3GPP TSG RAN WG1 #101 R1-200xxxx

e-Meeting, May 20th – June 5th, 2020

Source: Moderator (OPPO)

Title: Text Proposal for TS 38.214 in [101-e-NR-eMIMO-multiTRP-01]

Agenda Item: 7.2.6.2

Document for: Discussion and Decision

1. Introduction

Rel-16 enhancement on MIMO WID includes objectives of enhancing multi-TRP/Panel transmission with ideal and non-ideal backhaul. During the work of rel-16, designs for multiple-PDCCH based and single-PDCCH based multi-TRP/Panel transmission were discussed and specified. This document provides the Text Proposal for Issue #b-6 in multi-TRP email thread 1:

* Issue #b-6: Default TCI-state for PDSCH of Scheme 3 and Scheme 4
1. Text Proposal

*Reason for changes:*

In RAN1#101 e-Meeting, we made the following agreement:

**Agreement**

The default TCI-states for PDSCH transmission of scheme 3 or scheme 4 are determined as follows:

* When the time offset between the DCI and the 1st PDSCH transmission occasion is less than the threshold, the two default TCI-states are applied to PDSCH transmission occasions, respectively. The mapping between default TCI states and PDSCH transmission occasions follows the mapping specified for indicated TCI states in Section 5.1.2.1 in TS 38.214.
* The default TCI states are based on the activated TCI states in the slot with the first PDSCH transmission occasion
* Note: Whether to support this feature or not is subject to UE capability FG 16-2b-0.

**Agreement**

* Introduce a new RRC parameter [*enableTwoDefaultTCIStates*] that configures the UE to apply two default TCI states of single-DCI based multi-TRP .
* Introduce a new RRC parameter [*enableDefaultTCIStatePerCoresetPoolIndex*] that configures the UE to apply the default TCI state per CORESETPoolindex of multi-DCI based multi-TRP.

Therefore, TS 38.214 shall be updated accordingly on the description of default TCI states for multi-TRP transmission.

Summary of changes:

In TS 38.214, capture the above agreement made in RAN1 #101 e-Meeting.

**Specs/Sections impacted:**

TS 38.214 V16.1.0 /5.1.5

Consequences if not approved:

The UE behavior on receiving PDSCH of scheme 3 and Scheme 4 is ambiguous.

The text proposal for TS 38.214 is:

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| 5.1.5 Antenna ports quasi co-location\*\*\* Unchanged text is omitted \*\*\*Independent of the configuration of *tci-PresentInDCI* and *tci-PresentInDCI-ForFormat1\_2* in RRC connected mode, if no TCI codepoints are mapped to two different TCI states and the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL*, the UE may assume that the DM-RS ports of PDSCH of a serving cell are quasi co-located with the RS(s) with respect to the QCL parameter(s) used for PDCCH quasi co-location indication of the CORESET associated with a monitored search space with the lowest *controlResourceSetId* in the latest slot in which one or more CORESETs within the active BWP of the serving cell are monitored by the UE. In this case, if the 'QCL-TypeD' of the PDSCH DM-RS is different from that of the PDCCH DM-RS with which they overlap in at least one symbol, the UE is expected to prioritize the reception of PDCCH associated with that CORESET. This also applies to the intra-band CA case (when PDSCH and the CORESET are in different component carriers). If none of configured TCI states for the serving cell of scheduled PDSCH contains 'QCL-TypeD', the UE shall obtain the other QCL assumptions from the indicated TCI states for its scheduled PDSCH irrespective of the time offset between the reception of the DL DCI and the corresponding PDSCH. If a UE is configured with [*enableDefaultTCIStatePerCoresetPoolIndex*] and the UE is configured by higher layer parameter *PDCCH-Config* that contains two different values of *CORESETPoolIndex* in *ControlResourceSet,* for both cases,when *tci-PresentInDCI* is set to 'enabled' and *tci-PresentInDCI* is not configured in RRC connected mode, if the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL,* the UE may assume that the DM-RS ports of PDSCH associated with a value of *CORESETPoolIndex* of a serving cell are quasi co-located with the RS(s) with respect to the QCL parameter(s) used for PDCCH quasi co-location indication of the CORESET associated with a monitored search space with the lowest *CORESET-ID* among CORESETs, which are configured with the same value of *CORESETPoolIndex* as the PDCCH scheduling that PDSCH, in the latest slot in which one or more CORESETs associated with the same value of *CORESETPoolIndex* as the PDCCH scheduling that PDSCH within the active BWP of the serving cell are monitored by the UE. When a UE is configured with [*enableTwoDefaultTCIStates*], if the offset between the reception of the DL DCI and the corresponding PDSCH is less than the threshold *timeDurationForQCL* and atleast one configured TCI states for the serving cell of scheduled PDSCH contains the'QCL-TypeD', and at least one TCI codepoint indicates two TCI states, the UE may assume that the DM-RS ports of PDSCH of a serving cell are quasi co-located with the RS(s) with respect to the QCL parameter(s) associated with the TCI states corresponding to the lowest codepoint among the TCI codepoints containing two different TCI states.When a UE is configured by higher layer parameter *repetitionScheme-r16* set to '*TDMSchemeA' or* when the UE is configured with higher layer parameter *repetitionNumber-r16*, and if the UE is configured with [*enableTwoDefaultTCIStates*]:* If the offset between the reception of the DL DCI and the first PDSCH transmission occasion is less than the threshold *timeDurationForQCL* and atleast one configured TCI states for the serving cell of scheduled PDSCH contains the'QCL-TypeD', and at least one TCI codepoint indicates two TCI states, the UE may assume that the DM-RS ports of each PDSCH transmission occasion of a serving cell are quasi co-located with the RS(s) with respect to the QCL parameter(s) associated with the TCI states corresponding to the lowest codepoint among the TCI codepoints containing two different TCI states. The UE may assume the first TCI state and the second TCI state of the TCI states corresponding to the lowest codepoint among the TCI codepoints containing two different TCI states are applied to the PDSCH transmission occasions, respectively, as described in Clause 5.1.2.1 by replacing the indicated TCI states with the TCI states corresponding to the lowest codepoint among the TCI codepoints containing two different TCI states.

\*\*\* Unchanged text is omitted \*\*\* |

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| Company | Views and comments |
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1. Reference
2. R1-2003397 On remaining issues on M-TRP vivo
3. R1-2003469 Maintenance of multi-TRP enhancements ZTE
4. R1-2003531 Remaining issues on multi-TRP in R16 Huawei, HiSilicon
5. R1-2003627 Discussion on remaining issues of multi-TRP/panel transmission CATT
6. R1-2003660 Remaining issues on multi-TRP transmission MediaTek Inc.
7. R1-2003742 Corrections to multi-TRP Intel Corporation
8. R1-2003819 Remaining issues on multi-TRP/panel transmission Lenovo, Motorola Mobility
9. R1-2003881 On Rel.16 multi-TRP/panel transmission Samsung
10. R1-2003928 Text proposals on enhancements on multi-TRP/panel transmission LG Electronics
11. R1-2003954 Remaining issues on multi-TRP/panel transmission CMCC
12. R1-2003987 Discussion on remaining issues of multi-TRP operation Spreadtrum Communications
13. R1-2004047 Text proposals for enhancements on multi-TRP and panel Transmission OPPO
14. R1-2004229 Remaining issues for Multi-TRP enhancement Apple
15. R1-2004265 Maintenance of Rel-16 Multi-TRP operation Nokia, Nokia Shanghai Bell
16. R1-2004311 Remaining issues on multi-TRP transmission NEC
17. R1-2004395 Remaining issues on multi-TRP/panel transmission NTT DOCOMO, INC
18. R1-2004432 Remaining issues on Multi-TRP/Panel Transmission Ericsson
19. R1-2004463 Multi-TRP Enhancements Qualcomm Incorporated
20. R1-2004592 Clarification on Multi-TRP URLLC Scheme 4 Convida Wireless
21. R1-2004719 FL summary #2 for Multi-TRP/Panel Transmission Moderator (OPPO)