**3GPP TSG RAN WG1 #102-e R1-20xxxxx**

**e-Meeting, August 17th – 28th, 2020**

**Agenda Item:** 7.2.2.2.5

**Source:** Moderator (LG Electronics)

**Title:** Summary of email discussion [102-e-NR-unlic-NRU-WB]

**Document for:** Discussion and decision

# Introduction

[102-e-NR-unlic-NRU-WB] Email discussion/approval on the following until 8/19; if necessary, endorse remaining TPs by 8/25 – Seonwook (LGE)

* Editorial changes and discussion on whether/how to reflect previous RAN1 conclusion for CORESET misconfiguration
  + RRC parameter name alignment (freqMonitorLocations-r16, intraCellGuardBandsDL-r16, intraCellGuardBandsUL-r16) (Issue 8 in [10])
  + Whether/how to clarify indices of RB set and GB in TS 38.214 Section 7 (Issue 8 in [10])
  + Whether/how to reflect previous RAN1 conclusion for CORESET mis-configuration (Issue 7 in [10])

This email discussion [102-e-NR-unlic-NRU-WB] is to discuss the following issues identified from [10].

* Issue A (Issue 7 in [10]): Whether/how to reflect previous RAN1 conclusion for CORESET mis-configuration
* Issue B (Issue 8 in [10]): Editorial changes

# Issue A: Whether/how to reflect previous RAN1 conclusion for CORESET mis-configuration

## <Background>

In RAN1#101-e meeting, the following conclusion was made for CORESET configuration.

|  |
| --- |
| Conclusion:  When a configured RB set contains different size of RBs than RB set 0 within the active DL BWP, UE does not expect a CORESET configuration which has CORESET resource not confined within any of the RB set indicated by *freqMonitorLocations-r16*. |

## <Proposals in contributions>

As described in [10], at least following three alternatives are identified about whether/how to reflect the above conclusion in the specification.

* Alt 1: The above conclusion is specified using the TP provided in [2] as a starting point.
* Alt 2: More generalized statement needs to be specified, e.g., UE does not expect any RE of a CORESET to overlap with any RE determined as intra-cell guard bands.
* Alt 3: No need to specify such a mis-configuration of CORESET.

## <1st round comments>

Companies are encouraged to express preference among above three alternatives.

|  |  |
| --- | --- |
| Company | Comments |
| LG Electronics | Alt 2 |
| Nokia, NSB | Alt 2, but rather than negative, we could say UE expects RBs of CORESET to be confined within resource blocks of a RB-set. |
| Qualcomm | Alt 2. Nokia proposal seems to be better. |
| Ericsson | As I commented in the preparation phase, I don't believe this misconfiguration is needed to specify, i.e., Alt-3 is our first preference.  However, if something must be specified, then I think the TP needs to be a bit more precise. I agree that it needs to be written in the positive sense. To be more precise, the TP is [2] can be used as a starting point, but written in the positive sense. Something like:  For each RB set , the UE expects the common RB + is contained in RB set . |
| Sharp | Alt.2. |
| ZTE, Sanechips | Support Alt1 and we think that it is necessary to specify such a mis-configuration of CORESET in the spec. One the one hand, it is to restrict the configuration behavior of gNB side through the assumption in the UE side. On the other hand, it is also to reduce the risk of implementation error.  Further, in addition to our TP in [2], I think that the alternative from Ericsson is acceptable to me. |
| Lenovo, Motorola Mobility | Alt 2 is fine with us. |
| Samsung | Alt 3 is our first preference but we are fine with Alt 2. |
| Huawei, HiSilicon | Alt 2 |
| Spreadtrum | Alt 2 |

## <Summary of 1st round comments>

Company views are as follows:

* Alt 1: The above conclusion is specified using the TP provided in [2] as a starting point.
  + Supported by ZTE, Sanechips
* Alt 2: More generalized statement needs to be specified, e.g., UE does not expect any RE of a CORESET to overlap with any RE determined as intra-cell guard bands.
  + Supported by LG Electronics, Nokia (but with positive sentence), Qualcomm (but with positive sentence), Sharp, Lenovo, Motorola Mobility, Samsung (2nd preference), Spreadtrum
* Alt 3: No need to specify such a mis-configuration of CORESET.
  + Supported by Ericsson (but can be OK if precisely specified), Samsung (1st preference)

One additional thing to be considered: This clarification for CORESET configuration is not only for a CORESET that is confined within a RB set and may be associated with multiple monitoring locations, but also for a CORESET that spans multiple RB sets.

Considering that clear majority view is Alt 2 (i.e., to specify mis-configuration for a CORESET to cover wide-band or RB set confined case), the following proposal can be made:

**Proposal #1:**

Adopt the following text proposal for TS 38.213.

* UE expects that PRBs provided by *frequencyDomainResources* for a CORESET are contained within RB set(s) overlapped with the CORESET.

## <2nd round comments>

Companies are encouraged to express support/concern for the proposal in the summary of 1st round comments.

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Okay to compromise on Alt-2 considering the highlighted point raised by the FL. Question: where exactly will the proposed text be inserted in 38.213? I think a formal TP is needed before agreement.  I think better wording could be something like "The UE expects that the RBs of the CORESET indicated by *frequencyDomainResources* are fully contained within the RB set(s) of the DL BWP." |
| Lenovo, Motorola Mobility | Generally fine with us.  Moreover, we think “frequecyDomainResources” provides “RBs” not “PRBs”. So Ericsson’s wording seems more clear to us. |
| Spreadtrum | It’s fine to us. |
| ZTE, Sanechips | If Alt.2 is supported by most companies, we can also accept it.  But for this text proposal, I have same issue with Ericsson, that is, where is the best location to insert such a generalized statement? If it is placed in the following position, it seems to be inconsistent with the style described in other parts, because relevant RB position for other part is basically determined by formulas and parameters. So I tend to present this sentence “The UE expects that the RBs of the CORESET indicated by *frequencyDomainResources* are fully contained within the RB set(s) of the DL BWP” using formulas. If using formulas can make spec more clear and accurate and keep the style consistent for the front and back paragraphs, why don’t we use it?  ---------------------------------------------- < Start of TP#1 for 38.213 [1]> --------------------------------------------  10.1 UE procedure for determining physical downlink control channel assignment  < Unchanged parts are omitted >  For each CORESET in a DL BWP of a serving cell, a respective *frequencyDomainResources* provides a bitmap.  - if a CORESET is not associated with any search space set configured with *freqMonitorLocation-r16*, the bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index if *rb-Offset-r16* is not provided, or the first common RB of the first group of 6 PRBs has common RB index where is provided by *rb-Offset-r16.*  - if a CORESET is associated with at least one search space set configured with *freqMonitorLocation-r16*, the first bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in each RB set in the DL BWP bandwidth of PRBs with starting common RB position [6, TS 38.214], where the first common RB of the first group of 6 PRBs has common RB index and *k* is indicated by *freqMonitoringLocations-r16* if provided for a search space set; otherwise, . , is a number of available PRBs in the RB set 0 for the DL BWP, and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided.The UE expects that the RBs of the CORESET indicated by *frequencyDomainResources* are fully contained within the RB set(s) of the DL BWP |
| Qualcomm | In general fine. Using formula to describe this issue might not be easy. May need to involve some complicated math and descriptions. Some language should be fine if it is clear enough. Might be better say (on top of Ericsson’s change) "The UE expects that the RBs of the CORESET indicated by *frequencyDomainResources* are fully contained within the union of all RBs in all RB set(s) of the DL BWP."  For placement of the sentence, even for the case a coreset is not associated with search space with configured with *freqMonitorLocation-r16*, there will still be RB sets configured. Say for a multi-cluster CORESET. The clarification should apply to that case as well.  Might be good to do the following:  ---------------------------------------------- < Start of TP#1 for 38.213 [1]> --------------------------------------------  10.1 UE procedure for determining physical downlink control channel assignment  < Unchanged parts are omitted >  For each CORESET in a DL BWP of a serving cell, a respective *frequencyDomainResources* provides a bitmap.   * if a CORESET is not associated with any search space set configured with *freqMonitorLocation-r16*, the bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index if *rb-Offset-r16* is not provided, or the first common RB of the first group of 6 PRBs has common RB index where is provided by *rb-Offset-r16.* * if a CORESET is associated with at least one search space set configured with freqMonitorLocation-r16, the first bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in each RB set in the DL BWP bandwidth of PRBs with starting common RB position [6, TS 38.214], where the first common RB of the first group of 6 PRBs has common RB index and k is indicated by freqMonitoringLocations-r16 if provided for a search space set; otherwise, . , is a number of available PRBs in the RB set 0 for the DL BWP, and is provided by rb-Offset-r16 or if rb-Offset-r16 is not provided.   If one or more RB sets are provided in DL BWP, the UE expects that the RBs of the CORESET indicated by *frequencyDomainResources* are fully contained within the union of all RBs in all RB set(s) of the DL BWP. |
| Nokia | Do not agree with proposal if generalized to any CORESET,  we should keep strictly in scope of email thread and conclusion  Conclusion:  When a configured RB set contains different size of RBs than RB set 0 within the active DL BWP, UE does not expect a CORESET configuration which has CORESET resource not confined within any of the RB set indicated by *freqMonitorLocations-r16*.   * + Whether/how to reflect previous RAN1 conclusion for CORESET mis-configuration (Issue 7 in FL summary)   My concern is that CORESET mirroring feature is not a baseline for wideband operation.  If gNB has to manage with R15 CORESET, then there are quite some complications to scheduling if this restriction is agreed.  the difference is in hashing of candidates which is based on CORESET size.  For 2,4,8 candidates  hashing on nx8CCE CORESET is regular. For 7CCE CORESETs hashing works weirdly.  So if some CCE is on GB, gNB just does not use impacted candidate. So this was my thinking. |

## <Summary of 2nd round comments>

Majority companies (except Nokia) share the view that clarification of CORESET mis-configuration is needed not only for duplicated CORESET (i.e., CORESET associated with search space configured with *freqMonitorLocations*) but also for multi-cluster CORESET (i.e., CORESET not associated with search space configured with *freqMonitorLocations*). Moreover, it is suggested to remove “indicated by *frequencyDomainResources*” on top of Qualcomm’s TP considering that duplicated CORESET may not be confined within a RB set since each RB set can include different number of RBs, which is the original intention of Conclusion made in the last meeting. In other words, even though RBs “indicated by *frequencyDomainResources*” is confined within an original RB set, duplicated CORESET may not be confined within the other RB set provided by *freqMonitorLocations*.

