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DATE: 24 June 2015

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

FCC Radio Test Report

for

AeroScout Ltd.

Equipment under test:

Tag/ Exciter Deployment (TED) Tool

TED-1000

Tested by: _____

M. Zohar

Approved by: _____

D. Shidlowsky

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Measurement/Technical Report for
AeroScout Ltd.

Tag/ Exciter Deployment (TED) Tool

TED-1000

FCC ID: Q3HTED

IC: 5115A-TED

This report concerns:	Original Grant: X Class I change: Class II change:
Equipment Type:	Part 15 Low Power Transmitter Below 1705 kHz
Limits used:	47CFR15 Section 15.209 RSS-210, Issue 8, December 2010

Measurement procedure used is ANSI C63.4: 2009.

Application for Certification
prepared by:
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Applicant for this device:
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1. General Information

1.1 Administrative Information

Manufacturer:	AeroScout Ltd.
Manufacturer's Address:	Building 11, 6th floor, 2 Ilan Ramon St., Science Park, Ness Ziona, 7403635 Israel Tel: +972-8-936-9315 Fax: +972-8-936-5977
Manufacturer's Representative:	Leonid Genusin
Equipment Under Test (E.U.T):	Tag/ Exciter Deployment (TED) Tool
Equipment Model No.:	TED-1000
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	06.05.2015
Start of Test:	06.05.2015
End of Test:	08.05.2015
Test Laboratory Location:	I.T.L (Product Testing) Ltd. 1 Batsheva St., Lod ISRAEL 7120101
Test Specifications:	FCC Part 15, Subpart C RSS-210, Issue 8, December 2010 RSS Gen Issue 4, November 2014

1.2 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 US1004.
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 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.

1.3 Product Description

Tag/ Exciter Deployment (TED) Tool, is a small form factor version of the Tag Activator/Exciter Detector which will be used mainly to configure, initialize, activate, and get battery information of Tags and to measure the coverage/ leakage of LF/US Exciters. The TED will replace the current Tag Activator that is becoming End of Life and the Exciter Detector.
The TED shall have two operating modes: a USB connection to PC/laptops and a wireless mode for use with a smartphone/tablet. The functionality of the TED with these mobile devices shall be supported by an app that will provide limited TM/ED functions.
The E.U.T. contains a 2.4 GHz WiFi module FCC/IC certified under
FCC ID: PPD-AR4100, IC: 4104A-AR4100.
The E.U.T. also contains a 2.4 GHz Bluetooth module FCC/IC certified under
FCC ID: VPYLBZY, IC: 772C-LBZY.
There isn't any simultaneous transmission.

1.4 Test Methodology

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4: 2009. 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 US1004.

1.6 Measurement Uncertainty

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

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

2. System Test Configuration

2.1 Justification

Fundamental emission screening was performed in 3 orthogonal axes. The worst case orientation was the Z axis. See table below for further information.

	Z Axis (dBuV/m)	**Y Axis** (dBuV/m)	**X Axis** (dBuV/m)
Fundamental Emission	96.2	73.6	85.0

Figure 1. Screening Results

2.2 Special Accessories

No special accessories were needed to achieve compliance.

2.3 Equipment Modifications

No equipment modifications were required to achieve compliance.

2.4 Configuration of Tested System

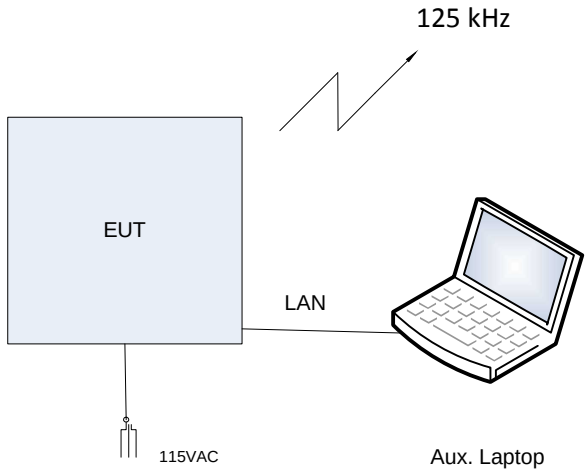

Figure 2. Configuration of Tested System

3. Test Set-up Photos

Figure 3. Conducted Emission Test

Figure 4. Radiated Emission Test

4. Conducted Emission From AC Mains

4.1 Test Specification

FCC Part 15, Subpart C, Section 15.207

4.2 Test Procedure

The E.U.T Configuration of Tested System are as described in Section 2.4. In order to minimize background noise interference, the conducted emission testing was performed inside a shielded room (see Section 3), with the E.U.T placed on an 0.8 meter high wooden table, 0.4 meter from the room's vertical wall. In the case of a floor-standing E.U.T., it was placed on the horizontal ground plane.

