3GPP TSG-RAN WG2 Meeting #113bis-e R2-21xxxxx

Electronic, April 12 – April 20 2021

Agenda item: 6.1.4.1.2

Source: Apple

Title: Summary of [AT113bis-e][020][NR16] RRM and Measurements (Apple)

Document for: Discussion

# 1 Introduction

This is the summary of the following email offline discussion.

* [AT113bis-e][020][NR16] RRM and Measurements (Apple)

 Scope: Treat R2-2102650, R2-2103030, R2-2103169, R2-2103879, R2-2103281, R2-2104173,

 Phase 1, determine agreeable parts, Phase 2, for agreeable parts Work on CRs.

 Intended outcome: Report and Agreed-in-principle CRs

 Deadline: Schedule A

Schedule A from chairman is also copied here for reference:

**Schedule A** (a schedule for main session for many offline dicussion):

A first round with **Deadline for comments Wednesday April 14 1000 UTC** to settle scope what is agreeable etc (phase 1)

A pre-final round with **Deadline for any functional and/or scope comments Monday April 19 1800 UTC.** At this point all non-agreeable parts shall be removed/excluded. (phase 2)

A final round (last 24h) for checking and smaller simplification / removal comments only including agreeable parts, with Deadline **EOM** (at this point all outcome documents need to be available in inbox with tdoc numbers).

Additional check-points etc if needed are defined by the Rapporteur. Offline discussion rapporteur must notify chairman / session chair if on-line comeback discussion is needed, if discussion doesn’t converge etc.

# 2 Contact info

|  |  |  |
| --- | --- | --- |
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# 3 Topic 1: E-UTRA CGI reporting with autonomous gap

[R2-2102650](file:///D%3A%5C%5CDocuments%5C%5C3GPP%5C%5Ctsg_ran%5C%5CWG2%5C%5CTSGR2_113bis-e%5C%5CDocs%5C%5CR2-2102650.zip%22%20%5Co%20%22D%3ADocuments3GPPtsg_ranWG2TSGR2_113bis-eDocsR2-2102650.zip) LS on CGI reading with autonomous gaps (R4-2103610; contact: ZTE) RAN4 LS in Rel-16 NR\_RRM\_enh-Core To:RAN2 Cc:-

[R2-2103030](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103030.zip) Correction on T321 for autonomous gap based E-UTRAN CGI reporting ZTE Corporation, Sanechips CR Rel-16 38.331 16.4.1 2494 - F NR\_RRM\_enh-Core

RAN4 sent the following agreement to RAN2 in LSin R2-2102650 [1] on E-UTRA CGI reporting with autonomous gap.

|  |
| --- |
| **Copied from RAN4 LSin R2-2102650[1]:**RAN4 had agreed the value of T321 timer for autonomous gap based CGI reading in FR1 and FR2, and an LS [2] was sent to RAN2 in RAN4#96e meeting.RAN4 has further discussed the T321 timer value for CGI reading in LTE and conclusion has been made. The value of T321 timer for autonomous gap based CGI reading in LTE is 0.2 seconds (200 ms). |

Based on the above info, R2-2103030 [2] proposes the following change to TS38.331:

|  |
| --- |
| 2> if the *reportType* is set to *reportCGI* in the *reportConfig* associated with this *measId*:3> if the *measObject* associated with this *measId* concerns E-UTRA:4> if the *useAutonomousGaps* is included in the *reportConfig* associated with this *measId*:5> start timer T321 with the timer value set to 200 ms for this *measId*; |

**Question 1: Do companies agree with the change proposed in R2-2103030 [2]?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple | Yes |  |
| Lenovo | Yes |  |
| MediaTek | Yes |  |
| Nokia | Yes |  |
| Ericsson | Yes |  |
| Qcom | Yes |  |
| Intel | Yes |  |
| vivo | Yes |  |
| Fujitsu | Yes |  |
| Samsung  | Yes  |  |
| ZTE (Jing Liu) | Yes |  |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| LGE | Yes |  |

**Summary: All companies agree with the change.**

**Proposal 1: The change proposed in R2-2103030 is agreed.**

# 4 Topic 2: CGI reporting in NPN

[R2-2103169](file:///D%3A%5C%5CDocuments%5C%5C3GPP%5C%5Ctsg_ran%5C%5CWG2%5C%5CTSGR2_113bis-e%5C%5CDocs%5C%5CR2-2103169.zip%22%20%5Co%20%22D%3ADocuments3GPPtsg_ranWG2TSGR2_113bis-eDocsR2-2103169.zip) Clarification on NPN related CGI report Huawei, CMCC, China Telecom, China Unicom, HiSilicon CR Rel-16 38.331 16.4.1 2501 - F NG\_RAN\_PRN-Core

Summary of change: In 5.5.5.1, refine the descriptions of the measurement reporting procedure to clarify that the UE reports the plmn-IdentityInfoList only when cellReservedForOtherUse is not set to “true” for CGI reporting.

|  |
| --- |
| 2> else:3> if the cell indicated by *cellForWhichToReportCGI* is an NR cell:4> if *cellReservedForOtherUse* is not set to *true* for the concerned cell and *plmn-IdentityInfoList* of the *cgi-Info* for the concerned cell has been obtained:5> include the *plmn-IdentityInfoList* including *plmn-IdentityList*, *trackingAreaCode* (if available), *ranac* (if available), *cellIdentity* and *cellReservedForOperatorUse* for each entry of the *plmn-IdentityInfoList*;5> include *frequencyBandList* if available; |

**Question 2: Do companies agree with the change in R2-2103169?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple | Yes |  |
| Huawei, HiSilicon | Yes | Proponent. Also, the need of the change has been confirmed by the co-sourcing operators, in order to avoid potentially ambiguous information reported to the network by the UE.  |
| Lenovo | No | Normally, the UE does not need to take care of the cellReservedForOtherUse field for cgi reporting. But the proposed change would then affect R16 non-NPN-capable UEs to consider this flag for cgi-reporting. |
| MediaTek | No | The proposed change is NBC to R15 UE, which is not acceptable to us.We also don’t understand the reason for change. Whether a cell is a NPN depends not only depends on the *cellReservedForOtherUse* but also the *npn-IdentityInfoList* IE.  |
| Nokia | No | This is not backward compatible - in NPN-only cells the operator should configure PLMN ID that does not cause problems. The proposed solution is NBC: a Rel-15 UE will report in a different way as a Rel-16 UE. And also there can be cells that are reserved due to other reasons with this flag. |
| Ericsson | Yes |  |
| Qcom | Yes |  |
| Intel | Yes | Another option to solve this issue would have been better to report this field as in the CGI report but it seems too late to make that sort of change. |
| vivo | Yes |  |
| Samsung  | No  | We agree with Lenovo and MediaTek’s comment on current cgi reporting of UE, and the CR is changing the current UE behavior. Nevertheless, if we want to correct, reporting cellReservedForOtherUse field together seems better than selectively reporting the original cgi contents so that gNB can identify the situation on the reported cell.  |
| ZTE | No | Share the same view as Lenovo and MTK, and even for the NPN, from the network side, whether a cell is a NPN-only doesn’t only depends on the *cellReservedForOtherUse.*  |
| China Unicom | Yes |  |
| CATT | Yes |  |

Summary: 8/13 companies agree with the change in R2-2103169. 5/13 oppose. The main concern from the opponents is this is a NBC change to Rel-15 UE(s). Besides, some companies bring up the concern that the *cellReservedForOtherUse* itself can not decide whether a cell is a NPN-only cell.

