3GPP TSG-RAN WG2 Meeting #113 bis electronic draftR2-2104307

Online, April 12 – April 20, 2021

Agenda Item: 10.7

Source: Session Chair (Huawei)

Title: draft Report NB-IoT breakout session

Document for: Approval

## General

Please see the following TDocs for e-meeting guidance:

[R2-2102600](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2102600.zip) Agenda for RAN2#113bis-e Chairman agenda Late

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

## List and Status of Offline Email Discussions

The deadlines refer to the deadline for providing company comments unless stated otherwise.

* [AT113bis-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:** EOM

* [AT113bis-e][301][NBIOT/eMTC R17] NB-IoT Carrier Selection (Qualcomm)

 **Scope:** Use [R2-2103015](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103015.zip) as a starting point.

* + - How options 1 and 2 work in the 2 cases – same cell, cell change.
		- Metrics needed from UE.

 Intended outcome: Report in [R2-2104450](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104450.zip)

 **Deadline:** Monday 19 April 1200 UTC

## 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: 4 tdocs

Email max expectation: 4 threads

### 9.1.1 Organizational

[R2-2104042](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104042.zip) Work plan of Rel-17 enhancements for NB-IoT and LTE-MTC Ericsson, Huawei Work Plan NB\_IOTenh4\_LTE\_eMTC6-Core

* ZTE wonders whether soft buffer sizes can be discussed now or wait until October.
* ZTE thinks running CR at the next meeting may be aggressive. Ericsson thinks it depends on how the discussion goes, the deadlines have been extended so it may be OK to start later.
* Qualcomm thinks even for previous meetings the work plan may not be accurate any more.
* Ericsson thinks the work plan was provided mainly to include RAN4 related aspects.
* noted

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

[R2-2103014](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103014.zip) Condition for NB-IoT connected mode neighbour cell measurement Qualcomm Incorporated discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2103191](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103191.zip) Signalling procedure for connected mode measurements support for reestablishment time reduction Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2103241](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103241.zip) Further discussion on the corresponding measurement before RLF Spreadtrum Communications discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2103320](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103320.zip) RAN2 aspects of measurement in connected mode ZTE Corporation, Sanechips discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core [R2-2100324](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100324.zip)

[R2-2103394](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103394.zip) Neighbor cell measurements triggering before RLF Lenovo, Motorola Mobility discussion Rel-17

[R2-2103486](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103486.zip) Neighbour cell measurements in RRC\_CONNECTED Huawei, HiSilicon discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2103925](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103925.zip) Discussion on Fast RLF Recovery procedures in NB-IoT Ericsson discussion

* [post113bis-e][3xy][NBIOT/eMTC R17] NB-IoT RLF measurements (Huawei)

 Scope: Taking into account the reply LS from RAN4, discuss only the following 4 questions:

1. What is/are the triggering condition(s) for measurements to start (RSRP, out of sync, other)?
2. What does the network need to configure (parameters/assistance info) to the UE and how (dedicated/broadcast)?
3. What information (if any) is needed to be sent by the UE to the NW?
4. What is the trigger to perform re-establishment (legacy, early RLF, other)?

 Intended outcome: Report to the next meeting

 Deadline: long

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

Including outcome of [Post113-e][351][NBIOT/eMTC R17] Paging carrier selection (Huawei).

[R2-2103487](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103487.zip) Summary of [Post113-e][351][NBIOT R17] Paging carrier selection Huawei report Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

* Sequans thinks it depends on company opinion about use-case, whether stationary or mobile UEs are the main use-case.
* ZTE Thinks option 1 is flexible to handle both cases.
* QC thinks p2 is a reasonable assumption to make. Maybe it is too early for p1 until we understand the usage. Ericsson agree, and think the solution should be simple.
* Huawei thinks the UE will be on one or the other carrier based on coverage, so from this point of view the power level is the simplest way for UE to measure.
* Nokia thinks both mobile and stationary case should be covered, and Rmax and repetitions should be considered
* Huawei thinks this is for stationary UE because it doesn’t make sense to use cell specific information for another cell, and we need to avoid paging in multiple carriers on multiple cells.

