**3GPP TSG-RAN WG2 Meeting #118 electronic  *R2-220xxxx***

**Online, May 9th – May 20th 2022**

**Agenda item: 7.2.3.2**

**Source: ZTE (email discussion rapporteur)**

**Title: Report of [AT118-e][050][IoTNTN] Miscellaneous (ZTE)**

**Document for: Discussion and Decision**

# Introduction

This document is the report of the offline email discussion “*[AT118-e][050][IoTNTN] Miscellaneous*”, as indicated below:

* *[AT118-e][050][IoTNTN] Miscellaneous (ZTE)*

 *Scope: Treat R2-2204712, R2-2205140, R2-2205145, R2-2205595,* *R2-2205146, R2-2205330, R2-2205830, R2-2204652, R2-2205329, R2-2204654, (part of)* *R2-2205996, (part of)* *R2-2205862*

 *Ph1 Determine agreeable parts, Ph2, agree/endorse TP(s) if applicable.*

 *Intended outcome: Report, endorsed TPs/Draft CRs*

 *Deadline CB online W2 TUE (settle as many points as possible offline)*

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# Discussion

## Issue 1: SIB31

### Change notification of SIB31

For SIB31, RAN2 has achieved the following agreements:

* *Update to serving cell ephemeris information does not affect the system information value tag and does not trigger System information modification procedure. How to trigger re-read of this information is FFS. FFS if the UE shall reacquire the new SIB when SI update is triggered.*
* *Updates to serving cell ephemeris information are not bound to the BCCH modification period.*
* *UE shall acquire the NTN specific SIB before accessing the cell, regardless of the state of UL sync validity timer.*

However, it’s still FFS whether changes to parameters other than satellite ephemeris and common TA parameters can only occur at the modification period boundary and notified via system information update notification.

Firstly, in [R2-2204712], company think the handing of SIB31 should follow the similar behaviour as in NR-NTN. That is, the fields of *epochTime, nta-Common, nta-CommonDrift, nta-CommonDriftVariation, orbitalParameters* and *stateVectors* do not affect the system information value tag and does not trigger System information modification procedure. Meanwhile, fields *k-MAC*, *k-Offset*, *ul-SyncValidationDuration* in SIB31 still follow the legacy SI modification procedure. In other word, not whole SIB31/SIB31-NB would be excluded from the legacy SI modification procedure. Therefore, company suggests to remove SIB31/SIB31-NB from the exception lists in Section 5.2.1.3 / 5.2.2.3. Furthermore, in section 6.2.2 / 6.3.1/ 6.7.2, to add sentence “*This field is excluded when estimating changes in system information, i.e. changes of epochTime(/nta-Common /nta-CommonDrift/nta-CommonDriftVariation /orbitalParameters /stateVectors) should neither result in system information change notifications nor in a modification of systemInfoValueTag in SIB1.*” In field descriptions of *epochTime, nta-Common, nta-CommonDrift, nta-CommonDriftVariation, orbitalParameters* and *stateVectors*, respectively.

Secondly, in [R2-2205140] and [R2-2205329], companies have similar understanding that, since parameters *k-MAC, k-Offset, ul-SyncValidationDuration* are only used for initial access or during the connection and UE shall acquire the NTN specific SIB before accessing the cell (Please note there is no such agreement in NR NTN), there is no motivation for the IoT UE to acquire SIB31 when only camping on the cell and thus no motivation for system information update notification in RRC\_IDLE. In [R2-2205595], company also think that the validity of system information is typically (but not always) done per SIB rather than per parameter. And in NR, the SIB validity is defined in terms of the SI message containing satellite assistance information rather than any individual parameter.

In [R2-2205329], company also mentions that, as IOT NTN Ues do not monitor paging in RRC\_CONNECTED, there is no motivation for an update notification in RRC\_CONNECTED either.

Thirdly, in [R2-2205595], company think the related editor’s note is incorrect. Instead of updates being restricted to occur at the start of a modification period, satellite ephemeris and common TA can instead be updated at any time, and the UE is triggered to re-acquire that information upon expiry of T317 (*ul-SyncValidationDuration*). As company also think the validity of system information is typically (but not always) done per SIB rather than per parameter, company suggest the entire contents of SIB31/SIB31-NB are considered valid by the UE until the expiry of T317 and can be updated at any time without being restricted to the modification period boundary. However, it’s not clear in [R2-2205595], whether network needs to set value tag when any parameter in SIB31 is changed. Per rapporteur’s understanding, there may be assumption that value tag need to be updated.

As there are diverse views, rapporteur suggest to have the following discussion:

**Q1: Companies are invited to give your preference on the following options:**

**Option 1: Different from satellite ephemeris and common TA, the parameters *k-MAC, k-Offset*, *ul-SyncValidationDuration in SIB31* still follow the legacy SI modification procedure.**

**Option 2: The system information update notification procedure does not apply to SIB31/SIB31-NB. Change to any parameter in SIB31/SIB31-NB does not affect the system information value tag.**

**Option 3: The entire contents of SIB31/SIB31-NB are considered valid by the UE until the expiry of T317 and can be updated at any time without being restricted to the modification period boundary.**

