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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart C (15.247) DTS Specifications and Industry Canada RSS 210 Issue 6 for an Intentional Radiator on the Horizon Hobby, Inc. Model: X1TXM Spektrum DSM X1

FCC ID:	BRWDSMTX10
UPN:	6157A-BRWDSMT
GRANTEE:	Horizon Hobby, Inc. 1657 Country Club Dr., Milpitas, CA 95035
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	October 10, 2005
FINAL TEST DATE:	October 6 and October 10, 2005
AUTHORIZED SIGNATORY:	Mark Briggs Principal Engineer

ACCREDITED
2016-01

DECLARATIONS OF COMPLIANCE

Equipment Name and Model:

X1TXM Spektrum DSM X1

Manufacturer:

Horizon Hobby, Inc.
1657 Country Club Dr.,
Milpitas, CA 95035

Tested to applicable standards:

Industry Canada RSS-Gen Issue 1
RSS 210 Issue 6 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC2845 SV2 Dated August 16, 2007

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of ANSI C63.4: 2003 as referenced by FCC Part 15 and by section 1.0 of RSS-212, Issue 1, "Test Facilities and Test Methods for Radio Equipment" / RSS-Gen Issue 1); and that the equipment performed in accordance with the data submitted in this report.

Signature	
Name	Mark Briggs
Title	Principal Engineer
Company	Elliott Laboratories Inc.
Address	684 W. Maude Ave Sunnyvale, CA 94086 USA
Date:	October 10, 2005

TABLE OF CONTENTS

SCOPE

An electromagnetic emissions test has been performed on the Horizon Hobby, Inc model X1TXM Spektrum DSM X1 pursuant to the following rules:

Industry Canada RSS-Gen Issue 1
RSS 210 Issue 6 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart C requirements for DTS devices

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
RSS-212 Issue 1 Test Facilities and Test Methods for Radio Equipment

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Horizon Hobby, Inc model X1TXM Spektrum DSM X1 and therefore apply only to the tested sample. The sample was selected and prepared by Paul Beard of Horizon Hobby, Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart C of Part 15 of FCC Rules and RSS-210 Issue 6 for license-exempt low power devices for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules and in RSS-Gen issue 1.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

SUMMARY OF RESULTS

DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)

FCC Part 15 Reference	RSS Reference	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 210 A8.2	Digital Modulation	Systems uses DSSS techniques	-	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	Greater than 900kHz	>500kHz	Complies
	RSP100	20dB Bandwidth 99% Bandwidth	1.52 MHz 1.32 MHz	Information only	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	16.7 dBm (0.047 Watts) EIRP = 0.07 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	3.39 dBm / 3 KHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All spurious emissions more than 20dB below fundamental signal	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	52.8dBµV/m (437.0µV/m) @ 2483.5MHz	15.207 in restricted bands, all others < -20dBc	Complies (-1.2dB)

Note 1: EIRP calculated using antenna gain of 2 dBi

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Part 15 Section	RSS 210 Section	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Unique connector	Unique connector	Complies
N/A	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	30.6dBµV/m @ 798.828MHz	Refer to standard	Complies (-15.4dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	All signals more than 15dB below the average limit when measured with a peak detector	Refer to standard	Complies
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies

MEASUREMENT UNCERTAINTIES

ISO Guide 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	30 to 1000	± 3.6

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Horizon Hobby, Inc model X1TXM Spektrum DSM X1 is a 2.4GHz DSSS transceiver module which is designed for model aircraft control and telemetry. Normally, the EUT would be placed on a tabletop during operation. The EUT was, therefore, treated as tabletop equipment during testing to simulate the end-user environment. The electrical rating of the 9.6V DC 300mA.

The sample was received on October 6, 2005 and tested on October 6 and October 10, 2005. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Horizon Hobby	X1TXM	2.4GHz DSSS Transceiver Module	PFB101005	BRWDSMTX10

ENCLOSURE

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host system.

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with the emission specifications.

SUPPORT EQUIPMENT

The X1TXM module was tested as a module. To support testing and to provide the device with power the module was mounted onto a remote control type of device, consisting of a fully plastic enclosure. The circuit board of the module was fully exposed during testing as required for modular approvals.

An AC-DC adapter was used for AC conducted emissions measurements.

EUT INTERFACE PORTS

The I/O cabling configuration during emissions testing was as follows:

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
None				

EUT OPERATION DURING TESTING

The X1TXM module was configured to continuously transmit on a single channel (top, center or bottom) for transmit-mode tests and for AC conducted emissions measurements (center channel only – changing the operating frequency had no effect on the AC emissions). For receive mode tests the device was configured to continuously receive on the center channel.

ANTENNA REQUIREMENTS

The EUT antenna is a 2dBi Folded dipole. The antenna connects to the EUT via a non-standard micro-coax, thereby meeting the requirements of FCC 15.203.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on October 6 and October 10, 2005 at the Elliott Laboratories Open Area Test Site #2 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Federal Communications Commission. In accordance with Industry Canada rules detailed in RSS 210 Issue 5 and RSS-212, construction, calibration, and equipment data for the test sites have been filed with the Federal Communications Commission.

The FCC recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde and Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

POWER METER

A power meter and peak power sensor are used for all direct output power measurements from transmitters as they provide a broadband indication of the power output.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors programmed into the test receivers.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

ANSI C63.4:2003 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

TEST PROCEDURES

EUT AND CABLE PLACEMENT

The FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4:2003 , and the worst case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

Measurement bandwidths (video and resolution) are set in accordance with FCC procedures for the type of radio being tested.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

Frequency (MHz)	Average Limit (dBuV)	Quasi Peak Limit (dBuV)
0.150 to 0.500	Linear decrease on logarithmic frequency axis between 56.0 and 46.0	Linear decrease on logarithmic frequency axis between 66.0 and 56.0
0.500 to 5.000	46.0	56.0
5.000 to 30.000	50.0	60.0

GENERAL RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D) and the limits for all emissions for a low power device operating under the general rules of RSS 210, FCC Part 15 Subpart C.

Frequency Range (MHz)	Limit (uV/m)	Limit (dBuV/m @ 3m)
0.009-0.490	$2400/F_{KHz}$ @ 300m	$67.6-20*\log_{10}(F_{KHz})$ @ 300m
0.490-1.705	$24000/F_{KHz}$ @ 30m	$87.6-20*\log_{10}(F_{KHz})$ @ 30m
1.705 to 30	30 @ 30m	29.5 @ 30m
30 to 88	100 @ 3m	40 @ 3m
88 to 216	150 @ 3m	43.5 @ 3m
216 to 960	200 @ 3m	46.0 @ 3m
Above 960	500 @ 3m	54.0 @ 3m

RECEIVER SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for emissions from the receiver as detailed in FCC Part 15.109, RSS 210 table 2, RSS GEN table 1.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

[1] The restricted bands are detailed in FCC 15.203, RSS 210 Table 1 and RSS 310 Table 2

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
902 – 928	1 Watt (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watt (30 dBm)	8 dBm/3kHz

The maximum permitted output power is reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5850 MHz band are not subject to this restriction.

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

The limits for unwanted (spurious) emissions from the transmitter falling in the restricted bands are those specified in the general limits sections of FCC Part 15 and RSS 210. All other unwanted (spurious) emissions shall be at least 20dB below the level of the highest in-band signal level (30dB if the power is measured using the sample detector/power averaging method).

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

Receiver readings are compared directly to the conducted emissions specification limit (decibel form) as follows:

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

Receiver readings are compared directly to the specification limit (decibel form). The receiver internally corrects for cable loss, preamplifier gain, and antenna factor. The calculations are in the reverse direction of the actual signal flow, thus cable loss is added and the amplifier gain is subtracted. The Antenna Factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

$$F_d = 20*LOG_{10} (D_m/D_s)$$

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

For electric field measurements below 30MHz the extrapolation factor is either determined by making measurements at multiple distances or a theoretical value is calculated using the formula:

$$F_d = 40*LOG_{10} (D_m/D_s)$$

Measurement Distance is the distance at which the measurements were taken and Specification Distance is the distance at which the specification limits are based. The antenna factor converts the voltage at the antenna coaxial connector to the field strength at the antenna elements.

