3GPP TSG-RAN WG2 #117-e R2-22xxxxx

Electronic meeting, 21 February – 3 March 2022

Agenda Item: 8.20.1

Source: Ericsson

Title: Summary of offline [211][71 GHz] RRC CR finalization for 71 GHz (Ericsson)

Document for: Discussion, Decision

# Introduction

This document is to summarize the inputs from companies on the remaining issues in order to resolving the remaining issues and attempt to finalize the RRC CR for 71 GHz.

* [AT117-e][211][71 GHz] RRC CR finalization for 71 GHz (Ericsson)

 Scope: Attempt to finalize the RRC CR for 71 GHz based on online decisions. Can discuss RRC parameter value ranges for 71 GHz.

 Intended outcome: Agreeable RRC CR in [R2-2203644](https://www.3gpp.org/ftp/TSG_RAN/WG2_RL2/TSGR2_117-e/Docs/R2-2203644.zip).

 Deadline: Deadline 5

The discussion includes two phases.

– Phase I is to collect companies views on the issues as captured in open issue list. The suggested deadline for companies' feedback: Monday W2, 2022-02-28 0800 UTC.

– Phase II is to update the CR according to phase I consensus and allow companies some time to review the updated CR. The deadline is Tuesday W2, 2022-03-01 1200 UTC.

The expected output of this discussion is the running CR including both of phase I and phase II consensus for agreement.

# Summary

## Contact information

|  |  |  |
| --- | --- | --- |
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## Issues to resolve

Per agreements made in RAN2#”117-e, the following issues need to be resolved for WI completion.

* At least the following essential issues need to be solved for WI completion:

Issue A1: LBT mode signaling (differentiation between licensed and unlicensed w/o LBT)

Issue A2: New values for existing parameters due to new SCS (e.g. maxPUSCH-Duration, UAI parameters)

Issue A3: New RAN1 parameters after RAN1#107bis-e (RAN1 LS R2-202111)

Issue A4: Q value is limited to operation with shared spectrum channel access

Issue A5: Dependency between new and legacy power saving parameters in UAI

Issue A6: Whether define new value for maxSchedulingK0/2-SchedulingOffset

Issue A7: Whether to introduce new indicators in OtherConfig IE to configure the report of newly introduced power saving/overheating parameters for FR2-2

Issue A8: Whether to define new UE capability for overheatingAssistance-r17 /minSchedulingOffsetPreferenceFR2-2-r17

Issue B6: Secondary DRX for FR2-2 (clarify if additional spec change is needed)

Issue C1: Capture RAN feature lists for 71 Ghz (sent in RAN1 LS R2-202113) in 38.306/38.331.

Issue C3: FRx differentiation (including FR2-1 and FR2-2 differentiation) for UE capability

Issue D1: Interaction of FR2-2 with other Rel-17 features

* The following issues may be discussed if there is available time:

Issue B1: Consistent LBT failure procedure (confirm no changes to MAC procedures)

Issue B2: LBT mode change (confirm no changes to MAC procedures)

Issue B3: New absolute periodicity and offset values for Configured Grant

Issue B4: New absolute periodicity and offset values for Scheduling Request

Issue B5: New DRX timer values

Issue B7: Specification of Contention Exempt Short Control Signaling rules applying to Msg1 and MsgA

Issue B8: Impacts on the guard symbols MAC CE (if FR2-2 is applicable to IAB)

Issue C2: UE capability for L2 buffer size

Among the issue list, rapporteur has also highlighted the issues which are not resolved and need to collect companies’ views and which may therefore affect RRC CR accordingly.

Issue A2: New values for existing parameters due to new SCS (e.g. maxPUSCH-Duration, ~~UAI parameters~~)

Issue A4: Q value is limited to operation with shared spectrum channel access

Issue A6: Whether define new value for maxSchedulingK0/2-SchedulingOffset

Issue B3: New absolute periodicity and offset values for Configured Grant

Issue B4: New absolute periodicity and offset values for Scheduling Request

Issue B5: New DRX timer values

In addition, the following issues regarding value range per agreements made in RAN2#116bis will be also discussed.

* Proposal E6: New periodicity values corresponding to the existing absolute periodicities are introduced for SPS in FR2-2.

In addition, the value range for new UAI parameters according to the below agreement made in RAN2#117-e will be also discussed

* 2: RAN2 to reuse the existing prohibit timers (i.e., maxBW-PreferenceProhibitTimer-r16, maxMIMO-LayerPreferenceProhibitTimer-r16, minSchedulingOffsetPreferenceProhibitTimer-r16) for newly introduced power saving parameters (i.e., maxBW-PreferenceFR2-2-r17, maxMIMO-LayerPreferenceFR2-2-r17, minSchedulingOffsetPreferenceProhibitTimer-r16)

Companies are invited to express views for the following questions.

### Issue A2: value range for maxPUSCH-Duration

RAN2#116bis-e has agreed on the following:

* *New values, e.g. 0.0313ms, 0.0156ms, 0.01ms, are added to maxPUSCH-Duration for FR2-2.*

The agreement does not capture, which of the values should be added for FR2-2.

The maximum PUSCH duration is intended for scheduling of latency critical data.

The current values for *maxPUSCH-Duration* are listed below.

