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DATE: 04 April 2016

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

Test Report According to EN 301 489-1; EN 301 489-3; EN 301 489-7; EN 301 489-17; EN 301 489-24

for

Pointer Telocation Ltd.

Equipment under test:

3G Self-powered Smart Hub With Muti-Sensing Device and Temperature/Humidity Multi-Sensing Device

CelloTrack Nano 20 3G, P/N: GC9771004-000;
MultiSense, P/N: 715-50100,
MultiSense TH, P/N: 715-50200
CelloTrack Nano 10 3G, P/N: GC9771003-000*

* See customer's declaration on page 4.

Tested by: _____
Y. Mordukhovitch

Approved by: _____
D. Shidlowsky

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1. General Information

1.1 Administrative Information

Manufacturer:	Pointer Telocation Ltd.
Manufacturer's Address:	14 Hamelacha St., Rosh Ha'ayin, 48091 Israel Tel: +972-3-572-3111 Fax: +972-73-262-2344
Manufacturer's Representative:	Refael Yakobov
Equipment Under Test (E.U.T):	3G Self-powered Smart Hub With Muti-Sensing Device and Temperature/Humidity Multi-Sensing Device
Equipment Model No.:	CelloTrack Nano 20 3G, P/N: GC9771004-000; MultiSense, P/N: 715-50100, MultiSense TH, P/N: 715-50200 CelloTrack Nano 10 3G, P/N: GC9771003-000 (See customer's declaration on following page).
Equipment Serial No.:	982968, 48.1A.84.00.06.E8, 48.1A.84.00.06.61
Date of Receipt of E.U.T:	03.01.16
Start of Test:	03.01.16
End of Test:	04.01.16
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	EN 301 489-1 V1.9.2: 2011; EN 301 489-3 V1.6.1: 2013 EN 301 489-7 V1.3.1: 2005; EN 301 489-17 V2.2.1: 2012 EN 301 489-24 V1.5.1: 2010; See Note below

Note:

1. CelloTrack Nano 20 3G is identical to the CelloTrack Nano except that the CelloTrack Nano uses a 2G cellular modem. The CelloTrack Nano was tested to EN 301 489-1; -3; -7; 17. See details in ITL test report No E160010.01.
2. Due to the above, the following tests were performed as agreed upon with the customer: ESD, EFT/B, and conductive surges.

POINTER

DECLARATION

Date: 14/2/2016

I HEREBY DECLARE THE FOLLOWING REGARDING THE BELOW MODELS:

#	Product name	P/N
1	CelloTrack Nano 20	GC9770001-000
2	CelloTrack Nano 20 3G	GC9771004-000
3	CelloTrack Nano 10	GC9770002-000
4	CelloTrack Nano 10 3G	GC9771003-000

All of the above models use the same PCB.

These models are all identical except:

1. That P/N GC9770001-000 has the Cinterion BGS2-W 2G GSM cellular modem while P/N GC9771004-000 has the Cinterion EHS6A 3G cellular modem.
2. That in P/N GC9770002-000 and P/N GC9771003-000 the 2.4GHz transmitter is deactivated by firmware.
3. That in both P/N GC9770001-000 and P/N GC9770002-000 have the Cinterion BGS2-W 2G GSM cellular modem while P/N GC9771003-000 and P/N GC9771004-000 both have the Cinterion EHS6A 3G cellular modem.

Please relate to them (from an EMC/RADIO point of view) as the same product.

IGOR ROGOV
16-02-2016

Signature
Igor Rogov
VP R&D
VP R&D
Pointer Telocation Inc.

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
AMN	Artificial Mains Network
ARA	Antenna Research Associates
Aux	auxiliary
Avg	average
CDN	coupling-decoupling network
cm	centimeter
dB	decibel
dBm	decibel referred to one milliwatt
dbµV	decibel referred to one microvolt
dbµV/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	Hewlitt 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. FCC Designation Number IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) (Japan), Registration Numbers: C-3006, R-2729, T-1877, G-245.
5. Industry Canada (Canada), IC File No.: 46405-4025; Sites No. IC 4025A-1; 4025A-2.

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	**R&TTE Directive: 1999**	*DIRECTIVE 1999/5/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 9 March 1999 on radio equipment and telecommunications terminal equipment and the mutual recognition of their conformity*
2.2	**EN 301 489-1 V1.9.2: 2011**	*Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part1: Common technical requirements*
2.3	**EN 301 489-3 V1.6.1: 2013**	*Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 3: Specific conditions for Short-Range Devices (SRD) operating on frequencies between 9 kHz and 246 GHz*
2.4	**EN 301 489-7 V1.3.1: 2005**	*Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 7: Specific conditions for mobile and portable radio and ancillary equipment of digital cellular radio telecommunication systems (GSM and DCS)*
2.5	**EN 301 489-17 V2.2.1: 2012**	*Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 17: Specific conditions for Broadband Data Transmission Systems*
2.6	**EN 301 489-24 V1.5.1: 2010**	*Electromagnetic compatibility and Radio spectrum Matters (ERM); ElectroMagnetic Compatibility (EMC) standard for radio equipment and services; Part 24: Specific conditions for IMT-2000 CDMA Direct Spread (UTRA and E-UTRA) for Mobile and portable (UE) radio and ancillary equipmen*

Applicable Documents (cont'd.)

2.7	**EN 61000-4-2: 2009**	*Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques; Section 2: Electrostatic discharge immunity test: Basic EMC publication.*
2.8	**EN 61000-4-4: 2004 + Amendment A1: 2010**	*Electromagnetic compatibility (EMC), Part 4. Testing and measurement techniques; Electrical fast transient /burst immunity test, Basic EMC Publication.*
2.9	**EN 61000-4-5: 2006**	*Electromagnetic Compatibility (EMC), Part 4: Testing and Measurement Techniques; Section 5: Surge immunity test.*

3. Test Site Description

3.1 Location:

The Electromagnetic Compatibility Test Facility of I.T.L. (Product testing) Ltd. Is located at
Telrad Industrial Park, Lod, 7120101 Israel.

Telephone: +972-8-9153100

Fax: +972-8-9153101

3.2 Shielded Room

A Modular Shielded Room, Type 20 SpaceSaver, manufactured by ETS, consisting of a Main Room and a Control Room.

The dimensions of the Main Room are: length: 7.0 m, width: 3.0 m, height: 3.0 m.

The shielding performance is:

magnetic field: 60 dB at 10 kHz rising linearly to 100 dB at 100 kHz,

electric field: better than 110 dB between 50 MHz and 1 GHz,

plane wave: 110 dB between 50 MHz and 1 GHz.

All the power lines entering the shielded room are filtered.

3.3 Open Site:

The OATS is located on a one floor-building roof. The OATS consists of 3 meter and 10 meter ranges, using a 21.5m X 8.5m solid metal ground plane, a remote controlled turntable and an antenna mast.

