3GPP TSG-RAN WG2 #113-e R2-210xxxx

eMeeting, 25th Jan – 5th Feb, 2021

Agenda Item: 5.4.4

Source: MediaTek Inc.

**Title: Summary of [AT113-e][013][NR15] Idle Inactive (Mediatek)**

Document for: Discussion and decision

# 1 Introduction

This is report for the following AT113-e mail discussion.

* [AT113-e][013][NR15] Idle Inactive (Mediatek)

Scope: Treat R[2-2100181](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100181.zip), R[2-2101249](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101249.zip), R[2-2101250](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101250.zip), R[2-2101355](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101355.zip), R[2-2101840](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101840.zip), R[2-2101896](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101896.zip), R[2-2101897](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101897.zip), R[2-2100247](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100247.zip), R[2-2100248](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100248.zip), R[2-2100306](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100306.zip), R[2-2100307](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100307.zip)

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

Intended outcome: Report and Agreed CRs.

Deadline: Schedule A (Deadline for comments Thursday Jan 28 1200 UTC). A Final round with Final deadline Thursday Feb 4 1200 UTC)

# 2 Discussion

## 2.1 Mobility State

### 2.1.1 Background

In the last RAN2 meetings, there was discussion on whether inter-RAT cell changes shall be counted for mobility state estimation. The following observation is made but the issue was postponed.

* Observation: 38.304 is not clear on whether inter-RAT cell changes shall be counted for mobility state estimation. The R5 test case is clear (option 1 – IRAT cell changes are counted). There seems to be different UE implementations.
* postponed

In this meeting, there are several proposals in [1-7] to conclude the topic. The e-mail discussion try to find an acceptable way forward.

### 2.1.2 Interpretation of current SPEC

As a starting point, we would like to confirm that current RAN2 specification is unclear on whether to include inter-RAT cell reselection in the MSE (mobility state estimation). No matter companies prefer to count IRAT cell reselection or not, it seems that the common understanding is that current SPEC is not clear enough.

**Question 1: Do companies agree that current RAN2 specification is not clear on whether inter-RAT cell changes shall be counted for mobility state estimation?**

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| --- | --- | --- |
| **Company** | **Agree or not** | **Comments** |
| Nokia | No | This topic was discussed for E-UTRA in 2009 (R2-095617 – Nokia) and it was agreed in the meeting to leave this to up to UE implementation |
| Ericsson | Yes | 38.304 is not explicit about this aspect in our view.  PS: it is not clear to use what triggered RAN5 to introduce this test case, which basically triggered this whole discussion. Apparently RAN5 thought 38.304 was clear ☺.  Thanks to Nokia for the history in LTE RAN2#67bis R2-095617:  If the UE enters E-UTRAN from another RAT, the UE is in Normal-mobility state and the counting of reselections is started from zero.  **=> Leave to UE implementation.** |
| Huawei, HiSilicon | Yes | It is not currently specified whether the UE counts reselections from the other RAT or not, therefore the behaviour is not clear and is open to interpretation.  The EUTRA conclusions mentioned by Nokia were based on cell reselection from UTRAN and GERAN. The mobility state estimation in UMTS/GERAN is not directly comparable to LTE and NR, and the coverage and deployment situation is different to the case of EUTRAN->NR, therefore it is not a sufficient justification to say that we should just follow conclusions made over 10 years ago based on different assumptions. |
| Apple | Yes | Neither LTE nor NR spec explicitly indicates the UE behavior, which means it’s up to UE implementation.  According to the history discussion as indicated by Nokia, it’s clear the inter-RAT case is up to UE implementation. |
| OPPO | No | The consequence is not significant even if we leave it to UE implementation. |
| Qualcomm | Yes | There is no explicit text on how inter-RAT cell is counted. |
| Samsung | Yes, but | Agree that both LTE and NR specification does not clearly specify whether to count IRAT cell reselection as a part of mobility state determination.  But as Nokia pointed out, it's clear that it is up to UE implementation i.e. no UE requirement on counting IRAT cell reselection. |
| CATT | Yes | There is no explicit description in both LTE and NR spec. |
| ZTE(Yuan) | Yes |  |
| Intel | Yes | Agree that the current specification is not clear. |
| LG | Yes, but | It is not explicitly stated whether the cell reselection count is continued after inter-RAT cell reselection, but we think it is better to leave it up to UE implementation. Specification update seems not really necessary for this. |
| MediaTek | Yes |  |

