3GPP TSG-RAN WG4 Meeting # 96-e R4-2012060

Electronic Meeting, 17-28 Aug., 2020

**Agenda item:** 6.2.1.2, 6.2.2

**Source:** Moderator (Huawei)

**Title:** Email discussion summary for [96e][229] NB\_IOTenh3\_RRM

**Document for:** Information

# Introduction

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round:

Discuss the issues related to core requirements maintenance

Discuss the issues related to performance requirements.

Discuss the test case list and work split.

* 2nd round:

Continue discussion if necessary.

# Topic #1: Core requirements maintenance

There are two CR submitted to the core requirements maintenance (R4-2011088, R4-2011089). Companies please provide comments in 1.1.1 directly.

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2011088 | Company A |
| Company B |
| Nokia: We are fine with the changes. |
| R4-2011089 | Company A |
| Company B |
| Qualcomm: we are ok with the proposal but we think it is captured in correctly. Perhaps the negated part is missing:* N=1 if relaxed serving cell monitoring, as defined in clause 4.6.2.1A for normal coverage or 4.6.2.3A for enhanced coverage, is NOT applied.
 |
| Ericsson: similar change is being discussed for MTC. We would like to keep both aligned.  |
| Further comments:Huawei: Thanks for the careful checking. We could revise the CR to capture the comment. |
| Nokia: We propose to proceed as for MTC regarding N=1 matter.Regarding the removal of the second bullet, we have the same concern as raised for MTC in more detail.Also, the case should be considered that not only *NRSRP-ChangeThresh-NB-r16* is configured by higher layer, then UE behaviour should be specified as well. |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

*Recommendations on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 |  |  |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2011088 | Agreeable  |
| R4-2011089 | To be revised |

## Discussion on 2nd round (if applicable)

There is one CR to be fruther discussed (R4-2012193 revised from R4-2011089), companies please provide comments in 1.3.1 directly.

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2012193 (revised from R4-2011089) | Company A |
|  |
|  |

## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

# Topic #2: RRM perf. requirements

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2009873 | Qualcomm Incorporated | **Proposal 1. RAN4 to specify performance tests for MSG3 DL channel quality reporting in non-anchor carrier with AWGN channel using 4-bit table. R15 tests can be used as guidelines.** **Proposal 2. RAN4 to specify separate test cases for channel quality reporting in connected mode. The test must ensure that the channel condition (i.e., SNR) is different in the evaluation period compared to the time prior to it so that UE only relies on the specified evaluation period for estimation of DL quality. As in R15 tests, 4-bit version in AWGN channel should be tested.**Table 1 4-bit DL channel quality reporting tests for idle and connected states

|  |  |  |  |
| --- | --- | --- | --- |
| Index | State | Mode | Note |
| 1 | Idle | NC | Tests for HD-FDD/TDD, AWGN |
| 2 | Idle | EC | Tests for HD-FDD/TDD, AWGN |
| 3 | Connected | NC | Tests for HD-FDD/TDD, AWGN |
| 4 | Connected | EC | Tests for HD-FDD/TDD, AWGN |

**Proposal 3. RAN4 to not specify any performance tests for group WUS.****Proposal 4. RAN4 to further consult RAN5 on how to make UE generate MO-data in RRC idle in order to test PUR feature.** **Proposal 5. RAN4 to not specify performance tests for NRSRP measurements on the non-anchor carrier as this is a UE choice. A UE may opt not to do RRM measurements on the non-anchor carrier at all or may opt to sometimes perform RRM measurements on the non-anchor carrier but not always.****Proposal 6. RAN4 to specify idle mode intra-frequency test cases for shortest DRX cycles (320ms) as in Table 2 below.**Table 2 Intra-frequency RRC idle tests for shorter DRX cycles

|  |  |  |  |
| --- | --- | --- | --- |
| Index | State | Mode | Note |
| 1 | Idle | NC | Tests for HD-FDD/TDD, AWGN with 320ms DRX cycle |
| 2 | Idle | EC | Tests for HD-FDD/TDD, AWGN with 320ms DRX cycle |

