3GPP TSG-RAN WG2 #116bis-e draftTdoc R2-2201738

Electronic meeting, Jan 17th – 25th January 2022

Agenda Item: 8.12.2.2

Source: Ericsson (Rapporteur)

Title: NCD-SSB and Initial BWP aspects

Document for: Discussion, Decision

# 1 Introduction

RAN1 sent an LS to RAN2 and RAN4 on use of NCD-SSB instead of CD-SSB in [R1-2112802](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_107-e/Docs/R1-2112802.zip) and asked for feedback from RAN2 and RAN4 on whether the working assumptions are acceptable from RAN2 and RAN4 perspectives, respectively.

In RAN2#116bis-e, a report is prepared to summarize the Tdocs listed below:

* [R2-2200190](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200190.zip) Discussions on RedCap-specific BWPs Qualcomm Incorporated
* [R2-2200287](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200287.zip) Open issues on Early identification, camping restrictions and NCD-SSB Intel Corporation
* [R2-2200401](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200401.zip) BWP configuration for RedCap UE DENSO CORPORATION
* [R2-2200554](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200554.zip) Identification and access restriction of RedCap UE, and NCD-SSB related issuesHuawei, HiSilicon
* [R2-2200597](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200597.zip) Issues on NCD SSB, identification and access for RedCap vivo, Guangdong Genius
* [R2-2200608](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200608.zip) Discussion on separate initial BWP and NCD-SSB for RedCap UE ZTE Corporation, Sanechips
* [R2-2200830](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200830.zip) Using NCD-SSB or CSI-RS in DL BWPs for RedCap UEs Ericsson
* [R2-2200831](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200831.zip) [DRAFT] Reply LS on the use of NCD-SSB or CSI-RS in DL BWPs for RedCap UEs Ericsson
* [R2-2200862](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200862.zip) Discussion on use of NCD-SSB or CSI-RS in DL BWPs for RedCap UE CMCC
* [R2-2201113](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201113.zip) RedCap UE power-saving aspects at cell re-selection Apple
* [R2-2201461](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201461.zip) Aspects related to use of NCD-SSB MediaTek Inc.

The summary was provided in [R2-2201732](http://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201732.zip) and during the online discussion, the following agreements were made:

Agreements:

1. A RedCap UE in idle/inactive mode monitors paging only in an initial BWP (default or RedCap specific) associated with CD-SSB and performs cell (re-)selection and measurements on the CD-SSB

2. 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.

In this document, we continue the discussion based on the agreements above and the list of Tdocs provided above with the intention to formulate a list of proposals that are agreeable and a list of proposals that require further discussion during the related online session.

# 2 Discussion

## 2.1 RRC Idle/Inactive mode

**Q 2.1.1** If a RedCap UE in idle/inactive mode is configured with a separate initial BWP associated with no SSB (CD or NCD) for RACH, do you think that measurements should be based on CD-SSB for RACH resource selection? Please elaborate your reply. If you agree comment on whether field description of *rach-ConfigCommon* should be updated accordingly.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | The field description update can be discussed in the running CR. |
| Qualcomm | Yes | If RedCap-specific initial DL BWP does not include any SSB, then RedCap UEs have to use the CD-SSB included in the default initial DL BWP as QCL source for RO selection, unless there are other options (Is there any?) |
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**Summary – Q 2.1.1**

TBD

1. …

**Q 2.1.2** If a RedCap UE in idle/inactive mode is configured with a separate initial BWP associated with no SSB (CD or NCD) for RACH, do you think that *PDCCH-ConfigCommon* of the separate initial DL BWP should include common search space configuration for RAR but not for paging, SIB1 and other SIBs? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Qualcomm | Yes | If network configures RedCap-specific initial UL BWP for RACH, then it is desirable to have RA search space configured in the RedCap-specific initial DL BWP, to avoid BWP switching in RACH procedures.  In RAN plenary #94e it was agreed that if RedCap-specific DL BWP does not include CD-SSB, then it should not include CSS for paging or SIBs. |
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**Summary – Q 2.1.2**

TBD

**Q 2.1.3** If a RedCap UE in idle/inactive mode is configured with a separate initial BWP associated with no SSB (CD or NCD) for RACH, do you think

* (**Option 1**) it should be up to UE implementation to perform new RSRP measurement in a DL BWP associated with CD-SSB before a Msg1/A retransmission, or
* (**Option 2**) UE should always perform new RSRP measurement in a DL BWP associated with CD-SSB?

