



InterLab[®]

Final Report on

MNUK60000

Report Reference: ODE_MUS_MOTOR_1004_FCCb
FCC Part 15, Subpart B

Date: September 21, 2010

Test Laboratory:

7 layers AG
Borsigstr. 11
40880 Ratingen
Germany



DGA-PL-192/99-02

Note:

The following test results relate only to the devices specified in this document. This report shall not be reproduced in parts without the written approval of the test laboratory.

7 layers AG
Borsigstrasse 11
40880 Ratingen, Germany
Phone: +49 (0) 2102 749 0
Fax: +49 (0) 2102 749 350
www.7Layers.com

Aufsichtsratsvorsitzender •
Chairman of the Supervisory Board:
Markus Becker
Vorstand • Board:
Dr. H.-J. Meckelburg
Wilfried Klassmann

Registergericht • registered in:
Düsseldorf, HRB 44096
USt-IdNr • VAT No.:
DE 203159652
TAX No. 147/5869/0385

1 Administrative Data

1.1 Project Data

Project Responsible: Patrick Lomax
Date Of Test Report: 2010/09/20
Date of first test: 2010/08/13
Date of last test: 2010/08/27

1.2 Applicant Data

Company Name: Motorola Inc.
Street: 8000 W Sunrise Blvd
PO Box: MD 5J1
City: 33324 Plantation
Country: United States

Contact Person: Mr. Robbie Fennell
Phone: +1 9546058456

1.3 Signature of the Testing Responsible



Carsten Steinröder
responsible for tests performed in: Lab 1, Lab 2

1.4 Signature of the Accreditation Responsible



Accreditation scope responsible person
responsible for Lab 1, Lab 2



7 layers AG, Borsigstr. 11
40880 Ratingen, Germany
Phone +49 (0)2102 749 0

2 Test Object Data

2.1 General OUT Description

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

OUT: MNUK6000

Product Category: Module

Parameter List:

<i>Parameter name</i>	<i>Value</i>
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2.2 Detailed Description of OUT Samples

Sample : C01

<i>OUT Identifier</i>	MNUK6000		
<i>Sample Description</i>	BT Radiated sample		
<i>HW Status</i>	P3C		
<i>SW Status</i>	D04.50.49		
<i>Low Voltage</i>	6.0 V	<i>Low Temp.</i>	-30 °C
<i>High Voltage</i>	9.0 V	<i>High Temp.</i>	60 °C
<i>Nominal Voltage</i>	7.5 V	<i>Normal Temp.</i>	23 °C

Parameter List:

<i>Parameter Description</i>	<i>Value</i>
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Parameter for Scope FCC_v2

Antenna Gain (Bluetooth Antenna)	-0.5 (dBi)
Frequency_high	2480 (MHz)
Frequency_low	2402 (MHz)
Frequency_mid	2441 (MHz)

2.3 OUT Features

Features for OUT: MNUK6000

<i>Designation</i>	<i>Description</i>	<i>Allowed Values</i>	<i>Supported Value(s)</i>
Features for scope: FCC_v2			
BT	EUT supports Bluetooth data rate of 1 Mbps with GFSK modulation in the band 2400 MHz - 2483.5 MHz		
Dant	removable antenna supplied and type tested with the radio equipment, designed as an example part of the equipment		
DC	The OUT is powered by or connected to DC Mains		
EDR2	EUT supports Bluetooth using data rate of 2 Mbps with PI/4 DQPSK modulation in the band 2400 MHz - 2483.5 MHz		
EDR3	EUT supports Bluetooth using data rate of 3 Mbps with 8DPSK modulation in the band 2400 MHz - 2483.5 MHz		
PantC	permanent fixed antenna connector, which may be built-in, designed as an indispensable part of the equipment		

2.4 Auxiliary Equipment

<i>AE No.</i>	<i>Type Designation</i>	<i>Serial No.</i>	<i>HW Status</i>	<i>SW Status</i>	<i>Description</i>
AE 01	Flatron L1740BQ	509WANF1W607			TFT 1
AE 05	M-BAD58B	S74115015C			Mouse
AE 03	PA3378E-3AC3	G71C0006R310			Adapter 1
AE 06	RS 6000	G 0000273 2P28			Keyboard 1
AE 04	Stylus C84 (B251A)	FBPT048906			Printer
AE 02	TECRA M9	87060248H			Laptop 1

2.5 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.

