3GPP TSG-RAN WG2 Meeting #109-e R2-200xxxx

Online, 24 February – 6 March 2020

**Agenda item: 6.11.6**

**Source: Huawei (summary rapporteur)**

**Title: Summary of RRM measurement relaxation open issues**

**WID: NR\_UE\_pow\_sav-Core**

**Document for: Discussion and Decision**

# 1 Introduction

This document contains the summary of documents from agenda item 6.11.6 (“RRM measurement relaxation”) as referenced in Section 4.

# 2 RRM Measurement relaxation issues summary

## 2.0 Proposals covered in the email discussion

The following table contains all of the proposals and indicates where a proposal is already covered by the email discussion in [15]. The green highlighted proposals are not covered by the email discussion conclusion, either partly or entirely, and are covered in the following sections.

|  |  |  |
| --- | --- | --- |
| [1] | CATT | Proposal 1: Ask RAN4:Q1: Would RAN4 have a concern if it is allowed to relax measurement on higher priority frequencies beyond the legacy limit, Thigher\_priority\_search, if the UE is in good coverage (i.e. Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ) and meets the low-mobility criterion for RRM measurement relaxation?Proposal 2: Ask RAN4:Q2: In case the UE is not in good coverage conditions (Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ), legacy behavior is to perform measurements at least every Tmeasure,NR\_Inter (< Thigher\_priority\_search ). In case RAN4 decides that when RAN2-defined RRM relaxation criterion(s) is/are met, UE is allowed to relax its neighbor cells measurements to, say Tmeasure,NR\_Inter\_relax where one would expect that Tmeasure,NR\_Inter < Tmeasure,NR\_Inter\_relax < Thigher\_priority\_search, does it make sense from load balancing performance perspective, to not relax higher priority frequencies, but only relax lower priority frequencies? |
| [2] | MediaTek Inc. | Proposal 1: Network should be able to configure UE to perform RRM measurement in the following conditions: (1) UE is with low mobility, (2) UE is not at cell edge, (3) UE is with low mobility or not at cell edge, and (4) UE is with low mobility and not at cell edge.* Proposal is covered in the email discussion [15] (Proposals 8 and 9).

Proposal 2: RAN2 should define RRM measurement relaxation methods corresponding to the three scenarios: (1) UE with at low mobility, (2) UE is not at cell edge, and (3) UE is with low mobility and not at cell edge.* Proposal is covered in the email discussion [15] (Proposals 8 and 9).

Proposal 3: UE takes the following RRM measurement relaxation actions:- When UE experiences low-mobility scenario, it is allowed to skip neighbour cell measurements. - When UE experiences not-at-cell-edge scenario, it is allowed to perform measurements with longer intervals. - When UE experiences low-mobility and not-at-cell-edge scenario, it is allowed to skip neighbour cell measurements.* Proposal is covered in the email discussion [15] (Proposals 8 and 9 and 23).

Proposal 4: The ASN.1 structure shown in this paper is considered as baseline for further discussions on RRC configurations for RRM measurement relaxation in NR.* Proposal is covered in the email discussion [15] which provides a baseline running CR.
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| [3] | Ericsson | Proposal 1: UE shall not un-conditionally, i.e. when relaxed criterion is not fulfilled, relax needed measurements, as specified in section 5.2.4.2 in 38.304:• Intra-frequency measurements when below intra-frequency measurement threshold• Inter-frequency measurements on all priority layers when below inter-frequency measurement threshold• Higher priority inter-frequency measurements every Thigher\_priority\_search when above inter-frequency measurement threshold* Proposal is implicitly covered in the email discussion [15] (Proposal 12).

Proposal 2: UE is required to perform measurements on higher priority frequencies at least Thigher\_priority\_search independent of relaxed monitoring criterion. Proposal 3: For “low mobility” trigger the serving cell reference value (SrxlevRef) shall be set to the serving cell value (Srxlev) after a configurable time period (TSearchDeltaP). * Proposal is covered in the email discussion [15] (Proposal 12).