3.4 Ground Plane:

The ground plane is made from steel plates, which are welded continuously together. The Ground plane is lies and welded on welded steel construction with vias to allow for water drainage. All the power, control, and signal lines to the turntable and the 3 m and 10m antenna mast outlets are routed in shielded conduits under the plane to the control building.

3.5 Antenna Mast:

ETS model 2070-2. The antenna position and polarization are remote controlled via Fiber Optical Link using ETS/EMCO Dual Controller Type 2090. The antenna position is adjustable between 1-4 meters. Pressurized air is used to power changing the polarity of the antenna.

3.6 Turntable:

ETS model 2087 series. The position of the turntable is remote-controlled via Fiber Optic Link, using ETS/EMCO Dual Controller Type 2090. The turntable is mounted in a pit and its surface is flush with the Open Site Ground Plane. Brushes near the periphery of the turntable ensure good conductive connection to the ground plane. The Turntable maximum load is 1250 Kg.

3.7 EMI Receiver:

Type 8542E, manufactured by HP, being in full compliance with CISPR 16 requirements.

3.8 E.U.T. Support:

Table mounted E.U.T.s are supported during testing on 80 cm high all plastic table.

3.9 Test Equipment:

See details in Section 6.

4. Summary of Test Results

Test	Results
ESD EN 61000-4-2: 2009 Air Discharge, 8kV Contact Discharge, 4kV	Passed
EFT/B EN 61000-4-4: 2004 + Amendment A1: 2010 1kV Power lines	Passed
Conductive Surges EN 61000-4-5: 2006 Differential mode; 1kV	Passed

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

CelloTrack Nano 20 3G, P/N: GC9771004-000:

Self-powered Smart hub for Asset & Cargo Management IoT applications with universal 3G cellular communication, GNSS, short range RF and wide sensing capabilities.

MultiSense, P/N: 715-50100:

All-in-one multi-sensing device for cargo and cold chain monitoring, supporting short range RF communication.

MultiSense TH, P/N: 715-50200:

All-in-one multi-sensing device including humidity sensor for cargo and cold chain monitoring, supporting short range RF communication.

List of ancillary and/or support equipment provided by the applicant

Description	Manufacturer	Model/Part Number	Serial Number
Pointer server			
AUX Laptop	Lenovo	Type 2518-4PG	ID 25184PG
AUX adapter	Lenovo	92P1158	11S9P1158Z1ZD2H79V51

Input/Output Ports:

Port No.	Name	Type*	Cable Max. >3m	Cable Shielded	Comments
0	Enclosure	N/E	—	—	None
1	AC power port	AC	-	-	CelloTrack Nano 20 3G

*Note: AC = AC Power Port DC = DC Power Port N/E = Non-Electrical
I/O = Signal Input or Output Port (Not Involved in Process Control)
TP = Telecommunication Ports

EUT Internal Operating Frequencies:

Frequency (MHz)	Description	Frequency (MHz)	Description
16.0	Bluetooth clock		
0,032768	clock		
32.0	CPU		

Power Interface

Mode No.	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (No.)	Comments
Rated						
1	**100-240**	**0.3**	**72**	**50-60**	**1**	**CelloTrack Nano 20 3G**
2	**3**			**DC**		**MultiSense**
3	**3**			**DC**		**MultiSense TH**
Supplementary information:						

6. List of Test Equipment

6.1 Immunity Tests

Equipment indicated below by an "X" used in **Tests IEC 61000-4:-2, -4,-5**

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

Instrument	Manuf.	Model	Serial No.	Used in Test IEC 61000-4:		
				-2	-4	-5
Transient Generator	KeyTek	CEMASTER	9612436		X	
ESD Simulator	KIKUSUI	KES4021A	UG002517	X		
Surge Generator	EM TEST	UCS 500-M	1198-45			X

7. E.U.T. Performance Verification

7.1 Mode of Operation

The E.U.T.s were operated in regular mode with 10s period between Bluetooth transmissions between the MultiSense and MultiSense TH to the CelloTrack Nano 20 3G and 4s between cellular transmissions between the CelloTrack Nano 20 3G and the Pointer Telocation server. The auxiliary laptop communicated with the Pointer Telocation Server via W-Fi connection to the internet.

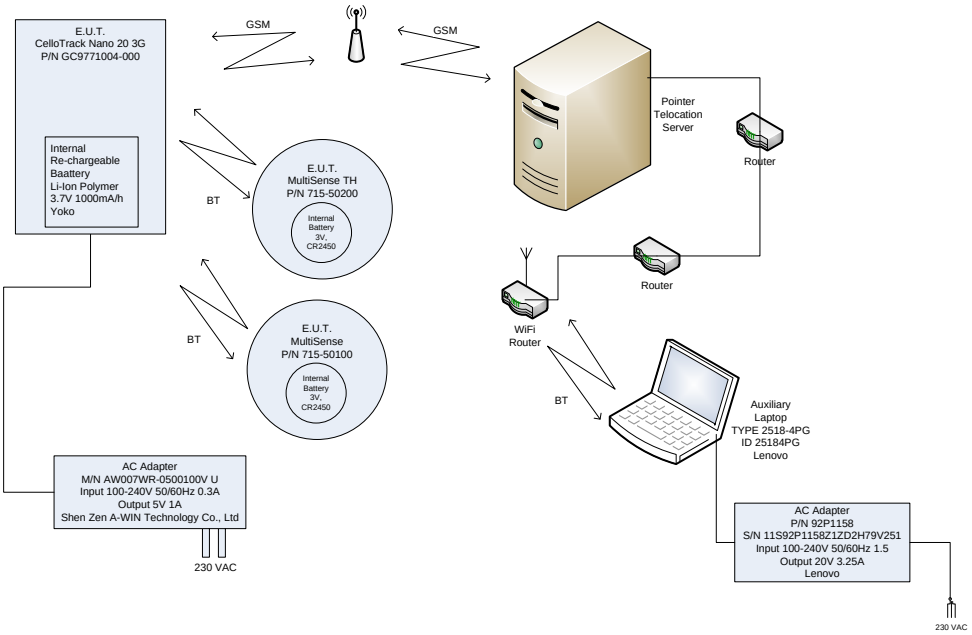


Figure 1. Test Set-up

7.2 Monitoring of E.U.T.

The AUX laptop screen was observed during and after the immunity tests. On the screen the "Communication center" program "window" with receiving results of the Bluetooth transmissions and cellular transmissions was observed.

7.3 Definition of Failure

Any cessation of the communications was regarded as a failure.

8. Immunity to Electrostatic Discharge

8.1 Test Specification

EN 61000-4-2: 2009

8.2 Test Procedure

In the case of tabletop equipment, the E.U.T. was set up on a wooden table 0.8m 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 illustrated in the photograph, *Figure 15. Immunity to Electrostatic Discharge Test.*

Photographs in *Figure 2* to *Figure 4* show the locations of test points.

