



Engineering Solutions & Electromagnetic Compatibility Services

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

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FCC ID/IC	QXP-SS661 4612A-SS661	Test Report Date	February 22, 2013
Platform	N/A	RTL Work Order #	2013032
Model	FlightScope X1	RTL Quote #	QRTL13-032
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 (10-01-12)		
Industry Canada	RSS-210 Issue 8: License-Exempt Radio Apparatus (All Frequency Bands): Category I Equipment RSS-Gen Issue 3: General Requirements and Information for the Certification of Radio Apparatus		
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	240KNON

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, IC RSS-210 and RSS-Gen.

Signature: 

Date: February 22, 2013

Typed/Printed Name: Desmond A. Fraser

Position: President

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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.

Table of Contents

1	General Information	4
1.1	Scope	4
1.2	Description of EUT	4
1.3	Test Facility	4
1.4	Related Submittal(s)/Grant(s)	4
1.5	Modifications	4
2	Test Information	5
2.1	Description of Test Modes	5
2.2	Exercising the EUT	5
2.3	Test Result Summary	5
2.4	Test System Details	5
2.5	Configuration of Tested System	6
3	Radiated Emissions – FCC 15.209, 15.245(b); RSS-210 Annex 7	7
3.1	Limits of Radiated Emissions Measurement	7
3.2	Radiated Emissions Measurement Test Procedure	7
3.3	Radiated Emissions Test Results	10
3.4	Radiated Emissions Harmonics/Spurious Test Data	10
3.5	Radiated Emissions Digital Test Data	11
4	AC Conducted Emissions - FCC 15.207; RSS-Gen 7.2.4	12
4.1	Test Methodology for Conducted Line Emissions Measurements	12
4.2	Conducted Line Emissions Test Procedure	12
4.3	Conducted Line Emissions Test Data	13
5	99% Bandwidth – IC RSS-Gen 4.6.1	14
5.1	99% Bandwidth Test Procedure	14
5.2	Bandwidth Test Data	14
5.3	99% Bandwidth Plots	15
6	Conclusion	16

Table of Figures

Figure 2-1: Configuration of System Under Test.....	6
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Table of Tables

Table 2-1: Test Result Summary	5
Table 2-2: Equipment Under Test	5
Table 3-1: Radiated Emissions Test Equipment.....	8
Table 3-2: Radiated Emissions Test Data	10
Table 3-3: Radiated Emissions Harmonics/Spurious.....	10
Table 3-4: Digital Radiated Emissions Test Data	11
Table 4-1: Conducted Line Emissions Test Equipment	12
Table 5-1: 99% Bandwidth Test Equipment	14
Table 5-2: Bandwidth Test Data	14

Table of Plots

Plot 4-1: Conducted Emissions (Neutral Side).....	13
Plot 4-2: Conducted Emissions (Phase Side)	13
Plot 5-1: 99% Bandwidth.....	15

Table of Appendixes

Appendix A: RF Exposure	17
Appendix B: Agency Authorization.....	18
Appendix C: FCC Confidentiality Request.....	19
Appendix D: IC Letters	20
Appendix E: IC Confidentiality Request Letter.....	21
Appendix F: Canadian Representative Letter.....	22
Appendix G: ID Label and Location.....	23
Appendix H: Technical Operational Description	24
Appendix I: Block Diagram	25
Appendix J: Schematics.....	26
Appendix K: Manual	27
Appendix L: Test Configuration Photographs.....	28
Appendix M: External Photographs	32
Appendix N: Internal Photographs	33

Table of Photographs

Photograph 1: Radiated Emissions - Front View	28
Photograph 2: Radiated Emissions - Rear View.....	29
Photograph 3: Conducted Emissions - Front View	30
Photograph 4: Conducted Emissions - Rear View.....	31

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)
- Industry Canada RSS-Gen Issue 3: General Requirements and Information for the Certification of Radio Apparatus

1.2 Description of EUT

Equipment Under Test	FlightScope Ball Sensor
Model	FlightScope X1
Power Supply	120V-240 VAC adapter to 12VDC
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 X1, FCC ID: QXP-SS661, IC: 4612A-SS661.

