**3GPP TSG-RAN WG2 Meeting #116bis electronic R2-22xxxxx**

Online, January, 2021

Agenda Item: 10.7

Source: Session Chair (Interdigital)

Title: Report NB-IoT breakout session

Document for: Approval

## General

Please see the following TDocs for e-meeting guidance:

[R2-2200000](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200000.zip) Agenda for RAN2#116bis-e Chairman agenda

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.

* [AT116bis-e][300][NBIOT/eMTC] Organisational Brian’s Session (Session Chair)

**Status**: Started

 **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

* [AT116bis-e][301][NBIOT/eMTC R17] Carrier Selection (ZTE)

 **Status**: closed

 **Scope:** Progress the outcome of email discussion [Post116-e][311] to have a set of agreeable proposals and a set of open issues/FFS.

 **Intended outcome:** Report in R2-2201786 to treat in wk2 online session (and “easy” agreements by email before the online session, if possible)

 **Deadline:** Friday 21 January 1200 UTC

* [AT116bis-e][302][NBIOT/eMTC R17] RLF Measurements (Qualcomm)

Status: started

 **Scope:** address the FFS above and other open issues.

 **Intended outcome:** report in R2-2201793, agreements offline.

 **Deadline:** Monday 24th January 1200 UTC.

* [AT116bis-e][303][NBIOT/eMTC R17] UE Capabilities (Huawei)

 **Status**: closed

 **Scope:** Initial discussion to progress UE capabilities discussion.

 **Intended outcome:** Report in R2-2201787 (agreements by email if possible – will not be treated online in this meeting)

 **Deadline:** Friday 21 January 1200 UTC

## 9.1 NB-IoT and eMTC enhancements

(NB\_IOTenh4\_LTE\_eMTC6-Core; leading WG: RAN1; REL-17; WID: RP-211340)

Time budget: 1 TU

Tdoc Limitation: 3 tdocs

Email max expectation: 4 threads

### 9.1.1 Organizational

Including outcome of [Post116-e][306][NBIOT/eMTC R17] 36.300 running CR (Huawei)

Including outcome of [Post116-e][307][NBIOT/eMTC R17] 36.331 running CR (Qualcomm)

Including outcome of [Post116-e][308][NBIOT/eMTC R17] 36.304 running CR (Nokia)

Including outcome of [Post116-e][309][NBIOT/eMTC R17] 36.306 running CR (ZTE)

LSin

[R2-2200093](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200093.zip) LS on channel quality reporting for NB-IoT (R1-2112971; contact: Huawei) RAN1 LS in Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core To:RAN2, RAN4

* Offline[300]: Noted
* Offline[300]: Wait for RAN1 to conclude on whether and when the legacy table can also be used when 16QAM DL is configured

Running CRs

[R2-2200027](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200027.zip) [Running CR] Introduction of NB-IoT/eMTC Enhancements Qualcomm Incorporated draftCR Rel-17 36.331 16.7.0 B NB\_IOTenh4\_LTE\_eMTC6-Core [R2-2110692](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110692.zip)

* Offline[300]: Endorsed as baseline

[R2-2200029](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200029.zip) Running CR: Introduction of additional enhancements for NB-IoT and eMTC ZTE Corporation, Sanechips draftCR Rel-17 36.306 16.7.0 B NB\_IOTenh4\_LTE\_eMTC6-Core

* Offline[300]: Endorsed as baseline

[R2-2200048](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200048.zip) Running CR: Introduction of Rel-17 enhancements for NB-IoT and eMTC Huawei draftCR Rel-17 36.300 16.7.0 B NB\_IOTenh4\_LTE\_eMTC6-Core [R2-2110477](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116-e/Docs/R2-2110477.zip)

* Offline[300]: Endorsed as baseline

[R2-2200058](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200058.zip) [Running CR] Introduction of NB-IoT/eMTC Enhancements Nokia draftCR Rel-17 36.304 16.6.0 B NB\_IOTenh4\_LTE\_eMTC6-Core

* Offline[300]: Endorsed as baseline
* [Post116bis-e][304][NBIOT/eMTC R17] Update agreements document (Ericsson)

 **Scope**: Update the agreements document

 **Intended** **outcome**: endorsed report in R2-2201788

 **Deadline**: short

* [Post116bis-e][305][NBIOT/eMTC R17] 36.300 running CR (Huawei)

 **Scope**: Update the running CR

 **Intended** **outcome**: endorsed CR in R2-2201789

 **Deadline**: short

* [Post116bis-e][306][NBIOT/eMTC R17] 36.331 running CR (Qualcomm)

 **Scope**: Update the running CR

 **Intended outcome**: endorsed CR in R2-2201790

 **Deadline**: short

* [Post116bis-e][307][NBIOT/eMTC R17] 36.304 running CR (Nokia)

