



**DATE: 16 February 2014**

**I.T.L. (PRODUCT TESTING) LTD.**

**Test Report According to  
IEC 60601-1-2**

for

**MediTouch Ltd.**

**Equipment under test:**

**Balance Rehabilitation Platform**

**BalanceTutor™ BT100**

Written by: \_\_\_\_\_

Y. Raz, Documentation

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Approved by: \_\_\_\_\_

I. Raz, EMC Laboratory Manager

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# 1. General Information

## 1.1 Administrative Information

Manufacturer:	MediTouch Ltd.
Manufacturer's Address:	4 Hamelacha St., Poleg Industrial Area, Netanya, 4250574, Israel Tel: +972-9-863-7477 Fax: +972-9-885-2935
Manufacturer's Representative:	Ziv Kuniz
Equipment Under Test (E.U.T):	Balance Rehabilitation Platform
Equipment Model No.:	BalanceTutor™ BT100
Equipment Serial No.:	A183000001
Start of Test:	27.01.14
End of Test:	28.01.14
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	See Section 2 (The tests listed in this section were performed according to the customer's request and at the customer's premises).



## 1.2 Abbreviations and Symbols

The following abbreviations and symbols are applicable to this test report:

A/m	ampere per meter
AC	alternating current
AM	amplitude modulation
ARA	Antenna Research Associates
Aux	auxiliary
Avg	average
CDN	coupling-decoupling network
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
db $\mu$ V	decibel referred to one microvolt
db $\mu$ V/m	decibel referred to one microvolt per meter
DC	direct current
EFT/B	electrical fast transient/burst
EMC	electromagnetic compatibility
ESD	electrostatic discharge
E.U.T.	equipment under test
GHz	gigahertz
HP	Hewlett Packard
Hz	Hertz
kHz	kilohertz
kV	kilovolt
LED	light emitting diode
LISN	line impedance stabilization network
m	meter
mHn	millihenry
MHz	megahertz
msec	millisecond
N/A	not applicable
per	period
QP	quasi-peak
PC	personal computer
RF	radio frequency
RE	radiated emission
sec	second
V	volt
V/m	volt per meter
VRMS	volts root mean square



### 1.3 List of Accreditations

The EMC laboratory of I.T.L. is accredited by the following bodies:

1. The American Association for Laboratory Accreditation (A2LA) (U.S.A.), Certificate No. 1152.01.
2. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
3. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-3006, R-2729, T-1877, G-245.
4. Industry Canada (Canada), IC File No.: 46405-4025; Site No. IC 4025A-1.

I.T.L. Product Testing Ltd. is accredited by the American association for Laboratory Accreditation (A2LA) and the results shown in this test report have been determined in accordance with I.T.L.'s terms of accreditation unless stated otherwise in the report.

## 2. Applicable Documents

- |     |  |   |
|-----|--|---|
| 2.1 | <b>Medical Devices Directive: 1993</b>                           | <i>Council Directive 93/42/EEC of 14 June 1993 concerning medical devices (OJ No L 169/1 of 1993-07-12)</i>   |
| 2.2 | <b>IEC 60601-1-2: 2007</b>                                       | <i>Medical Electrical Equipment. Part 1; General Requirements for Safety, 2. Collateral Standard. Electromagnetic compatibility - Requirements and tests.</i>                   |
| 2.3 | <b>CISPR 11: 2009 Amendment A1: 2010</b>                         | <i>Limits and Methods of Measurement of Radio Disturbance Characteristics of Industrial, Scientific, and Medical (I.S.M.) Radio Frequency Equipment</i>                         |
| 2.4 | <b>IEC 61000-4-2: 2008</b>                                       | <i>Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques; Section 2: Electrostatic discharge immunity test: Basic EMC publication</i>                 |
| 2.5 | <b>IEC 61000-4-4: 2004 A1: 2010</b>                              | <i>Electromagnetic compatibility (EMC), Part 4. Testing and measurement techniques; Electrical fast transient /burst immunity test, Basic EMC publication</i>                   |
| 2.6 | <b>IEC 61000-4-6: 2003 Amendment A1: 2004 Amendment A2: 2006</b> | <i>Electromagnetic Compatibility (EMC), - Part 4: Testing and Measurement Techniques- Section - 6:Immunity to conducted disturbances induced by radio-frequency fields.</i>     |
| 2.7 | <b>IEC 61000-4-11: 2004</b>                                      | <i>Electromagnetic Compatibility (EMC) - Part 4: Testing and Measurement Techniques - Section 11: Voltage dips, short interruptions and voltage variations. Immunity tests.</i> |



## **3. Test Site Description**

### **3.1 Location**

The tests were performed at the MediTouch Ltd. Manufacturing facility,  
4 Hamelacha St, Poleg Industrial Area  
Netanya, 4250574m Israel  
Telephone: + 972- 9 - 863-7477 , Fax: + 972-9-885-2935

### **3.2 Test Equipment**

See details in Section 6.

