**3GPP TSG RAN meeting #96 RP-221162**

**Budapest, Hungary, 6th – 9th June 2022**

## Status Report to TSG

**Agenda item:** 9.5.1.7

|  |  |
| --- | --- |
| **WI / SI Name** | Support of reduced capability NR devices |
| included in this status report | Study Item: No | Core part: Yes | Performance part:Yes | Testing part:No |
| **Acronym** | NR\_redcap |
| **Unique ID** | 900062 |
| **TSG Tdoc of latest approved WI/SI description (if any)** | [RP-220966](https://www.3gpp.org/ftp/TSG_RAN/TSG_RAN/TSGR_95e/Docs/RP-220966.zip) |
| **Target Completion Date****(indicate if changed)** | Study Item:  | Core part:06/2022 | Performance part:12/2022 | Testing part:  |
| **Overall Completion level** | Study Item:  | Core part:100% | Performance Part:50% | Testing part:  |

 **Source:**

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| **Leading WG** | RAN1 |
| **Rapporteur** | **Name** | Johan BERGMAN |
| **Company** | Ericsson |
| **Email** | johan.bergman@ericsson.com |

## 1 Work plan related evaluation

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| **Do you want to modify the time budget for this WI/SI compared to what was endorsed at the last RAN meeting?** | No |

## 2 Detailed progress in RAN WGs

## 2.1 RAN1

#### 2.1.1 Agreements

##### 2.1.1.1 RAN1#109-e

43 contributions were submitted to this meeting (for details see agenda item 8.6 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/TDoc_List_Meeting_RAN1%23109-e.xlsx)).

RAN1 carried out online (GTW) discussions and the following offline email discussions (with documents and agreements listed further down):

* [109-e-Prep-AI8.6 Rel-17 RedCap] Preparation phase for Rel-17 RedCap maintenance
* [109-e-R17\_RedCap-01] Email discussion for maintenance on UE bandwidth reduction
* [109-e-R17\_RedCap-02] Email discussion on incoming LS on introduction of an offset to transmit CD-SSB and NCD-SSB at different times
* [109-e-R17\_RedCap-03] Email discussion for maintenance on HD-FDD
* [109-e-R17-UE-features-RedCap-01] Email discussion on UE features for RedCap

The preparatory phase was documented in [R1-2205107](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205107.zip). After the meeting, an updated RAN1 agreement summary was provided in [R1-2205427](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205427.zip).

RAN1 made the following agreements related to **reduced maximum UE bandwidth**:

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| [R1-2205428](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205428.zip) FL summary for maintenance on UE bandwidth reduction for RedCap Moderator (Ericsson)Agreement:* The UE behavior for the case when initial DL BWP for non-RedCap UE is wider than maximum RedCap UE bandwidth is up to RAN2 with no RAN1 optimization.

Agreement:* For FR1, for BWP#0 configuration option 1,
	+ In connected mode, a RedCap UE supporting FG 28-1 but not FG 28-1a does not expect to operate in a separate initial DL BWP that does not include CD-SSB and the entire CORESET#0.
	+ In connected mode, a RedCap UE supporting both FG 28-1 and FG 28-1a is able to operate in a separate initial DL BWP that does not include CD-SSB and the entire CORESET#0.
* For FR2, for BWP#0 configuration option 1,
	+ In connected mode, a RedCap UE supporting FG 28-1 but not FG 28-1a does not expect to operate in a separate initial DL BWP that does not include CD-SSB.
	+ In connected mode, a RedCap UE supporting both FG 28-1 and FG 28-1a is able to operate in a separate initial DL BWP that does not include CD-SSB.

Agreement:* Adopt TP for TS 38.213 clause 17.1 in Proposal 3 in [R1-2204036](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204036.zip) with the following modification: the word ‘**not’** is removed in **“the field *intra-SlotFH* is not present”.**

Agreement:* Adopt the TP in Proposal 3 in [R1-2203787](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203787.zip) for TS 38.213 clause 17.1.

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RAN1 made the following agreements related to an **incoming LS on introduction of an offset to transmit CD-SSB and NCD-SSB at different times**:

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| [R1-2205429](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205429.zip) FL summary for incoming LS (R1-2203046) on introduction ofan offset to transmit CD-SSB and NCD-SSB at different times Moderator (Ericsson)Endorsement:* The draft LS in [R1-2205430](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205430.zip) is endorsed in principle.

Endorsement:* Final LS [R1-2205535](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205535.zip) is endorsed.

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RAN1 made the following agreements related to **duplex operation**:

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| [R1-2205364](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2205364.zip) FL summary #1 for maintenance on HD-FDD for RedCap Moderator (Qualcomm)[R1-2205442](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2205442.zip) FL summary #2 for maintenance on HD-FDD for RedCap Moderator (Qualcomm)Agreement:* Adopt the text proposal of Modified FL2 High Priority Proposal 1-2 in [R1-2205535](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205535.zip) to TS 38.213, clause 17.2

Agreement:* FL1 High Priority Proposal 2-3 in R1-2205442 is agreed.

Agreement:* Adopt the text proposal of FL2 Medium Priority Proposal 3-1 in R1-2205442 to TS 38.213, clause 17.2

Note: To editors, the proposals cited by the agreements could be found in the section of summary of R1-2205442.Agreement:Confirm the following WA from RAN1#108-e:* For Case 5 of SSB overlapping with Msg3 (re)transmission or PUCCH for Msg4/MsgB, reuse the same handling as for other dynamically scheduled UL transmission and prioritize the SSB
	+ Note: Whether the above collision rule is reused for Msg3 PUSCH repetition is up to the agreement in the CE WI.

