EMC Test Report

Application for Grant of Equipment Authorization

FCC Part 15 Subpart C
(Modified for India's Allocation of 5825 - 5875 MHz

Model: AirGridM5 Hi-Power

MANUFACTURER:	Ubiquiti Networks 91 E. Tasman Drive San Jose, CA 95134
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-4
REPORT DATE:	March 10, 2011
FINAL TEST DATES:	March 2 and 3, 2011

AUTHORIZED SIGNATORY:

Mark Briggs
Staff Engineer
Elliott Laboratories

Testing Cert #2016.01

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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	03-10-2011	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Ubiquiti Networks model AirGridM5 Hi-Power, pursuant to FCC Part 15 Subpart C (modified to account for the Indian allocation of 5825 - 5875 MHz).

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

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.

OBJECTIVE

The primary objective of the manufacturer is compliance with the regulations outlined in the previous section, modified to account for the Indian allocation of 5825 - 5875 MHz.

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 Ubiquiti Networks model AirGridM5 Hi-Power complied with the requirements of FCC Part 15 Subpart C with respect to measurements at the rf port of the device under test and with the allocated frequency band modified to match the Indian allocation of 5825 - 5875 MHz.

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Ubiquiti Networks model AirGridM5 Hi-Power and therefore apply only to the tested sample. The sample was selected and prepared by Jennifer Sanchez of Ubiquiti Networks.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report other than the allocated frequency band was modified to match the allocation in India.

TEST RESULTS SUMMARY

DIGITAL TRANSMISSION SYSTEMS (5725 –5850 MHz)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 210 A8.2	Digital Modulation	Systems uses OFDM / techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	> 16.6 MHz	>500kHz	Complies
15.247 (b)	RSS 210 A8.2 (4)	Output Power (antenna port) Note 1	**HT40** 12.75dBm / 7.64dBm **HT20** 12.91dBm / 7.98dBm **Legacy** 12.97dBm / 7.95dBm	1Watt (30dBm) EIRP limited to 4 Watts.	Complies
15.247 (b)	RSS 210 A8.2 (4)	Output Power (eirp) Note 2	**HT40** 35.8 dBm (3.758W) **HT20** 36.0 dBm (4.0 W) **Legacy** 36.0 dBm (4.0 W)		Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	-17.3 dBm / 3kHz	Maximum permitted is 8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions – 30MHz – 40 GHz	All spurious emissions < -20dBc	< -30dBc Note 3	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 40 GHz Note 4	52.9dBµV/m @ 5405.6MHz (-1.1dB)	15.207 in restricted bands, all others <-30dBc Note 3	Complies

Note 1: Two output power levels were evaluated, the lower power level is used when the system employs an antenna with 28dBi gain, the higher power setting when the antenna gain is 23dBi or less.
Note 2: EIRP calculated is the worst case for both low power/high gain antenna configuration and high power/low gain configuration (see note 1).
Note 3: Limit of -30dBc used because the power was measured using the UNII test procedure (maximum power averaged over a transmission burst).
Note 4: Radiated emissions below 1GHz are covered by digital device measurements (CISPR 22 and/or FCC 15 Subpart B). No emissions from the radio circuitry were observed below 1GHz.
Note 5: The FCC's frequency allocation under 15.247 is 5725 to 5850 MHz. Testing in this report covers the Indian allocation of 5825 – 5875 MHz.

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 integrated into the device	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	Not evaluated in the scope of this report. Device is powered via Power over Ethernet and not from an AC source.		
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	Not applicable, device operates above 960MHz.		
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	0.79mW/cm^2 at 20cm separation Refer to MPE calculations in Appendix B. Power density	1mW/cm^2 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	Measurement Unit	Frequency Range	Expanded Uncertainty
RF power, conducted (power meter)	dBm	25 to 7000 MHz	± 0.52 dB
RF power, conducted (Spectrum analyzer)	dBm	25 to 7000 MHz	± 0.7 dB
Conducted emission of transmitter	dBm	25 to 26500 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 26500 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 26500 MHz	± 2.5 dB
Radiated emission (field strength)	dBµV/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dBµV	0.15 to 30 MHz	± 2.4 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Ubiquiti Networks model AirGridM5 Hi-Power is an Outdoor 5GHz CPE device. Since the EUT would be pole-mounted during operation, the EUT was mounted on a tripod (non-conductive) and placed at a height of 1m above the floor during radiated emissions testing. The electrical rating of the EUT is 24V/0.5A POE.

The sample was received on March 2, 2011 and tested on March 2 and 3, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Ubiquiti Networks	AirGridM5-HP	5GHz CPE		SWX-M5G

ANTENNA SYSTEM

The EUT antenna is a 28dBi grid antenna or 23dBi grid antenna. The antenna is integrated into the device.

ENCLOSURE

The AirGridM5-HP enclosure is primarily constructed of PC122 Plastic. It measures approximately 7 cm wide by 30 cm deep by 4.5 cm high.

During testing the AirGridM5-HP was attached to metal-wire antenna dish with dimensions approximately 46 cm wide by 15 cm deep by 62 cm high.

When the AirGridM5-HP is installed on the antenna dish, the dimensions of the assembly are approximately 46 cm wide by 31 cm deep by 62 cm high.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at Elliott.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Ubiquiti Networks	2009-8-13	Grid Antenna	-	-

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

Company	Model	Description	Serial Number	FCC ID
Dell	Vostro 3500	Laptop	F0YD5N1	None

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
1	EUT	CAT 5E	Shielded	3
2	EUT	CAT 5E	Shielded	3

EUT OPERATION

During emissions testing the EUT was in a continuous transmit mode, operating at the lowest data rate in 802.11a, HT20 or HT40 modes. For radiated spurious emissions tests the antenna connected was the higher gain (28dBi) grid antenna and the output power was set at, or above, the highest power setting. The data, therefore, covers the use of both the 28dBi grid antenna at the low power setting and the 23dBi antenna at the high power setting.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken 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	
Chamber 3	769238	2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	211948	2845B-4	

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. 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 16-1-1 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.

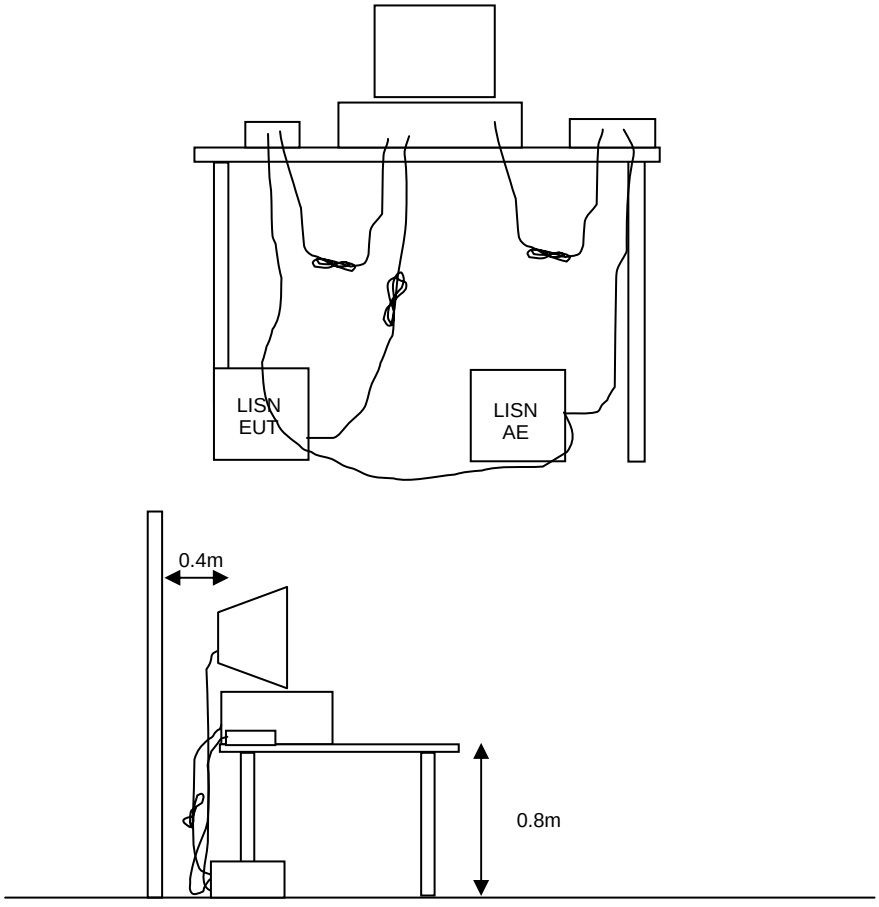
TEST PROCEDURES

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.