Therefore, the following is proposed.

**Updated Proposal #1:**

Adopt the following text proposal for TS 38.213 Section 10.1.

|  |
| --- |
| 10.1 UE procedure for determining physical downlink control channel assignment < Unchanged parts are omitted >  For each CORESET in a DL BWP of a serving cell, a respective *frequencyDomainResources* provides a bitmap.  - if a CORESET is not associated with any search space set configured with *freqMonitorLocation-r16*, the bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index if *rb-Offset-r16* is not provided, or the first common RB of the first group of 6 PRBs has common RB index where is provided by *rb-Offset-r16.*  - if a CORESET is associated with at least one search space set configured with *freqMonitorLocation-r16*, the first bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in each RB set in the DL BWP bandwidth of PRBs with starting common RB position [6, TS 38.214], where the first common RB of the first group of 6 PRBs has common RB index and *k* is indicated by *freqMonitoringLocations-r16* if provided for a search space set; otherwise, . , is a number of available PRBs in the RB set 0 for the DL BWP, and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided.  If one or more RB sets are provided in the DL BWP, the UE expects that the RBs of the CORESET are fully contained within the union of all RBs in all RB set(s) of the DL BWP. |

# Issue B: Editorial changes

## <Proposals in contributions>

As described in [10], companies suggested the following editorial changes.

* Alignment of name of RRC parameters (*freqMonitorLocations-r16, intraCellGuardBandsDL-r16, intraCellGuardBandsUL-r16*)
* There can be some ambiguity since the same index s is used to index intra-cell guard bands and RB sets, even though the number of guard bands is one less than the number of RB sets. This can be easily corrected by using different indices.
* The formatting of the variables in this section is not consistent with other specs, e.g., 38.211. Subscripts and superscripts should not be in italics, e.g., should be and should be . These can be highlighted and left to the editor to correct.

**<TS 38.213 Section 10.1>**

|  |
| --- |
| 10.1 UE procedure for determining physical downlink control channel assignment  < Unchanged parts are omitted >  For each CORESET in a DL BWP of a serving cell, a respective *frequencyDomainResources* provides a bitmap.  - if a CORESET is not associated with any search space set configured with *freqMonitorLocations-r16*, the bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index if *rb-Offset-r16* is not provided, or the first common RB of the first group of 6 PRBs has common RB index where is provided by *rb-Offset-r16.*  - if a CORESET is associated with at least one search space set configured with *freqMonitorLocations-r16*, the first bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in each RB set in the DL BWP bandwidth of PRBs with starting common RB position [6, TS 38.214], where the first common RB of the first group of 6 PRBs has common RB index and *k* is indicated by *freqMonitorLocations-r16* if provided for a search space set; otherwise, . , is a number of available PRBs in the RB set 0 for the DL BWP, and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided.  < Unchanged parts are omitted >  For each DL BWP configured to a UE in a serving cell, the UE is provided by higher layers with search space sets where, for each search space set from the search space sets, the UE is provided the following by *SearchSpace*:  - a search space set index , , by *searchSpaceId*  - an association between the search space set and a CORESET by *controlResourceSetId*  - a PDCCH monitoring periodicity of slots and a PDCCH monitoring offset of slots, by *monitoringSlotPeriodicityAndOffset*  - a PDCCH monitoring pattern within a slot, indicating first symbol(s) of the CORESET within a slot for PDCCH monitoring, by *monitoringSymbolsWithinSlot*  - a duration of slots indicating a number of slots that the search space set exists by *duration*  - a number of PDCCH candidates per CCE aggregation level by *aggregationLevel1*, *aggregationLevel2*, *aggregationLevel4*, *aggregationLevel8*, and *aggregationLevel16*, for CCE aggregation level 1, CCE aggregation level 2, CCE aggregation level 4, CCE aggregation level 8, and CCE aggregation level 16, respectively  - an indication that search space set is either a CSS set or a USS set by *searchSpaceType*  - if search space set is a CSS set  - an indication by *dci-Format0-0-AndFormat1-0* to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0  - an indication by *dci-Format2-0* to monitor one or two PDCCH candidates, or to monitor one PDCCH candidate per RB set if the UE is provided *freqMonitorLocations-r16* for the search space set, for DCI format 2\_0 and a corresponding CCE aggregation level  - an indication by *dci-Format2-1* to monitor PDCCH candidates for DCI format 2\_1  - an indication by *dci-Format2-2* to monitor PDCCH candidates for DCI format 2\_2  - an indication by *dci-Format2-3* to monitor PDCCH candidates for DCI format 2\_3  - an indication by *dci-Format2-4* to monitor PDCCH candidates for DCI format 2\_4  - an indication by *dci-Format2-6* to monitor PDCCH candidates for DCI format 2\_6  - if search space set is a USS set, an indication by *dci-Formats* to monitor PDCCH candidates either for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or an indication by *dci-Formats-Rel16* to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or for DCI format 0\_2 and DCI format 1\_2, or, if a UE indicates a corresponding capability, for DCI format 0\_1, DCI format 1\_1, DCI format 0\_2, and DCI format 1\_2, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1  - a bitmap by *freqMonitorLocations-r16*, if provided, to indicate an index of one or more RB sets for the search space set , where the MSB in the bitmap corresponds to RB set in the DL BWP. For RB set indicated in the bitmap, the first PRB of the frequency domain monitoring location confined within the RB set is given by , where is the index of first common RB of the RB set [6, TS 38.214], and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided. For each RB set with a corresponding value of 1 in the bitmap, the frequency domain resource allocation pattern for the monitoring location is determined based on the first bits in *frequencyDomainResources* provided by the associated CORESET configuration. |