## 4. Summary of Test Results

Test	Results
<p><b>Conducted Emissions From AC Mains</b> CISPR 11 : 2009 + Amendment A1: 2010, Class A</p>	<p>The E.U.T met the performance requirements of the specification.</p> <p>The margin between the emission levels and the specification limit is, in the worst case, 3.2 dB for the phase line at 24.01 MHz and 1.7 dB at 6.22 MHz for the neutral line. (See *NOTE on page 10).</p>
<p><b>Radiated Emissions</b> CISPR 11 : 2009 + Amendment A1: 2010, Class A</p>	<p>The E.U.T met the performance requirements of the specification.</p> <p>The margin between the emission level and the specification limit is 2.1 dB in the worst case at the frequency of 150.70 MHz, vertical polarization. (See **NOTE on page 11).</p>
<p><b>ESD</b> IEC 61000-4-2: 2008 Air Discharge, 8kV Contact Discharge, 6kV</p>	<p>The E.U.T met the performance requirements of the specification.</p>
<p><b>Radiated Immunity</b></p>	<p>The E.U.T met the performance requirements of the specification.</p>
<p><b>EFT/B</b> IEC 61000-4-4: 2004 + Amendment A1: 2010 2kV Power lines</p>	<p>The E.U.T met the performance requirements of the specification.</p>





## Summary of Test Results (cont'd.)

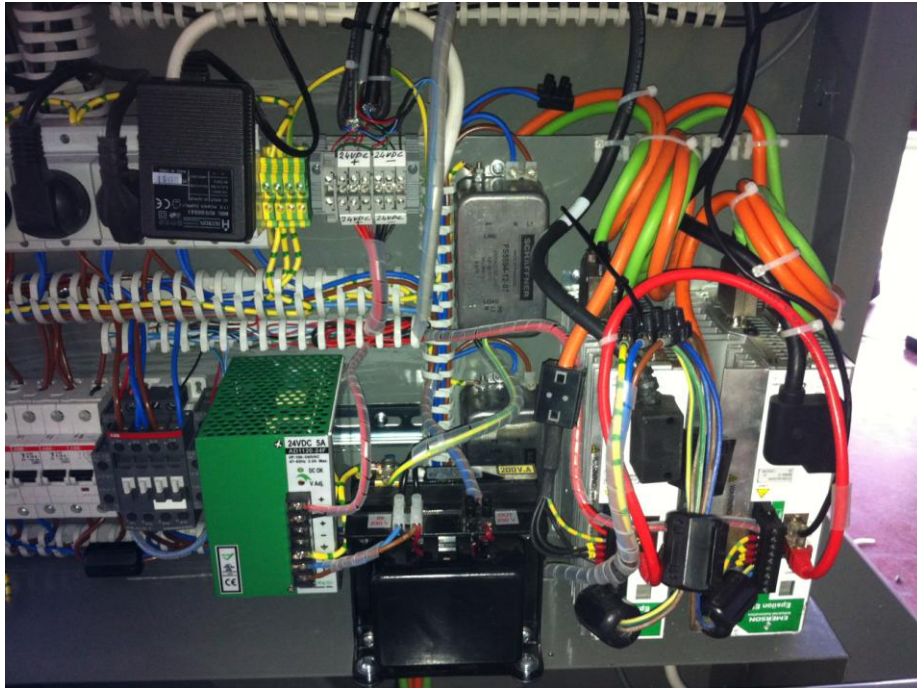
Test	Results
<b>Conducted Disturbances</b> (0.15-220 MHz) IEC 61000-4-6: 2003 Amendment A1: 2004 Amendment A2: 2006 3 VRMS, 80% A.M. by 1kHz	The E.U.T met the performance requirements of the specification.
<b>Voltage Dips and Short Interruptions</b> IEC 61000-4-11: 2004 Voltage reduction: >95% Duration: 5 seconds	The E.U.T met the performance requirements of the specification.

\*NOTE – Initially the EUT failed to meet the requirements of the specification.

