**3GPP TSG-RAN WG2 Meeting #113bis-e R2-210xxxx**

**Online, April 12 – April 20, 2021**

**Agenda Item: 5.4.3**

**Source: Huawei, HiSilicon**

**Title: Summary of [AT113bis-e][009][NR15] UE caps BCS EN-DC (Huawei)**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion.

**[AT113bis-e][009][NR15] UE caps BCS EN-DC (Huawei)**

START ONLY AFTER ON-line Monday

 Scope: Taking into account on-line agreements, Treat R2-2104025, R2-2103061, R2-2104030, R2-2104212, R2-2104213, R2-2104214, R2-2104026, R2-2104027, R2-2104028,

 Phase 1, determine agreeable parts, Phase 2, for agreeable parts Work on CRs.

 Intended outcome: Report and Agreed-in-principle CRs, Approved LS if agreeable.

 Deadline: Schedule A

# Contact from companies

|  |  |
| --- | --- |
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| Apple | naveen.palle@apple.com |
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| Huawei, HiSilicon | kuangyiru@huawei.com |
| MediaTek | Chun-fan.tsai@mediatek.com |
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# Discussion (Phase 1)

## Clarification on the BCS and its fallback

[R2-2104025](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2104025.zip) Discussion on BCS of a fallback band combination Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

[R2-2104212](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2104212.zip) Further Clarification on the supportedBandwidthCombinationSet ZTE Corporation, Sanechips discussion Rel-15 NG\_RAN\_PRN-Core

### 3.1.1 BCS of a fallback band combination (online)

**Companies are invited to provide the comments directly to the draft LS (once available).**

### 3.1.2 Intra-band (NG)EN-DC/NE-DC BC with only single NR carrier

The observations and proposals are listed as below:

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| Observation 1: Based on the current field description the BCS for the Intra-band Part of a “Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier” shall be reported in the *supportedBandwidthCombinationSetIntraENDC*.Observation 2: The *supportedBandwidthCombinationSetIntraENDC* was introduced for the case that can’t be covered by *supportedBandwidthCombinationSet*. From this point of view, the BCS for the Intra-band Part of a “Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier” shall be reported in the *supportedBandwidthCombinationSet*.Proposal 1: Ran2 to confirm which capability element (*SupportedBandwidthCombinationSet* or *supportedBandwidthCombinationSetIntraENDC*) shall be adopted to report the intra-band Part of “Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier”.Proposal 1.1: If RAN2 confirm that the *SupportedBandwidthCombinationSet* shall be reported, agree the related change in the draft CR [5][6] |

**Q1-1 Which capability element (*SupportedBandwidthCombinationSet* or *supportedBandwidthCombinationSetIntraENDC*) shall be adopted to report the intra-band Part of “Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier”.**

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| **Company** | ***SupportedBandwidthCombinationSet* or *supportedBandwidthCombinationSetIntraENDC*** | **Comments** |
| Apple | We are not yet sure about the issue, but our view is that with NR single carrier, there is no need for NR part of BCS and so is ***SupportedBandwidthCombinationSet*** sufficient…? |  |
| ZTE | ***SupportedBandwidthCombinationSet***  | 1. @Apple We share the same view that for the case of **“**Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier”, there is no need for NR part of BCS so the ***SupportedBandwidthCombinationSet***  is sufficient, which means the UE shall report the BCS for the intra-band EN-DC part in the ***SupportedBandwidthCombinationSet*** instead of the ***supportedBandwidthCombinationSetIntraENDC.***
2. Furthermore, the original intention of the “***supportedBandwidthCombinationSetIntraENDC***” was introduced to cover the cases that can’t be covered by the “***SupportedBandwidthCombinationSet*** ”, but for the case of “**“**Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier”, as described above, it can be covered by “***SupportedBandwidthCombinationSet*** ”
3. Then back to the current spec, in the “***supportedBandwidthCombinationSetIntraENDC***”, it said “ It is mandatory if the band combination is an intra-band (NG)EN-DC/NE-DC combination supporting both UL and DL intra-band (NG)EN-DC/NE-DC parts with additional inter-band NR/LTE CA component.”

