

## EMC - TEST REPORT

<b>Test Report No.:</b>	<b>CPSC01150614</b>	April 28, 2014 Date of issue
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**Type / Model Name** : BIOMAT MINI

**Modified Model List** : None

**Product Description** : HEATING PAD

**Applicant** : Richway & Fuji Bio Inc.

**Address** : 1750 Kalakaua Avenue #103 - 3534  
Honolulu, Hawaii 96826

**Contact person** : Mr. Calvin Kim  
Tel.: 808 589 2800

**Manufacturer** : RICHWAY & LIFE Co., Ltd.

**Address** : 11F, ACE Gwang Myeong Tower B,  
1365, Soha 1-dong, Gwangmyeong-si,  
Gyeonggi-do, 423-798  
Republic of Korea

**Test Standards** : EN 55014-1:2006+A1:2009+A2:2011  
EN 55014-2:1997+A1:2001+A2:2008  
EN 61000-3-2:2006+A1:2009+A2:2009  
EN 61000-3-3:2008

**Test Result** : Complied

*This test report consists of 38 pages. The test report only responds to the tested sample only.  
It's not allowed to copy this report partly without the allowance of the test laboratory.*

## Contents

1. Documentation		Page
Test Standards		3
Test Environment and Measurement Uncertainty		4
Test set-up and Condition		5
Test operation mode of the EUT		6
Performance criteria		6
Summary		7
Test result		8
2. Test data		
<b>Emissions</b>		
2.1 Mains terminal voltage		
2.1.1 Continuous disturbance	150 kHz - 30 MHz	9
2.1.2 Discontinuous disturbance	(0.15, 0.5, 1.4 & 30) MHz	10 - 11
2.2 Radiated disturbances	30 MHz - 1000 MHz	12
2.3 Harmonic current / Voltage fluctuation & flicker		13 - 16
<b>Immunity</b>		
2.4 Electrostatic Discharge (ESD)	4 kV (contact), 8 kV (air)	17 - 18
2.5 Immunity to radiated electromagnetic fields	N/A	19 - 20
2.6 Electrical Fast Transients (BURST)	1.0 kV	21 - 22
2.7 Surge	1.0 kV for Differential mode 2.0 kV for Common mode	23 - 24
2.8 Immunity to conducted disturbance	150 kHz - 230 MHz (3 V)	25 - 26
2.9 Voltage dips, interruptions & variations	100%, 60%, 30%	27 - 28
3. Appendixes		
Appendix A. Photographs of test set-up		29 - 34
Appendix B. Test graph / data		35 - 36
Appendix C. Injection point of ESD		37
Appendix D. Construction Data form		38

## Test Standards

- EN 55014-1:2006+A1:2009+A2:2011  
Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus - Part 1: Emission
- EN 55014-2:1997+A1:2001+A2:2008  
Electromagnetic compatibility – Requirements for household appliances, electric tools and similar apparatus - Part 2 Immunity
- EN 61000-3-2:2006+A1:2009+A2:2009  
Electromagnetic compatibility (EMC) – Part 3-2: Limits for harmonic current emissions (equipment input current up to and including 16 A per phase).
- EN 61000-3-3:2008  
Electromagnetic compatibility (EMC) – Part 3-3: Limits - Limitation of voltage changes, voltage fluctuations and flicker in public low-voltage supply systems, for equipment with rated current  $\leq$  16 A per phase and not subject to conditional connection.

## Referenced document

- EN 61000-4-2:2009  
Testing and measurement techniques - Electrostatic discharge immunity test.
- EN 61000-4-3:2006+A1:2008+A2:2010  
Testing and measurement techniques - Radiated, radio-frequency of electromagnetic field immunity test
- EN 61000-4-4:2004+A1:2010  
Testing and measurement techniques - Electrical fast transient/burst immunity test.
- EN 61000-4-5:2006  
Testing and measurement techniques – Surge immunity test.
- EN 61000-4-6:2009  
Testing and measurement techniques – Immunity to conducted disturbances, induced by Radio-frequency fields.
- EN 61000-4-11:2004  
Testing and measurement techniques – Voltage dips, short interruptions and voltage variation immunity tests.

## Additions, deviations and exclusions from standards

No additions, deviations or exclusions have been made from standards

## Test Environment

### Address of the test Laboratory.

- ESTECH Co., Ltd.

97-1, Hoiuk-Ri, Majang-Myun,  
Icheon-City, Kyungki-Do,  
Korea

### Environmental condition

During the measurement the environmental conditions were within the listed ranges:

Temperature: 20.8 °C – 21.6 °C

Relative Humidity: 51.2% - 55.0%

### Statement of measurement uncertainty

The measurement uncertainty describes the overall uncertainty of the given measured value during the operation of the EUT in the above-mentioned way.

Measurement uncertainty is calculated in accordance with ISO “Guide to the expression of uncertainty in measurement”. The measurement uncertainty is given with a confidence of 95%.

Continuous disturbance, mains terminal voltage, ( $k = 2$ , 95%)

- 0.15 MHz – 30 MHz:  $\pm 1.66\text{dB}$

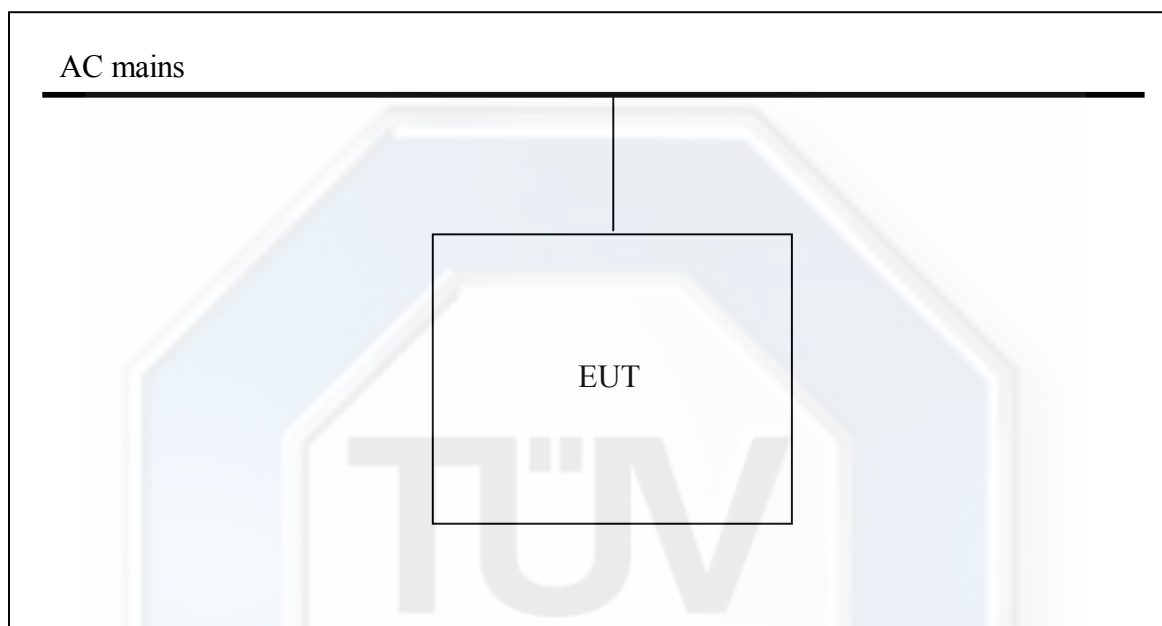
Radiated Disturbances: ( $k = 2$ , 95%)

- Horizontal polarization:  $\pm 3.20\text{dB}$

- Vertical polarization:  $\pm 4.02\text{dB}$

## Test set-up and Condition

For the test set-up and condition, please see the below and the photographs of test set-up, Appendix A.