The manufacturer took the following corrective action:

1. A ferrite core, P/N 0431176451, manufactured by Fair-Rite, was added on the power cord near the AC inlet. The core has 2turns. See photo on following page.
2. Two ferrite cores, P/N 0431167281, manufactured by Fair-Rite were added to the power wires of the servo controllers near the servo controllers' case. One core was placed on each set of wires. Each core has one turn. See photo on following page.
3. A ferrite core, P/N 0446164181, manufactured by Fair-Rite, was added to all of the power wires of servo controllers near the servo controllers' case. The core has one turn. See photo on following page.
4. A ferrite core, P/N 0431167281, manufactured by Fair-Rite, was added on the current breaker line between current breaker and RF filter near the current breaker case. The core has one turn. See photo on following page.

## Summary of Test Results (cont'd.)



**\*\*NOTE** – Initially the EUT failed to meet the requirements of the specification.

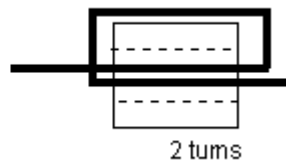
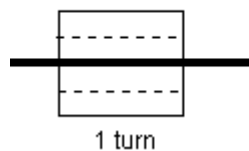
The manufacturer took the following corrective action:

Two ferrite cores, P/N 0443167251, manufactured by Fair-Rite were added to the servo power cords near the motors. One ferrite core was placed on each set of power cords. Each core has 1turn.

### General Note:

The number of turns when using ferrite cores is determined by the times the cable/wire crosses the internal aperture of the core.

### Examples



## 5. Equipment Under Test (E.U.T.) Description

The MediTouch BalanceTutor is a platform for static and dynamic balance rehabilitation and also fall prevention. The system consists of a moving treadmill and powerful dedicated rehabilitation software that allows for planned controlled perturbation. Forward, backward and side treadmill movement at variable accelerations simulates controlled tripping and sliding. Practice with the BalanceTutor enhances the patient's reaction time and the quality of a "compensatory step". This results in improvements in balance, equilibrium, and coordination which improves functional activities while preventing falls. Objective balance evaluations are performed while the patient is standing and walking and can be recorded and documented allowing for objective follow up.

The system is indicated for the rehabilitation of orthopedic, peripheral and/or central neurological injury and disease, vestibular dysfunction, sport injuries in addition to fall prevention in the elderly.



## 6. List of Test Equipment

### 6.1 Emission Tests

The equipment indicated below by an “X” was used for testing Conducted Emission (CE), Radiated Emission (RE)

Test equipment calibration is in accordance with ITL Q.A. Procedure PM 110 "Calibration Control Procedure", which complies with ISO 9002 and ISO/IEC Guide 17025.

Instrument	Manufacturer	Model	Serial No.	Used in Test	
				CE	RE
Spectrum Analyzer	HP	8591E	3414U01226	X	X
Antenna - Biconical	EMCO	3104	2606		X
Antenna - Log Periodic	A.H. Systems	SAS-200/510	809		X
Voltage Probe	ITL	ITL-100		X	

### 6.2 Immunity Tests

Equipment indicated below by an “X” used in Tests IEC 61000:-2,-3,-4,-5,-6,-8,-11.

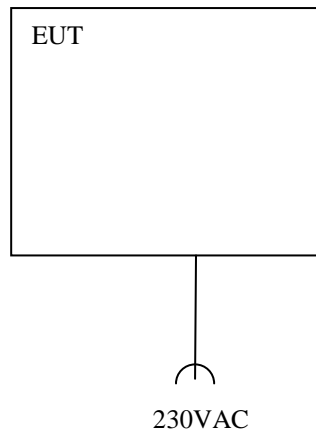
Test equipment calibration is in accordance with ITL Q.A. Procedure PM 110, "Calibration Control Procedure", which complies with ISO 9002 and ISO/IEC Guide 17025.

Instrument	Manuf.	Model	Serial No.	Used in Test IEC 61000-4:						
				-2	-3	-4	-5	-6	-8	-11
Transient Generator	EM TEST	EFT 500SI	1198-01			X				
Signal Generator	Marconi	2022D	119196015					X		
ESD Simulator	Schaffner	NSG 435	174-002-001(Z1)	X						
Power Amplifier	IFI	SMX100	1194-4537					X		
RF Current Probe	FCC	F-120-9	105					X		
Surge Generator	EM TEST	UCS 500-M	1198-45							
AC Power Source	EM TEST	UCS 500-M	1198-45							
Current Generator	FCC	F-1000-4-8-125A	9838							
Magnetic Loop	FCC	F-1000-4-8/9/10-L-1M	9836							

## 7. E.U.T. Performance Verification

### 7.1 Mode of Operation

During all the tests the E.U.T. was operated with velocity 3.5km/h with operation of perturbation plate according to program.



