

*Electromagnetic Emissions Test Report
Application for Grant of Equipment Authorization
pursuant to
FCC Part 15 Subpart C
on the
Adura Technologies
Transmitter
Model: Light Controller*

FCC ID: WYXLCR10P2

GRANTEE: Adura Technologies
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San Francisco, CA 94105

TEST SITE(S): Elliott Laboratories
684 W. Maude Ave
Sunnyvale, CA 94086
Fremont, CA. 94538-2435
IC Site Registration #: IC 2845-2

REPORT DATE: June 8, 2009

FINAL TEST DATE: March 5 and March 6, 2009

AUTHORIZED SIGNATORY:



Mark E. Hill
Staff Engineer



Testing Cert #2016-01

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REVISION HISTORY

Rev #	Date	Comments	Modified By
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SCOPE

An electromagnetic emissions test has been performed on the Adura Technologies model Light Controller pursuant to the following rules:

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

FCC DTS Measurement Procedure KDB558074, March 2005

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 Adura Technologies model Light Controller and therefore apply only to the tested sample. The sample was selected and prepared by Michael Corr of Adura Technologies.

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.

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 Adura Technologies model Light Controller complied with the requirements of the following regulations:

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**DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)**

FCC Rule Part	RSS Rule Part	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	1.58 MHz	>500kHz	Complies
	RSP100	99% Bandwidth	4.1 MHz	Information only	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	11.8 dBm (0.015 Watts) EIRP = 0.024 W ^{Note 1}	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	-2.33 dBm/3kHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	<-30dBc	< -30dBc ^{Note 2}	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	53.7dB μ V/m @ 2483.5MHz (-0.3dB)	15.207 in restricted bands, all others <-30dBc ^{Note 2}	Complies

Note 1: EIRP calculated using antenna gain of 2 dBi for the highest EIRP multi-point system.

Note 2: Limit of -30dBc used because the power was measured using the UNII test procedure (maximum power averaged over a transmission burst) / RMS averaging over a time interval, as permitted under RSS 210 section A8.4(4).

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Device use a MMCX connector for the external antennas, but requires professional installation.		Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	38.8dB μ V @ 0.811MHz (-7.2dB)	Refer to standard	Complies (-7.2 dB)
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies

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 Adura Technologies model Light Controller is a lighting control device which is designed to be installed in commercial and industrial lighting fixtures to control light levels. The EUT uses a 2.4GHz radio to communicate with lighting control panels. Normally, the EUT would be installed inside a ceiling lighting fixture during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 120/277 V, 50/60 Hz, 5 Amps.

The sample was received on March 5, 2009 and tested on March 5 and March 6, 2009. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Adura Technologies	Light Controller, LC-2R	Lighting control for commercial and industrial buildings	Lcxxwwyyrrbnnnnnnnn	WYXLCR10P2

OTHER EUT DETAILS

Serial number coding follows this format. xx: Model SKU; ww: Week of Year of build; yy: Year of Build; rr: PCB Revision; b: BOM version; nnnnnnn: 7-digit Serial Number (Hex formatting)

The model LC-2R was tested as representative of the models LC-1R and LC-1RD. These models vary only in the stuffing options on the digital circuitry. There are no changes in the RF portion of the device.

ANTENNA SYSTEM

The EUT has two antenna options. The primary antenna is a printed inverted F-trace antenna. The secondary antenna is an external 1/2 wave whip antenna or 1/4 wave dome antenna.

The two external antennas connect to the EUT via a MMCX antenna connector and are to be installed by trained professionals, thereby meeting the requirements of FCC 15.203.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 18 cm wide by 4 cm deep by 2 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	-	Laptop	-	-
Adura	-	Serial Adapter Board	-	-

Note: Laptop was used to configure the radio and then was removed for final testing.

No remote support equipment was used during emissions testing.

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)
Serial Adapter Board	Laptop	DB9	Shielded	1.5
Serial Adapter Board	EUT	ribbon cable	Unshielded	0.5
AC Power	AC Mains	2Wire	Unshielded	1.0

EUT OPERATION

During emissions testing the EUT was configured to transmit continuously at full power on the selected channel.

TEST SITE**GENERAL INFORMATION**

Final test measurements were taken on March 5 and March 6, 2009 at the test sites listed below. 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 and with industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
SVOATS #2	90593	IC 2845A-2	684 West Maude Ave, Sunnyvale CA 94085-3518

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, on OATS sites, of predictable local TV, radio, and mobile communications traffic. The test site(s) contain 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.

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 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.

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 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.

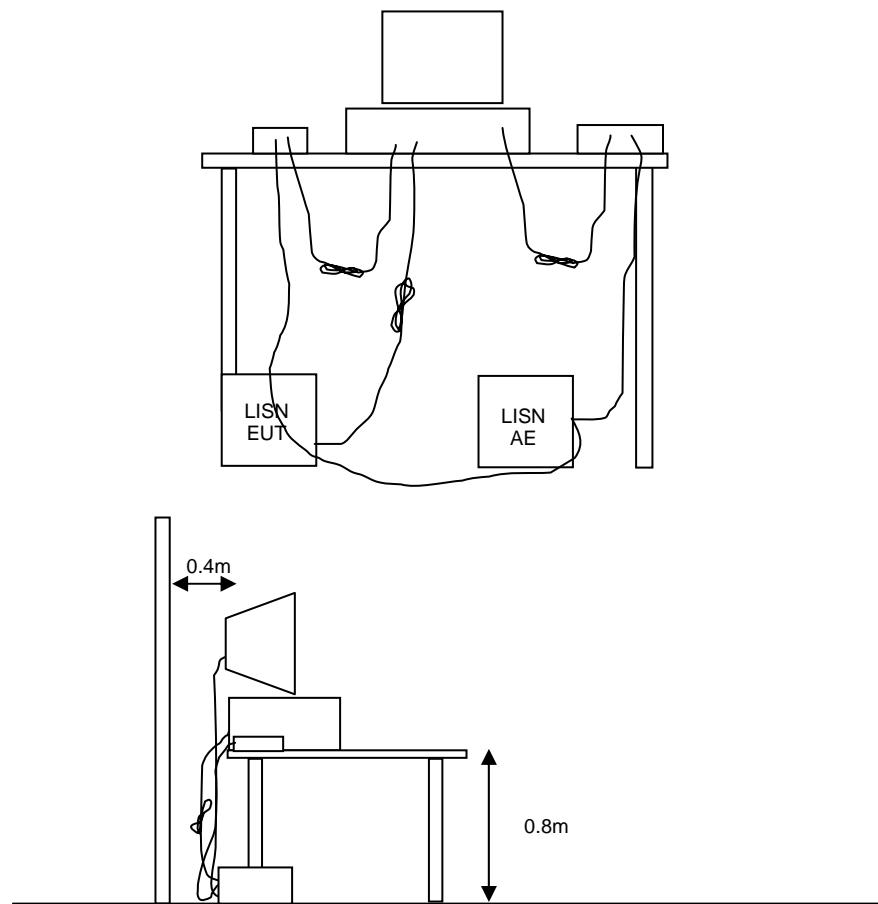
TEST PROCEDURES

EUT AND CABLE PLACEMENT

The 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.



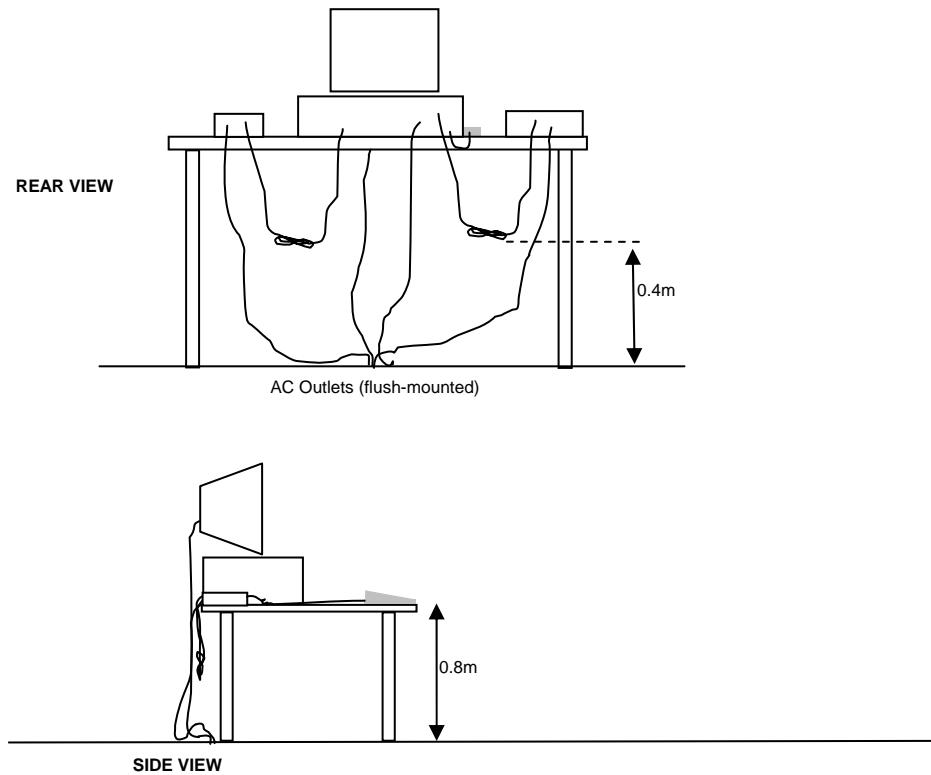
RADIATED EMISSIONS

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.

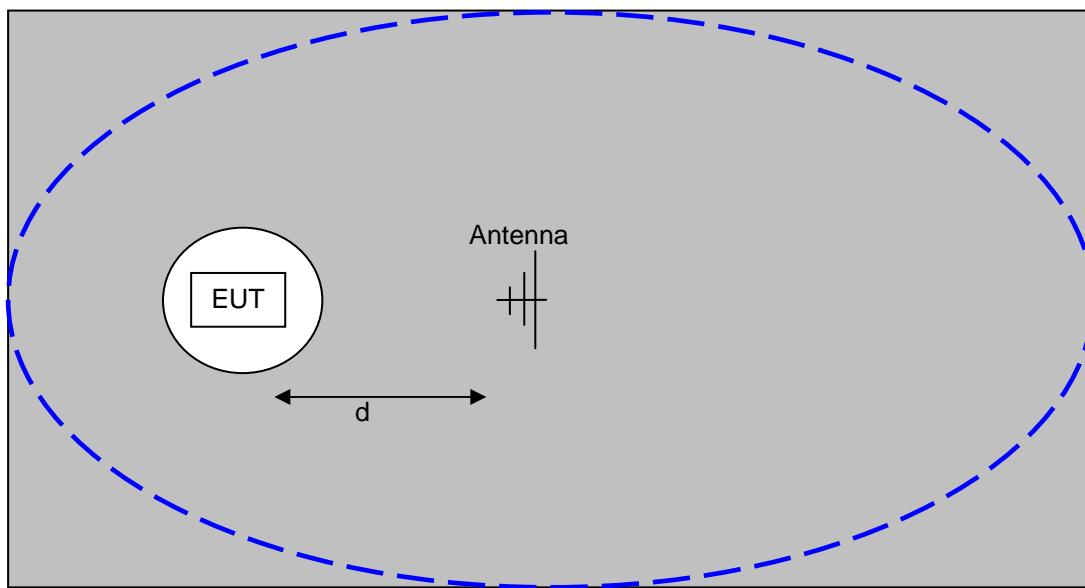
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

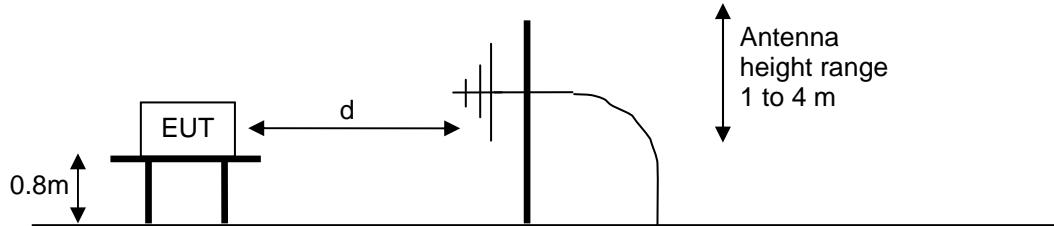
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements



The ground plane extends beyond the ellipse defined in CISPR 16 / CISPR 22 / ANSI C63.4 and is large enough to accommodate test distances (d) of 3m and 10m. Refer to the test data tables for the actual measurement distance.



Test Configuration for Radiated Field Strength Measurements OATS- Plan and Side Views

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:

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands¹ (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

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).

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

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_f - S = M$$

where:

R_f = 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:

$$F_d = 20 * \text{LOG10} (D_m/D_s)$$

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:

$$F_d = 40 * \text{LOG10} (D_m/D_s)$$

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:

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

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 1,000 MHz, 25-Feb-09

Engineer: Joseph Cadigal

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Log Periodic Antenna, 0.3-1 GHz	3146A	364	23-Dec-09
Hewlett Packard	EMC Spectrum Analyzer, 9 kHz - 6.5 GHz	8595EM	780	30-Dec-09
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	19-Sep-09
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT 010	1826	29-May-09

Radiated Emissions, 1000 - 26,500 MHz, 06-Mar-09

Engineer: Rafael Varelas

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	09-Oct-09
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	15-Jul-10
Hewlett Packard	Head (Inc W1-W4, 1143, 1144) Red	84125C	1145	03-Dec-09
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	24-Mar-09
Hewlett Packard	High Pass filter, 3.5 GHz	P/N 84300-80038	1157	13-Oct-09
EMCO	Antenna, Horn, 18-26.5 GHz (RENTAL)	3160-09 (84125C)	44673	N/A

Radiated Emissions, 1,000 - 18,000 MHz, 06-Mar-09

Engineer: Mehran Birgani

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	09-Oct-09
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	15-Jul-10
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	24-Mar-09

Radiated Emissions, 30 - 1,000 MHz, 11-Mar-09

Engineer: Suhaila Khushzad

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	Log Periodic Antenna, 0.2-1 GHz	3146	1294	17-Sep-10
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	29-Mar-09
EMCO	Biconical Antenna, 30-300 MHz	3110B	1498	18-Apr-09

Conducted Emissions - AC Power Ports, 11-Mar-09

Engineer: Suhaila Khushzad

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Elliott Laboratories	LISN, FCC / CISPR	LISN-4, OATS	362	31-Jul-09
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	812	23-Feb-10
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	29-Mar-09
Hewlett Packard	EMC Spectrum Analyzer, 9 kHz - 6.5 GHz	8595EM	780	30-Dec-09

Radio Antenna Port (Power and Spurious Emissions), 11-Mar-09

Engineer: Suhaila Khushzad

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	SpecAn 9 KHz-26.5 GHz, Non-Program	8563E	284	29-Dec-09

Radio Antenna Port (Power and Spurious Emissions), 27-Mar-09

Engineer: Suhaila Khushzad

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-Mar-10
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-Jun-10

Radio Spurious Emissions, 30-Apr-09

Engineer: Suhaila Khushzad

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	09-Oct-09
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	15-Jul-10
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-Mar-10

EXHIBIT 2: Test Measurement Data

49 Pages



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
		Account Manager:	Deepa Shetty
Contact:	Josh Mooney		-
Emissions Standard(s):	FCC Part 15.247	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Adura Technologies

Model

Light Controller

Date of Last Test: 5/1/2009



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
		Account Manger:	Deepa Shetty
Contact:	Josh Mooney		
Emissions Standard(s):	FCC Part 15.247	Class:	B
Immunity Standard(s):	-	Environment:	-

EUT INFORMATION

The following information was collected during the test session(s).

General Description

The EUT is a lighting control device which is designed to be installed in commercial and industrial lighting fixtures to control light levels. The EUT uses a 2.4GHz radio to communicate with lighting control panels. Normally, the EUT would be installed inside a ceiling lighting fixture during operation. The EUT was, therefore, placed in this position during emissions testing to simulate the end user environment. The electrical rating of the EUT is 120/277 V, 50/60 Hz, 5 Amps.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Adura Technologies	Light Controller (LC-2R)	Lighting control for commercial and industrial buildings	Lcxxwwyyrrbnnnnnnnn	WYXLCR10P2

Other EUT Details

Serial number coding follows this format. xx: Model SKU; ww: Week of Year of build; yy: Year of Build; rr: PCB Revision; b: BOM version; nnnnnnn: 7-digit Serial Number (Hex formatting)

EUT Antenna (Intentional Radiators Only)

The EUT has three antenna options. The primary antenna is a printed inverted F-trace antenna. The secondary antennas are an external 1/2 wave whip antenna or an external 1/4 wave dome antenna.

The two external antennas connect to the EUT via a MMCX antenna connector and are to be installed by trained professionals, thereby meeting the requirements of FCC 15.203.

EUT Enclosure

The EUT enclosure is primarily constructed of Plastic. It measures approximately 18 cm wide by 4 cm deep by 2 cm high.

Modification History

Mod. #	Test	Date	Modification
1			No modifications were made to the EUT during testing.
2			
3			

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



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
		Account Manger:	Deepa Shetty
Contact:	Josh Mooney		
Emissions Standard(s):	FCC Part 15.247	Class:	B
Immunity Standard(s):	-	Environment:	-

Test Configuration #1

The following information was collected during the test session(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell		Laptop	-	-
Adura		Serial Adapter Board	-	-

Note: Laptop was used to configure the radio and then was removed for final testing.

Remote Support Equipment

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

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Serial Adapter Board	Laptop	DB9	Shielded	1.5
Serial Adapter Board	EUT	ribbon cable	Unshielded	0.5
AC Power	AC Mains	2Wire	Unshielded	1.0

EUT Operation During Emissions Tests

During emissions testing the EUT was configured to transmit continuously at full power on the selected channel.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated 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.

