InterLab®

Final Report on

MO3311 / GTM501
HW: 4.3
SW: 0.19.2

Report Reference: MDE_OPTI_0720_Mauro_FCCa

Date: März 18, 2009

Test Laboratory:

DAT-P-192/99-01

7 layers AG
Borsigstr. 11
40880 Ratingen
Germany

1 Administrative Data

1.1 Project Data

Project Responsible:	Holger Leutfeld
Date Of Test Report:	2009/03/18
Date of first test:	2009/03/16
Date of last test:	2009/03/18

1.2 Applicant Data

Company Name:	Option Wireless Germany GmbH
Street:	Südstrasse 9 47475 Kamp-Lintfort
City:	47475 Kamp-Lintfort
Contact Person:	Mr. Matthias Ruch
Function:	Certification Engineer
Phone:	+49 2842 92730-24
Fax:	+49 2842 92730-01
Mobile:	+49 172 3500321
E-Mail:	M.Ruch@option.com

1.3 Test Laboratory Data

The following list shows all places and laboratories involved for test result generation:

7 layers DE

Company Name :	7 layers AG
Street :	Borsigstrasse 11
City :	40880 Ratingen
Country :	Germany
Contact Person :	Mr. Michael Albert
Phone :	+49 2102 749 201
Fax :	+49 2102 749 444
E Mail :	michael.albert@7Layers.de

Laboratory Details

Lab ID	*Identification*	*Responsible*	*Accreditation Info*
Lab 1	Conducted Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAR-Registration no. DAT-P-192/99-01
Lab 2	Radiated Emissions	Mr. Robert Machulec Mr. Andreas Petz	DAR-Registration no. DAT-P-192/99-01

1.4 Signature of the Testing Responsible

Dr. Michael Küppers
responsible for tests performed in: Lab 1, Lab 2

1.5 Signature of the Accreditation Responsible

Accreditation scope responsible person
responsible for Lab 1, Lab 2

2 Test Object Data

2.1 General OUT Description

The following section lists all OUTs (Object's Under Test) involved during testing.

OUT: MO3311

Type / Model / Family:	MO3311 / GTM501 HW: 4.3 SW: 0.19.2
Product Category:	Module
Manufacturer:	
Company Name:	Option Wireless Germany GmbH
Street:	Südstrasse 9
City:	47475 Kamp-Lintfort
Country:	Germany
Company URL:	http://www.option.com
Contact Person:	Mr. Dr. Holger Weinforth
Function:	Certification Engineer
Phone:	+49 2842 92730 17
E-Mail:	H.Weinforth@option.com

Parameter List:

Parameter name	*Value*

2.2 Detailed Description of OUT Samples

Sample : U06

OUT Identifier	MO3311		
Sample Description			
Serial No.	MAOI93B00X		
HW Status	4.3		
SW Status	0.19.2		
Date of Receipt	2009/03/10		
Low Voltage	3.2 V	*Low Temp.*	-10 °C
High Voltage	4.2 V	*High Temp.*	55 °C
Nominal Voltage	4.2 V	*Normal Temp.*	21 °C

2.3 Auxiliary Equipment

AE No.	*Type Designation*	*Serial No.*	*HW Status*	*SW Status*	*Description*
AE 08					Interposer
AE 07					Test Antenna
AE 05	CHERRY RS 6000 USB ON	G83-6105LUNDE-2 /03			Keyboard
AE 01	Cosi Board				Test Cradle
AE 02	EPSON Stylus C84 (B251A)	FBPT048906			Printer
AE 03	IBM Lenovo R60 9461-54G	L3-AA471 06/10			Laptop 3 ERF3
AE 04	Lenovo 92P1103	11S92P1103Z1Z BEF7161JH			AC Charger
AE 06	LG Flatron L1740BQ	509WANF1W607			TFT Display

2.4 Setups used for Testing

For each setup a relation is given to determine if and which samples and auxiliary equipment is used. The left side list all OUT samples and the right side lists all auxiliary equipment for the given setup.

Setup No.	*List of OUT samples*		*List of auxiliary equipment*	
	Sample No.	*Sample Description*	*AE No.*	*AE Description*
FCC15b (Setup for)				
	Sample: U06		AE 08	Interposer
			AE 07	Test Antenna
			AE 05	Keyboard
			AE 01	Test Cradle
			AE 02	Printer
			AE 03	Laptop 3 ERF3
			AE 04	AC Charger
			AE 06	TFT Display

3 Results

3.1 General

Documentation of tested devices: Available at the test laboratory.

