**3GPP TSG RAN WG1 #110 R1-220xxxx**

**Toulouse, France, August 22nd – 26th, 2022**

**Agenda Item: 8.11**

**Source: Moderator (Apple)**

**Title: Moderator Summary of Reply LS to R1-2207813 (LS on missing RRC parameter in IUC Scheme 2, RAN2)**

**Document for: Discussion and Decision**

# Introduction

RAN2 sent an LS [1] on missing RRC parameter in IUC. In the LS, RAN2 mentioned that RAN2 agreed to add “deltaRSRP-Threshold” in the RRC specification ensure IUC scheme 2 can be correctly implemented in Rel-17.

In this contribution, we discuss the value range of the new RRC parameter “deltaRSRP-Threshold” for the LS from RAN2.

# Discussions

## Background

The following working assumption was made in RAN1 #107e meeting.

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| **Working Assumption**A resource pool level (pre-)configuration can enable one of the following options: * Option 1:
	+ For Condition 2-A-1 of Scheme 2, support following additional criteria to determine resource(s) where expected/potential resource conflict occurs
		- For the case when UE-A is a destination UE of a TB transmitted by UE-B
			* The resource(s) are fully/partially overlapping in time-and-frequency with other UE’s reserved resource(s) whose RSRP measurement is larger than a RSRP threshold according to the priorities included in the SCI:
				+ prio\_TX and prio\_RX are the priorities indicated in the SCI making the overlapping reservations for UE-B and other UE respectively
		- For the case when UE-A is a destination UE of a TB transmitted by another UE
			* The resource(s) are fully/partially overlapping in time-and-frequency with other UE’s reserved resource(s) when RSRP measurement of UE-B’s reserved resource is larger than a RSRP threshold according to the priorities included in the SCI:
				+ prio\_TX and prio\_RX are the priorities indicated in the SCI making the overlapping reservations for other UE and UE-B respectively
* Option 4:
	+ For Condition 2-A-1 of Scheme 2, support following additional criteria to determine resource(s) where expected/potential resource conflict occurs
		- For the case when UE-A is a destination UE of a TB transmitted by UE-B
			* The resource(s) are fully/partially overlapping in time-and-frequency with other UE’s reserved resource(s) whose RSRP measurement is larger than a (pre)configured RSRP threshold compared to the RSRP measurement of UE-B’s reserved resource.
		- For the case when UE-A is a destination UE of a TB transmitted by another UE
			* The resource(s) are fully/partially overlapping in time-and-frequency with other UE’s reserved resource(s) when RSRP measurement of UE-B’s reserved resource is larger than a (pre)configured RSRP threshold compared to the RSRP measurement of the resource(s).
	+ Support of Option 4 is subject to UE capability
* FFS: Whether/how RSRP threshold depends on priority, MCS, overlap
 |

This working assumption is captured in TS 38.213 as follows:

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| TS38.21316.3.0 UE procedure for transmitting PSFCH with control information\*\*\* < Unchanged parts are omitted> \*\*\*The first UE can be provided conditions by *optionForCondition2A1Scheme2* to determine conflict of reserved resources in a resource pool- if *optionForCondition2A1Scheme2* = 'RSRP-ThresPerPriorities', the first UE can be provided by, *ThresPSSCH-RSRP-List* $Th\left(p\_{i},p\_{j}\right)$, a list of RSRP thresholds for each priority combination $\left(p\_{i},p\_{j}\right)$ [6, TS 38.214]- if the first UE is an intended receiver for PSSCH in a reserved resource of the second UE, the first UE determines a resource conflict if the RSRP [6, TS 38.214] of the third UE is above a threshold$ Th\left(p\_{2},p\_{1}\right)$- if the first UE is an intended receiver for PSSCH in a reserved resource of the third UE, the first UE determines a resource conflict if the RSRP of the second UE is above a threshold$ Th\left(p\_{1},p\_{2}\right)$- if *optionForCondition2A1Scheme2* = 'RSRP-ThresWithRsrpMeasurement', the first UE can be provided a value $Delta\\_Th$ by *deltaRSRPThresh*- if the first UE is an intended receiver for PSSCH in a reserved resource of the second UE, the first UE determines a resource conflict if $RSRP\_{2}>RSRP\_{1}+Delta\\_Th$, where $RSRP\_{1}$ and $RSRP\_{2}$ are the RSRP measurements from the first UE for the second UE and the third UE, respectively- if the first UE is an intended receiver for PSSCH in a reserved resource of the third UE, the first UE determines a resource conflict if $RSRP\_{1}>RSRP\_{2}+Delta\\_Th$\*\*\* < Unchanged parts are omitted> \*\*\* |

