

EMC - R e p o r t

Emission and Immunity Tests

Test Item :

**Illumination measurement system
Radex Lupin**

Manufacturer:

OOO Quarta-Rad

Report No.: PLE150317

Test Item: Illumination measurement system

Type or Model: Radex Lupin

Manufacturer: OOO Quarta-Rad
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Arrival Date: 25. March 2015

Place of Testing: PRO EMV Labor Strausberg GmbH
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Standards: EN 61326-1 /2013 Emission: class B
Immunity: table 1

Date of Testing: 25. March and 1. April 2015

Procedure: The device under test was tested for compliance with the referenced standards.

Test Result: The test item meets the requirements.

Tested by: T. Haugk
Test Engineer

Inspected : R. Erxleben
General Manager

2015-04-01
Date, Signature

2015-04-01
Date, Signature

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1. Instruments And Equipment Used

Conducted disturbance:

	Type	Make	Ser. / Inv. No.
EMI test receiver	ESIB 26	Rohde&Schwarz	SN 100172
EMI test software	ES-K1 V1.60	Rohde&Schwarz	
Network simulation	ESH2-Z5	Rohde&Schwarz	SN 832769/008

Radiated disturbance:

	Type	Make	Ser. / Inv. No.
EMI test receiver	ESIB 26	Rohde&Schwarz	SN 100172
EMI test software	ES-K1 V1.60	Rohde&Schwarz	
Bilog antenna	CBL 6111D	Chase	SN 35421

Immunity test (RF field):

	Type	Make	Ser. / Inv. No.
Power amplifier	KAW3020	amplifier research	SN 10479-1
Power amplifier	30S1G3	amplifier research	SN 30778
Signal generator	SML03	Rohde&Schwarz	SN 100097
Test software (RF field)	OATS-sX V6.0.9	CONFORMITAS	
Power meter	NRVD	Rohde&Schwarz	SN 836519/011
Direction coupler	DC-6180	amplifier research	SN 14375
Thermal power head	NRV-Z 51	Rohde&Schwarz	SN 834519/023
Field strength meter	PMM 8051	PMM	SN 0106
Probe	BA 01	PMM	SN 059
Broadband antenna	BTA-L	Frankonia	SN 97061002
Horn antenna	BBHA 9120 E	Schwarzbeck	SN 0899

Immunity test (Conducted disturbance by RF field, current injection):

	Type	Make	Ser. / Inv. No.
Power amplifier	50W1000A	amplifier research	SN 14506
Signal generator	SML03	Rohde&Schwarz	SN 100097
Test software (current injection)	OATS-sX V6.0.9	CONFORMITAS	
Power meter	NRVD	Rohde&Schwarz	SN 836519/011
HF-Voltage head	URV5-Z7	Rohde&Schwarz	SN 860620
Coupling networks	CDN801	MEB	

Immunity test (Burst pulses):

	Type	Make	Ser. / Inv. No.
Burst generator	NSG 3040	Teseq	SN 1933
Test software (Burst)	FW 0002.31	Teseq	

Immunity test (ESD):

	Type	Make	Ser. / Inv. No.
ESD simulator	NSG 435	Schaffner	SN 00000599

Immunity test (Surge pulses):

	Type	Make	Ser. / Inv. No.
Surge simulator	NSG 3040	Teseq	SN 1933
Test software (Surge)	FW 0002.31	Teseq	

Immunity test (Voltage dips, interruptions and fluctuations):

	Type	Make	Ser. / Inv. No.
Simulator	NSG 3040	Teseq	SN 1933
Test software (PQM)	FW 0002.31	Teseq	

Measuring equipment:

	Type	Make	Ser. / Inv. No.
Absorbing chamber	8,4 x 7,2 x 5,3 [m]	Frankonia	
Antenna mast	MA 240	Deisel	
Rotary disk	DS 415	Deisel	
Controller (Turn table)	HD 100	Deisel	
Controller (Mast)	CO3000	INNCO systems	

2. Equipment under Test (EUT) Description

The EUT is a measuring instrument for the illumination, brightness and the pulsation coefficient of the luminous flux with a specific photoelectric sensor.

Classification of the EUT into group and class based on CISPR 11:

The illumination measuring device is an equipment of group1, class B.

Technical data:

Identifier:	Illumination measuring device
Type:	Radex Lupin
Serial no.:	1000
Manufacturer:	Quarta-Rad
Housing:	Plastic
Dimension:	100 mm x 42 mm x 18 mm (L x B x H)
Weight:	0,18 kg
Power supply:	3,7 V DC (internal Lithium Accumulator)
Interface:	Micro USB (for data transmission and charging, power supply not included)

Range:

Illumination	x	v. 10 - 200000
Brightness	cd/m	v. 3 - 70000
Pulsation coefficient	%	v. 1 - 100

Relative measurement deviation:

Illumination, brightness, pulsation coefficient 10 %

Time of operation with fully charged accumulator: 6 h

Range of temperature: -10 - +40 °C:



3. Test Set-up and Mode of Operation During the Tests

The measurements were performed in a typical test configuration providing a maximum interference capability.

The test set up was done according to the named EMC base standards.

Mode of operation during the tests	:	Normal operation i.e.: Measurement of illumination and charging mode
Mains voltage at tests	:	All tests except conducted disturbances at mains port: 230 V AC USB power supply Model: 5058 Conducted disturbances at mains port: 230 V AC USB-power supply Samsung Model: ETA0U10EBE (S/N RT4C918OS/7-E)
Set up	:	The test item was placed and driven in a manner that agrees with its conventional use.
Indicators for the evaluation of the EUT behaviour	:	Display
Tolerance	:	Allowable Tolerance: $\pm 10 \%$

The test item was tested as a table top equipment.

Climatic conditions:

	Required	Actual
Ambient temperature	15 to 35°C	√
Relative humidity	30 to 60 %	√
Atmospheric pressure	86 to 106 kPa	√

Unless otherwise noted these conditions are valid for all following measurements.

Details of device settings and test arrangements may also be seen in the photo documentation.

4. Test Program / Summary and Test Results

The device presented for testing was tested for compliance with the mentioned standards. The following tests (measurements) have been performed on the test item:

Test	Test level	Result
Conducted continuous disturbance at mains port	class B	passed
Radiated disturbance	class B	passed
Immunity to radiated electromagnetic fields	1 / 3 V/m	passed
Conducted immunity, injected currents	3 V	passed
Immunity to fast transient disturbances	1 kV	passed
Immunity to electrostatic discharge	4 / 8 kV	passed
Immunity to surge pulses	0,5 kV	passed
Voltage dips, interruptions and fluctuations		passed

5. Performance Criteria

The following performance criteria were utilized to evaluate the performance of the EUT during testing.

Criterion	Abridged version
A	If the equipment is used properly, the operating behaviour shall not be impaired and no failure shall occur below a manufacturer-defined minimum operating quality.
B	If the equipment is used properly, the operating behaviour shall not be impaired and no failure shall occur below a manufacturer-defined minimum operating quality. In certain cases the minimum operating quality may be replaced by a tolerable loss of operating quality. During the test, however, an impairment of the operating behaviour may be tolerated, but no modification in the selected mode and no loss of stored data.
C	A temporary failure is tolerated. The function must restore itself, or it must be restorable using the control elements.

6. Measurements

Note:

The test results shall apply exclusively to the device under test. They shall not represent a generally valid opinion on the properties of the respective products from the running production process.

6.1. Conducted Continuous Disturbance at Mains Port

6.1.1. Standards

EN 61326-1 /2013

CISPR 11 /2009, modified

group 1

class B

6.1.2. Test Description

The conducted disturbance at the mains port was tested. It was measured in the frequency range from 0.15 MHz to 30 MHz.

6.1.3. Limits

The limiting values are:

Frequency range	Limit class A (Detector)
0,15 - 0,5 MHz	66 - 56 dB μ V (QP) 56 - 46 dB μ V (AV)
0,5 - 5 MHz	56 dB μ V (QP) 46 dB μ V (AV)
5 - 30 MHz	60 dB μ V (QP) 50 dB μ V (AV)

6.1.4. Measured Values

Measurement	Diagram	Phase	Detector	Remark
1	Page 17, 18	L1/N	PK/QP/AV	passed

6.1.5. Test Result

The test item meets the requirements.

Note: No exceeding of the limits was observed.

6.2. Radiated Disturbance

6.2.1. Standards

EN 61326-1 /2013

CISPR 11 /2009, modified

group 1

class B

6.2.2. Test Description

The radiated disturbance was tested. It was measured in the frequency range from 30 MHz to 1000 MHz at a measuring distance of 3 m with Quasipeak-Detector (QP).

6.2.3. Limits

The QP limiting values are:

Frequency range	class A
30 - 230 MHz	40 dB μ V/m
230 - 1000 MHz	47 dB μ V/m

6.2.4. Set-up and Operating Conditions During the Measurements

The measurement diagrams with QP verification (decisive for the rating) represent the maximum which could be reached by turning the test item, by variations in the height of the antenna (1 - 4 m), and by changing the antenna polarisation.

The correction values: test assembly attenuation, antenna factor, and cable attenuation, are taken into consideration in the measurement result.

6.2.5. Measured Values

6.2.5.1. Measured values of the pre-measurements

Preview measurements have been carried out inside an anechoic chamber using the peak detector (PK), antenna height 2.0 m; horizontal and vertical polarization; antenna-to-EUT azimuth 0, 90, 180, 270 [dg]; MaxHold scan

Measurement	Diagram	Detector	Remark
1	page 19	PK	horizontal antenna
2	page 20	PK	vertical antenna

6.2.5.2. Measured values of the final measurement

Measurement	Diagram	Detector	Remark
3	page 21, 23	QP	horizontal antenna Test ok.
4	page 22, 23	QP	vertical antenna Test ok.

6.2.6. Test Result

The test item meets the requirements.

Note: No exceeding of the limits was observed.

6.3. Immunity to Radiated Electromagnetic Fields

6.3.1. Standards

EN 61326-1 /2013

Tab. 1

6.3.2. Set-up and Operating Conditions During the Measurements

The EUT was placed on a wooden rotation desk so that it was positioned in a 0.8 m distance from the chamber's floor and in a 3 m distance in front of the antenna.

The EUT was exposed to radiation from the front, from the right side, from the left side, and from behind.

The frequency range was passed through once in each polarisation.

6.3.3. Test Description

Basic standard	IEC 61000-4-3	IEC 61000-4-3	IEC 61000-4-3
Frequency range	80 - 1000 MHz	1,4 - 2,0 GHz *	2,0 - 2,7 GHz
Step size	1 %	1 %	1 %
Modulation	AM 80%, 1 kHz Sinus	AM 80%, 1 kHz Sinus	AM 80%, 1 kHz Sinus
Field strength	3 V/m	3 V/m	1 V/m
Polarisation	horizontal and vertical	horizontal and vertical	horizontal and vertical
Perform. criteria	A	A	A
Dwell time	2 s for each frequency step	2 s for each frequency step	2 s for each frequency step

6.3.4. Test Result

The "A" rating criteria is complied with.

Test item reactions: No unacceptable loss of performance or loss of data was observed.

During and after the influence of the disturbance the test item fulfilled his normal function properly.

6.4. Immunity to Conducted Disturbance by RF fields, injected Current

6.4.1. Standards

EN 61326-1 /2013

Tab. 1

6.4.2. Test Description

Basic standard	IEC 61000-4-6
Frequency range	0,15 - 80 MHz
Frequency steps	1%
Modulation	AM 80%, 1 kHz sinus
RF-voltage	3 V (adjusted unmodulated wave)
Signal lines (I/O port)*	3 V (modulated wave)
I/O ports with direct connection to power supply net	3 V (modulated wave)
DC lines *	3 V (modulated wave)
AC-lines	3 V (modulated wave)
Rating criteria	A
Dwell time	2 s for each frequency step

*) Applicable only to ports interfacing with cables whose total length according to the manufacturers functional specification may exceed 3 m.

6.4.3. Set-up and Operating Conditions During the Measurements

For the tests the following circuits/lines were led through coupling networks (CDN).

Interfaces / lines	Coupling network (0,15 - 80 MHz)
AC-power supply	CDN 801-M2

The coupling network were separately connected to a RF generator for each test run. One RF port of the inactive coupling networks was equipped with 50 R.

6.4.4. Test Result

The "A" rating criteria is complied with.

Test item reactions: No unacceptable loss of performance or loss of data was observed.

During and after the influence of the disturbance the test item fulfilled his normal function properly.

6.5. Immunity to Fast Transient Disturbances (Bursts)

6.5.1. Standards

EN 61326-1 /2013

Tab. 1

6.5.2. Test Description

Basic standard	IEC 61000-4-4
Pulse shape	5 / 50 ns
Repetition frequency	5 kHz
Test duration	> 1 min
Signal lines (I/O port) *	0,5 kV
I/O ports with direct connection to power supply net	1 kV
DC lines	1 kV
AC-lines	1 kV
Rating criteria	B

*) Applicable only to ports interfacing with cables whose total length according to the manufacturers functional specification may exceed 3 m.

6.5.3. Set-up and Operating Conditions During the Measurements

The burst pulses were coupled into the following circuits/lines:

Test voltage [kV]	Interfaces / lines
+/- 1,0	AC - Power Supply

The test voltage was increased in steps from the lowest up to the selected test level.

6.5.4. Test Result

The "B" rating criteria is complied with.

Test item reactions: No unacceptable loss of performance or loss of data was observed.

During and after the influence of the disturbance the test item fulfilled his normal function properly.

6.6. Immunity to Electrostatic Discharge (ESD)

6.6.1. Standard

EN 61326-1 /2013

Tab. 1

6.6.2. Test Description

Basic standard	IEC 61000-4-2
Air discharge	8 kV
Contact discharge	4 kV
Discharges per pole	> 10
Discharge-R	330 R
Discharge-C	150 pF
Perform. criteria	B

The test item was subjected to 320 discharges.

Test points:	The direct air discharge was applied to all isolated touchable parts.
	The direct contact discharge was applied to all touchable metal parts.
	The indirect contact discharge was applied to the horizontal / vertical coupling area.

The test voltage was increased in steps from the lowest up to the selected test level.

6.6.3. Test Result

The "B" rating criteria is complied with.

Test item reactions: No unacceptable loss of performance or loss of data was observed.

During and after the influence of the disturbance the test item fulfilled his normal function properly.

6.7. Immunity to Surge Pulses

6.7.1. Standards

EN 61326-1 /2013

Tab. 1

6.7.2. Test Description

Basic standard	IEC 61000-4-5
Open circuit pulse shape	1,2µs / 50µs
Short circuit pulse shape	8µs / 20µs
Number of pulses	5 pos. and 5 neg.
Repetition pulse	all 30 seconds pulse
Angles	0°, 90°, 180°, 270°
Signal lines (I/O port) *	1 kV asym.
I/O ports with direct connection to power supply net	0,5 kV sym. and 1 kV asym.
DC lines	0,5 kV sym. and 1 kV asym.
AC lines	0,5 kV sym. and 1 kV asym.
Performance criteria	B

*) Applicable only to ports interfacing with cables whose total length according to the manufacturers functional specification may exceed 30 m.

6.7.3. Measurements

AC power port: Input from Tando 700 with SN: AF158D (Charging mode)

sym. (S) = differential mode :L against N

$R_i = 2 \text{ Ohm}$ and $C = 18 \mu\text{F}$ (LZ)

asym. (A) = common mode :L, N against PE

$R_i = 12 \text{ Ohm}$ and $C = 9 \mu\text{F}$ (HZ)

Number of pulses	Form	Pol.	Up	Angle	Surge, Tot.	EUT
5 x (L against N)	Surge LZ	+	500	S 0	5	Test ok
5 x (L against N)	Surge LZ	-	500	S 0	10	Test ok
5 x (L against N)	Surge LZ	+	500	S 90	15	Test ok
5 x (L against N)	Surge LZ	-	500	S 90	20	Test ok
5 x (L against N)	Surge LZ	+	500	S 180	25	Test ok
5 x (L against N)	Surge LZ	-	500	S 180	30	Test ok
5 x (L against N)	Surge HZ	+	500	S 270	35	passed
5 x (L against N)	Surge HZ	-	500	S 270	40	passed

The test voltage was increased in steps from the lowest up to the selected test level.

6.7.4. Test Result

The "B" rating criteria is complied with.

Test item reactions: No unacceptable loss of performance or loss of data was observed.

During and after the influence of the disturbance the test item fulfilled his normal function properly.

6.8. Voltage dips, interruptions and fluctuations immunity tests

6.8.1. Standards

EN 61326-1 /2013

Tab. 1

6.8.2. Test levels

Basic standard	IEC 61000-4- 11			
	dips	dips	dips	interruptions
Input voltage (U_{in})	230 V (U_{nom})	230 V (U_{nom})	230 V (U_{nom})	230 V (U_{nom})
Variable voltage (U_{var})	0 V (-100 %)	0 V (-100 %)	161 V (-30 %)	0 V (0 %)
Phase angle t_{Phase} [grd]	0, 180	0, 180	0, 180	0, 180
Duration of the events t_{event}	10 ms	20 ms	500 ms	5000 ms
Repetition time t_{rep}	3 x for each phase position	3 x for each phase position	3 x for each phase position	3 x for each phase position
Performance criteria	B	B	C	C

6.8.3. Test Result

The test item meets the requirements.

Test item reactions:

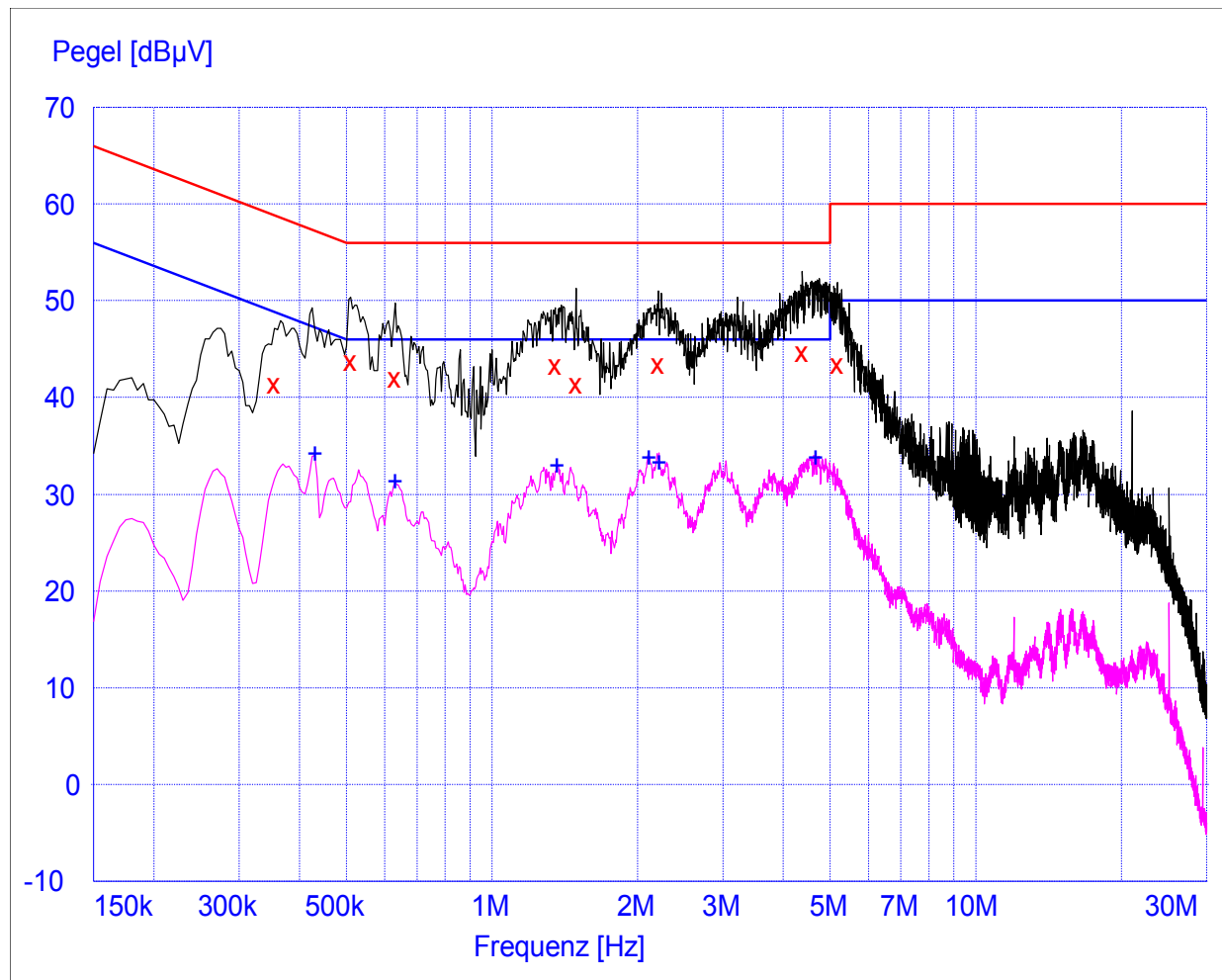
Test	Parameter U_{var} / t_{event}	Remarks
dips	0 V / 10 ms	During and after the test the EUT functioned as intended.
dips	0 V / 20 ms	
dips	161 V / 500 ms	
interruptions	0 V / 5000 ms	

PRO EMV Labor Strausberg GmbH

EUT: Radex Lupin
Hersteller: Quarta Rad
Prüfgrundlage: EN 61326-1 /2013 (CISPR 11, Klasse A)
Kommentar: Meßbetrieb Beleuchtungsstärke + Ladebetrieb
Meßort: 230 V AC "In" mit Netzteil Samsung ETA0U10EBE

SCANTABELLE: "Voltage_pre PK/AV"

Start-Frequenz	Stop-Frequenz	Schrittweite	Detektor	Meßzeit	ZF-Bandbr.	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	MaxPeak Average	20.0 ms	9 kHz	None



- x MES vol_0001_fin QP
- + MES vol_0001_fin AV
- MES vol_0001_pre PK
- MES vol_0001_pre AV
- LIM EN 55011 V QP (KI.B)
- LIM EN 55011 V AV (KI.B)

PRO EMV Labor Strausberg GmbH

EUT: Radex Lupin
Hersteller: Quarta Rad
Prüfgrundlage: EN 61326-1 /2013 (CISPR 11, Klasse A)
Kommentar: Meßbetrieb Beleuchtungsstärke + Ladebetrieb

Meßort: 230 V AC "In" mit Netzteil Samsung ETA0U10EBE

SCANTABELLE: "Voltage_fin QP/AV"

Start- Frequenz	Stop- Frequenz	Schritt- weite	Detektor	Meß- zeit	ZF- Bandbr.	Transducer
150.0 kHz	30.0 MHz	5.0 kHz	QuasiPeak Average	1.0 s	9 kHz	None

MEßERGEBNIS: "vol_0001_fin QP"

01.04.2015 12:32

Frequenz MHz	Pegel dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.355000	41.40	0.0	59	17.5	L1	GND
0.510000	43.80	0.0	56	12.2	L1	GND
0.630000	42.10	0.0	56	13.9	L1	GND
1.350000	43.40	0.0	56	12.6	L1	GND
1.490000	41.40	0.0	56	14.6	L1	GND
2.205000	43.50	0.0	56	12.5	L1	GND
4.375000	44.70	0.0	56	11.3	L1	GND
5.180000	43.50	0.0	60	16.5	L1	GND

MEßERGEBNIS: "vol_0001_fin AV"

01.04.2015 12:32

Frequenz MHz	Pegel dBµV	Transd dB	Limit dBµV	Margin dB	Line	PE
0.430000	34.20	0.0	47	13.0	L1	GND
0.630000	31.40	0.0	46	14.6	L1	GND
1.360000	33.00	0.0	46	13.0	L1	GND
2.105000	33.80	0.0	46	12.2	L1	GND
2.215000	33.30	0.0	46	12.7	L1	GND
4.660000	33.80	0.0	46	12.2	L1	GND

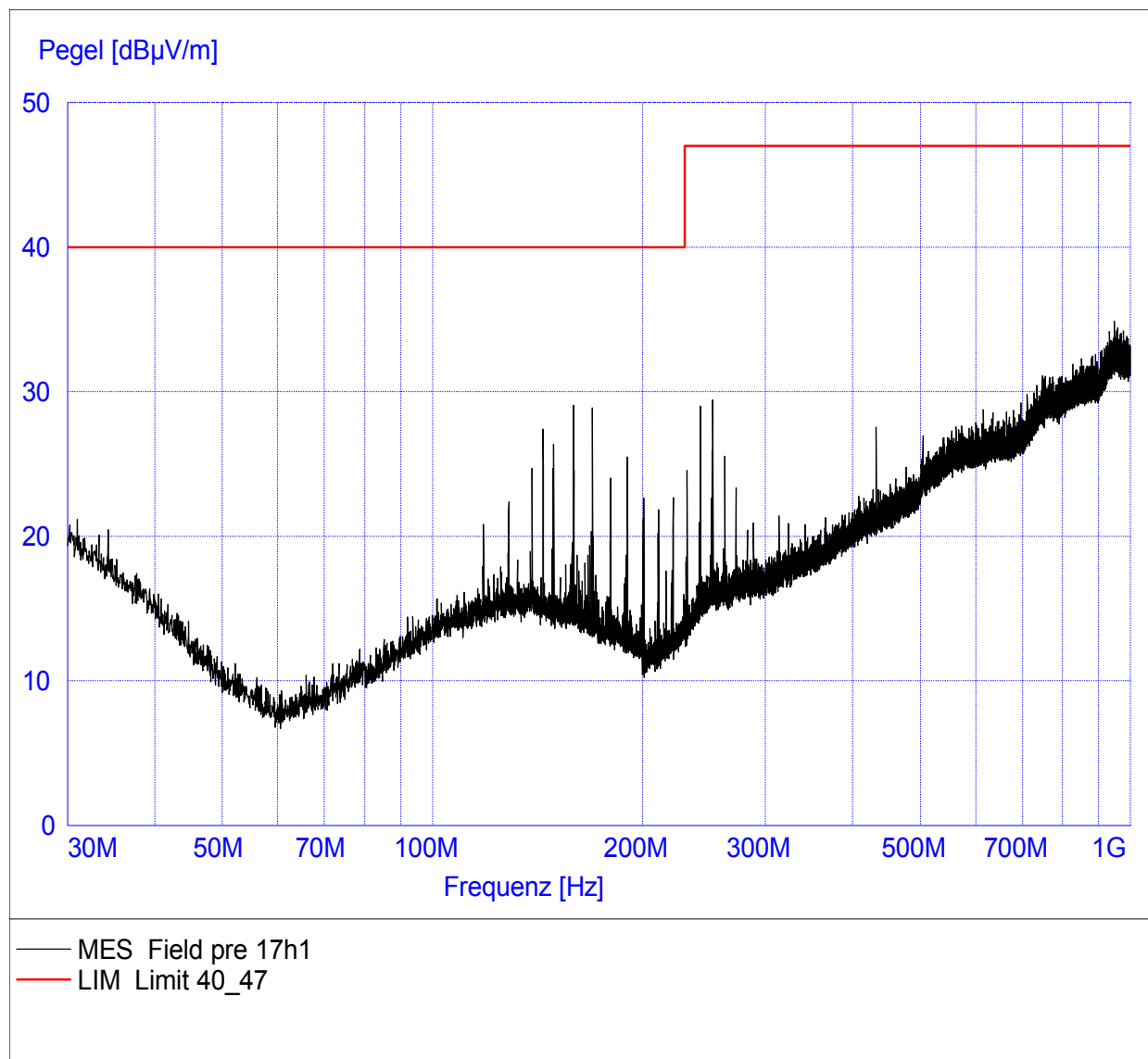
PRO EMV Labor Strausberg GmbH

EUT: Radex Lupin
Hersteller: Quarta Rad
Prüfgrundlage: EN 61326-1 /2006 (CISPR 11, Klasse B)
Messentfernung 3 m: Antenne horizontal
Kommentar: Meßbetrieb Beleuchtungsstärke + Ladebetrieb

Uh= 230 V DC:

SCANTABELLE: "Field (30-1000 MHz)"

Start- Frequenz	Stop- Frequenz	Schritt- weite	Detektor	Meß- zeit	ZF- Bandbr.	Transducer
30.0 MHz	1.0 GHz	50.0 kHz	MaxPeak	10.0 ms	120 kHz	Bilog 6111D



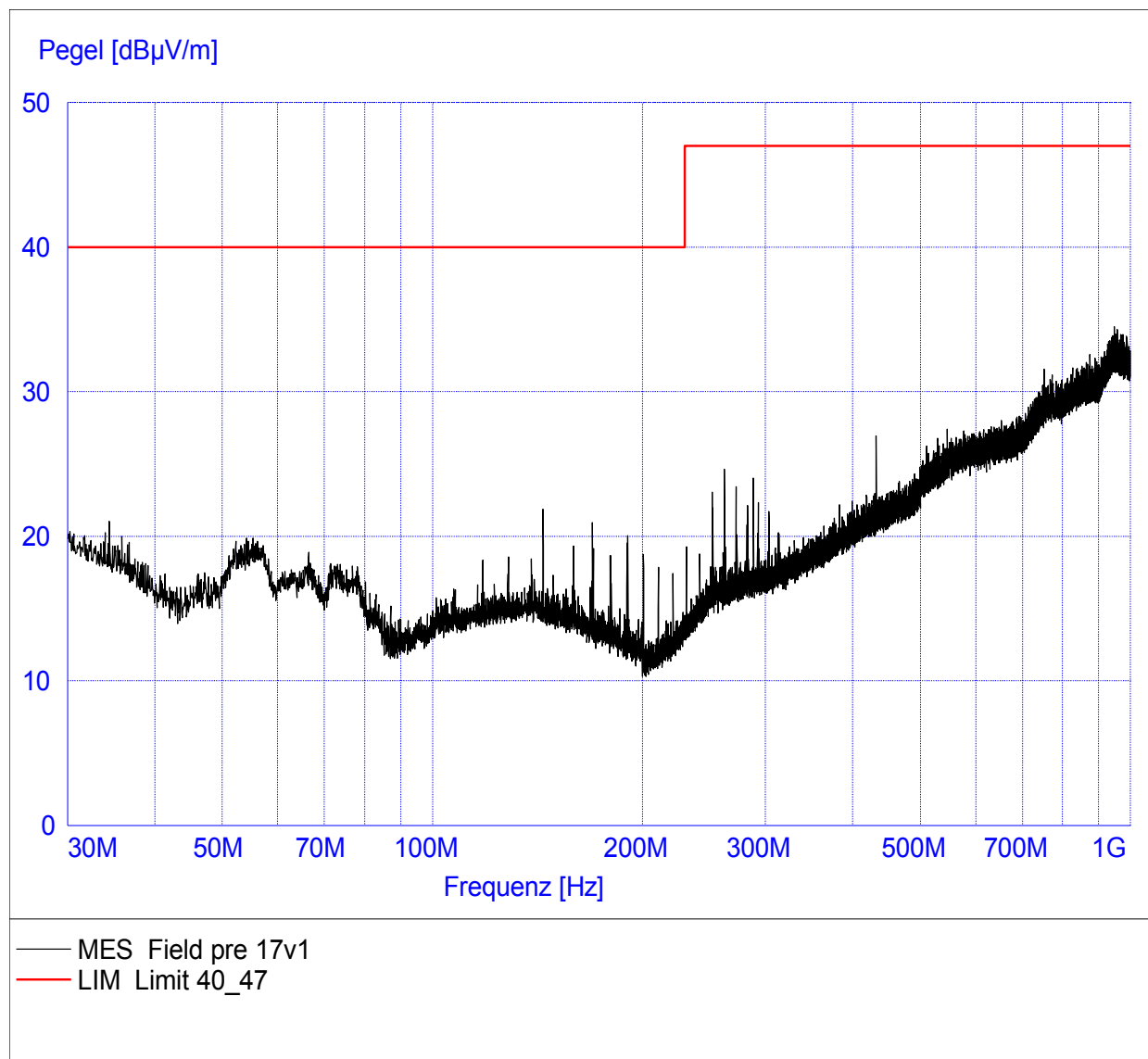
PRO EMV Labor Strausberg GmbH

EUT: Radex Lupin
Hersteller: Quarta Rad
Prüfgrundlage: EN 61326-1 /2006 (CISPR 11, Klasse B)
Messentfernung : 3 m: Antenne vertikal
Kommentar: Meßbetrieb Beleuchtungsstärke + Ladebetrieb

Uh= 230 V DC:

SCANTABELLE: "Field (30-1000 MHz)"

Start- Frequenz	Stop- Frequenz	Schritt- weite	Detektor	Meß- zeit	ZF- Bandbr.	Transducer
30.0 MHz	1.0 GHz	50.0 kHz	MaxPeak	10.0 ms	120 kHz	Bilog 6111D



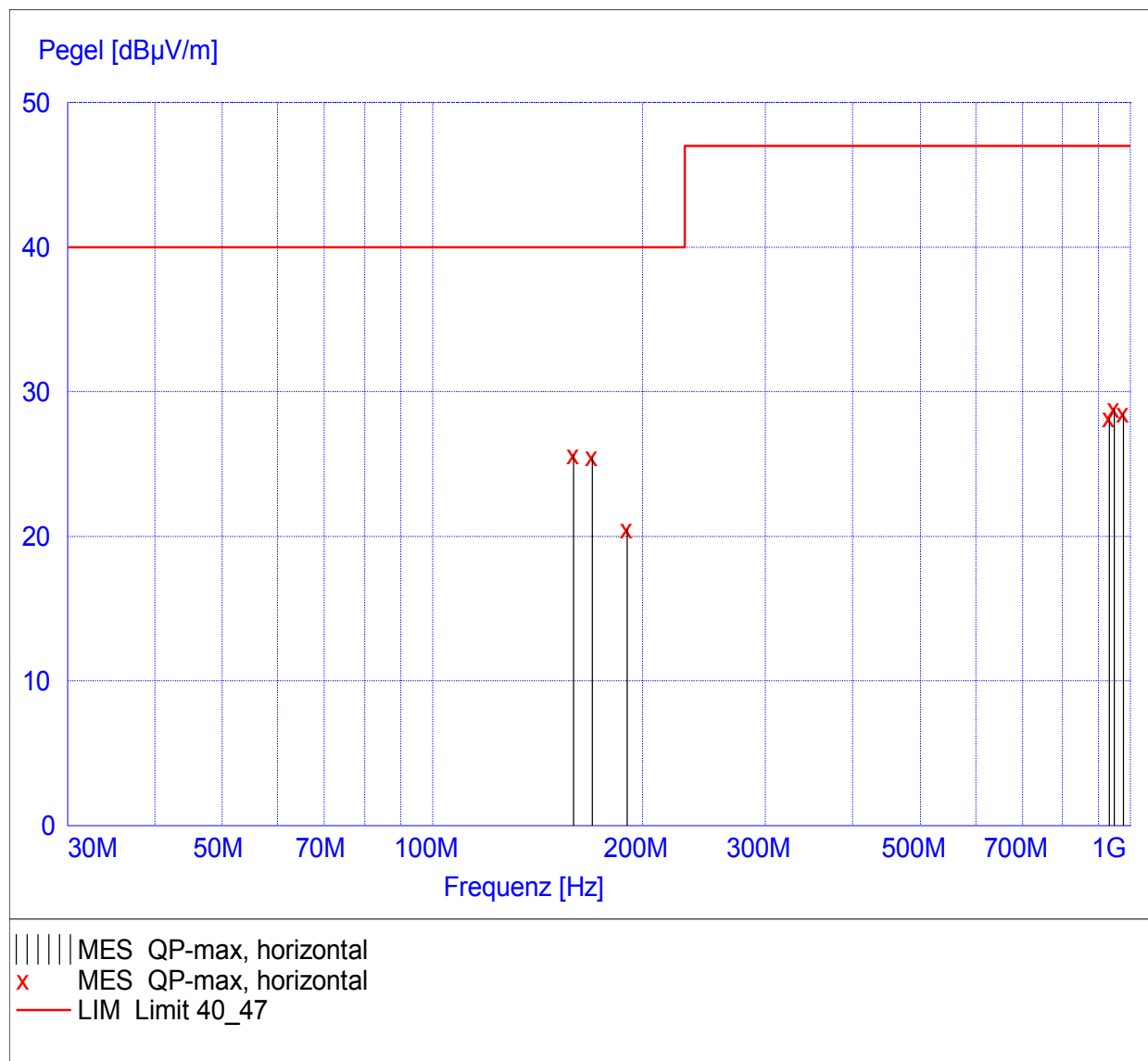
PRO EMV Labor Strausberg GmbH

EUT: Radex Lupin
Hersteller: Quarta Rad
Prüfgrundlage: EN 61326-1 /2006 (CISPR 11, Klasse B)
Messentfernung : 3 m: Antenne horizontal
Kommentar: Meßbetrieb Beleuchtungsstärke + Ladebetrieb

Uh= 230 V DC:

SCANTABELLE: "QP, 30-1000 MHz"

Start-Frequenz	Stop-Frequenz	Schrittweite	Detektor	Meßzeit	ZF-Bandbr.	Transducer
30.0 MHz	1.0 GHz	50.0 kHz	QuasiPeak	1.0 s	120 kHz	Bilog 6111D



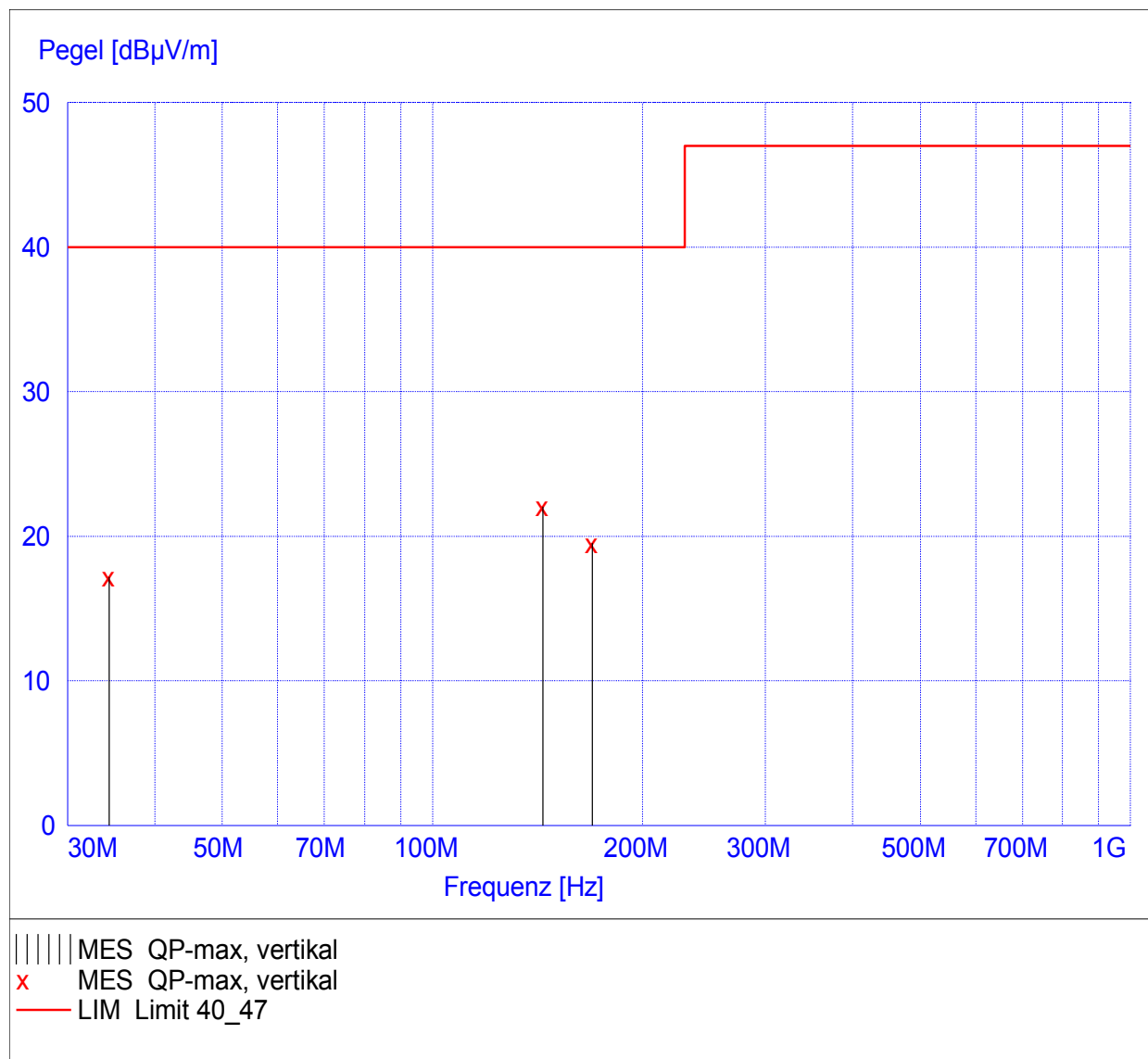
PRO EMV Labor Strausberg GmbH

EUT: Radex Lupin
Hersteller: Quarta Rad
Prüfgrundlage: EN 61326-1 /2006 (CISPR 11, Klasse B)
Messentfernung : 3 m: Antenne vertikal
Kommentar: Meßbetrieb Beleuchtungsstärke + Ladebetrieb

Uh= 230 V DC:

SCANTABELLE: "QP, 30-1000 MHz"

Start-Frequenz	Stop-Frequenz	Schrittweite	Detektor	Meßzeit	ZF-Bandbr.	Transducer
30.0 MHz	1.0 GHz	50.0 kHz	QuasiPeak	1.0 s	120 kHz	Bilog 6111D



PRO EMV Labor Strausberg GmbH

EUT: Radex Lupin
Hersteller: Quarta Rad
Prüfgrundlage: EN 61326-1 /2006 (CISPR 11, Klasse B)
Messentfernung : 3 m: Antenne horizontal / vertikal
Kommentar: Meßbetrieb Beleuchtungsstärke + Ladebetrieb

Uh= 230 V DC:

SCANTABELLE: "QP, 30-1000 MHz"

Start- Frequenz	Stop- Frequenz	Schritt- weite	Detektor	Meß- zeit	ZF- Bandbr.	Transducer
30.0 MHz	1.0 GHz	50.0 kHz	QuasiPeak	1.0 s	120 kHz	Bilog 6111D

MEßERGEBNIS: "QP-max, horizontal"

25.03.2015 11:46

Frequenz MHz	Pegel dBµV/m
159.350000	25.64
169.600000	25.50
190.100000	20.48
933.400000	28.22
949.250000	28.82
978.250000	28.48

MEßERGEBNIS: "QP-max, vertikal"

25.03.2015 12:39

Frequenz MHz	Pegel dBµV/m
34.450000	17.18
144.000000	22.04
169.450000	19.54

7. Photo documentation

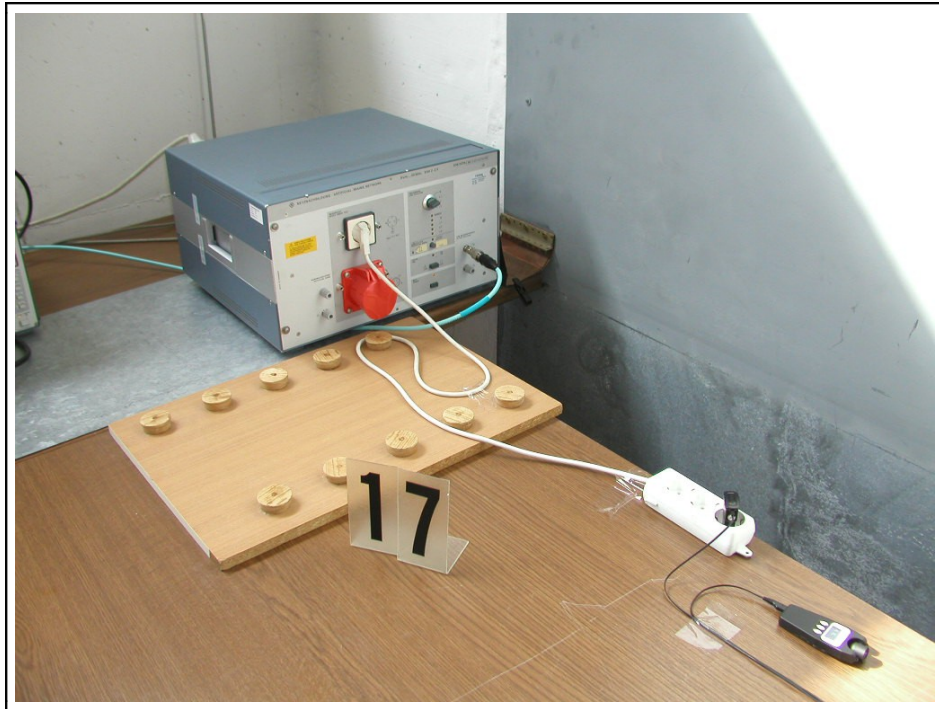


Figure 1 : Test Set-up "Conducted continuous disturbance at mains port"

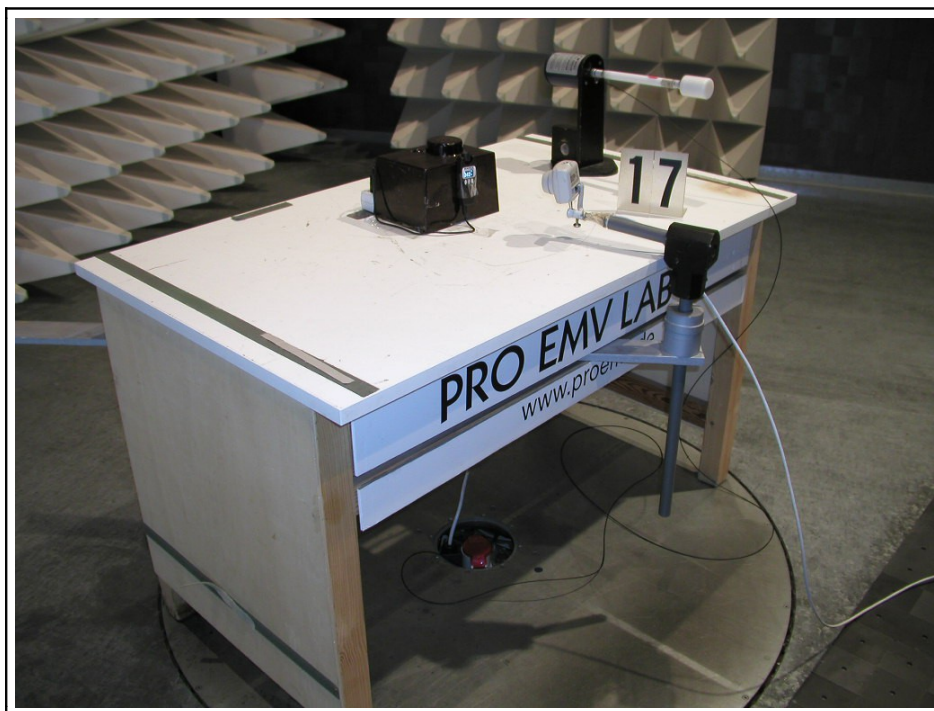


Figure 2 : Test Set-up "Radiated electromagnetic fields and immunity to radiated electromagnetic fields"

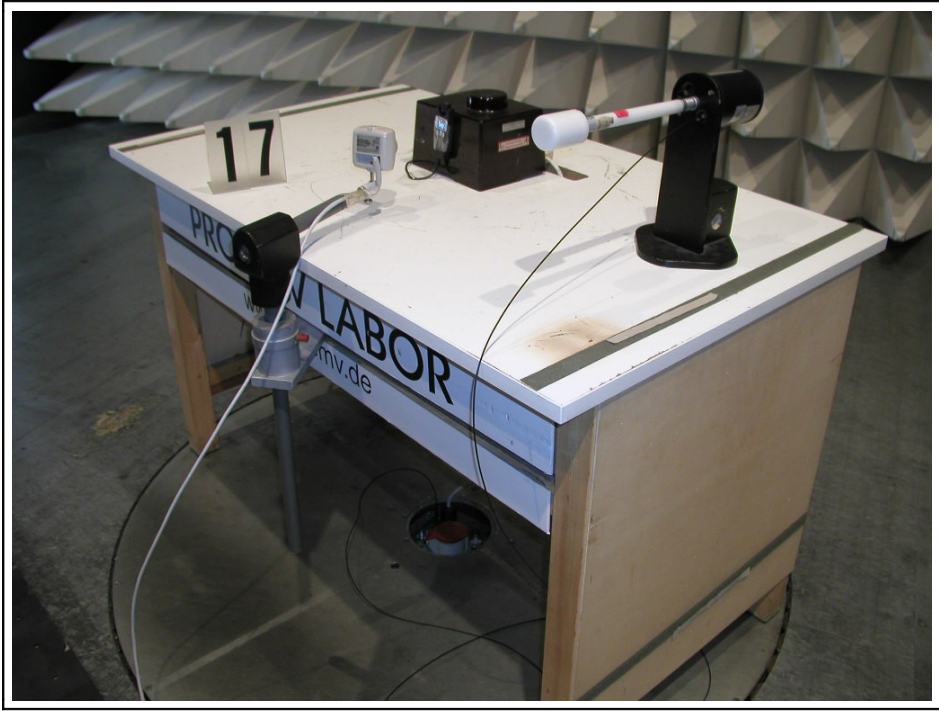


Figure 3 : Test Set-up "Radiated electromagnetic fields and immunity to radiated electromagnetic fields"

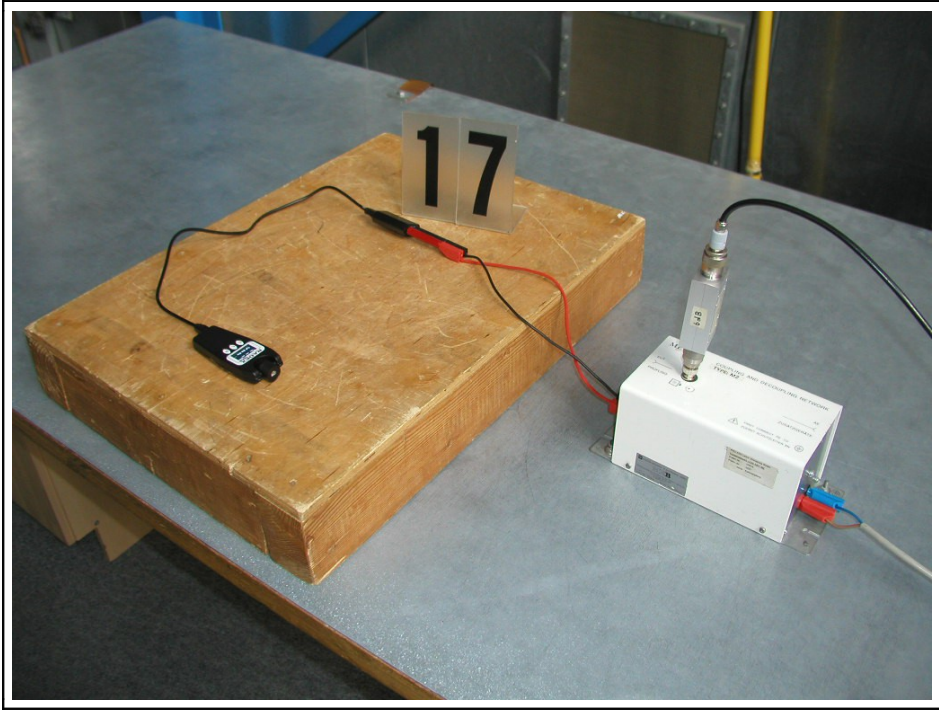


Figure 4 : Test Set-up "Immunity to conducted disturbance by RF field, current injection"



Figure 5 : Test Set-up "Immunity to fast transient disturbances (Bursts)"

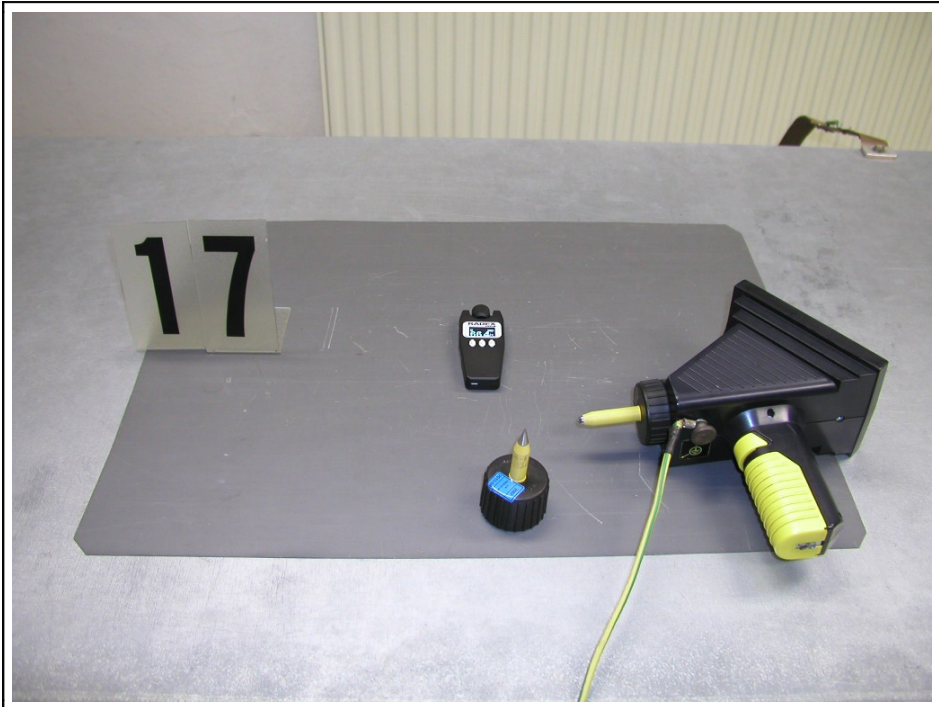


Figure 6 : Test Set-up "Immunity to electrostatic discharge (ESD)"



Figure 7 : Test Set-up "Immunity to surge pulses (Surge)"

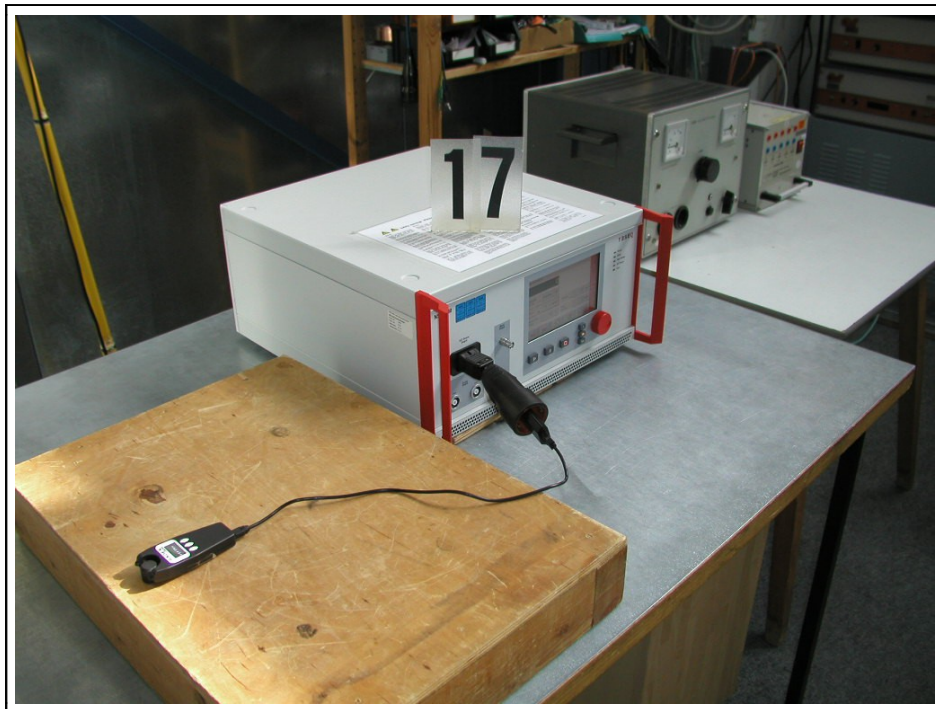


Figure 8 : Test Set-up "Immunity to voltage dips, interruptions and fluctuations"