**Proposal 2: It’s suggested to have a further discussion on NPN related CGI reporting in the next RAN2 meeting.**

# 5 Topic 3: NR-U RRM measurement

[R2-2103879](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103879.zip) Discussion on NR-U RRM measurement Apple, xiaomi, LG Electronics discussion Rel-16 NR\_unlic-Core

[R2-2103281](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2103281.zip) Discussion on configuration of SSBs to be measured for NR-U Fujitsu discussion Rel-16 NR\_unlic-Core

## 5.1 Sub-topic 1: Change to SSB-ToMeasure field description

R2-2103879 [4] mentions the following issue and has proposal 1.

|  |
| --- |
| **Issue 1: Lack restriction in SSB-ToMeasure**However, we observed that for *SSB-ToMeasure* in *MeasObjectNR*, the spec does not have such restriction that only *mediumBitmap* is used for operation with shared spectrum. This may lead to unnecessary complexity in spec and also UE implementation. For example, if NW configures SSB-ToMeasure with longBitmap, we would need a special handling, e.g., truncation. In order to simplify the spec, we propose to introduce the same restriction to *SSB-ToMeasure* that only *mediumBitmap* is used for operation with shared spectrum. |

In R2-2103879 [4]:

**Proposal 1: Suggest to have the same restriction to SSB-ToMeasure that only *mediumBitmap* is used for operation with shared spectrum.**

|  |
| --- |
| **Text proposal for SSB-ToMeasure:*****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, only *mediumBitmap* is used. ~~i~~If the k-th bit 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 the kt-th bit is set to 0, the UE assumes that the corresponding SS/PBCH block(s) are not transmitted. If *ssb-PositionQCL* is configured, the k-th bit is set to 0, where k > *ssb-PositionQCL* and the number of actually transmitted SS/PBCH blocks is not larger than the number of 1's in the bitmap. |

**Question 3: Do companies agree with the proposal 1 in R2-2103879 shown above?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
| MediaTek | Yes |  |
| Nokia | No | Not needed. We have already limitation in SIB1 and network will not configure conflicting configuration in measObject. |
| Qcom | Yes | This should be already the case, given NRU is only defined in FR1 TDD bands in R16, but it does not hurt to make it more clear |
| Intel  | Yes |  |
| vivo | Yes |  |
| Fujitsu | No | In our understanding, the current spec. already indicates that ‘only mediumBitmap is used for shared spectrum’ by e.g.:1. Only the description of *mediumBitmap* in SSB-ToMeasure includes how to interpret the bitmap for shared spectrum.
2. The first sentences of description of shortBitmap, mediumBitmap and longBitmap which respectively clarify applicable cases from perspective of maximum number of SSBs.
 |
| Samsung | No strong view but | We share the view with Nokia. |
| ZTE(Eswar) | No | NW may ensure that ***mediumBitmap*** is used for shared spectrum, and the restriction is not needed.  |
| OPPO | Yes but | Agree with intention. But considering there is no relevant description of shared spectrum for long and short bitmap, would it be already clear enough? |
| Ericsson | No | If clarification is needed, this should be clarified in the parent field/IE, in this case, IE descr of SSB-ToMeasure. |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| LGE (proponent) | Yes |  |

Summary: 9/14 companies replied with “Yes” and 4/14 companies replied “No”. One says “No strong view”. From reading the comments, moderator believe all companies agree with the intention of this change. It’s only about if it’s necessary to make it clear in spec or we leave it to speculation. For example, since only this *mediumBitmap* field mentions shared spectrum, thus it implies other two bitmaps would not be used in NR-U. Moderator suggests in this circumstance, it’s better to make the spec clearer, and leaves no room for misunderstanding.

**Proposal 3: It is agreed to have the restriction to SSB-ToMeasure that only *mediumBitmap* is used for operation with shared spectrum.**

R2-2103281 [5] mentions the following issue and correspondingly has Proposal 1.

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| --- |
| Firstly, since this field is used for indicating SSB pattern for measurement, the first sentence for case of NR-U should elaborate from measurement perspective, instead of SSB transmission perspective. For example, ‘SMTC measurement duration’ should be used rather than ‘discovery burst transmission window’, and ‘may be transmitted’ could be changed to ‘are to be measured’, as shown in the following example given in a RAN1 LS [2] which was discussed in RAN2#109bis meeting. |

In R2-2103281 [5]:

**Proposal 1: For configuration ofSSBs to be measured for NR-U, RAN2 is kindly asked to clarify how to interpret *mediumBitma*p in SSB-ToMeasure from measurement perspective.**

* + - **The following example can be considered.**

|  |
| --- |
| ***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, if the k-th bit is set to 1, the UE assumes that one or more SS/PBCH blocks within the SMTC measurement duration with candidate SS/PBCH block indexes corresponding to SS/PBCH block index equal to k – 1 are to be measured; if the k-th bit is set to 0, the UE assumes that the corresponding SS/PBCH block(s) are not to be measured. If *ssb-PositionQCL* is configured, the k-th bit is set to 0, where k > *ssb-PositionQCL* and the number of actually transmitted SS/PBCH blocks is not larger than the number of 1's in the bitmap. |

**Question 4: Do companies agree with the proposal 1 in R2-2103281 as shown above?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple | Yes | After checking with our RAN1 and RAN4 colleagues, we think NR-U should have no impact on SMTC measurement. |
| MediaTek | See comments | Change from “discovery burst transmission” to “SMTC measurement duration” maybe okay. No strong view. It seems that the term “discovery burst transmission” is common usage in NR-U. So, no change is also fine.Change from “may be transmitted” to “to be measured” has different meaning. The original one is more correct indicate that SSB may NOT transmitted in NR-U. (e.g. LBT failure) |
| Nokia | No | Change for the usage of ssb-ToMeasure should be coming from RAN1 (or RAN4) |
| Qcom | Yes |  |
| Intel  | See comments | These are not essential change and also do not see any issue with the current text |
| vivo | No strong view | But we think it is not essential |
| Fujitsu(Proponent) | Yes | Thanks for the comments above. Given the comments, we would like to further elaborate why the changes are essential and needed.Firstly, let us recall the discussion history of this field description. In RAN2#109b-e, the LS from RAN1 which contains example of the field description was received. As highlighted below, ‘SMTC measurement duration’ and ‘to be measured’ are used for the description.

|  |
| --- |
| ***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. |

After discussion in this meeting, we had the agreement regarding the description, just to add one more sentence based on the description suggested by RAN1.

|  |
| --- |
| **Agreements**1 Introduce the field descriptions communicated by RAN1 with the following changes:…* Include the statement in “The UE expects that a bit at position k > ssb-PositionQCL-Relationship-16 is 0, and the number of actually transmitted SS/PBCH blocks is not larger the number of 1’s in the bitmap.” in SSB-ToMeasure
 |

