**3GPP TSG-RAN2 Meeting 121** **R2-230xxxx**

**Athens, Greece, Feb. 27 – Mar. 3, 2023**

**Agenda item: 6.10.2**

**Source: LG**

**Title: Summary of [POST121][510][V2X/SL] IUC procedure in re-evaluation/pre-emption/conflict indicator (LG)**

**Document for: Discussion and Decision**

1. Introduction

This is the summary of below offline discussion.

* [POST121][510][V2X/SL] IUC procedure in re-evaluation/pre-emption/conflict indicator (LG)

 **Scope:** Discuss how to specify IUC procedure in re-evaluation/pre-emption/conflict indicator.

 **Intended outcome:** Discussion summary and the corresponding CR

**Deadline:** Long email discussion

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1. Discussion

According to the RAN2 agreement below, this email discussion discusses how to specify P15-related correction in the MAC specification.

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| --- |
| (6, 7) Proposal 15. RAN2 can discuss whether or not to agree on correction (“Add a normative text for IUC procedure (i.e., “IUC procedure when re-evaluation/pre-emption/conflict indicator based resource re-selection is triggered”)”) in R2-2301745.* Related correction is needed. How to specify will be discussed in long email discussion.
 |

Since IUC procedure of RAN1 agreement (i.e., IUC scheme 1’s agreements) below is missing in section 5.22.1.2a (Re-evaluation and Pre-emption) and Section 5.22.1.2b (Re-selection for using a received resource conflict indication), the related texts should be specified in the section 5.22.1.2a and 5.22.1.2b.

|  |
| --- |
| * *Agreement made in RAN1#106-e meeting:*
	+ *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)*
 |

Rapporteur has added the initial version of the CR to section 3 (Corresponding CR) below. If you have any comments on Rapporteur's proposed CR below, please comment in the questionnaire below. Also, if there is any modification you want to suggest in the CR, you can modify it in the section 3 (Corresponding CR).

**Q1: Please comment if you have any suggestions on the correction of P15?**

|  |  |  |
| --- | --- | --- |
| Company | Agree/Disagree | Further comments |
| Sharp | Agree (comments) | Regarding the case “4> if more than one resource of the selected sidelink grant are indicated for re-evaluation/pre-emption by the physical layer as specified in clause 8.1.4 of TS 38.214 [7]”, we don't think it is needed. In our view, current specs “if a resource(s) of the selected sidelink grant” already include the above case. |
| Apple | Disagree | The above RAN1 agreements does not single out “pre-emption and reevaluton or IUC scheme 2 ” cases from generic resource (re)selection case. Thus, there is no any special handling needed for preempation/reevalutaion/conflict-indication case in MAC spec. To have this issue resolved, we do not think the procedures already specified in 5.22.1.1 needs to be completely duplicated in 5.22.1.2a/2b. Instead, the soluton we prefer is to simply add a small sentence in the procedure text for resource selection, as shown in the below example for the first reevalution case for 5.22.1.2a:1> if a resource(s) of the selected sidelink grant which has not been identified by a prior SCI is indicated for re- evaluation by the physical layer as specified in clause 8.1.4 of TS 38.214 [7]; 2> remove the resource(s) from the selected sidelink grant associated to the Sidelink process; 2> randomly select the time and frequency resource from either the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7], or from available resources after a received preferred resource set is taken into account according to 5.22.1.1, for either the removed resource or the dropped resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9];  |
| ZTE | See comments | We first share similar view with Apple that RAN1 agree has been specified in 5.22.1.1 and do not think duplication is really needed for pre-emption/re-evaluation/conflict. IUC is just an assistance information. Ignoring such assistance information for pre-emption/re-evaluation/conflict is acceptable for us. And if necessary, we suggest using a Note to capture **the basic principle** of RAN1 agreement for pre-emption/re-evaluation/conflict, the possible Note can be shown in following:Note\*: For resources selected for replacing resources indicated for re-evaluation, if sl-InterUE-CoordinationScheme1 enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and if a preferred resource set is received from a UE, the resource within the intersection of the received preferred resource set and the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] is selected. |
| OPPO | See comments | We agree with the intention, and we are open (can follow majority view) on the solutions (e.g., solution from Apple/ZTE or original solution in the below section).For the solution in the below section, some revision suggestions as follows:1. the structure shoud be aligned with resource selection (section 5.22.1.1 in the latest 321 CR) to only include * IUC is not configured
* IUC is configured UE and preferred resource set is not received
* IUC is configured UE has sensing result and preferred resource set is received
* IUC is configured UE has no sensing result and preferred resource set is received

