**3GPP TSG-RAN WG4 Meeting # 98-bis-e R4-210XXXX**

**Electronic Meeting, 12th – 20th April, 2021**

**Agenda item:** 12.1

**Source:** Moderator (Huawei)

**Title:** Email discussion summary for [98-bis-e][226] LS\_reply\_R2-2102165\_NBIOT

**Document for:** Information

# Introduction

Companies are encouraged to provided views on the questions raised in RAN2 LS R2-2102165 in the 1st and 2nd round discussion.

1st round:

Companies provide comments on issues identified in submitted contributions.

Companies provide comments on questions raised in LS R2-2102165.

2nd round:

Companies provide comments on remaining issues based on the 1st round discussion.

Companies provide comments on the draft LS reply and finalize the LS reply.

# Topic #1: Title

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| R4-2104429 | ZTE Corporation | Proposal 1: It is totally feasible to conduct such measurements without gaps. The triggering condition for such measurements can be the deteriorates in the serving cell channel quality.  Proposal 2: One-shot measurement is to be used by the UE for neighbor cell measurements.  Proposal 3: Tsearch\_NB1-NC = 1400 ms for UE in normal coverage and Tsearch\_NB1-EC = 14800 ms for UE in enhanced coverage.  Proposal 4: A neighbor cell is known if it has been detected by the UE within 5 seconds.  Proposal 5: NB-IoT UE can perform measurement occasionally.  Proposal 6: The minimum length of a measurement occasion can be 21ms. In some scenarios it can be 6ms for Frame structure type 1 and 7ms for Frame structure type 2.  **Proposal 7: As to question 4, for scenario B, D and E, several measurement occasions might be needed.**  **Proposal 8: For question 5, re-use the time period defined for Question 3 and avoid any confusion.**  **Proposal 9: Agree on the answers in the table to be provided in the reply LS.** |
| R4-2106345 | Qualcomm Incorporated | **Proposal 1: The UE would be able to perform neighbor cell measurements in RRC\_CONNECTED in scenarios A and C, assuming that no interruptions in traffic are allowed.**  **Proposal 2: RAN2 may refer to the re-establishment delay requirements for NB-IoT UEs in TS 36.133 sections 6.5.2.1 and 6.5.2.2. The search times are defined by Tsearch\_NB1-NC and Tsearch\_NB1-EC.**  **Proposal 3: RAN4 to discuss which definition of known cell to use for the new neighbor cell measurement requirements for NB-IoT UEs. At least two candidate options, one for LTE UEs and one for Cat M1 UEs, may be considered.**  **Proposal 4: RAN2 may refer to the intra-frequency measurement period requirements in RRC\_CONNECTED in TS 36.133 sections 8.14.2 and 8.14.3. The measurement period without DRX is either 800 ms and 1600 ms depending on the type of coverage. With DRX the measurement period (= 5 DRX cycles) ranges from ~1.3 s to ~50 s depending on the DRX cycle duration.**  **Proposal 5: RAN4 could consider at least the following options for measurement validity:**   1. **A NRSRP measurement would be considered valid if it was performed within the last 5 seconds, leveraging the definition of known cell for LTE UEs.** 2. **A NRSRP measurement would be considered valid for a period of time equal to N times the measurement period, where N is TBD.** |
| R4-2106857 | Ericsson | **Proposal #1: Upon starting of RLF timer (T310) or detecting an X number of out-of-sync indications, the UE starts detecting and measuring on the target intra-frequency cell anytime, X is TBD.**  **Proposal #2: Upon starting of RLF timer (T310) or detecting an X number of out-of-sync indications, the UE starts detecting and measuring on the target inter-frequency cell during the DRX inactive period if currently served by a non-anchor carrier.**  **Proposal #3: Upon starting of RLF timer (T310) or detecting an X number of out-of-sync indications, the UE starts detecting and measuring on the target inter-frequency cell during the DRX inactive period excluding subframes (#0, #4, #5 in every frame and #9) if currently served by an anchor carrier.**  **Proposal #4: Time required to perform cell detection and a measurement on another cell in normal and enhanced coverage are 1400 ms and 14800 ms respectively in non-DRX.**  **Proposal #5: Time required to perform cell detection and a measurement on another cell in normal and enhanced coverage are as defined in Table 1 and 2 for normal and enhanced coverage respectively in DRX.**  **Proposal #6: A NB-IoT cell is considered known if it has been meeting the relevant cell identification requirement for a time duration equal to or longer than the time duration required for the cell identification (Tsearch). Otherwise, the cell is considered unknown.**  **Proposal #7: The non-DRX measurement delay for NRSRP on intra-frequency serving cell is as follows:**   |  |  |  | | --- | --- | --- | | **Coverage mode** | **Measurement period** | | |  | **NRS based NRSRP** | **NSSS based NRSRP** | | **Normal coverage** | **800 ms** | **1600 ms** | | **Enhanced coverage** | **1600 ms** | **1600 ms** |   **Proposal #8: The DRX measurement delay for NRSRP on intra-frequency serving cell comprises of 5 DRX cycles for both normal and enhanced coverage.**  **Proposal #9: How long NRSRP measurement can be considered valid depends on many factors including UE mobility state (e.g. static or moving) and also on the intended use case.** |