**Figure 1. Test Set-up**

### 7.2 Monitoring of E.U.T.

The display was observed during and after each Immunity test.

### 7.3 Definition of Failure

1. Message “ motor system disarmed” on the display and LED on emergency button in “ON” position (the perturbation plate exceeds from the boundary).
2. Any error message about operation system (Windows).

## 8. Conducted Emission From AC Mains

### 8.1 Test Specification

0.15-30 MHz, CISPR 11: 2009 + A1: 2010, CLASS A

### 8.2 Test Procedure

The E.U.T operation mode and test set-up are as described in Section 7.1.

The E.U.T was powered from single phase 230 VAC. The emissions were measured using a voltage probe as described in Section 6.2 of EN 55011. The voltage probe was grounded to the E.U.T. ground point at the power cable plug.

A frequency scan between 0.15 and 30 MHz was performed at 9 kHz I.F. band width, and using peak detection.

The spectral components having the highest level on each line were measured using a quasi-peak and average detector.

The configuration tested is shown in the photograph, *Figure 13. Conducted Emission From AC Mains Test.*

### 8.3 Test Results

The E.U.T complies with the CISPR 11: 2009 + A1: 2010, CLASS A specification requirements.

The margin between the emission levels and the specification limit is, in the worst case, 3.2 dB for the phase line at 24.01 MHz and 1.7 dB at 6.22 MHz for the neutral line.

The details of the highest emissions are given in *Figure 2 to Figure 5.*

NOTE – Initially the EUT failed to meet the requirements of the specification.

The manufacturer took the following corrective action:

1. A ferrite core, P/N 0431176451, manufactured by Fair-Rite, was added on the power cord near the AC inlet. The core has 2 turns. See photo on page 11.
2. Two ferrite cores, P/N 0431167281, manufactured by Fair-Rite were added to the power wires of the servo controllers near the servo controllers' case. One core was placed on each set of wires. Each core has one turn. See photo on page 11.
3. A ferrite core, P/N 0446164181, manufactured by Fair-Rite, was added to all of the power wires of servo controllers near the servo controllers' case. The core has one turn. See photo on page 11.
4. A ferrite core, P/N 0431167281, manufactured by Fair-Rite, was added on the current breaker line between current breaker and RF filter near the current breaker case. The core has one turn. See photo on page 11.

## Conducted Emission

E.U.T Description      Balance Rehabilitation Platform  
Type                      BalanceTutor™ BT100  
Serial Number:         A183000001

Specification:    CISPR 11: 2009 + A1: 2010, Class A  
Lead:                Phase  
Detectors:         Quasi-peak, Average

Frequency (MHz)	Peak Reading (dBμV)	Quasi-peak Reading (dBμV)	Quasi-peak Specification (dBμV)	Margin (dB)
5.42	68.4	63.5	73.0	-9.5
5.56	68.3	63.2	73.0	-9.8
8.10	63.8	63.2	73.0	-9.8
15.61	56.9	49.9	73.0	-23.1
17.45	55.7	49.8	73.0	-23.2
24.01	61.8	58.8	73.0	-14.2

Figure 2. Detectors: Peak, Quasi-peak

Frequency (MHz)	Peak Reading (dBμV)	Average Reading (dBμV)	Average Specification (dBμV)	Margin (dB)
5.42	68.4	49.0	60.0	-11.0
5.56	68.3	48.7	60.0	-11.3
8.10	63.8	54.8	60.0	-5.2
15.61	56.9	36.7	60.0	-23.3
17.45	55.7	36.1	60.0	-23.9
24.01	61.8	56.8	60.0	-3.2

Figure 3. Detectors: Peak, Average

*Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*

## Conducted Emission

E.U.T Description    Balance Rehabilitation Platform  
Type                    BalanceTutor™ BT100  
Serial Number:        A183000001

Specification:    CISPR 11: 2009 + A1: 2010, Class A  
Lead:                Neutral  
Detectors:         Quasi-peak, Average

Frequency (MHz)	Peak Reading (dBμV)	Quasi-peak Reading (dBμV)	Quasi-peak Specification (dBμV)	Margin (dB)
4.62	59.7	55.5	73.0	-17.5
6.22	75.2	69.7	73.0	-3.3
7.51	59.0	53.6	73.0	-19.4
8.70	64.7	59.5	73.0	-13.5
19.00	66.6	59.1	73.0	-13.9
24.01	62.1	61.0	73.0	-12.0

