InterLab®

FCC Measurement / Technical Report on

Multi-radio Mobile PC
VC6096

Report Reference: MDE_MOT_0805_FCCcc

Test Laboratory:

Deutscher Akkreditierungs Rat
DAR
DAT-P-192/99-01

7 layers AG
Borsigstrasse 11
40880 Ratingen
Germany
email: info@7Layers.de

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 a multi radio device containing a GSM / UMTS cellular device and a WLAN device

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 (10-1-07 Edition).

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

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

Especially for this report:

For the representative worst-case combinations of operating modes listed in the test matrix the following tests shall be performed:

- Radiated spurious emissions tests according to the standard which is applicable to the dominant transmitter:
  Part 22: Subpart H, § 22.917 Emission limitations for cellular equipment
  Part 24: Subpart E, § 24.238 Emission limitations for Broadband PCS equipment
  in combination with:
  Part 2: § 2.1053 Measurement required: Field strength of spurious radiation
- Radiated spurious emissions tests according to Part 22: Subpart H, § 22.917 Emission limitations for cellular equipment
  in order to check an external antenna which has higher gain than listed in the grant of the module

Note:
-

Summary Test Results:

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

0.2 Measurement Summary

FCC Part 22 / 24		§§ 22.917, 24.238	
Spurious radiated emissions			
The measurement was performed according Part 2: § 2.1053			10-1-07
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	setup_01	Enclosure	passed
op-mode 2	setup_01	Enclosure	passed
op-mode 3	setup_01	Enclosure	passed
op-mode 4	setup_01	Enclosure	passed
op-mode 5	setup_01	Enclosure	passed
op-mode 6	setup_01	Enclosure	passed
op-mode 7	setup_01	Enclosure	passed
op-mode 8	setup_01	Enclosure	passed
op-mode 9	setup_01	Enclosure	passed
op-mode 10	setup_01	Enclosure	passed
op-mode 19	setup_01	Enclosure	passed
op-mode 20	setup_01	Enclosure	passed

This test report replaces the test report MDE_MOT_0805_FCCc

Responsible for Accreditation Scope: _____ Responsible for Test Report: _____

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

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. DAT-P-192/99-01
Responsible for Accreditation Scope:	Dipl.-Ing. Bernhard Retka Dipl.-Ing. Robert Machulec Dipl.-Ing. Thomas Hoell Dipl.-Ing. Andreas Petz
Report Template Version:	2008-08-06

1.2 Project Data

Responsible for testing and report:	Dipl.-Ing. Andreas Petz
Date of Test(s):	2008-07-15 to 2008-09-15
Date of Report:	2008-09-16

1.3 Applicant Data

Company Name:	Motorola, Inc.
Address:	One Motorola Plaza Holtsville, New York 11742 USA
Contact Person:	Mr. Mark Luksich

1.4 Manufacturer Data

Company Name:	please see at Applicant Data
Address:	
Contact Person:	

2 Product labelling

2.1 FCC ID label

At the time of the report there was no FCC label available.

2.2 Location of the label on the EUT

see above

3 Test object Data

3.1 General EUT Description

Equipment under Test	Mobile Computer with GSM/UMTS / Bluetooth / WLAN multi radio and GPS receiver
Type Designation:	VC6096
Kind of Device:	The separate transceivers / receiver are built-in
(optional)	a Mobile Computer
Voltage Type:	DC
Voltage level:	14.5 V

General product description:

The EUT is a mobile PC which serves as multi-radio host that has implemented the following radio parts:

- Bluetooth: An uncertified module with integral antenna is used (listing will be applied)
- WLAN: A qualified module with existing FCC grant is used which provides a connector for an external antenna. Frequencies in the bands 2.4 and 5 GHz are supported.
- GSM / UMTS: A qualified module with existing FCC grant is used which provides a connector for an external antenna. The bands 850 and 1900 are supported.
  The antenna gain of the grant (2.0 dBi) is exceeded by the external antenna (2.7 dBi) in the 850 MHz band.

