3GPP TSG-RAN WG2 #119e R2-220xxxx

eMeeting, 17th – 26th August, 2022

Agenda Item: 5.1.3.3

Source: MediaTek Inc.

**Title: [Draft] Report of [AT119-e][012][NR1516] UE capabilities (MediaTek)**

Document for: Discussion and decision

# 1 Introduction

This is report for the following AT119-e mail discussion.

* [AT119-e][012][NR1516] UE capabilities (MediaTek)

 Scope: Treat R2-2206911, R2-2208501, R2-2208502, R2-2208503, R2-2208504, R2-2207640, R2-2207641, R2-2207049, R2-2207085, R2-2207086, R2-2207094, R2-2207095, R2-2207113, R2-2207114, R2-2208027, R2-2208028, R2-2207331, R2-2207332, R2-2208505, R2-2208506. Determine agreeable parts, For agreeable parts, agree CRs.

 Intended outcome: Report, Agreed CRs, LS out if applicable

 Deadline: Schedule 1

This discussion follows Schedule 1, which is organized as follow:

Discussions with Deadline **Schedule 1**:

A **first round** with **Deadline for comments W1 Friday Aug 19th 1400 UTC** to settle scope what is agreeable etc

A Final round with **Final deadline W2 Thursday Aug 25th 1200 UTC** to settle details / agree CRs etc.

For all discussions: Additional deadlines check points etc if needed are defined by the Rapporteur of each discussion respectively. In case some parts of an email discussion need more time, doesn’t converge, need on-line treatment, then please contact the chair.

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

|  |  |  |
| --- | --- | --- |
| Company | Name | Email Address |
| MediaTek (Rapp) | Mutai Morton Lin | morton.lin@mediatek.com |
| Huawei, HiSilicon | Tong Sha | shatong3@hisilicon.com |
| Qualcomm Incorporated | Masato Kitazoe | mkitazoe@qti.qualcomm.com |
| Ericsson | Lian Araujo | lian.araujo@ericsson.com |
| Apple | Naveen Palle | naveen.palle@apple.com |
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# 3 Discussion

## 3.1 First round: Intended to determine agreeable parts

### **Power Class 1.5**

[1] [R2-2207049](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207049.zip) On early implementation and capability signaling of Power Class 1.5 MediaTek Inc. discussion Rel-16 LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79

[2] [R2-2207094](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207094.zip) Make PC1.5 an early implementation candidate MediaTek Inc. CR Rel-16 38.331 16.9.0 3454 - F LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79

[3] [R2-2207095](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207095.zip) Make PC1.5 an early implementation candidate MediaTek Inc. CR Rel-17 38.331 17.1.0 3455 - A LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79

The discussion paper [1] indicates the necessity in the early implementation of PC1.5 and discloses a special power class reporting strategy which is unclear how would network treat such a UE capability. It proposed:

1. **Add PC 1.5 in the Table C-1 of TS 38.331 as the earliest implementable release is Rel-15.**
2. **The principle “Network regards the highest supported power class among all advertised ones as the supported capability” shall be captured in RAN2 specification.**

Therefore CRs [2][3] propose to make PC1.5 an early implementable feature to resolve prerequisite absence issue.

**Q1: Do companies agree with the intention of the CRs [2][3]?**

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| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Qualcomm Incorporated | Yes, but | Why is the proposed text only limit the early implementability to intra-band EN-DC, while the PC1.5 was introduced also for n41 NR SA? |
| Ericsson | See Comments | We are fine with P1.On P2, we prefer to capture the principle as a UE requirement, e.g. that “UE indicates all power classes it supports”. We typically avoid requirements on Nw impl in UE capabilities. We should keep that principle. |
| Apple | OK to P1, no to P2 | Power-class handling has been different to other capabilities. The philosophy of p-max is that UE uses it’s power-class unless NW specifically informs otherwise. We are not sure if anything needs to be captured. UE report the capability and based on presence/absence of power config, the UE uses the relevant Tx power. |
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[4] [R2-2207085](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207085.zip) PC1.5 and legacy power class capability reporting clarification MediaTek Inc. CR Rel-16 38.306 16.9.0 0795 - F LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79

[5] [R2-2207086](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207086.zip) PC1.5 and legacy power class capability reporting clarification MediaTek Inc. CR Rel-17 38.306 17.1.0 0796 - A LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79

Based on the proposal in discussion paper [1], CRs [4][5] propose to clarify network interpretation when UE reports more than one PC (to gain better UL coverage in legacy NW).