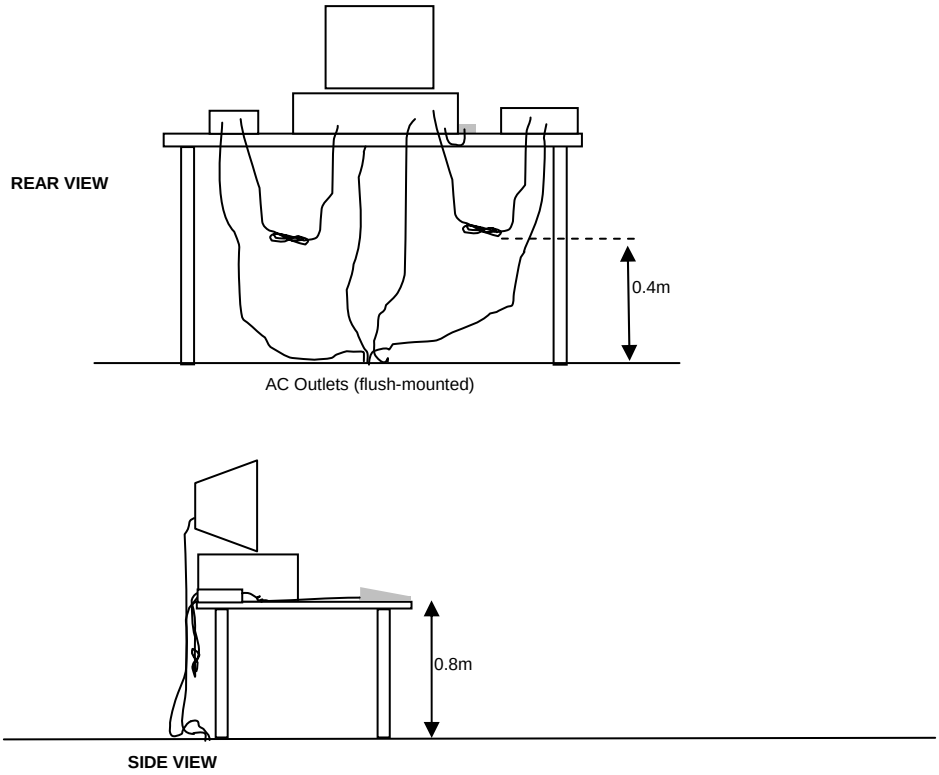
RADIATED EMISSIONS

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.

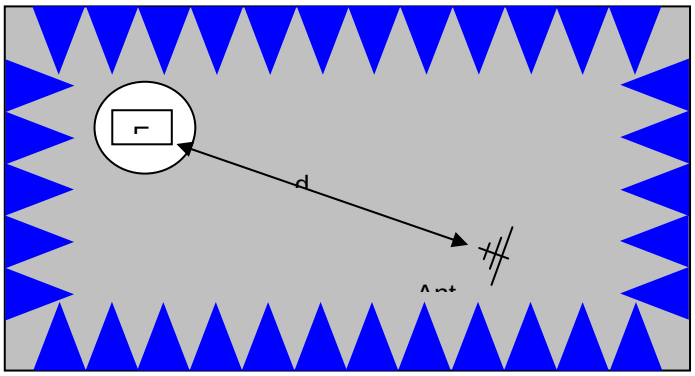
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

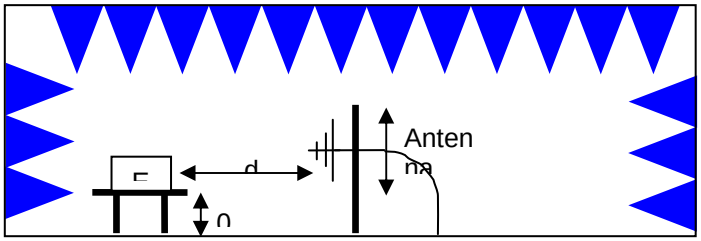
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements



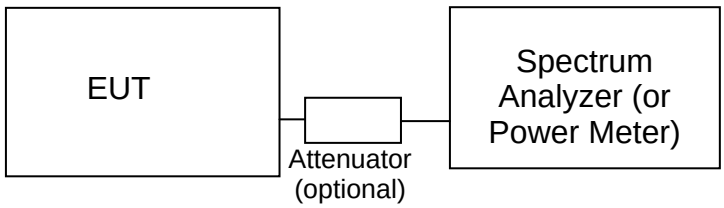
The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

CONDUCTED EMISSIONS FROM ANTENNA PORT

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



Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and Elliott's test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

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 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

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:

$$R_r - S = M$$

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 d (meters) from the equipment under test:

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

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.3dB.

Appendix A Test Equipment Calibration Data

Radio Antenna Port (Power and Spurious Emissions), 03-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
Agilent	PSA, Spectrum Analyzer, (installed options, 111, 115, 123, 1DS, B7J, HYX,	E4446A	2139	1/26/2012

Radiated Emissions, 1000 - 18,000 MHz, 03-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	High Pass filter, 8.2 GHz (Blu System)	P/N 84300-80039 (84125C)	1392	5/17/2011
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	6/22/2012
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	8/26/2011
Hewlett Packard	Head (Inc W1-W4, 1946, 1947) Purple	84125C	1772	5/6/2011
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	11/23/2011
A.H. Systems	Blue System Horn, 18-40GHz	SAS-574, p/n: 2581	2159	3/18/2011
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	2241	10/1/2011

DTS Radiated Spurious Emissions, 1000-40,000 MHz, 03-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	6/22/2012
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	1682	3/29/2011
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	8/26/2011
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	11/23/2011

Appendix B Test Data

T82326

Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		-
Emissions Standard(s):	India Radio	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Ubiquiti

Model

AirGridM5-HP

Date of Last Test: 3/3/2011

Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	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. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane or routed in overhead in the GR-1089 test configuration.