**<TS 38.214 Section 7>**

|  |
| --- |
| 7 UE procedures for transmitting and receiving on a carrier with intra-cell guard bands  For operation with shared spectrum channel access, when the UE is configured with any of *intraCellGuardBandsUL-r16* for UL carrier and *intraCellGuardBandsDL-r16* for DL carrier, the UE is provided with intra-cell guard bands on a carrier, each defined by start CRB and size in number of CRBs, and, provided by higher layer parameters *startCRB-r16* and *nrofCRBs-r16*, respectively, where . The subscript *x* is set to DL and UL for the downlink and uplink, respectively. Where there is no risk of confusion, the subscript *x* can be dropped. The intra-cell guard bands separate RB sets, each defined by start and end CRB, and, respectively. UE does not expect that *nrofCRBs-r16* is configured with non-zero value smaller than the applicable intra-cell guard bands as specified in [8, TS 38.101-1] corresponding to and carrier size. UE determines, , and the remaining start and end CRBs for as and. The RB set with index *s* consists of resource blocks where . When the UE is not configured with *intraCellGuardBandsUL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size. When the UE is not configured with *intraCellGuardBandsDL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size. For either or both DL and UL, if the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] contains no intra-cell guard bands, the number of RB sets for the carrier is.  For a carrier, the UE expects , and where for a BWP *i* configured by *BWP-DownlinkCommon* or *BWP-DownlinkDedicated* for the DL BWP, or *BWP-UplinkCommon* or *BWP-UplinkDedicated* for the UL BWP. Within the BWP *i*, RB sets are numbered in increasing order from 0 to where is the number of RB sets contained in the BWP *i* and RB set 0 within the BWP *i* corresponds to RB set in the carrier and RB set within the BWP *i* corresponds to RB set in the carrier.  When a UE is provided with *nrofCRBs-r16=*0 for all intra-cell guard band(s) on a carrier, the UE is indicated that no intra-cell guard-bands are configured for the carrier, and expects . For , the UE expects the number of RBs within a RB set is between 100 and 110. For , the UE expects the number of RBs within a RB set is between 50 and 55 except for at most one RB set which may contain 56 RBs. |

## <1st round comments>

Companies are encouraged to express whether the above TPs are acceptable or not.

|  |  |
| --- | --- |
| Company | Comments |
| Nokia, NSB | 1. Notify 38.214 specification editor to align parameters in sub-clause 7 to RAN2 naming and formatting of parameters to 38.211. 2. There cannot be any ambiguity between GBs and RB-sets, it is clearly stated that “The intra-cell guard bands separate RB sets”. Maybe we can state that value range of GBs is s 0… N\_RB\_set - 2. |
| Qualcomm | For parameter name alignment, we can let editors taking care of these by providing the list of parameter names with issues. We don’t need TP for these. There should be a lot of similar issues.  The font to use can be left to editor as well.  Providing proper range for GB index is helpful. |
| Ericsson | 1. Agree to the TP on the RRC parameter name alignment 2. Regarding the formatting of variables, I think we can just add a note to the editor to correct these and simply highlight the variables in question (like we did in TP#1 in our contribution) 3. Prefer to have separate indices since the indices have different ranges. It is not proper to use one index and say that in one case the index s has range {0 .. N-1} and in the other case it has range {0 .. N-2}. Why not just be clear from the beginning? In fact the clean way to do this would be as follows:   For operation with shared spectrum channel access, when the UE is configured with any of *intraCellGuardBandUL-r16* for UL carrier and *intraCellGuardBandDL-r16* for DL carrier, the UE is provided with intra-cell guard bands on a carrier, each defined by start CRB and size in number of CRBs, and , provided by higher layer parameters *startCRB-r16* and *nrofCRBs-r16*, respectively, where . The subscript *x* is set to DL and UL for the downlink and uplink, respectively. Where there is no risk of confusion, the subscript *x* can be dropped. The intra-cell guard bands separate RB sets, each defined by start and end CRB, and , respectively. The UE does not expect that *nrofCRBs-r16* is configured with non-zero value smaller than the applicable intra-cell guard bands as specified in [8, TS 38.101-1] corresponding to and carrier size . The UE determines ~~, , and the remaining start and end CRBs as and .~~ the start and end CRB indices for as  and |
| Sharp | We are OK with the FL proposal. |
| ZTE, Sanechips | Support to the TP on alignment RRC parameters with TS 38.331.  Agree to use different indices to distinguish intra-cell guard band indices and RB set indices. Further, regarding how to determine the start and ending of RB set, we think the revised TP from Ericsson is more clear. |
| Lenovo, Motorola Mobility | We support FL proposal to align the parameter name. |
| Samsung | Support the TP for alignment of RRC parameter, clarification of indexes, and other editorial changes |
| Huawei, HiSilicon | Support FL proposal. An index for guard band proposed by Ericsson can help understand the spec. |
| Spreadtrum | Support this TP. |