We understand in the current change in the following section, whether non-preferred resource set is received is still considered.2. We understand that IUC only has impact on the “reselect resource” operation but not the “remove” and “replace” operation, so the IUC related condition should be only applied to “randomly select resource”. According to the current shape of the CR, the UE only remove and replace the resources indicated as pre-empted/re-evaluted if the preferred resource set is received.Besides, we are open to hear if any other good solution to simplify the lengthy change. |
| Xiaomi | See comments | We agree the intention is correct but we share the other companies’ view that duplication is not needed. We think we can add note to clarify how to select resource for pre-emption and re-evaluton or IUC scheme 2 and the note from ZTE can be used as a baseline.  |
| Ericsson | comments | We share the same understanding as Apple and ZTE. Duplication would make the specs difficult to read. We prefer ZTE’s solution, i.e., add a note. |

**Rapporteur view (updated):**

Rapporteur checked that most companies don't like adding duplicate text to 5.22.1.2a/5.22.1.2b section. So, Rapporteur will check the opinions of the companies once again to see if there is a more preferred option among the two options below.

**Option 1: simplified normative text**

*START OF CHANGE*

5.22.1.2a Re-evaluation and Pre-emption

A resource(s) of the selected sidelink grant for a MAC PDU to transmit from multiplexing and assembly entity is re-evaluated by physical layer at *T3* before the slot where the SCI indicating the resource(s) is signalled at first time as specified in clause 8.1.4 of TS 38.214 [7].

A resource(s) of the selected sidelink grant which has been indicated by a prior SCI for a MAC PDU to transmit from multiplexing and assembly entity could be checked for pre-emption by physical layer at *T3* before the slot where the resource(s) is located as specified in clause 8.1.4 of TS 38.214 [7].

NOTE 1: It is up to UE implementation to re-evaluate or pre-empt before 'm – *T3*' or after 'm – *T3*' but before 'm'. For re-evaluation, m is the slot where the SCI indicating the resource(s) is signalled at first time as specified in clause 8.1.4 of TS 38.214. For pre-emption, m is the slot where the resource(s) is located as specified in clause 8.1.4 of TS 38.214.

If the MAC entity has been configured with Sidelink resource allocation mode 2 to transmit using pool(s) of resources in a carrier as indicated in TS 38.331 [5] or TS 36.331 [21] based on sensing or random selection the MAC entity shall for each Sidelink process:

1> if a resource(s) of the selected sidelink grant which has not been identified by a prior SCI is indicated for re-evaluation by the physical layer as specified in clause 8.1.4 of TS 38.214 [7];

2> remove the resource(s) from the selected sidelink grant associated to the Sidelink process;

2> randomly select the time and frequency resource from either the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7], or from available resources after a received preferred resource set is taken into account according to 5.22.1.1, for either the removed resource or the dropped resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9];

2> replace the removed or dropped resource(s) by the selected resource(s) for the selected sidelink grant.

1> if any resource(s) of the selected sidelink grant which has been indicated by a prior SCI is indicated for pre-emption by the physical layer as specified in clause 8.1.4 of TS 38.214 [7]:

2> remove the resource(s) from the selected sidelink grant associated to the Sidelink process;

2> if one or multiple SL DRX is configured:

3> randomly select the time and frequency resource from the resources later than the resources for either the removed resource or the dropped resource indicated by a prior SCI, from the resource indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] which occur within the SL DRX active time as specified in clause 5.28.3 of the destination UE selected for indicating to the physical layer the SL DRX active time above, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9].

2> else:

3> randomly select the time and frequency resource from either the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7], or from available resources after a received preferred resource set is taken into account according to 5.22.1.1, for either the removed resource or the dropped resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9].

NOTE 2: If retransmission resource(s) cannot be selected by ensuring that the resource(s) can be indicated by the time resource assignment of a prior SCI, how to select the time and frequency resources for one or more transmission opportunities from the available resources is left for UE implementation by ensuring the minimum time gap between any two selected ‎resources in case that PSFCH is configured for this pool of ‎resources.

2> replace the removed or dropped resource(s) by the selected resource(s) for the selected sidelink grant.

NOTE 3: It is left for UE implementation to reselect any pre-selected but not reserved resource(s) other than the resource(s) indicated for pre-emption or re-evaluation by the physical layer during reselection triggered by re-evaluation or pre-emption indicated by the physical layer.

NOTE 4: It is up to UE implementation whether to set the resource reservation interval in the re-selected resource to replace pre-empted resource.

NOTE 5: It is up to UE implementation whether to trigger resource reselection due to de-prioritization as specified in clause 16.2.4 of TS 38.213 [6], clause 5.14.1.2.2 of TS 36.321 [22] and clause 5.22.1.3.1a.