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| --- | --- | --- |
| **Company** | **Option** | **Comment** |
| ZTE | **Option 2** | For Option 1, we see no benefit and have sympathy with the comments in [R2-2205595] that the validity of system information is typically (but not always) done per SIB rather than per parameter.For Option 3, at least for satellite ephemeris and common TA, as RAN2 has agreed that the change of these parameters doesn’t affect the value tag, UE cannot know whether these parameters are really changed. So without valid value tag, it’s obviously useless to let UE always re-acquire SIB31/SIB31-NB each time upon expiry of T317. One possible way may be that, network still needs to set value tag when any parameter in SIB31 is changed. Meanwhile, UE doesn’t need to follow legacy system information modification procedure and can just re-acquire SIB31/SIB31-NB upon expiry of T317. We think this is to revert the previous agreement. We disagree as we cannot see the benefit. |
| Huawei. HiSilicon | Option 2 |  |
| OPPO | Option 1 | Prefer to follow the similar behaviour as in NR-NTN. |
| Ericsson | Option 1, but not ul-syncValidityDuration | These parameters have to be under SI modification procedure (except for ***ul-SyncValidationDuration***). If the parameters change without the UE knowing then network would not know which parameters that are applied by which UE. And these parameters are vital and are used during connected mode and if there is confusion regarding which value is applied communication will break down. Also remember that UE-specific k-offset and k-mac is an optional capability, so the network cannot reliably handle it through these.  |
| Qualcomm | Option 1 | We have to do it right way in specification for any parameters that are supposed to be pretty static (not time variant). It should consistent in future as what have been doing from the past.There is no issue of option 1. Probably we can discuss what to do for validity duration as per NR conclusion. |
| Spreadtrum | Option 2 | It was agreed that the UE shall acquire the NTN specific SIB before accessing the cell, regardless of the state of UL sync validity timer. What’s more, the parameters k-MAC, k-Offset, ul-SyncValidationDuration are useless when the UE just camps on the cell. Therefore, we think that any parameters in SIB31/SIB31-NB should not affect value tag and should not trigger system information modification procedure.  |
| Lenovo | Option 1 | For now we see no issue following legacy SI modification procedure. |
| InterDigital | Option 1 with comment | We had proposed option 2 since technically once the validity timer expires, the UE anyway has to re-read the entire SI, however it seems better to align with NR. Rather than agree the proposal based on the current wording of proposal 1 we think we should rather just specify which parameters are not bound to the SI modification proceudre, as this is what the spec will capture.Similar to the proposal in offline-107 we can say **Proposal 1: Ephemeris, common TA parameters and epoch time can be updated without invoking the SI modification procedure.** |
| Xiaomi | Option 1/2 | For option 1: *ul-SyncValidationDuration* has not been decided in NR NTN whether it is controlled by system modification procedure.For option 2: as epoch time only has length 10.24s, network anyway has to update SIB31 every 10.24s. So perhaps it is enough to use this to update all the parameters. |
| CATT |  | For ***ul-SyncValidationDuration,*** we can follow the output of the ongoing NR NTN 107 offline discussion. And we think ***ul-SyncValidationDuration*** can also be excluded by the system modification procedure.  |
| Nokia | Option 2 | As the UE will read SIB-31/SIB-31 BR prior to access always and in connected mode it can acquire based on validity timer, UE can get the latest information by these means even for the parameters which are not related to ephemeris and TA. So triggering change notification is not needed which will wake-up the UE in idle mode for SI-reception without any actual benefit for the same |

### SIB31 acquisition in RRC\_CONNECTED

There is another Editor's Note/FFS that, besides to re-acquire SIB31 upon expiry of T317, whether the UE needs to acquire other system information (e.g. MIB, SIB1 …) in RRC\_CONNECTED.

In [R2-2205140], company think it’s possible that the scheduling information of SIB31 in SIB1 can be changed. Therefore, upon expiry of T317 in connected mode, UE needs to firstly acquire MIB and SIB1 and then it can have correct scheduling information to acquire SIB31.

Meanwhile, in [R2-2205329] and [R2-2205595], companies have similar view that there is no need to acquire any other system information than SIB31/SIB31-NB in RRC\_CONNECTED. In [R2-2205329], company further indicate that, if UE also requires MIB/SIB1 and if the value tag indicates a change to the system information, the UE shall reacquire all system information that are applicable to RRC\_CONNECTED, including SIB2, SIB26, SIB22-NB. And if the resource configuration in any of these SIBs has changed, it will cause a resource configuration mismatch between UE and eNB as the eNB is not aware that the UE has updated its configuration. Company think it’s not good to introduce new behavior that UE only update the scheduling information of SIB31 and ignore all other parameters in MIB/SIB1. Alternatively, the rare case where the scheduling information of SIB31 has changed can be handled by the guard timer T318.

Based on the view from a bit more companies, rapporteur suggest to agree the following draft proposal:

**Draft proposal: In RRC\_CONNECTED, the UE assumes that the scheduling information of SIB31 is unchanged and only re-acquires SIB31.**

**Q2: Whether companies can agree the above draft proposal? If no, please elaborate the against reason or wording suggestions.**

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| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes | We think SIB26 may be typo, it should be SIB25? As we assume UE implementation anyway may have some special process when it temporarily tune away from connected mode, e.g., need to store and restore the dedicated configuration, we are not sure whether the mentioned resource configuration mismatch issue can be occur. But we can agree that, to acquire MIB/SIB1 may cause unnecessary complexity and potential problems. So we are fine to depend on T318 to handle the rare case where the scheduling information of SIB31 has changed.  |
| Huawei, HiSilicon | Yes | SIB26 is correct, resource reservation for eMTC which is used by UE in RRC\_CONNECTED |
| OPPO | Yes |  |
| MediaTek | Yes |  |
| Ericsson | Yes |  |
| Qualcomm | Yes | Yes this can be the first assumption. However it is up to UE, in case, the scheduling information has changed and UE cannot find SIB31, UE may again try to acquire SIB1 and then SIB31 before the guard timer expires.That’s why we have guard timer T318. |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| InterDigital | Yes |  |
| Xiaomi | No | If UE doesn’t acquire MIB and SIB1, if SIB1 scheduling changes, UE will attempt SIB31 reception with wrong scheduling information for a long time until T318 expiry, so it causes UE a lot of power wasting. Also, it triggers RLF, which should be unnecessary. |
| CATT |  | We are not sure the reason to have this assumption. If the scheduling information of SIB31 has changed, that is the SIB1 has changed too, the UE anyway will be notified, regardless with SIB31 re-reception.  |
| Nokia | Neutral | As the timer is meant to cover the UE reading MIB/SIB-1 followed by SIB-31 the UE can follow the normal acquisition as similar to the case of system information notification change. Considering the change of scheduling information is rare and It will be anyhow notified via system information change notification, we are OK with above assumption for direct acquisition of SIB-31 |

### Confirmation of T318 and its timer length

In section 5.3.3.22 of RRC, there are still the following Editor’s Notes:

Editor’s Note: *Agreement*: Introduce a guard timer TXXXX for SIBXX acquisition in connected mode. At TXXX expiry, UE triggers RLF (if it can be shown in Q2 that UE will loose RLM when UE tunes away, it can be discussed to skip this timer).

