3GPP TSG-RAN WG2 Meeting #118 Electronic R2-22xxxxx

Online, May 9th – 20th, 2022

**Agenda item: 5.1.4.3**

**Source: NTT DOCOMO INC. (Moderator)**

**Title: [Draft] Summary of [AT118-e][020][NR1516] UE capabilities I (NTT DOCOMO)**

**Document for: Discussion and Decision**

# 1 Introduction

This document is to report on the following offline discussion:

* [AT118-e][020][NR1516] UE capabilities I (NTT DOCOMO)

Scope: Treat R2-2205118, R2-2205119, R2-2205121, R2-2204472, R2-2206063, R2-2206064, R2-2204419, R2-2204840, R2-2204841, R2-2205451, R2-2205452, R2-2206000, R2-2206001

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

This discussion follows Schedule 1, which is organized as follows.

Discussions with Deadline **Schedule 1**:

A **first round** with **Deadline for comments W1 Thursd May 12th 1200 UTC** to settle scope what is agreeable etc

A Final round with **Final deadline W2 Wednesd May 18th 1200 UTC** to settle details / agree CRs etc.

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

|  |  |  |
| --- | --- | --- |
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# 3 Discussion (1st round)

## 3.1 R4 - Simultaneous Rx/Tx

[1] R2-2205118 Clarification on simultaneous Rx/Tx capability per band pair NTT DOCOMO, INC. CR Rel-15 38.306 15.16.0 0708 - F NR\_newRAT-Core

[2] R2-2205119 Clarification on simultaneous Rx/Tx capability per band pair NTT DOCOMO, INC. CR Rel-16 38.306 16.8.0 0709 - A NR\_newRAT-Core

[3] R2-2205121 Clarification on simultaneous Rx/Tx capability per band pair NTT DOCOMO, INC. CR Rel-17 38.306 17.0.0 0710 - A NR\_newRAT-Core

According to the contributions, RAN4 discussed when the per-band-pair simultaneous Rx/Tx capability should be mandatory and the following agreements were made, which were captured in Rel-15 TS 38.101 series (R4-2206610, R4-2206616)

Agreement:

Proposal 1: For inter-band EN-DC, NE-DC, NR CA, NR DC and SUL configurations, If mandatory simultaneous RxTx capability apply for a band configuration, mandatory simultaneous RxTx capability also apply for the band pair of the configuration when the applicable configuration is a subset of a higher order band configuration.

Proposal 2: Clarification in Proposal 1 should apply from Rel-15 TS 38.101 series.

The CRs propose to reflect the agreement to 38.306 by adding the following text.

*Otherwise, for the band pairs where the mandatory simultaneous Rx/Tx capability applies as specified in <reference to 38.101-x series>, the UE shall set the corresponding bits to “1”.*

The CRs also propose to clarify that Per-BC capability signalling should be used if the UE supports the capability for all *applicable* band pairs, as simultaneous Rx/Tx capability is not applicable to certain band combinations or band pairs, e.g. intra-band band pairs.

**Question 1: Do companies agree with the intention of R2-2205118 [1] and its mirror CRs[2][3]?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO (Qianxi) | Yes |  |
| Huawei, HiSilicon | Yes with comments | We agree that the simultaneousRxTx capability is only applicable for inter-band band pairs within a BC. To avoid confusion and keep alignment between the terminologies, the applicable band pairs should be clarified for simultaneousRxTxSULPerBandPair as well.  ***simultaneousRxTxSULPerBandPair***  Indicates whether the UE supports simultaneous reception and transmission for a NR band combination including SUL for each band pair in the band combination.  Encoded in the same manner as *simultaneousRxTxInterBandCAPerBandPair*.  The UE does not include this field if the UE supports simultaneous transmission and reception for all applicable band pairs in the band combination (in which case *simultaneousRxTxSUL* is included) or does not support for any band pair in the band combination. Otherwise, for the band pairs where the mandatory simultaneous Rx/Tx capability applies as specified in 38.101-1 [2], the UE shall set the corresponding bits to “1”. The UE shall consistently set the bits which correspond to the same band pair.  Besides, since the intra-band band pairs are not applicable for *simultaneousRxTxInterBandCAPerBandPair* and *simultaneousRxTxSULPerBandPair*, we understand the bit corresponding to a non-contiguous intra-band band pair should be set to 0 as they are signalled through two band entries. It is requested to confirm the understanding above. |
| Intel | Yes |  |
| ZTE | Yes |  |
| Nokia | Yes |  |
| Qualcomm Incorporated | Yes | We propose to use somewhat different wording though. Something similar to the text for release-15 capability *simultaneousRxTxInterBandCA* - "It is mandatory for certain band pairs as specified in TS 38.101-1 [2], TS 38.101-2 [3] and TS 38.101-3 [4]." |
| Apple | Yes |  |
| Samsung | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Ericsson | Yes | We also prefer the suggestion given by Qualcomm. |
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## 3.2 R4 - *maxNumberCSI-RS-RRM-RS-SINR*

