**3GPP TSG-RAN WG2 Meeting #118-e R2-220xxxx**

**Online, May 09 – 20, 2022**

**Agenda Item: 5.1.4.3**

**Source: Huawei, HiSilicon**

**Title: Summary of [AT118-e][021][NR1516] UE capabilities II**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion.

* [AT118-e][021][NR1516] UE capabilities II (Huawei)

 Scope: Treat R2-2206002, R2-2204485, R2-2205558, R2-2205559, R2-2205560, R2-2205561, R2-2205453, R2-2205556, R2-2205557, R2-2205984, R2-2205985,

 Ph1 Determine agreeable parts, Ph2 for agreeable parts agree CRs (offline agreement, CB online only if necessary).

 Intended outcome: Report, Agreed CRs

 Deadline: Schedule 1

# Contact from companies

|  |  |
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# Discussion

## Part 1: Intended to determine agreeable parts

### **Configured UL grant**

[R2-2206002](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206002.zip) Clarification on configuredUL-GrantType1-v1650 Qualcomm Incorporated CR Rel-16 38.306 16.8.0 0736 - F NR\_newRAT-Core

The above CR[1] adds the configuredUL-GrantType1-v1650 and configuredUL-GrantType2-v1650 to be the possible prerequisite capability in the field description for all related features, which is missing in current specification.

**Q1 Do companies agree with the intention of the CR?**

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| **Company** | **Yes or No** | **Comments** |
| Nokia | Yes | Okay with the proposed change. Why is there not a corresponding Rel-17 CR? |
| Ericsson | Yes | A mirror for Rel 17 will be needed.  |
| Intel | Yes |  |
| Qualcomm Incorporated | Yes (Proponent) | Qualcomm will provide release-17 mirror CR. |
| Samsung | Yes |  |
| OPPO | Yes |  |
| MediaTek | Yes |  |
| Apple | No | The modification in section 6 (copied below) reads like the Rel-16 UE needs to support UL skipping if it is capable of advertising its CG support per band, which may not be true.

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| Skipping UL configured grant if no data to transmit. | Either configuredUL-GrantType1 or configuredUL-GrantType1-v1650 or configuredUL-GrantType2 or configuredUL-GrantType2-v1650 is supported. |

UL skipping of configured grants has been conditionally mandatory only for the Rel-15 variant of the feature. In Rel-16, UL skipping is not supposed to be conditionally mandatory as this also depends on the optional Rel-16 capabilities for enhanced UL skipping. Adding a Rel-16 CG capability here gives the impression this rule no longer applies. We are ok to support the CR if the change in section 6 is removed.  |
| ZTE | Yes |  |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes with comments | Agree with Apple. |
| Qualcomm Incorporated |  | Trying to understand the concern from Apple and Huawei.The UE capabilities *configuredUL-GrantType1-v1650* and *configuredUL-GrantType2-v1650* are merely trimmed version of release-15 CG capabilities, *configuredUL-GrantType1* and *configuredUL-GrantType2*. So obviously it is NOT our intention to conditionally mandate release-16 UL skipping features there.One could argue even the current text without our proposed addition is not entirely clear on this point.We are wondering if the change to section 6 is acceptable if we clarify that the feature that is conditionally mandated is release-15 UL skipping feature only. |
| vivo | Yes |  |

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| --- | --- |
| Skipping UL configured grant if no data to transmit. | Either *configuredUL-GrantType1* or *configuredUL-GrantType1*-v1650 or *configuredUL-GrantType2* or *configuredUL-GrantType2-v1650*is supported. |
| CATT | Yes |  |

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| Summary Most of the companies agree with the intention of the CR. One company says no because the Rel-16 UL skipping capability is not supposed to be conditionally mandatory as this also depends on the optional Rel-16 capabilities for enhanced UL skipping. The proponent of the CR suggests to clarify that the conditionally mandated is Rel-15 UL skipping feature only.Rapp thinks the CR could be acceptable for companies with the clarification above in section 6 as Qualcomm suggested.Proposal 1: The CR R2-2206002 can be pursued with clarification on the conditionally mandated feature in section 6. |