Please elaborate your reply.

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| **Company** | **Option (1/2/Other)** | **Comments** |
| Huawei, HiSilicon | Option1 | If there is no clear RAN2 majority, maybe we can consult/wait for R4 on this issue. |
| Qualcomm | Option 1 | The rationale behind this proposal is the following.  In legacy procedure, if UE needs to perform Msg1/A reTx, it restarts the RACH procedure from RO selection. And RAN4 spec has a tight timing requirement on how soon UE shall start the reTx procedure. This is not a problem in legacy because UE may take new RSRP measurement during RAR window.  If RedCap-specific initial DL BWP is not configured with any SSB, UE then has to measure CD-SSB in the default initial DL BWP before performing Msg1/A reTx. Therefore, there are two options:   1. Leave it to UE implementation whether to take new RSRP measurement before Msg1/A reTx;   Or relax the timing requirement for Msg1/A reTx (RAN4 have to be involved). |
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**Summary – Q 2.1.3**

TBD

**Q 2.1.4** Do you think RedCap-specific two-step RACH (if configured) and four-step RACH should always configured in the same BWP? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | It seems quite clear from the agreement we made:” *2. 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.*” |
| Qualcomm | Yes | This proposal intends to avoid the following scenarios:   1. Network configures a 2-step RACH configuration in RedCap-specific initial UL BWP but no 4-step RACH configuration in that UL BWP. In this case, UE does not have a RedCap-specific 4-step RACH configuration to perform fallback;   If network configures only a 4-step RACH in RedCap-specific initial UL BWP, then RedCap UE should not use 2-step RACH configuration (if configured) in the non-RedCap initial UL BWP. |
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**Summary – Q 2.1.4**

TBD

**Q 2.1.5** Please provide your comments here if you think there are any other issues that should be discussed for RedCap UEs in idle/inactive mode.

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| **Company** | **Comments** |
| Huawei, HiSilicon | **To save SIB1 size, the RedCap-specific initial BWP configurations (introduced by RAN1) should be only configured with the delta parameters compared to the legacy one.( i.e. use the same value as legacy if absent).** |
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**Summary – Q 2.1.5**

TBD

## 2.2 RRC Connected mode

**Q 2.2.1** In RRC connected mode, do you think it should be possible to configure NCD-SSB for a RedCap UE in dedicated DL BWP? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | But, it can be further discussed whether the new IE is added in *BWP-DownlinkDedicated* or *BWP-DownlinkCommon.* |
| Qualcomm | Yes | As agreed by RAN1 |
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**Summary – Q 2.2.1**

TBD

**Q 2.2.2** For connected mode operation do you think NCD-SSB should have the same properties (e.g., *ssb-PositionsInBurst*, *PCI*, *ssb-periodicity*, *ssb-PBCH-BlockPower*) as the corresponding CD-SSB? Please elaborate your reply. Note that the question is about “properties”, not “configuration” (please see the next question regarding the discussion on configuration).

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes, but | But see our comments in below question. |
| Qualcomm | Yes | Regarding ssb-periodicity:  It is fine with us if RAN2 agree to mandate the same periodicity between CD-SSB and NCD-SSB. But RAN1 and RAN2 did agree last meeting that the periodicity of NCD-SSB can be different from that of CD-SSB. |
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**Summary – Q 2.2.2**

