**3GPP TSG-RAN WG2 Meeting #109bis-e R2-200xx**

**20-24 April 2020**

**Agenda item: 6.**

**Source: Qualcomm Incorporated**

**Title: Report of [Post109e#38][NR-U] RRC open issues (Qualcomm)**

**Document for: Discussion and decision**

# Introduction

The following email discussion was agreed in RAN2#109e to discuss the current and possibly new open issues in RRC:

* [Post109e#38][NR-U] RRC open issues (Qualcomm)

Address known stage-3 remaining open issues from 109e for 38.331 and update E-UTRAN (36.331) with relevant agreements and any open issues that need to be discussed

Capture identified NEW, if any, stage-3 corrections/issues.  Issues that have already been discussed and not pursued should not be brought up again.

**Intended outcome:** Agreable proposals.  CR for 38.331 addressing open issues and CR for 36.331 (including editorials received offline) (Deadline above)

 **Intended outcome 2**: Open Issues list with RRC impact (April 1)

This report captures the outcome of the discussion on the above issues with proposals for resolution. In addition, based on the endorsed ASN.1 review plan in R2-2001709, for each issue, the following will be captured:

*WI Rapporteurs produces a list of known open issues that has RRC impact, by email on the R2 reflector after R2 109e. For each issue, expected RRC impact shall be listed if possible. For each known open issue, WI rapporteur should suggest if to treat WI open issue in the scope of the ASN.1 review or not. Some guidance:*

* + 1. *Issues isolated to procedure text or ASN.1 specific to the WI could be handled in WI-specific CR*
		2. *Issues with impact on other WIs and/or legacy (Rel-15) procedure text or ASN.1 should be handled in ASN.1 review.*

# Changes needed due to new RAN1 agreements

RAN1#100e has made several agreements which impact RRC. These are discussed in this section.

Note that there are still RAN1 parameters with FFS values which will need further decision by RAN1. These are captured in Annex 3 as a reference.

Also, RAN2 has changed the names of several RAN1 parameteres to comply with ASN.1 guidelines. These are captured in Annex 2 as a reference.

All the issues in this section will be addressed in the WI specific CR but not in the ASN.1 review.

### Issue A1: Clarification of SS/PBCH

RAN1 has agreed on further clarifications relaed to the SS/PBCH block index and sent an LS to RAN2 (and RAN4) in R1-2001357. The LS text is included in Annex 1 for reference. In this LS, RAN1 suggested several changes to the field descriptions of *ssb-PositionsInBurst* and *mediumBitmap* as follows:

|  |
| --- |
| *ServingCellConfigCommon* field descriptions |
| ***ssb-PositionsInBurst***For operation without shared spectrum channel access, i~~I~~ndicates the time domain positions of the transmitted SS-blocks in a half frame with SS/PBCH blocks as defined in TS 38.213 [13], clause 4.1. The first/ leftmost bit corresponds to SS/PBCH block index 0, the second bit corresponds to SS/PBCH block index 1, and so on. Value 0 in the bitmap indicates that the corresponding SS/PBCH block is not transmitted while value 1 indicates that the corresponding SS/PBCH block is transmitted. The network configures the same pattern in this field as in the corresponding field in ServingCellConfigCommonSIB.For operation with shared spectrum channel access, only mediumBitmap is used, and as described in the TS 38.213 [13], clause 4.1, UE assumes that one or more SS/PBCH blocks indicated by ssb-PositionsInBurst may be transmitted within the discovery burst transmission window and have candidate SS/PBCH blocks indexes corresponding to SS/PBCH block indexes provided by ssb-PositionsInBurst. If MSB $k$, $k\geq 1$, of ssb-PositionsInBurst is set to 1, the UE assumes that one or more SS/PBCH blocks within the discovery burst transmission window with candidate SS/PBCH block indexes corresponding to SS/PBCH block index equal to $k-1$ may be transmitted; if MSB $k$ is set to 0, the UE assumes that the corresponding SS/PBCH block(s) are not transmitted. The UE expects that a bit at position k > ssb-PositionQCL-Relationship-16 is 0, and the number of actually transmitted SS/PBCH blocks equal to the number of 1’s in the bitmap. The network configures the same pattern in this field as in the corresponding field in ServingCellConfigCommonSIB. |

|  |
| --- |
| *ServingCellConfigCommonSIB* field descriptions |
| ***ssb-PositionsInBurst***Time domain positions of the transmitted SS-blocks in an SS-burst as defined in TS 38.213 [13], clause 4.1. For operation with shared spectrum channel access, only mediumBitmap is used, and UE interpret this field the same as in the corresponding field in ServingCellConfigCommon. |

|  |
| --- |
| *SSB-ToMeasure* field descriptions |
| ***mediumBitmap***Bitmap when maximum number of SS/PBCH blocks per half frame equals to 8 as defined in TS 38.213 [13], clause 4.1.For operation with shared spectrum channel access, a bit set to 1 at position k (indexing starts at 1) in the bitmap indicates SS/PBCH block index k-1. A UE can derive the time domain positions of the candidate SS/PBCH blocks within the SMTC measurement duration based on this bitmap. From a value 0 at position k in the bitmap, the UE can derive the candidate SS/PBCH block(s) with index corresponding to the SS/PBCH block index k-1 are not to be measured, while from a value 1 at position k in the bitmap, the UE can derive the candidate SS/PBCH block(s) with index corresponding to the SS/PBCH block index k-1 are to be measured. |

Note that these parts of the suggested changes in *ssb-PositionsInBurst* were already in the RRC CR:

 For operation with shared spectrum channel access, only mediumBitmap is used, and as described in the TS 38.213 [13], clause 4.1.

