3GPP TSG-RAN WG2 Meeting #112 electronic draftR2-2010707

**Online, November 2nd - 13th, 2020**

Agenda Item: 10.7

Source: Session Chair (Huawei)

Title: <draft> Report NB-IoT breakout session

Document for: Approval

## General

Please see the following TDoc for e-meeting guidance:

R2-2008700 Agenda for RAN2#112-e Chairman

Time Schedule
Please refer to the latest schedule in the RAN2 inbox on the public 3GPP servers.

## List and Status of Offline Email Discussions

NOTE: The official kick off date for these email discussions is Monday, November 02, 0700 UTC. The rapporteurs can share them on the reflector earlier, however companies are not required to participate before the official kick off date. The deadlines refer to the deadline for providing company comments unless stated otherwise.

* [AT112-e][300][NBIOT] Organisational (Session Chair)

 **Scope:** Comments to session notes. Kick-off and management of email discussions for NB-IoT session. Coordination issues. Other organisational issues and announcements.

 **Intended outcome:** Approval of Report from NB-IoT session.

 **Deadline:** Nov 13 1100 UTC

* [AT112-e][301][NBIOT R17] RLF enhancements (Qualcomm)

 Scope: Discuss whether and what to ask RAN4.

 Intended outcome: Report of email discussion in [R2-2010905](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010905.zip), potential LS.

 Deadline: Tuesday 10th 1200 UTC

* [AT112-e][302][NBIOT R17] Carrier selection (Ericsson)

 Scope: Discuss what coverage information to use and whether DRX information can be used.

 Intended outcome: Report in [R2-2010906](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010906.zip)

 Deadline: Tuesday 10th 1200 UTC

* [AT112-e][303][NBIOT/eMTC R16] Clarification on the last used cell for GWUS (Huawei)

 Status:

 Scope: Update the CR according to online discussion.

 Intended outcome: Agreed CR in [R2-2010907](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010907.zip)

 Deadline: Tuesday 10th 1200 UTC

* [AT112-e][304][NBIOT/eMTC R16] Clarification on the reference (N)RSRP for the first TA validation for PUR (Huawei)

 Scope: Improve the wording of the change.

 Intended outcome: Agreed CR in R2-2010909

 Deadline: Tuesday 10th 1200 UTC

* [AT112-e][305][NBIOT/eMTC R16] Paging narrowband selection for RRC\_INACTIVE (ZTE)

 Scope: Discussion on solutions and try to converge.

 Intended outcome: Report in [R2-2010910](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010910.zip)

 Deadline: Tuesday 10th 1200 UTC

## 4.1 NB-IoT corrections Rel-15 and earlier

Documents in this agenda item will be handled in a break out session. Common NB-IoT/eMTC parts treated jointly with 4.2.

## 7.3 Additional enhancements for NB-IoT

(NB\_IOTenh3-Core; leading WG: RAN1; REL-16; started: Jun 18; Completed: June 20; WID: RP-200293)

Documents in this agenda item will be handled in a break out session

Some sub-items in 7.2 and 7.3 may be treated jointly.

Limit: 5-6 email threads

### 7.3.1 General and Stage-2 Corrections

Including incoming LSs etc

[R2-2008758](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2008758.zip) Reply LS on system support for WUS (S2-2006478; contact: Qualcomm) SA2 LS in Rel-15 NB\_IOTenh3-Core, LTE\_eMTC5-Core To:RAN2, RAN3

* noted

### 7.3.2 UE-group wake-up signal (WUS) Corrections

UE group wake Up signal for MTC and NB-IoT is treated jointly under this Agenda Item.

[R2-2009024](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009024.zip) Discussion for correction on paging narrowband selection for eMTC UE ZTE Corporation, Sanechips discussion Rel-16 LTE\_eMTC5-Core

Observation 1: For eMTC UE in RRC\_INACTIVE, when eNB needs to send RAN initiated paging, eNB can clearly know that the eMTC UE is in RRC\_INACTIVE and selects paging narrowbands from the ones provided in system information. However, when eNB receives CN initiated paging for an eMTC UE, it cannot differentiate whether the UE is in RRC\_IDLE or RRC\_INACTIVE state. Therefore, there will exist ambiguity for eNB’s selection on paging narrowbands. Accordingly, eMTC UE in RRC\_INACTIVE may need to monitor two narrowbands for paging. Such process looks over eMTC UE capability and is obviously undesired. But if not, e.g., UE only monitor one narrowbands for paging, UE may miss the CN paging.