 |
| R4-2011090 | Huawei, Hisilicon | **Proposal 1: It is suggested not to define test cases for Group WUS.****Proposal 2: RAN4 to define the Msg-3 based channel quality report on non-anchor carrier.****Proposal 3: RAN4 to define test cases for channel quality report in connected mode.****Proposal 4: RAN4 to defined test case for TA validation requirement and transmit timing accuracy for PUR transmission** **Proposal 5: It is suggested not to define test cases for measurement on non-anchor carrier.****Proposal 6: It is suggested to define test cases for the new introduced short DRX cycles length.**  |
| R4-2011091 | Huawei, Hisilicon | **Table: Test cases list for Rel-16 NB-IoT**

|  |  |  |  |
| --- | --- | --- | --- |
| **Test cases** | **Operation mode** | **Coverage level** | **Company** |
| **MSG3 channel quality report on non-anchor carrier** |
| A.9.14.x HD-FDD Downlink channel quality reporting accuracy on non-anchor carrier | SA | NC |  |
| A.9.14.x HD-FDD Downlink channel quality reporting accuracy on non-anchor carrier | SA | EC |  |
| **channel quality report in connected mode** |
| A.9.14.x HD-FDD Downlink channel quality reporting accuracy in connected mode | SA | NC |  |
| A.9.14.x HD-FDD Downlink channel quality reporting accuracy in connected mode | SA | EC |  |
| **PUR** |
| A.7.1.x HD-FDD Transmit Timing Accuracy Tests for Category NB1 UE for PUR  | In-Band | NC |  |
| A.7.1.x HD-FDD Transmit Timing Accuracy Tests for Category NB1 UE for PUR | In-Band | EC |  |
| A.4.2.x TA validation for transmission using PUR | In-Band | NC |  |
| A.4.2.x TA validation for transmission using PUR | In-Band | EC |  |
| **UE specific DRX cycle (320ms & 640ms)** |
| A.4.2.x HD – FDD Intra frequency reselection with UE specific DRX (320ms & 640ms) | In-Band | NC |  |
| A.4.2.x HD – FDD Intra frequency reselection with UE specific DRX (320ms & 640ms) | In-Band | EN |  |
| A.4.2.x HD – FDD Inter frequency reselection with UE specific DRX (320ms & 640ms) | In-Band | EN |  |
| A.4.2.x E-UTRAN TDD - TDD Intra frequency reselection with UE specific DRX (320ms & 640ms) | In-Band | NC |  |
| A.4.2.x E-UTRAN TDD - TDD Intra frequency reselection with UE specific DRX (320ms & 640ms) | In-Band | EC |  |
| A.4.2.x E-UTRAN TDD - TDD Inter frequency reselection with UE specific DRX (320ms & 640ms) | In-Band | EC |  |
| A.4.2.x HD-FDD Intra frequency reselection with serving cell RRM measurement relaxation | In-Band | NC |  |

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| R4-2011209 | Ericsson |

|  |  |  |
| --- | --- | --- |
| **Feature** | **Test case** | **Comments** |
| Wake up signal  | No new test case | WUS was introduced in release 15 and no test case was introduced. The main difference with release 16 WUS compared to release 15 WUS is that the UE is required to receive at least two sequences compared to single sequence in release 15.  |
| Preconfigured uplink resources | New test case needed | Transmission using preconfigured resources require the UE to validate the TA prior to transmission. The validation is made by comparing two RSRP measurements and ensuring that the relative difference is less than a configured threshold. One way to design a test case is by configuring the UE with a certain maximum RSRP threshold for verifying the TA, and then modifying the signal levels over the different time periods. In a first time period the signal levels can be lowered or increased a lot to cause the relative RSRP change to be greater than the configured threshold. In this case, the test shall verify that UE does not carry out any PUR transmission. In a second time period, the signal levels can be changed only marginally to cause a relative change which is less than the configured threshold. In this case, the test shall verify that the PUR transmission takes place.  |
| DL quality reporting | New test case in IDLE mode for non-anchor carrier is neededNew test case in CONNECTED mode needed | Reuse the framework of Rel-14 NB-IoT MSG3-based channel quality reporting.Possible to verify both MSG3-based channel quality reporting in IDLE mode and MAC-CE based channel quality reporting in CONNECTED mode.  |
| Non-anchor carrier RRM measurement | No test case needed | The UE is allowed to camp on the non-anchor carrier and perform RRM measurement in normal and enhanced coverage. In normal coverage, the UE is further required to fulfill a certain condition related to the difference between anchor- and non-anchor carrier measurements. Since non-anchor carrier RRM measurement is up to the UE and UE is not reporting any measurement, it is quite difficult to have an explicit test case for this feature.  |

