**3GPP TSG-RAN4 Meeting #112 *R4-24xxxxx***

**Maastricht, Netherlands, Aug 19 – 23, 2024**

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| *CR-Form-v12.3* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.133** | **CR** | **draftCR** | **rev** |  | **Current version:** | **18.6.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ***Proposed change affects:*** | UICC apps |  | ME | **X** | Radio Access Network |  | Core Network |  |

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|  | | | | | | | | | | |
| ***Title:*** | (10-1 10-2) Draft CR on RSTD measurement delay TCs for RRC\_IDLE mode | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | vivo | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | NR\_pos\_enh2-Perf | | | | |  | ***Date:*** | | | 8/X/2024 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **B** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-17 (Release 17) Rel-18 (Release 18) Rel-19 (Release 19)  Rel-20 (Release 20)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | Add test cases to verify RSTD measurement delay requirements without eDRX in RRC\_IDLE. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | 1. Add the TC for RSTD measurement reporting delay without eDRX in RRC\_IDLE state for non-RedCap UE in FR1 (clause A.6.10.1.1). 2. Add the TC for RSTD measurement reporting delay without eDRX in RRC\_IDLE state for non-RedCap UE in FR2 (clause A.7.10.1.1). | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | There will be no TCs for verifying RSTD measurement delay requirements without eDRX in RRC\_IDLE. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | A.6.10.1.1, A.7.10.1.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | | **X** |  | Test specifications | | | | TS 38.533 | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

# **--- Start of Change #1 ---**

#### A.6.10.1.1 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR1 SA in RRC\_IDLE state for non-RedCap UE

##### A.6.10.1.1.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 4.5.2.5 for RSTD measurements in RRC\_IDLE without eDRX. The tests are conducted under AWGN propagation condition with the UE operating in FR1 stand-alone mode and configured to perform RSTD measurements on a single positioning frequency layer (PFL) in FR1.

The supported test configurations are listed in Table A.6. 10.1.1.1-1.

Table A.6.10.1.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| Configuration | Description |
| 1 | 15 kHz SSB SCS, 20 MHz bandwidth, FDD duplex mode |
| 2 | 15 kHz SSB SCS, 20 MHz bandwidth, TDD duplex mode |
| 3 | 30 kHz SSB SCS, 50 MHz bandwidth, TDD duplex mode |
| Note: The UE is only required to be tested in one of the supported test configurations. | |

There are three cells in the test: Cell 1 (PCell and RSTD reference cell), Cell 2 (neighbor cell) and Cell 3 (neighbor cell). All cells are on the same RF channel in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and released to RRC\_IDLE state before the start of T2. All cells transmit PRS only during the second time interval of duration T2.

Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *NR-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE during T1. The last TTI of the last message shall be provided to the UE at least ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the DL-TDOA assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the start of the first PRS resource instance received after the UE has transitioned to RRC\_IDLE.

The general test parameters are listed in Table A.6. 10.1.1.1-2 and cell specific test parameters are listed in Table A.6.10.1.1.1-3 and Table A.6.10.1.1.1-4.

Table A.6.10.1.1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| SSB configuration | Config 1 |  | SSB.1 FR1 |  |
| Config 2 |  | SSB.1 FR1 |
| Config 3 |  | SSB.2 FR1 |
| SMTC configuration | Config 1 |  | SMTC.2 |  |
| Config 2 |  | SMTC.1 |
| Config 3 |  | SMTC.1 |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| Config 2 |  | SR.1.1 TDD |  |
| Config 3 |  | SR.2.1 TDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.1.1 FDD | As specified in clause A.3.1.2.1 |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| Config 2 |  | CR.1.1 TDD |  |
| Config 3 |  | CR.2.1 TDD |  |
| Initial BWP configuration | Config 1,2,3 |  | DLBWP.0.1  ULBWP.0.1 |  |
| Active UL BWP configuration | Config 1,2,3 |  | ULBWP.1.1 |  |
| PRS Configuration | Config 1 |  | PRS.1.1 FR1 | As specified in clause A.3.31 |
| Config 2 |  | PRS.1.2 FR1 |
| Config 3 |  | PRS.2.1 FR1 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 1.28 |  |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance ta specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 4 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [34] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | 5 | The length of the time interval that follows immediately after time interval T1. |

Table A.6.10.1.1.1-3: Cell-specific test parameters for RSTD measurement reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -98 | | |
| Config 2 | dBm/SCS | -98 | | |
| Config 3 | dBm/SCS | -95 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| SSB | | dB | 10 | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 2 | dBm/  19.08MHz | -56.54 | -56.54 | -56.54 |
| Config 3 | dBm/  47.88MHz | -52.56 | -52.56 | -52.56 |
| SSB RP Note4 | Config 1 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 2 | dBm/SCS | -88 | -Infinity | -Infinity |
| Config 3 | dBm/SCS | -85 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

Table A.6.10.1.1.1-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| T2 | T2 | T2 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 | FR1 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -98 | -98 | -98 |
| Config 2 | dBm/SCS | -98 | -98 | -98 |
| Config 3 | dBm/SCS | -95 | -95 | -95 |
| PRS | Config 1 | dB | -5.45 | -11.67 | -11.67 |
| Config 2 | dB | -5.45 | -11.67 | -11.67 |
| Config 3 | dB | -5.45 | -11.67 | -11.67 |
| Io Note 4 | Config 1 | dBm/  19.08MHz | -65.43 | -65.43 | -65.43 |
| Config 2 | dBm/  96.48MHz | -65.43 | -65.43 | -65.43 |
| Config 3 | dBm/  47.88MHz | -61.44 | -61.44 | -61.44 |
| PRS | | dB | -6 | -13 | -13 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T2) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the subframes with transmitted PRS.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | | |

##### A.6.10.1.1.2 Test requirements

The RSTD measurement time shall fulfill the requirements specified in clause 4.5.2.5.

The UE shall perform and report the RSTD measurements for Cell 1, Cell 2 and Cell 3 within the specified measurement period duration starting from the beginning of time interval T2.

NOTE: The actual overall delays measured in the test may be higher than the time duration above because of the uncertainty in acquiring the first available PRACH occasion to transition to RRC\_CONNECTED state to report the measurements.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the time duration above because of TTI insertion uncertainty of the measurement report in DCCH.

# The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1.23.3.**--- End of Change #1 ---**

# **--- Start of Change #2---**

#### A.7.10.1.1 NR RSTD measurement reporting delay test case for single positioning frequency layer in FR2 SA in RRC\_IDLE state for non-RedCap UE

##### A.7.10.1.1.1 Test purpose and environment

The purpose of the test is to verify the measurement requirements specified in clause 4.5.2.5 for RSTD measurements in RRC\_IDLE without eDRX. The tests are conducted under AWGN propagation condition with the UE operating in FR2 stand-alone mode and configured to perform RSTD measurements on a single positioning frequency layer (PFL) in FR2.

The supported test configurations are listed in Table A.7.10.1.1.1-1.

Table A.7.10.1.1-1: Supported test configurations

|  |  |
| --- | --- |
| PCell configuration | Description |
| 1 | 120 kHz SSB SCS, 200 MHz bandwidth, TDD duplex mode |

There are three cells in the test: Cell 1 (PCell and RSTD reference cell), Cell 2 (neighbor cell) and Cell 3 (neighbor cell). All cells are on the same RF channel in FR2.

The test consists of two consecutive time intervals, with duration of T1 and T2. The UE shall be in RRC\_CONNECTED state during T1 and released to RRC\_IDLE state before the start of T2. All cells transmit PRS only during the second time interval of duration T2.

Note: The information on when PRS is muted is conveyed to the UE using PRS muting information.

The *NR-DL-TDOA-ProvideAssistanceData* and *NR-DL-TDOA-RequestLocationInformation* as defined in TS 37.355 [34, clause 6.5.12], shall be provided to the UE during T1. The last TTI of the last message shall be provided to the UE at least ΔT ms before the start of T2, where ΔT = 50 ms is the maximum processing time of the DL-TDOA assistance data and location information request.

The beginning of the time interval T2 shall be aligned with the first DRX cycle containing a DL PRS resource(s).

The UE is configured with DRX cycle of 0.64s.

The general test parameters are listed in Table A.7.10.1.1.1-2, and cell specific test parameters are listed in Table A.7.10.1.1.1-2-3 and Table A.7.10.1.1.1-4.

Table A.7.10.1.1.1-2: General test parameters for RSTD measurement reporting delay

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | | Unit | Value | Comment |
| Reference cell | |  | Cell 1 | Reference cell is the cell in the DL-TDOA assistance data with respect to which the RSTD measurement is defined, as specified in TS 38.215 [4] and TS 37.355 [34]. The reference cell is the PCell in this test case. |
| Neighbor cells | |  | Cell 2 and Cell 3 | Cell 2 and Cell 3 appear at the first and second places in the neighbour cell list in the DL-TDOA assistance data. |
| BWchannel | | MHz | 200: NRB,c = 132 |  |
| SSB configuration | Config 1 |  | SSB.2 FR2 |  |
| SMTC configuration | Config 1 |  | SMTC.1 |  |
| PDSCH RMC configuration | Config 1 |  | SR.1.1 FDD |  |
| RMSI CORESET RMC configuration | Config 1 |  | CR.3.1 TDD | As specified in clause A.3.1.2.1 |
| Dedicated CORESET RMC configuration | Config 1 |  | CR.1.1 FDD |  |
| PRS Configuration | Config 1 |  | PRS.1.4. FR2 | As specified in clause A.3. 31 |
| Physical cell ID PCI | |  | (PCI of Cell 1 – PCI of Cell 2)mod6=0  and  (PCI of Cell 1 – PCI of Cell 3)mod6=0 | The cell PCIs are selected such that the relative shifts of PRS patterns among cells are as given by the test parameters |
| CP length | |  | Normal |  |
| DRX | | s | 0.64 |  |
| Radio frame receive time offset between the cells at the UE antenna connector | | μs | Cell 2 to Cell 1: 0  Cell 3 to Cell 1: 3 | PRS are transmitted from synchronous cells |
| Expected RSTD | | μs | Cell 2: 3  Cell 3: 3  Other neighbour cells: randomly between -3 and 3 | The expected RSTD is what is expected at the receiver. The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD indicator |
| Expected RSTD uncertainty for all neighbour cells | | μs | 5 | The corresponding parameter in the DL-TDOA assistance data specified in TS 37.355 [34] is the expectedRSTD-Uncertainty index |
| Number of cells provided in DL-TDOA assistance data | |  | 4 | Including the reference cell |
| PRS muting info | |  | Cell 1: ‘10’  Cell 2: ‘01’  Cell 3: ‘10’ | Correponds to prs-MutingInfo defined in TS 37.355 [24] |
| PRS resource RE offset | |  | Cell 1: 0  Cell 2: 0  Cell 3: 1 | Cell 1 and Cell 3 are configured with different resource offsets |
| T1 | | s | 3 | The length of the time interval from the beginning of each test |
| T2 | | s | [1.28] | The length of the time interval that follows immediately after time interval T1 |
| AoA setup | |  | Setup 1 | As defined in A.3.15.1 |
| Beam assumption | |  | Rough | Information about types of UE beam is given in B.2.1.3, and does not limit UE implementation or test system implementation |

Table A.7.10.1.1.1-2-3: Cell-specific test parameters for RSTD measurement reporting delay during T1

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
| NR RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.5 FDD | N/A | N/A |
| Note 3 | Config 1 | dBm/SCS | -89 | | |
| PRS | | dB | -Infinity | -Infinity | -Infinity |
| Io Note 4 | Config 1 | dBm/  190.08MHz | -54.00 | -54.00 | -54.00 |
| SSB RP Note4 | Config 1 | dBm/SCS | -89 | -Infinity | -Infinity |
|  |  | dB | 0 | -Infinity | -Infinity |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cell (Cell 1) is fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled.  Note 4: SSB RP and Io levels have been derived from other parameters and are given for information purpose. These are not settable test parameters. | | | | | |

Table A.7.10.1.1.1-2-4: Cell-specific test parameters for RSTD measurement reporting delay during T2

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Parameter | | Unit | Cell 1 | Cell 2 | Cell 3 |
|  | |  | T2 | T2 | T2 |
| RF Channel Number | |  | 1 | 1 | 1 |
| Positiong frequency layer | |  | 1 | 1 | 1 |
| Correlation Matrix and Antenna Configuration | |  | 1x2 Low | 1x2 Low | 1x2 Low |
| OCNG patterns defined in A.3.2.1 | |  | OP.1 | OP.1 | OP.1 |
| PRACH configuration | |  | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 | FR2 PRACH configuration 1 |
| Note 3 | Config 1 | dBm/SCS | -89 | -89 | -89 |
| PRS | Config 1 | dB | -5.44 | -11.67 | -11.67 |
| Io | Config 1 | dBm/  19.08MHz | -55.48 | -55.48 | -55.48 |
| PRS | | dB | -6 | -13 | -13 |
| Propagation Condition | |  | AWGN | | |
| Note 1: OCNG shall be used such that active cells (all, except Cell 3 in T3) are fully allocated and a constant total transmitted power spectral density is achieved for all OFDM symbols other than those in the slots with transmitted PRS.  Note 2: The resources for uplink transmission are assigned after the end of time period T2 to UEs that do not support SDT for measurement reporting.  Note 3: Interference from other cells and noise sources not specified in the test are assumed to be constant over subcarriers and time and shall be modelled as AWGN of appropriate power for  to be fulfilled. | | | | | |

##### A.7.10.1.1.2 Test requirements

The RSTD measurement time shall fulfill the requirements specified in clause 4.5.2.5.

The UE shall perform and report the RSTD measurements for Cell 1, Cell 2 and Cell 3 within the specified measurement period duration starting from the beginning of time interval T2.

NOTE: The actual overall delays measured in the test may be higher than the time duration above because of the uncertainty in acquiring the first available PRACH occasion to transition to RRC\_CONNECTED state to report the measurements.

NOTE: The actual overall delays measured in the test may be up to 2xTTIDCCH higher than the time duration above because of TTI insertion uncertainty of the measurement report in DCCH.

# The rate of the correct events for each neighbour cell observed during repeated tests shall be at least 90%, where the reported RSTD measurement for each correct event shall be within the RSTD reporting range specified in clause 10.1.23.3.**--- End of Change #2 ---**