

Test Report

Customer:

Elatec Vertriebs GmbH

Max-Planck-Straße 16
82223 Eichenau

Tel.: +49 89 5529961 13

Fax: +49 89 5529961 13

RF test report

110091-AU01+W02 Ed. 2



 Industry Canada Industrie Canada
Elatec Vertriebs GmbH

Transponder

TWN3 Legic NFC



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
Fax: +49 9421 56868-100
Email: company@emv-testhaus.com

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

Location of Testing:

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: 1.0

Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 2 of 29

Table of contents

| | | |
|----|--|----|
| 1 | Test regulations | 5 |
| 2 | Equipment under Test (EUT) | 6 |
| 3 | AC power line conducted emissions | 8 |
| 5 | Radiated emission measurement (<1 GHz) | 18 |
| 6 | Occupied Bandwidth (99%) | 24 |
| 8 | Equipment calibration status | 27 |
| 9 | Measurement uncertainty | 28 |
| 10 | Summary | 29 |



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 3 of 29

List of pictures

| | |
|---|----|
| Picture 1: Outline of conducted emission test setup | 9 |
| Picture 2: Conducted emission on mains, phase 1 (Chart) | 10 |
| Picture 3: Conducted emission on mains, phase 1 (Table)..... | 11 |
| Picture 4: Conducted emission on mains, phase 1 (Chart), with 50 Ohm load..... | 12 |
| Picture 5: Conducted emission on mains, phase 1 (Table), with 50 Ohm load..... | 13 |
| Picture 6: Conducted emission on mains, neutral (Chart)..... | 14 |
| Picture 7: Conducted emission on mains, neutral (Table)..... | 15 |
| Picture 8: Conducted emission on mains, neutral (Chart), with 50 Ohm load..... | 16 |
| Picture 9: Conducted emission on mains, neutral (Table), with 50 Ohm load | 17 |
| Picture 12: Test setup for radiated emission measurement (< 30 MHz)..... | 19 |
| Picture 13: Test setup for radiated emission measurement (< 1 GHz)..... | 20 |
| Picture 14: Radiated emission 9 kHz – 30 MHz (pre-scan, 3 m)..... | 21 |
| Picture 15: Radiated emission 30 MHz – 1000MHz..... | 22 |
| Picture 16: Radiated emission 30 MHz – 1000MHz (Table)..... | 23 |
| Picture 17: Test setup for radiated emission measurement (< 30 MHz)..... | 25 |
| Picture 18: Occupied bandwidth 99% | 26 |

List of tables

| | |
|---|----|
| Table 1: Equipment Calibration status | 27 |
| Table 2: Measurement uncertainty | 28 |



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 4 of 29

1 Test regulations

| | |
|--|---|
| CFR 47 Part 2: October 1, 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: October 1, 2010 | 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 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 3 and RSS-Gen Issue 3 | Passed |



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 5 of 29

2 Equipment under Test (EUT)

Product type: Transponder
Model Name: TWN3 Legic NFC
Manufacturer: Elatec Vertriebs GmbH
Serial number: Sample 2
FCC ID: WP5TWN3B1
IC: 7948A-TWN3B1
Application freq. band: N/A
Frequency range: 13.56 MHz
Operating frequency: 13.56 MHz
Number of RF-channels: 1
Modulation: ASK
Antenna type: Integrated PCB antenna
 detachable not detachable
Power supply: Host powered (USB)
nominal: 5.0 VDC
Alternative: If equipped with serial connector, external 5 VDC power supply
Temperature range: -20°C to +55°C



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 6 of 29

2.2 Photo documentation

For photos taken during testing, see annex A.

For photos of the EUT, see annex B.

For internal photos of the EUT, see annex C.

2.3 Short description of the EUT

The EUT is a RFID reader for the Legic RFID tags. It is operating at a frequency of 13.56 MHz

2.4 Operation mode

The EUT was tested in the following operation modes:

- Reading tags continuously. The EUT was preconfigured for this operation mode.
- The EUT employs a combined receiver and transmitter that cannot be operated separately.

Physical type of connection to the host computer: USB or RS232, DSUB25, DSUB9 or PS/2. Based on preliminary tests the device with USB connector was identified as worst case. All following test were carried out with this type of connection.

2.5 Configuration

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

| Device | Model: | S/N |
|------------------|-------------------------------|------------|
| Transponder | TWN3 Legic NFC | Sample 2 |
| 19" LCD monitor | Belinea 1019 | N/A |
| Test Notebook | Pro 600 IW | N/A |
| AC power supply | SADP-65KB AD | N/A |
| Test PC-System 1 | Fujitsu Siemens Esprimo P9900 | YL6K001108 |
| USB Mouse | Microsoft | N/A |
| PS/2 Keyboard | Maxdata | N/A |

Used cables

| Numbers: | Description: (type / lengths / remarks) | Serial No |
|----------|--|-----------|
| 1 | EUT: non-detachable USB cable (shielded / 2 m) | N/A |
| 2 | AC cable, unshielded, 1.5m | N/A |
| 1 | DVI cable, shielded, 1.5 m | N/A |



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH

TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 7 of 29

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"/> | 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 |

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.
8. Additionally for a device with a permanent antenna the measurements are done with a suitable dummy load, in lieu of the permanent antenna (see KB174176).



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

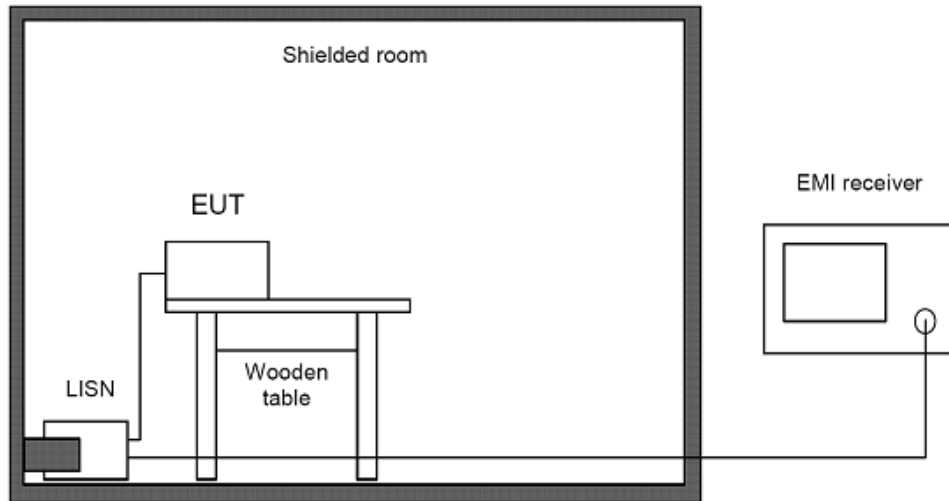
Elatec Vertriebs GmbH

TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 8 of 29

3.5 Test setup



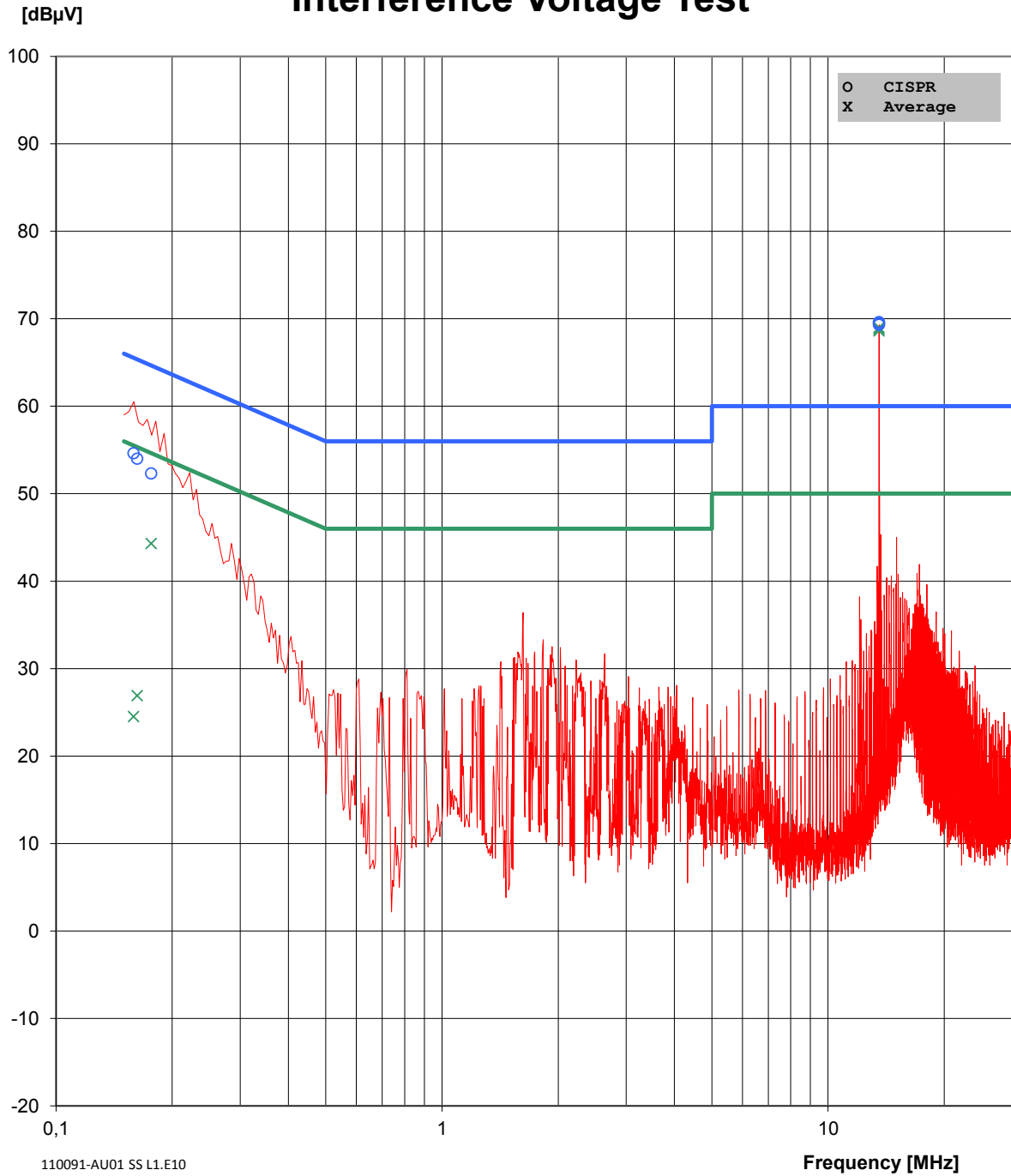
Picture 1: Outline of conducted emission test setup

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

3.6 Test results

| | | | |
|--------------|-----------|------------|------------|
| Temperature: | 22°C | Humidity: | 32% |
| Tested by: | M. Janker | Test date: | 2011-04-18 |

Interference Voltage Test



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

Interference Voltage Test

| Freq. [MHz] | U_CISPR [dBµV] | Limit [dBµV] | delta_U [dB] | U_AV [dBµV] | Limit [dBµV] | delta_U [dB] | Corr. [dB] | Remark |
|----------------|-------------------|-----------------|-----------------|----------------|-----------------|-----------------|---------------|-----------------------|
| 0,16 | 54,6 | 65,5 | 10,9 | 24,5 | 55,5 | 31,0 | 0,0 | 110091-AU01 SS L1,F10 |
| 0,16 | 54,0 | 64,8 | 10,8 | 26,9 | 54,8 | 27,9 | 0,0 | |
| 0,18 | 52,3 | 64,4 | 12,1 | 44,3 | 54,4 | 10,1 | 0,0 | |
| 13,56 | 69,3 | 60,0 | -9,3 | 68,6 | 50,0 | -18,6 | 0,0 | |
| 13,56 | 69,5 | 60,0 | -9,5 | 68,8 | 50,0 | -18,8 | 0,0 | |
| 13,56 | 69,6 | 60,0 | -9,6 | 69,0 | 50,0 | -19,0 | 0,0 | |
| 13,56 | 69,6 | 60,0 | -9,6 | 69,0 | 50,0 | -19,0 | 0,0 | |

Picture 3: Conducted emission on mains, phase 1 (Table)



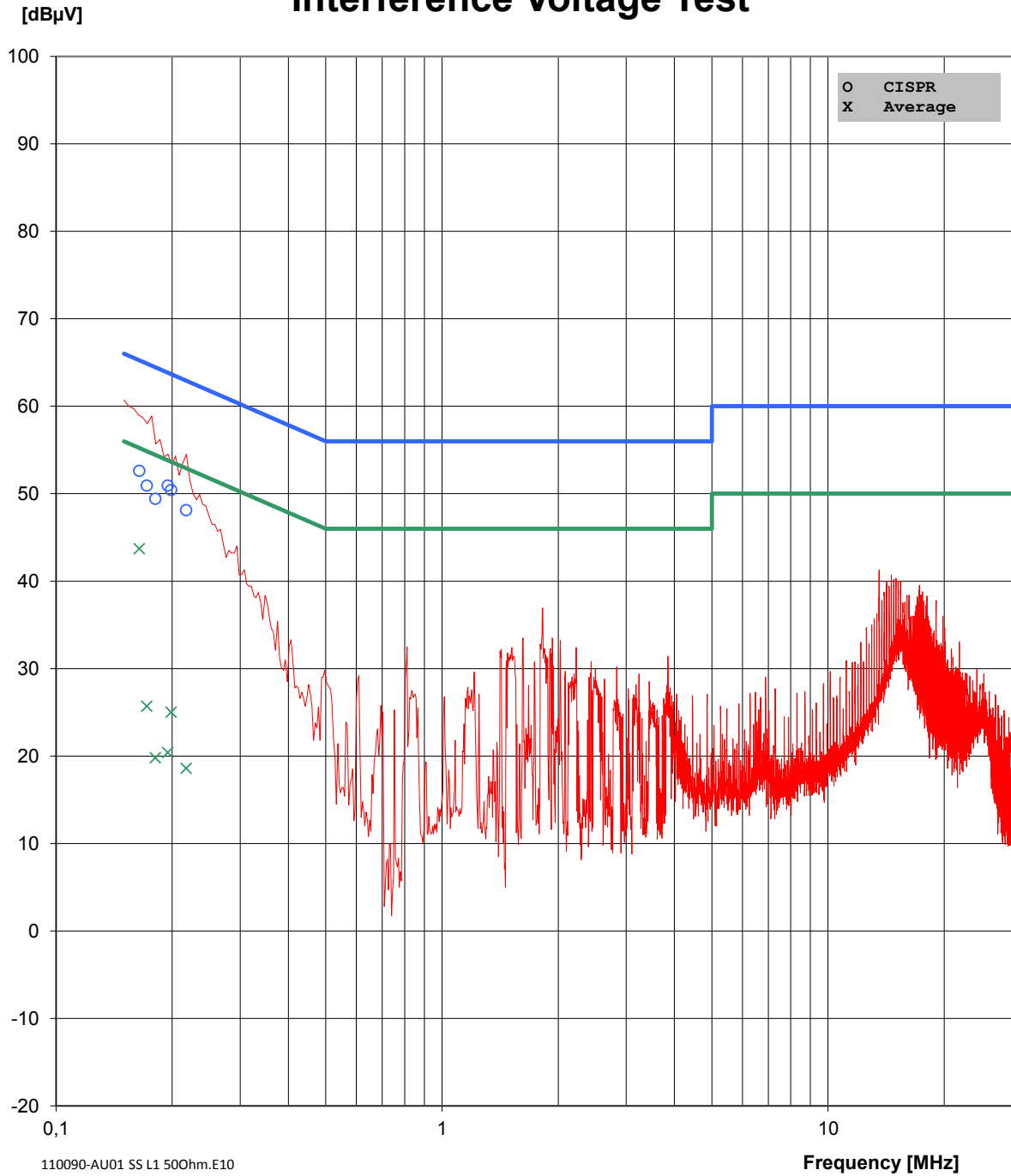
EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

110091-AU01+W02
 Ed. 2

Page 11 of 29

Interference Voltage Test



Picture 4: Conducted emission on mains, phase 1 (Chart), with 50 Ohm load

Interference Voltage Test

| Freq. [MHz] | U_CISPR [dBµV] | Limit [dBµV] | delta_U [dB] | U_AV [dBµV] | Limit [dBµV] | delta_U [dB] | Corr. [dB] | Remark |
|----------------|-------------------|-----------------|-----------------|----------------|-----------------|-----------------|---------------|-----------------------------|
| 0,16 | 52,6 | 65,8 | 13,2 | 43,7 | 55,8 | 12,1 | 0,0 | 110090-AU01 SS L1 50Ohm.F10 |
| 0,17 | 50,9 | 64,6 | 13,7 | 25,7 | 54,6 | 28,9 | 0,0 | |
| 0,18 | 49,4 | 64,2 | 14,8 | 19,8 | 54,2 | 34,4 | 0,0 | |
| 0,20 | 50,9 | 63,8 | 12,9 | 20,4 | 53,8 | 33,4 | 0,0 | |
| 0,20 | 50,4 | 63,4 | 13,0 | 25,0 | 53,4 | 28,4 | 0,0 | |
| 0,22 | 48,1 | 62,9 | 14,8 | 18,6 | 52,9 | 34,3 | 0,0 | |

Picture 5: Conducted emission on mains, phase 1 (Table), with 50 Ohm load



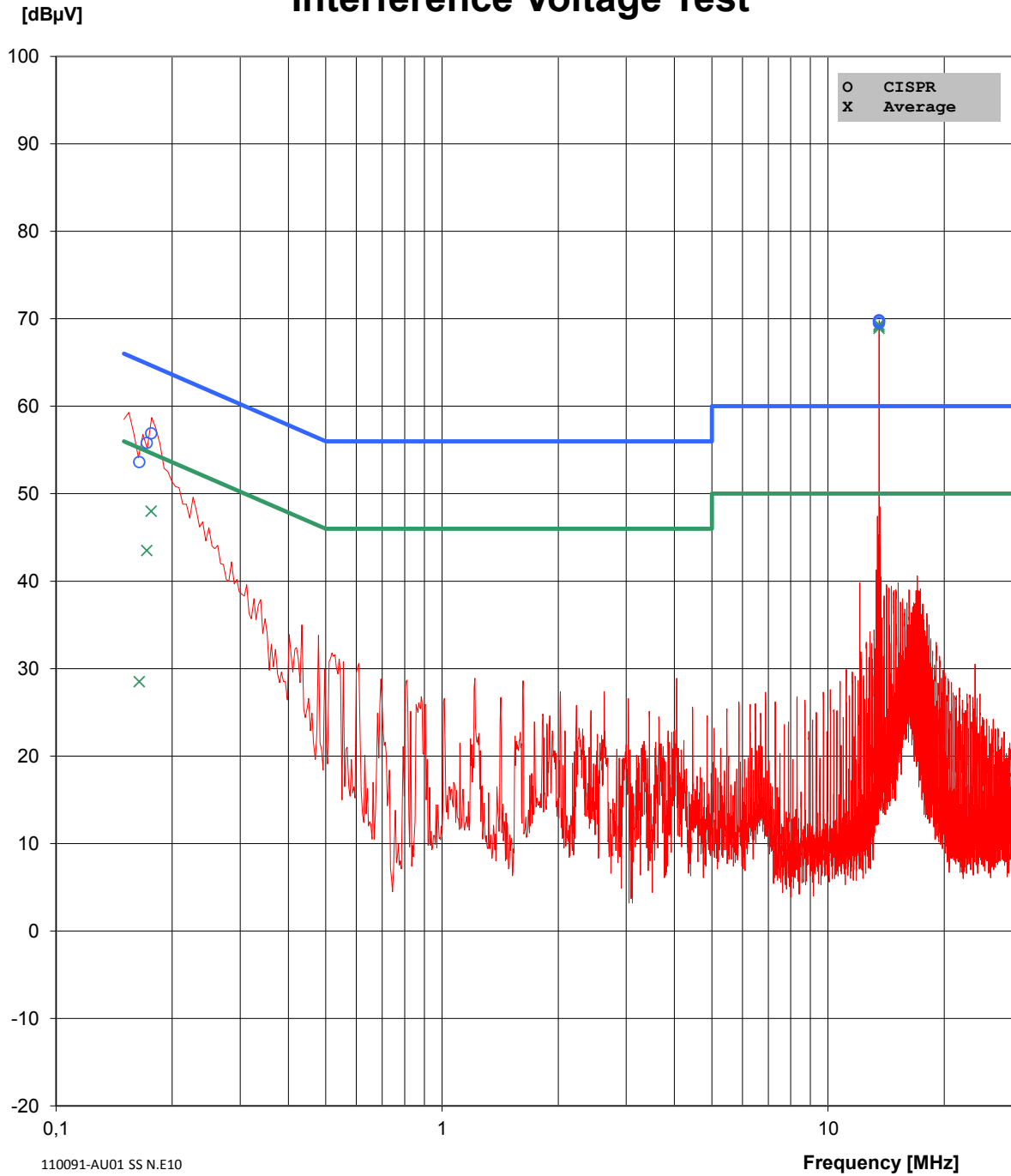
EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

110091-AU01+W02
 Ed. 2

Page 13 of 29

Interference Voltage Test



110091-AU01 SS N.E10

Picture 6: Conducted emission on mains, neutral (Chart)



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

Interference Voltage Test

| Freq. [MHz] | U_CISPR [dBµV] | Limit [dBµV] | delta_U [dB] | U_AV [dBµV] | Limit [dBµV] | delta_U [dB] | Corr. [dB] | Remark |
|----------------|-------------------|-----------------|-----------------|----------------|-----------------|-----------------|---------------|----------------------|
| 0,16 | 53,6 | 65,8 | 12,2 | 28,5 | 55,8 | 27,3 | 0,0 | 110091-AU01 SS N.E10 |
| 0,17 | 55,8 | 64,6 | 8,8 | 43,5 | 54,6 | 11,1 | 0,0 | |
| 0,18 | 56,9 | 64,4 | 7,5 | 48,0 | 54,4 | 6,4 | 0,0 | |
| 13,56 | 69,5 | 60,0 | -9,5 | 68,9 | 50,0 | -18,9 | 0,0 | |
| 13,56 | 69,7 | 60,0 | -9,7 | 69,1 | 50,0 | -19,1 | 0,0 | |
| 13,56 | 69,8 | 60,0 | -9,8 | 69,3 | 50,0 | -19,3 | 0,0 | |
| 13,56 | 69,8 | 60,0 | -9,8 | 69,3 | 50,0 | -19,3 | 0,0 | |

Picture 7: Conducted emission on mains, neutral (Table)



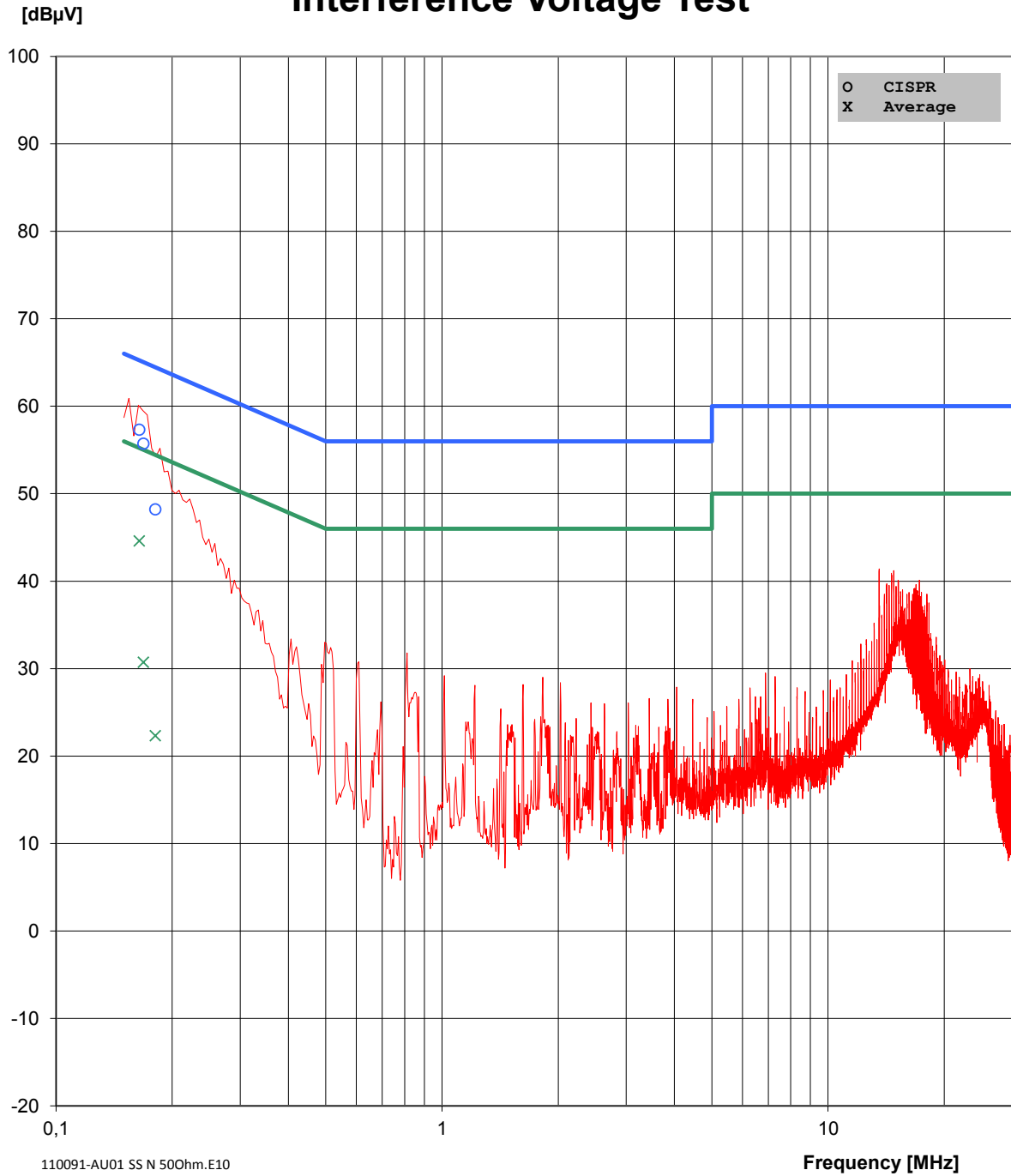
EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

110091-AU01+W02
 Ed. 2

Page 15 of 29

Interference Voltage Test



110091-AU01 SS N 50Ohm.E10

Frequency [MHz]

Picture 8: Conducted emission on mains, neutral (Chart), with 50 Ohm load



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

110091-AU01+W02
 Ed. 2

Page 16 of 29

Interference Voltage Test

| Freq. [MHz] | U_CISPR [dBµV] | Limit [dBµV] | delta_U [dB] | U_AV [dBµV] | Limit [dBµV] | delta_U [dB] | Corr. [dB] | Remark |
|----------------|-------------------|-----------------|-----------------|----------------|-----------------|-----------------|---------------|----------------------------|
| 0,16 | 57,3 | 65,8 | 8,5 | 44,6 | 55,8 | 11,2 | 0,0 | 110091-AU01 SS N 50Ohm.E10 |
| 0,17 | 55,7 | 65,3 | 9,6 | 30,7 | 55,3 | 24,6 | 0,0 | |
| 0,18 | 48,2 | 64,2 | 16,0 | 22,3 | 54,2 | 31,9 | 0,0 | |

Picture 9: Conducted emission on mains, neutral (Table), with 50 Ohm load



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

110091-AU01+W02
 Ed. 2

Page 17 of 29

5 Radiated emission measurement (<1 GHz)

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

5.1 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 |

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 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 |

5.3 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 [$\mu\text{V}/\text{m}$] | Field strength [dB $\mu\text{V}/\text{m}$] | 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 |



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

110091-AU01+W02
 Ed. 2

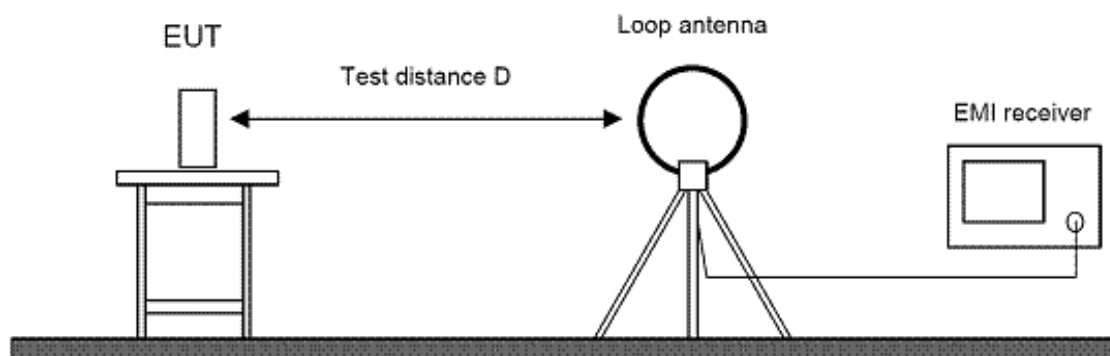
Page 18 of 29

| | | | |
|-----------|-----|------|---|
| 88 – 216 | 150 | 43.5 | 3 |
| 216 - 960 | 200 | 46 | 3 |
| Above 960 | 500 | 54 | 3 |

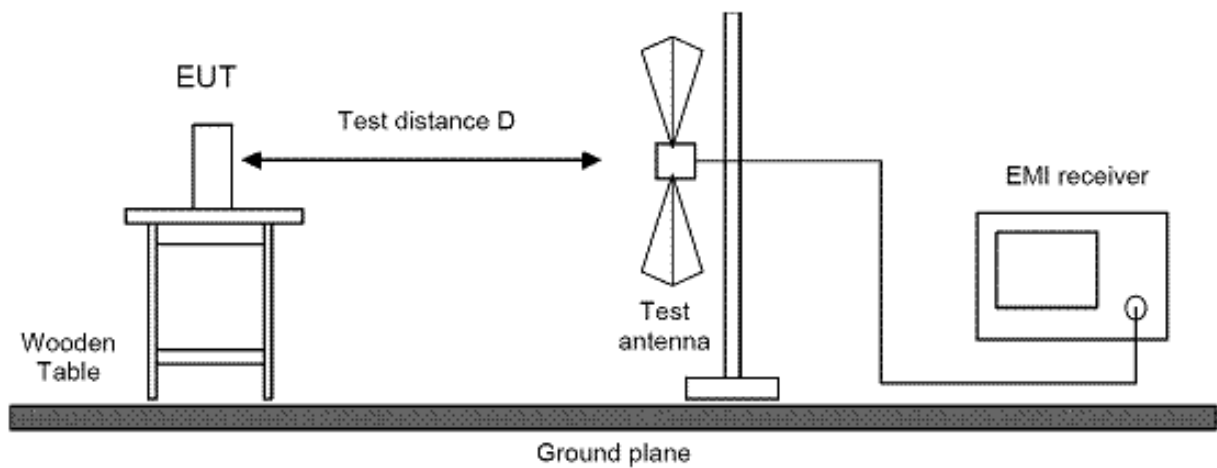
5.4 Test procedure

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 of the receiver. Antenna height was not changed during this test.

5.5 Test setup



Picture 12: Test setup for radiated emission measurement (< 30 MHz)



Picture 13: Test setup for radiated emission measurement (< 1 GHz)

5.6 Test deviation

There is no deviation with the original standard.

5.7 EUT operation during test

The EUT was programmed to be in continuously transmitting mode.

5.8 Test results

Transmit mode

| | | | |
|--------------|-----------|------------|------------|
| Temperature: | 30°C | Humidity: | 27% |
| Tested by: | M. Janker | Test date: | 2011-04-21 |

Radiated Emission Measurement 9 kHz – 30 MHz

Amplitudes of spurious emissions that are attenuated more than 20 dB below the permissible limit are not reported.

| Frequency (GHz) | 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 | 44,22 | QP | 40 | 4,22 | 29.54 | 25,32 | PASS |

Note:

Measured value = 44,22 dB μ V/m @ 3 m

Recalculation factor = 40 dB / decade

Recalculated value = 44,22 dB μ V/m @ 3 m - 40 dB = **4,22 dB μ V/m @ 30 m**



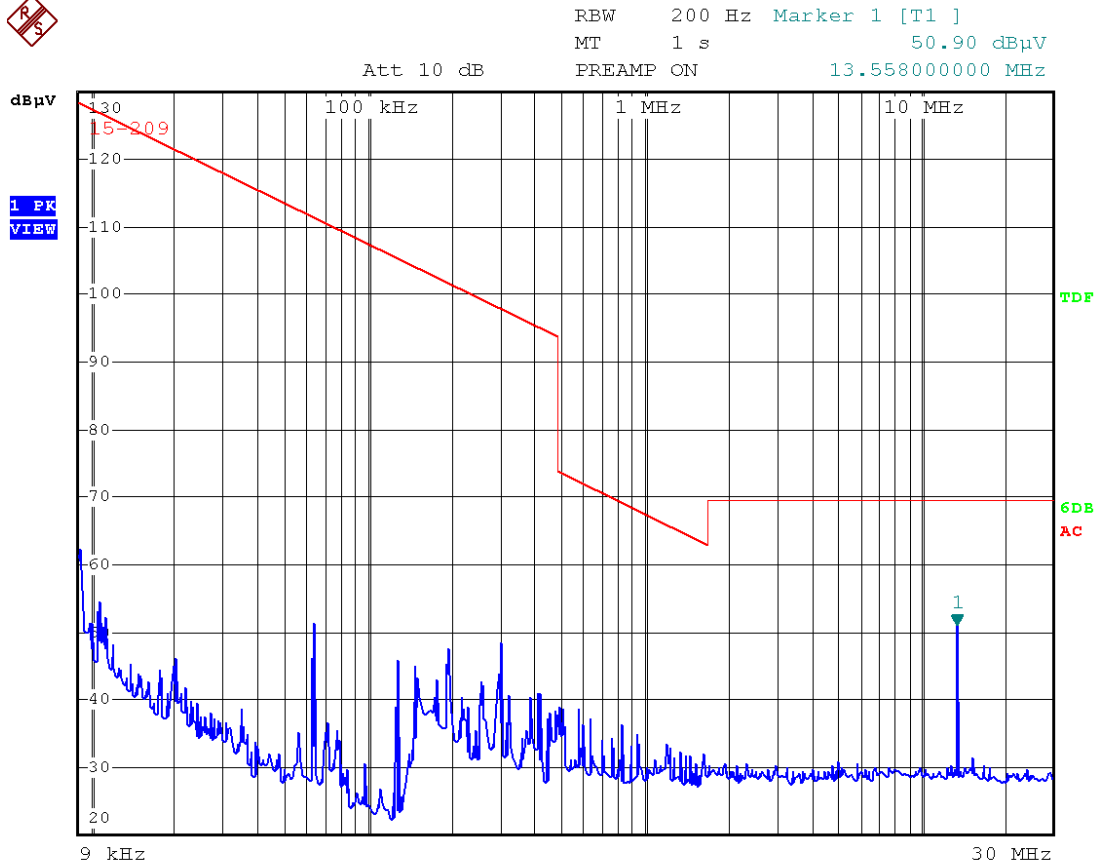
EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH

TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 20 of 29



Date: 14.APR.2011 15:22:00

Picture 14: Radiated emission 9 kHz – 30 MHz (pre-scan, 3 m)



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

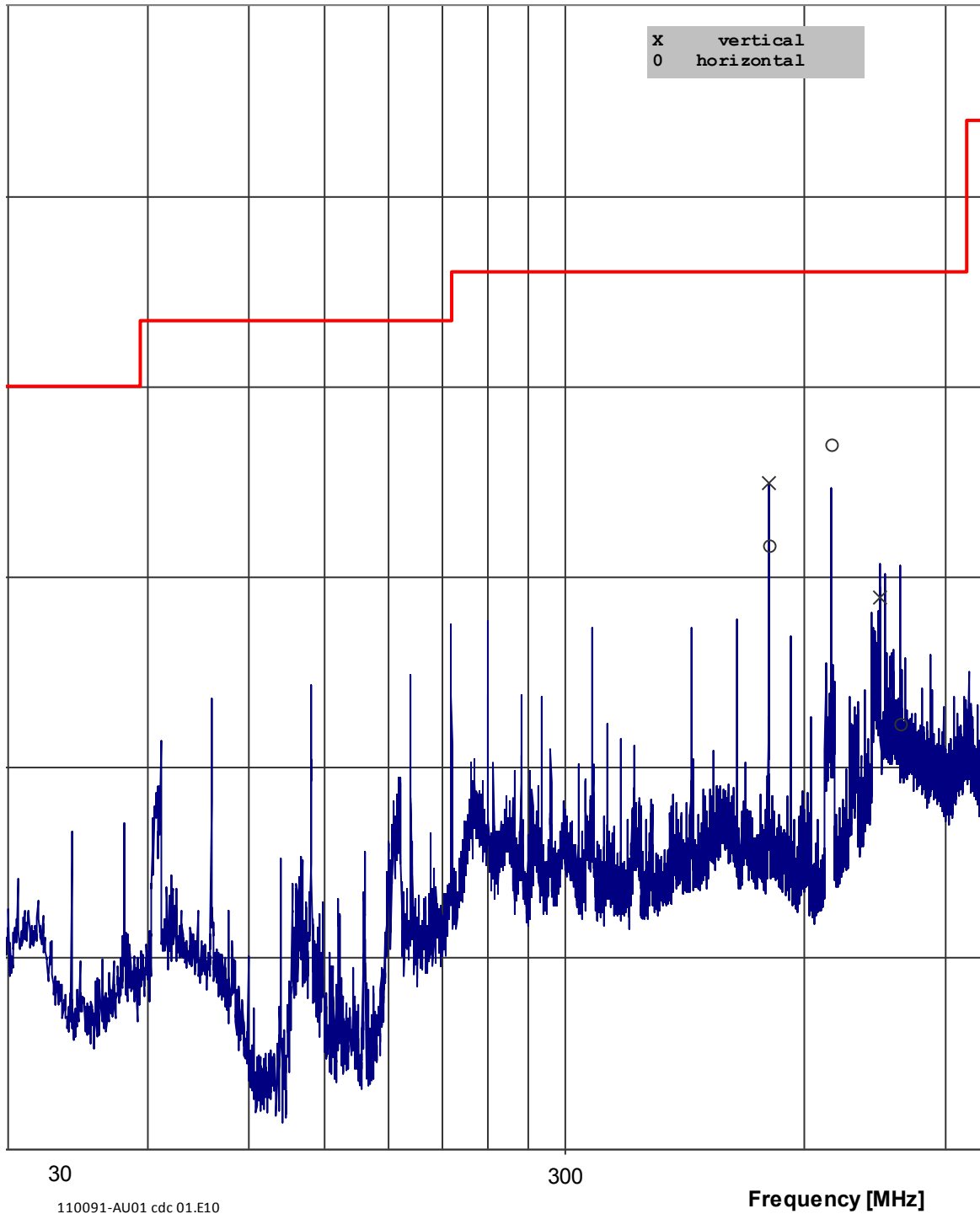
Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 21 of 29

Interference Radiation Test

[dB μ V/m]



Picture 15: Radiated emission 30 MHz – 1000MHz

Interference Radiation Test

| Freq. [MHz] | U_Rec [dB μ V/m] | Limit [dB μ V/m] | Corr. [dB] | U_Ant. [dB μ V] | delta_U [dB] | Turn- table | Antenna | Pol. | Remark |
|----------------|-------------------------|-------------------------|---------------|------------------------|-----------------|----------------|---------|------|------------------------|
| 42,60 | 23,6 | 40,0 | 14,3 | 9,3 | 16,4 | 213° | 250 cm | H | 110091-AU01 cdc.01.F10 |
| 42,60 | 35,6 | 40,0 | 14,3 | 21,3 | 4,4 | 10° | 100 cm | V | |
| 44,20 | 22,7 | 40,0 | 14,2 | 8,5 | 17,3 | 234° | 250 cm | H | |
| 44,20 | 32,4 | 40,0 | 14,2 | 18,2 | 7,6 | 20° | 100 cm | V | |
| 45,40 | 29,2 | 40,0 | 14,2 | 15,0 | 10,8 | 218° | 250 cm | H | |
| 45,40 | 38,2 | 40,0 | 14,2 | 24,0 | 1,8 | 270° | 120 cm | V | |
| 540,00 | 31,7 | 46,0 | 19,8 | 11,9 | 14,3 | 33° | 250 cm | H | |
| 540,00 | 34,9 | 46,0 | 19,8 | 15,1 | 11,1 | 255° | 100 cm | V | |
| 648,00 | 37,0 | 46,0 | 14,5 | 22,5 | 9,0 | 7° | 100 cm | H | |
| 746,60 | 29,0 | 46,0 | 17,0 | 11,9 | 17,0 | 170° | 100 cm | V | |
| 792,00 | 22,3 | 46,0 | 20,6 | 1,6 | 23,7 | 188° | 100 cm | H | |

Picture 16: Radiated emission 30 MHz – 1000MHz (Table)



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

110091-AU01+W02
 Ed. 2

Page 23 of 29

6 Occupied Bandwidth (99%)

according to RSS Gen Issue 2, section 4.6.1

6.1 Test location

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

6.2 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 |

6.3 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.



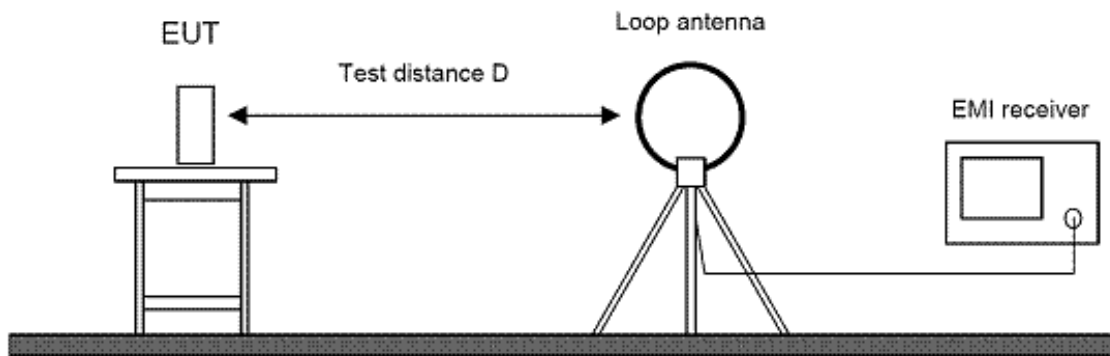
EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

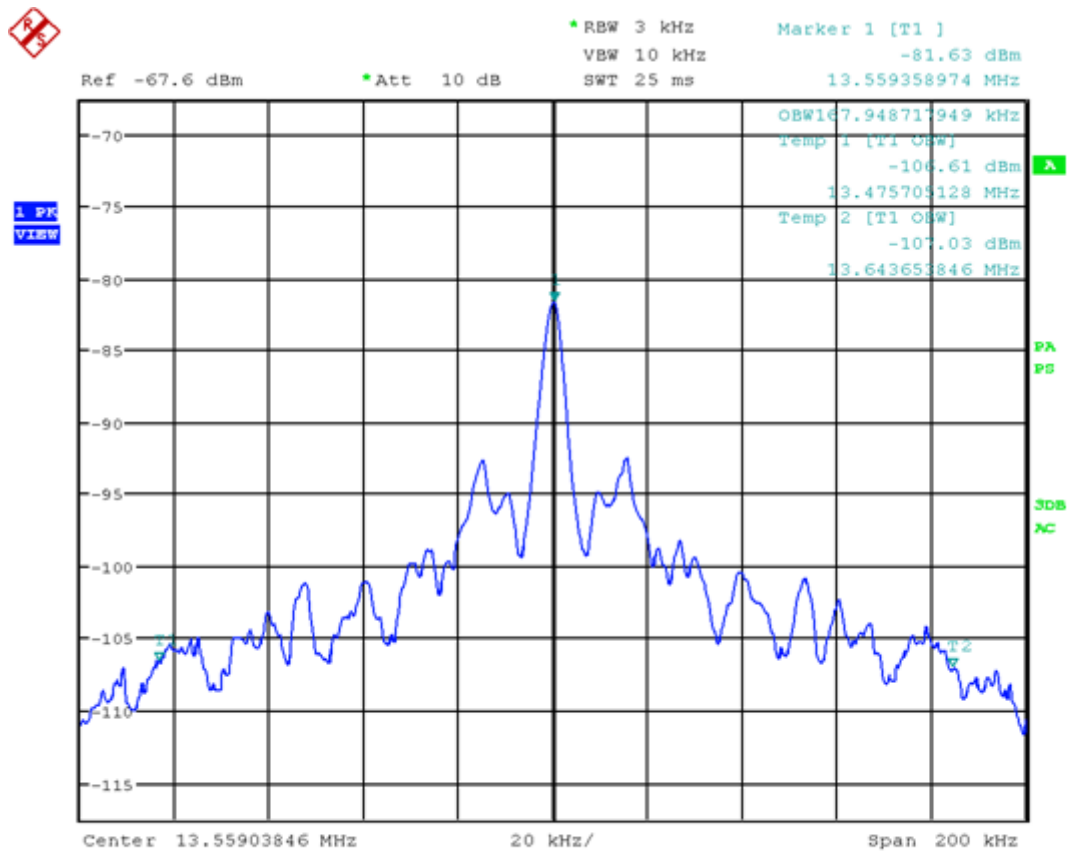
Page 24 of 29

6.4 Test setup



Picture 17: Test setup for radiated emission measurement (< 30 MHz)

6.5 Test results



Picture 18: Occupied bandwidth 99%

Occupied Bandwidth: **167.95kHz**

8 Equipment calibration status

| Inventory Number | Model Number | Manufacturer | Last calibration | Next calibration | Cycle of calibration |
|------------------|----------------------|-----------------|------------------|------------------|----------------------|
| W00002 | ESU26 | Rohde & Schwarz | Sep 09 | Sep 11 | 2 Years |
| E00001 | ESCI | Rohde & Schwarz | Sep 09 | Mar 11 | 2 Years |
| E00003 | ESCS 30 | Rohde & Schwarz | Oct 10 | Oct 12 | 1 Year |
| E00004 | ESH 2-Z5 | Rohde & Schwarz | Jan 11 | Jan 13 | 2 Years |
| E00005 | ESH 2-Z5 | Rohde & Schwarz | Sep 09 | Sep 11 | 2 Years |
| E00060 | HFH2-Z2 | Rohde & Schwarz | Oct 08 | Oct 11 | 4 Years |
| E00011 | VULB 9160 | Schwarzbeck | Sep. 09 | Sep. 11 | 2 Years |
| E00012 | VULB 9163 | Schwarzbeck | Mar 11 | Mar 12 | 1 Years |
| C00015 | VC ³ 4034 | Vötsch | Aug 10 | Aug 14 | 4 Years |

Table 1: Equipment Calibration status



EMV **TESTHAUS** GmbH
 Gustav-Hertz-Straße 35
 94315 Straubing
 Germany
 Revision: 1.0

Elatec Vertriebs GmbH
 TWN3 Legic NFC

110091-AU01+W02
 Ed. 2

Page 27 of 29

9 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 %.



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 28 of 29

10 Summary

The EMC Regulations according to the marked specifications are

KEPT

The EUT does fulfill the general approval requirements mentioned.

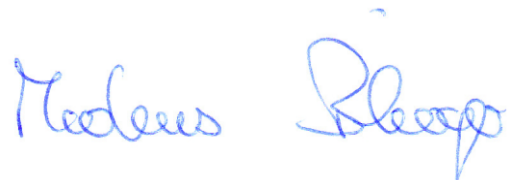
NOT KEPT

The EUT does not fulfill the general approval requirements mentioned.

Place, Date: Straubing, May 04, 2011



Marco Janker
EMI / EMC Test Engineer



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



EMV **TESTHAUS** GmbH
Gustav-Hertz-Straße 35
94315 Straubing
Germany
Revision: 1.0

Elatec Vertriebs GmbH
TWN3 Legic NFC

110091-AU01+W02
Ed. 2

Page 29 of 29