NOTE 6: For the selected sidelink grant corresponds to transmissions of multiple MAC PDU, 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.

*NEXT CHANGE*

5.22.1.2b Re-selection for using a received resource conflict indication

If the MAC entity has been configured with Sidelink resource allocation mode 2 to transmit using pool(s) of resources in a carrier as indicated in TS 38.331 [5] based on full sensing, or partial sensing or random selection or any combination(s), the MAC entity shall for each Sidelink process:

1> if *sl-interUECoordinationScheme2* enabling reception/transmission of a resource conflict indication is configured by RRC; and

1> if the next resource of the selected sidelink grant which has been indicated by a prior SCI is overlapped with conflict resource(s) indicated by the physical layer as specified in clause 16.3.1 of TS 38.213 [6]:

2> remove the resource from the selected sidelink grant associated to the Sidelink process;

2> randomly select the time and frequency resource from either the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7], or from available resources after a received preferred resource set is taken into account according to 5.22.1.1, excluding the conflict resource(s) for the removed resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9];

NOTE 1: If retransmission resource cannot be selected by ensuring that the resource can be indicated by the time resource assignment of a prior SCI, how to select the time and frequency resource for more transmission opportunities from the available resources is left for UE implementation by ensuring the minimum time gap between any two selected ‎resources in case that PSFCH is configured for this pool of ‎resources.

2> replace the removed resource by the selected resource for the selected sidelink grant.

NOTE 2: It is left for UE implementation to reselect any pre-selected but not reserved resource(s) other than the resource overlapping with the conflict resource(s) indicated by the physical layer during reselection triggered by the conflict resource(s) indicated by the physical layer.

NOTE 3: It is up to UE implementation whether and how to set the resource reservation interval in the re-selected resource to replace the resource overlapping with the conflict resource(s) indicated by the physical layer.

*END OF CHANGE*

**Option 2: NOTE Based solution**

*START OF CHANGE*

5.22.1.2a Re-evaluation and Pre-emption

A resource(s) of the selected sidelink grant for a MAC PDU to transmit from multiplexing and assembly entity is re-evaluated by physical layer at *T3* before the slot where the SCI indicating the resource(s) is signalled at first time as specified in clause 8.1.4 of TS 38.214 [7].

A resource(s) of the selected sidelink grant which has been indicated by a prior SCI for a MAC PDU to transmit from multiplexing and assembly entity could be checked for pre-emption by physical layer at *T3* before the slot where the resource(s) is located as specified in clause 8.1.4 of TS 38.214 [7].

NOTE 1: It is up to UE implementation to re-evaluate or pre-empt before 'm – *T3*' or after 'm – *T3*' but before 'm'. For re-evaluation, m is the slot where the SCI indicating the resource(s) is signalled at first time as specified in clause 8.1.4 of TS 38.214. For pre-emption, m is the slot where the resource(s) is located as specified in clause 8.1.4 of TS 38.214.

If the MAC entity has been configured with Sidelink resource allocation mode 2 to transmit using pool(s) of resources in a carrier as indicated in TS 38.331 [5] or TS 36.331 [21] based on sensing or random selection the MAC entity shall for each Sidelink process:

1> if a resource(s) of the selected sidelink grant which has not been identified by a prior SCI is indicated for re-evaluation by the physical layer as specified in clause 8.1.4 of TS 38.214 [7];

2> remove the resource(s) from the selected sidelink grant associated to the Sidelink process;

2> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] for either the removed resource or the dropped resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9];

2> replace the removed or dropped resource(s) by the selected resource(s) for the selected sidelink grant.

1> if any resource(s) of the selected sidelink grant which has been indicated by a prior SCI is indicated for pre-emption by the physical layer as specified in clause 8.1.4 of TS 38.214 [7]:

2> remove the resource(s) from the selected sidelink grant associated to the Sidelink process;

2> if one or multiple SL DRX is configured:

3> randomly select the time and frequency resource from the resources later than the resources for either the removed resource or the dropped resource indicated by a prior SCI, from the resource indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] which occur within the SL DRX active time as specified in clause 5.28.3 of the destination UE selected for indicating to the physical layer the SL DRX active time above, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9].

2> else:

3> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] for either the removed resource or the dropped resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9].

NOTE 2: If retransmission resource(s) cannot be selected by ensuring that the resource(s) can be indicated by the time resource assignment of a prior SCI, how to select the time and frequency resources for one or more transmission opportunities from the available resources is left for UE implementation by ensuring the minimum time gap between any two selected ‎resources in case that PSFCH is configured for this pool of ‎resources.

2> replace the removed or dropped resource(s) by the selected resource(s) for the selected sidelink grant.

