



**DATE: 28 February 2016**

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

# **Test Report According to EN 301 511 V9.0.2: 2003**

**for  
Pointer Telocation**

**Equipment under test:**

## **Self Powered Smart Hub**

**CelloTrack Nano 20 P/N GC9770001-000  
CelloTrack Nano 10 P/N GC9770002-000\***

\*See customer's Declaration on page 4.

Tested by: \_\_\_\_\_

M. Zohar

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

D. Shidlovsky

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# 1. General Information

## 1.1 Administrative Information

Manufacturer: Pointer Telocation

Manufacturer's Address: 14 Hamelacha St.,  
Rosh Ha'ayin, 48091, Israel  
Tel: +972-3-572-3111  
Fax: +972-3-572-3100

Manufacturer's Representative: Itamar Gohary

Equipment Under Test (E.U.T): Self Powered Smart Hub

Equipment Model No.: CelloTrack Nano 20 P/N GC9770001-000  
CelloTrack Nano 10 P/N GC9770002-000\*

Equipment Serial No.: 982966

Date of Receipt of E.U.T: 21 December 2015

Start of Test: 21 December 2015

End of Test: 21 December 2015

Test Laboratory Location: I.T.L (Product Testing) Ltd.  
1 Batsheva St.,  
Lod  
ISRAEL 7120101

Test Specifications: EN 301 511 V9.0.2: 2003

\*See customer's Declaration on following page.



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.

~~Signature~~ **IGOR ROGOV**  
~~Igor Rogov~~ 16-02-2016  
~~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
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 Federal Communications Commission (FCC) (U.S.A.), 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; Site Nos. IC 4025A-1, IC 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 301 511  
V9.0.2: 2003** *Global System for Mobile communications (GSM); Harmonized EN for mobile stations in the GSM 900 and GSM 1800 bands covering essential requirements under article 3.2 of the R&TTE directive (1999/5/EC)*
- 2.3 **TS 151 010-1  
V7.10.0: 2008** *Digital cellular telecommunications system (Phase 2+); Mobile Station (MS) conformance specification; Part 1: Conformance specification (3GPP TS 51.010-1 version 7.10.0 Release 7)*



## 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 ESCI7, manufactured by Rohde & Schwarz, 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 150 cm high all plastic table.

**3.9 Test Equipment:**

See details in Section 6.

## 4. Summary of Test Results

Test	Results
<p><b>Spurious Emissions</b> EN 301 511 V9.0.2:2003 Clause 5.2.16 TS 151 010-1 V7.10.0: 2008 Clause 12.2.1</p>	<p>The E.U.T met the performance requirements of the specification.</p> <p>The margin between the spurious emission level and the specification limit is 0.2 dB in the worst case at the frequency of 3569.5 MHz, horizontal polarization.</p>



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

Self-powered Smart Hub for asset and cargo management IoT applications supporting 2G cellular communication, GNSS, short range RF and wide sensing capabilities.

The E.U.T.s contain a Cinterion BGS2 Wireless 2G module.

## 6. List of Test Equipment

### 6.1 Emission Tests

The equipment indicated below by an “X” was used for testing Spurious Radiated Emissions, EN 301 511 V9.0.2: 2003, Clause 5.2.16, 5.2.17

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
Spectrum Analyzer	HP	8592L	3826A01204	X
Base Station	Agilent	E5515B	GB41400124	X
EMI Receiver	Rohde & Schwarz	ESCI7	100724	X
EMI Receiver	HP	8542E	3906A00276	X
RF Filter Section	HP	85420E	3705A00248	X
Biconical Antenna	EMCO	3104	2606	X
Log Periodic Antenna	EMCO	3146	9505-4081	X
Horn Antenna	ETS	3115	29845	X
Spectrum Analyzer	HP	8593EM	3536A00120ADI	X
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	X
Low Noise Amplifier	Narda	DBS-0411N313	13	X
Low Noise Amplifier	Sophia Wireless	LNA28-B	232	X