In [4], company claims that RAN5 should define the test case based on RAN2 spec description. And in [5] it is pointed out that an editorial note is added in 38.523-1, which also implies that RAN5 test purposes shall be based on 3GPP core requirement. Rapporteur suggest to confirm this general 3GPP principle.

**Question 2: Do companies agree that RAN5 should define the test case based on RAN2 spec description?**

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| --- | --- | --- |
| **Company** | **Agree or not** | **Comments** |
| Nokia | Yes | But as we expect this to be up to UE implementation test case should consider UE to pass independent of UE behaviour |
| Ericsson | Yes | RAN5 test cases should be based on core specification, i.e. RAN5 should not invent new test cases that are not captured in core specification. |
| Huawei, HiSilicon | N/A | In our understanding all RAN5 test cases correspond to one or more core requirements, however it is not appropriate for RAN2 to confirm the ToR of other working groups. |
| Apple | Yes | RAN5 test case should be defined based on core spec. |
| OPPO | Yes |  |
| Qualcomm | N/A | Agree with HW |
| Samsung | Yes | Test case in RAN5 should not introduce additional UE requirements i.e. they should only cover requirements clearly stated in core specifications. |
| CATT | Yes |  |
| ZTE | Yes |  |
| Intel | N/A | Agree with HW and QC that this should be left to RAN5 |
| LG | N/A | Agree with Huawei. |
| MediaTek | Yes |  |

### 2.1.3 Counting Inter-RAT cell reselection

In [1], company think that this is a purely UE side issue and the magnitude of the problem is not big. In [5], company also think that the issue is not so critical and leave to UE implementation would be reasonable. However, in [2], it is stated that there are some performance lost if UE does not count inter-RAT cell reselection. It seems worthwhile to discuss the consequence if UE does not count this inter-RAT reselection in MSE.

In [2], it is claimed that

“*As a consequence, taking the case when the UE is moving with high-mobility in inter-RAT cell reselection for instance, before the UE gets the new evaluation results of high-mobility state, the UE may be far away from the serving cell, in which case the UE may miss paging due to long transmission distance or may fail to transmit RRC setup/resume request message even after receiving paging successfully*”

**Question 3: Do companies agree that missing page or fail to access the network may arise if both the mobility state and reselection count are not inherited after inter-RAT cell reselection?**

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree or not** | **Comments** |
| Nokia | No | See previous comments |
| Ericsson | No | It is our understanding that the UE continuous to measure, independent of the mobility state, and if the UE loses the serving cell it would try to re-select to a suitable cell as soon as possible. |
| Huawei, HiSilicon | Yes | This is the case that UE should be in high mobility state, but finds itself only in normal mobility state due to not continuing the count after an inter-RAT change, and as a result does not reselect quickly enough to a new cell.  If the UE loses the serving cell before performing a cell reselection, it performs cell selection (not reselection as commented above). During this time the UE is not camped on a cell and can therefore not be paged. |
| Apple | No | UE may perform the cell reselection based on the RRM measurement regardless of the mobility state. |
| OPPO | No | The consequence is not significant even if we leave it to UE implementation. |
| Qualcomm | Maybe | The scenario by HW is possible. |
| Samsung | No | We are not convinced that in general NR deployments can only achieve sufficient paging reliability by use of MSE including IRAT continuation. |
| CATT | No | UE could quickly select a new cell if loss the current serving cell. |
| ZTE | No | We understand the mobility state estimation is only used to fasten the cell reselection when UE is in high mobility state, which is actually an enhancement for improvement. UE can still perform cell reselection even without the MSE related enhancements. It is not a matter of life or death. |
| Intel | No | Even if the UE mobility speed estimation is not that accurate (it is not that accurate anyway), doesn’t mean that it will miss paging or fail to access the network. |
| LG | No | The mobility state only affects how quickly UE can perform cell reselection. Therefore, as UE continues the measurement on serving cell and neighbour cell based on the measurement requirements specified in TS 38.311 but regardless of mobility state, the described scenario seems not really significant. |
| MediaTek | No | The mobility state is just a rough estimation and the idle mode mobility depends on the RRM measurement. Maybe the scaling of the cell reselection could allow UE to do quick cell reselection but it is debatable where quick cell reselection is better.  In additional, inert-RAT cell reselection is anyway not frequent in the field. We do not think the consequence is so serious. |

