3GPP TSG-RAN WG1 Meeting #109-e R1-22xxxxx

e-Meeting, 9th – 20th May 2022

**Agenda Item: 8.6.1**

**Title: FL summary for maintenance on UE bandwidth reduction for RedCap**

**Source: Moderator (Ericsson)**

**Document for: Discussion, Decision**

# Introduction

This feature lead (FL) summary (FLS) concerns the Rel-17 work item (WI) for support of reduced capability (RedCap) NR devices [1]. Earlier RAN1 agreements for this WI are summarized in [2], which also includes links to earlier FLSs.

This document captures this email discussion on maintenance issues for UE bandwidth reduction for RedCap:

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| [109-e-R17\_RedCap-01] Email discussion under 8.6.1 for maintenance on UE bandwidth reduction, for issues 1, 2 and 3 under High Priority Proposal 2-1c in the FL summary [R1-2205107](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_109-e/Docs/R1-2205107.zip) – Johan (Ericsson)   * Discussion and decision by May 18 |

The three issues mentioned above are the following ones:

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| 1. Clarification of case when initial DL BWP is wider than maximum UE bandwidth, including discussion on center frequency alignment for TDD    * See references [3, 4, 5, 7, 8, 9, 11, 14, 16, 18, 20, 22, 23, 24, 25, 27, 28, 29, 32] 2. SSB presence in separate initial DL BWP in connected mode for BWP configuration option 1    * See references [5, 7, 8, 9, 11, 14, 16, 18, 20, 22, 23, 24, 25, 27, 28, 29, 32] 3. Corrections for BWP operation description in 38.213 clause 17.1    * See references [5, 7, 9, 18, 22, 26, 28, 29] |

Each one of the issues listed above is treated in its own section in this document. All contributions submitted to agenda items 8.6.1 and 8.6.2 are included in the References section as references [3] – [32]. The final FLS on UE bandwidth reduction from the previous RAN1 meeting can be found in [33].

The feedback forms in this document are tagged and color coded with High Priority or Medium Priority. The aspects that are in the focus of this round of the discussion are furthermore tagged FL1.

**FL1 Question: Please consider entering contact info below for the points of contact for this email discussion.**

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| **Company** | **Point of contact** | **Email address** |
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# 1 Issue #1: Clarification of case when initial DL BWP is wider than maximum UE bandwidth, including discussion on center frequency alignment for TDD

Clarification of the case when initial DL BWP is wider than maximum UE bandwidth, including discussion on center frequency alignment for TDD, is discussed in contributions [3, 4, 5, 7, 8, 9, 11, 14, 16, 18, 20, 22, 23, 24, 25, 27, 28, 29, 32]. This issue was discussed in the previous RAN1 meeting, and the discussion is captured on pages 3-44 in the FLS in [33]. The following agreement was made regarding DL/UL center frequency alignment for TDD:

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| Agreement:   * For FR1 and FR2, for TDD, when a (separate or shared) initial DL BWP includes CD-SSB (for FR1 and FR2) and the entire CORESET#0 (for FR1), the center frequencies for the (separate or shared) initial DL BWP and the (separate or shared) initial UL BWP are assumed to be the same. |

All main options under discussion (Options 1, 2a and 2b) as listed in the following FL proposal were met with both some support and some opposition.

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| High Priority Proposal 2-1-2b: For the case that the initial DL BWP for non-RedCap UEs is wider than the maximum RedCap UE bandwidth, down select between the following options:   * Option 1: A separate initial DL BWP is always configured for RedCap if the initial DL BWP for non-RedCap UEs is wider than the maximum RedCap UE bandwidth.   + Note: For TDD, the center frequencies of the separate initial DL BWP and the initial UL BWP are aligned (in accordance with earlier agreement). * Option 2a: If a separate initial DL BWP is not configured for RedCap, the RedCap UE continues to use at least the location, bandwidth, SCS, and cyclic prefix of the MIB-configured CORESET#0.   + For TDD, the total frequency span of MIB-configured CORESET#0 and the initial UL BWP does not exceed the RedCap UE maximum bandwidth. * Option 2b: If a separate initial DL BWP is not configured for RedCap, the RedCap UE continues to use at least the location, bandwidth, SCS, and cyclic prefix of the MIB-configured CORESET#0.   + For TDD, the center frequencies of the MIB-configured CORESET#0 and the initial UL BWP are aligned. |

The latest version of the FL proposal addressing this issue was only shared on the RAN1 reflector and it looked like this:

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| High Priority Proposal 2-1-2e: For the case that the initial DL BWP for non-RedCap UEs is wider than the maximum RedCap UE bandwidth,   * A separate initial DL BWP is always configured for RedCap if the initial DL BWP for non-RedCap UEs is wider than the maximum RedCap UE bandwidth. * From RAN1 perspective, if generic parameters (location, bandwidth, SCS, and cyclic prefix) of this separate initial DL BWP are absent, RedCap UE can continue to use the location, bandwidth, SCS, and cyclic prefix of the MIB-configured CORESET#0. Necessity and feasibility of signaling optimizations are up to RAN2. * Note: For TDD, the center frequencies of the separate initial DL BWP and the initial UL BWP are aligned (in accordance with earlier agreement). |

Several contributions [7, 8, 22, 23, 24] propose to use the above FL proposal (Proposal 2-1-2e) as a starting point in this meeting, since there was not enough time to treat it in the previous meeting. Among the other contributions, some [5, 9, 11, 16, 18, 27] lean toward Option 1, some [3, 4, 25] toward Option 2a, and some [20, 29, 32] toward Option 2b.

