**3GPP TSG RAN meeting #94e RP-21xxxx**

**Electronic Meeting, Dec. 6-17, 2021**

## Status Report to TSG

**Agenda item:** 10.4.1

|  |  |
| --- | --- |
| **WI / SI Name** | Additional enhancements for NB-IoT and LTE-MTC |
| included in this status report | Study Item: No | Core part: Yes | Performance part:Yes | Testing part:No |
| **Acronym** | NB\_IOTenh4\_LTE\_eMTC6 |
| **Unique ID** | 860044 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | RP-211340 |
| **Target Completion Date****(indicate if changed)** | Study Item:  | Core part: 03/2022 | Performance part: 09/2022 | Testing part:  |
| **Overall Completion level** | Study Item:  | Core part: 85% | Performance Part: 0% | Testing part:  |

Note: Overall completion level percentage numbers should use one of the colors below:

* xx%: Normal progress, no RAN plenary action needed
* xx%: Progress behind schedule, may need RAN plenary intervention. If so, SR should clearly define requested action
* xx%: Progress critically behind, RAN plenary shall intervene. SR should define requested action

**Source:**

|  |  |
| --- | --- |
| **Leading WG** | RAN WG 1 |
| **Rapporteur** | **Name** | Yubo YANGEmre YAVUZ |
| **Company** | HuaweiEricsson |
| **Email** | yangyubo1@huawei.comemre.yavuz@ericsson.com |

## 1 Work plan related evaluation

|  |  |
| --- | --- |
| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

*If you answered No: Then please remove the Excel file from the zip file of this status report.*

*If you answered Yes: Then please fill out the attached Excel template to request a modification of the time budgets for your WI /SI. The Excel table has to be filled out for all affected RAN WGs and up to the target date of the WI/SI. The basis are the endorsed time budgets of the last RAN meeting. Please highlight all changes of the values.
 One time unit (TU) corresponds to ~ 2 hours in the meeting.
 If this status report covers a WI with Core and Performance part, then please have one line for each in the attached Excel table.
 Note: If no Excel table is attached, then this means no time budget change.*

**Additional explanations/motivations for the time budget changes in the attached Excel table:**

## 2. Detailed progress in RAN WGs since last TSG meeting (for all involved WGs)

 NOTE: Agreements and Open issues impacted cross-TSG aspects shall be explicitly highlighted

## 2.1 RAN1

#### 2.1.1 Agreements

In RAN1#106bis-e meeting, 20 contributions [1-20] were submitted, and the following agreements were achieved:

For NB-IoT 16-QAM:

Working Assumption

For the new term $∆\_{TF,c}$ introduced for power control of NPUSCH,

* Reuse the LTE definition simplified for NB-IoT: $∆\_{TF,c}\left(i\right)=10log\_{10}\left(\left(2^{BPRE∙K\_{s}}-1\right)\right)$ for $K\_{s}=1.25$ and $∆\_{TF,c}\left(i\right)=0$ for $K\_{s}=0$, where $K\_{s}$ is given by higher layer parameter *deltaMCS-Enabled*, and $BPRE=\frac{K}{N\_{RE}}$ where K is the code block size.
* FFS: whether the new term applies to QPSK when configured with 16QAM, if it does not, whether an additional term is introduced to avoid jump between QPSK and 16QAM

Agreement

Support 16-QAM for NPDSCH in PUR procedure

* CSI report is not supported/expected during PUR procedure.

Agreement

Support 16-QAM for NPDSCH and NPUSCH in PUR procedure,

* 16-QAM can be enabled/disabled by UE specific RRC signaling for NPDSCH and NPUSCH separately
	+ The corresponding configurations and signaling details are up to RAN2

Agreement

The reserved state to indicate the use of 16QAM in DCI format N0 and DCI format N1 should be “1111”.

Agreement

Confirm the following working assumption:

Working Assumption

For downlink power allocation to support 16QAM:

* For inband deployments, a power ratio is signaled in addition to the signaling for standalone and guard-band deployments which in this case applies to “symbols with NRS” and “symbols without NRS nor CRS”.
	+ the power ratio between NPDSCH EPRE and NRS EPRE in symbols with CRS is signaled
	+ the signaling is UE specific

Note: “symbols with NRS” and “symbols without NRS nor CRS” have the same power.

Agreement

For the UE configured with 16-QAM for NPDSCH, the deployment of the carrier is signaled by *operationModeInfo* in MIB or *inbandCarrierInfo* in SIB/UE specific signaling.