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

Ambient Conditions:

Temperature: 20.1 °C
Rel. Humidity: 35 %

Summary of Results - Device Operating in the 5725 - 5875 MHz Band

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	802.11a	low	17	-	Radiated Emissions, 1 - 40GHz	FCC Part 15.209 / 15.247(c)	52.9dBµV/m @ 5405.6MHz (-1.1dB)
1b	802.11a	center	17	-	Radiated Emissions, 1 - 40GHz	FCC Part 15.209 / 15.247(c)	52.8dBµV/m @ 5416.3MHz (-1.2dB)
1c	802.11n20	center	17	-	Radiated Emissions, 1 - 40GHz	FCC Part 15.209 / 15.247(c)	52.2dBµV/m @ 1560.1MHz (-1.8dB)
1d	802.11n40	center	16	-	Radiated Emissions, 1 - 40GHz	FCC Part 15.209 / 15.247(c)	52.3dBµV/m @ 5414.6MHz (-1.7dB)
1e	802.11a	high	17	-	Radiated Emissions, 1 - 40GHz	FCC Part 15.209 / 15.247(c)	52.5dBµV/m @ 4998.1MHz (-1.5dB)

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:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

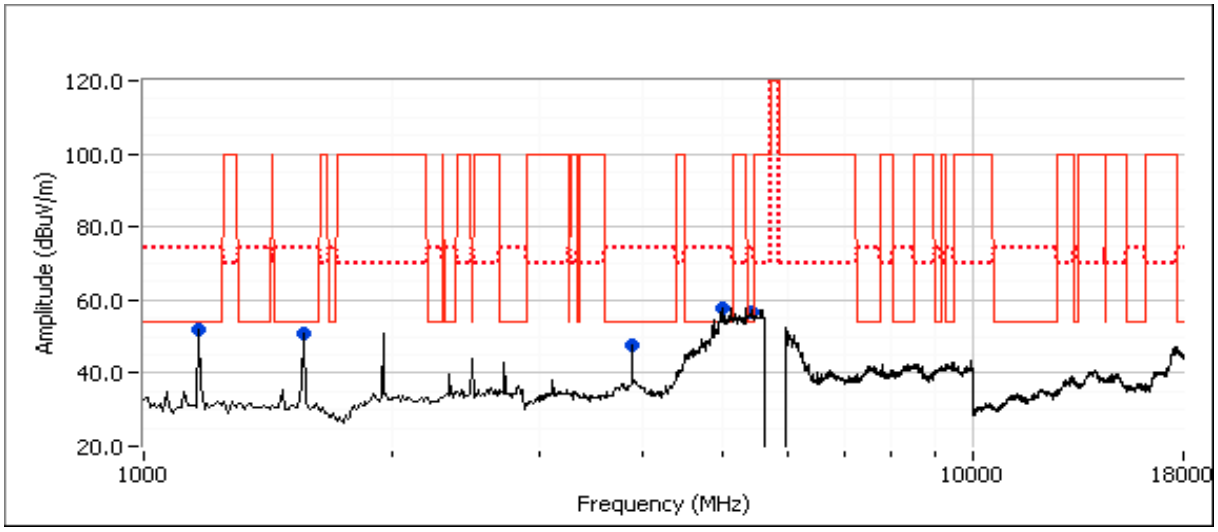
Run #1: Radiated Spurious Emissions, 1000 - 40000 MHz.
Date of Test: 3/3/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

Run #1a: Low Channel @ 5840 MHz
Operating Mode: 802.11a

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	
5405.640	52.9	V	54.0	-1.1	AVG	353	1.0	RB 1 MHz;VB 10 Hz;Pk
5405.490	64.3	V	74.0	-9.7	PK	353	1.0	RB 1 MHz;VB 3 MHz;Pk
3893.380	48.9	V	54.0	-5.1	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Pk
3893.210	51.4	V	74.0	-22.6	PK	0	1.0	RB 1 MHz;VB 3 MHz;Pk
4992.460	51.8	V	54.0	-2.2	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Pk
4991.250	66.4	V	74.0	-7.6	PK	0	1.0	RB 1 MHz;VB 3 MHz;Pk
1170.040	51.3	V	54.0	-2.7	AVG	358	1.6	RB 1 MHz;VB 10 Hz;Pk
1169.990	52.5	V	74.0	-21.5	PK	358	1.6	RB 1 MHz;VB 3 MHz;Pk
1560.030	51.2	V	54.0	-2.8	AVG	342	1.0	RB 1 MHz;VB 10 Hz;Pk
1559.930	52.4	V	74.0	-21.6	PK	342	1.0	RB 1 MHz;VB 3 MHz;Pk

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.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

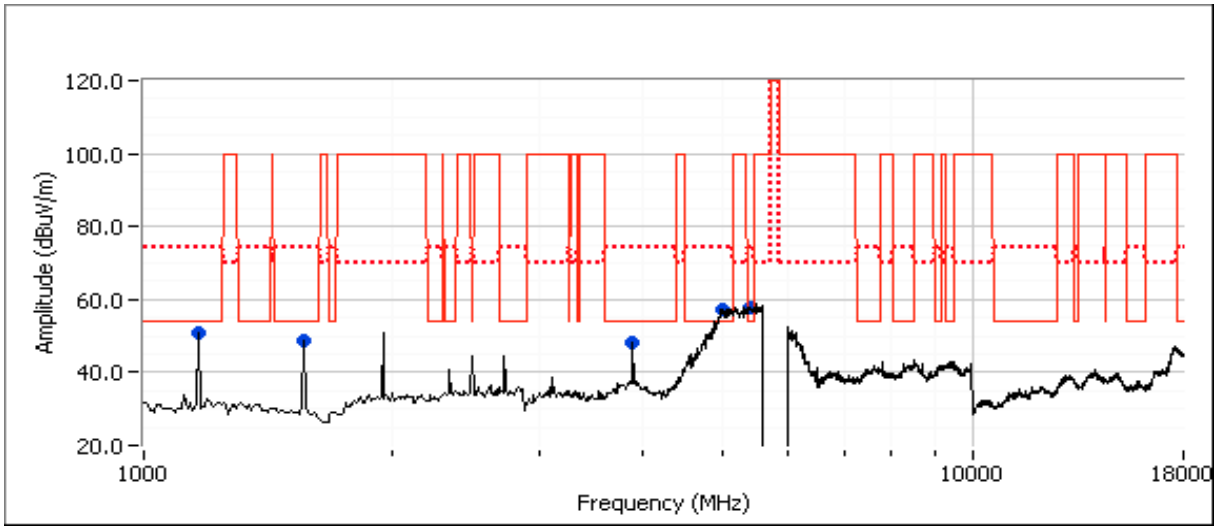
Run #1b: Center Channel @ 5850 MHz
Operating Mode: 802.11a

Date of Test: 3/2/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #4

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	
5416.260	52.8	V	54.0	-1.2	AVG	1	1.0	RB 1 MHz;VB 10 Hz;Pk
5415.760	64.0	V	74.0	-10.0	PK	1	1.0	RB 1 MHz;VB 3 MHz;Pk
1170.030	50.7	V	54.0	-3.3	AVG	17	1.5	RB 1 MHz;VB 10 Hz;Pk
1170.030	52.0	V	74.0	-22.0	PK	17	1.5	RB 1 MHz;VB 3 MHz;Pk
3900.040	49.0	V	54.0	-5.0	AVG	4	1.0	RB 1 MHz;VB 10 Hz;Pk
3899.840	52.6	V	74.0	-21.4	PK	4	1.0	RB 1 MHz;VB 3 MHz;Pk
4997.670	52.8	V	54.0	-1.2	AVG	1	1.0	RB 1 MHz;VB 10 Hz;Pk
4997.420	67.7	V	74.0	-6.3	PK	1	1.0	RB 1 MHz;VB 3 MHz;Pk
1560.050	50.3	H	54.0	-3.7	AVG	65	1.0	RB 1 MHz;VB 10 Hz;Pk
1560.010	51.3	H	74.0	-22.7	PK	65	1.0	RB 1 MHz;VB 3 MHz;Pk

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.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