Figure 4. Detectors: Peak, Quasi-peak

Frequency (MHz)	Peak Reading (dBμV)	Average Reading (dBμV)	Average Specification (dBμV)	Margin (dB)
4.62	59.7	43.0	60.0	-17.0
6.22	75.2	58.3	60.0	-1.7
7.51	59.0	46.1	60.0	-13.9
8.70	64.7	50.9	60.0	-9.1
19.00	66.6	43.6	60.0	-16.4
24.01	62.1	54.5	60.0	-5.5

Figure 5. Detectors: Peak, Average

*Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*



## 9. Radiated Emission

### 9.1 Test Specification

30-1000 MHz, CISPR 11: 2009 + A1: 2010, CLASS A

### 9.2 Test Procedure

The E.U.T operation mode and test set-up are as described in section 7.1.

A preliminary measurement to characterize the E.U.T.'s emission frequencies was performed using a short electrical monopole.

The E.U.T. was probed at all its surfaces to identify the worst emitting surface.

The frequency range 30-1000 MHz was scanned using a Spectrum Analyzer.

To enable the signal-to background noise ratio greater than 6 dB, the antenna was placed 1 meter from the E.U.T.

During the test a minimum distance of at least 1 meter was maintained between each surface of the E.U.T. and the adjacent wall or conducting surface. A minimum distance of 1 meter was also maintained between the edges of the test antenna and the adjacent wall or conducting objects.

Special attention was given to the list of frequencies that were recorded in the characterization phase.

The specification limit was adjusted from 30 meters distance to 1 meter distance by adding to the original limit factor of:  $20 \log 30/1 = 30\text{dB}$ .

The configuration tested is shown in the photograph, *Figure 14. Radiated Emission Test*.

### 9.3 Test Results

The E.U.T met the requirements of the CISPR 11: 2009 + A1: 2010, CLASS A specification requirements.

The margin between the emission level and the specification limit is 2.1 dB in the worst case at the frequency of 150.70 MHz, vertical polarization.

The details of the highest emissions are given in *Figure 6*.

NOTE – Initially the EUT failed to meet the requirements of the specification.

The manufacturer took the following corrective action:

Two ferrite cores, P/N 0443167251, manufactured by Fair-Rite were added to the servo power cords near the motors. One ferrite core was placed on each set of power cords. Each core has 1turn.

## Radiated Emission

E.U.T Description    Balance Rehabilitation Platform  
Type                    BalanceTutor™ BT100  
Serial Number:        A183000001

Specification: CISPR 11: 2009 + A1: 2010, Class A

Antenna Polarization: Horizontal/Vertical      Frequency range: 30 MHz to 1000 MHz  
Test distance: 1 meters                            Detectors: Peak, Quasi-peak

Frequency (MHz)	Peak Amp dBµV/m	QP Amp dBµV/m	Antenna Polarization:		Limit dBµV/m	Margin (dB)
			Hor.	Ver.		
54.71	52.6	44.9	X		60.0	-15.1
104.30	53.5	50.8	X		60.0	-9.2
109.10	54.1	50.0	X		60.0	-10.0
119.80	54.1	51.0	X		60.0	-9.0
125.80	55.0	51.4	X		60.0	-8.6
128.50	54.3	51.9	X		60.0	-8.1
400.00	34.5	29.0	X		67.0	-38.0
30.11	49.9	44.6		X	60.0	-15.4
36.80	63.0	53.1		X	60.0	-6.9
51.73	61.2	54.4		X	60.0	-5.6
52.91	60.3	51.5		X	60.0	-8.5
149.80	57.3	54.8		X	60.0	-5.2
150.70	60.0	57.9		X	60.0	-2.1
180.30	58.3	55.8		X	60.0	-4.2
314.20	38.1	33.3		X	67.0	-33.7
371.60	41.5	35.2		X	67.0	-31.8

**Figure 6. Radiated Emission. Antenna Polarization: HORIZONTAL/VERTICAL  
Detectors: Peak, Quasi-peak**

*Note: Margin refers to the test results obtained minus specified requirement; thus a positive number indicates failure, and a negative result indicates that the product passes the test.*

## 10. Immunity to Electrostatic Discharge

### 10.1 Test Specification

IEC 61000-4-2: 2008

### 10.2 Test Procedure

In the case of tabletop equipment, the E.U.T. was set up on a wooden table 0.8 meter high on an insulating support 0.5 mm thick above the reference ground plane. In the case of floor-standing equipment, the EUT and cables were set up on an insulating support 0.1m above the reference plane. The test setup is shown in the photograph, Figure 15. Immunity to Electrostatic Discharge Test

The locations of test points are shown in the photographs, Figure 7 to Figure 10.

