**3GPP TSG-RAN WG4 Meeting # 97-e R4-20XXXXX**

**Electronic Meeting, 2 - 13 November 2020**

**Agenda item:** 7.1.1 & 7.1.3

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [97e][106] NR\_unlic\_SysParameters

**Document for:** Information

# Introduction

This document summarizes the email discussion on topics related to NR-U system parameters in AIs 7.1.1 and 7.1.3.

Based on the contributions, following main topics are discussed in this thread:

* Spectrum Utilization and Channelization
* Wideband Operation
* NR-U CA BW Classes

Proposals 1&2 from R4-2015372 are also considered in this thread.

# Topic #1: Spectrum Utilization

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **R4-2014496** | Skyworks Solutions, Inc. | **Proposal: Brackets can be removed from 38.101-1 Table 5.4.2.3-3 values.** |
| **R4-2015372** | Nokia | ***Proposal 1: It is proposed to removed brackets for NR-ARFCN for band n96 in*** ***table 5.4.2.3-1 in Note 2 in TS 38.104 (BS core spec)***  ***Proposal 2: It is proposed to removed brackets for GSCN for band n96 in Note 6 in table 5.4.3.3-1 of TS 38.104.*** |
| **R4-2015694** | Huawei, HiSilicon | ***Proposal 1: It is proposed to revise channel raster, GSCN and transmission bandwidth configuration as proposed in section 2.*** |
| **R4-2014887** | Apple Inc. | **Proposal: For 60kHz SCS, adopt alternative 1 for intra-carrier guard bands (i.e. 5 RBs for in-carrier guard band with 23-5-23 pattern).** |

## 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 1-1

*Sub-topic description:*

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

**Issue 1-1:** NR-ARFCN for band n96

* Proposals
  + Option 1: Remove Brackets from 38.101-1 Table 5.4.2.3-3 and TS 38.104 Table 5.4.2.3-1 in Note 2 values (Nokia, Skyworks)
  + Option 2: One 60MHz channel with Fc=7095MHz (NREF=873000) is missing. Revise 38.101-1 Table 5.4.2.3-3 and TS 38.104 Table 5.4.2.3-1 in Note 2 by adding NREF=873000 (Huawei)
* Recommended WF
  + Collect companies’ views in the 1st round discussions

### Sub-topic 1-2

*Sub-topic description*

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

**Issue 1-2:** GSCN for band n96

* Proposals
  + Option 1: Removed brackets for GSCN for band n96 in Note 6 in table 5.4.3.3-1 of TS 38.104(Nokia)
  + Option 2: Revise GSCN for band n96 in Note 4 in table 5.4.3.3-1 of TS 38.101-1 and Note 6 in table 5.4.3.3-1 of TS 38.104 as below: [Huawei]

GSCN = [9548, 9562, 9575, 9589, 9603, 9617, 9631, 9645, 9659, 9673, 9687, 9700, 9714, 9728, 9742, 9756, 9770, 9784, 9798, 9812, 9826, 9840, 9853, 9867, 9881, 9895, 9909, 9923, 9937, 9950, 9964, 9978, 9992, 10006, 10020, 10034, 10048, 10062, 10075, 10089, 10103, 10117, 10131, 10145, 10159, 10173, 10187, 10200, 10214, 10228, 10242, 10256, 10270, 10284, 10298, 10312, 10325, 10339, 10353]

* Recommended WF
  + Collect companies’ views in the 1st round discussions

### Sub-topic 1-3

*Sub-topic description*

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

**Issue 1-3:** Revise Table 5.3.2-1: Transmission bandwidth configuration NRB for FR1in 38.101-1 as follows (text in blue is added):

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| SCS (kHz) | 5  MHz | 10  MHz | 15  MHz | 20 MHz | 25 MHz | 30  MHz | 40 MHz | 50 MHz | 60 MHz | 70  MHz | 80 MHz | 90  MHz | 100 MHz |
| NRB | NRB | NRB | NRB | NRB | NRB | NRB | NRB | NRB | NRB | NRB | NRB | NRB |
| 15 | 25 | 52 | 79 | 106 | 133 | 160 | 216 | 270 | N/A | N/A | N/A | N/A | N/A |
| 30 | 11 | 24 | 38 | 51 | 65 | 78 | 106 | 133 | 162 | 189 | 217 | 245 | 273 |
| 60 | N/A | 11 | 18 | 24  251 | 31 | 38 | 51 | 65 | 79 | 93 | 107 | 121 | 135 |
| Note 1 It is only applied for Band n46 and n96. | | | | | | | | | | | | | |

