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DATE: 7 May 2019

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

FCC/IC Radio Test Report

for

Pointer Telocation

Equipment under test:

Smart Hub

CelloTrack Nano 20 LTE C1 NA, GC9771010

Tested by: _____
M. Zohar

Approved by: _____
D. Shidlowsky

Measurement/Technical Report for

Pointer Telocation

Smart Hub

CelloTrack Nano 20 LTE C1 NA, GC9771010

FCC ID: 2AG69NANO3G
IC: 9975A-NANO3G

This report concerns:	Original Grant: Class II change: X Class I change:
Equipment type:	FCC – Digital Transmission System IC – Low Power Device (2400-2483.5MHz)

Measurement procedure used is ANSI C63.10 2013

Substitution Method used as in ANSI/TIA-603-D: 2010.

Application for Certification
prepared by:
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Applicant for this device:
(different from "prepared by")
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Israel
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E-mail: Igorr@pointer.com

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1. General Information

1.1 Administrative Information

Manufacturer:	Pointer Telocation
Manufacturer's Address:	14 Hamelacha, PO Box 11473 Roash Haain, Israel Tel: + +972 73 2622320
Manufacturer's Representative:	Igor Rogov
Equipment Under Test (E.U.T):	Smart Hub
Equipment Model No.:	CelloTrack Nano 20 LTE C1 NA, GC9771010
Equipment Serial No.:	2308679
HVIN:	1010
Date of Receipt of E.U.T:	February, 03, 2019
Start of Test:	February, 05, 2019
End of Test:	February, 06, 2019
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St, Lod, Israel 7116002
Test Specifications:	FCC Part 22, 24, 27

1.2 List of Accreditations

The EMC laboratory of I.T.L. is accredited by/registered with 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 is IL1005.
3. The Israel Ministry of the Environment (Israel), Registration No. 1104/01.
4. Innovation, Science and Economic Development (ISED) Canada CAB Identifier: IL1002

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.

1.3 Product Description

Smart hub for Asset & Cargo Management IoT applications supporting 4G cellular communications, GNSS, short range RF and wide sensing capabilities.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.10 2013 and ANSI/TIA-603-D: 2010. Radiated testing was performed at an antenna to EUT distance of 3 meters.

1.5 Test Facility

Both conducted and radiated emissions tests were performed at I.T.L.'s testing facility in Lod, Israel. I.T.L.'s EMC Laboratory is accredited by A2LA, certificate No. 1152.01 and its FCC Designation Number is IL1005.

1.6 Measurement Uncertainty

Conducted Emission

Conducted Emission (CISPR 11, EN 55011,CISPR 22, EN 55022, ANSI C63.4)
0.15 – 30 MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 3.44 dB

Radiated Emission

Radiated Emission (CISPR 11, EN 55011, CISPR 22, EN 55022, ANSI C63.4) for open site:
30-1000MHz:
Expanded Uncertainty (95% Confidence, K=2):
± 4.96 dB

1 GHz to 6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.19 dB

>6 GHz
Expanded Uncertainty (95% Confidence, K=2):
±5.51 dB

2. System Test Configuration

2.1 Justification

1. The E.U.T. was originally FCC certified on 11/02/2016 under FCC ID: 2AG69NANO3G and IC certified on 11/4/2016 under IC: 9975A-NANO3G.
2. The E.U.T contains 2 transceivers: a BLE, as certified above, and a 3G cellular approved module LTE/WCDMA module, manufactured by Cinterion EHS6 Wireless 3G module, FCC ID: QIPEHS6-A, IC: 7830A-EHS6A.
3. The manufacturer wishes to replace the above Gemalto cellular module with the following LTE/WCDMA 4G module, manufactured by Gemalto M2M GmbH, model Cinterion ELS61-USA, FCC ID: QIPELS61-USA, IC: 7830A-ELS61USA. See customer's Declaration of Change on following page.
4. A C2PC is requested based on this change. Intermodulation Radiated testing was performed and RF exposure was calculated.
5. The E.U.T. met the requirements of a C2PC.
6. Testing was performed with simultaneous transmission at maximum power and at the following frequencies:
   For BLE: 2402.0MHz
   For 4G cellular: 1910.0MHz
7. Testing was performed in 3 orthogonal orientations to find the "worst case" radiation which was determined to be the X axis.
8. Evaluation was performed in charge mode for "worst case" emissions.

2.2 EUT Exercise Software

No exercise software was needed in order to achieve compliance.

2.3 Special Accessories

No special accessories were needed in order to achieve compliance.

2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.