### **Measurement**

[R2-2204485](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204485.zip) LS on UE capability for inter-frequency measurement without MG (R4-2207090; contact: Huawei) RAN4 LS in Rel-16 NR\_RRM\_enh-Core To:RAN2

[R2-2205558](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205558.zip) Correction on UE capability for inter-frequency measurement without MG Huawei, HiSilicon CR Rel-16 38.306 16.8.0 0720 - F NR\_RRM\_enh-Core

[R2-2205559](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205559.zip) Correction on UE capability for inter-frequency measurement without MG Huawei, HiSilicon CR Rel-17 38.306 17.0.0 0721 - A NR\_RRM\_enh-Core

In the LS[2], RAN4 informed that non-CA capable UE is not expected to indicate support of *interFrequencyMeas-Nogap-r16*. The CRs[3][4] add the restriction above for the capability in TS 38.306. Otherwise, if a non-CA capable UE signals the capability, the network may configure inter-frequency measurement without gap, and the UE behaviour is unclear.

**Q2 Do companies agree with the intention of the CRs?**

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| **Company** | **Yes or No** | **Comments** |
| Nokia | No | We do not see this as essential correction |
| Ericsson | No | The signaling specifications should not account for the case where the UE includes a capability but does not really support the feature, this is rather and error case and this same motivation can be done for basically all UE capabilities.If really needed, we can capture it in meeting notes. |
| Intel | No | Agree with others. |
| Qualcomm Incorporated | No | While we understand what RAN4 stated is a reasonable implementation choice, we do not see the need of restricting UE implementation unnecessarily. It is not a testable requirement and there is no inter-operability issue even if a non-CA UE supports gap-less measurement, as far as we can see. |
| Samsung | No |  |
| ZTE | No |  |
| OPPO | No |  |
| MediaTek | No |  |
| Apple | No  | Same view as Ericsson |
| Xiaomi | No |  |
| Huawei, HiSilicon | Yes | The motivation is that the NW cannot identify whether UE is capable of CA from hardware perspective even though single CC capability is reported. From our RAN4 colleagues, only CA-capable UE can satisfy the RAN4 measurement requirement without measurement gap. Then if the capability is reported by non-CA capable UE, the network will anyway configure inter-frequency measurement without gap, which leads to impact on PCell transmission.  |
| CATT | Neutral |  |
| vivo | No |  |

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| Summary One company think it is an error case for UE not supporting a feature to indicate support of the corresponding capability but OK to capture some clarification in chairman notes if needed. One company think there is no need to restrict UE implementation and no inter-operability issue if a non-CA UE supports gap-less measurement.The proponent pointed out the issue is that the transmission on PCell will be impacted if a non-CA capable UE indicates the gap-less measurement capability and there is no way for network to verify.Rapp thinks the inter-operability issue raised by proponent should be discussed further. And if the problem exists, whether to capture the requirement from RAN4 LS into chairman notes.Proposal 2: The CRs R2-2205558/R2-2205559 are not pursued. Discuss in phase2 whether to capture the requirement from RAN4 LS into chairman notes to avoid the inter-operability issue. |

[R2-2205453](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205453.zip) Clarification on the rmtc-Config-r16 Xiaomi Communications, Apple, OPPO CR Rel-16 38.331 16.8.0 3087

The CR[5] is to clarify that *rmtc-Config-r16* is only applicable for shared spectrum, and a condition tag *SharedSpectrum2* is added for *rmtc-Config-r16*.

**Q3 Do companies agree with the intention of the CR?**

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| **Company** | **Yes or No** | **Comments** |
| Nokia | See comment | We would prefer a field description than the ASN.1 condition which is a bit difficult to read and not prefer ASN.1 change even though that would work as what is proposed? |
| Ericsson | No | The CR is not needed/not correct.In principle, RMTC-Config should only be included for RSSI measurements on unlicensed frequencies. So that part is correct.1. Not correct because: MeasObjectNR may be configured for licensed spectrum while the RMTC-Config may refer to a different frequency provided by rmtc-Frequency-r16 (note that e.g. measObjectCLI which is quite similar, is configured separately). So their text proposal is not correct.
2. Not needed because: The UE provides RSSI measurement capability to the network. So the network would anyway not configure RMTC for a UE that does not support this feature.

