**3GPP TSG-RAN WG2 Meeting #117-e R2-220xxxx**

**Online, 21 February - 03 March 2022**

**Agenda Item: 6.1.4.3**

**Source: Huawei, HiSilicon**

**Title: Summary of [AT117-e][035][NR1615] UE capabilities II**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion.

* [AT117-e][035][NR1615] UE capabilities II (Huawei)

Scope: Treat R2-2202810, R2-2202811, R2-2203268, R2-2203492, R2-2202229, R2-2202108, R2-2203510, R2-2203490, R2-2203491, R2-2203409, R2-2202525, R2-2202526. Ph1 Determine agreeable parts, Ph2 for agreeable parts, progress CRs.

Intended outcome: Report, Agreed CRs.

Deadline: Schedule 1

# Contact from companies

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# Discussion

## Part 1: Intended to determine agreeable parts

### **UL MIMO coherence for UL TX Switching**

[R2-2202810](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202810.zip) Adding UE capability of UL MIMO coherence for UL Tx switching Huawei, HiSilicon, China Telecom, Apple CR Rel-16 38.306 16.7.0 0635 2 F NR\_RF\_FR1-Core R2-2110483

[R2-2202811](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202811.zip) Adding UE capability of UL MIMO coherence for UL Tx switching Huawei, HiSilicon, China Telecom, Apple CR Rel-16 38.331 16.7.0 2786 2 F NR\_RF\_FR1-Core R2-2110484

The above two CRs[1][2] are update of R2-2110483 and R2-2110484, which were both endorsed in RAN2#116e. It has been agreed to revisit the CRs after RAN1 discussion on the legacy MIMO coherence capability. In this meeting, it is confirmed from RAN1 that no new capability will be introduced for UL MIMO coherence in Rel-16 according to LS R2-2202107/R1-2112778. Now the two endorsed CRs are ready to be agreed.

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| Agreements in RAN2#116e* [013] Both endorsed, not for RP, final version later. The CRs R2-2110483 and R2-2110484 correctly captures RAN4 request in their LS. CRs can be revisited after RAN1 discussion on the legacy MIMO coherence capability.
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**Q1 Do companies agree that the two endorsed CRs(R2-2202810/R2-2202811) can be agreed?**

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

[R2-2203268](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203268.zip) UE capabilities for UL full power modes Nokia, Nokia Shanghai Bell discussion Rel-16 NR\_eMIMO-Core

The paper in [3] discussed about the UL full power capability reporting. The proposals are listed below.

**Proposal 1:** RAN2 to clarify whether the UE should always indicate UL full power capabilities consistently across the (UL) featureSets linked to the same band combination entry.

**Proposal 2:** RAN2 to clarify whether UE is allowed to report multiple UL full power mode capabilities per BC.

**Proposal 3:** RAN2 to discuss what is the typical case where UE would support UL full power mode for a BC.

**Proposal 4:** RAN2 to discuss whether the current description of dependencies between the UL full power mode capabilities should be clarified.

**Q2 Do companies agree with the intention to clarify in RAN2 whether the UL full power capabilities should be indicated consistently across the (UL) FeatureSets linked to the same band combination entry by UE?**

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| **Company** | **Yes or No** | **Comments** |
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**Q3 Do companies agree with the intention that multiple UL full power mode capabilities are allowed to be reported for a BC?**

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| **Company** | **Yes or No** | **Comments** |
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**Q4 Do companies agree with the need to further discuss in RAN2 the typical case where UE would support UL full power mode for a BC, and the potential description of dependencies between the UL full power mode capabilities?**

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| **Company** | **Yes or No** | **Comments** |
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[R2-2203492](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203492.zip) Correction on ssb-csirs-SINR-measurement-r16 capability Huawei, HiSilicon CR Rel-16 38.306 16.7.0 0695 - F NR\_eMIMO-Core

In above CR [4], it is pointed out that there is mismatch between RAN1 feature list and 38.306 on the *ssb-csirs-SINR-measurement-r16* capability. The proposed changes in above CR include:

1) Correct that if *ssb-csirs-SINR-measurement-r16* is indicated by UE, the UE shall support CSI-RS as CMR with dedicated CSI-IM.

2) Clarify that the maximum numbers reported within ssb-csirs-SINR-measurement-r16 are across all the CCs in the band.

3) Remove the undefined MD\_1 in the field description.