In [2], it is claimed that

“*Take the inter-RAT cell reselection from NR to LTE for example, assuming that TCRmaxHys****t*** *broadcasted by the LTE cell is 240s, and the value of the timer corresponding to TCRmaxHys****t*** *(i.e. elapsed TCRmaxHys****t****) is 230s when the UE reselects the LTE cell from a NR cell.*

*If elapsed TCRmaxHys****t*** *is not inherited, the UE has to use the high-mobility state related parameters in cell reselection for at least 240s, else if inherited the UE may need to use the high-mobility state related parameters in cell reselection for 10s.*

*in other word, compared to the inheritance of elapsed TCRmaxHys****t****, no inheritance of elapsed TCRmaxHys****t*** *may lead to the time period 230s of contradiction between the adopted mobility state (i.e. high-mobility state) and actually mobility state (i.e. normal-mobility state). Considering the speed scaling factor of high-mobility state is 0.25~1, adopting high-mobility state may result in four times the number of cell reselections than adopting normal-mobility state within the same time period.*”

**Question 4: Do companies agree that power consumption may be increased if both the mobility state and reselection count and related time information are not inherited after inter-RAT cell reselection?**

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| --- | --- | --- |
| **Company** | **Agree or not** | **Comments** |
| Nokia | No | See previous comments |
| Ericsson | No | Idle mode power consumption contributes little to the overall UE power consumption, which is in connected. And most of the cell re-selections are intra-RAT. |
| Huawei, Hisilicon | Yes | If only the mobility state is inherited, then it will not be possible to return to “normal” mobility until *TCRmaxHys****t***elapses, therefore the UE could perform more cell reselection than it should which has a direct impact on UE power consumption. |
| Apple | No | We do not think it’s a big issue. |
| OPPO | No | Not significant |
| Qualcomm | Maybe | The considered scenario is feasible. |
| SAmsung | No | We share with other companies that the magnitude of problem is not a big. At this late stage, we should focus on essential correction, not an enhancement. |
| CATT | No | Not significant. |
| ZTE | No |  |
| Intel | May be | There may be some impact but even with these changes, mobility speed estimation will not be that accurate. Further, inter-RAT changes may not be that frequent in mature network deployments. |
| LG | No | This is just minor issue, because we do not think staying in the high mobility state will increase power consumption significantly. |
| MediaTek | No | First we wonder why UE will inherit mobility state from other RAT but not the corresponding time information. We understand either the UE consider the MSE from other RAT or the UE ignore all MSE status from other RAT. There is no partial inherit.  Secondary we don’t think changing of the scaling factor will not increase the power consumption so much. This does not look like a critical issue. |

### 2.1.4 Possible way forward

In [1], [4], [5], companies think that this should leave to UE implementation. In [2], it is proposed to have some clarification in Rel-16 but left to UE implementation in Rel-15. In [6] and [7], it is proposed to clarify inter-RAT cell reselection is counted for MSE in both Rel-15 and Rel-16. We suggest to discuss the way forward Release by Release. It is also possible to have further clarification in Rel-17 if we decided that it should be up to UE implementation at this moment.

