Test Report

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RF test report

110186-AU01+W02

Identive Group Inc

RFID reader

PAC21x1

DGA-PL-224/95-03 / BNetzA-CAB-02/21-02/2

EMV **TESTHAUS** GmbH

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Accreditation:

Registration number: DGA-PL-224/95-03
CAB (EMC) registration number: BNetzA-CAB-02/21-02/3
FCC facility registration number: 221458
MRA US-EU, FCC designation number: DE0010

Test Laboratory:

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

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

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1 Test regulations

CFR 47 Part 2: 10-2010	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: 10-2010	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)
ANSI C63.4: September 2009	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

1.1 Summary of test results

Standard	Test result
FCC CFR 47 Part 15	Passed

2 Equipment under Test (EUT)

Product type:	RFID reader
Model Name:	PAC21x1
Manufacturer:	Identive Group Inc
Serial number:	Prototype
FCC ID:	MBPPAC21X1-001
Application freq. band:	N/A
Frequency range:	125kHz / 13,56MHz
Operating frequency:	125kHz / 13,56MHz
Number of RF-channels:	2
Modulation:	ASK
Antenna type:	PCB antenna
	☐ detachable ☒ not detachable
Power supply:	External power source nominal: 12.0 VDC
Temperature range:	-20°C to +55°C

2.1 Photo documentation

For photos of the EUT, see annex B.
For photos taken during testing, see annex A.

2.2 Short description of the EUT

RFID reader 125kHz and 13,56MHz

2.3 Operation mode

The EUT was tested in the following operation modes:

preconfigured by manufacturer (continuous transmitting)

2.4 Configuration

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

Device	Model:	S/N
RFID reader	PAC21x1	Prototype
DC power supply	Statron 3231.1	0702007

Used cables

Numbers:	Description: (type / lengths / remarks)	Serial No
1	Data & power cable / 5.0m / shielded	N/A
1	AC cable, unshielded, 1.5m	N/A

3 AC power line conducted emissions

according to CFR 47 Part 15, section 15.207

3.1 Test location

Description	Manufacturer	Inventory No.
Shielded chamber	Siemens - Matsushita	E00107

3.2 Test instruments

	Description	Manufacturer	Inventory No.
☐	ESCS 30	Rohde & Schwarz	E00003
☑	ESU 26	Rohde & Schwarz	W00002
☐	ESCI	Rohde & Schwarz	E00001
☑	ESH3 Z2	Rohde & Schwarz	E00028
☑	ESH 2-Z5	Rohde & Schwarz	E00004
☑	ESH 2-Z5	Rohde & Schwarz	E00005

3.3 Limits

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

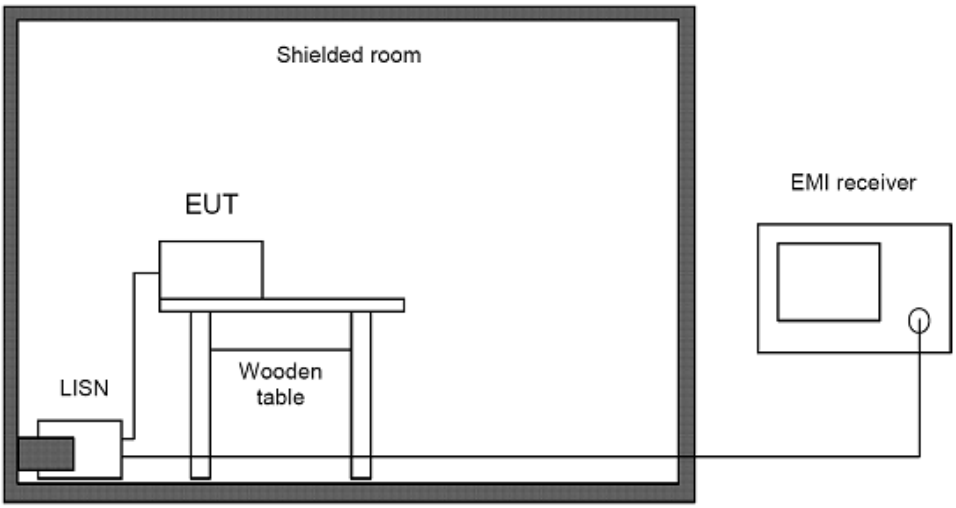
The test of conducted emission at AC line was performed with 120V AC / 60Hz.