The E.U.T was powered from 115 V AC / 60 Hz via 50 Ohm / 50 µHn Line Impedance Stabilization Network (LISN) on the phase and neutral lines. The LISN's were grounded to the shielded room ground plane (floor), and were kept at least 0.8 meters from the nearest boundary of the E.U.T

The center of the E.U.T.'s AC cable was folded back and forth, in order to form a bundle less than 0.40 meters and a total cable length of 1 meter.

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 the photograph, *Figure 3. Conducted Emission Test.*

The emission voltages at the LISN's outputs were measured using a computerized receiver, complying with CISPR 16 requirements. The specification limits are loaded to the receiver via a 3.5" floppy disk and are displayed on the receiver's spectrum display.

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

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

4.3 Test Results

JUDGEMENT: Passed by 12.62 dB

The EUT met the F.C.C. Part 15, Subpart C, Class B specification requirements.

The margin between the emission levels and the specification limit is, in the worst case, 14.88 dB for the phase line at 4.254 MHz and 12.62 dB at 0.198 MHz for the neutral line.

The details of the highest emissions are given in *Figure 5* to *Figure 8*.

Conducted Emission

E.U.T Description	Tag/ Exciter Deployment (TED) Tool
Type	TED-1000
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	150 kHz	46.85	-19.14
1	Quasi Peak	202 kHz	48.51	-15.00
2	Average	202 kHz	33.59	-19.93
1	Quasi Peak	262 kHz	40.51	-20.85
1	Quasi Peak	326 kHz	36.00	-23.54
1	Quasi Peak	1.942 MHz	39.03	-16.96
2	Average	1.966 MHz	27.10	-18.89
1	Quasi Peak	2.126 MHz	39.43	-16.56
2	Average	2.234 MHz	28.80	-17.19
1	Quasi Peak	4.254 MHz	41.11	-14.88
2	Average	4.254 MHz	30.50	-15.49
1	Quasi Peak	6.866 MHz	32.25	-27.74
2	Average	6.926 MHz	26.35	-23.64
2	Average	8.434 MHz	27.10	-22.89
2	Average	10.786 MHz	24.75	-25.24
1	Quasi Peak	18.858 MHz	32.80	-27.19
2	Average	18.998 MHz	30.57	-19.42
2	Average	20.518 MHz	28.11	-21.88
1	Quasi Peak	20.522 MHz	33.99	-26.00
2	Average	21.278 MHz	29.20	-20.79

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Figure 5. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta 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	Tag/ Exciter Deployment (TED) Tool
Type	TED-1000
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C
Lead:	Phase
Detectors:	Peak, Quasi-peak, Average

