

# PARTIAL TEST REPORT

## No.: 2-0037-12-1-1 L







According to:  
**FCC Regulations**  
 Part 15.247, Part 15.407  
 Part 15.207, Part 15.109

**IC-Regulations**  
 RSS-Gen, Issue 3  
 RSS-210, Issue 8

for

Research In Motion Limited  
 Mobile Phone RFG81UW

FCC-ID: L6ARFG80UW  
 IC: 2503A-RFG80UW

Laboratory Accreditation and Listings			
 Deutsche Akkreditierungsstelle D-PL-12047-01-01	 Reg. No.: 736496 MRA US-EU 0003	 Industry Canada Reg. No.: 3462D-1 Reg. No.: 3462D-2 Reg. No.: 3462D-3	 Voluntary Controls for Electromagnetic Emissions Reg. No.: R-2665, R-2666 C-2914, T-1967, G-301
 AUTHORIZED RF LABORATORY	 <b>Authorized Test Lab</b> LAB CODE 20011130-00		
accredited according to DIN EN ISO/IEC 17025			
<p><b>CETECOM GmbH</b> Laboratory Radio Communications &amp; 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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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. The presented device integrates a IEEE802.11a WLAN transmitter in the 5 GHz frequency range. Other implemented wireless technologies were not considered within this test report.

Following test cases have been performed to show compliance with valid Part 15.207/15.209/15.247/15.407 of the FCC CFR 47 Rules, Edition 1<sup>st</sup> October 2011 and IC RSS-210 Issue 8/RSS-Gen Issue 3 standards.

### 1.1. Tests overview FCC and Canada IC Standards (RSS)

TEST CASES	PORT	REFERENCES & LIMITS			EUT set-up	EUT operating mode	Result
		FCC Standard	RSS Section	TEST LIMIT			
TX-Mode							
6 dB emission bandwidth	Antenna terminal (conducted)	§15.247(a)(2)	RSS-210 Issue 8: A8.2 (a) RSS-Gen Issue 3: Chapter 4.6.2	≥ 500 kHz for DTS systems according	--	--	Not performed 1.)
99% occupied bandwidth (=B)	Antenna terminal (conducted)	--	RSS-Gen Issue 3: Chapter 4.6.1	99% Power bandwidth	--	--	Not performed 1.)
Transmitter Peak output power	Antenna terminal (conducted)	§15.247(b)(3)	RSS-210 Issue 8: A8.4 (4)	1 Watt Peak	--	--	Not performed 1.)
		§15.407(a)(1)(2)(3)	RSS-210 Issue 8: A9.2 (1)(2)(3)(4)	Lesser of: 200mW or 10dBm+10log <sub>10</sub> (B)  Lesser of: 250mW or 11dBm+10log <sub>10</sub> (B)  Lesser of 1W or 17dBm+10log <sub>10</sub> (b)			
Transmitter Peak output power radiated	Cabinet (radiated)	§15.247(b)(4)	RSS-210 Issue 8:A8.4 (4)	< 4 Watt (EIRP) for antenna with directional gain less 6dBi	1	1	Performed 2.)
		§15.407(a)(1)(2)(3)	RSS-210 Issue 8: A9.2 (1)(2)(3)(4)	Lesser of: 200mW or 10dBm+10log <sub>10</sub> (B)  Lesser of: 250mW or 11dBm+10log <sub>10</sub> (B)  Lesser of 1W or 17dBm+10log <sub>10</sub> (b)			
Out-Of-Band RF- emissions	Antenna terminal (conducted)	§15.205	RSS-210 Issue 8: A8.5	20 dBc	1	1	Not performed 1.)
Band-Edge emissions		§15.247 (d)					


Peak Power spectral density	Antenna terminal (conducted)	§15.407(a)(5)	RSS-210 Issue 8: A9.2 (1)(2)	10dBm/MHz 11dBm/MHz	--	--	Not performed 1.)
Transmitter frequency stability	Antenna terminal (conducted)	--	RSS-Gen, Issue 3, Chapter 4.7	Operation within designated operational band	--	--	Not performed 1.)
Ratio between Peak-Average on power envelope (Peak excursion)	Antenna terminal (conducted)	§15.407(a)(6)	--	< 13 dB across any 1MHz	--	--	Not performed 1.)
General field strength emissions + restricted bands (30 MHz to 40 GHz)	Cabinet + Inter-connecting cables (radiated)	§15.247 (d) §15.205 §15.209	RSS-210 Issue 8, Chapter 2.5  RSS-Gen: Issue 3: §7.2.5 Table 5+6	Emissions in restricted bands must meet the general field-strength radiated limits (Peak+AV)	1	1	passed
Out-of-band emission limits		§15.407(b)(1)(2)(3)(4)	RSS-210 Issue 8, Chapter A9.2 (1)(2)(3)(4)	Outside Bands: -27dBm/MHz e.i.r.p. or max. 10MHz near operating-band: -17dBm/MHz e.i.r.p.			
AC-Power Lines  Conducted Emissions	AC-Power lines	§15.207	RSS-Gen, Issue 3: Chapter 7.2.4, Table 4	§15.207 limits  IC: Table 4, Chapter 7.2.4	2	2+4	passed
RX Mode							
RECEIVER  Radiated emissions (30 MHz to 18 GHz)	Cabinet + Inter-connecting cables (radiated)	§15.109 §15.33 §15.35	RSS-Gen, Issue 3: Chapter 6.1	FCC 15.109 class B limits  IC-limits: Table 1, Chapter 6	2	3+4	Not performed

