RADIO TEST REPORT

No. 906106-3

EQUIPMENT UNDER TEST

Equipment:	13,56 MHz RFID module
Type / model:	CPX186 r2.0
Manufacturer:	Cypak AB
Tested by request of:	Cypak AB

SUMMARY

The equipment complies with the requirements of the following standards:

47 CFR, Part 15, Subpart B (2008) and Subpart C (2008);

Date of issue: November 12, 2009

Tested by: Stefan Andersson

Approved by: Niklas Larsson

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1. CLIENT INFORMATION

The EUT has been tested by request of

Company:	Cypak AB
Name of contact:	Jonas Tirèn Box 2332 10318 Stockholm Sweden

2. EQUIPMENT UNDER TEST (EUT)

2.1 Identification of the EUT according to the manufacturer/client declaration

Equipment:	13.56 MHz RFID module
Type/Model:	CPX186 r2.0
Brand name:	Cypak
Serial number:	Unmarked
Manufacturer:	Cypak AB
Rating/Supplying voltage:	USB bus 5VDC
Rating RF output power:	-
External antenna connector:	No
Operating temperature range:	-30 to +55 °C
Frequency range:	13.56 MHz
Number of channels:	1
Channel spacing	-
Stand by mode supported:	No

3. TEST SPECIFICATIONS

3.1 Standards

FCC 47 CFR part 15 (2008) Subpart B – Unintentional radiators

FCC 47 CFR part 15 (2008) Subpart C – Intentional Radiators; §15.225 Operation within the band 13.110 – 14.010 MHz.

Measurements methods according to ANSI C63.4-2003 - Methods of Measurements of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz

3.2 Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards.

3.3 Test set-up

Measurement set-ups for the test of out-of-band spurious emissions and field strength of emission test are described in corresponding sections. During other tests the EUT was connected to the spectrum analyzer small loop antenna.

3.4 Operating environment

If not additionally specified, the tests were performed under the following environmental conditions:

Air temperature:	20-25	°C
Relative humidity:	25-65	%

4. TEST SUMMARY

The results in this report apply only to the sample tested.

FCC reference	Test	Result	Note
15.225(a)	Field strength of emission at 13.553 - 13.567 MHz	PASS	
15.225(b)	Field strength of emission at 13.410 - 13.553 MHz and 13.567-13.710 MHz	PASS	
15.225(c)	Field strength of emission at 13.110 - 13.410 MHz and 13.710-14.010	PASS	
15.225(d)	Spurious emission	PASS	
15.225(e)	Frequency tolerance	PASS	
15.209(a)	Spurious emission	PASS	
15.207(a)	Conducted emission from AC mains	PASS	
15.109(a)	Radiated emission	PASS	

5. FIELDSTRENGTH OF EMISSION

5.1 Test protocol

Date of test: 2009-07-27

EUT mode of operation: TX.

Measurement receiver settings:

IF BW: 9 kHz
Sweep time: Auto
Detector: quasi Peak
Trace: Max Hold

Test site: Semi-anechoic shielded chamber (9 kHz – 30 MHz

The radiated electric field strength was measured in a semi-anechoic chamber at a distance of 10 m and the EUT was placed on a non-metallic table, 0, 8 m above the reference ground plane. The specified test mode was enabled.

The centre of the loop antenna placed 1,5 m, above the floor. The polarisation was horizontal and vertical. The measurement was done with the EUT rotated in 1-degree steps.

Channel (MHz)	Field strength (dBuV/m)	Plot	Limit value (dBuV/m) @ 10m
13.56	43.7	chapter 7.5	103.0

Measurement results are corrected for attenuation in the set-up configuration.

Example calculation:

Field strength [dBuV/m] = Analyser reading [dBuA/m] + cable loss [dB] + antenna gain [dBi] + preamplifier gain [dB] + H field to E field value conversion [dB]

6. FREQUENCY TOLERANCE

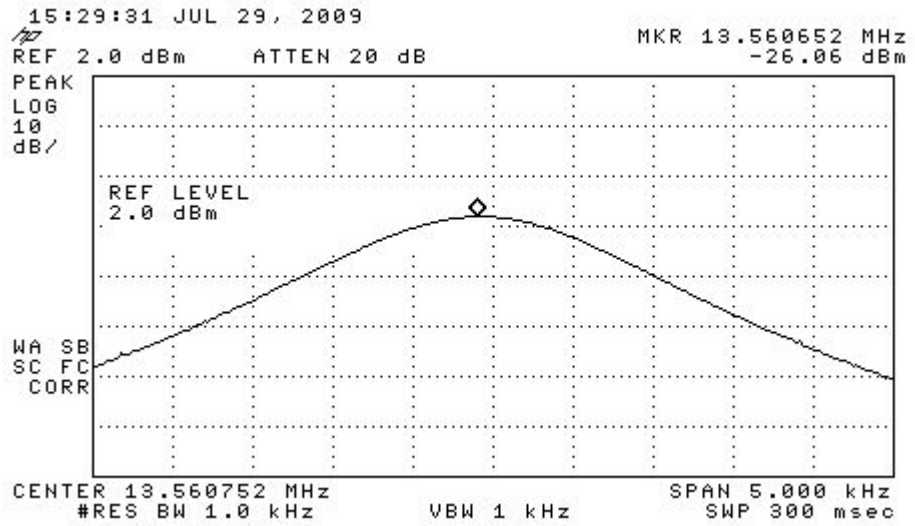
6.1 Test protocol

EUT was placed in climatic chamber.
Spectrum analyzer was used to record the transmitting frequency of the EUT.
A small loop antenna was placed on top of the EUT and connected to the spectrum analyzer.

Span: 5 kHz
Center frequency: on peak of carrier
RBW: 1 kHz
VBW: 1 kHz
Sweep time: Auto
Detector: Peak
Trace: clear write

Temperature °C	Plot	Results MHz	Limit value 0,01% ±1,3kHz
50	Plot P6.1	13.560652	PASS
40	Plot P6.2	13.560640	PASS
30	Plot P6.3	13.560690	PASS
20	Plot P6.4	13.560615	PASS
10	Plot P6.5	13.560652	PASS
0	Plot P6.6	13.560677	PASS
-10	Plot P6.7	13.560627	PASS
-20	Plot P6.8	13.560602	PASS
-30	Plot P6.9	13.560527	PASS

Plot P6.1



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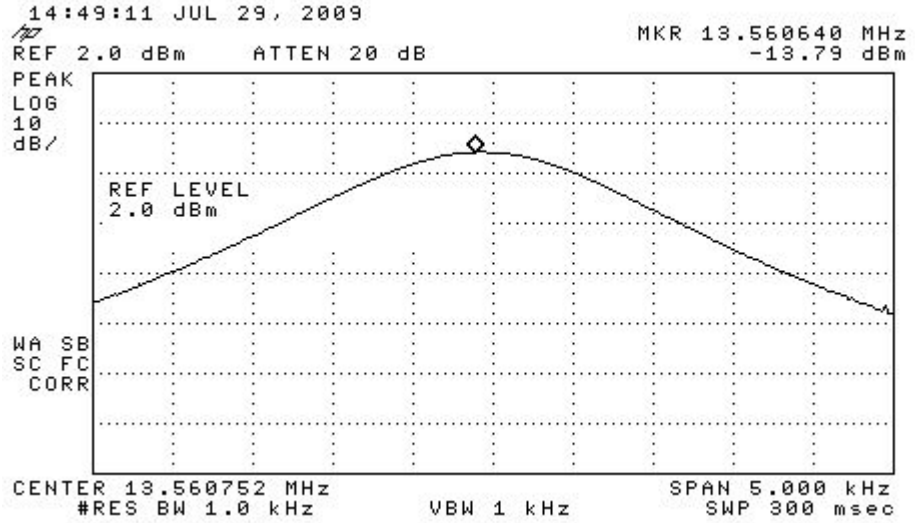
Plot P6.2



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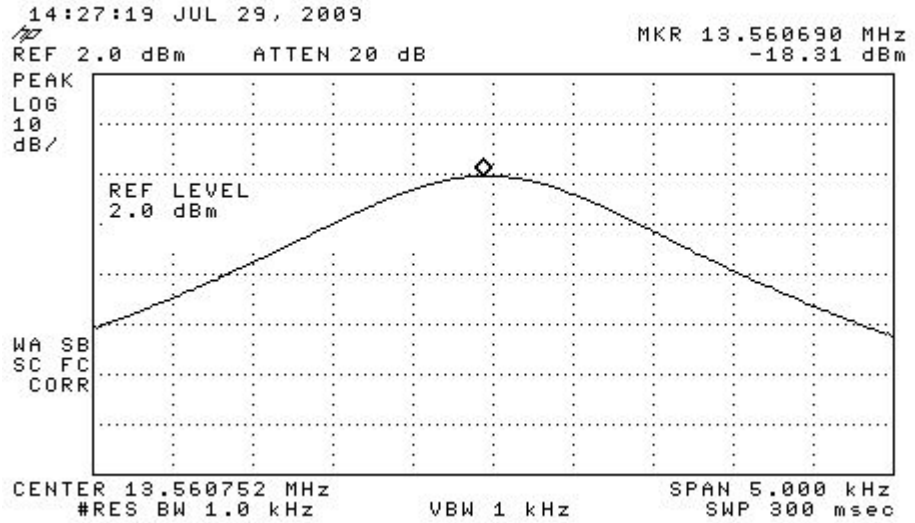
Plot P6.3



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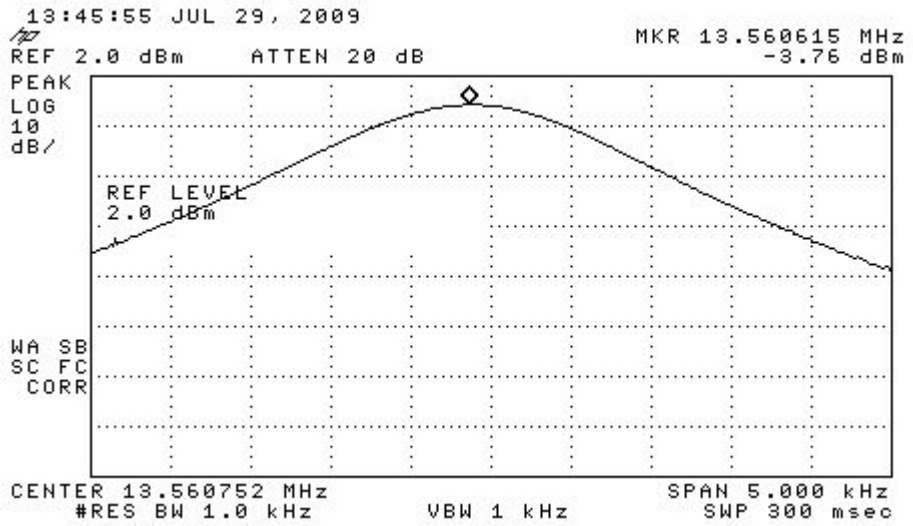
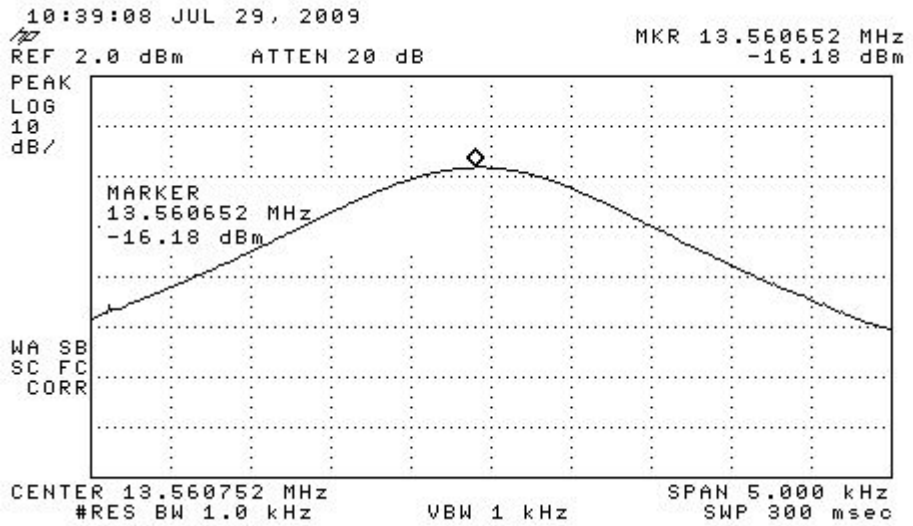
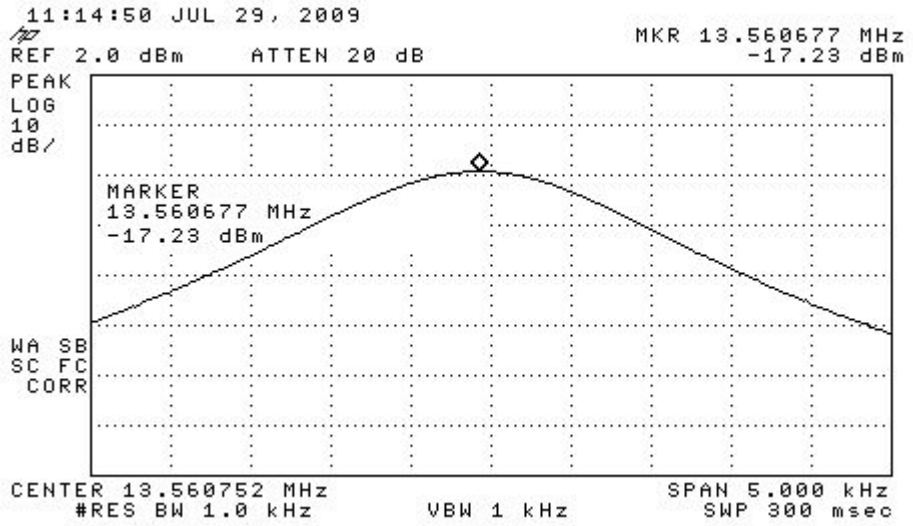
PlotP6.4



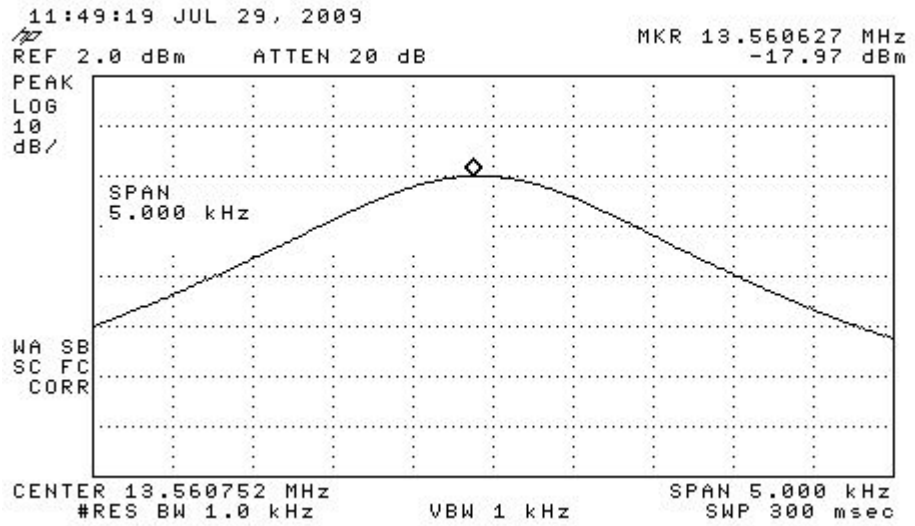
Plot P6.5



Plot P6.6



Plot P6.7



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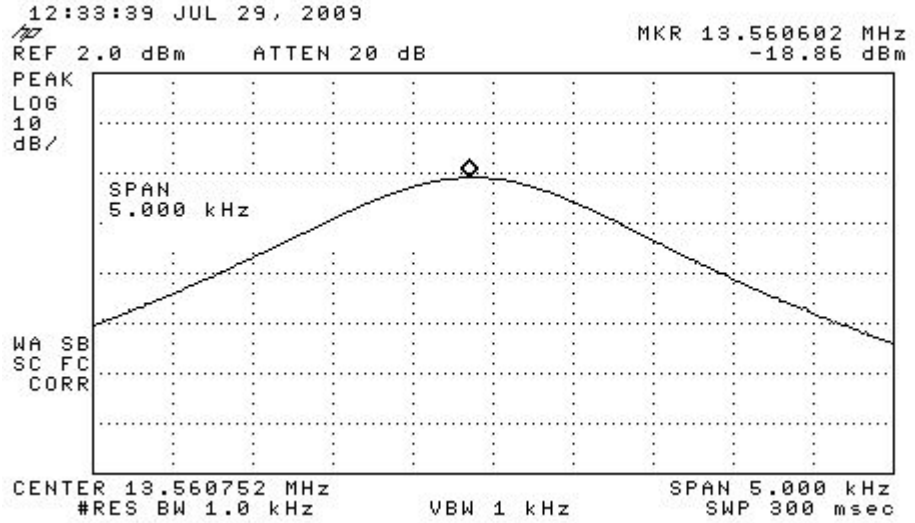
Plot P6.8



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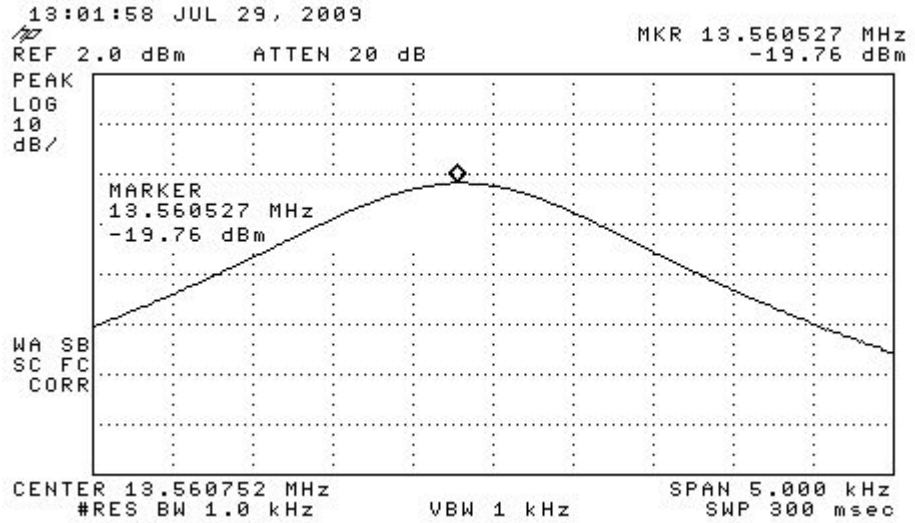
Plot P6.9



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7. RADIATED SPURIOUS EMISSIONS

7.1 Operating environment

Temperature: 20-25 °C (10 – 40 °C)
Relative Humidity: 25-45 % (10 - 90 %)

7.2 Measurement uncertainty

Radiated disturbance magnetic field intensity, 9 kHz – 30 MHz: ± 3.2 dB
Radiated disturbance electric field intensity, 30 – 1000 MHz: ± 4.6 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95%.

7.3 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
Test site: Big Chamber			
Software:	Rohde & Schwarz	EMC32	
Measurement receiver:	Rohde & Schwarz	ESCI	12798
Antenna:	Chase	CBL 6111	8578
Loop Antenna:	Rohde & Schwarz	HFH-2Z2	SPKTT48

7.4 Measurement set-up

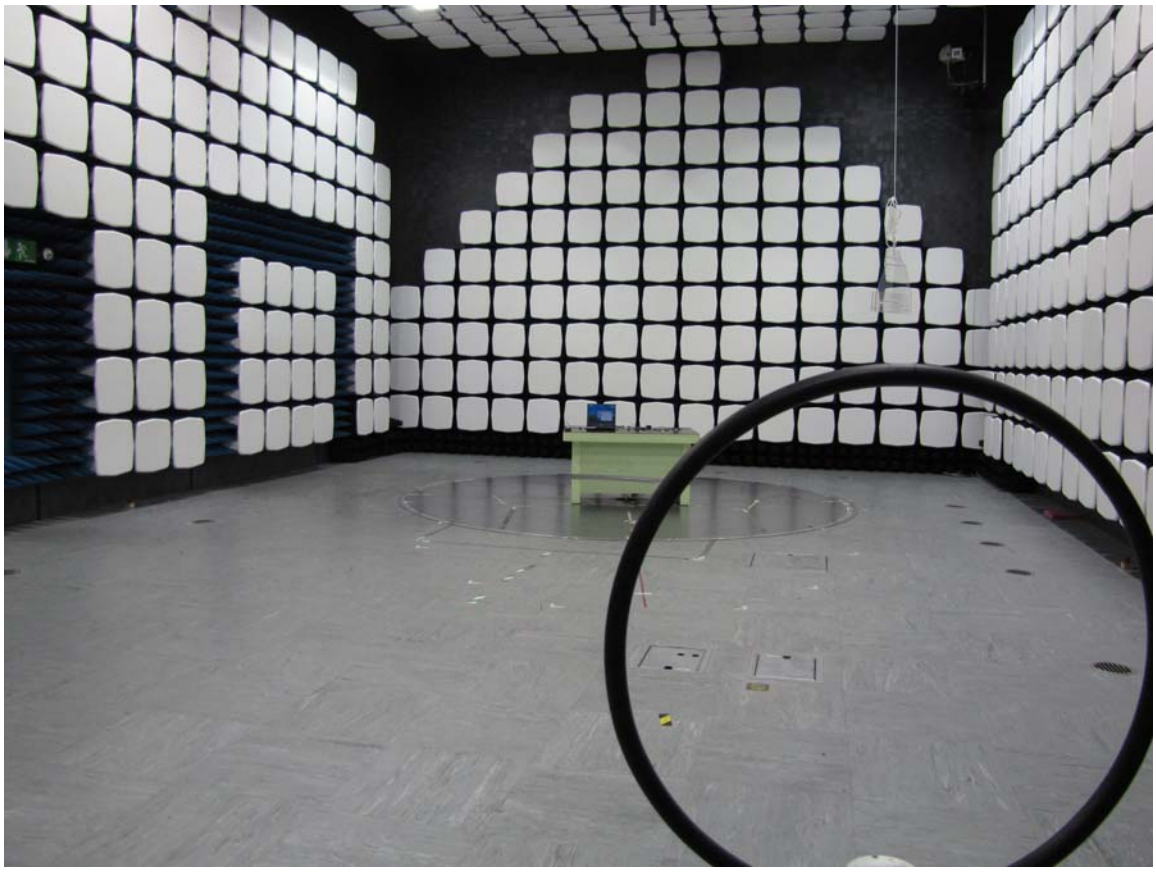
Test site: Semi-anechoic shielded chamber (9 kHz – 30 MHz

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 10 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photo is given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the centre of the loop antenna placed 1,5 m, above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements were carried out.

Test set-up photo:



Test site: Semi-anechoic shielded chamber (30 – 1000 MHz)

The radiated disturbance electric field intensity was measured in a semi-anechoic chamber at a distance of 3 m and the EUT was placed on a non-metallic table, 0,8 m above the reference ground plane. The specified test mode was enabled. Test set-up photo is given below.

An overview sweep with peak detection of the electric field intensity was performed with the measurement receiver in max-hold and with the antenna placed 1,5 m, 2,5 m and 3,5 m above the floor. The polarisation was horizontal and vertical. The measurements were repeated with the EUT rotated in 90-degree steps.

At the frequencies where high disturbance levels were found a search for max disturbance level was performed. With the EUT and antenna in the worst-case configuration new measurements were carried out.

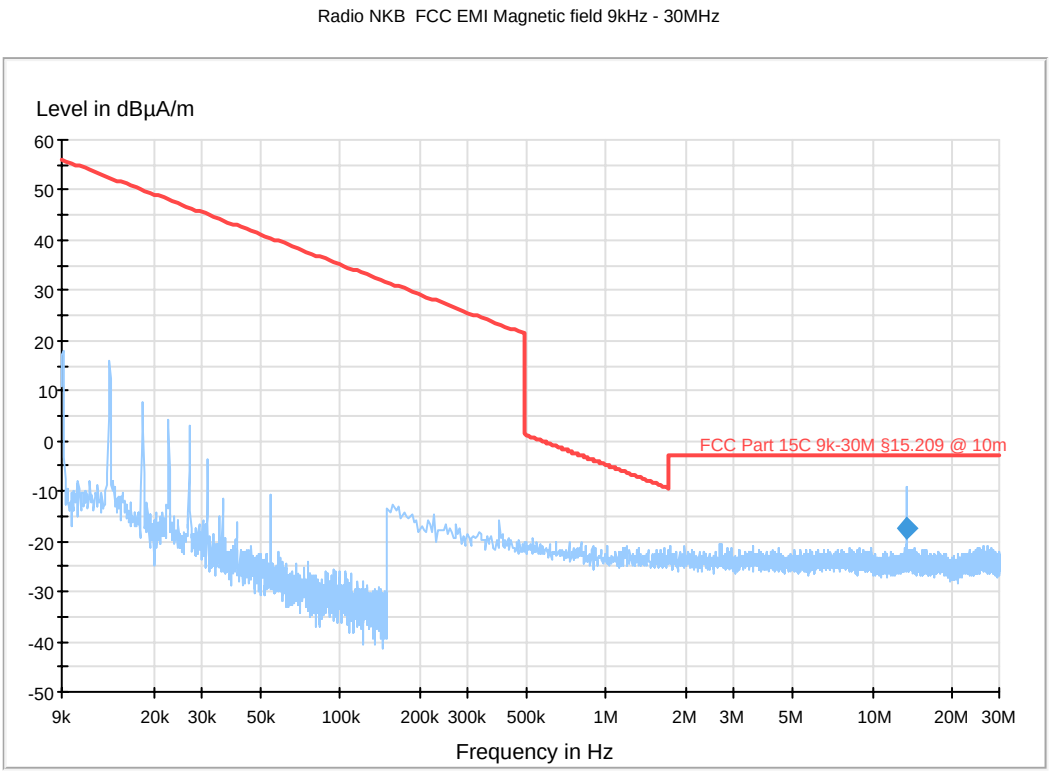
Test set-up photo:

7.5 Test protocol

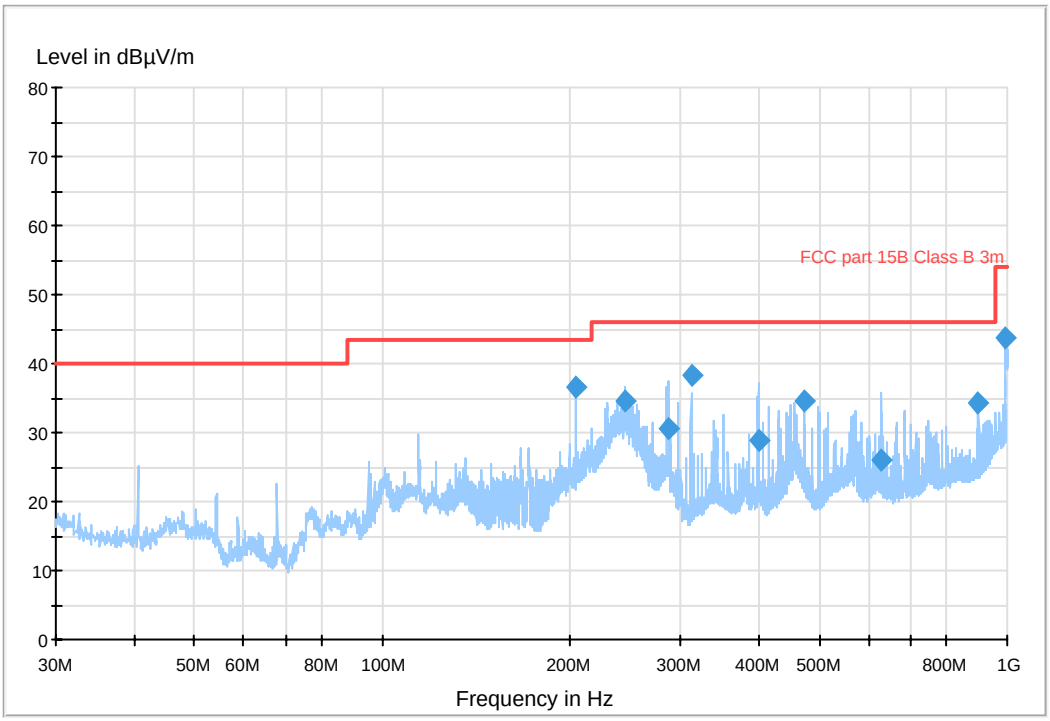
Semi-anechoic shielded chamber

Date of test: 2009-07-27

9kHz – 30 MHz, max peak at a distance of 10m TX



FCC 30 - 1000 MHz FCC class B 3m



30 – 1000 MHz, max peak at a distance of 3 m TX

Data summary

Field strength of spurious emissions						
Frequency	RBW	Measured level		Limit		Note
		Peak	QP/AV	Peak	QP/AV	
[MHz]	[kHz]	[dB(µV/m)]	[dB(µV/m)]	[dB(µV/m)]	[dB(µV/m)]	
13.560	9		43,7		103.0	Carrier
203.86	120		36.7		43.5	
244.12	120		34.6		46.0	
286.38	120		30.7		46.0	
311.91	120		38.3		46.0	
400.99	120		29.0		46.0	
472.51	120		34.6		46.0	
628.81	120		26.0		46.0	
900.01	120		34.3		46.0	
995.20	120		43.8		54.0	

Example calculation:
Measured level [dBµV/m] = Analyser reading [dBµV] + cable loss [dB] – preamplifier gain [dB] + antenna factor [1/m]

8. CONDUCTED EMISSION FROM AC MAINS

8.1 Operating environment

Temperature: 20-25 °C (10 – 40 °C)
Relative Humidity: 25-65 % (10 - 90 %)

8.2 Measurement uncertainty

Conducted disturbance intensity, 150 kHz – 30 MHz: ± 3.6 dB

The measurement uncertainty describes the overall uncertainty of the given measured value during operation of the EUT.

Measurement uncertainty is calculated in accordance with EA-4/02-1997.
The measurement uncertainty is given with a confidence of 95%.

8.3 Test equipment

Equipment	Manufacturer	Type	SEMKO No.
Software:	Rohde & Schwarz	ES-K1	
Measurement receiver:	Rohde & Schwarz	ESHS 30	4946
AMN:	Rohde & Schwarz	ESH2-Z3	2727

8.4 Measurement set-up

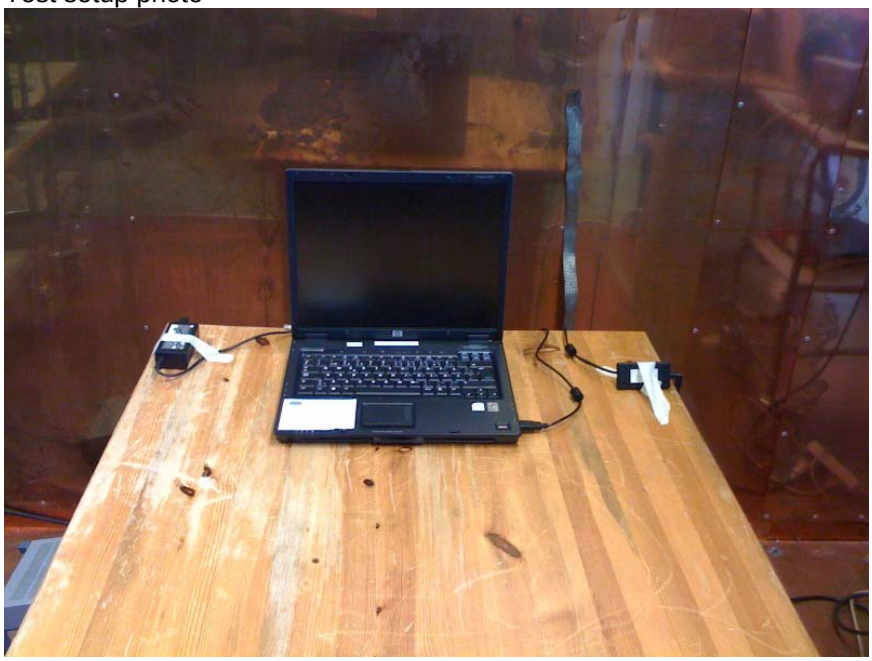
EUT was placed on a non-metallic table, 0,8 m above the reference ground plane and 0,4 m from conductive wall. EUT was connected to a PC and PC mains were connected to a LISN.

The RF part of the EUT was terminated with a terminator with equal impedance as the antenna to avoid radiated coupling to the AC cable from the computer.

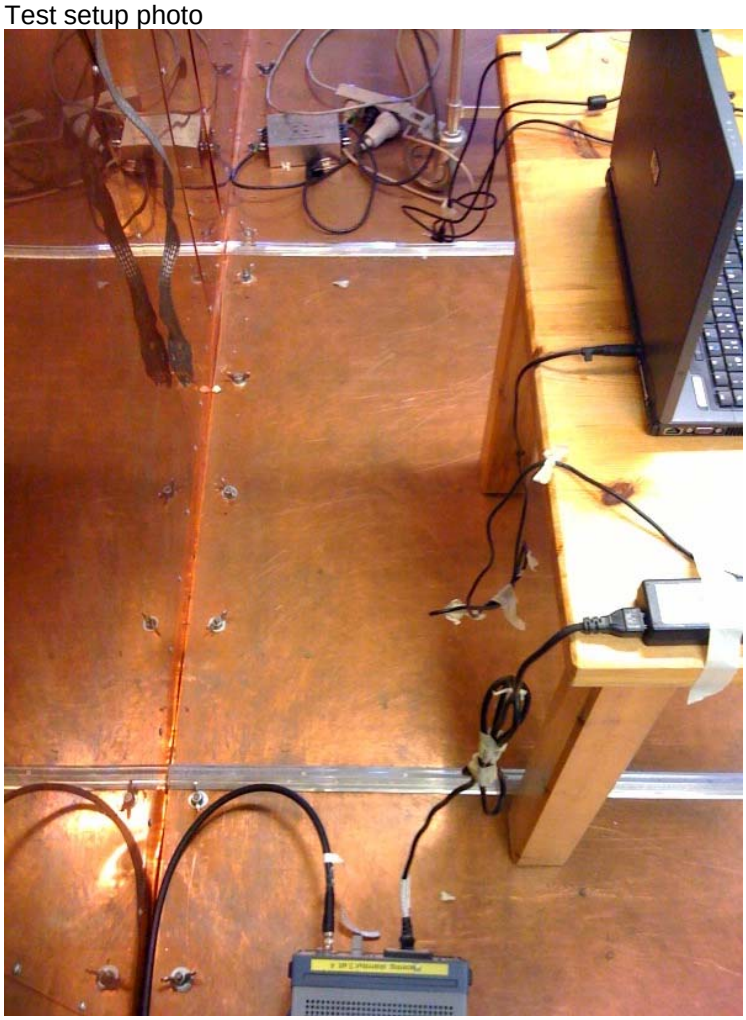
An overview sweep with peak and average detection of the disturbance voltage was performed with the measurement receiver in max-hold. Both line and neutral were measured.

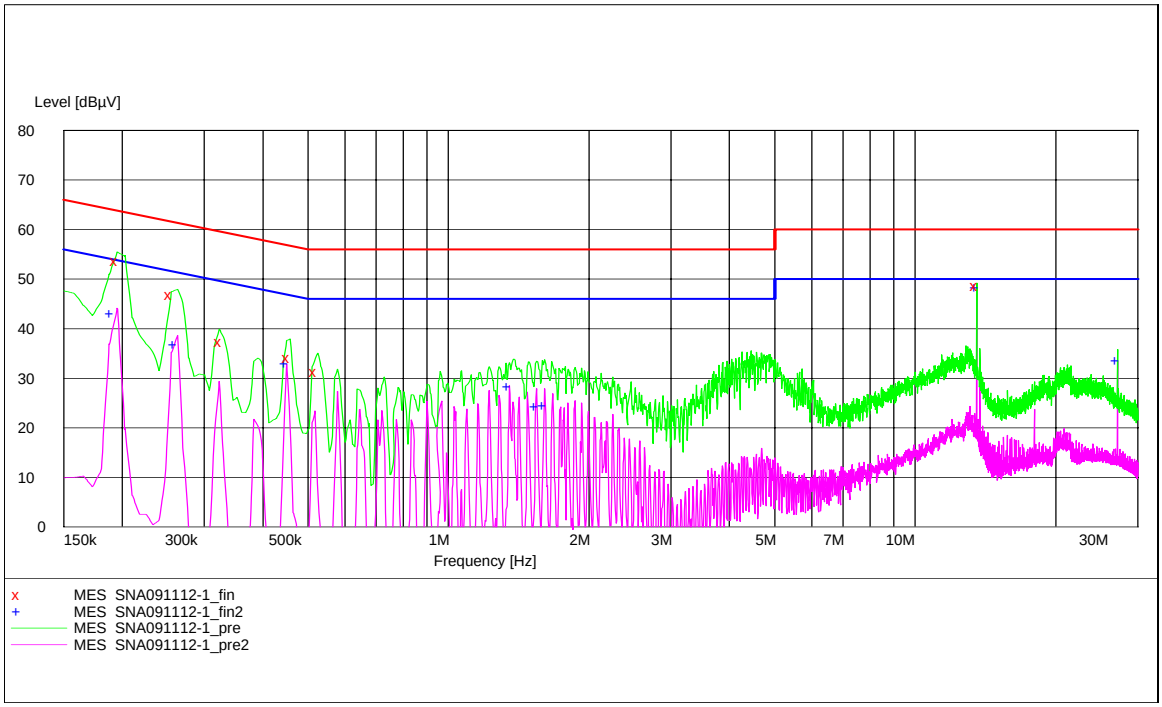
At the frequencies where high disturbance levels were found a final measurement was made with quasi peak and average detectors.

Test setup photo



Test setup photo





Data summary

Frequency /MHz	Quasi-Peak Disturbance Level /dB(µV)	Quasi-Peak Permitted limit /dB(µV)
0.195	53.7	63.8
0.255	46.9	61.6
0.325	37.3	59.6
0.455	34.2	56.8
0.520	31.4	56.0
13.560	48.7	60.0

Frequency /MHz	Average Disturbance Level /dB(µV)	Average Permitted limit /dB(µV)
0.190	43.0	54.0
0.260	36.8	51.4
0.450	32.9	46.9
1.350	28.2	46.0
1.545	24.2	46.0
1.605	24.5	46.0
13.560	48.3*	50.0
27.120	33.5	50.0

*The measured result is below the limit by a margin less than the measurement uncertainty; it is therefore not possible to state compliance based on the 95 % level of confidence. However, the result indicates that compliance is more probable than non-compliance with the specification limit.

APPENDIX – PHOTOS OF THE EUT