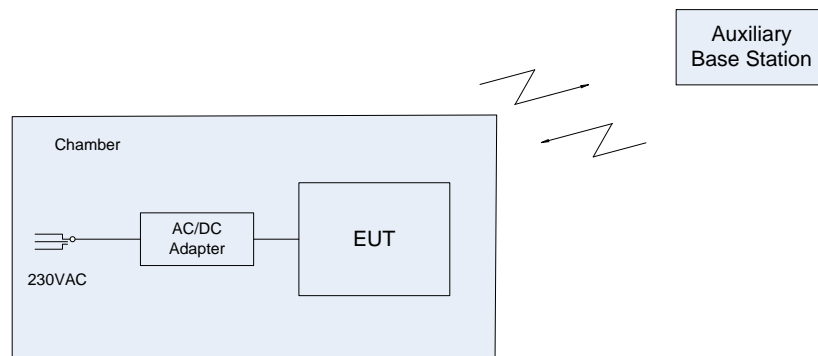
## 7. Mode of Operation

The E.U.T. was operated, transmitting to, and receiving information from the operator, through the Cinterion BGS2 Wireless 2G GSM module. Using the base station, a link was achieved with the E.U.T that transmitted in UL.

The evaluation was done in 2 modes (traffic mode and idle mode) and in 2 channels: (Low and High in 2 operational bands):

1. E-GSM900 (Low: 880.0MHz, High: 915.0MHz)
2. DCS1800 (Low: 1710.2MHz, High: 1784.8MHz)

The E.U.T. was transmitting each channel continuously and with modulation.



**Figure 1. Test Set-up**

## 8. Radiated Emissions GSM-900/DCS-1800 Band

### 8.1 Test Specification

EN 301 511 V9.0.2: 2003, Clauses 5.2.16, 5.2.17

TS 151 010-1 V7.10.0: 2008, Clause 12.2.

### 8.2 Test Procedure

The test was performed in the cellular frequency bands.

The E.U.T. was operated as described in Section 12.2 of TS 151.

Scanning of the frequency range 30 MHz to 4 GHz was performed. The spurious signals were recorded.

The EMI receiver was operated with 120 kHz resolution bandwidth and 300 kHz video bandwidth.

The E.U.T. was replaced by the substitution antenna and a signal generator.

The signal generator was adjusted to the same level at the substitution antenna as the level measured with the E.U.T. This level was recorded.

The above tests were performed in both horizontal and vertical polarizations.

The maximum signal generator levels were recorded as the test results.

A Peak detector was used.

### 8.3 Test Results

The E.U.T met the requirements of EN 301 511 V9.0.2: 2003, Clauses 5.2.16, 5.2.17.

Additional details are given in *Figure 2* and *Figure 5*.

The margin between the spurious emission level and the specification limit is 0.2 dB in the worst case at the frequency of 35.69.5 MHz, horizontal.

## Radiated Emissions GSM-900 Band

E.U.T Description    Self Powered Smart Hub  
Type                    CelloTrack Nano 20  
                              P/N GC9770001-000  
Serial Number:        982966

Specification: EN 301 511 V.9.0.1: 2003, Clauses 5.2.16, 5.2.17

Operating Frequency	Frequency (MHz)	E (dB $\mu$ V/m)	Antenna Pol. (H/V)	Power Output Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Spec. (dBm)	Margin (dB)
Low	1760.0	59.4	V	-41.3	0.5	7.0	-34.8	-30.0	-4.8
	1760.0	59.0	H	-41.0	0.5	7.0	-34.5	-30.0	-4.5
High	1830.0	59.8	V	-40.9	0.5	7.0	-34.4	-30.0	-4.4
	1830.0	58.1	H	-41.9	0.5	7.0	-35.4	-30.0	-5.4

Figure 2. Spurious Emissions GSM-900 Traffic Mode

Operating Frequency	Frequency (MHz)	E (dB $\mu$ V/m)	Antenna Pol. (H/V)	Power Output Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Spec. (dBm)	Margin (dB)
Low	3762.9	41.8	V	-57.3	0.5	9.5	-48.3	-47.0	-1.3
	3961.7	42.4	H	-56.7	0.5	9.5	-47.7	-47.0	-0.7
High	3762.9	41.9	V	-57.2	0.5	9.5	-48.2	-47.0	-1.2
	3961.7	42.3	H	-56.8	0.5	9.5	-47.8	-47.0	-0.8

Figure 3. Spurious Emissions GSM-900 Idle Mode

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.*

## Radiated Emissions DCS-1800 Band

E.U.T Description    Self Powered Smart Hub  
Type                    CelloTrack Nano 20  
                              P/N GC9770001-000  
Serial Number:        982966