**Remark:**

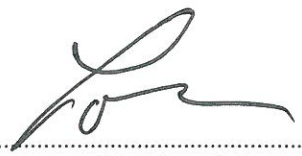
- 1.) only partial tests performed due to customer request
- 2.) limited result → performed for band-edge judgement (step1)

**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. W. Richter  
 Responsible for test section

  
 GmbH  
 Im Teelbruch 116  
 45219 Essen  
 Tel.: + 49 (0) 20 54 / 95 19 - 0  
 Fax: + 49 (0) 20 54 / 95 19 - 997

  
 .....  
 Dipl.-Ing. C. Lorenz  
 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. 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. C. Lorenz
Receipt of EUT:	June 2012
Date(s) of test:	June 2012 – August 2012 (see diagrams)
Date of report:	2012-09-14
-----	
Version of template:	12.08

### 2.4. Applicant's details

Applicant's name:	Research In Motion Limited
Address:	440 Phillip Street Waterloo, Ontario N2L 5R9  Canada
Contact person:	Mr. Masud S. Attayi

### 2.5. Manufacturer's details

Manufacturer's name:	Research In Motion Limited
Address:	295 Phillip Street Waterloo, Ontario N2L 3W8  Canada

### 3. Equipment under test (EUT)

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

Main function	Mobile phone with integrated IEEE 802.11a/b/g/n W-LAN Transceiver		
Type	RFG81UW		
Frequency range and channels (US/Canada -bands)	5150 – 5350: 36, 40, 44, 48, 52, 56, 60, 64 5470 – 5725: 100, 104, 108, 112, 116, 136, 140 5725 – 5825: 149, 153, 157, 161 5725 – 5850: 149, 153, 157, 161, 165 <i>Note: some channels (5600-5650MHz) are not available for US/Canada or indoor-only allowed</i>		
Type of modulation (packet types)	See chapter 3.7		
Antenna Type	<input checked="" type="checkbox"/> Integrated <input type="checkbox"/> External, no RF- connector <input type="checkbox"/> External, separate RF-connector		
Antenna Gain	No information from applicant		
MAX Field strength (radiated):	107.3 dBμV/m@3m distance on channel 165 (measured as electrical field strength with RBW=1MHz)		
FCC-ID	L6ARFG80UW		
IC	2503A-RFG80UW		
Installed options (not tested within this test report)	<input checked="" type="checkbox"/> GSM 900 and GSM 1800 Bands (not usable in USA/Canada) <input checked="" type="checkbox"/> W-CDMA Band I and Band VIII (not usable in USA/Canada) <input checked="" type="checkbox"/> NFC, Bluetooth® <input checked="" type="checkbox"/> battery charging option <input checked="" type="checkbox"/> GPS		
Power supply	<input checked="" type="checkbox"/> Internal battery Li-Io		
Special EMI components	--		
EUT sample type	<input type="checkbox"/> Production	<input checked="" type="checkbox"/> Pre-Production	<input type="checkbox"/> Engineering
Firmware	<input type="checkbox"/> for normal use		<input checked="" type="checkbox"/> Special version for test execution
FCC label attached	<input type="checkbox"/> yes	<input checked="" type="checkbox"/> 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: 004401139037002	CER-48928-001 Rev 2 PIN: 2A47CC42	10.0.6.420
EUT B	Mobile Phone	RFG81UW	IMEI: 004401139037010	CER-48928-001 Rev 2 PIN: 2A47CC45	10.0.6.420
EUT C	Li-Io Battery	BAT-47277-001	--	--	--

\*) 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	Headset (HS1)	HDW-44306-001	#1	--	--
AE 2	AC-Charger, Micro-B (CH7)	HDW-17957-003	#1	--	--
AE 3	USB-cable (USB1)	HDW-28109-003	#1	1.2m length	--
AE 4	USB Y-cable (USB3)	--	#1	--	--
AE 5	Battery charger (ACC2)	--	#1	--	--
AE 6	Notebook Dell	Latitude D2120	CTC#1	--	Windows 7 + Special Firmware SW
AE 7	D-Link Access-Point	DAP-2553	#1	--	--

\*) 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 + EUT C	Set-up for radiated EMI measurements
Set. 2	EUT B + AE 1 + AE 2 + AE 3 + AE 4 + AE 5 + (AE 6 + AE 7)	Set-up for EMI measurements with accessories. AE 7 placed nearby the main EUT A.

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

### 3.5. EUT operating modes

EUT operating mode no. *)	Description of operating modes	Additional information
op. 1	WLAN Continuous TX-Mode	The EUT was put to continuous transmissions mode with help of a special firmware software. The modulation and Bit rate used will be special mentioned in the results.
op. 2	WLAN TX Traffic link	A traffic link as slave was established to an master access-point. The settings were set from the web-control page of the access-point.
op. 3	WLAN RX mode	The EUT as slave is powered on and WLAN mode switched on, and registered to the Access-Point. MCS0 was chosen as working operating mode.
op. 4	Charging battery	Charging standard battery. This operating mode is combined with other op. modes.

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



### 3.6. Configuration of cables used for testing

Cable number	Item	Type	S/N serial number	HW hardware status	Cable length
Cable 1	USB1	shielded	--	--	1.2m

### 3.7. IEEE 802.11 Overview: Modulation and Data Rates

The modulations and data rates defined for 802.11 b/g/n transmitters are identified in the table below. Also it shows which operational mode is possible for the device under test (EUT) according applicant's information.

802.11b-Mode (DSSS System)		
Data rate [Mbps]	Modulation type	Supported by EUT
1	DBPSK (Differential binary phase shift keying)	YES
2	DQPSK (Differential quadrature phase shift keying)	YES
5.5	CCK/PBCC (8-chip complementary code keying)	YES
11		
22	ERP-PBCC (Packet binary convolutional coding)	YES

802.11g-Mode (OFDM system)		
Brutto data rate [Mbps]	Modulation type of subcarriers	Supported by EUT
6	BPSK	YES
9		
12	QPSK	YES
18		
24	16-QAM	YES
36		
48	64-QAM	YES
54		

Remark: 52 sub-carriers which can be modulated at different data-rates.

802.11n-Mode (OFDM)		
Brutto data rate [Mbps]	Modulation type	Supported by EUT
7.2/14.4/21.7/28.9/43.3/57.8/65/72.2 Mbps	HT20 (MCS0..MCS7)	Yes
14.444/28.889/43.333/57.778/86.667/115.556/130/144.444 Mbps	HT20 (MCS8..MCS15)	No
15/30/45/60/90/120/135/150 Mbps	HT40 (MCS0..MCS7)	Yes
30/60/90/120/180/240/270/300 Mbps	HT40 (MCS8..MCS15)	No



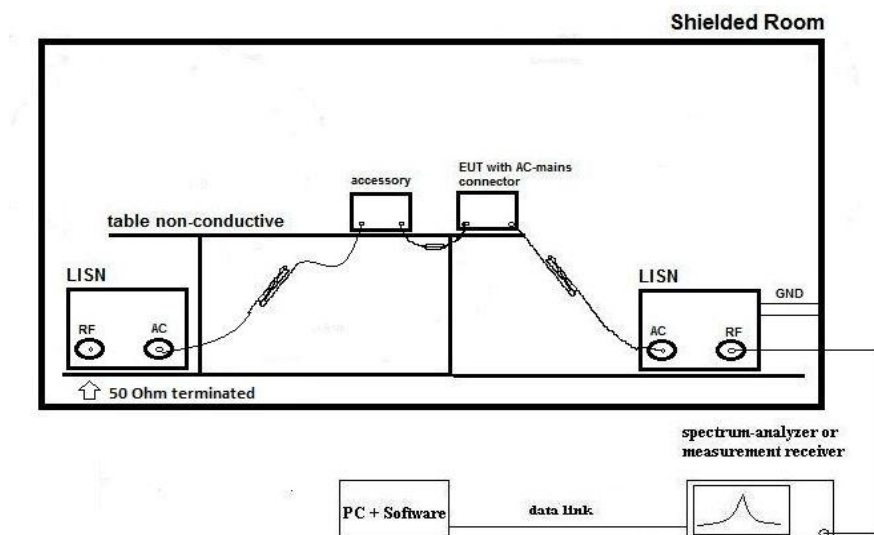
## 4. Description of test system set-up's

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

**Specification:** ANSI C63.4-2009 chapter 7, ANSI C63.10-2009 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  $\mu$ H 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.

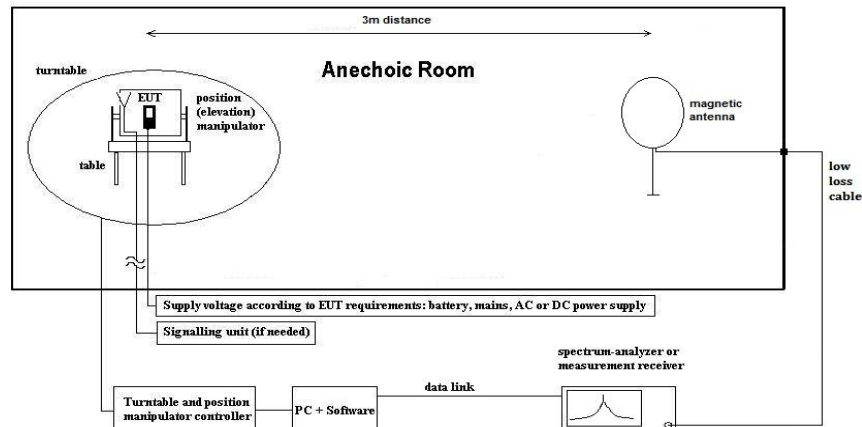
## 4.2. Test system set-up for radiated magnetic field measurements below 30 MHz

**Specification:** ANSI C63.4-2009 chapter 8.2.1, ANSI C63.10-2009 chapter 6.4

**General Description:** Evaluating the radiated field emissions to be done first by an exploratory emissions measurement and a final measurement for most critical frequencies.

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

**Schematic:**



**Testing method:**

### Exploratory, preliminary measurement

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

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

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

**Formula:**

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

$$M = L_T - E_C$$

AF = Antenna factor

C<sub>L</sub> = Cable loss

D<sub>F</sub> = Distance correction factor

E<sub>C</sub> = Electrical field – corrected value

E<sub>R</sub> = Receiver reading

G<sub>A</sub> = Gain of pre-amplifier (if used)

L<sub>T</sub> = Limit

M = Margin

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

**Distance correction:**

Reference for applied correction (extrapolating) factors:

IEEC Transaction EMC, Vol. 47, No. 3, Aug. 2005, Journal Paper

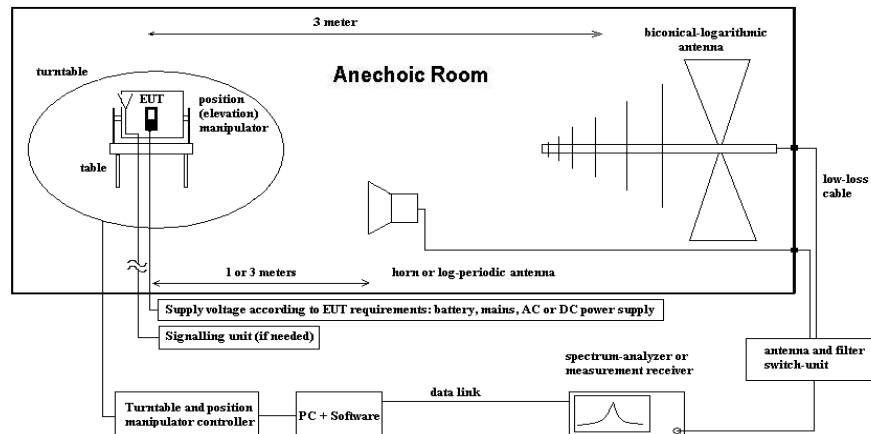
“Extrapolating Near-field emissions of low frequency loop transmitters”.

### 4.3. 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 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. 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<sub>L</sub> = Cable loss

D<sub>F</sub> = Distance correction factor (if used)

E<sub>C</sub> = Electrical field – corrected value

E<sub>R</sub> = Receiver reading

G<sub>A</sub> = Gain of pre-amplifier (if used)

L<sub>T</sub> = Limit

M = Margin

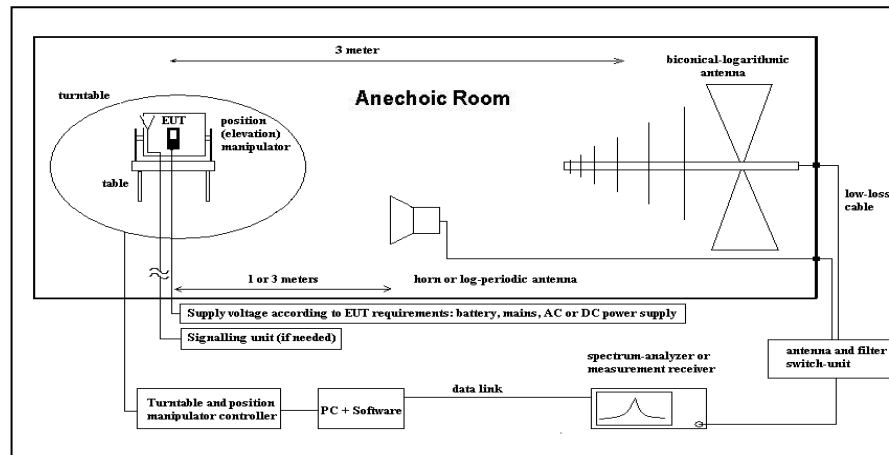
All units are dB-units, positive margin means value is below limit.

#### 4.4. 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 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 - Conducted emissions on AC-Power lines

#### 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 type="checkbox"/> 333 EMI field	<input checked="" type="checkbox"/> 348 EMI cond.	
receiver	<input type="checkbox"/> 001 ESS	<input checked="" type="checkbox"/> 377 ESCS 30	<input type="checkbox"/> 489 ESU 40 <input type="checkbox"/> 620 ESU 26
LISN	<input checked="" type="checkbox"/> 005 ESH2-Z5	<input type="checkbox"/> 007 ESH3-Z6	<input type="checkbox"/> 300 ESH3-Z5 & 50Ω used for AE <input type="checkbox"/> no LISN for AE
signalling	<input type="checkbox"/> 371 CBT32	<input type="checkbox"/> 436 CMU	<input type="checkbox"/> 547 CMU <input type="checkbox"/> 594 CMW
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains	<input checked="" type="checkbox"/> 060 110 V 60 Hz via PAS 5000	

#### 5.1.2. Requirements

<b>FCC</b>		Part 15, Subpart B, §15.207	
<b>IC</b>		RSS-Gen., § 7.2.4	
<b>ANSI</b>		C63.10-2009	
Limit	Frequency [MHz]	QUASI-Peak [dBμV]	AVERAGE [dBμV]
	0.15 – 0.5	66 to 56*	56 to 46*
	0.5 – 5	56	46
	5 – 30	60	50
Remark: * decreases with the logarithm of the frequency			

#### 5.1.3. Test condition and test set-up

link to test system (if used):		<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection	<input type="checkbox"/>
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 (40 cm distance to reference ground plane (wall))	<input type="checkbox"/> floor standing EUT stands isolated on reference ground plane (floor)	
Climatic conditions		Temperature: (22±3°C)		Rel. humidity: (40±20)%
EMI-Receiver or Analyzer settings	Scan data	<input checked="" type="checkbox"/> 9 – 150 kHz, RBW = 200 Hz, Step = 61 Hz <input checked="" type="checkbox"/> 150 kHz – 30 MHz RBW = 9 kHz, Step = 4 kHz <input type="checkbox"/> other:		
	Scan-Mode	6 dB EMI-Receiver Mode		
	Pre-measurement	Peak detector, Repetitive-Scan, max-hold, sweep-time 50 μs per frequency point		
General measurement procedures		Average & Quasi-peak detector at critical frequencies		
		Please see chapter "Test system set-up for AC power line conducted emissions measurements"		

#### 5.1.4. Measurement results

The results are presented below in summary form only. For more information please see the diagrams

EUT Type and S/N or EUT set-up no.		EUT set-up 2			
Diagram No.	EUT operating mode no. or commend	Used Detector	Power line	Additional (scan-) information or remarks	Result
1.1_WLAN_a_Mode	EUT operating mode 2	<input checked="" type="checkbox"/> Peak <input checked="" type="checkbox"/> CAV <input checked="" type="checkbox"/> QP	L1/ N	--	passed

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

### 5.2.1. 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"/> 436 CMU	<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
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains	<input checked="" type="checkbox"/> 060 110 V 60 Hz via PAS 5000	

### 5.2.2. Requirements/Limits for non-restricted bands (outside operational bands)

<b>FCC</b>		<input checked="" type="checkbox"/> Part 15 Subpart C, §15.407(b)(1)(2)(3)(4)	
<b>IC</b>		RSS-210, Issue 8, A9.2(1)(2)(3)(4)	
<b>ANSI</b>		<input checked="" type="checkbox"/> C63.10-2009 for TX-mode	
	Operating frequency band [MHz]	EIRP – limit for outside operating frequency band	
		Peak [dBm] 30 MHz to 40 GHz	Peak [dBμV/m] <sup>1.)</sup> 30 MHz to 40 GHz@3m
	5.15 – 5.25 GHz	-27.0	68.2
	5.25 – 5.35 GHz	-27.0	68.2
	5.47 – 5.725 GHz	-27.0	68.2
	5.725 – 5.825 GHz	-27.0 (10 MHz greater above/below band edge) -17.0 (within 10 MHz offset to band-edge)	68.2 (10 MHz greater above/below band edge) 78.2 (within 10 MHz offset to band-edge)

Remark: 1.) Conversion formula between EIRP and field strength:  $E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2\text{dB}$  for measurement distance of 3m. (Guidance no. 789033 D01 General UNII test procedures v01r01)

2.) for practical reasons for measurements below 1 GHz only the stricter limit of §15.209 is visible.

### 5.2.3. Requirements/Limits for restricted bands (§15.205):

<b>FCC</b>		<input checked="" type="checkbox"/> Part 15 Subpart B, §15.109, class B <input checked="" type="checkbox"/> Part 15 Subpart C, §15.209 @ frequencies defined in §15.205	
<b>IC</b>		RSS-Gen., Issue 3	
<b>ANSI</b>		<input checked="" type="checkbox"/> C63.4-2009 for RX-Mode <input checked="" type="checkbox"/> C63.10-2009 for TX-mode	
<b>Limit</b>	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

#### 5.2.4. 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			

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

link to test system (if used):		<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection	
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±3°C)		Rel. humidity: (40±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"/> 6dB EMI-Receiver Mode <input type="checkbox"/> 3dB spectrum analyser mode		
	Detector	Peak / Quasi-peak		
	RBW/VBW	100 kHz/300 kHz		
	Mode:	Repetitive-Scan, max-hold		
		80 kHz		
		Coupled – calibrated display if continuous TX-signal otherwise adapted to EUT's individual duty-cycle (>98%)		
General measurement procedures		Please see chapter "Test system set-up for electric field radiated measurements in the range 30 MHz to 1000 MHz"		



### 5.2.6. MEASUREMENT RESULTS: TX-MODE

The results are presented below in summary form only. For more information please see diagrams.

Table of measurement results:

Diagram no.	Carrier channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Channel no.	Channel frequency					PK	AV	QP	
8.07_Ch36_Sweep1	36	5180 MHz	30 to. 1000 MHz	1	1	g-Mode, 6Mbps	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.07_Ch48_Sweep1	48	5240 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.07_Ch64_Sweep1	64	5320 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.07_Ch100_Sweep1	100	5500 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.07_Ch120_Sweep1	120	5600 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.07_Ch140_Sweep1	140	5700 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.07_Ch149_Sweep1	149	5745 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.07_Ch157_Sweep1	157	5785 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.07_Ch161_Sweep1	161	5805 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed

Remark:

Table of measurement results:

Diagram no.	Carrier channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Channel no.	Channel frequency					PK	AV	QP	
8.08_Ch36_Sweep1	36	5180 MHz	30 to. 1000MHz	1	1	n-Mode, MCS0	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch48_Sweep1	48	5240 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch64_Sweep1	64	5320 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch100_Sweep1	100	5500 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch120_Sweep1	120	5600 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch140_Sweep1	140	5700 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch149_Sweep1	149	5745 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch157_Sweep1	157	5785 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch161_Sweep1	161	5805 MHz					<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed

Remark:

### 5.2.7. Measurement Results: RX-Mode

The results are presented below in summary form only. For more information please see diagrams.

Diagram no.	Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
					PK	AV	QP	
2.01	30 to 1GHz	2	3+4	Channel 100 used RX Mode + charging battery	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	passed

### 5.3. General Limit - Radiated emissions, above 1 GHz

#### 5.3.1. Test location and equipment

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"/>
equipment	<input type="checkbox"/> 331 HC 4055	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<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 checked="" type="checkbox"/> 608 HL 562	<input checked="" type="checkbox"/> 549 HL025	<input 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 type="checkbox"/>	<input type="checkbox"/>	<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"/>
power meter	<input type="checkbox"/> 009 NRV	<input type="checkbox"/> 010 URV5-Z2	<input type="checkbox"/> 011 URV5-Z2	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
signalgener.	<input type="checkbox"/> 008 SMG	<input type="checkbox"/> 140 SMHU	<input type="checkbox"/> 263 SMP04	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
power meter	<input type="checkbox"/> 262 NRV-S	<input type="checkbox"/> 266 NRV-Z31	<input type="checkbox"/> 265 NRV-Z33	<input type="checkbox"/> 261 NRV-Z55	<input type="checkbox"/> 356 NRV-Z1	<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"/> 436 CMU	<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"/>
line voltage	<input type="checkbox"/> 230 V 50 Hz via public mains		<input checked="" type="checkbox"/> 060 110 V 60 Hz via PAS 5000			

#### 5.3.2. Requirements/Limits for non-restricted bands (outside operational bands)

FCC		<input checked="" type="checkbox"/> Part 15 Subpart C, §15.407(b)(1)(2)(3)(4)	
IC		RSS-210, Issue 8, A9.2(1)(2)(3)(4)	
ANSI		<input checked="" type="checkbox"/> C63.10-2009 for TX-mode	
	Operating frequency band [MHz]	EIRP – limit for outside operating frequency band	
		Peak [dBm] 30 MHz to 40 GHz	Peak [dBμV/m] <sup>1.)</sup> 30 MHz to 40 GHz@3m
	5.15 – 5.25 GHz	-27.0	68.2
	5.25 – 5.35 GHz	-27.0	68.2
	5.47 – 5.725 GHz	-27.0	68.2
	5.725 – 5.825 GHz	-27.0 (10 MHz greater above/below band edge) -17.0 (within 10 MHz offset to band-edge)	68.2 (10 MHz greater above/below band edge) 78.2 (within 10 MHz offset to band-edge)

Remark: 1.) Conversion formula between EIRP and field strength:  $E[\text{dB}\mu\text{V/m}] = \text{EIRP}[\text{dBm}] + 95.2\text{dB}$  for measurement distance of 3m. (Guidance no. 789033 D01 General UNII test procedures v01r01)

#### 5.3.3. Requirements/Limits for restricted bands

FCC	<input checked="" type="checkbox"/> Part 15 Subpart B, §15.109 class B <input checked="" type="checkbox"/> Part 15 subpart C, §15.209			
IC	RSS-Gen., Issue 3			
ANSI	<input checked="" type="checkbox"/> C63.4: 2009 <input checked="" type="checkbox"/> C63.10: 2009			
Frequency [MHz]	Limits			
	AV [μV/m]	AV [dBμV/m]	Peak [μV/m]	Peak [dBμV/m]
above 1 GHz	500	54.0	5000	74.0

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

link to test system (if used):		<input checked="" type="checkbox"/> air link	<input type="checkbox"/> cable connection
EUT-grounding		<input checked="" type="checkbox"/> none	<input type="checkbox"/> with power supply
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: Scan-Mode Detector RBW/VBW Trace-Mode: Sweep-Time	<input checked="" type="checkbox"/> 1 – 18 GHz <input type="checkbox"/> 18 – 25 GHz <input checked="" type="checkbox"/> 18 – 40 GHz <input type="checkbox"/> other: <input type="checkbox"/> 6 dB EMI-Receiver Mode <input checked="" type="checkbox"/> 3 dB Spectrum analyser Mode Peak and Average for restricted bands, Peak for non-restricted bands 1 MHz / 3 MHz Max-hold Coupled – calibrated display if CW signal otherwise adapted to EUT's individual duty-cycle (>98%)	
General measurement procedures		Please see chapter "Test system set-up for radiated electric field measurements above 1 GHz"	

### 5.3.5. Measurement Results TX-Mode

#### 5.3.5.1. Operating-Mode: g-Mode, 6Mbps

Table of measurement results:

Diagram no.	Carrier channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Channel no.	Channel frequency					PK	AV	QP	
8.07_ Ch36_ Sweep2a	36	5180 MHz	1 to 7GHz	1	1	g-Mode, 6Mbps	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch48_ Sweep2a	48	5240 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch64_ Sweep2a	64	5320 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch100_ Sweep2a	100	5500 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch120_ Sweep2a	120	5600 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch140_ Sweep2a	140	5700 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch149_ Sweep2a	149	5745 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch157_ Sweep2a	157	5785 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch161_ Sweep2a	161	5805 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed

Remark: Peak above limit from wanted TX traffic channel, not relevant for results

Table of measurement results:

Diagram no.	Carrier channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Channel no.	Channel frequency					PK	AV	QP	
8.07_ Ch36_ Sweep2b	36	5180 MHz	7 to 18 GHz	1	1	g-Mode, 6Mbps	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch48_ Sweep2b	48	5240 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch64_ Sweep2b	64	5320 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch100_ Sweep2b	100	5500 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch120_ Sweep2b	120	5600 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch140_ Sweep2b	140	5700 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch149_ Sweep2b	149	5745 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch157_ Sweep2b	157	5785 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch161_ Sweep2b	161	5805 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed

Remark: --

Table of measurement results:

Diagram no.	Carrier channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Channel no.	Channel frequency					PK	AV	QP	
8.07_ Ch36_ Sweep3	36	5180 MHz	18 to 40 GHz	1	1	g-Mode, 6Mbps	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch48_ Sweep3	48	5240 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch64_ Sweep3	64	5320 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch100_ Sweep3	100	5500 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch120_ Sweep3	120	5600 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch140_ Sweep3	140	5700 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch149_ Sweep3	149	5745 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch157_ Sweep3	157	5785 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.07_ Ch161_ Sweep3	161	5805 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed

Remark: --

### 5.3.5.2. Operating-Mode: n-Mode, MCS0

Table of measurement results:

Diagram no.	Carrier channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Channel no.	Channel frequency					PK	AV	QP	
8.08_Ch36_Sweep2a	36	5180 MHz	1 to 7GHz	1	1	n-Mode, MCS0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch48_Sweep2a	48	5240 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch64_Sweep2a	64	5320 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch100_Sweep2a	100	5500 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch120_Sweep2a	120	5600 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch140_Sweep2a	140	5700 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch149_Sweep2a	149	5745 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch157_Sweep2a	157	5785 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch161_Sweep2a	161	5805 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed

Remark: Peak above limit from wanted TX traffic channel, not relevant for results



Table of measurement results:

Diagram no.	Carrier channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Channel no.	Channel frequency					PK	AV	QP	
8.08_Ch36_Sweep2b	36	5180 MHz	7 to 18 GHz	1	1	n-Mode, MCS0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch48_Sweep2b	48	5240 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch64_Sweep2b	64	5320 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch100_Sweep2b	100	5500 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch120_Sweep2b	120	5600 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch140_Sweep2b	140	5700 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch149_Sweep2b	149	5745 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch157_Sweep2b	157	5785 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch161_Sweep2b	161	5805 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed

Remark: --

Table of measurement results:

Diagram no.	Carrier channel		Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
	Channel no.	Channel frequency					PK	AV	QP	
8.08_Ch36_Sweep3	36	5180 MHz	18 to 40 GHz	1	1	n-Mode, MCS0	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch48_Sweep3	48	5240 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch64_Sweep3	64	5320 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch100_Sweep3	100	5500 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch120_Sweep3	120	5600 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch140_Sweep3	140	5700 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch149_Sweep3	149	5745 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch157_Sweep3	157	5785 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed
8.08_Ch161_Sweep3	161	5805 MHz					<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed

Remark: --

### 5.3.6. Measurement results for RX-Mode

The results are presented below in summary form only. For more information please see diagrams.

Diagram no.	Frequency range	Set-up no.	OP-mode no.	Remark	Used detector			Result
					PK	AV	QP	
8.03	1 to 18 GHz	2	3+4	Channel 100 used RX Mode + charging battery	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	passed

Remark: no peaks found within noise-level

## 5.4. Band-Edge compliance measurements

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

test location	<input checked="" type="checkbox"/> CETECOM Essen (Chapter. 2.2.1)		<input checked="" type="checkbox"/> 443 System CTC-FAR-EMI-		<input type="checkbox"/> Please see Chapter. 2.2.3	
test site	<input type="checkbox"/> 441 EMI SAR	<input type="checkbox"/> 487 SAR NSA	<input type="checkbox"/> 337 OATS	<input type="checkbox"/> 347 Radio.lab.	<input type="checkbox"/>	<input type="checkbox"/>
receiver	<input type="checkbox"/> 377 ESCS30	<input type="checkbox"/> 001 ESS	<input checked="" type="checkbox"/> 489 ESU	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
spectr. analys.	<input type="checkbox"/> 489 ESU	<input type="checkbox"/> 120 FSEM	<input type="checkbox"/> 264 FSEK	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
power supply	<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 40
otherwise	<input checked="" type="checkbox"/> 613 20 dB Attenuator			<input checked="" type="checkbox"/> cable K4		

### 5.4.2.

**Reference: §15.247, §15.205, RSS-210: A8.5**

*(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits.*

**Reference: §15.407(b): -27dBm**

### 5.4.3. Measurement method

A Delta marker method was used for showing compliance to restricted bands according §15.205. The method is according Public Notice “Marker-Delta method”, Extract from DA00-705/ANSI C63.10:2009. The method consists of three independent steps:

1. **Step:** Prior to the measurement the fundamental radiated In-Band field strength was performed. The determined value is used as reference value.
2. **Step:** Second step consist of finding the relative attenuation between the fundamental emission and the maximum local out-of-band emission (within 2 MHz range around the band edge either on the band-edge directly or some modulation product if the level is greater than that on the band-edge) when measured with lower resolution bandwidth.
3. **Step:** The delta value recorded in step 2 will be subtracted from value recorded in step 1, thus giving the required field strength at the band-edge. This value must fulfil the requirements for radiated spurious emissions in restricted bands in §15.205 with the general limits of §15.209.

### 5.4.4. EUT settings:

The EUT was instructed to send with maximum power (if adjustable) according to applicants instructions. For sending with continuous mode a special firmware was used.

## 5.4.5. RESULTS

### 5.4.5.1. RESULTS for g-Mode/6MBps

Set-up: 1 Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 36	106.3 (Peak)	54.86	51.44 (PK)	--	Passed
	94.2 (AV)		39.34 (AV)	-53.16 (AV)	

Remark: see also diagrams enclosed

Set-up: 1 Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 64	105.3 (Peak)	53.64	51.66 (Peak)	--	Passed
	93.0 (AV)		39.36 (AV)	-55.84	

Remark: see also diagrams enclosed

Set-up: 1 Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 100	106.2 (Peak)	52.9	53.3 (Peak)	--	Passed
	95.1 (AV)		42.2 (AV)	-53.0	

Remark: see also diagrams enclosed

Set-up: 1 Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 140	100.58 (Peak)	49.07 > 20	51.51 (Peak)	-43.69	Passed
	-- (AV)		-- (AV)	--	

Remark: see also diagrams enclosed

No restricted band on border, 20dBc requirement valid instead

Set-up: 1 Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 149	99.3 (Peak)	41.68 > 20	57.62 (Peak)	-37.58	Passed
	-- (AV)		-- (AV)	--	

Remark: see also diagrams enclosed

No restricted band on border, 20dBc requirement valid instead

Set-up: 1 Op. Mode: 1							
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength- radiated [dBμV/m]	Delta Marker Value	Value at Band-Edge				Verdict
			§15.205	§15.407	§15.205	§15.407	
			[dBμV/m]	dBm	[dBμV/m]	dBm	
Channel = 165	107.3 (Peak)	Left border:	69.2 (Peak)	--	--	--	Passed
		38.1 > 20	55.04 (AV)	-39.8			
	93.5 (AV)	Right border:	--	--	63.0 (Peak)	--	
		44.3 > 20	--	--	49.2 (AV)	-46.0	

Remark: see also diagrams enclosed

No restricted band on border, 20dBc requirement valid instead

#### 5.4.5.2. RESULTS for n-Mode/MCS0

Set-up: 1					
Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 36	106.2 (Peak)	53.0	53.2 (Peak)	--	Passed
	91.5 (AV)		38.5 (AV)	-56.7	

Remark: see also diagrams enclosed

Set-up: 1					
Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 64	104.8 (Peak)	52.64	52.16 (Peak)	--	Passed
	92.6 (AV)		39.96 (AV)	-55.24	

Remark: see also diagrams enclosed

Set-up: 1					
Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 100	106.1 (Peak)	51.51	54.59 (Peak)	--	Passed
	93.4 (AV)		41.89 (AV)	-53.31	

Remark: see also diagrams enclosed

Set-up: 1					
Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band- Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 140	100.51 (Peak)	47.52 > 20	52.99 (Peak)	-42.21	Passed
	-- (AV)		-- (AV)		

Remark: see also diagrams enclosed

No restricted band on border, 20dBc requirement valid instead

Set-up: 1 Op. Mode: 1					
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength-radiated [dBμV/m]	Delta Marker Value [dBc]	Value at Band-Edge		Verdict
			§15.205	§15.407	
			[dBμV/m]	dBm	
Channel = 149	99.3 (Peak)	41.68 > 20	57.62 (Peak)	-37.58	Passed
	-- (AV)		-- (AV)		

Remark: see also diagrams enclosed

No restricted band on border, 20dBc requirement valid instead

Set-up: 1 Op. Mode: 1							
T <sub>NOM</sub> = 21°C, V <sub>NOM</sub> = 5V	Fundamental field strength- radiated [dBμV/m]	Delta Marker Value	Value at Band-Edge				Verdict
			§15.205	§15.407	§15.205	§15.407	
			[dBμV/m]	dBm	[dBμV/m]	dBm	
Channel = 165	106.3 (Peak)	Left border:	65.41(Peak)	--	--	--	Passed
		40.89 > 20	55.51 (AV)	-39.69			
	96.4 (AV)	Right border:	--	--	59.26(Peak)	--	
		47.04 > 20			49.36 (AV)	-45.84	

Remark: see also diagrams enclosed

No restricted band on border, 20dBc requirement valid instead



## 5.5. 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 <sub>CISPR</sub> )	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
337 487 558 348 348	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 Measurem.	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
337 487 550 348 348	R-2665 R-2666 G-301 C-2914 T-1967	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) Mains Ports Conducted Interference Measurements 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
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	
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)	-	CETECOM	12 M	5	31.10.2012

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
		Cable					
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	Wainwright	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	
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	201.0999.9302.6.4.1.4 3	G. Lufft GmbH	24 M	-	30.05.2014
634	Spectrum Analyzer	FSM (HF-Unit)	826188/010	Rohde & Schwarz	pre-m	2	
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