**3GPP TSG-RAN WG4 Meeting # 104-e R4-221xxxx**

**Electronic Meeting, 15th – 26th August, 2022**

**Agenda item:** 9.18.3, 9.18.3.1 and 9.18.4

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [104-e][223] NR\_redcap\_RRM\_1

**Document for:** Information

# Introduction

It is appreciated that the delegates for this topic put their contact information in the table below.

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1. Please add your contact information in above table once you make comments on this email thread.
2. If multiple delegates from the same company make comments on single email thread, please add you name as suffix after company name when make comments i.e. Company A (XX, XX)

# Topic #1: General

Contributions from AI 9.18.3.1.1 are discussed here.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2212037](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212037.zip) | OPPO | Proposal 1: No need to add restrictions of relaxed measurements for the case if the UE is not configured with eDRX\_IDLE cycle. |
| [R4-2212393](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212393.zip) | Nokia, Nokia Shanghai Bell | CR on applicability of requirements for RedCap Ues |
| [R4-2212987](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212987.zip) | Huawei, HiSilicon | Proposal 1: Not introduce threshold offset in spec and the measurement difference gap between 1Rx and 2RX is up to UE implementation. |
| [R4-2212141](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212141.zip) | Intel Corporation | Proposal 1: Reflect the RAN2 consideration of *sdt-RSRP-Threshold* in RAN4 RRM requirements as below.

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| For FR1, RedCap UE determines the absolute RSRP related thresholds for SDT procedure as follows: • UE using 2 Rx branches determines any of the above threshold (H1) based on existing signalling and RSRP range defined in TS 38.133.  • For absolute RSRP threshold, UE using 1 Rx branch determines any of the above threshold (H2) as H2 = H1 + offsetabsolute * + - Absolute RSRP threshold for SDT procedure includes *sdt-RSRP-Threshold* and *cg-SDT-RSRP-ThresholdSSB*
	+ *-* The offsetabsolute is to be inherited from RRC parameter of 1 Rx. RSRP absolute configuration margin which is
	+ to be introduced for absolute RSRP THLDs for RA-related procedures.
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Proposal 1a: Send an LS to RAN2 capturing the Proposal 1 above to include *cg-SDT-RSRP-ThresholdSSB* among the candidate of 1 Rx. RSRP absolute configuration margin.Proposal 2: Introduce separate offset of offsetRSRPChange, cg-SDT for TA validation of cg-SDT procedure as below.

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| For FR1, RedCap UE determines the RSRP change related threshold for SDT procedure as follows: • UE using 2 Rx branches determines any of the above threshold (H1) based on existing signalling and RSRP range defined in TS 38.133.  • For RSRP change threshold for TA validation of cg-SDT procedure, UE using 1 Rx branch determines any of the above threshold (H2) as H2 = H1 + offsetRSRPChange, cg-SDT. |

Proposal 2a: Send an LS to RAN2 capturing the Proposal 2 above. |
| [R4-2212988](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212988.zip) | Huawei, HiSilicon | CR: Correction on Ranking for 1RX RedCap UE |
| [R4-2213064](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213064.zip) | Nokia, Nokia Shanghai Bell | 1. Do not specify different TA validation requirements when eDRX is configured and hence reuse the requirements specified for the configuration without eDRX.
2. Reuse the FR2 requirements for SDT for legacy NR devices defined in clause 5.5.3 for RedCap UE in clause 5.2B.2.1.
3. Add the phrase: “In this case the UE shall not relax measurements on any of the neighbour cells even if the UE is configured with any relaxed measurement criterion and has fulfilled that criterion.”, for the cases with and without configured eDRX in clause 4.2B.2.2 in TS 38.133.
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| [R4-2213407](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213407.zip) | Ericsson | Proposal 1: TA validation requirements for RedCap CG-SDT is defined for UE configured with eDRX in RRC\_INACTIVE state.  Proposal 2: X1 in FR2 TA validation rules is set to max{480ms, 8\*SMTC periodicity}.Proposal 3: Z1 is set to 640 ms.  |
| [R4-2213408](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213408.zip) | Ericsson | Changes to RRC\_IDLE mode requirements for RedCap for TS 38.133 |
| [R4-2213441](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213441.zip) | vivo | Proposal 1: SDT requirements when DRX is configured can be reused for eDRX configuration without PTW. For eDRX configuration with PTW, SDT requirements when DRX is configured can be reused within PTW.Proposal 2: Determine whether the offset is a fixed value for all scenarios or is configurable and reply LS considering all impacted scenarios. |
| [R4-2213643](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213643.zip) | MediaTek inc. | 1. RAN4 can define TA validation requirement as a single value = 640ms for SDT in RedCap with eDRX.
2. RAN4 not to capture the additional highlighted text from the WF in the RAN4 specifications.
3. RAN4 can agree to provide offset if it is given as a constant value in the RAN4 specification.
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| [R4-2213656](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213656.zip) | MediaTek inc. | CR on RedCap maintenance in TS 38.133 |
| [R4-2212142](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212142.zip) | Intel Corporation | Proposal 1: For 1 Rx. RedCap UE, introduce separate offset of offsetRSRQ and offsetSINR used for *absThreshSS-BlocksConsolidation*.Proposal 1a: For 1 Rx. RedCap UE, reuse offsetRSRP and offsetRSRQ for *Q-RxLevMin / Q-QualMin* level determination.Proposal 2: Introduce separate offset of offsetRSRPChange, cg-SDT for TA validation of cg-SDT procedure for 1 Rx. RedCap UE in INACTIVE.Proposal 3: For 1 Rx. RedCap UE, introduce separate offsetRSRPChange, RRM Relxation, offsetReselectionThreshold and offsetReselectionThresholdQ for RRM relaxation evaluation in IDLE/INACTIVE if RAN4 agree to consider them within the scope of 1 Rx. configuring margin for Rel-17 RedCap UEs.Proposal 4: For 1 Rx. RedCap UE, consider separate offsetL3, RSRPChange and offsetL3, Quality for RLM/BFD relaxation evaluation in CONNECTED if RAN4 agree to consider them within the scope of 1 Rx. configuring margin for Rel-17 RedCap UEs. |
| [R4-2214062](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2214062.zip) | Ericsson | Proposal #1: RedCap UE with 1 Rx branch should apply the offset to all the cell-specific RSRP thresholds used in RAN2 specifications except those discussed in proposal 2 below.Proposal #2: RAN4 does not recommend that the RedCap UE with 1 Rx branch applies the offset to any of the conditions or thresholds used for any relaxed measurement criteria defined in Rel-16 or Rel-17.Proposal #3: RAN4 considers that it is beneficial for the RedCap UE with 1 Rx branch to apply configurable offset to the cell (re)selection thresholds: *Qrxlevmin* and *Qqualmin* |
| [R4-2213378](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213378.zip) | ZTE Wistron Telecom AB | CR on SDT RRM requirements for RedCap Ues |

## Open issues summary

### Sub-topic 1-1: Small data transmission for RedCap

**Issue 1-1-1: SDT FR2 requirements**

1. Proposals
	* **Option 1 (Nokia):** Reuse the FR2 requirements for SDT for legacy NR devices defined in clause 5.5.3 for RedCap UE in clause 5.2B.2.1.
		1. **Option 1a (Ericsson):**
			1. X1 in FR2 TA validation rules is set to max{480ms, 8\*SMTC periodicity}.
			2. Z1 is set to 640 ms.
2. Recommended WF

Discuss the options.

**Issue 1-1-2: SDT for RedCap with eDRX**

1. Proposals
	* **Option 1 (Ericsson, vivo, MTK, Nokia):** TA validation requirements for RedCap CG-SDT is defined for UE configured with eDRX in RRC\_INACTIVE state.
		1. **Option 1a (vivo):** SDT requirements when DRX is configured can be reused for eDRX configuration without PTW. For eDRX configuration with PTW, SDT requirements when DRX is configured can be reused within PTW.
		2. **Option 1b (MTK):** RAN4 can define TA validation requirement as a single value = 640ms for SDT in RedCap with eDRX.
		3. **Option 1c (Nokia)**: Do not specify different TA validation requirements when eDRX is configured and hence reuse the requirements specified for the configuration without eDRX.
2. Recommended WF
	* Moderator: Note that eDRX was not considered in Rel-17 SDT WI since eDRX is currently not support for non-RedCap UEs. eDRX is introduced in Rel-17 for RedCap UEs.

Discuss the options.

Sub topic 1-1

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| **Company** | **Comments** |
| Apple | Issue 1-1-1: fine with option 1.Issue 1-1-2: Fine with option 1a, and we think measurement window for TA validation shall not cross PTW windows. |
| Huawei | **Issue 1-1-1: SDT FR2 requirements**Option 1 is reasonable as 1RX/ reduced bandwidth has no impact on TA validation requirements. Option 1 and option 1a are the same. **Issue 1-1-2: SDT for RedCap with eDRX**In general, we think even a UE which is outside PTW window when eDRX is configured still needs to perform TA validation for transmitting in uplink using CG-SDT. In addition, in SDT WI there is below agreement:C:\Users\h00388629\AppData\Roaming\eSpace_Desktop\UserData\h00388629\imagefiles\3A88D350-1D24-44C8-A519-8119FDF1A12B.pngProposal 1c is aligned with the above agreement. Besides, we think Option 1b may be also reasonable for FR1. However for FR2, when SMTC periodicity is 160ms, max{480ms, 8\*SMTC periodicity}=1.28s, then 640ms can not cover the upper bound. |
| vivo | **Issue 1-1-2: SDT for RedCap with eDRX****Prefer option 1. Open for discussion for inactive state TA validation outside PTW window.**  |
| Ericsson | **Issue 1-1-1: SDT FR2 requirements**Option 1 is referring to the requirements listed in option 1a. Thus both options are acceptable. **Issue 1-1-2: SDT for RedCap with eDRX**eDRX was introduced for RedCap in Rel-17 and it’s impact on RRM requirements was not even discussed in other SDT WI. We support option 1, meaning that UE shall be allowed to validate the TA when configured in eDRX. In INACTIVE mode, the eDRX is configured by RAN and used without PTW is used and in this case it is treated like normal DRX. Thus there is additional work to allow TA validation with eDRX.  |
| Nokia  | **Issue 1-1-1: SDT FR2 requirements** We support option 1 and option 1a. **Issue 1-1-2: SDT for RedCap with eDRX** We support option 1, 1a and 1c. Option 1b is somewhat unclear, it should provide the condition for T1’ and T2’.  |
| CATT | **Issue 1-1-1: SDT FR2 requirements**Ok with option 1, and option 1a is the same. **Issue 1-1-2: SDT for RedCap with eDRX**Option 1 is ok for us, and option 1a is a futher description for TA validation requirements for RedCap CG-SDT. |
| Intel | **Issue 1-1-1:** Fine with option 1a. Option 1a the same for SDT WI.**Issue 1-1-2**: For FR1, TA validation rule is as below. We support the intention of Option 1. By the way, can each of propoents clarify that what would be the rules for each options ? Need to check this aspect to select between Options - 1a, 1b and 1c.Cf) TA validation rule for FR1 under DRX

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| Measurement | FR1 |
| RSRP1 | (T1 – min(640ms, M1\*TDRX)) ≤ T1’ ≤ (T1 + min(640ms, M1\*TDRX)) |
| RSRP2 | (T2 – min(640ms, M1\*TDRX)) ≤ T2’ ≤ T2 |

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| Qualcomm | **Issue 1-1-1: SDT FR2 requirements**Fine with Option 1/1a**Issue 1-1-2: SDT for RedCap with eDRX**Support option 1. Option 1a is okay with us, but for INACTIVE mode we don’t have eDRX with PTW. So requirements refined for non-Redcap UEs may apply here. We can further discuss whether the upper bound of 640ms need to be extended. |
| MediaTek | **Issue 1-1-1: SDT FR2 requirements**Option 1 is reasonable. **Issue 1-1-2: SDT for RedCap with eDRX for FR1**In general, this issue is only applicable for FR1, which is because the TA validation requirements are independent of eDRX/DRX as highlighted by Huawei comment (i.e. TA validation in FR2 is dependent on SMTC only). Therefore, we support Option 1b for FR1 and there is no need to discuss eDRX for TA validation in FR2. Besides, Option 1a is not applicable to this issue. This is because the SDT is in INACTIVE mode and the eDRX for the INACTIVE mode has no PTW association. Therefore, the only applicable eDRX in this issue are: 2.56s, 5.12s, and 10.24s. Now, if we substitute these values in the TA validation formula the resulting value is equal to 640ms, which is Option 1b in this issue. Therefore, we support Option 1b. |

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Company A |  |
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### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

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| **CR/TP number** | **Comments collection** |
| [R4-2212759](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212759.zip)Moderator (Ericsson) | *Big CR to capture all missed endorsed CRs for TS 36.133.* |
|  | Nokia: The CR is agreeable. There are few editorial errors:  Cover page: The meeting where the draft CRs were endorsed was RAN4 #102-e in February (not April).  Clauses affected: 3.1 to be removed. Page 2: “2 Rx ReCap” in last but not last paragraph of clause 4.2.2.5.8. Page 3 / Page 4: “NOTE 1: Applies for RedCap UE of all power class.” => classes.  |
|  | MediaTek: We have the following comments:1. Clause 4.2.2.14 is missing the requirements for 2Rx, where the current CR covers the requirements for 1Rx.
2. Clause 4A.1.2.9 shouldn’t be the same as caluse 4.2.2.5.8 because the eDRX range for IDLE is different than that for INACTIVE mode, hence it would be better to write a new clause for the INACTIVE mode.
 |
| [R4-2212393](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212393.zip)(Nokia, Nokia Shanghai Bell) | *CR on applicability of requirements for RedCap Ues* |
|  | Apple: fine with the CR |
|  | Huawei: we have concern on the CR.In essence the requirements of 7.4 Cell phase synchronization accuracy and 7.7 deriveSSB-IndexFromCell are for network. The description that the network requirements are applicable to RedCap UE is ambiguous. Moreover as per RANP agreement [RP-212634], RedCap UE can support SUL and the specification will not contain any explicit restriction to prevent implementation of RedCap UE with SUL. Therefore the RRM requirements related with SUL, e.g., 8.4, is supposed to be applicable for Redcap UE. However we believe there would be many other features mixed with RedCap UE in the future. From future-proof perspective, to avoid repeated updating the applicability rule when considering RedCap+ new features, we prefer not to have this applicability rule. |
|  | Ericsson: OK |
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| [R4-2212988](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212988.zip)(Huawei, HiSilicon) | *Correction on Ranking for 1RX RedCap UE* |
|  | Apple: fine with the CR |
|  | *vivo: ok with the CR* |
|  | Ericsson: OK |
|  | Nokia: The CR is agreeable. On cover page, the ME box needs to be ticked.  |
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| [R4-2213408](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213408.zip)(Ericsson) | *Changes to RRC\_IDLE mode requirements for RedCap for TS 38.133* |
|  | Apple: we don’t understand the revision of “In this case the UE shall not relax measurements on any of the neighbour cells even if the UE is configured with any relaxed measurement criterion and has fulfilled that criterion.” In section 4.2B.2.2. Is that an agreement from previous discussion? In R16 RRM relaxation we didn’t have such UE behavior clarification, we are wondering why it’s needed for RedCap RRM relaxation. |
|  | Huawei: we doubt whether the below UE behavior is necessary. How UE react in this case can leave to UE implementation.*“In this case the UE shall not relax measurements on any of the neighbour cells even if the UE is configured with any relaxed measurement criterion and has fulfilled that criterion.”* |
|  | *vivo：Technical discussion related to the issue mentioned by Apple are in the thread [224].*  |
|  | OPPO: Whether UE is configured with eDRX\_IDLE cycle is decoupled with whether UE shall meet relaxed measurement requirements on neighbour cells. But it depends on network configurations of relaxed measurement criterion and whether UE has fulfilled corresponding criterion. In our view, the requirements for power saving when the UE is not configured for eDRX should also apply. Therefore, we think there is no need to add such restrictions for the case if the UE is not configured with eDRX\_IDLE cycle. |
|  | Nokia: The CR is agreeable. Proposed rewording for first change in 4.2B.1: “The terms SSB and SMTC in this clause apply to CD-SSB only if not specified otherwise.”  |
|  | Intel: As pointed by Apple, we need to check any previous agreement or reach new agreement on the neighbor cell measurement relaxation when the serving cell does not fulfil the cell selection criterion although Ericsson’s view on this exception handling seems to be reasonable. |
| [R4-2213656](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213656.zip)(MediaTek inc.) | *CR on RedCap maintenance in TS 38.133* |
|  | Apple: fine with the CR |
|  | Ericsson: OK |
| [R4-2213406](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213406.zip)(Ericsson) | *Changes to SDT requirements for NR RedCap*Apple: Up to the conclusion from issue 1-1-1 and 1-1-2 |
| [R4-2213378](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213378.zip) (ZTE Wistron Telecom AB) | *CR on SDT RRM requirements for RedCap Ues*Apple: Up to the conclusion from issue 1-1-1 and 1-1-2 |
|  | Ericsson: We prefer to keep the current spec structure with separate section for RedCap, the reason is that some details are different. For example, for RedCap there is eDRX based requirements which is not the case for non-RedCap UEs. |

## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic #1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic 1-1** | **Issue 1-1-1: SDT FR2 requirements***Company positions after 1st round:***Option 1 (Nokia, Apple, HW, Ericsson, CATT, QC, MTK):** Reuse the FR2 requirements for SDT for legacy NR devices defined in clause 5.5.3 for RedCap UE in clause 5.2B.2.1.**Option 1a (Ericsson, HW, Nokia, CATT, Intel, QC):** * + X1 in FR2 TA validation rules is set to max{480ms, 8\*SMTC periodicity}.
	+ Z1 is set to 640 ms.

*Tentative agreements:*Reuse the FR2 requirements for SDT for legacy NR devices defined in clause 5.5.3 for RedCap UE in clause 5.2B.2.1, where:* + 1. - X1 in FR2 TA validation rules is set to max{480ms, 8\*SMTC periodicity}.
		2. - Z1 is set to 640 ms.

**Issue 1-1-2: SDT for RedCap with eDRX***Company positions after 1st round:***Option 1 (Ericsson, vivo, MTK, Nokia, CATT, Intel, QC):** TA validation requirements for RedCap CG-SDT is defined for UE configured with eDRX in RRC\_INACTIVE state.**Option 1a (vivo, Apple, Nokia):** SDT requirements when DRX is configured can be reused for eDRX configuration without PTW. For eDRX configuration with PTW, SDT requirements when DRX is configured can be reused within PTW.**Option 1b (MTK):** RAN4 can define TA validation requirement as a single value = 640ms for SDT in RedCap with eDRX.**Option 1c (Nokia, HW)**: Do not specify different TA validation requirements when eDRX is configured and hence reuse the requirements specified for the configuration without eDRX.*Recommendations for 2nd round:*Compaines to confirm if following can be agreed:“TA validation requirements for RedCap CG-SDT is defined for UE configured with eDRX in RRC\_INACTIVE state by rusing the principles from DRX requirements introduced in R17 SDT WI. 1. Note: eDRX in RRC\_INACTIVE state does not have PTW. “

Moderator comment: Note that eDRX was introduced in R17 RedCap WI for RedCap UEs and currently does not apply to non-RedCap UEs.  |

## Discussion on 2nd round (if applicable)

**Issue 1-1-2: SDT for RedCap with eDRX**

Compaines to confirm if following can be agreed:

*“TA validation requirements for RedCap CG-SDT is defined for UE configured with eDRX in RRC\_INACTIVE state by rusing the principles from DRX requirements introduced in R17 SDT WI.”*

Note: eDRX in RRC\_INACTIVE state does not have PTW.

Moderator comment: Note that eDRX was introduced in R17 RedCap WI for RedCap UEs and currently does not apply to non-RedCap UEs.

Issue 1-1-2

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| **Company** | **Comments** |
| Apple | Fine with the moderator WF |
| Qualcomm | Fine with the recommeded WF |
| Huawei | The recommended WF is not clear to us. Could Moderator clarify the following question?1. What does ” *rusing the principles from DRX requirements introduced in R17 SDT WI.*” mean? It is TDRX or TEdrx\_Inactive, if the following existing TA validation requirements are reused for RedCap UE with eDRX in inactive mode?

Table 5.2B.2.1-1 Valid measurement for FR1

|  |  |
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| Measurement | FR1 |
| RSRP1 | (T1 – min(640ms, M1\*TDRX)) ≤ T1’ ≤ (T1 + min(640ms, M1\*TDRX)) |
| RSRP2 | (T2 – min(640ms, M1\*TDRX)) ≤ T2’ ≤ T2 |

Table 5.2B.2.1-2 Valid measurement for FR2

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| Measurement | FR2 |
| RSRP1 | (T1 – [X1]) ≤ T1’ ≤ (T1 + [X1]) |
| RSRP2 | (T2 – [X1]) ≤ T2’ ≤ T2 |

1. As we know Redcap UE in RRC\_INACTIVE state has DRX\_inactive, DRX\_idle, Edrx\_idle (if configured) and eDRX\_inactive (if configured). Herein do we consider Edrx\_idle?
 |
| Intel | Fine with the recommeded WF with the following understanding that”Reuse the equaltion for FR1 by replacing TDRX by TeDRX,RAN configured by gNB only under eDRX” |
| Ericsson | We support the recommend WF.  |
| vivo | Fine with the recommeded WF |

# Topic #2: Mobility requirements

Contributions from AI 9.18.3.1.2 are discussed here.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2211970](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211970.zip) | Xiaomi | Proposal 1: RAN4 to reuse legacy HO requirements for handover directly to RedCap specific BWP with NCD-SSB only without measurement except Tsearch relaxation from 1 Rx reception.Proposal 2: There is no need to discuss the SMTC configuration mismatch issue. |
| [R4-2212038](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212038.zip) | OPPO | Proposal 1: OK with option 2 that UE could perform measurement based on NCD-SSB, and no additional handover delay (Trs) is expected.Observation 1: Trs is the SMTC periodicity of the target measured SSB, which could be configured in its SMTC configuration in the handover command or in MO on this SSB’s frequency.Proposal 2: If the UE is provided SMTC configuration in HO command or measurement object for the target measured SSB (either NCD-SSB or CD-SSB), Trs shall follow legacy requirements. Otherwise, UE can assume no reference SMTC periodicity for Trs. In this case, Trs=5ms if the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. |
| [R4-2212752](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212752.zip) | Ericsson | *Proposal 1: UE should check both CD-SSB and NCD-SSB configuration in the measObjectNR when NW doesn’t configure the SMTC in HO command.* |
| [R4-2212989](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212989.zip) | Huawei, HiSilicon | Proposal: Trs in handover requirements for RedCap UE is defined as:Trs is the SMTC periodicity of NCD-SSB indicated by nonCellDefiningSSB-r17 if the first active DL BWP included in handover command is configured with nonCellDefiningSSB-r17, otherwise, Trs is the SMTC periodicity of the CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL in handover command. If the UE is not provided SMTC configuration in handover command, Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of smtc2 prior to the handover command, Trs follows smtc1 or smtc2 according to the physical cell ID of the target cell. |
| [R4-2212990](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212990.zip) | Huawei, HiSilicon | Correction on Trs definition for RedCap UE |
| [R4-2213406](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213406.zip) | Ericsson | Changes to SDT requirements for NR RedCap |
| [R4-2213442](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213442.zip) | vivo | Proposal 1: For the requirements for HO directly to a RedCap specific BWP with NCD-SSB only without measurement (Scenario 1a), UE shall choose the SSB within the target active BWP and no additional Trs is expected.Proposal 2: For Mismatch between SMTC configurations in scenario 1, 2, 3 and 4, use option 3.  |
| [R4-2213644](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213644.zip) | MediaTek inc. | Proposal 1: RAN4 shall not add additional Trs samplefor the handover delay for unknown cell.Proposal 2: The issue of mismatch SMTC shall be left to RAN2 discussion.Proposal 3: RAN4 can leverage the existing requirements of no SMTC configuration to resolve the issue of SMTC mismatch between CD-SSB and NCD-SSB. |
| [R4-2214073](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2214073.zip) | Qualcomm Incorporated | Proposal 1: The scenario when handover is performed to a BWP which has different SSB than the one used during measurement should be considered as handover to an unknown cell.1. Capture the above condition as a note in the Handover related section in TS38.133

Proposal 2: When the Redcap specific initial DL BWP is configured for RA, extend the RRC re-establishment delay and RRC connection release with re-direction delay by X ms.1. $T\_{UE\\_re-establish\\_delay}=50 ms+T\_{identify\\_intra\\_NR}+\sum\_{i=1}^{N\_{freq}-1}T\_{identify\\_inter\\_NR,i}+T\_{SI-NR}+T\_{PRACH}+X$
2. Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH + X
3. X = 6ms (BWP switching delay)
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## Open issues summary

### Sub-topic 2-1 Handover

**Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**

1. Proposals
	* **Option 1 (Xiaomi, OPPO, vivo, MTK):** RAN4 to reuse legacy HO requirements for handover directly to RedCap specific BWP with NCD-SSB only without measurement except Tsearch relaxation from 1 Rx reception.
		1. **Option 1a (vivo, vivo):** For the requirements for HO directly to a RedCap specific BWP with NCD-SSB only without measurement (Scenario 1a), UE shall choose the SSB within the target active BWP and no additional Trs is expected.
2. Recommended WF
	* Discuss the options.

**Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement**

1. Proposals
	* **Option 1 (QC):** The scenario when handover is performed to a BWP which has different SSB than the one used during measurement should be considered as handover to an unknown cell.
		1. Capture the above condition as a note in the Handover related section in TS38.133
2. Recommended WF
	* Discuss the options.

**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**

1. Proposals
	* **Option 1 (Xiaomi, vivo, MTK):** There is no need to discuss the SMTC configuration mismatch issue.
		1. **Option 1a:** The issue of mismatch SMTC shall be left to RAN2 discussion. RAN4 can leverage the existing requirements of no SMTC configuration to resolve the issue of SMTC mismatch between CD-SSB and NCD-SSB.
	* **Option 2 (Ericsson):** UE should check both CD-SSB and NCD-SSB configuration in the measObjectNR when NW doesn’t configure the SMTC in HO command.
	* **Option 3 (HW):**
		1. Trs is the SMTC periodicity of NCD-SSB indicated by nonCellDefiningSSB-r17 if the first active DL BWP included in handover command is configured with nonCellDefiningSSB-r17, otherwise, Trs is the SMTC periodicity of the CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL in handover command. If the UE is not provided SMTC configuration in handover command, Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of smtc2 prior to the handover command, Trs follows smtc1 or smtc2 according to the physical cell ID of the target cell.
	* **Option 4 (OPPO):**
		1. If the UE is provided SMTC configuration in HO command or measurement object for the target measured SSB (either NCD-SSB or CD-SSB), Trs shall follow legacy requirements. Otherwise, UE can assume no reference SMTC periodicity for Trs. In this case, Trs=5ms if the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.
2. Recommended WF
	* Discuss the options.

Sub topic 2-1

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| **Company** | **Comments** |
| Apple | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**Option 1. But don’ t understand the rationale to capture active BWP in option 1a. **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement**The NCD-SSB and CD-SSB of the target cell carry the same information and option 1 is not needed.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**Fine with option 3 based on RRC spec definition. |
| Qualcomm | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**Support Option 1. UE shall use the SSB (CD-SSB or NCD-SSB) in the first active BWP and no additional Trs is needed**Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** Support Option 1. This was also discussed in the last meeting, although no formal agreement was captured. If the UE hasn’t measured the SSB in the target BWP before the Handover, it should be considered as HO to unknown cell and corresponding interruption delay should apply**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**We support Option 4. For Option 3 we don’t agree with “otherwise, Trs is the SMTC periodicity of the CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL in handover command”. This assumption may not be true, if the first active BWP is configured with NCD-SSB whose periodicity is larger than that of CD-SSB.  |
| Huawei | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**Support option 1. **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement**We have concern on option 1. The intention of cell search during handover is for PCI and coarse timing acquisition. As we know CD-SSB and NCD-SSB have the same PCI, and they are QCLed, therefore the coarse timing information achieved on the SSB during measurement can be applied for the NCD-SSB which UE is target to handover. Moreover cell detection would consume more power, it is not desired for RedCap UE.**Issue 2-1-3: Trs clarification due to SMTC configurations mismatch**Option 3.We don’t observe issues if the legacy requirements 5ms are applied if the NCD-SSB MO has no SMTC periodicity is provided (the idea also is captured in option 4).In addition, the current definition of Trs when SMTC is configured in HO command needs some updates according to RAN2’s agreement on SMTC:@Qualcomm, the wording “otherwise, Trs is the SMTC periodicity of the CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL” is the same as RAN2. Please check the latest SMTC definition in TS38.331.

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| ***smtc***The SSB periodicity/offset/duration configuration of target cell for NR PSCell change and NR PCell change. The network sets the *periodicityAndOffset* to indicate the same periodicity as *ssb-periodicityServingCell* in *spCellConfigCommon*.For case of NR PCell change, the *smtc* is based on the timing reference of (source) PCell. For case of NR PSCell change, it is based on the timing reference of source PSCell.If both this field and *targetCellSMTC-SCG* are absent, the UE uses the SMTC in the *measObjectNR* having the same SSB frequency and subcarrier spacing, as configured before the reception of the RRC message. For a RedCap UE, if the first active DL BWP included in this RRC message is configured with *nonCellDefiningSSB-r17*, this field corresponds to the NCD-SSB indicated by *nonCellDefiningSSB-r17*, otherwise, this field corresponds to the CD-SSB indicated by *absoluteFrequencySSB* in *frequencyInfoDL*. |

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| Xiaomi | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**Support option 1.**Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** **Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**We support option 1. For SMTC configurations mismatch issue, RAN2 has modified the signalling configuration to avoid it. From our perspective the legacy requirement cold be reused.If companies have concern on it, we are also fine with option 3. |
| vivo | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**Option 1.. **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement**We are fine with option 1. Since the target SSB after handover was not measured by the UE, the known condition of the target cell is not met and the cell would be considered as unknown. However, it is also beneficial to further discuss if there is information obtained by measurement on different SSB is also applicable to the SSB of the target cell, e.g., timing information. The known condition may be changed to account for this new scenario.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**Option 1. |
| OPPO | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**Support option 1.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**Option 4. It is not conflicted with option 1 and 3. Regardless NCD-SSB or CD-SSB in HO command, Trs shall be the SMTC periodicity of the target SSB configured by network, and the details could refer to RAN2’s definition. We are also fine with option 3 if most companies perfer to clearly paste the signalling discription of RAN2 here. |
| Ericsson | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**Option 1**Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** From our understanding, if these two SSBs are close, or these two active BWPs are overlapping, no additional delay is needed. Otherwise, similar as legacy HO, additional AGC retuning is needed. In legacy requirement, if inter-frequency HO(the target SSB doesn’t align with the serving cell’s SSB), additional AGC retuning is needed. But we don’t think it should follow unknown requirement directly which will result in an unnecessary longer delay for HO.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**Option 2.When NW configures NCD-SSB measurement, but HO to initial BWP with CD-SSB. In this case, UE can directly follow NCD-SSB periodicity to perform handover. |
| Nokia  | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)** We support Option 1.  **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** Do not agree with Option 1. In this case, the UE has valid measurements from the target cell. Especially in FR2, the handover interruption might be unnecessarily long if we agree to option 1. **Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch** Option 1. The legacy requirements cover the case in which there is a mismatch in the SMTC configurations. If the configuration is given, the UE uses it (either NCD-SSB or CD-SSB). Otherwise, the same behavior applies.  |
| Qualcomm | **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** Support Option 1. Although PCI ID is known, we think the UE still needs to measure SSBs in order to tune AGC and obtain fine time/freq offset based on the target SSB.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**@Huawei. Thank you for pointing out the definition of smtc. With that clarification, RAN4 doesn’t need to specy anything, since it’s already taken care of by RAN2.  |
| CMCC | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)****Option 1****Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** **We don’t think option 1 is needed. Even though handover is performed to a different SSB, but the measurements of original SSB can still be used. This is quite different from unknown cell.****Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch****According to RAN2 spec, option 3 is preferred** |
| MediaTek | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)**We support Option 1. Option 1a is not clear to us. **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement**Given that the SSB used for measurements is different than the one in the BWP then the HO shall be treated as a blind HO because the reference signal is not the same, hence we support Option 1.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**In general, we support Option 1a, which specifies that legacy requirements are applicable when no SMTC configuration (i.e. 5ms). This is already captured in Options 3 and 4, hence we are fine with these options too (3 and 4). Yet, we have a slight preference to support Option 4. The reason is that Option 3 provides all details from RAN2 specs, now, if in the future some of these lines are edited in RAN2 specs then RAN4 needs to modify their specs too. This to avoid that RAN4 should avoid mirroring all the details from RAN2.  |

### Sub-topic 2-2 RRC re-establishment

**Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP**

1. Proposals
	* **Option 1 (QC):**

When the Redcap specific initial DL BWP is configured for RA, extend RRC re-establishment delay by X ms.

1. $T\_{UE\\_re-establish\\_delay}=50 ms+T\_{identify\\_intra\\_NR}+\sum\_{i=1}^{N\_{freq}-1}T\_{identify\\_inter\\_NR,i}+T\_{SI-NR}+T\_{PRACH}+X$
2. X = 6ms (BWP switching delay)
3. Recommended WF
	* Discuss the option.
4. Sub topic 2-2

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| **Company** | **Comments** |
| Apple | **Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP**Agree with option 1. |
| Qualcomm | **Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP** Support Option 1. During this procedure the UE performs a cell search on the CD-SSB (configured in the non-RedCap specific initial BWP), obtain the SI (again in non-RedCap specific initial BWP) and transmits PRACH where ROs can be configured either in RedCap specific BWP or non-RedCap specific BWP. If former is the case, then UE will need to perform a BWP switch to transmit RACH, so additional delay is needed.  |
| Huawei | **Issue 2-2-1: RRC reestablishment on a BWP with NCD-SS** Don’t think the issue exists. When UE detects a loss in RRC connection, UE enters idle mode and starts to perform cell selection. In this case, UE can only observe CD-SSB (as UE is in idle mode). Therefore in our understanding, RRC reestablishment on a BWP with NCD-SSB is not a valid case. |
| Xiaomi | We agree that additional delay is need. Need to further check the X=6ms for BWP switching delay. |
| Ericsson | **Issue 2-2-1: RRC reestablishment on a BWP with NCD-SS** Firstly, we support HW’s observation. RAN4 needs to further discuss whether the scenario is valid.Secondly, we think the BWP switching delay can be absorbed into other procedure delay and don’t need to add the additional component.  |
| Nokia  | **Issue 2-2-1: RRC reestablishment on a BWP with NCD-SS** We also support Huawei’s observantion, and don’t see need to include the BWP switching delay. We need first to check with RAN2 if this scenario is possible.  |
| Intel | **Issue 2-2-1: RRC reestablishment on a BWP with NCD-SS** As pointed out by other companys, RAN4 needs to check validity of the procedure.Also, it is required to check the possibility of BWP switching delay absortion in other procedure as metioned by Ericsson. |
| Qualcomm | **Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP** Support Option 1. Note the title of the issue that we corrected during our first comment. This issue has nothing to do with NCD-SSB. It’s about performing RA in RedCap specific initial BWP, while receiving SI in non-RedCap initial BWP which is a perfectly valid scenario. We are open to discuss the exact value of X. |
| CMCC | **Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP****According to Qualcomm’s clarification, it seems that RLF happens in a BWP with NCD-SSB and UE has to reestablish on a BWP with CD-SSB for RedCap. Then it seems this BWP switching is not needed in all the cases. Also we should check whether BWP switching can be absorbed in other procedure delay.** |
| MediaTek | **Issue 2-2-1: RRC reestablishment on a BWP with NCD-SS** Fine with Option 1. |

### Sub-topic 2-3 RRC Connection release with redirection

**Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP**

1. Proposals
	* Option 1 (QC):

When the Redcap specific initial DL BWP is configured for RA, extend RRC connection release with re-direction delay by X ms.

1. Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH + X
2. X = 6ms (BWP switching delay)
3. Recommended WF
	* Discuss the option.

Sub topic 2-3

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| **Company** | **Comments** |
| Apple | **Issue 2-3-1: RRC connection release with redirection with RedCap specific initial DL BWP**Agree with option 1. |
| Qualcomm | **Issue 2-3-1: RRC connection release with redirection with RedCap specific initial DL BWP** Support Option 1. During this procedure, the UE performs a cell search on the CD-SSB (configured in the non-RedCap specific initial BWP), obtain the SI (again in non-RedCap specific initial BWP) and transmits PRACH where ROs can be configured either in RedCap specific BWP or non-RedCap specific BWP. If former is the case, then UE will need to perform a BWP switch to transmit RACH, so additional delay is needed.  |
| Huawei | **Issue 2-3-1: RRC connection release with redirection on a BWP with NCD-SS** In our understanding, whether network can indicate a NCD-SSB frequency for redirection depends on RAN2. If RAN2 think RedCap UE can support the redirection to NCD-SSB scenario, RAN4 can further discuss how to specify the corresponding requirements. |
| Xiaomi | **Issue 2-3-1: RRC connection release with redirection with RedCap specific initial DL BWP** We agree that additional delay is need. Need to further check the X=6ms for BWP switching delay. |
| Ericsson | **Issue 2-3-1: RRC connection release with redirection on a BWP with NCD-SS** Firstly, we support HW’s observation. RAN4 needs to further discuss whether the scenario is valid.Secondly, we think the BWP switching delay can be absorbed into other procedure delay and don’t need to add the additional component. |
| Nokia  | **Issue 2-3-1: RRC connection release with redirection on a BWP with NCD-SS** We no not agree with Option 1. There is need to clarify with RAN2 if the scenario is possible.  |
| Intel | **Issue 2-2-1: RRC reestablishment on a BWP with NCD-SS** As pointed out by other companys, RAN4 needs to check validity of the procedure.Also, it is required to check the possibility of BWP switching delay absortion in other procedure as metioned by Ericsson. |
| Qualcomm | **Issue 2-3-1: RRC connection release with redirection with RedCap specific initial DL BWP** Support Option 1. Note the title of the issue that we corrected during our first comment. This issue has nothing to do with NCD-SSB. It’s about performing RA in RedCap specific initial BWP, while receiving SI in non-RedCap initial BWP which is a perfectly valid scenario. We are open to discuss the exact value of X. |
| CMCC | **Issue 2-3-1: RRC connection release with redirection with RedCap specific initial DL BWP** **This issue is similar as the previous one. Same conclusion should apply.** |
| MediaTek | **Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP**Fine with Option 1. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [R4-2212990](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212990.zip)(Huawei, HiSilicon) | *Correction on Trs definition for RedCap UE* |
| Apple: up to issue 2-1-3 |
| Qualcomm: Depends on outcome of Issue 2-1-3 |
| Ericsson: Pending on the discussion |
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## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic#2-1** | **Issue 2-1-1: Requirements for HO to a RedCap specific BWP with NCD-SSB (no CD-SSB) (Scenario 1)***Company positions after 1st round:***Option 1 (Xiaomi, OPPO, vivo, MTK, Apple, QC, HW, Xioami, E///, Nokia, CMCC):** RAN4 to reuse legacy HO requirements for handover directly to RedCap specific BWP with NCD-SSB only without measurement except Tsearch relaxation from 1 Rx reception.**Option 1a (vivo):** For the requirements for HO directly to a RedCap specific BWP with NCD-SSB only without measurement (Scenario 1a), UE shall choose the SSB within the target active BWP and no additional Trs is expected.*Tentative agreements:*RAN4 to reuse legacy HO requirements for handover directly to RedCap specific BWP with NCD-SSB only without measurement except Tsearch relaxation from 1 Rx reception.**Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** *Company positions after 1st round:***Option 1 (QC, vivo, MTK):** The scenario when handover is performed to a BWP which has different SSB than the one used during measurement should be considered as handover to an unknown cell.**Option 2 (Apple, HW, Nokia, CMCC):** NCD-SSB and CD-SSB of the target cell carry same information. Option 1 not needed. **Option 3 (E///):** Additional Trs delay for AGC when handover is performed to a BWP which has different SSB than the one used during measurement*Recommendations for 2nd round:*Continue the discussions in the 2nd round.. **Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch***Company positions after 1st round:***Option 1 (Xiaomi, vivo, MTK, Nokia, QC):** There is no need to discuss the SMTC configuration mismatch issue.**Option 1a (MTK):** The issue of mismatch SMTC shall be left to RAN2 discussion. RAN4 can leverage the existing requirements of no SMTC configuration to resolve the issue of SMTC mismatch between CD-SSB and NCD-SSB.**Option 2 (Ericsson):** UE should check both CD-SSB and NCD-SSB configuration in the measObjectNR when NW doesn’t configure the SMTC in HO command.**Option 3 (HW, Apple, Xiaomi, OPPO, CMCC,):**Trs is the SMTC periodicity of NCD-SSB indicated by nonCellDefiningSSB-r17 if the first active DL BWP included in handover command is configured with nonCellDefiningSSB-r17, otherwise, Trs is the SMTC periodicity of the CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL in handover command. If the UE is not provided SMTC configuration in handover command, Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of smtc2 prior to the handover command, Trs follows smtc1 or smtc2 according to the physical cell ID of the target cell.**Option 4 (OPPO, QC, MTK):** If the UE is provided SMTC configuration in HO command or measurement object for the target measured SSB (either NCD-SSB or CD-SSB), Trs shall follow legacy requirements. Otherwise, UE can assume no reference SMTC periodicity for Trs. In this case, Trs=5ms if the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms.*Recommendations for 2nd round:*Based on the number of supporting companies, continue the discussions based on one of these two options in the 2nd round:**Option 1 (Xiaomi, vivo, MTK, Nokia, QC):** There is no need to discuss the SMTC configuration mismatch issue.**Option 3 (HW, Apple, Xiaomi, OPPO, CMCC,):**Trs is the SMTC periodicity of NCD-SSB indicated by nonCellDefiningSSB-r17 if the first active DL BWP included in handover command is configured with nonCellDefiningSSB-r17, otherwise, Trs is the SMTC periodicity of the CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL in handover command. If the UE is not provided SMTC configuration in handover command, Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of smtc2 prior to the handover command, Trs follows smtc1 or smtc2 according to the physical cell ID of the target cell. |
| **Sub-topic 2-2** | **Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP** *Company positions after 1st round:***Option 1 (QC, Apple, Xiaomi, MTK):** When the Redcap specific initial DL BWP is configured for RA, extend RRC re-establishment delay by X ms.1. $T\_{UE\\_re-establish\\_delay}=50 ms+T\_{identify\\_intra\\_NR}+\sum\_{i=1}^{N\_{freq}-1}T\_{identify\\_inter\\_NR,i}+T\_{SI-NR}+T\_{PRACH}+X$
2. X = [6] ms (BWP switching delay)

**Option 2 (HW, Ericsson, Nokia, Intel, CMCC):** Scenario is not valid, disagree to option 1.* + 1. 2a(Ericsson, Intel, CMCC): Assuming scenario is valid, delay can be absorbed into existing (other) procedure delay

*Recommendations for 2nd round:*Based on the number of supporting companies, diverse views on whether the scenario is valid. During the 2nd round, companies are further encouraged to check internally whether the scenario is supported from RAN2 perspective and provide updated comments based on that.  |
| **Sub-topic 2-2** | **Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP***Company positions after 1st round:***Option 1 (QC, Apple, Xiaomi, MTK):** When the Redcap specific initial DL BWP is configured for RA, extend RRC connection release with re-direction delay by X ms.1. Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH + X
2. X = [6] ms (BWP switching delay)

**Option 2 (HW, Ericsson, Nokia, Intel, CMCC):** Whether the scenario is valid needs to be checked.**2a(Ericsson, Intel, CMCC):** Assuming scenario is valid, delay can be absorbed into existing (other) procedure delay*Recommendations for 2nd round:*Based on the number of supporting companies, diverse views on whether the scenario is valid. During the 2nd round, companies are further encouraged to check internally whether the scenario is supported from RAN2 perspective and provide updated comments based on that. |

## Discussion on 2nd round (if applicable)

**Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement**

*Company positions after 1st round:*

* + **Option 1 (QC, vivo, MTK):** The scenario when handover is performed to a BWP which has different SSB than the one used during measurement should be considered as handover to an unknown cell.
	+ **Option 2 (Apple, HW, Nokia, CMCC):** NCD-SSB and CD-SSB of the target cell carry same information. Option 1 not needed.
	+ **Option 3 (E///):** Additional Trs delay for AGC when handover is performed to a BWP which has different SSB than the one used during measurement

*Recommendations for 2nd round:*

Continue the discussions in the 2nd round.

**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**

**Option 1 (Xiaomi, vivo, MTK, Nokia, QC):** There is no need to discuss the SMTC configuration mismatch issue.

**Option 3 (HW, Apple, Xiaomi, OPPO, CMCC,):**

Trs is the SMTC periodicity of NCD-SSB indicated by nonCellDefiningSSB-r17 if the first active DL BWP included in handover command is configured with nonCellDefiningSSB-r17, otherwise, Trs is the SMTC periodicity of the CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL in handover command. If the UE is not provided SMTC configuration in handover command, Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of smtc2 prior to the handover command, Trs follows smtc1 or smtc2 according to the physical cell ID of the target cell.

**Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP**

*Recommendations for 2nd round:*

Based on the number of supporting companies, diverse views on whether the scenario is valid. During the 2nd round, companies are further encouraged to check internally whether the scenario is supported from RAN2 perspective and provide updated comments for the options based on that.

**Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP**

Based on the number of supporting companies, diverse views on whether the scenario is valid. During the 2nd round, companies are further encouraged to check internally whether the scenario is supported from RAN2 perspective and provide updated comments for the options based on that.

Sub topic 2-1, 2-2 and 2-3

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| **Company** | **Comments** |
| Apple | **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** Option 2.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**Option 3 is precise for spec.**Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP** Fine with HW’s observation and then since CD-SSB is used for cell detection during IDLE, no additional delay shall be considered.**Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP**After checking with RAN2 colleagues, so far redirection cannot use NCD-SSB and therefore no new requirement shall be considered. |
| Qualcomm | **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** We support Option 1. Measuement conditions for the cell are not satisfied if the two SSBs are different, and the cell cannot be considered as known.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**Option 1. RAN4 doesn’t need to specify anything, since it’s already taken care of by RAN2.**Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP** **Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP**We support Option 1. This issue is not related to NCD-SSB. This issue is related to RedCap specific initial BWP configured for RA. UE performs a cell search on the CD-SSB (configured in the non-RedCap specific initial BWP), obtain the SI (again in non-RedCap specific initial BWP) and transmits PRACH where ROs can be configured either in RedCap specific BWP or non-RedCap specific BWP. If former is the case, then UE will need to perform a BWP switch to transmit RACH, so additional delay is needed. |
| Huawei | **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** Option 2. CD-SSB and NCD-SSB have the same PCI, and they are QCLed, therefore the coarse timing information achieved on the SSB during measurement can be applied for the NCD-SSB which UE is target to handover. Moreover cell detection would consume more power, it is not desired for RedCap UE.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**As per the 1st round discussion, some companies think the **SMTC configuration** has already captured in RAN2, so suggest to reuse the legacy wording. After further checking, although we prefer explicit description of what SMTC periodicity corresponds to, we can compromise not to capture this.However we found for RedCap, the legacy wording on same frequency and SCS is ambiguous. In handover command, **there may be multiple SSBs, i.e., NCD-SSB and CD-SSB, which SSB frequency/SCS shall be used herein**?

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| **Legacy Trs definition in TS38.133**Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cell in the handover command, otherwise Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing. If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*prior to the handover command, Trs follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. |

Therefore we think for this part, RedCap shall have specific description.**(Note: RAN2 has no any discription for RedCap UE on the scneario where SMTC is not indicated in handover command.**) Please check if the following Trs definition for RedCap is clear:

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| Trs is the SMTC periodicity of the target NR cell if the UE has been provided with an SMTC configuration for the target cellin the handover command, otherwise,Trs is the SMTC configured in the measObjectNR having the same SSB frequency and subcarrier spacing as NCD-SSB indicated by nonCellDefiningSSB-r17 if the first active DL BWP included in handover command is configured with nonCellDefiningSSB-r17, otherwise, as CD-SSB indicated by absoluteFrequencySSB in frequencyInfoDL in handover command.If the measObjectNRs having the same SSB frequency and subcarrier spacing configured by MN and SN have different SMTC, Trs is the periodicity of one of the SMTC which is up to UE implementation. If the UE is not provided SMTC configuration or measurement object on this frequency, the requirement in this clause is applied with Trs=5ms assuming the SSB transmission periodicity is 5ms. There is no requirement if the SSB transmission periodicity is not 5ms. If the UE has been provided with higher layer in TS 38.331 [2] signaling of *smtc2*prior to the handover command, Trs follows *smtc1* or *smtc2* according to the physical cell ID of the target cell. |

In summary, if option 3 is not acceptable, please check revised Trs definition as above. To us, if option 3 is **Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP** Thanks for further clarification from QC. The scenario is RedCaP UE first performs cell search to a cell and abtain SI on CD-SSB BWP, and then transmits RACH on redcap specific initial bwp. The scenario may exisits. But we are not sure whether RAN4 needs to consider this scenario and define requirements. We are open to furhter discuss.**Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP**After checking with RAN2, whether network can indicate a NCD-SSB frequency for redirection depends on RAN2. |
| Ericsson | **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** We propose option 3 which is a compromise solution between option 1 and 2.**Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch**We’re fine with Huawei’s update version.**Issue 2-2-1: RRC reestablishment on a BWP with RedCap specific initial DL BWP** **Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP**From our understanding, the BWP switching time can be absorbed into other procedure delay and don’t need to add the additional component. |
| vivo | **Issue 2-1-2: Requirements for HO to a BWP which has different SSB with the one used for measurement** **We prefer option 1.** **Issue 2-1-3: Trs clarification due to** **SMTC configurations mismatch****Support option 1.****Issue 2-3-1: RRC connection release with redirection on a BWP with RedCap specific initial DL BWP****We are ok with option 2a, which means the delay can be absorbed.** |

# Topic #3: Timing requirements

Contributions from AI 9.18.3.1.3 are discussed here.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2214074](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2214074.zip) | Qualcomm Incorporated | Proposal 1: UE shall meet UL Tx timing accuracy requirement based on intra-freq reference SSB outside active BWP if max (MGRP, SMTC period) x CSSFintra\_RedCap <= 160 ms |
| [R4-2214076](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2214076.zip) | Qualcomm Incorporated | Draft CR on timing requirements with measurement gaps for RedCap UEs |

## Open issues summary

### Sub-topic 3-1 Timing

**Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP**

Background: Following was agreed at RAN4#103-e [R4-2210592]:

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| **Whether SSB has to be in UE active BWP for meeting the UE transmit timing requirements**For core requirement, Redcap UE should meet the existing Te and Tq requirements provided that the SSB is available at the UE at least once every 160 ms on the following conditions that1. The SSB should be within active BWP, or
2. The SSB is not within active BWP, and the gap is configured
3. Capture the condition in the section for RedCap timing of the specification
 |

1. Proposals
2. **Option 1 (QC):**  UE shall meet UL Tx timing accuracy requirement based on intra-freq reference SSB outside active BWP if max (MGRP, SMTC period) x CSSFintra\_RedCap <= 160 ms.
3. Recommended WF
	1. Discuss the option.

Sub topic 3-1

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| **Company** | **Comments** |
| Apple | Option 1 is not necessary. The current description is already generic enough to reflect the SSB availability at UE within 160ms, and it’s up to UE implementation to coordinate for the actual SSB tracking timing. |
| Qualcomm | Support option 1. Since the SSB would be measured in the gap in this case, this would be the case of intra-frequency measurement with gaps (CD-SSB reference) and because the MG is shared, CSSF scales the measurement period. So this condition is necessary to ensure that an SSB is measured by the UE to obtain reference timing in the last 160ms. |
| Huawei | We think the yellow highlight part in the existing sentence has already ensure UE can meet Te requirements for both within and outside active BWP. We are wondering wheter option 1 is necessary.“The UE shall meet the Te requirement for an initial transmission provided that at least one SSB (CD-SSB or NCD-SSB) is available at the UE during the last 160 ms” |
| Xiaomi | Prefer to keep the current requirement. |
| vivo | We think the current descrption is sufficient.  |
| Ericsson | **Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP**Option 1 is not agreeable. RAN4 has already discussed and agreed on the timing requirements and the CR was approved. Although detailed proposals were discussed, the conclusion was to not include this level of details.  |
| Nokia | **We support option 1.**  |
| CATT | It is not necessary to describe as option 1, the current description is enough. |
| Intel | The general description of ” the SSB is available at the UE at least once every 160 ms” in the current requirment would be enough. |
| Qualcomm | We disagree that current description is sufficient. When NCD-SSB is not configured, UE will have to measure the CD-SSB within gaps and because of measurement gap sharing, even though the SSB is available at the UE, it not be able to perform this intra-freq measurement with gaps within last 160ms if the MGRP periodicity is high. E.g. if the MGRP is 160ms and CSSFintra\_RedCap is greater than 1, it cannot be guranteed that the UE measures the serving cell CD-SSB in last 160ms.The condition max (MGRP, SMTC period) x CSSFintra\_RedCap <= 160 ms basically ensures that the UE can actually obtain the reference timing in last 160ms |
| CMCC | We don’t think option1 is necessary.  |
| MediaTek | We don’t think this condition is necessary.  |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [R4-2214076](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2214076.zip)(Qualcomm Incorporated) | *Draft CR on timing requirements with measurement gaps for RedCap UEs* |
| Apple: Up to issue 3-1-1 |
| Ericsson: We can’t agree to the proposed changes. RAN4 has already discussed and reached the conclusion that no such conditions or details need to be specified in the specification. |
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## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic 3-1** | **Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP***Company positions after 1st round:***Option 1 (QC, Nokia):**  UE shall meet UL Tx timing accuracy requirement based on intra-freq reference SSB outside active BWP if max (MGRP, SMTC period) x CSSFintra\_RedCap <= 160 ms.**Option 2 (Apple, HW, Xiaomi, vivo, Ericsson, CATT, Intel, CMCC, MTK):**  Conditions in option 1 is not necessary.*Recommendations for 2nd round:*Continue the discussions based on the technical arguemented provided in the 1st round.  |

## Discussion on 2nd round (if applicable)

**Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP**

Continue the discussions based on the technical arguemented provided in the 1st round.

Sub topic 3-1

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| **Company** | **Comments** |
| Apple | **Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP**Option 2. In our view ”availble at UE” means UE is able to use this SSB for timing tracking at least every 160ms but how to coordinatethe measurement resource is up to UE implementation. |
| Qualcomm | **Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP**Option 1. We disagree that current description is sufficient. In our understanding available at UE may not mean that the UE is able to use the SSB for timing purpose. When NCD-SSB is not configured, UE will have to measure the CD-SSB within gaps and because of measurement gap sharing, even though the SSB is available at the UE, it not be able to perform this intra-freq measurement with gaps within last 160ms if the MGRP periodicity is high. E.g. if the MGRP is 160ms and CSSFintra\_RedCap is greater than 1, it cannot be guranteed that the UE measures the serving cell CD-SSB in last 160ms. |
| Huawei | **Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP****Option 2.** We think the legacy disciption of “The UE shall meet the Te requirement for an initial transmission provided that at least one SSB (CD-SSB or NCD-SSB) is available at the UE during the last 160 ms” has already ensure UE can meet Te requirements for both within and outside active BWP. |
| Intel | **Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP**Option 2. The general description of ” the SSB is available at the UE at least once every 160 ms” in the current requirement would be enough. |
| Ericsson | **Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP**We also support option 2, i.e. the additional conditions as proposed in option 1 to meet the timing requirements are not needed. This issue was also discussed quite a lot during earlier meetings and RAN4 finally reached the conclusion to not introduce such conditions. As also pointed out by Huawei during the 1st round, we believe the wording in current requirements is very clear (i.e. the timing requirements apply provided that at least one SSB (CD-SSB or NCD-SSB) is available. This wording is also well aligned with the legacy (Rel-15) timing requirements also. *“The UE shall meet the Te requirement for an initial transmission provided that at least one SSB (CD-SSB or NCD-SSB) is available at the UE during the last 160 ms””* |
| vivo | **Issue 3-1-1: Timing requirements hwen SSB is not in the active BWP****Prefer option 2. We think the current threshold (160ms) is sufficient and how to cooperate with this threshold is an UE implementation issue.**  |
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# Topic #4: Signalling characteristics

Contributions from AI 9.18.3.1.4 are discussed here.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2211971](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211971.zip) | Xiaomi | Proposal 1: It is feasible to further relax RLM/BFD for Rel-17 RedCap UE satisfying stationary criterion and good serving cell quality criterion.Proposal 2: Further relaxation of RLM/BFD is feasible when SSearchDeltaP\_stationary ≤ SSearchDeltaP-Connected and/or TSearchDeltaP\_stationary ≥ TSearchDeltaP-Connected. |
| [R4-2212757](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212757.zip) | Ericsson | draftCR on RedCap RLM |
| [R4-2212913](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212913.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: RAN4 to prioritize the definition of RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17.Proposal 2: The RLM/BFD relaxation factors defined in the NR\_power\_sav\_enh WI are applicable to 2 Rx RedCap UEs. |
| [R4-2212991](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212991.zip) | Huawei, HiSilicon | Proposal 1: Not to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17. |
| [R4-2212992](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212992.zip) | Huawei, HiSilicon | Clarification on SSB in RLM and BFD for RedCap UE |
| [R4-2213443](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213443.zip) | vivo | Proposal 1: Suggest to consider RLM/BFD relaxation for Redcap UE within the maintenance phase. Proposal 2: if proposal 1 is agreeable, the baseline is the corresponding requirements of Rel-17 RLM/BFD are reused for Redcap UE, i.e., K value and DRX cycle range defined in Rel-17 power saving WI are reused for Redcap UE.Proposal 3: RAN4 considers to define the BWP switch requirements when BWP switch happens between disjoint channel bandwidths or in partially overlapping channel bandwidths. The corresponding requirements could be defined in Rel-17 Redcap maintenance phase. |
| [R4-2213645](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213645.zip) | MediaTek inc. | 1. RAN4 to define further relaxations (e.g., introduce K values) to RLM/BFD measurements for a Rel-17 RedCap UE that is configured with and satisfies RLM/BFD relaxation criteria.
 |

## Open issues summary

### Sub-topic 4-1 Relaxed RLM/BFD

**Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**

1. Proposals
	* **Option 1 (Xiaomi, vivo, MTK):** RAN4 to define further relaxations (e.g., larger K values) to RLM/BFD measurements for a Rel-17 RedCap UE based on outcome of relaxed RLM/BFD from Rel-17 power saving WI.
		1. **Option 1a (Nokia):** RAN4 to prioritize the definition of RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17.
	* **Option 2 (HW):** Not to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17.
2. Recommended WF

Discuss the options.

**Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17**

1. Proposals
	* **Option 1 (vivo):** The baseline is the corresponding requirements of Rel-17 RLM/BFD are reused for Redcap UE, i.e., K value and DRX cycle range defined in Rel-17 power saving WI are reused for Redcap UE.
		1. **Option 1a (MTK):** RAN4 to define further relaxations (e.g., introduce K values) to RLM/BFD measurements for a Rel-17 RedCap UE that is configured with and satisfies RLM/BFD relaxation criteria.
		2. **Option 1b (Nokia):** The RLM/BFD relaxation factors defined in the NR\_power\_sav\_enh WI are applicable to 2 Rx RedCap UEs.
	* **Option 2 (Xiaomi):** Further relaxation of RLM/BFD is feasible when SSearchDeltaP\_stationary ≤ SSearchDeltaP-Connected and/or TSearchDeltaP\_stationary ≥ TSearchDeltaP-Connected.
2. Recommended WF

Discuss the options.

Sub topic 4-1

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| **Company** | **Comments** |
| Apple | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**Option 2. The R17 feature is not in the scope of RedCap WI. According to the agreement in LS R4-2206977, RAN4 will not define any RRM requirements for RedCap UE for other release 16/release 17 features which are not listed in the table of R4-2206977 in release 17, and only R17 SDT is considered in R17 RedCap. **Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17**Same as issue 4-1-1. |
| Qualcomm | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**We think RLM/BFD relaxations defined in Rel-17 UE power saving WI are applicable to a RedCap UE as specified in the WID. We are okay with specifying further relaxations based on stationarity criteria. Also we are okay to discuss whether the same relaxation factors (as 2Rx UEs) are applicable to 1Rx UEs as well**Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17**Agree with Option 1. We can check the feasibility of Option 2. |
| Huawei | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**Support option 2.In R17 RLM/BFD WI, it had taken several meeting cycles to evaluate the power saving gain with RLM/BFD relaxation. The conclusion is agree to relax RLM/BFD evaluation period for short DRX cycles (not larger than 80ms DRX). It is not necessary to relax for larger DRX cycles as no outstanding gain is observed.For RedCap UE with 1RX, the evaluation period for Qout for both SSB-based and CSI-RS based RLM and BFD are doubled. It can be expected that less power saving gain is achieved with further relaxation on these requirements. Therefore we think not to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17.**Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17** |
| Xiaomi | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**Support option 1. The principle of the Rel-17 RLM/BFD low mobility criterion and Rel-17 RRM stationary criterion are basically the same, so we think the evaluation of “stationary” mobility state could also be effective to RLM/BFD. **Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17**Option 1 and option 2 are not excluded with each other. We are fine with both options.Option 2 is to make sure that the Rel-17 stationary criterion has more stringent configuration than Rel-17 RLM/BFD low mobility criterion. In current spec, the parameters for the two criteria are configured based on NW implementation, we want to clarify that the further relaxation is only feasible under the condition that Rel-17 stationary criterion is more stringent. |
| vivo | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**Prefer option 1. Technically Rel-17 UE power saving conclusions on RLM/BFD relaxation can be applied to Redcacp and could be done in the maintenance phase. **Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17****Prefer use option 1 as the baseline.**  |
| OPPO | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**Prefer option 2. As compromise, we are ok to discuss the feasibility of applying RLM/BFD relaxation factors to Redcap 2Rx UE. |
| Ericsson | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**We support option 1a from Nokia. **Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17**We support option 1b from Nokia.  |
| Nokia | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17** Our preferred option is option 1a. In order to fully resolve this issue, we need to clarify the following questions: 1. Is RAN4 defining relaxed RLM/BFD requirements based on Rel-17 power saving for RedCap UEs?

Our view is that the effort in introducing RLM / BFD requirements based on Rel-17 power saving for RedCap UEs with 2 Rx is small. In the power saving WI, UEs with 2 Rx were the baseline for the definition of the requirements. Therefore, our view is that the requirements could be reused. 1. If yes, is this relaxation applicable to both 1 Rx and 2 Rx UEs?

Only for 2 Rx UEs. For 1 Rx UEs, we believe that more information is needed. First of all, we do not know how the relaxation criteria will work considering the offset to the different thresholds used in power saving (if the offsets are applicable in this case). So we need more time, and maybe this case could be considered in Rel-18. Furthermore, the RLM OOS and BFD evaluation times were already extended for RedCap UEs with 1 Rx. 1. Which K values need to be considered?

The same values used in Rel-17 power saving for 2 Rx UEs **Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17** Option 1b, as explained above.  |
| CATT | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**Option 1a is a good compromise.**Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17**Option 1 is ok for us, and option 1b also is a good compromise. Option 2 can be futher discussed. |
| Intel | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**According to the recent updates on Rel-17 RedCap WID in [RP-211574](https://www.3gpp.org/ftp/tsg_ran/TSG_RAN/TSGR_92e/Docs/RP-211574.zip) in last June RAN plenary, it is stated that “No RRM measurement relaxations are specified for the serving cell”. If this proposal is to change the WID scope, more justification would be required in this maintenance stage. |
| CMCC | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17****Option2. We don’t prefer to combine RedCap with Rel-17 features at this very late stage.****Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17****We do not agree to define new relxation requirements for RedCap at the very late stage of Rel-17. This WI was already announced to be closed in RAN#96 meeting.** |
| MediaTek | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**We support Option 1. If we only support Option 1a to prioritize the work on 2Rx, then that is already completed but we beleive the workload for 1Rx is not much. **Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17**We support Option 1. If we only support Option 1a to prioritize the work on 2Rx, then that is already completed but we beleive the workload for 1Rx is not much. |

### Sub-topic 4-2 BWP switching

**Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths**

1. Proposals
	* **Option 1 (vivo**): RAN4 considers to define the BWP switch requirements when BWP switch happens between disjoint channel bandwidths or in partially overlapping channel bandwidths. The corresponding requirements could be defined in Rel-17 Redcap maintenance phase.
2. Recommended WF
	* Discuss the option.

Sub topic 4-2

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| **Company** | **Comments** |
| Apple | **Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths** Option 1 needs more clarification. If it’s for RRC based BWP switching, we think it’s already supported in current spec for disjoint channel bandwidths or in partially overlapping channel bandwidths. If it’s for DCI based BWP switching, we disagree to introduce it for disjoint channel bandwidths or in partially overlapping channel bandwidths, because even the legacy UE has no such requirement. |
| Qualcomm | **Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths** Do not support Option 1. Such requirements are not defined for non-RedCap UEs and we don’t think a RedCap UE, which has low complexity, need to be tested with corner case scnearios especially during the close of the WI. |
| Huawei | We are open to further discuss on this. Could proponent of option 1 clarify whether the BWP switching delay would be reduced for the partial overlapping case. |
| vivo | **Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths** To Apple QC and Huawei, yes, the intention is for DCI based BWP switching. We do agree that the legacy UE has no such requirement. The reason we have this suggestion is for legacy UE, the typical BWP switch case could be switch from a BWP with small bandwidth to a BWP with large bandwidth. BWP switch for disjoint channel bandwidth maybe not a typical case. However for a Redcap UE it may switch between a few different BWPs with identical bandwidth however with disjoint location on the frequency domain. Hence what we suggest to define is a typical case for Redcap and this is the reason of our suggestion.  |
| Ericsson | **Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths** We don’t agree to opton 1. To our understanding it is not clear why this would be more typical scenario for RedCap compared to non-RedCap scenario.  |
| Nokia  | The BWP switching when only the center frequency is changed has been discussed for some meetings without any conclusion. We do not agree to option 1. |
| CATT | We understand the explaination from vivo.But we consider even the typical BWP switch case could be switch from a BWP with small bandwidth to a BWP with large bandwidth, the probability of partially overlapping between channel bandwidths for Redcap UE seems like similar to the normal UE, so we think it should be the same consideration on this issue for the Redcap UE and the normal UE. So, we prefer not to considering this case for low complexity. |
| Intel. | **Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths** As pointed by Nokia, there is a history to reduce BWP change delay under center freq. only change but failed to reach an agreement. Thus, the necessity of scenario in **Issue 4-2-1** seems to have lower priority.  |
| CMCC | **Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths** **We do not agree with option 1. We proposed new BWP switching requirements for RedCap in previous meetings, and no companies agree to define RedCap specific BWP switching requirements. Why we repen the discussion after the WI is closed?** |
| MediaTek | **Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths** We have similar comment as Ericsson. More study is needed.  |
| vivo | **To Nokia and Intel. To our understanding what we proposed is quite different from the case where RAN4 has discussed before. The intention to define the BWP switch requirement for disjoint channel bandwidth is due to the introduction of the separate initial BWP, which is a mandatory feature of Redcap.** **As indicated in the following figure the scenario is where Initial DL BWP and Separate initial DL BWP is not overlapping at the frequency domain, which is a typical for Redcap. Then there coudld be frequently BWP swtich between initial DL BWP and separate initial DL BWP and currently there is no corresponding RAN4 requirements.** **This scenario is somehow a hole in current spec which impacts the Redcap functionality and when defing requirement, legacy reqwuireent could be reused for this scenario. Whereas the BWP switch scenario RAN4 discussed before is an optimization issue, to our understanding**  |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [R4-2212757](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212757.zip)(Ericsson) | *draftCR on RedCap RLM* |
| Apple: in the existing transition requirement, we have the case of “transitions from a first configuration of BFD/RLM resources to a second configuration of BFD/RLM resources”, we are wondering if the revision has already been covered by existing spec. |
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| [R4-2212992](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212992.zip)(Huawei, HiSilicon) | *Clarification on SSB in RLM and BFD for RedCap UE**Apple: fine with the CR.* |
| Ericsson: OK |
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## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic 4-1** | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17***Company positions after 1st round:***Option 1 (Xiaomi, vivo, MTK, QC):** RAN4 to define further relaxations (e.g., larger K values) to RLM/BFD measurements for a Rel-17 RedCap UE based on outcome of relaxed RLM/BFD from Rel-17 power saving WI.**Option 1a (Nokia, OPPO, Ericsson, CATT):** RAN4 to prioritize the definition of RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17.**Option 2 (HW, Apple, OPPO, Intel, CMCC):** Not to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17.*Recommendations for 2nd round:*Based on the 1st round comments and considering that RedCap WI is already completed and the effort of introducing new relaxed RLM/BFD requirements for 1 Rx based on R17 PS WI agreements, check if following alternative proposal can be agreed:1. ***Alternative proposal:*** RAN4 to define RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17 by reusing the R17 PS requirements with following exception:
	* Low mobility criterion used in R17 PS WI is replaced with RedCap stationary criterion

**Issue 4-1-2: If further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI is defined for RedCap in Rel-17***Company positions after 1st round:***Option 1 (vivo, QC, Xioami, MTK):** The baseline is the corresponding requirements of Rel-17 RLM/BFD are reused for Redcap UE, i.e., K value and DRX cycle range defined in Rel-17 power saving WI are reused for Redcap UE.**Option 1a (MTK):** RAN4 to define further relaxations (e.g., introduce K values) to RLM/BFD measurements for a Rel-17 RedCap UE that is configured with and satisfies RLM/BFD relaxation criteria.**Option 1b (Nokia, Ericsson, CATT):** The RLM/BFD relaxation factors defined in the NR\_power\_sav\_enh WI are applicable to 2 Rx RedCap UEs.**Option 2 (Xiaomi, OPPO):** Further relaxation of RLM/BFD is feasible when SSearchDeltaP\_stationary ≤ SSearchDeltaP-Connected and/or TSearchDeltaP\_stationary ≥ TSearchDeltaP-Connected.**Option 3 (Apple, CMCC):** Not to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17.*Recommendations for 2nd round:*Continue the discussion under issue 4-1-1. |
| **Sub-topic 4-2** | **Issue 4-2-1: BWP switch between disjoint channel bandwidths or in partially overlapping channel bandwidths** *Company positions after 1st round:***Option 1 (vivo**): RAN4 considers to define the BWP switch requirements when BWP switch happens between disjoint channel bandwidths or in partially overlapping channel bandwidths. The corresponding requirements could be defined in Rel-17 Redcap maintenance phase.**Option 2 (vivo, QC, Ericsson, Nokia, CATT, Intel, CMCC**): No work needed.*Recommendations for 2nd round:*Consdidering that RedCap WI is already completed and taking into account the large number of companies supporting option 2, it is recommended maintain the current requirements and not to introduce an new BWP switching requirements. No discussions needed in 2nd round.  |

## Discussion on 2nd round (if applicable)

**Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**

Based on the 1st round comments and considering that RedCap WI is already completed and the effort of introducing new relaxed RLM/BFD requirements for 1 Rx based on R17 PS WI agreements, check if following alternative proposal can be agreed:

1. ***Alternative proposal:*** RAN4 to define RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17 by reusing the R17 PS requirements with following exception:
	* Low mobility criterion used in R17 PS WI is replaced with RedCap stationary criterion

Sub topic 4-1

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| **Company** | **Comments** |
| Apple | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**We think it’s no need to discuss the relaxed RLM/BFD requirements for RedCap, sicne it has been clearly mentioned in the lastest WID (RP-220966): No RRM measurement relaxations are specified for the serving cell. |
| Qualcomm | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**We agree that RLM/BFD relaxations defined in Rel-17 UE power saving WI are applicable to a RedCap UE as specified in the WID. We are okay with specifying further relaxations based on stationarity criteria.We don’t understand why we need to replace the low mobility criterion used in R17 PS WI with stationary criterion. Low mobility crierion should already apply to (at least 2Rx) RedCap UEs. This issue is to discuss whether we need additional relaxations for stationary UEs.  |
| Huawei | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**Agree with Apple, this is out of RedCap WI scope.  |
| Intel | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**As pointed out in the 1st round, current Rel-17 RedCap WID states that “No RRM measurement relaxations are specified for the serving cell”. If this proposal is to change the WID scope, more justification would be required in this maintenance stage.The doubling of the evaluation period for Qout for both SSB-based and CSI-RS based RLM and BFD for RedCap UE with 1Rx should be interpredted as a remedy for measurement accuracy compensation in RedCap WI scope rather than power saving WI scope. |
| Ericsson | **Issue 4-1-1: Whether to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17**We are fine with the alternative proposal because for 2 Rx RedCap, the relaxed BFD/RLM can be reused. Note that no relaxation was introduced for 2 Rx RedCap in terms of accuracy or measurement period, in that sense we believe the 2 Rx evaluations done in R17 PS WI may be valid and can be reused. The reason we think stationary criterion has to be used is because, our understanding is that the RedCap low mobility criterion introduced in R17 applies only in IDLE/INACTIVE state while the stationary criterion applies in CONNECTED state. But we don’t support alternative proposal for 1 Rx since there is already relaxation introduced for RedCap 1 Rx due to reduction of receive antenna.  |
| vivo | **We are ok with “**RAN4 to define RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17 by reusing the R17 PS requirements” however we need further check whether Low mobility criterion used in R17 PS WI can be replaced with RedCap stationary criterion or not.  |

# Topic #5: Measurement procedure

Contributions from AI 9.18.3.1.5 are discussed here.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2211847](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211847.zip) | Apple | *Proposal 1: If intra-frequency measurement is with MG, CSSFoutside\_gap,i = Y for inter-frequency measurement with no measurement gap, Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG.**Proposal 2: the serving cell thresholds of SIntraSearchP/SIntraSearchQ/SnonIntraSearchP/SnonIntraSearchQ for IDLE/Inactive mode and s-MeasureConfig for Connected mode should be checked based on reference SSB measurement.**Proposal 3: RAN4 to support the RAN2 proposal on the time offset between CD-SSB of the serving cell and this Non-Cell Defining SSB, with the value range {sf5, sf10, sf15, spare5, spare4, spare3, spare2, spare1}.* |
| [R4-2212039](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212039.zip) | OPPO | Proposal 1: If a RedCap UE support both FR1 and FR2, whether RedCap UE can support per-FR gap(e.g., independentGapConfig) depends on UE capability.Proposal 2: As compromise, it is also fine for Redcap UE to only support per UE gap in R17. |
| [R4-2212279](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212279.zip) | CMCC | Proposal 1: When SMTC occasions of inter-frequency measurement object are partially overlapped by the measurement gap are measured outside of MG, RedCap UEs should perform inter-frequency MOs outside MG.Proposal 2: If a RedCap UE support both FR1 and FR2, whether RedCap UE can support per-FR gap (e.g., independentGapConfigdf) depends on UE capability. |
| [R4-2212280](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212280.zip) | CMCC | CR on carrier-specific scaling factor for RedCap (9.1A.5) |
| [R4-2212753](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212753.zip) | Ericsson | *Proposal 1: If a RedCap UE support both FR1 and FR2, UE can support per-FR gap capability.* |
| [R4-2212756](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212756.zip) | Ericsson | draftCR on inter-RAT NR measurement for RedCap |
| [R4-2212758](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212758.zip) | Ericsson | draftCR on RedCap measurement |
| [R4-2212993](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212993.zip) | Huawei, HiSilicon | Proposal 1: No need to report RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting.Proposal 2: If a RedCap UE supports both FR1 and FR2, whether RedCap UE can support per-FR gap(e.g., independentGapConfig) depends on UE capability (Option 1).Proposal 3: CSSFoutside\_gap is also supposed to be applied to following measurement type:SSB-based inter-frequency measurement with no measurement gap in clause [9.3B.7], when part of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement, if UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network. |
| [R4-2212994](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212994.zip) | Huawei, HiSilicon | Correction on measurement requirements for RedCap UE |
| [R4-2213065](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213065.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: Specify separate measurement requirements and interruption requirements for per-FR gap compared to per-UE gap.Proposal 2: Support of per-UE gap is mandatory for RedCap UE supporting FR1 and FR2, whilst support of per-FR gap is optional and indicated as UE capability. |
| [R4-2213444](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213444.zip) | vivo | Proposal 1: For the issue whether to support for per-FR/per-UE gap, support option 2. Option 1 is also acceptable.  |
| [R4-2213646](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213646.zip) | MediaTek inc. | Proposal 1: If MG is needed, both per-UE and per-FR MG can be supported by UE, but they both share the same per-UE MG based cell identification/measurement requirements. |
| [R4-2214075](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2214075.zip) | Qualcomm Incorporated | Proposal 1: Define minimum UE requirements to handle measurement type transition from intra-frequency (with/without MGs) to inter-frequency (with/without MGs) and vice versa, when BWP-specific *servingCellMO* is configured.Proposal 2: For a frequency layer whose classification (intra/inter frequency) changes due to the BWP switch, UE should start measuring the number of cells/SSBs according to the new classification (based on the relationship between the new reference SSB and configured MO), at the end of the BWP switch.Proposal 3: For a frequency layer whose classification (intra/inter frequency measurements with/without MGs) changes due to the BWP switch, starting from end of the BWP switch, the UE should be able to perform the measurements within the delays (cell identification and cell measurement delays) according to the new classification (based on the relationship between the new reference SSB and configured MO), i.e., the measurement/cell identification period resets at the end of the BWP switch. |

## Open issues summary

### Sub-topic 5-1 Use of NCD-SSB for CONNECTED mode measurements

**Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB**

1. Proposals
	* **Option 1-1 (QC):**  Define minimum UE requirements to handle measurement type transition from intra-frequency (with/without MGs) to inter-frequency (with/without MGs) and vice versa, when BWP-specific *servingCellMO* is configured.
	* **Option 1-2 (Ericsson):**  Define minimum UE requirements to handle SSB type transition from CD-SSB to NCD-SSB and vice versa for the following scenarios:
		1. RLM/BFD/CBD/L3 measurement/L1-RSRP measurement
2. Recommended WF
	* Discuss the options.

**Issue 5-1-2: Requirements when measurement changes due to BWP switching**

1. Proposals
	* **Option 1 (QC):** For a frequency layer whose classification (intra/inter frequency) changes due to the BWP switch,
		1. UE should start measuring the number of cells/SSBs according to the new classification (based on the relationship between the new reference SSB and configured MO), at the end of the BWP switch.
		2. starting from end of the BWP switch, the UE should be able to perform the measurements within the delays (cell identification and cell measurement delays) according to the new classification (based on the relationship between the new reference SSB and configured MO), i.e., the measurement/cell identification period resets at the end of the BWP switch.
	* **Option 2(Ericsson):**
		1. When the measurement on one intra-frequency measurement object transitions from measurements performed by CD-SSB to measurements performed by NCD-SSB or vice versa during one measurement period, the cell identification and measurement period requirements with NCD-SSB delay apply.
2. Recommended WF
	* Discuss the options.

**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting**

1. Proposals
	* **Option 1 (HW):** No need to report RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting.
2. Recommended WF
	* Discuss the option.

**Issue 5-1-4: Serving cell threshold associated SSB**

1. Proposals
	* **Option 1 (Apple):** The serving cell thresholds of SIntraSearchP/SIntraSearchQ/SnonIntraSearchP/SnonIntraSearchQ for IDLE/Inactive mode and s-MeasureConfig for Connected mode should be checked based on reference SSB measurement.
2. Recommended WF
	* Discuss the option.

Sub topic 5-1

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| **Company** | **Comments** |
| Apple | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** Not sure if the option 1-1 and 1-2 is really necessary since we didn’t have transition requirement between intra-freq with MG and intra-freq without MG either (when the BWP switching happens). But if majority companies think it’s worthwhile to have such requirement, we are open to discuss.**Issue 5-1-2: Requirements when measurement changes due to BWP switching** Up to conclusion from issue 5-1-1.**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** May leave it to RAN2 and don’t need to discuss further in RAN4. **Issue 5-1-4: Serving cell threshold associated SSB**Option 1. We think it’s necessary to clarify this in the requirement, e.g., add a note in the requirement section, to avoid ambiguity. |
| Qualcomm | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** We support both Option 1-1 and 1-2. For L3 measurements, number of cells/SSBs to be measured/monitored changes when during BWP switch the measurement type changes from intra-freq to inter-freq and vice versa. Cell identification and measurement delays also changesFor L1 measurements, the SSB type may change from CD-SSB to NCD-SSB and vice versa. As they may have different periodicities, the delays may be different. **Issue 5-1-2: Requirements when measurement changes due to BWP switching** During the BWP switch, whether the UEs keep the the past samples during the measurement ornot is totally upto UE implementation. We think, as minimum UE requirements, RAN4 should reset the measurement periods at the end of the BWP switch, implying that the UE should not be required to consider past samples (from the old BWP) in the measurements for the target BWP.We support Option 1.**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** Fine with Option 1**Issue 5-1-4: Serving cell threshold associated SSB**In our understanding, all IDLE/INACTIVE mode procedures use CD-SSB. There is no reference SSB for IDLE/INACTIVE mode. Could the proponents clarify their proposal? |
| Huawei | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** Either defining measurement type (intra-f/inter-f) transition or no requirements is fine to us. If companies would like to define the requirements, we think we shall follow the principle as R17 concurrent gap (section 9.1.7.2):

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| C:\Users\h00388629\AppData\Roaming\eSpace_Desktop\UserData\h00388629\imagefiles\DCBCC4A9-1A9F-4DC9-A0D9-9A2A84A2BDDC.png |

It means that if the measurement type changes due to BWP switching, UE is allowed to restart the measurement (means restart measurement sample counting).**Issue 5-1-2: Requirements when measurement changes due to BWP switching**Similar comments as issue 5-1-1. For the both cases mentioned in option 1 and option2, we suggest to follow the principle for pre-MG, that is, if the measurement type (inta-f/inter-f) changes or measurement changes between CD-SSB and NCD-SSB, UE is allowed to restart the measurement((means restart measurement sample counting).**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting**Support option 1.RAN2’s signalling design work for RedCap UE has been completed at last meeting. The IE *MeasResults* or *MeasConfig* or *reportConfigNR* are reused for RedCap UE. Based the current signalling, network can acquire the information of the SSB type (NCD-SSB or CD-SSB) from measurement reporting.**Issue 5-1-4: Serving cell threshold associated SSB**Option 1 is fine. |
| Xiaomi | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** No strong view on this issue. Open to discuss.**Issue 5-1-2: Requirements when measurement changes due to BWP switching**Up to conclusion from issue 5-1-1.**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting**Fine with option 1.**Issue 5-1-4: Serving cell threshold associated SSB**Fine with option 1. |
| vivo | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** The transition requirements would be not necessary in our view. It would be better to leave it to UE implementation. Under different configurations, there may be different handling of the transitions. If it is standardized, it may not be optimized implementation for many cases.**Issue 5-1-2: Requirements when measurement changes due to BWP switching** Depending on issue 5-1-1**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** It should be RAN2 scope and no need to discuss in RAN4.**Issue 5-1-4: Serving cell threshold associated SSB**NCD-SSB is not supported for IDLE mode so far. Thus, no clarification is needed. There is no requirements for connected mode threshold s-MeasureConfig. |
| OPPO | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** Donot see the necessity.**Issue 5-1-2: Requirements when measurement changes due to BWP switching** Depending on issue 5-1-1**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** Leave to RAN2 .**Issue 5-1-4: Serving cell threshold associated SSB**Option 1 is fine |
| Ericsson | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** Option 1-1, 1-2.RAN4 should define the transition period requirement for SSB type changes which is the same as legacy requirement for intra-frequency measurement due to BWP switching.From our understanding, the typical SSB transition scenarios are as follow.1. UE camps on initial BWP with CD-SSB and further transfers to RedCap BWP with NCD-SSB1(configured in BWP-specific servingCellMO)
	1. Intra-frequency meas. changes from CD-SSB to NCD-SSB1 (intra-freq without gap -> without gap)
2. UE performs BWP switching among different RedCap BWPs
	1. Intra-frequency meas. changes from NCD-SSB1 to NCD-SSB2(intra-freq without gap -> with gap)

The SSB type transition will impact L3 intra-frequency measurement and L1 measurement for serving cell.At the same time, inter-frequency measurement will also change between different SSB types.**Issue 5-1-2: Requirements when measurement changes due to BWP switching** Option 2.UE should follow the legacy transition requirement, such as intra-freq meas. without gap to with gap.

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| When the measurement on one intra-frequency measurement object transitions from measurements performed outside gaps to measurements performed within gaps or vice versa during one measurement period, the cell identification and measurement period requirements with the longer delay apply. |

When UE performs intra-freq meas. from CD-SSB to NCD-SSB, after BWP switching, UE should continue the measurement and follow NCD-SSB periodicity which periodicity is equal or larger than CD-SSB.**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** Option 1**Issue 5-1-4: Serving cell threshold associated SSB**In Idle mode, it was agreed to only use CD-SSB for measurement. Thus, it’s unnecessary to consider the association with different SSB type.We also think *RSRP-Range* in *s-MeasureConfig* is independent with different SSB types in CONNECTED mode. |
| Nokia | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** The benefit of introducing transition requirements should be further discussed, as there will be additional measurement requirements, additional testing and perhaps additional delay. In our view, another option to be considered is the reporting of the RS type to the network as discussed under issue 5-1-3.  **Issue 5-1-2: Requirements when measurement changes due to BWP switching** We agree that measurement requirements for CD-SSB and NCD-SSB may deviate based on their frequency. The difference in requirements due to BWP switch or other RRM procedures should be minimised though. **Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** We do not agree with option 1. For the network it can be beneficial to know the reported RS type, in case it configures measurements on both RS types.  **Issue 5-1-4: Serving cell threshold associated SSB** We agree with Qualcomm and vivo, NCD-SSB is not supported for IDLE mode in Rel-17.  |
| CATT | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** It is OK for us to define requirements or not.**Issue 5-1-2: Requirements when measurement changes due to BWP switching** Depending on issue 5-1-1**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** Leave to RAN2 .**Issue 5-1-4: Serving cell threshold associated SSB**Agree with Qualcomm, vivo and Nokia, NCD-SSB is not supported for IDLE mode in Rel-17.  |
| MediaTek | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** Fine with both Options.**Issue 5-1-2: Requirements when measurement changes due to BWP switching** Fine with Option 1.**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** We beleive this is a RAN2 issue. **Issue 5-1-4: Serving cell threshold associated SSB**Fine with option 1. |

### Sub-topic 5-2 CSSF, gap related issues

**Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG**

1. Proposals
	* **Option 1 (Apple):** If intra-frequency measurement is with MG, CSSFoutside\_gap,i = Y for inter-frequency measurement with no measurement gap, Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG.
	* **Option 2 (CMCC, HW):** When SMTC occasions of inter-frequency measurement object are partially overlapped by the measurement gap are measured outside of MG, RedCap UEs should perform inter-frequency MOs outside MG.
2. Recommended WF
	* Following was agreed during the GTW on 2022-08-17:

**Agreement:**

1. If intra-frequency measurement is with MG, CSSFoutside\_gap,i = Y for inter-frequency measurement with no measurement gap, Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG.
2. When SMTC occasions of inter-frequency measurement object are partially overlapped by the measurement gap are measured outside of MG, RedCap UEs should perform inter-frequency MOs outside MG. If UE supports this inter-frequency without gap, the flag of [inter-frequency\_config\_R16] is configured by network.

**Issue 5-2-2: Whether to support for per-FR gap**

1. Proposals
	* **Option 1 (OPPO, CMCC, Ericsson, HW, vivo, Nokia):**  If a RedCap UE support both FR1 and FR2, whether RedCap UE can support per-FR gap(e.g., independentGapConfigdf) depends on UE capability.
		1. **Option 1a (Nokia):** Specify separate measurement requirements and interruption requirements for per-FR gap compared to per-UE gap. Support of per-UE gap is mandatory for RedCap UE supporting FR1 and FR2, whilst support of per-FR gap is optional and indicated as UE capability.
		2. **Option 1b (OPPO):** As compromise, it is also fine for Redcap UE to only support per UE gap in R17.
	* **Option 2 (MTK):** If MG is needed, both per-UE and per-FR MG can be supported by UE, but they both share the same per-UE MG based cell identification/measurement requirements.
2. Recommended WF

Following was agreed during the GTW on 2022-08-17:

**Agreement:**

* If a RedCap UE support both FR1 and FR2, whether RedCap UE can support per-FR gap(e.g., independentGapConfigdf) depends on UE capability.
* Define the requirements only considering per-UE gap in Rel-17.

Sub topic 5-2

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| **Company** | **Comments** |
| Apple | **Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG**option 1 and option 2 are not mutual exclusive.We support option 1.The current option 2 is not very clear, we can use Huawei’s proposal directly:SSB-based inter-frequency measurement with no measurement gap in clause [9.3B.7], when part of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement, if UE supports *interFrequencyMeas-NoGap-r16* and the flag *interFrequencyConfig-NoGap-r16* is configured by the Network.**Issue 5-2-2: Whether to support for per-FR gap**Option 1b and option 2. |
| Qualcomm | **Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG**We are fine with Option 1.**Issue 5-2-2: Whether to support for per-FR gap**When per-FR gaps are configured, which gaps should the UE use when it’s operating in FR1 and measuring FR2 MOs? For non-RedCap UEs, these measurements can be done with the second searcher, but a RedCap UE has a single searcher, so the interruptions should be carefully considered.  |
| Huawei | **Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG**Option 1 and option 2 are not conflict. We support both.The update in Option 1 is reasonable with considering the case Intra-frequency MO needs MG. Regarding Option 2, when considering CSSFoutsidegap for RedCap, both SMTC non-overlapping and partial overlapping with gap shall be considered. The reason is that SMTC and gap partial overlapping case is one typical configuration. Moreover in the approved CR for RedCap UE [3], Kp is already considered in inter-frequency measurements without gaps requirements in clause 9.3B.7 (shown in below). As we know, Kp is introduced due to inter-frequency SMTC is partially colliding with measurement Gap.**Issue 5-2-2: Whether to support for per-FR gap**Option 1. |
| Xiaomi | **Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG**Fine with both options.**Issue 5-2-2: Whether to support for per-FR gap**Option 1b and option 2 |
| vivo | **Issue 5-2-2: Whether to support for per-FR gap****We think option 1 could be used a compromise, then further discussion requirements, especially on interrution as mentioned by QC.**  |
| OPPO | **Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG**We support option 1.**Issue 5-2-2: Whether to support for per-FR gap**Option 1b. If we go with option 1, then search assumption and interruption can be further discussed.  |
| Ericsson | **Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG**Fine with option 1.We also don’t have strong view for option 2. **Issue 5-2-2: Whether to support for per-FR gap**Option 1Per-FR gap capability is optional. When UE has FR1 serving cell and can perform measurement on FR2 without gap, it can claim to support per-FR gap. Otherwise, UE can claim to support per-UE gap. Especially, considering forward compatibility, per-FR gap capability should be kept. |
| CMCC | **Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG****Issue 5-2-2: Whether to support for per-FR gap****These were agreed on Monday GTW session** |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [R4-2212280](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212280.zip) (CMCC) | *CR on carrier-specific scaling factor for RedCap (9.1A.5)* |
| Apple: for CSSF inside MG, if part of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap and and the flag *interFrequencyConfig-NoGap-r16* is not configured by the Network, can we also count it in the CSSF inside MG? |
| Ericsson: Same as HW’s CR. Depends on inter-frequency discussion, can merge into one CR. |
| Nokia: CR is a agreeable with the rewording: “overlapped by the measurement gap”. We agree with Apple regarding CSSF inside MG.  |
|  | CMCC: To Apple, yes, we agree with your understanding, network flag is necessary to enable this feature. Maybe we can add the following sentence for within gap- part of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap but the flag *interFrequencyConfig-NoGap-r16* is not configured by the NetworkTo Nokia for pointing out the typo, we will update this accordingly. |
| [R4-2212756](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212756.zip)(Ericsson) | *draftCR on inter-RAT NR measurement for RedCap* |
| Apple: fine |
| Nokia: CR is agreeable.  |
| [R4-2212758](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212758.zip)(Ericsson) | *draftCR on RedCap measurement* |
| Apple: why transition requirement for L1-RSRP measurement is needed? We don’t have such requirement for legacy L1-RSRP even though legacy L1-RSRP may also change when BWP switching happens. And also up to issue 5-2-2. |
| Huawei: the part “When the measurement on one intra-frequency measurement object transitions from measurements performed by CD-SSB to measurements performed by NCD-SSB or vice versa during one measurement period, the cell identification and measurement period requirements with NCD-SSB delay apply. ” depends on conclusion of issue 5-1-2. |
| Nokia: The part on measurement transitions depends on outcome of issue 5-1-1. For FR capable UE in clause 9.1A.2, why term “MN” is used for the network. Is DC scenario referred here?  |
| [R4-2212994](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212994.zip)(Huawei, HiSilicon) | Correction on measurement requirements for RedCap UE |
| Apple: up to issue 5-2-2. |
| Ericsson: Same as CMCC’s CR. Depends on inter-frequency discussion, can merge into one CR. |
| Nokia: More discussion is needed on the first change related to requirements for effective MGRP. For second change on CSSF, there is no change for CSSF inside gap and we prefer the Ericsson CR.  |

## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic#5-1** | **Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB,** **Issue 5-1-2: Requirements when measurement changes due to BWP switching,***Company positions after 1st round:***Option 1-1 (QC, E///, CATT, Xiaomi, MTK):**  Define minimum UE requirements to handle measurement type transition from intra-frequency (with/without MGs) to inter-frequency (with/without MGs) and vice versa, when BWP-specific *servingCellMO* is configured.**Option 1-2 (Ericsson, QC, CATT, Xiaomi, MTK, HW):**  Define minimum UE requirements to handle SSB type transition from CD-SSB to NCD-SSB and vice versa for the following scenarios:* + 1. RLM/BFD/CBD/L3 measurement/L1-RSRP measurement

**Option 3 (vivo, OPPO):**  No need to define transition requirements.**Option 4 (Nokia):** Instead of defining transition requirements, UE shall report the RS type to the NW**Issue 5-1-1: Whether to define requirements to handle measurement type transition between NCD-SSB and CD-SSB** *Company positions after 1st round:***Option 1 (QC, MTK):** For a frequency layer whose classification (intra/inter frequency) changes due to the BWP switch, * + UE should start measuring the number of cells/SSBs according to the new classification (based on the relationship between the new reference SSB and configured MO), at the end of the BWP switch.
	+ starting from end of the BWP switch, the UE should be able to perform the measurements within the delays (cell identification and cell measurement delays) according to the new classification (based on the relationship between the new reference SSB and configured MO), i.e., the measurement/cell identification period resets at the end of the BWP switch.

**Option 2(Ericsson):** * + When the measurement on one intra-frequency measurement object transitions from measurements performed by CD-SSB to measurements performed by NCD-SSB or vice versa during one measurement period, the cell identification and measurement period requirements with NCD-SSB delay apply.

**Option 3 (HW):** Follow the principle as R17 concurrent gap (section 9.1.7.2) for defining the transition requirements.*Tentative agreements:*RAN4 to define transitioning requirements for following cases, when BWP-specific servingCellMO is configured:1. Transition from CD-SSB to NCD-SSB and vice versa for
	* RLM/BFD/CBD measurement
	* Intra-frequency/Inter-frequency measurement
2. How to define the requirements is:
	* Option 1: Following legacy measurement requirement (9.1.6), UE should continue the measurement after BWP switching. The NCD-SSB measurement delay shall apply.
	* Option 2: Following Pre-MG requirement (9.1.7), UE can restart the measurement after BWP switching.

*Recommendations for 2nd round:*Compaines continue to discuss how to define the requirement based on the options above.**Issue 5-1-3: Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** *Company positions after 1st round:** + **Option 1 (HW, QC, Xiaomi, Ericsson):** No need to report RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting.
	+ **Option 2 (Apple, vivo, OPPO, CATT, MTK):** Up to RAN2.
	+ **Option 3 (Nokia):** UE reports the RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting.

*Recommendations for 2nd round:*Given that this issue has been discussed quite a lot during last few meetings and no strong support for option 3, there is no need to continue the discussion in 2nd round. **Issue 5-1-4: Serving cell threshold associated SSB***Company positions after 1st round:** + **Option 1 (Apple, HW, Xiaomi, OPPO, MTK):** The serving cell thresholds of SIntraSearchP/SIntraSearchQ/SnonIntraSearchP/SnonIntraSearchQ for IDLE/Inactive mode and s-MeasureConfig for Connected mode should be checked based on reference SSB measurement.
	+ **Option 2 (QC, vivo, Nokia, Ericsson):** IDLE mode procedures depend on CD-SSB, thus no need to check reference SSB.

Moderaor’s comment:Following was sated in the LS from RAN2 to RAN1 and RAN4 [R2- 2201759]:1. *“RAN2 agreed that “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, using an NCD-SSB for such purposes is not considered further.”*

Based on the above agreement from RAN2, no further discussions needed in 2nd round. *Recommendations for 2nd round:*No discussion for IDLE mode procedures; RAN4 to continue the discussion *s-MeasureConfig* for Connected mode.  |
| **Sub-topic#5-2** | **Issue 5-2-1: CSSF assumptions for intra/inter-frequency measurement with MG****Agreement:** 1. If intra-frequency measurement is with MG, CSSFoutside\_gap,i = Y for inter-frequency measurement with no measurement gap, Y is the number of configured inter-frequency MOs without MG that are being measured outside of MG.
2. When SMTC occasions of inter-frequency measurement object are partially overlapped by the measurement gap are measured outside of MG, RedCap UEs should perform inter-frequency MOs outside MG. If UE supports this inter-frequency without gap, the flag of [inter-frequency\_config\_R16] is configured by network.

**Issue 5-2-2: Whether to support for per-FR gap****Agreement:** * If a RedCap UE support both FR1 and FR2, whether RedCap UE can support per-FR gap(e.g., independentGapConfigdf) depends on UE capability.
* Define the requirements only considering per-UE gap in Rel-17.
 |

## Discussion on 2nd round (if applicable)

**Issue 5-1-2: Requirements when measurement changes due to BWP switching,**

Compaines continue to discuss how to define the requirement based on the options below:

**Option 1:** Following legacy measurement requirement (9.1.6), UE should continue the measurement after BWP switching. The NCD-SSB measurement delay shall apply.

**Option 2:** Following Pre-MG requirement (9.1.7), UE can restart the measurement after BWP switching.

**Issue 5-1-4: Serving cell threshold associated SSB**

* + **New option:** The serving cell thresholds of *s-MeasureConfig* for Connected mode should be checked based on reference SSB measurement.

Note: The new option applies only to CONNECTED mode threshold.

Sub topic 5-1

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| **Company** | **Comments** |
| Apple | **Issue 5-1-2: Requirements when measurement changes due to BWP switching,**Can compromise to option 2, or we don’t need such requirement because legacy RLM/BFD RS change transition requirement can already cover this NCD-SSB to CD-SSB change.**Issue 5-1-4: Serving cell threshold associated SSB**Support new option. The intention here is to clarify: the reference SSB used in serving cell mobility measurement shall also be used for serving cell threshold checking, that is, the reference SSB based RSRP will be used to trigger serving cell thredhold *s-MeasureConfig* and alsoreference SSB based RSRP will be used to trigger the mobility event. With such clarification, we can avoid the ambiguity that: UE uses reference SSB(e.g., NCD-SSB) to trigger the mobility event, but use different SSB(e.g., CD-SSB) to trigger *s-MeasureConfig* for neighbor cell measurement. |
| Qualcomm | **Issue 5-1-2: Requirements when measurement changes due to BWP switching,**We support option 2 |
| Huawei | **Issue 5-1-2: Requirements when measurement changes due to BWP switching**Fine with option 2.**Issue 5-1-4: Serving cell threshold associated SSB**One question, what is the impact on specificiation if option 1 is agreed? |
| Ericsson | **Issue 5-1-2: Requirements when measurement changes due to BWP switching,**Option 1.From our understanding, RedCap UE should at least continue the intra-frequency measurement after BWP switching which is the same as legacy intra-frequency transition requirement. Considering NCD-SSB periodicity is equal or larger than CD-SSB, the delay can follow NCD-SSB periodicity.**Issue 5-1-4: Serving cell threshold associated SSB**We understood the intention of option 1, but we still need time to check whether this further clarification is necessary. |
| vivo | **Issue 5-1-2: Requirements when measurement changes due to BWP switching****Our initial thinking is this requirement is not needed. Can compromise to option 2.** **Issue 5-1-4: Serving cell threshold associated SSB****Ok with the recommended WF** |

# Topic #6 Reply LS

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2211847](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211847.zip) | Apple | *Proposal 4: RAN4 to confirm that a RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds, including the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC idle/inactive state.**Proposal 5: RAN4 to confirm that a RedCap UE with 1 Rx branch can apply a predefined offset to cell (re)selection thresholds, i.e., Qrxlevmin (minimum required Rx level in the cell [dBm]) and Qqualmin (minimum required quality level in the cell [dB]), Qqualmin.* |
| R4-2213051 | vivo | *Proposal 1: For RedCap UE, there are three potential alternatives as follows for the UE to support operation without SSB in an RRC-configured active BWP.*1. *Alt 1. UE works in a larger bandwidth than active BWP, which should be no larger than channel bandwidth of the RedCap UE, so that SSB can be included in the UE working channel bandwidth, which could be either the configured UE carrier channel bandwidth or a larger channel bandwidth that includes bandwidth of both active BWP and SSB.*
	1. *Minimum spec changes, which would be applicability of requirements mainly, are expected.*
2. *Alt 2. UE is provided measurement gaps, including NCSG gap pattern, to perform BM/RLM/BFD when the active BWP does not contain SSB.*
	1. *Further study and evaluation are needed. Big impacts to spec, including requirements and signaling, are expected.*
3. *Alt 3. UE uses redundant RF chain to perform BM/RLM/BFD when the active BWP does not contain SSB.*
	1. *Measurement requirements need to be studied and specified in RAN4.*
	2. *Cost should also be considered for RedCap UE.*

*Observation 1: For RedCap UE, Alt 1 may not be the typical implementations.**Observation 2: For RedCap UE, Alt 2 seems workable in all of the cases.**Observation 3: For RedCap UE, Alt 3 may bring extra cost.* |
| [R4-2212916](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212916.zip) | Nokia, Nokia Shanghai Bell | *Proposal 1: RedCap UE with 1 Rx branch applies a fixed offset to all cell-specific RSRP thresholds which are applicable to RedCap.**Proposal 2: A RedCap UE with 1 Rx branch shall apply a configurable offset to cell (re)selection thresholds, i.e., either Qrxlevmin and Qqualmin or only Qrxlevmin.**Proposal 3: RAN4 to discuss whether to define configurable offsets to all RSRP/ RSRQ thresholds for 1 Rx RedCap UEs either from Rel-17 or from Rel-18.**Proposal 4: RAN4 shall send the following LS response:* |
| [R4-2213649](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213649.zip) | MediaTek inc. | Proposal 1: RAN4 shall inform RAN2 that the offset is not applicable for all cell-specific RSRP thresholds.Proposal 2: If RAN4 would like to introduce offset for other RSRP threshold then this shall be discussed case by case.Proposal 3: RAN4 shall inform RAN2 that there is no need to define configurable offset to cell and offset is always a fixed value defined in dB in RAN4 spec.Proposal 4: RAN4 shall send the following LS response:

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| 1. Overall Description:RAN4 discussed RAN2 LS R2-2206504 based on the discussion progress in RAN4. RAN4 would like to inform RAN2 that during the RAN4#104-e meeting, RAN4 reached to the following agreement shown below.Agreement 1: the offset is not applicable for all cell-specific RSRP thresholds and If RAN4 would like to introduce offset for other RSRP threshold then this shall be discussed case by case.Agreement 2: RAN4 shall inform RAN2 that there is no need to define configurable offset to cell and offset is always a fixed value defined in dB in RAN4 spec.Therefore, based on the above agreement, RAN4 wants to clarify that RAN4 don’t see the advantage of configurable offset also the offset is not applicable for all cell-specific RSRP thresholds.2. To RAN WG2 group. ACTION: RAN4 kindly ask RAN2 to take the above into consideration. |

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## Open issues summary

### Sub-topic 6-1 NCD-SSB issues

**Issue 6-1-1: UE supports SSB without active BWP**

1. Proposals
	* **Option 1 (vivo):** UE can support SSB without active BWP by three potential alternatives.
		1. a larger bandwidth than active BWP, but not a typical implemenation
		2. using NCSG gap pattern to perform BM/RLM/BFD seems workable
		3. using redundant RF chain to perform BM/RLM/BFD which may bring extra cost
2. Recommended WF
	* Discuss the options.

Sub topic 6-1

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| **Company** | **Comments** |
| Apple | This issue shall be treated in thread #240 (FG 6-1a) |
| Huawei | We don’t think NCSG gap is workable in this case. The precondition for UE to support NCSG is either larger bandwith retuning or spare RF chain available, however RedCap UE has no such capability.  |
| vivo | Email thread #240 is for normal UE. However, this is target for RedCap UE based on LS from RAN1 two meetings ago.The solutions identified in email #240 may not be applicable to RedCap UE. For example, due to limited BW (max 20MHz), larger BW than active BWP doesn’t always work.Option 1 doesn’t caputre our proposals very accuratly. It is update as below.* + **Option 1 (vivo):** UE can support SSB without active BWP by three potential alternatives.
		1. a larger bandwidth than active BWP, but not a typical implemenation
		2. using measurement gaps to perform BM/RLM/BFD seems workable
		3. using redundant RF chain to perform BM/RLM/BFD which may bring extra cost

In summary, it seems measurement gap for L1 measurement is the only feasible soution for RedCap UE supporting BWP without SSB (CD-SSB and NCD-SSB). We are open to see views from other companies. |
| Ericsson | **Issue 6-1-1: UE supports SSB without active BWP**Not support option 1.This issue should be discussed in bwpWithoutRestriction for non-RedCap UE.We don’t think supporting SSB without active BWP is valid in Rel-17 RedCap. UE should assume the SSB always within active BWP at least in R17 RedCap. |
| Nokia  | We should wait the conclusion of the discussion in thread #240.  |
| Intel | It is for UE with more processing power. For RedCap UE, it seems that this feature is not alingend with complexity reduction.  |
| MediaTek | No need to discuss this issue. It is already being discussed in email thread #240. |

### Sub-topic 6-2: Cell-specific RSRP offset

**Issue 6-2-1: Applicability of cell-specific RSRP offset**

1. Proposals
	* **Option 1 (Ericsson):** RedCap UE with 1 Rx branch should apply the offset to all the cell-specific RSRP thresholds used in RAN2 specifications except those discussed in proposal 2 below.
		+ 1. RAN4 does not recommend that the RedCap UE with 1 Rx branch applies the offset to any of the conditions or thresholds used for any relaxed measurement criteria defined in Rel-16 or Rel-17.
		1. Option 1a (Intel):
			1. Introduce separate offset of offsetRSRPChange, cg-SDT for TA validation of cg-SDT procedure for 1 Rx. RedCap UE in INACTIVE.
			2. include *cg-SDT-RSRP-ThresholdSSB* among the candidate of 1 Rx. RSRP absolute configuration margin
			3. For 1 Rx. RedCap UE, introduce separate offset of offsetRSRQ and offsetSINR used for *absThreshSS-BlocksConsolidation*.
			4. For 1 Rx. RedCap UE, reuse offsetRSRP and offsetRSRQ for *Q-RxLevMin / Q-QualMin* level determination.
	* **Option 2 (Apple, Nokia):** A RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds, including the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC idle/inactive state.
	* **Option 3 (HW):** Not introduce threshold offset in spec and the measurement difference gap between 1Rx and 2RX is up to UE implementation.
	* **Option 4 (MTK):** If RAN4 would like to introduce offset for other RSRP threshold (for all cell-specific RSRP thresholds) then this shall be discussed case by case
	* **Option 5(vivo)**: A configurable offset can be applied to cell (re)selection thresholds.
2. Recommended WF

Provide further comments based on following GTW agreements:

**Agreement:**

* Only consider L3 measurement and the cell specific threshould
* Down-select to
	+ **Option 2 :** A RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds, including the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC idle/inactive state.
		1. FFS on the offset values
	+ **Option 3:** Not introduce threshold offset in spec and the measurement difference gap between 1Rx and 2RX is up to UE implementation.
	+ **Option 6:** Consider the listed five scenario in LS R4-2206951 and define the fixed value case by case for each scenario.
		1. Further discuss whether to limit the scenario which is related to coverage
		2. Need consider SDT scenario.
1. Remove the rsrp-ThresholdBFR from the previous LS and send the new LS to RAN2, if RAN4 agreed to limit to idle and inactive modes.

**Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria**

1. Proposals
	* **Option 1 (Ericsson):**
		1. RAN4 does not recommend that the RedCap UE with 1 Rx branch applies the offset to any of the conditions or thresholds used for any relaxed measurement criteria defined in Rel-16 or Rel-17.
	* **Option 2 (Apple, Nokia):**
		1. RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds, including the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC idle/inactive state.
		2. **Option 2a (Intel):**
			1. introduce separate offsetRSRPChange, RRM Relxation, offsetReselectionThreshold and offsetReselectionThresholdQ for RRM relaxation evaluation in IDLE/INACTIVE if RAN4 agree to consider them within the scope of 1 Rx. configuring margin for Rel-17 RedCap UEs.
			2. consider separate offsetL3, RSRPChange and offsetL3, Quality for RLM/BFD relaxation evaluation in CONNECTED if RAN4 agree to consider them within the scope of 1 Rx. configuring margin for Rel-17 RedCap UEs.
	* **Option 3 (HW):** Not introduce threshold offset in spec and the measurement difference gap between 1Rx and 2RX is up to UE implementation.
	* **Option 4 (MTK):** If RAN4 would like to introduce offset for other RSRP threshold (for all cell-specific RSRP thresholds) then this shall be discussed case by case
2. Recommended WF

Provide further comments based on the GTW agreements from 22-08-16 shown under related issue 6-2-1.

**Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds**

1. Proposals
	* **Option 1 (Ericsson, Nokia):**
		1. RAN4 considers that it is beneficial for the RedCap UE with 1 Rx branch to apply configurable offset to the cell (re)selection thresholds: *Qrxlevmin* and *Qqualmin*
	* **Option 2 (Apple):**
		1. RAN4 to confirm that a RedCap UE with 1 Rx branch can apply a predefined offset to cell (re)selection thresholds, i.e., Qrxlevmin and Qqualmin.
2. Recommended WF

Provide further comments based on the GTW agreements from 2022-08-16 shown under related issue 6-2-1.

**Issue 6-2-4: Fixed or configurable offsets**

1. Proposals
	* **Option 1 (Nokia, vivo):** RAN4 to discuss whether to define configurable offsets to all RSRP/ RSRQ thresholds for 1 Rx RedCap UEs either from Rel-17 or from Rel-18.
	* **Option 2 (MTK, Apple):** RAN4 can agree to provide offset if it is given as a constant value in the RAN4 specification.
2. Recommended WF

Provide further comments based on the GTW agreements from 2022-08-16 shown under related issue 6-2-1.

Sub topic 6-2

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| **Company** | **Comments** |
| Apple | **Issue 6-2-1: Applicability of cell-specific RSRP offset**Option 2. As discussed in previous meeting, a predefined offset specified in RAN4 spec is more preferable and it can also give UE more flexibility to decide the implementation.**Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria**Option 2. **Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds**Option 2. As discussed in previous meeting, a predefined offset specified in RAN4 spec is more preferable and it can also give UE more flexibility to decide the implementation.**Issue 6-2-4: Fixed or configurable offsets**Option 2. In previous meeting RAN4 agreed for 2step RACH case that,Network configures one RSRP/RSRQ threshold for 2 Rx RedCap UE (same as for legacy 2 Rx UE), and 1 Rx RedCap UE applies an offset to that threshold. The offset is predefined in the specification. We think same logic can apply for all those offsets in RAN4 requirement. |
| Huawei | **Issue 6-2-1: Applicability of cell-specific RSRP offset**Support option 3.Although there is high measurement uncertainty due to 1Rx, regarding whether to introduce an offset to the 2RX threshold, we think there are some aspects need further consideration:1. Workload: We try to sort the existing cell specific RSRP thresholds which can be applicable for RedCap UE in RAN2 specification and observe that there are dozens of such threshold. So there would be enormous workload for RAN2 if configurable threshold offset is introduced. RAN2 needs to carefully review each RSRP threshold and design corresponding offset IE.
2. There are many different types of RSRP thresholds, if we agree to introduce an offset, the question is the offset is added or subtracted? For example, regarding the threshold for cell selection (Qrxlevmin), it is better to set the offset as a negetive value, in order to ensure 1RX UE can camp on serving cell. However Regarding RACH procedure, the threshold msgA-RSRP-Threshold is used for decide 2-step RACH and 4-step RACH. To avoid 1 RX UE overestimate serving cell quantity and perform 2-step RACH, it is better to set the offset as a positive value. It means that applying positive or negative offset values shall be analysed case by case.There are so many thresholds in RAN2, it is impossible to analyse each parameter one by one.
3. If a good implemented RedCap UE can achieve comparable measurement results from both 2RX and 1RX, then require 1RX Redcap UE to use an offset on top of 2RX threshold would be unfair for well-implemented UE.
4. If the offsets are only applicable for L3 related measurement, we already agreed that the accuracy difference between 1RX and 2Rx is 1dB. We don’t think it is desired to pay high cost to accommodate a small difference.

Therefore we propose RAN4 to re-consider the offset issue, and suggest to leave this to UE implementation.**Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria**Prefer option 3.**Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds****Issue 6-2-4: Fixed or configurable offsets** |
| Xiaomi | **Issue 6-2-1: Applicability of cell-specific RSRP offset**Option 2 is fine with us. **Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria**Option 2 is fine with us. **Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds**Option 2 is fine with us. **Issue 6-2-4: Fixed or configurable offsets**Prefer option 2 to define fixed offset value. |
| vivo | **Issue 6-2-1: Applicability of cell-specific RSRP offset** We think clarificaion on the meaning of offset and how it applies is needed to facilitate the discussion, for example what is the relationship with the margin (1dB) due to the degradation of accuracy of 1 Rx UE. Regarding the applicability issue, we need clarefully consider the impact on RAN2/RAN4 spec before making a decision to avoid any huge impact on specs, especially on RAN2 specs. To our understanding it is better to apply the already agreed fixed value within RAN4 specs and limit impact on other groups’ spec. We propose to apply the 1dB for 1 Rx Redcap and do not consider any more offsets. One example on how to apply it is copied from R4-2212988 like below: when *rangeToBestCell* is not configured:- the cell is at least 3dB better ranked in FR1 or 4.5dB better ranked in FR2 for 2 Rx RedCap.- the cell is at least 4dB better ranked in FR1 for 1 Rx RedCap**Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria****We think it highly depends on the outcome of issue 6-2-1.** **Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds****We think it highly depends on the outcome of issue 6-2-1 and whether there is common understanding on offset. Option 2 is fine** **Issue 6-2-4: Fixed or configurable offsets****Option 2 is fine** |
| Ericsson | **Issue 6-2-1: Applicability of cell-specific RSRP offset** While we prefer Option 1 i.e. the offset is applicable to all the cell-specific RSRP thresholds except those used for relaxed measurement. But we can compromise to Option 2. We also like to emphasis that RAN4 already agreed to have the offset. Also, RAN4 does not have full technical understanding of the RAN2 specs. That’s in RAN4 LS to RAN2 in R4-2206951, RAN4 provided the list of the cell-specific RSRP thresholds for which the offset applies as an example. **Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria**As indicated in issue 6-2-1, while we prefer Option 1 but we can compromise to Option 2.**Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds**We support Option 1. It allows implementation flexibility and does not add any significant complexity in the UE or BS. The range can have positive and negative values. We can also consider a default value of the offset which UE applies if the offset is not signalled. The bidirectional range addresses the concern that for cell selection the offset should be negative value. **Issue 6-2-4: Fixed or configurable offsets** We support Option 1. Please see our arguments in issue 6-2-3.  |
| Nokia | **Issue 6-2-1: Applicability of cell-specific RSRP offset** In our view, offsets would be needed for all cell-specific thresholds, so we are OK with option 2 and 6 (after the GTW session). We can compromise to define offsets only to IDLE and INACTIVE mode thresholds. The exact values need to be defined in each case, or RAN4 can investigate the offsets by grouping the different thresholds. We can group the thresholds based on whether the thresholds are used in low SINR or high SINR conditions (this may lead to different offsets, considering that the accuracy varies with the SINR levels), and also consider whether they are absolute thresholds or change thresholds, as proposed by Intel. **Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria** Option 2 is OK for us. We agree with the analysis in Intel discussion paper that different offsets might be needed for different thresholds. However, given that no specific simulation effort was done  by RAN4 to study how to define these offsets so far, we would prefer to allow these offsets to be configured by network. **Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds** We think the offset is also applicable in this case, but compromise to the view of the majority, a fixed offset, as discussed in the GTW meeting. **Issue 6-2-4: Fixed or configurable offsets** We compromise to the view of the majority, as discussed in the GTW meeting.  |
| Intel | **Issue 6-2-1: Applicability of cell-specific RSRP offset** As SDT procedure in RRC INACTIVE is within Rel-17 RedCap scopes, RAN4 need to consider separate offset for RSRP Change THLDs in addition to already agreed (absolute) RSRP THLD offset. The necessity of separate offset of RSRP Change THLD is discussed in [R4-2212141](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212141.zip) and easily justified as below since, 1) For conservative setting of RSRP THLD for 1 Rx. RedCap UE, offset >= 0. 2) For conservative setting of RSRP Change THLD for 1 Rx. RedCap UE, offset <= 0. Under down-scoping Options after GTW, we can compromise Option 2 and Option 6 after 1st GTW session conditionining that separate offset of RSRP Change THLD for CG-SDT procedures is included in the scope of each options since SDT procedure in RRC INACTIVE is within Rel-17 RedCap scope.**Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria** We can compromise with Option 2 althouth separate offset with Option 2a is required. We think that it is reable to allow these offsets to be configured by network since neighborcell RRM relaxation mainly occur in high SINR region in contrast to RA-related RSRP THLD for low SINR region and no simulation results are available now. **Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds** We think the offset is also applicable in this case, but can compromise to the view of the majority, a fixed offset, as discussed in the GTW meeting. **Issue 6-2-4: Fixed or configurable offsets** For RRC IDLE/INACTIVE, RAN4 needs to at least introduce two different configurable offsets as beolow: (absolute) RSRP offset and RSRP Chage offset  |
| CMCC | **After GTW discussion, we can compromise to option 2 or option6** |
| MediaTek | **Issue 6-2-1: Applicability of cell-specific RSRP offset**We support Option 2, with a fixed offset value equal to 3dB. To our understanding, 3dB can apply to all threshold hence no need to to discuss the cases one by one. |
| Ericsson2 | **Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria/ Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds/ Issue 6-2-4: Fixed or configurable offsets** We are also fine to compromise to option 2 which we believe is the rather simple approach since offset is applied to all the cell specific RSRP threhshods. Furthermore, we are also fine to limit the scope of the offset to cell specific RSRP thresholds signaled in RRC idle and RRC inactive state. This greatly reduces the work load. The offset can be fixed value. and RAN4 can start AN4 can discussing the value of the offset. exact value of the offset as par tof the performance part. We are also fine to consider one value of 3dB for all RSRP thresholds. If no consensus is reached then the exact value of the offset can be completed as part of the performance part i.e. until the next meeting. In that case we can also put some tentative values in brackets e.g. [1-3] dB. Whether negative offset is beneficial for thresholds (Qrxlevmin and Qqualmin) used in cell (re)selection can be part of the RAN4 discussion. In terms of specification impact/work: our view is that the offset value can be specified in TS 38.133 and can be referenced in the RAN2 spec (e.g. TS 38.331) where the cell-specific RSRP threshold is signaled to Redcap UE with 1Rx. RAN2 details are of course up to RAN2.We do not think option 3 is the correct approach given that RAN4 has clearly agreed to have offset for the RSRP threshold. The purpose should be to reply to questions to the RAN2 LS, which has clearly acknowleged the benefits of the offset. We also prefer to send LS to RAN2 in this meeting so they are aware of the on going RAN4 work.  |

## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic#6-1** | **Issue 6-1-1: UE supports SSB without active BWP***Company positions after 1st round:** + **Option 1 (vivo):** UE can support SSB without active BWP by three potential alternatives.
		1. a larger bandwidth than active BWP, but not a typical implemenation
		2. using measurement gaps to perform BM/RLM/BFD seems workable
		3. using redundant RF chain to perform BM/RLM/BFD which may bring extra cost
	+ **Option 2 (HW):** NCSG cannot work for RedCap
	+ **Option 3 (Apple, Ericcson, Nokia, MTK):** Treat the issue under thread #240 or wait for conclusion from #240
	+ **Option 4 (Ericcson):** Not relevant for RedCap usecae

*Tentative agreements:*To avoid parallel discussions and since same or similar topic is being discussed under thread #240, it is recommended to wait for the conclusion in that thread.  |
| **Sub-topic 6-2** | **Issue 6-2-1: Applicability of cell-specific RSRP offset, Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria, Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds, Issue 6-2-4: Fixed or configurable offsets :****Agreement:** * Only consider L3 measurement and the cell specific threshould
* Down-select to
	+ **Option 2 :** A RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds, including the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC idle/inactive state.
		1. FFS on the offset values
	+ **Option 3:** Not introduce threshold offset in spec and the measurement difference gap between 1Rx and 2RX is up to UE implementation.
	+ **Option 6:** Consider the listed five scenario in LS R4-2206951 and define the fixed value case by case for each scenario.
		1. Further discuss whether to limit the scenario which is related to coverage
		2. Need consider SDT scenario.
1. Remove the rsrp-ThresholdBFR from the previous LS and send the new LS to RAN2, if RAN4 agreed to limit to idle and inactive modes.

*Recommendations for 2nd round:*Check if following can be agreed:A RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds in RRC\_IDLE/INACTIVE state, including the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC IDLE/INACTIVE state.1. Offset is a fixed value set to [1 - 3] dB specified in TS 38.133. Exact value is FFS.
 |

## Discussion on 2nd round (if applicable)

**Issue 6-2-1: Applicability of cell-specific RSRP offset,**

**Issue 6-2-2: Applicability of cell-specific RSRP offset to relaxed measurement criteria,**

**Issue 6-2-3: Applicability of cell-specific RSRP offset to cell (re)selection thresholds,**

**Issue 6-2-4: Fixed or configurable offsets :**

Check if following alternative proposal (based on 1st round discussions + GTW agreements) can be agreed:

*A RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds in RRC\_IDLE/INACTIVE state, including the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC IDLE/INACTIVE state.*

* + *Offset is a fixed value set to [1 - 3] dB specified in TS 38.133. Exact value is FFS.*

Sub topic 6-2

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| **Company** | **Comments** |
| Apple | We are fine with the moderator proposal. |
| Qualcomm | Okay with the recommended WF |
| Huawei | We can compromise to have fixed offset. However from UE implementation perspective, the wording “*A RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds in RRC\_IDLE/INACTIVE state*” would introduce enormous UE work load for checking each threshold parameters in idle/ inactive mode. We sort out the RSRP/RSRQ thresholds in RRC\_IDLE mode as below table. It is not acceptable to UE to consider each threshold and judge +/- value.

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| **RSRP/RSRQ threshold** | **Use case** |
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| Srxlev > 0 AND Squal > 0 |

where:

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| Srxlev = Qrxlevmeas – (Qrxlevmin + Qrxlevminoffset )– Pcompensation - QoffsettempSqual = Qqualmeas – (Qqualmin + Qqualminoffset) - Qoffsettemp |

 |
| q-RxLevMinq-QualMinq-RxLevMinSUL | Cell selection |
| q-RxLevMinOffsetq-QualMinOffset |
| Qoffsettemp |
| Rs = Qmeas,s +Qhyst - QoffsettempRn = Qmeas,n -Qoffset - Qoffsettemp |
| q-OffsetCellq-OffsetFreq | Cell Reselection |
| q-Hystq-HystSF |
| absThreshSS-BlocksConsolidation |
| s-IntraSearchPs-IntraSearchQ |
| s-NonIntraSearchPs-NonIntraSearchQ |
| threshX-HighPthreshX-HighQ |
| threshServingLowPthreshServingLowQthreshX-LowPthreshX-LowQ |
| q-QualMinq-RxLevMinq-RxLevMinSUL |
| q-QualMinOffsetCellq-RxLevMinOffsetCellq-RxLevMinOffsetCellSUL |
| Qoffsettemp |
| msgA-RSRP-ThresholdSSB |

One compromised way is to explicitly list which parameters in which scenarios the offset is applied to, rather than ”all cell specific parameters” |
| Intel | According to moderater’s proposal, it seems that RAN4 would purse single offset to all absolute RSRP related procedures during test specifications in RRC IDLE/INACTIVE. The intention of the configuring margin is to ensure reliable operation of 1 Rx. UEs in RRC IDLE/INACTIVE under less measurement accuracy than 2 Rx. UE. For this end, we would like to point out a few aspects.1) The CG-SDT operation in RRC INACTIVE is in scope of Rel-17 RedCap WI and the *cg-SDT-RSRP-ChangeThreshold-r17* is configured in *RRC release* message. Thus, RAN4 needs to consider cg-SDT RSRP parameters *in RRC\_IDLE/INACTIVE* for the completeness of Rel-17 RedCap WI.2) In contrast to positive offset for absolute RSRP thresholds, negative offset for RSRP Change threshold also needs to be considered in CG-SDT procedure as well as *Rel-16 low mobility and Rel-17 stationary* conditions since they are based on RSRP changes rather than absolute RSRP vlaues.Cf) Sec. 5.2.4.9.1 TS 38.304

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| The relaxed measurement criterion for UE with low mobility is fulfilled when:- (SrxlevRef – Srxlev) < SSearchDeltaP,Where:- Srxlev = current Srxlev value of the serving cell (dB).- SrxlevRef = reference Srxlev value of the serving cell (dB), set as follows: - After selecting or reselecting a new cell, or - If (Srxlev - SrxlevRef) > 0, or - If the relaxed measurement criterion has not been met for TSearchDeltaP: - The UE shall set the value of SrxlevRef to the current Srxlev value of the serving cell. |

Thus, we are proposing the modifcation as below considering 1) and 2) above.

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| *A RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds in RRC\_IDLE/INACTIVE state, including the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC IDLE/INACTIVE state. The offset also can be applied to cg-SDT-RSRP-ChangeThreshold-r17 for TA validation in CG-SDT procedure in RRC INACTIVE.*• *Offset is a fixed value set to [1 - 3] dB specified in TS 38.133. Exact value is FFS.* *In contrast to positive offset for absolute RSRP thresholds, offset to RSRP Change threshold for TA validation in CG-SDT and s-SearchDeltaP-r16 / s-SearchDeltaP-Stationary-r17 for low mobility and stationarioty evaluation is substracted from the threshold values for 2 Rx. UE.*  |

Besides “Reply LS to RAN2”, the offset needs to be optimized per each procedure during RAN4 performance specifications due to variations in operating SINR regime, # of samples and presence of normative measurement guide. Thus, RAN4 needs to capture WF to leave a room for possibility of introducing new separate offsets in RRC IDLE/INACTIVE within RAN4 specification in maintenance phase.• *Separate offset to RSRP Change thresholds for TA-validation in CG-SDT with potential applicability to s-SearchDeltaP-r16 / s-SearchDeltaP-Stationary-r17 for low mobility and stationarioty evaluation.* • *Separate offset to RRM relaxation condition due to different operating SINR regime and normative procedure with memory for low mobility / stationarity evaluation in section 5.2.4.9.1 TS 38.304.* |
| Ericsson | We support the recommend WF.  |
| vivo | We think the recommended WF needs update. Based on the agrement ” Only consider L3 measurement and the cell specific threshould”, the fixed value should be 1 dB nstead of a range [1-3]. For a compromise between down-select option 2, 3 and 6, we suggest “*A RedCap UE with 1 Rx branch applies the offset to all cell-specific RSRP thresholds in RRC\_IDLE/INACTIVE state, excluding the ones used for Rel-16 low mobility and/or not at cell edge conditions, and Rel-17 stationary and not at cell edge conditions for RRC IDLE/INACTIVE state”*The reason is these cases are exception cases from RAN2 LS.In addtion we have concern with the sentence ”applies the offset to all cell-specific RSRP thresholds in RRC\_IDLE/INACTIVE state”, this means there will be a lot update on RAN2 specs where paremters does not refer RAN4 for the offset. The impact on RAN2 specs could be large. An alternative could be start from option 6, focus on cases listed in the previous LS.  |

# Topic #7: Performance part of RedCap

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [R4-2213411](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213411.zip) | Ericsson | Test case list for RedCap RRM performance part |
| [R4-2211691](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211691.zip) | CATT | Proposal 1: It is suggested to specify SSB configurations for RedCap UEs in a separate chapter.Proposal 2: It is suggested to a new configuration of '30 kHz SCS and 20 MHz BW' for RedCap UEs in FR1.Proposal 3: It is suggested that existing BWP configurations defined in A.3.9.2 and A.3.9.3 in TS 38.133 are reused for RedCap UEs, and no new configuration is needed for RedCap specific BWP.  |
| [R4-2211692](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211692.zip) | CATT | Draft CR on SSB configurations for FR1 |
| [R4-2213002](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213002.zip) | Huawei, HiSilicon | CR on accuracy requirements for Redcap |
| [R4-2212143](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212143.zip) | Intel Corporation | Proposal 1: For 1 Rx. RedCap UEs in FR1, consider the test case with offsetRSRP if test case associated with sdt-RSRP-Threshold and cg-SDT-RSRP-ThresholdSSB is introduced in Rel-17 SDT test. Proposal 2: For 1 Rx. RedCap UEs in FR1, consider the test case with offsetRSRPChange,CG-SDT under different RSRP change set-up if TA-validation for CG-SDT is introduced in Rel-17 SDT test.Proposal 3: Reuse DL/UL pattern for the UE demodulation/CSI requirements as a baseline for SDT RRM test of RedCap UEs. |
| [R4-2212914](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212914.zip) | Nokia, Nokia Shanghai Bell | Proposal 1: NR test case configurations are used as baseline for RedCap UEs. In FR1, NR test cases defined with bandwidth equal to 40 MHz are replaced by test cases with bandwidth equal to 20 MHz for RedCap test cases. Proposal 2: Define a new SSB pattern for SSB SCS = 30 kHz in 20 MHz channel as:SSB Parameters ValuesChannel bandwidth 20 MHzSSB SCS 30 kHzSSB periodicity (TSSB) 20 msNumber of SSBs per SS-burst 1SS/PBCH block index 0Symbol numbers containing SSB Note 3 4-7 or 2-5 Note 2Slot numbers containing SSB Note 3 0SFN containing SSB SFN mod (max(TSSB,10ms)/10ms) = 0RB numbers containing SSB within channel BW (RBJ, RBJ+1,.…, RBJ+19)Note 1Note 1: RBs containing SSB can be configured in any frequency location within the cell bandwidth according to the allowed synchronization raster defined in TS 38.104 [13].Note 2: Symbols 4-7 is chosen, if the SSB pattern Case B should be used for the current band as indicated by Table 5.4.3.3-1 of TS 38.104 [13]; Otherwise, symbol 2-5 is chosen.Note 3: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselvesProposal 3: Existing configurations of reference channels in FDD and TDD duplex modes for NR UEs can be reused for RedCap test cases. In addition to NR configurations, new configurations of RMSI CORESET and Control Channel RMC are needed considering an aggregation level of 16 CCE for RLM OOS and BFD test cases for 1 Rx RedCap.Proposal 4: New HD-FDD configurations are needed for: PDSCH, CORESET for RMSI scheduling, CORESET for RMC scheduling and CSI-RS for tracking. |
| [R4-2213001](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213001.zip) | Huawei, HiSilicon | Proposal 1: The accuracy requirements for L3 measurement are applied provided that reference SSB is not changed during measurement period. |
| [R4-2213409](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213409.zip) | Ericsson | Proposal 1 Update A.2.1 after introducing RedCap test cases, if necessary. Proposal 2 Existing RMC tables (PDSCH, CORESET for RMSI and RMC) for FDD and TDD defined in A.3.1 in TS 38.133 are reused for RedCap.Proposal 3 Existing TDD DL/UL configurations defined in A.3.1.4 in TS 38.133 are reused for RedCap.Proposal 4 Existing OCNG configurations defined in A.3.2.1 in TS 38.133 are reused for RedCap.Proposal 5 RAN4 to decide on whether to update the DRX configurations defined in A.3.3 in TS 38.133 based on type of test cases agreed for eDRX. Proposal 6 Existing FR1 antenna configuration defined in A.3.6.1 in TS38.133 are reused for RedCap UEs in FR1. Proposal 7 Existing FR2 antenna configurations defined in A.3.6.2 in TS 38.133 are reused for RedCap UEs in FR2. Proposal 8 Existing PRACH configurations defined in A.3.8 in TS 38.133 are reused for RedCap. Proposal 9 Existing BWP configurations defined in A.3.9.2 and A.3.9.3 in TS 38.133 are reused for RedCap. Proposal 10 RAN4 to decide on whether to introduce new configuration for RedCap specific BWP based on type of test cases agreed for RedCap. Proposal 11 In addition to the existing SSB configurations, new SSB configurations are introduced for 30 kHz SCS and 20 MHz BW instead of 30 KHz SCS and 40 MHz BW. Proposal 12 Existing SMTC configurations defined in A.3.11 in TS 38.133 are reused for RedCap. Proposal 13 Existing CSI-RS configuration for FDD and TDD defined in A.3.14 in TS 38.133 are reused for RedCap. No new RMCs are needed for HD-FDD.Proposal 14 New AoA requirements need to be introduced considering the new RedCap power class.Proposal 15 Existing TCI state configuration defined in A.3.16 in TS 38.133 is reused for RedCap. Proposal 16 Existing configuration for CSI-RS tracking defined for FDD and TDD defined in A.3.17 in TS 38.133, aligned with corresponding SSB configuration, are reused for RedCap. No need to create new configurations for HD-FDD. Proposal 17 Existing additional definitions related to OTA testing defined in A.3.18 are reused for RedCap. Proposal 18 Existing PRACH configurations defined in A.3.8 in TS 38.133 are reused for RedCap. Proposal 19 Existing CSI-IM configurations defined in A.3.22 in TS 38.133 are reused for RedCap. Proposal 20 Existing spatial relation configuration defined in A.3.23 in TS 38.133 is reused for RedCap. Proposal 21 Existing channel bandwidth (CBW) configuration defined in A.3.25 in TS 38.133 is reused for RedCap. Proposal 22 Existing CSI-RS configuration for RRM defined for FDD and TDD in A.3.30 can be reused for RedCap except those designed for SCS > 30 kHz. Proposal 23 All RRM test cases are introduced for FDD, TDD and HD-FDD UEs. Proposal 24 RedCap SS-RSRQ accuracy level is derived by relaxing the legacy SS-RSRQ accuracy level by the same level as agreed for RedCap SS-RSRP measurement compared to legacy SS-RSRP measurement. Proposal 25 RedCap SS-SINR accuracy level is derived by relaxing the legacy SS-SINR accuracy level by the same level as agreed for RedCap SS-RSRP measurement compared to legacy SS-RSRP measurement.  |
| [R4-2212282](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212282.zip) | CMCC | Proposal 1: Specify following RRM test configurations for RedCap UE.

|  |  |
| --- | --- |
| Config | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | NR 15KHz SSB SCS, 10 MHz bandwidth, HD-FDD mode |
| 3 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 4 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |

Proposal 2: Specify UE dedicated BWP configuration with NCD-SSB for RedCap .Proposal 3: Specify UE dedicated BWP configuration with smaller number of RBs for TDD RedCap, i.e. 24RBs. |
| [R4-2213003](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213003.zip) | Huawei, HiSilicon | CR: SSB and SMTC configuration for NCD-SSB for RedCap |
| [R4-2213412](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213412.zip) | Ericsson | Draft CR: IDLE mode test cases for FR1 RedCap |
| [R4-2213752](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213752.zip) | Ericsson | Draft CR on side conditions on RRM requirements applicability for RedCap |
| [R4-2211973](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211973.zip) | Xiaomi | CR on 4-step random access test in FR1 for RedCap UE |
| [R4-2212040](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212040.zip) | OPPO | draftCR on test for RRC connection release with redirection to NR redcap |
| [R4-2212391](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212391.zip) | Nokia, Nokia Shanghai Bell | CR for introduction of RRC connection mobility control test cases in FR1 for RedCap Ues |
| [R4-2213005](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213005.zip) | Huawei, HiSilicon | Test case for handover for FR1 RedCap UE |
| [R4-2213452](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213452.zip) | Vivo | draft CR for test case for SA NR - E-UTRAN handover for Redcap |
| [R4-2213453](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213453.zip) | Vivo | draft CR for test case for 2-step random access test in FR1 for NR standalone for Redcap |
| [R4-2213654](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213654.zip) | MediaTek inc. | DraftCR on Intra-frequency handover from FR1 to FR1 unknown target cell for 2 and 1 Rx UE |
| [R4-2212915](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212915.zip) | Nokia, Nokia Shanghai Bell | 1. The following test configurations are defined for RRC re-establishment test cases in FR1:

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |

1. The following test configurations are defined for the Redirection from NR to NR test cases in FR1:

|  |  |
| --- | --- |
| Config | Description |
| 1 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex modeTarget cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex modeTarget cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | Source cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex modeTarget cell: NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | Source cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
|  | Target cell: NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations |

1. The following test configurations are defined for Redirection from NR to E-UTRAN test cases:

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE FDD |
| 2 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE FDD |
| 3 | NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE FDD |
| 4 | NR 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode, LTE TDD |
| 5 | NR 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode, LTE TDD |
| 6 | NR 30kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode, LTE TDD |
| 7 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE FDD |
| 8 | NR 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode, LTE TDD |
| Note: The UE is only required to be tested in one of the supported test configurations |

1. NR test configurations for RRC re-establishment and RRC release with redirection in FR2 are reused for RRM test configurations for RedCap UEs.
 |
| [R4-2213004](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213004.zip) | Huawei, HiSilicon | Proposal 1: Verify the functionality of intra-NR handover NCD-SSB for RedCap UE.Proposal 2: E-UTRA-NR handover to CD-SSB for 2RX RedCap UE test is to be verified.Proposal 3: Add the following new SSB patterns and SMTC pattern in FR1 to consider 20MHz and 80ms NCD-SSB periodicity.Proposal 4: To guarantee 1RX RedCap UE handover to target cell, the SSB-RSRP level difference between serving cell and target cell shall be larger than 4dB in test. |
| [R4-2211693](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211693.zip) | CATT | Proposal 1: It is suggested to introduce a new test configuration of 20 MHz bandwidth and 30 kHz SSB SCS for test configuration on timing advance for RedCap UEs in FR1 .Proposal 2: It is suggested to modify Config 3 in Table A.6.4.3.1.2-1 to 'NR 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode' in the section A.16.4.3.1 for RedCap UEs.Observation 2: According to Table 5.3.2-1 in TS 38.101-1, the maximum transmission bandwidth configuration NRB corresponds to each UE channel bandwidth and subcarrier spacing, and the value of BWchannel and BWP BW in test cases need to be specified according to different channel bandwidth and subcarrier spacing.Proposal 3: It is suggested that the BWchannel and the BWP BW parameters in Table A.16.4.3.x1.2-3 should be set to '20: NRB,c = 51' for RedCap UEs.Proposal 4: The ‘SSB.1 RedCap FR1’ and the ‘SSB.2 RedCap FR1’ need to be configured for RedCap UEs in Table A.16.4.3.1.2-3 for RedCap UEs.Observation 3: The antenna configuration does not seem to affect test cases on timing in FR1, so it is not necessary to separately consider test cases on timing for 1Rx UE and 2Rx UE.Proposal 5: It is suggested to merge A.16.4.3.1 and A.16.4.3.2 into section A.16.4.3.1 and change the title to: SA FR1 timing advance adjustment accuracy for 1 Rx and 2 Rx UE. |
| [R4-2211694](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211694.zip) | CATT | Draft CR on test case for timing for Redcap UE for FR1 |
| [R4-2213655](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213655.zip) | MediaTek inc. | DraftCR on NR UE Transmit Timing Test for FR1 for 1 and 2 Rx UE |
| [R4-2211974](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211974.zip) | Xiaomi | CR on SSB-based RLM in-sync test in FR1 for RedCap UE |
| [R4-2213007](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213007.zip) | Huawei, HiSilicon | Test case on Out-of-sync Test for FR1 RedCap UE |
| [R4-2213454](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213454.zip) | vivo | draft CR for test case for BFD and LR test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for Redcap |
| [R4-2212041](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212041.zip) | OPPO | Draft CR on SA event triggered reporting tests without gap under DRX for 1Rx&2Rx UE for intra-frequency measurement |
| [R4-2212042](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212042.zip) | OPPO | Draft CR on SA event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE & 2Rx UE |
| [R4-2212043](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212043.zip) | OPPO | Draft CR on SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE & 2Rx UE |
| [R4-2212044](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212044.zip) | OPPO | Draft CR on SA NR - E-UTRAN event-triggered reporting in non-DRX in FR1 for 1 Rx UE & 2Rx UE |
| [R4-2212045](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212045.zip) | OPPO | Draft CR on SA NR - E-UTRAN event-triggered reporting in DRX in FR1 for 1 Rx UE & 2Rx UE |
| [R4-2213455](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213455.zip) | vivo | draft CR for test case for SA event triggered reporting with SSB time index detection when DRX is not used for FR1 Redcap |
| [R4-2213456](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213456.zip) | vivo | draft CR for test case for SA event triggered reporting without SSB time index detection when DRX is used for FR1 Redcap |
| [R4-2213457](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213457.zip) | vivo | draft CR for test case for SSB based L1-RSRP measurement for beam reporting for Redcap |
| [R4-2213009](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213009.zip) | Huawei, HiSilicon | Test case on measurement accuracy for FR1 RedCap UE |
| [R4-2213414](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213414.zip) | Ericsson | Draft CR on side conditions on RRM requirements applicability for RedCap |
| [R4-2213413](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213413.zip) | Ericsson | Draft CR: IDLE mode test cases for FR2 RedCap |
| [R4-2211975](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211975.zip) | Xiaomi | CR on 4-step random access test in FR2 for RedCap UE |
| [R4-2212392](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212392.zip) | Nokia, Nokia Shanghai Bell | CR for introduction of RRC connection mobility control test cases in FR2 for RedCap Ues |
| [R4-2213006](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213006.zip) | Huawei, HiSilicon | Test case for handover for FR2 RedCap UE |
| [R4-2213458](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213458.zip) | vivo | draft CR for test case for 2-step RA type test in FR2 for NR Standalone |
| [R4-2211695](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211695.zip) | CATT | Proposal 1: It is suggested to reuse existing timing supported test configurations for RedCap UEs in FR2.Proposal 2: It is reasonable to reuse the BWchannel and BWP BW parameters specified in Table A.7.4.1.1.1-2 and Table A.7.4.3.1.2-3 of TS 38.133 for Redcap UEs.Proposal 3: It is reasonable to reuse the SSB Configuration specified in Table A.7.4.1.1.1-2 and Table A.7.4.3.1.2-3 in TS 38.133 for Redcap UEs.Proposal 4: The ‘SSB.4 RedCap FR2’ and ‘the SSB.3 RedCap FR2’ need to be configured for RedCap UEs in Table A.17.4.1.1.1-2 and Table A.17.4.3.1.2-3 for RedCap UEs. |
| [R4-2211696](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211696.zip) | CATT | Draft CR on test case for timing for Redcap UE for FR2 |
| [R4-2211976](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211976.zip) | Xiaomi | CR on SSB-based RLM in-sync test in FR2 for RedCap UE |
| [R4-2213008](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213008.zip) | Huawei, HiSilicon | Test case on Out-of-sync Test for FR2 RedCap UE |
| [R4-2213011](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213011.zip) | Huawei, HiSilicon | Test case on measurement procedure for FR2 RedCap UE |
| [R4-2213010](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213010.zip) | Huawei, HiSilicon | Test case on measurement accuracy for FR2 RedCap UE |
| R4-2213410 | Ericsson | Big CR for Performance part of RedCap - TS 38.133 |

## Open issues summary

### Sub-topic 7-1 Work split

**Issue 7-1-1: Worksplit for performance part for RedCap**

1. Proposals
2. Recommended WF

Companies are encouraged to provide their comments directly to the updated test case list with volunteering companies.

### Sub-topic 7-2 Test configurations

**Issue 7-2-1: Test configurations**

1. Proposals
2. Recommended WF

Companies are encouraged to provide comments directly to the CRs.

### Sub-topic 7-3 Testing of SDT

**Issue 7-3-1: SDT test case**

1. Proposals
	* **Option 1 (Intel):**
		1. For 1 Rx. RedCap UEs in FR1, consider the test case with offsetRSRP if test case associated with sdt-RSRP-Threshold and cg-SDT-RSRP-ThresholdSSB is introduced in Rel-17 SDT test.
		2. For 1 Rx. RedCap UEs in FR1, consider the test case with offsetRSRPChange,CG-SDT under different RSRP change set-up if TA-validation for CG-SDT is introduced in Rel-17 SDT test.
		3. Reuse DL/UL pattern for the UE demodulation/CSI requirements as a baseline for SDT RRM test of RedCap UEs
2. Recommended WF

Discuss the options.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Apple | **Issue 7-3-1: SDT test case**Fine with option 1. |
| Ericsson | **Issue 7-3-1: SDT test case**Our view is to reuse the testing method from Rel-17 SDT WI, if agreed. Thus no separate discusisons needed.  |
| Nokia   | **Issue 7-3-1: SDT test case** We are fine with option 1.  |
| Intel | **Issue 7-3-1: SDT test case**@ Ericsson, Option 1 is to illustrate the possible changes for 1 Rx. RedCap UE and HD-FDD aspects comparing with Rel-17 SDT WI for non-RedCap 2Rx. UE. |
| MediaTek | Depends on whether SDT Rel-17 has defined test cases or not. |

### CRs/TPs comments collection

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection for Test Configurations CRs** |
| [R4-2213003](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213003.zip)(Huawei, HiSilicon) | *DraftCR: SSB and SMTC configuration for NCD-SSB for RedCap* |
| Ericsson: We should put different RMC name to avoid overlapping with the non-RedCap. For example, use SSB.1 RedCap FR1, as shown in R4-2211692, |
| CMCC: We support to have NCD-SSB configurations for RedCap considering it is mandatory supported by RedCap UE. |
| [R4-2213752](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213752.zip)(Ericsson) | *Draft CR on side conditions on RRM requirements applicability for RedCap*Huawei: we have no comments on this CR. On top of the SSB configuration in this CR, we suggest to add some SSB configuration with large SSB periodicity which would be used for NCD-SSB in certain test cases (e.g., handover). As we know, the SSB periodicity for NCD-SSB is not less than CD-SSB. From network configuration overload perspective, NCD-SSB with 20ms periodicity would degrade about 5% overload loss. Therefore 80ms periodicity of NCD-SSB (Tssb) is a good trade-off.  |
| [R4-2213414](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213414.zip)(Ericsson) | Draft CR on side conditions on RRM requirements applicability for RedCap |
| [R4-2211692](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211692.zip)(CATT) | *Draft CR on SSB configurations for FR1**Ericsson: We prefer to the approach used in*  |
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| --- | --- |
| **CR/TP number** | **Comments collection for RRC\_IDLE state mobility CRs**  |
| [R4-2213412](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213412.zip)(Ericsson) | *Draft CR: IDLE mode test cases for FR1 RedCap* |
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| [R4-2213413](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213413.zip)(Ericsson) | *Draft CR: IDLE mode test cases for FR2 RedCap* |
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| **CR/TP number** | **Comments collection for RRC\_CONNECTED state mobility CRs**  |
| [R4-2211973](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211973.zip)(Xiaomi) | *CR on 4-step random access test in FR1 for RedCap UE* |
|  | Ericsson: For all FR1 test cases, we propose to align the supported test configurations as follows:

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| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |

Also test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
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| [R4-2212040](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212040.zip)(OPPO) | *draftCR on test for RRC connection release with redirection to NR redcap* |
| Ericsson: Same comment as for R4-2211973. |
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| [R4-2212391](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212391.zip)(Nokia, Nokia Shanghai Bell) | *CR for introduction of RRC connection mobility control test cases in FR1 for RedCap Ues* |
| Ericsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
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| [R4-2213005](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213005.zip)(Huawei, HiSilicon) | *Test case for handover for FR1 RedCap UE*Ericsson: Same comment as for R4-2211973. |
|  | Ericsson: Same comment as for R4-2211973. |
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| [R4-2213452](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213452.zip)(vivo) | *draft CR for test case for SA NR - E-UTRAN handover for Redcap*Ericsson: Test configurations need to be updated to include 15 kHz SSB SCS, 10 MHz bandwidth, HD-FDD duplex mode. Also test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
| [R4-2213453](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213453.zip)(vivo) | *draft CR for test case for 2-step random access test in FR1 for NR standalone for Redcap*Ericsson: Same comment as for R4-2211973. |
| [R4-2213654](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213654.zip)(MediaTek inc.) | *DraftCR on Intra-frequency handover from FR1 to FR1 unknown target cell for 2 and 1 Rx UE*Ericsson: Same comment as for R4-2211973.  |
| [R4-2211975](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211975.zip)(Xiaomi) | *Ericsson:* Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
| [R4-2212392](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212392.zip)(Nokia, Nokia Shanghai Bell) | *CR for introduction of RRC connection mobility control test cases in FR2 for RedCap Ues*Ericsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
| [R4-2213006](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213006.zip)(Huawei, HiSilicon) | *Test case for handover for FR2 RedCap UE*Ericsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
| [R4-2213458](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213458.zip)(vivo) | *draft CR for test case for 2-step RA type test in FR2 for NR Standalone*Ericsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |

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| **CR/TP number** | **Comments collection for Timing CRs** |
| [R4-2211694](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211694.zip)(CATT) | *Draft CR on test case for timing for Redcap UE for FR1* |
| Ericsson: Same comment as for R4-2211973.  |
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| [R4-2213655](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213655.zip)(MediaTek inc.) | *DraftCR on NR UE Transmit Timing Test for FR1 for 1 and 2 Rx UE*Ericsson: Same comment as for R4-2211973. |
| [R4-2211696](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211696.zip)(CATT) | Draft CR on test case for timing for Redcap UE for FR2Ericsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
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| **CR/TP number** | **Comments collection for Signaling characteristics CRs** |
| [R4-2211974](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211974.zip)(Xiaomi) | *CR on SSB-based RLM in-sync test in FR1 for RedCap UE* |
| Ericsson: Same comment as for R4-2211973. |
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| [R4-2213007](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213007.zip)(Huawei, HiSilicon) | *Test case on Out-of-sync Test for FR1 RedCap UE**Ericsson: Same comment as for R4-2211973.* |
| [R4-2213454](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213454.zip)(vivo) | draft CR for test case for BFD and LR test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for RedcapEricsson: Same comment as for R4-2211973. |
|  |  |
| [R4-2211976](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211976.zip)(Xiaomi) | *CR on SSB-based RLM in-sync test in FR2 for RedCap UE* |
| Ericsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
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| [R4-2213008](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213008.zip)(Huawei, HiSilicon) | *Test case on Out-of-sync Test for FR2 RedCap UE*Ericsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |

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| **CR/TP number** | **Comments collection for Measurement procedures CRs** |
| [R4-2212041](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212041.zip)(OPPO) | *Draft CR on SA event triggered reporting tests without gap under DRX for 1Rx&2Rx UE for intra-frequency measurement* |
| Ericsson: Same comment as for R4-2211973. |
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| [R4-2212042](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212042.zip)(OPPO) | *Draft CR on SA event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE & 2Rx UE**Ericsson: Same comment as for R4-2211973.* |
| [R4-2212043](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212043.zip)(OPPO) | Draft CR on SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE & 2Rx UEEricsson: Same comment as for R4-2211973. |
|  |  |
| [R4-2212044](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212044.zip)(OPPO) | *Draft CR on SA NR - E-UTRAN event-triggered reporting in non-DRX in FR1 for 1 Rx UE & 2Rx UE**Ericsson: Same comment as for R4-2211973.* |
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| [R4-2212045](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212045.zip)(OPPO) | *Draft CR on SA NR - E-UTRAN event-triggered reporting in DRX in FR1 for 1 Rx UE & 2Rx UE**Ericsson: Same comment as for R4-2211973.* |
| [R4-2213455](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213455.zip)(vivo) | *draft CR for test case for SA event triggered reporting with SSB time index detection when DRX is not used for FR1 Redcap*Ericsson: Same comment as for R4-2211973.  |
| [R4-2213456](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213456.zip)(vivo) | *draft CR for test case for SA event triggered reporting without SSB time index detection when DRX is used for FR1 Redcap**Ericsson: Same comment as for R4-2211973.* |
| [R4-2213457](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213457.zip)(vivo) | *draft CR for test case for SSB based L1-RSRP measurement for beam reporting for Redcap*Ericsson: Same comment as for R4-2211973. |
| [R4-2213011](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213011.zip)(Huawei, HiSilicon) | *Test case on measurement procedure for FR2 RedCap UE*Ericsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |

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| **CR/TP number** | **Comments collection for Measurement accuracy CRs** |
| [R4-2213009](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213009.zip)(Huawei, HiSilicon) | *Test case on measurement accuracy for FR1 RedCap UE* |
| Ericsson: Same comment as for R4-2211973. |
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| [R4-2213010](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213010.zip)(Huawei, HiSilicon) | Test case on measurement accuracy for FR2 RedCap UEEricsson: Test case needs to be revised to update the test configurations (SSB coconfigurations, AoA, etc.) as discussed under the test configuration CRs.  |
| [R4-2213002](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213002.zip)(Huawei, HiSilicon) | *CR on accuracy requirements for Redcap*Ericsson: Same comment as for R4-2211973. |
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## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |
| **Sub-topic 7-3** | * + **Option 1 (Intel, Apple, Nokia):**
		1. For 1 Rx. RedCap UEs in FR1, consider the test case with offsetRSRP if test case associated with sdt-RSRP-Threshold and cg-SDT-RSRP-ThresholdSSB is introduced in Rel-17 SDT test.
		2. For 1 Rx. RedCap UEs in FR1, consider the test case with offsetRSRPChange,CG-SDT under different RSRP change set-up if TA-validation for CG-SDT is introduced in Rel-17 SDT test.
		3. Reuse DL/UL pattern for the UE demodulation/CSI requirements as a baseline for SDT RRM test of RedCap UEs
	+ **Option 1 (Ericsson, MTK):** Depends on whether SDT R17 has defined test cases or note.

*Tenative agreements:** + 1. For 1 Rx. RedCap UEs in FR1, consider the test case with offsetRSRP if test case associated with sdt-RSRP-Threshold and cg-SDT-RSRP-ThresholdSSB is introduced in Rel-17 SDT test.
		2. For 1 Rx. RedCap UEs in FR1, consider the test case with offsetRSRPChange,CG-SDT under different RSRP change set-up if TA-validation for CG-SDT is introduced in Rel-17 SDT test.

Note: Following bullet is related to demodulation requirements and shall not be discussed under RRM thread. * + 1. Reuse DL/UL pattern for the UE demodulation/CSI requirements as a baseline for SDT RRM test of RedCap UEs
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# Recommendations for Tdocs

## 1st round

**New tdocs**

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| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
| Reply LS on configuring margin for 1 Rx RedCap UEs | Ericsson | To: RAN2 |
| WF on RedCap RRM requirements | Ericsson |  |

**Existing tdocs**

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| [R4-2212759](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212759.zip) | *Big CR to capture all missed endorsed CRs for TS 36.133.* | Ericsson | Revised |  |
| [R4-2212393](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212393.zip) | *CR on applicability of requirements for RedCap Ues* | Nokia, Nokia Shanghai Bell | Revised |  |
| [R4-2212988](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212988.zip) | *Correction on Ranking for 1RX RedCap UE* | Huawei, HiSilicon | Revised |  |
| [R4-2213408](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213408.zip) | *Changes to RRC\_IDLE mode requirements for RedCap for TS 38.133* | Ericsson | Revised |  |
| [R4-2213656](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213656.zip) | *CR on RedCap maintenance in TS 38.133* | MediaTek inc. | Revised | *IDLE mode changes aer to be merged into revision of R4-2213408. Thus those changes should be removed.* |
| [R4-2213406](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213406.zip) | *Changes to SDT requirements for NR RedCap* | Ericsson | Revised |  |
| [R4-2213378](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213378.zip) | *CR on SDT RRM requirements for RedCap Ues* | ZTE Wistron Telecom AB | Not Pursued | *Merged to R4-2213406.* |
| [R4-2212990](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212990.zip) | *Correction on Trs definition for RedCap UE* | Huawei, HiSilicon | Revised |  |
| [R4-2214076](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2214076.zip) | *Draft CR on timing requirements with measurement gaps for RedCap UEs* | Qualcomm Incorporated | Not Pursued |  |
| [R4-2212757](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212757.zip) | *draftCR on RedCap RLM* | Ericsson | Revised |  |
| [R4-2212992](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212992.zip) | *Clarification on SSB in RLM and BFD for RedCap UE* | Huawei, HiSilicon | Agreeable |  |
| [R4-2212280](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212280.zip) | *CR on carrier-specific scaling factor for RedCap (9.1A.5)* | CMCC | Revised |  |
| [R4-2212756](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212756.zip) | *draftCR on inter-RAT NR measurement for RedCap* | Ericsson | Agreeable |  |
| [R4-2212758](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212758.zip) | *draftCR on RedCap measurement* | Ericsson | Revised |  |
| [R4-2212994](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212994.zip) | Correction on measurement requirements for RedCap UE | Huawei, HiSilicon | Merged  | Merged into revision of [R4-2212280](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212280.zip) if agreement reached. |
| [R4-2213003](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213003.zip) | *DraftCR: SSB and SMTC configuration for NCD-SSB for RedCap* | Huawei, HiSilicon | Merged | *Merged into revision of R4-2213752 based on the worksplit* |
| [R4-2213752](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213752.zip) | *Draft CR on side conditions on RRM requirements applicability for RedCap* | Ericsson | Revised |  |
| [R4-2213414](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213414.zip) | Draft CR on side conditions on RRM requirements applicability for RedCap | Ericsson | Agreeable |  |
| [R4-2211692](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211692.zip) | *Draft CR on SSB configurations for FR1* | CATT | Not pursued | *Merged into revision of R4-2213752 based on the worksplit* |
| [R4-2213412](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213412.zip) | *Draft CR: IDLE mode test cases for FR1 RedCap* | Ericsson | Revised |  |
| [R4-2213413](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213413.zip) | *Draft CR: IDLE mode test cases for FR2 RedCap* | Ericsson | Revised |  |
| [R4-2211973](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211973.zip) | *CR on 4-step random access test in FR1 for RedCap UE* | Xiaomi | Revised |  |
| [R4-2212040](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212040.zip) | *draftCR on test for RRC connection release with redirection to NR redcap* | OPPO | Revised |  |
| [R4-2212391](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212391.zip) | *CR for introduction of RRC connection mobility control test cases in FR1 for RedCap Ues* | Nokia, Nokia Shanghai Bell | Revised |  |
| [R4-2213005](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213005.zip) | *Test case for handover for FR1 RedCap UE* | Huawei, HiSilicon | Revised |  |
| [R4-2213452](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213452.zip) | *draft CR for test case for SA NR - E-UTRAN handover for Redcap* | Vivo | Revised |  |
| [R4-2213453](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213453.zip) | *draft CR for test case for 2-step random access test in FR1 for NR standalone for Redcap* | vivo | Revised |  |
| [R4-2213654](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213654.zip) | *DraftCR on Intra-frequency handover from FR1 to FR1 unknown target cell for 2 and 1 Rx UE* | MediaTek inc. | Revised |  |
| [R4-2211975](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211975.zip) | *CR on 4-step random access test in FR2 for RedCap UE* | Xiaomi | Revised |  |
| [R4-2212392](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212392.zip) | *CR for introduction of RRC connection mobility control test cases in FR2 for RedCap Ues* | Nokia, Nokia Shanghai Bell | Revised |  |
| [R4-2213006](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213006.zip) | *Test case for handover for FR2 RedCap UE* | Huawei, HiSilicon | Revised |  |
| [R4-2213458](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213458.zip) | *draft CR for test case for 2-step RA type test in FR2 for NR Standalone* | Vivo | Revised |  |
| [R4-2211694](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211694.zip) | *Draft CR on test case for timing for Redcap UE for FR1* | CATT | Revised |  |
| [R4-2213655](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213655.zip) | *DraftCR on NR UE Transmit Timing Test for FR1 for 1 and 2 Rx UE* | MediaTek inc. | Revised |  |
| [R4-2211696](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211696.zip) | Draft CR on test case for timing for Redcap UE for FR2 | CATT | Revised |  |
| [R4-2211974](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211974.zip) | *CR on SSB-based RLM in-sync test in FR1 for RedCap UE* | Xiaomi | Revised |  |
| [R4-2213007](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213007.zip) | *Test case on Out-of-sync Test for FR1 RedCap UE*  | Huawei, HiSilicon | Revised |  |
| [R4-2213454](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213454.zip) | draft CR for test case for BFD and LR test for FR1 PCell configured with SSB-based BFD and LR in non-DRX mode for Redcap | Vivo | Revised |  |
| [R4-2211976](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2211976.zip) | *CR on SSB-based RLM in-sync test in FR2 for RedCap UE* | Xiaomi | Revised |  |
| [R4-2213008](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213008.zip) | *Test case on Out-of-sync Test for FR2 RedCap UE* | Huawei, HiSilicon | Revised |  |
| [R4-2212041](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212041.zip) | *Draft CR on SA event triggered reporting tests without gap under DRX for 1Rx&2Rx UE for intra-frequency measurement* | OPPO | Revised |  |
| [R4-2212042](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212042.zip) | *Draft CR on SA event triggered reporting tests with per-UE gaps under DRX for 1 Rx UE & 2Rx UE* | OPPO | Revised |  |
| [R4-2212043](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212043.zip) | Draft CR on SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading for 1 Rx UE & 2Rx UE | OPPO | Revised |  |
| [R4-2212044](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212044.zip) | *Draft CR on SA NR - E-UTRAN event-triggered reporting in non-DRX in FR1 for 1 Rx UE & 2Rx UE* | OPPO | Revised |  |
| [R4-2212045](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2212045.zip) | *Draft CR on SA NR - E-UTRAN event-triggered reporting in DRX in FR1 for 1 Rx UE & 2Rx UE* | OPPO | Revised |  |
| [R4-2213455](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213455.zip) | *draft CR for test case for SA event triggered reporting without SSB time index detection when DRX is used for FR1 Redcap* | Vivo | Revised |  |
| [R4-2213457](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213457.zip) | *draft CR for test case for SSB based L1-RSRP measurement for beam reporting for Redcap* | Vivo | Revised |  |
| [R4-2213011](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213011.zip) | *Test case on measurement procedure for FR2 RedCap UE* | Huawei, HiSilicon | Revised |  |
| [R4-2213009](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213009.zip) | *Test case on measurement accuracy for FR1 RedCap UE* | Huawei, HiSilicon | Revised |  |
| [R4-2213010](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213010.zip) | Test case on measurement accuracy for FR2 RedCap UE | Huawei, HiSilicon | Revised |  |
| [R4-2213002](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104-e/Docs/R4-2213002.zip) | *CR on accuracy requirements for Redcap* | Huawei, HiSilicon | Revised |  |
| R4-2213411 | *Test case list for RedCap RRM performance part* | Ericsson  | Revised |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
	1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
	2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
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## 2nd round

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| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
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