**Rel-17 MTRP CSI Enhancement**

**Min Zhang (Moderator)**

# **Agreements in RAN1 108**

**Conclusion**

* The UE is not expected to be configured with higher layer parameter *cmrGroupingAndPairing-r17* in an NZP CSI-RS resource set that is indicated as the first NZP CSI-RS resource set via *resourcesForChannel,*  or as the second NZP CSI-RS resource set via higher layer parameter *resourcesForChannel2-17* in *CSI-AssociatedReportConfigInfo*, when both *resourcesForChannel* and *resourcesForChannel2-17*  are configured in CSI-AssociatedReportConfigInfo.
* For a higher layer parameter *resourcesForChannelMeasurement* configured with two Periodic or semi-persistent NZP CSI-RS resource sets, the UE is not expected to be configured with higher layer parameter *cmrGroupingAndPairing-r17* in any of the two NZP CSI-RS resource sets.

**Agreement**

* Text Proposal in Section 2 in R1-2202647 for 38.212 is agreed to be included in editor’s CR.
* Text Proposal in Section 2 in R1-2202648 for 38.214 is agreed to be included in editor’s CR.

# **Agreements in RAN1 107**

**Agreement**

for the ordering of UCI payload construction with PMI/CQI configured for subband reporting, mapping order of CSI fields are in the order of NCJT CSI, the first TRP CSI, and the second TRP CSI applied separately, for CSI part 1, CSI part 2 WB, even subbands of CSI part 2 SB, and odd subbands of CSI part 2 SB.

**Agreement**

For a CSI report associated with a Multi-TRP/panel NCJT measurement hypothesis configured by single CSI reporting setting:

* **Two CBSRs can be configured per *CodebookConfig*, whereas one CBSR is applied to one CMR group in a CMR resource set respectively, i.e. per TRP.**

**Agreement**

For the ordering of UCI payload construction for reported CSIs

* Alt 4: modify mapping order of CSI fields of one CSI report, **e.g.** Table 6.3.2.1.2-3/4/5 in 38.212
	+ i.e. introducing mapping order of CSI fields in the order of MTRP CSI, the first TRP CSI, and the second TRP CSI.
	+ It also implies that one CSI reporting setting for NCJT measurement reporting contains single CSI report which corresponds multiple single-TRP and/or NCJT measurement hypotheses.

Note: There is no further optimization for CSI part 2 omission rules in Rel-17

**Agreement**

For a CSI report associated with a Multi-TRP/panel NCJT measurement hypothesis configured by single CSI reporting setting, the UE can be configured with *pmi-FormatIndicator=widebandPMI* and *cqi-FormatIndicator=widebandCQI* only for Mode 1 with X=0

# **Summary of Agreements:**

# **CSI Measurement Enhancement and CSI framework for Multi-TRP**

**Agreement**

For CSI enhancement for multi-TRP, study following aspects taking into account trade-off among UE complexity, performance and reporting/RS overhead

* Category 1 - For a reporting setting CSI-ReportConfig, more than one CSI-RS port groups in a resource or resources or resource sets are associated to different TRPs/TCI states,
	+ the UE will determine CSI reporting quantities based on pre-defined/indicated/configured/UE-selected channel and interference hypotheses across TRPs /TCI states
	+ and then report one or more CSIs within a single CSI report.
* Category 2 – Within an implicit/explicit set of reporting settings CSI-ReportConfigs, which are associated to different TRPs/TCI states,
	+ the UE will determine CSI reporting quantities based on pre-defined/indicated/configured/ UE-selected channel and interference hypotheses
	+ and then report multiple CSIs with multiple CSI reports (including one or more CSIs per report or selected CSI with single CSI report)
* Other enhancement are not excluded, e.g. CQI enhancements for multi-TRP transmission including CQI format, CQI reporting mechanism

Note that companies are encouraged to clarify applicable transmission schemes/scenarios and strive to unify Rel-17 MTRP CSI framework enhancements