The UE expects that a bit at position k > ssb-PositionQCL-Relationship-16 is 0,

**Question A1a: Do you agree to the suggested changes by RAN1 in the LS R1-2001357? If not, please provide justification and alternative text if applicable.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | Yes |  |
| **ZTE** | Yes,but | For *ServingCellConfigCommonSIB* field description, inOneGroup should be used instead of mediumBitmap. |
| **Samsung** | Yes | Agree with ZTE |
| **MediaTek** | Yes |  |
| **CMCC** | Yes |  |

**Summary:**

**Proposal .**

**Question A1b: Do you think any additional changes to RRC are needed in regards to the RAN1 agreements on this?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | No |  |
| **ZTE** | No |  |
| **Samsung** | No |  |
| **MediaTek** | No |  |
| **CMCC** | No |  |

**Summary:**

**Proposal .**

### Issue A2: COT duration parameters

RAN1#100e had the following agreements on COT duration:

|  |
| --- |
| Agreement:The length of each COT duration indicator is not configured explicitly by RRC, but is derived from the number X of values configured in the co-DurationList-r16, e.g. length=ceil[log2(X)].Agreement:The size of the list of configured channel occupancy durations for a serving cell (in the field co-DurationList-r16) can range from 1 to 64 channel occupancy duration values (co-Duration-r16).Agreement:The value for a single channel occupancy duration value (co-Duration-r16) can range from 0 to 20 ms with a granularity of one symbol. |

Based on these agreements, the following changes are needed in the RRC:

1. Add field description for *co-DurationList-r16* which states that “The UE determines the length of the COT duration indicator based on the number of entries in the *co-DurationList-r16”.*
2. Replace ffsValue with 64 in:

co-DurationList-r16 SEQUENCE (SIZE(1..ffsValue)) OF CO-Duration-r16 -- FFS size upper limit 64

1. Replace ffsValue below with 1120 to support 20ms duration (the new upper limit is changed from 560 to 1120 as it is needed for SCS 60Khz):

CO-Duration-r16 ::= INTEGER (0..ffsValue) -- FFS upper limit 560

**Question A2: Do you agree with the above changes to implement the RAN1 agreements on COT duration? If not, please provide justification and suggestions.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | Yes |  |
| **ZTE** | Yes |  |
| **Samsung** | Yes |  |
| **MediaTek** | Yes |  |
| **CMCC** | Yes |  |

**Summary:**

**Proposal .**

### Issue A3: Search space switching

RAN1#100e had the following agreements on search space switching:

|  |
| --- |
| Agreement:Higher layer parameter searchSpaceSwitchingTimer can take values in the range of 1 to 20 ms.Agreement:For processing times for search space switching, P1 and P2 have the same value. |

Based on these agreements, the following changes are suggested in the RRC:

1. Replace ffsValue below with 80 (maximum needed for 20ms with SCS of 60khz):

searchSpaceSwitchingTimer-r16 INTEGER (1..ffsValue)

1. Put in the field description of *searchSpaceSwitchingTimer* that “For 15 KHz SCS, {1..20} are valid. For 30KHz SCS, {1..40} are valid. For 60Khz SCS, {1..80} are valid. Note that this is in slots as used in 38.213.

**Question A3: Do you agree with the above changes to implement the RAN1 agreements on search space switching? If not, please provide justification and suggestions.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | Yes |  |
| **ZTE** | Yes |  |
| **Samsung** | Yes |  |
| **MediaTek** | Yes |  |
| **CMCC** | Yes |  |

### Issue A4: CP extension

RAN1#100e had the following agreements on CP extension:

|  |
| --- |
| Agreement:For UL transmissions prior to dedicated RRC configuration or in CBRA, C2 and C3 before RRC configuration are set to the maximum integers which satisfy following:* C2\*symbol length – 16 us – TA < symbol length
* C3\*symbol length – 25 us – TA < symbol length

Agreement:The value ranges for C2 and C3 are updated as follows:* C2 values
	+ 1, 2, 3, .. , 28 for 15/30 kHz SCS
	+ 2, 3, .., 28 for 60 kHz SCS
* C3 values
	+ 1, 2, 3, .. , 28 for 15 kHz SCS
	+ 2, 3, .. , 28 for 30 kHz SCS
	+ 3, 4, .. , 28 for 60 kHz SCS
 |

The agreement which impacts RRC are the new range of values for C2 and C3. The existing field description in the NR-U CR is as follows:

***cp-ExtensionC2, cp-ExtensionC3***

Configures the cyclic prefix (CP) extension (see TS 38.211 [16], clause 5.3.1). For 15 and 30KHz SCS, {1..28} are valid. For 60KHz SCS, {2..28} are valid.

Based on these agreements, the following changes are needed in the field description of these IEs:

Configures the cyclic prefix (CP) extension (see TS 38.211 [16], clause 5.3.1). For 15 KHz SCS, {1..28} are valid. For 30Khz SCS, {1..28} are valid for *cp-ExtensionC2* and{2..28} are valid for *cp-ExtensionC3.* For 60KHz SCS, {2..28} are valid for *cp-ExtensionC2* and{3..28} are valid for *cp-ExtensionC3*.

