3GPP TSG-RAN WG2 Meeting #116bis-e ***R2-220xxxx***

Electronic Meeting, Jan 17 – 25, 2021

**Agenda item:** 8.24.1

**Source:** Xiaomi Communications

Title: Report of [AT116bis-e][040][NR17] BCS4 and BCS5 (xiaomi)

**Document for:**  Discussion

# 1. Introduction

This document summarizes the following email discussion:

**BCS4/BCS5**

Offline only

* [AT116bis-e][040][NR17] BCS4/BCS5 (xiaomi)

Scope: Treat R2-2201371, R2-2201372

Intended outcome: Agreed in principle CRs.

Deadline: Friday W1

**Phase 1:** Focus on capturing the agreements of both RAN2 and RAN4 as indicated in R2-2201371 and R2-2201372.

Deadline: Wednesday 2022-01-19 1600 UTC

**Phase 2:** Based on companies’ comments, the rapporteur will provide an update (if any) of the CRs for the Phase 2 discussion staring at Thursday 2022-01-20 0100 UTC. We will try to have in-principle agreed CRs from the offline discussion.

Deadline: Friday 2022-01-20 0300 UTC.

## 1.1 Contacts

Contact person for each participating company:

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| --- | --- | --- |
| Company | Name | Email Address |
| Xiaomi | Yumin Wu | wuyumin@xiaomi.com |
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| OPPO | Qianxi Lu | Qianx.lu@oppo.com |
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# 2. Phase 1

## 2.1 38.331 CR for BCS4/BCS5

The CR in [R2-2201371](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201371.zip) captures the following agreements from both RAN2 and RAN4:

In RAN2#115e, RAN2 agreed to support Solution 2 as indicated in [R2-2106957](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_115-e/Docs//R2-2106957.zip) for BCS5.

* Solution 2: introduce a new UE signalling in IE FeatureSetUplinkPerCC /FeatureSetDownlinkPerCC to allow UE to report the minimum channel bandwidths supporting on each CC for the band combination, then UE can report maximum and minimum channel bandwidth supporting on each CC for the same band combination via multiple feature sets. Note that the signalling for maximum channel bandwidth has been specified as supportedBandwidthUL /supportedBandwidthDL in RAN2 specification.

In RAN2#116e meeting, RAN2 made the following agreements for BCS4 and BCS5:

* A UE that indicates BCS#4/5 for a band combination should also indicate the other BCS that it supports for this band combination (no specification change expected).
* RAN2 confirm that the introduction of BCS4 and BCS5 does not cause a backward compatibility problem, and the signalling can be introduced within the existing band combination list, i.e. no need to introduce a new band combination list.

In RAN4#100-e meeting, RAN4 made agreed that BCS4 and BCS5 apply to SUL, NR CA, NR DC and/or NR CA part of inter band MR-DC while it does not apply to intra band MR DC.

In RAN4#101-e meeting, RAN4 made the following agreements:

* To respond RAN2 LS [R2-2109073](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_115-e/Docs//R2-2109073.zip), the following answers are agreeable in RAN4
  + Question 1: Is BCS5 required to be release independent by RAN4?
    - Answer 1: From RAN4 perspective, BCS5 and new signaling were introduced in Rel-17, and BCS5 with new signaling is allowed for early implementation from Rel-15.
  + Question 2: Can BCS5 be reported together with BCS4 or not?
    - Answer 2: BCS5 can’t be reported together with BCS4

**Question 1**: Do you agree to the changes proposed in the 38.331 CR of R2-2201371?

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| Company | Agree as is/  Need change(s) | Comments |
| Ericsson | Need changes | Description of IE *SupportedBandwidth* need to be corrected.  The IE *SupportedBandwidth* is used to indicate channel bandwidths supported by the UE on one carrier of a band of a band combination. |
| Apple | OK with Ericsson’s comments. |  |
| Qualcomm Incorporated | Fine with Ericsson’s suggestion. |  |
| ZTE | OK with Ericsson’s comments. | Or we can add “or the minimum”  The IE *SupportedBandwidth* is used to indicate the maximum or the minimum channel bandwidth supported by the UE on one carrier of a band of a band combination. |
| Xiaomi | OK with Ericsson’s comments. |  |
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## 2.2 38.306 CR for BCS4/BCS5

The CR in [R2-2201372](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs//R2-2201372.zip) captures the following agreements from both RAN2 and RAN4:

In RAN2#115e, RAN2 agreed to support Solution 2 as indicated in [R2-2106957](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_115-e/Docs//R2-2106957.zip) for BCS5.