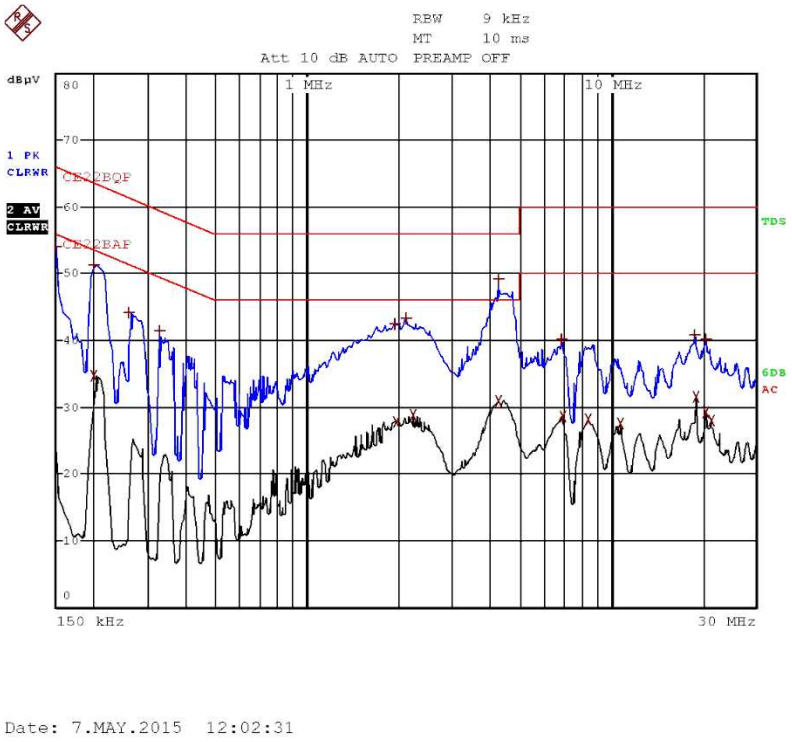

Figure 6. Detectors: Peak, Quasi-peak, Average

Notes:

1. Horizontal axis shows logarithmic frequency scale.

2. The vertical axis shows amplitude (in dB µV).

3. Peak detection is designated by the top of each vertical line.

4. Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.

5. Average detection is designated by the second dash mark (from the top) of each vertical line.

Conducted Emission

E.U.T Description	Tag/ Exciter Deployment (TED) Tool
Type	TED-1000
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average

EDIT PEAK LIST (Final Measurement Results)

Trace1: CE22BQP
Trace2: CE22BAP
Trace3: ---

	TRACE	FREQUENCY	LEVEL dBµV	DELTA LIMIT dB
1	Quasi Peak	150 kHz	48.89	-17.10
2	Average	150 kHz	27.02	-28.97
1	Quasi Peak	198 kHz	51.06	-12.62
2	Average	206 kHz	35.30	-18.05
1	Quasi Peak	266 kHz	43.00	-18.24
2	Average	274 kHz	27.35	-23.64
1	Quasi Peak	330 kHz	40.00	-19.44
1	Quasi Peak	1.978 MHz	37.88	-18.11
1	Quasi Peak	2.142 MHz	37.62	-18.37
2	Average	4.39 MHz	30.92	-15.07
1	Quasi Peak	4.47 MHz	42.14	-13.85
1	Quasi Peak	5.822 MHz	32.52	-27.47
1	Quasi Peak	6.058 MHz	33.16	-26.83
2	Average	18.998 MHz	31.82	-18.17
1	Quasi Peak	19.35 MHz	34.48	-25.51
2	Average	20.518 MHz	30.66	-19.33
2	Average	21.426 MHz	25.96	-24.03
2	Average	21.57 MHz	26.67	-23.32
2	Average	21.646 MHz	25.35	-24.64
2	Average	21.778 MHz	27.18	-22.81

Date: 7.MAY.2015 11:56:06

Figure 7. Detectors: Peak, Quasi-peak, AVERAGE

Note: QP Delta/Av Delta 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	Tag/ Exciter Deployment (TED) Tool
Type	TED-1000
Serial Number:	Not designated

Specification:	FCC Part 15, Subpart C
Lead:	Neutral
Detectors:	Peak, Quasi-peak, Average