Specification: EN 301 511 V.9.0.1: 2003, Clauses 5.2.16, 5.2.17

Operating Frequency	Frequency (MHz)	E (dB $\mu$ V/m)	Antenna Pol. (H/V)	Power Output Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Spec. (dBm)	Margin (dB)
Low	3420.4	58.2	V	-40.9	0.5	9.5	-31.9	-30.0	-1.9
	3420.4	58.0	H	-40.7	0.5	9.5	-31.7	-30.0	-1.7
High	3569.6	59.8	V	-39.3	0.5	9.5	-30.3	-30.0	-0.3
	3569.5	59.5	H	-39.2	0.5	9.5	-30.2	-30.0	-0.2

Figure 4. Spurious Emissions DCS1800 Traffic Mode

Operating Frequency	Frequency (MHz)	E (dB $\mu$ V/m)	Antenna Pol. (H/V)	Power Output Generator (dBm)	Cable Loss (dB)	Antenna Gain (dBi)	EIRP (dBm)	Spec. (dBm)	Margin (dB)
Low	3420.2	41.5	V	-57.6	0.5	9.5	-48.6	-47.0	-1.6
	3420.3	40.0	H	-58.7	0.5	9.5	-49.7	-47.0	-2.7
High	3741.2	41.2	V	-57.9	0.5	9.5	-48.9	-47.0	-1.9
	3889.3	39.6	H	-59.1	0.5	9.5	-50.1	-47.0	-3.1

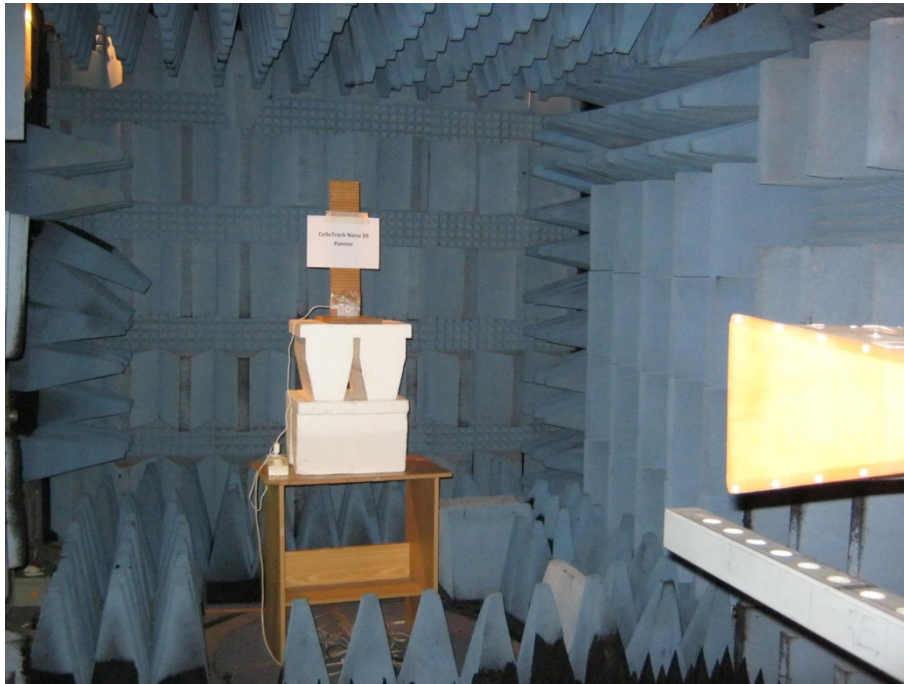
Figure 5. Spurious Emissions DCS1800 Idle Mode

