**3GPP TSG-RAN WG1 Meeting #106b-e *R1-210xxxx***

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| *CR-Form-v12.1* | | | | | | | | |
| **DRAFT CHANGE REQUEST** | | | | | | | | |
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|  | **38.214** | **CR** |  | **rev** | **-** | **Current version:** | **16.7.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** | Sidelink enhancements | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia | | | | | | | | | |
| ***Source to TSG:*** |  | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_SL\_enh-Core | | | | |  | ***Date:*** | | | 2021-11-01 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-17 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Introduction of NR Sidelink enhancements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | In section 8.1.4, specified the operation of periodic-based partial sensing...  In section 8.1.4A, specified the UE procedure for determining the set of preferred and/or non-preferred resources in inter-UE coordination  In section 8.1.4B, specified the UE procedure for determining the presence of an expected/potential resource conflict in inter-UE coordination  In section 8.1.4C, specified the UE procedure for combining the received resource set with its own sensing result in inter-UE coordination | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Incomplete support of NR Sidelink enhancements | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 8.1.4, 8.1.4A (new), 8.1.4B (new), 8.1.4C (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | | **X** |  | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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### 8.1.4 UE procedure for determining the subset of resources to be reported to higher layers in PSSCH resource selection in sidelink resource allocation mode 2

In resource allocation mode 2, the higher layer can request the UE to determine a subset of resources from which the higher layer will select resources for PSSCH/PSCCH transmission. To trigger this procedure, in slot *n,* the higher layer provides the following parameters for this PSSCH/PSCCH transmission:

- the resource pool from which the resources are to be reported;

- L1 priority, ;

- the remaining packet delay budget;

- the number of sub-channels to be used for the PSSCH/PSCCH transmission in a slot, ;

- optionally, the resource reservation interval, , in units of msec.

- if the higher layer requests the UE to determine a subset of resources from which the higher layer will select resources for PSSCH/PSCCH transmission as part of re-evaluation or pre-emption procedure, the higher layer provides a set of resources which may be subject to re-evaluation and a set of resources which may be subject to pre-emption.

- it is up to UE implementation to determine the subset of resources as requested by higher layers before or after the slot - , where is the slot with the smallest slot index among and , and is equal to , whereis defined in slots in Table 8.1.4-2 whereis the SCS configuration of the SL BWP.

- the indication of resource selection mechanism(s), as *allowedResourceSelectionConfig*, which may comprise of full sensing only, partial sensing only, random resource selection only, or any combination(s) thereof.

The following higher layer parameters affect this procedure:

*- sl-SelectionWindowList*:internal parameter is set to the corresponding value from higher layer parameter *sl-SelectionWindowList* for the given value of .

*- sl-Thres-RSRP-List*: this higher layer parameter provides an RSRP threshold for each combination , where is the value of the priority field in a received SCI format 1-A and is the priority of the transmission of the UE selecting resources; for a given invocation of this procedure, .

*- sl-RS-ForSensing* selects if the UE uses the PSSCH-RSRP or PSCCH-RSRP measurement, as defined in clause 8.4.2.1.

*- sl-ResourceReservePeriodList*

*- sl-SensingWindow*: internal parameter is defined as the number of slots corresponding to *sl-SensingWindow* msec

*- sl-TxPercentageList*: internal parameter for a given is defined as *sl-TxPercentageList ()* converted from percentage to ratio

- *sl-PreemptionEnable*: if *sl-PreemptionEnable* is provided, and if it is not equal to 'enabled', internal parameter is set to the higher layer provided parameter *sl-PreemptionEnable.*

- minimum number of Y slots as Y\_min (*minNumCandidateSlots*), which indicates the minimum number of Y slots that are included in the resources corresponding to periodic-based partial sensing.

- sensing occasion as *periodicSensingOccasionReservePeriodList,* which indicates the subset of periodicity values from *sl-ResourceReservePeriodList* used to determine periodic sensing occasions in periodic-based partial sensing. If not configured, all periodicity values from *sl-ResourceReservePeriodList* are used to determine periodic sensing occasions in periodic-based partial sensing.