The margin of a given emission peak relative to the limit is calculated as follows:

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \text{ v } 30 P}{3} \quad \text{microvolts per meter}$$

where P is the eirp (Watts)

EXHIBIT 1: Test Configuration Photographs

Separate Document

EXHIBIT 2: Proposed FCC ID Label & Label Location

Separate Document

EXHIBIT 3: Detailed Photographs of Horizon Hobby, Inc. Model X1TXM Spektrum DSM X1Construction

Separate Document

EXHIBIT 4: Operator's Manual for Horizon Hobby, Inc. Model X1TXM Spektrum DSM X1

Separate Document

EXHIBIT 5: Block Diagram of Horizon Hobby, Inc. Model X1TXM Spektrum DSM X1

Separate Document

EXHIBIT 6: Schematic Diagrams for Horizon Hobby, Inc. Model X1TXM Spektrum DSM X1

Separate Document

EXHIBIT 7: Theory of Operation for Horizon Hobby, Inc. Model X1TXM Spektrum DSM X1

Separate Document

EXHIBIT 8: RF Exposure Information

Separate Document

EXHIBIT 9: Modular Approval Requirements

Separate Document

EXHIBIT 10: Test Equipment Calibration Data

1 page following

Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1321	30-Mar-07
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	23-May-06
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 40 GHz, Fremont (SA40)	8564E (84125C)	1393	26-Oct-05
EMCO	Horn antenna, D. Ridge 1-18GHz (SA40 system antenna)30Hz sunnyvale	3115	1142	11-Jun-06
Hewlett Packard	Microwave EMI test system head (includes W1 - W4, Asset 1143 and 1144)	84125C	1145	07-Sep-06
EMCO	Horn antenna, 18-26.5 GHz (SA40 30Hz)	3160-09 (84125C)	1150	12-Sep-06
Hewlett Packard	High Pass filter, 3.5GHz	P/N 84300-80038	1157	28-Apr-06

PSD and 99% Bandwidth, 31-Oct-05

Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	787	17-Dec-05

Conducted Emissions - AC Power Ports, 31-Oct-05

Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	FCC / CISPR LISN	LISN-3, OATS	304	08-Jul-06
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	787	17-Dec-05
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1398	11-Feb-06

EXHIBIT 11: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T61435 21 Pages following

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EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	Test-Log Number:	T61435
		Project Manager:	Ezther Zhu
Contact:	Paul Beard		
Emissions Spec:	FCC 15.247	Class:	-
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Horizon Hobby, Inc.

Model

X1TXM Spedtrum DSM X1 module

Date of Last Test: 10/31/2005

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	Test-Log Number:	T61435
		Project Manager:	Ezther Zhu
Contact:	Paul Beard		
Emissions Spec:	FCC 15.247	Class:	-
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a 2.4GHz DSSS transceiver module which is designed for model aircraft control and telemetry. Normally, the EUT would be placed on a table top during operation. The EUT was, therefore, treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the 9.6V DC 300mA.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Horizon Hobby	X1TXM	2.4GHz DSSS	PFB101005	BRWDSMTX10

EUT Antenna (Intentional Radiators Only)

The EUT antenna is a 2dBi Folded dipole.
The antenna connects to the EUT via a non-standard micro-coax, thereby meeting the requirements of FCC 15.203.

EUT Enclosure

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer.

Modification History

Mod. #	Test	Date	Modification
1	-	-	None

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Project Manager:	Ezther Zhu
Contact:	Paul Beard		
Emissions Spec:	FCC 15.247	Class:	-
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
JR	XP9303	9# RC Unit	1953706	N/A
SPEKTRUM	SPM7101	AC-DC Adapter	-	N/A

JR RC unit was used as atest fixture to provide the module with power and control signals during testing.
AC adapter used for conducted emissions measurements. An external battery pack was used for radiated emissions.

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None				

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
None				

EUT Operation During Emissions Tests

The X1TXM module was configured to continuously transmit on a single channel (top, center or bottom) for transmit-mode tests. For receive mode tests the device was configured to continuously receive on the center channel.

Elliott

EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	-

Conducted Emissions - Power Ports

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 10/31/2005 Config. Used: 1

Test Engineer: Rafael Varelas Config Change: None

Test Location: SVOATS #2 EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN.

Ambient Conditions:

Temperature: 18 °C

Rel. Humidity: 52 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	15.209	Pass	> 15dB below the limit

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

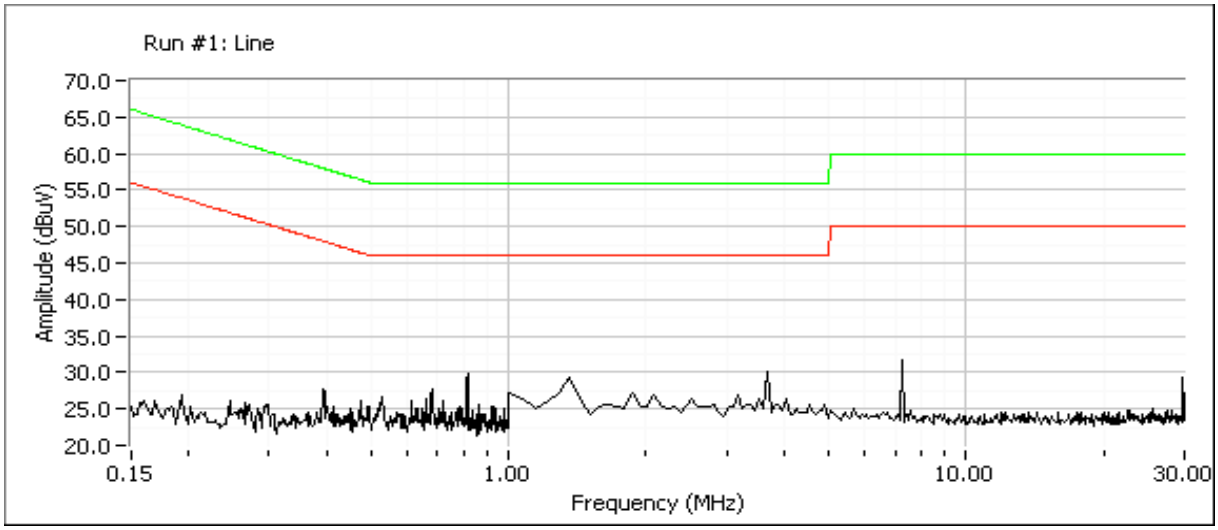
No deviations were made from the requirements of the standard.

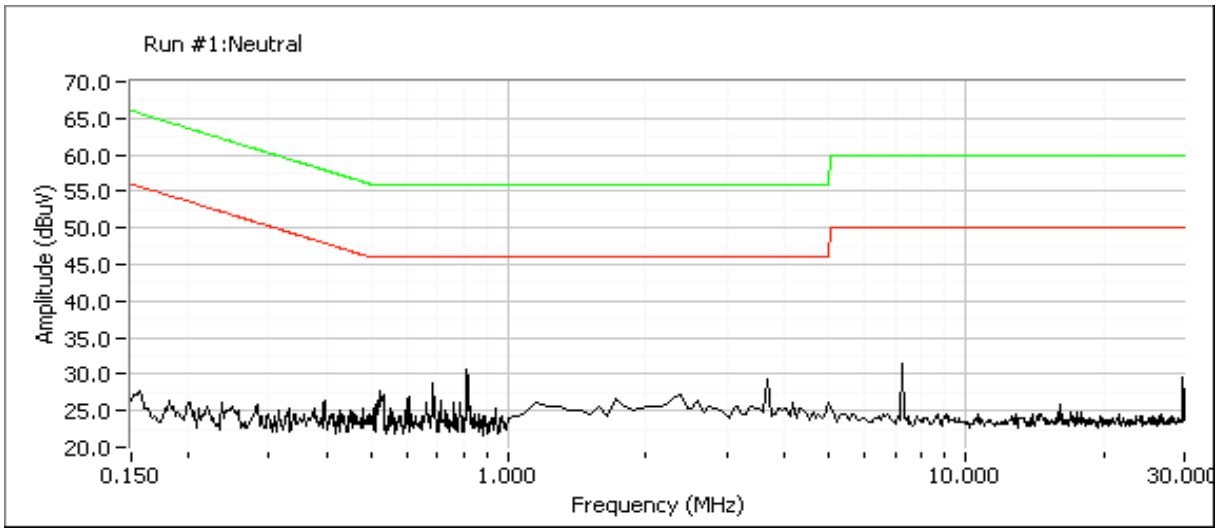
Elliott

EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz





Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

FCC 15.247 DTS - Power, Bandwidth and Spurious Emissions

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 10/6/2005 Config. Used: 1
Test Engineer: Juan Martinez Config Change: None
Test Location: SVOATS# 2 EUT Voltage: 10Vdc

General Test Configuration

The EUT was located on the turntable for radiated spurious emissions testing.