3.4 Test procedure

1. The tests of conducted emission were carried out in a shielded room using a line impedance stabilization network (LISN) 50 µH/50 Ohms and an EMI test receiver.
2. The EMI test receiver was connected to the LISN and set to a measurement bandwidth of 9 kHz in the frequency range form 0.15 MHz to 30 MHz.
3. The EUT was placed on a wooden table and connected to the LISN.
4. To accelerate the measurement the detector of the EMI test receiver was set to peak and the whole frequency range form 0.15 MHz to 30 MHz were scanned.
5. After that all peaks values with fewer margins than 10 dB to quasi-peak limit or exceeding the limit were marked and re-measured with quasi-peak detector.
6. 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.
7. 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.

3.5 Test setup

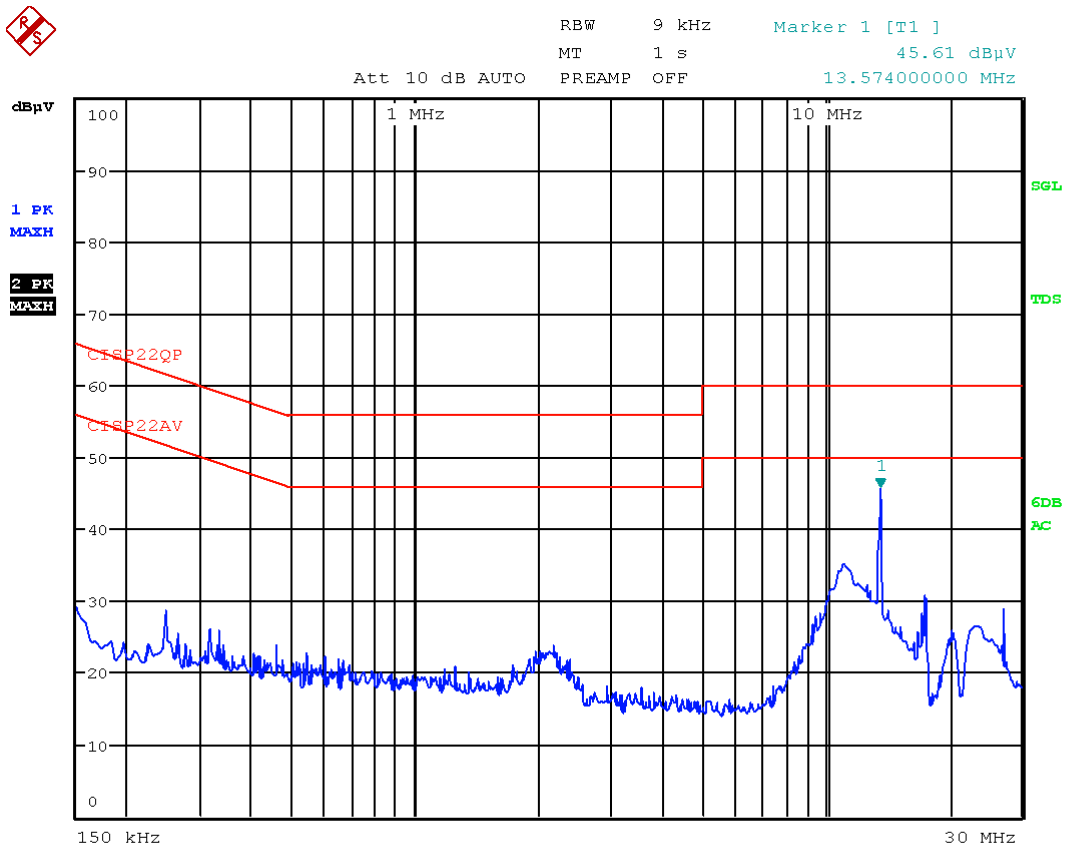


Picture 1: Outline of conducted emission test setup

Comments: All peripheral devices were additionally decoupled by means of a line stabilization network.