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.

Ambient Conditions:

Temperature: 8-15 °C
 Rel. Humidity: 50-100 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Frequency (MHz)	Channel	Power Setting	Antenna	Test Performed	Limit	Result / Margin
1a	2405	Low (ch 11)	16	Internal	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	52.9dB μ V/m @ 2351.1MHz (-1.1dB)
			16	Internal	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	49.4dB μ V/m @ 4810.6MHz (-4.6dB)
1b	2440	Center (ch 18)	16	Internal	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	50.5dB μ V/m @ 4879.1MHz (-3.5dB)
1c	2475	High (ch 25)	16	Internal	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	47.4dB μ V/m @ 2483.5MHz (-6.6dB)
			16	Internal	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	52.3dB μ V/m @ 4959.1MHz (-1.7dB)

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.

Note: Prescan showed the EUT with internal antenna in flat orientation has highest emission. Run 1c has the supporting data. No radio related emissions below 1 GHz detected.

Note: Due to the difference in power between channel 25 and channel 26, bandedge and spurious emissions testing was performed at channel 25 in addition to channel 26.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 26000 MHz.

Date of Test: 3/6/2008

Config. Used: 1

Test Engineer: Mehran Birgani

Config Change: None

Test Location: SVOATS #2

EUT Voltage: 120V/60Hz

Run #1a: Low Channel 11 @ 2405 MHz (EUT Flat)
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H					
2405.000	107.2	V	-	AVG	175	1.1	RB 1 MHz; VB: 10 Hz
2405.580	109.6	V	-	PK	175	1.1	RB 1 MHz; VB: 1 MHz
2405.100	104.1	H	-	AVG	221	1.7	RB 1 MHz; VB: 10 Hz
2404.650	106.2	H	-	PK	221	1.7	RB 1 MHz; VB: 1 MHz
2405.290	105.4	V	-	-	175	1.1	RB 100 kHz; VB: 100 kHz

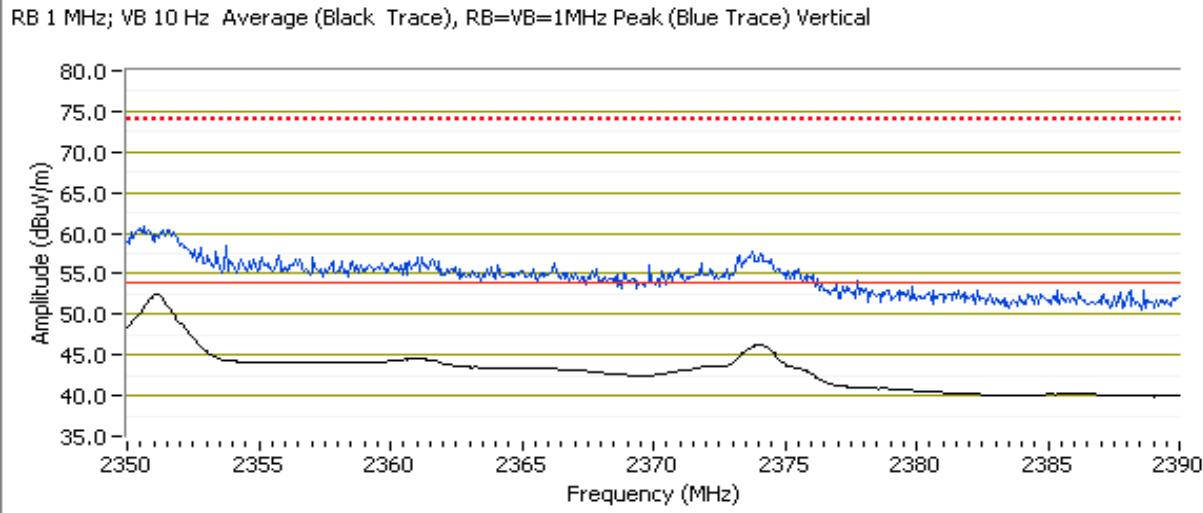
 Fundamental emission level @ 3m in 100kHz RBW: 105.4 dB μ V/m

 Limit for emissions outside of restricted bands: 75.4 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H					
2351.070	52.9	V	54.0	AVG	175	1.1	
2351.070	50.4	H	54.0	AVG	221	1.7	
2350.600	59.7	V	74.0	PK	175	1.1	
2350.800	59.3	H	74.0	PK	221	1.7	





EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Other Spurious Emissions

Frequency MHz	Level dB μ V/m	Pol V/H	15.209 / 15.247 Limit	Margin	Detector	Azimuth degrees	Height meters	Comments
4810.620	49.4	V	54.0	-4.6	AVG	274	1.1	
7216.310	46.1	H	54.0	-7.9	AVG	0	1.7	Note 2
4809.410	45.4	H	54.0	-8.6	AVG	175	1.0	
7216.280	43.1	V	54.0	-10.9	AVG	51	1.9	Note 2
9621.500	41.8	V	54.0	-12.2	AVG	261	1.9	Note 2
9621.480	39.9	H	54.0	-14.1	AVG	268	1.7	Note 2
12026.360	39.2	V	54.0	-14.8	AVG	285	1.0	
12026.400	39.2	H	54.0	-14.8	AVG	0	1.0	
4810.960	55.5	V	74.0	-18.5	PK	274	1.1	
7216.390	54.5	H	74.0	-19.5	PK	0	1.7	Note 2
4811.240	52.4	H	74.0	-21.6	PK	175	1.0	
7216.460	51.9	V	74.0	-22.1	PK	51	1.9	Note 2
9621.180	51.3	V	74.0	-22.7	PK	261	1.9	Note 2
9621.490	50.8	H	74.0	-23.2	PK	268	1.7	Note 2
12025.150	50.0	V	74.0	-24.0	PK	285	1.0	
12023.680	49.6	H	74.0	-24.4	PK	0	1.0	

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Run #1b: Center Channel 18 @ 2440 MHz (EUT Flat)

Fundamental emission level @ 3m in 100kHz RBW:	dB μ V/m
Limit for emissions outside of restricted bands:	-30 dB μ V/m

Limit is -30dBc (UNII power measurement)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4879.060	50.5	V	54.0	-3.5	AVG	66	1.0	
4880.630	50.0	H	54.0	-4.0	AVG	182	1.0	
9761.500	43.1	V	54.0	-10.9	AVG	247	1.9	Note 2
7321.310	42.2	H	54.0	-11.8	AVG	355	1.6	
7321.310	41.9	V	54.0	-12.1	AVG	270	1.9	
9761.480	40.3	H	54.0	-13.7	AVG	252	1.8	Note 2
12201.160	39.3	H	54.0	-14.7	AVG	21	1.0	
12201.160	39.2	V	54.0	-14.8	AVG	360	1.0	
4879.040	56.4	V	74.0	-17.6	PK	66	1.0	
4881.200	56.1	H	74.0	-17.9	PK	182	1.0	
9761.470	53.1	V	74.0	-20.9	PK	247	1.9	Note 2
9761.370	51.6	H	74.0	-22.4	PK	252	1.8	Note 2
7318.690	51.0	V	74.0	-23.0	PK	270	1.9	
7321.160	50.7	H	74.0	-23.3	PK	355	1.6	
12199.750	50.6	H	74.0	-23.4	PK	21	1.0	
12200.920	50.5	V	74.0	-23.5	PK	360	1.0	

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/6/2008
 Test Engineer: Mehran Birgani
 Test Location: SVOATS #2

Config. Used: 1
 Config Change: None
 EUT Voltage: 120V/60Hz

Run #1c: High Channel 25 @ 2475 MHz

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

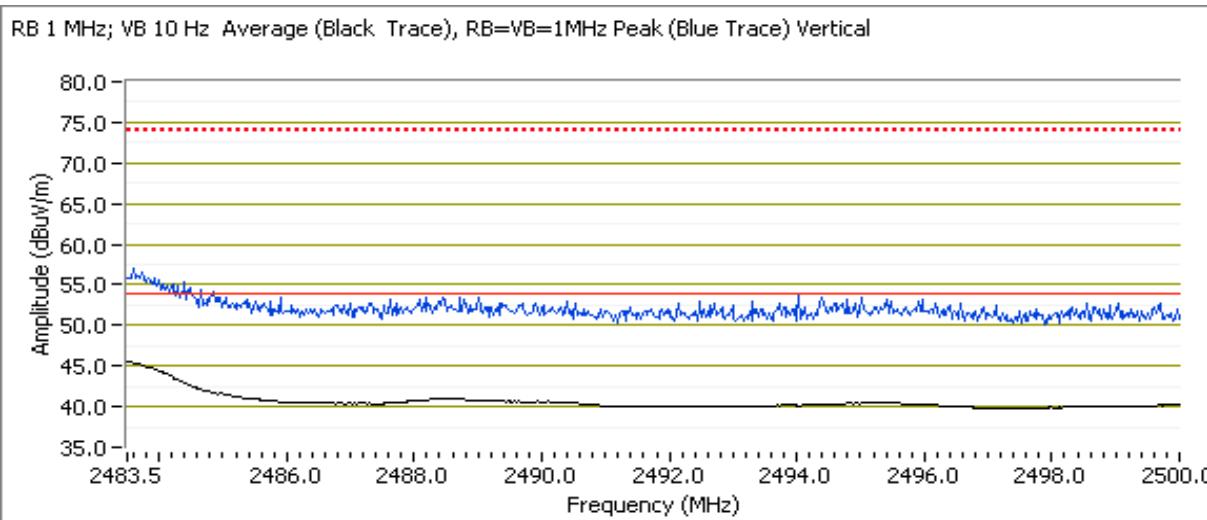
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2475.010	106.7	V	-	-	AVG	171	1.1	RB 1 MHz; VB: 10 Hz
2475.560	109.0	V	-	-	PK	171	1.1	RB 1 MHz; VB: 1 MHz
2474.990	100.4	H	-	-	AVG	211	1.7	RB 1 MHz; VB: 10 Hz
2474.550	102.4	H	-	-	PK	211	1.7	RB 1 MHz; VB: 1 MHz
2474.760	105.3	V	-	-	-	171	1.1	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	105.3 dB μ V/m
Limit for emissions outside of restricted bands:	75.3 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	47.4	V	54.0	-6.6	AVG	171	1.1	
2483.500	42.0	H	54.0	-12.0	AVG	211	1.7	
2483.500	56.7	V	74.0	-17.3	PK	171	1.1	
2483.660	51.9	H	74.0	-22.1	PK	211	1.7	





EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Other Spurious Emissions

Frequency MHz	Level dB μ V/m	Pol V/H	15.209 / 15.247 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
EUT Flat								
4959.110	52.3	V	54.0	-1.7	AVG	89	1.0	
7438.700	43.5	V	54.0	-10.5	AVG	273	1.8	
4959.030	43.4	H	54.0	-10.6	AVG	191	1.0	
12398.670	39.7	H	54.0	-14.3	AVG	68	1.0	
12398.530	39.6	V	54.0	-14.4	AVG	25	1.5	
7438.560	39.5	H	54.0	-14.5	AVG	3	1.8	
9918.500	38.5	V	54.0	-15.5	AVG	360	1.0	Note 2
9918.500	38.0	H	54.0	-16.0	AVG	0	1.0	Note 2
4959.190	57.0	V	74.0	-17.0	PK	85	1.0	
7441.460	52.3	V	74.0	-21.7	PK	273	1.8	
4961.440	50.8	H	74.0	-23.2	PK	191	1.0	
7438.650	50.7	H	74.0	-23.3	PK	3	1.8	
12398.790	50.7	H	74.0	-23.3	PK	68	1.0	
12398.860	50.7	V	74.0	-23.3	PK	25	1.5	
9919.360	49.6	H	74.0	-24.4	PK	0	1.0	Note 2
9919.700	49.6	V	74.0	-24.4	PK	360	1.0	Note 2
EUT Side								
4959.120	51.5	V	54.0	-2.5	AVG	85	1.0	
4958.840	58.3	V	74.0	-15.7	PK	89	1.0	
4960.960	47.9	H	54.0	-6.1	AVG	272	1.9	
4961.060	54.4	H	74.0	-19.6	PK	272	1.9	
EUT Upright								
4959.250	50.0	H	54.0	-4.0	AVG	157	1.1	
4959.040	56.6	H	74.0	-17.4	PK	157	1.1	
4959.250	46.4	V	54.0	-7.6	AVG	264	1.0	
4959.130	53.6	V	74.0	-20.4	PK	264	1.0	

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated 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.

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.

Ambient Conditions: Temperature: 8-15 °C
Rel. Humidity: 50-100 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Frequency (MHz)	Channel	Power Setting	Antenna	Test Performed	Limit	Result / Margin
1a	2405	Low (ch 11)	16	External Whip	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	53.0dB μ V/m @ 2351.1MHz (-1.0dB)
			16	External Whip	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	52.9dB μ V/m @ 4811.0MHz (-1.1dB)
1b	2440	Center (ch 18)	16	External Whip	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	52.9dB μ V/m @ 4879.1MHz (-1.1dB)
1c	2475	High (ch 25)	16	External Whip	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	46.1dB μ V/m @ 2483.5MHz (-7.9dB)
			16	External Whip	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	51.1dB μ V/m @ 4959.1MHz (-2.9dB)

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.

Note: Due to the difference in power between channel 25 and channel 26, bandedge and spurious emissions testing was performed at channel 25 in addition to channel 26.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 26000 MHz.

External Whip Antenna, Nearson Inc, S181FL-5-RMM-2450S, 1/2 Wave RA 5" Cable

 Date of Test: 3/6/2008
 Test Engineer: Mehran Birgani
 Test Location: SVOATS #2

 Config. Used: 1
 Config Change: None
 EUT Voltage: 120V/60Hz

Run #3a: Low Channel @ 2405 MHz
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2405.010	108.5	V	-	-	AVG	172	1.1	RB 1 MHz; VB: 10 Hz
2404.560	110.0	V	-	-	PK	172	1.1	RB 1 MHz; VB: 1 MHz
2405.000	100.7	H	-	-	AVG	267	1.8	RB 1 MHz; VB: 10 Hz
2404.540	102.7	H	-	-	PK	267	1.8	RB 1 MHz; VB: 1 MHz
2404.760	107.6	V	-	-	-	172	1.1	RB 100 kHz; VB: 100 kHz

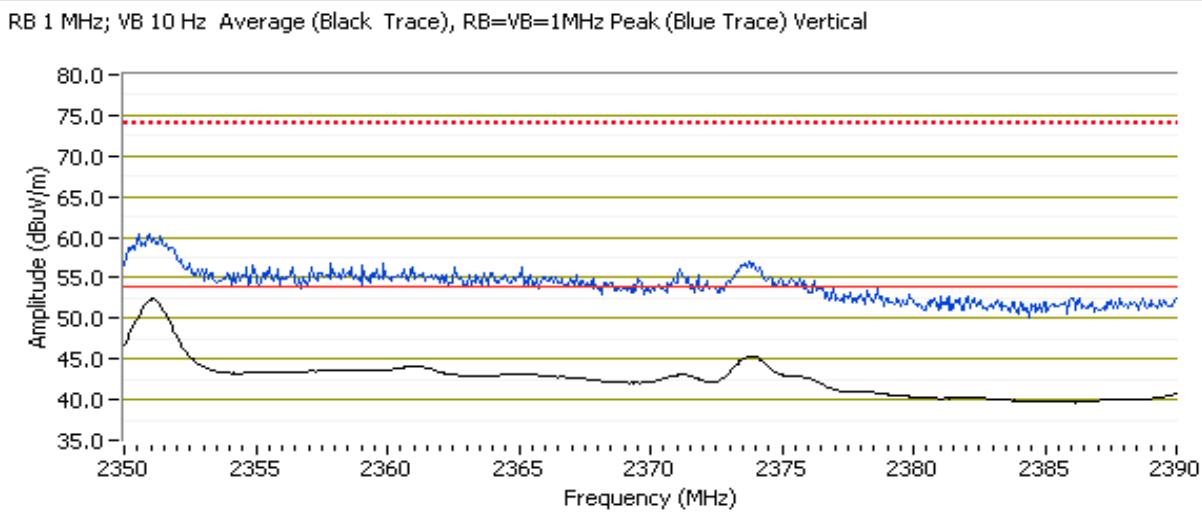
 Fundamental emission level @ 3m in 100kHz RBW: 107.6 dB μ V/m

 Limit for emissions outside of restricted bands: 77.6 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2351.070	53.0	V	54.0	-1.0	AVG	172	1.1	
2351.000	46.8	H	54.0	-7.2	AVG	267	1.8	
2350.930	59.2	V	74.0	-14.8	PK	172	1.1	
2350.670	54.5	H	74.0	-19.5	PK	267	1.8	





EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Other Spurious Emissions

Frequency MHz	Level dB μ V/m	Pol V/H	15.209 / 15.247 Limit	Detector Margin	Azimuth degrees	Height meters	Comments
4811.020	52.9	V	54.0	-1.1	AVG	86	1.0
7216.230	47.1	V	54.0	-6.9	AVG	46	1.9
4811.010	45.7	H	54.0	-8.3	AVG	271	1.0
9621.500	41.3	V	54.0	-12.7	AVG	120	1.0
7216.380	39.4	H	54.0	-14.6	AVG	183	1.6
12026.360	39.2	H	54.0	-14.8	AVG	230	1.0
12026.490	39.2	V	54.0	-14.8	AVG	360	1.0
4809.160	58.8	V	74.0	-15.2	PK	86	1.0
9621.470	38.6	H	54.0	-15.4	AVG	82	1.6
7216.400	54.8	V	74.0	-19.2	PK	46	1.9
4811.120	52.6	H	74.0	-21.4	PK	271	1.0
9619.120	51.0	V	74.0	-23.0	PK	120	1.0
12025.340	51.0	H	74.0	-23.0	PK	230	1.0
12025.990	50.2	V	74.0	-23.8	PK	360	1.0
9619.680	49.2	H	74.0	-24.8	PK	82	1.6
7216.160	49.1	H	74.0	-24.9	PK	183	1.6

