3GPP TSG-RAN WG4 Meeting # 96-e DRAFT R4-2012704

Electronic Meeting, 17 – 28 August, 2020

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| *CR-Form-v12.0* |
| **CHANGE REQUEST** |
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|  | **37.145-2** | **CR** | **0237** | **rev** | **1** | **Current version:** | **15.7.0** |  |
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| *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:***  | CR to TS 37.145-2: internal TR references corrections (wrt. TR 37.941 for OTA BS testing), Rel-15  |
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| ***Source to WG:*** | Huawei |
| ***Source to TSG:*** | R4 |
|  |  |
| ***Work item code:*** | OTA\_BS\_testing  |  | ***Date:*** | 2020-07-29 |
|  |  |  |  |  |
| ***Category:*** | **F** |  | ***Release:*** | Rel-15 |
|  | *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-12 (Release 12)**Rel-13 (Release 13)Rel-14 (Release 14)Rel-15 (Release 15)Rel-16 (Release 16)* |
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| ***Reason for change:*** | In relation to the OTA BS testing WI and the new TR 37.941, multiple TR/TS were reviewed with the goal to capture the OTA BS testing content in a single external TR 37.941, as well as to remove any outstanding references to internal TRs. This CR provides correction to the internal TR references in TS 37.145-2.This CR is a fine-tuned version based on the agreed content of R4-2007454, which was not implemented into TS 37.145-2 due to comments received from MCC after RAN4#95-e meeting. |
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| ***Summary of change:*** | * Removal of the references to TR 37.842 and TR 37.843, replaced by reference to TR 37.941.
* Multiple ”specific references” were removed, replaced by “non-specific references” for simplicity.
* Editorial corrections.
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| ***Consequences if not approved:*** | References to the internal TR (not allowed by the drafting rules) would exist.  |
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| ***Clauses affected:*** | 2, 4.1.2.2, 4.1.2.3, 8.3.2, 8.4.2, A, B, E |
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|  | **Y** | **N** |  |  |
| ***Other specs*** |  | **X** |  Other core specifications  |  |
| ***affected:*** |  | **X** |  Test specifications |  |
| ***(show related CRs)*** |  | **X** |  O&M Specifications |   |
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| ***Other comments:*** |  |
|  |  |
| ***This CR's revision history:*** |  |

*------------------------------ Modified section ------------------------------*

# 2 References

The following documents contain provisions which, through reference in this text, constitute provisions of the present document.

- References are either specific (identified by date of publication, edition number, version number, etc.) or non‑specific.

- For a specific reference, subsequent revisions do not apply.

- For a non-specific reference, the latest version applies. In the case of a reference to a 3GPP document (including a GSM document), a non-specific reference implicitly refers to the latest version of that document *in the same Release as the present document*.

[1] 3GPP TR 21.905: "Vocabulary for 3GPP Specifications".

[2] 3GPP TS 25.104: "Base Station (BS) radio transmission and reception (FDD)".

[3] 3GPP TS 25.105: "Base Station (BS) radio transmission and reception (TDD)".

[4] 3GPP TS 36.104: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) radio transmission and reception".

[5] 3GPP TS 37.104: "NR, E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) radio transmission and reception".

[6] 3GPP TS 37.105: "Active Antenna System (AAS) Base Station (BS) transmission and reception".

[7] Void

[8] Recommendation ITU-R M.1545: "Measurement uncertainty as it applies to test limits for the terrestrial component of International Mobile Telecommunications-2000".

[9] 3GPP TS 37.145-1: "Active Antenna System (AAS) Base Station (BS) conformance testing; Part 1: Conducted conformance testing".

[10] 3GPP TS 25.141: "Base Station (BS) conformance testing (FDD)".

[11] 3GPP TS 25.142: "Base Station (BS) conformance testing (TDD)".

[12] 3GPP TS 36.141: "Evolved Universal Terrestrial Radio Access (E-UTRA); Base Station (BS) conformance testing".

[13] 3GPP TS 37.141: "NR, E-UTRA, UTRA and GSM/EDGE; Multi-Standard Radio (MSR) Base Station (BS) conformance testing".

[14] Recommendation ITU-R M.328: "Spectra and bandwidth of emissions".

[15] 3GPP TS 25.331 (V14.3.0): "Radio Resource Control (RRC); Protocol specification (Release 14)".