In addition, rapporteur understand that the proposal in [2] and [6] applies for inter-RAT cell reselection between LTE and NR (i.e. not for reselection to/from UMTS/GSM). It seems that we also need 36.304 CR if agree to clarify. However, we would leave the CR discussion in phase 2 if necessary.

**Question 5: Which option(s) would be acceptable/preferable way forward for you in Rel-15?**

* **Option 1 – Leave to UE implementation**
* **Option 2 – Clarify that inter-RAT cell reselection between NR and LTE is counted in mobility state estimation.**

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| --- | --- | --- |
| **Company** | **Prefer Option** | **Comments** |
| Nokia | Option 1 | This is agreed option in LTE and we see no need to have different handling in case reselections happened to different direction. In fact that would lead to quite werid situations that we do not have strict behaviour in case reselection occurs from LTE to NR but only if reselection occurs from NR to other RAT. |
| Ericsson | Option 1 | Given that 38.304 is not explicit about this aspect, and we have different UE implementations, it is reasonable to leave this to UE implementation. We also agree with Nokia that it makes sense to align with LTE. |
| Huawei, Hisilicon | Option 1 | It is late to make corrections in R15 considering that there appears to be different interpretations. |
| Apple | Option 1 | We share Nokia’s view. |
| OPPO | Option 1 |  |
| Qualcomm | Either | Even though Option 2 is better for both performance and compliance with RAN5 tests, we understand that it may be late for some UE implementations. |
| Samsung | Option 1 | 1/ We strongly prefer to leave to UE implementation as this is not an essential correction but an enhancement. So we see no need to introducing a clear UE requirement at this late stage. We agree with Nokia that it sounds reasonable to align with LTE. |
| CATT | Option 1 | We share Nokia’s view. |
| ZTE | Option 1 | Based on the discussion last meeting and papers submitted this meeting, it is clear that different UE vendors have implemented in different ways thus it is not preferred to put further limitations at least for the existing R15 UEs and it may impact some R16 UEs which have already been implemented. |
| Intel | Option 1 | Anything else will not be backward compatible with all UEs in the field. |
| LG | Option 1 | We do not think different handling is needed for this. |
| MediaTek | Option 1 | It is too late to have this change in Rel-15. |

**Question 6: Which option(s) would be acceptable/preferable way forward for you in Rel-16?**

* **Option 1 – Leave to UE implementation**
* **Option 2 – Clarify that cell reselections in both NR and LTE are counted in mobility state estimation.**

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| **Company** | **Prefer Option** | **Comments** |
| Nokia | Option 1 | See all the previous comments. |
| Ericsson | Option 1 | See Question 5. |
| Huawei, HiSilicon | Option 2 | It would be better to have consistent behaviour and to avoid the problems pointed out. |
| Apple | Option 1 | See the previous comments. |
| OPPO | Option 1 | No much gains for option2 |
| Qualcomm | Option 2 | It is better to have a predictable UE behaviour, as always preferred by operators, and there is now time to fix the UE implementations in Rel-16. |
| Samsung | Option 1 | On top of our comments in Q5, we prefer not to touch it in later releases. |
| CATT | Option1 | See the previous comments. |
| ZTE | Option 1 |  |
| Intel | Option 1 | We don’t see it essential to specify |
| LG | Option 1 | Same comments with Question 5. |
| MediaTek | Option 1 | Even in Rel-16, we do not see big need to define this. The consequence of counting or not the IRAT cell reselection in MSE seems not so critical. Simply leave to UE implementation would be reasonable approach. Anyway this is Idle mode behavior, lots of behaviours are UE implementation. |

### 2.1.3 LS to RAN5

In both [1] and [4], it is proposed to have LS to RAN5 to remove the mobility state test case related to the inter-RAT cell reselection. Rapporteur would assume that we should at least inform RAN5 our conclusion.

