

Test Report

RF Test Report



Industry
Canada

Industrie
Canada

268.426

GiS mbH

RFID Reader
TS-HRW38

Customer:

GiS Gesellschaft für Informatik
und Steuerungstechnik mbH
Höllochstrasse 1
73252 Lenningen
Germany
Phone: +49.7026.606-0
Fax.: +49.7026.606-66



The test result refers exclusively
to the model tested.

This report must not be copied without
the written authorization by the lab.
Revision: 2.1



Registration number: DAT-P-224/95-02

EMV **TESTHAUS** GmbH

Gustav-Hertz-Straße 35
94315 Straubing
Tel.: +49 9421 56868-0
Fax: +49 9421 56868-100
Email: company@emv-testhaus.com

Accreditation:



Registration number: DAT-P-224/95-02
Valid until 08.06.2011

CAB (EMC) registration number: BNetzA-CAB-02/21-02/1
Valid until 27.11.2008

FCC facility registration number: 221458
Valid until 04.09.2011

Industry Canada registration number: 3472A-1
Valid until 17.07.2010

Place of Inspection:

EMV **TESTHAUS** GmbH
Gustav-Hertz-Strasse 35
94315 Straubing
Germany

The technical accuracy is guaranteed through the quality management of the
EMV **TESTHAUS** GmbH



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 2 of 53

Table of contents

1	Test regulations	4
2	Summary of test results separated by FCC and Industry Canada	5
3	Equipment under Test (EUT)	7
4	Modifications	10
5	Spectrum Mask	11
6	Conducted emission test.....	15
7	Measurement of radiated emission	22
8	Occupied Bandwidth (99%).....	36
9	Occupied Bandwidth (20dB)	39
10	Occupied Bandwidth (99%).....	43
11	Carrier frequency stability	46
12	Designation of emissions	49
13	Exposure of humans to RF fields	50
14	Equipment calibration status	52
15	Summary.....	53



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 2.1

GiS mbH
 RFID Reader
 TS-HRW38

268.426

Page 3 of 53

1 Test regulations

CFR 47 Part 2: 10-2007	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)
CFR 47 Part 15: 09-2007	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)
ANSI C63.4: December 2003	American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz
RSS-Gen Issue 2 June 2007	Radio Standards Specification RSS-Gen Issue 2 containing General Requirements and Information for the Certification of Radiocommunication Equipment, published by Industry Canada
RSS-102: Issue 2 November 2005	
RSS-210: Issue 7 June 2007	Radio Standards Specification RSS-210 Issue 7 for Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 4 of 53

2 Summery of test results separated by FCC and Industry Canada

FCC CFR 47 Part 2 and Part 15			
Section	Test	Page	Result
2.1046(a)	Conducted output power	----	Not applicable
2.202(a)	Occupied bandwidth	36	Recorded
15.215(c)	Occupied bandwidth	39	Passed
2.201, 2.202	Class of emission	49	Calculated
15.35(c)	Pulse train measurement	----	Not applicable
15.205(a) 15.205(d)(7)	Restricted bands of operation	----	Passed
15.207	Conducted emission at AC power line 0,150MHz to 30MHz	15	Passed
15.225(a)-(d)	Spectrum mask	11	Passed
15.205(b) 15.215(b) 15.225(a)(d)	Radiated emission 0,009MHz to 30MHz	22	Passed
15.205(b) 15.225(d)	Radiated emission 30MHz to 1000MHz	29	Passed
15.225(e)	Carrier frequency stability	46	Passed



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 5 of 53

Industry Canada RSS Gen Issue 2

Section	Test	Page	Result
4.8	Transmitter output power	----	Not applicable
4.6.1	Occupied bandwidth	43	Recorded
3.2(h)	Emission designator	49	Calculated
4.5	Pulsed operation	----	Not applicable
7.2.2	Transmitter AC conducted emission	15	Passed
5.5	Exposure of humans to RF fields	50	Exempted form SAR and RF evaluation

Industry Canada RSS 210 Issue 7

Section	Test	Page	Result
2.2(a)	Restricted bands and unwanted emission frequencies	----	Passed
A2.6	Spectrum mask	11	Passed
2.2(b)(c), 2.6, A2.6	Unwanted emission 0,009MHz to 30MHz	22	Passed
2.2(b)(c), 2.6, A2.6	Unwanted emission 30MHz to 1000MHz	29	Passed
A2.6	Carrier frequency stability	46	Passed



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 6 of 53

3 Equipment under Test (EUT)

Device name:	TS-HRW38
Manufacturer:	GiS mbH
Serial number:	0001
FCC ID:	WR5TSHRW38
Canada IC:	none
Application freq. band:	13.110MHz – 14.010MHz
Frequency range:	13,1466 MHz – 13,8906 MHz
Operating frequency:	13,56023 MHz
Class of emission:	10K0A1D
Type of modulation:	ASK
Channel spacing:	N/A
Number of RF-channels:	1
Pulse train:	none
Pulse width:	none
Antenna type:	Integrated PCB antenna
	<input type="checkbox"/> detachable <input checked="" type="checkbox"/> not detachable
Power supply:	USB powered
	nominal: 5.0 V minimum: 4.25 V maximum: 5.75 V
Temperature range:	-20 °C to +55 °C
Interfaces:	N/A



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 7 of 53


3.1 Photo documentation



Picture: 1 EUT TS-HRW38 front side



Picture: 2 EUT TS-HRW38 back side

	EMV TESTHAUS GmbH Gustav-Hertz-Straße 35 94315 Straubing Germany Revision: 2.1		GiS mbH RFID Reader TS-HRW38	
			268.426	Page 8 of 53

3.2 Short description of the EUT

The EUT is a RFID Reader with the operating frequency of 13.56 MHz

3.3 Operation Mode

The EUT was tested in the following operation mode:
Transmitting continuously without modulation. For this mode software from GiS was used.

3.4 Configuration

The following peripheral devices and interface cables were connected during the tests:

Device	Model:	S/N
RFID reader (EUT)	TS-HRW38	0020
Test Monitor	Belinea 10 17 05 with 1,8m cable attached. Ferrite 10cm away from VGA connector. Power cord 1.8m from Longwell	AA1117230420AC10400802
Test PC	Monitor Test PC 3 with 1,8m power cord form Longwell	302822800136
Keyboard	Cherry RS6000M, PS/2 cable 1.7m	G0572236 2 R3 2 I
Mouse	Logitech M-S48a, PS/2 cable 1.8m	LZH03691730

To find the worst case configuration pre tests in three orientations (x,y and z axis) were made. The worst configuration was used for the whole test.



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

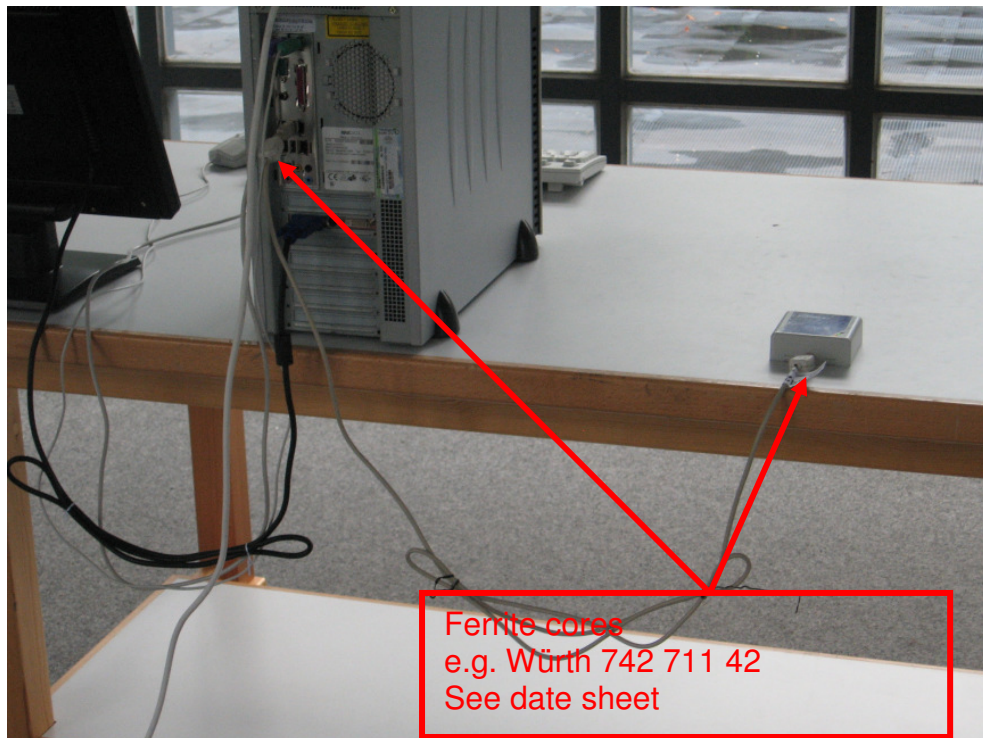
268.426

Page 9 of 53

4 Modifications

To keep the limit the following modifications need to be done:

- Add a ferrite core to the USB cable at both sides



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 10 of 53

5 Spectrum Mask

according to CFR 47 Part 15, section 15.225 (a)-(d),
RSS-210 Issue 7, section 2.6 and section A2.6

5.1 Test location

- ☐ Scan with peak detector in 3 m CDC
- ☐ CISPR measurement with quasi peak detector on 10m open area test site.
- ☒ Measurement with peak detector on 3m open area test site

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	100089
Open area test site	EMV TESTHAUS GmbH	200017

5.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	100072
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	100132
<input checked="" type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	100005
<input type="checkbox"/>	VULB 9163 (CDC)	Schwarzbeck	100077
<input type="checkbox"/>	VULB 9160 (FF)	Schwarzbeck	100064



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 11 of 53

5.3 Limits

Frequency [MHz]	Field strength Fs [μV/m]	Field strength [dBμV/m]	Measurement distance d [m]
1.705 – 13.110	30	29.5	30
13.110 -13.410	106	40.5	30
13.410 – 13.553	334	50.5	30
13.553 – 13.567	15848	84.0	30
13.567 – 13.710	334	50.5	30
13.710 – 14.010	106	40.5	30
14.010 – 30.000	30	29.5	30

To calculate the limit for 3m measurement distance the following calculation was used.

$$L_{dm} = L_d + (-40 \frac{dB}{dec} * (\log(dm) - \log(d)) - 20) L_{dm} = \text{Limit at the new distance}$$

L_d = Limit according ANSI 63.4
 dm = Distance according to ANSI 63.4
 d = New distance for limit

$$L_{dm} = 29,5 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(30m)) - 20) = 49,5dB$$

$$L_{dm} = 40,5 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(30m)) - 20) = 60,5dB$$

$$L_{dm} = 50,5 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(30m)) - 20) = 70,5dB$$

$$L_{dm} = 84 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(30m)) - 20) = 104dB$$



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 2.1

GiS mbH
 RFID Reader
 TS-HRW38

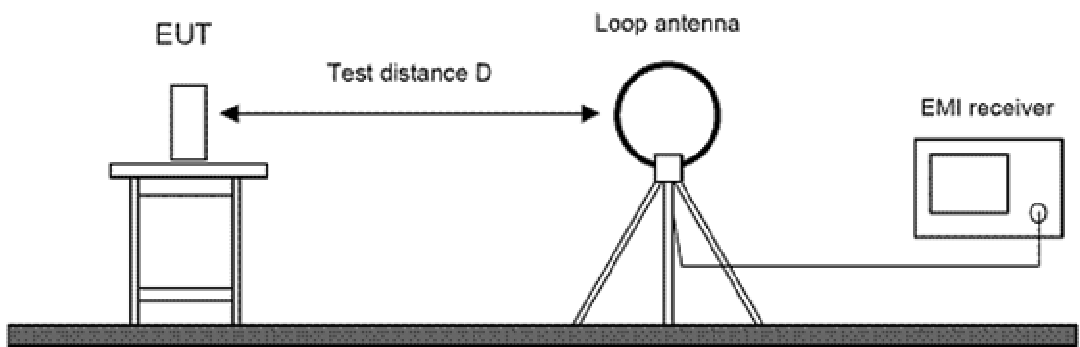
5.4 Test method to demonstrate compliance