## Test Operation Mode of the Equipment Under Test (EUT) :

During the testing, the equipment under test was operated under the following conditions:

- ☐ Stand-by
- ☐ Test Program (H-Pattern)
- ☐ Test Program (Customer Specified)
- ☒ Operating Mode: Set the controller to the Max temperature mode

☐ \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

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

- |   |                                |
|---|--------------------------------|
| <input checked="" type="checkbox"/> Power cable | Type : Unshielded type (2.0 m) |
| <input type="checkbox"/> _____                  | Type : _____                   |
| <input type="checkbox"/> _____                  | Type : _____                   |
| <input type="checkbox"/> _____                  | Type : _____                   |

## Performance Criteria for Immunity testing

**Performance criterion A:** No function disturbances, such as changes in the power are allowed during the test.

**Performance criterion B:** The EUT shall continue to operate as intended after the test.  
During the test, degradation of performance is allowed however.

**Performance criterion C:** Temporary loss of function is allowed, provided the function is self-recoverable or can be restored by power on/off.

**Performance verification:** The EUT was observed the status of controller during immunity test.

## Summary

### General Remarks

The results in this report apply only to sample tested.  
No additions, deviations or exclusions have been made from standard.  
All tests are performed with the contents of the accreditation.

### Final Assessment

We confirm that the product tested without reasonable doubt will fulfil the requirements concerning electromagnetic compatibility according to the above mentioned standard harmonised with the EMC Directive 2004/108/EC.

Date of receipt of test sample : March 24, 2014

Testing commenced on : March 26, 2014

Testing concluded on : April 28, 2014

Reviewed by:



Jin-Mo Yang / Technical Manager of  
ESTECH

Tested by:



Jin-Ho Kim / Test Engineer of ESTECH

Approved by:



TÜV SÜD Korea Ltd.

Test Results				Order No.: CPSC01150614
Manufacture	RICHWAY & LIFE Co., Ltd.	Type	HEATING PAD	<input checked="" type="checkbox"/> Approval Test (EMI/EMS)
Applicant	Richway & Fuji Bio Inc.	Incoming date	Mar. 26, 2014	<input type="checkbox"/> Retest / Pre-test
Model	BIOMAT MINI	Outgoing date	Apr. 28, 2014	<input type="checkbox"/> Mass Production test
M/L models	None			<input type="checkbox"/> Technical Documentation
Test are made according to the EN 55014-1, EN 55014-2, EN 61000-3-2, EN 61000-3-3				
Kind of Test			Serial No.: None	
Emission			Max. Limit exceeding	O.K Not O.K N/A
2.1 Mains terminal voltage, (0.15 MHz – 30 MHz)				
2.1.1 Continuous disturbance			<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.1.2 Discontinuous disturbance			<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.2 Disturbance power, (30 MHz – 300 MHz)			<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.3 Harmonic current / Voltage fluctuation & flicker			<input checked="" type="checkbox"/>	<input type="checkbox"/>
Immunity				
2.4 ESD (EN 61000-4-2)			<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.5 Immunity to radiated electromagnetic fields (EN 61000-4-3)			<input type="checkbox"/>	<input type="checkbox"/> *
2.6 EFT/Burst (EN 61000-4-4)			<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.7 Surge (EN 61000-4-5)			<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.8 Immunity to conducted disturbance (EN 61000-4-6)			<input checked="" type="checkbox"/>	<input type="checkbox"/>
2.9 Voltage dip, interruption & variations (EN 61000-4-11)			<input checked="" type="checkbox"/>	<input type="checkbox"/>
Remarks: Category II equipment				



<b>2.1.1</b>	<b>Mains terminal voltages - Continuous disturbance</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test Engineer</b>	<b>Jin-Ho Kim</b>

- Test data

Frequency [MHz]	Line	Quasi-Peak			Average		
	H / N	Disturbance Level [dBμV]	Permitted Limit [dBμV]	Margin [dB]	Disturbance Level [dBμV]	Permitted Limit [dBμV]	Margin [dB]
Fundamental frequencies:							
0.16	H / N	<<	65.5	<<	<<	58.3	<<
0.24	H / N	<<	62.1	<<	<<	53.9	<<
0.55	H / N	<<	56.0	<<	<<	46.0	<<
1.00	H / N	<<	56.0	<<	<<	46.0	<<
1.40	H / N	<<	56.0	<<	<<	46.0	<<
2.00	H / N	<<	56.0	<<	<<	46.0	<<
3.50	H / N	<<	56.0	<<	<<	46.0	<<
6.00	H / N	<<	60.0	<<	<<	50.0	<<
10.00	H / N	<<	60.0	<<	<<	50.0	<<
22.00	H / N	<<	60.0	<<	<<	50.0	<<
30.00	H / N	<<	60.0	<<	<<	50.0	<<
Other frequencies:							
0.150	H	53.8	66.0	-12.2	<<	59.0	<<
0.200	H	49.9	63.7	-13.8	<<	56.0	<<

Note) '<<-' means that the disturbance voltage level is lower than 20dB below the limit.  
The measured disturbance voltage level includes the factor of LISN and Pulse Limiter and Cable loss.

**Remarks:** For the detailed graph, see the Appendix B1.

**Test instrumentation**

<u>Equipment</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Serial No.</u>	<u>Due calibration</u>
Test receiver	R&S	ESPI	100005	2015. 01. 12
LISN	R&S	ESH3-Z5	838979/010	2015. 01. 12
Pulse Limiter	R&S	ESH3-Z2	-	2015. 01. 12

<b>2.1.2</b>	<b>Mains terminal voltages - Discontinuous disturbance</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test Engineer</b>	<b>Jin-Ho Kim</b>

Operating mode: Normal operation mode

Observation time (min): 120 minutes

Frequency	(MHz)	0.15	0.50	1.40	30.00
Permitted limit for continuous interference	(dB $\mu$ V)	66	56	56	60
Counted clicks < 10 ms	(number)	0	0	0	0
10 ms < clicks < 20 ms	(number)	0	0	0	0
Counted clicks > 20 ms	(number)	0	0	0	0
Counted clicks sum	(number)	0	0	0	0
Duration of continuous interference	(s)	0	0	0	0
Switching operations	(number)	-			
Factor	(f)	-	-	-	-
Click rate, N		-			
Value to be added	(dB)	-	-	-	-
Permitted limit for clicks	(dB $\mu$ V)	-	-	-	-
Counted clicks exceeding the limit	(number)	-	-	-	-
Counted clicks allowed to exceed the permitted limit	(number)	-	-	-	-
Complies with the limit		YES	YES	YES	YES

