3GPP TSG-RAN2 Meeting #111-e R2-200xxxx

eMeeting, 17th - 28th August, 2020

Agenda Item: 6.16 NR Other

Source: Ericsson

Title: Summary of [AT111-e][039][TEI16] Secondary DRX corrections

Document for: Discussion and Decision

# Introduction

During RAN2#111-e it was agreed to have an email discussion on the proposed corrections for secondary DRX:

* [AT111-e][039][TEI16] Secondary DRX corrections (Ericsson)

Scope: Treat R2-2007062, 7370, 7486, 7258, 7890

Determine agreeable parts in a first phase, Agree CRs in a second phase

Deadline: Agreed CRs EOM, Deadline for comments at least 24h before. Intermediate deadlines by Rapporteur if needed.

The email discussion is divided into two phases:

* 1st phase: determine agreeable parts (**deadline for comments 20th august 12:00 CEST**)
* 2nd phase: agreed CRs (**deadline for comments 27th august 12:00 CEST**)

This version of the email report kicks off the 1st phase of the email discussion.

# 1st phase discussion

There are 4 CRs to 38.321 [1, 2, 3, 4] and 1 CR for 38.331 [5] to discuss.

The 38.321 CRs in some cases contain the same or similar corrections. Furthermore the proposed corrections range from non-controversial editorial type of corrections, to “for this/both group(s)” type of clarifications, to proposals to re-structure, to actual functional changes. The rapporteur made an attempt to discuss corrections per “category” and not go by “CR” because the CRs overlap.

## Editorial type of corrections in [1, 2, 3]

There are a number of editorial type of corrects, that according to the rapporteur might be easy to agree, and that a mentioned in more than one CR:

**Proposal 1: The following editorial corrections are made:**

* + DRX cycle
  + DRX group
  + Serving Cells may be configured by RRC in two DRX groups
  + use the Long DRX cycle for this DRX Group.

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| **Company** | **Agree/**  **Disagree** | **Comments** |
| Ericsson | Agree | Editorial corrections that ok. |
| Qualcomm | Agree, with changes | We agree these changes are necessary. However, we think it is better to have “DRX Group” instead of “DRX group”, because it is a specific technical term and thus should have the same style as similar terms such as “Active Time”, “Timing Advance Group”, or “Serving Cell” etc. |
| OPPO | Agree with changes | Either “DRX Group” or”DRX group” is ok for us as long as it’s aligned. We noticed in the last bullet, it’s still “DRX Group” which is not aligned with other places |
| Apple | Agree with changes | We agree with the editorial corrections, and the “DRX Group” should be “DRX group” in last bullet.  We understand QC’s comments, but since DRX group is used widely in MAC and RRC spec, then we are fine to use “DRX group” to minimize the spec change. |
| NEC | Agree |  |
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## “for this group” and “for both groups” type of corrections [1, 2, 3]

With the introduction of two DRX groups there is the obvious question whether a requirement applies to one, or both groups. This topic has been discussed in last meeting, and then further clarifications were agreed for different cases. In this meeting that are further proposals to clarify this issue, i.e. basically to clarify this aspect for each possible cases:

**Proposal 2: The following “group” clarifications are agreeable:**

For each DRX group, the MAC entity shall:

1> if a DRX Command MAC CE or a Long DRX Command MAC CE is received:

2> stop *drx-onDurationTimer* for both groups;

2> stop *drx-InactivityTimer* for both groups.

1> if *drx-InactivityTimer* for this DRX Group expires:

2> if the Short DRX cycle is configured for this DRX group:

3> start or restart *drx-ShortCycleTimer* for this DRX Group in the first symbol after the expiry of *drx-InactivityTimer*;

3> use the Short DRX Cycle for this DRX group.

2> else:

3> use the Long DRX cycle for this DRX group.

1> if a DRX Command MAC CE is received:

2> if the Short DRX cycle is configured:

3> start or restart *drx-ShortCycleTimer* for both DRX Groups in the first symbol after the end of DRX Command MAC CE reception;

3> use the Short DRX Cycle for both DRX groups.

2> else:

3> use the Long DRX cycle for both DRX groups.

1> if *drx-ShortCycleTimer* for this DRX Group expires:

2> use the Long DRX for this DRX Group cycle.

1> if a Long DRX Command MAC CE is received:

2> stop *drx-ShortCycleTimer* for both DRX groups;

2> use the Long DRX cycle for both DRX groups.

1> if the Short DRX Cycle is used for this DRX group, and [(SFN × 10) + subframe number] modulo (*drx-ShortCycle*) = (*drx-StartOffset*) modulo (*drx-ShortCycle*):

2> start *drx-onDurationTimer* for this DRX group after *drx-SlotOffset* from the beginning of the subframe.

1> if the Long DRX Cycle is used for this DRX group, and [(SFN × 10) + subframe number] modulo (*drx-LongCycle*) = *drx-StartOffset*:

2> if DCP monitoring is configured for the active DL BWP as specified in TS 38.213 [6], clause 10.3:

3> if DCP indication associated with the current DRX Cycle received from lower layer indicated to start *drx-onDurationTimer*, as specified in TS 38.213 [6]; or

3> if all DCP occasion(s) in time domain, as specified in TS 38.213 [6], associated with the current DRX Cycle occurred in Active Time considering grants/assignments/DRX Command MAC CE/Long DRX Command MAC CE received and Scheduling Request sent until 4 ms prior to start of the last DCP occasion, or within BWP switching interruption length, or during a measurement gap; or

3> if *ps-Wakeup* is configured with value *true* and DCP indication associated with the current DRX Cycle has not been received from lower layers:

4> start *drx-onDurationTimer* after *drx-SlotOffset* from the beginning of the subframe.

2> else:

3> start *drx-onDurationTimer* for this DRX group after *drx-SlotOffset* from the beginning of the subframe.

**Note from the rapporteur**: Secondary DRX cannot be configured together with DCP, i.e. we should not talk about DRX groups under “2> if DCP monitoring is configured…”.

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| **Company** | **Agree/**  **Disagree** | **Comments** |
| Ericsson | Agree | We started to explicitly write “for this DRX group” and “for both groups” in some cases, and we can just as well try to be complete. |
| Qualcomm | Agree, with changes | We are fine with making “this DRX Group” or “both DRX Groups” explicit in this loop. However, if we take that approach, then we do not need “For each DRX group” in the first line of the loop, i.e. we should simply start the loop with “The MAC entity shall:”.  We do not think “for this DRX group” is necessary in the following block:  1> if *drx-InactivityTimer* for this DRX Group expires:  2> if the Short DRX cycle is configured for this DRX group:  3> start or restart *drx-ShortCycleTimer* for this DRX Group in the first symbol after the expiry of *drx-InactivityTimer*;  3> use the Short DRX Cycle for this DRX group.  Because short DRX cycle is configured per MAC entity, not per DRX Group. |
| OPPO | Agree | We also think the above change mentioned by Qualcomm is not necessary since Short DRX cycle is common parameter. |
| Apple | Agree | We are fine with the change. |
| NEC | Agree with changes | the first “both groups” should be “both DRX groups” for consistency |
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## Proposal to re-structure the text for DRX command [1]

LG [1] proposes to move the text for (Long) DRX MAC CE command under “For each DRX group …” to a separate section on level one:

1> if a DRX Command MAC CE is received:

2> for both DRX groups:

3> stop drx-onDurationTimer;

3> stop drx-InactivityTimer.

2> for each DRX group:

3> if the Short DRX cycle is configured for this DRX group:

4> start or restart drx-ShortCycleTimer for this DRX group in the first symbol after the end of DRX Command MAC CE reception;

4> use the Short DRX cycle for this DRX group.

3> else:

4> use the Long DRX cycle for this DRX group.

1> if a Long DRX Command MAC CE is received:

2> for both DRX groups:

3> stop *drx-onDurationTimer*;

3> stop *drx-InactivityTimer*.

3> stop *drx-ShortCycleTimer*;

3> use the Long DRX cycle.

**Proposal 3: The text on (Long) DRX Command CE is moved to a separate section.**

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| **Company** | **Agree/**  **Disagree** | **Comments** |
| Ericsson | Disagree | We think that moving the text does makes it necessarily clearer. We also think that the corrections under 2.2 make the existing text on DRX command sufficiently clear, and think that no further changes are needed. |
| Qualcomm | Disagree | We do not think the proposed change is necessary, if we agree to the corrections proposed in Proposal 2. |
| OPPO | Disagree |  |
| Apple | Disagree |  |
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## Correction for CSI masking [2]

**Proposal 4: Clarify that if CSI masking is configured CSI is not reported in the DRX group(s) where PUCCH is configured:**

1> else:

2> in current symbol n, if the DRX group would not be in Active Time considering grants/assignments scheduled on Serving Cell(s) in this DRX Group and DRX Command MAC CE/Long DRX Command MAC CE received and Scheduling Request sent until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause:

3> not transmit periodic SRS and semi-persistent SRS defined in TS 38.214 [7] in this DRX group;

3> not report CSI on PUCCH and semi-persistent CSI configured on PUSCH in this DRX group.