Agreement:* For a HD-UE in paired spectrum and for PUSCH repetition type B transmission
	+ Symbols that are not at least before the first symbol or not at least  after the last symbol in the set of symbols with SSB transmission are considered as invalid symbols for PUSCH repetition type B transmission

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RAN1 made the following agreements related to **RedCap UE feature list** (under the separate agenda item 8.16.6):

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| [R1-2204404](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_108-e/Docs/R1-2204404.zip) Summary on UE features for REDCAP Moderator (NTT DOCOMO, INC.)[R1-2205328](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205328.zip) LS on updated Rel-17 RAN1 UE features list for NR RAN1, AT&T, NTT DOCOMO, INC.[R1-2202927](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205327.zip) Updated RAN1 UE features list for Rel-17 NR after RAN1 #109-e Week1 Moderators (AT&T, NTT DOCOMO, INC.)[R1-2205609](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205609.zip) LS on updated Rel-17 RAN1 UE features list for NR RAN1, AT&T, NTT DOCOMO, INC.[R1-2205607](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205607.zip) Updated RAN1 UE features list for Rel-17 NR after RAN1 #109-e Week2 Moderators (AT&T, NTT DOCOMO, INC.)[R1-2205608](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2205608.zip) Updated RAN1 UE features list for Rel-17 NR after RAN1 #109-e Week2 including remaining RAN1 issues Moderators (AT&T, NTT DOCOMO, INC.)Agreement:* No FDD/TDD and FR1/FR2 differentiation are necessary for FG 28-1

Agreement:* Following components are added in FG 28-1
	+ 1 UE-specific RRC configured DL BWP per carrier
	+ 1 UE-specific RRC configured UL BWP per carrier
	+ RRC reconfiguration of any parameters related to BWP
	+ [RRC-configured DL BWP with CD-SSB or NCD-SSB]
	+ NCD-SSB based measurements in RRC-configured DL BWP
* Add a note in FG 28-1: A UE supporting this FG is not required to support FG 6-1
* Add an FG for RRC-configured DL BWP without CD-SSB or NCD-SSB for RedCap

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| 28. NR\_redcap | 28-1a | RRC-configured DL BWP without CD-SSB or NCD-SSB | RRC-configured DL BWP without CD-SSB or NCD-SSBFFS whether to add additional components | 28-1 | Yes |  |  | Per band | N/A | N/A |  |  | Optional with capability signaling |

Agreement:* Component 9 in FG 28-1 is updated as: ~~[~~UE-specific RRC~~-~~ configured DL BWP with CD-SSB or NCD-SSB~~]~~

Agreement:* Confirm the contents in square brackets in the columns of “Consequence if the feature is not supported by the UE” in FG 28-1
* Confirm the note “RedCap UEs do not support carrier aggregation or dual connectivity.” in FG 28-1

Agreement:* The columns of “Consequence if the feature is not supported by the UE” in FG 28-3 is updated as: UE is assumed to support FD-FDD in that ~~FDD~~ band~~s~~

Agreement:* The prerequisite FGs of FG 6-2/6-3/6-4 are revised as “6-1 or 28-1”
* Component 5 in FG 6-2/6-3 is revised as: BW of a UE-specific RRC configured BWP includes BW of the CORESET#0 (if CORESET#0 is present) and SSB for PCell/PSCell (if configured) and BW of the UE-specific RRC configured BWP includes SSB for SCell if there is SSB on SCell. For RedCap UE, BW of a UE-specific RRC configured BWP includes CD-SSB or NCD-SSB
* Component 6 in FG 6-4 is revised as: BW of a UE-specific RRC configured BWP includes BW of the CORESET#0 (if CORESET#0 is present) and SSB for PCell/PSCell (if configured) and BW of the UE-specific RRC configured BWP includes SSB for SCell if there is SSB on SCell. For RedCap UE, BW of a UE-specific RRC configured BWP includes CD-SSB or NCD-SSB
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#### 2.1.2 Remaining Open issues

No remaining RAN1 issues

## 2.2 RAN2

#### 2.2.1 Agreements

##### 2.2.1.1 RAN2#118-e

85 contributions were submitted to this meeting (for details see agenda item 6.12 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/TDoc_List_Meeting_RAN2%23118-e.xlsx)).

RAN2 carried out online (GTW) discussions and the following offline email discussions:

* [AT118-e][102][RedCap] RRC CR (Ericsson)

Final scope: 1. Draft reply LS to RAN4 (for [R2-2204475](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204475.zip)) and 2. update the 38.331 CR reflecting the meeting agreements

Final intended outcome:

1) Reply LS

2) Agreeable 38.331 CR

1) Deadline (for companies' feedback to draft reply LS):  Thursday 2022-05-19 16:00 UTC

1) Deadline (for reply LS [R2-2206504](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206504.zip)):  Thursday 2022-05-19 18:00 UTC

2) Deadline (for companies' feedback to CR):  Friday 2022-05-20 08:00 UTC

2) Deadline (for final CR in [R2-2206215](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206215.zip)):  Friday 2022-05-20 10:00 UTC

(Deadlines for CR are indicative. It’s likely that this discussion will move to a Post118-e discussion)

* [AT118-e][105][RedCap] NCD-SSB aspects (ZTE)

Final scope: Continue the discussion on p4 and on the issue (RIL 520 related) raised by Samsung. Also draft reply LSs to [R2-2204476](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204476.zip) (to RAN1) and to [R2-2204486](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204486.zip) (RAN4) based on meeting agreements

Final intended outcome: Summary of the offline discussion with e.g.:

* List of proposals for agreement (if any)
* List of proposals that require online discussions
* text proposals for reply LSs to RAN1 and RAN4

Deadline (for companies' feedback): Wednesday 2022-05-18 08:00 UTC

Deadline (for rapporteur's summary in [R2-2206414](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206414.zip)): Wednesday 2022-05-18 10:00 UTC

* AT118-e][109][RedCap] RRM relaxation (vivo)

Final scope: draft a reply LS to [R2-2204487](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204487.zip)

Final intended outcome: reply LS in [R2-2206418](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206418.zip)

Deadline (for companies' feedback): Thursday 2022-05-19 12:00 UTC

* + Deadline (for LS in [R2-2206418](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206418.zip)): Thursday 2022-05-19 14:00 UTC
* [AT118-e][110][RedCap] UE capabilities (Intel)

Final scope: Update the UE capability CRs, reflecting the meeting agreements

Final intended outcome: Endorsable UE capability CRs

Deadline (for companies' feedback): Friday 2022-05-20 08:00 UTC

Deadline (for final CRs in [R2-2206615](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206615.zip) and [R2-2206616](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206616.zip)): Friday 2022-05-20 10:00 UTC

* [AT118-e][113][RedCap] Stage-2 CR (Nokia)

 Scope: continue the discussion on the Stage-2 CR, also considering Stage-2 text proposals in submitted contributions

