

TEST REPORT
 No.: 18-1-0002701T01a

According to:

FCC Regulations
 Part 15.107
 Part 15.109

for

Agilion GmbH

WIRELESS TAG EPAPER 3
WIRELESS TAG EPAPER 3 PULSE | PHASE

FCC-ID: SCF6032704







| Laboratory Accreditation and Listings | | | |
|--|--|--|---|
|  DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-01 |  FCC FEDERAL COMMUNICATIONS COMMISSION U.S.A. • MISSISSAUGA MRA US-EU 0003 |  Industry Canada Reg. No.: 3462D-2 Reg. No.: 3462D-3 |  VCEI Voluntary Controls for Electromagnetic Emissions Reg. No.: R-2666 C-2914, T-1967, G-301 |
|  WiFi ALLIANCE AUTHORIZED RF LABORATORY |  ctia Authorized Test Lab Lab Code: 20011130-00 | | |
| accredited according to DIN EN ISO/IEC 17025 | | | |
| <p align="center"> CETECOM GmbH Laboratory Radio Communications & Electromagnetic Compatibility Im Teelbruch 116 • 45219 Essen • Germany Registered in Essen, Germany, Reg. No.: HRB Essen 8984 Tel.: + 49 (0) 20 54 / 95 19-954 • Fax: + 49 (0) 20 54 / 95 19-964 E-mail: info@cetecom.com • Internet: www.cetecom.com </p> | | | |

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1. Summary of test results

The test results apply exclusively to the test samples as presented in this Report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests.

The test results apply exclusively to the test samples as presented in this Report. The CETECOM GmbH does not assume responsibility for any conclusions and generalizations taken in conjunction with other specimens or samples of the type of the item presented to tests. Also we refer on special conditions which the applicant should fulfill according FCC: §2.927 to §2.948 & ISED: RSP-100, Issue 11, special focus regarding modification of the equipment and availability of sample equipment for market surveillance tests.

- **WIRELESS TAG EPAPER 3 WIRELESS TAG EPAPER 3 PULSE | PHASE: typical non wireless digital functions & unintentional operating modes were tested according to intended use of the equipment.**

Following tests have been performed to show compliance with applicable FCC Part 15, Subpart B (Unintentional Radiators) of the CFR 47 Rules, Edition 2015 and Canadian ICES-003, Issue6 & RSS-Gen, Issue 4 standards.

1.1. TEST OVERVIEW ACCORDING FCC PART 15B AND CANADIAN RSS- OR ICES STANDARDS

| Test Cases | Port | References, Standards & Limits | | | EUT set-up | EUT op-mode | Result |
|------------------------------------|-----------------------------------|--------------------------------|---|---|------------|-------------|--------|
| | | FCC | ISED | Class | | | |
| Radiated emissions 30 MHz-1 GHz | Cabinet + Inter-connecting cables | §15.105 §15.109 | ICES-003, Issue 6 Chapter 6.2.1 Table 5 + RSS Gen, Issue4 Chapter 8.9 Table 4 + 6 | <input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B | 1 | 1 | Pass |
| Radiated emissions above 1 GHz | Cabinet + Inter-connecting cables | §15.105 §15.109 | ICES-003, Issue 6 Chapter 6.2.2 Table 7 + RSS Gen, Issue4 Chapter 8.9 Table 4 + 6 | <input type="checkbox"/> Class A <input checked="" type="checkbox"/> Class B | 1 | 1 | Pass |

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 requirements as shown in above table are met in accordance with enumerated standards.

.....
Dipl.-Ing. Niels Jeß
Responsible for test section

.....
B. Sc. H. Laayouni
Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

| | |
|-------------------------------------|--|
| Company name: | CETECOM GmbH |
| Address: | Im Teelbruch 116 45219 Essen - Kettwig Germany |
| Responsible for testing laboratory: | Dipl.-Ing. Rachid Acharkaoui |

2.2. Test location

2.2.1. Test laboratory "CTC"

| | |
|---------------|---|
| Company name: | see chapter 2.1. Identification of the testing laboratory |
|---------------|---|

2.3. Organizational items

| | |
|-----------------------------|--------------------------|
| Responsible for test report | B. Sc. H. Laayouni |
| Receipt of EUT: | 2018-06-26 |
| Date(s) of test: | 2018-06-27 to 2018-06-28 |
| Date of report: | 2018-07-05 |
| ----- | |

2.4. Applicant's details

| | |
|-------------------|--|
| Applicant's name: | Agilion GmbH |
| Address: | Blankenauer St.74 09113 Chemnitz Germany |
| Contact: | Mr. Sven Sieber |

2.5. Manufacturer's details

| | |
|----------------------|-------------------|
| Manufacturer's name: | same as Applicant |
| Address: | same as Applicant |

3. Equipment under test (EUT)

3.1. EUT: Type, S/N etc. and short descriptions used in this test report

| Short description*) | EUT | Type | S/N serial number | HW hardware status | SW software status |
|---------------------|-----------------------|---------|-------------------|--------------------|--------------------|
| EUT A | WIRELESS TAG EPAPER 3 | 6032704 | A48307 | 100010615 | 2.0.19 |

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

3.2. Auxiliary Equipment (AE): Type, S/N etc. and short descriptions

| AE short description *) | Auxiliary Equipment | Type | S/N serial number | HW hardware status | SW software status |
|-------------------------|----------------------------|------------------------------|-------------------|--------------------|---|
| AE 1 | Notebook | Acer Aspire One 722 Notebook | - | - | Windows 10 + TestModes MESH PPP SW V1.0.0 |
| AE 2 | Cable with debug interface | 1,5 m | - | - | - |

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

3.3. EUT set-ups

| EUT set-up no. *) | Combination of EUT and AE | Remarks |
|-------------------|---------------------------|--|
| set. 1 | EUT A + AE 1 + AE 2 | Radiated RF-setup, AE1 and AE2 are used bevor and after the Measurement to setup the operating mode. |

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

3.4. EUT operating modes

| EUT operating mode no. *) | Description of operating modes |
|---------------------------|---|
| Op. 1 | internal timer is activated. The timer counts the time since the last reset in milliseconds |

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

3.5. Additional declaration and description of EUT

| | | | |
|--|--|--|---|
| EUT A | <input type="checkbox"/> Table-Top <input type="checkbox"/> Floor-Standing <input type="checkbox"/> Wall-Mounted <input checked="" type="checkbox"/> Not Defined | Typical Use <input checked="" type="checkbox"/> Portable Use <input type="checkbox"/> Fixed Use <input type="checkbox"/> Vehicular Use | typical operating cycle of EUT. <input checked="" type="checkbox"/> < 0.5 sec. <input type="checkbox"/> : Not known |
| Place of use | <input checked="" type="checkbox"/> Residential, commercial and light industry <input type="checkbox"/> Industrial environment <input type="checkbox"/> vehicular use | | |
| Highest Frequency generated or used in EUT | 2480 MHz | | |
| Frequency range of radiated measurements According to Standards | Highest Frequency generated or used [MHz] | Upper frequency of Radiated Measurements [MHz] | |
| FCC § 15.33 Unintentional radiator + ISED ICES-003, Issue 6 - Chapter 6.2 Table 3 | <input type="checkbox"/> Below 1.705 <input type="checkbox"/> 1.705 - 108 <input type="checkbox"/> 108 - 500 <input type="checkbox"/> 500 -1000 <input checked="" type="checkbox"/> Above 1000 | <input type="checkbox"/> 30 <input type="checkbox"/> 1000 <input type="checkbox"/> 2000 <input type="checkbox"/> 5000 <input checked="" type="checkbox"/> 5 th harmonic of highest frequency or 40 GHz whichever is lower | |
| ISED RSS-Gen, Issue4 Chapter 6.13 | <input type="checkbox"/> Below 10000 <input type="checkbox"/> Above 10000 | <input type="checkbox"/> 30 - 10 th harmonic of highest frequency or 40 GHz whichever is lower <input checked="" type="checkbox"/> 30 - 5 th harmonic of highest frequency or 40 GHz whichever is lower | |
| EUT Power Supply Details | <input checked="" type="checkbox"/> DC <input checked="" type="checkbox"/> Internal battery 3V DC | | |
| EUT Grounding | <input checked="" type="checkbox"/> None <input type="checkbox"/> with Power Supply <input type="checkbox"/> Additional: | | |
| Does EUT contain devices susceptible to magnetic fields, e.g. Hall elements, electrodynamic microphones, etc.? | <input checked="" type="checkbox"/> Yes | <input type="checkbox"/> No | <input type="checkbox"/> : Other |