Proposal 4: The UE shall perform intra-frequency and inter-frequency neighbour cell measurement during TSearchDeltaP after cell selection/re-selection.Proposal 5: The UE shall perform intra-frequency and inter-frequency neighbour cell measurement at least every TMinSearchPeriod (range {x min .. y hours}). * Proposal is covered in the email discussion [15] (Proposal 18).

Proposal 6: The network can configure “low mobility” or “not-at-cell-edge” trigger or both triggers, and configure whether either or both triggers (AND/OR) shall be satisfied to enable relaxed RRM measurements. * Proposal is covered in the email discussion [15] (Proposals 8 and 9).

Proposal 7: RAN4 to discuss and agree on the relaxed RRM measurement requirements.* Proposal is covered in the email discussion [15] (Proposal 23).
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| [4] | vivo | Proposal 1: Detailed solution and requirements for RRM measurement relaxation in time domain should be decided in RAN4. * Proposal is covered in the email discussion [15] (Proposal 23).

Proposal 2: When the network configured criteria is satisfied, the UE can perform the reduced RRM measurement with less neighboring cell numbers.Proposal 3: Network can configure “anchor” carrier(s), whose measurement results can represent the measurement of this co-site band deployment, e.g. in system information.Proposal 4: UE performs inter-frequency RRM measurement on the configured “anchor” carrier(s), and performs cell reselection in this band according to the measurement results. Proposal 5: An LS should be sent to RAN4 for any discussion on further requirements for relaxed RRM measurement in time domain, with less neighboring cell / carrier numbers, if any. * Proposal is covered in the email discussion [15] (Proposal 25).
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| [5] | Apple | Proposal 1: It would be appropriate to use the term “relaxed measurement” in the current context and to avoid confusion with the RLM of “relaxed monitoring”.* Proposal is covered in the email discussion [15] (Proposal 1).

Proposal 2: Per frequency indication for measurement relaxation is better as it offers finer granularity and helps to distinguish between FR1 and FR2 deployments.* Proposal is covered in the email discussion [15] (Proposal 6).

Proposal 3: NW should mandatorily indicate to the UE which measurement relaxation criteria to use (either cell-edge or low mobility or both criteria).* Proposal is covered in the email discussion [15] (Proposals 8 and 9).

Proposal 4: UE can perform measurement relaxation when either RSRP or RSRQ criteria (if configured) is met.* Proposal is covered in the email discussion [15] (Proposal 19).
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| [6] | Sony | Proposal: Network configures additional criteria for measuring a particular frequency. These criteria could include the detection of a particular cell or frequency (higher priority) or a timer (e.g. if UE does not find this frequency whilst the timer is running then it skips measuring this frequency). |
| [7] | CMCC | Proposal: Support inter-frequency measurement relaxation in idle mode:- SIB4 is added with carrier association, which means the associated carriers are in the same band and co-site deployed. - While UE performs inter-frequency measurement, UE randomly pick 1 carrier from associated carriers.- UE perform inter-frequency measurement and cell re-selection only considering the picked carrier instead of other associated carriers. |
| [8] | Nokia, Nokia Shanghai Bell | Proposal 1: Network can allow/disallow RRM measurement relaxation e.g. for the UE configured with early measurements* Proposal is covered in the email discussion [15] (Proposal 24).

