3GPP TSG-RAN WG2 Meeting #129-bis Tdoc R2-25xxxxx

Wuhan, China, April 7 – 11, 2025

Agenda: x.x.x

Source: Ericsson

Title: Issues and proposals on RRC impact

Document for: Discussion, Decision

# 1 Introduction

This document summarises the following e-mail discussion:

* [Post129][208][ MIMO\_Ph5] Issues and proposals on RRC impact (Ericsson)

Scope: Discuss RRC impact taking into account proposals in R2-2500930, R2-2500218, R2-2501223, R2-2500103, and R2-2500250, and also include new RRC parameters if R1 agreed further, identify main issues and try to form proposals for next meeting’s discussions

Intended outcome: Summary document with proposals

Deadline: Long

Companies are invited to provide contact details on the table below.

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| Name | Company | E-mail |
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Note that some aspects raised in the papers are already considered in the running CR and thus are not discussed here. There are also proposals from the papers that were already treated in RAN2#129-bis and/or that can be discussed later once the parameter list is more stable. Hence, this document focuses on issues to be treated in RAN2#129-bis, aiming to close the aspects left to RAN2 in the L1 parameter list. If needed and something is missing, companies can refer to the section “Other issues” and raise further aspects therein.

# 2 Discussion

## 2.1 UEBIM

In the RAN1 parameter list, the parameters for UE initiated beam reporting are defined under CSI-ReportConfig. From the papers in RAN2 there are both proposals to keep those parameters in CSI-ReportConfig [2] or to move them to CSI-MeasConfig [5].

### Question 1

Which options is preferred – add currently defined UEIBM parameters in CSI-ReportConfig or in CSI-MeasConfig? In case of CSI-ReportConfig, the legacy reportConfigType can be clarified in the field description to be ignored by a UE receiving configuration for UEIBM. It should also be noted that the running CR for now is based on the RAN1 input and thus includes the parameters in CSI-ReportConfig, but it can be updated depending on the conclusion of the discussion.

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| Company | CSI-ReportConfig/CSI-MeasConfig | Comments |
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From R1 parameter list, the following was left to RAN2:

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| UEIBM | CSI-ReportConfig | enabledCurrentBeamReport-r19 | New | This parameter is to enable or disable whether current beam is always reported. - When enabled by RRC, the current beam + N beams from the measurement RSs for new beam(s) are reported l - Note: The reported current beam is NOT counted in the N reported beams. - When disabled by RRC, N beams are reported. | Up to RAN2 | Relevant agreement:  Agreement in RAN1#117 [117] Agreement On UE-initiated/event-driven beam reporting, regarding L1-RSRP report format Option-3 depending on Event-2, for a report instance where N ≥ 1 beam(s) are reported, the following is supported. - RRC can enable or disable whether current beam is always reported  u- When enabled by RRC, the current beam + N beams from the measurement RSs for new beam(s) are reported  l- Note: The reported current beam is NOT counted in the N reported beams.  - When disabled by RRC, N beams are reported. . |
| UEIBM | CSI-ReportConfig | newBeamResourceSet-r19 | New or existing | This parameter is used to configure the RS resource set for new beam(s) for Event 1, Event 2, or Event 7 | Up to RAN2 | Up to RAN2 whether to introduce the new RRC parameter associating with *CSI-SSB-ResourceSetId* or reuse the existing *resourcesForChannelMeasurement* in *CSI-ReportConfig*. RAN1 doesn’t see the need for introducing new parameter, |

For the enabledCurrentBeamReport-r19, the enable/disable behaviour can be achieved in RRC by having an optional need R field where presence means the feature is enabled and absence means the feature is not enabled/released.

For newBeamResourceSet-r19, it should be discussed whether to use a new parameter or reuse resourcesForChannelMeasurement in CSI-ReportConfig. RAN1 does not see the need to introduce a new parameter as clarified in the comment section of the table above. Therefore, it seems simpler to just reuse resourcesForChannelMeasurement. In this case, it can be considered to add a clarification to the field description of nzp-CSI-RS-ResourceSetList in CSI-ResourceConfig to clarify that only CSI-SSB-ResourceSetId is configured in case of UEIBM configuration.

### Question 2

Do companies agree with the way forward below?