ENUMERATED {ms0p02, ms0p04, ms0p0625, ms0p125, ms0p25, ms0p5, spare2, spare1}

As discussed in [1], these values mainly cover the following (mini-)slot durations:

|  |  |  |  |
| --- | --- | --- | --- |
| 0.02 ms | 2 OS for 120 kHz ~ 0.018 ms |  |  |
| 0.04 ms | 4 OS for 120 kHz ~ 0.036 ms | 4 OS for 120 kHz ~ 0.036 ms | 2 OS for 60 kHz ~ 0.036 ms |
| 0.0625 ms | 7 OS for 120 kHz | 4 OS for 120 kHz ~ 0.036 ms | 2 OS for 60 kHz ~ 0.036 ms |
| 0.125 ms | 7 OS for 60 kHz | 4 OS for 60 kHz ~ 0.07 ms | 2 OS for 30 kHz ~ 0.07 ms |
| 0.25 ms | 7 OS for 30 kHz | 4 OS for 30 kHz ~ 0.14 ms | 2 OS for 15 kHz ~ 0.14 ms |
| 0.5 ms | 7 OS for 15 kHz | 4 OS for 15 kHz ~ 0.29 ms |  |

For FR2-2, we have new slot durations, i.e. 0.03125 ms for 480 kHz and 0.015625 ms for 960 kHz. These could be covered by the existing values, 0.04 ms and 0.02 ms, respectively. If UE needs to distinguish a PUSCH with SCS 480 kHz or 960 kHz from a PUSCH with shorter than 1 slot with 120 kHz, the gNB can configure allowedSCS-List to the UE in addition to *maxPUSCH-Duration.*

it is also possible to support mini-slot duration with SCS 480 and 960 kHz, therefore, it would be straightforward to also support shorter values which allows PUSCH transmission with shorter duration than one slot. Therefore, at least the additional value of 0.01ms should be supported which would allow a PUSCH transmission with duration shorter than 1 slot with 960.

it is necessary to check companies’ views for the values separately.

***Q1: what values do companies agree to adopt for maxPUSCH-Duration for FR2-2?***

***Value 1) 0.0313ms***

***Value 2) 0.0156ms***

***Value 3) 0.01ms***

***Value 4) other? Please specify the value if there is any other***

|  |  |  |
| --- | --- | --- |
| Company | Values | Comments |
| LGE | Value 3) 0.01ms | Considering the definition of *maxPUSCH-Duration*, value 1 and value 2 can be covered by 0.04 ms and 0.02 ms, respectively. If additional value is needed, value 3 can be considered. |
| Ericsson | 3) |  |
| Intel | 3) |  |
| Huawei, HiSilicon | 3 |  |
| Samsung | 3 (0.01ms) |  |
| Nokia | 3 |  |

**Rapporteur summary**:

in total, there are 6 companies who have provided inputs. All 6 companies agree to adopt the value 0.01ms.

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. (easy) Only adopt the new value 0.01ms for maxPUSCH-Duration for FR2-2

### Issue A4: Q value is limited to operation with shared spectrum channel access

As discussed in [1], the following has been captured in the running RRC CR, [R2-2201975](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Inbox/R2-2201975.zip):

|  |
| --- |
| ***subCarrierSpacingCommon***Subcarrier spacing for *SIB1*, Msg.2/4 and MsgB for initial access, paging and broadcast SI-messages. If the UE acquires this *MIB* on an FR1 carrier frequency, the value *scs15or60* corresponds to 15 kHz and the value *scs30or120* corresponds to 30 *kHz. If the U*E acquires this *MIB* on an FR2 carrier frequency, the value *scs15or60* corresponds to 60 kHz and the value *scs30or120* corresponds to 120 kHz. For operation with shared spectrum channel access in FR1 (see 37.213 [48]) and for operation in FR2-2, the subcarrier spacing for *SIB1*, Msg.2/4 and MsgB for initial access, paging and broadcast SI-messages is same as that for the corresponding SSB and this field instead is used for deriving the QCL relation between SS/PBCH blocks as specified in TS 38.213 [13], clause 4.1. |

This was to capture the RAN1 agreement that for FR2-2 only the same SCS for SSB and coreset 0 is supported. However, the QCL relation which is derived from *subcarrierSpacingCommon* is only needed for shared spectrum channel access as can be derived from RAN1 TS 38.213.

For licensed operation, the following is stated related to cell search in TS 38.213, clause 4.1:

For operation without shared spectrum channel access, an SS/PBCH block index is same as a candidate SS/PBCH block index.

For operation with shared spectrum channel access, the following is stated related to cell search in TS 38.213, clause 4.1:

For operation with shared spectrum channel access in FR2-2, a UE assumes that SS/PBCH blocks in a serving cell that are within a same discovery burst transmission window or across discovery burst transmission windows are quasi co-located with respect to average gain, quasi co-location 'typeA' and 'typeD' properties, when applicable, if a value of is same among the SS/PBCH blocks, where is the candidate SS/PBCH block index. is either provided by *ssb-PositionQCL* or, if *ssb-PositionQCL* is not provided,obtained from a *MIB* provided by a SS/PBCH block according to Table 4.1-2. The UE can determine an SS/PBCH block index according to .

To align with RAN1 understanding that the QCL relation is not used for licensed operation, this should be clarified in the field description as follows:

For operation with shared spectrum channel access in FR1 (see 37.213 [48]) and for operation in FR2-2, the subcarrier spacing for *SIB1*, Msg.2/4 and MsgB for initial access, paging and broadcast SI-messages is same as that for the corresponding SSB. For operation with shared spectrum channel access,this field instead is used for deriving the QCL relation between SS/PBCH blocks as specified in TS 38.213 [13], clause 4.1.

it is necessary to check companies’ views for the issue.