Note: Existing agreement from RAN1#106e is "For the UE configured with 16-QAM for NPDSCH, the deployment of the carrier is signaled by *operationModeInfo* in MIB or *inbandCarrierInfo* in SIB", which is replaced by the updated agreement above from RAN1#106bis-e.

For eMTC 14-HARQ processes:

Working Assumption

For the joint encoding of “PDSCH Scheduling delay” and “HARQ-ACK delay” when Alt-2e is configured, the HARQ-ACK delay set has a size of:

* Alt-C:
	+ 12 elements: HARQ-ACK delay set = {a, b, c, d, e, f, g, h, i, j, k, l} for the PDSCH Scheduling delay expression associated to the delay of 2.
	+ 10 elements: HARQ-ACK delay set = {o, p, q, r, s, t, u, v, x, w} for the two PDSCH Scheduling delay expressions associated to the delay of 7.
	+ FFS: The values of {a, b, c, d, e, f, g, h, i, j, k, l}, {o, p, q, r, s, t, u, v, x, w} where some of these elements may share the same value.

Conclusion:

How to implement/describe the states, e.g., table, resulting from the joint encoding solution of Alt-2e is left up to the Editor, based on the agreements for the PDSCH scheduling delay, HARQ-ACK delay and the WA confirmed for Alt-2e.

Agreement

The Rel-17 14 HARQ processes feature only applies to User Specific Search Space (USS).

Agreement (completed and confirmed on Oct 22nd)

In Rel-17, for the 14 HARQ processes feature the “HARQ-ACK process number” field uses 4-bits.

* The mapping associated to the 4-bits of this field is updated to include the newly added HARQ processes (i.e., 11th, 12th, 13th, and 14th HARQ processes).

Agreement

In Rel-17, for the 14 HARQ processes feature the following updates on the technical specification are to be performed.

* The maximum number of received PDSCH receptions pending HARQ-ACK is set to W = 12 (in Sect. 7.3.1 of TS 36.213) when the UE is configured with 14 HARQ processes.

Agreement

In Rel-17, one option will be down selected from Opt-2 and Opt-3 for the 14 HARQ processes feature the “Repetition number” field in RAN1#107e:

* Opt-2: 0-bits when the 14 HARQ processes feature is configured (i.e., 2-bits from this field become available for jointly-encoding purposes).
* Opt-3: 2-bits as in legacy.

In RAN1#107-e meeting, 19 contributions [21-39] were submitted, and the following agreements were achieved:

For NB-IoT 16-QAM:

Agreement

* The value range for the following RRC parameters is {-6, -4.77, -3, -1.77, 0, 1, 2, 3} dB
* Power ratio of NPDSCH EPRE to NRS EPRE in symbols without NRS for standalone and guard-band deployments, or in symbols without NRS nor CRS for in-band deployments.
* Power ratio of NPDSCH EPRE to NRS EPRE in symbols with CRS for in-band deployments.

Agreement

* Variant of option 1 is agreed in principle, detailed content in following table will be revisited.
	+ A new table is defined for the combination of NPDCCH repetitions and NPDSCH MCS
* FFS: larger number NPDCCH repetition level

|  |  |  |  |
| --- | --- | --- | --- |
| **Reported value** | **NPDCCH repetition level** | **NPDSCH transport block** **error probability not exceeding 0.1** | **SNR** |
| **Modulation** | **Code rate x 1024** | **Efficiency** |
| noMeasurement | No measurement reporting | Out of range |  |
| candidateRep-A | 1 | QPSK (TBS index 4) | 221 | 0.4316 | -0.6 dB ([2]) |
| candidateRep-B | 2 | QPSK (TBS index 2) | 280 | 0.2737 | -3.6 |
| candidateRep-C | 4 | BPSK (TBS index 0) | 162 | 0.1579 | -6.6 |
| candidateRep-D | 8 | BPSK (TBS index 0, repetition 2) | 162 | 0.0789 | -9.6 |
| candidateRep-E | 16 | BPSK (TBS index 0, repetition 4) | 162 | 0.0395 | -12.6 |
| candidateRep-F | 32 | BPSK (TBS index 0, repetition 8) | 162 | 0.0198 | -15.6 |
| candidateRep-G | 1 | QPSK (TBS index 6) | 336.8 | 0.6579 | 1.0 dB ([3]) |
| candidateRep-H | 1 | QPSK (TBS index 8) | 453.6 | 0.8860 | 2.6 dB ([3]) |
| candidateRep-I | 1 | QPSK (TBS index 10) | 579.4 | 1.1316 | 4.1 dB ([3]) |
| candidateRep-J | 1 | QPSK (TBS index 12) | 759 | 1.4825 | 6.3 dB ([3]) |
| candidateRep-K | 1 | 16QAM (TBS index 14) | 487.3 | 1.9035 | 8.9 dB ([3]) |
| candidateRep-L | 1 | 16QAM (TBS index 16) | 541.2 | 2.1140 | 9.7 dB ([3]) |
| candidateRep-M | 1 | 16QAM (TBS index 18) | 658 | 2.5702 | 11.7 dB ([3]) |
| candidateRep-N | 1 | 16QAM (TBS index 20) | 783.7 | 3.0614 | 13.0 dB ([3]) |
| candidateRep-O | 1 | 16QAM (TBS index 21) | 837.6 | 3.2719 | 14.1 dB ([3]) |

