

Test Report

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RF test report

110584-AU01+W01



De Lorean Power GmbH

RFID-Reader Blacksocks

Sock-Reader



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

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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:

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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

1.1 Summary of test results

| Standard | Test result |
|--------------------|-------------|
| FCC CFR 47 Part 15 | Passed |



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2 Equipment under Test (EUT)

| | |
|-------------------------|--|
| Product type: | RFID-Reader Blacksocks |
| Model Name: | Sock-Reader |
| Manufacturer: | De Lorean Power GmbH |
| Serial number: | Prototype |
| FCC ID: | E5OBSSS01 |
| Application freq. band: | N/A |
| Frequency range: | 13,56MHz |
| Operating frequency: | 13,56MHz |
| Number of RF-channels: | 1 |
| Modulation: | ASK |
| Antenna type: | PCB antenna |
| | <input type="checkbox"/> detachable <input checked="" type="checkbox"/> not detachable |
| Power supply: | Battery powered nominal: 5.0 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 at 13,56MHz with integrated Bluetooth module with FCCID QQQWT12.

2.3 Operation mode

The EUT was tested in the following operation modes:

preconfigured by manufacturer (continuous transmitting of RFID)

The Bluetooth module was continuous activated during the test.

2.4 Configuration

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

| Device | Model: | S/N |
|-------------|-------------------|-----------|
| RFID-Reader | Sock-Reader | Prototype |
| Notebook | Fujitsu Life Book | N/A |

Used cables

| Numbers: | Description: (type / lengths / remarks) | Serial No |
|----------|--|-----------|
| 1 | UDB cable / 0,6m / shielded; only for charging | 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 type="checkbox"/> | ESCS 30 | Rohde & Schwarz | E00003 |
| <input checked="" 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] | Avarage [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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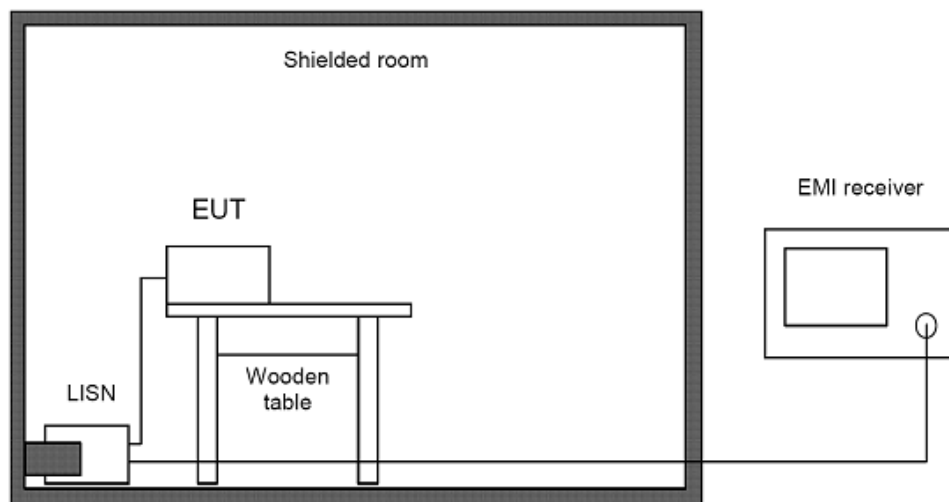
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3.4 Test procedure

