

Partial Test Report

21-1-0178701T019a-C01



Number of pages: 27 **Date of Report:** 2023-May-10

Testing company: cetecom advanced GmbH
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Applicant: Actia Nordic AB

Product: Telematic Device
Model: 104760201

FCC ID: 2AGKK104760201 **IC:** 20839-104760201

Testing has been carried out in accordance with:

FCC Regulations
Title 47 CFR, Chapter I, Subchapter A
 Part 15, Subpart C Intentional Radiators; § 15.209 Radiated emission limits; general requirements
Title 47 CFR, Chapter I, Subchapter B
 Part 22, Subpart H Cellular Radiotelephone Service
 Part 24, Subpart E Paging and Radiotelephone Service
 Part 27, Subpart C Miscellaneous Wireless Communications Services

ISED-Regulations, Radio Standards Specification
RSS-Gen, Issue 5
 General Requirements for Compliance of Radio Apparatus
RSS-132, Issue 4
 Cellular Telephone Systems Operating in the Bands 824-849 MHz and 869-894 MHz
RSS-133, Issue 6, Amendment 1
 2 GHz Personal Communications Services
RSS-139, Issue 4
 Advanced Wireless Services (AWS) Equipment Operating in the Bands 1710-1780 MHz and 2110-2180 MHz


Tested Technology: UTRA FDD (W-CDMA)

Test Results: **The EUT complies with the requirements in respect of selected parameters subject to the test.**

The test results relate only to devices specified in this document

The current version of Test Report TR21-1-0178701T019a-C01 replaces the test report TR21-1-0178701T019a dated 2023-Mar-10. The replaced test report is herewith invalid.

Signatures:



Dipl.-Ing. Ninovic Perez
 Test Lab Manager
 Authorization of test report



Dipl.-Ing. Christian Lorenz
 (Senior) Test Manager
 Responsible of test report

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1 General information

1.1 Disclaimer and Notes

The test results of this test report relate exclusively to the test item specified in this test report as specified in chapter 2.7. cetecom advanced does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item.

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Also we refer on special conditions which the applicant should fulfill according §2.927 to §2.948, special focus regarding modification of the equipment and availability of sample equipment for market surveillance tests.

1.2 Attestation

I declare that all measurements were performed by me or under my supervision and that all measurements have been performed and are correct to my best knowledge and belief to Industry Canada standards. All of the above requirements are met in accordance with enumerated standards.

1.3 Summary of Test Results

| Test case in W-CDMA2 | Reference Clause FCC | Reference Clause ISED | Page | Remark | Result |
|--|---|-------------------------------------|------|--------|--------|
| AC-Power Lines Conducted Emissions | §15.207(a) | RSS-Gen, Issue 5:§8.8 | -- | -- | N/A |
| Conducted RF output power | §2.1046(a) | RSS-133:4.1/6.4 + SRSP-510:5.1.2 | 13 | -- | PASSED |
| Radiated RF output power | §24.232(c), §2.1046(a) | RSS-133:6.4 + SRSP-510:5.1.2 | -- | -- | NP |
| Occupied Channel Bandwidth 99% | §24.238(b), §2.1049(h) | RSS-Gen, Issue 5:§6.6 | -- | -- | NP |
| 26dB Emission bandwidth | §24.238(b), §2.1049(h) | RSS-Gen, Issue 5:§6.6 | -- | -- | NP |
| Radiated Band Edge | §24.238(a)(b), §2.1053(a), §2.1057(a) | RSS-133, Issue 6: §6.5.1(i)(ii) | 22 | -- | PASSED |
| Conducted RF Band Edge | §24.238(a)(b), §2.1051 | RSS-133, Issue 6: §6.5.1(i)(ii) | -- | -- | NP |
| Peak to Average ratio (PAPR) | §2.1046(a) | RSS-133:4.1/6.4 + SRSP-510:5.1.2 | -- | -- | NP |
| Radiated field strength emissions below 30 MHz | §15.205, §15.209 | RSS-Gen: Issue 5: §8.9 Table 6 | 17 | -- | PASSED |
| Spurious emissions at antenna terminals | §24.238(a)(b), §2.1051 | RSS-133, Issue 6: §6.5.1(i)(ii) | -- | -- | NP |
| Radiated spurious emissions | §24.238(a)(b), §2.1053(a) | RSS-133, Issue 6: §6.5.1(i)(ii) | 20 | -- | PASSED |
| Frequency stability, temperature variation | §24.235, §2.1055(a)(1) | RSS-133: 6.3 | -- | -- | NP |
| Frequency stability, voltage variation | §15.207(a) | RSS-Gen, Issue 5:§8.8 | -- | -- | NP |

| Test case in W-CDMA4 | Reference Clause FCC | Reference Clause ISED | Page | Remark | Result |
|--|-------------------------------------|-------------------------------------|------|--------|--------|
| AC-Power Lines Conducted Emissions | §15.207(a) | RSS-Gen, Issue 5:§8.8 | -- | -- | N/A |
| Conducted RF output power | §27.50(d)(4), §2.1046 | RSS-139, Issue 4:§6.5 | 13 | -- | PASSED |
| Radiated RF output power | §27.50(d)(4), §2.1046(a) | RSS-139, Issue 4: 6.5 + SRSP-513 | -- | -- | NP |
| Occupied Channel Bandwidth 99% | §27.53(h)(3), §2.202(a) | RSS-Gen, Issue 5:§6.6 | -- | -- | NP |
| 26dB Emission bandwidth | §27.53(h)(3), §2.202(a) | RSS-Gen, Issue 5:§6.6 | -- | -- | NP |
| Radiated Band Edge | §27.53(h), §2.1053(a) §2.1057(a) | RSS-139, Issue 4: 6.6 (i)(ii) | 22 | -- | PASSED |
| Conducted RF Band Edge | §27.53(h), §2.1051 | RSS-139, Issue 4: §6.6 (i)(ii) | -- | -- | NP |
| Peak to Average ratio (PAPR) | §27.50(d)(4), §2.1046 | RSS-139, Issue 4:§6.5 | -- | -- | NP |
| Radiated field strength emissions below 30 MHz | §15.205, §15.209 | RSS-Gen: Issue 5: §8.9 Table 6 | 17 | -- | PASSED |
| Spurious emissions at antenna terminals | §27.53(h), §2.1051 | RSS-139, Issue 4: §6.6 (i)(ii) | -- | -- | NP |
| Radiated spurious emissions | §27.53(h), §2.1053(a) | RSS-139, Issue 4: §6.6 (i)(ii) | 20 | -- | PASSED |
| Frequency stability, temperature variation | §27.54, §2.1055(a)(1) | RSS-139, Issue 4:§6.4 | -- | -- | NP |
| Frequency stability, voltage variation | §15.207(a) | RSS-Gen, Issue 5:§8.8 | -- | -- | NP |

| Test case in W-CDMA5 | Reference Clause FCC | Reference Clause ISED | Page | Remark | Result |
|--|---|-----------------------------------|------|--------|--------|
| AC-Power Lines Conducted Emissions | §15.207(a) | RSS-Gen, Issue 5:§8.8 | -- | -- | N/A |
| Conducted RF output power | §22.913(a)(5), §2.1046 | RSS-132:5.4 + SRSP 503:5.1.3 | 13 | -- | PASSED |
| Radiated RF output power | §22.913, §2.1046(a) | RSS-132: 5.4 + SRSP 503:5.1.3 | -- | -- | NP |
| Occupied Channel Bandwidth 99% | §22.917(b), §2.1049(h) | RSS-Gen, Issue 5:§6.6 | -- | -- | NP |
| 26dB Emission bandwidth | §22.917(b), §2.1049(h) | RSS-Gen, Issue 5:§6.6 | -- | -- | NP |
| Radiated Band Edge | §22.917(a)(b), §2.1053(a), §2.1057(a) | RSS-132, Issue 4: §5.5(i)(ii) | 22 | -- | PASSED |
| Conducted RF Band Edge | §22.917(a)(b), §2.1051 | RSS-132, Issue 4: §5.5(i)(ii) | -- | -- | NP |
| Peak to Average ratio (PAPR) | §22.913(a)(5), §2.1046 | RSS-132:5.4 + SRSP 503:5.1.3 | -- | -- | NP |
| Radiated field strength emissions below 30 MHz | §15.205, §15.209 | RSS-Gen: Issue 5: §8.9 Table 6 | 17 | -- | PASSED |
| Spurious emissions at antenna terminals | §22.917(a)(b), §2.1051 | RSS-132, Issue 4: §5.5(i)(ii) | -- | -- | NP |
| Radiated spurious emissions | §22.917(a)(b), §2.1053(a) | RSS-132, Issue 4: §5.5(i)(ii) | 20 | -- | PASSED |
| Frequency stability, temperature variation | §22.355, §2.1055(a)(1) | RSS-132: 5.3 | -- | -- | NP |
| Frequency stability, voltage variation | §22.355, §2.1055(a)(1) | RSS-132: 5.3 | -- | -- | NP |

PASSED The EUT complies with the essential requirements in the standard.
 FAILED The EUT does not comply with the essential requirements in the standard.
 N/A Test case does not apply to the test object.
 NP The test was not performed by the cetecom advanced laboratory.