Note: The (TBS index X) and SNR are just for information, based on standalone deployment. They will be removed once it’s agreed.

Agreement

* The table is taken as working assumption.

|  |  |  |  |
| --- | --- | --- | --- |
| **Reported value** | **NPDCCH repetition level** | **NPDSCH transport block** **error probability not exceeding 0.1** | **SNR** |
| **Modulation** | **Code rate x 1024** | **Repetition** | **Efficiency** |
| noMeasurement | No measurement reporting | Out of range |  |
| candidateRep-A | 1 | QPSK (TBS index 4) | 221 | 1 | 0.4316 | -0.6 dB ([2]) |
| candidateRep-B | 2 | QPSK (TBS index 2) | 280 | 1 | 0.2737 | -3.6 |
| candidateRep-C | 4 | QPSK (TBS index 0) | 81 | 1 | 0.1579 | -6.6 |
| candidateRep-D | 8 | QPSK (TBS index 0) | 81 | 2 | 0.0789 | -9.6 |
| candidateRep-E | 16 | QPSK (TBS index 0) | 81 | 4 | 0.0395 | -12.6 |
| Working assumptioncandidateRep-F | 32 | QPSK (TBS index 0) | 81 | 8 | 0.0198 | -15.6 |
| candidateRep-G | 1 | QPSK (TBS index 6) | 336.8 | 1 | 0.6579 | 1.0 dB ([3]) |
| candidateRep-H | 1 | QPSK (TBS index 8) | 453.6 | 1 | 0.8860 | 2.6 dB ([3]) |
| candidateRep-I | 1 | QPSK (TBS index 10) | 579.4 | 1 | 1.1316 | 4.1 dB ([3]) |
| candidateRep-J | 1 | QPSK (TBS index 12) | 759 | 1 | 1.4825 | 6.3 dB ([3]) |
| candidateRep-K | 1 | 16QAM (TBS index 14) | 487.3 | 1 | 1.9035 | 8.9 dB ([3]) |
| candidateRep-L | 1 | 16QAM (TBS index 16) | 541.2 | 1 | 2.1140 | 9.7 dB ([3]) |
| candidateRep-M | 1 | 16QAM (TBS index 18) | 658 | 1 | 2.5702 | 11.7 dB ([3]) |
| candidateRep-N | 1 | 16QAM (TBS index 20) | 783.7 | 1 | 3.0614 | 13.0 dB ([3]) |
| candidateRep-O | 1 | 16QAM (TBS index 21) | 837.6 | 1 | 3.2719 | 14.1 dB ([3]) |

Note: The (TBS index X) and SNR are just for information, based on standalone deployment. They will be removed once it’s agreed.

**Agreement:**

**The following working assumption is confirmed with following modification**

* The table is endorsed.