Observation 2: The above issue in observation 1 doesn’t exist for NB-IoT UE.

Proposal 1: eMTC UE always selects paging narrowband among the ones provided in system information.

* Huawei thinks RRC\_INACTIVE should use the same as in RRC\_IDLE mode, there is not much choice.
* QC thinks there is an issue, but agree with HW that RRC\_INACTIVE should use the same paging narrowband as RRC\_IDLE. At the same time we don’t need to use WUS in Inactive. So first we should determine whether GWUS will be used in RRC\_IDLE, then use the same narrowband in RRC\_INACTIVE so we could clarify that way.
* Ericsson agrees there is a problem when the paging occasions coincide but there may be other ways to solve this such as monitoring CN paging for those paging occasions.
* Huawei thinks the simplest way to resolve this would be to remove the possibility of GWUS on only certain paging narrowbands. Ericsson thinks this might have further consequences.
* ZTE thinks for RAN paging the eNB knows UE state so can use the NB signalled in SI but for CN paging there state may not be known.
* QC thinks RRC\_INACTIVE is only temporary so the problem would only be for a short time.
* Nokia thinks eDRX may also have an issue as the paging occasions may be different in RRC\_IDLE and RRC\_INACTIVE so should be monitoring at different times. HW thinks there are some PO which would be at the same time and UE has to monitor both CN and RAN paging.
* UE in RRC\_INACTIVE needs to monitor CN and RAN paging in the same paging narrowband
* [AT112-e][305][NBIOT/eMTC R16] Paging narrowband selection for RRC\_INACTIVE (ZTE)

 Scope: Discussion on solutions and try to converge.

 Intended outcome: Report in [R2-2010910](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010910.zip)

 Deadline: Tuesday 10th 1200 UTC

[R2-2010910](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010910.zip) Report of [305] Paging narrowband selection for RRC\_INACTIVE (ZTE)

* QC thinks eNB that released the UE has the UE capability so can determine the paging narrowband, so should not change behaviour in the current specification. Huawei has a different understanding and thinks the eNB does not have the UE capability, but agrees the key issue is whether or not this is the case. Ericsson has the same understanding as HW and thinks we had a similar discussion in the past. Nokia agrees with Qualcomm.
* ZTE wonders whether eNB without the UE capability should release the UE into RRC\_INACTIVE.
* QC thinks we should ask RAN3 before we can progress in RAN2.
* [Post112-e][xxx][NBIOT/eMTC R16] Paging narrowband selection for RRC\_INACTIVE (ZTE)

 Scope: Draft an LS to RAN3 asking whether eNB has the UE radio paging capability in all of the cases discussed.

 Intended outcome: Approved LS to RAN3

 Deadline: short

 [CB] whether to have the above LS

[R2-2010057](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010057.zip) Correction on paging narrowband selection for eMTC UE ZTE Corporation, Sanechips CR Rel-16 36.304 16.2.0 0816 - F LTE\_eMTC5-Core

[R2-2009728](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009728.zip) Clarification on the last used cell for GWUS Huawei, HiSilicon CR Rel-16 36.331 16.2.1 4479 - F NB\_IOTenh3-Core, LTE\_eMTC5-Core

* Ericsson agrees with the intent but interoperability statement could indicate the problem if UE does not implement.
* QC wonders if this could go in the rapporteur CR [R2-2009603](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009603.zip)
* Merged to the rapporteur CR

[R2-2009729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009729.zip) Clarification on the last used cell for GWUS Huawei, HiSilicon CR Rel-16 36.304 16.2.0 0814 - F NB\_IOTenh3-Core, LTE\_eMTC5-Core

* QC wonders if we also need to change section 7.4. Huawei thinks this is a bit of a corner case, Ericsson agrees. QC thinks it is better to make sure the case is covered.
* Add parenthesis (G) in 7.5.1 and add the change to 7.4.
* Revised in [R2-2010907](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010907.zip)
* [AT112-e][303][NBIOT/eMTC R16] Clarification on the last used cell for GWUS (Huawei)

 Status:

 Scope: Update the CR according to online discussion.