[4] R2-2204472 LS on the applicability of mixed numerology on UE capability maxNumberCSI-RS-RRM-RS-SINR (R4-2206828; contact: Apple) RAN4 LS in Rel-17 NR\_CSIRS\_L3meas To:RAN1, RAN2

Chair: The LS indicates a Rel-16 WI and Rel-17 applicability

[5] R2-2206063 Clarification on the applicability of mixed numerology on UE capability maxNumberCSI-RS-RRM-RS-SINR Apple Inc CR Rel-16 38.306 16.8.0 0740 - F NR\_CSIRS\_L3meas

[6] R2-2206064 Clarification on the applicability of mixed numerology on UE capability maxNumberCSI-RS-RRM-RS-SINR Apple Inc CR Rel-17 38.306 17.0.0 0741 - A NR\_CSIRS\_L3meas

According to [5] [6]**,** RAN4 made the below agreement that for the case of mixed numerology in R4-2205655:

*the number of CSI-RS resources in any duration that equals to the length of a slot is no larger than UE capability maxNumberCSI-RS-RRM-RS-SINR*

the number of CSI-RS resources in any duration that equals to the length of a slot is no larger than UE capability *maxNumberCSI-RS-RRM-RS-SINR*.

* When there are mixed numerologies, the length of a slot is defined based on the smallest SCS

The RAN4 LS [4] states that RAN4 concludes the UE capability of *maxNumberCSI-RS-RRM-RS-SINR* and the related requirements should be specified based on the duration associated with the slot of minimum SCS in case of mixed numerologies. The CRs[5][6] propose to add the following text to reflect this.

***maxNumberCSI-RS-RRM-RS-SINR***

Defines the maximum number of CSI-RS resources for RRM and RS-SINR measurement across all measurement frequencies per slot. If UE supports any of *csi-RSRP-AndRSRQ-MeasWithSSB*, *csi-RSRP-AndRSRQ-MeasWithoutSSB*, and *csi-SINR-Meas*, UE shall report this capability.

NOTE: A slot is based on minimum SCS among all measurement frequencies configured for RRM and RS-SINR measurement.

**Question 2: Do companies agree with the intention of R2-2206063 [5] and R2-2206064 [6]?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO (Haitao) | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Intel | Yes |  |
| Nokia | Yes | It is better to capture the NOTE with the formulation based in RAN4 “When there are mixed numerologies, the length of a slot is defined based on the smallest SCS”  We think the interop statement is incorrect that if the network is not implemented according to the CR the definition of length of slot is not aligned and may result in overconfiguration of CSI resources exceeding UE capability. The current formulation says there is no problem which sounds strange given the issue description.  [Apple] our intention is that inter-operability in terms of communication of RRC messages is possible, but the link operation might fail. We are ok to reword this if RAN2 prefers. |
| Qualcomm Incorporated | Yes |  |
| Apple | Yes (proponent) |  |
| Samsung | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Ericsson | Yes |  |
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## 3.3 L1

[7] R2-2204419 LS on updated Rel-16 RAN1 UE features lists for NR after RAN1#108-e (R1-2202764; contact: NTT DOCOMO) RAN1 LS in Rel-16 TEI16, NR\_CLI\_RIM-Core, NR\_eMIMO-Core, NR\_Mob\_enh-Core, LTE\_NR\_DC\_CA\_enh-Core, NR\_unlic-Core, NR\_2step\_RACH-Core, NR\_IAB-Core, NR\_L1enh\_URLLC-Core, NR\_UE\_pow\_sav-Core, NR\_pos-Core, 5G\_V2X\_NRSL-Core, NR\_IIOT-Core To:RAN2 Cc:RAN4

[8] R2-2204840 Correction to multi-DCI multi-TRP and new UE capability to limit PDCCH monitoring Intel Corporation CR Rel-16 38.306 16.8.0 0704 - F NR\_eMIMO-Core, TEI16

[9] R2-2204841 New UE capability to limit PDCCH monitoring Intel Corporation CR Rel-16 38.331 16.8.0 2999 - F NR\_eMIMO-Core, TEI16

The CRs [8] and [9] are to update 38.306 and 38.331 based on the updated R1 UE feature list [7].