**Question A4: Do you agree with the above changes to implement the RAN1 agreements on new value ranges for *cp-ExtensionC2* and *cp-ExtensionC3*? If not, please provide justification and suggestions.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | Yes |  |
| **ZTE** | Yes |  |
| **Samsung** | Yes |  |
| **MediaTek** | Yes |  |
| **CMCC** | Yes |  |

**Summary:**

**Proposal .**

### Issue A5: RMTC configuration

RAN1#100e had the following agreements on RMTC configuration:

|  |
| --- |
| Agreement:The RMTC-Config can indicate a reference SCS and CP as one of {15 kHz, 30 kHz, 60 kHz-NCP, 60 kHz-ECP}Agreement:The L1 averaging duration of RSSI measurements (within a configured measurement duration) is limited to 1 OFDM symbol of a configured reference subcarrier spacing.Agreement:Keep value range for rmtc-Period-r16 and rmtc-SubframeOffset-r16 the same as for LTE-LAA.Agreement:Keep value range for rssi-Result-r16 and channelOccupancyThreshold-r16 the same as for LTE-LAA and inform RAN2 of this decision.Agreement:For RSSI (and channel occupancy measurements) layer 3 filtering is not applied. |

For *rssi-Result-r16* and *channelOccupancyThreshold-r16*, the RAN1 recommendation is to keep the same values as LTE LAA. However, in LTE LAA, these are integer values which are determined by the table in RAN4 LTE specs as follows.

-- ASN1START

RSSI-Range-r13 ::= INTEGER(0..76)

-- ASN1STOP

MeasRSSI-ReportConfig-r13 ::= SEQUENCE {

 channelOccupancyThreshold-r13 RSSI-Range-r13 OPTIONAL -- Need OR

}

MeasResultForRSSI-r13 ::= SEQUENCE {

 rssi-Result-r13 RSSI-Range-r13,

 channelOccupancy-r13 INTEGER (0..100),

 ...

}

The RAN1 agreement above was based on the contribution R1-2000827 and it seems that RAN1 was assuming RAN4 would agree to the same table as follows:

Another item that is FSS in the running CR for 38.331 and where RAN2 needs RAN1 input is the value range for *rssi-Result-r16* and *channelOccupancyThreshold-r16*. Both of these fields are inherited from LTE-LAA and have the value range INTEGER(0..76). The value is then mapped to dBm based on Table 9.1.18.5.1-1 in 36.133. Given that the RSSI measurement is defined in the same way for NR as for LTE-LAA, we see no reason to change the value range.

Such a table is not available for NR-U yet. Since RAN4 is still discussing this, it is prudent to wait for their conclusion.

Based on the aboave agreements, the following changes to the RRC are suggested:

1. Introduce a new IE in RMTC-Config called *ref-SCS-CP* with the values of {15 kHz, 30 kHz, 60 kHz-NCP, 60 kHz-ECP}.
2. Remove the Editor’s Note on L3 filtering for RSSI
3. Wait for RAN4 conclusion on actual values for *rssi-Result-r16* and *channelOccupancyThreshold-r16* before introducing the indices corresponding to RAN4 table

**Question A5: Do you agree with the above changes to implement the RAN1 agreements on RMTC configuration? If not, please provide justification and suggestions.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | Yes |  |
| **ZTE** | Yes |  |
| **Samsung** | Yes |  |
| **MediaTek** | Yes |  |
| **CMCC** | Yes |  |

**Summary:**

**Proposal .**

### Issue A6: Configured Grant

RAN1#100e had the following agreements on Configured Grant parameters:

|  |
| --- |
| Agreement:The value range for cg-nrofSlots-r16 is {1, 2, …, 40} slotsAgreement:Value ranges for cg-minDFIDelay-r16 in symbols with the step size of [14] symbols except for the first two values for different SCS are {[7], [14], [28], …, M} where M is as follows:* 1 \*4 \* 14 = 56 (symbols)} for 15 kHz SCS
* 2 \* 4 \* 14 = 112 (symbols)} for 30 kHz SCS
* 4 \* 4 \* 14 = 224 (symbols) for 60 kHz SCS

Agreement:For values of CP extension 7 possible starting positions are introduced* The indices to 7 possible starting positions will be specified
* A UE is configured with indices to values from the indices to the 7 values.

Agreement:The set of Beta-offset values used for CG-UCI is the same as the set of Beta-offset values used for HARQ-ACK* When CG-UCI is jointly encoded with HARQ, use the Beta-offset values configured for HARQ-ACK
 |

These agreements impact the following IEs:

 cg-minDFI-Delay-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R Upper limit 7 FFS

 cg-nrofSlots-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R

 cg-StartingFullBW-InsideCOT-r16 ENUMERATED (ffs) OPTIONAL, -- Need R

 cg-StartingFullBW-OutsideCOT-r16 ENUMERATED (ffs) OPTIONAL, -- Need R

 cg-StartingPartialBW-InsideCOT-r16 ENUMERATED (ffs) OPTIONAL, -- Need R

 cg-StartingPartialBW-OutsideCOT-r16 ENUMERATED (ffs) OPTIONAL, -- Need R

 betaOffsetCG-UCI-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R

For the cg-startingXX IEs which point to CP extension, the agreement is to have an index to 7 possible values. Therefore INTEGER (0..6) is reasonable. However, 38.214 Section 6.1.2.3 refers to a “set of values” for FullBW case where the UE picks one randomly within the set and a single value for “PartialBW” case. Therefore, a sequence of FFS size for FullBW can be introduced at this point.

For *betaOffsetCG-UCI*, the RAN1 agreement is to use the same values as HARQ-ACK. The *BetaOffsets* IEs in RRC are all of INTEGER (0..31) and map to the Table 9.3-1 in 38.213. Therefore, the same range should be used for *betaOffsetCG-UCI.*

Based on these agreements, the following changes are suggested:

1. Change the value range for *cg-nrofSlots-r16* to {1,2, ..., 40}
2. Change the value range for *cg-minDFIDelay-r16* to ENUMERATED {sym7, sym1x14, sym2x14, sym3x14, sym4x14, sym5x14, sym6x14, sym7x14, sym8x14, sym9x14, sym10x14, sym11x14, sym12x14, sym13x14, sym14x14} and introduce additional text in the field description as:

***cg-minDFIDelay***

Indicates the minimum duration (in unit of symbols) from the ending symbol of the CG-PUSCH to the starting symbol of the DFI carrying HARQ-ACK for that PUSCH. UE assumes HARQ-ACK is valid only for PUSCH transmissions ending before n - cg-minDFIDelay-r16, where n is the time corresponding to the beginning of the start symbol of the DFI (see TS 38.213 [13], clause 10.3).

