**3GPP TSG-RAN WG2 Meeting #115-e R2-210xxxx**

**Online, Aug 16th – 27th, 2021**

**Agenda Item: 6.1.4.3**

**Source: Huawei, HiSilicon**

**Title: Summary of [AT115-e][028][NR16] UE capabilities I**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion.

* [AT115-e][028][NR16] UE capabilities I (Huawei)

Scope: Determine agreeable parts and agree CRs, Treat R2-2108480, R2-2107342, R2-2108641, R2-2108468, R2-2108585, R2-2108586, R2-2108651, R2-2106952, R2-2108618, R2-2108619, R2-2108735, R2-2108736

Intended outcome: Report, Agreed CRs.

Deadline: Schedule 1

# Contact from companies

|  |  |
| --- | --- |
| Company | Email |
| Huawei, HiSilicon | Yiru Kuang, kuangyiru@huawei.com |
| ZTE | liu.jing30@zte.com.cn |
| Qualcomm Incorporated | mkitazoe@qti.qualcomm.com |
| MediaTek | chun-fan.tsai@mediatek.com |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |
|  |  |

# Discussion

## Part 1: Intended to determine agreeable parts

### **Misc Corrections**

[R2-2108480](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108480.zip) Miscellaneous corrections to UE capability descriptions Lenovo, Motorola Mobility CR Rel-16 38.306 16.5.0 0626 - F NR\_unlic-Core, TEI16

The proposed changes in above CR include:

1. offsetSRS-CB-PUSCH-PDCCH-MonitorAnyOccWithGap-fr1-r16: The description of the conditional support of pdcch-MonitoringAnyOccasions with value withDCI-Gap (FG 3-5a) has been added.

2. searchSpaceSetGroupSwitchingwWithDCI-r16: The capability name has been replaced by searchSpaceSwitchWithDCI-r16.

3. extendedSearchSpaceSwitchWithDCI-r16: It has been clarified that UE indicating support of this feature shall indicate support of searchSpaceSwitchWithDCI-r16.

4. Number of editorial issues have been fixed (missing suffices, misalignment of parameter names with TS 38.331 etc.).

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

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Qualcomm Incorporated | Yes |  |
| MediaTek | Yes |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### **DAPS**

[R2-2107342](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2107342.zip) Correction on the capability field DiffSCS-DAPS Huawei, HiSilicon discussion Rel-16 NR\_Mob\_enh-Core

[R2-2108641](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108641.zip) Correction on the capability field DiffSCS-DAPS Huawei, HiSilicon CR Rel-16 38.306 16.5.0 0636 - F NR\_Mob\_enh-Core

The proposal in above discussion paper is listed below. The above CR includes the corresponding change.

Proposal 1: for the two capability fields, i.e. intraFreqDiffSCS-DAPS-r16 and interFreqDiffSCS-DAPS-r16, add clarification that “In this release the UE shall not report this UE capability”.

**Q2 Do companies agree with the intention of Proposal 1 and CR above?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent. |
| Qualcomm Incorporated | No | Fine with the intention of the CRs. But we think making them dummy fields which is ignored by the network is better approach for backward compatibility. |
| MediaTek | Intention OK, CR not | Same view as QC. We prefer to dummify those IEs in new ASN.1 and NW just ignore those fields if included |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### **eMIMO**

[R2-2108468](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108468.zip) Correction to ul-FullPwrMode capability Sequans Communications CR Rel-16 38.306 16.5.0 0625 - F NR\_eMIMO-Core

The proposed change in above CR includes: removing the misleading reference “fullpower as specified in clause 6.1.1.1 of TS.38.214 [12]” for *ul-FullPwrMode-r16*.

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

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | Yes | Editorial change. Minor change, can be merged to e.g. Misc Corrections in [1]. |
| Qualcomm Incorporated | No | Why not correct the specification reference, instead of removing it? |
| MediaTek | Yes, but | As QC commented, maybe we could use correct reference section? |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### **IIOT**

[R2-2108585](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108585.zip) Correction on PDCCH Blind Detection in CA Huawei, HiSilicon CR Rel-16 38.331 16.5.0 2781 - F NR\_IIOT-Core

[R2-2108586](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108586.zip) Correction on PDCCH Blind Detection in CA Huawei, HiSilicon CR Rel-16 38.306 16.5.0 0634 - F NR\_IIOT-Core

The proposed changes in above CRs include: To allow UE to report more than one combinations of pdcch-BlindDetectionCA1-r16 capability and pdcch-BlindDetectionCA2-r16 capability, add a list of elements of SEQUENCE type except for *pdcch-BlindDetectionCA-Mixed-r16* IE and *pdcch-BlindDetectionCA-Mixed-NonAlignedSpan-r16* IE.