**Q2: Do companies agree with the intention of the CRs [4][5]?**

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| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Qualcomm Incorporated | Yes |  |
| Ericsson | No |  |
| Apple | No |  |
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### **CSI-RS capability signaling**

[6] [R2-2207113](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207113.zip) Clarification on codebookParametersPerBC parameter for extension of CSI-RS capabilities reporting MediaTek Inc. CR Rel-16 38.331 16.9.0 3452 - F NR\_newRAT-Core, TEI16

[7] [R2-2207114](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207114.zip) Clarification on codebookParametersPerBC parameter for extension of CSI-RS capabilities reporting MediaTek Inc. CR Rel-17 38.331 17.1.0 3453 - A NR\_newRAT-Core, TEI16

CRs [6][7] point out a conflict that UE is required to report *codebookParametersPerBC* parameter under *CA-ParametersNR* for non-CA band combination and propose to clarify reporting condition.

**Q3: Do companies agree with the intention of the CRs [6][7]?**

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| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | No | This is NBC. In current specification, it is required that both codebookParametersPerBC and codebookParametersPerBand should be reported together by UE if supported, regardless whether the BC is for CA or not. Then for the legacy NW, the NW would consider a UE not reporting codebookParametersPerBC as not supporting the corresponding enhanced codebook capability. If a UE is implemented according to the CR, then the enhanced codebooks can never be configured for a non-CA BC. We should avoid such a NBC change for a Rel-16 capability at this stage.  |
| Qualcomm Incorporated | Yes | But backward compatibility to legacy network must be assessed by infra-vendors. |
| Ericsson | Yes | The RAN1 LS stated that the per BC parameter is to be used to limit the CSI-RS resources that can be used across carriers, it was not meant for single CC case. How exactly would the NW use the per BC parameter in case of single CC case? |
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### **Beam management**

[8] [R2-2207331](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207331.zip) Correction on beamManagementSSB-CSI-RS Qualcomm Incorporated CR Rel-16 38.306 16.9.0 0765 - F TEI16

[9] [R2-2207332](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207332.zip) Correction on beamManagementSSB-CSI-RS Qualcomm Incorporated CR Rel-17 38.306 17.1.0 0766 - A TEI16

CRs [8][9] indicate that the current R2 specification does not correctly capture the RAN1 conclusion in RAN1#101-e regarding to the beam management capability and propose corresponding corrections.

**Q4: Do companies agree with the intention of the CRs [8][9]?**

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| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | No | We do not see the description in the CR reflected in the RAN1 feature list nor in the LS to RAN2, thus it is not necessary to be captured in the 38.306.Besides, for FR2, it is confused how the UE indicates the capability according to the smallest SCS configured for PDSCH, since UE has no idea what is the smallest SCS of the serving cell(s) configured by the NW when reporting the capability information. Assuming that UE reports the capability according to the supported smallest SCS for FR2 band (e.g. 60kHz), then it is contradictory with the conclusion of the smallest SCS configured for PDSCH.We suggest to send RAN1 a LS, asking to clarify what does it mean by “For FR2, the parameter indicates the total number of resources across serving cells within 1 slot of the smallest subcarrier spacing configured for PDSCH in FR2”.  |
| Qualcomm Incorporated | Yes | At least the current text is incorrect and must be corrected.As for the FR2 capability (Huawei’s question), it is our understanding that the UE capability is semi-static regardless of the size of the smallest SCS that may be configured.We are OK sending an LS to RAN1, if majority prefer. |
| Ericsson |  | Fine to go with Huawei suggestion and ask clarifications to RAN1. |
| Apple | Yes | Same view as Qualcomm. |
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### **MMSE-IRC**