Editor’s Note: *Editor*: FFS whether a new timer T31Y is signalled or the value signalled for T310 is used.

T318 has been introduced in the current RRC spec to prevent the UE being stuck in trying to acquire SIB31. In this meeting, no new contribution suggests to skip this timer. In [R2-2205329], company further indiates T318 can be useful in the case that UE may not be able to acquire SIB31 due to change in the scheduling information of SIB31. Based on all the related discussion and proposal 6 in [R2-2205329], rapporteur suggest to quickly discuss whether we can confirm the introduction of timer T318.

**Q3a: Whether companies can agree to confirm the introduction of timer T318?**

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| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes |  |
| Huawei, HiSilicon  | already agreed | agreed in Monday’s online session (proposal 6-1) |
| OPPO | Yes |  |
| MediaTek | Yes | Agree with Huawei’s comments. |
| Ericsson | Yes |  |
| Qualcomm | Yes |  |
| Spreadtrum | Yes |  |
| Lenovo | Yes |  |
| InterDigital | Yes |  |
| Xiaomi | yes |  |
| Nokia | Yes |  |

In [R2-2205329], company firstly indicates the difference between T318 and legacy T310. But company also think, as T318 is just a guard timer, no need to be optimised or to be UE specific, the value of T310 signaled in SIB2 can be reused for T318.

In [R2-2205862], company also discuss the issue of time length setting for T318. Company have similar view that the timers (T310 and T318) are very different from the perspective of the UE actions performed, e.g., a network could potentially need to have a low T310 to quickly trigger RLF, but have a longer period to allow UE to read SIB31 (especially if SIB31 is not signalled often). Therefore,company think it would not be good idea to force the network to use the same value and suggest T318 should be configurable.

Company further think the length of T318 may mainly be related to the potential time that it would take to read system information, which can be below 50 ms in good conditions up to in order of seconds in bad coverage and a lot of repetitions. In this sense the possible values can be similar to T310 timer. Company suggest different value range for eMTC and NB-IoT. In a summary, all the related proposals are listed below:

*Proposal 8 Timer T317 and T318 are associated with a specific cell.*

*Proposal 9 T318 is separately RRC configured.*

*Proposal 10 For LTE-M the T318 timer value range shall be {0, 50, 100, 200, 500, 1000, 2000, 4000}.*

*Proposal 11 For NB-IoT the T318 timer value range shall be {0, 100, 200, 500, 1500, 2000, 2000, 4000, 8000}*

**Q3b: Companies are invited to give your preference on the following options for the time length of T318:**

* **Option 1: To set timer T318 with the value of T310 signalled in SIB2**
* **Option 2: The time length of T318 is configurable via RRC. Different value range can be defined for eMTC over NTN and NB-IoT over NTN (Company can give further suggestion based on the above P10 and P11).**
* **Option 3: Other**

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| **Company** | **Yes/No** | **Comment** |
| ZTE | Option 1 |  |
| Huawei, HiSilicon  | Option 1 | in any case, we do not see any reason for a IUE specific timer. |
| OPPO | Option 3 | We agree to configure T318 via SIB, but no need to restrict T318 set with the same value of T310 given that their usage is different. |
| MediaTek | Option 1 |  |
| Ericsson | Option 2/3 | The important part is it should be separately configured per cell and not use the value of T310. T318 duration would depend on SIB19 periodicity which highly depends on the scenario. We cannot assume length of T310 can be the same as T318. Regarding the value range, we suggested a specific value range. But we would also be OK with using the same value range as T310.  |
| Qualcomm | Option 1 |  |
| Spreadtrum | Option 3 | We think that T310 is used for reflecting the quality of radio link. That is significantly different from the purpose of T318. Therefore, a specific value range can be configured for T318, which can be configured per cell via SIB. |
| Lenovo | Option 1 |  |
| InterDigital | Option 2 | Timer can be configured separately to T310, per cell in system information. |
| Xiaomi | Option 3 | No need to restrict to the value of T310 |
| CATT | Option 1 |  |
| Nokia  | Option 2 | Defining independent timer allow flexibility for configuring them independently |

### Clarification for epoch time in SIB31

In [R2-2205140], company mentions that, when *epochTime* is explicitly configured in SIB31, there can be an infinite number of positions corresponding to the configured (*startSFN*, *startSubframe*) values, e.g., with 10.24 seconds as a cycle. So company suggests to have further clarification.

**Q4: Companies are invited to give your preference on the following clarification for the *epochTime* in SIB31:**

* **Option 1: No need of clarification**
* **Option 2: The DL subframe indicated by *startSFN* and *startSubframe* is the one immediately after the DL subframe corresponding to the end of the SI window during which the SI message carrying SIB31 is transmitted.**
* **Option 3: The DL subframe indicated by *startSFN* and *startSubframe* is the early one closest to the DL subframe corresponding to the end of the SI window during which the SI message carrying SIB31 is transmitted.**
* **Other option**

