# PARTIAL TEST REPORT
# No.: 2-0037-12-1h

According to:
**FCC Regulations**
Part 15, Part 22 & Part 24
**IC-Regulations**
RSS-132, RSS-133, RSS-210 &
RSS-Gen

for

## Research In Motion Limited

## Mobile phone RFG81UW

FCC-ID: **L6ARFG80UW**
IC: **2503A-RFG80UW**

| Laboratory Accreditation and Listings | | | |
|---|---|---|---|
| DAkkS Deutsche Akkreditierungsstelle D-PL-12047-01-01 | Reg. No.: 736496<br>MRA US-EU 0003 | Industry Canada<br>Reg. No.: 3462D-1<br>Reg. No.: 3462D-2<br>Reg. No.: 3462D-3 | Voluntary Controls for Electromagnetic Emissions<br>Reg. No.: R-2665, R-2666<br>C-2914, T-1967, G-301 |
| Wi Fi ALLIANCE AUTHORIZED RF LABORATORY | CTIA Authorized Test Lab<br>LAB CODE 20011130-00 | | |
| accredited according to DIN EN ISO/IEC 17025 | | | |


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## Table of contents



| **Table of annex** | **Total pages** |
|---|---|
| Annex 1: Measurement diagrams | 80 |

The listed attachments are an integral part of this report.

# 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 Equipment Under Test (in this report, hereinafter referred as EUT) supports radiofrequency technologies. This test report shows results for GSM/(E)GPRS Band 850 and 1900, W-CDMA Band II and V technologies only. Other implemented wireless technologies were not considered within this test report.

Following tests have been performed to show compliance with applicable FCC Part 2, Part 22, Subpart H and Part 24, Subpart E (Broadband PCS) of the FCC CFR 47 Rules, Edition October 2011 (e-CFR 47 FCC Rules, Edition 1. October 2011) and Canada RSS-132 Issue 2, RSS-133 Issue 5, RSS-210 Issue 8 and RSS-Gen Issue 3 standards.

Due to customer request no EUT photographs should be inside this test report.

## 1.1. TX mode, tests overview FCC and Canada IC Standards (RSS)

| No. of Diagram group | Test Cases | Port | References & Limits | | | EUT set-up | EUT op-mode | Result |
|---|---|---|---|---|---|---|---|---|
| | | | FCC Standard | RSS Section | Test limit | | | |
| | Emissions AC-Power lines 0,15-30 MHz<br><br>conducted | AC-Power lines | §15.207 | RSS-Gen, Issue 3: Chapter 7.2.4 | FCC §15.107 class B limits §15.207 limits<br><br>IC: Table 4, Chapter 7.2.4 | -- | -- | Remark 1.) |
| | RF Power conducted | Antenna terminal | §2.1046 | -- | N/A | -- | -- | Remark 1.) |
| | RF-Power (ERP/EIRP)<br><br>radiated | Cabinet | §2.1046<br>§22.913(a)(2)<br><br>§24.232(c) | RSS-132: 4.4<br>SRSP-503: 5.1.3<br><br>RSS-133: 4.1/6.4<br>SRSP-510: 5.1.2 | < 7 Watt (ERP)<br><br>< 2 Watt (EIRP) | 1 + 2 | 1 + 3 + 4 + 6 + 7 + 8 + 9 + 10 + 11 + 12 | passed |
| | 26dB Emission bandwith<br>&<br>99% Occupied bandwith | Antenna terminal | §2.202<br>§2.1049<br>§22.917(a)<br>§24.238(a) | RSS Gen:4.6.1 | 99% Power | -- | -- | Remark 1.) |
| | Spurious emissions conducted | Antenna terminal | §2.1051<br>§2.1057<br>§22.917(a)(b)<br>§24.238(a)(b) | RSS 132: 4.5.1<br>RSS 133: 6.5.1(a)(b) | 43+10log(P) dBc | -- | -- | Remark 1.) |
| | Spurious emissions radiated (30 MHz...X*GHz) *tenth-times of fc | Cabinet + Inter-connect cables | §15.209(a)<br>§15.205<br>§15.247 (d)<br>§15.407 (b) | RSS-Gen: 4.11 & 7.2.5<br>RSS-Gen: 210, issue 8, chapter 2.5 & A9.2 | Emissions in restricted bands must meet the general field-strength radiated limits | 3 | 1 + 2+ 3 + 4 + 5 + 6 + 7 + 8 + 9 + 10 + 11 +12+ | passed |
| | | | §2.1053(a)<br>§2.1057<br>§22.917(a)(b)<br>§24.238(a)(b) | RSS-132: 4.5.1 & 4.5.2<br><br>RSS 133: 6.5.1(a)(b) | 43+10log(P) dBc | 1+2 | 13 +14+ 15+16 + 17 | passed |
| | Frequency stability conducted | Antenna terminal | §22.355, table C-1<br>§24.235<br>§2.1055(a)(2) | RSS-132: 4.3<br><br>RSS 133: 6.3 | < ±2.5ppm<br><br><±0.1 ppm | -- | -- | Remark 1.) |

Remark: 1.) Due to customer request no conducted tests were performed.

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Responsible for test report

# 2. Administrative Data

## 2.1. Identification of the testing laboratory

| | |
|---|---|
| Company name: | CETECOM GmbH |
| Address: | Im Teelbruch 116<br>45219 Essen - Kettwig<br>Germany |
| Responsible for testing laboratory: | Dipl.-Ing. W. Richter |
| Deputy: | Dipl.-Ing. J. Schmitt |

## 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 and project leader: | Dipl.-Ing. B. Taslica |
| Receipt of EUT: | 2012-05-29 |
| Date(s) of test: | 2012-05-29- 2012-08-17 |
| Date of report: | 2012-09-17 |
| Version of template: 12.08 | |

## 2.4. Applicant's details

| | |
|---|---|
| Applicant's name: | Research In Motion Limited |
| Address: | 440 Philip Street<br>Waterloo<br>Ontario N2L 5R9<br>CANADA |
| Contact person: | Mr. Masud S. Attayi |

## 2.5. Manufacturer's details

| | |
|---|---|
| Manufacturer's name: | Research In Motion Limited |
| Address: | 295 Philip Street<br>Waterloo<br>Ontario N2L 3W8<br>CANADA |

