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

Online, 17 – 25 January 2022

**Agenda item: 8.24.1**

**Source: Nokia (Rapporteur)**

**Title: Offline 037 on FR2 CA BW class**

**WID/SID: NR\_RF\_FR2\_req\_enh2-Core – Release 17**

**Document for: Discussion and Decision**

# 1 Introduction

This document is the report of the following email discussion:

* [AT116bis-e][037][NR17] FR2 CA BW class (Nokia)

 Scope: Treat R2-2200118, R2-2200839, R2-2200840, R2-2200841, R2-2200843, R2-2201385. Progress the topic, Determine agreeable parts, for agreeable parts, agree CRs, approve reply LS out if agreeable.

 Intended outcome: Report, agreed in principle CRs, Approved LS out if applicable.

 Deadline: EOM (or earlier if online CB is needed, can CB W2).

# 2 Contact Points

Respondents to the email discussion are kindly asked to fill in the following table.

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| --- | --- | --- |
| Company | Name | Email Address |
| Nokia (Rapporteur) | Amaanat | amaanat.ali@nokia.com |
| Qualcomm Incorporated | Masato | mkitazoe@qti.qualcomm.com |
| OPPO | Qianxi | qianxi.lu@oppo.com |
| Huawei, HiSilicon | Tong Sha | shatong3@hisilicon.com |
| Apple | Naveen Palle | naveen.palle@apple.com |
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# 3 Discussion

There are the following input documents:

[1] R2-2200118 LS on release independence aspects of newly introduced FR2 CA BW Classes and CBM/IBM UE capability “both” (R4-2119966; contact: Nokia) RAN4 LS in Rel-17 NR\_RF\_FR2\_req\_enh2-Core To:RAN2

[2] R2-2200839 Introduction of FR2 FBG2 CA BW classes Nokia Italy CR Rel-17 38.331 16.7.0 2867 - B NR\_RF\_FR2\_req\_enh2-Core

[3] R2-2200840 Introduction of CBM/IBM UE capability “both” Nokia Italy CR Rel-17 38.331 16.7.0 2868 - B NR\_RF\_FR2\_req\_enh2-Core

[4] R2-2200841 Introduction of CBM/IBM UE capability “both” Nokia Italy CR Rel-17 38.306 16.7.0 0668 - B NR\_RF\_FR2\_req\_enh2-Core

[5] R2-2200843 Reply LS on release independence aspects of newly introduced FR2 CA BW Classes and CBM/IBM UE capability Nokia Italy LS out Rel-17 NR\_RF\_FR2\_req\_enh2-Core To:RAN4

[6] R2-2201385 Introduction of new FR2 CA bandwidth classes Xiaomi Communications discussion Rel-17 NR\_RF\_FR2\_req\_enh2-Core

The short background is that the LS in R2-2200118 contains two separate topics.

**Topic 1: Introduction of FR2 FBG2 CA BW classes**

With regards to the input documents in [2] and [6] respectively, before discussion on the CRs it is better to discuss the proposals in [6] first as they are quite good to have the alignment between companies.



**Proposal 1: When the UE indicates a new bandwidth class (i.e., R, S, T, U), the UE shall also indicate bandwidth class F.**

**Proposal 2: The indication of the new bandwidth classes (i.e., R, S, T, U) is via new capability signalling of *ca-BandwidthClassDL-NR-v17xy/ ca-BandwidthClassUL-NR-v17xy*.**

**Proposal 3: The indication of the new bandwidth classes (i.e., R, S, T, U) is allowed for early implementation from Rel-15.**

**Question 1: Do companies agree with P1 and P2 i.e., when the UE indicates a new bandwidth class among one of the new ones (i.e., R, S, T, U), the UE shall also indicate bandwidth class F (noting that if yes to P1 then automatically something like P2 is required at BandParameter level)?**

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| Answers to Question 1 |
| Company | Yes/No | Technical Arguments |
| Nokia | No | Due to the single enumeration, it seems that the legacy network that does not support the new bandwidth classes {R, S, T, U } will end up dropping a band combination. To interoperate with legacy networks, a UE is required to do this.[Nokia v2] We update our view based on the comments from Qualcomm and Oppo we also agree that the CA bandwidth class reported by the UE will be conditional to the filter setting. Hence we can simply use the extension as allowed in the BW class NR field. We already have a CR in [2] already built on this understanding. |
| Qualcomm Incorporated | No | We would avoid this unless it is absolutely necessary. But we are ready to listen to the network vendors.We suppose UE capability request filter, where the network can request bands and aggregated BW for each NR band, is sufficient. Then the UE declares CA band combinations and associated BW classes appropriately.  |
| OPPO | No  | Same view as QC, the fallback concept would be good to be kept here for BWC as well. |
| Huawei, HiSilicon | Yes | To avoid inter-operability issue, we support to define the new bandwidth classes in separate capability field. If a new bandwidth class is reported for a BC band, then the legacy bandwidth class within the same fallback group (e.g. BWC-F) should be reported at the same time for the band. For example, UE can indicate BWC-R and BWC-F for a BC band with 5 FSPCs, then the legacy gNB supporting most 4 CCs can interpret the BC band as BWC-F and use any 4 of the 5 FSPCs within the band. For the UE capability request filter method, we think there is a problem when there is handover from a new gNB to a legacy gNB. If the filters used by the new gNB corresponding to the new BWC can be understood by the legacy gNB, the legacy gNB may not inquire UE capability again. Thus the BCs with new BWC and the fallback BCs will be discarded by the legacy gNB. In this case, the inter-operability issue is not solved. |
| Apple | No, and | We also think we should avoid this unless absolutely necessary. RAN4 is very likely to start adding more BW classes with a fallback and the UE cannot simply go on providing older BW classes (which is a bit similar to LTE UE categories, and this created unclean design). We assume that gNB vendors shall update their SW(?) to be able to handle improvements especially when these gNBs inter-operate with latest gNBs… If there was no UE capability filter, then the argument for the UE to provide backup classes would have been valid, but with ‘interactive’ signaling, I think we should try to be better in NR. |
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**Summary 1**: TBD.

**Proposal 1**: TBD.

**Question 2: Do companies agree with P3 i.e., the indication of the new bandwidth classes (i.e., R, S, T, U) is allowed for early implementation from Rel-15.**

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| Answers to Question 2 |
| Company | Yes/No | Technical Arguments |
| Nokia | Yes | This should be technically possible to allow, and we would be fine with this. |
| Qualcomm Incorporated | Yes |  |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
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**Summary 2**: TBD.

**Proposal 2**: TBD.

**Topic 2: Introduction of capability for UE capable of both IBM and CBM**

The CRs in [3] and [4] introduce the capability required by the RAN4 incoming LS in [1].

**Question 3: Do companies agree to the intention of the CRs in [3] and [4] introducing a capability that indicates UE supports both IBM and CBM as required by the RAN4 incoming LS in [1]?**

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| Answers to Question 3 |
| Company | Yes/No | Technical Arguments |
| Nokia | Yes | This aligns to the intent of the RAN4 LS. |
| Qualcomm Incorporated | Yes |  |
| OPPO | Yes |  |
| Huawei, HiSilicon | No | From RAN4 LS, we think currently there are three cases, IBM only, CBM only, and both IBM and CBM. In current 38.306, it is required that UE shall only indicate IBM for Rel-16. To avoid inter-operability issue with the legacy gNB, we think this should not be changed. If the new capability is defined as support of both IBM and CBM, the CBM only case cannot be reported by UE in Rel-16. Thus, we support to introduce a separate capability to indicate support of CBM. If both IBM and CBM are supported, UE can include IBM in the legacy field and indicate support of the new field at the same time.  |
| Apple | Yes, but we would like to see from Huawei, if we are missing something. | For Huawei’s comments: The Rel-16 UE can technically be able to say it supports CBM-only using Rel-16 signalling, right?  |
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**Summary 3**: TBD.

**Proposal 3**: TBD.

**Question 4: Do companies agree to introducing the capability early implementable for UE capable of both IBM and CBM starting from Rel-16?**

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| Answers to Question 4 |
| Company | Yes/No | Technical Arguments |
| Nokia | Yes | This should be technically possible to allow, and we would be fine with this. |
| Qualcomm Incorporated | Yes |  |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Apple | Yes |  |
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**Summary 4**: TBD.

**Proposal 4**: TBD.

# 4 Conclusion

Based on the outcome of the discussion above we can update the draft LS in [5]