**3GPP TSG RAN WG1 Meeting #113 R1-23xxxxx**

**Incheon, South Korea, May 22nd – May 26th, 2023**

**Agenda Item: 9.9**

**Source: Moderator (Thales)**

**Title: Summary of offline discussion on RRC parameters for Rel-18 NR NTN enhancements**

**Document for: Discussion and Decision**

# Introduction

Based on the agreements up to RAN1#112bis-e, a preliminary list of RRC parameters for Rel-18 NR NTN enhancements is provided in [1]. In current RAN1 meeting, RRC parameters pertinent for Release-18 NR NTN are further discussed.

This document aims to collect companies views on higher signaling in NTN.

# Coverage enhancement

## Related RRC parameters

Based on the agreements to date (up to RAN1#112bis-e), a preliminary list of RRC parameters for Rel-18 NR\_NTN\_Enh related to 9.9.1 Coverage enhancement for NR NTN is given within the following table:

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| **RAN1 specification** | **Section** | **New or existing?** | **Parameter name in the text** | **Description** | **Value range** | **Default value aspect** | **Per (UE, cell, TRP, …)** | **Required for initial access or IDLE/INACTIVE** | **Specification** | **Comment** |
| 38.213 | [9.2.6] | New | numberOfCommonPUCCH-RepetitionsList | Indicates the number of repetitions for PUCCH transmission for Msg4 HARQ-ACK. If multiple values are configured, a single value from the configured values is indicated in DCI. | One or more of {1,2,4,8} except for {1} | NA | Per cell | Cell-specific | 38.331 | **Agreement** For PUCCH repetition for Msg4 HARQ-ACK, candidate values of only one repetition factor configuration via SIB are {2, 4, 8}. • i.e., configuration of only ‘1’ is not supported. **Working assumption** For PUCCH repetition for Msg4 HARQ-ACK, • One or more repetition factors may be configured via SIB o If only one repetition factor is configured via SIB and if the value is one of {[1], 2, 4, 8}, UE capable of PUCCH repetition for Msg4 HARQ-ACK can perform repetition with the repetition factor - FFS: whether UE requests repetition or indicates repetition capability o If multiple factors from {1, 2, 4, 8} are configured via SIB, PUCCH repetition for Msg4 HARQ-ACK may be dynamically determined and indicated by gNB  - FFS: whether UE requests repetition or indicates repetition capability - FFS: whether repetition factor is indicated by UE o FFS: UE behavior when repetition factor is not configured via SIB o FFS: whether one or more UE capabilities are needed for the above is for further discussion |
|  |  | New | rsrp-ThresholdCommonPUCCH | Indicates RSRP threshold to determine whether UE capable of PUCCH repetition for Msg4 HARQ-ACK transmits repetition request. | TBD | NA | Per cell | Cell-specific | 38.331 | **Working assumption** For PUCCH repetition for Msg4 HARQ-ACK, • A RSRP threshold can be configured via SIB at least when the number of repetitions is configured by SIB. o If the RSRP threshold is configured and the configured RSRP threshold is smaller than X, - UE capable of PUCCH repetition for Msg4 HARQ-ACK transmits repetition request if measured RSRP is lower than a RSRP threshold. o If the RSRP threshold is not configured, or if the configured RSRP threshold is X, - UE capable of PUCCH repetition for Msg4 HARQ-ACK reports the capability of PUCCH repetition for Msg4 HARQ-ACK o FFS: value of X (the maximum configurable value of the RSRP threshold) o Down-select one from the following alternatives for the RSRP threshold. - Alt A: The same RSRP threshold as R17 Msg3 repetition (i.e., rsrp-ThresholdMsg3-r17) is used. - Alt B: New RSRP threshold is introduced. • Note: UE incapable of PUCCH repetition for Msg4 HARQ-ACK transmits neither repetition request nor capability report |

## Company views

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| **Companies** | **Comments** |
| LG | Agree in principle. But regarding “*numberOfCommonPUCCH-RepetitionsList*”, the wording of value range is necessary to be changed for clarification. For example, following modification can be considered.   * If one value is configured, one of {2, 4, 8} * Else if multiple values are configured, two or more of {1, 2, 4, 8} |
| Xiaomi | For *numberOfCommonPUCCH-RepetitionsList*, the current description is not exactly consistent with the working assumption. It would be possible for UE to report capability even when the RSRP threshold is configured, based on the working assumption stated that UE capable of PUCCH repetition for Msg4 HARQ-ACK reports the capability of PUCCH repetition for Msg4 HARQ-ACK if the RSRP threshold is not configured, or if the configured RSRP threshold is X. Hence we suggest to change the description as following:  Indicates RSRP threshold to determine whether UE capable of PUCCH repetition for Msg4 HARQ-ACK transmits repetition request. The repetition request could be repetition capability report if the configured RSRP threshold is X.  Regarding “*numberOfCommonPUCCH-RepetitionsList*”, both the Moderator’s version and LG’s version are fine to us and Moderator’s version is more concise. |
| Nokia, Nokia Shanghai Bell | Agree in principle. And we are a bit indifferent whether it should be FL suggestion or LG’s suggestion.  With respect to the “repetition request” we should be aware (and I also mentioned this in the online session) that the “repetition request” is basically just an indication from the UE that certain conditions are fulfilled (RSRP threshold), and UE supports the feature. Hence, it is simply a filtered “capability indication”. After all, it will be up to the gNB to determine whether or not to indicate repetitions to the UE afterwards. The UE does not have any idea of the receive conditions at the gNB side (applies both to path loss and to the interference situation). |
| Ericsson | Agree in principle. We support Nokia’s view that the “repetition request” can be seen as a filtered “capability indication”. This would simplify the specification text as we could always refer to the signaling as “capability indication” regardless of the use of RSRP threshold. For *rsrp-ThresholdCommonPUCCH*, the description could be updated as (assuming Proposal 1-4 is agreed):  “Indicates RSRP threshold to determine whether UE capable of PUCCH repetition for Msg4 HARQ-ACK transmits capability indication. Absence of this parameter indicates that UE capable of PUCCH repetition for Msg4 HARQ-ACK always transmits capability indication.”  For *numberOfCommonPUCCH-RepetitionsList*, we are fine with either the Moderator’s version or LG’s modification. |
| Huawei, HiSilicon | For the description of rsrp-ThresholdCommonPUCCH, Moderator’s version is more precise and aligns what we agreed. We prefer to use the wording in the working assumption, rather than give the description based on some new interpretation from companies.  For *numberOfCommonPUCCH-RepetitionsList,* we are fine with LG’s version or Moderator’s version. |

## Updated list of RRC parameters based on company views

# Reference

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|  | 1. R1-2306004 Initial input on higher layer parameters for Rel-18 NR NTN, Thales (Rapporteur) 2. RP-230809 (revision of RP-223534) Revised WID: NR NTN (Non-Terrestrial Networks) enhancements Thales 3. R1-2306005 RAN1 agreements for Rel-18 WI on NR NTN enhancements Rapporteur (Thales) 4. R1-2305769, “Recommendations for RAN1 RRC Parameter Preparation,” Moderator (Ericsson), RAN1 #113 meeting |
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