InterLab®

FCC Measurement/Technical Report on

Bluetooth – WLAN transceiver
ELF

Report Reference: MDE_Datal_0901_FCCc

Test Laboratory:

DGA-PL-192/99-02

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Note:
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0 Summary

0.1 Technical Report Summary

Type of Authorization
Certification for an Intentional Radiator (Frequency Hopping Spread Spectrum and Digital Device / Spread Spectrum).

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 (10-1-09 Edition).

The following parts and subparts are applicable to the results in this test report.

- Part 2, Subpart J – Equipment Authorization Procedures, Certification

- Part 15, Subpart C and E – Intentional Radiators

§ 15.205 Restricted bands of operation

§ 15.209 Radiated emission limits; general requirements

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

§ 15.407 General technical requirements

Note:
The tests are performed with reference to the FCC Public Notice DA 00-705, released March 30, 2000 (related to the Bluetooth part) and the FCC measurement guide line “Measurement of Digital Transmission Systems Operating under Section 15.247 March 23, 2005” (related to the WLAN part).
Instead of applying ANSI C63.4-1992 which is referenced in the FCC Public Note, the newer ANSI C63.4-2003 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 and E		§15.35, §15.205, §15.209, §15.407	
Spurious radiated emissions			
The measurement was performed according to ANSI C63.4			2003
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1-co	Setup_01/02	Enclosure	passed
op-mode 2-co	Setup_01/02	Enclosure	passed
op-mode 3-co	Setup_01/02	Enclosure	passed
op-mode 6-co	Setup_02	Enclosure	passed
op-mode 7-co	Setup_02	Enclosure	passed
op-mode 8-co	Setup_02	Enclosure	passed
op-mode 10-co	Setup_02	Enclosure	passed
op-mode 11-co	Setup_02	Enclosure	passed
op-mode 12-co	Setup_02	Enclosure	passed

The purpose of this test report is to evaluate co-location effects. Therefore especially the measured frequency range of radiated emissions tests and limits may deviate from the FCC requirements, if tested stand-alone.
The EUT which incorporates Bluetooth and integrates a WLAN module with an own FCC-ID will both be listed separately as individual EUTs at FCC.
For details please refer to the appropriate chapters.

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Responsible for Accreditation Scope: _____

Responsible for Test Report: _____

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:	2010-04-19

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Date of Test(s):	2010-04-23 to 2010-05-04
Date of Report:	2010-05-10

1.3 Applicant Data

Company Name:	Datalogic Mobile s.r.l.
Address:	Via S. Vitalino, 13 Lippo di Calderara di Reno 40012 Bologna Italy
Contact Person:	Mr. Davide E. Vaccaneo

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 / WLAN transceiver
Type Designation:	ELF
Kind of Device:	Handheld Mobile Computer (PDA) incorporating
(optional)	Bluetooth radio application
Voltage Type:	AC / DC (of AC/DC converter) / DC (internal battery)
Voltage level:	120 V / 5.0 V / Li-Ion 3.7 V / 3 Ah
Modulation Type:	Bluetooth: GFSK, 8DPSK, π/4 DQPSK WLAN: BPSK

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.

The WLAN transceiver operates in the 2.4 GHz ISM band using Direct Sequence Spread Spectrum (DSSS) Modulation. The EUT supports the modes 802.11b (maximum data rate 11 Mbps), 802.11g (maximum data rate 54 Mbps).
The WLAN transceiver operates also in the 5 GHz U-NII high performance RLAN sub-bands 5150 MHz to 5350 , 5470 MHz to 5725 MHz and 5725 MHz to 5850 MHz. The EUT supports the mode 802.11a (maximum data rate 54 Mbps).

Specific product description for the EUT:

The EUT is a handheld mobile computer (PDA) which uses Bluetooth technology to setup radio links to other Bluetooth devices.
The EUT (this sample as a variant) incorporates a WLAN module for which a grant of a modular approval exists.

The EUT provides the following ports:

Ports
Temp antenna connector
Enclosure
USB Port (connectable to AC power line)
System Connector (to Cradle)

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: EX000bc03) Remark: None.	Bluetooth transceiver	ELF	D10P00131	1.0	1.0 RC3	2010-04-22
EUT C (Code: EX000bc04)	Bluetooth transceiver	ELF	D10P00131	1.0	1.0 RC4	2010-05-03
Remark: EUT C is identical to EUT A besides the software was updated. EUT B is not used in this report.						