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

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent. |
| Qualcomm Incorporated | No | Agree to the intention, but the 38.331 CR is not complete in that it is FFS how many combinations the ASN.1 will support. We also wonder if we have the same problem with FG11-2e? |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

### **UL Skipping**

[R2-2108651](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108651.zip) FR1FR2 differentiation for enhanced UL grant skipping capabilities Qualcomm Incorporated, Nokia, Nokia Shanghai Bell discussion Rel-16 TEI16

The proposal in above discussion paper is listed below. The above CR includes the corresponding change.

Proposal 1: RAN2 to discuss and decide on an approach to modify the current specification to allow FR differentiation

Proposal 2: RAN2 to introduce a new capability IE to allow frequency range differentiation. 2 options are proposed:

• Option-A: new capability is defined per nr-bands, to allow full flexibility for the UE to indicate the supported duplex mode and frequency range combination.

• Option-B: new TDD only capability with frequency range differentiation. Both, current and new IE may be used by the UE to convey its capability to the network.

Proposal 3: to have one of the proposed changes in section 4 &5 or 6&7 agreed.

**Q5 Do companies agree to modify the current specification to allow FR differentiation for *enhancedSkipUplinkTxConfigured-r16* and *enhancedSkipUplinkTxDynamic-r16*? If yes, which option above do companies prefer?**

|  |  |  |  |
| --- | --- | --- | --- |
| **Company** | **Yes or No** | **Option-A or B?** | **Comments** |
| Huawei, HiSilicon | No | Option-A if CR is agreed to pursue | In RAN2#113 meeting, this issue has been discussed in offline 019 and the conclusion is no need of FR1/FR2 differentiation, we don’t see strong motivation to revert the previous conclusion.  If majority of companies prefer to introduce this now, we would prefer Option-A which is more aligned with our Rel-16 principle for FRx/xDD capability design. |
| Qualcomm Incorporated | Yes |  | Proponent. Fine with either solution. |
| MediaTek | No strong view | Option A | We see no strong need to have FR1/FR2 differentiation but fine to have this if majority prefer.  If agreed, prefer to follow previous agreement to avoid any misunderstanding. |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

### **UL TX Switching**

[R2-2106952](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2106952.zip) LS on UL MIMO coherence for Tx switching between two carriers (R4-2107765; contact: China Telecom) RAN4 LS in Rel-16 NR\_RF\_FR1-Core To:RAN2, RAN1

[R2-2108618](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108618.zip) Adding UE capability of UL MIMO coherence for UL Tx switching Huawei, HiSilicon, China Telecom, Apple CR Rel-16 38.306 16.5.0 0635 - F NR\_RF\_FR1-Core

[R2-2108619](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108619.zip) Adding UE capability of UL MIMO coherence for UL Tx switching Huawei, HiSilicon, China Telecom, Apple CR Rel-16 38.331 16.5.0 2786 - F NR\_RF\_FR1-Core

[R2-2108735](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108735.zip) Introducing UL MIMO coherence capability for Tx switching ZTE Corporation, Sanechips CR Rel-16 38.306 16.5.0 0638 - F NR\_RF\_FR1-Core

[R2-2108736](file:///D:/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108736.zip) Introducing UL MIMO coherence capability for Tx switching ZTE Corporation, Sanechips CR Rel-16 38.331 16.5.0 2796 - F NR\_RF\_FR1-Core

The intention of CRs in [9][10] and [11][12] is the same, i.e. adding new per-BC capability *uplinkTxSwitching-PUSCH-TransCoherence-r16* based on LS R2-2106952. The main difference between CRs in [9][10] and [11][12] is the value of *uplinkTxSwitching-PUSCH-TransCoherence-r16*.

**Q6-1 Do companies agree with the intention of the CRs above, i.e. adding a new per-BC UE capability *uplinkTxSwitching-PUSCH-TransCoherence-r16*?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes or No** | **Comments** |
| Huawei, HiSilicon | Yes | Proponent of CRs [9][10]. |
| ZTE | Yes | Proponent of CRs [11][12]. |
| Qualcomm Incorporated | No | RAN4 LS was also sent to RAN1.  The UL coherence depends on the UE transmitter architecture. Given typical UE implementation would support multiple bands with common Tx chains in CA and DC, the coherence should be per-band and per-band combination capability. Our view therefore is that we should change the existing UE capability from per RF band to per band per band combination. Then it can cover non-Tx-switching case and Tx-switching case in different band combinations.  We submitted a paper in RAN1. We should at least wait for RAN1 discussion to avoid out of sync. |
| MediaTek | Yes, but | Also fine to wait RAN1 progress |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

Option 1: The value set is: ENUMERATED {nonCoherent, partialCoherent, fullCoherent}