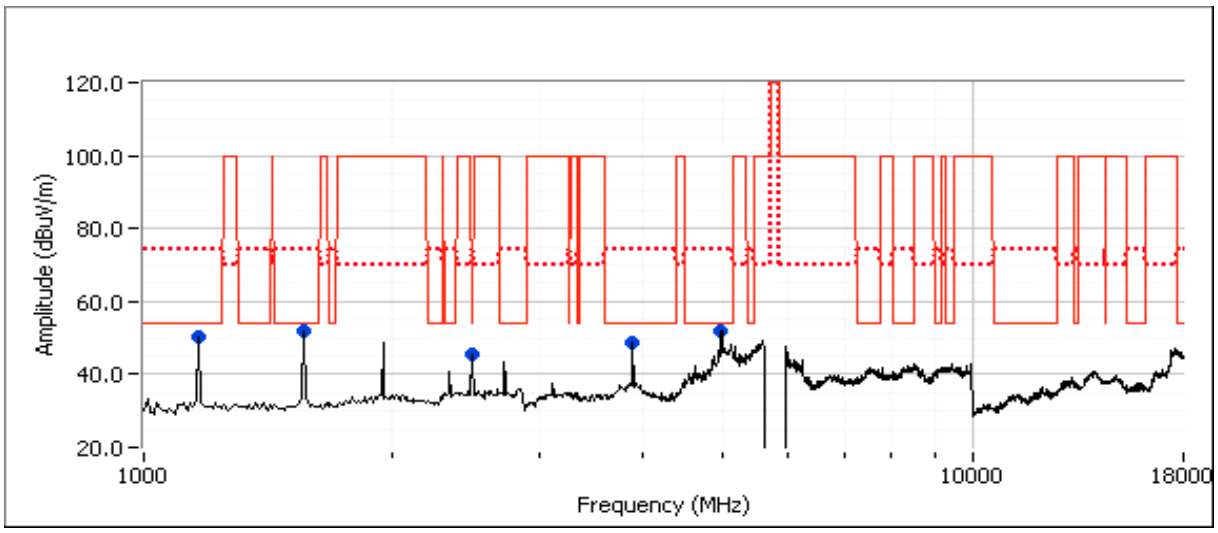
Run #1c: Center Channel @ 5850 MHz
Operating Mode: 802.11n20

Date of Test: 3/3/2011
Test Engineer: John Caizzi
Test Location: FT3

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	
1560.070	52.2	V	54.0	-1.8	AVG	339	1.0	RB 1 MHz;VB 10 Hz;Pk
1560.020	53.1	V	74.0	-20.9	PK	339	1.0	RB 1 MHz;VB 3 MHz;Pk
1170.070	51.7	V	54.0	-2.3	AVG	0	1.6	RB 1 MHz;VB 10 Hz;Pk
1170.070	52.8	V	74.0	-21.2	PK	0	1.6	RB 1 MHz;VB 3 MHz;Pk
3900.090	49.5	V	54.0	-4.5	AVG	351	1.0	RB 1 MHz;VB 10 Hz;Pk
3900.050	51.9	V	74.0	-22.1	PK	351	1.0	RB 1 MHz;VB 3 MHz;Pk
4988.500	51.6	V	54.0	-2.4	AVG	355	1.0	RB 1 MHz;VB 10 Hz;Pk
4978.570	65.6	V	74.0	-8.4	PK	355	1.0	RB 1 MHz;VB 3 MHz;Pk
2491.750	36.4	V	54.0	-17.6	AVG	343	1.0	RB 1 MHz;VB 10 Hz;Pk
2488.450	52.6	V	74.0	-21.4	PK	343	1.0	RB 1 MHz;VB 3 MHz;Pk

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.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

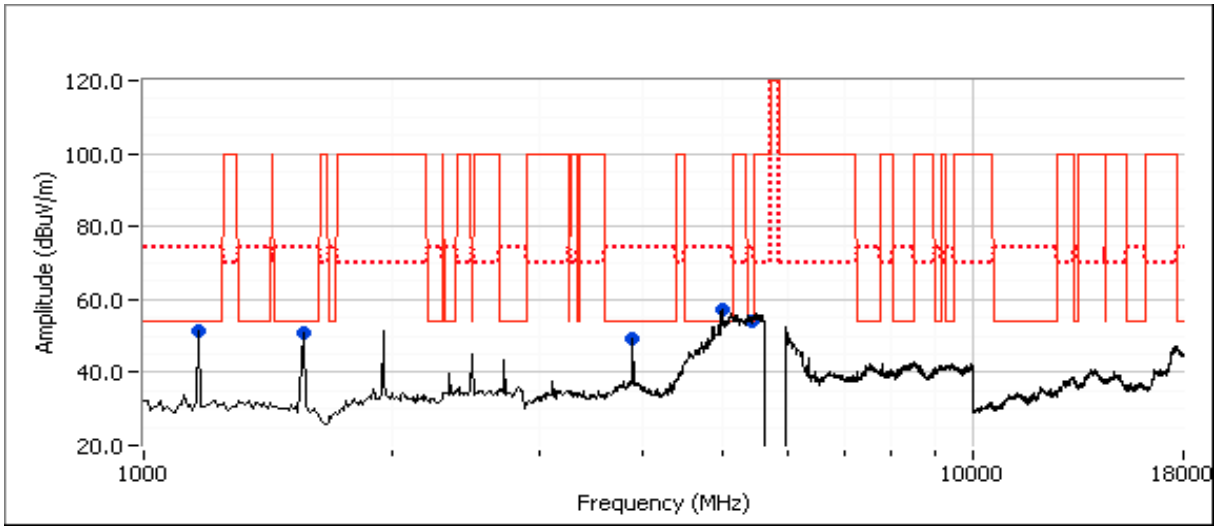
Run #1d: Center Channel @ 5850 MHz
Operating Mode: 802.11n40

Date of Test: 3/3/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

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	
5414.590	52.3	V	54.0	-1.7	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Pk
5406.790	63.8	V	74.0	-10.2	PK	0	1.0	RB 1 MHz;VB 3 MHz;Pk
4979.930	51.6	V	54.0	-2.4	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Pk
4977.270	66.7	V	74.0	-7.3	PK	0	1.0	RB 1 MHz;VB 3 MHz;Pk
3900.050	49.7	V	54.0	-4.3	AVG	350	1.0	RB 1 MHz;VB 10 Hz;Pk
3900.140	52.7	V	74.0	-21.3	PK	350	1.0	RB 1 MHz;VB 3 MHz;Pk
1560.060	50.7	V	54.0	-3.3	AVG	342	1.0	RB 1 MHz;VB 10 Hz;Pk
1559.950	51.8	V	74.0	-22.2	PK	342	1.0	RB 1 MHz;VB 3 MHz;Pk
1170.040	51.3	V	54.0	-2.7	AVG	360	1.6	RB 1 MHz;VB 10 Hz;Pk
1170.060	52.4	V	74.0	-21.6	PK	360	1.6	RB 1 MHz;VB 3 MHz;Pk

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.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

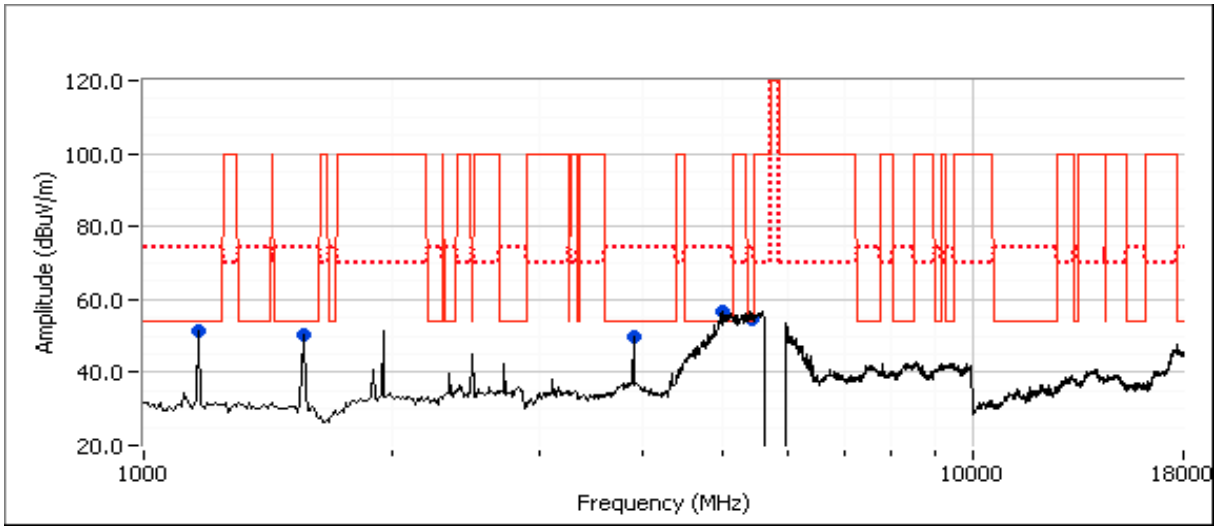
Run #1e: High Channel @ 5860 MHz
Operating Mode: 802.11a