|  |  |  |  |
| --- | --- | --- | --- |
| **Reported value** | **NPDCCH repetition level** | **NPDSCH transport block** **error probability not exceeding 0.1** | ~~SNR~~ |
| **Modulation** | **Code rate x 1024** | **Repetition** | **Efficiency** |
| noMeasurement | No measurement reporting | Out of range |  |
| candidateRep-A | 1 | QPSK ~~(TBS index 4)~~ | 221 | 1 | 0.4316 | ~~-0.6 dB ([2])~~ |
| candidateRep-B | 2 | QPSK ~~(TBS index 2)~~ | 280 | 1 | 0.2737 | ~~-3.6~~ |
| candidateRep-C | 4 | QPSK ~~(TBS index 0)~~ | 81 | 1 | 0.1579 | ~~-6.6~~ |
| candidateRep-D | 8 | QPSK ~~(TBS index 0)~~ | 81 | 2 | 0.0789 | ~~-9.6~~ |
| candidateRep-E | 16 | QPSK ~~(TBS index 0)~~ | 81 | 4 | 0.0395 | ~~-12.6~~ |
| ~~Working assumption~~candidateRep-F | 32 | QPSK ~~(TBS index 0)~~ | 81 | 8 | 0.0198 | ~~-15.6~~ |
| candidateRep-G | 1 | QPSK ~~(TBS index 6)~~ | 336.8 | 1 | 0.6579 | ~~1.0 dB ([3])~~ |
| candidateRep-H | 1 | QPSK ~~(TBS index 8)~~ | 453.6 | 1 | 0.8860 | ~~2.6 dB ([3])~~ |
| candidateRep-I | 1 | QPSK ~~(TBS index 10)~~ | 579.4 | 1 | 1.1316 | ~~4.1 dB ([3])~~ |
| candidateRep-J | 1 | QPSK ~~(TBS index 12)~~ | 759 | 1 | 1.4825 | ~~6.3 dB ([3])~~ |
| candidateRep-K | 1 | 16QAM ~~(TBS index 14)~~ | 487.3 | 1 | 1.9035 | ~~8.9 dB ([3])~~ |
| candidateRep-L | 1 | 16QAM ~~(TBS index 16)~~ | 541.2 | 1 | 2.1140 | ~~9.7 dB ([3])~~ |
| candidateRep-M | 1 | 16QAM ~~(TBS index 18)~~ | 658 | 1 | 2.5702 | ~~11.7 dB ([3])~~ |
| candidateRep-N | 1 | 16QAM ~~(TBS index 20)~~ | 783.7 | 1 | 3.0614 | ~~13.0 dB ([3])~~ |
| candidateRep-O | 1 | 16QAM ~~(TBS index 21)~~ | 837.6 | 1 | 3.2719 | ~~14.1 dB ([3])~~ |

**Conclusion**

There’s no consensus on the introduction of CSI reference resource in NB-IoT in Rel-17, whether/how to introduce CSI reference resource is up to RAN4.

R1-21xxxxx LS on channel quality reporting for NB-IoT From: RAN1, To: RAN2, RAN4

**Agreement**

**The following working assumption is confirmed.**

For the new term $∆\_{TF,c}$ introduced for power control of NPUSCH,

* Reuse the LTE definition simplified for NB-IoT: $∆\_{TF,c}\left(i\right)=10log\_{10}\left(\left(2^{BPRE∙K\_{s}}-1\right)\right)$ for $K\_{s}=1.25$ and $∆\_{TF,c}\left(i\right)=0$ for $K\_{s}=0$, where $K\_{s}$ is given by higher layer parameter *deltaMCS-Enabled*, and $BPRE=\frac{K}{N\_{RE}}$ where K is the code block size.
* FFS: whether the new term applies to QPSK when configured with 16QAM, if it does not, whether an additional term is introduced to avoid jump between QPSK and 16QAM

For eMTC 14 HARQ processes

**Agreement**

**Confirm the following Working Assumption:**

**Working Assumption**

**For the joint encoding of “PDSCH Scheduling delay” and “HARQ-ACK delay” when Alt-2e is configured, the HARQ-ACK delay set has a size of:**

* **Alt-C:**
	+ - **12 elements: HARQ-ACK delay set = {a, b, c, d, e, f, g, h, i, j, k, l} for the PDSCH Scheduling delay expression associated to the delay of 2.**
		- **10 elements: HARQ-ACK delay set = {o, p, q, r, s, t, u, v, x, w} for the two PDSCH Scheduling delay expressions associated to the delay of 7.**

**FFS: The values of {a, b, c, d, e, f, g, h, i, j, k, l}, {o, p, q, r, s, t, u, v, x, w} where some of these elements may share the same value.**

**Agreement**

**For the joint encoding of “PDSCH Scheduling delay” and “HARQ-ACK delay” when Alt-2e is configured, the HARQ-ACK delay sets consist of the following elements:**

* **Alt-C2:**
	+ - **12 elements: HARQ-ACK delay set = {4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15, 17} for the PDSCH Scheduling delay expression associated to the delay of 2.**
		- **10 elements: HARQ-ACK delay set = {4, 5, 10, 12, 13, 14, 15, 16, 17, 18} for the two PDSCH Scheduling delay expressions associated to the delay of 7.**

**Agreement**

**In Rel-17, for the 14 HARQ processes feature the “Repetition number” field is:**

         **Opt-3: 2-bits as in legacy**

**Note: Further optimization for using Repetition number” field is not pursued**

**Agreement**

**In Rel-17, for the 14 HARQ processes feature the “HARQ-ACK delay” field is:**

         **0-bits when the 14 HARQ processes feature is configured (i.e., 3-bits from this field become available for jointly-encoding purposes).**

Rel-17 NB-IoT and eMTC related MAC CE impact is captured in the following LS:

**Agreement**

LS to RAN2 on Rel-17 MAC-CE is endorsed in R1-2112842.

