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DATE: 20 January 2021

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

Test Report According to FCC Part 15 Subpart B ICES-003, Issue 6: 2016 Updated April 2017

for

Pointer Telocation

Equipment under test:

Asset Tracking Device

LV550

Tested by: _____

M. Zohar

Approved by: _____

D. Shidlowsky

TABLE OF CONTENTS

1. General Information

1.1 Administrative Information

Manufacturer:	Pointer Telocation
Manufacturer's Address:	14 Hamelacha, PO Box 11473 Rohash Haain, Israel Tel: +972 73 2622320
Manufacturer's Representative:	Igor Rogov
Equipment Under Test (E.U.T):	Asset Tracking Device
Equipment Model No.:	LV550
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	December 21, 2020
Start of Test:	December 21, 2020
End of Test:	December 21, 2020
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	FCC Part 15 Subpart B, ICES-003 Issue 6: 2016, Updated April 2017

1.2 Abbreviations and Symbols

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

AC	alternating current
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
EMC	electromagnetic compatibility
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
QP	quasi-peak
PC	personal computer
RF	radio frequency
RE	radiated emission
sec	second
V	volt

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.), Designation No. IL1005.
3. The Israel Ministry of Environmental Protection, Registration No. 1104/01.
4. Department of 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.

2. Applicable Standards

2.1	**Code of Federal Regulations Title 47, Federal Communications Commission Part 15, Subpart B**	*Unintentional Radiators.*
2.2	**ICES-003, Issue 6; 2016, Updated April 2017**	*Spectrum Management and Telecommunications Interference-Causing Equipment Standard Information Technology Equipment (Including Digital Apparatus) —Limits and Methods of Measurement*
2.3	**CAN/CSA-CEI/IEC CISPR 22: 10**	*Information technology equipment — Radio disturbance characteristics — Limits and methods of measurement*
2.4	**ANSI C63.4-2014**	*American National Standards for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz.*

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. System Test Configuration

4.1 Mode of Operation

The EUT was powered on with battery. All radio devices were in receive mode.

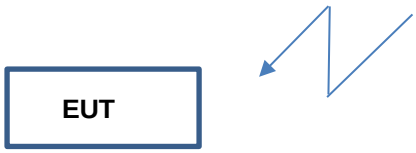

Figure 1. Configuration of Tested System

4.2 Equipment Modifications

No modifications were required in order to achieve compliance.

5. Summary of Test Results

Test	Results
Radiated Emissions FCC Part 15, Subpart B, Class B ICES-003, Issue 6: 2016, Updated April 2017, Class B	The E.U.T met the performance requirements of the specification. The margin between the emission level and the specification limit was 7.5 dB in the worst case at the frequency of 80.0 MHz, horizontal polarization.

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

The LV550 is a standalone dual-powered “deploy and forget” unit for asset tracking and freight visibility, requiring no external power connection. Solar-powered, the LV550 comes with long lasting primary batteries that ensure extended years of maintenance free reliable performance; in addition, its wireless sensor connectivity provides measurements of the various environmental conditions (temperature, humidity, shock, etc.) of your cargo. The LV550, with its highly rugged durable enclosure sized to perfectly fit the grooves and ceilings of containers, is an ideal solution for containers, trailers or assets in remote locations and harsh conditions, where no other recharging or Cellular communication facilities exist.

In case of lack of Cellular connective, LV550 equipped with Iridium satellite transceiver , giving it ability to communicate anywhere across the globe.

EUT and Support Equipment Used During Tests

Use*	Product Type	Manufacturer	Model	Comments
EUT	**LV550**	**Pointer Telocation Inc**		
AE				
AE				
AE				
SIM				

Note*: Use abbreviations:

EUT - Equipment Under Test

AE - Auxiliary/Associated Equipment

SIM - Simulator (Not Subjected to Test)

Description of Interface Cables for Testing:

Cable Type	Shield	Length [m]	Ferrite	Connection 1	Connection 2
N/A					

Input/ Output Ports:

Port No.	Name	Type*	Cable Max. >3m	Cable Shielded	Comments (Sip/Sop lines must include description of use)
0	**Enclosure**	**N/E**	**--**	**--**	**none**
1	**Mains**	**Batt**	**-**	**-**	
2					
3					

Supplementary information:Click or tap here to enter text.