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Run #1b: Center Channel @ 2440 MHz

Fundamental emission level @ 3m in 100kHz RBW:	dB μ V/m
Limit for emissions outside of restricted bands:	-30.0 dB μ V/m

Limit is -30dBc (UNII power measurement)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4879.120	52.9	V	54.0	-1.1	AVG	80	1.7	
4879.060	46.8	H	54.0	-7.2	AVG	190	1.0	
7321.400	43.8	V	54.0	-10.2	AVG	51	1.6	
9759.970	40.1	V	54.0	-13.9	AVG	317	1.8	Note 2
12201.250	39.3	H	54.0	-14.7	AVG	7	2.0	
12201.280	39.3	V	54.0	-14.7	AVG	86	1.0	
7321.310	39.2	H	54.0	-14.8	AVG	178	1.3	
9761.470	39.0	H	54.0	-15.0	AVG	227	1.7	Note 2
4879.040	58.1	V	74.0	-15.9	PK	80	1.7	
4878.950	53.1	H	74.0	-20.9	PK	190	1.0	
7321.450	51.7	V	74.0	-22.3	PK	51	1.6	
12201.360	50.5	H	74.0	-23.5	PK	7	2.0	
9758.640	50.3	V	74.0	-23.7	PK	317	1.8	Note 2
9759.720	50.2	H	74.0	-23.8	PK	227	1.7	Note 2
12198.980	50.2	V	74.0	-23.8	PK	86	1.0	
7318.620	48.8	H	74.0	-25.2	PK	178	1.3	

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/6/2008
 Test Engineer: Mehran Birgani
 Test Location: SVOATS #2

Config. Used: 1
 Config Change: None
 EUT Voltage: 120V/60Hz

Run #1c: High Channel 25 @ 2475 MHz

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

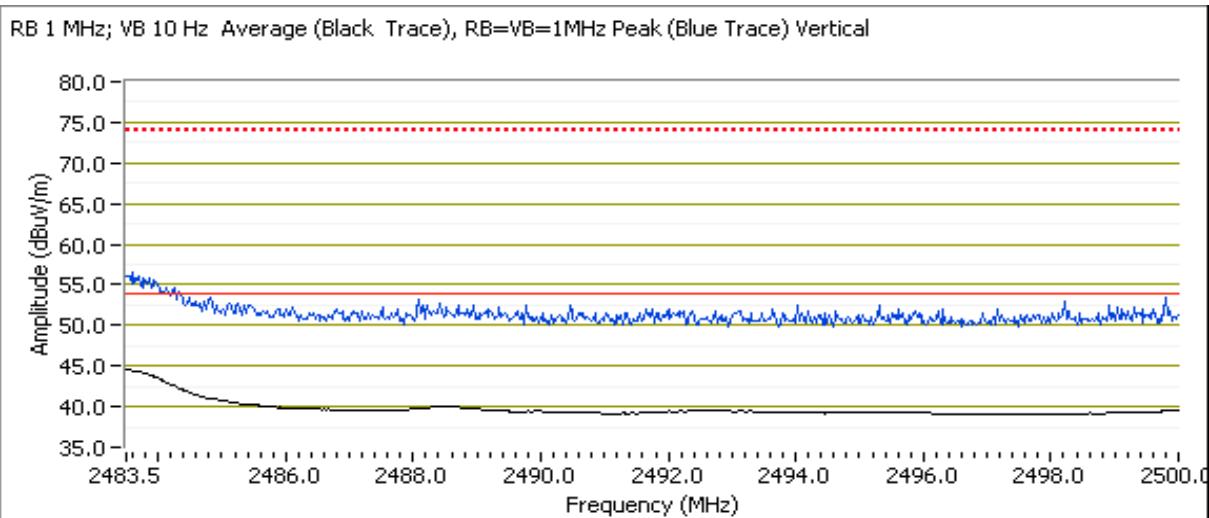
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2474.980	107.2	V	-	-	AVG	139	1.0	RB 1 MHz; VB: 10 Hz
2475.530	109.5	V	-	-	PK	139	1.0	RB 1 MHz; VB: 1 MHz
2474.920	96.2	H	-	-	AVG	85	1.6	RB 1 MHz; VB: 10 Hz
2474.590	98.3	H	-	-	PK	85	1.6	RB 1 MHz; VB: 1 MHz
2474.750	105.9	V	-	-	-	139	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	105.9 dB μ V/m
Limit for emissions outside of restricted bands:	75.9 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	46.1	V	54.0	-7.9	AVG	139	1.0	
2483.500	40.2	H	54.0	-13.8	AVG	85	1.6	
2483.640	54.9	V	74.0	-19.1	PK	139	1.0	
2484.020	50.2	H	74.0	-23.8	PK	85	1.6	





EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Other Spurious Emissions

Frequency MHz	Level dB μ V/m	Pol V/H	15.209 / 15.247 Limit	Detector Margin	Azimuth degrees	Height meters	Comments
4959.100	51.1	V	54.0	-2.9	AVG	82	1.9
4959.090	45.5	H	54.0	-8.5	AVG	270	1.9
7438.620	39.5	V	54.0	-14.5	AVG	296	1.5
12398.500	39.5	V	54.0	-14.5	AVG	182	1.1
12398.500	39.5	H	54.0	-14.5	AVG	208	1.0
9918.500	39.4	V	54.0	-14.6	AVG	329	1.3
9918.500	37.9	H	54.0	-16.1	AVG	239	1.0
4959.080	56.9	V	74.0	-17.1	PK	82	1.9
7438.600	35.7	H	54.0	-18.3	AVG	85	1.0
4960.860	52.4	H	74.0	-21.6	PK	270	1.9
12401.370	51.0	V	74.0	-23.0	PK	182	1.1
12398.580	50.8	H	74.0	-23.2	PK	208	1.0
9918.630	50.1	V	74.0	-23.9	PK	329	1.3
7441.430	49.4	V	74.0	-24.6	PK	296	1.5
9918.890	49.0	H	74.0	-25.0	PK	239	1.0
7439.290	47.0	H	74.0	-27.0	PK	85	1.0

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated 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.

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.

Ambient Conditions: Temperature: 8-15 °C
Rel. Humidity: 50-100 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Test Specific Details

Run #	Frequency (MHz)	Channel	Power Setting	Antenna	Test Performed	Limit	Result / Margin
1a	2405	Low (ch 11)	16	Dome	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	46.9dB μ V/m @ 2351.0MHz (-7.1dB)
			16	Dome	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	50.5dB μ V/m @ 4809.1MHz (-3.5dB)
1b	2440	Center (ch 18)	16	Dome	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	51.3dB μ V/m @ 4881.1MHz (-2.7dB)
1c	2475	High (ch 25)	16	Dome	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	49.2dB μ V/m @ 2483.5MHz (-4.8dB)
			16	Dome	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	50.6dB μ V/m @ 4959.1MHz (-3.4dB)

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.

Note: Due to the difference in power between channel 25 and channel 26, bandedge and spurious emissions testing was performed at channel 25 in addition to channel 26.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 26000 MHz.

External Dome Antenna, Linx Technologies, ANT-2.4-WRT-SMA, 1/4 Wave Dome

Date of Test: 3/6/2008
Test Engineer: Mehran Birgani
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Run #1a: Low Channel @ 2405 MHz
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2405.060	103.5	V	-	-	AVG	128	1.0	RB 1 MHz; VB: 10 Hz
2404.490	105.7	V	-	-	PK	128	1.0	RB 1 MHz; VB: 1 MHz
2405.040	96.7	H	-	-	AVG	224	1.8	RB 1 MHz; VB: 10 Hz
2404.460	98.7	H	-	-	PK	224	1.8	RB 1 MHz; VB: 1 MHz
2405.300	101.9	V	-	-	-	128	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW: 101.9 dB μ V/m

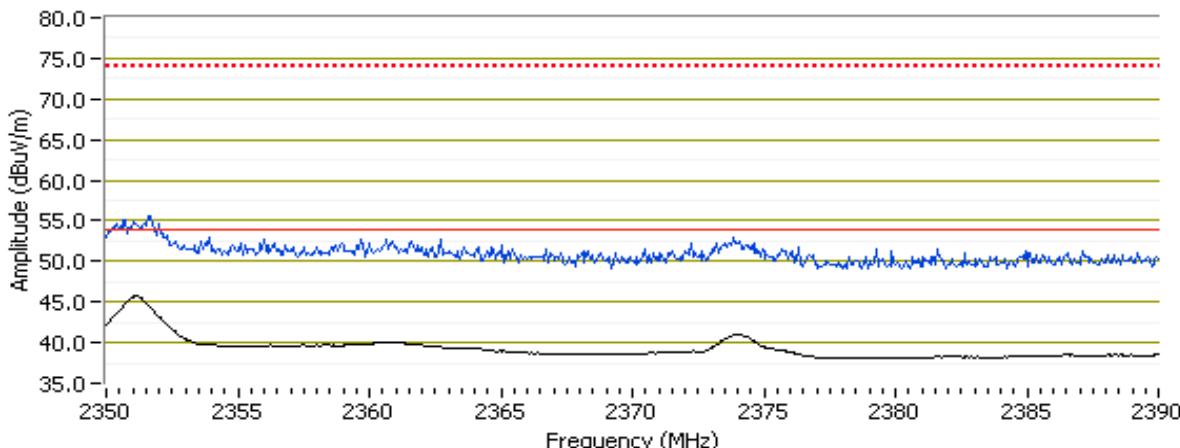
Limit for emissions outside of restricted bands: 71.9 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2351.000	46.9	V	54.0	-7.1	AVG	128	1.0	
2351.000	39.8	H	54.0	-14.2	AVG	224	1.8	
2351.600	54.1	V	74.0	-19.9	PK	128	1.0	
2351.070	49.9	H	74.0	-24.1	PK	224	1.8	

RB 1 MHz; VB 10 Hz Average (Black Trace), RB=VB=1MHz Peak (Blue Trace) Vertical





EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Other Spurious Emissions

Frequency MHz	Level dB μ V/m	Pol V/H	15.209 / 15.247 Limit	Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
4809.080	50.5	H	54.0	-3.5	AVG	39	1.0	
4811.040	46.6	V	54.0	-7.4	AVG	339	1.9	
7213.600	43.8	H	54.0	-10.2	AVG	19	1.8	Note 2
7216.370	39.0	V	54.0	-15.0	AVG	248	1.9	Note 2
9621.450	37.3	V	54.0	-16.7	AVG	315	1.0	Note 2
9621.500	42.3	H	54.0	-11.7	AVG	328	1.8	Note 2
12026.420	39.2	H	54.0	-14.8	AVG	300	1.0	
12026.470	39.3	V	54.0	-14.7	AVG	256	1.0	
4809.000	56.2	H	74.0	-17.8	PK	39	1.0	
4811.130	53.1	V	74.0	-20.9	PK	339	1.9	
7213.870	52.4	H	74.0	-21.6	PK	19	1.8	Note 2
7216.410	49.1	V	74.0	-24.9	PK	248	1.9	Note 2
9620.490	48.8	V	74.0	-25.2	PK	315	1.0	Note 2
9621.380	52.4	H	74.0	-21.6	PK	328	1.8	Note 2
12023.590	50.5	V	74.0	-23.5	PK	256	1.0	
12026.500	50.5	H	74.0	-23.5	PK	300	1.0	

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Run #1b: Center Channel @ 2440 MHz

Fundamental emission level @ 3m in 100kHz RBW:	dB μ V/m
Limit for emissions outside of restricted bands:	-30 dB μ V/m

Limit is -30dBc (UNII power measurement)

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4881.060	51.3	H	54.0	-2.7	AVG	14	1.0	
4879.040	51.2	V	54.0	-2.8	AVG	49	1.6	
7321.310	43.0	V	54.0	-11.0	AVG	232	1.9	
9761.480	41.9	V	54.0	-12.1	AVG	319	1.7	Note 2
7321.290	40.7	H	54.0	-13.3	AVG	128	1.8	
12199.880	39.5	V	54.0	-14.5	AVG	190	1.0	
12201.500	39.4	H	54.0	-14.6	AVG	360	1.0	
9761.480	39.2	H	54.0	-14.8	AVG	350	1.6	Note 2
4880.940	56.8	H	74.0	-17.2	PK	14	1.0	
4879.000	56.6	V	74.0	-17.4	PK	49	1.6	
9758.620	52.0	V	74.0	-22.0	PK	319	1.7	Note 2
7321.300	51.8	V	74.0	-22.2	PK	232	1.9	
12198.870	50.6	V	74.0	-23.4	PK	190	1.0	
12200.870	50.6	H	74.0	-23.4	PK	360	1.0	
9761.470	50.5	H	74.0	-23.5	PK	350	1.6	Note 2
7321.350	50.1	H	74.0	-23.9	PK	128	1.8	

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/6/2008
 Test Engineer: Mehran Birgani
 Test Location: SVOATS #2

Config. Used: 1
 Config Change: None
 EUT Voltage: 120V/60Hz

Run #1c: High Channel 25 @ 2475 MHz

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

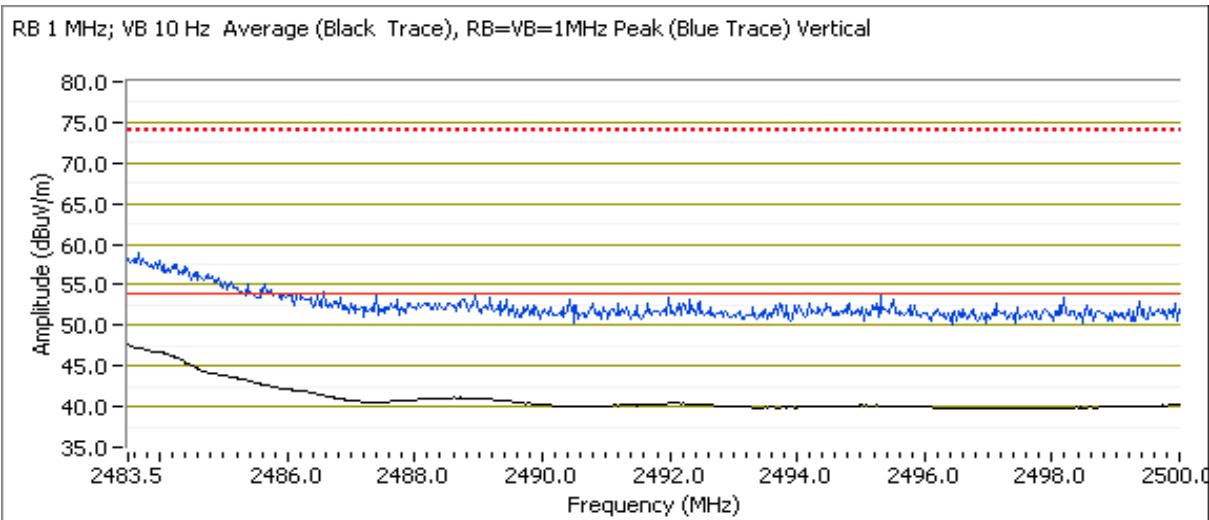
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2475.000	106.8	V	-	-	AVG	351	1.1	RB 1 MHz; VB: 10 Hz
2475.570	108.9	V	-	-	PK	351	1.1	RB 1 MHz; VB: 1 MHz
2475.040	93.3	H	-	-	AVG	10	1.0	RB 1 MHz; VB: 10 Hz
2475.530	95.1	H	-	-	PK	10	1.0	RB 1 MHz; VB: 1 MHz
2475.290	105.1	V	-	-	-	351	1.1	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	105.1 dB μ V/m
Limit for emissions outside of restricted bands:	75.1 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	49.2	V	54.0	-4.8	AVG	351	1.1	
2483.500	39.6	H	54.0	-14.4	AVG	10	1.0	
2483.550	58.6	V	74.0	-15.4	PK	351	1.1	
2484.300	49.7	H	74.0	-24.3	PK	10	1.0	





EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Date of Test: 3/5/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Other Spurious Emissions

Frequency MHz	Level dB μ V/m	Pol V/H	15.209 / 15.247 Limit	Detector Margin	Detector Pk/QP/Avg	Azimuth degrees	Height meters	Comments
4959.110	50.6	H	54.0	-3.4	AVG	18	1.0	
4959.060	46.6	V	54.0	-7.4	AVG	352	1.0	
12398.500	39.6	V	54.0	-14.4	AVG	360	1.0	
12399.410	39.6	H	54.0	-14.4	AVG	236	1.0	
9918.500	38.8	H	54.0	-15.2	AVG	266	1.0	Note 2
7438.600	38.7	V	54.0	-15.3	AVG	220	1.7	
9918.500	38.4	V	54.0	-15.6	AVG	0	1.0	Note 2
7438.520	37.3	H	54.0	-16.7	AVG	19	1.0	
4959.090	56.3	H	74.0	-17.7	PK	18	1.0	
4959.100	53.3	V	74.0	-20.7	PK	352	1.0	
9918.630	51.1	H	74.0	-22.9	PK	266	1.0	Note 2
12400.860	51.1	H	74.0	-22.9	PK	236	1.0	
12399.770	50.6	V	74.0	-23.4	PK	360	1.0	
7438.890	49.5	V	74.0	-24.5	PK	220	1.7	
9919.240	49.1	V	74.0	-24.9	PK	0	1.0	Note 2
7438.850	48.2	H	74.0	-25.8	PK	19	1.0	

Note 2: Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated 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.