The EUT is intended for the use in a car or office in a fixed mounting position (i.e. not portable) and the external antenna is also fixed mounted.
The RF output power of Bluetooth signals is below 5 dBm and the distance to the external antenna is more than 20 cm.
GSM / UMTS signals use a separate feeder line to a separate antenna element, as well as the WLAN has a separate feeder line to a separate antenna element. Both antenna elements are mounted in a common housing (“the antenna”) and the distance between them is less than 20 cm. The external antenna is dedicated to be used in conjunction with the EUT.

The radios can operate independently from each other and transmission at the same time is possible for one of these scenarios:
(Bluetooth) AND (GSM OR UMTS) AND (WLAN 2.4 OR WLAN 5)

Therefore, co-location testing is applicable to simultaneous GSM/UMTS and WLAN 2.4/5 transmission for representative worst-case combinations.

Specific product description for the EUT:

The Equipment Under Test (EUT) is a multi-radio mobile computer which supports WWAN GSM / EDGE / GPRS / UMTS (including HSDPA) in the bands 850 / 900 / 1800 / 1900 / 2100 MHz and Bluetooth 1 / 2 / 3 Mbps in the 2.4 GHz ISM band and WLAN modes a / b / g in the ISM bands 5 / 2.4 GHz and GPS (receiver) on L1-frequency (1575.42 MHz). Bluetooth uses an integral module which has an integral antenna, WWAN uses an integral module in combination of an external antenna, WLAN uses an integral module in combination of an external antenna and GPS uses an integral module in combination of an external antenna. The WWAN and WLAN antennas are assembled in a common housing, for GPS an active antenna is provided.
VC6096CN is a variant of VC6096 for China with same features but with no voice support (data only).

The EUT provides the following ports:

Ports
Enclosure
DC input (power supply)
WWAN antenna port
WLAN antenna port
GPS antenna port
LAN port
USB port (at rear side)
Mini-USB port (at rear side)
USB port (at left side)
Telemetry port (CAN bus)

The main components of the EUT are listed and described in Chapter 3.2

3.2 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: AB740d01)	GSM / UMTS / WLAN radio	VC6096	8149500000 012	0.0	V2.05	2008-07-11
Remark: EUT A is equipped with an external antenna (band / gain: 850 / 0.56 dBD (=2.7 dBi); 1900 / 0.5 dBi).						

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

3.3 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
AE1 (Code: AB740COMANT01)	Combination Antenna WWAN / WLAN	FLN4048A	-	-	–	–
AE2	Vehicle Power Supply Cable	3071815Y13	-	-	–	–
AE3	WAN RF cable (90deg connector)	3087568V84	-	-	–	–
AE4	WLAN RF cable (90deg connector)	3087568V83	-	-	–	–

3.4 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 + AE1 + AE2 + AE3 + AE4	setup for radiated measurements

3.5 Operating Modes

This chapter describes the operating modes of the EUTs used for testing according to the test matrix (sub-clause 3.6).

