3GPP TSG-RAN2 Meeting #110-e R2-200xxxx

eMeeting, 1st – 12th June, 2020

Agenda Item: 6.20.2.1 Open / ongoing proposals

Source: Ericsson

Title: Email report [AT110e][037][TEI16] Secondary DRX (Ericsson)

Document for: Discussion and Decision

# Introduction

During RAN2#110-e it was agreed to have an email discussion on:

* [AT110e][037][TEI16] Secondary DRX (Ericsson)

Scope: Treat R2-2004325, R2-2004364, R2-2005729 and Aspects that do not overlap with email discussion of: R2-2004856, R2-2004553, R2-2004640, R2-2004786 (proponents are responsible to explain and drive)

Part 1: Identify agreeable changes, and make agreements as far as possible. Deadline: June 4, 0700 UTC. Possibly if needed can be revisited on-line.

Part 2: For agreeable parts, continuation to agree CRs. Deadline: June 10, 0700 UTC

This document describes phase 1 of this email discussion.

# Phase 2

## Introduction

RAN2 discussed the response LS from RAN1 and RAN4 on secondary DRX and agreed:

* R2 continue to develop the solution and CRs at current meeting, endorse if possible, solutions to be simple, and have minimal R1 impact (as far as we can tell). Whether to have this in R16 or not for decision at RP.

The objective of phase 2 of this email discussion is to see if RAN2 can technically endorse the CRs for secondary DRX.

The open issues were discussed in the email discussion before the meeting (#054) and in phase 1 of the email discussion in this meeting (#037):

**Email discussion #054 (**[R2-2005729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2005729.zip)**):**

There was quite a large majority how to solve the open issues discussed during email discussion #054. The rapporteur thinks that these proposals are agreeable, and the CRs submitted to this meeting [7, 8, 9] are aligned with these proposals, and no further updates are needed:

**Proposal 1**: Joint configuration of DCP and secondary DRX is not supported in REL-16.

**Proposal 2**: Joint configuration of SCell dormancy during Active Time and secondary DRX is not supported in REL-16.

**Proposal 3**: All serving cells in the secondary DRX group shall belong to one Frequency Range and all serving cells in the legacy DRX group shall belong to another Frequency Range.

**Proposal 4**: The network shall configure a shorter *drx-InactivityTimer* and *drx-onDurationTimer* for the secondary DRX group compared to the default DRX group.

**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.

**Proposal 6**: The (Long) DRX Command MAC CE is handled per DRX group, i.e. it controls the DRX cycle switch of the DRX group where the command is received.

**Proposal 7**: While SR on PUCCH is pending both DRX groups are in Active Time.

**Proposal 8**: When RAR using CFRA has been received, and PDCCH indication new transmission has not been received yet, both DRX groups are in Active Time.

**Proposal 9**: The UE reports periodic and semi-persistent CSI when the DRX group that is configured with PUCCH/PUSCH for CSI reporting is in Active Time.

**Proposal 10**: SRS is transmitted when the DRX group where SRS is transmitted is in Active Time.

**Phase 1 email discussion #037 (see chapter 3):**

Based on the feedback, the rapporteur thinks that the following proposals of phase 1 are agreeable:

**Proposal 3**: Both DRX groups are in Active Time when *ra-ContentionResolutionTimer* is running,

**Proposal 4**: The UE is not required to support perFRgap when the UE supports secondary DRX group.

**Proposal 5**: The secondary DRX group capability is per UE.

**Proposal 7**: The UE can signal a separate *preferredDRX-InactivityTimer* value for the secondary DRX group

The CRs submitted to this meeting [7, 8, 9] are aligned with these proposals, except for proposal 7. It is proposed to discuss the stage 3 details for proposal 7 further in phase 2 of this email discussion, see “phase 2 discussion” below.

Concerning proposal 1, 2, and 6 of phase 1:

**Proposal 1**: The legacy DRX group remains in Active Time, while the secondary DRX group is in Active Time.

One company asked to capture explicitly in the phase 1 summary that RAN2 could not agree to couple the Active Time. The rapporteur proposes to discuss the coupling of the Active Time further in phase 2.

**Proposal 2**: The network is only required to configure the DRX groups in different frequency ranges when the UE supports perRFgap capability.

Proposal 2 is overlapping with proposal 4 in phase 1.

**Proposal 6:** The introduction of Dual DRX should be postponed to R17 power saving.

RAN2 agreed that this is for the RAN plenary to decide.

## Phase 2 discussion

**Coupling of Active Time**

There are potential problems when FR1 goes to sleep while FR2 remains active: CSI reporting from FR2 is interrupted, when PUCCH for CSI reporting is configured on FR1 only, and HARQ ACKs for FR2 are missing when uplink is configured on FR1 only. In many scenarios the uplink may be configured on FR1 only, due to coverage and uplink performance issues on FR2:

**Proposal 2-1**: When the *drx-InactivityTimer* of the primary group expires, while the *drx-InactivityTimer* of the secondary DRX group is running, the UE re-starts the *drx-InactivityTimer* of the primary group with the remaining time of the *drx-InactivityTimer* of the secondary DRX group.

Proposal 2-1 has been included in the draft CR 38.321 in the drafts folder for further discussion.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Ericsson | Agree | We think that coupling of the Active Time is required in the implementation to prevent certain problems.  We think that coupling of the Active Time cannot be efficiently achieved solely through NW scheduling, e.g. when the last data on FR2 does not get through due to poor coverage, while traffic on FR1 is acknowledged. Other NW solutions to keep FR1 artificially active, e.g. through scheduling of (fake) grants is not power efficient from a UE perspective (UE transmissions are very costly compared to PDCCH monitoring). Our proposal is that the *drx-InactivityTimer* for FR1 should be re-started when FR2 is still in active time. We do not think that this will happen often, and that there is minimal impact on the UE power consumption. We do think that this use case can happen and needs to be resolved. |
| Qualcomm | Neutral | Technically, we do not see strong needs to couple active time of two DRX groups. For example, even if PUCCH is configured on only FR1, UE should transmit HARQ feedback when such is expected by network (as in legacy), even when FR1 carriers are in DRX off state. So are aperiodic SRS transmissions.  On the other hand, in the spirit of moving forward, we can agree to coupling active time of two DRX groups, if that is preferred by majority of companies.  If the coupling of active time is agreed in principle, we can discuss further details of the coupling. For example, we think a simpler and more robust way to implement it is to specify that in the definition of active time, instead of restricting it to the start or restart of *drx-InactivityTimer.* |
| LG | Disagree | The solution should be kept simple as much as possible. Coupling two independent functions will bring unpredicted issue. Moreover, the situation addressed by Ericsson (i.e. when the last data on FR2 does not get through due to poor coverage, while traffic on FR1 is acknowledged) will not frequently happen, and the coupling is unnecessary optimization for rare case. |
| HW | Agree | From the NW vendor perspective, we don't accept separate Active Time for FR1 and FR2 which will put restriction on NW scheduling in order to keep FR1 active for CSI measurement and report from FR2. As for the stage 3 details, we should stick to the principle that the solution has to be as simple as possible in TEI, and the simplest solution is to exclude drx-InactivityTimer from secondary DRX to prevent the restart of the timer on FR2. We believe that this is the only clean solution with least impact to standard and to both NW and UE implementation. |
| Intel | Neutral | We share the same view as Qualcomm. Although we prefer decoupling in phase 1 discussion, we’re also OK to accept decoupling if that is majority view.  As for stage-3 changes, we agree with the proposal of Qualcomm by specify the coupling (if agreed) in the definition of Active Time. Only specifying the behaviour for *drx-InactivityTimer* is not sufficient since DRX Active Time also include other components e.g. when DRX retransmission timers are running. |
| Apple | Neutral | We share same view as Qualcomm. Our understanding is that 2 DRX groups without coupling active time can work well without L1 impact. But we are fine with it if it is the key point to introduce the 2 DRX group. |
| ZTE | Disagree | In our understanding, the drx-inactiveTimer in the primary DRX group can be started by the secondary DRX group is not a simple solution, since as LG mentioned above, this kind of coupling may cause unpredictable issue. If we would like to go for simple solution, we suggest that Whenever grant for new transmission is received, the UE should restart the drx-inactiveTimer for both DRX groups, and it is up to NW implementation to ensure the drx-inactiveTimer for primary DRX group is longer than secondary DRX group.  In addition to the drx-activeTimer, based on the target of the coupling active time, we think the drx-retransmissionTimer has to be taken into account as well. |
| OPPO | Disagree | We should following the principle agreed in the previous session to make it simple, to us, coupling two independent DRX Active Time would make it complex. |
| Nokia | Neutral | We prefer to ensure NW flexibility in scheduling and getting the needed reports for performing it but agree with Qualcomm, we should digest into other ways of achieving this. |
| MediaTek | Neutral | For simplicity, We prefer to have decoupled active time for the two DRX groups. But, considering NW configuration flexibility (i.e. FR1 only HARQ ACKs and PUCCH for CSI report mentioned by the rapporteur), we are okay to follow the majority view and consider how to model coupled active time in spec. |
| CATT | Agree | On top of Ericsson’s argument, it also prevents from configuring PUCCH in both groups to address the issue of CSI reporting in FR1 PUCCH when only FR2 is in Active Time, which we don’t think is a corner case. |