Proposal 2: Frequency specific RRM measurement relaxation is supported* Proposal is covered in the email discussion [15] (Proposal 3).
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| [9] | Huawei, HiSilicon | Proposal 1: Improve the LTE behaviour for NR by setting SrxlevRef = Highest measured Srxlev value of the serving cell (dB) within TSearchDeltaP.* Proposal is covered in the email discussion [15] (Proposal 12).
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| [10] | Huawei, HiSilicon | Proposal 1: Allow UE to only monitor N best neighbour cells on a carrier, until one of the N cells falls below a certain threshold.Proposal 2: Introduce signalling of the association between serving SSB index and neighbour cells/frequencies/SSBs to allow UE to limit measurements. |
| [11] | LG Electronics, Ericsson, MediaTek | Proposal: UE shall not perform measurement relaxation on a given frequency when the UE is configured to perform early measurement for fast CA/DC setup on that frequency and T331 is running. After T331 expiry, the UE may perform measurement relaxation on the frequency if the UE still continues to perform early measurements based on implementation.* Proposal is covered in the email discussion [15] (Proposal 24).
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| [12] | LG Electronics | Proposal 1: Consider per-frequency measurement relaxation based on the neighbour cell measurement results of a UE.Proposal 2: If the highest ranked cell of a frequency is below a configured threshold, the UE is allowed to perform measurement relaxation on that frequency. How to perform measurement relaxation on the frequency may be decided by RAN4.Proposal 3: Introduce an indication that UE has performed measurement relaxation, upon access to the network. |
| [13] | Samsung | Proposal 1: When network configures both not-cell-edge criteria and low-mobility criteria together for RRM measurement relaxation, the UE should perform relaxed RRM measurement when both criteria are fulfilled simultaneously.* Proposal is covered in the email discussion [15] (Proposals 8 and 9).

Proposal 2: The not-cell-edge criteria for RRM measurement relaxation should consider both RSRP and RSRQ.* Proposal is covered in the email discussion [15] (Proposal 19).

Proposal 3. For the not-cell-edge criteria for RRM measurement relaxation, cell selection level (Srxlev and Squal) should be used instead of measured cell level (Qrxlevmeas and Qqualmeas).* Proposal is covered in the email discussion [15] (Proposal 20).

Proposal 4. highPriorityMeasRelax should not be per-frequency indication, but one indication for all higher priority frequencies.* Proposal is covered in the email discussion [15] (Proposal 20).

Proposal 5. When highPriorityMeasRelax is configured with true (or present), different RRM measurement relaxation should be used for each of following two cases: 1) When the serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and 2) When the serving cell fulfils Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, and low-mobility and/or not-cell-edge criteria is fulfilled. How to relax these two cases differently is up to RAN4.Proposal 6: UE should perform relaxed RRM measurement irrespective of whether the priorities are provided by dedicated signalling or broadcast signalling.Proposal 7. If timer T330 is running, the UE should not perform relaxed RRM measurement. Instead, existing measurement rules in Rel-15 are applied |
| [14] | Samsung R&D Institute UK | Proposal 1. RAN2 don’t introduce reduced number of cells to be measured in the relaxed measurement operation. Proposal 2. RAN2 discuss whether other characteristics on frequency to be measured also affects to the selection of frequency to be measured in RRM relaxation |

## 2.1 Summary of open issues related to absolute priorities

The following proposals related to absolute priorities are covered in this section

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| --- | --- | --- |
| [1] | CATT | Proposal 1: Ask RAN4:Q1: Would RAN4 have a concern if it is allowed to relax measurement on higher priority frequencies beyond the legacy limit, Thigher\_priority\_search, if the UE is in good coverage (i.e. Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ) and meets the low-mobility criterion for RRM measurement relaxation?Proposal 2: Ask RAN4:Q2: In case the UE is not in good coverage conditions (Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ), legacy behavior is to perform measurements at least every Tmeasure,NR\_Inter (< Thigher\_priority\_search ). In case RAN4 decides that when RAN2-defined RRM relaxation criterion(s) is/are met, UE is allowed to relax its neighbor cells measurements to, say Tmeasure,NR\_Inter\_relax where one would expect that Tmeasure,NR\_Inter < Tmeasure,NR\_Inter\_relax < Thigher\_priority\_search, does it make sense from load balancing performance perspective, to not relax higher priority frequencies, but only relax lower priority frequencies? |
| [3] | Ericsson | Proposal 2: UE is required to perform measurements on higher priority frequencies at least Thigher\_priority\_search independent of relaxed monitoring criterion.  |
| [13] | Samsung | Proposal 5. When highPriorityMeasRelax is configured with true (or present), different RRM measurement relaxation should be used for each of following two cases: 1) When the serving cell fulfils Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, and 2) When the serving cell fulfils Srxlev ≤ SnonIntraSearchP or Squal ≤ SnonIntraSearchQ, and low-mobility and/or not-cell-edge criteria is fulfilled. How to relax these two cases differently is up to RAN4.Proposal 6: UE should perform relaxed RRM measurement irrespective of whether the priorities are provided by dedicated signalling or broadcast signalling. |

