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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to Industry Canada RSS-Gen Issue 1 / RSS 210 Issue 7 FCC Part 15 Subpart C on the RedOctane, Inc. Transmitter Model: Les Paul Wireless Controller

UPN:	7196A-95123805
FCC ID:	VFIBW95123805
GRANTEE:	RedOctane, Inc. 955 Benecia Avenue Sunnyvale, CA 94085
TEST SITE:	Elliott Laboratories, Inc. 41039 Boyce Road Fremont, CA 94538
REPORT DATE:	July 5, 2007
FINAL TEST DATE:	June 21, June 28 and June 29, 2007

AUTHORIZED SIGNATORY: _____

Juan Martinez
Senior EMC Engineer

ACCREDITED
2016-01

REVISION HISTORY

Revision #	Date	Comments	Modified By
1	July 9, 2007	Initial Release	David Guidotti

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SCOPE

An electromagnetic emissions test has been performed on the RedOctane, Inc. model Les Paul Wireless Controller pursuant to the following rules:

Industry Canada RSS-Gen Issue 1
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

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

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

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 RedOctane, Inc. model Les Paul Wireless Controller and therefore apply only to the tested sample. The sample was selected and prepared by Jack McCauley of RedOctane, Inc.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

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.).

STATEMENT OF COMPLIANCE

The tested sample of RedOctane, Inc. model Les Paul Wireless Controller complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 1
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

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.).

TEST RESULTS SUMMARY

FREQUENCY HOPPING SPREAD SPECTRUM (2400 – 2483.5 MHz, less than 75 channels)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	1463 kHz	Channel spacing > 20dB BW, BW < 1MHz	Complies
15.247 (a) (1)	RSS 210 A8.1 (2)	Channel Separation	1390 kHz		Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Number of Channels	41	15 or more	Complies
15.247 (a) (1) (ii)	RSS 210 A8.1 (4)	Channel Dwell Time (*average time of occupancy)*	13.76	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization	All channels are used equally - refer to the operational description for full explanation	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (2)	Output Power	7.4 dBm EIRP = 0.005 W	*0.125 Watts EIRP*	Complies
15.247(c)	RSS 210 A8.5	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 25GHz	45.0dBµV/m (177.8µV/m) @ 2388.2MHz	15.207 in restricted bands, all others < -20dBc	Complies (-9.0dB)
	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Antenna is internal and permanently attached		Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	23.9dBµV/m (15.7µV/m) @ 30.103MHz		Complies (-6.1dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	N/A EUT is battery operated	Refer to standard	N/A
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
	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding non-interference	
	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding detachable antenna	

MEASUREMENT UNCERTAINTIES

ISO/IEC 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	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The RedOctane, Inc. model Les Paul Wireless Controller is a wireless guitar that is designed as a musical instrument with wireless connection capability. Since the EUT would be normally handheld, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 3 Volts DC, - Amps.

The sample was received on June 21, 2007 and tested on June 21, June 28 and June 29, 2007. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
RedOctane, Inc.	Les Paul Wireless Controller	Wireless Guitar		VFIBW95123805

OTHER EUT DETAILS

The guitar contains the wireless module C3K-WKS368

ANTENNA SYSTEM

The antenna system used with the RedOctane, Inc. model Les Paul Wireless Controller is integral to the device.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 80 cm long by 45 cm wide by 5 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

No local support equipment was used during emissions testing.

The following equipment was used as remote support equipment for emissions testing:

Manufacturer	Model	Description	Serial Number	FCC ID
Laptop	-	-	-	-

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 emissions testing the EUT is communicating with the host console.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on June 21, June 28 and June 29, 2007at the Elliott Laboratories Anechoic Chamber 3, 4 and 5 located at 41039 Boyce Road, Fremont, California Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission.

ANSI C63.4:2003 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 requirements of ANSI C63.4:2003 and RSS 212.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003 and RSS 212. 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 or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003 / RSS 212.

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. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak 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, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & 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.

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 loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

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. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 and RSS 212 specify 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.

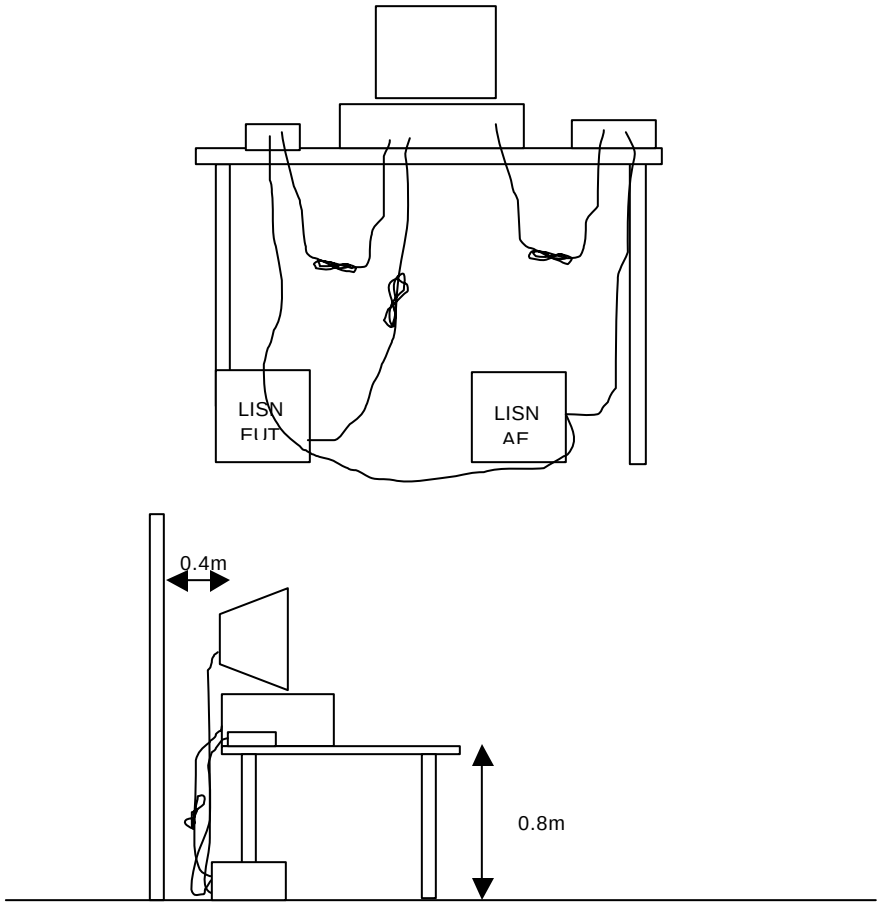
TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require 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.



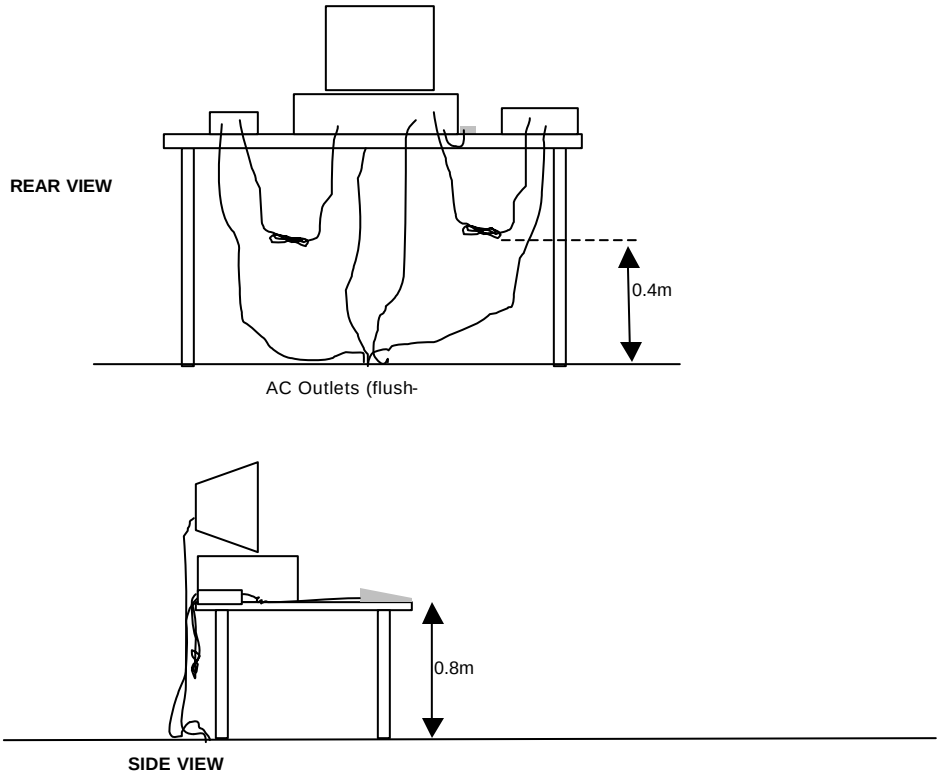
RADIATED EMISSIONS

A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

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 (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). 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.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements

BANDWIDTH MEASUREMENTS

The 6dB, 20dB and/or 26dB signal bandwidth is measured in using the bandwidths recommended by ANSI C63.4. When required, the 99% bandwidth is measured using the methods detailed in RSS GEN.

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 TRANSMITTER 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 RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

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 RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

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 – FHSS SYSTEMS

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

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:

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

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 25,000 MHz, 21-Jun-07
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	16-Mar-08
EMCO	Antenna, Horn, 1-18 GHz	3115	786	28-Nov-07
EMCO	Antenna, Horn, 18-26.5 GHz (SA40-Blu)	3160-09 (84125C)	1387	17-Jan-08
Hewlett Packard	High Pass filter, 3.5 GHz (Blu System)	P/N 84300-80038 (84125C)	1391	29-May-08
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FMT (SA40) Blue	8564E (84125C)	1393	09-Jan-08

EXHIBIT 2: Test Measurement Data

26 Pages

Elliott

EMC Test Data

Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	Test-Log Number:	T68389
		Project Manager:	Deepa Shetty
Contact:	Jack McCauley		
Emissions Spec:	FCC 15.247	Class:	B
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

R0R3 Devices

Model

Zepplin

Date of Last Test: 6/29/2007

Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	Test-Log Number:	T68389
		Project Manager:	Deepa Shetty
Contact:	Jack McCauley		
Emissions Spec:	FCC 15.247	Class:	B
Immunity Spec:	-	Environment:	-

EUT INFORMATION

General Description

The EUT is a wireless guitar that is designed as a musical instrument with wireless connection capability. Since the EUT would be normally handheld, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 3 Volts DC, - Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
RedOctane, Inc.	Les Paul Wireless Controller	Wireless Guitar		VFIBW95123805

Other EUT Details

The following EUT details should be noted: The guitar contains the wireless module C3K-WKS368

EUT Antenna (Intentional Radiators Only)

The antenna is integral to the device.