#### 10.2.1 Air Discharge

Potentials of 2, 4 and 8 kV were applied near each applicable test point. At places where discharge occurred, the potential was applied twenty times; ten times negative and ten times positive. The E.U.T.'s performance during the test was verified as detailed in Section 7.

#### 10.2.2 Contact Discharge

Potentials of 2, 4, and 6 kV were applied to each applicable test point. In places where discharge occurred, the potential was then applied twenty times; ten negative and ten positive discharges. The E.U.T.'s performance during the test was verified as detailed in Section 7.

#### 10.2.3 Indirect Discharge (*vertical and horizontal coupling plane*)

Potentials of 2, 4, and 6 kV were applied to the center of the vertical edge of the coupling plane at a distance of 0.1 meters from the outer casing of the E.U.T. to each applicable test point.

The potential was applied 10 times for each polarity, to each location of the coupling plane. All four faces of the E.U.T. were completely illuminated.

An ESD of the same characteristics as for the vertical coupling plane was applied to the horizontal coupling plane, at each side of the E.U.T., at a distance of 0.1 meter from it's outer casing.

Additional details are shown in Figures 4-5 of IEC 61000-4-2: 2008.

The E.U.T.'s performance during the test was verified as detailed in Section 7

### 10.3 Test Results

The E.U.T met the requirements of specification IEC 61000-4-2: 2008.

## Immunity to Electrostatic Discharge

E.U.T Description	Balance Rehabilitation Platform
Type	BalanceTutor™ BT100
Serial Number:	A183000001

Specification: IEC 61000-4-2: 2008



Figure 7. ESD Test Points

# Immunity to Electrostatic Discharge

E.U.T Description    Balance Rehabilitation Platform  
 Type                    BalanceTutor™ BT100  
 Serial Number:        A183000001

Specification: IEC 61000-4-2: 2008



Figure 8. ESD Test Points

## Immunity to Electrostatic Discharge

E.U.T Description	Balance Rehabilitation Platform
Type	BalanceTutor™ BT100
Serial Number:	A183000001

Specification: IEC 61000-4-2: 2008



Figure 9. ESD Test Points

## Immunity to Electrostatic Discharge

E.U.T Description	Balance Rehabilitation Platform
Type	BalanceTutor™ BT100
Serial Number:	A183000001

Specification: IEC 61000-4-2: 2008



**Figure 10. ESD Test Points**



## 11. Immunity to Radiated Field

### 11.1 Test Procedure

The test was performed outside of a shielded room, at the manufacturer's plant due to size, power, and transportability limitations.

Since there is no authorization to transmit legally at the 80-1000MHz range and in order to prevent possible interference from the radiating antenna to nearby TV/communication services and other electronic equipment, the test was performed at the spot frequencies as listed below.

The following E-M radiators were used during the test:

1. Portable transceiver (walkie-talkie)-

Operation frequency: 164.12 MHz

Manufacturer: Motorola

Model No. : P43QLC00B2AA

Field strength at 1 meter: 15 v/m

2. Portable telephone-

Operation frequency: 826.8 MHz

Manufacturer: Samsung

Model No.: SGH-Z300

S/N: 35591100106235/4

Field strength at 1 meter: 5 v/m

The electromagnetic radiators were placed 0.1 meter from the boundary of each surface of the inspection station and the control console.

During the transmission, speech of the operator was applied, in order to exercise modulation.

The performance of the E.U.T. was verified during the test as described in Section 7.

The test setup is illustrated in the photograph, *Figure 16. Immunity to Radiated Field Test*.

### 11.2 Test Results

No degradation of performance was observed during the test.



## 12. Immunity to Electrical Fast Transient / Burst

### 12.1 Test Specification

Specification: IEC 61000-4-4: 2004 + Amendment A1: 2010

### 12.2 Test Procedure

The EFT/B generator was placed on, and grounded to, a 1x2 meter ground plane. See the photograph, *Figure 17. Immunity to Electrical Fast Transient / Burst Test*.

A test signal having the waveform described in *Figure 18. Transient Waveforms* was applied to the phase neutral and ground lines of the E.U.T mains input, at a distance of 1 meter from the E.U.T. The test signal voltage was 2 kV and it was applied for 1 minute to each line, in negative and positive polarities using a capacitive clamp.