# 3. Equipment under test (EUT)

## 3.1. Technical data of main EUT declared by applicant

| | |
|---|---|
| Main function | Mobil phone |
| Type | RFG81UW |
| GSM Frequency range<br>(US/Canada -bands) | GSM 850: 824 – 849 MHz (Uplink), 869-894 MHz (Downlink)<br>GSM1900: 1850-1910 MHz (Uplink), 1930-1990 MHz (Downlink)<br>FDD Band 2: 1852.4–1907.6 MHz (Uplink), 1930-1990MHz (Downlink)<br>FDD Band 5: 826.4-846.6 MHz (Uplink), 869-894MHz (Downlink) |
| Type of modulation | GSM,GPRS, GMSK<br>EGPRS-Mode: 8-PSK<br>FDD-Mode Release99: QPSK<br>FDD Mode Release 5+6+7: DL 64 QAM, UL QPSK additionally |
| Number of channels<br>(USA/Canada -bands) | GSM 850: 128 – 251, 125 channels<br>GSM1900: 512 – 810, 300 channels<br>FDD Band 2: UARFCN range 9262 – 9400 – 9538<br>FDD Band 5: UARFCN range 4132 – 4183 – 4233 |
| Antenna Type | ☒ Integrated<br>☐ External, no RF- connector<br>☐ External, separate RF-connector |
| Measured Output Power:<br>Radiated<br><br>…… GSM 850<br>……EDGE 850<br>…… GSM 1900<br>……EDGE 1900 | <br><br>32.2 dBm (PK)<br>29.9 dBm (PK)<br>30.3 dBm (PK)<br>30.4 dBm (PK) |
| Measured Output Power:<br>Radiated<br>…….. FDD-Mode 2 RMC99<br>FDD-Mode 2 HSUPA<br>FDD-Mode 2 HSPA+<br>FDD-Mode 5 RMC99<br>FDD_Mode 5 HSUPA<br>FDD_Mode 5 HSPA+ | <br><br>25.4 dBm (PK)<br>25.0 dBm (PK)<br>29.6 dBm (PK)<br>29.1 dBm (PK)<br>26.7 dBm (PK)<br>28.7 dBm (PK) |
| FCC-ID | L6ARFG80UW |
| IC | 2503A-RFG80UW |
| Installed options | ☒ GSM 900 and GSM 1800 Bands (not usable in USA/Canada)<br>☒ W-CDMA Band I and Band VIII (not usable in USA/Canada)<br>☒ W-LAN, Bluetooth© wireless technologies<br>☒ battery charging option<br>☒ GPS (not tested within this test report)<br>☒ FM-Radio (Receiver only)<br>☒ NFC (not tested within this test report) |
| Power supply | ☒ Internal battery Li-Io, range 3.5V to 4.2V |
| Special EMI components | -- |
| Voltage | ☒ nominal 3.8 V ☐ min 3.5 V ☐ max 4.2 V |
| EUT sample type | ☒ Pre-Production |
| FCC label attached | ☐ yes ☒ no |
| | |

## 3.2. 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 | Mobile phone | RFG81UW | IMEI: 004401138946 757 | CER-48928-001 Rev 1 | 10.0.5.224 |
| EUT B | Mobile phone | RFG81UW | IMEI: 00440113896 435 | CER-48928-001 Rev 1 | 10.0.5.224 |
| EUT C | Mobile phone | RFG81UW | IMEI: 004401139036 988 | CER-48928-001 Rev 2 PIN:2A47CC2 2 | 10.0.6.420 |

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

## 3.3. 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 | Li-Ion Battery (1800mAh) | BAT-47277-006 | -- | LS1 | -- |

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

## 3.4. EUT set-ups

| EUT set-up no.*) | Combination of EUT and AE | Remarks |
|---|---|---|
| Set. 1 | EUT A +AE 1 | Used only for radiated tests |
| Set. 2 | EUT B +AE 1 | |
| Set. 3 | EUT C +AE 1 | |

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

## 3.5. EUT operating modes

**GSM modes**

| EUT operating mode no.*) | Description of operating modes | Additional information |
|---|---|---|
| op. 1 | GSM 850<br>TCH mode<br>TCH=128/190/251 | A communication link is established between the mobile station and the test simulator. The transmitter is operated at its maximum rated output power: 33 dBm (power class 4; power control level 5).<br>The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link. |
| op. 2 | GPRS 850<br>TCH mode<br>TCH=128/190/251 | A communication link is established between the mobile station and the test simulator. The transmitter is operated at its maximum rated output power: 33 dBm (power class 4; power control level 5). USF_Duty CYCLE set to 100%, coding scheme CS-1 for GMSK modulation, slot 3 active, uplink gamma: 3 (33 dBm).<br>The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link. |
| op. 3 | EGPRS 850<br>TCH mode<br>TCH=128/190/251 | A communication link is established between the mobile station and the test simulator. The transmitter is operated at its maximum rated output power: 33 dBm (power class 4; power control level 5). USF_Duty CYCLE set to 100%, coding scheme MCS-5 for 8PSK modulation, slot 3 active, uplink gamma: 6 (27dBm).<br>The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link. |
| op. 4 | GSM 1900<br>TCH mode<br>TCH=512/661/810 | A communication link is established between the mobile station and the test simulator. The transmitter is operated at its maximum rated output power: 30 dBm (power class 1; power control level 0).<br>The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link |
| op. 5 | GPRS 1900<br>TCH mode<br>TCH=512/661/810 | A communication link is established between the mobile station and the test simulator. The transmitter is operated at its maximum rated output power: 30 dBm (power class 1; power control level 0). USF_Duty CYCLE set to 100%, coding scheme CS-1 for GMSK modulation, slot 3 active, uplink gamma: 3 (30 dBm).<br>The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link |
| op. 6 | EGPRS 1900<br>TCH mode<br>PCL=0 (max. power)<br>TCH=512/661/810 | A communication link is established between the mobile station and the test simulator. The transmitter is operated at its maximum rated output power: 30 dBm (power class 1; power control level 0). USF_Duty CYCLE set to 100%, coding scheme MCS-5 for 8-PSK modulation, slot 3 active, uplink gamma: 5 (26 dBm).<br>The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link. |

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

**FDD modes**

| | | |
|---|---|---|
| op. 7 | FDD-Mode 2<br><br>12.2 kbps RMC | A communication link is established between the mobile station (UE) and the test simulator. The transmitter is operated on its maximum rated output power class: 24dBm.<br><br>The input signal to the receiver is modulated with normal test modulation. The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable communication link according Table E5.1/Table E5.1A as described in 3GPP TS34.121, Annex E. |
| op. 8 | FDD-Mode 5<br><br>12.2 kbps RMC | |
| op. 9 | FDD Mode 2<br><br>HSUPA | In addition to normal FDD-Mode, the UE was set to operate in HSDPA and HSUPA Mode too.<br>Chosen settings: 12.2kbps RMC + HSPA 34.108<br>This setting was chosen for all release 6 mobile equipment. |
| op. 10 | FDD Mode 5<br><br>HSUPA | |
| op. 11 | FDD Mode 2<br><br>HSPA+ | In addition to normal FDD-Mode, the UE was set to operate in HSPA+ Mode.<br>Chosen settings: RMC on CS domain + HSPA 34.108<br>This setting was chosen for all release 7 (HSDPA) mobile equipment. |
| op. 12 | FDD Mode 5<br><br>HSPA+ | |

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

**INTERMODULATION Modes**

| | | |
|---|---|---|
| op. 13 | GSM850 (TCH 190) + WiFi (Ch 11, b-mode 1Mbps) | Radiated Simultaneous Transmission.<br>For GSM communication settings see over view of GSM modes at this chapter and for WiFi used a special engineering SW to set the right modulation and channel. |
| op. 14 | PCS1900 (TCH 661) + BT (Ch0, pi/4 DQPSK= 2-DH5) | Radiated Simultaneous Transmission.<br>For GSM communication settings see over view of GSM modes at this chapter and for BT used the R&S CBT32 system to set the right modulation and channel. Also with a special engineering SW set the EUT on BT test mode. |
| op. 15 | FDD2 (TCH 9262) + WIFI (Ch 11, n-mode= MCS0) | Radiated Simultaneous Transmission.<br>For FDD communication settings see over view of GSM modes at this chapter and for WiFi used a special engineering SW to set the right modulation and channel.. |
| op. 16 | FDD5 (TCH 4182) + BT Test mode (Ch0 / 8DPSK= 3-DH5**)** | Radiated Simultaneous Transmission.<br>For GSM communication settings see over view of GSM modes at this chapter and for BT used the R&S CBT32 system to set the right modulation and channel. Also with a special engineering SW set the EUT before on BT test mode. |
| op. 17 | FDD 5 + WiFi A mode 5GHz (Ch36, 6 Mbps) | Radiated Simultaneous Transmission.<br>For GSM communication settings see over view of GSM modes at this chapter and for WiFi used a special engineering SW to set the right modulation and channel. |

