**3GPP TSG-RAN WG4 Meeting #** **97-e R4-2016966**

**Electronic Meeting, November 2nd – 13th, 2020**

**Agenda item:** 10.17

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [97e][124] NR\_bands\_R17\_BWs

**Document for:** Information

# Introduction

A new basket WI was agreed in last RAN#88e meeting to manage all requests related to adding new channel BW in existing NR bands.

This agenda item will handle all contributions related to this WI:

* Endorsement of the updated WI including the new requests submitted for this meeting.
* Agreement on the big CRs collecting all draft CRs from previous RAN4#96-e meeting.
* Initiate discussion and make early agreements on:
  + Adding 40 MHz CBW to n80.
  + Adding 40 MHz CBW to n83.
  + Adding 90 and 100MHz MHz CBW to n40.

# Topic #1: Rapporteur inputs

This topic is aiming endorsing the updated WI with new requests submitted for this meeting.

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2015910 | Ericsson | WID revision including new requests made for this meeting |

## Open issues summary

### Sub-topic 1-1

Sub-topic description: Adding 30 MHz (all SCS) to n48.

**Issue 1-1: 30 MHz (all SCS) should be added to in n48.**

* Proposals:
  + Option 1: Agree
  + Option 2: Not agree
* Recommended WF
  + Agree with this proposal.

### Sub-topic 1-2

Sub-topic description: The WID has been updated with the status of the previous request and the new requests submitted for this meeting, it should be endorsed by RAN4 according to the agreed way of working. Two similar requests (30MHz for band n2) were received, it’s proposed to merge them and approve the request.

**Issue 1-2: 25, 30 and 40 MHz (all SCS) should be added to in n2.**

* Proposals: Approve this request. Remove Huawei’s proposal on adding 30MHz CBW in band n2, adding Telefonica and Huawei as supporting companies to the AT&T’s request.
  + Option 1: Agree
  + Option 2: Not agree
* Recommended WF
  + Agree with this proposal, the WID would then be revised accordingly.

### Sub-topic 1-3

Sub-topic description: Adding 25 MHz (all SCS) to n5..

**Issue 1-3: 25 MHz (all SCS) should be added to in n5.**

* Proposals:
  + Option 1: Agree
  + Option 2: Not agree
* Recommended WF
  + Agree with this proposal.

### Sub-topic 1-4

Sub-topic description: The proposed big CRs are merging all draft CRs endorsed in last RAN4#96-e meeting. They are proposed for agreement in this meeting. Note that if new draft CRs will be endorsed during this meeting, those draft CRs will be added to those big CRs and proposed for email approval.

**Issue 1-4: Big CRs to TS 38.104 and TS 38.101-1**

* Recommended WF
  + Provide any comment to the CRs to TR here after and/or mention if they are agreeable.

If agreeable, they would:

* + - Either be agreed after the 2nd round if no draft CRs are endorsed.
    - Or revised to add the endorsed draft CRs. An email approval for those revised big CRs would then be organized after the RAN#97-e meeting.

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Sub topic 1-1: Agree to add 30MHz to n48. We already have 20M and 40M and 30, 35M NRCA.  Sub topic 1-2: Agree to add 25M, 30M, 40M to n2 like n25.  Sub topic 1-3: Agree, but requirements need to be defined due to REFSENS and relative channel BW is equal to 3%. Discuss optional support for earlier release and restriction of UL BW for certain LB-LB band combinations.  Others: |
| Skyworks | Sub topic 1-3: Impact of 25MHz UL CBW on n5 REFSENS needs to be evaluated. |
| Nokia | Sub topic 1-1: Option 1  Sub topic 1-2: Option 1  Sub topic 1-3: Option 1 |
| Huawei | Sub topic 1-2: We are happy to comply with the recommendation. |
| Apple | Sub topic 1-3: Agree, However, this covers the whole band. For full UL allocation IMD3 is falling into the RX band, therefore MSD needs to be defined. The better solution would be not to specify 25MHz for the UL, only for the DL. |
| AT&T | Sub topic 1-2: Option 1, Agree. In the merge of the Huawei’s request, please also add Verizon to the list of supporting companies based on email request from Verizon.  Sub topic 1-3: Option 1, Agree. We are open to consider limitation in UL allocation but would like to confirm after evaluation of MSD, Please also add Verizon to the list of supporting companies based on email request from Verizon. |

### CRs/TPs comments collection

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015911 | *Big CR to TS 38.104 - New CBW Basket WI* |
| Company A |
| Company B |
| R4-2015912 | *Big CR to TS 38.101-1 - New CBW Basket WI* |
| Company A |
| Company B |

