**3GPP TSG RAN WG1 #110bis-e R1-22xxxxx**

**E-meeting, October 10th – 19th, 2022**

**Agenda item: 7.1**

**Source: Moderator (xiaomi)**

**Title: Summary of email discussion on RSRP of the downlink pathloss reference for PRACH power control**

**WI: NR\_newRAT-Core**

**Document for: Discussion and Decision**

# 1 Introduction

This document collects company views on a RAN1#110bis-e submitted CR attempting to clarify whether the RSRP of the downlink pathloss reference for PRACH power control is L1 RSRP or L3 RSRP especially in idle/inactive states.

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| **TDoc** | **Title** | **Source** | **Release** | **Spec** | **Version** | **Related WIs** | **CR category** |
| [**R1-2209254**](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_110b-e/Docs/R1-2209254.zip) | Corrections on the RSRP of the downlink pathloss reference for PRACH power control | xiaomi | [**Rel-15**](https://portal.3gpp.org/desktopmodules/Release/ReleaseDetails.aspx?releaseId=190) | [**38.213**](https://portal.3gpp.org/desktopmodules/Specifications/SpecificationDetails.aspx?specificationId=3215) | 15.16.0 | [**NR\_newRAT-Core**](https://portal.3gpp.org/desktopmodules/WorkItem/WorkItemDetails.aspx?workitemId=750167) | F |

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| ***Reason for change:*** | In clause 7.4 of TS 38.213, it describes that the pathloss of PRACH is calculated by the UE in dB as *referenceSignalPower* - higher layer filtered RSRP in dBm, where the higher layer filtered RSRP configuration is defined in TS 38.331.  And, the higher layer filtering, i.e., L3 filtering, is defined as follows according to clause 5.5.3.2 of TS 38.331:  ***F*n = (1 – *a*)\**F*n-1 + *a*\**M*n**  Where, ***a*** = 1/2(***ki***/4), and ***ki*** is the *filterCoefficient* for the corresponding measurement quantity of the i:th *QuantityConfigNR* in *quantityConfigNR-List*, and *i* is indicated by *quantityConfigIndex* in *MeasObjectNR*  However, since *MeasObjectNR* is only configured in the RRC connected state, the *filterCoefficient* can’t be obtained in RRC idle/inactive state and the L3 filtering can’t be applied for the pathloss determination of PRACH. Even though the default value fc4 is configured for *filterCoefficient*, our RAN2 colleagues believe that the idle/inactive state can’t use a default value of the connected state.  Besides, for RSRP measurements for random access procedure, it has been discussed in RAN2 NR AdHoc 1807 meeting and the following agreement was achieved:  **For the purpose of Random Access the UE uses unfiltered L1 measurements for RSRP.**  Thus, we propose to change the “higher layer filtered RSRP” in clause 7.4 of TS 38.213 to “L1 RSRP” for the calculation of pathloss for PRACH. |
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| ***Summary of change:*** | Change ‘higher layer filtered RSRP’ in Clause 7.4 to ‘L1 RSRP’ for the pathloss determination of PRACH channel |
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| ***Consequences if not approved:*** | Misalignment between TS 38.213 and TS 38.331 |

**The proposed change and the corresponding paragraph:**

**<Unchanged parts omitted>**

* 7.4 Physical random access channel

A UE determines a transmission power for a physical random access channel (PRACH), , on active UL BWP  of carrier  of serving cell  based on DL RS for serving cell  in transmission occasion  as

 [dBm],

where  is the UE configured maximum output power defined in [8-1, TS 38.101-1], [8-2, TS38.101-2] and [38.101-3] for carrier  of serving cell  within transmission occasion ,  is the PRACH target reception power *PREAMBLE\_RECEIVED\_TARGET\_POWER* provided by higher layers [11, TS 38.321] for the active UL BWP  of carrier  of serving cell , and  is a pathloss for the active UL BWP  of carrier  based on the DL RS associated with the PRACH transmission on the active DL BWP of serving cell  and calculated by the UE in dB as *referenceSignalPower* – L1 RSRP in dBm, where RSRP is defined in [7, TS 38.215]. If the active DL BWP is the initial DL BWP and for SS/PBCH block and CORESET multiplexing pattern 2 or 3, as described in Clause 13, the UE determines  based on the SS/PBCH block associated with the PRACH transmission.

**<Unchanged parts omitted>**

To avoid excessive email load on the RAN1 email reflector, please note that there is NO need to send an info email to the reflector just to inform that you have uploaded a new version of this document. Companies are invited to enter the contact info in the table below.

**Moderator Question 1-1: Please consider entering contact info below for the points of contact for this email discussion.**

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| **Company** | **Point(s) of contact** | **Email address(es)** |
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# 2 Company views