* Proposals
  + Option 1: Agreeable
  + Option 2: Not Agreeable
* Recommended WF
  + Collect companies’ views in the 1st round discussions

### Sub-topic 1-4

*Sub-topic description*

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

**Issue 1-4:** For 60kHz SCS, adopt alternative 1 for intra-carrier guard bands (i.e. 5 RBs for in-carrier guard band with 23-5-23 pattern). (Apple)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **SCS** | **20MHz Channels** | **40MHz Channels** | | **60MHz Channels** | | **80MHz Channels** | |
| 15KHz | 106 | 105-6-105 | Max. 216 | N/A | | N/A | |
| 30KHz | 51 | 50-6-50 | Max. 106 | 50-6-50-6-50 | Max. 162 | 50-6-50-5-50-6-50 | Max. 217 |
| Alt. 1 60KHz | 24 | [23-5-23] | Max. 51 | [23-5-23-5-23] | Max. 79 | [23-5-23-5-23-5-23] | Max. 107 |
| Alt. 2 60KHz | [25] | [24-3-24] | Max. 51 | [24-3-25-3-24] | Max. 79 | [24-4-24-3-24-4-24] | Max. 107 |

* Proposals
  + Option 1: Agreeable
  + Option 2: Not Agreeable
* Recommended WF
  + Collect companies’ views in the 1st round discussions

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Issue 1-1: We support option 1. For option 2 it might not be possible to introduce additional 60 MHz channel as this would not be contained within an 80MHz channel.  Issue 1-2: We propose option 1 to remove the brackets. For option 2 we can not agree as this would violate the RAN1 design as CORESET#0 is not possible to configure within the RB-set for e.g. 40, 60 and 80 MHz channels. |
| ZTE | Sub topic 1-1: no strong opinions on adding additional 60MHz at the upper edge of 6GHz band, however how to meet the FCC requirement -27dBm/MHz should be clarified.    Sub topic 1-2: our results are more aligned with option 2, for lots of GSCN, there are still some guardband between carrier GB and SSB ;  Sub topic 1-3: support the option 1 which is aligned with agreement [R4-1910537](file:///D:\\RAN4\\TSGRAN4_92\\Docs\\R4-1910537.zip).  Sub topic 1-4: support the |
| Qualcomm | Sub-topic 1-1: We are ok to add the 60 MHz channel at Fc=7095  Sub-topic 1-2: We are checking the new GSCN.  Sub-topic 1-3: Option 2, not agreeable  Sub-topic 1-4: Option 1, agreeable to Alt 1. |
| Charter Communications Inc. | Sub-topic 1-1: We agree with Nokia and Skyworks. GSCN for n96 should follow the wi-Fi channel bonding configuration for proper co-existence. Option 1  Sub-topic 1-2: We agree with option 1  Sub-topic 1-3: Not agreeable, option 2  Sub-topic 1-4: Agreeable to alt 1, option 1 |
| Skyworks | Issue 1-1: if the additional 60MHz channel proposed by Huawei is following channel bonding rules (it might be considered the case as there is no WiFi 80 MHz channel and it does not overlap partially with any WiFi 80 MHz channel) , we are OK to add it.  Issue 1-2: according to 1-1 above we are OK with option 2 if according to channel bonding rules AND remove brackets |
| Huawei | Issue 1-3 and Issue 1-4: these issues have been discussed for several meetings without progress. As a compromise, we propose 25 RB for single carrier and 5 RB for in-carrier guard band, is it agreeable? |
| CableLabs | Sub-topic 1-1: We agree that NR-U channel should follow the Wi-Fi channel bonding configuration for proper co-existence. It looks like the last 80 MHz Wi-Fi channel in U-NII-8 band ranges 6985-7065 MHz, and the rest of spectrum from 7065-7125 could be utilized by a 60 MHz channel. We agree with option 2.  IEEE 802.11ax group released a IEEE P802.11ax™/D8.0 version in October which is newer than the D6.1 version used in Nokia’s contribution R4-2014496, where Table E-4 (on page 805) defined a 20 MHz channel starting from 5925 MHz. This conflicts with Observation 1. We should consider adding this 20 MHz channel from 5925-5945 MHz to NR-U band n96.    Sub-topic 1-2: we are checking the GSCN.  Sub-topic 1-3: option 2: Not Agreeable. We expressed our concern about coexistence issues introduced by 25 PRBs in the August meeting.  Sub-topic 1-4: we support option 1 and alternative 1. |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## 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#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

