**3GPP TSG-RAN** **WG2 Meeting #111-e R2-200xxxx**

**Electronic, 17th – 28th August 2020**

**Agenda Item: 5.4.3**

**Source: Huawei, HiSilicon**

**Title: Summary of offline 010 Rel-15 UE cap Clarifications**

**Document for: Discussion and decision**

# Introduction

This document summarizes the following offline discussion for Rel-15 UE capability corrections.

* [AT111-e][010][NR15] UE cap Clarifications (Huawei)

Scope: Treat [R2-2007209](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007209.zip), [R2-2007210](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007210.zip), [R2-2007211](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007211.zip), [R2-2007798](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007798.zip), [R2-2007799](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007799.zip), [R2-2007800](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007800.zip), [R2-2007796](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007796.zip), [R2-2007797](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007797.zip), [R2-2007885](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007885.zip), [R2-2007887](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007887.zip), [R2-2007850](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007850.zip) (proponents to drive)

Part 1: Decision whether to make corrections, identify agreeable parts. Identify Controversial issues for on-line treatment (if any).

Deadline: Aug 20, 0900 UTC.

Part 2: For agreeable parts, continuation to agree CRs.

Deadline: Aug 26, 0900 UTC.

# Discussion

## Part 1 discussion: to achieve agreeable principle

### 2.1.1 Clarification on band combination

Discussion and CRs are in [1][2][3].

**Proposal 1: Ran2 to confirm that the *BandCombinationList* and the *FreqBandList* also include the NR non-CA band combination.**

**Proposal 2: If the proposal 1 was agreed, agree the CR [1] for Rel15 and CR [2] for Rel 16.**

**Proposal 3: Ran2 to confirm whether the band in the *supportedBandListNR* shall always be included in the *supportedBandCombinationList.***

**Proposal 4: If the UE can indicate some bands only in the *supportedBandListNR*, for these bands, the network shall take the capabilities that only included in the *supportedBandCombinationList* as not reported.**

Please companies to provide feedback on the proposals listed in [1].

**Q1-1 Do companies agree with P1 and P2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes, but… | P1: Agree to intention, but a refinement is needed as follows:  **Proposal 1: Ran2 to confirm that the *BandCombinationList* and the *FreqBandList* also include the NR non-CA band combination, unless they are fallback band combinations.**  P2: Agree to the intention, but similar to above, is it clear that it does not contain the fallback band combinations? We suggest this wording instead:  **The IE BandCombinationList contains a list of (non-fallback) band combinations (NR non-CA, NR CA and/or MR-DC, also including DL only and/or UL only band).** |
| Nokia | Yes | Yes though editorial, P1 and P2 is okay. |
| ZTE | Yes (Proponent) |  |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes | We agree with P1, we do not fully understand the comment from Ericsson on the fallback part as I understand fallback BC would not have any explicit report but would still cover non-CA case. We think the addition of “*(NR non-CA, NR CA and/or MR-DC, also including DL only and/or UL only band)*” is more accurate.  For P2, not sure whether we need anything updated in the specification as this seems to reconfirm the original understanding, so to minute the updated P1 in chair’s notes could be one alternative. Anyway we would accept majority’s view |
| CATT | yes |  |
| Qualcomm Incorporated (Masato) | Yes | We understand the intention is to allow (not mandate) the inclusion of non-CA band combination. Non-CA band combination is the smallest component of band combination, i.e. fallback band combination of any band combination. The UE is allowed to include non-CA band combination only when the UE supports different capability from that of superset. |
| vivo | Yes |  |
| MediaTek (Nathan) | Yes | We think “non-CA” is not a completely clear description and it might be better to say “single-carrier band combinations”. |
| Apple (Naveen) | Yes | Ok to clarify |
| Samsung | Yes |  |