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 February 1, 2013. 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 X1	X1-00103-0711	QXP-SS661	4.5m USB	20850
AC Adapter	Mean Well	GS40A12	EB13563049	N/A	1.9m unshielded AC, 0.9m DC with ferrite at connector	20851

2.5 Configuration of Tested System

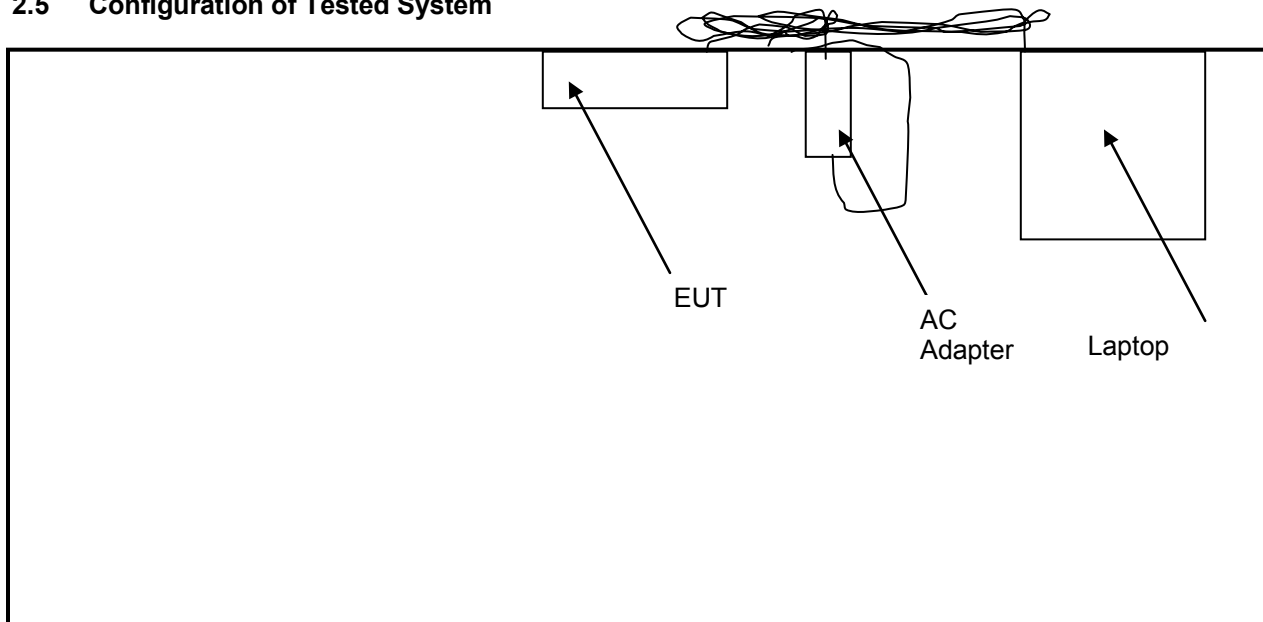


Figure 2-1: Configuration of System Under Test

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 5th 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
900791	Chase	CBL6111B	Bilog Antenna (30 MHz – 2000 MHz)	N/A	01/31/14
901303	EMCO	3160-10	Horn Antenna (26.5 - 40.0 GHz) WR-28	960452-007	6/19/13
900826	ATM	08-443-6R	Horn Antenna (90 - 140 GHz)	8041904-1	1/23/14
900711	ATM	10-443-6R	Horn Antenna (75 - 110 GHz)	8051905-1	1/23/14
900712	ATM	15-443-6R	Horn Antenna (50 - 75 GHz)	8051805-1	1/23/14
900713	ATM	05-443-6R	Horn Antenna (140 - 220 GHz)	S0685	1/23/14
900717	Hewlett Packard	11970U	Harmonic Mixer (40 - 60 GHz)	2332A01110	1/23/14
900873	CMT	RA28-K-F-4B-C	26.5-40 GHz waveguide	990706-001	1/23/14
900874	Continental Microwave & Tool	RA42-K-F-4B-C	18-26.5 GHz waveguide	990706-002	1/23/14
900932	Hewlett Packard	8449B OPT H02	Preamplifier (1 - 26.5 GHz)	3008A00505	8/10/13
901256	ATM	19-443-6R	Horn Antenna (40 - 60 GHz) WR-19	8041704-01	1/23/14
901581	Rohde & Schwarz	1166.1660.50	Spectrum Analyzer	2001006	6/3/13
901586	Rohde & Schwarz	1089.0876.00	50-75 GHz Mixer	100098	1/23/14
901586	Rohde & Schwarz	FS-Z110 1089.0947.04	75-110 GHz Mixer	100010	6/3/13
901587	Rohde & Schwarz	SAM-220	140-220 GHz Mixer	20005	6/3/13
901588	Rohde & Schwarz	SAM-140	90-140 GHz Mixer	20022	6/3/13
900151	Rohde and Schwarz	HFH2-Z2	Loop Antenna (9 kHz - 30 MHz)	827525/019	10/1/13
900905	Rhein Tech Laboratories	PR-1040	OATS 1 Preamplifier 40dB (30 MHz – 2 GHz)	1006	04/10/13