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.

Ambient Conditions: Temperature: 8-15 °C
 Rel. Humidity: 50-100 %

Summary of Results - Device Operating in the 2400-2483.5 MHz Band

Run #	Frequency (MHz)	Channel	Power Setting	Antenna	Test Performed	Limit	Result / Margin
1a	2480	High (ch 26)	0	Internal (EUT Flat)	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	49.9dB μ V/m @ 2483.5MHz (-4.1dB)
1b	2480	High (ch 26)	0	Internal (UpRight)	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	52.0dB μ V/m @ 2483.5MHz (-2.0dB)
			0	Internal (UpRight)	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	48.0dB μ V/m @ 4960.1MHz (-6.0dB)
2a	2480	High (ch 26)	0	External Omni	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	53.7dB μ V/m @ 2483.5MHz (-0.3dB)
			0	External Omni	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	41.2dB μ V/m @ 4960.1MHz (-12.8dB)
3a	2480	High (ch 26)	0	External Dome	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	53.2dB μ V/m @ 2483.5MHz (-0.8dB)
			0	External Dome	Radiated Emissions, 1 - 26 GHz	FCC Part 15.209 / 15.247(c)	45.8dB μ V/m @ 4960.0MHz (-8.2dB)

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.



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 26000 MHz.

Date of Test: 4/30/2009
Test Engineer: Suhaila Khushzad
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: 120V/60Hz

Run #1a: High Channel 26 @ 2480 MHz, Internal Antenna, EUT in Flat Orientation

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.190	79.0	V	-	-	AVG	289	1.0	RB 1 MHz; VB: 10 Hz
2479.780	81.2	V	-	-	PK	289	1.0	RB 1 MHz; VB: 1 MHz
2480.190	79.7	H	-	-	AVG	327	1.6	RB 1 MHz; VB: 10 Hz
2479.810	82.0	H	-	-	PK	327	1.6	RB 1 MHz; VB: 1 MHz
2480.630	76.5	V	-	-	PK	289	1.0	RB 100 kHz; VB: 100 kHz
2479.720	77.1	H	-	-	PK	327	1.6	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW: 77.1 dB μ V/m

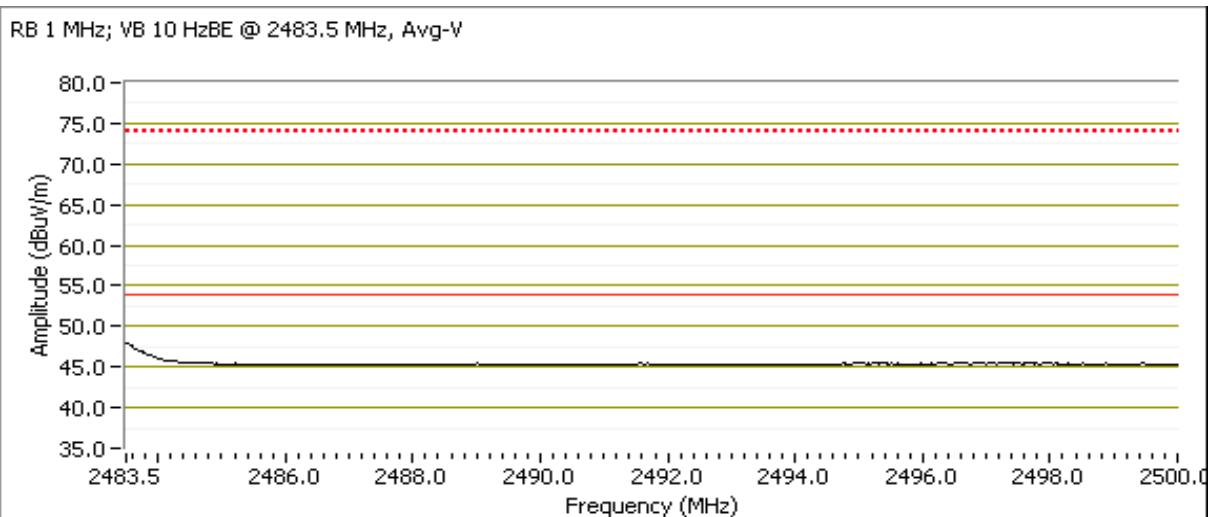
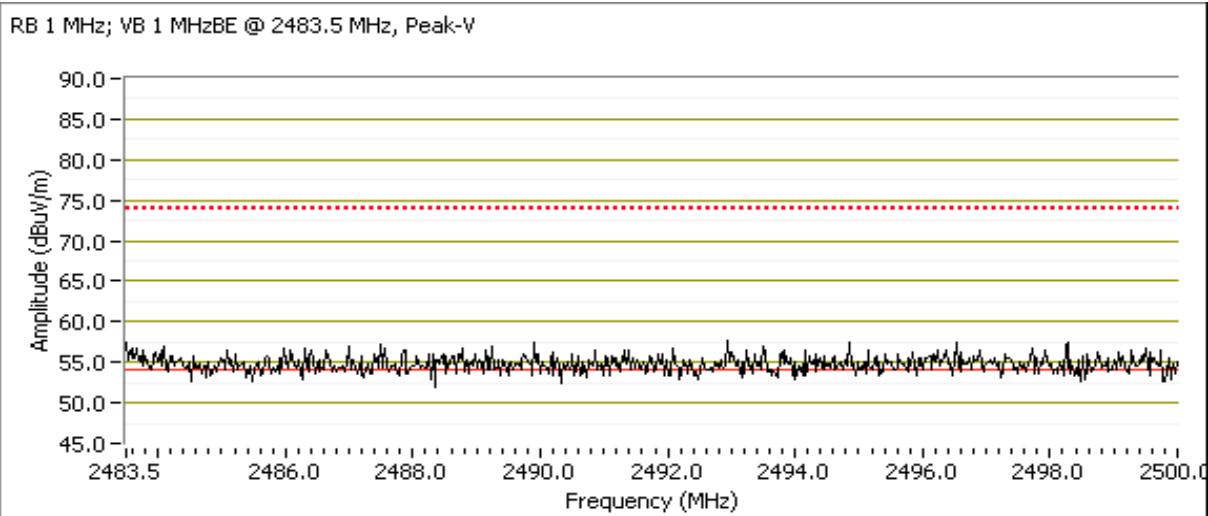
Limit for emissions outside of restricted bands: 47.1 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

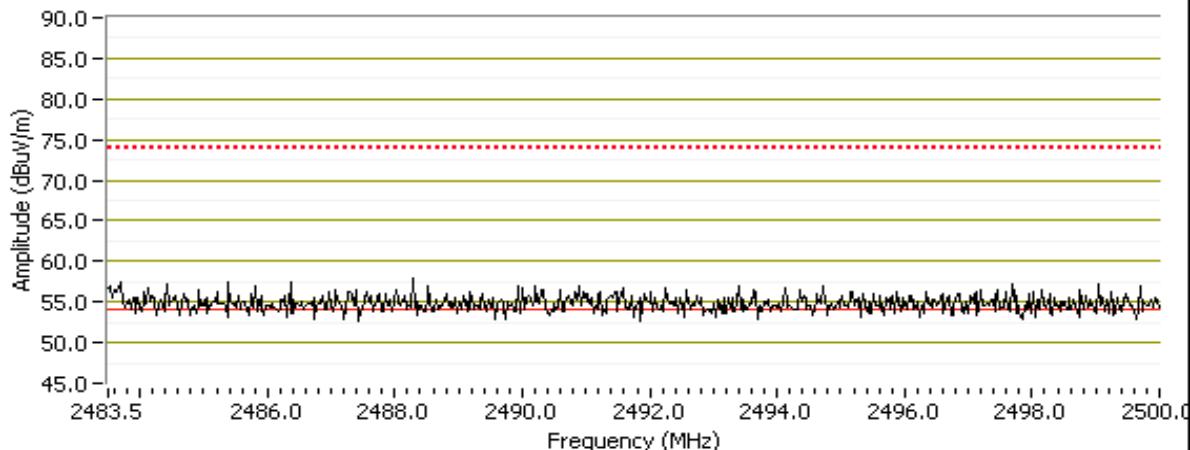
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	49.9	H	54.0	-4.1	AVG	327	1.6	RB 1 MHz; VB: 10 Hz
2483.500	49.4	V	54.0	-4.6	AVG	289	1.0	RB 1 MHz; VB: 10 Hz
2488.720	58.4	H	74.0	-15.6	PK	327	1.6	RB 1 MHz; VB: 1 MHz
2483.530	58.2	V	74.0	-15.8	PK	289	1.0	RB 1 MHz; VB: 1 MHz

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

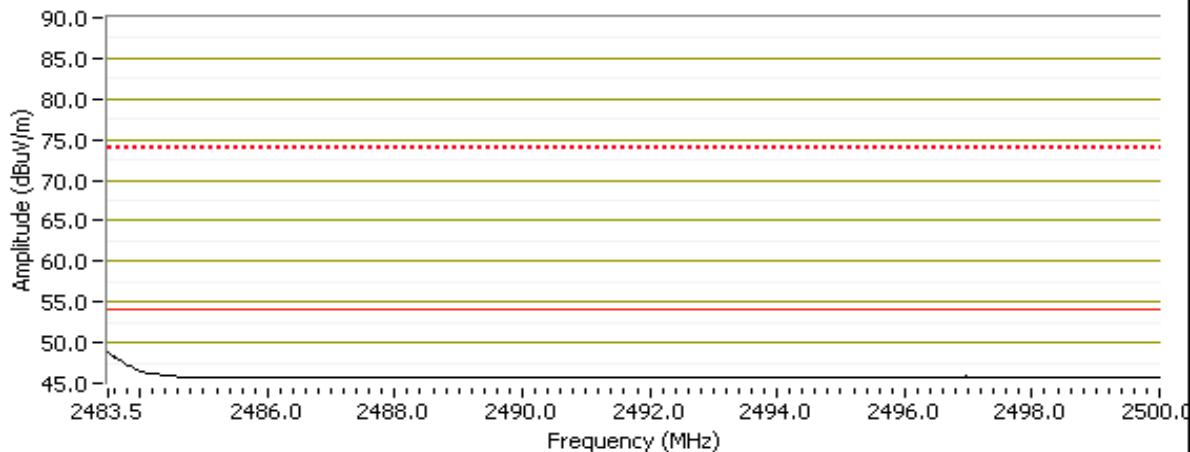


Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RB 1 MHz; VB 1 MHzBE @ 2483.5 MHz, Peak-H



RB 1 MHz; VB 10 HzBE @ 2483.5 MHz, Peak- Avg





EMC Test Data

Client:	Adura Technologies				Job Number:	J73243	
Model:	Light Controller				T-Log Number:	T74691	
Contact:	Josh Mooney				Account Manager:	Deepa Shetty	
Standard:	FCC Part 15.247				Class:	N/A	

Run #1b: High Channel 26 @ 2480 MHz, Internal Antenna, EUT in Up-Right Orientation

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.190	83.0	H	-	-	AVG	231	1.8	RB 1 MHz; VB: 10 Hz
2480.700	85.3	H	-	-	PK	231	1.8	RB 1 MHz; VB: 1 MHz
2480.220	83.7	V	-	-	AVG	281	1.0	RB 1 MHz; VB: 10 Hz
2479.780	86.1	V	-	-	PK	281	1.0	RB 1 MHz; VB: 1 MHz
2480.600	81.1	V	-	-	PK	281	1.0	RB 100 kHz; VB: 100 kHz
2480.340	79.8	H	-	-	PK	231	1.8	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW: 81.1 dB μ V/m

Limit for emissions outside of restricted bands: 51.1 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

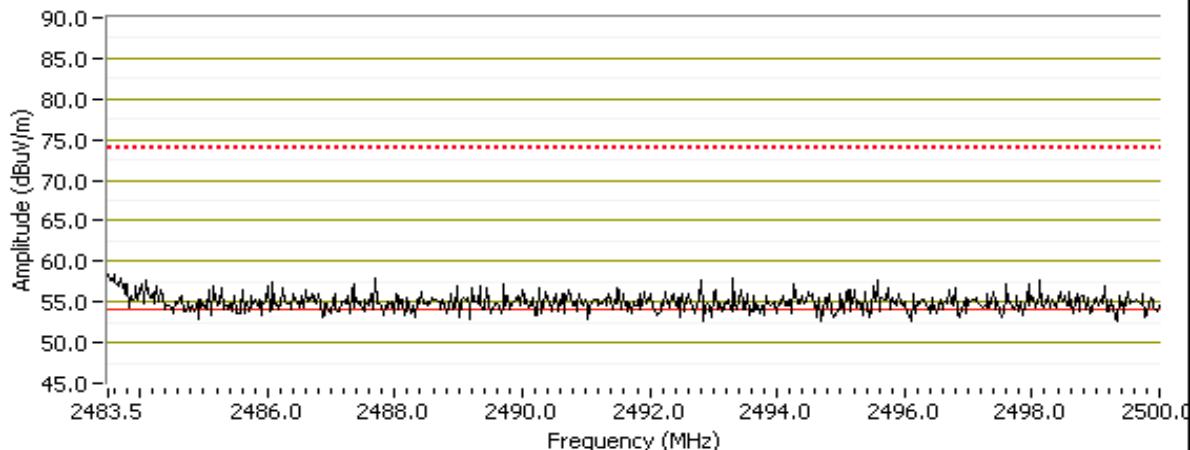
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	52.0	V	54.0	-2.0	AVG	281	1.0	RB 1 MHz; VB: 10 Hz
2483.500	51.6	H	54.0	-2.4	AVG	231	1.8	RB 1 MHz; VB: 10 Hz
2483.530	59.4	H	74.0	-14.6	PK	231	1.8	RB 1 MHz; VB: 1 MHz
2483.500	59.0	V	74.0	-15.0	PK	281	1.0	RB 1 MHz; VB: 1 MHz

Other Spurious Emissions

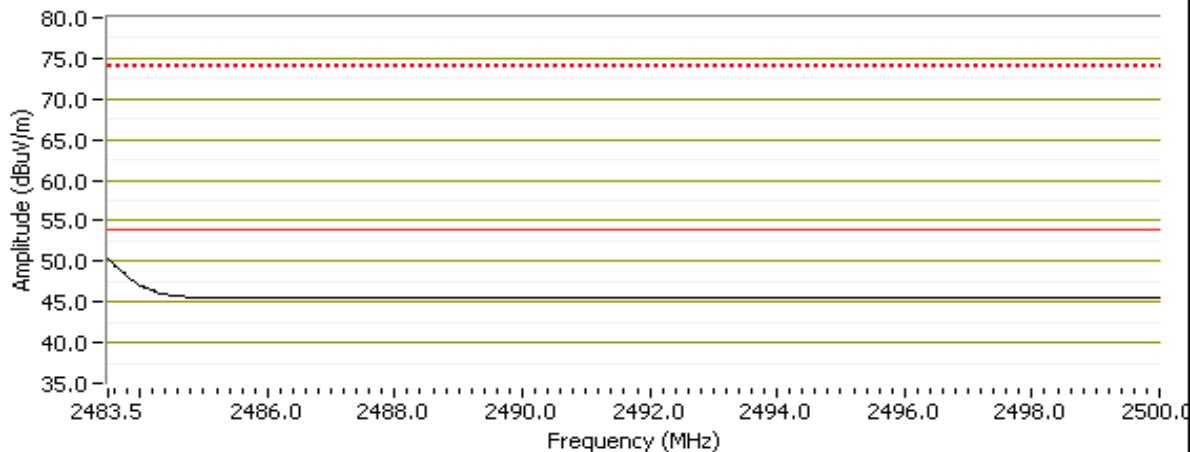
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4960.070	48.0	H	54.0	-6.0	AVG	211	1.0	RB 1 MHz; VB: 10 Hz
4960.040	44.0	V	54.0	-10.0	AVG	220	1.1	RB 1 MHz; VB: 10 Hz
7430.650	37.0	V	54.0	-17.0	AVG	26	1.0	RB 1 MHz; VB: 10 Hz
7434.230	37.0	H	54.0	-17.0	AVG	0	1.0	RB 1 MHz; VB: 10 Hz
4960.070	51.1	H	74.0	-22.9	PK	211	1.0	RB 1 MHz; VB: 1 MHz
4960.110	48.3	V	74.0	-25.7	PK	220	1.1	RB 1 MHz; VB: 1 MHz
7439.270	48.0	H	74.0	-26.0	PK	0	1.0	RB 1 MHz; VB: 1 MHz
7438.850	47.9	V	74.0	-26.1	PK	26	1.0	RB 1 MHz; VB: 1 MHz

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RB 1 MHz; VB 1 MHzBE @ 2483.5 MHz, Peak-H

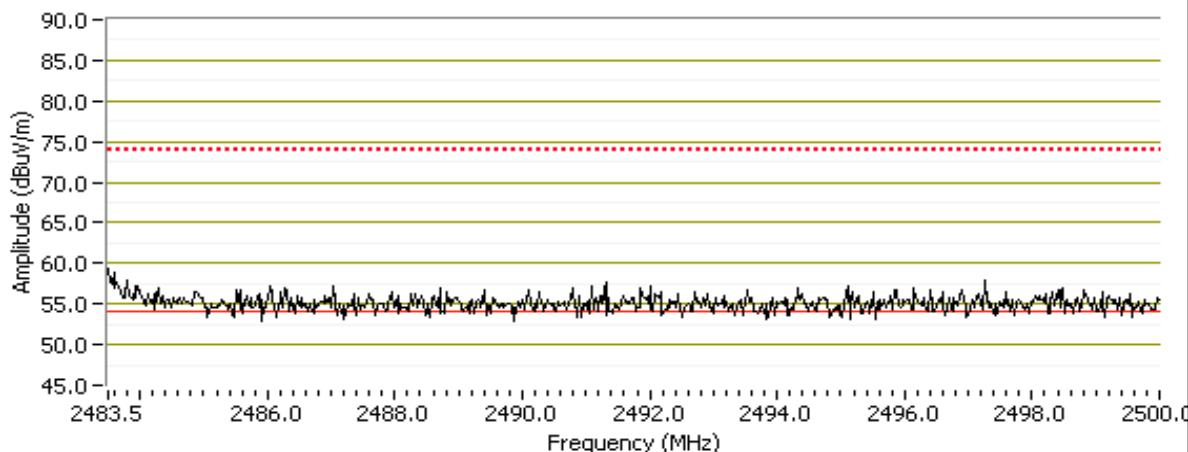


RB 1 MHz; VB 10 HzBE @ 2483.5 MHz, Avg-H

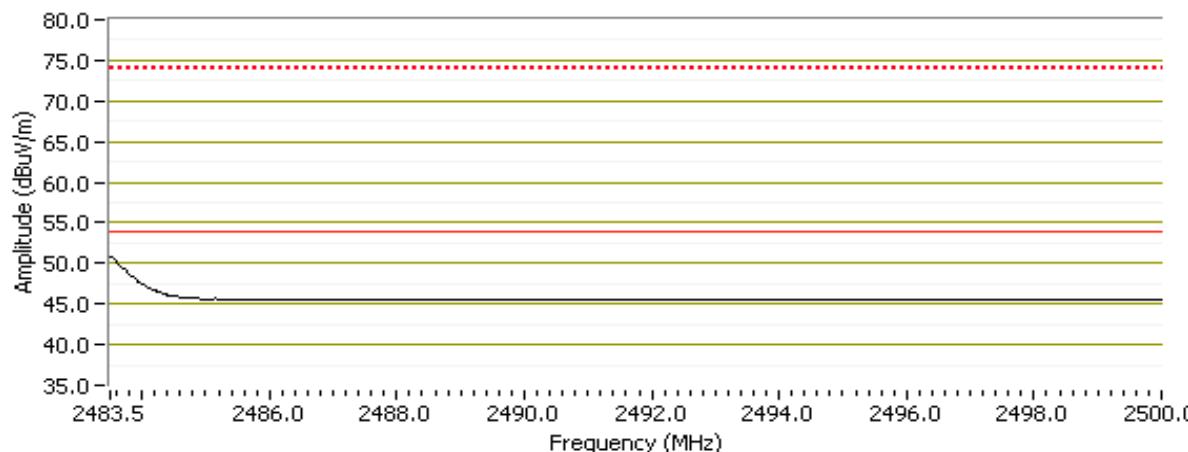


Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RB 1 MHz; VB 1 MHzBE @ 2483.5 MHz, Peak-V



RB 1 MHz; VB 10 HzBE @ 2483.5 MHz, Avg-V



Client:	Adura Technologies			Job Number:	J73243	
Model:	Light Controller			T-Log Number:	T74691	
Contact:	Josh Mooney			Account Manager:	Deepa Shetty	
Standard:	FCC Part 15.247			Class:	N/A	

Run #1c: High Channel 26 @ 2480 MHz, Internal Antenna, EUT in Side Orientation
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

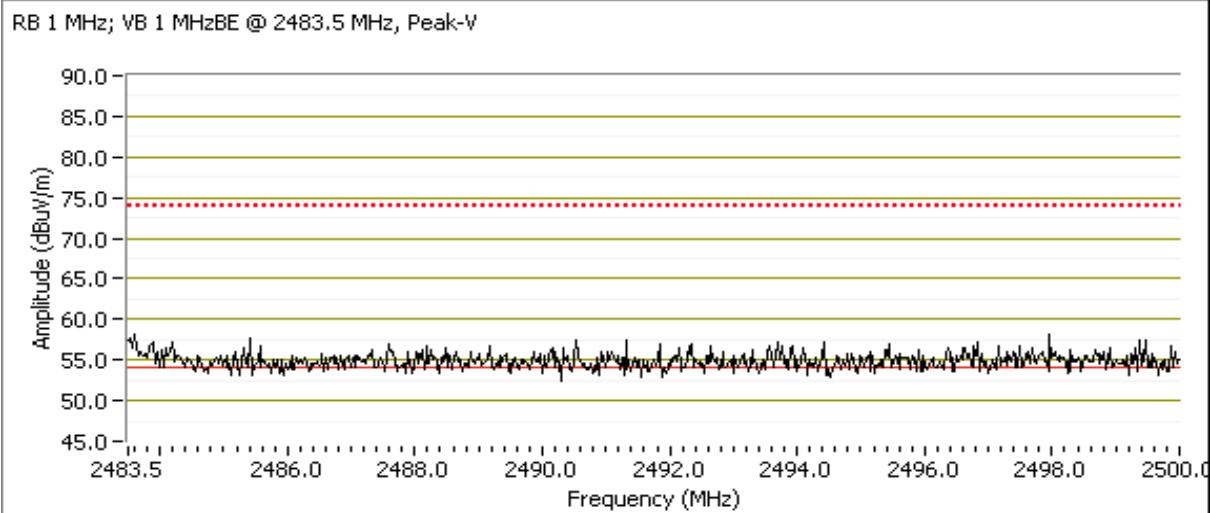
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.070	81.4	V	-	-	AVG	126	1.2	RB 1 MHz; VB: 10 Hz
2479.630	83.4	V	-	-	PK	126	1.2	RB 1 MHz; VB: 1 MHz
2479.700	78.6	V	-	-	PK	126	1.2	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	78.6 dB μ V/m
Limit for emissions outside of restricted bands:	48.6 dB μ V/m

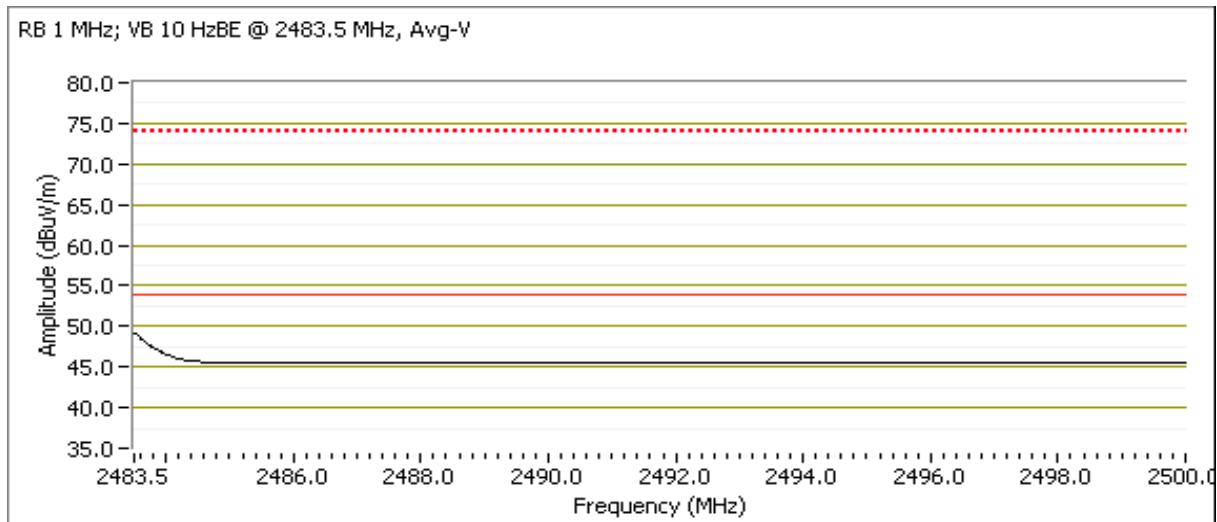
Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	50.3	V	54.0	-3.7	AVG	126	1.2	RB 1 MHz; VB: 10 Hz
2489.270	58.8	V	74.0	-15.2	PK	126	1.2	RB 1 MHz; VB: 1 MHz



Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A





EMC Test Data

Client:	Adura Technologies				Job Number:	J73243	
Model:	Light Controller				T-Log Number:	T74691	
Contact:	Josh Mooney				Account Manager:	Deepa Shetty	
Standard:	FCC Part 15.247				Class:	N/A	

Run #2a: High Channel 26 @ 2480 MHz, External Omni Antenna, EUT in Flat Orientation

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.090	86.6	V	-	-	AVG	75	1.1	RB 1 MHz; VB: 10 Hz
2480.560	88.9	V	-	-	PK	75	1.1	RB 1 MHz; VB: 1 MHz
2480.110	75.6	H	-	-	AVG	279	2.3	RB 1 MHz; VB: 10 Hz
2480.640	78.5	H	-	-	PK	279	2.3	RB 1 MHz; VB: 1 MHz
2480.200	73.0	H	-	-	PK	279	2.3	RB 100 kHz; VB: 100 kHz
2480.020	84.0	V	-	-	PK	330	1.0	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW: 84 dB μ V/m

Limit for emissions outside of restricted bands: 54 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	53.7	V	54.0	-0.3	AVG	330	1.0	RB 1 MHz; VB: 10 Hz
2483.500	48.3	H	54.0	-5.7	AVG	279	2.3	RB 1 MHz; VB: 10 Hz
2483.610	60.9	V	74.0	-13.1	PK	330	1.0	RB 1 MHz; VB: 1 MHz
2496.180	58.3	H	74.0	-15.7	PK	279	2.3	RB 1 MHz; VB: 1 MHz

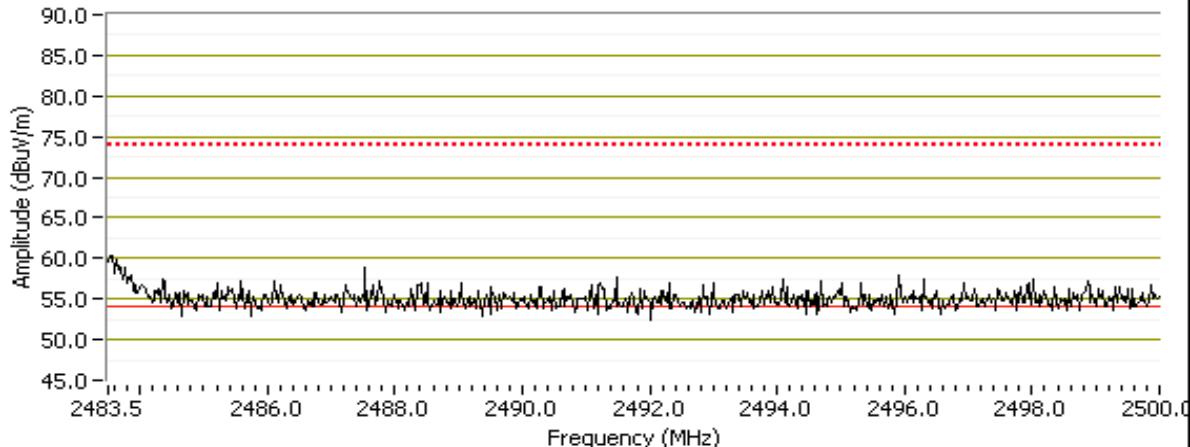
High Channel 26 @ 2480 MHz, External Omni Antenna, EUT in all 3 Orientation

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

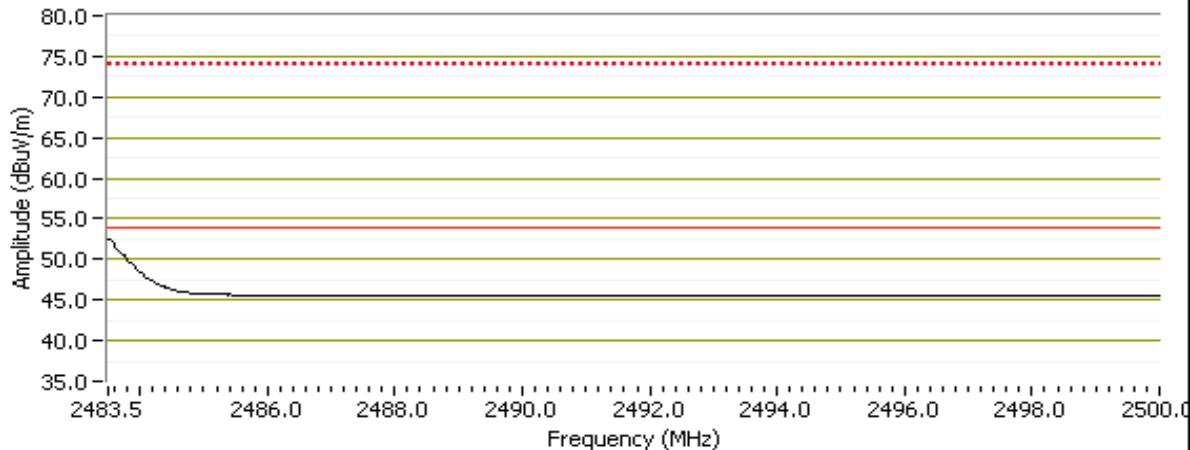
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.090	86.6	V	-	-	AVG	75	1.1	RB 1 MHz; VB: 10 Hz Flat
2480.560	88.9	V	-	-	PK	75	1.1	RB 1 MHz; VB: 1 MHz Flat
2480.120	76.0	H	-	-	AVG	111	1.4	RB 1 MHz; VB: 10 Hz Up Right
2480.600	78.6	H	-	-	PK	111	1.4	RB 1 MHz; VB: 1 MHz Up Right
2480.110	86.3	V	-	-	AVG	330	1.0	RB 1 MHz; VB: 10 Hz Up Right
2479.690	88.5	V	-	-	PK	330	1.0	RB 1 MHz; VB: 1 MHz Up Right
2480.110	85.3	V	-	-	AVG	219	1.1	RB 1 MHz; VB: 10 Hz On Side
2479.560	87.4	V	-	-	PK	219	1.1	RB 1 MHz; VB: 1 MHz On Side

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RB 1 MHz; VB 1 MHzBE @ 2483.5 MHz, Peak - V

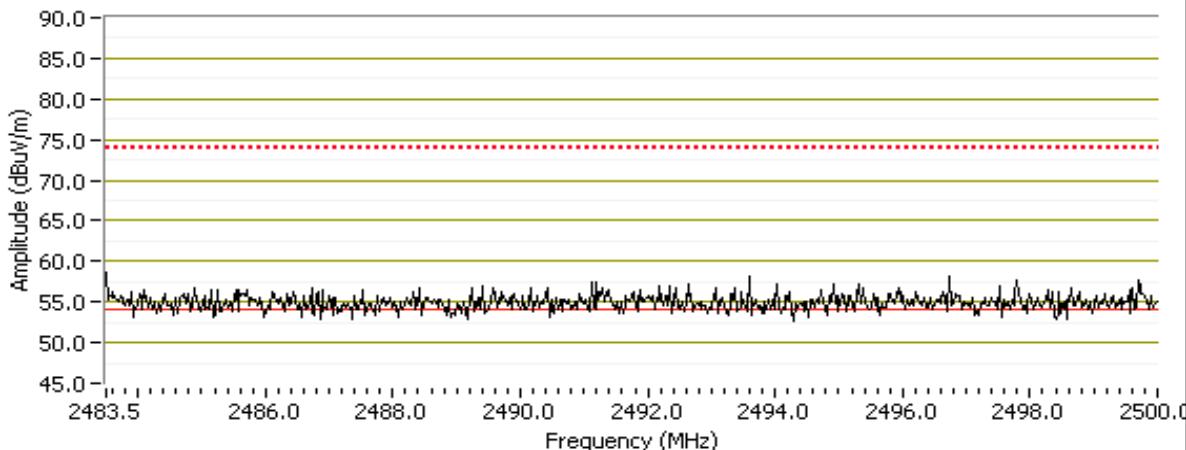


RB 1 MHz; VB 10 HzBE @ 2483.5 MHz, Avg - V

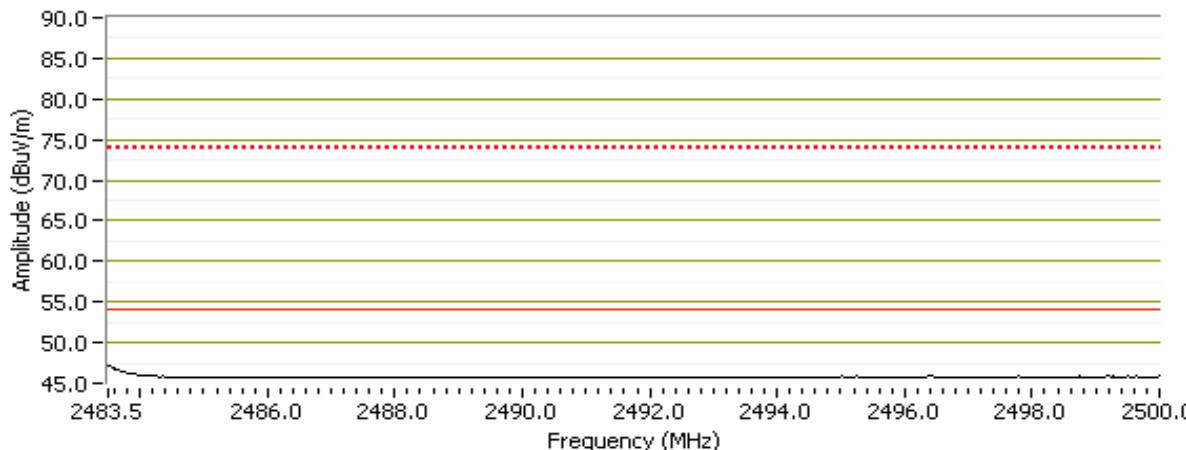


Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RB 1 MHz; VB 1 MHzBE @ 2483.5 MHz, Peak-H