**Stage 3 details of *preferredDRX-InactivityTimer* value for the secondary DRX group**

A simple solution is proposed that is aligned with the general UE assistance framework signalling.

The general UAI rules are: 1. UE can only report a preference after configuration 2. After configuration the UE can signal a preference, and the prohibit timer is started. 3. The UE can signal a change in preference when the prohibit timer is not running. 4. When the UE omits one of the DRX preferences the NW assumes the UE does not have a preference of the parameter that is omitted 5. When the UE omits the complete DRX preference structure in the UAI message the NW assumes that the previously signalling values remain valid.

**Proposal 2-2**: Adopt the general UAI rules for *preferredDRX-InactivityTimer* for the secondary DRX group and introduce *preferredDRX-InactivityTimerSecondaryGroup* for the secondary DRX group in *DRX-Preference-r16* structure:

DRX-Preference-r16 ::= SEQUENCE {

preferredDRX-InactivityTimer-r16 ENUMERATED {

ms0, ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60, ms80,

ms100, ms200, ms300, ms500, ms750, ms1280, ms1920, ms2560, spare9, spare8,

spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL,

preferredDRX-LongCycle-r16 ENUMERATED {

ms10, ms20, ms32, ms40, ms60, ms64, ms70, ms80, ms128, ms160, ms256, ms320, ms512,

ms640, ms1024, ms1280, ms2048, ms2560, ms5120, ms10240, spare12, spare11, spare10,

spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL,

preferredDRX-ShortCycle-r16 ENUMERATED {

ms2, ms3, ms4, ms5, ms6, ms7, ms8, ms10, ms14, ms16, ms20, ms30, ms32,

ms35, ms40, ms64, ms80, ms128, ms160, ms256, ms320, ms512, ms640, spare9,

spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL,

preferredDRX-ShortCycleTimer-r16 INTEGER (1..16) OPTIONAL,

preferredDRX-InactivityTimerSecondaryGroup-r16 ENUMERATED {

ms0, ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60, ms80,

ms100, ms200, ms300, ms500, ms750, ms1280, ms1920, ms2560, spare9, spare8,

spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL

}

Proposal 2-2 has been included in the draft CR 38.331 in the drafts folder for further discussion.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Ericsson | Agree | It is our understanding that the UE would only signal a preference for the *drx-InactivityTimerSecondaryGroup* when secondary DRX is configured. This could be further clarified, but we are not sure if there is a strong need for it, because the new parameter is always piggybacked when the UE sends preferences for other DRX parameters, i.e. there is no additional signalling overhead. The NW can simply ignore the preference when secondary DRX is not configured. This aspect is also similar for the short DRX preferences, which may not be configured in the UE when the UE reports DRX preferences. |
| Qualcomm | Agree | We share the same view as Ericsson. |
| HW | Disagree | As commented to Proposal 2-1, if we really need to implement the feature in early R16 as requested by some operators, we believe that drx-InactivitiyTimer should be excluded from the secondary DRX in this release. |
| Intel | Agree | We agree with Ericsson in general. One general question we’d like to raise is regarding the applicability of secondary DRX group feature to DC. Our understanding is that secondary DRX group is proposed for FR1+FR2 CA deployment. However there seems to be no explicit agreement that the feature cannot be applied to DC (e.g. from the draft TS 38.306 CR in R2-2004857). So our question is whether we need to address following UE Assistance Information related questions in case secondary DRX group is used in DC deployment (with FR1+FR2 CA within one cell group):   1. Do we need to allow transmission of *preferredDRX-InactivityTimerSecondaryGroup-r16* to the secondary gNB (transparently to the primary gNB)? 2. UAI procedure and field descriptions allow preference to be indicated to a given cell group (e.g. “DRX parameters of a cell group”). We wonder if there would be confusion now that the secondary group inactivity timer is also added within the DRX parameter general structure. Maybe we should rename the variable to *preferredDRX-InactivityTimerSecondaryDRX-Group-r16* to avoid the confusion (although the name is too long already) ? |
| Apple | Agree | We share Ericsson’s view. |
| ZTE | Not agree | It is up to NW to configure the drx-inactiveTimer length based on the legacy drx-inactiveTimer length, no suggestion from UE is needed. |
| OPPO | Not agree | We think the trigger for drx-preference can be independent, i.e., UE may have preference on primary DRX but not for secondary DRX or vice versa.  With this, we think the following change is feasible:  DRX-Preference-r16 ::= SEQUENCE {  preferredDRX-InactivityTimer-r16 ENUMERATED {  ms0, ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60, ms80,  ms100, ms200, ms300, ms500, ms750, ms1280, ms1920, ms2560, spare9, spare8,  spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL,  preferredDRX-LongCycle-r16 ENUMERATED {  ms10, ms20, ms32, ms40, ms60, ms64, ms70, ms80, ms128, ms160, ms256, ms320, ms512,  ms640, ms1024, ms1280, ms2048, ms2560, ms5120, ms10240, spare12, spare11, spare10,  spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL,  preferredDRX-ShortCycle-r16 ENUMERATED {  ms2, ms3, ms4, ms5, ms6, ms7, ms8, ms10, ms14, ms16, ms20, ms30, ms32,  ms35, ms40, ms64, ms80, ms128, ms160, ms256, ms320, ms512, ms640, spare9,  spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL,  preferredDRX-ShortCycleTimer-r16 INTEGER (1..16) OPTIONAL  }  SecondaryDRX-Preference-r16 ::= SEQUENCE {  preferredDRX-InactivityTimer-r16 ENUMERATED {  ms0, ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60, ms80,  ms100, ms200, ms300, ms500, ms750, ms1280, ms1920, ms2560, spare9, spare8,  spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL,  } |
| Nokia | Agree |  |
| MediaTek | Agree |  |
| CATT | Not agree | The inactivity timer is very much dependent on the traffic type, not much on the frequency being used. At this stage we are not sure how the UE would decide the value for the inactivity timer of the secondary DRX group. So we think it requires more thoughts and would prefer to keep this UAI unchanged in Rel-16. |

# Summary of phase 2

11 companies replied to phase 2.

