Radio Frequency (RF) - Exposure
TEST REPORT
No.: 6-0143-12-2-3c

According to:
FCC Regulations
Part 2.1091
IC Regulations
RSS-102

for

u-blox AG

RF-Module LISA-U230
FCC-ID: XPYLISAU230
IC-ID: 8595A-LISAU230

Laboratory Accreditation and Listings			
DAkkS 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
Wi Fi ALLIANCE AUTHORIZED RF LABORATORY	CTIA Authorized Test Lab LAB CODE 20011130-00		
accredited according to DIN EN ISO/IEC 17025			

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Table of contents

TABLE OF ANNEX

TOTAL PAGES

1. Summary of test results

The presented RF-Module can be build inside host applications and extends their capability by wireless GSM and UMTS technologies. Data transmissions application is possible field application.

In order to verify the compliance with applicable rules, a representative configuration consisting of representative auxiliary equipment was chosen. Embedded in this configuration, the GSM/UMTS Module can be tested. Pls. refer to set-up description and photos of report TR-6-0143-12-2 -3a and annexes for more details.
Following tests and evaluation have been performed to show compliance with applicable FCC Part 2.1091 and FCC Part 1.1310 of the FCC CFR 47 Rules (2011-10-01 Edition) and Canadian RSS-102 issue 4 regulations.
Only the frequency bands were considered which are operable in US & CANADA.
According to applicant's information only single band operation is possible. Multiple-Transmitter operating and co-location were not considered.

The test results apply exclusively to the test samples as presented in chapter 3.1. 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.

1.1. TESTS OVERVIEW USA FCC Part 2.1091 and Canada IC Standards RSS-102

TEST CASES	PORT	REFERENCES & LIMITS			EUT set-up	EUT operating mode	Result
		FCC Standard	RSS Section	Limits			
TX-Mode							
RF POWER (conducted)	Antenna terminal (conducted)	§2.1046	--	N/A	1	1+2+3+ 4+5+6+ 7	Passed remark 1
Radio frequency Exposure EVALUATION (MPE)	Antenna terminal (conducted)	§1.1310 §2.1091	RSS-102, Issue 4	FCC: §1.1310 Table 1, Limits for General Population IC: Chapter 4.2 RF-Limits	1	1+2+3+ 4+5+6+ 7	Passed (For a distance 20 cm of the antenna) remark 2

Remark: 1.) See separate test report TR-6-0143-12-2 -3a according Part 22H, 24E and 27C.
2.) For 850 MHz frequency band the max. antenna gain included cable loss shall be < 4.79 dBi
For 1700 MHz frequency band the max. antenna gain included cable loss shall be < 7.56 dBi
For 1900 MHz frequency band the max. antenna gain included cable loss shall be < 3.96 dBi

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Responsible for testsection

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Dipl.-Ing. B. Taslica
Responsible for test report

2. Administrative Data

2.1. Identification of the testing laboratory

Company name: Address:	CETECOM GmbH Im Teelbruch 116 45219 Essen - Kettwig Germany
Laboratory accreditations/Listings:	DAR-Registration No. DGA-PL-176/94-03 FCC-Registration No. 99538, MRA US-EU 0003 IC-Registration No. 3462D-1, 3462D-2 VCCI Registration No. R-2665,R-2666,C-2914,T-339
Responsible for testing laboratory:	Dipl.-Ing. W. Richter
Deputies:	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

Order No.:	E600143002
Responsible for test report and project leader:	Dipl.-Ing. B. Taslica
Receipt of EUT:	2012-03-19
Date(s) of test:	2012-03-20 – 2012-03-30
Date of report:	2012-05-24
Version of template: 09.06 _All.Dotm	

2.4. Applicant's details

Applicant's name:	u-blox AG
Address:	Zürcherstrasse 68 8800 Thalwil Switzerland
Contact person:	Mr. Giulio Comar