***Q2-1:* do companies agree to clarify in the field description for subCarrierSpacingCommon that only for operation with shared spectrum channel access, this field is used for deriving the QCL value?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |
| Nokia | Yes |  |

***Q2-2: If the answer of Q2-1 is yes,* do companies agree the following corresponding changes in the RRC CR?**

***subCarrierSpacingCommon***

Subcarrier spacing for *SIB1*, Msg.2/4 and MsgB for initial access, paging and broadcast SI-messages. If the UE acquires this *MIB* on an FR1 carrier frequency, the value *scs15or60* corresponds to 15 kHz and the value *scs30or120* corresponds to 30 kHz. If the UE acquires this *MIB* on an FR2 carrier frequency, the value *scs15or60* corresponds to 60 kHz and the value *scs30or120* corresponds to 120 kHz. For operation with shared spectrum channel access in FR1 (see 37.213 [48]) and for operation in FR2-2, the subcarrier spacing for *SIB1*, Msg.2/4 and MsgB for initial access, paging and broadcast SI-messages is same as that for the corresponding SSB, For operation with shared spectrum channel access, this field instead is used for deriving the QCL relation between SS/PBCH blocks as specified in TS 38.213 [13], clause 4.1.

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Huawei, HiSilicon | No | “For operation with shared spectrum channel access” is used twice in the same sentence so it feels redundant, the original sentence with “instead” is clear and concise.  |
| Samsung | Yes |  |
| Nokia | Yes | fine with also Huawei wording |

**Rapporteur summary**:

In total, there are 6 companies who have provided inputs. All companies agree to clarify in the field description for subCarrierSpacingCommon that only for operation with shared spectrum channel access, this field is used for deriving the QCL value. 5 out of 6 companies agree with the changes captured in the RRC CR. Meanwhile, 1 company thinks the original text with “instead” is already clear. No additional change is needed. Rapporteur would like to follow the majority view. Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. (easy)To confirm that the field description for subCarrierSpacingCommon needs to be clarified that only for operation with shared spectrum channel access, this field is used for deriving the QCL value
2. (easy)To adopt the changes captured in the RRC CR for the field description of subCarrierSpacingCommon

### **Issue A6: whether define new value for maxSchedulingK0/2-SchedulingOffset**

For *minimumSchedulingOffsetK2*, *maxK2-SchedulingOffset* is 16.

minimumSchedulingOffsetK2-r16 SetupRelease { MinSchedulingOffsetK2-Values-r16 } OPTIONAL, -- Need M

MinSchedulingOffsetK2-Values-r16 ::= SEQUENCE (SIZE (1..maxNrOfMinSchedulingOffsetValues-r16)) OF INTEGER (0..maxK2-SchedulingOffset-r16)

Compared to SCS up to 120 kHz, the maximum value for K0/K2 with SCS 480 and 960 kHz increased from 32 to 128, i.e. by a factor of 4, the new *maxK2-SchedulingOffset* can be defined as 4\*16 = 64 for SCS 480 and 960 kHz.

The similar issue is also applicable to MinSchedulingOffsetK0.

***Q3:* do companies agree to adopt 64 for maxSchedulingK0/2-SchedulingOffset-r17 for SCS 480 and 960 kHz? If the answer is No, please suggest the other values when providing comments**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Huawei, HiSilicon | Yes+comments | The exact value 64 can be further checked with RAN1.  |
| Samsung | See comment | Higher value (e.g., 96; see our input on Q4-3) would be needed. Also fine to check with RAN1.  |
| Nokia | RAN1 needs to check this |  |

**Rapporteur summary**:

In total, there are 6 companies who have provided inputs. 3 out of 6 companies agree with the changes in the RRC CR, while 3 companies suggest to check the new value with RAN1.

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. (discussion) To adopt 64 for maxSchedulingK0/2-SchedulingOffset-r17 for SCS 480 and 960 kHz, FFS if need to check the value with RAN1

### **value range for preferred maximum bandwidth and preferred min K0/K2 scheduling offset in UAI**

**Preferred maximum bandwidth**

Current value range for the maximum bandwidth that is common for FR1 and FR2-1 is

ReducedAggregatedBandwidth ::= ENUMERATED {mhz0, mhz10, mhz20, mhz30, mhz40, mhz50, mhz60, mhz80, mhz100, mhz200, mhz300, mhz400}

At RAN4#100, the following was agreed:

**Agreement:** For intermediate CBWs between min and max CBWs,

* Integer multiples of the min CBW for each SCS
	+ 120 kHz: 100 MHz (min), 400 MHz (max)
	+ 480 kHz: 400 MHz (min), **800 MHz,** 1600 MHz (max)
	+ 960 kHz: 400 MHz (min), **800 MHz, 1600 MHz,** 2000 MHz (max)
* FFS whether 1200Mhz CBW is needed for 480KHz SCS and 960Khz SCS
* FFS whether 200MHz CBW is needed for 120KHz SCS

For FR2-1, the largest value corresponds to the maximum channel bandwidth. This could be similar for FR2‑2:

ReducedAggregatedBandwidth-r17 ::= ENUMERATED {mhz0, mhz100, mhz200, mhz400, mhz800, mhz1200, mhz1600, mhz2000}

***Q4-1:* do companies agree to introduce the maximum bandwidth values in the below for SCS 480 and 960 kHz? If the answer is No, please suggest the other values when providing comments**

*ReducedAggregatedBandwidth-r17 ::= ENUMERATED {mhz0, mhz100, mhz200, mhz400, mhz800, mhz1200, mhz1600, mhz2000}*

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Huawei, HiSilicon | Yes+comments | The exact bandwidth values can be further checked with RAN4.  |
| Samsung | Yes |  |
| Nokia | Yes but RAN4 needs to check |  |

**Rapporteur summary**:

All companies agree the proposed values in the CR, however there is 2 companies suggesting to check with RAN4 on the exact values.