For radiated emissions testing the measurement antenna was located 3 meters from the EUT.

When measuring the conducted emissions from the EUT's antenna port, the antenna port of the EUT was connected to the spectrum analyzer or power meter via a suitable attenuator to prevent overloading the measurement system. All measurements are corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1a - c	Radiated Spurious Emissions, 30 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	Pass	52.8dBµV/m (437.0µV/m) @ 2483.5MHz (-1.2dB)
1d	RF Port Spurious Emissions, 30 - 26,000 MHz	FCC Part 15.209 / 15.247(c)	Pass	All emissions <-20dBc
2	6dB Bandwidth	15.247(a)	Pass	>900kHz
3	Output Power	15.247(b)	Pass	16.7dBm
4	Power Spectral Density (PSD)	15.247(d)	Pass	3.39dBm/3kHz

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

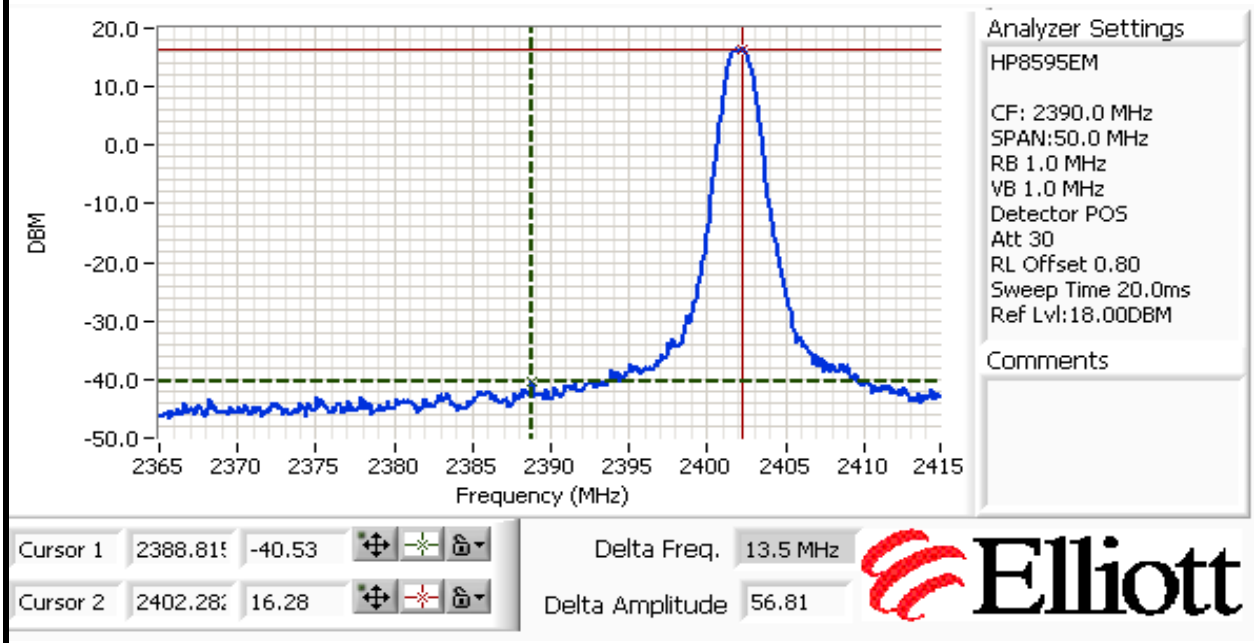
No deviations were made from the requirements of the standard.

Elliott EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

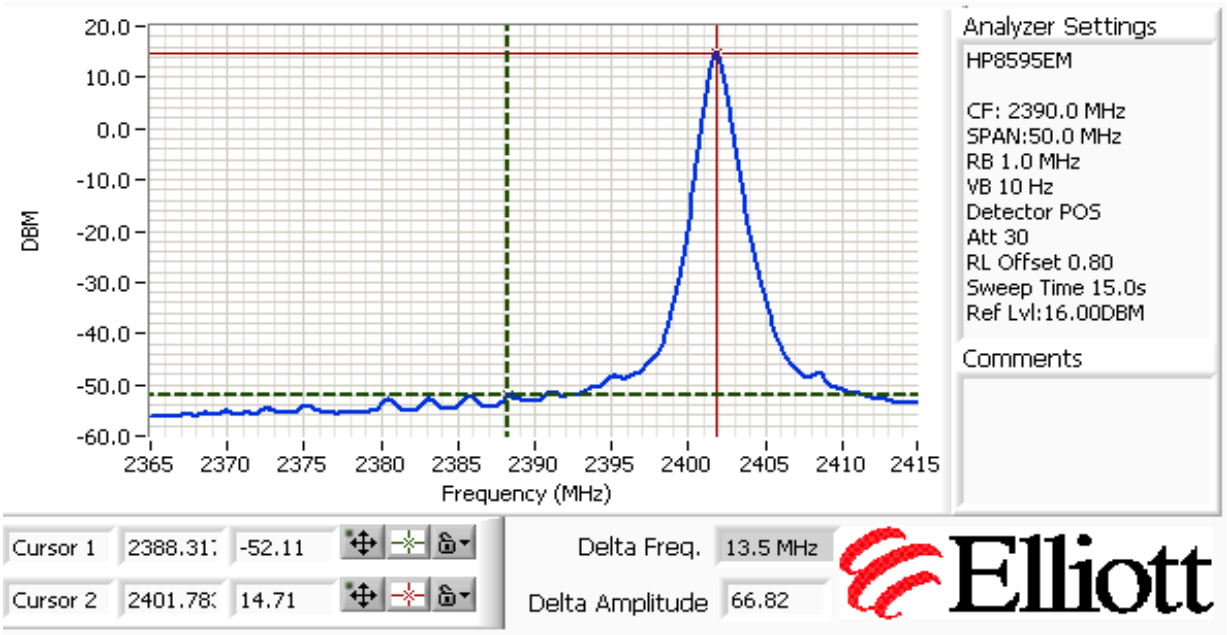
Run #1a: Radiated Spurious Emissions, 1000 - 25,000 MHz. Low Channel @ 2402 MHz
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Standing								
2401.648	115.7	V	-	-	PK	63	1.1	RB = VB = 1MHz
2401.648	113.9	V	-	-	AVG	63	1.1	RB = 1MHz, VB = 10Hz
2401.648	106.6	H	-	-	PK	100	1.1	RB = VB = 1MHz
2401.648	104.8	H	-	-	AVG	100	1.1	RB = 1MHz, VB = 10Hz
Laying flat								
2401.700	106.4	V	-	-	PK	331	1.0	RB = VB = 1MHz
2401.700	104.5	V	-	-	AVG	331	1.0	RB = 1MHz, VB = 10Hz
2401.813	115.6	H	-	-	PK	193	2.0	RB = VB = 1MHz
2401.813	113.7	H	-	-	AVG	193	2.0	RB = 1MHz, VB = 10Hz
On its side								
2401.708	115.5	H	-	-	PK	139	1.5	RB = VB = 1MHz
2401.708	113.6	H	-	-	AVG	139	1.5	RB = 1MHz, VB = 10Hz
2402.038	103.1	V	-	-	PK	276	1.0	RB = VB = 1MHz
2402.038	101.4	V	-	-	AVG	276	1.0	RB = 1MHz, VB = 10Hz



EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A



Delta Marker - Peak	56.81 dB	Delta between highest in-band and highest
Delta Marker - Average	66.82 dB	

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.000	48.1	v	54.0	-5.9	Avg	-	-	
2390.000	58.9	v	74.0	-15.1	Pk	-	-	

Note 1:	Calculated by subtracting the marker delta values from the fundamental field strength measurements.