RB 1 MHz; VB 10 HzBE @ 2483.5 MHz, Avg-H


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	
4960.070	41.2	V	54.0	-12.8	AVG	190	1.9	RB 1 MHz; VB: 10 Hz
4960.000	36.3	H	54.0	-17.7	AVG	266	1.8	RB 1 MHz; VB: 10 Hz
4959.830	46.4	V	74.0	-27.6	PK	190	1.9	RB 1 MHz; VB: 1 MHz
4960.120	44.9	H	74.0	-29.1	PK	266	1.8	RB 1 MHz; VB: 1 MHz



EMC Test Data

Client:	Adura Technologies			Job Number:	J73243	
Model:	Light Controller			T-Log Number:	T74691	
Contact:	Josh Mooney			Account Manager:	Deepa Shetty	
Standard:	FCC Part 15.247			Class:	N/A	

Run #3a: High Channel 26 @ 2480 MHz, External Dome Antenna, EUT in Up Right Orientation

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.090	86.2	V	-	-	AVG	144	1.2	RB 1 MHz; VB: 10 Hz
2479.590	88.7	V	-	-	PK	144	1.2	RB 1 MHz; VB: 1 MHz
2480.070	80.6	H	-	-	AVG	207	2.2	RB 1 MHz; VB: 10 Hz
2479.610	83.3	H	-	-	PK	207	2.2	RB 1 MHz; VB: 1 MHz
2480.340	69.5	H	-	-	PK	207	1.2	RB 100 kHz; VB: 100 kHz
2479.810	80.1	V	-	-	PK	144	1.2	RB 100 kHz; VB: 100 kHz

Fundamental emission level @ 3m in 100kHz RBW:	80.1 dB μ V/m
Limit for emissions outside of restricted bands:	50.1 dB μ V/m

Limit is -30dBc (UNII power measurement)

Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	53.2	V	54.0	-0.8	AVG	144	1.2	RB 1 MHz; VB: 10 Hz
2483.500	47.2	H	54.0	-6.8	AVG	207	1.2	RB 1 MHz; VB: 10 Hz
2483.530	59.5	V	74.0	-14.5	PK	144	1.2	RB 1 MHz; VB: 1 MHz
2490.430	58.3	H	74.0	-15.7	PK	207	1.2	RB 1 MHz; VB: 1 MHz

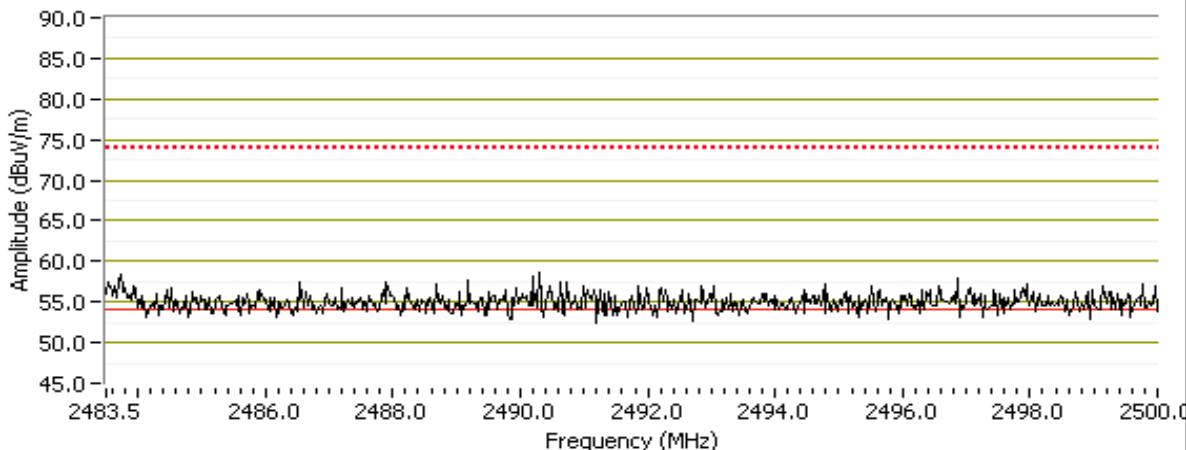
High Channel 26 @ 2480 MHz, External Dome Antenna, EUT in all 3 Orientation

Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

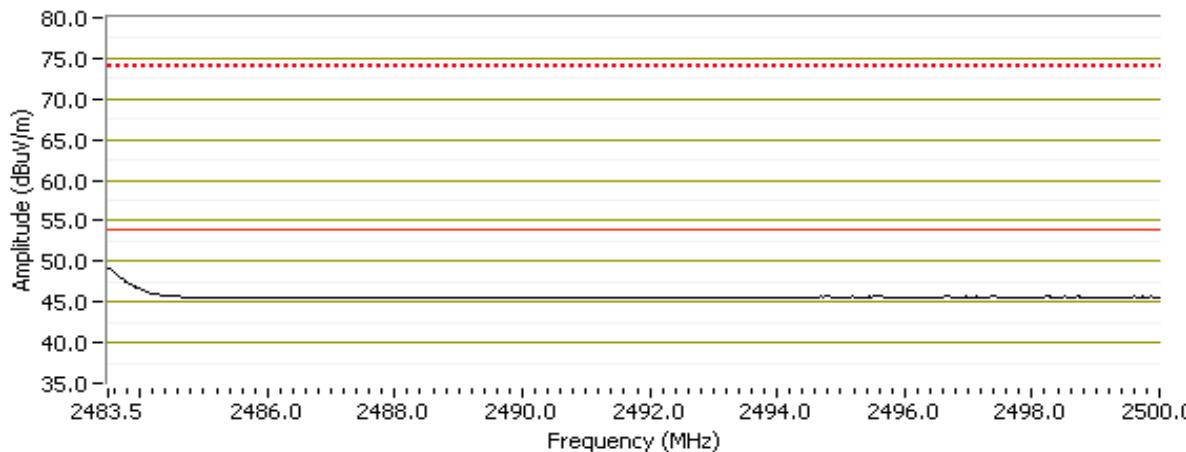
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.090	86.5	V	-	-	AVG	210	1.0	RB 1 MHz; VB: 10 Hz Up Right
2479.670	88.8	V	-	-	PK	210	1.0	RB 1 MHz; VB: 1 MHz Up Right
2480.090	85.4	V	-	-	AVG	219	1.3	RB 1 MHz; VB: 10 Hz Side
2479.630	87.9	V	-	-	PK	219	1.3	RB 1 MHz; VB: 1 MHz Side
2480.090	83.6	V	-	-	AVG	277	1.0	RB 1 MHz; VB: 10 Hz Flat
2479.630	85.9	V	-	-	PK	277	1.0	RB 1 MHz; VB: 1 MHz Flat

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RB 1 MHz; VB 1 MHzBE @ 2483.5 MHz, Peak-V

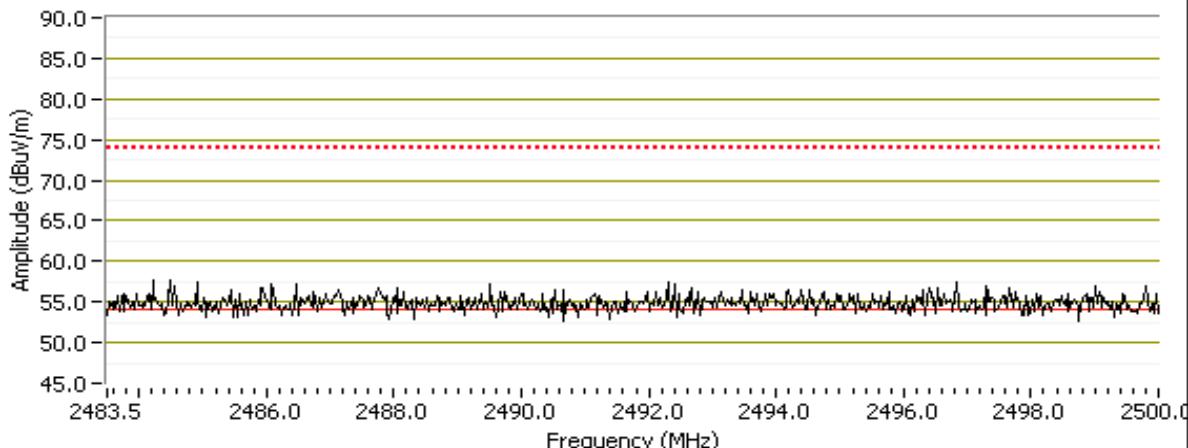


RB 1 MHz; VB 10 HzBE @ 2483.5 MHz, Avg-V

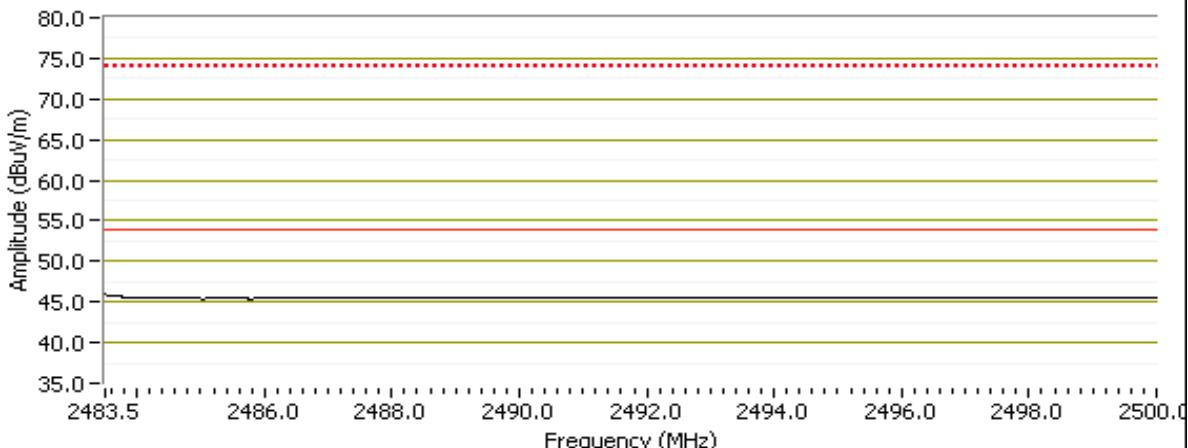


Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RB 1 MHz; VB 1 MHzBE @ 2483.5 MHz, Peak-H



RB 1 MHz; VB 10 HzBE @ 2483.5 MHz, Avg-H


Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4960.040	45.8	H	54.0	-8.2	AVG	203	1.0	MHz; VB: 10 Hz
4960.090	41.5	V	54.0	-12.5	AVG	149	1.0	MHz; VB: 10 Hz
4960.060	49.6	H	74.0	-24.4	PK	203	1.0	MHz; VB: 1 MHz
4960.270	46.3	V	74.0	-27.7	PK	149	1.0	MHz; VB: 1 MHz



EMC Test Data

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements Power, PSD, Bandwidth and 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: 3/11/2009

Config. Used: 1

Test Engineer: Suhaila Khushzad

Config Change: None

Test Location: SVOATS #2

EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was connected to the spectrum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:

Temperature: 12 °C

Rel. Humidity: 60 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	16	-	Output Power	15.247(b)	Pass	11.8 dBm
2	16	-	Power spectral Density (PSD)	15.247(d)	Pass	-2.33 dBm/3kHz
3	16	-	Minimum 6dB Bandwidth	15.247(a)	Pass	1.58 MHz
3	16	-	99% Bandwidth	RSS GEN	-	4.1 MHz
4	16	-	Spurious emissions	15.247(b)	Pass	All emissions below the -30dBc limit

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

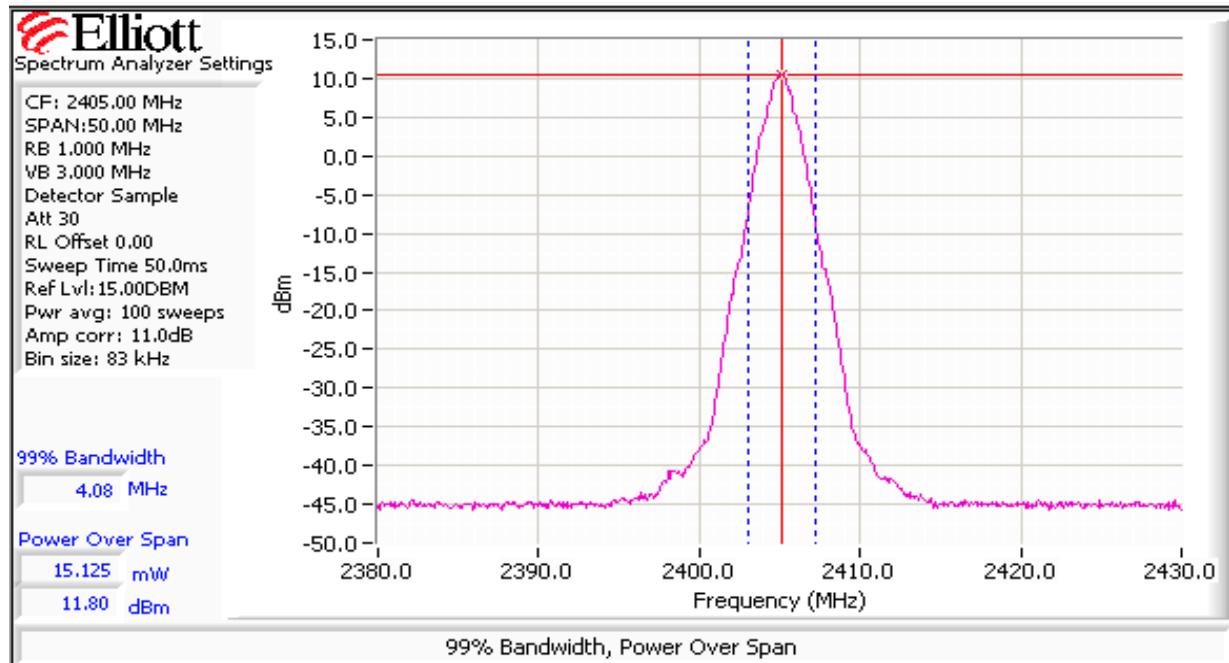
No deviations were made from the requirements of the standard.

Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

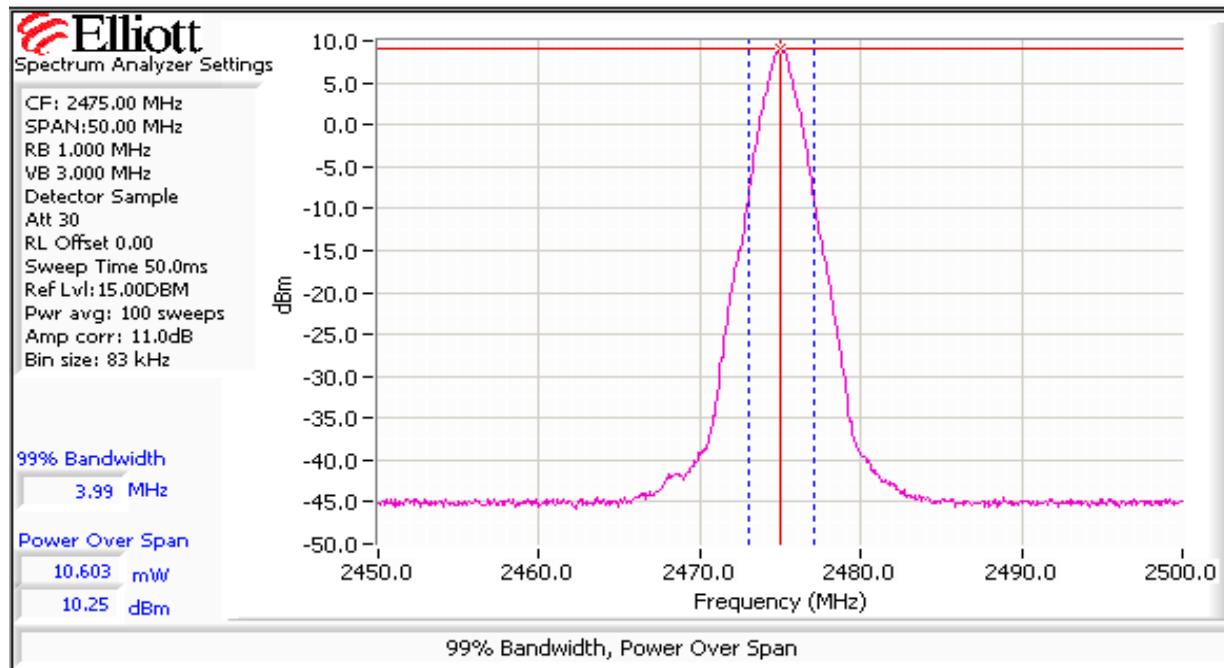
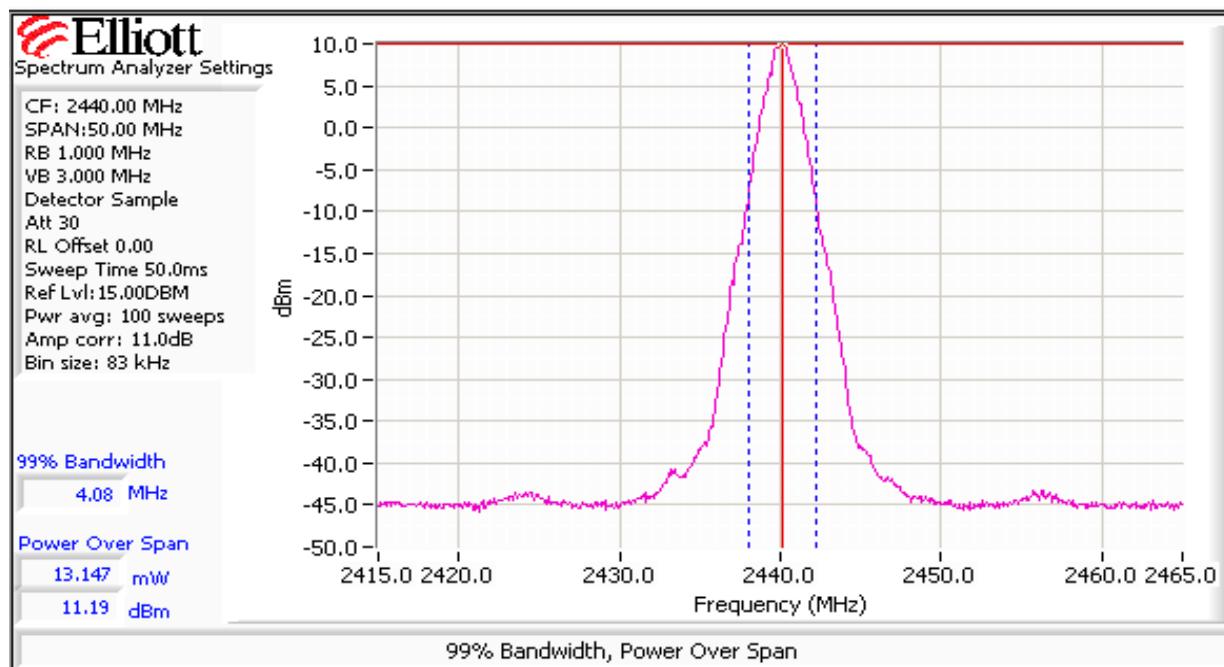
Run #1: Output Power