 Intended outcome: Agreed CR in [R2-2010907](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010907.zip)

 Deadline: Tuesday 10th 1200 UTC

[R2-2010907](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010907.zip) Clarification on the last used cell for GWUS Huawei, HiSilicon CR Rel-16 36.304 16.2.0 0814 1 F NB\_IOTenh3-Core, LTE\_eMTC5-Core

* agreed

[R2-2010236](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010236.zip) Clarification on WUS group set selection Ericsson CR Rel-16 36.304 16.2.0 0817 - F LTE\_eMTC5-Core, NB\_IOTenh3-Core

- QC thinks we could also add “and so on” to be totally clear.

* Update text to include “and so on, with”
* With the above change the CR is agreed in R2-2010908

### 7.3.3 Transmission in preconfigured resources corrections

Transmission in preconfigured resources for MTC and NB-IoT is treated jointly under this Agenda Item.

[R2-2009730](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009730.zip) Clarification on the reference (N)RSRP for the first TA validation for PUR Huawei, HiSilicon CR Rel-16 36.331 16.2.1 4480 - F NB\_IOTenh3-Core, LTE\_eMTC5-Core

- QC thinks the added description is clear from the procedure text. Huawei and Ericsson think the clarification is useful for the first TA validation. Ericsson thinks the wording could be improved.

* Postponed
* [AT112-e][304][NBIOT/eMTC R16] Clarification on the reference (N)RSRP for the first TA validation for PUR (Huawei)

 Scope: Improve the wording of the change.

 Intended outcome: Agreed CR in R2-2010909

 Deadline: Tuesday 10th 1200 UTC

* Rapporteur reports there are different understandings and suggests an email discussion.
* QC agrees with this summary and think we should ensure a common understanding.
* [Post112-e][xxx][NBIOT/eMTC R16] (N)RSRP reference for the TA validation for PUR (Huawei)

 Scope: To come to common understanding of the different cases

 Intended outcome: Report and possibly CR to the next meeting

 Deadline: long

### 7.3.4 Other NB-IoT Specific corrections

NB-IoT specific topics

[R2-2009733](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009733.zip) Correction to CP RRC Connection Reestablishment in 5GC Huawei, HiSilicon CR Rel-16 36.331 16.2.1 4481 - F NB\_IOTenh3-Core

- QC thinks the CR is needed because NW may not support re-establishment for this case.

* Agreed

## 9.1 NB-IoT and eMTC enhancements

(NB\_IOTenh4\_LTE\_eMTC6-Core; leading WG: RAN1; REL-17; WID: RP-201306)

Time budget: 1 TU

Tdoc Limitation: 2 tdocs

Email max expectation: 2 threads

Focus on two objectives only.

### 9.1.1 Organizational

### 9.1.2 NB-IoT neighbor cell measurements and corresponding measurement triggering before RLF

Including outcome of [Post111-e][923][NBIOT R17] RLF Enhancements (Qualcomm)

[R2-2009788](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009788.zip) Report for [Post111-e][923][NBIOT R17] RLF Enhancements (Qualcomm) Qualcomm Incorporated discussion Rel-15 NB\_IOTenh2-Core

Proposal 1: RAN2 to discuss whether the time taken from start of the random access procedure to successful reestablishment be considered when evaluating solutions.

* ZTE thinks that out of sync detection may be difficult to improve so we should try to reduce between points B and D. Ericsson have a similar view and WID states “before RLF”.
* On this proposal Nokia thinks RA time doesn’t need to be considered, but out-of-sync detection until RLF could be considered as part of other proposals. Huawei are OK not to consider the RA procedure enhancements.

Proposal 2: WID objective for RLF enhancements is to reduce the time between expiry of T310 and start of random access procedure.

* HW thinks this is included but not limited to only this. Ericsson thinks candidate cells should already be measured before T310 expiry therefore something needs to occur before that, but agree the main goal is to reduce this time. ZTE thinks we can prioirtise this, it is the most important part of this objective. MEdiatek also thinks this is part of the goal but we should not limit to this. Nokia thinks solutions which reduce this time should be prioritised as this is the main scope.

Proposal 3: RAN2 to discuss whether early RLF declaration is within the scope of WID objective for RLF enhancements.

* HW thinks this is useful, early RLF would occur based on the measurements.

Proposal 4: Solution performance is a measure of reduction of duration between T310 expiry (RLF declaration) and start of random access procedure.

* Nokia thinks performance should be based on the time between C and D. Ericsson and Thales thinks this is the priority but we can also consider reducing e.g. between B and C.

Proposal 5: RAN2 discuss whether solution performance measure also includes reduction in duration between T310 start and RLF declaration.

Proposal 6: UE uses known carrier frequencies for measurement during RRC connected state.