2> if CSI masking (*csi-Mask*) is setup by upper layers:

3> in current symbol n, if *drx-onDurationTimer* of the DRX group would not be running considering grants/assignments scheduled on Serving Cell(s) in this DRX Group and DRX Command MAC CE/Long DRX Command MAC CE received until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause; and

4> not report CSI on this PUCCH in this DRX group.

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| **Company** | **Agree/**  **Disagree** | **Comments** |
| Ericsson | Neutral | Not sure if this needed. The existing text already says “in this DRX group” and “on this PUCCH” but it is ok to further clarify. |
| Qualcomm | Neutral | We also do not feel this change is necessary. If majority of companies prefer to have it, then we think a better text is “not report CSI on PUCCH in this DRX Group”. |
| OPPO | Agree |  |
| Apple | Neutral | We think “This PUCCH” clearly indicates the PUCCH in this DRX group. But we are ok to follow majority view. |
| NEC | Neutral | also think “this PUCCH” looks already clear |
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## Corrections to the introductory text on DRX groups and “expected” UE behaviour [3]

Nokia proposes to clarify the introductory text on DRX groups and the ”expected” UE behaviour which does not fall under “For each DRX group, the MAC entity shall”:

Serving Cells may be configured by RRC in two groups with separate DRX parameters, DRX groups. When RRC does not configure a secondary DRX group, there is only one DRX group and all Serving Cells belong to that one DRX group. When two DRX groups are configured, all Serving Cells are uniquely assigned to either of the two groups. The DRX parameters that are separately configured for each DRX group are: *drx-onDurationTimer*, *drx-InactivityTimer*. The DRX parameters that are common to the DRX groups are: *drx-SlotOffset*, *drx-RetransmissionTimerDL*, *drx-RetransmissionTimerUL*, *drx-LongCycleStartOffset*, *drx-ShortCycle* (optional), *drx-ShortCycleTimer* (optional), *drx-HARQ-RTT-TimerDL*, and *drx-HARQ-RTT-TimerUL*.

Regardless of whether the MAC entity is monitoring PDCCH or not on the Serving Cells in a DRX group, the MAC entity transmits HARQ feedback, aperiodic CSI on PUSCH, and aperiodic SRS defined in TS 38.214 [7] on the Serving Cells in the DRX group when such is expected.

**Proposal 5: Clarify the introductory text on DRX groups and “expected” UE behaviour**

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| **Company** | **Agree/**  **Disagree** | **Comments** |
| Ericsson | Agree | We are fine with the proposed corrections by Nokia, but propose:  with separate DRX parameters, called DRX groups |
| Qualcomm | Agree, with change | We are fine the above changes. But we’d suggest moving the second sentence, ‘When RRC does not configure a secondary DRX group, there is only one DRX group and all Serving Cells belong to that one DRX group.’, to the end of that paragraph. That would help avoid the text jumping between the description of secondary DRX Group and single DRX Group.  We are also fine with the change proposed by Ericsson in their comment (i.e. “called DRX Groups). |
| OPPO | Agree with change | . When two DRX groups are configured, each Serving Cell ise uniquely assigned to either of the two groups |
| Apple | Agree, with change | The first sentence can be updated as below  Serving Cells may be configured by RRC in two **DRX** groups with separate DRX parameters~~, DRX groups~~. |
| NEC | Agree | together with change from Ericsson |
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## Change for CSI reporting [3]

Nokia indicates that [3]:

*Dual DRX group was introduced in Rel-16 assuming that the active time between the groups is not coupled i.e. one group can be in active time while the other is not.For CSI reporting, current specification states that CSI should not be reported in this DRX group if it is not in active time. This statement is innacurate since CSI reporting is not performed per group and when a group is not in active time while the other is, CSI reporting is still needed.”*

Nokia proposes to enable CSI reporting for a DRX group when that DRX group is in Active Time, but the DRX group in which the CSI is reported is not necessarily in Active Time. For example when FR1 goes to sleep, while FR2 is still in Active Time, then CSI for FR2 is still reported in FR1:

1> else:

2> in current symbol n, if the DRX group would not be in Active Time considering grants/assignments scheduled on Serving Cell(s) in this DRX Group and DRX Command MAC CE/Long DRX Command MAC CE received and Scheduling Request sent until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause:

3> not transmit periodic SRS and semi-persistent SRS defined in TS 38.214 [7] in this DRX group;

3> not report CSI on PUCCH and semi-persistent CSI configured on PUSCH for the cells in this DRX group.