Date of Test: 3/3/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

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	
4998.070	52.5	V	54.0	-1.5	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Pk
4997.430	66.7	V	74.0	-7.3	PK	0	1.0	RB 1 MHz;VB 3 MHz;Pk
5398.660	52.4	V	54.0	-1.6	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Pk
5398.610	63.3	V	74.0	-10.7	PK	0	1.0	RB 1 MHz;VB 3 MHz;Pk
3906.720	50.6	V	54.0	-3.4	AVG	0	1.0	RB 1 MHz;VB 10 Hz;Pk
3906.800	53.0	V	74.0	-21.0	PK	0	1.0	RB 1 MHz;VB 3 MHz;Pk
1560.050	50.4	V	54.0	-3.6	AVG	334	1.0	RB 1 MHz;VB 10 Hz;Pk
1560.060	51.7	V	74.0	-22.3	PK	334	1.0	RB 1 MHz;VB 3 MHz;Pk
1170.070	50.7	V	54.0	-3.3	AVG	360	1.6	RB 1 MHz;VB 10 Hz;Pk
1170.050	51.8	V	74.0	-22.2	PK	360	1.6	RB 1 MHz;VB 3 MHz;Pk

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.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

India (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: 3/2/2011
Test Engineer: Rafael Varelas
Test Location: FT Lab #4

Config. Used: 1
Config Change: none
EUT Voltage: POE

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: 20.4 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	16		Output Power	36dBm EIRP	Pass	35.8 dBm
2	16		Power spectral Density (PSD)	8dBm/3kHz	Pass	-20.1 dBm/3kHz
3	16		Minimum 6dB Bandwidth		Pass	36.3 MHz
3	16		99% Bandwidth		-	36.8 MHz
4	16		Spurious emissions	-30dBc	Pass	All emissions below the limit

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

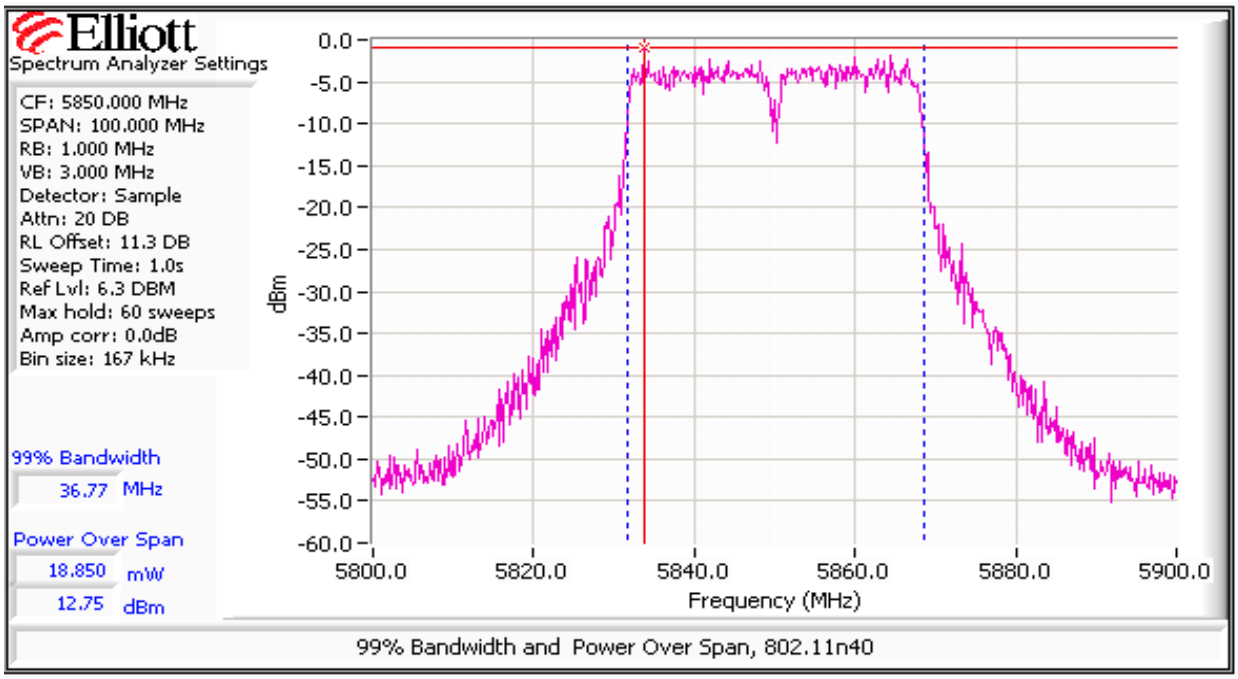
Run #1: Output Power

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP[Note 2] dBm	EIRP[Note 2] W	Output Power (dBm)[3]	Output Power mW
16	5850	12.75	18.84	23.0	Pass	35.8	3.758		

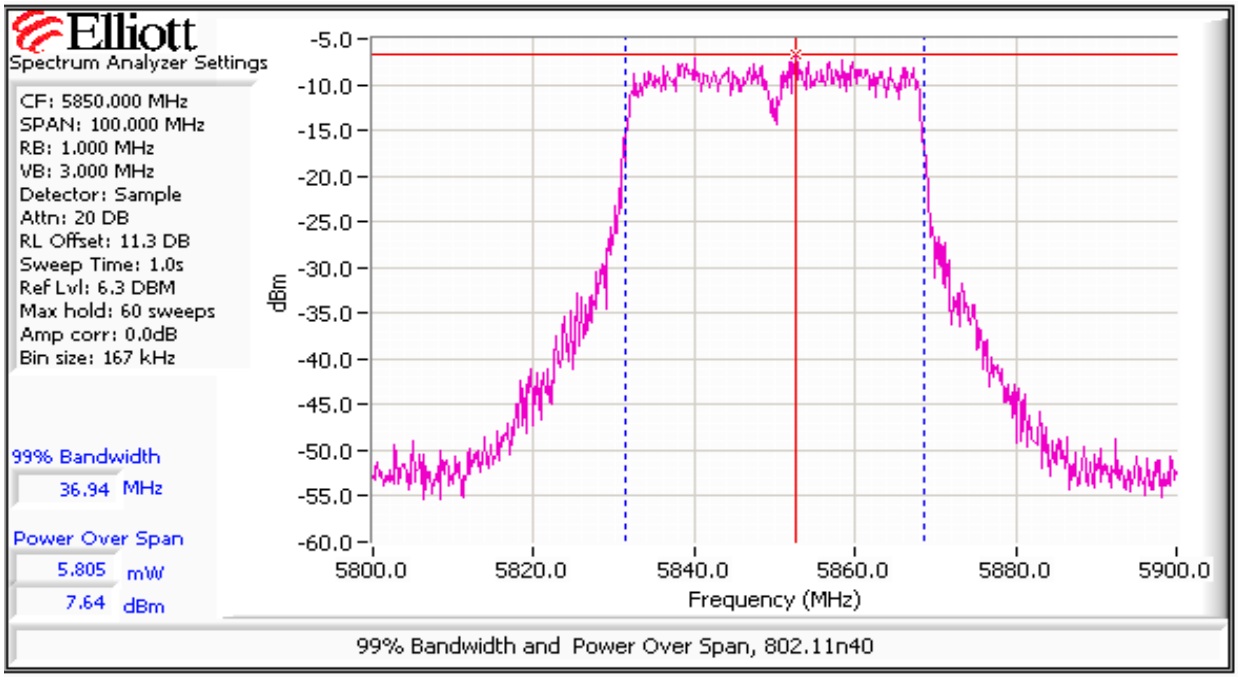
Alternate Power settings for higher gain antenna