8.2.1 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.

8.2.2 Contact Discharge

Potentials of 2 and 4 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.

8.2.3 Indirect Discharge (vertical and horizontal coupling plane)

Potentials of 2 and 4 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 Figure 5 of EN 61000-4-2: 2009.

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

8.3 Test Results

The E.U.T met the requirements of specification EN 61000-4-2: 2009.

Immunity to Electrostatic Discharge

E.U.T Description	3G Self-powered Smart Hub
Type	CelloTrack Nano 20 3G, P/N: GC9771004-000
Serial Number:	982968

Specification: EN 61000-4-2: 2009

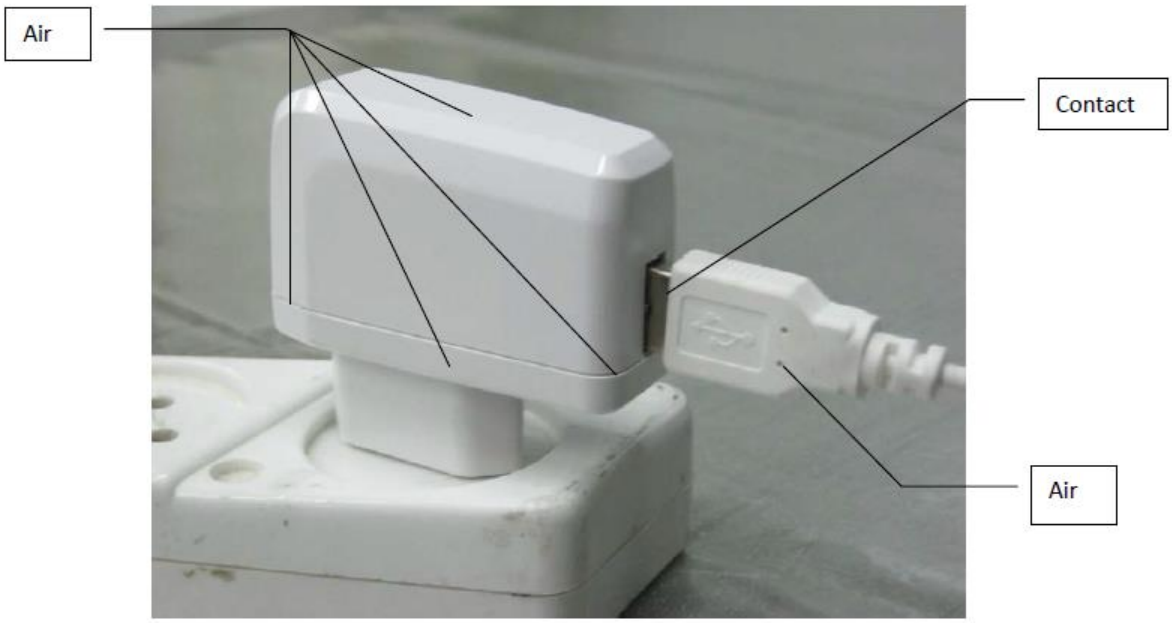


Figure 2. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	3G Self-powered Smart Hub
Type	CelloTrack Nano 20 3G, P/N: GC9771004-000
Serial Number:	982968

Specification: EN 61000-4-2: 2009

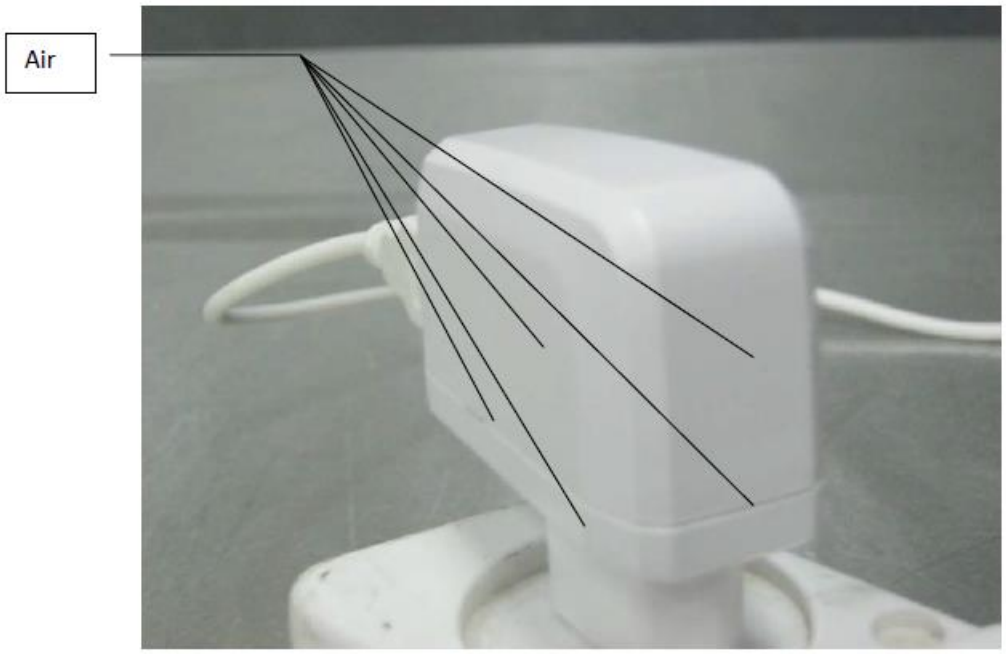


Figure 3. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	3G Self-powered Smart Hub
Type	CelloTrack Nano 20 3G, P/N: GC9771004-000
Serial Number:	982968