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

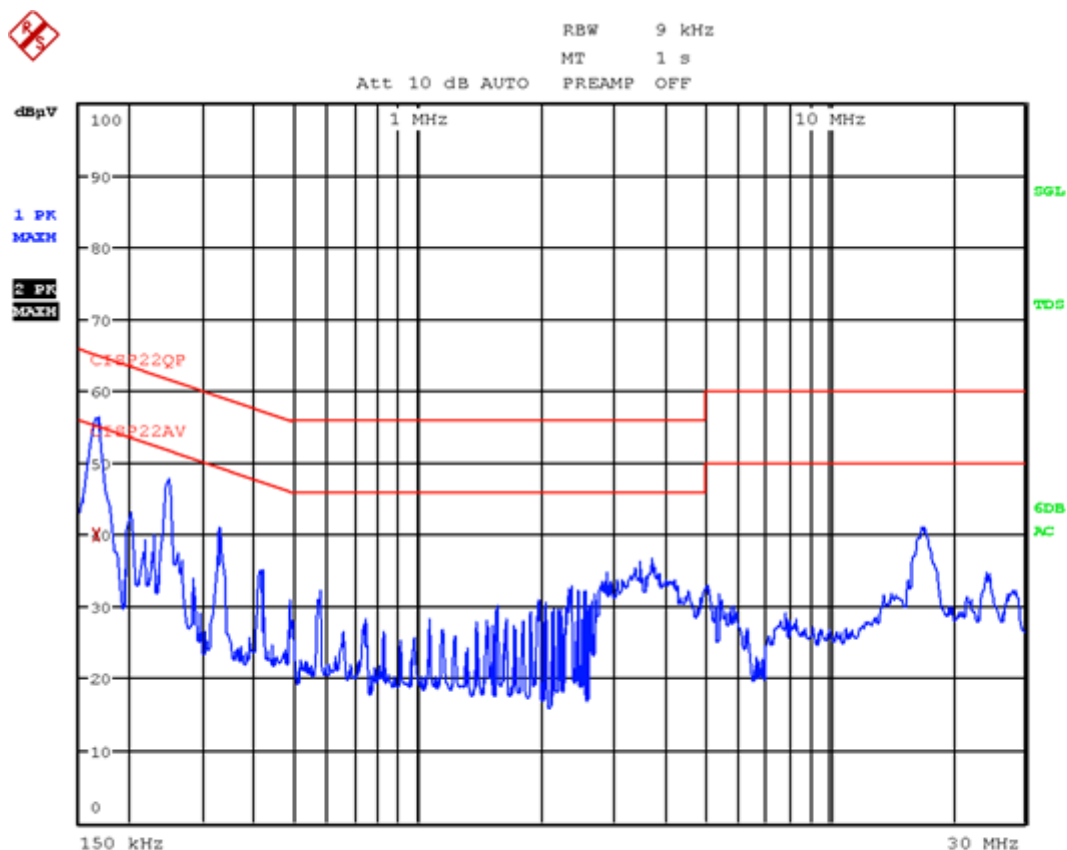


Picture 1: Outline of conducted emission test setup

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: | 2012-02-10 |



Picture 2: Conducted emission on mains, phase 1 (Chart) (120V/60HZ)

| Frequency (MHz) | Reading (dBμV/m) | Detector | Limit (dBμV/m) | Margin | Result |
|-----------------|------------------|----------|----------------|--------|--------|
| 0,166 | 40,4 | AV | 55,52 | -15,12 | PASS |

Note:

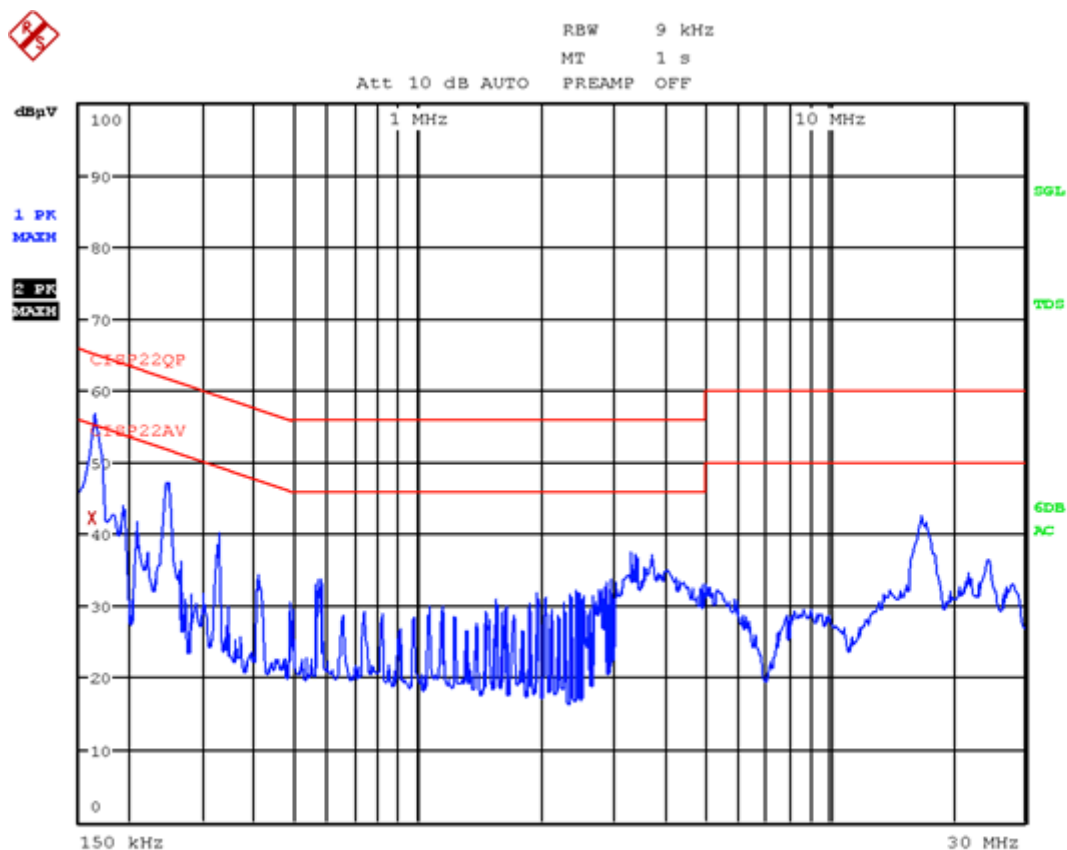


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Picture 3: Conducted emission on mains, neutral (Chart) (120V/60HZ)

| Frequency (MHz) | Reading (dBμV/m) | Detector | Limit (dBμV/m) | Margin | Result |
|-----------------|------------------|----------|----------------|--------|--------|
| 0,162 | 42,27 | AV | 55,36 | -13,09 | PASS |

Note:

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 [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 ($360^\circ / 6$) 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, measurements were done with a loop antenna. The recorded data were measured in QP mode off the receiver. Antenna height was not changed during this test.



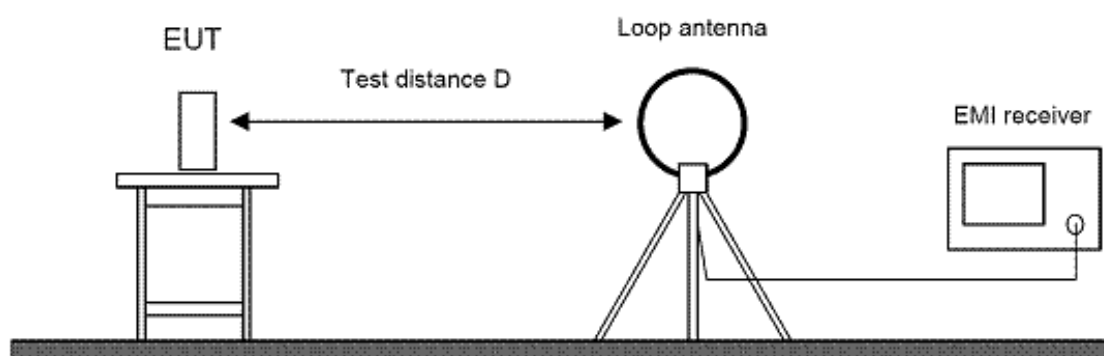
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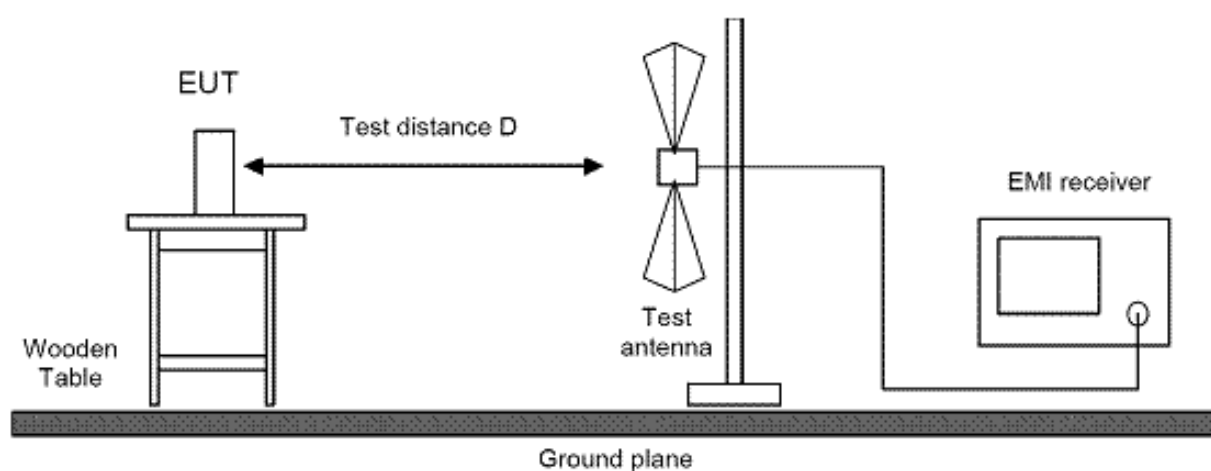
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4.5 Test setup



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: | 2012-10-10 |

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 |
|--------------------|---------------------|----------|--|-------------------------------|-------------------|--------|--------|
| 13.562 | 49,52 | QP | 40 | 9,52 | 50 | -40,48 | PASS |

Note:

Measured value = 49.52 dBµV/m @ 3 m

Recalculation factor = 40 dB / decade

Recalculated value = 56,85 dBµV/m @ 3 m - 40 dB = **9,52 dBµV/m @ 30 m**

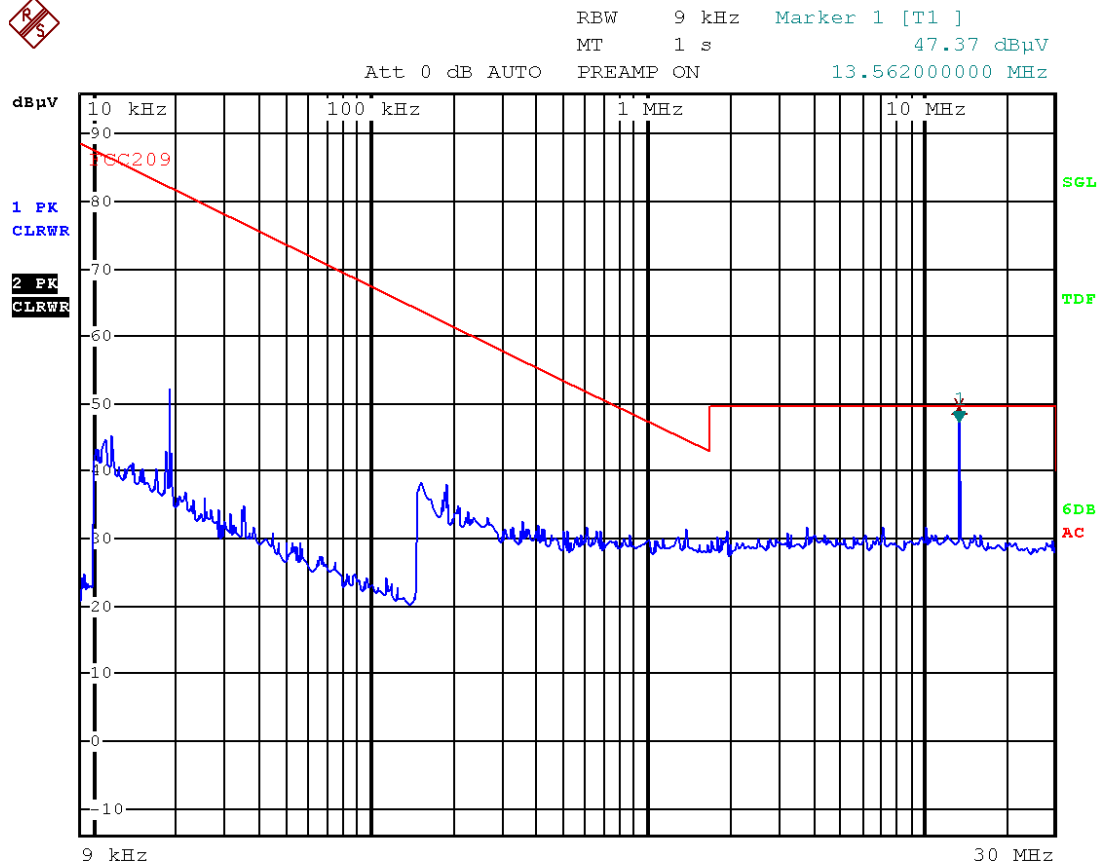


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Picture 6: Radiated emission 9 kHz – 30 MHz (@ 3m distance)

Radiated Emission Measurement 30 MHz – 1000 MHz

| Frequency (MHz) | Detector | Average field strength (dBµV/m) | Limit (dBµV/m) | Margin | Polarization | Result |
|--------------------|----------|--|-------------------|--------|--------------|--------|
| 893,52 | QPK | 22,80 | 46 | 23,20 | V | PASS |
| 909,56 | QPK | 22,88 | 46 | 23,12 | V | PASS |
| 909,64 | QPK | 22,89 | 46 | 23,11 | V | PASS |
| 897,92 | QPK | 22,79 | 46 | 23,21 | H | PASS |

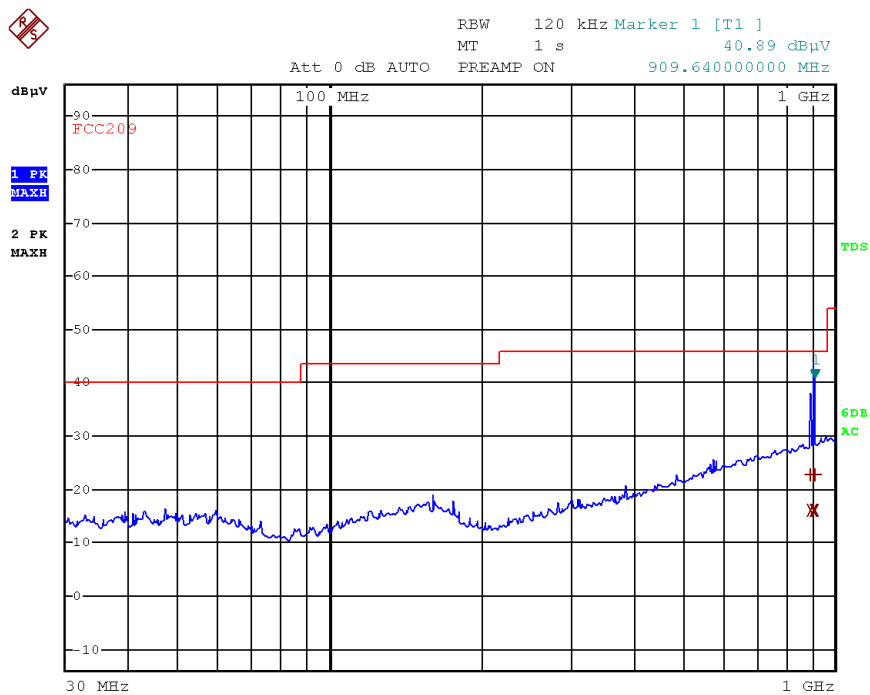


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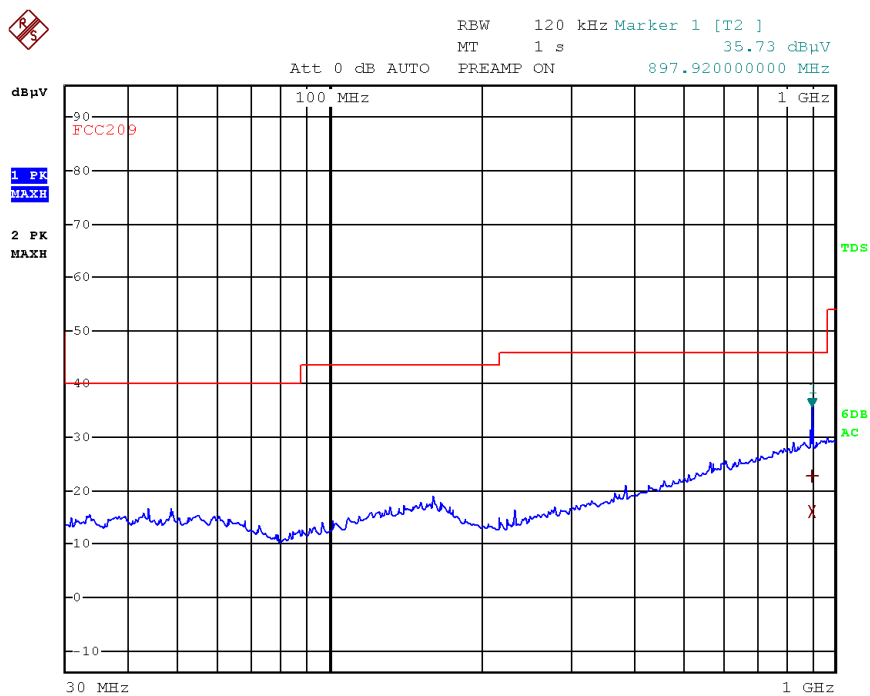
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Picture 7: Radiated emission 30 MHz – 1000MHz (Vertical)



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 | Mar 12 | 1 Years |

Table 1: Equipment Calibration status



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6 Measurement uncertainty

| Description | Max. deviation | k= |
|--|----------------|----|
| Conducted emission AMN (9kHz to 30 MHz) | $\pm 4,0$ dB | 2 |
| Radiated emission open field (30 MHz to 1 GHz) | $\pm 4,5$ dB | 2 |
| Radiated emission absorber chamber (> 1000 MHz) | $\pm 5,4$ 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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7 Summary

The EMC Regulations according to the marked specifications are

☒ **KEPT**

The EUT does fulfill the general approval requirements mentioned.

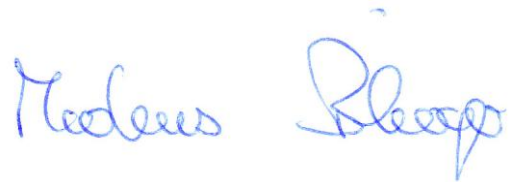
☐ **NOT KEPT**

The EUT does not fulfill the general approval requirements mentioned.

Place, Date: Straubing, February 10, 2012



Christian Kiermeier
EMI / EMC Test Engineer



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



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