**3GPP TSG RAN WG1 #118 R1-2407360**

**Maastricht, NL, August 19th – 23rd, 2024**

**Agenda item:** **7**

**Source: Moderator (NEC)**

**Title: Summary on CapabilityIndex Report in TS38.214**

**Document for:** **Discussion and Decision**

# Introduction

In Rel-17 NR FeMIMO, new *reportQuantity* was introduced for UE-initiated panel activation and selection. In this meeting, the submitted draft CRs [1][2] are intended to capture the following.

1. missing 'cri-RSRP-Index' and 'ssb-Index-RSRP-Index' in 5.1.6.1.

2. missing 'cri-RSRP-Index', or 'cri-SINR-Index' in 5.1.6.1.2.

3. missing 'cri-RSRP-Index' in 5.2.1.4.2.

# Discussion

In current TS, the following issues are identified, as in draft CRs [1][2].

1. In 5.1.6.1, 'cri-RSRP-Index' and 'ssb-Index-RSRP-Index' is missing from the conditions for the report for UE configured with DRX, therefore UE cannot report 'cri-RSRP-Index' and 'ssb-Index-RSRP-Index' for UE configured with DRX.

2. In 5.1.6.1.2, 'cri-RSRP-Index', or 'cri-SINR-Index', is missing from the conditions of CSI-RS resource configuration for L1-RSRP and L1-SINR computation in 5.1.6.1.2. Therefore, there is no restriction of same number (1 or 2) of ports for all CSI-RS resources within the set for L1-RSRP and L1-SINR computation if 'cri-RSRP-Index', or 'cri-SINR-Index' is configured.

3. In 5.2.1.4.2, 'cri-RSRP-Index' is missing from *reportQuantity* configuration in 5.2.1.4.2, therefore UE cannot not derive the CSI parameters other than CRI conditioned on the reported CRI if 'cri-RSRP-Index' is configured for Report Quantity.

In the draft CRs [1][2], NEC proposed to capture the following.

