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 [Pre117-e][105][RedCap] CP open issues

Document for: Discussion, Decision

# 1 Introduction

In RAN2#116bis-e, it was agreed to have post email discussions after the meeting to update the running CRs based on the agreements made during the meeting and to identify the remaining open issues. The open issues were then captured in a document with the intention to determine which issues are to be handled via Pre-RAN2#117 offline discussion(s) and which others are to be handled based on company contributions.

In this document, the discussion continues 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.

Contact information

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| Company | Contact person - [email@address.com](mailto:email@address.com) |
| OPPO | Haitao (lihaitao@oppo.com) |
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# 2 Discussion

## 2.1 Identification, access and camping restrictions

In RAN2#116bis-e, UE behaviour for the following cases were discussed but no conclusion was made:

1. the cell does not indicate support for RedCap UEs
2. Red Cap UE is unable to acquire SIB1
3. *cellBarred* in MIB is set

For i. and ii. the following options have been proposed:

1. UE considers IFRI as “allowed”
2. UE follows the IFRI in MIB

**Q 2.1.1** Assuming that common UE behaviour is preferred for cases i. and ii. above, which option do you prefer? Please elaborate your reply and comment especially if you think that UE behaviour should be different for cases i. and ii.

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| **Company** | **Option**  **(a or b)** | **Comments** |
| OPPO | a |  |
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**Summary – Q 2.1.1**

TBD

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

1. ???

For iii. above, i.e., *cellBarred* in MIB is set to barred, the following options have been proposed:

1. UE follows legacy IFRI in MIB
2. UE acquires SIB1 and follows the RedCap-specific IFRI provided in SIB1

**Q 2.1.2** Which option do you prefer for case iii. above? Please elaborate your reply.

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| **Company** | **Option**  **(a or b)** | **Comments** |
| OPPO | b |  |
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**Summary – Q 2.1.2**

TBD

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

1. ???

In RAN2#116bis-e the following working assumption was made:

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| **Working assumption**:  System information can provide information on which frequencies accept RedCap UE access (e.g. by considering whether supporting RedCap). |

The proposal was supported by many companies, yet a working assumption was made since a few companies preferred support for providing information also on cell level and few others think that this is an optimization that adds complexity with no significant gain.

**Q 2.1.3** Do you agree that the working assumption can be confirmed? Please comment especially if you do not agree and elaborate about the signalling aspects of the solution you propose, i.e., how such information can be provided, in which SIB etc.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | See comments | We don’t think it is efficient to indicate RedCap’s access support per frequency. With this, if one neighbor cell within the frequency does not accept RedCap UE’s access, network has to set the whole frequency as not accepting RedCap UE’s access, which will prevent RedCap UE from reselecting to those RedCap-supporting neighbor cells. We think the RedCap-supporting information should be indicated via a cell list. |
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**Summary – Q 2.1.3**

TBD

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

1. ???

RAN2 has agreed to introduce means for the network to control UEs with, for example, 1 Rx branch to access the network in order to avoid any impact on the performance. It has been agreed in RAN1 that a capability bit on Half-duplex FDD operation type A for RedCap UEs is introduced, therefore a similar mechanism, which indicates that HD-FDD is supported in the serving cell, may need to be introduced especially considering that half-duplex (HD) in FDD bands is not supported in NR prior to the RedCap feature. Note that supporting HD-FDD in the network may require quite large implementation effort and thus it would be beneficial to have an indication for HD-FDD to facilitate early support of FD-FDD RedCap UEs.

**Q 2.1.4** Do you think that support for Half-Duplex FDD RedCap should be indicated in SIB1? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | No | HD-FDD operation is RRC connected state feature. We think this can handled by the UE capability and connection management, e.g. if NW does not support HD-FDD, it can send UE to idle state. |
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**Summary – Q 2.1.4**

TBD

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

1. ???

## 2.2 eDRX

In RAN2#115-e, the following was agreed:

“RAN2 considers the configuration as an invalid case, where INACTIVE eDRX cycle is configured but IDLE eDRX cycle is not configured. FFS whether to capture this restriction in RAN2 spec”

**Q 2.2.1** Do you think that the case for invalid configuration should be captured in the specs? Please elaborate your reply and, if you agree, provide your opinion on how and where it should be captured.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes | It can be captured in the field description of INACTIVE eDRX cycle in 38.331. |
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**Summary – Q 2.2.1**

TBD

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

1. ???

In RAN2#115-e, the following was agreed:

“RAN2 considers the configuration as invalid case, where INACTIVE eDRX cycle is longer than IDLE eDRX cycle. FFS whether to capture this restriction in RAN2 spec.”

**Q 2.2.2** Do you think that the case for invalid configuration should be captured in the specs? Please elaborate your reply and provide your opinion regarding how and where it should be captured.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes | It can be captured in the field description of INACTIVE eDRX cycle in 38.331. |
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**Summary – Q 2.2.2**

TBD

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

1. ???