4. Description of test system set-up's

4.1. Test system set-up for AC power-line conducted emission measurements

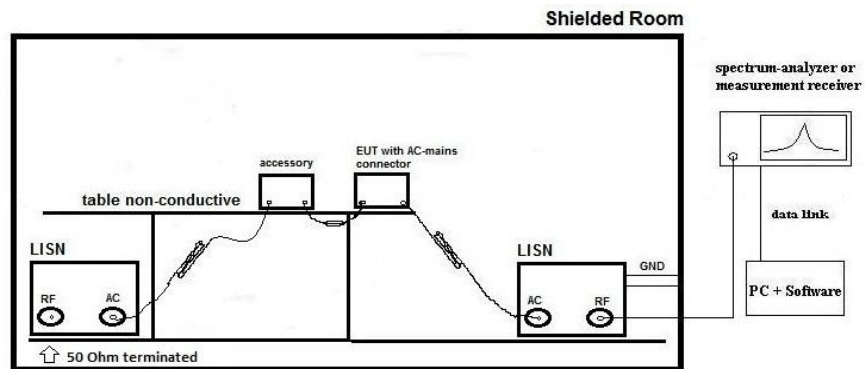
Specification: ANSI C63.4-2009 chapter 7, ANSI C63.10-2013 chapter 6.2

General Description: The radio frequency voltage conducted back into the AC power line in the frequency range 150 kHz to 30 MHz has to be investigated. Compliance should be tested by measuring the radio frequency voltage between each power line and ground at the power terminals in the stated frequency range.

A 50 Ohm / 50 μH line impedance stabilization network (LISN) is used coupling the interface to the measurement equipment. The EUT power input leads are connected through the LISN to the AC-power source. The LISN enclosure is electrically connected to the ground plane. The measuring instrument is connected to the coaxial output of the LISN.

Tabletop devices were set-up on a 80 cm height above reference ground plane, floor standing equipment 10 cm raised above ground plane. Measurements have been performed on each phase line and neutral line of the devices AC-power lines. The EUT was power supplied with 110 V/60 Hz. The EUT was tested in the defined operating mode and installed (connected) to accessory equipment according the general description of use given by the applicant.

Schematic:



Only schematic view, we refer to figure 6, 7 and 8 of ANSI C63.4-2009 for more details.

Testing method:

Exploratory, preliminary measurements as a first step, determines the worst-case phase line (neutral or phase) as well as the most critical operating mode of the equipment. A complete frequency-sweep with PK-Detector is performed on each current-carrying conductor.

Final testing for power phases and critical frequencies (Margin to AV- or QP limit lower than 3 dB) as a second step includes measurements with receivers detector set to Quasi-Peak and Average.

Formula:

$$V_C = V_R + C_L \quad (1)$$

$$M = L_T - V_C \quad (2)$$

V_C = measured Voltage –corrected value

V_R = Receiver reading

C_L = Cable loss

M = Margin

L_T = Limit

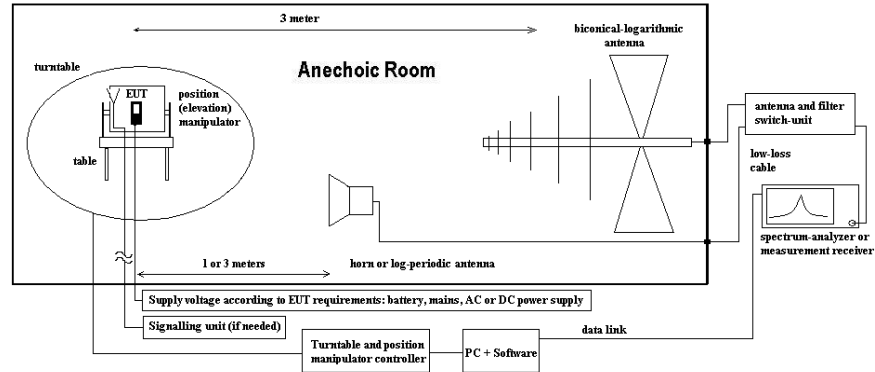
Values are in dB, positive margin means value is below limit.

4.2. Test system set-up for radiated electric field measurement 30 MHz to 1 GHz

Specification: ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.5

General Description: Evaluating the field 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 NSA-compliant semi anechoic room (SAR) recognized by the regulatory commissions.

Schematic:



Testing method:

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 (range 0° to 360°, step 90°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its characteristics was recorded with an EMI-receiver, broadband antenna and software.

Measurement antenna: horizontal and vertical, heights: 1,0 m and 1,82 m as worst-case determined by an exploratory emission measurements. 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 maintaining 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). The measurement antenna height between 1 m and 4 m.

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

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

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

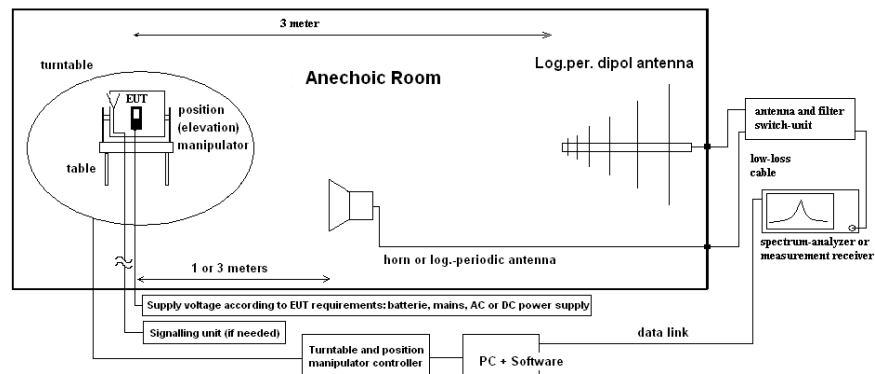
All units are dB-units, positive margin means value is below limit.

4.3. Test system set-up for radiated electric field measurement above 1 GHz

Specification: ANSI C63.4-2009 chapter 8, ANSI C63.10-2009 chapter 6.6

General Description: Evaluating the field 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 16-4 compliant fully anechoic room (FAR) recognized by the regulatory commissions. The measurement distance was set to 3 meter for frequencies up to 20 GHz and 1 meter above 20 GHz. The horn antenna is used for frequency range 1 GHz to 40 GHz. Due to use of a fully anechoic room the measurement antennas are set to fixed antenna height of 1.55 m (no height scan necessary) and the site validation criteria accord. ANSI63.10:2009 is fulfilled. The EUT is aligned within 3 dB beam width of the measurement antenna, on big EUTs several surface measurements are performed.