**Q5 Do companies agree with the intention of the CR above on the three corrections?**

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

[R2-2202229](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202229.zip) Discussion on BWP operation without bandwidth restriction Qualcomm Incorporated, ZTE Corporation discussion Rel-16 TEI16

In the discussion paper [5], the feature “BWP operation without bandwidth restriction” was discussed for non-RedCap UE. The proposals in the paper are as follows.

**Proposal 1:** RAN2 to clarify the BM/RLM/BFD requirements for a UE supporting BWP operation without bandwidth restriction (FG6-1a), but not supporting CSI-RS based RLM/BFD (FG1-7, 1-8 and 2-31).

**Proposal 2:** To confirm a UE with the capability of proposal 1 shall be able to perform SSB-based BM/RLM/BFD without measurement gaps, even if the active DL BWP does not contain the SSB associated to the initial DL BWP.

**Q6 Do companies agree that the current specification is not clear, and there are cases where a UE supporting BWP operation without bandwidth restriction, but not supporting CSI-RS based RLM/BFD?**

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| **Company** | **Yes or No** | **Comments** |
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**Q7 If the answer to Q6 is Yes, do companies agree with P2?**

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### **PDCCH blind detection**

[R2-2202108](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202108.zip) Reply LS on PDCCH Blind Detection in CA (R1-2112833; contact: Huawei) RAN1 LS in Rel-16 To:RAN2

[R2-2203489](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203489.zip) Discussion on PDCCH Blind Detection in CA Huawei, HiSilicon discussion Rel-16 NR\_L1enh\_URLLC-Core

=> Revised in R2-2203510

[R2-2203510](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203510.zip) Discussion on PDCCH Blind Detection in CA Huawei, HiSilicon discussion Rel-16 NR\_L1enh\_URLLC-Core R2-2203489 Late

[R2-2203490](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203490.zip) Correction on PDCCH Blind Detection in CA Huawei, HiSilicon CR Rel-16 38.331 16.7.0 2961 - F NR\_L1enh\_URLLC-Core

[R2-2203491](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203491.zip) Correction on PDCCH Blind Detection in CA Huawei, HiSilicon CR Rel-16 38.306 16.7.0 0694 - F NR\_L1enh\_URLLC-Core

According to the latest RAN1 reply LS[6], multiple combinations of a mix of Rel-16 and Rel-15 PDCCH monitoring capabilities on different serving cells can be reported by UE for FG 11-2c, FG 11-2g and FG 11-2e. The maximum number of combinations suggested by RAN1 is 8.

In the CRs [8][9], to allow UE to report more than one combination for these features, and to avoid non-backward compatible issue, additional lists of SEQUENCE type were added in ASN.1 to report multiple combinations for these features.

**Q8 Do companies agree with the intention of the CRs above?**

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In the reply LS, there is a note from RAN1 that one combination of (*pdcch-BlindDetectionMCG-UE-r15, pdcch-BlindDetectionSCG-UE-r15, pdcch-BlindDetectionMCG-UE-r16, pdcch-BlindDetectionSCG-UE-r16*) reported by a UE for FG 11-2e corresponds to one combination of (*pdcch-BlindDetectionCA-r15, pdcch-BlindDetectionCA-r16*) reported by the UE for FG 11-2c or FG 11-2g.

In current RAN2 spec, there is no restriction to report the mixed blind detection capability for MCG and SCG at the same time. In discussion paper [7], it is proposed to send a LS to RAN1 asking to clarify whether there is a requirement to report the mixed PDCCH blind detection capability for MCG and SCG together by UE, and inform RAN1 the possible NBC problem in the LS.

**Proposal 1:** RAN2 sends a LS to RAN1 asking to clarify whether there is a requirement to report the mixed PDCCH blind detection capability for MCG and SCG together by UE, and inform RAN1 the possible NBC problem in the LS.

**Q9 Do companies agree there is an NBC change if mixed blind detection capability is required to report together for MCG and SCG?**

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**Q9a If the answer to Q9 is Yes, do companies agree to send a LS to RAN1 asking to clarify the intention and inform RAN1 about the possible NBC change?**

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In RAN1 reply LS, it is required that only one from FG 11-2c and FG 11-2g can be reported by UE if reported, and only one from FG 11-2a and FG 11-2f can be reported by UE if reported. However, that will be an NBC change since there is no such restriction in current RAN2 spec.

