3GPP TSG RAN WG2 Meeting #109-e draftR2-200xxxx

**Electronic meeting, 24th February – 6th March, 2020**

**Agenda item:** 7.1.1

**Source:** Intel Corporation

**Title:** Open issues of running CR to 36.300 for eMTC

**Document for:**  Discussion and decision

# Introduction

This contribution addresses new/update of the stage-2 TP in the running CR to 36.300 [1] considering the R2#109-e agreements as part of the email discussion **“[AT109e][403][eMTC] Update 36.300 running CR (Intel)**”.

To reduce overlapping discussions between this email discussion [403] and “[AT109e][313][NBIOT] R16 36.300 CR (Huawei)”, we suggest not to discuss here the sections/TPs that address common features between MTC and NB-IoT as in our understanding, those are addressed on email discussion [31]; instead, this email discussion focuses on MTC specific ones.

# Discussion on RAN2#109-e agreements

1. On the sections of 36.300 that addresses common features for MTC and NB-IoT, companies are invited to provide their views on whether the related TP should also be included in this running CR or no (understanding that current version includes overlapping sections).
2. Keep current format on this running CRs which also includes overlapping TP on the features that are common for MTC and NB-IoT. If so, we suggest to only discuss them in one email discussion [313] and we would coordinate to include the updated TP from the email discussion [313]. Therefore, the TP of the following sections common for MTC and NB-IoT would be taken from email discussions [313]: section 2, 3, 7 (including 7.1, 7.2, 7.3, 7.3a, 7.3b, 7.3x, 7.3y), 8.1, 10.1.4, 15.3, 16.3, 23.13, 24.
3. Remove the description of the features that are relevant to both MTC and NB-IoT on this running CR where there is no MTC specific changes (e.g. in next discussion point 2, the common agreements between MTC and NB-IoT are shown in grey). If so, we understand that the MTC related TP that are common for NB-IoT are captured as part of email discussion [313].

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1. Companies are invited to provide their views and/or suggested TP on whether any of the following MTC specific agreements (i.e. those agreements not grey out) should be captured in this stage-2 running CR. As previous explained, this email discussion [403] suggested to only focus on non-overlapping topics/sections with the one discussed on email discussion [313]. In addition, you can also indicate in the table below if any of the grey out agreements should be considered within the scope of this email discussion [403] instead.

**Mobile-terminated (MT) early data transmission (EDT) [MTC & NB-IoT]**

1. **UE category information, i.e., Cat-M2 (Cat-NB2 for NB-IoT), is provided in the UE Radio Paging information container. FFS how the use of UE category information is captured in the specifications.**

**UE-group wake-up signal (WUS) [MTC & NB-IoT]**

1. **For NB-IoT, RAN2 agree signaling changes proposed in Table 5 as the baseline.**
2. **For NB-IoT, RAN2 assume the changes proposed in Table 7, 8 and 9 as the baseline for signalling group WUS information.**
3. **For NB-IoT, RAN2 use the changes proposed in Table 10 as the baseline.**
4. **For eMTC, RAN2 agree to use the changes proposed in Table 12 as the baseline.**
5. **For eMTC, RAN2 assume the changes proposed in Table 15, 16 and 17 as the baseline for signalling group WUS information.**
6. **For eMTC and NB-IoT support the same paging probability range and granularity.**
7. **No special handling of WUS resource overlap is specified and UE use the WUS resource corresponding to its gap capability**
8. **Update stage 2 to explain group WUS in more detail using text proposed in R2-2000639 as starting point.**
9. **From RAN2 point of view paging escalation does not need to be mandated**
10. **Working assumption:** 
    1. **For NB-IoT, if only one R16 WUS resource is configured and no Release 15 WUS resource is configured then R16 WUS resource is always in primary location**
    2. **Support of Release 16 WUS is independent to support of Release 15 WUS**
    3. **Define WUS group selection based on the formula defined in R2-2001472**
11. **FFS:**
    1. **Code points for paging probability thresholds.**
    2. **Mechanism to minimize false wake-up**
12. **For eMTC and NB-IoT support the same paging probability range and granularity.**
13. **No special handling of WUS resource overlap is specified and UE use the WUS resource corresponding to its gap capability**
14. **Update stage 2 to explain group WUS in more detail using text proposed in R2-2000639 as starting point.**
15. **From RAN2 point of view paging escalation does not need to be mandated**
16. **Working assumptions**
    1. **For NB-IoT, if only one R16 WUS resource is configured and no Release 15 WUS resource is configured then R16 WUS resource is always in primary location**
    2. **Support of Release 16 WUS is independent to support of Release 15 WUS**
    3. **Define WUS group selection based on the formula defined in R2-2001472**
17. **FFS**
    1. **Code points for paging probability thresholds.**
    2. **Mechanism to minimize false wake-up**

