**3GPP TSG-RAN4 Meeting #98-e** ***R4-2101291***

**Electronic meeting, Jan. 25 – Feb. 5, 2021**

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| --- |
| *CR-Form-v12.1* |
| **CHANGE REQUEST** |
|  |
|  | **38.133** | **CR** | **1587** | **rev** | **-** | **Current version:** | **16.6.0** |  |
|  |
| *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:***  | Big CR: Introduction of Rel-16 CSI-RS based L3 measurement RRM performance requirements |
|  |  |
| ***Source to WG:*** | CATT |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | NR\_CSIRS\_L3meas-Perf |  | ***Date:*** | 2021-02-08 |
|  |  |  |  |  |
| ***Category:*** | B |  | ***Release:*** | Rel-16 |
|  | *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-15 (Release 15)Rel-16 (Release 16)Rel-17 (Release 17)Rel-18 (Release 18)* |
|  |  |
| ***Reason for change:*** | The performance requirements for CSI-RS based L3 measurement need to be specified. It is a draft big CR to merge the endorsed CRs/draftCRs in RAN4#97e meeting and RAN4#98e meeting.  |
|  |  |
| ***Summary of change:*** | Introduce the performance requirements for CSI-RS based L3 measurement based on the endorsed CRs/draftCRs (R4-2015213, R4-2103636, R4-2103637, R4-2103638) with some editorial changes.  |
|  |  |
| ***Consequences if not approved:*** | The performance requirements for CSI-RS based L3 measurement are missing.  |
|  |  |
| ***Clauses affected:*** | 10.1.2.3, 10.1.3.3, 10.1.4.3, 10.1.5.3, 10.1.6, 10.1.7.2, 10.1.8.2, 10.1.9.2, 10.1.10.2, 10.1.11.2, 10.1.12.2, 10.1.13.2, 10.1.14.2, 10.1.15.2, 10.1.16, B.2.1.4, B.2.1.5, B.2.8, B.2.9 |
|  |  |
|  | **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 1>

#### 10.1.2.3 Intra-frequency CSI-RSRP accuracy requirements

##### 10.1.2.3.1 Absolute CSI-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the same center frequency as the CSI-RS resources indicated for measurement in the serving cell in FR1.

The accuracy requirements in Table 10.1.2.3.1-1 are valid under the following conditions:

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

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant CSI-RS to be measured.

- The bandwidth of CSI-RS resource is 48PRB when density is 3.

- The timing error between the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility* and the timing of the serving cell is within [TBD].

 Table 10.1.2.3.1-1: CSI-RSRP Intra frequency absolute accuracy in FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range |
| NR operating band groups Note 2 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | dBm/BWChannel | dBm/BWChannel |
| SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |
| ±4.5 | ±9 | ≥-6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -70 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -70 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -70 |
| NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -70 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A,NR\_FDD\_FR1\_B, NR\_TDD\_FR1\_C, NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D, NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E, NR\_FDD\_FR1\_F,NR\_FDD\_FR1\_G, NR\_FDD\_FR1\_H | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. |

##### 10.1.2.3.2 Relative CSI-RSRP Accuracy

The relative accuracy of CSI-RSRP is defined as the CSI-RSRP measured from one cell compared to the CSI-RSRP measured from another cell on the same center frequency, or between any two CSI-RSRP levels measured on the same cell in FR1.

The accuracy requirements in Table 10.1.2.3.2-1 are valid under the following conditions:

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

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant CSI-RS to be measured.

- The bandwidth of CSI-RS resource is 48PRB when density is 3.

- The timing error between the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility* and the timing of the serving cell is within [TBD].

Table 10.1.2.3.2-1: CSI-RSRP Intra frequency relative accuracy in FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 2 | Io Note 1 range |
| NR operating band groups Note 4 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | dBm/BWChannel | dBm/BWChannel |
| SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
| ±2 | ±3 | ≥-3 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
| NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
| NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
| NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| ±3 | ±3 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | N/A | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2. |

## <End of Change 1>

## <Start of Change 2>

#### 10.1.3.3 Intra-frequency CSI-RSRP accuracy requirements

##### 10.1.3.3.1 Absolute CSI-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the same center frequency as the CSI-RS resources indicated for measurement in the serving cell in FR2.

The accuracy requirements in Table 10.1.3.3.1-1 are valid under the following conditions:

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

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB(s).

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant CSI-RS to be measured.

- The bandwidth of CSI-RS resource is 48PRB when density is 3.

- The timing error between the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility* and the timing of the serving cell is within [TBD].

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.3.3.1-1: CSI-RSRP Intra frequency absolute accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
| Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel | dBm/BWChannel |
| SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |
| ±6 | ±9 | ≥-6 | Same value as CSI-RS\_RP in Table B.2.8-2, according to UE Power class, operating band and angle of arrival | N/A | -70 |
| ±8 | ±11 | N/A | -70 | -50 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. |

##### 10.1.3.3.2 Relative CSI-RSRP Accuracy

The relative accuracy of CSI-RSRP is defined as the CSI-RSRP measured from one cell compared to the CSI-RSRP measured from another cell on the same center frequency, or between any two CSI-RSRP levels measured on the same cell in FR2.

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

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each associated SSB(s).

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each CSI-RS to be measured.

- The bandwidth of CSI-RS resource is 48PRB when density is 3.

- The timing error between the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility* and the timing of the serving cell is within [TBD].

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.3.3.2-1: CSI-RSRP Intra frequency relative accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
| Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCS CSI-RS Note 1 | dBm/BWChannel |
| SCS CSI-RS = 60kHz | SCS CSI-RS = 120kHz |
| ±6 | ±9 | ≥-6 | Same value as CSI-RS\_RP in Table B.2.8-2, according to UE Power class, operating band and angle of arrival | -50 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.Note 4: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies. |

## <End of Change 2>

## <Start of Change 3>

#### 10.1.4.3 Inter-frequency CSI-RSRP accuracy requirements

##### 10.1.4.3.1 Absolute Accuracy of CSI-RSRP in FR1

The requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell where the CSI-RS resources to be measured have the different center frequency as the CSI-RS resources indicated for measurement in the serving cell in FR1.

The accuracy requirements in Table 10.1.4.3.1-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS to be measured.

- The bandwidth of CSI-RS resource is 48PRB when density is 3.

- The timing error between the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility* and the timing used to measure CSI-RS is within [TBD].

Table 10.1.4.3.1-1: CSI-RSRP Inter frequency Absolute accuracy in FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range |
|  |  |  | NR operating band groups Note 2 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -70 |
| ±4.5 | ±9 | ≥-6 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -70 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±8 | ±11 | ≥-6 | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A,NR\_FDD\_FR1\_B, NR\_TDD\_FR1\_C, NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D, NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E, NR\_FDD\_FR1\_F,NR\_FDD\_FR1\_G, NR\_FDD\_FR1\_H | N/A | N/A | N/A | -70 | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: NR operating band groups in FR1 are as defined in clause 3.5.2. |

##### 10.1.4.3.2 Relative Accuracy of CS-RSRP in FR1

The relative accuracy of CSI-RSRP in inter frequency case is defined as the CSI-RSRP measured from one cell on a frequency in FR1compared to the CSI-RSRP measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.4.3.2-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS to be measured.

- The bandwidth of CSI-RS resource is 48PRB when density is 3.

- The timing error between the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility* and the timing used to measure CSI-RS is within [TBD].

- |CSI\_RP1dBm - CSI\_RP2dBm| ≤ 27 dB

- | Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

Table 10.1.4.3.2-1: CSI-RSRP Inter frequency relative accuracy in FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot Note 2 | Io Note 1 range |
|  |  |  | NR operating band groups Note 4 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| ±4.5 | ±6 | ≥-6 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of CSI-RS resources to which the requirement applies.NOTE 3: VoidNOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2. |

## <End of Change 3>

## <Start of Change 4>

#### 10.1.5.3 Inter-frequency CSI-RSRP accuracy requirements

##### 10.1.5.3.1 Absolute CSI-RSRP Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRP in this clause apply to a cell on a frequency in FR2 where the CSI-RS resources to be measured have the different center frequency as the CSI-RS resources indicated for measurement in the serving cell.

The accuracy requirements in Table 10.1.5.3.1-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant associated SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS to be measured.

- The bandwidth of CSI-RS resource is 48PRB when density is 3.

- The timing error between the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility* and the timing used to measure CSI-RS is within [TBD].

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

**Table 10.1.5.3.1-1: CSI-RSRP Inter frequency absolute accuracy in FR2**

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
|  |  |  | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |  |
| ±6 | ±9 | ≥-4 | Same value as CSI\_RP in Table B.2.9-2, according to UE Power class, operating band and angle of arrival | N/A | -70 |
| ±8 | ±11 |  | N/A | -70 | -50 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. |

##### 10.1.5.3.2 Relative CSI-RSRP Accuracy

The relative accuracy of CSI-RSRP in inter frequency case is defined as the CSI-RSRP measured from one cell on a frequency in FR2 compared to the CSI-RSRP measured from another cell on another frequency in FR2.

The accuracy requirements in Table 10.1.5.3.2-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for each relevant associated SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS to be measured.

- The bandwidth of CSI-RS resource is 48PRB when density is 3.

- The timing error between the timing of the cell indicated by the *cellId* in the *CSI-RS-CellMobility* and the timing used to measure CSI-RS is within [TBD].

- |CSI\_RP1dBm - CSI\_RP2dBm| ≤ 27dB

- | Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.5.3.2-1: CSI-RSRP Inter frequency relative accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
|  |  |  | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |
| ±6 | ±9 | ≥-4 | Same value as CSI\_RP in Table B.2.9-2, according to UE Power class, operating band and angle of arrival | -50 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.Note 4: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies. |

## <End of Change 4>

## <Start of Change 5>

### 10.1.6 RSRP Measurement Report Mapping

The reporting range of SS-RSRP and CSI-RSRP for L3 reporting is defined from -156 dBm to -31 dBm with 1 dB resolution. The reporting range of SS-RSRP and CSI-RSRP for L1 reporting is defined from -140 to -44 dBm with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.1.6.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

The reporting range of differential SS-RSRP and CSI-RSRP for L1 reporting is defined from 0 dB to -30 dB with 2 dB resolution.

The mapping of measured quantity is defined in Table 10.1.6.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

## <End of Change 5>

## <Start of Change 6>

#### 10.1.7.2 Intra-frequency CSI-RSRQ accuracy requirements

##### 10.1.7.2.1 Absolute CSI-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the intra-frequency measurement defined in 9.10.2.1 in FR1.

The accuracy requirements in Table 10.1.7.2.1-1 are valid under the following conditions:

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

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for associated SSB.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant CSI-RS.

- The configuration of CSI-RS resource is {D=3 with PRB≥48}.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is smaller or equal to [TBD].

**Table 10.1.7.2.1-1: CSI-RSRQ Intra frequency absolute accuracy in FR1**

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range |
|  |  |  | NR operating band groups Note 3 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| ±2.5 | ±4 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2. |

## <End of Change 6>

## <Start of Change 7>

#### 10.1.8.2 Intra-frequency CSI-RSRQ accuracy requirements

##### 10.1.8.2.1 Absolute CSI-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the intra-frequency measurement defined in 9.10.2.1 in FR2.

The accuracy requirements in Table 10.1.8.2.1-1 are valid under the following conditions:

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

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.2 for a corresponding Band for each relevant SSB.

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band for each relevant CSI-RS.

- The configuration of CSI-RS resource is {D=3 with PRB≥48}.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is smaller or equal to [TBD].

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

Table 10.1.8.2.1-1: CSI-RSRQ Intra frequency absolute accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
|  |  |  | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |
| ±2.5 | ±4 | ≥-3 | Same value as CSI\_RP in Table B.2.8-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±3.5 | ±4 | ≥-6 |  |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. |

## <End of Change 7>

## <Start of Change 8>

#### 10.1.9.2 Inter-frequency CSI-RSRQ accuracy requirements

##### 10.1.9.2.1 Absolute CSI-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply to the inter-frequency measurement defined in 9.10.3.1 in FR1.

The accuracy requirements in Table 10.1.9.2.1-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for associated SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS.

- The configuration of CSI-RS resource is {D=3 with PRB≥48}.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is smaller or equal to [TBD].

Table 10.1.9.2.1-1: CSI-RSRQ Inter frequency absolute accuracy in FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range |
|  |  |  | NR operating band groups Note 3 | Minimum Io | Maximum Io |
| dB | dB | dB |  | dBm / SCSCSI-RS | dBm/BWChannel | dBm/BWChannel |
|  |  |  |  | SCSCSI-RS = 15 kHz | **SCSCSI-RS = 30 kHz** | **SCSCSI-RS = 60 kHz** |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| ±2.5 | ±4 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2. |

##### 10.1.9.2.2 Relative CSI-RSRQ Accuracy

The relative accuracy of CSI-RSRQ is defined as the CSI-RSRQ measured from one cell compared to the CSI-RSRQ measured from another cell with the same center frequency, or between any two CSI-RSRQ levels measured on the same cell in FR1.

The accuracy requirements in Table 10.1.9.2.2-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for the associated SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS.

- The configuration of CSI-RS resource is {D=3 with PRB≥48}.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is smaller or equal to [TBD].

Table 10.1.9.2.2-1: CSI-RSRQ Inter frequency relative accuracy in FR1

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 1 range |
|  |  | Note 2 | NR operating band groups Note 4 | Minimum Io | Maximum Io |
| **dB** | **dB** | **dB** |  | **dBm / SCSCSI-RS** | **dBm/BWChannel** | **dBm/BWChannel** |
|  |  |  |  | **SCSCSI-RS = 15 kHz** | **SCSCSI-RS = 30 kHz** | **SCSCSI-RS = 60 kHz** |  |  |
|  |  |  | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -50 |
|  |  |  | NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -50 |
| ±3 | ±4 | ≥-3 | NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -50 |
|  |  |  | NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -50 |
| ±4 | ±4 | ≥-6 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 | Note 3 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.NOTE 3: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2. |

## <End of Change 8>

## <Start of Change 9>

#### 10.1.10.2 Inter-frequency CSI-RSRQ accuracy requirements

##### 10.1.10.2.1 Absolute CSI-RSRQ Accuracy

Unless otherwise specified, the requirements for absolute accuracy of CSI-RSRQ in this clause apply the inter-frequency measurement defined in 9.10.3.1 in FR2.

The accuracy requirements in Table 10.1.10.2.1-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for associated SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS.

- The configuration of CSI-RS resource is {D=3 with PRB≥48}.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is smaller or equal to [TBD].

Table 10.1.10.2.1-1: CSI-RSRQ Inter frequency absolute accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
|  |  |  | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |
| ±2.5 | ±4 | ≥-3 | Same value as CSI\_RP in Table B.2.9-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±3.5 | ±4 | ≥-4 |  |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. |

##### 10.1.10.2.2 Relative CSI-RSRQ Accuracy

The relative accuracy of CSI-RSRQ is defined as the CSI-RSRQ measured from one cell compared to the CSI-RSRQ measured from another cell with the same center frequency, or between any two CSI-RSRQ levels measured on the same cell in FR2.

The accuracy requirements in Table 10.1.10.2.2-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.3 for a corresponding Band for the associated SSB.

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band for each relevant CSI-RS.

- The configuration of CSI-RS resource is {D=3 with PRB≥48}.

- The timing offset between the reference measurement timing and the target CSI-RS in one layer is smaller or equal to [TBD].

Table 10.1.10.2.2-1: CSI-RSRQ Inter frequency relative accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
|  |  |  | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |
| ±3 | ±4 | ≥-3 | Same value as CSI\_RP in Table B.2.9-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±4 | ±4 | ≥-4 |  |  |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.Note 4: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table. |

## <End of Change 9>

## <Start of Change 10>

### 10.1.11 RSRQ report mapping

10.1.11.2 CSI-RSRQ measurement report mapping

The reporting range of CSI-RSRQ is defined from -43 dB to 20 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 10.1.11.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.11.1-2: CSI-RSRQ measurement report mapping

|  |  |  |
| --- | --- | --- |
| Reported value | Measured quantity value | Unit |
| CSI-RSRQ\_0 | CSI-RSRQ<-43 | dB |
| CSI-RSRQ\_1 | -43≤ CSI-RSRQ<-42.5 | dB |
| CSI-RSRQ\_2 | -42.5≤ CSI-RSRQ<-42 | dB |
| CSI-RSRQ\_3 | -42≤ CSI-RSRQ<-41.5 | dB |
| CSI-RSRQ\_4 | -41.5≤ CSI-RSRQ<-41 | dB |
| .. | .. | … |
| CSI-RSRQ\_122 | 17.5≤ CSI-RSRQ<18 | dB |
| CSI-RSRQ\_123 | 18≤ CSI-RSRQ<18.5 | dB |
| CSI-RSRQ\_124 | 18.5≤ CSI-RSRQ<19 | dB |
| CSI-RSRQ\_125 | 19≤ CSI-RSRQ<19.5 | dB |
| CSI-RSRQ\_126 | 19.5≤ CSI-RSRQ<20 | dB |
| CSI-RSRQ\_127 | 20 ≤ CSI-RSRQ | dB |

## <End of Change 10>

## <Start of Change 11>

10.1.12.2 Intra-frequency CSI-SINR accuracy requirements in FR1

10.1.12.2.1 Absolute CSI-SINR Accuracy in FR1

Unless otherwise specified, the requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR1.

The accuracy requirements in Table 10.1.12.2.1-1 are valid under the following conditions:

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

- Conditions for intra-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band.

- The time difference between the reference measurement timing and the target CSI-RS in one layer is no larger than TBD

- The bandwidth of the CSI-RS resource is no less than 48 PRBs

- The resource density of the CSI-RS resource in frequency domain D=3

Table 10.1.12.2.1-1: CSI-SINR Intra frequency absolute accuracy in FR1

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot** | **Io Note 1 range** |
| **NR operating band groups** | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCS** | **dBm/BW Channel** | **dBm/BW Channel** |
| **SCS (kHz)** |
| ±3 | ±4 | ≥-3 | **15**  | **30** | **60** |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -70 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -70 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -70 |
| NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -70 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2. NOTE 4: The requirements apply for CSI-RS Ês/Iot ≤ [TBD] dB. |

## <End of Change 11>

## <Start of Change 12>

10.1.13.2 Intra-frequency CSI-SINR accuracy requirements in FR2

10.1.13.2.1 Absolute CSI-SINR Accuracy in FR2

Unless otherwise specified, the requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on the same frequency as that of the serving cell in FR2.

The accuracy requirements in Table 10.1.13.2.1-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.8 for a corresponding Band.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- The time difference between the reference measurement timing and the target CSI-RS in one layer is no larger than TBD

- The bandwidth of the CSI-RS resource is no less than 48 PRBs

- The resource density of the CSI-RS resource in frequency domain D=3

Table 10.1.13.2.1-1: CSI-SINR Intra frequency absolute accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
|  |  |  | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |
| ±3 | ±4 | ≥-3 | Same value as CSI\_RP in Table B.2.8-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±3.5 | ±4 | ≥-6 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.Note 4: The requirements apply for CSI-RS Ês/Iot ≤ [TBD] dB. |

## <End of Change 12>

## <Start of Change 13>

10.1.14.2 Inter-frequency CSI-SINR accuracy requirements in FR1

10.1.14.2.1 Aboslute Accuracy of CSI-SINR in FR1

The requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on a frequency in FR1 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.14.2.1-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band.

- The time difference between the reference measurement timing and the target CSI-RS in one layer is no larger than TBD

- The bandwidth of the CSI-RS resource is no less than 48 PRBs

- The resource density of the CSI-RS resource in frequency domain D=3

Table 10.1.14.2.1-1: CSI-SINR Inter frequency absolute accuracy in FR1

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot** | **Io Note 1 range** |
| **NR operating band groups** | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCS** | **dBm/BW Channel** | **dBm/BW Channel** |
| **SCS (kHz)** |
| ±3 | ±4 | ≥-3 | **15**  | **30** | **60** |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -70 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -70 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -70 |
| NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -70 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±3.5 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.NOTE 3: NR operating band groups in FR1 are as defined in clause 3.5.2.NOTE 4: The requirements apply for CSI-RS Ês/Iot ≤ [TBD] dB. |

10.1.14.2.2 Relative Accuracy of CSI-SINR in FR1

The relative accuracy of CSI-SINR in inter frequency case is defined as the CSI-SINR measured from one cell on a frequency in FR1 compared to the CSI-SINR measured from another cell on a different frequency in FR1.

The accuracy requirements in Table 10.1.14.2.2-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band.

- |CSI\_RP1dBm - CSI\_RP2dBm| ≤ 27 dB

- | Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

- The time difference between the reference measurement timing and the target CSI-RS in one layer is no larger than TBD

- The bandwidth of the CSI-RS resource is no less than 48 PRBs

- The resource density of the CSI-RS resource in frequency domain D=3

Table 10.1.14.2.2-1: CSI-SINR Inter frequency relative accuracy in FR1

|  |  |
| --- | --- |
| **Accuracy** | **Conditions** |
| **Normal condition** | **Extreme condition** | **CSI-RS Ês/Iot****Note 3** | **Io Note 1 range** |
| **NR operating band groups** | **Minimum Io** | **Maximum Io** |
| **dB** | **dB** | **dB** |  | **dBm / SCS** | **dBm/BW Channel** | **dBm/BW Channel** |
| **SCS (kHz)** |
| ±3.5 | ±4 | ≥-3 | **15**  | **30** | **60** |
| NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A,NR\_SDL\_FR1\_A | -121 | -118 | -115 | N/A | -70 |
| NR\_FDD\_FR1\_B | -120.5 | -117.5 | -114.5 | N/A | -70 |
| NR\_TDD\_FR1\_C | -120 | -117 | -114 | N/A | -70 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -119.5 | -116.5 | -113.5 | N/A | -70 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -119 | -116 | -113 | N/A | -70 |
| NR\_FDD\_FR1\_F | -118.5 | -115.5 | -112.5 | N/A | -70 |
| NR\_FDD\_FR1\_G | -118 | -115 | -112 | N/A | -70 |
| NR\_FDD\_FR1\_H | -117.5 | -114.5 | -111.5 | N/A | -70 |
| ±4 | ±4 | ≥-6 | Note 2 | Note 2 | Note 2 | Note 2 | N/A | Note 2 |
| NOTE 1: Io is assumed to have constant EPRE across the bandwidth.NOTE 2: The same bands and the same Io conditions for each band apply for this requirement as for the corresponding highest accuracy requirement.NOTE 3: The parameter CSI-RS Ês/Iot is the minimum CSI-RS Ês/Iot of the pair of cells to which the requirement applies.NOTE 4: NR operating band groups in FR1 are as defined in clause 3.5.2.NOTE 5: The requirements apply for CSI-RS Ês/Iot ≤ [TBD] dB. |

## <End of Change 13>

## <Start of Change 14>

10.1.15.2 Inter-frequency CSI-SINR accuracy requirements in FR2

10.1.15.2.1 Aboslute Accuracy of CSI-SINR in FR2

The requirements for absolute accuracy of CSI-SINR in this clause apply to a cell on a frequency in FR2 that has different carrier frequency from the serving cell.

The accuracy requirements in Table 10.1.15.2.1-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.9 for a corresponding Band.

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- The time difference between the reference measurement timing and the target CSI-RS in one layer is no larger than TBD

- The bandwidth of the CSI-RS resource is no less than 48 PRBs

- The resource density of the CSI-RS resource in frequency domain D=3

Table 10.1.15.2.1-1: CSI-SINR Inter frequency absolute accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
|  |  |  | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |
| ±3 | ±4 | ≥-3 | Same value as CSI\_RP in Table B.2.9-2, according to UE Power class, operating band and angle of arrival | -50 |
| 3.5 | ±4 | ≥-4 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.Note 4: The requirements apply for CSI-RS Ês/Iot ≤ [TBD] dB. |

10.1.15.2.2 Relative Accuracy of CSI-SINR in FR2

The relative accuracy of CSI-SINR in inter frequency case is defined as the CSI-SINR measured from one cell on a frequency in FR2 compared to the CSI-SINR measured from another cell on a different frequency in FR2.

The accuracy requirements in Table 10.1.15.2.2-1 are valid under the following conditions:

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

- Conditions for inter-frequency measurements are fulfilled according to Annex B.2.y for a corresponding Band.

- |CSI\_RP1dBm - CSI\_RP2dBm| ≤ 27 dB

- | Channel 1\_Io ‑Channel 2\_Io | ≤ 20 dB

- The measured signals are in the directions covered by the percentile EIS spherical coverage of the UE, defined in clause 7.3.4 of TS 38.101-2 [19].

- The time difference between the reference measurement timing and the target CSI-RS in one layer is no larger than TBD

- The bandwidth of the CSI-RS resource is no less than 48 PRBs

- The resource density of the CSI-RS resource in frequency domain D=3

Table 10.1.15.2.2-1: CSI-SINR Inter frequency relative accuracy in FR2

|  |  |
| --- | --- |
| Accuracy | Conditions |
| Normal condition | Extreme condition | CSI-RS Ês/Iot | Io Note 2 range |
|  |  |  | Minimum Io | Maximum Io |
| dB | dB | dB | dBm / SCSCSI-RS Note 1 | dBm/BWChannel |
|  |  |  | SCSCSI-RS = 60kHz | SCSCSI-RS = 120kHz |  |
| ±3.5 | ±4 | ≥-3 | Same value as CSI\_RP in Table B.2.9-2, according to UE Power class, operating band and angle of arrival | -50 |
| ±4 | ±4 | ≥-6 |
| Note 1: Values based on Refsens and EIS spherical coverage as defined in clauses 7.3.2 and 7.3.4 of TS 38.101-2 [19]. Applicable side condition selected depending on angle of arrival.Note 2: Io specified at the Reference point, and assumed to have constant EPRE across the bandwidth.Note 3: In the test cases, the CSI-RS Ês/Iot and related parameters may need to be adjusted to ensure Ês/Iot at UE baseband is above the value defined in this table.Note 4: The requirements apply for CSI-RS Ês/Iot ≤ [TBD] dB. |

## <End of Change 14>

## <Start of Change 15>

### 10.1.16 SINR report mapping

10.1.16.1 SS-SINR and CSI-SINR measurement report mapping

The reporting range of SS-SINR and CSI-SINR for L3 reporting is defined from -23 dB to 40 dB with 0.5 dB resolution. The mapping of measured quantity is defined in Table 10.1.16.1-1. The range in the signalling may be larger than the guaranteed accuracy range.

The reporting range of differential SS-SINR and CSI-SINR for L1 reporting is defined from -15 dB to 0 dB with 1 dB resolution.

The mapping of measured quantity is defined in Table 10.1.16.1-2. The range in the signalling may be larger than the guaranteed accuracy range.

Table 10.1.16.1-1: SS-SINR and CSI-SINR measurement report mapping

|  |  |  |  |
| --- | --- | --- | --- |
| Reported value | Measured quantity value (L3 SS-SINR and L3 CSI-SINR) | Measured quantity value (L1 SS-SINR and L1 CSI-SINR) | Unit |
| SINR\_0 | SINR<-23 | SINR<-23 | dB |
| SINR\_1 | -23≤SINR<-22.5 | -23≤SINR<-22.5 | dB |
| SINR\_2 | -22.5≤SINR<-22 | -22.5≤SINR<-22 | dB |
| SINR\_3 | -22≤SINR<-21.5 | -22≤SINR<-21.5 | dB |
| SINR\_4 | -21.5≤SINR<-21 | -21.5≤SINR<-21 | dB |
| .. | .. | .. | … |
| SINR\_123 | 38≤SINR<38.5 | 38≤SINR<38.5 | dB |
| SINR\_124 | 38.5≤SINR<39 | 38.5≤SINR<39 | dB |
| SINR\_125 | 39≤SINR<39.5 | 39≤SINR<39.5 | dB |
| SINR\_126 | 39.5≤SINR<40 | 39.5≤SINR<40 | dB |
| SINR\_127 | 40≤SINR | 40≤SINR | dB |

## <End of Change 15>

## <Start of Change 16>

### B.2.1.4 Gain to SS-RSRP and CSI-RSRP measurement point for FR1

In FR1 conducted requirements are specified at the UE antenna connector, which is also the SS-RSRP and CSI-RSRP measurement point.

### B.2.1.5 Gain to SS-RSRP and CSI-RSRP measurement point for FR2

#### B.2.1.5.1 Gain to SS-RSRP and CSI-RSRP measurement point for Rx Beam Peak angle of arrival

In clause 5.1.1 of TS 38.215 [4] SS-RSRP and CSI-RSRP is defined to be measured based on the combined signal from antenna elements corresponding to a given receiver branch. The reference point for requirement parameters from the UE perspective is the input of the UE antenna array. The gain “G” relates the combined signal from antenna elements corresponding to a given receiver branch to the reference point for requirement parameters.

The gain “G” affects absolute signal level values reported by the UE.



**Figure B.2.1.5.1-1: Gain and Reference point for requirement parameters**

The gain range for each power class is specified in Table B.2.1.5.1-1.

Table B.2.1.5.1-1: UE gain G, Rx beam peak direction

|  |  |
| --- | --- |
|  | UE Power class |
|  | 1 | 2 | 3 | 4 |
| Minimum, dBi | FFS | FFS | -10 | FFS |
| Maximum, dBi | FFS | FFS | +20 | FFS |

Gain range in spherical coverage directions may be lower than in Rx beam peak direction, according to the difference between the EIS spherical coverage value specified in TS 38.101-2 [19] clause 7.3.4 and the Reference sensitivity level specified in TS 38.101-2 [19] clause 7.3.2.

## <End of Change 16>

## <Start of Change 17>

## B.2.8 Conditions for NR CSI-RS based intra-frequency measurements

This clause defines the following conditions for NR CSI-RS based intra-frequency measurements and corresponding procedures performed based on CSI-RS: CSI\_RP and CSI-RS Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.8-1 for FR1 NR cells.

The conditions are defined in Table B.2.8-2 for FR2 NR cells.

Table B.2.8-1: Conditions for CSI-RS based intra-frequency measurements in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | NR operating band groups Note1 | Minimum CSI\_RP | CSI-RS Ês/Iot |
| dBm / SCSCSI-RS | dB |
| SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |
| Conditions | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -127 | -124 | -121 | ≥ -6 |
| NR\_FDD\_FR1\_B | -126.5 | -123.5 | -120.5 |
| NR\_TDD\_FR1\_C | -126 | -123 | -120 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -125.5 | -122.5 | -119.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -125 | -122 | -119 |
| NR\_FDD\_FR1\_F | -124.5 | -121.5 | -118.5 |
| NR\_FDD\_FR1\_G | -124 | -121 | -118 |
| NR\_FDD\_FR1\_H | -123.5 | -120.5 | -117.5 |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. |

Table B.2.8-2: Conditions for CSI-RS based intra-frequency measurements in FR2

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Angle of arrival | NR operating bands | Minimum CSI\_RP Note 2, Note 3 | CSI-RS Ês/Iot |
| dBm / SCSCSI-RS | dB |
| SCSCSI-RS = 120 kHz | SCSCSI-RS = 60 kHz |
| UE power class | UE power class |
| 1 | 2 | 3 | 4 | 1, 2, 3, 4 |
| Conditions | Rx Beam Peak | n257 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 | (Value for SCSCSI-RS = 120 kHz) - 3dB  | ≥-6 |
| n258 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 |
| n259 |  |  | -108.5 |  |
| n260 | -125.3+Y1 |  | -109.5 | -125.8+Y4 |
| n261 | -128.3+Y1 | -113.8 | -112.1 | -127.8+Y4 |
| Spherical coverage Note 1 | n257 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 | (Value for SCSCSI-RS = 120 kHz) - 3dB  | ≥-6 |
| n258 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 |
| n259 |  |  | -95.7 |  |
| n260 | -117.3+Z1 |  | -96.9 | -113.8+Z4 |
| n261 | -120.3+Z1 | -102.8 | -101.2 | -118.8+Z4 |
| Note 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.Note 2: Values specified at the Reference point to give minimum CSI-RS Ês/Iot, with no applied noise.Note 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ∆MBP,n and spherical coverage values are increased by ∆MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. |

*Editor’s notes for Table B.2.8-2:*

*- The value of Y for power classes 1 and 4 is FFS, where Y1 and Y4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively*

*- The value of Z for power classes 1 and 4 is FFS, where Z1 and Z4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively*

## B.2.9 Conditions for NR CSI-RS based inter-frequency measurements

This clause defines the following conditions for NR CSI-RS based inter-frequency measurements and corresponding procedures performed based on CSI-RS: CSI\_RP and CSI-RS Ês/Iot, applicable for a corresponding operating band.

The conditions are defined in Table B.2.9-1 for FR1 NR cells.

The conditions are defined in Table B.2.9-2 for FR2 NR cells.

Table B.2.9-1: Conditions for CSI-RS based inter-frequency measurements in FR1

|  |  |  |  |
| --- | --- | --- | --- |
| Parameter | NR operating band groups Note1 | Minimum CSI\_RP | CSI-RS Ês/Iot |
| dBm / SCSCSI-RS | dB |
| SCSCSI-RS = 15 kHz | SCSCSI-RS = 30 kHz | SCSCSI-RS = 60 kHz |
| Conditions | NR\_FDD\_FR1\_A, NR\_TDD\_FR1\_A, NR\_SDL\_FR1\_A | -125 | -122 | -119 | ≥ -6 |
| NR\_FDD\_FR1\_B | -124.5 | -121.5 | -118.5 |
| NR\_TDD\_FR1\_C | -124 | -121 | -118 |
| NR\_FDD\_FR1\_D, NR\_TDD\_FR1\_D | -124.5 | -120.5 | -117.5 |
| NR\_FDD\_FR1\_E, NR\_TDD\_FR1\_E | -123 | -120 | -117 |
| NR\_FDD\_FR1\_F | -122.5 | -119.5 | -116.5 |
| NR\_FDD\_FR1\_G | -122 | -119 | -116 |
| NR\_FDD\_FR1\_H | -121.5 | -118.5 | -115.5 |
| NOTE 1: NR operating band groups are defined in clause 3.5.2. |

**Table B.2.9-2: Conditions for CSI-RS based inter-frequency measurements in FR2**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Parameter | Angle of arrival | NR operating bands | Minimum CSI\_RP Note 2, Note 3 | CSI-RS Ês/Iot |
| dBm / SCSCSI-RS | dB |
| SCSCSI-RS = 120 kHz | SCSCSI-RS = 60 kHz |
| UE power class | UE power class |
| 1 | 2 | 3 | 4 | 1, 2, 3, 4 |
| Conditions | Rx Beam Peak | n257 | -126.3+Y1 | -111.8 | -110.1 | -125.8+Y4 | (Value for SCSCSI-RS = 120 kHz) - 3dB  | ≥-4 |
| n258 | -126.3+Y1 | -111.8 | -110.1 | -125.8+Y4 |
| n259 |  |  | -106.5 |  |
| n260 | -123.3+Y1 |  | -107.5 | -123.8+Y4 |
| n261 | -126.3+Y1 | -111.8 | -110.1 | -125.8+Y4 |
| Spherical coverage Note 1 | n257 | -118.3+Z1 | -100.8 | -99.2 | -116.8+Z4 | (Value for SCSCSI-RS = 120 kHz) - 3dB  | ≥-4 |
| n258 | -118.3+Z1 | -100.8 | -99.2 | -116.8+Z4 |
| n259 |  |  | -93.7 |  |
| n260 | -115.3+Z1 |  | -94.9 | -111.8+Z4 |
| n261 | -118.3+Z1 | -100.8 | -99.2 | -116.8+Z4 |
| NOTE 1: Values based on EIS spherical coverage as defined in clause 7.3.4 of TS 38.101-2 [19]. Side condition applies for directions in which EIS spherical coverage requirement is met.NOTE 2: Values specified at the Reference point to give minimum CSI-RS Ês/Iot, with no applied noise.NOTE 3: For UEs that support multiple FR2 bands, Rx Beam Peak values are increased by ∆MBP,n and Spherical coverage values are increased by ∆MBS,n, the UE multi-band relaxation factor in dB specified in clause 6.2.1 of TS 38.101-2 [19]. |

*Editor’s notes for Table B.2.9-2:*

*- The value of Y for power classes 1 and 4 is FFS, where Y1 and Y4 are the rough/fine beam gain differences in Rx beam peak direction for power classes 1 and 4 respectively*

*- The value of Z for power classes 1 and 4 is FFS, where Z1, and Z4 are the rough/fine beam gain differences in spherical coverage directions for power classes 1 and 4 respectively.*

## <End of Change 17>