[16] Recommendation ITU-R SM.329-10: "Unwanted emissions in the spurious domain".

[17] FCC publication number 662911: "Emissions Testing of Transmitters with Multiple Outputs in the Same Band"

[18] "Title 47 of the Code of Federal Regulations (CFR)", Federal Communications Commission

[19] CEPT ECC Decision (13)03, "The harmonised use of the frequency band 1452-1492 MHz for Mobile/Fixed Communications Networks Supplemental Downlink (MFCN SDL)".

[20] IEC 60721: "Classification of environmental conditions"

[21] IEC 60721-3-3: "Classification of environmental conditions - Part 3-3: Classification of groups of environmental parameters and their severities - Stationary use at weather protected locations"

[22] IEC 60721-3-4: "Classification of environmental conditions - Part 3: Classification of groups of environmental parameters and their severities - Section 4: Stationary use at non-weather protected locations"

[23] ETSI EN 300 019-1-3: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-3: Classification of environmental conditions; Stationary use at weatherprotected locations"

[24] ETSI EN 300 019-1-4: "Environmental Engineering (EE); Environmental conditions and environmental tests for telecommunications equipment; Part 1-4: Classification of environmental conditions; Stationary use at non-weatherprotected locations"

[25] IEC 60068-2-1 (2007): "Environmental testing - Part 2: Tests. Tests A: Cold"

[26] IEC 60068-2-2 (2007): "Environmental testing - Part 2: Tests. Tests B: Dry heat"

[27] IEC 60068-2-6 (2007): "Environmental testing - Part 2: Tests - Test Fc: Vibration (sinusoidal)"

[28] 3GPP TS 36.211: "Evolved Universal Terrestrial Radio Access (E-UTRA); Physical channels and modulation"

[29] Void

[30] Recommendation ITU-T O.153: "Basic parameters for the measurement of error performance at bit rates below the primary rate"

[31] 3GPP TR 25.942: "Radio Frequency (RF) system scenarios".

[32] 3GPP TS 45.004: "Digital cellular telecommunications system (Phase 2+); Modulation".

[33] 3GPP TS 38.104: "NR Base Station (BS) radio transmission and reception".

[34] 3GPP TS 38.141-2: "Base Station (BS) conformance testing Part 2: Radiated conformance testing".

[35] 3GPP TS 38.141-1: "NR;Base Station (BS) conformance testing; Part 1: Conducted conformance testing".

[36] 3GPP TS 38.211: "NR; Physical channels and modulation".

[37] 3GPP TS 38.104 (V15.6.0): "NR Base Station (BS) radio transmission and reception (Release 15)".

[38] 3GPP TR 37.941: "Radio Frequency (RF) conformance testing background for radiated Base Station (BS) requirements".

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### 4.1.2 Acceptable uncertainty of Test System

#### 4.1.2.1 General

The maximum acceptable uncertainty of the Test System is specified below for each test defined explicitly in the present specification, where appropriate.

The Test System shall enable the stimulus signals in the test case to be adjusted to within the specified tolerance and the equipment under test to be measured with an uncertainty not exceeding the specified values. All tolerances and uncertainties are absolute values, and are valid for a confidence level of 95 %, unless otherwise stated.

A confidence level of 95 % is the measurement uncertainty tolerance interval for a specific measurement that contains 95 % of the performance of a population of test equipment.

For details on measurement uncertainty budget calculation, OTA measurement methodology description (including calibration and measurement stage for each test range), MU budget format and its contributions, refer to TR 37.941 [38].