## <Summary of 1st round comments>

Based on comments from companies, the followings are observed:

* TP for RRC parameter name alignment seems supported by majority companies.
* It seems better to notify formatting issue to editor so that editor may implement it accordingly, so parts that need to be changed are marked as yellow.
* The change of index for RB set and GB, and equations proposed by Ericsson seem acceptable to majority companies, so they are reflected.

**<TS 38.213 Section 10.1>**

|  |
| --- |
| 10.1 UE procedure for determining physical downlink control channel assignment  < Unchanged parts are omitted >  For each CORESET in a DL BWP of a serving cell, a respective *frequencyDomainResources* provides a bitmap.  - if a CORESET is not associated with any search space set configured with *freqMonitorLocations-r16*, the bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index if *rb-Offset-r16* is not provided, or the first common RB of the first group of 6 PRBs has common RB index where is provided by *rb-Offset-r16.*  - if a CORESET is associated with at least one search space set configured with *freqMonitorLocations-r16*, the first bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in each RB set in the DL BWP bandwidth of PRBs with starting common RB position [6, TS 38.214], where the first common RB of the first group of 6 PRBs has common RB index and *k* is indicated by *freqMonitorLocations-r16* if provided for a search space set; otherwise, . , is a number of available PRBs in the RB set 0 for the DL BWP, and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided.  < Unchanged parts are omitted >  For each DL BWP configured to a UE in a serving cell, the UE is provided by higher layers with search space sets where, for each search space set from the search space sets, the UE is provided the following by *SearchSpace*:  - a search space set index , , by *searchSpaceId*  - an association between the search space set and a CORESET by *controlResourceSetId*  - a PDCCH monitoring periodicity of slots and a PDCCH monitoring offset of slots, by *monitoringSlotPeriodicityAndOffset*  - a PDCCH monitoring pattern within a slot, indicating first symbol(s) of the CORESET within a slot for PDCCH monitoring, by *monitoringSymbolsWithinSlot*  - a duration of slots indicating a number of slots that the search space set exists by *duration*  - a number of PDCCH candidates per CCE aggregation level by *aggregationLevel1*, *aggregationLevel2*, *aggregationLevel4*, *aggregationLevel8*, and *aggregationLevel16*, for CCE aggregation level 1, CCE aggregation level 2, CCE aggregation level 4, CCE aggregation level 8, and CCE aggregation level 16, respectively  - an indication that search space set is either a CSS set or a USS set by *searchSpaceType*  - if search space set is a CSS set  - an indication by *dci-Format0-0-AndFormat1-0* to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0  - an indication by *dci-Format2-0* to monitor one or two PDCCH candidates, or to monitor one PDCCH candidate per RB set if the UE is provided *freqMonitorLocations-r16* for the search space set, for DCI format 2\_0 and a corresponding CCE aggregation level  - an indication by *dci-Format2-1* to monitor PDCCH candidates for DCI format 2\_1  - an indication by *dci-Format2-2* to monitor PDCCH candidates for DCI format 2\_2  - an indication by *dci-Format2-3* to monitor PDCCH candidates for DCI format 2\_3  - an indication by *dci-Format2-4* to monitor PDCCH candidates for DCI format 2\_4  - an indication by *dci-Format2-6* to monitor PDCCH candidates for DCI format 2\_6  - if search space set is a USS set, an indication by *dci-Formats* to monitor PDCCH candidates either for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or an indication by *dci-Formats-Rel16* to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0, or for DCI format 0\_1 and DCI format 1\_1, or for DCI format 0\_2 and DCI format 1\_2, or, if a UE indicates a corresponding capability, for DCI format 0\_1, DCI format 1\_1, DCI format 0\_2, and DCI format 1\_2, or for DCI format 3\_0, or for DCI format 3\_1, or for DCI format 3\_0 and DCI format 3\_1  - a bitmap by *freqMonitorLocations-r16*, if provided, to indicate an index of one or more RB sets for the search space set , where the MSB in the bitmap corresponds to RB set in the DL BWP. For RB set indicated in the bitmap, the first PRB of the frequency domain monitoring location confined within the RB set is given by , where is the index of first common RB of the RB set [6, TS 38.214], and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided. For each RB set with a corresponding value of 1 in the bitmap, the frequency domain resource allocation pattern for the monitoring location is determined based on the first bits in *frequencyDomainResources* provided by the associated CORESET configuration. |

