Certification Application Report
FCC Part 15.245 & Industry Canada RSS-210

Test Lab:		Applicant:	
Rhein Tech Laboratories, Inc. Tel: 703-689-0368 360 Herndon Parkway Fax: 703-689-2056 Suite 1400 www.rheintech.com Herndon, VA 20170 E-Mail: atcbinfo@rheintech.com		EDH (South Africa) (Pty) Ltd P.O. Box 747 Tel: +27 21 880 2160 Stellenbosch Fax: +27 21 880 2159 South Africa 7599 Contact: Thomas Johnson	
FCC ID/ IC:	QXP-PT238/ 4612A-PT238	**Test Report Date:**	July 26, 2011
Platform:	N/A	**RTL Work Order #:**	2011040
Model:	FLIGHTSCOPE X2	**RTL Quote #:**	QRTL11-044
American National Standard Institute:	ANSI C63.4: Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz		
FCC Classification:	FDS: Field Disturbance Sensor		
FCC Rule Part(s)/Guidance:	FCC Rules Part 15.245: Operation within the bands 902–928 MHz, 2435–2465 MHz, 5785–5815 MHz, 10500–10550 MHz, and 24075–24175 MHz (10-01-10)		
Industry Canada:	RSS-210 Issue 8: License-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment		
Digital Interface Information:	Digital Interface was found to be compliant		

Frequency Range (MHz)	Output Power* (W)	Frequency Tolerance	Emission Designator
10,525	N/A	N/A	380KNON

I, the undersigned, hereby declare that the equipment tested and referenced in this report conforms to the identified standard(s) as described in this test report. No modifications were made to the equipment during testing in order to achieve compliance with these standards. Furthermore, there was no deviation from, additions to, or exclusions from, the applicable parts of FCC Part 2, FCC Part 15, ANSI C63.4, and IC RSS-210.

Signature: _____ Date: July 26, 2011

Typed/Printed Name: Desmond A. Fraser Position: President

These tests are accredited and meet the requirements of ISO/IEC 17025 as verified by ANSI-ASQ National Accreditation Board/ACLASS. Refer to certificate and scope of accreditation AT-1445.

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1 General Information

1.1 Scope

This is an original FCC and IC certification application report.

Applicable Standards:

- FCC Part 15.245: Operation within the bands 902–928 MHz, 2435–2465 MHz, 5785–5815 MHz, 10500–10550 MHz, and 24075–24175 MHz
- Industry Canada RSS-210: Low Power License-Exempt Communications Devices (Annex 7)

1.2 Description of EUT

Equipment Under Test	FLIGHTSCOPE Ball Sensor
Model	FLIGHTSCOPE X2
Power Supply	Internal batteries or 12 V DC
Modulation Type	CW
Frequency Range	10,525 MHz
Antenna Connector Type	N/A
Antenna Type	Microstrip patch antenna

1.3 Test Facility

The open area test site and conducted measurement facility used to collect the radiated data is located at 360 Herndon Parkway, Suite 1400, Herndon, Virginia 20170. This site has been fully described in a report and approved by the Federal Communications Commission to perform AC line conducted and radiated emissions testing (ANSI C63.4-2003).

1.4 Related Submittal(s)/Grant(s)

This is an original application for certification for EDH (South Africa)(Pty) Ltd., Model: FLIGHTSCOPE X2, FCC ID: QXP-PT238, IC: 4612A-PT238.

1.5 Modifications

No modifications were made to the equipment during testing in order to achieve compliance with these standards.

2 Test Information

2.1 Description of Test Modes

In accordance with FCC 15.31(m), because the EUT only utilizes one operating frequency, one channel was tested.

2.2 Exercising the EUT

The EUT was supplied with test firmware so that the EUT would continuously transmit during testing. The EUT was tested in all three orthogonal planes in order to determine worst-case emissions.

2.3 Test Result Summary

Table 2-1: Test Result Summary

Standard	Test	Pass/Fail or N/A
FCC 15.207	AC Power Conducted Emissions	Pass
FCC 15.209	Radiated Emissions	Pass
FCC 15.245(b)	Field Strength of Fundamental and Harmonics	Pass
RSS-Gen 4.6.1	99% Bandwidth	N/A

2.4 Test System Details

The test samples were received on March 29, 2011. The FCC identifiers for all applicable equipment, plus descriptions of all cables used in the tested system, are identified in the following table.