## Summary for 1st round

### Open issues

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| --- | --- |
|  | **Status summary** |
| **Sub-topics#1, 2 and 3** | Agreements: All requests are endorsed. The WID will be revised to merge the 2 requests adding 30 MHz in n2; Verizon will be added as supported company for the n2 and n5’s requests.  Note: For n5 and 25 MHz CBW, MSD shall be evaluated, limitation in the UL allocation might be considered.  Recommendations for 2nd round: Check revised WI. |
| **Sub-topics#4** | No comment received during the 1st round.  Recommendations for 2nd round: There are draft CRs endorsable during this meeting (R4-2015293, R4-2015294 and may be R4-2015295) those big CRs will be revised to add those draft CRs and submitted for email approval after RAN4 meeting. |
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*Recommendations on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | NA |  |

### CRs/TPs

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| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2015910 | To be revised |
| R4-2015911 | To be revised |
| R4-2015912 | To be revised |

## Discussion on 2nd round (if applicable)

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| Revision of R4-2015910 | *Basket WI (revision)* |
| Company A |
| Company B |
| R4-2015911 | *Big CR to TS 38.104 - New CBW Basket WI* |
| Company A |
| Company B |
| R4-2015912 | *Big CR to TS 38.101-1 - New CBW Basket WI* |
| Company A |
| Company B |

## Summary on 2nd round (if applicable)

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2016858  (Revision of R4-2015910) | No comment received during the 2nd round  To be endorsed |
| R4-2016859  (Revision of R4-2015911) | This big CR shall be updated to add the draft CRs endorsed during this meeting.  For email approval (1 week) |
| R4-2016860  (Revision of R4-2015912) | This big CR shall updated to add the draft CRs endorsed during this meeting.  For email approval (1 week) |

# Topic #2: Bands n80 (UE and BS) and n83 (BS only) - 40 MHz CBW

This topic is focusing on adding 40 MHz CBW support in bands n80 (UE and BS) and n83 (BS only).

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2015292 | Huawei | **Proposal: RAN4 agrees on the CRs proposed in this meeting in [2] [3] and [4] to add 40MHz for band n83 and n80, respectively.** |
| R4-2015293 | Huawei | DraftCR to TS 38.101-1 to add 40 MHz to band n80 |
| R4-2015294 | Huawei | DraftCR to TS 38.104 to add 40 MHz to band n80 |
| R4-2015295 | Huawei | DraftCR to TS 38.104 to add 40 MHz to band n83 |

## Open issues summary

### Sub-topic 3-1

It looks like no issue has been identified, draftCRs have been submitted.

**Issue 3-1: None has been identified.**

* Proposals
  + If any company disagrees with the proposed changes, please comment.
* Recommended WF
  + Focus on endorsing the draft CRs.

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| Skyworks | R4-2015292. Please note that this does not imply the 40MHz Uplink CBW is supported by the UE. In bands n28 and n83, the maximum supported UE UL CBW is 30MHz with restrictions on uplink channels. |
| Huawei | We confirm that UE UL CBW 40MHz is not introduced. |

### CRs/TPs comments collection

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2015293 | *DraftCR to TS 38.101-1 to add 40 MHz to band n80* |
| Company A |
| Company B |
| R4-2015294 | *DraftCR to TS 38.104 to add 40 MHz to band n80* |
| Company A |
| Company B |
| R4-2015295 | *DraftCR to TS 38.104 to add 40 MHz to band n83* |
| Skyworks: Same comment as for R4-2015292. In bands n28 and n83, the maximum supported UE UL CBW is 30MHz with restrictions on uplink channels.  Question for clarification: why are the n83 CBW not aligned with n28 from a 38.104-1 perspective? |
| Huawei: we confirm that UE UL only supports 30MHz at maximum for both n83 and n28. Could Skyworks indicate in which way are those not aligned for 38.104? |

## Summary for 1st round

### Open issues

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | Tentative agreements: UE UL only supports 30MHz CBW max. with restrictions in band n83  Candidate options: NA  Recommendations for 2nd round: Some clarifications are still needed on n83-n28 alignment. To be clarified during the 2nd round. The draft CR might be revised if needed during the 2nd round. |

*Suggestion on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | NA |  |

### CRs/TPs

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2015293 | To be endorsed |
| R4-2015294 | To be endorsed |

## Discussion on 2nd round (if applicable)

Skyworks commented: why are the n83 CBW not aligned with n28 from a 38.104-1 perspective?

Huawei wanted to get some clarification on this comment: Could Skyworks indicate in which way are those not aligned for 38.104?

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| **Company** | **Comments** |
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| R4-2015295 | *DraftCR to TS 38.104 to add 40 MHz to band n83* |
| [Skyworks] To Huawei:  We observed that 30MHz CBW is specified for band n28 and not for band n83. Is there any reason for this mis-alignment? See below the n83 channel bandwidth extracted from table 5.3.5-1. |
| [Skyworks] Our question has been resolved off-line. We are fine with this CR.  Huawei: thanks Skyworks. we can go with the original version of this CR. |

## Summary on 2nd round (if applicable)

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| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2015295 | Content was clarified during the 2nd round, no more concern with this draft CR  To be endorsed |

# Topic #3: Band n40 – 90 and 100 MHz CBW

This topic is focusing on adding 90 and 100 MHz CBW support in band n40.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2014593 | Skyworks | **Proposal: The need for 100MHz UL BW in n40 is further evaluated in relation to potential interference to the whole 2.4 GHz ISM band. If still adopted, MPR may be ignored.** |
| R4-2015296 | Huawei | **Proposal 1: Specify 1dB deltaMPR for 100MHz UE channel bandwidth for n40.**  **Proposal 2: Use values of REFSENS and RB allocation in the below table as the baseline when specifying requirements for 90 and 100MHz UE channel bandwidth for band n40.**   |  |  |  |  | | --- | --- | --- | --- | | **Bandwidth** | **SCS** | **REFSENS Value (dBm)** | **RB allocation** | | 90MHz | 30KHz | -87.1 | 243 | | 60KHz | -87.1 | 120 | | 100MHz | 30KHz | -84.7 | 270 | | 60KHz | -84.7 | 135 | |
| R4-2015297 | Huawei | draftCR to 38101-1 to add 90 and 100MHz BW for band n40 |
| R4-2015298 | Huawei | draftCR to 38104 to add 90MHz BW for band n40 |

## Open issues summary

### Sub-topic 3-1

Sub-topic description: It’s questionable if 100MHz UL CBW would be a relevant channel BW as it might impact the adjacent 2.4 GHz ISM band.

**Issue 3-1: Is 100MHz UL BW in n40 really needed considering potential interference to the whole 2.4 GHz ISM band.**

* Proposals
  + Option 1: Yes, it’s confirmed.
  + Option 2: No, better not specify this channel BW.
* Recommended WF
  + Share your view.

### Sub-topic 3-2

Sub-topic description: UE delatMPR.

**Issue 3-2: UE deltaPMR for 100MHz CBW.**

* Proposals:
  + Option 1: 1dB. (Huawei)
  + Option 2: Not needed.(Skyworks)
* Recommended WF

### Sub-topic 3-3

Sub-topic description: UE REFSENS limits and RB allocation.

**Issue 3-3:UE REFSENS.**

* Proposals
  + Option 1: Specify following REFSENS limits and corresponding RB allocation:

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| --- | --- | --- | --- |
| **Bandwidth** | **SCS** | **REFSENS Value (dBm)** | **RB allocation** |
| 90MHz | 30KHz | -87.1 | 243 |
| 60KHz | -87.1 | 120 |
| 100MHz | 30KHz | -84.7 | 270 |
| 60KHz | -84.7 | 135 |

* Recommended WF
  + Please confirm or comment if you have another proposal.

## Companies views’ collection for 1st round

### Open issues

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| --- | --- |
| **Company** | **Comments** |
| Qualcomm | Issue 3-1:. Possible to consider TX power reduction for edge allocated resources for coexistence due to any potential filter mitigation or UE coexistence management.  Issue 3-2: Need more time to investigate delta MPR effect, especially for PC2.  Issue 3-3: REFSENS is scalable with BW, so we can agree here  Other: |
| Skyworks | Issue 3-1: In our view, supporting 100MHz and 90MHz for n40 may create in device coexistence issues with WiFi/Bluetooth. Interference issues and possible mitigation techniques need to be further discussed and evaluated.  Issue 3-2: Contrary to work done for n28, delta MPR may not be needed since  1) n40 filters provide sharp rejection,  2) impact of Tx noise on REFSENS is not an issue.  Issue 3-3: Question for clarification on REFSENS derivation.  We observe a constant 2dB offset between n41 levels and n40 for channel BW up to 80MHz. This 2dB offset is proposed for 90MHz operation, but not for 100MHz, ie REFSENS scales with BW up to 90MHz but not at 100MHz. What is the rationale for this proposal? If 100MHz REFSENS is degraded due to sharp n40 filter roll-off, we also expect a significant impact on 90MHz REFSENS. We would like some clarifications on this proposal.  Other: |
| Huawei | Issue 3-1: There are explicit ways of solving the coexistence problem with 2.4GHz systems. Besides we are not sure if indevice coexistence studies with other techs are part of 3GPP scope. We think it is UE implementation perspective.  Issue 3-2: According to our measurements involving variety of modules, 1dB deltaMPR is still needed. To be safe let’s not create requirements beyond existing rules.  Issue 3-3: to respond to Skyworks, sorry for the mistake. The numbers should be -86.7dB instead of -84.7dB. |
| Apple | Issue 3-1: Option 2. There is no way to provide RF protection between a 100MHz carrier on n40 and WiFi/Bluetooth. If WiFi/Bluetooth transmits, the 100MHz n40 carrier RX fails and the other way round. This is different from other coexistence discussions with other systems, where better filters can help. In this case there are no filters that can help, therefore we should consider this and not specify this bandwidth. Otherwise blanking of one or the other system is needed to prevent both from simultaneous RX/TX which can degrade performance for tethering applications. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| R4-2015297 | *draftCR to 38101-1 to add 90 and 100MHz BW for band n40* |
| Skyworks: We would like to further discuss the technical aspects of issues 3-1, 3-2, 3-3 before discussing this CR. |
| Huawei: This one needs revision number. |
| Apple: We would also like not to add 90 and 100MHz and to check the issues in 3-1 first. |
|  | Qualcomm: Agree with SWKS and AAPL. Need to discuss/agree on technical aspects before adding into CR. |
| R4-2015298 | *draftCR to 38104 to add 90MHz BW for band n40* |
| Company A |
| Company B |

## Summary for 1st round

### Open issues

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|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:* Opposite view on the feasibility to support 100MHz CBW in band n40. This shall be further discussed in the 2nd round  *Recommendations for 2nd round*: Confirm or not if 100MHz CBW can be supported in band n40. |
| **Sub-topic#2** | *Tentative agreements:* Opposite view on the need for delta MPR or not. This shall be further discussed in the 2nd round  *Recommendations for 2nd round:* Confirm if 1dB delta MPR is needed or not. |
| **Sub-topic#3** | *Tentative agreements:* REFSENS values for 100MHz CBW: -86.7 dB  *Recommendations for 2nd round:* Revised corresponding draft CR in case an agreement could be reached on the other topics as well. |

*Suggestion on WF/LS assignment*

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| --- | --- | --- |
|  | **WF/LS t-doc Title** | **Assigned Company,**  **WF or LS lead** |
| #1 | NA |  |

### CRs/TPs

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| R4-2015297 | To be revised |

## Discussion on 2nd round (if applicable)

Topics to be discussed:

Issue 3-1: Feasibility of 100MHz CBW

Issue 3-2: Need for 1dB deltaMPR or not

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| **Company** | **Comments** |
| OPPO | Issue 3-1: Option 2.  We share the same view with Apple. The coexistence issue cannot be addressed with hardware modifications (adding filters) due to spectrum overlap. This may lead to significant sensitivity degradation for both n40 and WIFI/BT |
| Qualcomm | Issue 3-1:  100MHz poses an issue with n40 – n41 coexistence if the operator’s networks are unsynchronized. The -13dBm/MHz general SEM mask overlaps n41. The availability of filtering is most likely not enough. So, a combination of UL resource restriction and spurious limit relaxation would be required. This is another reason for not rushing 90MHz and 100MHz into the CR.  Issue 3-2  Measurements required to determine if 1dB or XdB MPR delta is required. |
| Skyworks | Issue 3-1:  There is only a 96MHz gap between n40 and n41 (using US band definition) if the channel BW is 100MHz, the other band in in the ACLR2 region. So PA noise level must be evaluated. MPR related to SEM only guaranties that -25dBm/MHz is met in the other band, so it can be estimated that noise level may be as high as -85dBm/Hz in the first 5MHz of ACLR2 range, and then -90dBm/Hz beyond. |
| Huawei | Thanks very much for all the comments.  We are ok to postpone the UE CR and come back in the next meeting. Meanwhile we believe thorough discussions are needed with further understanding of all the comments. For the time being we can at least agree on the REFSENS as proposed by the moderator.  For the BS CR we don’t receive any comment in both rounds, as I understand introducing 90MHz into BS spec for n40 is agreeable. Thus we recommend R4-2015298 is endorsed, in the sense that it is still part of the request from operators. |
| Apple | Similar to the issues described above by Skyworks, Qualcomm, Oppo and our comments in the first round, we still think we should not specify 90 or 100MHz CBW as there are too many technical issues to practically use the full band in a single carrier in a UE. |

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| **CR/TP number** | **CRs/TPs Status update recommendation** |
| Revision of R4-2015297 |  |

## Summary on 2nd round (if applicable)

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| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| R4-2016861  (Revision of R4-2015297) | There are still strong concerns on specifying 90 and 100MHz CBW in band n40 for UE.  This should be further discussed in next meeting  To be postponed |
| R4-2015298 | As there was no comment on BS draft CR, Huawei would like to have this draft endorsed.  Actually, according to the WID, the request is to add 90 and 100 MHz for UE (the request’s justification in the WID is even wrong as 90MHz CBW is not supported by BS…). This draft CR wouldn’t even have been proposed in the context of this request. A separate request should be made to add 90 MHz CBW in band n40 for BS.  To be Noted. |