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

**General modes**

| | | |
|---|---|---|
| op. 18 | Charging battery | Charging standard battery. This operating mode is combined with other op. modes or during the test was a secondary battery charged to change the tested EUT battery from nominal voltage to a full battery. |

## 3.6. Parameter Settings on mobile phone and base station CMU200

Following settings apply to the MS during the measurements in **GSM/GPRS/(E)GPRS**-Mode only:

| Parameter | Traffic Mode | Idle Mode |
|---|---|---|
| Traffic Channels mobile station (EUT) | GSM 850: $TCH_{MS}$= 128/ 190 /251<br>GSM 1900: $TCH_{MS}$ = 512 / 661 / 810 | -- |
| maximum power level (PCL) | GSM 850: PCL = 5 (2 Watt)<br>GSM 1900: PCL = 0 (1 Watt) | -- |
| Modulation | GSM/GPRS: GMSK-Modulation Scheme<br>EDGE: 8-PSK Modulation Scheme | -- |
| DTX | off | -- |
| Bitstream | PRBS 2E9-1 (pseudo-random-sequence) – CCITT 0.153 | |
| Timeslot(s) in Uplink | 3 | |
| Hopping | off | |
| Timeslot (slot mode) | GSM-Mode: single<br>GPRS-Mode: maximum allowed uplink slots no. according MS class | |
| MS slot class | Class 12 | |
| Maximum data transmission rate, single time slot | GSM: 9,6 kbit/s Slot<br>GPRS: 17,6 kbit/s Slot<br>EDGE: 59,2 kBit/s Slot | |
| Speech transcoding (Traffic Mode) | Full rate Version 1 | |
| Speed rate | 130 Kb/s | |
| Mode | BCCH and TCH | |
| BCCH – base station (CMU,CMD) | GSM 850: 182<br>GSM 1900: 651 | |
| TCH – base station (CMD, CMU) | auto | |
| Power level TCH – base station (used timeslot level) | - 70 dBm | |
| Power level BCCH – base station (control channel level) | - 80 dBm | |
| External attenuation RF/AF-Input/Output | Accord. calibration prior to measurements | |
| Mobile Country Code | 310 | 310 |
| Domain | PS or CS | |
| BS_AG_BLKS_RES | Not applicable | 0 |
| Paging reorganisation | | Off (0) |
| Signalling channel | | SDCCH |
| Location Update | | Auto |
| Cell access | | Disabled (barred) |

Following settings apply to the UE (EUT) during the measurements in **FDD-Mode** only:

| Parameter | Traffic Mode | Idle Mode |
|---|---|---|
| UARFCN UE Uplink (EUT) (according TS34.108) | FDD 2 = 9262/ 9400/ 9538<br>FDD 5 = 4132/ 4182/ 4233 | -- |
| UARFCN Node B (downlink) (according TS34.108) | FDD 2 = 9663/ 9800/ 9937<br>FDD 5 = 4358/ 4040/ 4457 | |
| UE power class | Class 3 (+24dBm) nominal | |
| HSDPA UE category/ HSUPA category | 14/6 | |
| Maximum power | FDD 2/4/5 12.2kbps RMC -> all TPC bits up ("1")<br>HSDPA-mode = accord. Subtests 1,2,3,4 defined in 3GPP TS34.121<br>HSUPA mode = accord. Subtests 1,2,3,4,5 defined in 3GPP TS34.121 | -- |
| Modulation | 12.2kbps RMC-mode: (UL) QPSK-Modulation Scheme<br>HSDPA/HSUPA/HSPA+ = (UL) BPSK, QPSK, (DL) 64 QAM Modulation Scheme is applicable | -- |
| Compression mode | Off | -- |
| Bitstream | PRBS 2E9-1 (pseudo-random-sequence) – CCITT 0.153 | |
| Maximum data transmission rate: | GSM: 17,6 kbps Slot<br>EDGE: 59,2 kbps Slot<br>FDD: QPSK 7,1 Mbps (UL)<br>64 QAM 21,10 Mbps (DL) | |
| Node B Downlink physical channels settings | According Table E.5.1/E.5.1A in 3GPP TS34.121 | |
| External attenuation RF/AF-Input/Output | Accord. Set-up calibration prior to measurements | |

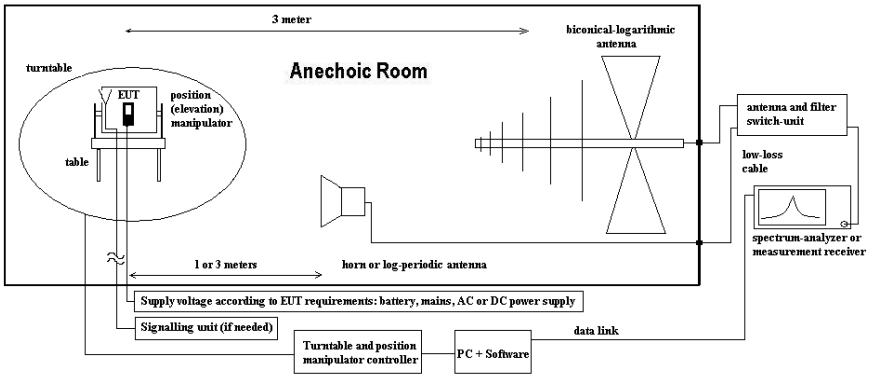
# 4. Description of test system set-up's

## 4.1. Test system set-up for electric field measurement in the range 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 it's 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 it's characteristics was recorded with an EMI-receiver, broadband antenna and software.

Measurement antenna: horizontal and vertical, heights: 1,0 m and 1,82 m. 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:**

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

$M = L_T - E_C$ (2)

AF = Antenna factor
$C_L$ = Cable loss
$D_F$ = Distance correction factor
$E_C$ = Electrical field – corrected value
$E_R$ = Receiver reading
$G_A$ = Gain of pre-amplifier (if used)
$L_T$ = Limit
M = Margin

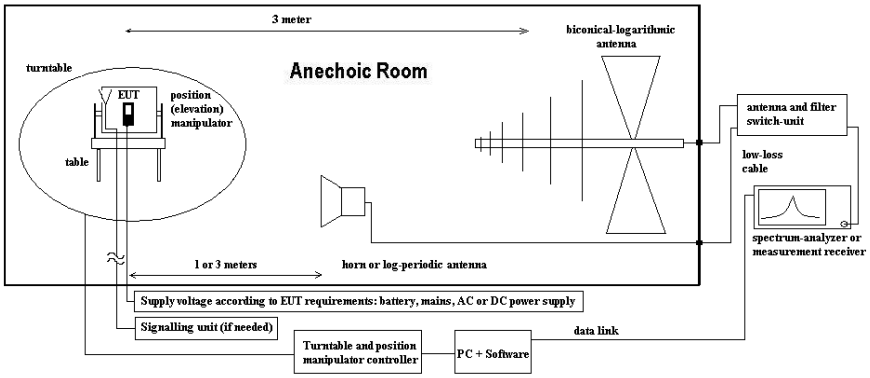
All units are dB-units, positive margin means value is below limit.

## 4.2. Test system set-up for 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 18 GHz and 1 meter above 18 GHz. Logarithmic periodic antenna is used for frequency range 1 GHz to 18 GHz, above 18 GHz a horn antenna is used. The antennas are set to fixed antenna height of 1.55 m and the EUT aligned within 3 dB cone of radiation pattern.

**Schematic:**




**Testing method:**

**Exploratory, preliminary measurements**
The EUT and it's 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 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 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:**

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

$M = L_T - E_C$ (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
$G_A$ = Gain of pre-amplifier (if used)

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

# 5. Measurements

## 5.1. RF-Parameter - RF Peak power output radiated

**5.1.1. Test location and equipment** (for reference numbers please see chapter 'List of test equipment')

| | | | | | | |
|---|---|---|---|---|---|---|
| test location | ☒ CETECOM Essen (Chapter. 2.2.1) | | ☐ Please see Chapter. 2.2.2 | | ☐ Please see Chapter. 2.2.3 | |
| test site | ☐ 441 EMI SAR | ☐ 487 SAR NSA | ☐ 347 Radio.lab. | ☒ 443 FAR | ☐ | ☐ |
| receiver | ☐ 377 ESCS30 | ☐ 001 ESS | ☐ 489 ESU 40 | ☐ 620 ESU 26 | ☐ | ☐ |
| spectr. analys. | ☐ 584 FSU | ☐ 120 FSEM | ☒ 264 FSEK | ☐ | ☐ | ☐ |
| antenna | ☐ 574 BTA-L | ☐ 133 EMCO3115 | ☐ 302 BBHA9170 | ☒ 608 HL 562 | ☒ 549 HL025 | ☐ 477 GPS |
| signaling | ☐ 392 MT8820A | ☐ 436 CMU | ☒ 546 CMU | | | |
| otherwise | ☐ 400 FTC40x15E | ☐ 401 FTC40x15E | ☐ 110 USB LWL | ☐ 482 Filter Matrix | ☐ 378 RadiSense | |
| DC power | ☐ 456 EA 3013A | ☐ 463 HP3245A | ☐ 459 EA 2032-50 | ☐ 268 EA- 3050 | ☐ 494 AG6632A | ☐ 498 NGPE 40 |
| otherwise | ☐ 331 HC 4055 | ☐ 248 6 dB Att. | ☐ 529 Power div. | ☐ - cable OTA20 | | |
| line voltage | ☐ 230 V 50 Hz via public mains | | ☐060 110 V 60 Hz via PAS 5000 | | | |

**5.1.2. Requirements**

| | |
|---|---|
| **FCC** | §2.1046 (radiated), §22.913(a)(2), § 24.232(c) |
| **IC** | RSS-132:4.4 + SRSP 503:5.1.3 for GSM 850; RSS-133:4.1/6.4 + SRSP-510:5.1.2 for GSM 1900 |
| **Limit** | Maximum Power Output of the mobile phone should be determined while measured radiated E(I)RP. |
| | Limits GSM850/ FDD 5: 7 Watt (ERP) |
| | Limit GSM1900/ FDD 2: 2 Watt (EIRP) |

**5.1.3. Test condition and measurement test set-up**

| | | | |
|---|---|---|---|
| link to test system (if used): | ☒ air link | ☐ cable connection | ☐ |
| Climatic conditions | Temperature: (22±3°C) | | Rel. humidity: (40±20)% |

**5.1.3.1. Test method**

The measurements were made at the upper, center, and lower carrier traffic frequencies of each of the supported operating band. Choosing three TX-carrier frequencies of the mobile phone, should be sufficient to demonstrate compliance.

The measurements were performed by using the **substitution method** (ANSI/TIA/EIA 603) with a spectrum-analyzer. This method can be described like follows:

1. choosing of suitable spectrum-analyzer settings for performing the measurements. This settings of the spectrum analyzer must be maintained for both stages of the measurements: EUT emission measurements and also for measurements of the substituted level.

| Parameter | Setting for GSM measurements | Settings for UTRA/FDD measurements |
|---|---|---|
| $RBW\|_{3dB}$ | 3 MHz | 10 MHz |
| VBW | 10 MHz | 10 MHz |
| Span | 20 MHz | 50 MHz |
| Detector Mode | Positive max-hold | Positive max-hold |
| Average | off | off |
| Sweep Time | coupled | coupled |
| | | |

2. The maximum level of the peak power was recorded, while the emissions were maximized by rotating the EUT in three orthogonal axes, which was situated on a non-conductive turntable of 1.55 m height ($P_{MEAS,1}$). This was performed for both measuring antenna polarisations (vertical/horizontal), the maximum of both values is used for further measurements and final substitution ($P_{MEAS,\,1,\,MAX}$).
3. As the maximum emission is recorded, the EUT is replaced by a frequency dependant suitable antenna, which is connected to a RF-signal generator, which is transmitting on the determined worst-case frequency as determined in step 2.
4. The RF-signal level of the signal generator is adjusted as long the same worst-case level determined first step is measured at the spectrum analyzer ($P_{SMHU}=P_{MEAS,1,\,MAX}$)
5. Than the RF-signal cable is disconnected from the antenna and connected to a power-level meter. The level is determined ($P_{MEAS,2}$).
6. The final result is calculated by adding the ERP/EIRP gain of the antenna which substitutes the EUT. $P_{EUT,SUBST} = P_{MEAS,2} + G_{ANTENNA}$

### 5.1.4. Measurement Results

#### 5.1.4.1. GSM 850 results (radiated)

| Channel/ Frequency (MHz) (Set-up 1, op. modes 1 & 3) | | | Peak Output Power [dBm] | | Limit | Result |
|---|---|---|---|---|---|---|
| Test case | Diagram no. | ARFCN no./ Frequency | PK | | | |
| GSM 850 | 8.01_Ch128_ERP | 128/ 824.2MHz | 1.) | ERP-Value | 38.5 dBm | passed |
| | 8.01_Ch190_ERP | 190/ 836.6 MHz | 32.2 | | | |
| | 8.01_Ch251_ERP | 251/ 848.8 MHz | 1.) | | | |
| E-GPRS 850 | 8.02_EDGE_Ch128_ERP | 128/ 824.2 MHz | 1.) | | | passed |
| | 8.02_EDGE_Ch190_ERP | 190/ 836.6 MHz | 29.9 | | | |
| | 8.02_EDGE_Ch251_ERP | 251/ 848.8 MHz | 1.) | | | |

Remark: 1.) Please see diagrams at annex 1. Peak levels above shown only the highest power of each modulation

#### 5.1.4.2. GSM 1900 results (radiated)

| Channel/ Frequency (MHz) (Set-up 1 & 2, op. modes 4 & 6) | | | Peak Output Power [dBm] | | Limit | Result |
|---|---|---|---|---|---|---|
| Test case | Diagram no. | ARFCN no./ Frequency | PK | | | |
| GSM 1900 | 8.03_Ch512_EIRP | 512/ 1850.2 MHz | 1.) | EIRP-Value | 33.0 dBm | passed |
| | 8.03_Ch661_EIRP | 661/ 1880.0 MHz | 30.3 | | | |
| | 8.03_Ch810_EIRP | 810/ 1909.8 MHz | 1.) | | | |
| E-GPRS 1900 | 8.04_EDGE_Ch512_EIRP | 512/ 1850.2 MHz | 30.4 | | | passed |
| | 8.04_EDGE_Ch661_EIRP | 661/ 1880.0 MHz | 1.) | | | |
| | 8.04_EDGE_Ch810_EIRP | 810/ 1909.8 MHz | 1.) | | | |

Remark: 1.) Please see diagrams at annex 1. Peak levels above shown only the highest power of each modulation

**5.1.4.2.1. FDD2 (radiated)**

| EUT | | | Set-up 1 & 2 / op. modes 7, 8 & 9 | | | |
|---|---|---|---|---|---|---|
| Test case | Diagram no. | U-ARFCN no. | Power[dBm] PK | | Limit | Result |
| Release 99, 12.2kbps RMC | 8.05_ch9262_Voice _EIRP | 9262 | 25.4 | EIRP | 33.0 dBm | Passed |
| | 8.05_ch9400_Voice _EIRP | 9400 | 1.) | | | |
| | 8.05_ch9538_Voice _EIRP | 9538 | 1.) | | | |
| HSUPA, Release 6 | 8.06_ch9262_ HSUPA_EIRP | 9262 | 1.) | | | |
| | 8.06_ch9400_ HSUPA_EIRP | 9400 | 25.0 | | | |
| | 8.06_ch9538_ HSUPA_EIRP | 9538 | 1.) | | | |
| HSPA+, Release 7 | 8.07_ch9262_ HSPA+_EIRP | 9262 | 29.6 | | | |
| | 8.07_ch9400_ HSPA+_EIRP | 9400 | 1.) | | | |
| | 8.07_ch9538_ HSPA+_EIRP | 9538 | 1.) | | | |

Remarks: 1.) Please see diagrams at annex 1. Peak levels above shown only the highest power of each Modulation.

**5.1.4.2.2. FDD 5 (radiated)**

| EUT | | | Set-up 1 & 2/ op. modes 10, 11 & 12 | | | |
|---|---|---|---|---|---|---|
| Test case | Diagram no. | U-ARFCN no. | Power[dBm] PK | | Limit | Result |
| Release 99, 12.2kbps RMC | 8.08_ch4132_Voice FDDV_ERP | 9262 | 29.1 | ERP | 38.5 dBm | Passed |
| | 8.08_ch4182_Voice FDDV_ERP | 9400 | 1.) | | | |
| | 8.08_ch4233_Voice FDDV_ERP | 9538 | 1.) | | | |
| HSUPA, Release 6 | 8.09_HSUPA_ Ch4132_ERP | 9262 | 1.) | | | |
| | 8.09_HSUPA_ ch4182_ERP | 9400 | 26.7 | | | |
| | 8.09_HSUPA_ Ch4233_ERP | 9538 | 1.) | | | |
| HSPA+, Release 7 | 8.10_ch4132 HSPA+_ERP | 9262 | 1.) | | | |
| | 8.10_ch4182_ HSPA+_ERP | 9400 | 28.7 | | | |
| | 8.10_ch4233_ HSPA+_ERP | 9538 | 1.) | | | |

Remarks: 1.) Please see diagrams at annex 1. Peak levels above shown only the highest power of each Modulation.

## 5.2. General Limit - Radiated field strength emissions, above 30 MHz

### 5.2.1. Test location and equipment (for reference numbers please see chapter 'List of test equipment')

| | | | | | | |
|---|---|---|---|---|---|---|
| test location | ☒ CETECOM Essen (Chapter. 2.2.1) | | ☐ Please see Chapter. 2.2.2 | | ☐ Please see Chapter. 2.2.3 | |
| test site | ☒ 441 EMI SAR | ☒ 487 SAR NSA | ☒ 443 FAR | ☐ 347 Radio.lab. | | |
| receiver | ☐ 377 ESCS30 | ☒ 001 ESS | ☒ 489 ESU | | | |
| spectr. analys. | ☐ 584 FSU | ☐ 120 FSEM | ☒ 264 FSEK | | | |
| antenna | ☒ 608 HL 562 | ☒ 549 HL 025 | ☐ 302 BBHA9170 | ☒ 289 CBL 6141 | ☐ 030 HL-025 | ☐ 477 GPS |
| signaling | ☐ 017 CMD 65 | ☐ 323 CMD 55 | ☐ 340 CMD 55 | | | |
| signaling | ☐ 392 MT8820A | ☒ 546 CMU | ☐ 547 CMU | | | |
| power supply | ☐ 463 HP3245A | ☐ 457 EA 3013A | ☐ 459 EA 2032-50 | ☐ 268 EA- 3050 | ☐ 494 AG6632A | ☐ 498 NGPE 40 |
| otherwise | ☐ 529 6dB divider | ☐ 530 6dB Att. | ☐ 110 USB LWL | ☐ 482 Filter Matrix | ☐ 431 Near field | |
| line voltage | ☐ 230 V 50 Hz via public mains | | ☐060 110 V 60 Hz via PAS 5000 | | | |

### 5.2.2. Requirements/Limits

| | | | |
|---|---|---|---|
| FCC | | ☐ Part 15 Subpart B, §15.109, class B<br>☒ Part 15 Subpart C, §15.209 @ frequencies defined in §15.205 | |
| IC | | RSS-Gen., Issue 3 | |
| ANSI | | C63.4-2009 | |
| Limit | Frequency [MHz] | Radiated emissions limits, 3 meters | |
| | | QUASI Peak [µV/m] | QUASI Peak [dBµV/m] |
| | 30-88 | 100 | 40.0 |
| | 88-216 | 150 | 43.5 |
| | 216-960 | 200 | 46.0 |
| | above 960 | 500 | 54.0 |

| Frequency [MHz] | Limits | | | |
|---|---|---|---|---|
| | AV [µV/m] | AV [dBµV/m] | Peak [µV/m] | Peak [dBµV/m] |
| above 1 GHz | 500 | 54.0 | 5000 | 74.0 |

### 5.2.3. Restricted bands of operation, §15.205

| MHz | MHz | MHz | GHz |
|---|---|---|---|
| 0.090-0.110 | 16.42-16.423 | 399.9-410 | 4.5-5.15 |
| 0.495-0.505 | 16.69475-16.69525 | 608-614 | 5.35-5.46 |
| 2.1735-2.1905 | 16.80425-16.80475 | 960-1240 | 7.25-7.75 |
| 4.125-4.128 | 25.5-25.67 | 1300-1427 | 8.025-8.5 |
| 4.20725-4.20775 | 37.5-38.25 | 1645.5-1646.5 | 9.3-9.5 |
| 6.215-6.218 | 73-74.6 | 1660-1710 | 10.6-12.7 |
| 6.26775-6.26825 | 74.8-75.2 | 1718.8-1722.2 | 13.25-13.4 |
| 6.31175-6.31225 | 108-121.94 | 2200-2300 | 14.47-14.5 |
| 8.291-8.294 | 123-138 | 2310-2390 | 15.35-16.2 |
| 8.362-8.366 | 149.9-150.05 | 2483.5-2500 | 17.7-21.4 |
| 8.37625-8.38675 | 156.52475-156.52525 | 2690-2900 | 22.01-23.12 |
| 8.41425-8.41475 | 156.7-156.9 | 3260-3267 | 23.6-24.0 |
| 12.29-12.293 | 162.0125-167.17 | 3332-3339 | 31.2-31.8 |
| 12.51975-12.52025 | 167.72-173.2 | 3345.8-3358 | 36.43-36.5 |
| 12.57675-12.57725 | 240-285 | 3600-4400 | -- |
| 13.36-13.41 | 322-335.4 | -- | -- |
| Remark: only spurious emissions are allowed within these frequency bands not exceeding the limits per §15.209 | | | |

### 5.2.4. Test condition and measurement test set-up

**According chapter 4.1**

| | | | | |
|---|---|---|---|---|
| link to test system (if used): | | ☒ air link | ☐ cable connection | |
| EUT-grounding | | ☒ none | ☐ with power supply | ☐ additional connection |
| Equipment set up | | ☒ table top 0.8m height | | ☐ floor standing |
| Climatic conditions | | Temperature: (22±3°C) | | Rel. humidity: (40±20)% |
| EMI-Receiver (Analyzer) Settings | Scan frequency range: | ☒ 30 – 1000 MHz ☐ other: | | |
| | Scan-Mode | ☒ 6dB EMI-Receiver Mode ☐ 3dB 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 radiated measurements" | | |

**According chapter 4.2**

| | | | | |
|---|---|---|---|---|
| link to test system (if used): | | ☒ air link | ☐ cable connection | |
| EUT-grounding | | ☒ none | ☐ with power supply | ☐ additional connection |
| Equipment set up | | ☒ table top 1.5m height | | ☐ floor standing |
| Climatic conditions | | Temperature: (22±3°C) | | Rel. humidity: (40±20)% |
| Spectrum-Analyzer settings | Scan frequency range: | ☒ 30 MHz – 20 GHz ☐ 18 – 25 GHz ☐ 18 – 40 GHz ☐ other: | | |
| | Scan-Mode | ☐ 6 dB EMI-Receiver Mode ☒ 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 measurements" | | |

#### 5.2.4.1. Frequency range

The spectrum was scanned from 30 MHz to the 10th harmonic of the highest frequency generated within the equipment except for simultaneous mode were measured till 18 GHz. A PEAK and AVERAGE (from 1 GHz) detector were used except measurements near the band-edge where a AVERAGE detector applied, but at last not requested from the applicant.

#### 5.2.4.2. Description of Set-up

See radiated set-up in chapter 4.1 and 4.2

#### 5.2.4.3. Settings on Mobile Phone

The measurements were made at the upper, middle, and lower carrier frequencies of the operating band. Choosing three representative TX-carrier frequencies of the mobile phone within each operable GSM/FDD band, should be sufficient to demonstrate compliance with the emissions limits outside and adjacent to the frequency blocks. A call was established with settings according chapter 3.6. For simultaneous was taken according applicant requested modes (s. chapter 3.5, op.-modes 11-15).

#### 5.2.4.4. Test method radiated:

By rotating the EUT in three orthogonal planes, the emissions were recorded with Peak-Detector and Hold-Max function of the spectrum-analyzer. If the harmonic could not be detected above the noise floor, the ambient level was recorded. Measurement distance is 3 m for frequencies up to 18 GHz and 1 m for frequencies above 18 GHz. For simultaneous (only combination with WiFi'a'-mode) was the measurement distance 1 m from 7 GHz to18 GHz. The readings on the spectrum analyzer are corrected with annually performed chamber path calibration values 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.

### 5.2.5. Results simultaneous transmission radiated

Generally only measured level will be notify here which has a margin to limit below 3 dB otherwise see diagrams at annex 1.

**5.2.5.1.**

| Diagram no. | Carrier Channel | Frequency range | Set-up no. | OP-mode no. | Remark | Used detector | | | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | PK | AV | QP | |
| 2.01_ST | see detailed description of carrier in the OP. modes at chapter 3.5 | 30 – 1000 MHz | 3 | 11 | Uplink carrier of GSM band on diagram | ☒ | ☐ | ☐ | passed |
| 2.02_ST | | | | 12 | -- | ☒ | ☐ | ☐ | passed |
| 2.03_ST | | | | 13 | -- | ☒ | ☐ | ☐ | passed |
| 2.04_ST | | | | 14 | Uplink carrier of FDD band on diagrams | ☒ | ☐ | ☐ | passed |
| 2.05_ST | | | | 15 | -- | ☒ | ☐ | ☐ | passed |
| 8.01_ST_1 | | 1 GHz – 18 GHz | | 11 | -- | ☒ | ☐ | ☐ | passed |
| 8.01_ST_2 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.02_ST_1 | | | | 12 | -- | ☒ | ☐ | ☐ | passed |
| 8.02_ST_2 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.03_ST_1 | | | | 13 | -- | ☒ | ☐ | ☐ | passed |
| 8.03_ST_2 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.04_ST_1 | | | | 14 | -- | ☒ | ☐ | ☐ | passed |
| 8.04_ST_2 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.05_ST_ sweep2_1G_ to_2.8GHz | | | | 15 | -- | ☒ | ☐ | ☐ | passed |
| 8.05_ST_2 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.05_ST_2a | | | | | | ☒ | ☐ | ☐ | passed |

### 5.2.6. Results spurious emission radiated

Generally only measured level will be notify here which has a margin to limit below 3 dB otherwise see the results at annex 1.

#### 5.2.6.1. GSM 850

| Diagram no. | Carrier Channel | Frequency range | Set-up no. | OP-mode no. | Remark | Used detector | | | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | PK | AV | QP | |
| 8.01_ch128 | see detailed description of carrier in the OP. modes at chapter 3.5 | 30 – 9000 MHz | 1 | 1 | Uplink carrier of GSM band on diagrams | ☒ | ☐ | ☐ | passed |
| 8.01_ch190 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.01_ch251 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.02_GPRS_ch190 | | | | 2 | | ☒ | ☐ | ☐ | passed |
| 8.03_ch128 | | | | 3 | | ☒ | ☐ | ☐ | passed |
| 8.03_ch190 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.03_ch251 | | | | | | ☒ | ☐ | ☐ | passed |

#### 5.2.6.2. GSM 1900

| Diagram no. | Carrier Channel | Frequency range | Set-up no. | OP-mode no. | Remark | Used detector | | | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | PK | AV | QP | |
| 8.04_ch512 | see detailed description of carrier in the OP. modes at chapter 3.5 | 30 MHz – 20 GHz | 1 | 4 | Uplink carrier of GSM band on diagrams | ☒ | ☐ | ☐ | passed |
| 8.04_ch661 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.04_ch810 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.05_GPRS_ch1661 | | | 2 | 5 | | ☒ | ☐ | ☐ | passed |
| 8.06_ch512 | | | | 6 | | ☒ | ☐ | ☐ | passed |
| 8.06_ch661 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.06_ch810 | | | | | | ☒ | ☐ | ☐ | passed |

### 5.2.6.3. FDD II

| Diagram no. | Carrier Channel | Frequency range | Set-up no. | OP-mode no. | Remark | Used detector | | | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | PK | AV | QP | |
| 8.07_ch9262 | see detailed description of carrier in the OP. modes at chapter 3.5 | 30 MHz – 20 GHz | 1 | 7 | Uplink carrier of FDD band on diagram and measured till 9 GHz, because on middle and high channels were only noise-floor | ☒ | ☐ | ☐ | passed |
| 8.07_ch9400 | | | | | Uplink carrier of FDD band on diagrams | ☒ | ☐ | ☐ | passed |
| 8.07_ch9835 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.08_Ch9262 _HSUPA | | | | 9 | | ☒ | ☐ | ☐ | passed |
| 8.08_Ch9400 _HSUPA | | | | | | ☒ | ☐ | ☐ | passed |
| 8.08_Ch9835 _HSUPA | | | | | | ☒ | ☐ | ☐ | passed |
| 8.09_Ch9262 | | | 2 | 10 | HSPA+ mode and uplink carrier of FDD band on diagrams | ☒ | ☐ | ☐ | passed |
| 8.09_Ch9400 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.09_Ch9835 | | | | | | ☒ | ☐ | ☐ | passed |

### 5.2.6.4. FDD V

| Diagram no. | Carrier Channel | Frequency range | Set-up no. | OP-mode no. | Remark | Used detector | | | Result |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | PK | AV | QP | |
| 8.10_ ch4132_ Voice | see detailed description of carrier in the OP. modes at chapter 3.5 | 30 MHz – 9 GHz | 1 | 8 | Uplink carrier of FDD band on diagrams | ☒ | ☐ | ☐ | passed |
| 8.10_ ch4183 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.10_ ch4233 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.11_ ch4132_ HSUPA | | | 2 | 9 | Uplink carrier of FDD band on diagrams | ☒ | ☐ | ☐ | passed |
| 8.11_ ch4183_ HSUPA | | | | | | ☒ | ☐ | ☐ | passed |
| 8.11_ ch4233_ HSUPA | | | | | | ☒ | ☐ | ☐ | passed |
| 8.12_ ch4132 | | 30 MHz – 12 GHz | | 10 | HSPA+ mode and Uplink carrier of FDD band on diagrams | ☒ | ☐ | ☐ | passed |
| 8.12_ ch4183 | | | | | | ☒ | ☐ | ☐ | passed |
| 8.12_ ch4233 | | | | | | ☒ | ☐ | ☐ | passed |

## 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 it's contribution to the overall uncertainty according it's statistical distribution calculated.

Following table shows expectable uncertainties for each measurement type performed.

| RF-Measurement | Frequency range | Calculated uncertainty based on a confidence level of 95% | Remarks: |
|---|---|---|---|
| Power Output conducted | 9 kHz .. 20 GHz | 1.0 dB | -- |
| Power Output radiated | 30 MHz .. 4 GHz | 3.17 dB | Substitution method |
| Conducted emissions on antenna ports | 9 kHz .. 20 GHz | 1.0 dB | -- |
| Radiated emissions enclosure | 150 kHz .. 30 MHz | 5.0 dB | Magnetic field |
| | 30 MHz .. 1 GHz | 4.2 dB | E-Field |
| | 1 GHz .. 20 GHz | 3.17 dB | Substitution method |
| 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 |
| | | 1.0 dB | Power |
| Frequency stability | 9 kHz .. 20 GHz | 0.0636 ppm | -- |
| Conducted emissions on AC-mains port ($U_{CISPR}$) | 9 kHz .. 150 kHz | 4.0 dB | -- |
| | 150 kHz .. 30 MHz | 3.6 dB | |

**Table: measurement uncertainties, valid for conducted/radiated measurements**

# 6. Abbreviations used in this report

| **The abbreviations** | |
|---|---|
| ANSI | American National Standards Institute |
| AV or AVG | Average detector |
| 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, Dokuments 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<br>487<br>558<br>348<br>348 | 736496 | Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS)<br>Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR)<br>Radiated Measurements above 1 GHz, 3 m (FAR)<br>Mains Ports Conducted Interference Measurements<br>Telecommunication Ports Conducted Interference Measurem. | FCC, Federal Communications Commission<br>Laboratory Division, USA<br>(MRA US-EU 0003) |
| 337<br>487<br>550<br>558 | 3462D-1<br>3462D-2<br>3462D-2<br>3462D-3 | Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS)<br>Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR)<br>Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR)<br>Radiated Measurements above 1 GHz, 3 m (FAR) | IC, Industry Canada<br>Certification and Engineering Bureau |
| 337<br>487<br>550<br>348<br>348 | R-2665<br>R-2666<br>G-301<br>C-2914<br>T-1967 | Radiated Measurements 30 MHz to 1 GHz, 3 m / 10 m (OATS)<br>Radiated Measurements 30 MHz to 1 GHz, 3 m (SAR)<br>Radiated Measurements 1 GHz to 6 GHz, 3 m (SAR)<br>Mains Ports Conducted Interference Measurements<br>Telecommunication Ports Conducted Interference Measurem. | 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

### 8.1. Used equipment "CTC"

The "Ref.-No" in 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 |
| 264 | Spectrum Analyzer | FSEK 30 | 826939/005 | Bios=2.1, Analyzer= 3.20 |
| 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 |
| 331 | Climatic Test Chamber -40/+80 Grad | HC 4055 | 43146 | TSI 1.53 |
| 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 |
| 383 | Signal Generator | SME 03 | 842 828 /034 | Firm.= 4.61 |
| 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 |

| Ref.-No. | Equipment | Type | Serial-No. | Version of Firmware or Software during the test |
|---|---|---|---|---|
| 443 | CTC-FAR-EMI-RSE | System CTC-FAR-EMI-RSE | - | Spuri 7.2.5 or EMC 32 Ver. 8.53 |
| 444 | CTC-FAR-EMS field | System-EMS-Field (FAR) | - | EMC 32 Version 8.40 |
| 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 |
| 594 | Wideband Radio Communication Tester | CMW500 | 101757 | Firmware Base=2.0.20.9, LTE=2.0.20.8. CDMA= 2.0.10 |
| 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 (Reserve) | 831259/013 | Firmware Bios 3.40 , Analyzer 3.40 Sp 2 |
| 620 | EMI Test Receiver | ESU 26 | 100362 | 4.43_SP3 |
| 642 | Wideband Radio Communication Tester | CMW 500 | 126089 | |
| | | | | |

## 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 | - | 31.03.2013 |
| 005 | AC - LISN (50 Ohm/50µH, test site 1) | ESH2-Z5 | 861741/005 | Rohde & Schwarz | 24/12 M | - | 31.03.2014 |
| 007 | Single-Line V-Network (50 Ohm/5µH) | ESH3-Z6 | 892563/002 | Rohde & Schwarz | 24/12 M | - | 31.03.2014 |
| 009 | Power Meter (EMS-radiated) | NRV | 863056/017 | Rohde & Schwarz | 24 M | - | 31.03.2013 |
| 016 | Line Impedance Simulating Network | Op. 24-D | B6366 | Spitzenberger+Spies | 36 M | - | 31.03.2013 |
| 020 | Horn Antenna 18 GHz (Subst 1) | 3115 | 9107-3699 | EMCO | 36/12 M | - | 31.03.2013 |
| 021 | Loop Antenna (H-Field) | 6502 | 9206-2770 | EMCO | 36 M | - | 31.03.2015 |
| 030 | Loop Antenna (H-field) | HFH-Z2 | 879604/026 | Rohde & Schwarz | 36 M | - | 31.03.2015 |
| 033 | RF-current probe (100kHz-30MHz) | ESH2-Z1 | 879581/18 | Rohde & Schwarz | 24 M | - | 31.03.2013 |
| 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 | 30.06.2013 |
| 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 | |
| 090 | Helmholtz coil: 2x10 coils in series | - | - | RWTÜV | - | 4 | |
| 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 | - | 31.03.2015 |
| 100 | passive voltage probe | Probe TK 9416 | without | Schwarzbeck | 36 M | - | 31.03.2015 |
| 110 | USB-LWL-Converter | OLS-1 | - | Ing. Büro Scheiba | - | 4 | |
| 119 | RT Harmonics Analyzer dig. Flickermeter | B10 | G60547 | BOCONSULT | 36 M | - | 31.03.2013 |
| 134 | horn antenna 18 GHz (Subst 2) | 3115 | 9005-3414 | EMCO | 12 M | - | 31.03.2014 |
| 136 | adjustable dipole antenna (Dipole 1) | 3121C-DB4 | 9105-0697 | EMCO | 36 M | - | 31.03.2015 |
| 140 | Signal Generator | SMHU | 831314/006 | Rohde & Schwarz | 24 M | - | 31.03.2014 |
| 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 | - | 31.03.2014 |
| 262 | Power Meter | NRV-S | 825770/0010 | Rohde & Schwarz | 24 M | - | 31.03.2014 |
| 263 | Signal Generator | SMP 04 | 826190/0007 | Rohde & Schwarz | 36 M | - | 31.03.2013 |
| 264 | Spectrum Analyzer | FSEK 30 | 826939/005 | Rohde & Schwarz | 12 M | - | 31.03.2013 |
| 265 | peak power sensor | NRV-Z33, Model 04 | 840414/009 | Rohde & Schwarz | 24 M | - | 31.03.2014 |
| 266 | peak power sensor | NRV-Z31, Model 04 | 843383/016 | Rohde & Schwarz | 24 M | - | 31.03.2014 |
| 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 | |

| Ref.-No. | Equipment | Type | Serial-No. | Manufacturer | Interval of calibration | Remark | Cal due |
|---|---|---|---|---|---|---|---|
| 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 | 30.06.2013 |
| 291 | high pass filter GSM 850/900 | WHJ 2200-4EE | 14 | Wainwright GmbH | 12 M | 1c | 30.06.2013 |
| 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 | 24/12 M | - | 31.03.2014 |
| 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 | - | 31.03.2014 |
| 303 | horn antenna 40 GHz (Subst 1) | BBHA9170 | 156 | Schwarzbeck | 36 M | - | 31.03.2014 |
| 331 | Climatic Test Chamber -40/+80 Grad | HC 4055 | 43146 | Heraeus Vötsch | 24 M | - | 30.11.2012 |
| 341 | Digital Multimeter | Fluke 112 | 81650455 | Fluke | 24 M | - | 31.03.2014 |
| 342 | Digital Multimeter | Voltcraft M-4660A | IB 255466 | Voltcraft | 24 M | - | 31.03.2013 |
| 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 | - | 31.03.2014 |
| 356 | power sensor | NRV-Z1 | 882322/014 | Rohde & Schwarz | 24 M | - | 31.03.2013 |
| 357 | power sensor | NRV-Z1 | 861761/002 | Rohde & Schwarz | 24 M | - | 31.03.2013 |
| 371 | Bluetooth Tester | CBT32 | 100153 | R&S | 12 M | - | 31.03.2013 |
| 373 | Single-Line V-Network (50 Ohm/5µH) | ESH3-Z6 | 100535 | Rohde & Schwarz | 24/12 M | - | 31.03.2014 |
| 376 | Horn Antenna 6 GHz | BBHA9120 E | BBHA 9120 E 179 | Schwarzbeck | 12 M | - | 31.03.2013 |
| 377 | EMI Test Receiver | ESCS 30 | 100160 | Rohde & Schwarz | 12 M | - | 31.03.2013 |
| 389 | Digital Multimeter | Keithley 2000 | 0583926 | Keithley | 24 M | - | 31.03.2013 |
| 392 | Radio Communication Tester | MT8820A | 6K00000788 | Anritsu | 12 M | - | 31.03.2013 |
| 431 | Model 7405 | Near-Field Probe Set | 9305-2457 | EMCO | - | 4 | |
| 436 | Univ. Radio Communication Tester | CMU 200 | 103083 | Rohde & Schwarz | 12 M | - | 31.03.2013 |
| 441 | CTC-SAR-EMI Cable Loss | System EMI field (SAR) Cable | - | CETECOM | 12 M | 5 | 31.10.2012 |
| 443 | CTC-FAR-EMI-RSE | System CTC-FAR-EMI-RSE | - | ETS-Lindgren / CETECOM | 12 M | 5 | 30.06.2013 |
| 448 | notch filter WCDMA_FDD II | WRCT 1850.0/2170.0-5/40- | 5 | Wainwright Instruments GmbH | 12 M | 1c | 30.06.2013 |
| 449 | notch filter WCDMA FDD V | WRCT 824.0/894.0-5/40-8SSK | 1 | Wainwright | 12 M | 1c | 30.06.2013 |
| 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 | - | 31.03.2013 |
| 463 | Universal source | HP3245A | 2831A03472 | Agilent | - | 4 | |
| 466 | Digital Multimeter | Fluke 112 | 89210157 | Fluke USA | 24 M | - | 31.03.2014 |
| 467 | Digital Multimeter | Fluke 112 | 89680306 | Fluke USA | 24 M | - | 31.03.2014 |
| 468 | Digital Multimeter | Fluke 112 | 90090455 | Fluke USA | 24 M | - | 31.03.2014 |
| 477 | ReRadiating GPS-System | AS-47 | - | Automotive Cons. Fink | - | 3 | |
| 480 | power meter (Fula) | NRVS | 838392/031 | Rohde & Schwarz | 24 M | - | 31.03.2013 |
| 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 | - | 30.06.2013 |
| 487 | System CTC NSA-Verification SAR-EMI | System EMI field (SAR) NSA | - | ETS Lindgren / CETECOM | 24 M | - | 30.09.2013 |
| 489 | EMI Test Receiver | ESU40 | 1000-30 | Rohde & Schwarz | 12 M | - | 31.03.2013 |
| 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 | Wainwrght | 12 M | 1c | 30.06.2013 |
| 517 | relais switch matrix | HF Relais Box Keithley | SE 04 | Keithley | pre-m | 2 | |
| 523 | Digital Multimeter | L4411A | MY46000154 | Agilent | 24 M | - | 31.03.2013 |
| 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 | - | 31.03.2013 |
| 547 | Univ. Radio Communication Tester | CMU 200 | 835390/014 | Rohde & Schwarz | 12 M | - | 31.03.2013 |
| 548 | Digital-Barometer | GBP 2300 | without | Greisinger GmbH | 36 M | - | 30.06.2015 |
| 549 | Log.Per-Antenna | HL025 | 1000060 | Rohde & Schwarz | 36/12 M | - | 31.03.2015 |
| 552 | high pass filter 2,8-18GHz | WHKX 2.8/18G-10SS | 4 | Wainwright | 12 M | 1c | 30.06.2013 |
| 558 | System CTC FAR S-VSWR | System CTC FAR S-VSWR | - | CTC | 24 M | - | 31.07.2013 |
| 574 | Biconilog Hybrid Antenna | BTA-L | 980026L | Frankonia | 36/12 M | - | 30.03.2013 |
| 584 | Spectrum Analyzer | FSU 8 | 100248 | Rohde & Schwarz | 12 M | - | 31.03.2013 |
| 594 | Wideband Radio Communication Tester | CMW500 | 101757 | Rohde & Schwarz | 24 M | - | 31.03.2014 |
| 597 | Univ. Radio Communication Tester | CMU 200 | 100347 | Rohde & Schwarz | 12 M | - | 31.03.2013 |
| 598 | Spectrum Analyzer | FSEM 30 (Reserve) | 831259/013 | Rohde & Schwarz | 24 M | - | 13.01.2013 |
| 600 | power meter | NRVD (Reserve) | 834501/018 | Rohde & Schwarz | 24 M | - | 31.03.2013 |
| 601 | medium-sensitivity diode sensor | NRV-Z5 (Reserve) | 8435323/003 | Rohde & Schwarz | 24 M | - | 12.01.2013 |
| 602 | peak power sensor | NRV-Z32 (Reserve) | 835080 | Rohde & Schwarz | 24 M | - | 12.01.2013 |
| 608 | UltraLog-Antenna | HL 562 | 830547/009 | Rohde & Schwarz | 36/12 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 | |

| Ref.-No. | Equipment | Type | Serial-No. | Manufacturer | Interval of calibration | Remark | Cal due |
|---|---|---|---|---|---|---|---|
| 616 | Digitalmultimeter | Fluke 177 | 88900339 | Fluke | 24 M | - | 31.03.2014 |
| 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 | - | 01.01.2013 |
| 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 | 201.0999.9302.6.4.1.43 | G. Lufft GmbH | 24 M | - | 30.05.2014 |
| 634 | Spectrum Analyzer | FSM (HF-Unit) | 826188/010 | Rohde & Schwarz | pre-m | 2 | |
| 635 | DFS Testbox | DFS Testbox | 2012 V01 | CETECOM SHA | - | - | |
| 636 | Wärmebildkamera | Ti32 | Ti32-12060213, Tele | Fluke Corporation | 24 M | - | 31.07.2014 |
| 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 | 24 M | - | 31.03.2014 |
| | | | | | | | |

### 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 |