*Note: **AC**= AC Power Port **DC** = DC Power Port **N/E** = Non-Electrical **Batt**=Battery

Sip/Sop = Signal Input/output Port **PC** – Patient-Coupled Cable

TP = Telecommunication Ports

EUT Internal Operating Frequencies (Clock):

Frequency (MHz)	Description	Frequency (MHz)	Description
16 XTAL	TCXO crystal		Satellite
2480.0	BLE		
1910.0	Cellular		

Power Interface

Mode No.	Voltage (V)	Current (A)	Power (W)	Frequency (DC/AC-Hz)	Phases (No.)	Comments
Rated	**3.6VDC**	**0.1**				
Supplementary information:						

7. List of Test Equipment

7.1 Emission Tests

The equipment indicated below were used for testing Radiated Emission (**RE**)

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

Instrument	Manufacturer	Model	Serial No.
EMI Receiver	HP	8542E	3906A00276
EMI Receiver Filter	HP	85420E	3705A00248
EMC Analyzer	HP	HP8593	3536A00120
Biconical Antenna	EMCO	3110B	9912-3337
Log Periodic Antenna	EMCO	3146	9505-4081
Horn Antenna	EMCO	3115	29845
Antenna Mast	ETS	2070-2	9608-1497
Turntable	ETS	2087	-
Mast & Table Controller	ETS/EMCO	2090	9608-1456

8. Radiated Emission

8.1 Test Specification

30-13,000 MHz, FCC Part 15, Subpart B, CLASS B
30-12,000 MHz, ICES-003 Issue 6: 2016, Updated April 2017, CLASS B

8.2 Test Procedure

The E.U.T operation mode and test configuration are as described in section 4.

A preliminary measurement to characterize the E.U.T was performed inside the shielded room at a distance of 3 meters, using peak detection mode and broadband antennas. The preliminary measurements produced a list of the highest emissions.

The E.U.T was then transferred to the open site, and placed on a remote-controlled turntable. The E.U.T was placed on a non-metallic table, 0.8 meters above the ground. The effect of varying the position of the cables was investigated to find the configuration that produces maximum emission. The configuration tested is shown in photographs *Radiated Emission Test 30-200 MHz* to *Figure 5. Radiated Emission Test Above 1 GHz.*

The E.U.T. highest frequency source or used frequency is 2480.0MHz.

The frequency range 30-13000 MHz was scanned, and the list of the highest emissions was verified and updated accordingly.

In the frequency range of 30 MHz – 1000 MHz, the emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements. The specification limits and applicable correction factors are pre-loaded to the receiver.

The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.

Verification of the E.U.T emissions was based on the following methods:
Turning the E.U.T on and off.
Using a frequency span less than 10 MHz.
Observation of the signal level during turntable rotation. Background noise is not affected by the rotation of the E.U.T.

The emissions were measured at a distance of 3 meters.

In the frequency range 1.0 – 13.0 GHz, a computerized EMI receiver complying to CISPR 16 requirements was used. During peak measurements, the I.F. bandwidth was 1 MHz, and video bandwidth 3 MHz. During average measurements, the I.F. bandwidth was 1 MHz and video bandwidth was 100 Hz.

The readings were maximized by adjusting the turntable azimuth between 0-360°, and the antenna polarization.
Verification of the E.U.T emissions was based on the following methods: turning the E.U.T on and off; using a frequency span less than 10 MHz; observation of the signal level during turntable rotation. (Background noise is not affected by the rotation of the E.U.T.)

The emissions were measured at a distance of 3 meters inside the anechoic chamber.

The field strength is calculated directly by the EMI Receiver software, and a "Correction Factors" data disk, using the following equation:

FS = RA + AF + CF

Where:

FS:	Field strength [dBμV/m]
RA:	Receiver Amplitude [dBμV]
AF:	Receiving Antenna Correction Factor [dB/m]
CF:	Cable attenuation Factor [dB]

Example: FS = 30.7 dBμV (RA) + 14.0 dB (AF) + 0.9 dB (CF) = 45.6 dBμV

8.3 Test Results

The E.U.T met the requirements of the FCC Part 15, Subpart B, Class B and ICES-003 Issue 6: 2016, Updated April 2017, Class B specifications.

The margin between the emission level and the specification limit is 7.5 dB in the worst case at the frequency of 80.0 MHz, vertical polarization.

In the frequency of 960MHz to 13.0GHz, no emissions detected above the noise level which is at least 20dB margin below the limit.