Some contributions [16, 28] note that the RRC parameter description for *initialDownlinkBWP-RedCap* in TS 38.331 [34] states that if the parameter is absent then “*RedCap UEs use initialDownlinkBWP provided that it does not exceed the RedCap UE maximum bandwidth*” and express that no additional agreement or specification change may be needed. One more contribution [11] also argues that the current specifications are enough and that no further optimization is needed, whereas another contribution [3] argues that an agreement is needed to specify the UE behavior for this case. Some contributions [3, 14] note that the analysis for issue #1 may be different for FDD and TDD.

Based on the submitted contributions, the following proposal can be considered. It is the same as Proposal 2-1-2e which was proposed in the previous meeting but not treated then due to lack of time.

**FL1 High Priority Proposal 1-1a: For the case that the initial DL BWP for non-RedCap UEs is wider than the maximum RedCap UE bandwidth,**

* **A separate initial DL BWP is always configured for RedCap if the initial DL BWP for non-RedCap UEs is wider than the maximum RedCap UE bandwidth.**
* **From RAN1 perspective, if generic parameters (location, bandwidth, SCS, and cyclic prefix) of this separate initial DL BWP are absent, RedCap UE can continue to use the location, bandwidth, SCS, and cyclic prefix of the MIB-configured CORESET#0. Necessity and feasibility of signaling optimizations are up to RAN2.**
* **Note: For TDD, the center frequencies of the separate initial DL BWP and the initial UL BWP are aligned (in accordance with earlier agreement).**

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| **Company** | **Y/N** | **Comments** |
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# 2 Issue #2: SSB presence in separate initial DL BWP in connected mode for BWP configuration option 1

SSB presence in separate initial DL BWP in connected mode for BWP configuration option 1 is discussed in contributions [5, 7, 8, 9, 11, 14, 16, 18, 20, 22, 23, 24, 25, 27, 28, 29, 32]. This issue was discussed in the previous RAN1 meeting, and the discussion is captured on pages 45-72 in the FLS in [33]. Both main options under discussion (Options 1 and 2) as listed in the following FL proposal were met with both some support and some opposition.

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| High Priority Proposal 3-1h: Down select between the following options during RAN1#108-e:   * Option 1:   + For FR1, for BWP#0 configuration option 1,     - A RedCap UE in connected mode does not expect 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,     - A RedCap UE in connected mode does not expect to operate in a separate initial DL BWP that does not include CD-SSB. * Option 2:   + For FR1, for BWP#0 configuration option 1,     - For a separate initial DL BWP (if it does not include CD-SSB and the entire CORESET#0) from RAN1 perspective,       * During a random access procedure in connected mode, RedCap UE does NOT expect it to contain SSB/CORESET#0/SIB.   + For FR2, for BWP#0 configuration option 1,     - For a separate initial DL BWP (if it does not include CD-SSB) from RAN1 perspective,       * During a random access procedure in connected mode, RedCap UE does NOT expect it to contain SSB/CORESET#0/SIB.   + For BWP#0 configuration option 1, upon successful completion of the random access procedure, a RedCap UE supporting FG 6-1 only (but not FG 6-1a) in connected mode is not required to operate on a separate initial DL BWP that does not contain SSB.   + Note: The network may choose to configure SSB or MIB-configured CORESET#0 or SIB1 to be within the respective DL BWP. |

Some contributions [7, 8, 22] propose to use the above FL proposal (Proposal 3-1h) as a starting point in this meeting. Among the other contributions, some [9, 14, 16, 29, 32] lean toward Option 1, and some [5, 7, 11, 18, 22, 23, 24, 25] toward Option 2. Some contributions [16, 22, 27] suggest that Option 1 could be adopted for RedCap UEs supporting FG 6-1 and Option 2 for RedCap UEs supporting FG 6-1a.

One contribution [24] points out that RAN2 has agreed that “*In connected mode if RA occasions are not configured on the active BWP, RedCap UEs should use the RedCap-specific initial UL BWP, if configured, or else legacy BWP#0*”, whereas another contribution [28] proposes to ask RAN2 to ensure that when *initialDownlinkBWP-RedCap* does not include CD-SSB, a RedCap UE (only supporting FG 6-1) expects to be provided with NCD-SSB until after Msg4.

Some contributions [9, 14, 29] express concerns with the formulation in Option 2 that “*For BWP#0 configuration option 1, upon successful completion of the random access procedure, a RedCap UE supporting FG 6-1 only (but not FG 6-1a) in connected mode is not required to operate on a separate initial DL BWP that does not contain SSB*”. It may not be clear whether the UE capabilities (FG 6-1/6-1a) are known when they need to be known, or what “required to operate” means, or how the UE is switched back to its ordinary active DL BWP, or whether there is a risk that the UE may in practice be required to transmit or receive data even after random access in a separate initial DL BWP that does not contain SSB. Some contributions, e.g., contributions [7, 20] propose some alternative formulations for Option 2.

**FL1 High Priority Question 2-1a: Companies are invited to comment on issue #2 and indicate the preferred option (Option 1 or 2) and potential updates that might address the concerns with current formulations of the options.**

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| **Company** | **Option (1/2)** | **Comments** |
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# 3 Issue #3: Corrections for BWP operation description in 38.213 clause 17.1

Various corrections for the BWP operation description for RedCap in TS 38.213 clause 17.1 are discussed in contributions [5, 7, 9, 14, 18, 22, 26, 28].