Interpretation of the test results: The results of the inspection are described on the following pages, where 'Conformity' or 'Passed' means that the certification criteria were verified and that the tested device is conform to the applied standard.

In cases where 'Declaration' is printed, the required documents are available in the manufacturers product documentation.

In cases where 'not applicable' is printed, the test case requirements are not relevant to the specific equipment implementation.

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

Designation	*Description*
FCC47CFRChIPART15bRADIO FREQUENCY DEVICES	Part 15, Subpart B - Unintentional Radiators

3.3 List of Test Specification

Test Specification:	**FCC part 2 and 15**
Date / Version	2008/10/01 Version: 10-1-08 Edition
Title:	PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES

3.4 Summary

Test Case Identifier / Name *Test (condition)*	*Result*	*Date of Test*	*Lab Ref.*	*Setup*
15b.1 Conducted Emissions (AC Power Line) §15.107				
15b.1; Mode = IDLE	Passed	2009/03/18	Lab 1	FCC15b
15b.2 Spurious Radiated Emissions §15.109				
15b.2; Mode = IDLE	Passed	2009/03/16	Lab 2	FCC15b

3.5 Detailed Results

3.5.1 15b.1 Conducted Emissions (AC Power Line) §15.107

Test: 15b.1; Mode = IDLE

Result:	Passed
Setup No.:	FCC15b
Date of Test:	2009/03/18 9:41
Body:	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification:	FCC part 2 and 15

Test Equipment Environmental Conditions

Temperature:	24°C
Air Pressure:	1035hPa
Rel. Humidity:	32%

Detailed Results:

AC MAINS CONDUCTED

```
EUT:                MO3311 (37330u06)
Manufacturer:       Icera/Option
Operating Condition: GSM 1900 idle mode, normal voltage=4,2V
Test Site:          7 layers Ratingen
Operator:           Suna
Test Specification: ANSI C63.4; FCC 15.107 / 15.207
Start of Test:      18.03.2009 / 09:26:06
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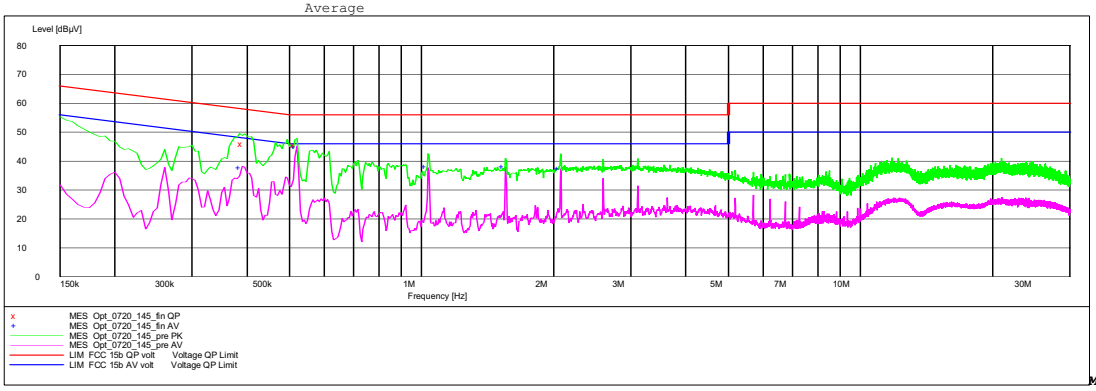
SCAN TABLE: "FCC Voltage"

Short Description:			FCC Voltage			
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak Average	20.0 ms	9 kHz	ESH3-Z5



MEASUREMENT

RESULT: "Opt_0720_145_fin QP"

18.03.2009 09:31

Frequency MHz	Level dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.395000	46.10	9.9	58	11.8	L1	GND
0.520000	45.60	10.0	56	10.4	L1	GND

3.5.2 15b.2 Spurious Radiated Emissions §15.109

Test: 15b.2; Mode = IDLE

Result:	Passed
Setup No.:	FCC15b
Date of Test:	2009/03/16 6:34
Body:	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
Test Specification:	FCC part 2 and 15

Test Equipment Environmental Conditions

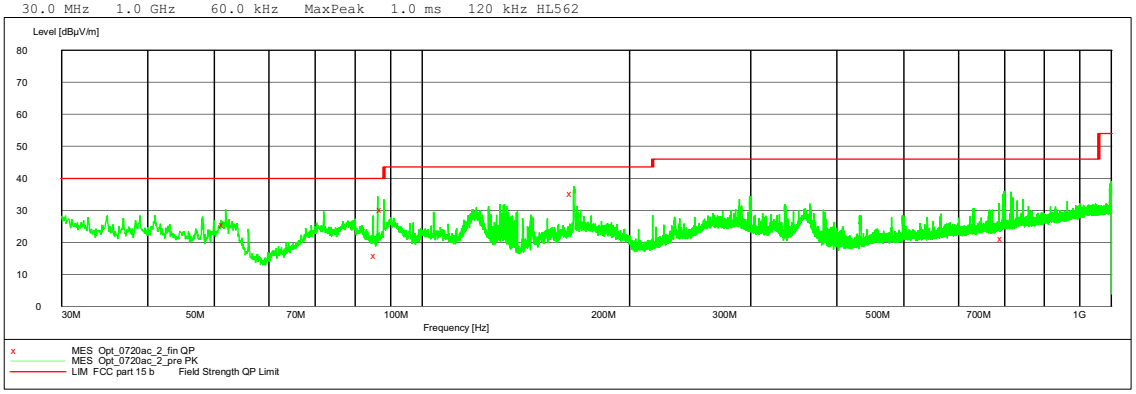
Temperature:	24°C
Air Pressure:	1034hPa
Rel. Humidity:	34%

Detailed Results:

EMI RADIATED TEST
EUT: MO3311 (37330)
Manufacturer: Icera / Option
Operating Condition: GSM 1900 idle mode, normal voltage = 4,2 V
Test Site: 7 layers, Ratingen
Operator: Mom
Test Specification: FCC part 15 b
Comment: Horizontal EUT position
Start of Test: 16.03.2009 / 12:25:15

SCAN TABLE: "FCC part 15 b"

Short Description:		FCC part 15 b				
Start Frequency	Stop Frequency	Step Width	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	1.0 ms	120 kHz	HL562

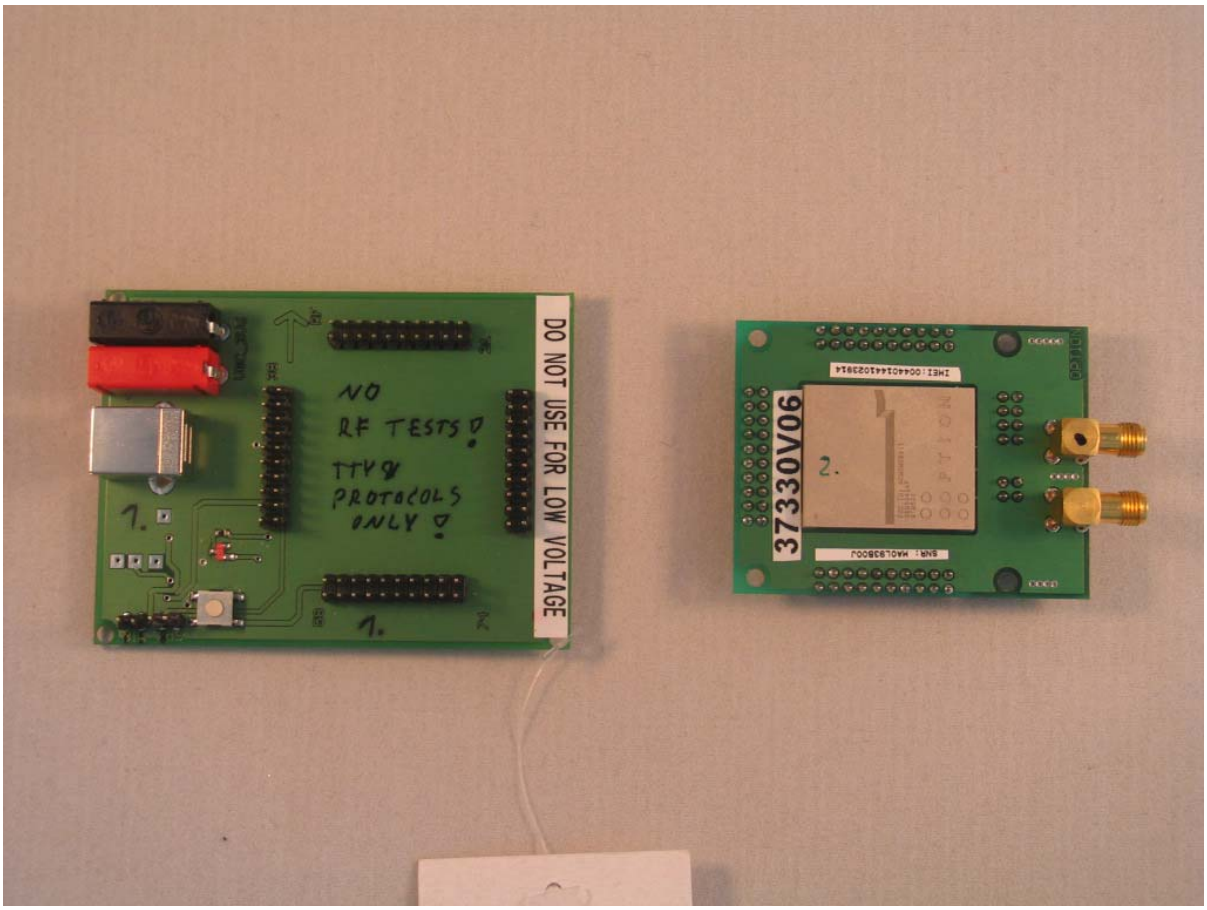


MEASUREMENT RESULT: "Opt_0720ac_2_fin QP"
16.03.2009 13:14

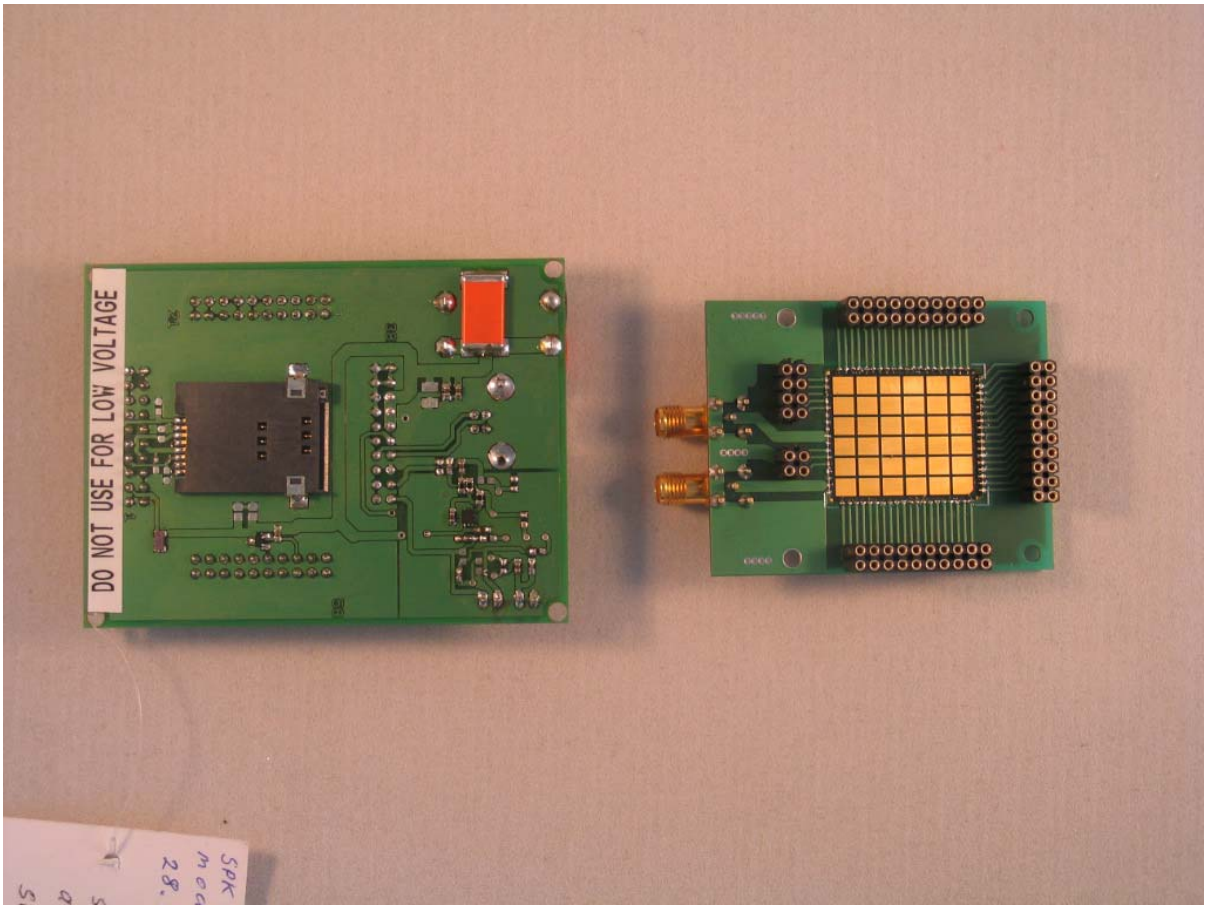
Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarization
51.900000	25.60	7.3	40.0	14.4	106.0	292.00	VERTICAL
86.160000	15.90	9.7	40.0	24.1	100.0	22.00	VERTICAL
87.960000	30.20	9.8	40.0	9.8	125.0	112.00	VERTICAL
166.140000	35.20	8.5	43.5	8.3	175.0	292.00	HORIZONTAL
699.720000	21.10	22.3	46.0	24.9	100.0	112.00	VERTICAL

4 Annex

4.1 Additional Information for OUT Description



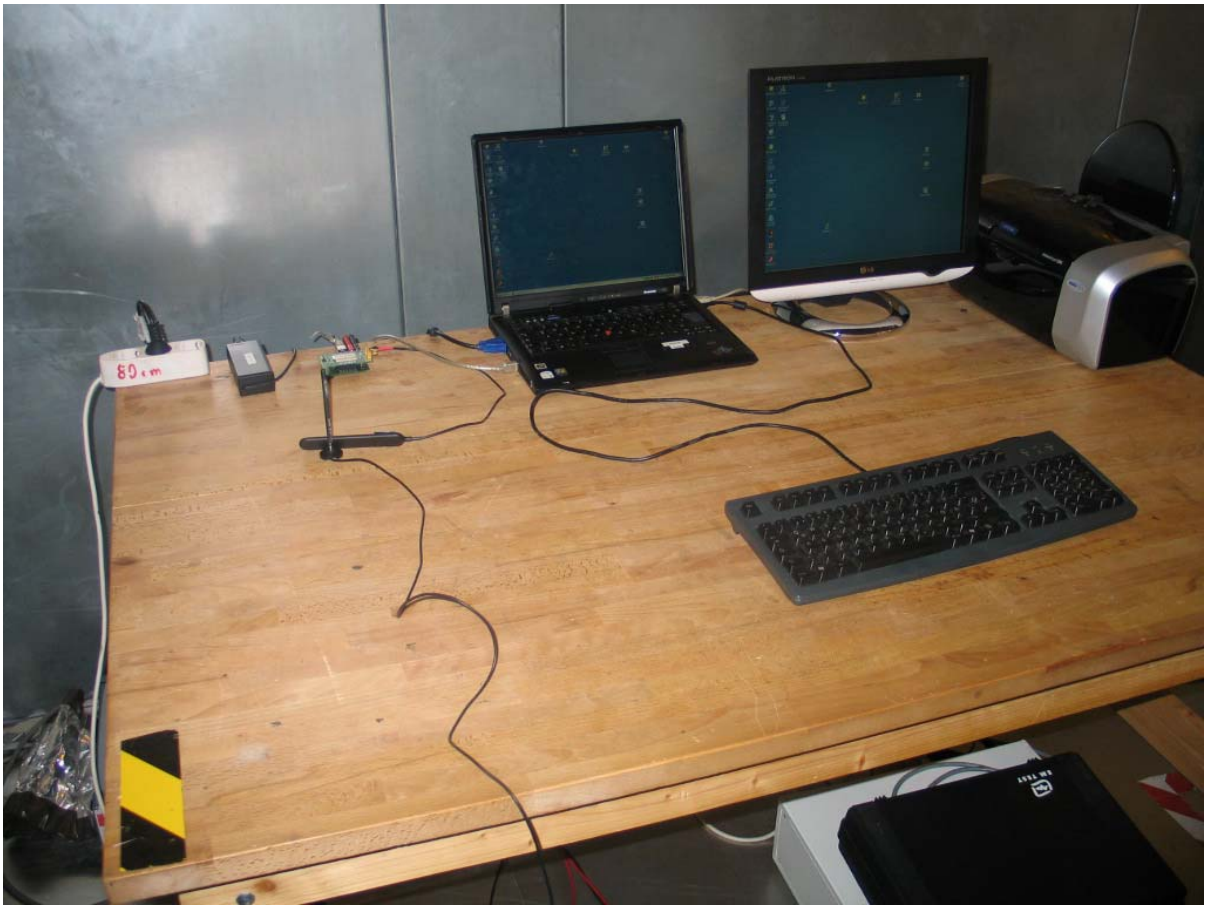
front view



back view

4.2 Additional Information for Report