EUT Enclosure

The EUT enclosure is primarily constructed of plastic. It measures approximately 80 cm long by 45 cm wide by 5 cm high.

Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Project Manager:	Deepa Shetty
Contact:	Jack McCauley		
Emissions Spec:	FCC 15.247	Class:	B
Immunity Spec:	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Laptop	-	-	-	-

Interface Cabling and Ports

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

EUT Operation During Emissions Tests

During emissions testing the EUT is communicating with the host console.

Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

FCC 15.247 FHSS - Bandwidth, Power, and Occupancy

Test Specific Details

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: 6/29/2007 0:01
Test Engineer: Rafael Varelas
Test Location: Fremont Chamber #5
Config. Used: 1
Config Change: None
EUT Voltage: Battery

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 15 meters from the EUT.

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.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 21.6 °C
Rel. Humidity: 38.4 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	20dB Bandwidth	15.247(a)	Pass	1463 kHz
1	Power	15.247(a)	Pass	7.4dBm
1	99% bandwidth	15.247(a)	Pass	1390kHz
1	Channel Occupancy	15.247(a)	Pass	13.76ms
1	Number of Channels	15.247(a)	Pass	41 Channels

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.

Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Run #1: Bandwidth, Channel Occupancy, Spacing and Number of Channels

Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	30kHz	1463	30kHz	1390
Mid	2442	30kHz	1393	30kHz	1380
High	2482	30kHz	1403	30kHz	1390

Note 1:	20dB bandwidth measured using RB = 30kHz, VB = 100kHz (VB > RB)
Note 2:	99% bandwidth measured using RB = 30kHz, VB = 100kHz (VB >=3RB)

Run #1: Output Power

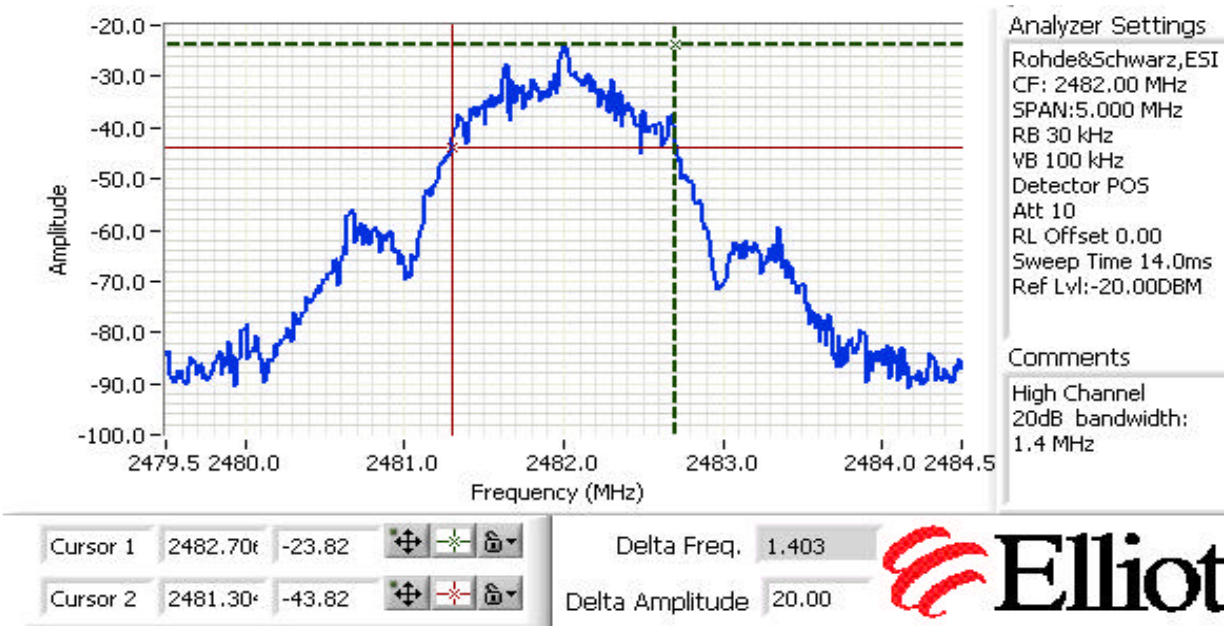
For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400-2483.5 MHz band: 0.125 watts.

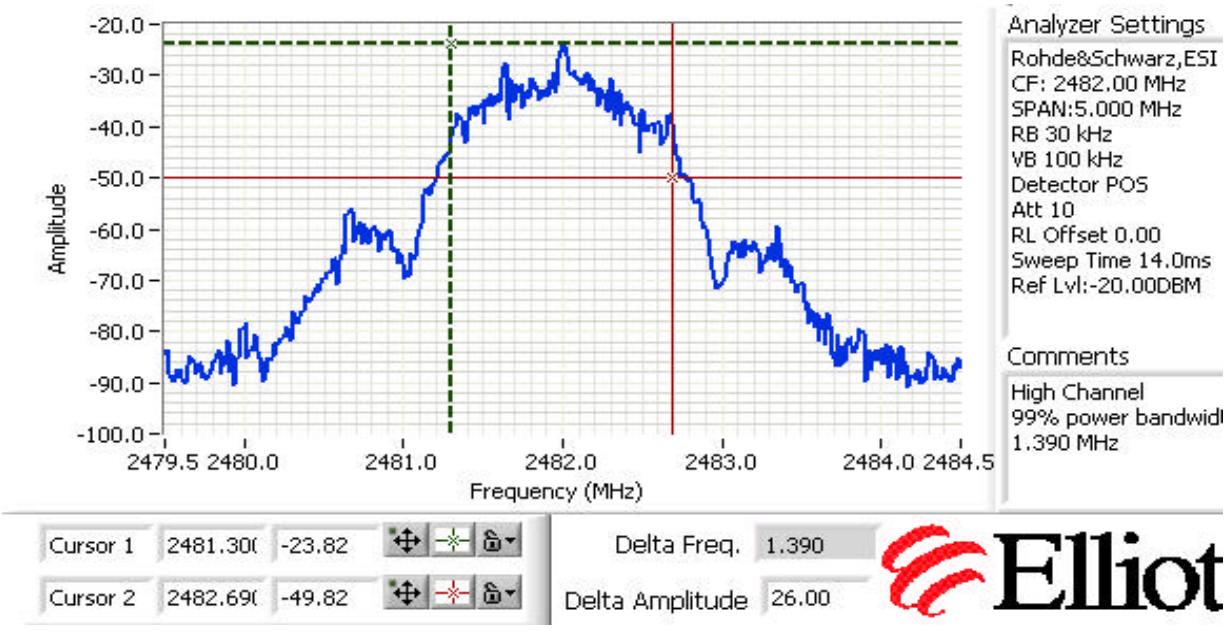
Channel	Frequency (MHz)	Field Strength at 3m (dBuV/m)	Antenna Pol. (H/V)	Res BW	Signal Banwidth	Bandwidth Correction	Power (dBm)	Power (Watts)
Low	2482	100	H	1MHz	-	0	4.7	0.00295121
Mid	2442	101	H	1MHz	-	0	5.7	0.00371535
High	2402	102	H	1MHz	-	0	6.7	0.00467735
Low	2482	101	V	1MHz	-	0	5.7	0.00371535
Mid	2442	101.5	V	1MHz	-	0	6.2	0.00416869
High	2402	102.7	V	1MHz	-	0	7.4	0.00549541

Note 1:	Output power calculated from field strength at 3m based on free space path loss formula E = v(30PG) / d, where E is the field strength (V/m), PG is the effective isotropic radiated power (W) and d is the distance (3m). Additional correction to the calculated power is made to account for the difference between the measurement bandwidth and signal bandwidth.