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

Radiated Emission

E.U.T Description	Asset Tracking Device
Type	LV550
Serial Number:	Not designated

Specification: FCC Part 15, Subpart B, Class B
ICES-003 Issue 6: 2016, Updated April 2019, Class B

Antenna Polarization: Horizontal/Vertical
Antenna: 3 meters distance
Frequency range: 30 MHz to 960 MHz
Detectors: Peak, Quasi-peak

Frequency	Antenna Polarization		Antenna Height	Peak Reading	QP Reading	Limit	Margin
(MHz)	Hor.	Ver.	(cm)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)
80.0	X		105.0	41.6(N.L)	32.5	40.0	-7.5
80.0		X	100.0	40.7(N.L)	32.0	40.0	-8.0
160.0	X		123.0	42.1(N.L)	32.8	43.5	-10.7
160.0		X	115.0	42.9(N.L)	33.0	43.5	-10.5
250.0	X		100.0	38.8(N.L)	29.9	46.0	-16.1
250.0		X	100.0	39.5(N.L)	30.0	46.0	-16.0

Figure 2. Radiated Emission Results

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 3. Radiated Emission Test 30-200 MHz

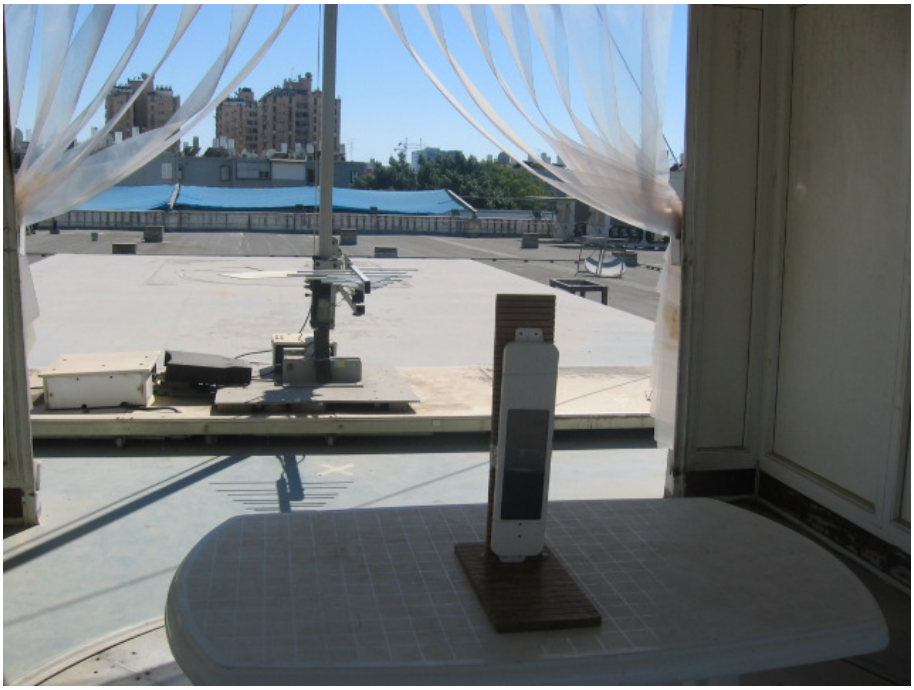

Figure 4. Radiated Emission Test 200-1000 MHz

Figure 5. Radiated Emission Test Above 1 GHz

10. APPENDIX A - CORRECTION FACTORS

10.1 Correction factors for RF OATS Cable 35m

ITL #1911

Frequency (MHz)	loss (dB)
30.0	1.3
50.0	1.7
100.0	2.6
200.0	3.7
300.0	4.7
400.0	5.5
500.0	6.3
600.0	7.0
700.0	7.6
800.0	8.4
900.0	9.0
1000.0	9.6

10.2 Correction factors for RF Cable Semi Anechoic Chamber

ITL #1840

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 # 0020132 and 10m long*

10.3 Correction factors for Biconical antenna

Model: 3110B

Antenna serial number: 9912-3337

Frequency [MHz]	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

10.4 Correction factors for Log Periodic ANTENNA

Model: 3146
Antenna serial number: 9505-4081
3 meter range

Frequency	AF
[MHz]	[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

10.5 Correction factors for Double-Ridged Waveguide Horn

Model: 3115, S/N 29845
at 3 meter range.

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

11. APPENDIX B - MEASUREMENT UNCERTAINTY

11.1Radiated 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):

± 4.98 dB