3GPP RAN TSG Meeting #92-e RP-21xxxx

Electronic meeting, June 14 – 18, 2021

**Agenda item:** 9.7.4.7

**Source:** Moderator (Apple)

**Title:** Email discussion summary of [92-e-21-RF-FR1-WI]

**Document for:** Information

# Introduction

In RAN#92-e, an email thread [92-e-21-RF-FR1-WI] is assigned to discuss the following tdocs: RP-211326, RP-211329, RP-211368.

The plan is to agree on the proposed changes to the WID first. Then the rapporteur can update the WID, if needed, based on the outcome of this email thread.

Note that the issue of band n77 is currently being discussed for R16 in RAN4, and hence is not related to the R17 WI “RF requirements enhancement for NR FR1” [NR\_RF\_FR1\_enh].

# Topic #1: RP-211326

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| RP-211326 | Qualcomm | **Proposal: Agree on Tables 3a-3f. In particular, clarify whether Rel-17 includes the switching scenario for intra-band CA option 1 and SUL where one port is supported in the band with intra-band CA and two port is supported in the band without intra-band CA. If Tables 3a-3f are agreed, update the WID with including them.**  **Table 3** Scenarios for intra band CA and SUL of R17 UL Tx switching (band A – 1 CC, band B – 2CC).   * + - * **For Tx switching based on SUL, or uplink CA option 1**   **Table 3a** - Case 1 and Case 2   |  |  | | --- | --- | |  | **Number of Tx chains in WID (band A + band B)** | | Case 1 | 1T+0T | | Case 2 | 0T+2T |   Or  **Table 3b** - Case 1 and Case 3   |  |  | | --- | --- | |  | **Number of Tx chains in WID (band A + band B)** | | Case 1 | 0T+1T | | Case 3 | 2T+0T |   Or  **Table 3c** – Case 2 and Case 3   |  |  | | --- | --- | |  | **Number of Tx chains in WID (band A + band B)** | | Case 2 | 0T+2T | | Case 3 | 2T+0T |  * + - * **For Tx switching based on uplink CA option 2**   **Table 3d** - Case 1, Case 2 and Case 3   |  |  | | --- | --- | |  | **Number of Tx chains in WID (band A + band B)** | | Case 1 | 1T+1T | | Case 2 | 0T+2T |   Or  **Table 3e** - Case 1, Case 2 and Case 3   |  |  | | --- | --- | |  | **Number of Tx chains in WID (band A + band B)** | | Case 1 | 1T+1T | | Case 3 | 2T+0T |   Or  **Table 3f** - Case 1, Case 2 and Case 3   |  |  | | --- | --- | |  | **Number of Tx chains in WID (band A + band B)** | | Case 1 | 1T+1T | | Case 2 | 0T+2T | | Case 3 | 2T+0T | |