3.1 Text proposal #1

Proposal 6 in contribution [[5]](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203114.zip) has the following motivation for its text proposal for TS 38.213 clause 17.1:

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| ***Reason for change:*** | The following RAN1 agreements have not been fully captured in 38.213:  Agreement:   * For FR1,   + For a separate initial DL BWP (if it does not include CD-SSB and the entire CORESET#0) from RAN1 perspective,     - If it is configured for random access while not for paging in idle/inactive mode, RedCap UE does NOT expect it to contain SSB/CORESET#0/SIB.     - […]   + […]   + Note: if a separate initial/RRC configured DL BWP is configured to contain the entire CORESET#0, CD-SSB is expected by RedCap UE.   + Note: The network may choose to configure SSB or MIB-configured CORESET#0 or SIB1 to be within the respective DL BWP.   + […]   Agreement:   * For FR2,   + For a separate initial DL BWP (if it does not include CD-SSB ~~and the entire CORESET#0~~) from RAN1 perspective,     - If it is configured for random access while not for paging in idle/inactive mode, RedCap UE does NOT expect it to contain SSB/CORESET#0/SIB.     - […]   + […]   + Note: For SSB and CORESET#0 multiplexing pattern 1, if a separate initial/RRC configured DL BWP is configured to contain the entire CORESET#0, CD-SSB is expected by RedCap UE.   + Note: The network may choose to configure SSB or MIB-configured CORESET#0 or SIB1 to be within the respective DL BWP.   + […]   Agreement:   * […] * For BWP#0 configuration option 1,   + For FR1,     - For a separate initial DL BWP, for a RedCap UE in connected mode, paging can only be configured if it contains CD-SSB and the entire CORESET#0.   + For FR2,     - For a separate initial DL BWP, for a RedCap UE in connected mode, paging can only be configured if it contains CD-SSB ~~and the entire CORESET#0~~. * […]   Agreement:   * A RedCap UE supports existing applicable mandatory feature(s) that are based on SSB using NCD-SSB (including NCD-SSB based measurements) as mandatory feature(s) in an RRC-configured DL BWP that does not include CD-SSB.   + NCD-SSB is ‘QCL’-ed with CD-SSB when the NCD-SSB and CD-SSB share the same SSB index.   + Note: RAN1 assumes that NCD-SSB is configured by higher layer |
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| ***Summary of change:*** | Changes to RedCap UE procedures in Clause 17.1 of TS 38.213. |
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| ***Consequences if not approved:*** | RedCap UE procedures that are not consistent with the agreements made in RAN1 during Rel-17. |

Text proposal:

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| For an initial DL BWP provided by *initialDownlinkBWP* in *DownlinkConfigCommonRedCapSIB*, if a UE monitors PDCCH according to a Type1-PDCCH CSS set and does not monitor PDCCH according to Type2-PDCCH CSS set, the UE ~~assumes that~~ does not expect the initial DL BWP ~~does not~~ to include SS/PBCH blocks ~~or~~and the CORESET with index 0. If the UE monitors PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP includes a SS/PBCH block and, for SS/PBCH block and CORESET multiplexing pattern 1, the CORESET with index 0 if the UE used the SS/PBCH block to obtain SIB1  ~~- includes a SS/PBCH block and does not include the CORESET with index 0 if the initial DL BWP does not include the SS/PBCH block the UE used to obtain SIB1~~  For an active DL BWP provided by *BWP-DownlinkDedicated*, a UE assumes that the active DL BWP includes a SS/PBCH block, unless the UE indicates a capability to operate in the DL BWP without receiving an SS/PBCH block, and does not expect the active DL BWP to include the CORESET with index 0. If the active DL BWP includes a different SS/PBCH block than the SS/PBCH block the UE used to obtain SIB1, the former and the latter SS/PBCH blocks have the same quasi-colocation properties when they have the same index. |

**FL2 Medium Priority Question 3.1-1a: Companies are invited to comment on TP1.**

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| **Company** | **Y/N** | **Comments** |
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3.2 Text proposal #2

Proposal 4 in contribution [[7]](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203307.zip) has the following motivation for its text proposal for TS 38.213 clause 17.1:

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| After RAN1#107e, the Text for the presence of the SSB in the RRC-configured DL BWP is drafted as follows:   |  | | --- | | For an active DL BWP provided by *BWP-DownlinkDedicated*, a UE assumes that the active DL BWP includes a SS/PBCH block, unless the UE indicates a capability to operate in the DL BWP without receiving an SS/PBCH block, and does not include the CORESET with index 0. |   In RAN1#108-e [3], the presence of the SSB in the RRC-configured DL BWP in connected mode was updated in terms of the working assumption.   |  | | --- | | Agreement:   * A RedCap UE supports existing applicable mandatory feature(s) that are based on SSB using NCD-SSB (including NCD-SSB based measurements) as mandatory feature(s) in an RRC-configured DL BWP that does not include CD-SSB.   + NCD-SSB is ‘QCL’-ed with CD-SSB when the NCD-SSB and CD-SSB share the same SSB index.   + Note: RAN1 assumes that NCD-SSB is configured by higher layer |   Considering this agreement, a “basic” RedCap UE should support the NCD-SSB and the NCD-SSB is QCLed with CD-SSB. According to this agreement and initial round of email discussion, the original Text is updated to the following Text:   |  | | --- | | If an active DL BWP includes an SS/PBCH block provided by dedicated RRC configuration and does not include the SS/PBCH block the UE used to obtain *physCellId* in *ServingCellConfigCommon*, the UE uses the SS/PBCH block [provided by dedicated RRC configuration] to support all Layer-1 UE features that are mandatory without capability signalling as described in [18, TS 38.306]. The SS/PBCH block the UE used to obtain *physCellId* in *ServingCellConfigCommon* and the SS/PBCH block provided by dedicated RRC configuration have same quasi-colocation properties, if they have the same index. |   Some companies suggested differentiating FR1 and FR2 by using multiplexing patterns. We think it may be a misunderstanding in the context of email discussion. Along this way, the Text is finally updated as the follows.   |  | | --- | | For an active DL BWP provided by dedicated RRC signalling   * the UE assumes that the active DL BWP includes a SS/PBCH block * for SS/PBCH block and CORESET multiplexing pattern 1, the UE does not expect the active DL BWP to include the CORESET with index 0 * if the active DL BWP includes an SS/PBCH block provided by dedicated RRC signalling and does not include the SS/PBCH block the UE used to obtain [*physCellId* or *SIB*] in *ServingCellConfigCommon*, the UE uses the SS/PBCH block provided by dedicated RRC configuration to support all Layer-1 UE features that are mandatory without capability signalling. The SS/PBCH block the UE used to obtain [*physCellId* or *SIB*] in *ServingCellConfigCommon* and the SS/PBCH block provided by dedicated RRC configuration have same quasi-colocation properties, if they have the same index |   We think the sentence that “for SS/PBCH block and CORESET multiplexing pattern 1, the UE does not expect the active DL BWP to include the CORESET with index 0” is not necessary. The “**but not CORESET#0/SIB**” in the agreement can be resolved in RAN2 spec, since RAN2 confirmed the RAN conclusion that RedCap UE monitors paging/SIB only in the initial DL BWP containing CORESET#0.  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  Furthermore, the “**but not CORESET#0/SIB**” indeed means no procedure of paging, cell (re-)selection or measurement, which is not suitable to be captured in RAN1 spec. Therefore, we suggest not mentioning “**but not CORESET#0/SIB**” in 38.213 and keeping the original structure of agreements as follows.   * Connected mode   + BWP#0 configuration option 2     - For the active RRC-configured DL BWP       * The presence of the SSB: It has agreements.   + BWP#0 configuration option 1     - For the active RRC-configured DL BWP (the non-initial DL BWP)       * The presence of the SSB: It has agreements.     - For the legacy initial DL BWP       * The presence of the SSB: containing the CD-SSB as legacy, no spec impact.     - For the separate initial DL BWP       * The presence of the SSB for paging: It has agreements.       * The presence of the SSB for random access: It is TBD (Issue 2). |

Text proposal:

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| For an initial DL BWP provided by *initialDownlinkBWP* in *DownlinkConfigCommonRedCapSIB*, if a UE monitors PDCCH according to a Type1-PDCCH CSS set and does not monitor PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP does not include SS/PBCH blocks or the CORESET with index 0.  For an initial DL BWP provided by *initialDownlinkBWP* in *DownlinkConfigCommonRedCapSIB* [without the dedicated RRC configuration], if a UE in RRC\_CONNECTED state monitors PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP includes [an SS/PBCH block that the UE used to obtain *ServingCellConfigCommonSIB or physCellId* in *ServingCellConfigCommon*], and for operation in FR1 includes the CORESET with index 0, unless the UE indicates a capability to operate otherwise.  For an active DL BWP provided by *BWP-DownlinkDedicated*,   * A UE that supports all Layer-1 UE features that are mandatory without capability signalling assumes that the active DL BWP includes a SS/PBCH block. * If the active DL BWP includes [an SS/PBCH block provided by higher layer parameter ncd-SSB] and does not include [the SS/PBCH block the UE used to obtain *ServingCellConfigCommonSIB* or *physCellId* in *ServingCellConfigCommon*], the UE uses [the SS/PBCH block provided by higher layer parameter ncd-SSB]. [The SS/PBCH block the UE used to obtain *ServingCellConfigCommonSIB* or *physCellId* in *ServingCellConfigCommon*] and [the SS/PBCH block provided by higher layer parameter ncd-SSB] have same quasi-colocation properties, if they have the same index |

**FL2 Medium Priority Question 3.2-1a: Companies are invited to comment on TP2.**

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| **Company** | **Y/N** | **Comments** |
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3.3 Text proposal #3

Proposal 8 in contribution [[9]](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203517.zip) has the following motivation for its text proposal for TS 38.213 clause 17.1:

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| ***Reason for change:***   1. The conclusion made in RAN#94-e meeting that Rel-17 RedCap UE in idle/inactive mode only use CD-SSB in an initial BWP to monitor paging has not been captured. 2. The following agreements made in RAN1#108-e meeting has not been captured.   Agreement:   * A RedCap UE supports existing applicable mandatory feature(s) that are based on SSB using NCD-SSB (including NCD-SSB based measurements) as mandatory feature(s) in an RRC-configured DL BWP that does not include CD-SSB.   + NCD-SSB is ‘QCL’-ed with CD-SSB when the NCD-SSB and CD-SSB share the same SSB index.   + Note: RAN1 assumes that NCD-SSB is configured by higher layer  1. The description for CD-SSB and NCD-SSB, and BWP#0 configuration option 1 are not accurate.   ***Summary of change:***   1. Capture above conclusion and agreements in clause 17.1. 2. Correct the description for CD-SSB and NCD-SSB, and BWP#0 configuration option 1 based on TS 38.331.   ***Consequences if not approved:*** Incomplete support for UEs with reduced capabilities in NR. |

Text proposal:

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| For an initial DL BWP provided by *initialDownlinkBWP* in *DownlinkConfigCommonRedCapSIB*, if a UE is not provided with *BWP-DownlinkDedicated* for the BWP and the UE monitors PDCCH according to a ~~Type1-PDCCH CSS set and does not monitor PDCCH according to~~ Type2-PDCCH CSS set, the UE assumes that the initial DL BWP ~~does not~~ includes SS/PBCH blocks the UE used to obtain a CORESET for Type0-PDCCH CSS set and for SS/PBCH block and CORESET multiplexing pattern 1 includes ~~or~~ the CORESET with index 0. ~~If the UE monitors PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP~~  ~~- includes a SS/PBCH block and the CORESET with index 0 if the UE used the SS/PBCH block to obtain SIB1~~  ~~- includes a SS/PBCH block and does not include the CORESET with index 0 if the initial DL BWP does not include the SS/PBCH block the UE used to obtain SIB1~~  For an active DL BWP provided by *BWP-DownlinkDedicated*, a UE assumes that the active DL BWP includes a SS/PBCH block, unless the UE indicates a capability to operate in the DL BWP without receiving an SS/PBCH block, and for SS/PBCH block and CORESET multiplexing pattern 1 does not include the CORESET with index 0.  If the active DL BWP includes an SS/PBCH block provided by *NonCellDefiningSSB* and does not include the SS/PBCH block the UE used to obtain a CORESET for Type0-PDCCH CSS set in *ServingCellConfigCommon*, the UE uses the SS/PBCH block provided by *NonCellDefiningSSB* to support all mandatory UE features that are based on SS/PBCH block. The SS/PBCH block the UE used to obtain a CORESET for Type0-PDCCH CSS set in *ServingCellConfigCommon* and the SS/PBCH block provided by *NonCellDefiningSSB* have same quasi-colocation properties, if they have the same index |

**FL2 Medium Priority Question 3.3-1a: Companies are invited to comment on TP3.**

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| **Company** | **Y/N** | **Comments** |
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3.4 Text proposal #4

Proposal 3 in contribution [[14]](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203787.zip) has the following motivation for its text proposal for TS 38.213 clause 17.1:

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| According to the current text, restricting the separate initial UL BWP to be smaller than or equal to the maximum RedCap UE bandwidth (which was agreed in RAN1 106-e and is copied as below) is missing. Thus, the current specification text should be updated to reflect this point.   |  | | --- | | Agreement:  Confirm the following working assumption from RAN1#105-e regarding RACH occasions.   * For enabling/supporting that the RACH occasion (RO) associated with the best SSB falls within the RedCap UE bandwidth, support separate initial UL BWP for RedCap UEs (which is not expected to exceed the maximum RedCap UE bandwidth), and this separate initial UL BWP for RedCap includes ROs for RedCap UEs.   + Note: these ROs can be dedicated for RedCap UEs or shared with non-RedCap UEs. |   In addition, according to the RedCap CR of 38.331[2] as indicated below, there is no definition of *DownlinkConfigCommonRedCapSIB* and *UplinkConfigCommonRedCapSIB* dedicated for RedCap. RedCap would reuse the IE of *UplinkConfigCommonSIB* and *DownlinkConfigCommonSIB* for UL/DL configuration. As for the configuration of separate initial UL BWP and initial DL BWP, new IE *initialUplinkBWP-RedCap* and *initialDownlinkBWP-RedCap* are defined, respectively. Considering this point, terminology and signalling structure should be aligned across different specifications.   |  | | --- | | ***DownlinkConfigCommonSIB* information element**  -- ASN1START  -- TAG-DOWNLINKCONFIGCOMMONSIB-START  DownlinkConfigCommonSIB ::= SEQUENCE {  frequencyInfoDL FrequencyInfoDL-SIB,  initialDownlinkBWP BWP-DownlinkCommon,  bcch-Config BCCH-Config,  pcch-Config PCCH-Config,  ...,  [[  initialDownlinkBWP-RedCap-r17 BWP-DownlinkCommon OPTIONAL -– Need R  ]]  }  ***UplinkConfigCommonSIB* information element**  -- ASN1START  -- TAG-UPLINKCONFIGCOMMONSIB-START  UplinkConfigCommonSIB ::= SEQUENCE {  frequencyInfoUL FrequencyInfoUL-SIB,  initialUplinkBWP BWP-UplinkCommon,  timeAlignmentTimerCommon TimeAlignmentTimer  }  UplinkConfigCommonSIB-v17xy ::= SEQUENCE {  initialUplinkBWP-RedCap-r17 BWP-UplinkCommon OPTIONAL -- Need R  }  -- TAG-UPLINKCONFIGCOMMONSIB-STOP  -- ASN1STOP | |

Text proposal:

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| A UE expects the initial DL BWP and the active DL BWP after the UE (re)establishes dedicated RRC connection to be smaller than or equal to the maximum DL bandwidth that the UE supports. A UE can be provided a DL BWP by  *initialDownlinkBWP-RedCap* in *DownlinkConfigCommonSIB* , and an UL BWP by *initialUplinkBWP-RedCap* in*UplinkConfigCommonSIB* . If *initialUplinkBWP* in *UplinkConfigCommonSIB* indicates an UL BWP that is larger than a maximum UL BWP that a UE supports, the UE expects to be provided an UL BWP by *initialUplinkBWP-RedCap* in *UplinkConfigCommonSIB* , that is smaller than or equal to the maximum UL bandwidth that the UE supports .  A UE can be provided by *BWP-DownlinkDedicated* a DL BWP, other than the initial DL BWP. A UE can be provided by *BWP-UplinkDedicated* an UL BWP, other than the initial UL BWP, that is smaller than or equal to the maximum UL bandwidth that the UE supports. |

**FL2 Medium Priority Question 3.4-1a: Companies are invited to comment on TP4.**

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| **Company** | **Y/N** | **Comments** |
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3.5 Text proposal #5

Proposal 3 in contribution [[18]](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204036.zip) has the following motivation for its text proposal for TS 38.213 clause 17.1:

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| Next, we discuss corrections to the text in TS 38.213 based on the following considerations. Some of the RedCap parameter names used in TS 38.213 are not aligned with how the RedCap-specific configurations are defined in TS 38.331. Specifically, a separate initial DL BWP (*initialDownlinkBWP*) and initial UL BWP (*initialUplinkBWP*) are not configured, for RedCap UEs in new *DownlinkConfigCommonRedCapSIB* and *UplinkConfigCommonRedCapSIB* IEs, respectively. Rather, a new initial DL BWP IE (*initialDownlinkBWP-RedCap*) and a new initial UL BWP IE (*initialUplinkBWP-RedCap*) are defined in the legacy downlink and uplink common configuration IEs *DownlinkConfigCommonSIB* and *UplinkConfigCommonSIB*, respectively.  The name and use of the parameter for enabling/disabling frequency hopping for PUCCH transmission in TS 38.213 is not aligned with the definition and description in TS 38.331. Specifically, frequency hopping is disabled not by providing *disable-FH-PUCCH* (which is not defined) but rather by omitting the parameter *intra-SlotFH*.  Another parameter name misalignment issue is related to how the configuration for 4-step or 2-step RACH is provided to the RedCap UE. According to the current specification text in TS 38.213, the RedCap UE is provided *RACH-ConfigCommon-RedCap* or *RACH-ConfigCommonTwoStepRA-RedCap*. This suggests that separate RACH configurations are provided for RedCap UEs and non-RedCap UEs in *BWP-UplinkCommon* configured with the legacy *initialUplinkBWP* IE. This may cause some confusion, however, since according to the specification in TS 38.331, the RACH configurations for a RedCap UE are provided in *rach-ConfigCommon* or *msgA-ConfigCommon* in *BWP-UplinkCommon* configured for the separate UL BWP by *initialUplinkBWP-RedCap*. |

Text proposal:

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| A UE expects the initial DL BWP and the active DL BWP after the UE (re)establishes dedicated RRC connection to be smaller than or equal to the maximum DL bandwidth that the UE supports. A UE can be provided a DL BWP by *initialDownlinkBWP-RedCap* in *DownlinkConfigCommon~~RedCap~~SIB*, and an UL BWP by *initialUplinkBWP-RedCap* in *UplinkConfigCommon~~RedCap~~SIB*. If *initialUplinkBWP* in *UplinkConfigCommonSIB* indicates an UL BWP that is larger than a maximum UL BWP that a UE supports, the UE expects to be provided an UL BWP by *initialUplinkBWP-RedCap* in *UplinkConfigCommon~~RedCap~~SIB*.  A UE can be provided by *BWP-DownlinkDedicated* a DL BWP, other than the initial DL BWP. A UE can be provided by *BWP-UplinkDedicated* an UL BWP, other than the initial UL BWP, that is smaller than or equal to the maximum UL bandwidth that the UE supports.  ~~If a UE is provided~~ *~~RACH-ConfigCommon-RedCap~~* ~~or~~ *~~RACH-ConfigCommonTwoStepRA-RedCap~~*~~, the UE uses corresponding parameters to perform the procedures in clauses 8.1, 8.1A, and 8.3; otherwise, the UE uses corresponding parameters from~~ *~~RACH-ConfigCommon~~* ~~or~~ *~~RACH-ConfigCommonTwoStepRA~~*~~.~~If a UE is provided an UL BWP by *initialUplinkBWP-RedCap* in *UplinkConfigCommonSIB* and is provided *rach-ConfigCommon* or *msgA-ConfigCommon* in *BWP-UplinkCommon* for this UL BWP, the UE uses corresponding parameters to perform the procedures in clauses 8.1, 8.1A, and 8.3; otherwise, the UE uses corresponding parameters from *rach-ConfigCommon* or *msgA-ConfigCommon* in *BWP-UplinkCommon* for the UL BWP provided by *initialUplinkBWP*.  If a UE is provided *initialUplinkBWP-RedCap* in *UplinkConfigCommon~~RedCap~~SIB* and does not have dedicated PUCCH resource configuration, the UE transmits PUCCH with HARQ-ACK information as described in clause 9.2.1 using a PUCCH resource set provided by *pucch-ResourceCommonRedCap*, except that frequency hopping for the PUCCH transmission is disabled if the field *intra-SlotFH* is not present *~~disable-FH-PUCCH~~* ~~is provided~~ in *PUCCH-ConfigCommon~~RedCap~~*. If frequency hopping of the PUCCH transmission is disabled then, for the PUCCH transmission, the UE determines the initial cyclic shift index in the set of initial cyclic shift indexes as and determines the PRB index as  - , if *BWP-part* = '*FromLowerEdge*'  - , otherwise  where is provided by *additional-RB-Offset*, if provided; otherwise, |

**FL2 Medium Priority Question 3.5-1a: Companies are invited to comment on TP5.**

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| **Company** | **Y/N** | **Comments** |
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3.6 Text proposal #6

Section 2.2 in contribution [[22]](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204277.zip) has the following motivation for its text proposal for TS 38.213 clause 17.1:

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| In draft CR 38.213, existing text about SSB transmission when paging is configured is as below.  If the UE monitors PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP  - includes a SS/PBCH block and the CORESET with index 0 if the UE used the SS/PBCH block to obtain SIB1  - includes a SS/PBCH block and does not include the CORESET with index 0 if the initial DL BWP does not include the SS/PBCH block the UE used to obtain SIB1  In last round of discussion on CR, there has been no consensus on how to capture SSB transmission for paging reception in separate initial DL BWP for BWP#0 configuration option 1 and option 2. |

