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

**Online, Aug 16th – 27th, 2021**

**Agenda Item: 5.4.3**

**Source: Huawei, HiSilicon**

**Title: Summary of [AT115-e][016][NR15] UE Capabilities II**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion.

* [AT115-e][016][NR15] UE Capabilities II (Huawei)

Scope: Determine agreeable parts in a first phase, for agreeable parts agree on CRs. Treat R2-2108574, R2-2108575, R2-2107390, R2-2108578, R2-2108579, R2-2108580, R2-2106958, R2-2107980, R2-2106963, R2-2108572, R2-2108573, R2-2107130, R2-2107389,

Intended outcome: Report, agreed CRs if applicable

Deadline: Schedule 1

# Contact from companies

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# Discussion

## Part 1: Intended to determine agreeable parts

### BW handling

[R2-2108574](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108574.zip) Introduction of NR channel bandwidth capability for LTE-to-NR HO case Huawei, HiSilicon CR Rel-15 36.331 15.14.0 4716 - F NR\_newRAT-Core

[R2-2108575](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108575.zip) Introduction of NR channel bandwidth capability for LTE-to-NR HO case Huawei, HiSilicon CR Rel-16 36.331 16.5.0 4717 - A NR\_newRAT-Core

In IE *UE-EUTRA-Capability*, UE only reports supported NR bands in NR-SA for handover and redirection. However, the UE may not 100% be able to work under the target gNB although the UE can support the NR band, it still relies on the supported bandwidth of this band. Thus, the target gNB checks UE NR capability and may find that the UE supported bandwidth cannot fulfil the condition, the target gNB will reject this handover procedure. It increases the failure probability for handover preparation and leads to handover delay and signalling overhead.

The proposed change is: to introduce the NR channel bandwidth capability per SCS in IE *UE-EUTRA-Capability*.

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

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| **Company** | **Yes or No** | **Comments** |
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[R2-2107390](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_115-e%5CDocs%5CR2-2107390.zip) UE Capability filtering solution for EN-DC BC selection issue NTT DOCOMO, Inc. discussion Rel-17 TEI17

In realistic deployments, there is a possibility that EN-DC configuration fails due to the band combination selection process between eNB and gNB, if gNB supports only certain value of bandwidth (e.g. 100MHz). The proposals are listed below.

Proposal 1: RAN2 to support NR UE capability filtering by additional NR bandwidth parameters, e.g. list of channel bandwidths that should be supported for each band in the reported band combinations.

Proposal 2: RAN2 to support NR UE capability filtering by subcarrier spacing.

**Q2 Do companies agree with the intention of Proposal 1&2 above?**

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| **Company** | **Yes or No** | **Comments** |
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[R2-2108578](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108578.zip) Support of newly introuduced 100M bandwidth for band n40 Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

In RAN4#99e meeting, the new channel bandwidth 90M/100M were introduced for band n40, RAN2 need to consider how to differentiate the new UEs supporting 100MHz in n40 and the legacy n40 UEs which does not supporting 100MHz. The proposal is listed below.

Proposal 1: use spare bit in *channelBWs-DL/UL-v1590* to indicate the support of 100MHz channel bandwidth introduced later than 38101-1 v17.1.0 for FR1, and mandate the new UEs to set this bit to 1.

**Q3 Do companies agree with the intention of Proposal 1 above?**

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| **Company** | **Yes or No** | **Comments** |
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[R2-2107980](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2107980.zip) Allowed bandwidth in BWP configuration Ericsson discussion

In RAN2#114-e, this topic was addressed but no conclusion was taken, the contribution discusses this scenario and the impact to BWP configuration. The proposals are listed below.

Proposal 1 When configuring a UE with a dedicated BWP that is not within the channel bandwidth that the UE applied when acquiring SIB1, the network configures the downlinkChannelBW-PerSCS-List and/or uplinkChannelBW-PerSCS-List so that the channel bandwidth covers at least the active BWP.

Proposal 2 The network avoids DCI- and timer-based BWP switching to BWPs that are not within the RRC-configured channel bandwidth.

**Q4-1 Do companies agree with the intention of Proposal 1 above?**

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| **Company** | **Yes or No** | **Comments** |
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**Q4-2 Do companies agree with the intention of Proposal 2 above?**

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### SimultaneousRxTx

[R2-2106958](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2106958.zip) Reply LS on simultaneous Rx/Tx capability (R4-2108003; contact: Qualcomm) RAN4 LS in Rel-15 NR\_newRAT To:RAN2

[R2-2106963](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2106963.zip) Reply LS on simultaneous Rx/Tx capability (R4-2111452; contact: Huawei) RAN4 LS in Rel-15 NR\_newRAT To:RAN2

[R2-2108572](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108572.zip) Clarification on the simultaneousRxTxInterBandCA capability in NR-DC Huawei, HiSilicon, Ericsson CR Rel-15 38.306 15.14.0 0561 2 F NR\_newRAT-Core R2-2106128

[R2-2108573](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2108573.zip) Clarification on the simultaneousRxTxInterBandCA capability in NR-DC Huawei, HiSilicon, Ericsson CR Rel-16 38.306 16.5.0 0562 2 A NR\_newRAT-Core R2-2106129

[R2-2107130](file:///D%3A/Documents/3GPP/tsg_ran/WG2/RAN2/2108_R2_115-e/Docs/R2-2107130.zip) Simultaneous Rx/Tx UE capability Qualcomm Incorporated discussion Rel-15 NR\_newRAT-Core

[R2-2107389](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_115-e%5CDocs%5CR2-2107389.zip) Considerations on simultaneous Rx/Tx capability per band pair NTT DOCOMO, Inc. discussion Rel-15

In the LS R2-2106958, there are UEs that do not support simultaneous Rx/Tx capability for a band combination, but do support simultaneous Rx/Tx operation for some band pair(s) in the band combination. RAN4 asks to introduce per-band-pair signalling to the simultaneous Rx/Tx capability. Two possible solutions are provided in [10] and [11].