A summary is provided for the two proposals discussed in phase 2:

**Proposal 2-1**: When the *drx-InactivityTimer* of the primary group expires, while the *drx-InactivityTimer* of the secondary DRX group is running, the UE re-starts the *drx-InactivityTimer* of the primary group with the remaining time of the *drx-InactivityTimer* of the secondary DRX group.

**Summary**: 3 companies agreed, 5 companies were neutral and 3 companies disagreed. Of the three companies that disagreed with the proposed solution, two companies think that there should not be a coupling, but one company disagreed with the proposed solution. Furthermore the companies that were neutral also expressed concerns about the proposal solution to enable the coupling via *drx-InactivityTimer* and it was noted that the UE is required to transmit HARQ feedback, report aperiodic CSI on PUSCH and report aperiodic SRS when such is expected independent from the requirement to monitor PDCCH (section 5.7 in 38.321):

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

**Rapporteur**: It is not clear if there is a common understanding that the proposed coupling is already covered by existing requirements. Furthermore the legacy text does not cover the case when periodic CSI reporting is configured. But perhaps it is correct that there is not a big UE impact to support the proposed coupling. Companies expressed concerns to specify the coupling via the *drx-InactivityTimer* and therefore the following correction is proposed:

When a DRX cycle is configured, the Active Time for serving cells in a DRX group includes the time while:

- *drx-onDurationTimer* or *drx-InactivityTimer* configured for the DRX group is running; or

- *drx-RetransmissionTimerDL* or *drx-RetransmissionTimerUL* is running on any serving cell in the DRX group; or

- *ra-ContentionResolutionTimer* (as described in clause 5.1.5) is running; or

- a Scheduling Request is sent on PUCCH and is pending (as described in clause 5.4.4); or

- a PDCCH indicating a new transmission addressed to the C-RNTI of the MAC entity has not been received after successful reception of a Random Access Response for the Random Access Preamble not selected by the MAC entity among the contention-based Random Access Preamble (as described in clause 5.1.4).

In addition, the Active Time for the serving cells, configured with *secondaryDRX-GroupConfig* as specified in TS 38.331, includes the time when the serving cells, not configured with *secondaryDRX-GroupConfig*, are in Active Time.

**Proposal 2-2**: Adopt the general UAI rules for *preferredDRX-InactivityTimer* for the secondary DRX group and introduce *preferredDRX-InactivityTimerSecondaryGroup* for the secondary DRX group in *DRX-Preference-r16* structure:

**Summary**: 6 companies agreed and 4 companies disagreed.

**Rapporteur**: There was not a large support for this enhancement, and RAN2 agreed to introduce a simple solution for the secondary DRX in REL-16. Therefore it is proposed to not agree on this enhancement. Without further corrections it is understood that the preferred *preferredDRX-InactivityTimer* applies only to the primary DRX group when the secondary DRX group is configured. It is anyways up to the NW how to configure the *drx-InactivityTimer* of the secondary DRX group, except that the UE shall configure it equal or shorter than the *drx-InactivityTimer* of the primary DRX group.

# Phase 1

In phase 1 the RAN1 LS ([R2-2004325](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004325.zip)), RAN4 LS ([R2-2004364](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004364.zip)), email report ([R2-2005729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2005729.zip)) and the proposals in the Ericsson contribution ([R2-2004856](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004856.zip)), OPPO contribution ([R2-2004553](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004553.zip)), vivo contribution ([R2-2004640](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004640.zip)) and Xiaomi contribution ([R2-2004786](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004786.zip)) to this meeting should be discussed, unless they were already discussed during the email discussion ([R2-2005729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2005729.zip)):

[R2-2004325](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004325.zip), *LS response on secondary DRX*, LS out, To: RAN2, Cc: RAN4, RAN1#100bis-e

[R2-2004364](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004364.zip), *LS on secondary DRX group for FR1+FR2 CA*, LS out, To: RAN2, RAN4, RAN4#94bis-e

[R2-2005729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2005729.zip), *Email report of [PostAT109bis-e][054][TEI16] Secondary DRX*, Ericsson, RAN2#110-e

[R2-2004856](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004856.zip), *Introduction of secondary DRX group*, Ericsson, DISC, RAN2#110-e

[R2-2004553](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004553.zip), *Further considerations on secondary DRX group*, OPPO, DISC, RAN2#110-e

[R2-2004640](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004640.zip), *Views on NR TEI for secondary DRX group*, vivo, DISC, RAN2#110-e

[R2-2004786](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004786.zip), *Views on introduction of Dual DRX*, Xiaomi, DISC; RAN2#110-e

There was one submission under the Power Saving agenda item that is added to this email discussion:

[R2-2004558](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004558.zip), *Impact of secondary DRX group on UE assistance information*, OPPO, DISC; RAN2#110-e

The following topics were already discussed during email #054 ([R2-2005729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2005729.zip)) which lead to the following proposals:

1. RAN1 reply LS

**Proposal 1**: Joint configuration of DCP and secondary DRX is not supported in REL-16.

**Proposal 2**: Joint configuration of SCell dormancy during Active Time and secondary DRX is not supported in REL-16.

1. RAN4 reply LS

Many companies think that no further discussion in RAN2 is required based on the RAN4 reply LS. But there are also quite a few companies that think that the UE should support perFRgap with secondary DRX to make use of the power saving gains. Two companies pointed out that more work in RAN4 is needed when RAN2 decides to introduce secondary DRX. From a rapporteur perspective we make the following comments:

* The need to support perFRgap with secondary DRX was extensively discussed in RAN4 meeting, and RAN4 did not agree that the UE is required to support perFRgap with secondary DRX. The need to support perFRgap is a RAN4 topic, and RAN4 is the working group that can best decide if this is required or not. Furthermore the same discussion should not be repeated in RAN2.
* RAN4 indicated that there is impact on RAN4, but that the impact is limited.

1. RRC configuration issues

**Proposal 3**: All serving cells in the secondary DRX group shall belong to one Frequency Range and all serving cells in the legacy DRX group shall belong to another Frequency Range.

**Proposal 4**: The network shall configure a shorter *drx-InactivityTimer* and *drx-onDurationTimer* for the secondary DRX group compared to the default DRX group.

1. Active Time

**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.

**Proposal 6**: The (Long) DRX Command MAC CE controls the DRX cycle switch of both DRX groups.

**Proposal 7**: While SR on PUCCH is pending both DRX groups are in Active Time.

**Proposal 8**: When RAR using CFRA has been received, and PDCCH indication new transmission has not been received yet, both DRX groups are in Active Time.