**Question 7: Do companies agree to send an LS to RAN5? If yes, what would be the suggested content?**

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| --- | --- | --- |
| **Company** | **Agree to have LS** | **Comments** |
| Nokia | No strong view |  |
| Ericsson | Yes | It is our understanding that RAN5 cannot decide itself to remove the test case (even though they should perhaps not have added it in the first place). |
| Huawei, HiSilicon | Depends | If we agree CRs then we can attach them in a brief LS to RAN5, otherwise there is no need. |
| Apple | Yes | RAN2 should tell RAN5 to remove the test case related to inter-RAT cell reselection since it’s up to UE implementation. |
| OPPO | Yes | At least we should inform RAN5 of RAN2 agreements. |
| Qualcomm | No strong view | We can include RAN2 decisions and they can decide on what to do. Asking RAN5 to remove test cases is beyond RAN2 responsibility. |
| Samsung | Yes | Agree with Rapportuer's understanding i.e. we need to inform RAN5 of our conclusion. Based on the outcome in RAN2, we can further discuss which content can be also added i.e. whether to remove the mobility state test case related to the inter-RAT cell reselection counts. |
| CATT | Yes | The LS could be sent for information. And the decision is depend on RAN5. |
| ZTE | No strong view | The agreements can be forwarded to RAN5 for information. |
| Intel | Yes | We can provide the current RAN2 status and leave the rest to RAN5. |
| LG | Yes | It is good to inform RAN2’s understanding. |
| MediaTek | Yes | We prefer to inform RAN5 our conclusion. How to do with the test case would be up to RAN5. |

## 2.2 Other Idle/Inactive corrections

### 2.2.1 Corrections for Inactive (OPPO)

Companies are invited to provide comments on the following proposed CR.

R[2-2100247](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100247.zip) Corrections for Inactive OPPO CR Rel-15 38.304 15.7.0 0197 - F NR\_newRAT-Core

R[2-2100248](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100248.zip) Corrections for Inactive OPPO CR Rel-16 38.304 16.3.0 0198 - A NR\_newRAT-Core

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| --- | --- | --- |
| **Company** | **Do you agree with the intent of the CR?** | **Comments** |
| Nokia | No | There is no misalignment. It is not PLMN selection to select PLMN in equivalent PLMN list. Only if PLMN is not part of the list! |
| Ericsson | No | As Nokia indicated when an equivalent PLMN is selected, it is not a new PLMN. Furthermore there is a reference to 24.501, i.e. “*as specified in TS 24.501 [14]*”, and RAN2 should not clarify PLMN selection issues in 38.304. |
| Huawei, HiSilicon | No | Agree with Nokia |
| Apple | No | Agree with Nokia |
| OPPO | Yes | We don’t think Nokia’s comments are valid, in which spec we say that new PLMN will not include EPLMN list of RPLMN, if we can find the clear definition, ok, we can accept the objection.  In our understanding, all PLMN except RPLMN will be called new PLMN. The evidence is quite clear in 24.501:  *The UE shall trigger a transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-IDLE mode upon selection of a PLMN that is not an equivalent PLMN to the registered PLMN. The UE shall not trigger a transition from 5GMM-CONNECTED mode with RRC inactive indication to 5GMM-IDLE mode upon entering a new PLMN which is in the list of equivalent PLMNs.*  It’s quite clear in NAS spec that EPLMN list is also part of new PLMN, so the misalignment happens between NAS and RRC.  Other companies think the reference there is enough, but the reason is also not valid, if we think only the reference is needed, the 304 spec should be changed like the following (Option1):  When UE selects a new PLMN, UE behaviour is ~~UE transitions from RRC\_INACTIVE to RRC\_IDLE, as~~ specified in TS 24.501 [14].  Option2: the change in R[2-2100247](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100247.zip);  We believe the change is anyway needed, no matter we go any understanding explained above, i.e. Option1 or option2. |
| Qualcomm | Maybe | It is true that selecting an equivalent PLMN should not trigger moving to Idle. However, there is no real problem since we do refer to 24.501 which clearly states this. We are fine with Oppo CR for further clarification/alignment. |
| Samsung | No | Due to the following text "as specified in TS 24.501", nothing is broken and we believe it is not essential correction. |
| CATT | Yes | We are fine with Oppo CR for further clarification/alignment. |
| ZTE | No | Agree with Nokia that in RAN2 we call it cell reselection when UE select an EPLMN. Since it is clear in CT1 spec, maybe we do not need to clarify it further in RAN2 spec. |
| Intel | May be | Agree with the intent. 24.501 is clear that it shall not trigger a change to IDLE. Including that in RAN spec may be helpful. |
| LG | No | We understand the intention of the CR, but the change seems not really necessary because it is already referring TS 24.501. |
| MediaTek | Maybe | We are fine to aligned 304 with 24.501. However, we also think the change is not so essential and no UE will have wrong implementation. |
|  |  |  |