**Remarks:****Test instrumentation**

<u>Equipment</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Serial No.</u>	<u>Due calibration</u>
Discontinuous Interference analyzer	Schaffner	DIA1512D	5239	2014. 10. 21
LISN	R&S	ESH3-Z5	838979/010	2015. 01. 12



<b>2.2</b>	<b>Radiated disturbances (30 MHz – 1000 MHz)</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test Engineer</b>	<b>Jin-Ho Kim</b>

- **Test data**

Frequency [MHz]	Reading [dBμV]	Pol. [Hor./Ver.]	Height [m]	Correction factor		Result [dBμV/m]	Limit [dBμV/m]	Margin [dB]
				Antenna [dB/m]	Cable [dB]			
46.1	3.2	H	4.0	12.9	1.2	17.21	30.0	12.8
54.7	3.4	V	1.0	12.7	1.2	17.30	30.0	12.7
102.2	5.2	V	1.0	8.5	1.7	15.40	30.0	14.6
144.0	2.8	H	4.0	12.3	2.0	17.10	30.0	12.9
206.4	8.2	H	4.0	9.8	2.3	20.20	30.0	9.8
302.8	3.2	V	1.0	13.6	2.7	19.50	37.0	17.5
325.8	3.8	H	3.2	14.1	2.8	20.80	37.0	16.2
360.0	4.8	H	2.8	14.7	2.9	22.40	37.0	14.6

Note) H: Horizontal polarization, V: Vertical polarization

Total Results (dBμV/m) = Level (dBμV) + Antenna Factor (dB/m) + Cable Loss (dB)

**Remarks:**

**Test instrumentation**

<u>Equipment</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Serial No.</u>	<u>Due calibration</u>
Test Receiver	R&S	ESCI7	100916	2015. 01. 22
Logbicon Antenna	Schwarzbeck	VULB 9168	237	2015. 01. 12

<b>2.3</b>	<b>Harmonic current / Voltage fluctuations &amp; flicker</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test Engineer</b>	<b>Jin-Ho Kim</b>

### Harmonic current emissions

The requirement is kept.

### Voltage fluctuations flicker

The requirement is kept.

**Note:** For the detailed data, see the following 3 pages of graphic data.

**Remarks:**


### Test instrumentation

<u>Equipment</u>	<u>Manufacturer</u>	<u>Type</u>	<u>Serial No.</u>	<u>Due calibration</u>
Test System	Haefely	PHF555	080419-11	2014.09.13
Motorized Variac	EM Test	DPA 550N	V1033107193	2014.09.13

**Graphic data of Harmonic current emissions (1/2):**

## **Test Report ISMDPA**

Report title:	ESTC-14-00564
Company Name:	RICHWAY INTERNATIONAL INC
Date of test:	19:30 26.Mar 2014
Measurement file name:	00564-HA.rsd
Tester:	JINHO KIM
Standard used:	EN/IEC 61000-3-2 Ed.3 Short cyclic Equipment class A <= 200% of the limit
Observation time:	150s
Windows width:	10 periods - (EN/IEC 61000-4-7 Edition 2002 + A1:2008)
Customer:	MAT
E. U. T.:	BioMat Mini
Temperature :	22.6
Humidity :	48.5

<b>Test Result</b>	
E. U. T.:	PASS
Power Source:	PASS
2014.03.28	
(Date)	(Sign)

### **E. U. T. Result**

<b>Harmonic(s) &gt; 200%:</b>	
Order (n):	None
<b>Harmonic(s) with average &gt; 90%:</b>	
Order (n):	None
<b>Harmonic(s) between 150% and 200% during more than 10% of the test time or max. 10min:</b>	
Order (n):	None

### **Power Source Result**

<b>First dataset out of limit:</b>	
DS (time):	None
<b>Harmonic(s) out of limit:</b>	
Order (n):	None

**Graphic data of Harmonic current emissions (2/2):**

**Test Report ISMDPA**

**Maximum harmonic current results**


Hn	I <sub>eff</sub> [A]	% of Limit	Limit [A]	Result
1	477.688E-3			
2	1.709E-3			PASS
3	4.900E-3			PASS
4	968.684E-6			PASS
5	3.611E-3			PASS
6	856.004E-6			PASS
7	1.106E-3			PASS
8	792.554E-6			PASS
9	975.628E-6			PASS
10	750.898E-6			PASS
11	1.003E-3			PASS
12	771.423E-6			PASS
13	946.187E-6			PASS
14	704.013E-6			PASS
15	1.396E-3			PASS
16	705.285E-6			PASS
17	814.165E-6			PASS
18	880.608E-6			PASS
19	1.039E-3			PASS
20	896.829E-6			PASS
21	1.149E-3			PASS
22	847.624E-6			PASS
23	947.050E-6			PASS
24	658.823E-6			PASS
25	850.741E-6			PASS
26	761.609E-6			PASS
27	987.891E-6			PASS
28	750.460E-6			PASS
29	938.807E-6			PASS
30	764.067E-6			PASS
31	1.027E-3			PASS
32	906.788E-6			PASS
33	957.247E-6			PASS
34	737.149E-6			PASS
35	988.084E-6			PASS
36	754.088E-6			PASS
37	1.027E-3			PASS
38	806.810E-6			PASS
39	966.247E-6			PASS
40	913.446E-6			PASS



## Graphic data of Flicker (1/1):

# Test Report ISMDPA

Report title:	ESTC-14-00564
Company Name:	RICHWAY INTERNATIONAL INC
Date of test:	20:04 26.Mar 2014
Tester:	JINHO KIM
Standard used:	EN/IEC 61000-3-3 Flicker
Short time (Pst):	10 min
Observation time:	120 min (12 Flicker measurements)
Flickermeter:	230V / 50Hz according IEC 61000-4-15 Ed.2
Flicker Impedance:	Zref (IEC 60725)
Customer:	MAT
E. U. T.:	BioMat Mini
Temperature :	22.8
Humidity :	48.5

Test Result	PASS
2014.03.28	
(Date)	(Sign)

## Maximum Flicker results

	EUT values	Limit	Result
Pst	0.042	1.00	PASS
Plt	0.040	0.65	PASS
dc [%]	0.102	3.30	PASS
dmax [%]	0.144	4.00	PASS
dt [s]	0.000	0.50	PASS



<b>2.4</b>	<b>Electrostatic Discharge (ESD)</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test engineer</b>	<b>Jin-Ho Kim</b>

## TEST CONDITIONS AND RESULTS

The measurement of the immunity against electrostatic discharge was performed in a shielded room.

☐ - Test not applicable

### Test location:

- ☒ Shielded room
- ☐ Anechoic chamber no.1
- ☐ Full compact chamber

### Test specifications:

- Discharge voltage Conducted:
- |  |  |  |
|--|--|--|
| <input type="checkbox"/> 1 kV            | <input checked="" type="checkbox"/> 2 kV | <input type="checkbox"/> 3 kV            |
| <input checked="" type="checkbox"/> 4 kV | <input type="checkbox"/> 6 kV            | <input checked="" type="checkbox"/> 5 kV |
- Discharge voltage Air:
- |  |  |                                |
|--|--|--------------------------------|
| <input type="checkbox"/> 2 kV            | <input checked="" type="checkbox"/> 4 kV | <input type="checkbox"/> 6 kV  |
| <input checked="" type="checkbox"/> 8 kV | <input type="checkbox"/> 15 kV           | <input type="checkbox"/> __ kV |
- Discharge impedance:
- |   |  |
|---|--|
| <input checked="" type="checkbox"/> 330 $\Omega$ / 150 pF | <input type="checkbox"/> 150 $\Omega$ / 150 pF |
|---|--|
- Discharge factor:
- ☒ 1 s
- Number of discharges:
- ☒ 10 times (each point, voltage and polarity)
- Kind of discharges:
- |                    |   |
|--------------------|---|
| Direct discharge   | <input checked="" type="checkbox"/> Air discharge     |
|                    | <input checked="" type="checkbox"/> Contact discharge |
| Indirect discharge | <input checked="" type="checkbox"/> Contact discharge |
- Polarity:
- |  |  |
|--|--|
| <input checked="" type="checkbox"/> positive | <input checked="" type="checkbox"/> negative |
|--|--|

Location of discharge:

- - See drawing in Appendix C
- - Each location on the surface touchable by hand
- Horizontal Coupling Plane (HCP)
- Vertical Coupling Plane (VCP)
- Infrared remote control

Test point #	Test level [kV]	Air/ Contact	Polarity (+/-)	Pass/ Fail	Comment
VCP	4	Contact	+/-	Pass	Criterion A fulfilled
HCP	4	Contact	+/-	Pass	Criterion A fulfilled
1. Front LED part	8	Air	+/-	Pass	Criterion A fulfilled
2. Front Button part	8	Air	+/-	Pass	Criterion A fulfilled
3. Front connector part	8	Air	+/-	Pass	Criterion A fulfilled
4. Rear side cover part	8	Air	+/-	Pass	Criterion A fulfilled
5. Rear power cable part	8	Air	+/-	Pass	Criterion A fulfilled
6. Left side cover part	8	Air	+/-	Pass	Criterion A fulfilled
7. Right side cover part	8	Air	+/-	Pass	Criterion A fulfilled

#### Result:

- No degradation of function - Met Criterion A
- Distortion of function - Met Criterion B
- Error of function - Met Criterion C
- Loss of function - Unrecoverable Failure
- Safe failure
- Unsafe failure

#### Remarks:

#### Test instrumentation

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial No.</u>	<u>Due Calibration</u>
ESD Generator	Haefely	PESD-1600	H605105	2014. 04. 26

<b>2.5</b>	<b>Immunity to radiated electromagnetic fields</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test engineer</b>	<b>Jin-Ho Kim</b>

## TEST CONDITIONS AND RESULTS

The measurement of the immunity against radiated electromagnetic fields was performed in a chamber.

☒ - Test not applicable

### Test location:

- ☐ Anechoic chamber  
☐ Full compact chamber

### Test specifications:

Frequency - range:

- ☐ 27 MHz - 500 MHz      ☐ 26 MHz – 1 000 MHz  
☐ 80 MHz – 1 000 MHz      ☐ 1 400 MHz – 2 000 MHz  
☐ 2 000 MHz – 2 700 MHz

Field strength:

- ☐ 1 V/m (2 000 MHz – 2 700 MHz)      ☐ 3 V/m  
☐ 10 V/m      ☐ 20 V/m

Distance of antenna - EUT:

- ☐ 1 m      ☐ 3 m      ☐ \_\_ m

Modulation:

- ☐ AM 80% with 1 kHz sinewave  
☐ FM :      kHz  
☐ PM 50% with 200 Hz  
☐ un-modulated

Frequency step:

- ☐ 0.0015 decades/s  
☐ 1% / 3 s      ☐ 1% / 1 s

Polarization of antenna:

- ☐ Horizontal      ☐ Vertical      ☐ circular

Position of EUT:

- ☐ Front      ☐ Rear      ☐ Right      ☐ Left

**Result:**

- |   |                         |
|---|-------------------------|
| <input type="checkbox"/> No degradation of function | - Met Criterion A       |
| <input type="checkbox"/> Distortion of function     | - Met Criterion B       |
| <input type="checkbox"/> Error of function          | - Met Criterion C       |
| <input type="checkbox"/> Loss of function           | - Unrecoverable Failure |
| <input type="checkbox"/> Safe failure               |                         |
| <input type="checkbox"/> Unsafe failure             |                         |

**Remarks:** 'Category II' equipment

**Test instrumentation**

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial No.</u>	<u>Due calibration</u>
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<b>2.6</b>	<b>Electrical Fast Transients (BURST)</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test engineer</b>	<b>Jin-Ho Kim</b>

## TEST CONDITIONS AND RESULTS

The measurement of the immunity against electrical fast transients was performed in a shielded room.

☐ Test not applicable

### Test location:

- ☒ Shielded room
- ☐ Anechoic chamber no.1
- ☐ Anechoic chamber no.2
- ☐ Full compact chamber

### Test specifications:

<u>Pulse Amplitude-</u>	<input type="checkbox"/> 0.5 kV	<input checked="" type="checkbox"/> 1.0 kV	<input type="checkbox"/> Coupling Clamp
<u>AC Power Port</u>	<input type="checkbox"/> 2.0 kV	<input type="checkbox"/> 4.0 kV	<input checked="" type="checkbox"/> C/D Network
<u>Pulse Amplitude-</u>	<input type="checkbox"/> 0.5 kV	<input type="checkbox"/> 1.0 kV	<input type="checkbox"/> Coupling Clamp
<u>Signal Port</u>	<input type="checkbox"/> 2.0 kV	<input type="checkbox"/> 4.0 kV	<input type="checkbox"/> C/D Network
<u>Pulse Amplitude- Signal/Control</u>	<input type="checkbox"/> 0.5 kV	<input type="checkbox"/> 1.0 kV	<input type="checkbox"/> Coupling Clamp
<u>RS-485</u>	<input type="checkbox"/> 2.0 kV	<input type="checkbox"/> ___ kV	
<u>Pulse Amplitude- Process</u>	<input type="checkbox"/> 0.5 kV	<input type="checkbox"/> 1.0 kV	<input type="checkbox"/> Coupling Clamp
<u>Audio/Video Signal Port</u>	<input type="checkbox"/> 2.0 kV	<input type="checkbox"/> ___ kV	
<u>Burst frequency:</u>	<input type="checkbox"/> 2.5 kHz	<input checked="" type="checkbox"/> 5.0 kHz	<input type="checkbox"/> ___
<u>Coupling time:</u>	<input checked="" type="checkbox"/> 120 s	<input type="checkbox"/> ___ minute	
<u>Polarity:</u>	<input checked="" type="checkbox"/> positive	<input checked="" type="checkbox"/> negative	