Specification: EN 61000-4-2: 2009

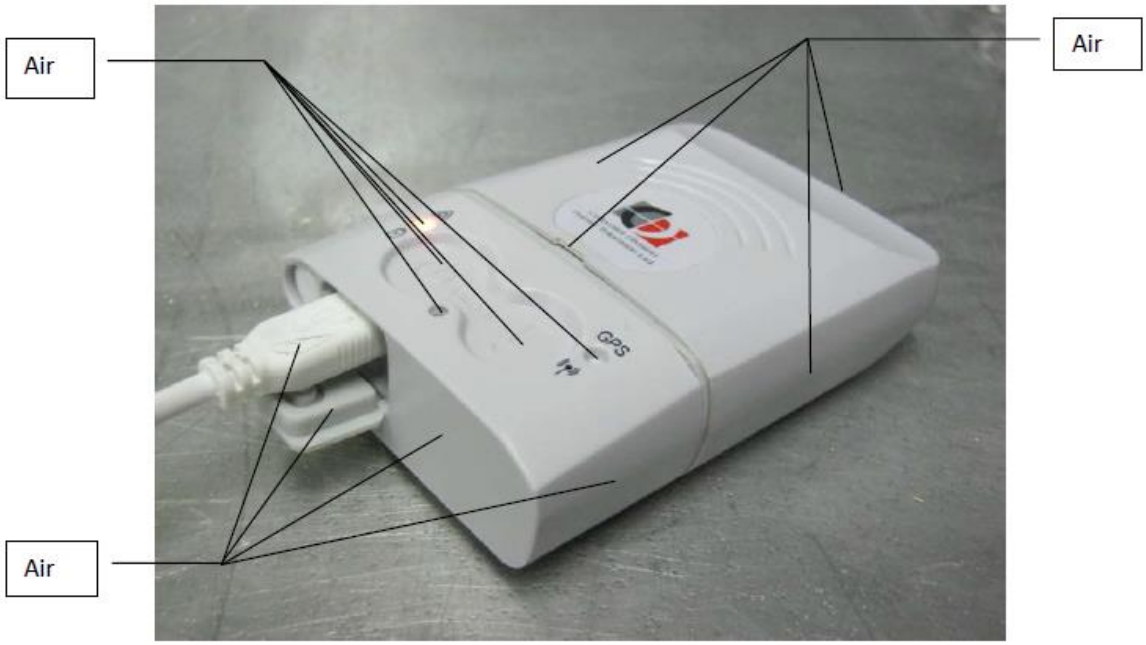


Figure 4. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	3G Self-powered Smart Hub
Type	CelloTrack Nano 20 3G, P/N: GC9771004-000
Serial Number:	982968

Specification: EN 61000-4-2: 2009

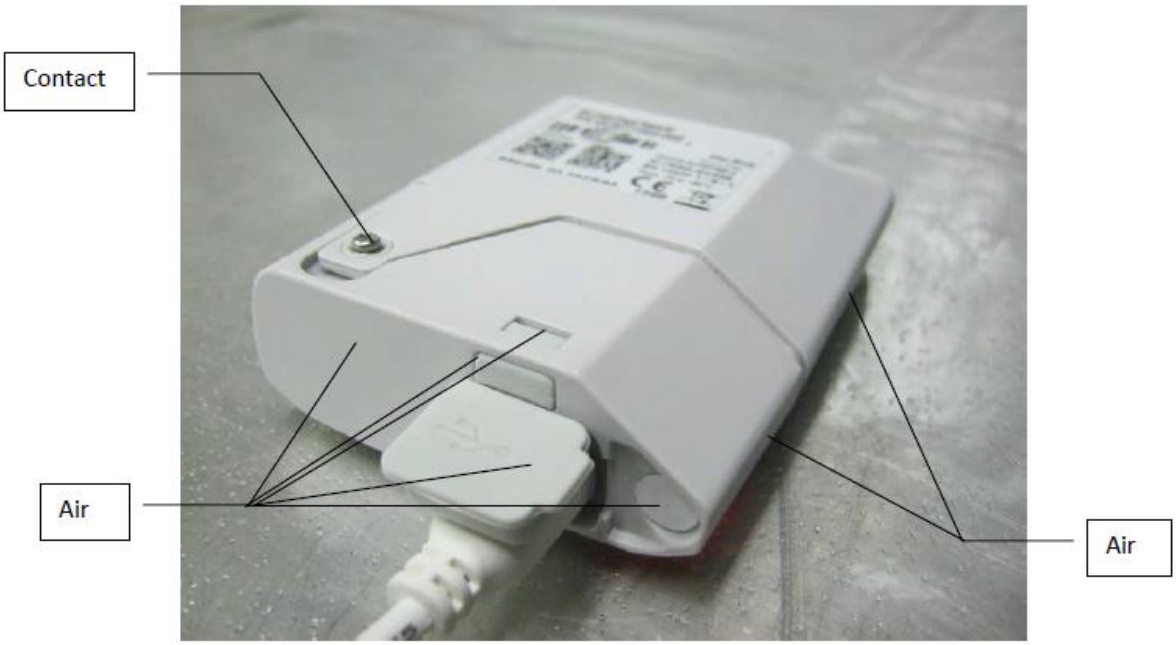


Figure 5. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	3G Self-powered Smart Hub
Type	CelloTrack Nano 20 3G, P/N: GC9771004-000
Serial Number:	982968

Specification: EN 61000-4-2: 2009

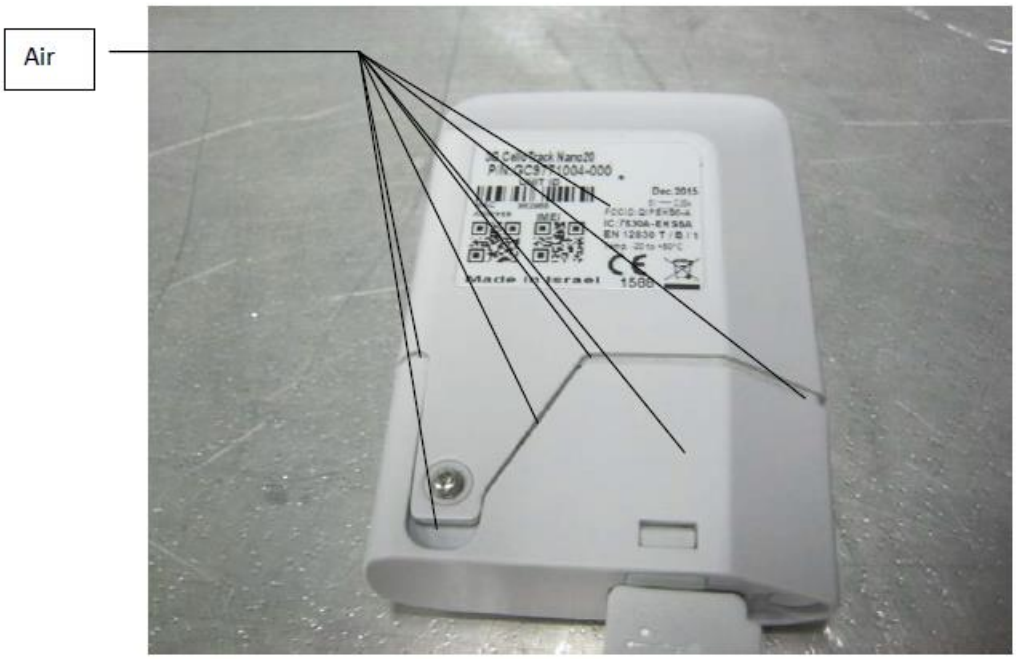


Figure 6. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	Temperature/Humidity Multi-Sensing Device
Type	MultiSense TH, P/N: 715-50200
Serial Number:	48.1A.84.00.06.61