1. Adding 'cri-RSRP-Index' and 'ssb-Index-RSRP-Index' in 5.1.6.1.

2. Adding 'cri-RSRP-Index', or 'cri-SINR-Index' in 5.1.6.1.2.

3. Adding 'cri-RSRP-Index' in 5.2.1.4.2.

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| ***Reason for change:*** | 1. 'cri-RSRP-Index' and 'ssb-Index-RSRP-Index' is missing from the conditions for the report for UE configured with DRX in 5.1.6.1
2. 'cri-RSRP-Index', or 'cri-SINR-Index', is missing from the conditions of CSI-RS resource configuration for L1-RSRP and L1-SINR computation in 5.1.6.1.2.
3. 'cri-RSRP-Index' is missing from *reportQuantity* configuration in 5.2.1.4.2.
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| ***Summary of change:*** | 1. Adding 'cri-RSRP-Index' and 'ssb-Index-RSRP-Index' in 5.1.6.1.
2. Adding 'cri-RSRP-Index', or 'cri-SINR-Index' in 5.1.6.1.2.
3. Adding 'cri-RSRP-Index' in 5.2.1.4.2.
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| ***Consequences if not approved:*** | 1. UE cannot report 'cri-RSRP-Index' and 'ssb-Index-RSRP-Index' for UE configured with DRX.
2. No restriction of same number (1 or 2) of ports for all CSI-RS resources within the set for L1-RSRP and L1-SINR computation if 'cri-RSRP-Index', or 'cri-SINR-Index' is configured.
3. UE cannot not derive the CSI parameters other than CRI conditioned on the reported CRI if 'cri-RSRP-Index' is configured for Report Quantity.
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5.1.6 UE procedure for receiving reference signals5.1.6.1 CSI-RS reception procedure<Unchanged part omitted>If the UE is configured with DRX, - if the UE is configured to monitor DCI format 2\_6 and configured by higher layer parameter *ps-TransmitOtherPeriodicCSI* to report CSI with the higher layer parameter *reportConfigType* set to 'periodic' and *reportQuantity* set to quantities other than 'cri-RSRP', 'cri-RSRP-Index', 'ssb-Index-RSRP' and 'ssb-Index-RSRP-Index' when *drx-onDurationTimer* in *DRX-Config* is not started, the most recent CSI measurement occasion occurs in DRX active time or during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside DRX active time for CSI to be reported;- if the UE is configured to monitor DCI format 2\_6 and configured by higher layer parameter *ps-TransmitPeriodicL1-RSRP* to report L1-RSRP with the higher layer parameter *reportConfigType* set to 'periodic' and *reportQuantity* set to 'cri-RSRP' or 'cri-RSRP-Index' when *drx-onDurationTimer* in *DRX-Config* is not started, the most recent CSI measurement occasion occurs in DRX active time or during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside DRX active time for CSI to be reported;- otherwise, the most recent CSI measurement occasion occurs in DRX active time for CSI to be reported.<Unchanged part omitted>5.1.6.1.2 CSI-RS for L1-RSRP and L1-SINR computation<Unchanged part omitted>If the UE is configured with a *CSI-ReportConfig* with *reportQuantity* set to 'cri-RSRP', 'cri-SINR', 'none', 'cri-RSRP-Index', or 'cri-SINR-Index', and if the *CSI-ResourceConfig* for channel measurement (higher layer parameter *resourcesForChannelMeasurement*) contains a *NZP-CSI-RS-ResourceSet* that is configured with the higher layer parameter *repetition* and without the higher layer parameter *trs-Info*, the UE can only be configured with the same number (1 or 2) of ports with the higher layer parameter *nrofPorts* for all CSI-RS resources within the set. If the UE is configured with the CSI-RS resource in the same OFDM symbol(s) as an SS/PBCH block, the UE may assume that the CSI-RS and the SS/PBCH block are quasi co-located with 'typeD' if 'typeD' is applicable. Furthermore, the UE shall not expect to be configured with the CSI-RS in PRBs that overlap with those of the SS/PBCH block, and the UE shall expect that the same subcarrier spacing is used for both the CSI-RS and the SS/PBCH block.<Unchanged part omitted>5.2.1.4.2 Report Quantity Configurations<Unchanged part omitted>If the UE is configured with a *CSI-ReportConfig* with the higher layer parameter *reportQuantity* set to 'cri-RSRP', 'cri-RSRP-Index', 'cri-RI-PMI-CQI ', 'cri-RI-i1', 'cri-RI-i1-CQI', 'cri-RI-CQI', 'cri-RI-LI-PMI-CQI', 'cri-SINR', or 'cri-SINR- Index ', and $K\_{s}>1 $resources are configured in the corresponding resource set for channel measurement, then the UE shall derive the CSI parameters other than CRI conditioned on the reported CRI, where CRI *k* (*k* ≥ 0) corresponds to the configured (*k*+1)-th entry of associated *nzp-CSI-RS-Resources* in the corresponding *NZP-CSI-RS-ResourceSet* for channel measurement, and (*k*+1)-th entry of associated *csi-IM-Resource* in the corresponding *csi-IM-ResourceSet* (if configured) or (*k*+1)-th entry of associated *nzp-CSI-RS-Resources* in the corresponding *NZP-CSI-RS-ResourceSet* (if configured for *CSI-ReportConfig* with *reportQuantity* set to 'cri-SINR' or 'cri-SINR- Index ') for interference measurement. If $K\_{s}=2 $CSI-RS resources are configured, each resource shall contain at most 16 CSI-RS ports. If $2<K\_{s}\leq 8 $CSI-RS resources are configured, each resource shall contain at most 8 CSI-RS ports. <Unchanged part omitted> |

During online session, companies raised concerns on if 'cri-RSRP-Index' and 'ssb-Index-RSRP-Index' can be configured for UE with DRX.

# Collection of companies’ view

**Q1: Please provide your views or suggestions on the draft CR [1][2].**

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| **Company** | **Y or N** | **Comments** |
| Moderator (NEC) | Y | As we don’t have any agreement on restricting CapabilityIndex reporting for UE configured with DRX, and in current TS38.214, in 5.2.2.5, cri-RSRP-Index' and 'ssb-Index-RSRP-Index' can be configured for UE with DRX (as shown in red font below), therefore we think changes in 5.1.6.1 are needed. Otherwise, we may need to update 5.2.2.5 by removing those *reportQuantity*.

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| 5.2.2.5 CSI reference resource definitionWhen DRX is configured, the UE reports a CSI report with the *reportQuantity* not set to 'ssb-Index-RSRP', 'ssb-Index-SINR', 'ssb-Index-RSRP-Index' or 'ssb-Index-SINR-Index' only if receiving at least one CSI-RS transmission occasion for channel measurement and CSI-RS and/or CSI-IM occasion for interference measurement in DRX Active Time no later than CSI reference resource and drops the report otherwise. When the UE is configured to monitor DCI format 2\_6 and if the UE configured by higher layer parameter *ps-TransmitOtherPeriodicCSI* to report CSI with the higher layer parameter *reportConfigType* set to 'periodic' and *reportQuantity* set to quantities other than 'cri-RSRP', 'ssb-Index-RSRP', 'cri-RSRP-Index', and 'ssb-Index-RSRP-Index ' when *drx-onDurationTimer* is not started, the UE shall report CSI with the *reportQuantity* not set to 'ssb-Index-SINR' or 'ssb-Index-SINR-Index' during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside active time according to the procedure described in Clause 5.2.1.4 if receiving at least one CSI-RS transmission occasion for channel measurement and CSI-RS and/or CSI-IM occasion for interference measurement during the time duration indicated by drx-onDurationTimer in *DRX-Config* outside DRX active time or in DRX Active Time no later than CSI reference resource and drops the report otherwise. When the UE is configured to monitor DCI format 2\_6 and if the UE configured by higher layer parameter *ps-TransmitPeriodicL1-RSRP* to report L1-RSRP with the higher layer parameter *reportConfigType* set to 'periodic' and *reportQuantity* set to 'cri-RSRP', 'ssb-Index-RSRP', 'cri-RSRP- Index', or 'ssb-Index-RSRP- Index' when *drx-onDurationTimer* is not started, the UE shall report L1-RSRP during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside active time according to the procedure described in clause 5.2.1.4 and when reportQuantity set to 'cri-RSRP' or *'*cri-RSRP- *Index*' if receiving at least one CSI-RS transmission occasion for channel measurement during the time duration indicated by drx-onDurationTimer in *DRX-Config* outside DRX active time or in DRX Active Time no later than CSI reference resource and drops the report otherwise. |

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| Google |  | It seems the change for section **5.1.6.1 CSI-RS reception procedure** could be unnecessary. L1-SINR is also not included for this part. There seems to be no ambiguity if capability index related report is not included.The changes for section **5.1.6.1.2 CSI-RS for L1-RSRP and L1-SINR computation** and section **5.2.1.4.2 Report Quantity Configurations** should be fine. |
| Ericsson |  | Changes are fine |
| Apple |  | TP looks fine to us.  |
| ZTE |  | Okay for us |
| Samsung |  | We are okay with the changes |
| Moderator (NEC) |  | Thanks for the comments. I also include the cover page content in Section 2 Discussion. If you have any comments on the cover page, please share. @Google, please have a further check about the spec provided in 5.2.2.5 and consider if the changes in the 5.1.6.1 are acceptable. |
| Huawei, HiSilicon |  | We are fine with the changes. |
| Moderator (NEC) |  | Thanks for the comments. After a further check, Google is also fine to support the changes. Therefore, we will propose to agree on this CR. |

**Q2: Please share if any other issues.**

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| **Company** | **Comments** |
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# Conclusion

**According to companies’ input, it is proposed to adopt the CR.**

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3. UE cannot not derive the CSI parameters other than CRI conditioned on the reported CRI if 'cri-RSRP-Index' is configured for Report Quantity.
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| 5.1.6.1 CSI-RS reception procedure<Unchanged part omitted>If the UE is configured with DRX, - if the UE is configured to monitor DCI format 2\_6 and configured by higher layer parameter *ps-TransmitOtherPeriodicCSI* to report CSI with the higher layer parameter *reportConfigType* set to 'periodic' and *reportQuantity* set to quantities other than 'cri-RSRP', 'cri-RSRP-Index', 'ssb-Index-RSRP' and 'ssb-Index-RSRP-Index' when *drx-onDurationTimer* in *DRX-Config* is not started, the most recent CSI measurement occasion occurs in DRX active time or during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside DRX active time for CSI to be reported;- if the UE is configured to monitor DCI format 2\_6 and configured by higher layer parameter *ps-TransmitPeriodicL1-RSRP* to report L1-RSRP with the higher layer parameter *reportConfigType* set to 'periodic' and *reportQuantity* set to 'cri-RSRP' or 'cri-RSRP-Index' when *drx-onDurationTimer* in *DRX-Config* is not started, the most recent CSI measurement occasion occurs in DRX active time or during the time duration indicated by *drx-onDurationTimer* in *DRX-Config* also outside DRX active time for CSI to be reported;- otherwise, the most recent CSI measurement occasion occurs in DRX active time for CSI to be reported.<Unchanged part omitted>5.1.6.1.2 CSI-RS for L1-RSRP and L1-SINR computation<Unchanged part omitted>If the UE is configured with a *CSI-ReportConfig* with *reportQuantity* set to 'cri-RSRP', 'cri-SINR', 'none', 'cri-RSRP-Index', or 'cri-SINR-Index', and if the *CSI-ResourceConfig* for channel measurement (higher layer parameter *resourcesForChannelMeasurement*) contains a *NZP-CSI-RS-ResourceSet* that is configured with the higher layer parameter *repetition* and without the higher layer parameter *trs-Info*, the UE can only be configured with the same number (1 or 2) of ports with the higher layer parameter *nrofPorts* for all CSI-RS resources within the set. If the UE is configured with the CSI-RS resource in the same OFDM symbol(s) as an SS/PBCH block, the UE may assume that the CSI-RS and the SS/PBCH block are quasi co-located with 'typeD' if 'typeD' is applicable. Furthermore, the UE shall not expect to be configured with the CSI-RS in PRBs that overlap with those of the SS/PBCH block, and the UE shall expect that the same subcarrier spacing is used for both the CSI-RS and the SS/PBCH block.<Unchanged part omitted>5.2.1.4.2 Report Quantity Configurations<Unchanged part omitted>If the UE is configured with a *CSI-ReportConfig* with the higher layer parameter *reportQuantity* set to 'cri-RSRP', 'cri-RSRP-Index', 'cri-RI-PMI-CQI ', 'cri-RI-i1', 'cri-RI-i1-CQI', 'cri-RI-CQI', 'cri-RI-LI-PMI-CQI', 'cri-SINR', or 'cri-SINR- Index ', and $K\_{s}>1 $resources are configured in the corresponding resource set for channel measurement, then the UE shall derive the CSI parameters other than CRI conditioned on the reported CRI, where CRI *k* (*k* ≥ 0) corresponds to the configured (*k*+1)-th entry of associated *nzp-CSI-RS-Resources* in the corresponding *NZP-CSI-RS-ResourceSet* for channel measurement, and (*k*+1)-th entry of associated *csi-IM-Resource* in the corresponding *csi-IM-ResourceSet* (if configured) or (*k*+1)-th entry of associated *nzp-CSI-RS-Resources* in the corresponding *NZP-CSI-RS-ResourceSet* (if configured for *CSI-ReportConfig* with *reportQuantity* set to 'cri-SINR' or 'cri-SINR- Index ') for interference measurement. If $K\_{s}=2 $CSI-RS resources are configured, each resource shall contain at most 16 CSI-RS ports. If $2<K\_{s}\leq 8 $CSI-RS resources are configured, each resource shall contain at most 8 CSI-RS ports. <Unchanged part omitted> |

# References

1. R1-2406545, Draft CR on CapabilityIndex Report in TS38.214, NEC, RAN1 #118, Maastricht, NL, August 19th – 23rd, 2024
2. R1-2406545, Draft CR on CapabilityIndex Report in TS38.214 (mirror on Rel-18), NEC, RAN1 #118, Maastricht, NL, August 19th – 23rd, 2024