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	EUT transmits on 836 MHz (GSM) and on 2437 MHz (WLAN, 802.11b)	GSM: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 2	EUT transmits on 836 MHz (GSM) and on 2437 MHz (WLAN, 802.11g)	GSM: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 3	EUT transmits on 836 MHz (GSM) and on 5240 MHz (WLAN, 802.11a)	GSM: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 4	EUT transmits on 836 MHz (EDGE) and on 5755 MHz (WLAN, 802.11a)	EDGE: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 5	EUT transmits on 836 MHz (UMTS FDD5) and on 2437 MHz (WLAN, 802.11b)	UMTS: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 6	EUT transmits on 1880 MHz (GSM) and on 2437 MHz (WLAN, 802.11b)	GSM: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 7	EUT transmits on 1880 MHz (GSM) and on 2437 MHz (WLAN, 802.11g)	GSM: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 8	EUT transmits on 1880 MHz (GSM) and on 5755 MHz (WLAN, 802.11a)	GSM: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 9	EUT transmits on 1880 MHz (EDGE) and on 5240 MHz (WLAN, 802.11a)	EDGE: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 10	EUT transmits on 1880 MHz (UMTS FDD2) and on 2437 MHz (WLAN, 802.11g)	UMTS: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 11	EUT transmits on 836 MHz (GSM) and on 5755 MHz (WLAN, 802.11a)	GSM: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 12	EUT transmits on 836 MHz (EDGE) and on 2437 MHz (WLAN, 802.11g)	EDGE: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 13	EUT transmits on 836 MHz (UMTS FDD5) and on 5240 MHz (WLAN, 802.11a)	UMTS: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 14	EUT transmits on 836 MHz (UMTS HSDPA) and on 2437 MHz (WLAN, 802.11g)	UMTS: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 15	EUT transmits on 1880 MHz (GSM) and on 5240 MHz (WLAN, 802.11a)	GSM: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 16	EUT transmits on 1880 MHz (EDGE) and on 2437 MHz (WLAN, 802.11g)	EDGE: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 17	EUT transmits on 1880 MHz (UMTS FDD2) and on 2437 MHz (WLAN, 802.11b)	UMTS: in test network, max. output power WLAN: local TX mode, max. output power
op-mode 18	EUT transmits on 1880 MHz (UMTS HSDPA) and on 5755 MHz (WLAN, 802.11a)	UMTS: in test network, max. output power WLAN: local TX mode, max. output power

In order to verify radiated spurious emissions with the external antenna which has higher gain as listed in the grant for the module, the following operating modes are used which provides the highest output power as “worst-case-scenario”:

Op. Mode	Description of Operating Modes	Remarks
op-mode 19	Call established on Traffic Channel (TCH) 128, Carrier Frequency 824.2 MHz	128 is the lowest channel
op-mode 2	EUT transmits on 836 MHz (GSM) and on 2437 MHz (WLAN, 802.11g)	190 is a mid channel of the full GSM band
op-mode 20	Call established on Traffic Channel (TCH) 251, Carrier Frequency 848.8 MHz	251 is the highest channel

3.6 Test Matrix Co-Location (GSM / UMTS — WLAN 2.4 / 5 GHz)

WLAN → GSM / UMTS ↓	2437 b	2437 g	5240 a	5755 a	Operating Mode	Standard	Remark
GSM 850	**X**				op-mode 1	FCC 22	Measurement: 0.03–10 GHz
		X			op-mode 2	FCC 22	Measurement: 1–10 GHz
			X		op-mode 3	FCC 22	Measurement: 1–10 GHz
				O	op-mode 11	FCC 22	Measurement: 1–10 GHz
EDGE 850				**X**	op-mode 4	FCC 22	Measurement: 1–10 GHz
		O			op-mode 12	FCC 22	Measurement: 1–10 GHz
UMTS FDD5	**X**				op-mode 5	FCC 22	Measurement: 1–10 GHz
			O		op-mode 13	FCC 22	Measurement: 1–10 GHz
UMTS HSDPA		**O**			op-mode 14	FCC 22	Measurement: 1–10 GHz
GSM 1900	**X**				op-mode 6	FCC 24	Measurement: 0.03–20 GHz
		X			op-mode 7	FCC 24	Measurement: 1–20 GHz
			O		op-mode 15	FCC 24	Measurement: 1–20 GHz
				X	op-mode 8	FCC 24	Measurement: 1–20 GHz
EDGE 1900		**O**			op-mode 16	FCC 24	Measurement: 1–20 GHz
			X		op-mode 9	FCC 24	Measurement: 1–20 GHz
UMTS FDD2	**O**				op-mode 17	FCC 24	Measurement: 1–20 GHz
		X			op-mode 10	FCC 24	Measurement: 1–20 GHz
UMTS HSDPA				**O**	op-mode 18	FCC 24	Measurement: 1–20 GHz

Notes:

X = to be tested.

O = if after testing no relevant emissions are found these tests will be omitted, otherwise (some of) the tests will be additionally performed in dependence of the results of the performed tests.

Vertical / 1st column: dominant carrier GSM/UMTS providing higher output power

Horizontal / 1st row: WLAN carrier providing lower output power

GSM signal has the highest output power compared to EDGE and UMTS (worst-case)

All numerical values are given in MHz.

4 Test Results

4.1 Field strength of spurious radiation

Standard FCC Part 22, 10-1-07
Subpart H
/
FCC Part 24, 10-1-07
Subpart E

The test was performed according to: FCC §2.1053, 10-1-07

4.1.1 Test Description

1) The EUT was placed inside an anechoic chamber. Refer to chapter "Setup Drawings". The EUT was coupled to the R&S CMU200 Digital Communication Tester which was located outside the chamber via air link.

2) A call was established on a Traffic Channel (TCH) between the EUT and the base station simulator (R&S CMU200 Digital Communication Tester).
Important Settings:
- Discontinuous Transmission: OFF
- Modulation Signal: PSR16-1 (Pseudo Random Sequence)
- Output Power: Maximum
- Channel : Varied during measurements

3) A pre-calibration procedure is used so that the readings from the spectrum analyser are corrected and represent directly the equivalent radiated power (related to a lamda/2 dipole).

4) All spurious radiation measurements were made with spectrum analyser and the appropriate calibrated antennas for the frequency range of 30 MHz to 20 GHz (up to the 10th harmonic of the transmit frequency).

5) Important Analyser Settings
- [Resolution Bandwidth / Video Bandwidth]:
a) [3 kHz / 10 kHz] in the Span of 1 MHz directly below and above the GSM-Band,
b) [10 kHz / 30 kHz] in case the curve of the analyser IF-Filter leads to an exceeding of the limit, in this case a worst case correction factor of 20 dB (1 MHz -> 10 kHz) was used
c) [1 MHz / 3 MHz] otherwise
- Sweep Time: Calculated by using a formula given in the Product Standard "GSM 11.10-1 edition 4" for spurious emissions measurements (depending on the transmitting signal, the span and the resolution bandwidth)

6) The spurious emissions (peak) were measured in both vertical and horizontal antenna polarisation during the call is established.

4.1.2 Test Requirements / Limits

§ 2.1053 Measurements required: Field strength of spurious radiation.

Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of Sec. 2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.
(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:
(2) All equipment operating on frequencies higher than 25 MHz.

§ 2.1057 Frequency spectrum to be investigated.

(a) In all of the measurements set forth in Secs. 2.1051 and 2.1053, the spectrum shall be investigated from the lowest radio frequency signal generated in the equipment, without going below 9 kHz, up to at least the frequency shown below:
(1) If the equipment operates below 10 GHz: to the tenth harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower.
(b) Particular attention should be paid to harmonics and subharmonics of the carrier frequency as well as to those frequencies removed from the carrier by multiples of the oscillator frequency. Radiation at the frequencies of multiplier stages should also be checked.
(c) The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.
(d) Unless otherwise specified, measurements above 40 GHz shall be performed using a minimum resolution bandwidth of 1 MHz.

§ 22.917 Emission limitations for cellular equipment

(a) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
This is calculated to be -13 dBm (effective radiated power) which corresponds to 84.6 dBµV/m (field strength) in a distance of 3 m.

(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 100 kHz or greater. In the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (*i.e.* 100 kHz or 1 percent of emission bandwidth, as specified).

The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

§ 24.238 Emission limitations for Broadband PCS equipment

(a) The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.
This is calculated to be -13 dBm (effective radiated power) which corresponds to 84.6 dBµV/m (field strength) in a distance of 3 m.

(b) Compliance with these rules is based on the use of measurement instrumentation employing a resolution bandwidth of 1 MHz or greater. However, in the 1 MHz bands immediately outside and adjacent to the frequency block a resolution bandwidth of at least one percent of the emission bandwidth of the fundamental emission of the transmitter may be employed. A narrower resolution bandwidth is permitted in all cases to improve measurement accuracy provided the measured power is integrated over the full required measurement bandwidth (i.e. 1 MHz or 1 percent of emission bandwidth, as specified). The emission bandwidth is defined as the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, outside of which all emissions are attenuated at least 26 dB below the transmitter power.
(c) Licensees in this service may establish an alternative out of band emission limit to be used at specified band edge(s) in specified geographical areas [...].
(d) If any emission from a transmitter operating in this service results in interference to users of another radio service, the FCC may require a greater attenuation of that emission than specified in this section.

4.1.3 Test Protocol

Temperature: 24 – 28 °C
Air Pressure: 1014 – 1025 hPa
Humidity: 37 – 53 %

Op. Mode	Setup	Port
op-mode 1	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
2438	Horizontal	1000	11.7	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 2438 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 2	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
2435	Horizontal	1000	13.2	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 2435 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 3	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
5247	Vertical	1000	11.1	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 5247 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 4	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
5748	Vertical	1000	3.1	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 5748 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 5	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
2438	Horizontal	1000	10.7	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 2438 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 6	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
2437	Horizontal	1000	12.7	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 2437 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 7	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
2435	Horizontal	1000	13.0	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 2435 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 8	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
5754	Vertical	1000	3.9	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 5754 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 9	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
5234	Vertical	1000	10.9	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 2438 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 10	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
2435	Horizontal	1000	11.8	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.
The emission at 2435 MHz is the WLAN carrier and not a spurious emission.

Op. Mode	Setup	Port
op-mode 19	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
824	Horizontal	3.0	–17.88	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.

Op. Mode	Setup	Port
op-mode 20	setup_01	Enclosure

Frequency MHz	Antenna Polarisation	Bandwidth kHz	Measured Level dBm	Limit dBm
849	Horizontal	3.0	–15.66	-13.0

Remark: No (further) spurious emissions were found in the range 20 dB below the limit.

4.1.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed
	op-mode 2	passed
	op-mode 3	passed
	op-mode 4	passed
	op-mode 5	passed
	op-mode 6	passed
	op-mode 7	passed
	op-mode 8	passed
	op-mode 9	passed
	op-mode 10	passed
	op-mode 19	passed
	op-mode 20	passed

5 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	01.12.05	01.12.08
Signalling Unit for Bluetooth	PTW60	100004	Rohde & Schwarz	-	-
Universal Radio Communication Tester	CMU200	102366	Rohde & Schwarz	22.09.07	22.09.09
Universal Radio Communication Tester	CMU200	837983/052	Rohde & Schwarz	22.09.07	22.09.09
Signalling Unit for Bluetooth	CBT	100302	Rohde & Schwarz	22.09.06	N/A – only used for signalling

EMI Test System

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Comparison Noise Emitter	CNE III	99/016	York	-	-
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz	06.12.07	06.12.09
Signal Generator	SMR 20	846834/008	Rohde & Schwarz	05.12.07	05.12.09
AC Power Source	6404	64040000B04	Croma ATE INC.	01.06.08	N/A the parameters will be checked before testing

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	02.07.03	06.10.08
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32	849785	Miteq	06.02.08	06.10.08
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35	896037	Miteq	06.02.08	06.10.08
Broadband Amplifier 45MHz-27GHz	JS4-00102600-42	619368	Miteq	06.02.08	06.10.08
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2 W38.01-2	Kabel Kusch	06.02.08	06.10.08
Cable "ESI to Horn Antenna"	UFB311A UFB293C	W18.02-2 W38.02-2	Rosenberger-Microcoax	06.02.08	06.10.08
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz	12.05.06	06.10.08
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	06.02.08	06.10.08
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	06.02.08	06.10.08
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	06.02.08	06.10.08
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz	17.05.06	17.05.09
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz	19.08.02	N/A – only used for pre-testing
Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO	06.02.08	06.10.08

EMI Conducted Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber+Suhner	06.02.08	06.10.08
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz	01.11.05	01.11.08
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz	-	-

Auxiliary Test Equipment – calibration not applicable; spare 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 01	Voltcraft M-3860M	IJ096055	Conrad	-	-
Digital Multimeter 02	Voltcraft M-3860M	IJ095955	Conrad	-	-
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	-	-
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz	-	-
Temperature Chamber	VT 4002	58566002150010	Vötsch	-	-
Temperature Chamber	KWP 120/70	59226012190010	Weiss	-	-
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH	-	-

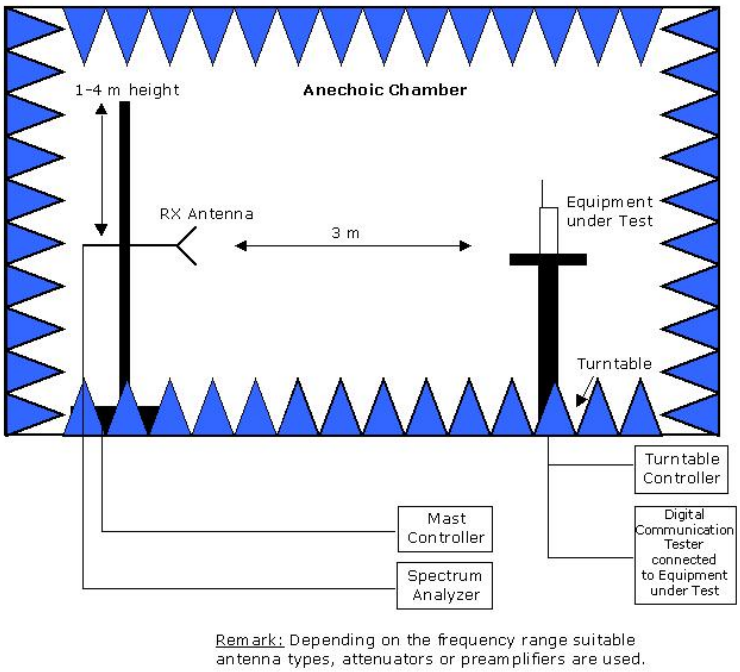
Anechoic Chamber – calibration not applicable

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Air Compressor (pneumatic)			Atlas Copco	-	-
Controller	CO 2000	CO2000/328/12470406/L	Innco innovative constructions 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	-	-

Equipment	Type	Serial No.	Manufacturer	Cal data	Next cal
Power Meter 832025/059	NRVD	832025/059	Rohde & Schwarz	22.08.07	22.08.08
Power Sensor A 832279/013	NRV-Z1	832279/013	Rohde & Schwarz	23.08.07	23.08.08
Power Sensor B 832279/015	NRV-Z1	832279/015	Rohde & Schwarz	23.08.07	23.08.08
Power Supply	E3632A	MY40003776	Agilent	-	-
Power Supply	PS-2403D	-	Conrad	-	-
RF Step Attenuator 833695/001	RSP	833695/001	Rohde & Schwarz	09.08.06	09.08.08
Rubidium Frequency Normal	MFS	002	Efratom	24.08.07	24.08.08
Signal Analyzer FSIQ26 832695/007	FSIQ26	832695/007	Rohde & Schwarz	23.08.07	23.08.09
Signal Generator 833680/003	SMP 03	833680/003	Rohde & Schwarz	04.07.06	04.07.09
Signal Generator A 834344/002	SMIQ03B	834344/002	Rohde & Schwarz	04.07.06	04.07.09
Signal Generator B 832870/017	SMIQ03B	832870/017	Rohde & Schwarz	24.05.07	24.05.10
Signal Switching and Conditioning Unit	SSCU	338826/005	Rohde & Schwarz	-	-
Signalling Unit PTW60 838312/014	PTW60 for TS8960	838312/014	Rohde & Schwarz	-	-
System Controller 829323/008	PSM12	829323/008	Rohde & Schwarz	-	-

6 Photo Report

7 Setup Drawings



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