#### 2.1.2 Remaining Open issues

None. The RAN1 core part is complete.

## 2.2 RAN2

#### 2.2.1 Agreements

Contributions [40]– [65] were submitted to RAN2#116-e meeting.

**NB-IoT neighbour cell measurements and corresponding measurement triggering before RLF**

RAN2 discussed NB-IoT neighbour cell measurements and corresponding measurement triggering before RLF and made the following agreements:

|  |
| --- |
| RAN2#116-e agreements:* NW signals two separate thresholds for intra- and inter-frequency measurements.
* The values of s-SearchDeltaP and TSearchDeltaP may be different in RRC\_CONNECTED and RRC\_IDLE, they are signalled in a separate set of parameters.
* s-SearchDeltaP has the same value range as the existing RRC\_IDLE parameter
	+ FFS how to specify the state change
	+ [FFS] An indication that the UE starts measurement is not introduced.
* No enhancement is introduced to have a shorter T310 timer for mobile UEs supporting connected mode measurement.
* For RRC\_CONNECTED state, TSearchDeltaP is configured via SIB.
* Working assumption: For RRC\_CONNECTED state, TSearchDeltaP range is 10 – 60 seconds.
* For RRC\_CONNECTED state, no default value for TSearchDeltaP.
* No limit for how long UE can remain in relaxed neighbour cell monitoring state while it is in RRC\_CONNECTED state.
* For RRC\_CONNECTED state, the RRC\_IDLE state SSearchDeltaP is not used if the RRC\_CONNECTED state SSearchDeltaP is not provided.
* Relaxed neighbour cell monitoring is enabled in RRC\_CONNECTED state if TSearchDeltaP and SSearchDeltaP for RRC\_CONNECTED state are provided.
 |

RAN2 has agreed on an email discussion until next meeting:

* [Post116-e][310][NBIOT/eMTC R17] RLF measurements (Qualcomm)

 Scope: Remaining details of relaxed monitoring

 Intended outcome: report to the next meeting

 Deadline: long

**NB-IoT carrier selection based on the coverage level and associated carrier specific configuration**

RAN2 discussed NB-IoT carrier selection based on the coverage level and associated carrier specific configuration and made the following agreements.

|  |
| --- |
| RAN2#116-e agreements:* DRX is not used a criterion that needs to be explicitly considered for paging carrier selection.
* Option 1c with Alt2 (fallback when cell change) is supported
 |

RAN2 has agreed on an email discussion until next meeting:

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

 Scope: open issues and solution details

 Intended outcome: report to the next meeting

 Deadline: long

**NB-IoT: 16-QAM for unicast in UL and DL**

RAN2 discussed 16-QAM for unicast in UL and DL and made the following agreements.

|  |
| --- |
| RAN2#116-e agreements:* Confirm the working assumption of 12000 bytes for DL 16QAM for NB-IoT
 |

**eMTC: 14-HARQ processes in DL, for HD-FDD Cat M1 UEs**

RAN2 did not discuss 14-HARQ processes in DL, for HD-FDD Cat M1 UEs.

**eMTC: maximum DL TBS of 1736 bits**

RAN2 discussed maximum DL TBS of 1736 bits and made the following agreements.

|  |
| --- |
| RAN2#116-e agreements:* No change to existing L2 buffer requirements for supporting 1736bits TBS for eMTC
 |

#### 2.2.2 Remaining Open issues

* For NB-IoT, support of NB-IoT neighbour cell measurements and corresponding measurement triggering before RLF, details of relaxed monitoring criteria and whether to have a UE indication that it starts/stops measurements.
* For NB-IoT, support of NB-IoT carrier selection based on the coverage level and associated carrier specific configuration, details of the solution and associated signaling.
* For NB-IoT, 16-QAM for unicast in DL and UL, CQI reporting pending on RAN1/ RAN4 inputs.
* For all topics, UE capabilities and FDD/TDD differentiation pending on RAN1/ RAN4 inputs.

## 2.3 RAN3

In RAN3#114-e meeting, 10 contributions were submitted in [40] ~ [49], and the following progress was achieved:

#### 2.3.1 Agreements

Contributions [66-75] were submitted to RAN3#114-e meeting.

**Support for Carrier Selection and Carrier Specific Configuration**

* Agree to wait RAN2 decision between RAN2 option 1 or option 2 to decide the RAN3 solution.