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

Other Spurious Emissions
OATS measurements at 3 meters

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4803.69	52.8	H	54.0	-1.2	Avg	178	1.0	
4803.63	49.9	V	54.0	-4.2	Avg	167	1.0	
4803.69	60.4	H	74.0	-13.6	Pk	178	1.0	
4803.63	58.2	V	74.0	-15.8	Pk	167	1.0	
7205.00	35.0	V	54.0	-19.0	Avg	180	1.0	Note 2
7205.00	32.0	H	54.0	-22.0	AVG	180	1.0	Note 2
7205.00	39.0	H	74.0	-35.0	PK	180	1.0	Note 2
7205.00	38.0	V	74.0	-36.0	Pk	180	1.0	Note 2

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	The signal does not fall in a restricted band, but the more stirngent limits of 15.209 were applied.

Run #1b: Radiated Spurious Emissions, 1000 - 25,000 MHz. Center Channel @ 2441 MHz
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz.
Standing

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2442.260	99.0	H	-	-	PK	143	1.3	RB = VB = 1MHz
2442.260	96.9	H	-	-	AVG	143	1.3	RB = 1MHz, VB = 10Hz
2442.320	115.7	V	-	-	PK	294	1.0	RB = VB = 1MHz
2442.320	113.8	V	-	-	AVG	294	1.0	RB = 1MHz, VB = 10Hz

Laying flat

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2441.810	105.2	V	-	-	PK	135	1.0	RB = VB = 1MHz
2441.810	103.4	V	-	-	AVG	135	1.0	RB = 1MHz, VB = 10Hz
2442.328	116.8	H	-	-	PK	267	2.2	RB = VB = 1MHz
2442.328	115.0	H	-	-	AVG	267	2.2	RB = 1MHz, VB = 10Hz

On its side

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2442.313	101.3	V	-	-	PK	70	1.0	RB = VB = 1MHz
2442.313	99.5	V	-	-	AVG	70	1.0	RB = 1MHz, VB = 10Hz
2441.743	102.5	H	-	-	PK	6	1.0	RB = VB = 1MHz
2441.743	100.7	H	-	-	AVG	6	1.0	RB = 1MHz, VB = 10Hz

Elliott

EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

OATS measurements at 3 meters

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4883.54	51.1	V	54.0	-2.9	AVG	271	1.2	
4883.38	50.8	H	54.0	-3.3	AVG	185	1.0	
7332.00	68.0	H	74.0	-6.0	PK	0	1.2	no emission; standing up, note 2
7332.00	63.0	V	74.0	-11.0	PK	0	1.2	no emission; laying flat
4883.54	59.2	V	74.0	-14.8	PK	271	1.2	
4883.38	58.9	H	74.0	-15.1	PK	185	1.0	
7332.00	38.0	H	54.0	-16.0	Avg	60	1.0	no emission; standing up
7332.00	36.0	H	54.0	-18.0	AVG	60	1.0	standing up
7332.00	33.0	H	54.0	-21.0	AVG	0	1.2	no emission; laying flat
7332.00	32.0	V	54.0	-22.0	AVG	60	1.0	no emission; standing up
7332.00	48.0	H	74.0	-26.0	PK	0	1.2	no emission; laying flat
7332.00	44.0	H	74.0	-30.0	PK	60	1.0	standing up

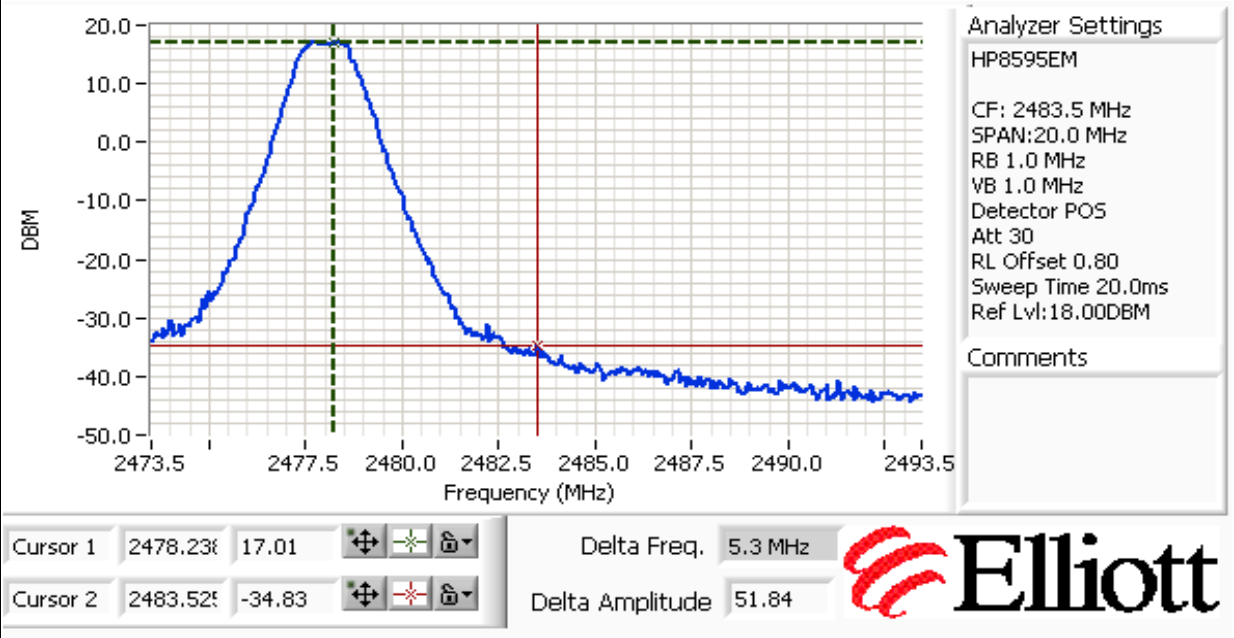
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	Ambient signal with high peak:average ratio at this frequency causing peak signal level recorded to be significnatly higher than the EUT signal level.

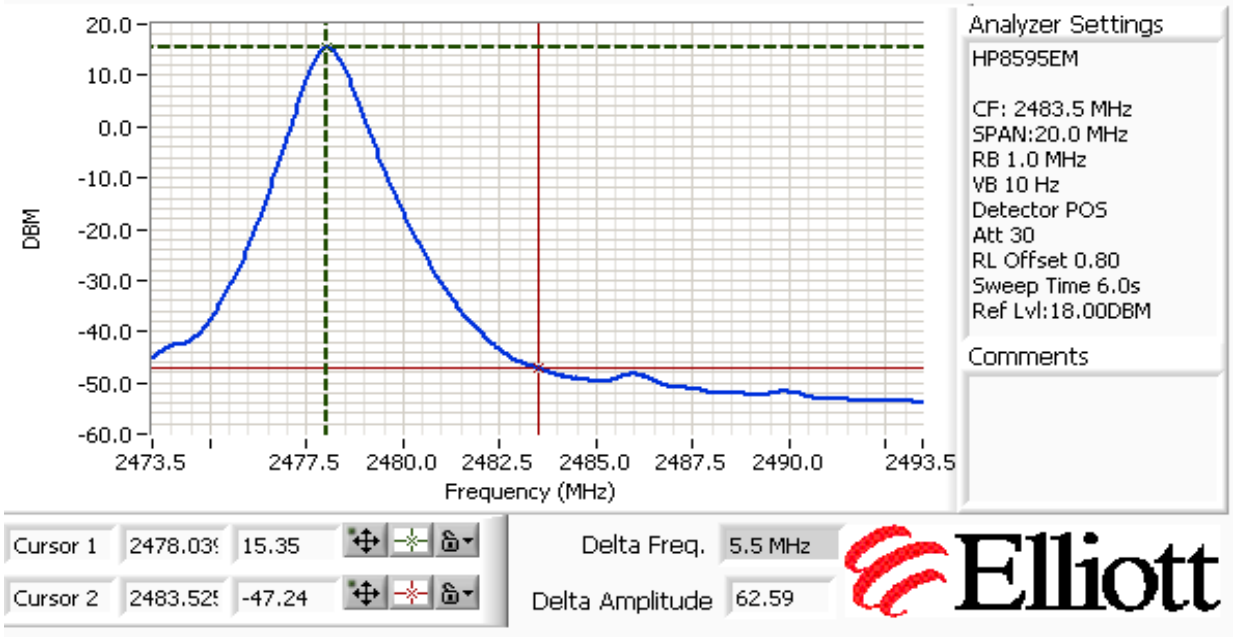
Run #1c: Radiated Spurious Emissions, 1000 - 25,000 MHz. High Channel @ 2478 MHz
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz.