obviously, the **“**Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier” would be also mandatory to report the “*supportedBandwidthCombinationSetIntraENDC*’” That’s why we want to have a clarification on this issue. |
| Huawei, HiSilicon | ***supportedBandwidthCombinationSetIntraENDC*** | We understand the intention is that UE use *supportedBandwidthCombinationSet* only for “intra-band (NG)EN-DC/NE-DC **without additional inter-band NR and LTE CA component**”. So for the case “Intra-band (NG)EN-DC/NE-DC BC **with LTE inter-band CA**”, *supportedBandwidthCombinationSetIntraENDC* should be used. |
| MediaTek | ***supportedBandwidthCombinationSetIntraENDC*** | This is current SPEC and it was the original intention of the agreed option 1 from R2-1913696. |
| Nokia | ***supportedBandwidthCombinationSetIntraENDC*** | ***supportedBandwidthCombinationSetIntraENDC***Defines the supported bandwidth combination set for a band combination that allows configuration of at least one EUTRA serving cell and at least one NR serving cell in the same band, as defined in the TS 38.101-3 [4], table 5.3B.1.2-1 and table 5.3B.1.3-1.- For intra-band (NG)EN-DC with additional inter-band CA component(s) of LTE **and/or** NR |
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**Q1-2 Based on the Q1-1, do companies think any clarifications are needed in the specification?**

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| **Company** | **Yes or No** | **Comments** |
| Apple | No strong preference | If companies feel any additional clarification (using NOTE) is needed, we are ok with it. |
| ZTE | Yes(Proponent) | As comment in the question 1,for the case of **“**Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier”, the UE shall report the BCS for the intra-band EN-DC part in the ***SupportedBandwidthCombinationSet .***Based on this, the current specification have 2 problems:1. As comments in the question 1, the UE was required to report ***supportedBandwidthCombinationSetIntraENDC*** also for the case of **“**Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier”.
2. For the following 2 cases, as agreed in the last meeting:
* It is mandatory if it supports both UL and DL intra-band (NG)EN-DC/NE-DC parts (e.g. DC\_1A- **(n)41AA);**
* It is optional if it doesn’t support UL in both the bands of the intra-band (NG)EN-DC/NE-DC UL part.(e.g. DC**\_1A-(n)41A**A)

Thus if RAN2 confirm that **“**Intra-band (NG)EN-DC/NE-DC BC with LTE inter-band CA and NR single carrier”, the UE shall report the BCS for the intra-band EN-DC part in the ***SupportedBandwidthCombinationSet ,*** the following clarification shall be added to the ***SupportedBandwidthCombinationSet*** : (together with some other minor modifications)For the intra-band (NG)EN-DC/NE-DC BC with additional LTE CA component but no NR CA* It is mandatory if it supports both UL and DL intra-band (NG)EN-DC/NE-DC parts
* It is optional if it doesn’t support UL in both the bands of the intra-band (NG)EN-DC/NE-DC UL part. If not included, the network assumes the UE supports BCS0 as defined in TS 38.101 TS 38.101-3 [4], table 5.3B.1.2-1 and table 5.3B.1.3-1 for the intra-band (NG)EN-DC/NE-DC.
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| Huawei, HiSilicon | No strong preference |  |
| MediaTek | Seems not |  |
| Nokia | No | The spec is clear and we see no need to say anything more. |
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### 3.1.2 90M limitation

To determine whether the UE supports a channel bandwidth of 90 MHz, the network shall also validate *SupportedBandwidthCombinationSetEN-DC*, though currently it only happens for the BC with the band 41. The proposal are listed as below:

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| Proposal 3: To determine whether the UE supports a channel bandwidth of 90 MHz, the network shall also validate *SupportedBandwidthCombinationSetEN-DC*. |

**Q1-3 Do companies generally agree with the above Proposal?**

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| **Company** | **Yes or No** | **Comments** |
| Apple | Yes but | We think this is already implied? |
| ZTE | Yes(Proponent) | In the last meeting, the similar CR (R2-2102401/2402)was agreed, but when we go through the RAN4’s BC and BCS table, we find that for the 90 MHz bandwidth, the same modification was also needed (though currently it only happens for the BC with the band 41). Thus we add this clarification together with other issues with the intention to avoid unnecessary confusion. |
| Huawei, HiSilicon | Yes |  |
| MediaTek | Yes |  |
| Nokia | Yes |  |
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##  Reported BCS when IE intraBandENDC-support is set to “both” (online)