**Q1-2 Do companies agree with P3 and P4?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | No | P3: Disagree. The supportedBandCombinationList is filtered as requested by the NW in the capability enquiry. The supportedBandListNR will hence contain all bands that the UE supports, while supportedBandCombinationList may not contain some of those bands. The reason why supportedBandListNR is not filtered is that the gNB would at least see which bands the UE supports. We note also that even if the filter asked for a certain band, it could happen that the UE has no space in the container to report combinations including that band. So it may happen that a band which the UE supports as per supportedBandListNR is not included in the supportedBandCombinationList.  P4: Disagree. The NW should not assume anything. If the UE does not report a BC with a certain band, the NW cannot configure that band. |
| Nokia | Yes, but | P3 understanding is that the UE must set the fields consistently? Is there a problem that prevents this from happening from current specification?  For P4 we have same view as P3 that the UE must set the fields consistently. I think this is already the intention of the specification and maybe no need to clarify anything on top.  Anyway, understanding this better now aligned with Ericsson’s feedback. |
| ZTE | Proponent | For proposal 3, we don’t have strong view, we just want to RAN2 to confirm this issue. In the last meeting, it has been agreed that the band in the supportedBandCombinationList shall also been included in the supportedBandListNR, thus we want to further confirm whether the band in the supportedBandListNR shall also be included in the supportedBandCombinationList.  For the proposal 4, we are open, we just want to have a clear clarification on how to process the scenario that the band is only included in the supportedBandListNR. |
| OPPO | See comment | We tend to agree the band list and BC list should be set consistently.  If the case happens due to the reason outlined by Ericsson above, those bands are anyway not configurable so at least P4 is not needed. |
| Huawei, HiSilicon | No | Agree with Ericsson for both P3 and P4. |
| CATT | No | Intention might be OK but no need to change the spec as nothing seems to be broken right now. |
| Qualcomm Incorporated (Masato) | No | For proposal 3, the UE may not be able to guarantee always, e.g. due to UE capability filter or RRC signalling size limitation, the UE may have to give up some band combinations to be included.  After all, it is up to the network to see if the reported UE capabilities provides sufficient information for the network to be able to configure a given band. |
| vivo | No | Agree with Ericsson. |
| MediaTek (Nathan) | No | We agree with the principle that the UE should indicate support for things it actually supports. But we don’t see a problem in the current spec that would prevent this from happening, and Ericsson’s observations above seem on point, so we think P3 is not right as stated. For P4, as OPPO and Ericsson point out, these bands cannot be configured, so the proposal seems not needed. |
| Apple | No | Same view as Ericsson. We are wondering why NW wants to know about the capabilities of the bandNR band if this is not present in supportBandCombination list. The NW needs to know the params in supportedBandCombinationList to use that band (for eg., featureSetPerCC). BandNR alone is not enough. |
| Samsung | Not sure | First, we are not sure if UE report all supported bands in supportedBandListNR. I think supportedBandListNR was introduced by mistake i.e. RAN2 agreed to add all supported band in supportedBandCombinationList.  In that sense, UE must consistently set the supported single band in supportedBandListNR and supportedBandCombinationList.  If our understanding is not correct i.e. supportedBandListNR includes all supported bands from the UE without filtering, we share the view on Ericsson. |

### 2.1.2 Discussion on ambiguity for multi bands/cells

The discussion is seen in [4] and corresponding CRs are seen in [6] and [7].

**Proposal 1: the UE needs to indicate capabilities (*simultaneousTxSUL-NonSUL, dynamicSwitchSUL*) for both SUL band and the paired NUL band, and the network only enables this configuration for the bands pair where these capabilities are indicated for both SUL and NUL band.**

**Proposal 2: confirm that** **the network could only configure PUCCH on the bands where *twoPUCCH-Group*** **is indicated if two PUCCH groups are configured.**

**Proposal 3: for interpretation of FGs applicable to cross-carrier operation, RAN2 waits for RAN1 conclusion.**

It is worth mentioning that Proposal 3 has been updated after tdoc submission as RAN1 already started a similar discussion, and thus from the proponent RAN2 does not need to duplicate the discussion.

Please companies to provide feedback on the proposals listed in [4].