**Transmission in preconfigured resources [MTC & NB-IoT]**

1. **PUR TA timer configuration is provided to MAC when RRC receives PUR configuration from eNB.**
2. **When TA validation fails due to other than expiration of TA timer, the PUR TA timer is not stopped (i.e. keeps running until expiry).**
3. **MAC entity starts the PUR TA timer when the MAC entity is configured with the PUR TA timer.**
4. **TA adjustment by DCI is captured in MAC specification 5.4.x.2 to include the condition “when a Timing Advance Command MAC control element is received or PDCCH indicates timing advance adjustment as specified in TS 36.212 [5]”.**
5. **RAN2 confirms TA validation procedure is captured/kept in RRC spec.**
6. **When "PUR fallback indication" is received, MAC stops monitoring PDCCH in PUR response window.**
7. **(Already captured in MAC CR) Upon L1 ACK indication received from lower layers, MAC indicated PUR success to the RRC.**
8. **In RRC CR 5.3.3.3x, add “NOTE: UE actions upon reception of fallback/failure indication from lower layers (see TS 36.213 [23]) is left up to implementation.” Remove Editor’s Notes.**
9. **Upon PUR fallback indication from lower layers, MAC indicates PUR fallback and PUR failure separately to the RRC.**
10. **Upon reception of RRC message indicating successful PUR transmission, RRC does not need to indicate this to MAC layer.**
11. **Working assumptions: (Can be used as baseline for CR and revisit if there is a problem):**
    1. **RRC provides PUR configuration to MAC once and MAC calculates the PUR grant for each PUR occasion.**
    2. **“m” counter is maintained in MAC. When the counter value reaches the configured max value, MAC sends indication to RRC to release PUR configuration.**
12. **FFS:**
    1. **Where to capture PUR release due to RACH initiation on a new cell.**
13. **Similar to EDT, upon transmission using PUR, RRC configures PHY to use PUR.**
14. **EDT value for timer t300 applies when UL data is included in transmission using PUR.**
15. **When UL data is not included (i.e. only RRC message is included) in transmission using PUR, non-EDT value applies to t300.**
16. **PUR periodicity includes at least values of several minutes, tens of minutes, ~hour, several hours, ~one day. FFS exact minimum and maximum values and total number of values.**
17. **TA validation criterion “Serving cell changes” applies also when handover and RRC Connection Re-establishment results in RA in a new cell.**
18. **TA timer range is multiple of PUR periodicities, e.g. 1,…, 8.** 
    1. **FFS on exact values and whether offset is applied so that e.g. retransmissions are covered.**
19. **For NB-IoT: The value range for PUR response timer is same as in EDT (FDD): {pp1, pp2, pp3, pp4, pp8, pp16, pp32, pp64} with upper boundary 10.24 s.**
20. **For eMTC: The value range for PUR response timer is same as in EDT: {sf240, sf480, sf960, sf1920, sf3840, sf5760, sf7680, sf10240}.**
21. **Number of PUR grant occasions requested can be one or infinity.**
22. **Working assumptions**
    1. **PUR periodicity configuration granularity is based on counts of binary multiples of HSFN, i.e. full SFN cycles (= 10.24 s).**
    2. **PUR periodicity is {hsf8, hsf16, hsf32, hsf64, hsf128, hsf256, hsf512, hsf1024, hsf2048, hsf4096, hsf8192, spareX, [FFS]}.**
    3. **Maximum PUR time offset range should be the same as maximum PUR periodicity. FFS further details e.g. how exact PUR start time is configured.**
23. **FFS**
    1. **how storing of PUR parameters would be split between eNB and MME and other details before agreeing on where PUR configuration is stored for CP solution.**
    2. **if and how eNB links CP-PUR configuration to each UE in RRC\_IDLE.**
    3. **To ask RAN1**
       1. **RAN2 to confirm L1 update on repetition number is not intended to update the RRC configuration (i.e. higher layer configuration) but adjust the configuration provided by higher layers.**
       2. **whether L1 adjustment applies only to retransmissions or also future PUR UL transmissions and where it is stored.**

