

Test Report

Customer:

Identive GmbH

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RF test report

120129-AU01+W01



Identive Group Inc

RFID reader

PAC2111



The test result refers exclusively
to the model tested.

This report must not be copied without
the written authorization by the lab.
Revision: 1.0



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

EMV **TESTHAUS** GmbH

Gustav-Hertz-Straße 35
94315 Straubing
Tel.: +49 9421 56868-0
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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: 10-2011	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: 10-2011	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
RSS-Gen Issue 3, December 2010	General Requirements and Information for the Certification of Radiocommunication Equipment, published by Industry Canada
RSS-102 Issue 4, March 2010, updated December 2010	Radio Frequency Exposure Compliance of Radiocommunications Apparatus
RSS-210 Issue 8, December 2010	Low Power Licence-Exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment, published by Industry Canada

1.1 Summary of test results

Standard	Test result
FCC CFR 47 Part 15	Passed
RSS-210 Issue 8 and RSS-Gen Issue 3	Passed



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2 Equipment under Test (EUT)

Product type: RFID reader
Model Name: PAC2111
Manufacturer: Identive Group Inc
Serial number: Prototype
FCC ID: MBPPAC21X1-002
IC Canada: 7485A-PAC2111R2
Application freq. band: N/A
Frequency range: 13,56MHz
Operating frequency: 13,56MHz
Number of RF-channels: 1
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



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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 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	PAC2111	21601204200126
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



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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.
<input checked="" type="checkbox"/>	ESCS 30	Rohde & Schwarz	E00003
<input type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input type="checkbox"/>	ESCI	Rohde & Schwarz	E00001
<input checked="" type="checkbox"/>	ESH3 Z2	Rohde & Schwarz	E00028
<input checked="" type="checkbox"/>	ESH 2-Z5	Rohde & Schwarz	E00004
<input checked="" type="checkbox"/>	ESH 2-Z5	Rohde & Schwarz	E00005

3.3 Limits

Frequency [MHz]	Quasi-peak [dB μ V]	Average [dB μ V]
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.



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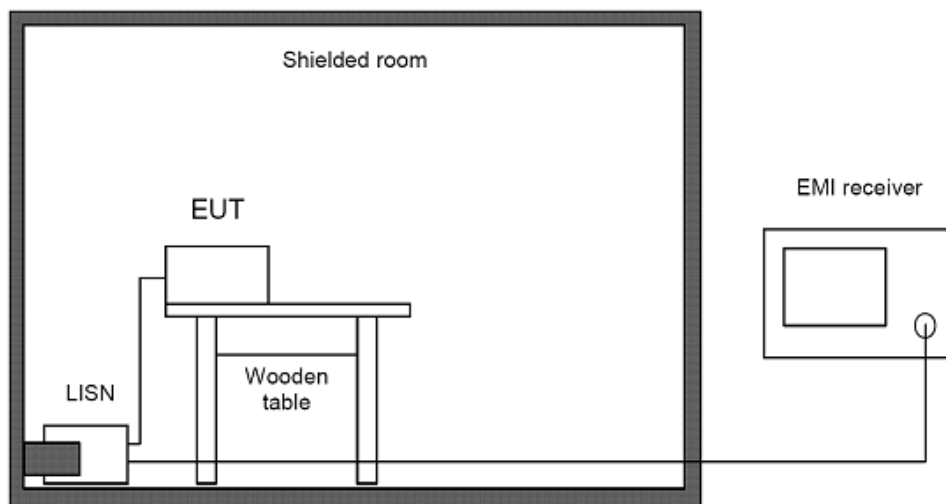
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3.4 Test procedure

1. The tests of conducted emission were carried out in a shielded room using a line impedance stabilization network (LISN) 50 μ H/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 from 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 from 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

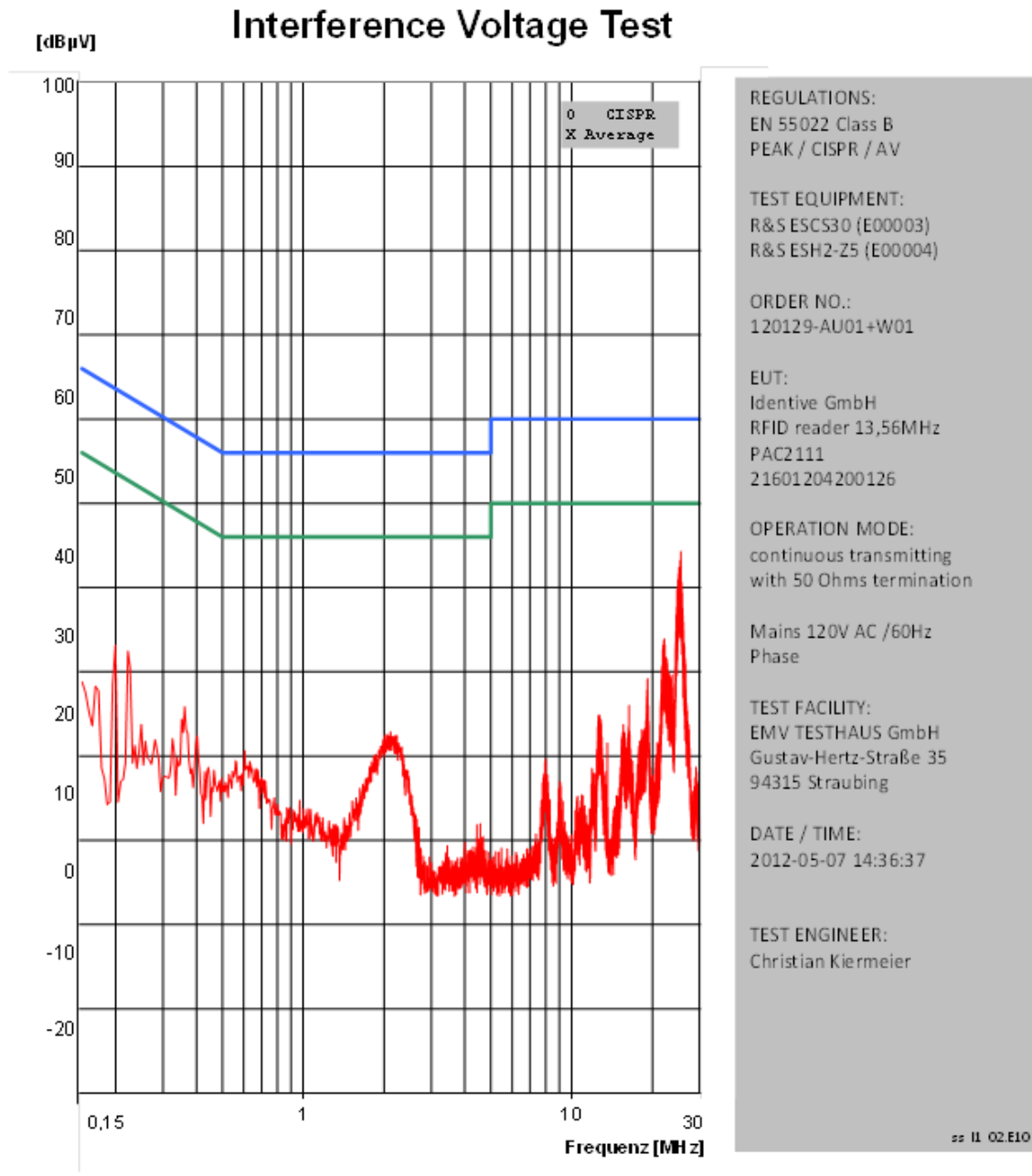


Picture 1: Outline of conducted emission test setup

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:	2012-05-07



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

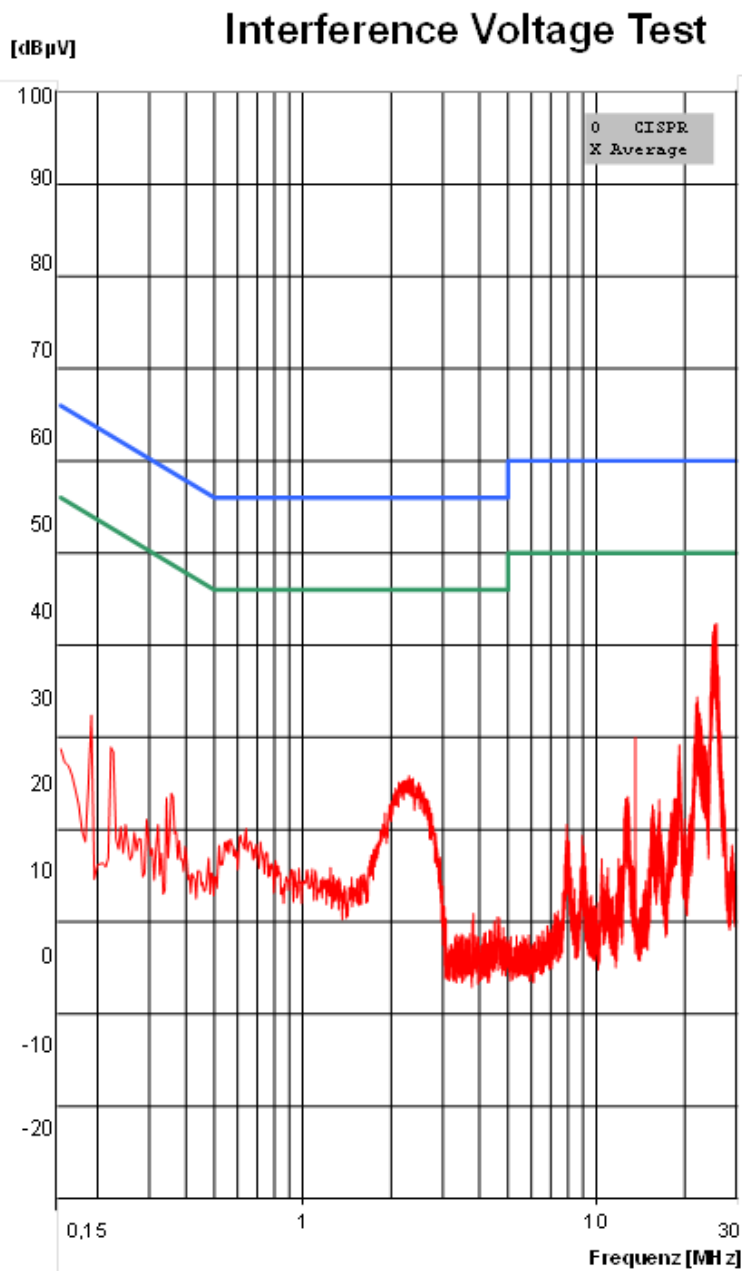


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REGULATIONS:
EN 55022 Class B
PEAK / CISPR / AV

TEST EQUIPMENT:
R&S ESCS30 (E00003)
R&S ESH2-Z5 (E00004)

ORDER NO.:
120129-AU01+W01

EUT:
Identive GmbH
RFID reader 13,56MHz
PAC2111
21601204200126

OPERATION MODE:
continuous transmitting
with 50 Ohms termination

Mains 120V AC /60Hz
Neutral

TEST FACILITY:
EMV TESTHAUS GmbH
Gustav-Hertz-Straße 35
94315 Straubing

DATE / TIME:
2012-05-07 14:38:49

TEST ENGINEER:
Christian Kiermeier

≈ n 02.E10

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



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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.
<input checked="" type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input checked="" type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input checked="" type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011
<input type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input checked="" type="checkbox"/>	Feedline OATS	Huber & Suhner	200024



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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 [$\mu\text{V/m}$]	Field strength [dB $\mu\text{V/m}$]	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 ($360^\circ / 6$) 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 off he receiver. Antenna height was not changed during this test.



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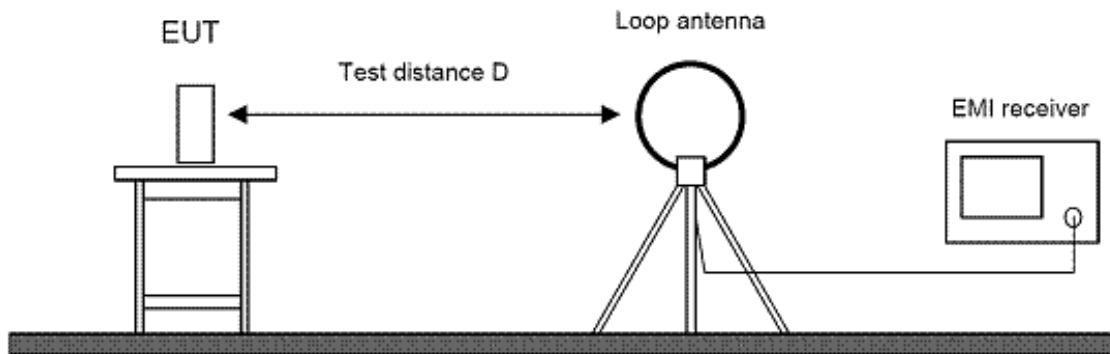
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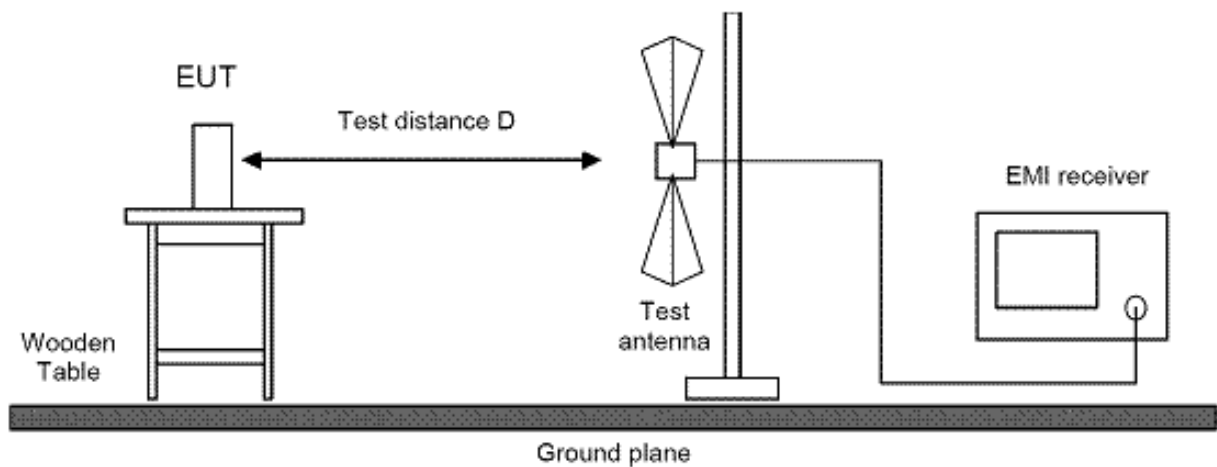
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4.5 Test setup



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:	2012-05-04

Radiated Emission Measurement 9 kHz – 30 MHz

Frequency (MHz)	Reading (dB μ V/m)	Detector	Recalculation factor (dB/decade)	Field strength (dB μ V/m)	Limit (dB μ V/m)	Margin	Result
13.56	56.85	QP	40	16.67	29.54	-12.87	PASS

Note:

Measured value = 56.67 dB μ V/m @ 3 m

Recalculation factor = 40 dB / decade

Recalculated value = 56,67 dB μ V/m @ 3 m - 40 dB = **16,67 dB μ V/m @ 30 m**

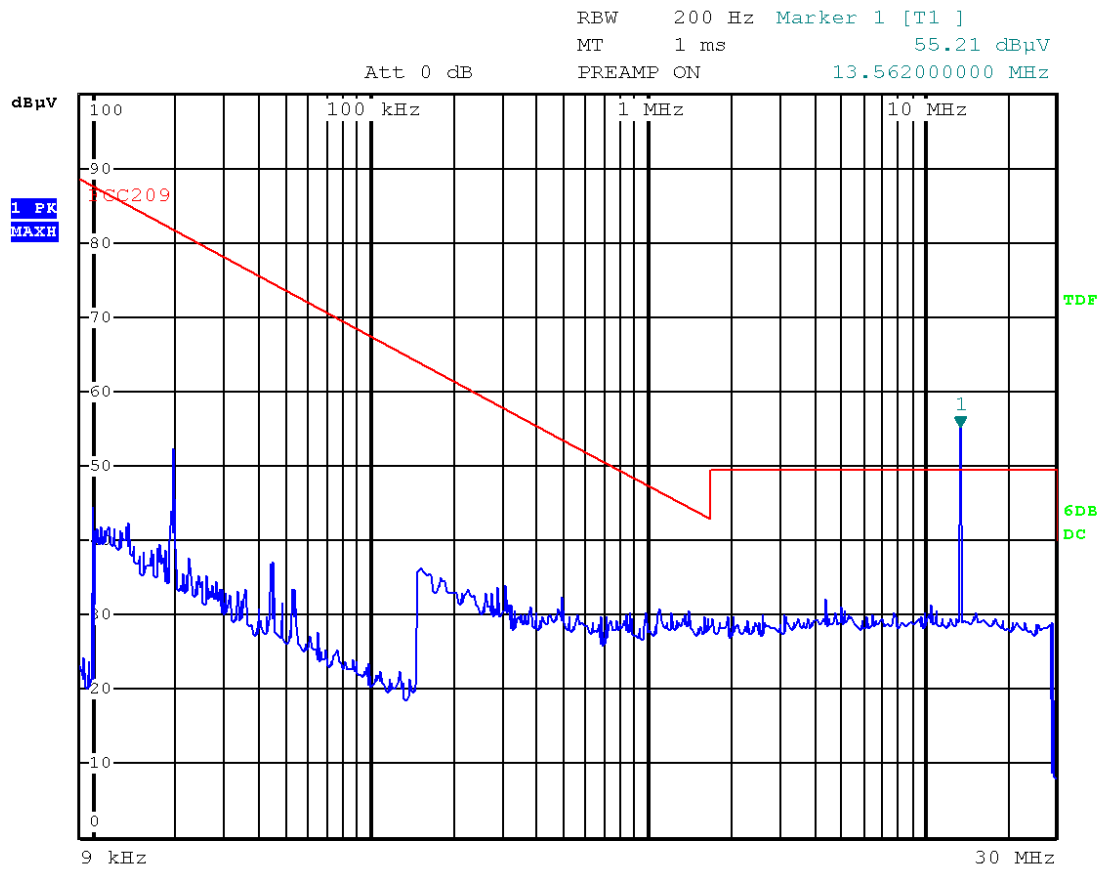


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Date: 4.MAY.2012 09:51:39

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



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Radiated Emission Measurement 30 MHz – 1000 MHz

Frequency (MHz)	Detector	Average field strength (dBµV/m)	Limit (dBµV/m)	Margin	Polarization	Result
284,67	QPK	21,98	46,0	-24,02	V	PASS
298,32	QPK	25,80	46,0	-20,02	V	PASS
311,88	QPK	27,80	46,0	-18,20	V	PASS
211,20	QPK	33,00	46,0	-13,00	H	PASS
284,77	QPK	35,00	46,0	-11,00	H	PASS
311,88	QPK	31,00	46,0	-15,00	H	PASS

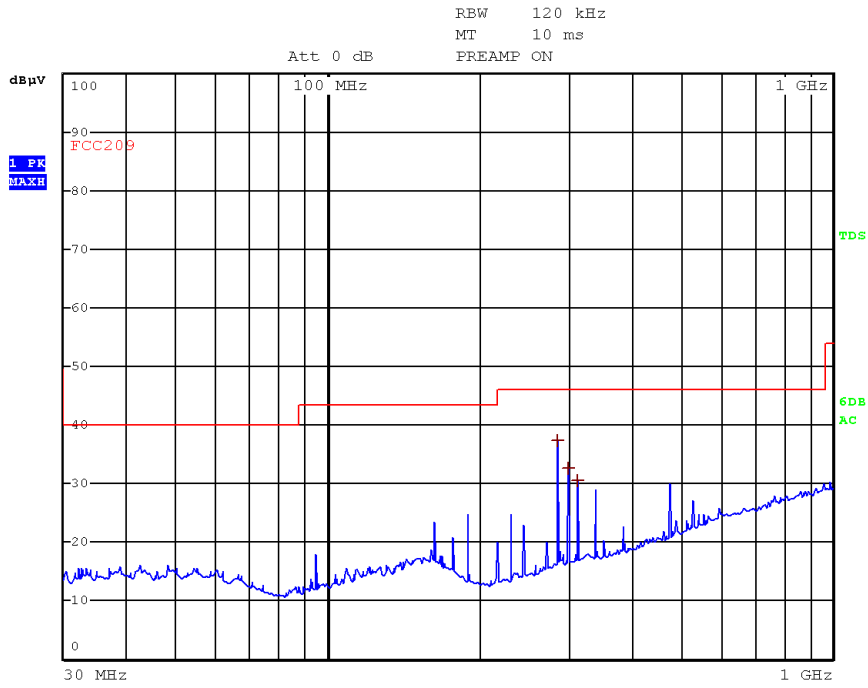


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Phones

Date: 4.MAY.2012 11:00:42

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

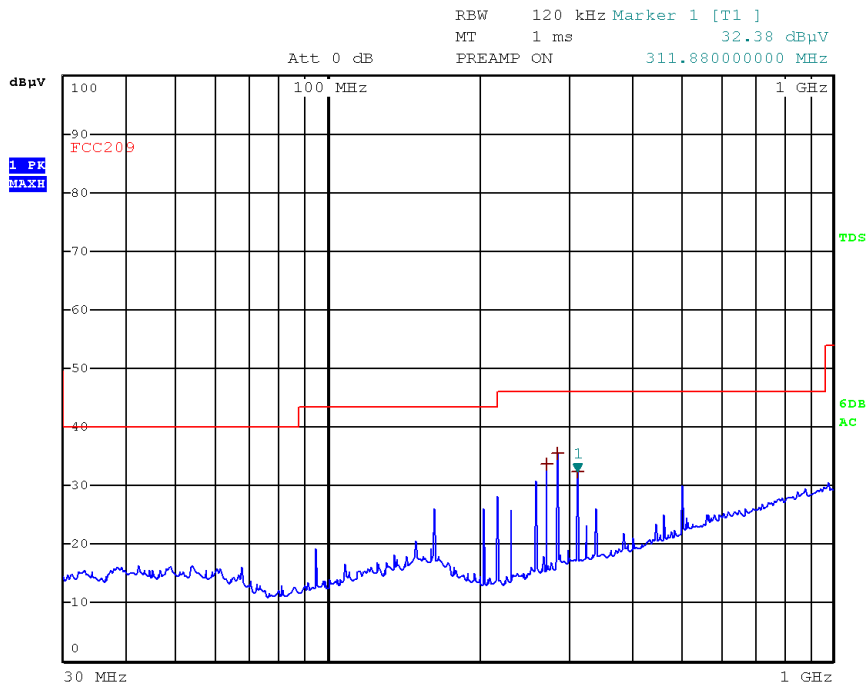


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Phones

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



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5 Occupied Bandwidth (99%)

according to RSS Gen Issue 2, section 4.6.1

5.1 Test location

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

5.2 Test Instruments

	Description	Manufacturer	Inventory No.
<input checked="" type="checkbox"/>	ESCS 30 (FF)	Rohde & Schwarz	E00003
<input type="checkbox"/>	ESU 26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/>	ESCI (CDC)	Rohde & Schwarz	E00001
<input type="checkbox"/>	VULB 9163 (FF)	Schwarzbeck	E00013
<input type="checkbox"/>	VULB 9160 (CDC)	Schwarzbeck	E00011
<input checked="" type="checkbox"/>	HFH2-Z2	Rohde & Schwarz	E00060
<input checked="" type="checkbox"/>	Feedline OATS	Huber & Suhner	200024

5.3 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.



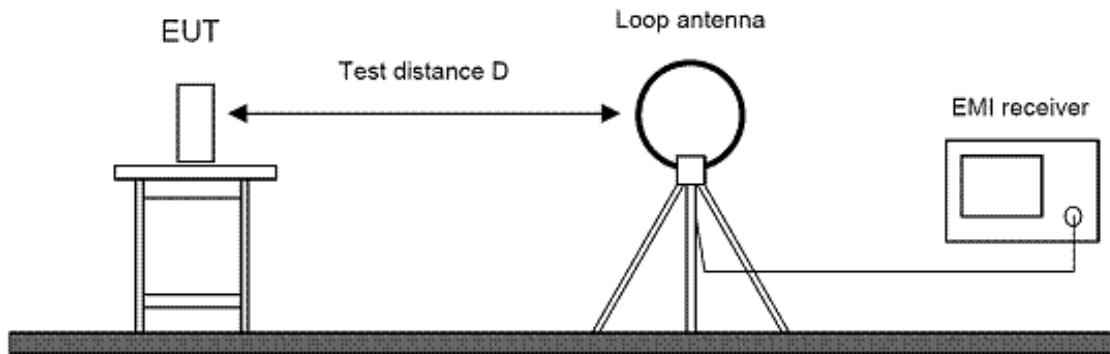
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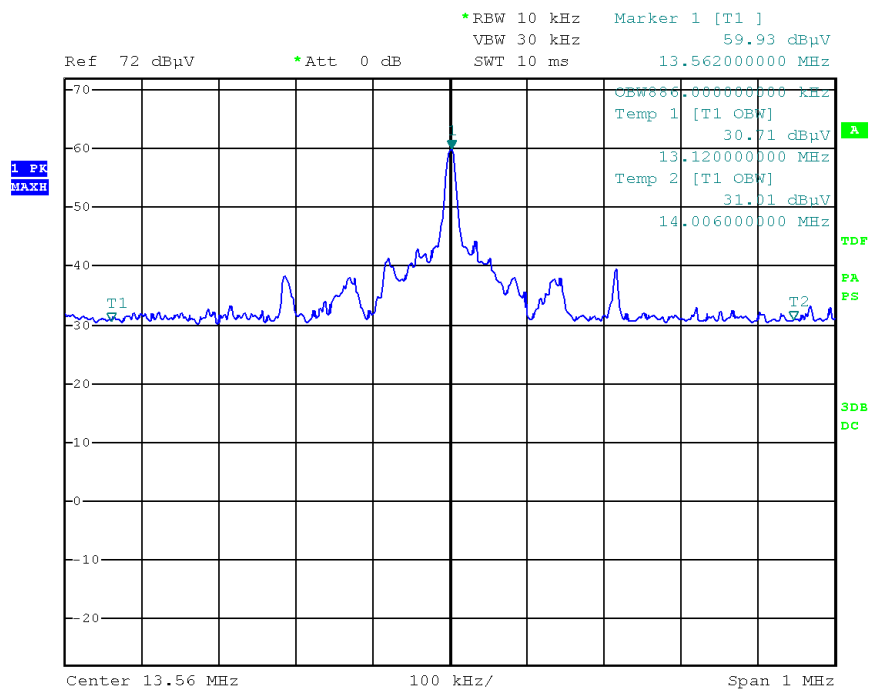
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5.4 Test setup



Picture 9: Test setup for radiated emission measurement (< 30 MHz)

5.5 Test results



Date: 4.MAY.2012 10:22:10

Picture 10: Occupied bandwidth 99%

Occupied Bandwidth: **886kHz**



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6 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. 12	Apr. 13	1 Years

Table 1: Equipment Calibration status



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7 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 %.



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8 Summary

The EMC Regulations according to the marked specifications are

KEPT

The EUT does fulfill the general approval requirements mentioned.

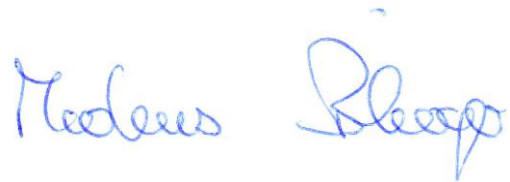
NOT KEPT

The EUT does not fulfill the general approval requirements mentioned.

Place, Date: Straubing, May 08, 2012



Christian Kiermeier
EMI / EMC Test Engineer



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



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