Text proposal:

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| If the UE monitors PDCCH according to Type2-PDCCH CSS set,  -   * for an initial DL BWP provided by *initialDownlinkBWP-RedCap-r17* in *DownlinkConfigCommonSIB* and with *BWP-DownlinkDedicated* in RRC\_CONNECTED mode, if the initial DL BWP does not include the SS/PBCH block the UE used to obtain SIB1 and the CORESET with index 0, the UE assumes that the initial DL BWP includes a SS/PBCH block, unless the UE indicates a capability to operate in the DL BWP without receiving an SS/PBCH block and does not include the CORESET with index 0. * for other cases of initial DL BWP, the UE assumes that the initial DL BWP includes a SS/PBCH block and the CORESET with index 0 if the UE used the SS/PBCH block to obtain SIB1. |

**FL2 Medium Priority Question 3.6-1a: Companies are invited to comment on TP6.**

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| **Company** | **Y/N** | **Comments** |
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3.7 Text proposal #7

Proposal 1 in contribution [[26]](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204663.zip) has the following motivation for its text proposal for TS 38.213 clause 17.1:

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| ***Reason for change:*** | 1. Current specification does not clearly describe, when the RedCap UE is provided the initial DL BWP by the separate initial DL BWP configuration if the RedCap UE receives the separate initial DL BWP configuration in SIB1 and the separate DL BWP does not include the CORESET#0.  2. Current specification does not clearly describe, when the RedCap UE is provided the initial UL BWP by the separate initial UL BWP configuration if RedCap UE receives the separate initial UL BWP configuration in SIB1. |
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| ***Summary of change:*** | 1.Clarify that if RedCap UE receives the seperate initial DL BWP configuration in SIB1 and the separate initial DL BWP does not include the CORESET#0, the RedCap UE is provided the initial DL BWP by the separate initial DL BWP configuration upon and after the initiation of the random access procedure.  2. Clarify that if RedCap UE receives the seperate initial UL BWP configuration in SIB1, the RedCap UE is provided the initial UL BWP by the separate initial UL BWP configuration. |
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| ***Consequences if not approved:*** | 1.It is unclear when the RedCap UE is provided the initial DL BWP by the separate initial DL BWP configuration if the separate initial DL BWP does not include the CORESET#0.  2. It is unclear when the RedCap UE is provided the initial UL BWP by the separate initial UL BWP configuration. |

Text proposal:

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| A UE expects the initial DL BWP and the active DL BWP after the UE (re)establishes dedicated RRC connection to be smaller than or equal to the maximum DL bandwidth that the UE supports. A UE can be provided a DL BWP by *initialDownlinkBWP* in *DownlinkConfigCommonRedCapSIB*, and an UL BWP by *initialUplinkBWP* in *UplinkConfigCommonRedCapSIB*. If a UE is provided the DL BWP by *initialDownlinkBWP* in *DownlinkConfigCommonRedCapSIB* not including the CORESET with index 0, the UE is provided an initial DL BWP by the *initialDownlinkBWP* in *DownlinkConfigCommonRedCapSIB* upon initiation of the physical random access procedure. If a UE is provided *initialUplinkBWP* in *UplinkConfigCommonRedCapSIB*, the UE is provided an initial UL BWP by the *initialUplinkBWP* in *UplinkConfigCommonRedCapSIB.* If *initialUplinkBWP* in *UplinkConfigCommonSIB* indicates an UL BWP that is larger than a maximum UL BWP that a UE supports, the UE expects to be provided an UL BWP by *initialUplinkBWP* in *UplinkConfigCommonRedCapSIB*.  A UE can be provided by *BWP-DownlinkDedicated* a DL BWP, other than the initial DL BWP. A UE can be provided by *BWP-UplinkDedicated* an UL BWP, other than the initial UL BWP, that is smaller than or equal to the maximum UL bandwidth that the UE supports. |

**FL2 Medium Priority Question 3.7-1a: Companies are invited to comment on TP7.**

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| **Company** | **Y/N** | **Comments** |
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3.8 Text proposal #8

Proposal 4 in contribution [[28]](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204744.zip) has the following motivation for its text proposal for TS 38.213 clause 17.1:

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| In our opinion, SSB presence shall not be dependent on TYPE-2 CSS being configured for BWP or not. At the same time, it should not depend on whether BWP has been configured with BWP-DownlinkDedicated or not (as in current spec). Instead, based on agreements (“For an RRC-configured active DL BWP in connected mode (if it does not include CD-SSB and the entire CORESET#0) from RAN1 perspective”) it should depend on whether UE is RRC connected or not. When it comes to paging, RAN1 should leave capturing of current RAN1 paging agreements to RAN2.  Proposal:   * Send LS to kindly ask RAN2 to capture the following:   + in IDLE/Inactive mode UE monitors paging within CORESET#0 by MIB   + in RRC connected mode paging can be monitored in any active BWP (as in legacy) * Adopt the following text proposal that   + removes paging aspects from RAN1 specification   + clarifies agreed condition under which SSB is expected by UE |

Text proposal:

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| For an initial DL BWP provided by *initialDownlinkBWP-RedCap* if the BWP does not include CORESET with index 0 and UE does not monitor PDCCH candidates for DCI formats with CRC scrambled by a C-RNTI, UE assumes that the BWP does not include SS/PBCH block. *~~initialDownlinkBWP~~* ~~in~~ *~~DownlinkConfigCommonRedCapSIB~~*~~, if a UE monitors PDCCH according to a Type1-PDCCH CSS set and does not monitor PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP does not include SS/PBCH blocks or the CORESET with index 0. If the UE monitors PDCCH according to Type2-PDCCH CSS set, the UE assumes that the initial DL BWP~~  ~~- includes a SS/PBCH block and the CORESET with index 0 if the UE used the SS/PBCH block to obtain SIB1~~  ~~- includes a SS/PBCH block and does not include the CORESET with index 0 if the initial DL BWP does not include the SS/PBCH block the UE used to obtain SIB1~~  If a UE monitors PDCCH candidates for DCI formats with CRC scrambled by a C-RNTI, for an active DL BWP ~~provided by~~ *~~BWP-DownlinkDedicated~~*~~,~~ a UE assumes that the active DL BWP includes a SS/PBCH block, unless the UE indicates a capability to operate in the DL BWP without receiving an SS/PBCH block, and does not include the CORESET with index 0. |

**FL2 Medium Priority Question 3.8-1a: Companies are invited to comment on TP8.**

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| **Company** | **Y/N** | **Comments** |
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# References

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| [2] | [R1-2202535](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2202535.zip) | RAN1 agreements for Rel-17 NR RedCap | Rapporteur (Ericsson) |
| [3] | [R1-2203053](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203053.zip) | Remaining aspects of Bandwidth Reduction for RedCap UEs | Futurewei |
| [4] | [R1-2203109](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203109.zip) | Remaining issues on UE complexity reduction | Huawei, HiSilicon |
| [5] | [R1-2203114](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203114.zip) | Maintenance issues for UE complexity reduction for RedCap | Ericsson |
| [6] | [R1-2203115](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203115.zip) | Draft summary of WI on support of reduced capability (RedCap) NR devices | Ericsson |
| [7] | [R1-2203307](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203307.zip) | Remaining issues on aspects related to reduced maximum UE bandwidth | Spreadtrum Communications |
| [8] | [R1-2203438](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203438.zip) | Remaining issues on RedCap UE complexity reduction in Rel-17 | CATT |
| [9] | [R1-2203517](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203517.zip) | Remaining issues on reduced maximum UE bandwidth | Vivo, Guangdong Genius |
| [10] | [R1-2203518](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203518.zip) | Remaining issues on RedCap half-duplex operation | Vivo, Guangdong Genius |
| [11] | [R1-2203593](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203593.zip) | Discussion on UE complexity reduction for Rel-17 Redcap UE | ZTE, Sanechips |
| [12] | [R1-2203594](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203594.zip) | Remaining aspects for Rel-17 RedCap UE | ZTE, Sanechips |
| [13] | [R1-2203762](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203762.zip) | SIB reception for RedCap UE | Panasonic |
| [14] | [R1-2203787](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203787.zip) | Discussion on the remaining issues of complexity reduction | Xiaomi |
| [15] | [R1-2203788](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203788.zip) | Discussion on the other aspects for R17 RedCap | Xiaomi |
| [16] | [R1-2203866](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203866.zip) | Remaining issues on UE complexity reduction | Samsung |
| [17] | [R1-2203992](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2203992.zip) | Other remaining issues for Reduced Capability NR Devices | OPPO |
| [18] | [R1-2204036](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204036.zip) | Remaining Issues in UE Complexity Reduction | Nokia, Nokia Shanghai Bell |
| [19] | [R1-2204037](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204037.zip) | Other Remaining Issues in RedCap Support | Nokia, Nokia Shanghai Bell |
| [20] | [R1-2204208](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204208.zip) | Reduced maximum UE bandwidth for Redcap | Apple |
| [21] | [R1-2204209](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204209.zip) | On other UE complexity reduction aspects of RedCap | Apple |
| [22] | [R1-2204277](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204277.zip) | Remaining issues on UE complexity reduction | CMCC |
| [23] | [R1-2204347](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204347.zip) | Maintenance on complexity reduction for RedCap | NTT DOCOMO, INC. |
| [24] | [R1-2204435](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204435.zip) | Remaining details on BWP operation for RedCap | NEC |
| [25] | [R1-2204619](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204619.zip) | Remaining aspects of UE complexity reduction for RedCap | LG Electronics |
| [26] | [R1-2204663](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204663.zip) | Remaining issues on UE complexity reduction for RedCap NR devices | Sharp |
| [27] | [R1-2204711](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204711.zip) | On RedCap UE complexity reduction | MediaTek Inc. |
| [28] | [R1-2204744](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204744.zip) | On remaining aspects related to reduced maximum UE BW | Nordic Semiconductor ASA |
| [29] | [R1-2204771](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204771.zip) | Remaining details on UE complexity reduction for Rel-17 RedCap | Intel Corporation |
| [30] | [R1-2204772](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204772.zip) | Remaining details on support of HD-FDD for Rel-17 RedCap | Intel Corporation |
| [31] | [R1-2204906](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204906.zip) | Remaining issues on RAN2 related issues | Huawei, HiSilicon |
| [32] | [R1-2204987](https://www.3gpp.org/ftp/TSG_RAN/WG1_RL1/TSGR1_109-e/Docs/R1-2204987.zip) | Remaining Issues on UE Complexity Reduction | Qualcomm Incorporated |
| [33] | [R1-2202532](https://www.3gpp.org/ftp/tsg_ran/WG1_RL1/TSGR1_108-e/Docs/R1-2202532.zip) | FL summary #5 on reduced maximum UE bandwidth for RedCap | Moderator (Ericsson) |
| [34] | [TS 38.331 V17.0.0](https://www.3gpp.org/ftp/Specs/archive/38_series/38.331/38331-h00.zip) | NR; Radio Resource Control (RRC) protocol specification (Release 17) | 3GPP |