NOTE 3: It is left for UE implementation to reselect any pre-selected but not reserved resource(s) other than the resource(s) indicated for pre-emption or re-evaluation by the physical layer during reselection triggered by re-evaluation or pre-emption indicated by the physical layer.

NOTE 4: It is up to UE implementation whether to set the resource reservation interval in the re-selected resource to replace pre-empted resource.

NOTE 5: It is up to UE implementation whether to trigger resource reselection due to de-prioritization as specified in clause 16.2.4 of TS 38.213 [6], clause 5.14.1.2.2 of TS 36.321 [22] and clause 5.22.1.3.1a.

NOTE 6: For the selected sidelink grant corresponds to transmissions of multiple MAC PDU, 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.

NOTE 7: For resources selected for replacing resources indicated for re-evaluation or pre-emption, if sl-InterUE-CoordinationScheme1 enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and if a preferred resource set is received from a UE, MAC entity randomly selects the time and frequency resource from available resources after a received preferred resource set is taken into account according to 5.22.1.1.

*NEXT CHANGE*

5.22.1.2b Re-selection for using a received resource conflict indication

If the MAC entity has been configured with Sidelink resource allocation mode 2 to transmit using pool(s) of resources in a carrier as indicated in TS 38.331 [5] based on full sensing, or partial sensing or random selection or any combination(s), the MAC entity shall for each Sidelink process:

1> if *sl-interUECoordinationScheme2* enabling reception/transmission of a resource conflict indication is configured by RRC; and

1> if the next resource of the selected sidelink grant which has been indicated by a prior SCI is overlapped with conflict resource(s) indicated by the physical layer as specified in clause 16.3.1 of TS 38.213 [6]:

2> remove the resource from the selected sidelink grant associated to the Sidelink process;

2> randomly select the time and frequency resource from the resources indicated by the physical layer as specified in clause 8.1.4 of TS 38.214 [7] excluding the conflict resource(s) for the removed resource, according to the amount of selected frequency resources, the selected number of HARQ retransmissions and the remaining PDB of either SL data available in the logical channel(s) by ensuring the minimum time gap between any two selected resources of the selected sidelink grant in case that PSFCH is configured for this pool of resources, and that a resource can be indicated by the time resource assignment of an SCI for a retransmission according to clause 8.3.1.1 of TS 38.212 [9];

NOTE 1: If retransmission resource cannot be selected by ensuring that the resource can be indicated by the time resource assignment of a prior SCI, how to select the time and frequency resource for more transmission opportunities from the available resources is left for UE implementation by ensuring the minimum time gap between any two selected ‎resources in case that PSFCH is configured for this pool of ‎resources.

2> replace the removed resource by the selected resource for the selected sidelink grant.

NOTE 2: It is left for UE implementation to reselect any pre-selected but not reserved resource(s) other than the resource overlapping with the conflict resource(s) indicated by the physical layer during reselection triggered by the conflict resource(s) indicated by the physical layer.

NOTE 3: It is up to UE implementation whether and how to set the resource reservation interval in the re-selected resource to replace the resource overlapping with the conflict resource(s) indicated by the physical layer.

NOTE 4: For resources selected for replacing resources indicated for conflict indication, if sl-InterUE-CoordinationScheme1 enabling reception/transmission of preferred resource set and non-preferred resource set is configured by RRC and if a preferred resource set is received from a UE, MAC entity randomly selects the time and frequency resource from available resources after a received preferred resource set is taken into account according to 5.22.1.1.

*END OF CHANGE*

**Q2: Which of the options below do you prefer for the correction of P15?**

**Option 1: Simplified normative text**

**Option 2: NOTE based sloution**

|  |  |  |
| --- | --- | --- |
| Company | Option 1/Option 2 | Further comments |
| Sharp | 1/2 | Either Option1/2 is fine. Regarding the existing Note 3B2, since the case may occur for re-evaluation/pre-emption/IUC scheme 2 as well, we wonder NOTE 3B2 are needed in the corresponding sections as well. |
| ZTE | 2 |  |
| Xiaomi | 2 |  |
| CATT | 2 |  |
| OPPO | 1 | The normative text solution is preferred but can follow majority view. |
| Apple | 1 | We prefer the normative text change as long as it is simple, but we can also accept majority view. |
| LG | 1 |  |
| vivo | 1 | Slightly prefer the normative text as it is already simple/clear now. |
| Ericsson  | 1 | Always good to have simpler solution. |
| Huawei, HiSilicon | 2 | Our understanding is that NOTE implementation, compared with Normative implementation, reflects better the discussion status in RAN1. Which implementation is simpler (hence favorable) is a minor issue.  |

1. Conclusion