**<Modified TP for TS 38.214 Section 7>**

|  |
| --- |
| 7 UE procedures for transmitting and receiving on a carrier with intra-cell guard bands  Note to editor: to be consistent with other specs, e.g., 38.211, the subscripts/superscripts in the highlighted variables should be formatted so they are not italicized, e.g., should be , should be , and should be .  For operation with shared spectrum channel access, when the UE is configured with any of *intraCellGuardBandsUL-r16* for UL carrier and *intraCellGuardBandsDL-r16* for DL carrier, the UE is provided with intra-cell guard bands on a carrier, each defined by start CRB and size in number of CRBs, and, provided by higher layer parameters *startCRB-r16* and *nrofCRBs-r16*, respectively, where . The subscript *x* is set to DL and UL for the downlink and uplink, respectively. Where there is no risk of confusion, the subscript *x* can be dropped. The intra-cell guard bands separate RB sets, each defined by start and end CRB, and , respectively. The UE does not expect that *nrofCRBs-r16* is configured with non-zero value smaller than the applicable intra-cell guard bands as specified in [8, TS 38.101-1] corresponding to and carrier size . The UE determines the start and end CRB indices for as  and  The RB set with index *s* consists of resource blocks where . When the UE is not configured with *intraCellGuardBandsUL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size . When the UE is not configured with *intraCellGuardBandsDL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size . For either or both DL and UL, if the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] contains no intra-cell guard bands, the number of RB sets for the carrier is .  For a carrier, the UE expects , and where for a BWP *i* configured by *BWP-DownlinkCommon* or *BWP-DownlinkDedicated* for the DL BWP, or *BWP-UplinkCommon* or *BWP-UplinkDedicated* for the UL BWP. Within the BWP *i*, RB sets are numbered in increasing order from 0 to where is the number of RB sets contained in the BWP *i* and RB set 0 within the BWP *i* corresponds to RB set in the carrier and RB set within the BWP *i* corresponds to RB set in the carrier.  When a UE is provided with *nrofCRBs-r16=*0 for all intra-cell guard band(s) on a carrier, the UE is indicated that no intra-cell guard-bands are configured for the carrier, and expects . For , the UE expects the number of RBs within a RB set is between 100 and 110. For , the UE expects the number of RBs within a RB set is between 50 and 55 except for at most one RB set which may contain 56 RBs. |

## <2nd round comments>

Companies are encouraged to provide further comments for the modified TP in the summary of 1st round comments.

|  |  |
| --- | --- |
| Company | Comments |
| Ericsson | Support the modified TP |
| Lenovo, Motorola Mobility | We support this TP. |
| Spreadtrum | Support this TP. |
| ZTE,Sanechips | Support the modified TP. |
| Qualcomm | Support the TP |
| Nokia | Agree that Steve’s RB-set determination visualization is good.  If we keep  s instead of r  in below, I am fine with the TP.  and, provided by higher layer parameters *startCRB-r16* and *nrofCRBs-r16*, respectively, where . |

# Conclusion

# Reference

1. R1-2005538 Remaining issue on wideband operation Fujitsu
2. R1-2005604 Remaining issues on the wideband operation for NR-U ZTE, Sanechips
3. R1-2005813 Maintenance on the wideband operation procedures Huawei, HiSilicon
4. R1-2005829 Text proposals for wideband operation for NR-U Lenovo, Motorola Mobility
5. R1-2005906 Remaining issues on Wideband operation in NR-U Nokia, Nokia Shanghai Bell
6. R1-2005918 Wideband operation Ericsson
7. R1-2006024 Discussion on the remaining issues of wide-band operations OPPO
8. R1-2006556 Remaining corrections for wideband operation for NR-U Sharp
9. R1-2006767 TP for Wideband operation for NR-U operation Qualcomm Incorporated
10. R1-2006967 Summary on maintenance of wide-band operation for NR-U Moderator (LG Electronics)

# Appendix: Text proposals corresponding to Issues A and B

## Issue A

### From ZTE [2],

|  |
| --- |
| ---------------------------------------------- < Start of TP#1 for 38.213 [1]> --------------------------------------------  10.1 UE procedure for determining physical downlink control channel assignment  < Unchanged parts are omitted >  For each CORESET in a DL BWP of a serving cell, a respective *frequencyDomainResources* provides a bitmap.  - if a CORESET is not associated with any search space set configured with *freqMonitorLocation-r16*, the bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index if *rb-Offset-r16* is not provided, or the first common RB of the first group of 6 PRBs has common RB index where is provided by *rb-Offset-r16.*  - if a CORESET is associated with at least one search space set configured with *freqMonitorLocation-r16*, the first bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in each RB set in the DL BWP bandwidth of PRBs with starting common RB position [6, TS 38.214], where the first common RB of the first group of 6 PRBs has common RB index and *k* is indicated by *freqMonitoringLocations-r16* if provided for a search space set; otherwise, . , is a number of available PRBs in the RB set 0 for the DL BWP, and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided.For each RB set , the UE does not expect the common RB + is not in the RB set .  < Unchanged parts are omitted >  -------------------------------------------------- < End of text proposal> ---------------------------------------------------- |

