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| **Change Request** | | | | | | | |
| **Document** | **ORAN-WG4.COMF.0** | **ver.** | **04.00.00** | **CR** | **NVI-0101** | **rev** | **1** |

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| ***Title:*** | Relaxing the condition of the test case for UC-Plane O-DU Scenario Class Beamforming 3GPP – Weight-based 1 Beamforming | | |
| ***Source to WG:*** | NVidia | | |
| ***Target WG :*** | **WG4 CONF Test Spec** | | |
| ***Category:*** | **C (or F tbd)** | ***CR Creation Date*** | 2021-05-18 |
|  | *Use one of the following* ***categories****:* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)* ***F*** *(correction)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | |

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| ***Reason for Change:*** | Currently, the CONF Specification V03 Section 3.4.4.2.2 requires the O-DU DUT must exercise at least two different beams to serve at least two SS Blocks (SSBs) and perform beam sweeping. Weight-based beamforming does not have to require two SSBs, and does not have to perform beam sweeping in relation to these SSBs. |
| ***Summary of change:*** | Removing (implicit assumption of quasi-colocation) restriction to two or more SSBs. |
| ***Consequences if not aproved:*** | Enable O-DU to perform weight-based beamforming flexibly without specifically dependency on two or more SSBs. Permit channel reciprocity based-beamforming or quasi-colocation based on other than two or more SSBs. |

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| ***Clauses affected:*** | Section 3.4.4.2.2 | | | | |
|  | **Y** | **N** |  | |  |
| ***Other specs*** |  | **X** | Other core specifications: | <fill in related CRs if “Y”> | |
| ***affected:*** |  | **x** | Test specifications: | <fill in related CRs if “Y”> | |
| ***(show related CRs)*** |  | **X** | O&M Specifications: TBD | <fill in related CRs if “Y”> | |
| ***Supporting material:***  ***Other comments:*** |  | | | | |

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| ***Status:*** |  | ***CR Closed Date:*** |  |
| ***Outcome:*** |  | ***Duplication:*** |  |
| ***Outcome explanation:*** |  | | |

Current text:

\*\*\*\* FIRST CHANGE \*\*\*\*

1. **Test Description and Applicability**

This test is CONDITIONAL MANDATORY.

The purpose of this test is to ensure that the O-DU can meet the most basic requirements of the O-RAN fronthaul to support connecting with a O-RU emulator with weight-based beamforming. This test exercises the beamId field found in the C-plane section descriptions as well as section extension = 1 to converge beamforming information to the O-RU emulator of TED.

1. **Test Entrance Criteria**

The O-DU DUT must be provisioned to connect with an O-RU for 5G New Radio and are synchronized with the O-RU emulator of the TED. The O-DU DUT could use any of the NR BF profiles for O-RU as specified in the Fronthaul Interoperability Test Specification [25] in Annex A.2 (except using 16-bit fixed point IQ format), or any other suitable profile that satisfies the test scenario.

The O-DU DUT must exercise at least two different DL beams. The two beams under test, i.e. beam=A and beam=B, can have neither a vector size of one (i.e. only contains a single beam weight value) nor have identical beam weight values (i.e. no beamforming). Additionally, O-DU DUT cannot assign beamId=0x0000 (i.e. no beamforming) to any of the two beams when sending beamforming information to the O-RU emulator. The O-DU might retrieve a list of O-RU beam capabilities to be able to generate beam weight vectors supported by the O-RU emulator. The O-DU DUT will use at least any two set of beam weight vectors to converge beamforming information to the O-RU emulator along with the test vectors (IQ data).

The beams may be quasi-colocated with one or more SSBs. The O-DU DUT may use any variant of Beamforming Method 2 – Weight-based Beamforming as specified in Annex J Beamforming Method Description of O-RAN.WG4.CUS.0-v04 [2].

The O-RU emulator must be configured to report support for weight-based beamforming in the M-Plane capabilities to allow the O-DU DUT to use weight-based beamforming. It is assumed that the O-DU can be configured in some way to force the use of dynamic weight-based beamforming.

1. **Test Methodology**
   1. **Initial Conditions**

Configure the O-DU DUT such that it carries out the broadcasting of SSBs, the transmission of CSI-RS, the reception of SRS, or a combination of these through its interfaces with the appropriate entities in the TED. Configure the O-RU Emulator with weight-based beamforming and 16-bit fixed point IQ format.

* 1. **Procedure**
     1. O-DU DUT starts broadcasting procedure
     2. O-DU DUT may start transmitting zero, one, or more CSI-RS resource sets
     3. O-DU DUT may receive CSI Reports, or SRS, or both CSI Reports and SRS from the O-RU emulator of the TED
     4. Log and analyze the open front haul data stream between the O-DU DUT and O-RU Emulator including used section types and section extensions

1. **Test Requirement (expected result)**
   1. Successful decoding of one or more SSBs
   2. Log of at least two different assigned beamIds (i.e. beamId=A and beamId=B) are used and none of them are beamId=0x0000
   3. Log of at least two different assigned beam weight vectors are used for beam=A and beam=B.

\*\*\*\* End of CR \*\*\*\*

**Discussion**

It is possible to maintain a single CR as the above. Alternatively, it may be possible to breakup the CR into 3 different test cases for Weight-based Beamforming. 1) Codebook based Beamforming with CSR Reports from SSB or CSI-RS (this may be further broken up into 1.1 SSB and 1.2 SSB+CSI-RS), 2) Reciprocity based Beamforming with SRS and with or without CSI Reports