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

### CRs/TPs

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

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: Wideband Operation

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **R4-2014621** | *MediaTek inc.* | Proposal 1: UL wide-band transmission mode 1 assumes that LBT is successful in all LBT sub-bands of BWP, irrespective of which sub-bands are scheduled with data.  Proposal 2: For UL WB operation, only Mode 1 is introduced as a basic feature, while Mode 2A and 2B should be removed according to Section 4.2.1.0.4 of TS 37.213.  Proposal 3: For DL WB operation, Mode 1 is introduced as a basic feature, while Mode 2 and 3 are introduced as optional features. |
| **R4-2014888** | *Apple Inc.* | Proposal 1a: DL wide-band mode 1 can be construed as the baseline NR-U functionality.  Proposal 1b: DL wide-band mode 2 and 3 must be differentiated from mode 1.  Proposal 1c: Discuss further whether DL mode 2 and 3 should have separate capabilities or they can be covered by the same "mode 2/3" capability.  Proposal 1c: DL wide-band mode 1 UE performance requirements apply only if sub-bands of the configured channel contain serving gNB transmission.  Proposal 2a: A UE should perform LBT only for those sub-bands where data is scheduled.  Proposal 2b: If Proposal 2a is agreeable, then UL wide-band mode 1 is not needed as the UE behaviour will always correspond to UL mode 2A/2B.  Proposal 2c: It is preferable to have differentiation between 2A and 2B accounting for different UE LBT capabilities.  Proposal 3: Add the corresponding NR-U capabilities into the RAN WG4 feature list and inform other WGs about it. |
| **R4-2015251** | Nokia, Nokia Shanghai Bell | Proposal 1: Agree that there is no difference in UE capability between DL Cases 2a/2b/3 and DL Case 4.  Proposal 2: No UE capabilities are needed for DL wideband operation.  Observation 1: RAN2 did not reserve any bits for non-agreed UE capabilities based on the RAN1 request.  Proposal 3: Further discus UE capabilities for UL wideband operation. |
| **R4-2016438** | Qualcomm Incorporated | Proposal: From a RAN4 perspective, none of the feature groups is needed for Rel-16 since requirements are not available or the feature group is already part of the baseline assumption that all UE’s are expected to support. |
| **R4-2015972** | Ericsson | CR to TS 38.101-1 on Correction to the intra-cell guard band definition for wideband operation  38.101-1 v16.5.0 CR-0550 Cat: F (Rel-16)  The 38.101-1 defines ‘wideband operation’ as  Wideband operation: For a UE that supports shared spectrum channel access, wideband operation refers to operation within a channel larger than 20 MHz in which intra-cell guard bands may be configured to distinguish individual RB-sets  hence not including operations with the 10 MHz and 20 MHz channel bandwidths. However, it is not obvious from sub-clause 5.3.3 that that there are no intra-cell GB for these bandwidths; the 20 MHz channel bandwidth is nevertheless included in Table 5.3.3-2 defining the nominal GB for wideband operations.  Since 38.331 refers to 38.101-1 for the guard-band sizes when the above IEs are absent, the intra-cell GB configuration must be clearly defined for all channel bandwidths. |

## 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:* NR-U UL Wideband operation

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

**Issue 2-1-1:** UL Wideband operation

* Proposals
  + Option 1: wide-band transmission mode 1 assumes that LBT is successful in all LBT sub-bands of BWP, irrespective of which sub-bands are scheduled with data. (MediaTek)
  + Option 2: A UE should perform LBT only for those sub-bands where data is scheduled. Then UL wide-band mode 1 is not needed as the UE behaviour will always correspond to UL mode 2A/2B (Apple)
* Recommended WF
  + Collect companies’ views in the 1st round discussions