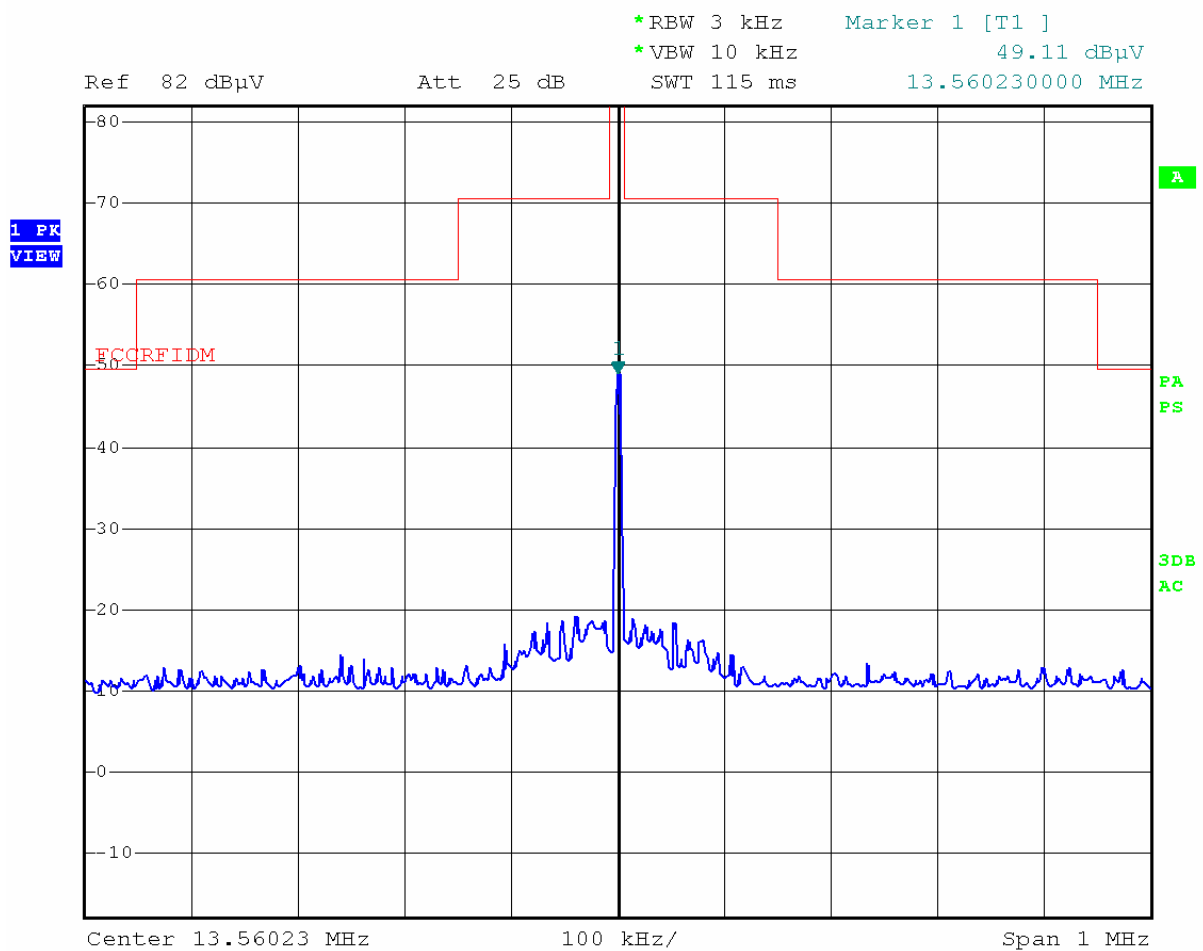
A spectrum analyzer was used and set to a center frequency equal to transmitter frequency. The resolution bandwidth was adjusted to 1 kHz and the video bandwidth at least 3 times higher than the resolution bandwidth. Span was set to 1MHz to cover the whole spectrum mask. The detector was set to maxpeak with hold function.

The spectrum analyzer was connected to a loop antenna with vertical polarization at a measurement distance of 3m on an open area test site. This loop antenna has a correction factor of 20dB. Due to better visibility in the printing the actual spectrum mask limit was reduced by this 20dB. Therefore the picture 3-1: shows the correct distance to the limit, to get the correct field strength 20dB has to be added to the marker value T1.

The EUT was placed on a turntable and rotate 360° to find maximum value. To find the maximum in horizontal polarization the EUT was rotated by 90°.

5.5 Test setup





Picture 5-1:Result of spectrum mask measurement

The actual field strength of the carrier is:

$$F_S = T1 + 20\text{dB} = 49,1\text{dB}\mu\text{V}/\text{m} + 20\text{dB} = 69,11\text{dB}\mu\text{V}/\text{m}$$

Expanded uncertainty (0,009 to 30MHz):

$$E_{(y)} = (y \pm 4,25) \text{ dB}\mu\text{A}/\text{m}; k=2.00$$

y = Indicated value

Comments:



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 14 of 53

6 Conducted emission test

according to CFR 47 Part 15, section 15.207
RSS-Gen Issue 2, section 7.2.2

6.1 Test Location

Description	Manufacturer	Inventory No.
Shielded chamber	Siemens - Matsushita	200016

6.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESH 3	Rohde & Schwarz	100002
<input type="checkbox"/>	ESCS 30	Rohde & Schwarz	100072
<input type="checkbox"/>	ESCI	Rohde & Schwarz	100132
<input checked="" type="checkbox"/>	ESH3 Z2	Rohde & Schwarz	200051
<input checked="" type="checkbox"/>	ESH 2-Z5	Rohde & Schwarz	100040



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 15 of 53

6.3 Limits

Frequency [MHz]	Quasi-peak [dB μ V]	Avarage [dB μ V]
0.15 – 0.5	66 - 56	56 – 46
0.5 – 5.0	56	46
5 – 30	60	50

6.4 Test method to demonstrate compliance

The tests of conducted emission were carried out in a shielded room using a line impedance stabilization network (LISN) 50 μ H/50ohms and a EMI test receiver.

The EMI test receiver was connected to the LISN and set to a measurement bandwidth of 9kHz in the frequency range form 0.15MHz to 30MHz.

The EUT was placed on a wooden table and connected to the LISN.

To accelerate the measurement the detector of the EMI test receiver was set to peak and the whole frequency range form 0.15MHz to 30MHz were scanned. After that all peaks values with fewer margins than 10dB to quasi-peak limit or exceeding the limit were marked and re-measured with quasi-peak detector. If after that all values are under the average limit no addition measurement is necessary. In case there are still values between quasi-peak and average limit than these values were re-measured again with an average detector.

These measurements were done on all current carrying conductors.

According to ANSI C63.4, section 13.1.3.1 testing of intentional radiators with detachable antennas shall be done with a dummy load otherwise the tests should be done with connected antenna and if adjustable fully extended.



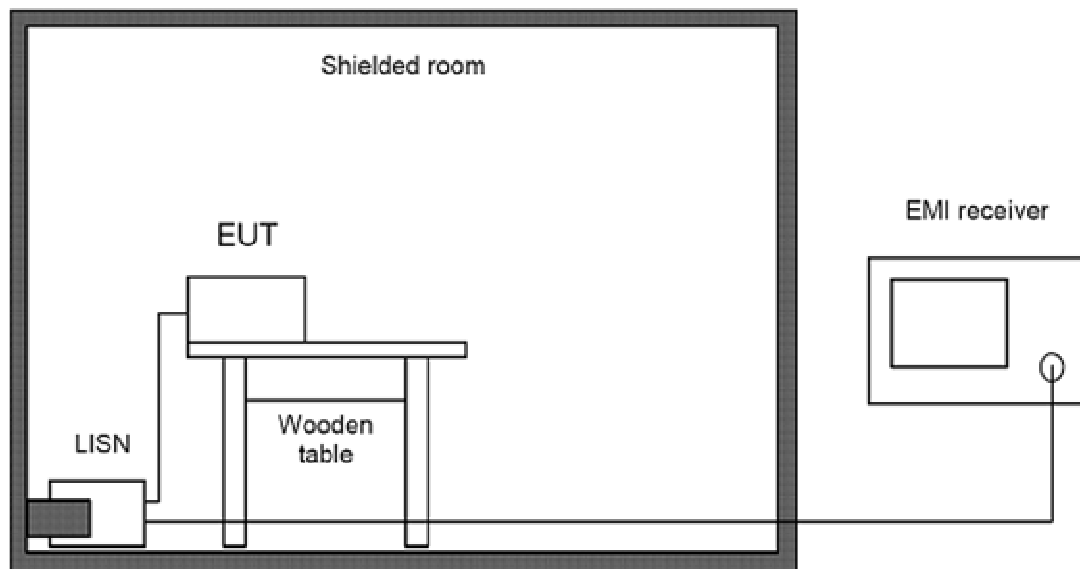
EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 16 of 53

6.5 Test setup



Expanded Uncertainty (9kHz to 150kHz):

$$U_{(y)} = (y \pm 4.024) \text{ dB}\mu\text{V}; k=2.00$$

y = Indicated value

Expanded Uncertainty (150kHz to 30MHz):

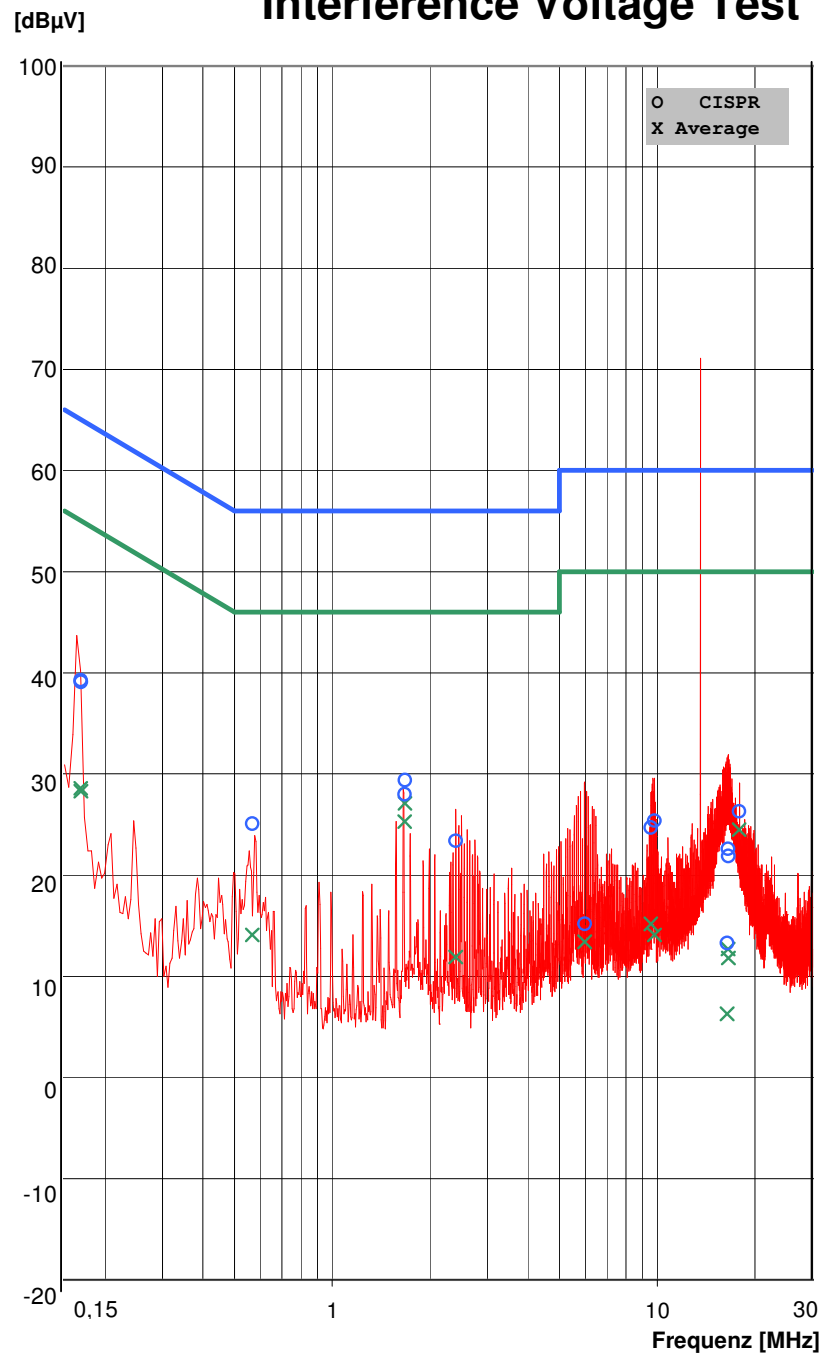
$$U_{(y)} = (y \pm 3.604) \text{ dB}\mu\text{V}; k=2.00$$

y = Indicated value

Comments: The 13,56MHz disturbance belongs to the carrier frequency, which is exempted for this test. Due to fixed internal antenna a test with 50ohm dummy was not possible.
All peripheral devices were additionally decoupled by means of a line stabilization network.