 **Scope**: Update the running CR

 **Intended outcome**: endorsed CR in R2-2201791

 **Deadline**: short

* [Post116bis-e][308][NBIOT/eMTC R17] 36.306 running CR (ZTE)

 **Scope**: Update the running CR

 **Intended outcome**: endorsed CR in R2-2201792

 **Deadline**: short

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

Including outcome of [Post116-e][310][NBIOT/eMTC R17] RLF measurements (Qualcomm)

Contributions invited on open issues not covered by email discussion

Online Tuesday 18 January:

[R2-2200028](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200028.zip) Report of [Post116-e][310][NBIOT/eMTC] RLF measurements Qualcomm Incorporated report Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

* Huawei think that for TsearchDeltaP a smaller value may be better. QC thought that equal spacing was more suitable. Zte, Nokia prefer the 2nd groups (equal spaced)
* Ericsson thinks we should avoid using “relaxed monitoring” because this is not quite the same.

Proposal 2 RAN2 discuss whether the RRC\_CONNECTED state reference level is derived by taking the RRC\_IDLE state reference level and adjusted by nrs-PowerOffsetNonAnchor for the connected mode carrier.

* HW thinks this is not a reference but it is the last measurement from RRC\_IDLE

Proposal 3 If upon entry to RRC\_CONNECTED state UE is not in relaxed neighbour cell monitoring state then timer TsearchDeltaP restarted with the RRC\_CONNECTED state timer value.

Proposal 4 If upon entry to RRC\_CONNECTED state UE is in relaxed neighbour cell monitoring state then timer TsearchDeltaP is not started.

 One company while agreeing with question but propose some stage 3 description which Rapportuer considers is inline with the starting of TsearchDeltaP timer upon entering RRC\_CONNECTED state.

Proposal 5 In RRC\_CONNECTED state UE exits relaxed neighbour cell monitoring state then timer TsearchDeltaP is started with the RRC\_CONNECTED timer value (i.e., when Srxlevref-C - Srxlev >= sSearchDeltaP).

* QC thinks the main issue is whether the relaxed monitoring state in RRC\_IDLE is used to define the starting state of monitoring when moving to RRC\_CONNECTED. Sequans agrees we should agree the principle first.
* Nokia thinks the idle mode state should not be used. Ericsson think we should just define the trigger and no need to carry idle mode state into RRC\_CONNECTED.
* QC agrees that it would be simpler not to take idle mode state into account, but it would mean that UE would always have to measure for RLF for TSearchDeltaP which is not useful if the radio conditions haven’t changed.
* Nokia thinks the purpose is not the same and it would be simpler as well as more beneficial not to take idle mode state into connected.
* ZTE thinks we should not add additional criteria, so agree with Nokia and Ericsson.
* Huawei, Thales, Mediatek, Sequans, Nordic agree with QC, this is not linking idle and connected it is just setting the initial condition based on known history. It would be a waste of UE power to have to start from scratch.
* Nokia thinks at least one set of measurements should be performed. Ericsson thinks it is anyway a corner case. Huawei don’t think this is a corner case.

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| **Agreements [Online]:*** Confirm that early RLF for NB-IoT is not supported in Release 17.
* Value for TSearchDeltaP is [15s, 30s, 45s, 60s]
* Neighbour cell monitoring in RRC\_CONNECTED has no impact on neigbour cell monitoring in RRC\_IDLE state and vice-versa
* If upon transition to RRC\_CONNECTED state, UE is not in relaxed neighbour cell monitoring state in RRC\_IDLE, then timer TsearchDeltaP restarted with the RRC\_CONNECTED state timer value.
* If upon transition to RRC\_CONNECTED state, UE is in relaxed neighbour cell monitoring state in RRC\_IDLE, then timer TsearchDeltaP is not started.
* In RRC\_CONNECTED state UE exits relaxed neighbour cell monitoring state then timer TsearchDeltaP is started with the RRC\_CONNECTED timer value (i.e., when NRSRP - Srxlev >= sSearchDeltaP (FFS update variable names offline).
* FFS: whether the RRC\_CONNECTED state reference level is derived by taking the RRC\_IDLE state reference level and adjusted by nrs-PowerOffsetNonAnchor for the connected mode carrier.
* FFS: whether UE reports to NW when the criteria is met.
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* [AT116bis-e][302][NBIOT/eMTC R17] RLF Measurements (Qualcomm)