1. CSI measurements and reporting

**Proposal 9**: The UE reports periodic and semi-persistent CSI when the DRX group that is configured with PUCCH/PUSCH for CSI reporting is in Active Time.

**Proposal 10**: SRS is transmitted when the DRX group where SRS is transmitted is in Active Time.

The new proposals submitted to RAN2#110-e [4-8] are listed below, and the proposals that have already been discussed in email discussion #054 are stricken though:

[R2-2004856](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004856.zip), *Introduction of secondary DRX group*, Ericsson, DISC, RAN2#110-e

**Proposal 1**: The legacy DRX group remains in Active Time, while the secondary DRX group is in Active Time.

**Proposal 2**: The network is only required to configure the DRX groups in different frequency ranges when the UE supports perRFgap capability.

[R2-2004553](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004553.zip), *Further considerations on secondary DRX group*, OPPO, DISC, RAN2#110-e

**~~Proposal 1~~** ~~If a SR is sent on PUCCH and is pending, UE enters Active Time for either or both of DRX groups based on the LCP restriction for the logical channel which triggers the SR.~~

**~~Proposal 2~~** ~~Upon receiving a RAR in CFRA, UE enters Active Time of a DRX group for the serving cell where preamble is sent.~~

**Proposal 3** For a UE configured with secondary DRX group, the UE enters Active Time of the primary DRX group if ra-*ContentionResolutionTimer* is running.

**~~Proposal 4~~** ~~The expiration of~~ *~~drx-InactivityTimer~~* ~~or~~ *~~drx-ShortCycleTimer~~* ~~for a DRX group triggers the DRX cycle switch for the corresponding DRX group.~~

**~~Proposal 5~~** ~~If a (Long) DRX Command MAC CE is received on a serving cell, UE switches the DRX cycle of a DRX group to which the serving cell belongs.~~

**~~Proposal 6~~** ~~UE reports periodic or semi-persistent CSI for a cell only when this cell is in Active Time, regardless of whether the cell carrying the CSI report is in Active Time or not.~~

**~~Proposal 7~~** ~~Secondary DRX group is not configured simultaneously with DCP or SCell dormancy in Rel-16.~~

[R2-2004640](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004640.zip), *Views on NR TEI for secondary DRX group*, vivo, DISC, RAN2#110-e

**~~Proposal 1:~~** ~~In Rel-16 TEI on secondary DRX group, if it is needed, only consider the case where secondary DRX group is not configured simultaneously with DCP or SCell dormancy for a UE.~~

**~~Proposal 2:~~** ~~The interaction with DCP or SCell dormancy indication for secondary DRX group, if needed, can be further considered in Rel-17, e.g. in the UE power saving enhancement WI.~~

**Proposal 3:** The TEI on secondary DRX group should be configured for UEs with per-FR MG capability in FR1 + FR2 CA.

**Proposal 4:** The capability for secondary DRX group should be defined as per-BC.

[R2-2004786](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004786.zip), *Views on introduction of Dual DRX*, Xiaomi, DISC; RAN2#110-e

**Proposal 1** The introduction of Dual DRX should be postponed to R17 power saving.

[R2-2004558](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004558.zip), *Impact of secondary DRX group on UE assistance information*, OPPO, DISC; RAN2#110-e

**Proposal** : RAN2 discuss how the UE provides its preference on DRX parameters if secondary DRX group is configured.

# Discussion

The new proposals identified in phase 1 are discussed below.

**Active time**

[R2-2004856](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004856.zip), *Introduction of secondary DRX group*, Ericsson, DISC, RAN2#110-e

Even when the *OnDurationTimer* and *drx-InactivityTimer* are configured shorter for the secondary DRX goup, there can be (corner) cases where the primary DRX group goes to sleep while the secondary DRX group is still in Active Time.

**Proposal 1**: The legacy DRX group remains in Active Time, while the secondary DRX group is in Active Time.

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| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Ericsson | Agree | This is perhaps a corner case, but potential problems with CSI reporting from FR2 can be avoided when proposal 1 is agreed, and we think proposal 1 is not complicated, nor increases the UE power consumption significantly. |
| Qualcomm | Disagree | Given that on duration timer and data inactivity timer for legacy DRX groups are longer, this scenario where legacy DRX group goes to sleep before secondary DRX group does happens only when network schedules traffic exclusively on FR2. That does not seem to be a sensible network implementation to us, i.e. not to fully utilize all available radio resources when there is enough traffic requiring the use of FR2 carriers. On other hand, even if that happens in some network implementation, system is not broken. For example, for CSI reporting, although periodic CSI reports for FR2 carriers have to stop after FR1 carriers enter sleep, network can just use aperiodic CSI to get CSI reports on FR2 carriers.  Therefore, we do not think any forced coupling between active time of two DRX groups is needed. |
| NEC | Disagree | it seems that before having additional agreements, e.g. shorter timers in secondary DRX group or handling of SR/CFRA (Proposals 4,7,8 in post-109bis Email discussion report [3]), this proposal itself may not be so meaningful. However, in any case, there is no need for such restriction. This could happen according to ongoing data activity due to traffic volume or HARQ retransmissions in each DRX group, but nothing will be broken. |
| LG | Disagree | There should be no dependencies between two DRX groups. |
| Intel | Disagree | We share the same view as Qualcomm. |
| HW | Agree | As we pointed in the previous discussions, the misaligned active time for two DRX groups have impact on the RLM and CSI reporting from FR2. We understand the issue comes from the drx-InactivityTimer, and the simplest approach is to exclude drx-InactivityTimer, which would make the discussions easier to conclude. Otherwise, we have strong concers on how to settle down the feature in TEI within the last meeting before ASN.1 frozen. |
| OPPO | Disagree | Firstly, we think FR1 DRX and FR2 DRX Active Time should be independent. Secondly, we have different understanding on the PUCCH CSI reporting, in the case when reported carrier (FR2) is in Active Time and reporting carrier (FR1) is not in Active Time, UE can still report the PUCCH CSI in order to enable data scheduling in FR2. |
| vivo | Disagree | We also think this restriction makes no sense. There is not much time when the legacy DRX group is not in Active Time but the secondary DRX group is in Active Time. Firstly, we would like to understand why network only schedules on FR2 and gives up radio resource on the FR1 when there is enough traffic buffering. Secondly, even if only FR2 is in Active Time, the network can get CSI reports on FR2. Hence the restriction is not needed. |
| Panasonic | Disagree | We agree with Qualcomm |
| MediaTek | Disagree | We share same view with QC. We prefer to decouple active time of the two DRX groups. |
| Nokia | Agree | We should not artificially require NW to schedule over primary DRX group to keep it in Active Time while the secondary DRX group is in Active Time to ensure, e.g., proper CSI reporting from FR2. |
| Apple | Disagree | We share the same view as Qualcomm. |
| ZTE | Agree | Share the same view with HW |
| CATT | Agree | On top of Ericsson’s argument, it also prevents from configuring PUCCH in both groups to address this issue, which we don’t think is a corner case. |
| Verizon | Agree | This helps for exception case handling |
| Futurewei | Agree | There shouldn’t be unnecessary restriction on network’s scheduling operation over FR1 and FR2. |
| Samsung | Agree |  |
| Spreadtrum | Disagree | We agree with Qualcomm |
| Deutsche Telekom | Agree | Share the view of HW |
| NTT DOCOMO | Agree | Same view as Ericsson. Instead of optimising the corner case, proper CSI reporting needs to be ensured. |
| Xiaomi | Agree | We think this restriction is reasonable. A sensible network implementation should keep FR1 carriers active as long as FR2 carriers are active |
|  |  |  |
|  |  |  |