#### 4.1.2.2 Measurement of transmitter

Table 4.1.2.2-1: Maximum Test System uncertainty for transmitter tests

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| Clause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| 6.2 Radiated transmit power (normal conditions) | ±1.1 dB, f ≤ 3.0 GHz±1.3 dB, 3.0 GHz < f ≤ 4.2 GHz | For the derivation of test system measurement uncertainty, uncertainty budget contributors as well as uncertainty budget assessment, refer to TR 37.941 [38]. |
| 6.2 Radiated transmit power (extreme conditions) | ±2.5 dB, f ≤ 3.0 GHz±2.6 dB, 3.0 GHz < f ≤ 4.2 |
| 6.3.2 OTA maximum output power | ±1.4 dB, f ≤ 3.0 GHz±1.5 dB, 3.0 GHz < f ≤ 4.2 GHz |
| 6.3.3 OTA E-UTRA DL RS power | 1.3 dB, f ≤ 3.0 GHz1.5 dB, 3.0 GHz < f ≤ 4.2 GHz |
| 6.4.2 OTA UTRA inner loop power control in the downlink | 0.1 dB  |
| 6.4.3 OTA power control dynamic range | 1.1 dB  |
| 6.4.4 OTA total power dynamic range | 0.3 dB UTRA0.4 dB E-UTRA & NR |
| 6.4.5 OTA IPDL time mask | 0.7 dB |
| 6.5 OTA transmit ON/OFF power | ±3.4 dB, f ≤ 3.0 GHz±3.6 dB, 3.0 GHz < f ≤ 4.2 GHz (NOTE 1) |
| 6.6.2 OTA frequency error | 12 Hz |
| 6.6.3 OTA TAE | 25 ns |
| 6.6.4 OTA modulation Quality | 1 % |
| 6.7.2 OTA occupied bandwidth | 30 kHz: BWChannel 1.4 MHz, 3 MHz100 kHz: BWChannel 5 MHz, 10 MHz300 kHz: BWChannel 15 MHz, 20 MHz 25 MHz, 30 MHz, 40 MHz, 50 MHz600 kHz: BWChannel 60 MHz, 70 MHz, 80 MHz, 90 MHz, 100 MHz |
| 6.7.3 OTA ACLR/CACLR | ±1.0 dB, f ≤ 3.0 GHz±1.2 dB, 3.0 GHz < f ≤ 4.2Absolute limit±2.2 dB, f ≤ 3.0GHz±2.7 dB, 3.0GHz < f ≤ 4.2GHz |
| 6.7.4 OTA spectrum emission mask | ±1.8 dB, f ≤ 3.0GHz±2.0 dB, 3.0GHz < f ≤ 4.2GHz |
| 6.7.5 OTA operating band unwanted emissions | ±1.8 dB, f ≤ 3.0GHz±2.0 dB, 3.0GHz < f ≤ 4.2GHz |
| 6.7.6.2 OTA transmitter spurious emissions, mandatory requirements | ±2.3 dB, 30MHz < f ≤ 6 GHz±4.2 dB, 6 GHz < f ≤ 19 GHz |
| 6.7.6.3 OTA transmitter spurious emissions, protection of BS receiver | ±3.1 dB, f ≤ 3.0GHz±3.3 dB, 3.0GHz < f ≤ 4.2GHz(NOTE 1) |
| 6.7.6.4 OTA transmitter spurious emissions, additional spurious emission requirements | ±2.6 dB, f ≤ 3.0GHz±3.0 dB, 3.0GHz < f ≤ 4.2GHz |
| 6.7.6.5 OTA transmitter spurious emissions, co-location | ±3.1 dB, f ≤ 3.0GHz±3.3 dB, 3.0GHz < f ≤ 4.2GHz (NOTE 1) |
| 6.8 OTA transmitter intermodulation(interferer requirements) (NOTE 2) | The value below applies only to the interfering signal and is unrelated to the measurement uncertainty of the tests (6.6.1, 6.6.2 and 6.6.4) which have to be carried out in the presence of the interferer.±3.2 dB, f ≤ 3.0GHz±3.4 dB, 3.0GHz < f ≤ 4.2GHz (NOTE 1) |
| NOTE 1: Fulfilling the criteria for CLTA selection and placement in subclause 4.15 is deemed sufficient for the test purposes. When these criteria are met, the measurement uncertainty related to the selection of the co-location test antenna and its alignment as specified in the appropriate measurement uncertainty budget in TR 37.941 [38], shall be used for evaluating the test system uncertainty.NOTE 2: This tolerance applies to the stimulus and not the measurements defined in clause 6.8. |

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#### 4.1.2.3 Measurement of receiver

Table 4.1.2.3-1: Maximum Test System Uncertainty for receiver tests

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| Clause | Maximum Test System Uncertainty | Derivation of Test System Uncertainty |
| 7.2 OTA sensitivity | ±1.3 dB, f ≤ 3.0 GHz±1.4 dB, 3.0 GHz < f ≤ 4.2 GHz | For the derivation of test system measurement uncertainty, uncertainty budget contributors as well as uncertainty budget assessment, refer to TR 37.941 [38]. |
| 7.3 OTA reference sensitivity | ±1.3 dB, f ≤ 3.0 GHz±1.4 dB, 3.0 GHz < f ≤ 4.2 GHz |
| 7.4 OTA dynamic range | ±0.3 dB |
| 7.5 OTA adjacent channel selectivity, general blocking, and narrowband blocking | ±1.7 dB, f ≤ 3.0 GHz±2.1 dB, 3.0 GHz < f ≤ 4.2 GHz |
| 7.5 OTA in-band general blocking | ±1.9 dB, f ≤ 3.0 GHz±2.2 dB, 3.0 GHz < f ≤ 4.2 GHz |
| 7.6.2 OTA blocking | fwanted ≤ 3 GHz1 MHz < finterferer ≤ 3 GHz: ±2.0 dB3 GHz < finterferer ≤ 6 GHz: ±2.1 dB6 GHz < finterferer ≤ 12.75 GHz: ±3.5 dB3 GHz < fwanted ≤ 4.2GHz:1 MHz < finterferer ≤ 3 GHz: ±2.0 dB3 GHz < finterferer ≤ 6 GHz: ±2.1 dB6 GHz < finterferer ≤ 12.75 GHz: ±3.6 dB |
| 7.6.3 OTA co-location blocking | fwanted ≤ 3.0 GHz:±3.4 dB, finterferer ≤ 3.0 GHz±3.5 dB, 3.0 GHz < finterferer ≤ 4.2 GHz3 GHz < fwanted ≤ 4.2 GHz:±3.5 dB, finterferer ≤ 3.0 GHz±3.6 dB, 3.0 GHz < finterferer ≤ 4.2 GHz(NOTE 2)  |
| 7.7 OTA receiver spurious emissions |  ±2.5 dB, 30MHz < f ≤ 6 GHz: dB ±4.2 dB, 6 GHz < f ≤ 19 GHz |
| 7.8 OTA receiver intermodulation (general requirements) | ±2.0 dB, f ≤ 3.0 GHz±2.6 dB, 3.0 GHz < f ≤ 4.2 GHz |
| 7.8 OTA receiver intermodulation (Narrowband requirements) | ±2.0 dB, f ≤ 3.0 GHz±2.6 dB, 3.0 GHz < f ≤ 4.2 GHz |
| 7.9 OTA in-channel selectivity | ±1.7 dB, f ≤ 3.0 GHz±2.1 dB, 3.0 GHz < f ≤ 4.2 GHz |
| NOTE 1: Unless otherwise noted, only the Test System stimulus error is considered here. The effect of errors in the throughput measurements or the BER/FER due to finite test duration is not considered.NOTE 2: Fulfilling the criteria for CLTA selection and placement in clause 4.15 is deemed sufficient for the test purposes. When these criteria are met, the measurement uncertainty related to the selection of the co-location test antenna and its alignment as specified in the appropriate measurement uncertainty budget in TR 37.941 [38], shall be used for evaluating the test system uncertainty. |

*------------------------------ Next modified section ------------------------------*

### 8.3.2 Definitions and applicability

Definitions of radiated performance requirements in *single RAT UTRA operation* in FDD and their applicability are the same as defined in TS 25.141 [10], in requirement's specific "Definition and applicability" subclauses within 8.2 ‑ 8.13 subcluases.

The following limitation apply for the radiated performance requirements in *single RAT UTRA operation* in FDD:

- All the radiated performance requirements referred from TS 25.141 [10] are subject to 2Rx limitation in the OTA test setup, as captured in subclause 8.1.1.

- If the OTA AAS BS does not use polarisation diversity then performance requirements only apply to a single *demodulation branch* (i.e. 1TX-1RX test setup).

- If the OTA AAS BS uses polarisation diversity and has the ability to maintain isolation between the performance requirements signals for each of the *demodulation branches,* then performance requirements can be applied to up to two *demodulation branches* (i.e. 1TX-2RX test setups).

NOTE: for the list of BS demodulation requirements which were found to be feasible in OTA test setup with the above 2Rx limitation, refer to TR 37.941 [38].

- For FRC8 in TS 25.104 [2] the non E-DPCCH boosting and E-DPCCH boosting requirement only apply for the option supported by the OTA AAS BS.

- Performance of signalling detection for 4C-HSDPA HS-DPCCH test shall be performed only for the BS supporting 4C-HSDPA.

- Performance of signalling detection for 8C-HSDPA HS-DPCCH test shall be performed only for the BS supporting 8C-HSDPA.

- The performance requirements for the high speed train scenarios defined in TS 25.104 [2] are optional.

*------------------------------ Next modified section ------------------------------*

### 8.4.2 Definitions and applicability

Definitions of radiated performance requirements in *single RAT E-UTRA operation* and their applicability are the same as defined in TS 36.141 [12], in requirement's specific "Definition and applicability" subclauses within 8.2 ‑ 8.4 subcluases.

The following limitation apply for the radiated performance requirements in *single RAT E-UTRA operation*:

- All the radiated performance requirements referred from TS 36.141 [12] are subject to 2Rx limitation in the OTA test setup, as captured in subclause 8.1.1.

- If the OTA AAS BS does not use polarisation diversity then performance requirements only apply to a single *demodulation branch* (i.e. 1TX-1RX test setup).

- If the OTA AAS BS uses polarisation diversity and has the ability to maintain isolation between the performance requirements signals for each of the *demodulation branches,* then performance requirements can be applied to up to two *demodulation branches* (i.e. 1TX-2RX test setups).

NOTE: for the list of BS demodulation requirements which were found to be feasible in OTA test setup with the above 2Rx limitation, refer to TR 37.941 [38].

- A test for a specific channel bandwidth is only applicable if the BS supports it. For a BS supporting multiple channel bandwidths only the tests for the lowest and the highest channel bandwidths supported by the BS are applicable.

- The performance requirements for High Speed Train conditions are optional.

- The performance requirements for UL timing adjustment scenario 2 are optional.

- Performance requirements for coverage enhancments are applicable only to the AAS BS supporting coverage enhancement configured with CEModeA. This applies to the following requirements:

- Requirements for PUSCH supporting coverage enhancement

- Requirements for PUSCH supporting Cat-M1 UEs

- PUCCH performance requirements for supporting Cat-M1 UEs

- PRACH missed detection, Cat-M1 mode

- The enhaced performance requirements apply to AAS BS supporting the enhanced performance requirements type A and/or type B.

- Performance requirements for NB-IoT are not applicable to AAS BS.

For PUSCH performance requiremetns, the FRCs for the throughput performance metric derivation are listed in TS 36.141 [12], annex A.

*------------------------------ Next modified section ------------------------------*

Annex A (normative):
Test system characterization

The radiated measurement methods for AAS BS conformance testing were described in TR 37.941 [38], including descriptions of their limitations and testing applicability.

*------------------------------ Next modified section ------------------------------*

Annex B (normative):
Calibration

The radiated measurement methods for AAS BS conformance testing were described in TR 37.941 [38]. Calibration stage description was covered for each of the identified Test Systems in the measurement's procedure description, which covered two distinct stages: calibration stage and measurement stage. This has been separately covered for transmitter and for receiver requirements.

*------------------------------ Next modified section ------------------------------*

Annex E (normative):
Estimation of Measurement Uncertainty

# E.1 General

Common measurement uncertainty budget calculation principle, was described in TR 37.941 [38].

# E.2 Measurement methodology descriptions

The AAS BS radiated measurement method descriptions, including description of the calibration stage, and the measurement stage, are described separately for each of the OTA tests, i.e. for radiated transmit power and for OTA sensitivity test in TR 37.941 [38].

# E.3 Measurement uncertainty budget format

Each test methodology is characterized by different uncertainty contributors. Moreover, within single test methodology, certain uncertainty contributors will need to be modified, depending on the transmitter, or receiver test. Therefore, separate uncertainty budget format were collected for all considered Test Systems in TR 37.941 [38], specifying uncertainty contributors for calibration stage, as well as measurement stage.

# E.4 Measurement uncertainty budgets

Descriptions of uncertainty assessment for radiated transmit power and for OTA sensitivity test were described separately for each of the considered Tests Systems as in TR 37.941 [38].

# E.5 Measurement error contribution descriptions

Detailed descriptions of the uncertainty contributors for the radiated transmit power and OTA sensitivity test were described separately for each of the considered Tests Systems as in TR 37.941 [38].

*----------------------------- End of modified section ------------------------------*