



InterLab®

FCC Measurement/Technical Report on

Bluetooth transceiver

Peltor WS5

Report Reference: MDE_3M_1103_FCCa

Test Laboratory:

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40880 Ratingen
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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 testing laboratory.

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0 Summary

0.1 Technical Report Summary

Type of Authorization

Certification for an Intentional Radiator (Frequency Hopping Spread Spectrum).

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-10 Edition) and 15 (10-1-10 Edition). The following subparts are applicable to the results in this test report.

Part 2, Subpart J - Equipment Authorization Procedures, Certification

Part 15, Subpart C – Intentional Radiators

§ 15.201 Equipment authorization requirement

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.247 Operation within the bands 902-928 MHz, 2400-2483.5 MHz and 5725-5850 MHz

Note:

The tests were selected and performed with reference to the FCC Public Notice DA 00-705, released March 30, 2000.

Instead of applying ANSI C63.4-1992 which is referenced in the FCC Public Note, the newer ANSI C63.4-2009 is applied.

Summary Test Results:

The EUT complied with all performed tests as listed in chapter 0.2 Measurement Summary.



0.2 Measurement Summary

FCC Part 15, Subpart C

§ 15.207

Conducted emissions (AC power line)

The measurement was performed according to ANSI C63.4

2009

OP-Mode

Setup

Port

Final Result

op-mode 5

–

AC Port (power line)

N/P

FCC Part 15, Subpart C

§ 15.247 (a) (1)

Occupied bandwidth

The measurement was performed according to FCC § 15.31

10-1-10 Edition

OP-Mode

Setup

Port

Final Result

op-mode 1

–

Temp ant.connector

N/P

op-mode 2

–

Temp ant.connector

N/P

op-mode 3

–

Temp ant.connector

N/P

op-mode 6

–

Temp ant.connector

N/P

op-mode 7

–

Temp ant.connector

N/P

op-mode 8

–

Temp ant.connector

N/P

op-mode 10

–

Temp ant.connector

N/P

op-mode 11

–

Temp ant.connector

N/P

op-mode 12

–

Temp ant.connector

N/P

FCC Part 15, Subpart C

§ 15.247 (b) (1)

Peak power output

The measurement was performed according to FCC § 15.31

10-1-10 Edition

OP-Mode

Setup

Port

Final Result

op-mode 1

–

Temp ant.connector

N/P

op-mode 2

–

Temp ant.connector

N/P

op-mode 3

–

Temp ant.connector

N/P

op-mode 6

–

Temp ant.connector

N/P

op-mode 7

–

Temp ant.connector

N/P

op-mode 8

–

Temp ant.connector

N/P

op-mode 10

–

Temp ant.connector

N/P

op-mode 11

–

Temp ant.connector

N/P

op-mode 12

–

Temp ant.connector

N/P

FCC Part 15, Subpart C

§ 15.247 (d)

Spurious RF conducted emissions

The measurement was performed according to FCC § 15.31

10-1-10 Edition

OP-Mode

Setup

Port

Final Result

op-mode 1

–

Temp ant.connector

N/P

op-mode 2

–

Temp ant.connector

N/P

op-mode 3

–

Temp ant.connector

N/P

op-mode 6

–

Temp ant.connector

N/P

op-mode 7

–

Temp ant.connector

N/P

op-mode 8

–

Temp ant.connector

N/P

op-mode 10

–

Temp ant.connector

N/P

op-mode 11

–

Temp ant.connector

N/P

op-mode 12

–

Temp ant.connector

N/P



FCC Part 15, Subpart C**§ 15.247 (d), § 15.35 (b), § 15.209**

Spurious radiated emissions

The measurement was performed according to ANSI C63.4

2009

OP-Mode	Setup	Port	Final Result
op-mode 1	–	Enclosure	N/P
op-mode 2	Setup_01	Enclosure	passed ¹⁾
op-mode 3	–	Enclosure	N/P
op-mode 6	–	Enclosure	N/P
op-mode 7	–	Enclosure	N/P
op-mode 8	–	Enclosure	N/P
op-mode 10	–	Enclosure	N/P
op-mode 11	–	Enclosure	N/P
op-mode 12	–	Enclosure	N/P

