**3GPP TSG RAN WG1 #121 R1-250XXXX**

**St Julian’s, Malta, May 19th – 23rd, 2025**

**Source: Moderator (CATT)**

**Title:** **Summary on LS on differentiation of sDCI based mTRP and sTRP**

**Agenda Item:** **5**

**Document for:** **Decision**

# Introduction

In RAN1#120, the following LS in sent from RAN2 to ask for suggestions from RAN1 on differentiation of sDCI mTRP, mDCI mTRP and sTRP [1]:

R1-2500013 LS on differentiation of sDCI mTRP, mDCI mTRP and sTRP CATT

Two issues are raised in the LS. T first issue is to differentiate between sDCI mTRP/sTRP vs mDCI mTRP for operated cells, while the second issue is differentiate between sTRP vs sDCI mTRP for the operated cells. The first issue was discussed and the following agreement was achieved in RAN1#120 meeting:

* The answer to question 1a is NO.

The second issue was discussed and the following agreement was achieved in RAN1#120bis meeting [2]:

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| **Agreement**To differentiate the cells operated as sTRP vs sDCI mTRP, down-select one of the options:* Alt-1: It is RAN1 consensus that RRC parameter(s) is used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation.
	+ Option 1: RAN1 agrees that whether RRC parameter *applyIndicatedTCI-State* is configured in *ControlResourceSet* can be used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation. However, for each list, the network ensures that either at least one of the following RRC parameters is configured for all BWPs of all serving cells or none of the following RRC parameters is configured in any BWP of any serving cell.
		- “applyIndicatedTCI-State-r18” in ConfiguredGrantConfig, ControlResourceSet, PUSCH-Config, SRS-ResourceSet, PDCCH-ConfigCommon, PUCCH-ResourceExt-v1610, or
		- “applyIndicatedTCI-State-r18” and “applyIndicatedTCI-State2-r18” in CSI-AssociatedReportConfigInfo, or
		- “applyIndicatedTCI-StateDCI-1-0-r18” in TCI-InDCI-r18.
		- mappingPattern-r17”, “multipanelSchemeSDM-r18”, “multipanelSchemeSFN-r18” in PUSCH-Config
		- “repetitionSchemeConfig-r16” in PDSCH-Config
		- “searchSpaceLinkingId-r17” in searchSpace
		- “sfnSchemePDCCH-r17” and “sfnSchemePDSCH-r17” in MIMOParam-r17
		- “cjt-Scheme-PDSCH-r18” in ServingCellConfig
		- Two SRS resource sets configured in srs-ResourceSetToAddModList or srs-ResourceSetToAddModListDCI-0-2 with higher layer parameter usage in SRS-ResourceSet set to 'codebook' or ‘noncodebook’
	+ Option 2 (No concern): RAN1 agrees that whether RRC parameter *applyIndicatedTCI-State* is configured in *ControlResourceSet* can be used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation.
* Alt 2: It is RAN1 consensus that the number of indicated TCI states can be used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation.
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This moderator summary aims at collecting the comments from companies regarding the consensus on the alternatives in the above agreement for the second issue in the above contribution.

# Discussion

**2.1 RAN2 suggestion**

For the second issue, it is RAN2’s suggestions that the RRC parameter *applyIndicatedTCI-State* can be used to separate the cells operated as sDCI mTRP vs sTRP. In this case, the following modifications are suggested:

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| ***imultaneousU-TCI-UpdateList1, simultaneousU-TCI-UpdateList2, simultaneousU-TCI-UpdateList3, simultaneousU-TCI-UpdateList4***List of serving cells for which the Unified TCI States Activation/Deactivation MAC CE applies simultaneously, as specified in TS 38.321 [3] clause 6.1.3.47. The different lists shall not contain same serving cells. Network only configures in these lists serving cells that are configured with *unifiedTCI-StateType*. Network should not configure serving cells that are configured with a BWP with different number of *coresetPoolIndexes* in the same list. For each list, the network ensures that either applyIndicatedTCI-State is configured for all ControlResourceSets in all BWPs of all serving cells or applyIndicatedTCI-State is not configured in any ControlResourcesSet of any BWP of any serving cell. |

Based on the information above and the discussions in the contributions received from the interested companies [3-10], the followings are identified from the moderator perspective:

**2.2 Issue2: Differentiation between sDCI based mTRP and sTRP**

For the second issue, the views are diverged among the companies. Although a few companies believe the modifications RAN2 made is sufficient, a few other companies believe that the current wording using *applyIndicatedTCI-State* is not sufficient to differentiate between sDCI mTRP vs sTRP.