**Issue 2-1-2:** UE capabilities for UL wideband operation.

* Proposals
  + Option 1: For UL WB operation, only Mode 1 is introduced as a basic feature, while Mode 2A and 2B should be removed according to Section 4.2.1.0.4 of TS 37.213. (MediaTek)
  + Option 2: If Option 2 of Issue 2-1-1 is adopted, it is preferable to have differentiation between 2A and 2B accounting for different UE LBT capabilities. (Apple)
  + Option 3: From a RAN4 perspective, none of the feature groups is needed for Rel-16 since requirements are not available or the feature group is already part of the baseline assumption that all UE’s are expected to support. (Qualcomm)
* Recommended WF
  + Collect companies’ views in the 1st round discussions

### Sub-topic 2-2

*Sub-topic description:* NR-U DL wideband operation

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

**Issue 2-2-1:** DL wide-band mode 1 UE performance requirements apply only if sub-bands of the configured channel contain serving gNB transmission.

* Proposals
  + Option 1: Agreeable
  + Option 2: Not agreeable
* Recommended WF
  + Collect companies’ views in the 1st round discussions

**Issue 2-2-2:** UE capabilities for DL wideband operation.

* Proposals
  + Option 1: There is no difference in UE capability between DL Cases 2a/2b/3 and DL Case 4. No UE capabilities are needed for DL wideband operation.(Nokia)
  + Option 2: From a RAN4 perspective, none of the feature groups is needed for Rel-16 since requirements are not available or the feature group is already part of the baseline assumption that all UE’s are expected to support. (Qualcomm)
  + Option 3: (Apple, MediaTek)
    - Proposal 1a: DL wide-band mode 1 can be construed as the baseline NR-U functionality.
    - Proposal 1b: DL wide-band mode 2 and 3 must be differentiated from mode 1.
    - Proposal 1c: Discuss further whether DL mode 2 and 3 should have separate capabilities or they can be covered by the same "mode 2/3" capability or they can be optional capabilities
* Recommended WF
  + Collect companies’ views in the 1st round discussions

