**3GPP TSG-RAN WG4 Meeting #104bis-e R4-210XXXX**

**Electronic Meeting, 10 – 19 October, 2022**

**Agenda item:** 4.6.3, 4.6.3.1 and 4.6.4

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [104-bis-e][207] NR\_redcap\_RRM\_1

**Document for:** Information

# Introduction

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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 4.6.3.1.1 are discussed here.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2215364**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215364.zip) | Intel Corporation | Proposal 1: Select 5% false admission rate at the interested RSRP THLD region as a baseline performance target for the design of 1 Rx. offset to cell-specific RSRP THLDs since 5% error rate can give intuitive interpretation related with the amount of “Measurement accuracy degradation with 1 Rx. UE”.Proposal 2: To keep the same level of false admission rate between 1 Rx. and 2 Rx. RSRP change THLDs at the region of target RSRP change, the 1 Rx. offset to RSRP change THLDs for RRM relaxation such as s-SearchDeltaP-r16 and s-SearchDeltaP-Stationary-r17 should have negative sign while positive value is required for 1 Rx. offset to absolute RSRP THLDs. Note that the difference arises from the admission condition that absolute THLD is for “greater than” condition while change THLD is for “less than” condition. |
| [**R4-2215365**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215365.zip) | Intel Corporation | CR on 1Rx. margin for RedCap UEs configured with relaxed measurement criterion |
| [**R4-2216215**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216215.zip) | Nokia, Nokia Shanghai Bell | 1. Agree changes in R4-2216216 correcting references to the respective SDT section in 38.321, adding term definition for TeDRX-RAN , and removing brackets for FR2-1 aligned to FR2-1 requirements for SDT in clause 5.5.3.
 |
| [**R4-2216216**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216216.zip) | Nokia, Nokia Shanghai Bell | CR 38.133: Corrections to SDT requirements for RedCap |
| [**R4-2216291**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216291.zip) | Huawei, HiSilicon | Correction to idle measurement requirements for RedCap Ues |
| [**R4-2216855**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216855.zip) | Ericsson | * Proposal #1: The 1Rx RedCap UE shall apply -1 dB offset to the signaled value of *Qrxlevmin* and *Qqualmin* for cell selection and cell resection procedures:
* Proposal #2: The 1Rx RedCap UE shall apply +1 dB offset to the signaled value of the following cell-specific RSRP thresholds for executing the corresponding procedures:
	+ *rsrp-ThresholdSSB*,
	+ *msgA-RSRP-ThresholdSSB*,
	+ *msgA-RSRP-Threshold,*
	+ *absThreshSS-BlocksConsolidation,*
	+ *sdt-RSRP-Threshold.*
	+ *s-SearchDeltaP-r16,*
	+ *s-SearchDeltaP-Stationary-r17*
	+ *s-SearchThresholdP-r16,*
	+ *s-SearchThresholdQ-r16,*
	+ *s-SearchThresholdP2-r17,*
	+ *s-SearchThresholdQ2-r17.*
* Proposal #3: The application of the offset to the signaled cell-specific RSRP threshold is specified under each relevant requirement in TS 38.133 defined for the procedure using the the corresponding cell specific threshold(s).
 |
| [**R4-2216856**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216856.zip) | Ericsson | Draft CR on offset for cell specific RSRP thresholds for 1Rx Redcap UE in 38.133 |
| [**R4-2216597**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216597.zip) | Nokia, Nokia Shanghai Bell | 1. For absolute thresholds, the offset to be applied by 1Rx RedCap UEs is equal to 1 dB .
 |
| [**R4-2216293**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216293.zip) | Huawei, HiSilicon | Proposal 1: For RedCap UE with 1 Rx branch, a positive offset (i.e.,+1dB) is supposed to be applied for the following parameters:* + *rsrp-ThresholdSSB*,
	+ *msgA-RSRP-ThresholdSSB*,
	+ *msgA-RSRP-Threshold,*
	+ *absThreshSS-BlocksConsolidation,*
	+ *sdt-RSRP-Threshold.*
	+ *s-SearchThresholdP-r16,*
	+ *s-SearchThresholdQ-r16,*
	+ *s-SearchThresholdP2-r17,*
	+ *s-SearchThresholdQ2-r17.*
	+ *Qrxlevmin and Qqualmin*

A negative offset (-1dB) is supposed to be applied for the following parameters:* + *s-SearchDeltaP-r16,*
	+ *s-SearchDeltaP-Stationary-r17*
 |
| [**R4-2216294**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216294.zip) | Huawei, HiSilicon | CR on offset margin for 1Rx RedCap UE |
| [**R4-2215606**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215606.zip) | Apple | *Proposal 1: For UE configured with eDRX in RRC\_INACTIVE state, the TA validation requirements for RedCap CG-SDT is defined as,** *For FR1,*

|  |  |
| --- | --- |
| *Measurement* | *FR1* |
| *RSRP1* | *(T1 – min(640ms, M1\*T)) ≤ T1’ ≤ (T1 + min(640ms, M1\*T))* |
| *RSRP2* | *(T2 – min(640ms, M1\*T)) ≤ T2’ ≤ T2* |
| *Note: T is as defined in table 5.1B.2.2-1* |

* *For FR2-1, same as the requirement with DRX in R17 SDT WI*
 |
| [**R4-2216764**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216764.zip) | Ericsson | Changes to RRC\_IDLE mode requirements for RedCap for TS 38.133 |
| R4-2215962 | vivo | Proposal 1: RAN4 should implement all modification/update related to this margin within RAN4 specs, i.e., TS 38.133. Proposal 2: It is not necessary for RAN4 to include any new parameters to the listed parameters in [3] in this and future meeting however if any listed parameter in [3] is not cell-specific, that parameter should be removed from the list.Proposal 3: Remove the bracket of [1] dB, i.e., the magnitude of the exact offset value is 1 dBProposal 4: Update absThreshSS-BlocksConsolidation and sdt-RSRP-Threshold used for 1 Rx Redcap UE in TS38.133 as: absThreshSS-BlocksConsolidation (1 Rx) = absThreshSS-BlocksConsolidation (2 Rx) + 1 dBsdt-RSRP-Threshold (1 Rx) = sdt-RSRP-Threshold (2 Rx) + 1 dBProposal 5: For the parameter rsrp-ThresholdSSB, msgA-RSRP-ThresholdSSB and msgA-RSRP-Threshold, two options are available:Option 1: Remove them from the list of parameters. Option 2: The value for 1 Rx Redcap UE is: rsrp-ThresholdSSB (1 Rx) = rsrp-ThresholdSSB (2 Rx) + 1 dBmsgA-RSRP-ThresholdSSB (1 Rx) = msgA-RSRP-ThresholdSSB (2 Rx) + 1 dBmsgA-RSRP-Threshold (1 Rx) = msgA-RSRP-Threshold (2 Rx) + 1 dBProposal 6: Parameters for the cell-specific RSRP thresholds 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 and to be applied 1 Rx margin are included in TS18.133Proposal 7: SuggestSSearchThresholdP (1 Rx) = SSearchThresholdP (2 Rx) + 1 dBSSearchThresholdP2 (1 Rx) = SSearchThresholdP2 (2 Rx) + 1 dBSSearchThresholdQ (1 Rx) = SSearchThresholdQ (2 Rx) + 1 dBSSearchThresholdQ2 (1 Rx) = SSearchThresholdQ2 (2 Rx) + 1 dBProposal 8: Suggest the margin for 1Rx Redcap UE does not apply for the following parameters:SSearchDeltaP, SSearchDeltaP-Stationary |

## Open issues summary

### Sub-topic 1-1: Cell specific RSRP ofset

**Agreements related to sub-topic 1-1 from GTW 2022-10-11:**

**Agreement:**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Type of threshold | Threshold [dB] | Status | Options |
| 1 | *rsrp-ThresholdSSB*, | + 1 |  |  |
| 2 | *msgA-RSRP-ThresholdSSB*,  | + 1 |  |  |
| 3 | *msgA-RSRP-Threshold* | + 1 |  |  |
| 4 | *absThreshSS-BlocksConsolidation* | + 1 |  |  |
| 5 | *sdt-RSRP-Threshold* | + 1 |  |  |
| 6 | *s-SearchDeltaP-r16* | -1 |  |  |
| 7 | *s-SearchDeltaP-Stationary-r17* | -1 |  |  |
| 8 | *s-SearchThresholdP-r16* | + 1   |  |  |
| 9 | *s-SearchThresholdQ-r16* | + 1 |  |  |
| 10 | *s-SearchThresholdP2-r17* | + 1 |  |  |
| 11 | *s-SearchThresholdQ2-r17* | + 1 |  |  |
| 12 | *Qrxlevmin* and *Qqualmin* |  | **FFS** | Option 1: + 1 dB Option 2: - 1 dB |

**Issue 1-1-1: 1 Rx RSRP offset – method**

Background:

At last meeting following agreement was reached [R4-2214484]: *“The offset is a fixed value in dB in the above cell-specific RSRP thresholds and will be specified in TS 38.133. The magnitude of the exact offset value is [1] dB.”*

* Proposals
	+ **Option 1 (Intel):** Select 5% false admission rate at the interested RSRP THLD region as a baseline performance target for the design of 1 Rx. offset to cell-specific RSRP THLDs since 5% error rate can give intuitive interpretation related with the amount of “Measurement accuracy degradation with 1 Rx. UE”.
* Recommended WF

Not clear how option 1 relates to the previous agreement. Proponent of option 1 needs to clarify option 1, and based on that discussions can continue.

**Option 1 Clarification (Intel)**

* + - 1.0 dB is the magnitude of “Measurement accuracy degradation with 1 Rx. UE” agreed in RAN4 with 5%-tile/95-tile range and it is linked with the THLD margin to get 5% false admission rate.
		- Under this framework, +1 dB offset for absolute RSRP THLDs including *Qrxlevmin* and *Qqualmin* are required to get the same 5% false admission rate for both 1 Rx. UEs and 2 Rx. UEs
		- For RSRP change between RSRP measurements, the measurement error would not change much comparing absolute RSRP measurement under the assumption that UE would filter the samples in the similar way for L3-RSRP measurement report with default coefficient. Thus, -1 dB is needed for RSRP change THLDs under this false admission rate framework.

Moderator: See the agreement from GTW above. No further discussions needed on this issue.

**Issue 1-1-2: Sign of RSRP offset for cell selection and reselection**

* Proposals
	+ **Option 1 (Ericsson, Nokia):** The 1Rx RedCap UE shall apply -1 dB offset to the signaled value of *Qrxlevmin* and *Qqualmin* for cell selection and cell resection procedures.
	+ **Option 2 (Huawei, Intel):** The 1Rx RedCap UE shall apply +1 dB offset to the signaled value of *Qrxlevmin* and *Qqualmin* for cell selection and cell resection procedures.
* Recommended WF

Discuss the option.

Moderator: See the agreement from GTW above. Based on the comments made during the GTW, continue the discussions to resolve the sign for case 12 (*Qrxlevmin* and *Qqualmin*).

**Issue 1-1-3: Sign of RSRP offset for RRM relaxation**

* Proposals
	+ **Option 1 (Intel, Huawei):** To keep the same level of false admission rate between 1 Rx. and 2 Rx. RSRP change THLDs at the region of target RSRP change, the 1 Rx. offset to RSRP change THLDs for RRM relaxation such as *s-SearchDeltaP-r16* and *s-SearchDeltaP-Stationary-r17* should have negative sign.
	+ **Option 2 (Ericsson):** Sign of RSRP offset used in RRM relaxation is positive.
* Recommended WF

Discuss the options.

Moderator: See the agreement from GTW above. No further discussions needed on this issue.

**Issue 1-1-4: Sign of RSRP offset for other procedures**

* Proposals
	+ **Option 1 (Ericsson, Nokia, Intel, Huawei, vivo):** The 1Rx RedCap UE shall apply +1 dB offset to the signaled value of the following cell-specific RSRP thresholds for executing the corresponding procedures:
		- *rsrp-ThresholdSSB*,
		- *msgA-RSRP-ThresholdSSB*,
		- *msgA-RSRP-Threshold,*
		- *absThreshSS-BlocksConsolidation,*
		- *sdt-RSRP-Threshold.*
		- *s-SearchThresholdP-r16,*
		- *s-SearchThresholdQ-r16,*
		- *s-SearchThresholdP2-r17,*
		- *s-SearchThresholdQ2-r17.*
* Recommended WF

Discuss the option.

Moderator: See the agreement from GTW above. No further discussions needed on this issue.

**Issue 1-1-5: How to capture RSRP offset in specification**

* Proposals
	+ **Option 1 (Ericsson, Intel, vivo):** The application of the offset to the signaled cell-specific RSRP threshold is specified under each relevant requirement in TS 38.133 defined for the procedure using the the corresponding cell specific threshold(s), see [R4-2216856](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216856.zip) (Ericsson). See R4-2215365 (Intel).
	+ **Option 2 (HW):** The application of the offset to the signaled cell-specific RSRP threshold is specified in one section, see [R4-2216294](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216294.zip).
* Recommended WF

Discuss the options.

**Issue 1-1-6: Application of 1 Rx margin**

* Proposals
	+ **Option 1 (vivo):** The margin for 1Rx Redcap UE does not apply for the following parameters: SSearchDeltaP, SSearchDeltaP-Stationary
* Recommended WF

Discuss the option.

Moderator: See the agreement from GTW above. No further discussions needed on this issue.

**Issue 1-1-7: Value of the margin**

* Proposals
	+ **Option 1 (vivo):** Remove the bracket of [1] dB, i.e., the magnitude of the exact offset value is 1 dB.
* Recommended WF

Discuss the options.

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | **Issue 1-1-1: 1 Rx RSRP offset – method****Issue 1-1-2: Sign of RSRP offset for cell selection and reselection**Support option 2. We know the motivation of option 1, however we had different view. At one physical position at cell edge, the average value of received RSRP of 1RX UE is less than that of 2RX UE. If through lowering the Qrxlevmin and Qqualmin (-1db), let 1RX UE camp on a certain cell, however the paging reception performance for this UE on this cell would be very poor. To guarantee performance and UE experience, it is suggested to set -dB for 1RX on top of existing Qrxlevmin and Qqualmin.**Issue 1-1-3: Sign of RSRP offset for RRM relaxation**Support option 1. The parameters of s-SearchDeltaP-r16 and s-SearchDeltaP-Stationary-r17 are RSRP change delta. As 1Rx RedCap UE has larger measurement uncertainty/ fluctuation, it can easily satisfy the low mobility/ stationary criterion, and then enters to measurement relaxation procedure. To avoid the case, it is better to set a less RSRP change threshold. Therefore a negative offset on top of the current threshold is preferred.**Issue 1-1-4: Sign of RSRP offset for other procedures**Support option 1. These parameters are absolute values. When the measured RSRP is above one of these thresholds, UE will perform related behaviors. Since the 1Rx measurement results may result in larger measurement error, a positive offset on top of the current RSRP threshold is more proper, to avoid 1Rx UE execute radical behaviors.**Issue 1-1-5: How to capture RSRP offset in specification**Technically option 2 and option 1 are similar. Option 2 creates an applicability section in clause 3, it makes specification simple.**Issue 1-1-6: Application of 1 Rx margin**Shall be discussed together with Issue 1-1-3.**Issue 1-1-7: Value of the margin**Support option 1.  |
| Nokia | **Issue 1-1-1: 1 Rx RSRP offset – method**We don’t believe it is necessary to have this clarification. RAN4 has agreed that the accuracy degradation from 1 Rx when compared to 2 Rx will be considered in the offset to the thresholds. Whether this offset assumes negative of positive values, is already discussed below in specific issues.**Issue 1-1-2: Sign of RSRP offset for cell selection and reselection**Option 1. We agree with the analysis in Ericsson’s paper. The measurements performed by 1 Rx UE will be worse than the measurements performed by 2 Rx UEs so the cell size will be smaller to 1 Rx UEs. If we add 1 dB on top of those thresholds, this will limit the range in which 1 Rx UEs will be able to connect to the network.**Issue 1-1-3: Sign of RSRP offset for RRM relaxation**We prefer option 1. **Issue 1-1-4: Sign of RSRP offset for other procedures**Option1 **Issue 1-1-5: How to capture RSRP offset in specification**We prefer option 1.**Issue 1-1-6: Application of 1 Rx margin**We believe the margin applies for all thresholds.**Issue 1-1-7: Value of the margin**We support option 1. |
| Apple | **Issue 1-1-1: 1 Rx RSRP offset – method**Still not very sure about option 1, does it propose that for absolute RSRP threshold, e.g., Qrxlevmin and Qqualmin, +1dB offset shall be applied, but for those RSRP threshold related with relative RSRP measurement, e.g., low-mobility criteria related threshold, the -1dB offset shall be applied to the threshold of RSRP variance? If our understanding is correct, then we are fine with proposal 1.**Issue 1-1-2: Sign of RSRP offset for cell selection and reselection**Support option 2. Due to the inaccuracy of RSRP measurement with 1Rx (1dB was introduced for measurement inaccuracy), it shall be more conservative if 1Rx UE can measure higher RSRP to trigger the corresponding UE behavior, e.g., Qrxlevmin and Qqualmin for cell selection/reselection.**Issue 1-1-3: Sign of RSRP offset for RRM relaxation**Option 1. When the inaccuracy 1dB applies to threshold of RSRP variance, the conservative way is to make the variance threshold smaller to guarantee 1 Rx UE is really in a low mobility mode.**Issue 1-1-4: Sign of RSRP offset for other procedures**Option 1.**Issue 1-1-5: How to capture RSRP offset in specification**Either way is fine to us.**Issue 1-1-6: Application of 1 Rx margin**We have different view from option 1. The RSRP for comparison is measured on different time instance and the inaccuracy impact shall still be considered in such RSRP variance threshold.**Issue 1-1-7: Value of the margin**Option 1. |
| MediaTek | **Issue 1-1-1: 1 Rx RSRP offset – method**The issue is still not clear to us.**Issue 1-1-2: Sign of RSRP offset for cell selection and reselection**The criterion S is satisified if Srxlev > 0 AND Squal > 0 WhereSrxlev = Qrxlevmeas – (Qrxlevmin + Qrxlevminoffset )– Pcompensation - Qoffsettemp Squal = Qqualmeas – (Qqualmin + Qqualminoffset) - Qoffsettemp Now, given that criterion S is satisifed when it is greater than zero value. Hence, relaxing the cell selection threshold should allow for higher Srxlev/Squal, which can be acheived if the offset is negative and the equation can be re-written as:Srxlev = Qrxlevmeas – (Qrxlevmin **– 1** + Qrxlevminoffset )– Pcompensation - Qoffsettemp Squal = Qqualmeas – (Qqualmin **– 1** + Qqualminoffset) - Qoffsettemp Therefore, we support option 1.**Issue 1-1-3: Sign of RSRP offset for RRM relaxation**We are fine with option 2**Issue 1-1-4: Sign of RSRP offset for other procedures**We are fine with option 1**Issue 1-1-5: How to capture RSRP offset in specification**Fine with option 1**Issue 1-1-7: Value of the margin**Our preference is to have larger value than 1dB because 1dB maybe too small to make an impact. In gerneral 3dB makes more sense to us, however, we can compromise to 1dB too. |
| Intel | **Issue 1-1-1: 1 Rx RSRP offset – method**Under 5% false admission rate, +1 dB offset for absolute RSRP thresholds shall be applied, but for those RSRP threshold related with RSRP change e.g., low-mobility criteria related threshold, the -1 dB offset shall be applied. The 5% is linked with the confident interval of 5%-tile/95%-tile of the error distribution. **Issue 1-1-2: Sign of RSRP offset for cell selection and reselection**Support Option 2. With the method of Option 1 in Issue 1-1-1, + 1.0 dB offset to absolute RSRP THLDs is required to get the same 5% false admission rate for 1 Rx. UEs and 2 Rx. UEs.**Issue 1-1-3: Sign of RSRP offset for RRM relaxation**Option 1. With the method of Option 1 in Issue 1-1-1, - 1.0 dB offset to RSRP change THLDs is required to get the same 5% false admission rate for 1 Rx. UEs and 2 Rx. UEs.**Issue 1-1-4: Sign of RSRP offset for other procedures**Option 1. It is the same conclusion with the method of Option 1 in Issue 1-1-1**Issue 1-1-5: How to capture RSRP offset in specification**We can move forward with the following compromise for clarity and readability.1. List-up 1 Rx. offset value with sign and the related THLDs in “3.6.11.4 Applicability of offset margin for 1 Rx. RedCap”
2. Refer the “Applicability section” for value in the relevant section with the associated operation. For example, for “4.2B.2.9 Measurements of intra-frequency NR cells for UE configured with relaxed measurement criterion for RedCap”, add the sentence as below.

“For 1 Rx. RedCap UE, the offsets in clause 3.6.11.4 is applied to the thresholds used for *lowMobilityEvaluation*, *cellEdgeEvaluation*, *stationaryMobilityEvaluation* and *cellEdgeEvaluationWhileStationary* in[2].” **Issue 1-1-6: Application of 1 Rx margin**The offset for RSRP change THLDs is also required. **Issue 1-1-7: Value of the margin**Option 1. For RSRP change between RSRP measurements, the measurement error would not change much comparing absolute RSRP measurement under the assumption that UE would filter the samples in the similar way for L3-RSRP measurement report with default coefficient. Thus, -1 dB offset margin is needed for RSRP change THLDs under this false admission rate framework of Option 1 in Issue 1-1-1. |
| CMCC | **Issue 1-1-2: Sign of RSRP offset for cell selection and reselection**Qrxlevmin and Qqualmin for cell selection and cell resection procedures are broadcasted for legacy 2Rx UE, and also represents the cell coverage for legacy NR network. We can understand that the 1Rx UE measurement performance may be worse than 2Rx, so in theory, the threshold should be more stringent for 1Rx UE. However, the network coverage will not be optimized for 1Rx RedCap UE, +1dB will cause the coverage shrink for RedCap 1Rx UE. Normally, since UE will perform ranking for cell reselection, if a better neighbor cell is found, UE can reselect to the neighbor cell. The worst case is that the network coverage is not that good; UE cannot find a better neighbor cell while the serving cell quality is also poor. In this case, tightening the thresholds will not help and will only cause another round of cell selection procedure.Hence, we prefer option 1 with -1dB offset or 0dB offset to the Qrxlevmin and Qqualmin**Issue 1-1-4: Sign of RSRP offset for other procedures**OK with option1**Issue 1-1-5: How to capture RSRP offset in specification**We prefer option2 which is more clear to capture the offsets in one section. |
| vivo | **Issue 1-1-2: Sign of RSRP offset for cell selection and reselection****For the remaining case 12, support** Option 2: - 1 dB**Issue 1-1-5: How to capture RSRP offset in specification**Either option 1 or option 2 works. Slightly prefer option 1 since these parameters appear a few different places in specs. Suggest to address this issue in the CR directly.**Issue 1-1-7: Value of the margin****Support option 1**  |
| Ericsson | We provide our comments on issues 1-1-2 and 1-1-5 since other issues were resolved at the GTW.**Issue 1-1-2: Sign of RSRP offset for cell selection and reselection**We support Option 2 (-1 dB offset). The reason is that -1 dB will compensate for the reduction in the cell size/coverage due to 1Rx UE which has worse accuracy than 2Rx UE. There was concern about the paging reception. According to TS 38.331, 1Rx UE can be barred. This means cell supporting 1Rx UEs may have means to reach the 1 Rx UEs. Our main concern is that under patchy/discontinuous coverage with +1 dB offset, 1Rx UE will not be able to camp to a cell. Patchy/discontinuous coverage may exist since some cells may not accept e.g. 1Rx UE, HD-FDD UEs (according to 38.331 procedures). Under continuous coverage the UE generally selects the strongest cell so RxLev and RxQual are likely to be much higher. **Issue 1-1-5: How to capture RSRP offset in specification**We prefer Option 1 since it is easy to relate the threshold to the relevant procedure where it is applied. Putting them at once place (Option 2) is easy from specification point of view but is difficult to related to the procedure for which it applies.  |

### Sub-topic 1-2: Small data transmission for RedCap

**Issue 1-2-1: Clarification of SDT FR2 requirements**

* Proposals
	+ **Option 1 (Apple, Nokia):** Same as the requirement with DRX in R17 SDT WI
* Recommended WF

Given that FR2 requirements were updated in R4-2214626 at RAN4#104-e meeting, further discuss need of option1.

**Issue 1-2-2: Clarification of SDT FR1 requirements**

Background: Note that clarifications to the eDRX was agreed in R4-2214626 at RAN4#104-e meeting.

* Proposals
	+ **Option 1 (Nokia):** Add the term definition for TeDRX-RAN
	+ **Option 2 (Apple):** For UE configured with eDRX in RRC\_INACTIVE state, the TA validation requirements for RedCap CG-SDT is defined as,
		- * *For FR1,*

|  |  |
| --- | --- |
| *Measurement* | *FR1* |
| *RSRP1* | *(T1 – min(640ms, M1\*T)) ≤ T1’ ≤ (T1 + min(640ms, M1\*T))* |
| *RSRP2* | *(T2 – min(640ms, M1\*T)) ≤ T2’ ≤ T2* |
| *Note: T is as defined in table 5.1B.2.2-1* |

* Recommended WF

Given that clarification was already agreed in R4-2214626, discuss if any further clarification is needed.

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Nokia | **Issue 1-2-1: Clarification of SDT FR2 requirements**We agree with the recommended WF.**Issue 1-2-2: Clarification of SDT FR1 requirements**We support option 1. The addition in option 2 is not required.  |
| Apple | **Issue 1-2-1: Clarification of SDT FR2 requirements**Option 1.**Issue 1-2-2: Clarification of SDT FR1 requirements**Option 2. Since in RedCap inactive mode the serving cell measurement period is specified based on T in table Table 5.1B.2.2-1, the TA validation requirement shall also be based on T instead of TDRX.  |
| MediaTek | **Issue 1-2-1: Clarification of SDT FR2 requirements**Fine with the current changes in CR R4-2214626, i.e. follow the FR2 requirements in SDT.**Issue 1-2-2: Clarification of SDT FR1 requirements**Fine with option 2. The approach in option 2 is similar to that in CR R4-2214626 but the methodology of defining the T in option 2 in here makes more sense to us because there is no need to mention which TeDRX is configured, which aligns with Table 5.1B.2.2-1. |
| Intel | **Issue 1-2-1: Clarification of SDT FR2 requirements**Option 1.**Issue 1-2-2: Clarification of SDT FR1 requirements**To all) Is TeDRX-RAN in Option 1 is diffrent from the definition in Option 2 ?  |
| vivo | **Issue 1-2-1: Clarification of SDT FR2 requirements**OK with Option 1. |
| Ericsson | **Issue 1-2-1: Clarification of SDT FR2 requirements**FR2 requirements were already clarified at last meeting in R4-2214626. We don’t think any updates or further clarifications are needed. **Issue 1-2-2: Clarification of SDT FR1 requirements**Current text already contains following definition: "TeDRX-RAN by serving gNB and CN eDRX cycle (TeDRX-CN) by the core network (AMF)”Our view is that it is sufficient, however we are open to consider option 1.  |

## Companies views’ collection for 1st round

### Open issues

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| **Company** | **Comments** |
| Company A |  |
|  |  |

### 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.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2215365**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215365.zip)(Intel Corporation) | *CR on 1Rx. margin for RedCap UEs configured with relaxed measurement criterion* |
| Huawei: pending on the conclusion of issue 1-1 |
| Intel: For CR revision, we can move forward with the following compromise for clarity and readability.1. List-up 1 Rx. offset value with sign and the related THLDs in “3.6.11.4 Applicability of offset margin for 1 Rx. RedCap”
2. Refer the “Applicability section” for value in the relevant section with the associated operation. For example, for “4.2B.2.9 Measurements of intra-frequency NR cells for UE configured with relaxed measurement criterion for RedCap”, add the sentence as below.

“For 1 Rx. RedCap UE, the offsets in clause 3.6.11.4 is applied to the thresholds used for *lowMobilityEvaluation*, *cellEdgeEvaluation*, *stationaryMobilityEvaluation* and *cellEdgeEvaluationWhileStationary* in[2].” |
| [**R4-2216216**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216216.zip)(Nokia, Nokia Shanghai Bell) | *CR 38.133: Corrections to SDT requirements for RedCap* |
| Apple: Up to sub-topic 1-2 |
| Ericsson: depends on the outcome of related sub-topic.  |
| [**R4-2216291**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216291.zip)(Huawei, HiSilicon) | *Correction to idle measurement requirements for RedCap Ues* |
| Apple: fine with the CR |
| Ericsson: Regarding change 1, 2 Rx requirements are pointing to Table 4.2.2.2-1: Nserv which are for 2 Rx (legacy). We not understand what is the issue. If references to 2 Rx tables are removed, then it is not clear which requirements the 2 Rx UE needs to meet. |
| [**R4-2216856**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216856.zip)(Ericsson) | *Draft CR on offset for cell specific RSRP thresholds for 1Rx Redcap UE in 38.133* |
| Huawei: pending on the conclusion of issue 1-1 |
|  |
| [**R4-2216294**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216294.zip)(Huawei, HiSilicon) | CR on offset margin for 1Rx RedCap UE |
| Apple: up to the issue 1-1-5. |
| Ericsson: depends on issue 1-1-5. If this approach is used the wording needs to be modified. For example, the thresholds are signalled by RRC in TS 38.331 but some of them are used in requirements in 38.133, some in procedures in 38.304 and some in procedures 38.321. These references need to be clearly added for different thresholds. This problem does not arise in the other approach (in E/// CR in R4-2216856) where requirement section is referred to the relevant RAN2 spec. |
| [**R4-2216764**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216764.zip)(Ericsson) | Changes to RRC\_IDLE mode requirements for RedCap for TS 38.133 |
| Huawei: Was the CR is agreed in last meeting? This is a resubmition? Please component clarify. |
| Apple: Can be fine with this CR. In our previous comment in last meeting: It’s not realistic to us that serving cell S criteria is not met but the relaxation criteria of not-at-cell-edge is still met. SSearchThresholdP and SSearchThresholdQ is cell specific configuration controlled by network, we just don’t understand what’s the motivation to configure a low threshold of “SSearchThresholdP and SSearchThresholdQ” (lower than S criteria) but specify in RAN4 spec to not allow UE doing the relaxation.However, if both stationary criteria and not-cell-edge criteria are configured, it’s possible that UE doesn’t meet S criteria and non-at-cell-edge but UE meets stationary criteria, and this case to us is a possible configuration and for this case we agree to not relax measurement. |

## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic #1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

## Discussion on 2nd round (if applicable)

# Topic #2: Mobility requirements

Contributions from AI 4.6.3.1.2 are discussed here.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2215471**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215471.zip) | Xiaomi | Proposal 1: When RedCap UE configured with separate initial UL BWP, the RRC re-establishment delay requirement and RRC connection release with redirection delay requirement should be extended taking the BWP switching time of 6ms into consideration.  |
| [**R4-2216455**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216455.zip) | Ericsson | *Proposal 1: No additional delay is needed when UE handover to a BWP which has different SSB type with the one used for measurement.*  |
| [**R4-2216456**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216456.zip) | Ericsson | CR on RedCap HO |
| [**R4-2216877**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216877.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.* 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.* $T\_{UE\\_re-establish\\_delay}=50 ms+T\_{identify\\_intra\\_NR}+\sum\_{i=1}^{N\_{freq}-1}T\_{identify\\_inter\\_NR,i}+T\_{SI-NR}+T\_{PRACH}+X$
* Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH + X
* X = 6ms
 |

## Open issues summary

### Sub-topic 2-1 Handover

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

* Proposals
	+ **Option 1 (Ericsson):** No additional delay is needed when UE handover to a BWP which has different SSB type with the one used for measurement.
	+ **Option 2 (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. Capture the above condition as a note in the Handover related section in TS38.133
* Recommended WF

Discuss the options.

Sub topic 2-1

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| **Company** | **Comments** |
| Huawei | Support option 1. CD-SSB and NCD-SSB have the same PCI, and they are QCLed, and the signal level measurement on CD and NCD are almost the same. We don’t think this case shall be regarded as unknown cell handover scenario. Moreover unknown case requires cell detection procedure which would consume more power, it is not desired for RedCap UE. |
| Nokia | **Issue 2-1-1: Requirements for HO to a BWP which has different SSB with the one used for measurement** We support Option 1. In this case, the targed cell measurements are available at the UE, therefore we don’t believe that this case shall be regarded as unknown cell.  |
| Apple | Support option 1 since we think CD-SSB and NCD-SSB carries the same information for timing. However, if companies can agree on the timing misalignment between CD-SSB and NCD-SSB if the frequency domain separation is huge between them, we are fine to consider option 2. |
| MediaTek | **Issue 2-1-1: Requirements for HO to a BWP which has different SSB with the one used for measurement** We support option 2. We don’t have an assumption that the measurements of CD-SSB is the same as in NCD-SSB hence we don’t understand option 1. Also, if the frequency sparation between the CD-SSB and NCD-SSB is large then will the measurements based on CD-SSB is the same as in NCD-SSB? |
| Intel | The same QCLed assumption between CD-SSB and NCD-SSB should be valid and thus Option 1 would work. |
| CMCC | We support option1.  |
| vivo | Similar view with Apple if the separation on the frequency domain is large than a threshold and there is a consensus to further study it.  |
| OPPO | Support option 1. In our understanding, if either CD-SSB or NCD-SSB of the cell has been measured then the cell should be assumed as known. |
| Xiaomi | Option 1 is preferred. |
| Qualcomm | We understand that both CD-SSB and NCD-SSB carry the same information, but the main concern here is from measurement difference between CD-SSB and NCD-SSB. For unknown cell handover, additional delay is needed for AGC, which is also needed in this case since the two SSBs are separated in frequency. There can be two ways to specify this:1. Specify additional delay for such scenario2. Classify the case as unknown cell handoverWe support option 2 but are also okay to specify additional delay for this scenario, but the scenario must be handled. |
| Ericsson | Option 1. FFS option 2We proposed such AGC concern several meetings ago, in that time UE vendors claimed they can handle such power difference between CD-SSB and NCD-SSB.A possible compromise solution is to consider a sub-set which mentioned by Apple.An additional delay is allowed if some conditions are met, such as the frequency difference between NCD-SSB and CD-SSB is larger than a threshold,  |

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

**Issue 2-2-1: RRC reestablishment delay with RedCap specific initial BWP**

* Proposals
	+ **Option 1 (QC, Xiaomi):**

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

* $T\_{UE\\_re-establish\\_delay}=50 ms+T\_{identify\\_intra\\_NR}+\sum\_{i=1}^{N\_{freq}-1}T\_{identify\\_inter\\_NR,i}+T\_{SI-NR}+T\_{PRACH}+X$
* X = 6ms
* Recommended WF
	+ Discuss the option.

Sub topic 2-2

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| --- | --- |
| **Company** | **Comments** |
| Huawei | In general, we think the scenario may happen in practical network, so additional time duration for UE switching from initial BWP with CD-SSB to redcap specific BWP with RA resource are needed. However 6ms seems too long for BWP switch. We are open to further discuss the concrete value. |
| Nokia | We have a similar view as Huawei. In some cases, such as the one in the example used by Xiomi in their paper, extra time might be needed. RRC reestablishment can happen due to different causes (as specified in 38.331) the justification for twice the BWP switch appears in a corner case. We are open to discuss another value of X.  |
| Apple | Fine with option 1. |
| MediaTek | Support Option 1. However, the value can be discussed later because we think it should be 3ms (to follow BWP switch delay) instead of 6ms. |
| Intel | We agreed the motivation but not sure on that X = 6 ms is required. |
| CMCC | Similar view as other companies. The value of X should not be 6ms. |
| vivo | Support option 1. |
| OPPO | Support option 1 and ok to further discuss shorter X. |
| Xiaomi | Support option 1. For the value of X, based on our understanding, UE would perform two times of BWP switching in the worst case. For example, when handover failure happens in a BWP with NCD-SSB, UE has to switch to the BWP configured with CD-SSB for SI first and then switch to separate initial BWP for RACH. So, we prefer to define 6ms which is two times of BWP switching delay. |
| Qualcomm | Support option 1. We can further discuss whether X=6 or X=3. |
| Ericsson | Fine with option 1 except the value X.We can agree the principle and discuss the value X later. |

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

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

* Proposals
	+ Option 1 (QC, Xiaomi):

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

* Tconnection\_release\_redirect\_NR = TRRC\_procedure\_delay + Tidentify-NR + TSI-NR + TRACH + X
* X = 6ms
* Recommended WF
	+ Discuss the option.

Sub topic 2-3

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | Same comments as issue 2-2-1. |
| Nokia | Same as issue 2-2-1 |
| Apple | Fine with option 1. |
| MediaTek | Support Option 1. Same comment as in the previous issue. |
| Intel | Same view as issue 2-2-1 |
| CMCC | Same view as issue 2-2-1. |
| vivo | Support option 1 |
| OPPO | Same view as issue 2-2-1 |
| Xiaomi | Support option 1, similar comment as issue 2-2-1. |
| Qualcomm | Support option 1 and same comment as above |
| Ericsson | Same view as issue 2-2-1. |

### CRs/TPs comments collection

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| --- | --- |
| **CR/TP number** | **Comments collection** |
| [**R4-2216456**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216456.zip)(Ericsson) | CR on RedCap HO |
| Huawei: According to the existing description, the target cell is regarded as known cell regardless measurement on CD-SSB or NCD-SSB if the following conditions are met:“In the interruption requirement a cell is known if it has been meeting the relevant cell identification requirement during the last 5 seconds otherwise it is unknown. Relevant cell identification requirements are described in Clause 9.2.5 for intra-frequency handover and Clause 9.3.4 for inter-frequency handover.” |
| To Huawei:Current known cell definition is unclear since it’s only talking about SSB which means CD-SSB for non-RedCap UE.

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| In FR2, the target cell is known if it has been meeting the following conditions:- During the last 5 seconds before the reception of the handover command:- the UE has sent a valid measurement report for the target cell and- One of the SSBs measured from the NR target cell being configured remains detectable according to the cell identification conditions specified in clause 9.3,- One of the SSBs measured from the target cell also remains detectable during the handover delay according to the cell identification conditions specified in clause 9.3.otherwise it is unknown. |

When UE measures CD-SSB and handover to the target cell with NCD-SSB, during the handover procedure, UE should handover to the BWP with NCD-SSB. Thus, the NCD-SSB which is QCLed to the CD-SSB but not be measured should be the reference and should be remains detectable. |

## Summary for 1st round

### Open issues

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|  | **Status summary**  |
| **Sub-topic#1** | *Tentative agreements:**Candidate options:**Recommendations for 2nd round:* |

## Discussion on 2nd round (if applicable)

# Topic #3: Timing requirements

Contributions from AI 4.6.3.1.3 are discussed here.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2216217**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216217.zip) | Nokia, Nokia Shanghai Bell | 1. RAN4 to ensure that Tx timing requirements cover the scenario of active BWP without SSB and need for measurement gap for monitoring CD-SSB in case of MG sharing and large MGRP/SMTC.
2. Existing Tx timing requirements are reused for the scenario of active BWP without SSB and need for measurement gap for monitoring CD-SSB in case of MG sharing and large MGRP/SMTC under the condition that UE prioritizes SSB measurement for obtaining reference timing of the serving cell over other configured measurements.
 |
| [**R4-2216218**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216218.zip) | Nokia, Nokia Shanghai Bell | CR 38.133 Correction to Tx timing requirements for active BWP without SSB for RedCap |
| [**R4-2216878**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216878.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 |
| [**R4-2216880**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216880.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: Requirements for the case SSB and MG overlapping**

*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 that** *The SSB should be within active BWP, or*
* *The SSB is not within active BWP, and the gap is configured*
* *Capture the condition in the section for RedCap timing of the specification*
 |

* Proposals
* **Option 1 (Nokia):**  RAN4 to ensure that Tx timing requirements cover the scenario of active BWP without SSB and need for measurement gap for monitoring CD-SSB in case of MG sharing and large MGRP/SMTC.
* Recommended WF
	+ Discuss the option.

**Issue 3-1-2: Timing requirements when SSB is not in the active BWP**

* Proposals
* **Option 1 (Nokia):** Existing Tx timing requirements are reused for the scenario of active BWP without SSB and need for measurement gap for monitoring CD-SSB in case of MG sharing and large MGRP/SMTC under the condition that UE prioritizes SSB measurement for obtaining reference timing of the serving cell over other configured measurements.
* **Option 2 (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.
* Recommended WF

Discuss the options.

Sub topic 3-1

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| **Company** | **Comments** |
| Huawei | **Issue 3-1-1: Requirements for the case SSB and MG overlapping**We think the current discription is generic enough to cover many cases including the scenario in option 1.**Issue 3-1-2: Timing requirements when SSB is not in the active BWP**Disagree on option 1 and option 2.In our view “available at UE” means UE is able to use this SSB for timing tracking at least every 160ms, therefore the current requirements don’t need to be changed. How UE preform and obtain measurement resource is up to UE implementation. It shall be noted that the current discription is a trade-off after lots of discussion, we would not like to re-discuss the issue. |
| Nokia | **Issue 3-1-2: Timing requirements when SSB is not in the active BWP**Option 1. In our view, the Tx timing requirement is applicable for all scenarios listed above in the RAN4 #103-e agreement, i.e. even if high MGRP is configured and CSSFintra\_RedCap > 1. In such case, the UE has also to ensure that it meets the Tx timing requirements to be ready for transmission, In case of MG sharing, it hence needs to prioritize the SSB reception of the serving cell for reference time tracking over any intra-/inter-frequency/inter-RAT measurements. Option 2 has the drawback that no Tx timing requirements are defined for some scenarios, and it is left to network to exclude such scenarios.  |
| Apple | **Issue 3-1-1: Requirements for the case SSB and MG overlapping** We also think current requirement has already ecovedr the option 1.**Issue 3-1-2: Timing requirements when SSB is not in the active BWP**We can somewhat compromise to option 2, we agree that how to coordinate measurement resource is up to UE implementation, but if the condition in option 2 is met, it would give UE more flexiblity to handle the coordination between measurement and timing tracking. |
| MediaTek | **Issue 3-1-1: Requirements for the case SSB and MG overlapping** In general, we agree with option but more details are needed because to our understanding the largest MGRP and SMTC is 160ms hence there is no issue observed from our side. **Issue 3-1-2: Timing requirements when SSB is not in the active BWP**The difference between option 1 and option 2 is not clear to us. We believe these two options are similar can be merged in single option. Option 2 doesn’t contradict the existing specs writing. Also, the max value of SMTC and MGRP are equal to 160ms, while the only case to have > 160 is when inter-frequency without gaps, hence Option 2 is valid case. Thus, we are fine to support Option 2.

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| CSSFoutside\_gap,i =1, if only one measurement object is configured to be measured outside of MG for RedCap. Otherwise, CSSFoutside\_gap,i =2 for intra-frequency measurement, and CSSFoutside\_gap,i = 2\*Y for inter-frequency measurement with no measurement gap, |

 |
| Intel | **Issue 3-1-1: Requirements for the case SSB and MG overlapping** We also think current requirement is general and already cover the Option 1.**Issue 3-1-2: Timing requirements when SSB is not in the active BWP**The availabity condition of ” .. *the SSB is available at the UE at least once every 160 ms* ” would be sufficient to cover all cases if valid. Any specific elaboration would not be necessary.  |
| CMCC | **Issue 3-1-1: Requirements for the case SSB and MG overlapping**In case, SSB is available at the UE at least once every 160 ms, Tx requirements should be met. It is not necessary to add further conditions on top of the requirements.**Issue 3-1-2: Timing requirements when SSB is not in the active BWP**Same comments as issue 3-1-1.  |
| vivo | **Issue 3-1-1: Requirements for the case SSB and MG overlapping**We think that the current spec is clear |
| OPPO | **Issue 3-1-1: Requirements for the case SSB and MG overlapping** Share the views that current requirement is general and sufficient.**Issue 3-1-2: Timing requirements when SSB is not in the active BWP**Same comments as issue 3-1-1. |
| Xiaomi | **Issue 3-1-1: Requirements for the case SSB and MG overlapping**We prefer to keep the current description. |
| Qualcomm | **Issue 3-1-1: Requirements for the case SSB and MG overlapping** We also think that existing requirements are sufficient to cover timing accuracy requirements with MG except that we need to make sure that an SSB is available to be measured by the UE for timing purpose as discussed under Issue 3-1-2**Issue 3-1-2: Timing requirements when SSB is not in the active BWP**Support Option 2. Can companies clarify how will the UE measure the serving cell SSB when MGRP is 160ms and there are multiple intra-frequency, inter-frequency and inter-RAT MOs to be measured in the same gap. RedCap UE has only one searcher and the MG has to be shared by all these measurements. From network POV as SSB is transmitted and available at the UE because it’s unaware of how the UE is using the MGs but from UE’s POV the SSBs are not available if the UE is performing measurements on MOs other than the serving cell MO. So we think this additional condition is needed to ensure that the UE meetings the timing requirements. |
| Ericsson | **Issue 3-1-1: Requirements for the case SSB and MG overlapping**The condition that the UE shall meet the transmit timing requirements provided that the SSB is available at the UE at least once every 160 ms is sufficient, ultimate and self explanatory.This means for example due to gap configuration etc., if the SSB cannot be made available at the UE every 160 ms then the UE is not required to meet the Te requirements.The SSB availability at least once every 160 ms at the UE is requirement on the network node. NW also configures the gaps and carriers to measure. So it is NW responsibility to provide configuration that will enable SSB availability at the UE once every 160 ms. Failure to do so means the Te may not be met by the UE. Therefore in our view no further clarification is needed in 38.133. We therefore do NOT support Option 1.**Issue 3-1-2: Timing requirements when SSB is not in the active BWP**As described above (under issue 3-1-1) no further clarification is needed. We therefore do NOT support any of the Option 1 and Option 2. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [**R4-2216218**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216218.zip)(Nokia, Nokia Shanghai Bell) | *Huawei: depends on issue 3-1-1 and 3-1-2.* |
| Ericsson: Depends on the outcome of issue 3-1-1 and 3-1-2. But as stated above we don’t see any further clarification in 38.133. |
|  |
| [**R4-2216880**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216880.zip)(Qualcomm Incorporated) | *Huawei: depends on issue 3-1-1 and 3-1-2.* |
| Ericsson: Depends on the outcome of issue 3-1-1 and 3-1-2. But as stated above we don’t see any further clarification in 38.133. |
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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:* |

## Discussion on 2nd round (if applicable)

# Topic #4: Signalling characteristics

Contributions from AI 4.6.3.1.4 are discussed here.

## Companies’ contributions summary

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| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| [R4-2215472](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215472.zip) | Xiaomi | Proposal 1: RAN4 to define relaxed RLM/BFD requirements for RedCap UE.Proposal 2: It is feasible to further relax RLM/BFD requirements for Rel-17 RedCap UE satisfying both Rel-17 stationary criterion and Rel-17 RLM/BFD relaxation criteria (low mobility criterion and good serving cell quality criterion).Proposal 3: Further relaxation of RLM/BFD should be restricted to the condition when the configuration of Rel-17 stationary criterion is more stringent than Rel-17 RLM/BFD low mobility criterion, i.e. SSearchDeltaP\_stationary ≤ SSearchDeltaP-Connected and/or TSearchDeltaP\_stationary ≥ TSearchDeltaP-Connected. |
| [R4-2216292](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216292.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. |
| [R4-2216598](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216598.zip) | Nokia, Nokia Shanghai Bell | 1. RAN4 to prioritize the definition of RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17.
2. The RLM/BFD relaxation factors defined in the NR\_power\_sav\_enh WI are applicable to 2 Rx RedCap UEs.
 |
| [R4-2215606](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215606.zip) | Apple | *Proposal 2:* *RAN4 will not define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17.* |

## 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**

* Proposals
	+ **Option 1 (Xiaomi):** RAN4 to define relaxed RLM/BFD requirements for RedCap UE.
		- **Option 1a (Nokia):** RAN4 to prioritize the definition of RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17.
	+ **Option 2 (HW, Apple):** Not to define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17.
* 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**

* Proposals
	+ **Option 1 (**Xiaomi**):** For RedCap UE satisfaying both Rel-17 stationary criterion and Rel-17 RLM/BFD relaxation criteria (low mobility criterion and good serving cell quality criterion):
		- Further relaxation of RLM/BFD should be restricted to the condition when the configuration of Rel-17 stationary criterion is more stringent than Rel-17 RLM/BFD low mobility criterion, i.e. SSearchDeltaP\_stationary ≤ SSearchDeltaP-Connected and/or TSearchDeltaP\_stationary ≥ TSearchDeltaP-Connected.
	+ **Option 1b (Nokia):** The RLM/BFD relaxation factors defined in the NR\_power\_sav\_enh WI are applicable to 2 Rx RedCap UEs.
* Recommended WF

Discuss the options.

Sub topic 4-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| 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.As per the objective in RedCap WID, “No RRM measurement relaxations are specified for the serving cell”, it is no need to further discuss the requirements of further RLM/BFD relaxation for RedCap UE.In addition, in RRC connected mode, stationary criterion is introduced for RedCap UE. If the stationary criterion is met, RedCap UE is required to report the information to network. When the met criterion is not satisfied anymore, UE is required to report the information to network as well. Enabling/disabling of RRM measurement relaxation is under network’s control. RAN4 has already agreed that no new UE behaviour/requirements are needed on how to evaluate RRM relaxation criteria at RRC\_CONNECTED mode (R4-2210596). As network can have the knowledge of RedCap UE state (e.g., stationary state), proper configuration can be configured, e.g., longer DRX cycle. Then the RLM/ BFD evaluation period would be accordingly prolonged. The power saving gain is achieved as well. Therefore we don’t think there is need to introduce an additional relaxation criterion (low mobility criterion) for RLM/BDF measurement for RedCap UE, as stationary criterion has already been specified for connected mode UE. In addition, it is up to network configuration and UE implementation to how to let UE to achieve power saving gain. |
| 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 view is that if relaxed RLM/BFD is defined for RedCap UEs in Rel-17, we should only focus on 2 Rx UEs, and reuse the framework defined in the power saving WI. If no agreement can be reached on this issue, we are also ok with Option 2. |
| 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**Support option 2.In latest WID RP-220966, it was clearly stated the scope of R17 RedCap WI that,* + No RRM measurement relaxations are specified for the serving cell.

In RAN4 LS (R4-2206977), it was agreed that,

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| RAN4 would like to thank RAN2 for the incoming LS in R2-2109218. RAN4 has discussed the RAN2 agreements on UE capabilities from a RRM perspective and further discussed the Rel-16 UE features and their applicability for RedCap in Rel-17. Based on the discussions, following conclusion is reached:

|  |  |
| --- | --- |
| **Rel-15/Rel-16 features in TS 38.133**  | **RedCap RRM requirements applicability in R17** |
| Dual connectivity and carrier aggregation | Not applicable |
| 2-step RA | Applicable |
| NR measurements with autonomous gaps | Applicable |
| **Rel-17 features in TS 38.133** |  |
| SDT | Applicable |
| *Note: RAN4 will not define any RRM requirements for RedCap UE for other release 16/release 17 features which are not listed above in release 17.* |

 |

Thus, we think RAN4 shall not define further relaxation (relaxed RLM/BFD) based on Rel-17 UE power saving WI for RedCap in Rel-17. It is also like the previous discussion about RedCap UE to support unlicensed band: as in RP-212634, RedCap UE can support such feature but no requirement or spec modification shall happen in R17 timeline. |
| 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**Fine to support option 1. This aligns with RAN4 approach of merging SDT R17 with RedCap R17.**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**Support option 1. Same comment as in previous issue 4-1-1. |
| Intel | **Issue 4-1-1:**Support Option 2 based on the current scope in the latest WID RP-220966. |
| CMCC | **Issue 4-1-1: Option 2. The core part of this WI is already closed, we should follow existing WI scope and do not introduce new requirements.** |
| 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**Fine if there is consensus to go with option 1.  |
| OPPO | **Issue 4-1-1:**Fine with Option 2. We also agree that RedCap UE can support Rel-17 UE power saving, but no requirement or spec modification in R17. |
| 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**We support option 1.According to WID RP-220966, “*Power saving enhancement solutions specified in the UE Power Saving Enhancements WI (NR\_UE\_pow\_sav\_enh) shall be assumed to be available also to RedCap UEs by default*”, we think the Rel-17 RLM/BFD relaxation feature is applicable to RedCap UE. Considering the description of “*No RRM measurement relaxations are specified for the serving cell*”, we think the restriction is for RRM measurement relaxation which is based on the evalution of stationarity criterion and not-at-cell-edge criterion, and may not preclude the RLM/BFD relaxation feature for RedCap UE.Consideirng this late stage, we can comprise to option 1a to prioritize the definition of RLM/BFD relaxation requirements to 2 Rx RedCap UEs in Rel-17, which from our side the current RLM/BFD relaxation requirements defined in the NR\_power\_sav\_enh WI could be reused without much effort. **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, as the principle of the Rel-17 RLM/BFD low mobility criterion and Rel-17 RRM stationary criterion are basically the same, we think the evaluation of “stationary” mobility state could also be effective to RLM/BFD. However, considering the workload, we can comprise to option 1b, to reuse the RLM/BFD relaxation factors defined in the NR\_power\_sav\_enh WI for 2RX RedCap UE. |
| 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 there is some confusion w.r.t. to connected mode measurements. The WID clearly says that the Power Saving (RLM/BFD measurement relaxations) enhancements are assumed to be applicable to RedCap UEs. However, some companies mentioned that the WID says that no RRM relaxations for the serving cell. In our understanding, RLM/BFD (L1) measurements are different from RRM measurements (L3) and the latter are not specified while the former is supported.Now the next question is whether to specify further enhancements to RLM/BFD by considering Stationarity criteria as well. Remember that the PS enhancements only consider low mobility scenarios. Given that the core part of the WI is already closed, we are okay with not to specify stationarity based RLM/BFD relaxations, but those specified in PS WI should apply to RedCap UEs. We are okay to extend those requirements to 1Rx UEs as well, since the only difference is w.r.t. measurement accuracy and we are already specifying offsets to thresholds for various procedures and same methodology can be applied to specify RLM/BFD relaxations as well for 1Rx UEs. |
| 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 and 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 have similar view as Nokia, i.e. if relaxed RLM/BFD is introduced (reused from Rel-17 UE power saving WI), then it can apply to 2 Rx RedCap UE. But we are also fine to not introduce those as RAN4 has already agreed on what other features are to be supported for RedCap in Release 17 as pointed out by Apple.  |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
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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:* |

## Discussion on 2nd round (if applicable)

# Topic #5: Measurement procedure

Contributions from AI 4.6.3.1.5 are discussed here.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| T-doc number | Company | Proposals / Observations |
| [R4-2215491](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215491.zip) | CMCC | Proposal: No need to clarify in the spec that serving cell thresholds of s-MeasureConfig for Connected mode should be checked based on reference SSB measurement. |
| [R4-2215606](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215606.zip) | Apple | *Proposal 3: The serving cell thresholds of s-MeasureConfig for Connected mode should be checked based on reference SSB measurement.* |
| [R4-2215607](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215607.zip) | Apple | CR for serving cell thresholds of s-MeasureConfig for RedCap |
|  |  |  |
| [R4-2216457](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216457.zip) | Ericsson | *Proposal 1: In RedCap, RAN4 to define UE behaviour when the MG and the SMTC meets the proximity condition with the time distance = 4ms.**Proposal 2: When the SMTC for intra-frequency layer is fully-partially overlapping with the MG due to NCD-SSB offset, UE is required to perform intra-frequency measurement and drop the configured MG.*  |
| [R4-2216458](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216458.zip) | Ericsson | CR on RedCap CGI |
| [R4-2216599](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216599.zip) | Nokia, Nokia Shanghai Bell | 1. The serving cell thresholds of s-MeasureConfig for Connected mode ssb-RSRP should be checked based on reference SSB measurement.
 |
| [R4-2216771](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216771.zip) | Ericsson | Inter-RAT accuracy requirements for RedCap |
| [R4-2216881](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216881.zip) | Qualcomm Incorporated | *Draft CR on measurement procedures for RedCap UEs* |

## Open issues summary

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

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

* Proposals
	+ **Option 1 (Apple, Nokia):** The serving cell thresholds of *s-MeasureConfig* for Connected mode should be checked based on reference SSB measurement.
	+ **Option 2 (CMCC):** No need to clarify in the spec that serving cell thresholds of *s-MeasureConfig* for Connected mode should be checked based on reference SSB measurement.

Recommended WF

* + Discuss the options.

Sub topic 5-1

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| --- | --- |
| **Company** | **Comments** |
| Huawei | Prefer Option 2.Technically, we think option 1 is reasonable and alligned with the RAN2 agreements. However we doubt the necessity of clarifiction on it, as the current intra-frequency measurement definition already reflects the corresponding agreements. Moreover s-MeasureConfig is used in RAN2 and not in the RRM specification and RAN2 has implicitly specify that UE performs measurements on serving cell based on reference SSB. |
| Nokia | **Issue 5-1-1: Serving cell threshold associated SSB**Both options lead to the same conclusion: the serving cell thresholds should be checked based on the reference SSB measurement. The question is whether we need to clarify that in the specification or not. CMCC discussion paper points to clause 9.2B.1, to the definition of intra-frequency measurements, to us this statement is enough, so there is no need to clarify it in the specification. |
| Apple | Support option 1.The current RAN4 spec is unclear to us if this threshold shall be checked based on reference SSB or not, and we don’t think the exiting intra-frequency measurement section already stated the reference SSB for such *s-MeasureConfig* checking. Since it’s related with measurement definition, it would be better to clarify it in the requirement introduction section.In RAN2 spec, so far there is nowhere clarified this threshold associated with reference SSB, as duplicated below.***s-MeasureConfig***Threshold for NR SpCell RSRP measurement controlling when the UE is required to perform measurements on non-serving cells. Choice of *ssb-RSRP* corresponds to cell RSRP based on SS/PBCH block and choice of *csi-RSRP* corresponds to cell RSRP of CSI-RS.  |
| MediaTek | Shouldn’t this issue be solved in RAN2? |
| Intel | Support Option 2. Same view with Huawei |
| CMCC | Support option2 as we discussed in our paper. |
| vivo | OK with option 2.  |
| OPPO | Option 2 is fine. It seems common understanding that the serving cell thresholds should be checked based on the reference SSB measurement. We think RAN4 can skip it. |
| Xiaomi | Fine with option2. |
| Ericsson | Support option 2. We think it should be a RAN2 issue and if it needs to be specified, RAN2 should be the correct place. |
| Apple2 | Since majority companies thought it’s not proper to clarify it in RAN4 spec but companies also technically agree with that *s-MeasureConfig* for Connected mode should be checked based on reference SSB measurement, we suggest to send LS to RAN2 for a confirmation. Based on our understanding so far there is nowhere in either RAN4 or RAN2 spec for clarifying this *s-MeasureConfig* associated with reference SSB in RedCap. |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection** |
| [**R4-2215607**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215607.zip)(Apple) | *CR for serving cell thresholds of s-MeasureConfig for RedCap* |
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| [**R4-2216458**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216458.zip)(Ericsson) | *CR on RedCap CGI* |
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| [**R4-2216771**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216771.zip)(Ericsson) | *Inter-RAT accuracy requirements for RedCap* |
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| [**R4-2216881**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216881.zip)(Qualcomm Incorporated) | *Draft CR on measurement procedures for RedCap UEs* |
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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:* |

# Topic #6 Performance part of RedCap – Test config.

Contributions from AI 4.6.4.1 are discussed here.

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2215492**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215492.zip) | CMCC | Proposal 1: Define RedCap test cases for NCD-SSB.Proposal 2: Define handover test cases for NCD-SSB as follows:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | Intra-frequency handover from FR1 CD-SSB to FR1 CD-SSB; known target cell for UE (1Rx, 2Rx) |
| 2 | Intra-frequency handover from FR1 NCD-SSB to FR1 NCD-SSB; unknown target cell for UE (1Rx, 2Rx) |
| 3 | Inter-frequency handover from FR1 CD-SSB to FR1 NCD-SSB; unknown target cell for UE (1Rx, 2Rx) |

Proposal 3: Define intra-frequency measurement test cases for NCD-SSB as follows:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | SA event triggered reporting tests without gap under non-DRX (1Rx, 2Rx)  |
| 2 | SA event triggered reporting tests with per-UE gaps under non-DRX (1Rx, 2Rx) |
| 3 | SA event triggered reporting tests without gap under non-DRX with SSB index reading (1Rx, 2Rx)  |
| 4 | SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading (1Rx, 2Rx) |

Proposal 4: Define active BWP switch test cases between BWP-1 with CD-SSB and BWP-2 with NCD-SSB as follows:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | DCI-based and Timer-based Active BWP Switch: NR FR1 DL active BWP switch of Cell with non-DRX in SA (1Rx, 2Rx)  |
| 2 | DCI-based and Timer-based Active BWP Switch: NR FR1 DL active BWP switch with non-DRX in SA (1Rx, 2Rx) |

Proposal 5: NCD-SSB periodicity 80ms, NCD-SSB offset 5ms. |
|  |  |  |
| [**R4-2216452**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216452.zip) | Ericsson | *Proposal 1: RAN4 to define the total RF channel bandwidth for NCD-SSB test cases as follow.** *In FR1, TDD SCS=30KHz: 40MHz*
* *In FR1, TDD SCS=15KHz, FD-FDD SCS=15KHz, HD-FDD SCS=15KHz: 20MHz*
* *In FR2, TDD SCS=120/240KHz: 100MHz*

*Proposal 2: RAN4 to define the dedicated BWPs/SSBs for NCD-SSB test cases as follow.** *Two dedicated BWPs whose BW is the half of the total RF CBW are configured without any overlapping in frequency domain.*
* *CD-SSB is configured within one dedicated DLBWP, and NCD-SSB is configured within the other dedicated DLBWP.*

*Proposal 3: RAN4 to introduce the new dedicated BWPs for RedCap test as follow: One BWP configuration for RedCap UE with SSB; another BWP configuration for RedCap UE where the BWP is not fully overlapped with SSB.*Table 1: Downlink BWP patterns for dedicated BWP configuration*Proposal 4: RAN4 to define the different CD-SSBs for NCD-SSB test cases as follow.*Table 3: SSB.4 RedCap FR1: SSB Pattern 4 for SSB SCS=15 kHz in 20 MHz channelTable 4: SSB.5 RedCap FR1: SSB Pattern 5 for SSB SCS=30 kHz in 40 MHz channelTable 5: SSB.2 RedCap FR2: SSB Pattern 2 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-*Proposal 5: RAN4 to define the different SSBs for NCD-SSB test cases as follow.*Table 6: SSB.6 RedCap FR1: SSB Pattern 6 for SSB SCS=15 kHz in 20 MHz channelTable 7: SSB.7 RedCap FR1: SSB Pattern 7 for SSB SCS=30 kHz in 40 MHz channelTable 8: SSB.3 RedCap FR2: SSB Pattern 3 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-*Proposal 6: RAN4 to define the different SMTCs for NCD-SSB test cases as follow.*Table 9: SMTC.2 RedCap: SMTC Pattern 2 for SMTC period = 80 ms and duration = 1 msTable 10: SMTC.3 RedCap: SMTC Pattern 3 for SMTC period = 40 ms and duration = 1 ms*Proposal 7: RAN4 to define the NCD-SSB test case based on SMTC.2 if no measurement gap is needed; and SMTC.3 if measurement gap is needed.**Proposal 8: RAN4 to define the NCD-SSB test case configuration as follow.*Table 11: Supported test configurations in FR1Table 12: General test case setting for NCD-SSB*Proposal 9: RAN4 to define the NCD-SSB based Handover test case by verifying the UE transmitting the RACH in the dedicated UL BWP associated with the DL BWP including NCD-SSB.**Proposal 10: RAN4 to define the NCD-SSB based intra-frequency measurements test case.* |
| [**R4-2216453**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216453.zip) | Ericsson | draftCR on RedCap NCD-SSB RMC |
| [**R4-2216600**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216600.zip) | Nokia, Nokia Shanghai Bell | 1. RAN4 to define RRM test cases with NCD-SSB.
2. RAN4 to define the following test cases for Handover:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | Intra-frequency handover from FR1 to FR1; known target cell for UE (1Rx, 2Rx)1 Rx: CD-SSB2 Rx: NCD-SSB |
| 2 | Intra-frequency handover from FR1 to FR1; unknown target cell for UE (1Rx, 2Rx)1 Rx: NCD-SSB2 Rx: CD-SSB |
| 3 | Inter-frequency handover from FR1 to FR1; unknown target cell for UE (1Rx, 2Rx)1 Rx: CD-SSB2 Rx: NCD-SSB |

1. RAN4 to define the following test cases for intra-frequency measurements:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | SA event triggered reporting tests without gap under non-DRX (1Rx, 2Rx) CD-SSB |
| 2 | SA event triggered reporting tests with per-UE gaps under non-DRX (1Rx, 2Rx)NCD-SSB |
| 3 | SA event triggered reporting tests without gap under non-DRX with SSB index reading (1Rx, 2Rx)NCD-SSB  |
| 4 | SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading (1Rx, 2Rx)CD-SSB |

 |
| [**R4-2216765**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216765.zip) | Ericsson | Updated test case list for RedCap RRM performance part |
| [**R4-2216298**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216298.zip) | Huawei, HiSilicon | Proposal 1: The test cases highlighted in yellow highlight are proposed to be defined for NCD-SSB based handover TC.FR1A.X.3.1.x1 Intra-frequency handover from FR1 to FR1; known target cell for 1 Rx UEA.X.3.1.x2 Intra-frequency handover from FR1 to FR1; known target cell for 2 Rx UEA.X.3.1.x1 Intra-frequency handover from FR1 to FR1; unknown target cell for 1 Rx UEA.X.3.1.x2 Intra-frequency handover from FR1 to FR1; unknown target cell for 2 Rx UEA.X.3.1.x1 Inter-frequency handover from FR1 to FR1; unknown target cell for 1 Rx UEA.X.3.1.x2 Inter-frequency handover from FR1 to FR1; unknown target cell for 2 Rx UEFR2A.X.3.1.x Intra-frequency handover from FR2 to FR2; unknown target cellA.X.3.1. x Inter-frequency handover from FR2 to FR2; unknown target cellProposal 2: It is suggested the NCD-SSB configuration with 80ms periodicity and 5ms offset. |

## Open issues summary

### Sub-topic 6-1 Test configuration and list of test cases

**Issue 6-1-1: Whether to define test cases for NCD-SSB**

* Proposals
	+ **Option 1 (Nokia, CMCC, Ericsson, HW):** RAN4 to define RRM test cases with NCD-SSB.
* Recommended WF

Discuss the option.

**Issue 6-1-2: If NCD-SSB test cases are introduced, total RF channel bandwidth for NCD-SSB test cases**

* Proposals
	+ **Option 1 (Ericsson):** RAN4 to define the total RF channel bandwidth for NCD-SSB test cases as follow.
		- * In FR1, TDD SCS=30KHz: 40MHz
			* In FR1, TDD SCS=15KHz, FD-FDD SCS=15KHz, HD-FDD SCS=15KHz: 20MHz
			* In FR2, TDD SCS=120/240KHz: 100MHz
* Recommended WF

Discuss the option.

**Issue 6-1-3: If NCD-SSB test cases are introduced, dedicated BWPs and SSBs for NCD-SSB test cases**

* Proposals
	+ **Option 1 (Ericsson):** RAN4 to define the dedicated BWPs/SSBs for NCD-SSB test cases as follow:
		- * Two dedicated BWPs whose BW is the half of the total RF CBW are configured without any overlapping in frequency domain.
			* CD-SSB is configured within one dedicated DLBWP, and NCD-SSB is configured within the other dedicated DLBWP.
* Recommended WF

Discuss the option.

**Issue 6-1-4: Dedicated DL BWP configuration for test cases**

* Proposals
	+ **Option 1 (Ericsson):** RAN4 to introduce the new dedicated BWPs for RedCap test as follow: One BWP configuration for RedCap UE with SSB; another BWP configuration for RedCap UE where the BWP is not fully overlapped with SSB.

Table 1: Downlink BWP patterns for dedicated BWP configuration

|  |  |  |
| --- | --- | --- |
| **BWP Parameters** | **Unit** | **Values** |
| Reference BWP |   | DLBWP.1.1 RedCap | DLBWP.1.2 RedCap | DLBWP.1.3 RedCap |
| Starting PRB index |   | RBa Note 1 | RBb Note 2 | RBc Note 3 |
| Bandwidth | RB | 1. 25 for SSB SCS = 15KHz,
2. 51 for SSB SCS = 30KHz,
3. 32 for SSB SCS = 120KHz

[16] for SSB SCS = 240KHz | 1. 25 for SSB SCS = 15KHz,
2. 51 for SSB SCS = 30KHz,
3. 32 for SSB SCS = 120KHz

[16] for SSB SCS = 240KHz | [52] for SSB SCS = 15KHz,[51] for SSB SCS = 30KHz,[32] for SSB SCS = 120KHz[16] for SSB SCS = 240KHz |
| Note 1: RBa is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10.Note 2: RBb is the lowest PRB index to guarantee the BWP not fully overlapped with SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10.Note 3: RBc is the lowest PRB index to guarantee the BWP including SSB PRB index (RBJ, RBJ+1,.…, RBJ+19) which is defined in Clause A.3.10. |

* Recommended WF
	+ To moderator’s understanding, DLBWP.1.1 and DLBWP.1.2 cannot be used for RedCap FR2 test since the DL BWP exceeds RedCap UE’s BW capability. Thus, they should be replaced by DLBWP.1.1 RedCap and DLBWP.1.2 RedCap
	+ DLBWP.1.3 RedCapis used for NCD-SSB test.

**Issue 6-1-5: Dedicated UL BWP configuration for test cases**

* Proposals
	+ **Option 1 (Ericsson):** RAN4 to introduce the new dedicated BWPs for RedCap test as follow: One BWP configuration for RedCap UE with SSB; another BWP configuration for RedCap UE where the BWP is not fully overlapped with SSB.
* **Table 2: Uplink BWP patterns for dedicated BWP configuration**

|  |  |  |
| --- | --- | --- |
| **BWP Parameters** | **Unit** | **Values** |
| Reference BWP |   | ULBWP.1.1 RedCap | ULBWP.1.2 RedCap | ULBWP.1.3 RedCap |
| Starting PRB index |   | RBa Note 1 | RBb Note 2 | RBc Note 3 |
| Bandwidth | RB | 25 for SSB SCS = 15KHz,51 for SSB SCS = 30KHz,32 for SSB SCS = 120KHz[16] for SSB SCS = 240KHz | 25 for SSB SCS = 15KHz,51 for SSB SCS = 30KHz,32 for SSB SCS = 120KHz[16] for SSB SCS = 240KHz | [52] for SSB SCS = 15KHz,[51] for SSB SCS = 30KHz,[32] for SSB SCS = 120KHz[16] for SSB SCS = 240KHz |
| Note 1: RBa is the same as RBa for DLBWP.1.1 RedCap.Note 2: RBb is the same as RBb for DLBWP.1.2 RedCap.Note 3: RBc is the same as RBc for DLBWP.1.3 RedCap. |

* Recommended WF
	+ To moderator’s understanding, DLBWP.1.1 and DLBWP.1.2 cannot be used for RedCap FR2 test since the DL BWP exceeds RedCap UE’s BW capability. Thus, they should be replaced by DLBWP.1.1 RedCap and DLBWP.1.2 RedCap
	+ DLBWP.1.3 RedCapis used for NCD-SSB test..

**Issue 6-1-6: If NCD-SSB test cases are introduced, CD-SSB configurations for NCD-SSB test cases**

* Proposals
	+ **Option 1 (Ericsson):** RAN4 to define the different CD-SSBs for NCD-SSB test cases as follow:
* Table 3: SSB.4 RedCap FR1: SSB Pattern 4 for SSB SCS=15 kHz in 20 MHz channel

|  |  |
| --- | --- |
| **SSB Parameters** | **Values** |
| Channel bandwidth | 20 MHz |
| SSB SCS | 15 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB Note 2 | 2-5 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part according to the allowed synchronization raster defined in TS 38.104 [13].Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. |

* Table 4: SSB.5 RedCap FR1: SSB Pattern 5 for SSB SCS=30 kHz in 40 MHz channel

|  |  |
| --- | --- |
| **SSB Parameters** | **Values** |
| Channel bandwidth | 40 MHz |
| SSB SCS | 30 kHz |
| SSB periodicity (TSSB) | 20 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB Note 3 | 4-7 or 2-5 Note 2 |
| Slot numbers containing SSB Note 3 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part 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 themselves |

* Table 5: SSB.2 RedCap FR2: SSB Pattern 2 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 120 kHz |
| SSB periodicity (TSSB) | 40 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSBs Note 2 | 4-7 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part according to the allowed synchronization raster defined in TS 38.104 [13]. Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. |

* Recommended WF
	+ Discuss the option.

**Issue 6-1-7: If NCD-SSB test cases are introduced, different SSB configurations for NCD-SSB test cases**

* Proposals
	+ **Option 1 (Ericsson):** RAN4 to define the different CD-SSBs for NCD-SSB test cases as follow:
* Table 6: SSB.6 RedCap FR1: SSB Pattern 6 for SSB SCS=15 kHz in 20 MHz channel

|  |  |
| --- | --- |
| **SSB Parameters** | **Values** |
| Channel bandwidth | 20 MHz |
| SSB SCS | 15 kHz |
| SSB periodicity (TSSB) | 80 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB Note 2 | 2-5 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the allowed synchronization raster defined in TS 38.104 [13].Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. |

* Table 7: SSB.7 RedCap FR1: SSB Pattern 7 for SSB SCS=30 kHz in 40 MHz channel

|  |  |
| --- | --- |
| **SSB Parameters** | **Values** |
| Channel bandwidth | 40 MHz |
| SSB SCS | 30 kHz |
| SSB periodicity (TSSB) | 80 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSB Note 3 | 4-7 or 2-5 Note 2 |
| Slot numbers containing SSB Note 3 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSB within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except 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 themselves |

* Table 8: SSB.3 RedCap FR2: SSB Pattern 3 for SSB SCS = 120 kHz in 100 MHz channel with 1 SSB per SS-burst

|  |  |
| --- | --- |
| SSB Parameters | Values |
| Channel bandwidth | 100 MHz |
| SSB SCS | 120 kHz |
| SSB periodicity (TSSB) | 40 ms |
| Number of SSBs per SS-burst | 1 |
| SS/PBCH block index | 0 |
| Symbol numbers containing SSBs Note 2 | 4-7 |
| Slot numbers containing SSB Note 2 | 0 |
| SFN containing SSB | SFN mod (max(TSSB,10ms)/10ms) = 0 |
| RB numbers containing SSBs within channel BW | (RBJ, RBJ+1,.…, RBJ+19)Note 1 |
| Note 1: RBs containing SSB can be configured in any frequency location within the associated bandwidth part except the allowed synchronization raster defined in TS 38.104 [13]. Note 2: These values have been derived from other parameters for information purposes (as per TS 38.213 [3]). They are not settable parameters themselves. |

1. Recommended WF

Discuss the option.

**Issue 6-1-8: If NCD-SSB test cases are introduced, SMTC configuration for NCD-SSB test cases**

1. Proposals
2. **Option 1 (Ericsson):** RAN4 to define the different SMTCs for NCD-SSB test cases as follow.
3. Table 9: SMTC.2 RedCap: SMTC Pattern 2 for SMTC period = 80 ms and duration = 1 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 80 ms |
| SMTC offset | 5 ms |
| SMTC duration | 1 ms |

1. Table 10: SMTC.3 RedCap: SMTC Pattern 3 for SMTC period = 40 ms and duration = 1 ms

|  |  |
| --- | --- |
| SMTC Parameters | Values |
| SMTC periodicity | 40 ms |
| SMTC offset | 20 ms |
| SMTC duration | 1 ms |

1. **Option 2 (CMCC, Huawei):** It is suggested the NCD-SSB configuration with 80ms periodicity and 5ms offset.
2. **Option 3 (Nokia**): Introduce NCD-SSB configuration as: NCD-SSB periodicity 40ms, NCD-SSB offset [20 ms].
3. Recommended WF
	* Discuss the options.

Sub topic 6-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | **Issue 6-1-1: Whether to define test cases for NCD-SSB**Option 1.Taking handover as an example. In R17 handover requirements specified for RedCap UE are applied for the following handover scenarios:* Handover to a target cell’s initial BWP associated with CD-SSB;
* Handover to a target cell’s specific Redcap BWP associated with NCD-SSB besides to the initial BWP associated with CD-SSB (i.e. UE directly sync to the NCD-SSB and perform RACH on that BWP).

Although the requirements of the second scenario with NCD-SSB reuse the requirements of CD-SSB based handover, it is necessary to verify the functionality.**Issue 6-1-2: If NCD-SSB test cases are introduced, total RF channel bandwidth for NCD-SSB test cases**Generally fine with the idea that CD-SSB is configured within one DLBWP, and NCD-SSB is configured within another DLBWP. We are wondering whether the RF bandwidth of FR2 shall be 200MHz? and we suggest to only verify 120kHz SCS in FR2 as legacy.**Issue 6-1-3: If NCD-SSB test cases are introduced, dedicated BWPs and SSBs for NCD-SSB test cases**Option 1 is fine.**Issue 6-1-6: If NCD-SSB test cases are introduced, CD-SSB configurations for NCD-SSB test cases**Fine with table 3, 4. The question in issue 6-1-2 is also for table 5.**Issue 6-1-7: If NCD-SSB test cases are introduced, different SSB configurations for NCD-SSB test cases**Option 1 is fine.**Issue 6-1-8: If NCD-SSB test cases are introduced, SMTC configuration for NCD-SSB test cases**Support option 2. Regarding the periodicity of NCD-SSB, from network configuration overload perspective, NCD-SSB with 20ms periodicity would degrade about 5% overload loss. Then 80ms periodicity of NCD-SSB (Tssb) is a good trade-off and only about 1.2% overload loss. |
| Nokia | **Issue 6-1-1: Whether to define test cases for NCD-SSB**Option 1.**Issue 6-1-2: If NCD-SSB test cases are introduced, total RF channel bandwidth for NCD-SSB test cases**We have a question about Option 1: Shouldn’t the bandwidth in FR2 be also doubled for test cases with CD-SSB and NCD-SSB?**Issue 6-1-3: If NCD-SSB test cases are introduced, dedicated BWPs and SSBs for NCD-SSB test cases****Option 1 is fine****Issue 6-1-4: Dedicated DL BWP configuration for test cases**We are OK with defining new BWPs. But shouldn’t DLBWP 1.3 RedCap have twice the RBs of the other BWPs, for all SCSs?**Issue 6-1-5: Dedicated UL BWP configuration for test cases**Same comments as above.**Issue 6-1-6 and Issue 6-1-7:** In general we are fine with the configurations in the tables, but we would prefer to amend the notes, and refer directly CD-SSB or NCD-SSB. It is clearer than mentioning that the (CD)SSB can be configured in any frequency location according to the allowed synchronization raster, and that the (NCD)SSB can be configured in any location except the sync raster.The periodicity and offsets of NCD-SSBs for testing are still up to discussions (see core requirements discussion related to 5 ms offset).**Issue 6-1-8: If NCD-SSB test cases are introduced, SMTC configuration for NCD-SSB test cases**We are fine with Option 1, Table 10. For table 9, we would prefer the conclusion about the issue that is discussing offset equal to 5ms |
| Apple | **Issue 6-1-1: Whether to define test cases for NCD-SSB**Option 1. Fine to test the functionality with NCD-SSB even though the requirement for NCD-SSB is quite similar as CD-SSB. But applicability can be further discussed, e.g., when requirement for CD-SSB and NCD-SSB are same, if UE passed NCD-SSB test, UE may not need to do CD-SSB testing.**Issue 6-1-2: If NCD-SSB test cases are introduced, total RF channel bandwidth for NCD-SSB test cases**For FR1 TDD SCS=30kHz, why 40MHz is used? In our view, the max bandwidth of an FR1 RedCap UE during and after initial access is 20 MHz.**Issue 6-1-3: If NCD-SSB test cases are introduced, dedicated BWPs and SSBs for NCD-SSB test cases**Option 1.**Issue 6-1-4: Dedicated DL BWP configuration for test cases**Fine with moderator WF.**Issue 6-1-5: Dedicated UL BWP configuration for test cases**Fine with moderator WF.**Issue 6-1-6: If NCD-SSB test cases are introduced, CD-SSB configurations for NCD-SSB test cases**Have comment on table 4, why 40MHz channel BW is considered for RedCap? The max bandwidth of an FR1 RedCap UE during and after initial access is 20 MHz.**Issue 6-1-7: If NCD-SSB test cases are introduced, different SSB configurations for NCD-SSB test cases**Have same comment on table 7, as to issue 6-1-6.**Issue 6-1-8: If NCD-SSB test cases are introduced, SMTC configuration for NCD-SSB test cases**Prefer to choose one combination for simplicity, and we can agree on option 2. |
| CMCC | **Issue 6-1-1: Whether to define test cases for NCD-SSB****Option 1.****Issue 6-1-2: If NCD-SSB test cases are introduced, total RF channel bandwidth for NCD-SSB test cases**OK to use 40MHz for 30KHz SCS TDD. To Apple: the total RF channel bandwidth is 40MHz, however RedCap UE only operates in maximum 20MHz. **Issue 6-1-8: If NCD-SSB test cases are introduced, SMTC configuration for NCD-SSB test cases**We are OK to introduce two SMTC patterns for NCD-SSB. But if only one pattern is introduced, then 80ms should be used. |
| OPPO | **Issue 6-1-1: Whether to define test cases for NCD-SSB**Option 1.**Issue 6-1-2: If NCD-SSB test cases are introduced, total RF channel bandwidth for NCD-SSB test cases**We thought here RF channel BW is different from the max UE CBW of Redcap UE. Some clarification may be needed.**Issue 6-1-3: If NCD-SSB test cases are introduced, dedicated BWPs and SSBs for NCD-SSB test cases**Option 1.**Issue 6-1-4: Dedicated DL BWP configuration for test cases**Fine with moderator WF.**Issue 6-1-5: Dedicated UL BWP configuration for test cases**Fine with moderator WF.**Issue 6-1-8: If NCD-SSB test cases are introduced, SMTC configuration for NCD-SSB test cases**One SMTC configuration for NCD-SSB is sufficient. We support SMTC.2 redcap. |
| Qualcomm | **Issue 6-1-1: Whether to define test cases for NCD-SSB**We are okay with the proposal**Issue 6-1-2: If NCD-SSB test cases are introduced, total RF channel bandwidth for NCD-SSB test cases**We As mentioned during GTW, our understanding is that the CBW RAN4 discussed is the UE CBW and it cannot be greater than 20MHz for FR1. So we don’t agree with the proposal.**Issue 6-1-3: If NCD-SSB test cases are introduced, dedicated BWPs and SSBs for NCD-SSB test cases**Same comment as above**Issue 6-1-4: Dedicated DL BWP configuration for test cases**Same comment as above**Issue 6-1-5: Dedicated UL BWP configuration for test cases**Same comment as above**Issue 6-1-6: If NCD-SSB test cases are introduced, CD-SSB configurations for NCD-SSB test cases**Same comment as above**Issue 6-1-7: If NCD-SSB test cases are introduced, different SSB configurations for NCD-SSB test cases**Same comment as above**Issue 6-1-8: If NCD-SSB test cases are introduced, SMTC configuration for NCD-SSB test cases**We prefer to define NCD-SSB periodicity of 40ms and no offset |
| Ericsson | **Issue 6-1-2: If NCD-SSB test cases are introduced, total RF channel bandwidth for NCD-SSB test cases**To apple, QC, we think it’s a good question. In legacy test case, UE CBW will equal with NW CBW, but in RedCap, the NW CBW can be different with UE’s CBW. Thus, we think test configuration should be updated to clarify this difference for NCD-SSB test.For example,

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz UE bandwidth, 40 MHz RF bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |

To Huawei, Nokia,We think current BW is fine for FR2 but we’re open to use two 100MHz. |

### Sub-topic 6-2 NCD SSB test cases

**Issue 6-2-1: HO test cases in FR1**

* Proposals
	+ **Option 1 (CMCC):** RAN4 to define following HO test cases for NCD-SSB:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | Intra-frequency handover from FR1 CD-SSB to FR1 CD-SSB; known target cell for UE (1Rx, 2Rx) |
| 2 | Intra-frequency handover from FR1 NCD-SSB to FR1 NCD-SSB; unknown target cell for UE (1Rx, 2Rx) |
| 3 | Inter-frequency handover from FR1 CD-SSB to FR1 NCD-SSB; unknown target cell for UE (1Rx, 2Rx) |

* + **Option 2 (Nokia):**

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | Intra-frequency handover from FR1 to FR1; known target cell for UE (1Rx, 2Rx)1 Rx: CD-SSB2 Rx: NCD-SSB |
| 2 | Intra-frequency handover from FR1 to FR1; unknown target cell for UE (1Rx, 2Rx)1 Rx: NCD-SSB2 Rx: CD-SSB |
| 3 | Inter-frequency handover from FR1 to FR1; unknown target cell fsor UE (1Rx, 2Rx)1 Rx: CD-SSB2 Rx: NCD-SSB |

* + **Option 3 (Huawei):** Following TCs are proposed to be defined for NCD-SSB based handover TC:
		- A.X.3.1.x1 Intra-frequency handover from FR1 to FR1; known target cell for 1 Rx UE
		- A.X.3.1.x2 Intra-frequency handover from FR1 to FR1; unknown target cell for 2 Rx UE
		- A.X.3.1.x2 Inter-frequency handover from FR1 to FR1; unknown target cell for 2 Rx UE
* Recommended WF
	+ Discuss the options.
	+ Agreement from GTW 2022-10-11:

**Agreement:**

* Test cases list for HO test cases in FR1

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | Intra-frequency handover from FR1 CD-SSB to FR1 CD-SSB; known target cell for UE (1Rx, 2Rx) |
| 2 | Intra-frequency handover from FR1 NCD-SSB to FR1 NCD-SSB; unknown target cell for UE (1Rx, 2Rx) |
| 3 | Inter-frequency handover from FR1 CD-SSB to FR1 NCD-SSB; unknown target cell for UE (1Rx, 2Rx) |

**Issue 6-2-2: HO test cases in FR2**

* Proposals
	+ **Option 1 (Huawei):** Following TCs are proposed to be defined for NCD-SSB based handover TC:
		- A.X.3.1.x Intra-frequency handover from FR2 to FR2; unknown target cell
* Recommended WF
	+ Discuss the option.
* Agreement from GTW 2022-10-11:

**Agreement:**

* Test cases list for HO test cases in FR2

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | Intra-frequency handover from FR2 CD-SSB to FR2 CD-SSB; known target cell for UE (2Rx) |
| 2 | Intra-frequency handover from FR2 NCD-SSB to FR2 NCD-SSB; unknown target cell for UE (2Rx) |

**Issue 6-2-3: Measurement test cases**

* Proposals
	+ **Option 1 (CMCC,):** Define intra-frequency measurement test cases for NCD-SSB as follows:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | SA event triggered reporting tests without gap under non-DRX (1Rx, 2Rx)  |
| 2 | SA event triggered reporting tests with per-UE gaps under non-DRX (1Rx, 2Rx) |
| 3 | SA event triggered reporting tests without gap under non-DRX with SSB index reading (1Rx, 2Rx)  |
| 4 | SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading (1Rx, 2Rx) |

* + **Option 2 (Nokia):** RAN4 to define the following test cases for intra-frequency measurements:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | SA event triggered reporting tests without gap under non-DRX (1Rx, 2Rx) CD-SSB |
| 2 | SA event triggered reporting tests with per-UE gaps under non-DRX (1Rx, 2Rx)NCD-SSB |
| 3 | SA event triggered reporting tests without gap under non-DRX with SSB index reading (1Rx, 2Rx)NCD-SSB  |
| 4 | SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading (1Rx, 2Rx)CD-SSB |

* Recommended WF

Discuss the option and also clarify the proposal whether they apply to FR1 or FR2 or both.

Agreement from GTW 2022-10-11:

**Agreement:**

* Test cases list for NCD-SSB measurement test cases

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | SA event triggered reporting tests without gap under non-DRX (1Rx, 2Rx)  |
| 2 | SA event triggered reporting tests with per-UE gaps under non-DRX (1Rx, 2Rx) |
| 3 | SA event triggered reporting tests without gap under non-DRX with SSB index reading (1Rx, 2Rx)  |
| 4 | SA event triggered reporting tests with per-UE gaps under non-DRX with SSB index reading (1Rx, 2Rx) |

**Issue 6-2-4: BWP switching test cases**

* Proposals
	+ **Option 1 (CMCC):** Define active BWP switch test cases between BWP-1 with CD-SSB and BWP-2 with NCD-SSB as follows:

|  |  |
| --- | --- |
| Test Index | Test  |
| 1 | DCI-based and Timer-based Active BWP Switch: NR FR1 DL active BWP switch of Cell with non-DRX in SA (1Rx, 2Rx)  |
| 2 | DCI-based and Timer-based Active BWP Switch: NR FR1 DL active BWP switch with non-DRX in SA (1Rx, 2Rx) |

* Recommended WF

Continue the discussions based on the comments made during the GTW.

**Issue 6-2-5: Updated test case list for RedCap**

* Recommended WF

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

Sub topic 6-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| Huawei | **Issue 6-2-1: HO test cases in FR1**Support option 3. There is no need to design two full sets of TCs to verify both CD-SSB based handover and NCD-SSB based handover. Handover to NCD-SSB TC can be selected from intra-frequency and inter-frequency scenarios. As RedCap UE can be 1Rx capable or 2RX capable in FR1, some TC can be selected from each 1RX and 2RX TC sets (see yellow highlight).

|  |
| --- |
| **FR1**A.X.3.1.x1 Intra-frequency handover from FR1 to FR1; known target cell for 1 Rx UEA.X.3.1.x2 Intra-frequency handover from FR1 to FR1; known target cell for 2 Rx UE===A.X.3.1.x1 Intra-frequency handover from FR1 to FR1; unknown target cell for 1 Rx UEA.X.3.1.x2 Intra-frequency handover from FR1 to FR1; unknown target cell for 2 Rx UE==A.X.3.1.x1 Inter-frequency handover from FR1 to FR1; unknown target cell for 1 Rx UEA.X.3.1.x2 Inter-frequency handover from FR1 to FR1; unknown target cell for 2 Rx UE**FR2**A.X.3.1.x Intra-frequency handover from FR2 to FR2; unknown target cellA.X.3.1. x Inter-frequency handover from FR2 to FR2; unknown target cell |

**Issue 6-2-2: HO test cases in FR2**Support option 1. Same comments as issue 6-2-1**Issue 6-2-3: Measurement test cases**Can we pick some TCs from option 1 to save test load. |
| Nokia | **Issue 6-2-1: HO test cases in FR1**Our view is that we should define test cases for when the CD-SSB or the NCD-SSB is used in the target cell. We are fine with the option proposed by CMCC (Option 1) or Option 2. We agree with Huawei, there is no need to define two full sets of test cases.**Issue 6-2-2: HO test cases in FR2**The test cases defined for FR2 should follow the decision of the test cases defined in FR1.**Issue 6-2-3: Measurement test cases**Our proposal was slightly misinterpreted, so we included it as Option 2. We proposed that tests 2 and 3 are done with NCD-SSB, and 1 and 4 are done with CD-SSB. The proposal could be applicable to both FR1 and FR2. **Issue 6-2-4: BWP switching test cases**We don’t think it is necessary to introduce these test cases. |
| Apple | **Issue 6-2-1: HO test cases in FR1****Issue 6-2-2: HO test cases in FR2****Issue 6-2-3: Measurement test cases****Issue 6-2-4: Measurement test cases**Why BWP switching test case needs to verify both 1Rx and 2Rx cases? We may need to only choose one case. |
| CMCC | **Issue 6-2-1: HO test cases in FR1****Option 1. For 1Rx and 2Rx, we prefer to define the same sets of test cases since these are different types of RedCap UEs.****Issue 6-2-2: HO test cases in FR2****HO test cases for FR2 can be same as FR1.****Issue 6-2-3: Measurement test cases****OK with option 2 to save some test load. The proposals apply to both FR1 and FR2****Issue 6-2-4: BWP switching test cases****BWP switching is important for RedCap UE. We can even consider replace the legacy BWP switching test cases with switching between NCD-SSB BWP and CD-SSB BWP.** **1Rx and 2Rx test cases are for different RedCap UE types.** |
| Ericsson | **Issue 6-2-1: HO test cases in FR1****Issue 6-2-2: HO test cases in FR2****Issue 6-2-3: Measurement test cases**Follow the latest agreement in GTW.**Issue 6-2-4: BWP switching test cases**We can further discuss whether define BWP switching between different type of SSB  |

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection for Test Configurations CRs** |
| [**R4-2216453**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216453.zip)(Ericsson) | *draftCR on RedCap NCD-SSB RMC* |
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# Topic #7: Performance part of RedCap – FR1 test cases

Contributions from AI 4.6.4.2.2 - 4.6.4.2.7 are discussed here.

## Companies’ contributions summary

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| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2216601**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216601.zip) | Nokia, Nokia Shanghai Bell | draft CR on correction to IDLE mode test cases for RedCap in FR1 |
| [**R4-2215473**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215473.zip) | Xiaomi | CR on 4-step random access test in FR1 for RedCap UE |
| [**R4-2216299**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216299.zip) | Huawei, HiSilicon | Test case for handover for FR1 RedCap UE |
| [**R4-2216602**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216602.zip) | Nokia, Nokia Shanghai Bell | draft CR on correction to CONNECTED mode test cases for RedCap in FR1 |
| [**R4-2216749**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216749.zip) | MediaTek inc. | DraftCR on Intra-frequency handover from FR1 to FR1 unknown target cell for 2 and 1 Rx UE |
| [**R4-2215420**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215420.zip) | CATT | CR on timing test for RedCap for FR1 |
| [**R4-2216603**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216603.zip) | Nokia, Nokia Shanghai Bell | draft CR on corrections on timing test cases for RedCap |
| [**R4-2216748**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216748.zip) | MediaTek inc. | DraftCR on NR UE Transmit Timing Test for FR1 for 1 and 2 Rx UE |
| [**R4-2215474**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215474.zip) | Xiaomi | CR on SSB-based RLM in-sync test in FR1 for RedCap UE |
| [**R4-2215493**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215493.zip) | CMCC | Draft CR on test case for FR1 active BWP swith and UE specific CBW change |
| [**R4-2216301**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216301.zip) | Huawei, HiSilicon | RLM test cases for FR1 RedCap UE |
| [**R4-2216604**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216604.zip) | Nokia, Nokia Shanghai Bell | Draft CR introducing BFD and LR test cases for RedCap in FR1 |
| [**R4-2216750**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216750.zip) | MediaTek inc. | DraftCR on Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 1 and 2 Rx UE |
| [**R4-2215422**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215422.zip) | CATT | Draft CR for RedCap UEs for intra-frequency measurement in FR1 |
| [**R4-2215808**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215808.zip) | OPPO | CR on SA test with per-UE gaps under non-DRX with SSB index reading for intra-frequency measurement |
| [**R4-2215964**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215964.zip) | vivo | draft CR for CSI-RS based L1-RSRP for Redcap |
| [**R4-2216305**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216305.zip) | Huawei, HiSilicon | Test case on SA inter-frequency measurement procedure in FR1 for Redcap |
| [**R4-2216751**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216751.zip) | MediaTek inc. | DraftCR on SA event triggered reporting tests without gap under non-DRX for 1 Rx and 2 Rx UE |
| [**R4-2216756**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216756.zip) | MediaTek inc. | Draft CR on the test case for SA event triggered reporting tests for FR1 without SSB time index detection when DRX is not used |
| [**R4-2216772**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216772.zip) | Ericsson | RRM test cases for FR1: Measurement procedure |
| [**R4-2216303**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216303.zip) | Huawei, HiSilicon | Test case for intra-frequency SS-RSRQ measurement accuracy for FR1 RedCap UE |
| [**R4-2216343**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216343.zip) | Ericsson | Draft CR for introduction of the test cases for FR1 measurement accuracy on Redcap |
| [**R4-2216307**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216307.zip) | Huawei, HiSilicon | Test case on E-UTRA – NR inter-RAT measurement performance for Redcap |

## Open issues summary

### CRs/TPs comments collection

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| --- | --- |
| **CR/TP number** | **Comments collection for RRC\_IDLE state mobility CRs**  |
| [**R4-2216601**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216601.zip)(Nokia, Nokia Shanghai Bell) | draft CR on correction to IDLE mode test cases for RedCap in FR1 |
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| **CR/TP number** | **Comments collection for RRC\_CONNECTED state mobility CRs**  |
| [**R4-2215473**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215473.zip)(Xiaomi) | CR on 4-step random access test in FR1 for RedCap UE |
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| [**R4-2216299**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216299.zip)(Huawei, HiSilicon) | Test case for handover for FR1 RedCap UE |
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| [**R4-2216602**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216602.zip)(Nokia, Nokia Shanghai Bell) | draft CR on correction to CONNECTED mode test cases for RedCap in FR1 |
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| [**R4-2216749**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216749.zip)(MediaTek inc.) | DraftCR on Intra-frequency handover from FR1 to FR1 unknown target cell for 2 and 1 Rx UE |
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| **CR/TP number** | **Comments collection for Timing CRs** |
| [**R4-2215420**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215420.zip)(CATT) | CR on timing test for RedCap for FR1 |
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| [**R4-2216603**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216603.zip)(Nokia, Nokia Shanghai Bell) | draft CR on corrections on timing test cases for RedCap |
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| [**R4-2216748**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216748.zip)(MediaTek inc.) | DraftCR on NR UE Transmit Timing Test for FR1 for 1 and 2 Rx UE |
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| **CR/TP number** | **Comments collection for Signaling characteristics CRs** |
| [**R4-2215474**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215474.zip)(Xiaomi) | CR on SSB-based RLM in-sync test in FR1 for RedCap UE |
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| [**R4-2215493**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215493.zip)(CMCC) | Draft CR on test case for FR1 active BWP swith and UE specific CBW change |
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| [**R4-2216301**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216301.zip)(Huawei, HiSilicon) | RLM test cases for FR1 RedCap UE |
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| [**R4-2216604**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216604.zip)(Nokia, Nokia Shanghai Bell) | Draft CR introducing BFD and LR test cases for RedCap in FR1 |
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| [**R4-2216750**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216750.zip)(MediaTek inc.) | DraftCR on Radio Link Monitoring Out-of-sync Test for FR1 PCell configured with SSB-based RLM RS in DRX mode for 1 and 2 Rx UE |
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| **CR/TP number** | **Comments collection for Measurement procedures CRs** |
| [**R4-2215422**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215422.zip)(CATT) | Draft CR for RedCap UEs for intra-frequency measurement in FR1 |
| Ericsson: Follow the latest agreement. with both CD-SSB and NCD-SSB configuration and different UE and RF CBW. For example,

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| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz UE bandwidth, 40 MHz RF bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |

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| [**R4-2215808**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215808.zip)(OPPO) | CR on SA test with per-UE gaps under non-DRX with SSB index reading for intra-frequency measurement |
| Ericsson: Follow the latest agreement. with both CD-SSB and NCD-SSB configuration and different UE and RF CBW. For example,

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz UE bandwidth, 40 MHz RF bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |

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| [**R4-2215964**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215964.zip)(vivo) | draft CR for CSI-RS based L1-RSRP for Redcap |
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| [**R4-2216305**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216305.zip)(Huawei, HiSilicon) | Test case on SA inter-frequency measurement procedure in FR1 for Redcap |
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| [**R4-2216751**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216751.zip)(MediaTek inc.) | DraftCR on SA event triggered reporting tests without gap under non-DRX for 1 Rx and 2 Rx UE |
| Ericsson: needs to update to differentiate the UE CBW and RF CBW for NCD-SSB BWP |
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| [**R4-2216756**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216756.zip)(MediaTek inc.) | Draft CR on the test case for SA event triggered reporting tests for FR1 without SSB time index detection when DRX is not used |
| Ericsson: Follow the latest agreement. with both CD-SSB and NCD-SSB configuration and different UE and RF CBW. For example,

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz UE bandwidth, 40 MHz RF bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |

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| [**R4-2216772**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216772.zip)(Ericsson) | RRM test cases for FR1: Measurement procedure |
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| [**R4-2216307**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216307.zip)(Huawei, HiSilicon) | *Test case on E-UTRA – NR inter-RAT measurement performance for Redcap* |
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| **CR/TP number** | **Comments collection for Measurement accuracy CRs** |
| [**R4-2216303**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216303.zip)(Huawei, HiSilicon) | Test case for intra-frequency SS-RSRQ measurement accuracy for FR1 RedCap UE |
| Configuration 3 shall be 20MHz TDD  |
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| [**R4-2216343**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216343.zip)(Ericsson) | Draft CR for introduction of the test cases for FR1 measurement accuracy on Redcap |
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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:* |

# Topic #8: Performance part of RedCap – FR2 test cases

Contributions from AI 4.6.4.3.2 - 4.6.4.3.7 are discussed here.

## Companies’ contributions summary

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| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2215475**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215475.zip) | Xiaomi | CR on 4-step random access test in FR2 for RedCap UE |
| [**R4-2216300**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216300.zip) | Huawei, HiSilicon | Test case for handover for FR2 RedCap UE |
| [**R4-2215421**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215421.zip) | CATT | CR on timing test for RedCap for FR2 |
| [**R4-2215476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215476.zip) | Xiaomi | CR on RLM in-sync and scheduling restriction in FR2 for RedCap UE |
| [**R4-2215494**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215494.zip) | CMCC | Draft CR on test case for FR2 active BWP swith, UE specific CBW change, active TCI state switch and uplink spatial relation switch delay |
| [**R4-2215965**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215965.zip) | vivo | draft CR for CSI-RS-based BFD and LR for FR2 PCell |
| [**R4-2216302**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216302.zip) | Huawei, HiSilicon | RLM test cases for FR2 RedCap UE |
| [**R4-2215423**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215423.zip) | CATT | Draft CR for RedCap UEs for intra-frequency measurement in FR2 |
| [**R4-2215477**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215477.zip) | Xiaomi | CR on SA event triggered reporting test with per-UE gaps under DRX for RedCap UE in FR2 |
| [**R4-2215478**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215478.zip) | Xiaomi | CR on SSB and CSI-RS based L1-RSRP measurement for RedCap UE in FR2 |
| [**R4-2216306**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216306.zip) | Huawei, HiSilicon | Test case on SA inter-frequency measurement procedure in FR2 for Redcap |
| [**R4-2216752**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216752.zip) | MediaTek inc. | DraftCR on SSB based L1-RSRP measurement when DRX is not used for FR2 |
| [**R4-2216757**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216757.zip) | MediaTek inc. | Draft CR on the test case for SA event triggered reporting test without gap under DRX |
| [**R4-2216773**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216773.zip) | Ericsson | RRM test cases for FR2: Measurement procedure |
| [**R4-2216304**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216304.zip) | Huawei, HiSilicon | Test case for intra-frequency SS-RSRQ measurement accuracy for FR2 RedCap UE |
| [**R4-2216344**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216344.zip) | Ericsson | Draft CR for introduction of the test cases for FR2 measurement accuracy on Redcap |
| [**R4-2216753**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216753.zip) | MediaTek inc. | DraftCR on SSB based L1-RSRP measurement for beam reporting for FR2 |
| [**R4-2216754**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216754.zip) | MediaTek inc. | DraftCR on CSI-RS based L1-RSRP measurement for beam reporting for FR2 |

## Open issues summary

### CRs/TPs comments collection

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| **CR/TP number** | **Comments collection for RRC\_IDLE state mobility CRs**  |
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| **CR/TP number** | **Comments collection for RRC\_CONNECTED state mobility CRs**  |
| [**R4-2215475**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215475.zip)(Xiaomi) | CR on 4-step random access test in FR2 for RedCap UE |
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| [**R4-2216300**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216300.zip)(Huawei, HiSilicon) | Test case for handover for FR2 RedCap UE |
| Ericsson: Follow the latest agreement. with both CD-SSB and NCD-SSB configuration and different UE and RF CBW. For example,

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 20 MHz UE bandwidth, 40 MHz RF bandwidth, TDD duplex mode |
| 4 | 15 kHz SSB SCS, 10 MHz UE bandwidth, 20 MHz RF bandwidth, HD-FDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. |

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| **CR/TP number** | **Comments collection for Timing CRs** |
| [**R4-2215421**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215421.zip)(CATT) | CR on timing test for RedCap for FR2 |
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| **CR/TP number** | **Comments collection for Signaling characteristics CRs** |
| [**R4-2215476**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215476.zip)(Xiaomi) | CR on RLM in-sync and scheduling restriction in FR2 for RedCap UE |
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| [**R4-2215494**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215494.zip)(CMCC) | Draft CR on test case for FR2 active BWP swith, UE specific CBW change, active TCI state switch and uplink spatial relation switch delay |
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| [**R4-2215965**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215965.zip)(vivo) | draft CR for CSI-RS-based BFD and LR for FR2 PCell |
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| [**R4-2216302**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216302.zip)(Huawei, HiSilicon) | RLM test cases for FR2 RedCap UE |
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| **CR/TP number** | **Comments collection for Measurement procedures CRs** |
| [**R4-2215423**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215423.zip)(CATT) | Draft CR for RedCap UEs for intra-frequency measurement in FR2 |
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| [**R4-2215477**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215477.zip)(Xiaomi) | CR on SA event triggered reporting test with per-UE gaps under DRX for RedCap UE in FR2 |
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| [**R4-2215478**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2215478.zip)(Xiaomi) | CR on SSB and CSI-RS based L1-RSRP measurement for RedCap UE in FR2 |
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| [**R4-2216306**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216306.zip) (Huawei, HiSilicon) | Test case on SA inter-frequency measurement procedure in FR2 for Redcap |
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| [**R4-2216752**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216752.zip)(MediaTek inc.) | DraftCR on SSB based L1-RSRP measurement when DRX is not used for FR2 |
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| [**R4-2216757**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216757.zip)(MediaTek inc.) | Draft CR on the test case for SA event triggered reporting test without gap under DRX |
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| [**R4-2216773**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216773.zip)(Ericsson) | RRM test cases for FR2: Measurement procedure |
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| **CR/TP number** | **Comments collection for Measurement accuracy CRs** |
| [**R4-2216304**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216304.zip)(Huawei, HiSilicon) | Test case for intra-frequency SS-RSRQ measurement accuracy for FR2 RedCap UE |
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| [**R4-2216344**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216344.zip)(Ericsson) | Draft CR for introduction of the test cases for FR2 measurement accuracy on Redcap |
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| [**R4-2216753**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216753.zip)(MediaTek inc.) | DraftCR on SSB based L1-RSRP measurement for beam reporting for FR2 |
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| [**R4-2216754**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_104bis-e/Docs/R4-2216754.zip)(MediaTek inc.) | DraftCR on CSI-RS based L1-RSRP measurement for beam reporting for FR2 |
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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:* |

# 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 |
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**Existing tdocs**

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| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
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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
4. Do not include hyper-links in the documents

## 2nd round

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| **Tdoc number** | **Title** | **Source** | **Recommendation**  | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
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Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
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. Do not include hyper-links in the documents