### 2.2.2 UE power class in S Criterion (OPPO)

Companies are invited to provide comments on the following proposed CR.

R[2-2100306](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100306.zip) Clarification on UE power class in S Criterion-R15 OPPO CR Rel-15 38.304 15.7.0 0199 - F NR\_newRAT-Core

R[2-2100307](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100307.zip) Clarification on UE power class in S Criterion-R16 OPPO CR Rel-16 38.304 16.3.0 0200 - A NR\_newRAT-Core

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| --- | --- | --- |
| **Company** | **Do you agree with the intent of the CR?** | **Comments** |
| Nokia | No | Even the LTE spec TS36.101 defines more than one UE power class e.g. 23 dB and 26 dBm UE power classes for certain frequency bands. Thus, NR is not any different from LTE and thus, the specs should also be aligned. And as there has not been problems in LTE it seems not justified to have changes in NR either. |
| Ericsson | No | It is our understanding that the UE always uses one power class, even when the UE supports more than one, e.g. in the old days where a handheld could be connected to a “larger” unit in the car. The used power class may also depend on the selected band, not only on what the UE supports. Therefore we do not agree with the proposed clarification:  The maximal UE power class will be used if more than one UE power class are supported.  Similar as Nokia we do no think there is anything to clarify here. |
| Huawei, HiSilicon | No | There may be some confusion, see RP-201032, that it is possible to support a multiple power classes for certain bands depending on the band combination, however this relates to connected mode and is not relevant for idle mode. |
| Apple | No | We share Nokia’s view. |
| Qualcomm | No | Agree that the UE always chooses one power class. |
| Samsung | No | Due to the following text "as defined in TS 38.101-1 [15]", nothing is broken and it is not essential correction. |
| CATT | No | The spec TS38.101 defines more than one UE power class for a band. But a single UE could support only one power class in a band, the supported power class is explicitly indicated in the UE capability send to the network. |
| ZTE | No | We understand UE will use one power class. |
| Intel | No | Agree with others. |
| LG | No | We think no clarification is needed for this. |
| MediaTek | No | Similar view as Nokia |
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# 3 Conclusions

Base on the discussion in section 2, we propose the following:

**Proposal 1:**

# 4 References

[1] R[2-2100181](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2100181.zip), “Way forward for open issue on mobility state determination”, Samsung Electronics Co., Ltd

[2] R[2-2101249](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101249.zip), “Discussion on Inter-RAT Cell Reselection and Mobility State”, Huawei, HiSilicon

[3] R[2-2101250](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101250.zip), “Correction to Inter-RAT Cell Reselection and Mobility State”, Huawei, HiSilicon

[4] R[2-2101355](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101355.zip), “Clarification on Inter-RAT Cell Reselection and Mobility State”, Apple

[5] R[2-2101840](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101840.zip), “Discussion on Inter-RAT Cell Reselection and Mobility State”, MediaTek Inc,

[6] R[2-2101896](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101896.zip), “Clarification of inter-RAT Cell Reselection for Mobility State Determination”, Qualcomm Incorporated

[7] R[2-2101897](file:///E:\3GPP文档\2021\RAN2%20113e\R2-2101897.zip), “Clarification of inter-RAT Cell Reselection for Mobility State Determination”, Qualcomm Incorporated