**Category 1:**

**Agreement**

For CSI measurement associated to a reporting setting CSI-ReportConfig for NCJT, [at least for multi-DCI based and single-DCI based schemes (scheme 1a)], NZP CSI-RS resources for channel measurement are associated to different TRPs/TCI states at resource level

* CMRs corresponding to different TRPs respectively shall be configured within the same resource set (i.e. scheme 1-2) and have the same number of ports among CMRs.
* At least ‘typeI-SinglePanel’ codebook is supported
	+ FFS: Other codebook types
* Note that RAN1 shall strive to finalize NCJT CSI enhancement with single reporting setting firstly.
* The support of larger than 32 ports across two CMRs is optional for a UE supporting Rel. 17 mTRP CSI

**Agreement**

For CSI measurement associated to a reporting setting CSI-ReportConfig for NCJT, the UE can be configured with Ks ≥ 2 NZP CSI-RS resources in a CSI-RS resource set for CMR and N ≥ 1 NZP CSI-RS resource pairs whereas each pair is used for a NCJT measurement hypothesis

* Configure UE with two CMR groups with Ks=K1+K2 CMRs. CMR pairs are determined from two CMR groups by following method(s).
	+ K1 and K2 are the number of CMRs in two groups respectively. FFS K1=K2 or different K1/K2.
	+ Note that CMRs in each CMR group can be used for both NCJT and Single-TRP measurement hypotheses
	+ N CMR pairs are higher-layer configured by selecting from all possible pairs
		- signalling mechanism can be discussed further, e.g. using a bitmap
		- FFS: Whether MAC-CE or RRC+MAC CE indication is needed
		- FFS: how to support NCJT measurement hypotheses in FR2
* Support N=1 and Ks =2, FFS other maximal values of N>1 and Ks>2
* Note: for CPU/resource/port occupation, NCJT hypothesis is considered separately from single TRP hypothesis

**Agreement**

With regarding to the maximal values of *Nmax* for *N, Ks,max* for *Ks*:

* Support of *Nmax*=2 is a UE optional feature
* Support of *Ks,max*=*X* is a UE optional feature
	+ *X* can be up to 8 and other candidate values can be discussed as part of UE features
* FFS: Default value of *Nmax*, *Ks,max*
* FFS: Which combinations of *N*<=*Nmax*, *Ks*<=*Ks,max* are supported

**Agreement**

With regarding to possible restriction between K1 and K2

* Alt 2: No restriction as long as K1+K2=Ks

**Agreement**

Whether a NZP CSI-RS resource m can be referred by two CMR pairs (m, a) and (m, b) configured for NCJT measurement hypotheses

* Alt 1: It is feasible for FR1 but not for FR2.

**Agreement**

Whether a NZP CSI-RS resource can be referred by both a CMR pair configured for NCJT measurement hypothesis and a CMR configured for Single-TRP measurement hypothesis:

* It is feasible in both FR1 and FR2 but subject to UE capability for FR2. If a UE supports and the sharing is also enabled by gNB, two CMRs from a CMR pair configured for a NCJT measurement hypothesis can be used for Single-TRP measurement hypotheses, otherwise they cannot.

**Conclusion**

Whether to support interference measurement based on NZP CSI-RS outside the CMR pair configured for NCJT measurement hypothesis, in addition to CSI-IM

Alt 2: No, it is not supported

**Agreement**

A CSI-IM resource is configured to be associated with either a CMR for Single-TRP measurement hypothesis or a CMR pair for NCJT measurement hypothesis:

* One-to-one mapping between M+N CSI-IM resources versus M NZP CSI-RS resources for single-TRP measurement hypothesis and N NZP CSI-RS resource pairs for NCJT measurement hypothesis configured in a CSI-RS resource set.
	+ **FFS the value/definition of M**

Note: it is possible to configure the same **value of** CSI-IM resource ID for both NCJT and Single-TRP measurement hypotheses i**n FR1 and FR2, subject to QCL-Type D consistency between measurement hypotheses of the shared CMR in FR2**

**Agreement**

For a CSI-RS resource set with Ks NZP CSI-RS resources configured for CMR and N NZP CSI-RS resource pairs configured for NCJT measurement hypotheses, study following default value of Ks,max,

* Alt 1: Ks,max = 4
* Alt 2: Ks,max = 2
* Alt 3: Ks,max = 4 for FR2, and Ks,max = 2 for FR1
* Note that default value means the minimal supported value for Ks,max in UE capability reporting, if UE support this feature.

