FCC Part 22/24
T E S T R E P O R T

No.: 2-20719349c/07

for

GSM/GPRS/UMTS/WLAN Wireless Router

Globesurfer II 7.2
(FCC-ID NCMOGS0201)
+
TELSA External Antenna 2 dBi

Applicant: Option International N.V.

Laboratory Accreditation and Listings		
Deutscher Akkreditierungs Rat DAR **DAT-P-176/94-02**	**Federal Communications Commission** **FCC Registration No. 99538** **MRA US-EU DE0003**	**Industry Canada** **IC Registration No. IC 3465**
accredited according to DIN EN ISO/IEC 17025		

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1. Summary of test results

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 generalisations taken in conjunction with other specimens or samples of the type of the item presented to tests.

Following tests have been performed to show compliance with applicable FCC Part 2, Part 22 (Subpart H) and Part 24 (Subpart E, broadband PCS) of the FCC CFR 47 Rules.

1.1. TESTS OVERVIEW

TEST CASES	PORT	REFERENCES & LIMITS			EUT set-up	EUT operating mode	Result
		FCC Standard	--	TEST LIMIT			
TX-Mode							
RF POWER (conducted)	Antenna terminal (conducted)	§2.1046		N/A	--	--	Not performed Remark 1
RF-POWER radiated (ERP/EIRP)	Cabinet	§2.1046 §22.913(a)(2) §24.232(c)		< 7 Watt ERP < 2 Watt	1	1+2+3+4 +5	Passed
SPURIOUS EMISSIONS (conducted)	Antenna terminal (conducted)	§2.1051 §22.917(a)(b) §24.238(a)(b)		43+10log(P) dBc	--	--	Not performed Remark 1
99% OCCUPIED BANDWIDTH	Antenna terminal (conducted)	§2.202 §2.1049 §22.917(a) §24.238(a)		99% Power	--	--	Not performed Remark 1
SPURIOUS EMISSIONS (radiated)	Cabinet + Interconnecting cables (radiated)	§15.209(a)		2400/F(kHz) µV/m 24000/F(kHz) µV/m 30 µV/m	--	--	Not performed Remark 1
		§2.1053(a) §22.917(a)(b) §24.238(a)(b)		43+10log(P) dBc	--	--	Not performed Remark 1
FREQUENCY STABILITY	Antenna terminal (conducted)	§22.355 §24.235 §2.1055		< 2.5ppm <0.1 ppm	--	--	Not performed Remark 1
RADIO FREQUENCY EXPOSURE EVALUATION (MPE)	Cabinet	§1.1310 §2.1091		§1.1310 Table 1	1	1+2+3+4 +5	Passed

RX-MODE							
RECEIVER Spurious emissions	Cabinet + Interconnecting cables (radiated)	§15.109 §15.33 §15.35		FCC 15.109 Limits	--	--	Not performed Remark 1
	Antenna terminal (conducted)	§2.1051		43+10log(P) dBc	--	--	Not performed Remark 1

Remarks: 1.) Update tests, radiated power E(I)RP tests only

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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
Laboratory accreditations/Listings:	DAR-Registration No. DAT-P-176/94-02 FCC-Registration No. 99538 MRA Accreditation US-EU DE0003 IC-Registration No. 3465
Responsible for testing laboratory:	Dipl.-Ing. W. Richter
Deputies:	Dipl.-Ing. H. Strehlow, D. Franke

2.2. Test location

2.2.1. Test laboratory “CTC”

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

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2.3. Organizational items

Order No.:	20719349
Responsible for test report and project leader:	Dipl.-Ing. C. Lorenz
Receipt of EUT:	Week 50/2007
Date(s) of test:	19.12.2007
Date of report:	20.12.2007
Number of report pages:	29
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Version of template: 06.08	

2.4. Applicant’s details

Applicant’s name:	Option International N.V.
Address:	Gaston Geenslan 14 3001 Leuven Belgium
Contact person:	Mr. Stefan Lodeweyckx

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 and description of main EUT

Main function	GSM/GPRS/UMTS/WLAN Wireless Router		
Type	*Globesurfer II 7.2*		
GSM Frequency range	GSM850: 824-849MHz (Uplink), 869–894 MHz (Downlink) GSM1900: 1850-1910MHz (Uplink), 1930-1990MHz (Downlink)		
UTRA/FDD frequency range	Band 2: 1850-1910MHz (Uplink), 1930-1990MHz (Downlink) Band 5: 824-849MHz (Uplink), 860-894MHz (Downlink)		
Type of modulation	GSM: GMSK EGSM: 8PSK UTRA/ FDD: QPSK		
Number of channels	GSM850: 128 – 251, 125 channels GSM1900: 512 – 810, 300 channels UTRA/FDD Band 2: 290 channels URA/FDD Band 5: 109 channels		
EMISSION DESIGNATOR(S)			
Antenna Type	External, frequency range GSM: 870-960MHz, 1710-2200 MHz Max. 2 dBi gain		
MAX PEAK Output Power: GSM 850 Radiated GSM 1900 EDGE GSM 1900 UTRA/FDD Band 2 UTRA/FDD Band 5	32.49 dBm 32,11 dBm 31.77 dBm 31.12 dBm 27.48 Bm		
MAX PEAK Output Power: GSM 850 Conducted GSM1900	--, not tested --, not tested		
FCC-ID	NCMOGS0201		
Installed option	WLAN		
Special EMI components	--		
EUT sample type	☐ Production	☒ Pre-Production	☐ Engineering

(Applicant's declaration, ☐ = not selected, ☒ = selected)

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	GSM/GPRS/UMTS/WLAN Wireless Router	Globesurfer II 7.2	IMEI: 35237501.0055 64.8.06	3.0 Configuration C01	R1I07
EUT B	Telsa 2 dBi external antenna	GPRS/UMTS TO1111929	#1	--	--
EUT C	Kosh AC/DC Power Supply	1880337	--	--	--

*) 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 descrip-tion *)	Auxiliary Equipment	Type	S/N serial number	HW hardware status	SW software status
AE 1	CAT5 cable	--	--	--	--
AE 2	Notebook	DELL D610	#4	--	Windows XP + Terminal Program

*) 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 B + EUT C + AE 1 + AE 2	ERP/EIRP Power radiated measurements

*) 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	**GSM 850** TCH mode PCL 5	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). 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	**GSM 1900** TCH mode PCL 0	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). The input signal to the receiver is modulated with normal test modulation GMSK. 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	**EDGE GSM 1900** TCH mode PCL 0	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). The input signal to the receiver is modulated with normal test modulation: 8PSK. Packet data, Test Mode A, MSC5 coding scheme, 1 Slot Uplink: 3, USF-Duty cycle: 100% 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	**UMTS UTRA/FDD** Band 2	The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable data communication link: Output channel power:-55dBm, Settings BS: operating band 2, chip symbol rate 3.84Mcp/s, UL/DL 12.2 kbps RMC, TCP commands: all 1
op. 5	**UMTS UTRA/FDD** Band 5	The wanted RF input signal level to the receiver of the mobile station is set to a level to provide a stable data communication link: Output channel power:-55dBm, Settings BS: operating band 5, chip symbol rate 3.84Mcp/s, UL/DL 12.2 kbps RMC, TCP commands: all 1

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

3.6. Additional declaration and description of EUT's

(Applicant's declaration, ☐ = not selected, ☒ = selected)

EUT A	typical operating cycle. ☒ < 0,5 sec. ☐ :	typical use ☒ portable use ☐ fixed use	☐ table-top ☐ floor-standing ☒ not defined
Place of use? ☐ vehicular use	☒ Residential, commercial and light industry ☐ Industrial environment		

Power line:		EUT-grounding:	
☐ AC	☐ L1, ☐ L2, ☐ L3, ☐ N	☒ none	(in case of deviation during tests the single details are described on chapter 4)
____Hz	☐ 12V, ☐ 24V, ☐ 230V, ☐ 400V	☐ with power supply	
☒ DC	☒ 5 V DC	☐ additional:	