The following minimum delay values are supported depending on the configured subcarrier spacing [symbols]:

15 kHz: 7, n\*14, where n={1, 2, 3, 4}

30 kHz: 7, n\*14, where n={1, 2, 3, 4, 5, 6, 7, 8}

60 kHz: 7, n\*14, where n={1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14}

1. Change the value ranges as follows:

 *cg-StartingPartialBW-InsideCOT-r16* and *cg-StartingPartialBW-OutsideCOT-r16* to to INTEGER (0..6)

 *cg-StartingFullBW-InsideCOT-r16* and *cg-StartingFullBW-OutsideCOT-r16*r to SEQUENCE (SIZE (1..ffsValue)) OF INTEGER (0..6)

1. Change the ffsValue in *betaOffsetCG-UCI-r16* value range to 31

**Question A6: Do you agree with the above changes to implement the RAN1 agreements on configured grant parameters? If not, please provide justification and suggestions.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | Yes | Some editorials:1. There are 2 ‘n’ s in the field description. Perhaps we could change one to ‘m’ …2. 7,n\*14 is a range, so, it should look something like below:15 kHz: {7,.., n\*14}, where n={1, 2, 3, 4}30 kHz: {7, …, n\*14}, where n={1, 2, 3, 4, 5, 6, 7, 8}60 kHz: {7, …, n\*14}, where n={1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14}Alternatively we could just provide the range without using n (which would also solve the issue with 1. above).3. 60 kHz: {7, …, n\*14}, where n={1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14} is missing 2 values 15 and 16 to go to M=224 |
| **ZTE** | Yes, but | For cg-minDFIDelay, two values are missing. Firstly, the value range of *cg-minDFIDelay-r16* should be ENUMERATED {sym7, sym1x14, sym2x14, sym3x14, sym4x14, sym5x14, sym6x14, sym7x14, sym8x14, sym9x14, sym10x14, sym11x14, sym12x14, sym13x14, sym14x14, sym15x14, sym16x14 }. Secondly, for the field description, when 60kHz is used, the value range of n should be {1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16}. |
| **Samsung** | Yes | Agree with Intel and ZTE. |
| **MediaTek** | Yes | We agree with ZTE that two values “sym15x14”, “sym16x14” are missing in the value range of *cg-minDFIDelay-r16* and field description should include “15” and “16”.  |
| **CMCC** | Yes | Agree with Intel and ZTE on the editorials and missing values. |

**Summary:**

**Proposal .**

# Open issues from RAN2#109e

These are issues which were not resolved in RAN2#109e due to limited discussion and/or captured in the NR-U RRC CR (R2-2001981) as FFS.

All the issues in this section will be addressed in the WI specific CR but not in the ASN.1 review.

### Issue B1: Signaling of intra-cell guard bands

RAN2#109e has discussed the signaling of guard bands and agreed on the following:

1. The guard bands for a cell are signalled by using a starting index and length for each guard band, only when the network wants to configure it.

*(FFS – move to offline) RAN2 should further discuss the signalling for the cases when there is no guard band, when RAN4 specs should be used, and when/if the UE does not support guard bands.*

This is captured in the CR as follows for the case RRC signals an actual guard band:

IntraCellGuardBand-r16 ::= SEQUENCE (SIZE (1..ffsValue)) OF GuardBand-r16 -- FFS upper size 4, assuming 100Mhz cell

GuardBand-r16 ::= SEQUENCE {

 startCRB-r16 INTEGER (0..ffsValue), --FFS upper range 275

 nrofCRBs-r16 INTEGER (1..ffsValue)

}

Several options have come up during the email discussion on how to signal the default case (when RAN4 specs are used) and when there is “no guard band” (e.g. 20Mhz).

During the email discussion in RAN2#109e, there was no resolution to this issue as there was no real majority for any of the options.

To recap the issue, these are the two intra-cell guard options which need to be signaled:

1. No guard band (e.g. 80 Mhz cell without any guards between each 20 Mhz sub-band)
2. Instead of the guard bands explicitly provided via RRC, RAN4 specs should be used instead (will be called “default” case)

One company brought up the possibility that the UE may not support guard bands. However, such an option is missing in the ongoing UE features discussion in RAN1 and therefore will not be addressed here; in other words, it is assumed that it is mandatory for the NR-U capable UE to support guard bands.

To simplify the discussion, we can focus on the three options:

**Option 1:** Explicit IE for “no guard band”; “default” if signaling is absent

**Option 2:** Explicit IE for “default”, “no guard band” if signaling is absent

**Option 3:** Explicit IEs for both “no guard band” and “default”

Note that the explicit IEs can just be NULL when using a CHOICE structure between them and the agreed IE of *IntraCellGuardBand-r16*.

**Question B1: Please provide which option you prefer for the signaling of no guard and default for intra-cell guard bands.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | Option 2 | This is more aligned with the existing RRC signalling, where default is provided via a CHOICE while absent indicates no configuration. |
| **ZTE** | Option1 |  |
| **Samsung** | Option 2 | Agree with Intel that absent can be used for release of the configuration. |
| **MediaTek** | Option 2 | We agree with Intel. |
| **CMCC** | Option 2 | Agree with Intel. |

**Summary:**

**Proposal .**

### Issue B2: Multi-TTI grant

In RAN2#100e, there were some papers on implementing multi-TTI grant but this topic was skipped due to limited input and time as well as to wait for conclusion in RAN1.