Power Setting ²	Frequency (MHz)	Output Power		Antenna Gain (dBi)	Result	EIRP Note 2		Output Power	
		(dBm) ¹	mW			dBm	W	(dBm) ³	mW
16	2405	11.8	15.1	2.0	Pass	13.8	0.024		
16	2440	11.2	13.2	2.0	Pass	13.2	0.021		
16	2475	10.3	10.6	2.0	Pass	12.3	0.017		
16	2480	-10.6	0.1	2.0	Pass	-8.6	0.000		

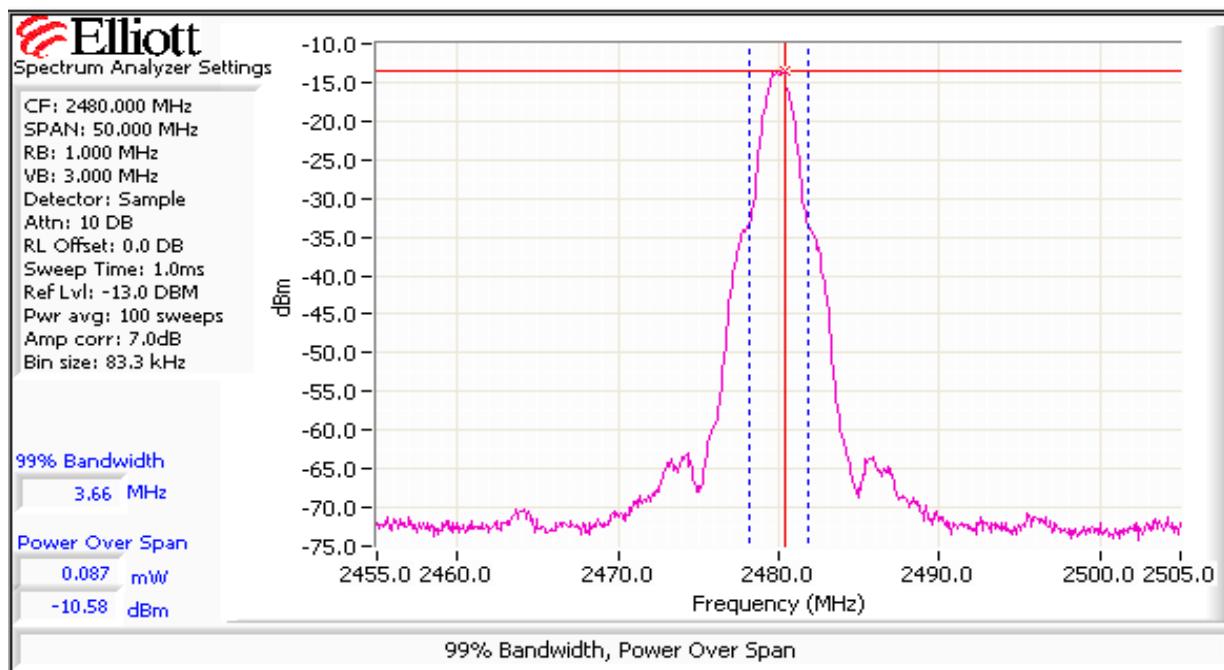
Note 1: Output power measured using a spectrum analyzer (see plots below):
 Note 2: RBW=1MHz, VB=3 MHz, sample detector, power averaging on (transmitted signal was continuous) and power integration over 50 MHz. **Spurious limit is -30dBc because this method was used.**
 Note 2: Power setting - the software power setting used during testing, included for reference only.



Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A



Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

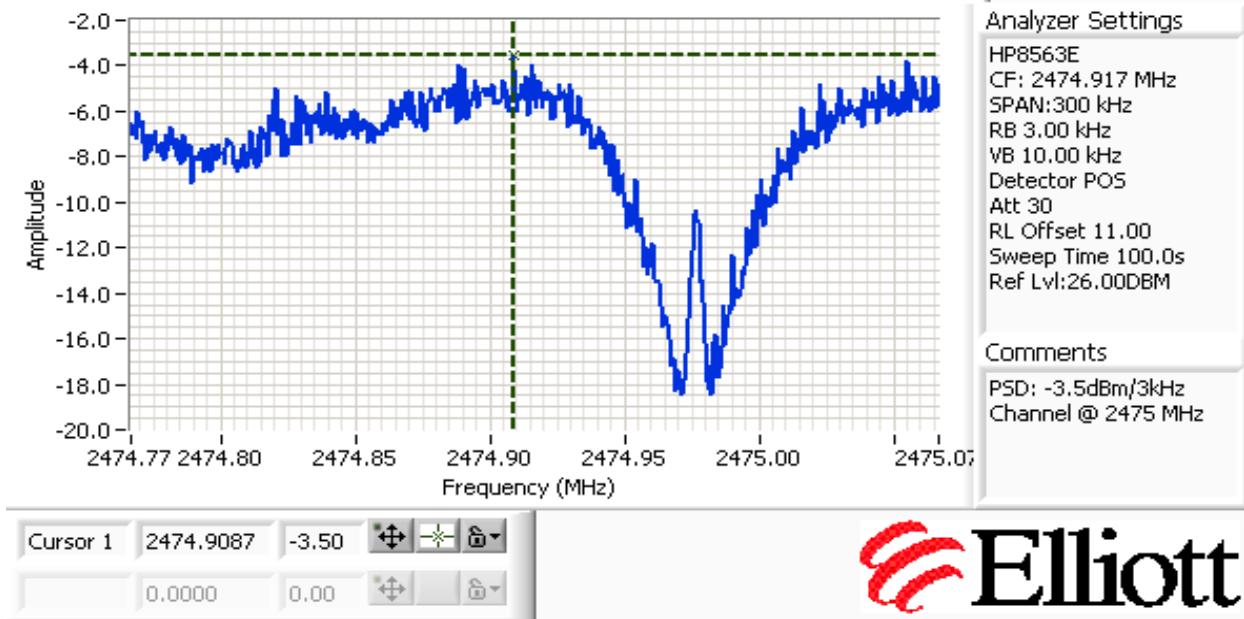


Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
		Account Manager:	Deepa Shetty
Contact:	Josh Mooney		
Standard:	FCC Part 15.247	Class:	N/A

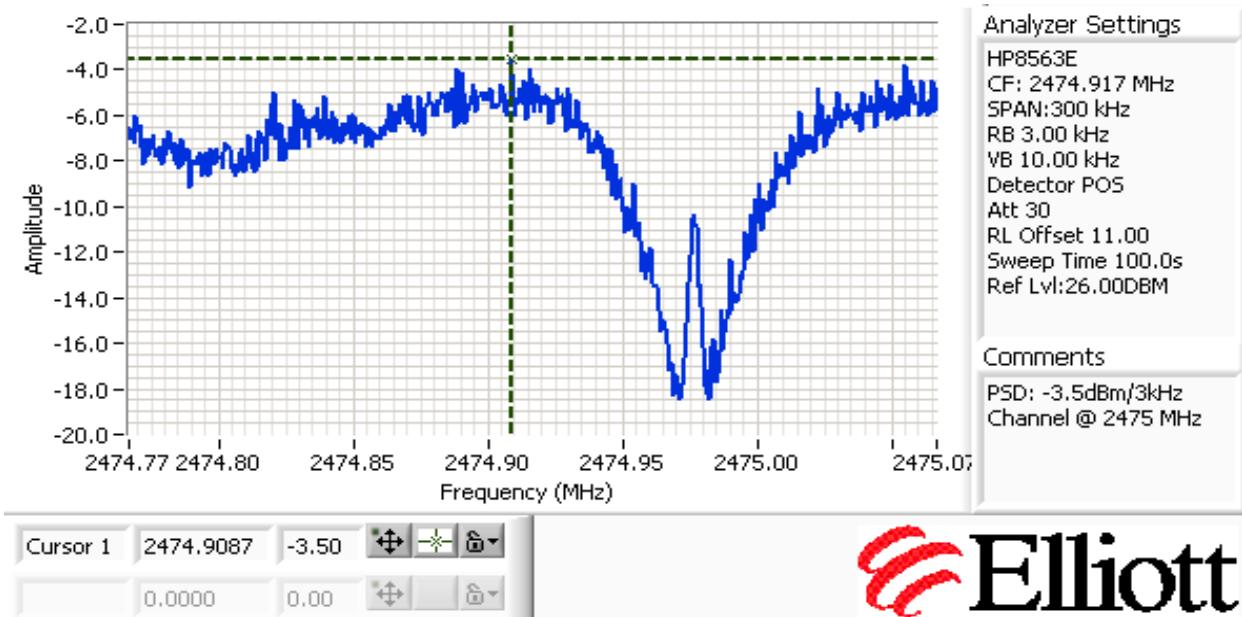
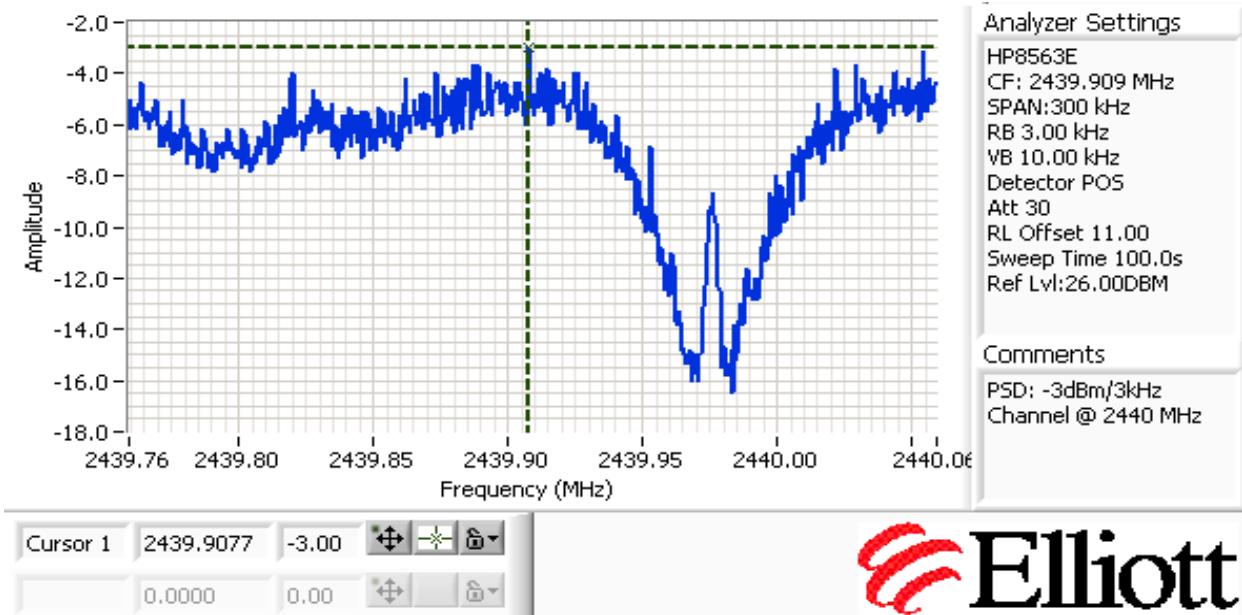
Run #2: Power spectral Density

Power Setting	Frequency (MHz)	PSD	Limit dBm/3kHz	Result
		(dBm/3kHz) <small>Note 1</small>		
16	2405	-2.3	8.0	Pass
16	2440	-3.0	8.0	Pass
16	2475	-3.5	8.0	Pass
0	2480	-26.0	8.0	Pass

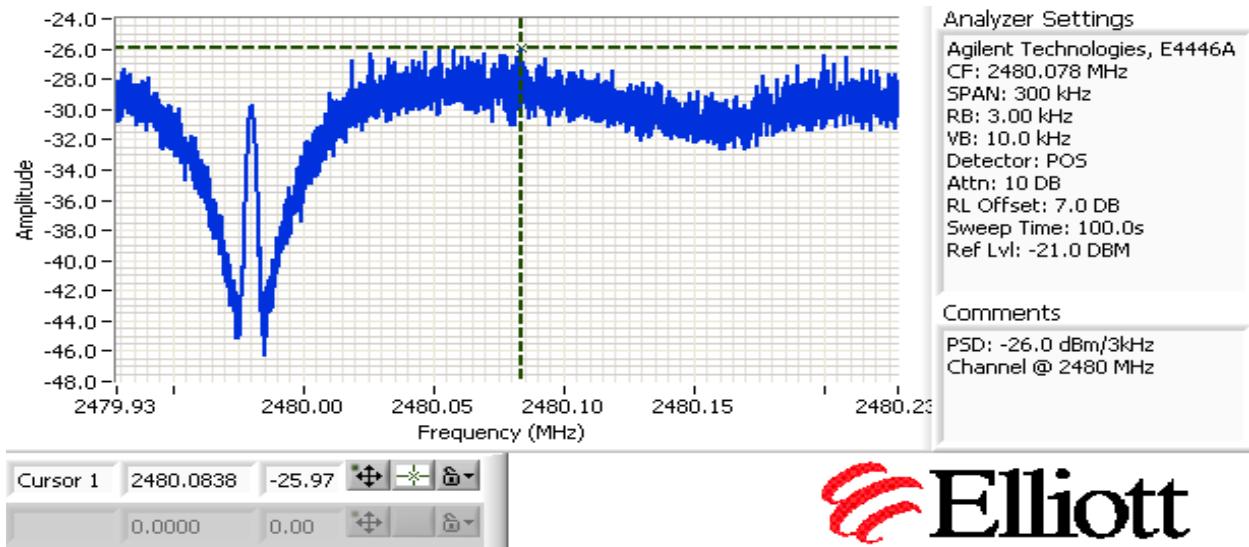
Note 1: Power spectral density measured using RB=3 kHz, VB=10kHz, analyzer with peak detector and with a sweep time set to ensure a dwell time of at least 1 second per 3kHz. The measurement is made at the frequency of PPSD determined from preliminary scans using RB=3kHz using multiple sweeps at a faster rate over the 6dB bandwidth of the signal.



Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A



Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A



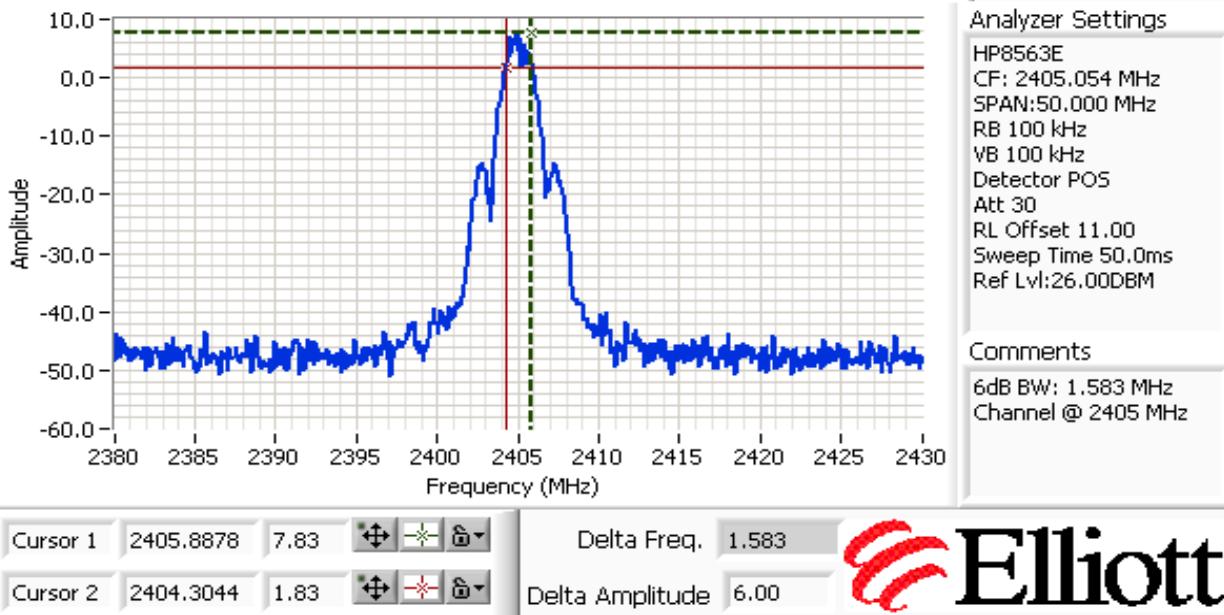
Elliott

Client:	Adura Technologies	Job Number:	J73243
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Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A

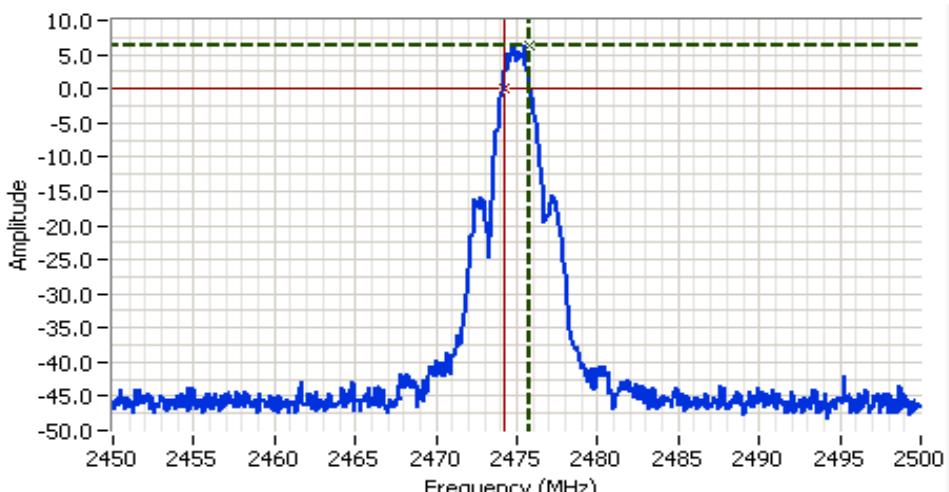
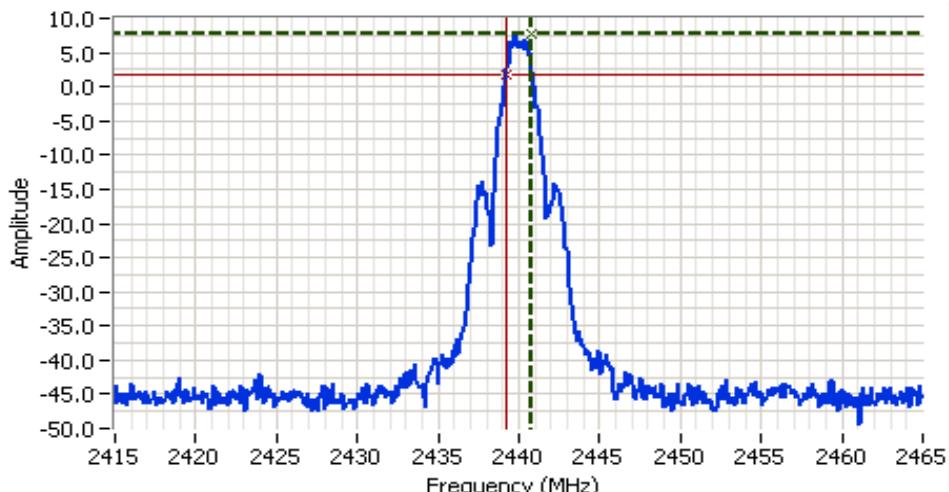
Run #3: Signal Bandwidth

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz)	
			6dB	99%
16	2405	100kHz	1.58	4.1
16	2440	100kHz	1.58	4.1
16	2475	100kHz	1.58	4.0
0	2480	100kHz	1.25	3.7

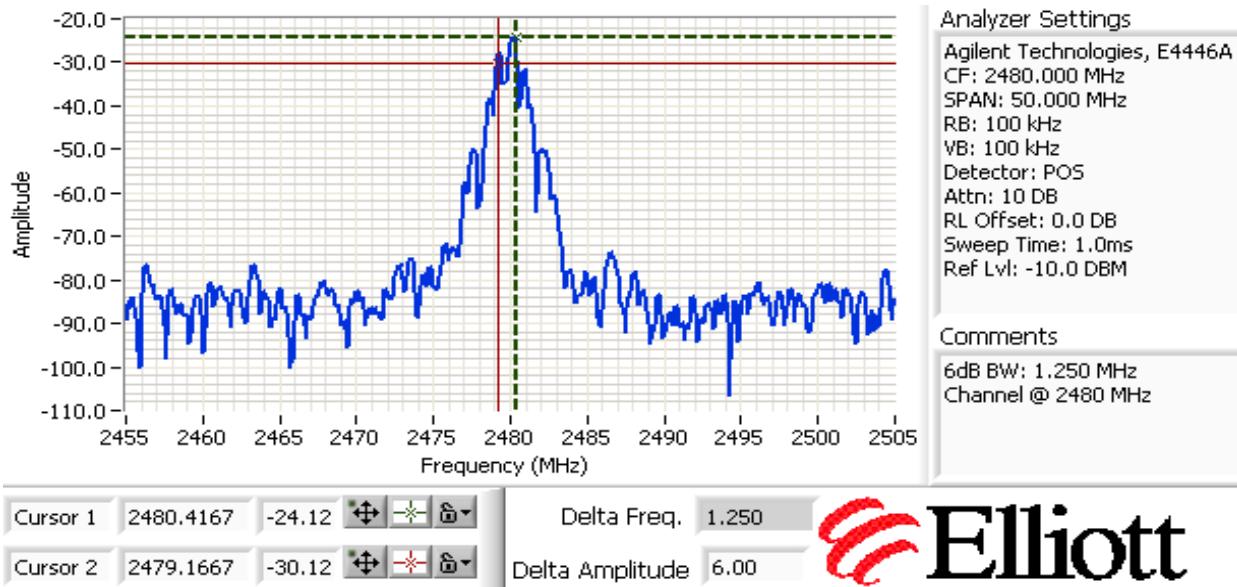
Note 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB



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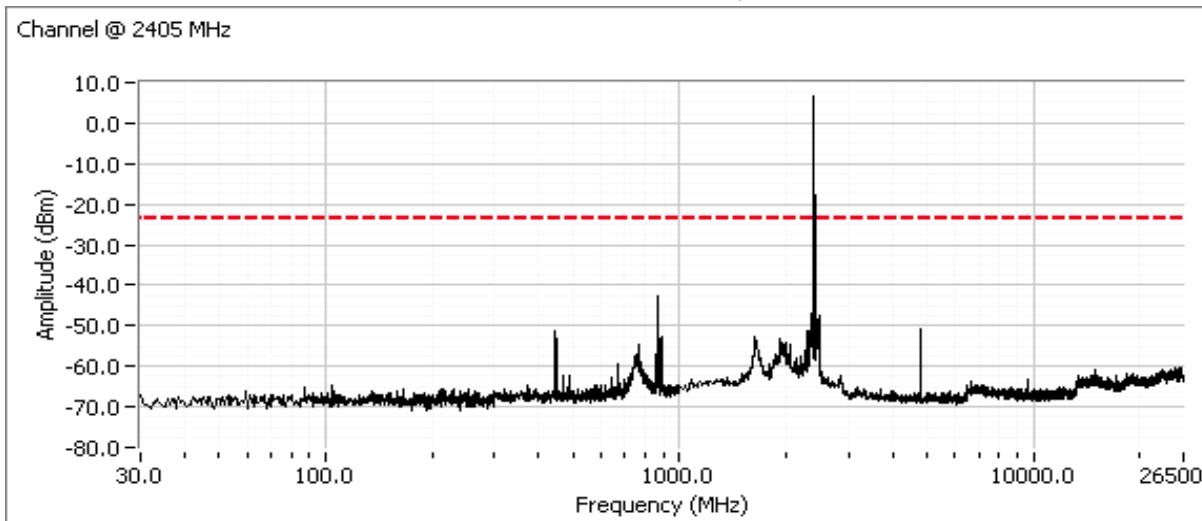
Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
Contact:	Josh Mooney	Account Manager:	Deepa Shetty
Standard:	FCC Part 15.247	Class:	N/A



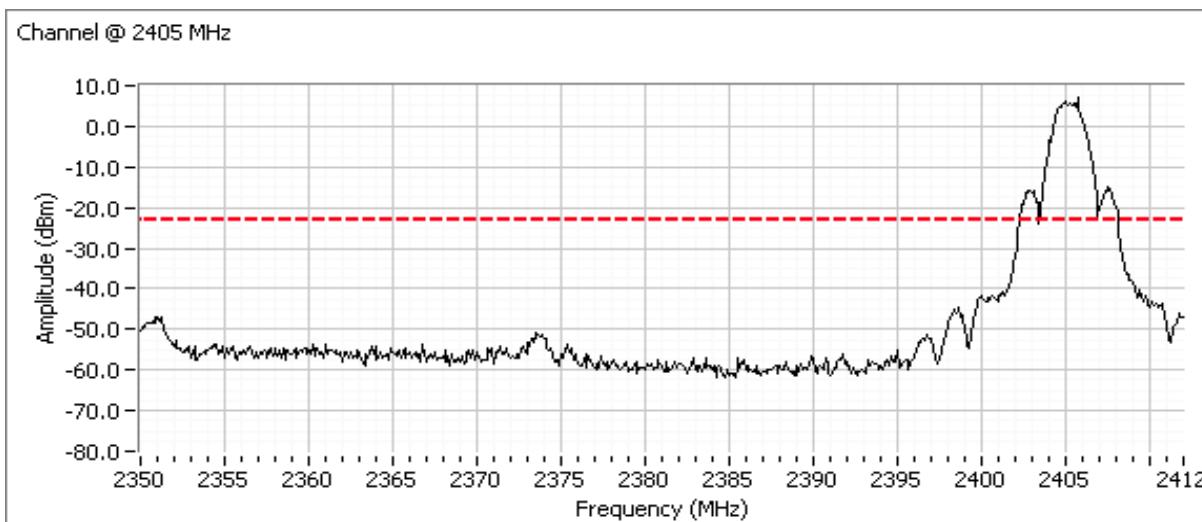
Client:	Adura Technologies	Job Number:	J73243
Model:	Light Controller	T-Log Number:	T74691
		Account Manager:	Deepa Shetty
Contact:	Josh Mooney		
Standard:	FCC Part 15.247	Class:	N/A

Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Limit	Result
2405	-30dBc	Pass
2440	-30dBc	Pass
2475	-30dBc	Pass
2480	-30dBc	Pass

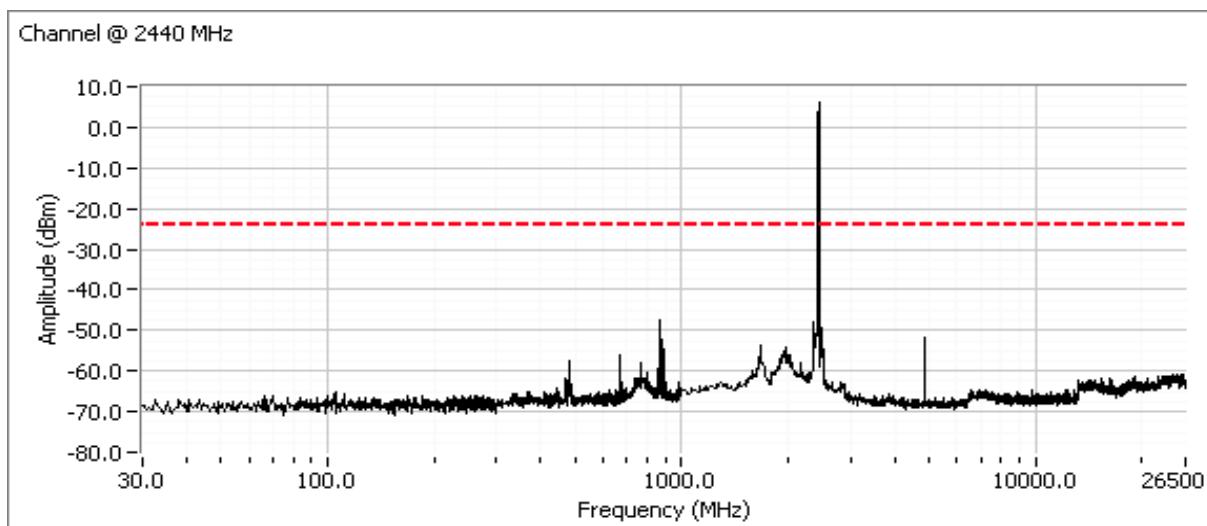
Plots for low channel, power setting(s) = 16


Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.

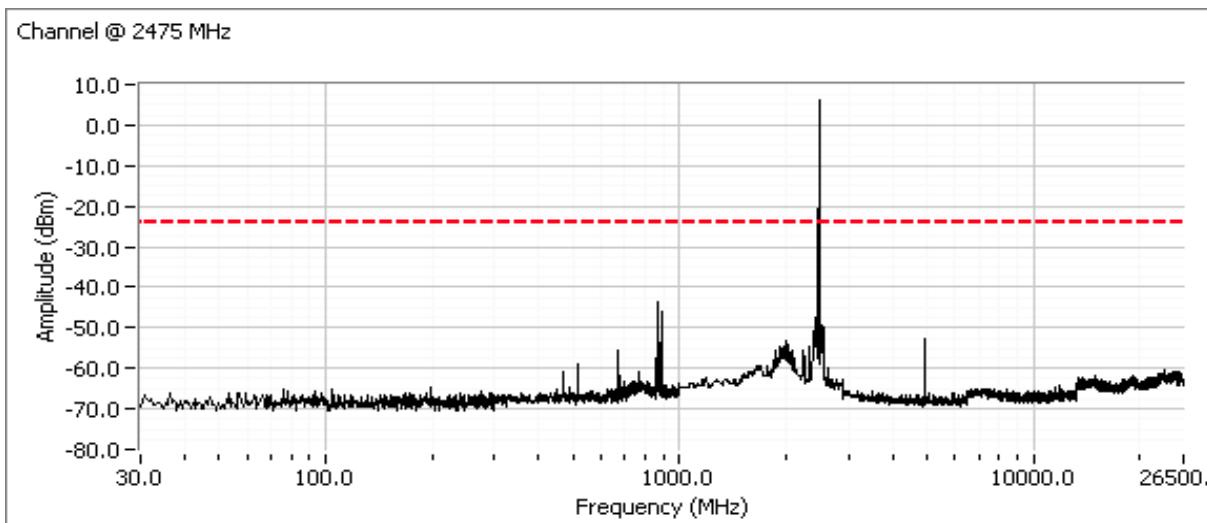


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Plots for center channel, power setting(s) = 16



Plots for high (2475 MHz) channel, power setting(s) = 16



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Standard:	FCC Part 15.247	Class:	N/A

Plots for high (2480 MHz) channel, power setting(s) = 0

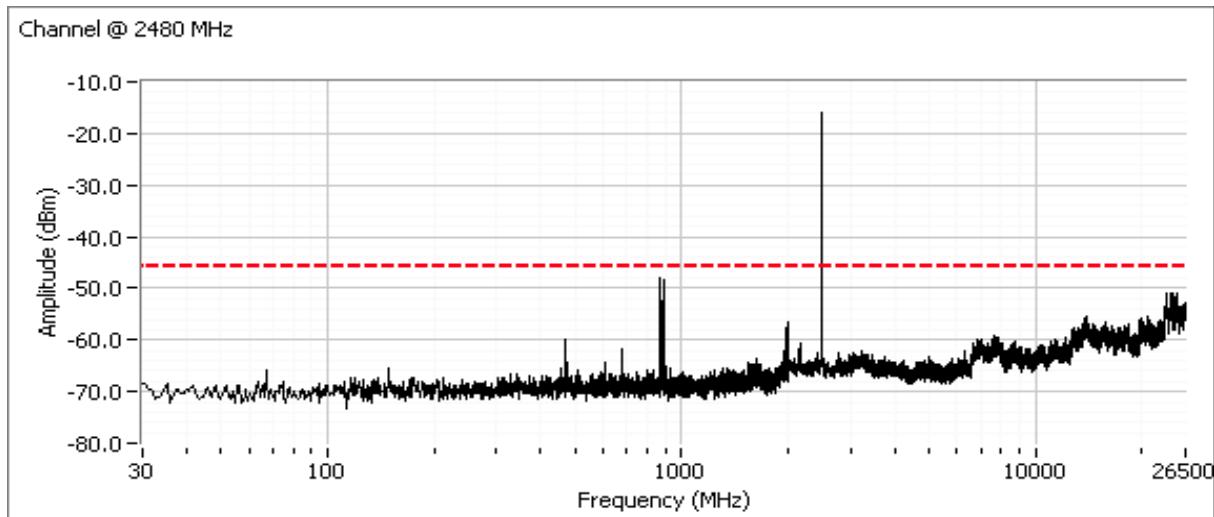


EXHIBIT 3: Photographs of Test Configurations

Uploaded as a separate exhibit.

EXHIBIT 4: Proposed FCC ID Label & Label Location

Uploaded as a separate exhibit.

*EXHIBIT 5: Detailed Photographs
of Adura Technologies Model Light Controller Construction*

Uploaded as a separate exhibit.

*EXHIBIT 6: Operator's Manual
for Adura Technologies Model Light Controller*

Uploaded as a separate exhibit.

*EXHIBIT 7: Block Diagram
of Adura Technologies Model Light Controller*

Uploaded as a separate exhibit.

*EXHIBIT 8: Schematic Diagrams
for Adura Technologies Model Light Controller*

Uploaded as a separate exhibit.

*EXHIBIT 9: Theory of Operation
for Adura Technologies Model Light Controller*

Uploaded as a separate exhibit.

EXHIBIT 10: RF Exposure Information

Uploaded as a separate exhibit.