1. add enabledCurrentBeamReport-r19 as an optional need-R field;
2. do not add newBeamResourceSet-r19 (i.e. reuse resourcesForChannelMeasurement in CSI-ReportConfig). Companies also are invited to comment on whether they see a need to add a clarification in the field description of nzp-CSI-RS-ResourceSetList in CSI-ResourceConfig to clarify that only CSI-SSB-ResourceSetId is configured in case of UEIBM configuration.

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| Company | Yes/No | Comments |
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## 2.2 CSI support for up to 128 CSI-RS ports

From [2], 3 options are outlined for the Re-19 CBSR as below.

**Option 1:**

Reuse the Rel-18 CHOICE structure for the CBSR of Rel-19 type-1 and type-2 codebooks, i.e., bit string length is signaled as a CHOICE of (N1, N2), a CHOICE of (no CBSR), and a CHOICE of (X1, X2), which leads to CHOICE embedded in 3 layers. This option does not need separate parameters for N1, N2, X1, X2, but cannot reflect nonapplicable (X1, X2) pairs so extra configuration restrictions have to be capture in field description.

In our understanding, extra configuration restrictions are not needed in the field description if N1-N2 fields point to different X1-X2 IE restrictions as depicted below:

n1-n2-codebookSubsetRestriction-r19 N1-N2-CBSR-r19

N1-N2-CBSR-r19 ::= CHOICE {

eight-three-r19 CHOICE {no-cbsr-r19 NULL, X1-X2-Restriction1-r19},

six-four-r19 CHOICE {no-cbsr-r19 NULL, X1-X2-Restriction1-r19},

sixteen-two-r19 CHOICE {no-cbsr-r19 NULL, X1-X2-Restriction2-r19},

eight-four-r19 CHOICE {no-cbsr-r19 NULL, X1-X2-Restriction2-r19},

sixteen-four-r19 CHOICE {no-cbsr-r19 NULL, X1-X2-Restriction3-r19},

eight-eight-r19 CHOICE {no-cbsr-r19 NULL, X1-X2-Restriction3-r19}

}

X1-X2-Restriction1-r19 ::= CHOICE {

one-one-r19 BIT STRING (SIZE (384)),

two-one-r19 BIT STRING (SIZE (192)),

two-two-r19 BIT STRING (SIZE (96)),

four-one-r19 BIT STRING (SIZE (96)),

four-two-r19 BIT STRING (SIZE (48)),

four-four-r19 BIT STRING (SIZE (24))

}

X1-X2-Restriction2-r19 ::= CHOICE {

one-one-r19 BIT STRING (SIZE (512)),

two-one-r19 BIT STRING (SIZE (256)),

two-two-r19 BIT STRING (SIZE (128)),

four-one-r19 BIT STRING (SIZE (128)),

four-two-r19 BIT STRING (SIZE (64)),

four-four-r19 BIT STRING (SIZE (32))

}

X1-X2-Restriction3-r19 ::= CHOICE {

one-one-r19 BIT STRING (SIZE (1024)),

two-one-r19 BIT STRING (SIZE (512)),

two-two-r19 BIT STRING (SIZE (256)),

four-one-r19 BIT STRING (SIZE (256)),

four-two-r19 BIT STRING (SIZE (128)),

four-four-r19 BIT STRING (SIZE (64))

}

**Option 2:**

Alternatively, (N1, N2) can be signaled as a separate parameter, and CBSR can be signaled as a CHOICE of (X1, X2) and a CHOICE of N1N2. Note there are many (X1, X2) values not applicable to type-II and type-II Doppler codebook, but only applicable to type-I single-panel codebook. This option does not need separate parameter/description for X1, X2, and can directly reflect applicable (X1, X2) pairs in the CHOICE of (X1, X2). An example is shown below.

