3GPP TSG-RAN WG2 Meeting #121-bis electronic \_R2-23xxx

April 17th - 26th, 2023

Agenda Item: 6.1.3.1

Source: Huawei, HiSilicon

**Title:** **Summary of [AT121bis-e][005][NR17] CP Redcap Corrections (Huawei)**

Document for: Discussion and Decision

# Introduction

This paper aims at capturing the summary of the offline discussion.

* **[AT121bis-e][005][NR17] CP Redcap Corrections (Huawei)**

 Scope: Treat R2-2302529, R2-2303133, R2-2303134, R2-2303286, R2-2303287, R2-2304012, R2-2303616, R2-2303135,
Ph1: Determine agreeable parts, and online CB if any. Ph2: For agreeable parts, if any, reflect these in agreeable CRs.

 Intended outcome: Report, If applicable: In-Principle-Agreed CRs

 Deadline: Schedule 1

A **first round** with **Deadline W1 Thursday April 21th 1200 UTC** to settle scope what is agreeable etc

A Final round with **Final deadline W2 Wednesday April 26th 1000 UTC (EOM)** to settle details / agree CRs etc.

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| --- | --- |
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# Discussion

**2.1 1RX offset related CRs**

### RRC CR [R2-2302529](file:///D%3A%5CTdoc%20review%5CRAN2%23121bis%5Cword%5CR2-2302529-%20Correction%20on%20offset%20for%20cell%20specific%20RSRP%20thresholds%20for%201Rx%20Redcap%20UE.doc)

Following changes are proposed in [R2-2302529](file:///D%3A%5CTdoc%20review%5CRAN2%23121bis%5Cword%5CR2-2302529-%20Correction%20on%20offset%20for%20cell%20specific%20RSRP%20thresholds%20for%201Rx%20Redcap%20UE.doc):

Clarify in the field description of the parameters that for 1Rx RedCap UE, an offset is applied to the signaled value of the cell specific RSRP threshold.

This is corresponding to previous RAN2 FFS on whether to also capture this in RRC, in addition the TS 38.300 text.

“*A RedCap UE with 1 Rx branch applies the associated offset for broadcasted cell specific RSRP thresholds for random access, SDT, cell edge condition and cell (re)selection criterion as specified in TS 38.133 [13].*”

**Question 1a: Do you agree with the intention as in R2-2302529 to capture those in the filed descriptions in RRC?**

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| **Companies** | **Yes or No?** | **Comments** (also comments to the detailed change if any) |
| ZTE | Prefer No | We prefer to rely on the general statement in stage 2 and TS 38.133 spec, if we start to clarify in every field description, once the affected parameter list is updated, we have to update both RAN2 and RAN4 specs simultaneously, this increases specification maintenance burden. |
| MediaTek | Wait for R4 to conclude | RAN4 are discussing the set of parameters for which 1Rx UE offset is to be applied to. This will continue next in the Incheon meeting. We propose to wait for RAN4 discussion to conclude before prematurely updating our specifications |
| Qualcomm | No | We have the same view as ZTE |
| Xiaomi | Wait for RAN4 | Agree with MTK |
| OPPO | Yes | Currently, the offset value is fixed and specified in RAN4 spec. From RAN2 perspective, changes are also needed in the field description of each affected cell specific RSRP threshold. |
| Nokia | No | Unless RAN4 decides something that would not fall within the Stage-2 statement already defined. |
| Samsung | Yes | We prefer to clarify this in 331 as well. |
| vivo | No | Since we already have the stage 2 wording in 38.300, there is no need to capture the those in the filed description repeatedly. Otherwise the text in TS 38.300 should add the wording that ” as specified in TS 38.331”. |
| Apple | No | 38.133 is better |
| Intel | No | Share the view explained by ZTE |

### 304 CR R2-2303135

Based on the TS 38.300, the 1RX RedCap specific offset is captured: “A RedCap UE with 1 Rx branch applies the associated offset for broadcasted cell specific RSRP thresholds for random access, SDT, cell edge condition and cell (re)selection criterion as specified in TS 38.133 [13]. “

In RAN2#120 meeting, there is an agreement addressing the problem of configuring margin for 1 Rx RedCap UEs as follows.

* RAN2 understands that the offset should not apply twice in this case and we will update our specs to avoid the double offset.

It is proposed to add a NOTE to capture the missing agreement: “The offset used for configuring margin for 1 Rx branch RedCap UEs as specified in TS 38.133 [8] shall not apply twice to both sides of the inequation for this criterion.”

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| **38.304 on how to calculate Srxlev/Squal:****38.133 on the offset:**The 1 Rx RedCap UE for the cell selection procedure [1] applies:*- Qrxlevmin* as the signaled value of *Qrxlevmin* [2] -1 dB.*- Qqualmin* as the signaled value of *Qqualmin* [2] -1 dB.…The 1 Rx RedCap UE for the evaluation of one or more relaxed measurement criteria defined in clause 5.2.4.9 [1] applies:- *s-SearchThresholdP-r16* as the signaled value of *s-SearchThresholdP-r16* [2] + 1 dB.- *s-SearchThresholdQ-r16* as the signaled value of *s-SearchThresholdQ-r16 [*2] + 1 dB.- *s-SearchThresholdP2-r17* as the signaled value of *s-SearchThresholdP2-r17* [2] + 1 dB.- *s-SearchThresholdQ2-r17* as the signaled value of *s-SearchThresholdQ2-r17* [2] + 1 dB. |

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| 5.2.4.9.2 Relaxed measurement criterion for UE not at cell edgeThe relaxed measurement criterion for UE not at cell edge is fulfilled when:- Srxlev > SSearchThresholdP, and,- Squal > SSearchThresholdQ, if SSearchThresholdQ is configured,Where:- Srxlev = current Srxlev value of the serving cell (dB).- Squal = current Squal value of the serving cell (dB).NOTE: The offset used for configuring margin for 1 Rx branch RedCap UEs as specified in TS 38.133 [8] shall not apply twice to both sides of the inequation for this criterion.5.2.4.9.4 Relaxed measurement criterion for a stationary RedCap UE not at cell edgeThe relaxed measurement criterion for a stationary RedCap UE not at cell edge is fulfilled when:- the relaxed measurement criterion in clause 5.2.4.9.3 is fulfilled for a period of TSearchDeltaP-Stationary,- Srxlev > SSearchThresholdP2, and,- Squal > SSearchThresholdQ2, if SSearchThresholdQ2 is configured.Where:- Srxlev = current Srxlev value of the serving cell (dB).- Squal = current Squal value of the serving cell (dB).NOTE: The offset used for configuring margin for 1 Rx branch RedCap UEs as specified in TS 38.133 [8] shall not apply twice to both sides of the inequation for this criterion. |

**Question 1b: Do you think the change in** **R2-2303135 is agreeable?**

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| **Companies** | **Yes or No?** | **Comments** |
| ZTE | Yes | The intention is correct and it seems this wasn’t captured anywhere. |
| MediaTek | No | RAN4 are discussing the set of parameters for which 1Rx UE offset is to be applied to. This will continue next in the Incheon meeting. We propose to wait for RAN4 discussion to conclude before prematurely updating our specificationsBesides, a Note as proposed cannot override normative requirements defined by RAN4 |
| Huawei, HiSilicon | Yes | This is important UE behavior. we should not wait for the May meeting. Please note the last RAN4 meeting discussion end up with “no conclusion“. Also, see no reason RAN4 should revert RAN2 agreement.Also, this note does not override any RAN4 spec. It only clarify how UE use the offset when one formulation has two offsets to consider. |
| Qualcomm | Neutral | We can go with the majority view.  |
| Xiaomi | Wait for RAN4 | Agree with MTK |
| OPPO | Yes with comments | A LS has been sent to inform RAN4 about the following RAN2 agreement:

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| * RAN2 understands that the offset should not apply twice in this case and we will update our specs to avoid the double offset.
 |

Maybe this note can be removed later if RAN4 spec is updated based on RAN2 agreement. |
| Nokia | No | We can wait for RAN4 conclusions since we already have the agreements in place. Besides, NOTE cannot state a “shall” behaviour. |
| Samsung | Yes |  |
| vivo | No | As we discussed before, there will be no ambiguity according to the current RAN4 specification, as the offset is applied for “for the cell selection procedure” or “relaxed measurement criteria”. There is no chance to apply the offset twice. Otherwise, we need some CR in RAN4 according to our RAN2 conclusion.  |
| Apple | Yes | No harm in adding this and link the reference to 38.133 |
| Intel | Wait for RAN4 | In our understanding, RAN4 is currently discussing this topic and some of the proposal considers removing the offset in Qqualmin and Qrxlevelmin while keeping offset to relaxed measurement criteria. Therefore, we suggest waiting for RAN4 conclusion |

**2.2 initial BWP configuration**

### Miscellaneous in R2-2303133

Two changes are proposed:

Change 1: In current spec, the *controlResourceSetZero* is conditional present in *PDCCH-ConfigCommon* with condition *InitialBWP-Only*, and the conditional description of of *InitialBWP-Only* states:

*If SIB1 is broadcast the field is mandatory present in the PDCCH-ConfigCommon of the initial BWP (BWP#0) in ServingCellConfigCommon except it is the RedCap-specific initial BWP not including CD-SSB and the entire CORESET#0; …… In other cases, the field is absent.*

In the case of the RedCap-specific initial BWP not including CD-SSB and the entire CORESET#0, *controlResourceSetZero* should be absent, based on the conditional descirption. Even in that case, CORSET#0 is usefull e.g. to determine the DCI format 1\_0. However, how the UE accquires the configuration of controlResourceSetZero is not clear, espetially in handover case.

It is proposed to add a clarification under the field description of controlResourceSetZero:”If absent in case of the RedCap-specific initial BWP not including CD-SSB and the entire CORESET#0, a RedCap UE uses the one provided in the PDCCH-ConfigCommon of the initial DL BWP that includes CORESET#0.”

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| ***controlResourceSetZero***Parameters of the common CORESET#0 which can be used in any common or UE-specific search spaces. The values are interpreted like the corresponding bits in *MIB* *pdcch-ConfigSIB1*. Even though this field is only configured in the initial BWP (BWP#0) *controlResourceSetZero* can be used in search spaces configured in other DL BWP(s) than the initial DL BWP if the conditions defined in TS 38.213 [13], clause 10 are satisfied. If absent in case of the RedCap-specific initial BWP not including CD-SSB and the entire CORESET#0, a RedCap UE uses the one provided in the *PDCCH-ConfigCommon* of the initial DL BWP that includes CORESET#0. |

**Question 2a: Do you think the first change in** **R2-2303133 is agreeable?**

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| **Companies** | **Yes or No?** | **Comments** |
| ZTE | No | Even if CORESET#0 is not configured in RedCap-specific initial UL BWP when it does not contain CORESET#0, there is only one CORESET#0 (the one from legacy initial DL BWP), there is no ambiguity issue. On the hand, even if the CORESET#0 field can be configured in RedCap-specific initial DL BWP when it contains CORESET#0, the physical configuration is same as the CORESET#0 of legacy initial DL BWP, so all in all there is only one CORESET#0.  |
| MediaTek | No | Agree with ZTE.  |
| LGE | No strong view | Agree with the UE behavior, but we are not sure whether the clarifying text is essential. |
| Huawei, HiSilicon | Yes | It seems above companies agree the intended UE behaviors.It is true there is only one CORESET#0 to use. But, it is not clear for UE on whether it can use CORESET#0, in case the using redcap specific BWP does not configure this CORESET. |
| Qualcomm | Neutral | We agree that the proposed text is correct. But we also agree with the comments from other companies that there is no ambiguity in which coreset#0 UE should use. So it is not a critical fix. For this reason, we can go with the majority view.  |
| Xiaomi | No | Agree that Redcap Ue will use the coreset#0 from the legacy initial DL BWP. But there is no ambiguity. |
| OPPO | No | Agree that there is no ambiguity issue.  |
| Nokia | No | Agree with ZTE. |
| Samsung | No | We do not see any ambiguity as pointed out by many companies. |
| vivo | No | Agree with the intention, but we think the current specification is clear.There is no ambiguity, even without the clarification, RedCap UE will still use the CORESET#0 to monitor paging in RRC\_IDLE or RRC\_INACTIVE if the separate initial BWP doesn’t contain CD-SSB and the entire CORESET#0 based on the controlResourceSetZero in legacy initial BWP. |
| Apple | No | There is no ambiguity and this CR is not essential |
| Intel | No | Agree with ZTE |

Change 2: The *additionalPRBOffset* and *intra-SlotFH* in *PUCCH-ConfigCommon* should be only configured on RedCap sepecifc initial UL BWP. While in the current ASN.1, it is not clear on whether NW can include those fields in legacy initial BWP, without any presence condition defined.

Note that the similar conditional presence are clarified for other fields in *PUCCH-ConfigCommon* (se*e InitialBWP-Only* and *InitialBWP-RedCap).*

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**Question 2b: Do you think the second change in** **R2-2303133 is agreeable?**

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| **Companies** | **Yes or No?** | **Comments** |
| ZTE | Yes | We think the second change is correct and aligned with RAN1 agreement:Agreement:* Disabling of frequency hopping for common PUCCH resources for RedCap UEs is only supported for separate (not shared) initial UL BWP.
 |
| MediaTek | Yes |  |
| LGE | Yes |  |
| Huawei, HiSilicon | Yes |  |
| Qualcomm | Yes |  |
| Xiaomi | YEs |  |
| OPPO | Yes |  |
| Nokia | Yes |  |
| Samsung | Yes |  |
| vivo | Yes |  |
| Intel | Yes |  |

### Dedicated configuration in R2-2304012

Followings are proposed:

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| **Proposal 1.** RAN2 discusses whether the dedicated BWP configuration can be applied for initial BWP when the RedCap-specific initial BWP is configured:* **Option 1.** The dedicated parameters (i.e. *BWP-DownlinkDedicated* and *BWP-UplinkDedicated*) cannot be configured for initial BWP of RedCap UE when RedCap-specific initial UL/DL BWP is configured
* **Option 2.** The dedicated parameters (i.e. *BWP-DownlinkDedicated* and *BWP-UplinkDedicated*) can be configured for initial BWP of RedCap UE when RedCap-specific initial UL/DL BWP is configured

**Proposal 2**. If Option 2 of proposal 1 is agreed, following should be clarified:* If the UE is a RedCap UE and the *initialDownlinkBWP-RedCap* and *initialUplinkBWP-RedCap* is configured in SIB1, *initialDownlinkBWP* and *initialUplinkBWP* in *ServingCellConfig* IE (i.e., dedicated configuration of initial DL BWP and initial UL BWP) is applied for RedCap-specific initial DL/UL BWP.

**Proposal 3**. Adopt the TP in Annex 1 |

**Rapporteur understanding:** Based on the RAN1 conclusion, this option 2 is actually agreed to be supported as “BWP#0 configuration option 2.”

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| **Agreement** Confirm the following working assumptions from RAN1#105-e:* After initial access (i.e., after RRC Setup, RRC Resume, or RRC Reestablishment), for BWP#0 configuration option 1 (as in 38.331, Appendix B2), a RedCap UE is not expected to operate with an initial DL BWP wider than the maximum RedCap UE bandwidth.
* After initial access (i.e., after RRC Setup, RRC Resume, or RRC Reestablishment), for BWP#0 configuration option 2 (as in 38.331, Appendix B2), a RedCap UE is not expected to operate with an initial DL BWP wider than the maximum RedCap UE bandwidth.

  **Note: For BWP#0 configuration option 2,*** + **For FR1,**
		- **For a separate initial DL BWP in connected mode (if it does not include CD-SSB and the entire CORESET#0), if it is configured for paging,**
			* **A RedCap UE supporting mandatory FG 6-1 (but not optional FG 6-1a) expects it to contain NCD-SSB for serving cell but not CORESET#0/SIB**
			* **A RedCap UE supporting FG 6-1a does not expect it to contain SSB/CORESET#0/SIB**
	+ **For FR2,**
		- **For a separate initial DL BWP in connected mode (if it does not include CD-SSB~~and the entire CORESET#0~~), if it is configured for paging,**
			* **A RedCap UE supporting mandatory FG 6-1 (but not optional FG 6-1a) expects it to contain NCD-SSB for serving cell but not CORESET#0/SIB**
			* **A RedCap UE supporting FG 6-1a does not expect it to contain SSB/CORESET#0/SIB**
 |

**Please note that:**

* “*If a RedCap-specific initial UL/DL BWP is configured, for BWP switching, the BWP #0 always maps to the RedCap-specific initial UL/DL BWP.*” is already captured in B.2 of 38.331
* “*The dedicated (UE-specific) configuration for the initial downlink bandwidth-part (i.e., DL BWP#0).*” is already clarified in the field description of initialDownlinkBWP in ServingCellConfig of 38.331.

Then, the question is whether we need to clarify something in RRC, as in Proposal 2.



**Question 2c: Do you think the change in Annex 1 in R2-2304012 is agreeable?**

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| **Companies** | **Yes or No?** | **Comments** |
| ZTE | No | We think Option 1 is the correct understanding (no matter what was agreed in RAN1).Technically, when RedCap-specific initial BWP is configured, it means the legacy initial BWP cannot be used by the RedCap UE (e.g. due to large bandwidth), so it is meaningless to configure dedicated BWP configuration of legacy initial BWP to make it as an RRC configured BWP. Please note that once it becomes an RRC configured BWP, it occupies UE capability, and the network can only configure 3 additional BWPs for the UE (including RedCap-specific initial BWP). [Rapp]: This should be NW implementation on whether to really use BWP#0 config option2.From signalling point of view, there is only one field in ServingCellConfig that provides the dedicated configuration for initial BWP, once RedCap-specific initial BWP is configured, that field will autonomously associate with RedCap-specific initial BWP, so clarification/change is not needed.[Rapp]: Then, BWP#0 config option 2 can be supportThe confusion occurs because of the common terminology ’initial BWP’ is used in field description, but there are many places in current spec that ‘initial BWP (or BWP#0)’ refers to either legacy initial BWP or RedCap-specific initial BWP(if configured), so unless state otherwise, by default, ‘initial BWP’ means ‘legacy initial BWP for non-RedCap UEs and RedCap-specific initial BWP (if configured) for RedCap UEs.’ |
| MediaTek | No | Agree with the rapporteur that this is already clarified in the RRC spec, i.e. BWP#0 maps to the RedCap specific initial BWP. The dedicated BWP configuration can only map to the RedCap specific initial BWP as agreed in RAN2#119 (see email discussion 117 in R2-2208786), so we agree with ZTE above that Option 1 is the correct understanding.[Rapp]: ??? But option 1 in P1 says NW cannot configure this.[ZTE] It seems people have different interpretations of Option 1. In our view, the “initial BWP of RedCap UE” means the legacy initial BWP, not RedCap-specific initial BWP. So Option 1 means the network cannot configure dedicated configuration for legacy initial BWP when RedCap-specific initial BWP is configured. For RedCap-specific initial BWP, of course, dedicated configuration can be provided. (i.e. BWP#0 configuration Option 1 and Option 2 in Annex B.2 are both supported).* **Option 1.** The dedicated parameters (i.e. *BWP-DownlinkDedicated* and *BWP-UplinkDedicated*) cannot be configured for initial BWP of RedCap UE when RedCap-specific initial UL/DL BWP is configured

[MTK] Same comment as ZTE. The wording of option 1 is confusing since it separately refers to ‘initial BWP’ and ‘RedCap specific initial BWP’, implying that there’s a difference between them. At least I interpreted ‘initial BWP’ to mean legacy initial BWP.In our view, what is possible today is that if the UE is configured with a RedCap specific initial BWP, and the NW provides a dedicated BWP configuration in *ServingCellConfig* for *initialDownlinkBWP* or *initialUplinkBWP*, this dedicated configuration is for the RedCap specific initial BWP, which is BWP#0 as clarified in Annex B.2. The specifications are already clear on this.[LGE2] In paper ‘R2-2304012,’ the intention of proposal 1 is to clarify whether the BWP#0 configuration option 2 is allowed for initial BWP which would be used by RedCap UE (i.e., RedCap-specific intial BWP). The wording ‘initial BWP of RedCap UE’ is intentionally used in order to include the following option to clarify this in the second part of paper.* Option 3: For RedCap UE, when *initialDownlinkBWP* and *initialUplinkBWP* in *ServingCellConfig* IE is configured, the MAC entity switches to BWPs indicated by *initialDownlinkBWP* and *initialUplinkBWP*, not to the BWP indicated by *initialDownlinkBWP-RedCap* and *initialUplinkBWP-RedCap* (i.e., clarify in the MAC specification)

Looking at the responses from other companies, common understanding is that *initialDownlinkBWP* and *initialUplinkBWP* in *ServingCellConfig* IE is applied to RedCap-specific initial BWP (i.e., *initialDownlinkBWP-RedCap* and *initialUplinkBWP-RedCap* in MAC spec), if configured. We think that it is confusing, but fine to not clarifying this if current spec is clear to others. |
| LGE | Yes, if Option 2 of proposal 1 is agreed. | Proponent.Regarding the comment by MediaTek, if the dedicated BWP configuration can map to the RedCap specific initial BWP, it is for option 2. Option 1 says that the no dedicated BWP configuration will be used for RedCap-specific initial BWP.If option 1 of proposal 1 is a common understanding, agree that no change is needed.On the other hand, if option 2 of proposal 1 is a common understanding, current spec is not enough, because current MAC specification typically uses the name of RRC parameter, as in clause 5.15.Note that in the following Conditional presence in PUCCH-ConfigCommon (in TS 38.331) specifies the case of the initial BWP (BWP#0) and the RedCap-specific initial uplink BWP separatedly.

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| Conditional Presence | Explanation |
| *InitialBWP-Only* | The field is mandatory present in the *PUCCH-ConfigCommon* of the initial BWP (BWP#0) in SIB1. It is absent in other BWPs including the RedCap-specific initial uplink BWP, if configured. |
| *InitialBWP-RedCap* | The field is mandatory present in the *PUCCH-ConfigCommon* of the RedCap-specific initial BWP. It is optional present, Need R, in the *PUCCH-ConfigCommon* of the initial BWP configured by *initialUplinkBWP*. It is absent in other BWPs. |

Also note that the following text in Annex B.2 of TS 38.331 only specifies for BWP switching* “*If a RedCap-specific initial UL/DL BWP is configured,* ***for BWP switching****, the BWP #0 always maps to the RedCap-specific initial UL/DL BWP.*”

Therefore, the current field description with BWP#0 is not enough and should be clarified.[MTK] – The term ‘BWP switching’ was added to indicate that applies to connected mode operation only (where RRC, DCI or timer based switching can take place). When in Idle mode, there are potentially two initial BWPs to use (one for paging and the other for RACH) – but in Idle, the BWP ID has no role. BWP ID only becomes relevant when we enter connected mode where it is used for switching BWPs. Again, please refer to email discussion 117 in R2#119e meeting where this was extensively discussed. |
| Huawei, HiSilicon | No strong view on the need of CR | BWP#0 configuration option 2 is support by current spec. We can follow majority on whether clarification is needed.  |
| Qualcomm | No | In our understanding, Option 2 is the current UE behavior. So nothing needs to be clarified or changed. |
| Xiaomi | No | Option 2 is the current UE behavior. And it is already supported by current spec.I do not understand why the dedicated configuration can not be configured to Redcap specific BWP. |
| OPPO | No | Agree with Qualcomm |
| Nokia | No | Agree with others |
| Samsung | No | We understand spec now works with Option2. However, if majority supports, we can accept clarification. |
| vivo | No  | We think option 2 is current understanding, and this is already clarified in the RRC spec: BWP#0 maps to the RedCap specific initial BWP. Thus, there is no need to clarify anything more.  |
| Apple | No | As other have commented, op#2 is the current behaviour and nothing needs to be changed. |
| Intel | No | We also share the view that option 2 is the behaviour. |

**2.3 NCD-SSB R2-2303134**

Following changes are proposed in R2-2303134

Change 1: In RAN2#121 meeting, RAN2 has agreed to use NCD-SSB of initial DL BWP in CG/RA-SDT procedure for RRC\_INACTIVE UE, which means the NCD-SSB can be configured to RRC\_INACTIVE RedCap UE during SDT. This is different with the case when RedCap UE is not confiugred with SDT. This NCD-SSB can be used for RSRP measurement during SDT procedure as agreed. Then, it should be clarified that, during SDT procedure configured with NCD-SSB, RedCap UE shall also perform cell re-selection related measurement based on NCD-SSB. Therefore, when SDT procedure is ongoing, RedCap UE shall continue cell re-selection related measurements as well as cell re-selection evaluation, if the RedCap-specific initial downlink BWP is associated with NCD-SSB.

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| 5.3.3.3 Actions related to transmission of *RRCSetupRequest* messageThe UE shall set the contents of *RRCSetupRequest* message as follows:…..The UE shall submit the *RRCSetupRequest* message to lower layers for transmission.If the UE is a RedCap UE and the RedCap-specific initial downlink BWP is associated with neither CD-SSB nor NCD-SSB, the UE may continue cell re-selection related measurements as well as cell re-selection evaluation, otherwise the UE shall continue cell re-selection related measurements as well as cell re-selection evaluation. If the conditions for cell re-selection are fulfilled, the UE shall perform cell re-selection as specified in 5.3.3.6.NOTE 3: For L2 U2N Remote UE in RRC\_IDLE, the cell (re)selection procedure as specified in TS 38.304 [20] and relay (re)selection procedure as specified in 5.8.15.3 are performed independently and up to UE implementation to select either a cell or a L2 U2N Relay UE. |

**Question 3a: Do you think the 1st change in** **R2-2303134 is agreeable?**

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| **Companies** | **Yes or No?** | **Comments** |
| ZTE | No | We understand when the UE supports RedCap+SDT based on NCD-SSB, the basic assumption is that this will not impact legacy idle/inactive behavior (e.g. cell reselection). Technically, the SMTC configuration provided in SIB is for CD-SSB frequencies, it may not fit the NCD-SSB frequency (e.g. SMTC offset may be wrong, and SMTC periodicity may be smaller). So even if NCD-SSB is there, similar to cell reselection during RRCSetup/Resume procedure, the UE is allowed to relax the measurements if SDT is ongoing. This relaxation was agreed for REDCAP UEs whenever there is no CD-SSB on initial BWP and this has nothing to do with existence of NCD-SSB.btw, the proposed change is made to the section of RRCSetupRequest (5.3.3.3) which is not applicable to RRC\_INACTIVE UE. So, we disagree with both the reason for change and the actual change made in this CR.[Rapp] The change should be Resume procedure in 5.3.13.3 Actions related to transmission of RRCResumeRequest or RRCResumeRequest1 message |
| MediaTek | No | Agree with ZTE.  |
| LGE | No | 1. Given that UE in RRC\_INACTIVE may use NCD-SSB only if SDT procedure is ongoing, no changes is needed in clause 5.3.3.3. Note that if something is really needed, it should be applied to clause 5.13.3.3, which is for RRC resume procedure.2. In our understanding, NCD-SSB for SDT procedure is not intended to change the legacy behavior, i.e., using CD-SSB to measurement for cell (re-)selection agreed in RAN2#116bis-e:- A RedCap UE in idle/inactive mode monitors paging only in an initial BWP (default or RedCap specific) associated with CD-SSB and performs cell (re-)selection and measurements on the CD-SSB Therefore, we prefer to maintain the current behavior, i.e., **may** perform cell related measurement. |
| Qualcomm | No | We have the same view as ZTE. In general, there is no agreement for UE to use NCD-SSB for cell reselection in idle modes. |
| Xiaomi | No | NCD-SSB is not used for cell reselection, but only used for RSRP measurement during SDT procedure. |
| OPPO | No | We have no agreement to use NCD-SSB for cell re-selection. |
| Nokia | No | Same view as others. |
| Samsung | No | This proposal is exactly what we were worried about for the previous decision. |
| vivo | See comment | Technically, we think it is benefit for UE to perform cell re-selection related measurement based on NCD-SSB. But the truth is we have agreed that the NCD-SSB could be used for RSRP measurement during SDT procedure when UE is in RRC\_INACTIVE, while we have no agreements on whether the NCD-SSB could be used for RSRP measurement in RRC\_IDLE/RRC\_INACTIVE. |
| Apple | No | We cannot go above what RANP has decided on the NCD-SSB usage. |
| Intel | No | Agree with ZTE |

Change 2: In the field descriptions of nonCellDefiningSSB-r17, it is specified that the NCD-SSB has the same values for the properties (e.g., ssb-PositionsInBurst, PCI, ssb-periodicity, ssb-PBCH-BlockPower) of the corresponding CD-SSB.

However, based one RAN2#116bis agreements, ssb-periodicity is only the same property rather than same value:

*“For connected mode operation NCD-SSB has the same properties (e.g., ssb-PositionsInBurst, PCI, ssb-periodicity, ssb-PBCH-BlockPower) as the corresponding CD-SSB. FFS if an additional property needs to be specified.*

*The network may provide absoluteFrequencySSB and ssb-periodicity explicitly for NCD-SSB, i.e., other properties such as PCI, ssb-PBCH-BlockPower, ssb-PositionsInBurst are configured with the same values from serving cell's CD-SSB.*”

The SSB periodicity of NCD-SSB can be re-configured in NonCellDefiningSSB-r17 IE (i.e. ssb-Periodicity-r17). Therefore, ssb-periodicity should be removed from the field descriptions of nonCellDefiningSSB-r17, to avoid the confusion

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| ***nonCellDefiningSSB***If configured, the RedCap UE operating in this BWP uses this SSB for the purposes for which it would otherwise have used the CD-SSB of the serving cell (e.g. obtaining sync, measurements, RLM). Furthermore, other parts of the BWP configuration that refer to an SSB (e.g. the "SSB" configured in the *QCL-Info* IE; the "ssb-Index" configured in the *RadioLinkMonitoringRS*; *CFRA-SSB-Resource*; *PRACH-ResourceDedicatedBFR*) refer implicitily to this NCD-SSB.The NCD-SSB has the same values for the properties (e.g., *ssb-PositionsInBurst*, *PCI*, *ssb-PBCH-BlockPower*) of the corresponding CD-SSB apart from the values of the properties configured in the *NonCellDefiningSSB-r17* IE. |

**Question 3b: Do you think the 2nd change in** **R2-2303134 is agreeable?**

|  |  |  |
| --- | --- | --- |
| **Companies** | **Yes or No?** | **Comments** |
| ZTE | Yes | Intention is correct, but the change is not essential, so can be merged with rapporteur CR. |
| MediaTek | Maybe | No strong view on this. Even without the change, it is already clear from the statement that the values listed in the NCD SSB IE override CD-SSB properties. |
| Huawei, HiSilicon | Yes  |  |
| Qualcomm | Yes |  |
| Xiaomi | No strong view | The current spec is very clear that SSB periodicity of NCD-SSB can be re-configured. |
| OPPO | Yes |  |
| Noki | Yes |  |
| Samsung | Yes |  |
| Vivo | Maybe | No strong view. There is no issue as SSB-periodicity could be reconfigured.  |
| Intel | Yes | It might be preferable to clarify the intetion |

Change 3: In field descriptions of ssb-Periodicity-r17, it is specified that if the field is absent in the NonCellDefiningSSB IE, the UE applies the SSB periodicity of the CD-SSB (ssb-periodicityServingCell configured in ServingCellConfigCommon). The ssb-periodicityServingCell field can be provided in either ServingCellConfigCommon IE or ServingCellConfigCommonSIB IE to configure CD-SSB. To address the case that the UE is not provided with ServingCellConfigCommon yet (e.g. the UE does not switch to any other cell via handover), the UE should be allowed to also obtain ssb-periodicityServingCell field in ServingCellConfigCommonSIB IE.

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| ***ssb-Periodicity***The periodicity of this NCD-SSB. The network configures only periodicities that are larger than the periodicity of serving cell's CD-SSB. If the field is absent, the UE applies the SSB periodicity of the CD-SSB (*ssb-periodicityServingCell* configured in *ServingCellConfigCommon* or *ServingCellConfigCommonSIB*). |

**Question 3c: Do you think the 3rd change in** **R2-2303134 is agreeable?**

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| --- | --- | --- |
| **Companies** | **Yes or No?** | **Comments** |
| ZTE | Yes | Intention is correct, but the change is not essential, so can be merged with rapporteur CR. |
| MediaTek | Yes |  |
| Huawei, HiSilicon | Yes  |  |
| Qualcomm | Yes |  |
| Xiaomi | Yes |  |
| OPPO | Yes |  |
| Nokia | Yes |  |
| Samsung | Yes |  |
| Vivo | Yes |  |
| Intel | Yes |  |

**2.4 cell barring indications in R2-2303286/R2-2303287**

It is proposed as following:

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| --- |
| **Observation 1 Besides SIB1, the cell barring indications for 1Rx/2Rx RedCap UEs are also exchanged between gNBs, so the network can select suitable target cell for triggering handover.****Observation 2 Different from initial access, for handover, it is up to the network to determine UE’s supported Rx number and select suitable target cell.****Observation 3 For FR1, the UE’s Rx number is implicitly indicated by supported DL MIMO layers, but based on current signalling design, for a specific band, the UE may report different DL MIMO layers in different FS.****Observation 4 From network implementation point of view, it is unclear whether the network can switch RedCap UE (with 2 layers DL MIMO capabilities) to a Case 3 cell by ensuring the UE is not configured with 2 layers DL MIMO in target cell.****Observation 5 There is no clear benefit/motivation to configure a cell to only support 1Rx RedCap UEs but not 2Rx RedCap UEs.****Proposal 1 To clarify in specification that “cellBarredRedCap2Rx can be set to “barred” only if cellBarredRedCap1Rx is set to “barred”.****Proposal 2 If Proposal 1 is agreed, agree the CR in [1].****Proposal 3 If Proposal 1 is not agreed, then to select one of following options:*** + **Approach 1.1: The network CANNOT switch a RedCap UE (with 2 layers DL MIMO capability) to the cell which cellBarredRedCap2Rx is set to barred.**
	+ **Approach 1.2: The network CAN switch a RedCap UE (with 2 layers DL MIMO capability) to the cell which cellBarredRedCap2Rx is set to ‘barred’ but cellBarredRedCap1Rx is set to ‘notbarred’, as long as the network ensures the UE will not be configured with 2 layers DL MIMO in target cell.**
 |

**Rapporteur understanding:**

Source cell is not supposed to handle 1RX RedCap UE to a target cell, if Xn indicates it is not allowed by this target cell. Source cell is not supposed to handle 2RX RedCap UE a target cell, if Xn indicates it is not allowed by this target cell. This is per UE type handling/Xn indication, rather than per FS. Note that UE capability/Rx branches type will not change during the connected mode.

So, even though it is source cell implementation to determine the Rx branches based on DL MIMO layer capabilities, the target cell can always decide whether to reject the handover based on its own understanding on the UE capability. In any case, after HO, target cell will always configure UE properly based on the UE capability reporting about DL MIMO layer. Then, there is no need to restrict NW implementation, as proposed in P1.

**Question 4: Do you agree to clarify in specification that “cellBarredRedCap2Rx can be set to “barred” only if cellBarredRedCap1Rx is set to “barred”? If not, please clarify your understanding on Proposal 3.**

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| --- | --- | --- |
| **Companies** | **Yes or No?** | **Comments** |
| ZTE | Yes | ProponentRegarding rapporteur’s comments, we think it is worse to purely rely on network implementation, because different NW vendors may have different implementations, then handover reject may happen frequently and without clear failure cause, the source cell even don’t know the reason is about different interpretations on DL MIMO capability. Adding restriction is the simplest solution, we haven’t seen the motivation to configure a cell that only supports 1Rx but not support 2Rx.However, as we proposed in R2-2303286, if proposal 1 cannot be agreed, then RAN2 needs to clarify which approach is correct, so the network does not need to guess the reason of HO rejection. **Proposal 3 If Proposal 1 is not agreed, then to select one of following options:*** + **Approach 1.1: The network CANNOT switch a RedCap UE (with 2 layers DL MIMO capability) to the cell which cellBarredRedCap2Rx is set to barred.**
	+ **Approach 1.2: The network CAN switch a RedCap UE (with 2 layers DL MIMO capability) to the cell which cellBarredRedCap2Rx is set to ‘barred’ but cellBarredRedCap1Rx is set to ‘notbarred’, as long as the network ensures the UE will not be configured with 2 layers DL MIMO in target cell.**
 |
| MediaTek | No strong view | Ok to go with NW vendors preference here |
| Qualcomm | No | In our view, no change is needed, because network should not admit a 2Rx UE into a cell which bars 2Rx cell by downgrading it to 1Rx UE. That depletes the purpose of having separate 1Rx and 2Rx barring indicators[ZTE] If I understand correctly, your proposal is Approach 1.1.We don’t have strong view to must go for Option 1, but we want to make sure the network implementations are aligned and be compatible with UE’s expectation. |
| Xiaomi | No | P1 would contradict with the rule of separate barring indications for 1RX and 2RX. At this late stage, it is not suggested to change this.[ZTE] Not really, with P1, the network can still set separate barring indications for 1Rx and 2Rx, but only the following scenarios are supported.* scenario 1: 1Rx is not allowed, 2Rx is allowed;
* scenario 2: Both 1Rx and 2Rx are allowed;
* scenario 3: Both 1Rx and 2Rx are not allowed.
 |
| OPPO | No | Share the same view as Qualcomm |
| Nokia | No | This is up to NW. |
| Samsung | No | Our understanding is Approach 1.1 in P3, but can leave it as NW implementation. |
| vivo | No  | We prefer the approach 1.1 above. Regarding the approach 1.2, we think NW had better to ensure a UE which is equipped with 2 RX to keep using 2 RX during and after the handover. The proposal 1 above restricts the Network flexibility.  |
| Intel | No | Decision can be left up to NW implementation. We also have similar understanding as Qualcomm; network shall respect UE capability, and therefore shall not move a UE to the cell which UE cannot support. No change is needed.  |

**2.5 eDRX CR R2-2303616**

Change 1 in 7.1:

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| The following parameters are used for the calculation of PF and i\_s above:T: DRX cycle of the UE.If the UE does not operate in eDRX as defined in clause 7.4:- T is determined by the shortest of the UE specific DRX value(s), if configured by RRC and/or upper layers or provided in PC5-RRC signalling in case of a L2 U2N Relay UE, and a default DRX value broadcast in system information. In RRC\_IDLE state, if UE specific DRX is not configured by upper layers, the default value is applied.If the UE operates in eDRX for CN paging as defined in clause 7.4:- If TeDRX, CN is no longer than 1024 radio frames:- T = TeDRX, CN;- else:- During CN configured PTW, T is determined by the shortest of UE specific DRX value, if configured by upper layers, and the default DRX value broadcast in system information.If the UE operates in eDRX for RAN paging as defined in clause 7.4: T = TeDRX, RAN;N: number of total paging frames in T |

**Rapporteur Note:** This may change the UE behavior.

**Question 5a: Do you agree with the above first change in** [**R2-2303616**](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_121bis-e/Docs/R2-2303616.zip)**?**

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| **Companies** | **Yes or No?** | **Comments** |
| ZTE | Prefer No | We understand the intention is to reformulate the text, but the UE behavior is the same, e.g. the number of POs monitored by UE does not change. In our view, the change is not necessary because the original text isn’t broken.  |
| MediaTek | No | The proposed change, while leading to simpler spec text, also leads to an inconsistent spec.If the UE is in Inactive mode with CN and RAN configured eDRX (<10.24s), the proposed text leads to the UE having T = TeDRX, CN and T = TeDRX, RANIn this case, what value of T is the UE expected to use? |
| Huawei, HiSilicon | No  | This change UE behaviors, which may be NBC.  |
| Qualcomm | No | The proposed text is indeed more readable in our view. But the original text is not broken. At this stage of R17, we prefer not to make such major changes to spec text unless something is really broken. |
| Xiaomi | No |  |
| OPPO | No | We think this change is not correct and would make UE behavior unclear, e.g. for a UE in RRC\_INACTIVE state, who needs to monitor both CN paging and RAN paging, based on the first change in R2-2303616, how to determine T in this case is unclear. |
| Nokia | No | Such changes are vulnerable to errors while nothing is broken. |
| Samsung | No | Should not remove determination of T. |
| Ericsson | Yes (proponent) | We would argue that the current text is broken because in section 7.4 it specified when the “*UE operates in eDRX*", but in section 7.1 it says “*If TeDRX, RAN is not configured or used*”, i.e. it is not clear how to interpret the text in 7.1.In section 7.4 companies are willing to specify when UE operates in eDRX for RAN and CN paging. But in section 7.1 there is concern to specify the requirements from that perspective, while it is much simpler and it does not change the UE requirements: @MDTK and @OPPO: For CN paging the UE uses T = TeDRX, CN and for RAN paging the UE uses T = TeDRX, RAN.[MTK] – But the UE is expected to monitor both CN and RAN paging – what is the expected paging cycle (T) to be used in Inactive? Bear in mind, the outcome from the earlier text is that there is only a single paging cycle used by the UE.@HW: This change does not change the UE requirements, because with the original text the UE in RRC\_INACTIVE is not required to monitor for CN paging outside PTW, correct? PS: we also did not understand why different wording is used for the same:* T = min{TeDRX, RAN, TeDRX, CN}
* shortest of UE specific DRX value configured by RRC and TeDRX, CN

[MTK] – We had proposed using a common naming scheme in Rel-17, but this was not agreeable. While we sympathise with the intent to have a single naming scheme, RAN2 was not willing to agree to this.We are also not sure if the existing text covers all the cases and combinations when TeDRX, RAN, TeDRX, CN and UE specific DRX are or are not configured.  |
| vivo | No  | Even the wording of the change is simpler, but it is hard to be understood, e.g. it is not clear to us how to determine the T when UE operates in eDRX for CN paging and RAN paging based on the change in R2-2303616. Besides, the paging mechanism with eDRX cycle has been fully discussed during R17 RedCap WI, and the current spec is clear enough which represents the reached agreements, we don’t see any motivation to overturn the previous conclusion. |
| Apple | No | Prefer not to change and bring risk of introducing unintended interpretations at this stage of the spec. |
| Intel | No | General comment to the CR - the specification of this section had lot of discussion during the WI phase, we understand the motivation (as current wording/approach was not our preferred one either) but said this, we do not see any technical reason to change it now that the WI is closed. |

Chagne 2 in 7.1: It is clarified that, if the UE is configured with eDRX, the UE uses the same i\_s as used in RRC\_IDLE. It is clarified that in RRC\_INACTIVE state, if the UE is operating in eDRX, the UE shall use the same i\_s as for RRC\_IDLE state, i.e. the UE uses the i\_s from RRC\_IDLE also outside CN configured PTW.

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| In RRC\_INACTIVE state, if the UE is operating in eDRX as specified in clause 7.4, the UE shall use the same i\_s as for RRC\_IDLE state.I |

**Rapporteur Note:**

In addiotion to the text improvement (by combing two paragraphs), it also somehow changes UE behaviors for ‘outside CN PTW’ case. Legacy text is not clear on whether UE uses the same i\_s as used in RRC\_IDLE outside the CN PTW.

**Question 5b: Do you agree with the above 2nd in R2-2303616?**

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| --- | --- | --- |
| **Companies** | **Yes or No?** | **Comments** |
| ZTE | Yes | We are fine with the change.  |
| MediaTek | Yes |  |
| Xiaomi |  | When out side the CN PTW, UE only needs to monitoring for RAN paging. This no misalignment for CN paging and RAN paging. Why use the i\_s from RRC\_IDLE which is only for the case UE needs to monitoring both CN and RAN paging. |
| OPPO | No | Agree with Xiaomi. Using the same i\_s as that in RRC\_IDLE is needed in the case when UE needs to monitor both CN paging and RAN paging. Outside CN PTW, UE only needs to monitor RAN paging. Based on the current spec, UE shall determine i\_s based on the T value used outside CN PTW. There is no ambiguity |
| Nokia | No | This seems to be NBC change. |
| Samsung |  | We need to clarify either option(use same i\_s or different i\_s) in the spec to achieve alignment of paging between UE and NW. However, we are not sure which option is NBC, as current spec does not specify it. |
| Ericsson | See comment | Perhaps for some companies this is a change, but we have the same view as Samsung, that this needs to be clarified (either way).  |
| vivo | Yes  |  |
| Apple | No | Similar view as Oppo/Xiaomi |
| Intel | Neutral | Agree that the change is preferable but it is also NBC. |

Change 3 in 7.3.2: It is unclear what SubgroupID the UE uses in RRC\_INACTIVE outside CN configured PTW.

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| 7.3.2 UE\_ID based subgroupingPaging with UE\_ID based subgrouping is used in the cell which supports UE\_ID based subgrouping, as described in clause 7.3.0.If the UE is not configured with a CN assigned subgroup ID, or if the UE configured with a CN assigned subgroup ID is in a cell supporting only UE\_ID based subgrouping, the subgroup ID of the UE is determined by the formula below:SubgroupID = (floor(UE\_ID/(N\*Ns)) mod subgroupsNumForUEID) + (subgroupsNumPerPO - subgroupsNumForUEID),where:N: number of total paging frames in T, which is the DRX cycle of RRC\_IDLE state as specified in clause 7.1. In RRC\_INACTIVE state with CN configured PTW the SubgroupID used outside CN PTW is the same as the SubgroupID used inside CN PTW.Ns: number of paging occasions for a PF |

**Rapporteur Note:**

Note this change is aligned with the intention of R2-2303467, which is discussed by powering saving offline [AT121bis-e][006][NR17] CP PowSav and DCCA Corrections (CATT). Please comment on change in offline [006], in oder to avoid redundent discusion.

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| R2-2303467:N: number of total paging frames in T, which is the DRX cycle of RRC\_IDLE state as specified in clause 7.1. For RRC\_INACTIVE UEs operating in eDRX configured by upper layers which is longer than 1024 radio frames, the T used outside CN configured PTW is the same as the T specified during the CN configured PTWNs: number of paging occasions for a PF |

Change 4 in 7.4: The upper layers/TeDRX, RAN and RRC/TeDRX, RAN are swapped between the “and/or” in section 7.4.

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| 7.4 Paging in extended DRXThe UE may be configured by RRC and/or upper layers with an extended DRX (eDRX) cycle TeDRX, RAN and/or TeDRX, CN. The UE operates in eDRX for CN paging in RRC\_IDLE or RRC\_INACTIVE states if the UE is configured for eDRX by upper layers and *eDRX-AllowedIdle* is signalled in SIB1. The UE operates in eDRX for RAN paging in RRC\_INACTIVE state if the UE is configured for eDRX by RAN and *eDRX-AllowedInactive* is signalled in SIB1. If the UE operates in eDRX with an eDRX cycle no longer than 1024 radio frames, it monitors POs as defined in 7.1 with configured eDRX cycle. Otherwise, a UE operating in eDRX monitors POs as defined in 7.1 during a periodic Paging Time Window (PTW) configured for the UE. The PTW is UE-specific and is determined by a Paging Hyperframe (PH), a starting position within the PH (PTW\_start) and an ending position (PTW\_end). PH, PTW\_start and PTW\_end are given by the following formula: |

**Question 5c: Do you agree with the above 4th change in R2-2303616?**

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| --- | --- | --- |
| **Companies** | **Yes or No?** | **Comments** |
| ZTE | No | The change is not essential. |
| MediaTek | No | Don’t see the point of this change. |
| Huawei, HiSilicon | No |  |
| Qualcomm | No |  |
| Xiaomi | No | Do not see the motivation. |
| OPPO | No |  |
| Nokia | No |  |
| Samsung | No |  |
| Ericsson | Yes (proponent) | The existing text is incorrect:* The UE can only be configured with TeDRX, RAN when configured with TeDRX, CN.
* “The UE may be configured with TeDRX, RAN or TeDRX, CN” is incorrect.
* NOTE: in other places the correct “ordering” has been used:

configured by RRC and/or upper layersRRC and/or upper layers TeDRX, RAN , and/or upper layers[MTK] – But the proposed change still results in the same and/or formulation, i.e. configured by RRC or upper layers – which can lead to the same misinterpretation. This text is not meant to clarify this dependency. The dependency of RAN eDRX on CN eDRX is clarified in the RRC spec with the following conditional flag:*RANPaging - This field is optionally present, Need R, if the UE is configured with IDLE eDRX, see TS 24.501 [23]; otherwise the field is not present.* |
| vivo | No strong view |  |
| Apple | No | Not essential |
| Intel | No | Not essential change |

# Conclusion and proposals

Based on the above summary, following proposals are given.

**TBD.**

# Reference

1. R2-2302529 Clarification on offset for cell specific RSRP thresholds for 1Rx Redcap UE OPPO
2. R2-2303133 Corrections on initial BWP configuration for RedCap Huawei, HiSilicon
3. R2-2303134 Corrections on NCD-SSB for RedCap Huawei, HiSilicon
4. R2-2303286 Clarification on cell barring indications for RedCap UEs ZTE Corporation, Sanechips
5. R2-2303287 Correction on cellBarredRedCap2Rx ZTE Corporation, Sanechips
6. R2-2304012 Issues on dedicated configuration of RedCap-specific initial BWP LG Electronics Inc.
7. R2-2303616 Corrections for eDRX in RRC\_INACTIVE Ericsson
8. R2-2303135 Corrections on RRM relaxation for RedCap Huawei, HiSilicon, OPPO