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| ***rssi-ChannelOccupancyReporting-r16***Indicates whether the UE supports RSSI measurements and channel occupancy reporting. | Band | No | N/A | N/A |

As a consequence, there are no issues with the current implementation. |
| Intel | See comment | I think this CR is placed in the wrong agenda as it is not UE capability related. If restriction to the configuration is needed, we would prefer including it in the field description for rmtc-Config. |
| Qualcomm Incorporated | See comment | We thought the intention of the CR is correct.We should verify Ericsson’s comment #1. Isn’t it just that the frequency for RSSI measurement may not be the frequency of *ssbFrequency* of *MeasObjectNR*, but the *ssbFrequency* should still be of shared spectrum? |
| Samsung | Yes | We can follow the LTE case. Alternatively, it’s acceptable to update the corresponding field description. |
| ZTE | See comment | Agree with the intention, but prefer to update the corresponding field description. |
| OPPO | Proponent | Regarding E///’s comment#1, our understanding is that the condition refers to the frequency within RMTC-Config.  |
| MediaTek | See comments | We tend to agree with the proposal to eliminate ambiguity if the applicability of RMTC-Config in NR is not fundamentally different from in LTE. (We see the term “SharedSpectrum” here refers to unlicensed and shared licensed frequency bands.) |
| Apple | Yes/proponent |  |
| Xiaomi | ProponentSee comment | Regarding Ericsson’s comment 1, we think that companies should verify whether one MO including both licensed frequency (i.e. ssbFrequency) and unlicensed frequency (i.e. rmtc-Frequency-r16) is allowed. We should have aligned understandings between the UE and the network, so as to avoid IoT issues.How to clarify the allowed configuration in the specification can be discussed later once companies’ views are aligned. |
| Huawei, HiSilicon | See comments | We think this issue is not about UE capability which should not be discussed here.However, the comment from Ericsson seems make sense which should be clarified by proponents. |
| vivo | See comments | It seems reasonable, but comments from Ericsson should be clarified. If the change is needed, we also prefer to update it in field description.  |

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| Summary Six companies agree with the intention of the CR (Qualcomm, Samsung, ZTE, OPPO, Apple, Xiaomi). Five companies prefer to clarify in the field description but not change ASN.1. One company thinks the CR is not correct because a MO may be configured for a licensed SSB frequency while the RMTC-Config may refer to a different unlicensed frequency. Rapp thinks that most companies agree with the intention that rmtc-Config-r16 is used for shard spectrum operation as in LTE, but it is doubted not correct to change the ASN.1 condition tag as the MO configured for a licensed SSB frequency may also be used for unlicensed RSSI measurement configured by rmtc-Config-r16. Rapp proposed to continue the discussion on MO configuration in phase 2, and seek a consensus on how to clarify in the spec. Proposal 3: Discuss in phase2 whether the MO configured for a licensed SSB frequency can be used for unlicensed RSSI measurement configured by rmtc-Config-r16 and how to clarify it in spec. |

[R2-2205556](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205556.zip) Correction on measurementEnhancement capability for high speed scenario Huawei, HiSilicon CR Rel-16 38.306 16.8.0 0718 - F NR\_HST-Core

[R2-2205557](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205557.zip) Correction on measurementEnhancement capability for high speed scenario Huawei, HiSilicon CR Rel-17 38.306 17.0.0 0719 - A NR\_HST-Core

The CRs[6][7] are to clarify that intra-NR enhanced RRM requirements are applicable to SN configured measurement when (NG)EN-DC is configured, but inter-RAT E-UTRAN RRM requirements are not.

