InterLab®

FCC Measurement/Technical Report on

SpringCard PC/SC Contactless Smartcard Reader

Prox'n'Roll

Report Reference: MDE_SPRING_0801_FCCc

Test Laboratory:

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.

Table of Contents

0 Summary

0.1 Technical Report Summary

Type of Authorization
Certification for an 13.56 MHz USB RF-Cardreader

Applicable FCC Rules

Prepared in accordance with the requirements of FCC Rules and Regulations as listed in 47 CFR Ch.1 Parts 2 (10-1-07 Edition) and 15 (10-1-07 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

§ 15.205 Restricted bands of operation

§ 15.207 Conducted limits

§ 15.209 Radiated emission limits; general requirements

§ 15.215 Additional provisions to the general radiated emission limitations

§ 15.225 Operation within the band 13.110-14.010 MHz

Note:
none

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		**§15.209**	
Radiated Emissions			
The measurement was performed according to ANSI C63.4			2003
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_a01	enclosure	passed

FCC Part 15, Subpart C		**§ 15.207**	
Conducted Emissions AC Power line			
The measurement was performed according to ANSI C63.4			2003
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_a03/ Setup_a04	AC port (power line)	passed

FCC Part 15, Subpart C		**§ 15.215**	
Occupied Bandwidth			
The measurement was performed according to FCC § 2.1049			10-1-07
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_a02	enclosure	passed

FCC Part 15, Subpart C		**§ 15.225**	
Spectrum Mask			
The measurement was performed according to to ANSI C63.4			10-1-07
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 1	Setup_a01	enclosure	passed

FCC Part 15, Subpart C		**§ 15.225**	
Frequency Tolerance			
The measurement was performed according to FCC § 2.1055			10-1-07
OP-Mode	**Setup**	**Port**	**Final Result**
op-mode 2	Setup_a01	enclosure	passed

This Test Report replaces the following Test Report: MDE_SPRING_0801_FCCa

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. Andreas Petz
Report Template Version:	2009-02-24

1.2 Project Data

Responsible for testing and report:	Dr.-Ing. M. Küppers
Date of Test(s):	2008-12-10 to 2009-02-25
Date of Report:	2009-02-25

1.3 Applicant Data

Company Name:	SpringCard
Address:	13 voie la Cardon Parc Gutenberg 91120 Palaiseau
Contact Person:	Mr. Jerome Chalbot

1.4 Manufacturer Data

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

2 Product labeling

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	PC/SC Contactless Smartcard Reader
Type Designation:	Prox'n'Roll
Kind of Device:	13.56 MHz USB RF card reader
(optional)	
Voltage Type:	DC
Voltage level:	5.0 V

General product description:

The SpringCard Prox'n'Roll is a 13.56 MHz contactless smartcard reader and encoder for PC with USB interface for reading RFID tags.
The EUT does not have a "receive only" mode.

The EUT provides the following ports:

Ports
enclosure
AC power line of hosting PC

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 (D8000b02)	Smartcard reader	Prox'n'Roll	25F9205A	EAN8I9P-AA	CSB6 1.48	2008-12-10
Remark: EUT A is equipped with an integral antenna (gain= -67 dBi).						
EUT B (D8000c03)	Smartcard reader	Prox'n'Roll		modified, see remark	CSB6 1.48	2008-12-10
Remark: EUT B is equipped with a dummy load in lieu of the permanent antenna.						

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	Laptop	Toshiba Tecra M9		WinX Prof. Ger.	S.No.: 8706 0248H	-
AE2	smardcard	Mifare classic 1kB				-
AE3	TFT Display	LG Flatron L1740BQ			509WANF1 W607	BEJL17NU
AE4	Printer	EPSON Stylus C84 (B251A)			FBPT048906	-
AE5	Mouse	Logitech RX250	810-000208		HS7411501 5C	-

3.4 EUT Setups

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

Setup No.	Combination of EUT's	Description
Setup_a01	EUT A + AE 1	setup for EUT not reading a tag
Setup_a02	EUT A + AE 1 +AE 2	setup for EUT reading a tag
Setup_a03	EUT A + AE 1 +AE 3 +AE 4 +AE 5	setup for test on power line
Setup_a04	EUT B + AE 1 +AE 3 +AE 4 +AE 5	setup for test on power line, EUT is equipped with dummy load

3.5 Operating Modes

This chapter describes the operating modes of the EUT's used for testing.

Op. Mode	Description of Operating Modes	Remarks
op-mode 1	modulated carrier signal	EUT is transmitting a periodic modulated signal
op-mode 2	CW carrier signal	EUT is transmitting a non-modulated signal

4 Test Results

4.1 Spurious radiated emissions

Standard FCC Part 15, 10-1-07
Subpart C

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

4.1.1 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: 10m
- 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
Measurement 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
- Turntable angle range: –180 to 180 °
- Turntable step size: 90°
- Height variation range: 1 – 3m
- Height variation step size: 2m
- 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: 100ms
- Turntable angle range: –180 to 180 °
- Turntable step size: 45°
- Height variation range: 1 – 4m
- Height variation step size: 0.5m
- 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: 0.5m

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 1 determined frequencies
- IF – Bandwidth: 120 kHz
- Measuring time: 1s

Measurement above 1GHz
The following modifications apply to the measurement procedure for the frequency range above 1 GHz:
The measurement distance was reduced to 1m. 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
- RBW = VBW = 100 kHz
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.

4.1.2 Test Requirements / Limits

FCC Part 15, Subpart C, §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

4.1.3 Test Protocol

Temperature: 24°C
Air Pressure: 1013 hPa
Humidity: 33%

4.1.3.1 Measurement up to 30 MHz

Op. Mode	Setup	Port
op-mode 1	Setup_a01	Enclosure

Polarisation	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
0°	-	-	-	-	-	-	-	-	-
90°	-	-	-	-	-	-	-	-	

Remark: No (further) spurious emissions in the range 20 dB below the limit found therefore step 2 was not performed. Please refer to the plot in the annex.
The found peak at 99.5kHz is an emission from loop antenna power supply, and the peak found at 13.56MHz is the wanted signal of the EUT.

