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DATE: 28 April 2015

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

FCC Radio Test Report

for

AeroScout Ltd.

Equipment under test:

TAG1200 Bi-Directional WiFi Module

TAG1200

Tested by: _____
I. Siboni

Approved by: _____
D. Shidlowsky

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Measurement/Technical Report for
AeroScout Ltd.

TAG1200 Bi-Directional WiFi Module

TAG1200

FCC ID: Q3HTAG1200

IC: 5115A-TAG1200

28 April 2015

This report concerns:	Original Grant: Class I Change: Class II Change: X
Equipment type:	Bi-directional WiFi module transmitter
Limits used:	47CFR15 Section 15.247

Measurement procedure used is ANSI C63.4-2009.

Application for Certification
prepared by:
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ITL (Product Testing) Ltd.
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Applicant for this device:
(different from "prepared by")
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1. General Information

1.1 Administrative Information

Manufacturer:	AeroScout Ltd.
Manufacturer's Address:	3 Pekeris St. Einstein Entrance 4th Floor Rechovot 76702 Tel: +972-8-9369393 Fax: +972-8-9365977
Manufacturer's Representative:	Leonid Genusin
Equipment Under Test (E.U.T):	TAG1200 Bi-Directional WiFi Module
Equipment Model No.:	TAG1200
Equipment Serial No.:	Not designated
Date of Receipt of E.U.T:	02.12.2014
Start of Test:	02.12.2014
End of Test:	02.12.2014
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, 2010

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-1350, R-1285.
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

The TAG1200 is a Wi-Fi module which designed to use for real time location systems.
The module can be installed inside variety of equipment, such as medical devices, containers, manufacturing equipment and vehicles. The module reports its location to AeroScout Visibility system via Wi-Fi infrastructure. This enables tagged items to be accurately located in real-time and in any environment – from crowded indoor locations such as hospital floors to open outdoor spaces such as parking lots.

1.4 Test Methodology

Both conducted and radiated testing were performed according to the procedures in ANSI C63.4: 2009 and RSS, Gen Issue 4. 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):

± 5.2 dB

Note: See ITL Procedure No. PM 198.

2. System Test Configuration

2.1 Justification

The EUT was originally authorized for single modular approval under FCC ID: Q3HTAG1200, IC: 5115A-TAG1200.

Grant Notes state that "the antenna (s) used for this transmitter …. must not transmit simultaneously with any other antenna or transmitter."

AeroScout LTD is requesting FCC/IC certification of another product, the Fall Monitor under FCC ID: Q3HFM, IC: 5115A-FM.

This device contains the EUT (2.4 GHZ modular approved transmitter) and an additional 916 MHz transmitter which incorporates 2 diversity printed antennas.

A C2PC is requested to:

1) Allow simultaneous transmission of both the 2.4 GHz and 916 MHz transmitter in the Fall Monitor;
2) Add limited modular approval of the EUT in the new host, the Fall Monitor; and
3) Change the allowable separation distance between the antenna and all persons from 20cm to 1cm.

Intermodulation testing was performed and RF exposure was calculated.

2.2 EUT Exercise Software

No special exercise software was used.

2.3 Special Accessories

No special accessories were needed to achieve compliance.

2.4 Equipment Modifications

No modifications were necessary in order to achieve compliance.