900878	Rhein Tech Laboratories	AM3-1197-0005	3 meter antenna mast, polarizing	Outdoor Range 1	Not Required
901593	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/16/13
901594	Insulated Wire Inc.	KPS-1503-360-KPR	SMK RF Cables 36"	NA	8/16/13
901242	Rhein Tech Laboratories	WRT-000-0003	Wood rotating table	N/A	Not Required

Radiated Emissions Test Equipment Continued

RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900772	EMCO	3161-02	Horn Antenna (2 - 4 GHz)	9804-1044	4/19/14
900321	EMCO	3161-03	Horn Antenna (4.0 - 8.2 GHz)	9508-1020	4/19/14
900323	EMCO	3160-07	Horn Antenna (8.2 - 12.4 GHz)	9605-1054	4/19/14
900356	EMCO	3160-08	Horn Antenna (12.4 - 18 GHz)	9607-1044	4/19/14
900325	EMCO	3160-9	Horn Antenna (18 - 26.5 GHz)	9605-1051	4/19/14
900717	Hewlett Packard	11970U	Harmonic Mixer (40 – 60 GHz)	2332A01110	4/19/14
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	2/6/14
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	2/6/14
900933	Hewlett Packard	11975A	2 - 8 GHz Amplifier	2304A00348	Not required
900913	Hewlett Packard	85462A	EMI Receiver RF Section (9 kHz – 6.5 GHz)	3325A00159	9/20/13
900914	Hewlett Packard	8546OA	RF Filter Section (100 kHz - 6.5 GHz)	3330A00107	9/20/13

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)	Average Limit (dBuV/m)	Margin (dB)
10,517	87.5	35.5	123.0	128.0	-5.0

* testing performed at 3m

** note: peak measurement shown complying with average limit

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)	Average Limit (dBuV/m)	Margin (dB)
21,034.6	39.2	42.2	81.4	88.0	-6.6
31,551.9	32.1	44.4	76.5	88.0	-11.5
42,069.2	21.6	24.0	45.6	88.0	-42.4
52,586.6	-40.1	41.4	1.3	88.0	-86.7

* note: peak measurements shown complying with average limit

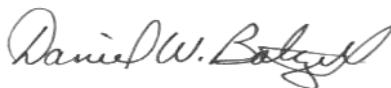
3.5 Radiated Emissions Digital Test Data

Table 3-4: Digital Radiated Emissions Test Data

Temperature: 36°F Humidity: 87%										
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
64.717	Qp	H	0	1.0	38.9	-25.8	13.1	40.0	-26.9	Pass
130.640	Qp	V	0	1.0	47.3	-20.4	26.9	43.5	-16.6	Pass
155.560	Qp	V	90	1.0	50.6	-21.6	29.0	43.5	-14.5	Pass
160.950	Qp	V	90	1.0	50.3	-21.8	28.5	43.5	-15.0	Pass
171.712	Qp	H	0	1.4	56.8	-22.1	34.7	43.5	-8.8	Pass
190.137	Qp	V	90	1.0	52.6	-22.0	30.6	43.5	-12.9	Pass
205.330	Qp	H	0	1.4	53.3	-21.8	31.5	43.5	-12.0	Pass
220.350	Qp	V	100	1.0	48.7	-21.8	26.9	46.0	-19.1	Pass
224.865	Qp	H	180	1.0	52.9	-21.2	31.7	46.0	-14.3	Pass
293.800	Qp	H	180	1.0	61.3	-17.4	43.9	46.0	-2.1	Pass
317.070	Qp	V	90	1.0	42.3	-17.0	25.3	46.0	-20.7	Pass
325.550	Qp	H	0	1.4	55.6	-16.8	38.8	46.0	-7.2	Pass
353.900	Qp	V	0	1.0	49.1	-15.8	33.3	46.0	-12.7	Pass
383.420	Qp	H	0	1.0	45.6	-14.9	30.7	46.0	-15.3	Pass
414.013	Qp	V	140	1.2	52.7	-13.4	39.3	46.0	-6.7	Pass
432.688	Qp	V	120	1.0	44.3	-13.0	31.3	46.0	-14.7	Pass

Test Personnel:

Daniel W. Baltzell
Test Engineer



Signature

February 19, 2013
Date 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 emissions 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 emissions 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 Emissions Test Procedure

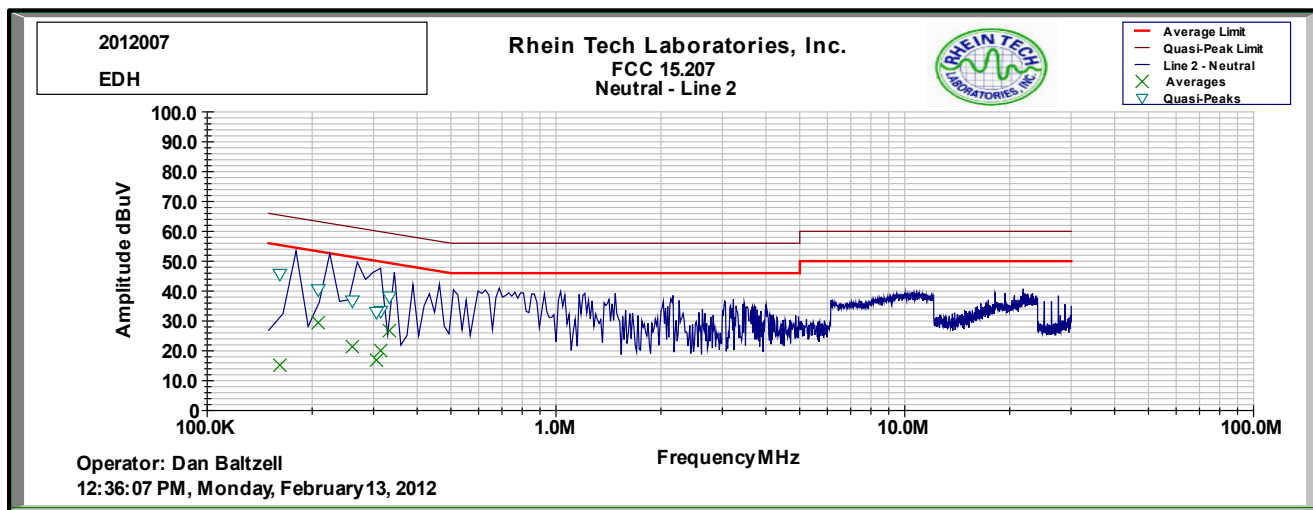
The conducted test was performed with the EUT exercise program loaded, and the emissions were scanned between 150 kHz to 30 MHz on the NEUTRAL SIDE and PHASE SIDE.

Table 4-1: Conducted Line Emissions Test Equipment

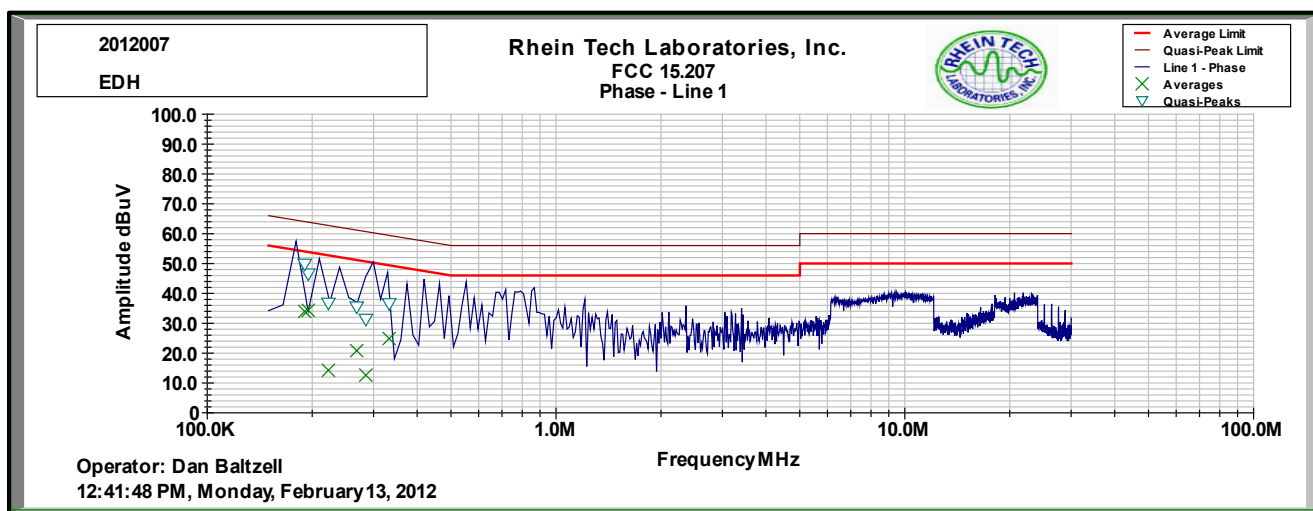
RTL Asset #	Manufacturer	Model	Part Type	Serial Number	Calibration Due Date
900930	Hewlett Packard	85662A	Spectrum Analyzer Display Section	3144A20839	2/6/14
900931	Hewlett Packard	8566B	Spectrum Analyzer (100 Hz - 22 GHz)	3138A07771	2/6/14
900969	Hewlett Packard	85650A	Quasi-Peak Adapter	2412A00414	2/6/14
901082	AFJ International	LS16	16A LISN	16010020081	2/6/14

4.3 Conducted Line Emissions Test Data

Plot 4-1: Conducted Emissions (Neutral Side)



Plot 4-2: Conducted Emissions (Phase Side)



Test Personnel:

Daniel Baltzell
Test Engineer

Signature

February 13, 2013
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
901581	Rohde & Schwarz	1166.1660.50	Spectrum Analyzer	2001006	6/03/13

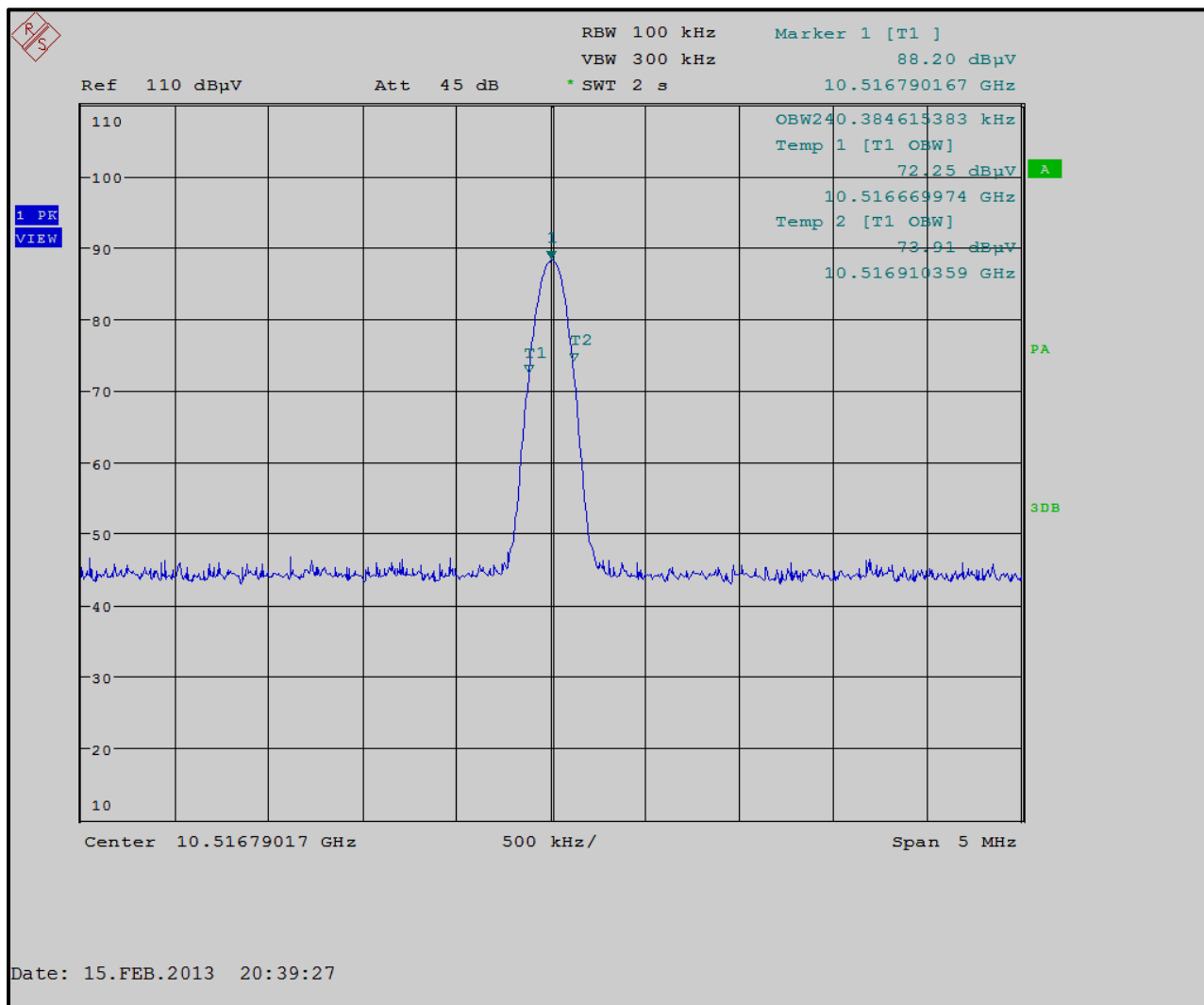
5.2 Bandwidth Test Data

Table 5-2: Bandwidth Test Data

99% Bandwidth (kHz)
240

5.3 99% Bandwidth Plots

Plot 5-1: 99% Bandwidth



Test Personnel:

Daniel W. Baltzell
 Test Engineer

Daniel W. Baltzell

Signature

February 15, 2013
 Date of Test

Rhein Tech Laboratories, Inc.
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Suite 1400
Herndon, VA 20170
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Client: EDH (South Africa) (Pty) Ltd
Model: FlightScope X1
Standards: FCC 15.245/IC RSS-210
FCC/IC ID: QXP-SS661/4612A-SS661
Report #: 2013032

6 Conclusion

The data in this measurement report shows that the EUT as tested, EDH (South Africa) (Pty) Ltd., Model: FlightScope X1, FCC ID: QXP-SS661, IC: 4612A-SS661, 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.