**Q2-1 Do companies agree with P1?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes | This is the safer option. If we would go for the other option (Interpretation 2), a NW might configure something which some UEs do not support |
| Nokia | Yes | P1: **OK** - since this is per-FS capability, UE should indicate in which carriers it supports the simultaneous Tx |
| ZTE | Yes | It’s a Rel 15 UE capability, it can be up to the current UE vendors understanding. Anyway, from the network side, we agree with this proposal, which makes the clarification more clear. |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes | proponent |
| CATT | Yes |  |
| Qualcomm Incorporated (Masat0) | Yes |  |
| vivo | Yes |  |
| MediaTek (Nathan) | Yes |  |
| Apple | Yes | We agree to clarifying this more which tell when the NW can configure this. |
| Samsung | Yes | As Nokia mentioned, this capability is per FS it means this capability is signaled per band per BC so P1 is the correct understanding.  If we want to go interpretation 2, then there are no reason to signal this feature in FSU i.e. it is better to move this parameter under BC. |

**Q2-2 Do companies agree with P2?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes |  |
| Nokia | Yes | P2: We agree, though we think the other alternative could also be **OK**. |
| ZTE | Yes | See above |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes | Proponent |
| CATT | Yes |  |
| Qualcomm Incorporated (Masato) |  | Is it correct understanding that a serving cell from a band where twoPUCCH-Group is included can be configured for PUCCH SCell? Somehow the CR text does not preclude PUCCH on PCell. But the UE capability for PCell placement is signalled elsewhere. |
| vivo | Yes |  |
| MediaTek (Nathan) | Yes |  |
| Apple | Yes to P2 |  |
| Samsung | Yes |  |

**Q2-3 Do companies agree with P3?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes |  |
| Nokia | No | P3: **Not OK** - We think for cross-carrier scheduling, it's still about the measured carrier: Otherwise we mix two features together. So UE supporting cross-carrier scheduling and aperiodicReport has to support them together - the capability is there for being able to measure quickly, not for the report generation. |
| ZTE | Yes | We think it just wants to say it’s under RAN1 discussion, we can wait for RAN1 response. |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes | We have already clarified in the background that P3 has been updated to wait for RAN1, we agree this part needs careful review. |
| CATT | yes |  |
| Qualcomm Incorporated (Masato) | Yes |  |
| vivo | Yes |  |
| MediaTek (Nathan) | Yes |  |
| Apple | Yes | We agree RAN1 needs to decide how to interpret. |
| Samsung |  | Same issue is now discussed in RAN1, so we have to wait RAN1 response. |

### 2.1.3 Clarification on PDSCH rate matching

The CRs are in [7][8], and the main intention is to clarify support of *rateMatchingResrcSetDynamic* means only supporting dynamic rate matching for *bitmaps* in *patternType*.

**Q3 Do companies agree with the CR principle?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | Yes | We agree that this bit is for bitmap-based rate matching only (not for matching around CORESETs). But does it really require a clarification considering that there is another capability for “rateMatchingCtrlResrcSetDynamic” just above this one? If needed, it could be good to clarify in the next field “rateMatchingResrcSetSemi-Static” that it is for bitmaps and CORESET. |
| Nokia | Needs more checking and discussion | A bit detailed comments from our understanding of how RAN1 intended this.   1. The text you propose to delete is the 38.214 section heading for the behavior, and the RRC parameters are described there. Now the CR is a mix-up of stage 2 and stage 3. That said, we don’t think they are wrong, but we would not delete the RB symbol level granularity. These are now misaligning the dynamic and semi-static capability descriptions.   See 38.214 5.1.4.1 for additional information.  2) We have the following UE features on the topic:  5-26 Semi-static rate-matching resource set configuration for DL 1) Bitmap 1/2/3 2) controlResourceSet rateMatchingResrcSetSemi-Static 5-27 Dynamic rate-matching resource set configuration for DL Bitmap 1/2/3 rateMatchingResrcSetDynamic 5-27a Dynamic rate-matching control resource set for DL Dynamic rate-matching control resource set for DL rateMatchingCtrlResrcSetDynamic  For dynamic rate matching this is divided in two parts, and CR is addressing specifically 5-27. However, the same logic applies to 5-26, though the description would need to consider both bitmap and control resource set adaptation in the same parameter. The CR makes the dynamic and semi-static look different and that creates an inconsistency though we are essentially talking about the same thing.   3) No strong opinion here, but whatever is changed in rateMatchingResrcSetDynamic should apply to rateMatchingResrcSetSemi-Static. Perhaps the whole rateMatchingResrcSetSemi-Static should be updated to separate the control resource set and bitmap aspects. |
| ZTE | Yes |  |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes | Proponent  To address Nokia’s comment, our intention is to clarify there was a difference on 5-26 and 5-27 shown below. So we can find the way forward is that we change 5-27 and 5-26 together, as Ericsson also suggested.  C:\Users\z00300952.CHINA\AppData\Roaming\eSpace_Desktop\UserData\z00300952\imagefiles\34E930F6-FDC2-40EF-9A43-B17F08B9D3AB.png  As it seems that the principle is agreeable, we suggest to update the chanage as below:  Keep the RB symbol level granularity in 5-27 with addtion that this part only includes bitmap, and also add clarification for 5-26 that this part includes both bitmap and ctrlResourceSet. |
| CATT | Yes |  |
| Qualcomm Incorporated (Masato) | Yes |  |
| vivo | Yes |  |
| MediaTek (Nathan) | No strong view | We agree that this description is intended for the bitmaps branch, but that may be already implied by the existing language “RB symbol level granularity”. Considering that companies seem to prefer having the clarification, we are OK with the proposal. |
| Apple | Yes | We agree with the intention |
| Samsung | Yes | We are fine to clarify the description as CR suggested!  RB symbol level granularity implies both bitmap and CORESET but rateMatchingResrcSetDynamic is only to indicate that UE supports receiving PDSCH with resource mapping which can be dynamically updated by configured bitmap-level. |

### 2.1.4 Clarification on the simultaneousRxTxInterBandCA capability

The CRs are in [9][10], and the main intention is to apply this capability to NR-DC case.

**Q4 Do companies agree with the CR principle?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | No | We think for NR-DC the UE should always support simultaneous RX-TX beyond MN and SN, since simultaneousRxTxInterBandCA tells the NW whether it supports TX on an NR carrier while it also RX on another NR carrier, but it is not tight to NR-DC. |
| Nokia | No | We think Ericsson is correct but should we check this with RAN1/4? |
| ZTE | FFS | We need further check it with RAN1/4 internally. |
| OPPO | Yes | We do not think the TDD interference issues can be solved simply due to a DC being configured, so the CR is correct to us. In fact in the LS reply from RAN4 in R4-1808093, it has been clarified clearly |
| Huawei, HiSilicon | FFS | We also think it is better to check with RAN4 first before making conclusion. The sentence cited by OPPO is for EN-DC, but not for NR-DC. |
| CATT | FFS | Needs further checking. |
| Qualcomm Incorporated (Masato) | Proposal unclear | We did not fully understand the intention of the CR. Does the CR try to clarify that simultaneousRxTxInterBandCA in ca-ParametersNR-ForDC should not be signalled, but the one signalled in ca-ParametersNR applies to NR-DC? If so, we disagree.  The UE can essentially signal different band combinations for CA and DC by means of feature sets, and so the simultaneous Rx/Tx capability can be different between CA and DC in a given band combination.  It is true that simultaneous Rx/Tx is mandatory for inter-CG of NR-DC. We believe the UE capability is still applicable to intra-CG. |
| vivo | FFS | Agree that we need to check with RAN1/RAN4. |
| MediaTek (Nathan) | Yes (proponent) | First thanks OPPO to indicate the LS [R4-1808093](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_87/Docs/R4-1808093.zip) from RAN4, which clearly indicate the need for simultaneous RX-TX capability in case that a UE is operating in inter-band TDD-TDD or TDD-FDD band combination. It was talking about EN-DC and NR CA at that time since we don't have late drop yet. But we believe that NR-DC requires the same capability as the architecture of NR-DC and NR CA is agnostic from RF transmission point of view.  Currently, it is unclear on how to interpret the meaning of *simultaneousRxTxInterBandCA* in case that it is presented in *ca-ParametersNR-ForDC*. And our CR simply want to clarify that in that case, it indicates simultaneous RX/TX capability in inter-band TDD-TDD or TDD-FDD NR-DC.  But of course, companies may want to check again with RAN4 on this capability. If companies are ok, we could prepare an LS to consult with RAN4. |
| Apple | Check with RAN4 |  |
| Samsung | Check with RAN4 |  |