* Solution 2: introduce a new UE signalling in IE FeatureSetUplinkPerCC /FeatureSetDownlinkPerCC to allow UE to report the minimum channel bandwidths supporting on each CC for the band combination, then UE can report maximum and minimum channel bandwidth supporting on each CC for the same band combination via multiple feature sets. Note that the signalling for maximum channel bandwidth has been specified as supportedBandwidthUL /supportedBandwidthDL in RAN2 specification.

In RAN2#116e meeting, RAN2 made the following agreements for BCS4 and BCS5:

* Once BCS4 was indicated by the UE, the network that supports BCS4 can further determine the supported bandwidth based on the {channelBWs-UL/DL, supportedBandwidthDL/UL, channelBW-90mh }.
* A UE that indicates BCS#4/5 for a band combination should also indicates the other BCS that it supports for this band combination (no specification change expected).
* Ran2 confirm that the below conclusion still work even the BCS4/5 was indicated: (no spec change needed)

“The channel bandwidths of a (not signaled) fallback BC are determined by the bandwidth combination set (BCS) that the UE supports for the explicitly signaled parent BC.”

* RAN2 confirm that the introduction of BCS4 and BCS5 does not cause a backward compatibility problem, and the signalling can be introduced within the existing band combination list, i.e. no need to introduce a new band combination list.
* For DAPS, BCS4/5 follow the same rule as the legacy BCS.
* Fallback per CC feature set is not applicable to the supported minimum bandwidth of BCS5.

In RAN4#100-e meeting, RAN4 made agreed that BCS4 and BCS5 apply to SUL, NR CA, NR DC and/or NR CA part of inter band MR-DC while it does not apply to intra band MR DC.

In RAN4#101-e meeting, RAN4 made the following agreements:

* To respond RAN2 LS [R2-2109073](http://www.3gpp.org/ftp//tsg_ran/WG2_RL2/TSGR2_115-e/Docs//R2-2109073.zip), the following answers are agreeable in RAN4
  + Question 1: Is BCS5 required to be release independent by RAN4?
    - Answer 1: From RAN4 perspective, BCS5 and new signaling were introduced in Rel-17, and BCS5 with new signaling is allowed for early implementation from Rel-15.
  + Question 2: Can BCS5 be reported together with BCS4 or not?
    - Answer 2: BCS5 can’t be reported together with BCS4