[10] [R2-2207640](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207640.zip) CR to TS 38.306 on UE capability of MMSE-IRC receiver China Telecom CR Rel-15 38.306 15.17.0 0775 - F NR\_newRAT-Core

[11] [R2-2207641](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2207641.zip) CR to TS 38.306 on UE capability of MMSE-IRC receiver China Telecom CR Rel-16 38.306 16.9.0 0776 - A NR\_newRAT-Core

CRs [10][11] propose new MMSE-IRC receiver capability shall be specified in TS 38.306 for Rel-15 based on RAN4 LS.

**Q5: Do companies agree with the intention of the CRs [10][11]?**

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| **Company** | **Yes or No** | **Comments** |
| Qualcomm Incorporated | Yes, but | Fine in principle. We do not see the need to talk about FDD/TDD differentiation for mandatory feature without signalling. Ideally, reference to RAN4 specification / section should be added so that it is clear what the corresponding feature is. |
| Ericsson | No | If the feature is mandatory for Rel-17, it seems odd to include an optional feature on 38.306 for Rel-15/16 that will later disappear from the specifications. Nothing would be broken if we do not capture anything. |
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### **Aperiodic CSI-RS**

[12] [R2-2208027](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2208027.zip) Correction on crossCarrierA-CSI-trigDiffSCS-r16 (38.306) Ericsson CR Rel-17 38.306 17.1.0 0786 - A LTE\_NR\_DC\_CA\_enh-Core

[13] [R2-2208028](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2208028.zip) Correction on crossCarrierA-CSI-trigDiffSCS-r16 (38.306) Ericsson CR Rel-16 38.306 16.9.0 0787 - F LTE\_NR\_DC\_CA\_enh-Core

CRs [12][13] proposed to clarify the meaning of the term. "A-CSI trigger" and to remove prerequisite capability description because the prerequisite had been already mandated to report.

**Q6: Do companies agree with the intention of the CRs [12][13]?**

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| **Company** | **Yes or No** | **Comments** |
| Qualcomm Incorporated | Yes |  |
| Ericsson | Yes (Proponent) |  |
| Apple | Ok |  |
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### **PDCCH blind detection**

[14] [R2-2206911](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2206911.zip) Reply LS on PDCCH Blind Detection in CA (R1-2205320; contact: Huawei) RAN1 LS in Rel-17 NR\_L1enh\_URLLC-Core To:RAN2

[15] [R2-2208501](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2208501.zip) Correction on PDCCH Blind Detection capability in CA Huawei, HiSilicon CR Rel-16 38.306 16.9.0 0789 - F NR\_L1enh\_URLLC-Core

[16] [R2-2208502](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2208502.zip) Correction on PDCCH Blind Detection capability in CA Huawei, HiSilicon CR Rel-17 38.306 17.1.0 0790 - A NR\_L1enh\_URLLC-Core

[17] [R2-2208503](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2208503.zip) Correction on PDCCH Blind Detection capability in CA Huawei, HiSilicon CR Rel-16 38.331 16.9.0 3429 - F NR\_L1enh\_URLLC-Core

[18] [R2-2208504](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2208504.zip) Correction on PDCCH Blind Detection capability in CA Huawei, HiSilicon CR Rel-17 38.331 17.1.0 3430 - A NR\_L1enh\_URLLC-Core

The TP in CRs [15][16][17][18] to capture agreements from RAN1 LS R2-2200079 and R2-2206911 [14]. Late non-critical extensions are added to avoid NBC problem.

