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

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

**Agenda Item: 5.4.3**

**Source: ZTE, Sanechips**

**Title: Clarification of the BandCombination**

**Document for: Discussion and decision**

# Introduction

During the part 1 discussion, it has been agreed by all of the companies that

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| The supportedBandListNR should contain all bands that the UE supports, while the supportedBandCombinationList may not contain all supported bands. |

Furthermore, in [1] we also want to clarify the UE or network's understanding on the bands that only including in the supportedBandListNR (there is no BC reported for such kind of bands). As in the annex, during the Part 1 discussion, most of companies agree with the understanding that

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| If the UE does not report a BC with a certain band, the NW cannot configure that band. |

In this document, we just want to further confirm whether this understanding can be accepted by all of the companies and whether it shall be clarified. For the discussion convenience, we also give our understanding on this issue.

# Discussion

In this chapter, we first discuss whether it’s necessary to clarify the UE or Network’s understanding on the bands that only including in the supportedBandListNR or can it be left to the network implementation. For the band that only including in the supportedBandlistNR, there would be 2 different understandings as below

* Alt 1: The network can configure the band that only including in the supportedBandlistNR with the minimum capabilities, e.g. for the capabilities that only included in the supportedBandCombinationList, the network can take them as not reported.
* Alt 2: The network can’t configure the band that only including in the supportedBandlistNR.

Thus we think, if the UE and the network take the different understandings, it will cause the unexpected failure, e.g. reconfiguration fail. To avoid this issue, we think it’s better to clarify this issue at least in the Chairman note to align the UE and Network vendors understanding.

**Q1: Do company think that the understanding on the bands that only including in the supportedBandListNR shall be clarified.**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm Incorporated (Masato) | No | It is not clear if supportedBandCombinationList referred to here is band combination lists both in RF-ParametersMRDC and RF-Parameters.  It is possible for instance that the UE supports a given NR band only in EN-DC and not in NR standalone operation. In this case, such band won’t be included in RF-Parameters, but will be included in RF-Parameters MRDC.  The significance of “*the bands that only including in the supportedBandListNR*” is slightly different between supportedBandCombinationList included in ParametersMRDC and the one in RF-Parameters.  We feel it is too much to clarify all these.  [ZTE] In this discussion, supportedBandCombinationList referred to here is band combination lists in the RF-Parameters. |
| ZTE  (Wenting) | Yes |  |
| Huawei, HiSilicon |  | We think this is a second question. We should first have consensus on the interpretation. |
| Ericsson (Mattias) |  | It is important that companies have the same understanding.  Our understanding is that the UE may very well indicate in the supportedBandListNR a band which is not included in a band combination. The network should not configure such bands. |
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If companies think that there is a need to clarify this issue, as mentioned above, most of companies agree with the understanding that

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| If the UE does not report a BC with a certain band, the NW cannot configure that band. |

To thoroughly discuss this issue, we also want to mention the handover case as the moderator suggested. The issue is can Network try to handover the UE to a target band that was only included in the supportedBandlistNR. For this issue, our understanding is that if the network can, it also means that the target node can only configure the minimum capabilities (e.g. for the capabilities that only included in the supportedBandCombinationList, the network can take them as not reported) to the UE during the handover. Obviously, it will affect the handover performance. As another option, the UE can get the BC capability on the target band before the handover preparation, and if there is no BC for this Band, the network shall not take this band into consideration, which is also aligned with above companies’ views.

**Q2: Do company agree that if the UE does not report a BC with a certain band, the NW cannot configure that band and can’t take that band as target band for handover.**

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| **Company** | **Yes/No** | **Comments** |
| Qualcomm Incorporated (Masato) | Need clarification | It is not clear if supportedBandCombinationList referred to here is band combination lists both in RF-ParametersMRDC and RF-Parameters.  It is possible for instance that the UE supports a given NR band only in EN-DC and not in NR standalone operation.  In this case, such band won’t be included in RF-Parameters, but will be included in RF-Parameters MRDC. This band cannot be used as handover target even if it is included in supportedBandCombinationList of ParametersMRDC.  [ZTE] In this discussion, supportedBandCombinationList referred to here is band combination lists in the RF-Parameters.  We tend to agree that it is safer for the network NOT to assume the band included in *supportedBandListNR* and not included in supportedBandCombinationList of Parameters can be a handover target. |
| ZTE  (wenting) | Yes |  |
| Huawei, HiSilicon | No | We think this question should be carefully reviewed after a second thinking.  So first we want to understand whether this would impact the measurement configuration. We understand measurement is useful for redirection, handover etc, if measurement configuration is not allowed for the case that the UE has a band in bandlist but not in BC list, this means the network cannot even enable the redirection based on the measurement reporting for other bands.  [ZTE] We think the redirection is similar to Handover. It’s better to get the BC capability of the related Band first before the measurement, and if can’t get the BC capability, the network shall not assume this band as the target band.  Also considering we have introduced one step handover from NR SA to EN-DC, if the UE includes Band A and Band B in bandlist and BC list in RF-paramtersMRDC, but only include Band A in the BC list in RF-Parameters, this actually results in the no possibility to support one step handover. This sounds not the original intention.  [ZTE] We are a little confused. So do you mean that the UE can’t do one step handover from Band B SA mode to EN-DC with Band B. But we think for this case, if there is no BC for the Band B in the RF-Parameters, the UE shall not stay at Band B with NR SA mode.  Secondly we also think it is possible that the UE is not able to indicate of support BC A+B but indeed indicates support of Band A and Band B respectively, with additional support of handover capability, applicable for HO between Band A and Band B. In this case we think it should be allowed to enable ndover e.g. from Band A to Band B. The unknown capabilities for Band B can be probably using the minimized default values, as what we assume for MSG4 during initial access. Otherwise handover between Band A and Band B cannot happen if the UE is not able to indicate support A+B BC.  [ZTE] We think there is no need to support A+B BC, just need to report Single Band BC.  If it is due to the situation that the UE has no enough room to report Band B in the BC list, the overall mobility function is significantly impacted by the uncertainty of UE capability reporting, , which in our understanding is an unnecessary restriction.  [ZTE] We think for this case, before the measurement, the network can re-require the UE capability, and put such kind of band at the first place, then the UE will report the BC for such kind of band. If handover with the minimum capability, there maybe two problems:   1. The UE reject such kind of configuration. Furthermore, according to the first round discussion as in the Annex, the Company disagree with the minimum UE capability assumption. 2. Even some UE can accept this, and handover success, the UE still need to get the BC capability of this Band and reconfigure UE at the target node to guarantee the performance, and before get the BC capability of this Band, the UE would work with minimum UE capability. Thus it’s better to get the BC capability of the target band at the source node first before the related measurement. |
| Ericsson (Mattias) | Yes, in practice. | The NW could of course attempt a HO to a band which is not included in a BC, but that could fail and there are no guarantees that the HO will succeed. So in practice the gNB shouldn’t do HO to a band which is not included in a BC. |
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# Reference

1. [R2-2007209](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_111-e\\Docs\\R2-2007209.zip" \o "D:Documents3GPPtsg_ranWG2TSGR2_111-eDocsR2-2007209.zip) Clarification on the BandCombination ZTE Corporation, Sanechips

# Annex --Companies’ feedback in part 1

Related proposals in [1].

**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.**

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

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| **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. |
| Intel | No for P3 | Due to gNB request band combination reporting, the UE may not report all BCs, while the UE should report all supported bands in supportedBandListNR. In this case, P3 cannot be met. |