**3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-2114743**

Electronic Meeting, 16th – 26th August 2021

**Agenda item:** 10.2

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [100-e][143] FS\_NR\_eff\_BW\_util

**Document for:** Information

# Introduction

This email discussion is for FS\_NR\_eff\_BW\_util study item. The main objective of the study is on efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidth. The following is the agreed agenda:

* Study on Efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths
  + General and work plan
  + Evaluation of use of larger channel bandwidths than operator licensed bandwidth
  + Evaluation of use of overlapping UE channel bandwidths
  + Others

The following topics are discussed in this email thread:

Topic #1: TR Update

Topic #2: Evaluation of Use of Larger Channel Bandwidth

Topic #3: Evaluation of Use of Overlapping UE Channel Bandwidths

# Topic #1: TR Update

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2113948 | Ericsson | draft TR 38.844 v0.0.4  Updated draft TR after RAN4#99bis-e |
| R4-2112391 | Globalstar Inc. | Moved and thread in email thread [312] (AI 9.13.1.1) |

## Companies views’ collection for 1st round

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
| R4-2112391 | T-Mobile USA: RAN4 has already decided to limit the scope of the SID to channel BWs > 5 MHz, so the proposal for 3.8 MHz is not acceptable. The proponents of 3.8 MHz should align with the proponents of < 5 MHz channel BWs for Rel-18. There are also some other channel BWs listed that are not multiples of 1 MHz. RAN4 has previously decided to restrict the SID to multiples of 1 MHz. But in general, the techniques developed in the SID should be usable for NTN, so we think there is no need to update the SID at this time. |
| Globalstar: To clarify, the proposal does not seek irregular channel BWs < 5MHz. The specified allocations are 1610 MHz – 1618.875 MHz and 2483.5 MHz – 2500 MHz. Therefore, we propose 8 MHz and 16 MHz channel BWs. |
| T-Mobile USA: To Globalstar: Thanks for the clarification. We are not opposed to 8 and 16 MHz channel BWs. We think the techniques developed will work for those BWs, but we don’t think that you can add a band to the SID that is not in the specs. We were not allowed to add 6 MHz for n85 to the SID until band n85 was officially in 38.101-1, so we would object to adding these to the SID. |

## Summary for 1st round

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2113948 | Agreeable |

## Discussion on 2nd round not required

# Topic #2: Evaluation of Use of Larger Channel Bandwidth

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2111744 | China Telecommunications | Proposal 1: In the case there are adjacent channels on both sides of the irregular channel, it is best to align the center of the larger channel bandwidth and the irregular channel bandwidth. The blanked RBs should be divided into two parts and placed on each side of the larger channel.  Proposal 2: In the case the irregular channel is on the edge of the frequency band, the blanked RBs can be placed on one side of the irregular channel, i.e., the side with no adjacent channel in this band.  Proposal 3: The number of blanked RBs needs to be carefully investigated considering the tradeoff between the maximizing spectrum utility and the good co-existence with adjacent channel(s).  Proposal 4: To reduce the specification drafting efforts, the number of the blanked RBs can be determined based on certain assumptions and criteria. |
| R4-2112327 | ZTE | Observation 1: the irregular channel bandwidths requested up to now are FDD bands except only one SDL band.  Proposal 1: The asymmetric channel bandwidth consisting of SmallerCBW at UL and WiderCBW at DL may enable the method of using the immediate wider channel bandwidth.  Proposal 2: Apply the deviation to the Tx-Rx carrier centre frequency for the WiderCBW method as |
| R4-2112365 | Apple, Skyworks Solutions Inc. | TP on using next larger channel bandwidth solution  *Moderator: Comments on specifics for the TP should be captured in Section 2.3.2* |
| R4-2113045 | Huawei, HiSilicon | Observation 1: Without introduction of new channel filters, WiderCHBW might not be applicable for non-collocated scenarios.  Observation 2: To meet the TX emission and RX ACS/blocking, new channel filters are needed for the gNB which is not prioritized as stated in the SID.  Observation 3: If no dedicated channel filter is assumed, the requirements are not clear for the UE with capability to receiver the entire spectrum block.  Observation 4: the co-existence issue during the initial access need to be considered for WiderCHBW approach. |
| R4-2113161 | Intel Corporation | Observation 1: Of the proposed methods for addressing support of efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths, the Next Wider CBW method is the simplest, requiring no changes to the RF hardware of the BS or UE. The impact to RAN1,2 is minimal and the least of the three proposed solutions.  Observation 2: The ACS degradation due to potential blockers is a trade-off between simple implementation of the Next Wider CBW method and somewhat degraded performance. Operators views on acceptability of this trade-off are encouraged.  Proposal 1: In many cases, the NW is aware of certain blockers located adjacent to the left or right of the operator. For these cases, the NW should provide assistance to the UE on the blocker location and UE can adjust the BWP PRBs to be left, right or centered within the UE Rx filter and utilize the existing capabilities of the UE Rx filter to eliminate ACS degradation due to these known blockers. |
| R4-2113657 | Ericsson | Observation 1: For irregular bandwidths between 5 and 10MHz the overlapping UE channel bandwith solution is not preffered since the minimum bandwith of CORESET#0. Hence the method of using immediate wider channel bandwidht is suggested.  Observation 2: Wider channel bandwidth approach can be applied for all irregular bandwidth sizes with no technical difficulty compared to that of the UE overlapping channel bandwidth approach where less than 10 MHz poses challenges such as overlapping CORESET0  Observation 3: A “legacy” UE not indicating ensured support for unwanted emission while blanking will still be able to attach to the NW but be configured with a smaller UE CHBW providing lower SU.  Observation 4: Additional UE Emission requirements might need to be developed (in a possible W.I phase)  Observation 5: The blanking method will need implementation changes for both the NW/base station as well as a UE.  Observation 6: A reduced set of requirements for the irregular bandwidth, only regulatory emissions requirements in UL, are required for irregular bandwidths if next largest standardized bandwidth is supported.  Observation 7: A “Fall back” mode to the next smaller regular BW can be used and handled by NW implementation (deployment or steering of BWP) for scenarios where near-far problem occurs.  Observation 8: The Near-far problem of ACS/blocking performance can be solved by a UE indicating support for the irregular BW and that the #of PRBs of the irregular bandwidth in use is indicated in SIB1.  Proposal 1: Agree to further extend the wider CHBW (blanking) approach for irregular bandwidths also larger than 10 MHz.  Proposal 2: Incorporate Table 1 (SU, SCS, SSB) (except 12.5; 33 MHz BWs) to the TR.  Proposal 3: Agree to consider the usage of full irregular CHBW also in UL in later releases.  Proposal 4: Adding UE capability/capabilities that indicate the UEs support for irregular bandwidths if to be supported in UL.  Proposal 5: Consider introducing “regular” channel bandwidths of 6 and 7 MHz into TS 38.104 and TS 38.101-1.  TP to TR on immediate wider bandwidth  *Moderator: Comments on specifics for the TP should be captured in Section 2.3.2* |
| R4-2114004 | MediaTek Inc. | Proposal 1: UE is not mandated to implement new (dedicated) channel filter in order to support irregularBW. Degraded ACS/blocking performance is expected, if new requirements are defined.  Proposal 2: Define the number of utilized RB numbers for each irregular BW at least from BS perspective.  Proposal 3: RAN4 to discuss how to handle the limitation of aligned center frequency of UL and DL BWPs, if irregularBW is to be applied on TDD bands.  Proposal 4: If Tx-Rx separation will get narrower in FDD band due to the introduction of WCBW, at least the REFSENS may need to be revisited. |
| R4-2114239 | T-Mobile USA | TP\_TR38.844 n85\_6\_MHz  *Moderator: Comments on specifics for the TP should be captured in Section 2.3.2* |
| R4-2114240 | T-Mobile USA | Proposal 1: Interested companies are requested to provide answers to the following questions:  1) If the SCS-specific carrier broadcast in the SIB covers 728-738 MHz and the 5 MHz at the low end of n12 is the initial BWP and the gNB, will n12 UEs that don’t support n85 be able to access the network since 728-729 MHz in the cell-specific carrier bandwidth is not part of n12?Alternatively, if cell-specific carrier bandwidth is configured to be 729-734 MHz, can the network then configure n85 capable UEs with UE specific channel bandwidths from 728-738 MHz? (See [1] for reference).  2) Alternatively, if cell-specific carrier is configured to be 729-734 MHz, can the network then configure n85 capable UEs with UE specific carriers from 728-738 MHz? (See [1] for reference)?  3) If it is possible to configure n85 UEs with UE specific carrier of 728-738 MHz when the cell specific carrier broadcast in the SIB is 729-734 MHz, will it be possible to ensure the RBs for the 728-738 MHz carrier align with the RBs for the 729-234 MHz Carrier?  4) Is it the case that it will not be possible to use the low 6 MHz of n85 for n85 capable UEs and at the same time the low 5 MHz of n12 for n12 capable UEs with the next wider bandwidth approach? |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 2-1

*Sub-topic description: Details on how to determine UE Rx filter placement and blanked RBs for WiderCBW approach*