4.1.3.2 Measurement above 30 MHz

Op. Mode	Setup	Port
op-mode 1	Setup_a01	Enclosure

Polarisation	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
Vertical	135.6000	35.9			43.5			7.6	
Vertical	162.7325	35.3			43.5			8.2	

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

4.1.4 Test result: Spurious radiated emissions

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed

4.2 Conducted emissions (AC power line)

Standard FCC Part 15, 10-1-07
Subpart C

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

4.2.1 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 setup in a shielded room to perform the conducted emissions measurements in a typical installation configuration. The EUT was powered from 50µH || 50 Ohm Line Impedance Stabilization Network (LISN). The LISN's unused connections were terminated with 50 Ohm loads.

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

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

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

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

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

The highest value is reported.

4.2.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.207

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

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

4.2.3 Test Protocol

Temperature: 23°C
Air Pressure: 1037 hPa
Humidity: 37%

Op. Mode	Setup	Port
op-mode 1	Setup_a03	AC Port (power line)

Power line	Frequency MHz	Measured value dBµV	Delta to limit dBµV	Remarks
N	1.710	46.20	9.8	QP-detector
N	2.140	43.40	12.6	QP-detector
L1	13.35	51.20	8.8	QP-detector
N	13.455	44.10	15.9	QP-detector
L1	13.470	50.00	10.0	QP-detector
L1	13.485	50.10	9.9	QP-detector
L1	13.560	75.00	-15.0	QP-detector
L1	13.660	54.30	5.7	QP-detector
N	13.670	47.70	12.3	QP-detector
L1	13.770	54.60	5.4	QP-detector
L1	13.560	72.90	-22.9	AV-detector

Temperature: 25°C
Air Pressure: 1023 hPa
Humidity: 32%

Op. Mode	Setup	Port
op-mode 1	Setup_a04	AC Port (power line)

Power line	Frequency MHz	Measured value dBµV	Delta to limit dBµV	Remarks
L1	1.24	41.20	14.8	QP-detector
L1	1.61	46.30	9.7	QP-detector
L1	1.58	36.70	9.3	AV-detector

Remark: No final measurement was performed because no frequencies (peaks) were found within the offset for acceptance analysis during the preliminary scan. Please see annex for the measurement plot.
The operating frequency (wanted signal / carrier) of the EUT is set to 13.56 MHz (RFID) by the manufacturer and cannot be changed.
The conducted emission found in the uppermost table corresponds clearly to the fixed transmitter frequency of the EUT. It was determined that this emission on the AC mains is based on radiated coupling into the test setup. Therefore a second test has been performed to demonstrate this fact with a modified EUT with a suitable dummy load in lieu of the permanent antenna. The results can be seen in the table above. No exceeding of limit line can be found.

4.2.4 Test result: Conducted emissions (AC power line)

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed

4.3 Occupied bandwidth

Standard FCC Part 15, 10-1-07
Subpart C

The test was performed according to: FCC §15.31, 10-1-07

4.3.1 Test Description

The Equipment Under Test (EUT) was setup in a shielded room to perform the occupied bandwidth measurements.
The reference level is the level of the highest amplitude signal observed from the transmitter at either the fundamental frequency or first-order modulation products in all typical modes of operation, including the unmodulated carrier, even if atypical.
The results recorded were measured with the modulation which produces the worst-case (widest) occupied bandwidth.

4.3.2 Test Requirements / Limits

FCC Part 15, Subpart C, §15.215 (c)
Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §§ 15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. …

4.3.3 Test Protocol

Temperature: 24°C
Air Pressure: 1028hPa
Humidity: 32%

Op. Mode	Setup	Port
op-mode 1	Setup_a02	Enclosure

20 dB bandwidth kHz	99% bandwidth kHz	Remarks
440.882	1655.31062	The 20 dB bandwidth from 13.34557114 MHz to 13.7864529 MHz is contained within the designated frequency band 13.110 MHz to 14.010 MHz.

Remark: Please see annex for the measurement plot.

4.3.4 Test result: Occupied bandwidth

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed

4.4 Spectrum mask

Standard FCC Part 15, 10-1-07
Subpart C

The test was performed according to: FCC §15.225, 10-1-07

4.4.1 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 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.

- Anechoic chamber
- Antenna distance: 10m
- 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

4.4.2 Test Limits

FCC Part 15, Subpart C, §15.225 (a-d), and §15.209, corrected by the means of the extrapolation of §15.31 due to the reduced measuring distance from 30m to 10m.

4.4.3 Test Protocol

Temperature: 24°C
Air Pressure: 1028 hPa
Humidity: 32%

Op. Mode	Setup	Port
op-mode 1	Setup_a01	Enclosure

Maximum value dBµV/m	Limit dBµV/m	Remarks
49.37	104	measuring distance 10m

Remark: Please see annex for the measurement plot.

4.4.4 Test result: Spectrum mask

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 1	passed

4.5 Frequency tolerance

Standard FCC Part 15, 10-1-07
Subpart C

The test was performed according to: FCC §15.225, 10-1-07

4.5.1 Test Description

The Equipment Under Test (EUT) was placed in a climatic chamber.
The frequency drift during temperature and voltage variation was measured by the means of a spectrum analyzer with frequency counter function.
The temperature was varied from -30°C to +50°C. For +20°C the extreme power supply voltages of 85% and 115% were applied. After reaching each target temperature and waiting sufficient time to stabilize the temperature conditions in chamber and EUT one measurement was performed immediately after powering the EUT on, and two further measurements were performed after 5 and 10 minutes continuos operation of EUT.

4.5.2 Test Limits

FCC Part 15, Subpart C, §15.225 (e): The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of -20 degrees to +50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

4.5.3 Test Protocol

Temperature: 24°C
Air Pressure: 1028 hPa
Humidity: 32%

Op. Mode	Setup	Port
op-mode 2	Setup_a01	Enclosure

temperature/°C	voltage/V	minutes/min.	frequency/MHz	margin/Hz
50	5	0	13.560706	-706
50	5	5	13.560707	-707
50	5	10	13.560715	-715
40	5	0	13.560721	-721
40	5	5	13.560705	-705
40	5	10	13.560704	-704
30	5	0	13.560735	-735
30	5	5	13.560715	-715
30	5	10	13.560708	-708
20	5.75	0	13.560747	-747
20	5.75	5	13.560744	-744
20	5.75	10	13.560747	-747
20	5	0	13.560725	-725
20	5	5	13.560728	-728
20	5	10	13.560719	-719
20	4.25	0	13.560683	-683
20	4.25	5	13.560684	-684
20	4.25	10	13.560690	-690
10	5	0	13.560752	-752
10	5	5	13.560732	-732
10	5	10	13.560727	-727
0	5	0	13.560755	-755
0	5	5	13.560749	-749
0	5	10	13.560744	-744
-10	5	0	13.560756	-756
-10	5	5	13.560754	-754
-10	5	10	13.560752	-752
-20	5	0	13.560715	-715
-20	5	5	13.560736	-736
-20	5	10	13.560757	-757
-30	5	0	13.560619	-619
-30	5	5	13.560722	-722
-30	5	10	13.560738	-738

Remark: The limit is ±1.356 kHz.