Power Setting[2]	Frequency (MHz)	Output Power (dBm)[1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP[Note 2] dBm	EIRP[Note 2] W	Output Power (dBm)[3]	Output Power mW
7	5850	7.64	5.81	28.0	Pass	35.6	3.664		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, sample detector, max hold and power integration over 50 MHz (option #2, method 3 in KDB 558074, equivalent to method 3 of DA-02-2138A1 for U-NII devices). Spurious limit becomes -30dBc.
Note 2:	Power setting - the software power setting used during testing, included for reference only.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

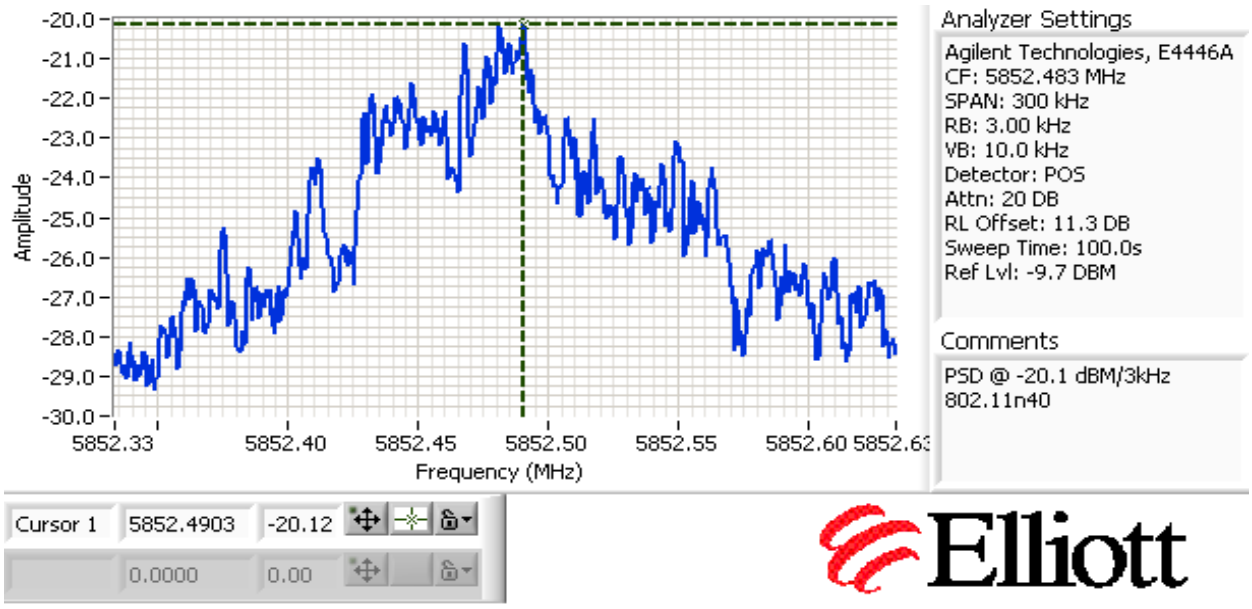


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Run #2: Power spectral Density

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
16	5850	-20.1	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.

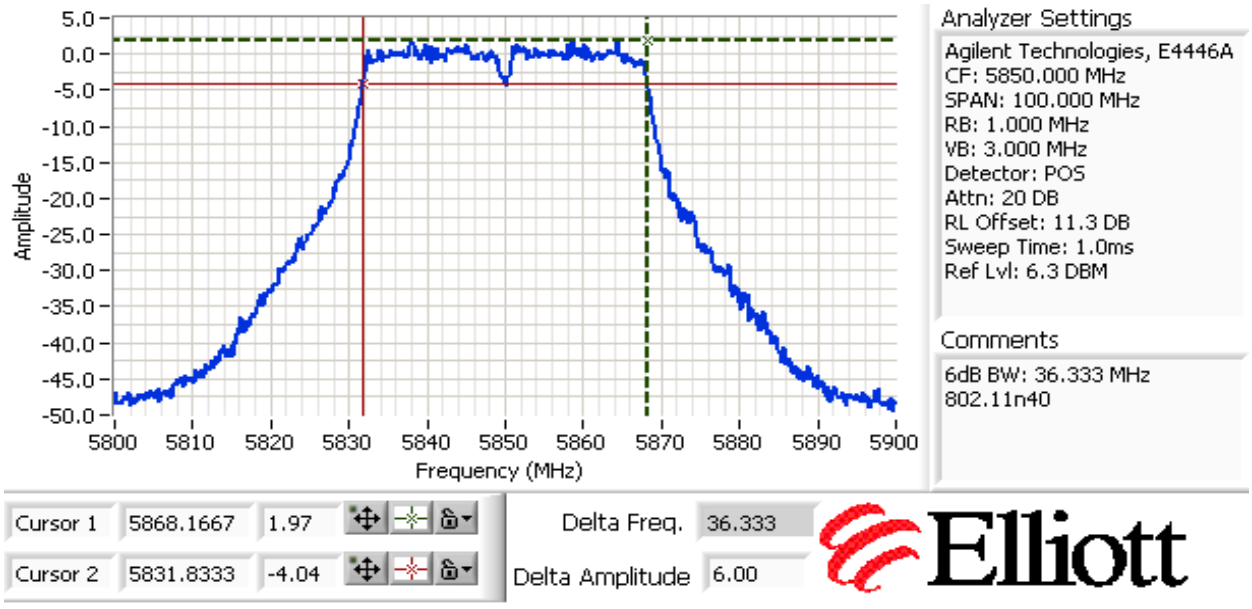


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Run #3: Signal Bandwidth

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz)	
			6dB	99%
16	5850	1MHz	36.3	36.8