2.5. Manufacturer's details

Manufacturer's name:	please see Applicant's details
Address:	please see Applicant's details

3. Equipment under test (EUT)

3.1. Additional declaration, results and description of EUT

GSM

Main function	GSM/GPRS/WCDMA RF Module		
Type	RF module		
GSM Frequency range (US/Canada -bands)	GSM 850: 824 – 849MHz (Uplink), 869-894MHz (Downlink) GSM1900: 1850-1910MHz (Uplink), 1930-1990MHz (Downlink)		
Type of modulation	GMSK/8-PSK		
Number of channels (USA/Canada -bands)	GSM 850: 128 – 251, 125 channels GSM1900: 512 – 810, 300 channels		
EMISSION DESIGNATOR(S)	247KGXW (GSM850) 250KGXW (EDGE850) 247KG7W (GSM1900) 256KG7W (EDGE 1900)		
Antenna Type	☐ Integrated ☐ External, no RF- connector ☒ External, separate RF-connector	Frequency range of 'EUT C' antenna: 800MHz to 2200MHz	
Antenna Gain	☒ radiated: 3.0 dBi average gain		
Max.Output Power (conducted): GPRS 850 EDGE 850	 32.33 dBm (PK) / 32.14 dBm (Average Burst Power) 29.26 dBm (PK) / 26.48 dBm (Average Burst Power)		
Max. Output Power (conducted): GPRS 1900 EDGE 1900	 29.24 dBm (PK) / 29.06 dBm (Average Burst Power) 28.06 dBm (PK) / 25.29 dBm (Average Burst Power)		
FCC-ID	XPYLISAU230		
IC	8595-LISAU230		
Installed options	☒ GSM900 and DCS1800 Bands (not usable in USA/Canada) ☒ W-CDMA Band I and VIII (not usable in USA/Canada)		
Power supply	☒ Internal battery Li-Io, range 3.4V to 4.2V ☒ over AC/DC adaptor: 110V/60Hz ☒ DC power 3.8 Volt (nominal)		
Special EMI components	--		
Lowest radio frequency signal	Master clock 26 MHz		
EUT sample type	☐ Production	☒ Pre-Production	☐ Engineering

FDD

Main function	GSM/GPRS/WCDMA RF Module		
Type	RF module		
TX-frequency range	FDD Band 2: 1852.4–1907.6 MHz (Uplink), 1930-1990MHz (Downlink) FDD Band 4: 1712.4–1752.6 MHz (Uplink), 2110-2155MHZ (Downlink) FDD Band 5: 826.4-846.6 MHz (Uplink), 869-894MHz (Downlink)		
Type of modulation	GSM-mode: GMSK GPRS-Mode: 8-PSK FDD-Mode Release99: QPSK FDD Mode Release 5+6: DL: 16QAM, UL: BPSK		
Number of channels	FDD Band 2: UARFCN range 9262 – 9400 – 9538 FDD Band 4: UARFCN range 1312 – 1413 – 1513 FDD Band 5: UARFCN range 4132 – 4183 – 4233		
EMISSION DESIGNATOR(S)	4M06F9D (FDD 2) 4M05F9D (FDD 4) 4M08F9D (FDD 5)		
Antenna Type	☐ Integrated ☐ External, no RF- connector ☒ External, separate RF-connector	Frequency range of ‚EUT C' antenna: 800MHz to 2200MHz	
Antenna Gain	☒ radiated: Max. 2.6 dBi gain at FDD 5 ☒ radiated: Max. -2.1 dBi gain at FDD 2/FDD 4		
Max. Output Power: Conducted FDD-Mode 2 FDD-Mode 4 FDD-Mode 5	 25.86 dBm (PK) / 22.72 dBm (RMS) 25.65 dBm (PK) / 22.45 dBm (RMS) 26.12 dBm (PK) / 22.82 dBm (RMS)		
FCC-ID	XPYLISAU230		
IC	8959-LISAU230		
Installed option	☒ G850, GSM 900, DCS1800 and PCS1900 Bands. ☒ W-CDMA Band I, VI and Band VIII (not usable in USA/Canada)		
Special EMI components	--		
Lowest radio frequency signal	Master clock 26 MHz		
Voltage settings	3.8 V DC (nominal), 3.4 V DC (minimum) and 4.2 V DC (maximum)		
EUT sample type	☐ Production	☒ Pre-Production	☐ Engineering