Other Ports	possible total cable length	shielding	connected during test
1. Ethernet cable (CAT5)	☐ > 1m ☐ > 2m ☒ > 3m ☐ :	☐ screened ☒ unscreened	☐ yes ☒ no
2. DC-Power cable port	☐ > 1m ☒ > 2m ☐ > 3m ☐ :	☐ screened ☒ unscreened	☒ yes ☐ no
3. Analogue telephone line port	☐ > 1m ☐ > 2m ☒ > 3m ☐ :	☐ screened ☒ unscreened	☐ yes ☒ no
4. External Antenna RF-Port	☐ > 1m ☐ > 2m ☒ > 3m ☒ : not specified	☐ screened ☒ unscreened	☐ yes ☒ no
Does EUT contain devices susceptible to magnetic fields, e.g. Hall elements, electrodynamics microphones, etc.?			☐ yes ☒ no
Is mounting position / usual operating position defined?			☐ yes ☒ no

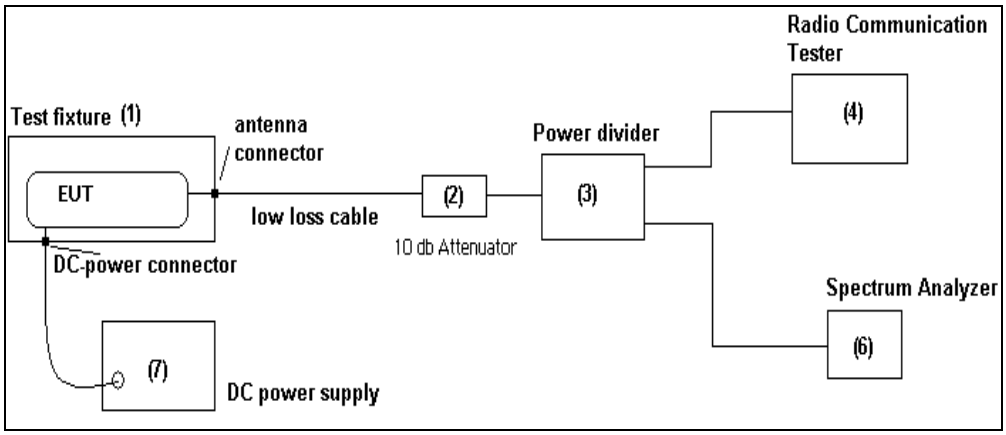
3.7. Configuration of cables used for testing

For the measurements the Ethernet CAT5 cable port was connected to a computer. Call establishment and band selection can be set-up by AT-commands sent from the notebook to the EUT.

4. Measurement and Test Set-up's

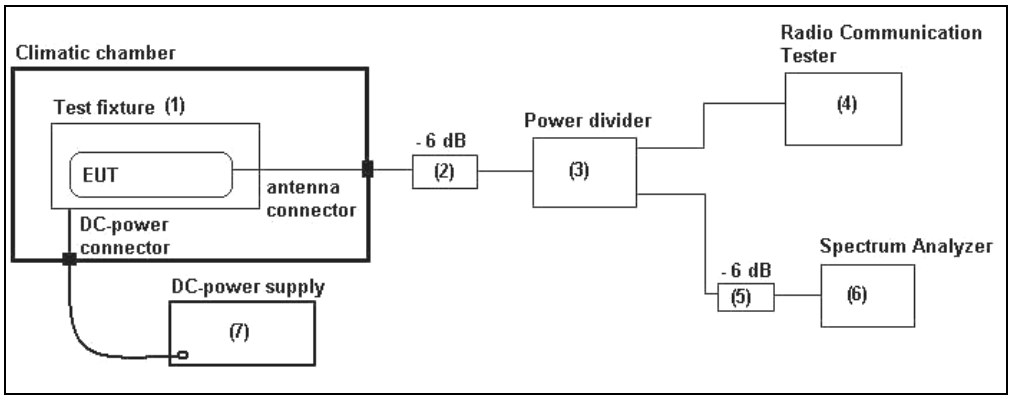
4.1. Conducted measurements

The EUT's RF-signal is coupled out by a suitable antenna coupling connector (1). The signal is first 10 dB attenuated (2) before it is 0° divided by a power divider (3). One of the signal path is connected to the communication base station (4), other branch is connected to the spectrum – analyzer (5). The specific attenuation losses for both signal paths/branches are determined prior to the measurement within a set-up calibration. These are then taken into account by correcting the measurement readings on the spectrum-analyzer.



Schematic: Test set-up conducted

Following modified test set-up schematic apply for tests performed inside the climatic chamber: (Frequency stability)



Schematic: Test set-up conducted within climatic chamber

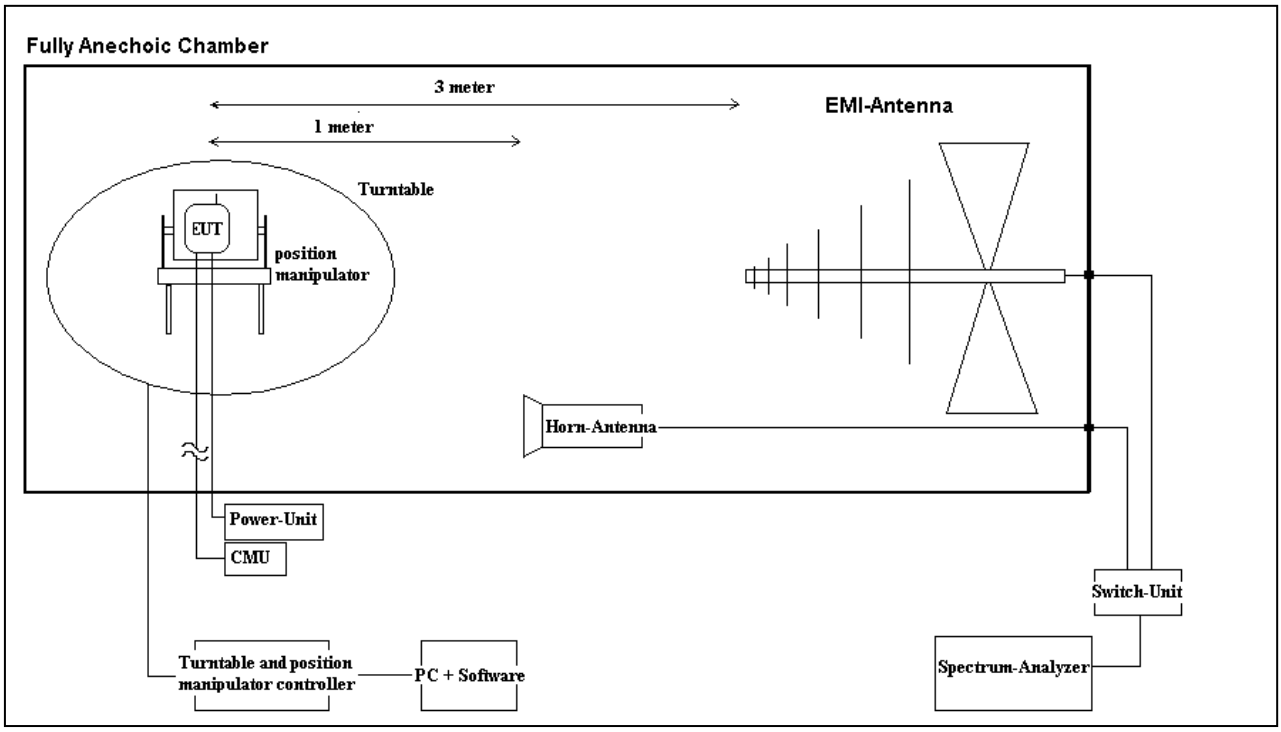
4.2. Radiated measurements

The radiated emissions from the test device are measured first as exploratory measurement in a semi or fully anechoic chamber with the dimensions of 12 x 8 x 8 meter. After determining the emissions spectrum from the EUT and connected accessories, the most critical frequencies within a defined range are re-checked on CETECOM's Open Area Test side recognized by the FCC to be compliant with ANSI 63.4: 2001

The EUT and accessories are placed on a non-conducting tipping table of 1 meter height (semi-anechoic chamber) or 1.55m height (fully-anechoic chamber) which is situated in the middle of the turntable. The turntable can rotate the device under test 360 degree, the tipping table can rotate the device from laid to standing position. This way the device under test can be rotated in all three orthogonal planes in order to maximize the detected emissions. The turn- and tipping table are controlled by a controller unit. All positions manipulations are software controlled from a operator PC.
The measurements are performed for both receiving antenna polarisations: vertical and horizontal.

