3GPP TSG-RAN WG4 Meeting #95-e R4-2008815

Electronic meeting, 25 May – 5 June 2020

Agenda Item: 6.11.3.2

Source: Ericsson

Title: Simulation assumption for PDSCH requirements with Single-DCI SDM scheme and Multi-DCI transmission schemes

Document for: Approval

# 1 Introduction

This contribution provides the simulation assumption of PDSCH demodulation requirements with multi-TRP transmission scheduled by single-DCI and multi-DCI. Interested companies are encouraged to provide the alignment simulation results in RAN4#96-e.

Companies are encouraged to provide the evaluation results with the following frequency/time offset scenario:

1. No frequency and time offsets (ideal case)
2. With frequency and time offsets
   * UE enables frequency and time offset tracking and compensation
   * UE does not enable frequency time offset tracking and compensation

# 2 Simulation assumption for PDSCH demodulation with multi-TRP transmission

## 2.1 Multi-DCI based scheduling

| Parameters | Tests 1-1 and 1-2 | Tests 2-1 and 2-2 |
| --- | --- | --- |
| TDD UL/DL configuration | N/A | [FR1.30-1 (7DS2U, 6D+4G+4U)]  FFS whether PDSCH is scheduled in the special slots |
| Timing offset of the second TRP from the first TRP | Option 1-1: 2 μs  Option 1-2: -0.5 μs  Interested companies can evaluate the following options  Option 2-1: -1 μs  Option 2-2: 1 μs  Option 2-3: 3 μs | Option 1-1: 1 μs  Option 1-2: -0.25 μs  Interested companies can evaluate the following options  Option 2-1: -0.5 μs  Option 2-2: 0.5 μs  Option 2-3: 1.5 μs |
| Frequency offset between two TRPs | Option 1: 200 Hz  Option 2: 300 Hz | Option 1: 300 Hz  Option 2: 600 Hz |
|  | **Common serving cell parameters** | |
| Physical Cell ID | 0 | |
| SSB position in burst | First SSB in Slot #0 | |
| SSB periodicity | 20ms | |
| Transmit TRP | Option 1: TRP1  ~~Option 2: TRP1 and TRP2~~ | |
|  | **TRS#1 (configuration for TCI state #1)** | |
| Transmit TRP | TRP#1 | |
| CSI-RS periodicity | [20] slots | [40] slots |
| CSI-RS offset | [10] for CSI-RS resources 1 and 2  [11] for CSI-RS resources 3 and 4 | [20] for CSI-RS resources 1 and 2  [21] for CSI-RS resources 3 and 4 |
| Density | 3 | 3 |
| First subcarrier index in the PRB used for CSI-RS | k0=0 | k0=0 |
| First OFDM symbol in the PRB used for CSI-RS | l0 = 6 for CSI-RS resources 1 and 3  l0 = 10 for CSI-RS resources 2 and 4 | l0 = 6 for CSI-RS resources 1 and 3  l0 = 10 for CSI-RS resources 2 and 4 |
|  | **TRS#2 (configuration for TCI state #2)** | |
| Transmit TRP | TRP#2 | |
| CSI-RS periodicity | [20] slots | [40] slots |
| CSI-RS offset | [10] for CSI-RS resources 1 and 2  [11] for CSI-RS resources 3 and 4 | [20] for CSI-RS resources 1 and 2  [21] for CSI-RS resources 3 and 4 |
| Density | 3 | 3 |
| First subcarrier index in the PRB used for CSI-RS | k0=1 (Baseline, Non-colliding)  k0=0 (FFS, Colliding) | k0=1 (Baseline, Non-colliding)  k0=0 (FFS, Colliding) |
| First OFDM symbol in the PRB used for CSI-RS | l0 = 6 for CSI-RS resources 1 and 3  l0 = 10 for CSI-RS resources 2 and 4 | l0 = 6 for CSI-RS resources 1 and 3  l0 = 10 for CSI-RS resources 2 and 4 |
|  | **TCI State configuration #0** | |
| Type 1 QCL information | SSB index #0, QCL type C | |
| Type 2 QCL information | N/A | |
|  | **TCI State configuration #1** | |
| Type 1 QCL information | CSI-RS resource: TRS#1, QCL type A | |
| Type 2 QCL information | N/A | |
|  | **TCI State configuration #2** | |
| Type 1 QCL information | CSI-RS resource: TRS#2, QCL type A | |
| Type 2 QCL information | N/A | |
|  | **PDCCH configuration** | |
| CORESETPoolIndex | 0, 1 | |
| Symbols for PDCCH | 0, 1 | |
| Number of PRB | Half of the channel bandwidth with contiguous RB allocation and non-interleaved CCE-to-REG mapping | |
| K0 | 0 | |
| AL | 8 (576REs) | |
|  | **PDSCH configuration** | |
| PDSCH resource mapping type | Type A | |
| Resource allocation type | Type 1 | |
| DMRS configuration | Type 1, 1+1 | |
| Antenna ports index ​ | {1000,1001} for TCI#1 and {1002,1003} for TCI#2 | |
| Start symbol (S) | 2 | |
| Time duration (L) | 12 | |
| PRB allocation | Non-overlapping case  PDSCH#1: PRB#0 to RPB#25  PDSCH#2: PRB#26 to PRB#51 | Non-overlapping case  PDSCH#1: PRB#0 to PRB#52  PDSCH#2: PRB#53 to PRB#105 |

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| --- | --- | --- | --- | --- | --- |
| Test number | BW / SCS | MCS | Propagation condition (Note 1) | Antenna configuration | Metric |
| 1-1 | 10MHz / 15kHz | [64QAM 0.5 (baseline)] | [TDLA30-10] for both TRP1 and TRP2 | [2x2 ULA Low] for each TRP | 70% of max Tput |
| 1-2 | 10MHz / 15kHz | [64QAM 0.5 (baseline)] | [TDLA30-10] for both TRP1 and TRP2 | [2x4 ULA Low] for each TRP | 70% of max Tput |
| 2-1 | 40MHz / 30kHz | [64QAM 0.5 (baseline)] | [TDLA30-10] for both TRP1 and TRP2 | [2x2 ULA Low] for each TRP | 70% of max Tput |
| 2-2 | 40MHz / 30kHz | [64QAM 0.5 (baseline)] | [TDLA30-10] for both TRP1 and TRP2 | [2x4 ULA Low] for each TRP | 70% of max Tput |
| Note 1: MIMO faders are independent for each TRP transmission. | | | | | |

## 2.2 Simulation assumption for Single-DCI based SDM scheme

| Parameters | Tests 3-1 and 3-2 | Tests 4-1 and 4-2 |
| --- | --- | --- |
| TDD UL/DL configuration | N/A | [FR1.30-1 (7DS2U, 6D+4G+4U)]  FFS whether PDSCH is scheduled in the special slots |
| Timing offset of the second TRP from the first TRP | Option 1-1: -1 μs  Option 1-2: -0.5 μs  Interested companies can evaluate the following options  Option 2-1: -1 μs  Option 2-2: 1 μs  Option 2-3: 3 μs | Option 1-1: -0.5 μs  Option 1-2: -0.25 μs  Interested companies can evaluate the following options  Option 2-1: -0.5 μs  Option 2-2: 0.5 μs  Option 2-3: 1.5 μs |
| Frequency offset between two TRPs | Option 1: 200 Hz  Option 2: 300 Hz | Option 1: 300 Hz  Option 2: 600 Hz |
|  | **Common serving cell parameters** | |
| Physical Cell ID | 0 | |
| SSB position in burst | First SSB in Slot #0 | |
| SSB periodicity | 20ms | |
| Transmit TRP | Option 1: TRP1  ~~Option 2: TRP1 and TRP2~~ | |
|  | **TRS#1 (configuration for TCI state #1)** | |
| Transmit TRP | TRP#1 | |
| CSI-RS periodicity | [20] slots | [40] slots |
| CSI-RS offset | [10] for CSI-RS resources 1 and 2  [11] for CSI-RS resources 3 and 4 | [20] for CSI-RS resources 1 and 2  [21] for CSI-RS resources 3 and 4 |
| Density | 3 | 3 |
| First subcarrier index in the PRB used for CSI-RS | k0=0 | k0=0 |
| First OFDM symbol in the PRB used for CSI-RS | l0 = 6 for CSI-RS resources 1 and 3  l0 = 10 for CSI-RS resources 2 and 4 | l0 = 6 for CSI-RS resources 1 and 3  l0 = 10 for CSI-RS resources 2 and 4 |
|  | **TRS#2 (configuration for TCI state #2)** | |
| Transmit TRP | TRP#2 | |
| CSI-RS periodicity | [20] slots | [40] slots |
| CSI-RS offset | [10] for CSI-RS resources 1 and 2  [11] for CSI-RS resources 3 and 4 | [20] for CSI-RS resources 1 and 2  [21] for CSI-RS resources 3 and 4 |
| Density | 3 | 3 |
| First subcarrier index in the PRB used for CSI-RS | k0=1 (Baseline, Non-colliding)  k0=0 (FFS, Colliding) | k0=1 (Baseline, Non-colliding)  k0=0 (FFS, Colliding) |
| First OFDM symbol in the PRB used for CSI-RS | l0 = 6 for CSI-RS resources 1 and 3  l0 = 10 for CSI-RS resources 2 and 4 | l0 = 6 for CSI-RS resources 1 and 3  l0 = 10 for CSI-RS resources 2 and 4 |
|  | **TCI State configuration #0** | |
| Type 1 QCL information | SSB index #0, QCL type C | |
| Type 2 QCL information | N/A | |
|  | **TCI State configuration #1** | |
| Type 1 QCL information | CSI-RS resource: TRS#1, QCL type A | |
| Type 2 QCL information | N/A | |
|  | **TCI State configuration #2** | |
| Type 1 QCL information | CSI-RS resource: TRS#2, QCL type A | |
| Type 2 QCL information | N/A | |
|  | **PDCCH configuration** | |
| CORESETPoolIndex | 0 (or not configured) | |
| Symbols for PDCCH | 0, 1 | |
| K0 | 0 | |
| AL | 8 (576REs) | |
|  | **PDSCH configuration** | |
| PDSCH resource mapping type | Type A | |
| Resource allocation type | Type 1 | |
| DMRS configuration | Type 1, 1+1 | |
| Antenna ports index ​ | {1000} for TCI#1 and {1002} for TCI#2 | |
| Start symbol (S) | 2 | |
| Time duration (L) | 12 | |
| PRB allocation | Full-overlapping case  PDSCH#1: PRB#0 to RPB#51  PDSCH#2: PRB#0 to RPB#51 | Full-overlapping case  PDSCH#1: PRB#0 to RPB#105  PDSCH#2: PRB#0 to RPB#105 |
| Note 1: Apply a power scaling factor as 1/sqrt(2) for transmitted signaling from each TRP. | | |

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| --- | --- | --- | --- | --- | --- |
| Test number | BW / SCS | MCS | Propagation condition | Antenna configuration | Metric |
| 3-1 | 10MHz / 15kHz | [64QAM 0.5 (baseline)] | [TDLA30-10] for both TRP1 and TRP2 | [1x2] for each TRP | 70% of max Tput |
| 3-2 | 10MHz / 15kHz | [64QAM 0.5 (baseline)] | [TDLA30-10] for both TRP1 and TRP2 | [1x4] for each TRP | 70% of max Tput |
| 4-1 | 40MHz / 30kHz | [64QAM 0.5 (baseline)] | [TDLA30-10] for both TRP1 and TRP2 | [1x2] for each TRP | 70% of max Tput |
| 4-2 | 40MHz / 30kHz | [64QAM 0.5 (baseline)] | [TDLA30-10] for both TRP1 and TRP2 | [1x4] for each TRP | 70% of max Tput |