6.6 Test result

Interference Voltage Test



REGULATIONS:

FCC 15.207
PEAK / CISPR / AV

TEST EQUIPMENT:

R&S ESH3 (10 0 002)
R&S ESH2-Z5 (10 0 040)
R&S Pulse Limiter (20 0 051)

ORDER NO.:

268.426

EUT:

GiS mbH
RFID reader
TS-HRW38
1460-165V1.00#0020 08/08

OPERATION MODE:

PC connection USB
non-detachable cable

Mains 120V AC /60Hz / Line1
13,56 MHz = reader frequency

TEST FACILITY:

EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing

DATE / TIME:

23.09.2008
20 °C 45 %H

TEST ENGINEER:

Hofmann Michael

426 sr 02 L1.E10

Picture: 6-1 Conducted emission on mains, Line 1



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 18 of 53

Interference Voltage Test

Freq. [MHz]	U_CISPR [dBμV]	Limit [dBμV]	delta_U [dB]	U_AV [dBμV]	Limit [dBμV]	delta_U [dB]	Corr. [dB]	Remark
0,17	39,1	65,0	25,9	28,3	55,0	26,7	0,0	
0,17	39,3	65,1	25,8	28,6	55,1	26,5	0,0	
0,57	25,1	56,0	30,9	14,1	46,0	31,9	0,0	
1,67	28,0	56,0	28,0	25,3	46,0	20,7	0,0	
1,67	29,4	56,0	26,6	27,1	46,0	18,9	0,0	
2,40	23,4	56,0	32,6	11,9	46,0	34,1	0,0	
5,98	15,2	60,0	44,8	13,4	50,0	36,6	0,0	
9,55	24,7	60,0	35,3	15,2	50,0	34,8	0,0	
9,80	25,4	60,0	34,6	14,1	50,0	35,9	0,0	
16,41	13,3	60,0	46,7	6,3	50,0	43,7	0,0	
16,50	22,6	60,0	37,4	12,7	50,0	37,3	0,0	
16,56	21,9	60,0	38,1	11,8	50,0	38,2	0,0	
17,87	26,3	60,0	33,7	24,5	50,0	25,5	0,0	

Table: 6-1 Conducted emission on mains, Line 1

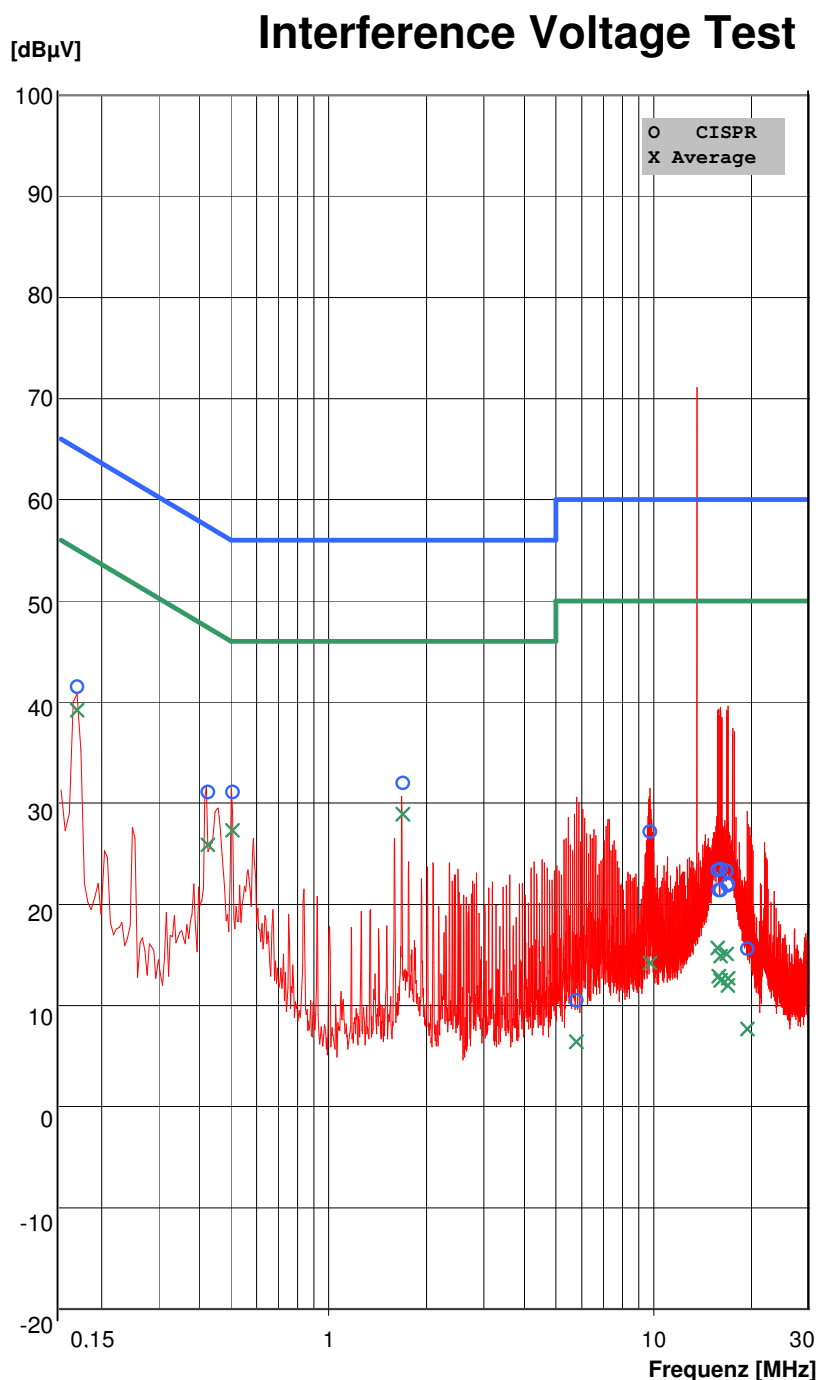


EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 19 of 53

**REGULATIONS:**

FCC 15.207
PEAK / CISPR / AV

TEST EQUIPMENT:

R&S ESH3 (10 0 002)
R&S ESH2-Z5 (10 0 040)
R&S Pulse Limiter (20 0 051)

ORDER NO.:

268.426

EUT:

GiS mbH
RFID reader
TS-HRW38
1460-165V1.00#0020 08/08

OPERATION MODE:

PC connection USB
non-detachable cable

Mains 120V AC /60Hz / Line2
13,56 MHz = reader frequency

TEST FACILITY:

EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing

DATE / TIME:

23.09.2008
20 °C 45 %H

TEST ENGINEER:

Hofmann Michael

426 sr 02 N.E10

Picture: 6-2 Conducted emission on mains, Line 2



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 20 of 53

Interference Voltage Test

Freq. [MHz]	U_CISPR [dBμV]	Limit [dBμV]	delta_U [dB]	U_AV [dBμV]	Limit [dBμV]	delta_U [dB]	Corr. [dB]	Remark
0,17	41,5	65,1	23,6	39,2	55,1	15,9	0,0	
0,43	31,1	57,3	26,2	25,9	47,3	21,4	0,0	
0,51	31,1	56,0	24,9	27,3	46,0	18,7	0,0	
1,69	32,0	56,0	24,0	28,9	46,0	17,1	0,0	
5,78	10,5	60,0	49,5	6,4	50,0	43,6	0,0	
9,74	27,2	60,0	32,8	14,2	50,0	35,8	0,0	
15,72	23,4	60,0	36,6	15,7	50,0	34,3	0,0	
15,85	21,4	60,0	38,6	12,9	50,0	37,1	0,0	
16,04	23,5	60,0	36,5	14,9	50,0	35,1	0,0	
16,06	21,4	60,0	38,6	12,5	50,0	37,5	0,0	
16,75	23,3	60,0	36,7	15,1	50,0	34,9	0,0	
16,89	21,9	60,0	38,1	12,0	50,0	38,0	0,0	
16,94	22,0	60,0	38,0	12,7	50,0	37,3	0,0	
19,42	15,6	60,0	44,4	7,7	50,0	42,3	0,0	

Table: 6-2 Conducted emission on mains, Line 2



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 21 of 53

7 Measurement of radiated emission

according to CFR 47 Part 15, section 15.205(d7), 15.209
RSS-210 Issue 7, section 2.6

7.1 Radiated emission measurement from 9kHz to 30MHz:

7.1.1 Location of measurement

- ☒ Scan with peak detector in 3 m CDC
- ☒ Final CISPR measurement with quasi peak detector on 3m open site area.

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	100089
Open site area	EMV TESTHAUS GmbH	200017

7.1.2 Measurement equipment

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	100072
<input checked="" type="checkbox"/>	ESCI (CDC and FF)	Rohde & Schwarz	100132
<input type="checkbox"/>	ESVP (FF)	Rohde & Schwarz	100001
<input type="checkbox"/>	VULB 9163 (CDC)	Schwarzbeck	100077
<input type="checkbox"/>	VULB 9160 (FF)	Schwarzbeck	100064
<input checked="" type="checkbox"/>	Feedline OATS	Huber & Suhner	200024
<input checked="" type="checkbox"/>	HFH2-Z2 (CDC and FF)	Rohde & Schwarz	100005



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 22 of 53

7.1.3 Limits

Frequency [MHz]	Field strength Fs [μV/m]	Field strength [dBμV/m]	Measurement distance d [m]
0.009 – 0.490	266.7 – 4.9	48.5 – 13.8	300
0.490 – 1.705	49.0 – 14.1	33.8 – 23.0	30
1.705 - 30	30	29.5	30

To calculate the limit for 3m measurement distance the following calculation was used.

$$L_{dm} = L_d + (-40 \frac{dB}{dec} * (\log(dm) - \log(d)))$$

L_{dm} = Limit at the new distance
 L_d = Limit according ANSI 63.4
 dm = Distance according to ANSI 63.4
 d = New distance for limit

$$L_{dm} = 48.5 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(300m))) = 128,5dB \quad \text{for 0.009MHz}$$

$$L_{dm} = 13.8 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(300m))) = 93.8dB \quad \text{for 0.490MHz (high)}$$

$$L_{dm} = 33.8 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(30m))) = 73.8dB \quad \text{for 0.490MHz (low)}$$

$$L_{dm} = 23 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(30m))) = 63dB \quad \text{for 1.705MHz (high)}$$

$$L_{dm} = 29.5 \frac{dB\mu V}{m} + (-40 \frac{dB}{dec} * (\log(3m) - \log(30m))) = 69.5dB \quad \text{for 1.705MHz (low)}$$



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 2.1

GiS mbH
 RFID Reader
 TS-HRW38

268.426

Page 23 of 53

7.1.4 Test method to demonstrate compliance

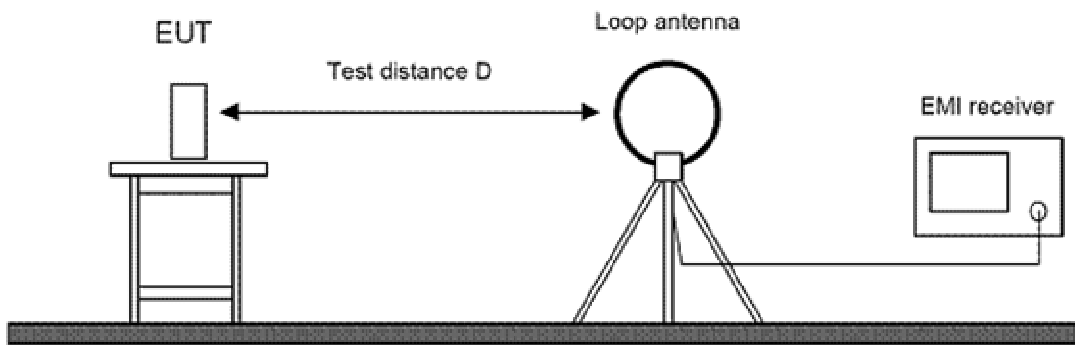
An EMI test receiver was used and connected to the loop antenna. The EUT was placed on a wooden table in a distance of 3m inside a compact diagnostic chamber.. The loop antenna was placed in vertical polarization at an angle of 0° and the EMI receiver performed a scan form 0.009MHz to 30MHz with the detector set to peak and the measurement bandwidth to 200Hz. At .150kHz the measurement bandwidth was changed to 9kHz.

