**3GPP TSG-RAN WG2 Meeting #109e R2-2001437**

**24 February – 6 March 2020**

**Agenda item: 6.3.3**

**Source: Qualcomm Incorporated**

**Title: Report of [AT111e][506][NR-U] CR to 38.331**

**Document for: Discussion and decision**

# Introduction

Several CRs and discussion papers for corrections of NR-U Control Plane were submitted to RAN2#11e. Due to the limited online time, it was agreed to have the following offline discussion to conclude on the contributions which were not concluded online:

* [AT111e][506][NR-U] CR to 38.331 (Qualcomm)
  + - Capture agreed changes from online session
    - Identify topics that need further discussions from papers in CP
    - Present agreeable CR in CB session

Deadline for providing comments:

* + - Companies input: Aug. 21th
    - Rapporteur summary: Aug. 24th

This contribution will report the outcome of above discussion with proposals to be used as a basis for a single merged 38.331 CR.

Note that the merged CR will also include the below CRs which were already agreed online and thus are not in the scope of this discussion:

[R2-2007067](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007067.zip) Guardbands corrections Nokia, Nokia Shanghai Bell CR Rel-16 38.331 16.1.0 1777 - F NR\_unlic-Core

=> Merge the changes with RRC CR

[R2-2007730](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007730.zip) Corrections on configuredGrantTimer ASUSTeK CR Rel-16 38.331 16.1.0 1889 - F NR\_unlic-Core

- LG thinks that we can modify the timers in a different way. Nokia, Lenovo, agree with the change.

=> Merge with the RRC CR

[R2-2007821](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007821.zip) Correction on ssb-SubcarrierOffset in MIB Huawei, HiSilicon CR Rel-16 38.331 16.1.0 1919 - F NR\_unlic-Core

=> merge with RRC CR and change wording “this IE is used instead for”

[R2-2007820](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007820.zip) Correction on ServingCellConfig Huawei, HiSilicon CR Rel-16 38.331 16.1.0 1918 - F NR\_unlic-Core

=> Merge first change in the RRC CR

=> For second change delete “~~with length longer than 2, 4, and 8 OFDM symbols for 15Khz, 30Khz, 60KHz SCS respectively,”~~. Add clause number to the reference. Change from “should use” to “uses”

[R2-2008054](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2008054.zip) Clarification on pusch-TimeDomainResourceAllocationList Samsung CR Rel-16 38.331 16.1.0 1982 - F NR\_unlic-Core, NR\_L1enh\_URLLC-Core

=> Add this to the RRC CR and clarify that it is 16 rows in the table

# Discussion

## 2.1 Correction for *searchSpaceSwitchingTimer*

Several CRs were submitted for corrections of this IE:

* R2-2007451 proposed to delete this IE from PDCCH-Config and add in field description of this IE in PDCCH-ServingCellConfig that the value of the IE is same “for all the cells belong to a given cell group”
* R2-2007066 has the same proposals as R2-2007451 with slightly different wording for the second change that “Only one timer value is configured for all the cells of the same Search Space Set Group.”
* R2-2008065 also proposes to clarify in the field description that “The network configures the same value for all BWPs within the same cell and for all cells within the same cell group.”

It was agreed in RAN2#111e main session that “R2 assumes that for Rel-16 at R2 111-e NBC changes for NR and LTE can be accepted if there is consensus.”. In particular, it is also common understanding that “deletion” and “insertion” of IEs will be preferred over “dummification” when there is an agreement that an IE is not needed.

Based on the above CRs and RAN2 guideline, the following are suggested for the correction of this IE:

1. *searchSpaceSwitchingTimer* is deleted from *PDCCH-Config.*
2. In the field description of *searchSpaceSwitchingTimer* in *PDCCH-ServingCellConfig*, the following sentence is added:
   * “The network configures the same value for all the serving cells in the same *CellGroupForSwitching*.”

**Do you agree with the above way-forward for correction of *searchSpaceSwitchingTimer*? If not, please provide justification and alternative options.**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## 2.2 Other search space switching corrections

R2-2007066 also suggests the following for search space switching corrections:

* Add in field description of *searchSpaceSwitchingDelay* that the value is common “for all the serving cells”
* *cellGroupsForSwitchingList* is limited to have only one value “across all BWPs of serving cell or serving cells of Search Space Set group”

This is similar to the clarification of *searchSpaceSwitchingTimer* where the same values should be used for all cells in the same search space switching group. Therefore, a similar way-forward can be considered by adding the following sentence in the field descriptions of *searchSpaceSwitchingDelay* and *cellGroupsForSwitchingList:*

* The network configures the same value for all the BWPs of serving cells in the same *CellGroupForSwitching*.

**Do you agree with the above way-forward for correction of *searchSpaceSwitchingDelay* and *CellGroupForSwitching*? If not, please provide justification and alternative options.**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## 2.3 Intra-cell guard band

The IEs for intra-cell guard bands, which are intraCellGuardBandDL-r16 and intraCellGuardBandUL-r16, are currently signaled in ServingCellConfig and thus are cell specific.

R2-2007451 proposes to define the IEs per numerology, citing the following RAN1#101-e agreement:

Agreement:

RRC parameters intraCellGuardBandDL-r16 and intraCellGuardBandUL-r16 can be configured at least as UE-specific, per cell **per numerology**.

R2-2007451 proposes to make both DL and UL IEs a SEQUENCE with a size of maxSCSs.

A second change in R2-2007451 is to also move the UL guard band IE to *UplinkConfig s*o that different values can be configured for SUL and NUL. However, there doesn’t seem to any RAN1 or RAN4 agreements to justify this. In particular, neither RAN1 or RAN4 have discussed SUL in NR-U bands and there is no RAN4 plan for this in Rel-16.

Based on the above, the following way-forward is suggested:

1. Define new IEs intraCellGuardBandsDL-PerSCS-List-r16 and intraCellGuardBandsUL-PerSCS-List-r16 as SEQUENCE (SIZE (1..maxSCSs)) OF SCS-IntraCellGuardBands-r16
2. Keep the IEs in *ServingCellConfig* as before.

**Do you agree with the above way-forward for correction of intra-cell guard bands? If not, please provide justification and alternative options.**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

R2-2007596 also discusses intra-cell guard band and states that the existing signalling can cause problems for operation in licensed bands when the IE is not signalled. For NR-U, the UE uses the RAN4 defined guard bands when the IE is not signalled. R2-2007596 suggests the following options for the resolution of this issue:

**Option 1:** Add a CHOICE structure and remove Need -S tagging as

intraCellGuardBandsUL-r16 ~~IntraCellGuardBands-r16~~ CHOICE {

default NULL,

explicit IntraCellGuardBands-r16

} OPTIONAL, ~~-- Need S~~

intraCellGuardBandsDL-r16 ~~IntraCellGuardBands-r16~~ CHOICE {

default NULL,

explicit IntraCellGuardBands-r16

} OPTIONAL, ~~-- Need S~~

**Option 2:** Add clarification in the field description about exception to licensed spectrum with alignment to RRC language.

Note that Option 1 is NBC.

**Do you agree with the issue identified in R2-2007596? If yes, do you support one of the suggested options or another option?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## 2.4 RAR window extension

[R2-2007822](file:///C:\Users\oozturk\OneDrive%20-%20Qualcomm\Documents\RAN2_after100\RAN2_111e_Aug2020\Docs\R2-2007822.zip) proposes the following changes:

1. Add clarification that the network configures a value lower than or equal to 40 ms for operation with shared spectrum channel access
2. Remove the sentence for the content of DCI when the length of the rar-window is larger than 10ms
3. update the field description for prach-RootSequenceIndex

The first change is justified by the claim that the current sentence as below may imply that the value is always 40ms for NR-U.

Msg2 (RAR) window length in number of slots. The network configures a value lower than or equal to 10 ms when Msg2 is transmitted in licensed spectrum and 40 ms when Msg2 is transmitted with shared spectrum channel access (see TS 38.321 [3], clause 5.1.4).

The intention of the second change in removing the sentence for setting SFN LSB in RAR seems to have this in RAN1 specifications. However, there doesn’t seem to a RAN1 CR or discussion on this. Note that the agreement related to this sentence was made by RAN2.

The last change adds the L=571 or L=1151 values introduced for NR-U to the *prach-RootSequenceIndex.*

There was also a CR submitted to 2-step RACH AI for the second change and it was decided to coordinate with NR-U discussion here. The following are from the Chair Notes:

R2-2006708        Correction to msgB-ResponseWindow    vivo        CR           Rel-16   38.331  16.1.0    1730      -               F                NR\_2step\_RACH-Core

=> Coordinate with NR-U and follow NR-U and add proper WI code 2stepRA

**Do you agree any of the three changes introduced by R2-2007822? If the second change is agreed, what action should be taken to introduce an equivalent statement in RAN1 specifications?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## 2.5 Coreset correction

R2-2007823 proposes to modify the field description of ***frequencyDomainResources*** as follows:

***frequencyDomainResources***

Frequency domain resources for the CORESET. If a CORESET is not associated with any search space set configured with *freqMonitorLocation-r16*, each bit corresponds a group of 6 RBs, with grouping starting from the first RB group (see TS 38.213 [13], clause 10.1) in the BWP. If a CORESET is associated with at least one search space set configured with *freqMonitorLocation-r16*, each bit in the first bits corresponds a group of 6 RBs, with grouping starting from the first RB group (see TS 38.213 [13], clause 10.1) in the BWP. The first (left-most / most significant) bit corresponds to the first RB group in the BWP, and so on. A bit that is set to 1 indicates that this RB group belongs to the frequency domain resource of this CORESET. Bits corresponding to a group of RBs not fully contained in the bandwidth part within which the CORESET is configured are set to zero (see TS 38.211 [16], clause 7.3.2.2).

This is justified by the following text in 38.213 for the difference of this IE when *freqMonitorLocation-r16* is configured or not:

For each CORESET in a DL BWP of a serving cell, a respective *frequencyDomainResources* provides a bitmap.

- if a CORESET is not associated with any search space set configured with *freqMonitorLocation-r16*, the bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index if *rb-offset* is not provided, or the first common RB of the first group of 6 PRBs has common RB index where is provided by *rb-offset.*

- if a CORESET is associated with at least one search space set configured with *freqMonitorLocation-r16*, the first bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index . , is a number of available PRBs in the RB set 0 for the DL BWP, and is provided by *rb-offset* or if *rb-offset* is not provided.

It seems that the main difference is due to the parameters in legacy and for NR-U. Even though the change is technically correct, there is a repetition of similar text and references. One option could be to shorten this, e.g., as follows:

Frequency domain resources for the CORESET. Each bit corresponds a group of 6 RBs, with grouping starting from the first RB group in the BWP. When at least one search space is configured with *freqMonitorLocation-r16*, only the first bits are valid (see TS 38.213 [13], clause 10.1).

**Do you agree with the issue identified in R2-2007823? If yes, do you support either the proposed change or shorter change?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## 2.6 Minor changes

R2-2007452 identified the following corrections:

1) nrofCandidates-SFI is set to n1 for a search space configured with freqMonitorLocations-r16.

2) Wrong references to 38.213 and 38.212 are corrected

3) Change the following need codes to Need R:

* + *nfi-TotalDAI-Included-r16* in PhysicalCellGroupConfig
  + schedulingRequestID-LBT-SCell-r16 in MAC-CellGroupConfig
  + discoveryBurstWindowLength-r16 in *ServingCellConfigCommon*

**Do you agree with the proposed changes in R2-2007452?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

## 2.7 Other RRC issues

R2-2007596 has the following additional proposals:

Proposal 2 Include all descriptions relevant for stopPagingMonitoring in the corresponding bit description of the Short Message.

Proposal 3 Clarify that the stopPagingMonitoring bit is only applicable for operation with shared spectrum channel access and only if nrofPDCCH-MonitoringOccasionPerSSB-InPO is present.

Proposal 5 Group channel access related capabilities in “ChannelAccessParameters”

Proposal 6 Shorten the search space switching related names in SlotFormatIndicator and PDCCH-Config and use “switch” consistently instead of “switching”.

Proposal 7 In PDCCH-Config, add “SearchSpaceSwitchConfig” parameter to group all the search space switching related parameters.

Proposal 9 Use 1-bit indications to indicate whether a search space set belongs to group ID 0 and/or group ID 1 instead of providing a list of integer values representing the group IDs.

Note that there was an explicit RAN2 agreement for the current form of the short message for stopping paging, which is modified by Proposal 2.

Also note that Proposals 5, 7, and 9 are NBC.

Before discussing and identifying the necessary changes due to these proposals, it would be good to first check if there is consensus to agree to them? If there is consensus, we can discuss the changes within the merged CR.

**Do you support any of the proposals above?**

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| **Company** | **Response** | **Comments** |
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**Summary:**

**Proposal:**

# Conclusion

Based on the feedback received, the following are proposed regarding the NR-U corrections:

# References

[R2-2007067](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007067.zip) Guardbands corrections Nokia, Nokia Shanghai Bell CR Rel-16 38.331 16.1.0 1777 - F NR\_unlic-Core

[R2-2007451](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007451.zip) RRC corrections for NR-U ZTE Corporation, Sanechips CR Rel-16 38.331 16.1.0 1843 - F NR\_unlic-Core

[R2-2007066](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007066.zip) searchSpaceSwitchingGroup handling Nokia, Nokia Shanghai Bell CR Rel-16 38.331 16.1.0 1776 - F NR\_unlic-Core

[R2-2007452](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007452.zip) RRC clarficiations for NR-U ZTE Corporation, Sanechips CR Rel-16 38.331 16.1.0 1844 - F NR\_unlic-Core

[R2-2007730](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007730.zip) Corrections on configuredGrantTimer ASUSTeK CR Rel-16 38.331 16.1.0 1889 - F NR\_unlic-Core

[R2-2007820](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007820.zip) Correction on ServingCellConfig Huawei, HiSilicon CR Rel-16 38.331 16.1.0 1918 - F NR\_unlic-Core

[R2-2007821](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007821.zip) Correction on ssb-SubcarrierOffset in MIB Huawei, HiSilicon CR Rel-16 38.331 16.1.0 1919 - F NR\_unlic-Core

[R2-2008054](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2008054.zip) Clarification on pusch-TimeDomainResourceAllocationList Samsung CR Rel-16 38.331 16.1.0 1982 - F NR\_unlic-Core, NR\_L1enh\_URLLC-Core

[R2-2007597](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007597.zip) NR-U features in 38.306 Ericsson discussion NR\_unlic-Core

[R2-2008065](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2008065.zip) Correction to the search space switching timer vivo CR Rel-16 38.331 16.1.0 1983 - F NR\_unlic-Core

[R2-2007596](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007596.zip) Remaining RRC issues Ericsson discussion NR\_unlic-Core

[R2-2007822](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007822.zip) Correction on RACH Configuration Huawei, HiSilicon, Ericsson CR Rel-16 38.331 16.1.0 1920 - F NR\_unlic-Core

[R2-2007823](file:///C:\Users\panidx\Documents\RAN2_111-e\Docs\R2-2007823.zip) Correction on ControlResourceSet Huawei, HiSilicon CR Rel-16 38.331 16.1.0 1921 - F NR\_unlic-Core