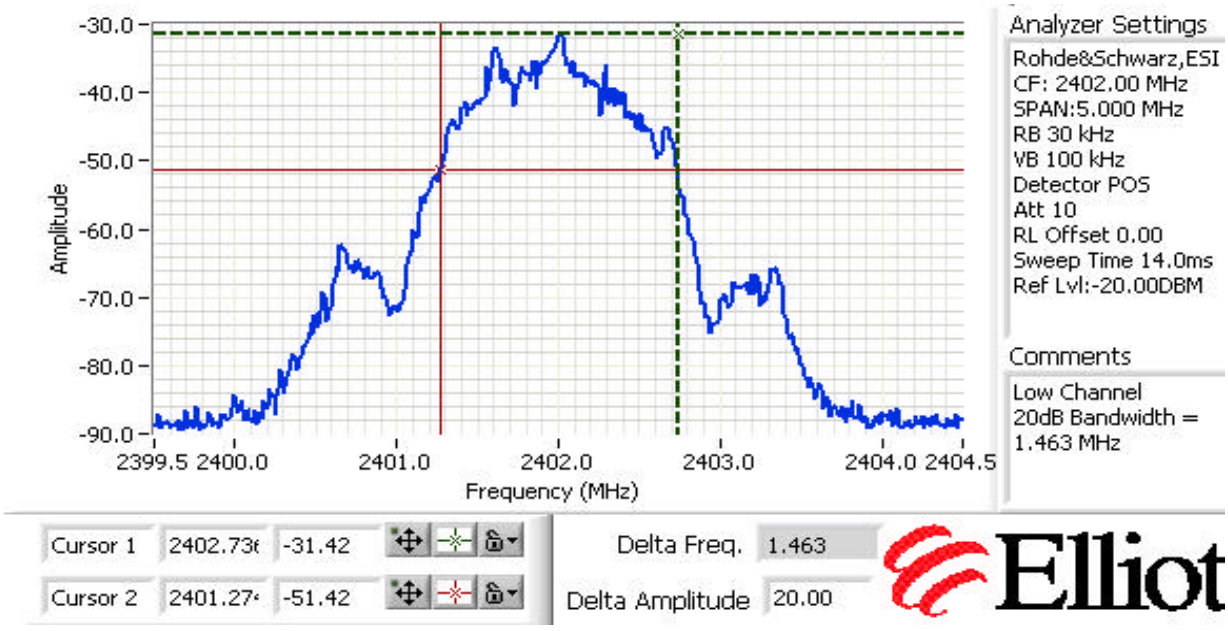
Run #1: Power output

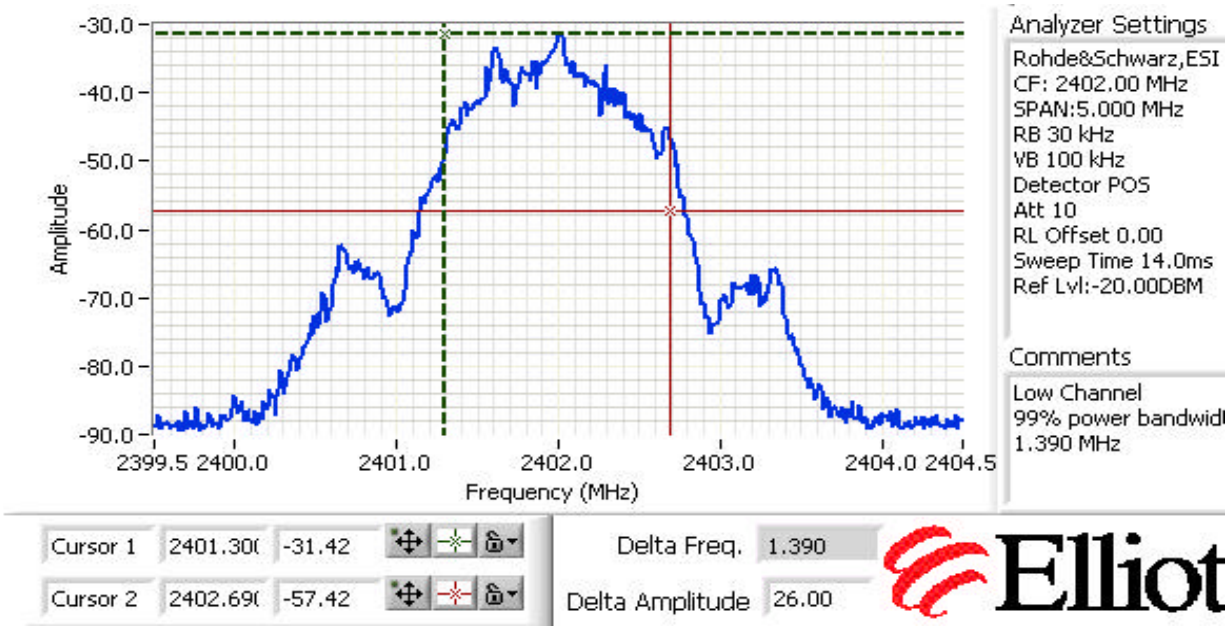
Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A



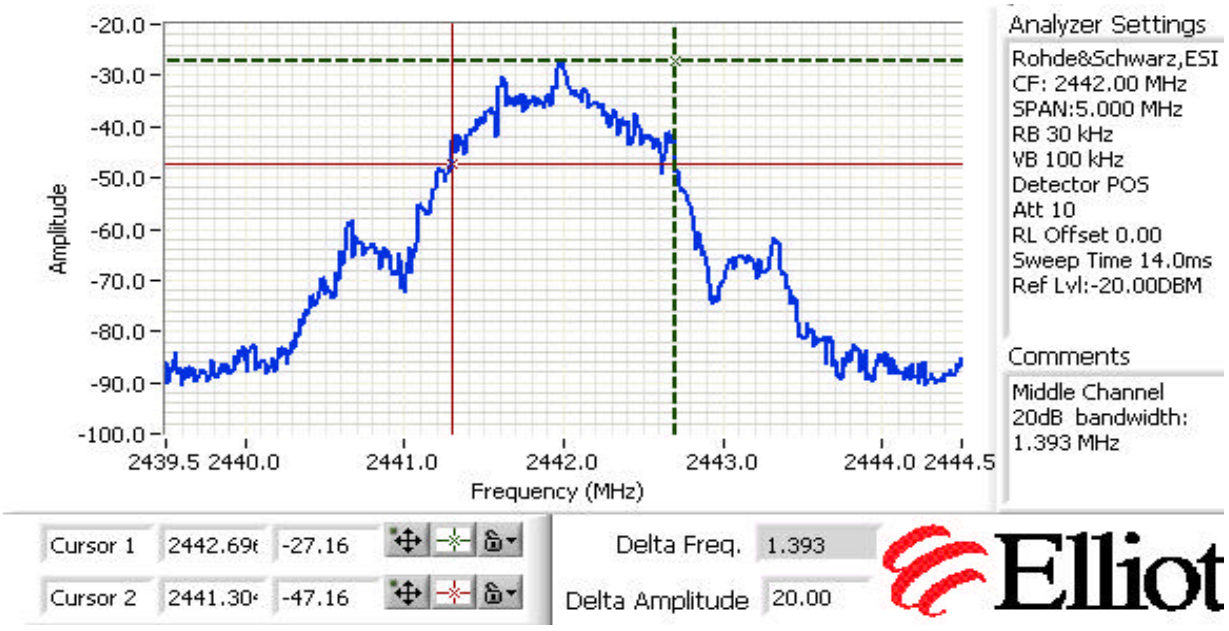


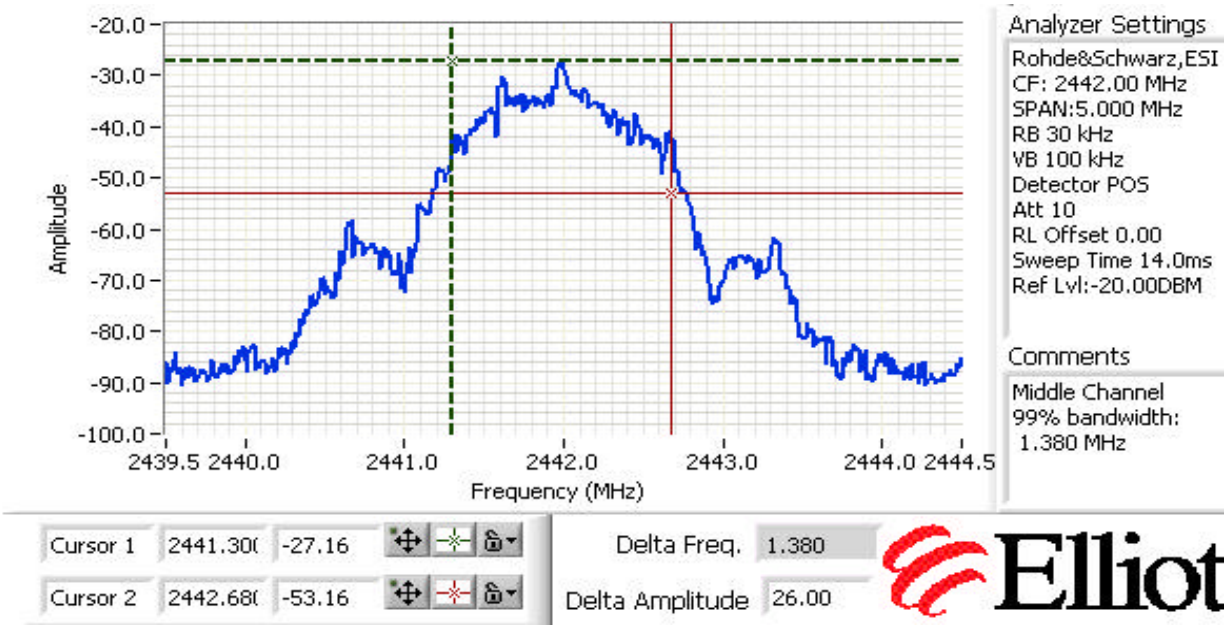
Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A





Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A





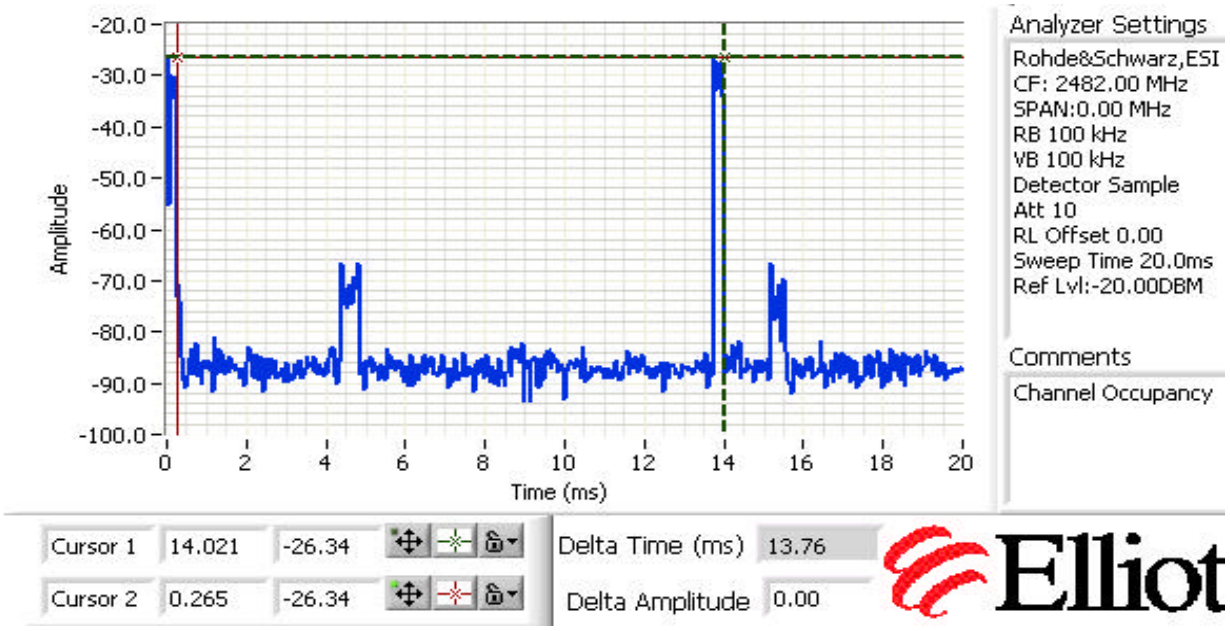
EMC Test Data

Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Frequency hopping systems in the **2400-2483.5 MHz** band shall use at least 15 channels.
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)
The channel dwell time is calculated from the transmit time on a channel mulitplied by the number of times a channel could be used in a period of 0.4 times the number of channels, N (i.e. 0.4N divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 0.4N, in which case the channel dwell time is the transmit time on a channel.