**Q6: Do companies agree with the intention of the CRs [15][16][17][18]?**

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| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Qualcomm Incorporated | Yes |  |
| Ericsson |  | For 38.331, shouldn’t it be a choice structure between pdcch-BlindDetectionCA-MixedExt-r16 and pdcch-BlindDetectionCG-UE-MixedExt-r16? So the UE could report the CA value on the CA branch and the NR-DC value on the NR-DC branch.For 38.306: We don’t need to capture the aspects 2) and 3) from the coversheet (also pasted below) because they are already clear from ASN.12) Clarify that only one between pdcch-BlindDetectionCA-Mixed-r16 and pdcch-BlindDetectionCA-Mixed-NonAlignedSpan-r16 can be reported by UE, only one between pdcch-MonitoringCA-r16 and pdcch-MonitoringCA-NonAlignedSpan-r16 can be reported by UE.3) Clarify that pdcch-BlindDetectionMCG-UE-Mixed-r16 for MCG and pdcch-BlindDetectionSCG-UE-Mixed-r16 for SCG should be reported together if supported by UE.This sentence is awfully long. Possible to increase readability by splitting to more sentences?: “If a UE supports *pdcch-BlindDetectionCA-Mixed-r16*or *pdcch-BlindDetectionCA-Mixed-NonAlignedSpan-r16*, then the capability defined by *pdcch-BlindDetectionCA-Mixed-r16*or *pdcch-BlindDetectionCA-Mixed-NonAlignedSpan-r16* is applied to the combination of *pdcch-BlindDetectionMCG-UE-Mixed-r16 and pdcch-BlindDetectionSCG-UE-Mixed-r16*, if a UE supports *pdcch-BlindDetectionCA-Mixed-v16xy* or *pdcch-BlindDetectionCA-Mixed-NonAlignedSpan-v16xy*, then the capability defined by *pdcch-BlindDetectionCA-Mixed-v16xy* or *pdcch-BlindDetectionCA-Mixed-NonAlignedSpan-v16xy* is applied to the combination of *pdcch-BlindDetectionMCG-UE-Mixed-v16xy and pdcch-BlindDetectionSCG-UE-Mixed-v16xy* correspondingly as defined in clause 10 in TS 38.213.”The formatting of the RRC CRs seems wrong. The spacing between lines is larger than it should be and some indentations are incorrect. If/when merged these should be fixed. |
| Apple | Yes, we agree with the intent. |  |
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### **PUSCH repetition**

[19] [R2-2208505](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2208505.zip) Clarification on pusch-RepetitionTypeA-r16 capability Huawei, HiSilicon CR Rel-16 38.306 16.9.0 0791 - F NR\_L1enh\_URLLC-Core

[20] [R2-2208506](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_119-e/Docs/R2-2208506.zip) Clarification on pusch-RepetitionTypeA-r16 capability Huawei, HiSilicon CR Rel-17 38.306 17.1.0 0792 - A NR\_L1enh\_URLLC-Core

CRs [19][20] propose to capture prerequisites for FG11-6 mentioned in RAN1 feature list, and also to clarify corresponding parameters for unlicensed band case.

**Q6: Do companies agree with the intention of the CRs [19][20]?**

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| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Qualcomm Incorporated | Yes, but | The first change in pusch-RepetitionTypeA-r16 does not seem necessary. It is merely explaining how the feature works. Usually, we only provide a pointer to the feature itself, and do not explain the feature itself in detail. |
| Ericsson | Yes | Agree with QC. |
| Apple | Yes but | While we agree with the intention and think that the CRs are ok in general, we think that the capability description needs an update (not directly related but should be corrected). The statement *"Indicates whether the UE supports PUSCH transmission with or without slot aggregation”* does not make sense since PUSCH transmission without slot aggregation is basic functionality and does not need to be covered by a UE capability. The feature is not about whether the UE supports slot aggregation or not (which is provided by of type2-PUSCH-RepetitionMultiSlots and pusch-RepetitionMultiSlots). Instead, it is about whether the UE supports the dynamic indication of the number of repetitions. In the RAN1 UE feature list, “with or without aggregation” was used because the dynamic indication could indicate a value of 1, meaning no slot aggregation, or a value of larger than 1, meaning with slot aggregation.We would suggest correcting the above statement by replacing the text with: *“Indicates whether the UE supports the dynamic indication of the number of repetitions for PUSCH transmission, as specified in TS 38.214 [12], clause 6.1.2.1.”* |
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## 3.2 Second round: Further discussion

(TBD)

# 4 Conclusions

(TBD)