Test points of coupling:

Name of lines: AC Power line

type of lines:

☐ shielded

☒ unshielded

status of lines:

☐ passive

☒ active

kind of transmission:

☒ analogue

☐ digital

length of lines:

☒ 2.0 m

**Result:**

- ☒ No degradation of function - Met Criterion A
- ☐ Distortion of function - Met Criterion B
- ☐ Error of function - Met Criterion C
- ☐ Loss of function - Unrecoverable Failure
- ☐ Safe failure
- ☐ Unsafe failure

**Remarks:**

Test No. #	Level [kV]	Polarity +/-	Line for test	Pass/ Fail	Comment
1	1	+	AC-mains (L1, L2, PE, L1-L2, L1-PE, L2-PE, L1-L2-PE)	Pass	Criterion A fulfilled
2	1	-	AC-mains (L1, L2, PE, L1-L2, L1-PE, L2-PE, L1-L2-PE)	Pass	Criterion A fulfilled

**Test instrumentation**

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial No.</u>	<u>Due calibration</u>
Compact test system	Haefely	ECOMPACT 4	153528	2015. 01. 12

<b>2.7</b>	<b>Surge</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test engineer</b>	<b>Jin-Ho Kim</b>

## TEST CONDITIONS AND RESULTS

The measurement of the immunity against surge was performed in a shielded room.

☐ Test not applicable

### Test location:

- ☒ Shielded room
- ☐ Anechoic chamber no.1
- ☐ Anechoic chamber no.2
- ☐ Full compact chamber

### Test specifications:

- |   |  |   |  |
|---|--|---|--|
| <u>Test Voltage - AC Power Port</u><br>(Differential mode)      | <input type="checkbox"/> 0.5 kV<br><input type="checkbox"/> 2.0 kV                                 | <input checked="" type="checkbox"/> 1.0 kV<br><input type="checkbox"/> 4.0 kV | <input type="checkbox"/> Coupling Clamp<br><input checked="" type="checkbox"/> C/D Network |
| <u>Test Voltage - AC Power Port</u><br>(Common mode)            | <input type="checkbox"/> 0.5 kV<br><input checked="" type="checkbox"/> 2.0 kV                      | <input type="checkbox"/> 1.0 kV<br><input type="checkbox"/> 4.0 kV            | <input type="checkbox"/> Coupling Clamp<br><input checked="" type="checkbox"/> C/D Network |
| <u>Test Voltage - Signal/Data</u><br><u>Non Control Port</u>    | <input type="checkbox"/> 0.5 kV<br><input type="checkbox"/> 2.0 kV                                 | <input type="checkbox"/> 1.0 kV<br><input type="checkbox"/> ___ kV            | <input type="checkbox"/> Coupling Clamp  |
| <u>Test Voltage - Process</u><br><u>Audio/Video Signal Port</u> | <input type="checkbox"/> 0.5 kV<br><input type="checkbox"/> 2.0 kV                                 | <input type="checkbox"/> 1.0 kV<br><input type="checkbox"/> ___ kV            | <input type="checkbox"/> Coupling Clamp  |
| <u>Phase</u>  | <input checked="" type="checkbox"/> 90 and 270 degrees <input type="checkbox"/> other _____ degree |   |  |
| <u>Number of surges:</u>  | <input checked="" type="checkbox"/> 5 times / angle <input type="checkbox"/> ___ times             |   |  |
| <u>Polarity:</u>  | <input checked="" type="checkbox"/> positive <input checked="" type="checkbox"/> negative          |   |  |
| <u>Repetition Rate</u>  | <input checked="" type="checkbox"/> 60 s <input type="checkbox"/> ___ s                            |   |  |

Test points of coupling:

name of lines: AC Power line

type of lines: ☐ shielded ☒ unshielded

status of lines: ☐ passive ☒ active

kind of transmission: ☒ analogue ☐ digital

length of lines: ☒ 2.0 m

**Result:**

- ☒ No degradation of function - Met Criterion A
- ☐ Distortion of function - Met Criterion B
- ☐ Error of function - Met Criterion C
- ☐ Loss of function - Unrecoverable Failure
- ☐ Safe failure
- ☐ Unsafe failure

**Remarks:**

Test No. #	Level [kV]	Phase [°]	Diff. / Comm.	Line for test	Pass/ Fail	Comment
1	1	90/270	Diff.	AC mains (L1-L2)	Pass	Criterion A fulfilled
2	2	90/270	Comm.	AC mains (L1-PE)	Pass	Criterion A fulfilled
3	2	90/270	Comm.	AC mains (L2-PE)	Pass	Criterion A fulfilled

**Test instrumentation**

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial No.</u>	<u>Due calibration</u>
Compact test system	Haefely	ECOMPACT 4	153528	2015. 01. 12



<b>2.8</b>	<b>Immunity to conducted disturbance</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test engineer</b>	<b>Jin-Ho Kim</b>

## TEST CONDITIONS AND RESULTS

The measurement of the immunity against conducted disturbance was performed in a shielded room.

☐ Test not applicable

### Test location:

- ☒ Shielded room
- ☐ Anechoic chamber no.1
- ☐ Anechoic chamber no.2
- ☐ Full compact chamber

### Test specifications:

Frequency - range:

- ☐ 27 MHz - 80 MHz
- ☐ 150 kHz - 80 MHz
- ☐ 26 MHz - 230 MHz
- ☒ 150 kHz - 230 MHz

Field strength:

- ☐ 1 V
- ☐ 10 V
- ☒ - 3 V
- ☐ - \_\_ V

Modulation:

- ☒ AM 80% with 1 kHz sinewave
- ☐ FM :                      kHz
- ☐ sine wave                      1 000 Hz
- ☐ un-modulated
- ☐ PM 1 Hz (0.5 s ON: 0.5 s OFF)

Frequency step / Dwell time:

- ☐ 0.0015 decades/s
- ☒ 1% / 3 s
- ☐ 1% / 1 s

Test points of coupling:

Name of lines: AC Power line

Type of lines: ☐ shielded ☒ unshielded

Status of lines: ☐ passive ☒ active

Kind of transmission: ☒ analogue ☐ digital

Length of lines: ☒ 2.0 m

**Result:**

- ☒ No degradation of function - Met Criterion A
- ☐ Distortion of function - Met Criterion B
- ☐ Error of function - Met Criterion C
- ☐ Loss of function - Unrecoverable Failure
- ☐ Safe failure
- ☐ Unsafe failure

**Remarks:**

Freq. [MHz]	Level [V]	Tested line	Pass/ Fail	Comment
0.15 - 230	3.0	Mains	Pass	Criterion A fulfilled.