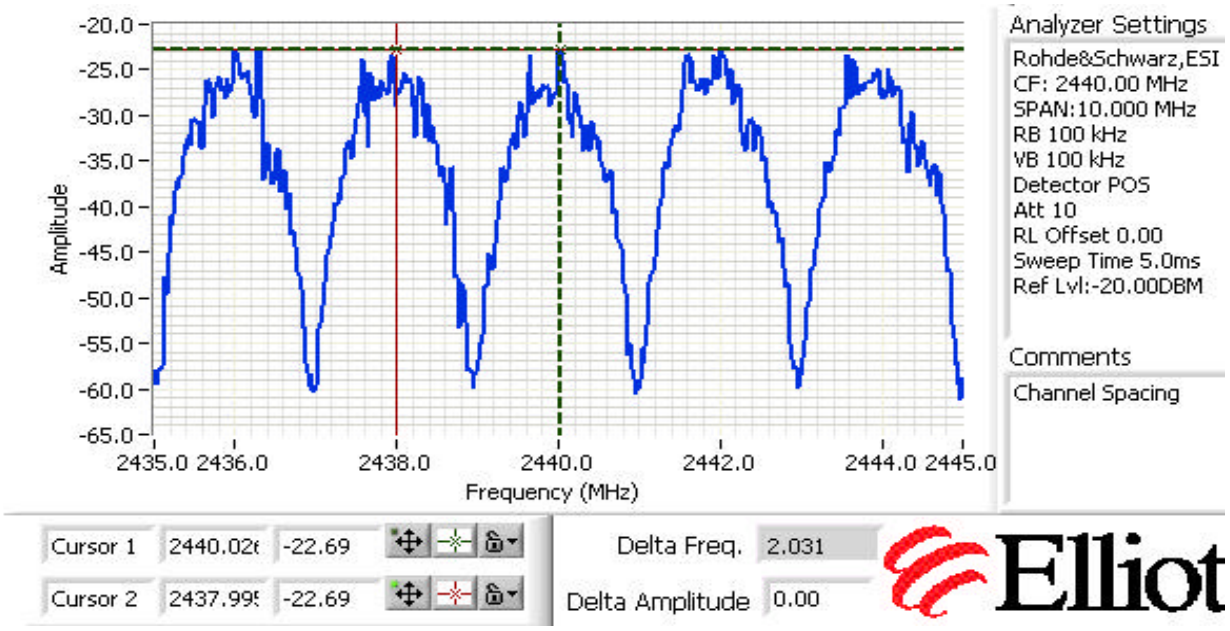
Maximum 20dB bandwidth:	1463	kHz	**Pass**
Channel spacing:	2031	kHz	**Pass**
Transmission time per hop:	0.28	ms	
The time between successive hops on a channel:	13.76	ms	
Number of channels (N):	41		**Pass**
Channel dwell time in 16.4 seconds:	0.56	ms	**Pass**

Occupancy Time

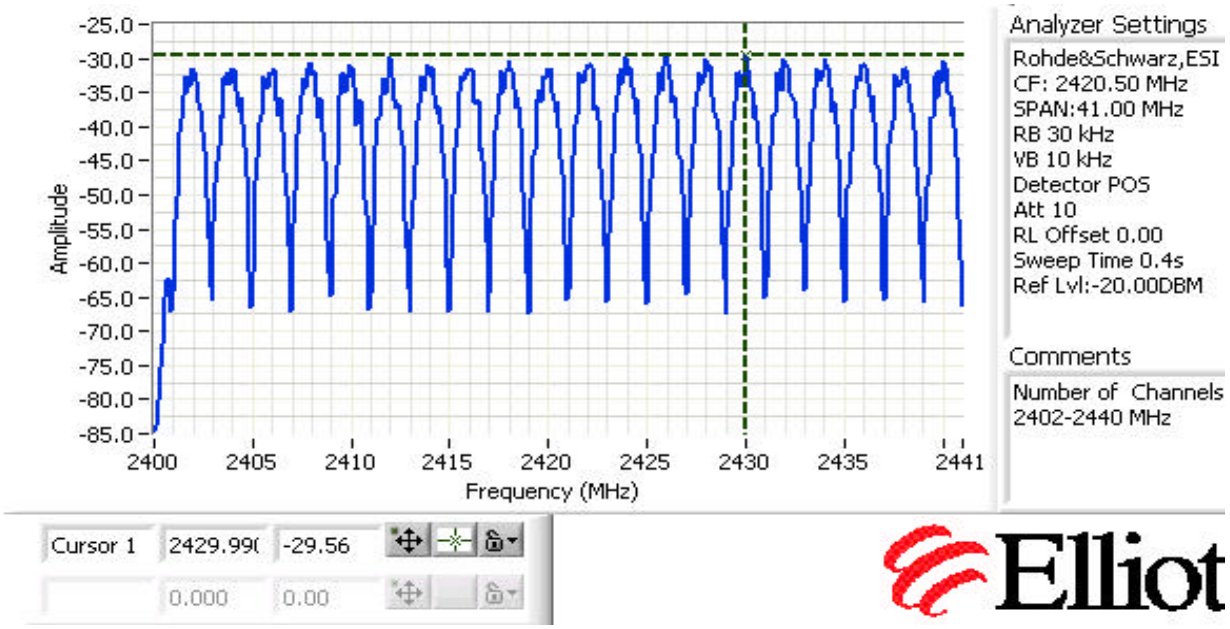


Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Channel Seperation

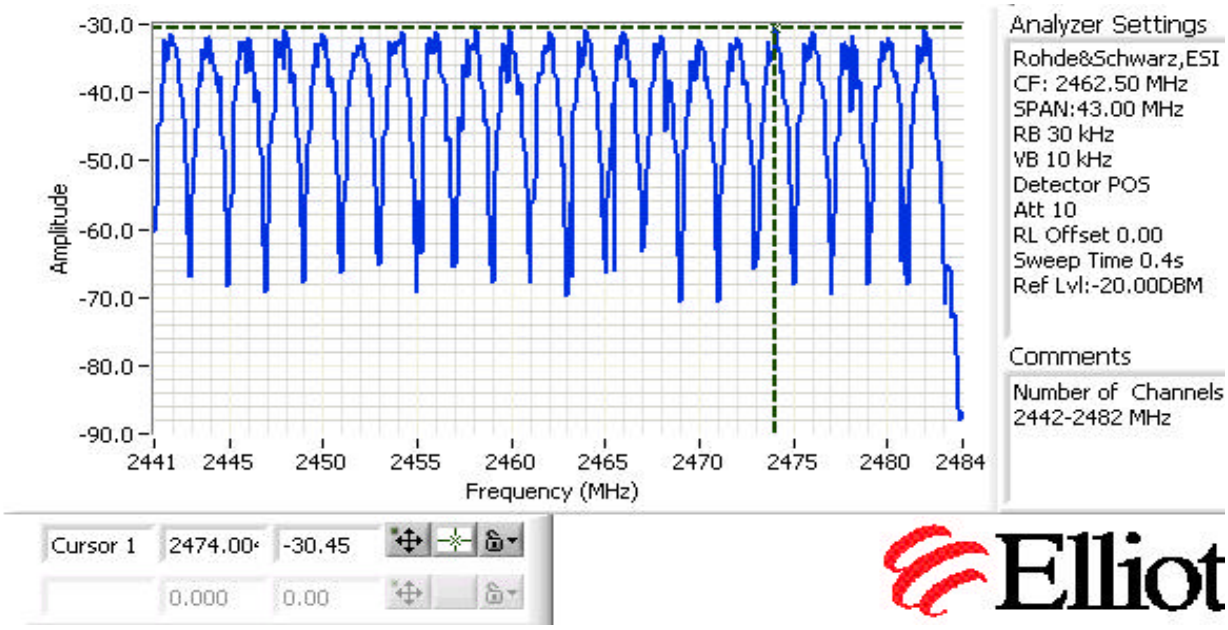


Hopping channels



Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Hopping channels



Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

FCC 15.247 FHSS - Spurious Emissions

Test Specific Details

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: 6/21/2007
Test Engineer: Mehran Birgani
Test Location: FT Chamber #4
Config. Used: 1
Config Change: None
EUT Voltage: Battery

General Test Configuration

The EUT and all local support equipment were 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.

Unless stated otherwise the EUT was operating such that it constantly hopped on either the low, center or high channels.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 47 %

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	45.0dBµV/m (177.8µV/m) @ 2388.2MHz (-9.0dB)

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.

Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	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.

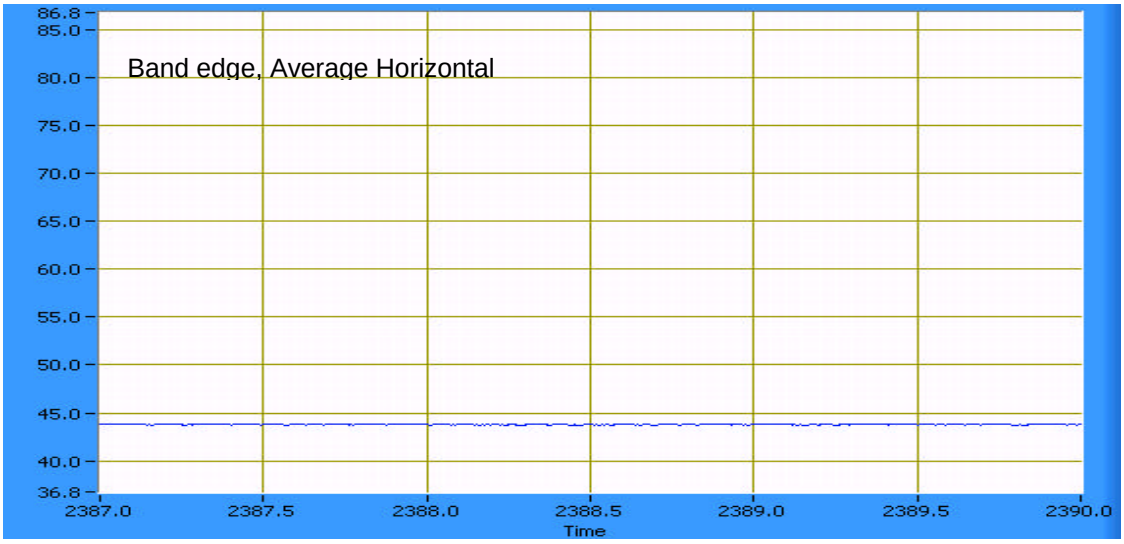
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
Upright								
2402.110	85.1	V	-	-	AVG	88	1.1	RB = 1MHz, VB = 10Hz
2402.110	102.7	V	-	-	PK	88	1.1	RB = VB = 1MHz
2402.190	84.5	H	-	-	AVG	271	1.0	RB = 1MHz, VB = 10Hz
2402.190	102.0	H	-	-	PK	271	1.0	RB = VB = 1MHz
Laying flat								
2402.070	85.2	V	-	-	AVG	178	1.1	RB = 1MHz, VB = 10Hz
2402.070	102.4	V	-	-	PK	178	1.1	RB = VB = 1MHz
2402.030	81.3	H	-	-	AVG	172	2.4	RB = 1MHz, VB = 10Hz
2402.030	98.2	H	-	-	PK	172	2.4	RB = VB = 1MHz
Side								
2402.090	83.1	H	-	-	AVG	220	1.5	RB = 1MHz, VB = 10Hz
2402.090	100.6	H	-	-	PK	220	1.5	RB = VB = 1MHz
2401.890	82.7	V	-	-	AVG	145	1.1	RB = 1MHz, VB = 10Hz
2401.890	99.6	V	-	-	PK	145	1.1	RB = VB = 1MHz