Proposal 7: RAN2 to discuss whether stored information on cell parameters can be used for measurement during RRC connected state.

Proposal 8: RAN2 to discuss whether stored information on cell parameters can be used for cell selection following RLF.

Proposal 9: RAN2 to ask RAN4 what is the definition of target cell (un)known in NB-IoT.

Proposal 10: Time to synchronize to the cell upon RLF depends on coverage level of the target cell.

Proposal 11: RAN2 to assume with present specification UE needs to perform NPSS/NSSS detection for cell selection following RLF.

|  |
| --- |
| **Agreements:*** Enhancements to the random access procedure are not considered.
* The solution includes reduction of the time between declaration of RLF and the start of the random access procedure (points C and D)
* FFS whether the solution includes reduction of the time between out-of-sync detection and declaration of RLF (points B and C)
 |

* [AT112-e][301][NBIOT R17] RLF enhancements (Qualcomm)

 Scope: Discuss whether and what to ask RAN4.

 Intended outcome: Report of email discussion in [R2-2010905](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010905.zip), potential LS.

 Deadline: Tuesday 10th 1200 UTC

[R2-2008937](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2008937.zip) Impact on Static devices THALES discussion

[R2-2009058](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009058.zip) Further consideration on measurement in connected mode ZTE Corporation, Sanechips discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2009146](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009146.zip) Discussion on the corresponding measurement before RLF Spreadtrum Communications discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2009268](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009268.zip) Enhancements for Re-establishment time reduction Nokia, Nokia Shanghai Bell discussion Rel-17

[R2-2009731](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009731.zip) Neighbour cell measurements in RRC\_CONNECTED Huawei, HiSilicon discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2009789](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009789.zip) Way forward for connected mode neighbour cell measurement in NB-IoT Qualcomm Incorporated discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2009876](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009876.zip) Neighbor cell measurements triggering before RLF Lenovo, Motorola Mobility discussion Rel-17

[R2-2010076](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010076.zip) Reducing time taken for reestablishment procedures in NB-IoT Ericsson discussion Rel-17

[R2-2010249](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010249.zip) Discussion on Total Interruption Time ETRI discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2010460](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010460.zip) Measurement before radio link failure MediaTek Inc. discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

### 9.1.3 NB-IoT carrier selection based on the coverage level, and associated carrier specific configuration

[R2-2010470](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010470.zip) Carrier selection enhancement MediaTek Inc. discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

Proposal 1: How the network know UE’s current CE level should be discussed.

Proposal 2: Network gets the UE’s current CE level by the latest random access procedure.

Proposal 3: How the UE selects the paging carrier should be discussed.

Proposal 4: Resource waste should be taken into consideration.

Proposal 5: Whether UE can autonomously send an indication to the network when CE level changed should be discussed.

Proposal 6: No autonomous indication from UE to network when CE level changes.

Proposal 7: Support paging carrier selection based on DRX cycle.

Proposal 8: Whether DRX cycle based carrier selection is a part of CE level based solution can be discussed after we have a WA for CE level based solution.

* Ericsson wonders whether this is about coverage level or PRACH levels. Nokia thinks it is about paging carrier selection and this is about number of repetitions not CE levels. Huawei agrees.
* [AT112-e][302][NBIOT R17] Carrier selection (Ericsson)

 Scope: Discuss what coverage information to use and whether DRX information can be used.

 Intended outcome: Report in [R2-2010906](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2010906.zip)

 Deadline: Tuesday 10th 1200 UTC

[R2-2009180](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009180.zip) NB-IoT carrier selection and configuration based on coverage level Ericsson discussion Rel-17

[R2-2009732](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009732.zip) Paging carrier selection based on CEL and on DRX Huawei, HiSilicon discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2009059](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009059.zip) Further consideration on multi carriers configuration and selection ZTE Corporation, Sanechips discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2009147](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009147.zip) Discussion on enhanced paging carrier selection and multi carrier configuration Spreadtrum Communications discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2009269](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009269.zip) Analysis on carrier selection options for NB-IoT Nokia, Nokia Shanghai Bell discussion Rel-17

[R2-2009790](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_112-e/Docs/R2-2009790.zip) Support for NB-IoT carrier selection based on the coverage level Qualcomm Incorporated discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

R2-2010077 NB-IoT carrier selection and configuration based on coverage level Ericsson discussion Rel-17 Withdrawn