**3GPP TSG-RAN WG4 Meeting # 99-e R4-210XXXX**

**Electronic Meeting, 19th – 27th May 2021**

**Agenda item:** 9.19;9.19.1

**Source:** Moderator (Ericsson)

**Title:** Email discussion summary for [99-e][149] NR\_RedCap

**Document for:** Information

# Introduction

*Briefly introduce background, the scope of this email discussion (e.g. list of treated agenda items) and provide some guidelines for email discussion if necessary.*

*List of candidate target of email discussion for 1st round and 2nd round*

* 1st round: TBA
* 2nd round: TBA

This is the first RAN4 meeting to start work on WI NR RedCap from RAN4#99e. The following topic will be discussed in 1st round:

1. RAN4 RF Work plan
2. Specification structure to capture RedCap UE RF requirement in TS 38.101-1 and TS 38.101-2
3. # Rx branch for RedCap UE
4. Generic issue: Power class, bandwidth and operating band
5. RF impact on the BS specification
6. RF impact on UE specification
7. Others feature RF impact: RRM relaxation and extended DRX
8. LS response to on Half-duplex FDD switching time

# Topic #1: Work plan

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111196**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111196.zip) | Ericsson | 3.1 May 2021  RAN4#99e (0.25 TU):   * Discuss general RF specification impact on UE and BS * Discuss RF specification structure related to the new RedCap UE type   3.4 August 2021  RAN4#100e (0.5 TU):   * Continue discussion on RF specification impact for UE * Start to discuss CR based on agreed RF requirements.   3.5 November 2021  RAN4#101 (0.5 TU):   * Continue discussion on RF specification impact for UE * Continue to discuss CR based on agreed RF requirements.   3.6 January 2022  RAN4#101bis (0.5 TU):   * Continue discussion on RF specification impact for UE * Continue to discuss CR based on agreed RF requirements.   3.7 February 2022  RAN4#102 (0.5 TU):   * Finalization of CR |
| [**R4-2109880**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109880.zip) | Huawei, HiSilicon | **Proposal 1: SUL band combinations should be included into work plan as RedCap WI RAN4 scope.** |
| [**R4-2111198**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111198.zip) | Ericsson | **Proposal 3: SUL bands and their band combinations are not considered to be included in current WI scope.** |
| [**R4-2109683**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109683.zip) | Vivo | Strictly speaking, SUL was not explicated included or excluded in the WID scope. It is conceptually similar to CA, and this extended scope are not quite aligned with the common understanding of intention of Redcap. However, its structure may be no more complicated than HD-FDD, which may be simpler compared to DC etc.  We do not have strong view on this issue. If contentious, maybe we can focus on more aligned scenarios. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Work plan itself discuss the timeline of the RAN4 RF work and work scope relating to the RedCap WI. There are discussion on WI scope to include SUL band combination with different views from companies.

### Sub-topic 1-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 1-1: Work plan**

* Proposals
  + Option 1: Agree the work plan
  + Option 2: TBA
* Recommended WF
  + TBA

### Sub-topic 1-2

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 1-2: SUL**

* Proposals
  + Option 1: SUL band combinations should be included into work plan as RedCap WI RAN4 scope
  + Option 2: SUL bands and their band combinations are not considered to be included in current WI scope
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

*One of the two formats, i.e. either example 1 or 2 can be used by moderators.*

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*For close-to-finalize WIs and maintenance work, comments collections can be arranged for TPs and CRs. For ongoing WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic #1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provides recommendation on CRs/TPs Status update*

*Note: The tdoc decisions shall be provided in Section 3 and this table is optional in case moderators would like to provide additional information.*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

