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

**Online, January 25th – February 5th 2021**

**Agenda item: 5.4.3**

**Source: Samsung**

**Title: Summary of [011][NR15] UE Capabilites III (Samsung) – Phase2**

**Document for: Discussion and Decision**

# 1 Brief scope of the contributions

* [AT113-e][011][NR15] UE Capabilites III (Samsung)

 Scope: Treat R2-2100016, R2-2100439, R2-2100440, R2-2101911, R2-2101912, R2-2101432, R2-2101430, R2-2101431, R2-2101660, R2-2101661, R2-2101354,

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

 Intended outcome: Report and Agreed CRs.

 Deadline: Schedule A

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| --- | --- |
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During the phase 1 discussion on [011], companies’ views were divided into two ways: “Option 1” and “None” (i.e. please see the Annex A to see the results of phase 1) for “Supported Number of TAG” issues.

Supported Number of TAG

Continue last meeting

[R2-2101354](file:///C%3A%5CUsers%5CDocs%5CR2-2101354.zip) Clarification on the capability of supportedNumberTAG Apple discussion Rel-16 NR\_newRAT-Core, TEI16

# 2 Company comments to the contributions

## Supported Number of TAG

Some companies agree on problem that UE is required to support the different TAGs in the different bands if the TAG number < band entry number especially for the mix inter/intra-band BC. Option 1 is supported by these companies because of the simple approach.

However, some network vendors expressed concerns on the NBC problem from NW point of view and there is no difference between intra-band and inter-band combination. In that sense, UE should be able to do any combination that satisfies the TAG number if the TAG number < band entry in a band combination.

It would be better to check whether above understanding can be acceptable to companies because NW vendors have concerns on the Option 1.

Q1: Do companies agree that UE should be able to support any combination that satisfies the TAG number if the TAG number < band entry in a band combination?

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| **Company** | **Agree?** | **Comments to the CR** |
| MediaTek | Disagree | From UE implementation, inter-band BC and intra-band non-contiguous BC are not the same. The UE may be able to support multiple TA for inter-band BC but not intra-band non-contiguous BC. It seems that most UE vendors are preferring option 1. So, we tend to agree that something is needed.We however understand the concern from some NW vendors. If option 1 is not agreeable, it would mean that the UE will report only 1 supported TAG in field (which may be acceptable?).Maybe we should consider option 2 in later release (or would it be too late for Rel-16?)  |
| Qualcomm Incorporated | See comment | We prefer not to mandate something that is not practically used in the field. We hear intra-vendors comment about backward compatibility. But we still wonder whether there is any real use case today to use different TAGs for different blocks of non-contiguous intra-band CA, e.g. non-collocated cells supporting the same band? |
| Apple | Disagree | We agree with MediaTek that the support of multiple-TA in intra-band and inter-band BC are different from UE implementation perspective. We also agree with QC’s view on NBC issue. We are not sure whether there is real use case in the field now, so there may no the NBC issue.If UE is required to support the TAG number in any combination (if TAG number < band entry number in BC), UE has to degrade its capability and report no support of multi-TA in such BC, and NW cannot provide the appropriate configuration to the UE, which leads to the nagtive impact on the UE and NW performance. For example, for the BC (Band1/FR1+Band1/FR1+Band2/FR2), UE cannot report the support of multi-TA in B1/FR1 and B2/FR2, since UE cannot support the multi-TA in multi-TA in B1/FR1. And the consequence is that NW cannot enable the FR1+FR2 configuration. To avoid the misinterpretation on this UE capability, some clarification which can accurately reflect UE capability like option 1 is needed.  |
| Samsung | Agree, but | We understood that there are no differences between intra-band non-contiguous and inter-band non-contiguous but we need to see other UE vendor’s view whether this understanding is implemented or not.  |
| Ericsson |  | Option 1 would be NBC according to the specifications. But we also see the point that there may be no practical issue at the moment, hence we tend to think that it may be possible to introduce option 1 to address it now. Otherwise, later there may be a bigger impact. |
| Huawei, HiSilicon | Agree | We have same understanding as Samsung and from network point of view there is no difference on handling intra-band and inter-band case. |
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Q2: If companies are agreed with Q1, do companies agree the clarification on the *supportedNumberTAG* capability is needed from R16 (i.e. CR for the 38.306)?

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| **Company** | **Option?** | **Comments to the CR** |
| MediaTek | No | No need to have further change is neither option 1 nor 2 is agreed in Rel-15 or Rel-16. |
| Qualcomm Incorporated | Yes | Should be clarified in one way or another. |
| Apple | No | Same view as MediaTek. We prefer to clarify it as Option 1 or 2, but not the as the proposal in Q1.  |
| Samsung | Yes | Should be clarified in one way or another. |
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# 3. Conclusions

**TBD**

# 4. Annex A: Phase 1 discussion

This section deals with **DISC\_S3: Supported Number of TAG**.

In last RAN2 meeting, the clarification of *supportedNumberTAG* capability was discussed, and companies wants to have more time to check further.



According to the description marked in yellow, it’s clear that for the BC with two band entries NW can configure the TAG per band entry. But for the BC with more than 2 band entries, especially for the mixed inter-/intra band BC, if UE indicates 2 TAGs, how to interpret the capability is not clear and needs to be clarified.