Secondly, it is necessary to change back to the terms using by the description provided by RAN1 due to the following reasons.1. SMTC is frequency specific while discovery burst transmission window is cell specific. As also mentioned by Apple, NR-U follows the legacy that UE should perform measurement in ‘SMTC’ measurement duration’. However, using ‘discovery burst transmission window’ would change the UE hehavior, that is, UE may need to perform measurement within a cell-specific ‘discovery burst transmission window’. Considering that, we think changing to ‘SMTC measurement duration’ is not just nice to have, but is essential and needed.
2. As commented by Apple, they think ‘may be transmitted’ and ‘to be measured’ has different meaning. If we trace back the discussion history as above, the original one should be ‘to be measured’. So it is also necessary to change ‘may be transmitted’ to ‘to be measured’.
 |
| Samsung | No strong view but | We also think that the change is not essential |
| ZTE(Eswar) | No strong view |  |
| OPPO | Yes | We think the clarification is helpful |
| Ericsson | Partly yes, partly no. See comments. | 1. Replacing DBTW with SMTC is OK.2. Disagree. It seems to require the UE to perform measurements on SSBs which have not been detected/transmitted.3. Should remove “the UE assumes that”:“if the k-th bit is set to 0, the UE does not measure on the corresponding SS/PBCH block(s). |
| Huawei, HiSilicon | No strong view | No ambiguity found for the current texts. |
| CATT | Yes |  |
| LGE | No strong view |  |

Summary: From reading the comments:

1) 7/14 companies agree with the first change of replacing “discovery transmission burst window” with “SMTC measurement”; 1/14 company opposes this change. Other companies have no strong views.

2) 5/14 companies agree with the second change of replacing “may be transmitted” with “to be measured”; 3/14 companies oppose it. Other companies have no strong views.

**Proposal 4: The change of replacing “discovery transmission burst window” with “SMTC measurement” in SSB-ToMeasure is agreed.**

## 5.2 Sub-topic 2: Replace *ssb-PositionQCL* with *ssb-PositionQCL-Common* in SSB-ToMeasure

In both contributions [4] and [5], the same proposal was brought up that SSB-ToMeasure should associates with ***ssb-PositionQCL-Common-r16***,

In R2-2103879:

**Proposal 2: Confirm in RAN2 that *ssb-ToMeasure* associates with *ssb-PositionQCL-Common-r16*.**

In R2-2103281:

**Proposal 2: For configuration ofSSBs to be measured for NR-U, RAN2 is kindly asked to change *ssb-PositionQCL* to *ssb-PositionQCL-Common* in description of *mediumBitma*p in *SSB-ToMeasure*.**

**Question 5: Do companies agree with the following text proposal to replace *ssb-PositionQCL* with *ssb-PositionQCL-Common* in SSB-ToMeasure?**

|  |
| --- |
| *SSB-ToMeasure* field descriptions |
| *mediumBitmap*<Unrelevant text omitted>If *ssb-PositionQCL-Common* is configured, the k-th bit is set to 0, where k > *ssb-PositionQCL-Common* and the number of actually transmitted SS/PBCH blocks is not larger than the number of 1's in the bitmap. |

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
| MediaTek | Yes | Change from “ssb-PositionQCL” (per target cell configuration) to “ssb-PositionQCL-Common” (per target frequency configuration) seems fine as SSB-ToMeasure is per frequencies configuration. |
| Nokia | Yes |  |
| Qcom | Yes |  |
| Intel | Yes |  |
| vivo | Yes |  |
| Fujitsu(Proponent) | Yes |  |
| Samsung | Yes |  |
| ZTE(Eswar) | No | We think the current description is correct. Firstly, maybe the different QCL value is configured for each cell. If configured, the cell specific QCL value should be used. Secondly, UE may assume that the number of actually transmitted SSB is not larger than the number of 1’s in the bitmap. |
| OPPO | No | Our understanding is *ssb-PositionQCL-Common* is applied for cells not in the whitelist. Otherwise cell specific QCL should be applied. So it is not correct to change them all to *ssb-PositionQCL-Common* either. |
| Ericsson | No | *ssb-PositionQCL-Common* is mandatory for NR-U. So “if configured” would not make sense.Furthermore, this would also contradict with the issue raised for sub-topic 3.However, a description for *ssb-PositionQCL-Common* is missing and could be added before the above sentence: The k-th bit is set to 0 for k > *ssb-PositionQCL-Common.* |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| LGE (proponent) | Yes |  |

Summary: 11/14 companies agree with this proposal. 3/14 companies oppose. The comments from opponents mention that if configured, cell specific QCL value should be used for those cells, which is true. But the question here is to discuss the configuration restriction in ssb-ToMeasure, i.e., the k-th bit is set to 0 for k>ssb-PositionQCL-Common.

**Proposal 5: Agree that the *ssb-ToMeasure* associates with *ssb-PositionQCL-Common-r16* (i.e.,** **the k-th bit is set to 0 for k>ssb-PositionQCL-Common). The corresponding CR should take companies’ comment into account that “if configured” is not applicable to ssb-PositionQCL-Common since it’s a mandatory field.**

## 5.3 Sub-topic 3: *ssb-ToMeasure* with a longer bitmap than cell specific Nqcl value

R2-2103879 [4] discusses the case where the cell specific Nqcl value (*ssb-PositionQCL-CellsToAddModList-r16*) is smaller than *ssb-ToMeasure* (Case 1 in below table) and correspondingly has Proposal 3 copied below.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Common Nqcl | Cell specific Nqcl | ssb-ToMeasure | UE behavior |
| Case 1 | 8 | 4 (cell A) | 10001000 | Not clear to RRM on cells with cell specific Nqcl (common problematic case) |
| Case 2 | 4  | 8 (cell A) | 10001000 | Not clear to RRM on cells with common Nqcl (rare case, no need to concern) |

In R2-2103879 [4]:

**Proposal 3: If *ssb-ToMeasure* indicates a longer bitmap (10001000) while a smaller Nqcl (I.e.=4) is configured for *ssb-PositionQCL-CellsToAddModList-r16*, only the first Nqcl bits in *ssb-ToMeasure* are applicable.**

**Question 6: Do companies agree with Proposal 3 in R2-2103879 [4]?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
| Nokia | No | This should be discussed in RAN1.  |
| Qcom | Yes |  |
| Fujitsu | No | By reading the spec, we think the UE behavior is clear for case 1. No ambiguity issue.According to the example of case 1, since the cell specific Nqcl=4, the SSB indexes for the cell would be 0~3. As the k-th bit in *ssb-ToMeasure* is corresponding to candidate SSBs with SSB index k-1, when *ssb-ToMeasure=*10001000, it means that only candidate SSBs with SSB index=0 are to be measured for the cell, so there is no ambiguity on interpreting the indicated SSBs to be measured for the cell. |
| Samsung | Maybe | The scenario seems valid, and the proposal has the least impact, instead of providing separate ssb-ToMeasure per cell. |
| ZTE(Eswar) | Yes |  |
| OPPO | Yes | We think the intention is correct. And following our interpretation of the field description of *mediumBitmap*, then it is also clear. |
| Ericsson | Yes, this is already covered by the specs. | Already clear from the field description for “Nqcl”:***ssb-PositionQCL***Indicates the QCL relation between SS/PBCH blocks for a specific cell as specified in TS 38.213 [13], clause 4.1. If provided, the cell specific value overwrites the value signalled by *ssb-PositionQCL-Common*. |
| Huawei, HiSilicon | No strong view |  |
| CATT | Yes |  |
| LGE (proponent) | Yes |  |

Summary: 12/14 companies agree with the intention. 2/14 companies oppose it. But reading the comment from Fujitsu (one of the opponents), the example provided is exactly aligned with the proposal. Thus it could be seen 13/14 companies share the same understanding.