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

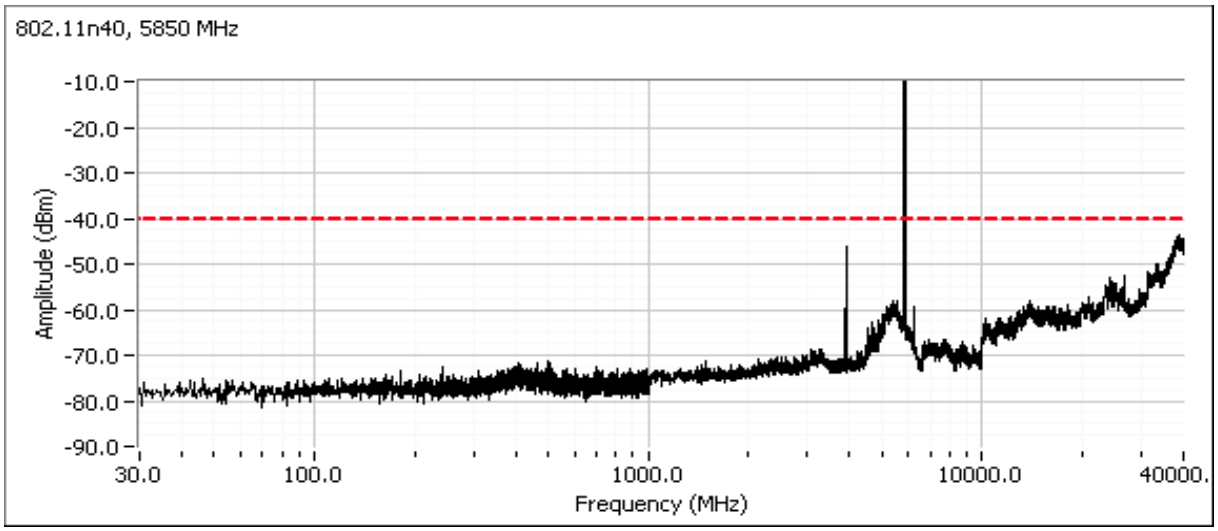


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

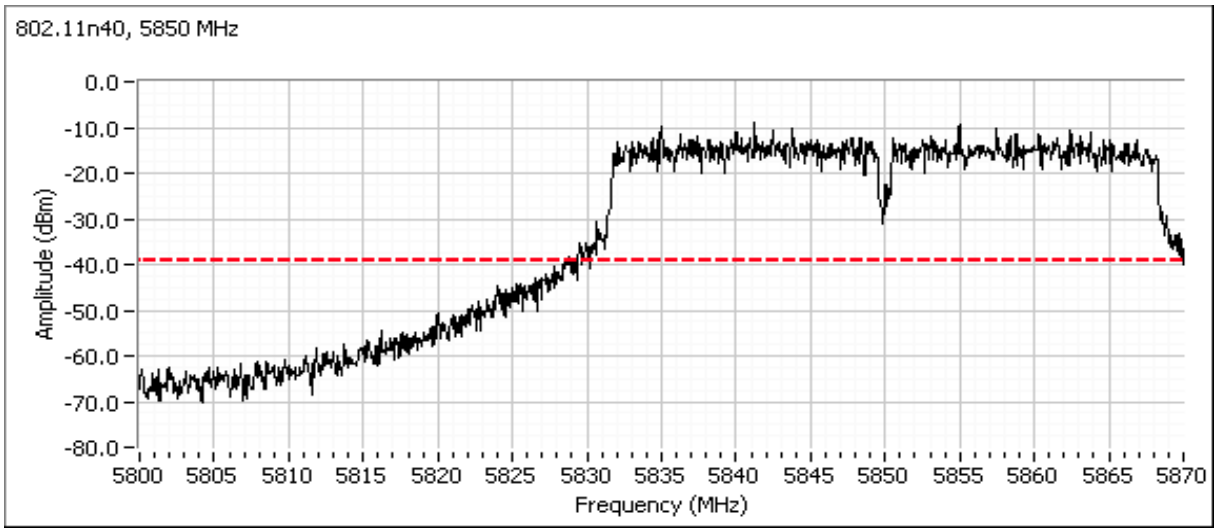
Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Limit	Result
5850	-30dBc	Pass

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

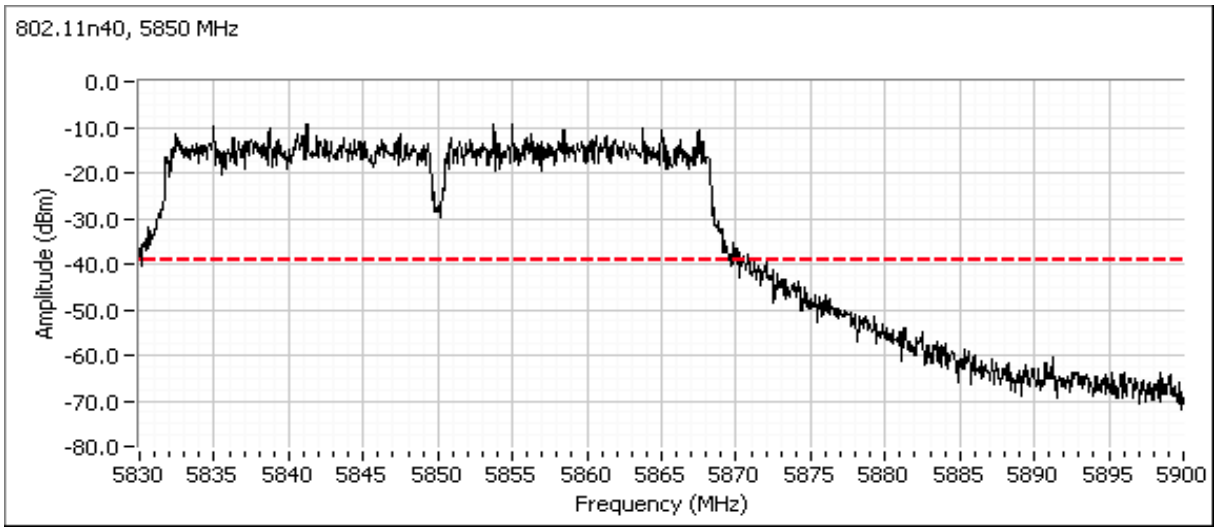


Additional plot from 5800 - 5870 MHz showing compliance with -30dBc at the band edge.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Additional plot from 5830 - 5900 MHz showing compliance with -30dBc at the band edge.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

India (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: 3/2/2011
Test Engineer: Rafael Varelas
Test Location: FT Lab #4

Config. Used: 1
Config Change: none
EUT Voltage: POE

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: 20.4 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	17		Output Power	36dBm EIRP	Pass	35.9 dBm
2	17		Power spectral Density (PSD)	8dBm/3kHz	Pass	-17.7 dBm/3kHz
3	17		Minimum 6dB Bandwidth		Pass	16.6 MHz
3	17		99% Bandwidth		-	18.7 MHz
4	17		Spurious emissions	-30dBc	Pass	All emissions below the limit

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Run #1: Output Power

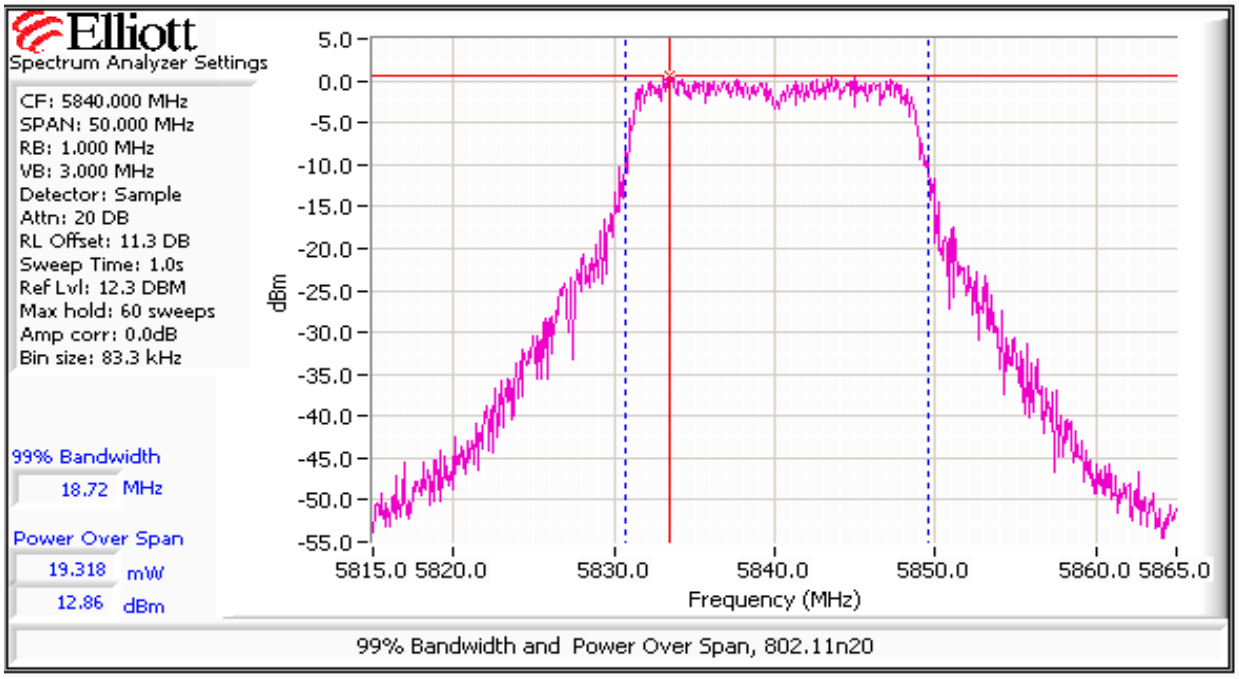
EIRP can not exceed 36 dBm - adjust power so that you are just at or below 36dBm EIRP. Record the PDAC settings