The following note is captured in subclause 5.2.2.2.2 on “SI change indication and PWS notification” in the running CR for TS 38.331:

“Editor’s Note: The details for modification period, eDRX acquisition period and which eDRX/DRX cycles are referred to below are subject to further changes once relevant agreements are made.”

The following options have been considered regarding which DRX cycle UE should consider for comparing with the modification period to decide if eDRX acquisition period is used.:

1. CN\_eDRX for both RRC\_IDLE and RRC\_INACTIVE (same as LTE)
2. CN\_eDRX for RRC\_IDLE, and RAN eDRX, if configured, for RRC\_INACTIVE, i.e., use CN\_eDRX if RAN eDRX is not configured.

**Q 2.2.3** Which option do you prefer? Please elaborate your reply.

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| **Company** | **Option**  **(a or b)** | **Comments** |
| OPPO | b with modification | For UE in RRC INACTIVE, since UE would always monitor for RAN paging based on RAN eDRX if configured for RRC\_INACTIVE or RAN DRX if RAN eDRX is not configured, we think it would be better to use RAN eDRX (if RAN eDRX is configured) or RAN DRX (if RAN eDRX is not configured) to compare with the modification period.  The proposed option b-bis:  CN\_eDRX for RRC\_IDLE, and RAN eDRX, if configured, for RRC\_INACTIVE, i.e., use RAN DRX if RAN eDRX is not configured. |
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**Summary – Q 2.2.3**

TBD

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

1. ???

The following note is captured in subclause 5.2.2.2.2 on “SI change indication and PWS notification” in the running CR for TS 38.331:

“Editor’s Note: The case for RRC\_INACTIVE is FFS”

**Q 2.2.4** Please provide your preference regarding the case for RRC\_INACTIVE considering the procedure in subclause 5.2.2.2.2.

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| **Company** | **Comments** |
| OPPO | Depending on the outcome of Q 2.2.3, the procedure text should be added for RRC\_INACTIVE case. |
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**Summary – Q 2.2.4**

TBD

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

1. ???

The following note is captured as part of the ASN.1 coding for the *RRCRelease* message in the running CR for TS 38.331:

ExtendedPagingCycle-r17 ::= ENUMERATED {rf256, rf512, rf1024, spare1} -- Editor's note: TBD how many spare values are needed.

Only one spare value is available currently, but more may be required for forward compatibility.

**Q 2.2.5** Please provide your preference regarding the number of spare values needed and motivate why.

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| **Company** | **# of spare values** | **Comments** |
| OPPO | 1 | But no strong view. |
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**Summary – Q 2.2.5**

TBD

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

1. ???

The following note is captured in subclause 7.x on “Paging in extended DRX” in the running TS 38.304 CR:

The PH for CN is the H-SFN satisfying the following equations:

H-SFN mod TeDRX\_CN= (UE\_ID\_H mod TeDRX\_CN), where

- UE\_ID\_H

- xx most significant bits of the Hashed ID.

Editor’s note: FFS how many bits we use above for UE\_ID\_H.

- TeDRX\_CN: UE-specific eDRX cycle in Hyper-frames, (TeDRX\_CN = 2, …, 1024 Hyper-frames) configured by upper layers.

**Q 2.2.6** Please indicate your preference regarding the number of most significant bits that should be used for UE\_ID\_H? Please elaborate your reply.

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| **Company** | **# of bits** | **Comments** |
| OPPO | 12 | To align with NB-IoT. |
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**Summary – Q 2.2.6**

TBD

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

1. ???

## 2.3 RRM relaxations

The following note was captured in the procedural part of the “Relaxed measurement criterion for a stationary UE” in the subclause 5.7.4.X in the running CR for TS 38.331:

5.7.4.X Relaxed measurement criterion for a stationary UE

The relaxed measurement criterion for a stationary UE is fulfilled when:

- (SrxlevRefStationaryConnected – Srxlev) < SSearchDeltaP-StationaryConnected,

Where:

- Srxlev = current Srxlev value of the PCell cell (dB).

- SrxlevRefStationaryConnected = reference Srxlev value of the PCell cell (dB), set as follows:

- After MAC of an MCG successfully completes a Random Access procedure after applying an *reconfigurationWithSync* in *spCellConfig* of an MCG, or

Editor's Note: The above bullet and how to capture the case if RRM relaxation is not configured at the time of handover is TBD.

- If (Srxlev – SrxlevRefStationaryConnected) > 0, or

- If the relaxed measurement criterion has not been met for TSearchDeltaP-StationaryConnected:

- The UE shall set the value of SrxlevRefStationaryConnected to the current Srxlev value of the serving cell.