**Proposal 6-1: If *ssb-ToMeasure* indicates a longer bitmap (10001000) while a smaller Nqcl (I.e.=4) is configured for *ssb-PositionQCL-CellsToAddModList-r16*, only the first Nqcl bits in *ssb-ToMeasure* are applicable.**

**Proposal 6-2: How to reflect it into spec is to be discussed in Phase 2. Proponent company is recommended to provide text proposal.**

## 5.4 Sub-topic 4: Different values on *ssb-PositionQCL-Common-r16/ ssb-PositionQCL-CellsToAddModList-r16* from MN/SN

R2-2103879 [4] brings the following issue if MN and SN configures different values on *ssb-PositionQCL-Common-r16/ ssb-PositionQCL-CellsToAddModList-r16* according to TS 38.133.

|  |
| --- |
| Main issue we can see is UE may perform measurement on wrong candidate SSB index positions. For example, say MN configures Nqcl to 4 and SN configures Nqcl to 8, while one target cell is actually using SSB QCL value 8. For RRM with MN configured MO, suppose the *ssb-ToMeasure* points to SSB index #3, since UE calculates the SSB index according to QCL 4 (wrong one) thus UE may refer to the **candidate SSB index 7** in Fig. 1, which is not the right candidate SSB index position (which should be candidate SSB index 3).Fig. 1 - Time shifted SSB transmission subject to LBT |

To solve the issue, two alternatives are proposed in R2-2103879 [4].

**- Alt 1:** MN and SN always configure the same value on Nqcl on the same carrier and/or cell.

**- Alt 2:** If Alt 1 cannot be guaranteed, UE simply follows the configuration of NW in performing RRM.

**Question 7: Which alternative do companies prefer in order to solve the issue that UE may perform measurement on wrong candidate SSB index positions if MN and SN configure different values on *ssb-PositionQCL-Common-r16/ ssb-PositionQCL-CellsToAddModList-r16* according to TS 38.133?**

**- Alt 1:** MN and SN always configure the same value on Nqcl on the same carrier and/or cell.

**- Alt 2:** If Alt 1 cannot be guaranteed, UE simply follows the configuration of NW in performing RRM.

|  |  |  |
| --- | --- | --- |
| Company Name | Alt 1/Alt 2? | Comments |
| Apple | Alt 1 | Alt 1 is much simpler and can guarantee the correctness of measurement results. |
| MediaTek | Alt 1 |  |
| Nokia | None | No need to specify limitation. UE just follows what is configured via Uu. Most likely NW will follow alt.1 behaviour. |
| Qcom | Alt1 or Alt2 | Although the issue used to justify it may not happen in our opinion, since we believe the “candidate” SSB position should be unique irrespective of QCL-factor config, **but it is good to have it clarified**. |
| Intel | Alt 1 |  |
| vivo | Alt 1 |  |
| Fujitsu | None, but | Not sure if we understand the issue correctly. One question for clarification. Is it assumed that MN and SN shares a single *ssb-ToMeasure* but configures different *ssb-PositionQCL-Common-r16/ ssb-PositionQCL-CellsToAddModList-r16*? If MN and SN would separately configure *ssb-ToMeasure* and its corresponding *ssb-PositionQCL-Common-r16/ ssb-PositionQCL-CellsToAddModList-r16*, then UE should determine SSBs to be measured for MN and SN respectively according to the corresponding configurations. In such case, there seems no issue. |
| Samsung | Alt 1 but | We are not sure whether we need to capture it to the specification, as this should be the case in general. |
| ZTE(Eswar) | Alt 1 |  |
| OPPO | Alt1 |  |
| Ericsson | Alt 1 | The network should configure the values consistently for MN and SN |
| Huawei, HiSilicon | Alt2 | We don’t think the restriction of Alt1 is needed, may need to coordinate with RAN4.  |
| CATT | Alt1 |  |
| LGE | Alt2 | No need to specify the restriction.  |

Summary: 10/14 companies prefer Alt 1. 3/14 companies prefer Alt 2. 2/13 select none.

**Proposal 7: Capture in chairman notes, that MN and SN always configure the same value on *ssb-PositionQCL-Common-r16/ ssb-PositionQCL-CellsToAddModList-r16* for the same carrier and/or cells.**

## 5.5 Sub-topic 5: Inter-RAT NR-U RRM in LTE spec

R2-2103879 [4] brings up that In LTE spec, for inter-RAT NR-U RRM related configuration in *SIB24 and MeasObjectNR*, *ssb-PositionQCL-Common-r16* is optional present.



In R2-2103879 [4]:

**Proposal 5: Suggest to make *ssb-PositionQCL-Common-r16* in *SIB24/MeasObjectNR* conditional mandatory for shared spectrum in LTE spec, to align with NR spec.**

**Question 8: Do companies agree with Proposal 5 in R2-2103879 [4]?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
| MediaTek | Yes |  |
| Nokia | Maybe | No strong need as anyway measurements wont work if this is not configured. But ASN.1 should not be changed as UE behaviour does not change.  |
| vivo | No strong view |  |
| Fujitsu | Yes |  |
| Samsung | No strong view |  |
| ZTE(Eswar) | Yes |  |
| OPPO | Yes |  |
| Ericsson | Yes | Seems this had been a copy/paste error in LTE spec? |
| Huawei, HiSilicon | No | No strong view, we can keep the optionality as it is now.  |
| CATT | Yes |  |
| LGE (proponent) | Yes |  |

Summary: 9/12 companies agree with the proposal. 1/12 company opposes. And 2/12 companies have no strong view.

**Proposal 8: Agree to make *ssb-PositionQCL-Common-r16* in *SIB24/MeasObjectNR* conditional mandatory for shared spectrum in LTE spec, to align with NR spec.**

**Question 9: If the answer to Question 8 is Yes, do companies agree with the text proposal in** **change 1 and 2 in Annex 2 in R2-2103879 [4]?**

The TP is also copied in Annex-1 in this paper for reference.

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
| MediaTek | Yes |  |
| Nokia | No | See the comments on specific proposals |
| Qcom | Yes |  |
| Fujitsu | Yes |  |
| ZTE(Eswar) | Yes |  |
| OPPO | Yes | Only Change 1 is fine |
| Ericsson | Yes | This is aligned with 38.331 |
| CATT | Yes |  |
| LGE (proponent) | Yes |  |

Summary: 9/10 companies agree with the change. 1/10 company opposes. One company is not fine with change 2.

**Proposal 9: The text proposals in change 1 and 2 in Annex 2 in R2-2103879 [4] are agreed.**

**Question 10: Do company agree with the following proposal in R2-2103879 [4]?**

**Proposal 6: Suggest to modify the field description to SSB-ToMeasure as below in TS36.331.**

|  |
| --- |
| Text proposal to SSB-ToMeasure in TS36.331***mediumBitmap*** Bitmap when maximum number of SS/PBCH blocks per half frame equals to 8 as defined in TS 38.213 [88], clause 4.1. For operation with shared spectrum channel access, only *mediumBitmap* is used. If the k-th bit 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 the kt-th bit is set to 0, the UE assumes that the corresponding SS/PBCH block(s) are not transmitted. If *ssb-PositionQCL* is configured, the k-th bit is set to 0, where k > *ssb-PositionQCL* and the number of actually transmitted SS/PBCH blocks is not larger than the number of 1's in the bitmap. |

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
| MediaTek | Yes |  |
| Nokia | Maybe | See comments on specific proposals |
| Qcom  | Yes |  |
| Fujitsu | Yes, but | In principle, we are fine with the intention of the modification. But we think we should modify this field according to the discussion results of sub-topic 1-4. If it is preferred to handle it in parallel, another way may be just putting the counterpart description in TS 38.331 as a reference. |
| Samsung | No strong view | as said in Question 3 above. |
| ZTE(Eswar) | No |  |
| OPPO | Maybe |  |
| Ericsson | No | Same as comment as for Q3 |
| Huawei, HiSilicon | Yes |  |
| CATT | Yes |  |
| LGE (proponent) | Yes |  |

Summary: 7/12 companies agree with the proposal. 2/12 companies oppose. 3/12 companies have no strong views.

**Proposal 10: It’s suggested to have the same field description into LTE spec for SSB-ToMeasure as the final text achieved for NR (pending to Proposal 5).**

## 5.6 Sub-topic 6: *rmtc-SubframeOffset*

In R2-2103879 [4], it brings up that when *rmtc-SubframeOffset* is not configured, it’s not clear if this random value generation is done per RMTC period, or per every *ReportInterval*, or upon every *RRCReconfiguration*.



It’s Rapporteur’s understanding that this issue also involves RAN1. However, it’s also beneficial if RAN2 can have some discussions first and then request RAN1’s confirmation since RAN2 is responsible for TS 38.331.

**Question 11: Which option do companies think should be applied for the random value generation when *rmtc-SubframeOffset* is not configured?**

Option 1: Per RMTC period

Option 2: Per every *ReportInterval*

Option 3: Per every *RRCReconfiguration* messag*e*

|  |  |  |
| --- | --- | --- |
| Company Name | Option | Comments |
| Apple | Option 1 | As we explained in the paper, we think the original motivation of the randomized value is to achieve a higher possibility to find out the overloaded carrier. If one fixed value (say 0) per Option 2 and 3 is used, the RSSI measurement result gets biased and then UE may miss the detection on the overloaded carrier. |
| MediaTek |  | We think it should be discussed in RAN1 first and we prefer leave this to UE implementation.  |
| Nokia | None | This is RAN1 topic and discussion should be initiated there |
| Intel |  | Wait for RAN1 |
| vivo |  | Agree with MediaTek |
| Samsung | - | Should be discussed in RAN1. |
| ZTE(Eswar) |  | It may be up to UE implementation. |
| OPPO |  | Not clear about the question itself. Current field description already make it clear that the random value should be 0 and rmtc-periodicity. So what is not clear? |
| Huawei, HiSilicon |  | RAN1 shall discuss this first.  |
| CATT |  | It should be decided in RAN1. |
| LGE |  | Should be discussed in RAN1. |

**Question 12: Should the potential agreement in Question 11 also apply to LAA?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple | Yes | It’s better to also have the same description in LAA. |
| Nokia | No | See Q11 |
| OPPO |  | Please find answer above |
|  |  |  |
|  |  |  |
|  |  |  |
|  |  |  |

**Question 13: Should an LS sent to RAN1 to inform them about RAN2 agreement?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple | Yes | We understand some companies may feel this should be decided by RAN1 but we encourage people to align with their RAN1 colleagues internally to save time. Once RAN2 gets something agreed, it’s better to inform RAN1. |
| Nokia | No | See Q11 |
| OPPO | Not sure |  |
| Huawei, HiSilicon | No | Don’t think RAN2 needs to agree before it is discussed by RAN1.  |
| CATT | Yes |  |
|  |  |  |
|  |  |  |
|  |  |  |

Summary on Sub-topic 6: Clearly companies think this should be discussed in RAN1 first.

**Proposal 11: Suggest to send an LS to RAN1 to trigger the discussion there on random value generation when *rmtc-SubframeOffset* is not configured. Discuss the LS content in Phase 2.**

# 6 Topic 4: Missing smtc3 for IAB

[R2-2104173](file:///D%3A%5CDocuments%5C3GPP%5Ctsg_ran%5CWG2%5CTSGR2_113bis-e%5CDocs%5CR2-2104173.zip) Missing smtc3 for smtc restriction with ssbFrequency Samsung R&D Institute UK CR Rel-16 38.331 16.4.1 2558 - F NR\_IAB-Core

Summary of change: Add “and that an smtc3list included in any measurement object with the same ssbFrequency has the same value” in the general section of measurement configuration.

|  |
| --- |
| 5.5.2 Measurement configuration5.5.2.1 GeneralThe network applies the procedure as follows:- to ensure that, whenever the UE has a *measConfig* associated with a CG, it includes a *measObject* for the SpCell and for each NR SCell of the CG to be measured;- to configure at most one measurement identity across all CGs using a reporting configuration with the *reportType* set to *reportCGI;*- to configure at most one measurement identity per CG using a reporting configuration with the *ul-DelayValueConfig;*-to ensure that, in the *measConfig* associated with a CG:- for all SSB based measurements there is at most one measurement object with the same *ssbFrequency*;*-* an *smtc1* included in any measurement object with the same *ssbFrequency* has the same value and that an *smtc2* included in any measurement object with the same *ssbFrequency* has the same value and that an *smtc3list* included in any measurement object with the same *ssbFrequency* has the same value;- to ensure that all measurement objects configured in this specification and in TS 36.331 [10] with the same *ssbFrequency* have the same *ssbSubcarrierSpacing*;- to ensure that, if a measurement object associated with the MCG has the same *ssbFrequency* as a measurement object associated with the SCG:- for that *ssbFrequency*, the measurement window according to the *smtc1* configured by the MCG includes the measurement window according to the *smtc1* configured by the SCG, or vice-versa, with an accuracy of the maximum receive timing difference specified in TS 38.133 [14].- if both measurement objects are used for RSSI measurements, bits in *measurementSlots* in both objects corresponding to the same slot are set to the same value. Also, the *endSymbol* is the same in both objects. |

**Question 14: Do companies agree with the change in R2-2104173 [6]?**

|  |  |  |
| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple | Yes |  |
| Huawei, HiSilicon | No strong view | This can be considered as straightforward editorial change, which can be merged to the miscellaneous CR. Without any change, we can always trust CU implementation. |
| Nokia | No | Without any change we can just trust proper implementation |
| Qualcomm | See comment | Same as Huawei and Nokia. |
| Intel | Yes |  |
| vivo | No strong view |  |
| Samsung  | Yes  | Proponent. CU can handle appropriately, but the consistency in the spec is always necessary too. We are ok with merging to the miscellaneous CR. |
| ZTE(Ying Huang) | Yes |  |
| Ericsson | No strong view | Same comment as Huawei and Nokia. |
| CATT | Yes |  |
| LGE | No strong view | Same as Huawei. |

Summary: 5/11 companies agree with the change in R2-2104173. 1/11 company opposes it. 5/11 companies have no strong views and seem fine to merge it into the big RRC rapporteur CR.

**Proposal 12: Merge the change in R2-2104173 to the big RRC rapporteur CR.**

# 7 Conclusion

**Proposal 1: The change proposed in R2-2103030 is agreed.**

**Proposal 2: It’s suggested to have a further discussion on NPN related CGI reporting in the next RAN2 meeting.**

**Proposal 3: It is agreed to have the restriction to SSB-ToMeasure that only *mediumBitmap* is used for operation with shared spectrum.**

**Proposal 4: The change of replacing “discovery transmission burst window” with “SMTC measurement” in SSB-ToMeasure is agreed.**

**Proposal 5: Agree that the *ssb-ToMeasure* associates with *ssb-PositionQCL-Common-r16* (i.e., the k-th bit is set to 0 for k>ssb-PositionQCL-Common). The corresponding CR should take companies’ comment into account that “if configured” is not applicable to ssb-PositionQCL-Common since it’s a mandatory field.**

**Proposal 6-1: If *ssb-ToMeasure* indicates a longer bitmap (10001000) while a smaller Nqcl (I.e.=4) is configured for *ssb-PositionQCL-CellsToAddModList-r16*, only the first Nqcl bits in *ssb-ToMeasure* are applicable.**

**Proposal 6-2: How to reflect it into spec is to be discussed in Phase 2. Proponent company is recommended to provide text proposal.**

**Proposal 7: Capture in chairman notes, that MN and SN always configure the same value on *ssb-PositionQCL-Common-r16/ ssb-PositionQCL-CellsToAddModList-r16* for the same carrier and/or cells.**

**Proposal 8: Agree to make *ssb-PositionQCL-Common-r16* in *SIB24/MeasObjectNR* conditional mandatory for shared spectrum in LTE spec, to align with NR spec.**

**Proposal 9: The text proposals in change 1 and 2 in Annex 2 in R2-2103879 [4] are agreed.**

**Proposal 10: It’s suggested to have the same field description into LTE spec for SSB-ToMeasure as the final text achieved for NR (pending to Proposal 5).**

**Proposal 11: Suggest to send an LS to RAN1 to trigger the discussion there on random value generation when *rmtc-SubframeOffset* is not configured. Discuss the LS content in Phase 2.**

**Proposal 12: Merge the change in R2-2104173 to the big RRC rapporteur CR.**

# 8 Reference

[1] R2-2102650 LS on CGI reading with autonomous gaps (R4-2103610; contact: ZTE) RAN4 LS in

[2] R2-2103030 Correction on T321 for autonomous gap based E-UTRAN CGI reporting ZTE Corporation, Sanechips CR Rel-16 38.331

[3] R2-2103169 Clarification on NPN related CGI report Huawei, CMCC, China Telecom, China Unicom, HiSilicon CR Rel-16 38.331

[4] R2-2103879 Discussion on NR-U RRM measurement Apple, xiaomi, LG Electronics discussion Rel-16 NR\_unlic-Core

[5] R2-2103281 Discussion on configuration of SSBs to be measured for NR-U Fujitsu discussion Rel-16 NR\_unlic-Core

[6] R2-2104173 Missing smtc3 for smtc restriction with ssbFrequency Samsung R&D Institute UK CR Rel-16 38.331

# 9 Annex 1 - Text Proposal to TS 36.331 (Change 1 and 2) in R2-2103879 [4]

### ---------------------------------------------------------------------------<start of 1st change>---------------------------------------------------------------------------

### 6.3.1 System information blocks

<Text omitted>

#### – *SystemInformationBlockType24*

The IE *SystemInformationBlockType24* contains information relevant for inter-RAT cell re-selection (i.e. information about NR frequencies and NR neighbouring cells relevant for cell re-selection), which can also be used for NR idle/inactive measurements. The IE includes cell re-selection parameters common for a frequency.

*SystemInformationBlockType24* information element

-- ASN1START

SystemInformationBlockType24-r15 ::= SEQUENCE {

 carrierFreqListNR-r15 CarrierFreqListNR-r15 OPTIONAL, -- Need OR

 t-ReselectionNR-r15 T-Reselection,

 t-ReselectionNR-SF-r15 SpeedStateScaleFactors OPTIONAL, -- Need OR

 lateNonCriticalExtension OCTET STRING OPTIONAL,

 ...,

 [[ carrierFreqListNR-v1610 CarrierFreqListNR-v1610 OPTIONAL -- Need OR

 ]]

}

CarrierFreqListNR-r15 ::= SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-r15

CarrierFreqListNR-v1610 ::= SEQUENCE (SIZE (1..maxFreq)) OF CarrierFreqNR-v1610

CarrierFreqNR-r15 ::= SEQUENCE {

 carrierFreq-r15 ARFCN-ValueNR-r15,

 multiBandInfoList-r15 MultiFrequencyBandListNR-r15 OPTIONAL, -- Need OR

 multiBandInfoListSUL-r15 MultiFrequencyBandListNR-r15 OPTIONAL, -- Need OR

 measTimingConfig-r15 MTC-SSB-NR-r15 OPTIONAL, -- Need OR

 subcarrierSpacingSSB-r15 ENUMERATED {kHz15, kHz30, kHz120, kHz240},

 ss-RSSI-Measurement-r15 SS-RSSI-Measurement-r15 OPTIONAL, -- Cond RSRQ2

 cellReselectionPriority-r15 CellReselectionPriority OPTIONAL, -- Need OP

 cellReselectionSubPriority-r15 CellReselectionSubPriority-r13 OPTIONAL, -- Need OR

 threshX-High-r15 ReselectionThreshold,

 threshX-Low-r15 ReselectionThreshold,

 threshX-Q-r15 SEQUENCE {

 threshX-HighQ-r15 ReselectionThresholdQ-r9,

 threshX-LowQ-r15 ReselectionThresholdQ-r9

 } OPTIONAL, -- Cond RSRQ

 q-RxLevMin-r15 INTEGER (-70..-22),

 q-RxLevMinSUL-r15 INTEGER (-70..-22) OPTIONAL, -- Need OR

 p-MaxNR-r15 P-MaxNR-r15,

 ns-PmaxListNR-r15 NS-PmaxListNR-r15 OPTIONAL, -- Need OR

 q-QualMin-r15 INTEGER (-43..-12) OPTIONAL, -- Need OP

 deriveSSB-IndexFromCell-r15 BOOLEAN,

 maxRS-IndexCellQual-r15 MaxRS-IndexCellQualNR-r15 OPTIONAL, -- Need OR

 threshRS-Index-r15 ThresholdListNR-r15 OPTIONAL, -- Need OR

 ...,

 [[ multiBandNsPmaxListNR-v1550 MultiBandNsPmaxListNR-1-v1550 OPTIONAL, -- Need OR

 multiBandNsPmaxListNR-SUL-v1550 MultiBandNsPmaxListNR-v1550 OPTIONAL, -- Need OR

 ssb-ToMeasure-r15 SSB-ToMeasure-r15 OPTIONAL -- Need OR

 ]]

}

CarrierFreqNR-v1610 ::= SEQUENCE {

 smtc2-LP-r16 MTC-SSB2-LP-NR-r16 OPTIONAL, -- Need OR

 ssb-PositionQCL-CommonNR-r16 SSB-PositionQCL-RelationNR-r16 OPTIONAL, -- Cond SharedSpectrum2

 whiteCellListNR-r16 WhiteCellListNR-r16 OPTIONAL, -- Cond SharedSpectrum

 highSpeedCarrierNR-r16 ENUMERATED {true} OPTIONAL -- Need OR

}

MultiBandNsPmaxListNR-1-v1550 ::= SEQUENCE (SIZE (1.. maxMultiBandsNR-1-r15)) OF NS-PmaxListNR-r15

MultiBandNsPmaxListNR-v1550 ::= SEQUENCE (SIZE (1.. maxMultiBandsNR-r15)) OF NS-PmaxListNR-r15

WhiteCellListNR-r16 ::= SEQUENCE (SIZE (1..maxCellWhiteNR-r16)) OF PhysCellIdNR-r15

-- ASN1STOP

| *SystemInformationBlockType24* field descriptions |
| --- |
| ***carrierFreqListNR***List of carrier frequencies of NR carriers. These frequencies correspond to GSCN values as specified in TS 38.101 [85]. If the *carrierFreqListNR-v1610* is present, it contains the same number of entries, listed in the same order as in the *carrierFreqListNR* (without suffix). |
| ***cellReselectionPriority***The field concerns the absolute priority of the concerned carrier frequency as used by the cell reselection procedure. Corresponds with parameter "priority" in TS 36.304 [4]. |
| ***deriveSSB-IndexFromCell***The field indicates whether the UE may use, to derive the SSB index of a cell on the indicated SSB frequency and subcarrier spacing, the timing of any detected cell with the same SSB frequency and subcarrier spacing. If this field is set to TRUE, the UE assumes SFN and frame boundary alignment across cells on the same NR carrier frequency as specified in TS 36.133 [16]. |
| ***highSpeedCarrierNR***If the field is present, the UE shall apply the enhanced inter-RAT NR measurement requirements to support high speed up to 500 km/h as specified in TS 36.133 [16] to the NR carrier. |
| ***maxRS-IndexCellQual***Number of SS blocks to average for cell measurement derivation. Corresponds to the parameter *nrofSS-BlocksToAverage* in TS 38.304 [92]. |
| ***measTimingConfig***Used to configure measurement timing configurations, i.e., timing occasions at which the UE measures SSBs. If the field is absent, the UE assumes that SSB periodicity is 5ms in this frequency. |
| ***multiBandInfoList***Indicates the list of frequency bands for which the NR cell reselection parameters apply. The UE shall select the first listed band which it supports in the *multiBandInfoList* field to represent the NR neighbour carrier frequency. The network always includes this field. |
| ***multiBandInfoListSUL***Indicates the list of frequency bands for which the NR cell reselection parameters apply. The UE shall select the first listed band which it supports in the *multiBandInfoListSUL* field to represent the NR neighbour carrier frequency. |
| ***multiBandNsPmaxListNR***Indicates the *NS-PmaxListNR* configuration for the NR frequency band(s) listed in *multiBandInfoList*. The first entry corresponds to the second listed band in *multiBandInfoList*, and second entry corresponds to the third listed band in *multiBandInfoList*, and so on.  |
| ***multiBandNsPmaxListNR-SUL***Indicates the *NS-PmaxListNR* configuration for the NR SUL frequency band(s) listed in *multiBandInfoListSUL*. The first entry corresponds to the first listed band in *multiBandInfoListSUL*, and second entry corresponds to the second listed band in *multiBandInfoListSUL*, and so on. |
| ***Ns-PmaxListNR***Indicates a list of *additionalPmax* and *additionalSpectrumEmission*, corresponds to the first listed band in the *multiBandInfoList*. |
| ***p-MaxNR***Indicates the maximum power for NR (see TS 38.104 [91]) the UE can use in NR SCG. |
| ***q-QualMin***Parameter "Qqualmin" in TS 36.304 [4], applicable for NR neighbour cells. If the field is not present, the UE applies the (default) value of negative infinity for Qqualmin. The actual value Qqualmin = field value [dB]. |
| ***q-RxLevMin***Parameter "Qrxlevmin" in TS 38.304 [92], applicable for NR neighbour cells. The actual value Qrxlevmin = field value \* 2 [dBm]. |
| ***q-RxLevMinSUL***Parameter "Qrxlevmin" in TS 38.304 [92], applicable for NR neighbouring cells. The actual value Qrxlevmin = field value \* 2 [dBm]. |
| ***Smtc2-LP***Measurement timing configuration for inter-RAT neighbour cells in NR with a Long Periodicity (LP) indicated by periodicity in *smtc2-LP*. The timing offset and duration are equal to the offset and duration indicated in *measTimingConfig* in *CarrierFreqNR*. The periodicity in *smtc2-LP* can only be set to a value strictly larger than the periodicity in *measTimingConfig* in *CarrierFreqNR* (e.g. if *measTimingConfig* indicates sf20 the Long Periodicity can only be set to sf40, sf80 or sf160, if *measTimingConfig* indicates sf160, *smtc2-LP* cannot be configured). The *pci-List*, if present, includes the physical cell identities of the inter-RAT neighbour cells with Long Periodicity. If *smtc2-LP* is absent, the UE assumes that there are no inter-RAT neighbour cells with a Long Periodicity. |
| ***Ssb-PositionQCL-CommonNR***Indicates the QCL relationship between SS/PBCH blocks for NR neighbor cells on the indicated frequency as specified in TS 38.213 [88], clause 4.1. |
| ***ssb-ToMeasure***The set of SS blocks to be measured within the SMTC measurement duration (see TS 38.215 [89]). When the field is absent the UE measures on all SS-blocks. |
| ***ss-RSSI-Measurements***Indicates the SSB-based RSSI measurement configuration. If the field is absent, the UE behaviour is defined in TS 38.215 [89], clause 5.1.3. |
| ***threshRS-Index***List of thresholds for consolidation of L1 measurements per RS index. Corresponds to the parameter *absThreshSS-BlocksConsolidation* in TS 38.304 [92]. |
| ***threshX-High***Parameter "ThreshX, HighP" in TS 36.304 [4]. |
| ***threshX-HighQ***Parameter "ThreshX, HighQ" in TS 36.304 [4]. |
| ***threshX-Low***Parameter "ThreshX, LowP" in TS 36.304 [4]. |
| ***threshX-LowQ***Parameter "ThreshX, LowQ" in TS 36.304 [4]. |
| ***t-ReselectionNR***Parameter "TreselectionNR" in TS 36.304 [4]. |
| ***t-ReselectionNR-SF***Parameter "Speed dependent ScalingFactor for TreselectionNR" in TS 36.304 [4]. If the field is not present, the UE behaviour is specified in TS 36.304 [4]. |
| ***whiteCellListNR***List of whitelisted neighbouring NR cells. |

| Conditional presence | Explanation |
| --- | --- |
| *RSRQ* | The field is mandatory present if the *threshServingLowQ* is present in *systemInformationBlockType3*; otherwise it is not present. |
| *RSRQ2* | The field is optional Need OP if the *threshServingLowQ* is present in *systemInformationBlockType3*; otherwise it is not present. |
| *SharedSpectrum* | The field is optional Need OP if NR operates with shared spectrum channel access; otherwise, it is not present. |
| *SharedSpectrum2* | The field is mandatory present if NR operates with shared spectrum channel access; otherwise, it is not present. |

### ---------------------------------------------------------------------------<start of 2nd change>---------------------------------------------------------------------------

### 6.3.5 Measurement information elements

<Text omitted>

#### – *MeasObjectNR*

The IE *MeasObjectNR* specifies information applicable for inter-RAT NR neighbouring cells.

*MeasObjectNR* information element

-- ASN1START

MeasObjectNR-r15 ::= SEQUENCE {

 carrierFreq-r15 ARFCN-ValueNR-r15,

 rs-ConfigSSB-r15 RS-ConfigSSB-NR-r15,

 threshRS-Index-r15 ThresholdListNR-r15 OPTIONAL, -- Need OR

 maxRS-IndexCellQual-r15 MaxRS-IndexCellQualNR-r15 OPTIONAL, -- Need OR

 offsetFreq-r15 Q-OffsetRangeInterRAT DEFAULT 0,

 blackCellsToRemoveList-r15 CellIndexList OPTIONAL, -- Need ON

 blackCellsToAddModList-r15 CellsToAddModListNR-r15 OPTIONAL, -- Need ON

 quantityConfigSet-r15 INTEGER (1.. maxQuantSetsNR-r15),

 cellsForWhichToReportSFTD-r15 SEQUENCE (SIZE (1..maxCellSFTD)) OF PhysCellIdNR-r15 OPTIONAL, -- Need OR

 ...,

 [[ cellForWhichToReportCGI-r15 PhysCellIdNR-r15 OPTIONAL, -- Need ON

 deriveSSB-IndexFromCell-r15 BOOLEAN OPTIONAL, -- Need ON

 ss-RSSI-Measurement-r15 SS-RSSI-Measurement-r15 OPTIONAL, -- Need ON

 bandNR-r15 CHOICE {

 release NULL,

 setup FreqBandIndicatorNR-r15

 } OPTIONAL -- Need ON

 ]],

 [[

 rmtc-ConfigNR-r16 SetupRelease {RMTC-ConfigNR-r16} OPTIONAL -- Cond SharedSpectrum

 ]]

}

RS-ConfigSSB-NR-r15 ::= SEQUENCE {

 measTimingConfig-r15 MTC-SSB-NR-r15,

 subcarrierSpacingSSB-r15 ENUMERATED {kHz15, kHz30, kHz120, kHz240},

 ...,

 [[ ssb-ToMeasure-r15 CHOICE {

 release NULL,

 setup SSB-ToMeasure-r15

 } OPTIONAL -- Need ON

 ]],

 [[

 ssb-PositionQCL-CommonNR-r16 SSB-PositionQCL-RelationNR-r16 OPTIONAL, -- Cond SharedSpectrum2

 ssb-PositionQCL-CellsToAddModListNR-r16 SSB-PositionQCL-CellsToAddModListNR-r16 OPTIONAL, -- Cond SharedSpectrum

 ssb-PositionQCL-CellsToRemoveListNR-r16 SEQUENCE (SIZE (1..maxCellMeas)) OF PhysCellIdNR-r15 OPTIONAL -- Cond SharedSpectrum

 ]]

}

CellsToAddModListNR-r15 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF CellsToAddModNR-r15

CellsToAddModNR-r15 ::= SEQUENCE {

 cellIndex-r15 INTEGER (1..maxCellMeas),

 physCellId-r15 PhysCellIdNR-r15

}

SSB-PositionQCL-CellsToAddModListNR-r16 ::= SEQUENCE (SIZE (1..maxCellMeas)) OF SSB-PositionQCL-CellsToAddNR-r16

SSB-PositionQCL-CellsToAddNR-r16 ::= SEQUENCE {

 physCellId-r16 PhysCellIdNR-r15,

 ssb-PositionQCL-r16 SSB-PositionQCL-RelationNR-r16

}

RMTC-ConfigNR-r16 ::= SEQUENCE {

 rmtc-PeriodicityNR-r16 ENUMERATED {ms40, ms80, ms160, ms320, ms640},

 rmtc-SubframeOffsetNR-r16 INTEGER(0..639) OPTIONAL, -- Need ON

 measDurationNR-r16 ENUMERATED {sym1, sym14or12, sym28or24, sym42or36, sym70or60},

 rmtc-FrequencyNR-r16 ARFCN-ValueNR-r15,

 refSCS-CP-NR-r16 ENUMERATED {kHz15, kHz30, kHz60-NCP, kHz60-ECP},

 ...

}

-- ASN1STOP

| *MeasObjectNR* field descriptions |
| --- |
| ***bandNR***Indicates the frequency band of the NR carrier frequency configured in this *MeasObjectNR*. This field is always set to setup when the network configures measurements with this *MeasObjectNR*. |
| ***carrierFreq***Identifies the SSB frequency to be measured. E-UTRAN does not configure more than one measurement object for the same SSB frequency. |
| ***deriveSSB-IndexFromCell***The field indicates whether the UE may use, to derive the SSB index of a cell on the indicated SSB frequency and subcarrier spacing, the timing of the NR serving cell with the same SSB frequency and subcarrier spacing if configured. Otherwise, the field indicates whether the UE may use the timing of any detected cell with the same SSB frequency and subcarrier spacing. |
| ***measDurationNR***Number of consecutive symbols for which the Physical Layer reports samples of RSSI (see TS 38.215 [89]). Value *sym1* corresponds to one symbol, *sym14or12* corresponds to 14 *symbols* of the reference numerology for NCP and 12 symbols for ECP, and so on. |
| ***quantityConfigSet***Indicates the n-th element of *quantityConfigNRList* provided in *MeasConfig*. |
| ***refSCS-CP-NR***Indicates a reference subcarrier spacing and cyclic prefix to be used for RSSI measurements (see TS 38.215 [89]). |
| ***rmtc-FrequencyNR***Indicates the center frequency of the measured bandwidth (see TS 38.215 [89]). |
| ***rmtc-PeriodicityNR***Indicates the RSSI measurement timing configuration (RMTC) periodicity (see TS 38.215 [89]). Value *ms40* corresponds to 40 ms periodicity, *ms80* corresponds to 80 ms periodicity, and so on. |
| ***rmtc-SubframeOffsetNR***Indicates the RSSI measurement timing configuration (RMTC) subframe offset (see TS 38.215 [89)). If not configured, the UE chooses a random value as *rmtc-SubframeOffsetNR* for *measDurationNR* which shall be selected to be between 0 and the configured *rmtc-PeriodicityNR* with equal probability. |
| ***rs-ConfigSSB***Indicates the SSB configuration for measuring the set of SS blocks within the SMTC measurement duration. |
| ***ssb-PositionQCL-NR***Indicates the QCL relationship between SS/PBCH blocks for a specific neighbor cell as specified in TS 38.213 [88], clause 4.1. If provided, the cell specific value overwrites the common value signalled by *ssb-PositionQCL-CommonNR* in *MeasObjectNR* for the indicated cell. |
| ***ssb-PositionQCL-CommonNR***Indicates the QCL relationship between SS/PBCH blocks for NR neighbor cells as specified in TS 38.213 [88], clause 4.1. |
| ***threshRS-Index***List of thresholds for consolidation of L1 measurements per RS index. |

| Conditional presence | Explanation |
| --- | --- |
| *SharedSpectrum* | The field is optional Need ON if NR operates with shared spectrum channel access; otherwise, it is not present. |
| *SharedSpectrum2* | The field is mandatory present if NR operates with shared spectrum channel access; otherwise, it is not present. |