 **Scope:** address the FFS above and other open issues.

 **Intended outcome:** report in R2-2201793, agreements offline.

 **Deadline:** Monday 24th January 1200 UTC.

[R2-2200675](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200675.zip) On remaining issues for connected mode measurements for RLF Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2200681](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200681.zip) Remaining FFSs on connected mode measurement ZTE Corporation, Sanechips discussion NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2201020](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201020.zip) Consideration on open issues for neighbour cell measurement in RRC connected state Qualcomm Incorporated discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2201077](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201077.zip) Discussion on connected mode measurement in NB-IoT Ericsson discussion Rel-17

* Offline[300]: Above 4 papers are noted

Late/withdrawn

R2-2201534 Support of Early rLF THALES discussion Late

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

Including outcome of [Post116-e][311][NBIOT/eMTC R17] NB-IoT carrier selection (ZTE)

Contributions invited on open issues not covered by email discussion

[R2-2200030](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200030.zip) Report of [Post116-e][311] NB-IoT carrier selection ZTE Corporation, Sanechips discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

* Offline[300]: noted
* [AT116bis-e][301][NBIOT/eMTC R17] Carrier Selection (ZTE)

 **Scope:** Progress the outcome of email discussion [Post116-e][311] to have a set of agreeable proposals and a set of open issues/FFS.

 **Intended outcome:** Report in R2-2201786 to treat in wk2 online session (and “easy” agreements by email before the online session, if possible)

 **Deadline:** Friday 21 January 1200 UTC

Online Monday 25 January:

[R2-2201786](file:///C%3A%5C%5CUsers%5Cbrian.martin%5COneDrive%20-%20InterDigital%20Communications%2C%20Inc%5CDocuments%5CRAN2%5CRAN2_116bis_e%5CDocs%5CR2-2201786.zip) [AT116bis-e][301][NBIOT/eMTC R17] Carrier Selection (ZTE)

(To discuss) Proposal 3: Coverage-specific default DRX cycle is supported.

* QC thinks we can have UE specific coverage specific DRX cycle, but don’t need default DRX cycle per coverage level, ZTE, HW agree.
* Sequans wonders how to enforce the UE specific DRX cycle. HW thinks in legacy the CN knows default DRX and UE specific DRX, but not sure about the coverage specific DRX. Ericsson thinks MME should know

(To discuss) Proposal 6: UE measured NRSRP can be reported to network for assisting the network to provide suitable coverage level related information. The way is to make legacy Msg5 report mandatory. No other UE report is introduced.

* QC wonders whether the legacy report is reliable enough for the NW to select the carrier, so additional report may be needed and Msg5 report may not always need to be sent. ZTE are not sure what the timing would be.

(To discuss) Proposal 7: For ASN.1, RAN2 discuss whether to introduce a new paging carrier list, e.g., DL-ConfigCommon-NB-r17, or just to extend PCCH-ConfigList-NB.

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| **Agreements [Online]*** UE can be enabled/disabled coverage-based paging carrier selection via dedicated signalling. Presence or absence of the coverage information can be implicit enable/disable indication.
* In SIB, the value range for Rmax (npdcch-NumRepetitionPaging) in R17 paging carrier (list) configuration can be ENUMERATED {r1, r2, r4, r8, r16, r32, r64, r128}.
* In SIB, coverage specific nB is supported, e.g., a common nB value is configured for the R17 paging carrier(s) with same Rmax (npdcch-NumRepetitionPaging).
* In SIB, coverage specific ue-SpecificDRX-CycleMin is supported, e.g., a common ue-SpecificDRX-CycleMin value is configured for the R17 paging carrier(s) with same Rmax (npdcch-NumRepetitionPaging).
* Paging weight can still be used in coverage-based paging carrier selection.
* In SIB, both non-mixed operation mode and mixed operation mode can be supported in R17 paging carrier list configuration. They can be configured separately (as legacy).
* The extension in SIB22-NB can be used for providing R17 paging carrier list configuration.
* No “offset” (headroom) would be introduced for the configured NRSRP threshold.
* A configurable cell specific timer period can be applied when UE compares its serving cell NRSRP with the NRSRP threshold. FFS how to signal and value range.
* It’s specified that UE does not switch paging carrier if it has stayed less than [xx] seconds on the carrier or within a PTW. FFS value of [xx] seconds
* Coverage based paging carrier selection is enabled implicitly, i.e., when relevant parameters are provided to the UE during release.
* The Rel-17 paging carriers can also be used as the DL carriers for random access.
* No need to introduce a subgroup of paging carriers for the more easily changed CE level.
* In SIB, at most 2 coverage levels can be configured in R17 paging carrier list, each coverage level has one NRSRP threshold
* Rmax may be configured per carrier or per carrier group (coverage level).
* A paging carrier group index, e.g., the index to one of the two lists which correspond to the 2 coverage levels in SIB, is provided to the UE in dedicated signaling (when UE is released to idle).
* Coverage-specific default DRX cycle is not supported.
	+ FFS check whether there are any issues with the UE specific minimum DRX cycle per coverage level
* UE measured NRSRP can be reported to network for assisting the network to provide suitable coverage level related information. FFS how.
* FFS whether to introduce a new paging carrier list, e.g., *DL-ConfigCommon-NB-r17*, or just to extend *PCCH-ConfigList-NB*.
* FFS whether to send LS to RAN3 (at the start of the next meeting)
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[R2-2200633](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200633.zip) The remaining issues on enhanced paging carrier selection Spreadtrum Communications discussion Rel-17