| R4-2106985 | Huawei, HiSilicon | **Proposal 1: RAN4 provide the time duration needed for detection and measurement on a certain frequency layer.**  **Proposal 2: For scenario A and C, UE could perform measurement on neighbour anchor without measurement gap. For scenario B, D and E, UE could perform measurement on neighbour anchor without measurement gap provided that the UE is not required to do data transmission/reception or NPDCCH monitoring during the time period for detection and measurement.**  **Observation 1: Provide the same time duration needed for detection/measurement for all scenarios.**  **Observation 2: Neighbour cell detection and measurement before RLF in a more intensive manner needs to be considered; otherwise, it will take a long time to detect the Cell and UE may already enter the RRC Re-establishment process.**  **Proposal 3: For normal coverage, for scenario A-E, the time needed for cell detection or measurement is 800 ms. For scenarios B, D and E, the length of a single available time period for detection or measurement shall be at least 400 ms, and the maximum interval between two available time periods for detection/measurement on the cell shall be less than 5 seconds.**  **Observation 3: The benefits of neighbour cell measurement in enhanced coverage before RLF is limited in time reduction for RRC Re-establishment.**  **Proposal 4: Focus on neighbour cell measurement before RLF in normal coverage and provide the observations to RAN2 in the LS reply.**  **Observation 4: The overall time for neighbour cell detection and measurement will be longer if UE is configured to perform neighbour cell measurement on multiple frequency layers, and the maximum interval between two available time periods shall be scaled.**  **Proposal 5: The neighbour cell can be considered as known if it has been measured within the last 5 seconds and during which the cell remains detectable.** |
| R4-2107185 | Nokia, Nokia Shanghai Bell | 1. **The search time for target cell and system information acquisition related delay are the major contributors to the re-establishment delay.** 2. **The target cell search time depends on whether the target cell is known or unknown. In case it is known, it is 0 s, else it can vary between 80 and 1400 ms in normal coverage and between 80 and 14800 ms in enhanced coverage.** 3. **The system information acquisition delay needs to be added for unknown target cells. It depends on the system information scheduling in the target cell (MIB and SIB1 are at least required) and the required number of repetitions for each system information block which will further increase the time required to identify the target cell.** 4. **The depicted scenarios in the LS covering intra-frequency and inter-frequency target cells are quite different and need to be distinguished. The number of target cells to be measured prior RLF will also impact the measurement time.** 5. **Intra-frequency measurement requirements for RRC\_CONNECTED state for NB-IoT UE are specified in TS 36.133 whilst inter-frequency measurement requirements are not specified. Normal and enhanced coverage requirements are distinguished.** 6. **Whether the UE is capable to measure the cells prior to RLF, depends on several conditions:**  * **whether the UE is in normal coverage or in enhanced coverage determining the search time for target cells** * **whether the target cell is known or not** * **whether the target cell is on intra-frequency layer or inter-frequency layer** * **the system information scheduling and the number of required repetitions in the target cell the UE needs to receive** * **the number of target cells the UE is to measure** * **the DRX cycle in RRC\_CONNECTED mode** * **the network deployment.**  1. **RAN2 to provide further information on the considered scenarios regarding the listed conditions in above observation 6.** 2. The use of measurement gaps should not be excluded at this stage to enable full network control. |