[R2-2103015](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103015.zip) Determining paging carrier suitability Qualcomm Incorporated discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

* Ericsson think we could use this paper as a starting point to compare the options.
* Ericsson thinks the most important things to understand are how the UE decides the coverage level changed, and how the NW sets the reference
* [AT113bis-e][301][NBIOT/eMTC R17] NB-IoT Carrier Selection (Qualcomm)

 Scope: Use [R2-2103015](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103015.zip) as a starting point.

* + - How options 1 and 2 work in the 2 cases – same cell, cell change.
		- Metrics needed from UE.

 Intended outcome: Report in [R2-2104450](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104450.zip)

 Deadline: Monday 19 April 1200 UTC

[R2-2104450](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2104450.zip) Report of [AT113bis-e][301][NBIOT/eMTC R17] NB-IoT Carrier Selection (Qualcomm)

Proposal 1 With Option 1 and Option 2, broadcast and dedicated signalling may be used.

Proposal 2 When coverage level deteriorates such that the coverage-based paging carrier is no longer suitable then UE switches to fallback paging carrier.

Proposal 3 Details of the fallback paging carrier are FFS.

Proposal 4 RAN2 to discuss UE behaviour when coverage level becomes suitable for using coverage-based paging carrier.

Proposal 5 RAN2 to discuss how UE decides to switch between paging carrier.

Proposal 6 RAN2 to decide between Option 1 and Option 2 after considering complete solution for each option.

Proposal 7 RAN2 to discuss cell change scenario as part of solution for each option.

Proposal 8 RAN2 to discuss what metrics should be used for coverage-based paging carrier selection.

* Chair think we may also consider a compromise solution e.g. a rule with possibility for NW to configure a specific carrier
* Ericsson think option 2 is the clearest and simplest. ZTE disagrees. QC also thinks option 2 is not clearest.
* Huawei thinks dedicated signalling is needed for both options.
* QC think we could have a compromise but it should not have multiple options which complicate matters.
* Nokia thinks option 1 vs. 2 is a secondary question, and think we should look at the common issues.
* Sequans think one of the main issues is double paging but also we should avoid complexity. We could start with the same cell scenario and see how this works.

[R2-2103176](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103176.zip) Carrier selection enhancement MediaTek Inc. discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2103927](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103927.zip) Comparing solution for NB-IoT paging carrier selection Ericsson discussion

[R2-2103192](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103192.zip) Further analysis on paging carrier selection options Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2103242](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103242.zip) Further discussion on enhanced paging carrier selection and NPRACH carrier selection Spreadtrum Communications discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2103321](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103321.zip) Details of CEL-based paging carrier selection ZTE Corporation, Sanechips discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core [R2-2100326](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113-e/Docs/R2-2100326.zip)

### 9.1.4 Other

Includes WI objectives led by other WGs.

Including Summary of AI 9.1.4 (TBD).

[R2-2103926](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103926.zip) Support of 16-QAM for unicast in UL and DL in NB-IoT Ericsson discussion

Proposal 1 Introduce for the support of 16-QAM separate UE capabilities for DL and UL into PhyLayerParameters-NB included in UE-Capability-NB.

* HW are OK but we may need RAN1 input for dependencies.
* Mediatek agree UL/DL have separate capability as UL is more demanding from hardware perspective.
* QC think it is too early to decide capabilities.
* ZTE agree that we should have separate capabilities but agree dependences needs consideration.

Proposal 2 Introduce for the support of 16-QAM separate UE dedicated RRC signaling for DL and UL into NPDSCH-ConfigDedicated-NB and NPUSCH-ConfigDedicated-NB included in physicalConfigDedicated-NB separately.

Proposal 3 RAN2 should wait for RAN1 agreements on downlink power allocation related to the signaling details.

Proposal 4 RAN2 should wait for RAN1 and/or RAN4 agreements on channel quality report.

[R2-2103488](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103488.zip) Discussion on 16-QAM for NB-IoT Huawei, HiSilicon discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

Proposal 1: For the UE supporting 16-QAM, the L2 buffer size is 12000 bytes.

* QC thinks this is mainly acedemic, it depends on implementation. HW thinks the memory impacts cost so impacts the chipset design so it is essential to decide but OK to decide at the end.
* Ericsson are OK with the proposal
* ZTE have a different calculation, we need to consider soft channel bits in UL and DL so the buffer size may need to be larger. HW indicate that the calculation used for 12000 bits is done in the same way as legacy, based on traffic model.

Proposal 2: 16-QAM is not applicable for EDT.