**Test instrumentation**

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial No.</u>	<u>Due calibration</u>
Continuous Wave Simulator	EM TEST	CWS 500C	1101-07	2015. 02. 13
CDN	TESEQ	CDN M016	27445	2015. 01. 12
Attenuator	EM TEST	ATT6/75	1001-43	2015. 01. 12

<b>2.9</b>	<b>Voltage dips, interruptions &amp; variations</b>		
<b>Product</b>	<b>HEATING PAD</b>		
<b>Model / Type No.</b>	<b>BIOMAT MINI</b>	<b>Applicant</b>	<b>Richway &amp; Fuji Bio Inc.</b>
<b>Serial No.</b>	<b>NONE</b>	<b>Test engineer</b>	<b>Jin-Ho Kim</b>

## TEST CONDITIONS AND RESULTS

The measurement of the immunity against interruptions & variations was performed in a shielded room.

☐ Test not applicable

### Test location:

- ☒ Shielded room
- ☐ Anechoic chamber no.1
- ☐ Anechoic chamber no.2
- ☐ Full compact chamber

### Test specifications:

- Voltage reduction                      ☒ 30%                      ☒ 60%                      ☒ 100%
- Duration of reduction                      ☒ 0.5 periods (for 100% reduction)
- (No. of periods)                      ☒ 25 periods (for 30% reduction)
- ☒ 10 periods (for 60% reduction)
- ☐ 250/300 periods (for 100% reduction)
- Number of reduction                      ☒ 3 times                      ☐ other \_\_\_\_ times
- Interval between reduction                      ☒ 10 s                      ☐ other \_\_\_\_ s
- Phase                      ☒ Zero crossing (0 °)
- Nominal Voltage(V<sub>nom</sub>)                      ☐ 100 Va.c.                      ☒ 230 Va.c.
- Nominal Frequency (Hz)                      ☒ 50 Hz                      ☒ 60 Hz

# Result:

- |  |                         |
|--|-------------------------|
| <input checked="" type="checkbox"/> No degradation of function | - Met Criterion A       |
| <input type="checkbox"/> Distortion of function                | - Met Criterion B       |
| <input type="checkbox"/> Error of function                     | - Met Criterion C       |
| <input type="checkbox"/> Loss of function                      | - Unrecoverable Failure |
| <input type="checkbox"/> Safe failure                          |                         |
| <input type="checkbox"/> Unsafe failure                        |                         |

# Remarks:

Test no.	Test level	Voltage level in % of rated $U_t$	Duration in periods of rated freq.	Pass/Fail	Comment
1	30%	70	25 / 60	Pass	Criterion A fulfilled.
2	60%	40	10 / 12	Pass	Criterion A fulfilled.
3	100% positive half cycle	0	0.5	Pass	Criterion A fulfilled.
4	100 % negative half cycle	0	0.5	Pass	Criterion A fulfilled.

\* Note: For the 100 % voltage dips, we applied the positive and negative polarity dips starting degree 0 and 180, respectively.

# Test instrumentation

<u>Equipment</u>	<u>Manufacturer</u>	<u>Model</u>	<u>Serial No.</u>	<u>Due calibration</u>
Test System	Haefely	PHF555	080419-11	2014. 09. 13
Motorized Variac	EM Test	DPA 550N	V1033107193	2014. 09. 13

## APPENDIX A. Photographs of Test Set-up

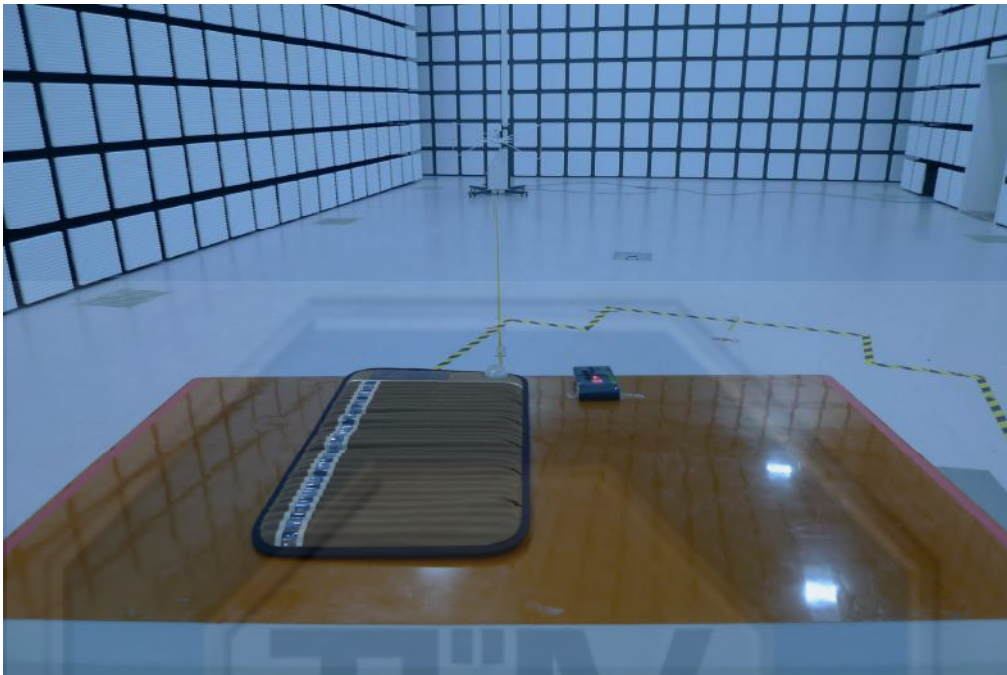
### A1. Mains terminal disturbance – Continuous disturbance (0.15 MHz ~ 30 MHz)



### A2. Mains terminal disturbance – Discontinuous disturbance



### A3. Radiated Disturbance



### A4. Harmonic current / Voltage fluctuation & flicker





#### A5. ESD



#### A6. Immunity to radiated electromagnetic fields

Not Applicable

#### A7. Fast transient (Burst)



#### A8. Surge





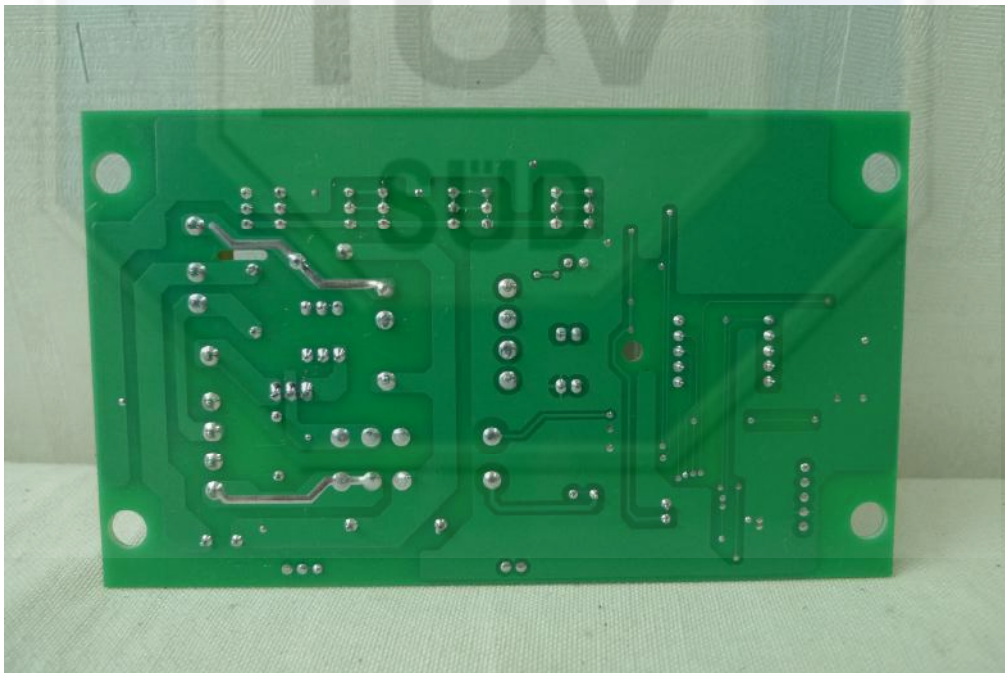
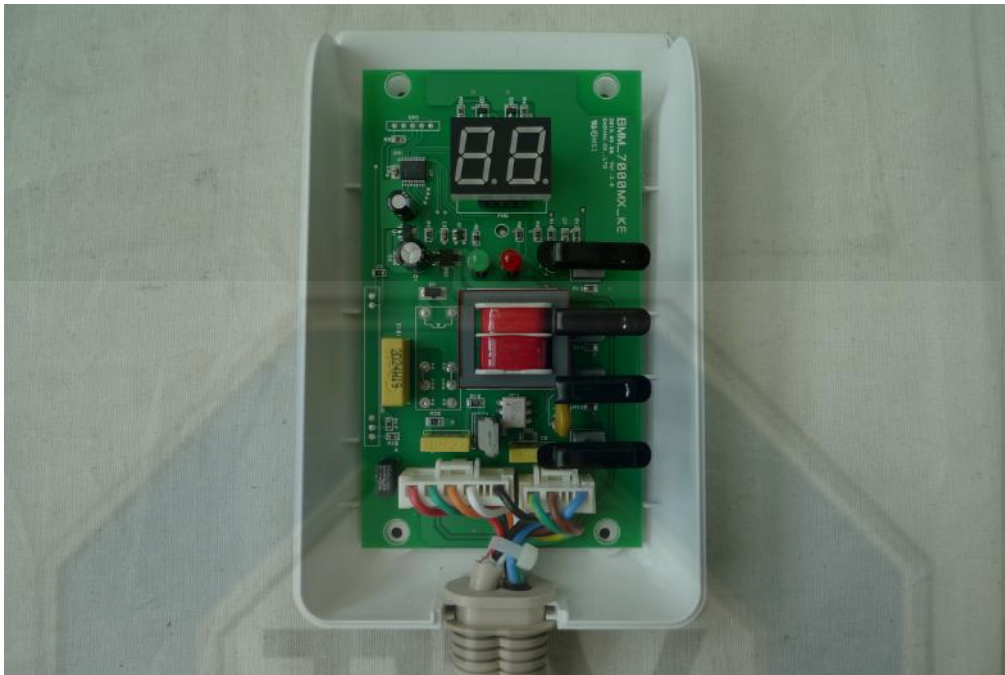
#### A9. Conducted disturbance



#### A10. Voltage dips, interruptions & variations



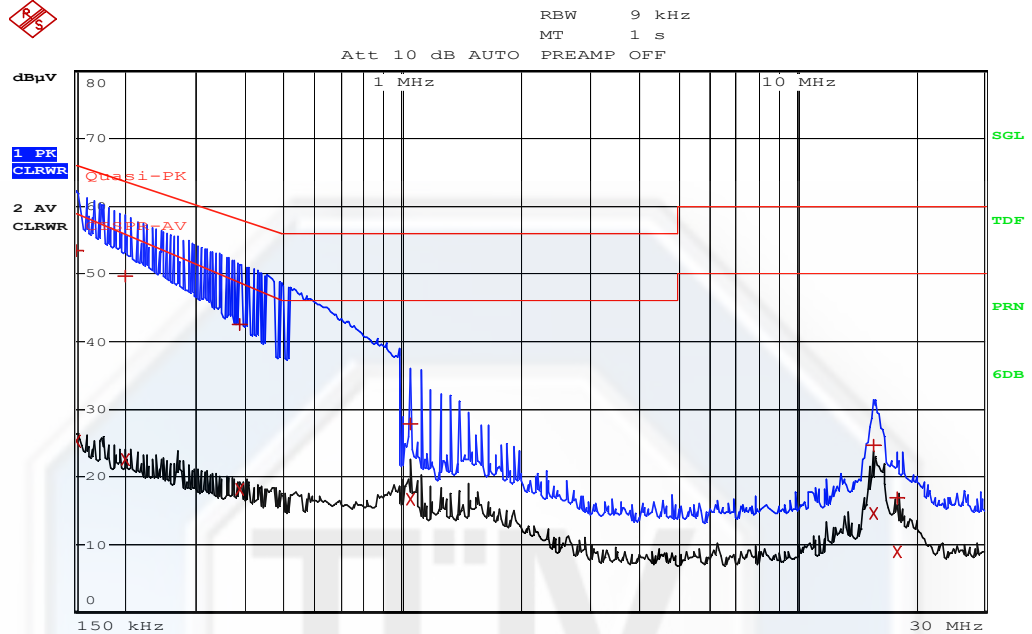
## A11. Inside of EUT



## APPENDIX B. Test graph / data

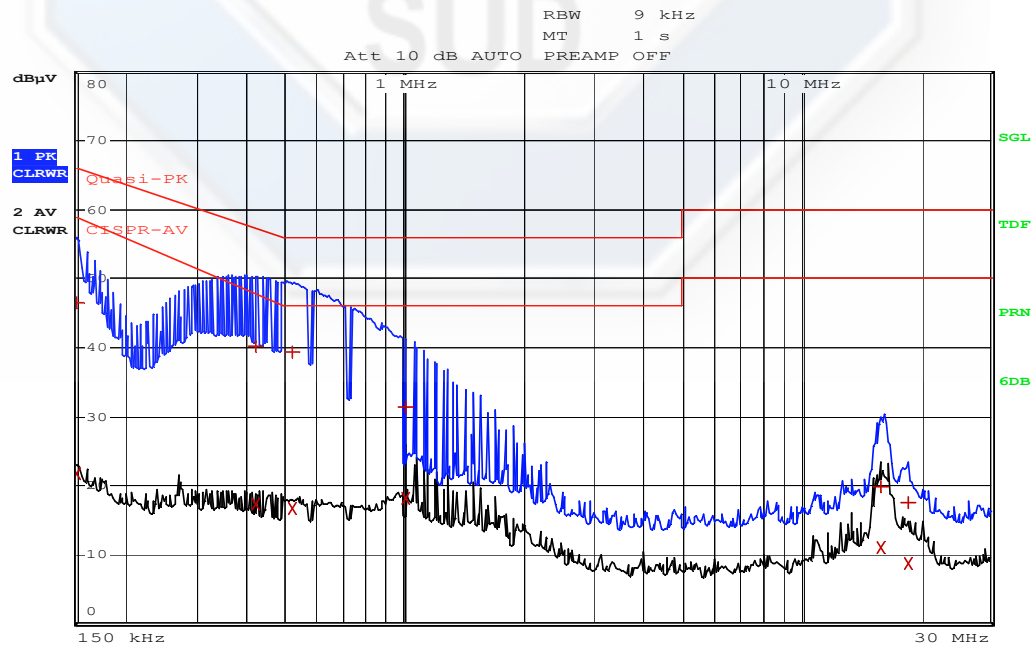
### B1. Mains terminal voltage

#### - Phase H



Comment: ESTC-14-00564 HOT  
Date: 26.MAR.2014 13:44:13

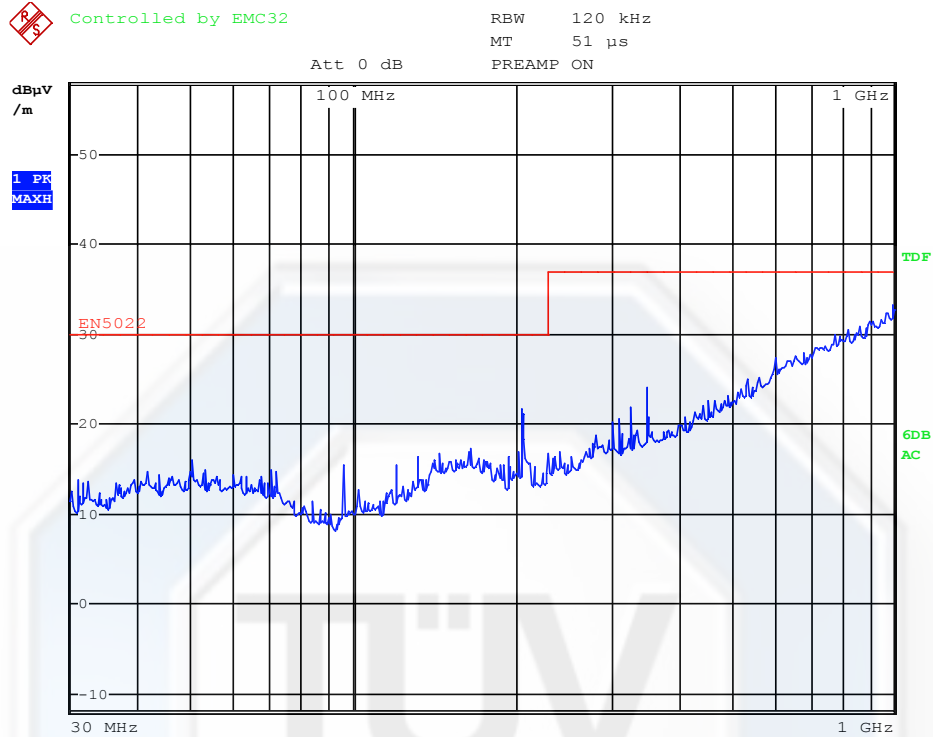
#### - Phase N



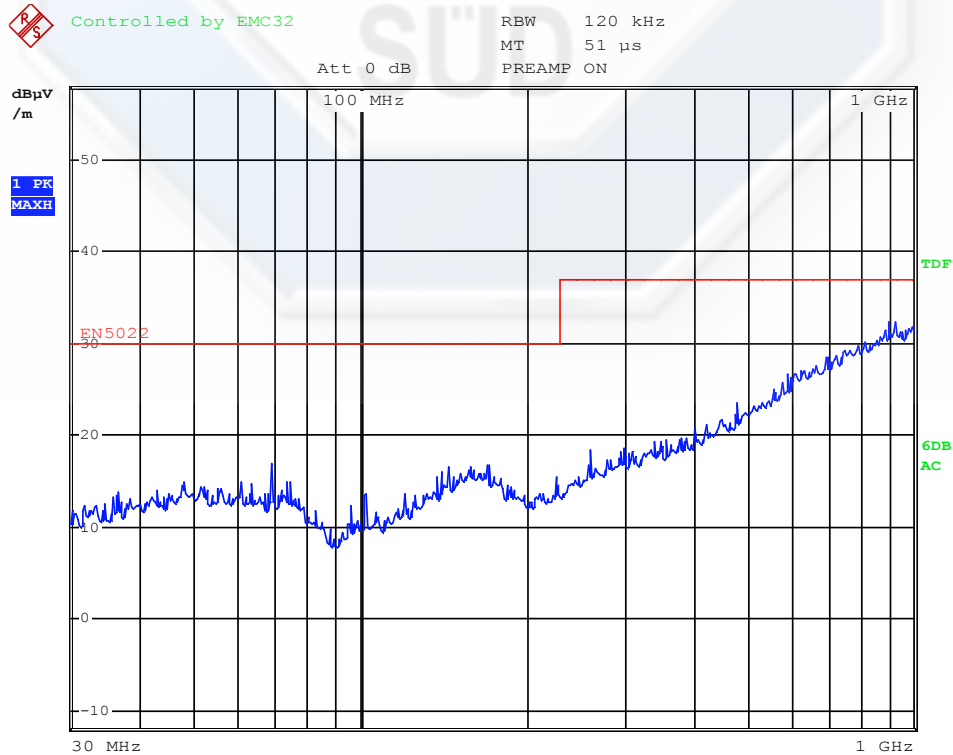
Comment: ESTC-14-00564 NEUTRAL  
Date: 26.MAR.2014 13:40:56

## B2. Radiated Disturbances

### - Horizontal



### - Vertical





## APPENDIX C. Injection point of ESD

\* The application points of ESD (**BLUE TAG**: Contact Discharge, **RED TAG**: Air Discharge):



### Constructional data form for EMC testing

**Type** : HEATING PAD  
**Model** : BIOMAT MINI **Rated Voltage** : AC (220-240) V  
**Serial Number** : N/A 50/60 Hz  
**Protection class** : CLASS II **Rated input power** : 120 W

#### Configuration of equipment:

Main Board and Ass'y

Rev. V.2.0.2

Rev.

Rev.

#### Short description of the EUT ( Purpose of system, area of use, function of the system) :

Household appliances, HEATING PAD

#### Source of Interference :

Internal oscillator

#### Internal frequencies :

Main Clock: 4 MHz

**Noise suppression components** : Varistor : 10D471 , X2-Capacitor : 0.1uF 275V

**Measures for electromagnetic shielding** : N/A

Korea

Place of issue

Date: April 30, 2014



seal and signature of applicant