**Frequency Range**

[R2-2004856](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004856.zip), *Introduction of secondary DRX group*, Ericsson, DISC, RAN2#110-e

**Proposal 2**: The network is only required to configure the DRX groups in different frequency ranges when the UE supports perRFgap capability.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Ericsson | Agree | We think that the NW configuration restriction only makes sense when the UE support perFRgap, otherwise it is not needed.  PS: there is a dependency with proposal 4 below, i.e. in case it is agreed that UE shall support perFRgap with secondary DRX. |
| Qualcomm | See comment | We agree that power saving enabled by DRX group would be limited if UE does not support perFRgap capability.  But regardless of whether UE supports perFRgap or not, network always has the full control in whether to configure DRX groups or not. So we are not sure if anything needs to be captured in the specs. And we can just leave it to network configuration.  If companies want to capture a common understanding in the meeting minutes/agreements, the proposal maybe can be reworded to:  “Network is not required to configure DRX groups in different frequency ranges for a UE that does not support perFRgap capability.” |
| NEC | See comment | this is rather UE capability aspect which highly depends on RAN4 work, but not functional aspect. We do not see any urgency to agree or disagree with this network behavior. if necessary, it should be discussed from UE capability point of view. |
| LG | Disagree | Though it is reasonable configuration, it is up to network. There should be no configuration restriction from the specification point of view. |
| Intel | Disagree | We share Qualcomm’s view that the configuration aspect can be left to network implementation. |
| HW | Agree | We think P2 is the intention that we agreed it is the preliminary understanding in the previous discussions, and thus we should stick to the previous agreement. |
| OPPO | Agree | We agree with the intention, it’s up to network configuration and smart network configuration does not configure secondary DRX if UE does not support per FR MG capability. We’re open to add an restriction for network saying that the secondary DRX is configured when UE supports per FR MG capability. |
| vivo | Agree with comments | We think the proposal should be:  The network is required to configure the DRX groups in different frequency ranges only when the UE supports perRFgap capability.  We think this restriction makes sense, which is the main motivation when we agreed to have this secondary DRX group. |
| Panasonic | Disagree | It can be left up to NW configuration. |
| MediaTek | Disagree | We can leave this up to NW configuration, so nothing needs to be captured in spec. |
| Nokia | Disagree | The proposal seems rather confusing and we don’t want the NW to be required to configure the feature regardless of UE support for perRFgap capability. |
| Apple | Disagree | We share Qualcomm’s view that the configuration is up to NW implementation. |
| ZTE | Agree | This is the original intention why we agree with introduction of it |
| CATT | Disagree | Same view as above companies. We see no reason to relax the requirement about the different frequency ranges. This is a RAN2 agreement, we don't need to re-discuss it. |
| Verzion | See comment | Share the same view with QC and many others – it is up to the NW, though the intention is for different frequency range. A lot of the differences of “agree” or “disagree” is just the interpretation of the question and different ways of answering. We don’t see further specifing it is needed (or important). |
| Futurewei | Disagree | Though it is understood that the intention is to use the secondary DRX group when UE is capable of per-FR measurement gap, it shouldn’t be network requirement but rather should be network choice to configure secondary DRX group when it deems secondary DRX group useful. |
| Samsung | See comment | It is preferable to defer to NW implementation rather than introducing any limitation. |
| Spreadtrum | Disagree | Leave to gNB implementation. |
| Deutsche Telekom | Agree | Same view with ZTE, that was the original intention. |
| NTT DOCOMO | Agree | O.K to stick to the original intention, as long as the function is available, whilst the spec usually does not pose such a restriction. |
| Xiaomi | Agree | That is the motivation to have the secondary DRX group. |

***ra-ContentionResolutionTimer***

[R2-2004553](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004553.zip), *Further considerations on secondary DRX group*, OPPO, DISC, RAN2#110-e

**Proposal 3:** For a UE configured with secondary DRX group, the UE enters Active Time of the primary DRX group if ra-*ContentionResolutionTimer* is running.

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| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Ericsson | Disagree | We think this should be handled similar as for SR and RAR i.e. both groups wake up. |
| Qualcomm | Disagree | We have the same view as Ericsson. |
| NEC | Disagree | but firstly handling of SR and CFRA should be decided based on Email discussion report [3], then confirm this. |
| LG |  | Same view as NEC. The e-mail discussion on SR and CFRA should be decided first. |
| Intel | Disagree | Agree with Ericsson. |
| HW | Disagree |  |
| OPPO | Agree | Active time is independent between FR1 and FR2, for contention resolution timer, it’s used for UE for monitoring DCI scheduling MSG4. Currently, DCI scheduling MSG4 can only be transmitted in PCell/PSCell which corresponding to one of the DRX groups, so we think UE can only starts the Active Time for that DRX group. It does not make any sense to let UE start Active Time for the other DRX group for which UE can not receive DCI scheduling MSG4. |
| vivo | Disagree | We also think both DRX groups will wake up in this case. |
| Panasonic | Disagree | Agree with Ericsson |
| MediaTek | Disagree | Both DRX group should enter active time. |
| Nokia |  | In principle, the contention resolution is only scheduled through SpCell so in that sense this could be considered. |
| Apple | Disagree |  |
| ZTE | Disagree |  |
| CATT | Disagree | Same understanding as Ericsson. |
| Verizon | Disagree | Agree with Ericsson & others. Both waking up is a cleaner solution with less hidden risk |
| Futurewei | Disagree | Both DRX group should wake up to avoid other subtle issues. |
| Samsung | Disagree |  |
| Spreadtrum | Disagree | We have the same view as Ericsson. |
| Deutsche Telekom | Disagree |  |
| NTT DOCOMO | Disagree | Although we share the same view as NEC, it is simple and straight forward that both groups wake up. |
| Xiaomi | Disagree | This UL/assignment grant after msg2 in CFRA can be scheduled on both groups. So a simple way is to wake both groups. |

**Per-FR MG capability**

[R2-2004640](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004640.zip), *Views on NR TEI for secondary DRX group*, vivo, DISC, RAN2#110-e