Specification: EN 61000-4-2: 2009

Figure 7. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	Temperature/Humidity Multi-Sensing Device
Type	MultiSense TH, P/N: 715-50200
Serial Number:	48.1A.84.00.06.61

Specification: EN 61000-4-2: 2009

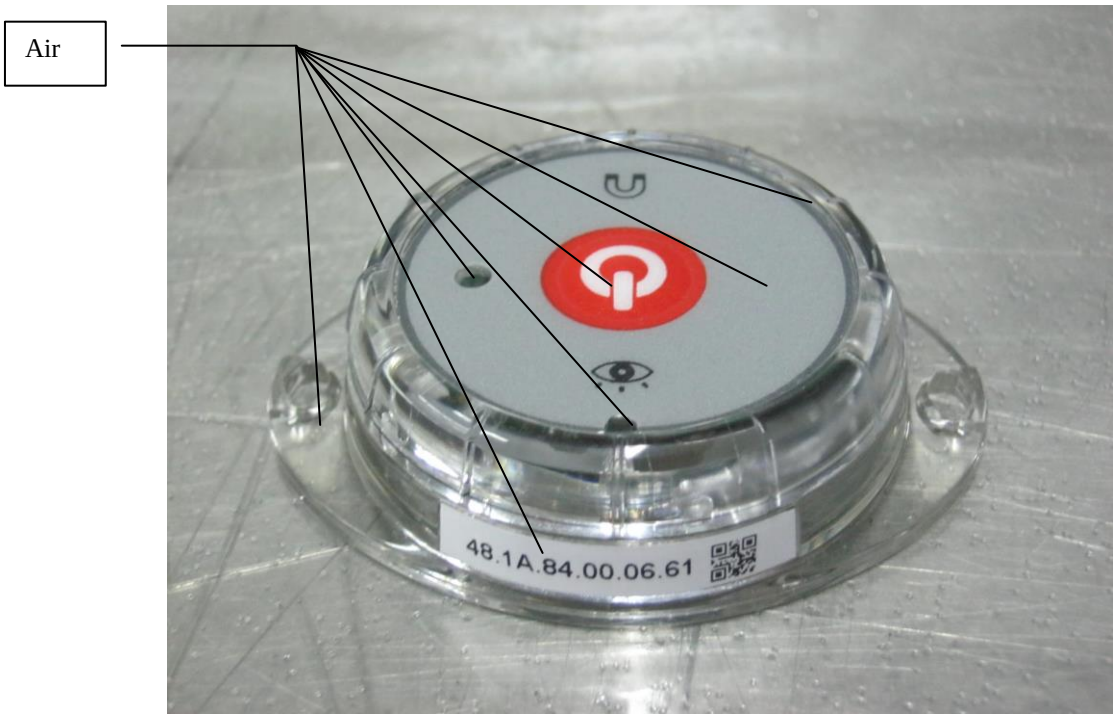


Figure 8. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	Temperature/Humidity Multi-Sensing Device
Type	MultiSense TH, P/N: 715-50200
Serial Number:	48.1A.84.00.06.61

Specification: EN 61000-4-2: 2009

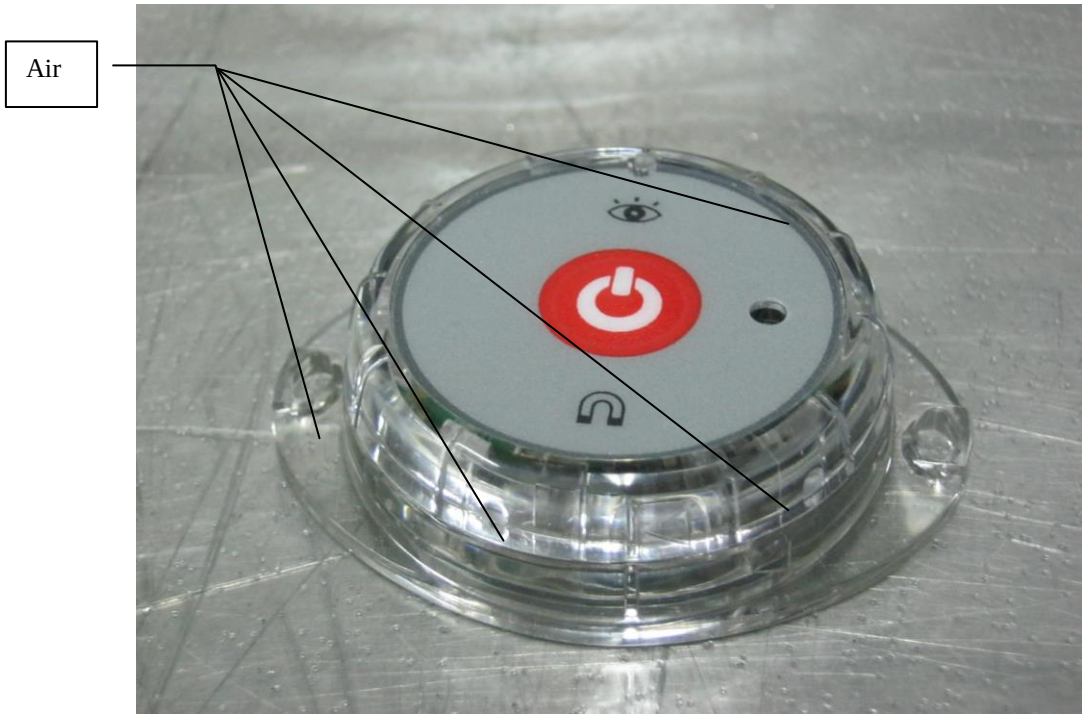


Figure 9. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	Muti-Sensing Device
Type	MultiSense, P/N: 715-50100
Serial Number:	48.1A.84.00.06.E8

