

Test report

Customer:

Gromako Data & Services Ltd.

dba Vaughter Wellness
20-22 Bedford Row
London WC1R 4JS
United Kingdom

EMC test report

160466-AU01+E01



Gromako Data & Services Ltd.

DERMINATOR

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The test result refers exclusively to the model tested.

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Accreditation:



FCC facility registration number: 221458
Test Firm Type "2.948 listed": Valid until 2017-04-22
Test Firm Type "accredited": Valid until 2017-06-09
MRA US-EU, FCC designation number: DE0010
BnetzA-CAB-02/21-02/04 Valid until 2018-11-27

Industry Canada test site number: 3472A-1
Registration expiry date: 2015-10-02

Location of Testing:

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



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Page 2 of 27

Table of contents

1	Summary of test results	5
1.1	Emission	5
2	Referenced publications	6
3	Equipment under test (EUT)	7
4	Equipment modifications.....	8
5	Product labeling according to Part 15.19, Part 15.21 and Part 15.212	9
5.1	Label and Location (Verification).....	9
5.2	Information to the user for Class A devices to be stated in the user manual according to Part 15.105	9
6	Photographs of EUT	10
7	Test configuration and mode of operation.....	12
7.1	Test configuration	12
7.2	Mode of operation.....	12
8	Test results.....	13
8.1	Conducted disturbance at mains terminals	14
8.2	Radiated disturbance (30 MHz – 1000 MHz)	21
9	Equipment calibration status.....	25
10	Measurement uncertainties	26
11	Revision history	27
12	Additional documents	27



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List of pictures

Picture 1: FCC Label (example)	9
Picture 2: Top view of EUT	10
Picture 3: Name plate of EUT	11
Picture 4: Test setup of conducted emission	15
Picture 5: Test setup of radiated emission (30 MHz – 1000 MHz)	22

List of figures

Figure 1: Chart of conducted disturbance test at mains terminals – phase L1	17
Figure 2: Final results of conducted disturbance test at mains terminals – phase L1	18
Figure 3: Chart of conducted disturbance test at mains terminals – phase N	19
Figure 4: Final results of conducted disturbance test at mains terminals – phase N	20
Figure 5: Chart of radiated disturbance test	24

List of tables

Table 1: Devices used for testing	12
Table 2: Ports of EUT and appropriate cables	12



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1 Summary of test results

1.1 Emission

Reference: FCC 47 CFR Part 15					
Section	Test	Class	Page	Result	Note
15.107	Conducted disturbance at mains terminals 150 kHz – 30 MHz	Class B	14	Passed	---
15.109	Radiated disturbance 30 MHz – 1 GHz	Class B	21	Passed	---
15.109	Radiated disturbance above 1 GHz	Class B	---	Not applicable	1

Note 1: The EUT has no internal clock frequencies above 108 MHz.

Straubing, July 25, 2016



Alexander Grill
Test engineer
EMV **TESTHAUS** GmbH



Christian Kiermeier
Technical executive
EMV **TESTHAUS** GmbH



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2 Referenced publications

In this report any reference to publications without stating the issue date explicitly refers to the versions as listed below.

<i>European publication</i>	<i>Title</i>
47 CFR Part 2: 10-2014	Code of Federal Regulations Part 2 (Frequency allocation and radio treaty matters; General rules and regulations) of the Federal Communication Commission (FCC)
47 CFR Part 15: 10-2014	Code of Federal Regulations Part 15 (Radio Frequency Devices) of the Federal Communication Commission (FCC)
ANSI C63.4: 09-2009	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 Information technology equipment - Radio disturbance characteristics - Limits and methods of measurement



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3 Equipment under test (EUT)

Product type: DERMINATOR

Model name: 1EU2MM

Serial number: 20281

Manufacturer: Gromako Data & Services Ltd.

Version: Hardware: ---
Software: ---

Power supply: AC supply

Nominal voltage: 120 V

Minimum voltage: 110 V

Maximum voltage: 240 V

Nominal frequencies: 50 Hz, 60 Hz

Selected for testing:

Nominal input supply: 120 V / 60 Hz

Classification according to CFR 47 Part 15:

Class B digital device

Class A digital device

Declaration of conformity

Verification

Included modular transmitter: (If applicable) FCC ID: ---



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4 Equipment modifications

To achieve compliance with the regulations, the following modifications were made by a responsible employee of the manufacturer directly or via appropriate instructions:

No modifications were carried out during testing.



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5 Product labeling according to Part 15.19, Part 15.21 and Part 15.212

5.1 Label and Location (Verification)

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Picture 1: FCC Label (example)

5.2 Information to the user for Class A devices to be stated in the user manual according to Part 15.105¹

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

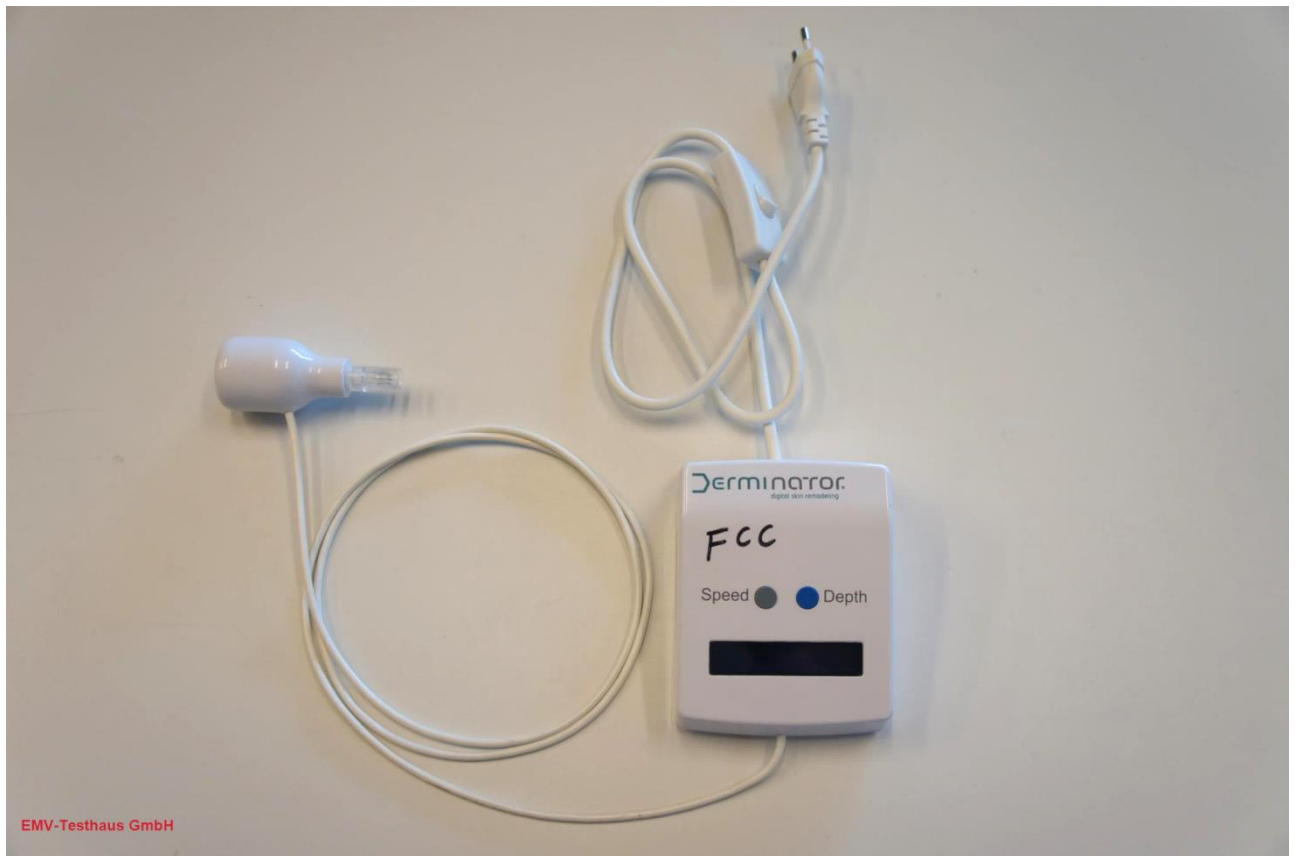
¹ Verification only



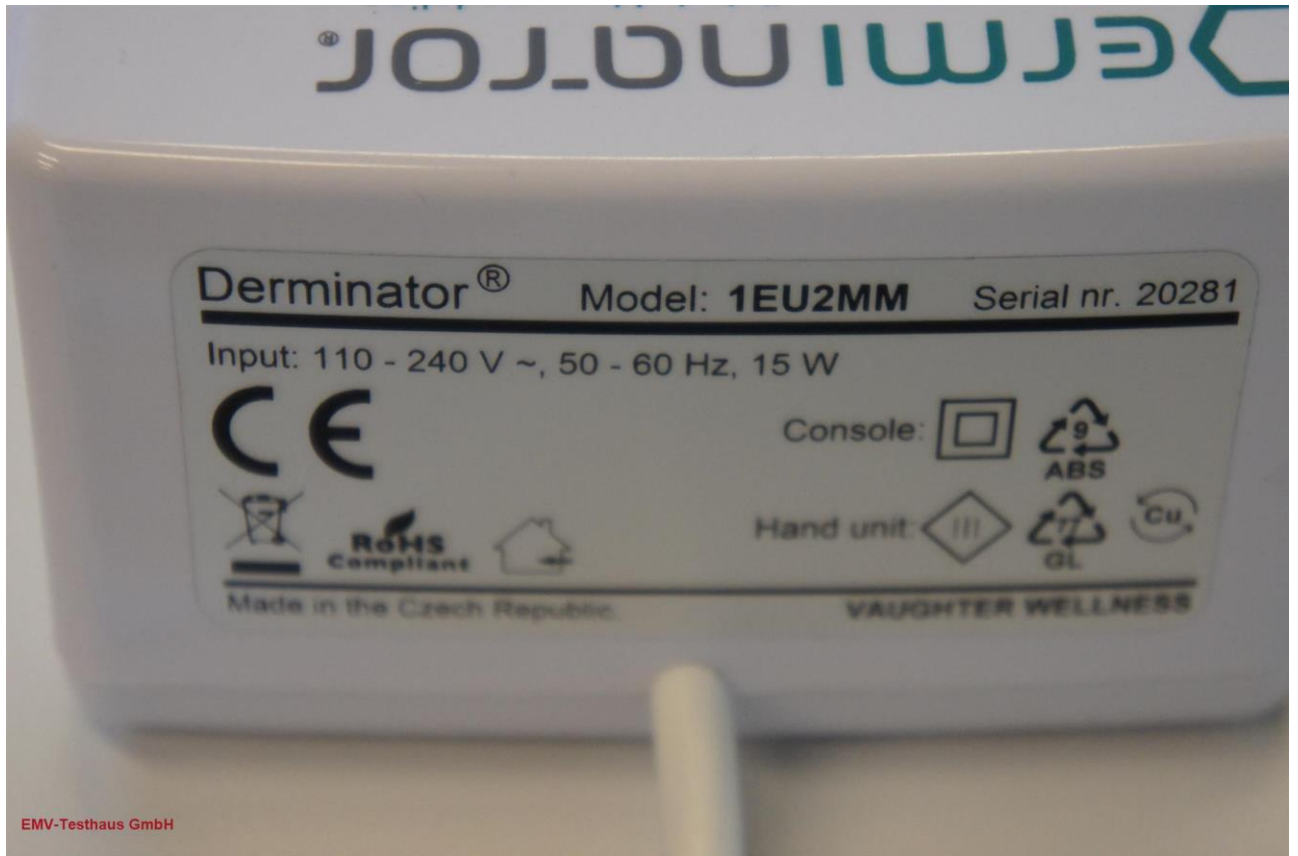
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6 Photographs of EUT



Picture 2: Top view of EUT



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Picture 3: Name plate of EUT



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7 Test configuration and mode of operation

7.1 Test configuration

<i>Device</i>	<i>Type designation</i>	<i>Serial or inventory no.</i>	<i>Manufacturer</i>
DERMINATOR	1EU2MM	20281	Gromako Data & Services Ltd.

Table 1: Devices used for testing

<i>Port</i>	<i>Classification</i>	<i>Cable type</i>	<i>Cable length</i>	
			<i>used</i>	<i>maximum²</i>
Power	ac power	Unshielded	1.50 m	---

Table 2: Ports of EUT and appropriate cables

7.2 Mode of operation

Firmware:	---
Applied Software:	---
Settings:	Slow / 0.25 mm
Maximum used or generated internal clock frequency	16 MHz

² As specified by applicant



8 Test results



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8.1 Conducted disturbance at mains terminals

Reference: 47 CFR Part 15.107

Basic standard: ANSI C63.4

Performed by:	Maximilian Schmucker	Date of test:	July 13, 2016
Climatic conditions:	Ambient temperature 23 °C	Relative humidity 42 %	Barometric pressure 98 kPa
Result ³ :	<input checked="" type="checkbox"/> Test passed	<input type="checkbox"/> Test not passed	

8.1.1 Test equipment

Type	Designation	Manufacturer	Inventory no.
<input checked="" type="checkbox"/> Shielded room	P92007	Siemens Matsushita	E00107
<input type="checkbox"/> EMI test receiver	ESCI 3	Rohde & Schwarz	E00001
<input type="checkbox"/> EMI test receiver	ESU 26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/> EMI test receiver	ESCS 30	Rohde & Schwarz	E00003
<input checked="" type="checkbox"/> Artificial mains network	ESH2-Z5	Rohde & Schwarz	E00004
<input checked="" type="checkbox"/> Artificial mains network	ESH2-Z5	Rohde & Schwarz	E00005
<input type="checkbox"/> 4-wire ISN	ENY 41	Rohde & Schwarz	E00041
<input type="checkbox"/> 2-wire ISN	ENY 22	Rohde & Schwarz	E00042
<input type="checkbox"/> Fixture for shielded LAN cables	ISN LAN	EMV TESTHAUS GmbH	E00357
<input checked="" type="checkbox"/> Attenuator (10 dB)	50FHB-010-10	JFW Industries	E00471
<input checked="" type="checkbox"/> Measurement software	E10	EMV TESTHAUS GmbH	E00443
<input type="checkbox"/> Measurement software	EMC 32	Rohde & Schwarz	---

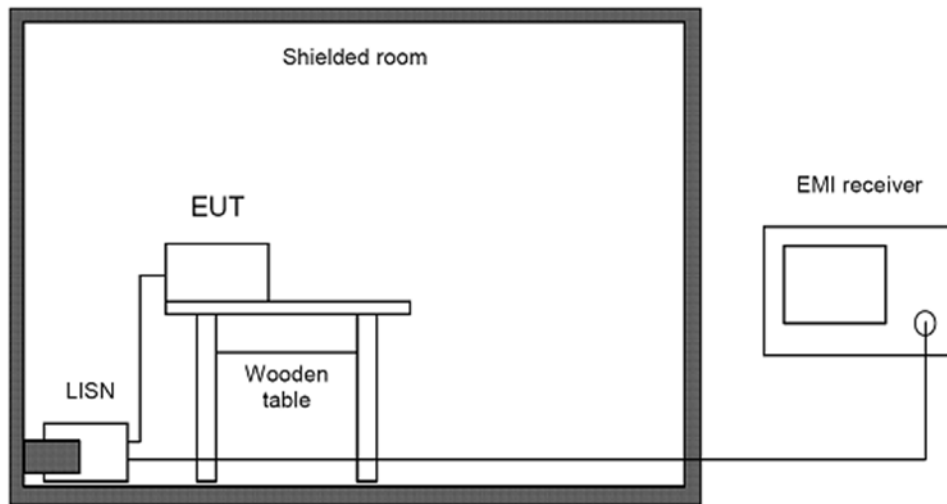
³ For information about measurement uncertainties see page 28



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8.1.2 Test setup



Picture 4: Test setup of conducted emission

8.1.3 Test method to demonstrate compliance

The tests of conducted emission is carried out in a shielded room using a line impedance stabilization network (LISN) 50 μ H/50 Ohms and a EMI test receiver. The EMI test receiver is connected to the LISN and set to a measurement bandwidth of 9 kHz in the frequency range from 0.15 MHz to 30 MHz. The EUT is placed on a wooden table and connected to the LISN.

To accelerate the measurement the detector of the EMI test receiver is set to peak. A prescan is performed covering the whole frequency range from 0.15 MHz to 30 MHz. After that all peak values with less margin than 10 dB to quasi-peak limit or exceeding the limit are marked and re-measured with quasi-peak detector. If all values are below the average limit no additional measurement is necessary. In case of there are values between quasi-peak and average limit these values are re-measured using an average detector.

All peripheral devices are additionally decoupled by means of a line stabilization network.

8.1.4 Limits

Class B digital devices		
Frequency [MHz]	Quasi-peak [dB μ V]	Average [dB μ V]
0.15 – 0.5	66 to 56	56 to 46
0.5 – 5	56	46
5 - 30	60	50



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8.1.5 Test results

Subrange	Step Size	Detector	IF Bandwidth	Measurement Time	Preamplifier
0.15 MHz – 30 MHz	4.5 kHz	PK / AV / QPK	9 kHz	10 ms / 1 s	20 dB

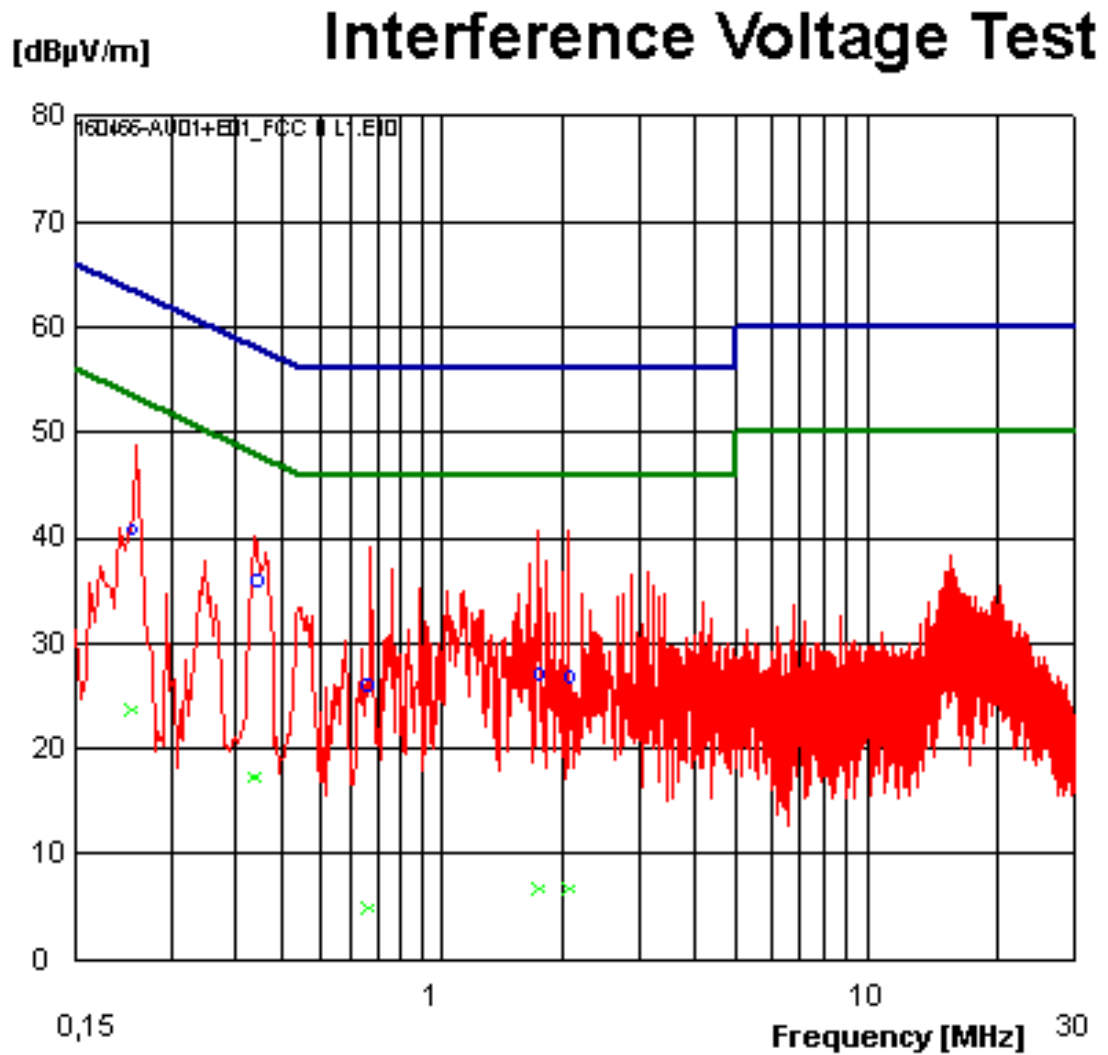


Figure 1: Chart of conducted disturbance test at mains terminals – phase L1

Interference Voltage Test

Freq. [MHz]	U_CISPR [dB μ V]	Limit [dB μ V]	delta_U [dB]	U_AV [dB μ V]	Limit [dB μ V]	delta_U [dB]	Corr. [dB]	Remark
0,20	40,8	63,5	22,7	23,8	53,5	29,7	0,0	160466-AU01+E01_FCC.B.L1.E10
0,39	36,0	58,0	22,0	17,3	48,0	30,7	0,0	
0,71	26,1	56,0	29,9	4,8	46,0	41,2	0,0	
1,76	27,1	56,0	28,9	6,7	46,0	39,3	0,0	
2,07	26,9	56,0	29,1	6,7	46,0	39,3	0,0	

Figure 2: Final results of conducted disturbance test at mains terminals – phase L1



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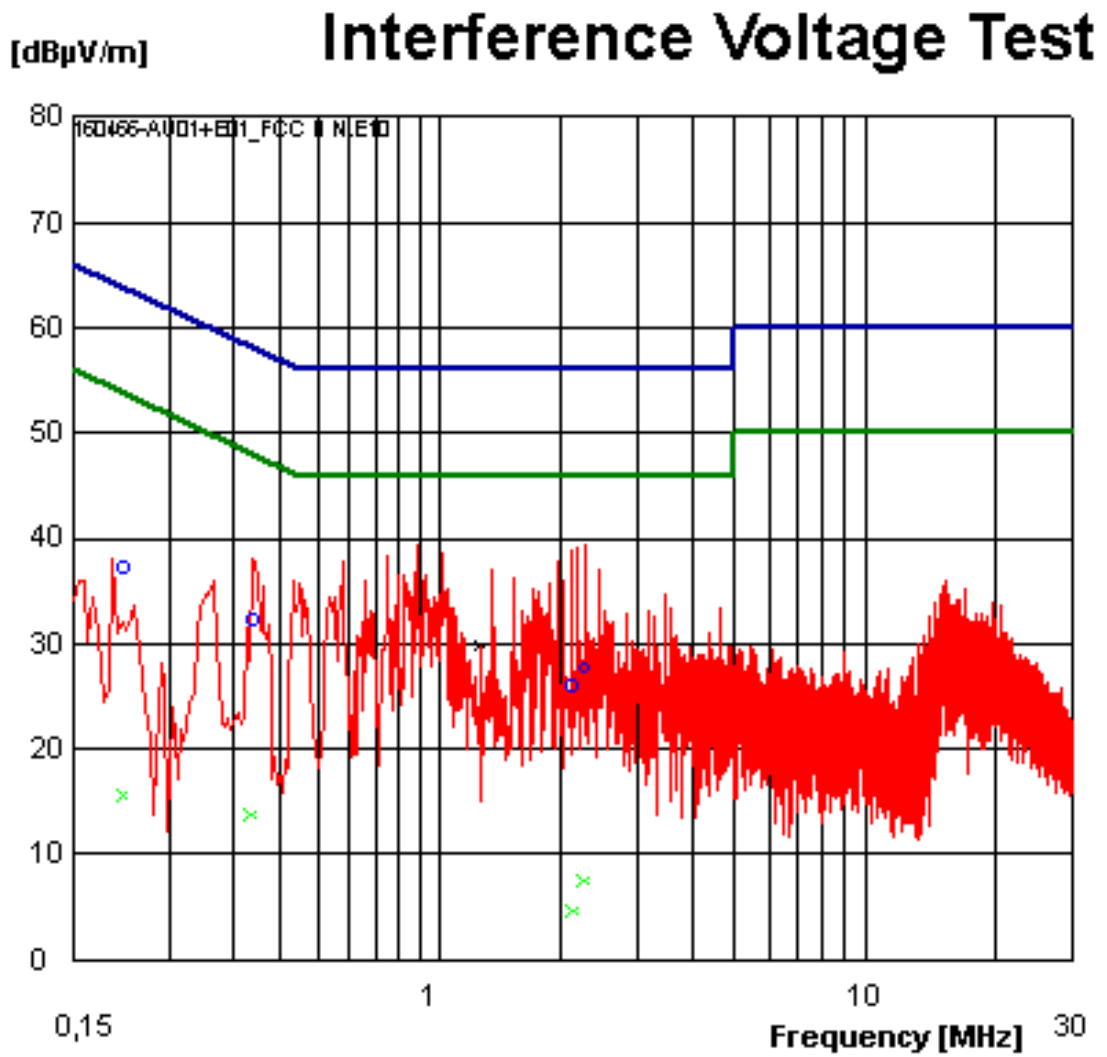


Figure 3: Chart of conducted disturbance test at mains terminals – phase N

Interference Voltage Test

Freq. [MHz]	U_CISPR [dBμV]	Limit [dBμV]	delta_U [dB]	U_AV [dBμV]	Limit [dBμV]	delta_U [dB]	Corr. [dB]	Remark
0,20	37,2	63,8	26,6	15,7	53,8	38,1	0,0	160466-AU01+E01_FCC_B.N.F10
0,39	32,4	58,1	25,7	13,8	48,1	34,3	0,0	
2,12	26,0	56,0	30,0	4,7	46,0	41,3	0,0	
2,26	27,7	56,0	28,3	7,4	46,0	38,6	0,0	

Figure 4: Final results of conducted disturbance test at mains terminals – phase N



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8.2 Radiated disturbance (30 MHz – 1000 MHz)

Reference: 47 CFR Part 15.109

Basic standard: ANSI C63.4

Performed by:	Maximilian Schmucker	Date of test:	July 12, 2016
Climatic conditions:	Ambient temperature 22 °C	Relative humidity 42 %	Barometric pressure 98 kPa
Result ⁴ :	<input checked="" type="checkbox"/> Test passed <input type="checkbox"/> Test not passed		

8.2.1 Test equipment

Type	Designation	Manufacturer	Inventory no.
<input type="checkbox"/> Compact Diagnostic Chamber (CDC)	VK041.0174	Albatross Projects	E00026
<input checked="" type="checkbox"/> Semi Anechoic Chamber (SAC)	---	Albatross Projects	E00716
<input type="checkbox"/> Open area test site	---	EMV TESTHAUS GmbH	E00354
<input type="checkbox"/> EMI test receiver (CDC)	ESCI 3	Rohde & Schwarz	E00001
<input type="checkbox"/> EMI test receiver	ESU 26	Rohde & Schwarz	W00002
<input checked="" type="checkbox"/> EMI test receiver (SAC)	ESR 7	Rohde & Schwarz	E00739
<input type="checkbox"/> EMI test receiver (OATS)	ESCS 30	Rohde & Schwarz	E00551
<input type="checkbox"/> TRILOG broadband antenna (CDC)	VULB 9160	Schwarzbeck	E00011
<input type="checkbox"/> TRILOG broadband antenna (OATS)	VULB 9163	Schwarzbeck	E00013
<input checked="" type="checkbox"/> TRILOG broadband antenna (SAC)	VULB 9162	Schwarzbeck	E00643
<input type="checkbox"/> Switch box	COSB 4-1-26	Conformitas	W00091
<input type="checkbox"/> Preamplifier	AMF-5D-00501800	Parzich	W00089
<input type="checkbox"/> Measurement software	E10 v1.4.12	EMV TESTHAUS GmbH	E00443
<input checked="" type="checkbox"/> Measurement software	EMC 32	Rohde & Schwarz	---

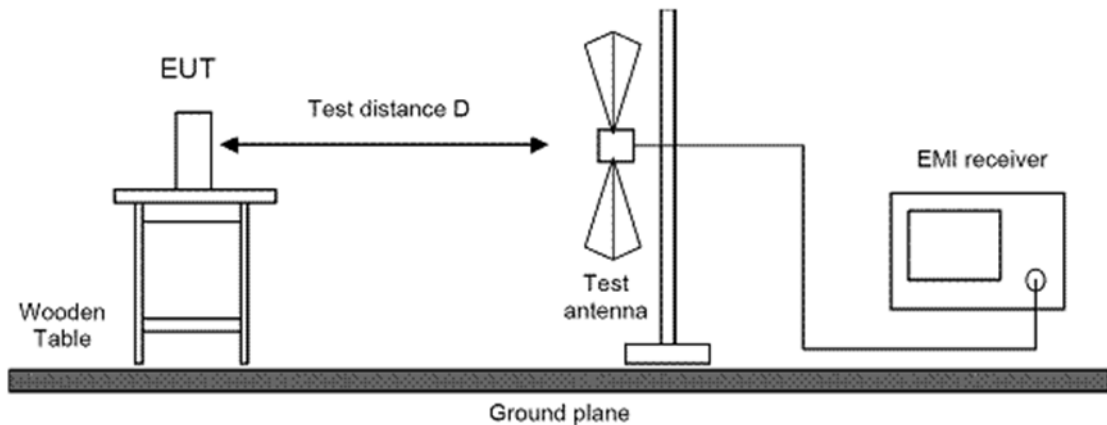
⁴ For information about measurement uncertainties see page 28



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8.2.2 Test setup



Picture 5: Test setup of radiated emission (30 MHz – 1000 MHz)

8.2.3 Test method to demonstrate compliance

1. Configure the EUT according to ANSI C63.4. The EUT is placed on the top of the turntable 0.8 m above ground. The receiving antenna is placed 3 meters from the turntable. The test setup was placed inside the semi anechoic chamber.
2. Power on the EUT and all peripherals.
3. The broadband antenna was set to vertical polarization.
4. The EMI receiver performs a FFT prescan from 30 MHz to 1000 MHz with the detector set to Q-peak and the measurement bandwidth to 120 kHz.
5. The turn table is rotated to 6 different positions ($360^\circ / 6 = 60^\circ$) and the antenna is moved between 1 and 4 height.
6. Change antenna polarization to horizontal and repeat step 4 and 5.
7. After recording prescan values in horizontal and vertical polarization data reduction is performed using an margin of 10 dB to the appropriate limit.
The critical frequencies are re-measured using a QP- detector with a bandwidth set to 120 kHz. At every frequency the polarization with the emission closest to the limit is selected for final test.
8. During Final measurement the turntable is rotated by $\pm 60^\circ$ to determine the position of the highest radiation around the maximum emission found during the prescan.
9. The height of the broadband receiving antenna was varied between 1 m and 4 m above ground to find the maximum emissions field strength. of both horizontal and vertical polarization. The highest value is recorded.

8.2.4 Limits

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705 – 108	1000

Class B digital devices

Frequency [MHz]	Field strength FS [$\mu\text{V}/\text{m}$]	Field strength [$\mu\text{V}/\text{m}$]	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

Class A digital devices

Frequency [MHz]	Field strength FS [$\mu\text{V}/\text{m}$]	Field strength [$\mu\text{V}/\text{m}$]	Measurement distance d [m]
30 – 88	90	39	10
88 – 216	150	43,5	10
216 - 960	210	46,5	10
Above 960	300	49,5	10

Class A digital devices

Frequency [MHz]	Field strength FS [$\mu\text{V}/\text{m}$]	Field strength [$\mu\text{V}/\text{m}$]	Measurement distance d [m]
30 – 88	300	49,5	3
88 – 216	500	54	3
216 - 960	707	57	3
Above 960	1000	60	3

To calculate the limit for 3 m measurement distance for Class A digital devices the following calculation is used according to Part 15.31.

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

- L_{dm}** = Limit at the new distance
L_d = Limit according FCC Part 15.109
d = Distance according to FCC Part 15.109
dm = New distance for limit

$$L_{dm} = 39 \frac{dB\mu V}{m} + (-20 \frac{dB}{dec} * (\log(3 m) - \log(10 m))) = 49 \frac{dB\mu V}{m}$$



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8.2.5 Test results

Subrange	Step Size	Detector	IF Bandwidth	Measurement Time	Preamplifier
30 MHz – 1 GHz	30 kHz	QPK	120 kHz	1 s	20 dB

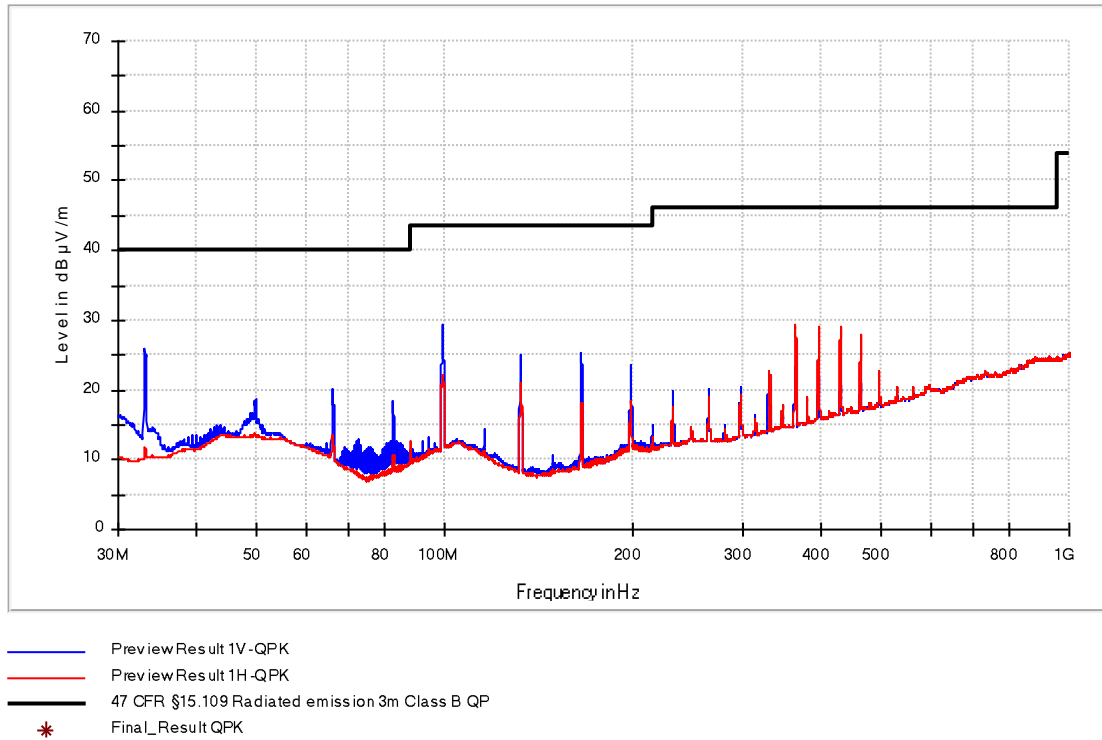


Figure 5: Chart of radiated disturbance test

9 Equipment calibration status

<i>Type</i>	<i>Designation</i>	<i>Last calibration</i>	<i>Next calibration</i>	<i>Inventory no.</i>
EMI test receiver	ESCI 3	2016-02	2018-02	E00001
EMI test receiver	ESU 26	2016-03	2018-03	W00002
EMI test receiver	ESCS 30	2016-04	2018-04	E00003
Artificial mains network	ESH2-Z5	2015-06	2017-06	E00004
Artificial mains network	ESH2-Z5	2016-02	2018-02	E00005
Attenuator (10 dB)	50FHB-010-10	--- ⁵	---	E00471
Compact Diagnostic Chamber (CDC)	VK041.0174	--- ⁶	---	E00026
Semi Anechoic Chamber (SAC)	---	2015-03	2018-03	E00716
Open area test site (OATS)	---	2015-10	2017-10	E00354
TRILOG broadband antenna (CDC)	VULB 9160	--- ⁶	---	E00011
TRILOG broadband antenna (OATS)	VULB 9163	2015-09	2017-09	E00013
TRILOG broadband antenna (SAC)	VULB 9162	2015-11	2017-11	E00643
Horn antenna	BBHA 9120	2014-03	2017-03	W00053
Measurement software	EMC 32	N/A	N/A	E00777
Measurement software	E10	N/A	N/A	E00443

⁵ Internal validation every year.

⁶ Only used for prescan. Therefore no calibration is necessary. The final measurement is performed with calibrated equipment.



10 Measurement uncertainties

<i>Standard</i>	<i>Description</i>	<i>Max. deviation</i>	<i>k=</i>
ANSI C63.4	Conducted emission AMN (150kHz to 30 MHz)	± 4.1 dB	2
ANSI C63.4	Radiated emission open field (30 MHz to 300 MHz) (300MHz to 1 GHz)	± 5.4 dB ± 4.7 dB	2
ANSI C63.4	Radiated emission absorber chamber (1 GHz to max. 6 GHz)	± 4.5 dB	2

Comment: The uncertainty stated is the expanded uncertainty obtained by multiplying the standard uncertainty by the coverage factor k. For a confidence level of 95 % the coverage factor k is 2.

Test related measurement uncertainties have to be taken into consideration when evaluating the test results. All used test instrument as well as the test accessories are calibrated at regular intervals.



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11 Revision history

<i>Revision</i>	<i>Date</i>	<i>Issued by</i>	<i>Description of modifications</i>
0	2016-08-03	Alexander Grill	First edition

12 Additional documents

- Annex A: Pictures of test setup
- Annex B: Pictures of EUT
- Annex C: Block diagram

Template used: A_3.0_FCC Part 15_EN_PB.dotx



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