**Scheduling multiple DL/UL transport blocks [MTC & NB-IoT]**

1. **For LTE-M, the length of HARQ RTT timer is set to 7+k\*N for bundled HARQ ACK, where k is equal to the number of HARQ ACK bundles.**
2. **Remove Editor's note from the document that captures RAN2 agreements and clarify that those agreements are for non-interleaved NB-IoT case.**
3. **Capture the following RAN1 agreement in RAN2 specifications: “For NB-IoT, support of multiTB-UL-r16 and multiTB-DL-r16 is conditional on support of two HARQ processes.”**

**Quality report in Msg3 [MTC]**

1. **RAN2 confirms that 2-bit CQI report in MSG3 is supported.**
2. **Quality Report trigger in Connected Mode for eMTC is the same MAC CE as agreed for NB-IoT.**

**MPDCCH performance improvement using CRS [MTC]**

**Improvements for non-BL UEs [MTC]**

**Stand-alone deployment [MTC]**

**Mobility Enhancements [MTC]**

**Coexistence with NR [MTC]**

**Connection to 5GC (eDRX, EDT, UP optimisation, RRC\_INACTIVE and other MTC specific topics) [MTC & NB-IoT]**

1. **DRBs are resumed upon receiving RRCConnectionResume in UP optimization when connected to 5GC.**
2. **When idle mode eDRX is not configured, eMTC UEs in RRC\_INACTIVE monitor the paging occasions according to the shortest of the cell default paging cycle, the UE specific DRX (if configured), and the RAN paging cycle (if configured).**
3. **When idle mode eDRX is not configured, eMTC UEs in RRC\_INACTIVE cannot be configured with values 5.12 sec and 10.24 sec**
4. **DRB resumption for EDT for eMTC UEs connected to 5GC follows the same principle as in EPC, i.e.:**
   1. **drb-ContinueROHC is provided in RRCConnectionRelease message triggering the suspension in RRC\_IDLE. The flag applies to all DRBs.**
   2. **When resuming the DRBs for EDT, RRC procedure text triggers PDCP re-establishment and provides NR PDCP with the drb-ContinueROHC indication received in RRCConnectionRelease message.**