2> if CSI masking (*csi-Mask*) is setup by upper layers:

3> in current symbol n, if *drx-onDurationTimer* of the DRX group would not be running considering grants/assignments scheduled on Serving Cell(s) in this DRX Group and DRX Command MAC CE/Long DRX Command MAC CE received until 4 ms prior to symbol n when evaluating all DRX Active Time conditions as specified in this clause; and

4> not report CSI on PUCCH for the cells in this DRX group.

This was discussed during email discussion #037 [6] and not agreed.

**Proposal 6: CSI is reported when the DRX group for which the CSI is reported is in Active Time, but the DRX group in which the CSI is reported may or may not be in Active Time.**

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| **Company** | **Agree/**  **Disagree** | **Comments** |
| Ericsson | Disagree | This was discussed and not agreed during email discussion #037 [6]. |
| Qualcomm | Disagree | We share the same view as Ericsson. There is no new, convincing technical argument in Nokia’s CR that justifies reverting an existing agreement that was made after extensive discussions on the topic. |
| OPPO | Yes | We think the change is technically correct, the CSI should be reported as long as the reported serving cells is in Active Time. |
| Apple | Disagree | We share the same view as Ericsson. |
| NEC | Disagree | Now that there is the restriction that “The network configures a drx-InactivityTimer value for the second DRX group that is smaller than the drx-InactivityTimer configured for the default DRX group in IE DRX-Config” in RRC, the expected situation will occur rarely. So, can work without it. |
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## Change for handling of *drx-ShortCycleTimer* and DRX command [4]

When secondary DRX is not configured, and the UE receives a DRX command, the UE drops into short DRX, when short DRX is configured, otherwise the UE drops into long DRX. This is the same behaviour as when the *drx-InactivityTimer* expires. When secondary DRX is not configured, and the UE receives a Long DRX command, the UE drops into Long DRX.

When secondary DRX is configured, there is a single *drx-ShortCycleTimer* **value** configured, but there is a separate **instance** of the *drx-ShortCycleTimer* for each DRX group. This was discussed during email discussion #037:

**Proposal 5**: The *drx-ShortCycleTimer* is handled per DRX group, i.e. (re-)started when *drx-InactivityTimer* of the associated DRX group expires, and when *drx-ShortCycleTimer* expires the associated DRX group goes into Long DRX.

Mediatek also confirms this understanding [5]: “*In our understanding, current spec intends to allow the two DRX groups to maintain their own drx-ShortCyle timer separately*”. Mediatek indicates that there is some ambiguity w.r.t. the *drx-ShortCycleTimer* and (Long) DRX Command CE, and propose to change the *drx-ShortCycleTimer* handling [5]:

**Observation 1: It's unclear what value of drx-ShortCycle timer a DRX group should apply if this DRX group uses long DRX cycle and DRX command MAC CE is received on the other DRX group.**

**Proposal 1: RAN2 clarify the operation of drx-ShortCyle timer for one DRX group when UE receives DRX command MAC CE on the other DRX group.**

**Proposal 2: If UE receives DRX command MAC CE on one DRX group, the other DRX group (re)start its drx-ShortCyle timer if it applied long DRX cycle before; otherwise, the other DRX group continues using current value of drx-ShortCyle timer.**

Mediatek proposes the following change [5]:

1> if a DRX Command MAC CE is received:

2> if the Short DRX cycle is configured:

3> start or restart *drx-ShortCycleTimer* for this DRX Group in the first symbol after the end of DRX Command MAC CE reception;

3> if the long DRX cycle was used for the other DRX group:

4> start or restart *drx-ShortCycleTimer* for the other DRX Group in the first symbol after the end of DRX Command MAC CE reception;

3> use the Short DRX Cycle for both DRX groups.

2> else:

3> use the Long DRX cycle for both DRX groups.

The rapporteur thinks that the current specification is clear, i.e. the UE (re-)starts the *drx-ShortCycleTimer* for both DRX groups when DRX Command MAC CE is received and short DRX is configured:

For each DRX group, the MAC entity shall:

…

1> if a DRX Command MAC CE is received:

2> if the Short DRX cycle is configured:

3> start or restart *drx-ShortCycleTimer* for this DRX Group in the first symbol after the end of DRX Command MAC CE reception;

3> use the Short DRX Cycle for both DRX groups.