2.5 Configuration of Tested System

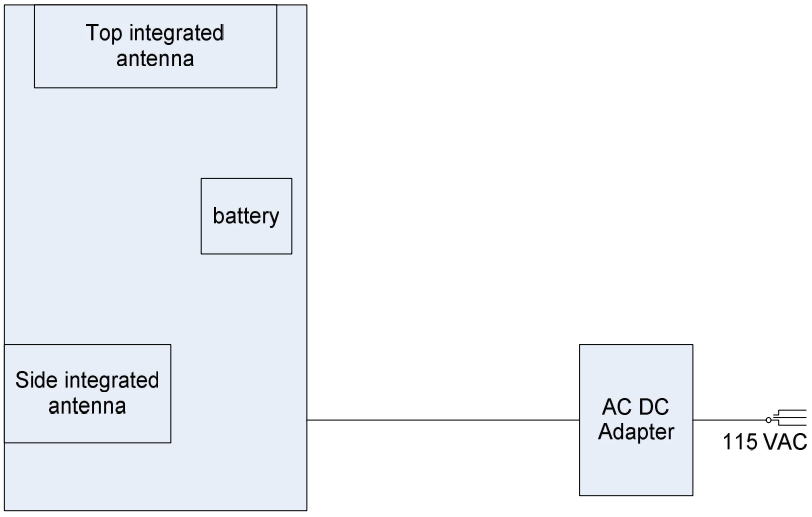

Figure 1. Configuration of Tested System

3. Intermodulation Test Set-Up Photos

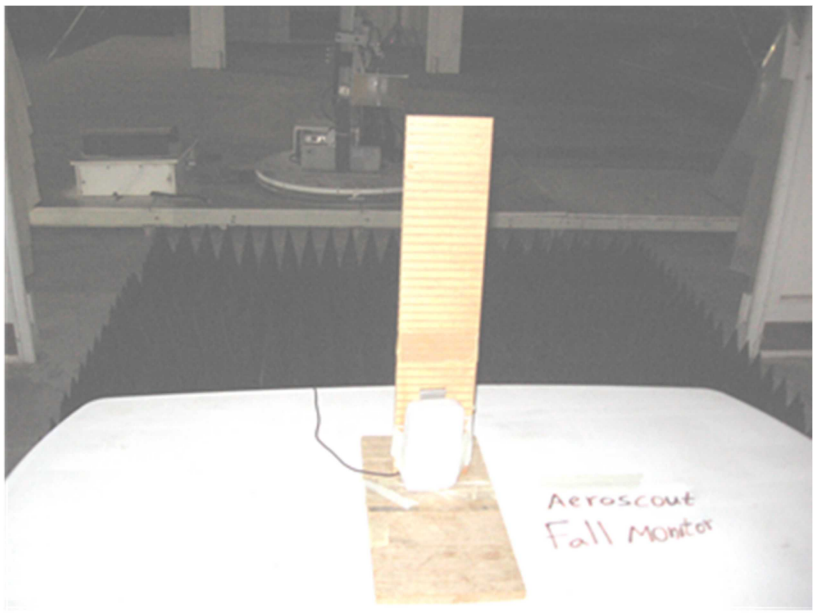

Figure 6. Intermodulation Radiated Test

5. Intermodulation Radiated

5.1 Test procedure

The power of any emission outside of the authorized operating frequency ranges (916; 2405-2483.5 MHz) must be attenuated below the radiated limit.

(a) The E.U.T. operation mode and test set-up are as described in Section 2.5.
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 1.

The E.U.T. was operated in transmission mode at CW signal.

(b) The frequency range 30 MHz-7 GHz was scanned and the list of the highest emissions was verified and updated accordingly. The readings were maximized by adjusting the antenna height between 1-4 meters, the turntable azimuth between 0-360°, and the antenna polarization.
The emissions were measured at a distance of 3 meters.

In the frequency range 7-26.5 GHz, a spectrum analyzer including a low noise amplifier was used. During average measurements, the IF bandwidth was 1 MHz and the video bandwidth was 10 Hz. During peak measurements, the IF bandwidth was 1 MHz and the video bandwidth was 3 MHz.

The EUT was transmitting at the frequencies: 916 and 2442 MHz.

5.2 Test Results

JUDGEMENT: Passed

TEST PERSONNEL:

Tester Signature: _____ Date: 04.1.15

Typed/Printed Name**:** I. Siboni

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal, Vertical **Frequency range: 30 MHz to 1000 MHz**
Antenna: 3 meters distance **Detectors: Peak, Quasi-peak**

Frequency	Antenna Polarization		Azimuth	Antenna Height	Peak Amp	QP Amp	Limit	Margin
(MHz)	Hor.	Ver.	(Degrees)	(cm)	(dBµV/m)	(dBµV/m)	(dBµV/m)	(dB)
304.35	X		258.4	147.6	39.2	33.9	46.5	-12.6
		X	75.1	149.6	39.0	33.9	46.5	-12.6
611.10	X		123.1	137.1	36.2	31.1	46.5	-15.4
		X	214.9	135.7	35.7	31.1	46.5	-15.4

Figure 2 Intermodulation Radiated Results –Peak/Quasi Peak

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal, Vertical **Frequency range: 1 GHz to 26.5 GHz**
Antenna: 3 meters distance **Detectors: Peak**

Frequency	Antenna Polarization		Azimuth	Antenna Height	Peak Amp	Peak Limit	Peak Margin
(MHz)	Hor.	Ver.	(Degrees)	(cm)	(dBµV/m)	(dBµV/m)	(dB)
3357.45	X		123.1	158.0	55.3	74.0	-18.7
		X	333.9	134.4	65.9	74.0	-8.1
3968.45	X		0.0	191.0	58.6	74.0	-15.4
		X	85.2	106.0	68.4	74.0	-5.6
4272.9	X		105.1	147.1	60.1	74.0	-13.9
		X	168.4	194.4	59.6	74.0	-14.4
5835.45	X		66.9	108.9	65.7	74.0	-8.3
		X	139.5	160.0	66.1	74.0	-7.9

Figure 3 Intermodulation Radiated Results – Peak

Specification: FCC Part 15, Subpart C

Antenna Polarization: Horizontal, Vertical **Frequency range: 1 GHz to 26.5 GHz**
Antenna: 3 meters distance **Detectors: Average**

Frequency	Antenna Polarization		Azimuth	Antenna Height	AVG Amp	AVG Limit	AVG Margin
(MHz)	Hor.	Ver.	(Degrees)	(cm)	(dBµV/m)	(dBµV/m)	(dB)
3357.45	X		123.1	158.0	41.9	54.0	-12.1
		X	333.9	134.4	41.8	54.0	-12.2
3968.45	X		0.0	191.0	45.1	54.0	-8.9
		X	85.2	106.0	45.1	54.0	-8.9
4272.9	X		105.1	147.1	45.5	54.0	-8.5
		X	168.4	194.4	45.7	54.0	-8.3
5835.45	X		66.9	108.9	52.0	54.0	-2.0
		X	139.5	160.0	51.9	54.0	-2.1

Figure 4 Intermodulation Radiated Results – Average

5.3 Test Instrumentation Used; Radiated Measurements Intermodulation

Instrument	Manufacturer	Model	Serial Number	Calibration	Period
Spectrum Analyzer	HP	8592L	3826A01204	February 28, 2014	1 year
Log Biconical Antenna	EMCO	3142	1250	May 22, 2014	2 years
Horn Antenna	ETS	3115	29845	March 14, 2012	3 years
EMI Receiver	R&S	ESBI7	100120	December 19, 2013	1 year
Low Noise Amplifier	Sophia Wireless	LNA 28-B	232	August 29, 2014	1 year
Low Noise Amplifier	DBS MICROWAVE	LNA-DBS-0411N313	013	August 22, 2014	1 year
Antenna Mast	ETS	2070-2	-	N/A	N/A
Turntable	ETS	2087	-	N/A	N/A
Mast & Table Controller	ETS/EMCO	2090	9608-1456	N/A	N/A

Figure 5 Test Equipment Used

6. R.F Exposure/Safety

The TAG1200 is being used in the AeroScout Fall Monitor which also uses a 916 MHz transmitter. Typical use of the Fall Monitor is as a monitor that sends off an alarm when a patient attempts to get out of a wheelchair, bed or commode.

The typical placement of the Fall Monitor is on either a chair or a bed.

The typical distance between the E.U.T. and the user in the worst case application, is 10 cm.

Calculation of Maximum Permissible Exposure (MPE)

Based on Section 1.1310 Requirements

(a) FCC limits at 916.00 MHz is: $\frac{f}{1500} = 0.610 \frac{mW}{cm^2}$

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

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

(c) **<u>Top antenna</u>**

P_t- Transmitted Power 95.5 dBuV/m (Peak) = 1.07 mW

G_T- Antenna Gain, -5dBi = 0.32 numeric – tests were performed radiated and take gain into account

R- Distance from Transmitter using 1 cm worst case

Duty Cycle = 0.1% - based on customer's Duty Cycle Declaration

S_{AVG} - Equivalent averaged transmitted power is 1.07 x 0.001 = 0.00107 mW

(d) The average power density is:

$$S = \frac{(0.00107)}{4\pi (1)^2} = 0.000085 \frac{mW}{cm^2}$$

(e) **Side antenna**:

P_t- Transmitted Power 99.6 dBuV/m (Peak) = 2.75 mW

G_T- Antenna Gain, -2.6dBi = 0.55 numeric – tests were performed radiated and take gain into account

R- Distance from Transmitter using 1cm worst case

Duty Cycle = 0.1% - based on customer's Duty Cycle Declaration

S_{AVG} - Equivalent averaged transmitted power is 2.75 x 0.001 = 0.00275 mW

(f) The average power density is:

$$S = \frac{(0.00275)}{4®(1)^2} = 0.00022 \frac{mW}{cm^2}$$

(g) **Combined intermodulated RF**

916 MHz Highest Average Transmited Power (using side antenna):

P_t- Transmitted Power 99.6 dBuV/m (Peak) = 2.75 mW

Duty Cycle = 0.1% - based on customer's Duty Cycle Declaration

S_{AVG} - Equivalent averaged transmitted power is 2.75 x 0.001 = 0.00275 mW

2.4 GHz Average Transmitted Power

P_t- Transmitted Power 22.48 dBm (Peak) = 177.01 mW

Duty Cycle = 0.1% - based on customer's Duty Cycle Declaration

G_T – Antenna Gain, -2.0 dBi = 0.63

S_{AVG} - Equivalent averaged transmitted power is 177.01 x 0.001 = 0.17701 mW

R- Distance from Transmitter using 1 cm worst case

$$S = \frac{(0.17701 \times 0.63) + 0.00275}{4®(1)^2} = 0.009 \frac{mW}{cm^2}$$

(h) This is below the FCC limit.

7. APPENDIX A - CORRECTION FACTORS

7.1 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	20.1
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

7.2 Correction factors for CABLE

from EMI receiver to test antenna at 3 meter range.

FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.2
2.0	1.6
3.0	2.0
4.0	2.4
5.0	3.0
6.0	3.4
7.0	3.8
8.0	4.2
9.0	4.6
10.0	5.0
12.0	5.8

NOTES:

1. The cable type is RG-8.

2. The overall length of the cable is 10 meters.

7.3 Correction factors for CABLE

from spectrum analyzer to test antenna above 2.9 GHz

FREQUENCY (GHz)	CORRECTION FACTOR (dB)	FREQUENCY (GHz)	CORRECTION FACTOR (dB)
1.0	1.9	14.0	9.1
2.0	2.7	15.0	9.5
3.0	3.5	16.0	9.9
4.0	4.2	17.0	10.2
5.0	4.9	18.0	10.4
6.0	5.5	19.0	10.7
7.0	6.0	20.0	10.9
8.0	6.5	21.0	11.2
9.0	7.0	22.0	11.6
10.0	7.5	23.0	11.9
11.0	7.9	24.0	12.3
12.0	8.3	25.0	12.6
13.0	8.7	26.0	13.0

NOTES:

1. The cable type is SUCOFLEX 104 E manufactured by SUHNER.

2. The cable is used for measurements above 2.9 GHz.

3. The overall length of the cable is 10 meters.

8.4 Correction factors for Bilog ANTENNA

Model: 3142
Antenna serial number: 1250
3 meter range

FREQUENCY (MHz)	AFE (dB/m)	FREQUENCY (MHz)	AFE (dB/m)
30	18.4	1100	25
40	13.7	1200	24.9
50	9.9	1300	26
60	8.1	1400	26.1
70	7.4	1500	27.1
80	7.2	1600	27.2
90	7.5	1700	28.3
100	8.5	1800	28.1
120	7.8	1900	28.5
140	8.5	2000	28.9
160	10.8		
180	10.4		
200	10.5		
250	12.7		
300	14.3		
400	17		
500	18.6		
600	19.6		
700	21.1		
800	21.4		
900	23.5		
1000	24.3		