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| **Company** | **Option** | **Comment** |
| ZTE | **Option 3** |  |
| Huawei, HiSilicon | FFS | This is currently discussed in RAN1 |
| OPPO | FFS | It is under RAN1 discussion, and we can wait for RAN1 conclusion.BTW, it seems there is no difference between option 2 and option 3 |
| MediaTek | FFS | Agree with Huawei and OPPO that it has RAN1 dependencies |
| Ericsson | FFS | Same reasons as others.  |
| Qualcomm | Option 2 | This is in system information so option 2 will be cleaner. |
| Spreadtrum | FFS | We can wait for RAN1 conclusion. |
| Lenovo | FFS | For now we think Option 3 is reasonable but we can wait for RAN1’s decision |
| InterDigital | FFS | Wait for RAN1 |
| Xiaomi | RAN1 to decide | RAN1 is discussing this. |
| CATT | FFS | Waiting for RAN1 input. |
| Nokia  | FFS | Wait for RAN1 |

### t-Service for the serving cell

RAN2 has agreed to include t-Service for the serving cell in SIB3. In [R2-2205595], companies think t-Service needs to be frequently updated in order to remain relatively accurate. Therefore, similar as that in NR NTN, company suggests to move t-Service from SIB3/SIB3-NB to SIB31/SIB-31-NB, along with other serving cell satellite information which can be updated at any time without the SI update mechanism.

**Q5: Whether companies can agree to move *t-Service* for the serving cell from SIB3 to SIB31/SIB31-NB? As “Yes” means to revert the previous agreement, more explanation may be needed.**

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| **Company** | **Yes/No** | **Comment** |
| ZTE | No | We think the legacy change notification for *t-Service* is enough to let UE be aware of the stop time of serving cell.With this proposal in [R2-2205595], it’s not clear whether UE would acquire SIB31/SIB-31-NB to update *t-Service* even if the T317 is not expired? |
| Huawei, HiSilicon | No |  |
| OPPO | No |  |
| MediaTek | No |  |
| Ericsson | No | T-service should only need to be acquired once for each cell and shouldn’t need to be updated. If it really needs to be changed, which we doubt then we have SI modification procedure.  |
| Spreadtrum | No |  |
| Lenovo | No |  |
| InterDigital | No | Although we proposed this, based on Q1 and NR discussions in this meeting we think it can be left alone. |
| Xiaomi | No | t-Service is introduced only for earth fixed cell, then the t-Service will not be changged frequently and the legacy SI modification mechanism is enough. |
| CATT | No |  |
| Nokia | No |  |

## Issue 2: Dedicated SIB31

As RAN2 has the agreement as below, the related proposals would not be further discussed:

* *P8: Signalling of SIB31 in RRCConnectionReconfiguration not for HO is supported (but no further specification effort is expected due to this, e.g. up to network impl when to provide this).*

Moreover, In [R2-2205145], company think it's still not crystal clear how the UE deal with the previously configured dedicated SIB31 in the cases where UE receives *RRCConnectionReconfiguration* message without dedicated SIB31. Company further suggests in order to avoid any unpredictable UE behaviour, clarification is needed for the case that UE hands over to a TN cell and receives *RRCConnectionReconfiguration* message in which *systemInformationBlockType31Dedicated-r17* is mandatory absent. The related change is as below:

| *RRCConnectionReconfiguration* field descriptions |
| --- |
| ***conditionalReconfiguration***This field is used to configure the UE with a conditional reconfiguration. The reconfiguration is applied when the execution condition(s) is fulfilled. The field is absent if *daps-HO* is configured for any DRB or if *MobilityControlInfo* is included in the *RRCConnectionReconfiguration* message. The *conditionalReconfiguration* is not configured in the *RRCConnectionReconfiguration* message included in a *conditionalReconfiguration.* |
| ***…………………*** |

| Conditional presence | Explanation |
| --- | --- |
| ……… | ………. |
| *HO-NTN* | The field is mandatory present in case of handover to a NTN cell. Otherwise the field is not present. UE should release the *systemInformationBlockType31Dedicated*, if previously configured, in case of handover to a TN cell. |

**Q6: Whether companies can agree to add clarification in the condition explanation of HO-NTN for dedicated SIB31 that, if UE hands over to a TN cell, UE should release the dedicated SIB31, if previously configured?**

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| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes |  |
| Huawei, HiSilicon  | Ni | the text is not aligned with the rapporteur CR. see belowThe field is mandatory present in case of handover to a NTN cell. Otherwise the field is optionally present, Need ON, in a NTN cell. Otherwise the field is not present. |
| OPPO | No | Same understandings as Huawei. |
| MediaTek | No | Agree with Huawei |
| Ericsson | No | Agree with Huawei.  |
| Qualcomm | No | Agree with Huawei. However, we have to consider NB-IoT CP case where RRC reconfiguration may not be used. |
| Spreadtrum | No | We also have similar comments as Huawei. |
| Lenovo | No | If the field is optionally present in an NTN cell, we think there is no such issue. |
| InterDigital | No |  |
| Xiaomi | No | Same view as Huawei  |
| CATT | No | If HO to TN cell, the UE can release *systemInformationBlockType31Dedicated* by implementation. It is useless when working in TN cell.  |
| Nokia | No | Agree with Huawei |

## Issue 3: Maintenance of UL Synchronization

In [R2-2205830], company mentions that SIB31 acquistion related Timer stop actions should be aligned to system information acquistion description. Company has the following change suggestions **(Alt1)** (the irrelevant change is not copied):

|  |
| --- |
| 5.3.3.22 T317 expiryThe UE shall:1> if in RRC\_CONNECTED:2> inform lower layers that the UL synchronisation is lost;2> start timer T318;2> acquire *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT) as specified in 5.2.2;5.2.2.4 System information acquisition by the UE…………………………………………..1> if the UE is a BL UE or a UE in CE or a NB-IoT UE:2> if *schedulingInfoList* indicates that *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT) is present:3> immediately before establishing, resuming or re-establishing an RRC connection; or3> if in RRC\_CONNECTED and T317 is not running:4> acquire *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT);4> stop timer T318 on successful acquisition. 4> Inform lower layers that the UL synchronisation is restored. |

In [R2-2205996], the maintenance of UL Synchronization is also discussed. Company want to address the case that the T318 happens to expire, and *SystemInformationBlockType31* is later acquired. Company think it is ambiguous whether MAC spec can transmit in the uplink if any time in the future *SystemInformationBlockType31* is acquired.