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| MTK | **Issue 2-1-1:**  Although we proposed Option 1, we are also fine with the 1st sentence of Option 2.  Regarding the 2nd sentence in Option 2, we think we share the same argument with Apple, but different in conclusion. We suggest to keep Mode 1 only and delete Modes 2A and 2B which are essentially Mode 1 according current RAN1 spec (Section 4.2.1.0.4 of TS 37.213).  **Issue 2-1-2:**  Support Option 1.  According to Section 4.2.1.0.4 of TS 37.213, UE will not transmit anything if any of the LBT subband overlapped with the UL signal has LBT failure. In that case, Mode 2A/2B is essentially Mode 1.  **Issue 2-1-3:**  Support Option 2.  We believe the intention of the original proposal should be “DL wide-band mode 1 UE performance requirements apply only if all sub-bands of the configured channel contain serving gNB transmission.” However, it is up to network. Rel-15 NR already allows network to schedule PDSCH on only partial PRBs in a carrier. It would be strange to limit network behavior in Rel-16.  **Issue 2-2-2:**  Support Option 3  Although we agreed that Mode 1/2/3 are the same from RF perspective, they still have large difference in baseband complexity in terms of the hypotheses UE needs to handle for PDCCH blind detection. |
| Qualcomm | Issue 2-1-1: We think that UL LBT is only performed on those sub-bands for which the UE is scheduled for transmission. In that sense, we don’t see the value in having a capability for Mode 1 but we’re open for discussion. In our understanding, mode 2B is the baseline mode but we don’t see the need to have a capability for it.  Issue 2-1-2: We don’t see the value of signaling capability for any of mode 1, 2A, or 2B.  Issue 2-2-1: The proposal might be too restrictive. Agree that specifications for jammers inside of the channel are not available, but to say that only serving gNB transmission suggests that even if the sub-bands were unoccupied, the requirements would not apply.  Issue 2-2-2: We agree that DL mode 1 is supported by the RAN4 specs, but mode 2 and 3 do not have requirements. However, we don’t necessarily agree that there needs to be capability signaling for mode 2 and 3 separate from mode 1, especially at this time. The capability can preferably be decided as a package with the requirements for mode 2 and 3 when available. |
| Nokia | **Issue 2-1-1:** We support option 2.  **Issue 2-1-2:** We support option 3 but could be fine with option 2 if only a capability for 2B is included. This to separate UEs capable of performing either single or multiple LBT for transmission in either single or multiple contiguous 20MHz LBT sub-bands.  **Issue 2-2-1:** We would like to understand from which contribution this comes from and/or at least which performance requirements are referred.  **Issue 2-2-2:** We firmly insists on option 1 as there are no RF differences. If, as some compagnies mention, other issues related to baseband exists this should have been discussed in RAN1 as they have the expertise to asses these matters. Therefore, we suggest that no UE capabilities are needed from a RF perspective.  Our understanding was that in RAN1, the only issues identified were AGC and RF filter adaptation. Hence, the request to have RAN4 further discuss the need for capacities in the RAN1 LS [R4-2009509].  When it comes to baseband issues, PDCCH blind detection is a RAN1 matter. However, we can add here that there is no difference between the wideband modes with respect to the PDCCH blind detection limits or monitoring. It is suggested that companies with concerns on this matter check with their RAN1 colleagues, there is already an FG 10-20 as well as FG 10-29 which already has its own capability bits and are optional. |
| Charter Communications, Inc. | **Issue 2-1-1:** We support option 2  **Issue 2-1-2:** We support Option 3  **Issue 2-2-1:** Agreeable, option 1  **Issue 2-2-2:** We agree in option 1 |
| Skyworks | Issue 2-1-1: we support option 2 which has been the main assumption for R16 UL work for WB operation |
| Huawei | Issue 2-1-1: Option 2  Issue 2-1-2: option 3, no UL capability is needed.  Issue 2-2-1: Option 2 not agreeable, in our understanding for Mode 1, BS will transmit all sub-bands although it may be allocated to different UEs  Issue 2-2-2: no additional capability is needed for DL case 2a/2b and DL case 3 and 4, except FG 4-1. |

### 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** |
| **R4-2015972** | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## 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#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

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

### 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** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #3: NR-U CA BW Classes

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **R4-2014889** | Apple Inc. | Proposal 1: Revise NR CA BW classes definition based on the changes shown in Table 2.1-3 to support NR-U intra-band contiguous CA.  Proposal 2: Merge NR-U CA configurations CA\_n46G, CA\_n46H, and CA\_n46I into CA\_n46M, n46N, and n46O respectively as shown in Table 2.2-2.  Proposal 3: Remove CA BW class “I” from NR-U DL CA Rx requirements for ACS, in-band blocking, and out-of-band blocking as it can be covered by CA BW class “O”. |
| **R4-2015973** | Ericsson | CR to TS 38.101-1 on Correction to CA bandwidth classes M, N and O  38.101-1 v16.5.0 CR-0551 Cat: F (Rel-16)  The aggregated bandwidth of CA BW classes M, N and O should support bandwidth combinations down to 10 + 2\*20 MHz, 3\*20 MHz and 4\*20 MHz, respectively. This is not allowed by the strict inequalities in the lower limits for M and N.  The upper limits of the aggregated bandwidths are within square brackets, the tentative limits based on \*60 MHz. Aggregation of up to four carriers with 80 MHz and 100 MHz channel bandwidths is covered by the respective classes B, C, D and E. To that end, the square brackets for M and N can be removed. For 5 CC a new (general) CA BW class applicable for all relevant bands can be defined when needed.  Use of BCS is likely regardless of the value of the upper limit. |
| **R4-2014954** | ZTE Corporation | The notation of NR-U CA BW class is still unclear and need further clarifications.  Observation 1: The fallback group for NR CA bandwidth class “D” and “E” in the current specification does not match the agreement captured in [4].  Proposal 1: Keep the description of FBG 3 for NR CA bandwidth classes D and E unchanged in the current specification as it is.  Proposal 2: It is reasonable for classes M and N to capture sign “=” in the lower limits of aggregated channel bandwidth 50MHz and 80MHz respectively.  Proposal 3: It is suggested not to use notation N for NR CA BW class in FR1. |
| **R4-2014955** | ZTE Corporation | CR to TS 38.101-1 on NR CA bandwidth classes for unlicensed spectrum (Rel-16)  38.101-1 v16.5.0 CR-0522 Cat: F (Rel-16) |

