coordination information transmission triggered by a condition other than explicit request reception in Mode 2:*
    - *A UE that satisfies the condition mentioned in the main bullet and sends inter-UE coordination information is UE-A*
    - *A UE that received inter-UE coordination information from UE-A and uses it for resource (re-)selection is UE-B*
    - *The above feature can be enabled or disabled or controlled by (pre-)configuration*
      * *FFS: Details on how to support this, including (pre-)configuration signaling granularity*
    - *FFS: Additional details and conditions on UE-A and UE-B*
* *Agreement:*
  + *In scheme 2, at least the following is supported for UE(s) to be UE-A(s)/UE-B(s) in the inter-UE coordination transmission triggered by a detection of expected/potential resource conflict(s) in Mode 2:*
    - *A UE that transmitted PSCCH/PSSCH with SCI indicating reserved resource(s) to be used for its transmission, received inter-UE coordination information from UE-A indicating expected/potential resource conflict(s) for the reserved resource(s), and uses it to determine resource re-selection is UE-B*
    - *A UE that detects expected/potential resource conflict(s) on resource(s) indicated by UE-B’s SCI sends inter-UE coordination information to UE-B, subject to satisfy one of the following conditions, is UE-A*
      * *(Working assumption) At least a destination UE of one of the conflicting TBs, i.e., TBs to be transmitted in the expected/potential conflicting resource(s)*
        + *Whether a non-destination UE of a TB transmitted by UE-B can be UE-A is (pre-)configured*
      * *FFS: Additional details and condition(s) on UE-A and UE-B*
    - *The above feature can be enabled or disabled or controlled by (pre-)configuration*
      * *FFS: Details on how to support this, including (pre-)configuration signaling granularity*
    - *FFS: Definition of expected/potential resource conflict(s) and other details (if any)*
* *Agreement:*
  + *In scheme 2, the following UE-B’s behavior in its resource (re)selection is supported when it receives inter-UE coordination information from UE-A:*
    - *UE-B can determine resource(s) to be re-selected based on the received coordination information*
      * *UE-B can reselect resource(s) reserved for its transmission when expected/potential resource conflict on the resource(s) is indicated*
        + *FFS: Other details (if any)*
* *Agreement:*
  + *In scheme 1, at least following UE-B’s behavior in its resource (re-)selection is supported when it receives inter-UE coordination information from UE-A:*
    - *For preferred resource set, the following two options are supported:*
      * *Option A): UE-B’s resource(s) to be used for its transmission resource (re-)selection is based on both UE-B’s sensing result (if available) and the received coordination information*
        + *UE-B uses in its resource (re-)selection, resource(s) belonging to the preferred resource set in combination with its own sensing result*

*UE-B uses in its resource (re-)selection, resource(s) not belonging to the preferred resource set when condition(s) are met*

*FFS: Details of condition(s)*

*This option is supported when UE-B performs sensing/resource exclusion*

*FFS: Other details (if any)*

* + - * *Option B): UE-B’s resource(s) to be used for its transmission resource (re-)selection is based only on the received coordination information*
        + *UE-B uses in its resource (re-)selection, resource(s) belonging to the preferred resource set*

*This option is supported at least when UE-B does not support sensing/resource exclusion*

*FFS: Whether the support is conditional or UE capability*

*FFS: Other details (if any)*

* + - * *FFS: Other option(s), and other details (if any)*
    - *For non-preferred resource set,* 
      * *UE-B’s resource(s) to be used for its transmission resource (re-)selection is based on both UE-B’s sensing result (if available) and the received coordination information* 
        + *UE-B excludes in its resource (re-)selection, resource(s) overlapping with the non-preferred resource set*

*FFS: Details including*

*Whether/how UE-B can use in its resource (re-)selection, resource(s) overlapping with the non-preferred resource set, definition of the overlap, and other details (if any)*

*When UE-B excludes in its resource (re-)selection, resource(s) overlapping with the non-preferred resource set*

* + - * + *FFS: UE-B reselects in its resource (re-)selection, resource(s) to be used for its transmission when the resource(s) are fully/partially overlapping with the non-preferred resource set*
      * *FFS: Other option(s), and other details (if any)*
* *Agreement:*
  + *In scheme 2, at least the following is supported to determine inter-UE coordination information:*
    - *Among resource(s) indicated by UE-B’s SCI, UE-A considers that expected/potential resource conflict occurs on the resource(s) satisfying at least one of the following condition(s):* 
      * *Condition 2-A-1:*
        + *Other UE’s reserved resource(s) identified by UE-A are fully/partially overlapping with resource(s) indicated by UE-B’s SCI in time-and-frequency*
        + *FFS: Other details (if any)*
        + *FFS: Whether/how to specify additional criteria and other details (if any) including signaling details of conflict indication*
      * *(Working Assumption) Condition 2-A-2:* 
        + *Resource(s) (e.g., slot(s)) where UE-A, when it is intended receiver of UE-B, does not expect to perform SL reception from UE-B due to half duplex operation*

*FFS: Other details (if any)*

* + - * *FFS: Other condition(s)*
    - *FFS: Other details (if any)*
* *Agreement:*
  + *In scheme 1, at least the following is supported to determine inter-UE coordination information of preferred resource set:*
    - *UE-A considers any resource(s) satisfying all the following condition(s) as set of resource(s) preferred for UE-B’s transmission*
      * *Condition 1-A-1:*
        + *Resource(s) excluding those overlapping with reserved resource(s) of other UE identified by UE-A whose RSRP measurement is larger than a RSRP threshold*

*FFS: Other details (if any)*

* + - * *FFS: Condition 1-A-2:*
        + *Resource(s) excluding slot(s) where UE-A, when it is intended receiver of UE-B, does not expect to perform SL reception from UE-B*

*FFS: Other details (if any)*

* + - * *FFS: Condition 1-A-3:*
        + *Resource(s) satisfying UE-B’s traffic requirement (if available)*

*FFS: Other details (if any)*

* + - * *FFS: Other condition(s)*
    - *FFS: Other details (if any)*
* *Agreement:* 
  + *In scheme 1, at least the following is supported to determine inter-UE coordination information of non-preferred resource set:*
    - *UE-A considers any resource(s) satisfying at least one of the following condition(s) as set of resource(s) non-preferred for UE-B’s transmission*
      * *Condition 1-B-1:*
        + *Reserved resource(s) of other UE identified by UE-A from other UEs’ SCI (including priority field) and RSRP measurement*

*FFS: Other details (if any)*

* + - * *FFS: Condition 1-B-2:*
        + *Resource(s) (e.g., slot(s)) where UE-A, when it is intended receiver of UE-B, does not expect to perform SL reception from UE-B*

*FFS: Other details (if any)*

* + - * *FFS: Other condition(s)*
    - *FFS: Other details (if any)*