FCC Part 15, Subpart C**§ 15.247 (d)**

Band edge compliance

The measurement was performed according to FCC § 15.31 /

10-1-10 Edition /

ANSI C63.4

2009

OP-Mode	Setup	Port	Final Result
op-mode 1	–	Temp ant.connector	N/P
op-mode 3	–	Temp ant.connector	N/P
op-mode 3	–	Enclosure	N/P
op-mode 6	–	Temp ant.connector	N/P
op-mode 8	–	Temp ant.connector	N/P
op-mode 8	–	Enclosure	N/P
op-mode 10	–	Temp ant.connector	N/P
op-mode 12	–	Temp ant.connector	N/P
op-mode 12	–	Enclosure	N/P



1 Administrative Data

1.1 Testing Laboratory

Company Name: 7 Layers AG
Address: Borsigstr. 11
40880 Ratingen
Germany

This facility has been fully described in a report submitted to the FCC and accepted under the registration number 96716.

The test facility is also accredited by the following accreditation organisation:

- Deutscher Akkreditierungs Rat DAR-Registration no. DGA-PL-192/99-02

Responsible for Accreditation Scope: Dipl.-Ing. Bernhard Retka
Dipl.-Ing. Robert Machulec
Dipl.-Ing. Thomas Hoell
Dipl.-Ing. Andreas Petz

Report Template Version: 2011-05-25

1.2 Project Data

Responsible for testing and report: Dipl.-Ing. Carsten Steinröder
Date of Test(s): 2001-05-18 to 2011-05-20
Date of Report: 2011-06-30

1.3 Applicant Data

Company Name: 3M PELTOR Communications
3M Svenska AB
Address: Malmstensgatan 19
331 02 Värnamo
Sweden
Contact Person: Mr. Patric Anvegård

1.4 Manufacturer Data

Company Name: please see applicant data
Address:
Contact Person:



2 Test object Data

2.1 General EUT Description

Equipment under Test	Bluetooth transceiver
Type Designation:	Peltor WS5
Kind of Device: (optional)	Bluetooth Headset / Ear Protection
Voltage Type:	DC (internal battery)
Voltage level:	3.0 V
Modulation Type:	GFSK, 8DPSK, $\pi/4$ DQPSK

General product description:

Bluetooth is a short-range radio link intended to be a cable replacement between portable and/or fixed electronic devices.

Bluetooth operates in the unlicensed ISM Band at 2.4 GHz. In the US a band of 83.5 MHz width is available. In this band, the Bluetooth technology defines 79 RF channels spaced 1 MHz (2402 - 2480 MHz). The actual RF channel is chosen from a pseudo-random hopping sequence through the 79 channels. A channel is occupied for a defined amount of time slots, with a nominal slot length of 625 μ s. The maximum time slot length on one channel is defined by the packet type and is 0.625 ms for DH1 packets, 1.875 ms for DH3 and 3.125 ms for DH5. The nominal hop rate is 1600 hops/s for DH1, 1600/3 for DH3 and 1600/5 for DH5. All frequencies are equally used. The maximum nominal average time of occupancy is 0.4 s within a period of 79*0.4 seconds.

The basic data rate of 1 Mbps uses GFSK modulation and the enhanced data rate uses PSK modulation. For the enhanced data rate of 3 Mbps 8DPSK modulation and of 2 Mbps $\pi/4$ DQPSK modulation is used.

Specific product description for the EUT:

The EUT is a headset/handsfree which uses Bluetooth technology to be connected to e.g. a mobile phone. It provides a function to provide surrounding sound to the Headset. The headset is an ear protection (hearing conservation). It is supplied by internal batteries (2x1.5 V).

The EUT provides the following ports:

Ports
Enclosure
Audio 1
Audio 2
DC Port

The main components of the EUT are listed and described in Chapter 2.2.



2.2 EUT Main components

Type, S/N, Short Descriptions etc. used in this Test Report

Short Description	Equipment under Test	Type Designation	Serial No.	HW Status	SW Status	Date of Receipt
EUT A (Code: DW001a01)	Bluetooth transceiver	Peltor WS5Type MT16H21FW S5UM581CR	0110160186	K276 AVxxx	WS5-1120-xxx	2011-05-12

Remark: EUT A is equipped with an integral antenna (gain = -0.5 dBi).

NOTE: The short description is used to simplify the identification of the EUT in this test report.