4.5.4 Test result: Frequency tolerance

FCC Part 15, Subpart C	Op. Mode	Result
	op-mode 2	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	07.10.08	07.10.11
Signalling Unit for Bluetooth	PTW60	100004	Rohde & Schwarz	-	N/A *)
Universal Radio Communication Tester	CMU200	102366	Rohde & Schwarz	16.02.09	16.02.11
Universal Radio Communication Tester	CMU200	837983/052	Rohde & Schwarz	01.12.08	01.12.11
Signalling Unit for Bluetooth	CBT	100589	Rohde & Schwarz	14.08.08	N/A *)
Signalling Unit for GPS	SMU200	100912	Rohde & Schwarz	28.10.08	N/A *)

*) N/A – only used for signalling

EMI Test System

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
EMI Analyzer	ESI 26	830482/004	Rohde & Schwarz	06.12.07	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	01.06.11

EMI Radiated Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Antenna mast 4m	MA 240	240/492	HD GmbH H. Deisel	-	-
Biconical dipole	VUBA 9117	9117108	Schwarzbeck	27.10.08	27.10.13
Broadband Amplifier 18MHz-26GHz	JS4-18002600-32	849785	Miteq	12.11.08	12.05.09
Broadband Amplifier 30MHz-18GHz	JS4-00101800-35	896037	Miteq	12.11.08	12.05.09
Broadband Amplifier 45MHz-27GHz	JS4-00102600-42	619368	Miteq	12.11.08	12.05.09
Cable "ESI to EMI Antenna"	EcoFlex10	W18.01-2 W38.01-2	Kabel Kusch	12.11.08	12.05.09
Cable "ESI to Horn Antenna"	UFB311A UFB293C	W18.02-2 W38.02-2	Rosenberger-Microcoax	12.11.08	12.05.09
Double-ridged horn	HF 906	357357/002	Rohde & Schwarz	12.05.06	12.05.09
Double-ridged horn	HF 906	357357/001	Rohde & Schwarz	20.01.04	N/A – spare antenna
High Pass Filter	5HC3500/12750-1.2-KK	200035008	Trilithic	12.11.08	12.05.09
High Pass Filter	5HC2700/12750-1.5-KK	9942012	Trilithic	12.11.08	12.05.09
High Pass Filter	4HC1600/12750-1.5-KK	9942011	Trilithic	12.11.08	12.05.09
High Pass Filter	WHKX 7.0/18G-8SS	9	Wainwright	12.11.08	12.05.09
KUEP pre amplifier	Kuep 00304000	001	7 layers AG	-	N/A – spare antenna
Log.-per. Antenna	HL 562 Ultralog	830547/003	Rohde & Schwarz	17.05.06	17.05.09
Loop Antenna	HFH2-Z2	829324/006	Rohde & Schwarz	07.10.08	07.10.11
Pyramidal Horn Antenna 26.5 GHz	Model 3160-09	9910-1184	EMCO	28.02.08	N/A (Stand. Gain Horn)
Pyramidal Horn Antenna 40 GHz	Model 3160-10	00086675	EMCO	18.12.07	N/A (Stand. Gain Horn)

EMI Conducted Auxiliary Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Cable "LISN to ESI"	RG214	W18.03+W48.03	Huber+Suhner	12.11.08	12.05.09
Two-Line V-Network	ESH 3-Z5	828304/029	Rohde & Schwarz	13.10.08	13.10.11
Two-Line V-Network	ESH 3-Z5	829996/002	Rohde & Schwarz	-	-
Four-Line Network	ENY41	838119/004	Rohde & Schwarz	06.03.08	05.03.11

Auxiliary Test Equipment

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Broadband Resist. Power Divider N	1506A / 93459	LM390	Weinschel	-	-
Broadband Resist. Power Divider SMA	1515 / 93459	LN673	Weinschel	-	-
Digital Multimeter	177	86670383	Fluke	01.08.08	31.07.10
Digital Oscilloscope	TDS 784C	B021311	Tektronix	-	-
Fibre optic link Satellite	FO RS232 Link	181-018	Pontis	-	-
Fibre optic link Transceiver	FO RS232 Link	182-018	Pontis	-	-
I/Q Modulation Generator	AMIQ-B1	832085/018	Rohde & Schwarz	-	-
Notch Filter ultra stable	WRCA800/960 -6E	24	Wainwright	-	-
Temperature Chamber	VT 4002	58566002150010	Vötsch	29.02.08	28.02.09
Temperature Chamber	KWP 120/70	59226012190010	Weiss	29.02.08	28.02.09
ThermoHygro Datalogger 03	Opus10 THI (8152.00)	7482	Lufft Mess- und Regeltechnik GmbH	22.01.09	21.01.10
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	838164/004	Rohde & Schwarz	06.10.08	06.10.11
Spectrum Analyzer 9 kHz to 3 GHz	FSP3	836722/011	Rohde & Schwarz	06.10.08	05.10.11
Signal Analyzer 20 Hz to 26.5 GHz	FSIQ26	840061/005	Rohde & Schwarz	02.10.08	02.10.11
Near-Field Probe Set	Model 7405	00075639	ETS Lindgren	-	-

Anechoic Chamber

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

7 layers InterLab Bluetooth RF Test Solution - Setup C – Bluetooth BDR and EDR RF Conformance Test System

Equipment	Type	Serial No.	Manufacturer	Cal. data	Next cal.
Power Meter	NRVD	832025/059	Rohde & Schwarz	17.06.08	15.06.09
Power Sensor A	NRV-Z1	832279/013	Rohde & Schwarz	18.06.08	17.06.09
Power Supply	E3632A	MY40003776	Agilent	-	-
Power Supply	PS-2403D	-	Conrad	-	-
Power Supply	NGSM 32/10	2725	Rohde & Schwarz	28.04.08	27.04.09
Rubidium Frequency Normal	MFS	002	Datum GmbH	18.06.08	17.06.09
Signal Analyzer FSIQ26	FSIQ26	832695/007	Rohde & Schwarz	23.08.07	23.08.09
Signal Generator	SMP 03	833680/003	Rohde & Schwarz	04.07.06	04.07.09
Signal Generator	SMIQ03B	832870/017	Rohde & Schwarz	24.05.07	24.05.10
Signal Switching Unit	TOCT	030106	7 layers Inc.	-	-
Signalling Unit	CBT	100302	Rohde & Schwarz	07.05.08	06.05.09
ThermoHygro Datalogger 04	Opus10 THI (8152.00)	7481	Luft Mess- und Regeltechnik GmbH	22.01.09	21.01.10
Temperature Chamber	KWP 120/70	59226012190010	Weiss	29.02.08	28.02.09

6 Photo Report

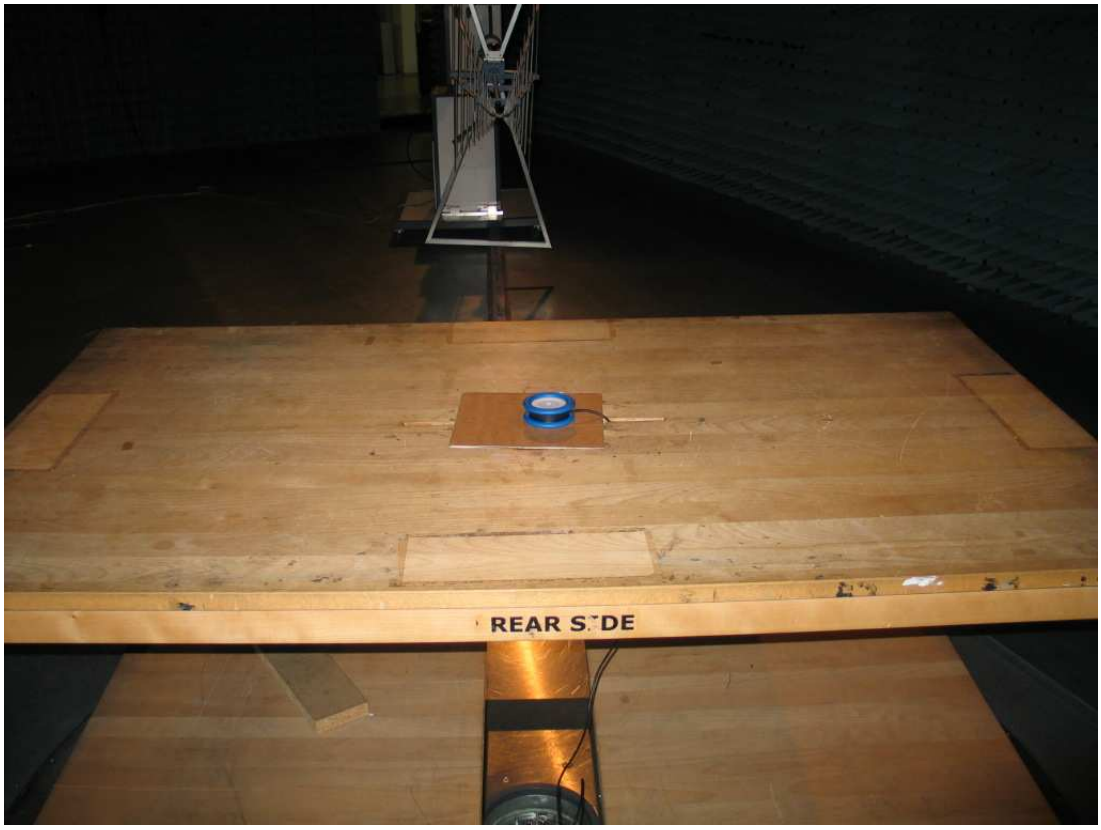


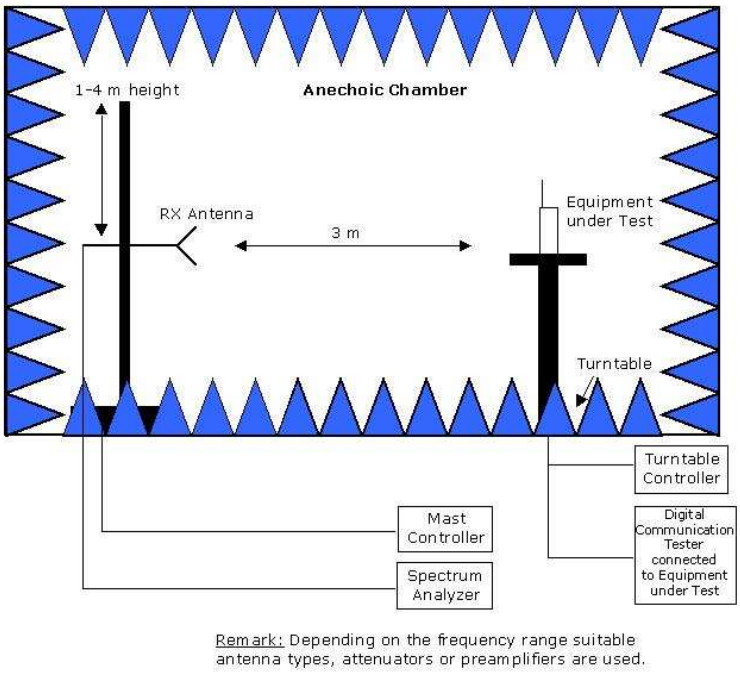
Photo 1: Test setup for radiated measurements

Photo 2: Test setup for conducted measurements (AC line)

Photo 3: EUT (front side)

Photo 4: EUT (rear side)

7 Setup Drawings



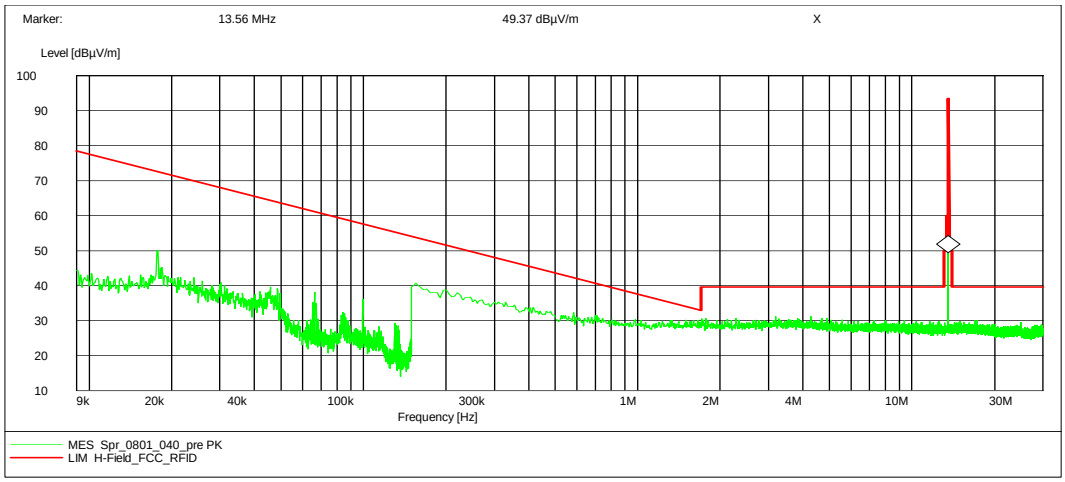
Drawing 1: Setup in the Anechoic chamber. For measurements below 1 GHz the ground was replaced by a conducting ground plane.

8 Annex measurement plots

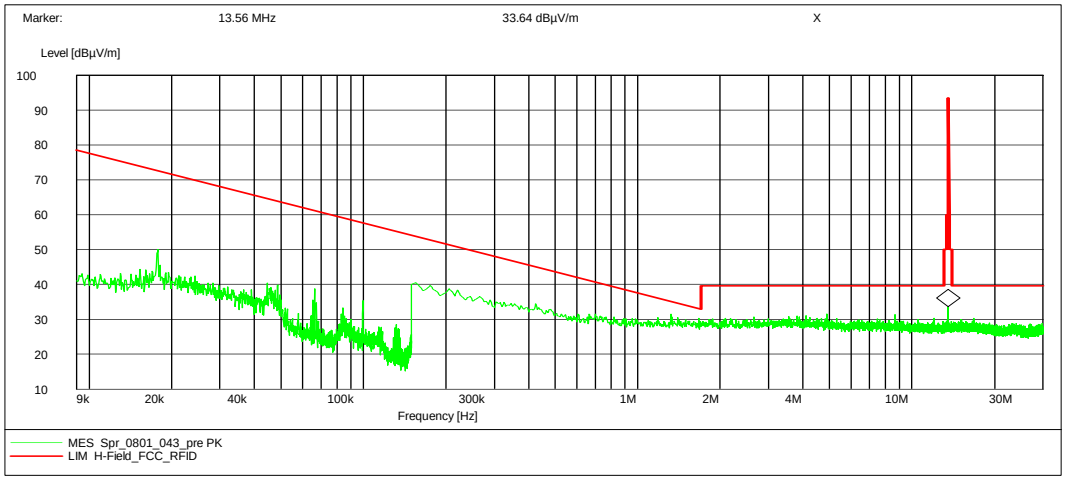
8.1 Radiated emissions

8.1.1 Radiated emissions (f<30MHz)

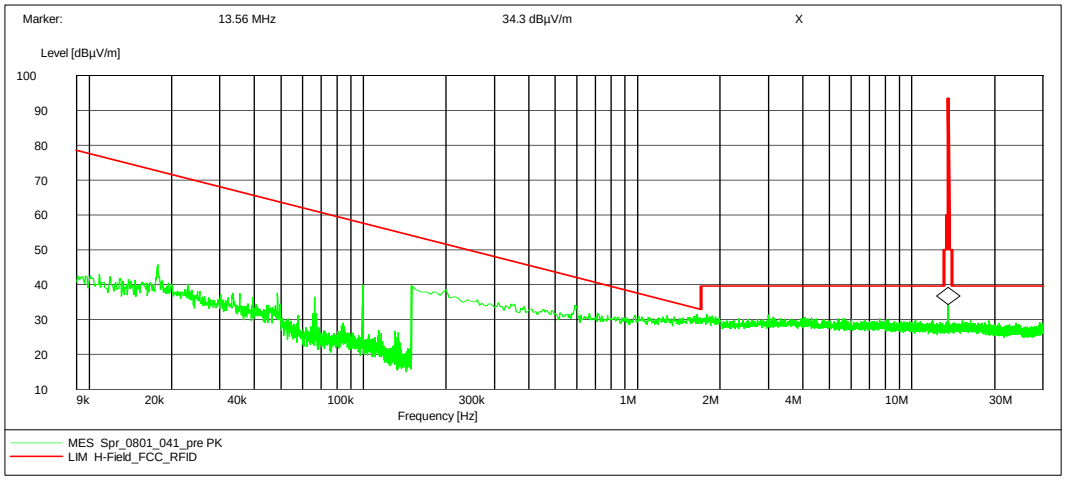
Antenna position 90°
EUT position vertical



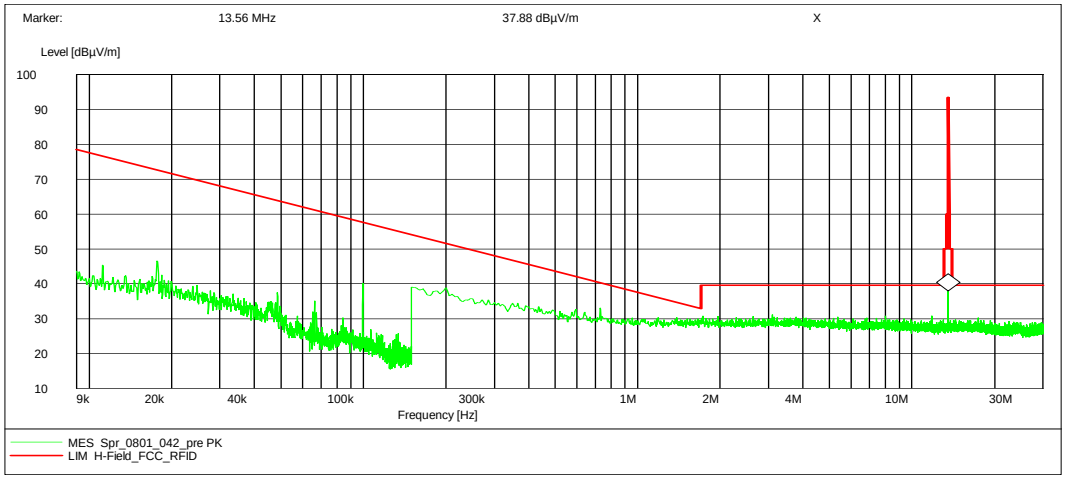
Antenna position 90°
EUT position horizontal



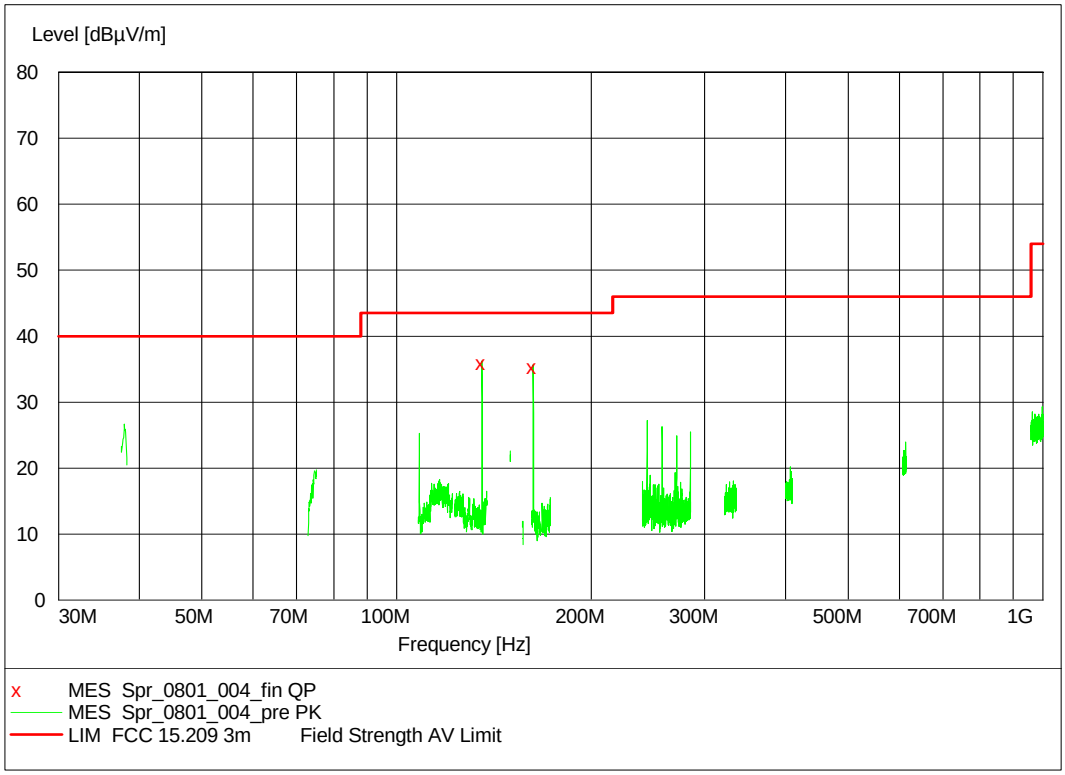
Antenna position 0°
EUT position vertical



Antenna position 0°
EUT position horizontal

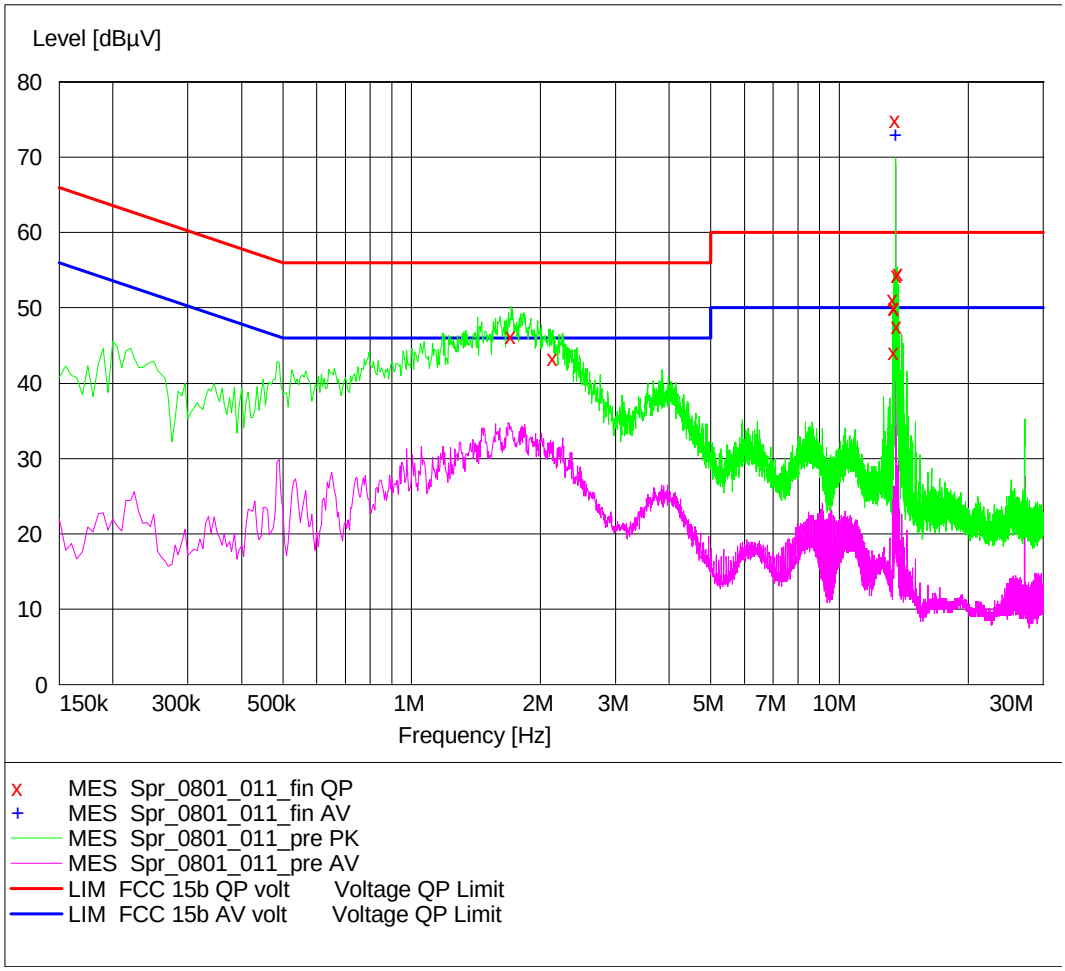


8.1.2 Radiated emissions (f>30MHz)



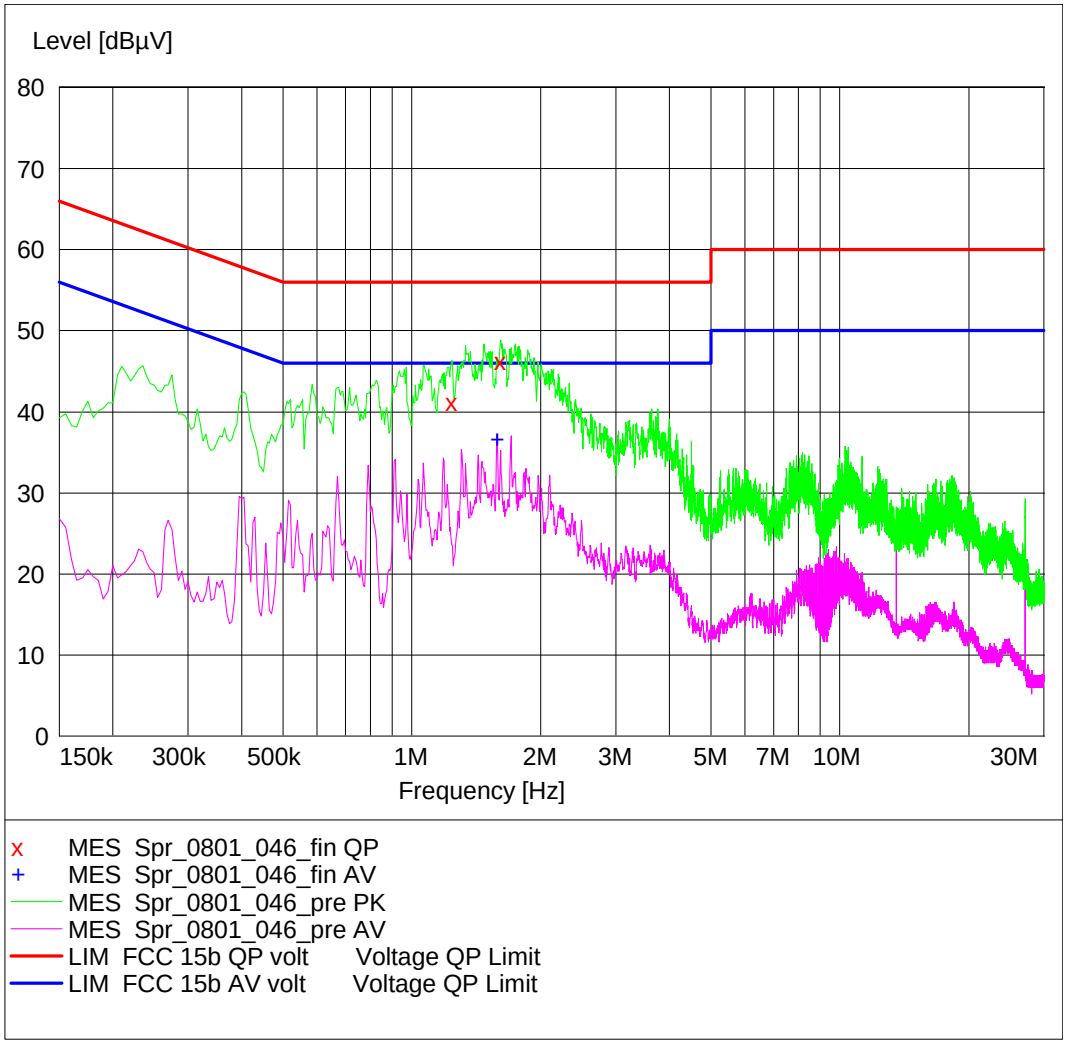
8.2 AC Mains conducted

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



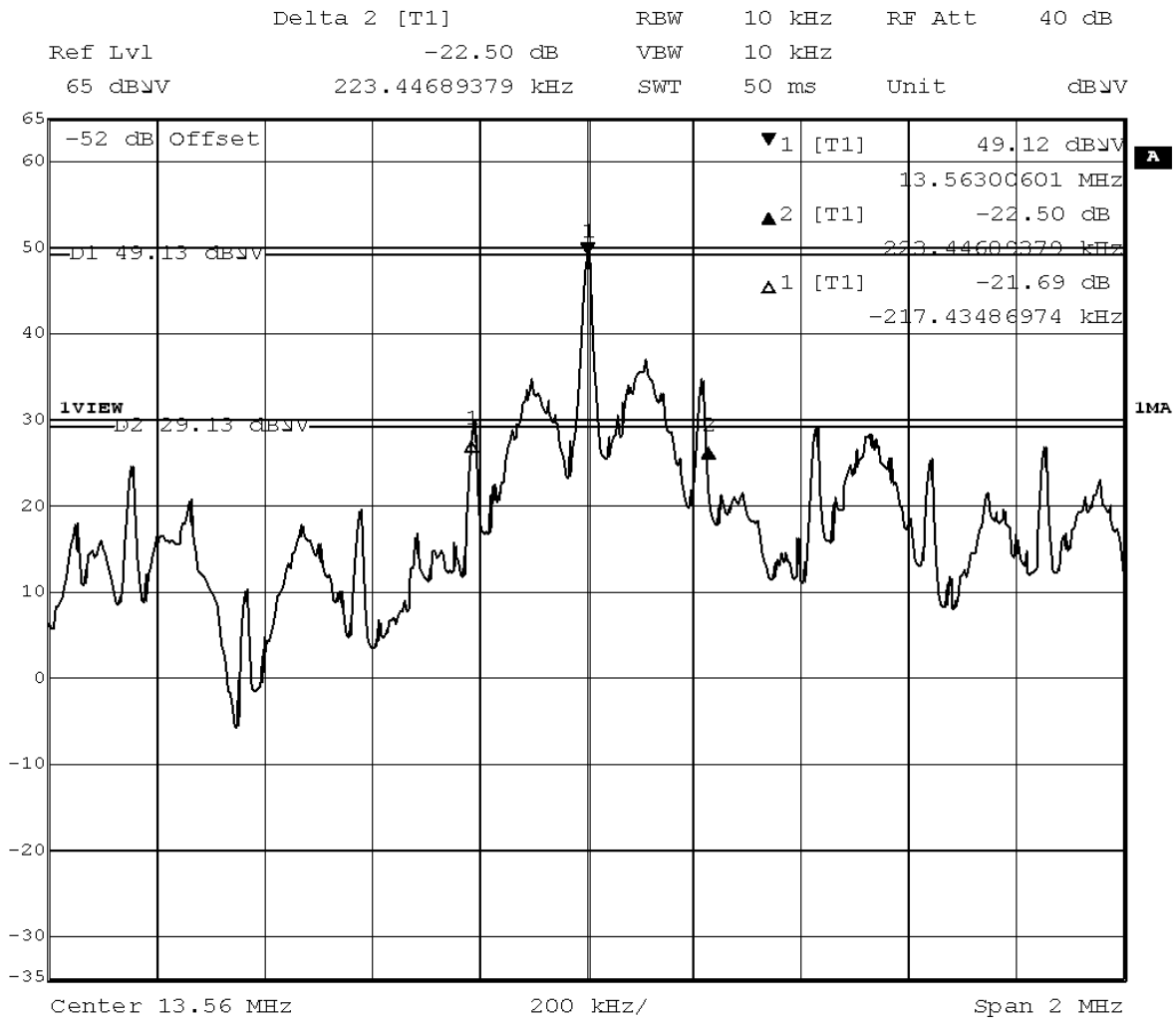
EUT equipped with permanent antenna

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



EUT equipped with suitable dummy load in lieu of permanent antenna

8.3 Occupied bandwidth



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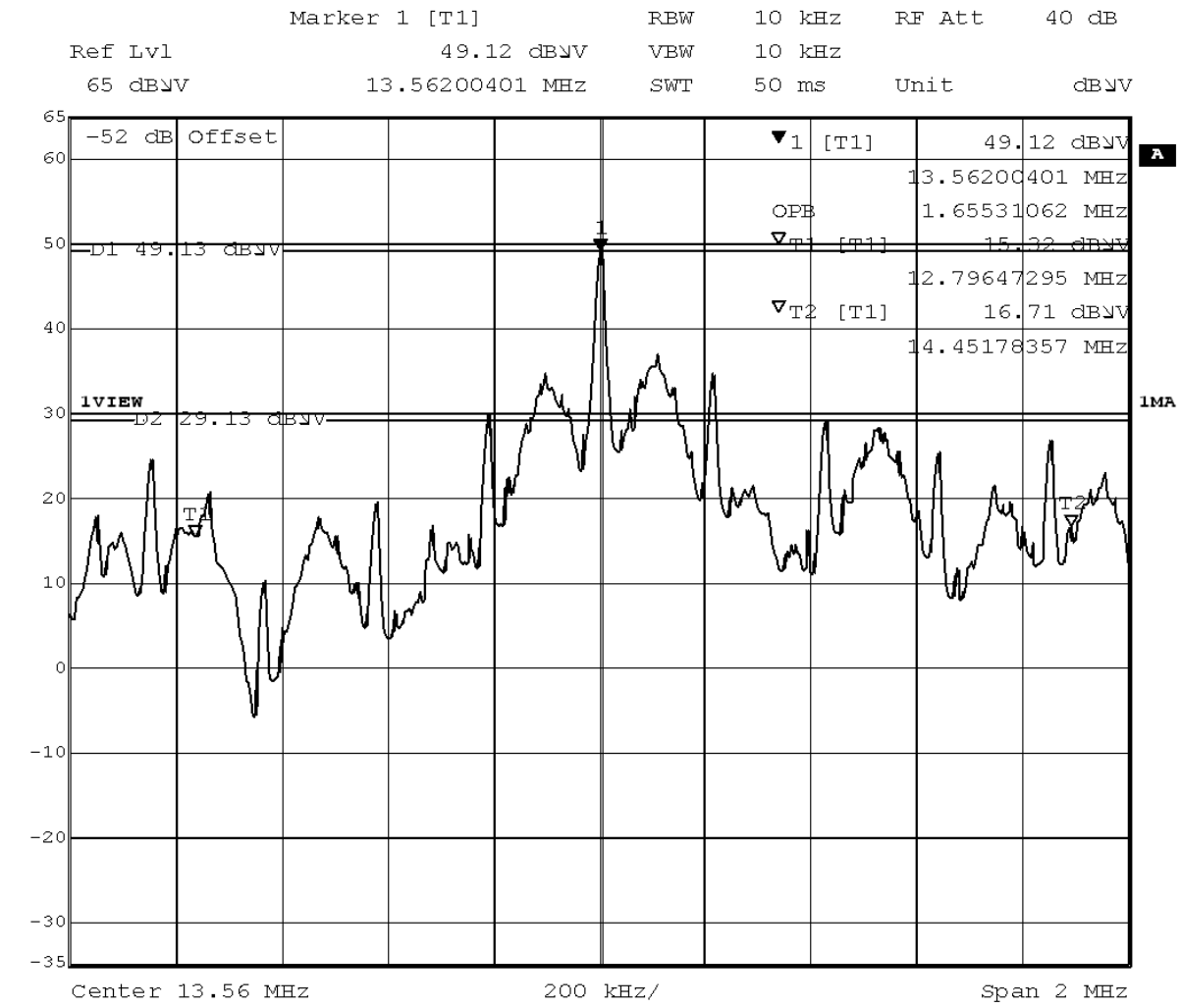
Comment A: D8000b02
Date: 25.FEB.2009 14:51:29



Title: 99% Bandwidth
Comment A: D8000b02
Date: 25.FEB.2009 14:54:59

8.4 Spectrum mask