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	RF-Module	LISA-U230	IMEI: 35223705001 1958	146AA0	22.00
EUT B	Adapter Board	LISA-U200 FAE	SN096	IP02_HW_CS_ 150000	--
EUT C	Magnetic Mount Antenna	Taoglas GA.107	#1	--	--

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

Remark: The magnetic mount antenna (EUT C) will be offer optionally together with the RF-Module.

3.3.EUT set-ups

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

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

3.4. EUT operating modes

EUT operating mode no.*)	Description of operating modes	Additional information
op. 1	GSM/GPRS 850 TCH mode TCH=128/192/251	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 (33dBm). 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	EGPRS 850 TCH mode TCH=128/192/251	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). 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	GSM/GPRS 1900 TCH mode 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 (30dBm). 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	EGPRS 1900 TCH mode PCL=0 (max. power) 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 (26dBm). 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	FDD Mode 2 RMC99-Mode	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. 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. Chosen settings: 12.2kbps RMC + HSPA 34.108 This setting was chosen for all Release 6 mobile equipment.
op. 6	FDD Mode 4 RMC99-Mode	
op. 7	FDD Mode 5 RMC99-Mode	

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

3.5. Parameter Settings on mobile phone and base station CMU200

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

Parameter	Traffic Mode	Idle Mode
Traffic Channels mobile station (EUT)	GSM 850 TCH_{MS}= 128/ 190 /251 GSM 1900 TCH_{MS} = 512 / 661 / 810	--
maximum power level (PCL)	GSM 850: PCL = 5 (2 Watt) GSM 1900: PCL = 0 (1 Watt)	--
Modulation	GSM/GPRS: GMSK-Modulation Scheme EDGE: 8-PSK Modulation Scheme	--
DTX	off	--
Bitstream	PRBS 2E9-1 (pseudo-random-sequence) – CCITT 0.153	
Timeslot	3	
Hopping	off	
Timeslot (slot mode)	GPRS/EDGE-Mode: maximum power on one uplink slot according MS class	
MS slot class	Class 8	
Maximum data transmission rate, single time slot	GPRS: 20.0 kBit/s Slot EDGE: 59.2 kBit/s Slot	
Speech transcoding (Traffic Mode)	Full rate Version 1	
Mode	BCCH and TCH	
BCCH – base station (CMU,CMD)	GSM 850: 180 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
BS_AG_BLKS_RES	Not applicable	0
Paging reorganisation		Off (0)
Signalling channel		SDCCH
Location Update		Auto
Cell access		Disabled (barred)

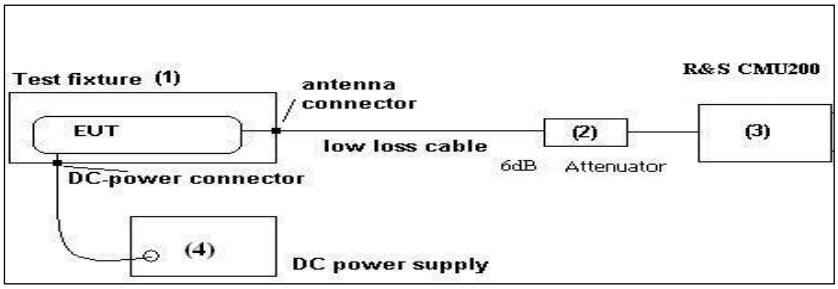
Following settings apply to the UE (EUT) during the measurements in **FDD-Mode** only:

Parameter	Traffic Mode	Idle Mode
UARFCN UE Uplink (EUT) (according TS34.108)	FDD 2 = 9262/ 9400/ 9538 FDD 4 = 1312/1413/1513 FDD 5 = 4132/ 4182/ 4233	--
UARFCN Node B (downlink) (according TS34.108)	FDD 2 = 9663/ 9800/ 9937 FDD 4 = 1537/1675/1738 FDD 5 = 4358/ 4400/ 4457	
UE power class	Class 3 (+24dBm)	
HSDPA UE category/ HSUPA category	14/6	
Maximum power	FDD 2/5 12.2kbps RMC99 -> all TPC bits up (“1”) HSDPA-mode = accord. Subtests 1,2,3,4 defined in 3GPP TS34.121 HSUPA mode = accord. Subtests 1,2,3,4,5 defined in 3GPP TS34.121	--
Modulation	12.2kbps RMC99-mode: QPSK-Modulation Scheme HSDPA/HSUPA = QPSK, BPSK and 16 QAM Modulation Scheme is applicable	--
Compression mode	Off	--
Bitstream	PRBS 2E9-1 (pseudo-random-sequence) – CCITT 0.153	
Maximum data transmission rate:	GSM: 20.0 kbps/ Slot EDGE: 59.2 kbps/ Slot FDD: 12.2 kbps	
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 SET-UP's

4.1. Test Set-up for conducted measurements

The EUT's RF-signal is coupled out by a suitable antenna coupling connector (1). The signal is first 6 dB attenuated (2) before it is connected to the communication base station CMU200 (3, Ref. no. 460). The specific attenuation losses for the signal path is determined prior to the measurement within a set-up calibration. These are taken into account by correcting the measurement readings on the communication base station (3).



Schematic: Test set-up for conducted measurements

The test set-up include path losses of interconnecting cables between RF-output port to the test system. Typical path losses are 0.1 to 0.2 dB per meter depending of cable quality (used 1m length) and frequency.

5. Radio Frequency Exposure Evaluation §2.1091, RSS-102

5.1.References

FCC: §1.1310, § 2.1091
IC: RSS-102, Issue 4

The criteria used for the evaluation of human exposure to radio frequency radiation is table 1 according FCC §1.1310 and table chapter 4.2 of RSS-102 standard.

As the mobile equipment is authorized under Part 22 (Subpart H), Part 24 and Part 27 of the FCC Rules, it is subject for evaluation of the RF exposure prior to equipment authorization.

§2.1091: Further information on evaluating compliance with these limits can be found in the FCC's OST/OET Bulletin Number 65, ''Evaluating Compliance with FCC-Specified Guidelines for Human Exposure to Radiofrequency Radiation.''

1)For purposes of analyzing mobile transmitting devices under the occupational/controlled criteria specified in Sec. 1.1310 of this chapter, time-averaging provisions of the guidelines may be used in conjunction with typical maximum duty factors to determine maximum likely exposure levels.

For purposes of these requirements mobile devices are defined by the FCC as transmitters designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between radiating structures and the body of the user or nearby persons. These devices are normally evaluated for exposure potential with relation to the MPE limits given in Table 1 of Appendix A.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz

Table 1: LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

The used equation to predict the power density in the far-field of one single radiating antenna can be made by following equation:

$$S = \frac{EIRP}{4\pi R^2} = \frac{P * G}{4\pi R^2}$$

Abbreviations:

S: Power density (mW/cm^2)
P: Power Input measured conducted on RF-port (mW)
G: Numeric gain of the antenna relative to an isotropic radiator
R: distance from the surface or antenna of the EUT (cm)

For given power density limit at a single frequency (accord. Table 1 Limits) the maximum antenna gain can be calculated:

$$G_{NUMERIC} = \frac{S * 4\pi R^2}{P}$$

5.2.General Limits

§1.1307
Cellular Radiotelephone Service (subpart H of part 22)
Non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 1000 W ERP (1640 W EIRP)