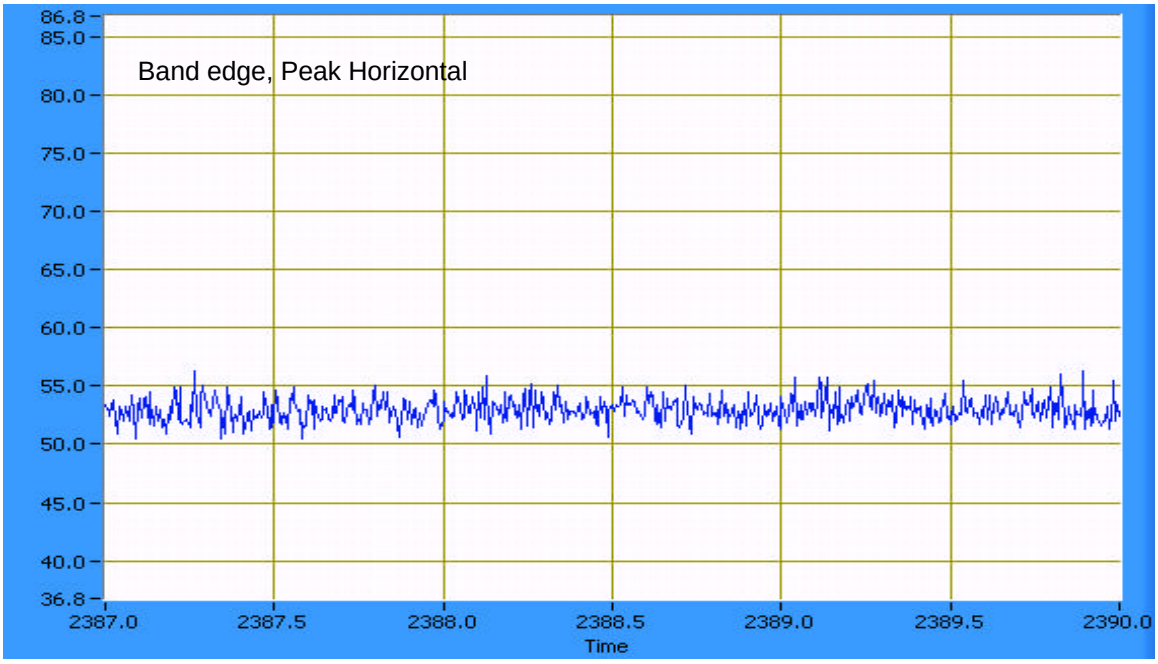
Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2388.190	45.0	V	54.0	-9.0	AVG	360	1.0	Upright
2388.190	56.7	V	74.0	-17.3	PK	360	1.0	Upright
2387.480	45.0	H	54.0	-9.0	AVG	141	1.0	Upright
2387.480	56.5	H	74.0	-17.5	PK	141	1.0	Upright

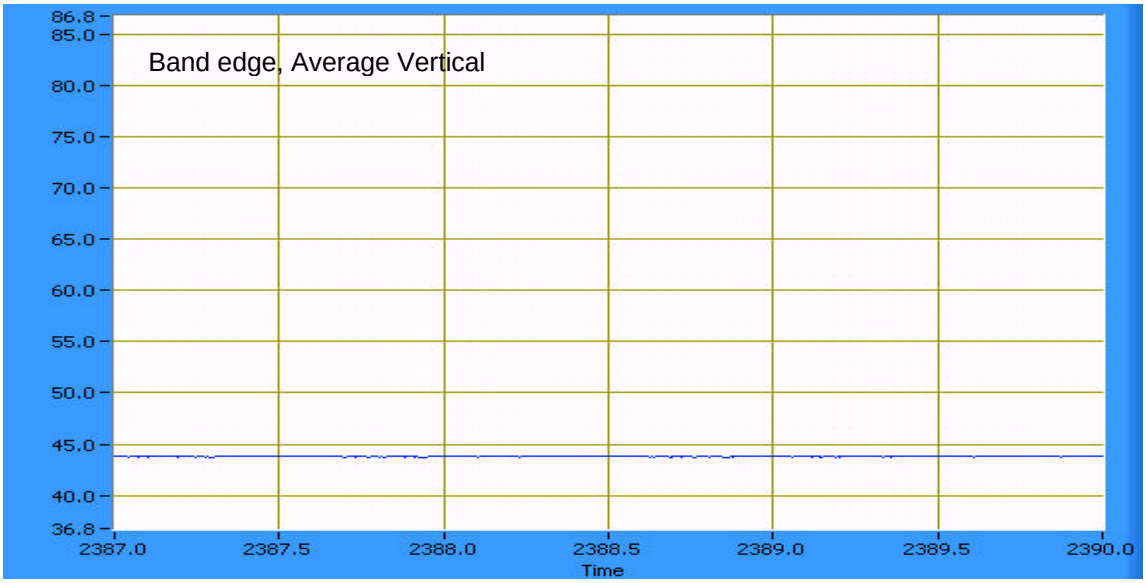
Note 1:	Calculated by subtracting the marker delta values from the fundamental field strength measurements.

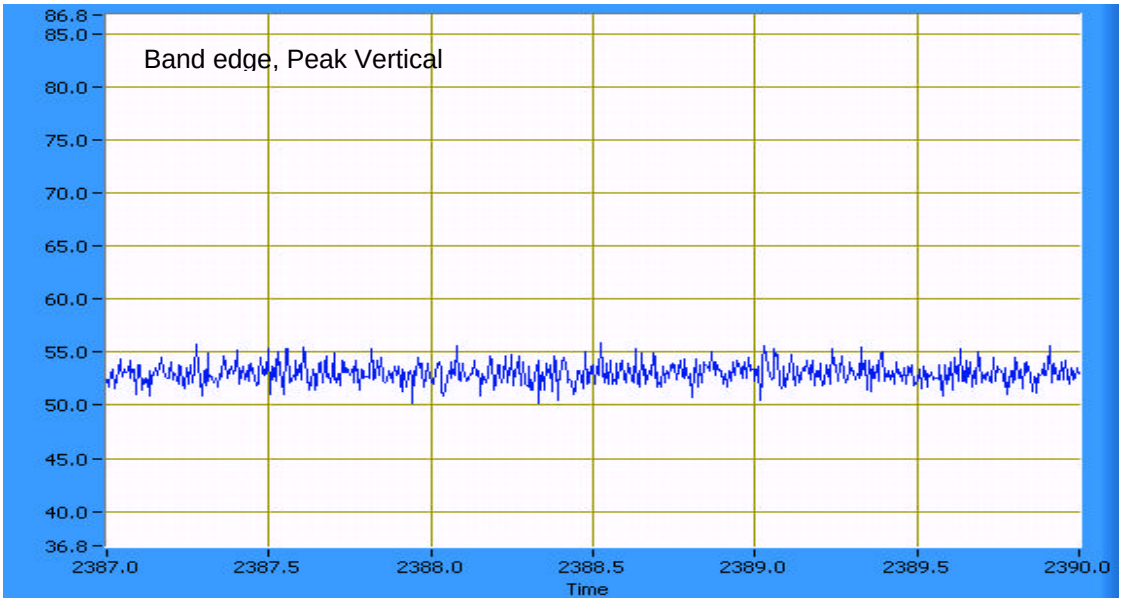
Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A





Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A



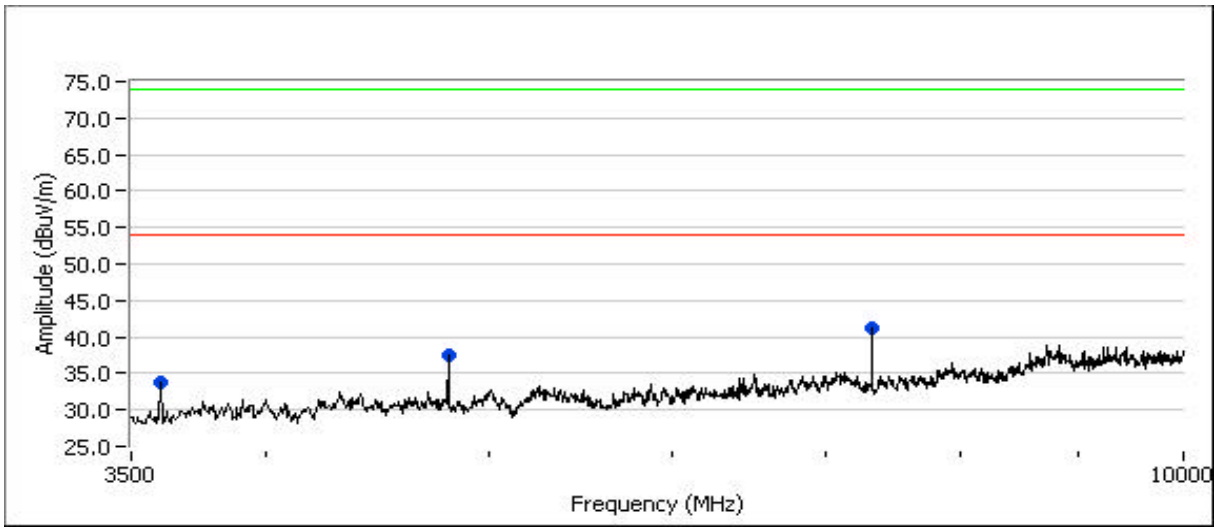


Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Run 1a: Continue (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	
4804.670	37.5	V	54.0	-16.5	Peak	194	1.3	Peak reading with average limit
7326.102	35.5	V	54.0	-18.5	AVG	38	1.4	
3602.940	33.9	H	54.0	-20.1	Peak	49	2.0	Peak reading with average limit
7325.890	33.6	H	54.0	-20.4	AVG	178	1.0	
7326.102	52.4	V	74.0	-21.7	PK	38	1.4	
7325.890	47.9	H	74.0	-26.1	PK	178	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.
Note 2:	The signal does not fall in a restricted band, but the more stirngent limits of 15.209 were applied.
Note 3:	No signal was found above 10GHz.