**Q 2.3.1** Please provide your preference regarding the following bullet

“After MAC of an MCG successfully completes a Random Access procedure after applying an *reconfigurationWithSync* in *spCellConfig* of an MCG,”

and how to capture the case if RRM relaxation is not configured at the time of handover.

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| **Company** | **Comments** |
| OPPO | We understand this relates to initiation of SrxlevRefStationaryConnected, but we think handover is not the only case which needs to be addressed. To us, following cases are relelvant:  Case 1: configuration (first time) of RRM relaxation  In this case, initiation of SrxlevRefStationaryConnected shoud be specified.  Case 2: handover  In this case, handover command may not explicitly include RRM relaxation (e.g. delta configuation), but UE should still set the initial value of SrxlevRefStationaryConnected. |
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**Summary – Q 2.3.1**

TBD

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

1. ???

The following note was captured in the subclause 5.2.4.9.0 on “Relaxed measurement rules” in the running CR for TS 38.304:

Editor's note: When the network configures both R16/R17 relaxation criteria and the UE fulfils both, it is TBD if the UE performs Rel-17 RRM relaxation method or it is up to UE implementation to select either Rel-16 or Rel-17 relaxation operation.

The following options have been considered when the network configures both R16/R17 relaxation criteria and the UE fulfils both:

1. UE performs Rel-17 RRM relaxation method
2. it is up to UE implementation to perform either Rel-16 or Rel-17 relaxation method

**Q 2.3.2** Which option do you prefer? Please elaborate your reply.

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| **Company** | **Option**  **(a or b)** | **Comments** |
| OPPO | A | But b is also ok. |
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**Summary – Q 2.3.2**

TBD

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

1. ???

Regarding the same case above, Rel-16 low mobility and Rel-17 stationary criteria are evaluated based on independent *Tsearch* periods, which may have different durations and therefore the evaluations can be out of synch. It has been observed that typically a UE considers one criterion fulfilled first while still waiting for the other to conclude. Based on the current text, the UE may simply proceed with the RRM relaxation actions related to the first criterion fulfilled. The UE may wait for the measurement period of the second criterion to conclude, but it is possible that the UE does not end up in a state where both criteria are fulfilled at the same time.

**Q 2.3.3** Do you agree with the assessment above? Please elaborate your reply and provide comments regarding how to capture the UE behaviour especially if you reply “Yes”.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes |  |
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**Summary – Q 2.3.3**

TBD

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

1. ???

## 2.4 NCD-SSB

For further discussion regarding the configuration of SSBs and the corresponding measurement objects, possible deployment and configuration variants should be considered. The rapporteur takes the variants listed in [R4-2201780](http://www.3gpp.org/ftp//tsg_ran/WG4_Radio/TSGR4_101-bis-e/Docs//R4-2201780.zip) as reference for this discussion.

*RedCap UE's BWP contains CD SSB*

When the network configures a RedCap to use the Cell-defining (CD) SSB, it can do so using BWP#0 or a dedicated BWP, e.g., BWP#1 in the example below. In this case, the CD-SSB can be used for all purposes including serving- and neighbour cell measurements. Hence, an NCD-SSB is not required and not configured for this UE.



**Figure 1.** **RedCap UE operating on dedicated BWP that contains the CD-SSB**

*RedCap UE’s BWP does not contain CD-SSB*

In this case the NW configures the NCD-SSB in UE’s dedicated BWP. There are two scenarios to consider:

1. All neighbour cells send SSBs on UE’s NCD-SSB frequency
2. Some neighbour cells do not send SSBs on UE’s NCD-SSB frequency

In scenario a)., RedCap UEs may measure serving- and neighbour cells on NCD-SSB frequency which requires no measurement gaps. UEs measure (neighbour) cells according to the configured Measurement Object (*MeasObj*).



**Figure 2. RedCap UE operating on dedicated BWP that does not contain the CD-SSB - all neighbour cells broadcast their SSB on the UE's NCD-SSB frequency**

The rapporteur observes two possible approaches for this scenario:

1. UE can follow the legacy principles, i.e., it would configure an MO on the NCD-SSB frequency (but no gaps) and associate necessary report configurations (e.g., A3, A2, ...).
2. instead of configuring a *MeasObj* on the NCD-SSB frequency explicitly, RAN2 could specify that a UE that is configured with a dedicated BWP that contains an NCD-SSB should perform serving- and neighbour cell measurements on the NCD-SSB instead of on the CD-SSB, i.e., the UE would re-interpret the *MeasObj* based on the given NCD-SSB configuration.

In case RAN2 follows the first approach, rapporteur thinks that the following should be considered: whether the network should also configure a MO on CD-SSB and, if not, whether the network should set the *servingCellMO* to the ID of the NCD-SSB.

In scenario b), where some neighbour 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.



