3GPP TSG-RAN WG4 Meeting #95-e R4-200xxxx

Online, May 25 – June 5, 2020

**Agenda item:** 6.8.2.1.5

**Source:** Qualcomm Incorporated

**Title:** Link-level simulation assumptions for UE Rx-Tx time difference measurements

**Document for:** Discussion

# Introduction

In RAN4#94-e-Bis meeting, it was agreed to bring forth simulation assumptions for UE Rx-Tx time difference measurements [1]:

**Link-level simulation plan for UE Rx-Tx time difference:**

* **Link-level simulations plan:** 
  + **RAN4#95 – try to agree on simulation assumptions,**
  + **RAN4#96 – provide first simulation results.**

In this paper, we present simulation assumptions for UE Rx-Tx time difference measurement. Some of the assumptions are common to RSTD/RSRP link-level simulation assumptions [2].

# Simulation assumptions

**Table 1: General parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | |
|  | **FR1** | **FR2** |
| Cell layout | 3 cells at distinct locations: <cell 1, cell 2, cell3>, where cell 1 is the serving/reference cellNOTE 1 | |
|  | • | |
| Duplex modes | FDD and TDD | |
| TDD specific parameters (TTD configuration is in 38.133, section A.3.1.4) | * TDDConf.1.1 (15 kHz) * TDDConf.2.1 (30 kHz) | * TDDConf.3.1 (120 kHz) |
| Data and CCH transmissions in the measured cell: | no other cell transmissions in its positioning symbols, except PRS   * non-PRS symbols: 100% RE utilization | |
|  |  | |
| Cyclic prefix | Normal | |
| DRX | OFF | |
| Carrier frequency / BW / SCS / duplex mode | * 2 GHz * 10 MHz, 20 MHz, 50 MHz * 15 kHz * FDD, TDD * 4 GHz * 20 MHz, 50 MHz, 100 MHz * 30 kHz * FDD, TDD | * 40 GHz * 50 MHz, 100 MHz, 200 MHz * 120 kHz * TDD |
| Propagation conditions [TS 38.101-4] | AWGN,  TDL-C (300 ns delay spread, 100 Hz),  TDL-A (30 ns delay spread, 5Hz),  TDL-B (100 ns delay spread, 200Hz) | AWGN,  TDL-C (60 ns delay spread, 300 Hz) |
| Es/Iot for tw cells (cell 1, cell 2), [dB] | (-3, -6, -13) | (-3, -6, -13)  (-3, -6, -10) |
| Number of UE receive antennas | 2 rx (uncorrelated with equal gain, no rx beamforming) | |
| UE measurement bandwidth | Full carrier bandwidth | |
| NOTE 1: nr-DL-PRS-ReferenceInfo is a member of NR-DL-PRS-AssistanceData which is a common NR positioning IE applicable to all positioning methods (see clause 6.4.3 of TS 37.355). | | |

**Table 2: PRS transmission configuration parameters**

|  |  |  |
| --- | --- | --- |
| **Parameter** | **Value** | |
| Number of transmit PRS antennas | 1 | |
| Cell ID, TRP ID, PRS Resource Set ID | Selected to ensure non-overlapping PRS REs in frequency | |
| Number of DL PRS Resource sets for a positioning fix | 1 (including all PRS resource repetitions) | |
| PRS transmission bandwidth (in PRBs) - full carrier BW | * 15 kHz: * 52 (10MHz), 104 (20MHz), 268 (50MHz) * 30 kHz: * 48 (20MHz),132 (50MHz), 272 (100MHz) | * 120 kHz: * 32(50MHz),64(100MHz), 128 (200MHz) |
| Comb | Comb-6, comb-2 | |
| DL-PRS-ResourceRepetitionFactor | 1, 2, 4, 16 | |
| PRS-ResourceTimeGap | 1, 2, 4 | 1, 8, 16 |
| PRS muting | No muting, muting (comb-2) | |
| Power boosting | No power boosting | |
| ExpectedRSTD-UncertaintyNOTE 1 | 5 us (15 kHz), 2.5 us (30 kHz), 0.625 us (120 kHz) | |
| NOTE 1: nr-DL-PRS-expectedRSTD-uncerainty is a member of NR-DL-PRS-AssistanceData which is a common NR positioning IE applicable to all positioning methods (see clause 6.4.3 of TS 37.355). | | |

At least the following performance characteristics are to be provided for TUE-RX:

* TUE-RX error CDFs for the 3 cells
* 90%-ile of the TUE-RX errors for each cell

In the above,

* TUE-RX error = abs(estimated TUE-RX – ideal TUE-RX ) (based on perfect channel and UE location knowledge).

Companies are encouraged to identify the number of samples used for deriving TUE-RX error.

# References

[1] R4-2005378

[2] R4-2002287