 Intended outcome: Agreeable Stage-2 CR

 Deadline (for companies' feedback): Thursday 2022-05-19 18:00 UTC

 Deadline (for final CR in [R2-2206203](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206203.zip)): Friday 2022-05-20 08:00 UTC

* [AT118-e][115][RedCap] 38.304 CR (Samsung)

Final scope: continue the discussion on p1, p4 and p5 from [R2-2206213](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206213.zip) and update the 38.304 CR, also reflecting other meeting agreements

Intended outcome: Agreeable 38.304 CR

Deadline (for companies' feedback): Friday 2022-05-20 08:00 UTC

Deadline (for final CR in [R2-2206216](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206216.zip)): Friday 2022-05-20 10:00 UTC

(Deadlines for CR are indicative. It’s likely that this discussion will move to a Post118-e discussion)

* [AT118-e][116][RedCap] MAC aspects (vivo)

Final scope: Update MAC CR considering the submitted contributions

Final Intended outcome: Agreeable MAC CR

Deadline (for companies' feedback): Friday 2022-05-20 08:00 UTC

Deadline (for final CR in [R2-2206217](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206217.zip)): Friday 2022-05-20 10:00 UTC

(Deadlines for CR are indicative. It’s likely that this discussion will move to a Post118-e discussion)

* [AT118-e][121][RedCap] SI request (Samsung)

Scope: finalize the 38.331 TP for SI request, to reflect option 1 in [R2-2206214](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206214.zip)

Final intended outcome: Endorsable TP

Deadline (for companies' feedback): Friday 2022-05-20 08:00 UTC

Deadline (for TP in [R2-2206618](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206618.zip)): Friday 2022-05-20 10:00 UTC

* [AT118-e][122][RedCap] LS on the maximum PTW length (Huawei)

Scope: Discuss a LS to RAN3/CT1 on maximum PTW length of IDLE eDRX, based on [R2-2205039](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205039.zip)

Final intended outcome: LS to RAN3/CT1

Deadline (for companies' feedback): Friday 2022-05-20 08:00 UTC

Deadline (for LS in [R2-2206620](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206620.zip)): Friday 2022-05-20 10:00 UTC

RAN2 made the following agreements related to **control plane issues**:

Agreements:

1. RedCap UEs in RRC Connected only need to support the following three options for acquiring SI update or ETWS/CMAS message in a dedicated DL BWP that does not contain CD-SSB:

 • From CSS for SIBs configured within this DL BWP;

 • Via dedicated signaling;

 • Switched by network (either DCI or RRC) to an initial DL BWP where SIBs are sent.

Agreements via email – from offline 105 – second round:

1. RAN2 confirms that when RedCap UE’s active BWP contains NCD-SSB, it is up to network configuration whether the UE performs serving cell measurements on NCD-SSB or CD-SSB.

2. For how to indicate serving cell MO for RedCap UE, adopt solution A-2.

 Solution A-2: Optionally configures a BWP-specific servingCellMO under BWP-DownlinkDedicated IE when the BWP-DownlinkDedicated contains nonCellDefiningSSB-r17. If the field is present, the UE uses this servingCellMO for serving cell measurements, otherwise, the UE uses legacy servingCellMO IE under ServingCellConfig.

3. For the second measurement related question in [R2-2204486](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204486.zip), reply to RAN4 with the following RAN2 understandings:

 From RAN2 signalling point of view, a BWP-specific servingCellMO is defined under BWP-DownlinkDedicated, the SSB defined in this servingCellMO is the reference SSB to be used for serving cell measurements when the UE is in this active BWP; if the field is absent, SSB defined in servingCellMO under ServingCellConfig is the reference SSB to be used for serving cell measurements. This reference SSB is used to define intra-frequency measurements.

4. From RAN2 perspective, handover scenario 1 is supported.

 Scenario 1: 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)

5. From RAN2 perspective, handover scenario 2 is not supported.

 Scenario 2: Handover to a target cell’s initial BWP and further switch to the specific Redcap BWP to send the RACH (i.e. UE first sync to the CD-SSB and then autonomously switch to first active BWP to perform RACH)

6. Clarify in the RRC field description that the paging search space is configured in an initial BWP only if that BWP includes the CD-SSB.

7. RAN2 confirms that if RedCap-specific initial DL BWP does not contain CD-SSB and CORESET#0, then this BWP will not be configured with a paging search space in any RRC state. In this case, the RedCap UE in RRC\_CONNECTED state is not required to read paging.

8. Reply to RAN1 and explain there is no need to support paging connected RedCap UEs in a RedCap-specific initial DL BWP which does not contain CD-SSB and CORESET#0.

9. In Rel-17, from UE perspective, one configured BWP can only contain up to one SSB (CD-SSB or NCD-SSB).

Agreements online:

1. During handover, if dedicatedSIB1-Delivery IE is not included in the handover command and the first active BWP in the target cell does not contain CD-SSB, UE can only acquire SI, if needed, only within the first active BWP either from CSS for SIBs or via dedicated signaling.

2. For scenario 1, in handover command, if the first active BWP is associated with NCD-SSB, the smtc field included reconfigurationWithSync is configured according to the NCD-SSB of target cell.

Agreements online after first round from offline 102

1. The following RILs are agreed: H506, V163, H509, H514, Z033, H515, M608, H517, V161, Z034, H522

2. The following RILs are agreed: V168, V169

3. The following RILs are not pursued: X115, X112, V165, H525, H526.

4. O374 is not pursued.

5. X116 is not pursued.

6. RIL 510 is agreed.

7. FW001 is agreed.

8. S952 is not pursued

9. Z035 is agreed with the following change: "The NW configures SSB-based RA (and hence RACH-ConfigCommon) only for UL BWPs if the linked DL BWPs (same bwp-Id as UL-BWP) are the initial DL BWPs or DL BWPs containing the SSB associated to the initial DL BWP or for RedCap UEs DL BWPs associated with nonCellDefiningSSB."

10. V164 is not pursued.

11. H513 and H516 are not pursued.

12. H518 is not pursued.

13. X119-2 is not pursued.

14. V166 is not pursued.

15. Number of Rx supported by a RedCap UE is provided in UERadioPagingInformation.

Agreements via email – from offline 102 – second round:

1. H705 as implemented in [R2-2206021](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206021.zip) is agreed.

2. X110 and X111 are agreed.

3. H511 and C271 are agreed.

4. The following proposal is not pursued: “UEs configured with eDRX should consider stored system information to be invalid after 24 hours.”