RAN1 had the following agreements on this:

|  |
| --- |
| **RAN1#98bis**Agreement:For signaling the number of scheduled PUSCHs and TDRA in one DCI scheduling multiple PUSCHs, the TDRA table is extended such that each row indicates multiple PUSCHs (continuous in time-domain)* Alt. 1: Each PUSCH has a separate SLIV and mapping type. The number of scheduled PUSCHs is signalled by the number of indicated valid SLIVs in the row of the TDRA table signalled in DCI.
	+ FFS: Separate k2
* Alt. 2:
	+ A separate SLIV for
		- the starting slot,
		- the ending slot
	+ The slots in between have a SLIV of S=0, L=14
	+ A separate mapping type for
		- the starting slot,
		- the ending slot,
		- the slots in between (a single mapping type for all of them)
	+ The total number of PUSCHs for the row.
* FFS: Extension to non-contiguous PUSCHs

**RAN1#99**Agreement:* The TDRA table configuration allows indicating single or multiple continuous PUSCHs in any slot of the multiple scheduled slots
* For signaling the number of scheduled PUSCHs and TDRA in one DCI format 0\_1 scheduling multiple PUSCHs, the TDRA table is extended such that each row indicates multiple PUSCHs (continuous in time-domain)
	+ Each PUSCH has a separate SLIV and mapping type. The number of scheduled PUSCHs is signalled by the number of indicated valid SLIVs in the row of the TDRA table signalled in DCI.
* Note: For the fallback DCI, Rel-15 TDRA table is used

Agreement:For scheduling multiple PUSCHs by a single DCI Format 0\_1:* The same DCI Format 0\_1 can schedule a single PUSCH or multiple PUSCHs
* Maximum number of PUSCHs that can be configured in a row of the TDRA table: 8
* The number of NDI bits and RV bits in DCI format 0\_1 is determined based on the configured TDRA table
	+ 1 RV bit per PUSCH in case multiple PUSCHs are scheduled
	+ 2 RV bits for the PUSCH in case only a single PUSCH is scheduled

**RAN1#100e (based on R1-200170)**Agreement:* TS38.214 and TS38.212 editors to implement the missing RAN1#97 agreement:
	+ *HARQ process ID signaled in the DCI applies to the first scheduled PUSCH. HARQ process ID is then incremented by 1 for subsequent PUSCHs in the scheduled order (with modulo operation as needed)*
* The corresponding ordering of bits in RV and NDI fields also needs to be specified for the multiple PUSCHs, taking into account BWP switching where MSB are added with zeros.
 |

The agreements in RAN#99 show that the first alternative in RAN2#98bis (Alt-1) has been chosen as the solution. RAN1#100e agreements have no impact on RRC since they are all related to PHY level signalling.

The relevant part in 38.214 v16.0.0 (Section 6.1.2.1) which can impact RRC signalling is the following:

If *pusch-TimeDomainAllocationList* in *pusch-Config* contains row indicating resource allocation for two to eight contiguous PUSCHs, *K2* indicates the slot where UE shall transmit the first PUSCH of the multiple PUSCHs. Each PUSCH has a separate SLIV and mapping type. The number of scheduled PUSCHs is signalled by the number of indicated valid SLIVs in the row of the *pusch-TimeDomainAllocationList* signalled in DCI format 0\_1.

As the 38.214 text shows, a variable length of PUSCH time domain resource allocation (SLIV and mapping type) is needed for each row. The number of rows, as in Rel-15, will determined the bit-width of the DCI field. Note that there is a single K2 value for each row. This is in contrast to the Rel-15 signaling where each row has one element with a separate K2 as follows:

***PUSCH-TimeDomainResourceAllocation* information element**

-- ASN1START

-- TAG-PUSCH-TIMEDOMAINRESOURCEALLOCATIONLIST-START

PUSCH-TimeDomainResourceAllocationList ::= SEQUENCE (SIZE(1..maxNrofUL-Allocations)) OF PUSCH-TimeDomainResourceAllocation

PUSCH-TimeDomainResourceAllocation ::= SEQUENCE {

 k2 INTEGER(0..32) OPTIONAL, -- Need S

 mappingType ENUMERATED {typeA, typeB},

 startSymbolAndLength INTEGER (0..127)

}

-- TAG-PUSCH-TIMEDOMAINRESOURCEALLOCATIONLIST-STOP

-- ASN1STOP

Here, the logical choice seems to be to have a new IE to replace *PUSCH-TimeDomainResourceAllocation* in Rel-16 which corresponds to the new row vector described above. This was suggested in R2-200964 (Huawei). A possible ASN.1 based on the Ericsson proposal in RAN2#109e is as follows:

In PUSCH-Config:

pusch-TimeDomainAllocationList-r16 SetupRelease { PUSCH-TimeDomainResourceAllocationList-r16 }

The new PUSCH-TimeDomainResourceAllocationList-r16:

PUSCH-TimeDomainResourceAllocationList-r16 ::= SEQUENCE (SIZE(1..maxNrofUL-Allocations)) OF PUSCH-TimeDomainResourceAllocation-r16

PUSCH-TimeDomainResourceAllocation-r16 ::=  SEQUENCE {

   k2-r16                                              INTEGER (0..32)                                    OPTIONAL,   -- Need S

   multiplePUSCH-Allocations-r16             SEQUENCE (SIZE(2..maxNrofMultiplePUSCHs-r16)) OF PUSCH-TimeDomainResourceAllocation-r16

}

PUSCH-TimeDomainResourceAllocation-r16 ::= SEQUENCE {

 mappingType ENUMERATED {typeA, typeB},

 startSymbolAndLength INTEGER (0..127)

}

Here, the value of maxNrofMultiplePUSCHs-r16 would be 8.