The high layer parameter *deltaRSRP-Thresh* has not been defined in RAN2 specifications TS 38.331, due to the lack of this parameter in RRC parameters for sidelink enhancement provided from RAN1 to RAN2.

## (Closed) Round 1 discussion

In NR sidelink, RSRP threshold (e.g., the IE *SL-Thres-RSRP-List*) is defined in the unit of dBm. The parameter *deltaRSRP-Thresh* is the metric for the difference between two RSRP measurements. Hence, to take advantage of the convenience of using logarithmic unit, it is moderator’s understanding that the unit of *deltaRSRP-Thresh* is dB. With this understanding, the inequality such as $RSRP\_{2}>RSRP\_{1}+Delta\\_Th$ in TS 38.213 are presented as logarithmic addition.

*Question 1: Do you agree that the unit of deltaRSRP-Thresh is dB?*

|  |  |  |
| --- | --- | --- |
| Company | Answer to Question 1 | Comments |
| OPPO | Yes |  |
| DCM | Yes |  |
| vivo | Yes |  |
| Intel | Yes |  |
| Xiaomi | Yes |  |
| Qualcomm | Yes |  |
| Samsung | Yes |  |
| Nokia, NSB | Yes |  |
| ZTE,Sanechips | Yes |  |
| NEC | Yes  |  |
| CATT, GOHIGH | Yes |  |
| Huawei, HiSilicon | Yes |  |

The IE *SL-Thres-RSRP* is of integer 0 to 66 to indicate the sidelink RSRP threshold, where value 0 corresponds minus infinity dBm, value 66 corresponds infinity dBm, and the other value n corresponds to (-128+(n-1)\*2) dBm.

The parameter *deltaRSRPThresh* is for the difference of two RSRP measurements. Companies are welcomed to share their views on the value range of *deltaRSRP-Thresh.* Some possible options are listed below.

*Question 2: What is the value range of deltaRSRP-Thresh?*

*Alt 1: always positive plus 0*

*Alt 2: always negative plus 0*

*Alt 3: either positive or negative*

*Alt 4: other (please describe)*

*For each alternative, please share the maximum value and/or minimum value.*

|  |  |  |
| --- | --- | --- |
| Company | Answer to Question 2 | Comments |
| OPPO | Alt 1 | “larger than” in the agreement suggests that the threshold should be *positive plus 0*. |
| DCM | Alt 3 | Even if power of signal being interference is a bit smaller than that of interfered signal, it should be possible to assume that it is conflict. |
| vivo | Alt 3 | Either 1/2/3 is OK. Alt 3 seems to be flexible and can cover both Alt 1 and Alt 2. |
| Intel | Alt 1 |  |
| Xiaomi | Alt 3 | Alt 3 is more flexible than others. |
| Qualcomm | Alt 1 |  |
| Samsung | Alt3 | Value 0 should not be mapped to minus infinity and value 66 should not be mapped to infinity |
| Nokia, NSB | Alt 3 | More flexible |
| ZTE,Sanechips | Alt 3 | The maximum for deltaRSRP-Thres can be 10dB, approximately 15% of the maximum value for sidelink RSRP threshold. |
| NEC | Alt 1 | [] |
| CATT, GOHIGH | Alt.4, the value range could be both positive and negative plus 0 | From our understanding, the deltaRSRP-Thresh could be a range of [-X, Y]. We don’t have strong views on the detail value of X and Y, but the deltaRSRP-Thresh can be a large range which can provide more flexibility for implementation. E.g. X and Y can be 30dB |
| Huawei, HiSilicon | Alt 1 | The introduction of $RSRP\_{2}>RSRP\_{1}+Delta\\_Th$, was intended to define how reserved resource are considered as conflict, i.e. when RSRP of interference on that resource is higher than that of signal, not the other way around. Thus it is only reasonable that $Delta\_{Th}>0$ in linear value, which can be converted as Alt1. |

The sidelink RSRP threshold *SL-Thres-RSRP* has step size of 2 dBm. It is moderator’s view that the step size of *deltaRSRPThresh* is 2 dB.

