**3GPP TSG RAN WG2 #119bis-e *draft R2-2210850***

**Online, 10 - 19 Oct, 2022**

**Source:** Huawei, HiSilicon

**Title:** Report of [Offline-109][NR NTN] cell reselection requirements (Huawei)

**Agenda Item:** 6.10.1.1

**Document for:** Discussion and decision

# Introduction

This document is the report of the following offline discussion, which is triggered by RAN4 LS [1].

* [AT119bis-e][109][NR NTN] cell reselection requirements (Huawei)

Initial scope: Discuss the proposals for enhanced cell reselection requirements for NTN

Initial intended outcome: Summary of the offline discussion with e.g.:

* List of proposals for agreement (if any)
* List of proposals that require online discussions
* List of proposals that should not be pursued (if any)

Deadline (for companies' feedback): Thursday 2022-10-13 14:00 UTC

Deadline (for rapporteur's summary in R2-2210850): Thursday 2022-10-13 16:00 UTC

Proposals marked "for agreement" in R2-2210850 not challenged until Friday 2022-10-14 10:00 UTC will be declared as agreed via email by the session chair (for the rest the discussion might continue online).

During online discussion on 10th October, the following was agreed:

Agreements:

1. Introduce one indication for cell reselection requirement enhancement for LEO. FFS if in SIB1 or SIB19

In this offline discussion, we will discuss:

1) Whether the indication for LEO is in SIB1 or SIB 19;

2) Whether the relaxed monitoring of GEO can reuse the existing configuration;

And try to attempt some stage-3 details and a draft reply LS.

1. Contact Information

To make it easier to find the contact delegate for potential follow-up questions, delegates are encouraged to provide their contact information in the following table:

|  |  |  |
| --- | --- | --- |
| **Company** | **Name** | **Email** |
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# Discussion

It was raised online by OPPO that the indication should be in SIB19 rather than SIB1, so that all NTN-related information can be grouped into one SIB.

**Q1: Please share your views on whether the indication for enhanced requirements for LEO should be in SIB1 or SIB19.**

|  |  |  |
| --- | --- | --- |
| **Company** | **SIB1/SIB19** | **Comments** |
| Huawei, HiSilicon | SIB1 | Firstly we think 1-bit will not take much space and can be included in SIB1.Secondly, there are other NTN related configuration located in SIB2/4 (e.g. multiple SMTCs). There is no need to restrict all NTN configuration to SIB19. If we follow this principle, the relaxed monitoring configuration will be located in SIB19 as well, while R16 relaxed monitoring configuration for UE power saving and R17 relaxed monitoring configuration for RedCap are in SIB2. |
| vivo |  | We can follow the majority. |
| MediaTek | No strong view | We can follow the majority. |
| Xiaomi | No strong view |  |
| ITRI |  | We can follow the majority.The enhanced cell reselection requirements for LEO would be applied when UE is served by a NTN cell that UE should acquire SIB19. However, we agree that no need to restrict all NTN configuration in SIB19.  |
| OPPO | SIB19 | We think it’s better to put in SIB19. Multiple SMTCs have to be put in SIB2/4 because they are part of those frequency list which is however not present in SIB19. |
| Intel | SIB1 | Since TN UEs are barred for NTN access, a NTN cell only serves NTN-capable UE, adding this indication in SIB1 is more efficient. |
| Samsung |  | Follow majority |
| China Telecom | SIB1 | Similar to HST, we think the enhanced requirements can also be in SIB1. |
| CAICT | SIB1 | One indication will not take up too much space.  |
| Lenovo | No strong view | We can follow the majority. |
| CMCC | Both are ok | Follow the majority |
| TTP | SIB 19 | It is more efficient to put all NTN related signalling and indication on SIB19; SIB1 is already congested |
| Ericsson | SIB1 | Not all NTN related info is in SIB19 anyway |
| LGE | No strong view | Not much difference from functional point of view.  |
| Qualcomm | SIB1 |  |
| NEC | No strong view  |  |
| Apple | SIB1 | We share Huawei’s view. The understanding is incorrect that all NTN related info are in the same SIB19, e.g. the SMTC config and gap config are in SIB2/4. |
| CATT | No strong view |  |
| ZTE | SIB1 | We understand having such indication in SIB1 would be more efficient as all the cell reselection and measurement configuration are provided in SIB2-5. |
| Nokia | SIB1 | Slight preference for SIB1 out of these two options. |

Summary: 21 companies provided their views. 9 companies prefer SIB1, 2 companies prefer SIB19, others have no strong view.