* **Proposal #1:** Test case list in Table 1 is agreed for the new features introduced in release 16 NB-IOT.
* **Proposal #2:** RAN4 shall reuse existing test configurations (RMCs and OCNGs) for defining new test cases.
 |

## Open issues summary

### Sub-topic 2-1 Test cases

**Issue 2-1-1: DL channel quality reporting in non-anchor carrier**

* Proposals
	+ Option 1: RAN4 to specify performance tests for MSG3 DL channel quality reporting in non-anchor carrier (Qualcomm R4-2009873, Huawei, HiSilicon R4-2011090, Ericsson R4-2011209)
* Recommended WF
	+ Option 1

**Issue 2-1-2: Channel quality reporting in connected mode**

* Proposals
	+ Option 1: RAN4 to specify separate test cases for channel quality reporting in connected mode. (Qualcomm R4-2009873, Huawei, HiSilicon R4-2011090, Ericsson R4-2011209)
* Recommended WF
	+ Option 1

**Issue 2-1-3: Group WUS**

* Proposals
	+ Option 1: RAN4 to not specify performance tests for group WUS. (Qualcomm R4-2009873, Huawei, HiSilicon R4-2011090, Ericsson R4-2011209)
* Recommended WF
	+ Option 1

**Issue 2-1-4: PUR**

* Proposals
	+ Option 1: RAN4 to not specify any tests for transmission in PUR occasions. (Qualcomm R4-2009873)
	+ Option 2: RAN4 to specify performance tests for group WUS (Huawei, HiSilicon R4-2011090, Ericsson R4-2011209)
* Recommended WF
	+ Discussion is needed

**Issue 2-1-5: New introduced short DRX cycles**

* Proposals
	+ Option 1: RAN4 to define test cases for the new introduced short DRX cycles length. (Qualcomm R4-2009873, Huawei, HiSilicon R4-2011090)
* Recommended WF
	+ Option 1

**Issue 2-1-6: NRSRP Measurement on non-anchor carrier**

* Proposals
	+ Option 1: RAN4 to not specify performance tests for NRSRP measurements on the non-anchor carrier. (Qualcomm R4-2009873, Huawei, HiSilicon R4-2011090, Ericsson R4-2011209)
* Recommended WF
	+ Option 1

### Sub-topic 2-2 Test configuration

**Issue 2-2-1: DL channel quality reporting in non-anchor carrier**

* Proposals
	+ Option 1: AWGN channel using 4-bit table (Qualcomm R4-2009873)
* Recommended WF
	+ Discussion is needed

**Issue 2-2-2: Channel quality reporting in connected mode**

* Proposals
	+ Option 1:
* The test must ensure that the channel condition (i.e., SNR) is different in the evaluation period compared to the time prior to it so that UE only relies on the specified evaluation period for estimation of DL quality. (Qualcomm R4-2009873)
* 4-bit version in AWGN channel should be tested. (Qualcomm R4-2009873)
* Recommended WF
	+ Discussion is needed

**Issue 2-2-3: New introduced short DRX cycles**

* Proposals
	+ Option 1: Specify intra-frequency test cases for shortest DRX cycles (320ms) (Qualcomm R4-2009873)
	+ Option 2: Specify intra-frequency, inter-frequency and serving cell RRM measurement relaxation test cases for 320ms and 640ms. ( Huawei, HiSilicon R4-2011091)
* Recommended WF

Discussion is needed.

**Issue 2-2-4: RMCs and OCNGs**

* Proposals
	+ Option 1: AN4 shall reuse existing test configurations (RMCs and OCNGs) for defining new test cases. (Ericsson R4-2011209)
* Recommended WF

Discussion is needed.

