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 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. |
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**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.

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| **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. |
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***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 |  |
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**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.

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| **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. |
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**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.

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| **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 |  |
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**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. |
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**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. |
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# Summary of email discussion

TBD

# Conclusions

TBD

# References

1. [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
2. [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
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