**Question B2: Is the above ASN.1 text to introduce multi-TTI grant for NR-U acceptable? If not, please provide reason and possible alternatives.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | Yes | An editorial on the ASN.1. There are 2 PUSCH-TimeDomainResourceAllocation-r16 being used. The latter should be changed to Single-PUSCH-TimeDomainResourceAllocation-r16 as it provides a single TDRA. |
| **ZTE** | Yes | We agree with Intel |
| **Samsung** | Yes | Agree with Intel |
| **MediaTek** | Yes | We agree with Intel. |
| **CMCC** | Yes | Agree with Intel |

**Summary:**

**Proposal .**

### Issue B3: Signaling of intra-cell guard bands

The procedural text for reception of short message with paging stop indication is currently captured in section “5.2.2.2.2 SI change indication and PWS notification” as follows:

1> if the *stopPagingMonitoring* bit of Short Message is set:

2> stop monitoring PDCCH monitoring occasion(s) for paging in this Paging Occasion (PO).

It was commented that the title of the section is not compatible with this procedure. The companies are invited to provide input whether they see this as an issue and if so how to resolve it. Following options can be considered:

Option 1: No changes to the spec

Option 2: Change the title of the section, e.g. to “Reception of Short Message”

Option 3: A new section for the new short message reception

**Question B3: Please select which option is preferable. If neither, please provide an alternative one.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **Intel** | None of the above Option | It is better to include a text in Section 6.5. For example,For operation with shared spectrum channel access, once a Short Message is received, the UE shall stop monitoring PDCCH monitoring occasion(s) for paging in this Paging Occasion (PO). |
| **ZTE** | Option2 |  |
| **Samsung** | None of the above Option | The current text in RRC is misleading (i.e. it does not cover all the cases which RAN2 agreed), and TS 38.304 already covers all the behaviors regarding paging reception, so the text in RRC can be removed.TS 38.304:"If X > 1, when the UE detects a PDCCH transmission addressed to P-RNTI within its PO, the UE is not required to monitor the subsequent PDCCH monitoring occasions for this PO."In case of short message, the PDCCH is also addressed to P-RNTI. |
| **MediaTek** | Option 2 | We agree with ZTE that the title should be changed.  |
| **CMCC** | Option 2 | Agree with ZTE and MediaTek |

**Summary:**

**Proposal .**

### Issue B4: Additional values for multiple paging occasions

For *nrofPDCCHMonitoringOccasionPerSSB-r16,* the value range is INTEGER (2..4) and the following Editor’s Note is in the RRC.

1. Editor’s Note: Additional values for *nrofPDCCHMonitoringOccasionPerSSB-r16* are FFS.

**Question B4: Are additional values needed for *nrofPDCCHMonitoringOccasionPerSSB-r16?* If yes, please suggest them with justification.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **MediaTek** | No |  |

**Summary:**

**Proposal .**

### Issue B5: Additional values for LBT failure detection parameters

The values for LBT Failure detection parameters are as follows with the Editor’s Note that additional values are FFS.

***LBT-FailureRecoveryConfig* information element**

-- ASN1START

-- TAG-LBT-FAILURERECOVERYCONFIG-START

LBT-FailureRecoveryConfig-r16 ::= SEQUENCE {

 lbt-FailureInstanceMaxCount ENUMERATED {n4, n8, n16, n32} OPTIONAL, -- Need R

 lbt-FailureDetectionTimer ENUMERATED {ms10, ms20, ms40, ms80, ms160, ms320} OPTIONAL, -- Need R

 ...

}

-- TAG-LBT-FAILURERECOVERYCONFIG-STOP

-- ASN1STOP

|  |
| --- |
| ***LBT-FailureRecoveryConfig* field descriptions** |
| ***lbt-FailureDetectionTimer***Timer for consistent uplink LBT failure detection (see TS 38.321 [3]). Value *ms10* corresponds to 10 ms, value *ms20* corresponds to 20 ms, and so on. |
| ***lbt-FailureInstanceMaxCount***This field determines after how many consistent uplink LBT failure events the UE triggers uplink LBT failure recovery (see TS 38.321 [3]). |

1. Editor’s Note: Additional values for *lbt-FailureDetectionTimer* and *lbt-FailureInstanceMaxCount* are FFS.

**Question B5: Are additional values needed for *lbt-FailureInstanceMaxCount-r16* and *lbt-FailureDectectionTimer-r16?* If yes, please suggest them with justification.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Response** | **Comments** |
| **ZTE** | Yes | For lbt-FailureInstanceMaxCount, we think more values should be defined, such as 64, 128. |
| **Samsung** | Yes | No strong view, but agree with ZTE that more values would be useful to avoid false alarm. |
| **MediaTek** | No Preference | In general we agree with the rapporteur. However, if companies see a need for further values, that can also be acceptable |
| **CMCC** | No Preference | We understand the motivation of avoiding false alarm. To us configuring appropriate *lbt-FailureDetectionTimer* may solve this issue. Considering the backoff mechanism already existed in LBT procedure (e.g. CCA backoff duration increases as contention happens), we wonder if it is necessary to extend values for *lbt-FailureInstanceMaxCount* to avoid false alarm. |

**Summary:**

**Proposal .**

# ASN.1 related Issues

Please suggest if there are any ASN.1 related issues such as changes to Need codes, clarifications on field descriptions etc.