n1-n2-r19 ENUMERATED {eight-three, six-four, sixteen-two, eight-four, sixteen-four, eight-eight},

typeI-codebookSubsetRestriction-r19 typeI-X1-X2-CBSR-r19 OPTIONAL -- Need R

typeI-X1-X2-CBSR-r19 ::= CHOICE {

one-one-r19 CHOICE {twentyfour BIT STRING (SIZE (384)), thirtytwo BIT STRING (SIZE (192)), sixtyfour BIT STRING (SIZE (1024))},

two-one-r19 CHOICE {twentyfour BIT STRING (SIZE (192)), thirtytwo BIT STRING (SIZE (256)), sixtyfour BIT STRING (SIZE (512))},

two-two-r19 CHOICE {twentyfour BIT STRING (SIZE (96)), thirtytwo BIT STRING (SIZE (128)), sixtyfour BIT STRING (SIZE (256))},

four-one-r19 CHOICE {twentyfour BIT STRING (SIZE (96)), thirtytwo BIT STRING (SIZE (128)), sixtyfour BIT STRING (SIZE (256))},

four-two-r19 CHOICE {twentyfour BIT STRING (SIZE (48)), thirtytwo BIT STRING (SIZE (64)), sixtyfour BIT STRING (SIZE (128))},

four-four-r19 CHOICE {twentyfour BIT STRING (SIZE (24)), thirtytwo BIT STRING (SIZE (32)), sixtyfour BIT STRING (SIZE (64))}

}

typeII-codebookSubsetRestriction-r19 typeII-X1-X2-CBSR-r19 OPTIONAL -- Need R

typeII-X1-X2-CBSR-r19 ::= CHOICE {

one-one-r19 CHOICE {twentyfour BIT STRING (SIZE (24)), thirtytwo BIT STRING (SIZE (32)), sixtyfour BIT STRING (SIZE (64))},

two-one-r19 CHOICE {twentyfour BIT STRING (SIZE (12)), thirtytwo BIT STRING (SIZE (16)), sixtyfour BIT STRING (SIZE (32))},

two-two-r19 CHOICE {twentyfour BIT STRING (SIZE (6)), thirtytwo BIT STRING (SIZE (8)), sixtyfour BIT STRING (SIZE (16))},

four-one-r19 CHOICE {twentyfour BIT STRING (SIZE (6)), thirtytwo BIT STRING (SIZE (8)), sixtyfour BIT STRING (SIZE (16))},

four-two-r19 CHOICE {thirtytwo BIT STRING (SIZE (4)), sixtyfour BIT STRING (SIZE (8))}

}

**Option 3:**

(N1, N2) is signaled as a separate parameter, and CBSR is optionally signaled as a variable BIT STRING. Variable BIT STRING is widely used in UE capability signaling, which can be utilized to simplify the signaling of CBSR. This option needs extra parameters for (X1, X2) and capture nonapplicable pairs in FD. An example is shown below.

n1-n2-r19 ENUMERATED {eight-three, six-four, sixteen-two, eight-four, sixteen-four, eight-eight},

typeI-x1-x2-r19 ENUMERATED {one-one, two-one, two-two, four-one, four-two, four-four} OPTIONAL -- Need R

typeII-x1-x2-r19 ENUMERATED {one-one, two-one, two-two, four-one, four-two} OPTIONAL -- Need R

typeI-codebookSubsetRestriction-r19 BIT STRING (SIZE (24, 32, 48, 64, 96, 128, 192, 256, 384, 512, 1024)) OPTIONAL -- Need R

typeII-codebookSubsetRestriction-r19 BIT STRING (SIZE (4, 6, 8, 12, 16, 24, 32, 64)) OPTIONAL -- Need R

### Question 3

Which option is preferred by companies for CBSR design? Note that the scope of the examples above are for typeI-CBSR and typeII-CBSR, but the option chosen should also be applicable to typeI-softScalingRank.

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| Company | Option 1/ Option 2/ Option 3 / Other | Comments |
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From R1 parameter list, the following was left to RAN2:

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| ng-n1-n2-r19 | new | Supported values of (Ng, N1,N2): 48 ports: (2,4,3), (2,6,2),(2,12,1) 64 ports: (2,8,2), (2,16,1), (4,4,2), (2,4,4), (4,8,1) 128 ports: (4,4,4), (4,16,1), (4,8,2) | up to RAN2,  (direct extension of the legacy design of ng-n1-n2 in R15 typeI-multiPanel) |

Including the following for CSI-RI:

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| CSI-AssociatedReportConfigInfo | the MR selected CSI-RS resources  MR={1,2} for Rel-15 Type-I SP  MR={1} for Rel-16 eType-II | up to RAN2 | "The value of MR (number of CRIs that NW selects to report) canbe inferred from the list of selected resources.  The parent IE is up to RAN2" |
| cri-typeI-SinglePanel-ri-restriction-r19 | resource-specific RI restriction (8-bit bitmap per resource, where the 8-bit bitmap is similar to (or the same as) typeI-SinglePanel-ri-restriction) , Rel-15 Type-I-based | up to RAN2 |  |
| cri-typeII-ri-restriction-r19 | resource-specific RI restriction (4-bit bitmap per resource, where the 4-bit bitmap is similar to (or the same as) typeII-ri-restriction) , Rel-16 eType-II based | up to RAN2 |  |
| cri-typeI-SinglePanel-CBSR-r19 | resource-specific CBSR: reuse Rel-15 Type-I SP CBSR design for each of the KS resources | up to RAN2 | • Just as Rel-18 Type-II CJT CBSR, decouple (N1,N2) from each of the Ks CBSR IEs  • This implies that it is possible not to configure CBSR for any of the KS resources |
| cri-typeII-CBSR-r19 | resource-specific CBSR: reuse Rel-16 eType-II CBSR design for each of the KS resources | up to RAN2 | • Just as Rel-18 Type-II CJT CBSR, decouple (N1,N2) from each of the KS CBSR IEs  • This implies that it is possible not to configure CBSR for any of the KS resources  • Only 1-bit hard CBSR is supported |

The parameters highlighted in yellow above can have the same design as other existing fields, i.e: ng-n1-n2-r19 can have the same structure as ng-n1-n2 in R15 typeI-multiPanel, cri-typeI-SinglePanel-ri-restriction-r19/cri-typeII-ri-restriction-r19 can have the same structure as legacy RI restrictions, while cri-typeI-SinglePanel-CBSR-r19/cri-typeII-CBSR-r19 can have the same structure as in n1-n2-codebookSubsetRestriction-r18. ASN.1 examples of the reuse of the structures are also depicted below.

typeI-MultiPanel-r19 SEQUENCE {

ng-n1-n2 CHOICE {

two-four-three-TypeI-MultiPanel-Restriction BIT STRING (SIZE (192)),

two-six-two-TypeI-MultiPanel-Restriction BIT STRING (SIZE (192)),

two-twelve-one-TypeI-MultiPanel-Restriction BIT STRING (SIZE (48)),

two-eight-two-TypeI-MultiPanel-Restriction BIT STRING (SIZE (256)),

two-sixteen-one-TypeI-MultiPanel-Restriction BIT STRING (SIZE (64)),

four-four-two-TypeI-MultiPanel-Restriction BIT STRING (SIZE (128)),

two-four-four-TypeI-MultiPanel-Restriction BIT STRING (SIZE (256)),

four-eight-one-TypeI-MultiPanel-Restriction BIT STRING (SIZE (32)),

four-four-four-TypeI-MultiPanel-Restriction BIT STRING (SIZE (256)),

four-sixteen-one-TypeI-MultiPanel-Restriction BIT STRING (SIZE (64)),

four-eight-two-TypeI-MultiPanel-Restriction BIT STRING (SIZE (256))

}

}

cri-RI-Restriction-r19 CHOICE {

typeI-SinglePanel-RI-Restriction-r19 BIT STRING (SIZE (8)),

typeII-r19-RI-Restriction-r19 BIT STRING (SIZE (4))

} OPTIONAL -- Need R

CRI-TypeI-SinglePanelN1-N2-CBSR-r19 ::= CHOICE {

two-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (8))},

two-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (64))},

four-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (16))},

three-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (96))},

six-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (24))},

four-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (128))},

eight-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (32))},

four-three-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (192))},

six-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (192))},

twelve-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (48))},

four-four-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (256))},

eight-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (256))},

sixteen-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (64))}

}

CRI-TypeII-N1-N2-CBSR-r19 ::= CHOICE {

two-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (16))},

two-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (43))},

four-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (32))},

three-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (59))},

six-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (48))},

four-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (75))},

eight-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (64))},

four-three-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (107))},

six-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (107))},

twelve-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (96))},

four-four-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (139))},

eight-two-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (139))},

sixteen-one-r19 CHOICE {no-cbsr-r19 NULL, cbsr-r19 BIT STRING (SIZE (128))}

}

### Question 4

Do companies agree with the way forward below?