- additional sensing occasions as *additionalPeriodicSensingOccasion*, which indicates that UE additionally monitors periodic sensing occasions that correspond to a set of values. The possible values of the set at least includes the most recent sensing occasion before the first slot of the candidate slots for a given reservation periodicity and the last periodic sensing occasion prior to the most recent one for the given reservation periodicity. If not configured, the UE monitors the most recent sensing occasion before the first slot of the candidate slots for the given periodicity used to determine periodic sensing occasions in periodic-based partial sensing.

- indication of the size of contiguous partial sensing window as *contiguousSensingWindowPeriodic*.

The resource reservation interval, , if provided, is converted from units of msec to units of logical slots, resulting in according to clause 8.1.7.

When the resource pool is (pre-)configured with *allowedResourceSelectionConfig* for full sensing, the UE may perform full sensing.

When periodic reservation for another TB (sl-MultiReserveResource) is enabled for the resource pool, the resource poll is (pre-)configured with *allowedResourceSelectionConfig* for partial sensing, the UE may perform periodic-based partial sensing.

When a UE is triggered by higher layer to report resources for resource (re-)selection in a mode 2 Tx pool, the resource pool is (pre-)configured with *allowedResourceSelectionConfig* for partial sensing, and partial sensing is configured by higher layer, the UE may perform contiguous partial sensing.

Notation:

denotes the set of slots which belongs to the sidelink resource pool and is defined in Clause 8.

The following steps are used:

1) A candidate single-slot resource for transmission is defined as a set of contiguous sub-channels with sub-channel *x+j* in slot where . The UE shall assume that any set of contiguous sub-channels included in the corresponding resource pool within the time interval correspond to one candidate single-slot resource, where

- selection of is up to UE implementation under , where is defined in slots in Table 8.1.4-2 where is the SCS configuration of the SL BWP;

- if is shorter than the remaining packet delay budget (in slots) then is up to UE implementation subject to remaining packet delay budget (in slots); otherwise is set to the remaining packet delay budget (in slots).

The total number of candidate single-slot resources is denoted by .

2) When the UE is configured with the higher layer parameter *allowedResourceSelectionConfig*, the sensing window is defined by the range of slots [) where is defined above and is defined in slots in Table 8.1.4-1 where is the SCS configuration of the SL BWP. 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. The UE shall perform the behaviour in the following steps based on PSCCH decoded and RSRP measured in these slots.

When the UE performs periodic-based partial sensing, the UE shall monitor slots at , where is the first slot of the selected *Y* candidate slots. The UE shall perform the behaviour in the following steps based on PSCCH decoded and RSRP measured in these slots.

The value of corresponds to *periodicSensingOccasionReservePeriodList* if configured, otherwise, the values correspond to all periodicity from *sl-ResourceReservePeriodList.*

The UE monitors *k* sensing occasions determined by *additionalPeriodicSensingOccasion*, as previously described, and not earlier than .

When the UE performs contiguous partial sensing, the sensing window is defined by the range of slots , where and can be zero, positive or negative.

When the UE performs periodic-based partial sensing and contiguous partial sensing with periodic reservation for another TB (*sl-MultiReserveResource*) enabled, if the sensing window is defined by the range of slots . *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. The value of *M* is (pre-)configured with the *contiguousSensingWindowPeriodic*. If *contiguousSensingWindowPeriodic* is not (pre-)configured, *M* equals to 31.

3) The internal parameter is set to the corresponding value of RSRP threshold indicated by the *i*-th field in *sl-Thres-RSRP-List*, where .

4) The set is initialized to the set of all the candidate single-slot resources.

5) The UE shall exclude any candidate single-slot resource from the set if it meets all the following conditions:

- the UE has not monitored slot in Step 2.

- for any periodicity value allowed by the higher layer parameter *sl-ResourceReservePeriodList* and a hypothetical SCI format 1-A received in slot with '*Resource reservation period*' field set to that periodicity value and indicating all subchannels of the resource pool in this slot, condition c in step 6 would be met.