All the issues here should be within the scope of the ASN.1 review and a list will be provided for that discussion.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| INDEX | Subclause | IE name | Class (0: Trivial; 1: Minor; 2: ASN.1 specific) | Issue |
| SS001 | 5.3.10.3 |   | 0 | "; or" is missing before the second change |
| SS002 | 6.3.1 | SIB2 | 2 | the field 'ssb-PositionQCL-Common-r16' should have separate double-square brackets, instead of reusing the existing one. |
| SS003 | 6.3.2 | BWP-UplinkCommon | 2 | double-square brackets should be added after extension marker. |
| SS004 | 6.3.2 | ConfiguredGrantConfig | 0 | The field name in the table should be corrected to 'cg-minDFI-Delay' (i.e. '-' is missing) |
| SS005 | 6.3.2 | LogicalChannelConfig | 0 | typo: channellAccessPriority in the table should be channelAccessPriority (doulbe l) |
| SS006 | 6.3.2 | MeasObjectNR | 2 | the field rmtc-SubframeOffset-r16 does not have to be optional: it should be mandatory |
| SS007 | 6.3.2 | MeasObjectNR | 0 | typo: the reference of rmtc-Periodicity is TS 38.215 (i.e. 5 is missing) |
| SS008 | 6.3.2 | PUCCH-Config | 0 | The field name can be updated to 'dl-DCI-triggered-UL-ChannelAccess-CP-ext-r16' (i.e. to add '-' after acronym CP). |
| SS009 | 6.3.2 | PUSCH-Config | 0 | The field name can be updated to 'ul-dci-triggered-UL-ChannelAccessCP-ext-CAPC-r16' (i.e. to remove '-' after Access and add '-' after acronym CP). |
| SS010 | 6.3.2 | BWP-UplinkDedicated | 2 | The field 'useInterlacePUCCH-PUSCH-r16' should be possible to release: can be changed to BOOLEAN with need M. |
| SS011 | 6.3.2 | ConfiguredGrantConfig  | 2 | (Many) new NR-U parameters can be grouped together, and can be SetupRelease with need M. Also, some fields (e.g. cg-RetransmissionTimer-r16) within the group can be mandatory to save bits for optional fields. |
| SS012 | 6.3.2 | ControlResourceSet | 2 | Need code for 'rb-Offset' should be 'Need S', and it has to refer RAN1 specification (to use value 0 in case of absence). |
| SS013 | 6.3.2 | MAC-CellGroupConfig | 2 | Both 'lbt-FailureRecoveryConfig-r16' and 'schedulingRequestID-LBT-SCell-r16' should use SetupRelease with need M |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Index | Subclause | IE Name | Class |  |
| MTK001 | 6.3.1 | SIB2, SIB4 | 2 | Our understanding is that Q is always needed for measurements on an NR-U cell. However in RRC CR, it appears to be optional (perhaps because it’s not needed for licensed operation). To make it clear that Q always needs to be signaled for an NR-U cell/frequency, perhaps “ssb-PositionQCL-Common-r16” in SIB2, SIB4 and MeasObjectNR should be made **“Cond Mandatory” (mandatory for NR-U)** for NR-U. Without mandatory configuration value of Q, a NR-U UE might not be able to correctly combine measurements from detected SSBs, which would affect RRM. |
| MTK002 | 6.3.2 | MeasObjectNR | 2 |

# New Open Issues

Please suggest if there are any other issues not capture above. For each one, we will also need to determine if it should be addressed within the WI RRC or as part of ASN.1 review.

# Conclusion

Based on the discussion on the above issues, the following are proposed:

# Annex 1 (RAN1 LS R1-2001357)

**1. Overall Description:**

RAN WG1 has made the following agreements related to the candidate SS/PBCH block index and SS/PBCH block index for NR-U:

Agreement:

UE determines serving cell timing from the detected SSB candidate position, where the SSB candidate positions within the DRS transmission window are indexed from 0,…,Y-1 (Y = 10 for 15 kHz SCS and Y = 20 for 30 kHz SCS).

Agreement:

RAN1 recommends the following terminology to be used consistently across RAN1 (and RAN2/RAN4) specifications for operation with shared spectrum channel access:

* “SS/PBCH block index” can be expressed as modulo(PBCH DMRS sequence index, Q) or modulo(Candidate SS/PBCH block index, Q)
	+ Note: These two modulo operations yield the same result and which index should be applied depends on the specific scenario
	+ Note: This is applicable for cases in the specification where “SS/PBCH block” instead of “SS/PBCH block index”
* “Candidate SS/PBCH block index” within a DRS transmission window was previously agreed in RAN1
* Include this agreement in an LS to RAN2/RAN4

Agreement:

The interpretation of ssb-PositionsInBurst in SIB1 or ServingCellConfigCommon is as follows:

* A bit set to 1 at position k (indexing starts at 1) indicates SS/PBCH block index k-1.
* The UE expects that a bit at position k > Q is set to 0

Please note: in RAN1 specifications, the normative term used for “DRS transmission window” in the above agreements is “Discovery burst transmission window,” where “Discovery burst” is defined in Clause 4 of TS 37.213.

RAN WG1 kindly asks RAN WG2 and WG4 to take the above agreements on SS/PBCH block indexing into account for developing their specifications for operation with shared spectrum channel access.

A list of examples of the expected changes to the specifications are provided in the Appendix, and more examples can be found in R1-1913538.