*Open issues and candidate options before e-meeting:*

**Issue 2-1: UE Rx Filter**

* Proposals
  + Point 1: Apply the deviation to the Tx-Rx carrier centre frequency for the WiderCBW method as
  + Point 2: Align the larger channel bandwidth and the irregular channel bandwidth dependent on the adjacent channel is present in the band. e.g. blanked RBs to be planned on side without adjacent channel in band. [e.g. diagram R4-2111744]
* 图示, 表格

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* Figure 2. Case 2: with adjacent channel on one side of the irregular channel
  + Point 3: Do not consider adjacent channels and apply consistent placement of UE Rx filter as priority. In other words, always align the center of the larger channel bandwidth with irregular channel bandwidth regardless of adjacent channels
  + Point 4: SmallerCBW at UL and WiderCBW at DL need to have same location of channel filter.
* Recommended WF
  + TBA

**Issue 2-2: To help reduce specification drafting impacts, companies are encouraged to indicate how to handle UE filter placement and RBs may be captured in TS 38.101 and/or TS 38.104**

* Companies are encouraged to comment on how to capture the following in (TS 38.104, TS 38.101)
  + Number of RBs (blanked or used)
  + UE filter placement
* Recommended WF
  + Same approach should be applied for both TS UE and gNB specifications

### Sub-topic 2-2

*Sub-topic description: Number of RBs (blanked and/or in use) for determining SU may require specifying.*

*Open issues and candidate options before e-meeting:*

**Issue 2-3: Specifics on RBs (blanked and/or used) in widerCBW approach need to be specified.**

* Proposals
  + Point 1: Only number of blanked RBs and their location need to be specified
  + Point 2: Both SU and number of blanked RBs needs to be specified
  + Point 3: Guard band, SU, blanked RBs all need to be specified
  + Point 4: No need to specify the number of SU, blanked RBs or guard band.

For any of the following options please indicate whether it is required for gNB, UE or both

* Recommended WF
  + TBA

### Sub-topic 2-3

*Sub-topic description: UE ACS and Blocking*

*Open issues and candidate options before e-meeting:*

**Issue 2-4: UE Dedicated channel Filter**

* Proposals
  + Point 1: Dedicated channel filters are required to meet existing requirements such as UE Rx ACS/blocking
  + Point 2: ACS degradation due to potential blockers is a trade-off between simple implementations. No dedicated filters are needed if this is expected and therefore agreeable.
  + Point 3: A “Fall back” mode to the next smaller regular BW can be used and handled by NW implementation (deployment or steering of BWP) for scenarios where near-far problem occurs.
* Recommended WF
  + TBA

### Sub-topic 2-4

*Sub-topic description: n85 and n12 specific considerations*

*Open issues and candidate options before e-meeting:*

**Issue 2-5: Band n12 and n85 irregular bandwidths**

* Proposal: n12 UEs that don’t support n85 will be able to access the network even though 728-729 MHz in the cell-specific carrier bandwidth broadcast in the SIB is not part of n12
  + Option 1: This specific case should be documented in TR with how to handle
  + Option 2: This specific case can be treated as part of the general work for WiderCBW approach and does not need special considerations

## Companies views’ collection for 1st round

### Open issues

Sub topic 2-1

*Sub-topic description: Details on how to determine UE Rx filter placement and blanked RBs for WiderCBW approach*

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| **Company** | **Comments** |
| T-Mobile USA | **Issue 2-1: UE Rx Filter:**  **Point 1:** We don’t understand the purpose of. Is this supposed to be the maximum offset between the normal position? If so, then maybe the equation should be:  **Point 2:** It may not be possible to configure the blanked RBs beyond the edge of the band when the allocation is at the edge of the band. Is it a valid configuration to have the DL channel BW extend beyond the edge of the band? We need to check with RAN1 and RAN2 on this. It may only be possible that the next wider channel BW has to be completely contained within the DL band. Also, it may not make sense to align the blanked RBs beyond the edge of the band because there may be other interferers there, or it may be moving the DL closer to the UL which might result in increased self-interference/decreased sensitivity. It would be good to hear input on this from chip and RFFE vendors.  **Point 3:** It may not always be possible to center the larger channel BW. If the wider DL channel BW is centered it may extend beyond the edge of the band. We need to check with RAN1 and RAN2 to see if there are problems with this. We think the only safe assumption is that the next wider channel BW is fully contained in the band.  **Point 4:** Not sure what it means that the Smaller CBW at UL and wider CBW at DL need to have the same location of the channel filters. The same edge? The same center frequency? We don’t know if they can be centered at the edge of a band. It seems like sometimes they may be centered, sometimes not. So sometimes the centers will align, sometimes one edge will align. |
| Intel | **Issue 2-1: UE Rx Filter**  Point 2: Introduce new signalling to provide assistance to the UE on the blocker location, so that UE can strategically place CC. In many cases, the NW is aware of certain blockers located adjacent to the left or right of the operator. For these cases, the NW should provide assistance to the UE on the blocker location and UE can adjust the BWP PRBs to be left, right or centered within the UE Rx filter. Legacy UEs would simply use the same CC as UL, but rel-17 UEs could take advantage of additional signalling  **Issue 2-2: To help reduce specification drafting impacts, companies are encouraged to indicate how to handle UE filter placement and RBs may be captured in TS 38.101 and/or TS 38.104**  NW should provide assistance to the UE on the blocker location and UE can adjust the BWP PRBs to be left, right or centered within the UE Rx filter placement. |
| Qualcomm | **Issue 2-1: UE Rx Filter**  **Point 1:** This formula seems to limit the placement to the center of the channel, further consideration whether this limitation is needed or not should be done. If UL usable RBs can be placed anywhere then there might be issues with UL-DL separation that will not be the default anymore.  **Point 2:** This alignment should be left to deployment, it will depend on adjacent channels and emission requirements but specs should not impose any restrictions.  Point 3: We do not understand this point. Adjacent channels and emission requirements will influence number of usable RBs and placement.  Point 4: This needs further consideration as it is relate to UL-DL frequency separation.  **Issue 2-2: To help reduce specification drafting impacts, companies are encouraged to indicate how to handle UE filter placement and RBs may be captured in TS 38.101 and/or TS 38.104**  In our understanding nothing should be done in the specs and this will be left up to deployment to find the best possible configuration |
| Huawei | **Issue 2-1: UE Rx Filter**  Point 1: in general it is ok, but in some case the RBs will be outside of operator’s spectrum block.  Point 2&3: it may be not needed to specify it in the standard, but the requirements could be different for the two sides of option 2  Point 4: if yes, then it will be not possible when you have two smaller BWs to cover the whole spectrum block. Hence is it not suitable for TDD?  **Issue 2-2: To help reduce specification drafting impacts, companies are encouraged to indicate how to handle UE filter placement and RBs may be captured in TS 38.101 and/or TS 38.104**  It seems no new RF filter is assumed for the approach, the TX emission /RX ACS degradation need to be addressed. |
| ZTE | **Issue 2-1: UE Rx Filter**  Point 1: Since RAN4 decides WiderCBW applies at DL direction, not at UL, it is quite straightforward that the UE is required to support asymmetric UL/DL operation, and the UL CBW would be SmallerCBW for the irregular CBW. Therefore, under the current framework for the asymmetric UL/DL operation, it is natural to define this deviation. This is how we think as the proponent of this point and reply to T-Mobile’s question.  Point 2 & 3:  These two placements should be possible up to deployment demands.  Point 4: Similar consideration as Point 1, but it is not clear what “the same location of channel filter” exactly means.  Issue 2-2: To help reduce specification drafting impacts, companies are encouraged to indicate how to handle UE filter placement and RBs may be captured in TS 38.101 and/or TS 38.104  RAN4 specs just need to specify the corresponding requirements, and UE needs to fulfil those requirements, no matter how UE handles its filter placement, thus how to handle UE filter placement should not be captured in specs, and it is up to implementation totally. |
| Ericsson | **Issue 2-1: UE Rx Filter**  Point 1: Although this provides the simplest (or obvious) solution it provides the least flexibility because it would align the GBs which leads to risk for higher potential of ACS, block and near-far effects.  Point 2: With this solution it provides the ability to maximize protection from near-far effects but requires more efforts when it comes to correct deployment configuration. From gNB point of view there will more implementation/configuration variants as different operators will have different band allocations. We see this partly as a proprietary solution. This solution will cover all possible placements of irregularBWs regards to adjacent frequency usage.  Point 3: Similar to Point 1 (above)  **Issue 2-2: To help reduce specification drafting impacts, companies are encouraged to indicate how to handle UE filter placement and RBs may be captured in TS 38.101 and/or TS 38.104**  Similar to guardband definition, we should provide the number of blanked RBs per each irregularBW in TS 38.104 and TS 38.101 |
| Apple | **Issue 2-1: UE Rx filter**  Point 1: This is not as simple as the formula suggests. Firstly, since the DL channel has discrete rasters of 100kHz, there is no guarantee that it will be perfectly aligned to the center of the actual spectrum block. As a result, a smaller UL channel might be shifted to the right or to the left from with respect to the center of the DL channel and/or the center of the actual allocation.  Point 2 and 3: This is up to the deployment. It is up to the network where to place channel center and as a result how many RBs should be blanked at the left or right edge.  Point 4: The proposal is not clear, what “same location” means and why would Rx fiter be dependent on the Tx filter?  **Issue 2-2:**  As for the UE filter placement, this is up to the UE implementation.  As for the number of available RBs and/or number of blanked RBs, our general view is that it can be up to the network implementation and deployment. If needed, something can be captured in TS 38.104 as a “recommendation” for the network side, but it is anyway transparent to the UE. |
| MediaTek | **Issue 2-1: UE Rx Filter**  Our general concern would be where the lower edge of the occupied RBs in the downlink channel will be slightly closer to the upper edge of the uplink channel RBs, which may cause some sensitivity degradation for FDD bands.  Point 1: Not sure we fully understand this point. Is the idea to push the DL channel further away from the UL due to its larger size? Not very clear in the diagram in the ZTE document what the reference case is if this offset is not applied. With respect to PRBs outside of the operator allocation, we assume the PRB allocation would then just need to be reduced to make sure that this does not happen.  Point 2: How does this affect the DL-UL separation?  Point 3: Not 100% sure which DL-UL separation is assumed here or how this is really different from Point 1.  Point 4: Like others, this proposal seems unclear.  **Issue 2-2: To help reduce specification drafting impacts, companies are encouraged to indicate how to handle UE filter placement and RBs may be captured in TS 38.101 and/or TS 38.104**  We think locations of blanked RBs and guardband to adjacent channel edge would be good to specify and inform the UE when present, with some verification of ACS/blocking degradation specified and tested in at least for some common reference scenarios versus an assumed guardband.  We feel this would be useful for all stakeholders to gain a common understanding of expected and actual performance. |
| Nokia | Issue 2-1: Simulations/measurements data are encouraged to identify which UE Rx filter placement guarantees the best performance for specific scenario.  Issue 2-2: Before discussing any impact to 3GPP specifications, further details (e.g. requested analysis/measurement data showing that requirements (e.g. ACS, blocking) are still met or not, assumptions for Tx channel filter to indicate how many PRBs can be used, etc.) need to be provided to conclude of effectiveness of this method. |
| Skyworks | Issue 2-1: In many case the proposed irregular BW is at one edge of the band and even in some case the entire band so the ACS issue can be helped with the RF filter on top of the RB blanking. It is thus important that the wider CBW position is chosen according the channel placement in the band or on existing interference level in adjacent channels. For Wider CBW case since this is not applicable to the UL it is anyhow an assymetric DL/UL situation and fexible duplex is already supported for this. One aspect that requires attention is whether the flexibility on wider CBW channel placement can only be achieved by new UEs or also by legacy UEs (with possibly different capability/constraint). This is worth addressing in the LS. |
| China Telecom | **Issue 2-1: UE Rx Filter**  The alignment of CCs should be left to implementation considering the actual deployment scenario. For the wider CBW approach, there are possibilities that the wider CBW is out of the frequency band if the irregular bandwidth is on the edge of the band. |