5a) If the number of candidate single-slot resources remaining in the set is smaller than , the set is initialized to the set of all the candidate single-slot resources as in step 4.

6) The UE shall exclude any candidate single-slot resource from the set if it meets all the following conditions:

a) the UE receives an SCI format 1-A in slot , and '*Resource reservation period'* field, if present, and '*Priority*' field in the received SCI format 1-A indicate the values and , respectively according to Clause 16.4 in [6, TS 38.213];

b) the RSRP measurement performed, according to clause 8.4.2.1 for the received SCI format 1-A, is higher than

c) the SCI format received in slot or the same SCI format which, if and only if the '*Resource reservation period*' field is present in the received SCI format 1-A, is assumed to be received in slot(s) determines according to clause 8.1.5 the set of resource blocks and slots which overlaps with for *q*=1, 2, …, *Q* and *j=*0, 1, …, . Here, is converted to units of logical slots according to clause 8.1.7, if and , where if slot *n* belongs to the set , otherwise slot is the first slot after slot *n* belonging to the set ; otherwise . is set to selection window size *T2* converted to units of msec.

7) If the number of candidate single-slot resources remaining in the set is smaller than , then is increased by 3 dB for each priority value and the procedure continues with step 4.

The UE shall report set to higher layers.

If a resource from the set is not a member of , then the UE shall report re-evaluation of the resource to higher layers

If a resource from the set meets the conditions below then the UE shall report pre-emption of the resource to higher layers

- is not a member of , and

- meets the conditions for exclusion in step 6, with set to the final threshold after executing steps 1)-7), i.e. including all necessary increments for reaching , and

- the associated priority satisfies one of the following conditions:

- *sl-PreemptionEnable* is provided and is equal to 'enabled' and

- *sl-PreemptionEnable* is provided and is not equal to 'enabled', and and

Table 8.1.4-1: depending on sub-carrier spacing

|  |  |
| --- | --- |
|  | **[slots]** |
| 0 | 1 |
| 1 | 1 |
| 2 | 2 |
| 3 | 4 |

Table 8.1.4-2: depending on sub-carrier spacing

|  |  |
| --- | --- |
|  | **[slots]** |
| 0 | 3 |
| 1 | 5 |
| 2 | 9 |
| 3 | 17 |

### 8.1.4A UE procedure for determining a set of preferred and/or non-preferred resources for another UE’s transmission

A UE configured with the higher layer parameter *interUECoordinationScheme1* set to ‘enabled’ for transmission of preferred inter-UE co-ordination information considers [any candidate single-slot resource(s), as defined in clause 8.1.4] satisfying all the following conditions as preferred resources:

- resource(s) excluding those overlapping with reserved resource(s) indicated by a received SCI format 1-A whose RSRP measurement is larger than an RSRP threshold.

- if the UE is an intended receiver of the transmission(s) for which the preferred resource set is being determined, resource(s) excluding slot(s) in which the UE does not expect to perform SL reception due to half-duplex operation, unless this condition is disabled by the higher layer parameter *condition1A2Scheme1Disabled*.

When the inter-UE coordination information transmission is triggered by reception of an explicit request, the candidate single-slot resource(s) are determined in the same way as described in clause 8.1.4 with at least the following parameters indicated in the received explicit request:

- Priority value to be used for PSCCH/PSSCH transmission replaces

- Number of sub-channels to be used for PSCCH/PSSCH transmission in a slot replaces

- Resource reservation interval replaces

A UE configured with the higher layer parameter *interUECoordinationScheme1* set to ‘enabled’ for transmission of non-preferred inter-UE co-ordination information considers any resource(s) satisfying at least one of the following conditions as non-preferred resource(s):

- resource(s) indicated by a received [SCI format 1-A], satisfying [at least one of the following criteria]:

- the RSRP measurement performed, according to clause 8.4.2.1 for the received SCI format 1-A, is higher than where is the value of the priority field in the received SCI format 1-A. The internal parameter is set to the corresponding value of RSRP threshold indicated by the *i*-th field in *thresRSRPCondition1B1Option1Scheme1*, where .