**Conclusion:**

Default value of Ks, max can be discussed later with Rel-17 MIMO UE capability.

**Agreement**

For CSI measurement associated with a CSI-ReportConfig for NC-JT, down-select one or more Alts in RAN1#106-e:

* Alt 2: additional RRC signalling is needed to configure M (M≤ Ks) CMRs from the CSI-RS resource set for CMR for Single-TRP measurement hypotheses
	+ Example: For a given set of {{#0, #1}, {#2, #3}} with N=1, {#0, #2} are for NCJT measurement hypothesis. Additional RRC signaling may select {#0,#3} (if sharing is allowed), or {#1, #3} (if not allowed), or select any from the set for single-TRP measurement hypotheses.
* Alt 3: For CMRs configured in the CSI-RS resource set, support RRC signalling to enable/disable single-TRP measurement hypothesis using CMR configured within CMR pairs for NCJT measurement hypothesis
	+ Example: For a given set of {{#0, #1}, {#2, #3}} with N=1, {#0, #2} are for NCJT measurement hypothesis. If gNB enables the sharing, {#0, #1, #2, #3} are for single-TRP measurement. If gNB disable the sharing, {#1, #3} are for single-TRP measurement hypotheses.
* Alt 4: CMR sharing between single-TRP measurement hypothesis and NCJT measurement hypothesis is realized by configuring the same value of CMR ID for single-TRP CMR and NCJT CMR pair.
	+ Example: When the UE supports sharing, for a given set of {{#0, #0}, {#2, #3}} with N=1, {#0, #2} are for NCJT measurement hypotheses, the rest {#0, #3} are for single-TRP measurement hypotheses. The CMRs for STRP can be updated by re-configuring the CSI resource set.

Note that above examples are only for the purpose of illustrating/discussing Alternatives.

**Agreement**

**For CSI measurement associated with a CSI-ReportConfig for NC-JT, support following Alt:**

* Alt 3: For CMRs configured in the CSI-RS resource set, support RRC signalling to enable/disable single-TRP measurement hypothesis using CMRs configured within CMR pairs for NCJT measurement hypothesis

**Agreement**

For CSI measurement associated with a CSI-ReportConfig for NC-JT, study whether/how to support following dynamic updating on, e.g. by MAC-CE

* Alt 1: CMR pairs for NCJT measurement hypotheses
* Alt 2: CMRs for Single-TRP measurement hypotheses
* Alt 3: TCI states in CMRs
* Alt 4: the number of single-TRP CSIs (i.e. X=0/1/2) in a NCJT CSI report

**Category 2:**

**Agreement**

For CSI measurement associated to a reporting setting CSI-ReportConfig for NCJT, [at least for multi-DCI based and single-DCI based schemes (scheme 1a)], NZP CSI-RS resources for channel measurement are associated to different TRPs/TCI states at resource level

* CMRs corresponding to different TRPs respectively shall be configured within the same resource set (i.e. scheme 1-2) and have the same number of ports among CMRs.
* At least ‘typeI-SinglePanel’ codebook is supported
	+ FFS: Other codebook types
* Note that RAN1 shall strive to finalize NCJT CSI enhancement with single reporting setting firstly.
* The support of larger than 32 ports across two CMRs is optional for a UE supporting Rel. 17 mTRP CSI

**Working Assumption**

For CSI measurement for multi-DCI based NCJT, down select one of following two options:

* Option 1 (Explicit): CMRs corresponding to different TRPs can be associated with different reporting settings respectively, with the same configurations between two settings except for PUCCH/PUSCH resources and CMR/IMR resources setting(s)
* Option 2 (Implicit): a single CSI reporting setting associated with each TRP where a NZP CSI-RS is configured for interference measurement from another TRP
* FFS:  how interference from CMR in the linked reporting settings in option 1 or from the NZP CSI-RS configured as IMR in option 2 is considered in CQI calculation

Following restrictions apply to both options:

* At least ‘typeI-SinglePanel’ codebook is supported
	+ FFS: Other codebook types
* Only ‘periodic’ and ‘semiPersistentOnPUCCH’ cases are supported;
* The number of ports of two CMRs associated to two reporting settings for NCJT CSI measurement are the same;
* The support of larger than 32 ports across two CMRs is optional for a UE supporting Rel. 17 mTRP CSI

**Conclusion:**

There is no consensus to go with either of the following options in RAN1 #105e:

* Option 1: Confirm the Working Assumption from RAN1#103e
* Option 2: The UE can be expected to report one RI, one PMI, one LI and one CQI per TRP, up to 2 TRPs, for Multi-DCI based NCJT

**Agreement**

For CSI measurement associated to a NCJT measurement hypothesis in Rel-17, the maximal number of total transmission layers is up to 4 layers.

**Agreement**

For CSI measurement associated with a CSI-ReportingConfig for NC-JT, study following restriction(s) for two CMRs within the same CMR pair configured for NCJT measurement hypothesis:

* FFS: two resources are restricted within the same DL slot
* FFS: two resources are restricted with the same CDRX active time

**Agreement**

For CSI measurement associated with a *CSI-ReportingConfig* for NCJT,

* Alt 1: It is expected by a UE that two CMRs within the same CMR pair configured for NCJT measurement hypothesis are within the same CDRX active time.

**Agreement**

**For CSI measurement associated with a *CSI-ReportingConfig* for NCJT, support two CMRs within the same CMR pair configured for NCJT measurement hypothesis to be restricted within X continuous slot(s) without DL/UL switch between two CMRs**

* **X=1, 2**
	+ **whereas X=1 implying the same slot and X=2 implying two adjacent slots**
* **FFS other restrictions for FR2**
* **FFS whether UE capability is needed for X=2**

**Agreement**

For a CMR pair configured for a NCJT measurement hypothesis, study following Alternatives:

* Alt 1: a separate *powerControlOffset* (Pc ratio) shall be configured for the NCJT measurement hypothesis by re-defining such Pc ratio as 10log10(P\_PDSCH/P\_CSIRS) dB, whereas
	+ P\_PDSCH is the energy of PDSCH ports with a same TCI state as the CMR on one subcarrier of one OFDM symbol
	+ P\_CSIRS is the energy of all CSI-RS ports of the CMR multiplexed on one subcarrier of one OFDM symbol
* Alt 2: re-interpret two Pc ratios configured for the CMR pair for the NCJT measurement hypothesis, FFS detailed impact of specification
* Alt 3: No change to definition or configuration of Pc ratio
* Note that other solutions are not excluded.

**Agreement**

For a NCJT measurement hypothesis, the *powerControlOffset* (“Pc”) ratio associated with a CMR within a CMR pair configured for the NCJT measurement hypothesis, is defined as 10log10(P\_PDSCH/P\_CSIRS)  dB

where

* P\_PDSCH is the energy of PDSCH ports, which is associated with the CMR, multiplexed on one subcarrier of one OFDM symbol
* P\_CSIRS is the energy of all CSI-RS ports of the CMR multiplexed on one subcarrier of one OFDM symbol

Note that whether/how to above agreement is up to the editor.

**Agreement**

For CSI computation delay requirement associated with a *CSI-ReportingConfig* for a NCJT measurement hypothesis, study following alternatives:

* Alt1: introducing new/relaxed values on Z and Z’, FFS exact values or other conditions
* Alt2: No changes of values on Z and Z’

**Agreement**

For CSI measurement associated to a reporting setting *CSI-ReportConfig* for NCJT measurement hypothesis, study whether to support non-PMI CSI reporting with *reportQuantity* set to "CRI-RI-CQI" in Rel-17

* Related details, if needed, are to be discussed in RAN1#106bis.
* Interested companies are encouraged to share details and related specification impact if support

# **CSI Reporting Enhancements for Multi-TRP**

**Agreement**

For a CSI report associated with a Multi-TRP/panel NCJT measurement hypothesis configured by single CSI reporting setting, support following two options:

* Option 1: the UE can be configured to report X CSIs associated with single-TRP measurement hypotheses and one CSI associated with NCJT measurement hypothesis
	+ X = 0, 1, 2
		- If X=2, two CSIs are associated with two different single-TRP measurement hypotheses with CMRs from different CMR groups
		- Support of X=1,2 is UE optional for the UE supporting option 1
	+ FFS omission of CSI associated with NCJT measurement hypothesis
* Option 2: the UE can be configured to report one CSI associated with the best one among NCJT and single-TRP measurement hypotheses
	+ FFS how to report recommended measurement hypothesis associated with that CSI report

**Agreement**

For a CSI report associated with a Multi-TRP/panel NCJT measurement hypothesis configured by single CSI reporting setting, the UE is expected to report

* two RIs, two PMIs, two LIs and one CQI per codeword, for single-DCI based NCJT when the maximal transmission layers is less than or equal to 4
	+ FFS: Maximal transmission layers larger than 4
	+ FFS: Whether/how a subset of above reporting quantities are allowed to be configured to the UE
* FFS: whether/how to support two RIs, two PMIs, two LIs and two CQIs, for multi-DCI based NCJT
* FFS: whether/how to support CRI(s) to be reported in a CSI
* FFS: restrictions among reported CSI quantities, e.g. among reported RIs and PMIs
* FFS: whether/how to support non-PMI based port-selection
* FFS: whether/how to support single value of reported LI

Note that other NCJT CSI measurement/reporting enhancement for other scenarios is not precluded, e.g. for HST-SFN

**Agreement**

Support the indication of following RI combinations by a joint RI field for a NCJT measurement hypothesis in CSI part 1, when the maximal transmission layers is less than or equal to 4:

* {1, 1}, {1, 2}, {2,1}, {2,2}
* FFS: CBSR and/or RI restrictions per TRP or across TRPs

**Agreement**

A 2-part CSI report is supported in Rel-17 for a CSI reporting configuration associated with NCJT measurement hypothesis with following clarifications:

* Within CSI part 1
	+ CRI, RI, WB CQI and SB CQI for the first CW are reported with consistent payload and zero padding (if needed). FFS further details
	+ FFS whether RI can be shared between NCJT CSI and single-TRP CSIs to reduce CSI feedback overhead
	+ FFS whether additional field is needed, at least for Option 2
* Within CSI part 2:
	+ FFS further compression/omission/Sharing of PMI among Single-TRP and NCJT hypotheses

**For Option 1:**

**Agreement**

For the UE configured to report X CSIs associated with single-TRP measurement hypotheses and one CSI associated with NCJT measurement hypothesis (i.e. Option 1),

* Alt 1: X+1 CRIs are reported, whereas X CRIs are for single-TRP measurement hypotheses and one CRI is for NCJT measurement hypothesis.  Each CRI bit size depends on the corresponding number of either valid CMR pairs for NCJT measurement hypothesis or valid CMRs for single-TRP measurement hypotheses
* FFS: Whether the X+1 CRIs are reported jointly as one CSI report or as separate CSI reports.

**Agreement**

For Option 1 CSI reporting associated with NCJT and X single-TRP measurement hypotheses, study whether to support following PMI/RI sharing mechanisms between NCJT CSI and single-TRP CSI(s):

* Enabling/Disabling PMI, RI sharing via higher-layer configuration
* Dynamic indication of PMI, RI sharing in the CSI report
* FFS: other details
* FFS: applicable conditions/restrictions of CMR sharing among Single-TRP and NCJT hypotheses, if above PMI/RI sharing mechanism can be applied

**Agreement**

For the UE configured to report X CSIs associated with single-TRP measurement hypotheses and one CSI associated with NCJT measurement hypothesis (i.e. Option 1), the bitwidth associated to X+1 CRI(s) are given as following:

* Ceil(log2(N)) for X=0
* Ceil(log2(N)) in CSI associated with NCJT measurement hypothesis and Ceil(log2(M1+M2)) in CSI associated with Single-TRP measurement hypothesis for X=1
* Ceil(log2(N))  in CSI associated with NCJT measurement hypothesis and Ceil(log2(M1))  and  Ceil(log2(M2)) in CSI associated with Single-TRP measurement hypothesis for X=2
* Note that M1 (M1<=K1) and M2 (M2<=K2) is the number of CMRs configured for Single-TRP measurement hypothesis in the first and second CMR groups respectively in a CMR measurement set.

**For Option 2**

**Agreement**

For the UE be configured to report one CSI associated with the best one among NCJT and single-TRP measurement hypotheses (i.e. Option 2),

* Alt 1: Single CRI is reported whereas CRI bit size depends on total number of valid CMR pairs for NCJT measurement hypothesis and valid CMRs for single-TRP measurement hypotheses.
	+ FFS further mapping mechanism between each CRI codepoint and Single-TRP/NCJT measurement hypothesis.

**Agreement**

For the UE be configured to report one CSI associated with the best one among NCJT and single-TRP measurement hypotheses (i.e. Option 2),

* Alt 1: the first M1+M2 codepoints of CRI corresponds to M1+M2 CMRs for Single-TRP measurement hypothesis and the second N codepoints corresponds to N CMR pairs for NC-JT measurement hypothesis.
* Note that M1$M\_{1}$ (M1<=K1) and M2 (M2<=K2) is the number of CMRs configured for Single-TRP measurement hypothesis in the first and second CMR groups respectively in a CMR measurement set.

**Conclusion**

* **“*N CMR pairs*” and “*Two CMR groups*” are configured in NZP-CSI-RS-Resource-Set**
* **“*sharedCMR*” is configured in CSI-ReportConfig**

# **CSI Processing and Others**

**Agreement**

The UE may assume that QCL-Type D of CMRs associated with a NCJT measurement hypothesis are applied to the corresponding CSI-IM resource.

**Agreement**

For CSI measurement associated to a reporting setting CSI-ReportConfig for NCJT, an NCJT CSI hypothesis based on a pair of CMRs assumes to occupy two CPUs, two active NZP CSI-RS resources, and a number of active ports corresponding to both CMRs.

* If a NZP CSI-RS resource is referred X times by CMR pairs for NCJT measurement hypothesis and CMR for Single-TRP measurement hypothesis, the CSI-RS resource and the CSI-RS ports within the CSI-RS resource are counted X times for active resources and active ports.
* Note: For **above** CSI computation, **UE assumes** PDSCH transmission is single-DCI based multi-TRP scheme**(s)**. FFS: Multi-DCI based multi-TRP scheme

**Agreement**

For Rel-17 Multi-TRP CSI enhancement, companies are encouraged to study following potential specification impact:

* CRI codepoint mapping order with CMRs and CMR pairs
* Whether/how to configure RI restriction/CBSR configuration for NCJT CSI measurement
* Whether/how to enhance the CSI updating rule to address CPU overbooking
* Whether/how to introduce new CSI computation delay requirement for NCJT CSI calculation
* Whether/how to support wideband CSI report

**Agreement**

**For a CSI report associated with a Multi-TRP/panel NCJT measurement hypothesis configured by single CSI reporting setting, support RI restriction by selecting at most one alternative from the following in RAN1#106bis-e:**

* **Alt 1: One RI restriction is configured per CodebookConfig, whereas the RI restriction is applied to both Single-TRP and NCJT measurement hypotheses.**
	+ **If rank restriction of X is configured, reported rank is X for a Single-TRP measurement hypothesis and sum of two reported ranks is X for a Multi-TRP measurement hypothesis.**
* **Alt 2: Two RI restrictions can be configured per CodebookConfig, whereas one RI restriction is applied to one CMR group in a CMR resource set respectively, i.e. per TRP.**
	+ **If rank restriction of (X, Y) is configured, reported rank is X for the CMR in the first CMR group and Y for the CMR in the second CMR group, regardless single-TRP and NCJT measurement hypotheses.**
* **Alt 3: Multiple RI restrictions can be configured per CodebookConfig, whereas RI restriction is applied to per each CMR in CMR pair for NCJT and per each CMR for Single-TRP.**
* **Alt 4: Two RI restrictions can be configured per CodebookConfig, whereas one RI restriction is applied to all Single-TRP measurement hypotheses, and another one is applied to all NCJT measurement hypotheses.**
	+ **If rank restriction of (X, Y) is configured, reported rank is X for all single-TRP measurement hypotheses and reported rank (1 out of 4 possible rank combinations) is Y for all NCJT measurement hypotheses.**
* **Alt 5: Three RI restrictions can be configured per CodebookConfig, whereas two RI restrictions are applied to two CMR groups in a CMR resource set respectively for Single-TRP measurement hypothesis, and the third one is applied to all NCJT measurement hypotheses.**
	+ **If rank restriction of (X1, X2, Y) is configured, reported rank is X1, X2 for each CMR group respectively for single-TRP measurement hypotheses and reported rank (1 out of 4 possible rank combinations) is Y for all NCJT measurement hypotheses.**
* **Alt 6:** Switch between Alt 4 and Alt 5 where gNB can configure via RRC signaling which alternative to use

**Note that if none of above Alternatives is agreed in Rel-17, RI restriction is only applied for Single-TRP measurement hypotheses and no RI restriction is applied for Multi-TRP measurement hypotheses.**

**Agreement**

**For a CSI report associated with a Multi-TRP/panel NCJT measurement hypothesis configured by single CSI reporting setting**

* **Alt 4: Two RI restrictions can be configured per CodebookConfig, whereas one RI restriction is applied to all Single-TRP measurement hypotheses, and another one is applied to all NCJT measurement hypotheses.**
	+ **If rank restriction of (X, Y) is configured, reported rank is X for all single-TRP measurement hypotheses and reported rank (1 out of 4 possible rank combinations) is Y for all NCJT measurement hypotheses.**
		- **FFS: Whether there can be multiple candidate values of X and Y**

**Agreement**

For a CSI report associated with a Multi-TRP/panel NCJT measurement hypothesis configured by single CSI reporting setting

* Alt 1: CBSR is supported and can be applied for both single-TRP and Multi-TRP measurement hypotheses.
	+ FFS detailed CBSR signalling configured for Multi-TRP

**Agreement**

**For a CSI report associated with a Multi-TRP/panel NCJT measurement hypothesis configured by single CSI reporting setting, down-select one alternative from the following in RAN1 107:**

* **Alt 1: One CBSR can be configured per *CodebookConfig*, whereas CBSR is applied to all CMRs regardless measurement hypotheses or CMR groups.**
* **Alt 2: Two CBSRs can be configured per *CodebookConfig*, whereas one CBSR is applied to one CMR group in a CMR resource set respectively, i.e. per TRP.**

**For future RAN1 meeting:**

For a CSI report setting with Option 1 and X=1 or 2, study prioritizing CSI associated with reported CSI hypotheses within a CSI Reporting Setting

* FFS potential impact for UCI payload generation
* FFS whether/how to update CSI priority formula, and additional specification impact due to updated formula
* FFS whether/how to update CSI omission rules for Part 2 CSI based on prioritized CSI
* FFS: whether the X+1 CSI hypotheses per CSI Reporting Setting are mapped to a single CSI report or X+1 CSI reports
* Companies are encouraged to discuss and justify purposes of prioritizing CSI associated with reported CSI hypotheses.

**Agreement**

**To confirm the order of UCI payload construction for reported CSIs, study following Alternatives and down-select one or more Alternative(s) for required specification changes in RAN1 106bis:**

* **Alt 1: modify priority equation, i.e., Section 5.2.5 in 38.214.**
* **Alt 2: modify the table of priority reporting levels for Part 2 CSI, i.e., Table 5.2.3-1 in 38.214.**
* **Alt 4: modify mapping order of CSI fields of one CSI report, i.e., Table 6.3.2.1.2-3/4/5 in 38.212**