* QC thinks we need to wait for formal indication from RAN1, but already agreed it. Nokia agree we can wait for RAN1. HW agree RAN1 are discussing but could possibly take a decision from RAN2 perspective as this impacts RAN2. ZTE agree with HW. Ericsson wonders what the problem is for EDT.

[R2-2103365](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103365.zip) Consideration on supporting 16QAM for NB-IoT ZTE Corporation, Sanechips discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

Proposal 1: 16QAM activations for UE in RRC\_CONNECTED state are configured in NPDSCH-ConfigDedicated-NB and NPUSCH-ConfigDedicated-NB separately.

Proposal 2: Not support 16QAM for EDT and whether to support 16QAM for PUR should wait for the RAN1 conclusion.

Proposal 3: To add two capability bits (one bit indicates DL 16 QAM support and one bit indicates UL 16 QAM support) in UE-Capability-NB message.

Proposal 4: 16QAM related channel quality reporting in Msg3 is not supported.

Proposal 5: It’s feasible to support 16QAM related channel quality reporting in RRC\_CONNECTED state, e.g., by extending the quality report value and/or the "R" bits in current DCQR and AS RAI MAC CE. How many 16QAM channel quality values should be reported can wait RAN1 and RAN4 agreement.

* HW think we need to wait for RAN1. QC agree, we can decide whether we need to make changes depending on RAN1 progress. Mediatek think we should wait.

Proposal 6: The DL total number of soft channel bits for Cat. NB2 UEs is updated to 12800 for UEs supporting DL 16QAM, and the total layer 2 buffer size for Cat. NB2 UEs is updated to 16000 for UEs supporting DL 16QAM.

Proposal 7: Wait for RAN1 agreements on signaling details about 16QAM related NPDSCH EPRE allocation.

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| Agreements:* Working assumption: For the UE supporting 16-QAM, the L2 buffer size is 12000 bytes.
* Working assumption: Support of 16-QAM has separate UE capabilities for DL and UL
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[R2-2103364](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103364.zip) Consideration on supporting 14 HARQ for eMTC ZTE Corporation, Sanechips discussion NB\_IOTenh4\_LTE\_eMTC6-Core

Proposal 1: 14 HARQ activation is configured in PhysicalConfigDedicated IE.

Proposal 2: To add one capability bit to indicate the 14 HARQ processes capability in UE-Capability message.

Proposal 3: Whether to extend the HARQ RTT timer for supporting 14 HARQ processes should wait for RAN1 related agreements.

* QC thinks we need to wait for all the information from RAN1 and the signalling will be clear.
* HW thinks it would be good to make the agreements even if it is obvious, this helps with CR.
* QC thinks we need the RAN1 feature list, e.g. we may have separate capabilities for CE mode A/B. ZTE thinks it would be only for CE ModeA

[R2-2103489](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103489.zip) Support of 14 HARQ Processes in DL, for HD-FDD Cat M1 UEs Huawei, HiSilicon discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

Proposal 1: Introduce optional UE capability to support 14 HARQ processes for HD-FDD Cat M1 UEs, and new dedicated configuration for enabling the feature.

Proposal 2: Consider whether to update the L2 buffer size requirements based on the correct assumptions for Cat.M1 with HD-FDD and 14 HARQ processes, or to re-use the values currently specified for Cat.M1.

* QC thinks it is fine not to change.

Proposal 3: Study the MAC impact, particularly the impact to HARQ RTT and DRX timers due to introduction of 14 HARQ processes.

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| Agreement* 14 HARQ activation is configured by dedicated RRC signalling.
* Working assumption: No change to current L2 buffer size requirement
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[R2-2103490](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_113bis-e/Docs/R2-2103490.zip) Support of DL TBS of 1736 bits for HD-FDD Cat. M1 UEs Huawei, HiSilicon discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

Proposal 1: Introduce optional UE capability to support DL TBS of 1736 bits for HD-FDD Cat. M1 UEs in CE mode A, and new dedicated configuration for enabling the feature.

Proposal 2: Evaluate the L2 buffer size requirements in order to support 1736 bits TBS, considering other eMTC features applicable for HD-FDD Cat. M1 UEs in CE mode A.

* Ericsson think the L2 buffer size may be impacted in this case.

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| Agreement* DL TBS of 1736 bits is configured by dedicated RRC signalling.
* FFS: Whether to update L2 buffer size requirement
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