# 5 References

1. R2-2207049 On early implementation and capability signaling of Power Class 1.5 MediaTek Inc. discussion Rel-16 LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79
2. R2-2207094 Make PC1.5 an early implementation candidate MediaTek Inc. CR Rel-16 38.331 16.9.0 3454 - F LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79
3. R2-2207095 Make PC1.5 an early implementation candidate MediaTek Inc. CR Rel-17 38.331 17.1.0 3455 - A LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79
4. R2-2207085 PC1.5 and legacy power class capability reporting clarification MediaTek Inc. CR Rel-16 38.306 16.9.0 0795 - F LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79
5. R2-2207086 PC1.5 and legacy power class capability reporting clarification MediaTek Inc. CR Rel-17 38.306 17.1.0 0796 - A LTE\_NR\_B41\_Bn41\_PC29dBm, HPUE\_PC1\_5\_n77\_n78, NR\_UE\_PC1\_5\_n79
6. R2-2207113 Clarification on codebookParametersPerBC parameter for extension of CSI-RS capabilities reporting MediaTek Inc. CR Rel-16 38.331 16.9.0 3452 - F NR\_newRAT-Core, TEI16
7. R2-2207114 Clarification on codebookParametersPerBC parameter for extension of CSI-RS capabilities reporting MediaTek Inc. CR Rel-17 38.331 17.1.0 3453 - A NR\_newRAT-Core, TEI16
8. R2-2207331 Correction on beamManagementSSB-CSI-RS Qualcomm Incorporated CR Rel-16 38.306 16.9.0 0765 - F TEI16
9. R2-2207332 Correction on beamManagementSSB-CSI-RS Qualcomm Incorporated CR Rel-17 38.306 17.1.0 0766 - A TEI16
10. R2-2207640 CR to TS 38.306 on UE capability of MMSE-IRC receiver China Telecom CR Rel-15 38.306 15.17.0 0775 - F NR\_newRAT-Core
11. R2-2207641 CR to TS 38.306 on UE capability of MMSE-IRC receiver China Telecom CR Rel-16 38.306 16.9.0 0776 - A NR\_newRAT-Core
12. R2-2208027 Correction on crossCarrierA-CSI-trigDiffSCS-r16 (38.306) Ericsson CR Rel-17 38.306 17.1.0 0786 - A LTE\_NR\_DC\_CA\_enh-Core
13. R2-2208028 Correction on crossCarrierA-CSI-trigDiffSCS-r16 (38.306) Ericsson CR Rel-16 38.306 16.9.0 0787 - F LTE\_NR\_DC\_CA\_enh-Core
14. R2-2206911 Reply LS on PDCCH Blind Detection in CA (R1-2205320; contact: Huawei) RAN1 LS in Rel-17 NR\_L1enh\_URLLC-Core To:RAN2
15. R2-2208501 Correction on PDCCH Blind Detection capability in CA Huawei, HiSilicon CR Rel-16 38.306 16.9.0 0789 - F NR\_L1enh\_URLLC-Core
16. [16] R2-2208502 Correction on PDCCH Blind Detection capability in CA Huawei, HiSilicon CR Rel-17 38.306 17.1.0 0790 - A NR\_L1enh\_URLLC-Core
17. [17] R2-2208503 Correction on PDCCH Blind Detection capability in CA Huawei, HiSilicon CR Rel-16 38.331 16.9.0 3429 - F NR\_L1enh\_URLLC-Core
18. [18] R2-2208504 Correction on PDCCH Blind Detection capability in CA Huawei, HiSilicon CR Rel-17 38.331 17.1.0 3430 - A NR\_L1enh\_URLLC-Core
19. R2-2208505 Clarification on pusch-RepetitionTypeA-r16 capability Huawei, HiSilicon CR Rel-16 38.306 16.9.0 0791 - F NR\_L1enh\_URLLC-Core
20. [20] R2-2208506 Clarification on pusch-RepetitionTypeA-r16 capability Huawei, HiSilicon CR Rel-17 38.306 17.1.0 0792 - A NR\_L1enh\_URLLC-Core