2.3 Ancillary Equipment

For the purposes of this test report, ancillary equipment is defined as equipment which is used in conjunction with the EUT to provide operational and control features to the EUT. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Ancillary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial no.	HW Status	SW Status	FCC ID
-	-	-	-	-	-	-

2.4 Auxiliary Equipment

For the purposes of this test report, auxiliary equipment is defined as equipment which is used temporarily to enable operational and control features especially used for the tests of the EUT which is not used during normal operation or equipment that is used during the tests in combination with the EUT but is not subject of this test report. It is necessary to configure the system in a typical fashion, as a customer would normally use it. But nevertheless Auxiliary Equipment can influence the test results.

Short Description	Equipment under Test	Type Designation	Serial no.	HW Status	SW Status	FCC ID
AUX_cab	3 auxiliary cables, each of 1 m length	2-wire	-	-	-	-

2.5 EUT Setups

This chapter describes the combination of EUTs and equipment used for testing.

Setup No.	Combination of EUTs	Description and Rationale
Setup_01	EUT A + AUX_cab	setup for radiated measurements; the EUT is operated from 2 primary batteries (2x1.5 V) while the 3 ports are terminated by 3 open-ended 2-wire cables as representative configuration instead of connecting real devices

The rationale for selecting the EUTs, ancillary and auxiliary equipment and interconnecting cables, is to test a representative configuration meeting the requirements of the referenced standards, applying long-term experience and good engineering practice.

2.6 Operating Modes

This chapter describes the operating modes of the EUTs used for testing.

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	The EUT transmits on 2402 MHz	Loopback mode, basic data rate 1 Mbps
op-mode 2	The EUT transmits on 2441 MHz	Loopback mode, basic data rate 1 Mbps
op-mode 3	The EUT transmits on 2480 MHz	Loopback mode, basic data rate 1 Mbps
op-mode 4	The EUT is in Hopping mode	The EUT is hopping on 79 channels, basic data rate 1 Mbps
op-mode 5	Bluetooth "standby" EUT powered	BT scan mode
op-mode 6	The EUT transmits on 2402 MHz	Loopback mode, enhanced data rate 3 Mbps
op-mode 7	The EUT transmits on 2441 MHz	Loopback mode, enhanced data rate 3 Mbps
op-mode 8	The EUT transmits on 2480 MHz	Loopback mode, enhanced data rate 3 Mbps
op-mode 10	The EUT transmits on 2402 MHz	Loopback mode, enhanced data rate, 2 Mbps
op-mode 11	The EUT transmits on 2441 MHz	Loopback mode, enhanced data rate, 2 Mbps
op-mode 12	The EUT transmits on 2480 MHz	Loopback mode, enhanced data rate, 2 Mbps

Note: Tests are only performed using op-mode 2.

2.7 Special software used for testing

The EUT can not be operated in all modes listed at sub-clause **Fehler! Verweisquelle konnte nicht gefunden werden.** E.g. a special firmware version can be used in the EUT where code is added to the normal operation providing the additional modes required for testing. This is listed at sub-clause 2.2.

If a special software to control the EUT is used then it is described below. This software might directly control the EUT.

For Bluetooth technology, the Bluetooth Standards define a test mode that enables the operator during the tests to set the EUT into a mode that it can be externally controlled by the signalling unit in the active Bluetooth radio-link "over-the-air." The Bluetooth test mode is completely documented in the Bluetooth Specifications.

2.7.1 Software to control the EUT directly

None.

2.7.2 Software to enable control the EUT by a signalling unit

None.



2.8 Product labelling

2.8.1 FCC ID label

Please refer to the documentation of the applicant.

2.8.2 Location of the label on the EUT

Please refer to the documentation of the applicant.

3 Test Results

3.1 Spurious radiated emissions

Standard FCC Part 15, 10-1-10 Edition Subpart C

The test was performed according to: ANSI C63.4-2009

3.1.1 Test Description

The test set-up was made in accordance to the general provisions of ANSI C63.4-2009. 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 influence of the EUT support table that is used between 30–1000 MHz was evaluated.

The test was performed at the distance of 3 m between the EUT and the receiving antenna. The measurement procedure is implemented into the EMI test software ES-K1 from R&S. The radiated emissions measurements were made in a typical installation configuration. Exploratory tests are performed at 3 orthogonal axes to determine the worst-case orientation of a body-worn or handheld EUT. The final test on all kind of EUTs is performed at 2 axes. A pre-check is also performed while the EUT is powered from both AC and DC (battery) power in order to find the worst-case operating condition.

1. Measurement up to 30 MHz

The test set-up was made in accordance to the general provisions of ANSI C63.4-2009. The Equipment Under Test (EUT) was set up on a non-conductive table in the anechoic chamber.

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. The Loop antenna HFH2-Z2 is used.

Step 1: pre-measurement

- Anechoic chamber
- Antenna distance: 10 m
- Detector: Peak-Maxhold
- Frequency range: 0.009 – 0.15 and 0.15 – 30 MHz
- Frequency steps: 0.1 kHz and 5 kHz
- IF-Bandwidth: 0.2 kHz and 10 kHz
- Measuring time / Frequency step: 100 ms

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: final measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is to find the maximum emission level.

- Open area test side
- Antenna distance: according to the Standard
- Detector: Quasi-Peak
- Frequency range: 0.009 – 30 MHz
- Frequency steps: measurement at frequencies detected in step 1
- IF-Bandwidth: 200 Hz – 10 kHz
- Measuring time / Frequency step: 100 ms

2. Measurement above 30 MHz and up to 1 GHz

Step 1: Preliminary scan

Preliminary test to identify the highest amplitudes relative to the limit.

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 μ s (BT Timing 1.25 ms)
- Turntable angle range: -180° to $+180^\circ$
- Turntable step size: 90°
- Height variation range: 1 – 3 m
- Height variation step size: 2 m
- Polarisation: Horizontal + Vertical

Intention of this step is, to determine the radiated EMI-profile of the EUT. Afterwards the relevant emissions for the final measurement are identified.

Step 2: second measurement

For the relevant emissions determined in step 1, an additional measurement with the following settings will be performed. Intention of this step is, to find out the approximate turntable angle and antenna height for each frequency.

- 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 $+/ - 22.5^\circ$ 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: 100 ms
- Turntable angle range: -22.5° to $+22.5^\circ$ around the determined value
- Height variation range: -0.25 m to $+0.25$ m 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 (< 1 GHz)
- Measured frequencies: in step 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1 s

3. Measurement above 1 GHz

The following modifications apply to the measurement procedure for the frequency range above 1 GHz:

The Equipment Under Test (EUT) was set up on a non-conductive support at 1.4 m height in the fully-anechoic chamber. 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 reference level 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 are omitted. Step 1 was performed with one height of the receiving antenna only.

EMI receiver settings:

- Detector: Peak, Average
- IF Bandwidth = 1 MHz

After the measurement a plot will be generated which contains a diagram with the results of the preliminary scan and a chart with the frequencies and values of the results of the final measurement.

For the enhanced data rate packets the test is performed as worst-case-check in order to verify that emissions have a comparable level as found at basic data rate. Typically, the measurement for these packets is performed in the frequency range 1 to 8 GHz but it depends on the emissions found during the test for the basic data rate. Please refer to the results for the used frequency range.

3.1.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.247 (d)

... In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

FCC Part 15, Subpart C, §15.209, Radiated Emission Limits

Frequency in MHz	Limit (μ V/m)	Measurement distance (m)	Limit(dB μ V/m @10m)
0.009 – 0.49	2400/F(kHz)	300	Limit (dB μ V/m)+30dB
0.49 – 1.705	24000/F(kHz)	30	Limit (dB μ V/m)+10dB
1.705 - 30	30	30	Limit (dB μ V/m)+10dB

Frequency in MHz	Limit (μ V/m)	Measurement distance (m)	Limit (dB μ V/m)
30 - 88	100	3	40.0
88 - 216	150	3	43.5
216 - 960	200	3	46.0
above 960	500	3	54.0

§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 (dB μ V/m) = 20 log (Limit (μ V/m)/1 μ V/m)



3.1.3 Test Protocol

Temperature: 25–27 °C
Air Pressure: 1010–1014 hPa
Humidity: 36 %

3.1.3.1 Measurement up to 30 MHz

No test is performed in this measurement range.

3.1.3.2 Measurement above 30 MHz

Op. Mode	Setup	Port							
op-mode 2	Setup_01	Enclosure	Corrected value dB μ V/m			Limit dB μ V/m	Limit dB μ V/m	Limit dB μ V/m	Delta to limit dB
			QP	Peak	AV	QP	Peak	AV	QP/Peak
Vertical + horizontal	1602	–	47.4	36.1	–	74.0	54.0	26.6	17.9
	1626	–	46.8	35.8	–	74.0	54.0	27.2	18.2
	4882	–	49.5	37.4	–	74.0	54.0	24.5	16.6

Remark: No (further) spurious emissions in the range 20 dB below the limit found. The measurement was performed from 30 MHz up to 25 GHz.

3.1.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 2	passed

4 Test Equipment

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

Test Equipment Anechoic Chamber

Lab ID: **Lab 1**
Manufacturer: Frankonia
Description: Anechoic Chamber for radiated testing
Type: 10.58x6.38x6 m³

Single Devices for Anechoic Chamber

Single Device Name	Type	Serial Number	Manufacturer
Air compressor	none	-	Atlas Copco
Anechoic Chamber	10.58 x 6.38 x 6.00 m ³ <i>Calibration Details</i>	none	Frankonia <i>Last Execution</i> <i>Next Exec.</i>
	FCC listing 96716 3m Part15/18	2011/01/11	2014/01/10
	IC listing 3699A-1 3m	2011/02/07	2014/02/06
Controller Maturo	MCU	961208	Maturo 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 Radiated emissions

Lab ID: **Lab 1**
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	620/37	HD GmbH
Biconical dipole	VUBA 9117 <i>Calibration Details</i>	9117-108	Schwarzbeck <i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2008/10/27 2013/10/26
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq
	Path Calibration		2011/05/11 2011/11/10
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq
	Path Calibration		2011/05/11 2011/11/10
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq
	Path Calibration		2011/05/11 2011/11/10
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-Kabel Kusch 2	
	Path Calibration		2011/05/11 2011/11/10
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-Rosenberger Micro-Coax 2	
	Path Calibration		2011/05/11 2011/11/10



Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	Type	Serial Number	Manufacturer		
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG	Last Execution Next Exec.	
<i>Calibration Details</i>					
Standard Calibration			2009/04/16	2012/04/15	
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG	Last Execution Next Exec.	
<i>Calibration Details</i>					
Standard Calibration			2009/04/28	2012/04/27	
High Pass Filter	4HC1600/12750-1.5-KK Path Calibration	9942011	Trilithic 2011/05/11	2011/11/10	
High Pass Filter	5HC2700/12750-1.5-KK Path Calibration	9942012	Trilithic 2011/05/11	2011/11/10	
High Pass Filter	5HC3500/12750-1.2-KK Path Calibration	200035008	Trilithic 2011/05/11	2011/11/10	
High Pass Filter	WHKX 7.0/18G-8SS Path Calibration	09	Wainwright 2011/05/11	2011/11/10	
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG	Last Execution Next Exec.	
<i>Calibration Details</i>					
Standard Calibration			2009/05/27	2012/05/26	
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG	Last Execution Next Exec.	
<i>Calibration Details</i>					
DKD calibration			2008/10/07	2011/10/06	
Network Analyzer	E5071B <i>Calibration Details</i>	MY42200813	Agilent Last Execution Next Exec.	2010/11/09 2011/11/09	
Standard Calibration					
Pyramidal Horn Antenna 3160-09 26,5 GHz		00083069	EMCO Elektronik GmbH		
Pyramidal Horn Antenna 3160-10 40 GHz		00086675	EMCO Elektronik GmbH		
Tilt device Maturo (Rohacell)	Antrieb TD1.5-10kg	TD1.5- 10kg/024/3790709	Maturo GmbH		



Test Equipment Auxiliary Test Equipment

Lab ID: **Lab 1**
Manufacturer: see single devices
Description: Single Devices for various Test Equipment
Type: various
Serial Number: none

Single Devices for Auxiliary Test Equipment

Single Device Name	Type	Serial Number	Manufacturer
AC Power Source	Chroma 6404	64040001304	Chroma ATE INC.
Broadband Power Divider1506A / 93459 N (Aux)		LM390	Weinschel Associates
Broadband Power DividerWA1515 SMA		A855	Weinschel Associates
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
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
Vector Signal Generator	SMIQ 03B	832492/061	Rohde & Schwarz GmbH & Co.KG

Test Equipment Digital Signalling Devices

Lab ID:

Lab 1

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 2011/08/13
Universal Radio Communication Tester	CMU 200	102366	Rohde & Schwarz GmbH & Co. KG
	<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		2007/07/16
	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		

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 2011/11/30
	<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		2007/01/02
	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		

	SW: K62, K69		2008/11/03



Test Equipment Emission measurement devices

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

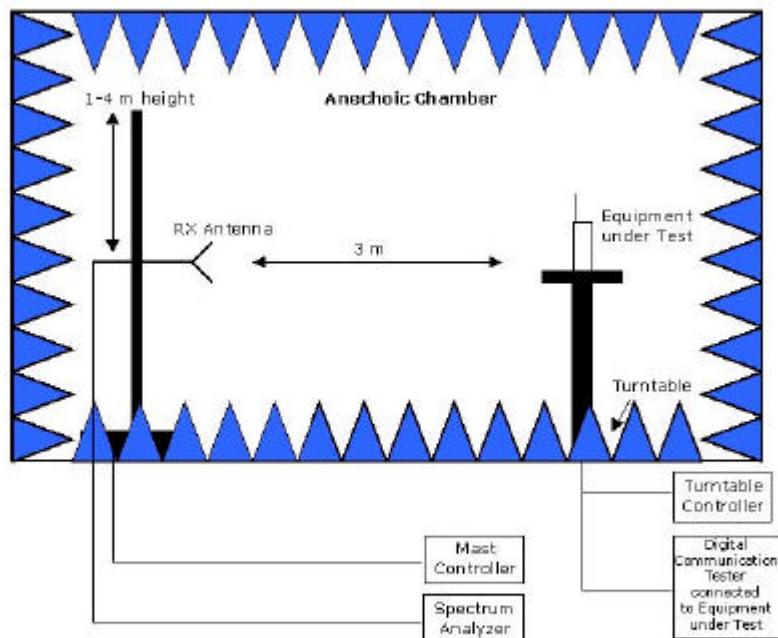
Single Devices for Emission measurement devices

Single Device Name	Type	Serial Number	Manufacturer
Personal Computer	Dell	30304832059	Dell
Power Sensor	NRV-Z1	836219/005	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard Calibration		2009/10/20 2011/10/19
Powermeter	NRVS	836333/064	Rohde & Schwarz GmbH & Co. KG
	<i>Calibration Details</i>		<i>Last Execution</i> <i>Next Exec.</i>
	Standard calibration		2009/10/15 2011/10/14
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG
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

5 Photo Report

Photos are included in an external report.

6 Setup Drawings



Drawing 1: Setup in the Anechoic chamber:

Measurements below 1 GHz: Semi-anechoic, conducting ground plane.

Measurements above 1 GHz: Fully-anechoic, absorbers on all surfaces



7 FCC and IC Correlation of measurement requirements

The following tables show the correlation of measurement requirements for Bluetooth equipment and Digital Apparatus from FCC and IC standards.

Bluetooth® equipment

Measurement	FCC reference	IC reference
Conducted emissions on AC mains	§ 15.207	RSS-Gen: 7.2.4
Occupied bandwidth	§ 15.247 (a) (1)	RSS-210: A8.1
Peak power output	§ 15.247 (b) (1)	RSS-210: A8.4
Spurious RF conducted emissions	§ 15.247 (d)	RSS-Gen: 6; RSS-210: A8.5
Spurious radiated emissions	§ 15.247 (d)	RSS-Gen: 6; RSS-210: A8.5
Band edge compliance	§ 15.247 (d)	RSS-210: A8.5
Dwell time	§ 15.247 (a) (1) (iii)	RSS-210: A8.1
Channel separation	§ 15.247 (a) (1)	RSS-210: A8.1
No. of hopping frequencies	§ 15.247 (a) (1) (iii)	RSS-210: A8.1
Antenna requirement	§ 15.203 / 15.204	RSS-Gen: 7.1.2

Digital Apparatus

Measurement	FCC reference	IC reference
Conducted Emissions (AC Power Line)	§15.107	ICES-003
Spurious Radiated Emissions	§15.109	ICES-003