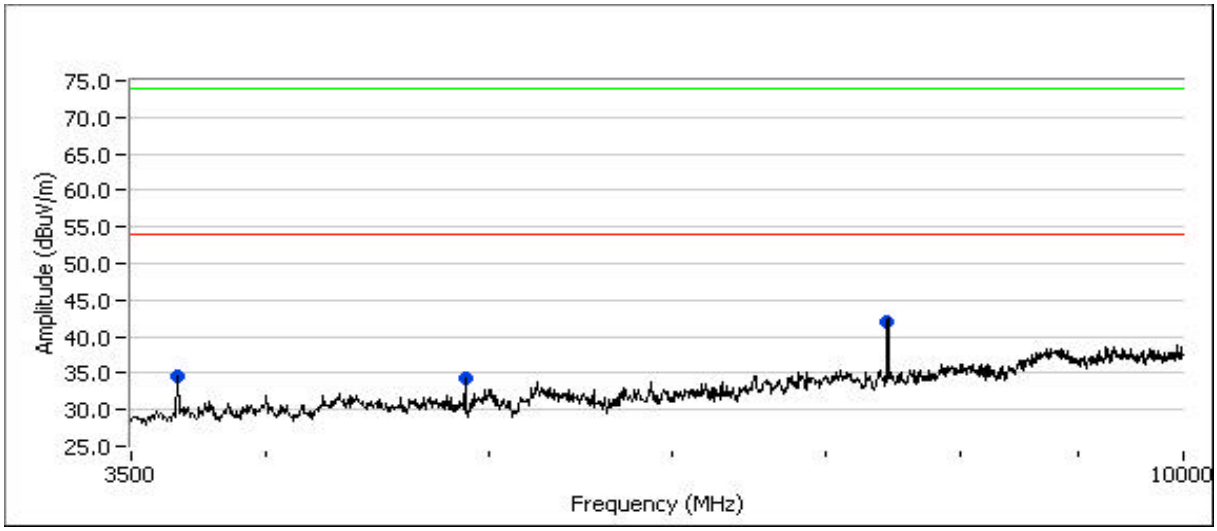
Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Run #1b: Radiated Spurious Emissions, 1000 - 25,000 MHz. Center Channel @ 2440 MHz

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	
7331.981	47.9	H	74.0	-26.1	PK	175	1.1	
7332.261	52.7	V	74.0	-21.3	PK	42	1.3	
7331.981	33.4	H	54.0	-20.6	AVG	175	1.1	
7332.261	35.1	V	54.0	-18.9	AVG	42	1.3	
3665.425	36.1	H	54.0	-17.9	Peak	104	1.4	Peak reading with average limit
4885.175	37.1	V	54.0	-16.9	Peak	108	1.9	Peak reading with average limit

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.
Note 3:	No signal was found above 10GHz.



Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Run #1c: Radiated Spurious Emissions, 1000 - 25,000 MHz. High Channel @ 2482 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	
Upright								
2481.900	88.1	V	-	-	AVG	92	1.0	RB = 1MHz, VB = 1kHz
2481.900	101.0	V	-	-	PK	92	1.0	RB = VB = 1MHz
2481.840	87.4	H	-	-	AVG	245	1.0	RB = 1MHz, VB = 1kHz
2481.840	100.2	H	-	-	PK	245	1.0	RB = VB = 1MHz

Note: Due to the signal being pulse modulated could not use VBW of 10Hz as this will artificially drop signal level by 20dB. A 1kHz was used instead of the 10Hz to prevent pulse desensitization.

Delta (dB): 47.1 Measurement taken with a RBW: 30kHz and VBW: 30 kHz

Band Edge Signal Field Strength

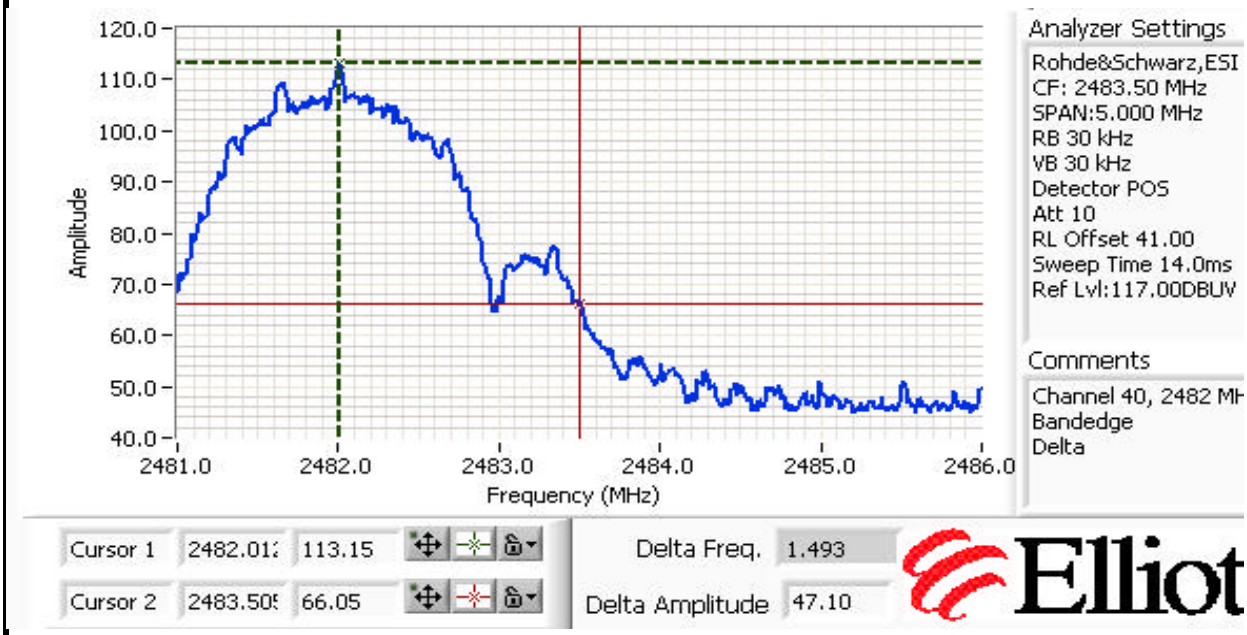
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.640	41.0	V	54.0	**-13.0**	AVG	125	1.0	
2483.640	53.9	V	74.0	**-20.1**	PK	125	1.0	
2483.580	40.3	H	54.0	**-13.7**	AVG	260	1.0	
2483.580	53.1	H	74.0	**-20.9**	PK	260	1.0	

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

EMC Test Data

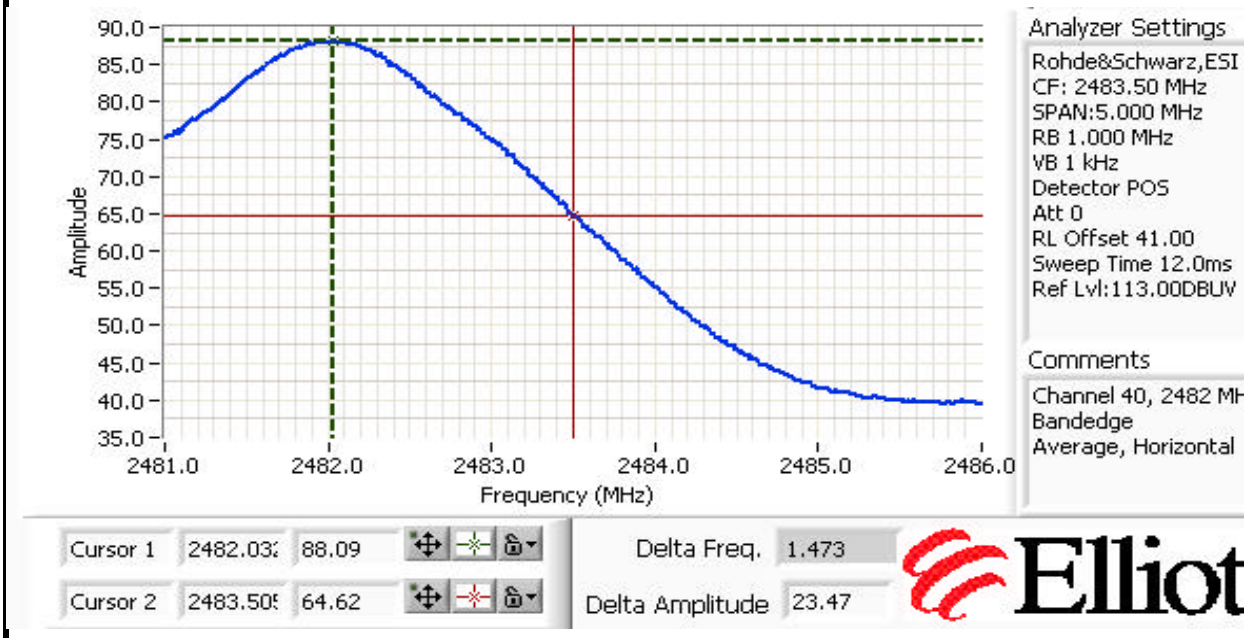
Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Delta Measurement

