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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| **Company** | **Point of contact** | **Email address** |
| Intel Corporation | Yi Guo | Yi.guo@intel.com |
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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 no?

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

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| **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?**

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| **Company’s name** | **Yes/No** | **Comments, if any** |
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### 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 signalling as

5.6 RRM measurement features

| Definitions for feature |
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| **Relaxed measurement**  It is optional for UE to support relaxed RRM measurements of neighbour 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 signalling.

**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 signalling? 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 neighbour 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.**

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| **Company’s name** | **Yes/No** | **Comments, if any** |
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### 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:**

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| 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.**

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| **Company’s name** | **Yes/No** | **Comments, if any** |
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**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;**

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| **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** |
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**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.

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| **Company’s name** | **FDD/TDD diff or No** | **Comments, if any** |
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**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.

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| **Company’s name** | **FR1/FR2 diff or No** | **Comments, if any** |
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## 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]. |

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| **Company’s name** | **Yes/No** | **Comments, if any** |
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### 3.2.2 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

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| 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:

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| 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 |

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| **Company’s name** | **Option 1 or Option 2** | **Comments, if any** |
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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 signalling, i.e. introduce a capability bit on this;**

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| **Company’s name** | **Yes/No** | **Comments, if any** |
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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:

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| 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:

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| 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]. | ? | ? | ? | ? |

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| 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]. | ? | ? | ? | ? |

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| **Company’s name** | **Option 1 or Option 2** | **Comments, if any** |
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**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);**

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| **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** |
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**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.

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| **Company’s name** | **FDD/TDD diff or No** | **Comments, if any** |
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**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.

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| **Company’s name** | **FR1/FR2 diff or No** | **Comments, if any** |
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## 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*. |
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| ***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**: 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** |
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| **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** |
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### 3.3.2 changes on shortSN, 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 *shortSN, 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 *shortSN* and *am-WithShortSN*?**

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| --- | --- | --- |
| **Company’s name** | **Keep or**  **Remove** | **Comments, if any** |
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### 3.3.3 changes on supportOf16DRB-r17, longSN-RedCap-r17 and am-WithLongSN-RedCap-r17

Currently, in the running CR, we captured them as

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| --- | --- | --- | --- |
| 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 signalling 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 signalling 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 signalling for other UEs. | UE | No | No |

We added “since support for 16 DRBs is mandatory without capability signalling 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 signalling 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** |
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### 3.3.4 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):

|  |
| --- |
| Ericsson  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. |

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

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

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

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

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| --- | --- | --- | --- |
| ***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?**

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| --- | --- | --- |
| **Company’s name** | **Yes or No?** | **Comments, if any** |
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## 3.5 Any other issues?

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

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| --- | --- |
| **Company’s name** | **Comments, if any** |
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# Summary report and proposals

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

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| --- | --- | --- | --- |
| **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 as  Remove “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 suggest  Remove “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 comments  The 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.  Suggest  We 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)

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| --- | --- | --- | --- |
| **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