R2-2101354 explains that the current UE capability signalling will lead the NW misinterpretation on the UE capability when *supportedNumberTAG* < band entries in the BC, so the contribution proposes that the clarification is needed. Below options are suggested:

* **Option 1:** UE is required to support the different TAGs in the different bands if the TAG number < band entry number;

For the mix inter/intra-band BC:

* If UE reports the TAG number = band entry number, UE supports the different TAGs configured in both intra-band non-contiguous CA and inter-band CA;
* If UE reports TAG number < band entry number, UE only supports the different TAG configured in inter-band CA.
* **Option 2:** Introduce the association between the TAG and the band entries, e.g. via the cell grouping;

The cell grouping signaling designed for Async DC capability can be considered to be used to indicate the association between band entry and TAG.

Q4: Which option is preferred if the changes are required?

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| **Company** | **Option?** | **Comments to the CR** |
| Qualcomm Incorporated | Option 1 | We understand typical deployments can still be address with this solution. Option 2 is more flexible, but introduces complexity and overhead. |
| Huawei, HiSilicon | None  | We agree there may exist the case that supportedNumberTAG < band entries in the BC. In this case, it means different TAGs are on different band entries (some band entries may belong to the same TAG) according to the current spec. Option 1 is NBC change from NW perspective and Option 2 is too complicated. We don’t see any issue with current definition, and we prefer not to change the current specification. |
| OPPO (Qianxi) |  | We tend to see option-1 as the preferred starting point.On the other hand, option-1 may not be exhaustive so worth further clarification: e.g., * When the indicated TAG no. < the no. of band (for inter-band case only), whether the association between TAG and band can be arbitrary.
* When the indicated TAG no. > the no. of band (for inter-band case only) and the indicated TAG no. < the no. of band entry (considering intra-band non-contiguous case), whether the association between the extra TAG (= no. of TAG – no. of band) and the intra-band band-entries can be arbitrary.
 |
| Ericsson | None | Option 1 is NBC, a UE setting *supportedNumberTAG* to something larger than 1 must support any set of contiguous carriers in any group. The reasoning in Rel-15 was that UEs would anyway serve each group of contiguous carriers by one RF chain and, if it supports several sets of contiguous UL carriers, it should also be able to handle those with different TAGs. There should be no difference between intra-band non-contiguous and inter-band non-contiguous. Hence, option 2, besides being complex, it is also not needed. |
| Nokia | None | Agree about the NBC nature of Option 1 as this puts a meaning that was not previously understood. Option 2 complexity is not justified enough for the given use case and till there is a real issue we don’t propose to fix anything. |
| MediaTek | Option 1 |  |
| Apple | Both are ok(proponent of the paper) | Option 2 is perfect, and Option 1 is acceptable. UE could have different mutli-TA capability for inter-band BC and intra-band non-contigous BC. Therefore, in the mix inter-/intra-band BC, UE should be allowed to use the *supportedNumberTAG* to indicates its inter-band BC capability but not for the intra-band BC capability. But current defination of the *supportedNumberTAG* capability is not clear in the mixed inter-/intra-band BC case. So how to understand the *supportedNumberTAG* capability needs to be clarified.Option 1 is the simple solution, which is to interpret *supportedNumberTAG* capability is only applicable for the inter-band CA case if TAG number < band entry number. There is no inter-operability issue for Option 1, because multi-TA for intra-band CA requires UE having the dual PA capability. In the mix inter-/intra-band BC case, UE cannot indicate its *dualPA-Architecture*capability for the intra-band case, so NW cannot assume UE can support the multi TA for the intra-band CA case. Option 2 is more accurate to provide the association between the TAG and the band entries. It can also indicates the case that UE can support multi-TA in some inter-band cases but not in the others in one BC. But it will introduce new signaling for it. |
| vivo | Option1  | Option1 is OK now. more flexibility method can be discussed in later release.  |
| ZTE | Option 1 and option 2 | We think the option 1 can be as the start point. |
| Intel | None | Our understanding is that there is no differentiation between intra-band and inter-band combination. If the TAG number < band entry in a band combination, the UE should be able to do any combination that satisfies the TAG number, |
| CATT | Option 1 |  For its simplicity. We don’t see much issue with such simple solution.  |
| Samsung | None | We also think option 1 is NBC from NW point of view and the current specification seems fine i.e. UE should be support any combination as Intel mentioned. |
| LG | Option 1 | Option1 is simpler and straightforward from UE perspective. But if this is considered as network NBC, we may consider Intel approach, but wonder if this may result in the UE announcing lower TAG than option 1.  |

**Conclusions (DISC\_S3): TBA**

Companies views are divided into two ways: “Option 1” and “None” (i.e. no further clarification is needed).

Some companies agree on problem that UE is required to support the different TAGs in the different bands if the TAG number < band entry number especially for the mix inter/intra-band BC. Option 1 is supported by these companies because of the simple approach.

However, some network vendors expressed concerns on the NBC problem from NW point of view and there is no difference between intra-band and inter-band combination. In that sense, UE should be able to do any combination that satisfies the TAG number if the TAG number < band entry in a band combination.

**Proposal 3: RAN2 further discuss whether UE should be able to do any combination that satisfies the TAG number if the TAG number < band entry in a band combination in the Phase 2.**