[R2-2103061](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103061.zip) Reported BCS when IE intraBandENDC-support is set to “both” T-Mobile USA Inc. discussion Rel-16 38.306 TEI16

The observations and proposals are listed as below:

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| Observation 1: When a UE reports a value of “both” in IE *intraBandENDC-support* the reported BCS in IE *supportedBandwidthCombinationSetIntraENDC* is ambiguous. Observation 2: Current specification allows the UE’s supporting both intraband contiguous and intraband non-contiguous ENDC to report different intraband BCS values using two different band combination sets.Option 1: Change “Both” in IE intraBandENDC-support to “dummy” in 38.331 Release 15 and Release 16. And modify the definition in 38.306MRDC-Parameters ::= SEQUENCE { singleUL-Transmission ENUMERATED {supported} OPTIONAL, dynamicPowerSharingENDC ENUMERATED {supported} OPTIONAL, tdm-Pattern ENUMERATED {supported} OPTIONAL, ul-SharingEUTRA-NR ENUMERATED {tdm, fdm, both} OPTIONAL, ul-SwitchingTimeEUTRA-NR ENUMERATED {type1, type2} OPTIONAL, simultaneousRxTxInterBandENDC ENUMERATED {supported} OPTIONAL, asyncIntraBandENDC ENUMERATED {supported} OPTIONAL, ..., [[ dualPA-Architecture ENUMERATED {supported} OPTIONAL, intraBandENDC-Support ENUMERATED {non-contiguous, dummy} OPTIONAL, ul-TimingAlignmentEUTRA-NR ENUMERATED {required} OPTIONAL ]]Change to 38.306

| ***intraBandENDC-Support***Indicates whether the UE supports intra-band (NG)EN-DC with only non-contiguous spectrum, for the (NG)EN-DC combination as specified in TS 38.101-3 [4].If the UE does not include this field for an intra-band (NG)EN-DC combination the UE only supports the contiguous spectrum for the intra-band (NG)EN-DC combination. |
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Option 2: Add a note to the definition of IE intraBandENDC-support in 38.306 Release 15 and Release 16Given observation 2 it is unnecessary for a UE to report a intraband BCS value when IE intraBandENDC support is set to “both”. We aren’t aware of any current implementations supporting both intraband contiguous and intraband non-contiguous spectrum which makes it unlikely that the introduction of the note will cause problems for legacy UE’s.

| ***intraBandENDC-Support***Indicates whether the UE supports intra-band (NG)EN-DC with only non-contiguous spectrum, or with both contiguous and non-contiguous spectrum for the (NG)EN-DC combination as specified in TS 38.101-3 [4].If the UE does not include this field for an intra-band (NG)EN-DC combination the UE only supports the contiguous spectrum for the intra-band (NG)EN-DC combination.Note: If the value of intraBandENDC-Support is set to “both” the UE shall not report a intraband BCS value in IE *supportedBandwidthCombinationSetIntraENDC*. A UE supporting both intraband contiguous and intraband non-contiguous (NG)EN-DC shall report the appropriate intraband (NG)EN-DC BCS value (found in 38.101-3) using two separate (NG)EN-DC band combinations, one (NG) EN-DC band combination for intraband contiguous and a separate (NG)EN-DC band combination for intraband non-contiguous.  |
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Proposal 1 - RAN2 to endorse one of the options listed above |

**Q2-1 Do companies think any clarifications in the specification or in the chairman’s note is needed, according to the GTW online discussion?**

