

**[102-e][237] NB\_IOTenh4\_LTE\_eMTC6\_RRM\_NWM - Version 0.0.5**  
**RAN4**

3GPP TSG-RAN WG4 Meeting #102-e R4-2206780

Online Meeting, February 21- March 3, 2022

**Agenda item:** 12.9.4

**Source:** Moderator (Huawei)

**Title:** Email discussion summary for [102-e][237] NB\_IOTenh4\_LTE\_eMTC6\_RRM

**Document for:** Information

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## 1 Introduction

*List of candidate target of email discussion for 1<sup>st</sup> round and 2<sup>nd</sup> round*

- 1<sup>st</sup> round:

Discuss remaining issues on neighbour cell measurements in connected mode before RLF for Rel-17 NB-IoT.

Discuss submitted CRs

- 2<sup>nd</sup> round:

Discuss remaining issues and CRs if needed.

### 1.1 Companies' contributions summary

**Table 1: Companies' contributions summary**

<b>T-doc number</b>	<b>Company</b>
R4-2204470	Qualcomm Incorporated
R4-2204882	Huawei, Hisilicon
R4-2205635	Ericsson

## 1.2 Open issues summary

### 1.2.1 inter-frequency measurement requirement

#### **Issue 1-1-1: Minimum length of occasion for cell detection and measurement**

- Proposals

Option 1: 100 ms for detection and 50 ms for measurement (Huawei)

Option 2: 21 ms for detection, 21 ms for NSSS based measurement and 11 ms for NRS based measurement (Ericsson)

- Recommended WF
  - o Discuss above options.

#### **Feedback Form 1: Issue 1-1-1: Minimum length of occasion for cell detection and measurement**

##### **1 – HUAWEI TECHNOLOGIES Co. Ltd.**

We support option 1, which is already a compromised value based the two options in last meeting. We understand option 2 is to guarantee that there is at least one RS in one occasion. But it means UE in very heavy data traffic. As UE needs many samples (40/60) for measurement and detection, then the overall delay will be very long. The benefits is minor to perform neighbor cell measurement in this case and there will be a lot RF tuning.

##### **2 – Qualcomm Incorporated**

We agree with Huawei's observation that expecting the UE to retune just to measure one RS sample at a time would not be efficient.

Our preference would be to assume the values we proposed in the previous meeting, captured in the WF:

Minimum length of occasion for measurements: 50 ms

Minimum length of occasion for cell detection: 200 ms

##### **3 – Ericsson Hungary Ltd**

We can compromise to option 1.

#### **Issue 1-1-2: Conditions of maximum value of $T_{\text{measure\_inter}}$ and $T_{\text{detect\_inter}}$**

- Proposals

Option 1:

The inter-frequency measurement requirements when  $T_{\text{measure\_inter}} \leq 50$  sec. The UE is not required to continue trying to measure cells in an inter-frequency carrier if it has not been able to collect the minimum required number of samples after that amount of time. (Qualcomm, Huawei)

The inter-frequency detection requirements apply when  $T_{\text{detect\_inter}} \leq 60$  sec. The UE is not required to continue trying to detect cells in an inter-frequency carrier if it has not been able to collect the minimum required number of samples after that amount of time. (Qualcomm)

Option 2: There is no need to define the maximum value for  $T_{\text{measure\_inter}}$  and  $T_{\text{detect\_inter}}$ . If defined, they should be calculated based on the number of samples as agreed at last meeting. (Ericsson)

- Recommended WF
  - o Discuss above options.

**Feedback Form 2: Issue 1-1-2: Conditions of maximum value of  $T_{\text{measure\_inter}}$  and  $T_{\text{detect\_inter}}$**

**1 – HUAWEI TECHNOLOGIES Co. Ltd.**

We support option1. We agree with the principle of defining the maximum time of  $T_{\text{measure\_inter}}$  and  $T_{\text{detect\_inter}}$  which is to keep the same level as the maximum time for intra-frequency case. As commented by companies in last meeting, it is to prevent the case that the available samples are spaced very far away (e.g. 4000ms). Then the delay is very long and it does not make much sense to perform inter-f measurement under this case.

**2 – Qualcomm Incorporated**

We support option 1.