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. (discussion) Agree to introduce the maximum bandwidth values in the below for SCS 480 and 960 kHz, FFS if need to check with RAN4
	1. *ReducedAggregatedBandwidth-r17 ::= ENUMERATED {mhz0, mhz100, mhz200, mhz400, mhz800, mhz1200, mhz1600, mhz2000}*

**Preferred min K0/K2 scheduling offset in UAI**

For Rel-16, the values for K0 and K2 range from 0-32. The value for Rel-17 was increased by a factor of 4, i.e. the new range is from 0-128.

For the preferred K0/K2 (range is identical for K0 and K2), the following can be indicated by the UE:

 preferredK2-r16 SEQUENCE {

 preferredK2-SCS-15kHz-r16 ENUMERATED {sl1, sl2, sl4, sl6} OPTIONAL,

 preferredK2-SCS-30kHz-r16 ENUMERATED {sl1, sl2, sl4, sl6} OPTIONAL,

 preferredK2-SCS-60kHz-r16 ENUMERATED {sl2, sl4, sl8, sl12} OPTIONAL,

 preferredK2-SCS-120kHz-r16 ENUMERATED {sl2, sl4, sl8, sl12} OPTIONAL

 } OPTIONAL

As a rule of thumb, values for SCS 480 kHz are scaled by a factor of 4 and values for CS 960 kHz are scaled by a factor of 8.

Thus, it is straightforward for Rapporteur to propose the following value ranges for 480 kHz and 960 kHz. Anyway, it is necessary to check companies’ views on the value range

Note: please specify the exact value range in case you don’t agree with the proposed value range.

***Q4-2:* do companies agree to adopt the following value range for m**inSchedulingOffsetPreference **in case of SCS 480 kHz (range is identical for K0 and K2), i.e., scaled by 4 compared to the existing value for 60/120 kHz SCS? If the answer is No, please suggest the other values when providing comments**

preferredK2-r17 SEQUENCE {

 preferredK2-SCS-480kHz-r17 ENUMERATED {sl8, sl16, sl32, sl48} OPTIONAL,

 }

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Samsung | Yes |  |
| Nokia | Yes |  |

***Q4-3:* do companies agree to adopt the following value range for minSchedulingOffsetPreference in case of SCS 960 kHz (range is identical for K0 and K2)?**

**Option 1: value of 120 kHz scaled by 8, i.e.,**

preferredK2-r17 SEQUENCE {

 preferredK2-SCS-960kHz-r17 ENUMERATED {sl16, sl32, sl64, sl96} OPTIONAL,

 }

**Option 2: value of 120 kHz scaled by 4, i.e.,**

preferredK2-r17 SEQUENCE {

 preferredK2-SCS-960kHz-r17 ENUMERATED {sl8, sl16, sl32, sl48} OPTIONAL,

 }

**Option 3: other, please suggest values**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | Option 2 | Option 2 seems enough, but option 1 is also acceptable. |
| Ericsson | Option 3 | For the preferred K0/K2 (range is identical for K0 and K2), the following can be indicated by the UE: preferredK2-r16 SEQUENCE { preferredK2-SCS-15kHz-r16 ENUMERATED {sl1, sl2, sl4, sl6} OPTIONAL, preferredK2-SCS-30kHz-r16 ENUMERATED {sl1, sl2, sl4, sl6} OPTIONAL, preferredK2-SCS-60kHz-r16 ENUMERATED {sl2, sl4, sl8, sl12} OPTIONAL, preferredK2-SCS-120kHz-r16 ENUMERATED {sl2, sl4, sl8, sl12} OPTIONAL } OPTIONALAs a rule of thumb, values for SCS 480 kHz are scaled by a factor of 4 and values for CS 960 kHz are scaled by a factor of 8.Thus, we propose the following value ranges for 480 kHz and 960 kHz. Specifically, for SCS 960 kHz, the value of sl96 seems to be over-dimensioned. preferredK2-r17 SEQUENCE { preferredK2-SCS-480kHz-r17 ENUMERATED {sl8, sl16, sl32, sl48} OPTIONAL, preferredK2-SCS-960kHz-r17 ENUMERATED {sl16, sl32, sl48, sl64} OPTIONAL } OPTIONAL |
| Intel | Option 2 | We also think Option 2 is enough but are also ok to go with Option 3 from Ericsson. |
| Huawei, HiSilicon | Option 2 | We think can follow R16 way of “grouping” that SCS 480kHz and SCS 960kHz have the same value range, as for 15/30 and 60/120.  |
| Samsung | Option 1 | Since the required processing time at the UE will not decrease that much even with the reduced slot time for 480/960kHz SCS, we prefer to support same amount of absolute time (i.e., 0.125ms \* 12sl = 1.5ms for 120kHz SCS) also for 480/960kHz. For that, the value set for 120kHz {sl2, sl4, sl8, sl12} can be used as baseline and scaled up by 4/8 times for 480/960kHz separately. (i.e., {sl 8, sl16, sl24, sl48} for 480 kHz and {sl16, sl32, sl48, sl96} for 960 kHz).However, we can also accept option 2 sharing the view with HW. |
| Nokia | Huawei proposal seems quite good |  |