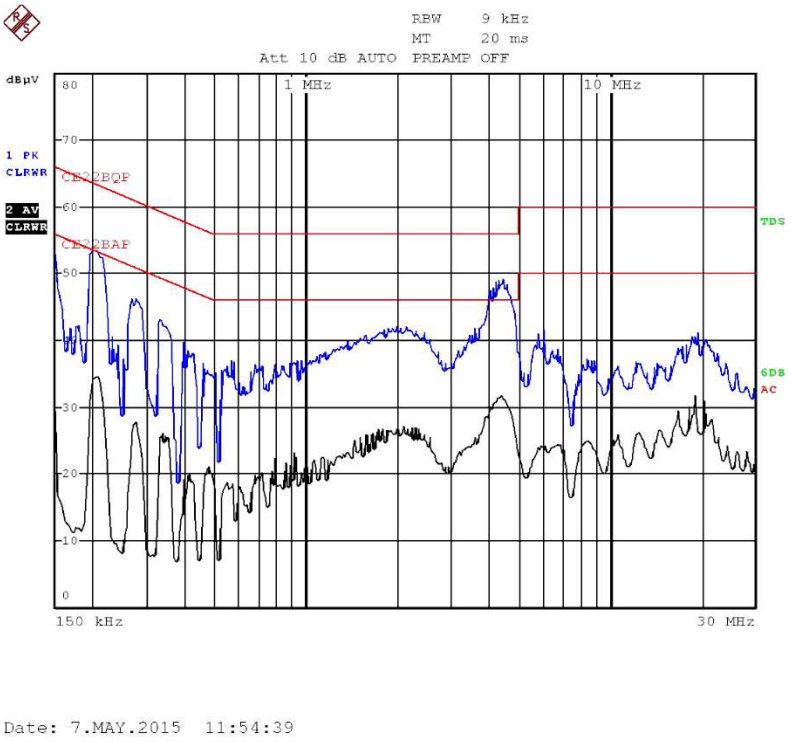

Figure 8 Conducted Emission: NEUTRAL
Detectors: Peak, Quasi-peak, Average

Notes:

1. *Horizontal axis shows logarithmic frequency scale.*
2. *The vertical axis shows amplitude (in dB µV).*
3. *Peak detection is designated by the top of each vertical line.*
4. *Quasi-peak detection is designated by the first dash mark (from the top) of each vertical line.*
5. *Average detection is designated by the second dash mark (from the top) of each vertical line.*

4.4 Test Instrumentation Used, Conducted Measurement

Instrument	Manufacturer	Model	Serial No.	Last Calibration Date	Period
LISN	Fischer	FCC-LISN-25A	127	March 16, 2015	1 year
Transient Limiter	HP	11947A	3107A03041	May 13, 2014	1 year
EMI Receiver	Rohde & Schwarz	ESCI7	100724	January 4, 2015	1 year

Figure 9 Test Equipment Used

5. 26dB Minimum Bandwidth

5.1 Test Specification

F.C.C., Part 2 Section 2.1049
RSS GEN 2014, Section 6.6

5.2 Test Procedure

The E.U.T was placed on a non-metallic table, 0.8 meters above the ground plane, on a remote-controlled turntable in the OATS. The test distance was 3 meters. The transmitter unit operated with normal modulation. The EMI receiver was set to 1 kHz resolution BW. The spectrum bandwidth of the transmitter unit was measured and recorded. The test was performed to measure the transmitter occupied bandwidth. The EUT was set up as shown in Figure 3, and its proper operation was checked. The transmitter occupied bandwidth was measured with the EMI receiver as frequency delta between reference points on modulation envelope. The E.U.T. was tested at 125 KHz.

5.3 Test Results

Operational Antenna (kHz)	Bandwidth Reading (kHz)
125.0	10.54

Figure 10 Test Results

JUDGEMENT: Passed

For additional information see *Figure 11*.