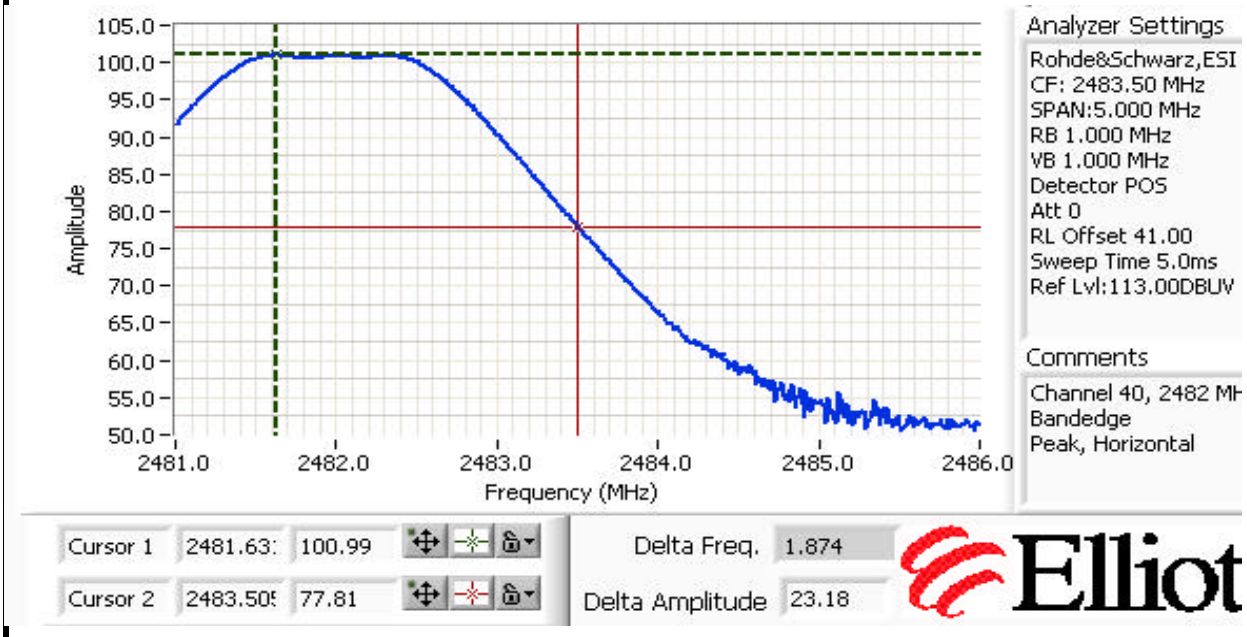


Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Average Bandedge

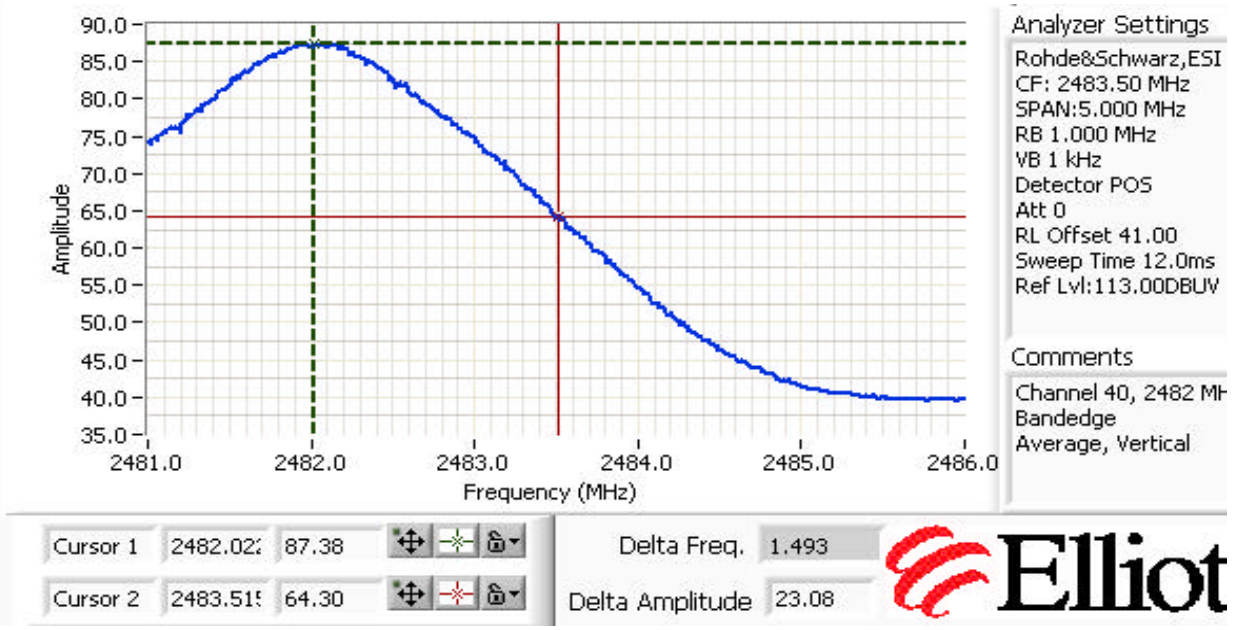


Peak Bandedge

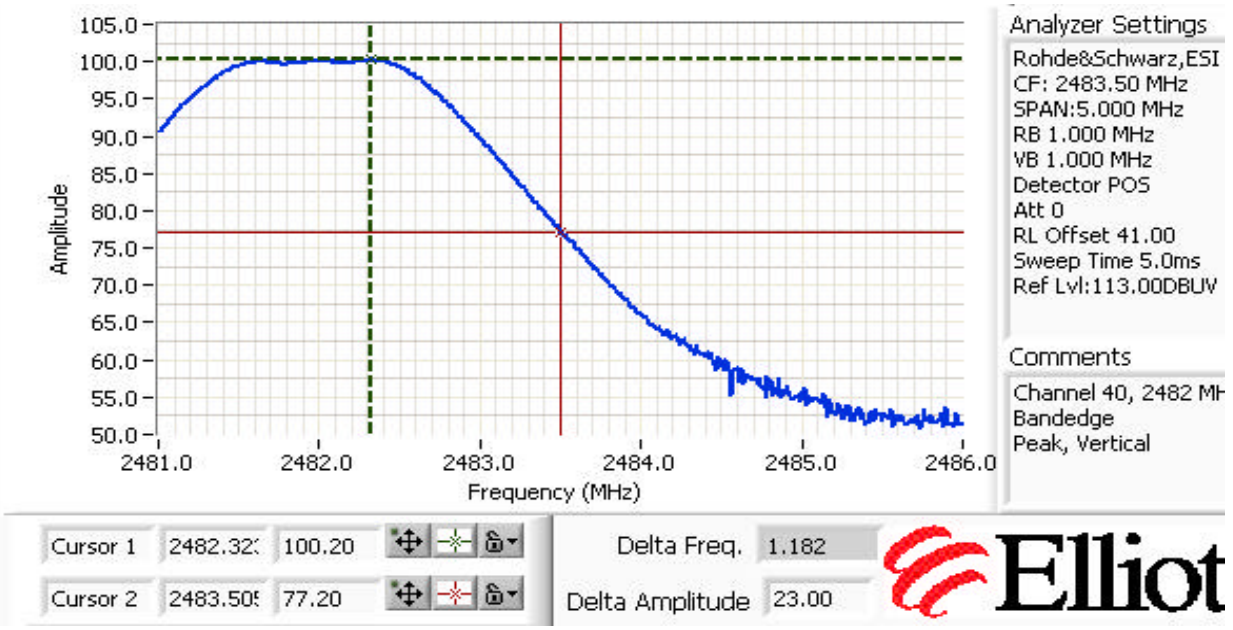


Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

Average Bandedge



Peak Bandedge

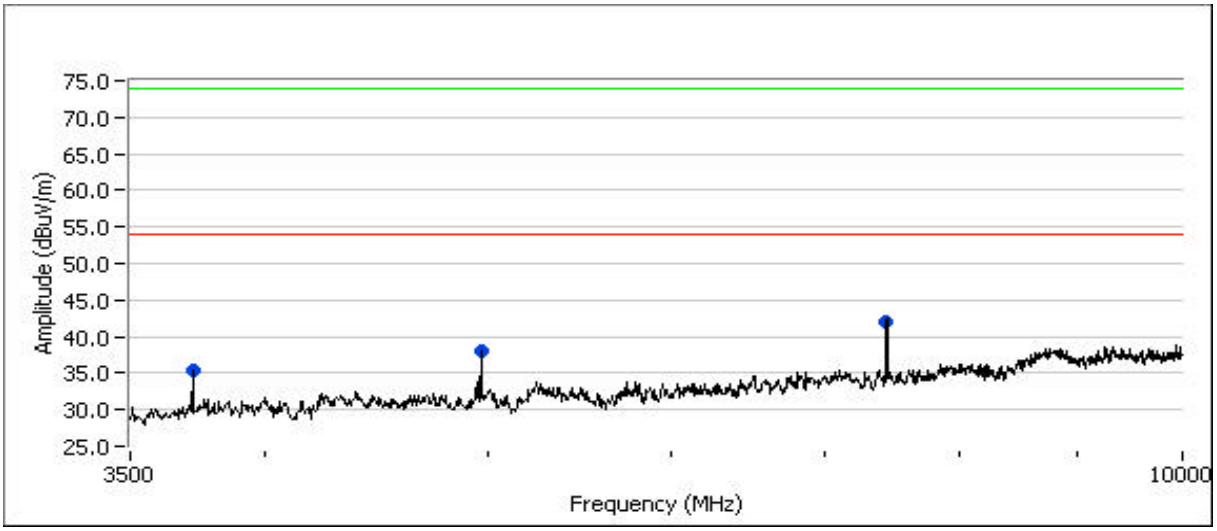


Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Standard:	FCC 15.247	Class:	N/A

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	
7446.430	35.3	V	54.0	-18.7	AVG	40	1.4	
7446.020	33.2	H	54.0	-20.8	AVG	175	1.1	
7446.430	52.6	V	74.0	-21.4	PK	40	1.4	
4964.070	31.2	V	54.0	-22.8	AVG	26	1.0	
4963.150	30.8	H	54.0	-23.2	AVG	269	1.2	
3722.790	28.5	H	54.0	-25.5	AVG	260	1.3	
7446.020	47.6	H	74.0	-26.4	PK	175	1.1	
4964.070	45.7	V	74.0	-28.3	PK	26	1.0	
4963.150	43.6	H	74.0	-30.4	PK	269	1.2	
3722.790	40.9	H	74.0	-33.1	PK	260	1.3	

Note 1:	No signal was found above 10GHz.



Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Spec:	FCC 15.247	Class:	B

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: 6/28/2007
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3
Config. Used: 1
Config Change: None
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: 21.6 °C
Rel. Humidity: 36.4 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1-2	RE, 30 -10,000 MHz	15.209 / RSS-210	Pass	23.9dBµV/m (15.7µV/m) @ 30.103MHz (-6.1dB)

Modifications Made During Testing:

No modifications were made to the EUT during testing

Deviations From The Standard

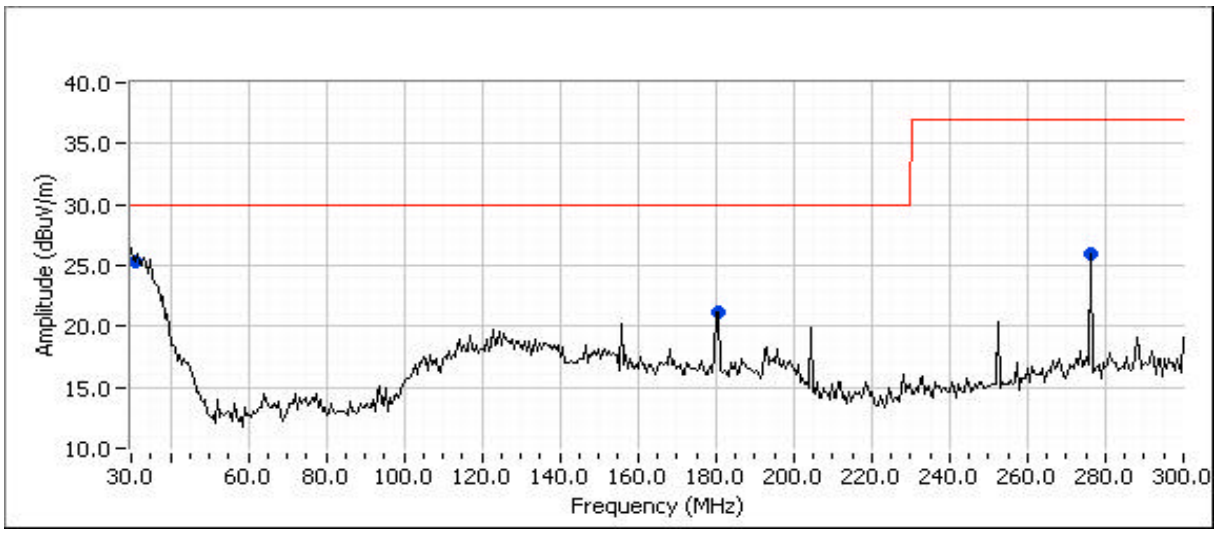
No deviations were made from the requirements of the standard.

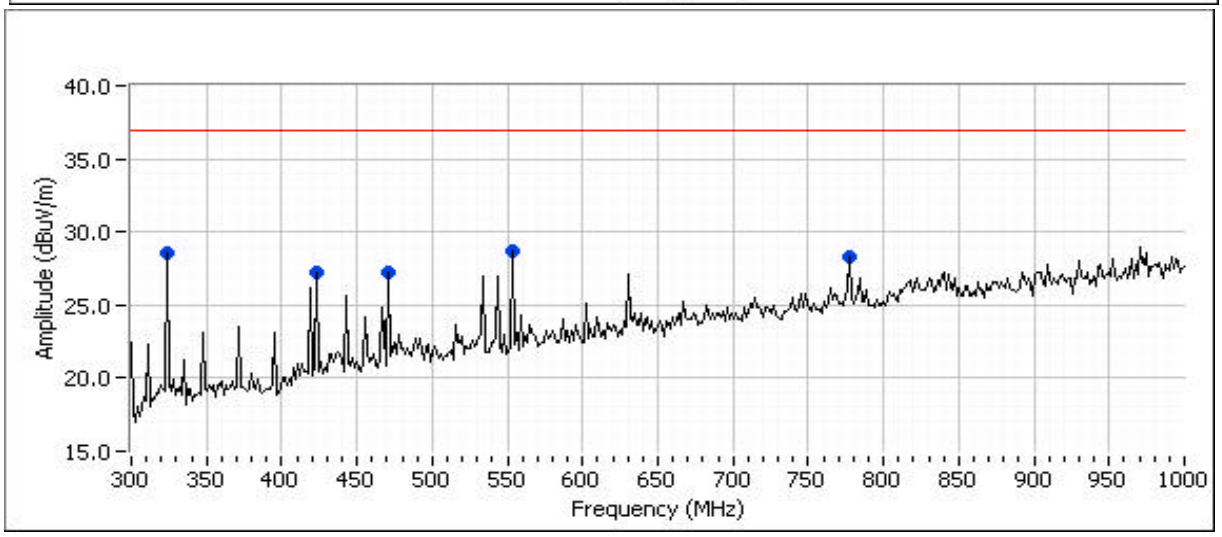
Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Spec:	FCC 15.247	Class:	B

Run #1: Preliminary Radiated Emissions, 30-1000 MHz

Receive mode, EUT Flat

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	10	10	0.0





Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Spec:	FCC 15.247	Class:	B

Run #1: Continued

Preliminary Readings

Frequency	Level	Pol	15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
321.988	28.5	H	37.0	-8.5	Peak	195	2.5	
425.206	27.2	H	37.0	-9.8	Peak	53	1.0	
471.268	27.3	H	37.0	-9.7	Peak	35	4.0	
554.354	28.7	V	37.0	-8.3	Peak	40	2.0	
777.265	28.3	H	37.0	-8.7	Peak	360	1.0	
30.103	25.3	H	30.0	-4.7	Peak	260	4.0	
180.664	21.1	H	30.0	-8.9	Peak	31	3.5	
276.007	25.9	H	37.0	-11.1	Peak	215	3.5	

Maximized Readings

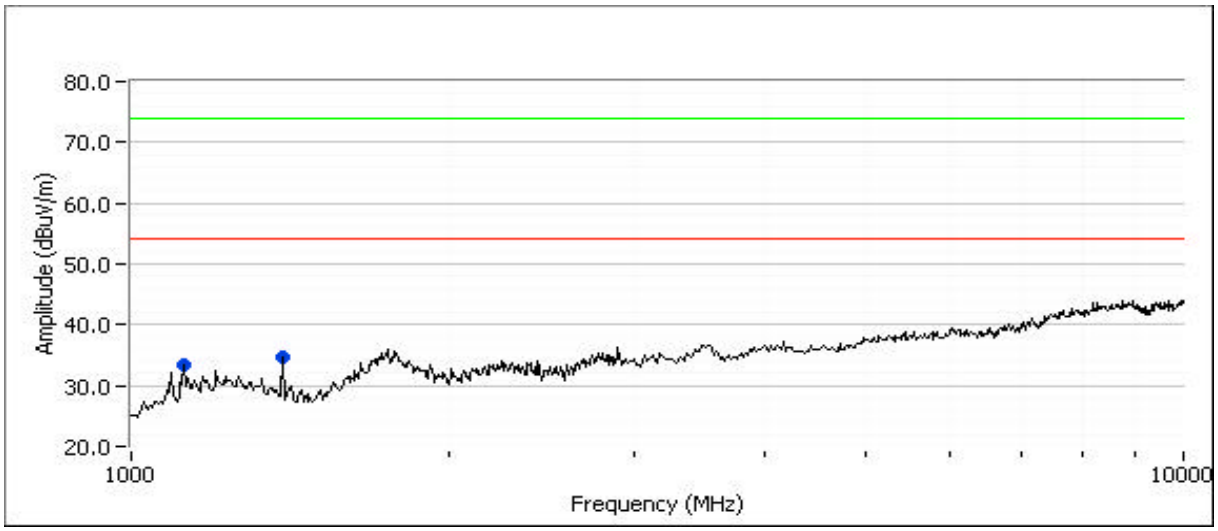
Frequency	Level	Pol	15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
30.103	23.9	H	30.0	-6.1	QP	260	4.0	
777.265	26.4	H	37.0	-10.6	QP	360	1.0	
276.007	24.2	H	37.0	-12.8	QP	215	3.5	
471.268	23.7	H	37.0	-13.3	QP	35	4.0	
180.664	15.2	H	30.0	-14.8	QP	31	3.5	
554.354	19.8	V	37.0	-17.2	QP	39	2.0	

Client:	R0R3 Devices	Job Number:	J68386
Model:	Zepplin	T-Log Number:	T68389
		Account Manager:	Deepa Shetty
Contact:	Jack McCauley		
Spec:	FCC 15.247	Class:	B

Run #2: Preliminary Radiated Emissions, 1000-10000 MHz

Receive mode, EUT Flat

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 - 10000 MHz	3	3	0.0



Preliminary Readings

Frequency	Level	Pol	15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1123.220	33.4	V	54.0	-20.6	Peak	76	2.0	
1393.750	34.6	H	54.0	-19.4	Peak	231	1.0	

Maximized Readings

Frequency	Level	Pol	15.209 / RSS 210		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
1121.945	23.5	V	54.0	-30.5	AVG	76	2.0	
1121.945	35.1	V	74.0	-38.9	PK	76	2.0	
1392.500	20.9	H	54.0	-33.1	AVG	231	1.0	
1392.500	32.3	H	74.0	-41.7	PK	231	1.0	

EXHIBIT 3: Photographs of Test Configurations

3 Pages

EXHIBIT 4: Proposed FCC ID Label & Label Location

1 Page

EXHIBIT 5: Detailed Photographs of RedOctane, Inc. Model Les Paul Wireless Controller Construction

Internal photos 4 Pages
External photos 2 Pages

EXHIBIT 6: Operator's Manual for RedOctane, Inc. Model Les Paul Wireless Controller

7 Pages

EXHIBIT 7: Block Diagram of RedOctane, Inc. Model Les Paul Wireless Controller

1 Page

EXHIBIT 8: Schematic Diagrams for RedOctane, Inc. Model Les Paul Wireless Controller

6 Pages

EXHIBIT 9: Theory of Operation for RedOctane, Inc. Model Les Paul Wireless Controller

EXHIBIT 10: RF Exposure Information

1 Page