**Figure 3. RedCap UE operating on dedicated BWP that does not contain the CD-SSB - some neighbour cells do NOT broadcast their SSB on the UE's NCD-SSB frequency**

Even though it may be a rare case, rapporteur thinks that it would be better if the network configures the *MeasObj* and suitable measurement configurations on the CD-SSB frequency as shown in Figure 3 above. In this case configuring a *MeasObj* on the NCD-SSB frequency appears unnecessary for the sole purpose of performing serving cell measurements and all information about the NCD-SSB would be given in the serving cell configuration (either explicitly or inherited from the CD-SSB configuration).

In case RAN2 follows the 1st approach above, the rapporteur would like to ask companies the following two questions:

**Q 2.4.1** Do you think the network should configure a MO on the NCD-SSB if it wants the UE to perform neighbour cell measurements thereon (as in legacy)? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes |  |
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**Summary – Q 2.4.1**

TBD

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

1. ???

**Q 2.4.2** Do you think that the network should also configure MO on CD-SSB even if it does not expect the UE to perform neighbour measurements thereon? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| OPPO |  | We think this may be up to network’s implementation. |
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**Summary – Q 2.4.2**

TBD

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

1. ???

**Q 2.4.3** Regarding the discussion on scenario b), do you think the network should configure a MO on the NCD-SSB frequency if it wants the UE to use it only for serving cell measurements? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes |  |
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**Summary – Q 2.4.3**

TBD

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

1. ???

**Q 2.4.4** If you replied with “Yes” to the previous question, do you think that the network should refer to this MO explicitly from within the *ServingCell* configuration (similarly to servingCellMO)? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes |  |
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**Summary – Q 2.4.4**

TBD

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

1. ???

*RedCap UE’s BWP contains neither CD-SSB nor NCD-SSB*

The network’s configuration should follow the previous case above, i.e., network will configure the *servingCellMO* to the MO on the CD-SSB.

**Q 2.4.5** Regarding scenario a); which approach do you prefer? Please elaborate your reply.

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| **Company** | **1 or 2** | **Comments** |
| OPPO | Neither | Network should configure an MO on the CD-SSB frequency. |
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**Summary – Q 2.4.5**

TBD

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

1. ???

*Non-overlapping BWPs*

If the UE supports DCI-based BWP-switching, the network could configure different NCD-SSB in different non-overlapping dedicated BWPs (only one NCD-SSB per BWP!) as depicted below.



Figure 4. RedCap UE configured with several non-overlapping BWPs   
that contain different NCD-SSBs.

In this scenario the UE may always use the SSB in its currently active BWP. If all neighbour nodes are known to send the same SSBs, the UE may measure serving- and neighbour cells on the NCD-SSB frequency. To achieve that, the network should configure MOs and report configurations on each NCD-SSB frequency of the UE. However, the NW does not need to configure gaps.

Assuming that the NCD-SSB is configured in the *BWP-DownlinkDedicated* anyway, the rapporteur observes that RRC signalling offers the possibility to configure a UE with several NCD-SSB. Note that if this is not meant to be allowed, a restriction should be specified.

**Q 2.4.6** Do you think that such configuration should be allowed? Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes | Several BWP-DownlinkDedicated containing NCD-SSB. |
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**Summary – Q 2.4.6**

TBD

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

1. ???

**Q 2.4.7** If it is allowed to configure several NCD-SSBs, Which MO should be set in *servingCellMO*? Any of the NCD-SSBs? Or the CD-SSB? Or none, since the UE can derive it anyway? Please elaborate your reply.

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| **Company** | **Comments** |
| OPPO | The NCD-SSB contained in the current active BWP. |
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**Summary – Q 2.4.7**

TBD

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

1. ???

*Other aspects*

In RAN2#116bis-e the following working assumption was made:

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| **Working assumption**:  The periodicity of NCD-SSB shall be not less than the periodicity of serving cell’s CD-SSB. |

**Q 2.4.8** Do you agree that the working assumption can be confirmed? Please comment especially if you do not agree.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | Yes |  |
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**Summary – Q 2.4.8**

TBD

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

1. ???

**Q 2.4.9** Do you think it should be possible to use NCD-SSB to trigger the handover procedure? If so, in which field should it be indicated? How should *ServingCellConfigCommon*-> *absoluteFrequencySSB* be set in this case? Still to the CD-SSB?” Please elaborate your reply.

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| **Company** | **Yes/No** | **Comments** |
| OPPO | No | UE will read MIB in the target, for which NCD-SSB should not be indicated. |
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**Summary – Q 2.4.9**

TBD

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

1. ???

**Q 2.4.10** 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** |
| OPPO |  | No strong view. For simplicity, we can focus on RedCap UEs in Rel-17. |
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**Summary – Q 2.4.10**

TBD

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

1. ???

# 3 Conclusion

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

[Proposal 1 ???](#_Toc93533244)

# References

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