**Q4 Do companies agree with the intention of the CRs?**

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| **Company** | **Yes or No** | **Comments** |
| Nokia | Yes | Okay to clarify |
| Ericsson | Not essential | The SN in EN-DC should anyway not configure E-UTRAN measurements so there seems to be no real issue. But can be considered into rapporteur CR if companies would prefer to clarify it. |
| Intel | Yes |  |
| Qualcomm Incorporated | Yes | But not essential correction. It seems very unlikely that the current standard causes any misunderstanding. |
| Samsung | Yes | preferable to update the field description in order to avoid any confusion |
| ZTE | Yes |  |
| OPPO | Yes | Agree with E///’s comment and acceptable for us to incorporated into rapporteur CR |
| MediaTek | Yes | But don’t think it’s particularly useful (Not an essential correction to UE behaviour.) |
| Apple | No | The clarification is not needed, since SN is not allowed to configure the inter-RAT E-UTRAN measurement in EN-DC. |
| Xiaomi | Yes |  |
| Huawei, HiSilicon | Yes | To avoid confusion, the field description should be corrected. |
| CATT | Yes | To make the description more readable.  |
| vivo | Yes |  |

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| Summary Ten companies agree with the intention of the CRs. Two companies think the correction is not essential and one company think it is not needed. Two companies think the CRs can be incorporated into rapporteur CR.As most companies agree with the correction, after offline discussion with Intel (rapporteur for TS38.306), the rapp propose the proponent provides a merged 38.306 CR for CRs [6][7] and CHO/CPC capability CRs [10][11], and the merged CR can be pursued after check in phase2 discussion.Proposal 4: A merged 38.306 CR for R2-2205556 and R2-2205984 and for their Rel-17 mirror CRs are to be provided by the proponent in phase 2. The merged CRs can be pursued after double check in phase2. |

### **eMIMO**

[R2-2205560](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205560.zip) Clarification on capabilities reported in different granularity with prerequisite Huawei, HiSilicon CR Rel-16 38.306 16.8.0 0722 - F NR\_eMIMO-Core

[R2-2205561](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205561.zip) Clarification on capabilities reported in different granularity with prerequisite Huawei, HiSilicon CR Rel-17 38.306 17.0.0 0723 - A NR\_eMIMO-Core

The CRs[8][9] are to clarify that for the eMIMO capabilities with prerequisite defined in a finer granularity, UE shall indicate support of the prerequisite for at least one band/component carrier in at least on band combination.

For example, UE supports *supportNewDMRS-Port-r16* (which is defined in perband level) shall indicate support of *singleDCI-SDM-scheme-r16* (which is defined in perFS level) for the band in at least one band combination reported in BandCombinationList. UE supports *maxNumberActivatedTCI-States-r16* (which is defined in perband level) shall support *multiDCI-MultiTRP-r16* (which is defined in FSperCC level) for at least one component carrier for the band.

**Q5 Do companies agree with the intention of the CRs?**

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| **Company** | **Yes or No** | **Comments** |
| Ericsson | Yes, but | If the network is interested on a certain feature, it should check the support of that feature and not its prerequisite. Hence, it may not actually matter in some cases how we clarify it. In any case, this approach seems safe. |
| Intel | Maybe | We are ok with clarifying this. However, we think it would be good to check the understanding with RAN1 via a LS. |
| Qualcomm Incorporated | Yes, but | We support the intention of the CRs.Agree with Intel that we should first check with RAN1. It is OK for us to indicate RAN2’s understanding as outlined by the CRs. |
| Samsung | Yes | This change is safer way considering the legacy UE implementation. |
| OPPO | Yes | We agree with the intention. Current wording in the CR i.e. “for at least one component carrier for the band” however doesn’t make it clear whether it applies for all relevant band combination or at least one relevant band combination.[rapp] We think if the capability is defined in perband/perUE level and the prerequisite is in FSperCC level, it is clear enough to say the prerequisite shall be supported for at least one component carrier, without raising confusion for implementation. There are similar examples in current capability descriptions, e.g. twoTCI-Act-servingCellInCC-List-r16. |
| MediaTek | Yes | We agree that reporting rule dependency (to prerequisite) shall be clarified. |
| ZTE | Yes with intention | We also have a concern that it shall be confirmed by RAN1 to check whether our understanding is correct or not. |
| Xiaomi | Yes | We agree with the intention of the CR. We are also open to ask RAN1 for double-checking. |
| Huawei, HiSilicon | Yes | As for the comment from Ericsson, we cannot agree that the NW should check the support of a feature and not its prerequisite. In fact, for a capability A (e.g. perUE) with prerequisite B in a finer granularity (e.g. FSperCC), even capability A is signalled ‘supported’ in perUE level, it is only supported/applicable on the component carrier where capability B is supported. If majority prefer to check with RAN1, we are OK to send a LS. |
| CATT | Yes | Agree the suggestion to check with RAN1. |
| vivo | Yes, but | Better to check with RAN1.  |