Up to 18GHz a measurement distance of 3 meters is used, above 18GHz the distance is 1meter. A Bikonical-Logarithmic antenna up to 1 GHz and a Horn antenna for frequencies greater then 1 GHz are used. (see equipment list)

The EUT is powered either by a external DC-supply with nominal voltage or a AC/DC power supply as accessory. The signalling is performed from outside the chamber with a communication test center (CMU) by airlink.



Schematic: radiated measurements test set-up

4.3. Parameter Settings on mobile phone and base station

4.3.1. GSM Parameter Settings on mobile phone and base station CMU200

Following general GSM settings apply to the MS during the measurements:

Parameter	Traffic Mode	Idle Mode
Traffic Channels mobile station	GSM 850 TCHMS= 128/ 192 /251 GSM 1900 TCHMS = 512 / 681 / 810	--
maximum power step (PCL)	GSM 850: PCL = 5 (2 Watt) GSM 1900: PCL = 0 (1 Watt)	--
Modulation	GSM - GMSK-Modulation scheme EGSM – 8PSK Modulation scheme	--
DTX	off	--
Bitstream	PRBS 2E9-1 (pseudo-random-sequence) – CCITT 0.153	
Timeslot	3	
Hopping	off	
Timeslot (slot mode)	single	
Maximum data transmission rate, single time slot	GSM: 17,6 kBit/s Slot EDGE/E-GSM: 59.2 kBit/s Slot	
Speech transcoding (Traffic Mode)	Full rate Version 1	
Mode	BCCH and TCH	
BCCH – base station (CMU,CMD)	GSM 850: Channel 182 GSM 1900: Channel 561	530
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	
P/PCL	3 channels	
BS_AG_BLKS_RES	Not applicable	0
Paging reorganisation		Off (0)
Signalling channel		SDCCH
Location Update		Auto
Cell access		Disabled (barred)

4.3.2. Additional settings on the base stations CMU200 for GSM frequency stability measurements

Repetition	Continuous	
Stop condition	None	
Display mode	Max./Min	
Statistic Count	1000 Bursts	
Decoder	Standard	

5. Test results

5.1. RF-power conducted

REFERENCES

§2.1046

Maximum Power Output of the mobile phone should be determined while measured conducted and radiated way.
Limit: Part 24 – GSM 1900: 33dBm (2 Watt)

These tests have not been performed due to change of external antenna only. Therefore radiated ERP/EIRP measurements have been performed only.

5.2. RF-Power radiated (ERP/EIRP)

REFERENCES

§ 22.913(a)(2), § 24.232(c)
LIMIT: §22.913(a)(2) - 7 Watt, §24.232(c) – 2 Watt

TEST METHOD

The measurements were made at the upper, center, and lower carrier traffic frequencies of the each operable band. Choosing three TX-carrier frequencies for each operable band of the mobile phone, should be sufficient to demonstrate compliance.
The measurements were performed by using the **substitution method** (ANSI/TIA/EIA 603) with a spectrum-analyzer. This method can be described like follows:

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

Parameter	GSM-Settings	UTRA/FDD-Settings
RBW	1 MHz	10 MHz
VBW	10 MHz	10 MHz
Span	8 MHz	8 MHz
Detector Mode	Positive max-hold	Positive max-hold
Average	off	off
Sweep Time	coupled	coupled

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

GSM RESULTS (RADIATED)

Channel/ Frequency (MHz)		Peak Output Power (dBm)		Antenna Polarisation for maximum Power	Verdict
GSM 850	Channel 128/ 824.2 MHz	32.49	ERP-Value	V	Passed
	Channel 192/ 837.0 MHz	32.28			
	Channel 251/ 848.8 MHz	31.30			
GSM 1900	Channel 512/ 1850.2 MHz	31.60	EIRP-Value	V	Passed
	Channel 661/ 1880.0 MHz	32.11			
	Channel 810/ 1909.8 MHz	30.44			

REMARK: only worst–case results between GSM and EGSM mode related

UTRA/FDD RESULTS (RADIATED)

Channel/ Frequency (MHz)		Peak Output Power (dBm)		Antenna Polarisation for maximum Power	Verdict
Band 2	UARFCN 9262 / 1852.4 MHz	28.30	EIRP-Value	V	Passed
	UARFCN 9400 / 1880 MHz	30.85			
	UARFCN 9538 / 1907.6 MHz	31.12			
Band 5	UARFCN 4132 / 826.4 MHz	26.48	ERP-Value	V	Passed
	UARFCN 4185 / 837 MHz	27.48			
	UARFCN 4233 / 846.6 MHz	27.16			

AMBIENT ENVIRONMENTAL CONDITIONS

Temperature	23.7°C
Relative Humidity	24%
Air pressure	986hPa

TEST EQUIPMENT

Used equipment (see reference in the annex)
020, 133, 262, 264, 392, 439, 443, 460

5.3. Occupied bandwidth

REFERENCES

§2.202, §2.1049, §22.917(a), §24.238(a)

*„the **occupied bandwidth** is the frequency bandwidth, such that, below it lower and above it upper frequency limits, the mean powers radiated are each equal to 0.5 percent of the total mean power radiated.*

These tests have not been performed due to change of external antenna only. Therefore radiated ERP/EIRP measurements have been performed only.

5.4. Emission limits (Spurious emission radiated) f< 30 MHz

REFERENCES

§15.209

These tests have not been performed due to change of external antenna only. Therefore radiated ERP/EIRP measurements have been performed only.

5.5. Emission limits (Spurious emissions conducted/ radiated) f>30MHz

REFERENCES

§2.1053(a), §22.917(a)(b), §24.238(a)(b),

„the power of emissions shall be attenuated below the transmitter output power (p) by at least least 43+10Log(P) dB“

These tests have not been performed due to change of external antenna only. Therefore radiated ERP/EIRP measurements have been performed only.

5.6. Frequency stability on temperature and voltage variations

REFERENCES

§24.235, §2.1055

§ 24.235
“The frequency stability shall be sufficient to ensure that the fundamental emission stays within the authorized frequency block”

§ 2.1055
(*d) The frequency stability shall be measured with variation of primary supply voltage as follows:*
(1) Vary primary supply voltage from 85 to 115 percent of the nominal value for other than hand carried battery equipment.
(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

These tests have not been performed due to change of external antenna only. Therefore radiated ERP/EIRP measurements have been performed only.

6. Radio Frequency Exposure Evaluation: Mobile Equipment

REFERENCES: §1.1310, § 2.1091

The criteria used for the evaluation of human exposure to radio frequency radiation is table 1 according §1.1310. As the mobile equipment is authorized under Part 22 (Subpart H) and Part 24 (Subpart E) 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.''*

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.