Table 2-2: Equipment Under Test

Part	Manufacturer	Model	Serial Number	FCC ID	Cable Description	RTL Bar Code
Ball Sensor	EDH	FLIGHTSCOPE X2	FX2-0010	QXP-PT238	4.5m USB	20062
AC Adapter	Mean Well	GS40A12	EB05370936	N/A	Unshielded power ferrite on DC	20063

2.5 Configuration of Tested System

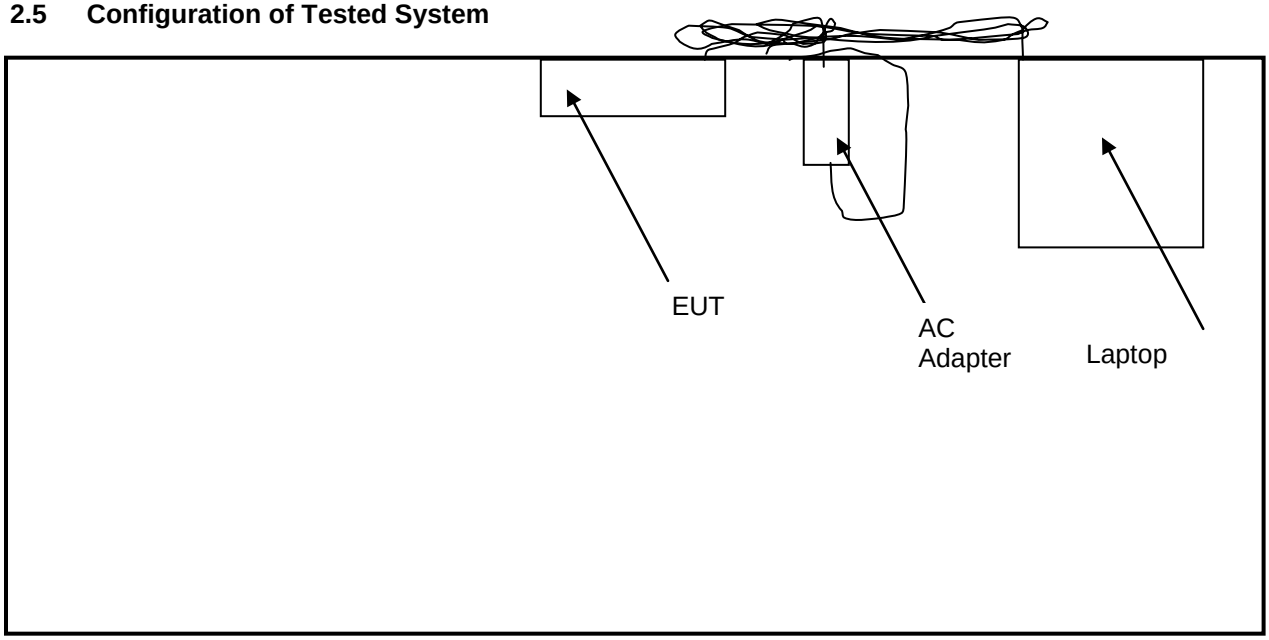


Figure 2-1: Configuration of System Under Test

3 Radiated Emissions – FCC 15.209, 15.245(b); RSS-210 Annex 7

3.1 Limits of Radiated Emissions Measurement

Frequency (MHz)	Field Strength (uV/m)	Measurement Distance (m)
0.009-0.490	2400/f (kHz)	300
0.490-1.705	2400/f (kHz)	30
1.705-30.0	30	30
30-88	100	3
88-216	150	3
216-960	200	3
Above 960	500	3
10,500 – 10,550 (fundamental)	2,500,000	3
harmonics	25,000	3

As shown in 15.35(b), for frequencies above 1,000 MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits specified above by more than 20 dB under any circumstances of modulation.

3.2 Radiated Emissions Measurement Test Procedure

Before final measurements of radiated emissions were made on the open-field three/ten meter range, the EUT was scanned indoors at one and three meter distances. This was done in order to determine its emissions spectrum signature. The physical arrangement of the test system and associated cabling was varied in order to determine the effect on the EUT's emissions in amplitude, direction and frequency. This process was repeated during final radiated emissions measurements on the open-field range, at each frequency, in order to ensure that maximum emission amplitudes were attained.

Final radiated emissions measurements were made on the three/ten-meter open-field test site. The EUT was placed on a nonconductive turntable 0.8 meters above the ground plane. The spectrum was examined from 9 kHz to the 5^{th} harmonic of the highest fundamental transmitter frequency (52.6 GHz).