### 2.1.1 Proposals with potential easy agreement

Proposal 6 of [13] has not been explicitly agreed, however it should also be noted that no different handling depending on whether broadcast or dedicated priorities are used has been proposed either (i.e. there is no opposing view, and the proposal is in line with agreeing nothing new), which is why this proposal is put forward as a potential easy agreement.

**Proposal S1-1: Relaxed RRM measurement is applied in the same way irrespective of whether the priorities are provided by dedicated signalling or broadcast signalling.**

**Company views (to be completed during the meeting)**

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| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments** |
|  |  |  |

### 2.1.2 Proposals needing further discussion in this meeting

Proposals 1 and 2 of [1] and proposal 5 of [13] highlight the possibility that different handling could be needed for high priority frequencies, depending on the coverage level, as is also the case for legacy measurements. All of the proposals also indicate that RAN4 should be asked. The email discussion in [15] proposal 25 suggests sending an LS to RAN4, so the question is whether to include this issue in the LS if sent.

In addition the email discussion in [15] contains the proposal 5, which is related to whether the handling of the *highPriorityMeasRelax* indication is associated with the trigger criteria for measurement relaxation and how RAN4 will make use of it. The more important question to answer before solving that is how the high priority carrier measurements are relaxed in each of the existing cases, before deciding if and how the different values of an indication impact that.

Proposal 2 of [3] relates to RAN4 performance requirements, and therefore could be discussed in RAN4. However since it has been raised in RAN2 the question should be whether an explicit indication to RAN4 in an LS is needed. The email discussion in [15] proposal 25 suggests sending an LS to RAN4, so the question is whether to include this issue in the LS if sent.

**Proposal S1-2: [FFS]** **Ask RAN4 about the behaviour of relaxation of higher priority carriers, e.g.**

* **whether different relaxation should be used for higher priority carriers depending on whether Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ**
* **whether it makes sense to (further) relax high priority carrier measurements at all in each of the 2 cases**
* **whether the same or different relaxation is used for high priority carriers compared to equal/lower priority carriers.**
* **whether UE should be required to perform measurements on higher priority frequencies at least Thigher\_priority\_search independent of relaxed monitoring criterion**

**Company views (to be completed during the meeting)**

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| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments****(including comments on the specific question(s))** |
|  |  |  |

**Note:** It is assumed that proposal S1-2, if agreed, can be included in the same LS to RAN4 resulting from the email discussion in [15], if that is also agreed to be sent**.**

## 2.2 Summary of reducing the number of cells/carriers to measure

The following proposals related to reducing the number of cells/carriers to measure are covered in this section