#### 2.3.2 Remaining Open issues

* Support of Carrier Selection and Carrier Specific Configuration.

## 2.4 RAN4

#### 2.4.1 Agreements

**For RF core part:**

In RAN4#101-e meeting, 9 contributions [82-90] were submitted, and the following agreements were achieved:

* CR IBE mask and MPR for NB-IoT 16QAM (R4-2119952) is agreed, and the RF requirements for UE in support of 16QAM are completed.
* WF on remaining issues for NB-IoT 16QAM (BS side) is agreed in R4-2119948.

**For RRM core part:**

In RAN4#101-e meeting, 6 contributions [76-81] were submitted, and the following agreements were achieved:

Deprioritize defining CONNECTED mode neighbour cell measurement requirements when the target cell is in enhanced coverage

#### 2.4.2 Remaining Open issues

**For RF core part:**

**NB-IoT:**

 FFS rated output power for 16QAM, down-select from two options: one declaration or up to 2 declarations.

**LTE-MTC:**

For UEs supporting PUSCH sub-PRB resource allocation, study and if found feasible for the concluded options, specify support power reduction for PRACH, PUCCH, and full-PRB PUSCH, with a maximum reduction of e.g. 3 dB below sub-PRB PUSCH power.

**For RRM core part:**

Discuss the relation between carriers for connected mode neighbour cell measurement and carriers detected in IDLE mode. [NB-IoT]

Discuss the minimum interval between two measurements/samples for inter-frequency measurement [NB-IoT]

Discuss the minimum length of single measurement occasions for inter-frequency measurement [NB-IoT]

Discuss the detailed requirements for intra-frequency/inter-frequency measurement and multiple carriers operations. [NB-IoT]

**For performance part:**

Specify necessary performance requirements, measurement accuracy requirements and test cases related to the above-mentioned enhancements and core requirements. [NB-IoT][LTE-MTC]

## 2.5 RAN5

#### 2.5.1 Agreements

#### 2.5.2 Remaining Open issues

#### 2.5.3 Remaining Open issues with cross-WG dependencies

## 2.6 RAN6

#### 2.6.1 Agreements

#### 2.6.2 Remaining Open issues

## 3. Detailed progress in SA/CT WGs since last TSG meeting (for all involved WGs)

NOTE: This section only needs to be filled in for WI/SIs where there is a corresponding relevant WI/SI in SA/CT.

## 3.1 SAx/CTs

#### 3.1.1 Agreements with cross-TSG impacts

#### 3.1.2 Remaining Open issues with cross-TSG impacts

NOTE: This section should also flag any critical dependencies that need TSG attention.

## 4. References

NOTE: This can be e.g. a list of all related Tdocs in the affected WGs since last TSG, references to LSs, produced TRs/TSs, the work/study item description or status reports of previous TSGs.