**Proposal 4:** The TEI on secondary DRX group should be configured for UEs with per-FR MG capability in FR1 + FR2 CA.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Ericsson | Disagree | It is true that the UE obtains the most power saving gain, when the UE supports perFRgap capability with secondary DRX. But RAN4 has discussed whether a UE supporting secondary DRX group shall support perFRgap capability, but RAN4 did not agree on this, and RAN2 should not re-discuss this. RAN4 is the WG that can best asses whether perFRgap is needed. |
| Qualcomm | Disagree | See our comment on Proposal 2. |
| NEC | Agree, but see comment | Firstly, as RAN4 confirms, the feature gives the most benefit when the UE supports the per-FR MG. At the same time RAN4 does not say it is not feasible to support by the UE without per-FR MG capability.  What RAN2 should do is to discuss and confirm whether there is technical issue when the UE without per-FR MG capability supports the secondary DRX? This should be discussed from UE point of view, not network configuration point of view, because if the network receives the information that the UE supports the secondary DRX group even though it does not support per-FR MG, there is no stopper to configure the feature to this UE from functional aspect.  Therefore, our view is as follow:  - from network point of view, the secondary DRX **should be** configured to the UE with per-FR MG capability to realize good UE power saving,  - from UE point of view, if the UE/chipset vendors want to support the secondary DRX regardless of per-FR MG capability, it is up to them. If they want, they **can support**. This is because we cannot identify the issue prohibiting from doing as such. |
| LG | Disagree | See our comment on Proposal 2. |
| Intel | Disagree | Agree with Ericsson. |
| HW | Agree | That is just what RAN4 concerns on how to implement this feature. We understand if we really rush for this, we should take RAN4 concerns into account and not expand the discussions. Otherwise, we need a second round LS check with RAN4. |
| OPPO | Disagree | We think this is the correct intention but we don't think there should be any restrictions on the specification. It’s up to network configuration and smart network configuration does not configure secondary DRX if UE does not support per FR MG capability. |
| vivo | Agree | We think this is the intention for RAN4’s reply LS. In RAN4 reply LS [4], it is clearly stated that RAN4 has observed that dual DRXs configured to the UE without per-FR MG capability in FR1 + FR2 CA may not be able to provide same power saving gain.  In our understanding, the reasonable implementation for UE capable of per-FR MG have individual RF chains for FR1 and FR2. On/off control on different RF chain can be performed by dual DRX groups. In this way, power saving gain can be obtained for UEs with per-FR MG capability. For UEs without per-FR MG capability in FR1+FR2 CA, even different DRX on/off state can be achieved by secondary DRX group, but the UE cannot go to sleep due to the implementation. |
| Panasonic | Disagree | Agree with Ericsson |
| MediaTek | Disagree | We understand the intention, but we think it could be up to NW configuration/determination whether to configure secondary DRX for a UE without per-FR MG capability in FR1+FR2 CA. |
| Nokia | Disagree | Up to RAN4. |
| Apple | Disagree | Agree with Ericsson |
| ZTE | Agree |  |
| CATT | Agree | This is consistent with the primary intention of the feature, the discussion on P2 and earlier RAN2 agreement. |
| Verizon | Disagree | Our understanding is also that RAN4 didn’t say to support this, UE needs to support per-FR MG capability. NW should be able to handle it properly without this added specification. |
| Futurewei | Agree | But there may be no specs impact, as it is up to network implementation. |
| Samsung | Disagree |  |
| Spreadtrum | Disagree | Up to RAN4. |
| Deutsche Telekom | Disagree | Up to RAN4 |
| NTT DOCOMO | Disagree | Same view as Ericsson that it is up to RAN4. |
| Xiaomi |  | It is for RAN4 to decide. |

**UE capability**

[R2-2004640](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004640.zip), *Views on NR TEI for secondary DRX group*, vivo, DISC, RAN2#110-e

**Proposal 5:** The capability for secondary DRX group should be defined as per-BC.

|  |  |  |
| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Ericsson | Disagree | When the UE indicates support for secondary DRX group, the UE should support it for all the supported band combinations in different FRs. |
| Qualcomm | Disagree | Our view is that per-UE capability likely is sufficient, as DRX groups are already restricted to per FR in FR1+FR2 CA configuration. |
| NEC | Disagree | Given that the DRX groups are configured in FR1 and FR2 respectively, the per-UE capability should be sufficient. |
| LG | Disagree | This feature is independent of band combination. |
| Intel | Disagree | Agree with Ericsson and Qualcomm. |
| HW | Disagree |  |
| OPPO | Disagree |  |
| vivo | Agree | If we agree to have per-UE capability, we should clearly capture in the specification that secondary DRX group is only applicable in FR1+FR2 CA. |
| Panasonic | Disagree |  |
| MediaTek | Disagree | Per-UE capability should be sufficient, i.e. supported for all band combinations. |
| Nokia | Disagree |  |
| Apple | Disagree |  |
| ZTE | Disagree |  |
| CATT | Disagree | We don’t think such granularity is needed. |
| Verizon | Disagree |  |
| Futurewei | Disagree | Per UE capability should be sufficient. |
| Samsung | Disagree |  |
| Spreadtrum | Disagree |  |
| Deutsche Telekom | Disagree |  |
| NTT DOCOMO | Disagree | Per-UE capability is enough, as it is not clear if functional support and testing is different amongst the band combinations supported by the UE. |
| Xiaomi | Disagree | Per-UE capability is sufficient. |

**Postpone to REL-17**

[R2-2004786](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004786.zip), *Views on introduction of Dual DRX*, Xiaomi, DISC; RAN2#110-e