## Company views

**Are Tables 3a-3f agreeable? Why or why not? Please share your views in the table below.**

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| **Company** | **Comments** |
| Qualcomm | Yes.  The scope on Rel-17 UL Tx switching includes two parts, the first of which is UL Tx switching between two carriers in two bands, and the second is UL Tx switching between three carriers in two bands.  For 2nd part – 3 carriers switching, the tables in the WID do not capture the actual scenarios correctly as one switching cases combination (Case 1 and 3) is missing. We support to add Table 3b above to make the switching cases combos complete.  Table 3d and 3e are the splitting tables of CA option 2 in corresponding to CA option 1 and SUL (Table 3a and 3b). the splitting is to clarify the difference because that part is still unclear in the WID. |
| Apple | The switching scenarios are better to be clarified by the WID rapporteur. The difference between the scenarios (carrier 1 + carrier 2) and (band A + band B) seems to be only on carrier 2 and band B where carrier 2 is 1CC and band B is with 2 contiguous CCs. From Tx switching perspective, 1CC in carrier 2 and 2 contiguous CCs in band B does not seem to make any difference in requirements. |
| China Telecom | The issue here is whether to include the scenarios of one port is supported in the band with intra-band CA and two port is supported in the band without intra-band CA, i.e., whether Table 3b and 3e are included.  Based on the approved RAN4 CR on R17 Tx switching, the scenarios in Table 3b and 3e are not included yet. We are neutral on the additional scenarios, but appreciate a clear RAN plenary guidance.  In general, we don’t expect much additional effort due to Table 3b and 3e (if added) in RAN4/1/2, since most of the agreements can be reused. Meanwhile, given that RAN4 has already complete the work for the other scenarios excepting Table 3b/e, we should have explicit agreement that the RAN 1/2 work on the other scenarios will not be impacted by the addition of Table 3b/e (if added). |
| CMCC | Current WID does not include the switching between band A and band B with 1Tx. Band B support intra-band CA, according to the previous discussion, band B should be relative higher bands, e.g. 2.6GHz, 3.5GHz. And band A should be relative lower bands. That is why there is no band B with 1Tx. If any operator clarifies they scenario is valid, we are OK to support the scenarios. The requirements should be the same as other Tx switching scenarios. |
| Huawei, HiSilicon | It’s not clear whether case 3b as proposed in RP-211326 is really necessary. At least from the previous discussion in both RAN1 and RAN4, this scenario is not considered. And we see no strong interest from operator for the case. Considering the RAN4 workload, we prefer not to consider the unnecessary cases in Rel-17. |
| Samsung | The six new tables are very clear in logic. Since table 3f is already in WID, not sure if table 3d and 3e is needed. |
| ZTE | In our understanding, all tables are included in the current WID except Table 3b. And we are fine to add this into the WID WID to have full “coverage” support without need of much additional efforts. |
| OPPO | For 3b, we don’t see the benefit of such switching, could proponent clarify the intention of this switching and is there demands on this?  For 3e, isn’t it included by 3f? |
| Ericsson | We agree with the proposal. In addition, we think the following notes should be applicable for SUL but not CA:  Note 1: Only addressing the case of co-located and synchronized network deployment for the two UL carriers for SUL.  Note 2: Only addressing the case of single TAG for the two UL carriers for SUL ~~and for UL CA~~. |
| vivo | The scenarios can be based on operator’s needs and preference. The requirements are highly likely to be reused. |
| Xiaomi | We can based on the operator’s demands |

## Initial Summary

Based on the comments, the following observations can be made:

1. The RAN4 R17 CR for UL switching was approved, among tables 3a-3f, China Telecom commented that 3b and 3e are not included. There were clarifications that 3b was not considered. The reason is band B, usually a high band, is supposed to have two TXs
2. The current wording in the WID is somewhat unclear. For instance, people may think the following table includes switching between any two cases of cases 1, 2, and 3.

For Tx switching based on uplink CA band combination

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|  | **Number of Tx chains in WID (band A + band B)** |
| Case 1 | 1T+1T |
| Case 2 | 0T+2T |
| Case 3 | 2T+0T |

1. Whether requirements for completed cases can be reused for the new cases, the decision of which will determine the RAN4 workload impact
2. There were proposals that any new cases should be based on operators’ demands.
3. Ericsson proposed to add/revise two notes.

## Intermediate round discussion

It is recommended to focus on the following aspects:

1. Seek a consensus if, among tables 3a-3f, only 3b and 3e are not supported yet.
2. Proponents of RP-211326 share more reasons why 3b and 3e need to be considered. Interested operators are also encouraged to makes their demands clear.
3. Whether to update the WID to remove any ambiguity in the switching cases.

Note that moderator believes it is more important to focus on the existing/new cases, so proposes not to further discuss the added/revised notes by Ericsson.

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| **Company** | **Comments** |
| Ericsson | We support addition of the 3b/e cases but welcome also operator feedback.  Regarding the notes, this comment was made rather late in the 1st round, but since we are discussing which cases are useful we think it could be useful to check in the second round if in particular operators see a usefulness in supporting non co-located CA and UL MIMO (we think it would be a useful case). (The change is straightforward and was discussed in R4-2109977 and R4-2109978.) |