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
Standing up								
2477.582	117.2	V	-	-	PK	294	1.0	RB = VB = 1MHz
2477.582	115.4	V	-	-	AVG	294	1.0	RB = 1MHz, VB = 10Hz
2477.582	101.7	H	-	-	PK	200	1.0	RB = VB = 1MHz
2477.582	99.9	H	-	-	AVG	200	1.0	RB = 1MHz, VB = 10Hz
On its side								
2477.832	102.5	V	-	-	PK	180	1.0	RB = VB = 1MHz
2477.832	100.6	V	-	-	AVG	180	1.0	RB = 1MHz, VB = 10Hz
2477.952	115.8	H	-	-	PK	141	1.8	RB = VB = 1MHz
2477.952	113.9	H	-	-	AVG	141	1.8	RB = 1MHz, VB = 10Hz
Laying Flat								
2477.780	117.0	H		117.0	PK	267	1.8	RB = 1MHz, VB = 10Hz
2477.780	115.1	H		115.1	AVG	267	1.8	RB = VB = 1MHz
2477.863	101.4	V		101.4	PK	229	1.0	RB = VB = 1MHz
2477.863	99.6	V		99.6	AVG	229	1.0	RB = 1MHz, VB = 10Hz

EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A





Elliott

EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

Delta Marker - Peak	51.84 dB
Delta Marker - Average	62.59 dB

Delta between highest in-band and highest

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	52.8	V	54.0	-1.2	Avg	-	-	
2483.500	65.4	V	74.0	-8.6	Pk	-	-	

Note 1:	Calculated by subtracting the marker delta values from the fundamental field strength measurements.

Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4957.607	49.4	V	54.0	-4.6	AVG	270	1.8	
4958.470	47.2	H	54.0	-6.9	AVG	185	1.0	
4957.607	58.0	V	74.0	-16.1	PK	270	1.8	
4958.470	56.9	H	74.0	-17.1	PK	185	1.0	
7432.000	34.0	V	54.0	-20.0	Avg	180	1.0	
7432.000	33.0	H	54.0	-21.0	AVG	180	1.0	
7432.000	45.0	V	74.0	-29.0	Pk	180	1.0	
7432.000	45.0	H	74.0	-29.0	PK	180	1.0	

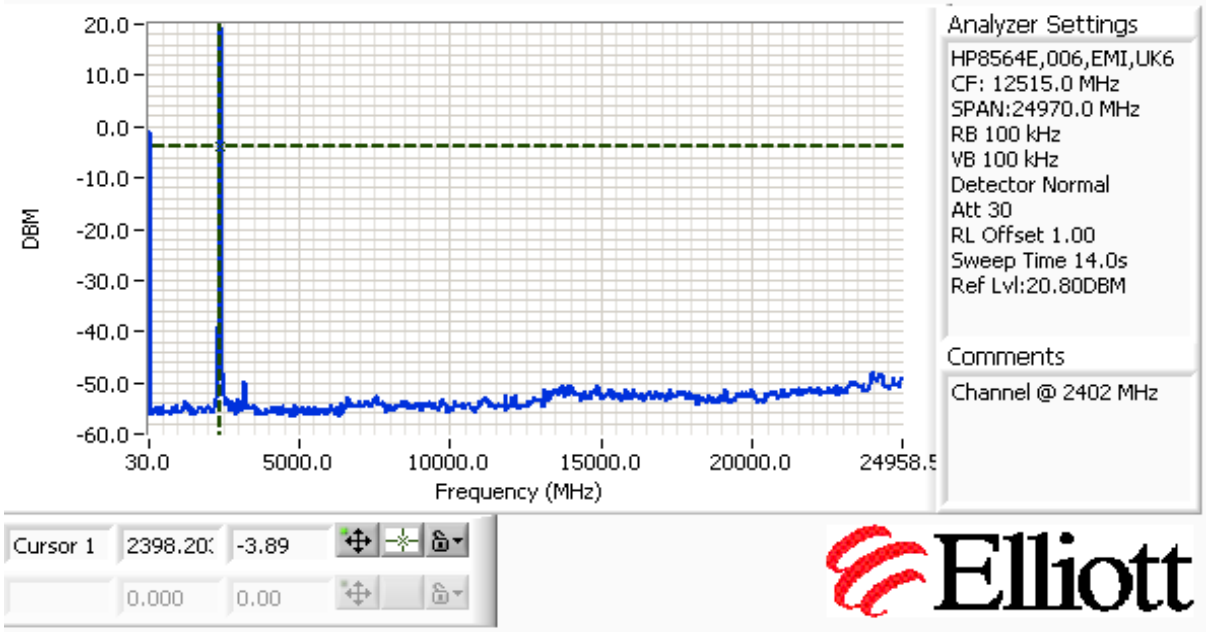
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

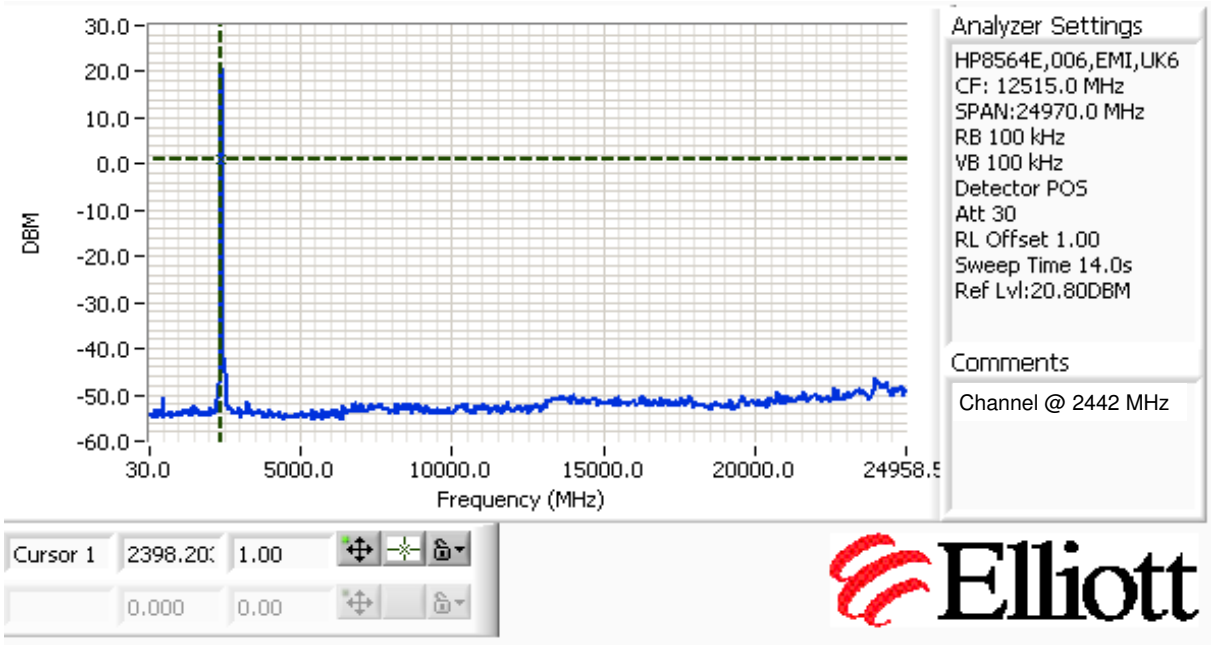
Elliott	EMC Test Data		
Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

Run #1d: Antenna Conducted Spurious Emissions, 30 - 25,000 MHz.