Sub topic 2-2

*Sub-topic description: Number of RBs (blanked and/or in use) for determining SU may require specifying.*

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| **Company** | **Comments** |
| Intel | **Issue 2-3: Specifics on RBs (blanked and/or used) in widerCBW approach need to be specified.**  Point 4: GB should be specified. RBs and SU should be bounded by equation but not individually specified. This leaves flexibility to the UE on exact CC placement. |
| Qualcomm | **Issue 2-3: Specifics on RBs (blanked and/or used) in widerCBW approach need to be specified.**  Nothing should be done in the specifications, this should be left entirely up to implementation/deployment configuration. If we would go and specify all these, it will be more work than defining new channel BWs. |
| ZTE | **Issue 2-3: Specifics on RBs (blanked and/or used) in widerCBW approach need to be specified.**  Point 1, i.e., number of blanked RBs should be specified. The reason is that there could be impacts on some requirements, e.g., ACS, REFSENS in the WiderCBW approach, whiech requires a specified number of blanked RBs, |
| Ericsson | **Issue 2-3: Specifics on RBs (blanked and/or used) in widerCBW approach need to be specified.**  This is a band and deployment specific problem, however similar to guard band definition of regular NR bandwidths the guard band, SU, blanked RBs can be captured in TS 38.104, TS 38.101. |
| Apple | **Issue 2-3: Specifics on RBs (blanked and/or used) in widerCBW approach need to be specified.**  Agree with Qualcomm and Ericsson, nothing should be specified. As commented for issue 2-2, we can consider some “recommendations” in TS 38.104 on the number of usable RBs, but it is up to the network vendors. Referring to comments from Intel and ZTE, specifying guard bands and SU will effectively means that we standardise a new channel bandwidth. |
| MediaTek | **Issue 2-3: Specifics on RBs (blanked and/or used) in widerCBW approach need to be specified.**  We think the number of PRBs and their location with respect to the adjacent channel edge would be good to specify in the RAN4 specs and signal the configuration to the UE, for same reasons as described in answer to 2-2. |
| Nokia | See Issue 2-2 |
| Skyworks | For Wider CBW like for Smaller CBW the goal is to limit the specification work to enable flexible BW but not specify them. Rules to be followed in terms of Guard bands, achievable SU,SSb… can be captured in TR. |
| China Telecom | **Issue 2-3: Specifics on RBs (blanked and/or used) in widerCBW approach need to be specified.**  The number of RBs should be specified and the GB size can be calculated based on it as captured in TS38.101 Clause 5.3. If all the parameters are left to implementation, there may be coexistence issue in some cases. There are possibilities that the placement of carrier has influence on the number of RBs. |

Sub topic 2-3

*Sub-topic description: UE ACS and Blocking*

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| **Company** | **Comments** |
| Intel | **Issue 2-4: UE Dedicated channel Filter**  Point 2: If ACS degradation is unacceptable, then Next Larger CBW method should not be used. |
| Qualcomm | **Issue 2-4: UE Dedicated channel Filter**  It seems we are re-discussing the same thing over and over again. Point 1 should be excluded since this method is about not having any new filters.  Point 2: if this method leads to too much degradation, it should not be used. |
| ZTE | **Issue 2-4: UE Dedicated channel Filter**  The WiderCBW approach assumes no dedicated channel filter for the irregular BW, and degradation on some core requirements are expected. However, RAN4 needs to check what the degradation will be and whether or not it is acceptable in a case-by-case manner. |
| Ericsson | **Issue 2-4: UE Dedicated channel Filter**  Preference for Point 3. |
| Apple | Agree with Qualcomm, for some reason we are discussing the same issue again and again. Usage of the next larger channel assumes that no dedicated filters are used. Some ACS degradation might happen, which depends on the RF bandwidth, BB bandwidth, blocker, etc. |
| MediaTek | **Issue 2-4: UE Dedicated channel Filter**  For same reasons as previous responses, we could consider verification of some level of “degraded” ACS here if useful for operators for some reference scenarios. |
| Nokia | If no new dedicated filters are needed, quantitative analysis or measurement are requested of the “trade-off” - relationship between the guard band size and the ACP (including the possibility of an adjacent standalone NB-IoT carrier challenging the ACS). If degradation is not acceptable, this method should not be considered. |
| Skyworks | Assumption has always been no dedicated channel filter (otherwise this is actually implementing all irregular CBW). In case of blocking or ACS issue that could not be dealt with by shifting the wider CBW and BWP, a fallback to smaller BW can be used |
| China Telecom | **Issue 2-4: UE Dedicated channel Filter**  Point 3 is preferred. The first issue is in what specific circumstances UE should fall back. Does it need to meet any conditions? The second issue is whether fall-back operation is determined by UE or NW. |

Sub topic 2-4

*Sub-topic description: n85 and n12 specific considerations*

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| **Company** | **Comments** |
| T-Mobile USA | **Issue 2-5: Band n12 and n85 irregular bandwidths**  Option 1: We would like to know how this specific case will be handled, because it is our primary scenario for this SI. We are concerned that having carrier broadcast in the SIB for n12 that is not completely contained in n12 may be problematic. |
| Intel | **Issue 2-5: Band n12 and n85 irregular bandwidths**  Option 2 |
| Qualcomm | **Issue 2-5: Band n12 and n85 irregular bandwidths**  Neither option is viable. Since UE would be configured with some spectrum that is not supported by it, this should not be used. It can be documented that such “hacks” should not be used. |
| Huawei | **Issue 2-5: Band n12 and n85 irregular bandwidths**  Option 1, it should be considered since it involves two overlapping bands. |
| ZTE | **Issue 2-5: Band n12 and n85 irregular bandwidths**  Option 2. This can be handled in the actual deployment and has no specs impacts. |
| Ericsson | **Issue 2-5: Band n12 and n85 irregular bandwidths**  Option 2: To our understanding this is covered by existing specifications.  Looking at the 38.211 and 38.331 there is no limitation of the carrierBandwidth (the “cell bandwidth” PRB-grid in SIB1) w r t a raster or operating band. The only limitation we are aware of in the RAN4 specifications is that the NR-ARFCN, the mid-point of the raster (of width carrierBandwidth) must be valid i.e. within the operating band. Hence the n85/n12 case should be possible from a specification standpoint. Likewise, there seem to be no restriction on the location of dedicated UE-bandwidth (locating the UE filter for a regular BW in ServingCellConfig-> downlinkChannelBW-PerSCS-List for the DL) other than that that can it be indexed by the locationandBandwidth field. |
| Nokia | **Issue 2-5:**  We agree with T-Mobile USA further consideration is needed how this method would work for n85. |
| T-Mobile USA | **Issue 2-5:** In offline discussions we have been advised by some companies that there is nothing in the RAN1 and RAN2 specs that prevents configuration of a carrier that extends beyond the edge of a 3GPP band, but that implementations might check that the configuration is within the band and reject configurations that extend outside of the band. I have been advised that this is more of a RAN4 issue. So, since we still have unanswered questions, we would like the following questions from R4-2114240 to be asked of RAN4 companies in Round 2:  Proposal 1: Interested companies are requested to provide answers to the following questions:  1) If the SCS-specific carrier broadcast in the SIB covers 728-738 MHz and the 5 MHz at the low end of n12 is the initial BWP and the gNB, will n12 UEs that don’t support n85 be able to access the network since 728-729 MHz in the cell-specific carrier bandwidth is not part of n12?Alternatively, if cell-specific carrier bandwidth is configured to be 729-734 MHz, can the network then configure n85 capable UEs with UE specific channel bandwidths from 728-738 MHz? (See [1] for reference).  2) Alternatively, if cell-specific carrier is configured to be 729-734 MHz, can the network then configure n85 capable UEs with UE specific carriers from 728-738 MHz? (See [1] for reference)?  3) If it is possible to configure n85 UEs with UE specific carrier of 728-738 MHz when the cell specific carrier broadcast in the SIB is 729-734 MHz, will it be possible to ensure the RBs for the 728-738 MHz carrier align with the RBs for the 729-234 MHz Carrier?  4) Is it the case that it will not be possible to use the low 6 MHz of n85 for n85 capable UEs and at the same time the low 5 MHz of n12 for n12 capable UEs with the next wider bandwidth approach? |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2112365 | Intel – The existing text forms a good baseline. Would propose to add the following text to the end of section 2, “In many cases, the NW is aware of certain blockers located adjacent to the left or right of the operator. For these cases, the NW should provide assistance to the UE on the blocker location and UE can adjust the BWP PRBs to be left, right or centered within the UE Rx filter. Legacy UEs would simply use the same CC as UL, but rel-17 UEs could take advantage of additional signalling” |
| Ericsson: suggestion to merge 2365 and 3657 |
| Apple:  @**Intel**: Answering to the Intel’s comment, we can add a sentence clarifying that the network is (usually) aware of the potential blocker and thus can consider locating the channel center accordingly and/or blanking the RBs. However, it is premature to add anything regarding optimizing UE RX operation by signaling blocker location. If we assume that we can tolerate some ACS degradation and we do not plan to specify ACS for irregular channels, then it is not clear why this information is needed.  @**Ericsson**: Yes, we can merge TPs (see further comments below). |
| Nokia: the following comments are related to TP part only (as suggested by “TPs comments collection”). Not clear why agreed text is removed, e.g. “Since the channel filter which is too wide cannot be expected to provide the usual stop-band attenuation at the edges of the irregular channel bandwidth and since the (i)FFT's filtering effect is limited, simulations will be needed to assess the performance degradation and the gap to the RF performance requirements where the margin in dB becomes negative”. Were there any simulations provided to justify removal of this text?  New text is again on the basis of some theoretical assumptions. The intention is to use an existing, wider filter. There are two filtering effects, one by the filters for the respective legacy CBW and one by the FFT. If the FFT's filtering was enough – and this is what the calculation implies – a discussion about how to avoid new filters would be obsolete because no channel filters with dedicated BWs would be needed. |
| Apple:  @**Nokia**: We agree to the following observation that “*further analysis is needed to assess performance degradation when the wider channel is used*”, this point can be added to the TP because it has been generally acknowledged that some degradation might happen. As for the number of RBs, yes, these are the “theoretical” calculations with the assumptions explained in the paper and with the assumption that some degradation might occur, as explained above. |
| R4-2113657 | Intel - There is no need to introduce fixed 6, 7MHz filters into the spec when there are other solutions (Overlapping CBW from UE perspective) that work for CBW <10MHz and CBW > 10MHz with a single SSB. The reason to introduce fixed filters is to support Overlapping CBW from NW perspective that requires multiple SSBs.Company A |
| Ericsson: suggestion to merge 2365 and 3657Company B |
| Apple:  Section 6.1.2 is a good example of how signaling works for the usage of the next wider channel solution. Details can be further polished, but the baseline is good, which can be added to the corresponding section describing the solution.  Section 6.1.3, our understanding is that there is no unanimous agreement on the near-far Rx blocking problem solutions. It is a more generic issue on Rx blocking and ACS, which should be discussed further. Of course, the issue itself can be captured in the TR.  Section 6.3 relates to the comparison and complexity analysis. No strong view on whether it can be included now. We can work on a separate TR for this meeting and see how much we can capture. |
| Nokia: the following comments are related to TP part only (as suggested by “TPs comments collection”):  - preference not to agree on any text related to RAN1/2 until response LS is received from these WGs  - it is not clear how SU numbers were derived and under which assumptions, see also Nokia comments to Issue 2-4 on required analysis as well as on Tx filter assumptions which would guide discussion on SU. Complexity part is missing.  - it is stated it works with legacy UEs but there is no evidence how co-ex issues (ACS/blocking) are addressed  - it is stated it is generic solution while it requires a lot of specific changes in relevant specifications, further clarification needed |
| R4-2114239 | Intel – Adding the additional band n85 to the TR is another good case. |
| Ericsson: ok with this TPCompany B |
| Apple: Ok |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#2-1** | UE RX Filter  Tentative agreements:  Consider whether the following in LS to RAN1/2   1. It needs to be confirmed that (Blanked or unused) PRBs outside the operator allocation is allowable by specification.   Candidate options/points for further discussion:   1. DL and UL filter and RB placement have same center. WiderCBW (DL), smallerCBW (UL) and irregular bandwidths all contain same center point.    1. Consider raster point may not align, shift to (right or left) next point relative to center. 2. Introduce new signaling to provide UE with appropriate RB location (UE to adjust the BWP PRBs left or right or centered and corresponding filter placement) 3. widerCBW placement is optimized to be contained in the band or meeting interference level in adjacent channels   Recommendations for 2nd round:  Continue to discuss and capture in WF candidate options/points above in 2nd round. There is a tentative agreement to include question for RAN1/2 whether (blanked or unused) PRBs can be scheduled outside operator allocation; continued discussion on this on LS email thread |
| **Sub-topic#2-2**  **Sub-topic#2-3** | Tentative agreements:   1. Number of blanked RBs required to be specified in TS38.101-1 and/or TS 38.104 . This requirement needs to be captured in Clause 6.7 “RAN4 standard impact identification” 2. Capture in WF: companies are encouraged to provide simulation or analysis results to verify the level of potential degradation due to performance of ACS/blocking due to lack of UE dedicated channel filter. Companies are encouraged to provide further information on ACS/blocking to assess resulting performance   Recommendations for 2nd round: Number of blanked RBs definition agreement shall be captured in Revision of R4-2113657/R4-2112365 under Clause 6.7 “RAN4 standard impact identification” |
| **Sub-topic#2-4** | Tentative agreements:  Questions relating to the configuration of a carrier that extends beyond the edge of a band as described in R4-2114240 shall be captured in WF. |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2112365 | To be revised  Taking first round comments into account  Take contents of R4-2113657 into account and capture agreement/outcome of guardband definition from Sub-topic #2-2, #2-3 (above) |
| R4-2113657 | To be noted.  Contents merged into R4-2112365 and Taking first round comments into account |
| R4-2114239 | Agreeable |

## Companies views’ collection for 2nd round

### CRs/TPs comments collection

*Companies are encouraged to focus efforts on WF/LS/TPs assigned after first round discussions. Company comments after first round shall be captured in WF/LS/TPs. No comments will be captured in this Email Summary.*

*List of WF/LS/TPs can be found in Section 4.1 of this Email Summary.*

# Topic #3: Evaluation of Use of Overlapping UE Channel Bandwidths

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2111743 | China Telecommunications | Observation 1: For the approach of Combined UE Channel Bandwidth, the potential RAN1/2 spec impact needs to be identified.  Observation 2: To address the problem of not having enough bandwidth to accommodate two SSBs, there are three possible options:  Option 1: Two SSBs multiplex in time domain.  Option 2: SSB with different indexes to indicate different carrier.  Option 3: One SSB is used and UEs can be reconfigured by dedicated RRC signaling to indicate the existence of second carrier.  Proposal 1: Option 3 is simple and supported by current RAN1 and RAN2 spec and is preferred to resolve the problem when there is no sufficient bandwidth to accommodate two SSBs which do not overlap in frequency domain. |
| R4-2112190 | CMCC | Proposal: it is proposed to continue discuss overlapping CA and combined UE CBW in work item phase. |
| R4-2112233 | Qualcomm Incorporated | Overall, some analysis/summary on the trade-offs between implementation complexity and gains from a network capacity and UE throughput point of view is needed. If the absolute gains are small, it would not be justified to introduce a scheme that is very complicated. |
| R4-2112328 | ZTE | Observation 1: In the conventional non-overlapping CA, PRB grids of the two CCs are not required to be aligned, however, this does not apply to the overlapping case.  Observation 2: In the overlapping CA, subcarrier grids between two CCs shall be aligned to avoid inter-CC interference.  Observation 3: In the overlapping CA, if PRB grids are not aligned between two CCs, then either there could be a waste of some sub-carriers, or there could be inter-cc interference.  Proposal 1: Align PRB grids between two overlapped CCs. |
| R4-2113046 | Huawei, HiSilicon | Observation 1: for channel bandwidths less than 50 MHz, integer-multiples of 5MHz channel bandwidths are supported or will be supported in BS/UE specifications.  Observation 2: It will create huge technical specification work to define each irregular channel bandwidths explicitly in the specification.  Proposal 1: New dedicated channel bandwidths for irregular channel bandwidths are not defined explicitly in the specification for both BS and UE.  Observation 3: Intra-band non-continuous CA is not supported for most bands requested in the SID  Proposal 2: for UE, single carrier using legacy channel bandwidth operation in both sides should be prioritized.  Observation 3: The impact to RF core requirements is very limited to support overlapping CA.  Observation 4: there is no impact on RAN1 and RAN2 of intra-band overlapping CA to support the irregular channel bandwidth except for some capability signaling for the new UE.  TP on overlapping UE channel bandwidths  *Moderator: Comments on specifics for the TP should be captured in Section 3.3.2* |
| R4-2113162 | Intel Corporation | Observation 1: Overlapping CBW from Network Perspective approach has limited benefit in that a single UE can’t utilize the entire irregular BW. This method also requires RAN 1,2 to assess possible impacts of multiple time or frequency staggered SSB to the UE PHY, MAC and RRC.  Observation 2: Overlapping CBW from the UE and Network Perspective approach allows the UE to fully utilize the available spectrum and has no ACS problem.  Observation 3: Overlapping CBW from the UE and Network Perspective approach requires no changes to SSB, CORESET#0, Initial BWP signalling because the primary BWP uses all of the legacy signalling, and the secondary BWP is additionally setup only by UEs that notify the NW of this capability.  Observation 4: Addressing a secondary BWP with an integer number of offset PRBs results in a much simple initial access methodology including SSB, CORESET#0 compared to a method requireing multiple SSBs, ie. Overlapping from Network Perspective.  Proposal 1: For Overlapping CBW from UE and Network Perspective Method, a new higher layer signalling to indicate a secondary BWP would allow UEs with at least two RF carriers to setup a seconary RF carrier with for Overlapping CBW with aligned RBs.  Proposal 2: Overlapping CBW from UE and Network Perspective Method capable UEs should combine overlapping RBs to form a single combined BWP for higher network layers following the PHY. |
| R4-2113949 | Ericsson | Proposal 1: It may be desirable to consider introducing channel bandwidths of 6 and 7 MHz into TS 38.104 and TS 38.101-1.  Observation 1: Intra-band CA approach may be of particular interest for operator requested bandwidths for larger than 100 MHz.  Proposal 2: Define only the needed regulatory subset BS RF requirements for irregular bandwidths.  TP to TR 38.844: Section 6.2 Overlapping UE Channel BWs  *Moderator: Comments on specifics for the TP should be captured in Section 3.3.2* |
| R4-2114005 | MediaTek Inc. | Observation 1: Introducing overlapping CA will create a new bandwidth class at least in the RAN4 spec  Proposal 1: FFS how overlapping CA configuration and capability are considered and reported together with intra-band CCA/NCCA and inter-band CA.  Proposal 2: Define the number of overlapped RB numbers for each irregular BW in both BS and UE spec.  Proposal 3: The 2 overlapping CCs should be aligned based on 900KHz raster.  Observation 2: The Rel-15 feature ‘scellWithoutSSB’ can be directly re-used in overlapping CA case.  Observation 3: The signaling overhead for overlapping CA is higher than other competing solutions  Proposal 4: The BWPs of the 2 overlapping CCs should be mutually exclusive in terms of occupied RBs.  Proposal 5: For overlapping CA, MRTD ≤ 260ns and power imbalance ≤ 6dB. |
| R4-2114367 | Nokia, Nokia Shanghai Bell | Observation 1: The proposed method does not have impact to existing RAN2 signalling or to RAN1 specifications. RAN4 may consider LS to RAN1/2 to confirm this observation.  Proposal 1: Generic LS is recommended to be sent to RAN1/2, as proposed in RAN4#99-e [4]. If a more detailed LS is preferred, at least the aspects above shall be addressed for other methods.  TP on the use of overlapping channel bandwidths from UE perspective  *Moderator: Comments on specifics for the TP should be captured in Section 3.3.2* |
| R4-2113950 | Ericsson | TP to TR 38.844: Section 6.5 RAN1 and RAN2 Impacts  *Moderator: Comments on specifics for the TP should be captured in Section 3.3.2* |
| R4-2114006 | MediaTek Inc | Proposal 1: Request RAN1 and RAN2 to check whether allowing BWP BW > CBW BW leads to any spec change.  Proposal 2: Explicit signaling is needed to tell UE to operate under combined UE BW.  Proposal 3: Define the number of overlapped RB numbers for each irregular BW in both BS and UE spec.  Proposal 4: RAN4 to discuss how to handle the limitation of aligned center frequency of UL and DL BWPs, if irregularBW is to be applied on TDD bands.  Proposal 5: UE should be allowed to support combined UE BW with different implementations, e.g. based on single CC or 2 CCs architecture. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1

*Sub-topic description: Combined UE channel bandwidth approach*

*Open issues and candidate options before e-meeting:*

**Issue 3-1: Reconfiguring a wider UE dedicated BWP**

As reference for discussions below the actual carrier as described in TS 38.211 clause 4.4.5 and copied below:

* Proposals
  + Option 1: TS 38.211 Clause 4.4.5 implies the reconfiguration of a wider UE dedicated BWP to irregular BW. No RAN1/2 spec impact.
  + Option 2: TS 38.211 Clause 4.4.5 only allows for the reconfiguration of a smaller UE dedicated BWP to irregular BW. Reconfiguration to irregular BW which is larger than indicated in MIB/SIB1 during initial access has RAN1/2 spec impact.
  + Option 3: New UE capability and signalling is needed (and should be added) to support the interpretation/application of the reconfiguring of wide.
  + Option 4: Request RAN1 and RAN2 to check whether allowing BWP BW > CBW BW leads to any spec change.
  + Option 5: LS to be sent to RAN1/2 for clarification on all aspects indicated by all methods
* August 17, 2021 GTW Main Session Discussion:

Qualcomm: need of new signalling is quite obvious. Option 2 has big impact. Those options are not preclusive.

Intel: we are talking from network and for UE perspective. Not use if Ericsson is talking about from UE perspective.

Qualcomm: Overlapping channel bandwidth from UE perspective is also possible without combining them, like overlapping CA. Initially like combined channel bandwidth from network perspective.

Nokia: I have a feeling that we are discussing the same issue. We provide the evidence that there is no impact of RAN1.

ZTE: If we are talking about signalling issue, what is channel bandwidth here. Is it whole RF carrier or base band bandwidth for option 4? RF channel bandwidth is larger than channel bandwidth. Should we treat RF bandwidth and baseband bandwidth separately? We need common understanding on it.

Huawei: If we re-configure UE wide BWP, then we will have RAN1 and RAN2 impact. Not all the UE supports intraband NC CA. We need consider the case with new UE use legacy channel bandwidth.

Ericsson: We should differentiate the cases between single serving cell or two cells. UE only operates in the regular bandwidth. BS has irregular bandwidth. Regarding option 2 and Nokia proposal, that needs major changes in RAN1/2.

Intel: we are talking about all the existing UE has two RF chains. It combines somewhere. It is good to reuse the hardware. For changes, we see sub-topic 3-1. There is need of extension of BWP, which can be done as small impact. Change of SSB technology is a big thing.

ZTE: From RAN4 understanding, it is clear that UE reuse the same architecture.

* Recommended WF

Follow GTW Outcome 🡪 Agreement: Send LS to RAN1 and RAN2, including the specific questions about the BWP configuration for solution of reconfiguring a wider UE dedicated BWP. Nokia will provide draft LS.

*Moderator: Companies are welcome to continue to provide comments/views in Section 3.3.1 of this email summary, however it’s encouraged to focus the efforts and discussions in draft LS provided in Drafts folder*

### Sub-topic 3-2

*Sub-topic description: Overlapping CA approach*

*Open issues and candidate options before e-meeting:*

**Issue 3-2: PRB grid alignment**

* Proposals
  + Option 1: Overlapping CA approach needs to have PRB grids between overlapping CCs
  + Option 2: No PRB grids alignment is needed
  + Option 3: Define the number of overlapping RBs
  + Option 4: Alignment on the 900 kHz raster is required
* Recommended WF

Follow GTW August 17, 2021 GTW Main Session Outcome 🡪 Agreement:

* Overlapping CA approach needs to have PRB grid alignment between overlapping CCs
* FFS: Alignment on the 900 kHz raster is required.
* 900KHz raster is applied to the case with 15Khz SCS.

*Moderator: Please capture these agreements in revision of R4-2113046. Huawei will provide revision.*

**Issue 3-3: New UE capabilities and signalling are needed**

* Proposals
  + Point 1: New UE capabilities is required
  + Point 2: Current RAN1/2 specifications support this approach
  + Point 3: New CA combinations would need to be added; heavy workload is on RAN4
  + Point 4: Current RAN1/2 specifications no not support this approach
  + Point 5: New bandwidth class would need to be introduced
* Recommended WF
  + TBA

### Sub-topic 3-3

*Sub-topic description: Overlapping from Network perspective*

*Open issues and candidate options before e-meeting:*

**Issue 3-4: UE signalling**

* Proposals
  + Option 1: Current RAN1/2 specifications support this approach only new signalling is needed
  + Option 2: Current RAN1/2 specifications does not support this approach

*Moderator comment: Please further information for what would be required to enable the RAN1/2 specification in order to support this approach e.g. higher layer signalling is needed to indicate second BWP needed, if this Option is selected.*

* August 17, 2021 GTW Main Session Discussion:

Apple: where is Option 2 coming from.

Intel: for <10Mhz case.

Apple: staggering solution is not precluded.

Qualcomm: same understanding as Apple. It is possible to make it like two cells. There are different ways to address this and has already been supported.

* Recommended WF
  + TBA

**Issue 3-5: Single SSB and/or CORESET**

* Proposals
  + Option 1: single SSB/CORESET for irregularBWs > 10 MHz and two SSBs/CORESET for irregualarBWs < 10 MHz
  + Option 2: single SSB/CORESET for irregularBWs > 10 MHz and handle irregularBWs < 10 MHz by other method
  + Option 3: two SSBs for all irregular BWs (apply such methods as time division multiplex in case of irregular BWs < 10 MHz)
* Recommended WF
  + TBA

**Issue 3-6: PRB grid alignment**

* Proposals
  + Option 1: Overlapping UE channel bandwidth approach needs to have PRB grids between 1st UE CBW and 2nd UE CBW
    - Option 1a: Define the number of overlapping RBs
    - Option 1b: Alignment on the 900 kHz raster is required
  + Option 2: No PRB grids alignment is needed
* Recommended WF
  + Follow GTW Outcome 🡪 Agreement: PRB grid alignment is needed for the solution of Overlapping from Network perspective.
  + Capture agree approach in TR 38.844 Clause 6.2
  + *Moderator: Please capture these agreements in revision of R4-2113949. Ericsson will provide revision.*

## Companies views’ collection for 1st round

### Open issues

Sub topic 3-1

*Sub-topic description: Combined UE channel bandwidth approach*

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Intel | **Issue 3-1: Reconfiguring a wider UE dedicated BWP**  Option 3. New UE capability and signalling are needed. However the proposals are somewhat misleading for the Combined CBW from UE approach.  There should be no change to TS 38.211 clause 4.4.5, as that spec is about setting BWP within the existing UE Filter BW. No need to change to any Ngrid parameters since no new filters being defined. Yet, there should be new specs added to support Overlapping BWP, assuming the UE has two separate RF/analog chains. In R4-2113162 we note that the existing Ngrid and NBWP parameters can be re-used as long as there are two distinct Offset-to-Point-A values defined for each RF/analog chain. This is a small addition for RAN1, 2. |
| Qualcomm | **Issue 3-1: Reconfiguring a wider UE dedicated BWP**  It should be clarified what exactly this issue is about. It seems this is about the “combined channel BW” proposal from Nokia. Is this correct?  Option 2 and Option 3. There will be some spec impact, at least to clarify that some new type of behavior is available. capability is also needed because this is not currently supported by UEs. |
| Huawei | **Issue 3-1: Reconfiguring a wider UE dedicated BWP**  Option 3 and 5  Reconfiguring a wider UE dedicated BWP or a BWP outside the carrier configured in the SIB1 has RAN1/2 impact, but the needed change is small. Meanwhile we think single carrier using legacy channel bandwidth operation in both sides should be prioritized. Hence reconfigure a BWP outside the SIB1 carrier should be considered as well. |
| ZTE | **Issue 3-1: Reconfiguring a wider UE dedicated BWP**  As commented in GTW, firstly we need to clarify what channel bandwidth refers to from signaling control perspective. For example, in this approach by combining two RF carriers but treating it is a single cell, then the channel bandwidth of this ”special” cell is the total frequency span of the two combined RF carriers, or just one of them? If the former case is the understanding, then the scheduler does its job in the same way as a conventional cell, Option 4 does not exist in this case.  Option 5 sending an LS to RAN1/2 to help understanding the scheme is fine with us. |
| Ericsson | **Issue 3-1: Reconfiguring a wider UE dedicated BWP**  Option 2.  We are also ok with Option 4 if there is a consensus to send specific LS relating to BWP BW > CBW BW is supported. |
| Apple | There are severl independent aspects: a) whether the existing signalling supports it, b) whether existing UEs would act correctly on this signalling, and c) whether combined channels at UE side will need a separate capability. Fo a) and b) we already agreed to send the LS, even though our view that b) is not necessarily the case for all UEs. And for c), yes, a new UE capability is needed. |
| MediaTek | **Issue 3-1: Reconfiguring a wider UE dedicated BWP**  Option 4 and 5 is fine – send LS to RAN1/2. Apple’s specific points to add seem okay. |
| Nokia | As discussed in GTW, we believe there is no impact to RAN1 specifications and existing RAN2 signalling. If there are different views, these questions should be answered by RAN1/2. As pointed out in our document, network can reconfigure UEs in RRC\_CONNECTED to use wider BWP (and channel bandwidth, if necessary) than used for initial access (with no change in MIB/SIB1). |
| Skyworks | One aspect to consider getting feedback from RAN1/2 is whether a given overlapping method can be compatible with UEs using wider BW and Legacy UEs. Ie whether there is some constraint to which smaller CBW legacy UEs can attach |
| China Telecom | **Issue 3-1: Reconfiguring a wider UE dedicated BWP**  Option4. It’s better to send LS to RAN1 and/or RAN2 for confirmation as agreed in Tuesday GTW. |

Sub topic 3-2

*Sub-topic description: Overlapping CA approach*

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Intel | **Issue 3-2: PRB grid alignment**  Option 3 or 4, the entire existing RAN1 grid and BWP methodology is already defined on integer numbers of PRBs because this makes the implementation straightforward. Any new methodology should try to fit well with the existing spec, thus, the PRB grid alignment should include an integer number of overlapping RBs.  **Issue 3-3: New UE capabilities and signalling are needed**  Point 1, 4, New UE capabilities and new RAN1/2 specifications are required. With Overlapping CA these changes may be complex, however, with Overlapping CBW from UE perspective, we can make these changes simple by introducing Overlapping BWP as described in R4-2113162. This only introduces a minimum of new IE fields and no changes to existing SSB, CORESET0 requirements. |
| Qualcomm | **Issue 3-2: PRB grid alignment**  These options are not mutually exclusive. Option 1. it is possible to have Option 2 also but there is no gain since fractional PRBs are not supported.  Option 4 depends on the channel raster used.  **Issue 3-3: UE signalling**  All options. |
| Huawei | **Issue 3-2: PRB grid alignment**  Ok with option 1 and option 4  Disagree with option 3, by defining the guard band from the smaller BW and 900x kHz spacing, the overlapping RBs are known and not necessary to define the number.  **Issue 3-3: UE signalling**  Agree with point 1 and 2.  Agree with point 5 for Aggregated channel bandwidth less than 20 MHz.  Disagree with point 3 and 4, the workload for RAN4 is limited. It can be specified in a general way per band based on operator’s request. |
| ZTE | **Issue 3-2: PRB grid alignment**  Option 1. For Option 4, it should be a sub-bullet under Option 1, and subject to SCS and channel raster. And for Option 3, how many PRBs are overlapped depends on the channel placement, which is up to deployment flexibility.  **Issue 3-3: New UE capabilities and signalling are needed**  If a UE satisfies RF intra-band contiguous CA requirements for the bandwidth combination of the overlapping CA, then it can also support the overlapping CA operation with the same bandwidth combinations under the conventional intra-band contiguous CA framework but with scheduling coordination, thus there is no need for new requirement, no new CA combination, no new bandwidth class.  The only issue left for this approach is whether or not to harvest some more PRBs due to the overlapping, and if not, Point 2, otherwise, Point 1, only this part may have RAN1/2 impacts. |
| Ericsson | **Issue 3-2: PRB grid alignment**  For Option 1 and 2. Regarding PRB grid alignment, to our understanding it depends upon how the overlapping CA method will schedule the PRBs in the overlapping portion. Perhaps further details can be described in a TP to the TR.  For Option 3, similar to other methods, the number of overlapping RBs would need to be defined in TS 38.104, TS 38.101  **Issue 3-3: UE signalling**  Support/Agreement to Point 1.  Signaling specifics needs to be documented in the TR on how this shall work. Will somewhat affect RAN2 specs  For Point 2: Will be part of the agreed LS to RAN1/2 from 1st GTW  For Point 3 the UE needs to report capabilities on overlapping CA if its CA combinations or something else needs to be discussed. And fundamentally decided by RAN2 new signaling. Does this detail need to be included in the approach general description (TR 38.844 Clause 6.2.3.1)?  For Point 4: Will be part of the agreed LS to RAN1/2 from 1st GTW |
| Apple | **Issue 3-2: PRB grid alignment**  Both option 1 and 2 are possible, but the gain of the option 2 is not clear, at least comparing this method to other solutions that use PRB grid alignment.  **Issue 3-3: UE signalling**  Option 1 - Option 4, we anticipate certain impact on RAN1 and RAN2 specifications. |
| MediaTek | **Issue 3-2: PRB grid alignment**  We support PRB grid alignment, according to Option 1 and 4. We also believe that the specific supported configurations would need to be defined in the spec, including overlapping RBs or specific channel centre frequency location combinations for different CCs – hence we also support Option 3.  **Issue 3-3: UE signalling**  Largely agree with Ericsson comments above on the different points. |
| Nokia | Issue 3-2: PRB grid alignment is needed  Issue 3-3: we propose to ask in generic LS to RAN1/2 the following questions:   * + check if the overlap of the subcarrier (not necessarily PRB) aligned carriers results in a conflict of physical signals (in particular reference signals) or channels that legacy UEs distributed over both carriers expect to receive   since CA is considered, there will be BSR per serving cell – how would this be handled when these are overlapped? How does UE report CSI for the overlapped part? What about SRS, can there be SRS carrier switching between the carriers? SCell has either PDCCH or is cross-carrier scheduled, how would that work in overlapping CA case? |
| Skyworks | Option 1 RB alignment (already agreed), for Option 4 900kHz raster this may be the condition for legacy UEs to attach to both channels with smaller CBW. at least one of the CC shall be accessible to legacy UE. Again compatibility with Wider CBW is also to be understood. |
| China Telecom | **Issue 3-2: PRB grid alignment**  CCs should be placed on the channel raster with aligned PRB grid.  **Issue 3-3: New UE capabilities and signalling are needed**  Agree with Point 1 and 4. For point 4, we can also send LS to further check. |

Sub topic 3-3

*Sub-topic description: Overlapping from Network perspective*

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| **Company** | **Comments** |
| Intel | **Issue 3-4: UE signalling**  Option 2 – The Overlapping CBW from Network perspective requires multiple time staggered SSBs, CORESET0 (CBW < 10MHZ) which the current RAN1/2 specifications do not support. New signaling required for SSBs and CORESET0 would potentially require changes to many spec layers: ie. PHY, MAC, RRC.  **Issue 3-5: Single SSB and/or CORESET**  Option 3 – Multiple time and frequency staggered SSBs required for this approach.  **Issue 3-6: PRB grid alignment**  Option 2 – Since with this method only works with a single UE receiving a subset of the full Irregular CBW there is no requirement for alignment to any grid. |
| Qualcomm | **Issue 3-4: UE signalling**  Option 1. current signaling supports this. We disagree with Intel, it is possible also not to even have coreset#0 in part of the channel.  **Issue 3-5: Single SSB and/or CORESET**  Option 2.  **Issue 3-6: PRB grid alignment**  Option 1b is fully supported by the current specs. why would there be a need to define the number of overlapping RBs? |
| Huawei | **Issue 3-5: Single SSB and/or CORESET**  Option 3, so it is similar as overlapping CA from network perspective  **Issue 3-6: PRB grid alignment**  Agree with option 1b.  Meanwhile, it should be pointed out that It will create huge technical specification work to define each irregular channel bandwidths explicitly in the BS specification. |
| ZTE | **Issue 3-4: UE signalling**  It seems to us that both Option 1 and Option 2 look like the same option, which implies that without new signaling or new design, current specs cannot this approach. However, it is not true. Current specs supports this approach without any new signaling.  **Issue 3-5: Single SSB and/or CORESET**  Option 1 or 2 represents two different ways of handling irregularBW < 10MHz, and both are possible. And of course, an operator has to accept that two SSBs may offset the benefits of this approach if going for Option 1.  **Issue 3-6: PRB grid alignment**  Option 1. Similar case to the overlapping CA. |
| Ericsson | **Issue 3-4: UE signalling**  Option 1. Signaling configurations are detailed in TP (R4-2113949)  **Issue 3-5: Single SSB and/or CORESET**  Option 2.  **Issue 3-6: PRB grid alignment**  Option 1a. Similar to other methods the overlapping RBs shall be documented/defined. |
| Apple | **Issue 3-4: UE signalling**  Is it a typo? Previously issue 3-4 was about the UE signalling. If this is a new issue, we should not re-use old numbers.  *Moderator: Corrected incorrect heading in comments – not a new issue should be “UE signalling”*  **Issue 3-5: Single SSB and/or CORESET**  Our view is that it is up to the network implementation. If one or two SSB/CORESET are possible, then it is up to the network implementation which option to use, we cannot see any reason why a particular network implementation or deployment option should be precluded.  **Issue 3-6: PRB grid alignment**  Already agreed that PRB alignment is assumed. |
| MediaTek | **Issue 3-4: UE signalling**  Option 1.  **Issue 3-5: Single SSB and/or CORESET**  Option 1 or 2 is fine.  **Issue 3-6: PRB grid alignment**  Option 1b is maybe simpler from Network side, but may be up to network implementation as long as no UE impact. |
| Nokia | Issue 3-4: it is proposed to check with RAN1/2 if a single SSB and/or CORESET, in particular for irregular BWs >10 MHz where a 5 MHz wide initial BWP can be in the common frequency range, is enough to make in DL and UL some UEs operate spectrally left-aligned and others right-aligned  Issue 3-5: using two SSBs/CORESET is clearly the disadvantage of this method due to complexity and spectrum efficiency, overlapping channel BW from UE perspective does not require two SSBs/CORESET for all irregular BWs  Issue 3-6: carriers to be aligned with PRB grid, increased SU (up to 2 PRBs) is expected if the second carrier is not on the 100kHz channel raster. We share the concern from Huawei this method would create huge technical specification work to define each irregular channel bandwidths explicitly in the BS specification. |
| Skyworks | **Issue 3-5: Single SSB and/or CORESET :**  when common SSB is feasible this should be the default, time-staggered SSBs needs to be supported for <10MHz  **Issue 3-6: PRB grid alignment:**  already decided and necessary for common SSB case |
| China Telecom | **Issue 3-4: UE signalling**  Based on our understanding the current specs support this approach and no new signalling is needed.  **Issue 3-5: Single SSB and/or CORESET**  Single common SSB and CORESET is preferred. The initial access is through the single common SSB and then UEs can be reconfigured to use the second carrier.  **Issue 3-6: PRB grid alignment**  PRB grid alignment is needed to reduce interference between UEs. |