Specification: EN 61000-4-2: 2009

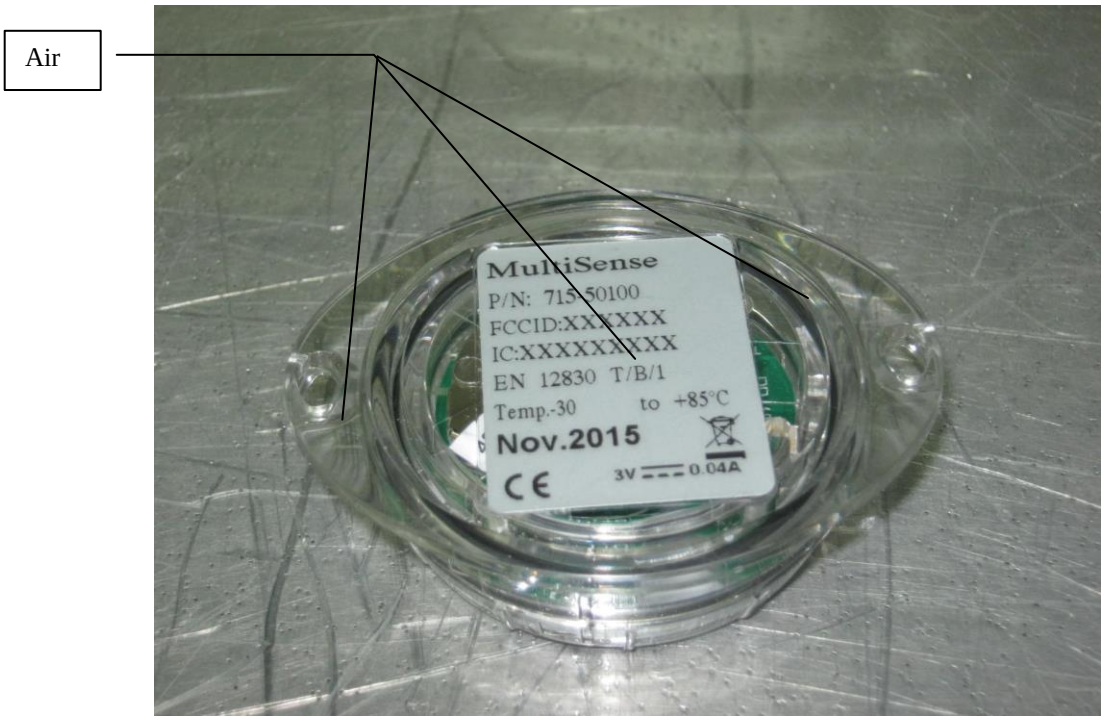


Figure 10. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	Muti-Sensing Device
Type	MultiSense, P/N: 715-50100
Serial Number:	48.1A.84.00.06.E8

Specification: EN 61000-4-2: 2009

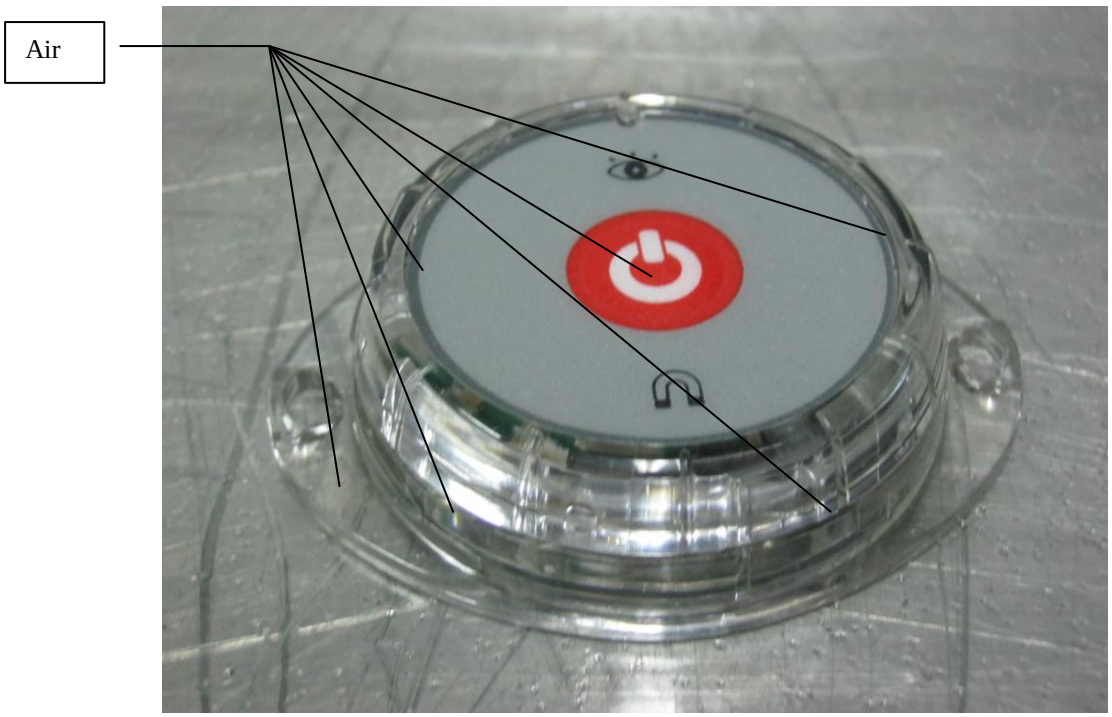


Figure 11. ESD Test Points

Immunity to Electrostatic Discharge

E.U.T Description	Muti-Sensing Device
Type	MultiSense, P/N: 715-50100
Serial Number:	48.1A.84.00.06.E8

Specification: EN 61000-4-2: 2009

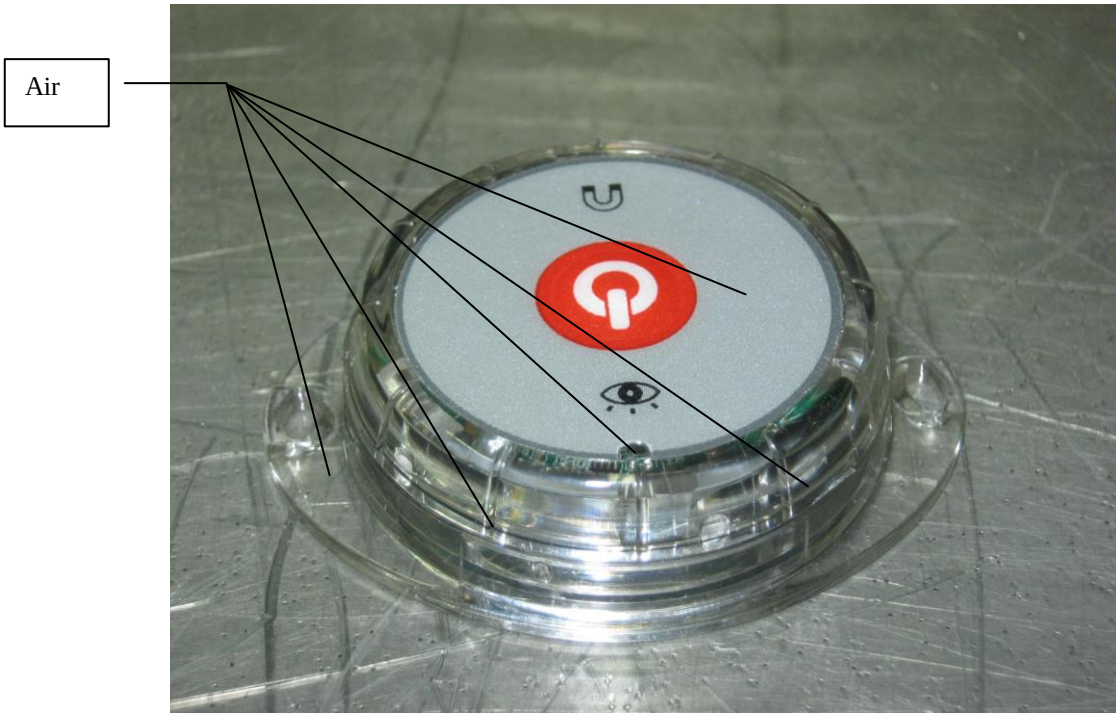


Figure 12. ESD Test Points

9. Immunity to Electrical Fast Transient / Burst

9.1 Test Specification

EN 61000-4-4: 2004 + Amendment A1: 2010

9.2 Test Procedure

The E.U.T. was placed 0.1 m above a reference ground plane.