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	HW Status	SW Status	Serial no.	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
–						

2.5 EUT Setups

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

Setup No.	Combination of EUTs	Description
Setup_01	EUT A	setup for radiated measurements
Setup_02	EUT C	setup for radiated measurements

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-co	The EUT transmits on 2402 MHz (Bluetooth) + 2462 MHz (WLAN)	BT 1 Mbps + WLAN 802.11g / 6 Mbps
op-mode 2-co	The EUT transmits on 2441 MHz (Bluetooth) + 2437 MHz (WLAN)	BT 1 Mbps + WLAN 802.11g / 6 Mbps
op-mode 3-co	The EUT transmits on 2480 MHz (Bluetooth) + 2412 MHz (WLAN)	BT 1 Mbps + WLAN 802.11g / 6 Mbps
op-mode 6-co	The EUT transmits on 2402 MHz (Bluetooth) + 5260MHz (WLAN)	BT 3 Mbps + WLAN 802.11a / 6 Mbps
op-mode 7-co	The EUT transmits on 2441 MHz (Bluetooth) + 5500 MHz (WLAN)	BT 3 Mbps + WLAN 802.11a / 6 Mbps
op-mode 8-co	The EUT transmits on 2480 MHz (Bluetooth) + 5825 MHz (WLAN)	BT 3 Mbps + WLAN 802.11a / 6 Mbps
op-mode 10-co	The EUT transmits on 2402 MHz (Bluetooth) + 2462 MHz (WLAN)	BT 2 Mbps + WLAN 802.11b / 1 Mbps
op-mode 11-co	The EUT transmits on 2441 MHz (Bluetooth) + 2437 MHz (WLAN)	BT 2 Mbps + WLAN 802.11b / 1 Mbps
op-mode 12-co	The EUT transmits on 2480 MHz (Bluetooth) + 2412 MHz (WLAN)	BT 2 Mbps + WLAN 802.11b / 1 Mbps

Remark: All modes are set locally at the EUT.

2.7 Product labelling

2.7.1 FCC ID label

Please refer to the documentation of the applicant.

2.7.2 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, 10-1-09 Edition Subpart C and E

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

3.1.1 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 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.

1. Measurement up to 30 MHz
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 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 µs (BT Timing 1.25 ms)
- 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

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° 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 ° around the determined value
- Height variation range: –0.25 m to + 0.2 5m 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 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.

3.1.2 Test Requirements / Limits

FCC §15.205 (b)

"Except as provided in paragraphs (d) and (e) of this section, the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in § 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in § 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in § 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in § 15.35 apply to these measurements."

FCC §15.209 (a)

"Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:"

FCC §15.209, Radiated Emission Limits

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

Frequency in MHz	Limit (µV/m)	Measurement distance (m)	Limit (dBµV/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

FCC §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)

FCC §15.407(b), Undesirable (Radiated) Emission Limits

For the frequency sub-band 5715 - 5825 the following limits apply for peaks which does not fall in any of the restricted bands as defined at 15.205(a).
Alternatively, devices may instead comply to Subpart C, § 15.247 in the sub-band 5825 - 5850 MHz.

Carrier Frequency in MHz	EIRP Limit (dBm/MHz)	Measurement distance (m)	Limit (dBµV/m)
5150 - 5250	–27.0	3	68.2
5250 - 5350	–27.0	3	68.2
5470 - 5725	–27.0	3	68.2
5725 - 5825	–27.0	3	68.2

For co-location scenarios the limit which permits the higher emission applies for simultaneous opertion.

3.1.3 Test Protocol

Temperature: 23 – 26 °C
Air Pressure: 1007 – 1023 hPa
Humidity: 27 – 35 %

Op. Mode	Setup	Port
op-mode 1-co	Setup_01/02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	1326	-	45.5	35.1	-	74.0	54.0	28.5	18.9
Hor. + Vert.	1602	-	47.1	35.2	-	74.0	54.0	26.9	18.8
Hor. + Vert.	2344	-	54.6	40.3	-	74.0	54.0	19.4	13.7
Hor. + Vert.	2389	-	53.9	39.7	-	74.0	54.0	20.1	14.3
Hor. + Vert.	2484	-	63.7	46.7	-	74.0	54.0	10.3	7.3
Hor. + Vert.	4924	-	46.6	34.0	-	74.0	54.0	27.5	20.0

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement is performed for setup_01 at frequency ranges: 30 MHz - 1 GHz, 5 GHz - 18 GHz and for setup_02 at frequency ranges: 1 GHz - 5 GHz, 18 GHz - 25 GHz.

Op. Mode	Setup	Port
op-mode 2-co	Setup_01/02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	1170	-	44.5	34.1	-	74.0	54.0	29.5	19.9
Hor. + Vert.	1326	-	44.6	34.9	-	74.0	54.0	27.4	19.1
Hor. + Vert.	2344	-	53.7	41.1	-	74.0	54.0	20.3	12.9
Hor. + Vert.	4874	-	48.7	36.0	-	74.0	54.0	25.3	18.0

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement is performed for setup_01 at frequency ranges: 30 MHz - 1 GHz, 5 GHz - 18 GHz and for setup_02 at frequency ranges: 1 GHz - 5 GHz, 18 GHz - 25 GHz.