[R2-2200676](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200676.zip) Further details on coverage level based paging carrier selection Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2200682](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200682.zip) Remaining FFSs on CEL-based paging carrier selection ZTE Corporation, Sanechips discussion NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2200922](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200922.zip) Discussion on details of paging carrier selection MediaTek Inc. discussion NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2201021](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201021.zip) Paging carrier selection with hysteresis Qualcomm Incorporated discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2201022](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201022.zip) Signalling for coverage-based paging carrier selection Qualcomm Incorporated discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2201076](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201076.zip) Remaining issues of carrier selection Ericsson discussion Rel-17

* Offline[300]: Above 7 papers are noted

Legacy issue

[R2-2200866](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200866.zip) Discussion on the issue for Random Access on multicarrier for NB-IoT CMCC discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2200867](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200867.zip) Solution for random access issue on multiCarrier in NB-IoT CMCC draftCR Rel-17 36.331 16.7.0 B NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2200868](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200868.zip) Solution for random access issue on multiCarrier in NB-IoT CMCC draftCR Rel-17 36.321 16.6.0 B NB\_IOTenh4\_LTE\_eMTC6-Core

* Offline[300]: Above 3 papers not treated

### 9.1.4 Other

Includes WI objectives led by other WGs.

[R2-2200677](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200677.zip) On thje open issues for 16QAM for NB-IoT Nokia, Nokia Shanghai Bells discussion Rel-17

[R2-2200683](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200683.zip) Remaining FFSs on 16QAM for NB-IoT and 1736bits TBS for eMTC ZTE Corporation, Sanechips discussion NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2201078](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201078.zip) Support of 16-QAM for unicast in UL and DL in NB-IoT Ericsson discussion Rel-17

[R2-2201449](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201449.zip) CQI reporting for 16QAM DL Huawei, HiSilicon discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

[R2-2201448](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201448.zip) Introduction of Rel-17 enhancements for NB-IoT and eMTC Huawei, HiSilicon draftCR Rel-17 36.302 16.1.0 B NB\_IOTenh4\_LTE\_eMTC6-Core

* Offline[300]: Above 5 papers are noted

[R2-2201450](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201450.zip) UE capabilities and FDD/TDD, EPC/5GC differentiation Huawei, HiSilicon discussion Rel-17 NB\_IOTenh4\_LTE\_eMTC6-Core

* Offline[300]: Noted
* [AT116bis-e][303][NBIOT/eMTC R17] UE Capabilities (Huawei)

 **Scope:** Initial discussion to progress UE capabilities discussion.

 **Intended outcome:** Report in R2-2201787 (agreements by email if possible – will not be treated online in this meeting)

 **Deadline:** Friday 21 January 1200 UTC

Agreements by email [303]:

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| **Agreements Offline[303]*** For 16-QAM for unicast NPDSCH and 16-QAM for unicast NPUSCH, wait for RAN1 to conclude on the scope of the capability before discussion FDD/TDD differentiation.
* Support for 16-QAM for unicast NPDSCH & 16-QAM for unicast NPUSCH are indicated without EPC/5GC differentiation.
* Introduce a new UE capability ce-14HARQProcesses-r17, conditional to support of ce-ModeA-r13. Signalling of the capability implies support of HARQ-ACK delay solution with Alt-1.
* Introduce a new UE capability ce-14HARQProcesses-Alt2-r17, conditional to support of ce-14HARQProcesses-r17, for additional support of HARQ-ACK delay solution with Alt-2e.
* Support for 14 HARQ processes for PDSCH is indicated without EPC/5GC differentiation.
* Support for connected mode measurements for RLF is indicated with FDD/TDD differentiation.
* Support for connected mode measurements for RLF is indicated without EPC/5GC differentiation.
* Support for coverage based paging carrier selection is indicated without FDD/TDD differentiation.
* Support for coverage based paging carrier selection is indicated without EPC/5GC differentiation.
* Wait for RAN4 to decide which capability is needed for power reduction for PRACH, PUCCH, and full-PRB PUSCH.
* Support for maximum DL TBS of 1736 bits is indicated without EPC/5GC differentiation
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