**2. Actions:**

**To RAN WG2 and WG4.**

**ACTION:** RAN WG1 kindly asks RAN WG2 and WG4 to take above agreements for developing their specifications.

**3. Date of Next TSG-RAN WG1 Meetings:**

TSG-WG1 Meeting #100bis 20th – 24th Apr 2020 Busan, KR

TSG-WG1 Meeting #101 25th – 29th May 2020 Athens, GR

**Appendix: Example changes to TS 38.331**

**6.3.2 Radio resource control information elements**

|  |
| --- |
| *ServingCellConfigCommon* field descriptions |
| ***ssb-PositionsInBurst***For operation without shared spectrum channel access, i~~I~~ndicates the time domain positions of the transmitted SS-blocks in a half frame with SS/PBCH blocks as defined in TS 38.213 [13], clause 4.1. The first/ leftmost bit corresponds to SS/PBCH block index 0, the second bit corresponds to SS/PBCH block index 1, and so on. Value 0 in the bitmap indicates that the corresponding SS/PBCH block is not transmitted while value 1 indicates that the corresponding SS/PBCH block is transmitted. The network configures the same pattern in this field as in the corresponding field in ServingCellConfigCommonSIB.For operation with shared spectrum channel access, only mediumBitmap is used, and as described in the TS 38.213 [13], clause 4.1, UE assumes that one or more SS/PBCH blocks indicated by ssb-PositionsInBurst may be transmitted within the discovery burst transmission window and have candidate SS/PBCH blocks indexes corresponding to SS/PBCH block indexes provided by ssb-PositionsInBurst. If MSB $k$, $k\geq 1$, of ssb-PositionsInBurst is set to 1, the UE assumes that one or more SS/PBCH blocks within the discovery burst transmission window with candidate SS/PBCH block indexes corresponding to SS/PBCH block index equal to $k-1$ may be transmitted; if MSB $k$ is set to 0, the UE assumes that the corresponding SS/PBCH block(s) are not transmitted. The UE expects that a bit at position k > ssb-PositionQCL-Relationship-16 is 0, and the number of actually transmitted SS/PBCH blocks equal to the number of 1’s in the bitmap. The network configures the same pattern in this field as in the corresponding field in ServingCellConfigCommonSIB. |

|  |
| --- |
| *ServingCellConfigCommonSIB* field descriptions |
| ***ssb-PositionsInBurst***Time domain positions of the transmitted SS-blocks in an SS-burst as defined in TS 38.213 [13], clause 4.1. For operation with shared spectrum channel access, only mediumBitmap is used, and UE interpret this field the same as in the corresponding field in ServingCellConfigCommon. |

|  |
| --- |
| *SSB-ToMeasure* field descriptions |
| ***mediumBitmap***Bitmap when maximum number of SS/PBCH blocks per half frame equals to 8 as defined in TS 38.213 [13], clause 4.1.For operation with shared spectrum channel access, a bit set to 1 at position k (indexing starts at 1) in the bitmap indicates SS/PBCH block index k-1. A UE can derive the time domain positions of the candidate SS/PBCH blocks within the SMTC measurement duration based on this bitmap. From a value 0 at position k in the bitmap, the UE can derive the candidate SS/PBCH block(s) with index corresponding to the SS/PBCH block index k-1 are not to be measured, while from a value 1 at position k in the bitmap, the UE can derive the candidate SS/PBCH block(s) with index corresponding to the SS/PBCH block index k-1 are to be measured. |

# Annex 2 Changes to RAN1 parameter names by RAN2

RAN2 decided to use a single ***useInterlacePUCCH-PUSCH*** IE which is signaled in *BWP-UplinkCommon* and *BWP-UplinkDedicated* instead of separate PUSCH and PUCCH used in RAN1 specifications*.*

The following RAN1 parameters were modified to comply with ASN.1 guidelines:

cg-CG-UCI-Multiplexing -> cg-UCI-Multiplexing

ChannelAccess-Config-r16 -> channelAccess-Config-r16

ChannelAccessMode-r16   -> channelAccessMode-r16

CO-DurationList-r16 - > co-DurationList-r16

CO-DurationPerCell-r16 - > co-DurationPerCell-r16

CP-ExtensionC2-r16 -> cp-ExtensionC2-r16

CP-ExtensionC3-r16 -> cp-ExtensionC3-r16

DLDCI-triggered-UL-ChannelAccess-CPext-r16 - > dl-DCI-triggered-UL-ChannelAccess-CPext-r16

EnableConfiguredUL-r16 -> enableConfiguredUL-r16

Interlace1 -> interlace1

InterlaceAllocation-r16 -> interlaceAllocation-r16

NFI-TotalDAI-Included-r16 -> nfi-TotalDAI-Included-r16

OCC-Index -> occ-Index

OCC-Length -> occ-Length

Period -> period

rbOffset-r16 -> rb-Offset-r16

SearchSpaceSwitchTrigger-r16 -> searchSpaceSwitchTrigger-r16

ssb-positionsInBurst -> ssb-PositionsInBurst

ULDCI-trigerred-UL-ChannelAccess-CPext-CAPC-r16 -> ul-dci-triggered-UL-ChannelAccess-CPext-CAPC-r16

ULtoDL-CO-SharingED-Threshold-r16 - > ul-toDL-COT-SharingED-Threshold-r16

UL-TotalDAI-Included-r16 -> ul-TotalDAI-Included-r16

# Annex 3 RAN1 parameters with FFS values

cg-COT-SharingOffset-r16 INTEGER (1..ffsValue) OPTIONAL, -- Need R

cg-COT-SharingList-r16 SEQUENCE (SIZE (1..ffsValue)) OF CG-COT-Sharing-r16 OPTIONAL, -- Need R

CG-COT-Sharing-r16 ::= SEQUENCE {

 duration-r16 INTEGER (1..ffsValue),

 offset-r16 INTEGER (1..ffsValue),

 channelAccessPriority-r16 INTEGER (1..4)

}

IntraCellGuardBand-r16 ::= SEQUENCE (SIZE (1..ffsValue)) OF GuardBand-r16 -- FFS upper size 4, assuming 100Mhz cell

GuardBand-r16 ::= SEQUENCE {

 startCRB-r16 INTEGER (0..ffsValue), --FFS upper range 275

 nrofCRBs-r16 INTEGER (1..ffsValue)

}