# Topic #2: RP-211329

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| RP-211329 | Ericsson | **It is proposed to add the following objectives to the WID:**   * 5) Specify RF requirements for UL CA and the 100 MHz channel bandwidth for shared spectrum channel access for both 5 GHz and 6 GHz   a. specification of UL CA for shared spectrum access in applicable bands including at least the 2 x 20 MHz and 2 x 80 MHz cases;  b. specification of the 100 MHz channel bandwidth for ‘wideband’ operation;  RF requirements accounting for the regulatory requirements that apply in different regions (including the pending EU regulation for the 6 GHz range). |

## Company views

**Are the proposed objectives agreeable? Why or why not? Please share your views in the table below.**

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| **Company** | **Comments** |
| Charter Communications Inc. | With regards to objective #5, “Specify RF requirements for UL CA and the 100 MHz channel bandwidth for shared spectrum channel access for both 5 GHz and 6 GHz” , we will like to add to this objective that alignment with Wi-Fi channel bonding needs to be assured for 100 Mhz channel bandwidths. A lot of work was done during the introduction to n46 and n96 to insure co-existence with Wi-Fi technologies for channel bandwidths 40 MHz, 60 MHz and 80 MHz. The same needs to be done for 100 MHz channel bandwidth |
| Qualcomm | It was already been endorsed (RP-202890) that 100 MHz channel bandwidth would be included in NR\_bands\_R17\_BWs work item and intra-band contiguous UL CA in the NR\_CA\_R17\_Intra WID. Perhaps it is those WID’s that should be modified instead of this one? In general, we think agreements should be followed but if companies prefer to include the objectives in this WID instead of following the previous agreement, we don’t have a strong view. |
| Apple | In RAN #90-e meeting, RAN has endorsed the RAN4 recommendations in R4-2017835 (for 100MHz for NR-U) and intra-band contiguous UL CA for NR-U (RP-202890):  **For the introduction of 100 MHz channel BW**  •       The *NR\_bands\_R17\_BWs*WID should be modified to add this new objective  •       Papers and discussion related to 100 MHz NR-U shall not be treated by block approval within this work item  **For intra-band contiguous UL CA**  •       This work shall be handled in *NR\_CA\_R17\_Intra* WID.  This WID should be modified to add this new objective  •       Papers and discussion related to NR-U intra-band contiguous UL CA shall not be treated by block approval within this work item  For 100MHz CBW for NR-U, we are fine to add this objective to *NR\_bands\_R17\_BWs*WID. For NR-U intra-band contiguous UL CA, it might be better to include this objective in FR1 enhancement WID rather than *NR\_CA\_R17\_Intra* WID. |
| Intel | We are fine to define requirements for 100MHz CBW in Rel-17 timeframe. As commented by QC it was agreed to be handled in a different item, but we are open to have it in FR1 RF.  For UL CA we are generally fine as well and would like to clarify several aspects.  1) Is it intended for both intra-band contiguous CA only as stated in RP-202890 or non-contiguous CA is proposed as well?  2) What is the motivation to focus on 2 x 20MHz and 2 x 80MHz cases? |
| Huawei, HiSilicon | Before adding the new objective in UE RF FR1 WI, the channel BW and UL CA configuration should be added to the NR\_bands\_R17\_BWs and NR\_CA\_R17\_Intra WIs firstly. |
| ZTE | We are fine to add this objective. |
| Skyworks | We support the addition of 100MHz and NR-U ULCA to existing WI (new BW WI for 100MHz) and (FR1 enh for UL CA).  Some initial work is needed to define SEM requirement for 100MHz and NR-U ULCA that should cover wideband operation. We suggest that the NR-U UL CA work is restricted to up to 2x80MHz with contiguous UL CCs and for wideband operation only adjacent sub-bands transmissions are supported: for example if two 80MHz CCs UL CA: 0001+1000 case is valid but not 0010+1000. Ie there should be no non-transmitted UL subbands between transmitted sub-bands. This will allow a reduced number of cases and is consistent with the single CC wideband operation restriction in UL |
| Ericsson | Reading the comments, it seems like there is a preference to add the objectives to the *NR\_bands\_R17\_BWs* and *NR\_CA\_R17\_Intra*  WIDs. This is OK for us, so we propose to update those two WIDs in this meeting with the respective objectives. We can provide WID updates.  Responding to Intel:  1) only for contiguous UL CA.  2) the motivation is to include at least one case for the two modes, wide band operation (in integer multiples of 20MHz) for DL and UL for NR-U supported with multiple serving cells, and ‘wideband’ operation (in integer multiples of 20MHz) for DL and UL for NR-U supported with one serving cell with bandwidth > 20MHz. |
| Nokia | Not agreeable.  Regarding the bullet of “a”, we don’t see the necessity of adding UL CA as one of the objectives to this WI in following reasons.   * + - * Not clear if UL CA is contiguous and/or non-contiguous         1. If it is contiguous, still not clear that why we need 20 MHz x 2 is needed. This can be covered by 40 MHz CBW. Also it is not clear why only 2x80 MHz is needed.         2. If it is non-contiguous, DL contiguous CA needs to finished first.   Regarding the bullet of “b”, if we introduce a new CBW of 100MHz, then, this WI is not the one to accommodate it, but rather a new WI or an existing WI such as NR\_BW\_Bands to introduce a new CBW should be established or used. |