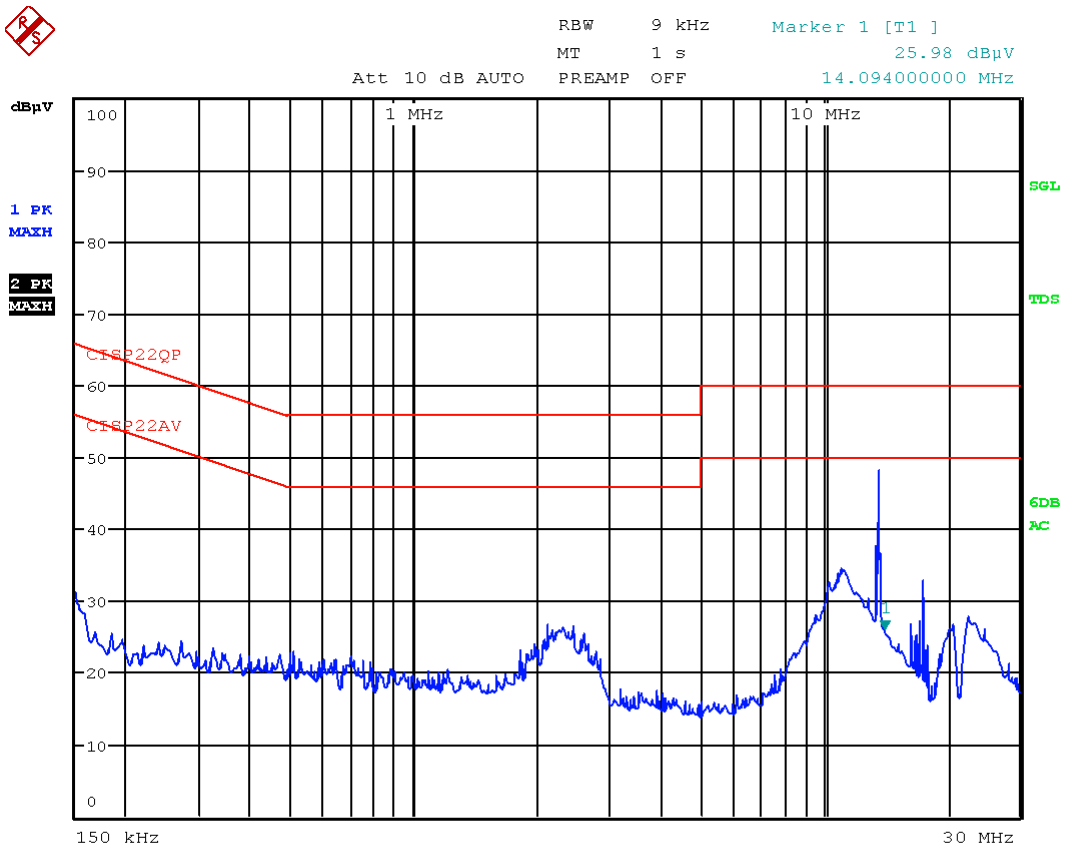
3.6 Test results

Temperature:	22°C	Humidity:	44%
Tested by:	Ch.Kiermeier	Test date:	2010-11-17



Picture 2: Conducted emission on mains, phase 1 (Chart)

Note: There was no measurement in QPK because all PK values are below the average limit line



Picture 3: Conducted emission on mains, neutral (Chart),

Note: There was no measurement in QPK because all PK values are below the average limit line

4 Radiated emission measurement (<1 GHz)

according to CFR 47 Part 15, section 15.205(a), 15.209(a), 15.247(d)

4.1 Test Location

☑ Scan with peak detector in 3 m CDC.

☑ Final CISPR measurement with quasi peak detector on 3 m open area test site.

Description	Manufacturer	Inventory No.
CDC	Albatross Projects	E00026
Open site area	EMV **TESTHAUS** GmbH	E00354

4.2 Test instruments

	Description	Manufacturer	Inventory No.
☑	ESCS 30 (FF)	Rohde & Schwarz	E00003
☐	ESU 26	Rohde & Schwarz	W00002
☑	ESCI (CDC)	Rohde & Schwarz	E00001
☑	VULB 9163 (FF)	Schwarzbeck	E00013
☑	VULB 9160 (CDC)	Schwarzbeck	E00011
☐	HFH2-Z2	Rohde & Schwarz	E00060
☑	Feedline OATS	Huber & Suhner	200024

4.3 Limits

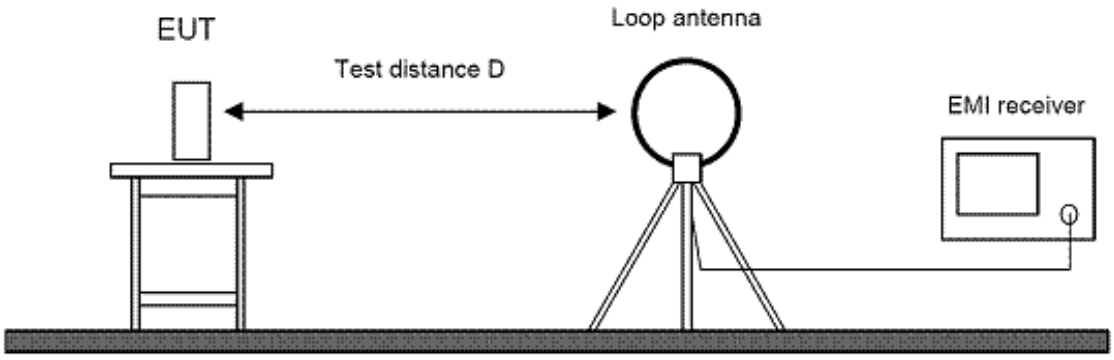
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power.
In case the emission fall within the restricted band specified on 15.205(a), then the 15.209(a) limit in the table below has to be followed.

Frequency [MHz]	Field strength Fs [µV/m]	Field strength [dBµV/m]	Measurement distance d [m]
0.009 – 0.490	266.6 – 4.9	48.5 – 13.8	300
0.490 – 1.705	48.98 – 14.08	33.8 – 22.97	30
1.705 – 30.0	30	29.54	30
30 – 88	100	40	3
88 – 216	150	43.5	3
216 - 960	200	46	3
Above 960	500	54	3

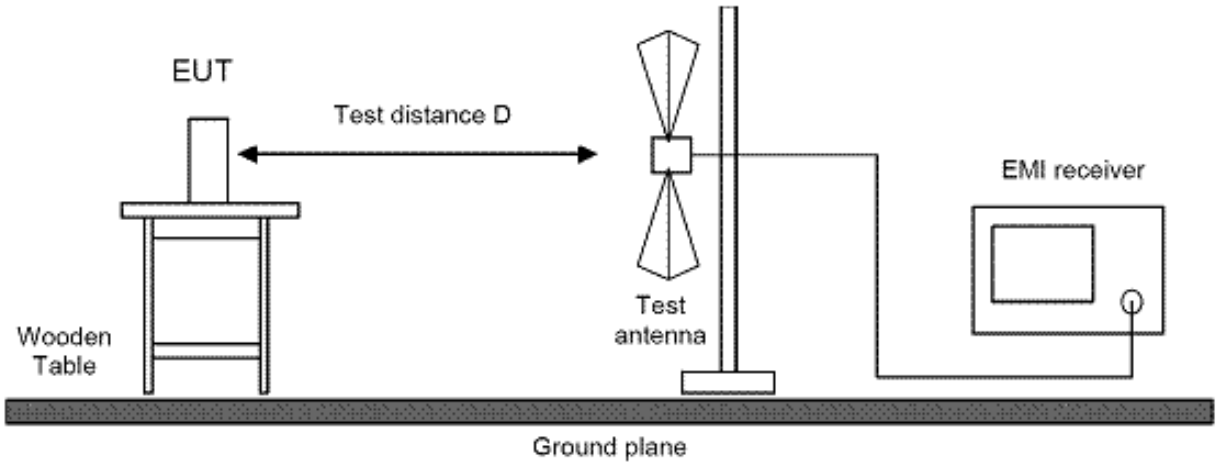
4.4 Test procedure

1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The receiving antenna was placed 3 meters from the turntable. The test setup was placed inside a compact diagnostic chamber.
2. Power on the EUT and all peripherals.
3. The broadband antenna was set to vertical polarization.
4. The EMI receiver performed a scan from 30MHz to 1000MHz with the detector set to peak and the measurement bandwidth to 120 kHz.
5. The turn table was rotated to 6 different positions (360° / 6) and the antenna polarization was changed to horizontal.
6. Repeat the test procedure at step 4 and 5.
7. The test setup was then placed in an OATS at 3 m distance and all peak values over or with less distance to limit then 6dB were marked and re-measured with a quasi-peak detector.
8. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
9. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both horizontal and vertical polarization. The highest value was recorded.
10. For emissions below 30MHz, measurement were done with a loop antenna. The recorded data were measured in QP mode oft he receiver. Antenna height was not changed during this test.

4.5 Test setup



Picture 4: Test setup for radiated emission measurement (< 30 MHz)



Picture 5: Test setup for radiated emission measurement (< 1 GHz)

4.6 Test deviation

There is no deviation with the original standard.

4.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

4.8 Test results

Transmit mode

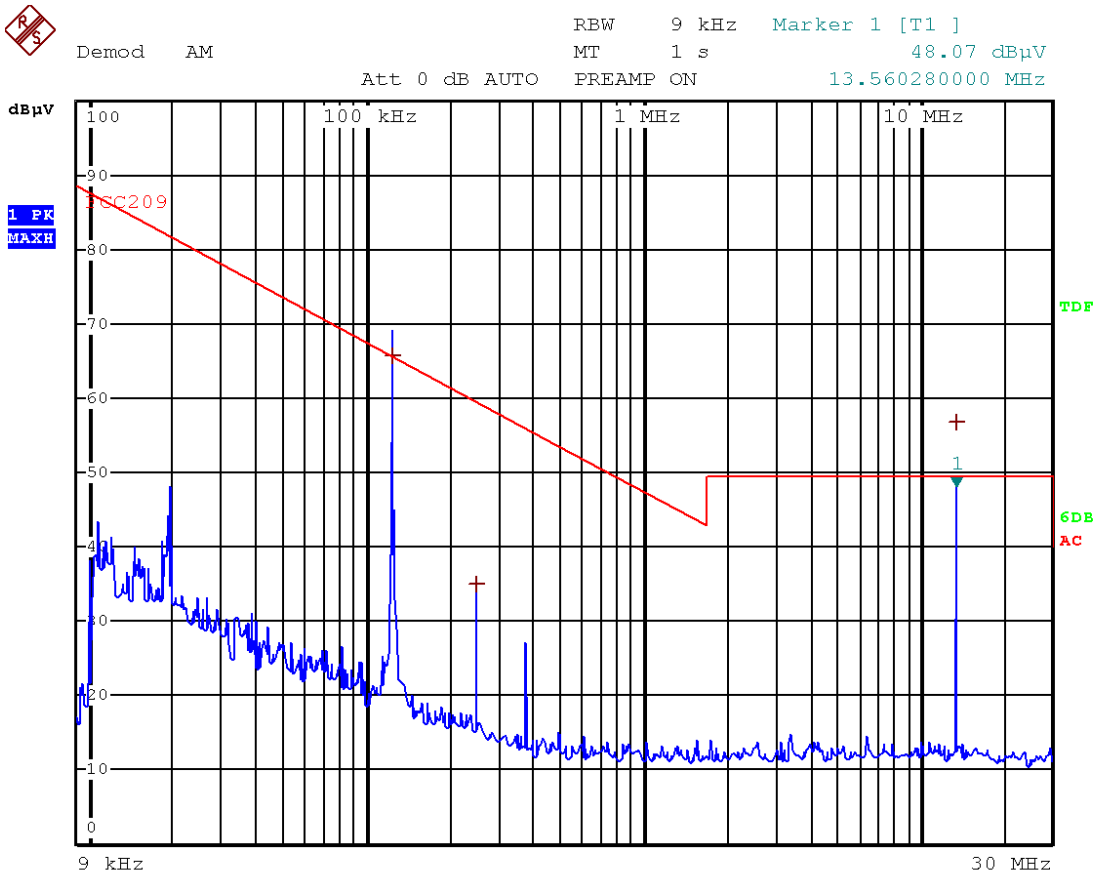
Temperature:	22°C	Humidity:	44%
Tested by:	Ch.Kiermeier	Test date:	2010-12-02

Radiated Emission Measurement 9 kHz – 30 MHz

Frequency (MHz)	Reading (dBµV/m)	Detector	Recalculation factor (dB/decade)	Field strength (dBµV/m)	Limit (dBµV/m)	Margin	Result
0.125	65.73	QP	80	**-14.27**	25,66	-39,93	PASS
13.56	56.85	QP	40	**16.85**	29.54	-12.69	PASS

Note:
Measured value = 56.85 dBµV/m @ 3 m
Recalculation factor = 40 dB / decade
Recalculated value = 56,85 dBµV/m @ 3 m - 40 dB = **16,85 dBµV/m @ 30 m**

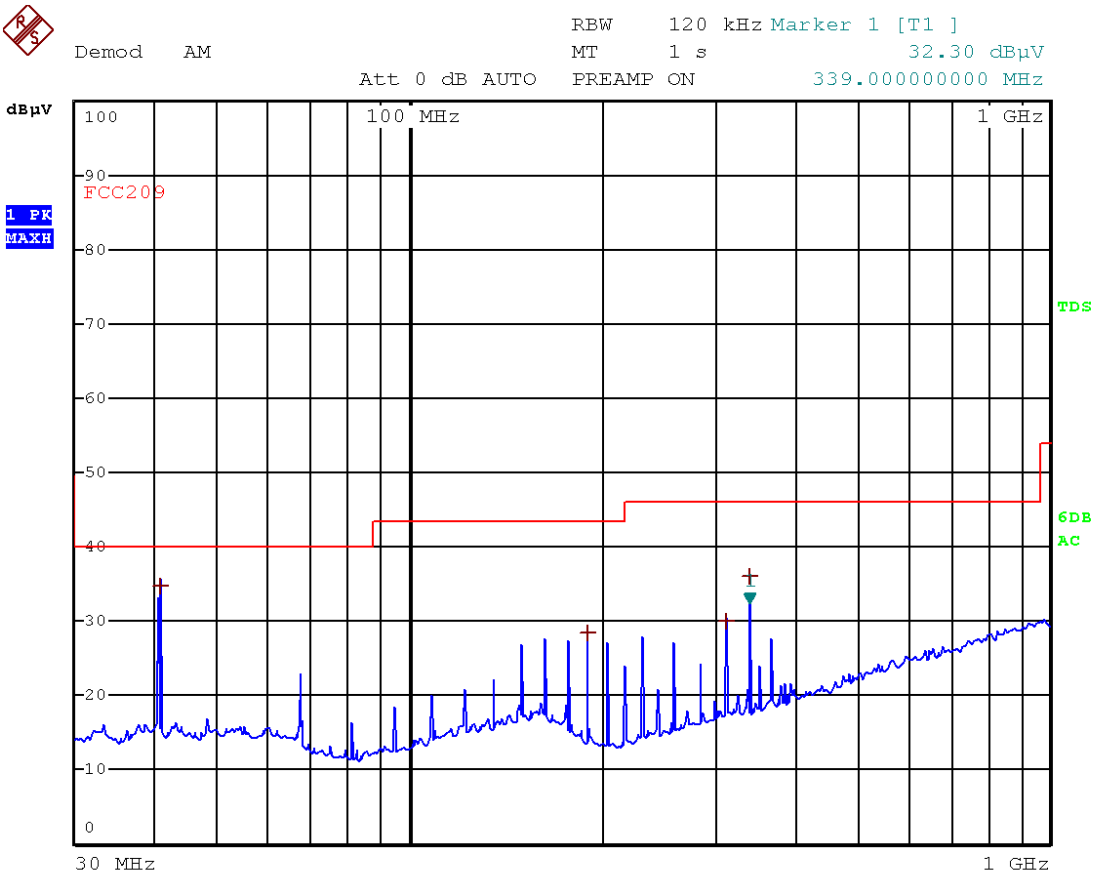
Measured value = 65.73 dBµV/m @ 3 m
Recalculation factor = 40 dB / decade
Recalculated value = 56,85 dBµV/m @ 3 m - 80 dB = **-14,27 dBµV/m @ 300 m**



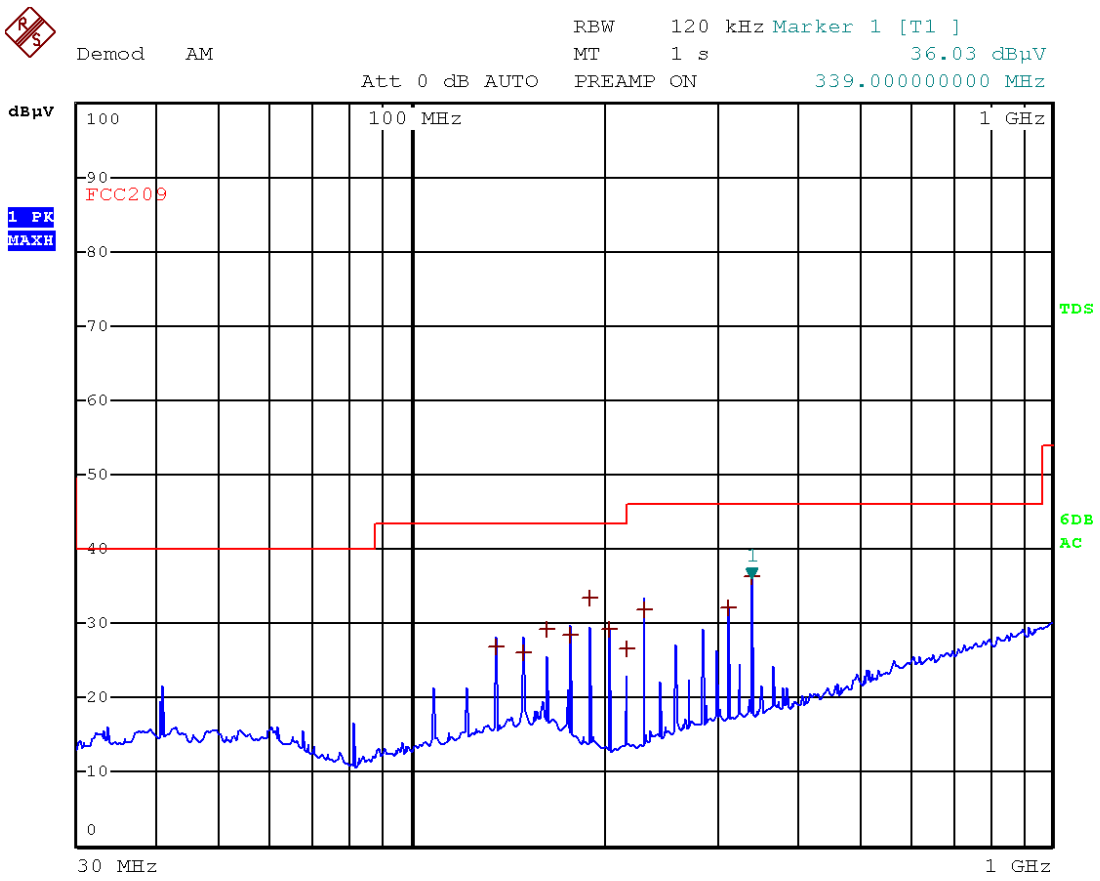
Picture 6: Radiated emission 9 kHz – 30 MHz (@ 3m distance)

Radiated Emission Measurement 30 MHz – 1000 MHz

Frequency (MHz)	Detector	Average field strength (dBµV/m)	Limit (dBµV/m)	Margin	Polarization	Result
40.68	QPK	34.73	40.0	-5.27	V	PASS
135.0	QPK	26.81	43.5	-16.69	H	PASS
149.16	QPK	26.22	43.5	-17.28	H	PASS
162.72	QPK	29.20	43.5	-14.30	H	PASS
176.28	QPK	28.40	43.5	-15.10	H	PASS
189.84	QPK	33.47	43.5	-10.03	H	PASS
203.4	QPK	29.28	43.5	-14.22	H	PASS
216.96	QPK	26.70	46.0	-.19.30	H	PASS
230.52	QPK	31.81	46.0	-14.19	H	PASS
311.88	QPK	30.18	46.0	-15,82	V	PASS
339.00	QPK	35.97	46.0	-10.03	V	PASS



Picture 7: Radiated emission 30 MHz – 1000MHz (Vertical)



Picture 8: Radiated emission 30 MHz – 1000MHz (Horizontal)

5 Equipment calibration status

Inventory Number	Model Number	Manufacturer	Last calibration	Next calibration	Cycle of calibration
W00002	ESU26	Rohde & Schwarz	Dec 11	Dec 12	2 Years
E00001	ESCI	Rohde & Schwarz	Jul 11	Jul 12	2 Years
E00003	ESCS 30	Rohde & Schwarz	Dec 11	Dec 12	1 Year
E00004	ESH 2-Z5	Rohde & Schwarz	Jan. 11	Oct. 13	2 Years
E00005	ESH 2-Z5	Rohde & Schwarz	Dec 11	Dec 13	2 Years
E00060	HFH2-Z2	Rohde & Schwarz	Dec 11	Dec 13	2 Years
E00012	VULB 9163	Schwarzbeck	Mar. 11	Apr. 12	1 Years

Table 1: Equipment Calibration status

6 Measurement uncertainty

Description	Max. deviation	k=
Conducted emission AMN (9kHz to 30 MHz)	± 4,0 dB	2
Radiated emission open field (30 MHz to 1 GHz)	± 4,5 dB	2
Radiated emission absorber chamber (> 1000 MHz)	± 5,4 dB	2

Table 2: Measurement uncertainty

Comment: The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k. If k=2 the value of the measurements lies within the assigned range of values with a probability of 95 %.

7 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, December 21, 2011

Christian Kiermeier
EMI / EMC Test Engineer

Markus Biberger
Technical Executive / EMV **TESTHAUS** GmbH