**Rapporteur summary**:

For SCS 960 kHz, 4 companies agreed to adopt Option 2, while 1 company prefers Option 1, while 1 company prefers option 3. Rapporteur would like to follow the majority view, i.e., to adopt Option 2.

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. (easy) Adopt the following value range for minSchedulingOffsetPreference in case of SCS 480 kHz (range is identical for K0 and K2), i.e., scaled by 4 compared to the existing value for 60/120 kHz SCS
2. (discussion) Adopt the following value range for minSchedulingOffsetPreference in case of SCS 960 kHz (range is identical for K0 and K2), i.e., scaled by 4 compared to the existing value for 60/120 kHz SCS

### **Issue B3: new absolute periodicity and offset values for configured grant**

As described in [1], for configured grant, the periodicity [symbols] can be reused as is, and there is already an extension, *periodicityExt* which is used to derive the actual periodicity [symbols]. *periodicityExt* and *timeDomainOffset* [slots] can be scaled by a factor of 4 for 480 kHz SCS and by a factor of 8 for 960 kHz SCS to avoid unnecessarily large value ranges or many values in ENUMERATED.

Meanwhile, it is suggested to scale the values for both ***periodicity and periodicityExt*** *in [3],* therefore, rapporteur would like to check companies’ view.

***Q5-1:* do companies agree to support the new values for *periodicity in addition to periodicityExt in* ConfiguredGrantConfig?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | Yes |  |
| Ericsson | No | We think it is sufficient to only extend *periodicityExt* which is used to derive the actual periodicity [symbols]. *periodicityExt* and *timeDomainOffset* [slots] can be scaled by a factor of 4 for 480 kHz SCS and by a factor of 8 for 960 kHz SCS to avoid unnecessarily large value ranges or many values in ENUMERATED.While in order to minimize the spec change, we think no need to extend values for periodicity with SCS of 480 and 960 kHz, i.e., scale the existing values of 120 kHz by 4 and 8 for 480 and 960 kHz. |
| Intel | No | Agree with Ericsson. |
| Huawei, HiSilicon | No |  |
| Samsung | No |  |
| Nokia | No |  |

Regarding how to introduce the new values for SCS of 480 and 960 kHz, there are two different alternatives proposed by companies [1][2][3].

***Alternative 1:*** as proposed in the RRC CR and [1], legacy values are reused and scaled by a factor of 4 for 480 kHz and by a factor of 8 for 960 kHz to achieve the same absolute periodicities/offsets.

In this alternative, only field description needs to be updated, without the need to define a new field.

An example for this alternative is shown in the below

***periodicityExt***

This field is used to calculate the *periodicity* for UL transmission without UL grant for type 1 and type 2 (see TS 38.321 [3], clause 5,8.2). If this field is present, the field *periodicity* is ignored.

The following periodicites are supported depending on the configured subcarrier spacing [symbols]:

15 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 640.

30 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 1280.

60 kHz with normal CP: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 2560.

60 kHz with ECP: *periodicityExt*\*12, where *periodicityExt* has a value between 1 and 2560.

120 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 5120.

480 kHz: *periodicityExt*\*14\*4, where *periodicityExt* has a value between 1 and 5120.

960 kHz: *periodicityExt*\*14\*8, where *periodicityExt* has a value between 1 and 5120.

***timeDomainOffset***

Offset related to the reference SFN indicated by *timeReferenceSFN*, see TS 38.321 [3], clause 5.8.2.

The actual offset value is derived from the received value and depends on the configured subcarrier spacing [slots]:

15, 30, 60, 120 kHz: *timeDomainOffset*

480 kHz: 4\* *timeDomainOffset*

960 kHz: 8\* *timeDomainOffset*

**Alternative 2: define a new field specifying the extended values for SCS 480 and 960 kHz**

In this alternative, both field description and a new field need to be defined/updated.

An example for this alternative is shown in the below

***periodicityExt***

 periodicityExt-r17 INTEGER (1..40960) OPTIONAL, -- Need R

This field is used to calculate the periodicity for UL transmission without UL grant for type 1 and type 2 (see TS 38.321 [3], clause 5,8.2). If this field is present, the field *periodicity* is ignored.

The following periodicites are supported depending on the configured subcarrier spacing [symbols]:

15 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 640.

30 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 1280.

60 kHz with normal CP: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 2560.

60 kHz with ECP: *periodicityExt*\*12, where *periodicityExt* has a value between 1 and 2560.

120 kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 5120.

480kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 20480.

960kHz: *periodicityExt*\*14, where *periodicityExt* has a value between 1 and 40960.

timeDomainOffset-r17 INTEGER (5220..40959) OPTIONAL,..-- Need R

***timeDomainOffset***

Offset related to the reference SFN indicated by *timeReferenceSFN*, see TS 38.321 [3], clause 5.8.2.

If the field *timeDomainOffset*-r17 is present, the UE shall ignore the *timeDomainOffset* field (without suffix).

It is therefore necessary to check companies’ views on the alternatives.

***Q5-2: which alternative* do companies agree to adopt to support the new values for periodicity and offset in ConfiguredGrantConfig with SCS of 480 and 960 kHz?**

1. **Alternative 1**
2. **Alternative 2**

|  |  |  |
| --- | --- | --- |
| Company | Alternative | Comments |
| LGE | Alt 2 | Alt 2 seems more intuitive. |
| Ericsson | Alt 1 | As captured in the RRC CR, in order to minimize the spec changes (i.e., no need to define new field), we think it is better to adopt alternative 1. |
| Intel | Prefer Alt 1 |  |
| Huawei, HiSilicon | Alt 2, please companies check on the shortcoming of alt 1-> | For SCS 480/960, alt 1 can only schedule every 4/8 slots while for 120kHz and below, it can schedule any integer number of slots (which is the agreement in IIoT WI). We don’t think it is reasonable to add such restriction for SCS 480/960, only due to this signaling design. “Minimizing spec change” is secondary concern compared with this restriction on gNB scheduling.  |
| Samsung | Alt 2 | Alt 2 seems clearer and Alt 1 gives unnecessary limitation on the scheduling flexibility. |
| Nokia | Alt 2  | Alt 2 seems fine and avoid possible limiataiont as expressed by Huawei |

In addition, regardless alternative 1 or alternative 2 is chosen for CG periodicity, we need to check if the values in unit of symbol (i.e., 2/6/7 symbols) need to be supported for SCS of 480 and 960 kHz in addition the values in unit of slot. As indicated in [2], there is no strong motivation to support such short CG periodicities (i.e., values of symbols) in FR2-2. Therefore, it is necessary to check companies’ views on this question.

***Q5-3: Do companies agree whether to support CG* periodicity values in unit of symbol in addition to the values in unit of slot for SCS of 480 and 960 kHz?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Ericsson | No | It is sufficient to only support values of slots for **periodicity with SCS of 480 and 960 kHz** |
| Intel | No |  |
| Huawei, HiSilicon | No need | Also based on RAN1 agreement on PDSCH/PUSCH scheduling, the granularity is at least slot level for 480/960 KHz SCS.  |
| Samsung | No | Since there is no new latency requirement from new URLLC services, it seems sufficient to support only slot values for 480/960 kHz. |
| LGE | No |  |
| Nokia | No |  |

**Rapporteur summary**:

For Q5-1, 6 companies have provided inputs. 5 out of 6 companies to not support the new values for *periodicity in addition to periodicityExt in* ConfiguredGrantConfig. Rapporteur would like to follow the majority view and formulate the following proposal

1. (easy) Not to support the new values for periodicity in addition to periodicityExt in ConfiguredGrantConfig

For Q5-3, 6 companies have provided inputs, and all companies agree to only support the values in unit of slot for SCS of 480 and 960 kHz.

1. (easy) Only support CG periodicity values in the unit of slot for SCS of 480 and 960 kHz in ConfiguredGrantConfig

For Q5-2, 6 companies have provided inputs, 4 companies prefer Alternative 2, while 2 companies prefer Alternative 1. Rapporteur would like to follow the majority view, i.e., adopt Alternative 2.

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. (discussion) To define new fields specifying the extended values for periodicityExt and timeDomainOffset in case of SCS 480 and 960 kHz

### **Issue B4: new absolute periodicity and offset values for scheduling request**

As shown in the RRC CR,

SchedulingRequestResourceConfigExt-r17 ::= SEQUENCE {

 periodicityAndOffset-r17 CHOICE {

 sl1280 INTEGER (0..1279),

 sl2560 INTEGER (0..2559),

 sl5120 INTEGER (0..5119)

 }

}

***periodicityAndOffset***

SR periodicity and offset in number of symbols or slots (see TS 38.213 [13], clause 9.2.4) The following periodicities may be configured depending on the chosen subcarrier spacing:

SCS = 15 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 5sl, 8sl, 10sl, 16sl, 20sl, 40sl, 80sl

SCS = 30 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 8sl, 10sl, 16sl, 20sl, 40sl, 80sl, 160sl

SCS = 60 kHz: 2sym, 7sym/6sym, 1sl, 2sl, 4sl, 8sl, 16sl, 20sl, 40sl, 80sl, 160sl, 320sl

SCS = 120 kHz: 2sym, 7sym, 1sl, 2sl, 4sl, 8sl, 16sl, 40sl, 80sl, 160sl, 320sl, 640sl

SCS = 480 kHz: 1sl, 2sl, 4sl, 8sl, 16sl, 40sl, 80sl, 160sl, 320sl, 640sl, 1280sl, 2560sl

SCS = 960 kHz: 1sl, 2sl, 4sl, 8sl, 16sl, 40sl, 80sl, 160sl, 320sl, 640sl, 1280sl, 2560sl, 5120sl

[Editor’s note: 2\*4 = 8 symbols for 480 kHz is rounded to 1 slot]

For *SchedulingRequestResourceConfig,* the values in the ASN.1 provide the periodicity and offset values in slots. Here, it is better to extend the *SchedulingRequestResourceConfig* with larger values to avoid ambiguities with regard to the unit.

***Q6: In SchedulingRequestResourceConfig*, do companies agree to only adopt new values in the unit of slot to provide larger values for periodicityAndOffset (i.e., scale the legacy value of 120 kHz by 4 and 8 for SCS 480 and 960 kHz and skipping the values in unit of symbol)? If the answer is No, please suggest the other values when providing comments**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | Yes |  |
| Ericsson | Yes |  |
| Intel | Yes |  |
| Huawei, HiSilicon | Yes | Unlike CG/SPS scheduling, SR periodicity can scale with 4/8.  |
| Samsung | Yes |  |
| Nokia | Yes |  |

**Rapporteur summary**:

6 companies have provided inputs. All companies agree the proposed changes captured in the CR.

Rapporteur would like to try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. (easy) Adopt new values captured in the RRC CR for periodicityAndOffset (i.e., scale the legacy value of 120 kHz by 4 and 8 for SCS 480 and 960 kHz while skipping the values in the unit of symbol)

### **Issue B5: new DRX timer values**

**As described in [2], f**or DRX function, the configuration of some DRX parameters are related to the numerology. For example, for *drx-HARQ-RTT-TimerDL* and *drx-HARQ-RTT-TimerUL*, the values are in number of symbols, and the maximum value is 56. Take *drx-HARQ-RTT-TimerDL* as an example, it means the minimum duration before a DL assignment for HARQ retransmission is expected. The MAC entity will start the timer for a HARQ process in the first symbol after the end of the transmission carrying DL HARQ feedback. On the expiry of *drx-HARQ-RTT-TimerDL*, the UE shall start *drx-RetransmissionTimerDL* and be in DRX active time to monitor PDCCH occasions for possible retransmission scheduling for the failed downlink transmission. The gNB shall configure such parameter based on its processing capability, for example, how much time is needed to process the HARQ feedback and schedule retransmission grant if necessary. It seems the process time length is not related to the specific numerology adopted for transmission.

When a higher SCS is introduced, the length of a symbol is shortened. If we keep the current values for *drx-HARQ-RTT-TimerDL* and *drx-HARQ-RTT-TimerUL*, the UE may need to wake up earlier than needed, which is not favourable for UE’s power saving.

If the processing capability of the gNB remains the same, a higher value for *drx-HARQ-RTT-TimerDL* and *drx-HARQ-RTT-TimerUL* in the unit of symbol shall be introduced. Currently, the maximum SCS for data channel is 240 KHz, and *drx-HARQ-RTT-TimerDL* can take a value from 0 to 56. When 480 KHz and 960 KHz are introduced, we suggest that the maximum value of *drx-HARQ-RTT-TimerDL* can be extended to 224.

Therefore, it is necessary to check companies’ views on this issue.

***Q7-1: Do companies agree to* introduce new values for DRX parameters for SCS of 480 and 960 kHz, for *drx-HARQ-RTT-TimerDL* and *drx-HARQ-RTT-TimerUL*?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| LGE | No |  |
| Ericsson | No |  |
| Intel | No |  |
| Huawei, HiSilicon | Yes | We think the “earlier wake-up” issue is obvious and the needed change (added values) is minimum.  |
| Samsung | Yes | Although it seems an optimization issue, we agree with the motivation. |
| Nokia | no |  |

***Q7-2: If the answer of Q7-1 is yes, what values do companies agree to* introduce for DRX parameters *drx-HARQ-RTT-TimerDL* and *drx-HARQ-RTT-TimerUL in case of SCS 480 and 960 kHz*?**

|  |  |  |
| --- | --- | --- |
| Company | Yes or No | Comments |
| Huawei, HiSilicon |  | 112, 224 |
| Samsung | See comment | Since the 240 kHz SCS is only applicable to the synchronisation signal/PBCH Blocks, currently the maximum SCS used for application data with HARQ feedback is 120kHz. Thus, the legacy value 56 should be scaled up by 8 times for 960kHz. (i.e., the value can be extended to 448.) |
|  |  |  |
|  |  |  |

**Rapporteur summary**:

5 companies have provided inputs, while 4 companies don’t agree to introduce new values for DRX parameters for SCS of 480 and 960 kHz, for drx-HARQ-RTT-TimerDL and drx-HARQ-RTT-TimerUL. Rapporteur thinks the issue can be categorized as optimization, and therefore, can be left to be addressed to the maintenance phase.

Rapporteur would like to follow the majority view and try to reach at least a consensus about the above highlighted points and thus would like to suggest:

1. (discussion) RAN2 to confirm to not introduce new values for DRX parameters for SCS of 480 and 960 kHz, for drx-HARQ-RTT-TimerDL and drx-HARQ-RTT-TimerUL.

# Conclusion

We have the following proposal:

[Proposal 1 (easy) Only adopt the new value 0.01ms for maxPUSCH-Duration for FR2-2](#_Toc97022848)

[Proposal 2 (easy)To confirm that the field description for subCarrierSpacingCommon needs to be clarified that only for operation with shared spectrum channel access, this field is used for deriving the QCL value](#_Toc97022849)

[Proposal 3 (easy)To adopt the changes captured in the RRC CR for the field description of subCarrierSpacingCommon](#_Toc97022850)

[Proposal 4 (discussion) To adopt 64 for maxSchedulingK0/2-SchedulingOffset-r17 for SCS 480 and 960 kHz, FFS if need to check the value with RAN1](#_Toc97022851)

[Proposal 5 (discussion) Agree to introduce the maximum bandwidth values in the below for SCS 480 and 960 kHz, FFS if need to check with RAN4](#_Toc97022852)

[a. *ReducedAggregatedBandwidth-r17 ::= ENUMERATED {mhz0, mhz100, mhz200, mhz400, mhz800, mhz1200, mhz1600, mhz2000}*](#_Toc97022853)

[Proposal 6 (easy) Adopt the following value range for minSchedulingOffsetPreference in case of SCS 480 kHz (range is identical for K0 and K2), i.e., scaled by 4 compared to the existing value for 60/120 kHz SCS](#_Toc97022854)

[Proposal 7 (discussion) Adopt the following value range for minSchedulingOffsetPreference in case of SCS 960 kHz (range is identical for K0 and K2), i.e., scaled by 4 compared to the existing value for 60/120 kHz SCS](#_Toc97022855)

[Proposal 8 (easy) Not to support the new values for periodicity in addition to periodicityExt in ConfiguredGrantConfig](#_Toc97022856)

[Proposal 9 (easy) Only support CG periodicity values in the unit of slot for SCS of 480 and 960 kHz in ConfiguredGrantConfig](#_Toc97022857)

[Proposal 10 (discussion) To define new fields specifying the extended values for periodicityExt and timeDomainOffset in case of SCS 480 and 960 kHz](#_Toc97022858)

[Proposal 11 (easy) Adopt new values captured in the RRC CR for periodicityAndOffset (i.e., scale the legacy value of 120 kHz by 4 and 8 for SCS 480 and 960 kHz while skipping the values in the unit of symbol)](#_Toc97022859)

[Proposal 12 (discussion) RAN2 to confirm to not introduce new values for DRX parameters for SCS of 480 and 960 kHz, for drx-HARQ-RTT-TimerDL and drx-HARQ-RTT-TimerUL.](#_Toc97022860)

## Proposals in priority order

For block approval

[Proposal 1 (easy) Only adopt the new value 0.01ms for maxPUSCH-Duration for FR2-2](#_Toc97022848)

[Proposal 2 (easy)To confirm that the field description for subCarrierSpacingCommon needs to be clarified that only for operation with shared spectrum channel access, this field is used for deriving the QCL value](#_Toc97022849)

[Proposal 3 (easy)To adopt the changes captured in the RRC CR for the field description of subCarrierSpacingCommon](#_Toc97022850)

[Proposal 6 (easy) Adopt the following value range for minSchedulingOffsetPreference in case of SCS 480 kHz (range is identical for K0 and K2), i.e., scaled by 4 compared to the existing value for 60/120 kHz SCS](#_Toc97022854)

[Proposal 8 (easy) Not to support the new values for periodicity in addition to periodicityExt in ConfiguredGrantConfig](#_Toc97022856)

[Proposal 9 (easy) Only support CG periodicity values in the unit of slot for SCS of 480 and 960 kHz in ConfiguredGrantConfig](#_Toc97022857)

[Proposal 11 (easy) Adopt new values captured in the RRC CR for periodicityAndOffset (i.e., scale the legacy value of 120 kHz by 4 and 8 for SCS 480 and 960 kHz while skipping the values in the unit of symbol)](#_Toc97022859)

For discussion

[Proposal 5 (discussion) Agree to introduce the maximum bandwidth values in the below for SCS 480 and 960 kHz, FFS if need to check with RAN4](#_Toc97022852)

[a. *ReducedAggregatedBandwidth-r17 ::= ENUMERATED {mhz0, mhz100, mhz200, mhz400, mhz800, mhz1200, mhz1600, mhz2000}*](#_Toc97022853)

[Proposal 4 (discussion) To adopt 64 for maxSchedulingK0/2-SchedulingOffset-r17 for SCS 480 and 960 kHz, FFS if need to check the value with RAN1](#_Toc97022851)

[Proposal 7 (discussion) Adopt the following value range for minSchedulingOffsetPreference in case of SCS 960 kHz (range is identical for K0 and K2), i.e., scaled by 4 compared to the existing value for 60/120 kHz SCS](#_Toc97022855)

[Proposal 10 (discussion) To define new fields specifying the extended values for periodicityExt and timeDomainOffset in case of SCS 480 and 960 kHz](#_Toc97022858)

[Proposal 12 (discussion) RAN2 to confirm to not introduce new values for DRX parameters for SCS of 480 and 960 kHz, for drx-HARQ-RTT-TimerDL and drx-HARQ-RTT-TimerUL.](#_Toc97022860)

# Reference

1. [R2-2202434](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202434.zip)[M](http://mannerheim.nomadiclab.com/Mannerheim/tdoc/R2-2202434)[Remaining RRC aspects](https://ericsson.sharepoint.com/R2-2202434.zip), Ericsson
2. R2-2202710[M](http://mannerheim.nomadiclab.com/Mannerheim/tdoc/R2-2202710)[Discussion about RAN2 impacts of Ext 52-71GHz](https://ericsson.sharepoint.com/R2-2202710.zip)M, Huawei, **HiSilicon**
3. [R2-2203418](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203418.zip)[M](http://mannerheim.nomadiclab.com/Mannerheim/tdoc/R2-2203418)[CP open issues for RRC CR Extending NR operation to 71GHz](https://ericsson.sharepoint.com/R2-2203418.zip) **ZTE Corporation, Sanechips.**

# Appendix