## Initial Summary

Most companies are ok to consider the objectives. Regarding using which WIDs to capture the objectives, there was a previous RAN agreement. And it seems that there is a consensus that we should follow the RAN agreement.

It was also clarified that only contiguous UL CA is proposed.

## Intermediate round discussion

It is recommended to focus on the following aspects:

1. Can we use the *NR\_bands\_R17\_BWs* WID to specify 100MHz channel bandwidth?
2. For contiguous UL CA, further discuss:
   1. Is 2 x 20MHz really needed in light of the 40MHz CBW that has already been supported?
   2. Why 2 x 80MHz is needed.
3. Can we use the *NR\_CA\_R17\_Intra* WID to specify the CA, if there is any agreement on bullet 2 above?

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| **Company** | **Comments** |
| Ericsson | Regarding (1) and (3), we are fine to use these WIDs  Regarding (2), the 2x20 and 2x80 are proposed to cover CA with both modes of wideband operation, since both are within the NR-U scope and specs. CBW 40MHz does not cover WB mode 1. We can clarify that the proposal is for contiguous CA. |

# Topic #3: RP-211368

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| RP-211368 | Huawei, HiSilicon | **It is proposed to add the following objectives to the WID:**   * 5) Specify upper limit for configured power that prevent transmission power dropping on the cell with lower priority order   + The solution applies for both inter-band UL CA and intra-band UL CA |

## Company views

**Are the proposed objectives agreeable? Why or why not? Please share your views in the table below.**

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| **Company** | **Comments** |
| SoftBank | We support to add this objective to the WID. The solution should be discussed in the RAN4 August meeting. |
| Qualcomm | More detail is needed to understand the scope of this new objective. We are not ready to agree yet. |
| MTK | Power control was designed in RAN1. We would like to know how RAN1 should be involved in this work first. |
| Apple | Our understanding is that allowing SCells to drop is the outcome of RAN1 prioritization rule. If the prioritization rule would be causing problems in the field, maybe RAN1 should reconsider the need and the impact of this rule instead of RAN4 introducing a new requirement to work against this rule. If the motivation is to only solve the conformance test issue, we also think it is not necessary. |
| Intel | The motivation of the proposal is not very clear. In particular, it is not evident if the issue arises in the field or in the tests only (as discussed in the last plenary). We think it would be more appropriate to have a cross-WG discussion and involve RAN1, since the Re-15 power control solutions were specified in RAN1. |
| Huawei, HiSilicon | To Apple, this new objective is not for conformance test, but the UE behavior on setting the upper power limit. RAN1 uplink power control procedure does not include the definition on PCMAX,CA and PCMAX,C, the upper limit definition is referenced to RAN4 spec as stated in TS 38.213. So we propose the new objective as the “Specify upper limit for configured power”, it is under RAN4 scope.  UL CA is important feature for NR to improve the UL performance, but limited to current upper power limit setting and corresponding configuration, the UE and network cannot benefit from UL CA feature. So, we propose to start the discussion in RAN4 ASAP as UL CA feature has been already introduced from Rel-15. |
| Samsung | As indicated in the justification part of RP-211329, it is trying solving the Scell drop issue in real network rather than conformance test. At least cross-WG discussion is needed for the solution. |
| OPPO | We would like to understand better on the issue in field better how the RAN1 power control would cause problems. The Pcmax is defined in RAN4, however, the power scaling is RAN1 issue, and the “Scell drop” is power scaling issue instead of Pcmax calculation in our view. If there is problem of power scaling, then RAN1 is the responsible group. We are not ok with adding this objective before these are clear.  Besides, in previous RAN meetings many efforts are putting on reducing the workload of RAN4, but now with keep extending the WID scope, RAN4 might return to over loading. This is not a good practice. |
| Ericsson | We support the proposal and think it should be added to the FR2 WI objectives in addition. |
| Nokia | Not agreeable  We understand the motivation on adding this to this WI. We, however, think that this is related to FR1 as well as FR2. We need to make clear if this work is related to RAN1 or not. So, recommendation is to set a common agenda item including FR1 and FR2 and discuss scope and impact on other WGs. |
| vivo | Understand the intention of this scope, but not quite clear whether and how RAN1 would be impacted. Can be considered as a supplementary of current WID. |
| Xiaomi | We understand the motivation and also prefer to have a consideration together with FR2. |