The EFT/B generator was placed on, and grounded to, this ground plane. See the photograph, *Figure 16. Immunity to Electrical Fast Transient / Burst Test*.

A test signal having the waveform described in *Figure 17. 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 1 kV and it was applied for 1 minute to each line, in negative and positive polarities.

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 0.5 kV in this case

Applicable signal and control lines should have a length greater than 3m.

9.3 Test Results

The E.U.T. passed the immunity to electrical fast transients / bursts requirements as detailed by specification EN 61000-4-4: 2004 + Amendment A1: 2010.

Additional details are given in *Figure 13.*

Electrical Fast Transient / Burst

E.U.T Description	3G Self-powered Smart Hub
Type	CelloTrack Nano 20 3G, P/N: GC9771004-000
Serial Number:	982968

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

[x] Positive Polarity **[x] Negative Polarity**

TEST POINT	PASS / FAIL	ANOMALY	SPECIFICATION (kV)
Phase	Pass	No anomaly	1.0
Neutral	Pass	No anomaly	1.0

Figure 13. Immunity to Electrical Fast Transient / Burst

10. Immunity to Conductive Surges

10.1 Test Specification

EN 61000-4-5: 2006

10.2 Test Procedure

The E.U.T. was subjected to surges in the form of double exponential waves as follows:

For AC or DC power lines:

Open circuit voltage: Rise time of 1.2 µsec. and pulse width of 50 µsec.

Short circuit current: Rise time of 8 µsec. and pulse width of 20 µsec.

See *Figure 18 Open Circuit Voltage Waveform (1.2/50 µs)* to *Figure 19 Short Circuit Current Waveform (8/20 µs).*

For signal/telecommunication lines:

Open circuit voltage: Rise time of 10 µsec. and pulse width of 700 µsec.

Short circuit current: Rise time of 5 µsec. and pulse width of 320 µsec.

See *Figure 20. Open Circuit Voltage Waveform (10/700µs)* to *Figure 21 Short Circuit Current Waveform (5/320µs).*

The surges were applied to the E.U.T. AC power lines in differential mode. The differential (between phase and neutral) voltages were 0.5 and 1 kV.

The surges were injected in both positive and negative polarities in to the AC line, at phase angles of 0°, 90°, 180°, 270° and 360°; both peak and zero crossings.

At least five surges were applied at each polarity. The surge repetition rate was kept to not more than one per minute.

DC power lines were tested at 0.5 kV (when applicable).

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

The test setup is shown in the photograph, *Figure 22. Immunity to Conductive Surges.*

10.3 Test Results

The E.U.T. passed the immunity to surges requirements as detailed by specification EN 61000-4-5: 2006.

Additional details are given in Figure 14.

Immunity to Conductive Surges

E.U.T Description	3G Self-powered Smart Hub
Type	CelloTrack Nano 20 3G, P/N: GC9771004-000
Serial Number:	982968

Specification: EN 61000-4-5: 2006

TEST POINT	Polarity	0°/360°	90°	180°	270°	Specified Level	Remarks
Phase to Neutral	+	P	P	P	P	0.5, 1 kV	
	-	P	P	P	P	0.5, 1 kV	

Figure 14. Immunity to Conductive Surges

NOTE: Each test was executed at least five times.

