**3GPP TSG- Meeting #**

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| *CR-Form-v12.3* |
| **CHANGE REQUEST** |
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|  |  | **CR** |  | **rev** |  | **Current version:** |  |  |
|  |
| *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:***  |  |
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| ***Source to WG:*** |  |
| ***Source to TSG:*** |  |
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| ***Work item code:*** |  |  | ***Date:*** |  |
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| ***Category:*** | **F** |  | ***Release:*** |  |
|  | *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 canbe 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:*** | IEs in the performance requirements are not aligned with TS37.355. |
|  |  |
| ***Summary of change:*** | IEs for PRS resource bandwidth is now aligned with TS37.355. |
|  |  |
| ***Consequences if not approved:*** | Performance requirement for PRS-RSRP and PRS-RSRPP remain ambiguous. |
|  |  |
| ***Clauses affected:*** | 10.1.23.2, 10.1.24.2.1, 10.1.24.2.2, 10.1.25.2, 10.1.38.2.1 |
|  |  |
|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  | TS/TR ... CR ...  |
| ***affected:*** |  | **X** |  Test specifications | TS/TR ... CR ...  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications | TS/TR ... CR ...  |
|  |  |
| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

**START OF CHANGE**

#### 10.1.23.2 Measurement Accuracy Requirements

The accuracy requirements for RSTD measurement shall be within ±(X+Y+Z+Δ) Tc.

X is defined in Table 10.1.23.2-1 for AWGN channel and Table 10.1.23.2-3 for fading channel for FR1, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE does not perform positioning measurement with reduced number of samples.

X is defined in Table 10.1.23.2-2 for AWGN channel and Table 10.1.23.2-4 for fading channel for FR2, provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE does not perform positioning measurement with reduced number of samples.

X is defined in Table 10.1.23.2-7 for AWGN channel in FR1 provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE supports positioning measurement with reduced number of sample and is indicated by LMF to perform positioning measurement with reduced number of samples.

X is defined in Table 10.1.23.2-8 for AWGN channel in FR2 provided that the following conditions are met.

- Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

- Conditions for RSTD measurements are fulfilled according to Annex B.2.14 for a corresponding Band for each relevant PRS resource configured for measurement.

- UE supports positioning measurement with reduced number of sample and is indicated by LMF to perform positioning measurement with reduced number of samples.

Note: The requriements for fading channel in this clause are derived based on TDL-A (30 ns delay spread, 5Hz) and TDL-C (60 ns delay spread, 300 Hz) channel models for FR1 and FR2 respectively.

When UE measures RSTD on PRS resources belonging to different PFLs, then the RSTD accuracy is defined as the accuracy corresponding to the largest accuracy value among different PFLs.

If the UE doesn’t support Rx TEG reporting for RSTD measurement or when the measurements of reference cell and neighbour cell belong to different Rx TEGs, Y, Z and Δ are defined as follows:

- When UE measures RSTD on PRS resources belonging to same PFL, Y=32 Tc, provided that the time offset between the two PRS resource instances from the reference cell and the neighbor cell, which are used for a single RSTD estimate, is no greater than 160 ms.

- When UE measures RSTD on PRS resources belonging different PFLs, Y=256 Tc, provided that the time offset between the two PRS resource instances from the reference cell and the neighbor cell, which are used for a single RSTD estimate, is no greater than 1280 ms.

- Z is defined in Table 10.1.23.2-5 for FR1 and Table 10.1.23.2-6 for FR2, respectively.

- Δ is zero for single PFL, and is defined in Table 10.1.23.2-5a for FR1 and Table 10.1.23.2-6a for FR2, respectively, for dual PFL.

If the measurements of reference cell and neighbour cell belong to the same Rx TEG, i.e. associated and reported with a common Rx TEG ID, then the sum of Y+Z+Δ is equal to the timing error margin of the Rx TEG reported in *nr-UE-RxTEG-TimingErrorMargin*. The timing error margin reported via *nr-UE-RxTEG-TimingErrorMargin* cannot be larger than the value of (Y+Z+Δ) defined when the UE does not associate the measurements with the same Rx TEG.

Table 10.1.23.2-1: RSTD absolute accuracy in FR1 for AWGN channel

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | PRS SCS | PRS bandwidthNote 1 | PRS resource repetition ()Note 2 | Io Note 3 range |
| NR operating band groups Note 4 | Minimum Io  | Maximum Io |
| Tc Note 5 | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| 132 | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| 98 | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 42 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 75 | 30  | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| 48 | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 24 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 50 | 60 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| 24 | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 10 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.NOTE 3: Io is assumed to have constant EPRE across the bandwidth.NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: Void |

Table 10.1.23.2-2: RSTD absolute accuracy in FR2 for AWGN channel

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | PRS SCS | PRS bandwidthNote 1 | PRS resource repetition () Note 2 | Io Note 3 range |
| Minimum Io  | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| 35 | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 24 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| 24 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 11 | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| 24 | 120 | ≥ 32 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| 13 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 6 | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.NOTE 3: Io is assumed to have constant EPRE across the bandwidth.NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 6: Void |

Table 10.1.23.2-3: RSTD absolute accuracy in FR1 for fading channel

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | PRS SCS | PRS bandwidthNote 1 | PRS resource repetition ()Note 2 | Io Note 3 range |
| NR operating band groups Note 4 | Minimum Io  | Maximum Io |
| Tc Note 5 | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| 247 | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| 140 | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 86 | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 118 | 30 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| 109 | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 28 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 147 | 60 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| 27 | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 21 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.NOTE 3: Io is assumed to have constant EPRE across the bandwidth.NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: Void |

Table 10.1.23.2-4: RSTD absolute accuracy in FR2 for fading channel

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | PRS SCS | PRS bandwidthNote 1 | PRS resource repetition () Note 2 | Io Note 3 range |
| Minimum Io  | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| 83 | (PRS Ês/Iot)ref ≥-6dB (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 24 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| 64 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 46 | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| 48 | 120 | ≥ 32 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| 54 | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 36 | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.NOTE 3: Io is assumed to have constant EPRE across the bandwidth.NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 6: Void |

Table 10.1.23.2-5: Margin for RSTD measurement accuracy in FR1

|  |  |
| --- | --- |
| PRS BW (RB number) | Margin (Tc) |
| SCS=15kHz | SCS=30kHz | SCS=60kHz |
| ≥ 24 | N/A | N/A | 120 |
| ≥ 52 | ≥ 24 | N/A | 72 |
| ≥ 104 | ≥ 48 | ≥ 24 | 36 |
| N/A | ≥ 132 | ≥ 64 | 16 |
| N/A | N/A | ≥ 132 | 12 |

Table 10.1.23.2-5a: Margin Δ for RSTD measurement accuracy in FR1

|  |  |
| --- | --- |
| PRS BW (RB number) | Margin (Tc) |
| SCS=15kHz | SCS=30kHz | SCS=60kHz |
| ≥ 24 | N/A | N/A | 128 |
| ≥ 52 | ≥ 24 | N/A | 64 |
| ≥ 104 | ≥ 48 | ≥ 24 | 32 |
| N/A | ≥ 132 | ≥ 64 | 16 |
| N/A | N/A | ≥ 132 | 8 |

**Table 10.1.23.2-6: Margin for RSTD measurement accuracy in FR2**

|  |  |
| --- | --- |
| **PRS BW (RB number)** | **Margin (Tc)** |
| **SCS=60kHz** | **SCS=120kHz** |
| ≥ 24 | N/A | 72 |
| ≥ 64 | ≥ 32 | 32 |
| ≥ 132 | ≥ 64 | 16 |
| N/A | ≥ 128 | 12 |

Table 10.1.23.2-6a: Margin Δ for RSTD measurement accuracy in FR2

|  |  |
| --- | --- |
| PRS BW (RB number) | Margin (Tc) |
| SCS=60kHz | SCS=120kHz |
| ≥ 24 | N/A | 32 |
| ≥ 64 | ≥ 32 | 16 |
| ≥ 132 | ≥ 64 | 8 |
| N/A | ≥ 128 | 4 |

Table 10.1.23.2-7: RSTD absolute accuracy in FR1 for AWGN channel with reduced number of samples

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | PRS SCS | PRS bandwidthNote 1 | PRS resource repetition ()Note 2 | Io Note 3 range |
| NR operating band groups Note 4 | Minimum Io  | Maximum Io |
| Tc Note 5 | dB | kHz | RB |  |  | dBm/SCS | dBm/BWChannel |
| 98  | (PRS Ês/Iot)ref ≥-3dB (PRS Ês/Iot)*i* ≥-6dB | 15 | ≥ 52 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| 42  | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 48  | 30 | ≥ 48 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| 24 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 24  | 60 | ≥ 64 | ≥ 1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| 10 | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.NOTE 3: Io is assumed to have constant EPRE across the bandwidth.NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: Void |

Table 10.1.23.2-8: RSTD absolute accuracy in FR2 for AWGN channel with reduced number of samples

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | PRS SCS | PRS bandwidthNote 1 | PRS resource repetition () Note 2 | Io Note 3 range |
| Minimum Io  | Maximum Io |
| Tc Note 4 | dB | kHz | RB |  | dBm/SCS | dBm/BWChannel |
| 24  | (PRS Ês/Iot)ref ≥-3dB (PRS Ês/Iot)*i* ≥-6dB | 60 | ≥ 64 | ≥ 1 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | Note 5 |
| 11 | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| 13 | 120 | ≥ 64 | ≥ 1 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | Note 5 |
| 6  | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of the reference resource and the measured neighbour resource i.NOTE 2: Minimum number of PRS resource repetitions among the reference resource and the measured neighbour resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.NOTE 3: Io is assumed to have constant EPRE across the bandwidth.NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 6: Void |

**END OF CHANGE**

**START OF CHANGE**

#### 10.1.24.2 Measurement Accuracy Requirements

##### 10.1.24.2.1 Absolute PRS RSRP accuracy

The absolute accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.1-1 are valid under the following conditions:

- Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

- UE does not support positioning measurements with reduced number of samples, or LMF does not indicate UE to perform positioning measurements with reduced number of samples

The absolute accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.1-2 are valid under the following conditions:

- Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

- UE does not support positioning measurements with reduced number of samples, or LMF does not indicate UE to perform positioning measurements with reduced number of samples

Table 10.1.24.2.1-1: PRS-RSRP absolute accuracy for FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | Io Note 7 range |
| NR operating band groups Note 8 | MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| dB | dB | dB | PRB | - |  | dBm / SCSPRS | dBm/BWChannel |
| dBm/15kHz Note 6 | dBm/30kHz Note 6 | dBm/60kHz Note 6 |
| ±3.5 | ±8 | ≥-3dB | ≥24 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| Note 4 |
| Note 4 |
| ±8.5 | ±13 | ≥-13dB | 24 ≤ BW ≤ 52 | All | Note 4 |
| ±6 | ±10.5 | 52< BW≤ 104 | All | Note 4 |
| ±4.5 | ±9 | BW >104 | All | Note 4 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: Void.NOTE 3: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2. |

Table 10.1.24.2.1-2: PRS-RSRP absolute accuracy for FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | Io Note 7 range |
| MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| dB | dB | dB | PRB | - | dBm / SCSPRS | dBm/BWChannel |
| dBm/120kHz Note 6 | dBm/60kHz Note 6 |
| ±5 | ±8 | ≥-3dB | ≥24 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| Note 4 |
| Note 4 |
| ±8.5 | ±11.5 | ≥-13dB | 24 ≤ BW ≤ 64 | All | Note 4 |
| ±6 | ±9 | BW >64 | All | Note 4 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: Void.NOTE 3: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2. |

The absolute accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.1-3 are valid under the following conditions:

- Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

- UE supports positioning measurements with reduced number of samples, and LMF indicates UE to perform positioning measurements with reduced number of samples

- AWGN channel

The absolute accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.1-4 are valid under the following conditions:

- Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

- UE supports positioning measurements with reduced number of samples, and LMF indicates UE to perform positioning measurements with reduced number of samples

- AWGN channel

Table 10.1.24.2.1-3: PRS-RSRP absolute accuracy for FR1 with reduced sample number

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor** **(** | **Io Note 6 range** |
| **NR operating band groups Note 7** | **MinimumIo Note 1****dBm / SCSPRS** | **MaximumIo** |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| **dBm/15kHz Note 5** | **dBm/30kHz Note 5** | **dBm/60kHz Note 5** |
| ±3.5 | ±8 | ≥0 | ≥48 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| ±8.5 | ±13 | ≥-6 | 48 ≤ BW ≤ 52 | All | Note 3 |
| ±6 | ±10.5 | 52< BW≤ 104 | All | Note 3 |
| ±4.5 | ±9 | BW >104 | All | Note 3 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.NOTE 4: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 5: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 6: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 7: NR operating band groups are as defined in Section 3.5.2. |

Table 10.1.24.2.1-4: PRS-RSRP absolute accuracy for FR2 with reduced sample number

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor** **(** | **Io Note 6 range** |
| **MinimumIo Note 1****dBm / SCSPRS** | **MaximumIo** |
| **dB** | **dB** | **dB** | **PRB** | **-** | **dBm / SCSPRS** | **dBm/BWChannel** |
| **dBm/120kHz Note 5** | **dBm/60kHz Note 5** |
| ±5 | ±8 | ≥0 | ≥48 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±8.5 | ±11.5 | ≥-6 | 48 ≤ BW ≤ 64 | All | Note 3 |
| ±6 | ±9 | BW >64 | All | Note 3 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.NOTE 4: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 5: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 6: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 7: NR operating band groups are as defined in Section 3.5.2. |

##### 10.1.24.2.2 Relative PRS RSRP accuracy

The relative accuracy of PRS-RSRP is defined as accuracy of the difference between two PRS-RSRP measurements.

The relative PRS-RSRP accuracy requirements apply for the cases when PRS-RSRP is measured from PRS resources in the same PRS resource set in FR1 or FR2, and measured with same Rx beam in case of FR2.

The accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.2-1 are valid under the following conditions:

- Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

- UE does not support positioning measurements with reduced number of samples, or LMF does not indicate UE to perform positioning measurements with reduced number of samples

The accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.2-2 are valid under the following conditions:

- Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

- UE does not support positioning measurements with reduced number of samples, or LMF does not indicate UE to perform positioning measurements with reduced number of samples

Table 10.1.24.2.2-1: PRS-RSRP relative accuracy for FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | Io Note 7 range |
| NR operating band groups Note 8 | MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| dB | dB | dB | PRB | - |  | dBm / SCSPRS | dBm/BWChannel |
| dBm/15kHz Note 6 | dBm/30kHz Note 6 | dBm/60kHz Note 6 |
| ±3.5 | ±5.0 | ≥-3dB | ≥24 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| Note 4 |
| Note 4 |
| ±9.5 | ±11.0 | ≥-13dB | 24 ≤ BW ≤ 52 | All | Note 4 |
| ±6.5 | ±8.0 | 52< BW≤ 104 | All | Note 4 |
| ±5.0 | ±6.5 | BW >104 | All | Note 4 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: Void.NOTE 3: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2.  |

Table 10.1.24.2.2-2: PRS-RSRP relative accuracy for FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | Io Note 7 range |
| MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| dB | dB | dB | PRB | - | dBm / SCSPRS | dBm/BWChannel |
| dBm/120kHz Note 6 | dBm/60kHz Note 6 |
| ±5.0 | ±8.0 | ≥-3dB | ≥24 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| Note 4 |
| Note 4 |
| ±10 | ±13 | ≥-13dB | 24 ≤ BW ≤ 64 | All | Note 4 |
| ±7.5 | ±10.5 | BW >64 | All | Note 4 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: Void.NOTE 3: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2.  |

The absolute accuracy requirements for PRS-RSRP measurement for FR1 defined in Table 10.1.24.2.2-3 are valid under the following conditions:

- Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

- UE supports positioning measurements with reduced number of samples, and LMF indicates UE to perform positioning measurements with reduced number of samples

- AWGN channel

The absolute accuracy requirements for PRS-RSRP measurement for FR2 defined in Table 10.1.24.2.2-4 are valid under the following conditions:

- Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

- UE supports positioning measurements with reduced number of samples, and LMF indicates UE to perform positioning measurements with reduced number of samples

- AWGN channel

Table 10.1.24.2.2-3: PRS-RSRP relative accuracy for FR1 with reduced sample number

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **Normal condition** | **Extreme condition** | **PRS Ês/Iot** | **PRS BW** | **Repetition factor** **(** | **Io Note 6 range** |
| **NR operating band groups Note 7** | **MinimumIo Note 1****dBm / SCSPRS** | **MaximumIo** |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| **dBm/15kHz Note 5** | **dBm/30kHz Note 5** | **dBm/60kHz Note 5** |
| ±3.5 | ±5.0 | ≥0 | ≥48 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| ±9.5 | ±11.0 | ≥-6 | 48 ≤ BW ≤ 52 | All | Note 3 |
| ±6.5 | ±8.0 | 52< BW≤ 104 | All | Note 3 |
| ±5.0 | ±6.5 | BW >104 | All | Note 3 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.NOTE 4: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 5: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 6: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 7: NR operating band groups are as defined in Section 3.5.2.  |

Table 10.1.24.2.2-4: PRS-RSRP relative accuracy for FR2 with reduced sample number

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | Io Note 6 range |
| MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| dB | dB | dB | PRB | - | dBm / SCSPRS | dBm/BWChannel |
| dBm/120kHz Note 5 | dBm/60kHz Note 5 |
| ±5.0 | ±8.0 | ≥0 | ≥48 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±10 | ±13 | ≥-6 | 48 ≤ BW ≤ 64 | All | Note 3 |
| ±7.5 | ±10.5 | BW >64 | All | Note 3 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.NOTE 4: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 5: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 6: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2.  |

**END OF CHANGE**

**START OF CHANGE**

#### 10.1.25.2 Measurement Accuracy Requirements

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall not apply, if:

NTA\_offset defined in Table 7.1.2-2 changes during the UE Rx-Tx measurement period or

if the uplink transmission timing changes during the UE Rx-Tx measurement period due to the network-configured Timing Advance.

The UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that:

- The UE transmits SRS within [-160, 160] msec of at least one DL PRS resource of each of the TRPs in the assistance data.

If the uplink transmission timing changes during the UE Rx-Tx measurement period due to the autonomous timing adjustment defined in clause 7.1.2 then:

- UE Rx-Tx measurement accuracy requirements shall apply for a cell, which is also the downlink reference cell (defined in section 7.1.1) for SRS transmission even if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment.

- UE Rx-Tx measurement accuracy requirements shall not apply for a cell, which is not the downlink reference cell (defined in section 7.1.1) for SRS transmission, if the uplink transmission timing changes during the UE Rx-Tx measurement period due to autonomous adjustment.

When a serving cell change occurs during the UE Rx-Tx measurement period, the UE Rx-Tx time difference measurement accuracy requirements in this clause shall apply provided that the serving cell change does not impact SRS configuration for the UE Rx-Tx measurement.

The relative accuracy of UE Rx-Tx measurement in this clause is defined as accuracy of the difference between two UE Rx-Tx measurements.

The accuracy requirements in Table 10.1.25.2-1 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

Table 10.1.25.2-1: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetition Note 3 | NR operating band groupsNote 2 | IoNote 4 range |
| MinimumIoNote 1 | MaximumIo |
| TcNote 5 | dB | RB | kHz |  |  | dBm / SCSPRS | dBm/BW |
| ± 78+δ | -3 | ≥24 | 15 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 |
| NR\_TDD\_FR1\_C | -126 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 |
| NR\_FDD\_FR1\_F | -124.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 |
| NR\_FDD\_FR1\_H | -123.5 |
| ± 59+δ | ≥52 | ≥1 | Note 6 | NOTE 6 | NOTE 6 |
| ± 30+δ | >104 | ≥1 | Note 6 | NOTE 6 | NOTE 6 |
| ± 57+δ |  | ≥24 | 30 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 |
| NR\_TDD\_FR1\_C | -123 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 |
| NR\_FDD\_FR1\_F | -121.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 |
|  | NR\_FDD\_FR1\_H | -120.5 |
| ± 30+δ |  | ≥48 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 15+δ |  | ≥132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 29+δ | ≥24 | 60 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 |
| NR\_TDD\_FR1\_C | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |
| NR\_FDD\_FR1\_F | -118.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 |
| NR\_FDD\_FR1\_H | -117.5 |
| ± 15+δ |  | ≥ 64 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 7+δ |  | ≥ 132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 101+δ | -13 | ≥24 | 15 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 75+δ | ≥52 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 37+δ | >104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 58+δ |  | ≥24 | 30 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 39+δ |  | ≥48 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 16+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 36+δ | ≥24 | 60 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 16+δ |  | ≥ 64 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 8+δ |  | ≥ 132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: NR operating band groups are as defined in Section 3.5.NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34].NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: δ is the margin determined from Table 10.1.25.2-5. |

The accuracy requirements in Table 10.1.25.2-1a for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

Number of measurement samples is less than 4

AWGN propagation condition.

**Table 10.1.25.2-1a: UE Rx-Tx time difference measurement accuracy in FR1 in AWGN with reduced measurement samples**

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetition Note 3** | **NR operating band groupsNote 2** | **IoNote 4 range** |
| **MinimumIoNote 1** | **MaximumIo** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± 59+δ | 0 | ≥52 | 15 | ≥1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| ± 30+δ6 |  | >104 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 30+δ |  | ≥48 | 30 | ≥1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| ± 15+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 15+δ |  | ≥64 | 60 | ≥1 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| ± 7+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 75+δ | -6 | ≥52 | 15 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 37+δ |  | >104 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 39+δ |  | ≥48 | 30 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 16+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 16+δ |  | ≥64 | 60 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 8+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: NR operating band groups are as defined in Section 3.5.NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34].NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: δ is the margin determined from Table 10.1.25.2-5. |

The relative accuracy requirements in Table 10.1.25.2-1b for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

the two UE Rx-Tx time difference measurements are associated with the same RxTx TEG

Table 10.1.25.2-1b: UE Rx-Tx time difference relative measurement accuracy in FR1 in AWGN with TEG reporting

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth****Note 1** | **PRS resource repetition ()****Note 2** | **Io Note 3 range** |
| **NR operating band groups Note 4** | **Minimum Io**  | **Maximum Io** |
| **Tc Note 5** | **dB** | **kHz** | **RB** |  |  | **dBm/SCS** | **dBm/BWChannel** |
| 132 +ΔNote 7 | (PRS Ês/Iot)*j*≥-6dB (PRS Ês/Iot)*i* ≥-13dB | 15 | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -50 |
| 98 +Δ | ≥ 52 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 42 +Δ | ≥ 104 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 75 +Δ | 30  | ≥ 24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 | -50 |
| NR\_TDD\_FR1\_C | -123 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 | -50 |
| NR\_FDD\_FR1\_F | -121.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 | -50 |
| NR\_FDD\_FR1\_H | -120.5 | -50 |
| 48 +Δ | ≥ 48 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 24 +Δ | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 50 +Δ | 60 | ≥24 | ≥ 4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -50 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -50 |
| 24 +Δ | ≥ 64 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| 10 +Δ | ≥ 132 | ≥ 1 | Note 6 | Note 6 | Note 6 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of resource j and resource i.NOTE 2: Minimum number of PRS resource repetitions among resource j and resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.NOTE 3: Io is assumed to have constant EPRE across the bandwidth.NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: Δis the value of the timing error margin for the RxTx TEG, reported via *nr-UE-RxTxTEG-TimingErrorMargin*. Δ cannot be larger than the sum of the margins in table 10.1.25.2-5 (dependent on PRS/SRS BW) for any pair of individual UE Rx-Tx time difference measurements associated with the RxTx TEG. . |

The accuracy requirements in Table 10.1.25.2-2 for FR1 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-1 [18] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

Fading propagation condition.

Table 10.1.25.2-2: UE Rx-Tx time difference measurement accuracy in FR1 in fading

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetition Note 3** | **NR operating band groupsNote 2** | **IoNote 4 range** |
| **MinimumIoNote 1** | **MaximumIo** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  |  | **dBm / SCSPRS** | **dBm/BW** |
| ± 137+δ | -3 | ≥24 | 15 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -127 | -50 |
| NR\_FDD\_FR1\_B | -126.5 |
| NR\_TDD\_FR1\_C | -126 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 |
| NR\_FDD\_FR1\_F | -124.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -124 |
| NR\_FDD\_FR1\_H | -123.5 |
| ± 96+δ | ≥52 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 62+δ | >104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 87+δ |  | ≥24 | 30 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -124 | -50 |
| NR\_FDD\_FR1\_B | -123.5 |
| NR\_TDD\_FR1\_C | -123 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -122.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -122 |
| NR\_FDD\_FR1\_F | -121.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -121 |
|  | NR\_FDD\_FR1\_H | -120.5 |
| ± 68+δ |  | ≥48 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 44+δ |  | ≥132 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 59+δ | ≥24 | 60 | ≥4 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -50 |
| NR\_FDD\_FR1\_B | -120.5 |
| NR\_TDD\_FR1\_C | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 |
| NR\_FDD\_FR1\_F | -118.5 |
| NR\_FDD\_FR1\_G, NR\_TDD\_FR1\_G | -118 |
| NR\_FDD\_FR1\_H | -117.5 |
| ± 42+δ |  | ≥ 64 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 36+δ |  | ≥ 132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 180+δ | -13 | ≥24 | 15 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 98+δ | ≥52 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 68+δ | >104 | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 87+δ |  | ≥24 | 30 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 85+δ |  | ≥48 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 44+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 139+δ | ≥24 | 60 | ≥4 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 46+δ |  | ≥ 64 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| ± 30+δ |  | ≥ 132 |  | ≥1 | NOTE 6 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: NR operating band groups are as defined in Section 3.5.NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34].NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: δ is the margin determined from Table 10.1.25.2-5. |

The accuracy requirements in Table 10.1.25.2-3 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

AWGN propagation condition.

Table 10.1.25.2-3: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetitionNote 3 | IoNote 4 range |
| MinimumIoNote 1 | MaximumIo |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± 22+δ | -3 | ≥24 | 60 | ≥4 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± 15+δ |  | ≥64 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 7+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 12+δ | ≥32 | 120 | ≥14 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± 7+δ |  | ≥64 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 4+δ |  | ≥128 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 35+δ | -13 | ≥24 | 60 | ≥1 | NOTE 6 | NOTE 6 |
| ± 15+δ |  | ≥64 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 7+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 14+δ | ≥32 | 120 | ≥4 | NOTE 6 | NOTE 6 |
| ± 9+δ |  | ≥64 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 4+δ |  | ≥128 |  | ≥1 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: NR operating band groups are as defined in Section 3.5.NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34].NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: δ is the margin determined from Table 10.1.25.2-6. |

The accuracy requirements in Table 10.1.25.2-3a for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band

Number of measurement samples is less than 4

AWGN propagation condition.

Table 10.1.25.2-3a: UE Rx-Tx time difference measurement accuracy in FR2 in AWGN with reduced measurement samples

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **PRS Ês/Iot** | **Minimum PRS bandwidth** | **PRS SCS** | **PRS resource repetitionNote 3** | **IoNote 4 range** |
| **MinimumIoNote 1** | **MaximumIo** |
| **TcNote 5** | **dB** | **RB** | **kHz** |  | **dBm / SCSPRS** | **dBm/BWChannel** |
| ± 15+δ | 0 | ≥64 | 60 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | NOTE 6 |
| ± 7+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 7+δ |  | ≥64 | 120 | ≥1 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | NOTE 6 |
| ± 4+δ |  | ≥128 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 15+δ | -6 | ≥64 | 60 | ≥1 | NOTE 6 | NOTE 6 |
| ± 7+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 9+δ |  | ≥64 | 120 | ≥1 | NOTE 6 | NOTE 6 |
| ± 4+δ |  | ≥128 |  | ≥1 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: NR operating band groups are as defined in Section 3.5.NOTE 3: are configured by higher layer parameter dl-PRS-ResourceRepetitionFactor, *dl-PRS-NumSymbols* and *dl-PRS-CombSizeN* defined in TS 37.355 [34].NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: δ is the margin determined from Table 10.1.25.2-6. |

The relative accuracy requirements in Table 10.1.25.2-3b for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band

AWGN propagation condition.

the two UE Rx-Tx time difference measurements are associated with the same RxTx TEG

Table 10.1.25.2-3b: UE Rx-Tx time difference relative measurement accuracy in FR2 in AWGN with TEG reporting

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **PRS Ês/Iot** | **PRS SCS** | **PRS bandwidth****Note 1** | **PRS resource repetition** **() Note 2** | **Io Note 3 range** |
| **Minimum Io**  | **Maximum Io** |
| **Tc Note 4** | **dB** | **kHz** | **RB** |  | **dBm/SCS** | **dBm/BWChannel** |
| 35 +ΔNote 6 | (PRS Ês/Iot)*j*≥-6dB (PRS Ês/Iot)*i* ≥-13dB | 60 | ≥ 24 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| 24 +Δ | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 11 +Δ | ≥ 132 | ≥ 1 | Note 5 | Note 5 |
| 24+Δ | 120 | ≥ 32 | ≥ 4 | Same value as PRS\_RP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| 13 +Δ | ≥ 64 | ≥ 1 | Note 5 | Note 5 |
| 6 +Δ | ≥ 128 | ≥ 1 | Note 5 | Note 5 |
| NOTE 1: Minimum PRS bandwidth, which is minimum of the PRS bandwidths of resource j and resource i.NOTE 2: Minimum number of PRS resource repetitions among resource j and resource i. are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34], respectively.NOTE 3: Io is assumed to have constant EPRE across the bandwidth.NOTE 4: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 5: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 6: Δis the value of the timing error margin for the RxTx TEG, reported via *nr-UE-RxTxTEG-TimingErrorMargin*. Δ cannot be larger than the sum of the margins in table 10.1.25.2-6 (dependent on PRS/SRS BW) for any pair of individual UE Rx-Tx time difference measurements associated with the RxTx TEG.  |

The accuracy requirements in Table 10.1.25.2-4 for FR2 are valid under the following conditions:

Conditions defined in clause 7.3 of TS 38.101-2 [19] for reference sensitivity are fulfilled.

PRP|dBm according to Annex B.2.14 for a corresponding Band.

Fading propagation condition.

Table 10.1.25.2-4: UE Rx-Tx time difference measurement accuracy in FR2 in fading

|  |  |
| --- | --- |
| Accuracy | Conditions |
| PRS Ês/Iot | Minimum PRS bandwidth | PRS SCS | PRS resource repetitionNote 3 | IoNote 4 range |
| MinimumIoNote 1 | MaximumIo |
| TcNote 5 | dB | RB | kHz |  | dBm / SCSPRS | dBm/BWChannel |
| ± 75+δ | -3 | ≥24 | 60 | ≥4 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± 72+δ |  | ≥64 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 57+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 61+δ | ≥32 | 120 | ≥4 | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| ± 64+δ |  | ≥64 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 55+δ |  | ≥128 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 92+δ | -13 | ≥24 | 60 | ≥4 | NOTE 6 | NOTE 6 |
| ± 70+δ |  | ≥64 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 57+δ |  | ≥132 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 60+δ | ≥32 | 120 | ≥4 | NOTE 6 | NOTE 6 |
| ± 66+δ |  | ≥64 |  | ≥1 | NOTE 6 | NOTE 6 |
| ± 62+δ |  | ≥128 |  | ≥1 | NOTE 6 | NOTE 6 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: NR operating band groups are as defined in Section 3.5.NOTE 3: are configured by higher layer parameter *dl-PRS-ResourceRepetitionFactor, dl-PRS-NumSymbols and dl-PRS-CombSizeN* defined in TS 37.355 [34].NOTE 4: The Io is defined in PRS slots. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same slot.NOTE 5: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 6: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth of the smallest RB number for the corresponding SCS.NOTE 7: δ is the margin determined from Table 10.1.25.2-6. |

Table 10.1.25.2-5: Margin for UE Rx-Tx time difference measurement accuracy in FR1

|  |  |
| --- | --- |
| Min(PRS BW, SRS BW) (RB) | Margin (Tc Note 1) |
| SCS = 15 kHz | SCS = 30 kHz | SCS = 60 kHz |
| ≥ 24 | N/A | N/A | 160 |
| ≥ 52 | ≥ 24 | N/A | 80 |
| ≥ 104 | ≥ 48 | ≥ 24 | 56 |
| N/A | ≥ 132 | ≥ 64 | 24 |
| N/A | N/A | ≥ 132 | 24 |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies. |

Table 10.1.25.2-6: Margin for UE Rx-Tx time difference measurement accuracy in FR2

|  |  |
| --- | --- |
| Min(PRS BW, SRS BW) (MHz) | Margin (Tc Note 1) |
| SCS = 60 kHz | SCS = 120 kHz |
| ≥ 24 | N/A | 76 |
| ≥ 64 | ≥ 32 | 32 |
| ≥ 132 | ≥ 64 | 24 |
| N/A | ≥ 128 | 20 |
| NOTE 1: Tc is the basic timing unit defined in TS 38.211 [6].NOTE 2: If SRS and PRS have different SCS, the margin corresponding to the smallest RS BW in MHz applies. |

**END OF CHANGE**

**START OF CHANGE**

#### 10.1.38.2 Measurement Accuracy Requirements

##### 10.1.38.2.1 Absolute PRS RSRPP accuracy

The absolute accuracy requirements for PRS-RSRPP measurement for FR1 defined in Table 10.1.38.2.1-1 and Table 10.1.38.2.1-3 are valid under the following conditions:

- Conditions defined in 38.101-1 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

The absolute accuracy requirements for PRS-RSRPP measurement for FR2 defined in Table 10.1.38.2.1-2 and Table 10.1.38.2.1-4 are valid under the following conditions:

- Conditions defined in 38.101-2 Clause 7.3 for reference sensitivity are fulfilled.

- PRP 1,2|dBm according to Annex B.2.14 for a corresponding Band

The absolute accuracy requirements for PRS-RSRPP measurement defined in Table 10.1.38.2.1-1 and Table 10.1.38.2.1-2 apply for the UE not supporting *supportedDL-PRS-ProcessingSamples* [34] or LMF does not indicate UE to perform positioning measurements with reduced number of samples.

The absolute accuracy requirements for PRS-RSRPP measurement defined in Table 10.1.38.2.1-3 and Table 10.1.38.2.1-4 apply for the UE supporting *supportedDL-PRS-ProcessingSamples* [34].

Note: The requriements in this clause are derived based on two-tap channel defined in 38.101-4 Annex B.2.4 (a = 1, τd=0.45 µs and fD=5 Hz).

Note: The requirements in this clause are derived based on the difference between the estimated PRS-RSRPP compared to the ideal PRS-RSRPP defined as

Where:

 is the effective channel frequency response (over REs occupied by PRS) measured without receiver noise.

 is the exact delay of the p-th path in the channel model.

Table 10.1.38.2.1-1: PRS-RSRPP absolute accuracy for FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| **Normal condition** | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | **Io Note 7 range** |
| NR operating band groups Note 8 | MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| **dB** | **dB** | **dB** | **PRB** | **-** |  | dBm / SCSPRS | dBm/BWChannel |
| dBm/15kHz Note 6 | dBm/30kHz Note 6 | dBm/60kHz Note 6 |
| ±4.1 | ±8.6 | ≥-3 | ≥24 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| Note 4 |
| Note 4 |
| ±5.8 | ±10.3 | ≥-13 | 24 ≤ BW ≤ 52 | All | Note 4 |
| ±4.9 | ±9.4 | BW > 52 | All | Note 4 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: Void.NOTE 3: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2. |

Table 10.1.38.2.1-2: PRS-RSRPP absolute accuracy for FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | Io Note 7 range |
| MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| dB | dB | dB | PRB | - | dBm / SCSPRS | dBm/BWChannel |
| dBm/120kHz Note 6 | dBm/60kHz Note 6 |
| ±6.0 | ±9.0 | ≥-3 | ≥24 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| Note 4 |
| Note 4 |
| ±7.3 | ±10.3 | ≥-13 | 24 ≤ BW ≤ 64 | All | Note 4 |
| ±6.2 | ±9.2 | BW >64 | All | Note 4 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: Void.NOTE 3: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 24 RB.NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2. |

Table 10.1.38.2.1-3: PRS-RSRPP absolute accuracy for FR1 for reduced number of samples

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | Io Note 7 range |
| NR operating band groups Note 8 | MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| dB | dB | dB | PRB | - |  | dBm / SCSPRS | dBm/BWChannel |
| dBm/15kHz Note 6 | dBm/30kHz Note 6 | dBm/60kHz Note 6 |
| ±3.9 | ±8.4 | ≥0 | ≥48 | All | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | -50 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 | -50 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 | -50 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 | -50 |
| NR\_FDD\_FR1\_G | -124 | -121 | -118 | -50 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 | -50 |
| Note 4 |
| Note 4 |
| ±4.2 | ±8.7 | ≥-6 | 48 ≤ BW ≤ 52 | All | Note 4 |
| ±4.1 | ±8.6 | BW >52 | All | Note 4 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: Void.NOTE 3: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2. |

Table 10.1.38.2.1-4: PRS-RSRPP absolute accuracy for FR2 for reduced number of samples

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| Normal condition | Extreme condition | PRS Ês/Iot | PRS BW | Repetition factor ( | Io Note 7 range |
| MinimumIo Note 1dBm / SCSPRS | MaximumIo |
| dB | dB | dB | PRB | - | dBm / SCSPRS | dBm/BWChannel |
| dBm/120kHz Note 6 | dBm/60kHz Note 6 |
| ±5.9 | ±8.9 | ≥0 | ≥48 | All | Same value as PRP in Table B.2.14-2, according to UE Power class, operating band and angle of arrival | -50 |
| Note 4 |
| Note 4 |
| ±5.6 | ±8.6 | ≥-6 | 48 ≤ BW ≤ 64 | All | Note 4 |
| ±5.4 | ±8.4 | BW >64 | All | Note 4 |
| NOTE 1: This minimum Io condition is expressed as the average Io per RE over all REs in an OFDM symbol.NOTE 2: Void.NOTE 3: PRS bandwidth is as indicated in *dl-PRS-ResourceBandwidth* in the DL-TDOA or DL-AoD or multi-RTT assistance data defined in [34].NOTE 4: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding requirement with the PRS bandwidth ≥ 48 RB.NOTE 5: The serving cell, the reference cell, and the measured neighbour cell i are on the same carrier frequency.NOTE 6: The condition level is increased by ∆>0, when applicable, as described in Sections B.3.2 and B.3.3.NOTE 7: The Io is defined in PRS positioning subframes. The same Io range applies to PRS and non-PRS symbols. Io levels are different in PRS and non-PRS symbols within the same subframe.NOTE 8: NR operating band groups are as defined in Section 3.5.2. |

**END OF CHANGE**