## 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:*

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

**Issue 3-1:** Keep the description of FBG 3 for NR CA bandwidth classes D and E unchanged in the current specification as it is. (ZTE)

* Proposals
  + Option 1: Agreeable
  + Option 2: Not agreeable
* Recommended WF
  + Collect companies’ views in the 1st round discussions

### Sub-topic 3-2

*Sub-topic description*

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

**Issue 3-2:** Revise NR CA BW classes definition based on the following changes:

1. Define the aggregated channel BW upper limits for classes M, N, and O as below: (Apple)

|  |  |  |
| --- | --- | --- |
| BW Class | Aggregated BW | No. of CC |
| M | 50 MHz ≤ BWChannel\_CA ≤ 200 MHz | 3 |
| N | 80 MHz ≤ BWChannel\_CA ≤ 300 MHz | 4 |
| O | 100 MHz ≤ BWChannel\_CA ≤ 400 MHz | 5 |

Also the aggregated channel BW lower limits of classes M, N and O in current specifications should have the “=” sign (ZTE, Apple)

* Proposals
  + Option 1: Agreeable
  + Option 2: Not agreeable
* Recommended WF
  + Collect companies’ views in the 1st round discussions

### Sub-topic 3-3

*Sub-topic description:*

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

**Issue 3-3:** Proposal 2: Merge NR-U CA configurations CA\_n46G, CA\_n46H, and CA\_n46I into CA\_n46M, n46N, and n46O respectively as shown in Table 2.2-2 in R4-2014889 (Apple)

* Proposals
  + Option 1: Agreeable
  + Option 2: Not agreeable
* Recommended WF
  + Collect companies’ views in the 1st round discussions

### Sub-topic 3-4

*Sub-topic description:*

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

**Issue 3-4:** Remove CA BW class “I” from NR-U DL CA Rx requirements for ACS, in-band blocking, and out-of-band blocking as it can be covered by CA BW class “O”. (Apple)

* Proposals
  + Option 1: Agreeable
  + Option 2: Not agreeable
* Recommended WF
  + Collect companies’ views in the 1st round discussions

### Sub-topic 3-5

*Sub-topic description:*

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

**Issue 3-5:** It is suggested not to use notation N for NR CA BW class in FR1 since NR band number begins with the letter “n”, CA BW class “N” is absent in FR2 to avoid unnecessary confusion. (ZTE)

* Proposals
  + Option 1: Agreeable
  + Option 2: Not agreeable
* Recommended WF
  + Collect companies’ views in the 1st round discussions