## Open issues summary

The inputs from companies are summarized according to the questions raised in RAN2 LS in the following sub-topics. Some genenarl issues are summarized in sub-topic 1-0 based on companies’s contributions. The poposed respones to the Q1-Q5 in RAN2 LS are summarized in sub-topic 1-1 to 1-5.

### Sub-topic 1-0 General

**Issue 1-0-1: Neighbour cell measurement triggering**

* Proposals
  + Option 1: The triggering condition for such measurements can be the deteriorates in the serving cell channel quality. (ZTE P1)
  + Option 2: UE starts detection and measurement upon starting of RLF timer (T310) or detecting an X number of out-of-sync indications, X is TDB. (Ericsson P1/2/3)
* Recommended WF
  + Need more discussion

**Issue 1-0-2: Feasibility of measurement gap**

* Proposals
  + Option 1: The use of measurement gaps should not be excluded at this stage to enable full network control (Nokia P2)
* Recommended WF
  + Need more discussion

**Issue 1-0-3: Feasibility of neighbour cell measurement in enhanced coverage**

* Proposals
  + Option 1: Focus on neighbour cell measurement before RLF in normal coverage and provide the observations to RAN2 in the LS reply. (Huawei O3 P4)
* Recommended WF
  + Need more discussion

**Issue 1-0-4: Measurement approach**

* Proposals
  + Option 1: One-shot measurement is to be used by the UE for neighbor cell measurements. The measurements can be done occasionally. (ZTE P2 P5)
* Recommended WF
  + Need more discussion

**Issue 1-0-5: Conditions for neighbour cell measurement to be considered:**

* Proposals
  + Option 1: (Nokia P1 O6)

Whether the UE is capable to measure the cells prior to RLF, depends on several conditions:

* + - whether the UE is in normal coverage or in enhanced coverage determining the search time for target cells
    - whether the target cell is known or not
    - whether the target cell is on intra-frequency layer or inter-frequency layer
    - the system information scheduling and the number of required repetitions in the target cell the UE needs to receive
    - the number of target cells the UE is to measure
    - the DRX cycle in RRC\_CONNECTED mode
    - the network deployment.
* Recommended WF
  + Need more discussion

**Companies views’ collection for 1st round for Sub-topic 1-0 (General)**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 1-0-1**  **Issue 1-0-2**  **Issue 1-0-3**  **Issue 1-0-4**  **Issue 1-0-5** |
| YYY |  |

### Sub-topic 1-1 Q1: Can UE perform measurements on neighbour anchor for RRC reestablishment, before RLF is declared, without measurement gaps and what would the conditions be?

**Issue 1-1-1: Whether UE can perform neighbour cell measurement in scenarios A/C**

* Proposals
  + Option 1: UE can perform neighbour cell measurement without gaps (ZTE P1, Qualcomm P1, Ericsson P1, Huawei P2)
* Recommended WF
  + Can we agree on option 1?