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| **Company** | **Comments** | **Specification or chairman’s note** |
| Apple | The NOTE says that UE can report ‘both’ with a restriction, the next next sentence says the UE should report BC twice…we think the wording needs clarification. | We are ok with clarifying this either in the NOTE or in chairman’s notes. |
| ZTE | We generally agree that “A UE supporting both intraband contiguous and intraband non-contiguous (NG)EN-DC shall report the appropriate intraband (NG)EN-DC BCS value (found in 38.101-3) using two separate (NG)EN-DC band combinations, one (NG) EN-DC band combination for intraband contiguous and a separate (NG)EN-DC band combination for intraband non-contiguous. ” But for the first sentence in the note part, we have different views. | We prefer to include it in the chairman note |
| Huawei, HiSilicon | The clarification can be: If the UE supports intra-band (NG)EN-DC with contiguous and non-contiguous, and the BCS for contiguous and non-contiguous are the same, the UE can signal “both” in *intraBandENDC-Support* with associated BCS value. If the BCS for contiguous and non-contiguous are different, the UE can signal two BC entries and set “contiguous” and “non-contiguous” separately, with associated BCS value respectively. | Chairman notes |
| MediaTek | We are fine with the wording provided by Huawei. | Chairman notes |
| Nokia | Okay with the above + if no BCS is signalled then the BCS0 is assumed for “both” signalled case | Chairman notes sounds good unless someone has really strong view on spec. |
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## Contiguous and non-contiguous for intra-band EN-DC

[R2-2104030](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2104030.zip) Discussion on contiguous and non-contiguous for intra-band EN-DC Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core

The observation and proposals are listed as below:

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| Observation 1: With the legacy IE intraBandENDC-support, UE cannot indicate the support of contiguous or non-contiguous for UL and DL separately.Proposal 1: Introduce new capability signalling indicating contiguous, non-contiguous or both for UL and DL separately.Proposal 2: Discuss the release (e.g. Rel-15, Rel-16) to introduce the new capability signalling. |

**Q3-1 Do companies generally agree with the above Proposal 1?**

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| **Company** | **Yes or No** | **Comments** |
| Apple | No | We think RAN4 needs to confirm if such combinations are valid. The DC\_(n)41AB has only DC\_41A\_n41A UL. Maybe we can send an LS to RAN4 to see if there will be cases where UE has options in supporting diff UL configs. Adding a capability before their view is a bit premature in our view. |
| ZTE | No | We think this issue has been assigned to RAN4 to discuss first in the plenary meeting, and there was an on-going discussion in RAN4, thus we prefer to wait for RAN4’s RSP. |
| Huawei, HiSilicon | Proponent | As companies commented RAN4 inputs are needed and RAN4 is discussing it, we are ok to wait for RAN4 conclusion. |
| MediaTek | Prefer to Wait R4 |  |
| Nokia | Await RAN4 | This is discussion in RAN4 currently and we would prefer to just wait for their discussion to conclude. |
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**Q3-2 Do companies generally agree with the above Proposal 2?**

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| **Company** | **Yes or No** | **Comments** |
| ZTE | No |  See Q3-1 |
| Huawei, HiSilicon | Proponent | As companies commented RAN4 inputs are needed and RAN4 is discussing it, we are ok to wait for RAN4 conclusion. |
| MediaTek | Prefer to Wait R4 |  |
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# Conclusions

*To be added…*

# References

1. R2-2104025 Discussion on BCS of a fallback band combination Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core
2. R2-2103061 Reported BCS when IE intraBandENDC-support is set to “both” T-Mobile USA Inc. discussion Rel-16 38.306 TEI16
3. R2-2104030 Discussion on contiguous and non-contiguous for intra-band EN-DC Huawei, HiSilicon discussion Rel-15 NR\_newRAT-Core
4. R2-2104212 Further Clarification on the supportedBandwidthCombinationSet ZTE Corporation, Sanechips discussion Rel-15 NG\_RAN\_PRN-Core
5. R2-2104213 CR on the supportedBandwidthCombinationSet-R15 ZTE Corporation, Sanechips CR Rel-15 38.306 15.13.0 0565 - F NR\_newRAT-Core
6. R2-2104214 CR on the supportedBandwidthCombinationSet-R16 ZTE Corporation, Sanechips CR Rel-16 38.306 16.4.0 0566 - A NR\_newRAT-Core
7. R2-2104026 Clarification on BCS of a fallback band combination Huawei, HiSilicon CR Rel-15 38.306 15.13.0 0563 - F NR\_newRAT-Core
8. R2-2104027 Clarification on BCS of a fallback band combination Huawei, HiSilicon CR Rel-16 38.306 16.4.0 0564 - A NR\_newRAT-Core
9. R2-2104028 Draft LS on BCS of a fallback band combination Huawei, HiSilicon LS out Rel-16 NR\_newRAT-Core To:RAN4