5. A configurable parameter is not introduced in SIB1 to indicate RSRP offset for UEs with 1 Rx branch.

Agreements online:

1. H704 is agreed

2. H520 as implemented in [R2-2206021](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206021.zip) is agreed.

3. The intention of H507 is agreed but this should be put as normative text. Continue in the CR updating phase.

4. Z036, N107, and H523 are not pursued.

5. X119-1 is not pursued.

6. Regarding possible UE behaviour for inter-RAT mobility from LTE to NR for RedCap UEs: Come back in the next meeting to check whether a different note in Stage2 can be agreed. In any case no Stage-3 impact will be considered because of this

7. I051 and N016 are not pursued

8. Regarding V162, option 1 is agreed: “perform barring based on intraFreqReselectionRedCap as specified in TS 38.304 [20]

9. Include a question on whether RedCap specific configurable Qrxlevmin\_1Rx and Qqualmin\_1Rx should be supported in the LS to RAN4

Agreements:

1. Network implementation should avoid handover attempts from source eNB to legacy gNB that does not support RedCap. FFS is specific UE behaviour should also be specified.

Agreements:

1. Capabilities for support for Rx branches and HD-FDD-only are included in the UERadioPagingInformation inter-node message.

Agreements:

1 Send an LS to RAN4 saying that RAN2 understands that RedCap UE with 1 Rx branch applies offset to the all RSRP thresholds which are applicable to RedCap (not only the thresholds explicitly mentioned in the incoming RAN4 LS), asking RAN4 for confirmation. In the LS, also ask RAN4 about their view on whether RedCap UE with 1 Rx branch applies offset to REL-16 low mobility and/or not at cell edge conditions (indicating that RAN2 is not sure about the low mobility condition). FFS if anything else needs to be included in the LS

Agreements via email – from offline 115:

1. Adopt proposed TP2 in [R2-2206213](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206213.zip), on top of changes in [R2-2206023](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206023.zip).

RAN2 made the following agreements related to **MAC issues**:

Agreements via email – from offline 116;

1. When the bwp-InactivityTimer is expired and the default BWP is not configured for a RedCap UE, the RedCap UE should switch to initialDownlinkBWP-RedCap, if configured. The corresponding TP provided in [[R2-2204811](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204811.zip)] is agreed.

2. For RedCap UEs in idle/inactive mode, if the RedCap-specific initial BWP is not configured, the legacy initial BWP should be used to perform RACH as legacy.

3. When a RedCap UE is in RRC\_IDLE/RRC\_INACTIVE, selection of the initial UL BWP and initial DL BWP are captured separately in the spec. Take the corresponding TP in [[R2-2205487](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205487.zip)] as the starting point when drafting CR.

Agreements online:

1. RA partitioning is assumed as mandatory for RedCap UE (i.e. no capability signalling).

2. Regarding SI request for RedCap UE, if the RedCap-specific initial UL BWP is configured, UE transmits SI request (Msg1 or Msg3 based) on RedCap-specific initial UL BWP

RAN2 made the following agreements related to **UE capabilities**:

Agreements via email – from offline 110;

1. Rel-17 RRM relaxation for RRC\_CONNECTED UEs is captured in TS38.306 as optional feature with capability signalling

2. Add Separate initial UL BWP for RedCap Ues and Separate initial DL BWP for RedCap Ues in the field description of supportOfRedCap-r17

3. Full-duplex FDD is an optional feature for RedCap Ues.

4. halfDuplexRedCapAllowed-r17 is kept in SIB1 and corresponding FFS “—FFS whether halfDuplexRedCapAllowed is kept, remove also from related procedure” is removed. FFS on whether further clarification is needed since HD-FDD is per band capability.

5. Introduce new UE power class pc7 as:

 Ue-PowerClass-v1700 ENUMERATED {pc5, pc6, pc7} OPTIONAL,

6. The changes in [R2-2206025](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2206025.zip) are not pursued

7. Add abbreviation CPAC in TS38.306

8. Update No to CY for supportOfRedCap-r17

9. Remove the EN “Editor’s Note: May be updated based on latest RAN1 and RAN4 agreements.”

RAN2 made the following agreements related to **RRM relaxation**:

Agreements:

1. RAN2 send an LS to RAN4 to clarify the following [Detailed wording may be updated when drafting reply LS]:

 • Simultaneous configuration of R16 not-at-cell-edge criterion and R17 stationary criterion for idle/inactive mode is a valid configuration from the network’s PoV, where the network supports RRM relaxation for both R16 and R17 UEs in idle/inactive mode.

 • From signalling’s PoV, any R16 RRM relaxation criterion and any R17 RRM relaxation criterion for idle/inactive mode can be configured in a same cell at a same time, as independent criteria (i.e., without requiring a UE to fulfil both the R16 and the R17 criteria in order to relax its RRM measurements).

 • If combined with a not-at-cell-edge criterion, the R17 stationary criterion can only be combined with the R17 not-at-cell-edge criterion, not with the R16 one.

2. In the LS, RAN2 also request RAN4 to consider supporting cases #8 and #9 [Detailed wording could be discussed when drafting reply LS].

3. Changes in section 5.3.7.2, 5.3.7.3, 5.3.13.2 on UAI for RRM relaxation fulfilment indication in [R2-2204737](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2204737.zip) are agreeable and merged into RRC CR.

4. Changes in section 5.7.4.2 on UAI for RRM relaxation fulfilment indication in [R2-2205091](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205091.zip) are agreeable and merged into RRC CR. FFS on which one is better “if it is configured to do so” or “if it was configured to do so”.

Agreements vie email – from offline 109:

1. In the reply LS, RAN2 inform RAN4 it is up to RAN4 to make the final decision on whether support case#8 and case#9, for example, considering other reason, if any.

2. [RIL: J002] is not agreed.

3. No prohibit timer will be introduced for UAI for RRM relaxation fulfilment status indication.

4. Update the previous agreement by removing the FFS part as below:

 Changes in section 5.7.4.2 on UAI for RRM relaxation fulfilment indication in [R2-2205091](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205091.zip) are agreeable and merged into RRC CR. FFS on which one is better “if it is configured to do so” or “if it was configured to do so”.