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| Summary All companies agree with the intention of the CRs but prefer to check with RAN1. Rapp proposed to send a LS to RAN1 for double checking. The CRs can be endorsed as a baseline attached in the LS, preparing to be pursued after confirmation from RAN1.Proposal 5: The CRs R2-2205560/R2-2205561 are endorsed. Send a LS to double check the understanding with RAN1.  |

### **CHO and CPC**

[R2-2205984](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205984.zip) Clarifications on CHO and CPC UE capabilities Huawei, HiSilicon CR Rel-16 38.306 16.8.0 0732 - F NR\_Mob\_enh-Core

[R2-2205985](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205985.zip) Clarifications on CHO and CPC UE capabilities Huawei, HiSilicon CR Rel-17 38.306 17.0.0 0733 - A NR\_Mob\_enh-Core

In above CRs[10][11], it is pointed out that for the CHO and CPC capabilities which are defined in perband level, UE should report consistently among all the supported TDD/FDD/FR1/FR2 bands respectively. To avoid confusion, the description on “at least one band” should be removed.

**Q6 Do companies agree with the intention of the CRs?**

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| **Company** | **Yes or No** | **Comments** |
| Nokia | Yes | This could be merged to rapporteur CR. Also why this is not CY?[rapp] The CHO/CPC capabilities are pre-condition of reporting the CHO/CPC capabilities between FDD/TDD and between FR1/FR2, but the capabilities are not mandatory supported when the pre-condition is met. |
| Ericsson | Not essential | We agree that the UE should report consistently CHO and CPC capabilities which are defined in perband level, but since this is clarified already in those capabilities, we do not think this wording would raise confusion. If companies see a need to clarify it, we may align with the similar Rel-15 wording i.e. simply saying “is set for both FDD and TDD”. |
| Intel | No, but is ok to go with majority   | We do not see it as an essential change. It’s already clear from the field description in condHandover-r16 that “UE shall set the capability value consistently for all FDD-FR1 bands, all TDD-FR1 bands and all TDD-FR2 bands respectively”.    So current field description “The parameter can only be set if condHandover-r16 is set for at least one FDD band and one TDD band.” actually doesn’t affect UE implementation.   |
| Qualcomm Incorporated | Yes | But not essential correction. |
| Samsung | Yes | It should be updated because it can be interpreted as these capability bits can be reported only if just one pair of band set satisfies the functionality. |
| ZTE | Yes | But not essential correction, so we think it can be merged to rapporteur CR. |
| OPPO | Yes | Merge into rapporteur CR |
| MediaTek | Yes with comments | We think this CR can be categorized as D because it’s already been clarified that for *condHandover-r16* and *condPSCellChange-r16* UE shall set capability value consistently for all FR1(TDD/FDD) and all FR2(TDD) bands respectively in 38.306. |
| Xiaomi | Yes with comments | We share the same views with MediaTek. |
| Huawei, HiSilicon | Yes | To avoid confusion, we think the correction is needed. Besides, as the capability is defined as OPTIONAL originally, we see no need to change to CY. |
| CATT | Yes | But not essential.  |
| vivo | Maybe no | We agree with the intention, but not sure whether it is needed. |