## 2.1 1st round

**Please provide company comments to the table below**

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| **Company** | **Comment** |
| Xiaomi | As a proponent we support this CR. |
| Huawei, HiSilicon | OK. For the cover page of the CR, suggest to add the part of “**Isolated Impact Analysis**” for review as well. In our understanding, it is not expected to impact on gNB/UE implementation by the CR. |
| OPPO | We are fine with the CR. |
| vivo | Disagree.  The cited RAN2 agreement ‘**For the purpose of Random Access the UE uses unfiltered L1 measurements for RSRP**’ is not for PRACH PowerControl, it is for SSB selection. UE determines if there is any SSB with L1 RSRP larger than a threshold, and if yes, UE will select one SSB and initiate random access on one RO associated with the selected SSB.   |  | | --- | | [R2-1809784](file:///C:\Users\11065411\AppData\Local\Temp\Rar$DIa2272.25320\Docs\R2-1809784.zip) RSRP measurements for RACH Intel Corporation discussion Rel-15 NR\_newRAT-Core   * Noted   [R2-1810083](file:///C:\Users\11065411\AppData\Local\Temp\Rar$DIa2272.25320\Docs\R2-1810083.zip) RSRP measurements for Random Access Ericsson discussion Rel-15 NR\_newRAT-Core  DISCUSSION on the two papers above   * Vivo prefers L1 RSRP (Ericsson proposal) and think there could be a note * Nokia think that for BFR R1 already agreed to apply L1 RSRP, so the Ericsson proposal would be ok. * Ericsson will bring a CR to the next meeting, capturing a NOTE. * For the purpose of Random Access the UE uses unfiltered L1 measurements for RSRP. |   This agreement and note has already been captured in 38.321 as the following text:  1> else (i.e. for the contention-based Random Access preamble selection):  2> if at least one of the SSBs with SS-RSRP above *rsrp-ThresholdSSB* is available:  3> select an SSB with SS-RSRP above *rsrp-ThresholdSSB*.  2> else:  3> select any SSB.  NOTE: When the UE determines if there is an SSB with SS-RSRP above *rsrp-ThresholdSSB* or a CSI-RS with CSI-RSRP above *rsrp-ThresholdCSI-RS*, the UE uses the latest unfiltered L1-RSRP measurement.  On the other hand, for PowerControl for UL from idle/inactive UE, L3 RSRP based on the default value fc4 can be used, thus no change is needed. |
| Nokia, NSB | We don’t agree with the CR. We agree with vivo that the cited RAN2 agreement is not intended to be read in the power control context and agree that L3 filter using the default value should be assumed. |
| QC | We don’t agree with the proposed change, at least not as it is. Regarding the proposed change, several questions need to be answered: 1. Does RAN2 agreement include PDCCH-ordered PRACH? 2. Following RAN2 agreement, when UE will start to apply L3 filtering, after the reception of relevant RRC configuration? 3. What are the reasons for RAN2’s agreement if it applies to all random access, as L3 filtering incurs no delay. |
| Apple | We do not support the CR.  If the justification for CR is purely based on RAN2 agreement. It would be more reasonable for proponent companies to ask RAN2 directly sending a LS to RAN1 if they see any impact on RAN1 spec. Without RAN2 LS to clarify the use case and impact on RAN1 spec, it is hard to modify RAN1 spec based on quoted RAN2 agreement, especially for Rel-15 spec where commercial product has been shipped. |
| Samsung | We do not support this CR. As mentioned by vivo and Nokia, RAN2's agreement for RSRP measurement of random access procedure is not related with PRACH power control. It is just for criterion of SSB or PRACH resource selection.  Besides, *QuantityConfigNR-List* is provided optionally in QuantityConfig IE. Therefore, for calculating pathloss for PRACH, higher latyer filtered RSRP can be calculated in the same way when *QuantityConfigNR-List* is not configured. |
| Spreadtrum | We do not agree with the CR. As vivo stated, the RAN2 agreement was not for PRACH power control. And default value can be used for L3 RSRP. |
| ZTE | Share the view of vivo. |
| MTK | We are generally fine with the CR. However, considering UE may also perform RACH process in connected mode (e.g. for TA alignment), we think the revised text should only modify Idle mode behavior, and do not change the existing connected mode behavior. |
| CATT | The higher layer RSRP for RACH has been used from 3G, LTE, and NR. RACH could be performed for CONNECTED mode UE too. Thus, we don’t see the need of this CR. |

## 2.2 2nd round

As vivo said, the cited agreement “**For the purpose of Random Access the UE uses unfiltered L1 measurements for RSRP**” is indeed only for SSB selection, and the related **NOTE** is already captured into TS 38.321 as following, so it is not proper to confuse it with the RSRP measurement of PRACH pathloss.

* NOTE: When the UE determines if there is an SSB with SS-RSRP above rsrp-ThresholdSSB or a CSI-RS with CSI-RSRP above rsrp-ThresholdCSI-RS, the UE uses the latest unfiltered L1-RSRP measurement.

But, in order to provide guidance and reference for UE implementation, Moderator think the following issue is worth to be further clarified: whether the default value fc4 specified for RRC connected states is also used for PRACH power control in RRC idle/inactive states? From the first round of discussion, we can see that different companies have different views for this issue, and I summarize it as follows:

* **Option 1: The default value fc4 specified for RRC connected states is used for PRACH power control in RRC idle/inactive states. [vivo, Nokia, NSB, Samsung, Spreadtrum]**
* **Option 2: The default value fc4 specified for RRC connected states is not used for PRACH power control in RRC idle/inactive states. [Xiaomi]**

**In this round, more companies are expected to provide their support for the above two options and put forward constructive views in the table below.**

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| **Company** | **Option 1 and/or Option 2?** | **Comment** |
| Xiaomi | Both are OK | Since it is a legacy behaviour in the R15 spec, it has already been commercialized and implemented by UEs. And, both of the above two options may be used by different companies. Therefore, we suggest to clarify that either of above two options can be used for UE implementation and no CR is needed. |
| CATT | Neither | The default L3 filter for RSRP had been used for 3G, 4G LTE, 5G NR. There is no need for further clarification or change. |
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