**3 – Ericsson Hungary Ltd**

As long as the cell is known, it should be possible for the UE to collect samples from that cell. So by applying the formula, then we get a maximum delay. We don't see any need to put another limit since there is already limit on minimum measurement occasion as discussed in previous issue.

**Issue 1-1-3: Inter-frequency carrier selection**

- Proposals

Option 1: In the case where the serving carrier is a non-anchor carrier, a UE that supports inter-frequency neighbor cell measurements in connected mode is expected to detect/measure inter-frequency cells on the anchor carrier. The selection of other inter-frequency carriers to detect/measure cells in connected mode is left up to UE implementation. (Qualcomm)

- Recommended WF
  - o Discuss above option.

**Feedback Form 3: Issue 1-1-3: Inter-frequency carrier selection**

<p><b>1 – HUAWEI TECHNOLOGIES Co. Ltd.</b></p> <p>We think the proposal is to guarantee that UE will choose the target carrier for inter-frequency in the test cases. We think it is more related to the performance part discussion and it only tests the case when serving cell is non anchor carrier. For the time being, we propose to use a more generic approach that configure the carrier intended for inter-frequency measurement in the SI(SIB3) to make sure that the carrier is the only one UE can obtained. This put less restriction on UE implementation for test purpose, and it is more reliable to follow the information about neighbor cells from NW.</p> <p>Companies please check whether the approach is acceptable:</p>
<p><b>2 – HUAWEI TECHNOLOGIES Co. Ltd.</b></p> <p>Add the missing part <input type="checkbox"/></p> <p>Companies please check whether the approach is acceptable:</p> <p>In test case design of inter-frequency measurement, consider the target carrier for inter-frequency neighbor cell measurement as the carrier configured in SIB3.</p>
<p><b>3 – Qualcomm Incorporated</b></p> <p>We will check Huawei’s proposal.</p>
<p><b>4 – Ericsson Hungary Ltd</b></p> <p>We suggest to discuss this issue in the performance part.</p>

1.2.2 Continue measurement on neighbour cell detected in RRC\_IDLE/INACTIVE modes

**Issue 1-2-1: Continue measurement on neighbour cell detected in RRC\_IDLE/INACTIVE modes**

- Option 1 (Ericsson)

The UE continues measuring on at least one neighbour cell detected in RRC\_IDLE/INACTIVE modes at least once every 5 seconds after transition to RRC\_CONNECTED state provided that it belongs to the serving carrier frequency and meets the side condition ( $E_s/I_{ot} \geq -6$  dB).

Intra-frequency RRC reestablishment delay requirements are modified as follows:

$T_{search\_NB1-NC} = 80\text{ ms}$  if target cell belongs an overlapping carrier configured for IDLE/INACTIVE mode measurements and target cell is a known cell.

- Option 2 (Huawei)

Follow the neighbour cell measurement defined in RAN2, and whether UE continues measurement on cells detected in RRC\_IDLE/INACTIVE mode is left to UE implementation without spec impact

- Recommended WF
  - o Discuss above options.

**Feedback Form 4: Issue 1-2-1: Continue measurement on neighbour cell detected in RRC\_IDLE/INACTIVE mode**

**1 – HUAWEI TECHNOLOGIES Co. Ltd.**

We support option 2. We now understand the action required in option 1. It requires UE to start intra-frequency neighbor cell measurement immediately when enters RRC connected mode. From my understanding, it is a new kind of connected mode measurement compared with the measurement defined in RAN2 (triggered by serving cell deterioration). So we suggested to focus on finalizing the requirements within the WI. And whether UE continues measurement on cells detected in RRC\_IDLE/INACTIVE mode is left to UE implementation without spec impact.

**2 – Qualcomm Incorporated**

We support option 2. Earlier we has suggested option 1 as a possibility but now RAN2 has already finalized the triggering mechanism for neighbor cell measurements in connected state.

**3 – Ericsson Hungary Ltd**

We can compromise to option 2.

