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

|  |  |  |
| --- | --- | --- |
| Company Name | Contact Person | Email Address |
| Apple | Yuqin Chen | yuqin\_chen@apple.com |
| Huawei, HiSilicon | Xiao XIAO | xiaoxiao6@huawei.com |
| Lenovo | Hyung-Nam Choi | hchoi5@lenovo.com |
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# 3 Topic 1: E-UTRA CGI reporting with autonomous gap

[R2-2102650](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_113bis-e\\Docs\\R2-2102650.zip" \o "D:Documents3GPPtsg_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:\Documents\3GPP\tsg_ran\WG2\TSGR2_113bis-e\Docs\R2-2103030.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.

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| **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]?**

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| --- | --- | --- |
| Company Name | Yes/No? | Comments |
| Apple | Yes |  |
| Lenovo | Yes |  |
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# 4 Topic 2: CGI reporting in NPN

[R2-2103169](file:///D:\\Documents\\3GPP\\tsg_ran\\WG2\\TSGR2_113bis-e\\Docs\\R2-2103169.zip" \o "D:Documents3GPPtsg_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?**

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| --- | --- | --- |
| 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. |
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# 5 Topic 3: NR-U RRM measurement

[R2-2103879](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113bis-e\Docs\R2-2103879.zip) Discussion on NR-U RRM measurement Apple, xiaomi, LG Electronics discussion Rel-16 NR\_unlic-Core

[R2-2103281](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113bis-e\Docs\R2-2103281.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.

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| --- |
| **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?**

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| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
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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?**

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| --- | --- | --- |
| 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. |
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## 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?**

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| --- |
| *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. |

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| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
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## 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]?**

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| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
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## 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.

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| --- |
| 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.

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| --- | --- | --- |
| Company Name | Alt 1/Alt 2? | Comments |
| Apple | Alt 1 | Alt 1 is much simpler and can guarantee the correctness of measurement results. |
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## 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]?**

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| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
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**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.

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| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
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**Question 10: Do company agree with the following proposal in R2-2103879 [4]?**

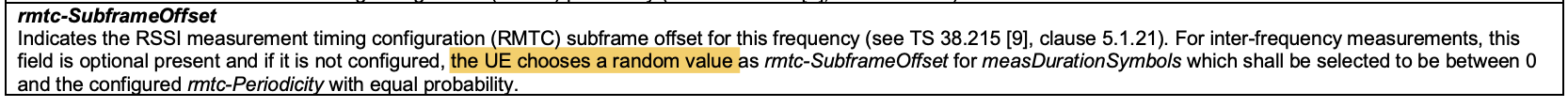
**Proposal 6: Suggest to modify the field description to SSB-ToMeasure as below in TS36.331.**

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| --- |
| 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. |

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| Company Name | Yes/No? | Comments |
| Apple (proponent) | Yes |  |
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## 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*

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

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| Company Name | Yes/No? | Comments |
| Apple | Yes | It’s better to also have the same description in LAA. |
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**Question 13: Should an LS sent to RAN1 to inform them about RAN2 agreement?**

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| 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. |
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# 6 Topic 4: Missing smtc3 for IAB

[R2-2104173](file:///D:\Documents\3GPP\tsg_ran\WG2\TSGR2_113bis-e\Docs\R2-2104173.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.

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| --- |
| 5.5.2 Measurement configuration  5.5.2.1 General  The 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]?**

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| --- | --- | --- |
| 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. |
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# 7 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

# 8 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. |