## Issue B

### From ZTE [2],

|  |
| --- |
| **Proposal 2: Correct the parameters in TS 38.213 to align with the parameter “*freqMonitorLocations-r16*” in TS 38.331, and the TP#2 can be adopted.**  ---------------------------------------------- < Start of TP#2 for 38.213 [1]> --------------------------------------------  10.1 UE procedure for determining physical downlink control channel assignment  < Unchanged parts are omitted >  For each CORESET in a DL BWP of a serving cell, a respective *frequencyDomainResources* provides a bitmap.  - if a CORESET is not associated with any search space set configured with *freqMonitorLocations-r16*, the bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in the DL BWP bandwidth of PRBs with starting common RB position , where the first common RB of the first group of 6 PRBs has common RB index if *rb-Offset-r16* is not provided, or the first common RB of the first group of 6 PRBs has common RB index where is provided by *rb-Offset-r16.*  - if a CORESET is associated with at least one search space set configured with *freqMonitorLocations-r16*, the first bits of the bitmap have a one-to-one mapping with non-overlapping groups of 6 consecutive PRBs, in ascending order of the PRB index in each RB set in the DL BWP bandwidth of PRBs with starting common RB position [6, TS 38.214], where the first common RB of the first group of 6 PRBs has common RB index and *k* is indicated by *freqMonitor~~ing~~Locations-r16* if provided for a search space set; otherwise, . , is a number of available PRBs in the RB set 0 for the DL BWP, and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided.  < Unchanged parts are omitted >  - if search space set is a CSS set  - an indication by *dci-Format0-0-AndFormat1-0* to monitor PDCCH candidates for DCI format 0\_0 and DCI format 1\_0  - an indication by *dci-Format2-0* to monitor one or two PDCCH candidates, or to monitor one PDCCH candidate per RB set if the UE is provided *freqMonitorLocations-r16* for the search space set, for DCI format 2\_0 and a corresponding CCE aggregation level  - an indication by *dci-Format2-1* to monitor PDCCH candidates for DCI format 2\_1  - an indication by *dci-Format2-2* to monitor PDCCH candidates for DCI format 2\_2  - an indication by *dci-Format2-3* to monitor PDCCH candidates for DCI format 2\_3  - an indication by *dci-Format2-4* to monitor PDCCH candidates for DCI format 2\_4  - an indication by *dci-Format2-6* to monitor PDCCH candidates for DCI format 2\_6  < Unchanged parts are omitted >  - a bitmap by *freqMonitorLocations-r16*, if provided, to indicate an index of one or more RB sets for the search space set , where the MSB in the bitmap corresponds to RB set in the DL BWP. For RB set indicated in the bitmap, the first PRB of the frequency domain monitoring location confined within the RB set is given by , where is the index of first common RB of the RB set [6, TS 38.214], and is provided by *rb-Offset-r16* or if *rb-Offset-r16* is not provided. For each RB set with a corresponding value of 1 in the bitmap, the frequency domain resource allocation pattern for the monitoring location is determined based on the first bits in *frequencyDomainResources* provided by the associated CORESET configuration.  < Unchanged parts are omitted >  -------------------------------------------------- < End of text proposal> ----------------------------------------------------  **Proposal 3: Correct the parameters in TS 38.214 to align with the parameters “*intraCellGuardBandsDL-r16*” and “*intraCellGuardBandsUL-r16*” in TS 38.331, and the TP#3 can be adopted.**  ---------------------------------------------- < Start of TP#3 for 38.214 [3]> --------------------------------------------  7 UE procedures for transmitting and receiving on a carrier with intra-cell guard bands  For operation with shared spectrum channel access, when the UE is configured with any of *intraCellGuardBandsUL-r16* for UL carrier and *intraCellGuardBandsDL-r16* for DL carrier, the UE is provided with intra-cell guard bands on a carrier, each defined by start CRB and size in number of CRBs, and , provided by higher layer parameters *startCRB-r16* and *nrofCRBs-r16*, respectively. The subscript *x* is set to DL and UL for the downlink and uplink, respectively. Where there is no risk of confusion, the subscript *x* can be dropped. The intra-cell guard bands separate RB sets, each defined by start and end CRB, and , respectively. UE does not expect that *nrofCRBs-r16* is configured with non-zero value smaller than the applicable intra-cell guard bands as specified in [8, TS 38.101-1] corresponding to and carrier size . UE determines , , and the remaining start and end CRBs as and . The RB set *s* consists of resource blocks where . When the UE is not configured with *intraCellGuardBandsUL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size . When the UE is not configured with *intraCellGuardBandsDL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size . For either or both DL and UL, if the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] contains no intra-cell guard bands, the number of RB sets for the carrier is .  For a carrier, the UE expects , and where for a BWP *i* configured by *BWP-DownlinkCommon* or *BWP-DownlinkDedicated* for the DL BWP, or *BWP-UplinkCommon* or *BWP-UplinkDedicated* for the UL BWP. Within the BWP *i*, RB sets are numbered in increasing order from 0 to where is the number of RB sets contained in the BWP *i* and RB set 0 within the BWP *i* corresponds to RB set in the carrier and RB set within the BWP *i* corresponds to RB set in the carrier.  When a UE is provided with *nrofCRBs-r16=*0 for all intra-cell guard band(s) on a carrier, the UE is indicated that no intra-cell guard-bands are configured for the carrier, and expects . For , the UE expects the number of RBs within a RB set is between 100 and 110. For , the UE expects the number of RBs within a RB set is between 50 and 55 except for at most one RB set which may contain 56 RBs.  -------------------------------------------------- < End of text proposal> ---------------------------------------------------- |