setup for radiated testing



setup for conducted testing

Test Description

Conducted emissions (AC power line)

Standard FCC Part 15, 10-1-08
Subpart B

The test was performed according to: ANSI C 63.4, 2003

Test Description
The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003.
The Equipment Under Test (EUT) was setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50µH || 50 Ohm Line Impedance Stabilization Network (LISN). The LISN's unused connections were terminated with 50 Ohm loads.

The measurement procedure consists of two steps. It is implemented into the EMI test software ES-K1 from R&S.

Step 1: Preliminary scan
Intention of this step is, to determine the conducted EMI-profile of the EUT.
EMI receiver settings:
- Detector: Peak - Maxhold
- Frequency range: 150 kHz – 30 MHz
- Frequency steps: 5 kHz
- IF–Bandwidth: 9 kHz
- Measuring time / Frequency step: 20 ms
- Measurement on phase + neutral lines of the power cords

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.

Step 2: Final measurement
Intention of this step is, to determine the highest emissions with the settings defined in the test specification for the frequencies identified in step 1.
EMI receiver settings:
- Detector: Quasi-Peak
- IF - Bandwidth: 9 kHz
- Measuring time: 1 s / frequency

At each frequency determined in step 1, four measurements are performed in the following combinations:
1) Neutral lead - reference ground (PE grounded)
2) Phase lead - reference ground (PE grounded)
3) Neutral lead - reference ground (PE floating)
4) Phase lead - reference ground (PE floating)

The highest value is reported.

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.107, Class B Limit

Frequency Range (MHz)	QP Limit (dBµV)	AV Limit (dBµV)
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5	56	46
5 – 30	60	50

FCC Part 15, Subpart B, §15.107, Class A Limit

Frequency Range (MHz)	QP Limit (dBµV)	AV Limit (dBµV)
0.15 - 0.5	79	66
0.5 - 30	73	60

Used conversion factor: Limit (dBµV) = 20 log (Limit (µV)/1µV).

NOTE: a missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Spurious radiated emissions

Standard FCC Part 15, 10-1-08,Subpart B

The test was performed according to: ANSI C 63.4, 2003

Test Description

Measurement below 1 GHz:
The test set-up was made in accordance to the general provisions of ANSI C 63.4-2003.
The Equipment Under Test (EUT) was set up on a non-conductive table 1.0 x 2.0 m in the semi-anechoic chamber. The test was performed at the distance of 3 m between the EUT and the receiving antenna.
The radiated emissions measurements were made in a typical installation configuration.
The measurement procedure is implemented into the EMI test software ES-K1 from R&S.
Step 1: Preliminary scan (test to identify the highest amplitudes relative to the limit)
Intention of this step is, to determine the radiated EMI-profile of the EUT.
Settings for step 1:
- Detector: Peak-Maxhold
- Frequency range: 30 – 1000 MHz
- Frequency steps: 60 kHz
- IF–Bandwidth: 120 kHz
- Measuring time / Frequency step: 100 µs
- Turntable angle range: –180° to 180°
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

On basis of this preliminary scan the highest amplitudes and the corresponding frequencies relative to the limit are identified. Emissions above the limit and emissions which are in the 10 dB range below the limit are considered.
Step 2:
A further measurement will be performed on the frequencies determined in step 1. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.
Settings for step 2:
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100 ms
- Turntable angle range: –180° to 180°
- Turntable step size: 45°
- Height variation range: 1 – 4 m
- Height variation step size: 0.5 m
- Polarisation: horizontal + vertical

After this step the EMI test system has determined the following values for each frequency (of step 1):
- Frequency
- Azimuth value (of turntable)
- Antenna height

The last two values have now the following accuracy:
- Azimuth value (of turntable): 45°
- Antenna height: 0.5 m

Step 3: final measurement
In this step the accuracy of the turntable azimuth and antenna height will be improved. This is necessary to

find out the maximum value of every frequency.
For each frequency, which was determined the turntable azimuth and antenna height will be adjusted. The turntable azimuth will be slowly varied by +/- 22.5° around this value. During this action the value of emission is continuously measured. The turntable azimuth at the highest emission will be recorded and adjusted. In this position the antenna height is also slowly varied by +/- 25 cm around the antenna height determined. During this action the value of emission is also continuously measured. The antenna height of the highest emission will also be recorded and adjusted.
- Detector: Peak – Maxhold
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 100ms
- Turntable angle range: –22.5° to + 22.5 ° around the determined value
- Height variation range: -0.25m to + 0.25m around the determined value

Step 4: Final measurement (with QP detector)
With the settings determined in step 3, the final measurement will be performed:
EMI receiver settings for step 4:
- Detector: Quasi-Peak(< 1GHz)
- Measured frequencies: in step 3 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

Measurement above 1 GHz:
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
The measurement distance was reduced to 1 m. The results were extrapolated by the extrapolation factor of 20 dB/decade (inverse linear-distance for field strength measurements, inverse-linear-distance-squared for the power density measurements). Due to the fact that in this frequency range a double ridged wave guided horn antenna (up to 18 GHz) and a horn antenna (18–25 GHz) are used, the steps 2-4 as described before, are omitted. Step 1 was performed at one height of the receiving antenna only.
Detector: Peak, Average (simultaneously)
RBW = VBW = 1 MHz; above 7 GHz 100 kHz

Test Requirements / Limits

If not stated within the measurement plot and/or test result, class B limits are applied.

FCC Part 15, Subpart B, §15.109, Radiated Emission Limits
Frequency Range (MHz): Class B Limit (dBµV/m)

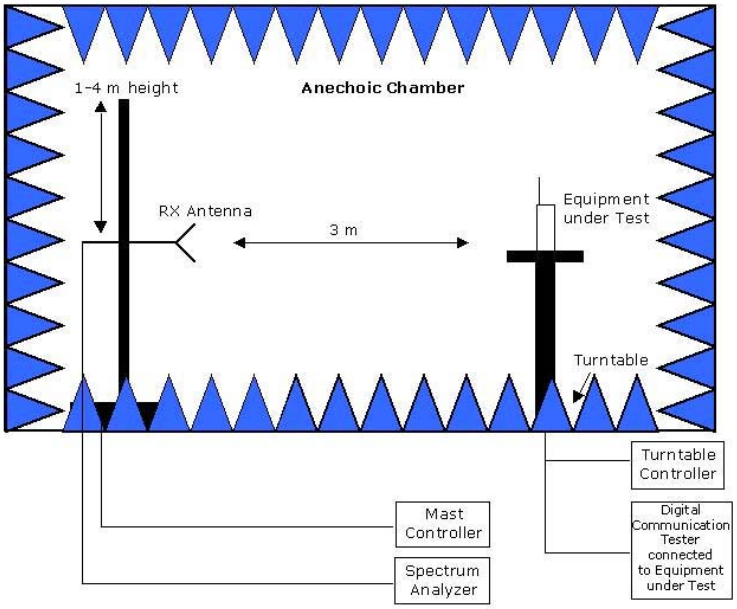
Frequency Range (MHz)	Class B Limit (dBµV/m)
30 – 88	40.0
88 – 216	43.5
216 – 960	46.0
above 960	54.0

Frequency Range (MHz)	Class A Limit (dBµV/m) / @ 3m !
30 - 88	49.5
88 - 216	54.0
216 - 960	56.9
above 960	60.0

§15.35(b)
..., there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function, corresponding to 20 dB above the maximum permitted average limit....
Used conversion factor: Limit (dBµV/m) = 20 log (Limit (µV/m)/1µV/m)

NOTE: a missing result table in the corresponding test report section means, that no final measurement was performed because no relevant frequencies (peaks) were found in the preliminary scan.

Setup Drawings



Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

Test Equipment

EUT Digital Signalling System

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz	07.10.08	06.10.11
Signalling Unit for Bluetooth	PTW60	100004	Rohde & Schwarz	-	N/A *)
Universal Radio Communication Tester	CMU200	102366	Rohde & Schwarz	16.02.09	15.02.11
Universal Radio Communication Tester	CMU200	837983/052	Rohde & Schwarz	01.12.08	30.11.11
Signalling Unit for Bluetooth	CBT	100589	Rohde & Schwarz	14.08.08	N/A *)
Signalling Unit for GPS	SMU200	100912	Rohde & Schwarz	28.10.08	N/A *)

*) N/A – only used for signalling

EMI Test System

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz	06.12.07	05.12.09
Signal Generator	SMR 20	846834/008	Rohde & Schwarz	05.12.07	04.12.09
AC Power Source	6404	64040000B04	Croma ATE INC.	01.06.08	31.05.11

EMI Radiated Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Antenna mast 4m	MA 240	240/492	HD GmbH H. Deisel	-	-
Biconical dipole	VUBA 9117	9117108	Schwarzbeck	27.10.08	26.10.13
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32	849785	Miteq	12.11.08	11.05.09
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35	896037	Miteq	12.11.08	11.05.09
Broadband Amplifier 45MHz-27GHz	JS4-00102600-42	619368	Miteq	12.11.08	11.05.09
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2 W38.01-2	Kabel Kusch	12.11.08	11.05.09
Cable "ESI to Horn Antenna"	UFB311A UFB293C	W18.02-2 W38.02-2	Rosenberger-Microcoax	12.11.08	11.05.09
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz	12.05.06	11.05.09
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz	20.01.04	N/A – spare antenna
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	12.11.08	11.05.09
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	12.11.08	11.05.09
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	12.11.08	11.05.09
High Pass Filter	WHKX 7.0/18G-8SS	9	Wainwright	12.11.08	11.05.09
KUEP pre amplifier	Kuep 00304000	001	7 layers AG	-	N/A – spare antenna
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz	17.05.06	16.05.09
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz	07.10.08	06.10.11
Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO	28.02.08	N/A (Stand. Gain Horn)
Pyramidal Horn Antenna 40 GHz	Model 3160-10	00086675	EMCO	18.12.07	N/A (Stand. Gain Horn)

EMI Conducted Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber+Suhner	12.11.08	11.05.09
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz	13.10.08	12.10.11
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz	-	-
Four-Line Network	ENY41	838119/004	Rohde & Schwarz	06.03.08	05.03.11

Auxiliary Test Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel	-	-
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel	-	-
Digital Multimeter	177	86670383	Fluke	01.08.08	31.07.10
Digital Oscilloscope	TDS 784C	B021311	Tektronix	-	-
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis	-	-
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis	-	-
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz	-	-
Notch Filter ultra stable	WRCA800/960 -6E	24	Wainwright	-	-
Temperature Chamber	VT 4002	58566002150010	Vötsch	13.03.09	12.03.10
Temperature Chamber	KWP 120/70	59226012190010	Weiss	13.03.09	12.03.10
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH	22.01.09	21.01.10
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz	06.10.08	05.10.11
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	836722/011	Rohde & Schwarz	06.10.08	05.10.11
Signal Analyzer 20 Hz to 26.5 GHz	FSIQ26	840061/005	Rohde & Schwarz	02.10.08	01.10.11

Anechoic Chamber

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Air Compressor (pneumatic)			Atlas Copco	-	-
Controller	MCU	1520506	Maturo GmbH	-	-
EMC Camera	CE-CAM/1		CE-SYS	-	-
EMC Camera for observation of EUT	CCD-400E	0005033	Mitsubishi	-	-
Filter ISDN	B84312-C110-E1		Siemens & Matsushita	-	-
Filter telephone systems / modem	B84312-C40-B1		Siemens & Matsushita	-	-
Filter Universal 1A	B84312-C30-H3		Siemens & Matsushita	-	-
Fully/Semi AE Chamber	10.58x6.38x6		Frankonia	-	-
Turntable	DS 420S	420/573/99	HD GmbH, H.Deisel	-	-
Valve Control Unit (pneum.)	VE 615P	615/348/99	HD GmbH, H.Deisel	-	-
ThermoHygro Datalogger 12	Opus10 THI (8152.00)	12482	Lufft Mess- und Regeltechnik GmbH	05.08.08	04.08.09
ThermoAirpressure Datalogger 13	Opus10 TPR (8253.00)	13936	Lufft Mess- und Regeltechnik GmbH	22.01.09	21.01.10

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