1. R1-2108777 Support of 16QAM for unicast in UL and DL in NB-IoT Huawei, HiSilicon
2. R1-2109174 Support of 16-QAM for NB-IoT Qualcomm Incorporated
3. R1-2109314 Support of 16-QAM for NB-IoT Nokia, Nokia Shanghai Bell
4. R1-2109320 Support 16QAM for NBIoT Lenovo, Motorola Mobility
5. R1-2109337 Discussion on UL and DL 16QAM for NB-IoT ZTE, Sanechips
6. R1-2109559 Remaining Issues on supporting 16QAM in NB-IOT R17 MediaTek Inc.
7. R1-2110316 Support of 16-QAM for unicast in UL and DL in NB-IoT Ericsson
8. R1-2110459 Feature lead summary #1 on 106bis-e-LTE-Rel17-NB-IoT-eMTC-01 Moderator (Huawei)
9. R1-2110555 Feature lead summary #2 on 106bis-e-LTE-Rel17-NB-IoT-eMTC-01 Moderator (Huawei)
10. R1-2108778 Support of 14-HARQ processes in DL for HD-FDD MTC UEs Huawei, HiSilicon
11. R1-2109175 Support of 14 HARQ processes and scheduling delay Qualcomm Incorporated
12. R1-2109315 Support of 14-HARQ processes in DL for eMTC Nokia, Nokia Shanghai Bell
13. R1-2109338 Remaining issues on 14-HARQ processes in DL for eMTC ZTE, Sanechips
14. R1-2110317 Support of 14 HARQ processes in DL in LTE-MTC Ericsson
15. R1-2110413 Feature Lead Summary [106bis-e-LTE-Rel17-NB-IoT-eMTC-02] - first checkpoint Moderator (Ericsson)
16. R1-2110414 Feature Lead Summary [106bis-e-LTE-Rel17-NB-IoT-eMTC-02] - final checkpoint Moderator (Ericsson)
17. R1-2110318 On the support of 16-QAM for unicast in UL and DL for TDD NB-IoT Ericsson
18. R1-2110372 Discussion on RRC parameters for max DL TBS of 1736 bits Huawei, HiSilicon
19. R1-2110650 Feature lead summary on 106bis-e-R17-RRC-NB-IoT-eMTC Moderator (Huawei)
20. R1-2110691 RAN1 agreements of Additional enhancements for NB-IoT and LTE-MTC WI rapporteur (Huawei)
21. R1-2112747 Feature lead summary #3 on 107-e-LTE-Rel17-NB-IoT-eMTC-01 Moderator (Huawei)
22. R1-2112651 Feature lead summary #2 on 107-e-LTE-Rel17-NB-IoT-eMTC-01 Moderator (Huawei)
23. R1-2112576 Feature lead summary #1 on 107-e-LTE-Rel17-NB-IoT-eMTC-01 Moderator (Huawei)
24. R1-2110857 Support of 16QAM for unicast in UL and DL in NB-IoT Huawei, HiSilicon
25. R1-2111070 Discussion on 16QAM for NB-IoT ZTE, Sanechips
26. R1-2111133 Support of 16-QAM for NB-IoT Nokia, Nokia Shanghai Bell
27. R1-2111449 Support of 16-QAM for NB-IoT Qualcomm Incorporated
28. R1-2112001 Support 16QAM for NBIoT Lenovo, Motorola Mobility
29. R1-2112300 Discussion on CQI table and NPUSCH power control parameter for 16QAM MediaTek Inc.
30. R1-2112361 Support of 16-QAM for unicast in UL and DL in NB-IoT Ericsson
31. R1-2112517 Summary#1st check point [107-e-LTE-Rel17-NB-IoT-eMTC-02] on support additional PDSCH scheduling Moderator (Ericsson)
32. R1-2110858 Support of 14-HARQ processes in DL for HD-FDD MTC UEs Huawei, HiSilicon
33. R1-2111071 Remaining issues on 14-HARQ processes in DL for eMTC ZTE, Sanechips
34. R1-2111134 Support of 14-HARQ processes in DL for eMTC Nokia, Nokia Shanghai Bell
35. R1-2111450 Support of 14 HARQ processes and scheduling delay Qualcomm Incorporated
36. R1-2112362 Support of 14 HARQ processes in DL in LTE-MTC Ericsson
37. R1-2111939 Further considerations on Rel-17 NB-IoT and eMTC enhancements Huawei, HiSilicon
38. R1-2112363 On the support of 16-QAM for unicast in UL and DL in TDD NB-IoT Ericsson
39. R1-2112877 Feature lead summary on 107-e-R17-RRC-NB-IoT-eMTC Moderator (Huawei)
40. R2-2109911 Report of email discussion [302] [NBIOT/eMTC R17] Carrier Selection Ericsson
41. R2-2109912 Analysis of Rmax based solution and carrier-based solution Ericsson
42. R2-2109913 Discussion on connected mode measurement in NB-IoT Ericsson
43. R2-2109914 Support of 16-QAM for unicast in UL and DL in NB-IoT Ericsson
44. R2-2110109 Remaining FFSs on RLF measurements ZTE Corporation, Sanechips
45. R2-2110110 Option1c for CEL-based paging carrier selection ZTE Corporation, Sanechips
46. R2-2110111 Remaining FFSs on 16QAM for NB-IoT ZTE Corporation, Sanechips
47. R2-2110112 Remaining FFSs on 1736bits TBS for eMTC ZTE Corporation, Sanechips
48. R2-2110147 Network assistance for Re-establishment enhancement Nokia, Nokia Shanghai Bells
49. R2-2110148 Paging strategy impacts for coverage based paging carrier selection Nokia, Nokia Shanghai Bells
50. R2-2110149 Network configuration for paging carrier selection based on coverage level Nokia, Nokia Shanghai Bells