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
| R4-2113046 | Qualcomm: the TP says that there is no impact to RAN1/2 with overlapping CA, we disagree. At least some clarifications in the specs that such configurations are allowed would be needed. Current specs assume that the CCs are not overlapping. Impact might not be major though. |
| Ericsson: In general it’s good to have a TP which documents this method, however some details are missing such as how we shall handle. UE capability and indication from UE on which bands it supports overlapping intra band CA to support irregular BW’s for a band.  Also some more details on signaling for setting up the SCell (Cc) might be useful to be updated in the TP.  - Is there a need for BWPs per CC?  - Will the SCell contain SSB? (possibly dependent on BW size)  - Will the “default” RRC configuration/ MAC-CE activation of the overlapping SCell be reused from legacy CA?  The handling/solution of the overlapping PRBs between the two Component carriers should be explained.  We can work on the proposed text during the meeting, and if not all details can be captured during this meeting time one approach is to include “Editor’s note” to encourage companies to provide update in coming meetings. |
| Apple: We agree with the comments from Qualcomm that this TP assumes that it works for legacy UEs, but we do not think that it is the case. As further elaborated by Ericsson, it is not clear whether one or two BWPs are are needed, how they are configured, etc. |
| Nokia: proposal in 6.2.2.1 not clear, this bullet is on UEs which support this solution. For 6.3.1 there is another TP which is overlapping with this one. RAN1/2 part to be addressed in the LS to these WGs (see more details on this method in R4-2114367). For SU part, the following should be mentioned: “For UEs supporting overlapping channel bandwidths, if the main RF carrier and additional RF carrier are treated as if it is a normal carrier aggregation operation, there may be additional overhead due to duplicated common channels and signals such as SSB, PDCCH and CSI-RS configured both in Pcell and Scell, in addition of the MAC processes associated with CA”. |
| R4-2113949 | Intel – CR should not include text requiring multiple SSBs this solution is further discussed. Other methods allow only a single SSB with additional signalling is needed. |
| Nokia: TP in Clause 6.4.x – to be confirmed by RAN1/2, last paragraph not needed on what was discussed in RAN4. |
| Apple: For every solution, our preference is to keep related explanations in the corresponding section. In other words we cannot see why we need to move existing text to section 6.3.  Content of section 6.4.x has two aspects: general signaling with configuration and one versus two SSB. General signaling aspects can be captured in the main section of the corresponding solution, and one versus two SSB text can be updated further based on the outcome of the meeting. |
| MediaTek: We don’t believe 2 SSBs are needed in case this is overlapping CA from UE perspective and legacy UEs are confined to the CC with the SSB, even for <10MHz. Spec today allows to establish a 2nd CC for the UE without an SSB. |
| R4-2114367 | Intel – Overlapping from UE perspective is promising method. The significant advantages of this method to allowing full UE SU and no ACS degradation make it worth pursuing.  We feel that there is some impact to RAN1/2 to indicated distinct Offset to Point A values to each BWP. However, this is actually less complicated than adding multiple time-staggered SSBs as in Overlapping NW method. |
| Apple: There was an agreement last meeting to provide further details on the UE architecture for this solution, but it is still not clear how it is going to work from the UE perspective. Figure 2 in the paper just shows a “black box” that performs some actions, and the TP has a very generic description, “*It requires UE support of intra-band non-contiguous CA with capability to separate bandwidth parts (CC1 and CC2) when frequency offset is less than the bandwidth of a single bandwidth part. The increased complexity due to combining two RF carriers into one baseband carrier is therefore affecting the receiver and its capability to separate the two CCs*”.  To understand better whether this solution fits existing UE architectures and/or which changes are needed, the following blocks should be shown for the exemplary "reference" UE design: RF filter, mixer, baseband, ADC, digital filtering, data splitters, FFT. It should be shown clearly:  - Is there one incoming RF signal from the RF front end or are they split further inside the chain? For contiguous CA one incoming RF signal after RF front end can be assumed, but since inter-band CA UE capability is mentioned, it is not clear whether there is one RF signal or not;  - Will the baseband receive one stream of data or two streams as in CA? If there are two streams coming to baseband, where are they split? If there is one stream to baseband, but there are two RF signals coming out of the RF front end, at which stage you would “mix” signals so that the baseband receives a single data stream? |
| R4-2113950 | Nokia: RAN1/2 to be confirmed by RAN1/2 LS |
| Apple: What is the purpose of this TP, provide additional information for every solution or compare them? It seems that TP mixes up a bit both aspects, so if the intention is to provide overview of the specification impact, only the essential information should be kept.  In section 6.5.2, there is no specification impact regardless of the fact whether the irregular channel is larger or smaller than 10MHz. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

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|  | **Status summary** |
| **Sub-topic #3-1** | Sub-topic description: Combined UE channel bandwidth approach  Tentative agreements:  Companies have different viewpoints on RAN2 specification interpretations and RAN4 has agreed to capture questions for clarification to RAN2 in LS.  Recommendations for 2nd round:  Specification (TS 38.211) support UE dedicated BWP reconfiguration clarification question to RAN1/2 is captured in LS. Companies are encouraged to focus efforts on draft LS, with no additional discussion in email summary on this sub-topic during 2nd round. |
| **Sub-topic #3-2** | Sub-topic description: Overlapping CA approach  Agreement from GTW August 17, 2021 GTW:   * Overlapping CA approach needs to have PRB grid alignment between overlapping CCs * FFS: Alignment on the 900 kHz raster is required. * 900KHz raster is applied to the case with 15Khz SCS.   Recommendations for 2nd round:   1. Agreements to be capture and revision of R4-2113046. 2. Companies are encouraged to bring analysis on alignment on 900 kHz raster requirement. 3. Issue 3-3 shall be captured as part of draft LS. 4. No additional discussion in email summary on this sub-topic during 2nd round. |
| **Sub-topic #3-3** | Sub-topic description: Overlapping from Network perspective  Tentative agreements:   1. Issue 3-4: UE signaling, does current RAN1/2 specification support this approach? There are different company views on this. This will be included in LS to RAN1/2 similar to other signal aspects for other methods. No additional discussion in email summary on this issue during 2nd round. 2. Single or multiple SSB/CORSET0 is include as configurations studied and both methodologies shall be captured in TR. Proponents of each approach are encouraged to provide text in revision of R4-2113949 where applicable. 3. PRB grid alignment is needed for this solution. This agreement needs to be captured in TR 38.844 Clause 6.2 as part of revision R4-2113949   Recommendations for 2nd round:  Companies are encouraged to focus efforts on draft LS and revision of TP (R4-2113949) to capture above agreements, with no additional discussion in email summary on this sub-topic during 2nd round. |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2113046 | To be Revised.  The revision shall take into account comments raised during 1st round by companies in Section 3.3.2 of this Email Summary. Additionally, agreements regarding raster/PRB grid alignment captured in Sub-topic #3-2 Section 3.4.1 of this Email Summary shall also be incorporated in revision. |
| R4-2113949 | To be Revised. |
| R4-2113950 | To be Noted. Await outcome of LS reply from RAN1/2 |
| R4-2114367 | Return to.  As the agreement already on LS to RAN1/2 (Observation 1/Proposal 1). Companies are encouraged to focus only on the TP in this contribution to provide comments if proposed text changes can be agreed in this meeting during 2nd round. |

## Companies views’ collection for 2nd round

### CRs/TPs comments collection

*List of WF/LS/TPs can be found in Section 4.1 of this Email Summary.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2114367 | *Moderator: comments on company TP. Proposals within the document shall be noted.* |
| Apple: Somewhat re-iterating the previous comment, there was an agreement last meeting to provide further details on the UE architecture for this solution, but it is still not clear how it is going to work from the UE perspective. Figure 2 in the paper just shows a “black box” that performs some actions, and the TP has a very generic description. It was clarified by the proponent that “*public information of detailed UE TRX architectures is not available and is implementation specific*”, but if that is the case, then how can we claim that to support this method it will be enough for the UE to support intra-band non-contiguous CA. If there are two "RF carriers" but one cell as perceived by baseband, then it should be explained further where signals are split / mixed using reference UE architecture as an example.  More detailed comments:  For the following sentence, “*The increased complexity due to combining two RF carriers into one baseband carrier is therefore affecting the receiver and its capability to separate the two CCs*”, it is not clear whether we deal with increased complexity of the existing architectures or a completely different architecture.  The following sentence should be clarified: , "“*additional RF carrier” not to be on the channel raster to increase spectrum utilization (up to 2 PRBs), it should be noted that the complete “additional RF carrier” is used only by UEs which support this solution. “additional RF carrier” can be used partially (with up to 2 PRBs not available) by legacy UEs which are on the channel raster.*". Did we agree to consider new channel rasters? The SU table has two columns without 100kHz raster, but it is not according to the existing design.  Similar to other methods, we encourage the proponent to include a section with signaling details to present which IEs and values are used to configure a UE and two RF carriers. |
| Ericsson:  Some comments on the TP part of the paper:  Since this method implies a “one cell” configuration we do not understand the CA portion needed to be supported by the UE, indicating two CC’s. CA should not be needed to differentiate two BWPs. This seams to be a new “type” of CA UE that we need clarification on.  We do not understand the “additional RF carrier” implication on the UE, and not really sure what a “additional RF carrier” is. |

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on widerCBW Approach | Ericsson | ACS/blocking, UE RX filter placement  Aspects to be included are described in moderator status summary after first round for further analysis/study in coming meeting. |
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**Existing tdocs**

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-2113948 | Draft TR 38.844 v0.0.4 | Ericsson | Agreeable |  |
| R4-2112365 | TP on using next larger channel bandwidth solution | Apple, Skyworks Solutions Inc. | To be revised | See Section 2.4.2 |
| R4-2113657 | TP to TR on immediate wider bandwidth | Ericsson | To be noted. | See Section 2.4.2 |
| R4-2114239 | TP for TR 38.844: 6 MHz for n85 with overlapping CHBW | T-Mobile USA | Agreeable | Addition of n85 |
| R4-2114751 | Draft LS on specification impact for methods on efficient utilization of licensed spectrum that is not aligned with existing NR channel bandwidths | Nokia, Nokia Shanghai Bell | Continue to discuss in 2nd Round | Title may need to be updated to remove “Draft” if agreeable in 2nd round |
| R4-2113046 | TP on overlapping UE channel bandwidths | Huawei, HiSilicon | To be revised | See Section 3.4.2 |
| R4-2113949 | TP to TR 38.844: Section 6.2 Overlapping UE Channel BWs | Ericsson | To be revised | See Section 3.4.2 |
| R4-2113950 | TP to TR 38.844: Section 6.5 RAN1 and RAN2 Impacts | Ericsson | To be noted. | See Section 3.4.2 |
| R4-2114367 | On the use of overlapping channel bandwidths from UE perspective | Nokia, Nokia Shanghai Bell | Return to | See Section 3.4.2 |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents

# Annex

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|  |  |  |
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Note:

1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)