5. RAN2 assume to change the Srxlev for stationary criterion to SS-RSRP in RRC\_CONNECTED

Agreements from third round offline 109:

1. The TP in [R2-2205284](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/R2-2205284.zip) is agreeable and merged into RRC CR. Update the previous agreement to: RAN2 assume to change the Srxlev for stationary criterion to SS-RSRP in RRC\_CONNECTED, pending confirmation by RAN4. Include this agreement in the LS to RAN4 and ask them to confirm whether it is reasonable.

#### 2.2.2 Remaining Open issues

No remaining RAN2 issues

## 2.3 RAN3

#### 2.3.1 Agreements

##### 2.3.1.1 RAN3#116-e

7 contributions were submitted to this meeting (for details see agenda item 9.1.12 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_116-e/Docs/TDoc_List_Meeting_RAN3%23116-e.xlsx)).

Based on the discussion in [R3-223704](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_116-e/Docs/R3-223704.zip), RAN3 discussed the proposed corrections for RedCap and made the following agreement:

* **the HD-FDD support information is added into the RedCap Broadcast Information IE for XnAP/F1AP**
* The resulting CRs [R3-223901](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_116-e/Docs/R3-223901.zip) to XnAP and [R3-223902](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_116-e/Docs/R3-223902.zip) to F1AP were agreed.

#### 2.3.2 Remaining Open issues

No remaining RAN3 issues

## 2.4 RAN4

#### 2.4.1 Agreements

##### 2.4.1.1 RAN4#103-e

189 contributions were submitted to this meeting (for details see agenda item 9.19 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/TDoc_List_Meeting_RAN4%23103-e.xlsx)).

RAN4 carried out the following offline email discussions:

* [103-e][133] NR\_RedCap
	+ Summarized in [R4-2210465](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210465.zip)
* [103-e][214] NR\_redcap\_RRM\_1
	+ Summarized in [R4-2210483](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210483.zip)
* [103-e][215] NR\_redcap\_RRM\_2
	+ Summarized in [R4-2210484](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210484.zip)
* [103-e][329] NR\_RedCap\_Demod
	+ Summarized in [R4-2210532](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210532.zip)

RAN4 agreed the following contributions for **RF requirements**:

|  |  |
| --- | --- |
| **Tdoc number** | **Title** |
| [R4-2210791](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210791.zip) | Draft CR on RedCap FR1 RF |
| [R4-2210792](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210792.zip) | CR to TS38.101-1: Corrections on Redcap requirements |
| [R4-2210793](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210793.zip) | CR for 38.101-2 to correct the errors and add the missing requirements for FR2 RedCap UE |
| [R4-2210795](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210795.zip) | CR on RedCap FR2 |

RAN4 approved and endorsed the contributions for **RRM requirements**:

|  |
| --- |
| **38.133 CRs:*** [R4-2211037](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211037.zip) Draft CR to TS 38.133 on definitions and applicability for RedCap
* [R4-2211038](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211038.zip) Draft CR on RRC\_IDLE mode requirements for RedCap for TS 38.133
* [R4-2211040](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211040.zip) Draft CR on mobility requirements for Redcap UE
* [R4-2211039](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211039.zip) Draft CR on SDT requirements for RedCap for TS 38.133
* [R4-2211043](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211043.zip) Draft CR to 38.133 introducing RedCap requirements on active BWP switch delay, active TCI state switching delay and UE specific CBW change
* [R4-2211045](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211045.zip) Draft CR on reduced capability UEs for RLM for RedCap
* [R4-2211215](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211215.zip) Draft CR on reduced capability UEs for general measurements and intra-frequency
* [R4-2211216](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211216.zip) Draft CR on reduced capability UEs for inter-frequency and inter-RAT measurements
* [R4-2211051](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211051.zip) Draft CR on measurement requirements for Redcap UE in inactive mode
* [R4-2211044](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211044.zip) Draft CR on uplink spatial relation requirements for RedCap for TS 38.133
* [R4-2211042](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211042.zip) Draft CR on timing requirements for RedCap UE

**36.133 CR:*** [R4-2211046](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211046.zip) Draft CR on inter-RAT NR measurement for RedCap
 |

RAN4 made the following agreements related to **UE demodulation performance requirements** ([R4-2210931](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210931.zip)).

|  |
| --- |
| * Spec structure of UE demodulation and CSI reporting requirements for RedCap in TS38.101
	+ No new suffix with existing structure for RedCap
* UL/DL pattern used for FDD tests for 1Rx UE
	+ Introduce demodulation/CSI requirements covering both FD-FDD and HD-FDD.
		- DDDSU applied for HD-FDD
		- Existing pattern applied for FD-FDD
		- Same demodulation requirement applied for FD-FDD and HD-FDD with different FRCs
		- For CSI requirements, configure the following CSI feedback scheduling pattern applicable for both FD-FDD and HD-FDD
			* CQI reporting test in static/fading condition (periodic CSI reporting)
				+ CSI-RS periodicity and offset: [10/1]
				+ CSI-Report periodicity and offset: [10/9]
				+ CQI/RI/PMI delay:

Option 1: 10msOption 2: 14ms* + - * PMI reporting tests (aperiodic CSI reporting)
				+ CSI request: [1 in slots i, where mod(i, 5) = 1], otherwise it is equal to 0.

Reuse the FRC from Rel-15 PMI test (R.PDSCH 1-6.1 FDD).* + - * + Aperiodic Report Slot Offset: [3 slots]
				+ CQI/RI/PMI delay: [6 ms]
	+ Test applicability rule:
		- If RedCap UE support only HD-FDD in a FDD band, this UE is tested with HD-FDD mode otherwise UE is tested with FD-FDD mode
	+ FFS for the UE demodulation and CSI reporting requirements for 2Rx RedCap UE supporting HD-FDD in FDD bands
* UE demodulation requirements
	+ PDSCH demodulation
		- Not define any additional PDSCH demodulation requirements other than those agreed in last RAN4 meeting (moderator: RAN4#102-e) in Rel-17 for RedCap
		- Introduce 256QAM requirement for 2Rx.
		- For 256QAM requirements for 1Rx,
			* Option 1: Define 256QAM demodulation requirements for 1Rx in FR1
				+ Option 1a: MCS20
				+ Option 1b: MCS is based on the operating SNR
			* Option 2: Not to define 256QAM demodulation requirements for 1Rx in FR1
	+ SDR requirements
		- Test setup for SDR requirements
		- For FR1, define SDR requirements with configuration 1T1R for UE supporting 1 layer and 2T2R for UE supporting 2 layers. For FR2, define SDR requirements for 2 layers only with configuration 2T2R
	+ PDCCH demodulation
		- Set CORESET duration to 1 for FR1 TDD PDCCH demodulation requirements
		- Set REG bundle size to 2 for FR1 TDD PDCCH demodulation requirements
		- Aggregation level
			* 1Rx UE:
				+ FR1 FDD 15kHz: Define AL8 only
				+ FR1 TDD 30kHz: Define AL4 only
			* 2Rx UE:
				+ FR1 FDD 15kHz: Define both AL4 and AL8
				+ FR1 TDD 30kHz: Define both AL4 and AL8
				+ FR2 TDD 120kHz: Define both AL4 and AL8
* CSI reporting requirements
	+ CQI reporting requirements in static condition
		- Test setup for CQI reporting test in static condition
			* Define the codebookSubsetRestriction for 2T1R to avoid the equivalent channel matrix is 0.
			* Set codebookSubsetRestriction to 000001 if H = [1 1] is used
		- Test points for CQI reporting test in static condition for 2Rx
			* Set SNR=8/9dB for the lower test point.
			* Set SNR=14/15dB for the higher test point.
		- Test points for CQI reporting test in static condition for 1Rx
			* SNR test points 3 dB lower than 2Rx test case
	+ CQI reporting requirements in fading condition
		- Reuse the same test metrics and pass/fail criteria as existing WB CQI reporting tests in fading channel for RedCap UE
		- Test points for CQI reporting test in fading condition for 2Rx
			* Lower SNR test points
				+ Option 1: SNR=5/6 dB
				+ Option 2: SNR=6/7 dB
			* Higher SNR test points:
				+ SNR=12/13dB
		- Test points for CQI reporting test in fading condition for 1Rx
			* Set SNR test points 3 dB higher than 2Rx case
	+ PMI reporting requirements
		- Reuse the same test metrics and pass/fail criteria as existing PMI reporting tests for RedCap UE
	+ RI reporting requirements
		- Whether to define RI reporting requirements for RedCap 2Rx UEs
			* Option 1: Define RI reporting requirements
			* Option 2: Not define RI reporting requirements
 |

RAN4 made the following agreements related to **RRM impacts**:

|  |  |
| --- | --- |
| **Frequency band grouping*** No new frequency band grouping table is introduced for FR1 RedCap.
* For FR2, the existing tables are updated to support UE power class 7 (PC7) for n257, n258 and n261 as per RF agreement.

**Paging reception*** For 1 Rx, there is no impact on the requirement for maximum interruption in paging reception, i.e. Rel-15 requirements shall apply to RedCap.

**Small data transmission for RedCap*** Time windows defining the valid measurements used for TA validation are reused from Rel-17 SDT.
* If NR SDT requirements (defined in other Rel-17 SDT WI) include references to 2 Rx measurement accuracy requirements, they shall be updated to point to corresponding 1 Rx measurement accuracy requirements.
* The requirements on UE synchronization towards the serving cell defined for 2 Rx SDT requirements are reused for 1 Rx RedCap UE.

RAN4 to consider defining an offset to *absThreshSS-BlocksConsolidation* for 1Rx UEs.* FFS: A separate offset is defined for different measurement quantities such as SS-RSRP, SS-RSRQ etc.

**Handover**RAN4 to relax the Tsearch for RedCap HO delay requirement as followings when SINR=-2dB and 1Rx is used:* For HO to FR1, Tsearch = 2\*Trs for intra-frequency HO and Tsearch = 5\* Trs for inter-frequency HO

The following scenarios are precluded based on RAN2’s agreements.* Scenario 2: HO to an initial BWP with CD-SSB but RACH on RedCap specific BWP associated with NCD-SSB
* Scenario 2a: HO to an initial BWP with CD-SSB but RACH on RedCap specific BWP associated with CD-SSB
* Scenario 3: HO to an initial BWP with CD-SSB but RACH on RedCap specific BWP with no SSB
* Reuse legacy HO requirements for handover to RedCap [first active] BWP with NCD-SSB except Tsearch relaxation from 1 Rx reception. RAN4 assume that the RACH occasion is configured with the [first active] BWP

**Requirements for HO to an initial BWP with CD-SSB but RACH on RedCap specific BWP associated with NCD-SSB (Scenario 2)*** The scenario is precluded.

**Requirements for HO to an initial BWP with CD-SSB but RACH on RedCap specific BWP associated with CD-SSB (Scenario 2a)*** The scenario is precluded.

**Requirements for HO to an initial BWP with CD-SSB but RACH on RedCap specific BWP with no SSB (Scenario 3)*** The scenario is precluded.

**Additional BWP switching delay (TBWP-switching-delay) in requirements**The scenario is precluded. No need to further discussion.**T/F tracking delay(T∆) in requirements**The scenario is precluded. No need to further discussion.**Requirements for HO to a BWP which has different SSB with the one used for measurement (Scenario 4)**Do not introduce HO requirements depending on the separation between initial BWP and RedCap BWPs or power difference between NCD-SSB and CD-SSB.**RRC reestablishment on a BWP with NCD-SSB** No need to further discussion the scenario.**RRC connection release with redirection on a BWP with NCD-SSB**No need to further discussion the scenario.**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

**Updated definition of reference point for UE transmit timing requirements**Use the following reference point definition as in 38.133 v17.5.0 for Redcap UE timing: * The downlink timing is defined as the time when the first path (in time) of the corresponding downlink frame used by the UE to determine downlink timing is received from the reference cell at the UE antenna.

BFDBFD evaluation period is extended by a factor of 2 for 1 Rx UE compared to 2 Rx UE.CBD including L1-RSRP measurements**Whether relaxed L1-RSRP requirements applies to both intra- and inter-frequency**No further discussions needed as relaxed L1-RSRP applies only to intra-frequency measurements.**SSB-based L1-RSRP measurements: absolute accuracy with measurement restriction in FR1**Relax the current absolute L1-RSRP accuracy by 3 dB when 1Rx is used compared with the legacy UE. **SSB-based L1-RSRP measurements: relative accuracy with measurement restriction in FR1**Relax the relative L1-RSRP accuracy by 3dB**CSI-RS based L1-RSRP measurements: absolute accuracy with measurement restriction in FR1**Relax by 3 dB when 1Rx is used compared with the legacy UE.**CSI-RS based L1-RSRP measurements: relative accuracy with measurement restriction in FR1**Relax the relative L1-RSRP accuracy by 3dB**Whether to introduce new UE capability to indicate support of new BWP switching delay when only center-frequency is changed** No consensus to introduce new UE capability to indicate the support of new BWP switching delay when only center-frequency is changed. **Whether to define BWP switching delay when only center-frequency is changed in Rel-17** No consensus to define BWP switching delay when only center-frequency is changed in Rel-17 for RedCap. **If new BWP switching delay when only center-frequency is changed is introduced, how to express those:** No consensus to define BWP switching delay when only center-frequency is changed in Rel-17 for RedCap.**UL spatial relation switch delay** For UL spatial relation switching requirements, the legacy UL spatial relation switch requirements are reused with following updates:* TL1-RSRP\_Measurement\_Period\_SSB replaced to TL1-RSRP\_Measurement\_Period\_SSB\_RedCap
* TL1-RSRP\_Measurement\_Period\_CSI-RS replaced to TL1-RSRP\_Measurement\_Period\_CSI-RS\_RedCap

**UL spatial relation switch for HD-FDD UE** * For RedCap UE in HD-FDD mode, if a downlink reception overlaps with uplink transmission associated with the target spatial relation of the serving cell then the UE is allowed to postpone the uplink transmission.

**Whether to support scenario: neighbour cells include NCD-SSB on the same frequency location as serving cell CD-SSB**RAN4 to preclude following scenario in Rel-17 RedCap: neighbour cells include NCD-SSB on the same frequency location as serving cell CD-SSB.**Whether to define requirements for scenario B-2**Case B-2 is supported if no additional requirements or minimum changes shall be introduced compared with other scenario.**Reference SSB to decide measurement type (intra- or inter-frequency)**The issue can be closed based on the following RAN2’s latest agreements.From RAN2 signalling point of view, * a BWP-specific servingCellMO is defined under BWP-DownlinkDedicated, the SSB defined in this servingCellMO is the reference SSB to be used for serving cell measurements when the UE is in this active BWP;
* if the field is absent, SSB defined in servingCellMO under ServingCellConfig is the reference SSB to be used for serving cell measurements.
* This reference SSB is used to define intra-frequency measurements.

**Definition of SSB based intra-frequency measurement**The centre frequency of the reference SSB of the serving cell and the centre frequency of the SSB of the neighbour cell are the same, and the subcarrier spacing of the two SSBs are also the same. The reference SSB is the SSB defined in BWP-specific *servingCellMO* under *BWP-DownlinkDedicated* of active DL BWP. If the field is absent, the reference SSB is the SSB defined in *servingCellMO* under *ServingCellConfig*.**When both CD-SSB and NCD-SSB are configured for serving cell measurements**The issue can be closed based on the following RAN2’s latest agreements.* It is possible to configure CD-SSB and/or multiple NCD-SSB for serving cell measurements, but the UE shall perform the measurements using the configured serving cell measurement object of the active BWP which can either be associated with CD-SSB or NCD-SSB.

**When both CD-SSB and NCD-SSB are configured for serving cell measurements and both require MG (if scenario is supported)**This scenario is invalid based on the following RAN2’s latest agreements.* It is possible to configure CD-SSB and/or multiple NCD-SSB for serving cell measurements, but the UE shall perform the measurements using the configured serving cell measurement object of the active BWP which can either be associated with CD-SSB or NCD-SSB.

**When both CD-SSB and NCD-SSB are configured for neighbour cell measurements**When both CD-SSB and NCD-SSB neighbour cell measurement are configured:* UE should follow NW’s configuration to perform measurements on both SSBs.

**Neighbour cell’s NCD-SSB information**The neighbor cell’s NCD-SSB information (frequency/SCS) shall be provided to UE if UE is configured to perform cell identification/measurement on neighbor cell’s NCD-SSB. **Delay requirements for NCD-SSB based measurement** Measurement delay requirements are introduced for RedCap UE when:Current requirements apply, no addition requirements are introduced.* *Note:  Requirements may be revisited once RAN4 has a clear definition and applicable scenarios for NCD-SSB.*

**Periodicity of NCD-SSB** The periodicity of NCD-SSB cannot be configured to be greater than 160ms.**Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting** No consensus on whether to support Reporting of RS type (NCD-SSB or CD-SSB) as part of RRM measurement reporting. **Serving cell threshold associated SSB**No consensus on whether whether the serving cell thresholds of SIntraSearchP/SIntraSearchQ/SnonIntraSearchP/SnonIntraSearchQ for IDLE/Inactive mode and s-MeasureConfig for Connected mode should be checked based on reference SSB measurement.**Inter-frequency without gap with capability**Reuse the existing ‘inter-frequency without MG’ capability signaling for redcap UE, and further discuss how to specify the requirements for UE supporting redcap and signaling of inter-frequency without MG in the future.**Inter-frequency without gap without capability**The MO#2 is the intra-frequency measurement without gap without capability based on latest RAN2’s agreements.**CSSF outside gap**Define the requirement based on the following update.* CSSFoutside\_gap,i =1, if only one MO is configured to be measured outside of MG for RedCap. The MO can be either intra-frequency MO without gap or inter-frequency MO without gap,
* Otherwise, CSSFoutside\_gap,i =2 for intra-frequency measurement, and CSSFoutside\_gap,i = 2\*Y for inter-frequency MO with no measurement gap, Y is the number of configured inter-frequency MOs without MG.
* Note: Only inter-frequency MOs without MG when none of the SMTC occasions of this inter-frequency measurement object are overlapped by the measurement gap are measured outside of MG

**Assumption on searcher** For RedCap UE, one searcher shall be shared with all frequency layers which are measured without gap.It was agreed to increase the number of attempts for PSS/SSS detection for 1 Rx RedCap UE in FR1, see [R4-2202670](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2202670.zip). Under this issue it is discussed how much (nr of attempts) to relax.* By 2 SMTC window as follows: non-DRX delay requirement: max( 600ms, ceil( 7 x Kp) x SMTC period ) x CSSFintra