It is proposed in [7] that a higher capability can be considered by the network if both FG 11-2a and FG 11-2f are reported by UE, or if both FG 11-2c and FG 11-2g are reported by UE. A LS should be sent to RAN1 to confirm the understanding above.

**Proposal 2:** RAN2 asks RAN1 whether a higher capability can be considered by the network if both FG11-2a and FG 11-2f are reported by the UE, or if both FG11-2c and FG 11-2g are reported by UE.

**Q10 Do companies agree a higher capability can be considered by the network if both FG11-2a and FG 11-2f are reported by the UE, or if both FG11-2c and FG 11-2g are reported by the UE?**

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**Q10a If the answer to Q10 is Yes, do companies agree to send a LS to RAN1 to confirm such understanding?**

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### **BCS**

[R2-2203409](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203409.zip) BCS for non-CA band combination Ericsson CR Rel-16 38.331 16.7.0 2956 - F NR\_newRAT-Core, TEI16

The above CR [10] intends to clarify the field description for *supportedBandwidthCombinationSet* capability. The CR includes the following change:

Add a clarification to the field description of the *supportedBandwidthCombinationSet* that the field does not restrict the bandwidths configured for a single CC (i.e. non-CA case).

**Q11 Do companies agree with the intention of the CR?**

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| **Company** | **Yes or No** | **Comments** |
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### **R15 DC combination without CA**

[R2-2202525](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202525.zip) Support of DC combination without CA Apple CR Rel-15 38.306 15.16.0 0680 - F NR\_newRAT-Core

[R2-2202526](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2202526.zip) Support of DC combination without CA Apple CR Rel-16 38.306 16.7.0 0681 - A NR\_newRAT-Core

The intention of CRs in [11][12] is to clarify in the field description of ca-ParametersNRDC that the presence of this field in the UE capability for a particular combination that UE reported (using an entry of BandCombinationList) while the absence of ca-Parameters implies that the UE only support NR-DC for that particular combination and not CA.

**Q12 Do companies agree with the intention of the CRs above?**

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# Conclusions

*To be added…*

# References

1. R2-2202810 Adding UE capability of UL MIMO coherence for UL Tx switching Huawei, HiSilicon, China Telecom, Apple CR Rel-16 38.306 16.7.0 0635 2 F NR\_RF\_FR1-Core R2-2110483
2. R2-2202811 Adding UE capability of UL MIMO coherence for UL Tx switching Huawei, HiSilicon, China Telecom, Apple CR Rel-16 38.331 16.7.0 2786 2 F NR\_RF\_FR1-Core R2-2110484
3. R2-2203268 UE capabilities for UL full power modes Nokia, Nokia Shanghai Bell discussion Rel-16 NR\_eMIMO-Core
4. R2-2203492 Correction on ssb-csirs-SINR-measurement-r16 capability Huawei, HiSilicon CR Rel-16 38.306 16.7.0 0695 - F NR\_eMIMO-Core
5. R2-2202229 Discussion on BWP operation without bandwidth restriction Qualcomm Incorporated, ZTE Corporation discussion Rel-16 TEI16
6. R2-2202108 Reply LS on PDCCH Blind Detection in CA (R1-2112833; contact: Huawei) RAN1 LS in Rel-16 To:RAN2
7. R2-2203510 Discussion on PDCCH Blind Detection in CA Huawei, HiSilicon discussion Rel-16 NR\_L1enh\_URLLC-Core R2-2203489 Late
8. R2-2203490 Correction on PDCCH Blind Detection in CA Huawei, HiSilicon CR Rel-16 38.331 16.7.0 2961 - F NR\_L1enh\_URLLC-Core
9. R2-2203491 Correction on PDCCH Blind Detection in CA Huawei, HiSilicon CR Rel-16 38.306 16.7.0 0694 - F NR\_L1enh\_URLLC-Core
10. R2-2203409 BCS for non-CA band combination Ericsson CR Rel-16 38.331 16.7.0 2956 - F NR\_newRAT-Core, TEI16
11. R2-2202525 Support of DC combination without CA Apple CR Rel-15 38.306 15.16.0 0680 - F NR\_newRAT-Core
12. R2-2202526 Support of DC combination without CA Apple CR Rel-16 38.306 16.7.0 0681 - A NR\_newRAT-Core