2.5 Configuration of Tested System

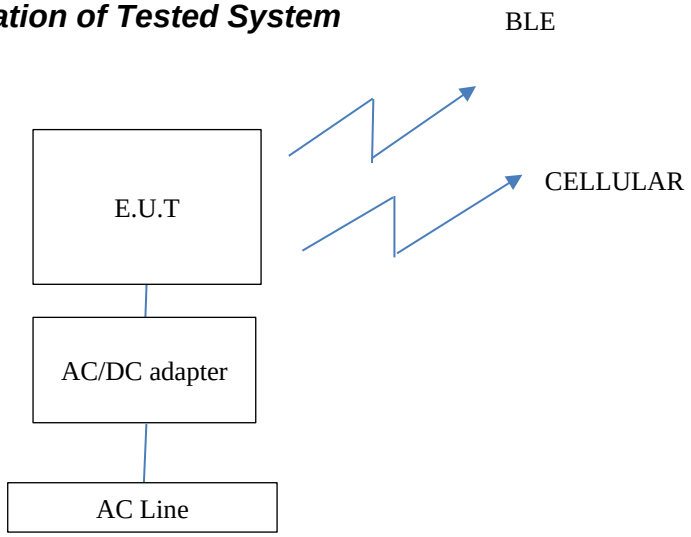

Figure 1. Radiated Test Set-Up

10 April 10, 2019

To whom it may concern,

Differences between Pointer Telocation CelloTrack Nano 3G/4G devices

Introduction

CelloTrack Nano is a family of a full featured 2G/3G/4G end units for Asset tracking applications.

Names and Part numbers

Model Name/Number:	CelloTrack Nano 20 3G/GC9771004-000
Model Name/Number:	CelloTrack Nano 20 LTE C1 NA/ GC9771010

Hardware main differences

In order to support 4G modem follow HW changes applied:

1. **Modem change** - modem change from Gemalto EHS6-A (3G) to ELS61-USA (4G). both modem have same foot print
2. **Cellular Antenna change**- The antenna is PCB embedded antenna that have to be modified in order to support 4G bands and stand with all FCC\CE regulations.
3. **Digital audio codec support**- The ELS61-USA supporting digital audio (4G) instead of analog audio supported by EHS6-A (3G). the modem change required additional audio codec component have to be added to the board "MAX9867ETJ " instead of analog audio amplifier.

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3. Test Set-Up Photos

Figure 2. Intermodulated Radiated Emission Test

4. Intermodulation Radiated

4.1 Test Procedure

(Temperature (24°C)/ Humidity (49%RH))

The test method was based on ANSI/TIA-603-D: 2010, Section 2.2.12 Unwanted Emissions: Radiated Spurious.

The E.U.T was tested inside the shielded room at a distance of 3 meters and the E.U.T was placed on a non-metallic table, 1.5 meters above the ground. The frequency range 1.0GHz -5.0GHz was scanned. The readings were maximized by the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

The E.U.T. was replaced by a substitution antenna (dipole 30MHz-1GHz, Horn Antenna above 1GHz) driven by a signal generator. The height was readjusted for maximum reading. The signal generator level was adjusted to obtain the same reading on the EMI receiver as in step (a).
The signals observed in step (a) were converted to radiated power using:

P_d(dBm) = P_g(dBm) – Cable Loss (dB) + Substitution Antenna Gain (dBd)

P_d = Dipole equivalent power (result).
P_g = Signal generator output level.

A Peak detector was used for this test.

The table below describe only results with the highest radiation.

4.2 Test Limit

The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10* log (P) dB, yielding –13dBm.

4.3 Test Results

JUDGEMENT: Passed

Intermodulation Radiated

Freq.	Pol.	Maximum Peak Level	Signal Generator RF Output	Cable Loss	Antenna Gain	ERP Level	Limit	Margin
(MHz)	(V/H)	(dBµV/m)	(dBm)	(dB)	(dBd)	(dBm)	(dBm)	(dB)
926.0	V	46.6	-54.8	0.5	5.0	-50.3	-13.0	-37.3
	H	46.8	-53.4	0.5	5.0	-48.9	-13.0	-35.9
1418.0	V	48.2	-50.9	0.5	4.9	-46.5	-13.0	-33.5
	H	48.7	-50.5	0.5	4.9	-46.1	-13.0	-33.1
2894.0	V	55.2	-49.6	1.0	7.9	-42.7	-13.0	-29.7
	H	55.0	-49.5	1.0	7.9	-42.6	-13.0	-29.6
3386.0	V	53.5	-51.6	1.0	7.9	-44.7	-13.0	-31.7
	H	53.1	-51.5	1.0	7.9	-44.6	-13.0	-31.6
3878.0	V	57.2	-48.0	1.0	7.4	-41.6	-13.0	-28.6
	H	57.0	-48.0	1.0	7.4	-41.6	-13.0	-28.6
4370.0	V	56.0	-49.0	1.0	7.4	-42.6	-13.0	-29.6
	H	56.9	-48.0	1.0	7.4	-41.6	-13.0	-28.6