A capacitive clamp was used, due to high power consumption of the E.U.T., based on Section 6.3 of IEC 61000-4-4. Double voltage level was used to compensate for greater coupling loss when using the capacitive clamp method compared to the direct coupling method.

The same test signal was applied to the signal lines, control and DC lines (as applicable), that are connected to the E.U.T. The voltage level was 1.0 kV in this case. Applicable signal and control lines should have a length greater than 3m.

### 12.3 Test Results

The E.U.T met the requirements of IEC 61000-4-4: 2004 + Amendment A1: 2010.

Additional details are given in *Figure 11*.



## Electrical Fast Transient / Burst

E.U.T Description    Balance Rehabilitation Platform  
 Type                    BalanceTutor™ BT100  
 Serial Number:        A183000001

Specification: IEC 61000-4-4: 2004 + A1: 2010

Positive Polarity

Negative Polarity

CAPACITIVE CLAMP				
TEST POINT	PASS / FAIL	ANOMALY	SPECIFICATION (kV)	THRESHOLD (kV)
Ac Power Port	Pass		1.0	

Figure 11. Immunity to Electrical Fast Transient / Burst

## 13. Immunity to Conducted Disturbances

### 13.1 Test Specification

IEC 61000-4-6: 2003 + Amendments A1: 2004; A2: 2006

### 13.2 Test Procedure

The E.U.T. was subjected to conducted disturbances in the frequency range 0.15 - 220 MHz, 3 VRMS, 1 kHz, 80% AM modulation.

The disturbance signal was applied to the AC power lines using an RF Current Injection Probe.

The driver signal generator levels used are based on calibration that was performed in accordance with Section 6.4 and Annex A of IEC61000-4-6, I.T.L. Procedures PM-111-CDN/M and PM-111-C.P. 105.

The frequency was swept using discrete increments having a value less than 1% of the fundamental frequency.

The performance of the E.U.T. was verified during the test as described in Section 7.

The test setup is illustrated in the photograph *Figure 19. Conducted Disturbances*.

### 13.3 Test Results

The E.U.T. passed the Conducted Disturbances immunity tests as required by specification IEC 61000-4-6: 2003 + Amendments A1: 2004; A2: 2006

Additional details are given in *Figure 12*.



## Immunity to Conducted Disturbances

E.U.T Description    Balance Rehabilitation Platform  
Type                    BalanceTutor™ BT100  
Serial Number:        A183000001

Specification: IEC 61000-4-6: 2003 + A1: 2004; A2: 2006

Tested at 1 kHz 80% AM Modulation

### Using Injection Probe

TEST POINT	PASS / FAIL	ANOMALY	SPECIFICATION (VRMS)	THRESHOLD (kV)
AC Power Port	Pass	No anomaly	3	

Figure 12. Immunity to Conducted Disturbances



## 14. Voltage Dips and Short Interruptions

### 14.1 Test Specification

IEC 61000-4-11: 2004

### 14.2 Test Procedure

The E.U.T. was operated from 230VAC, 50Hz

The following voltage interruption was applied:

5 sec, reduction of  $> 95\%$  of  $U_t$ .

The test was carried out 3 times, using equipment and test methods prescribed in IEC 61000-4-11: 2001.

The test setup is shown in the photograph, *Figure 20. Voltage Dips and Short Interruptions*.

### 14.3 Test Results

The E.U.T. passed the immunity to voltage dips and short interruptions requirements as detailed by specification IEC 61000-4-11: 2004.

## 15. Set Up Photographs



Figure 13. Conducted Emission From AC Mains Test



Figure 14. Radiated Emission Test



**Figure 15. Immunity to Electrostatic Discharge Test**



**Figure 16. Immunity to Radiated Field Test**



Figure 17. Immunity to Electrical Fast Transient / Burst Test

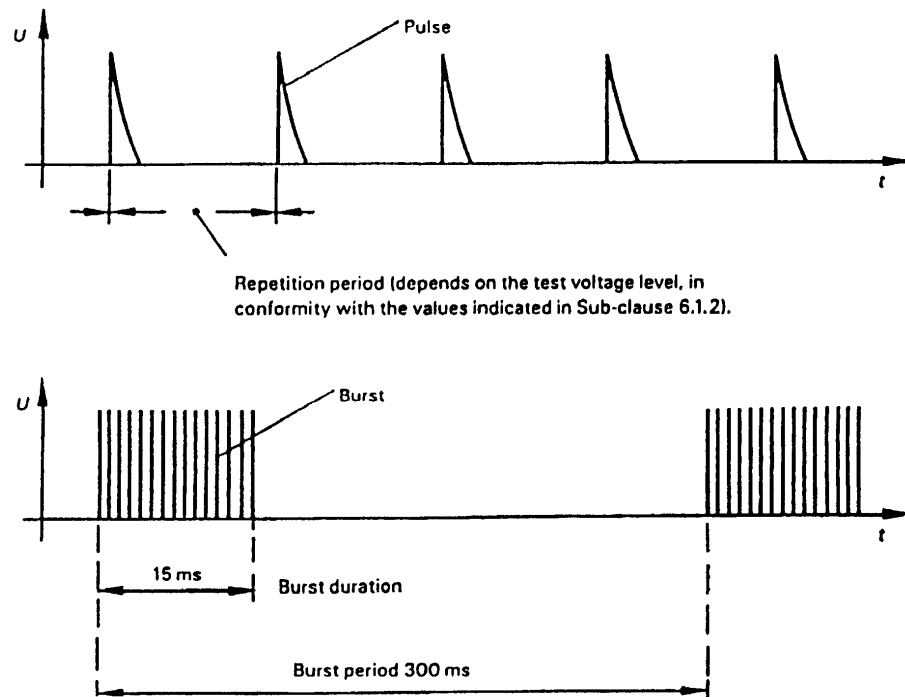


Figure 18. Transient Waveforms












**Figure 19. Conducted Disturbances**



**Figure 20. Voltage Dips and Short Interruptions**



## 16. Signatures of the E.U.T.'s Test Engineers

Test	Test Engineer Name	Signature	Date
Conducted Emissions From AC Mains	Y. Mordukhovitch		17.02.14
Radiated Emissions	Y. Mordukhovitch		17.02.14
ESD	Y. Mordukhovitch		17.02.14
Radiated Immunity	Y. Mordukhovitch		17.02.14
EFT/B	Y. Mordukhovitch		17.02.14
Conducted Disturbances	Y. Mordukhovitch		17.02.14
Voltage Dips and Short Interruptions	Y. Mordukhovitch		17.02.14

## 17. APPENDIX A - CORRECTION FACTORS

### 17.1 Correction factors for CABLE

from EMI receiver  
to test antenna

FREQUENCY (MHz)	CORRECTION FACTOR (dB)	FREQUENCY (MHz)	CORRECTION FACTOR (dB)
10.0	0.2	1200.0	1.6
20.0	0.2	1400.0	1.8
30.0	0.2	1600.0	2.1
40.0	0.2	1800.0	2.2
50.0	0.3	2000.0	2.3
60.0	0.4	2300.0	2.8
70.0	0.4	2600.0	2.7
80.0	0.4	2900.0	3.1
90.0	0.5		
100.0	0.5		
150.0	0.6		
200.0	0.6		
250.0	0.7		
300.0	0.8		
350.0	0.9		
400.0	1.0		
450.0	1.1		
500.0	1.2		
600.0	1.3		
700.0	1.4		
800.0	1.4		
900.0	1.5		
1000.0	1.5		

**NOTES:**

1. The cable type is RG-214.
2. The overall length of the cable is 5.5 meters.



**17.2 Correction factors for Antenna Bio-conical  
Type 3104  
at 3 meter range.**

<b>FREQUENCY</b> (GHz)	<b>ANTENNA</b> <b>FACTOR</b> (dB)
30	14.8
40	13.4
50	11.8
60	11.0
70	9.1
80	8.1
90	12.4
100	13.9
120	13.7
140	12.5
160	15.1
180	16.5
200	16.4
250	18.6
300	20.6

*NOTE:*

*Antenna serial number is 2606.*



### 17.3 Correction factors for LOG PERIODIC ANTENNA Type SAS-200/510

FREQUENCY (MHz)	ANTENNA FACTOR (dB)
200	51.4
300	14.3
400	15.6
500	17.2
600	20.1
700	20.8
800	21.1
900	23.0
1000	23.7

**NOTE:**

*Antenna serial number is 809.*



## 17.4 Correction factors for Voltage Probe Model ITL-100

FREQUENCY (MHz)	Insertion Loss (dB)
0.15	32.7
0.20	31.6
0.30	30.7
0.70	30.2
1.00	30.0
3.00	29.9
5.00	29.8
7.00	29.6
10.00	29.4
15.00	29.1
20.00	28.7
25.00	28.3
30.00	28.2