- the UE would receive a TB ssociated with the received SCI format 1-A and the RSRP measurement performed, according to clause 8.4.2.1 for the received SCI format 1-A, is lower than where is the value of the priority field in the received SCI format 1-A. The parameter is set to the corresponding value of RSRP threshold indicated by the *i*-th field in *thresRSRPCondition1B1Option2Scheme1*, where .

- [slot(s)] in which the UE does not expect to perform SL reception from other UE due to half duplex operation, if the UE is an intended receiver of the transmission(s) for which the non-preferred resource set is being determined.

### 8.1.4B UE procedure for determining a potential resource conflict

A UE configured with the higher layer parameter *interUECoordinationScheme2* set to ‘enabled’ for transmission of conflict indication considers that a potential resource conflict occurs on a resource indicated by a received SCI if at least one of the following conditions is satisfied:

- the resource indicated by the received SCI overlaps with a resource indicated by another received SCI.

- the resource indicated by the received SCI occurs in a slot in which the UE does not expect to perform SL reception due to half-duplex operation and the UE is an intended receiver of the resource indicated by the received SCI.

### 8.1.4C UE procedure for combining a received resource set with its own sensing result

A UE configured with the higher layer parameter *interUECoordinationScheme1* set to ‘enabled’ for reception of preferred or non-preferred inter-UE co-ordination information uses a received resource set as follows when performing resource (re-)selection:

- if the received resource set is a preferred resource set, the UE uses (re-)selection resource(s) belonging to the preferred resource set in combination with its own sensing result.

- if the received resource set is a non-preferred resource set, the UE excludes resource(s) overlapping with the non-preferred resource set.

### 8.1.5 UE procedure for determining slots and resource blocks for PSSCH transmission associated with an SCI format 1-A

The set of slots and resource blocks for PSSCH transmission is determined by the resource used for the PSCCH transmission containing the associated SCI format 1-A, and fields '*Frequency resource assignment*', '*Time resource assignment*' of the associated SCI format 1-A as described below.

'*Time resource assignment*' carries logical slot offset indication of N = 1 or 2 actual resources when *sl-MaxNumPerReserve* is 2, and N = 1 or 2 or 3 actual resources when *sl\_MaxNumPerReserve* is 3, in a form of time RIV (TRIV) field which is determined as follows:

if

elseif

else

if

else

end if

end if

where the first resource is in the slot where SCI format 1-A was received, and denotes i-th resource time offset in logical slots of a resource pool with respect to the first resource where for N = 2, ; and for N = 3, , .

The starting sub-channel of the first resource is determined according to clause 8.1.2.2. The number of contiguously allocated sub-channels for each of the N resources and the starting sub-channel indexes of resources indicated by the received SCI format 1-A, except the resource in the slot where SCI format 1-A was received, are determined from "Frequency resource assignment" which is equal to a frequency RIV (FRIV) where.

If *sl-MaxNumPerReserve* is 2 then

If *sl-MaxNumPerReserve* is3 then

where

- denotes the starting sub-channel index for the second resource

- denotes the starting sub-channel index for the third resource

- is the number of sub-channels in a resource pool provided according to the higher layer parameter *sl-NumSubchannel*

If TRIV indicates *N* < *sl-MaxNumPerReserve*, the starting sub-channel indexes corresponding to *sl-MaxNumPerReserve* minus N last resources are not used.

The number of slots in one set of the time and frequency resources for transmission opportunities of PSSCH is given by where = 10\*SL\_RESOURCE\_RESELECTION\_COUNTER [10, TS 38.321] if configured else is set to 1.

If a set of sub-channels in slot is determined as the time and frequency resource for PSSCH transmission corresponding to the selected sidelink grant (described in [10, TS 38.321]), the same set of sub-channels in slots are also determined for PSSCH transmissions corresponding to the same sidelink grant where *j=*1, 2,*…,* , , if provided, is converted from units of msec to units of logical slots, resulting in according to clause 8.1.7, and is determined by Clause 8. Here, is the resource reservation interval indicated by higher layers.

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