At each frequency, the EUT was rotated 360°, and the antenna was raised and lowered from 1 to 4 meters in order to determine the emission's maximum level. Measurements were taken using both horizontal and vertical antenna polarizations. For frequencies between 30 and 1000 MHz, the spectrum analyzer's 6 dB bandwidth was set to 120 kHz, and the analyzer was operated in the CISPR quasi-peak detection mode. For emissions above 1000 MHz, emissions are measured using the average detector function with a minimum resolution bandwidth of 1 MHz. No video filter less than 10 times the resolution bandwidth was used. The highest emission amplitudes relative to the appropriate limit were measured and recorded in this report.

Table 3-1: Radiated Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz - 30 MHz)	827525/019	10/1/12
901364	MITEQ	JS4-01002600-36-5P	Amplifier 0.1-26 GHz, 28 dB gain, power 5 dB	849863	02/22/12
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	04/10/12
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901516	Insulated Wire, Inc.	KPS-1503-2400-KPS	RF cable, 20'	NA	10/19/11
901517	Insulated Wire Inc.	KPS-1503-360-KPS	RF cable 36"	NA	10/19/11
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz – 6.5 GHz)	3325A00159	08/02/11
900914	Hewlett Packard	8546OA	RF Filter Section (100 kHz - 6.5 GHz)	3330A00107	08/02/11
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	06/14/12
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	06/14/12
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	06/14/12
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	06/14/12
900325	EMCO	3160-9	Horn Antenna (18 - 26.5 GHz)	9605-1051	06/14/12
901303	EMCO	3160-10	Horn Antenna (26.5 - 40.0 GHz)	960452-007	06/14/12
901256	ATM	19-443-6R	Horn Antenna. 40-60 GHz, Waveguard size WR-19	8041704-01	05/20/12
901413	Agilent Technologies	E4448A	Spectrum Analyzer	US44020346	04/08/12
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	01/31/13
900392	Hewlett Packard	1197OK	Harmonic Mixer (18 - 26 GHz)	3525A00159	11/27/12
900126	Hewlett Packard	11970A	Harmonic Mixer (26 - 40 GHz)	2332A01199	10/29/12
900717	Hewlett Packard	11970U	Harmonic Mixer (40 – 60 GHz)	2332A01110	05/20/12

3.3 Radiated Emissions Test Results

Table 3-2: Radiated Emissions Test Data

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV/m) (1 MHz RBW/VBW)	Site Correction Factor (dB/m)	Peak Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)
10,525	84.3	36	120.3	148	-27.7	128	-7.7

** testing performed at 3m*

3.4 Radiated Emissions Harmonics/Spurious Test Data

Table 3-3: Radiated Emissions Harmonics/Spurious

Emission Frequency (MHz)	Peak Analyzer Reading (dBuV/m) (1 MHz RBW/VBW)	Site Correction Factor (dB/m)	Peak Corrected (dBuV/m)	Peak Limit (dBuV/m)	Peak Margin (dB)	Average Limit (dBuV/m)	Average Margin (dB)
21,050	40.3	43.7	84.0	108.0	-24.0	88.0	-4.0
31,575	19.5	66.1	85.6	108.0	-22.4	88.0	-2.4
42,100	12.7	61.5	74.2	108.0	-33.8	88.0	-13.8
52,625	8.7	63.4	72.1	108.0	-35.9	88.0	-15.9

3.5 Radiated Emissions Digital Test Data

Table 3-4: Digital Radiated Emissions Test Data

Temperature: 83°F Humidity: 52%										
Emission Frequency (MHz)	Test Detector	Antenna Polarity (H/V)	Turntable Azimuth (deg)	Antenna Height (m)	Analyzer Reading (dBuV)	Site Correction Factor (dB/m)	Emission Level (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Pass/ Fail
117.870	Qp	V	180	1.0	31.7	-19.2	12.5	43.5	-31.0	Pass
147.459	Qp	H	180	2.0	33.3	-20.9	12.4	43.5	-31.1	Pass
206.448	Qp	V	180	1.0	40.4	-21.3	19.1	43.5	-24.4	Pass
265.435	Qp	V	180	1.0	39.7	-16.1	23.6	46.0	-22.4	Pass
265.448	Qp	V	130	1.9	44.3	-16.1	28.2	46.0	-17.8	Pass
324.422	Qp	H	0	1.0	39.8	-15.9	23.9	46.0	-22.1	Pass
353.906	Qp	H	180	1.0	43.9	-14.2	29.7	46.0	-16.3	Pass
383.404	Qp	H	180	1.0	46.9	-13.8	33.1	46.0	-12.9	Pass
442.387	Qp	V	170	1.5	49.2	-11.5	37.7	46.0	-8.3	Pass
501.363	Qp	V	180	1.0	42.4	-11.3	31.1	46.0	-14.9	Pass
737.276	Qp	H	120	1.0	43.6	-5.7	37.9	46.0	-8.1	Pass

Test Personnel:

Daniel W. Baltzell		May 22, 2011 & June 24, 2011
Test Engineer	Signature	Dates of Test

4 AC Conducted Emissions - FCC 15.207; RSS-Gen 7.2.4

4.1 Test Methodology for Conducted Line Emissions Measurements

The power line conducted emission measurements were performed in a Series 81 type shielded enclosure manufactured by Rayproof. The EUT was assembled on a wooden table 80 centimeters high. Power was fed to the EUT through a 50-ohm / 50 microhenry Line Impedance Stabilization Network (EUT LISN). The EUT LISN was fed power through an A.C. filter box on the outside of the shielded enclosure. The filter box and EUT LISN housing are bonded to the ground plane of the shielded enclosure. A second LISN, the peripheral LISN, provides isolation for the EUT test peripherals. This peripheral LISN was also fed A.C. power. A metal power outlet box, which is bonded to the ground plane and electrically connected to the peripheral LISN, powers the EUT host peripherals.

The spectrum analyzer was connected to the A.C. line through an isolation transformer. The 50-ohm output of the EUT LISN was connected to the spectrum analyzer input through a Solar high-pass filter. The filter is used to prevent overload of the spectrum analyzer from noise below 100 kHz. Conducted emission levels were measured on each current-carrying line with the spectrum analyzer operating in the CISPR quasi-peak mode (or peak mode if applicable). The analyzer's 6 dB bandwidth was set to 9 kHz. No video filter less than 10 times the resolution bandwidth was used. Average measurements are performed in linear mode using a 10 kHz resolution bandwidth, a 1 Hz video bandwidth, and by increasing the sweep time in order to obtain a calibrated measurement. The emission spectrum was scanned from 150 kHz to 30 MHz. The highest emission amplitudes relative to the appropriate limit were measured and have been recorded in this report.

4.2 Conducted Line Emission Test Procedure

The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

Table 4-1: Conducted Line Emissions Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900968	Hewlett Packard	8567A	Spectrum Analyzer (10 kHz - 1.5 GHz)	2602A00160	11/17/11
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	11/17/11
900970	Hewlett Packard	85662A	Spectrum Analyzer Display	2542A11239	11/17/11
901082	AFJ International	LS16	16A LISN	16010020081	4/13/11

4.3 Conducted Line Emissions Test Data

Table 4-2: Conducted Emissions (Neutral Side)

Temperature: 74°F Humidity: 25%							
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**QP Limit (dBuV)**	**QP Margin (dBuV)**	**Pass/ Fail**
0.193	Qp	47.6	0.1	47.7	63.9	-16.2	Pass
0.256	Qp	40.6	0.1	40.7	61.6	-20.9	Pass
0.329	Qp	34.4	0.1	34.5	59.5	-25.0	Pass
0.393	Qp	38.6	0.2	38.8	58.0	-19.2	Pass
0.464	Qp	31.7	0.2	31.9	56.6	-24.7	Pass
1.754	Qp	32.6	0.5	33.1	56.0	-22.9	Pass
19.250	Qp	32.6	2.4	35.0	60.0	-25.0	Pass
19.420	Qp	32.1	2.4	34.5	60.0	-25.5	Pass

Table 4-3: Conducted Emissions (Phase Side)

Temperature: 74°F Humidity: 25%							
Emission Frequency (MHz)	**Test Detector**	**Analyzer Reading (dBuV)**	**Site Correction Factor (dB)**	**Emission Level (dBuV)**	**QP Limit (dBuV)**	**QP Margin (dBuV)**	**Pass/ Fail**
0.193	Qp	40.6	0.1	40.7	63.9	-23.2	Pass
0.257	Qp	35.0	0.1	35.1	61.5	-26.4	Pass
0.327	Qp	35.1	0.1	35.2	59.5	-24.3	Pass
0.390	Qp	40.8	0.1	40.9	58.1	-17.2	Pass
0.462	Qp	35.2	0.2	35.4	56.7	-21.3	Pass
0.719	Qp	33.4	0.3	33.7	56.0	-22.3	Pass
9.107	Qp	32.4	1.6	34.0	60.0	-26.0	Pass
9.637	Qp	35.4	1.7	37.1	60.0	-22.9	Pass
19.080	Qp	31.8	2.4	34.2	60.0	-25.8	Pass

Test Personnel:

Daniel Baltzell		April 6, 2011
Test Engineer	Signature	Date of Test

5 99% Bandwidth – IC RSS-Gen 4.6.1

5.1 99% Bandwidth Test Procedure

The 99% bandwidths per RSS-Gen were measured using a 50-ohm spectrum analyzer. The modulated carrier was adjusted on the analyzer so that it was displayed entirely on the spectrum analyzer. The sweep time was auto and allowed through several sweeps with the max hold function used in peak detector mode. The resolution bandwidth was set to 100 kHz, and the video bandwidth set to 1 MHz. The table below contains the bandwidth measurement results.

Table 5-1: 99% Bandwidth Test Equipment

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
901215	Hewlett Packard	8596EM	Spectrum Analyzer	3826A00144	1/13/12

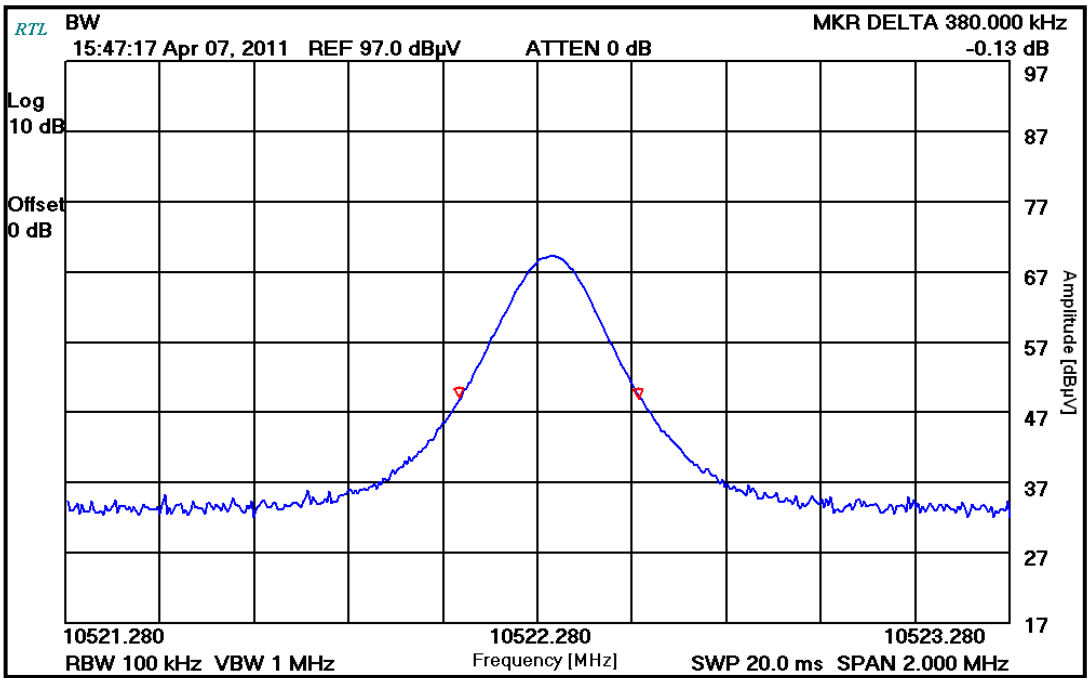
5.2 Bandwidth Test Data

Table 5-2: Bandwidth Test Data

99% Bandwidth (kHz)
380

5.3 99% Bandwidth Plots

Plot 5-1: 99% Bandwidth



Test Personnel:

Daniel W. Baltzell	Daniel W. Baltzell	April 7, 2011
Test Engineer	Signature	Date of Test

6 Conclusion

The data in this measurement report shows that the EUT as tested, EDH (South Africa) (Pty) Ltd., Model: FLIGHTSCOPE X2, FCC ID: QXP-PT238, IC: 4612A-PT238, complies with all the applicable requirements of Parts 2 and 15 of the FCC Rules and Regulations, and Industry Canada RSS-210 and RSS-Gen.