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| --- | --- | --- |
| [4] | vivo | Proposal 2: When the network configured criteria is satisfied, the UE can perform the reduced RRM measurement with less neighboring cell numbers.Proposal 3: Network can configure “anchor” carrier(s), whose measurement results can represent the measurement of this co-site band deployment, e.g. in system information.Proposal 4: UE performs inter-frequency RRM measurement on the configured “anchor” carrier(s), and performs cell reselection in this band according to the measurement results.  |
| [6] | Sony | Proposal: Network configures additional criteria for measuring a particular frequency. These criteria could include the detection of a particular cell or frequency (higher priority) or a timer (e.g. if UE does not find this frequency whilst the timer is running then it skips measuring this frequency). |
| [7] | CMCC | Proposal: Support inter-frequency measurement relaxation in idle mode:- SIB4 is added with carrier association, which means the associated carriers are in the same band and co-site deployed. - While UE performs inter-frequency measurement, UE randomly pick 1 carrier from associated carriers.- UE perform inter-frequency measurement and cell re-selection only considering the picked carrier instead of other associated carriers. |
| [10] | Huawei, HiSilicon | Proposal 1: Allow UE to only monitor N best neighbour cells on a carrier, until one of the N cells falls below a certain threshold.Proposal 2: Introduce signalling of the association between serving SSB index and neighbour cells/frequencies/SSBs to allow UE to limit measurements. |
| [12] | LG Electronics | Proposal 1: Consider per-frequency measurement relaxation based on the neighbour cell measurement results of a UE.Proposal 2: If the highest ranked cell of a frequency is below a configured threshold, the UE is allowed to perform measurement relaxation on that frequency. How to perform measurement relaxation on the frequency may be decided by RAN4. |
| [14] | Samsung R&D Institute UK | Proposal 1. RAN2 don’t introduce reduced number of cells to be measured in the relaxed measurement operation. Proposal 2. RAN2 discuss whether other characteristics on frequency to be measured also affects to the selection of frequency to be measured in RRM relaxation |

### 2.2.1 Proposals needing further discussion in this meeting

Most of the above proposals provide different ways in which the UE could reduce the number of cells or carriers to measure, although there is also a proposal (proposal 1 in [14]) not to reduce the number of cells to measure. It is proposed in this meeting to conclude whether or not to do that.

**Proposal S2-1: [FFS] A method for reducing the carriers to measure is introduced in Rel-16**

**Company views (to be completed during the meeting)**

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| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments****(including potential RAN2/RAN4 impact)** |
|  |  |  |

**Proposal S2-2: [FFS] A method for reducing the cells to measure on a carrier is introduced in Rel-16**

**Company views (to be completed during the meeting)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments****(including potential RAN2/RAN4 impact)** |
|  |  |  |

### 2.2.2 Proposals to postpone

If the S2-1 and S2-2 are not agreed then there is no need to postpone the following issue. We propose just to determine whether methods for reducing cells/carriers to measure is introduced. We think it is very unlikely to converge on a specific method or methods and therefore this should be postponed.

**Proposal S2-3: The specific method(s) for reducing cells/carrier to measure is FFS.**

**Note:** Whether this issue is needed depends on the discussion on S2-1 and S2-2. Whether this is handled by an email discussion to the next meeting or postponed entirely can be decided after discussion.

## 2.3 Summary of other miscellaneous issues

The following miscellaneous proposals are covered in this section

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| [3] | Ericsson | Proposal 4: The UE shall perform intra-frequency and inter-frequency neighbour cell measurement during TSearchDeltaP after cell selection/re-selection. |
| [13] | Samsung | Proposal 7. If timer T330 is running, the UE should not perform relaxed RRM measurement. Instead, existing measurement rules in Rel-15 are applied |
| [12] | LG Electronics | Proposal 3: Introduce an indication that UE has performed measurement relaxation, upon access to the network. |

### 2.3.1 Proposals with potential easy agreement

Proposal 4 of [3] is the current behaviour in LTE, but has not been explicitly agreed for NR. Assuming that the email discussion [15] proposal 12 is agreed (i.e. The parameter SrxlevRef is set according to the LTE mechanism as captured in current running 38.304 CR for power saving. ) then we expect this is an easy agreement to make. Given that this condition in LTE is there to ensure a UE which has just change cell does not relax too quickly, because by definition the UE is mobile, then even if an alternative approach to proposal 12 of [15] is agreed, we expect the behaviour shall ensure the following behaviour.

**Proposal S3-1: The UE shall perform intra-frequency and inter-frequency neighbour cell measurement during TSearchDeltaP after cell selection/re-selection.**

**Company views (to be completed during the meeting)**

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| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments** |
|  |  |  |

### 2.3.2 Proposals needing further discussion in this meeting

Proposal 7 of [13] raises the issue of whether measurement relaxation should be allowed while T330 is running. As this has not been discussed so far it is proposed to collect company views.