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| Summary Most companies agree with the intention of the CRs. Two companies prefer to merge into rapporteur CR and two companies indicated that the CR should be categorized as D. After offline discussion with Intel (rapporteur for TS38.306), the rapp propose the proponent provides a merged 38.306 CR for CRs[6][7] and CHO/CPC capability CRs[10][11], and the merged CR can be pursued after double check in phase2 discussion. See the proposal 4. |

## Part 2

### **Further discussion on inter-frequency measurement without MG**

During phase 1 discussion, most companies do not agree with the correction in CR[3][4]. But the proponent pointed out that there is inter-operability issue if a non-CA capable UE indicates the *interFrequencyMeas-Nogap-r16* capability, and the transmission on PCell will be impacted when an gap-less inter-freq measurement is configured by the network, because there is no way for network to verify whether the UE is CA-capable or not.

**Q6 Do companies agree to clarify the requirement from RAN4 LS in chairman notes (i.e. non-CA capable UE is not expected to indicate support of interFrequencyMeas-Nogap-r16) to avoid the inter-operability issue raised in phase 1?**

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| **Company** | **Yes or No** | **Comments** |
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# Conclusions

**Part1:**

**Proposal 1: The CR R2-2206002 can be pursued with clarification on the conditionally mandated feature in section 6.**

**Proposal 2: The CRs R2-2205558/R2-2205559 are not pursued. Discuss in phase2 whether to capture the requirement from RAN4 LS into chairman notes to avoid the inter-operability issue.**

**Proposal 3: Discuss in phase2 whether the MO configured for a licensed SSB frequency can be used for unlicensed RSSI measurement configured by rmtc-Config-r16 and how to clarify it in spec.**

**Proposal 4: A merged 38.306 CR for R2-2205556 and R2-2205984 and for their Rel-17 mirror CRs are to be provided by the proponent in phase 2. The merged CRs can be pursued after double check in phase2.**

**Proposal 5: The CRs R2-2205560/R2-2205561 are endorsed. Send a LS to double check the understanding with RAN1.**

# References

1. R2-2206002 Clarification on configuredUL-GrantType1-v1650 Qualcomm Incorporated CR Rel-16 38.306 16.8.0 0736 - F NR\_newRAT-Core
2. R2-2204485 LS on UE capability for inter-frequency measurement without MG (R4-2207090; contact: Huawei) RAN4 LS in Rel-16 NR\_RRM\_enh-Core To:RAN2
3. R2-2205559 Correction on UE capability for inter-frequency measurement without MG Huawei, HiSilicon CR Rel-17 38.306 17.0.0 0721 - A NR\_RRM\_enh-Core
4. R2-2205560 Clarification on capabilities reported in different granularity with prerequisite Huawei, HiSilicon CR Rel-16 38.306 16.8.0 0722 - F NR\_eMIMO-Core
5. R2-2205453 Clarification on the rmtc-Config-r16 Xiaomi Communications, Apple, OPPO CR Rel-16 38.331 16.8.0 3087 - F TEI16
6. R2-2205556 Correction on measurementEnhancement capability for high speed scenario Huawei, HiSilicon CR Rel-16 38.306 16.8.0 0718 - F NR\_HST-Core
7. R2-2205557 Correction on measurementEnhancement capability for high speed scenario Huawei, HiSilicon CR Rel-17 38.306 17.0.0 0719 - A NR\_HST-Core
8. R2-2205560 Clarification on capabilities reported in different granularity with prerequisite Huawei, HiSilicon CR Rel-16 38.306 16.8.0 0722 - F NR\_eMIMO-Core
9. R2-2205561 Clarification on capabilities reported in different granularity with prerequisite Huawei, HiSilicon CR Rel-17 38.306 17.0.0 0723 - A NR\_eMIMO-Core
10. R2-2205984 Clarifications on CHO and CPC UE capabilities Huawei, HiSilicon CR Rel-16 38.306 16.8.0 0732 - F NR\_Mob\_enh-Core
11. R2-2205985 Clarifications on CHO and CPC UE capabilities Huawei, HiSilicon CR Rel-17 38.306 17.0.0 0733 - A NR\_Mob\_enh-Core