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Issue 3-2: Support Option 1, since BW Class O proposed aggregated BW is up to 400MHz, would BW Class M/N need to have aggregated BW up to 240/320MHz?  Issue 3-3: Option 1 |
| ZTE | Sub topic 3-1: Option-1.  Although the agreement of fallback groups for BW classes C, D and E in RP-202117 are different from the current spec, it seems that the fallback groups for BW classes C, D and E in current spec having the fallback groups “1, 3” are reasonable. In Apple’s contribution R4-2014889, it also suggests the fallback groups for classes D and E are “1, 3”, which is the same as the current spec. However, we can merge the fallback groups for classes C, D and E in one row with the value of “1, 3”.  Sub topic 3-2:  We suggest the aggregated channel BW lower limits of classes M and N in current spec should use the sign of “≤” similar to class O, since the aggregated CH BW 10 + 2\*20 MHz and 3\*20 MHz should also be supported for classes M and N.  As for the upper limits of classes M, N and O, it’s better to keep the current aggrement of using \*60MHz. The aggregation of carriers with 80MHz and 100MHz CH BW can be covered by the current classes C, D and E.  Sub topic 3-3: Option 1  Classes G, H and I can be merged into classes M, N and O for CA\_n46. The detail configurations of CA\_n46M, n46N, and n46O can be further discussed after the definition of FBG 3 is fixed in topic 3-2.  Sub topic 3-4: Option 1  It depends on how to deal with the NR CA BW classes G, H and I in FBG 2.  Sub topic 3-5: Option 1  For the notation of newly introduced CA BW class “N”, considering that NR band number begins with the letter “n”, and also to be consistent with current FR2 spec in which CA BW class “N” is absent, in order to avoid unnecessary confusion, it is suggested to not use CA BW class “N” in FR1. |
| Qualcomm | Issue 3-1: Agreeable  Issue 3-2: Agreeable  Issue 3-3: Agreeable  Issue 3-4: Agreeable  Issue 3-5: Prefer to keep BW class N as it doesn’t really seem to cause confusion and NR band designation, but open for discussion. |
| Charter Communications Inc | Issue 3-2: Agreeable, option 1  Issue 3-3: Agreeable, option 1  Issue 3-4: Agreeable, option 1 |
| Skyworks | Issue 3-2: Option 1 agreeable (note this may require change for the n46M/N/O channel configurations it there are cases where the (NumberCC-1)\*100MHz can be used)  Issue 3-3: agreeable but may even extend the cases to wider aggregated channel BW if useful in n46 and there is potential operator request rather than defining another BCS later  Issue 3-4: agreeable |
| Huawei | Issue 3-1: Option 1  Issue 3-2: Option 1  Issue 3-3: Option 1  Issue 3-4: Option 1 |
| CableLabs | Issue 3-2: we support option 1: agreeable  Issue 3-3: we support option 1: agreeable |

### 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** |
| **R4-2014955** | Qualcomm: Need to resolve the above discussion points first before considering the CR. |
| Nokia: Discussions are still ongoing for multiple points. |
| Skyworks CR should be discussed later |
| **R4-2015973** | Qualcomm: Need to resolve the above discussion points first before considering the CR. |
| Nokia: Discussions are still ongoing for multiple points. |
| Skyworks CR should be discussed later |

## 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#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

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

### 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** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #4: Others

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

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| **R4-2016123** | ZTE Corporation | Proposal 1: further discuss how to apply the FCC requirements and AFC or non-AFC policy for the carriers across U-NII bands;  Observation: it is very challenging to achieve the required attenuation for lower edge and upper edge of 6GHz assuming -27dBm/MHz emission limit needed out of 6GHz band in FCC report.  Proposal 2: to achieve emission limit -27dBm/MHz required by FCC, either lower the BS output power or reserve more guard band or reserve guard band and put the fitter within the 6GHz band. |
| **R4-2016501** | Skyworks Solutions Inc. | Proposal: Companies views on NRU continuation work in 2021/Release 17 should be collected in order to enable small enhancement steps from Release 16 and devise a strategy for December plenary RAN#90e. |

## 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 4-1

*Sub-topic description:*

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

**Issue 4-1:** Based on FCC report, for different U-NII-bands, there are different EIRP limit and different usage policy from regulator e.g. AFC or non-AFC, therefore it is necessary for further discuss how to apply the requirements and AFC policy for those carries across the U-NII bands. (ZTE)

* Recommended WF
  + Collect companies’ views on how to apply the FCC requirements and AFC or non-AFC policy for the carriers across U-NII bands

### Sub-topic 4-2

*Sub-topic description:* It is very challenging to achieve the required attenuation for lower edge and upper edge of 6GHz assuming -27dBm/MHz emission limit needed out of 6GHz band in FCC report. (ZTE)

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

**Issue 4-2:** How to achieve emission limit -27dBm/MHz required by FCC?

* Proposals
  + Option 1: lower the BS output power
  + Option 2: reserve more guard band
  + Option 3: reserve guard band and put the fitter within the 6GHz band
  + Option 4: other proposals
* Recommended WF
  + Collect companies’ views

### Sub-topic 4-3

*Sub-topic description:*

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

**Issue 4-3:** Companies views on NRU continuation work in 2021/Release 17 should be collected in order to enable small enhancement steps from Release 16 and devise a strategy for December plenary RAN#90e.(Skywork)

* Recommended WF
  + Collect companies’ views on NRU continuation work in 2021/Release 17