*Question 3: Do you agree that the step size of deltaRSRP-Thresh is 2 dB?*

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| --- | --- | --- |
| Company | Answer to Question 3 | Comments |
| OPPO | yes |  |
| DCM | OK |  |
| vivo | OK |  |
| Intel | Agree |  |
| Xiaomi | OK |  |
| Qualcomm | OK |  |
| Samsung | Yes |  |
| Nokia, NSB | Yes |  |
| ZTE,Sanechips | Yes |  |
| NEC | Yes  |  |
| CATT, GOHIGH | Yes | 1dB is also OK.  |
| Huawei, HiSilicon | OK | Reuse *SL-Thres-RSRP* |

## Round 2 discussion

In Round 1, 3 questions are raised.

The first question is about the unit of *deltaRSRP-Thresh*. All companies support it is in dB. The last question is about the step size of *deltaRSRP-Thresh*. All companies support the step size of  *deltaRSRP-Thresh* is 2 dB. Hence, we have the following consensus.

*Proposal 1: The unit of deltaRSRP-Thresh is dB and the step size of deltaRSRP-Thresh is 2 dB.*

The second question is about the range of *deltaRSRP-Thresh.* 5 companies support Alt 1 and think *deltaRSRP-Thresh* should be a non-negative value. One reason to support Alt 1 is that“larger than” in the agreement suggests that the threshold should be *positive plus 0*. However, it is moderator’s understanding the “larger than” in the agreement is already captured in the specification of $RSRP\_{2}>RSRP\_{1}+Delta\\_Th$. It does not imply the value of *deltaRSRP-Thresh*.

The other reason to support Alt 1 is only when the RSRP of interference on that resource is higher than that of signal, then it can be considered non-preferred resource for signal.

On the other hand, 7 companies support Alt 3 or 4 and think *deltaRSRP-Thresh* could be positive, negative or 0. The main reason is even if power of signal being interference is a bit smaller than that of interfered signal, it should be possible to assume that it is conflict. This provides more flexibility.

Considering the slightly more companies support Alt 3 or 4, and it provides more flexibility in the design, the moderator has the following proposal.

*Proposal 2: It is supported that the value of deltaRSRP-Thresh is positive, negative or 0.*

Companies please provide the comments **only if** you have strong concern about the above proposal.

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| Company | Comments |
| Moderator | Companies achieve consensus on Proposal 2 during offline discussions.  |

Some companies propose the possible values of *deltaRSRP-Thresh.* Considering possible values of *SL-Thres-RSRP* are -128:2:0 dBm, the moderator has the following proposal given Proposal 2 is agreed.

*Proposal 3: The value range of deltaRSRP-Thresh is [-X, Y], where X and Y are down-selected from*

 *Alt 1: X=Y=10*

 *Alt 2: X=Y=30*

 *Alt 3: X=Y=64*

 *Alt 4: others (please provide values)*

Companies please provide the comments.

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Preferred alternatives | Unacceptable alternatives | Comments |
| Intel | Alt 1 | Alt 2 + Alt 3 |  |
| Nokia, NSB | Alt 2, 3 |  | Just to clarify:Are X and Y to be multiplied by the step size (2dB) (as RAN2 sometimes use the step size as factor) or is the value range to be understood as [-X dB, -X+2 dB, … , Y-2 dB, Y dB]? |
| Moderator |  |  | @ Nokia, your understanding is correct. The value range is [-X:2:Y] |
| DCM | Alt 2 |  | If controversial, wider range would be fine since still smaller value can be selected from the wider range. |

We have not received a lot of response on Proposal 3. Based on the existing responses, Alt 2 gets more supports. Hence, we consider Alt 2 as the moderator proposal.

# Conclusion

TBD

# References

1. R1-2207813, LS on missing RRC parameter in IUC Scheme 2, Aug. 2022.