51. R2-2110191 Further discussion on enhanced paging carrier selection NEC Corporation
52. R2-2110473 L2 buffer size calculations for eMTC and NB-IoT enhancements Huawei, HiSilicon
53. R2-2110474 Relaxed monitoring in RRC connected mode Huawei, HiSilicon
54. R2-2110475 Discussion on coverage based paging carrier Huawei, HiSilicon
55. R2-2110476 Summary of [301] RLF measurements (Huawei) Huawei
56. R2-2110477 Running CR: Introduction of Rel-17 enhancements for NB-IoT and eMTC Huawei
57. R2-2110692 [Running CR] Introduction of NB-IoT/eMTC Enhancements Qualcomm Incorporated
58. R2-2110693 Consideration on open issues for neighbour cell measurement in RRC connected state Qualcomm Incorporated
59. R2-2110694 Further consideration on open issues for coverage-based paging carrier selection Qualcomm Incorporated
60. R2-2110695 Signalling for coverage-based paging carrier selection Qualcomm Incorporated
61. R2-2110800 On remaining issues of 16QAM Nokia Solutions & Networks (I)
62. R2-2111113 Discussion on details of paging carrier selection options MediaTek Inc.
63. R2-2111393 Report of [AT116e][303][NBIOT/eMTC] RLF measurements (Qualcomm) Qualcomm Incorporated
64. R2-2111394 Report of [AT116-e][304][NBIOT/eMTC] NB-IoT carrier selection (ZTE) ZTE (email discussion rapporteur)
65. R2-2111396 RAN2 agreements for Rel-17 NB-IoT and LTE-MTC Ericsson
66. R3-214738 Discussion on Carrier Selection and Carrier Specific Configuration ZTE
67. R3-214739 Introduction of CEL based paging carrier selection ZTE
68. R3-214783 Support of Carrier Selection based on coverage level Nokia, Nokia Shanghai Bell
69. R3-214784 Support of Carrier Selection based on coverage level Nokia, Nokia Shanghai Bell
70. R3-215004 (TP to TS36.413) Consideration on Carrier Selection and Carrier Specific Configuration Huawei
71. R3-215005 Support of CE based carrier selection Huawei
72. R3-215419 Discussion on Rel-17 NB-IoT Carrier selection Ericsson
73. R3-215420 Enhancement on Intra eNB CP Relocation for NB-IoT Ericsson
74. R3-215897 CB: # NBIoTMTC1\_CarrierSelect - Summary of email discussion Nokia - moderator
75. R3-216219 CB: # NBIoTMTC2\_Others - Summary of email discussion Ericsson – moderator
76. R4-2120383 Email discussion summary for [101-e][241] NB\_IOTenh4\_LTE\_eMTC6\_RRM\_NWM moderator (Huawei)
77. R4-2120340 WF on RRM requirements for Rel-17 NB-IoT and LTE-MTC Huawei, HiSilicon
78. R4-2117496 On NB-IoT neighbor cell measurements in RRC\_CONNECTED Qualcomm Incorporated
79. R4-2118853 Discussion on RRM requirements for NB Huawei, Hisilicon
80. R4-2119064 Discussions on RRM requirements for release 17 NB-IoT Ericsson
81. R4-2119594 Discussion on neighbour cell measurements in NB-IoT RRC\_CONNECTED state Nokia, Nokia Shanghai Bell
82. R4-2117192 CR IBE mask and MPR for NB-IoT 16-QAM Nokia, Nokia Shanghai Bell
83. R4-2117250 Proposals on BS RF requirements for support of 16QAM in NB-IoT Nokia, Nokia Shanghai Bell
84. R4-2117620 On max power reduction for PRACH, PUCCH, and full-PRB PUSCH Sony
85. R4-2118544 Remaining issues for NB-IoT 16QAM BS RF requirements Huawei,HiSilicon
86. R4-2118545 PC6 MPR for NB-IoT 16QAM Huawei,HiSilicon
87. R4-2118996 BS RF impact analysis on R17 NB\_IoT Ericsson
88. R4-2118997 RF impact analysis on R17 eMTC WID Ericsson
89. R4-2119952 CR IBE mask and MPR for NB-IoT 16-QAM Nokia, Nokia Shanghai Bell
90. R4-2119948 WF on remaining issues for NB-IoT 16QAM Huawei, HiSilicon

 04.10.2021 minor adaptations for RAN #94e

 08.08.2021 minor adaptations for RAN #93e

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 28.01.2021 minor adaptations for RAN #91e

 09.11.2020 minor adaptations for RAN #90e

 31.08.2020 minor adaptations for RAN #89e

 20.04.2020 minor adaptations for RAN #88e

 18.02.2020 minor adaptations for RAN #87e

 14.11.2019 minor adaptations for RAN #86

 18.08.2019 minor adaptations for RAN #85

 12.05.2019 minor adaptations for RAN #84

 27.02.2019 minor adaptations for RAN #83

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v04.79 26.02.2018 minor adaptations for RAN #79

v04.78 18.11.2017 minor adaptations for RAN #78

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v04.74 28.10.2016 minor adaptations for RAN #74

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v02 07.05.2010 history added, some spelling corrections

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