Company suggest two ways to address the ambiguity and prefer the second way:

1) Change RRC text in 5.3.3.22 to make it clear that for any time in the future when *SystemInformationBlockType31* has been acquired, the UE may transmit in the UL

2) Change the RRC text in 5.2.2.39 to send an indication to lower layers that there is UL synchronisation

Company further give the following proposals:

[*Proposal 1 In MAC spec, change 5.2a according to the text proposal below:*](#_Toc101823312)

[*Proposal 2 In the RRC spec, at end of 5.2.2.39 add “1> indicate to lower layers that UL synchronization is acquired.” at the end, as in the following text proposal:*](#_Toc101823313)

[*Proposal 3 In the RRC spec, from 5.3.3.22 remove “3> inform lower layers that the UL synchronisation is restored;” and remove the Editor’s Notes as described in this text proposal:*](#_Toc101823314)

Besides updating the reference to TS 36.331 in MAC spec, company further think the current modelling in MAC is not future proof as the conditions to allow UL transmissions in hidden away in the same line where UL transmissions are stopped.

Based on the proposals, the change suggestions to TS 36.331 and TS 36.321 are given below **(Alt2)**.

|  |
| --- |
| 5.3.3.22 T317 expiryThe UE shall:1> if in RRC\_CONNECTED:2> inform lower layers that the UL synchronisation is lost;2> start timer T318;2> acquire *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT) as specified in 5.2.2;2> upon successful acquisition of *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT):3> stop timer T318;5.2.2.39 Actions upon reception of *SystemInformationBlockType31*Upon receiving *SystemInformationBlockType31* (*SystemInformationBlockType31-NB*), the UE shall:1> start or restart timer T317 with the duration *ul-SyncValidityDuration* from the subframe indicated by *epochTime*.1. indicate to lower layers that UL synchronization is acquired for this Serving Cell.

TS 36.321:5.2a Maintenance of UL SynchronizationIf upper layer informs that the UL synchronization is lost for the SpCell according to the clause 5.3.3.22 of TS36.331[8], the MAC entity shall:- flush all HARQ buffers;- not perform any uplink transmission.If upper layer informs that the UL synchronization is acquired for the SpCell according to the clause 5.2.2.39 of TS36.331 [8], the MAC entity shall allow uplink transmissions. |

Per rapporteur’s understanding, it’s no need to discuss the case that T318 happens to expire and SIB31 is later acquired. According to the previous RAN2 agreement, UE would trigger RLF upon expiry of T318. But companies still can compare these different ways with intention to optimize the handling of T318 and maintenance of UL Synchronization.

**Q7a: Companies are invited to give your preference on the following options and please elaborate your reason:**

**Option 1: no need of change**

**Option 2: Alt1 (can give further suggestions)**

**Option 3: Alt2 (can give further suggestions)**

**Option 4: Other**

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| **Company** | **Option** | **Comment** |
| ZTE | **Option 1** | For Alt2, as 5.2.2.39 is a general section to describe the actions upon reception of SIB31 and it can also be invoked by UE in idle, we think it’s incorrect to put the RRC-MAC indication here. UE in idle doesn’t need to send such indicate upon reception of SIB31.For Alt1, we see no difference from the original text. If we go for Alt1, at least we may need to check whether T318 is started in section 5.2.2.4. |
| Huawei. HiSilicon | Option 1 | In both option 2 and option 3, RRC informs MAC while UE is in RRC\_IDLE. We do not think this is OK, this is actually the reason why we did move the maintenance of the timer from MAC to RRC |
| OPPO | Option 4 | We agree with Huawei that for both Alt1 and Alt2, RRC informs MAC while UE is in RRC IDLE, which is not correct.For the original text, we think RRC should inform MAC that the UE sync is restored at the epoch time. Suggest to revise as following:5.3.3.22 T317 expiryThe UE shall:1> if in RRC\_CONNECTED:2> inform lower layers that the UL synchronisation is lost;2> start timer T318;2> acquire *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT) as specified in 5.2.2;2> upon successful acquisition of *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT):3> stop timer T318;3> inform lower layers that the UL synchronisation is restored at the epoch time; |
| MediaTek | Option 1 |  |
| Ericsson | Option 3  | We think that it is correct that MAC is notified before being in connected mode, otherwise MAC does not know when to start transmitting random access. We do not think that the MAC layer should be informed to be restored at epoch time as there is no point for eNB to send an epoch time that is valid that far in the future where it is not valid when it is received. This has been discussed in RAN1 extensively.  |
| Qualcomm | Option 2 | Makes sense to stop the T318 where the UE finishes reading SIB31. |
| Spreadtrum | Option 1 | We agree with Huawei. In RRC IDLE state, it is incorrect that RRC inform MAC. |
| Lenovo | Option 1 |  |
| InterDigital | Option 1/4 | The MAC spec needs to be updated, currently there is “Editor’s note” – at least this should be removed. No change is needed to RRC |
| Xiaomi | Option 1 |  |
| CATT | Option 1 with comments | Just reminding, the following agreement has been achieved in NR NTN this week:6. RRC indicates to lower layers when T3XX timer has expired or is restarted.We think we can follow the agreement for the following description:1. if in RRC\_CONNECTED:
2. inform lower layers that the UL ynchronization is lost;

And1. start or restart timer T317 with the duration *ul-SyncValidityDuration* from the subframe indicated by *epochTime*.
2. indicate to lower layers that UL synchronization is acquired for this Serving Cell.