## Initial Summary

Based on the comments, it seems more discussion/clarification is needed on the following aspects:

1. Whether the issue comes from the field or RAN5 testing
2. Whether the fix of the issue should be done in RAN4 or RAN1? Or at least RAN1 needs to be involved
3. Whether both FR1 and FR2 should be considered. Current proposal is for FR1.

## Intermediate round discussion

It is recommended to focus on the following aspects:

1. Whether the issue comes from the field or RAN5 testing? Interested/concerned operators/vendors are encouraged to share more details.
2. Whether the fix of the issue should be done in RAN4 or RAN1? Or at least RAN1 needs to be involved?
3. Whether both FR1 and FR2 should be considered?

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| **Company** | **Comments** |
| Ericsson | (1) The issue is primarily for the field and hence important to solve. (Of course, conformance test should verify behavior expected in the field so it is important for the conformance test to be relevant and testable too).  (2) We think a RAN4 solution is appropriate and works. There are postponed Rel-16 RAN4 CRs already. There would be a RAN2 signaling update, and no RAN1 impact.  (3) The same issue is applicable to both FR1 and FR2 so both should be considered |

# Topic #4: band n77

## Summary of the issue

RAN4 status report RP-210935 was flagged with the following reason:

“The status report doesn’t include information on US operation in band n77 for 3.45-3.55 GHz (which is being discussed for Rel-16). Since there was no GTW time allocated for this item and the discussion is also stuck on signalling issues which are not in RAN4 domain, RAN should request RAN2/RAN4 to finalize the topic by RAN#93e.”

## Company views

**To give RAN4 a clear guidance, please share your views in the table below. In particular, views on the following two aspects are encouraged:**

1. Does the network need to distinguish devices supporting the new frequency range (3.45 – 3.55 GHz) within the same release?
2. If so, how? Using a modifiedMPR bit corresponding to Band n77, or introducing a new UE capability, or other means?

Note: since there is no contribution submitted to RAN#92-e, please refer to more details about this issue in R4-2107971 “Email discussion summary for [99-e][161] US\_n77”.