Decision Rule: cetecom advanced GmbH follows [ILAC G8:2019 chapter 4.2.1 \(Simple Acceptance Rule\)](#).

Remarks:

- Please check the module report “**200722013RFM-1**” issued on 2021-Jan-06 by Shenzhen UnionTrust Quality and Technology Park, for not performed measurements by the cetecom advanced laboratory.

1.4 Summary of Test Methods

| Test case | Test method |
|--|--|
| AC-Power Lines Conducted Emissions | ANSI C63.4-2014, §7, ANSI C63.10-2013 § 6.2 |
| Conducted RF output power | ANSI C63.26:2015, §5.2, KDB 971168 D01 v03r01 |
| Radiated RF output power | ANSI C63.26:2015, §5.2.7, KDB 971168 D01 v03r01 |
| Occupied Channel Bandwidth 99% | ANSI C63.26:2015, §5.4.4, KDB 971168 D01 v03r01 |
| 26dB Emission bandwidth | ANSI C63.26:2015, §5.4.3, KDB 971168 D01 v03r01 |
| Modulation characteristics | ANSI C63.26:2015, §5.3 |
| Radiated Band Edge | ANSI C63.26:2015, §5.5, KDB 971168 D01 v03r01 |
| Conducted RF Band Edge | ANSI C63.26:2015, §5.7, KDB 971168 D01 v03r01 |
| Peak to Average ratio (PAPR) | ANSI C63.26:2015, §5.2.6 Result calculated with measured conducted RF-power value and stated/measured antenna gain for band of interest |
| Radiated field strength emissions below 30 MHz | ANSI C63.4-2014 §5.3, §8.2.1, §8.3.1.1+§8.3.2.1 |
| Spurious emissions at antenna terminals | ANSI C63.26:2015, §5.7, KDB 971168 D01 v03r01 |
| Radiated spurious emissions | ANSI C63.26:2015, §5.5, KDB 971168 D01 v03r01, ANSI C63.26.1:2018 |
| Frequency stability, temperature variation | ANSI C63.26:2015, §5.6, KDB 971168 D01 v03r01 |
| Frequency stability, voltage variation | ANSI C63.26:2015, §5.6, KDB 971168 D01 v03r01 |

2 Administrative Data

2.1 Identification of the Testing Laboratory

| | |
|-------------------------------------|--|
| Company name: | cetecom advanced GmbH |
| Address: | Im Teelbruch 116 45219 Essen - Kettwig Germany |
| Responsible for testing laboratory: | Dipl.-Ing. Ninovic Perez |
| Accreditation scope: | DAkkS Webpage: FCC ISED |
| IC Lab company No. / CAB ID: | 3462D / DE0005 |
| Test location: | Im Teelbruch 116; 45219 Essen |

2.2 General limits for environmental conditions

| | |
|---------------------|-----------|
| Temperature: | 22±2 °C |
| Relative. humidity: | 45±15% rH |

2.3 Test Laboratories sub-contracted

| | |
|---------------|----|
| Company name: | -- |
|---------------|----|

2.4 Organizational Items

| | |
|---------------------------|-----------------------------|
| Responsible test manager: | Dipl.-Ing. Christian Lorenz |
| Receipt of EUT: | 2022-Oct-31 |
| Date(s) of test: | 2022-Nov-22 to 2023-Jan-23 |
| Version of template: | 22.1101 |

2.5 Applicant's details

| | |
|-------------------------|--|
| Applicant's name: | Actia Nordic AB |
| Address: | Datalinjen 3b 58330 Linköping Sweden |
| Contact Person: | Salah Alazawi |
| Contact Person's Email: | salah.alazawi@actia.se |

2.6 Manufacturer's details

| | |
|----------------------|--|
| Manufacturer's name: | Actia Nordic AB |
| Address: | Datalinjen 3b 58330 Linköping Sweden |

2.7 Equipment under Test (EUT)

| EUT No. *) | Sample No. | Product | Model | Type | SN | HW | SW |
|------------|-------------------|------------------|-----------|------|--------------------|----|----|
| EUT 1 | 21-1-01787S50_C01 | Telematic Device | 104760201 | N/A | 9100022000000 7 | H1 | 1 |
| EUT 2 | 21-1-01787S51_C01 | Telematic Device | 104760201 | N/A | 9100022000000 8 | H1 | 1 |
| EUT 3 | 21-1-01787S52_C01 | Telematic Device | 104760201 | N/A | 9100022000000 3 | H1 | 1 |
| EUT 4 | 21-1-01787S57_C01 | Telematic Device | 104760201 | N/A | 9100001000024 0 | H1 | 1 |

*) EUT short description is used to simplify the identification of the EUT in this test report.

2.8 Untested Variant (VAR)

| VAR No. *) | Sample No. | Product | Model | Type | SN | HW | SW |
|------------|------------|---------|-------|------|----|----|----|
|------------|------------|---------|-------|------|----|----|----|

*) The listed additional untested model variant(s) (VAR) is/are not object of evaluation of compliance. For further information please see Annex 5: Declaration of applicant of model differences.

If the table above does not show any other line than the headline, no untested variants are available.

2.9 Auxiliary Equipment (AE)

| AE No. *) | Sample No. | Auxiliary Equipment | Model | SN | HW | SW |
|-----------|-------------------|---------------------------------|--------------------|-----------|-----|-------|
| AE 1 | -- | Laptop | DELL | CTC522013 | -- | WIN 7 |
| AE 2 | 21-1-01787S31_C01 | Cellular, GNSS and WIFI Antenna | SmartDisc II Combi | N/A | N/A | N/A |

*) AE short description is used to simplify the identification of the auxiliary equipment in this test report. If the table above does not show any other line than the headline, no AE was used during testing nor was taken into account for evaluation

2.10 Connected cables (CAB)

| CAB No. *) | Sample No. | Cable Type | Connectors / Details | Length |
|------------|-------------------|---------------|----------------------|--------|
| CAB 1 | 21-1-01787S37_C01 | USB/CAN cable | -- | < 3 m |
| CAB 2 | 21-1-01787S43_C01 | Main Harness | -- | < 3 m |

*) CAB short description is used to simplify the identification of the connected cables in this test report. If the table above does not show any other line than the headline, no cable was used during testing nor was taken into account for evaluation

2.11 Software (SW)

| SW No. *) | Sample No. | SW Name | Description | SW Status |
|-----------|-------------------|---------|-------------------------|-----------|
| SW 1 | 21-1-01787S63_C01 | ACU6 | PC software application | V1.1.0.9 |

*) SW short description is used to simplify the identification of the used software in this test report. If the table above does not show any other line than the headline, no SW was used during testing nor was taken into account for evaluation.

2.12 EUT set-ups

| set-up no. *) | Combination of EUT and AE | Description |
|---------------|-------------------------------------|---------------------------------|
| 1 | EUT 1 + AE 1 + AE 2 + CAB 1 + CAB 2 | Used for Radiated measurements |
| 2 | EUT 2 + AE 1 + AE 2 + CAB 1 + CAB 2 | Used for Radiated measurements |
| 3 | EUT 3 + AE 1 + AE 2 + CAB 1 + CAB 2 | Used for Radiated measurements |
| 4 | EUT 4 + AE 1 + CAB 1 + CAB 2 | Used for Conducted measurements |

*) EUT set-up no. is used to simplify the identification of the EUT set-up in this test report.