§1.1307
Personal Communications Services (part 24)
Broadband PCS (subpart E): non-building-mounted antennas: height above ground level to lowest point of antenna < 10 m and total power of all channels > 2000 W ERP (3280 W EIRP)

***§1.1310** LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)*
Table 1(B) Limits for General Population/Uncontrolled Exposure
300–1500 MHz: f/1500 mW/cm² (f in MHz)
1500–100,000 MHz: 1.0 mW/cm²

§2.1091
Subject to routine evaluation is required when the device operate at frequencies of 1.5 GHz or below and their effective radiated power (ERP) is 1.5 watts or more, or if they operate at frequencies above 1.5 GHz and their ERP is 3 watts or more.

§24.232
(a) Base stations are limited to 1640 watts peak equivalent isotropically radiated power (e.i.r.p.) with an antenna height up to 300 meters HAAT.
c) Mobile/portable stations are limited to 2 watts EIRP…

§22.913
(a)Maximum ERP. The effective radiated power (ERP) of base transmitters and cellular repeaters must not exceed 500 Watts.
(2)… The ERP of mobile transmitters and auxiliary test transmitters must not exceed 7 Watts.

§27.50
(4) Fixed, mobile, and portable (hand-held) stations operating in the 1710–1755 MHz band are limited to 1 watt EIRP. Fixed stations operating in this band are limited to a maximum antenna height of 10 meters above ground. Mobile and portable stations operating in this band must employ a means for limiting power to the minimum necessary for successful communications

Canadian RSS-102 standard for uncontrolled environment requires the RF-exposure value in W/m^2 unit, therefore the MPE limit value determined in mW/cm^2 unit, should be multiplied by 10 to have the required unit. The MPE limits are the same like on FCC §1.1301 at table 1.

5.3. Methods

Valid for GSM/GPRS/EDGE mode:

- The power was checked on 3 frequencies (lowest/middle/highest) within each operable bands.
- Average burst power (slot power) and peak were measured.
- Only one uplink slot (1 TX) was measured. 4 TX slots are maximum possible for this device and calculated as worst-case.
- A duty-cycle correction factor of $10*\log_{10}$ (max. number of possible active slots / 8 slots) were applied

Please find in the following tables the calculations. Also the maximum admissible allowed antenna gain is calculated which is not exceeding the MPE limit for fixed and mobile operations.
Valid for FDD/W-CDMA Mode:

- The power was checked on 3 frequencies (lowest/middle/highest) within each operable FDD-band. RMS and Peak detector was used.
- No duty-cycle correction factor is applicable

5.4. Results

850 MHz frequency band

Maximum output power considerations

Mode	Measured freq. (MHz)	Measured maximum conducted output power (dBm)	Duty cycle	Measured Maximum conducted output power (W)	Equivalent conducted output power (maximum conducted output power x duty cycle) (mW)
GSM/GPRS (PK)	824.2	32.20	50%	1.658	829
	837	32.24		1.675	838
	848.8	**32.33**		1.711	855
GSM/GPRS (Avg. Burst Power)	824.2	32.01	50%	1.589	795
	837	32.08		1.616	808
	848.8	**32.14**		1.636	818
EDGE (PK)	824.2	29.22	50%	0.835	417
	837	29.23		0.838	419
	848.8	**29.26**		0.844	422
EDGE (Avg. Burst Power)	824.2	26.32	50%	0.429	214
	837	26.39		0.436	218
	848.8	**26.48**		0.445	222
WCDMA (PK)	826.4	**26.12**	100%	0.409	409
	836.4	26.11		0.408	408
	846.6	25.86		0.385	385
WCDMA (RMS)	826.4	22.01	100%	0.159	159
	836.4	**22.82**		0.192	192
	846.6	22.72		0.187	187

Antenna gains considerations of 850 MHz band:

P	Selected the highest maximum power input to the antenna incl. Duty cycle (mW): (Avg. Burst Power or RMS)	818
R	Distance (cm):	20
S	Power density MPE limit acc. §1.1310 and RSS-102 for uncontrolled exposure (mW/cm²): (FCC use mW/cm² & IC use W/m²)	0.55
G_1	Maximum Antenna gain to comply with MPE limit (dBi):	**5.28**

(For G1 selected the lowest measured channel to reach minimum ant. gain)

	ERP power limit according to §2.1091 (W ERP): (Avg. Burst Power or RMS)	1.50
G_2	Max. Antenna gain to comply with limit incl. Duty cycle (dBi):	**4.78**

(For G2 selceted the highest max. Avg. Burst Power or RMS value incl. Duty cycle)

	ERP power limit according to §22.913 (W ERP):	7.00
G_3	Max. Antenna gain to comply with limit (dBi):	**8.46**

(For G3 selected the highest Average burst power value excluded Duty cycle)

$\mathbf{G_{850\ MHz\ band}}$	**Min (G_1, G_2, G_3)** (dBi)	**4.78**

The max. ant. gain for mobile operation at 850 MHz band to comply with MPE and ERP limits incl. path loss shall not exceed (dBi):	**4.78**

RF Exposure Evalution acc. RSS-102 allowed maximum antenna gain in a distance of 20 cm is for RF Field strength (W/m²): 4.90
(Exemption from Routine Evaluation Limits – RF Exposure Evaluation is not required, if the device below 1.5 GHz and the maximum e.i.r.p. is equal toor less than 2.5 W. However, if the device in question meets the exemption from routine evaluation limits of sections 2.5.1 or 2.5.2 (RSS-102) only a signed declaration of compliance needs to be submitted (see Annex C))

1700 MHz frequency band

Maximum output power considerations:

Mode	Measured freq. (MHz)	Measured maximum conducted output power (dBm)	Duty cycle	Measured Maximum conducted output power (W)	Equivalent conducted output power (maximum conducted output power x duty cycle) (mW)
WCDMA (PK)	1712.4	25.55	100%	0.359	359
	1732.6	25.49		0.354	354
	1752.6	**25.65**		0.367	367
WCDMA (RMS)	1712.4	22.35	100%	0.172	172
	1732.6	22.32		0.171	171
	1752.6	**22.45**		0.176	176

Antenna gains considerations:

P	Selected the maximum power input to the antenna incl. Duty cycle (mW): (RMS)	176
R	Distance (cm):	20
S	Power density MPE limit acc. §1.1310 and RSS-102 for uncontrolled exposure (mW/cm²): (note: FCC use mW/cm² & IC use W/m²)	1.00
G_1	Maximum Antenna gain to comply with MPE limit (dBi):	**14.56**

	ERP power limit according to §2.1091 (W ERP): (RMS)	3.00
G_2	Max. Antenna gain to comply with limit incl. Duty cycle (dBi):	**14.47**

	EIRP power limit according to §27.50(d) (W EIRP):	1.00
G_3	Max. Antenna gain to comply with limit (dBi):	**7.55**

(For G3 selected the max. RMS value excluded Duty cycle)

$G_{1700\ MHz\ band}$	**Min (G_1, G_2, G_3)** (dBi)	**7.55**

The max. ant. gain for mobile operation at 1700 MHz band to comply with MPE and EIRP limits incl. path loss shall not exceed (dBi):	**7.55**

RF Exposure Evalution acc. RSS-102 allowed maximum antenna gain in a distance of 20 cm is for RF Field strength (W/m²): 1.99
(Exemption from Routine Evaluation Limits – RF Exposure Evaluation is not required, if the device above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W. However, if the device in question meets the exemption from routine evaluation limits of sections 2.5.1 or 2.5.2 (RSS-102) only a signed declaration of compliance needs to be submitted (see Annex C))

1900 MHz frequency band

Maximum output power considerations:

Mode	Measured freq. (MHz)	Measured maximum conducted output power (dBm)	Duty cycle	Measured Maximum conducted output power (W)	Equivalent conducted output power (maximum conducted output power x duty cycle) (mW)
GSM/GPRS (PK)	1850.2	29.18	50%	0.828	414
	1880.0	**29.24**		0.839	419
	1909.8	29.11		0.814	407
GSM/GPRS (Avg. Burst Power)	1850.2	29.02	50%	0.799	399
	1880.0	**29.06**		0.806	403
	1909.8	28.97		0.789	394
EDGE (PK)	1850.2	28.04	50%	0.636	0.318
	1880.0	**28.06**		0.640	0.320
	1909.8	27.93		0.621	0.310
EDGE (Avg. Burst Power)	1850.2	25.24	50%	0.334	0.167
	1880.0	**25.29**		0.338	0.169
	1909.8	25.19		0.330	0.165
WCDMA (PK)	1852.4	25.74	100%	0.375	0.375
	1880.0	**25.86**		0.385	0.385
	1907.6	25.41		0.348	0.348
WCDMA (RMS)	1852.4	22.69	100%	0.186	0.186
	1880.0	**22.72**		0.187	0.187
	1907.6	22.51		0.178	0.178

Antenna gains considerations of 1900 MHz band:

P	Selected the maximum power input to the antenna incl. Duty cycle (mW): (Avg. Burst Power or RMS)	403
R	Distance (cm):	20
S	Power density MPE limit acc. §1.1310 and RSS-102 for uncontrolled exposure (mW/cm²): (FCC use mW/cm² & IC use W/m²)	1.00
G_1	Maximum Antenna gain to comply with MPE limit (dBi):	**10.96**

	ERP power limit according to §2.1091 (W ERP): (Avg. Burst Power or RMS)	3.00
G_2	Max. Antenna gain to comply with limit incl. Duty cycle (dBi):	**10.87**

(For G2 selceted the max. Avg. Burst Power or RMS value incl. Duty cycle)

	EIRP power limit according to §24.232 (W EIRP):	2.00
G_3	Max. Antenna gain to comply with limit (dBi):	**3.95**

(For G3 selected the max. Average burst power value excluded Duty cycle)

$G_{1900\ MHz\ band}$	**Min (G_1, G_2, G_3)** (dBi)	**3.95**

The max. ant. gain for mobile operation at 1900 MHz band to comply with MPE and EIRP limits incl. path loss shall not exceed (dBi):	**3.95**

RF Exposure Evalution acc. RSS-102 allowed maximum antenna gain in a distance of 20 cm is for RF Field strength (W/m²): 1.99
(Exemption from Routine Evaluation Limits – RF Exposure Evaluation is not required, if the device above 1.5 GHz and the maximum e.i.r.p. of the device is equal to or less than 5 W. However, if the device in question meets the exemption from routine evaluation limits of sections 2.5.1 or 2.5.2 (RSS-102) only a signed declaration of compliance needs to be submitted (see Annex C))

6. 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.

Measurement	Frequency range	Calculated uncertainty based on a confidence level of 95%	Remarks:
RF-Power Output conducted	9 kHz .. 20 GHz	1.0 dB	--
RF-Power Output radiated	30 MHz .. 4 GHz	3.17 dB	Substitution method
Conducted RF-emissions on antenna ports	9 kHz .. 20 GHz	1.0 dB	--
Radiated RF-emissions enclosure	150 kHz .. 30 MHz	5.0 dB	Magnetic field
	30 MHz .. 1 GHz	4.2 dB	E-Field
	1 GHz .. 18GHz	4.8 dB	E-Field
	1 GHz .. 20 GHz	3.17 dB	Substitution method
Occupied bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker method)	Frequency error
		1 dB	Power
Emission bandwidth	9 kHz .. 4 GHz	0.1272 ppm (Delta Marker method)	Frequency error
		1 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

7. Used equipment “CTC”

7.1. Used equipment “CTC”

The “Ref.-No” in the left column of the following tables allows the clear identification of the laboratory equipment.

7.1.1. 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	System-CTC-EMS-Conducted	System EMS Conducted	-	EMC 32 V 8.40
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
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 to be used ,
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR) Cable	-	EMC 32 Version 8.40
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. 8.40
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	Univ. 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

7.1.2. 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	-	31.03.2013
007	DC - LISN (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	24/12 M	-	31.03.2013
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	-	31.03.2013
030	Loop Antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2013
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	24 M	-	
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	30.06.2013
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-10EEK	5	Wainwright GmbH	12 M	1c	
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	31.03.2013
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	36 M	-	31.03.2013
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	36 M	-	
110	USB-LWL-Converter	OLS-1	-	Ing. Büro Scheiba	-	4	31.03.2013
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	-	31.03.2013
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	12 M	-	31.03.2013
140	Signal Generator	SMHU	831314/006	Rohde & Schwarz	24 M	-	
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	31.03.2013
261	Thermal Power Sensor	NRV-Z55	825083/0008	Rohde & Schwarz	24/12 M	-	31.03.2013
262	Power Meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	31.03.2013
263	Signal Generator	SMP 04	826190/0007	Rohde & Schwarz	36 M	-	31.03.2014
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	-	31.03.2013
266	peak power sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright GmbH	pre-m	2	
268	AC/DC power supply	EA 3050-A	9823636	Elektro Automatik	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	30.06.2013
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	
298	Univ. Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	pre-m	3	31.03.2013
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	24/12 M	-	
301	attenuator (20 dB) 50W, 18GHz	47-20-33	AW0272	Lucas Weinschel	pre-m	2	31.03.2014
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	-	30.11.2013
331	Climatic Test Chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	31.03.2013
341	Digital Multimeter	Fluke 112	81650455	Fluke	24 M	-	31.03.2013
342	Digital Multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	24 M	-	
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	31.03.2013
355	Power Meter	URV 5	891310/027	Rohde & Schwarz	24 M	-	31.03.2013
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
373	V-Network 5µH/50 Ohm	ESH3-Z6	100535	Rohde & Schwarz	24/12 M	-	31.03.2013
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	-	
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	31.03.2013
436	Univ. Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	31.10.2013
441	CTC-SAR-EMI Cable Loss	System EMI field (SAR) Cable	-	CETECOM	12 M	5	31.03.2013

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
443	CTC-FAR-EMI-RSE	System CTC-FAR-EMI-RSE	-	ETS-Lindgren/CETECOM	12 M	5	30.06.2012
448	notch filter WCDMA_FDD II	WRCT 1850.0/2170.0-5/40-10SSK	5	Wainwright Instruments GmbH	12 M	1c	30.06.2012
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-8SSK	1	Wainwright	12 M	1c	30.06.2012
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	-	31.03.2013
467	Digital Multimeter	Fluke 112	89680306	Fluke USA	24 M	-	31.03.2013
468	Digital Multimeter	Fluke 112	90090455	Fluke USA	24 M	-	31.03.2013
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	-	30.07.2012
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 824/849-814/859-60/10SS	SN 5	Wainwright	pre-m	2	
512	notch filter GSM 850	WRCA 800/960-02/40-6EEK	SN 24	Wainwrght	12 M	1c	30.06.2012
517	relais switch matrix	HF Relais Box Keithley System	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	36/12 M	-	31.03.2013
549	Log.Per-Antenna	HL025	1000060	Rohde & Schwarz	36/12 M	-	31.03.2013
552	high pass filter 2,8-18GHz	WHKX 2.8/18G-10SS	4	Wainwright	12 M	1c	30.07.2012
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	Univ. Radio Communication Tester	CMW500	101757	Rohde & Schwarz	24 M	-	31.03.2013
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	

7.1.3. 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