**Proposal 1: Introduce one indication for cell reselection requirement enhancement for LEO in SIB1.**

With respect to GSO relaxed monitoring, it was raised in [2][3] to reuse the exiting *relaxedMeasurement-r16* field, but several companies expressed online that a separate bit is preferred. One of the argument is that it is unclear whether the requirements are exactly the same with the R16 requirements.

In the current 38.133 v17.7.0, the intention is to simply refer to the R16 requirements:

|  |
| --- |
| 4.2C.2.7 Measurements of intra-frequency NR cells for UE configured with relaxed measurement criterionThe equirements in this clause 4.2.2.7 apply provided that UE is GEO. |

However, there is a mistake that the clause number should be 4.2.2.9 (Measurements of intra-frequency NR cells for UE configured with relaxed measurement criterion) instead of 4.2.2.7 (General requirements). This is an obvious mistake, and likely to be fixed by RAN4 shortly. The following is a CR proposed by CATT in RAN4 (R4-2215431):

|  |
| --- |
| 4.2C.2.7 Measurements of intra-frequency NR cells for UE configured with relaxed measurement criterionThe equirements in clause 4.2.2.9 apply provided that UE is GEO.4.2C.2.8 Measurements of inter-frequency NR cells for UE configured with relaxed measurement criterionThe equirements in clause 4.2.2.10 apply provided that UE is GEO. |

Based on the above, the requirements for GSO relaxed monitoring are the same with R16 requirements.

Companies may notice that Rel-17 also introduced relaxed monitoring specific to RedCap Ues in SIB2 (cited from 38.331 v17.2.0):

relaxedMeasurement-r16 SEQUENCE {

 lowMobilityEvaluation-r16 SEQUENCE {

 s-SearchDeltaP-r16 ENUMERATED {

 dB3, dB6, dB9, dB12, dB15,

 spare3, spare2, spare1},

 t-SearchDeltaP-r16 ENUMERATED {

 s5, s10, s20, s30, s60, s120, s180,

 s240, s300, spare7, spare6, spare5,

 spare4, spare3, spare2, spare1}

 } OPTIONAL, -- Need R

 cellEdgeEvaluation-r16 SEQUENCE {

 s-SearchThresholdP-r16 ReselectionThreshold,

 s-SearchThresholdQ-r16 ReselectionThresholdQ OPTIONAL -- Need R

 } OPTIONAL, -- Need R

 combineRelaxedMeasCondition-r16 ENUMERATED {true} OPTIONAL, -- Need R

 highPriorityMeasRelax-r16 ENUMERATED {true} OPTIONAL -- Need R

} OPTIONAL -- Need R

]],

[[

cellEquivalentSize-r17 INTEGER(2..16) OPTIONAL, -- Cond HSDN

relaxedMeasurement-r17 SEQUENCE {

 stationaryMobilityEvaluation-r17 SEQUENCE {

 s-SearchDeltaP-Stationary-r17 ENUMERATED {dB2, dB3, dB6, dB9, dB12, dB15, spare2, spare1},

 t-SearchDeltaP-Stationary-r17 ENUMERATED {s5, s10, s20, s30, s60, s120, s180, s240, s300, spare7, spare6, spare5,

 spare4, spare3, spare2, spare1}

 },

 cellEdgeEvaluationWhileStationary-r17 SEQUENCE {

 s-SearchThresholdP2-r17 ReselectionThreshold,

 s-SearchThresholdQ2-r17 ReselectionThresholdQ OPTIONAL -- Need R

 } OPTIONAL, -- Need R

 combineRelaxedMeasCondition2-r17 ENUMERATED {true} OPTIONAL -- Need R

} OPTIONAL -- Need R

]]

But the case for RedCap is different with NTN:

For RedCap, the criteria for relaxed measurements are different with R16: R16 uses 1) low mobility and 2) not-at-cell-edge, R17 RedCap uses 1) stationery and 2) not-at-cell-edge while stationery. RAN4 also defined separate requirements in 38.133 (clause 4.2B.2.9 and 4.2B.2.10). Besides, it is allowed that both R16 relaxed monitoring and R17 relaxed monitoring are configured simultaneously to RedCap Ues, and the UE behaviour for different combinations of configuration is specified in 38.133.

For NTN, as previously mentioned, RAN4 decided to reuse the current requirements. From RAN2 perspective, we don’t see the need to configure R16 relaxed monitoring and configure a new R17 NTN relaxed monitoring at the same time, so it is straightforward to reuse the R16 configuration.

**Q2: Which of the following is preferred:**

* **Option 1: Reuse the existing *relaxedMeasurement-r16* field;**
* **Option 2: Add a separate flag, but reuse the configuration in *relaxedMeasurement-r16*;**
* **Option 3: Add separate configuration, which is similar to *relaxedMeasurement-r16*.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option** | **Comments** |
| Huawei, HiSilicon | Option 1 | The field description can be modified, as in R2-2210409:***relaxedMeasurement***Configuration to allow relaxation of RRM measurement requirements for cell reselection (see TS 38.304 [20], clause 5.2.4.9). In NTN, this field is only present in GSO. |
| Vivo |  | We can follow the majority.  |
| MediaTek | Option 1 | Agree with Huawei |
| Xiaomi | Option 1 |  |
| ITRI | Option 1 | Agree with Huawei. |
| OPPO | Option 1 |  |
| Intel | Option 1 |  |
| Samsung | Option 1 or Option 2 | Our concern for option 1 is since ***relaxedMeasurement*** includes both r16 relaxed measurement and r17 relaxed measurement for redcap, by adding “In NTN, this field is only present in GSO.” Would this mean r17 relaxed measurement configuration for redcap could present in GSO? In our understanding relaxed measurement for redcap is not applicable to NTN.[HW] In my understanding, the R17 relaxed monitoring is only for RedCap UEs. So far there is no agreement in NTN/RedCap session that RedCap UEs can support NTN, there is no agreement to exclude it either, but this is a separate discussion. |
| China Telecom | Option 1 |  |
| CAICT | Option 1 |  |
| Lenovo | Option 1 | Agree with Huawei |
| CMCC | Option 1 |  |
| TTP | Option 1 |  |
| Ericsson |  | Can go with majority |
| LGE | Option1 | Agree with Rapporteur analysis. So option1 is sufficient with the proposal from Huawei. It may be better to slightly reword the network restriction as such: “In NTN, this field is only present in earth fixed cell”. [HW] It is not indicated in RAN4 LS that the enhancement is only for earth-fixed cells.Regarding Samsung concern, since there is no RedCap Ues in NTN cell, we do not think there exists actual ambiguity.  |
| Qualcomm |  | Ok to go with majority. Suggestion from Huawei is ok. |
| NEC | Option 1  | Ok to go with majority  |
| Apple | Option 2 or Option 3 | For the measurement relaxation, legacy requirement and the R17 NTN requirement are applied on the different frequencies/cell types. * For the legacy one, it is for TN capable UE to apply on the TN neighbor cells/frequencies.
* For the NTN one, it is for the NTN capable UE to apply on the NTN neighbor cells/frequencies.

If we only have one configuration to control the measurement relaxation of both NTN and TN neighbor cells/frequencies, if both TN and NTN neighbor frequencies are configured in SIBs, NW has no way to enable them separately. It’s lack of the NW configuration flexibility. [HW] We have different understanding on this. It is not based on whether neighbor cells are TN or NTN, it is based on whether serving cell is TN or NTN, because whether to relax the measurements is dependent on the fluctuation of serving cell quality and/or whether the UE is in the edge of serving cell.There is no need for separate configuration for TN and NTN neighbor cells.In addition, no matter which option is selected, we should clarify in the spec that the configuration targeted to the NTN purpose is only applied on the NTN frequencies which is provided in SIB19. |
| CATT |  | Ok to go with majority. For the Redcap UE case, maybe we can’t assume there is no RedCap UEs in NTN cell? |
| ZTE | Option 2 or Option 3 | We prefer to have a separate flag for NTN. |
| Nokia | Not Option 1 | Separate indication preferred. |

Summary: Among the 21 companies that replied, 14 companies support Option 1. Option 2 and Option 3 have limited support. Several companies have no strong view and can go with majority.