2.13 EUT operation modes

| EUT operating mode no. *) | Operating modes | Additional information |
|---------------------------|----------------------|--|
| Operating mode 1 | W-CDMA FDD 2 Traffic | Frequency / channel range (Low/Mid/High): Channel: UL: 9262/ 9400/ 9538 A Communication link has been established between Radio Communication Tester CMU200 and EUT, Max. UPL. Power-Level RMC-Mode and/or HSUPA |
| Operating mode 2 | W-CDMA FDD 4 Traffic | Frequency / channel range (Low/Mid/High): Channel: UL: 1312/ 1450/ 1513 A Communication link has been established between Radio Communication Tester CMU200 and EUT, Max. UPL. Power-Level RMC-Mode and/or HSUPA |
| Operating mode 3 | W-CDMA FDD 5 Traffic | Frequency / channel range (Low/Mid/High): Channel: UL: 4132/ 4185/ 4233 A Communication link has been established between Radio Communication Tester CMU200 and EUT, Max. UPL. Power-Level RMC-Mode and/or HSUPA |

*) EUT operating mode no. is used to simplify the test report.

3 Equipment under test (EUT)

3.1 General Data of Main EUT as Declared by Applicant

| | | | |
|---|--|--|---------------------------|
| Firmware | <input type="checkbox"/> for normal use | <input checked="" type="checkbox"/> Special version for test execution | |
| Power supply | <input type="checkbox"/> AC Mains | - | |
| | <input checked="" type="checkbox"/> DC Mains | 12 V DC | |
| | <input type="checkbox"/> Battery | - | |
| Operational conditions | T _{nom} = +21 °C | T _{min} = -40 °C | T _{max} = +85 °C |
| EUT sample type | Pre-Production | | |
| Weight | 0.540 kg | | |
| Size [LxWxH] | 15.4 cm x 15.1 cm x 4.0 cm | | |
| Interfaces/Ports | -- | | |
| For further details refer Applicants Declaration & following technical documents | | | |

3.2 Detailed Technical data of Main EUT as Declared by Applicant

| | | | |
|---|---|--|--------------------|
| TX Frequency range | <input checked="" type="checkbox"/> UMTS-FDD band 2 | 1850 - 1910 MHz (Uplink), 1930 - 1990 MHz (Downlink) | |
| | <input checked="" type="checkbox"/> UMTS-FDD band 4 | 1710 - 1755 MHz (Uplink), 2110 - 2155 MHz (Downlink) | |
| | <input checked="" type="checkbox"/> UMTS-FDD band 5 | 824 - 849 MHz (Uplink), 869 - 894 MHz (Downlink) | |
| Number of channels | <input checked="" type="checkbox"/> UMTS-FDD band 2 | UARFCN range 9262 - 9538 | |
| | <input checked="" type="checkbox"/> UMTS-FDD band 4 | UARFCN range 1312 - 1513 | |
| | <input checked="" type="checkbox"/> UMTS-FDD band 5 | UARFCN range 4132 - 4233 | |
| Type of modulation | RMC | | |
| Data rates | QPSK | 16-QAM | |
| Antenna Type | <input checked="" type="checkbox"/> Integrated (Backup antenna) | | |
| | <input checked="" type="checkbox"/> External, no RF- connector | | |
| | <input type="checkbox"/> External, separate RF-connector | | |
| Antenna gain | UMTS-FDD band 2: +5.9 dBi (external antenna) | | |
| | UMTS-FDD band 4: +6.0 dBi (external antenna) | | |
| | UMTS-FDD band 5: +1.4 dBi (external antenna) | | |
| FCC label attached | Yes | | |
| Test firmware / software and storage location | EUT 1, EUT 2, EUT 3, EUT 4 | | |
| For further details refer Applicants Declaration & following technical documents | | | |
| Description of Reference Document (supplied by applicant) | | Version | Total Pages |
| ACU6 OH Test Setup for Certification Testing | | 1.1 | 21 |
| MPE Information Requirements_104760201_US_CANADA_Ver1.6 | | 1.6 | -- |

3.3 Worst case identification

| UMTS mode | Data rate |
|--------------|-----------------|
| WCDMA FDD V | RMC high ch9262 |
| WCDMA FDD II | RMC low ch1413 |
| WCDMA FDD IV | RMC mid ch4233 |

3.4 Modifications on Test sample

| | |
|---|----|
| Additions/deviations or exclusions | -- |
|---|----|

4 Measurements

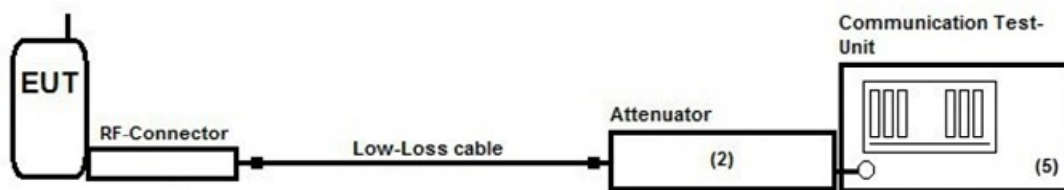
4.1 Conducted RF output power

4.1.1 Description of the general test setup and methodology, see below example:

Following modified test set-up apply for tests performed inside the climatic chamber (frequency stability) or conducted RF-carrier power-measurement. The EUT RF-Signal is directly connected over suitable RF-connector over low-loss cable and an attenuator (2) to the cellular radio communication test-unit. (5).

The measurements were performed with the integrated power measurement function of the communication test-unit. (5).

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

EUT settings

The EUT was instructed to send with maximum power (if adjustable) according applicants instructions.
The measurements were made at the low, middle and high carrier frequencies of each of the supported operating band within the designated range within the allowed channel bandwidths. Choosing three TX-carrier frequencies of the mobile phone, should be sufficient to demonstrate compliance

4.1.2 Measurement Location

| | |
|-----------|---------------------------------------|
| Test site | 120910 - Radio Laboratory 1 (TS 8997) |
|-----------|---------------------------------------|

4.1.3 Limit

| | Limit [W] | Limit [dBm] |
|-------------|-----------|-------------|
| 824 – 849 | 7 ERP | 38.5 |
| 1710 – 1755 | 1 EiRP | 30 |
| 1850 – 1910 | 2 EiRP | 33 |

4.1.4 Result

| WCDMA-Modulation Band 2 | | | | | | | | | | | | | | |
|---|-----------------------|-------------------------------------|------------------------------------|--------------------------------|----------------------------|-------------|--------------|------------|-------------|--------------------|-----------------------|---------------------|------------------------|---------|
| | ARFCN-Frequency (MHz) | Average power at Antenna Port (dBm) | Maximum declared Antenna Gain(dBi) | Path loss to Antenna Connector | Path loss in Antenna Cable | EIRP in dBm | EIRP in Watt | ERP in dBm | ERP in Watt | FCC Limit(W), EIRP | FCC Limit (dBm), EIRP | ISED Limit(W), EIRP | ISED Limit (dBm), EIRP | Verdict |
| Channel 9263 | 1852.60 | 21.69 | 5.90 | 1.25 | 0.75 | 25.59 | 0.36224 | 23.44 | 0.22080 | 2.00 | 33.01 | 2.00 | 33.01 | Passed |
| Channel 9400 | 1880.00 | 21.68 | 5.90 | 1.25 | 0.75 | 25.58 | 0.36141 | 23.43 | 0.22029 | 2.00 | 33.01 | 2.00 | 33.01 | Passed |
| Channel 9537 | 1907.40 | 21.82 | 5.90 | 1.25 | 0.75 | 25.72 | 0.37325 | 23.57 | 0.22751 | 2.00 | 33.01 | 2.00 | 33.01 | Passed |
| WCDMA-Modulation Band 4 | | | | | | | | | | | | | | |
| | ARFCN-Frequency (MHz) | Average power at Antenna Port (dBm) | Maximum declared Antenna Gain(dBi) | Path loss to Antenna Connector | Path loss in Antenna Cable | EIRP in dBm | EIRP in Watt | ERP in dBm | ERP in Watt | FCC Limit(W), EIRP | FCC Limit (dBm); EIRP | ISED Limit(W), EIRP | ISED Limit (dBm), EIRP | Verdict |
| Channel 1313 | 1712.60 | 21.57 | 6.00 | 0.96 | 0.54 | 26.07 | 0.40458 | 23.92 | 0.24660 | 1.00 | 30.00 | 1.00 | 30.00 | Passed |
| Channel 1450 | 1740.00 | 21.86 | 6.00 | 0.96 | 0.54 | 26.36 | 0.43251 | 24.21 | 0.26363 | 1.00 | 30.00 | 1.00 | 30.00 | Passed |
| Channel 1512 | 1752.40 | 21.85 | 6.00 | 0.96 | 0.54 | 26.35 | 0.43152 | 24.20 | 0.26303 | 1.00 | 30.00 | 1.00 | 30.00 | Passed |
| WCDMA-Modulation Band 5 | | | | | | | | | | | | | | |
| | ARFCN-Frequency (MHz) | Average power at Antenna Port (dBm) | Maximum declared Antenna Gain(dBi) | Path loss to Antenna Connector | Path loss in Antenna Cable | EIRP in dBm | EIRP in Watt | ERP in dBm | ERP in Watt | FCC Limit(W), ERP | FCC Limit (dBm), ERP | ISED Limit(W), EIRP | ISED Limit (dBm), EIRP | Verdict |
| Channel 4132 | 826.40 | 22.50 | 1.40 | 0.64 | 0.44 | 22.82 | 0.19143 | 20.67 | 0.11668 | 7.00 | 38.45 | 11.50 | 40.61 | Passed |
| Channel 4182 | 836.40 | 22.39 | 1.40 | 0.64 | 0.44 | 22.71 | 0.18664 | 20.56 | 0.11376 | 7.00 | 38.45 | 11.50 | 40.61 | Passed |
| Channel 4233 | 846.60 | 22.51 | 1.40 | 0.64 | 0.44 | 22.83 | 0.19187 | 20.68 | 0.11695 | 7.00 | 38.45 | 11.50 | 40.61 | Passed |
| EIRP= Average Power at Antenna Port + Maximum declared Antenna Gain - Path loss to Antenna Connector - Path loss in Antenna Cable | | | | | | | | | | | | | | |
| ERP _{dBd} = EIRP _{dbi} - 2.15 dB | | | | | | | | | | | | | | |

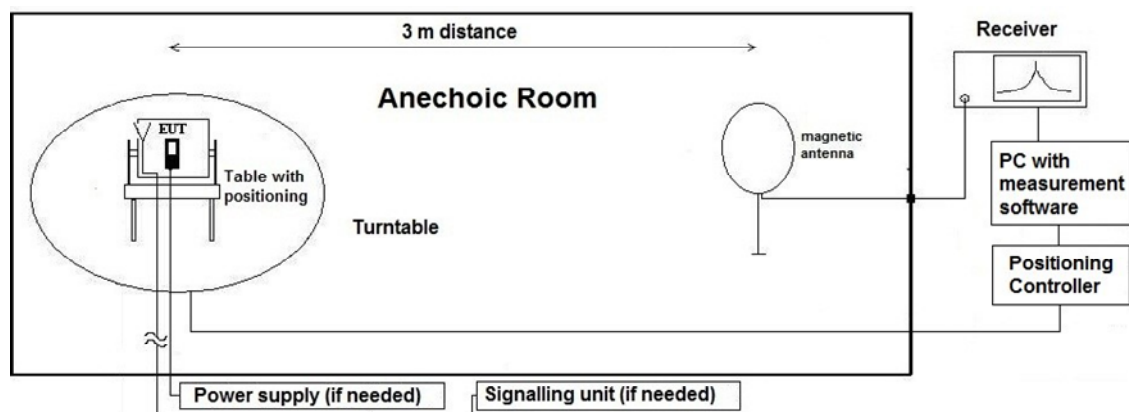
4.2 Radiated field strength emissions below 30 MHz

4.2.1 Description of the general test setup and methodology, see below example:

Evaluating the radiated field emissions are done first by an exploratory emission measurement and a final measurement for most critical frequencies determined.

The loop antenna was placed at 1 m height above ground plane and 3 m measurement distance from set-up for investigations. Because of reduced measurement distance, correction data were applied, as stated in chapter "General Limit - Radiated field strength emissions below 30 MHz". The tests are performed in the semi anechoic room recognized by the regulatory commission.

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 0.8 m height which is placed on the turntable. By rotating the turntable (step 90°, range 0° to 360°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT), the emission spectrum was recorded.

The loop antenna was moved at least to 2-perpendicular axes (antenna vector in direction of EUT and parallel to EUT) in order to maximize the emissions. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a data reduction table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by main-taining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself either over 3-orthogonal axis (not defined usage position) or 2-orthogonal axis (defined usage position).

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A$$

$$M = L_T - E_C$$

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor (if used)

E_C = Electrical field – corrected value

E_R = Receiver reading

G_A = Gain of pre-amplifier (if used)

L_T = Limit

M = Margin

All units are dB-units, positive margin means value is below limit.

4.2.2 Sample calculation

| Raw-Value [dBuV/m] | Antenna factor | Distance Correction [dB] | Cable Loss | Preamplifier | Resulting correction value [dB] | Final result [dBuV/m] | Remarks |
|--------------------|----------------|--------------------------|------------|--------------|---------------------------------|-----------------------|--|
| 19.83 | 18.9 | -70.75 | 0.18 | -- | -51.67 | -31.83 | 30 to 3 m correction used according ANSI C63.10-2013 |

Remark: This calculation is based on an example value at 458 kHz

4.2.3 Correction factors due to reduced meas. distance (f < 30 MHz):

The used correction factors when the measurement distance is reduced compared to regulatory measurement distance, are calculated according Extrapolation formulas valid for EUT's with maximum dimension of 0.625xLambda. Formula 2+3+4 as presented in ANSI C63.10, Chapter 6.4.4 are used for the calculations of proper extrapolation factors

| Frequency Range | f [kHz/MHz] | Lambda [m] | Far-Field Point [m] | Distance Limit accord. 15.209 [m] | 1st Condition (dmeas < Dnear-field) | 2nd Condition (Limit distance bigger dnear-field) | Distance Correction accord. Formula |
|-----------------|-------------|------------|---------------------|-----------------------------------|-------------------------------------|---|-------------------------------------|
| kHz | 9 | 33333.33 | 5305.17 | 300 | fulfilled | not fulfilled | -80.00 |
| | 10 | 30000.00 | 4774.65 | | fulfilled | not fulfilled | -80.00 |
| | 20 | 15000.00 | 2387.33 | | fulfilled | not fulfilled | -80.00 |
| | 30 | 10000.00 | 1591.55 | | fulfilled | not fulfilled | -80.00 |
| | 40 | 7500.00 | 1193.66 | | fulfilled | not fulfilled | -80.00 |
| | 50 | 6000.00 | 954.93 | | fulfilled | not fulfilled | -80.00 |
| | 60 | 5000.00 | 795.78 | | fulfilled | not fulfilled | -80.00 |
| | 70 | 4285.71 | 682.09 | | fulfilled | not fulfilled | -80.00 |
| | 80 | 3750.00 | 596.83 | | fulfilled | not fulfilled | -80.00 |
| | 90 | 3333.33 | 530.52 | | fulfilled | not fulfilled | -80.00 |
| | 100 | 3000.00 | 477.47 | | fulfilled | not fulfilled | -80.00 |
| | 125 | 2400.00 | 381.97 | | fulfilled | not fulfilled | -80.00 |
| | 200 | 1500.00 | 238.73 | | fulfilled | fulfilled | -78.02 |
| | 300 | 1000.00 | 159.16 | | fulfilled | fulfilled | -74.49 |
| | 400 | 750.00 | 119.37 | | fulfilled | fulfilled | -72.00 |
| | 490 | 612.24 | 97.44 | | fulfilled | fulfilled | -70.23 |
| | 500 | 600.00 | 95.49 | | fulfilled | not fulfilled | -40.00 |
| | 600 | 500.00 | 79.58 | | fulfilled | not fulfilled | -40.00 |
| | 700 | 428.57 | 68.21 | | fulfilled | not fulfilled | -40.00 |
| | 800 | 375.00 | 59.68 | | fulfilled | not fulfilled | -40.00 |
| 900 | 333.33 | 53.05 | fulfilled | not fulfilled | -40.00 | | |
| MHz | 1.00 | 300.00 | 47.75 | 30 | fulfilled | not fulfilled | -40.00 |
| | 1.59 | 188.50 | 30.00 | | fulfilled | not fulfilled | -40.00 |
| | 2.00 | 150.00 | 23.87 | | fulfilled | fulfilled | -38.02 |
| | 3.00 | 100.00 | 15.92 | | fulfilled | fulfilled | -34.49 |
| | 4.00 | 75.00 | 11.94 | | fulfilled | fulfilled | -32.00 |
| | 5.00 | 60.00 | 9.55 | | fulfilled | fulfilled | -30.06 |
| | 6.00 | 50.00 | 7.96 | | fulfilled | fulfilled | -28.47 |
| | 7.00 | 42.86 | 6.82 | | fulfilled | fulfilled | -27.13 |
| | 8.00 | 37.50 | 5.97 | | fulfilled | fulfilled | -25.97 |
| | 9.00 | 33.33 | 5.31 | | fulfilled | fulfilled | -24.95 |
| | 10.00 | 30.00 | 4.77 | | fulfilled | fulfilled | -24.04 |
| | 10.60 | 28.30 | 4.50 | | fulfilled | fulfilled | -23.53 |
| | 11.00 | 27.27 | 4.34 | | fulfilled | fulfilled | -23.21 |
| | 12.00 | 25.00 | 3.98 | | fulfilled | fulfilled | -22.45 |
| | 13.56 | 22.12 | 3.52 | | fulfilled | fulfilled | -21.39 |
| | 15.00 | 20.00 | 3.18 | | fulfilled | fulfilled | -20.51 |
| | 15.92 | 18.85 | 3.00 | | fulfilled | fulfilled | -20.00 |
| | 17.00 | 17.65 | 2.81 | | not fulfilled | fulfilled | -20.00 |
| | 18.00 | 16.67 | 2.65 | | not fulfilled | fulfilled | -20.00 |
| | 20.00 | 15.00 | 2.39 | | not fulfilled | fulfilled | -20.00 |
| 21.00 | 14.29 | 2.27 | not fulfilled | fulfilled | -20.00 | | |
| 23.00 | 13.04 | 2.08 | not fulfilled | fulfilled | -20.00 | | |
| 25.00 | 12.00 | 1.91 | not fulfilled | fulfilled | -20.00 | | |
| 27.00 | 11.11 | 1.77 | not fulfilled | fulfilled | -20.00 | | |
| 29.00 | 10.34 | 1.65 | not fulfilled | fulfilled | -20.00 | | |
| 30.00 | 10.00 | 1.59 | not fulfilled | fulfilled | -20.00 | | |

4.2.4 Measurement Location

| | |
|-----------|--|
| Test site | 120901 - SAC - Radiated Emission <1GHz |
|-----------|--|

4.2.5 Limit

| Radiated emissions limits, 3 meters | | | | | |
|-------------------------------------|----------------------------------|---|--------------|------------|-----------|
| Frequency Range [MHz] | Limit [$\mu\text{V}/\text{m}$] | Limit [$\text{dB}\mu\text{V}/\text{m}$] | Distance [m] | Detector | RBW [kHz] |
| 0.009 – 0.09 | 2400 / f [kHz] | 67.6 – 20Log(f) (kHz) | 300 | Pk & Avg | 0.2 |
| 0.09 – 0.11 | 2400 / f [kHz] | 67.6 – 20Log(f) (kHz) | 300 | Quasi peak | 0.2 |
| 0.11 – 0.15 | 2400 / f [kHz] | 67.6 – 20Log(f) (kHz) | 300 | Pk & Avg | 0.2 |
| 0.15 – 0.49 | 2400 / f [kHz] | 67.6 – 20Log(f) (kHz) | 300 | Pk & Avg | 9 |
| 0.49 – 1.705 | 24000 / f [kHz] | 87.6 – 20Log(f) (kHz) | 30 | Quasi peak | 9 |
| 1.705 - 30 | 30 | 29.5 | 30 | Quasi peak | 9 |

*Remark: In Canada same limits apply, just unit reference is different

4.2.6 Result

| Diagram | Band | Mode | Maximum Level [$\text{dB}\mu\text{V}/\text{m}$] Frequency Range 0.009 – 30 MHz | Result |
|-----------------------|---------------|---------------------------|---|--------|
| 2.201 | W-CDMA FDD II | 1, channel 9400, standing | No peaks found | Passed |
| 2.202 | W-CDMA FDD II | 1, channel 9400, laying | No peaks found | Passed |
| 2.401 | W-CDMA FDD IV | 2, channel 1412, laying | No peaks found | Passed |
| 2.501 | W-CDMA FDD V | 3, channel 4233, laying | No peaks found | Passed |

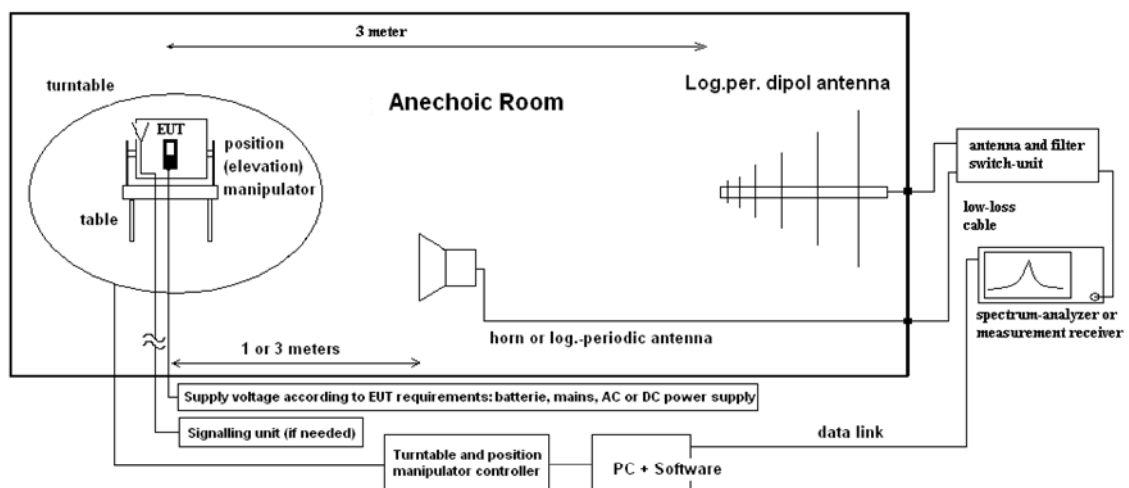
Remark: for more information and graphical plot see annex A1 **TR21-1-0178701T019a-C01-A1**

4.3 Radiated spurious emissions

4.3.1 Description of the general test setup and methodology, see below example:

Evaluating the emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a CISPR 16-1-4:2010 compliant fully anechoic room (FAR) recognized by the regulatory commission. The measurement distance was set to 3 meter for frequencies up to 18 GHz and 2 meter above 18 GHz. A logarithmic periodic antenna is used for the frequency range 30 MHz to 1 GHz. Horn antennas are used for frequency range 1 GHz to 40 GHz. The EUT is aligned within 3 dB beam width of the measurement antenna with three orthogonal axis measurements on the EUT.

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.50 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 45°) and the EUT itself on 3-orthogonal axis (the emission spectrum and it's characteristics was recorded with an EMI-receiver, broadband antenna and software.

The measurements are performed in horizontal and vertical polarization of the measurement antennas. The results are documented in a diagram. Critical frequencies (low margin to limit) are saved within a table for further investigations. If various operating modes are supported, further investigations are made to find the worst-case of them. Also the interconnection cables and equipment position were varied in order to maximize the emissions.

Final measurement on critical frequencies

Based on the exploratory measurements, the most critical frequencies are re-measured by main-taining the EUT's worst-case operation mode, cable position, etc.

First a frequency zoom around the critical frequency is done to locate the frequency more precisely. After this step, for all identified critical frequencies, the maximum peak was determined.

Following parameters were varied: the turntable angle continuously in the range 0 to 360 degree, the EUT itself over 3-orthogonal axis and the height for EUT with large dimensions.

On the determined worst-case position, a final measurement with necessary bandwidth and detector according standard has been carried out.

The readings on the spectrum analyzer are corrected with conversion value between field strength and E(I)RP, so the readings shown are equivalent to ERP/EIRP values. Critical measurements near the limit are re-measured with a substitution method accord. ANSI/TIA/EIA 603 C/D

Formula:

$$P_{EIRP} = P_{MEAS} + C_L + FSL - G_{PreA} - G_{ANT} \quad (1)$$

P_{MEAS} = measured power at instrument

M = Margin

L_T = Limit

FSL = Free Space loss = Function(frequency, measurement distance)

$$M = L_T - P_{EIRP}$$

C_L = cable loss

G_{PreA} = Gain of pre-amplifier (if used)

G_{ANT} = Gain of antenna in [dBi]

All units are dB-units, positive margin means value is below limit.

4.3.2 Measurement Location

| | |
|-----------|------------------------------------|
| Test site | 120907 - FAC2 - Radiated Emissions |
| | 120904 - FAC1 - Radiated Emissions |

4.3.3 Limit

| Frequency Range [MHz] | Limit [dBm] | Detector [MaxHold] | RBW / VBW [MHz] |
|-----------------------|-------------|--------------------|-----------------|
| 30 - 8500 | -13 | Peak | 1 / 3 |
| 30 - 17500 | -13 | Peak | 1 / 3 |
| 30 - 19100 | -13 | Peak | 1 / 3 |

4.3.4 Result

| Diagram | Band | Mode | 30 MHz to 1 GHz | 1 GHz to 9 GHz | 1 GHz to 18 GHz | 18 GHz to 19.5 GHz | Stop Freq [MHz] | Result |
|-----------------------|---------------|-----------------|-----------------|----------------|-----------------|--------------------|-----------------|--------|
| 8.03a | W-CDMA FDD IV | 2 | No peaks found | -- | -- | -- | 18 000 | Passed |
| 8.03b | W-CDMA FDD IV | 2, EUT standing | -- | No peaks found | No peaks found | No peaks found | 18 000 | Passed |
| 8.03b | W-CDMA FDD IV | 2, EUT laying | -- | No peaks found | No peaks found | No peaks found | 18 000 | Passed |
| 8.04a | W-CDMA FDD II | 1 | No peaks found | -- | -- | -- | 18 000 | Passed |
| 8.04b | W-CDMA FDD II | 1, EUT laying | -- | No peaks found | No peaks found | No peaks found | 18 000 | Passed |
| 8.04c | W-CDMA FDD II | 1, EUT standing | -- | No peaks found | No peaks found | No peaks found | 18 000 | Passed |
| 8.04d | W-CDMA FDD II | 1, EUT laying | -- | No peaks found | No peaks found | No peaks found | 19 500 | Passed |
| 8.04e | W-CDMA FDD II | 1, EUT standing | -- | No peaks found | No peaks found | No peaks found | 19 500 | Passed |
| 8.05a | W-CDMA FDD V | 3 | No peaks found | -- | -- | -- | 9 000 | Passed |
| 8.05b | W-CDMA FDD V | 3, EUT laying | -- | No peaks found | No peaks found | No peaks found | 9 000 | Passed |
| 8.05c | W-CDMA FDD V | 3, EUT standing | -- | No peaks found | No peaks found | No peaks found | 9 000 | Passed |

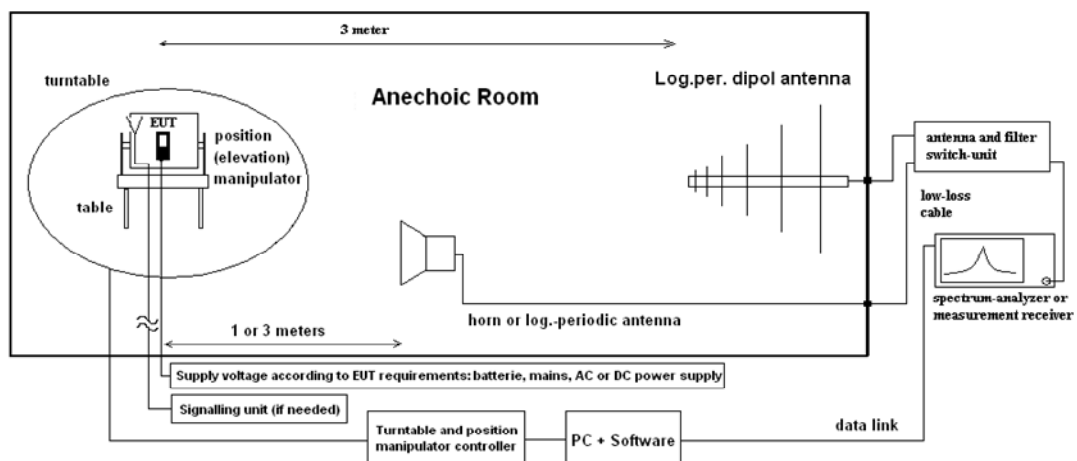
Remark: for more information and graphical plot see annex A1 **TR21-1-0178701T019a-C01-A1**

4.4 Radiated Band Edge

4.4.1 Description of the general test setup and methodology, see below example:

Evaluating the emissions have to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies. The tests are performed in a CISPR 16-1-4:2010 compliant fully anechoic room (FAR) recognized by the regulatory commission. The measurement distance was set to 3 meter for frequencies up to 18 GHz and 2 meter above 18 GHz. A logarithmic periodic antenna is used for the frequency range 30 MHz to 1 GHz. Horn antennas are used for frequency range 1 GHz to 40 GHz. The EUT is aligned within 3 dB beam width of the measurement antenna with three orthogonal axis measurements on the EUT

Schematic:



Testing method:

The measurement is made according to relevant reference clauses:
(See Tables *Summary of Test Results* and *Summary of Test Methods* on page 5)

See chapter Radiated Spurious Emission for Test method.

4.4.2 Measurement Location

| | |
|-----------|------------------------------------|
| Test site | 120907 - FAC2 - Radiated Emissions |
| | 120904 - FAC1 - Radiated Emissions |

4.4.3 Limit

| Frequency Range [MHz] | Limit [dBm] | Detector [MaxHold] | RBW / VBW [kHz] |
|---------------------------|-------------|--------------------|-----------------|
| Below 824 and above 849 | -13 | Peak | 3 / 3 |
| Below 1710 and above 1755 | -13 | Peak | 3 / 3 |
| Below 1850 and above 1910 | -13 | Peak | 3 / 3 |

4.4.4 Result

| Diagram | Band | Mode | Edge [Low / High] | Value [dBm] | Result |
|-----------------------|------------------|-------------------------------|-------------------|-------------------|--------|
| 9.01 | W-CDMA FDD V | 3, Channel 4132 | Low | No peaks found | Passed |
| 9.02a | W-CDMA FDD V | 3, Channel 4233 | High | No peaks found | Passed |
| 9.03a | W-CDMA FDD IV | 2, Channel 1312, EUT standing | Low | No peaks found | Passed |
| 9.03b | W-CDMA FDD IV | 2, Channel 1312, EUT laying | Low | No peaks found | Passed |
| 9.04a | W-CDMA FDD IV | 2, Channel 1513, EUT standing | High | No peaks found | Passed |
| 9.04b | W-CDMA FDD IV | 2, Channel 1513, EUT laying | High | No peaks found | Passed |
| 9.05a | W-CDMA FDD II | 1, Channel 9262, EUT laying | Low | No peaks found | Passed |
| 9.05b | W-CDMA FDD II | 1, Channel 9262, EUT standing | Low | No peaks found | Passed |
| 9.06a | W-CDMA FDD II | 1, Channel 9538, EUT laying | High | No peaks found | Passed |
| 9.06b | W-CDMA FDD II | 1, Channel 9538, EUT standing | High | No peaks found | Passed |

Remark: for more information and graphical plot see annex A1 **TR21-1-0178701T019a-C01-A1**

4.5 Equipment lists

| ID | Description | Manufacturer | SerNo | CheckType | Last Check | Interval | Next Check |
|-------|---|--|-----------------|-----------|--------------------------------------|----------------------|--------------------------------------|
| | 120901 - SAC - Radiated Emission <1GHz | | | calchk | cal: 2015-Jul-21 chk: 2021-Jul-27 | cal: 10Y chk: 12M | cal: 2025-Jul-21 chk: 2022-Jul-27 |
| 20442 | Semi Anechoic Chamber | ETS-Lindgren GmbH / Taufkirchen | - | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20482 | filter matrix Filter matrix SAR 1 | CETECOM GmbH | - | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20574 | Biconilog Hybrid Antenna BTA-L | Frankonia GmbH / Heideck | 980026L | cal | cal: 2022-Jun-15 | cal: 36M | cal: 2025-Jun-15 |
| 20620 | Test Receiver ESU26 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 100362 | cal | cal: 2022-Jun-08 | cal: 12M | cal: 2023-Jun-08 |
| 20885 | Power Supply EA3632A | Agilent Technologies Deutschland GmbH | 75305850 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 25038 | Loop Antenna HFH2-Z2 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 879824/13 | cal | cal: 2022-Jul-04 | cal: 24M | cal: 2024-Jul-04 |
| 20376 | Horn Antenna BBHA9120 E | Schwarzbeck Mess-Elektronik OHG | BBHA 9120 E 179 | cal | cal: 2020-Apr-08 | cal: 36M | cal: 2023-Apr-08 |
| | 120904 - FAC1 - Radiated Emissions | | | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20020 | Horn Antenna 3115 (Subst 1) | EMCO Elektronik GmbH | 9107-3699 | calchk | cal: 2021-Aug-17 chk: 2013-Apr-20 | cal: 36M chk: 12M | cal: 2024-Aug-17 |
| 20066 | Notch Filter WRCT 1900/2200-5/40-10EEK | Wainwright Instruments GmbH | 5 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20121 | Notch Filter WRCB 1879,5/1880,5EE | Wainwright Instruments GmbH | 15 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20122 | Notch Filter WRCB 1747/1748 | Wainwright Instruments GmbH | 12 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20254 | High Pass Filter 5HC 2600/12750-1.5KK | Trilithic | 23042 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20287 | Pre-Amplifier 25MHz - 4GHz AMF-2D-100M4G-35-10P | Miteq Inc. | 379418 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20290 | Notch Filter WRCA 901,9/903,1SS | Wainwright Instruments GmbH | 3RR | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20291 | High Pass Filter WHJ 2200-4EE | Wainwright Instruments GmbH | 14 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20302 | Horn Antenna BBHA9170 (Meas 1) | Schwarzbeck Mess-Elektronik OHG / Schönau | 155 | cpu | chk: 2020-Apr-15 | chk: 12M | |
| 20338 | Pre-Amplifier 100MHz - 26GHz JS4-00102600-38-5P | Miteq Inc. | 838697 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20341 | Digital Multimeter Fluke 112 | Fluke Deutschland GmbH / Glottertal | 81650455 | cal | cal: 2022-May-18 | cal: 24M | cal: 2024-May-18 |
| 20439 | Ultrabroadband-Antenna HL562 | Rohde & Schwarz Messgerätebau GmbH | 100248 | calchk | cal: 2017-Mar-10 | cal: 72M chk: 12M | cal: 2023-Mar-10 |
| 20443 | CTC-FAR-EMI-RSE System CTC-FAR-EMI-RSE | ETS-Lindgren GmbH / Taufkirchen | - | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20448 | Notch Filter WRCT 1850.0/2170.0-5/40-10SSK | Wainwright Instruments GmbH | 5 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20449 | Notch Filter WRCT 824.0/894.0-5/40-8SSK | Wainwright Instruments GmbH | 1 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20484 | Pre-Amplifier 2,5GHz - 18GHz AMF-5D-02501800-25-10P | Miteq Inc. | 1244554 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20489 | Test Receiver ESU40 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 100030 | cal | cal: 2022-Jul-20 | cal: 12M | cal: 2023-Jul-20 |
| 20512 | Notch Filter WRCA 800/960-02/40-6EEK (GSM 850) | Wainwright Instruments GmbH | 24 | chk | chk: 2022-Jun-30 | chk: 12M | chk: 2023-Jun-30 |
| 20549 | Log. Per. Antenna HL025 | Rohde & Schwarz Messgerätebau GmbH | 1000060 | calchk | cal: 2021-Aug-18 | cal: 36M chk: 12M | cal: 2024-Aug-18 |
| 20558 | Fully Anechoic Chamber 1 | ETS-Lindgren GmbH / Taufkirchen | - | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20611 | Power Supply E3632A | Agilent Technologies Deutschland GmbH | KR 75305854 | cpu | | | |
| 20670 | Radio Communication Tester CMU200 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 106833 | cal | cal: 2022-May-10 | cal: 24M | cal: 2024-May-10 |
| 20690 | Spectrum Analyzer FSU | Rohde & Schwarz Messgerätebau GmbH | 100302/026 | cal | cal: 2021-May-20 | cal: 24M | cal: 2023-May-20 |
| 20700 | PC ctc662012 [FAC] | Dell Inc. | | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20720 | Measurement Software EMC32 [FAC] | Rohde & Schwarz Messgerätebau GmbH | V10.xx | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20868 | High Pass Filter AFH-07000 | AtlanTechRF | 16071300004 | chk | chk: 2021-Jun-11 | chk: 12M | chk: 2022-Jun-11 |
| | 120907 - FAC2 - Radiated Emissions | | | chk | chk: 2021-Aug-30 | chk: 18M | chk: 2023-Jan-30 |
| 20005 | AC - LISN 50 Ohm/50uH ESH2-Z5 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 861741/005 | cal | cal: 2022-May-19 | cal: 12M | cal: 2023-May-19 |
| 20133 | Horn Antenna 3115 (Meas 1) | EMCO Elektronik GmbH | 9012-3629 | cal | cal: 2020-Apr-08 | cal: 36M | cal: 2023-Apr-08 |
| 20303 | Horn Antenna BBHA9170 (Subst 1) | Schwarzbeck Mess-Elektronik OHG | 156 | cpu | | chk: 12M | |
| 20354 | DC - Power Supply 40A NGPE 40/40 | | 448 | cpu | | | |
| 20412 | Fully Anechoic Chamber 2 | ETS-Lindgren GmbH / Taufkirchen | without | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20729 | FS-Z140 | Rohde & Schwarz Messgerätebau GmbH | 101004 | cal | cal: 2020-May-26 | cal: 36M | cal: 2023-May-26 |
| 20730 | FS-Z110 | Rohde & Schwarz Messgerätebau GmbH | 101468 | cal | cal: 2020-Jun-19 | cal: 36M | cal: 2023-Jun-19 |
| 20731 | FS-Z75 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 101022 | cal | cal: 2022-May-18 | cal: 36M | cal: 2025-May-18 |
| 20732 | Signal- and Spectrum Analyzer FSW67 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 104023 | cal | cal: 2022-Jun-08 | cal: 12M | cal: 2023-Jun-08 |
| 20733 | Harmonic Mixer FS-Z220 | RPG-Radiometer Physics GmbH | 101009 | cal | cal: 2021-May-27 | cal: 36M | cal: 2024-May-27 |
| 20734 | Harmonic Mixer FS-Z325 | RPG-Radiometer Physics GmbH | 101005 | cal | cal: 2021-May-27 | cal: 36M | cal: 2024-May-27 |
| 20765 | Pickett-Potter Horn Antenna FH-PP 40-60 | RPG-Radiometer Physics GmbH / Meckenheim | 010001 | cal | cal: 2020-Sep-15 | cal: 36M | cal: 2023-Sep-15 |
| 20767 | Pickett-Potter Horn Antenna FH-PP 140-220 | RPG-Radiometer Physics GmbH / Meckenheim | 010011 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20811 | Horn Antenna ASY-SGH-124-SMA | Antenna Systems Solutions S.L | 29F14182337 | cal | cal: 2021-Oct-20 | cal: 36M | cal: 2024-Oct-20 |

| ID | Description | Manufacturer | SerNo | CheckType | Last Check | Interval | Next Check |
|-------|--|---|-------------------|-----------|------------------|------------------|------------------|
| 20812 | Pickett-Potter Horn Antenna FH-PP-325 | RPG-Radiometer Physics GmbH | 10024 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20813 | Pickett-Potter Horn Antenna FH-PP 075 | RPG-Radiometer Physics GmbH / Meckenheim | 10006 | cal | cal: 2020-Sep-09 | cal: 36M | cal: 2023-Sep-09 |
| 20814 | Pickett-Potter Horn Antenna FH-PP 140 | RPG-Radiometer Physics GmbH | 10008 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20815 | Pickett-Potter Horn Antenna FH-PP 110 | RPG-Radiometer Physics GmbH | 10014 | cal | cal: 2020-Sep-04 | cal: 36M | cal: 2023-Sep-04 |
| 20816 | SGH Antenna SGH-26-WR10 | Anteral S.L. | 1144 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20817 | Waveguide Rectangular Horn Antenna SAR-2309-22-S2 | ERAVAN | 13254-01 | cal | cal: 2020-Jul-29 | cal: 36M | cal: 2023-Jul-29 |
| 20836 | 1-18 GHz Amplifier | Wright Technologies, Inc., Inc. | 0001 | chk | | chk: 36M | |
| 20877 | IS42-08001800-16-8P Verstärker | Miteq Inc. | 2079991 / 2079992 | chk | chk: 2020-Feb-27 | chk: 36M | chk: 2020-May-27 |
| 20907 | Waveguide WR-15 attenuator STA-30-15-M2 | SAGE Millimeter Inc. | 13256-01 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20908 | Waveguide WR 10 attenuator STA-30-10-M2 | SAGE Millimeter Inc. | 13256-01 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20909 | Waveguide Horn Antenna PE9881-24 | Pasternack Enterprises, Inc. | 37/2016 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20910 | Frequency Multiplier 936VF-10/385 | MI-Wave, Millimeter Wave Products Inc. | 142 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20911 | Frequency Multiplier 938WF-10/387 | MI-Wave, Millimeter Wave Products Inc. | 141 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20912 | Low noise Amplifier Module 0.5-4GHz | RF-Lambda Europe GmbH | 19041200083 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20913 | Phase Amplitude Stable Cable Assembly DC-40GHz | RF-Lambda Europe GmbH | AC19040001 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 25457 | DRG Horn Antenna SAS-574 | A.H. Systems, Inc. / Chatsworth | 383 | cal | cal: 2022-Mar-28 | cal: 36M | cal: 2025-Mar-28 |
| | 120910 - Radio Laboratory 1 (TS 8997) | | | chk | chk: 2022-Mar-16 | chk: 12M | chk: 2023-Mar-16 |
| 20559 | Vector Signal Generator SMU200A | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 103736 | cal | cal: 2021-May-20 | cal: 24M | cal: 2023-May-20 |
| 20687 | Signal Generator SMF 100A | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 102073 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20691 | Open Switch and control Platform OSP120 | Rohde & Schwarz Messgerätebau GmbH | 101056 | cal | cal: 2020-May-13 | cal: 36M | cal: 2023-May-13 |
| 20805 | Open Switch and control Platform OSP B157WX 40GHz 8Port Switch | Rohde & Schwarz Messgerätebau GmbH | 101264 | cal | cal: 2020-May-13 | cal: 36M | cal: 2023-May-13 |
| 20866 | Signal Analyzer FSV3030 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 101247 | cal | cal: 2022-Jun-20 | cal: 12M | cal: 2023-Jun-20 |
| 20871 | NRP-281 | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 104631 | cal | cal: 2022-May-16 | cal: 12M | cal: 2023-May-16 |
| 20872 | NRX Power Meter | Rohde & Schwarz Messgerätebau GmbH / Memmingen | 101831 | cal | cal: 2022-May-17 | cal: 24M | cal: 2024-May-17 |
| 20873 | WTS-80 Schirmbox | CETECOM GmbH | P3101 | cnn | cal: - chk: - | cal: - chk: - | cal: - chk: - |
| 20904 | Climatic Chamber Climevent C/1000/70a/5 | Weiss Umwelttechnik GmbH / Reiskirchen-Lindenstruth | 58226223240010 | cal | cal: 2022-Nov-29 | cal: 24M | cal: 2024-Nov-29 |

Tools used in 'P1M1'

4.5.1 Legend

| Note / remarks | Interval of calibration & Verification |
|----------------|--|
| 12M | 12 months |
| 24M | 24 months |
| 36M | 36 months |
| 10Y | 10 Years |

| Abbreviation Check Type | Description |
|-------------------------|--|
| cnn | Calibration and verification not necessary |
| cal | Calibration |
| calchk | Calibration plus intermediate Verification |
| chk | Verification |
| cpu | Verification before usage |

5 Results from external laboratory

| | |
|------|---|
| None | - |
|------|---|

6 Opinions and interpretations

| | |
|------|---|
| None | - |
|------|---|

7 List of abbreviations

| | |
|------|---|
| None | - |
|------|---|

8 Measurement Uncertainty valid for conducted/radiated measurements

The reported uncertainties are calculated based on the standard uncertainty multiplied with the appropriate coverage factor **k**, such that a confidence level of approximately 95% is achieved. For uncertainty determination, each component used in the concrete measurement set-up was taken in account and its contribution to the overall uncertainty according its statistical distribution calculated.

| Measurement type | Frequency range of measurement | | Calculated Uncertainty based on confidence level of 95.54% | Remarks |
|--|--------------------------------|------------|--|--|
| | Start [MHz] | Stop [MHz] | | |
| Magnetic field strength | 0.009 | 30 | 4.86 | Magnetic loop antenna, Pre-amp on |
| RF-Output power (eirp) Unwanted emissions (eirp) [dB] | 30 | 100 | 4.57 | without Pre-Amp |
| | 30 | 100 | 4.91 | with PreAmp |
| | 100 | 1000 | 4.02 | without Pre-Amp |
| | 100 | 1000 | 4.26 | with PreAmp |
| | 1000 | 18000 | 4.36 | without Pre-Amp |
| | 1000 | 18000 | 5.23 | with PreAmp |
| | 18000 | 33000 | 4.92 | Schwarzbeck BBHA9170 (#20302) Antenna set-up non-waveguide antenna) |
| | 33000 | 50000 | 4.17 | Set-up for Q-Band (WR-22), non-wave guide antenna |
| | 40000 | 60000 | 4.69 | Set-up U-Band (WR-19), non-waveguide antenna |
| | 50000 | 75000 | 4.06 | External Mixer set-up V-Band (WR-15) |
| | 75000 | 110000 | 4.17 | External Mixer set-up W-Band (WR-6) |
| | 90000 | 140000 | 5.49 | External Mixer set-up F-Band (WR-8) |
| | 140000 | 225000 | 6.22 | External Mixer set-up G-Band (WR-5) |
| | 225000 | 325000 | 7.04 | External Mixer set-up (WR-3) |
| 325000 | 500000 | 8.84 | External Mixer set-up (WR-2.2) | |
| Radiated Blocking [dB] | 1000 | 18000 | 2.85 | Typical set-up with microwave generator and antenna, value for 7GHz calculated |
| | 18000 | 33000 | 4.66 | Typical set-up with microwave generator and antenna |
| | 33000 | 50000 | 3.48 | WR-22 set-up |
| | 50000 | 75000 | 3.73 | WR-15 set-up |
| | 75000 | 110000 | 4.26 | WR-6 set-up |
| Frequency Error [kHz] | 40000 | 77000 | 276.19 | calculated for 77 GHz (FMCW) carrier |
| | 6000 | 7000 | 33.92 | calculated for 6.5GHz UWB Ch.5 |
| TS 8997 conducted Parameters | 30 | 6000 | 1.11 | 1. Power measurement with Fast-sampling-detector |
| | 30 | 6000 | 1.20 | 2. Power measurement with Spectrum-Analyzer |
| | 30 | 6000 | 1.20 | 3. Power Spectrum-Density measurement |
| | 30 | 7500 | 1.20 | 4. Conducted Spurious emissions: |
| | 0.009 | 30 | 2.56 | 5. Conducted Spurious emissions: |
| | 2.4 | 2.48 | 1.95 ppm | 6a. Bandwidth / 2-Marker Method for 2.4GHz ISM |
| | 5.18 | 5.825 | 7.180 ppm | 6b. Bandwidth / 2-Marker Method for 5GHz WLAN |
| | 5.18 | 5.825 | 1.099 ppm | 7 Frequency (Marker method) for 5GHz WLAN |
| | 30 | 6000 | 0.11561µs | 8 Medium-Utilization factor / Timing |
| | 30 | 6000 | 1.85 | 9 Blocking-Level of companion device |
| 30 | 6000 | 1.62 | 9 Blocking Generator level | |
| Conducted emissions | 0.009 | 30 | 3.57 | |

9 Versions of test reports (change history)

| Version | Applied changes | Date of release |
|---------|--|-----------------|
| -- | Initial release | 2023-Mar-10 |
| C01 | Updated issue to RSS-139 and RSS-132 from 3 to 4. Addition of reference document in chapter 3.2. Updated pathloss to antenna connector and in antenna cable for WCDMA Band 2 at chapter 4.1.4. | 2023-May-10 |
| -- | -- | -- |

End Of Test Report