1. ng-n1-n2-r19 is defined in the same way as ng-n1-n2 in R15 typeI-multiPanel;
2. cri-typeI-SinglePanel-ri-restriction-r19/cri-typeII-ri-restriction-r19 are defined in the same way as legacy RI restrictions;
3. cri-typeI-SinglePanel-CBSR-r19/cri-typeII-CBSR-r19 are defined in the same way as n1-n2-codebookSubsetRestriction-r18.

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The parameter highlighted in blue in the R1 parameter list excerpt above has an additional comment from RAN1: “The value of MR (number of CRIs that NW selects to report) can be inferred from the list of selected resources.”. Therefore, it is sufficient that the signaling accounts for the selected resources, which can be defined as a SEQUENCE structure with integer values from 1 to 8:

mrSelectedResources-r19 SEQUENCE {

firstSelectedResource-r19 INTEGER (1..8),

secondSelectedResource-r19 INTEGER (1..8) OPTIONAL

} OPTIONAL -- Need R

in the field description it can be clarified that for type II only the first field is present.

### Question 5

Do companies agree that mrSelectedResources is defined as a SEQUENCE structure containing two fields with integer values from one to eight?

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## 2.3 CSI-CJTC

From R1 parameter list, the following was left to RAN2:

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| numberofSubbandsPO | New |  | configuration of which NSB-P sub-band(s) out of all possible sub-bands that the UE reports Max value of NSB-P=16 | up to RAN2 |
| delayOffsetCompensation | New |  | To indicate whether or not the UE should perform delay offset (DO) compensation based on the latest linked CJTC Dd report when calculating the Rel-18 Type-II CJT CSI | {enabled} |
| triggeringScheme |  |  | Configuring the triggering scheme either separate triggering or joint triggering | {separate, joint} |

It was raised in [3] that the parameter delayOffsetCompensation can be located under CSI-AperiodicTriggerState and outside of CSI-AssociatedReportConfigInfo (in case there are more than 1 Rel-18 type-II CJT CSI reports under this trigger state, then the delay offset precompensation applies to all these Rel-18 type-II CJT CSI reports), and that the parameter triggeringScheme is not needed.

### Question 6

Do companies agree the parameter delayOffsetCompensation can be located under CSI-AperiodicTriggerState and outside of CSI-AssociatedReportConfigInfo and that the parameter triggeringScheme is not needed?

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From [4], the numberofSubbandsPO could in principle be defined similar as *csi-ReportingBand*, where the size of each bit on the bitstring would depend on the subbandSize parameter also provided by RAN1. However, that would imply that the bitstring could contain up to 275 bits to indicate a subband (since the subbands could be anywhere in a BWP). Therefore, it is simpler to define a list where the size of the list corresponds to the number of subbands used. Then each element of the list can be an integer that defines the start of a subband (while the subbandSize is given by a separate parameter in RAN1 parameter list).

numberofSubbandsPO SEQUENCE (SIZE (1.. 16)) OF INTEGER (1..275)} OPTIONAL -- Need R

### Question 7

Do companies agree to define numberofSubbandsPO as a list (with size up to the number of subbands) where each element is an integer value within the maximum size of a BWP?

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## 2.4 Other issues

If there are any other issues that should be discussed, please insert those into the table below. To facilitate the discussion, if a company raises an issue, it is helpful to also provide a suggested way forward.

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| Company | Comments |
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# 3 Conclusion

- to be updated after companies input-

# 4 References

1. [R2-2500103](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_129/Docs//R2-2500103.zip), RAN2 Aspects of the NR MIMO, Nokia Corporation, RAN2#129, Athens, Greece, February 2025

1. [R2-2500218](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_129/Docs//R2-2500218.zip), Discussion on UE-initiated Beam Reporting and CSI enhancement, Samsung, RAN2#129, Athens, Greece, February 2025

1. [R2-2500250](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_129/Docs//R2-2500250.zip), Discussion on UE-initiated Beam Reporting and CSI Enhancement, CATT, RAN2#129, Athens, Greece, February 2025

1. [R2-2500930](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_129/Docs//R2-2500930.zip), Impacts from other NR MIMO Phase 5 objectives, Ericsson, RAN2#129, Athens, Greece, February 2025

1. [R2-2501223](https://www.3gpp.org/ftp/tsg_ran/WG2_RL2/TSGR2_129/Docs//R2-2501223.zip), Consideration on the UEIBM, ZTE Corporation, RAN2#129, Athens, Greece, February 2025