(A) Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$, $\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	($900/f^2$)*	6
30-300	61.4	0.163	1.0	6
300-1500	--	--	f/300	6
1500-100,000	--	--	5	6

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:

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

Abbreviations:

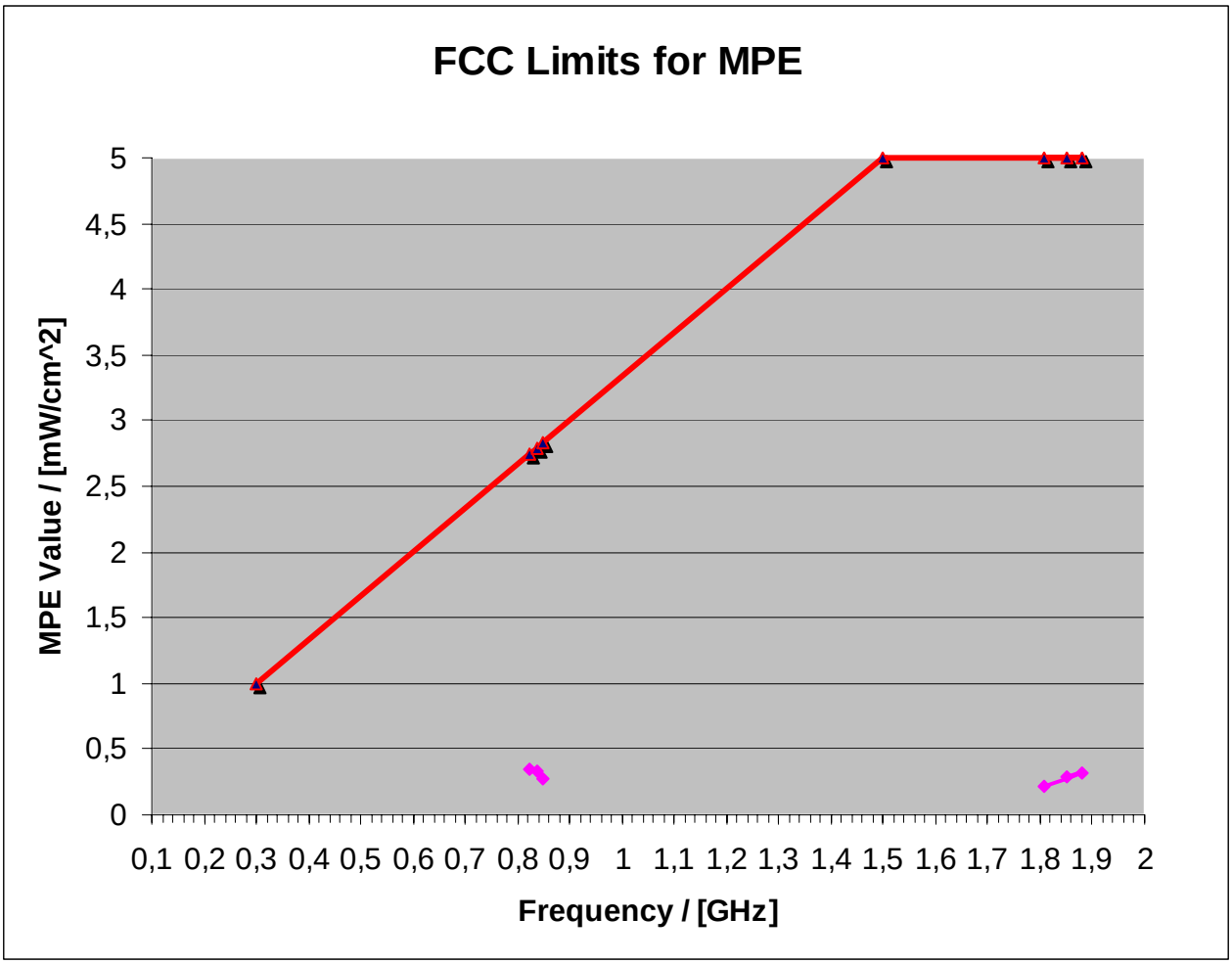
S: Power density (unit: mW/cm^2)
EIRP: Equivalent isotropically radiated power, determined within a separate measurement (unit: mW)
R: distance to the center of the radiation of the antenna (unit: cm)

MEASUREMENT METHOD

The equipment ERP/EIRP power value was checked for 3 frequencies (lowest/middle/highest) within each operable band. Please find enclosed the calculation of each limit and the graphical representation for the frequency range 300 MHz to 2.5 GHz.

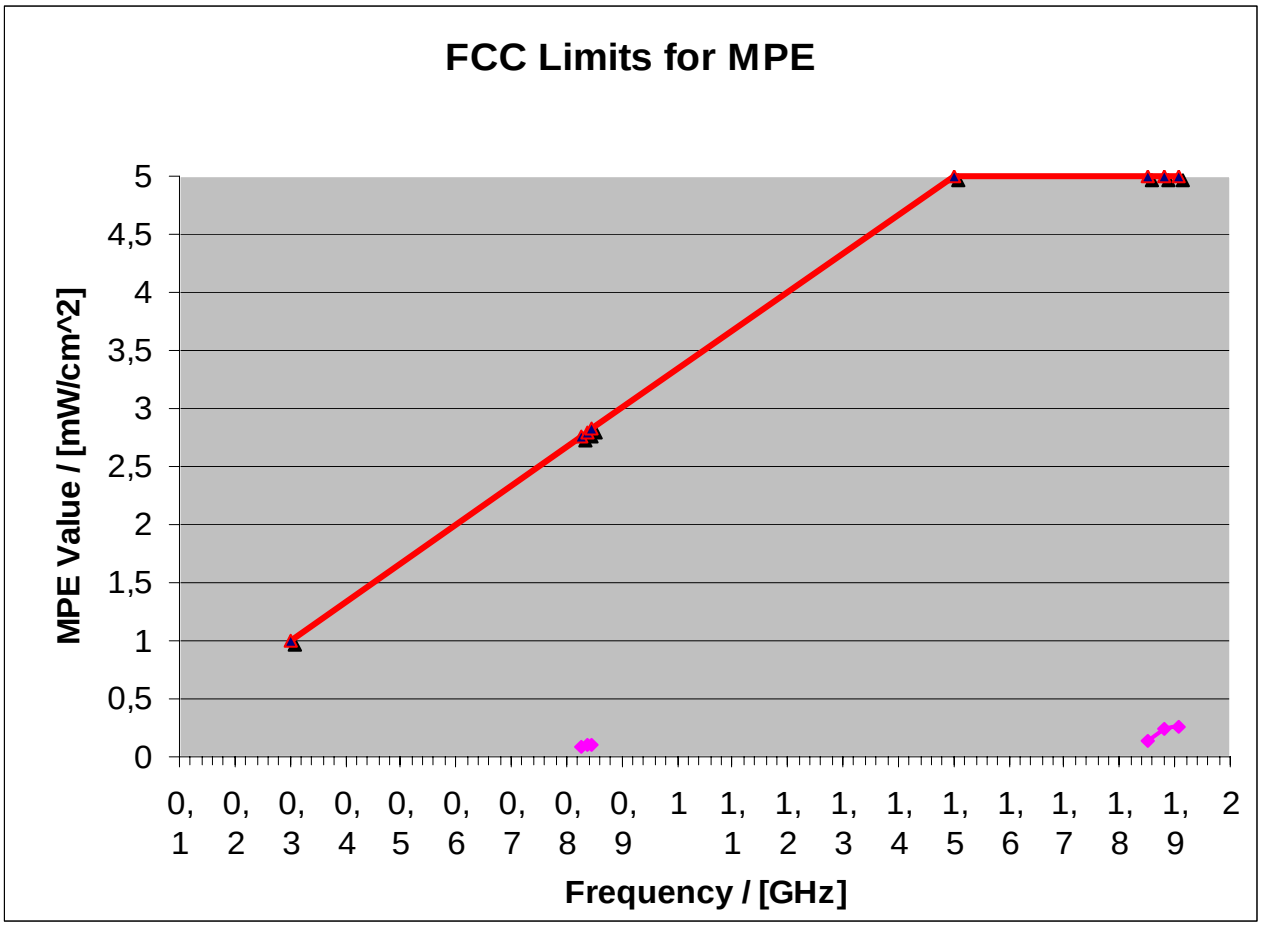
GSM-Mode:

Band	Channel no.	Channel Frequency		EIRP-Value (Unit: mWatt)	MPE-Value (Unit: mWatt/cm^2)	MPE-Limit at 20 cm distance	Margin to limit
GSM 850	128	824,2		1774,18	0,35	2,75	2,39
	192	837		1690,44	0,34	2,79	2,45
	251	848,8		1348,96	0,27	2,83	2,56
GSM 1900	512	1850,2		1445,43	0,29	5,00	4,71
	661	1880		1625,54	0,32	5,00	4,68
	810	1808,8		1106,62	0,22	5,00	4,78



UTRA/FDD Mode

Band	Channel no.	Channel Frequency		EIRP-Value (Unit: mWatt)	MPE-Value (Unit: mWatt/cm^2)	MPE-Limit at 20 cm distance	Margin to limit
FDD Band 5	4132	826,4		444,63	0,09	2,75	2,67
	4185	837		559,75	0,11	2,79	2,68
	4233	846,6		519,99	0,10	2,82	2,72
FDD Band 2	9262	1852,4		676,08	0,13	5,00	4,87
	9400	1880		1216,18	0,24	5,00	4,76
	9538	1907,6		1294,19	0,26	5,00	4,74



7. 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.

Measurement	Frequency range	Calculated uncertainty based on a confidence level of 95%	Remarks:
RF-Power Output conducted	9 kHz .. 20 GHz	1 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 dB	--
Radiated RF-emissions enclosure	150 kHz .. 30 MHz	5 dB	Magnetic field
	30 MHz .. 1 GHz	4,2 dB	E-Field
	1GHz .. 19 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 emission on AC-mains port (U_{CISPR})	9 kHz .. 150 kHz	4 dB	--
	150 kHz .. 30 MHz	3.6 dB	

Table : measurement uncertainties valid for conducted/radiated measurements

8. Calibration method of anechoic chamber

For non-critical frequencies a pre-calibration method was used for determining the relevant radiated field-strength of radiated spurious in the anechoic chamber.

Generally the measured value is influenced by the characteristics of the used cables, filters, antenna, but also by the characteristic of the anechoic chamber.
By defining a ***transducer*** value, which include all characteristics of the signal propagation path (used equipment, cables, properties of anechoic chamber, etc..) from the source of radiation to the final reading equipment (spectrum-analyzer), the measured value can be corrected in order to get the real value of the device under test.

The method resumes as follows:

1.) determination of the path-loss of all cables used on the TX- and RX-side, which are used for the radiated measurement in the specific set-up for 1 meter and 3 meter distance.
2.) connection of the cables to the relevant antennas used for calibration.
3.) determination of the ***space attenuation loss*** *(G)* in the anechoic-chamber for both horizontal and vertical antenna polarisations:

   A signal generator connected to the TX-antenna sweeps the frequency range of interest (30 MHz to 19.5 GHz) with a level of –30dBm - the readings on the RX-side on the spectrum analyzer gives the ***space attenuation loss.*** The distance between RX- and TX-antenna is 3 meter for frequencies below 1 GHz, and 1 meter for frequencies above 1 GHz.

4.) Mathematical determination of the frequency dependant transducer values ($TD_{H/V}$):

$$TD_{H/V} = G_{H/V} + B_{H/V} - 10 \cdot \log_{10}(1{,}64) + D + E - F$$

Abreviations:

$TD_{H/V}$ = λ/2 transducer values for horizontal /vertical antenna polarisations
$G_{H/V}$ = space attenuation loss horizontal/ vertical
$B_{H/V}$ = Gain of TX-antenna

$10*\mathrm{Log}_{10}(1.64)$ = Gain in dB of λ/2 Dipole relative to isotropic radiator
D = insertion losses of RX cable
E = Loss of filters in signal path (not used for FCC measurements)
F = Gain of pre-amplifiers in signal path

5.) The tables below are showing the transducer values for horizontal and vertical polarisation in two reference distances (1 meter and 3 meter). EIRP can be calculated from ERP by adding the gain of the lambda/2 dipole EIRP = ERP + 2.14 dBi
6.) Definition of transducer tables which are programmed/loaded in the spectrum analyzer. The readings on the spectrum-analyzer are automatically corrected by this values and can directly be compared with the limits as given in the relevant standards.

Used equiment for calibration (3 meter distance)

Used equipment (see reference in the annex)
264, 133, 020, 140, 484, 490

Used equiment for calibration (1 meter distance)

Used equipment (see reference in the annex)
302, 303, 264

9. Instruments and Ancillary

9.1. Used equipment "CTC"

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

9.1.1. 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.= 1.16 , 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	Communication Tester	CMD 60 M	844365/014	Firmware = V 3.52 .22.01.99, DECT Firmware D2.87
053	audio analyzer	UPA3	861215/015	Firm. V 4.3
119	RT harmonics analyser/dig. flickermeter	B10	G60547	Firm.= V 3.1DHG
120	spectrum analyzer	FSEM 30	845538/011	Bios=2.1, Analyzer-Firmware= 3.30.3
138	spectrum analyzer, display unit	FSA-D	863619/003	Firm.= 2.90
139	spectrum analyzer, RF unit	FSBS-RF	863373/003	Firm.= 2.90
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
277	Vector-Networkanalyzer	ZVC	831363/0005	Bios= 3.3, Analyzer=3.52
295	Racal Digital Radio Test Set	6103	1572	UNIT Firmware= 4.04, SW-Main=4.04, SW-BBP=1.04,
298	Radio Communication Tester	CMU 200	832221/091	R&S Test Firmware =3.53 /3.54 (current Testsoftw. f.
323	Communication Tester	CMD 55	825878/034	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	-	EMS-K1 Immunity Test-Software 1.20SR10
340	Communication Tester	CMD 55	849709/037	Firm.= 3.52 .22.01.99
355	power meter	URV 5	891310/027	Firm.= 1.31
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	001925 / 3.06a02
377	emi test receiver	ESCS 30	100160	Firm.= 2.29, 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,
420	System CTC CTIA-OTA	System CTC CTIA-OTA	-	EMQuest EMQ-100 Ver. 1.05
436	Radio Communication Tester	CMU 200	103083	R&S Test Firmware =4.30 (current Testsoftw. f. all band
441	System CTC-SAR-EMI	System EMI field (SAR)	-	EMC 32 Version 6.10. 3, ESXS-K1 Version 2.20
442	System CTC-SAR-EMS	System EMS field (SAR)	-	EMS-K1 Immunity-Software 1.20SR10
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	Spuri 6.4a und Spuri 7.0
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	EMS-K1 Immunity-Software 1.20SR10
460	Radio Communication Tester	CMU 200	108901	R&S Test Firmware Base=4.51/Messsoftware=4.50
489	emi test receiver	ESU40	1000-30	Firmware=3.93, Bios=V5.1-16-3, Specification=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.= 00030 Version V2.43
528	Load Dump Simulator	LD 200B	0496-06	Software-Nr. 000031 Version V2.35a01

9.1.2. 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	-	31.03.2008
005	AC - LISN (50 Ohm/50µH, test site 1)	ESH2-Z5	861741/005	Rohde & Schwarz	12 M	-	31.03.2008
007	DC - LISN (50 Ohm/5µH)	ESH3-Z6	892563/002	Rohde & Schwarz	12 M	-	31.03.2008
009	power meter (EMS-radiated)	NRV	863056/017	Rohde & Schwarz	12 M	-	31.03.2008
012	signal generator (EMS-cond.)	SMY 01	839069/027	Rohde & Schwarz	36 M	-	31.03.2008
013	power meter (EMS cond.)	NRVD	839111/003	Rohde & Schwarz	12 M	-	31.03.2008
014	insertion unit (EMS cond.)	URV5-Z2	838519/029	Rohde & Schwarz	12 M	-	31.03.2008
015	insertion unit (EMS cond.)	URV5-Z4	838570/024	Rohde & Schwarz	12 M	-	31.03.2008
016	line impedance simulating network	Op. 24-D	B6366	Spitzenberger + Spies	36 M	-	31.10.2010
017	Communication Tester	CMD 60 M	844365/014	Rohde & Schwarz	12 M	-	31.03.2008
020	horn antenna 18 GHz (Subst 1)	3115	9107-3699	EMCO	36 M	-	31.03.2010
021	loop antenna (H-Field)	6502	9206-2770	EMCO	36 M	-	31.03.2010
022	audio measurement amplifier	2636C	1537643	Brüel & Kjaer	12 M	-	31.03.2008
024	band pass filter 1 kHz	1625	1814825	Brüel & Kjaer	24 M	2	31.03.2008
030	loop antenna (H-field)	HFH-Z2	879604/026	Rohde & Schwarz	36 M	-	31.03.2009
031	absorbing clamp	MDS-21	863325/015	Rohde & Schwarz	24 M	-	31.03.2009
033	RF-current probe (100kHz-30MHz)	ESH2-Z1	879581/18	Rohde & Schwarz	12 M	-	31.03.2008
034	ESD - generator	ESD 30	ESD 30.0689-04	EM TEST	12 M	-	31.03.2008
035	air discharge module	P 18	P 18-0689-04	EM TEST	12 M	-	31.03.2008

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
036	contact discharge module	P 18	P 18-0392-55	EM TEST	12 M	-	31.03.2008
048	bicon. - log. antenna (SAR)	3143	1108	EMCO	36 M	-	31.10.2008
049	current clamp (injection)	F-120-2	48	FCC	12 M	-	31.03.2008
050	3-ph coupling-decoupling-netw. (Burst)	CDN 300	176	Schaffner	12 M	-	31.03.2008
051	VHF-current probe 20-300 MHz	ESV-Z1	872421	Rohde & Schwarz	12 M	-	31.03.2008
052	notch filter DECT	WRCB 1887,82/1889,55SS	12	Wainwright Industries	12 M	-	31.03.2008
053	audio analyzer	UPA3	861215/015	Rohde & Schwarz	36 M	-	31.03.2008
057	relay-switch-unit (EMS system)	RSU	494440/002	Rohde & Schwarz	-	1a	30.04.2008
058	capacitive clamp (Burst)	IP 4	99	Hafely	-	4	
059	ferrite tube	FGZ 40 X 15 E	4225	Lüthi	36 M	-	31.03.2010
060	power amplifier (DC-2kHz)	PAS 5000	B6363	Spitzenberger + Spies	-	3	
061	ferrite tube	FGZ 40 X 15 E	4250	Lüthi	36 M	-	31.03.2010
063	log.-per. antenna (Subst 1)	3146	860941/007	EMCO	36 M	-	31.10.2010
065	attenuator, (6 dB) 50 Ohm, 250W	AT 50-6-250	521057	BNOS Electronics	12 M	1b	30.04.2008
066	notch filter (WCDMA; FDD1)	WRCT 1900/2200-5/40-	5	Wainwright Instr. GmbH	12 M	-	31.03.2008
067	coupling decoupling-network	CDN801-M2/M3	272	Lüthi	12 M	-	31.03.2008
068	coupling decoupling-network	CDN 801-M5	95226	Lüthi	12 M	-	31.03.2008
069	EM - clamp	EM101	9535159	Lüthi	24 M	-	31.03.3008
070	ferrite tube	FTC101	4199	Lüthi	24 M	-	31.03.2008
071	biconical antenna (Subst 1)	HUF-Z2	863.029/010	Rohde & Schwarz	36 M	-	31.10.2010
072	coupling decoupling-network	CDN801-M2/M3	276	Lüthi	12 M	-	31.03.2008
079	4 wire T-network	EZ-10	862 939 / 011	Rohde & Schwarz	24 M	-	31.03.2009
083	AC - power supply, 0-10 A	EAC/MT 27010	910502096	EURO TEST	pre-m	2	
084	AC - power supply, 0-5 A	ELABO-8-34214	-	ELABO	pre-m	2	
085	AC - power supply, 0-10 A	R250	-	Schunterm.&Benningh.	pre-m	2	
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	pre-m	4	
091	USB-LWL-Converter	OLS-1	007/2006	Ingenieurbüro Scheiba	-	4	
094	artificial head (No.1)	4905	1566990	Brüel & Kjaer	pre-m	2	
095	band pass filter 1 kHz	MS 210R/T2.	2108400	IMD GmbH	24 M	2	31.03.2008
099	passive voltage probe	ESH2-Z3	299.7810.52	Rohde & Schwarz	12 M	-	31.03.2008
100	passive voltage probe	Probe TK 9416	without	Schwarzbeck	12 M	-	31.03.2008
110	USB-LWL-Converter	OLS-1	-	Extreme USB	-	4	
119	RT harmonics analyser/dig. flickermeter	B10	G60547	BOCONSULT	36 M	-	31.03.2010
120	spectrum analyzer	FSEM 30	845538/011	Rohde & Schwarz	12 M	-	31.03.2008
121	notch filter GSM 1900	WRCB 1879,5/1880,5EE	15	Wainwright Industries.	12 M	-	31.03.2008
122	notch filter GSM 1800	WRCB 1747/1748	12	Wainwright Industries	12 M	-	31.03.2008
123	biconical antenna (Subst 2)	HUF-Z2,	860941/007	Rohde & Schwarz	36 M	-	31.03.2010
131	RF-Current Probe	F-52	19	FCC	12 M	-	31.03.2008
132	log.-per. antenna (Subst 2)	HUF-Z3	860862/014	Rohde & Schwarz	36 M	-	31.03.2010
133	horn antenna 18 GHz (Meas 1)	3115	9012-3629	EMCO	36 M	-	31.03.2010
134	horn antenna 18 GHz (Subst 2)	3115	9005-3414	EMCO	12 M	-	31.03.2008
136	adjustable dipole antenna (Dipole 1)	3121C-DB4	9105-0697	EMCO	12 M	-	31.03.2008
137	1000 Hz calibrator 94 dB SPL	4230 94 dB	1 594 698	Brüel & Kjaer	12 M	-	31.03.2008
138	spectrum analyzer, display unit	FSA-D	863619/003	Rohde & Schwarz	12 M	-	31.03.2008
139	spectrum analyzer, RF unit	FSBS-RF	863373/003	Rohde & Schwarz	12 M	-	31.03.2008
140	signal generator	SMHU	831314/006	Rohde & Schwarz	24 M	-	31.03.2008
142	attenuator (6 dB) 2 W, 8 GHz	DGL N	-	Radiall	12 M	1b	30.04.2008
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	
254	high pass GSM1800/1900/DECT	5HC 2600/12750-1.5KK	23042	Trilithic	12 M	-	31.03.2008
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	-	31.03.2008
262	power meter	NRV-S	825770/0010	Rohde & Schwarz	24 M	-	31.03.2008
263	signal generator	SMP 04	826190/0007	Rohde & Schwarz	24 M	-	31.03.2009
264	spectrum analyzer	FSEK 30	826939/005	Rohde & Schwarz	12 M	-	31.03.2008
265	peak power sensor	NRV-Z33, Model 04	840414/009	Rohde & Schwarz	24 M	-	31.03.2008
266	peak power sensor	NRV-Z31, Model 04	843383/016	Rohde & Schwarz	24 M	-	31.03.2008
267	notch filter GSM 850	WRCA 800/960-6EEK	9	Wainwright Industries	12 M	-	31.03.2008
268	AC/DC power supply	EA 3050-A	9823636	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	
277	Vector-Networkanalyzer	ZVC	831363/0005	Rohde & Schwarz	12 M	-	31.03.2008
279	power divider	1515 (SMA)	LH855	Weinschel	pre-m	2	
284	coupling decoupling network	CDN 801-M1	1661	Lüthi	12 M	-	31.03.2008
285	coupling decoupling network	CDN 801-S1	1642	Lüthi	12 M	-	31.03.2008
287	pre-amplifier 25MHz - 4GHz	AMF-2D-100M4G-35-10P	379418	Miteq	12 M	-	31.03.2008
289	bicon. - log. antenna (OATS)	CBL 6141	4107	Schaffner Chase	36 M	-	31.10.2010
290	notch filter GSM 900	WRCA 901,9/903,1SS	3RR	Wainwright Industries	12 M	-	31.03.2008
291	high pass filter GSM 850/900	WHJ 2200-4EE	14	Wainwright Industries	12 M	-	31.03.2008
295	Racal Digital Radio Test Set	6103	1572	Racal	24 M	3	31.03.2009
298	Radio Communication Tester	CMU 200	832221/091	Rohde & Schwarz	12 M	-	31.03.2008
299	audio microphone	4134	-	Brüel & Kjaer	pre-m	2	
300	AC LISN (50 Ohm/50µH, 1-phase)	ESH3-Z5	892 239/020	Rohde & Schwarz	12 M	-	31.03.2008
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	24 M	-	31.03.2008

Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
303	horn antenna 40 GHz (Subst 1)	BBHA9170	156	Schwarzbeck	24 M	-	31.03.2008
304	fix dipole antenna 1,6 GHz	EMCO 3125-307	9907-1001	ETS	24 M	-	31.03.2009
305	fix dipole antenna 1,8-2,0 GHz	EMCO 3125-306	9907-1001	ETS	24 M	-	31.03.2009
306	fix dipole antenna 2,45 GHz	EMCO 3125-308	9907-1001	ETS	24 M	-	31.03.2009
307	fix dipole antenna 3 GHz	EMCO 3125-309	9907-1001	ETS	24 M	-	31.03.2009
312	Switch unit	TS-RSP	1000147	R&S	12 M	1f	31.03.2008
317	1000 Hz calibrator 94 dB SPL	4230 94dB	1542286	Brüel & Kjaer	12 M	-	31.03.2008
323	Communication Tester	CMD 55	825878/034	Rohde & Schwarz	12 M	-	31.03.2008
331	climatic test chamber -40/+80 Grad	HC 4055	43146	Heraeus Vötsch	24 M	-	31.10.2008
335	System-CTC-EMS-Conducted	System EMS Conducted	-	Rohde & Schwarz	12 M	5	30.04.2008
337	System CTC OATS	System EMI OATS	-	HD GmbH	12 M	5	30.10.2008
338	pre-amplifier 26GHz	JS4-00102600-38-5P	838697	Miteq	12 M	-	31.03.2008
340	Communication Tester	CMD 55	849709/037	Rohde & Schwarz	12 M	-	31.03.2008
341	digital multimeter	Fluke 112	81650455	Fluke	24 M	-	31.03.2008
342	digital multimeter	Voltcraft M-4660A	IB 255466	Voltcraft	12 M	-	31.03.2008
344	adaptor 150/50 Ohm	150/50	-	Krohne	12 M	-	31.03.2008
345	adaptor 150/50 Ohm	150/50	-	Krohne	12 M	-	31.03.2008
347	laboratory site	radio lab.	-	-	-	3	
348	laboratory site	EMI conducted	-	-	-	3	
349	car battery 12 V	car battery 12 V	without	-	-	3	
350	car battery 12 V	car battery 12 V	without	-	-	3	
354	DC - power supply 40A	NGPE 40/40	448	Rohde & Schwarz	24 M	-	31.03.2008
355	power meter	URV 5	891310/027	Rohde & Schwarz	12 M	-	31.03.2008
356	power sensor	NRV-Z1	882322/014	Rohde & Schwarz	24 M	-	31.03.2008
357	power sensor	NRV-Z1	861761/002	Rohde & Schwarz	24 M	-	31.03.2008
358	Power Amplifier 10 kHz-220MHz	AR75A220M1	15860	Amplifier Research	12 M	1b	30.04.2008
362	TOSM Calibration Kit 50 Ohm	ZV-Z21/ZV-Z11	without	Rohde&Schwarz	12 M	-	31.03.2008
366	Ultra Compact Simulator	UCS 500 M4	V0531100594	EM-Test	12 M	-	31.03.2008
367	audio measurement amplifier	2636	R=316832/001 :	Brüel & Kjaer	12 M	-	31.03.2008
369	insertion unit (SAR-EMS, Ch. A)	URV5-Z2	100301	Rohde & Schwarz	24 M	-	31.03.2008
370	insertion unit (SAR-EMS, Ch. B)	URV5-Z2	100302	Rohde & Schwarz	24 M	-	31.03.2008
374	power amplifier 0,8-3 GHz	60S1G3	306528	Amplifier Research	-	1a	30.04.2008
375	directional coupler	DC7144M1	306498	Amplifier Research	-	1a	30.04.2008
376	horn antenna 6 GHz	BBHA9120 E	BBHA 9120 E 179	Schwarzbeck	12 M	-	31.03.2008
377	emi test receiver	ESCS 30	100160	Rohde & Schwarz	12 M	-	31.03.2008
378	broadband RF field monitor	RadiSense III	03D00013SNO-08	DARE Electronics B.V.	12 M	-	31.03.2008
383	signal generator	SME 03	842 828 /034	Rohde & Schwarz	36 M	-	31.03.2010
386	coupling decoupling network	CDN USB/p	19397	Schaffner	12 M	-	31.03.2008
387	coupling decoupling network	CDN L-801 M2	2051	Lüthi	12 M	-	31.03.2008
388	coupling decoupling network	CDN L-801 T2	1929	Lüthi	12 M	-	31.03.2008
389	digital multimeter	Keithley 2000	0583926	Keithley	24 M	-	31.03.2009
392	Radio Communication Tester	MT8820A	6K00000788	Anritsu	18M	-	31.03.2008
394	power amplifier 80-1000 MHz	BLWA 0810-250/200	045610	Bonn-Elektronik	-	1a	30.04.2008
400	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5559	Lüthi	12 M	-	31.03.2008
401	ferrite tube (>15 dB, EN 55022)	FTC 40 X 15 E	5560	Lüthi	12 M	-	31.03.2008
411	Test Cable Kit N 50 Ohm (male)	ZV-Z11	100200	R&S / Rosenberger	pre-m	2	
413	Quad-Ridge Horn Antenna	3164-04	00090667	ETS-Lindgren	12 M	1f	31.03.2008
414	Circulary polarized com. Antenna	3102	00033734	EMCO	-	3	
415	Antenna Position Controller	2090	00035634	ETS-Lindgren	-	4	
416	MAPS Positioner	2010	-	ETS-Lindgren	-	4	
420	System CTC CTIA-OTA	System CTC CTIA-OTA	-	ETS-Lindgren/Cetecom	12 M	5	31.03.2008
429	MAPS-Positionier	2015	-	ETS-Lindgren	-	4	
430	Thermo-Hygrometer	H270	54476	Dostmann electronic	24 M	-	30.11.2008
431	Model 7405	Near-Field Probe Set	9305-2457	EMCO	-	4	
432	pre-amplifier 100MHz-26GHz	JS4-00102600-38-5P	1030896	Miteq USA	12 M	-	31.03.2008
436	Radio Communication Tester	CMU 200	103083	Rohde & Schwarz	12 M	-	31.03.2008
439	UltraLog-Antenna	HL 562	100248	Rohde + Schwarz	36 M	-	31.03.2008
440	CDN for Datacable	CDN-UTP	CDN-UTP 029	EMC Partner AG,	24 M	-	31.03.2008
441	System CTC-SAR-EMI	System EMI field (SAR)	-	ETS	12 M	5	31.12.2007
442	System CTC-SAR-EMS	System EMS field (SAR)	-	ETS-Lindgren/Cetecom	12 M	5	30.10.2008
443	System CTC-FAR-EMI-Spuri	System CTC-FAR-EMI-	-	ETS-Lindgren/Cetecom	12 M	5	30.04.2008
444	System CTC FAR-EMS	System EMS-Field (FAR)	-	ETS Lindgren/Cetecom	12 M	5	30.04.2008
448	notch filter WCDMA FDD II	WRCT 1850.0/2170.0-	5	Wainwright Instruments	12 M	1c	31.03.2008
449	notch filter WCDMA FDD V	WRCT 824.0/894.0-5/40-	1	Wainwright Instruments	12 M	1c	31.03.2008
454	Oscilloscope	HM 205-3	9210 P 29661	Hameg	-	4	
455	Oscilloscope	HP 54602B	US 350 336 45	Hawlett Packard	-	4	
456	DC-Power supply 0-5A	EA 3013 S	207810	Elektro Automatik	pre-m	2	
457	DC-Power supply, 0-5A	EA-3013 S	9624680	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	Radio Communication Tester	CMU 200	108901	Rohde & Schwarz	12 M	-	31.03.2008
462	AF-Generator	MX-2020	-	Conrad	-	4	
463	Universal source	HP3245A	2831A03472	Agilent	-	4	
464	Thermo-Hygro-Monitor	WS-9400	without	Europe Supplies Ltd.	24 M	-	30.11.2008
465	Thermo-Hygro-Monitor	WS-9400	without	Europe Supplies Ltd.	24 M	-	30.11.2008
466	digital multimeter	Fluke 112	89210157	Fluke Corporation USA	24 M	-	31.03.2008
467	digital multimeter	Fluke 112	89680306	Fluke Corporation USA	24 M	-	31.03.2008
468	digital multimeter	Fluke 112	90090455	Fluke Corporation USA	24 M	-	31.03.2008
470	Thermo-Hygro-Monitor	WS-9400	-	distr. by Conrad	24 M	-	30.11.2008
476	Spectrum Analyzer	FSM	840500/004	Rohde & Schwarz	24 M	-	31.03.2009
477	ReRadiating GPS-System	AS-47	-	Automotive Consulting	-	3	
482	filtermatrix	FilterMatrix SAR 1	-	CETECOM (Brl)	-	1d	
484	pre-amplifier 2,5 - 18 GHz	AMF-5D-02501800-25-	1244554	Miteq	12 M	-	31.03.2008
487	NSA-Verification of CTC-SAR-EMI	System EMI field (SAR)	-	ETS	12 M	-	31.10.2007
489	emi test receiver	ESU40	1000-30	Rohde & Schwarz	12 M	-	31.03.2008
490	high pass 2,65 GHz>18GHz	6HC 2650/18000-3-KK	200709138	Trilithic	12 M	-	31.03.2008

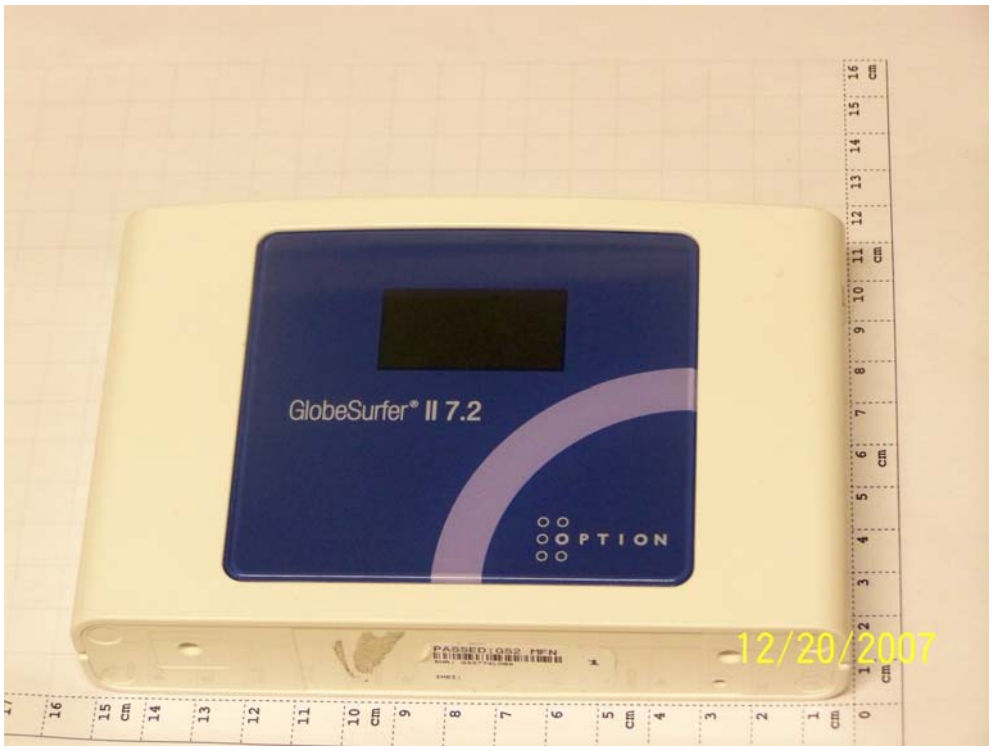
Ref.-No.	Equipment	Type	Serial-No.	Manufacturer	Interval of calibration	Remark	Cal due
491	ESD Simulator dito	ESD dito	dito307022	EM-Test	24 M	-	31.03.2009
494	power supply (GPIB)	Agilent 66332A	US 37474017	Agilent	24 M	-	31.03.2009
498	Power Supply	NGPE 40/40	402	Rohde & Schwarz	-	2	
500	industry Acoustic System	MO 2000 Set	100048	Sennheiser	-	4	
502	band reject filter	WRCG 1709/1786-	SN 9	Wainwright	-	-	
503	band reject filter	WRCG 824/849-814/859-	SN 5	Wainwright	-	-	
517	relais switc matrix	HF Relais Box Keithley	SE 04	-	-		
522	electronical load	EL 9000	-	ELV	-	-	
523	Digitalmultimeter	L4411A	MY46000154	Agilent	24 M	-	31.03.2009
524	Voltage Drop Simulator	VDS 200	0196-16	EM Test	18 M	-	31.03.2009
525	Koppelnetzwerk	CNA 200	1196-01	EM Test	18 M	-	31.03.2009
526	Burst Generator	EFT 200 A	0496-06	EM Test	18 M	-	31.03.2009
527	Micro Pulse Generator	MPG 200 B	0496-05	EM Test	18 M	-	31.03.2009
528	Load Dump Simulator	LD 200B	0496-06	EM Test	18 M	-	31.03.2009
529	6 dB Broadband resistive power divider	Model 1515	LH 855	Weinschel	-	2	
530	10 dB Broadband resistive power divider	R 416110000	LOT 9828	-	-	2	

9.1.3. 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-spurious emission (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, calibration of this equipment has no effect on measuring result
	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
	Pre-m	check before starting the measurement
	-	without calibration

10. Photographs



Photograph 1: Equipment under test: EUT A – front side

Photograph 2: Equipment under test: EUT A – rear side

Photograph 3: Equipment under test: EUT B – External antenna

Photograph 4: Equipment under test: EUT C – Power Supply

Photograph 5: Measurements in the anechoic chamber: Test Set-up

11. Annex 1: Measurement diagrams - none

NONE

12. Annex 2 – Data Sheet of External antenna (EUT B)

External Antenna for connect card GPRS/UMTS. 2dBi

T01111929

Electrical Specifications

Frequency Band	MHz	870÷960 1710÷2200
Impedance	Ω	50
Polarization		vertical
Gain	dBi	2
VSWR		≤2
Continuous max. power	W	10
OperatingTemp. range	°C	-40 ÷ +70

Mechanical Specifications

Connectors		90°mcx, 2 mt. cable other on request
Dimensions	mm	174 x 26,2 x 11
Weight	g	160
Mounting		desktop

We reserve the right to modify these data without any notice

TELSA s.r.l.