TBD

**Q 2.2.3** For connected mode operation do you think it should be possible for the network to provide *absoluteFrequencySSB*, *ssb-PositionsInBurst*, and *ssb-periodicity* explicitly for NCD-SSB, i.e., other properties such as *PCI*, *ssb-PBCH-BlockPower* are configured with the same values from serving cell's CD-SSB? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Not all | 1. *ssb-PositionsInBurst* should be same. 2. *ssb-PBCH-BlockPower* should be decided by R1/R4. 3. *ssb-periodicity*: In addition to the periodicty, the time offset of NCD-SSB should also be able to configure different values. If multile NCD-SSBs always have the same time offset with CD-SSB (even with different periodicty), it means the transmisison of NDC-SSBs may occur in the same time slot as CD-SSB. From gNB side, transmitting many SSBs at the same time will cause unaffordable power, which could be one blocking issue. We can use the similar IE like *periodicityAndOffset* in SSB-MTC |
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| Qualcomm | See comment | NCD-SSB and CD-SSB should have the same *ssb-PositionsInBurst* |
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**Summary – Q 2.2.3**

TBD

**Q 2.2.4** For connected mode operation do you think periodicity of NCD-SSB shall be not less than the periodicity of serving cell’s CD-SSB? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Qualcomm | Yes | It is unnecessary to have more frequent transmissions of NCD-SSB than CD-SSB. |
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**Summary – Q 2.2.4**

TBD

**Q 2.2.5** For connected mode operation if NCD-SSB is configured in a dedicated DL BWP, do you think RedCap UE should assume that the “*SSB*” in *QCL-Info* IE and “*ssb-Index*” in *RadioLinkMonitoringRS* IE refer to the beam with the same index in the NCD-SSB configured in that BWP? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes |  |
| Qualcomm | Yes | This helps ensure beam with the same index in NCD-SSB and CD-SSB are quasi-colocated and hence minimize the impact on the current spec. |
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**Summary – Q 2.2.5**

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**Q 2.2.6** For connected mode operation if NCD-SSB is configured in a dedicated DL BWP whose paired UL BWP is configured with *RACH-ConfigDedicated*, *RACH-ConfigCommon* or *BeamFailureRecovery Config*, do you think the SSB in that RACH configuration (e.g., in *CFRA-SSB-Resource* IE or in *PRACH-ResourceDedicatedBFR* IE) should refer to the NCD-SSB configured in that DL BWP? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | NCD-SSB can be used for RO selection. |
| Qualcomm | Yes | Otherwise UE has to use SSB configured in other DL BWP as QCL source for RO selection and RA search space. That may require UE to switch BWPs between steps in a RACH procedure. |
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**Summary – Q 2.2.6**

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**Q 2.2.7** For connected mode operation do you think neighbour cell measurements based on NCD-SSB should be supported for RedCap UEs? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | 1st, there is no guarantee that all the neighbor cells have NCD-SSB and all the NCD-SSB of neighbor cells will be in the same *absoluteFrequencySSB*. So, in normal cases, UE has to switch to CD-SSB for some measurement of neighbor cells. In that case, there is no benefit of power saving to support this NCD-SSB based measurement, if CD-SSB based measurement is anyway required.  2nd, it is not clear how the UE maintain the intra-frequency cells list, if the NCD-SSB is on the same frequency but the CD-SSB is on different frequency of one neigbor cell, especially when UE performs BWP switch. |
| Qualcomm | No | Although it is up to network configuration, we don’t see the need to do so. |
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**Summary – Q 2.2.7**

TBD

**Q 2.2.8** For serving cell measurement based on NCD-SSB in connected mode; do you think

* (**Option 1**) *MeasObjectId* should be configured for each NCD-SSB, or
* (**Option 2**) *MeasObjectNR* is extended to include *ssbFrequency* for each NCD-SSB?

Please elaborate your reply.

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| **Company** | **Option** | **Comments** |
| Huawei, HiSilicon | Option 1, but no strong view | The intention is to indicate the ssbFrequency for each NCD-SSB of BWP. In case of BWP switch, 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. Therefore, the RRC measurement configuration should provide the ssbFrequency of all possible NCD-SSB. |
| Qualcomm | Option 1 | Less impact on the current spec |
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**Summary – Q 2.2.8**