**Proposal 2: Reuse the exiting *relaxedMeasurement-r16* field to enable the relaxed cell reselection requirements for GEO.**

It was proposed in [6] to add the following description to 38.304 Section 5.2.4.2 Measurement rules for cell re-selection:

|  |
| --- |
| If the *enhancedNTN-Reselection* is present in SIB2 and the UE supports NTN LEO, the UE shall perform enhanced cell reselection measurements according to TS 38.133 [8]. If the *relaxedNTN-Reselection* is present in SIB2 and the UE supports NTN GEO, the UE shall perform relaxed cell reselection measurements according to TS 38.133 [8].  |

Even though the exact description depends on the 38.331 signalling details, the moderator would like to collect companies’ initial opinions on whether 38.304 changes are required.

**Q3: Do you think changes to 38.304 are needed?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | As long as the field description in 38.331 is made clear and refers to the correct RAN4 spec (i.e., 38.331), we don’t see the necessity to refer to RAN4 spec again in 38.304. |
| vivo | No | According to current Spec, TS 38.304 specifies that UE performs measurement according to TS 38.133 and TS 38.331 specifies which requirements to be applied by UE under what circumstances. The measurement behavior of UE is clear and no additional description in TS 38.304 is needed. |
| MediaTek | No | Agree with Huawei and vivo that this is not needed. |
| Xiaomi | No |  |
| ITRI | No | Agree with vivo. We don’t think the change is needed. |
| OPPO | No |  |
| Intel | No |  |
| China Telecom | No |  |
| CAICT | No |  |
| Lenovo | No |  |
| CMCC | No |  |
| TTP | No  |  |
| Ericsson | no |  |
| LGE | No |  |
| NEC | No  |  |
| Apple | See comments | If we can capture the meaning clearly in the field description in 38.331, then we donot need to change the 38.304.  |
| CATT | No |  |
| ZTE | No |  |
| Nokia | Yes | We believe there should be a proper description in dedicated specification (i.e. 38.304) which handles IDLE mode procedures, rather than to hide it within the field descriptions of 38.331. Of course, our suggested text can be improved, if companies have better suggestions. |

Summary: There is not enough support for the changes to 38.304.

**Proposal 3: Changes in R2-2210348 are not pursued.**

The draft LS and 38.331 details will wait for the conclusion of the previous questions.

Since P1 and P2 are in line with CR R2-2210409, it is suggested that R2-2210409 is taken as a baseline for further review. And a draft LS is also uploaded to the subfolder for further review.

# Conclusion

**Proposal 1: Introduce one indication for cell reselection requirement enhancement for LEO in SIB1.**

**Proposal 2: Reuse the exiting *relaxedMeasurement-r16* field to enable the relaxed cell reselection requirements for GEO.**

**Proposal 3: Changes in R2-2210348 are not pursued.**

# Reference

1. R2-2209337 LS to RAN2 on Network indication for applying enhanced cell reselection requirements (R4-2214472; contact: Huawei), RAN4
2. R2-2210408, Discussion on enhanced cell reselection requirements for NTN, Huawei, HiSilicon
3. R2-2210409, CR on enhanced cell reselection requirements for NTN, Huawei, HiSilicon
4. R2-2210044, On LS Network indication for applying enhanced cell reselection requirements, Ericsson
5. R2-2210347, NR RRC CR: Introduction of enhanced and relaxed cell reselection for NTN, Nokia, Nokia Shanghai Bell
6. R2-2210348, NR IDLE-mode CR: Introduction of enhanced and relaxed cell reselection for NTN, Nokia, Nokia Shanghai Bell