This procedure was repeated at 6 different positions of the EUT by rotating turn table. All peak values over the limit or with less distance to limit then 6dB were marked and re-measured with a quasi-peak detector with the following method on a 3m open area test site.

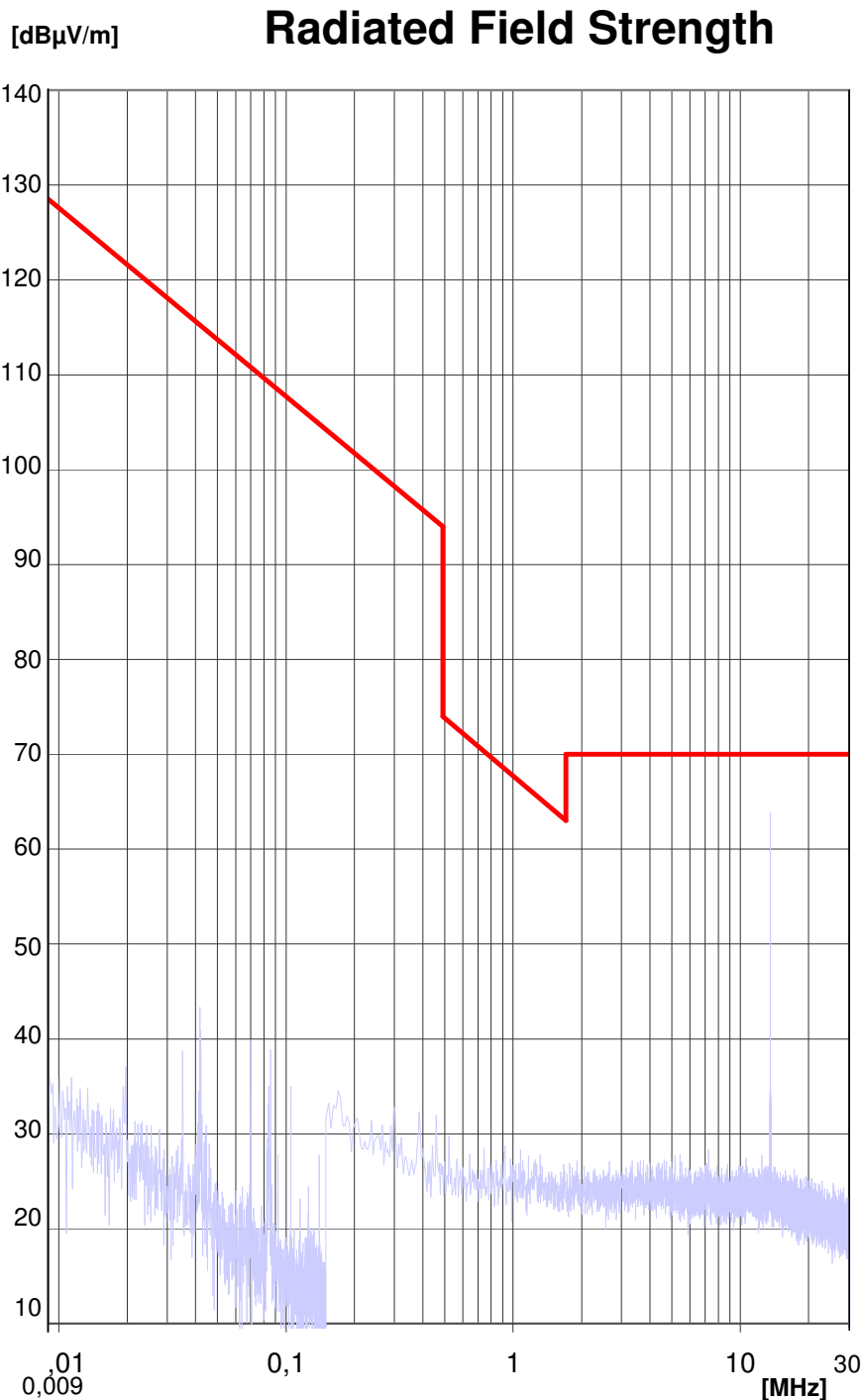
The turn table was turned 360° to find the position of maximum field strength. After reaching this position the loop antenna was rotated 360° to find the maxima. The measured value was recorded. This measurement was done for all marked frequencies with respect to the appropriate bandwidth for the frequency ranges.

To check the horizontal polarization the EUT was rotated by 90° instead of the loop antenna and the procedure was repeated. Both results are combined inside on graphic.

7.1.5 Test setup



7.1.6 Test result



REGULATIONS:

FCC 15.209 3m
PEAK / CISPR

TEST EQUIPMENT:

R&S ESCI (10 0 132)
R&S HFH2-Z2(10 0 005)
Suhner (20 0 024)

ORDER NO.:

268.426

EUT:

GiS mbH
RFID Reader
TS-HRW38
Engineering Sample

OPERATION MODE:

Continuous transmission
w/o modulation
13,56MHz

TEST FACILITY:

EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing

DATE / TIME:

22.09.2008
29 °C 32 %H 98 kPa

TEST ENGINEER:

Penning Axel

426 FCC cdc 9kHz-30MHz 01.E10

Picture: 7-1 Radiated field strength 0,009 MHz – 30 MHz (pre scan)



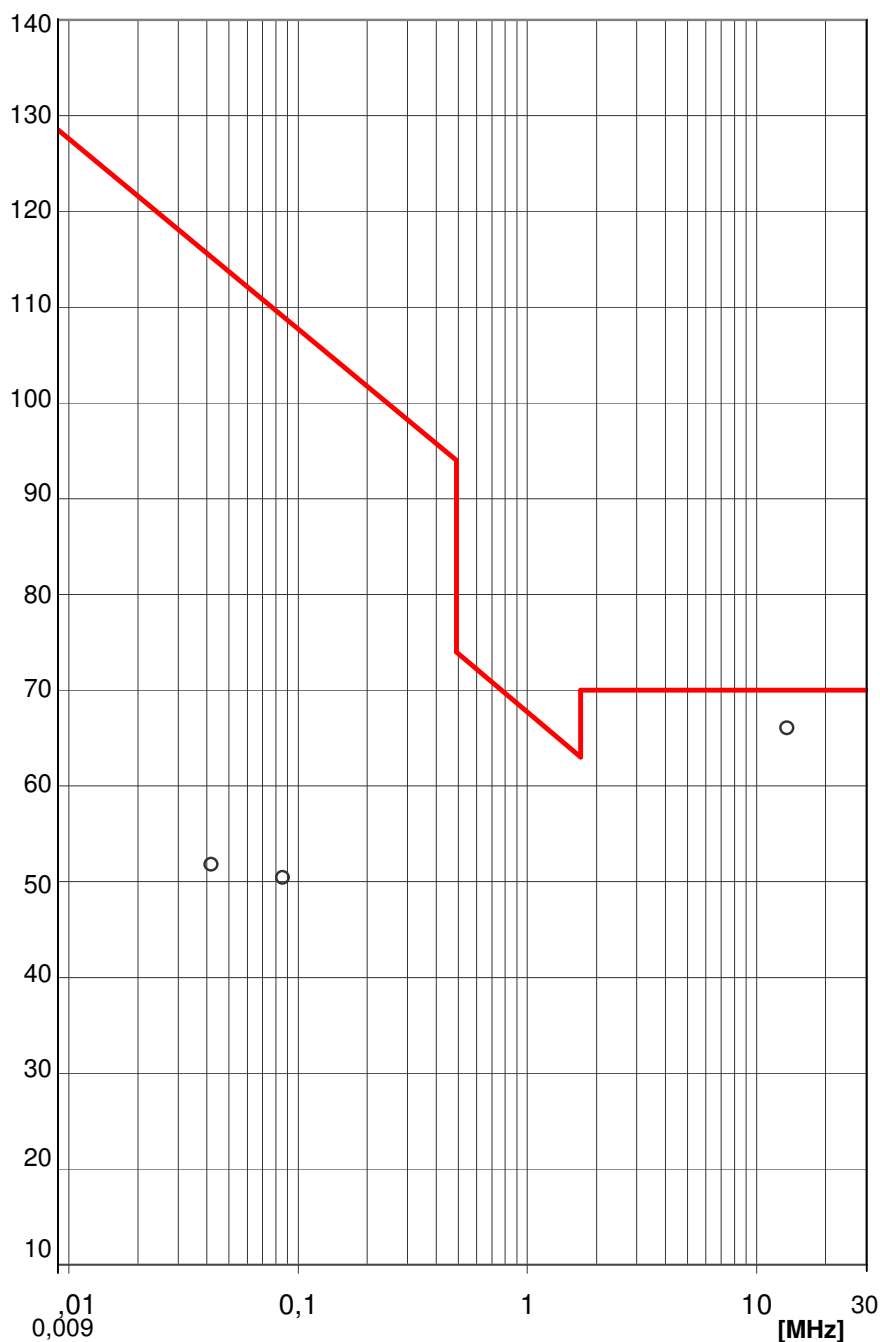
EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 25 of 53

Radiated Field Strength



REGULATIONS:

FCC 15.209 3m
PEAK / CISPR

TEST EQUIPMENT:

R&S ESCI (10 0 132)
R&S HFH2-Z2(10 0 005)
Suhner (20 0 024)

ORDER NO.:

268.426

EUT:

GiS mbH
RFID Reader
TS-HRW38
Engineering Sample

OPERATION MODE:

Continuous transmission
w/o modulation
13,56MHz

TEST FACILITY:

EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing

DATE / TIME:

22.09.2008
29 °C 32 %H 98 kPa

TEST ENGINEER:

Penning Axel

426 FCC cdc 9kHz-30MHz 01.E10

Picture: 7-2 Radiated field strength 0,009 MHz – 30 MHz (final)



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 26 of 53

Radiated Field Strength

Freq.	U_Rec	Limit	Corr.	U_Ant.	delta_U	Turn-	Antenna	Pol.	Remark
[MHz]	[dBµV/m]	[dBµV/m]	[dB]	dBµV/m]	[dB]	table			426 FCC cdc 9kHz-30MHz 01.E10
0,04	51,8	115,2	51,5	0,3	63,4	135°	100 cm	H	
0,09	50,4	109,1	51,5	-1,1	58,6	110°	100 cm	H	
13,56	66,1	70,0	51,5	14,6	3,9	75°	100 cm	H	

Table: 7-1 Radiated field strength 0,009 MHz – 30 MHz (final)

Expanded Uncertainty (9kHz to 150kHz):

$$U_{(y)} = (y \pm 4.024) \text{ dB}\mu\text{V}; k=2.00$$

y = Indicated value

Expanded Uncertainty (150kHz to 30MHz):

$$U_{(y)} = (y \pm 3.604) \text{ dB}\mu\text{V}; k=2.00$$

y = Indicated value



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 28 of 53

7.2 Radiated emission measurement from 30MHz to 1000MHz

7.2.1 Location of measurement

- ☒ Scan with peak detector in 3 m CDC witch is correlated to the 10m open site area.
- ☒ Final CISPR measurement with quasi peak detector on 10m open site area.

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	100089
Open site area	EMV TESTHAUS GmbH	200017

7.2.2 Measurement equipment

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	100072
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	100132
<input checked="" type="checkbox"/>	ESVP (FF)	Rohde & Schwarz	100001
<input checked="" type="checkbox"/>	VULB 9163 (CDC)	Schwarzbeck	100077
<input checked="" type="checkbox"/>	VULB 9160 (FF)	Schwarzbeck	100064
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	100005
<input checked="" type="checkbox"/>	Feedline OATS	Huber & Suhner	200024



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 29 of 53

7.2.3 Limits

Frequency [MHz]	Field strength Fs [μV/m]	Field strength [dBμV/m]	Measurement distance d [m]
30 – 88	100	40	3
88 – 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

To calculate the limit for 10m measurement distance the following calculation was used.

$$L_{dm} = L_d + (-20 \frac{dB}{dec} * (\log(dm) - \log(d)))$$

L_{dm} = Limit at the new distance
 L_d = Limit according ANSI 63.4
 d = Distance according to ANSI 63.4
 dm = New distance for limit

$$L_{dm} = 40 \frac{dB\mu V}{m} + (-20 \frac{dB}{dec} * (\log(10m) - \log(3m))) = 30dB \quad \text{for 30MHz to 88MHz}$$

$$L_{dm} = 43,5 \frac{dB\mu V}{m} + (-20 \frac{dB}{dec} * (\log(10m) - \log(3m))) = 33.5dB \quad \text{for 88MHz to 216MHz}$$

$$L_{dm} = 46 \frac{dB\mu V}{m} + (-20 \frac{dB}{dec} * (\log(10m) - \log(3m))) = 36dB \quad \text{for 216MHz to 960MHz}$$

$$L_{dm} = 54 \frac{dB\mu V}{m} + (-20 \frac{dB}{dec} * (\log(10m) - \log(3m))) = 44dB \quad \text{above 960MHz}$$



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 2.1

GiS mbH
 RFID Reader
 TS-HRW38

268.426

Page 30 of 53

7.2.4 Test method to demonstrate compliance

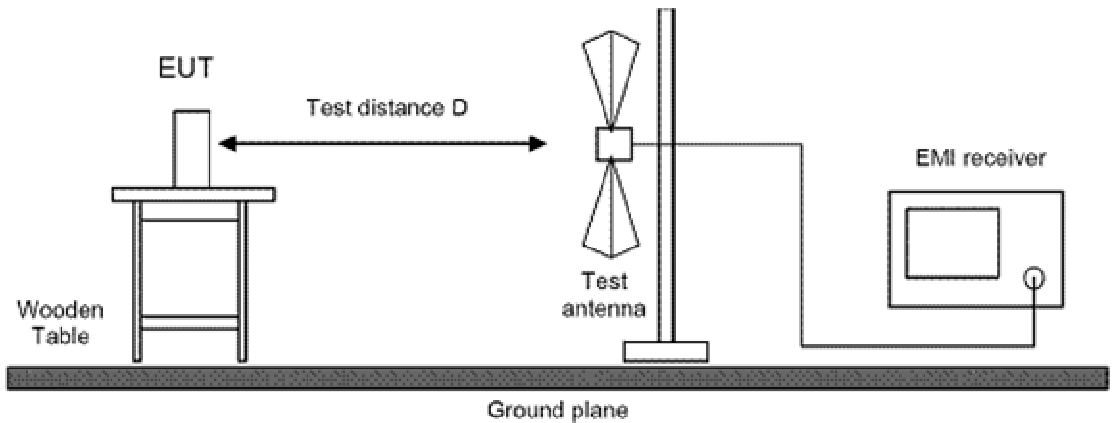
An EMI test receiver was used and connected to a broadband antenna. The EUT was placed on a wooden table in a distance of 3m inside a compact diagnostic chamber. This chamber is a fully anechoic chamber and correlated to our 10m open site. Therefore the 10m limit was applicable for the pre-scan inside this chamber. The broadband antenna was placed in vertical polarization and the EMI receiver performed a scan from 30MHz to 1000MHz with the detector set to peak and the measurement bandwidth to 120kHz.

This procedure was repeated at 6 different positions of the EUT by rotating turn table. After that die polarization switched to horizontal and repeated this procedure. After all 12 scans the results of the two polarizations were combined.

All peak values over or with less distance to limit then 6dB were marked and re-measured with a quasi-peak detector with the following method on a 10m open area test site.

The turn table was turned 360° to find the position of maximum field strength. After reaching this position the antenna was moved form 1m to 4m height to find the maximum value. This value was recorded.

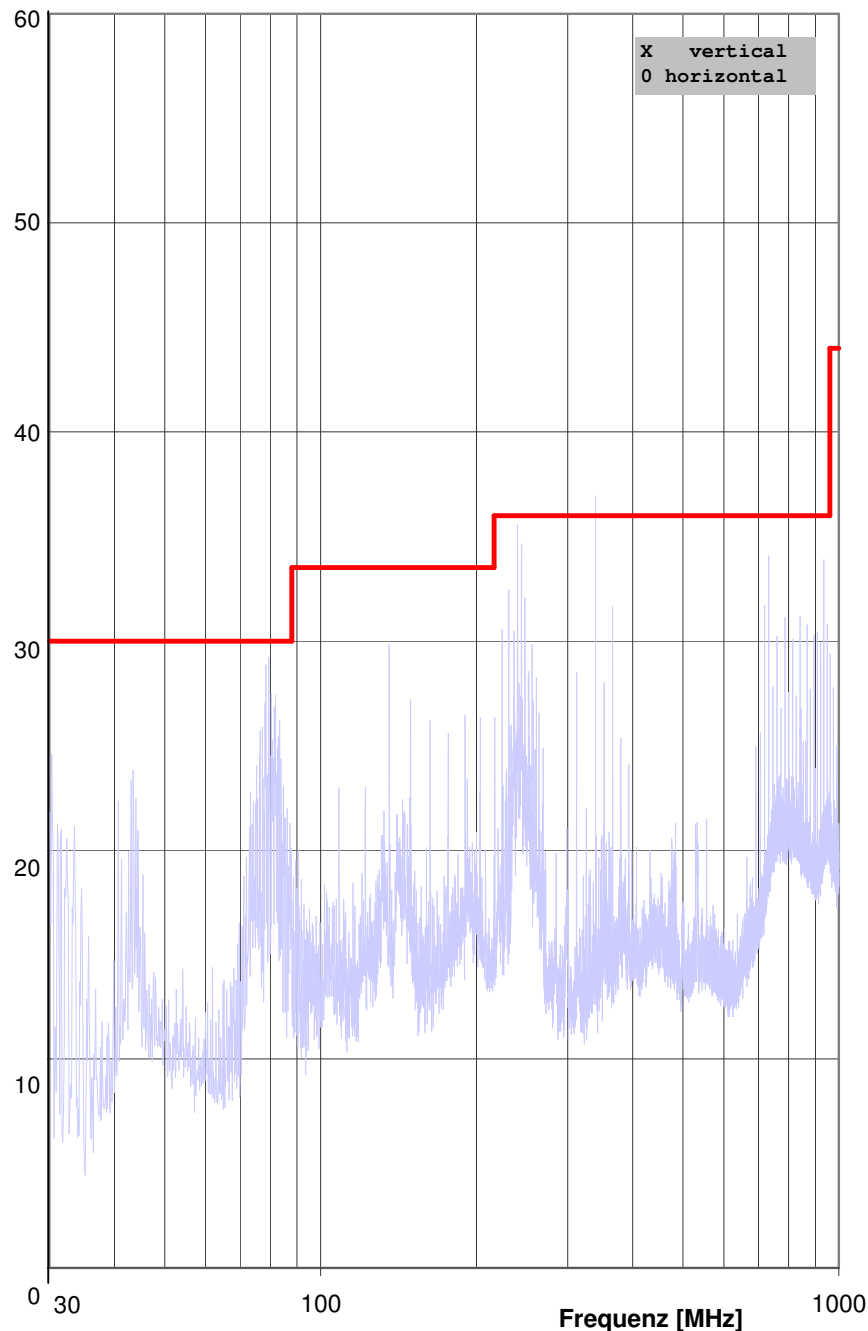
7.2.5 Test setup



7.2.6 Test result

[dB μ V/m]

Interference Radiation Test



REGULATIONS:

FCC 15.209 10m
PEAK / CISPR

TEST EQUIPMENT:

R&S ESVP (10 0 001)
VULB 9160 (10 0 064)
Suhner (20 0 024)

ORDER NO.:

268.426

EUT:

GiS mbH
RFID reader
TS-HRW38
1460-165V1.00#0020 08/08

OPERATION MODE:

PC connection USB
non-detachable cable
ground and shielding connected
Mains 120V AC /60Hz

TEST FACILITY:

EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing

DATE / TIME:

13.10.2008
21 °C 47 %H 98 kPa

TEST ENGINEER:

Markus Biberger

426 cdc FCC 209

Picture: 7-3 Radiated emission 30 MHz – 1000MHz (pre scan)



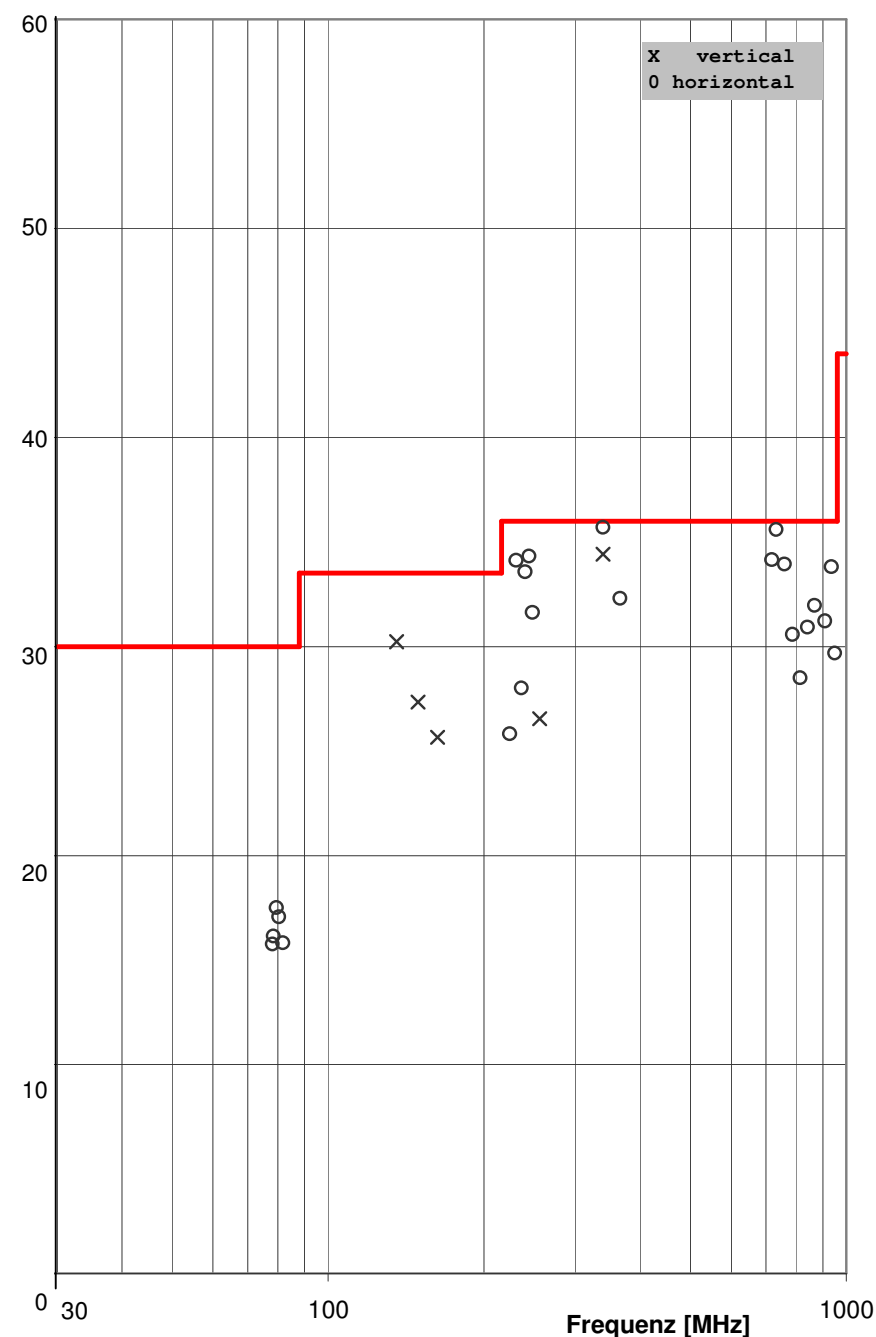
EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 32 of 53

Interference Radiation Test



REGULATIONS:

FCC 15.209 10m
 PEAK / CISPR

TEST EQUIPMENT:

R&S ESVP (10 0 001)
 VULB 9160 (10 0 064)
 Suhner (20 0 024)

ORDER NO.:

268.426

EUT:

GiS mbH
 RFID reader
 TS-HRW38
 1460-165V1.00#0020 08/08

OPERATION MODE:

PC connection USB
 non-detachable cable
 ground and shielding connected
 Mains 120V AC /60Hz

TEST FACILITY:

EMV TESTHAUS GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing

DATE / TIME:

13.10.2008
 21 °C 47 %H 98 kPa

TEST ENGINEER:

Markus Biberger

426 cdc FCC 209

Picture: 7-4 Radiated emission 30 MHz – 1000MHz (final)



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 2.1

GiS mbH
 RFID Reader
 TS-HRW38

268.426

Page 33 of 53

Interference Radiation Test

Freq. [MHz]	U_Rec [dBµV/m]	Limit [dBµV/m]	Corr. [dB]	U_Ant. [dBµV]	delta_U [dB]	Turn- table	Antenna	Pol.	Remark	426 edc FCC 209
78,10	15,8	30,0	3,5	12,2	14,2	72°	104 cm	H		
78,40	16,1	30,0	3,6	12,6	13,9	82°	104 cm	H		
79,50	17,5	30,0	3,7	13,8	12,5	68°	104 cm	H		
80,40	17,1	30,0	3,9	13,2	12,9	81°	104 cm	H		
81,80	15,8	30,0	4,1	11,7	14,2	67°	104 cm	H		
135,60	30,2	33,5	3,1	27,1	3,3	194°	104 cm	V		
149,20	27,3	33,5	2,7	24,6	6,2	203°	104 cm	V		
162,70	25,7	33,5	3,7	21,9	7,8	172°	104 cm	V		
224,00	25,8	36,0	9,7	16,1	10,2	171°	104 cm	H		
230,50	34,1	36,0	10,1	24,0	1,9	157°	104 cm	H		
236,10	28,0	36,0	10,3	17,7	8,0	156°	104 cm	H		
240,00	33,6	36,0	10,4	23,2	2,4	143°	104 cm	H		
244,10	34,3	36,0	10,5	23,9	1,7	142°	104 cm	H		
248,00	31,6	36,0	10,5	21,1	4,4	129°	104 cm	H		
256,00	26,5	36,0	8,6	17,9	9,5	189°	104 cm	V		
339,00	34,4	36,0	11,1	23,3	1,6	135°	104 cm	V		
339,00	35,7	36,0	11,4	24,3	0,3	301°	104 cm	H		
366,10	32,3	36,0	12,5	19,8	3,7	171°	104 cm	H		
718,70	34,1	36,0	18,0	16,1	1,9	158°	104 cm	H		
732,30	35,6	36,0	19,3	16,3	0,4	156°	104 cm	H		
759,40	33,9	36,0	20,7	13,2	2,1	143°	104 cm	H		
786,50	30,6	36,0	20,7	9,9	5,4	203°	104 cm	H		
813,70	28,5	36,0	20,5	8,0	7,5	172°	104 cm	H		
840,80	30,9	36,0	20,1	10,8	5,1	203°	104 cm	H		
867,90	32,0	36,0	19,7	12,3	4,0	189°	104 cm	H		
908,60	31,2	36,0	19,2	12,0	4,8	202°	104 cm	H		
935,70	33,8	36,0	20,4	13,4	2,2	190°	104 cm	H		
949,30	29,7	36,0	20,7	9,0	6,3	202°	104 cm	H		

Table: 7-2 Radiated emission 30 MHz – 1000MHz (final)

Expanded uncertainty (30MHz to 300MHz):

$$E_{(y)} = (y \pm 4.994) \text{ dB}\mu\text{V/m}; k=2.00$$

y = Indicated value

Expanded uncertainty (300MHz to 1000MHz):

$$E_{(y)} = (y \pm 5.276) \text{ dB}\mu\text{V/m}; k=2.00$$

y = Indicated value

Comments:



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 35 of 53

8 Occupied Bandwidth (99%)

according to CFR 47 Part 2 section 2.202

8.1 Test location

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	100089

8.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	100072
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	100132
<input checked="" type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	100005
<input type="checkbox"/>	VULB 9163 (CDC)	Schwarzbeck	100077
<input type="checkbox"/>	VULB 9160 (FF)	Schwarzbeck	100064

8.3 Test method to demonstrate compliance

The EUT has no detachable antenna therefore the radiated method was used

The occupied bandwidth is measured as the 99% bandwidth. For this measurement the occupied bandwidth function of the spectrum analyzer was used.



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 36 of 53

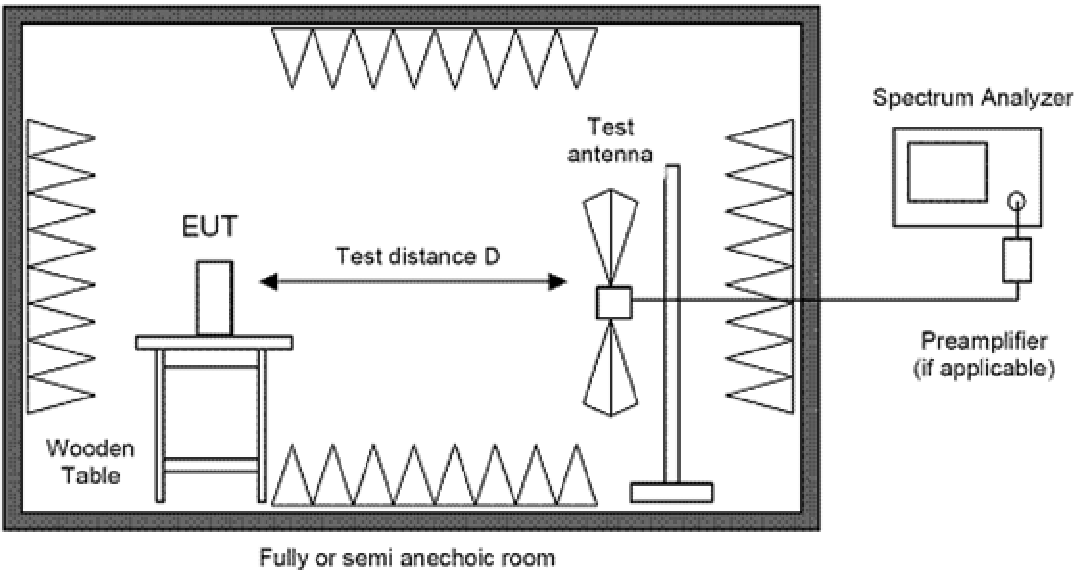
The resolution bandwidth of the spectrum analyzer shall be set to a greater value than 5% of the allowed bandwidth.

Because no resolution bandwidth was given the following guideline from ANSI C63.4 annex H6 was consulted.

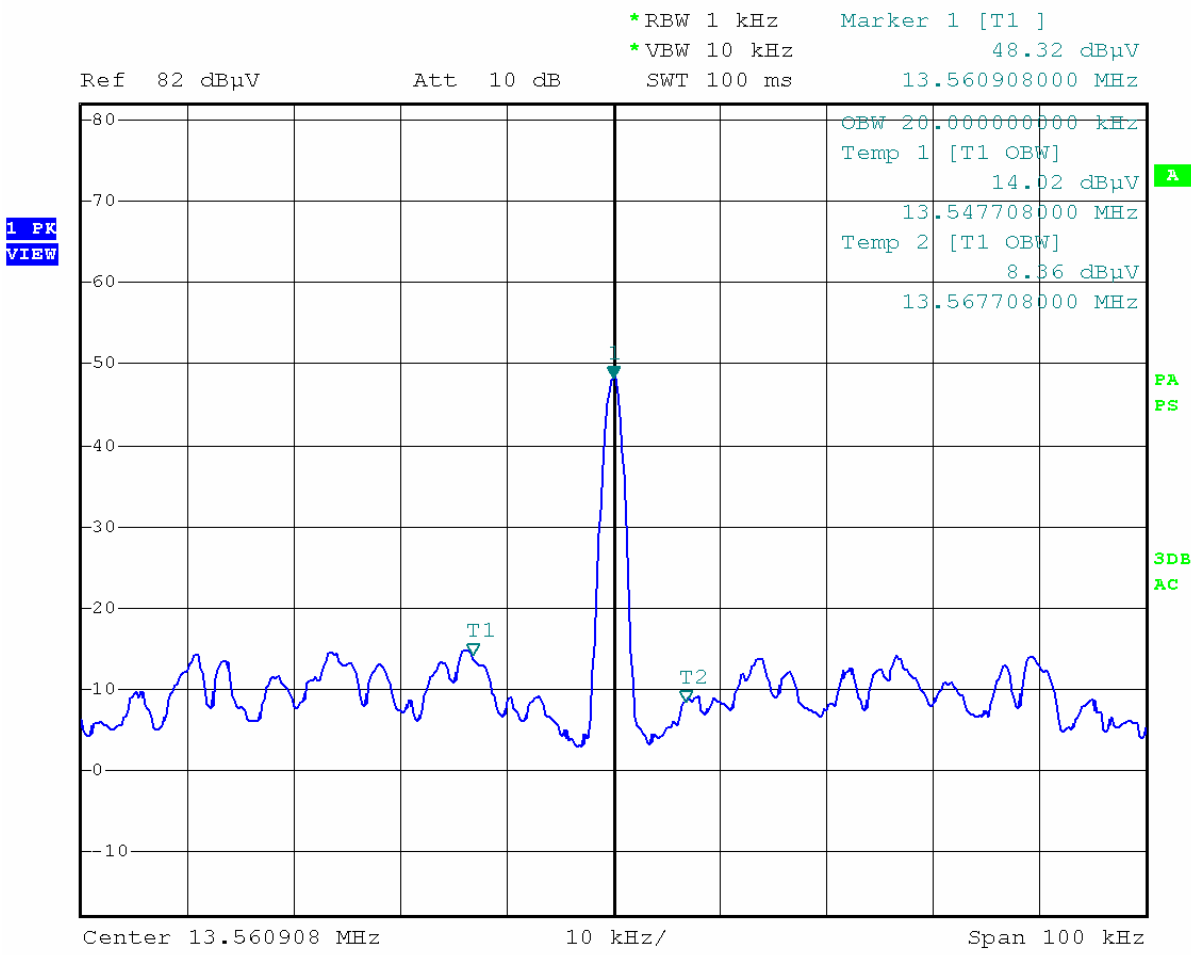
Fundamental frequency	Minimum resolution bandwidth
0.009MHz to 30MHz	1kHz
30MHz to 1000MHz	10kHz
1000MHz to 40000MHz	100kHz

The video bandwidth was adjusted at least 3 times wider than the resolution bandwidth

8.4 Test setup



8.5 Test result



Picture 8-1: Occupied bandwidth 99%

Frequency lower value: 13,547MHz Limit: 13,110MHz
Frequency upper value: 13,567MHz Limit: 14,010MHz
Occupied Bandwidth: 20kHz



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

9 Occupied Bandwidth (20dB)

according to FCC Part 15, section 15.215(c)

9.1 Test location

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	100089

9.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	100072
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	100132
<input checked="" type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	100005
<input type="checkbox"/>	VULB 9163 (CDC)	Schwarzbeck	100077
<input type="checkbox"/>	VULB 9160 (FF)	Schwarzbeck	100064

9.3 Test method to demonstrate compliance

The EUT has no detachable antenna therefore the radiated method was used

The 20 dB bandwidth of the emission is measured as the frequency range defined by the points that are 20 dB down relative to the maximum level of the modulated carrier.

For intentional radiators operating under the alternative provisions to the general emission limits the requirement to contain the 20 dB bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 39 of 53

and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation

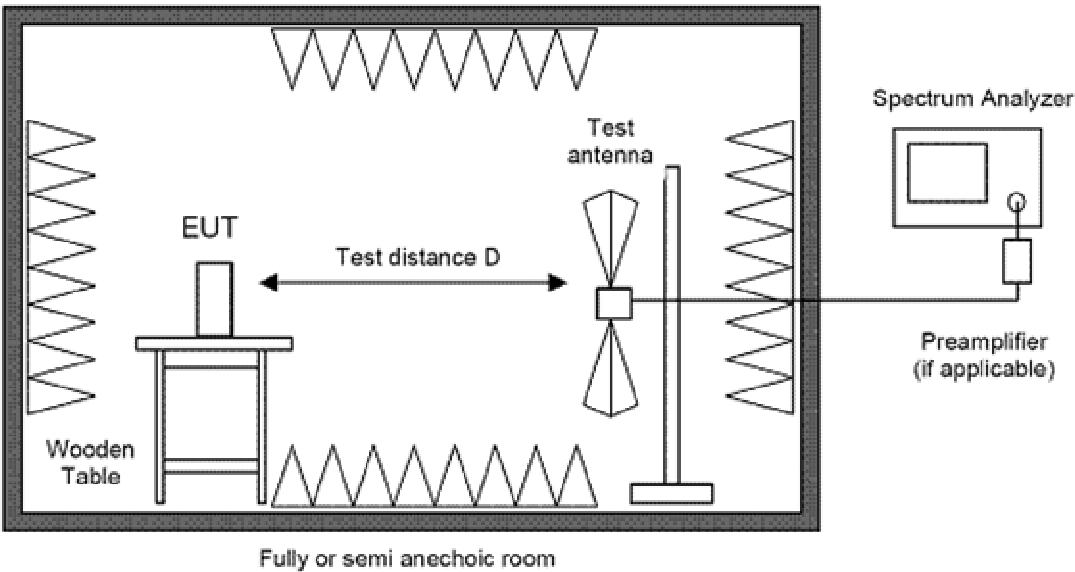
The resolution bandwidth of the spectrum analyzer shall be set to a greater value than 5% of the allowed bandwidth.

Because no resolution bandwidth was given the following guideline from ANSI C63.4 annex H6 was consulted.

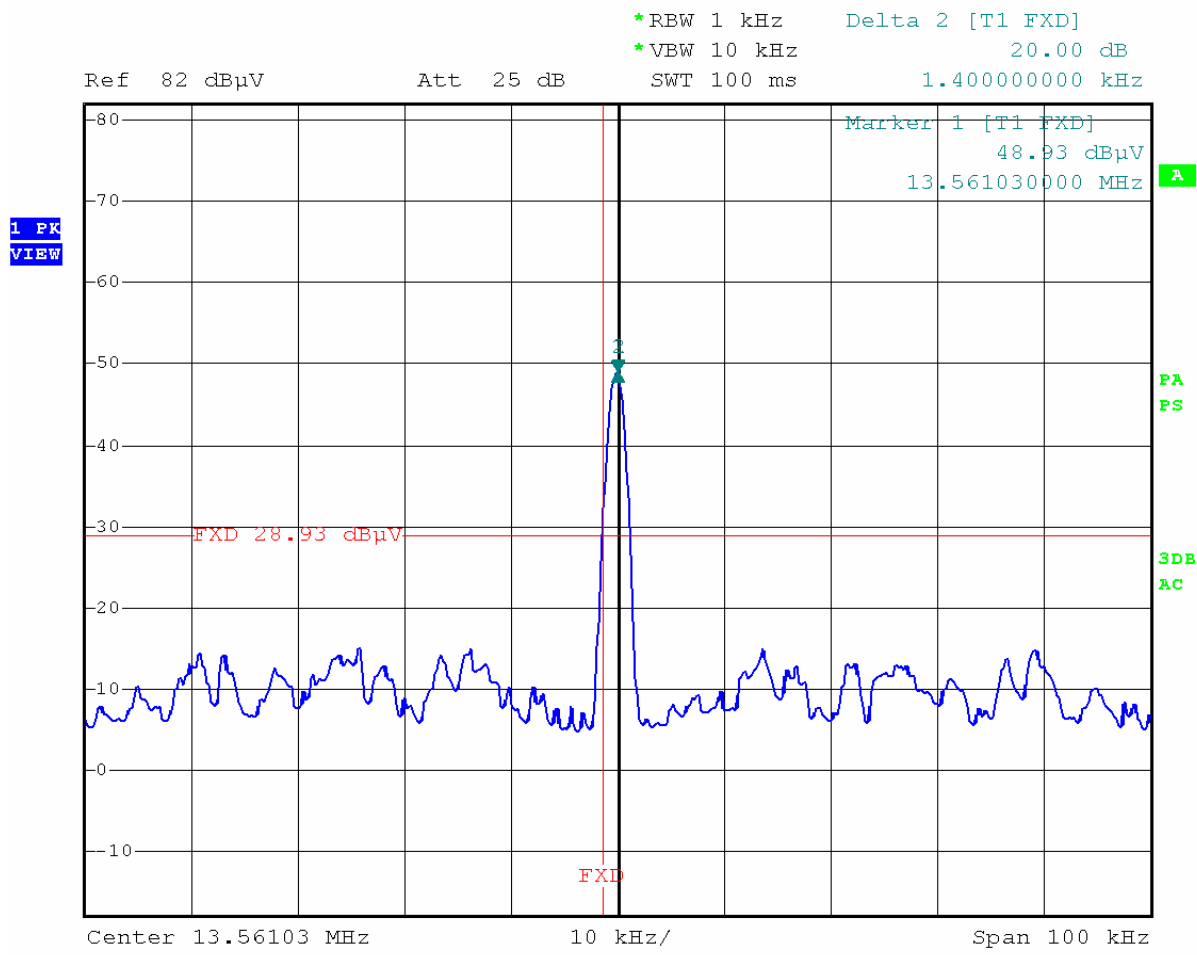
Fundamental frequency	Minimum resolution bandwidth
0.009MHz to 30MHz	1kHz
30MHz to 1000MHz	10kHz
1000MHz to 40000MHz	100kHz

The video bandwidth was adjusted at least 3 times wider than the resolution bandwidth

9.4 Test setup



9.5 Test result

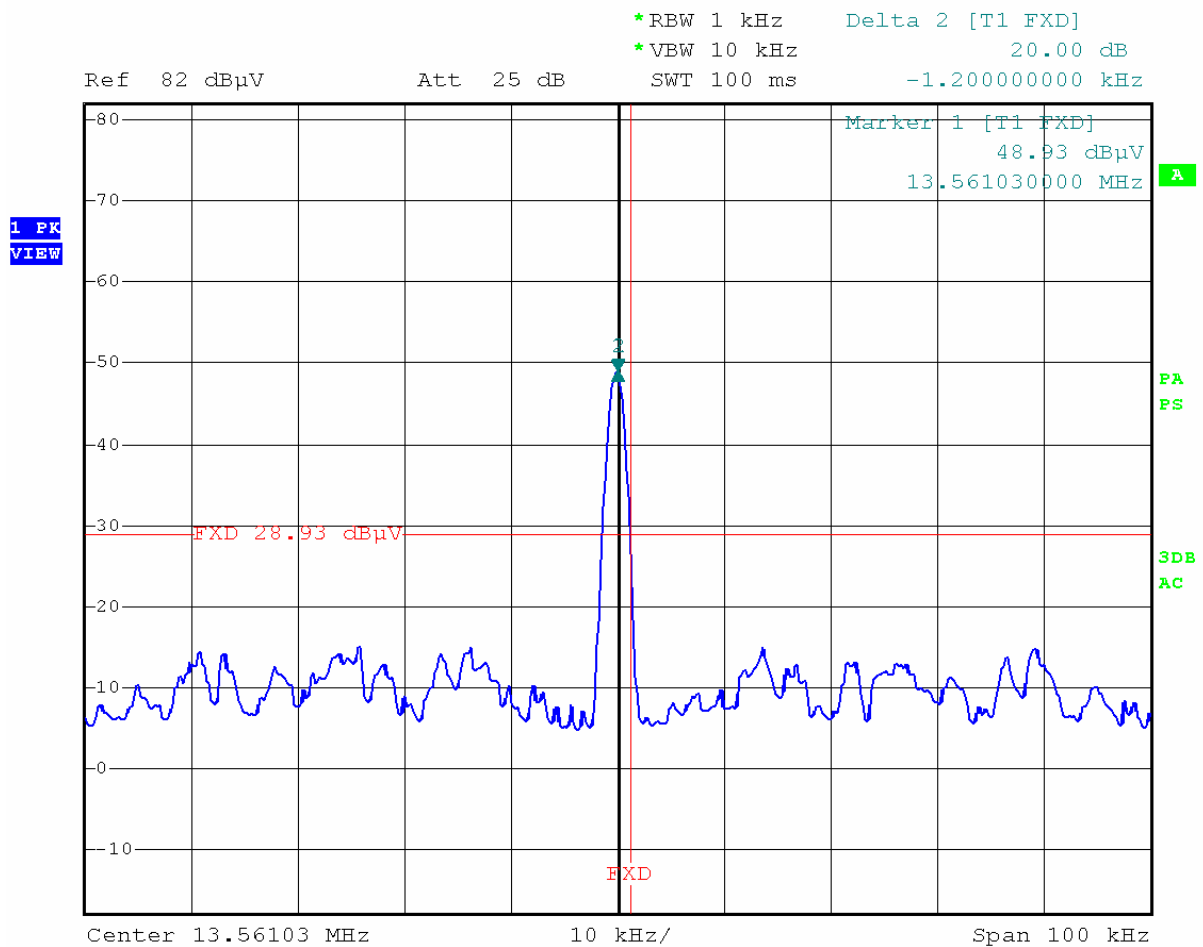


Picture 9-1: Occupied bandwidth lower value



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38



Picture 9-2: Occupied bandwidth upper value

Frequency lower value:	13,5596MHz	Limit: 13,110MHz
Frequency upper value:	13,5622MHz	Limit: 14,010MHz
Occupied Bandwidth:	2,6kHz	



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 2.1

GiS mbH
 RFID Reader
 TS-HRW38

268.426

Page 42 of 53

10 Occupied Bandwidth (99%)

according to RSS Gen Issue 2, section 4.6.1

10.1 Test location

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	100089

10.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	100072
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	100132
<input checked="" type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	100005
<input type="checkbox"/>	VULB 9163 (CDC)	Schwarzbeck	100077
<input type="checkbox"/>	VULB 9160 (FF)	Schwarzbeck	100064

10.3 Test method to demonstrate compliance

The EUT has no detachable antenna therefore the radiated method was used

If not specified in the applicable RSS the occupied bandwidth is measured as the 99% emission bandwidth.

The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth.

The trace data points are recovered and are directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is also recorded. The span between the two recorded frequencies is the occupied bandwidth.



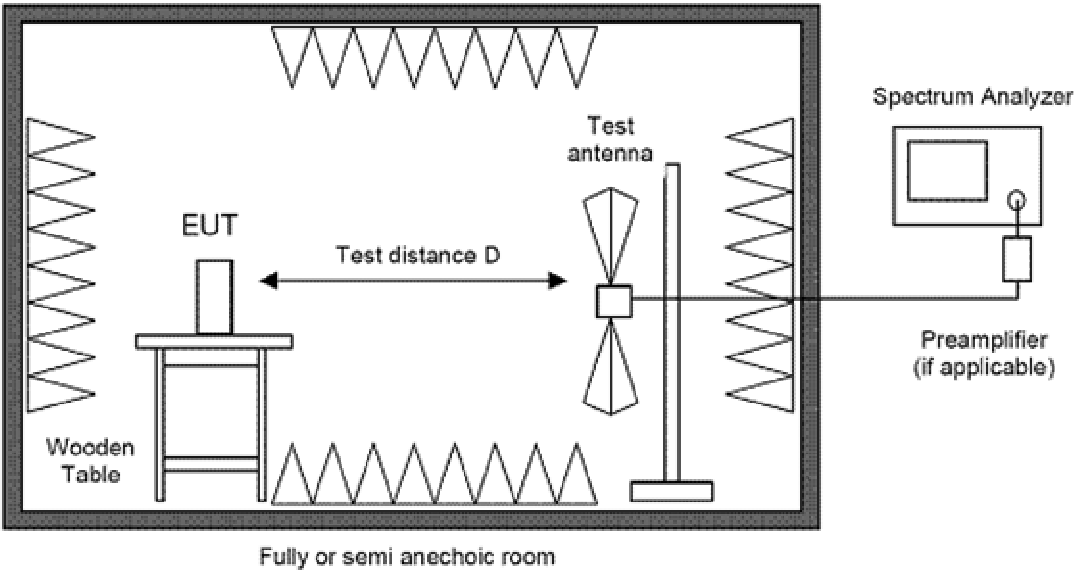
EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

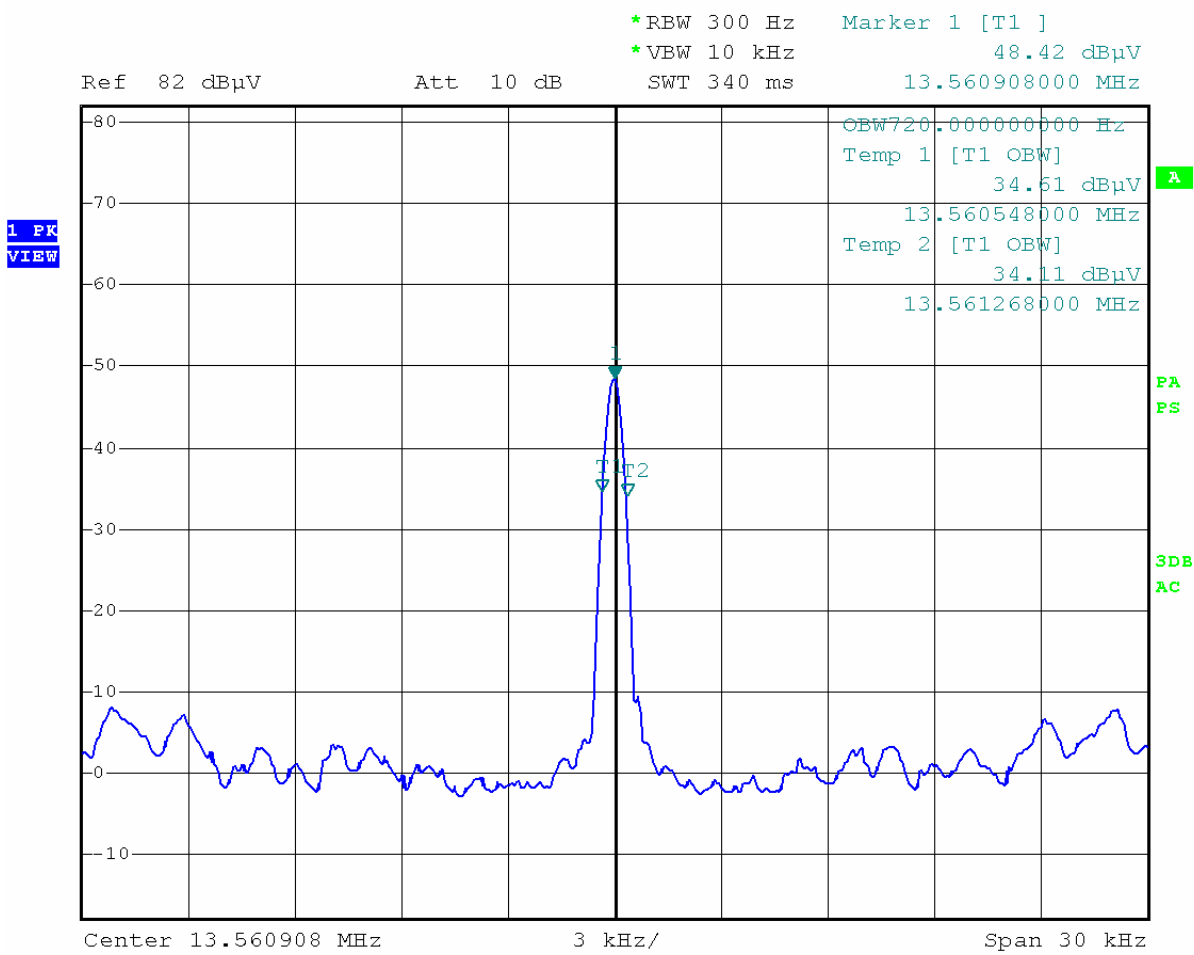
268.426

Page 43 of 53

10.4 Test setup



10.5 Test result



Picture 10-1: Occupied bandwidth 99%

Frequency lower value: 13,56054MHz Limit: 13,110MHz
Frequency upper value: 13,56126MHz Limit: 14,010MHz
Occupied Bandwidth: 720Hz



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

11 Carrier frequency stability

according to CFR 47 Part 15, section 15.225(e)
RSS-Gen Issue 2, section 7.2.4 and 4.7(b)

11.1 Test location

	Description	Manufacturer	Inventory No.
<input type="checkbox"/>	Climatic Chamber VC4100	Vötsch	110023
<input checked="" type="checkbox"/>	Climatic Chamber VC ³ 4043	Vötsch	110040

11.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESCI	Rohde & Schwarz	100132
<input checked="" type="checkbox"/>	Test Probe RFR400-1	Langer	200086
<input checked="" type="checkbox"/>	Power Supply	Statron	300193
<input checked="" type="checkbox"/>	Multimeter	Metra Hit 29S	100080
<input type="checkbox"/>	USLP 9142	USLP 9142	100044

11.3 Test method to demonstrate compliance

The frequency tolerance of the carrier signal is measured over a temperature variation of -20 °C to +50 °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 °C.

If the EUT provides an antenna connector the spectrum analyzer is connected to this port. If required, a resistive matching network equal to the impedance specified or employed for the antenna is used as well as dc block and appropriate attenuators (50 Ohms). In cases where the EUT does not provide an antenna connector a test fixture is used.



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 46 of 53

For battery operated equipment, the test is performed using a new battery.

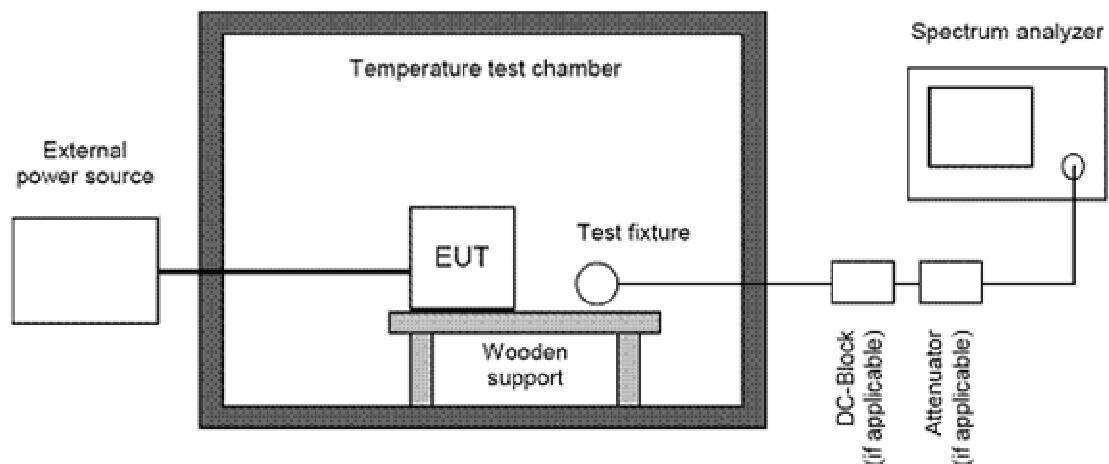
Alternatively, an external supply voltage can be used and is at least set to:

- the maximum battery voltage as delivered by a new battery or 115% of the battery nominal voltage
- the battery nominal voltage
- 85% of the battery nominal voltage
- the battery operating end point voltage which shall be specified by the equipment manufacturer

The EUT is operating providing an unmodulated carrier. The peak detector of the spectrum analyzer is selected and resolution as well as video bandwidth is set to values appropriate to the shape of the spectrum of the EUT. The frequency counter mode of the spectrum analyzer is used to maximize the accuracy of the measured frequency tolerance.

If an unmodulated carrier is not available a significant and stable point on the spectrum is selected and the span is reduced to a value that delivers an accuracy which shall be better than 1% of the maximum frequency tolerance allowed for the carrier signal. This method may be performed as long as the margin to the frequency tolerance allowed is larger than the uncertainty of the measured frequency tolerance

11.4 Test setup



11.5 Carrier vs. temperature

Supply Voltage 5V		Nominal frequency 13.56091 MHz	
Temperature	Carrier frequency	Δ Frequency	Deviation
°C	MHz	Hz	ppm
-20	13,56092	+10	+0,7
-10	13,56092	+10	+0,7
0	13,56093	+20	+1,5
+10	13,56093	+20	+1,5
+20	13,56091	0	0
+30	13,56090	-10	-0,7
+40	13,56088	-30	-2,2
+50	13,56088	-30	-2,2
Limit ± 100 ppm			

11.6 Carrier vs. input voltage

Temperature 20 °C		Nominal frequency 13.56091 MHz	
Voltage	Carrier frequency	Δ Frequency	Deviation
V	MHz	Hz	ppm
4,25	13,56086	-50	-3,7
5V	13,56091	0	0
5,75	13,56094	+30	+2,2
Limit ± 100 ppm			



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 2.1

GiS mbH
 RFID Reader
 TS-HRW38

268.426

Page 48 of 53

12 Designation of emissions

according to CFR 47 Part 2, Sections 2.201 and 2.202
RSS-Gen Issue 2, Sections 3.2(h) and 8

12.1 Designation

Type of Modulation:	Amplitude Modulation
Necessary Bandwidth: Modulation Rate: Overall numerical Factor:	$B_n = 2 \cdot B \cdot K$ $B = 5kHz$ $K = 1$ $B_n = 2 \cdot 5kHz \cdot 1 = 10kHz$
Designation of Emissions according ITU-R:	10K0A1D

Remarks:



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 49 of 53

13 Exposure of humans to RF fields

according to RSS-Gen Issue 2, section 5.5 and
RSS-102 Issue 2, section 2.5

13.1 Antenna type and power calculation

☒ Antenna detachable

$$EIRP = G \cdot CP$$

G: numerical antenna gain
CP: conducted output power [W]

☐ Antenna not detachable

$$EIRP = \frac{(F_s \cdot D)^2}{30}$$

Fs: field strength [V/m]
D: distance between antennas [m]

$$EIRP = \frac{(1.30 \cdot 3)^2}{30} = 507 nW$$

13.2 Distance between user and transmitting device*

☒ Distance >20cm

☐ Distance <20cm

*declared by applicant



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 50 of 53

13.3 Exemption from SAR evaluation

SAR evaluation is required if separation distance between user and devices is less than, or equal to 20cm, except the device operates:

- ☒ from 3 kHz up to 1 GHz inclusively and its source based time-averaged output power is ≤ 200 mW for general public use and ≤ 1000 mW for controlled use.
- ☐ above 1 GHz up to 2.2 GHz inclusively and its source-based time-averaged output power is ≤ 100 mW for general public use and ≤ 500 mW for controlled use.
- ☐ above 2.2 GHz up to 3 GHz inclusively and its source-based time-averaged output power is ≤ 20 mW for general public use and ≤ 100 mW for controlled use.
- ☐ above 3 GHz up to 6 GHz inclusively and its source-based time-averaged Output power is ≤ 10 mW for general public use and ≤ 50 mW for controlled use.

See output power calculation 13.1

13.4 Exemption from RF exposure evaluation

RF exposure evaluation is required if separation distance between user and devices is greater than 20cm, except the device operates:

- ☒ below 1,5GHz and its e.i.r.p is equal to, or less than 2.5W.
- ☐ above 1,5GHz and the e.i.r.p of the device is equal to or less than 5W.

See output power calculation 13.1



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 51 of 53

14 Equipment calibration status

Inventory Number	Model Number	Manufacturer	Last calibration	Next calibration	Cycle of calibration
100132	ESCI	Rohde & Schwarz	June 07	June 09	2 Years
100005	HFH2-Z2	Rohde & Schwarz	July 07	July 09	2 Years
100002	ESH 3	Rohde & Schwarz	Oct. 07	Oct. 08	1 Year
200051	ESH3 Z2	Rohde & Schwarz	Oct. 07	Oct. 08	1 Year
100040	ESH 2-Z5	Rohde & Schwarz	Oct. 07	Oct. 09	2 Years
100041	ESH 2-Z5	Rohde & Schwarz	Aug. 08	Aug. 10	2 Years
100072	ESCS 30	Rohde & Schwarz	July 08	July 09	1 Year
100001	ESVP	Rohde & Schwarz	Sep. 08	Sep. 09	1 Year
100077	VULB 9163	Schwarzbeck	April 08	April 10	2 Years
100064	VULB 9160	Schwarzbeck	March 07	March 09	2 Years
110040	VC ³ 4034	Vötsch	June 08	June 10	2 Years
110023	VC4100	Vötsch	January 07	January 09	2 Years
100080	Multimeter	Metra Hit 29S	Mai 08	Mai 09	1 Year



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 52 of 53

15 Summary

The EMC Regulations according to the marked specifications are

☒ **KEPT**

The EUT does fulfill the general approval requirements mentioned.

☐ **NOT KEPT**

The EUT does not fulfill the general approval requirements mentioned.

Place, Date: Straubing, October 13, 2008



Michael Hofmann
EMI / EMC Test Engineer



Dipl. Ing. (FH) Axel Penning
TM / EMV **TESTHAUS** GmbH



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 2.1

GiS mbH
RFID Reader
TS-HRW38

268.426

Page 53 of 53