**Connection to 5GC (Other common aspects) [MTC & NB-IoT]**

1. **AS RAI can be used when connected to EPC or 5GC, including when in RRC connected mode and using CP/UP optimisations, EDT, or PUR.**
2. **AS RAI can be provided with any higher layer PDU transmission in the UL including the last one or with no higher layer PDU transmission in the UL.**
3. **AS RAI is provided in the same MAC CE as the DL channel quality report.**
4. **One of the codepoints for AS RAI implies “no indication”.**
5. **AS RAI has higher priority than data when AS RAI and DL channel quality report are provided in the same MAC CE.**
6. **No other mechanisms are introduced to provide R16 AS RAI.**
7. **Codepoints for AS RAI are allocated as follows:**
   1. **Code Point 00: No RAI information**
   2. **Code Point 01: no subsequent DL and UL data transmission is expected**
   3. **Code Point 10: a single subsequent DL transmission is expected**
   4. **Code Point 11: Reserved.**
8. **AS RAI, when triggered, should have higher priority than data if including AS RAI would not lead to data segmentation.**
9. **For EDT and PUR: When AS RAI is triggered by upper layers but cannot be sent along with the associated MAC SDU due to MAC prioritisation, AS RAI is cancelled.**
   1. **FFS non-EDT/non-PUR case**
10. **Similar as UP CIoT EPS Optimization, rrc-SuspendIndication in RRCConnectionReject can be supported for UP CIoT 5GS Optimization. No change for specification is needed.**
11. **DL channel quality report can be supported for both NB-IoT and eMTC connected to 5GC.**
12. **Confirm the working assumption that cause delayTolerantAccess it not applicable to 5GC.**
13. **Confirm the working assumption that there is no need for an indication of extended Idle mode DRX support in system information for NB-IoT.**
14. **Confirm the working assumption that there is a new IE cp-EDT-5GC-r16 in SIB2-BR/SIB2-NB to indicate ng-eNB connected to 5GC supports CP MO-EDT.**
15. **Revert the working assumption that the values ‘n’ and ‘m’ for the truncation of the 5G-S-TMSI are signalled per PLMN in SystemInformationBlockType2-NB.**
16. **Remove the IE cp-ReestablishmentPLMNList-5GC-r16 in SystemInformationBlockType2-NB.**
17. **The existing capability multipleDRB-r13 is also applicable to 5GC**
18. **PUR is supported in EPC and 5GC.**
19. **Introduce separate indications up-PUR-5GC-r16 and cp-PUR-5GC-r16 in SIB2-BR/SIB2-NB**
20. **Introduce separate UE capabilities pur-UP-5GC-r16 and pur-CP-5GC-r16.**
21. **Add ab-PerRSRP-r16 parameter (same definition as SIB14-BR) in SIB25-BR.**
22. **BL UEs or UEs in CE in RRC\_CONNECTED mode performs access barring check based on the latest UAC parameters acquired prior to entering RRC\_CONNECTED.**
23. **For 5GC, CP re-establishment is always enabled and there is no need for an indication in system information.**
24. **systemInformationBlockType25-BR follows the same system information update mechanism as SIB14-BR and does not affect the value tag.**
25. **A new parameter uac-ParamModification (similar to eab-ParamModification) is introduced in the Paging message and in the Direct Indication Information to indicate SIB25-BR modification and scheduling.**

**Others [MTC]**

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| Intel | 45-46, 48-50 | * 45-46 & 48-50: No impact on stage-2 TP. * Depending on majority preference on discussion point 1), the TP for common topic of MTC and NB-IoT may need to be aligned with the latest ones captured in the email discussion [313]. |
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# Discussion on TP already captured in different sections

It is important to remember that depending on companies’ views in Discussion point 1), there might TP/sections that would be removed (if option b is preferable) or that would be updated to align with the TPs on email discussion [313] (if option a is preferable)

## Section 2 on References, 5 on Physical Layer for E-UTRA and 8 on E-UTRAN identities

1. Companies are invited to provide their views and/or suggested TP for section 7 on RRC. Note that the following editor notes are captured in this section within 7.2 “*Editor’s Note: FFS whether some additional information needs to be mentioned for PUR”*.

If companies prefer option a) of discussion point 1), TP of sections 2 and 3 will be updated based on the latest TP captured on the running CR of email discussion [313]. If companies prefer option b) of discussion point 1), sections 2 and 3 would be removed from this CR unless there was an eMTC specific input required to add on this CR.