**Question 2:** Do you agree to the changes proposed in the 38.306 CR of R2-2201372?

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| Company | Agree as is/  Need change(s) | Comments |
| Ericsson | Need of changes | 1. **3.1, definition of “Fallback per CC feature set”.**   We do not agree to add the sentence “*The fallback per CC feature set is not applicable to supportedMinBandwidthDL/ supportedMinBandwidthUL*”.  We agree that a UE which indicates “min-BW = 10 MHz” cannot be expected to support 5 MHz implicitly. This seems pretty clear considering that the field is called “supported**Min**BandwidthDL”. However, the UE shall support 20, 30, 35, ... MHz implicitly. Hence, this field is of course applicable to “fallback”. It defines the lower part of the BW range supported by the UE on the CC. Hence, the sentence as now worded is wrong and shall be removed from the CR. We think the fallback definition does not need to be modified.   1. ***supportedBandwidthCombinationSet***   Propose to change this:  The corresponding bits of Bandwidth Combination Set 4 and Bandwidth Combination Set 5 shall not both be set to “1” for the same band combination.   1. **supportedBandwidthCombinationSet,**   New text reads “The corresponding bits of Bandwidth Combination Set 4 or Bandwidth Combination Set 5 can be set to “1” only for NR SA CA, NR-DC, NR CA component of inter-band (NG)EN-DC without intra-band (NG)EN-DC component, NR CA component of inter-band NE-DC without intra-band NE-DC component, and NR CA component of intra-band (NG)EN-DC/NE-DC with additional inter-band NR CA component.”  This is motivated (on cover page) by “In RAN4#100-e meeting, RAN4 agreed that BCS4 and BCS5 apply to SUL, NR CA, NR DC and SUL and/or NR CA part of inter band MR-DC while it does not apply to intra band MR DC”.   1. But this will be clear from the RAN4 BCS tables, and need not be mentioned in RAN2 38.306. **supportedMinBandwidthDL/UL**   On last sentence, we propose to add  “This parameter is only applicable to the Bandwidth Combination Set 5. It does not restrict the supported bandwidths for configurations with a single DL (UL) serving cell.  This addition ensures that the UE does not need to indicate additional non-CA BCs explicitly to avoid BW limitation for single-CC.  In fact, we understand that it is in general (not only for BCS4/5) so that the BCS tables do not restrict the channel bandwidths that the UE supports when configured with the single-carrier fallback configuration. Therefore, RAN2 should consider adding similar clarification as below to the field description of supportedBandwidthCombinationSet:  The field does not restrict the supported bandwidths for configurations with a single DL (UL) serving cell.  We understand RAN2 could safely add this clarification. From the RAN4 specs it is clear that BCS applies to CA configurations with two or more serving cells. There is no BCS defined by RAN4 for non-CA case. |
| OPPO |  | For comment-4 by Ericsson above, although share the view on the intention, as clarified by Ericsson, this seems more a general issue but not specifically to BCS4/5.  We are open to other comments by Ericsson. |
| Qualcomm Incorporated |  | We understood Ericsson’s comment-1 is that supportedMinBandwidthDL/UL still defines the lower bound of fallback capability and hence should be taken into account in the fallback concept. We think this is a good point. However we still believe the current text “*A feature set per CC that has same or lower capabilities than the capabilities of UE*” is completely wrong if applied to the signalled minimum BW capabilities. We could add something like, supportedMinBandwidthDL/UL defines the lower bound of the UE capability.  OK with Ericsson’s comment-2, 3 and 4. |
| ZTE |  | OK with Ericsson’s comment- 2/3(seems have been included in the CR) for the 1, we tend to agree Q’s comments that “add something like, supportedMinBandwidthDL/UL defines the lower bound of the UE capability”  For the Ericsson’s comment- 4, we share the similar view as OPPO, anyway, we can follow the majorities’ view. |
| Xiaomi |  | For Ericsson’s comment-1, we think that companies’ understandings on the bandwidths which should be supported by the UE are aligned, i.e. the UE has to support all bandwidths between minBW and maxBW. In RAN4 specification, I would say that the bandwidths between minBW and maxBW is not called as fallback bandwidth, as the definition of BCS5 would provide the clear descriptions on the supported bandwidths between minBW and maxBW. In RAN2 specification, we only need to avoid the miss-understanding that the bandwidth below minBW is a fallback. Then we could add a text like:  supportedMinBandwidthDL/UL defines the lower bound of the bandwidth supported by the UE.  For Ericsson’s comment-2, we are ok with the change.  For Ericsson’s comment-3, we are ok with the change. I would say that RAN4 will not define extra BCS entry for BCS4/5. However after double checking with our RAN4 colleague, it seems that RAN4 will capture the corresponding BCS4/5 reporting restrictions somewhere in their specification in this RAN4 meeting. It is probably ok to remove the redundant texts in 38.306 for now. We can anyway revisit the specification when we find some miss-alignments between RAN2 specification and RAN4 specification.  For Ericsson’s comment-4, we are ok with the changes for both supportedMinBandwidthDL/UL and supportedBandwidthCombinationSet, to ensure a safer implementation of the supported bandwidth reporting. The cover page will be updated accordingly. We think that the text provided by Ericsson could be slightly modified to be more aligned with other texts of 38.306, as follows:  This field does not restrict the bandwidth(s) that a UE supports within a single CC. |
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# 3. Phase 2

TBD…

# 4. Summary

TBD…

# 5. Reference

[1] R2-2201371 Introduction of BCS4 and BCS5 Xiaomi Communications, Samsung, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated, OPPO, Huawei, HiSilicon, ZTE Corporation, Sanechips CR Rel-17 38.331 16.7.0 2871 - B NR\_BCS4-Core

[2] R2-2201372 Introduction of BCS4 and BCS5 Xiaomi Communications, Samsung, Nokia, Nokia Shanghai Bell, Qualcomm Incorporated, OPPO, Huawei, HiSilicon, ZTE Corporation, Sanechips CR Rel-17 38.306 16.7.0 0669 - B NR\_BCS4-Core