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| **Company** | **Comments** |
| T-Mobile USA | We think that the technical details should be left up to RAN4 and RAN2, but RAN Plenary should strongly encourage RAN4 and RAN2 to bring a complete solution to RAN#93e. |
| Qualcomm | As indicated during the RAN4 discussion, we do not think it is absolutely necessary for the network to be able to distinguish devices. We believe that introduction of signaling will incur delay in support of the new spectrum since both UE’s and infra needs to implement this new signaling. We see this as “nice-to-have” rather than “must have”, so we suggested that it could be included optionally. We agree with T-Mobile that the details should be resolved in the working groups. |
| MTK | Firstly, this issue is not included in any WI nor triggered by external LS. This is rather strange in 3GPP operation  In our view, issues should be identified in RAN4 first (if any) and RAN2 to work on the solution (if any). Doing nothing means we expect UE to follow the current RAN2 procedure to reject network configuration to access the range 3.45-3.55 GHz. This is really not an efficient way and 3GPP should seek for better solution for it. |
| Apple | Aspect #1:  We think the network needs to distinguish UEs supporting the new frequency range (3.45 – 3.55 GHz) or not, not necessarily within the same release. Otherwise, network may repetitively request UEs not supporting the new frequency range to perform cell measurement in this frequency range without knowing the failure of measurement is due to UE not supporting this frequency range or other field issues. This could impact legacy UE user experience and network efficiency. And the problem may aggravate when additional new frequency ranges would be introduced in future.  Aspect #2:  We propose to use modifiedMPR-behavior bit corresponding to Band n77 to indicate the support of the new frequency range. It not only allows UE to enable the support of the new frequency range back to Rel-15, but also future-proofs to accommodate the support of the potential new frequency range additions to US Band n77. |
| Intel | Agree with MTK that the work shall be formalized and handled in TEI or added to the specific WI.  Support of UE capabilities signalling to distinguish devices supporting the 3.45 - 3.55 GHz range can be helpful for the to optimize the network behavior and overall performance. We also agree with QC that the specification may not be broken in case the signalling is not introduced, but its support may simplify network behavior. The exact signalling solution can be considered in RAN2. |
| LGE | These issues should be addressed in each RAN WG4 and WG2 firstly. We think that NW should be distinguished the new UE in new n77 band. The new NS could be used to distinguish the new UE and legacy UE. |
| Samsung | We think the detailed aspect shall be discussed in the WG level. RAN can task WG and report the conclusion in next RAN. |
| ZTE | This technical question should be discussed further in RAN4, not RAN plenary. And RAN plenary may provide a guidance to ensure the work is carried out in a proper way. |
| Ericsson | We agree that the technical details should be further discussed in RAN4 august meeting. |
| AT&T | We think that RAN4 should not further discuss signalling and RAN2 should work on defining any necessary signalling during the August meeting. RAN4 should focus on the completing the necessary updates to the RAN4 core requirements at the August meeting. We also agree with Qualcomm that signalling is not a “must-have” and any signalling should be considered optional. |
| Nokia | Signalling is not RAN4 matter but RAN2. Regardless of whether signalling is created or not, it's very strange for companies to claim that should be discussed in RAN4  We would also note that RAN4 doesn't know the inter-operability of signalling aspects: That is in RAN2 scope. That's why RAN2 doing the work allows RAN4 to focus on the RF aspects, thereby allowing the work to complete faster. |
| OPPO | This should be discussed in RAN4 first since it is quite detailed discussion and no paper in this RAN meeting. Referring to group discussion summary is not efficient in RAN.  Tasking RAN4 to further discuss is ok. |
| Skyworks | We support reusing the modified MPR bit to enable UEs to signal their support of the lower 3.45 - 3.55 GHz range to optimize their behavior in the network. This will not be needed for later release and new devices that can be tested for conformance in the whole range. At least if no new spectrum in n77 is released. |

## Initial Summary

Based on the comments, it seems views are still divergent, and there is little appetite to discuss the technical details, given there is no contributions submitted to this RAN meeting.

As such, moderator proposes to reach some agreement on what RAN4/2 should do in Aug. meeting.

## Intermediate round discussion

It is recommended to seek to agree on the following guidance from RAN to RAN4/2:

1. RAN4 focuses on the necessary updates to RAN4 requirements and leave signaling work, if any, to RAN2
2. RAN tasks RAN4/2 to complete the required work in Aug. and report back to RAN#930e
3. RAN4 chair is kindly asked to use an appropriate agenda to facilitate the work in Aug. meeting, i.e., R16 maintenance, R16 TEI, etc.

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| **Company** | **Comments** |
| Ericsson | Agree with the proposed WF 1-3.  RAN4 needs to discuss any band restrictions and the magnitude of the problem. We note that introduction of a new band may be the cleanest solution, in which case RAN2 does not need new signaling. Otherwise, RAN2 should discuss signaling if/as needed. |

# Final proposals/recommendations