**Issue 1-1-2: Whether UE can perform neighbour cell measurement in scenarios B/D/E**

* Proposals
  + Option 1a: UE can perform neighbour cell measurement without gaps using vacant slots not scheduled for data transmission. (ZTE P1)
  + Option 1b: UE could perform measurement on neighbour anchor without measurement gap provided that the UE is not required to do data transmission/reception or NPDCCH monitoring during the time period for detection and measurement. (Huawei P2)
  + Option 1c: (Ericsson P2 and P3)
    - UE could perform measurement on neighbour anchor without measurement gap during the DRX inactive period if currently served by a non-anchor carrier.
    - UE could perform measurement on neighbour anchor without measurement gap during the DRX inactive period excluding subframes (#0, #4, #5 in every frame and #9) if currently served by an anchor carrier.
  + Option 2: UE is not able to perform neighbour cell measurement assuming that no interruptions in traffic are allowed. (Qualcomm P1)
* Recommended WF
  + Need more discussion

**Companies views’ collection for 1st round for Sub-topic 1-1 (Q1)**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 1-1-1**  **Issue 1-1-2** |
| YYY |  |

### Sub-topic 1-2 Q2: How long does it take to perform cell detection both in normal and in extended coverage?

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-2-1: Time for cell detection in normal coverage**

* Proposals
  + Option 1: Time for UE to perform cell detection and measurement is 1400 ms (ZTE P3)
  + Option 2: Delay requirements for NB-IoT UEs in TS 36.133 sections 6.5.2.1 (80 ms when signal quality is sufficient for successful cell detection on the first attempt, otherwise 1400 ms) (Qualcomm P2)
  + Option 3: The time needed for cell detection is 800 ms. For scenarios B, D and E, the length of a single available time period for detection or measurement shall be at least 400 ms, and the maximum interval between two available time periods for detection on the cell shall be less than 5 seconds. (Huawei P3)
  + Option 4: (Ericsson P4 and P5)
    - Time for UE to perform cell detection and measurement is 1400 ms in non-DRX mode.
    - Time for UE to perform cell detection and measurement in DRX mode as in the table:

|  |  |
| --- | --- |
| DRX cycle length [s] | Tdetect,NB\_Inter\_ NC [s] (number of DRX cycles) |
| 0.32 | 26 (80) |
| 0.64 | 26 (40) |
| 1.28 | 51 (40) |
| 2.56 | 51 (20) |
| 5.12 | 102 (20) |
| 10.24 | 102 (10) |

* Recommended WF
  + Need more discussion

**Issue 1-2-2: Time for cell detection in enhanced coverage**

* Proposals
  + Option 1: Time for UE to perform cell detection and measurement is 14800 ms (ZTE P3)
  + Option 2: Delay requirements for NB-IoT UEs in TS 36.133 sections 6.5.2.2 (80 ms when signal quality is sufficient for successful cell detection on the first attempt, otherwise 14800 ms) (Qualcomm P2)
  + Option 3: Focus on neighbour cell measurement before RLF in normal coverage and provide the observations to RAN2 in the LS reply. (Huawei O3 and P4)
  + Option 4: (Ericsson P4 and P5)
    - Time for UE to perform cell detection and measurement is 14800 ms in non-DRX mode.
    - Time for UE to perform cell detection and measurement in DRX mode as in the table:

|  |  |  |
| --- | --- | --- |
| SCH Ês/Iot of neighboring cell: Q2 | DRX cycle length [s] | Tdetect,NB\_Inter\_ EC [s] (number of DRX cycles) |
| -15≤ Q2 < -6 | 0.32 | 256 (800) |
| 0.64 | 266 (415) |
| 1.28 | 532 (415) |
| 2.56 | 532 (208) |
| 5.12 | 1063 (208) |
| 10.24 | 1063 (104) |
| Q2≥-6 | 0.32 | 26 (80) |
| 0.64 | 29 (45) |
| 1.28 | 58 (45) |
| 2.56 | 59 (23) |
| 5.12 | 113 (22) |
| 10.24 | 113 (11) |

* Recommended WF
  + Need more discussion

**Companies views’ collection for 1st round for Sub-topic 1-2 (Q2)**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 1-2-1**  **Issue 1-2-2** |
| YYY |  |

### Sub-topic 1-3 Q3: For how long the neighbour cell can be considered as known after it has been detected/re-confirmed?

