**3GPP TSG RAN WG1 Meeting #106-e** **R1-210xxxx**

**August 16th – August 27th, 2021**

**Agenda item: 8.2**

**Source: Rapporteur (Qualcomm Incorporated)**

**Title: Comments collection for RRC parameters for extending NR to 52.6-71GHz**

**Document for: Discussion and Decision**

# Introduction

This paper is a place holder to collect comments for RRC parameters for 60GHz work item. The RRC parameters are captured in the excel sheet in the same folder.

# Comments

## Initial access aspects

|  |  |
| --- | --- |
| Company | View |
| vivo | For the Subcarrierspacing, there are two methods to introduce new SCS 480K and 960KHz:Alt. 1: Introduce new parameter SubcarrierSpacing-r17 Alt. 2: Use spare entry in legacy parameter SubcarrierSpacing as mentioned in the comment part. If Alt. 1 is adopted as proposed in the Excel, new r17 parameters need to be introduced for all IEs corresponding to legacy SubcarrierSpacing besides current listed subcarrierSpacing-r17 in BWP and msg1-SubcarrierSpacing-r17 in RACH-ConfigCommon. There are many places which need to be updated, e.g. msg1-SubcarrierSpacing in *BeamFailureRecoveryConfig,* subcarrierSpacing in *CSI-RS-ResourceConfigMobility* and etc.If Alt. 2 is adopted, there is no need to introduce new parameter for most of the IEs.For msg1-SubcarrierSpacing in RACH-configCommon, it is conditional mandatory when L=139 (otherwise absent) as shown below. For L=571/1151, a new IE is needed to indicate PRACH SCS.msg1-SubcarrierSpacing SubcarrierSpacing OPTIONAL, -- Cond L139 Our preference is Alt. 2 for simplicity. We are also fine to let RAN2 decide on this. For msg1-SubcarrierSpacing-r17, we agree to list it here since it is needed for both Alt. 1 or Alt. 2. For subcarrierSpacing-r17 in BWP, we think there is no need to list here since it is anyway not the complete list for Alt. 1 and not needed for Alt. 2 |
| ZTE, Sanechips | For new SCS, we are fine to introduce new RRC parameters for FR2-2 but there are same concerns as vivo mentioned above. In order to avoid unnecessary changes for RAN2, we tend to reuse existing “SubcarrierSpacing” IE, that is, add new SCS (480kHz, 960kHz) in this IE by using spare entry.Besides, If the method of supporting the introduction of new parameter is eventually adopted (Alt.1 raised by vivo), then for RACH related parameter, we think it is necessary to add a new“msgA-SubcarrierSpacing-r17” in RACH-ConfigCommonTwoStepRA-r16/17 IE considering that there is no distinguish between 2-step RACH and 4-step RACH when RACH related discussions and conclusions are reached. |
| Samsung | Maybe “ssbSubcarrierSpacing” should also be listed for further discussion. Since we have agreed the SCS of SSB may subject to further UE capability to take values from 480 and 960, it may not be directly taking from “SubcarrierSpacing”.  |
| Huawei, HiSilicon | **Row 2:** * **Column B:**

Suggest to remove “init access” due to the following two reasons:1. The parameter SubcarrierSpacing--17 (or SubcarrierSpacing) does not only belong to initial access and it is also used in IEs not belonging (or, not only belonging) to initial access including *CSI-RS-ResourceConfigMobility, BeamFailureRecoveryConfig, SRS-Config*, *MeasObjectNR, ServingCellConfigCommon, ServingCellConfig,*

*TDD-UL-DL-ConfigCommon*, *SlotFormatIndicator, SlotFormatCombinationsPerCell,*  *RateMatchPattern, RACH-ConfigCommon, RACH-ConfigCommonTwoStepRA.*1. As per WID agreement “960 kHz numerology for the SSB is not supported by the UE for initial access in Rel-17”. Attitibuting SubcarrierSpacing--17 (or SubcarrierSpacing) to initial access sub-feature group and providing the range value of {kHz120, kHz480, kHz960} for it in column K while 960 kHz SSB is not supported for initial access can be misleading.
* **Column G:**

As pointed out by the moderator in Column P and vivo and ZTE above, it may be possible to use the spare entries of the legacy IE SubcarrierSpacing to indicate 480 kHz and 960 kHz. The decision should be made in RAN2. Given that, and to avoid confusion, we suggest to change “subcarrierSpacing-r17” to “subcarrierSpacing[-r17]” as “subcarrierSpacing-r17” implies that a new parameter must be introduced.* **Column H:**

Following the explanation of Column G, suggest to remove “New”. This entry may be left empty. * **Column P:**

Two points regarding the comment Section:1. The first sentence in the comment Section (Support 120/480/960KHz for FR2-2) would be out of context if it is provided without any additional explanation and may result in confusion as 960 kHz SSB is not supported for initial access and the support of 480/960 kHz is optional while the support of 120 kHz is mandatory. We think that above issues need to be reflected in the comment section to avoid misinterpretation. We believe that at least the additional explanation that are copy-pasted from WID need to be included in the comment section.
2. There have been long discussions in the first three WI meetings in RAN1 on the support of 480/960 kHz PRACH for initial access and/or non-initial access cases. As how to accurately define initial access and non-initial access applications for PRACH became controversial in RAN1 and RAN1 specifications do not make any distinction between PRACH for initial access and PRACH for non-initial access and, further, we already had this Agreement in RAN1 #104-e, initial access feature lead made the following assessment in RAN1 105-e feature lead summary (R1-2106311) to which no company made an objection: “Moderator assumes previous RAN1 agreement means 480/960kHz PRACH will be specified in RAN1 specification, and RAN1 could go ahead with further development of RAN1 specification for 480/960kHz PRACH”. Note that the “previous RAN1 agreement” in above feature lead assessment refers to Agreement in RAN1 #104-e. As such, we believe that this agreement [possibly along with the feature lead assessment should also be included in the comment section].

Based on the above two points, we suggest the following text in the comment section:

|  |
| --- |
| “Support 120/480/960KHz for FR2-2 with the following conditions from WID:* + 960 kHz numerology for the SSB is not supported by the UE for initial access in Rel-17.
	+ Note: 480 kHz is an optional SSB numerology for initial access for the UE. A UE supporting a band in 52.6-71 GHz must at least support 120 kHz SCS (for initial access and after initial access)
	+ Note 2: UEs supporting a band in the range of 52.6GHz-71GHz are not required to support 480kHz SCS and 960kHz SCS

Also, RAN1 made the following agreement in RAN1 104-e regarding the supported SCSs for PRACH based on which companies shared the understanding that 480/960kHz PRACH will be specified in RAN1 specification, and RAN1 could go ahead with further development of RAN1 specification for 480/960kHz PRACH.Agreement:* For initial access and non-initial access use cases, support 120kHz PRACH SCS with sequence length L=571, 1151 (in addition to L=139) for PRACH Formats A1~A3, B1~B4, C0, and C2.
* For non-initial access use cases,
	+ if 480kHz and/or 960 kHz SSB SCS is agreed to be supported, support 480 and/or 960 kHz PRACH SCS with sequence length L=139 for PRACH Formats A1~A3, B1~B4, C0, and C2, respectively.
		- FFS: support of sequence length L = 571, 1151
* FFS: Support of 480 and/or 960 kHz PRACH SCS for initial access use cases, if 480 and/or 960 kHz SSB SCS is agreed to be supported for initial access

RAN2 may determine if this can be merged with legacy SubCarrierSpacing (adding new values to existing IE)There may be other related RRC parameters to add if new RRC parameter is introduced for this subCarrierSpacing.”  |

**Row 3:** Agree with vivo and we think that entire row needs to be removed for now to avoid confusion. If the legacy IE SubcarrierSpacing is used to indicate 480 kHz and 960 kHz, then introducing a new field subcarrierSpacing-17 to BWP is not required. If a new parameter SubcarrierSpacing-r17 is introduced to indicate 480 kHz and 960 kHz, then, in addition to BWP, several other IEs are affected and subcarrierSpacing-17 field should be added to all of them. Singling out BWP may create confusion. **Row 4:**If both of the following conditions hold:1. L= 571 is not supported for 480kHz (that is, similar to FR2, msg1-SubcarrierSpacing needs to be indicated in RACH-ConfigCommon only when L=139); and
2. In Row two, a new IE SubcarrierSpacing-r17 is not introduced and the spare entries of the legacy IE SubcarrierSpacing are used to indicate 480 kHz and 960 kHz,

Then, it does not seem to be required to introduce new parameter msg1-SubcarrierSpacing-r17 and the legacy IE msg1-SubcarrierSpacing would work with the values indicated by SubcarrierSpacing and the exact same condition is in Rel-15/16 (-- Cond L139). In such a case, Row 4 should be removed. At this stage, since L=571 is not supported for 480 kHz, we suggest to remove Row 4. This can be added back if L= 571 is supported in RAN1 106b-e as, in such a case, if L=571 is configured, then UE needs to know whether the PRACH SCS is 120 kHz or 480 kHz (the confusion needs to be only resolved between 120 kHz and 480 kHz since 30 kHz PRACH is only supported in FR1). However, if companies decide to keep Row 4, we would like to suggest the following changes in the comment section in column P: * **Column P:**

In addition to our above discussion, we have two more points regarding the comment Section:1. Similar to our discussion in Column P of Row 2, we think that the current text “Support 120/480/960KHz for PRACH for FR2-2” in the comment Section without any additional explanation would not be accurate.
2. We have the following agreement in RAN1 106-e:

Agreement: (RAN1 106-e)Do not support PRACH length L=571, 1151 for 960kHz PRACH and at least L =1151 for 480kHz PRACH. This means that FFS for 960 kHz should be removed and 1151 should be removed from the FFS for 480 kHz. Based on the above discussion, we suggest the following text in the comment section:

|  |
| --- |
| “~~Support 120/480/960KHz for PRACH for FR2-2.~~ RAN1 made the following agreement regarding the supported SCSs for PRACH based on which companies shared the understanding in 104-e that 480/960kHz PRACH will be specified in RAN1 specification, and RAN1 could go ahead with further development of RAN1 specification for 480/960kHz PRACH. Also need to capture the valid combination of PRACH SCS and length: 120KHz - 139/571/1151480KHz - 139, w/ FFS 571~~/1151~~960KHz - 139~~, w/ FFS 571/1151~~Note: If both of the following conditions hold:1. L= 571 is not supported for 480kHz (that is, similar to FR2, msg1-SubcarrierSpacing needs to be indicated in RACH-ConfigCommon only when L=139); and
2. In Row two, a new IE SubcarrierSpacing-r17 is not introduced and the spare entries of the legacy IE SubcarrierSpacing are used to indicate 480 kHz and 960 kHz,

Then, it may not be required to introduce new parameter msg1-SubcarrierSpacing-r17 and the legacy IE msg1-SubcarrierSpacing would work with the values indicated by SubcarrierSpacing and the exact same condition is in Rel-15/16 (-- Cond L139).Agreement:* For initial access and non-initial access use cases, support 120kHz PRACH SCS with sequence length L=571, 1151 (in addition to L=139) for PRACH Formats A1~A3, B1~B4, C0, and C2.
* For non-initial access use cases,
	+ if 480kHz and/or 960 kHz SSB SCS is agreed to be supported, support 480 and/or 960 kHz PRACH SCS with sequence length L=139 for PRACH Formats A1~A3, B1~B4, C0, and C2, respectively.
		- FFS: support of sequence length L = 571, 1151
* FFS: Support of 480 and/or 960 kHz PRACH SCS for initial access use cases, if 480 and/or 960 kHz SSB SCS is agreed to be supported for initial access.”
 |