1. Clarify how the multi-DCI multi-TRP PUSCH operation is supported by existing FGs on the field description of multiDCI-MultiTRP-r16.
2. Introduce a new capability to limit PDCCH monitoring with a single span of three contiguous OFDM symbols that is within the first four OFDM symbols in a slot.

**Question 3: Do companies agree with the intention of R2-2204840 [8] and R2-2204841 [9]?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO (Zhongda) | Yes |  |
| Huawei, HiSilicon | Yes with comments | For correction 2), to avoid misunderstanding, it should be clarified that a new UE supporting the legacy field(i.e. *pdcch-MonitoringSingleOccasion*) shall indicate support of the new field(i.e. *pdcch-MonitoringSingleSpanFirst4Sym-r16*). |
| Intel | Yes | For correction 2), we prefer not to add any pre-requisite to the legacy field (i.e. *pdcch-MonitoringSingleOccasion*) since there may already be Rel-16 UE that may have set the legacy field but not indicating the new field. But we are fine to follow the majority. |
| Nokia | Yes | Agree with comments from above. |
| Qualcomm Incorporated | Yes | We also prefer not to add any pre-requisite, unless RAN1 indicates so. |
| Apple | Yes |  |
| Lenovo | Yes with comments | R2-224840, cover page: In WI code “TEI-16” remove dash.  R2-224841: The following comment should be added above the capability:  “-- R1 22-12: PDCCH monitoring with a single span of three contiguous OFDM symbols that is within the first four OFDM symbols in a slot”  Furthermore, for the new FG 22-12 we prefer not to add any pre-requisite to the legacy field since this was not indicated by RAN1.  Last but not least we suppose R17 shadow CRs will be provided if the R16 CRs are agreeable. |
| Samsung | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Ericsson | Yes | Agree with Intel. |
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[10] R2-2205451 Correction on the UE capability description of the overlapping PDSCH in Rel-17 Xiaomi Communications, Samsung CR Rel-17 38.306 17.0.0 0716 - F TEI16

[11] R2-2205452 Correction on the UE capability description of the overlapping PDSCH in Rel-16 Xiaomi Communications, Samsung CR Rel-16 38.306 16.8.0 0717 - A TEI16

According to the contributions, in 38.822, the UE indicating the support of *overlapPDSCHsInTimePartiallyFreq-r16* shall also indicate the support of the “Prerequisite feature” 16-2a-0 *overlapPDSCHsFullyFreqTime-r16*. However the field description of *overlapPDSCHsInTimePartiallyFreq-*r16 in 38.306 says that the “Prerequisite feature” of *overlapPDSCHsInTimePartiallyFreq-r16* is *multiDCI-MultiTRP-r16*. The CRs propose to correct the field description of *overlapPDSCHsInTimePartiallyFreq-r16* that the UE indicating the support of *overlapPDSCHsInTimePartiallyFreq-r16* shall also indicate the support of *overlapPDSCHsFullyFreqTime-r16*.

**Question 4: Do companies agree with the intention of R2-2205451 [10] and R2-2205452 [11]?**

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| --- | --- | --- |
| Company | Yes or No | Comments |
| OPPO (Zhongda) | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Intel | Yes | It seems like a wrong pre-requisite was added in the field description during Rel-16 UE cap implementation. |
| ZTE | Yes |  |
| Nokia | Yes |  |
| Qualcomm Incorporated | Yes |  |
| Apple | Yes |  |
| Lenovo | Yes but | Cover page changes are needed for both CRs:  R2-2205451: It’s a R17 CR, so category should be “A”.  R2-2205452: It’s a R16 CR, so category should be “F”.  And since the capability “overlapPDSCHsInTimePartiallyFreq-r16” was introduced in the context of MIMO the WI code should be “NR\_eMIMO-Core” instead of “TEI16”. |
| Samsung | Yes | Proponent |
| MediaTek | Yes | It’s a TEI16 issue then shall category F be on Rel-16 CR [11]? |
| Xiaomi | Yes | Proponent  Not sure about the WID code change and the CR category change proposed by others. |
| Ericsson | Yes |  |
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[12] R2-2206000 bwp-SwitchingDelay conditionally mandatory capability Qualcomm Incorporated CR Rel-15 38.306 15.16.0 0734 - F NR\_newRAT-Core

[13] R2-2206001 bwp-SwitchingDelay conditionally mandatory capability Qualcomm Incorporated CR Rel-16 38.306 16.8.0 0735 - F NR\_newRAT-Core

The contributions point out that the support of *bwp-SwitchingDelay* capability by the UE depends on the support of the BWP switch feature while per the current spec “*bwp-SwitchingDelay*” is classified as a mandatory capability without including any dependency on the support of the BWP switch feature, which is causing interoperability issue between UE and network during testing.

The CRs propose to clarify the dependency on the BWP switching feature in 38.306.

**Question 5: Do companies agree with the intention of R2-2206000 [12] and R2-2206001 [13]?**

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| Company | Yes or No | Comments |
| OPPO (Cong) | Yes | Agree the intention that the bwp-switchingDelay depends on whether the UE support BWP switch feature, thus we’re ok on the CRs |
| Huawei, HiSilicon | Yes |  |
| Intel | Yes? | Even though the change looks correct, the interoperability impact needs to be updated to indicate the case where BWP switch feature is supported but this is not advertised. Otherwise the change does not look like an essential change |
| Nokia | Yes |  |
| Qualcomm Incorporated | Yes (Proponent) |  |
| Apple | Ok with the correction. |  |
| Samsung | Yes |  |
| MediaTek | Yes |  |
| Xiaomi | Yes |  |
| Ericsson | Yes |  |
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# 5 Summary of 1st Round Discussion

# 6 Discussion (2nd round)

# 7 Conclusion

# References

R4 - Simu Rx/Tx

[1] R2-2205118 Clarification on simultaneous Rx/Tx capability per band pair NTT DOCOMO, INC. CR Rel-15 38.306 15.16.0 0708 - F NR\_newRAT-Core

[2] R2-2205119 Clarification on simultaneous Rx/Tx capability per band pair NTT DOCOMO, INC. CR Rel-16 38.306 16.8.0 0709 - A NR\_newRAT-Core

[3] R2-2205121 Clarification on simultaneous Rx/Tx capability per band pair NTT DOCOMO, INC. CR Rel-17 38.306 17.0.0 0710 - A NR\_newRAT-Core

R4 - maxNumberCSI-RS

[4] R2-2204472 LS on the applicability of mixed numerology on UE capability maxNumberCSI-RS-RRM-RS-SINR (R4-2206828; contact: Apple) RAN4 LS in Rel-17 NR\_CSIRS\_L3meas To:RAN1, RAN2

Chair: The LS indicates a Rel-16 WI and Rel-17 applicability

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[6] R2-2206064 Clarification on the applicability of mixed numerology on UE capability maxNumberCSI-RS-RRM-RS-SINR Apple Inc CR Rel-17 38.306 17.0.0 0741 - A NR\_CSIRS\_L3meas

L1

[7] R2-2204419 LS on updated Rel-16 RAN1 UE features lists for NR after RAN1#108-e (R1-2202764; contact: NTT DOCOMO) RAN1 LS in Rel-16 TEI16, NR\_CLI\_RIM-Core, NR\_eMIMO-Core, NR\_Mob\_enh-Core, LTE\_NR\_DC\_CA\_enh-Core, NR\_unlic-Core, NR\_2step\_RACH-Core, NR\_IAB-Core, NR\_L1enh\_URLLC-Core, NR\_UE\_pow\_sav-Core, NR\_pos-Core, 5G\_V2X\_NRSL-Core, NR\_IIOT-Core To:RAN2 Cc:RAN4

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[9] R2-2204841 New UE capability to limit PDCCH monitoring Intel Corporation CR Rel-16 38.331 16.8.0 2999 - F NR\_eMIMO-Core, TEI16

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[12] R2-2206000 bwp-SwitchingDelay conditionally mandatory capability Qualcomm Incorporated CR Rel-15 38.306 15.16.0 0734 - F NR\_newRAT-Core

[13] R2-2206001 bwp-SwitchingDelay conditionally mandatory capability Qualcomm Incorporated CR Rel-16 38.306 16.8.0 0735 - F NR\_newRAT-Core