1.2.3 Additional triggering conditions

**Issue 1-3-1: Whether to have additional triggering conditions**

- Proposals
  - o Option 1:
    - RAN4 to discuss the consequences of UE triggering RLM out-of-sync before the neighbour cell measurement triggering conditions is met.
    - In addition to the already agreed triggering conditions, the UE shall initiate the neighbour cell measurements if K (e.g. K=1) number of out-of-sync indications are detected in the cell. (Ericsson)

○ Option 2:

- It is suggested to follow RAN2 design about neighbour cell measurement triggering and no need to have further discussion in RAN4. □Huawei□

- Recommended WF

- Discuss above options

**Feedback Form 5: Issue 1-3-1: Whether to have additional triggering condition**

**1 – HUAWEI TECHNOLOGIES Co. Ltd.**

We support option 2. Based on previous discussion in RAN4, it is up to RAN2 to decide the triggering mechanism, and RAN2 has concluded on this issue that triggering by OOS is not supported in Rel-17. So we think it should be avoided to reopen the discussion in RAN4. Second, for the question mentioned in option 1, it is up to NW to configure the threshold of triggering the measurement. NW can make UE either start neighbor cell measurement before or after OOS. And we didn't see the problem if the measurement is triggering after OOS when NW want to UE to start measurement only when the conditions of serving cell is becoming bad for sure too avoid unnecessary measurement for power saving purpose.

**2 – Qualcomm Incorporated**

We support option 2.

**3 – Ericsson Hungary Ltd**

What would be the consequences if out-of-sync is triggered before the neighbour cell measurements are triggered. Isn't it too late especially if UE has to measure on inter-frequency carriers? For example, according to the current evaluation period for RLM out-of-sync for  $R_{max} \leq 64$ , out-of-sync can be sent before UE has completed a NRS based RSRP measurement or NSS based RSRP measurement. Then isn't it reasonable to start the neighbour cell measurement at this stage instead of waiting for the UE to complete the relaxed monitoring state evaluation or other criteria to be triggered? Our view is that it would be useful to start measuring upon out-of-sync is sent. Therefore we support option 1.

1.2.4 Channel quality reporting for 16-QAM of NB-IoT

Moderator□ Per agreed arrangement in RAN4#101-bis-e meeting (R4-2202764), the issue will be discussed in Demod session, and agreement will be captured in TS 36.133. Companies please provide your comments in [333], and the conclusion will be captured in CR of TS 36.133 finally.

1.2.5 CRs/TPs comments collection

**Feedback Form 6: R4-2204883 Draft CR on intra-frequency measurement requirements for Rel-17 NB-IoT**

**1 – Ericsson Hungary Ltd**

”When DRX is not used,  $T_{\text{detectintra}}$  is 1400 ms and  $T_{\text{measure intra}}$  is 800 ms for NRS-based measurement and 1600 ms for NSSS-based measurement.” → ”When DRX is not used,  $T_{\text{detectintra}}$  is 1400 ms, and  $T_{\text{measure intra}}$  is 800 ms and 1600 ms for NRS-based and NSSS-based measurement respectively.”

**2 – HUAWEI TECHNOLOGIES Co. Ltd.**

suggest to work on the details of the CR in 2nd round

**3 – Qualcomm Incorporated**

OK to discuss the CR in the 2nd round

**Feedback Form 7: R4-2205634 Draft CR on Connected mode inter-frequency neighbour cell measurement before RLF for Rel-17 NB-IoT**

**1 – HUAWEI TECHNOLOGIES Co. Ltd.**

suggest to work on the details of the CR in 2nd round

**2 – Qualcomm Incorporated**

OK to discuss the CR in the 2nd round

**Feedback Form 8: R4-2204884 Big CR of RRM requirements  
for Rel-17 NB-IoT and eMTC**

1.3 Summary for 1st round

**Table 2: summary of 1st round discussion**

	<b>Status summary</b>
<b>Sub-topic #1-1</b>	<p><b><u>Issue 1-1-1: Minimum length of occasion for cell detection and measurement</u></b></p> <p>Three companies commented in 1<sup>st</sup> round. Two company support option 1, and one company proposed a new option. All companies agree the minimum length of occasion for measurement is 50 ms.</p> <p><i>Tentative agreements:</i></p> <p>Minimum length of occasion for measurements: 50 ms</p> <p><i>Candidate options:</i></p> <p>Option 1: Minimum length of occasion for cell detection: 100 ms</p> <p>Option 3: Minimum length of occasion for cell detection: 200 ms</p> <p><i>Recommendations for 2<sup>nd</sup> round:</i></p> <p>Discuss above two options.</p>