**Proposal S3-2: If timer T330 is running, the UE should not perform relaxed RRM measurement. Instead, existing measurement rules in Rel-15 are applied**

**Company views (to be completed during the meeting)**

|  |  |  |
| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments** |
|  |  |  |

Proposal 3 of [12].

**Proposal S3-3: Introduce an indication that UE has performed measurement relaxation, upon access to the network.**

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| --- | --- | --- |
| **Company** | **Do you agree (yes/no)** | **Comments** |
|  |  |  |

# 3 Conclusions (may be updated following offline)

**Proposals with potential easy agreement**

**Proposal S1-1: UE should perform relaxed RRM measurement irrespective of whether the priorities are provided by dedicated signalling or broadcast signalling.**

**Proposal S3-1: The UE shall perform intra-frequency and inter-frequency neighbour cell measurement during TSearchDeltaP after cell selection/re-selection.**

**Proposals needing further discussion in this meeting**

**Proposal S1-2: [FFS]** **Ask RAN4 whether different relaxation should be used for higher priority carriers depending on whether Srxlev > SnonIntraSearchP and Squal > SnonIntraSearchQ, including whether it makes sense to relax high priority carrier measurements at all in each of the 2 cases and whether the same or different relaxation is used for high priority carriers compared to equal/lower priority carriers.**

**Proposal S1-3: [FFS]** **Ask RAN4 whether UE should be required to perform measurements on higher priority frequencies at least Thigher\_priority\_search independent of relaxed monitoring criterion**

**Note:** It is assumed that proposals S1-2 and S1-3, if agreed, can be included in the same LS to RAN4 resulting from the email discussion in [15], if that is also agreed to be sent**.**

**Proposal S2-1: [FFS] A method for reducing the carriers to measure is introduced in Rel-16**

**Proposal S2-2: [FFS] A method for reducing the cells to measure on a carrier is introduced in Rel-16**

**Proposals to postpone**

**Proposal S2-3: The specific method(s) for reducing cells/carrier to measure is FFS.**

**Proposal S3-2: If timer T330 is running, the UE should not perform relaxed RRM measurement. Instead, existing measurement rules in Rel-15 are applied**

**Proposal S3-3: Introduce an indication that UE has performed measurement relaxation, upon access to the network.**

# 4 List of referenced documents

1. [R2-2000256](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2000256.zip), “Way forward on measurement relaxation with high priority frequencies”, CATT
2. [R2-2000312](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2000312.zip), “Configurations for RRM Measurement Relaxation in NR”, MediaTek Inc.
3. [R2-2000352](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2000352.zip), “Open issues RRM measurement relaxation”, Ericsson
4. [R2-2000370](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2000370.zip), “UE Power Consumption Reduction in RRM Measurement”, vivo
5. [R2-2000595](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2000595.zip), “Open Issues of RRM Measurement Relaxation”, Apple
6. [R2-2000827](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2000827.zip), “UE power saving for inter frequency measurements”, Sony
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8. [R2-2001039](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2001039.zip), “On RRM measurement relaxation”, Nokia, Nokia Shanghai Bell
9. [R2-2001063](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2001063.zip), “On SrxlevRef adaptation in relaxed monitoring”, Huawei, HiSilicon
10. [R2-2001064](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2001064.zip), “Reducing the number of neighbour cells/carriers to measure”, Huawei, HiSilicon
11. [R2-2001401](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2001401.zip), “Coexistence issues of measurement relaxation and early measurements”, LG Electronics, Ericsson, MediaTek
12. [R2-2001402](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2001402.zip), “Per-frequency measurement relaxation based on neighbour cell quality”, LG Electronics
13. [R2-2001577](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2001577.zip), “RRM measurement relaxation”, Samsung
14. [R2-2001643](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e%5CDocs%5CR2-2001643.zip), “On the frequency selection for RRM relaxation”, Samsung R&D Institute UK
15. [R2-2000365](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_109_e/Docs/R2-2000365.zip), “Report of [108#79] [Power Saving] Running 38.304 phase 2 – Open issues”, Vivo