Option 2: The value set is: ENUMERATED {nonCoherent, coherent}

**Q6-2 if the answer for Q6-1 is yes, which option above do companies prefer?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option1 or 2?** | **Comments** |
| Huawei, HiSilicon | Option1 | The basic idea of option1 is to copy the value set of existing MIMO capability pusch-TransCoherence without change, in order to make sure the RAN1 spec related to the handling of pusch-TransCoherence can also applied to this new UE capability without any change. Regarding ‘fullCoherent’ in option1 v.s. ‘coherent’ in option2, the thing to be clarified is in RAN4 CR R4-2109582 the value of ‘coherent’ is used, but after checking with RAN4 colleague it actually meant ‘fullcoherent’, and RAN4 CR can be updated based on RAN2 agreed value set. Regarding ‘partialCoherent’, although we notified the value of partialCoherent will not be used for 2Tx UE, considering future-proof and spec maintenance we copied it here. But no strong view, we can follow majority views on whether to include partialCoherent or not. |
| ZTE | Option 2 | We think option 2 should be adopted, because:   1. “*partialCoherent*” is not applicable to 2Tx UE, so for both Rel-16 and Rel-17 UL Tx switching, this value will not be used. Even if in Rel-18, UL Tx switching will be enhanced to support more than 2Tx UEs (e.g. 3Tx, 4Tx), we understand several new capabilities will be defined, if needed, any extension (like *partialCoherent*) can be introduced at that time. In Rel-16 spec, we don’t have to reserve something for Rel-18+ use. 2. Option 2 is aligned with RAN4 agreed CR. And we see no need to update RAN4’s spec because using “Coherent” does not cause any confusion in RAN4. 3. If Option 1 is adopted, we are not sure how RAN4 spec describes the value of “*partialCoherent*” (as it is invalid right now), and also we need to discuss whether to add some restriction in RAN2 spec, like saying “UE is not allowed to report *partialCoherent* in this release”.   So we think option 2 is simple and more accurate.  Besides the value range of new capability, the description in TS 38.306 CRs are also different. We prefer the version in R2-2108735[11], because R2-2108618[9] describes the “support of *partialCoherent*” which is technically incorrect for Rel-16 and Rel-17 UL Tx switching. |
| MediaTek |  | It seems that RAN4 (and RAN1) should tell us what the correct enum value is in UE capability (as they did in UE feature table). |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

# Conclusions

*To be added…*

# References

1. R2-2108480 Miscellaneous corrections to UE capability descriptions Lenovo, Motorola Mobility CR Rel-16 38.306 16.5.0 0626 - F NR\_unlic-Core, TEI16
2. R2-2107342 Correction on the capability field DiffSCS-DAPS Huawei, HiSilicon discussion Rel-16 NR\_Mob\_enh-Core
3. R2-2108641 Correction on the capability field DiffSCS-DAPS Huawei, HiSilicon CR Rel-16 38.306 16.5.0 0636 - F NR\_Mob\_enh-Core
4. R2-2108468 Correction to ul-FullPwrMode capability Sequans Communications CR Rel-16 38.306 16.5.0 0625 - F NR\_eMIMO-Core
5. R2-2108585 Correction on PDCCH Blind Detection in CA Huawei, HiSilicon CR Rel-16 38.331 16.5.0 2781 - F NR\_IIOT-Core
6. R2-2108586 Correction on PDCCH Blind Detection in CA Huawei, HiSilicon CR Rel-16 38.306 16.5.0 0634 - F NR\_IIOT-Core
7. R2-2108651 FR1FR2 differentiation for enhanced UL grant skipping capabilities Qualcomm Incorporated, Nokia, Nokia Shanghai Bell discussion Rel-16 TEI16
8. R2-2106952 LS on UL MIMO coherence for Tx switching between two carriers (R4-2107765; contact: China Telecom) RAN4 LS in Rel-16 NR\_RF\_FR1-Core To:RAN2, RAN1
9. R2-2108618 Adding UE capability of UL MIMO coherence for UL Tx switching Huawei, HiSilicon, China Telecom, Apple CR Rel-16 38.306 16.5.0 0635 - F NR\_RF\_FR1-Core
10. R2-2108619 Adding UE capability of UL MIMO coherence for UL Tx switching Huawei, HiSilicon, China Telecom, Apple CR Rel-16 38.331 16.5.0 2786 - F NR\_RF\_FR1-Core
11. R2-2108735 Introducing UL MIMO coherence capability for Tx switching ZTE Corporation, Sanechips CR Rel-16 38.306 16.5.0 0638 - F NR\_RF\_FR1-Core
12. R2-2108736 Introducing UL MIMO coherence capability for Tx switching ZTE Corporation, Sanechips CR Rel-16 38.331 16.5.0 2796 - F NR\_RF\_FR1-Core