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-3-1: Known cell conditions**

* Proposals
  + Option 1a: A neighbor cell is known if it has been detected by the UE within 5 seconds (ZTE P3)
  + Option 1b: The neighbour cell can be considered as known if it has been measured within the last 5 seconds and during which the cell remains detectable (Huawei P5)
  + Option 2: A NB-IoT cell is considered known if it has been meeting the relevant cell identification requirement for a time duration equal to or longer than the time duration required for the cell identification (Tsearch). Otherwise, the cell is considered unknown. (Ericsson P6)
  + Option 3: More discussion among option 1a/1b and option 2. (Qualcomm P3)
* Recommended WF
  + Need more discussion

**Companies views’ collection for 1st round for Sub-topic 1-3 (Q3)**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 1-3-1** |
| YYY |  |

### Sub-topic 1-4 Q4: How long does it take to perform NRSRP measurements?

**Issue 1-4-1: Time for cell measurement in normal coverage**

* Proposals
  + Option 1: The minimum length of a measurement occasion can be 21ms. In some scenarios it can be 6ms for Frame structure type 1 and 7ms for Frame structure type 2. Several measurement occasions might be needed for scenarios B,D and E (ZTE P6 P7)
  + Option 2a: Non-DRX case: 800 ms; DRX case: 5 DRX cycles. (Qualcomm P4)
  + Option 2b: Non-DRX case: 800 ms for NRS based measurement and 1600 ms for NSSS based measurement; DRX case: 5 DRX cycles. (Ericsson P7)
  + Option 3: 800 ms and for scenarios B, D, a single available time period for measurement shall be at least 400 ms, and the maximum interval between two available time periods for measurement on the cell shall be less than 5 seconds. (Huawei P3)
* Recommended WF
  + TBA

**Issue 1-4-2: Time for cell measurement in enhanced coverage**

* Proposals
  + Option 1: The minimum length of a measurement occasion can be 21ms. In some scenarios it can be 6ms for Frame structure type 1 and 7ms for Frame structure type 2. Several measurement occasions might be needed for scenarios B,D and E (ZTE P6 P7)
  + Option 2a: Non-DRX case: 1600 ms; DRX case: 5 DRX cycles. (Qualcomm P4)
  + Option 2b: Non-DRX case: 1600 ms for NRS based measurement and 1600 ms for NSSS based measurement; DRX case: 5 DRX cycles. (Ericsson P8)
  + Option 3: Focus on neighbour cell measurement before RLF in normal coverage and provide the observations to RAN2 in the LS reply. (Huawei O3 and P4)
* Recommended WF
  + TBA

**Companies views’ collection for 1st round for Sub-topic 1-4 (Q4)**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 1-4-1**  **Issue 1-4-2** |
| YYY |  |

### Sub-topic 1-5 Q5: For how long the NRSRP measurements can be considered as valid?

**Issue 1-5-1: Valid NRSRP measurement definition**

* Proposals
  + Option 1: Refer to the known cell definition (ZTE P8, Huawei P5, Qualcomm P5)
  + Option 2: A NRSRP measurement would be considered valid for a period of time equal to N times the measurement period, where N is TBD. (Qualcomm P5)
  + Option 3: Depends on many factors including UE mobility state (e.g. static or moving) and also on the intended use case. (Ericsson P9)
* Recommended WF
  + TBA

**Companies views’ collection for 1st round for Sub-topic 1-5 (Q5)**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | **Issue 1-5-1** |
| YYY |  |

### CRs/TPs comments collection

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

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| 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** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

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

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
|  |  |  |  |  |
|  |  |  |  |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents