3GPP TSG-RAN WG2 #117-e Tdoc R2-220XXXX

Electronic meeting, Feb 21st – Mar 3rd, 2022

Agenda Item: 8.12.2.2.1

Source: Ericsson (Rapporteur)

Title: Email discussion report for [AT117-e][105][RedCap] CP open issues

Document for: Discussion, Decision

# 1 Introduction

Prior to RAN2#117-e, there was an offline discussion based on the list of open issues captured in [R2-2201887](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201887.zip) and [R2-2201889](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201889.zip) as the outcome of the related offline discussions after RAN2#116bis-e regarding TS 38.331 and TS 38.304, respectively. The outcome of this discussion is captured in [R2-2203502](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203502.zip).

In [R2-2203502](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203502.zip), the following observations were made

**Observation 1** It is up to network implementation to configure MO on CD-SSB (in addition to configuring a MO on NCD-SSB) even if the network does not expect the UE to perform neighbor cell measurements thereon.

**Observation 2** It is up to network implementation, but it is expected that the network configures a MO on the NCD-SSB frequency if it wants the UE to use it only for serving cell measurements when some neighbor cells do not send an SSB on UE’s NCD-SSB frequency.

**Observation 3** It is up to network implementation, but it is expected that network refers to MO on NCD-SSB explicitly from within the ServingCell configuration (similarly to servingCellMO) when some neighbor cells do not send an SSB on UE’s NCD-SSB frequency.

**Observation 4** It is possible for the network to configure a UE with multiple NCD-SSBs.

**Observation 5** It is sufficient to configure at least one of the MOs configured on CD-SSB or NCD-SSB in the current active BWP, if contained, in servingCellMO.

and the rapporteur proposed the following based on the discussion:

**Proposals for agreement**

**Proposal 3** The following working assumption is confirmed: “System information can provide information on which frequencies accept RedCap UE access (e.g. by considering whether supporting RedCap)”

**Proposal 5** The invalid configuration where INACTIVE eDRX cycle is configured but IDLE eDRX cycle is not configured, is captured in the field description of the parameter *ran-ExtendedPagingCycle*.

**Proposal 6** The invalid configuration where INACTIVE eDRX cycle is longer than IDLE eDRX cycle, is captured in the field description of the parameter *ran-ExtendedPagingCycle*.

**Proposal 9** In Rel-17, one spare value is sufficient for the parameter ExtendedPagingCycle-r17.

**Proposal 12** For the handover case; if the target gNB does not configure RRM relaxation for a UE, the UE shall not perform the evaluation of the Relaxed measurement criterion for a stationary UE, i.e. the UE shall not perform the procedural text of 5.7.4.X.

**Proposal 13** When network configures both R16/R17 relaxation criteria and the UE fulfils both, it is up to UE implementation to perform either Rel-16 or Rel-17 relaxation method.

**Proposal 14** It is up to UE implementation when to start the RRM relaxation if multiple methods are configured.

**Proposal 15** A MO is configured on the NCD-SSB for the UE to perform neighbour cell measurement (as in legacy).

**Proposal 16** *servingCellMO* is configured to the MO on the CD-SSB when RedCap specific BWP of a UE contains neither CD-SSB nor NCD-SSB.

**Proposal 17** There is no need to restrict the network from configuring a UE with multiple NCD-SSBs.

**Proposal 18** The working assumption “The periodicity of NCD-SSB shall be not less than the periodicity of serving cell’s CD-SSB.” is confirmed.

**Proposal 19** It is not possible to indicate NCD-SSB in the handover command.

**Proposal 20** The discussion on whether a non-RedCap UE should be able to use NCD-SSB instead of CD-SSB is deprioritized in Rel-17.

**Proposals for further discussion**

**Proposal 1** Discuss whether UE should consider IFRI as “allowed” or follows the IFRI in MIB when i) cell does not indicate support for RedCap UEs or ii) Red Cap UE is unable to acquire SIB1.

**Proposal 2** Discuss whether UE should follow legacy IFRI in MIB or acquire SIB1 and follow the RedCap-specific IFRI provided in SIB1 when cellBarred in MIB is set to barred.

**Proposal 4** Support for Half-Duplex FDD RedCap is indicated in SIB1.

**Proposal 7** UE should consider the RRC\_IDLE eDRX cycle for comparing with the modification period for both RRC\_IDLE and RRC\_INACTIVE to decide if eDRX acquisition period is used.

**Proposal 8** If Proposal 7 is agreed, it is captured with the following change in TS 38.331:

2>          if the UE is in RRC\_IDLE, configured with an eDRX cycle longer than the modification period and the *systemInfoModification-eDRX* bit of Short Message is set:

**Proposal 10** Working assumption: The number of most significant bits that should be used for UE\_ID\_H is 12.

**Proposal 11** Discuss whether 13 bits should be used instead as the number of most significant bits that is used for UE\_ID\_H.

Note: The rapporteur would like to update Proposal 17 above as follows: “A RedCap UE may be configured with with multiple NCD-SSBs.”

Contact information

|  |  |
| --- | --- |
| Company | Contact person - email@address.com |
| Ericsson | Emre A. Yavuz – emre.yavuz@ericsson.com |
| OPPO | Haitao Li (lihaitao@oppo.com) |
| Huawei, HiSilicon | Yulong (shiyulong5@huawei.com) |
| MediaTek | Pradeep Jose – pradeep dot jose at mediatek dot com |
| Qualcomm | Linhai He (linhaihe@qti.qualcomm.com) |
| Apple | Naveen Palle (naveen.palle@apple.com) |
| Sequans | Noam Cayron - noam.cayron@sequans.com |
| Intel | Yi Guo (yi.guo@intel.com) |
| DENSO | Hideaki Takahashi (hideaki.takahashi.j6e@jp.denso.com) |
| NEC | Hisashi Futaki (hisashi.futaki @ nec.com)  |
| Spreadtrum | Lifeng Han (Lifeng.Han@unisoc.com) |
| ZTE | LiuJing (liu.jing30@zte.com.cn) |
| LGE | HyunJung Choe (stella.choe@lge.com) |
| Vivo | Chenli (Chenli5g@vivo.com) |
| CATT | Xiangdong Zhang (zhangxiangdong@catt.cn ) |
| Samsung | Seungbeom Jeong (s90.jeong@samsung.com) |
| Futurewei | Yunsong Yang (yyang1@futurewei.com) |
| Nokia | Jussi Koskinen (jussi-pekka.koskinen@nokia.com) |

# 2 Discussion

### 2.1 Feedback based on the outcome of the Pre117-e offline

**Q 2.1.1** Do you have any comments/suggestions regarding the proposals for agreement above? Please elaborate your reply and provide an alternative formulation that addresses your concerns while capturing the feedback from other companies provided during the Pre-117-e offline.

|  |  |
| --- | --- |
| **Company** | **Comments** |
| OPPO | We have concerns on proposal 3 as the coarse granularity makes it less useful in real deployment because if one neighbor cell does not support RedCap UEs, network has to indicate the whole frequency as not supporting RedCap UEs and this will prohibit RedCap UE from reselecting to other cells on that frequency. We strongly believe that it should be indicated per neighbor cell list. |
| Huawei, HiSilicon | One general comment is that we should agree those observations as proposals for important clarifications.P14 is fine, but the formulation is too general to indicate the intention. We suggest to clarify.Proposal 14  It is up to UE implementation when to start the RRM relaxation if multiple methods are configured (i.e. UE implementation on whether to wait for measurement of the 2nd criterion to conclude, after 1st criterion is fufilled.).Proposal 15        A MO is configured on the NCD-SSB for the UE to perform neighbour cell measurement (as in legacy) for scenario a (i.e. all neighbour cells send SSBs on UE’s NCD-SSB frequency).Observation 1     It is up to network implementation to configure MO on CD-SSB (in addition to configuring a MO on NCD-SSB) even if the network does not expect the UE to perform neighbour cell measurements thereon, for scenario a (i.e. all neighbour cells send SSBs on UE’s NCD-SSB frequency).In the discussion phase, the question of P15 is asked on scenario a. Companies support this proposal with the limitation to scenario a, but not b. So, we need to clarify as above. This also applies to observation 1.Also, with P15 and O1 agreed, do we assume approach 1 as agreed?Observation 2b     It is up to network implementation, but it is expected that the network configures a MO on the NCD-SSB frequency if it wants the UE to use it only for serving cell measurements when some neighbour cells do not send an SSB on UE’s NCD-SSB frequency.It seems we miss the description/assumption part on scenario b in the proposals/observations, as rapporteur stated in the email discussion. Observation2 is reasonable if we clarify that. I copy the wording from rapporteur clarification in scenario b, and suggest to also agree that.Proposal2a/Observation 2a: **When some neighbor cells do not send an SSB on UE’s NCD-SSB frequency, measurements should be done on the CD-SSB frequency**, otherwise, the UE may end up in a neighbour cell without noticing it and without providing a corresponding measurement report to its serving gNB.Observation 3     ~~It is up to network implementation, but~~ it is expected that network refers to MO on NCD-SSB explicitly from within the *ServingCell* configuration (similarly to servingCellMO) when some neighbour cells do not send an SSB on UE’s NCD-SSB frequency.Majority companies agree that “it is expected that network refers xxx” is the correct behaviour. We need to delete “It is up to network implementation”.~~Observation 4     It is possible for the network to configure a UE with multiple NCD-SSBs.~~Proposal 17        It is possible for the network to configure a UE with multiple NCD-SSBs. There is no need to restrict the network from configuring a UE with multiple NCD-SSBs.Observation 4 and P17 should be agreed together. Otherwise, P17 seems ambiguity on the “restrict”. We suggest to merge O4 into P17. Rapporteur suggested update is also good “A RedCap UE may be configured with multiple NCD-SSBs.”Observation 5     It is sufficient to configure at least one of the MOs configured on CD-SSB or NCD-SSB in the current active BWP, if contained, in servingCellMO.We are not sure if the proposal is clear. If our understanding on O5 is correct, we support if it can be clarified as “Proposal : In servingCellMO, each active BWP will be configured with MO, either configured on CD-SSB or NCD-SSB, if contained.” |
| MediaTek | Ok with all proposals for agreement |
| Qualcomm | We are fine with all the “proposals for agreement” |
| Apple | We have same concerns as Oppo on proposal 3. We also would like to revise proposal 18 to have the NCD-SSB with same periodicity as CD-SSB… if the NCD-SSB is longer, then the effectiveness of NCD-SSB is not the same as CD-SSB and in CONNECTED mode, the UE trying to use CD-SSB can result in meas-gaps that the NW is not aware.  |
| Sequans | We are fine with the proposal for agreements and with HW’s comments, especially on introducing the observations as agreements.For P3, we don’t see why a single cell would affect the indication either way (if only one supports or if only on does not support) – it is up to the NW to make a sensible indication; it is assistance information, not a promise from NW that all cells will be suitable/acceptable |
| Intel | We are fine with all above proposals .  |
| DENSO | On Proposal 16 and 17, although we’re fine that UE is configured with multiple NCD-SSBs (i.e. Proposal 17), Proposal 16 is better to be clarified whether only 1 servingCellMO is configured for the UE as in the legacy or multiple servingCellMO can be configured, which is different from the legacy. For simplicity, we’re of opinion that 1 servingCellMO is enough which is the MO for either CD-SSB or NCD-SSB. If the active BWP does not contain (N)CD-SSB configured as servingCellMO, a measurement gap is configured for the UE.  |
| NEC | We are fine with all proposals for agreements.For P3, we have the same view as Sequans for the comment from Oppo. |
| Spreadtrum | OK with all the proposals for agreement. |
| ZTE | We have the same comments as DENSO on proposal 16 and 17, it is more important to clarify the spec impact behind the proposals, and we also think there is no need to introduce additional servingCellMO IEs, the legacy IE is sufficient for Rel-17 RedCap. Regarding the comments from Huawei, we think there is no need to highlight “for scenario a (i.e. all neighbour cells send SSBs on UE’s NCD-SSB frequency)”, from UE perspective, the UE does not need to know the deployment of neighbour cells, it just follows the RRM configuration provided by the network. So we’d better focus on UE behavior and identify potential spec impact at this stage. |
| LGE | We are ok with all the proposals for agreements. |
| Vivo | We are fine to follow the majority to agree the proposals above even we donot agree P15 exactly.Besides, we also prefer to agree the observations above to help figure out a full picture for NCD-SSB.  |
| Samsung | Regarding Proposal 13, there is an LS from RAN4 (i.e., R2-2202163). It shows RAN4's agreement for cases when both Rel-16 and Rel-17 RRM relaxation are configured.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| When both Rel-16 and Rel-17 relaxation criteria are configured, RAN4 agrees that the following cases will be considered in idle and inactive mode:

|  |  |  |  |
| --- | --- | --- | --- |
| 7 | Rel-16 low mobility | Rel-17 stationary | Allowed |
| 8 | Rel-16 not-at-cell-edge  | Rel-17 stationary | NO  |
| 9 | Rel-16 low mobility & Rel-16 not-at-cell-edge  | Rel-17 stationary | TBD |
| 10 | Rel-16 low-mobility | Rel-17 stationary & Rel-17 not-at-cell-edge | Allowed |
| 11 | Rel-16 not-at-cell-edge | Rel-17 stationary & Rel-17 not-at-cell-edge | TBD |
| 12 | Rel-16 low mobility & Rel-16 not-at-cell-edge | Rel-17 stationary & Rel-17 not-at-cell-edge | TBD |

 |

We wonder if RAN4 plans to determine RRM relaxation method for "Allowed" cases (possibly including "TBD" cases). If so, RAN2 should not agree Proposal 13. |
| Futurewei | We are fine with all the “proposals for agreement” and also fine with adding observations as suggested by Huawei. |
| Xiaomi | We also have similar question with DENSO on proposal 16 whether we can configure multiple servingCellMOs or keep a single servingCellMO as in legacy way. |
| Nokia | We are ok with proposals |

**Summary – Q 2.1.1**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

In [R2-2203502](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203502.zip), ZTE and MediaTek indicated in their replies to Q2.2.6 that if 12 bits were to be used, we would end up with 4 PTW\_start positions instead of 8, as intended, when TeDRX,H is equal to 1024 Hyper-frames. Some companies think it would be good to discuss this aspect further based on the feedback provided by ZTE and MediaTek.

**Q 2.1.2** Do you agree that the number of most significant bits used for UE\_ID\_H should be 13? Please elaborate your reply.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes |  |
| MediaTek | Yes | As indicated over the reflector, 13 bits are needed for the case of 1024HFN eDRX cycle to work correctly.PTW start is derived using ieDRX\_CN which is determined by floor(UE\_ID\_H /TeDRX) mod 23. For the case where TeDRX is 1024 (210) and if a 12-bit UE ID is used, the formula reduces to:ieDRX\_CN = floor (212 UE ID value/210) mod 23= floor (22 UE ID value) mod 23which can only result in four values i.e. 0, 1, 2 and 3. With a 13bit UE ID, we would correctly have eight values (0, 1…7) for the PTW start  |
| Qualcomm | Yes |  |
| Apple | Yes |  |
| Sequans | Yes |  |
| Intel | Yes |  |
| DENSO | Yes |   |
| Spreadtrum | Yes |  |
| ZTE | Yes |  |
| LGE | Yes |  |
| Vivo | Yes |  |
| CATT | Yes |  |
| Samsung | Yes |  |
| Futurewei | Yes |  |
| Xiaomi | - | In case of extended DRX cycle, the maximum value of ‘N’ is 1024 as maximum value of T is 1024. The maximum number of POs in DRX cycle is 4096 if we configure Ns=4. So 2 bits are used to determine the Ns not the PTW\_start? |
| Nokia | Yes |  |

**Summary – Q 2.1.2**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

### 2.2 Discussion based on AI 8.12.4 on NCD-SSB aspects

In this section, companies are expected to provide feedback based on the Tdocs below:

[R2-2202318](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202318.zip) Discussion on RAN2 impacts on NCD-SSB and separate initial BWP vivo, Guangdong Genius

[R2-2202653](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202653.zip) Remaining issues on separate initial BWP and NCD-SSB for RedCap UEs ZTE Corporation, Sanechips

[R2-2202998](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202998.zip) Left open issues on NCD-SSB OPPO

[R2-2203057](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203057.zip) Discussion on NCD-SSB aspects for RedCap UE Huawei, HiSilicon

[R2-2203078](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203078.zip) Discussion on the open issues of NCD-SSB CATT

[R2-2203505](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203505.zip) Monitoring POs in connected mode when using NCD-SSB Ericsson

[R2-2203508](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203508.zip) C-plane related open issues on NCD-SSB DENSO CORPORATION

In [6], the following proposals are made:

**Proposal 1** From RAN2 perspective, NCD-SSB should be used for the measurement for RLM/BFD in connected mode if the active BWP including NCD-SSB but without CD-SSB. The corresponding requirements for NCD-SSB measurement should be discussed and determined in RAN4.

**Proposal 2** From RAN2 perspective, NCD-SSB should be used for the measurement for RRM measurement of serving cell and neighbouring cell(s) in connected mode if the active BWP including NCD-SSB but without CD-SSB. The corresponding requirements for NCD-SSB measurement should be discussed and determined in RAN4.

**Proposal 3** If PRACH occasions on the active BWP is not configured for Redcap, RedCap UEs shall use the RedCap-specific initial UL BWP, if configured, to perform RACH.

The rapporteur assumes that Proposals 1 and 2 have been covered in the offline discussion [105]. In RAN2#116bis-e, the following agreement was made: “If a RedCap-specific initial UL BWP is configured for RACH, RedCap UEs shall use only the RedCap-specific initial UL BWP to perform RACH.” Regarding proposal 3; considering that this agreement was made within the context of idle/inactive mode, the rapporteur thinks it would be good to have a discussion on the connected mode related aspects.

**Q 2.2.1** If RA occasions are not configured on the active BWP, do you think that RedCap UEs should use the RedCap-specific initial UL BWP, if configured? Please elaborate your reply.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes, but | This proposal is also somehow discussed in the MAC offline. It depends on whether UE can be configured with the RedCap-specific initial UL BWP in connected as UE specific configuration, which may also need to be confirmed in Q 2.2.4. |
| MediaTek | Yes | This is aligned with legacy behaviour in the MAC spec (section 5.15) |
| Qualcomm | Yes | We need to be more precise about what exactly this initial UL BWP is:* If RedCap UE has both an initial UL BWP configured by dedicated signaling and an initial UL BWP configured by common signaling, then this UE should use the initial UL BWP configured by dedicated signaling (which we don’t think should be called RedCap-specific initial UL BWP);
* If RedCap UE has only an initial UL BWP configured by common signaling which is specific for RedCap UEs only, then this UE should use the RedCap-specific initial UL BWP.
 |
| Apple | Yes but | Along with same thinking as Qualcomm, we would also like to confirm that the RedCap UE is always configured with RA atleast in an initial UL BWP (either legacy in case RedCap UE shares the legacy initial UL BWP or in RedCap specific initial UL BWP). |
| Sequans | Yes |  |
| Intel | Yes |  |
| DENSO | Yes |  Agree with Apple that RACH is configured by two scenarios; one is to share the initial UL BWP used for legacy UEs, and the other is to prepare the RedCap specific initial UL BWP. |
| NEC | Yes |  |
| Spreadtrum | Yes |  |
| ZTE | Yes |  |
| LGE | Yes |  |
| Vivo | Yes |  |
| CATT | Yes |  |
| Samsung | Yes | In addition, in such case, we think that the RedCap-specific initial "DL" BWP should also be used to avoid bwp-id confusion (as in the legacy) but this can be checked with RAN1. Note that this discussion is also covered by MAC offline [AT117-e][106][RedCap]. |
| Futurewei | Yes |  |
| Xiaomi | Yes | If RACH is configured on RedCap-specific initial UL BWP. |
| Nokia | Yes |  |

**Summary – Q 2.2.1**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

In [7], the following proposals are made:

**Proposal 1** For RedCap-specific BWP, both common and dedicate configuration are provided using full configuration. Delta configuration compared to legacy initial BWP is not supported.

**Proposal 2** In case RedCap-specific initial DL BWP contains CD-SSB, the PDCCH-ConfigCommon should include common search space configurations for paging, RAR, SIB1 and OSI. Absence of the field means the UE does not receive corresponding message (same as in legacy). For SIB1 and OSI, the search space configurations are aligned with the configurations in legacy initial DL BWP.

**Proposal 3** If RedCap-specific initial BWP is configured, the cell barring determination is performed based on the bandwidth of RedCap-specific initial BWP instead of legacy initial BWP.

**Proposal 4** For RedCap in RRC Connected mode, to discuss whether the network is allowed to only configure the common part of RedCap-specific initial BWP (as for legacy initial BWP).

**Proposal 5** RedCap UE should mandatorily support RedCap-Specific initial BWP.

**Proposal 6** NCD-SSB is per cell configured, not per BWP. The frequency and periodicity configuration of NCD-SSB can be defined in ServingCellConfig.

**Proposal 7** One BWP contains more than one SSBs (e.g. CD-SSB and/or NCD-SSB) is not supported in Rel-17.

The rapporteur assumes that Proposal 5 needs to be discussed in RAN1 and there is no need to discuss Proposal 3 assuming that configuring a RedCap-specific initial BWP with a larger bandwidth than a RedCap can support is misconfiguration. Proposals 6 and 7 have been covered in the offline discussion [105]. The rest of the proposals are addressed below:

**Q 2.2.2** For RedCap-specific BWP, do you think both common and dedicated configurations should be provided using full configuration, i.e., delta configuration is not supported. Please elaborate your reply.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes | Full configuration is simple. |
| Huawei, HiSilicon | Yes, but | Fine to use the full configuration.But we want to clarify that in the R1 LS on the parameters RedCap-specific BWP, there are only few explicity paramters to be configured differently with legacy ones. For others, we will not design/add RedCap-specific BWP parameters in ASN.1 (i.e. always reuse the legacy onces), which makes the SIB1 size acceptable.  |
| MediaTek | Yes | Delta signalling is an unnecessary optimization that can result in more corner cases to deal with.  |
| Qualcomm | Yes |  |
| Apple | Yes, we can accept this. |  |
| Sequans | Yes | Delta configuration will require unnecessary additional specification effort, but we are fine to go with majority |
| Intel | Yes for common configuration;No for dedicated configuration; | Full configuration shall be used for common configuration. But for dedicated configuration, we should reuse delta signalling if possible.  |
| DENSO | Yes with comments | Whilst we agree that full configuration is simple, it is worthwhile the other way to reduce the SIB1 size, as much as possible. According to the higher layer parameter list in R1-2112976, if the RedCap-specific initial DL/UL configuration is not configured, RedCap UE uses the same initial DL/UL BWP as non-RedCap UEs on condition that the maximum bandwidth does not exceed the RedCap UE maximum bandwidth. This implies that even though the configurations except for the maximum bandwidth is common and can be used for both non-RedCap and RedCap UE, the network has to configure the separate initial DL/UL BWP specific to RedCap UE. If there is a scenario that only the maximum bandwidth is different and the rest is the same, only the RedCap specific maximum bandwidth can be added into the existing initial DL/UL BWP configuration. Namely, RedCap specific “*locationAndBandwidth*” is added in the existing *BWP-Donlink/UplinkCommon*. |
| NEC | Yes | We think this is simpler and sufficient. |
| Spreadtrum | Yes | It is simple. |
| ZTE | Yes | On how to configure RedCap-specific initial UL/DL BWP, it seems RAN1 has not discussed the signalling details. In our understanding, it is simpler to refer to the entire BWP-DownlinCommon and BWP-UplinkCommon structures in SIB1. Because most physical channel/resources are configured with respective to PRB0 (the lowest boundary of BWP), see below example, so it may not work if only separate *locationAndBandwidth* is provided.

|  |
| --- |
| ***msg1-FrequencyStart***Offset of lowest PRACH transmission occasion in frequency domain with respective to PRB 0. The value is configured so that the corresponding RACH resource is entirely within the bandwidth of the UL BWP. (see TS 38.211 [16], clause 6.3.3.2). |

 |
| LGE | Yes |  |
| Vivo | Yes | Full configuration is simpler.  |
| CATT | Yes |  |
| Samsung | Yes | - |
| Futurewei | Yes |  |
| Xiaomi | YEs |  |
| Nokia | Yes |  |

**Summary – Q 2.2.2**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

**Q 2.2.3** In case RedCap-specific initial DL BWP contains CD-SSB, do you think *PDCCH-ConfigCommon* should include common search space configurations for paging, RAR, SIB1 and OSI? Please elaborate your reply and comment on whether search space configurations for SIB1 and OSI should be aligned with the configurations in legacy initial DL BWP.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes | By doing so, RedCap UEs don’t need to switch to the legacy initial DL BWP. |
| MediaTek | Yes | Also agree that the search space configurations for SIB1 and OSI needs to be aligned with legacy initial DL BWP |
| Qualcomm | Yes |  |
| Apple | Yes |  |
| Sequans | Yes | Agree with OPPO |
| Intel | Yes |  |
| DENSO | Yes |  |
| NEC | Yes |  |
| Spreadtrum | Yes |  |
| Huawei, HiSilicon | No?See comment | This is the case where RedCap-specific initial DL BWP and the legacy initial DL BWP overlap on the CD-SSB. Then the NW only transmits on one common search space for each of the paging, SIB1 and OSI, but not two. So, this is the legacy common search space configuration. If that is the case, we agree (as commented by MediaTek).Otherwise, why does UE need two set of common search space?Regarding to OPPO’s comment, “in case RedCap-specific initial DL BWP contains CD-SSB“, there is no BWP switch anyway. |
| ZTE | Yes | Regarding HW’s comments, we think the network transmits the same set of SIB1 and OSI messages, but the common search space configuration can be indicated in both legacy initial DL BWP and separate initial DL BWP. Then the UE is not required to read the configuration from two BWPs. ***frequencyDomainResources***Frequency domain resources for the CORESET. Each bit corresponds a group of 6 RBs, with grouping starting from the first RB group in the BWP. |
| LGE | Yes |  |
| vivo | Yes  | It makes sense to align the search space configurations of RedCap-specific initial DL BWP for SIB1 and OSI with the configurations in legacy initial DL BWP. |
| CATT | Yes，with comment | If the redcap-specific initial DL BWP contains CD-SSB and the entire coreset#0, so it could get the SIB based on searchspace#0. So it is better to configure the PDCCH-ConfigCommon to include the search space configuration for paging, RAR, SIB1 and OSI.But if the redcap-specific initial DL BWP only contains CD-SSB but not contain the entire coreset#0, the PDCCH-configCommon doesn’t need to include search space for paging SIB1 and OSI. |
| Samsung | Yes | - |
| Futurewei | Yes |  |
| Xiaomi | See comments | Search space configurations for SIB1 and OSI should only be configured in legacy initial DL BWP. While for RedCap-specific initial DL BWP contains CD-SSB, the network can confiugre Paging only. Or it can be configured with RAR only or paging and RAR?And this need to be confirmed by RAN1. |
| Nokia | YEs |  |

**Summary – Q 2.2.3**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

**Q 2.2.4** For a RedCap UE in connected mode, do you think it should be restricted for the network to provide a dedicated configuration of a RedCap-specific initial BWP? Please elaborate your reply.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes | This is no motivation to prevent connected mode RedCap UEs from using the RedCap-specific initial BWP. |
| Huawei, HiSilicon | No | It seems better to say “network can provide a dedicated configuration of a RedCap-specific initial BWP”.Agree with the MediaTek below, to follow legacy. |
| MediaTek | No? | Don’t think the NW needs to be restricted here.I understood the proponent’s intention was to give the NW the freedom to provide (or not provide) a dedicated configuration corresponding to the RedCap-specific initial BWP, similar to the initial BWP in legacy UEs. If a dedicated configuration is provided for the RedCap-specific initial BWP, it would be considered as a RRC configured BWP.We support following legacy initial BWP behaviour for the RedCap-specific initial BWP as well. |
| Qualcomm | No | We share the same view as MediaTek |
| Apple | No | Share views with MediaTek. In addition, we would also note that even for legacy devices, communication with the NW is possible without dedicated config (just using common), and similar common config can be possible with RedCap. |
| Sequans | No | We don’t usually restrict the NW if there is no compelling reason, HW’s wording is fine. Agree that we need to clarify the naming for this BWP configured by dedicated signalling; some allusion to RedCap (RedCap RRC configured BWP?) may be needed to differentiate the cases where NCD SSBs may be relevant. |
| Intel |  | It is network implementation; |
| DENSO | No | We prefer to apply the BWP configuration Option 1/2 to RedCap UE as in the legacy, unless a problem is found to do so. For Option 1, the dedicated configuration is not required for BWP#0, whilst for option 2, it is required.  |
| NEC | No? | We are a bit confused with this question which looks slightly different from original P4. then, we have similar view as MediaTek. |
| Spreadtrum | No | No need to restrict network’s configuration. |
| ZTE | No | The question is a bit misleading, as proponent of the proposal, our preference is same as above companies, that both BWP configuration Option 1 and 2 are applicable to RedCap-specific initial BWP. |
| LGE | No | No need to restrict the network configuration |
| vivo | ? | It is network implementation for the network to provide a dedicated configuration of a RedCap-specific initial BWP.  |
| CATT | No | It is up to NW implementation to decide whether configure a dedicated configuration of redcap-specific initial BWP.  |
| Samsung | No | Share the view with MediaTek and others. |
| Futurewei | No | No need to restrict network’s configuration. |
| Xiaomi | No | RAN1 has agreed that BWP configuration Option 1/2 can be applied to RedCap UE as in the legacy |
| Nokia | No |  |

**Summary – Q 2.2.4**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

In [8] the following proposals are made:

**Proposal 1** NCD-SSB is applicable only for RedCap UEs.

**Proposal 2** There is no impact of NCD-SSB based RRM/RLM on BWP operation.

The rapporteur assumes that Proposals 1 and 2 have been covered in the offline discussion [105].

In [9], the following proposals are made:

**Proposal 1** Multiple NCD-SSB can be configured to one RedCap UE.

**Proposal 2** For serving cell measurement based on NCD-SSB in connected mode, MeasObjectId is configured for each NCD-SSB.

**Proposal 3** For serving cell measurement based on NCD-SSB, UE’s serving cell measurement object is the ssbFrequency associated with the NCD-SSB of its active BWP (i.e. UE changes the MO of servicing cell upon BWP switching).

**Proposal 4** NW can configure the time offset for NCD-SSB to RedCap UEs, e.g. using periodicityAndOffset.

**Proposal 5** In connected mode, neighbour cell measurements based on NCD-SSB is NOT supported for RedCap UEs.

**Proposal 6** Not to support non-RedCap UE using NCD-SSB instead of CD-SSB.

The rapporteur assumes that Proposals 1, 2, 3, 5 and 6 have been covered in the offline discussion [105].

**Q 2.2.5** Do you think it should be possible for the network to transmit CD-SSB and NCD-SSB(s) at different times by configuring an offset? Please elaborate your reply.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes |  |
| Huawei, HiSilicon | Yes | The power boosting may be used for CD-SSB, if the NCD-SSB is transmitted at the same time as CD-SSB, then the gNB cannot afford such a high transmission power, which results in a blocking issue. |
| MediaTek | Leave to RAN4 | From RAN2’s perspective, we see no need for such a configuration. However, we understand that there is a related discussion in RAN4, and we can wait for the conclusion from RAN4. |
| Qualcomm | Yes | It is desirable not to have CD-SSB and NCD-SSB transmitted at the same time. |
| Apple | Yes | But with same periodicity |
| Sequans | Yes |  |
| Intel | No strong opinion |  |
| DENSO | Leave to RAN4 | The technical motivation is reasonable. However, we agree with MediaTek that it should be up to RAN4 to decide. |
| NEC | No strong view | Shouldn’t this be decided by RAN4 or RAN1? |
| Spreadtrum | Yes |  |
| ZTE | Leave to RAN1/4 | In legacy spec, we don’t have such “offset” configuration, so from RAN2 perspective, it is unclear about the feasibility, and whether it may impact other features (e.g. timing)? We prefer to leave it to RAN1 and RAN4. We wonder whether the power concern can be addressed by different SSB transmission bitmap. |
| LGE | Yes | No strong view.  |
| vivo | Leave to RAN4 | We don’t see any need to have this restriction, but we are fine to leave it to RAN4. |
| CATT | Yes |  |
| Samsung | Leave to RAN4 | This can be discussed in RAN4. |
| Futurewei | Yes |  |
| Xiaomi | Leave to RAN1/4 |  |
| Nokia | Leave to RAN4 |  |

**Summary – Q 2.2.5**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

In [10], the following proposals are made:

**Proposal 1** A RedCap UE, which does not support CSI-RS, should be able to report “Not need NCD-SSB” as an optional UE capability

LS can be sent to RAN1 to confirm the motivation of “Not need NCD-SSB” if necessary

**Proposal 2** A non-RedCap UE should not be able to use NCD-SSB instead of CD-SSB with an optional capability at least in Rel-17.

The rapporteur assumes that Proposals 2 has been covered in the offline discussion [105] and for Proposal 1 it is rapporteur’s understanding that this is already agreed in RAN1 so there is no need for further discussion or confirmation.

In [11], the following proposal is made:

**Proposal 1** Discuss whether/how to introduce a mechanism for the network to provide SI or SIB6/SIB7/SIB8 to a UE configured with a DL BWP that does not contain CD-SSB after a notification for system information update or ETWS and/or CMAS is transmitted.

**Q 2.2.6** Do you think that a mechanism for the network to provide SI or SIB6/SIB7/SIB8 to a UE configured with a DL BWP that does not contain CD-SSB after a notification for system information update or ETWS and/or CMAS is transmitted? Please elaborate your reply and “how”, especially if you reply “Yes”.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO |  | It is not clear what mechanism is proposed in [11]. |
| MediaTek | No new mechanism needed | For Idle mode, there isn’t an issue to resolve.We agree that in connected mode, providing emergency notifications in SIB6/7/8 to a UE is important. However, we already have a mechanism defined, i.e. *dedicatedSystemInformationDelivery* IE in *RRCReconfiguration* message.  |
| Qualcomm | No | Network can use dedicated signaling to provide those SIBs, which already available in legacy as pointed out by MediaTek. |
| Apple | No new mechanism is needed | Existing procedures of legacy can be used here. |
| Sequans | No | Agree with MediaTek |
| Intel | no | Existing procedure, i.e. dedicated signalling can be used.  |
| DENSO | No | Agree that the existing dedicated SI delivery can be used for ETWS/CMAS SIBs. |
| NEC | No new mechanism | Just like legacy, network can send those SI to the corresponding UEs by dedicated RRC signaling. |
| Spreadtrum | No | The legacy mechanism can be used for providing SI to Connected UE. |
| Huawei, HiSilicon | No | Agree with MediaTek. |
| ZTE | No | Same view as above companies. |
| LGE | No | Same view as above companies. |
| vivo | No | The current dedicated signaling is sufficient. |
| CATT | No |  |
| Samsung | No | Same view as MediaTek that the issue was already addressed in Rel-15, so no new mechanism would be needed. |
| Futurewei | No | Agree with MediaTek. |
| Xiaomi | No |  |
| Nokia | No |  |

**Summary – Q 2.2.6**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

In [12], the following proposals are made:

**Proposal 1** Upon submitting the RRCSetupRequest/RRCResumeRequest message to the lower layer, if the RedCap UE is in the separate DL BWP where CD-SSB is not present, the RedCap UE does not have to continue cell re-selection related measurements as well as cell re-selection evaluation.

**Proposal 2** Upon the failure of RRC connection setup/resume, if the RedCap UE is in the separate DL BWP where CD-SSB is not present, the RedCap UE moves back to the default initial DL BWP where CD-SSB is present.

**Q 2.2.7** Upon submitting the *RRCSetupRequest/RRCResumeRequest* message to the lower layers, if the RedCap UE is in the separate DL BWP where CD-SSB is not present, do you think that RedCap UE should not continue cell re-selection related measurements as well as cell re-selection evaluation? Please elaborate your reply.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes | But whether UE continues measurement or not can be up to UE implementation. No need to mandate UE behaviors in spec. |
| Huawei, HiSilicon | Yes, but | It seems better to say “the RedCap UE does not have to continue cell re-selection xxx” |
| MediaTek | Yes | Once the UE is in the separate DL BWP where CD-SSB is absent, the UE would be unable to monitor the SSB to perform measurements for reselection, therefore making reselection evaluation pointless. |
| Qualcomm | Yes |  |
| Apple | Yes |  |
| Sequans | Yes | Agree with OPPO, HW |
| Intel | Yes | Agree to change it as “does not have to” |
| DENSO | Yes | Agree to align with the original proposal, “does not have to”. |
| NEC | Yes  | We also agree with Huawei |
| Spreadtrum | Yes |  |
| ZTE | Yes | Agree with OPPO and HW. |
| LGE | Yes |  |
| vivo | Yes | Agree with Huawei. |
| CATT | No | CATT |
| Samsung | Yes | Can be left to UE implementation. |
| Futurewei | Yes |  |
| Xiaomi | Yes |  |
| Nokia | Yes | Agree with Oppo |

**Summary – Q 2.2.7**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

**Q 2.2.8** Upon failure of *RRC connection setup/resume*, if the RedCap UE is in the separate DL BWP where CD-SSB is not present, do you think that RedCap UE should move back to the default initial DL BWP where CD-SSB is present? Please elaborate your reply.

|  |  |  |
| --- | --- | --- |
| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes | To receive SI and paging, etc. |
| MediaTek | Yes | Since the RACH procedure has failed, UE should go back to the default initial DL BWP for paging monitoring and reselection evaluation. |
| Qualcomm | Yes |  |
| Apple | Yes |  |
| Sequans | Yes |  |
| Intel | Yes |  |
| DENSO | Yes |  |
| NEC | Yes |  |
| Spreadtrum | Yes |  |
| Huawei, HiSilicon | See comment | The intention is correct but no need of agreement.The failure of RRC connection setup/resume means UE will stay in IDLE/inacitve, as in legacy. And the UE behaviors in IDLE/inacitve have been agreed to camped on CD-SSB.BTW, “default initial DL BWP“ means the leagcy non-RedCap-specific BWP, right? |
| ZTE | Yes | We are ok with the intention, but seems no need to capature it in spec. |
| LGE | Yes |  |
| vivo | Yes with comments | At least the original proposal is not exact enough. As we have agreed that RedCap UE only performs cell (re-)selection and measurements on the CD-SSB, hence it has to go bake the default initial DL BWP or CORESET0 when the initial DL BWP can’t support RedCap. |
| CATT | Yes | To receive SI and paging and perform cell reselection measurement |
| Samsung | Yes | - |
| Futurewei | Yes |  |
| Xiaomi | Yes | The UE only camps on initial DL BWP associated with CD-SSB. |
| Nokia | Yes |  |

**Summary – Q 2.2.8**

TBD

Based on the observations above, the rapporteur proposes the following:

1. ???

# 3 Conclusion

Based on the discussion above the following proposals have been made:

[Proposal 1 ???](#_Toc96429434)

[Proposal 2 ???](#_Toc96429435)

[Proposal 3 ???](#_Toc96429436)

[Proposal 4 ???](#_Toc96429437)

[Proposal 5 ???](#_Toc96429438)

[Proposal 6 ???](#_Toc96429439)

[Proposal 7 ???](#_Toc96429440)

[Proposal 8 ???](#_Toc96429441)

[Proposal 9 ???](#_Toc96429442)

[Proposal 10 ???](#_Toc96429443)

# References

1. [R2-2201886](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201886.zip) Running 331 CR for RedCap Ericsson
2. [R2-2201887](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201887.zip) Open issue list for 38.331 for RedCap Ericsson
3. [R2-2201888](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201888.zip) Running 304 CR for RedCap Ericsson
4. [R2-2201889](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201889.zip) Open issue list for 38.304 for RedCap Ericsson
5. [R4-2201780](http://www.3gpp.org/ftp//tsg_ran/WG4_Radio/TSGR4_101-bis-e/Docs//R4-2201780.zip) Discussion on the use of NCD-SSB MediaTek
6. [R2-2202318](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202318.zip) Discussion on RAN2 impacts on NCD-SSB and separate initial BWP vivo, Guangdong Genius
7. [R2-2202653](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202653.zip) Remaining issues on separate initial BWP and NCD-SSB for RedCap UEs ZTE Corporation, Sanechips
8. [R2-2202998](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2202998.zip) Left open issues on NCD-SSB OPPO
9. [R2-2203057](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203057.zip) Discussion on NCD-SSB aspects for RedCap UE Huawei, HiSilicon
10. [R2-2203078](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203078.zip) Discussion on the open issues of NCD-SSB CATT
11. [R2-2203505](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203505.zip) Monitoring POs in connected mode when using NCD-SSB Ericsson
12. [R2-2203508](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_117-e/Docs/R2-2203508.zip) C-plane related open issues on NCD-SSB DENSO CORPORATION