The proposals in [10] are listed below.

Proposal 1: Introduce UE capability signalling by which the UE indicates groups of bands where simultaneous Rx/Tx is NOT supported among bands in a group (FFS signalling details).

Proposal 2: The new UE capability signalling is introduced as an extension to the existing band combination list, i.e. no new band combination list is introduced.

Proposal 3: The UE using the new UE capability signalling shall not indicate the simultaneous Rx/Tx capability for the band combination, i.e. simultaneousRxTxInterBandCA and/or simultaneousRxTxInterBandENDC.

Proposal 4: The new UE capability signalling is introduced in release-16.

The proposals in [11] are listed below.

Proposal 1: RAN2 to specify per-band-pair signalling for simultaneous Rx/Tx capability as RAN4 suggested.

Proposal 2: Add a bitmap in MRDC-Parameters and CA-Parameters, where each bit represents whether simultaneous Rx/Tx is supported for a band pair in the BC.

**Q5-1 Do companies agree with the intention of introducing new capability signalling to support simultaneous Rx/Tx capability in a finer granularity for a band combination? If yes, which solution do companies prefer?**

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| **Company** | **Yes or No** | **Support of solution in [10] or [11] or other?** | **Comments** |
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In the LS R2-2106963, RAN4 understands that the per BC capability is determined by UE implementation, therefore, there is no distinguishment for applicability of this UE capability for cases of same cell group or cross cell groups, i.e. the capability can apply across cell-groups for NR-DC.

The proposals in [10] are listed below.

Proposal 5: RAN2 to confirm the following interpretation of simultaneousRxTxInterBandCA does not cause any interoperability issue.

1. The UE indicating the support for simultaneousRxTxInterBandCA for an NR-DC band combination is considered to support simultaneous Rx/Tx for any pair of TDD-FDD / TDD-TDD bands, including intra-CG and inter-CG.

2. The UE not indicating the support for simultaneousRxTxInterBandCA for an NR-DC band combination is considered not to support simultaneous Rx/Tx for any pair of TDD-FDD / TDD-TDD bands, including intra-CG and inter-CG.

3. In case 2, the legacy network would not configure the UE with NR-DC due to the lack of inter-node resource coordination mechanism, or shall avoid simultaneous Rx/Tx across CGs (e.g. via an implementation specific solution).

Proposal 6: Inform RAN3 about RAN2 agreements and request RAN3 to make necessary changes to their specifications.

**Q5-2 Do companies agree with Proposal 5 above? If yes, do companies agree with Proposal 6 above?**

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| **Company** | **Yes or No****for Proposal 5** | **Yes or No****for Proposal 6** | **Comments** |
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The proposed change in [8][9] is: to clarify that *simultaneousRxTxInterBandCA* capability applies to any of the NR bands of the same CG and across MCG and SCG in NR-DC case.

**Q5-3 Do companies agree with the intention of the CRs above?**

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| **Company** | **Yes or No** | **Comments** |
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In [11], it was observed that as *allowedBC-ListMRDC* omits the fallback band combinations, *allowedBC-ListMRDC* alone is not sufficient for the SN to determine which band pair to check the simultaneous Rx/Tx capability. The proposals in [11] are listed below.

Proposal 3: RAN2 to specify that the SN can use the selectedBandEntriesMNList field to check the per-band-pair simultaneous Rx/Tx capability in NR-DC, (NG)EN-DC, and NE-DC.

**Q5-4 Do companies agree with the intention of Proposal 3 above?**

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# Conclusions

*To be added…*

# References

BW handling

1. R2-2108574 Introduction of NR channel bandwidth capability for LTE-to-NR HO case Huawei, HiSilicon CR Rel-15 36.331 15.14.0 4716 - F NR\_newRAT-Core
2. R2-2108575 Introduction of NR channel bandwidth capability for LTE-to-NR HO case Huawei, HiSilicon CR Rel-16 36.331 16.5.0 4717 - A NR\_newRAT-Core
3. R2-2107390 UE Capability filtering solution for EN-DC BC selection issue NTT DOCOMO, Inc. discussion Rel-17 TEI17
4. R2-2108578 Support of newly introuduced 100M bandwidth for band n40 Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core
5. R2-2107980 Allowed bandwidth in BWP configuration Ericsson discussion

SimultaneousRxTx

1. R2-2106958 Reply LS on simultaneous Rx/Tx capability (R4-2108003; contact: Qualcomm) RAN4 LS in Rel-15 NR\_newRAT To:RAN2
2. R2-2106963 Reply LS on simultaneous Rx/Tx capability (R4-2111452; contact: Huawei) RAN4 LS in Rel-15 NR\_newRAT To:RAN2
3. R2-2108572 Clarification on the simultaneousRxTxInterBandCA capability in NR-DC Huawei, HiSilicon, Ericsson CR Rel-15 38.306 15.14.0 0561 2 F NR\_newRAT-Core R2-2106128
4. R2-2108573 Clarification on the simultaneousRxTxInterBandCA capability in NR-DC Huawei, HiSilicon, Ericsson CR Rel-16 38.306 16.5.0 0562 2 A NR\_newRAT-Core R2-2106129
5. R2-2107130 Simultaneous Rx/Tx UE capability Qualcomm Incorporated discussion Rel-15 NR\_newRAT-Core
6. R2-2107389 Considerations on simultaneous Rx/Tx capability per band pair NTT DOCOMO, Inc. discussion Rel-15