**3GPP TSG-RAN WG2 Meeting #127 *R2-240xxxx***

**Maastricht, Netherlands, Aug 19 – 23, 2024**

Agenda Item: 7.0.2.2

Source: ZTE Corporation, Huawei

Title: [AT127][010][NCR] Capability CRs (ZTE/Huawei)

Document for: Discussion, Decision

# Introduction

This document is the report of the following offline discussion:

* [AT127][010][NCR] Capability CRs (ZTE/Huawei)

Intended outcome: Discuss the two CRs and merge after receiving comments

Deadline: 08-23-24

R2-2406277 Discussion on NCR capability Huawei, HiSilicon, Intel Corporation discussion Rel-18 NR\_netcon\_repeater-Core

R2-2406278 Correction on NCR capability Huawei, HiSilicon, Intel Corporation CR Rel-18 38.331 18.2.0 4866 - F NR\_netcon\_repeater-Core

[R2-2406279](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_127\Docs\R2-2406279.zip) Correction on NCR capability Huawei, HiSilicon, Intel Corporation CR Rel-18 38.306 18.2.0 1133 - F NR\_netcon\_repeater-Core

[R2-2407524](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_127\Docs\R2-2407524.zip) Introduction of waveform capability for NCR-MT ZTE Corporation (Rapporteur), Fujitsu CR Rel-18 38.306 18.2.0 1136 1 F NR\_netcon\_repeater-Core [R2-2406415](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_127\Docs\R2-2406415.zip)

[R2-2407525](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_127\Docs\R2-2407525.zip) Introduction of waveform capability for NCR-MT ZTE Corporation (Rapporteur), Fujitsu CR Rel-18 38.331 18.2.0 4876 1 F NR\_netcon\_repeater-Core [R2-2406416](file:///C:\Users\panidx\OneDrive%20-%20InterDigital%20Communications,%20Inc\Documents\3GPP%20RAN\TSGR2_127\Docs\R2-2406416.zip)

# 1 Contact Information

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# R2-2406277, R2-2406278, R2-2406279

There are several proposals proposed in R2-2406277, we discuss them one by one:

Firstly, for mandatory feature that without capability signalling, based on latest RAN4 feature list and RAN4 LS (R4-2402517), it is proposed to update the Table in TS 38.306 to only keep FG1-3 and FG2-10.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Features** | **Index** | **Feature group** | **Components** | **Need of FDD/TDD differentiation** | **Need of FR1/FR2 differentiation** | **Note** | **NCR-MT** |
| 1. System parameter | 1-3 | 64QAM for PUSCH | 64QAM for PUSCH | No | No | Capability can be discussed in future, e.g. when low cost device (e.g. IoT) and/or higher frequency band in FR2 are introduced | mandatory without capability signalling |
| 2. UE RF | 2-10 | Multiple frequency band indication | Multiple frequency band indication | No | No | Per UE capability | mandatory without capability signalling |

These two FGs should be kept in Table 4.2.23.1-3 of TS 38.306. Other FGs should be removed from Table 4.2.23.1-3.

**Proposal 1: Remove the FGs from Table 4.2.23.1-3 of TS 38.306, except for FG1-3 and FG2-10.**

**Q1: Do companies agree with above Proposal 1 from R2-2406277?**

|  |  |  |
| --- | --- | --- |
| Company | Agree?  (Yes/No) | Comments |
| ZTE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
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In addition, the paper also pointed out that based on RAN4 feature list, FG1-11 and FG2-8 are not applicable to NCR-MT.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1-11 | 7.5kHz UL raster shift | 7.5kHz UL raster shift | No | No |  | not applicable |
| 2-8 | UE power class | 1) Support of FR1 UE power class  2) Support of FR2 UE power class  3) Support of FR1 UE power class for EN-DC  4) Support of FR1 UE power class for NR-CA | No | No | Capability signalling  - FR1 UE power class (per band)  - FR2 UE power class (per band)  - FR1 UE power class for EN-DC (per band combination)  - FR1 UE power class for NR CA (per band combination)  Default power class for each component is indicated in TS38.101-1/2/3. If the default power class is not indicated, UE shall report supported power class. The component 2) is also used as power class for intra-band NR-CA in FR2 | not applicable |

So, the proposal is to capture in TS 38.306 that these two capabilities are not applicable to NCR-MT:

**Proposal 2: Clarify in TS 38.306 that FG2-8 and FG1-11 are not applicable to NCR-MT.**

**Q2: Do companies agree with above Proposal 2 from R2-2406277?**

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| --- | --- | --- |
| Company | Agree?  (Yes/No) | Comments |
| ZTE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
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For optional features for NCR-MT, for FG1-4 and FG1-8, as there are existing fields, they can be reused with some clarification in the field descriptions.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 1-4 | 256QAM for PDSCH | 256QAM for PDSCH | No | Yes | For FR1, it can be revisited in the future whether the 256QAM is mandated in all UE types or categories | Optional with capability signalling for FR1 |
| For FR2, RAN4 agreed that no BS and UE requirements will be introduced in Rel.15. | Optional with capability signalling for FR2 |
| 1-8 | Active BWP switching delay | Support of active BWP switching delay specified in TS38.133, candidate values set: {type1, type2} | No | No | For this feature, RAN4 also sent another LS (R4-1803283).  Network cannot configure the shorter delay for certain UE type. | Optional with capability signalling |

For FG1-2 and FG2-1, as there are no existing fields for them, new optional capability IEs should be introduced in TS 38.331 and TS 38.306.