	<p><b><u>Issue 1-1-2: Conditions of maximum value of <math>T_{\text{measure\_inter}}</math> and <math>T_{\text{detect\_inter}}</math></u></b></p> <p>Three companies commented in 1<sup>st</sup> round. Two company support option 1, and one company think there is no need to have this condition.</p> <p><i>Tentative agreements: NA</i></p> <p><i>Candidate options:</i></p> <p>Option 1:  The inter-frequency measurement requirements when <math>T_{\text{measure\_inter}} \leq 50</math> sec. The UE is not required to continue trying to measure cells in an inter-frequency carrier if it has not been able to collect the minimum required number of samples after that amount of time.</p> <p>The inter-frequency detection requirements apply when <math>T_{\text{detect\_inter}} \leq 60</math> sec. The UE is not required to continue trying to detect cells in an inter-frequency carrier if it has not been able to collect the minimum required number of samples after that amount of time.</p> <p><i>Recommendations for 2<sup>nd</sup> round:</i>  Discuss whether to have option 1 in 2<sup>nd</sup> round.</p>
	<p><b><u>Issue 1-1-3: Inter-frequency carrier selection</u></b></p> <p>Three companies commented in 1<sup>st</sup> round. Two company think this should be discussed in performance stage. Moderator suggest to discuss this issue in performance state, and force on completing the core requirements in this meeting.</p> <p><i>Tentative agreements:</i>  Discuss how to determine the carrier of inter-frequency measurement in test cases in performance stage.</p> <p><i>Candidate options: NA</i></p> <p><i>Recommendations for 2<sup>nd</sup> round: NA</i></p>

<p><b>Sub-topic #1-2</b></p>	<p><b><u>Issue 1-2-1: Continue measurement on neighbour cell detected in RRC_IDLE/INACTIVE modes</u></b>  Three companies commented in 1<sup>st</sup> round, and all can agree on option 2.  <i>Tentative agreements:</i>  Follow the neighbour cell measurement defined in RAN2, and whether UE continues measurement on cells detected in RRC_IDLE/INACTIVE mode is left to UE implementation without spec impact  <i>Candidate options: NA</i>  <i>Recommendations for 2<sup>nd</sup> round: NA</i></p>
<p><b>Sub-topic #1-3</b></p>	<p><b><u>Issue 1-3-1: Whether to have additional triggering conditions</u></b>  Three companies commented in 1<sup>st</sup> round. Two company support option 2, and one company support option 1.  Tentative agreements: NA  Candidate options:</p> <ul style="list-style-type: none"> <li>- Option 1: <ul style="list-style-type: none"> <li>○ RAN4 to discuss the consequences of UE triggering RLM out-of-sync before the neighbour cell measurement triggering conditions is met.</li> <li>○ In addition to the already agreed triggering conditions, the UE shall initiate the neighbour cell measurements if K (e.g. K=1) number of out-of-sync indications are detected in the cell.</li> </ul> </li> <li>- Option 2: Follow RAN2 design about neighbour cell measurement triggering and no need to have further discussion in RAN4.</li> </ul> <p>Recommendations for 2<sup>nd</sup> round:  Discuss in 2nd round</p>

1.4 Discussion on 2nd round (if applicable)

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**2 Recommendations for Tdocs**

## 2.1 1st round

### New tdocs

**Table 3:**

<b>Title</b>	<b>Source</b>	<b>Comments</b>
WF on RRM requirements for Rel-17 NB-IoT and LTE-MTC	Huawei, Hisilicon	To capture all agreements in this meeting

### Existing tdocs

**Table 4:**

<b>Tdoc number</b>	<b>Title</b>	<b>Source</b>	<b>Recommendation</b>	<b>Comments</b>
R4-2204883	Draft CR on intra-frequency measurement requirements for Rel-17 NB-IoT	Huawei, Hisilicon	Revised	
R4-2205634	Draft CR on Connected mode inter-frequency neighbour cell measurement before RLF for Rel-17 NB-IoT	Ericsson	Revised	
R4-2204884	Big CR of RRM requirements for Rel-17 NB-IoT and eMTC	Huawei, Hisilicon	Revised	
R4-2205090	draft CR: Introduction of channel quality report for NB-IoT supporting 16QAM	Ericsson	Revised	<i>Based on discussion in [333]</i>