That is, RRC just indicate to lower the expiry or restarting of the valid timer. |
| Nokia | Option 2/Option 3 |  |

**Q7b: Whether companies can agree the above mentioned change for MAC spec in [R2-2205996]? If no, please elaborate the against reason or wording suggestions.**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes |  |
| Huawei. HiSilicon | No | The MAC change is based on the assumption that RRC informs MAC when reading SIB31 which we do not agree. If this was the case, it would have been simpler to have the timer in MAC.By default, MAC shall assume UL transmission are allowed (as a legacy) and only handle loss and recovery.  |
| OPPO | Yes |  |
| MediaTek | No | Agree with Huawei. The change is shifted from MAC to RRC in previous meeting. |
| Ericsson | Yes | See suggestions in **Q7a**.  |
| Qualcomm | No | It seems not necessary to capture that MAC resumes UL transmissions. |
| Spreadtrum | Yes |  |
| Lenovo | No | Agree with Huawei and MediaTek. |
| InterDigital | No | Just remove the editor’s note. |
| Xiaomi | Yes |  |
| CATT | No |  |
| Nokia  | No |  |

## Issue 4: GNSS position

### Reference to GNSS validation check

In [R2-2205146] (RILZ303), company mentions that, RAN2 has defined “*Condition for establishing RRC Connection in NTN*” (section 5.3.3.1d) in which UE is required to have a valid GNSS position. This condition should be checked when UE initiates RRC connection establishment or resumption procedure in NTN. But there is no any reference to this section in the current specification.

**Q8: Whether companies can agree the changes in [R2-2205146]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes |  |
| Huawei. HiSilicon | No | First we do not think that there is an actual need for this reference. This is very different from EDT and PUR where the handling of the RRC procedure is very different from legacy. It might be better to insert the condition in 5.3.3.1.Then we do not understand ‘camped normally’ (Emtc UE can initiate emergency call) If the UE is camping ~~normally~~ on a NTN cell as specified in TS 36.304 [4], UE can initiates establishment or resume of an RRC connection only when the condition ~~for establishing or resuming RRC connection in NTN, as~~ specified in 5.3.3.1d~~,~~ is fulfilled.  |
| OPPO | No | Agree with Huawei. |
| MediaTek | No | Agree with Huawei |
| Ericsson | No | Agree with Huawei |
| Qualcomm | No |  |
| Spreadtrum | No | We also agree with Huawei. |
| Lenovo | No | Agree with Huawei |
| InterDigital | No |  |
| Xiaomi | No | The current spec is clear, no need for change. |
| CATT | No |  |
| Nokia  | No |  |

### How to refer to GNSS in RRC

In section 5.2.1.3 of RRC, there is the following Editor’s Note:

Editor’s Note: FFS whether GNSS is considered as lower layers, upper layers or something else.

In [R2-2205329], company think the GNSS device and associated protocols are outside of 3GPP scope and not controlled by RRC thus it is not a ‘lower layer’. Company give the following proposal 5.

***Proposal 5****: GNSS is referred to as “upper layers” in RRC specification.*

In [R2-2205830], company may have the similar view and give the following change suggestion (the irrelevant change is not copied):

|  |
| --- |
| 5.3.3.21 UE actions upon indication of out-of-date GNSS position from upper layersUpon indication that the GNSS position has become out-of-date while in RRC\_CONNECTED, the UE shall:1> perform the actions upon leaving RRC\_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure'.Editor's Note: FFS release cause 'RRC Connection Failure' or 'other'. |

In [R2-2204652], company also think the interaction between AS layer and GNSS receiver can be left to UE implementation. A note is suggested as below (the irrelevant change is not copied):

|  |
| --- |
| 5.3.3.21 UE actions upon indication of out-of-date GNSS positionUpon indication that the GNSS position has become out-of-date while in RRC\_CONNECTED, the UE shall:1> perform the actions upon leaving RRC\_CONNECTED as specified in 5.3.12, with release cause 'RRC connection failure'.Editor's Note: FFS release cause 'RRC Connection Failure' or 'other'.NOTE: The interaction with GNSS receiver is up to UE implementation. |

**Q9: Whether companies can agree the above mentioned change in [R2-2205830] and/or the change in [R2-2204652]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE |  | We can agree the change in [R2-2205830] and think the change in [R2-2204652] is not needed. |
| Huawei, HiSilicon  | No | In Monday’s online session, it was agreed ‘Keep the text as it is and remove the Editor’s note.’ (Proposal 5) |
| OPPO |  | Agree with ZTE |
| MediaTek | No | Agree with Huawei that this is already discussed in Monday’s online session. |
| Ericsson | No | Already handled R2-2205830 and for the change in R2-2204652 we do not see the need for this or what it adds. We are not describing procedures for GNSS measurements, so this should be obvious.  |
| Qualcomm | Yes | Note in [R2-2204652] makes it clear. |
| Spreadtrum |  | Agree with ZTE |
| Lenovo | No | Already discussed in Monday. |
| InterDigital | No |  |
| Xiaomi |  | We are ok either add “from upper layer” or add nothing. |
| CATT | No |  |
| Nokia |  | Agree with ZTE. First change is sufficient. Note is not needed |

### AS/NAS interaction to handle GNSS position fix delay

In [R2-2204652], company mentions that, when the UE wakes up from long sleep (e.g., from discontinuous coverage), the UE may start to fix the GNSS position from the GNSS cold state before initiating random access from RRC\_IDLE. This could take 100s. Therefore, there should be AS/NAS interaction to handle the NAS timers accordingly. Therefore, a note can be added to clarify it can be done by UE implementation:

|  |
| --- |
| 5.3.3.1d Condition for establishing RRC Connection in NTNIf s*ystemInformationBlockType31* (*systemInformationBlockType31-NB* in NB-IoT) is broadcast, a RRC connection is initiated only if the UE has a valid GNSS position.NOTE 1: The UE may need to re-acquire the GNSS fix before establishing the connection to avoid interruption during the connection.NOTE 2: The interaction with NAS to handle the GNSS position fix delay is up to UE implementation.Editor’s Note: *Agreement*: RAN2 will follow the RAN1 agreement that UE will report the remaining GNSS validity duration to the network. FFS: value range (not clear if the values of RAN1 agreement can be used). FFS which message. |

**Q10: Whether companies can agree the above mentioned change in [R2-2204652]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | No | Seems not needed. But no strong view. |
| Huawei, HiSilicon | No |  |
| OPPO | No |  |
| MediaTek | No |  |
| Ericsson | No | This is handled in NAS spec. This section is only a requirement for establishing an RRC connection in NTN, not an instruction to perform a GNSS measurement. Most NAS-AS interactions are up to UE implementation anyhow.  |
| Qualcomm | Yes | It should be clear that there exists AS and NAS interaction for this process. |
| Spreadtrum | No |  |
| Lenovo | No |  |
| InterDigital | No |  |
| Xiaomi | No |  |
| CATT | No |  |
| Nokia | No |  |

### Cause for RRC connection release for GNSS-Out-of-sync

In [R2-2205830] and [R2-2204652], companies suggest that the release cause for RRC connection release for GNSS-Out-of-sync situation is updated as ‘others’. Meanwhile, in [R2-2205329], company suggest that the release cause when GNSS fix become out-of-date would be set to ‘RRC connection failure’.

As RAN2 has the following agreement in the first online discussion in RAN2#118e meeting:

* *P4 (Proposal 4: Editor’s note 4: Release cause when GNSS fix become out-of-date is ‘other’. Remove the Editor’s’ Note) is agreed.*

There is no need to further discuss this issue.

## Issue 4: NTN specific configuration parameters

In [R2-2205330], company suggests to agree RIL H012, H013, H016, H017, e.g., to group the NTN specific configuration parameters in *ntn-ConfigCommon* and *ntn-ConfigDedicated* respectively to avoid having conditions at multiple places.

**Q11: Whether companies can agree the changes in [R2-2205330]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes with comments | The following item PRACH-Config-v1700 may also need to be removed:***PRACH-Config* information elements**-- ASN1STARTPRACH-ConfigSIB ::= SEQUENCE { rootSequenceIndex INTEGER (0..837), prach-ConfigInfo PRACH-ConfigInfo}..............................PRACH-Config ::= SEQUENCE { rootSequenceIndex INTEGER (0..837), prach-ConfigInfo PRACH-ConfigInfo OPTIONAL -- Need ON}PRACH-Config-v1700 ::= SEQUENCE { ce-PRACH-TxDuration-r17 ENUMERATED {n1, n2, n4, n8, n16, n32, n64, n128} OPTIONAL -- Cond NTN}.............................. |
| Huawei, HiSilicon | yes with comments | agree with ZTE comment.Note that there are changes on these parameters in the rapporteur CR |
| OPPO | Yes with comments | Agree with ZTE. |
| MediaTek | Yes |  |
| Ericsson | Yes |  |
| Qualcomm | Yes |  |
| Spreadtrum | Yes  |  |
| Lenovo | Yes with comments | Agree with ZTE. |
| InterDigital | Yes | + agree with ZTE |
| Xiaomi | Yes |  |
| CATT | Yes |  |
| Nokia | Yes |  |

## Issue 5: RRC reestablishment between TN and NTN for NB-IoT

In [R2-2204654], company discuss the details for RRC reestablishment between TN and NTN for NB-IoT.

In TN, the parameter ***cp-Reestablishment*** in SIB2-NB indicates whether the cell supports RRC reestablishment for CP solution. There is a question that, whether a same indication *cp-Reestablishment-r14* can be used to indicate that the UE is allowed to perform RRC reestablishment from TN to NTN or NTN to TN? For example, due to that NTN MME and TN MME may not be same, network may reject RRC reestablishment request.

**Q12a: Whether companies can agree the existing *cp-Reestablishment* in SIB2-NB can only indicate that RRC reestablishment for CP within TN or within NTN is allowed. It cannot indicate that RRC reestablishment for CP between TN and NTN is allowed?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes |  |
| Huawei, HiSilicon | No | The parameter was introduced for backward compatibility purpose, i.e. to avoid a UE sending a RRC message not understood by the eNB. The parameter indicates that the eNB and the target MME support the procedure. If the MME associated to the target cell is different form the MME associated to the source cell are different, the target MME will reject the re-establishment. This is already the cases in legacy (no concept fetching across MMEs), we do not see any problem with that. |
| OPPO | No | We have similar views as Huawei. |
| MediaTek | No |  |
| Ericsson | No | This first of all assumes that the MMEs are different, which does not need to be the case. Second of all, it is already possible in a terrestrial networks that neighbouring cells have different MMEs, where re-establishment would not be possible in between two eNBs, but possible with other eNBs. So the same problem exists in TN as well and this has not been solved.  |
| Qualcomm | Yes | The scenario is different here which may increase the probability of receiving RRC connection reestablishment reject, which is not good for UE power consumption and delay given satellite cells are there only for certain duration.Increase in rejection means increase in loss of CP data.Therefore, we cannot simply ignore it comparing with the TN procedure.We do not need two procedures (RRC reestablishment procedure + TAU). We just need one which is TAU where there is no risk of rejection due to NTN MME being different from TN. |
| Spreadtrum | Yes |  |
| Lenovo | No |  |
| InterDigital | No |  |
| Xiaomi | No | We think there is a normal procedure that network may reject RRC reestablishment request when NTN MME and TN MME is not the same. So no need to optimize. |
| CATT | No |  |
| Nokia  | No |  |

In [R2-2204654], company give the following options to address the mentioned issue:

#**Solution 1**: a new indication “*cp-ReestablishmentTN-NTN*” in *SystemInformationBlockType2-NB*

#**Solution 2**: A NAS based RRC reestablishment solution

**Q12b: If answer to Q9a is Yes, companies are invited to give your preference on the following options and please elaborate your reason:**

**Option 1: To introduce a new indication “*cp-ReestablishmentTN-NTN*” in SIB2-NB**

**Option 2: NAS based solution, e.g., if the UE selects a new cell that belongs to different network (TN or NTN) from the currently connected network after RLF, it will trigger a tracking area update procedure instead of RRC reestablishment procedure.**

**Option 3: Other**

|  |  |  |
| --- | --- | --- |
| **Company** | **Option** | **Comment** |
| ZTE | **Option 1** | Seems simple. |
| Huawei. HiSilicon  | None | see answer to Q2Note that option 2 is not clear, in both cases UE will perform TAU |
| OPPO | None |  |
| MediaTek | None |  |
| Ericsson | None |  |
| Qualcomm | Option 2 | See answer to Q12a. It is important that we minimize loss of CP data, delay and power consumption due to reject message. Option 2 will just do that. As Huawei mentioned, UE anyway has to perform TAU, so why not make it work for delivery of any pending CP data same as what CP based RRC reestablishment procedure will do otherwise. But option 2 does not need RRC reestablishment procedure.We do not need two procedures (RRC reestablishment procedure + TAU). We just need one which is TAU where there is no risk of rejection due to NTN MME being different from TN. |
| Spreadtrum | Option 1 | It is simple and the bit overhead can be acceptable. |
| Lenovo | None |  |
| InterDigital | None |  |
| Xiaomi | None |  |

## Other issue

In [R2-2205830], company suggest to add clarification that SIB acquistion of IoT-NTN System Information is applicable for UE with NTN connectivity capability.

|  |
| --- |
| 5.2.2.4 System information acquisition by the UE…………………………………………..1> if the UE is a BL UE or a UE in CE or a NB-IoT UE and capable of NTN connectivity:2> if *schedulingInfoList* indicates that *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT) is present:3> immediately before establishing, resuming or re-establishing an RRC connection; or3> if in RRC\_CONNECTED and T317 is not running:4> acquire *SystemInformationBlockType31* (*SystemInformationBlockType31-NB* in NB-IoT); |

**Q13: Whether companies can agree the above mentioned change in [R2-2205830]?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comment** |
| ZTE | Yes? | There are some discussion during ASN.1 review for the similar thing but no related Tdoc in this meeting?We are fine to have some clarification in order to make TN UE in TN cell skip the checking for SIB31.Considering there may be the case that NTN-capable UE camping on a TN cell and acting as a TN UE, if we want to have a clarification, we think it’s better to be:1. if the UE is a BL UE or a UE in CE or a NB-IoT UE and camping normally on a NTN cell:
 |
| Huawei, HiSilicon  | not standalone | This is discussed in [IoT-NTN][46] together with RILs H001/ H002/ H003/ H004/ H005 |
| OPPO | Yes |  |
| MediaTek | No | Agree with Huawei. |
| Ericsson |  | Discussed elsewhere more comprehensively |
| Spreadtrum | Yes |  |
| Lenovo |  | Should be discussed elsewhere. |
| InterDigital |  | Handled in [046] |
| Xiaomi | No | TN UE cannot be connected in cell broadcasting SIB31. |
| Nokia | Yes |  |

**Q14: Companies are invited to indicate whether there is any other issue?**

|  |  |
| --- | --- |
| **Company** | **Comment** |
|  |  |
|  |  |
|  |  |

# Conclusion

TBD

# References

[1] R2-2204712 [O300][O301][O302][O303][O304][O306][O307][O311][O312][O313] Correction on the handing of SIB31 OPPO draftCR Rel-17 36.331 17.0.0 F LTE\_NBIOT\_eMTC\_NTN

[2] R2-2205140 FFS and RILO301 etc for SIB31 ZTE Corporation, Sanechips discussion Rel-17 LTE\_NBIOT\_eMTC\_NTN-Core

[3] R2-2205145 FFS and RILO305, X501 etc for dedicatedSIB31 ZTE Corporation, Sanechips discussion Rel-17 LTE\_NBIOT\_eMTC\_NTN-Core

[4] R2-2205595 IoT-NTN System Information Validity Interdigital, Inc. discussion Rel-17 LTE\_NBIOT\_eMTC\_NTN

[5] R2-2205146 RILZ303 Reference to GNSS validation check ZTE Corporation, Sanechips CR Rel-17 36.331 17.0.0 4787 F LTE\_NBIOT\_eMTC\_NTN-Core

[6] R2-2205330 RIL H012, H013, H016, H017 : Signalling of NTN specific configuration parameters Huawei, HiSilicon discussion Rel-17 LTE\_NBIOT\_eMTC\_NTN

[7] R2-2205830 Clarification on System Information acquistion and GNSS Fix related actions for IoT-NTN Nokia Solutions & Networks (I) CR Rel-17 36.331 17.0.0 4807 F LTE\_NBIOT\_eMTC\_NTN-Core

[8] R2-2204652 Clarification on GNSS fix Qualcomm Incorporated CR Rel-17 36.331 17.0.0 4786 F FS\_LTE\_NBIOT\_eMTC\_NTN

[9] R2-2205329 Adressing RRC Editor’s notes Huawei, HiSilicon discussion Rel-17 LTE\_NBIOT\_eMTC\_NTN

[10] R2-2204654 RRC reestablishment between TN and NTN for NB-IoT Qualcomm Incorporated discussion Rel-17 FS\_LTE\_NBIOT\_eMTC\_NTN

[11] R2-2205995 Other NR NTN user plane issues Ericsson discussion Rel-17 NR\_NTN\_solutions-Core

[12] [R2-2205862](file:///C%3A%5C%5CUsers%5C%5Cmtk65284%5C%5CDocuments%5C%5C3GPP%5C%5Ctsg_ran%5C%5CWG2_RL2%5C%5CTSGR2_118-e%5C%5CDocs%5C%5CR2-2205862.zip%22%20%5Co%20%22C%3AUsersmtk65284Documents3GPPtsg_ranWG2_RL2TSGR2_118-eDocsR2-2205862.zip) Other control plane open issues Ericsson discussion LTE\_NBIOT\_eMTC\_NTN