**Whether to extend the lower bound in PSS/SSS detection delay in FR1 and FR2** No consensus to extend the lower bound in PSS/SSS detection delay in FR1 and FR2.**Extension of lower bound in time index detection delay with DRX** Following agreement was reached at previous meeting:

|  |
| --- |
| The lower bound in the time index detection delay is extended as follows:* + - * non-DRX delay requirement: max(160ms, ceil( 4 x Kp ) x SMTC period)x CSSFintra
 |

RAN4 shall clarify if the lower bound extension (as agreed at last meeting see the background) applies to the cases with DRX too.**How much to extend time index delay in FR1 (PBCH-DMRS detection)**The time index delay in FR1 is extended by 3 samples/SMTC, i.e. total 6 samples.**Whether lower bound in measurement period for 1 Rx requirements is extended in FR1**No consensus to extend the lower bound in measurement period for 1 Rx requirements is extended in FR1. **Relaxation of accuracy levels for FR1*** Absolute accuracy level for 1 Rx RedCap is relaxed by 1 dB compared to legacy requirements.
* Relative accuracy level for 1 Rx RedCap is relaxed by 1 dB compared to legacy requirements.

*Note: Test cases will be defined with AWGN channel following the same principle as in Rel15/16 requirements.***SIB1 decoding delay for CGI reading**12 samples are needed for 1Rx RedCap UE to achieve the SIB1 90% successful rate.**Assistance information for CGI reading**It is up to RAN2 whether:* If indicated by network, UE will further report the NCD-SSB information (such as SSB-frequency, SCS etc.) together with global cell ID when UE reporting the CGI.

**Inactive state eDRX intra-frequency cell reselection requirements**Option 1 is agreed for intra-frequency cell reselection requirements for eDRX inactive state* Option 1: Measurement requirements for inactivate state (serving cell, intra/inter frequency) Redcap UE are based on inactive DRX or inactive eDRX when inactive eDRX is configured

For serving cell measurement, agree on Option 2: * Option 2: Based on the paging monitoring cycle of T agreed in RAN2

**Scenario to be considered for Rel-17 RRM relaxation for Redcap UE when both Rel-16 and Rel-17 criteria are configured:*** Rel-16 low mobility & Rel-16 not-at-cell-edge & Rel-17 stationary

UE follows the most relaxed requirements between Rel-16 low mobility and not-at-cell-edge criteria, and Rel-17 stationary criteria.**Requirements for transition when UE moves between different R17 states**No need to introduce transition requirements for relaxed measurements for switching between IDLE/INACTIVE and CONNECTED states.**Principle on RRM relaxation for eDRX with PTW**Relax RRM requirements for eDRX with PTW * For eDRX with PTW: For the single relaxation criterion, if Rel-16/17 relaxed measurement requirements can be applied with eDRX cycles greater than 10.24 seconds (with PTW), the relaxed RRM measurement period for PHY filtering shall not be cross different PTW windows. Scaling factor is 6
* FFS on the conditions that the scaling factor applies.

For two relaxation criteria, when the UE has met two relaxation criteria, the UE is allowed to reuse the fixed long measurement period of 4 hours.For eDRX without PTW* For two relaxation criteria, when the UE has met two relaxation criteria, the UE is allowed to reuse the fixed long measurement period of 4 hours.

**RRM relaxation triggering indicator combineRelaxedMeasCondition2** combineRelaxedMeasCondition2 has already taken into account in the endorsed CR.**On RRM relaxation principles for RRC\_CONNECTED mode*** no relaxation states in CONNECTED mode” is confirmed.

**On how to evaluate RRM relaxation criteria at RRC\_CONNECTED mode**No new UE behaviour/requirements are needed on how to evaluate RRM relaxation criteria at RRC\_CONNECTED mode**Whether UE shall report fulfilment of relaxation when performing CGI reading?**Do not discuss the issue related to CGI reading requirement in RAN4**On CD-SSB and NCD-SSB(s) transmission time**It’s feasible to configure a time offset between CD-SSB and corresponding NCD-SSB.**Detail configurations on the offset between CD-SSB and NCD-SSB**The offset configuration is left to network**Configuration on the offset and periodicity of NCD-SSB**It is a RAN2’s issue |

RAN4 made the following agreements related to **RRM performance requirements**:

|  |
| --- |
| Applicability requirements for RedCap test cases are introduced in A.3x.All RRM test cases are introduced for FDD, TDD and HD-FDD UEs.RedCap SS-RSRQ accuracy level is derived by relaxing the legacy SS-RSRQ accuracy level by the same level as agreed for RedCap SS-RSRP measurement compared to legacy SS-RSRP measurement.RedCap SS-SINR accuracy level is derived by relaxing the legacy SS-SINR accuracy level by the same level as agreed for RedCap SS-RSRP measurement compared to legacy SS-RSRP measurement.RRM performance part work plan was agreed in [R4-2211050](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2211050.zip).Test case list was agreed in [R4-2210595](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/R4-2210595.zip). |

#### 2.4.2 Remaining Open issues

UE demodulation requirements:

* Agreement of the detailed test parameters for UE demodulation and CSI reporting requirements.
* Alignment of simulation results for UE demodulation requirements.
* Draft CRs for UE demodulation and CSI reporting requirements.

RRM performance requirements:

* Test configurations
* CRs containing the test cases

## 4 References

RAN1#109-e

43 contributions (for details see agenda item 8.6 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/TDoc_List_Meeting_RAN1%23109-e.xlsx))

RAN2#118-e

85 contributions (for details see agenda item 6.12 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_118-e/Docs/TDoc_List_Meeting_RAN2%23118-e.xlsx))

RAN3#116-e

7 contributions (for details see agenda item 9.1.12 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG3_Iu/TSGR3_116-e/Docs/TDoc_List_Meeting_RAN3%23116-e.xlsx))

RAN4#103-e

189 contributions (for details see agenda item 9.19 in [Tdoc list](https://www.3gpp.org/ftp/tsg_ran/WG4_Radio/TSGR4_103-e/Docs/TDoc_List_Meeting_RAN4%23103-e.xlsx))