7.5 Correction factors for Horn ANTENNA.

Model: 3115

Antenna serial number: 6142

3 meter range

FREQUENCY (MHz)	Antenna Factor (dB/m)	FREQUENCY (MHz)	Antenna Factor (dB/m)
1000	23.9	10500	38.4
1500	25.4	11000	38.5
2000	27.3	11500	39.4
2500	28.5	12000	39.2
3000	30.4	12500	39.4
3500	31.6	13000	40.7
4000	33	14000	42.1
4500	32.7	15000	40.1
5000	34.1	16000	38.2
5500	34.5	17000	41.7
6000	34.9	17500	45.7
6500	35.1	18000	47.7
7000	35.9		
7500	37.5		
8000	37.6		
8500	38.3		
9000	38.5		
9500	38.1		
10000	38.6		

7.6 Correction factors for LOG PERIODIC ANTENNA

Type LPD 2010/A
at 3 and 10 meter ranges.

Distance of 3 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.1
250.0	10.2
300.0	12.5
400.0	15.4
500.0	16.1
600.0	19.2
700.0	19.4
800.0	19.9
900.0	21.2
1000.0	23.5

Distance of 10 meters

FREQUENCY (MHz)	AFE (dB/m)
200.0	9.0
250.0	10.1
300.0	11.8
400.0	15.3
500.0	15.6
600.0	18.7
700.0	19.1
800.0	20.2
900.0	21.1
1000.0	23.2

NOTES:

1. *Antenna serial number is 1038.*
2. *The above lists are located in file number 38M3O.ANT for a 3 meter range, and file number 38M100.ANT for a 10 meter range.*
3. *The files mentioned above are located on the disk marked "Radiated Emission Test EMI Receiver".*

7.7 Correction factors for Double-Ridged Waveguide Horn Model: 3115, S/N 29845

at 3 meter range.

FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)	FREQUENCY (GHz)	ANTENNA FACTOR (dB 1/m)	ANTENNA Gain (dBi)
1.0	24.8	5.4	10.0	38.8	11.4
1.5	26.1	7.6	10.5	38.9	11.8
2.0	28.6	7.7	11.0	39.0	12.1
2.5	29.8	8.4	11.5	39.6	11.8
3.0	31.4	8.4	12.0	39.8	12.0
3.5	32.4	8.7	12.5	39.6	12.5
4.0	33.7	8.6	13.0	40.0	12.5
4.5	33.4	9.9	13.5	39.8	13.0
5.0	34.5	9.7	14.0	40.2	13.0
5.5	35.1	9.9	14.5	40.6	12.9
6.0	35.4	10.4	15.0	41.3	12.4
6.5	35.6	10.8	15.5	39.5	14.6
7.0	36.2	10.9	16.0	38.8	15.5
7.5	37.3	10.4	16.5	40.0	14.6
8.0	37.7	10.6	17.0	41.4	13.4
8.5	38.3	10.5	17.5	44.8	10.3
9.0	38.5	10.8	18.0	47.2	8.1
9.5	38.7	11.1			

7.8 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

8. Comparison Industry Canada Requirements With FCC

AeroScout TAG-1200 Bi-Directional WiFi Module
M/N: TAG-12000
IC: 5115A-TAG1200 FCC ID: Q3HTAG1200

Test	FCC	IC
❑ Radiated Emission	15.209	RSS 210 Issue 8 Clause 2.5
❑ Max power / Peak power	15.247(b)(3)	RSS 210 Issue 8 A8.4(4)
❑ 6dB BW	15.247(a)2	RSS 210 Issue 8 A8.2a
❑ Power density	15.247(e)	RSS 210 Issue 8 A8.2b
❑ Spurious radiated emission in the restricted band	15.205(c)	RSS 210 Issue 8 2.5 RSS Gen 7.2.2 (Table 1)
❑ Band edge spectrum	15.247(d)	RSS 210 Issue 8 A8.5
❑ RF Exposure Limits	1.1307(b)(1)	RSS 102 4.4