**3GPP TSG-RAN WG4 Meeting # 98-e R4-210XXXX**

**Electronic Meeting, 25th January – 5th February, 2021**

**Agenda item:** 7.1.1, 7.1.2

**Source:** Moderator (Qualcomm Incorporated)

**Title:** Email discussion summary for [98e][106] NR\_unlic\_Maintenance

**Document for:** Information

# Introduction

This document summarizes the email discussion on topics related to NR-U maintenance in Agenda 7.1.1 and 7.1.2. The list of topics include

Topic #1: Wideband operation and aspects related to intra-cell guard bands and applicability of requirements in the Rel-16 specifications

Topic #2: Specification of channel raster and sync raster numbering.

# Topic #1: Wideband operation

For wideband operation, nominal intra-cell guard bands have been defined in Table 5.3.3-2 of 38.101-1. However, there has also been an understanding that the Rel-16 specifications apply in downlink Mode 1 where LBT passes on all sub-bands of the BWP or carrier and intra-cell guard bands are configured to zero.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2100511**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100511.zip) | Apple Inc. | **NR-U wideband operation and intra-carrier guard bands**  Observation 1a: From the UE perspective, baseline NR-U functionality assumes that a UE can receive data only if LBT succeeds in all the sub-bands.  Observation 1b: There are additional optional UE capabilities that indicate whether a UE can receive data if one or more LBT sub-bands have failed and whether a UE can receive data in intra-carrier guard bands.  Observation 2a: There are NR-U wide-band transmission modes, in which intra-carrier guard band configuration is not needed (or logically speaking, the intra-carrier guard bands are of size zero).  Observation 2b: Logically speaking, the default intra-carrier guard band configuration should correspond to zero width guard bands, while non-zero guard bands can be configured when a UE supports the corresponding wide-band transmission modes. |
| [**R4-2101932**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101932.zip) | Nokia, Nokia Shanghai Bell | **NR-U - On Intra-cell guardbands**  Proposal 1: Resolve the brackets in section 5.3.3 of TS 38.101-1 as given in the TP provided in section 3 of this contribution.  Proposal 2: It is proposed to align the spelling of guard band either in one or two words . |
| [**R4-2101720**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101720.zip) | Ericsson | **Applicability of minimum requirements for shared spectrum access**  The applicability of minimum requirements for the transmitter and receiver characteristics of wideband operation is not specified. For the UL, transmissions in contigous available RB sets where the intra-cell GB posibly scheduled should be assumed for the present release. For the DL, transmissions with no intra-cell GB with all RB sets of a channel scheduled and available should be assumed. |

## Open issues summary

Wideband operation is subject to certain limitations in Rel-16 version of the NR-U specifications. These limitations originate from assumptions taken in the definition of requirements on the success of LBT RB-sets and scheduling of contiguous RB-sets. At the same time, UE capabilities 4-1 and 4-2 have been defined for DL operation but without UE receiver requirements and nominal intra-cell guard bands (or guardbands) are included in the specifications. There are several proposals from companies to clarify the specifications on exactly what is supported in the Rel-16 (and Rel-17) specifications.

### Sub-topic 1-1

Clarification of wideband applicabililty and intra-cell guard bands for UL and DL in Rel-16:

### Sub-topic 1-2

Guard band? Or guardband?

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Qualcomm | Sub topic 1-1: Clarification if wideband applicability is beneficial and perhaps the CR’s in R4-2100512 and R4-2101720 could be revised and merged. It is also noted that there is already indication in the general section under clause 4.3 on restrictions of applicability in this version of the release, though if preferred by companies, this can be broken down and instead placed locally in appropriate sub-clauses  Sub topic 1-2: The fact that we are debating over guardband or guard band is a nice reprieve from some of the more challenging disagreements we’ve encountered in this work item. We are ok with either, but if the dictionary says “guard band”, then that is a strong reason to break it up into two words. On the other hand, what about “wideband” or “narrowband” or “bandwidth”? Should they also be broken up into two words? Maybe for the sake of consistency, despite what the dictionary says, we should treat all of them the same and keep them all as one word.  ….  Others: |
| MTK | Sub topic 1-1:  Clarification to WB operation is needed. We have no strong on where to capture it. (Fine with Ericsson’s approach or Qualcomm’s suggestion).  Regarding the baseline of guard band, 0512 is also fine to us. But we may need to update the feature description of 4-1, which is currently “Capability of reception in the non-zero intra-cell guardband between contiguous RB sets in DL wideband carrier operation wider than 20MHz when LBT is successful only in a subset of RB sets”. At least from our understanding, it seems non-zero width intra-cell guard bands is the baseline.  Sub-topic 1-2:  Fine to either one, as long as it is consistent in spec |
| Ericsson | Sub-topic 1-1:  On R4-2100511: Observation 2b contradicts the specification in 38.214 Clause 7, which followed from a long discussion in RAN4.  In our understanding the RAN4 RF receiver requirements apply for zero-width DL intra-cell GB with all RB sets available for transmission following a channel access procedure (read ‘has passed LBT’) and scheduled, a mode supported by all UEs supporting shared spectrum access. This does not mean that the gNB in the field cannot configure intra-cell GB. For LBT not successful in all DL RB sets, the gNB can still transmit subject to the UE capability indication.  It also our understanding that the RAN4 RF transmitter requirements apply for non-zero width UL intra-cell GB between one or >1 contiguous scheduled RB sets all available for transmission and with the intra-cell GB between the contiguous RB sets scheduled.  The 37.213 defines  “A channel access procedure is a procedure based on sensing that evaluates the availability of a channel for performing transmissions.”  The notion “available for transmission” is also used in harmonized standards for a channel that has passed LBT.  Sub-topic 1-2:  On R4-2101932: Proposal 1 is not agreed. The table and the nominal guard bands refer to wideband operation that is only defined for shared spectrum access and with channel bandwidths > 20 MHz. For shared spectrum access with smaller channel bandwidth, the paragraph below the table applies. The square brackets can be removed without changes of the text.  No strong view on used guard band or guardband, the former is used in 38.214. |

### 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.*

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| **CR/TP number** | **Comments collection** |
| [**R4-2100512**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100512.zip)**,**  [**R4-2100513**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2100513.zip)  Apple | Qualcomm: In the added “with data transmission on a subset of RB-sets”, do you mean both UL and DL? It might be helpful to clarify since it might be misunderstood that data transmission only means UL since the sentence in in the context of UE. I haven’t formed a strong opinion on whether the default guard band should be zero in case the IE’s are not provided, but is there any harm or benefit to zero as opposed to leaving the default values as specified in the table of nominal values? |
| Ericsson: not agreed. The nominal guard bands apply for all transmissions, not only on subset of RB sets (assuming ‘subset’ refers to a proper subset not including all RB sets).  The last sentence before the yellow highlight contradicts the 38.214 and a RAN4 agreement reached after considerable debate, from 38.214 sub-clause 7.5,  “When the UE is not configured with *intraCellGuardBandDL-r16*, the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size .”  Sub-clause 5.3.3 specifies these nominal intra-cell guard bands and corresponding RB subsets. |
|  |
| [**R4-2101720**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101720.zip)  Ericsson | Qualcomm: Not clear what “with all RB sets available for transmissions according to…” this means. Does it mean that all RB sets within the configured channel pass LBT? Does it mean all RB sets that have been scheduled for transmission pass LBT? The next statement reads “The requirements also apply”, but is the word “also” necessary? Also means in addition to what? And in the last sentence, what is a “channel part”? |
| MTK: Regarding the sentence “The requirements also apply when the UL intra-cell guard bands of non-zero size between the said contiguous RB are scheduled and available for transmissions.” in 6.1F, our understanding is the intra-cell guard band width should always be zero for UL. Not sure if there is any misunderstanding here. |
| Ericsson:  The “available for transmission” refers to a RB set that has passed LBT, from 37.213,  “A channel access procedure is a procedure based on sensing that evaluates the availability of a channel for performing transmissions.”  The word “also” should be removed, the UL intra-cell GB between RB the contiguous RB sets should be scheduled.  The “channel part” should be “This also applies for wideband operations within a channel *that is* part of a CA band combination.” (can be inter-band CA for example).  A revised CR can be provided. |

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

*Recommendations on WF/LS assignment*

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|  | **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*

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| **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*

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| **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: Channel raster and sync raster

The specifications 38.101-1 and 38.104 current list the channel and sync raster with a format (First – <Step size> – Last) with downsampled channels enumerated in a note in the table. It is proposed to simply refer to the Note rather than keep the (First – <Step size> – Last).

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2101968**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101968.zip) | ZTE Corporation | **CR to TS 38.104: system parameters maintenance for NR-U**  NR-ARFCN for n46 and n96 is not defined correctly in Table 5.4.2.3-1.  GSCN for n46 and n96 is not defined correctly in Table 5.4.3.3-1. |
| [**R4-2101970**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101970.zip) | ZTE Corporation | **CR to TS 38.101-1: system parameters maintenance for NR-U**  NR-ARFCN for n46 and n96 is not defined correctly in Table 5.4.2.3-1.  GSCN for n46 and n96 is not defined correctly in Table 5.4.3.3-1. |

## Open issues summary

In 38.104 and 38.101-1 specifications, the channel raster and sync raster for Bands n46 and n96 are specified as (First – <Step size> – Last) and then further downsampled by enumeration with notes. It is proposed to remove the (First – <Step size> – Last) values and simply refer to the note. Do companies support this proposal? Are the CR’s agreeable?

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Qualcomm | No strong view. Either way is ok for us.Sub topic 2-2:  ….  Others: |
| Skyworks | OK for us to refer only to the notes but CR may have overlapping part with needed changes to designate the valid rasters for the European sub-band from thread #133, hopefully we may prevent overlapping CRs |
| Ericsson | The channel raster listed in the notes is that matching the European harmonized standard and the Wi-Fi channel raster. If this channel raster is the only possible, then the changes according to the CR apply. |

### 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.*

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| **CR/TP number** | **Comments collection** |
| [**R4-2101968**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101968.zip)**,**  [**R4-2101969**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101969.zip)  38.104 CR | Company A |
| Company B |
|  |
| [**R4-2101970**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101970.zip)**,**  [**R4-2101971**](http://ftp.3gpp.org/TSG_RAN/WG4_Radio/TSGR4_98_e/Docs/R4-2101971.zip)  38.101-1 CR | Company A |
| Company B |
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## 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#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”* |