Schematic:



Testing method:

Exploratory, preliminary measurements

The EUT and its associated accessories are placed on a non-conductive position manipulator (tipping device) of 1.55 m height which is placed on the turntable. By rotating the turntable (range 0° to 360°, step 45°) and the EUT itself either on 3-orthogonal axis (portable equipment) or 2-orthogonal axis (defined operational position of EUT) the emission spectrum and its 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 maintaining 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). The measurement antenna height is fixed to 1.55 m.

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

Formula:

$$E_C = E_R + AF + C_L + D_F - G_A \quad (1)$$

$$M = L_T - E_C \quad (2)$$

E_C = Electrical field – corrected value

E_R = Receiver reading

M = Margin

L_T = Limit

AF = Antenna factor

C_L = Cable loss

D_F = Distance correction factor (if used)

G_A = Gain of pre-amplifier (if used)

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

5. Measurements

5.1. General Limit - Radiated field strength emissions, 30 MHz - 1 GHz

5.1.1. Test location and equipment

| | | | |
|-----------------|---|--|--|
| test location | <input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1) | <input type="checkbox"/> Please see Chapter. 2.2.2 | <input type="checkbox"/> Please see Chapter. 2.2.3 |
| test site | <input checked="" type="checkbox"/> 441 EMI SAR | <input checked="" type="checkbox"/> 487 SAR NSA | |
| receiver | <input type="checkbox"/> 377 ESCS30 | <input checked="" type="checkbox"/> 001 ESS | <input type="checkbox"/> 489 ESU 40 <input type="checkbox"/> 620 ESU 26 |
| spectr. analys. | <input type="checkbox"/> 584 FSU | <input type="checkbox"/> 120 FSEM | <input type="checkbox"/> 264 FSEK |
| antenna | <input checked="" type="checkbox"/> 574 BTA-L | <input type="checkbox"/> 133 EMCO3115 | <input type="checkbox"/> 302 BBHA9170 <input type="checkbox"/> 289 CBL 6141 <input type="checkbox"/> 030 HFH-Z2 <input type="checkbox"/> 477 GPS |
| signaling | <input type="checkbox"/> 392 MT8820A | <input type="checkbox"/> 371 CBT32 | <input type="checkbox"/> 547 CMU <input type="checkbox"/> 594 CMW |
| otherwise | <input type="checkbox"/> 400 FTC40x15E | <input type="checkbox"/> 401 FTC40x15E | <input type="checkbox"/> 110 USB LWL <input checked="" type="checkbox"/> 482 Filter Matrix |
| DC power | <input type="checkbox"/> 456 EA 3013A | <input type="checkbox"/> 457 EA 3013A | <input type="checkbox"/> 459 EA 2032-50 <input type="checkbox"/> 268 EA- 3050 <input type="checkbox"/> 494 AG6632A <input type="checkbox"/> 498 NGPE |
| Supply voltage | <input type="checkbox"/> 5 VDC <input type="checkbox"/> 060 120 V 60 Hz via PAS 5000 (for AE 1) | | |
| Supply voltage | <input checked="" type="checkbox"/> 3 V DC (fully charged internal battery) | | |

5.1.2. Requirements/Limits

| | | | |
|--------------|-----------------|---|---------------------------|
| FCC | | <input checked="" type="checkbox"/> Part 15 Subpart B, §15.109, Class B <input type="checkbox"/> Part 15 Subpart C, §15.209 @ frequencies defined in §15.205 | |
| ISED | | <input checked="" type="checkbox"/> RSS-Gen, Issue 4, Chapter 8.9, Table 4+6 <input checked="" type="checkbox"/> ICES-003, Issue 6, Chapter 6.2.1, Table 5 Class B | |
| ANSI | | <input checked="" type="checkbox"/> C63.4-2014 <input type="checkbox"/> C63.10-2009 | |
| Limit | Frequency [MHz] | Radiated emissions limits, 3 meters | |
| | | QUASI Peak [μ V/m] | QUASI-Peak [dB μ V/m] |
| | 30 - 88 | 100 | 40.0 |
| | 88 - 216 | 150 | 43.5 |
| | 216 - 960 | 200 | 46.0 |
| | above 960 | 500 | 54.0 |

5.1.3. Test condition and measurement test set-up

| | | | | |
|---------------------------------------|-----------------------|---|--|--|
| Signal link to test system (if used): | | <input type="checkbox"/> air link | <input checked="" type="checkbox"/> cable connection | <input type="checkbox"/> none |
| EUT-grounding | | <input checked="" type="checkbox"/> none | <input type="checkbox"/> with power supply | <input type="checkbox"/> additional connection |
| Equipment set up | | <input checked="" type="checkbox"/> table top 0.8m height | | <input type="checkbox"/> floor standing |
| Climatic conditions | | Temperature: (22 \pm 3 $^{\circ}$ C) | | Rel. humidity: (40 \pm 20)% |
| EMI-Receiver (Analyzer) Settings | Scan frequency range: | <input checked="" type="checkbox"/> 30 – 1000 MHz <input type="checkbox"/> other: | | |
| | Scan-Mode | <input checked="" type="checkbox"/> 6 dB EMI-Receiver Mode <input type="checkbox"/> 3 dB spectrum analyser mode | | |
| | Detector | Peak / Quasi-peak | | |
| | RBW/VBW | 100 kHz/300 kHz | | |
| | Mode: | Repetitive-Scan, max-hold | | |
| | Scan step | 80 kHz | | |
| | Sweep-Time | Coupled – calibrated display if continuous tx-signal otherwise adapted to EUT's individual duty-cycle | | |
| General measurement procedures | | Please see chapter "Test system set-up for electric field measurement in the range 30 MHz to 1 GHz" | | |

5.1.4. Radiated Field Strength Emissions – 30 MHz to 1 GHz Results

| Radiated Field Strength Emissions – 30 MHz to 1 GHz | | | | | | | |
|--|------------|-------------|------------------|--|--------------------------|-------------------------------------|-------------|
| Temperature :+21 °C | | | | Unintentional Operational Modes | | | |
| Diagram no. (Remark 1) | Set-up no. | OP-mode no. | Test Description | Used detector | | | Verdict |
| | | | | PK | AV | QP | |
| 3.01 | 1 | 1 | -- | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | Pass |

5.2. General Limit - Radiated emissions, above 1 GHz

5.2.1. Test location and equipment FAR

| | | | | | | |
|-----------------|---|--|--|---|--|----------------------------------|
| test site | <input type="checkbox"/> 441 EMI SAR | <input type="checkbox"/> 348 EMI cond. | <input checked="" type="checkbox"/> 443 EMI FAR | <input type="checkbox"/> 347 Radio.lab. | <input type="checkbox"/> 337 OATS | <input type="checkbox"/> |
| spectr. analys. | <input type="checkbox"/> 584 FSU | <input type="checkbox"/> 120 FSEM | <input type="checkbox"/> 264 FSEK | <input checked="" type="checkbox"/> 489 ESU 40 | <input type="checkbox"/> | <input type="checkbox"/> |
| antenna meas | <input type="checkbox"/> 574 BTA-L | <input type="checkbox"/> 289 CBL 6141 | <input type="checkbox"/> 608 HL 562 | <input checked="" type="checkbox"/> 549 HL025 | <input checked="" type="checkbox"/> 302 BBHA9170 | <input type="checkbox"/> 477 GPS |
| antenna meas | <input type="checkbox"/> 123 HUF-Z2 | <input type="checkbox"/> 132 HUF-Z3 | <input type="checkbox"/> 030 HFH-Z2 | <input checked="" type="checkbox"/> 376 BBHA9120E | | <input type="checkbox"/> |
| antenna subst | <input type="checkbox"/> 071 HUF-Z2 | <input type="checkbox"/> 020 EMCO3115 | <input type="checkbox"/> 063 LP 3146 | <input type="checkbox"/> 303 BBHA9170 | <input type="checkbox"/> | <input type="checkbox"/> |
| multimeter | <input type="checkbox"/> 341 Fluke 112 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| signaling | <input type="checkbox"/> 392 MT8820A | <input type="checkbox"/> 371 CBT32 | <input type="checkbox"/> 547 CMU | <input type="checkbox"/> 594 CMW | | |
| DCpower | <input type="checkbox"/> 086 LNG50-10 | <input type="checkbox"/> 087 EA3013 | <input type="checkbox"/> 354 NGPE 40 | <input type="checkbox"/> 349 car battery | <input type="checkbox"/> 350 Car battery | <input type="checkbox"/> |
| Supply voltage | <input type="checkbox"/> 5 VDC (for EUT A supplied from AE 1) | | <input type="checkbox"/> 060 120 V 60 Hz via PAS 5000 (for AE 1) | | | |
| Supply voltage | <input checked="" type="checkbox"/> 3 V DC (fully charged internal battery) | | | | | |

5.2.2. Requirements/Limits (CLASS B equipment)

| | | | | |
|---|--|----------------|----------------|----------------------------------|
| FCC | <input checked="" type="checkbox"/> Part 15 Subpart B, §15.109 Class B <input type="checkbox"/> Part 15 Subpart C, §15.209 for frequencies defined in §15.205 <input type="checkbox"/> Part 15 Subpart C, §15.407(b)(1)(2)(3) 9 | | | |
| ISED | <input checked="" type="checkbox"/> RSS-Gen, Issue 4 Chapter 8.9, Table 4+6 (transmitter licence exempt) <input type="checkbox"/> RSS-Gen., Issue 4 Chapter 8.9, Table 2 (receiver) <input checked="" type="checkbox"/> ICES-003, Issue 6, Chapter 6.2.2 Table 7 (Class B) | | | |
| ANSI | <input checked="" type="checkbox"/> C63.4-2014 <input type="checkbox"/> C63.10-2013 | | | |
| Frequency [MHz] | Limits | | | |
| | AV [µV/m] | AV [dBµV/m] | Peak [µV/m] | Peak [dBµV/m] or [dBm/MHz] |
| above 1 GHz for frequencies as defined in §15.205 or RSS-Gen., Issue 4, §8.10 - Table 6 | 500 | 54.0 | 5000 | 74.0 dBµV/m |

5.2.3. Test condition and measurement test set-up

| | | | |
|---------------------------------------|--|--|--|
| Signal link to test system (if used): | <input type="checkbox"/> air link | <input checked="" type="checkbox"/> cable connection | <input type="checkbox"/> none |
| EUT-grounding | <input checked="" type="checkbox"/> none | <input type="checkbox"/> with power supply | <input type="checkbox"/> additional connection |
| Equipment set up | <input checked="" type="checkbox"/> table top 1.5m height | | <input type="checkbox"/> floor standing |
| Climatic conditions | Temperature: (22±3°C) | | Rel. humidity: (40±20)% |
| Spectrum-Analyzer settings | Scan frequency range: <input checked="" type="checkbox"/> 1 – 18 GHz <input type="checkbox"/> 18 – 25 GHz <input checked="" type="checkbox"/> 18 – 40 GHz <input type="checkbox"/> other: Scan-Mode: <input checked="" type="checkbox"/> 6 dB EMI-Receiver Mode <input type="checkbox"/> 3 dB Spectrum analyser Mode Detector: Peak and Average RBW/VBW: 1 MHz / 3 MHz Mode: Repetitive-Scan, max-hold Scan step: 400 kHz Sweep-Time: Coupled – calibrated display if CW signal otherwise adapted to EUT's individual duty-cycle | | |
| General measurement procedures | Please see chapter "Test system set-up for radiated electric field measurements above 1 GHz" | | |

5.2.4. Radiated Field Strength Emissions – 1 GHz to 18 GHz Results

| Radiated Field Strength Emissions – 1 GHz to 18 GHz | | | | | | | |
|--|------------|-------------|------------------|--|-------------------------------------|--------------------------|-------------|
| Temperature :+21 °C | | | | Unintentional Operational Modes | | | |
| Diagram no. (Remark 1) | Set-up no. | OP-mode no. | Test Description | Used detector | | | Verdict |
| | | | | PK | AV | QP | |
| 4.01 | 3 | 3 | -- | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | Pass |

5.3. Measurement uncertainties

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 to its statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

| RF-Measurement | Reference | Frequency range | Calculated uncertainty based on a confidence level of 95% | | | | | | Remarks |
|--|--------------|--------------------|---|--------|------|------|------|----|---|
| Conducted emissions (U _{CISPR}) | CISPR 16-2-1 | 9 kHz - 150 kHz | 4.0 dB | | | | | | - |
| | | 150 kHz - 30 MHz | 3.6 dB | | | | | | |
| Radiated emissions Enclosure | CISPR 16-2-3 | 30 MHz - 1 GHz | 4.2 dB | | | | | | E-Field |
| | | 1 GHz - 18 GHz | 5.1 dB | | | | | | |
| Disturbance power | CISPR 16-2-2 | 30 MHz - 300 MHz | - | | | | | | - |
| Power Output radiated | - | 30 MHz - 4 GHz | 3.17 dB | | | | | | Substitution method |
| Power Output conducted | - | Set-up No. | Cel-C1 | Cel-C2 | BT1 | W1 | W2 | -- | - |
| | | 9 kHz - 12.75 GHz | N/A | 0.60 | 0.7 | 0.25 | N/A | -- | |
| | | 12.75 - 26.5GHz | N/A | 0.82 | -- | N/A | N/A | -- | |
| Conducted emissions on RF-port | - | 9 kHz - 2.8 GHz | 0.70 | N/A | 0.70 | N/A | 0.69 | -- | N/A - not applicable |
| | | 2.8 GHz - 12.75GHz | 1.48 | N/A | 1.51 | N/A | 1.43 | -- | |
| | | 12.75 GHz - 18GHz | 1.81 | N/A | 1.83 | N/A | 1.77 | -- | |
| | | 18 GHz - 26.5GHz | 1.83 | N/A | 1.85 | N/A | 1.79 | -- | |
| Occupied bandwidth | - | 9 kHz - 4 GHz | 0.1272 ppm (Delta Marker) | | | | | | Frequency error |
| | | | 1.0 dB | | | | | | Power |
| Emission bandwidth | - | 9 kHz - 4 GHz | 0.1272 ppm (Delta Marker) | | | | | | Frequency error |
| | | | See above: 0.70 dB | | | | | | Power |
| Frequency stability | - | 9 kHz - 20 GHz | 0.0636 ppm | | | | | | - |
| Radiated emissions Enclosure | - | 150 kHz - 30 MHz | 5.0 dB | | | | | | Magnetic field E-field Substitution |
| | | 30 MHz - 1 GHz | 4.2 dB | | | | | | |
| | | 1 GHz - 20 GHz | 3.17 dB | | | | | | |

Table: measurement uncertainties, valid for conducted/radiated measurements

6. Abbreviations used in this report

| The abbreviations | |
|-------------------|---|
| ANSI | American National Standards Institute |
| AV , AVG, CAV | Average detector |
| EIRP | Equivalent isotropically radiated power, determined within a separate measurement |
| EGPRS | Enhanced General Packet Radio Service |
| EUT | Equipment Under Test |
| FCC | Federal Communications Commission, USA |
| IC | Industry Canada |
| n.a. | not applicable |
| Op-Mode | Operating mode of the equipment |
| PK | Peak |
| RBW | resolution bandwidth |
| RF | Radio frequency |
| RSS | Radio Standards Specification, Documents from Industry Canada |
| Rx | Receiver |
| TCH | Traffic channel |
| Tx | Transmitter |
| QP | Quasi peak detector |
| VBW | Video bandwidth |
| ERP | Effective radiated power |

7. Accreditation details of CETECOM's laboratories and test sites

| Ref.-No. | Accreditation Certificate | Valid for laboratory area or test site | Accreditation Body |
|---------------------------------|--|--|---|
| - | D-PL-12047-01-01 | All laboratories and test sites of CETECOM GmbH, Essen | DAkkS, Deutsche Akkreditierungsstelle GmbH |
| 337 487 558 348 348 | 736496 | Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measurement. | FCC, Federal Communications Commission Laboratory Division, USA (MRA US-EU 0003) |
| 337 487 550 558 | 3462D-1 3462D-2 3462D-2 3462D-3 | Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS) Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Radiated Measurements above 1 GHz, 3 m (FAR) | IC, Industry Canada Certification and Engineering Bureau |
| 487 550 348 348 | R-2666 G-301 C-2914 T-1967 | Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR) Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR) Mains Ports Conducted Interference Measurements Telecommunication Ports Conducted Interference Measurement. | VCCI, Voluntary Control Council for Interference by Information Technology Equipment, Japan |

OATS = Open Area Test Site, SAR = Semi Anechoic Room, FAR = Fully Anechoic Room

8. Instruments and Ancillary

the left column of the following tables allows the clear identification of the laboratory equipment.

8.1.1. Test software and firmware of equipment

| Ref.-No. | Equipment | Type | Serial-No. | Version of Firmware or Software during the test |
|----------|---|------------------------|----------------|---|
| 001 | EMI Test Receiver | ESS | 825132/017 | Firm.= 1.21 , OTP=2.0, GRA=2.0 |
| 012 | Signal Generator (EMS-cond.) | SMY 01 | 839069/027 | Firm.= V 2.02 |
| 013 | Power Meter (EMS cond.) | NRVD | 839111/003 | Firm.= V 1.51 |
| 017 | Digital Radiocommunication Tester | CMD 60 M | 844365/014 | Firmware = V 3.52 .22.01.99, DECT = D2.87 13.01.99 |
| 053 | Audio Analyzer | UPA3 | 860612/022 | Firm. V 4.3 |
| 119 | RT Harmonics Analyzer dig. Flickermeter | B10 | G60547 | Firm.= V 3.1DHG |
| 140 | Signal Generator | SMHU | 831314/006 | Firm.= 3.21 |
| 261 | Thermal Power Sensor | NRV-Z55 | 825083/0008 | EPROM-Datum 02.12.04, SE EE 1 B |
| 262 | Power Meter | NRV-S | 825770/0010 | Firm.= 2.6 |
| 263 | Signal Generator | SMP 04 | 826190/0007 | Firm.=3.21 |
| 295 | Racal Digital Radio Test Set | 6103 | 1572 | UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04, SW-DSP=1.02, Hardboot=1.02, Softboot=2.02 |
| 298 | Univ. Radio Communication Tester | CMU 200 | 832221/091 | R&S Test Firmware =3.53 /3.54 (current Testsoftw. f. all band used |
| 323 | Digital Radiocommunication Tester | CMD 55 | 825878/0034 | Firm.= 3.52 .22.01.99 |
| 335 | CTC-EMS-Conducted | System EMS Conducted | - | EMC 32 V 8.52 |
| 340 | Digital Radiocommunication Tester | CMD 55 | 849709/037 | Firm.= 3.52 .22.01.99 |
| 355 | Power Meter | URV 5 | 891310/027 | Firm.= 1.31 |
| 365 | 10V Insertion Unit 50 Ohm | URV5-Z2 | 100880 | Eprom Data = 31.03.08 |
| 366 | Ultra Compact Simulator | UCS 500 M4 | V0531100594 | Firm. UCS 500=001925/3.06a02, rc=ISMIEC 4.10 |
| 371 | Bluetooth Tester | CBT32 | 100153 | CBT V5.30+ SW-Option K55, K57 |
| 377 | EMI Test Receiver | ESCS 30 | 100160 | Firm.= 2.30, OTP= 02.01, GRA= 02.36 |
| 378 | Broadband RF Field Monitor | RadiSense III | 03D00013SNO-08 | Firm.= V.03D13 |
| 389 | Digital Multimeter | Keithley 2000 | 0583926 | Firm. = A13 (Mainboard) A02 (Display) |
| 392 | Radio Communication Tester | MT8820A | 6K00000788 | Firm.= 4.50 #005, IPL=4.01#001,OS=4.02#001, GSM=4.41#013, W-CDMA= 4.54#004, scenario= 4.52#002 |
| 436 | Univ. Radio Communication Tester | CMU 200 | 103083 | R&S Test Firmware Base=5.14, Mess-Software= GSM:5.14 WCDMA:5.14 (current Testsoftw. F. all band |
| 441 | CTC-SAR-EMI Cable Loss | System EMI field (SAR) | - | EMC 32 Version 8.52 |
| 442 | CTC-SAR-EMS | System EMS field (SAR) | - | EMC 32 Version 8.40 |
| 443 | CTC-FAR-EMI-RSE | System CTC-FAR-EMI-RSE | - | Spuri 7.2.5 or EMC 32 Ver. 9.15.00 |
| 444 | CTC-FAR-EMS field | System-EMS-Field (FAR) | - | EMC 32 Version 9.15.00 |
| 460 | Univ. Radio Communication Tester | CMU 200 | 108901 | R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used, |
| 489 | EMI Test Receiver | ESU40 | 1000-30 | Firmware=4.43 SP3, Bios=V5.1-16-3, Spec. =01.00 |
| 491 | ESD Simulator dito | ESD dito | dito307022 | V 2.30 |
| 524 | Voltage Drop Simulator | VDS 200 | 0196-16 | Software Nr: 000037 Version V4.20a01 |
| 526 | Burst Generator | EFT 200 A | 0496-06 | Software Nr. 000034 Version V2.32 |
| 527 | Micro Pulse Generator | MPG 200 B | 0496-05 | Software-Nr. 000030 Version V2.43 |
| 528 | Load Dump Simulator | LD 200B | 0496-06 | Software-Nr. 000031 Version V2.35a01 |
| 546 | Univ. Radio Communication Tester | CMU 200 | 106436 | R&S Test Firmware Base=5.14, GSM=5.14 WCDMA=5.14 (current Testsoftw.,f. all band to be used |
| 547 | Univ. Radio Communication Tester | CMU 200 | 835390/014 | R&S Test Firmware Base=V5.1403 (current Testsoftw., f. all band used, GSM = 5.14 WCDMA: = 5.14 |
| 584 | Spectrum Analyzer | FSU 8 | 100248 | 2.82_SP3 |
| 597 | Univ. Radio Communication Tester | CMU 200 | 100347 | R&S Test Firmware Base=5.01, GSM=5.02 WCDMA= not installed, Mainboard= µP1=V.850 |
| 598 | Spectrum Analyzer | FSEM 30 | 831259/013 | Firmware Bios 3.40 , Analyzer 3.40 Sp 2 |
| 607 | Signal Generator | SMR 20 | 832033/011 | V1.25 |
| 620 | EMI Test Receiver | ESU 26 | 100362 | 4.43_SP3 |
| 642 | Wideband Radio Communication Tester | CMW 500 | 126089 | Setup V03.26, Test programm component V03.02.20 |
| 670 | Univ. Radio Communication Tester | CMU 200 | 106833 | µP1 =V8.50, Firmware = V.20 |
| 689 | Vector Signal Generator | SMU200 | 100970 | 02.20.360.142 |
| 692 | Bluetooth Tester | CBT 32 | 100236 | CBT V 5.40, FW: V.2.41 (FPGA Digital, V. 3.09 FPGA RF) |

8.1.2. Single instruments and test systems

| Ref.-No. | Equipment | Type | Serial-No. | Manufacturer | Interval of calibration | Remark | Cal due |
|----------|---|---------------------------|----------------------------|----------------------------|-------------------------|--------|------------|
| 001 | EMI Test Receiver | ESS | 825132/017 | Rohde & Schwarz | 12 M | - | 16.05.2018 |
| 005 | AC - LISN (50 Ohm/50µH, test site 1) | ESH2-Z5 | 861741/005 | Rohde & Schwarz | 12 M | - | 15.05.2018 |
| 007 | Single-Line V-Network (50 Ohm/5µH) | ESH3-Z6 | 892563/002 | Rohde & Schwarz | 12 M | - | 17.05.2018 |
| 009 | Power Meter (EMS-radiated) | NRV | 863056/017 | Rohde & Schwarz | 24 M | - | 15.05.2019 |
| 016 | Line Impedance Simulating Network | Op. 24-D | B6366 | Spitzenberger+Spies | 36 M | - | 30.05.2019 |
| 020 | Horn Antenna 18 GHz (Subst 1) | 3115 | 9107-3699 | EMCO | 36/12 M | - | 31.07.2017 |
| 021 | Loop Antenna (H-Field) | 6502 | 9206-2770 | EMCO | 36 M | - | 30.04.2018 |
| 030 | Loop Antenna (H-field) | HFH-Z2 | 879604/026 | Rohde & Schwarz | 36 M | - | 30.04.2018 |
| 033 | RF-current probe (100kHz-30MHz) | ESH2-Z1 | 879581/18 | Rohde & Schwarz | 24 M | - | 15.05.2019 |
| 057 | relay-switch-unit (EMS system) | RSU | 494440/002 | Rohde & Schwarz | pre-m | 1a | |
| 060 | power amplifier (DC-2kHz) | PAS 5000 | B6363 | Spitzenberger+Spies | - | 3 | |
| 066 | notch filter (WCDMA; FDD1) | WRCT 1900/2200-5/40-10EEK | 5 | Wainwright GmbH | 12 M | 1g | 30.06.2017 |
| 086 | DC - power supply, 0 -10 A | LNG 50-10 | - | Heinzinger Electronic | pre-m | 2 | |
| 087 | DC - power supply, 0 -5 A | EA-3013 S | - | Elektro Automatik | pre-m | 2 | |
| 091 | USB-LWL-Converter | OLS-1 | 007/2006 | Ing. Büro Scheiba | - | 4 | |
| 099 | passive voltage probe | ESH2-Z3 | 299.7810.52 | Rohde & Schwarz | 36 M | - | 30.04.2018 |
| 100 | passive voltage probe | Probe TK 9416 | without | Schwarzbeck | 36 M | - | 30.04.2018 |
| 110 | USB-LWL-Converter | OLS-1 | - | Ing. Büro Scheiba | - | 4 | |
| 119 | RT Harmonics Analyzer dig. Flickermeter | B10 | G60547 | BOCONSULT | 36 M | - | 30.05.2019 |
| 133 | horn antenna 18 GHz (Meas 1) | 3115 | 9012-3629 | EMCO | 36 M | 1c | 10.03.2020 |
| 134 | horn antenna 18 GHz (Subst 2) | 3115 | 9005-3414 | EMCO | 36 M | - | 10.03.2020 |
| 136 | adjustable dipole antenna (Dipole 1) | 3121C-DB4 | 9105-0697 | EMCO | 36 M | - | 30.04.2018 |
| 140 | Signal Generator | SMHU | 831314/006 | Rohde & Schwarz | 24 M | - | 30.05.2018 |
| 248 | attenuator | SMA 6dB 2W | - | Radiall | pre-m | 2 | |
| 249 | attenuator | SMA 10dB 10W | - | Radiall | pre-m | 2 | |
| 252 | attenuator | N 6dB 12W | - | Radiall | pre-m | 2 | |
| 256 | attenuator | SMA 3dB 2W | - | Radiall | pre-m | 2 | |
| 257 | hybrid | 4031C | 04491 | Narda | pre-m | 2 | |
| 260 | hybrid coupler | 4032C | 11342 | Narda | pre-m | 2 | |
| 261 | Thermal Power Sensor | NRV-Z55 | 825083/0008 | Rohde & Schwarz | 24 M | - | 30.05.2018 |
| 262 | Power Meter | NRV-S | 825770/0010 | Rohde & Schwarz | 24 M | - | 30.05.2018 |
| 263 | Signal Generator | SMP 04 | 826190/0007 | Rohde & Schwarz | 36 M | - | 30.05.2019 |
| 265 | peak power sensor | NRV-Z33, Model 04 | 840414/009 | Rohde & Schwarz | 24 M | - | 30.05.2018 |
| 266 | Peak Power Sensor | NRV-Z31, Model 04 | 843383/016 | Rohde & Schwarz | 24 M | - | 30.05.2018 |
| 267 | notch filter GSM 850 | WRCA 800/960-6EEK | 9 | Wainwright GmbH | pre-m | 2 | |
| 270 | termination | 1418 N | BB6935 | Weinschel | pre-m | 2 | |
| 271 | termination | 1418 N | BE6384 | Weinschel | pre-m | 2 | |
| 272 | attenuator (20 dB) 50 W | Model 47 | BF6239 | Weinschel | pre-m | 2 | |
| 273 | attenuator (10 dB) 100 W | Model 48 | BF9229 | Weinschel | pre-m | 2 | |
| 274 | attenuator (10 dB) 50 W | Model 47 (10 dB) 50 W | BG0321 | Weinschel | pre-m | 2 | |
| 275 | DC-Block | Model 7003 (N) | C5129 | Weinschel | pre-m | 2 | |
| 276 | DC-Block | Model 7006 (SMA) | C7061 | Weinschel | pre-m | 2 | |
| 279 | power divider | 1515 (SMA) | LH855 | Weinschel | pre-m | 2 | |
| 287 | pre-amplifier 25MHz - 4GHz | AMF-2D-100M4G-35-10P | 379418 | Miteq | 12 M | 1c | 30.06.2017 |
| 291 | high pass filter GSM 850/900 | WHJ 2200-4EE | 14 | Wainwright GmbH | 12 M | 1c | 30.06.2017 |
| 298 | Univ. Radio Communication Tester | CMU 200 | 832221/091 | Rohde & Schwarz | pre-m | 3 | |
| 300 | AC LISN (50 Ohm/50µH, 1-phase) | ESH3-Z5 | 892 239/020 | Rohde & Schwarz | 12 M | - | 17.05.2018 |
| 301 | attenuator (20 dB) 50W, 18GHz | 47-20-33 | AW0272 | Lucas Weinschel | pre-m | 2 | |
| 302 | horn antenna 40 GHz (Meas 1) | BBHA9170 | 155 | Schwarzbeck | 36 M | - | 14.03.2020 |
| 303 | horn antenna 40 GHz (Subst 1) | BBHA9170 | 156 | Schwarzbeck | 36 M | - | 20.03.2020 |
| 331 | Climatic Test Chamber -40/+180 Grad | HC 4055 | 43146 | Heraeus Vötsch | 24 M | - | 30.10.2018 |
| 341 | Digital Multimeter | Fluke 112 | 81650455 | Fluke | 24 M | - | 30.05.2018 |
| 342 | Digital Multimeter | Voltcraft M-4660A | IB 255466 | Voltcraft | 24 M | - | 17.05.2019 |
| 347 | laboratory site | radio lab. | - | - | - | 5 | |
| 348 | laboratory site | EMI conducted | - | - | - | 5 | |
| 354 | DC - Power Supply 40A | NGPE 40/40 | 448 | Rohde & Schwarz | pre-m | 2 | |
| 355 | Power Meter | URV 5 | 891310/027 | Rohde & Schwarz | 24 M | - | 30.05.2018 |
| 357 | power sensor | NRV-Z1 | 861761/002 | Rohde & Schwarz | 24 M | - | 24.05.2019 |
| 371 | Bluetooth Tester | CBT32 | 100153 | R&S | 36 M | - | 30.05.2019 |
| 373 | Single-Line V-Network (50 Ohm/5µH) | ESH3-Z6 | 100535 | Rohde & Schwarz | 12 M | - | 17.05.2018 |
| 377 | EMI Test Receiver | ESCS 30 | 100160 | Rohde & Schwarz | 12 M | - | 15.05.2018 |
| 389 | Digital Multimeter | Keithley 2000 | 0583926 | Keithley | 24 M | - | 30.04.2017 |
| 392 | Radio Communication Tester | MT8820A | 6K00000788 | Anritsu | 12 M | - | 18.05.2018 |
| 405 | Thermo-/Hygrometer | OPUS 10 THI | 126.0604.0003.3.3.3.2 2 | LUFFT Mess u. Regeltechnik | 24 M | - | 30.03.2019 |
| 431 | Model 7405 | Near-Field Probe Set | 9305-2457 | EMCO | - | 4 | |
| 436 | Univ. Radio Communication Tester | CMU 200 | 103083 | Rohde & Schwarz | 12 M | - | 24.05.2018 |
| 439 | UltraLog-Antenna | HL 562 | 100248 | Rohde & Schwarz | 36 M | - | 10.03.2020 |

| Ref.-No. | Equipment | Type | Serial-No. | Manufacturer | Interval of calibration | Remark | Cal due |
|----------|---|------------------------------|-------------------------|-----------------------------|-------------------------|--------|------------|
| 441 | CTC-SAR-EMI Cable Loss | System EMI field (SAR) Cable | - | CETECOM | 12 M | 5 | 05.06.2017 |
| 443 | CTC-FAR-EMI-RSE | System CTC-FAR-EMI-RSE | - | ETS-Lindgren / CETECOM | 12 M | 5 | 30.06.2017 |
| 448 | notch filter WCDMA_FDD II | WRCT 1850.0/2170.0-5/40- | 5 | Wainwright Instruments GmbH | 12 M | 1c | 30.06.2017 |
| 449 | notch filter WCDMA FDD V | WRCT 824.0/894.0-5/40-8SSK | 1 | Wainwright | 12 M | 1c | 30.06.2017 |
| 454 | Oscilloscope | HM 205-3 | 9210 P 29661 | Hameg | - | 4 | |
| 456 | DC-Power supply 0-5 A | EA 3013 S | 207810 | Elektro Automatik | pre-m | 2 | |
| 459 | DC -Power supply 0-5 A , 0-32 V | EA-PS 2032-50 | 910722 | Elektro Automatik | pre-m | 2 | |
| 460 | Univ. Radio Communication Tester | CMU 200 | 108901 | Rohde & Schwarz | 12 M | - | 16.06.2018 |
| 463 | Universal source | HP3245A | 2831A03472 | Agilent | - | 4 | |
| 466 | Digital Multimeter | Fluke 112 | 89210157 | Fluke USA | 24 M | - | 30.05.2018 |
| 467 | Digital Multimeter | Fluke 112 | 89680306 | Fluke USA | 36 M | - | 30.04.2018 |
| 468 | Digital Multimeter | Fluke 112 | 90090455 | Fluke USA | 36 M | - | 30.04.2018 |
| 477 | ReRadiating GPS-System | AS-47 | - | Automotive Cons. Fink | - | 3 | |
| 480 | power meter (Fula) | NRVS | 838392/031 | Rohde & Schwarz | 24 M | - | 16.05.2019 |
| 482 | filter matrix | Filter matrix SAR 1 | - | CETECOM (Brl) | - | 1d | |
| 484 | pre-amplifier 2,5 - 18 GHz | AMF-5D-02501800-25-10P | 1244554 | Miteq | 12 M | - | 30.07.2017 |
| 487 | System CTC NSA-Verification SAR-EMI | System EMI field (SAR) NSA | - | ETS Lindgren / CETECOM | 24 M | - | 31.07.2017 |
| 489 | EMI Test Receiver | ESU40 | 1000-30 | Rohde & Schwarz | 12 M | - | 18.05.2019 |
| 502 | band reject filter | WRCG 1709/1786-1699/1796- | SN 9 | Wainwright | pre-m | 2 | |
| 503 | band reject filter | WRCG 824/849-814/859- | SN 5 | Wainwright | pre-m | 2 | |
| 512 | notch filter GSM 850 | WRCA 800/960-02/40-6EEK | SN 24 | Wainwright | 12 M | 1c | 30.06.2017 |
| 517 | relais switch matrix | HF Relais Box Keithley | SE 04 | Keithley | pre-m | 2 | |
| 523 | Digital Multimeter | L4411A | MY46000154 | Agilent | 24 M | - | 18.05.2019 |
| 529 | 6 dB Broadband resistive power divider | Model 1515 | LH 855 | Weinschel | pre-m | 2 | |
| 530 | 10 dB Broadband resistive power divider | R 416110000 | LOT 9828 | - | pre-m | 2 | |
| 546 | Univ. Radio Communication Tester | CMU 200 | 106436 | R&S | 12 M | - | 30.03.2018 |
| 547 | Univ. Radio Communication Tester | CMU 200 | 835390/014 | Rohde & Schwarz | 12 M | - | 30.04.2017 |
| 549 | Log.Per-Antenna | HL025 | 1000060 | Rohde & Schwarz | 36/12 M | - | 31.07.2018 |
| 550 | System CTC S-VSWR Verification SAR-EMI | System EMI Field SAR S-VSWR | - | ETS Lindgren/CETECOM | 24 M | - | 31.07.2017 |
| 552 | high pass filter 2,8-18GHz | WHKX 2.8/18G-10SS | 4 | Wainwright | 12 M | 1c | 30.06.2017 |
| 557 | System CTC-OTA-2 | R&S TS8991 | - | Rohde & Schwarz | 12 M | 5 | 30.09.2016 |
| 558 | System CTC FAR S-VSWR | System CTC FAR S-VSWR | - | CTC | 24 M | - | 31.07.2017 |
| 574 | Biconilog Hybrid Antenna | BTA-L | 980026L | Frankonia | 36/12 M | - | 31.03.2019 |
| 584 | Spectrum Analyzer | FSU 8 | 100248 | Rohde & Schwarz | pre-m | - | |
| 594 | Wideband Radio Communication Tester | CMW 500 | 101757 | Rohde & Schwarz | 12 M | - | 30.04.2017 |
| 597 | Univ. Radio Communication Tester | CMU 200 | 100347 | Rohde & Schwarz | pre-m | - | |
| 598 | Spectrum Analyzer | FSEM 30 | 831259/013 | Rohde & Schwarz | 24 M | - | 30.04.2017 |
| 600 | power meter | NRVD (Reserve) | 834501/018 | Rohde & Schwarz | 24 M | - | 17.05.2019 |
| 601 | medium-sensitivity diode sensor | NRV-Z5 (Reserve) | 8435323/003 | Rohde & Schwarz | 24 M | - | 15.05.2019 |
| 602 | peak power sensor | NRV-Z32 (Reserve) | 835080 | Rohde & Schwarz | 24 M | - | |
| 608 | UltraLog-Antenna | HL 562 | 830547/009 | Rohde & Schwarz | 36 M | - | 31.03.2014 |
| 611 | DC power supply | E3632A | KR 75305854 | Agilent | pre-m | 2 | |
| 612 | DC power supply | E3632A | MY 40001321 | Agilent | pre-m | 2 | |
| 613 | Attenuator | R416120000 20dB 10W | Lot. 9828 | Radiall | pre-m | 2 | |
| 616 | Digitalmultimeter | Fluke 177 | 88900339 | Fluke | 24 M | - | 30.05.2018 |
| 617 | Power Splitter/Combiner | ZFSC-2-2-S+ | S F987001108 | Mini Circuits | - | 2 | |
| 618 | Power Splitter/Combiner | 50PD-634 | 600994 | JFW Industries USA | - | 2 | |
| 619 | Power Splitter/Combiner | 50PD-634 | 600995 | JFW Industries, USA | - | 3 | |
| 620 | EMI Test Receiver | ESU 26 | 100362 | Rohde-Schwarz | 12 M | - | 16.05.2018 |
| 621 | Step Attenuator 0-139 dB | RSP | 100017 | Rohde & Schwarz | pre-m | 2 | |
| 625 | Generic Test Load USB | Generic Test Load USB | - | CETECOM | - | 2 | |
| 627 | data logger | OPUS 1 | 201.0999.9302.6.4.1.4 3 | G. Lufft GmbH | 24 M | - | 30.03.2019 |
| 634 | Spectrum Analyzer | FSM (HF-Unit) | 826188/010 | Rohde & Schwarz | pre-m | 2 | |
| 637 | High Speed HDMI with Ethernet 1m | HDMI cable with Ethernet 1m | - | Kogilink | - | 2 | |
| 638 | HDMI Kabel with Ethernet 1,5 m flach | HDMI cable with Ethernet | - | Reichelt | - | 2 | |
| 640 | HDMI cable 2m rund | HDMI cable 2m rund | - | Reichelt | - | 2 | |
| 641 | HDMI cable with Ethernet | Certified HDMI cable with | - | PureLink | - | 2 | |
| 642 | Wideband Radio Communication Tester | CMW 500 | 126089 | Rohde&Schwarz | 12 M | - | 24.05.2018 |
| 644 | Amplifier | ZX60-2534M+ | SN865701299 | Mini-Circuits | - | - | |
| 670 | Univ. Radio Communication Tester | CMU 200 | 106833 | Rohde & Schwarz | 24 M | - | 30.05.2018 |
| 671 | DC-power supply 0-5 A | EA-3013S | - | Elektro Automatik | pre-m | 2 | |

| Ref.-No. | Equipment | Type | Serial-No. | Manufacturer | Interval of calibration | Remark | Cal due |
|----------|-----------------------------------|-------------------------|------------------------|-----------------------------|-------------------------|--------|------------|
| 678 | Power Meter | NRP | 101638 | Rohde&Schwarz | pre-m | - | |
| 683 | Spectrum Analyzer | FSU 26 | 200571 | Rohde & Schwarz | 12 M | - | 17.05.2018 |
| 686 | Field Analyzer | EHP-200A | 160WX30702 | Narda Safety Test Solutions | 24 M | - | 29.03.2019 |
| 687 | Signal Generator | SMF 100A | 102073 | Rohde&Schwarz | 12 M | - | 17.05.2018 |
| 688 | Pre Amp | JS-18004000-40-8P | 1750117 | Miteq | pre-m | - | |
| 690 | Spectrum Analyzer | FSU | 100302/026 | Rohde&Schwarz | 12 M | - | 16.05.2018 |
| 691 | OSP120 Base Unit | OSP120 | 101183 | Rohde & Schwarz | 12 M | - | 22.05.2018 |
| 692 | Bluetooth Tester | CBT 32 | 100236 | Rohde & Schwarz | 36 M | - | 29.05.2020 |
| 693 | TS8997 | CTC-Radio Lab 1_TS8997 | - | Rohde&Schwarz | 12 M | 5 | 06.06.2017 |
| 697 | Power Splitter | ZN4PD-642W-S+ | 165001445 | Mini-Circuits | - | 2 | |
| 701 | CMW500 wide. Radio Comm. | CMW500 | 158150 | Rohde & Schwarz | 12 M | - | 01.05.2017 |
| 703 | INNCO Antennen Mast | MA 4010-KT080-XPET-ZSS3 | MA4170-KT100-XPET- | INNCO | pre-m | - | |
| 704 | INNCON Controller | CO 3000-4port | CO3000/933/3841051 6/L | INNCO Systems GmBh | pre-m | - | |
| 711 | Harmonic Mixer 90 GHz - 140GHz | RPG FS-Z140 | 101004 | RPG | 12 M | - | 22.02.2018 |
| 712 | Harmonic Mixer 75 GHz - 110GHz | FS-Z110 | 101468 | Rohde & Schwarz | 12 M | - | 22.02.2018 |
| 713 | Harmonic Mixer, 50 GHz - 75GHz | FS-Z75 | 101022 | Rohde & Schwarz | 12 M | - | 22.05.2018 |
| 714 | Signal Analyzer 67GHz | FSW67 | 104023 | Rohde & Schwarz | 24 M | - | 03.03.2019 |
| 715 | Harmonic Mixer, 140 GHz - 220GHz | FS-Z220 | 101009 | RPG Radiometer Physics | 12 M | - | 03.08.2018 |
| 716 | Harmonic Mixer 220 GHz to 325 GHZ | FS-Z325 | 101005 | RPG Radiometer Physics | 12 M | - | 13.02.2018 |
| 747 | Spectrum Analyzer | FSU 26 | 200152 | Rohde & Schwarz | 12 M | - | 18.05.2018 |
| 748 | Pickett-Potter Horn Antenna | FH-PP 4060 | 010001 | Radiometer Physics | - | - | |
| 749 | Pickett-potter Horn Antenna | FH-PP 60-90 | 010003 | Radiometer Physics | - | - | |
| 750 | Pickett-Potter Horn Antenna | FH-PP 140-220 | 010011 | Radiometer Physics | - | - | |

8.1.3. Legend

| Note / remarks | Calibrated during system calibration: |
|----------------|---|
| 1a | System CTC-SAR-EMS (Ref.-No. 442) |
| 1b | System-CTC-EMS-Conducted (Ref.-No. 335) |
| 1c | System CTC-FAR-EMI-RSE (Ref.-No . 443) |
| 1d | System CTC-SAR-EMI (Ref.-No . 441) |
| 1e | System CTC-OATS (EMI radiated) (Ref.-No. 337) |
| 1 f | System CTC-CTIA-OTA (Ref.-No . 420) |
| 1 g | System CTC-FAR-EMS (Ref.-No . 444) |
| 2 | Calibration or equipment check immediately before measurement |
| 3 | Regulatory maintained equipment for functional check or support purpose |
| 4 | Ancillary equipment without calibration e.g. mechanical equipment or monitoring equipment |
| 5 | Test System |

| | | |
|-------------------------|---------|---|
| Interval of calibration | 12 M | 12 month |
| | 24 M | 24 month |
| | 36 M | 36 month |
| | 24/12 M | Calibration every 24 months. between this every 12 months internal validation |
| | 36/12 M | Calibration every 36 months. between this every 12 months internal validation |
| | Pre-m | Check before starting the measurement |
| | - | Without calibration |

9. Versions of test reports (change history)

| Version | Applied changes | Date of release |
|---------|-----------------|-----------------|
| -- | Initial release | 2018-07-05 |
| -- | -- | -- |
| -- | -- | -- |