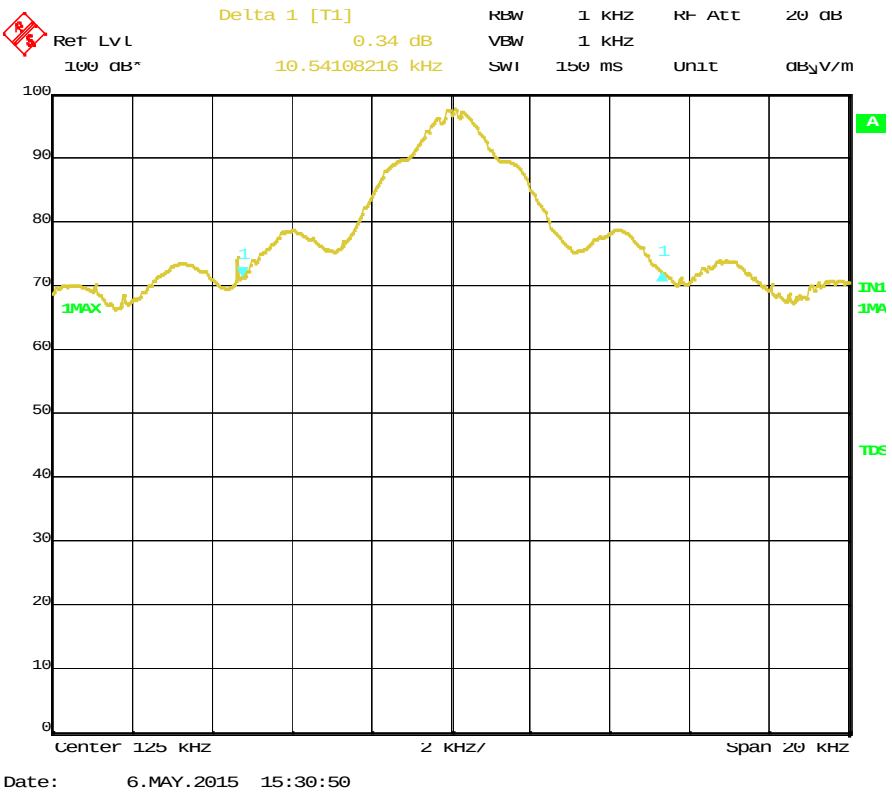

Figure 11. 26dB Bandwidth

5.4 Test Equipment Used; 26 dB Minimum Bandwidth

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	R&S	ESIB7	100120	January 1, 2015	1 year
Active Loop Antenna	EMCO	6502	2950	November 4, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 12 Test Equipment Used

6. Field Strength of Fundamental

6.1 Test Specification

F.C.C., Part 15, Subpart C, 15.209

RSS 210 Issue 8, Section 2.5

6.2 Test Procedure

The E.U.T. configuration of tested system are as described in Section 2.

The E.U.T. was placed on a non-conductive table, 0.8 meters above the O.A.T.S. ground plane.
The EMI receiver was set to the E.U.T. Fundamental Frequency (125 kHz) and Peak Detection.
The distance between the E.U.T. and test antenna was 3 meters.

The turntable and antenna were adjusted for maximum level reading on the EMI receiver. The loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter.

.

6.3 Test Results

Peak Reading (dB«V/m)	Average Factor (dB)	AVG Result (dBµV/m)	Limit (dB«V/m)	Margin (dB)
97.5	N/A	N/A	105.7	-8.2

Figure 13 Test Results

JUDGEMENT: Passed

The EUT met the FCC Part 15, Subpart C, Section 15.209 specification requirements.

The details of the highest emissions are given in *Figure 14.*

Field Strength of Fundamental

E.U.T Description	Tag/ Exciter Deployment (TED) Tool
Type	TED-1000
Serial Number:	Not designated

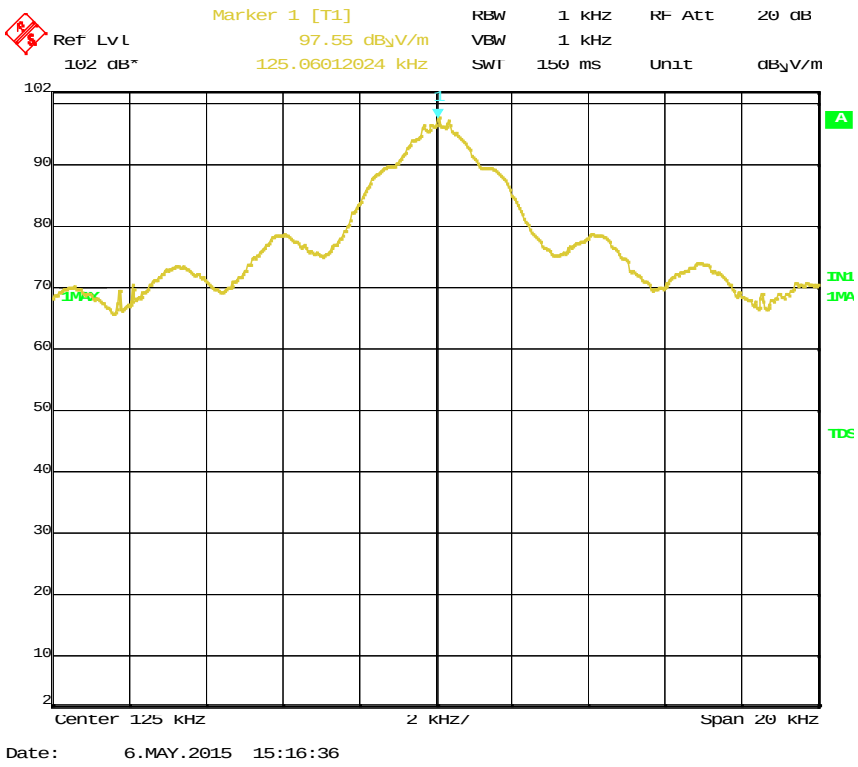

Figure 14. Field Strength of Fundamental
Detector: Peak

6.4 Test Equipment Used, Field Strength of Fundamental

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	R&S	ESIB7	100120	January 1, 2015	1 year
Active Loop Antenna	EMCO	6502	2950	November 4, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 15. Test Equipment Used

7. Radiated Emission, 9 kHz – 30 MHz

7.1 Test Specification

9 kHz-30 MHz, FCC, Part 15, Subpart C, Section 209
RSS 210 Issue 8, Clause 2.5

7.2 Test Procedure

The E.U.T. operation mode and test set-up are as described in Section 2.