11. Set Up Photographs

Figure 15. Immunity to Electrostatic Discharge Test

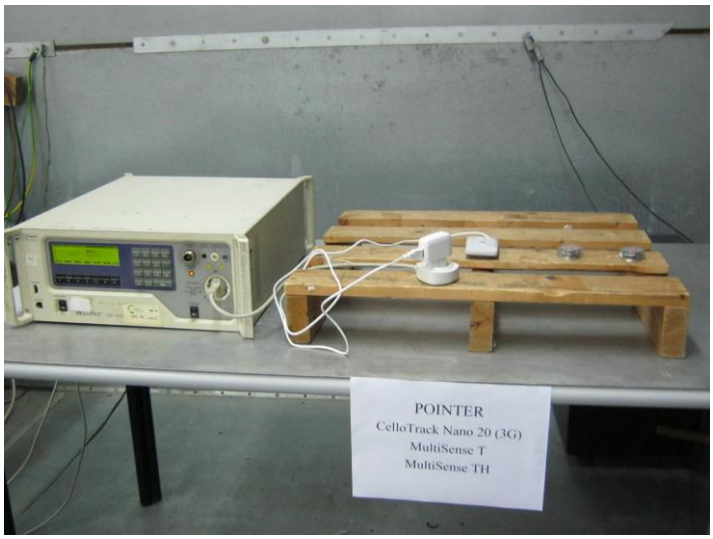


Figure 16. Immunity to Electrical Fast Transient / Burst Test

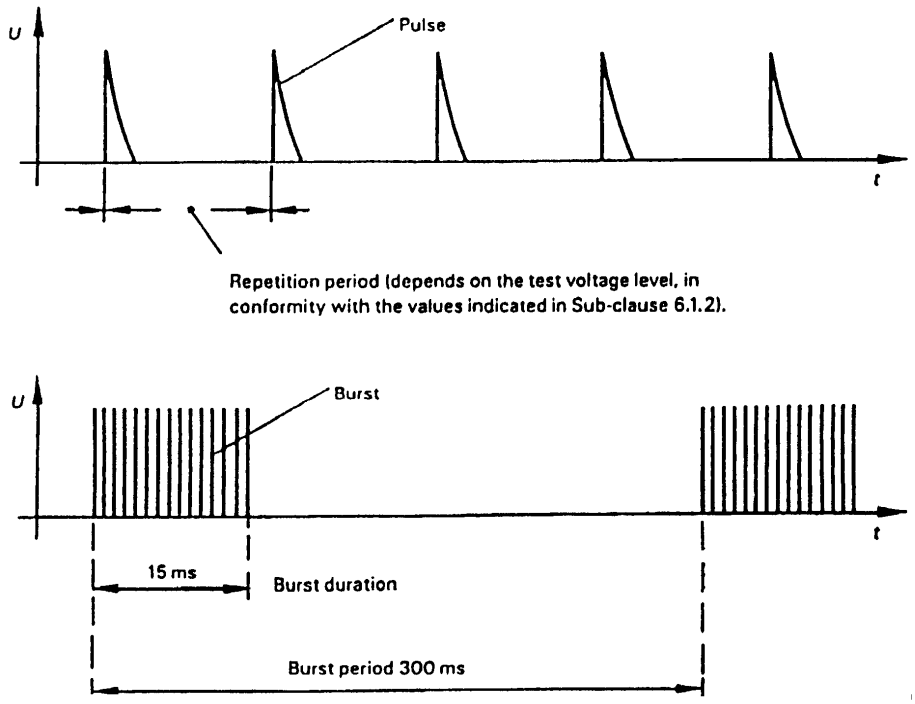
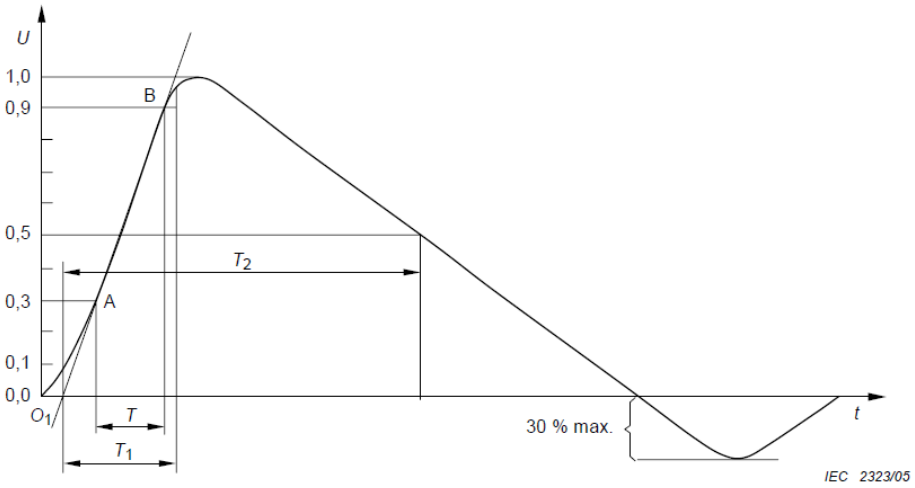
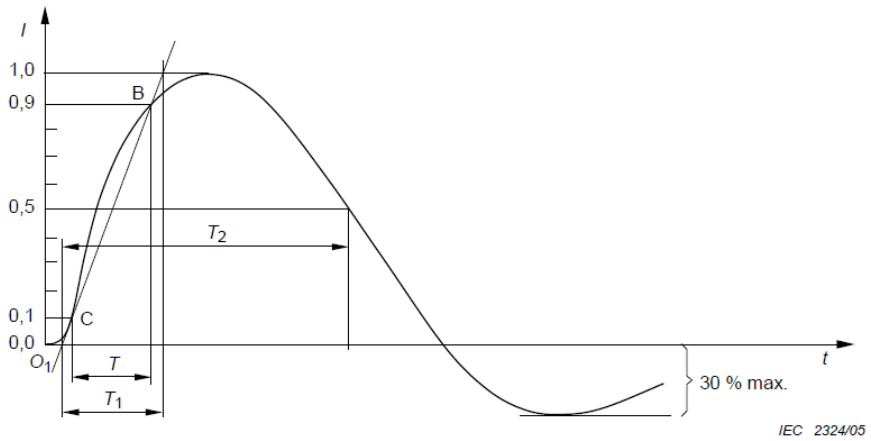


Figure 17. Transient Waveforms



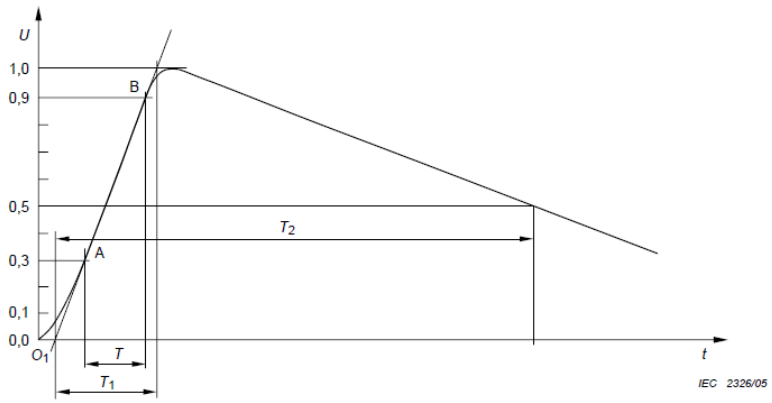
Front time: $T_1 = 1{,}67 \times T = 1{,}2\ \mu s \pm 30\ \%$
Time to half-value: $T_2 = 50\ \mu s \pm 20\ \%$.

Figure 18 Open Circuit Voltage Waveform (1.2/50 µs)



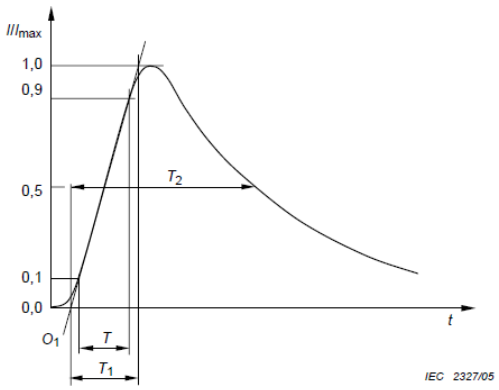
Front time: $T_1 = 1,25 \times T = 8\ \mu s \pm 20\ \%$
Time to half-value: $T_2 = 20\ \mu s \pm 20\ \%$

Figure 19 Short Circuit Current Waveform (8/20 µs)



Front time: $T_1 = 1,67 \times T = 10\ \mu s \pm 30\ \%$
Time to half-value: $T_2 = 700\ \mu s \pm 20\ \%$.

Figure 20. Open Circuit Voltage Waveform (10/700µs)



Front time: $T_1 = 1{,}25 \times T = 5\ \mu s \pm 20\ \%$
Time to half-value: $T_2 = 320\ \mu s \pm 20\ \%$.

Figure 21 Short Circuit Current Waveform (5/320µs)

Figure 22. Immunity to Conductive Surges

12. Signatures of the E.U.T's Test Engineers

Test	Test Engineer Name	Signature
ESD	Y. Mordukhovitch	
EFT/B	Y. Mordukhovitch	
Conductive Surges	Y. Mordukhovitch	

13. APPENDIX B - MEASUREMENT UNCERTAINTY

Test Method	Expanded Uncertainty (95% Confidence K=2)
ESD (EN/IEC 61000-4-2)	± 10 %
EFT/B (EN/IEC 61000-4-4)	± 10 %
Conductive Surges (EN/IEC 61000-4-5)	± 9 %