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## Section 7 on RRC

1. Companies are invited to provide their views and/or suggested TP for section 7 on RRC. Note that the following editor notes are captured in this section within 7.3a “*Editor’s note: To be confirmed whether to follow EDT or RRC\_INACTIVE for resumption of DRBs. In this CR, EDT procedure is followed*”, within 7.3b “*Editor’s note: This section may be updated for 5GS once the description is available in TS 23.502*”, and within 7.3x “*Editor’s note: To be updated considering discussion from the NB-IoT CR. So far no change specific only to eMTC is identified*”.

If companies prefer option a) of discussion point 1), TP of sections 7.1, 7.2, 7.3, 7.3a, 7.3b, 7.3x, and 7.3y will be updated based on the latest TP captured on the running CR of email discussion [313]. If companies prefer option b) of discussion point 1), sections 7.1, 7.2, 7.3, 7.3a, 7.3b, 7.3x, and 7.3y would be removed from this CR unless there was an eMTC specific input required to add in this CR.

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## Section 10.1.4 Paging and C-plane establishment

1. Companies are invited to provide their views and/or suggested TP for section 10.1.4 on Paging and C-plane establishment. Note that the following editor notes is captured in this section “*Editor’s Note: FFS whether the paging operation in the MME/AMF is aware of the use of GWUS*,

If companies prefer option a) of discussion point 1), TP of section 10.1.4 will be updated based on the latest TP captured on the running CR of email discussion [313]. If companies prefer option b) of discussion point 1), section 10.1.4 would be removed from this CR unless there was an eMTC specific input required to add on this CR.

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## Section 10.1.9 on Mobility in RRC\_INACTIVE

1. Companies are invited to provide their views and/or suggested TP for section 10.1.9 on Mobility in RRC\_INACTIVE. Note that the following editor notes is captured in this section “*Editor’s note: TBD if any change is needed for UE in enhanced coverage.”*.

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## Section 11 on Scheduling and Rate Control

1. Companies are invited to provide their views and/or suggested TP for section 11 on Scheduling and Rate Control.

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## Section 15 on MBMS Transmission

1. Companies are invited to provide their views and/or suggested TP for section 15 on MBMS Transmission.

If companies prefer option a) of discussion point 1), TP of section 15.3 will be updated based on the latest TP captured on the running CR of email discussion [313]. If companies prefer option b) of discussion point 1), section 15.3 would be removed from this CR unless there was an eMTC specific input required to add on this CR.

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## Section 23 on Others

1. Companies are invited to provide their views and/or suggested TP for section 23 on Others. Note that the following editor notes is captured in this section “*Editor’s note: No change is made here as section 24.5 is updated instead*” which in our understanding could be removed.

If companies prefer option a) of discussion point 1), TP of section 23.3 will be updated based on the latest TP captured on the running CR of email discussion [313]. If companies prefer option b) of discussion point 1), section 23.3 would be removed from this CR unless there was an eMTC specific input required to add on this CR.

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## Section 24 on support for 5GC

1. Companies are invited to provide their views and/or suggested TP for section 24 on support for 5GC. Note that the following editor notes is captured in this section “*Editor’s note: FFS selection between 5GC and EPC for BL UEs or UEs in enhanced coverage supporting connectivity to 5GC.*”

If companies prefer option a) of discussion point 1), TP of section 24 will be updated based on the latest TP captured on the running CR of email discussion [313]. If companies prefer option b) of discussion point 1), section 24 would be removed from this CR unless there was an eMTC specific input required to add on this CR.

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## Miscellaneous

1. Companies are invited to provide other their views and/or suggested TP on the running CR to 36.300 for Rel-16 eMTC WI.

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# Summary

*<If needed, to be updated when doing the summary>*

1. *<If needed, to be updated when doing the summary>.*

# Conclusion

The proposals captured are the following:

***Proposal 1.*** *<If needed, to be updated when doing the summary>.*

# References

1. R2-2001097 Introduction of Rel-16 eMTC enhancements, Intel Corporation , Rel-16, TS 36.300, v16.0.0, CR#1267, category B, LTE\_eMTC5-Core.