# Topic #2: Specification structure for RedCap UE

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111197**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111197.zip) | Ericsson | **Proposal 6: Discuss whether to add new suffix in TS 38.101-1 and TS 38.101-2 for RedCap UE requirements.**  For FR1 in TS 38.101-1, the suffix G could be added, and the naming could be aligned with RAN1/RAN2 later on.  Table 4.3-1: Definition of suffixes   |  |  | | --- | --- | | Clause suffix | Variant | | None | Single Carrier | | A | Carrier Aggregation (CA) | | B | Dual-Connectivity (DC) | | C | Supplement Uplink (SUL) | | D | UL MIMO | | E | V2X | | F | Shared spectrum channel access | | **[G]** | **[RedCap]** |   For FR2 in TS 38.101-2, the same suffix G could be added.  Table 4.3-1: Definition of suffixes   |  |  | | --- | --- | | Clause suffix | Variant | | None | Single Carrier | | A | Carrier Aggregation (CA) | | B | Dual-Connectivity (DC) | | C | Supplement Uplink (SUL) | | D | UL MIMO | | **[G]** | **[RedCap]** | | NOTE: Suffix D in this specification represents either polarized UL MIMO or spatial UL MIMO. RF requirements are same. If UE supports both kinds of UL MIMO, then RF requirements only need to be verified under either polarized or spatial UL MIMO. | | |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions*

As RedCap is a new type UE, RAN4 could discuss how to capture the RedCap UE RF requirements in specification.

### Sub-topic 2-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 2-1: Specification structure**

* Proposals
  + Option 1: Define new suffix G for RedCap UE RF requirement in TS 38.101-1 and TS 38.101-2
  + Option 2: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #3: # Rx branch for RedCap UE

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111197**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111197.zip) | Ericsson | Proposal 1: Specify RF requirement for all band in FR1 for RedCap UE equipped with 1 Rx antenna port.  Proposal 2: Specify RF requirement for all band in FR1 for RedCap UE equipped with 2 Rx antenna port.  Observation 2: Reducing to one antenna port could mean only one antenna panel in RedCap FR2 UE.  Observation 3: The polarization gain is band specific and possibly impact both the minimum EIRP and EIS.  Proposal 3: RAN4 discusses feasibility of reducing # of antenna ports and decides on the # of antenna ports for RedCap UE in FR2. |
| [**R4-2109747**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109747.zip) | Nokia, Nokia Shanghai Bell | **Proposal 1: New single carrier REFSENS requirements need to be defined for RedCap UE with one Rx branch and for RedCap UE with two Rx branches for frequency bands where a legacy NR UE (other than 2-Rx vehicular UE) is required to be equipped with a minimum of 4 Rx antenna ports.**  **Proposal 2: Reuse existing single carrier REFSENS requirements with two Rx branches when applicable.** |
| [**R4-2109675**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109675.zip) | vivo | **Observation 1**: RAN4 RF requirements need to be updated based on 1Rx antenna port of RedCap UE.  **Observation 2**: RAN4 need to define new antenna assumption for RedCap UEs.  **Observation 3**: RAN4 need to consider different UE type (form factor and antenna size) for RedCap devices, the 2Rx REFSENS and spherical coverage need to be relaxed based on new assumption.  **Proposal 1: A simulation campaign for RedCap UEs is needed to specify the Rx requirements.**  **Observation 4**: All the REFSENS related Rx requirements need to be updated.  **Proposal 2: There is confusion about the applicability of minimum number of branches in the WID, clarification feedback from RAN Plenary is needed.** |
| [**R4-2109880**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109880.zip) | Huawei, HiSilicon | **Proposal 2: RAN4 can consider whether to discuss and specify ΔRIB,1R for RedCap UE.** |
| [**R4-2111424**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111424.zip) | Qualcomm Incorporated | **Proposal 3:** Analyse REFSENS for FDD bands that support Type A HD-FDD in half duplex mode or no TX impact with 1 RX port case by case. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 3-1: # of RX branch in FR1

*Sub-topic description:*

There is current RAN1 discussion on how to report the # of Rx branch and RAN4 can make a working assumption that # of RX branch will be one of RedCap UE capability.

*Open issues and candidate options before e-meeting:*

**Issue 3-1-1: minimum # of Rx branch for RedCap UE to be specified in FR1**

* Proposals
  + Option 1: 1
  + Option 2: TBA
* Recommended WF
  + TBA

**Issue 3-1-2: additional # of Rx branch for RedCap UE to be specified in FR1**

* Proposals
  + Option 1: 2
  + Option 2: TBA
* Recommended WF
  + TBA

### Sub-topic 3-2: # of RX branch in FR2

*Sub-topic description*

One company want to define the new antenna assumption for RedCap UE with 2 RX branch in FR2 and propose the associated work for it. Another company think RAN4 should make feasibility study on how the # of Rx branch on FR2 can be reduced.

*Open issues and candidate options before e-meeting:*

**Issue 3-2: minimum # of Rx branch for RedCap UE to be specified in FR2**

* Proposals
  + Option 1: feasibility of reducing # of antenna ports and decides on the # of antenna ports for RedCap UE in FR2. (Ericsson)
  + Option 2: RAN4 need to define new antenna assumption for RedCap UEs. (vivo)
    - RAN4 need to consider different UE type (form factor and antenna size) for RedCap devices, the 2Rx REFSENS and spherical coverage need to be relaxed based on new assumption
    - A simulation campaign for RedCap UEs is needed to specify the Rx requirements.
  + Option 3: TBA
* Recommended WF
  + TBA

### Sub-topic 3-3

*Sub-topic description:*

One company is not sure about the # of reduced RX branch apply to FR1 only or FR1 &FR2 . Companies understanding could be collected.

*Open issues and candidate options before e-meeting:*

**Issue 3-3: whether the reduced # of RX branch to FR1 only or FR1&FR2 (vivo)**

* Proposals
  + Option 1: Apply both FR1 and FR2
  + Option 2: FR1 only.
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #4: Generic issue: Power class, bandwidth and operating band

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111197**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111197.zip) | Ericsson | **Proposal 4: RAN4 discuss and decide on the power class for RedCap UE for both FR1 and FR2.**  **Proposal 5: Operators could propose the initial frequency bands for RedCap UEs operating in FDD and TDD in FR1 and in FR2 in next meeting. RAN4 could add additional agenda item for it.** |
| [**R4-2109747**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109747.zip) | Nokia, Nokia Shanghai Bell | **Observation 2: All NR operating FDD and TDD bands are supported for RedCap UEs.**  **Proposal 3: Further dicuss and specify the frequency bands supporting HD-FDD UEs.**  **Proposal 4: New single carrier REFSENS requirements are needed for HD-FDD UE.**  No impact to RF core requirements is expected from the reduced UE bandwidth feature. However, RAN1 may ask RAN4 about RF retuning and BWP switching times as needed. |
| [**R4-2111424**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111424.zip) | Qualcomm Incorporated | **Proposal 3:** Analyse REFSENS for FDD bands that support Type A HD-FDD in half duplex mode or no TX impact with 1 RX port case by case. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

Some generic issue relating the power class and frequency band supported by RedCap should be clarified so RAN4 RF requirement can be specified.

### Sub-topic 4-1: Power class

*Sub-topic description:*

It can be discussed whether the PC3 should be baseline of the RedCap UE or other power class could be needed. The power class for RedCap could be based on RAN4 consensus or operator request

*Open issues and candidate options before e-meeting:*

**Issue 4-1-1: Power class for RedCap UE in FR1**

* Proposals (multiple choice is possible)
  + Option 1: PC3
  + Option 2: other PC, TBD
  + Option 3:
* Recommended WF
  + TBA

**Issue 4-1-2: Power class for RedCap UE in FR2**

* Proposals (multiple choice is possible)
  + Option 1: PC3
  + Option 2: other PC, TBD
  + Option 3:
* Recommended WF
  + TBA

### Sub-topic 4-2: frequency band

*Sub-topic description*

One company thinks the RedCap UE frequency band should be requested based on operation request; Companies view could be collected.

*Open issues and candidate options before e-meeting:*

**Issue 4-2-1: Frequency band supported by RedCap in FR1 & FR2**

* Proposals
  + Option 1: Operators could propose the initial frequency bands for RedCap UEs operating in FDD and TDD in FR1 and in FR2 in next meeting. RAN4 could add additional agenda item for it.
  + Option 2: All NR operating FDD and TDD bands
  + Option 3: TBA
* Recommended WF
  + TBA

**Issue 4-2-2: Frequency band supported for HD-FDD by RedCap UE**

* Proposals
  + Option 1: Further discuss and specify the frequency bands supporting HD-FDD UEs.
  + Option 2: FDD bands that support Type A HD-FDD
  + Option 3: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #2: RF impact on the BS specification

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111197**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111197.zip) | Ericsson | **Proposal 8: No BS RF impact to support RedCap UE.** |
| [**R4-2109747**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109747.zip) | Nokia, Nokia Shanghai Bell | **Observation 1: There is no impact to BS RF requirements, but impact to UE RF core requierments is expected from the support of UE complexity reduction features.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 5-1

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 5-1: BS RF impact**

* Proposals
  + Option 1: No
  + Option 2: TBA
* Recommended WF
  + Option 1

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #2: RF impact on UE specification

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111197**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111197.zip) | Ericsson | |  |  | | --- | --- | | **RF requirement** | **Comments** | | 5.2 Operating band | Based on operator request with release independent manner | | 5.3.5 UE channel bandwidth per operating band | The Maximum UE bandwidth for FR1 RedCap is 20MHz. | | 6.2.1 UE maximum output power | Could specify PC3 as default, based on operator request together with operating band or based on RAN4 consensus | | 6.2.2 UE maximum output power reduction | As the Re-15 NR support the UE RF bandwidth less than BS cell bandwidth with BWP. The UE RF capability with limited RF bandwidth can be configured with BWP within a wide cell bandwidth. The MPR has already covered for RedCap case. | | 6.2.3 UE additional maximum output power reduction | As the Re-15 NR support the UE RF bandwidth less than BS cell bandwidth with BWP. The UE RF capability with limited RF bandwidth can be configured with BWP within a wide cell bandwidth. The A-MPR has already covered for RedCap case. | | 6.3 Output power dynamics | Apply to RedCap UE, | | 6.4 Transmit signal quality | Apply to RedCap UE, | | 6.5 Output RF spectrum emissions | Apply to RedCap UE, | | 7.2 Diversity characteristics | Need to add in RedCap UE reduced RX branch limitation. | | 7.3 Reference sensitivity | Need to add in RedCap UE REFSENS for reduced RX antenna port per RedCap UE frequency Band.  Add also HD-FDD support | | 7.4 Maximum input level | Apply to RedCap UE, | | 7.5 Adjacent Channel Selectivity (ACS) | REFSENS table refer to REFSENS for RedCap UE | | 7.6 Blocking characteristics | REFSENS table refer to REFSENS for RedCap UE | | 7.7 Spurious response | REFSENS table refer to REFSENS for RedCap UE | | 7.8 Intermodulation characteristics | REFSENS table refer to REFSENS for RedCap UE | | 7.9 Spurious emissions | Apply to RedCap UE, | |  |  |   For FR2:   |  |  | | --- | --- | | **RF requirement** | **Comments** | | 5.2 Operating band | Based on operator request with release independent manner | | 5.3.5 UE channel bandwidth per operating band | The Maximum UE bandwidth for FR2 RedCap is 100MHz. | | 6.2.1 UE maximum output power | Could specify PC3 as default, based on operator request together with operating band or based on RAN4 consensus  Add RedCap UE on PC3 | | 6.2.1.0 General | | 6.2.2 UE maximum output power reduction | As the Re-15 NR support the UE RF bandwidth less than BS RF bandwidth with BWP. The UE RF capability with limited RF bandwidth can be configured with BWP within a wide cell bandwidth. The MPR has already covered for RedCap case. | | 6.2.3 UE additional maximum output power reduction | As the Re-15 NR support the UE RF bandwidth less than BS RF bandwidth with BWP. The UE RF capability with limited RF bandwidth can be configured with BWP within a wide cell bandwidth. The A-MPR has already covered for RedCap case | | 6.3 Output power dynamics | Apply to RedCap UE, | | 6.4 Transmit signal quality | Apply to RedCap UE, | | 6.5 Output RF spectrum emissions | Apply to RedCap UE, | | 7.2 Diversity characteristics | Apply to RedCap UE, | | 7.3 Reference sensitivity | Discuss # of Rx antenna ports for RedCap UE.  Need to add in RedCap UE REFSENS for reduced RX antenna port per RedCap FR2 Band. | | 7.4 Maximum input level | Apply to RedCap UE, | | 7.5 Adjacent Channel Selectivity (ACS) | Apply to RedCap UE, the wanted signal and interference signal need polarization match, discuss whether it still apply to RedCap UE with reduced RX antenna port | | 7.6 Blocking characteristics | Apply to RedCap UE, the wanted signal and interference signal need polarization match, discuss whether it still apply to RedCap UE with reduced RX antenna port | | 7.9 Spurious emissions | Apply to RedCap UE, | |
| [**R4-2109747**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109747.zip) | Nokia, Nokia Shanghai Bell | **Observation 1: There is no impact to BS RF requirements, but impact to UE RF core requierments is expected from the support of UE complexity reduction features.**  **Observation 2: All NR operating FDD and TDD bands are supported for RedCap UEs.**  Transmitter characteristics  The work item does not include any objective related to changing transmitter characteristics for RedCap UEs. As such, all the RF requirements related to device UE transmitter power (maximum output power, maximum output power reduction, etc.), output power dynamics including power control, and transmit signal quality including EVM that are **defined for NR UE can be reused for RedCap UE.**  **Proposal 1: New single carrier REFSENS requirements need to be defined for RedCap UE with one Rx branch and for RedCap UE with two Rx branches for frequency bands where a legacy NR UE (other than 2-Rx vehicular UE) is required to be equipped with a minimum of 4 Rx antenna ports.**  **Proposal 2: Reuse existing single carrier REFSENS requirements with two Rx branches when applicable.**  **Proposal 3: Further dicuss and specify the frequency bands supporting HD-FDD UEs.**  New REFSENS requirements also needed for HD-FDD UE with 1 Rx and 2 Rx branches.  **Proposal 4: New single carrier REFSENS requirements are needed for HD-FDD UE.** |
| [**R4-2109675**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109675.zip) | vivo | **Observation 1**: RAN4 RF requirements need to be updated based on 1Rx antenna port of RedCap UE.  **Observation 4**: All the REFSENS related Rx requirements need to be updated. |
| [**R4-2109880**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109880.zip) | Huawei, HiSilicon | **Proposal 2: RAN4 can consider whether to discuss and specify ΔRIB,1R for RedCap UE.** |
| [**R4-2111424**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111424.zip) | Qualcomm Incorporated | **Proposal 3:** Analyse REFSENS for FDD bands that support Type A HD-FDD in half duplex mode or no TX impact with 1 RX port case by case. |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

One company think there is no TX requirement impact on introducing RedCap UE, one company think it may be UE transmit power impact due to the power class and operating band. Most companies focus on the RX requirement impacts.

### Sub-topic 6-1: TX requirement

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 6-1-1: Tx requirements impact except the UE transmit power in FR1 and FR2**

* Proposals
  + Option 1: RedCap UE reuse the NR UE requirement
  + Option 2: TBA
* Recommended WF
  + TBA

**Issue 6-1-2: UE transmit power in FR1 and FR2**

* Proposals
  + Option 1: Depend on the RedCap PC and frequency band
  + Option 2: TBA
* Recommended WF
  + TBA

### Sub-topic 6-2: RX requriement

*Sub-topic description*

All companies sees the need to update the REFSENS, however, as the REFSENS has dependency of # of RX branch, so only high level impacted RX requirement is discussed.

*Open issues and candidate options before e-meeting:*

**Issue 6-2-1: REFSENS requirement impact in FR1**

* Proposals (multiple choice)
  + Option 1: Specify new single carrier requirement:
    - For one Rx branch.
    - For 2 Rx branches for bands where legacy NR UE is required with 4 Rx antenna ports.
  + Option 2: Reuse existing single carrier requirement for 2 Rx branches when applicable.
  + Option 3: others (to be detailed)
* Recommended WF
  + TBA

**Issue 6-2-2: Other RX requirement impact in FR1**

* Proposals (multiple choice)
  + Option 1: No other impact
  + Option 2: ACS
  + Option 3: Blocking
  + Option 4: others (to be detailed)
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #2: Others feature RF impact: RRM relaxation and extended DRX

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2109747**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109747.zip) | Nokia, Nokia Shanghai Bell | **Observation 3: No RF impact is expected from support of eDRX for RedCap UEs.**  **Observation 4: No RF impact is expected from support of RRM relaxation for RedCap UEs.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

### Sub-topic 7-1: eDRX RF impact

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 7-1: eDRX RF impact**

* Proposals
  + Option 1: No impact
  + Option 2: TBA
* Recommended WF
  + TBA

### Sub-topic 7-2: RRM relaxation impact

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 7-2: RRM RF impact**

* Proposals
  + Option 1: No RF impact
  + Option 2: TBA
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Topic #2: LS response to on Half-duplex FDD switching time

*Main technical topic overview. The structure can be done based on sub-agenda basis.*

## Companies’ contributions summary

|  |  |  |
| --- | --- | --- |
| **T-doc number** | **Company** | **Proposals / Observations** |
| [**R4-2111198**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111198.zip) | Ericsson | **Observation 1: No frequency tuning is required for Type A HD-FDD RedCap UE when switching between Tx and Rx.**  **Proposal 1: TX ON-OFF transient time requirement shall be mandatory for the HD-FDD RedCap UE to provide time orthogonality between HD-FDD RedCap UE and FD-FDD UE.**  **Observation 2: The benefit of additional TX/RX switching delay to allow switching ON/OFF one of the two PLLs is unclear for the RedCap use cases.**  **Observation 3: UE complexity reduction techniques and UE power saving techniques are part of different, non-overlapping objectives.**  **Proposal 2: FR1 transition time in Table 4.3.2-3 in TS 38.211 applies to Type A HD-FDD device Tx-Rx switching (transition) time.**  **Proposal 3: SUL bands and their band combinations are not considered to be included in current WI scope.** |
| [**R4-2109879**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109879.zip) | Huawei, HiSilicon | RAN4 confirms that RAN1’s working assumptions about transition time are applied for RedCap UE not capable of full-duplex and not supporting simultaneous transmission and reception as defined by parameter *simultaneousRxTxSUL*, e.g. HD-FDD operation, TDD operation, non-simultaneous RxTx for SUL band combinations. |
| [**R4-2111424**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111424.zip) | Qualcomm Incorporated | **Observation 1:** Using a guard time comparable to [2] guard symbols at 30KHz SCS, [FFS %] higher power savings compared to a 3% throughput loss for [FFS] consecutive DL frames. No throughput loss is observed using 15KHz SCS or using 1 guard symbol.  **Proposal 1:** RAN4 canconfirm the transition time for TX-RX as 13usec.  **Proposal 2:** Use a longer transition time for RX-TX of up to [1-2] guard symbols at 30KHz SCS. |
| [**R4-2109683**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109683.zip) | Vivo | **Proposal: Further discuss those issues, and current requirements and smaller scope should be the baseline.** |

## Open issues summary

*Before e-Meeting, moderators shall summarize list of open issues, candidate options and possible WF (if applicable) based on companies’ contributions.*

The SUL related question is moved to topic 1 relating to the work scope discussion. Any decision relating to SUL can be reflected in new LS response to RAN1.

One company bring the TX ON-OFF mask relating to TX-RX switching time, as there is no proponent of the different TX\_RX switching time relating to RAN1 LS working assumption, there is no need to discuss this aspect. Thus discussion focusing on the TX-RX and RX-Tx switching time.

### Sub-topic 8-1: TX – RX switching time

*Sub-topic description:*

*Open issues and candidate options before e-meeting:*

**Issue 2-1: TX- RX switching time**

* Proposals
  + Option 1: 13 us. (the same for FR1 TX-RX transition time in Table 4.3.2-3 in TS 38.211)
  + Option 2: TBA
* Recommended WF
  + TBA

### Sub-topic 2-2: RX -TX switching time

*Sub-topic description*

*Open issues and candidate options before e-meeting:*

**Issue 2-2: TBA**

* Proposals
  + Option 1: 13 us. (the same for FR1 RX-TX transition time in Table 4.3.2-3 in TS 38.211)
  + Option 2: longer transition time for RX-TX of up to [1-2] guard symbols at 30KHz SCS.
* Recommended WF
  + TBA