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**Q 2.2.9** Do you think RAN1 working assumption regarding the use of CSI-RS in connected mode is acceptable from RAN2 standpoint? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes, but up to R4 | From RAN2 perspective, we can say it is possible from signaling perspective. The final decision should be up to R4 reply. |
| Qualcomm | See comment | In our view, the optional UE capability “Not Need for NCD-SSB” does not need to be tied to the support for CSI-RS. For example, network may configure measurement gaps for a UE which signals “Not Need for NCD-SSB” and “No support for CSI-RS”. |
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**Summary – Q 2.2.9**

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**Q 2.2.10** Do you think a RedCap UE, which does not support CSI-RS, should be able to report “Not need NCD-SSB” as an optional UE capability? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | Yes | As agreed in RAN1. |
| Qualcomm | Yes | See our comment to Q2.2.9.  The motivation is that if for some reason, network does not configure NCD-SSB in a dedicated DL BWP for a RedCap UE which does not support CSI-RS, this UE can have the option of reporting “Not Need NCD-SSB” (measurement on CD-SSB can be done through gaps) so that network does not have to configure this UE’s dedicated DL BWPs around the default initial DL BWP, which can be congested. |
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**Summary – Q 2.2.10**

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**Q 2.2.11** Do you think it should be possible to use NCD-SSB to trigger the handover procedure, i.e., whether SSB indicated in *absoluteFrequencySSB* of *frequencyInfo-DL* IE in handover command must be CD-SSB? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | We can postpone this and focus on other essential issues.  Before making the decision, we need to analyses the whole spec impacts, e.g. whether SIB1 is included in HO command, whether DL syncnization is on NCD-SSB.  Also, we have not decided on the neighbor cell measurement based on NCD-SSB, which is the pre-condition of this proposal. |
| Qualcomm | No |  |
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**Summary – Q 2.2.11**

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**Q 2.2.12** Do you think a non-RedCap UE should be able to use NCD-SSB instead of CD-SSB with an optional capability? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| Huawei, HiSilicon | No | The motivation of supporting NCD-SSB is only for the UE with narrow bandwidth, e.g. for load balancing purpose among BWPs. |
| Qualcomm | Yes | We don’t see technical reasons that prevent non-RedCap UEs from using NCD-SSB. If supported, it would give network more flexibility in configuring UE’s dedicated BWPs, which is a good thing for both network and UE. |
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**Summary – Q 2.2.12**

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**Q 2.2.13** Please provide your comments here if you think there are any other issues that should be discussed for RedCap UEs in connected mode.

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| **Company** | **Comments** |
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**Summary – Q 2.2.13**

TBD

# 3 Conclusion

Based on the discussion above rapporteur suggests a discussion on the following proposals:

[Proposal 1 …](#_Toc93433069)

# References

1. [R2-2200190](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200190.zip) Discussions on RedCap-specific BWPs Qualcomm Incorporated
2. [R2-2200287](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200287.zip) Open issues on Early identification, camping restrictions and NCD-SSB Intel Corporation
3. [R2-2200401](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200401.zip) BWP configuration for RedCap UE DENSO CORPORATION
4. [R2-2200554](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200554.zip) Identification and access restriction of RedCap UE, and NCD-SSB related issues Huawei, HiSilicon
5. [R2-2200597](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200597.zip) Remaining issues on NCD SSB, identification and access for RedCap vivo, Guangdong Genius
6. [R2-2200608](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200608.zip) Discussion on separate initial BWP and NCD-SSB for RedCap UE ZTE Corporation, Sanechips
7. [R2-2200830](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200830.zip) Using NCD-SSB or CSI-RS in DL BWPs for RedCap UEs Ericsson
8. [R2-2200831](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200831.zip) [DRAFT] Reply LS on the use of NCD-SSB or CSI-RS in DL BWPs for RedCap UEs Ericsson
9. [R2-2200862](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2200862.zip) Discussion on use of NCD-SSB or CSI-RS in DL BWPs for RedCap UE CMCC
10. [R2-2201113](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201113.zip) RedCap UE power-saving aspects at cell re-selection Apple
11. [R2-2201461](http://ftp.3gpp.org/tsg_ran/WG2_RL2/TSGR2_116bis-e/Docs/R2-2201461.zip) Aspects related to use of NCD-SSB MediaTek Inc.