<i>Setup No.</i>	<i>List of OUT samples</i>	<i>List of auxiliary equipment</i>		
	<i>Sample No.</i>	<i>Sample Description</i>	<i>AE No.</i>	<i>AE Description</i>

C01_FCCb

<i>Sample:</i> C01	BT Radiated sample	AE 01	TFT 1
		AE 05	Mouse
		AE 03	Adapter 1
		AE 06	Keyboard 1
		AE 04	Printer
		AE 02	Laptop 1

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.

Note:

The laboratory environmental conditions are recorded and available in the Interlab system.

3.2 List of the Applicable Body

(Body for Scope: FCC_v2)

<i>Designation</i>	<i>Description</i>
FCC47CFRChIPART15bRADIO FREQUENCY DEVICES	Part 15, Subpart B - Unintentional Radiators

3.3 List of Test Specification

<i>Test Specification:</i>	FCC part 2 and 15
<i>Version</i>	10-1-09 Edition
<i>Title:</i>	PART 2 - GENERAL RULES AND REGULATIONS PART 15 - RADIO FREQUENCY DEVICES

<i>Applicable Errata</i>	<i>Activate Date</i>	<i>Comment</i>
ANSI C63.4-2003	04/1/30	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and electronic Equipment in the Range of 9 kHz to 40 GHz
DA 00-705 considerd	00/3/1	Public Notice: Filing and Measurement Guidelines for Frequency Hopping Spread Spectrum Systems

3.4 Summary

<i>Test Case Identifier / Name</i>	<i>Result</i>	<i>Date of Test</i>	<i>Lab Ref.</i>	<i>Setup</i>
15b.1 Conducted Emissions (AC Power Line) §15.107				
15b.1; Mode = transmit	Passed	2010/08/27	Lab 1	C01_FCCb
15b.2 Spurious Radiated Emissions §15.109				
15b.2; Mode = transmit	Passed	2010/08/13	Lab 2	C01_FCCb

3.5 Detailed Results

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

Test: 15b.1; Mode = transmit

<i>Result:</i>	Passed
<i>Setup No.:</i>	C01_FCCb
<i>Date of Test:</i>	2010/08/27 14:41
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

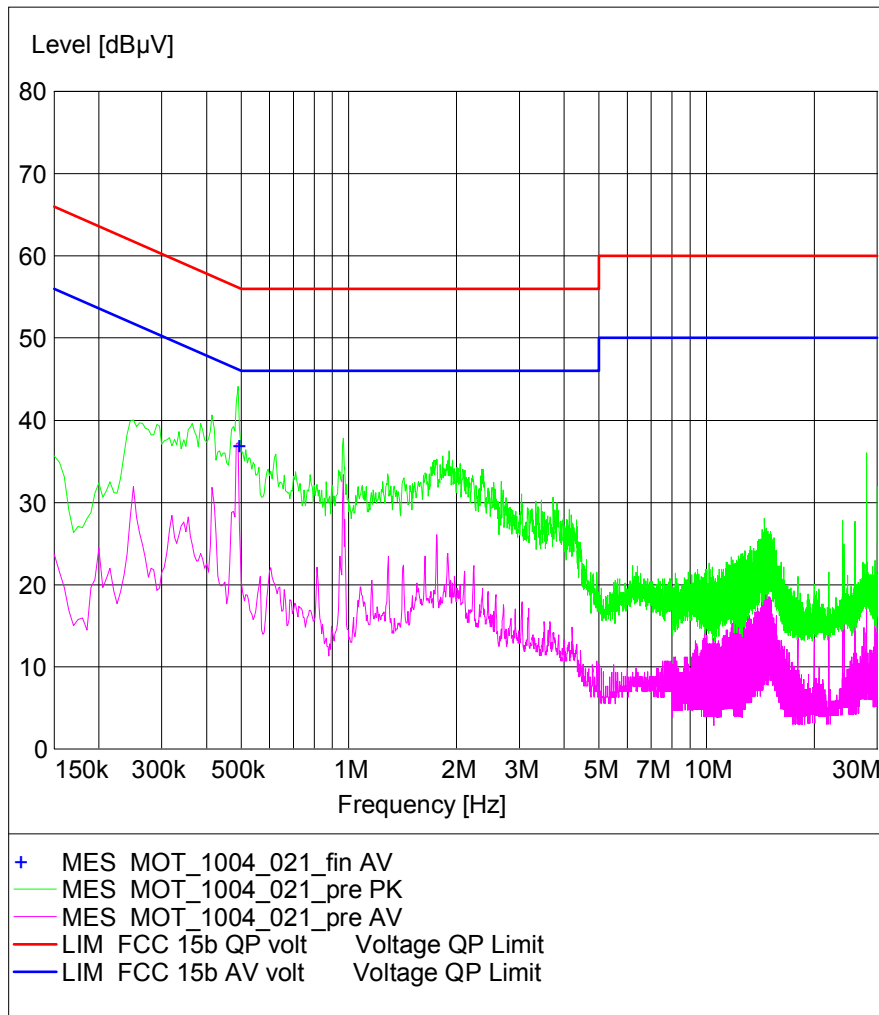
Detailed Results:

AC MAINS CONDUCTED

EUT: (4Z210c01)
 Manufacturer: Motorola
 Operating Condition: Tx on 2441 MHz, loopback mode, DH1
 Test Site: 7 layers Ratingen
 Operator: Doe
 Test Specification: ANSI C63.4; FCC 15.107 / 15.207
 Comment:
 Start of Test: 27.08.2010 / 15:21:07

SCAN TABLE: "FCC Voltage"

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



MEASUREMENT RESULT: "MOT_1004_021_fin AV"

27.08.2010 15:27

Frequency	Level	Transd	Limit	Margin	Line	PE
MHz	dBµV	dB	dBµV	dB		
0.490000	36.90	10.0	46	9.3	L1	GND

3.5.2 15b.2 Spurious Radiated Emissions §15.109

Test: 15b.2; Mode = transmit

<i>Result:</i>	Passed
<i>Setup No.:</i>	C01_FCCb
<i>Date of Test:</i>	2010/08/13 14:10
<i>Body:</i>	FCC47CFRChIPART15bRADIO FREQUENCY DEVICES
<i>Test Specification:</i>	FCC part 2 and 15

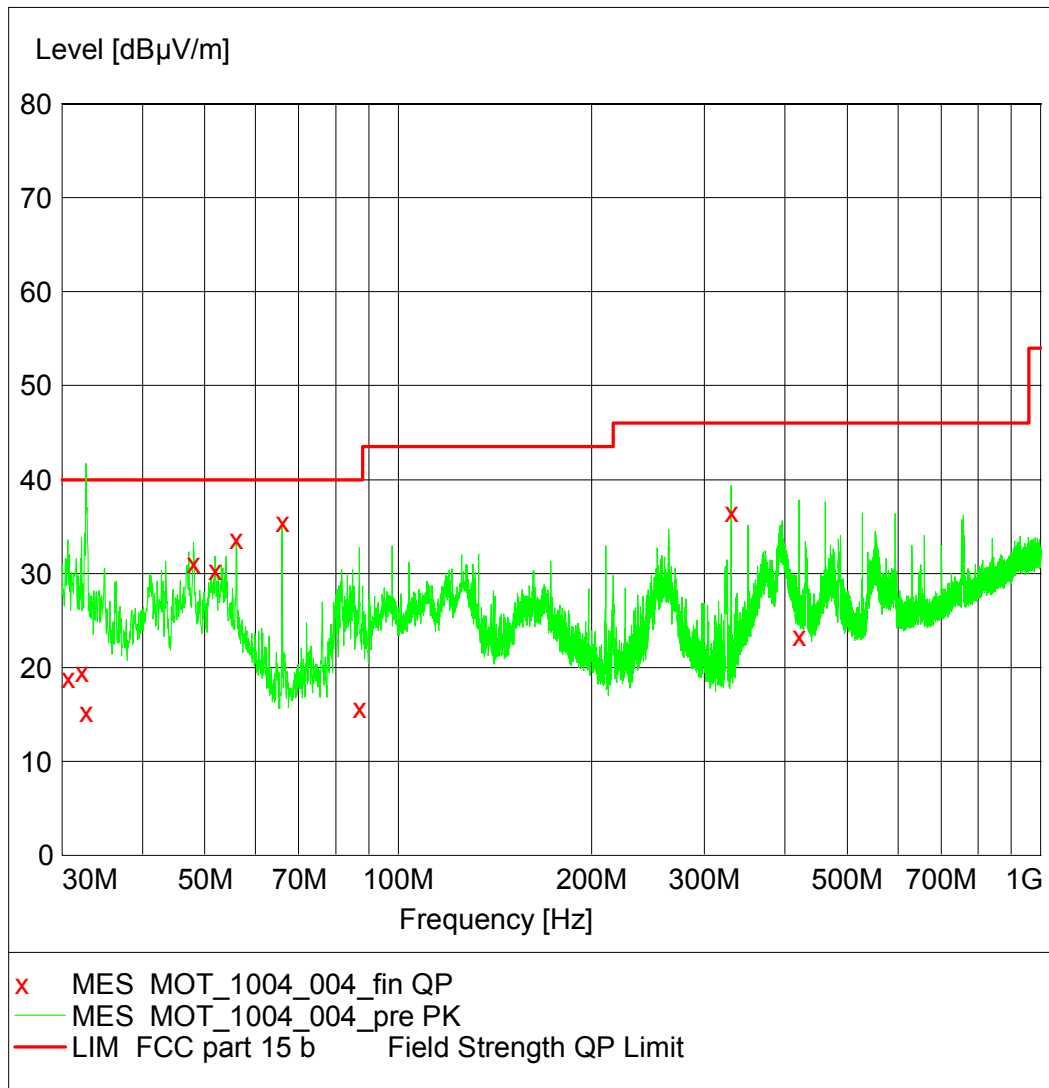
Detailed Results:

EMI RADIATED TEST

EUT: APX Option Board (4Z210c01)
 Manufacturer: Motorola
 Operating Condition: TX on 2441 MHz; Packet type 1-DH1
 Test Site: 7 layers, Ratingen
 Operator: Doe
 Test Specification: FCC part 15 b
 Comment: Horizontal EUT position, computer peripheral setup
 Start of Test: 13.08.2010 / 13:42:44

SCAN TABLE: "FCC part 15 b"

Start	Stop	Step	Detector	Meas. Time	IF Bandw.	Transducer
30.0 MHz	1.0 GHz	60.0 kHz	MaxPeak	1.0 ms	120 kHz	HL562



MEASUREMENT RESULT: "MOT_1004_004_fin QP"

Frequency MHz	Level dBµV/m	Transd dB	Limit dBµV/m	Margin dB	Height cm	Azimuth deg	Polarisation
30.600000	18.90	20.7	40.0	21.1	175.0	248.00	VERTICAL
32.160000	19.60	19.5	40.0	20.4	110.0	355.00	VERTICAL
32.640000	15.30	19.3	40.0	24.7	307.0	157.00	HORIZONTAL
48.060000	31.10	10.3	40.0	8.9	100.0	247.00	VERTICAL
51.900000	30.40	7.7	40.0	9.6	103.0	22.00	VERTICAL
55.980000	33.70	5.3	40.0	6.3	134.0	247.00	VERTICAL
66.000000	35.50	6.5	40.0	4.5	164.0	292.00	VERTICAL
87.060000	15.70	10.1	40.0	24.3	125.0	292.00	VERTICAL
330.000000	36.60	15.0	46.0	9.4	110.0	0.00	HORIZONTAL
420.780000	23.40	17.5	46.0	22.6	113.0	157.00	HORIZONTAL

4 Test Equipment Details

4.1 List of Used Test Equipment

The calibration, hardware and software states are shown for the testing period.

Test Equipment Anechoic Chamber

Lab ID:	Lab 2		
Manufacturer:	Frankonia		
Description:	Anechoic Chamber for radiated testing		
Type:	10.58x6.38x6		
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	IC renewal		2009/01/21 2011/01/20
	FCC renewal		2009/01/07 2011/01/06

Single Devices for Anechoic Chamber

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>	
Air compressor	none	-	Atlas Copco	
Anechoic Chamber	10.58 x 6.38 x 6.00 m ³	none	Frankonia	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	FCC listing 96716 3m Part15/18		2009/01/07	2011/01/06
	ANSI C64.3 NSA		2009/01/21	2011/01/20
Controller Innco 2000	CO 2000	CO2000/328/124 70406/L	Innco innovative constructions GmbH	
EMC camera	CE-CAM/1	-	CE-SYS	
EMC camera Nr.2	CCD-400E	0005033	Mitsubishi	
Filter ISDN	B84312-C110-E1		Siemens&Matsushita	
Filter Universal 1A	BB4312-C30-H3	-	Siemens&Matsushita	

Test Equipment Auxiliary Equipment for Conducted emissions

Lab ID:	Lab 1
Manufacturer:	Rohde & Schwarz GmbH & Co.KG
Description:	EMI Conducted Auxiliary Equipment

Single Devices for Auxiliary Equipment for Conducted emissions

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>	
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber&Suhner	
Coupling-Decoupling- Network	CDN ENY41	100002	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2008/03/06	2011/03/05
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz GmbH & Co. KG	
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	DKD calibration		2008/10/13	2010/10/12

Test Equipment Auxiliary Equipment for Radiated emissions

Lab ID: Lab 2
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Auxiliary Equipment for Radiated emissions

Single Device Name	Type	Serial Number	Manufacturer		
Antenna mast	AS 620 P		HD GmbH		
Biconical dipole	VUBA 9117	9117108	Schwarzbeck	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Standard Calibration			2008/10/27	2010/10/26
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Path Calibration			2010/05/10	2010/11/09
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Path Calibration			2010/05/10	2010/11/09
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Path Calibration			2010/05/10	2010/11/09
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01- 2+W38.01-2	Kabel Kusch	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Path Calibration			2010/05/10	2010/11/09
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02- 2+W38.02-2	Rosenberger Micro-Coax	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Path Calibration			2010/05/10	2010/11/09
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Standard Calibration			2009/04/16	2011/04/15
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Standard Calibration			2009/04/28	2011/04/27
Dreheinheit	DE 325		HD GmbH		
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Path Calibration			2010/05/10	2010/11/09
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Path Calibration			2010/05/10	2010/11/09
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Path Calibration			2010/05/10	2010/11/09
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG	<i>Last Execution</i>	<i>Next Exec.</i>
	<i>Calibration Details</i>				
	Standard Calibration			2009/05/27	2011/05/26

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>	
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	DKD calibration		2008/10/07	2010/10/06
Pyramidal Horn Antenna 26,5 GHz	3160-09	00083069	EMCO Elektronik GmbH	
Pyramidal Horn Antenna 40 GHz	3160-10	00086675	EMCO Elektronik GmbH	

Test Equipment Auxiliary Test Equipment

Lab ID:	Lab 2
<i>Manufacturer:</i>	see single devices
<i>Description:</i>	Single Devices for various Test Equipment
<i>Type:</i>	various
<i>Serial Number:</i>	none

Single Devices for Auxiliary Test Equipment

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>	
AC Power Source	Chroma 6404	64040001304	Chroma ATE INC.	
Broadband Power Divider N (Aux)	1506A / 93459	LM390	Weinschel Associates	
Broadband Power Divider SMA	WA1515	A855	Weinschel Associates	
Digital Multimeter 01 (Multimeter)	Voltcraft M-3860M	IJ096055	Conrad Electronics	
Digital Multimeter 03 (Multimeter)	Fluke 177	86670383	Fluke Europe B.V.	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration		2009/10/07	2011/10/06
Digital Oscilloscope [SA2] (Aux)	TDS 784C	B021311	Tektronix GmbH	
Fibre optic link Satellite (Aux)	FO RS232 Link	181-018	Pontis	
Fibre optic link Transceiver (Aux)	FO RS232 Link	182-018	Pontis	
Isolating Transformer	LTS 604	1888	Thalheimer Transformatorenwerke GmbH	
Notch Filter Ultra Stable (Aux)	WRCA800/960-6EEK	24	Wainwright	
Spectrum Analyser	FSP3	836722/011	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	DKD calibration		2008/10/06	2010/10/05
Vector Signal Generator	SMIQ B3	832492/061		

Test Equipment Digital Signalling Devices

Lab ID: Lab 1, Lab 2
Description: Signalling equipment for various wireless technologies.

Single Devices for Digital Signalling Devices

Single Device Name	Type	Serial Number	Manufacturer	
Bluetooth Signalling Unit CBT	CBT	100589	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2008/08/14	2010/08/30
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration		2008/10/07	2010/10/06
Digital Radio Test Set	6103E	2359	Racal Instruments, Ltd.	
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration		2009/02/16	2011/02/15
	<i>HW/SW Status</i>		<i>Date of Start</i>	<i>Date of End</i>
	Hardware: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B56V14, B68 3v04, PCMCIA, U65V04 Software: K21 4v21, K22 4v21, K23 4v21, K24 4v21, K42 4v21, K43 4v21, K53 4v21, K56 4v22, K57 4v22, K58 4v22, K59 4v22, K61 4v22, K62 4v22, K63 4v22, K64 4v22, K65 4v22, K66 4v22, K67 4v22, K68 4v22, K69 4v22 Firmware: µP1 8v50 02.05.06 ---		2007/07/16	
Universal Radio Communication Tester	CMU 200	837983/052	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration		2008/12/01	2010/11/30
	<i>HW/SW Status</i>		<i>Date of Start</i>	<i>Date of End</i>
	HW options: B11, B21V14, B21-2, B41, B52V14, B52-2, B53-2, B54V14, B56V14, B68 3v04, B95, PCMCIA, U65V02 SW options: K21 4v11, K22 4v11, K23 4v11, K24 4v11, K27 4v10, K28 4v10, K42 4v11, K43 4v11, K53 4v10, K65 4v10, K66 4v10, K68 4v10, Firmware: µP1 8v40 01.12.05 ---		2007/01/02	
SW: K62, K69		2008/11/03		
Vector Signal Generator	SMU200A	100912	Rohde & Schwarz GmbH & Co. KG	
	<i>Calibration Details</i>		<i>Last Execution</i>	<i>Next Exec.</i>
	Standard calibration		2008/10/28	2010/10/27

Test Equipment Emission measurement devices

Lab ID: Lab 1, Lab 2
Description: Equipment for emission measurements
Serial Number: see single devices

Single Devices for Emission measurement devices

<i>Single Device Name</i>	<i>Type</i>	<i>Serial Number</i>	<i>Manufacturer</i>	
Personal Computer	Dell	30304832059	Dell	
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG	
<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2008/12/05	2010/12/04
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG	
<i>Calibration Details</i>			<i>Last Execution</i>	<i>Next Exec.</i>
	Standard Calibration		2009/12/03	2011/12/02

Test Equipment Shielded Room 02

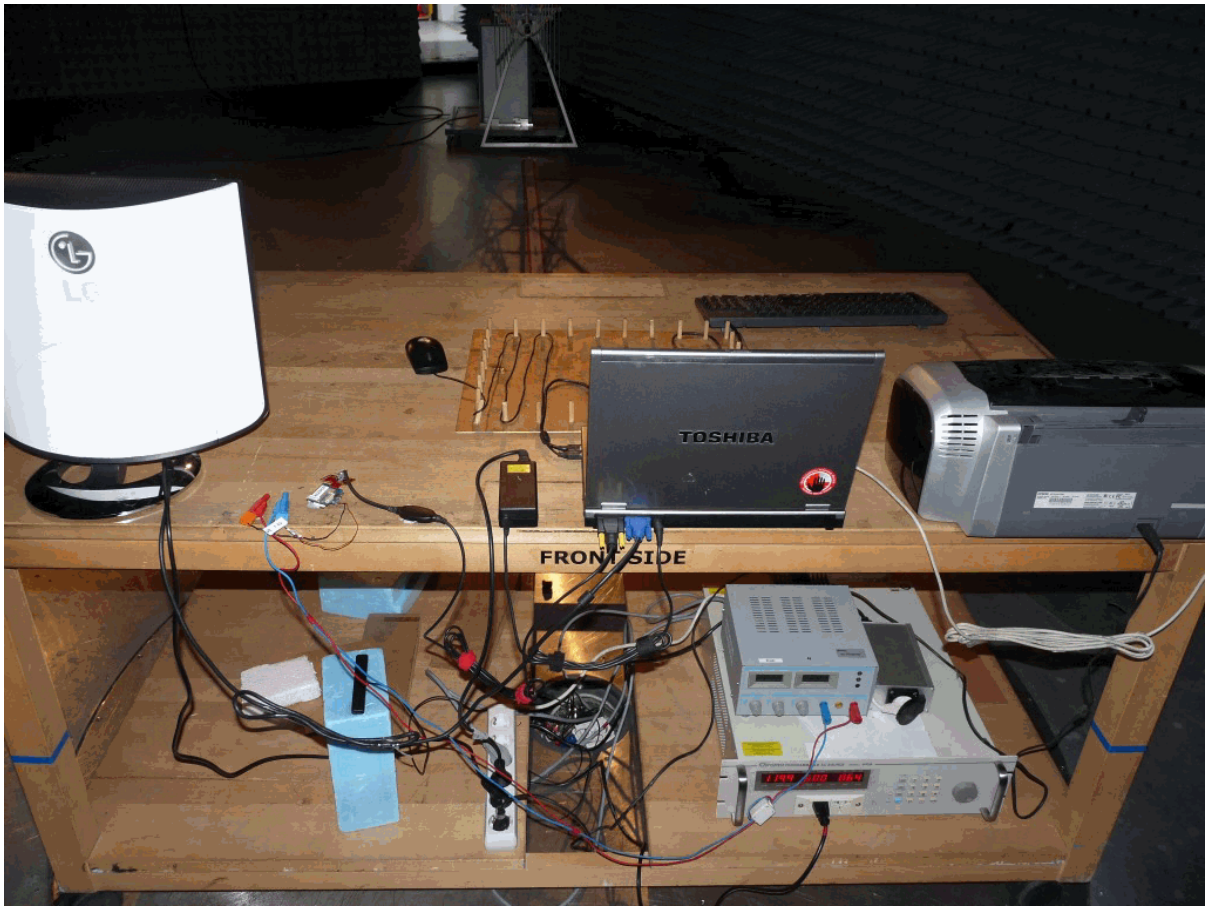
Lab ID: Lab 1
Manufacturer: Frankonia
Description: Shielded Room for conducted testing
Type: 12 qm
Serial Number: none

5 Annex

5.1 Additional Information for Report



Test Setup Photo (radiated measurement)



Test Setup Photo (radiated measurement)

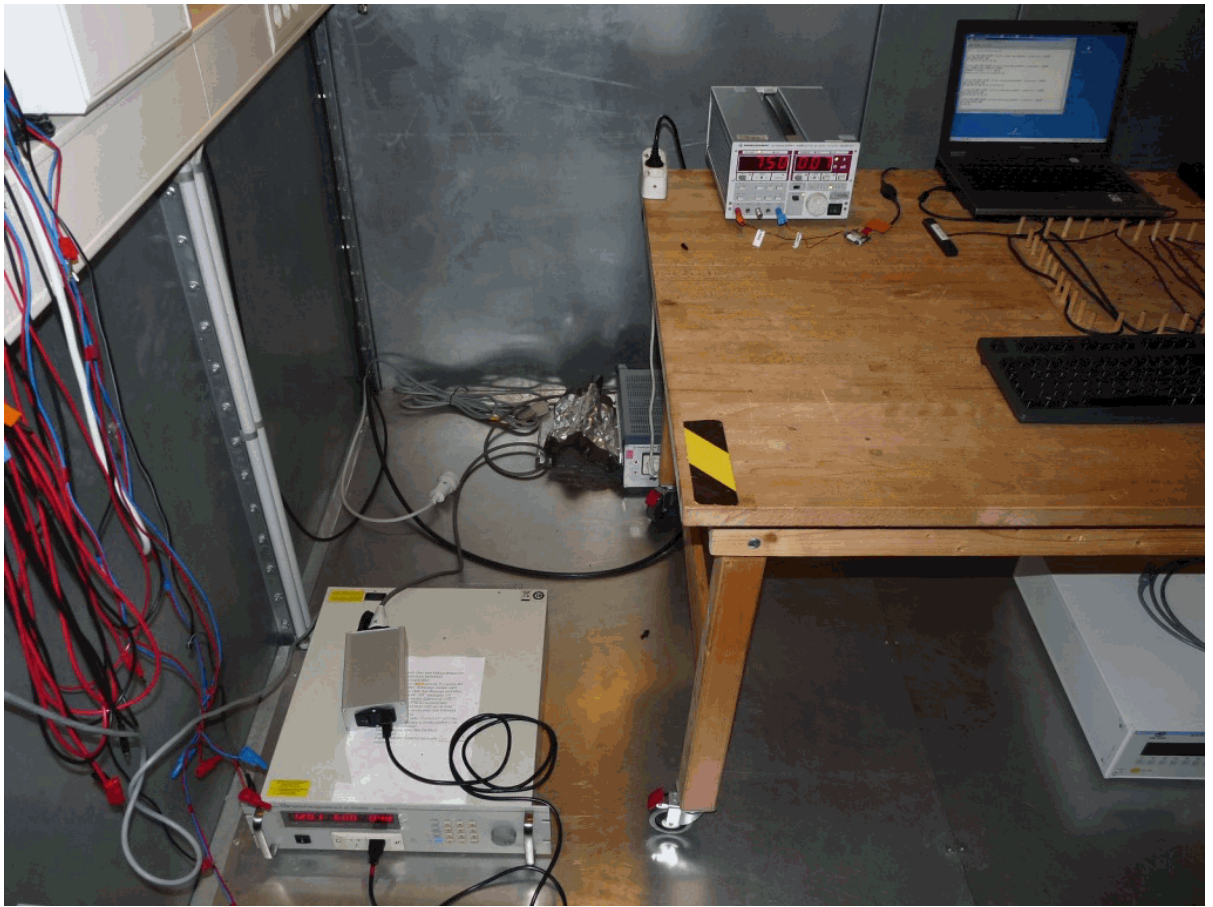


Photo test setup conducted

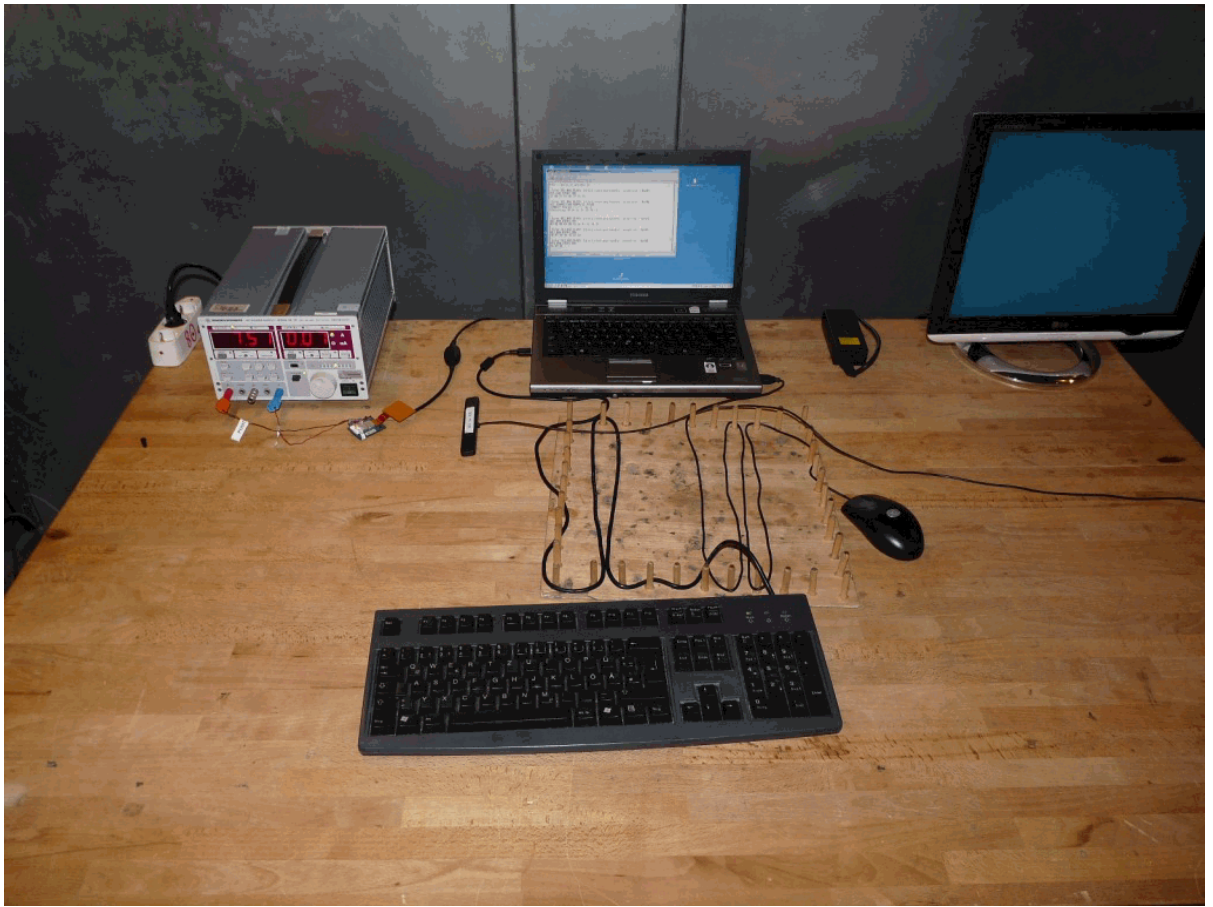
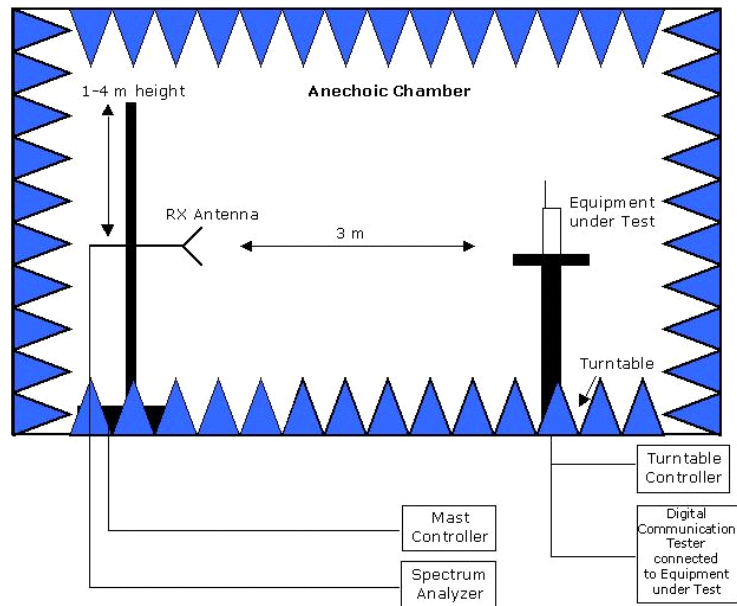


Photo test setup conducted

Setup Drawings



Remark: Depending on the frequency range suitable antenna types, attenuators or preamplifiers are used.

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

Test Description

Conducted emissions (AC power line)

Standard FCC Part 15
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 50 μ H || 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 (dB μ V)	AV Limit (dB μ V)
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, 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.

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