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | Issue 4-1: As commented by the number of companies (including Nokia) in RAN4#96e, AFC (similar way as SAS for Band 48/n48) is out of the scope of 3GPP specifications. Since there are different EIRP limits, it can be clarified further in specification in which frequency blocks of n96 MR BS class is supported.  Issue 4-2: As commented for the draft summary we do think this discussion is more relevant in the BS thread. However, since still included here we would like to comment that how to achieve regulatory compliance is an implementation related issue and therefore should be at the descension of the induvial vendors. Notes on regional requirements for operation with shared spectrum channel access are already included in BS core specification 38.104 in subclause 4.5 for Tx requirements*.* |
| ZTE | Sub topic 4-1/2: seek to collect the views from system parameter session.  Sub topic 4-3: fine with bandcombination work for NR-U and 100MHz carrier bandwidth, however for PC3 UE, we need further discussion on that. |
| Qualcomm | Issue 4-1: Our understanding is that the AFC and higher EIRP allowances apply to standard power AP’s and their clients, but not to low power. We think that at least AFC is outside the scope of 3GPP specifications.  Issue 4-2: We assume that the proposals here pertain only to the basestation and only for SP since UE has already been covered by NS\_54 and LP should not be a problem. For SP AP, how to meet the emission requirement can be a matter of implementation. It is understood that some basestations may perform better than others because of various tradeoffs. For the basestations which are not able to meet emissions, they can lower power, avoid edge channels, etc., as needed by their own implementation. Spec changes should be minimal, if any.  Issue 4-3: Since the core technology for NR-U has been completed in Rel-16, we are supportive of the proposal to continue work on various aspects under baskets or other Rel-17 work items. We do not anticipate a RAN4-led Rel-17 dedicated work item on NR-U enhancements. |
| Charter Communications Inc. | Issue 4-1: We agree that AFC is outside the scope of 3GPP.  Issue 4-2: We believe is an implementation related issue and it should be left at the vendors option to meet the regulatory emission limits  Issue 4-3: We are supportive of the proposal to continue working NR-U to enable enhancements from Rel-16. Whether this work can be done as a dedicated work item on NR-U enhancements or under other Rel-17 work items is a subject that should get further discussion. We will like to understand the pro’s and con’s as a dedicated work item on NR-U enhancements or under other Rel -17 work items |
| Skyworks | Issue 4-2: from UE prospective we have A-MPR to be able to comply and we should not increase guard band by removing channels since those are useful in indoor deployment whether all channels are used for outdoor is an implementation choice on the network side. Actually we already have skipped some channels based on aligning with WiFi which is considering EU rail ITS in the first 10MHz of the band which is not required in the US. Any further guard band would make NRU worse in using the spectrum.  Issue 4-3: Skyworks understands that it is difficult to assess what can be done under the R17 scope. May be at least it would be good if we could agree within RAN4 that some items are moved to basket/generic WI:   * CA/DC Band combinations with n46/n96 moved to related baskets * 100MHz for n46/n96 moved to NR\_bands\_R17\_BWs WI   This will leave only UL CA and PC3 cases that could still be discussed for TEI under the TxDiv and FR1 enhencement WI. If Europe unlicensed band work starts we could also cover some of the aspects there. |
| Huawei | Issue 4-2: Option 3  Issue 4-3: we prefer to discuss PC3 and 100 MHz in a dedicate agenda. It will be ok to move them to the WI for introduction of lower 6GHz NR unlicensed spectrum in Europe. |
| CableLabs | Issue 4-1: AFC coordinates NR-U/Wi-Fi frequencies and low-power indoor (LPI) device does not need AFC. We agree AFC is out of scope of 3GPP.  Issue 4-2: band n46 also have the -27 dBm/MHz emission limit according to FCC Part 15.407(b), which is the same requirement as band n96. Why can’t we apply the same method used in band n46 to band n96?  Issue 4-3: FCC is considering to release U-NII-4 band (5850-5895 MHz) for unlicensed use, RAN4 may consider to define a new band or extend band n46 to include the new 45 MHz spectrum in R17, depending on the FCC decision. |

### 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** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## 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#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

*Suggestion on WF/LS assignment*

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

### 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** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation** |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |