



INSTITUTE FOR TESTING AND CERTIFICATION, a.s.

Testing Laboratory of Electrical Products
Sokolovska 573
686 01 Uherske Hradiste
Czech Republic



TESTING LABORATORY No. 1004.3

accredited by the Czech Institute for Accreditation, o. p. s

Test Report No: 414102853AE1

Number of Copies:2

Copy No.: 1

TEST REPORT

ABOUT THE ELECTROMAGNETIC COMPATIBILITY TEST of the MICROWAVE RADIOMETER RTM-01-RES



Test Engineer and Report Author:

Mr Vlastimil Vaculik

Head of Testing Laboratory:

Mr Pavel Vavra

Issue Date: 2015-06-10

Number of pages: 19

Number of Appendices: 2

Distribution List: Institute for testing and certification (Copy No 1)
Applicant (Copy No 2)

Accredited Testing Laboratory No 1004.3 (CZ)

Test Report No. 414102853AE1

Page 2 of 19

No partial reproduction of this Test Report is allowed without a prior written permission of ATL 1004.3, except the case when reproduced in its entirety.

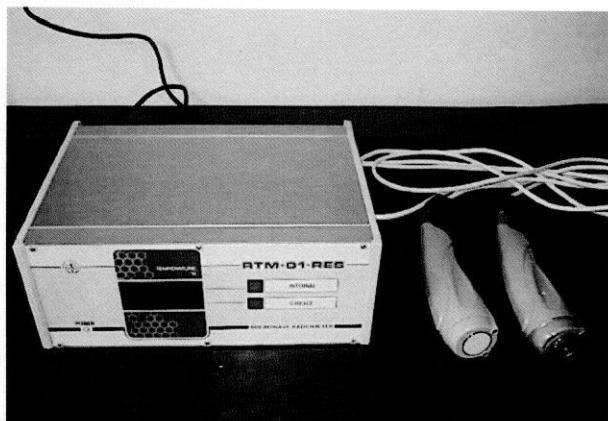
The test results mentioned below relate solely to the Equipment Under Test.

1. GENERAL SPECIFICATIONS

1.1. Equipment Under Test (EUT)

One sample the Microwave Radiometer RTM-01-RES with serial No. 15AKUE9347 was delivered to Institute for testing and certification on 2015-06-03. ATL 1004.3 started the requested tests under Job No 414102853.

Picture 1.1.A – EUT



Picture 1.1.B – rating label



1.2. Applicant

ONKOCET s.r.o.
Kutuzovova 4
902 01 Pezinok
Slovakia

ID No. 36767280
VAT No. SK2022370262

Order No.:
as of:



1.3. Manufacturer

RES Company Ltd.
Bolshaya Pochtovaya 22
105082 Moscow
Russia

1.4. Test Period

Started on: 2015-06-03
Finished on: 2015-06-03

1.5. Test Conditions

Ambient temperature: (+15 up to +35) °C / (+59 up to +95) °F
Barometric pressure: (86 up to 106) kPa / (25.4 up to 31.3) inHg
Relative humidity: (25 – 75) %

1.6. Regulations used

<i>i</i>	<i>Regulation used</i>	<i>As Czech implementation of</i>
1	ČSN EN 60601-1-2 ed.2:2008	EN 60601-1-2:2007
2	ČSN EN 55011 ed.3:2010	EN 55011:2009
3	ČSN EN 61000-3-2 ed.3:2006+A1:2010 +A2:2010	EN 61000-3-2:2006+A1:2009 +A2:2009
4	ČSN EN 61000-3-3 ed.2:2009	EN 61000-3-3:2008
5	ČSN EN 61000-4-2 ed.2:2009	EN 61000-4-2:2008
6	ČSN EN 61000-4-3 ed.3:2006+A1:2008+A2:2011	EN 61000-4-3:2006 +A1:2007+ A2:2010
7	ČSN EN 61000-4-4 ed.2:2005+A1:2010	EN 61000-4-4:2004/A1:2010
8	ČSN EN 61000-4-5 ed 2:2007	EN 61000-4-5:2006
9	ČSN EN 61000-4-6 ed 3:2009	EN 61000-4-6:2009
10	ČSN EN 61000-4-8 ed 3:2010	EN 61000-4-8:2009
11	ČSN EN 61000-4-11 ed 2:2005	EN 61000-4-11:2004

1.7. Test Instruments and Equipment

<i>i</i>	<i>Instrument / Equipment</i>	<i>Serial No</i>
1	Test Receiver Rohde & Schwarz ESIB 7	100318
2	Log-periodic Antenna Frankonia BTA-H	97061002
3	Antenna Rohde & Schwarz HF 906	359287/003
4	RF Amplifier AR 10W1000B	21532
5	RF Amplifier MILMEGA AS0840-30-17	10140028



<i>i</i>	<i>Instrument / Equipment</i>	<i>Serial No</i>
6	RF generator Rohde & Schwarz SMH	862490/007
7	RF generator Rohde & Schwarz SME 03	834617/007
8	ESD Generator PESD 3010	H805224
9	Burst Generator - Haefely PEFT-Junior	583333-82
10	Surge Generator - Haefely PSURGE 4010	080888/07
11	Coupling Network MEB M3	14413
12	Autotransformer RT 2,5	402405
13	Ammeter ELi	4759491
14	ZZ 023-E magnetic coil	001
15	Test System TECTRA SYS61K – 1PL95	08950603/A0603070

All listed equipment has been duly calibrated and they passed a regular metrological inspection.

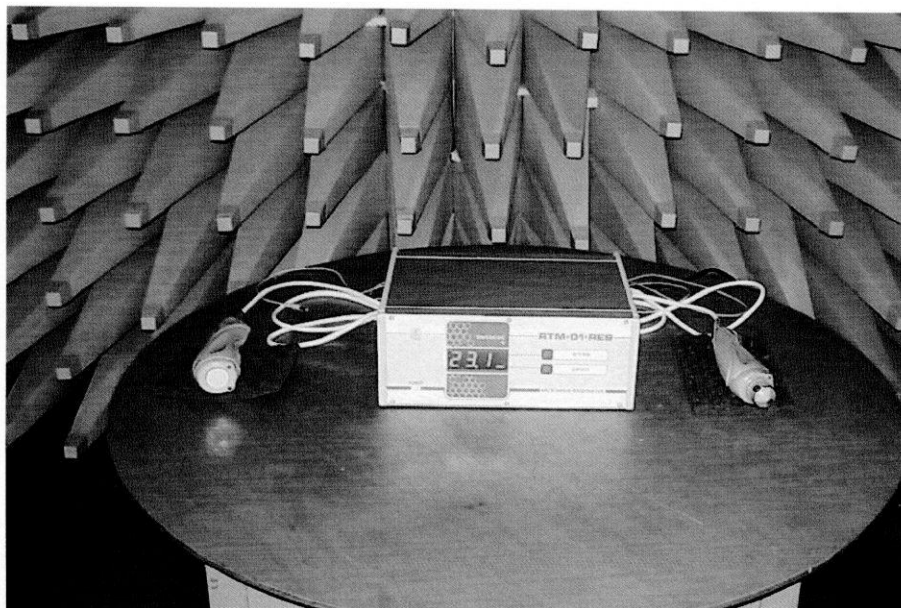
1.8. EUT Installation

One 3-wire cable (1.8 m long) was connected to the power voltage (230 V AC). The microwave sensor was connected to the EUT. Infrared sensor was connected to the EUT. The cables from the sensors were the shorter than 3m. The communications USB cable was connected to the EUT. The EUT was connected to the PC using USB cable. The USB cable is shorter than 3m. The checking and evaluation software was installed at the PC.

2. EMC TESTS OF RADIATED INTERFERENCE

The EUT was tested in operating mode.

Picture 2.A – EUT during the testing of radiated interferences



2.1. Mains Terminal Spurious Voltage

<i>Requirement in</i>	ČSN EN 60601-1-2, Clause 6.1.1.2
<i>Testing method</i>	ČSN EN 55011-1 Clause 8.2
<i>Test specification</i>	Measuring of the levels of spurious terminal voltages, radiated by the EUT into the supply leads on frequencies 150 kHz up to 30 MHz. The EUT was placed 0.1 m / 0.33 ft above the ground reference plane on transport palette. The spurious voltage levels were measured on the supply terminals of the L (phases) and N (neutral) supply conductors of the EUT using the Selective Micro-voltmeter with a peak, quasi-peak and average. The test was performed in operation mode.
<i>Measurement uncertainty</i>	$U = \pm 3.5 \text{ dB}$ (specified for the coverage coefficient $k = 2$ and the confidence probability of 95 %)
<i>Results</i>	PASSED, Class B

Limits of the conducted spurious voltage on the mains terminals according to ČSN EN 55011, 6.2.1.3 Table 3

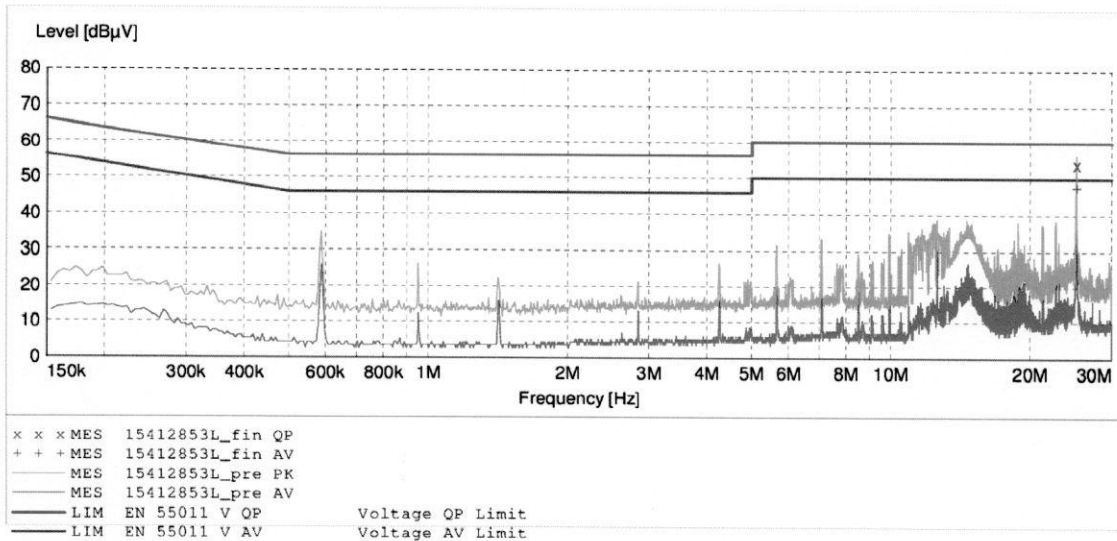
Frequency band [MHz]	Limits dB [μV]	
	Quasi-Peak values	Average Values
0.15 up to 0.50	66 up to 56	56 up to 46
0.5 up to 5	56	46
5 up to 30	60	50

NOTE 1 – The lower limit is valid for the frequency on boundary.

Graph 2.1.A - Conducted terminal voltage EN 55011 Class B, L

Voltage on Mains

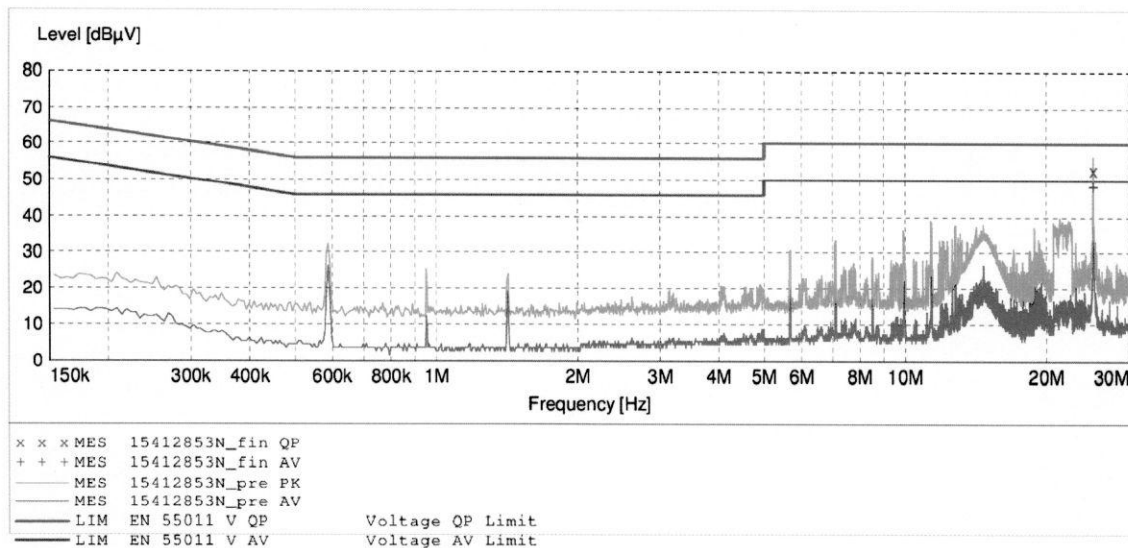
EUI: RIM-01-RES
 Manufacturer: ONKOCEI s.r.o.
 Operating Condition:
 Test Site:
 Operator: V.Vaculik
 Test Specification: L
 Comment:
 Start of Test: 3.6.2015 / 9:39:10



Graph 2.1.B - Conducted terminal voltage EN 55011 Class B, N

Voltage on Mains

EUI: RIM-01-RES
 Manufacturer: ONKOCEI s.r.o.
 Operating Condition:
 Test Site:
 Operator: V.Vaculik
 Test Specification: N
 Comment:
 Start of Test: 3.6.2015 / 9:43:23



2.2. Radiated Field

<i>Requirement in</i>	ČSN EN 60601-1-2, Clause 6.1.1.2
<i>Testing method</i>	ČSN EN 55011, Clause 8.3
<i>Test specification</i>	<p>The field strength levels, radiated by the EUT into environment on frequencies 30 up to 1,000 MHz.</p> <p>The measurement was carried out in the anechoic chamber at the distance of 3 m / 9.8 ft and recalculated for the distance of 10 m / 32.8 ft. The Selective Micro-voltmeter with a peak and a quasi-peak type detector was connected to the measuring antenna. The values of radiated electromagnetic field were subsequently measured at horizontal as well as vertical polarization of the measuring antenna. The maximum of emission was searched for horizontal and for vertical polarization by rotation of device and by turning the high of antenna. The EUT was placed on the transport palette in the anechoic chamber. The EUT was placed 0.1 m / 0.33 ft above the ground reference plane.</p> <p>The test was performed in operation mode.</p>
<i>Measurement uncertainty</i>	$U = \pm 5.2 \text{ dB}$ (specified for the coverage coefficient $k = 2$ and the confidence probability of 95 %)
<i>Results</i>	PASSED, Class B

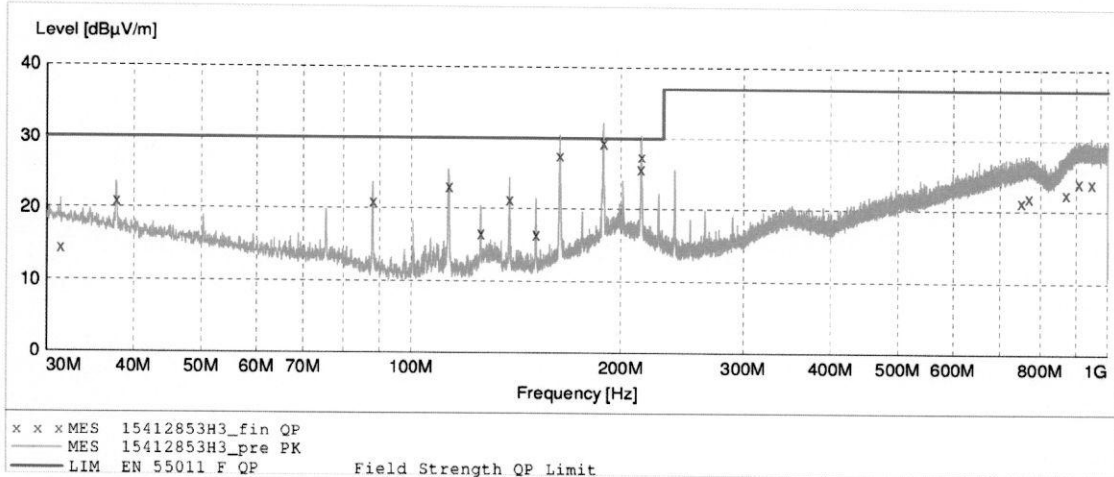
Limits of the radiated emissions (measuring distance 10 m) of the class B according to ČSN EN 55011, Table 5

<i>Frequency Range [MHz]</i>	<i>Quasi-Peak Limits dB [$\mu\text{V/m}$]</i>
30 – 230	30
230 – 1,000	37

Graph 2.2.A – radiated emissions according to EN 55011 Class B, horizontal

Electric Field Strength

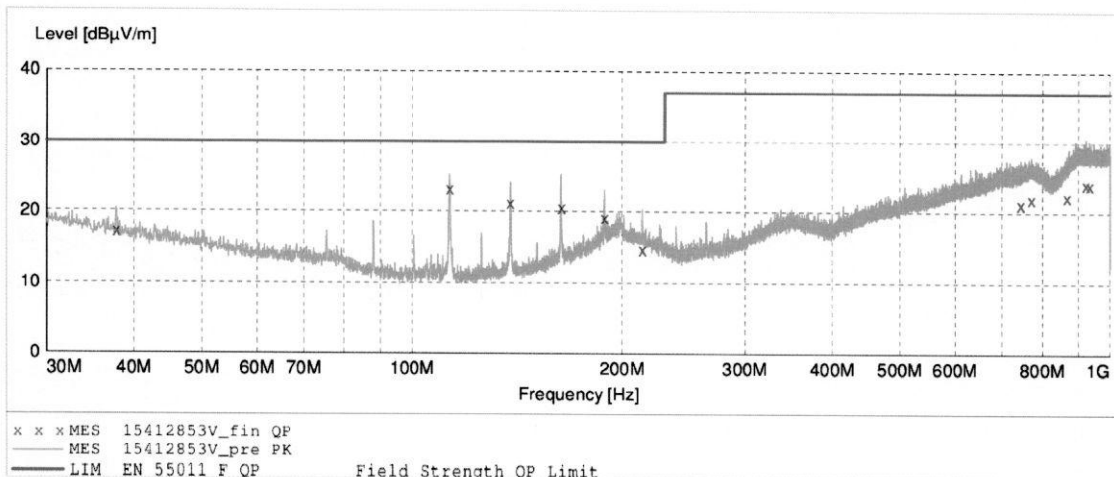
EUT: RIM-01-RES
 Manufacturer: ONKOCEP s.r.o.
 Operating Condition:
 Test Site:
 Operator: V.Vaculik
 Test Specification: Horizontal
 Comment: Odpojeno USB, ferity 2x A8 na kabelech k senzoru
 2x A6 ferity u senzoru



Graph 2.2.B – radiated emissions according to EN 55011 Class B, vertical

Electric Field Strength

EUT: RIM-01-RES
 Manufacturer: ONKOCEP s.r.o.
 Operating Condition:
 Test Site:
 Operator: V.Vaculik
 Test Specification: Vertical
 Comment: Odpojeno USB, ferity 2x A8 na kabelech k senzoru
 2x A6 ferity u senzoru





2.3. Harmonic Current Emissions

Requirement in	ČSN EN 61000-3-2
Test specification	The measurement on the EUT was carried out in compliance with the ČSN EN 61000-3-2 for the Class A. EUT was in normal operating mode during the test. The results are shown in the Appendix No. 1 of this test report.
Results	PASSED

2.4. Voltage Variation Reduction and Flickering Reduction in the Mains

Requirement in	ČSN EN 61000-3-3
Test specification	The measurement on the EUT was carried out in the compliance with the ČSN EN 61000-3-3. EUT was in normal operating mode during the test. The results are shown in the Appendix No. 2 of this test report.
Results	PASSED

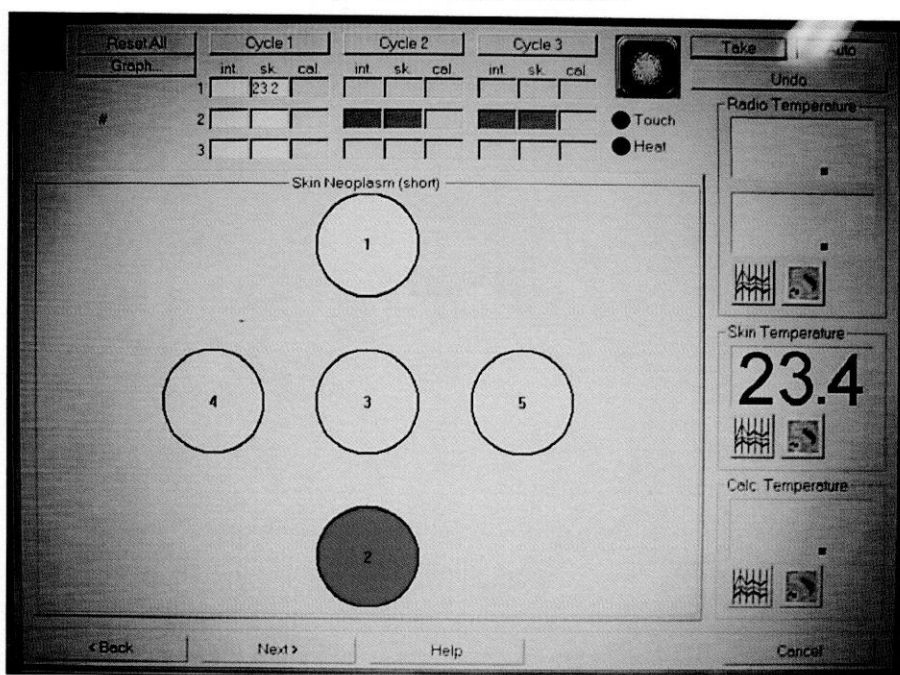
3. EMC IMMUNITY

The EUT was placed on the transport palette. The test was performed in operation mode. The correctness of the measured values was solved by the control software on the PC. The measured temperature have to be stable for at least 3 seconds to be assessed as correct.

The allowable tolerance from the manufacturer is $\pm 1^{\circ}\text{C}$

The sensitive sensor (microwave) was attached to the human body during test according to EN 61000-4-3.

Graph 3.B – control software



3.1. Electrostatic Discharge Immunity

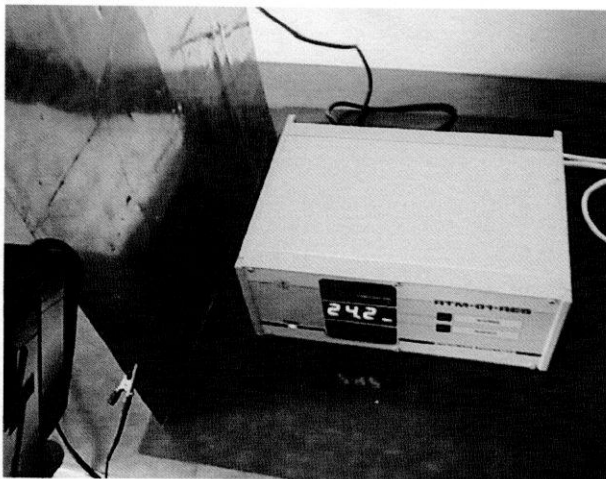
Requirement in	ČSN EN 60601-1-2, Clause 6.2.2
Testing method	ČSN EN 61000-4-2
Test specification	<p>The air method was applied for non-conductive surfaces while contact discharges were used for conductive parts.</p> <p>The air method was applied to all non-conductive, display, display of the thermometer, communicate cable.</p> <p>The contact discharge method was applied to all metallic places. Twenty discharges were applied to each metallic place (Ten discharges with positive polarity a ten with negative polarity). The value of the test voltage $\pm 6\text{kV}$.</p> <p>The EUT was placed on the wooden table. The test was performed in operation mode.</p>
Results	PASSED, Performance Criterion B

Table 3.1.A – Performance of the EUT on discharges

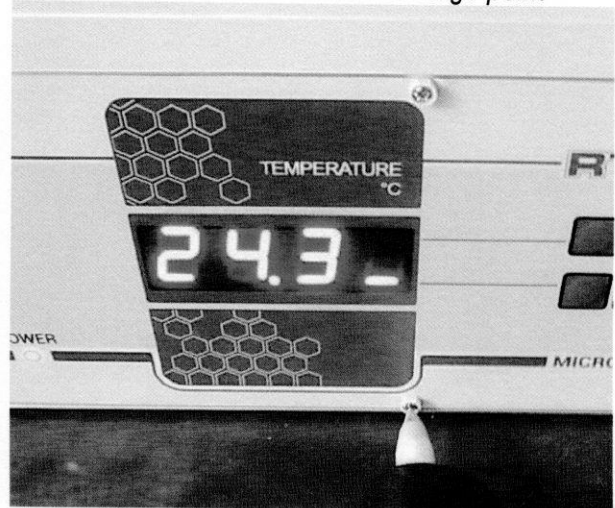
Level	+ 4 kV	- 4 kV	+ 6 kV	- 6 kV	+ 8 kV	- 8 kV
Contact Discharge	-	-	A	A	-	-
Air Discharge	-	-	-	-	B	B

B ... Performance Criterion B (impaired function of the EUT, function of the EUT was restored after the test) – the measured value out of tolerance

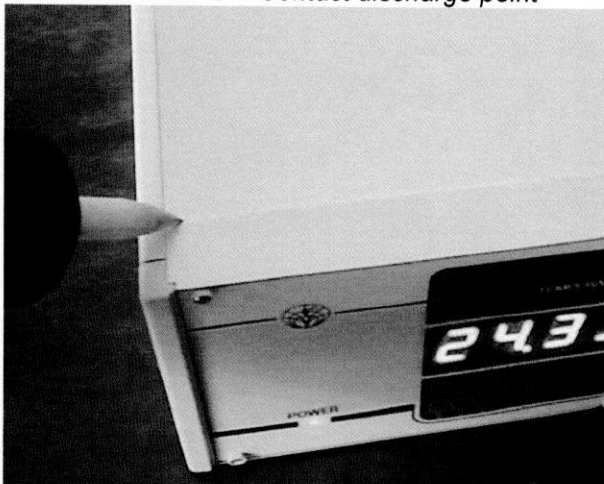
Picture 3.1.A – Contact discharge point



Picture 3.1.B – Contact discharge point



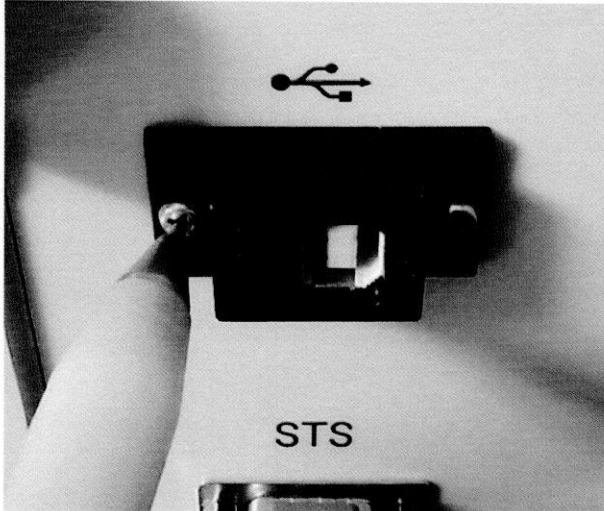
Picture 3.1.C – Contact discharge point



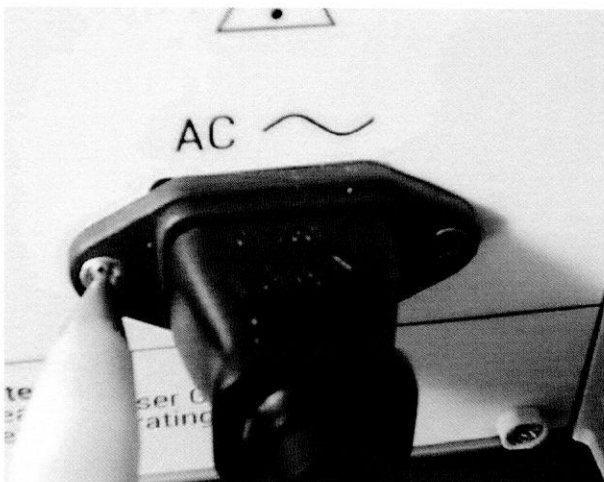
Picture 3.1.D – Contact discharge point



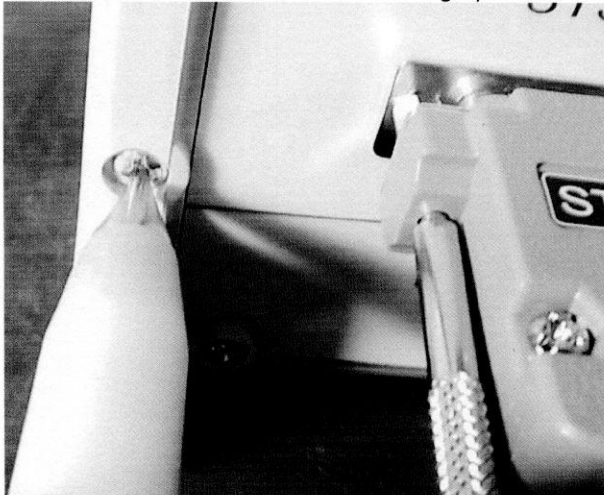
Picture 3.1.E – Contact discharge point



Picture 3.1.G – Contact discharge point



Picture 3.1.J – Contact discharge point



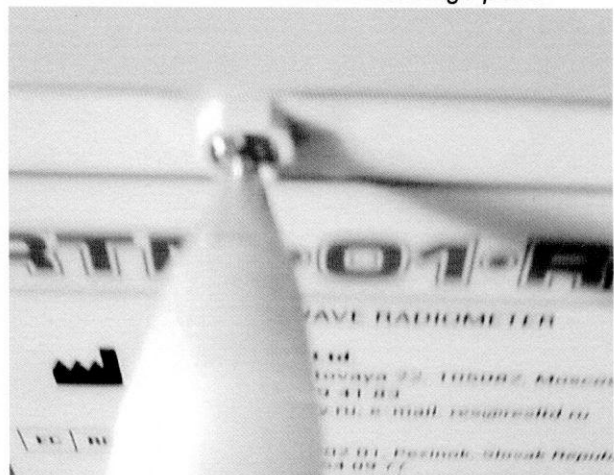
Picture 3.1.F – Contact discharge point



Picture 3.1.H – Contact discharge point



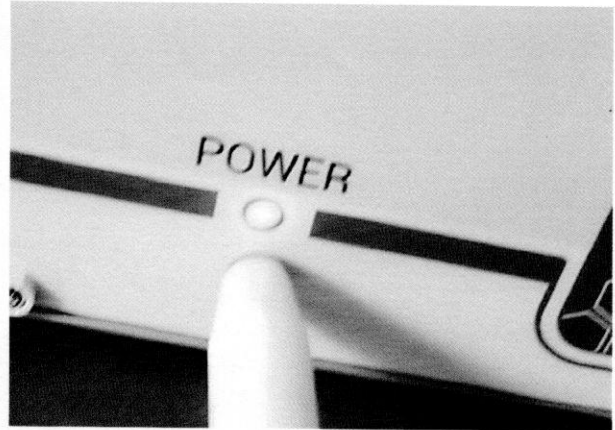
Picture 3.1.K – Contact discharge point



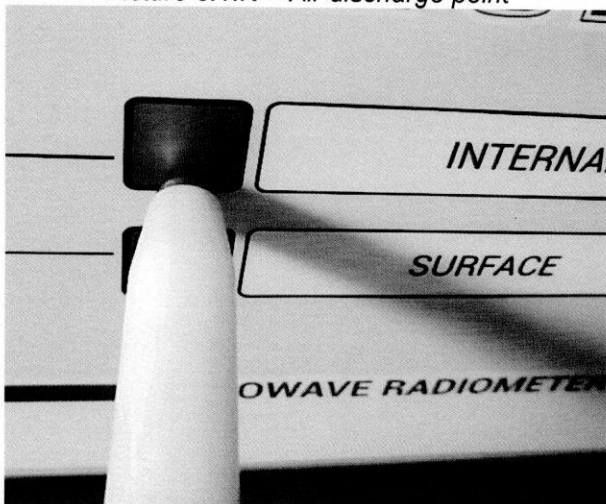
Picture 3.1.L – Air discharge point



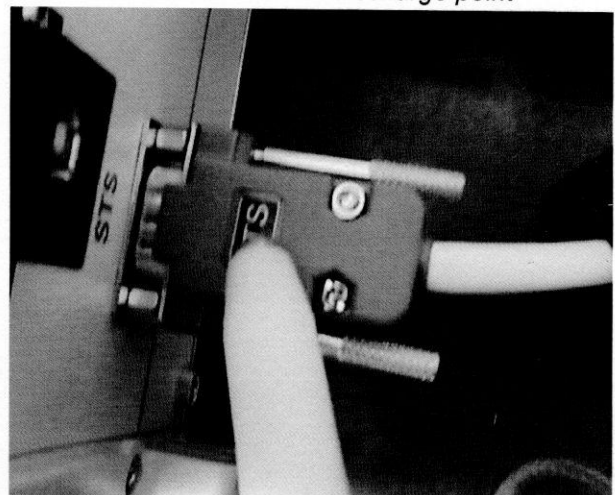
Picture 3.1.M – Air discharge point



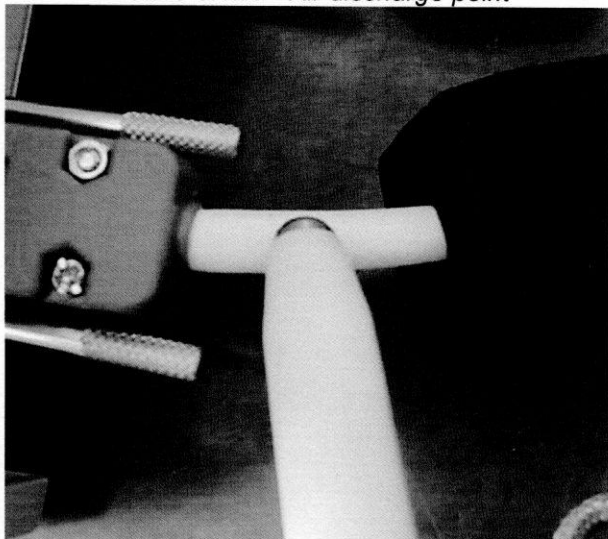
Picture 3.1.N – Air discharge point



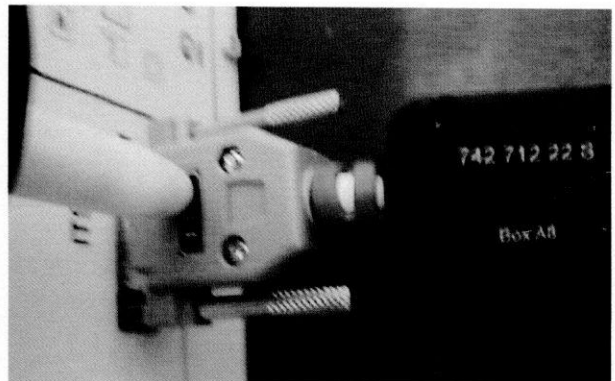
Picture 3.1.P – Air discharge point



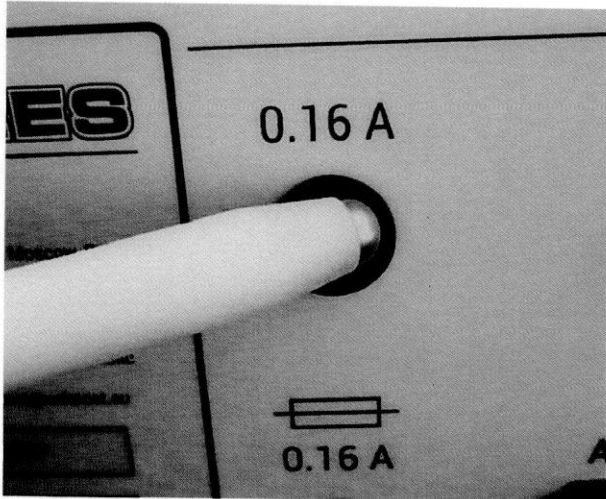
Picture 3.1.R – Air discharge point



Picture 3.1.S – Air discharge point



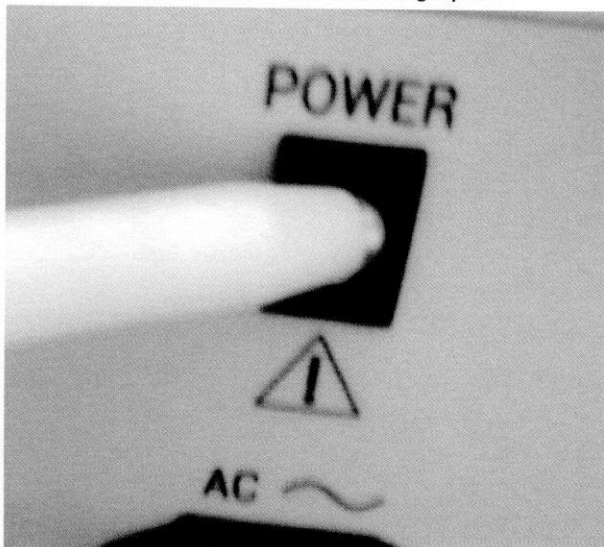
Picture 3.1.T – Air discharge point



Picture 3.1.U – Air discharge point



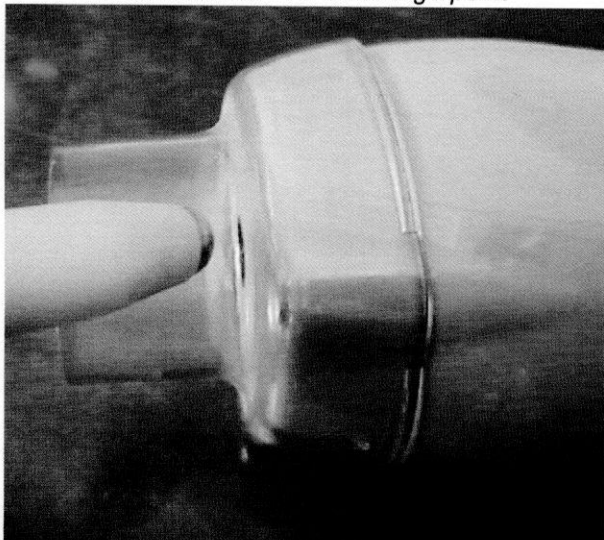
Picture 3.1.V – Air discharge point



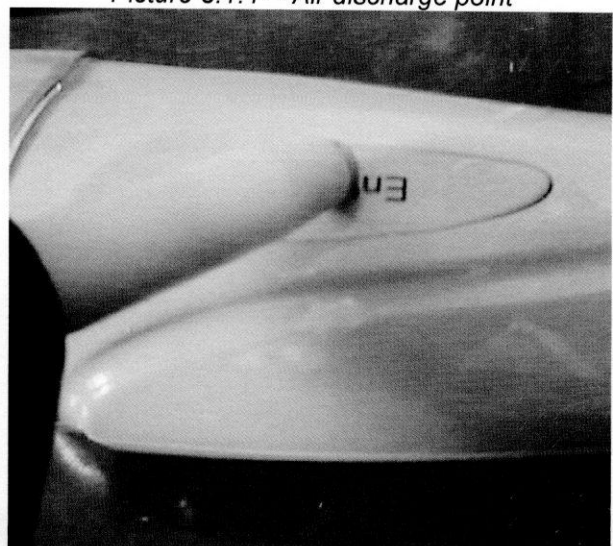
Picture 3.1.W – Air discharge point



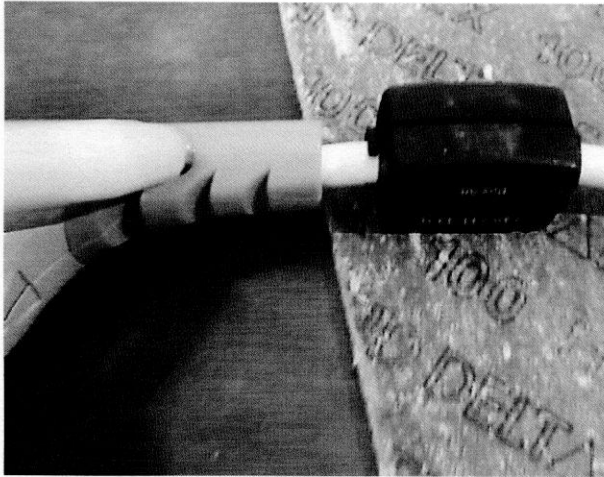
Picture 3.1.X – Air discharge point



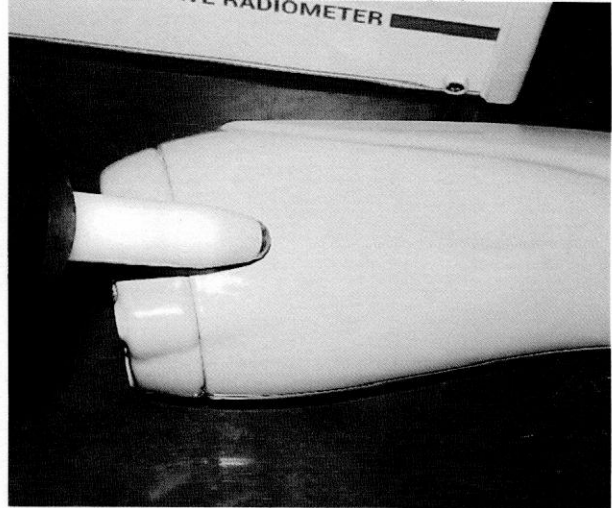
Picture 3.1.Y – Air discharge point



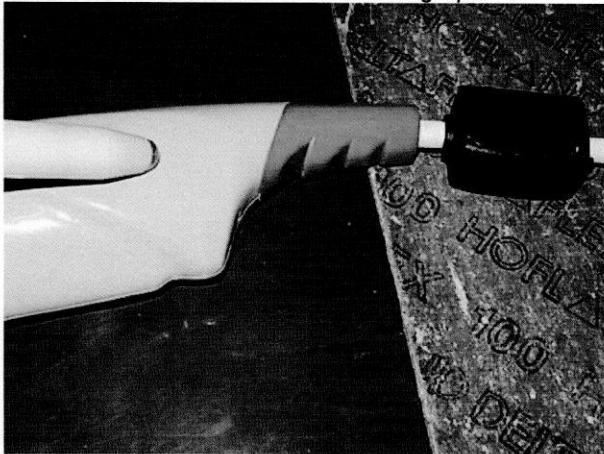
Picture 3.1.Z – Air discharge point



Picture 3.1.AA – Air discharge point



Picture 3.1.AB – Air discharge point

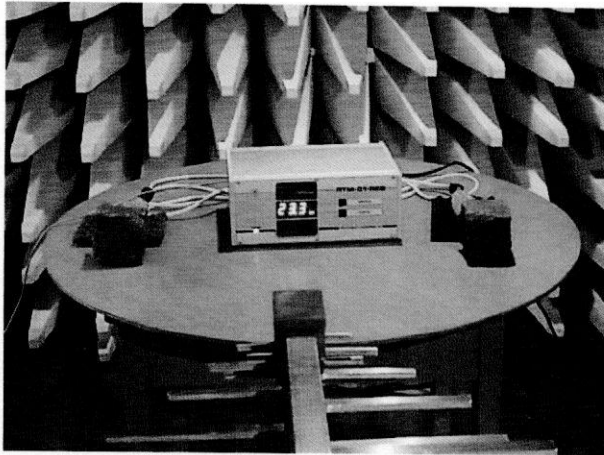


Picture 3.1.AC – Air discharge point

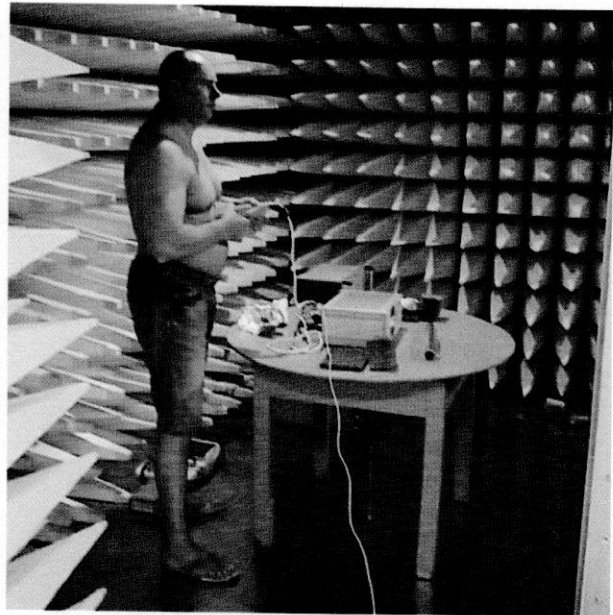


3.2. Field Immunity

Picture 3.1.A – EUT during the testing of field immunity



Picture 3.1.B - EUT during the testing of field immunity



Requirement in	ČSN EN 60601-1-2, Clause 6.2.3
Testing method	ČSN EN 61000-4-3
Test specification	The test was carried out within the frequency band of 80 MHz up to 2.5 GHz, using the 80% AM and modulating frequency of 1kHz, horizontal and vertical polarization, electric field intensity 3V/m. The EUT was placed on the transport palette in the anechoic chamber. The EUT was placed 0.1 m / 0.33 ft above the ground reference plane. The test was performed in operation mode.
Results	PASSED, Performance Criterion A

Table 3.2.A – Field immunity test parameters and performances

Frequencies	AM	Mod. Frequency	Polarisation	Field intensity [V]	Performance
80 MHz – 2.5 GHz	80%	1 kHz	Horizontal	3	A
80 MHz – 2.5 GHz	80%	1 kHz	Vertical	3	A

A ... Performance Criterion A (no function of the EUT under was affected)

3.3. Electrical Fast Transients/Burst Immunity

Requirement in	ČSN EN 60601-1-2, Clause 6.2.4
Testing method	ČSN EN 61000-4-4
Test specification	<p>The pulse groups were injected directly into the individual supply leads L, N and PE. The EUT was placed on the transport palette with the height of 0.1 m / 0.33 ft. above the reference grounding surface. The minimum distance from any metallic objects was more than 0.6 m / 1.97 ft. from the EUT. The pulse groups were subsequently fed directly into the individual supply leads L, N and the protective conductor PE.</p> <p>Pulse group width 15 ms pulse group period 300 ms Repeating frequency of the pulse groups 5 kHz Duration positive / negative pulses: 1 minute for each conductor</p> <p>The test was performed in operation mode.</p>
Results	PASSED, Performance Criterion A

Table 3.3.A – Performances of the EUT on the fast transients/burst immunity tests

Amplitude	+1 kV	- 1 kV	+2 kV	- 2 kV
L	-	-	A	A
N	-	-	A	A
PE	-	-	A	A

A ... Performance Criterion A (no function of the EUT was affected)

3.4. Surge Immunity

Requirement in	ČSN EN 60601-1-2, Clause 6.2.5
Testing method	ČSN EN 61000-4-5
Test specification	<p>The EUT was placed on the transport palette with the height of 0.1 m / 0.33 ft. above the reference grounding surface. The surges were applied directly between the:</p> <ul style="list-style-type: none"> L, N and PE conductors <p>The test was performed in operation mode.</p>
Results	PASSED, Performance Criterion A

Table 3.4.A – Surge immunity test parameters

Shape of pulses	1.2/50 μ s open-circuit voltage, 8/20 μ s short-circuit current
Phase of injected signal with reference to the mains	0°, 90°, 180°, 270°
No of surges in a series	5 surges
Interval between surges	10 s

Table 3.4.B – Performances of the EUT on the surge immunity test

Amplitude	+1 kV	- 1 kV	+2 kV	- 2 kV
L conductor – PE conductor	-	-	A	A
N conductor – PE conductor	-	-	A	A
L conductor – N conductor	A	A	-	-

A ... Performance Criterion A (no function of the EUT was affected)

3.5. Immunity to Conducted Disturbances Induced by RF Fields

Requirement in	ČSN EN 60601-1-2, Clause 6.2.6
Testing method	ČSN EN 61000-4-6
Test specification	The conducted spurious signal was injected into the power cable, wires to terminals L, N and PE using coupling clamp MEB M3. The EUT was placed 0.1 m / 0.33 ft above the ground reference plane. The EUT was placed on the wooden table. The test was performed in operation mode.
Results	PASSED, Performance Criterion A

Table 3.5.A – Field immunity test parameters and performances

	Frequencies	AM	Mod. frequency	Severity level [V]	Performance
Conductors L, N and PE	150 kHz – 80 MHz	80%	1 kHz	3	A

A ... Performance Criterion A (no function of the EUT was affected)

3.6. Immunity to Power Frequency Magnetic Field

Requirement in	ČSN EN 60601-1-2, Clause 6.2.8
Testing method	ČSN EN 61000-4-8
Test specification	The test was carried out on 3 axes of the EUT using inductance coil. The EUT was placed on the wooden table in the anechoic chamber. The test was performed in operation mode.
Results	PASSED, Performance Criterion A

Table 3.6.A – Field immunity test parameters)

Frequency	Field intensity [A/m]	Axis	Performance
50 Hz	3	X	A
50 Hz	3	Y	A
50 Hz	3	Z	A

A ... Performance Criterion A (no function of the EUT was affected)

3.7. Short-time Breaks and Drop-outs of Supply Voltage

Requirement in	ČSN EN 60601-1-2, Clause 6.2.7
Testing method	ČSN EN 61000-4-11
Test specification	3 drops for each test level 10 s delay between drops The test was performed operation mode.
Results	PASSED: Performance Criterion A for voltage dips Performance Criterion B for short interruptions

Table 3.7.A – Supply voltage drop-outs: test parameters and performances

Environmental Effect	Test Level	Time of Duration	Performance
Short-time drop-out to	0 % U_{supply}	0.5 of period	A
Short-time drop-out to	40 % U_{supply}	5 of period	A
Short-time drop-out to	70 % U_{supply}	25 periods	A
Short-time interruption	0 % U_{supply}	250 periods	B

A ... Performance Criterion A (no function of the EUT was affected)

B ... Performance Criterion B (impaired function of the EUT, function of the EUT was restored after the test) – reset EUT

4. CONCLUSIONS

The MICROWAVE RADIOMETER RTM-01-RES complies with requirements of the following regulations in the range of performed tests:

- EN 60601-1-2
- EN 55011, Class B
- EN 61000-3-2 Class A
- EN 61000-3-3
- EN 61000-4-2, Performance Criterion B
- EN 61000-4-3, Performance Criterion A
- EN 61000-4-4, Performance Criterion A
- EN 61000-4-5, Performance Criterion A
- EN 61000-4-6, Performance Criterion A
- EN 61000-4-8, Performance Criterion A
- EN 61000-4-11, Performance Criterion A, B

Measuring protocol printed at 03. June 2015 12:26:55

Measuring logfile d:\zesapps\SYS61K\Vaculik\15_41_2853_3_2.zes
is dated 03. June 2015 12:26:52

Test data:

Name: Vlastimil Vaculik
Department: EMC Laboratoř
Company: ITC - divize 4
Device: RTM-01-RES
Manufacturer: ONKOCET s.r.o.
Type:

SYS61K Version 1.34 was used
The measuring setup consists of
a LMG95, SN 08950603, Rev. 3.108
according to the standard: EN61000-4-7:2002
Compliance was tested against EN61000-3-2:2006 limits
The smoothing filter was switched on. Grouping on
The measuring ranges 250.0 V, scaling 1.0 for voltage
and 0.15 A, scaling 1.0 for current were used.
Class A was chosen
Measuring time was : 00:02:30

Voltage check:	Phase 1	Phase 2	Phase 3
All voltage harmonics within the limit	: ok		
Voltage +/-2% of nominal value	: ok		
Frequency within +/-0.5%	: ok		

Current check:
All current harmonics within the limit : ok
All current harmonics within 150/200% of limit : ok

Global values from chosen frame at 00:00:00 before end of measuring (informative):

Phase 1
U = 230.1082 V
I = 0.0240 A
P = 6.1605 W
PF = 0.7400
f = 50.0022 Hz

Phase 1

n	I _{aver}	I _{max}	I _{all}	I/I _{lim} ,%	Frame	U _{max}
0	0.0012	0.0013				0.0622
1	0.0188	0.0338		0.0000	0	230.1101
2	0.0065	0.0065		0.6052	678	0.1364
3	0.0135	0.0226		0.9806	286	0.5020
4	0.0017	0.0025		0.0000	0	0.0913
5	0.0086	0.0096		0.8378	60	0.0344
6	0.0027	0.0028		0.0000	0	0.0890
7	0.0038	0.0039		0.0000	0	0.0166
8	0.0026	0.0026		0.0000	0	0.0431
9	0.0017	0.0033		0.0000	0	0.0174
10	0.0008	0.0015		0.0000	0	0.0310
11	0.0016	0.0016		0.0000	0	0.0133
12	0.0010	0.0011		0.0000	0	0.0196
13	0.0011	0.0011		0.0000	0	0.0137
14	0.0008	0.0008		0.0000	0	0.0171
15	0.0005	0.0010		0.0000	0	0.0076
16	0.0001	0.0005		0.0000	0	0.0195
17	0.0004	0.0004		0.0000	0	0.0093
18	0.0003	0.0003		0.0000	0	0.0164
19	0.0004	0.0005		0.0000	0	0.0058
20	0.0002	0.0002		0.0000	0	0.0157
21	0.0001	0.0002		0.0000	0	0.0070
22	0.0002	0.0002		0.0000	0	0.0133
23	0.0002	0.0003		0.0000	0	0.0050
24	0.0001	0.0001		0.0000	0	0.0097
25	0.0001	0.0002		0.0000	0	0.0059
26	0.0001	0.0001		0.0000	0	0.0119
27	0.0001	0.0001		0.0000	0	0.0043
28	0.0001	0.0002		0.0000	0	0.0098
29	0.0001	0.0002		0.0000	0	0.0054
30	0.0001	0.0001		0.0000	0	0.0086
31	0.0001	0.0001		0.0000	0	0.0036
32	0.0001	0.0001		0.0000	0	0.0075
33	0.0000	0.0001		0.0000	0	0.0045
34	0.0001	0.0001		0.0000	0	0.0041
35	0.0000	0.0001		0.0000	0	0.0029
36	0.0001	0.0001		0.0000	0	0.0047
37	0.0000	0.0001		0.0000	0	0.0037
38	0.0000	0.0000		0.0000	0	0.0047
39	0.0000	0.0001		0.0000	0	0.0028
40	0.0001	0.0001		0.0000	0	0.0083

Measuring protocol printed at 03. June 2015 11:47:28

Measuring logfile d:\zesapps\SYS61K\Vaculik\15_41_2853_3_3.zes
is dated 03. June 2015 11:47:27

Name: Vlastimil Vaculik
Department: EMC Laboratoř
Company: ITC - divize 4
Device: RTM-01-RES
Manufacturer: ONKOCET s.r.o.
Type:

SYS61K Version 1.34 was used
The measuring setup consists of
a LMG95, SN 08950603, Rev. 3.108 according to the standard: EN61000-4-15
Compliance was tested against EN61000-3-3:1994+A1:2001+A2:2005 B2 limits
The measuring ranges 250.0 V, scaling 1.0 for voltage
and 0.15 A, scaling 1.0 for current were used.
Short time : 00:10:00
Number of periods : 1

dmax < 4.0 :
Phase 1 ok

Values from chosen frame at 00:00:00 before end of long time interval (informative):

Phase 1
Pst = 0.0000
Plt = 0.0000
dmax = 0.0639 %
dc = 0.0000 %
U = 230.1675 V
I = 0.0240 A
P = 3.7492 W
PF = 0.6800
f = 50.0023 Hz

n dmax 1

1 0.0639