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. Set Up Photographs



**Figure 6 Spurious Emission Test**



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

Test	Test Engineer Name	Signature
Spurious Emission	M. Zohar	



## 11. APPENDIX A - CORRECTION FACTORS

### 11.1 Correction factors for

**CABLE RE Chamber 1M**  
**Manufacturer Suhner**  
**Model: 104A**

Frequency ( MHz)	Ref. (dBm)	Tested ( dBm)	Cable loss (dB)
0.15	-20.11	-20.14	0.03
0.5	-20.1	-20.14	0.04
1	-20.08	-20.12	0.04
2	-19.96	-20.02	0.06
5	-19.94	-20	0.06
10	-19.97	-20.04	0.07
20	-19.94	-20.01	0.07
30	-19.8	-19.96	0.16
40	-19.92	-20.01	0.09
50	-19.91	-20.01	0.1
60	-19.93	-20.02	0.09
70	-19.95	-20.05	0.1
80	-19.98	-20.05	0.07
90	-20.01	-20.08	0.07
100	-20.04	-20.11	0.07
200	-20.11	-20.2	0.09
300	-19.98	-20.11	0.13
400	-20.17	-20.27	0.1
500	-20.13	-20.28	0.15
600	-20.18	-20.36	0.18
700	-20.11	-20.32	0.21
800	-20.08	-20.31	0.23
900	-20.04	-20.3	0.26
1000	-20.15	-20.45	0.3
1200	-20.28	-20.63	0.35
1400	-20.28	-20.6	0.32
1600	-20.2	-20.53	0.33
1800	-20.2	-20.54	0.34
2000	-20.24	-20.61	0.37
2300	-20.29	-20.7	0.41
2600	-20.5	-20.99	0.49
2900	-20.51	-21.01	0.5



**11.2 Correction factors for Amplifiers 83006A and 50-8P**

<b>FREQUENCY (GHz)</b>	<b>GAIN (dB)</b>
<b>1.0</b>	<b>49.3</b>
<b>2.0</b>	<b>51.5</b>
<b>3.0</b>	<b>52.7</b>
<b>4.0</b>	<b>53.8</b>
<b>5.0</b>	<b>51.7</b>
<b>6.0</b>	<b>51.8</b>
<b>7.0</b>	<b>50.1</b>
<b>8.0</b>	<b>47.4</b>
<b>9.0</b>	<b>47.3</b>
<b>10.0</b>	<b>46.2</b>
<b>11.0</b>	<b>47.6</b>
<b>12.0</b>	<b>47.1</b>
<b>13.0</b>	<b>48.4</b>



**11.3 Correction factors for**

**Log Periodic Antenna**

**Model: 3146**

**Serial #: 9505-4081**

**CALIBRATION DATA**

Frequency, MHz	Antenna factor, dB/m <sup>1)</sup>
200	11.55
250	11.60
300	14.43
400	15.38
500	17.98
600	18.78
700	21.17
800	21.16
900	22.67
1000	24.09

<sup>1)</sup> The antenna factor shall be added to receiver reading in dB $\mu$ V to obtain field strength in dB $\mu$ V/m.



**11.4 Correction factors for Biconical Antenna**  
**Model: 3104**  
**Serial #: 2606**

**CALIBRATION DATA**

Frequency, MHz	Near free space antenna factor, dB/m	Geometry specific correction factor, dB	Free space antenna factor, dB/m <sup>1)</sup>
30	12.97	0.13	12.84
35	12.34	0.09	12.25
40	12.03	0.06	11.97
45	11.42	0.02	11.40
50	11.91	0.03	11.88
60	11.92	0.37	11.55
70	9.60	0.25	9.35
80	6.99	-0.45	7.44
90	10.87	-0.34	11.21
100	11.51	-0.06	11.57
120	13.30	0.20	13.10
140	12.56	-0.01	12.57
160	14.49	-0.12	14.61
180	16.53	0.05	16.48
200	15.30	0.15	15.15

<sup>1)</sup> The antenna factor shall be added to receiver reading in dB $\mu$ V to obtain field strength in dB $\mu$ V/m.



**11.5 Correction factors for**

**Double-Ridged Waveguide Horn**

**Model: 3115**

**Serial # 29845**

**At 10 meter range.**

<b>FREQUENCY</b>	<b>AFE</b>	<b>FREQUENCY</b>	<b>AFE</b>
<b>(MHz)</b>	<b>(dB/m)</b>	<b>(MHz)</b>	<b>(dB/m)</b>
1000	22.4	10000	36.1
2000	25.2	11000	37.0
3000	31.1	12000	41.3
4000	30.2	13000	38.1
5000	34.2	14000	41.7
6000	31.6	15000	39.0
7000	34.7	16000	38.8
8000	34.8	17000	43.2
9000	36.2	18000	43.7