## Companies views’ collection for 1st round

### Open issues

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub-topic 2-1 Test casesIssue 2-1-1: DL channel quality reporting in non-anchor carrierIssue 2-1-2: Channel quality reporting in connected modeIssue 2-1-3: Group WUSIssue 2-1-4: PURIssue 2-1-5: New introduced short DRX cyclesIssue 2-1-6: NRSRP Measurement on non-anchor carrierSub-topic 2-2 Test configurationIssue 2-2-1: DL channel quality reporting in non-anchor carrierIssue 2-2-2: Channel quality reporting in connected modeIssue 2-2-3: New introduced short DRX cyclesIssue 2-2-4: RMCs and OCNGs |
| Qualcomm | Issue 2-1-1: Option 1 is agreeable.Issue 2-1-2: Option 1 is agreeable.Issue 2-1-3: Option 1 is agreeable.Issue 2-1-4: Similar to email thread 228, we think there are practical issues in designing a test for PUR. We’re ok to send an LS to RAN5 to solicit their feedback on these issues if other companies insist on having PUR tests. Issue 2-1-5: Option 1 is agreeable Issue 2-1-6: option is agreeable.Issue 2-2-1: Option 1 is similar to R15 and is reasonable to us.Issue 2-2-3: we think testing the shortest DRX cycle is sufficient and there is no need to test both. |
| Huawei | Issue 2-1-1: DL channel quality reporting in non-anchor carrierSupport option 1Issue 2-1-2: Channel quality reporting in connected modeSupport option 1Issue 2-1-3: Group WUSSupport option 1Issue 2-1-4: PURAfter reconsider the issue, we agree with QC’s views that UE which is capable of PUR could choose to use RA process even with data in buffer. So we are fine to not have PUR tests.Issue 2-1-5: New introduced short DRX cyclesSupport option 1Issue 2-1-6: NRSRP Measurement on non-anchor carrierSupport option 1Issue 2-2-1: DL channel quality reporting in non-anchor carrierSupport option 1.Issue 2-2-2: Channel quality reporting in connected modeSupport option 1.Issue 2-2-3: New introduced short DRX cyclesUE could request only one of the UE specific DRX cycle length (320ms or 640ms), so we think it is necessary to test both 320ms and 640ms in case some UE only support one of the values. |
| Ericsson | Issue 2-2-1: Option 1 is fine.Issue 2-1-2: Option 1 is fine.Issue 2-1-3: Option 1 is fine.Issue 2-1-4: We support option 2. It might be possible to define test cases by setting and modifying the RSRP levels in different time periods such that, in one time period the difference between the two RSRP measurements is larger than the allowed threshold, and in the second time period the difference is smaller than allowed threshold. It is then verified in the test that UE does not carry out the transmission in the first time period, but transmission is performed on the latter time period. Issue 2-1-5: Option 1 is fine.Issue 2-1-6: Option 1 is fine.Issue 2-2-1: Option 1 is fine.Issue 2-2-2: Option 1 is fine. Issue 2-2-3: We support option 2 since the new DRX cycles are supported for intra- and inter-frequency measurements, thus they need to be tested.2-2-4: We don’t see any need to define new RMC/OCNG, but we are open for discussion. |
| Huawei | Further comments:For Issue 2-1-4:To Ericsson:From our understanding, the difficult part maybe even UE requests the PUR, UE could still not use the PUR for transmission, thus UE won’t perform TA validation and PUR transmission.For Issue 2-2-4:We also don’t see the need for new RMC/OCNG, but could we capture it as taking the existing RMC/OCNG as baseline since there could be potential changes needed. |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2011091 | Company A |
| Company B |
| Qualcomm: we prefer to avoid an increased number of test cases. |
| Huawei: We understand the point for QC. However as we have to consider NC/EC and FDD/TDD cases, there could be multiple test cases for a single feature.  |
| Ericsson: looks fine, but there is no agreement on PUR test cases yet. |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary**  |
| **Topic#2**  | Sub-topic 2-1 Test casesIssue 2-1-1: DL channel quality reporting in non-anchor carrier*Tentative agreements:*RAN4 to specify performance tests for MSG3 DL channel quality reporting in non-anchor carrierIssue 2-1-2: Channel quality reporting in connected mode*Tentative agreements:*RAN4 to specify test cases for channel quality reporting in connected mode.Issue 2-1-3: Group WUS*Tentative agreements:*RAN4 to not specify performance tests for group WUSIssue 2-1-4: PURKeep discussion in the 2nd round.Issue 2-1-5: New introduced short DRX cycles*Tentative agreements:*RAN4 to define test cases for the new introduced short DRX cycles length.Issue 2-1-6: NRSRP Measurement on non-anchor carrier*Tentative agreements:*RAN4 to not specify performance tests for NRSRP measurements on the non-anchor carrier.Sub-topic 2-2 Test configurationIssue 2-2-1: DL channel quality reporting in non-anchor carrier*Tentative agreements:*AWGN channel using 4-bit tableIssue 2-2-2: Channel quality reporting in connected mode*Tentative agreements:*The test must ensure that the channel condition (i.e., SNR) is different in the evaluation period compared to the time prior to it so that UE only relies on the specified evaluation period for estimation of DL quality. 4-bit version in AWGN channel should be tested.Issue 2-2-3: New introduced short DRX cyclesKeep discussion in the 2nd roundOption 1: Specify intra-frequency test cases for shortest DRX cycles (320ms) Option 2: Specify intra-frequency, inter-frequency and serving cell RRM measurement relaxation test cases for 320ms and 640ms. Issue 2-2-4: RMCs and OCNGs*Tentative agreements:*Take the existing RMC/OCNG as baseline |