Vivo [3] believes that the number of TCI states can be used for such differentiation while the two MAC CEs for s-DCI based mTRP introduced in Rel-18 was not captured.

ZTE [4] prefers to option-1 in Alt1 but can be flexible on option-2. Also, ZTE has pointed out that alt2 (dynamically switching per the number of indicated TCI state(s)) may have potential risk that UE will perform dynamic switching between Rel-17 and Rel-18 framework, which is against the previous assumption that the framework of Rel-17 and Rel-18 is enabled by semi-static signaling.

CATT [5-6] also shares similar concern as ZTE that the number of TCI state(s) are dynamically changed. It is not proper to use it on a RRC level configuration. On the other hand, CATT prefers to option-1 in alt1 but prefer to reduce the number of listed RRC parameters to simplify the issue. It is their view that two cases are sufficient, i.e.,

* “applyIndicatedTCI-State-r18” in ControlResourceSet, or
* “applyIndicatedTCI-State-r18” in PUCCH-ResourceExt-v1610.

Xiaomi [7] and Ericsson [9] argues that the parameter ***applyIndicatedTCI-State*** is introduced in Rel-18 mTRP framework, thus, it can be used for differentiate the cells operated as sTRP vs sDCI mTRP. When the value ‘none’ is configured, it is still under the mTRP framework. Thus, there is no concern using it. Xiaomi also spares the same concern as ZTE and CATT that the number of TCI state(s) are not suitable on a RRC level configuration.

OPPO [8] agree that the *applyIndicatedTCI-State* can be used to separate the cells operated as sTRP and sDCI mTRP. However, OPPO argues that all the cases including PDCCH/PDSCH/PUCCH/PUSCH should be configured with the same, i.e., all the channels in the all the BWPs and channels should be in the same scenario.

Samsung [10] prefer to option-1 in Alt1 and suggests to list all the parameters that can be used for the differentiation of sDCI based mTRP and sTRP.

Based on the contributions from the companies for RAN1#121 meeting, the following companies’ preferences are captured:

**Companies’ preference:**

* **Alt1: RRC parameter(s)**
	+ **Option-1: CATT(with modifications); ZTE(1st preference), OPPO, Samsung**
	+ **Option-2: ZTE(2nd preference), xiaomi, Ericsson**
* **Alt2: Number of indicated TCI states**
	+ **Vivo**
	+ **Not support：CATT, ZTE**

From moderator’s assessment, based on the inputs so far, most companies prefer to use RRC parameters to solve the issue and a few companies share their concerns on supporting alt2. Also, the motivation of the LS is that RAN2 would like to know the differential between sDCI based mTRP and sTRP for configuration on a CC list. In this case, I suggest that we firstly agree on supporting Alt-1.

**Proposal 1: To differentiate the cells operated as sTRP vs sDCI mTRP, support Alt-1:**

* **Alt-1: It is RAN1 consensus that RRC parameter(s) is used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation.**
	+ **Option 1:** RAN1 agrees that whether RRC parameter *applyIndicatedTCI-State* is configured in *ControlResourceSet* can be used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation. However, for each list, the network ensures that either at least one of the following RRC parameters is configured for all BWPs of all serving cells or none of the following RRC parameters is configured in any BWP of any serving cell.
		- “applyIndicatedTCI-State-r18” in ConfiguredGrantConfig, ControlResourceSet PUSCH-Config, SRS-ResourceSet, PDCCH-ConfigCommon, PUCCH-ResourceExt-v1610, or
		- “applyIndicatedTCI-State-r18” and “applyIndicatedTCI-State2-r18” in CSI-AssociatedReportConfigInfo, or
		- “applyIndicatedTCI-StateDCI-1-0-r18” in TCI-InDCI-r18.
		- mappingPattern-r17”, “multipanelSchemeSDM-r18”, “multipanelSchemeSFN-r18” in PUSCH-Config
		- “repetitionSchemeConfig-r16” in PDSCH-Config
		- “searchSpaceLinkingId-r17” in searchSpace
		- “sfnSchemePDCCH-r17” and “sfnSchemePDSCH-r17” in MIMOParam-r17
		- “cjt-Scheme-PDSCH-r18” in ServingCellConfig
		- Two SRS resource sets configured in srs-ResourceSetToAddModList or srs-ResourceSetToAddModListDCI-0-2 with higher layer parameter usage in SRS-ResourceSet set to 'codebook' or ‘noncodebook’
	+ **Option 2 (No concern):** RAN1 agrees that whether RRC parameter *applyIndicatedTCI-State* is configured in *ControlResourceSet* can be used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation.

As we may not have sufficient online time, I am trying to further down-select between the two options in Alt-1 for now. For the two options in Alt-1, most companies agree that option-1 is a more proper technical solution. However, it involves huge spec impact which may not be feasible for implementation. To solve this, CATT suggested to choose two typical cases that *applyIndicatedTCI-State* will be configured for all the channels. This can also solve the concern that OPPO (all channels should be covered) and Ericsson (Further discuss the detailed conditions in Alt 1 Option 1) raised.

Based on the above assessment, the following proposal is prepared:

**Modified Proposal 1: To differentiate the cells operated as sTRP vs sDCI mTRP, support option-1 in Alt-1 with modifications:**

* **Alt-1: It is RAN1 consensus that RRC parameter(s) is used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation.**
	+ **Option 1:** RAN1 agrees that whether RRC parameter *applyIndicatedTCI-State* is configured in *ControlResourceSet* can be used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation. However, for each list, the network ensures that either at least one of the following RRC parameters is configured for all BWPs of all serving cells or none of the following RRC parameters is configured in any BWP of any serving cell.
		- “applyIndicatedTCI-State-r18” in ~~ConfiguredGrantConfig,~~ ControlResourceSet ~~PUSCH-Config, SRS-ResourceSet, PDCCH-ConfigCommon, PUCCH-ResourceExt-v1610,~~ or
		- “applyIndicatedTCI-State-r18” in PUCCH-ResourceExt-v1610.
		- ~~“applyIndicatedTCI-State-r18” and “applyIndicatedTCI-State2-r18” in CSI-AssociatedReportConfigInfo, or~~
		- ~~“applyIndicatedTCI-StateDCI-1-0-r18” in TCI-InDCI-r18.~~
		- ~~mappingPattern-r17”, “multipanelSchemeSDM-r18”, “multipanelSchemeSFN-r18” in PUSCH-Config~~
		- ~~“repetitionSchemeConfig-r16” in PDSCH-Config~~
		- ~~“searchSpaceLinkingId-r17” in searchSpace~~
		- ~~“sfnSchemePDCCH-r17” and “sfnSchemePDSCH-r17” in MIMOParam-r17~~
		- ~~“cjt-Scheme-PDSCH-r18” in ServingCellConfig~~
		- ~~Two SRS resource sets configured in srs-ResourceSetToAddModList or srs-ResourceSetToAddModListDCI-0-2 with higher layer parameter usage in SRS-ResourceSet set to 'codebook' or ‘noncodebook’~~
	+ **Option 2 (No concern):** RAN1 agrees that whether RRC parameter *applyIndicatedTCI-State* is configured in *ControlResourceSet* can be used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation.
* **Alt 2: It is RAN1 consensus that the number of indicated TCI states can be used to indicate whether a serving cell is in sDCI mTRP operation or sTRP operation.**

Or, if we cannot reach a converged solution, we may have to go for the conclusion: There is no RAN1 consensus on differentiation the cells operated as sTRP vs sDCI mTRP.

## Q1: Do you agree with the modified proposal 1? Please also specify your comments, if any.

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| **Company** | **Agree or Not Agree** | **Comments** |
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# Proposal for online discussion

TBD.

# Reference

1. R1-2500013 LS on differentiation of sDCI mTRP, mDCI mTRP and sTRP CATT
2. R1-25003019 Summary on LS on differentiation of sDCI mTRP and sTRP CATT
3. R1-2503344 Draft reply LS on differentiation of sDCI mTRP, mDCI mTRP and sTRP vivo
4. R1-2503676 Discussion on differentiation of sDCI mTRP, mDCI mTRP and sTRP ZTE Corporation, Sanechips
5. R1-2503768 Discussion on LS on differentiation of sDCI based mTRP and sTRP CATT
6. R1-2503769 Draft reply LS on differentiation of sDCI based mTRP and sTRP CATT
7. R1-2503871 Discussion on LS on differentiation of sDCI mTRP and sTRP Xiaomi
8. R1-2504186 Discussion on LS on differentiation of sDCI mTRP, mDCI mTRP and sTRP OPPO
9. R1-2504452 Discussion on LS on differentiation of sTRP and sDCI mTRP Ericsson
10. R1-2503544 Discussion on differentiation of sDCI mTRP, mDCI mTRP and sTRP Samsung