3GPP TSG RAN WG2 Meeting #117-e R2-220xxxx

**Electronic meeting, 21 Feb- 3 March, 2022**

**Agenda item:** 8.12.5.1

**Source:** Intel Corporation

**Title:** Report of [Pre117-e][107][RedCap] UE caps open issues (Intel)

**Document for:**  Discussion and decision

# Introduction

This is the report of [Pre117-e][107][RedCap] UE caps open issues (Intel).

Feb 9th Start of Pre-discussions that collects structured company Input.

Feb 14th, 2359 UTC. **General Tdoc Submission Deadline**. Tdoc number allocation deadline. Kick off, summaries. Stop of Pre-discussions that collects structured company Input (rapporteurs to provide report at earliest convenient time, within 24h if possible).

Feb 17th 1800 UTC Tdocs submission deadline for Summaries

Therefore companies should provide your comments by Feb 14th, 2359 UTC.

# Annex: companies’ point of contact

|  |  |  |
| --- | --- | --- |
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# Discussion

## 3.1 Capability on RRM relaxation

### 3.1.1 Can Rel-17 RRM relaxation apply to any Rel-17 UE or not?

Based on R2-2201752, RAN2 discussed whether Rel-17 RRM relaxation can apply to any Rel-17 UE or not as following:

|  |
| --- |
| **Q2-1**: Do you agree Proposal 5 in 1st round?Proposal 5. [Discussion] (16/20) Rel-17 RRM relaxation can apply to any Rel-17 UE.**Summary**:The rapporteur assumes 6 companies who do not provide any input in this round keeps their views in 1st round discussion. As a result, 16 companies still support Proposal 5, and 4 companies still disagree. One company mentioned this proposal is beyond the WID scope, but it is also pointed out Edrx feature also apply to non-RedCap UEs, which is also out of the WID scope. Besides, there is the opponent who commented Rel-17 RRM relaxation is for extreme power saving, so not applied to non-RedCap UEs. However, the rapporteur thinks, even if this proposal is adopted RRM relaxation is optional configuration, which means NW may not configure this feature to non-RedCap UEs. Anyway, it is proposed to discuss this proposal online.**Proposal 2-3. [Discussion] (16/20) Rel-17 RRM relaxation can apply to any Rel-17 UE.**Proposal 2-3. [Discussion] (16/20) Rel-17 RRM relaxation can apply to any Rel-17 UE.* Huawei wonders about impacts on other Wis
* Continue in the next meeting
 |

The situation for 2 rounds discussion were same, i.e. 16 companies supported the proposal, and 4 companies objected the proposal.

Rapporteur considers that anyway it is optional feature. If the network vendors/operators do not want to use it for non-RedCap UE, the network can simply not configure the threshold for non-RedCap Ues in RRC\_CONNECTED. For IDLE/INACTIVE Ues, we may introduce an additional indication in system information to indicate whether the RRM relaxation criterion applies to non-RedCap UE or not.

Rapporteur expects the situation will be same. Therefore the above compromise is suggested for agreement, i.e.:

**Compromised proposal**: Rel-17 RRM relaxation can apply to any Rel-17 UE. Network can control whether non-RedCap Ues can use Rel-17 RRM relaxation criterion or not, i.e. an new indication is added in system information to indicate whether the RRM relaxation criterion applies to non-RedCap UE or not.

**Discussion point 3.1.1-1: Do you agree the compromised proposal suggested above?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Ericsson | No | We are OK to allow it generally in Rel-17 or alternatively limit the RRM relaxation for stationary UEs just to RedCap UEs in Rel-17. The presented option with yet another configuration in SI is adding more complexity, and is actually completely outside of the WI as it would apply only to non-RedCap UEs. We should not spend valuable RedCap time on discussing anything else than what is absolutely necessary at this point of time.  |
| Huawei, HiSilicon | No | This will cause additional standard efforts.The concern is not to forbid non-RedCap UE to use RRM relaxation. The concern is this may cause more standard effort, e.g. some impact to other WI/feature to support this RRM relaxation. It may bring more CRs in the future meeting.How can RedCap session determine whether a non-RedCap UE to support a new R17 feature? |
| Apple | No for additional SI indication | Partly share view with Ericsson. Non RedCap Rel-17 can implement IDLE/INACTIVE RRM relaxations and in CONNECTED mode, it’s upto NW configuration.  |
| Qualcomm | Yes and see comment | We can support the proposal. Whether relaxations in RRC Idle/Inactive are applicable to non-RedCap UE or not is less important because UEs have flexibility in applying relaxations themselves. In RRC Connected, network can decide whether to configure RRM relaxation for a UE (either RedCap or non-RedCap) or not. Companies only need to agree that support for RRM relaxation in RRC Connected is a UE capability for both RedCap and non-RedCap UEs.  |
| ZTE | No for additional SI indication | We support to apply R17 RRM relaxation to non-RedCap UEs, so non-RedCap UE can also be benefit from this feature, we see no harm to do so. But we haven’t been fully convinced about the necessity of additional addition in SI. And in our view, it cannot solve the concern from opponent. For idle/inactive non-RedCap UEs, it is up to UE whether to support this feature. For non-RedCap UEs in RRC Connected, the same capability can be used to report its support of R17 RRM relaxation. We may not fully understand the concern from HW, why it will cause impact to other WI/feature? Maybe it is better to provide a detailed example.  |
| vivo | Yes with comments | We support to apply R17 RRM relaxation to non-RedCap UEs, as we didn’t see any motivation to excluded non-RedCap UEs to use it, which could also bring power saving gain, similar as eDRX. Besides, we think both idle/inactive and connected mode should be applicable, as new requirements are defined for RRM relaxation in idle/inactive mode.Regarding the additional SI indication, we have no strong view, as network could control the applicability to non-RedCap/RedCap UEs by provide corresponding configurations.  |
| CATT | No | We agree the Rel-17 RRM relaxation can apply to any Rel-17 UE.But we think it will add the complexity that using an additional indication to indicate whether RRM relaxation criterion applies to the non-redcap UE or not. |
| Futurewei | No | We prefer to limit the RRM relaxation for stationary UEs just to RedCap UEs in Rel-17. |
| OPPO | Yes with comments | But we don’t need to have separate indication in SIB for that. |
| Intel | No for additional SI indication | Seems almost all companies do not see the need to have separate indication in SIB. And quite many companies (similar as last meeting) prefer to apply R17 RRM relaxation to non-RedCap UEs. We also do not see the harm to do this, and indeed see the benefit.  |
| LGE | No |  The target scenario of R17 RRM relaxation is stationary UEs which have lower mobility than the low mobility UEs considered in R16 relaxed measurements. So the R17 RRM relaxation pursues extreme power saving for truly stationary UEs. So normal NR UEs which have frequent mobility should not support R17 RRM relaxation.We also agree with Huawei’s last comment that we cannot determine whether non-RedCap UE can support new R17 feature. |
| Samsung | No | We are not sure whether such additional indication is needed, and should go with the original proposal that were supported by the majority last meeting (i.e. applicable to any Rel-17 UE), as the feature is indeed beneficial for non-RedCap UEs as well.  |
| Xiaomi | NO | The Rel-17 RRM relaxation is mainly for stationary UE which may not applicable to normal UEs. |
| Nokia, Nokia Shanghai Bell | No | The SI indication would add even more complexity |
| MediaTek | No for additional SI indication | For the same reasons as Ericsson |
|  |  |  |

### 3.1.2 RRM relaxation for RRC\_IDLE/INACTIVE Ues

In Rel-16, RRM relaxation for RRC\_IDLE/INACTIVE was captured as optional feature without capability eighbor as

5.6 RRM measurement features

| Definitions for feature |
| --- |
| **Relaxed measurement**It is optional for UE to support relaxed RRM measurements of eighbor cells in RRC\_IDLE/RRC\_INACTIVE as specified in TS 38.304 [21]. |

Similar to Rel-16 RRM relaxation, Rel-17 RRM relaxation for RRC\_IDLE/INACTIVE Ues can be treated as optional feature without capability eighbor.

**Discussion point 3.1.2-1: Do you agree that Rel-17 RRM relaxation for RRC\_IDLE/INACTIVE Ues is captured in TS38.306 as optional feature without capability eighbor? Please also provide your comments on the text proposal if any.**

**Text proposal:**

| Definitions for feature |
| --- |
| **Rel-17 relaxed measurement for RRC\_IDLE/RRC\_INACTIVE**It is optional for RedCap UE to support Rel-17 relaxed RRM measurements of eighbor cells in RRC\_IDLE/RRC\_INACTIVE as specified in TS 38.304 [21]. |

**Note: “RedCap” should be removed if the compromised proposal in discussion point 3.1.1-1 is agreed.**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Ericsson | Yes |  |
| Huawei, HiSilicon |  Yes | “Rel-17” should be removed, since this may cause confusion R18 RedCap UE cannot support this. But, deleting R17 cannot make it different with the existing one in R16. How about:“It is optional for RedCap UE to support relaxed RRM measurements of eighbor cells in RRC\_IDLE/RRC\_INACTIVE as specified in TS 38.304 [21], based on stationary, stationary and not-at-cell-edge.” |
| Apple | Pls see comments. | We do not fully understand Huawei’s comments, as the capability refers to Rel-17 relaxations and not whether the UE is rel-17 or Rel-18. Also agree with moderator about ‘redCap’ and in our view, this should be removed.  |
| Qualcomm | Yes |  |
| ZTE | Yes | Same view as Apple. |
| Vivo | Yes | Agree with it by removing “RedCap”. Here, “R17” means “R17 measurement relaxation”, there is no mis-understanding. |
| CATT | Yes |  |
| Futurewei | Yes |  |
| OPPO | Yes |  |
| Intel | Yes |  |
| LGE | Yes |  |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |
| MediaTek | Yes |  |
|  |  |  |

### 3.1.3 RRM relaxation for RRC\_CONNECTED UEs

Regarding RRM relaxation for RRC\_CONNECTED UEs, RAN2 agreed:

1. Relaxation criteria for UEs in RRC Connected are configured by only dedicated signaling.

Agreements via email – from offline 104:

1. If UAI-based report is adopted, 1-bit indication (i.e., whether UE meets stationary criterion or not) is sufficient for UE to report its relaxation status.
2. Do not discuss the issue related to CGI reading requirement.
3. No need to specify any restriction (e.g., not evaluate stationary criterion / not report relaxation status) in specification, in case SpCell RSRP is not lower than s-MeasureConfig. It is left to UE implementation.

Agreements online:

1. Except for the first report, UE reports are triggered only if relaxation status (i.e., whether relaxation criterion is met or not) toggles. UE triggers the first report when relaxation criterion is first met since configured (further check if there is anything to fix when drafting the running CR)
2. RedCap UE cannot use CSI-RS-based measurement for stationary criterion in RRC\_CONNECTED.

Agreements:

1. UAI is used for UE to report its relaxation status

The network needs to configure the Relaxation criteria for RRC\_CONNECTED UEs, and therefore a capability bit is needed.

**Discussion point 3.1.3-1: Do you agree that Rel-17 RRM relaxation for RRC\_CONNECTED UEs is captured in TS38.306 as optional feature with capability signalling, i.e. introduce a capability bit on this, e.g. *rrm-RelaxationRRC-ConnectedRedCap-r17*; Please also provide your comments on the text proposal if any.**

**Text proposal:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Definitions for parameters | Per | M | FDD-TDD DIFF | FR1-FR2 DIFF |
| ***rrm-RelaxationRRC-ConnectedRedCap-r17***Indicates whether UE supports Rel-17 relaxed RRM measurements in RRC\_CONNECTED as specified in TS 38.331 [9]. | ? | ? | ? | ? |

**Note: “RedCap” should be removed from the field *rrm-RelaxationRRC-ConnectedRedCap-r17* if the compromised proposal in discussion point 3.1.1-1 is agreed.**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes | We need to add “RedCap” and delete Rel-17.Consider RAN4 has **not defined the new relaxation behavior** for connected mode. So, the capability is actually about UAI reporting. We suggest:“Indicates whether UE supports stationary status reporting for relaxed RRM measurements in RRC\_CONNECTED as specified in TS 38.331 [9].” |
| Apple | See comments | Same comment as for Q 3.1.2-1 |
| Qualcomm | Yes | It is fine with us to have this UE capability. Just for technical discussion: it seems unnecessary to introduce such a UE capability. If a UE does not support relaxation but network configures relaxation criteria for it, it simply does not request relaxation from the network.[Rapp] For RRC\_CONNECTED UE, the network shall not configure the parameters which cannot be supported by UE. And it is up to UE implementation on how to handle such error case, e.g. reestablishment. Therefore for RRC\_CONNECTED UE, the capability is to let the network know whether the network can configure criterion to the UE.  |
| ZTE | Yes | Same comment as for Q3.1.2-1. If UE indicates it does not support the feature, network does not need to send the configuration, it can reduce signaling overhead.Regarding QC’s comment, we think usually new RRC parameters are defined together with UE capability, of course it is possible to always signal the parameter and non-supported Ues can ignore them, but this is not the traditional way when we define the signalling.  |
| Vivo | Yes | Same views as for Q 3.1.2-1. |
| CATT | Yes |  |
| Futurewei | Yes |  |
| OPPO | Yes |  |
| Intel | Yes |  |
| LGE | Yes |  |
| Samsung | Yes |  |
| Xiaomi | Yes |  |
| Nokia, Nokia Shanghai Bell | Yes |  |
| MediaTek | Yes | Agree with Huawei’s clarification that the capability is for RRM relaxation status reporting. |
|  |  |  |

**Discussion point 3.1.3-2: Companies are invited to provide your views on Granularities for *rrm-RelaxationRedCap-r17* e.g. 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC;**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **1) Per UE or****2) Per Band or****3) Per BC or****4) Per FS or****5) Per FSPC)** | **Comments, if any** |
| Ericsson | 1. Per UE |  |
| Huawei, HiSilicon | 1) Per UE |  |
| Qualcomm | 1. Per UE
 |  |
| ZTE | 1) Per UE |  |
| Vivo | 1) Per UE |  |
| CATT | Yes |  |
| Futurewei | 1) Per UE |  |
| OPPO | 1) Per UE |  |
| Intel | Per UE |  |
| LGE | 1) Per UE |  |
| Samsung | 1) Per UE |  |
| Xiaomi | Per UE |  |
| Nokia, Nokia Shanghai Bell | Per UE |  |
| MediaTek | Per UE |  |
|  |  |  |

**Discussion point 3.1.3-3: Companies are invited to provide your views on the Need of FDD/TDD differentiation for *rrm-RelaxationRedCap-r17* ;**

Note: as agreed in RAN2#116bis, FDD/TDD diff capability should be captured as per band signalling.

* From Rel-17 onwards, at least for new capabilities, if a UE capability requires at least FRx or at least xDD differentiation, it is defined with both FRx and xDD differentiation in per band signaling, i.e. no new UE capabilities will be defined in the FRX and XDD capability signaling branches.

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **FDD/TDD diff or No** | **Comments, if any** |
| Ericsson | No  |  |
| Huawei, HiSilicon | No |  |
| Qualcomm | No |  |
| ZTE | No |  |
| Vivo | No |  |
| CATT | No |  |
| Futurewei | No |  |
| OPPO | No |  |
| Intel | No |  |
| LGE | No |  |
| Samsung | No |  |
| Nokia, Nokia Shanghai Bell | No |  |
| MediaTek | No |  |
|  |  |  |

**Discussion point 3.1.3-4: Companies are invited to provide your views on the Need of FR1/FR2 differentiation for *rrm-RelaxationRedCap-r17* ;**

Note: as agreed in RAN2#116bis, FR1/FR2 diff capability should be captured as per band signalling.

* From Rel-17 onwards, at least for new capabilities, if a UE capability requires at least FRx or at least xDD differentiation, it is defined with both FRx and xDD differentiation in per band signaling, i.e. no new UE capabilities will be defined in the FRX and XDD capability signaling branches.

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **FR1/FR2 diff or No** | **Comments, if any** |
| Ericsson | No |  |
| Huawei, HiSilicon | No |  |
| Qualcomm | No |  |
| ZTE | No |  |
| Vivo | No |  |
| CATT | No |  |
| Futurewei | No |  |
| OPPO | No |  |
| Intel | No |  |
| LGE | No |  |
| Samsung | No |  |
| Xiaomi | No |  |
| Nokia, Nokia Shanghai Bell | No |  |
| MediaTek | No |  |
|  |  |  |

## 3.2 Capability on eDRX

### 3.2.1 eDRX capability for RRC\_IDLE UEs

eDRX capability related agreements are

1. eDRX supporting UEs are assumed to also support the UE capability on PO determination for non overlapping CN/RN case (Further discuss on the reporting of eDRX capability)

Agreements via email – from offline 105 (second round):

1. eDRX feature can be supported by non RedCap UEs.
2. A UE in idle mode requests eDRX configuration via NAS signalling. FFS if capability signalling in RAN, as part of the UE capability message, is also needed.
3. eDRX support is optional for the RedCap UE.

In LTE, eDRX for RRC\_IDLE was captured as optional feature without capability signalling as

6.14.1 Extended DRX in RRC\_IDLE

It is optional for UE to support extended DRX cycle values up to and beyond 10.24 seconds and paging in extended DRX in RRC\_IDLE as specified in TS 36.331 [5] and TS 36.304 [14].

Similar to LTE, Rel-17 eDRX for RRC\_IDLE UEs can be treated as optional feature without capability signalling.

**Discussion point 3.2.1-1: Do you agree that Rel-17 eDRX for RRC\_IDLE UEs is captured in TS38.306 as optional feature without capability signalling? Please also provide your comments on the text proposal if any.**

**Text proposal:**

| Definitions for feature |
| --- |
| **Rel-17 extended DRX in RRC\_IDLE**It is optional for UE to support Rel-17 extended DRX cycle values beyond 10.24 seconds and up to 10485.76 seconds and paging in extended DRX in RRC\_IDLE as specified in TS 38.331 [9] and TS 38.304 [21]. |

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes | Delete “Rel-17”. |
| Apple | Yes and | We think Rel-17 should be kept. |
| Qualcomm | Yes with change | The TP from the rapporteur seems to suggest eDRX cycle <=10.24s is mandatorily supported. We’d like to suggest the following change:It is optional for UE to support Rel-17 extended DRX cycle values up to 10485.76 seconds and paging in extended DRX in RRC\_IDLE as specified in TS 38.331 [9] and TS 38.304 [21]. |
| ZTE | Yes with change | We agree with Qualcomm that the “beyond 10.24 seconds and” should be deleted. |
| Vivo | Yes | Agree with Apple and Qualcomm.  |
| CATT | Yes |  |
| Futurewei | Yes |  |
| OPPO | Yes with change | Agree with Qualcomm. |
| Intel | Yes with change  | Agree with Qualcomm ‘s suggestion.  |
| LGE | Yes |  |
| Samsung | Yes | Agree with QC |
| Xiaomi | Yes | Agree with QC. eDRX cycle <=10.24s is missed. |
| Nokia, Nokia Shanghai Bell | Yes | Agree with Qualcomm. |
| MediaTek | Yes | Agree with Qualcomm |
|  |  |  |

### Edrx capability for RRC\_INACTIVE Ues

Regarding Edrx for RRC\_INACTIVE,

Agreements via email – from offline 110:

1. Lower bound for Edrx configuration in RRC\_IDLE and RRC\_INACTIVE is 2.56 seconds. Inform SA2/CT1 and check if there is any concern.
2. The max Edrx cycle length for RRC Inactive is 10.24s in Rel-17
3. PO determination for non-overlapping CN/RN case is applicable to Edrx
4. Edrx supporting Ues are assumed to also support the UE capability on PO determination for non overlapping CN/RN case (Further discuss on the reporting of Edrx capability)

Agreements via email – from offline 105 (second round):

1. Edrx feature can be supported by non RedCap Ues.
2. A UE in idle mode requests Edrx configuration via NAS signalling. FFS if capability signalling in RAN, as part of the UE capability message, is also needed.
3. Edrx support is optional for the RedCap UE.

In [13], the capability on PO determination for non-overlapping CN/RN case has been introduced as

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Definitions for parameters | Per | M | FDD-TDD DIFF | **FR1-FR2**DIFF |
| ***inactiveStatePO-Determination-r17***Indicates whether the UE supports to use the same i\_s to determine PO in RRC\_INACTIVE state as in RRC\_IDLE state. | UE | No | No | No |

Then the question is whether it can be applied for Edrx feature or not, i.e. do we need to introduce a new UE capability for Edrx?

**Discussion point 3.2.2-1: Regarding the capability on “PO determination for non overlapping CN/RN case ”, which option do you prefer? Please also provide your comments on the text proposal if any.**

**Option 1:** *inactiveStatePO-Determination-r17* introduced in [13] covers Edrx case, and no new UE capability is needed;

**Option 2:** introduce *inactiveStatePO-DeterminationEDRX-r17* specific to handle “PO determination for non overlapping CN/RN case ” for Edrx;

Text proposal:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Definitions for parameters | Per | M | FDD-TDD DIFF | **FR1-FR2**DIFF |
| ***inactiveStatePO-DeterminationEDRX-r17***Indicates whether the UE supports to use the same i\_s to determine PO in RRC\_INACTIVE state as in RRC\_IDLE state when Edrx is configured. | UE | No | No | No |

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Option 1 or Option 2** | **Comments, if any** |
| Ericsson | Option 1 |  |
| Huawei, HiSilicon | Option 1 |  |
| Apple | Op1 | We think this is already agreed…? |
| Qualcomm | Option 1 |  |
| ZTE | Option 1 with restriction “a UE supports Edrx shall also support *inactiveStatePO-Determination-r17*” | Our RAN2 agreement is: “Edrx supporting Ues are assumed to also support the UE capability on PO determination for non overlapping CN/RN case”.It implies that a UE supporting Edrx should also support this new PO determination mechanism. So separate capability in Option 2 is not needed. For Option 1, the concern is that “*inactiveStatePO-Determination-r17*” was introduced for normal cases (non-Edrx). So if Option 1 is adopted, is it possible a UE indicates support of Edrx but does not support *inactiveStatePO-Determination-r17*? Then it will contradict to our RAN2 agreement, and cause complexity to network implementation.In our view, there are two options:* Alt-1: Option 1 with restriction, like: “a UE supports Edrx shall also support *inactiveStatePO-Determination-r17*”;
* Alt-2: Neither Option 1 nor Option 2, as long as UE supports inactive Edrx, it supports the PO-determination function. (How to determine UE supports inactive Edrx depends on the outcome of Discussion point 3.2.2-2).

Alt-1 implies that an Edrx-capable UE shall support new PO determination for both Edrx and non-Edrx cases. Alt-2 allows an Edrx-capable UE to only support new PO determination for Edrx case but not for non-Edrx case. We prefer Alt-1 because the UE behavior is aligned in two cases. And in our understanding, when UE implements new PO determination function, it is natural to support it for both Edrx and non-Edrx cases.  |
| Vivo | Option 1 |  |
| CATT | Option 1 |  |
| Futurewei | Option 1 |  |
| OPPO | Option 1 |  |
| Intel | Option 1 | Also agree with ZTE that “a UE supports Edrx shall also support *inactiveStatePO-Determination-r17*”. This can be added in the filed description of eDRX capability as precondition .  |
| LGE | Option 1 |  |
| Samsung | Option 1 |  |
| Xiaomi | Option 1 |  |
| Nokia, Nokia Shanghai Bell | Option 1 |  |
| MediaTek | Option 1 |  |
|  |  |  |

Regarding extended long DRX for RRC\_INACTIVE, RAN needs to configure the Edrx related parameters for RRC\_INACTIVE Ues, and therefore a new capability on Rel-17 extended long DRX for RRC\_INACTIVE is needed.

**Discussion point 3.2.2-2: Do you agree that Rel-17 extended long DRX for RRC\_INACTIVE is captured in TS38.306 as optional feature with capability ignaling, i.e. introduce a capability bit on this;**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes/No** | **Comments, if any** |
| Ericsson | Yes | We additionally need to further discuss the details on how INACTIVE Edrx configuration is requested, but as baseline this should be fine. |
| Huawei, HiSilicon | No | Similar to LTE, Gnb can know the UE capability on IDLE Edrx from CN, and assuming UE supporting IDLE Edrx also supports inactive Edrx. |
| Apple | No | Prefer to follow LTE and not complicate at late stages |
| Qualcomm | Yes | We think there should be separate UE capabilities for CN Edrx and RAN Edrx, because it is possible that a UE may support RAN Edrx but not CN Edrx and different signaling (NAS vs AS) are used for CN Edrx and RAN Edrx.  |
| ZTE | No | As agreed in RAN2 that RAN Edrx can be configured only if CN Edrx is configured. So we think there is no case that a UE supports RAN Edrx but does not support CN Edrx |
| vivo | No | At least in R17, we think there may be no need for this separate capability, as we have following agreements in RAN2#115e meeting:1. RAN2 considers the configuration as an invalid case, where INACTIVE Edrx cycle is configured but IDLE Edrx cycle is not configured. FFS whether to capture this restriction in RAN2 spec.2. RAN2 considers the configuration as invalid case, where INACTIVE Edrx cycle is longer than IDLE Edrx cycle. FFS whether to capture this restriction in RAN2 spec. |
| Futurewei | No | Same view as Apple. |
| OPPO | No | Agree with Huawei. |
| Intel | Yes | We see companies’ point that the UE must support eDRX for IDLE and INACTIVE simultaneously based on agreements “1. RAN2 considers the configuration as an invalid case, where INACTIVE Edrx cycle is configured but IDLE Edrx cycle is not configured. FFS whether to capture this restriction in RAN2 spec.”.  |
| LGE | No | Same view as Huawei |
| Samsung | No | Agree with HW and ZTE |
| Xiaomi | Yes | Yes, there is no case that a UE supports RAN Edrx but does not support CN Edrx. But there can be case that UE not supports RAN E-drx but support CN Edrx |
| Nokia, Nokia Shanghai Bell | Yes | IDLE and INACTIVE eDRX includes different functionality and therefore it would be natural to have separate capabilities for them. |
| MediaTek | Yes | Agree with Xiaomi above |
|  |  |  |

If your answer on discussion point 3.2.2-2 is yes, we need to discuss the details of Edrx capability for RRC\_INACTIVE Ues. We may introduce a new capability *extendedLongDRX-r17* to cover all Edrx values. We could also introduce a new capability on Edrx of 2.56s. This might be beneficial for normal Ues that want to meet legacy reachability requirements during paging while getting the advantage of using this Edrx values even when the paging default DRX cycle is smaller.

Therefore Rapporteur would like to check companies’ view:

**Discussion point 3.2.2-3: Regarding the capability on “extended long DRX for RRC\_INACTIVE”, which option do you prefer? Please also provide your comments on the text proposal if any.**

**Option 1:** Forextended long DRX for RRC\_INACTIVE, introduce a new capability bit *extendedLongDRX-r17* covering DRX values of 2.56s, 5.12s and 10.24s;

Text proposal for option 1:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Definitions for parameters | Per | M | FDD-TDD DIFF | FR1-FR2 DIFF |
| ***extendedLongDRX-Cycle-r17***Indicates whether UE in RRC\_INACTIVE supports the extended long DRX values of 256, 512 and 1024 radio frames as specified in TS 38.321 [8]. | ? | ? | ? | ? |

**Option 2:** Forextended long DRX for RRC\_INACTIVE, introduce a new capability bit *extendedLongDRX-r17* covering DRX values of 5.12s and 10.24s, and introduce a new capability bit *extendedLongDRX-LowerBound-r17* covering DRX value of 2.56s;

Text proposal for option 2:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Definitions for parameters | Per | M | FDD-TDD DIFF | FR1-FR2 DIFF |
| ***extendedLongDRX-Cycle-r17***Indicates whether UE in RRC\_INACTIVE supports the extended long DRX values of 512 and 1024 radio frames as specified in TS 38.321 [8]. | ? | ? | ? | ? |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Definitions for parameters | Per | M | FDD-TDD DIFF | FR1-FR2 DIFF |
| ***extendedLongDRX-LowerBound-r17*** Indicates whether UE in RRC\_INACTIVE supports the extended long DRX values of 256 radio frames as specified in TS 38.321 [8]. | ? | ? | ? | ? |

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Option 1 or Option 2** | **Comments, if any** |
| Ericsson | Option 1 | This should be a single feature and not create more fragmentation on how Ues are behaving, creating potentially more impacts in other specs as well. Introducing more options creates unnecessary complexity and slows down the adoption of such feature (e.g. more test cases and testing would be required). Not OK to introduce new features at this point.  |
| Qualcomm | Option 1 | Agree with Ericsson |
| CATT | Option 1 |  |
| Intel | Option 1 |  |
| Xiaomi | Option1 |  |
| Nokia, Nokia Shanghai Bell | Option 1 |  |
| MediaTek | Option 1 |  |
|  |  |  |

**Discussion point 3.2.2-4: Companies are invited to provide your views on Granularities for *extendedLongDRX-r17, extendedLongDRX-LowerBound-r17 ,* e.g. 1) Per UE or 2) Per Band or 3) Per BC or 4) Per FS or 5) Per FSPC);**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **1) Per UE or****2) Per Band or****3) Per BC or****4) Per FS or****5) Per FSPC)** | **Comments, if any** |
| Ericsson | Per UE |  |
| Huawei, HiSilicon | 1) Per UE |  |
| Qualcomm | 1. PER UE
 |  |
| ZTE | Per UE |  |
| Vivo | Per UE |  |
| CATT | Per UE |  |
| Futurewei | 1) Per UE |  |
| OPPO | 1) Per UE |  |
| Intel | Per UE |  |
| LGE | Per UE |  |
| Samsung | Per UE |  |
| Xiaomi | Per UE |  |
| Nokia, Nokia Shanghai Bell | Per UE | IDLE and INACTIVE eDRX includes different functionality and therefore it would be natural to have separate capabilities for them. |
| MediaTek | Per UE |  |
|  |  |  |

**Discussion point 3.2.2-5: Companies are invited to provide your views on the Need of FDD/TDD differentiation for *extendedLongDRX-r17, extendedLongDRX-LowerBound-r17* ;**

Note: as agreed in RAN2#116bis, FDD/TDD diff capability should be captured as per band signalling.

* From Rel-17 onwards, at least for new capabilities, if a UE capability requires at least FRx or at least xDD differentiation, it is defined with both FRx and xDD differentiation in per band signaling, i.e. no new UE capabilities will be defined in the FRX and XDD capability signaling branches.

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **FDD/TDD diff or No** | **Comments, if any** |
| Ericsson  | No |  |
| Huawei, HiSilicon | No |  |
| Qualcomm | No |  |
| ZTE | No |  |
| Vivo | No |  |
| CATT | No |  |
| Futurewei | No |  |
| OPPO | No |  |
| Intel | No |  |
| LGE | No |  |
| Samsung | No |  |
| Xiaomi | No |  |
| Nokia, Nokia Shanghai Bell | No |  |
| MediaTek | No |  |
|  |  |  |

**Discussion point 3.2.2-6: Companies are invited to provide your views on the Need of FR1/FR2 differentiation for *extendedLongDRX-r17, extendedLongDRX-LowerBound-r17* ;**

Note: as agreed in RAN2#116bis, FR1/FR2 diff capability should be captured as per band signalling.

* From Rel-17 onwards, at least for new capabilities, if a UE capability requires at least FRx or at least xDD differentiation, it is defined with both FRx and xDD differentiation in per band signaling, i.e. no new UE capabilities will be defined in the FRX and XDD capability signaling branches.

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **FR1/FR2 diff or No** | **Comments, if any** |
| Ericsson | No |  |
| Huawei, HiSilicon | No |  |
| Qualcomm | No |  |
| ZTE | No |  |
| Vivo | No |  |
| CATT | No |  |
| Futurewei | No |  |
| OPPO | No |  |
| Intel | No |  |
| LGE | No |  |
| Samsung | No |  |
| Xiaomi | No |  |
| Nokia, Nokia Shanghai Bell | No |  |
| MediaTek | No |  |
|  |  |  |

## 3.3 open issues on capability CR

### 3.3.1 BW related descriptions

| ***channelBWs-DL***Indicates for each subcarrier spacing the UE supported channel bandwidths.Absence of the *channelBWs-DL* (without suffix) for a band or absence of specific scs-XXkHz entry for a supported subcarrier spacing means that the UE supports the channel bandwidths among [5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100] and [50, 100, 200] that were defined in clause 5.3.5 of TS 38.101-1 version 15.7.0 [2] and TS 38.101-2 version 15.7.0 [3] for the given band or the specific SCS entry. For IAB-MT, to determine whether the IAB-MT supports a channel bandwidth of 100 MHz, the network checks c*hannelBW-DL-IAB-r16*.For FR1, the bits in *channelBWs-DL* (without suffix) starting from the leading / leftmost bit indicate 5, 10, 15, 20, 25, 30, 40, 50, 60 and 80MHz. For FR2, the bits in *channelBWs-DL* (without suffix) starting from the leading / leftmost bit indicate 50, 100 and 200MHz. The third / rightmost bit (for 200MHz) shall be set to 1. For IAB-MT the third / rightmost bit (for 200MHz) is ignored. To determine whether the IAB-MT supports a channel bandwidth of 200 MHz, the network checks *channelBW-DL-IAB-r16*.For FR1, the leading/leftmost bit in *channelBWs-DL-v1590* indicates 70MHz, the second leftmost bit indicates 45MHz, the third leftmost bit indicates 35MHz, the fourth leftmost bit indicates 100MHz and all the remaining bits in *channelBWs-DL-v1590* shall be set to 0. The fourth leftmost bit (for 100MHz) is not applicable for bands n41, n48, n77, n78, n79 and n90 as defined in TS 38.101-1 [2].RedCap UEs shall support the maximum channel bandwidth defined for the respective band up to 20 MHz for FR1 and up to 100 Mhz for FR2. *channelBWs-DL-v1590* is not applicable to RedCap Ues. For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1.Editor’s Note: FFS on how to handle the case that the UE cannot support 20MHz BW as specified in TS38.101. NOTE: To determine whether the UE supports a specific SCS for a given band, the network validates the *supportedSubCarrierSpacingDL* and the *scs-60kHz*.To determine whether the UE supports a channel bandwidth of 90 MHz, the network may ignore this capability and validate instead the *channelBW-90mhz*, the *supportedBandwidthCombinationSet* and the *supportedBandwidthCombinationSetIntraENDC*. For serving cell(s) with other channel bandwidths the network validates the *channelBWs-DL*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, the *asymmetricBandwidthCombinationSet* (for a band supporting asymmetric channel bandwidth as defined in clause 5.3.6 of TS 38.101-1 [2]) and *supportedBandwidthDL*. |
| --- |
| ***channelBWs-UL***Indicates for each subcarrier spacing the UE supported channel bandwidths.Absence of the *channelBWs-UL* (without suffix) for a band or absence of specific scs-XXkHz entry for a supported subcarrier spacing means that the UE supports the channel bandwidths among [5, 10, 15, 20, 25, 30, 40, 50, 60, 80, 100] and [50, 100, 200] that were defined in clause 5.3.5 of TS 38.101-1 version 15.7.0 [2] and TS 38.101-2 version 15.7.0 [3] for the given band or the specific SCS entry. For IAB-MT, to determine whether the IAB-MT supports a channel bandwidth of 100 MHz, the network checks *channelBW-UL-IAB-r16*.For FR1, the bits in *channelBWs-UL* (without suffix) starting from the leading / leftmost bit indicate 5, 10, 15, 20, 25, 30, 40, 50, 60 and 80MHz. For FR2, the bits in *channelBWs-UL* (without suffix) starting from the leading / leftmost bit indicate 50, 100 and 200MHz. The third / rightmost bit (for 200MHz) shall be set to 1. For IAB-MT the third / rightmost bit (for 200MHz) is ignored. To determine whether the IAB-MT supports a channel bandwidth of 200 MHz, the network checks *channelBW-UL-IAB-r16*.For FR1, the leading/leftmost bit in *channelBWs-UL-v1590* indicates 70 MHz, the second leftmost bit indicates 45MHz, the third leftmost bit indicates 35MHz, the fourth leftmost bit indicates 100MHz and all the remaining bits in *channelBWs-UL-v1590* shall be set to 0. The fourth leftmost bit (for 100MHz) is not applicable for bands n41, n48, n77, n78, n79 and n90 as defined in TS 38.101-1 [2].RedCap Ues shall support the maximum channel bandwidth defined for the respective band up to 20 MHz for FR1 and up to 100 Mhz for FR2. *channelBWs-UL-v1590* is not applicable to RedCap Ues. For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1.Editor’s Note: FFS on how to handle the case that the UE cannot support 20MHz BW as specified in TS38.101. NOTE: To determine whether the UE supports a specific SCS for a given band, the network validates the *supportedSubCarrierSpacingUL* and the *scs-60kHz*.To determine whether the UE supports a channel bandwidth of 90 MHz the network may ignore this capability and validate instead the *channelBW-90mhz*, the *supportedBandwidthCombinationSet* and the *supportedBandwidthCombinationSetIntraENDC*. For serving cell(s) with other channel bandwidths the network validates the *channelBWs-UL*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, the *asymmetricBandwidthCombinationSet* (for a band supporting asymmetric channel bandwidth as defined in clause 5.3.6 of TS 38.101-1 [2]) and *supportedBandwidthUL*. |

| ***supportedBandwidthDL***Indicates maximum DL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of intra-frequency DAPS handover for the source and target cells), which is defined in Table 5.3.5-1 in TS 38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.For FR1, all the bandwidths listed in TS38.101-1 Table 5.3.5-1 for each band shall be mandatory with a single CC unless indicated optional. For FR2, the set of mandatory CBW is 50, 100, 200 MHz. When this field is included in a band combination with a single band entry and a single CC entry (i.e. non-CA band combination), the UE shall indicate the maximum channel bandwidth for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].The UE may report a *supportedBandwidthDL* wider than the *channelBWs-DL*; this *supportedBandwidthDL* may not be included in the Table 5.3.5-1 of TS 38.101-1[2]/TS 38.101-2[3] for the case that the UE is unable to report the actual supported bandwidth according to the Table 5.3.5-1 of TS 38.101-1[2]/TS 38.101-2[3].RedCap Ues shall support the maximum channel bandwidth defined for the respective band up to 20 MHz for FR1 and up to 100 Mhz for FR2. For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1.Editor’s Note: FFS on how to handle the case that the UE cannot support 20MHz BW as specified in TS38.101. NOTE: To determine whether the UE supports a channel bandwidth of 90 MHz, the network may ignore this capability and validate instead the *channelBW-90mhz*, the *supportedBandwidthCombinationSet* and the *supportedBandwidthCombinationSetIntraENDC*. For serving cell(s) with other channel bandwidths the network validates the *channelBWs-DL*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, the *asymmetricBandwidthCombinationSet* (for a band supporting asymmetric channel bandwidth as defined in clause 5.3.6 of TS 38.101-1 [2]) and *supportedBandwidthDL*. |
| --- |

| ***supportedBandwidthUL***Indicates maximum UL channel bandwidth supported for a given SCS that UE supports within a single CC (and in case of intra-frequency DAPS handover for the source and target cells), which is defined in Table 5.3.5-1 in TS38.101-1 [2] for FR1 and Table 5.3.5-1 in TS 38.101-2 [3] for FR2.For FR1, all the bandwidths listed in TS38.101-1 Table 5.3.5-1 for each band shall be mandatory with a single CC unless indicated optional. For FR2, the set of mandatory CBW is 50, 100, 200 MHz. When this field is included in a band combination with a single band entry and a single CC entry (i.e. non-CA band combination), the UE shall indicate the maximum channel bandwidth for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].The UE may report a *supportedBandwidthUL* wider than the *channelBWs-UL*; this *supportedBandwidthUL* may not be included in the Table 5.3.5-1 of TS 38.101-1[2]/TS 38.101-2[3] for the case that the UE is unable to report the actual supported bandwidth according to the Table 5.3.5-1 of TS 38.101-1[2]/TS 38.101-2[3].RedCap Ues shall support the maximum channel bandwidth defined for the respective band up to 20 MHz for FR1 and up to 100 Mhz for FR2. For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1.Editor’s Note: FFS on how to handle the case that the UE cannot support 20MHz BW as specified in TS38.101. NOTE: To determine whether the UE supports a channel bandwidth of 90 MHz the network may ignore this capability and validate instead the *channelBW-90mhz*, the *supportedBandwidthCombinationSet* and the *supportedBandwidthCombinationSetIntraENDC*. For serving cell(s) with other channel bandwidths the network validates the *channelBWs-UL*, the *supportedBandwidthCombinationSet*, the *supportedBandwidthCombinationSetIntraENDC*, the *asymmetricBandwidthCombinationSet* (for a band supporting asymmetric channel bandwidth as defined in clause 5.3.6 of TS 38.101-1 [2]) and *supportedBandwidthUL*. |
| --- |

In [Post116bis-e][105][RedCap] 38.306 running CR and list of open issues (Intel), regarding how to resolve EN “FFS on how to handle the case that the UE cannot support 20MHz BW as specified in TS38.101. ”, following options were received:

**Option 1**: Remove “For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1.” Since it does not add anything to what the first sentence about RedCap already states. Then the EN can be removed;

**Option 2**: To add “For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1 unless the 20Mhz channel bandwidth is not supported for the operating band as specified in TS38.101 [2]”. Then the EN can be removed;

**Option 3**: EN can be removed without additional change since Even if there is one band not supporting 20Mhz, RedCap UE will not consider that band as supported band. Then, RedCap UE will not report the filed at all, e.g. channelBWs-DL and others.

**Option 4: Replace “For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1.” With “**The RedCap UE shall indicate the maximum channel bandwidth less than or equal to 20MHz for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].**”**

**Option 5**: other.

**Discussion point 3.3.1-1: Companies are invited to provide your views on which option from the above list do you prefer?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Option 1 or****Option 2 or****Option 3 or ?** | **Comments, if any** |
| Ericsson | Option 1 / 4 | It should be enough if the UE indicates the values up to 20 MHz depending on the band (i.e. no need to always have ‘1’ for 20 MHz). If option 1 is adopted the can amend the remaining text with with “and set the corresponding bits in channelBWs-DL” (or -UL) or similar, but please see further suggestion below. Similarly for supportedBW (the previous sentence already tells what the UE should do) and additionally, for supportedBandwidthDL/UE the reference to bitmap is actually wrong as the field is not a bitmap!Furthermore:1. “*RedCap Ues shall support the maximum channel bandwidth defined for the respective band up to 20 MHz for FR1 and up to 100 Mhz for FR2.*”

🡺 This seems to say that the UE shall **only** indicate support for 20 MHz but **not** for 5, 10, 15. We would like to further suggest the following text replacing the current one: “On FR1, RedCap Ues shall not support more than 20 MHz; they shall support 20 MHz defined for the band or the next lower bandwidth otherwise; they may additionally support lower bandwidths.On FR2, RedCap Ues shall not support more than 100 MHz; they shall support 100 MHz if defined for the band or the next lower bandwidth otherwise; they may additionally support lower bandwidths.”Furthermore, remove “*channelBWs-DL-v1590* is not applicable to RedCap Ues” since that is already implied by the text above.  |
| Huawei, HiSilicon | Option 3’:EN can be removed without additional change since there is no harm to indicate to gNB that UE supporting 20Mhz, even if the band from gNB side does not support 20Mhz. | Option 1 is not acceptable. The “20MHz shall be set to 1” indeed adds clarification that 20Hhz is always mandatory, in addition to just as the maximum value in “The maximum bandwidth is 20 MHz for FR1”.Option 3 is better than option 2, because:RedCap UE can work in the band not supporting 20Mhz, and there is no harm to indicate to gNB that UE supporting 20Mhz. Please note **“reporting 1 for 20Mhz” from UE side is NOT conflict with “not supporting 20Mhz” from NW side.** This is similar to the legacy UE on 100Mhz case (100Mhz is mandatory for legacy UE in every band), where there is no such sentence as in option2. This is aligned with the intention that we only have one type of RedCap UE. |
| Qualcomm | Option 1 |  |
| ZTE | Option 4  | We think two things need to be captured in spec:1. RedCap cannot indicate the support of BW that is larger than 20MH;2. RedCap shall indicate the support of the maximum BW less than or equal to 20M for the band according to TS 38.101-1 [2] and TS 38.101-2 [3]. For 2, it is same as legacy principle, for instance, `if the maximum BW of Band X is 15MHz, then RedCap UE shall mandatorily support 15MHz.In our view, both Option 1 and Option 2 cannot cover Point-2 precisely. Option 3 may cause IoT problem once RAN4 defines the band to support 20MHz in future release. [Rapp] current limitation on RedCap does not mean the UE cannot indicate the value less than 20Mhz. Therefore optioni 1 should be acceptable? “RedCap Ues shall support the maximum channel bandwidth defined for the respective band up to 20 MHz for FR1 and up to 100 Mhz for FR2. “We prefer to reword the sentence as:RedCap Ues shall support the maximum channel bandwidth defined for the respective band up to 20 MHz for FR1 and up to 100 Mhz for FR2. The RedCap UE shall indicate the maximum channel bandwidth less than or equal to 20MHz for the band according to TS 38.101-1 [2] and TS 38.101-2 [3].The newly added sentence is similar to the legacy sentence, but with extra condition: “less than or equal to 20MHz”. |
| vivo | Option 1 | We think it is enough for the UE to indicate the values up to 20 MHz depending on the band, while the 2nd part, i.e. seting the bit to “1” for 20 MHz, provides no additional information.  |
| CATT | Option 1 |  |
| OPPO | Option 1 |  |
| Intel  | Option 1 |  |
| T-Mobile USA | Option 1 | We have strong concerns with the proposed language in its entirety. It is up to RAN4 to determine which channel BW’s the UE must support. T-Mobile does not support language mandating channel BW’s in RAN2 specifications. In addition mandating support for 20 MHz contradicts the WID. RP-2111574 states in the objective that:Reduced maximum UE bandwidth:* **Maximum bandwidth** of an FR1 RedCap UE during and after initial access is 20 MHz.
* **Maximum bandwidth** of an FR2 RedCap UE during and after initial access is 100 MHz.

**Change sentence to read:****From:** RedCap UEs shall support the maximum channel bandwidth defined for the respective band up to 20 MHz for FR1 and up to 100 Mhz for FR2. *channelBWs-UL-v1590* is not applicable to RedCap UEs. For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1.**To:**  The RedCap UE shall indicate the maximum channel bandwidths found in TS 38.101-1 [2] and TS 38.101-2 [3]. |
| LGE | Option 1/ Option 4 |  |
| Samsung | Option 1 | We are also fine with the suggestion from Ericsson. |
| Nokia, Nokia Shanghai Bell | Option 1 |  |
| MediaTek | Option 1 |  |
|  |  |  |

| **Definitions for parameters** |
| --- |
| ***channelBW-90mhz***Indicates whether the UE supports the channel bandwidth of 90 MHz.For FR1, the UE shall indicate support according to TS 38.101-1 [2], Table 5.3.5-1.This capability is not applicable to RedCap UEs. |

In [Post116bis-e][105][RedCap] 38.306 running CR and list of open issues (Intel), regarding the change on “*channelBW-90mhz*”, following comments were received:

|  |
| --- |
| Ericsson commented We don’t think this kind of additions do ourselves any favour. It should be clear that RedCap UE shall not indicate such capability, as stated in the definition. And suggest Remove the statement about RedCap.Rapp: This has been discussed before and no conclusion to remove it. Would be good to check companies’ view. |

**Discussion point 3.3.1-2: Companies are invited to provide view on whether to remove the following sentence “This capability is not applicable to RedCap Ues.” From the definition of *channelBW-90mhz* ?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Keep or****remove** | **Comments, if any** |
| Ericsson | Remove | This is unnecessary since it is clear in the specification RedCap UE cannot support such channel BW. Is such statement important for UE or NW implementation? By adding such we create more problems than we solve, i.e. it can be asked if we should add such text to all possible capabilities RedCap UE doesn’t support. This will just complicate maintenance and future additions to the specifications. |
| Huawei, HiSilicon |  | No strong view |
| Qualcomm |  | No strong view. Either way is fine, as long as we are consistent about such clarifications, i.e. if we keep it, then all capabilities that are not applicable to RedCap should have such a clarification in their field description.  |
| ZTE |  | No strong view. |
| Vivo |  | No strong view.  |
| CATT |  | Agree with remove, but no strong view. |
| Futurewei |  | No strong view. |
| OPPO |  | No strong view. |
| Intel |  | No strong view. But tend to agree with QC, we see benefit to remove it.  |
| T-Mobile USA | Remove | Agree with Ericsson |
| LGE | Remove |  |
| Samsung | Remove | No strong view, but it is already clear from other part, and to keep the sentence will cause additional efforts for the maintenance in the future. |
| Nokia, Nokia Shanghai Bell |  | No strong view. |
| MediaTek | Ok to remove | Ericsson’s argument is sound |
|  |  |  |

### changes on horts, am-WithShortSN

In [Post116bis-e][105][RedCap] 38.306 running CR and list of open issues (Intel), based on RAN2 agreements we captured:

|  |  |  |  |
| --- | --- | --- | --- |
| ***shortSN***Indicates whether the UE supports 12 bit length of PDCP sequence number. RedCap UE shall always report “1”. | UE | Yes | No |

|  |  |  |  |
| --- | --- | --- | --- |
| ***am-WithShortSN***Indicates whether the UE supports AM DRB with 12 bit length of RLC sequence number. RedCap UE shall always report “1”. | UE | Yes | No |

However currently *horts, am-WithShortSN* are all mandatory features. Do we need to add this “RedCap UE shall always report “1”.”

FutureWei explained that “The signaling of these capabilities is mandatory, but the actually support of them is optional for non-RedCap Ues today. For RedCap Ues, we make the support of short SNs mandatory. Therefore, adding these text is necessary to highlight the difference for RedCap Ues.”

**Discussion point 3.3.2-1: Companies are invited to provide your views on whether to keep or remove the following sentence “RedCap UE shall always report “1”.” From the definition of *horts* and *am-WithShortSN*?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Keep or****Remove** | **Comments, if any** |
| Ericsson | Remove | The feature is mandatory already (for all Ues), as clearly indicated in the table. No need for further additions.  |
| Huawei, HiSilicon | Keep | We had the agreement:“Clarify in the field description of horts and am-WithShortSN that, RedCap UE should always report “1” in TS 38.306 section 4.2.4 and 4.2.5.” |
| Qualcomm | Keep | Agree with Huawei |
| ZTE | Keep | Agree with Huawei |
| vivo | Keep |  |
| CATT | Keep |  |
| Futurewei | Keep |  |
| OPPO | Keep |  |
| Intel |  | No strong opinion. From our perspective, anyway it is mandatory with capability, therefore there should not be different with or without the clarification. But we are fine to go for majority.  |
| LGE |  | No strong view |
| Samsung | Keep | It is worth to keep it according to the agreement, as the meaning of the bit for the mandatory features with the capability is different from the optional one (i.e. successfully tested) in general.  |
| Nokia, Nokia Shanghai Bell |  | No strong view. |
| MediaTek | Remove | For the same reason as Ericsson |
|  |  |  |

### changes on supportOf16DRB-r17, longSN-RedCap-r17 and am-WithLongSN-RedCap-r17

Currently, in the running CR, we captured them as

|  |  |  |  |
| --- | --- | --- | --- |
| Definitions for parameters | Per | M | FDD-TDD DIFF |
| ***supportOf16DRB-RedCap-r17***Indicates whether the RedCap UE supports 16 DRBs. This capability is only applicable for RedCap UEs since support for 16 DRBs is mandatory without capability ignaling for other Ues. | UE | No | No |

|  |  |  |  |
| --- | --- | --- | --- |
| ***longSN-RedCap-r17***Indicates whether the RedCap UE supports 18 bit length of PDCP sequence number. This capability is only applicable for RedCap Ues since support for the long sequence number is mandatory without capability ignaling for other Ues. | UE | No | No |

|  |  |  |  |
| --- | --- | --- | --- |
| ***am-WithLongSN-RedCap-r17***Indicates whether the RedCap UE supports AM DRB with 18 bit length of RLC sequence number. This capability is only applicable for RedCap Ues since support for the long sequence number is mandatory without capability ignaling for other Ues. | UE | No | No |

We added “since support for 16 DRBs is mandatory without capability ignaling for other Ues.” Based on comments that “mandatory without capability signaling – the current wording does not explain this. Amend the description by: “ since support fo 16 DRBs is mandatory without capability ignaling for other Ues”.

However some companies also commented that There is no need to add “since xxx” to explain the reason in specification. It is clear this is only for RedCap UE.

**Discussion point 3.3.3-1: Companies are invited to provide your views on whether to keep the change “since xxx.” From the definition of *supportOf16DRB-RedCap, longSN-RedCap* and *am-WithShortSN-RedCap*?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Keep or****Remove** | **Comments, if any** |
| Ericsson | Keep | The text clarifies the purpose of the capability and clarifies the difference vs. non-RedCap Ues. |
| Huawei, HiSlicon | Remove | We don’t explain the reason in the specification. |
| Apple | No strong view, but tend to agree with Huawei |  |
| Qualcomm | Remove | Agree with Huawei |
| ZTE | Remove |  |
| Vivo | Remove |  |
| CATT | Remove |  |
| Futurewei | Remove |  |
| OPPO | Remove |  |
| Intel | Remove | Tend to agree with Huawei |
| LGE | Remove |  |
| Samsung | Remove | No strong view, but they are already clear from the existing specification so can be removed. |
| Nokia, Nokia Shanghai Bell | Remove |  |
| MediaTek | No strong view | But tend to agree with Huawei |
|  |  |  |

### General structure

Regarding how to capture RedCap UE capabilities, companies had following comments in [Post116bis-e][105][RedCap] 38.306 running CR and list of open issues (Intel):

|  |
| --- |
| EricssonNow looking at the structure, we think it would be better to capture all the field descriptions in the correct locations (e.g. PDPC parameters, RLC parameters, etc) instead of in a new section to keep the existing structure intact and not to spread out the descriptions. If all RedCap-specific parameters can be identified through the name (i.e. by including “RedCap” in the name) it ould be easy to find such RedCap-specific parameters. With such update, it could actually be reasonable to have the description of RedCap then as a subsection of 4.1. instead of 4.2 as wellAnd suggestMove the field descriptions to their usual places in the existing structure. (Also consider moving RedCap description under 4.1 in such case).[Rapp] We discussed this in previous meeting and finally agreed current structure. Would be good to hear companies’ view. [Huawei]: Not OK to add this as open issue. But we are fine to discuss this in the next round of running CR discussion. |

Therefore there are two options:

**Option 1**: keep the structure as it is, i.e. separate section for RedCap specific capabilities;

**Option 2**: move the RedCap capabilities to existing sections, e.g. longSN-RedCap-r17 in 4.2.4 PDCP Parameters. All RedCap-specific parameters can be identified through the name (i.e. by including “RedCap” in the name).

Rapporteur would like to check companies ‘ view on this although we discussed this issue at the beginning since the situation on RedCap UE capabilities is much clear now.

**Discussion point 3.3.4-1: Companies are invited to provide your views on which option from the above list do you prefer?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Option 1 or****Option 2 or****?** | **Comments, if any** |
| Ericsson | Option 2 | In our view it is much clearer when all capabilities which are related to each other are grouped in the corresponding sections. This is also true if/when further capabilities are introduced in future releases (for RedCap, or otherwise). We can still keep other RedCap-related text in the new section |
| Huawei, HiSilicon | Option 1 | We had this similar structure for IAB, which is the clean for a **new type** of device (IAB-MT, RedCap UE).  |
| Qualcomm | Option 1 | Agree with Huawei |
| ZTE | Option 1 |  |
| Vivo | Option 1 | This option is more clean and clear for RedCap.  |
| CATT | Option 1 |  |
| Futurewei | Option 1 |  |
| OPPO | Option 1 |  |
| Intel | Option 1 |  |
| LGE |  | Option 1 seems fine. No strong view |
| Samsung | Option 1 | We also prefer to have a separate section for better readability. |
| Nokia, Nokia Shanghai Bell | Option 1 |  |
| MediaTek | Option 1 | A separate section is clear to the reader |
|  |  |  |

## 3.4 WA Msg3 early identification is mandatorily supported by RedCap UE

In last meeting, RAN2 made following working assumption on Msg3 early identification:

|  |
| --- |
| **Working assumption:****Msg3 early identification is mandatorily supported by RedCap UE** |

Rapporteur has captured the working assumption in TS38.306 CR R2-2201968 as

|  |  |  |  |
| --- | --- | --- | --- |
| ***supportOfRedCap-r17***Indicates that the UE is a RedCap UE with comprised of at least the following functional components:* Maximum FR1 RedCap UE bandwidth is 20 MHz;
* Maximum FR2 RedCap UE bandwidth is 100 MHz;
* Support of RedCap early indication based on Msg1, MsgA and Msg3 for RACH;

A RedCap UE shall always set the capability to “1”.  | UE | No | No |

Considering there is no additional work on this, and there is no serious problem to support it, Rapporteur would suggest to confirm the working assumption.

**Discussion point 3.4-1: Do you support to confirm the working assumption that Msg3 early identification is mandatorily supported by RedCap UE?**

|  |  |  |
| --- | --- | --- |
| **Company’s name** | **Yes or No?** | **Comments, if any** |
| Ericsson | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Qualcomm | Yes |  |
| ZTE | Yes |  |
| Vivo | No with See comment | As we commented before, it has already agreed that RedCap UE mandatorily supports Msg1 early identification. In our view, only supporting one kind of early identification is enough for RedCap UEs. Supporting duplicated functionalities for the same purpose is not needed. If all other companies support to confirm this WA, if would be acceptable even we donot agree it.[Rapp]Thanks.  |
| CATT | Yes |  |
| Futurewei | Yes |  |
| OPPO | Yes |  |
| Intel | Yes |  |
| T-Mobile USA | No | Benefits of early indication are questionable, therefor we don’t need to a need to support both MSG1 and MSG 3 indication. MSG should be optional. This adds unnecessary complexity and encourages companies to use LTE CAT 1/CAT 1 BIS devices instead of REDCAP.  |
| LGE | Yes |  |
| Samsung | Yes | - |
| Nokia, Nokia Shanghai Bell | Yes |  |
| MediaTek | Ok to confirm |  |
|  |  |  |

## 3.5 Any other issues?

**Discussion point 3.5-1: Companies are invited to provide your views if anything is missing in previous sections?**

|  |  |
| --- | --- |
| **Company’s name** | **Comments, if any** |
|  |  |
|  |  |
|  |  |
|  |  |

# Summary report and proposals

# Open issues list for RedCap UE capabilities (R2-2201893)

|  |  |  |  |
| --- | --- | --- | --- |
| **Topic** | **Open issues****Note:** Open Issues should be defined for aspects that need to be closed, important to make already agreed functionality work in a reasonable way. Not yet agreed optimizations that may not be needed shall not be listed as Open Issues. | **Remark**  | **To be handled by pre-117 discussion or company’s contribution**  |
| RAN1 led feature | To capture “introduce capability bit on Half-duplex FDD operation type A for RedCap UEs; ” | To be captured in Mega CR. (need to check latest RAN1 feature list after Jan meeting) | Mega CR directly. |
| To capture “introduce explicit bit to indicate the support of RedCap; ;” | RAN2 WA is per UE capability. (need to check latest RAN1 feature list after Jan meeting) | Has been captured in capability running CRs. May update if RAN1 has different agreements. No change for now.  |
| Support of NCD-SSB, it is unclear what capabilities are needed, e.g.[R2-2201753] *Proposal 15 Discuss whether a RedCap UE, which does not support CSI-RS, should be able to report “Not need NCD-SSB” as an optional UE capability.**Proposal 17 Discuss whether a non-RedCap UE should be able to use NCD-SSB instead of CD-SSB with an optional capability in this meeting.* | Wait for RAN1 and RAN4. P15/P17 may still be discussed in RAN2 | **Company’s contribution or to be considered in Pre-117 for RRC** |
| Handover UE to non-RedCap cell | For the LTE to NR handover, in case the target NR cell is a legacy cell, the RedCap UE should trigger RRC re-establishment procedure. FFS any specification impact or purely leave to implementation | Need to be resolved in RAN2;Note: Companies’ view and potential solutions can be found in R2-2201750. | **Company’s contribution or to be considered in Pre-117 for RRC** |
| RRM relaxation  | Is it applied for non-RedCap UE or not? | Need to be resolved in RAN2;Note: Companies’ view can be found in R2-2201752.*Proposal 5. [Discussion] (16/20) Rel-17 RRM relaxation can apply to any Rel-17 UE.* | **To be handled in Pre-117 for UE capability****Discussion point 3.1.1-1** |
| For IDLE/INACTIVE:* whether to capture it as optional without capability feature?
* To add additional descriptions in section 5.6 *Relaxed measurement or new section?*
 | Need to be resolved in RAN2; | **To be handled in Pre-117 for UE capability****Discussion point 3.1.2-1** |
| For RRC\_CONNECTED, * Is single bit sufficient?
* Granularity of RRM capability, e.g. per UE?
* FDD/TDD diff?
* FR1/FR2 diff?
* Any others?
 | Need to be resolved in RAN2; | **To be handled in Pre-117 for UE capability****Discussion point 3.1.3-1-Discussion point 3.1.3-4** |
| eDRX | For RRC\_INACTIVE, * What additional eDRX capability for RRC\_INACTIVE? E.g. long DRX cycle?
* Granularity of eDRX capability, .e.g.per UE? (legacy is per UE)
* FDD/TDD diff? (legacy yes)
* FR1/FR2 diff? (Legacy no)
* Any others?
 | Need to be resolved in RAN2;Note: RAN2 agreements:1. eDRX feature can be supported by non RedCap UEs.2. A UE in idle mode requests eDRX configuration via NAS signalling. FFS if capability signalling in RAN, as part of the UE capability message, is also needed.3. eDRX support is optional for the RedCap UE. | **To be handled in Pre-117 for UE capability****Discussion point 3.2.2-1-Discussion point 3.2.2-6** |
| For RRC\_IDLE:* A UE in idle mode requests eDRX configuration via NAS signalling. FFS if capability signalling in RAN, as part of the UE capability message, is also needed.
 | Need to be resolved in RAN2;Whether to capture it as optional features without UE capability under section 5 or capability signalling in RAN or nothing? | **To be handled in Pre-117 for UE capability****Discussion point 3.2.1-1** |
| CR implementation | channelBWs-DL/channelBWs-UL | Ericsson commented “The two sentences started with “For FR1…” are difficult to digest and don’t add anything to what the first sentence about RedCap already states.” And suggest to change it asRemove “For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1 unless the 20Mhz channel bandwidth is not supported for the operating band as specified in TS38.101 [2 ]. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1.”Consider adding to the first sentence: “and set the corresponding bits in channelBWs-DL”Regarding how to handle EN Editor's Note: FFS on how to handle the case that the UE cannot support 20MHz BW as specified in TS38.101. Rapp added “1 unless the 20Mhz channel bandwidth is not supported for the operating band as specified in TS38.101 [2”, Huawei think it is not needed since Even if there is one band not supporting 20Mhz, RedCap UE will not consider that band as supported band. Then, RedCap UE will not report the filed at all, e.g. channelBWs-DL and others. Rapp: Would be good to check companies’ view.[Huawei]: In this version of CR, we change nothing compared to the last endorsed version. Add the open issue as “**FFS on how to handle the case that the UE cannot support 20MHz BW as specified in TS38.101. FFS if anything to be added in the field description**”.[Rapp1] This is the open issue table. [Ericsson] Our point is that with the new additions the overall sentence becomes a bit cumbersome – with new additions we should be able to update the overall text even if it was endorsed before. But if there is no consensus now, then we can discuss next time as it seems clear we need to discuss the addition anyways. | **To be handled in Pre-117 for UE capability****Discussion point 3.3.1-1** |
|  | channelBW-90MHz | Ericsson commented We don’t think this kind of additions do ourselves any favour. It should be clear that RedCap UE shall not indicate such capability, as stated in the definition. And suggest Remove the statement about RedCap.Rapp: This has been discussed before and no conclusion to remove it. Would be good to check companies’ view. | **To be handled in Pre-117 for UE capability****Discussion point 3.3.1-2** |
|  | ***supportedBandwidthDL/supportedBandwidthUL*** | Ericsson commented “The two sentences starting at “For FR1…” are not needed (since covered by the first sentence about RedCap UEs) and are actually wrong since this field is not a bitmap. “And suggestRemove “For FR1 RedCap UE, the bit which indicates 20MHz shall be set to 1 unless the 20Mhz channel bandwidth is not supported for the operating band as specified in TS38.101 [2]. For FR2 RedCap UE, the bit which indicates 100MHz shall be set to 1”Rapp: Tend to agree with Ericsson. But the sentence was introduced before. Let’s check companies view on this. [Huawei]: Not agree to remove the sentence. This one has been endorsed after long discussion. See our comment/suggestion to above channelBWs-DL/channelBWs-UL[Ericsson] Same comment as before, with the addition it becomes unnecessary long. Also, we should not keep in text which is wrong.  | **To be handled in Pre-117 for UE capability****Discussion point 3.3.1-1** |
|  | ~~4.2.xx~~~~Location of RedCap general statements and the field descriptions~~ | ~~Ericsson commented~~ ~~Now looking at the structure, we think it would be better to capture all the field descriptions in the correct locations (e.g. PDPC parameters, RLC parameters, etc) instead of in a new section to keep the existing structure intact and not to spread out the descriptions. If all RedCap-specific parameters can be identified through the name (i.e. by including “RedCap” in the name) it woul be easy to find such RedCap-specific parameters.~~ ~~With such update, it could actually be reasonable to have the description of RedCap then as a subsection of 4.1. instead of 4.2 as well~~~~And suggest~~~~Move the field descriptions to their usual places in the existing structure. (Also consider moving RedCap description under 4.1 in such case).~~~~[Rapp] We discussed this in previous meeting and finally agreed current structure. Would be good to hear companies’ view.~~ ~~[Huawei]: Not OK to add this as open issue. But we are fine to discuss this in the next round of running CR discussion.~~ | **To be handled in Pre-117 for UE capability****Discussion point 3.3.4-1** |
|  | ***shortSN***Indicates whether the UE supports 12 bit length of PDCP sequence number. RedCap UE should always report "1".***am-WithShortSN***Indicates whether the UE supports AM DRB with 12 bit length of RLC sequence number. RedCap UE should always report "1". | Ericsson and Rapporteur commentsThe feature is Mandatory for all UEs, therefore all UEs shall support this. ‘Should’ seems to make it somewhat optional. Absence of this bit would make the UE unususable in any case. SuggestWe prefer to remove the addition completely as it is unnecessary. Agree with rapporteur comment. [Rapp] Agree with Ericsson. But Would be good to hear companies’ view. [FW] The signaling of these capabilities is mandatory, but the actually support of them is optional for non-RedCap UEs today. For RedCap UEs, we make the support of short SNs mandatory. Therefore, adding these text is necessary to highlight the difference for RedCap UEs.[Huawei]: Normally we use “This field shall be set to *supported*.” In 306 for mandatory feature. The debating on “shall” and “should” does not count as open issue. We prefer not to include this as open issue.[Rapp1] the debate is not “shall” or “should”. The discussion is whether we need to change anything since so far shortSN is mandatory feature. It is strange to say “it shall be set to 1” again for RedCap UE. [Ericsson]  There should be no debate between “shall” and “should”: “Shall” indicates requirement and “should” indicates recommendation. This case is about a rewuirement. HW suggestion would be also fine to us, if any addition is needed.  | **To be handled in Pre-117 for UE capability****Discussion point 3.3.2-1** |
|  | ***supportOf16DRB-r17***For legacy devices support of 16 DRBs is mandatory without capability signaling – the current wording does not explain this. Amend the description by: “ since support fo 16 DRBs is mandatory without capability signalling for other UEs”The field name could include “RedCap” for easy searching through capability names. [Rapp] updated in RRC v01, 306 v02. [Huawei]: There is no need to add “since xxx” to explain the reason in specification. It is clear this is only for RedCap UE. | [Rapp] discuss whether need to add “since xxx” for ***supportOf16DRB-r17, longSN-RedCap-r17 and am-WithLongSN-RedCap-r17******.*** ***,***  | **To be handled in Pre-117 for UE capability****Discussion point 3.3.3-1** |

# Open issue list on MAC (From R2-2201891)

|  |  |  |  |
| --- | --- | --- | --- |
| **1-2** | Confirm Working assumption or not on:**Working assumption:**1. **Msg3 early identification is mandatorily supported by RedCap UE**
 | This OI will be handled in RAN2 also considering MsgA early identification. | Type 1**Discussion point 3.4-1** |

# Reference

1. R2-2201737 [offline-105] RedCap capabilities Intel
2. R2-2201750 [offline-105] RedCap capabilities - second round Intel
3. R2-2201732 [Pre116bis-e][103][RedCap] Summary of NCD-SSB / Initial BWP aspects Ericsson
4. R2-2201738 [offline-106] NCD-SSB and Initial BWP aspects Ericsson
5. R2-2201753 [offline-106] NCD-SSB and Initial BWP aspects - second round Ericsson
6. R2-2201734 [offline-103] identification and access restriction aspects Huawei
7. R2-2201751 [offline-103] identification and access restriction aspects - second round Huawei
8. R2-2201735 [offline-104] RRM relaxations Samsung
9. R2-2201752 [offline-104] RRM relaxations - second round Samsung
10. R2-2201892 Running 38.331 CR on Capabilities
11. R2-2201968 Running 38.306 CR on Capabilities
12. R2-2201893\_Report of email discussion [Post116bis-e][105][RedCap] 38.306 running CR and list of open issues (Intel)
13. R2-2111586 Correction on PO determination for UE in inactive state ZTE corporation, Ericsson , vivo , CMCC , China Telecom , China Unicom ,Samsung, Sanechip s CR Rel-17 38.306 16.6.0 0665 1 F TEI17