*Suggestion on WF/LS assignment*

|  |  |  |
| --- | --- | --- |
|  | **WF/LS t-doc Title**  | **Assigned Company,****WF or LS lead** |
| #1 | WF on Rel-16 NB-IoT RRM performance requirements | Huawei |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation**  |
| R4-2011091 | To be revised  |

## Discussion on 2nd round (if applicable)

###  Open issues summary

**Issue 2-1-4: PUR**

* Proposals
	+ Option 1: RAN4 to not specify any tests for transmission in PUR occasions. (Qualcomm, Huawei)
	+ Option 2: RAN4 to specify performance tests for PUR (Ericsson)
* Recommended WF
	+ Discussion is needed

**Issue 2-2-3: New introduced short DRX cycles**

* Proposals
	+ Option 1: Specify intra-frequency test cases for shortest DRX cycles (320ms) (Qualcomm)
	+ Option 2: Specify intra-frequency, inter-frequency and serving cell RRM measurement relaxation test cases for 320ms and 640ms. (Huawei, Ericsson)
* Recommended WF

Discussion is needed.

### Companies’ views collection for 2nd round

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub-topic 2-1 Test casesIssue 2-1-4: PURSub-topic 2-2 Test configurationIssue 2-2-3: New introduced short DRX cycles |
| Huawei | Sub-topic 2-1 Test casesIssue 2-1-4: PURWe support option 1.As commented in the 1st round, UE may choose not to use PUR for transmission even it supports the feature. Regarding to Ericsson’s comment, the difficulty is that the UE may not use PUR and TA validation, thus the UE may not transmit in both time period. Sub-topic 2-2 Test configurationIssue 2-2-3: New introduced short DRX cyclesWe support option 2.As analyze in the 1st round, UE may support only one of the new introduced DRX cycles instead of both of them, so it is needed to test both 320ms and 640ms in all related test cases. |
| Qualcomm | Issue 2-1-4: support option 1. Actual transmission of data in any PUR occasion is highly dependent on UE implementation and cannot be effectively tested. Issue 2-2-3: If UE has separate capability for 320ms and 640ms DRX cycles in R16, then we can agree to option 2.  |
| Ericsson | **Issue 2-1-4: PUR**We prefer to align the agreement with eMTC. In eMTC it is being discussed to send LS to RAN5 and asking for feedback about how to test this feature.**Issue 2-2-3: New introduced short DRX cycles**We support option 2 since short DRX is supported not only for intra-frequency measurements. |

### CRs/TPs

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| R4-2012195 (revised from R4-2011091) | Company A |
|  |
|  |
| R4-2012194 (WF) | Company A |
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## Summary on 2nd round (if applicable)

*Moderator tries to summarize discussion status for 2nd round and provided recommendation on CRs/TPs/WFs/LSs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP/LS/WF number** | **T-doc Status update recommendation**  |
| XXX | *Based on 2nd round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |