**3GPP TSG- Meeting # *draft***

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
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|  |  | **CR** |  | **rev** | **1** | **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 |  | Radio Access Network | **X** | Core Network |  |

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| ***Title:*** |  | | | | | | | | | |
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| ***Source to WG:*** |  | | | | | | | | | |
| ***Source to TSG:*** | R4 | | | | | | | | | |
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| ***Work item code:*** |  | | | | |  | ***Date:*** | | |  |
|  |  | | | |  | |  | | |  |
| ***Category:*** |  |  | | | | | ***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 can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | There are still MU values and MU descriptions between brackets for PWS that requires completion. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | * Updated values for Longitudinal position uncertainty, QZ ripple with BS, System non-linearity and Field repeatability have been included in all applicable tables for the frequency range 4.2GHz to 6GHz. * Combined and expanded uncertainties have been updated in all applicable tables for the frequency range 4.2GHz to 6GHz. * Pending square brackets have been removed for the frequency range 4.2GHz to 6GHz in all applicable tables. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | Plane Wave Synthesizer could not be used as methodology for AAS BS conformance testing. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 9.2.6.3, 9.2.7, 9.4.5.3, 9.4.6, 9.7.5.3, 10.2.6.3, 10.2.7, 11.2.6.3, 11.2.7, 11.3.6.3, 11.3.7 and 11.4.7. | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **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:*** | | Discussion paper in R4-2016370 | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | Rev 1: Excel spreadsheets according to Annex G has been removed from the attachment. | | | | | | | | |

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#### 9.2.6.3 MU value derivation, FR1

Table 9.2.6.3-1 captures the uncertainty budget contributors and table 9.2.6.3-2 captures the derivation of the expanded measurement uncertainty values for EIRP accuracy measurements in PWS.

Table 9.2.6.3-1: PWS measurement accuracy contributors for EIRP accuracy measurements, FR1

|  |  |
| --- | --- |
| **UID / Details in annex** | **Uncertainty source** |
| **Stage 2: BS measurement** | |
| A7-1a | Misalignment BS & pointing error |
| C1-1 | RF power measurement equipment (e.g. spectrum analyzer, power meter) |
| A7-2a | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for BS antenna |
| A7-3 | RF leakage (calibration antenna connector terminated) |
| A7-4a | QZ ripple with BS |
| A7-5 | Miscellaneous Uncertainty |
| A7-14 | System non-linearity |
| A7-13 | Frequency Flatness |
| **Stage 1: Calibration measurement** | |
| C1-3 | Uncertainty of the network analyzer |
| A7-6 | Mismatch (i.e. reference antenna, network analyser and reference cable) |
| A7-7 | Insertion loss variation |
| A7-3 | RF leakage (calibration antenna connector terminated) |
| A7-8 | Influence of the calibration antenna feed cable |
| C1-4 | Uncertainty of the absolute gain of the reference antenna |
| A7-9 | Misalignment of positioning system |
| A7-1b | Misalignment of calibration antenna & pointing error |
| A7-10 | Rotary joints |
| A7-2b | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for calibration antenna |
| A7-4b | QZ ripple with calibration antenna |
| A7-11 | Switching uncertainty |
| A7-12 | Field repeatability |

NOTE: In the legacy technical reports for BS testability (RAN4) or UE testability (RAN5), the MU/TT derivation tables were using UID as counting numbers across multiple test chambers and requirement’s clauses. In this TR a simplified approach was taken with the UID’s being the annex number of the measurement uncertainty source description.

Table 9.2.6.3-2: PWS measurement uncertainty value derivation for EIRP accuracy measurements, FR1

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UID** | **Uncertainty source** | **Uncertainty value (dB)** | | | **Distribution of the probability** | **Divisor based on distribution shape** | ***ci*** | **Standard uncertainty *ui* (dB)** | | |
| **f<3 GHz** | **3<f<4.2 GHz** | **4.2<f<6 GHz** | **f<3 GHz** | **3<f<4.2 GHz** | **4.2<f<6 GHz** |
| **Stage 2: BS measurement** | | | | | | | | | | |
| A7-1a | Misalignment BS & pointing error | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-1 | RF power measurement equipment (e.g. spectrum analyzer, power meter) | 0.14 | 0.26 | 0.26 | Gaussian | 1.00 | 1 | 0.14 | 0.26 | 0.26 |
| A7-2a | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for BS antenna | 0.05 | 0.14 | 0.20 | Rectangular | 1.73 | 1 | 0.03 | 0.08 | 0.12 |
| A7-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Normal | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| A7-4a | QZ ripple with BS | 0.42 | 0.43 | 0.57 | Rectangular | 1.73 | 1 | 0.24 | 0.25 | 0.33 |
| A7-5 | Miscellaneous Uncertainty | 0.00 | 0.00 | 0.00 | Normal | 1.00 | 1 | 0.00 | 0.00 | 0.00 |
| A7-14 | System non-linearity | 0.10 | 0.10 | 0.15 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.09 |
| A7-13 | Frequency Flatness | 0.13 | 0.13 | 0.13 | Rectangular | 1.73 | 1 | 0.08 | 0.08 | 0.08 |
| **Stage 1: Calibration measurement** | | | | | | | | | | |
| C1-3 | Uncertainty of the network analyzer | 0.13 | 0.20 | 0.20 | Gaussian | 1.00 | 1 | 0.13 | 0.20 | 0.20 |
| A7-6 | Mismatch (i.e. reference antenna, network analyzer and reference cable) | 0.13 | 0.33 | 0.33 | U-shaped | 1.41 | 1 | 0.09 | 0.23 | 0.23 |
| A7-7 | Insertion loss variation | 0.18 | 0.18 | 0.18 | Rectangular | 1.73 | 1 | 0.10 | 0.10 | 0.10 |
| A7-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Normal | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| A7-8 | Influence of the calibration antenna feed cable | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-4 | Uncertainty of the absolute gain of the reference antenna | 0.50 | 0.43 | 0.43 | Rectangular | 1.73 | 1 | 0.29 | 0.25 | 0.25 |
| A7-9 | Misalignment of positioning system | 0.00 | 0.00 | 0.00 | Exp. normal | 2.00 | 1 | 0.00 | 0.00 | 0.00 |
| A7-1b | Misalignment of calibration antenna & pointing error | 0.05 | 0.05 | 0.05 | Rectangular | 1.73 | 1 | 0.03 | 0.03 | 0.03 |
| A7-10 | Rotary joints | 0.00 | 0.00 | 0.00 | U-shaped | 1.73 | 1 | 0.00 | 0.00 | 0.00 |
| A7-2b | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for calibration antenna | 0.12 | 0.12 | 0.15 | Rectangular | 1.73 | 1 | 0.07 | 0.07 | 0.09 |
| A7-4b | QZ ripple with calibration antenna | 0.20 | 0.20 | 0.20 | Rectangular | 1.73 | 1 | 0.12 | 0.12 | 0.12 |
| A7-11 | Switching uncertainty | 0.02 | 0.02 | 0.02 | Rectangular | 1.73 | 1 | 0.01 | 0.01 | 0.01 |
| A7-12 | Field repeatability | 0.06 | 0.12 | 0.15 | Normal | 1.00 | 1 | 0.06 | 0.12 | 0.15 |
| **Combined standard uncertainty (1σ) (dB)** | | | | | | | | **0.50** | **0.61** | **0.66** |
| **Expanded uncertainty (1.96σ - confidence interval of 95 %) (dB)** | | | | | | | | **0.98** | **1.19** | **1.29** |

### 9.2.7 Maximum accepted test system uncertainty

Maximum test system uncertainties derivation methodology was described in clause 5.1. The maximum accepted test system uncertainty values was derived based on test system specific values.

According to the methodology referred above, the common maximum accepted test system uncertainty values for the EIRP accuracy test can be derived from values captured in table 9.2.7-1, separately for each of the defined frequency ranges. The common maximum accepted test system uncertainty values are applicable for all test methods addressing EIRP accuracy test requirement in Normal test conditions. Based on input values in table 9.2.7-1, the expanded uncertainty *ue* (1.96σ - confidence interval of 95 %) values were derived for frequency ranges as below:

- For the frequency range up to 4.2 GHz (with the breakdown point at 3 GHz), the same MU values as for E‑UTRA in TS 37.145-2 [4] were adopted also for NR operation below 4.2 GHz. It is expected that the test chamber setup, calibration and measurement procedures for E-UTRA and NR will be highly similar. All uncertainty factors were judged to be the same. The MU value was thus agreed to be 1.1 dB for up to 3 GHz bands.

- For the frequency range 4.2 - 6 GHz, all MU factors including instrumentation related MU were judged to be the same as for the 3 - 4.2 GHz range, and thus the total MU for 4.2 – 6 GHz is the same as for 3 - 4.2 GHz. This assessment was made under the assumption of testing BS designed for licensed spectrum; for unlicensed spectrum the MU may differ. The MU value was thus agreed to be 1.3 dB for 3 – 6 GHz bands. The MU in 4.2 - 6 GHz is valid for BS designed to operate in licensed spectrum.

- Based on CATR inputs in clause 9.2.3.4, for the frequency range 24.25 < f < 29.5 GHz the MU was decided to be 1.7 dB.

- Based on CATR inputs in clause 9.2.3.4, for the frequency range 37 < f < 40 GHz the MU was decided to be 2.0 dB.

Table 9.2.7-1: OTA test system specific measurement uncertainty values for the EIRP accuracy, FR1, Normal test conditions

|  |  |  |  |
| --- | --- | --- | --- |
|  | Expanded uncertainty (dB) | | |
| f<3 GHz | 3<f<4.2 GHz | 4.2<f<6 GHz |
| Indoor Anechoic Chamber | 0.87 | 1.06 | 1.06 |
| Compact Antenna Test Range | 1.11 | 1.27 | 1.27 |
| One Dimensional Compact Range Chamber | 0.90 | 1.10 | 1.10 |
| Near Field Test Range | 1.01 | 1.10 | 1.10 |
| Plane Wave Synthesizer | 0.98 | 1.19 | 1.29 |
| **Common maximum accepted test system uncertainty** | **1.10** | **1.30** | **1.30** |

Table 9.2.7-2: OTA test system specific measurement uncertainty values for the EIRP accuracy, FR2, Normal test conditions

|  |  |  |
| --- | --- | --- |
|  | Expanded uncertainty (dB) | |
| 24.25<f<29.5GHz | 37<f<40GHz |
| Indoor Anechoic Chamber | - | - |
| Compact Antenna Test Range | 1.74 | 2.07 |
| One Dimensional Compact Range Chamber | - | - |
| Near Field Test Range | - | - |
| Plane Wave Synthesizer | - | - |
| **Common maximum accepted test system uncertainty** | **1.70** | **2.00** |

An overview of the MU values for all the requirements is captured in clause 17.

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#### 9.4.5.3 MU value derivation, FR1

As the DL RS power is an absolute measurement most of the uncertainties form the EIRP accuracy remain the same. Also it can be noted that the measured signal is a wanted signal and hence will be beam formed in the same way as the wanted signal, hence any errors which may be dependent on the beam shape will be the same as for the EIRP accuracy measurement.

Table 9.4.5.3-1: PWS MU value derivation for OTA E-UTRA DL RS power measurement

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UID | Uncertainty source | Uncertainty value (dB) | | | Distribution of the probability | Divisor based on distribution shape | *ci* | Standard uncertainty *ui* (dB) | | |
| f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz | f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz |
| **Stage 2: BS measurement** | | | | | | | | | |  |
| A7-1a | Misalignment BS & pointing error | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C3-1 | DL-RS MU derived from conducted specification | 0.41 | 0.56 | 0.56 | Gaussian | 1.00 | 1 | 0.41 | 0.56 | 0.56 |
| A7-2a | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for BS antenna | 0.05 | 0.14 | 0.20 | Rectangular | 1.73 | 1 | 0.03 | 0.08 | 0.12 |
| A7-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Gaussian | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| A7-4a | QZ ripple with BS | 0.42 | 0.43 | 0.57 | Rectangular | 1.73 | 1 | 0.24 | 0.25 | 0.33 |
| A7-5 | Miscellaneous Uncertainty | 0.00 | 0.00 | 0.00 | Gaussian | 1.00 | 1 | 0.00 | 0.00 | 0.00 |
| A7-14 | System non-linearity | 0.10 | 0.10 | 0.15 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.09 |
| A7-13 | Frequency Flatness | 0.13 | 0.13 | 0.13 | Rectangular | 1.73 | 1 | 0.08 | 0.08 | 0.08 |
| **Stage 1: Calibration measurement** | | | | | | | | | |  |
| C1-3 | Uncertainty of the network analyzer | 0.13 | 0.20 | 0.20 | Gaussian | 1.00 | 1 | 0.13 | 0.20 | 0.20 |
| A7-6 | Mismatch (i.e. reference antenna, network analyser and reference cable) | 0.13 | 0.33 | 0.33 | U-shaped | 1.41 | 1 | 0.09 | 0.23 | 0.23 |
| A7-7 | Insertion loss variation | 0.18 | 0.18 | 0.18 | Rectangular | 1.73 | 1 | 0.10 | 0.10 | 0.10 |
| A7-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Gaussian | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| A7-8 | Influence of the calibration antenna feed cable | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-4 | Uncertainty of the absolute gain of the reference antenna | 0.50 | 0.43 | 0.43 | Rectangular | 1.73 | 1 | 0.29 | 0.25 | 0.25 |
| A7-9 | Misalignment of positioning system | 0.00 | 0.00 | 0.00 | Exp. normal | 2.00 | 1 | 0.00 | 0.00 | 0.00 |
| A7-1b | Misalignment of calibration antenna & pointing error | 0.05 | 0.05 | 0.05 | Rectangular | 1.73 | 1 | 0.03 | 0.03 | 0.03 |
| A7-10 | Rotary joints | 0.00 | 0.00 | 0.00 | U-shaped | 1.73 | 1 | 0.00 | 0.00 | 0.00 |
| A7-2b | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for calibration antenna | 0.12 | 0.12 | 0.15 | Rectangular | 1.73 | 1 | 0.07 | 0.07 | 0.09 |
| A7-4b | QZ ripple with calibration antenna | 0.20 | 0.20 | 0.20 | Rectangular | 1.73 | 1 | 0.12 | 0.12 | 0.12 |
| A7-11 | Switching uncertainty | 0.02 | 0.02 | 0.02 | Rectangular | 1.73 | 1 | 0.01 | 0.01 | 0.01 |
| A7-12 | Field repeatability | 0.06 | 0.12 | 0.15 | Gaussian | 1.00 | 1 | 0.06 | 0.12 | 0.15 |
| **Combined standard uncertainty (1σ) (dB)** | | | | | | | | **0.63** | **0.78** | **0.82** |
| **Expanded uncertainty (1.96σ - confidence interval of 95 %) (dB)** | | | | | | | | **1.24** | **1.53** | **1.62** |

### 9.4.6 Maximum accepted test system uncertainty

Maximum test system uncertainties derivation methodology was described in clause 5.1. The maximum accepted test system uncertainty values was derived based on test system specific values.

According to the methodology referred above, the common maximum accepted test system uncertainty values for the OTA E-UTRA DL RS power test can be derived from values captured in table 6.4.5-1, separately for each of the defined frequency ranges. The common maximum values are applicable for all test methods addressing OTA E-UTRA DL RS power test requirement. Based on the input values, the expanded uncertainty *ue* (1.96σ - confidence interval of 95 %) values were derived.

Table 9.4.6-1: Test system specific measurement uncertainty values for the OTA E-UTRA DL RS power test

|  |  |  |  |
| --- | --- | --- | --- |
|  | Expanded uncertainty *ue* (dB) | | |
| f≦3 GHz | 3<f≦4.2 GHz | 4.2<f≦6 GHz |
| Indoor Anechoic Chamber | 1.15 | 1.44 | 1.44 |
| Compact Antenna Test Range | 1.35 | 1.60 | 1.60 |
| One Dimensional Compact Range Chamber | 1.17 | 1.39 | 1.39 |
| Plane Wave Synthesizer | 1.24 | 1.53 | 1.62 |
| **Common maximum accepted test system uncertainty** | **1.3** | **1.5** | **1.5** |

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#### 9.7.5.3 MU value derivation, FR1

As both the wanted signal and the noise signal are at the same frequency they will be measured at the same time the requirement is effectively differential and most of the OTA chamber errors will cancel out.

The wanted signal will be beam formed and hence the errors used for the EIRP accuracy will be valid, however the co-channel noise may not be beam formed and hence could suffer different errors due to the chamber quite zone, and phase profile. These items are included in both the calibration error and the measurement error, as the requirement is differential if there is a difference between the wanted and the unwanted it will only be due to the measurement phase. The calibration errors will cancel as calibration is only done one so they will be the same for both wanted and unwanted signals.

Potentially, the EVM may vary in space due to different patterns of wanted signal and distortion. Thus for narrow beams, it may be possible that beam pointing and alignment errors could impact EVM results.

As EVM is also dependent on the phase of the calibrated path it is possible that phase ripple in the quite zone or elsewhere, which arises due to multipath reflections, may lead to frequency ripple and cause additional EVM errors which do not appear in a power accuracy analysis as done for EIRP accuracy.

The potential impacts of both beam pointing misalignment and scattering within the chamber on the received waveform and measurement accuracy were investigated. The potential deviation in the measured EVM arising from beam pointing errors was examined considering a worst case scenario, in which variation in space of EVM is maximal due to the ideal signal being correlated and the distortion uncorrelated; hence the impact of misalignment error would be the difference between array gain and element gain. Even in this circumstance, alignment errors of several degrees would not lead to a significant error in the measured EVM. Considering all likely chamber sizes, for E-UTRA any scattering would fall within the cyclic prefix of the OFDM symbol and hence not cause ISI. Furthermore, the likely delay spread of any scattering would relate to coherence bandwidths much larger than any UTRA/E-UTRA channel bandwidth. Even if the scattered energy would cause interference, the interference level would anyhow not lead to a significant EVM increase. Thus it was concluded that the impact scattering within the measurement chamber would be negligible.

The uncertainty causing by power variations when measuring OTA EVM is indicated in table 9.7.5.3-1:

Table 9.7.5.3-1: PWS MU value derivation for power uncertainty aspects of OTA EVM, FR1

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **UID** | **Uncertainty source** | **Uncertainty value (dB)** | | | **Distribution of the probability** | **Divisor based on distribution shape** | ***ci*** | **Standard uncertainty *ui* (dB)** | | |
| **f<3 GHz** | **3<f<4.2 GHz** | **4.2<f<6 GHz** | **f<3 GHz** | **3<f<4.2 GHz** | **4.2<f<6 GHz** |
| **Stage 2: BS measurement** | | | | | | | | | | |
| A7-2a | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for BS antenna | 0.05 | 0.14 | 0.20 | Rectangular | 1.73 | 1 | 0.03 | 0.08 | 0.12 |
| A7-4a | QZ ripple with BS | 0.42 | 0.43 | 0.57 | Rectangular | 1.73 | 1 | 0.24 | 0.25 | 0.33 |
| **Stage 1: Calibration measurement** | | | | | | | | | | |
| **Combined standard uncertainty (1σ) (dB)** | | | | | | | | **0.24** | **0.26** | **0.35** |
| **Expanded uncertainty (1.96σ - confidence interval of 95 %) (dB)** | | | | | | | | **0.48** | **0.51** | **0.68** |

The PWS budget is carried out without consideration of the measurement equipment as this MU is given in %, converting to dB gives, for example:

2% is equivalent to 20\*log10(2/100) = -33.98 dB

If the unwanted signal is 0.5 dB higher than the wanted due to the test system then this will be degraded to -33.48 dB, and

-33.48 dB is equivalent to: 10(-33.48/20) \*100 = 2.12%

Additional error due to potential phase error has not been considered however the potential increase due to then OTA test equipment is well within the contribution allowable with a 1% linear MU.

NOTE: Analysis of the phase uncertainties indicates that the contributions are not significant to affect the final MU value, however if future work indicates that phase or any other errors not related to amplitude calibration may affect the EVM measurement uncertainty the MU analysis may be re-examined.

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#### 10.2.6.3 MU value derivation, FR1

Table 10.2.6.3-1 captures derivation of the expanded measurement uncertainty values for OTA sensitivity measurements in PWS.

Table 10.2.6.3-1: Plane wave synthesizer MU value derivation for OTA sensitivity measurements, FR1

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UID | Uncertainty source | Uncertainty value (dB) | | | Distribution of the probability | Divisor based on distribution shape | *ci* | Standard uncertainty *ui* (dB) | | |
| f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz | f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz |
| Stage 2: BS measurement | | | | | | | | | | |
| B5-1a | Misalignment BS & pointing error | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-2 | Uncertainty of the RF signal generator | 0.46 | 0.46 | 0.46 | Gaussian | 1.00 | 1 | 0.46 | 0.46 | 0.46 |
| B5-2a | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for BS antenna | 0.05 | 0.14 | 0.20 | Rectangular | 1.73 | 1 | 0.03 | 0.08 | 0.12 |
| B5-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Gaussian | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| B5-4a | QZ ripple with BS | 0.42 | 0.43 | 0.57 | Rectangular | 1.73 | 1 | 0.24 | 0.25 | 0.33 |
| B5-5 | Miscellaneous Uncertainty | 0.00 | 0.00 | 0.00 | Gaussian | 1.00 | 1 | 0.00 | 0.00 | 0.00 |
| B5-14 | System non-linearity | 0.10 | 0.10 | 0.15 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.09 |
| B5-13 | Frequency flatness | 0.13 | 0.13 | 0.13 | Rectangular | 1.73 | 1 | 0.08 | 0.08 | 0.08 |
| Stage 1: Calibration measurement | | | | | | | | | | |
| C1-3 | Uncertainty of the network analyzer | 0.13 | 0.20 | 0.20 | Gaussian | 1.00 | 1 | 0.13 | 0.20 | 0.20 |
| B5-6 | Mismatch (i.e. reference antenna, network analyser and reference cable) | 0.13 | 0.33 | 0.33 | U-shaped | 1.41 | 1 | 0.09 | 0.23 | 0.23 |
| B5-7 | Insertion loss variation | 0.18 | 0.18 | 0.18 | Rectangular | 1.73 | 1 | 0.10 | 0.10 | 0.10 |
| B5-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Gaussian | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| B5-8 | Influence of the calibration antenna feed cable | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-4 | Uncertainty of the absolute gain of the reference antenna | 0.50 | 0.43 | 0.43 | Rectangular | 1.73 | 1 | 0.29 | 0.25 | 0.25 |
| B5-9 | Misalignment of positioning system | 0.00 | 0.00 | 0.00 | Exp. normal | 2.00 | 1 | 0.00 | 0.00 | 0.00 |
| B5-1b | Misalignment of calibration antenna & pointing error | 0.05 | 0.05 | 0.05 | Rectangular | 1.73 | 1 | 0.03 | 0.03 | 0.03 |
| B5-10 | Rotary joints | 0.00 | 0.00 | 0.00 | U-shaped | 1.73 | 1 | 0.00 | 0.00 | 0.00 |
| B5-2b | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for calibration antenna | 0.12 | 0.12 | 0.15 | Rectangular | 1.73 | 1 | 0.07 | 0.07 | 0.09 |
| B5-4b | QZ ripple with calibration antenna | 0.20 | 0.20 | 0.20 | Rectangular | 1.73 | 1 | 0.12 | 0.12 | 0.12 |
| B5-11 | Switching uncertainty | 0.02 | 0.02 | 0.02 | Rectangular | 1.73 | 1 | 0.01 | 0.01 | 0.01 |
| B5-12 | Field repeatability | 0.06 | 0.12 | 0.15 | Gaussian | 1.00 | 1 | 0.06 | 0.12 | 0.15 |
| **Combined standard uncertainty (1σ) (dB)** | | | | | | | | **0.67** | **0.71** | **0.76** |
| **Expanded uncertainty (1.96σ - confidence interval of 95 %) (dB)** | | | | | | | | **1.31** | **1.40** | **1.48** |

### 10.2.7 Maximum accepted test system uncertainty

Maximum test system uncertainties derivation methodology was described in clause 5.1. The maximum accepted test system uncertainty values was derived based on test system specific values.

According to the methodology referred above, the common maximum accepted test system uncertainty values for OTA sensitivity test can be derived from values captured in table 10.2.7-1, derived based on the expanded uncertainty *ue* (1.96σ - confidence interval of 95 %) values. The common maximum accepted test system uncertainty values are applicable for all test methods addressing OTA sensitivity test requirement.

From FR2 MU inputs in clause 10.2.2.4 and 10.2.3.4, it has been agreed that MUEIS is 2.4 dB.

Table 10.2.7-1: OTA test system specific measurement uncertainty values for the OTA sensitivity in Normal test conditions

|  |  |  |  |
| --- | --- | --- | --- |
|  | Expanded uncertainty (dB) | | |
| f ≤3 GHz | 3 < f ≤ 4.2 GHz | 4.2 < f ≤ 6 GHz |
| Indoor Anechoic Chamber | 1.22 | 1.25 | 1.25 |
| Compact Antenna Test Range | 1.33 | 1.40 | 1.40 |
| Near Field Test Range | 1.24 | 1.24 | 1.24 |
| One Dimensional Compact Range Chamber | 1.29 | 1.43 | 1.43 |
| Plane Wave Synthesizer | 1.31 | 1.40 | 1.48 |
| **Common maximum accepted test system uncertainty** | **1.3** | **1.4** | **1.6** |

An overview of the MU values for all the requirements is captured in clause 17.

**< End of Changes >**

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#### 11.2.6.3 MU value derivation, FR1

Table 11.2.6.3-1 captures derivation of the expanded measurement uncertainty values for OTA BS output power measurements in PWS.

Table 11.2.6.3-1: PWS MU value derivation for OTA BS output power

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UID | Uncertainty source | Uncertainty value (dB) | | | Distribution of the probability | Divisor based on distribution shape | *ci* | Standard uncertainty *ui* (dB) | | |
| f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz | f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz |
| Stage 2: BS measurement | | | | | | | | | | |
| A7-1a | Misalignment BS & pointing error | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-1 | RF power measurement equipment (e.g. spectrum analyzer, power meter) | 0.14 | 0.26 | 0.26 | Gaussian | 1.00 | 1 | 0.14 | 0.26 | 0.26 |
| A7-2a | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for BS antenna | 0.05 | 0.14 | 0.20 | Rectangular | 1.73 | 1 | 0.03 | 0.08 | 0.12 |
| A7-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Gaussian | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| A7-4a | QZ ripple with BS | 0.42 | 0.43 | 0.57 | Rectangular | 1.73 | 1 | 0.24 | 0.25 | 0.33 |
| A7-5 | Miscellaneous Uncertainty | 0.00 | 0.00 | 0.00 | Gaussian | 1.00 | 1 | 0.00 | 0.00 | 0.00 |
| A7-14 | System non-linearity | 0.10 | 0.10 | 0.15 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.09 |
| A7-13 | Frequency Flatness | 0.13 | 0.13 | 0.13 | Rectangular | 1.73 | 1 | 0.08 | 0.08 | 0.08 |
| Stage 1: Calibration measurement | | | | | | | | | | |
| C1-3 | Uncertainty of the network analyzer | 0.13 | 0.20 | 0.20 | Gaussian | 1.00 | 1 | 0.13 | 0.20 | 0.20 |
| A7-6 | Mismatch (i.e. reference antenna, network analyser and reference cable) | 0.13 | 0.33 | 0.33 | U-shaped | 1.41 | 1 | 0.09 | 0.23 | 0.23 |
| A7-7 | Insertion loss variation | 0.18 | 0.18 | 0.18 | Rectangular | 1.73 | 1 | 0.10 | 0.10 | 0.10 |
| A7-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Gaussian | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| A7-8 | Influence of the calibration antenna feed cable | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-4 | Uncertainty of the absolute gain of the reference antenna | 0.50 | 0.43 | 0.43 | Rectangular | 1.73 | 1 | 0.29 | 0.25 | 0.25 |
| A7-9 | Misalignment of positioning system | 0.00 | 0.00 | 0.00 | Exp. normal | 2.00 | 1 | 0.00 | 0.00 | 0.00 |
| A7-1b | Misalignment of calibration antenna & pointing error | 0.05 | 0.05 | 0.05 | Rectangular | 1.73 | 1 | 0.03 | 0.03 | 0.03 |
| A7-10 | Rotary joints | 0.00 | 0.00 | 0.00 | U-shaped | 1.73 | 1 | 0.00 | 0.00 | 0.00 |
| A7-2b | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for calibration antenna | 0.12 | 0.12 | 0.15 | Rectangular | 1.73 | 1 | 0.07 | 0.07 | 0.09 |
| A7-4b | QZ ripple with calibration antenna | 0.20 | 0.20 | 0.20 | Rectangular | 1.73 | 1 | 0.12 | 0.12 | 0.12 |
| A7-11 | Switching uncertainty | 0.02 | 0.02 | 0.02 | Rectangular | 1.73 | 1 | 0.01 | 0.01 | 0.01 |
| A7-12 | Field repeatability | 0.06 | 0.12 | 0.15 | Gaussian | 1.00 | 1 | 0.06 | 0.12 | 0.15 |
| **Combined standard uncertainty (1σ) (dB)** | | | | | | | | **0.50** | **0.61** | **0.66** |
| **Expanded uncertainty (1.96σ - confidence interval of 95 %) (dB)** | | | | | | | | **0.98** | **1.19** | **1.29** |
| **TRP summation error** | | | | | | | | **0.75** | **0.75** | **0.75** |
| **Total MU** | | | | | | | | **1.24** | **1.40** | **1.49** |

### 11.2.7 Maximum accepted test system uncertainty

For the frequency range up to 4.2 GHz, the same MU values as for E-UTRA were adopted [9]. It is expected that the test chamber setup, calibration and measurement procedures for E-UTRA and NR will be highly similar. All uncertainty factors were judged to be the same.

For the frequency range 4.2 - 6 GHz, all MU factors, including instrumentation related MU were judged to be the same as for the 3 - 4.2 GHz range, and thus the total MU for 4.2 – 6 GHz is the same as for 3 - 4.2 GHz. This assessment was made under the assumption of testing BS designed for licensed spectrum; for unlicensed spectrum the MU may differ.

For CATR the expanded MU is established as a root sum square combining of the dB values for the MU and the SE (see clause 12.10), the MU was decided to be 2.1 dB for the frequency range 24.25 < f < 29.5GHz and 2.4 dB for the frequency range 37 < f < 40 GHz.

Maximum test system uncertainties derivation methodology was described in clause 5.1. The maximum accepted test system uncertainty values was derived based on test system specific values.

According to the methodology referred above, the common maximum accepted test system uncertainty values for OTA BS output power test can be derived from values captured in table 11.2.7-1, derived based on the expanded uncertainty *ue* (1.96σ - confidence interval of 95 %) values. The common maximum accepted test system uncertainty values are applicable for all test methods addressing OTA BS output power test requirement.

Table 11.2.7-1: Test system specific MU values for the OTA BS output power test, Normal test conditions, FR1

|  |  |  |  |
| --- | --- | --- | --- |
|  | Expanded uncertainty *ue* (dB) | | |
|  | f ≦ 3GHz | 3GHz < f ≦ 4.2 GHz | 4.2GHz < f ≦ 6GHz |
| Indoor Anechoic Chamber | 1.15 | 1.30 | 1.30 |
| Compact Antenna Test Range | 1.39 | 1.51 | 1.51 |
| Near Field Test Range | 1.26 | 1.33 | 1.33 |
| Plane Wave Synthesizer | 1.24 | 1.40 | 1.49 |
| Reverberation Chamber | 1.37 | 1.46 | 1.46 |
| **Common maximum accepted test system uncertainty** | **1.4** | **1.5** | **1.5** |

Table 11.2.7-2: Test system specific MU values for the OTA BS output power test, Normal test conditions, FR2

|  |  |  |
| --- | --- | --- |
|  | Expanded uncertainty *ue* (dB) | |
|  | 24.25 < f < 29.5 GHz | 37 < f < 40 GHz |
| Indoor Anechoic Chamber |  |  |
| Compact Antenna Test Range | 2.11 | 2.39 |
| Near Field Test Range |  |  |
| Reverberation chamber | 1.85 | 2.08 |
| Plane Wave Synthesizer |  |  |
| **Common maximum accepted test system uncertainty** | **2.1** | **2.4** |

An overview of the MU values for all the requirements is captured in clause 17.

**< End of Changes >**

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#### 11.3.6.3 MU value derivation, FR1

The MU value derivation for absolute ACLR measurements is the same as in clause 11.2.6.3 (i.e. OTA BS output power).

Table 11.3.6.3-1 captures derivation of the expanded measurement uncertainty values for relative ACLR measurements in PWS.

Table 11.3.6.3-1: PWS MU value derivation for relative ACLR measurement

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UID | Uncertainty source | Uncertainty value (dB) | | | Distribution of the probability | Divisor based on distribution shape | *ci* | Standard uncertainty *ui* (dB) | | |
| f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz | f≤ 3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz |
| Stage 2: BS measurement | | | | | | | | | | |
| A7-1a | Misalignment BS & pointing error | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-1 | RF power measurement equipment  (e.g. spectrum analyzer, power meter) | 0.14 | 0.26 | 0.26 | Gaussian | 1.00 | 1 | 0.14 | 0.26 | 0.26 |
| A7-4a | QZ ripple with BS | 0.42 | 0.43 | 0.57 | Rectangular | 1.73 | 1 | 0.24 | 0.25 | 0.33 |
| A7-13 | Frequency Flatness | 0.13 | 0.13 | 0.13 | Rectangular | 1.73 | 1 | 0.08 | 0.08 | 0.08 |
| Stage 1: Calibration measurement | | | | | | | | | | |
| C1-3 | Uncertainty of the network analyzer | 0.13 | 0.20 | 0.20 | Gaussian | 1.00 | 1 | 0.13 | 0.20 | 0.20 |
| A7-6 | Mismatch (i.e. reference antenna, network analyser and reference cable) | 0.13 | 0.33 | 0.33 | U-shaped | 1.41 | 1 | 0.09 | 0.23 | 0.23 |
| A7-7 | Insertion loss variation | 0.18 | 0.18 | 0.18 | Rectangular | 1.73 | 1 | 0.10 | 0.10 | 0.10 |
| A7-11 | Switching uncertainty | 0.02 | 0.02 | 0.02 | Rectangular | 1.73 | 1 | 0.01 | 0.01 | 0.01 |
| **Combined standard uncertainty (1σ) (dB)** | | | | | | | | **0.35** | **0.49** | **0.54** |
| **Expanded uncertainty (1.96σ - confidence interval of 95 %) (dB)** | | | | | | | | **0.69** | **0.96** | **1.05** |
| **TRP summation error** | | | | | | | | **0.75** | **0.75** | **0.75** |
| **Total MU** | | | | | | | | **1.02** | **1.22** | **1.29** |

Table 11.3.6.3-2: PWS MU value derivation for absolute ACLR measurement

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| UID | Uncertainty source | Uncertainty value (dB) | | | Distribution of the probability | Divisor based on distribution shape | *ci* | Standard uncertainty *ui* (dB) | | |
| f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz | f≤3 GHz | 3<f≤4.2 GHz | 4.2<f≤6 GHz |
| Stage 2: BS measurement | | | | | | | | | | |
| A7-1a | Misalignment BS & pointing error | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-1 | RF power measurement equipment (e.g. spectrum analyzer, power meter) | 0.14 | 0.26 | 0.26 | Gaussian | 1.00 | 1 | 0.14 | 0.26 | 0.26 |
| A7-2a | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for BS antenna | 0.05 | 0.14 | 0.20 | Rectangular | 1.73 | 1 | 0.03 | 0.08 | 0.12 |
| A7-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Gaussian | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| A7-4a | QZ ripple with BS | 0.42 | 0.43 | 0.57 | Rectangular | 1.73 | 1 | 0.24 | 0.25 | 0.33 |
| A7-5 | Miscellaneous Uncertainty | 0.00 | 0.00 | 0.00 | Gaussian | 1.00 | 1 | 0.00 | 0.00 | 0.00 |
| A7-14 | System non-linearity | 0.10 | 0.10 | 0.15 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.09 |
| A7-13 | Frequency Flatness | 0.13 | 0.13 | 0.13 | Rectangular | 1.73 | 1 | 0.08 | 0.08 | 0.08 |
| Stage 1: Calibration measurement | | | | | | | | | | |
| C1-3 | Uncertainty of the network analyzer | 0.13 | 0.20 | 0.20 | Gaussian | 1.00 | 1 | 0.13 | 0.20 | 0.20 |
| A7-6 | Mismatch (i.e. reference antenna, network analyser and reference cable) | 0.13 | 0.33 | 0.33 | U-shaped | 1.41 | 1 | 0.09 | 0.23 | 0.23 |
| A7-7 | Insertion loss variation | 0.18 | 0.18 | 0.18 | Rectangular | 1.73 | 1 | 0.10 | 0.10 | 0.10 |
| A7-3 | RF leakage (calibration antenna connector terminated) | 0.09 | 0.09 | 0.09 | Gaussian | 1.00 | 1 | 0.09 | 0.09 | 0.09 |
| A7-8 | Influence of the calibration antenna feed cable | 0.10 | 0.10 | 0.10 | Rectangular | 1.73 | 1 | 0.06 | 0.06 | 0.06 |
| C1-4 | Uncertainty of the absolute gain of the reference antenna | 0.50 | 0.43 | 0.43 | Rectangular | 1.73 | 1 | 0.29 | 0.25 | 0.25 |
| A7-9 | Misalignment of positioning system | 0.00 | 0.00 | 0.00 | Exp. normal | 2.00 | 1 | 0.00 | 0.00 | 0.00 |
| A7-1b | Misalignment of calibration antenna & pointing error | 0.05 | 0.05 | 0.05 | Rectangular | 1.73 | 1 | 0.03 | 0.03 | 0.03 |
| A7-10 | Rotary joints | 0.00 | 0.00 | 0.00 | U-shaped | 1.73 | 1 | 0.00 | 0.00 | 0.00 |
| A7-2b | Longitudinal position uncertainty (i.e. standing wave and imperfect field synthesis) for calibration antenna | 0.12 | 0.12 | 0.15 | Rectangular | 1.73 | 1 | 0.07 | 0.07 | 0.09 |
| A7-4b | QZ ripple with calibration antenna | 0.20 | 0.20 | 0.20 | Rectangular | 1.73 | 1 | 0.12 | 0.12 | 0.12 |
| A7-11 | Switching uncertainty | 0.02 | 0.02 | 0.02 | Rectangular | 1.73 | 1 | 0.01 | 0.01 | 0.01 |
| A7-12 | Field repeatability | 0.06 | 0.12 | 0.15 | Gaussian | 1.00 | 1 | 0.06 | 0.12 | 0.15 |
| **Combined standard uncertainty (1σ) (dB)** | | | | | | | | **0.50** | **0.61** | **0.66** |
| **Expanded uncertainty (1.96σ - confidence interval of 95 %) (dB)** | | | | | | | | **0.98** | **1.19** | **1.29** |
| **TRP summation error** | | | | | | | | **0.75** | **0.75** | **0.75** |
| **Total MU** | | | | | | | | **1.24** | **1.40** | **1.49** |

### 11.3.7 Maximum accepted test system uncertainty

For the frequency range up to 4.2 GHz, the same MU values as for E-UTRA were adopted. It is expected that the test chamber setup, calibration and measurement procedures for E-UTRA and NR will be highly similar. All uncertainty factors were judged to be the same.

For the frequency range 4.2 - 6 GHz, all MU factors, including instrumentation related MU were judged to be the same as for the 3 - 4.2 GHz range, and thus the total MU for 4.2 – 6 GHz is the same as for 3 - 4.2 GHz. This assessment was made under the assumption of testing BS designed for licensed spectrum; for unlicensed spectrum the MU may differ.

For CATR the expanded MU is established as a root sum square combining of the dB values for the MU and the SE (see clause 6.3.6), the MU for absolute ACLR was decided to be 2.7 dB for the frequency range 24.25<f<29.5GHz and 2.7 dB for the frequency range 37<f<40GHz. The MU for relative ACLR was decided to be 2.3 dB for the frequency range 24.25<f<29.5GHz and 2.6 dB for the frequency range 37<f<40GHz.

Maximum test system uncertainties derivation methodology was described in clause 5.1. The maximum accepted test system uncertainty values was derived based on test system specific values.

According to the methodology referred above, the common maximum accepted test system uncertainty values for absolute and relative OTA ACLR tests can be derived from values captured in table 11.3.7-1 and 11.3.7-2, derived based on the expanded uncertainty *ue* (1.96σ - confidence interval of 95 %) values. The common maximum accepted test system uncertainty values are applicable for all test methods addressing OTA ACLR test requirement.

Table 11.3.7-1: Test system specific MU values for the absolute OTA ACLR, Normal test conditions, FR1

|  |  |  |  |
| --- | --- | --- | --- |
|  | Expanded uncertainty *ue* (dB) | | |
|  | f ≦ 3GHz | 3GHz < f ≦ 4.2 GHz | 4.2GHz < f ≦ 6GHz |
| Indoor Anechoic Chamber | 1.15 | 1.30 | 1.30 |
| Compact Antenna Test Range | 1.39 | 1.51 | 1.51 |
| Near Field Test Range | 1.26 | 1.33 | 1.33 |
| Plane Wave Synthesizer | 1.24 | 1.40 | 1.49 |
| Reverberation Chamber | 1.37 | 1.46 | 1.46 |
| **Common maximum accepted test system uncertainty** | **2.2** | **2.7** | **2.7** |

Table 11.3.7-2: Test system specific MU values for the relative OTA ACLR, Normal test conditions, FR1

|  |  |  |  |
| --- | --- | --- | --- |
|  | Expanded uncertainty *ue* (dB) | | |
|  | f ≦ 3GHz | 3GHz < f ≦ 4.2 GHz | 4.2GHz < f ≦ 6GHz |
| Indoor Anechoic Chamber | - | - | - |
| Compact Antenna Test Range | 1.12 | 1.30 | 1.30 |
| Near Field Test Range | - | - | - |
| Plane Wave Synthesizer | 1.02 | 1.22 | 1.29 |
| Reverberation Chamber | 1.37 | 1.46 | 1.46 |
| **Common maximum accepted test system uncertainty** | **1.0** | **1.2** | **1.2** |

Table 11.3.7-3: Test system specific MU values for the absolute OTA ACLR, Normal test conditions, FR2

|  |  |  |
| --- | --- | --- |
|  | Expanded uncertainty *ue* (dB) | |
|  | 24.25 < f < 29.5 GHz | 37 < f < 40 GHz |
| Indoor Anechoic Chamber |  |  |
| Compact Antenna Test Range | 2.69 | 2.71 |
| Near Field Test Range |  |  |
| Reverberation Chamber | 2.36 | 2.36 |
| Plane Wave Synthesizer |  |  |
| **Common maximum accepted test system uncertainty** | **2.7** | **2.7** |

Table 11.3.7-4: Test system specific MU values for the relative OTA ACLR, Normal test conditions, FR2

|  |  |  |
| --- | --- | --- |
|  | Expanded uncertainty *ue* (dB) | |
|  | 24.25 < f < 29.5 GHz | 37 < f < 40 GHz |
| Indoor Anechoic Chamber | - | - |
| Compact Antenna Test Range | 2.28 | 2.54 |
| Near Field Test Range | - | - |
| Reverberation Chamber | 2.15 | 2.36 |
| Plane Wave Synthesizer | - | - |
| **Common maximum accepted test system uncertainty** | **2.3** | **2.6** |

For relative ACLR, the MU value was agreed to be 1.0 dB for 0 – 3 GHz bands and 1.2 dB for 3 – 6 GHz bands. The MU in 4.2-6 GHz is valid for BS designed to operate in licensed spectrum.

For absolute ACLR, the MU value was agreed to be 2.2 dB for 0 – 3 GHz bands and 2.7 dB for 3 – 6 GHz bands. The MU in 4.2-6 GHz is valid for BS designed to operate in licensed spectrum.

An overview of the MU values for all the requirements is captured in clause 17.

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### 11.4.7 Maximum accepted test system uncertainty

For the frequency range up to 4.2 GHz, the same MU values as for E-UTRA were adopted. It is expected that the test chamber setup, calibration and measurement procedures for E-UTRA and NR will be highly similar. All uncertainty factors were judged to be the same.

For the frequency range 4.2 - 6 GHz, all MU factors, including instrumentation related MU were judged to be the same as for the 3 - 4.2 GHz range, and thus the total MU for 4.2 – 6 GHz is the same as for 3 - 4.2 GHz. This assessment was made under the assumption of testing BS designed for licensed spectrum; for unlicensed spectrum the MU may differ.

Maximum test system uncertainties derivation methodology was described in clause 5.1. The maximum accepted test system uncertainty values was derived based on test system specific values.

According to the methodology referred above, the common maximum accepted test system uncertainty values for OTA OBUE or OTA SEM test can be derived from values captured in table 11.4.7-1, derived based on the expanded uncertainty *ue* (1.96σ - confidence interval of 95 %) values. The common maximum accepted test system uncertainty values are applicable for all test methods addressing OTA OBUE or OTA SEM test requirement.

Table 11.4.7-1: Test system specific MU values for the OTA OBUE or OTA SEM measurement, FR1

|  |  |  |  |
| --- | --- | --- | --- |
|  | **Expanded uncertainty *ue* (dB)** | | |
|  | **f ≦ 3GHz** | **3GHz < f ≦ 4.2 GHz** | 4.2GHz < f ≦ 6GHz |
| Indoor Anechoic Chamber | 1.15 | 1.30 | 1.30 |
| Compact Antenna Test Range | 1.39 | 1.51 | 1.51 |
| Near Field Test Range | 1.26 | 1.33 | 1.33 |
| Plane Wave Synthesizer | 1.24 | 1.40 | 1.49 |
| Reverberation Chamber | 1.40 | 1.46 | 1.46 |
| **Common maximum accepted test system uncertainty** | **1.8** | **2.0** | **2.0** |

Table 11.4.7-2: Test system specific MU values for the OTA OBUE measurement, FR2

|  |  |  |
| --- | --- | --- |
|  | Expanded uncertainty *ue* (dB) | |
|  | 24.25<f<29.5GHz | 37<f<40GHz |
| Indoor Anechoic Chamber | - | - |
| Compact Antenna Test Range | 2.70 | 2.72 |
| Near Field Test Range | - | - |
| Reverberation Chamber | 2.36 | 2.36 |
| Plane Wave Synthesizer | - | - |
| **Common maximum accepted test system uncertainty** | **2.7** | **2.7** |

The MU value was agreed to be 1.4 dB for up to 3 GHz bands and 1.5 dB for 3 – 6 GHz bands. The MU in 4.2-6 GHz is valid for BS designed to operate in licensed spectrum.

For CATR the expanded MU is established as a root sum square combining of the dB values for the MU and the SE (see clause 6.3.6), the MU was decided to be 2.7 dB for the frequency range 24.25<f<29.5GHz and 2.7 dB for the frequency range 37<f<40GHz.

An overview of the MU values for all the requirements is captured in clause 17.

**< End of Changes >**