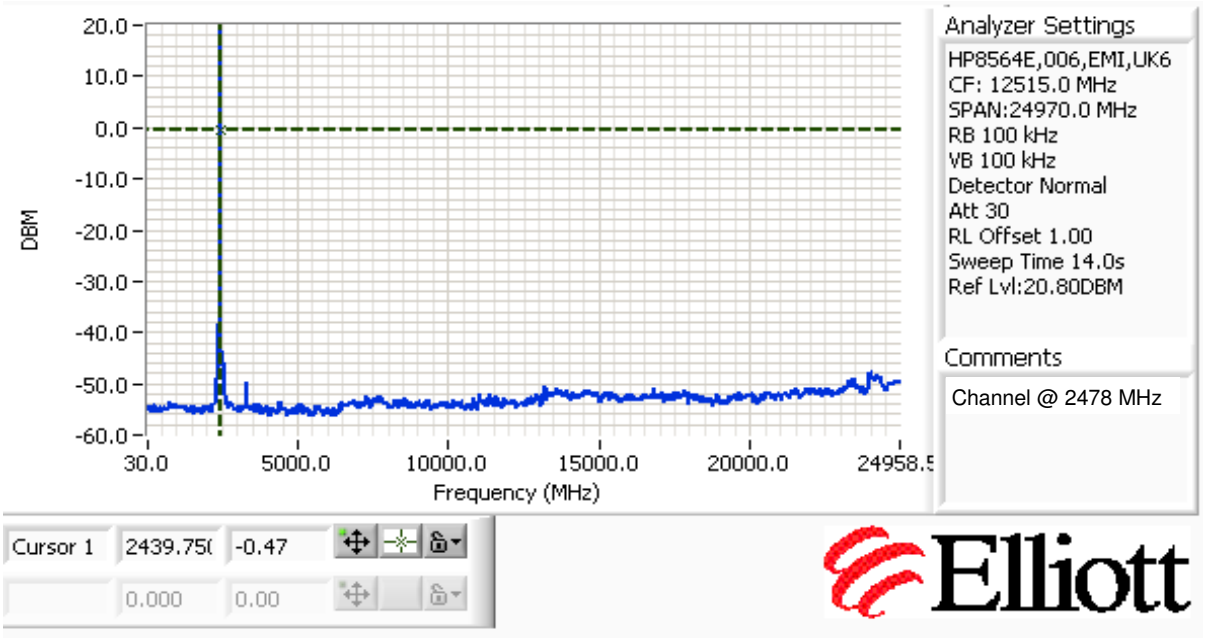
Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level.

[Spur at 30MHz in the first plot is actually artifact of 0Hz]





Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

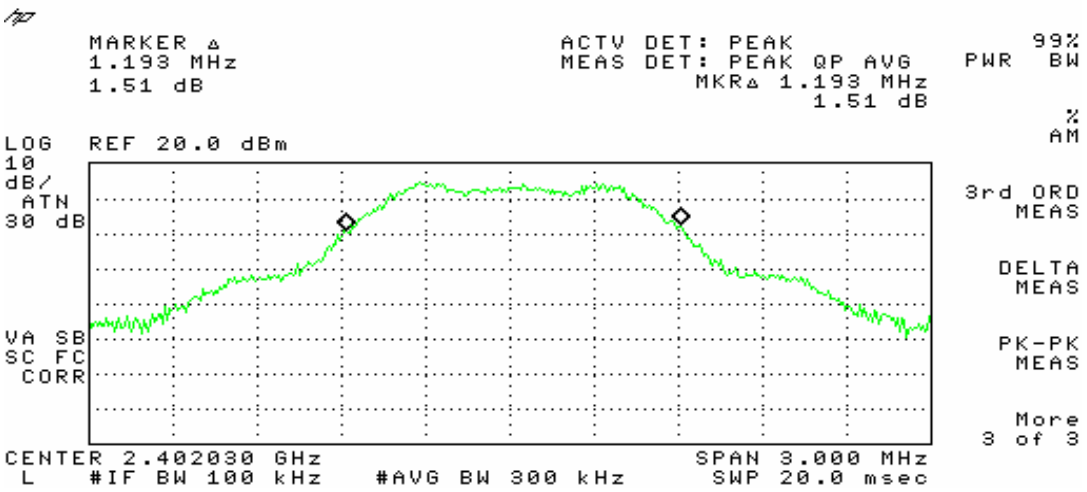


Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

Run #2: Signal Bandwidth

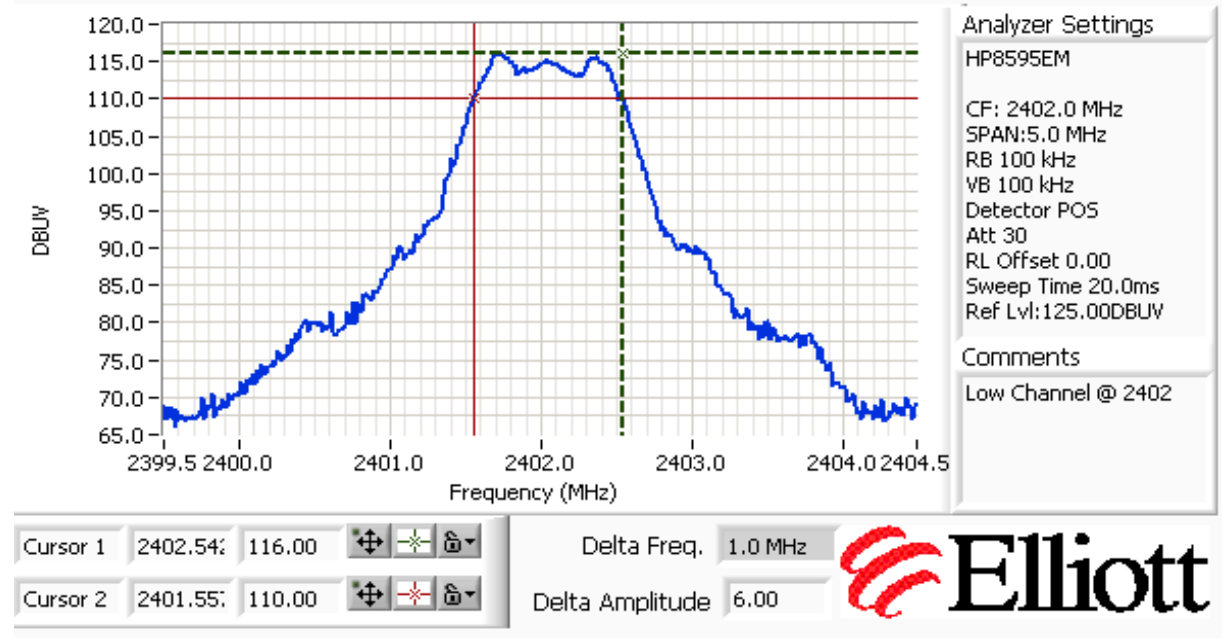
Rate	Frequency (MHz)	Resolution Bandwidth	6dB Signal Bandwidth	99% Signal Bandwidth
64	2402	100kHz	1 MHz	1.193 MHz
64	2442	100kHz	1 MHz	1.328 MHz
64	2478	100kHz	.9 MHz	1.245 MHz