2> else:

3> use the Long DRX cycle for both DRX groups.

…

**Proposal 7: Is there a need to clarify or change the *drx-ShortCycleTimer* handling with DRX command?**

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| **Company** | **Agree/**  **Disagree** | **Comments** |
| Ericsson | Disagree | We think the behaviour is clear, and we think the UE should also re-start the *drx-ShortCycleTimer* for the other group, when the other group was already in short DRX, because this is more aligned with the legacy behaviour. |
| Qualcomm | Disagree | The proposed change is not necessary, especially if we agree to the changes in Proposal 2. |
| OPPO | Disagree | We think the current spec is clear since the drx-ShortCycleTimer value is common for both DRX groups |
| Apple | See comment | UE should start/restart *drx-ShortCycleTimer* for both DRX groups upon receiving the DRX Command MAC CE. Therefore, we think the following sentence can be updated as below:  1> if a DRX Command MAC CE is received:  2> if the Short DRX cycle is configured:  3> start or restart *drx-ShortCycleTimer* for t~~his~~both DRX Groups in the first symbol after the end of DRX Command MAC CE reception; |
| NEC | Disagree (given P2 is agreed) | probably issues and proposals for DRX Command MAC CE should be discussed and confirmed all together… so that any (small) point is not missed. |
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## Proposed corrections by Ericsson to 38.331 ([R2-2007258](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_111-e/Docs/R2-2007258.zip))

The *secondaryDRX-Group* UE capability can be different for FDD and TDD, similar as the existing *longDRX-Cycle* and *shortDRX-Cycle* capabilities, see 36.306.

However the *secondaryDRX-Group* IE was incorrectly added to the *MAC-ParametersCommon* IE and should have been added to the *MAC-ParametersXDD-Diff* IE in 38.331:

**Proposal 8:** The *secondaryDRX-Group* MAC parameter is moved to the *MAC-ParametersXDD-Diff* IE.

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| **Company** | **Agree/**  **Disagree** | **Comments** |
| Ericsson | Agree | Specs need to be aligned. |
| Qualcomm | Agree |  |
| OPPO | Agree |  |
| Apple | Agree |  |
| NEC | Agree |  |
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## Any other suggestions

It is possible that the rapporteur overlooked some issues, or that some corrections were not discussed above, because the rapporteur tried to discuss the overlapping issues at once. Companies have the opportunity to add topics here that are not covered above:

**Proposal 9: TBD**

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| **Company** | **Comments** |
| Qualcomm | Since DRX Group is a new feature, we’d like to suggest adding a definition for it in 3.1 Definitions. The text can be the following:  **DRX Group**: Serving Cells may be configured by RRC in two groups with separate DRX parameters, called DRX Groups. The DRX parameters that are separately configured for each DRX Group are *drx-onDurationTimer* and *drx-InactivityTimer*, while other DRX parameters are common to both DRX Groups. |
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# 2nd phase discussion

TBD

# Summary

TBD

# Conclusions

TBD

# References

1. [R2-2007062](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_111-e/Docs/R2-2007062.zip), *38321 CR Corrections on Secondary DRX*, LG, CR 38.321, RAN2#111-e
2. [R2-2007370](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_111-e/Docs/R2-2007370.zip), *CR for secondary DRX group*, OPPO, CR 38.321, RAN2#111-e
3. [R2-2007486](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_111-e/Docs/R2-2007486.zip), *Miscellaneous corrections for multiple DRX groups*, Nokia, CR 38.321, RAN2#111-e
4. [R2-2007258](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_111-e/Docs/R2-2007258.zip), *Correction to secondaryDRX-Group capability*, Ericsson, CR 38.331, RAN2#111-e
5. [R2-2007890](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_111-e/Docs/R2-2007890.zip), (*Re)start condition of drx-shortCycleTimer for secondary DRX*, MediaTek, DISC+TP, RAN2#111-e
6. [R2-2006331](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2006331.zip), *Email report [AT110e][037][TEI16] Secondary DRX (Ericsson),* Ericsson, Report, RAN2#110-e
7. [RP-201198](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_88e/Docs/RP-201198.zip), *Technically endorsed RAN2 CRs on Secondary DRX*, RAN2, CR pack, RAN#88

# Annex: contact information

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