**Proposal 6:** The introduction of Dual DRX should be postponed to R17 power saving.

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| --- | --- | --- |
| **Company** | **Agree/Disagree** | **Comments** |
| Ericsson | Disagree | We think that the open issues have been addressed in email discussion #054 and this email discussion. The solution has been scaled down to a simple solution that can be supported in REL-16 with an acceptable impact on other WGs. Furthermore, and most importantly, there is large support for this feature in REL-16. The power consumption in FR2 is a concern for the operators which should be addressed. |
| Qualcomm | Disagree | Outcome of the post RAN2#109bis email discussion has shown that there is a strong support for this feature and companies have converged on nearly all open issues. We thus expect good progress can be made in this meeting. Moreover, as Ericsson explained above, power consumption in FR2 is a concern for operators and they do hope this feature can be deployed as soon as possible. |
| NEC | Disagree | Given that some combination of other features with the secondary DRX is to be removed (i.e. not supported), there seems no technical concern additionally for introducing this feature in Rel-16. |
| LG | Agree | RAN1 has not confirmed that the introduction of secondary DRX has zero or very little impact to RAN1 specifications. In addition, RAN4 impacts may not be neglected. Even the RAN2 aspects, there are many issues that need to be resolved. Thus, it is not feasible to introduce Dual DRX in Rel-16. |
| Intel | Disagree | Agree with Ericsson and Qualcomm. |
| HW | Agree | As identified by the contributions on the table, we don't believe it is a good idea to finalize everything within one meeting without any further check with other WGs. Given that we have introduced SCell dormancy and WUS, we truly believe there is no urgent to have another feather, which cannot be combined with existing mechanisms, unless there is convincing proof that sec DRX overwhelms the other two mechanisms. Otherwise, why it was not prioritized at the study phase of PS in R16? We think more analysis is therefore needed and can be postponed to Rel-17. |
| OPPO | Open | We are open to postpone this to Rel-17 given that there are some R16 power saving feature may not be supported if we have secondary DRX. We think it could be better to develop a complete feature instead of split it into different releases. |
| vivo | Open | We share the same view as OPPO. From technique point of view, it is better to consider it with power saving features as a complete design. But we are also OK to first introduce a simple, just a simple solution in Rel-16, after that, we can continue to discuss more design in future release. |
| Panasonic | Disagree | We share Qualcomm and Ericsson view. |
| MediaTek | Disagree | Based on previous agreement, we think we can have simple design for secondary DRX in R16. It may address the concern of FR2 power consumption (although the design may be not so complete and compatible with other features). |
| Apple | Disagree | Agree with Ericsson and Qualcomm. |
| ZTE | Agree |  |
| CATT | Disagree | No strong view though but this feature seems to have strong support from operators and discussions so far nailed down the issues and keep it simple. We would agree though to complement Rel-17 WID to include improvements related e.g. with joint configuration of DRX groups and DCP. |
| Verizon | Disagree | Being in Rel-16 is where its best value is. We need it now so we can request it immediately and have it up and running much earlier than the WUS. Having 2 loops working on the same things is common, and often good when they differ in time they apply. This is clearly an earlier goer much needed in our NW, which is currently suffering from big UE power consumption problem for FR2. It offers a much needed RAN2 high level approach – a diversity branch in addition to those lower level solutions (which usually take longer time to tune). We support efforts to make it simple (therefore reducing the scope a bit), but postphoning it is really not acceptable, sorry to say that but it would be hard to explain should that happen. |
| Futurewei | Agree | Given that it is the last meeting to finalize R16 functionalities and many open issues are still to be addressed, it’d be better not to rush into a decision that has many gaps to fill and may impact other WGs. |
| Samsung | Disagree | We have strong view to support this feature in Rel-16. It’s really immediate work in market. |
| Spreadtrum | Agree | RAN1 impact is not clear yet, so it is preferable to postpone this to R17. |
| Deutsche Telekom | Disagree | We support this feature in Rel-16. |
| NTT DOCOMO | Disagree | As commented by the others, there seems not to be a technical concern if secondary DRX is not used together with the other power saving related features. Better to be completed in Rel-16. |
| Xiaomi | Agree | We can understanding people’s enthusiasm to introduce it in R16. But there are so many details for us to look into. An example is the active time definition for Dual DRX triggered by SR or RAR reception, people are not sure whether only the corresponding DRX group will be in active time or both DRX groups will be in active time. For the impact to CSI reporting, we face the same problem. As we can see from the recent email discussions, it is hard to reach the consensus. Also, from RAN1’s LS, they has not confirmed it.  Considering the very limited time and unpredicted impact on RAN1/RAN2/RAN4, we would like to put it to R17 power saving for further study instead of coming up with a premature solution at this point of time. |
|  |  |  |

**UE assistance**

[R2-2004558](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2004558.zip), *Impact of secondary DRX group on UE assistance information*, OPPO, DISC; RAN2#110-e

**Proposal 7**: RAN2 discuss how the UE provides its preference on DRX parameters if secondary DRX group is configured.

**Option 1**: The *preferredDRX-InactivityTimer* applies to primary DRX group only

**Option 2**: The UE can signal a separate *preferredDRX-InactivityTimer* value for the secondary DRX group (if configured)

**Option 3**: Other

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| --- | --- | --- |
| **Company** | **Preferred option** | **Comments** |
| Ericsson | Option 2 | PS: thanks to OPPO for bringing up this issue, i.e. we overlooked it.  The intention with secondary DRX is to configure a shorter *drx-InactivityTimer* for the secondary DRX group, and therefore we think it makes sense that the UE can also indicate a preference for the *drx-InactivityTimer* of the secondary DRX group. |
| Qualcomm | Option 2 | We also agree that it makes sense for UE to be able to indicate its preference for DRX inactivity timer for its secondary DRX group. |
| NEC | Option 1 | we do not see strong need to combine two different power saving functions, just like removing the combination with WUS in Rel-16. |
| LG | Option 2 | Two DRX groups are independent. Thus, it is logical that preference signal is provided per DRX group. |
| Intel | Option 2 | We are OK allowing UAI on secondary DRX group under network control (i.e. Option 2). If companies prefer not to allow this in Rel-16, it might be good to clarify that current preference refers to primary DRX group (i.e. as in Option 1).  On the capability part, we do not think that a new UE capability is needed for this new parameter to be defined within UAI assistance. Basically, a UE supporting reporting DRX preference (capability *drx-Preference-r16* as specified in Power Saving WI) and secondary DRX group (capability *secondaryDRX-Group* as in R2-2004857) should be able to send its preference on *drx-InactivityTimer* for the secondary DRX group. No change is forseen on TS 38.306, but for TS 38.331, some change is needed on the procedure text regarding the condition that UE send its UAI preference on *drx-InactivityTimer* for the secondary DRX group.    On the related stage-3 work (i.e. ASN.1 and procedural changes to 38.331) to capture sending UE’s preference on *drx-InactivityTimer* for the secondary DRX group, the changes should better be captured within PWS CR as otherwise both CRs would be drafted in the same meeting and may run into issues keeping them up to date with the latest TP (which could even end up on having overlapping discussions on both threads). |
| HW | Option 3 | As commented to Q1, drx-InactivityTimer should be out. |
| OPPO | Option 2 with clarification | We think the UE should be able to indicate it’s preference on secondary DRX, so we don't support option 1.  Regarding option 2, it would be good to clarify by signalling a separate *preferredDRX-InactivityTimer* value, it means we introduce a separate drx-preference including only *preferredDRX-InactivityTimer*, something like below:  DRX-Preference-r16 ::= SEQUENCE {  preferredDRX-InactivityTimer-r16 ENUMERATED {  ms0, ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60, ms80,  ms100, ms200, ms300, ms500, ms750, ms1280, ms1920, ms2560, spare9, spare8,  spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL,  preferredDRX-LongCycle-r16 ENUMERATED {  ms10, ms20, ms32, ms40, ms60, ms64, ms70, ms80, ms128, ms160, ms256, ms320, ms512,  ms640, ms1024, ms1280, ms2048, ms2560, ms5120, ms10240, spare12, spare11, spare10,  spare9, spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL,  preferredDRX-ShortCycle-r16 ENUMERATED {  ms2, ms3, ms4, ms5, ms6, ms7, ms8, ms10, ms14, ms16, ms20, ms30, ms32,  ms35, ms40, ms64, ms80, ms128, ms160, ms256, ms320, ms512, ms640, spare9,  spare8, spare7, spare6, spare5, spare4, spare3, spare2, spare1 } OPTIONAL,  preferredDRX-ShortCycleTimer-r16 INTEGER (1..16) OPTIONAL  }  SecondaryDRX-Preference-r16 ::= SEQUENCE {  preferredDRX-InactivityTimer-r16 ENUMERATED {  ms0, ms1, ms2, ms3, ms4, ms5, ms6, ms8, ms10, ms20, ms30, ms40, ms50, ms60, ms80,  ms100, ms200, ms300, ms500, ms750, ms1280, ms1920, ms2560, spare9, spare8,  spare7, spare6, spare5, spare4, spare3, spare2, spare1} OPTIONAL,  }  Then of course network should be able to configure whether UE can report UAI for secondary DRX preference if secondary DRX group is configured, and we need to add corresponding signalling in otherConfig.  We also think it should be included in power saving RRC CR, thus the signalling details can be discussed there. |
| vivo | Option 1 | Option 1 is sufficient in this stage. The effect to report a separate *preferredDRX-InactivityTimer* value for the secondary DRX group is limited. |
| Panasonic | Option 2 | Since these are individual DRX group, preference should be also provided per DRX group |
| MediaTek | Option 2 | Since two DRX groups apply different DRX inactivity timers, we think it makes sense for UE to report preferred DRX inactivity timer for the secondary DRX. |
| Nokia | Option 2 |  |
| Apple | Option 2 | The UE preference should be provided per DRX group. |
| ZTE | Option 3 | Agree with Huawei |
| CATT | Option 1 | Thus there is no difference in interpreting this parameter irrespective of whether the DRX group is configured or not. |
| Verizon | Option 2 | But it is not a critical issue. We are OK to simplify as long as we have the basic functionalities of the 2nd DRX feature in Rel-16. Small issues shouldn’t block the main goal. |
| Futurewei | Option 1 or Option 3 | The intention is to have secondary DRX group go to sleep earlier than the primary DRX group. What is preferred for secondary DRX group can already be deduced from what is indicated for primary DRX group. |
| Samsung | Option 2 |  |
| Spreadtrum | Option3 | Agree with Huawei |
| Deutsche Telekom | Option 2 |  |
| NTT DOCOMO | Option 1 | No need to optimise and over-engineer at this stage. It is enough to support basic functionality in Rel-16, i.e. no UAI for secondary DRX. |
| Xiaomi | Option 2 | Option 2 seems simple. But is it too early to go those details? |

# Summary of phase 1

21 companies replied to phase 1.

A summary is provided for each proposal, and the proposals that are considered agreeable are marked green, and proposals that require further discussion in phase 2 is marked blue.

**Proposal 1**: The legacy DRX group remains in Active Time, while the secondary DRX group is in Active Time.

**Summary**: 11 out of 21 companies agreed to couple the Active Time, while the other 10 companies disagreed. The company views are basically divided along UE vendor vs NW vendor line. UE vendors arguing this is a corner case assuming that the timers in secondary DRX are shorter, and that it can be prevented by NW scheduling. NW vendors expressing concerns that this poses requirements on NW scheduling and configuration (PUCCH configuration), and the possible impact on CSI reporting from the secondary DRX group. One company propose to remove the separate *drx-InactivityTimer* of the secondary DRX group to avoid the problem.

**Rapporteur**: there is no consensus if there is a problem to solve, and there is not enough support for the proposed solution. It is likely that companies will not change their view in phase 2, and it is proposed not to discuss it further.

**Proposal 2**: The network is only required to configure the DRX groups in different frequency ranges when the UE supports perRFgap capability.

**Summary**: 13 out of 21 companies disagreed, while 8 companies agreed.

**Rapporteur**: Proposal 2 does not seem agreeable. During email discussion #054 ([R2-2005729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2005729.zip)) a majority of companies supported proposal 3:

**Proposal 3**: All serving cells in the secondary DRX group shall belong to one Frequency Range and all serving cells in the legacy DRX group shall belong to another Frequency Range.

It is proposed to treat proposal 3 in phase 2 of this email discussion:

**Proposal 2**: Treat proposal 3 from email discussion #054 in phase 2.

**Proposal 3:** For a UE configured with secondary DRX group, the UE enters Active Time of the primary DRX group if ra-*ContentionResolutionTimer* is running.

**Summary**: 19 out of 21 companies disagree, one company agrees, and one company thinks it can be considered.

**Rapporteur**: The majority of companies seem to think that both groups should wake-up in this case:

**Proposal 3**: Both DRX groups are in Active Time when *ra-ContentionResolutionTimer* is running,

**Proposal 4:** The TEI on secondary DRX group should be configured for UEs with per-FR MG capability in FR1 + FR2 CA.

**Summary**: 14 out of 21 companies disagree that UE should be required to support perFRgap when the UE support secondary DRX. 6 companies agree that UE should be required to support perRFgap with secondary DRX. One company thinks this should be left to RAN4.

**Rapporteur**: The majority of companies think that perFRgap should not be a requirement to support secondary DRX:

**Proposal 4**: The UE is not required to support perFRgap when the UE supports secondary DRX group.

**Proposal 5:** The capability for secondary DRX group should be defined as per-BC.

**Summary**: 20 out of 21 companies disagree, and only 1 company agrees.

**Proposal 5**: The secondary DRX group capability is per UE.

**Proposal 6:** The introduction of Dual DRX should be postponed to R17 power saving.

**Summary**: 12 out of 20 companies disagree, 6 companies agree to postpone, and 2 companies are open to postpone.

**Rapporteur**: RAN2 made a conditional agreement to introduce a simple secondary DRX solution in REL-16, provided RAN1 and RAN4 indicate there is zero or acceptable impact. RAN1 could not confirm there is zero or acceptable impact and indicated impact with DCP and SCell dormancy. There were mixed views in RAN1 about the impact of CSI measurements and reporting. In email discussion #054 ([R2-2005729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2005729.zip)) the majority of companies think that DCP and SCell dormancy should not be supported with secondary DRX. Furthermore the majority of companies in email discussion #054 agree on how to handle CSI measurements and reporting with Secondary DRX. For those reasons we think that secondary DRX can be supported in REL-16:

**Proposal 6**: Introduce secondary DRX group in REL-16

**Proposal 7**: RAN2 discuss how the UE provides its preference on DRX parameters if secondary DRX group is configured.

**Option 1**: The *preferredDRX-InactivityTimer* applies to primary DRX group only

**Option 2**: The UE can signal a separate *preferredDRX-InactivityTimer* value for the secondary DRX group (if configured)

**Option 3**: Other

**Summary**: 13 out of 21 companies prefer option 2. 4 companies prefer option 1. Two companies think that the question is not applicable, because they think that the *drx-InactivityTimer* should be common for primary and secondary DRX group.

**Rapporteur**: based on the feedback it is proposed to agree option 2 and discuss the stage 3 details further in phase 2.

**Proposal 7**: The UE can signal a separate *preferredDRX-InactivityTimer* value for the secondary DRX group

**Proposal 8**: Discuss the stage 3 details further in phase 2

**Phase 2:**

For phase 2 it is proposed to discuss the leftover from phase 1, and the proposals from email discussion #054 ([R2-2005729](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2//TSGR2_110-e/Docs/R2-2005729.zip)):

**Proposal 1**: Joint configuration of DCP and secondary DRX is not supported in REL-16.

**Proposal 2**: Joint configuration of SCell dormancy during Active Time and secondary DRX is not supported in REL-16.

**Proposal 3**: All serving cells in the secondary DRX group shall belong to one Frequency Range and all serving cells in the legacy DRX group shall belong to another Frequency Range.

**Proposal 4**: The network shall configure a shorter *drx-InactivityTimer* and *drx-onDurationTimer* for the secondary DRX group compared to the default DRX group.

**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.

**Proposal 6**: The (Long) DRX Command MAC CE controls the DRX cycle switch of both DRX groups.

**Proposal 7**: While SR on PUCCH is pending both DRX groups are in Active Time.

**Proposal 8**: When RAR using CFRA has been received, and PDCCH indication new transmission has not been received yet, both DRX groups are in Active Time.

**Proposal 9**: The UE reports periodic and semi-persistent CSI when the DRX group that is configured with PUCCH/PUSCH for CSI reporting is in Active Time.

**Proposal 10**: SRS is transmitted when the DRX group where SRS is transmitted is in Active Time.

# Conclusions

TBD

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