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| --- | --- | --- | --- | --- | --- | --- |
| 1-2 | 64QAM modulation for FR2 PDSCH | 64QAM modulation for FR2 PDSCH | No | Applicable only to FR2 | Capability can be discussed in future, e.g. when low cost device (e.g. IoT) and/or higher frequency band in FR2 are introduced | Optional with capability signalling |
| 2-1 | Maximum channel bandwidth supported in each band for DL and UL separately and for each SCS that UE supports within a single CC | 1) FR1 channel bandwidths in TS38.101-1 Table 5.3.5-1  2) FR2 channel bandwidths in TS38.101-2 Table 5.3.5-1 | No | No | UE capability signalling shall follow RP-172832 (Per-band capability signalling, separately for DL and UL and for each SCS)  Whether a bandwidth newly introduced in future is mandatory for UE shall be discussed case by case. | All BW should be optional instead of mandatory for largest channel bandwidth per-band |

Thus, the proposals are:

**Proposal 3a: Clarify in TS 38.306 that FG1-4 and FG1-8 are optional for NCR-MT.**

**Proposal 3b: Introduce new optional capability fields corresponding to FG1-2 and FG2-1 in TS 38.331 and TS 38.306 for NCR-MT.**

**Q3: Do companies agree with above Proposal 3a and Proposal 3b from R2-2406277?**

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| --- | --- | --- |
| Company | Agree?  (Yes/No) | Comments |
| ZTE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
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Last, for FG2-12, RAN4 indicates that it is optional for NCR-MT, but based on the previous agreed RAN2 CR in R2-2403445, it has already been captured in TS 38.331 that the NCR-MT should ignore the p-Max and nr-NS-PmaxList fields in SIB and only follow the output power and emissions requirements specified in TS 38.106. So, there is no need for NCR-MT to report this capability.

Due to the misalignment, it is proposed to send LS to RAN4 to confirm FG2-12 is not applicable to NCR-MT.

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| 2-12 | Multiple NS/P-Max | Multiple NS/P-Max | No | No | Per UE capability | Optional |

**Proposal 4: Send an LS to RAN4 to confirm the understanding that the multiple NS/Pmax (FG2-12) is not applicable to NCR-MT.**

**Q4: Do companies agree that FG2-12(multiple NS/Pmax) is not applicable to NCR-MT? If agrees, do you think LS to RAN4 is needed?**

|  |  |  |  |
| --- | --- | --- | --- |
| Company | Agree?  (Yes/No) | Need of LS  (Needed, not needed) | Comments |
| ZTE | Yes | No | We think LS is not needed, we haven’t sent LS to RAN4 when RAN2 agreed the CR in R2-2403445. Based on RAN4 spec, it is clear that UE applies separate power/emissions requirements, and the FG2-12 is not applied.  We admitted the RAN4 feature list has this mistake, but we think we can confirm and capture the RAN2 understanding in chairman notes, and rely on UE capability app to fix 38.822 (if necessary).  Companies can inform their RAN4 colleagues internally, based on RAN4 spec, we assume there is no possibility that people in RAN4 can have different understandings. |
| Huawei, HiSilicon | Yes | Yes | It is beneficial to send an LS to RAN4 to confirm in case we miss anything from RAN2 perspective, since normally they shouldn’t make this mistake.  But If majority think it is unnecessary, we are fine to directly change the 38822. |
| Nokia | Yes | Neutral | As ZTE mentioned, the reasoning behind the CR in R2-2403445 was already based on the RAN4 specs, so it seems like RAN4 overlooked this in their feature lists. We are ok to inform RAN4 about this if companies really think it is needed, but we agree with ZTE that it would probably be sufficient to correct 38.822 independently of RAN4. |
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If answers Yes to Q1~4, do you think the CRs provided in R2-2406278 and R2-2406279 are agreeable?

**Q5: Do companies think the CRs in R2-2406278 and R2-2406279 are agreeable and can be merged into UE capability mega CR?**

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| --- | --- | --- |
| Company | Agree?  (Yes/No) | Comments  (Please elaborate if you have comment on the CRs) |
| ZTE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes | In R2-2406279 we found some minor issues, which can be fixed by the capability rapporteur:   * some of the styles got corrupted in clause 4.2.23.1 * 100MHz DL/UL channel BW capabilities should be ordered alphabetically * pdsch-256QAM-FR1: "optional for (e)RedCap UE or NCR-MT" is a bit ambiguous; we think it would be clearer to say "optional for (e)RedCap UE and NCR-MT" |
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# R2-2407524, R2-2407525

In the CRs, it is proposed to introduce new capability for indicating the support of UL waveform DFT-S-OFDM waveforms for NCR-MT, because only CP-OFDM is considered as mandatory feature for NCR-MT, DFT-S-OFDM should be considered as optional feature for NCR-MT, but since DFT-S-OFDM was considered as mandatory feature for legacy UE, thus there is no signalling that can be reused to indicate the support of DFT-S-OFDM for NCR-MT.

**Q6: Do companies agree with the intention of CRs (e.g. introducing DFT-S-OFDM capability for NCR-MT)?**

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| --- | --- | --- |
| Company | Agree?  (Yes/No) | Comments |
| ZTE | Yes |  |
| Huawei, HiSilicon | Yes | Clearly there is ambiguity about current spec on whether DFT-S-OFDM is optional or mandatory or not applied.  For IAB, this is optional. So we are fine to make this also optional for NCR-MT. |
| Nokia | Yes | Same view as Huawei |
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If answers Yes to Q6, please provide your comments on the CRs, if any.

**Q7: Do companies think the CRs in R2-2407524 and R2-2407525 are agreeable and can be merged into UE capability mega CR?**

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| --- | --- | --- |
| Company | Agree?  (Yes/No) | Comments  (Please elaborate if you have comment on the CRs) |
| ZTE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Nokia | Yes |  |
|  |  |  |

# Conclusion

Based on companies’ input, proposals are listed as follows.

**TBD**