 |

## PDCCH monitoring enhancements

|  |  |
| --- | --- |
| Company | View |
|  |  |
|  |  |

## Enhancements for PUCCH formats 0/1/4

|  |  |
| --- | --- |
| Company | View |
| Ericsson | For the number of RBs, rather than listing 3 specific parameters (nrofPRBs-PF0-r17, nrofPRBs-PF1-r17, nrofPRBs-PF4-r17) it would be better to give RAN2 a little more freedom in how to specify the number of RBs (potentially differently) for each of PF0, 1, and 4. For example, in Rel-15, there is a single parameter nrofPRBs in each of PUCCH-format2 and PUCCH-format3, which still allows the number of RBs to be configured differently for each PUCCH format.We could always add an extra note to inform RAN2 that however they choose to specify it, it must be possible to configure the number of RBs differently for each PUCCH format.  |
| vivo | We think current RRC signalling design exactly reflects the agreement below:Agreement:• Support an RRC parameter to configure the number of RBs for a PUCCH resource for each of enhanced PUCCH formats 0, 1, and 4• The parameter is provided by dedicated signaling (per UE) per BWPBesides, we are also fine to put nrofPRBs inside each format following the way forlegacy format 2 and 3 as Ericsson indicates. In this case, it is configured per PUCCH resource to provide more flexibility. |
| ZTE, Sanechips | For us, we are fine with the configuration position of the number of RBs listed in the current excel sheet and the way to add the the number of RBs into each format as mentioned by Ericssion. But even so, we still think that the location or IE in which the number of RBs is configured should be eventually determined by RAN2. |
| Nokia, NSB | We agree with Ericsson that RAN1 does not need to attempt to do RRC design on RAN2’s behalf. It should be enough just to state that the number of RBs in PUCCH-Config is RRC configured separately for each PUCCH format, and the configuration is UE specific. RAN2 can decide on how to exactly implement this. |

## Beam management for new SCSs

|  |  |
| --- | --- |
| Company | View |
| Ericsson | For maxNumberRxTxBeamSwitchDLThe value range should be changed as follows since 2 has been agreed and 4 is common to both Alt-1 and Alt-2 in the agreement). 120KHz: No change480KHz: 2, 4, 7960KHz: ~~FFS~~ 2, 4FFS: additional value(s) for 960 kHz |
| ZTE, Sanechips | We agree with Ericsson’s modification for 960KHz SCS. In our view, the value 4for 960KHz SCS must be supported for maxNumberRxTxBeamSwitchDL regardless of which of the following two alternatives is finally selected.  For 960 kHz, support one of the following alternatives* Alt-1: Support 1, 4 and [7] as candidate values for 960 kHz in addition to the agreed candidate values 2
* Alt-2: Support 4 as a candidate value for 960 kHz in addition to the agreed candidate values 2
 |
| Huawei, HiSilicon | **Rows 14, 15, 16** * **Column K:**

Suggest the following change to avoid confusion 120KHz: No change480KHz: 4x 120 kHz values in number of OFDM symbols960KHz: 8x 120 kHz values in number of OFDM symbols* **Column P:**

We have reached the following agreement in RAN1 106-e: Agreement: (RAN1 106-e)For candidate values of timeDurationForQCL, beamSwitchTiming and beamReportTiming, * Support one of the following alternatives
	+ Alt-1: No additional candidate values are supported for 120 kHz, 480 kHz and 960 kHz
	+ Alt-2: 28 and 56 symbols are supported as additional candidate values for 480 kHz and 960 kHz, respectively
* For UE capability signaling, UE reports one value of the candidate values in OFDM symbols per each SCS

Following the above agreement, we suggest the following change in the comment section:

|  |
| --- |
| ~~FFS other values for 480KHz and 960KHz~~ FFS: additional value of 28 for 480 kHz and 56 for 960 kHz. |

  |

## PDSCH/PUSCH enhancements

|  |  |
| --- | --- |
| Company | View |
| DOCOMO | We think the intention of describing the two parameters below only is not very clear:

|  |
| --- |
| PDSCH-TimeDomainResourceAllocation-r17 |
| PUSCH-TimeDomainResourceAllocationList-r17 |

In 38.331, there are quite some parameters which relate to PDSCH/PUSCH resources per release and per functionality. If we need to describe more precisely, perhaps the following should be described:* For multi-PUSCH scheduling,
	+ pusch-TimeDomainAllocationList-r17
	+ PUSCH-TimeDomainResourceAllocationList-r17
	+ PUSCH-TimeDomainResourceAllocation-r17
	+ PUSCH-Allocation-r17
* For multi-PDSCH scheduling,
	+ pdsch-TimeDomainAllocationList-r17
	+ PDSCH-TimeDomainResourceAllocationList-r17
	+ PDSCH-TimeDomainResourceAllocation-r17
	+ PDSCH-Allocation-r17 (if we follow multi-PUSCH scheduling framework but no agreement implying this clearly so far?)

However, we think the aspects above may relate each other. So it may not essential to describe all of them. We would be open to discuss on this.  |
| Ericsson | Should it be the following instead? PUSCH-TimeDomainResourceAllocationList-r17PDSCH-TimeDomainResourceAllocationList-r17 |
| LG Electronics | We can add the following agreement in comment column for multi-PDSCH/PUSCH grant.Agreement:For TDRA in a DCI that can schedule multiple PDSCHs (or PUSCHs),* A row of the TDRA table can indicate PDSCHs (or PUSCHs) that are in consecutive or non-consecutive slots, by configuring {SLIV, mapping type, scheduling offset K0 (or K2)} for each PDSCH (or PUSCH) in the row of TDRA table.
* Note: Whether and how to reduce RRC overhead is left to RAN2.
 |
| vivo | Agree with Docomo that all related IEs need to be considered. |
| ZTE, Sanechips | we think that RAN1 only needs to list the following two parameters, while other related specific parameters and overhead issue should be considered by RAN2.* PUSCH-TimeDomainResourceAllocationList-r17
* PDSCH-TimeDomainResourceAllocationList-r17

Besides, we share the same view with LG on adding agreement in comment column to let RAN2 know that K0/K2 can be configured for each PDSCH/PUSCH for multi-PDSCH/PUSCH scheduled by a DCI case. |
| Nokia, NSB | Agree with Ericsson’s modification.Agree with LGE and ZTE that adding the related agreements in the comment column makes sense. The following agreement could be added as well.Agreement:* The maximum number of PDSCHs/PUSCHs that can be scheduled with a single DCI in Rel-17 is 8 for SCS of 120, 480 and 960 kHz.
 |
| Huawei, HiSilicon | **Rows 20 and 21*** **Column B**

The parameters are not only related to HARQ. A better sub-feature group would be “HARQ/Scheduling” similar to feature 5 is 38.822. * **Column J**

Could clarify the applicable values of SCS (960 kHz, 480 kHz, 120 kHz [120 kHz a working assumption for Row 20]).* **Column P**

We have the following two points:1. The first agreement can be deleted. It is sufficient to keep only the second agreement. More information can be provided later if RAN1 makes additional agreements on the FFS points from the first agreement. Otherwise there is no need to provide such information to RAN2. RAN2 won’t work on the RRC parameter unless there is no FSS remaining.
2. As Nokia mentioned above, the following agreement should be added because RAN2 would have to reflect it in the RRC parameter description of TDRA table:

“Agreement: The maximum number of PDSCHs/PUSCHs that can be scheduled with a single DCI in Rel-17 is 8 for SCS of 120, 480 and 960 kHz.” |

## Channel access mechanism

|  |  |
| --- | --- |
| Company | View |
| Lenovo, Motorola Mobility | For the parameter “LBT-Mode”, should we have two parameters already? For cell-specific and for UE-specific? We are open either way.Also, could just add it as “New” parameter” and add description “To switch between LBT and no-LBT mode”  |
| Samsung | For Row 23, i.e., “LBT-mode”, we may need to * add “New” in column H,
* split into two rows: one for “cell-specific” in column N and one for “UE-specific” in column N
* leave column K as FFS, since the details of indication content is not finalized in the meeting (still have FFS on whether per-beam indication is supported and FFS on whether gNB and UE can have different modes)
 |
| Nokia, NSB | We are ok with the description as is. Since the agreement is already listed in the comment field, RAN2 should be able to do the rest and specify support for both cell – and UE-specific signalling. |
| Huawei, HiSilicon | **Row 23:** * **Column E:** Fixing a typo: “FFS where to add. Need to add for both cell-specific ~~c~~and UE-specific configuration”
 |

## Others

|  |  |
| --- | --- |
| Company | View |
|  |  |
|  |  |