### From Lenovo [4],

|  |
| --- |
| -----------------------------------------------< BEGIN TEXT PROPOSAL >-------------------------------------------------  7 UE procedures for transmitting and receiving on a carrier with intra-cell guard bands  For operation with shared spectrum channel access, when the UE is configured with any of *intraCellGuardBandsUL-r16* for UL carrier and *intraCellGuardBandsDL-r16* for DL carrier, the UE is provided with intra-cell guard bands on a carrier, each defined by start CRB and size in number of CRBs, and , provided by higher layer parameters *startCRB-r16* and *nrofCRBs-r16*, respectively. The subscript *x* is set to DL and UL for the downlink and uplink, respectively. Where there is no risk of confusion, the subscript *x* can be dropped. The intra-cell guard bands separate RB sets, each defined by start and end CRB, and , respectively. UE does not expect that *nrofCRBs-r16* is configured with non-zero value smaller than the applicable intra-cell guard bands as specified in [8, TS 38.101-1] corresponding to and carrier size . UE determines , , and the remaining start and end CRBs as and . The RB set *s* consists of resource blocks where . When the UE is not configured with *intraCellGuardBandsUL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size . When the UE is not configured with *intraCellGuardBandsDL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size . For either or both DL and UL, if the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] contains no intra-cell guard bands, the number of RB sets for the carrier is .  For a carrier, the UE expects , and where for a BWP *i* configured by *BWP-DownlinkCommon* or *BWP-DownlinkDedicated* for the DL BWP, or *BWP-UplinkCommon* or *BWP-UplinkDedicated* for the UL BWP. Within the BWP *i*, RB sets are numbered in increasing order from 0 to where is the number of RB sets contained in the BWP *i* and RB set 0 within the BWP *i* corresponds to RB set in the carrier and RB set within the BWP *i* corresponds to RB set in the carrier.  When a UE is provided with *nrofCRBs-r16=*0 for all intra-cell guard band(s) on a carrier, the UE is indicated that no intra-cell guard-bands are configured for the carrier, and expects . For , the UE expects the number of RBs within a RB set is between 100 and 110. For , the UE expects the number of RBs within a RB set is between 50 and 55 except for at most one RB set which may contain 56 RBs.  -----------------------------------------------< END TEXT PROPOSAL >------------------------------------------------- |

### From Ericsson [6],

|  |
| --- |
| ---------------------------------------------- Text Proposal (TP#1) for 38.214, Section 7 ----------------------------------------  \*\*\* Unchanged text omitted \*\*\*  7 UE procedures for transmitting and receiving on a carrier with intra-cell guard bands  Note to editor: to be consistent with other specs, e.g., 38.211, the subscripts/superscripts in the highlighted variables should be formatted so they are not italicized, e.g., should be and should be .  For operation with shared spectrum channel access, when the UE is configured with any of *intraCellGuardBandUL-r16* for UL carrier and *intraCellGuardBandDL-r16* for DL carrier, the UE is provided with intra-cell guard bands on a carrier, each defined by start CRB and size in number of CRBs, and , provided by higher layer parameters *startCRB-r16* and *nrofCRBs-r16*, respectively, where . The subscript *x* is set to DL and UL for the downlink and uplink, respectively. Where there is no risk of confusion, the subscript *x* can be dropped. The intra-cell guard bands separate RB sets, each defined by start and end CRB, and , respectively. UE does not expect that *nrofCRBs-r16* is configured with non-zero value smaller than the applicable intra-cell guard bands as specified in [8, TS 38.101-1] corresponding to and carrier size . UE determines , , and the remaining start and end CRBs for as and . The RB set with index *s* consists of resource blocks where . When the UE is not configured with *intraCellGuardBandUL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size . When the UE is not configured with *intraCellGuardBandDL-r16,* the UE determines the CRB indices for the intra-cell guard band(s), if any, and corresponding RB set(s) according to the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] corresponding to and carrier size . For either or both DL and UL, if the nominal intra-cell guard band and RB set pattern as specified in [8, TS 38.101-1] contains no intra-cell guard bands, the number of RB sets for the carrier is .  For a carrier, the UE expects , and where for a BWP *i* configured by *BWP-DownlinkCommon* or *BWP-DownlinkDedicated* for the DL BWP, or *BWP-UplinkCommon* or *BWP-UplinkDedicated* for the UL BWP. Within the BWP *i*, RB sets are numbered in increasing order from 0 to where is the number of RB sets contained in the BWP *i* and RB set 0 within the BWP *i* corresponds to RB set in the carrier and RB set within the BWP *i* corresponds to RB set in the carrier.  When a UE is provided with *nrofCRBs-r16=*0 for all intra-cell guard band(s) on a carrier, the UE is indicated that no intra-cell guard-bands are configured for the carrier, and expects . For , the UE expects the number of RBs within a RB set is between 100 and 110. For , the UE expects the number of RBs within a RB set is between 50 and 55 except for at most one RB set which may contain 56 RBs.  \*\*\* Unchanged text omitted \*\*\*  ----------------------------------------------------------- End Text Proposal ----------------------------------------------------------- |