### 2.1.5 xDD and FRx differentiation on UE capabilities which are not signalled by ENUMERATED {supported}

The discussion is in [11]. The main intention is to discuss the case if the UE capabilities have XDD and FRX differentiation but the value is not simply ENUBERATED {supported}.

**Proposal 1: RAN2 clarify that Table B-1 is not applied for the the xDD/FRx differentiation of capabilities which are not signalled by ENUMERATED {supported}.**

**Q4 Do companies agree with the proposal?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Ericsson | No | We are not sure if there is any misinterpretation for such fields. The table seems to be clear in the sense that the UE shall include the field. One may wonder whether any unclarity may come from the exact values that the UE reports in that case, which should then be consistent. However, there seems to be no Rel-15 parameter defined with values other than ENUMERATED {supported} with both FDD/XDD diff, and for Rel-16 henceforth we would add them per-band, therefore it seems there is no issue currently. |
| Nokia | No | Which use case requires anything other than ENUMERATED {supported} as that is the binary value? |
| ZTE | No | Share the same view as E/// |
| OPPO | No | As commented above, there is no case for that yet. |
| Huawei, HiSilicon | No | Agree with previous comments. |
| CATT | No | Tend to agree with comments above. |
| Qualcomm Incorporated (Masato) | No | It is true that the table B-1 is developed under the assumption that there is no non-binary capability for which both xDD and FRx differentiation is allowed.  We do not think we have to deal with non-existent case. |
| vivo | No |  |
| MediaTek (Nathan) | No | If there is no such case of capability define. We don’t have to clarify it. |
| Apple | No | Same views as above. |
| Samsung |  | We just wanted to clarify what is the correct UE behaviour as mentioned is our paper. But all companies think it is not needed now we are fine for majorities view. |

## Part 2 discussion: TBD

To be updated after Phase I discussion

…

# Reference

1. [R2-2007209](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007209.zip) Clarification on the BandCombination ZTE Corporation, Sanechips
2. [R2-2007210](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007210.zip) CR on the BandCombination (R15) ZTE Corporation, Sanechips
3. [R2-2007211](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007211.zip) CR on the BandCombination (R16) ZTE Corporation, Sanechips CR
4. R2-2008368 Discussion on the ambiguity for the capabilities associated with multiple bands/Cells Huawei, HiSilicon
5. R2-2008369 Corrections on the capabilities associated with multiple bands/Cells Huawei, HiSilicon
6. R2-2008370 Corrections on the capabilities associated with multiple bands/Cells Huawei, HiSilicon
7. [R2-2007796](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007796.zip) Clarification on PDSCH rate-matching capabilities Huawei, HiSilicon
8. [R2-2007797](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007797.zip) Clarification on PDSCH rate-matching capabilities Huawei, HiSilicon
9. [R2-2007885](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007885.zip) Clarification on the simultaneousRxTxInterBandCA capability in NR-DC MediaTek Inc.
10. [R2-2007887](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007887.zip) Clarification on the simultaneousRxTxInterBandCA capability in NR-DC MediaTek Inc.
11. [R2-2007850](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_111-e\Docs\R2-2007850.zip) xDD and FRx differentiation on UE capabilities which are not signalled by ENUMERATED {supported} Samsung