Figure 3 Intermodulation Radiated Results

4.4 Test Instrumentation Used; Radiated Measurements Intermodulation

Instrument	Manufacturer	Model	Serial Number	Calibration	
				Last Calibration Date	Next Calibration Due
EMI Receiver	HP	85422E	3906A00276	February 19, 2018	February 28, 2019
RF Filter Section	HP	85420E	3705A00248	February 19, 2018	February 28, 2019
EMI Receiver	R&S	ESCI7	100724	February 19, 2018	February 28, 2019
Spectrum Analyzer	HP	8593EM	3536A00120ADI	February 20, 2018	February 28, 2019
Antenna Biconical	EMCO	3110B	9912-3337	May 31, 2018	May 31, 2019
Antenna Log Periodic	EMCO	3146	9505-4081	May 31, 2018	May 31, 2019
Horn Antenna 1G-18G	ETS	3115	29845	May 31, 2018	May 31, 2021
Signal Generator	WILTRON	6747B	278007	February 20, 2018	February 20. 2019
Signal Generator	HP	8648C	3623A04126	February 19, 2018	February 28, 2019
Semi Anechoic Civil Chamber	ETS	S81	SL 11643	NCR	NCR
Antenna Mast	ETS	2070-2	-	NCR	NCR
Turntable	ETS	2087	-	NCR	NCR
Mast & Table Controller	ETS/EMCO	2090	9608-1456	NCR	NCR

Figure 4 Test Equipment Used

5. Antenna Information

1.7 dBi, BLE chip
2.15 dBi, cellular GSM

6. RF Exposure/Safety

The typical placement of the E.U.T. is on a container. The typical distance between the E.U.T. and the user is at least 20cm.

Calculation of Maximum Permissible Exposure (MPE)
Based on Section 1.1310 Requirements

(a) FCC limits for 1.5GHz-100GHz is:

$$1\frac{mW}{cm^2}$$

Using table 1 of Section 1.1310 limit for general population/uncontrolled exposures, the above level is an average over 30 minutes.

(b) The power density produced by the E.U.T. is

$$S = \frac{P_t G_t}{4\pi R^2}$$

P_t- Transmitted Peak Power

G_T- Antenna Gain

R- Distance from Transmitter (using 20cm worst case)

For cellular transmitter:

Conducted power (worst case) – 0.22W + 10% = 242mW

Antenna gain 2.15dBi = 1.64059 numeric

S_1= 242 x 1.64/4π(400) = 0.079 mw/cm^2

For 2.4GHz transmitter:

Conducted power (worst case) – 7.4dbm = 5.5mW

Antenna gain 1.72dBi = 1.49numeric

S_2= 5.5 x 1.49/4π(400) = 0.001 mw/cm^2

Co-located RF exposure

$S_1 + S_2$ = 0.079 + 0.001 = 0.08 mw/cm^2

All are below the FCC/IC limits

7. APPENDIX A - CORRECTION FACTORS

7.1 Correction factor for RF CABLE for Semi Anechoic Chamber

ITL # 1841

FREQ (MHz)	LOSS (dB)
1000.0	1.5
2000.0	2.1
3000.0	2.7
4000.0	3.1
5000.0	3.5
6000.0	4.1
7000.0	4.6
8000.0	4.9
9000.0	5.7
10000.0	5.7
11000.0	6.1
12000.0	6.1
13000.0	6.2
14000.0	6.7
15000.0	7.4
16000.0	7.5
17000.0	7.9
18000.0	8.1
19000.0	8.8
20000.0	9.1

NOTES:

1. *The cable is manufactured by Commscope*
2. *The cable type is 0623 WBC-400, serial # G020132 and 10m long*

7.2 Correction factors for biconical antenna – ITL # 1356

Model: EMCO 3110B

Serial No.:9912-3337

Frequency [MHz]	**ITL 1356 AF [dB/m]**
30	13.00
35	10.89
40	10.59
45	10.63
50	10.12
60	9.26
70	7.74
80	6.63
90	8.23
100	11.12
120	13.16
140	13.07
160	14.80
180	16.95
200	17.17

7.3 Correction factors forlog periodic antenna – ITL # 1349

Model: EMCO 3146

Serial No.:9505-4081

Frequency [MHz]	**ITL 1349 AF [dB/m]**
200	11.58
250	12.04
300	14.76
400	15.55
500	17.85
600	18.66
700	20.87
800	21.15
900	22.32
1000	24.22

7.4 Correction factors for Double –Ridged Waveguide Horn ANTENNA

Model: 3115
Serial number:29845
3 meter range; ITL # 1352

FREQUENCY (GHz)	AFE (dB/m)	FREQUENCY (GHz)	AFE (dB/m)
0.75	25	9.5	38
1.0	23.5	10.0	38.5
1.5	26.0	10.5	38.5
2.0	29.0	11.0	38.5
2.5	27.5	11.5	38.5
3.0	30.0	12.0	38.0
3.5	31.5	12.5	38.5
4.0	32.5	13.0	40.0
4.5	32.5	13.5	41.0
5.0	33.0	14.0	40.0
5.5	35.0	14.5	39.0
6.0	36.5	15.0	38.0
6.5	36.5	15.5	37.5
7.0	37.5	16.0	37.5
7.5	37.5	16.5	39.0
8.0	37.5	17.0	40.0
8.5	38.0	17.5	42.0
9.0	37.5	18.0	42.5