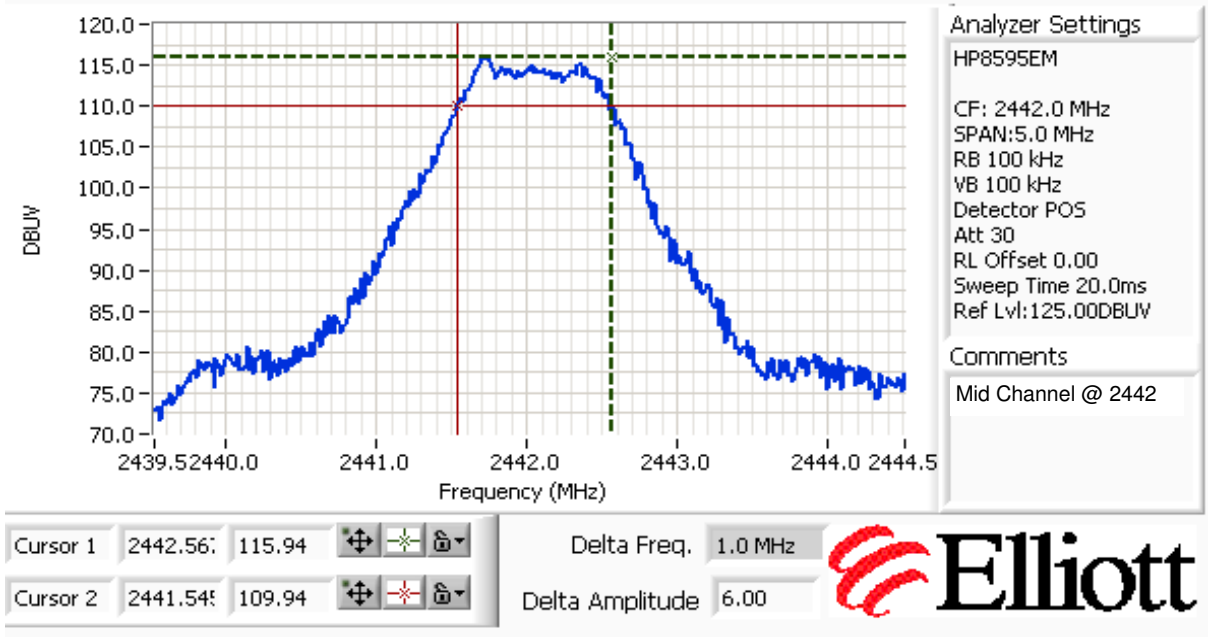
99% bandiwtdh measured on all three channels with RB=100kHz, VB=300kHz, peak detector (no averaging)
6dB bandwidth measured using RB=100kHz, VB=100kHz, peak detector, no averaging



EMC Test Data

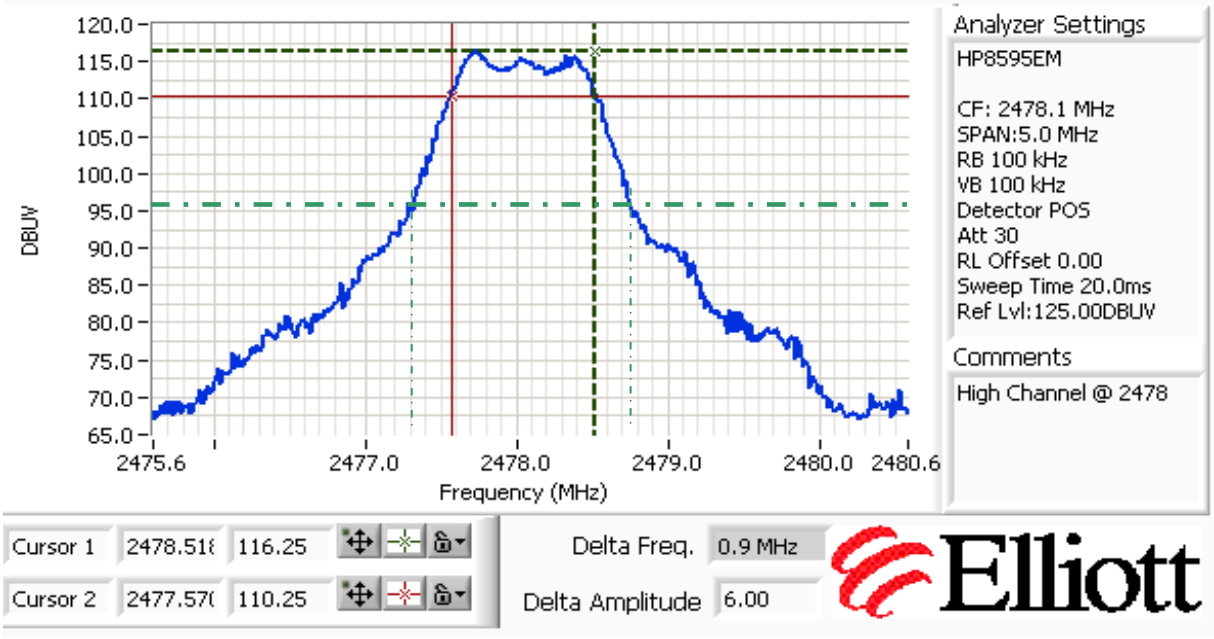
Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A





Elliott	EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A



Run #3: Output Power

Maximum antenna gain: 2 dBi

Rate	Frequency (MHz)		Output Power Note 1		EIRP	Average Power Note 2	
			dBm	W	W	dBm	W
64	2402		16.4	0.044	0.069		
64	2441		16.6	0.046	0.072		
64	2478		16.7	0.047	0.074		

Note 1:	Output power measured using a peak power meter

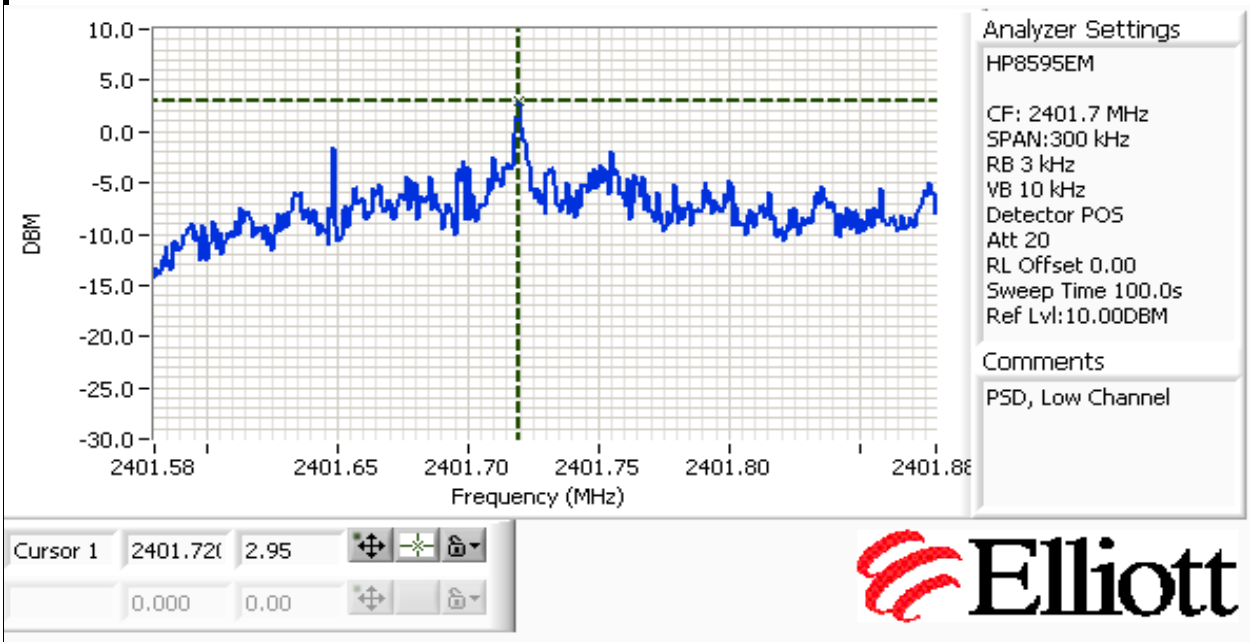
EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A

Run #4: Power Spectral Density

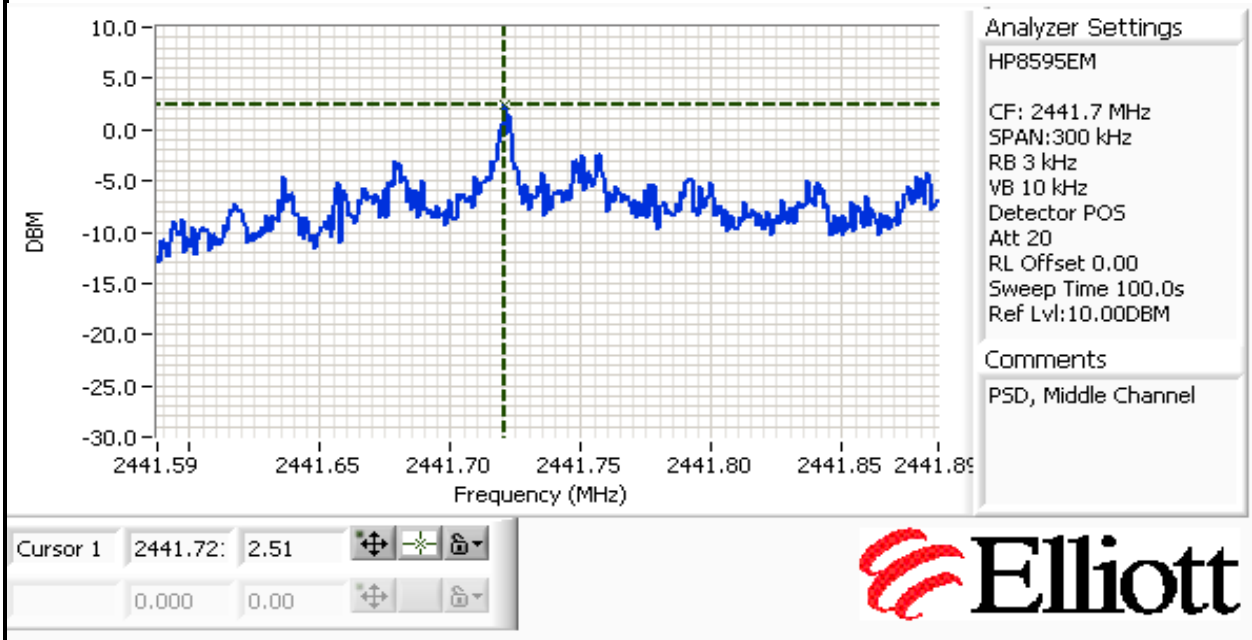
Rate	Operating Frequency (MHz)	Freq. @ PPSD	Res BW	P.S.D. (dBm/3kHz)
64	2402	2401.700	3 kHz	2.95
64	2441	2440.712	3 kHz	2.51
64	2478	2481.700	3 kHz	3.39

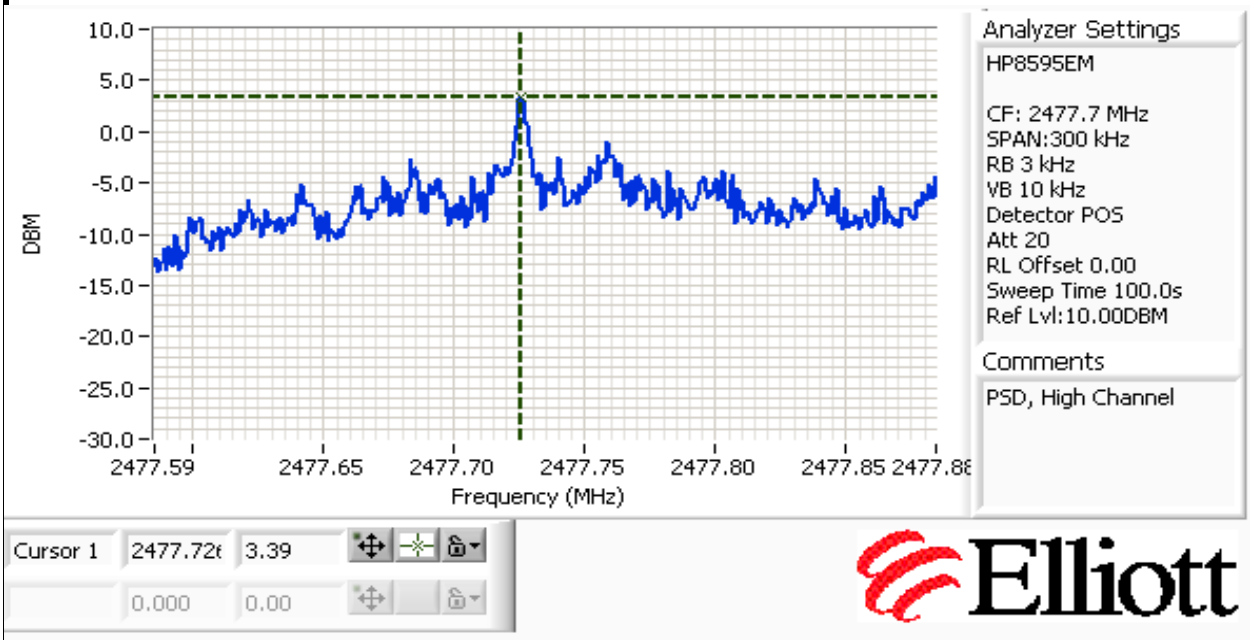
Note 1:	Freq. @ PPSD: Frequency of the Peak Power Spectral Density (PPSD)
Note 2:	Power spectral density measured using RB=3 kHz, VB=10kHz with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal.



EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	N/A





Elliott

EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	-

Radiated Emissions - Receive Mode

Test Specifics

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 10/10/2005 Config. Used: 1

Test Engineer: Mehran Birgani Config Change: None

Test Location: SVOATS #2 EUT Voltage: Battery

General Test Configuration

The EUT was located on the turntable for radiated emissions testing.

The test distance and extrapolation factor (if used) are detailed under each run description.

Note, **preliminary** testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. **Maximized** testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

Note, for testing above 1 GHz, the FCC specifies the limit as an average measurement. In addition, the FCC states that the peak reading of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Ambient Conditions:

Temperature: 26 °C

Rel. Humidity: 47 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 -8000 MHz	15.209	Pass	30.6dBµV/m @ 798.828MHz (-15.4dB)

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	Horizon Hobby, Inc.	Job Number:	J61376
Model:	X1TXM Spedtrum DSM X1 module	T-Log Number:	T61435
		Account Manager:	Ezther Zhu
Contact:	Paul Beard		
Spec:	FCC 15.247	Class:	-

Run #1: Preliminary Radiated Emissions, 30-8000 MHz

Frequency	Level	Pol	15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
798.828	30.6	V	46.0	-15.4	QP	54	1.0	EUT Lay Down
798.828	30.4	H	46.0	-15.6	QP	25	1.0	EUT Standing Up
798.828	29.3	V	46.0	-16.7	QP	160	1.0	EUT Standing Up
1597.589	35.6	V	54.0	-18.4	AVG	361	1.0	EUT Standing Up
798.828	25.4	H	46.0	-20.6	QP	4	1.5	EUT Lay Down
1597.460	29.8	V	54.0	-24.2	AVG	274	1.0	EUT Lay Down
1597.521	28.2	H	54.0	-25.9	AVG	41	1.0	EUT Lay Down
1597.453	26.7	H	54.0	-27.3	AVG	54	1.0	EUT Standing Up
1597.589	41.2	V	74.0	-32.8	PK	361	1.0	EUT Standing Up
1597.460	38.3	V	74.0	-35.7	PK	274	1.0	EUT Lay Down
1597.521	37.1	H	74.0	-36.9	PK	41	1.0	EUT Lay Down
1597.453	36.9	H	74.0	-37.1	PK	54	1.0	EUT Standing Up

Note 1: All harmonics of LO were measured and signal levels were more than 20dBuV/m under the limit.