## Companies views’ collection for 1st round

### Open issues

**Example 1**

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX | Sub topic 1-1:  Sub topic 1-2:  ….  Others: |

**Example 2**

Sub topic 1-1

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

Sub topic 1-2

|  |  |
| --- | --- |
| **Company** | **Comments** |
| XXX |  |

### CRs/TPs comments collection

*Major close to finalize WIs and Rel-15 maintenance, comments collections can be arranged for TPs and CRs. For Rel-16 on-going WIs, suggest to focus on open issues discussion on 1st round.*

|  |  |
| --- | --- |
| **CR/TP number** | **Comments collection** |
| XXX | Company A |
| Company B |
|  |
| YYY | Company A |
| Company B |
|  |

## Summary for 1st round

### Open issues

*Moderator tries to summarize discussion status for 1st round, list all the identified open issues and tentative agreements or candidate options and suggestion for 2nd round i.e. WF assignment.*

|  |  |
| --- | --- |
|  | **Status summary** |
| **Sub-topic#1** | *Tentative agreements:*  *Candidate options:*  *Recommendations for 2nd round:* |

### CRs/TPs

*Moderator tries to summarize discussion status for 1st round and provided recommendation on CRs/TPs Status update suggestion*

|  |  |
| --- | --- |
| **CR/TP number** | **CRs/TPs Status update recommendation** |
| XXX | *Based on 1st round of comments collection, moderator can recommend the next steps such as “agreeable”, “to be revised”* |

## Discussion on 2nd round (if applicable)

*Moderator can provide summary of 2nd round here. Note that recommended decisions on tdocs should be provided in the section titled ”Recommendations for Tdocs”.*

# Recommendations for Tdocs

## 1st round

**New tdocs**

|  |  |  |
| --- | --- | --- |
| **Title** | **Source** | **Comments** |
| WF on … | YYY |  |
| LS on … | ZZZ | To: RAN\_X; Cc: RAN\_Y |
|  |  |  |

**Existing tdocs**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| [**R4-2109675**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109675.zip) | General views on Redcap UE RF requirements | vivo |  |  |
| [**R4-2109747**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109747.zip) | On the scope of work on RF core requirements Redcap | Nokia, Nokia Shanghai Bell |  |  |
| [**R4-2109879**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109879.zip) | Draft Reply LS on Half-duplex FDD switching time for RedCap UE | Huawei, HiSilicon |  |  |
| [**R4-2109880**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109880.zip) | General discussion for RedCap UE | Huawei, HiSilicon |  |  |
| [**R4-2111196**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111196.zip) | RAN4 RF WI work plan for RedCap | Ericsson |  |  |
| [**R4-2111197**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111197.zip) | RF impact analysis on R17 RedCap | Ericsson |  |  |
| [**R4-2111198**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111198.zip) | Reply LS to Half-duplex FDD switching for RedCap UE | Ericsson |  |  |
| [**R4-2111424**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2111424.zip) | RedCap RF Issues | Qualcomm Incorporated |  |  |
| [**R4-2109683**](https://www.3gpp.org/ftp/TSG_RAN/WG4_Radio/TSGR4_99-e/Docs/R4-2109683.zip) | Discussion and reply LS on Half-duplex FDD switching time for RedCap UE | vivo |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics incl. existing and new tdocs.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. For new LS documents, please include information on To/Cc WGs in the comments column
4. Do not include hyper-links in the documents

## 2nd round

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Tdoc number** | **Title** | **Source** | **Recommendation** | **Comments** |
| R4-210xxxx | CR on … | XXX | Agreeable, Revised, Merged, Postponed, Not Pursued |  |
| R4-210xxxx | WF on … | YYY | Agreeable, Revised, Noted |  |
| R4-210xxxx | LS on … | ZZZ | Agreeable, Revised, Noted |  |
|  |  |  |  |  |

Notes:

1. Please include the summary of recommendations for all tdocs across all sub-topics.
2. For the Recommendation column please include one of the following:
   1. CRs/TPs: Agreeable, Revised, Merged, Postponed, Not Pursued
   2. Other documents: Agreeable, Revised, Noted
3. Do not include hyper-links in the documents