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 configuration tested is shown in Figure 3.1.

The frequency range 9 kHz-30 MHz was scanned.

The emissions were measured using a computerized EMI receiver complying with CISPR 16 requirements. The specification limits and applicable correction factors are loaded to the receiver via a 3.5" floppy disk.

In the frequency range 9 kHz-30MHz, the loop antenna was rotated on its vertical axis. The antenna height (center of loop) was 1 meter at a distance of 3 meters.

The E.U.T. was operated at the frequency of 125 kHz. This frequency was measured using a peak detector.

7.3 Test Results

Frequency (kHz)	Peak Reading (dBuV/m)	AVG. FACTOR (dBuV/m)	AVG RESULT (dBuV/m)	Limit (dBuV/m)	Margin (dB)
375.0	62.7	N/A	N/A	96.1	-33.4
625.0	64.0	N/A	N/A	71.7	-7.7

JUDGEMENT: Passed

The EUT was tested and it met the requirements of the FCC Part 15, Subpart C, Section 209 and RSS 210 Issue 8, Clause 2.5 specification.

7.4 Test Instrumentation Used, Radiated Measurements

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
EMI Receiver	R&S	ESIB7	100120	January 1, 2015	1 year
Active Loop Antenna	EMCO	6502	2950	November 4, 2014	1 year
Antenna Mast	ETS	2070-2	9608-1497	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 16. Test Equipment Used

7.5 Field Strength Calculation

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

$$FS = RA + AF + CF$$

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

No external pre-amplifiers are used.

8. Antenna Gain/Information

LF (125 kHz) Ferrite Coil – TAAO Series – CMKGEA-TAAO-M0490J

9. APPENDIX A – CORRECTION FACTORS

9.1 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

Frequency (MHz)	Cable Loss (dB)	Frequency (MHz)	Cable Loss (dB)
0.010	0.4	50.00	1.2
0.015	0.2	100.00	0.7
0.020	0.2	150.00	2.1
0.030	0.3	200.00	2.3
0.050	0.3	300.00	2.9
0.075	0.3	500.00	3.8
0.100	0.2	750.00	4.8
0.150	0.2	1000.00	5.4
0.200	0.3	1500.00	6.7
0.500	0.4	2000.00	9.0
1.00	0.4	2500.00	9.4
1.50	0.5	3000.00	9.9
2.00	0.5	3500.00	10.2
5.00	0.6	4000.00	11.2
10.00	0.8	4500.00	12.1
15.00	0.9	5000.00	13.1
20.00	0.8	5500.00	13.5
		6000.00	14.5

NOTES:

1. The cable type is SPUMA400 RF-11N(X2) and 39m long

2. The cable is manufactured by Huber + Suhner

9.2 Correction factors for ACTIVE LOOP ANTENNA

Model 6502
S/N 9506-2950

FREQUENCY	Magnetic Antenna Factor	Electric Antenna Factor
(MHz)	(dB)	(dB)
.009	-35.1	16.4
.010	-35.7	15.8
.020	-38.5	13.0
.050	-39.6	11.9
.075	-39.8	11.8
.100	-40.0	11.6
.150	-40.0	11.5
.250	-40.0	11.6
.500	-40.0	11.5
.750	-40.1	11.5
1.000	-39.9	11.7
2.000	-39.5	12.0
3.000	-39.4	12.1
4.000	-39.7	11.9
5.000	-39.7	11.8
10.000	40.2	11.3
15.000	-40.7	10.8
20.000	-40.5	11.0
25.000	-41.3	10.2
30.000	42.3	9.2

10. Comparison Industry Canada Requirements With FCC

AeroScout Ltd. M/N: TED-1000
IC: 5115A-TED FCC ID: Q3HTED

Test	FCC	IC
❑ Conducted Emission	Section 15.209	RSS 210 Issue 8 Clause 2.5
❑ Radiated Emission	Section 15.209	RSS 210 Issue 8 Clause 2.5