Op. Mode	Setup	Port
op-mode 3-co	Setup_01/02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	1326	-	45.3	35.3	-	74.0	54.0	28.7	18.7
Hor. + Vert.	2330	-	52.0	39.7	-	74.0	54.0	22.0	14.3
Hor. + Vert.	2390	-	57.9	43.8	-	74.0	54.0	16.1	10.2
Hor. + Vert.	2484	-	56.9	41.5	-	74.0	54.0	17.1	12.5
Hor. + Vert.	4824	-	56.1	43.2	-	74.0	54.0	17.9	10.8

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement is performed for setup_01 at frequency ranges: 30 MHz - 1 GHz, 5 GHz - 18 GHz and for setup_02 at frequency ranges: 1 GHz - 5 GHz, 18 GHz - 25 GHz.

Op. Mode	Setup	Port
op-mode 6-co	Setup_02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	1602	-	46.9	39.0	-	74.0	54.0	27.1	15.0
Hor. + Vert.	2400	-	60.9	48.0	-	74.0	54.0	13.3	6.0
Hor. + Vert.	3507	-	39.2	35.8	-	88.2	68.2	49.0	32.4
Hor. + Vert.	10520	-	54.3	41.2	-	88.2	68.2	33.9	27.0
Hor. + Vert.	15783	-	57.0	43.6	-	74.0	54.0	17.0	10.4

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed continuously from 1 GHz up to 26.5 GHz, not only within restricted bands. No significant emissions found above 18 GHz.

Op. Mode	Setup	Port
op-mode 7-co	Setup_02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	3666	-	39.3	35.9	-	74.0	54.0	34.7	18.1
Hor. + Vert.	11002	-	47.9	35.1	-	74.0	54.0	26.1	18.9

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed continuously from 1 GHz up to 26.5 GHz, not only within restricted bands. No significant emissions found above 18 GHz.

Op. Mode	Setup	Port
op-mode 8-co	Setup_02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	2483	-	53.4	39.6	-	74.0	54.0	20.6	14.4
Hor. + Vert.	3883	-	39.3	35.4	-	74.0	54.0	34.7	18.6
Hor. + Vert.	5850	-	62.4	43.2	-	74.0	54.0	11.6	10.8
Hor. + Vert.	17473	-	52.0	39.3	-	74.0	54.0	22.0	14.7

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed continuously from 1 GHz up to 26.5 GHz, not only within restricted bands. No significant emissions found above 18 GHz.

Op. Mode	Setup	Port
op-mode 10-co	Setup_02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	1305	-	46.4	34.6	-	74.0	54.0	27.6	19.4
Hor. + Vert.	4924	-	51.6	50.4	-	74.0	54.0	22.4	3.6

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1-co, 2-co and 3-co.

Op. Mode	Setup	Port
op-mode 11-co	Setup_02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	2344	-	52.5	38.7	-	74.0	54.0	21.5	15.3
Hor. + Vert.	4874	-	51.6	49.7	-	74.0	54.0	22.4	4.3

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1-co, 2-co and 3-co.

Op. Mode	Setup	Port
op-mode 12-co	Setup_02	Enclosure

Polarisation Horizontal / Vertical	Frequency MHz	Corrected value dBµV/m			Limit dBµV/m	Limit dBµV/m	Limit dBµV/m	Delta to limit dB	Delta to limit dB
		QP	Peak	AV	QP	Peak	AV	QP/Peak	AV
Hor. + Vert.	2387	-	52.6	39.2	-	74.0	54.0	21.4	14.8
Hor. + Vert.	4824	-	52.7	51.5	-	74.0	54.0	21.3	2.5

Remark: No (further) spurious emissions in the range 20 dB below the limit found.
The measurement was performed from 1 GHz up to 8 GHz because no significant spurious emissions were found outside this frequency range in op-mode 1-co, 2-co and 3-co.

3.1.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1-co	passed
	op-mode 2-co	passed
	op-mode 3-co	passed
	op-mode 6-co	passed
	op-mode 7-co	passed
	op-mode 8-co	passed
	op-mode 10-co	passed
	op-mode 11-co	passed
	op-mode 12-co	passed

4 Test Equipment

1 Test Equipment Details

1.1 List of Used Test Equipment

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

Test Equipment Anechoic Chamber

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

Calibration Details	*Last Execution*	*Next Exec.*
IC renewal	2009/01/21	2011/01/20
FCC renewal	2009/01/07	2011/01/06

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	none	Frankonia
	Calibration Details		*Last Execution* / *Next Exec.*
	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	CO2000/328/12470 406/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 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		HD GmbH	
Biconical dipole	VUBA 9117	9117108	Schwarzbeck	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2008/10/27	2013/10/26
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32-5P	849785	Miteq	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2009/11/16	2010/05/15
Broadband Amplifier 1GHz-4GHz	AFS4-01000400-1Q-10P-4	-	Miteq	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2009/11/16	2010/05/15
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35-5P	896037	Miteq	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2009/11/16	2010/05/15
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2+W38.01-2	Kabel Kusch	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2009/11/16	2010/05/15
Cable "ESI to Horn Antenna"	UFB311A+UFB293C	W18.02-2+W38.02-2	Rosenberger Micro-Coax	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2009/11/16	2010/05/15
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/04/16	2012/04/15
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/04/28	2012/04/27
Dreheinheit	DE 325		HD GmbH	
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2009/11/16	2010/05/15
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2009/11/16	2010/05/15
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	
	Calibration Details		*Last Execution*	*Next Exec.*
	Path Calibration		2009/11/16	2010/05/15
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/05/27	2012/05/26

Single Devices for Auxiliary Equipment for Radiated emissions (continued)

Single Device Name	*Type*	*Serial Number*	*Manufacturer*
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution* *Next Exec.*
	DKD calibration		2008/10/07 2011/10/06
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 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 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.
	Calibration Details		*Last Execution* *Next Exec.*
	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
	Calibration Details		*Last Execution* *Next Exec.*
	DKD calibration		2008/10/06 2011/10/05

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
	Calibration Details		*Last Execution* *Next Exec.*
	Standard Calibration		2008/08/14 2011/08/13
Digital Radio Communication Tester	CMD 55	831050/020	Rohde & Schwarz GmbH & Co. KG
	Calibration Details		*Last Execution* *Next Exec.*
	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
	Calibration Details		*Last Execution* *Next Exec.*
	Standard calibration		2009/02/16 2011/02/15
	HW/SW Status		*Date of Start* *Date of End*
	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
	Calibration Details		*Last Execution* *Next Exec.*
	Standard calibration		2008/12/01 2011/11/30
	HW/SW Status		*Date of Start* *Date of End*
	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
	Calibration Details		*Last Execution* *Next Exec.*
	Standard calibration		2008/10/28 2011/10/27

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	
Signal Generator	SMR 20	846834/008	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2007/12/05	2010/12/04
Spectrum Analyzer	ESIB 26	830482/004	Rohde & Schwarz GmbH & Co. KG	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard Calibration		2009/12/03	2011/12/02

Test Equipment Multimeter 12

Lab ID:	**Lab 2**
Description:	Ex-Tech 520
Serial Number:	05157876

Single Devices for Multimeter 12

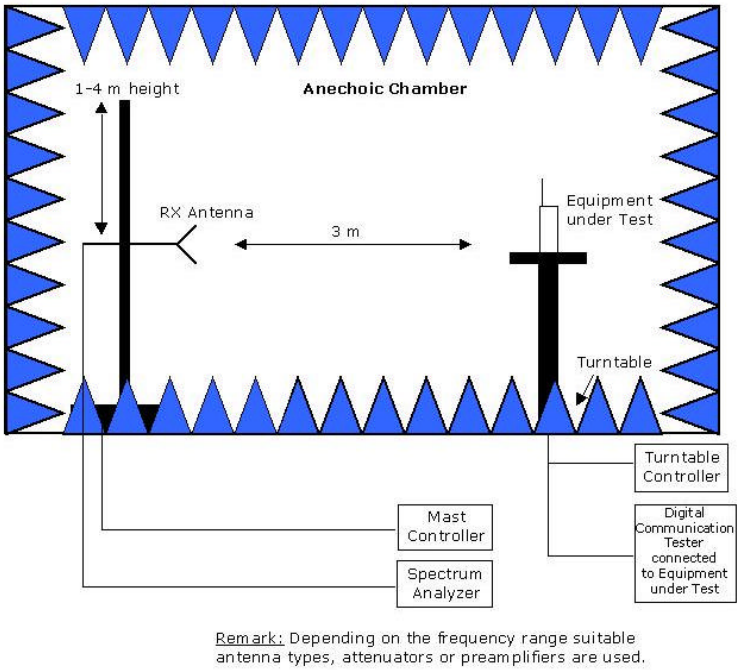
Single Device Name	*Type*	*Serial Number*	*Manufacturer*	
Digital Multimeter 12 (Multimeter)	EX520	05157876	Extech Instruments Corp.	
	Calibration Details		*Last Execution*	*Next Exec.*
	Standard calibration		2009/10/07	2011/10/06

5 Photo Report

Detailed photos of the OUT are declared as confidential.

Photo 1: Test setup for radiated measurements (Enclosure, above 1 GHz)

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