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP [Note 2] dBm	EIRP W	Output Power (dBm) [3]	Output Power mW
17	5840	12.86	19.32	23.0	Pass	35.9	3.855		
17	5850	12.87	19.36	23.0	Pass	35.9	3.864		
17	5860	12.91	19.54	23.0	Pass	35.9	3.899		

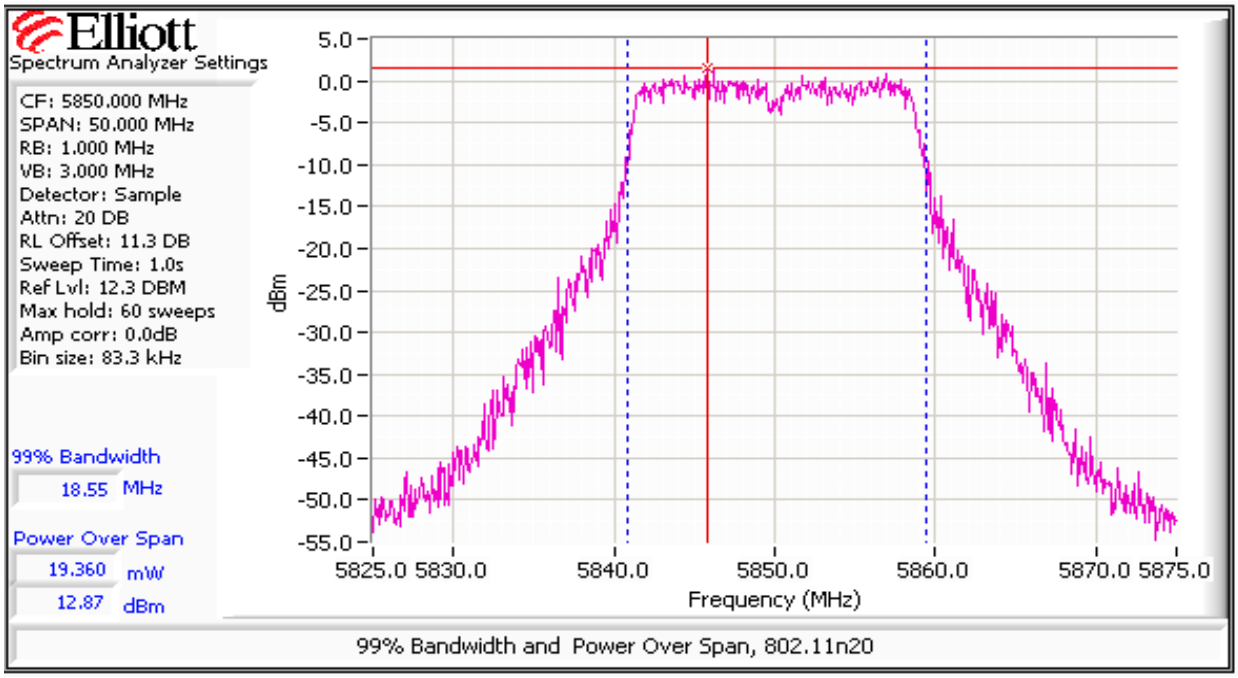
Alternate Power settings for higher gain antenna

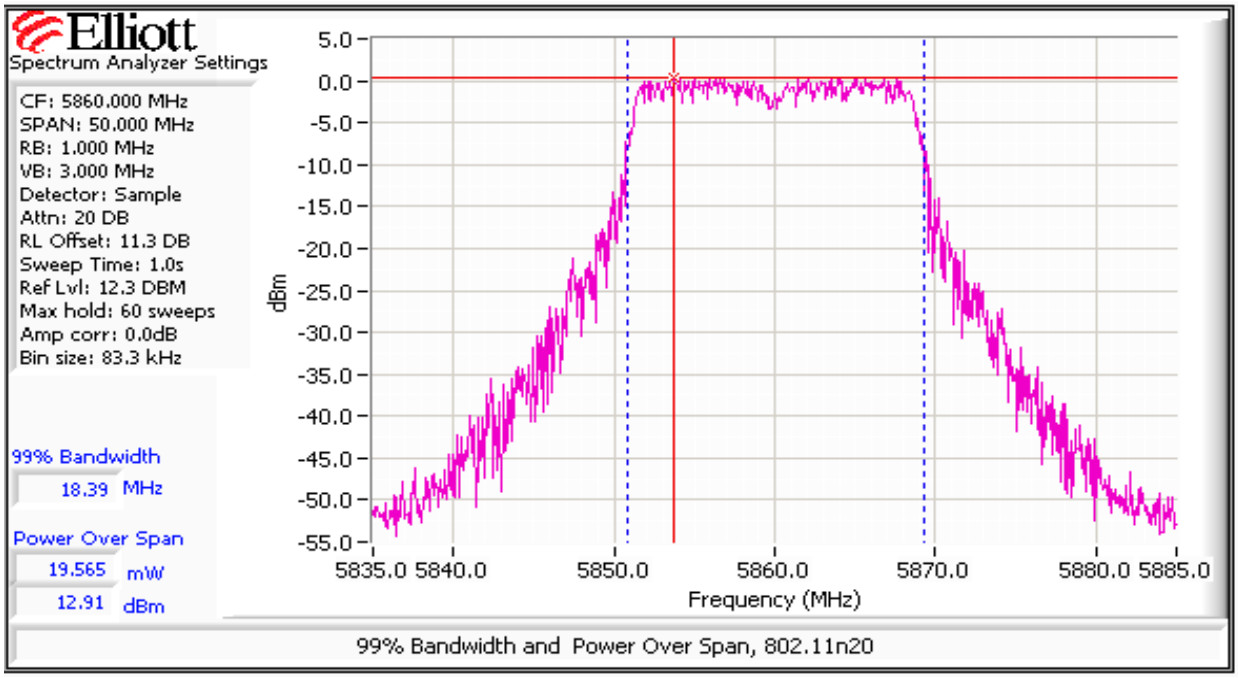
Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP [Note 2] dBm	EIRP W	Output Power (dBm) [3]	Output Power mW
8	5840	7.98	6.3	28.0	Pass	36.0	3.963		
8	5850	7.85	6.1	28.0	Pass	35.9	3.846		
8	5860	7.87	6.1	28.0	Pass	35.9	3.864		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, sample detector, max hold and power integration over 50 MHz (option #2, method 3 in KDB 558074, equivalent to method 3 of DA-02-2138A1 for U-NII devices). Spurious limit becomes -30dBc.
Note 2:	Power setting - the software power setting used during testing, included for reference only.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A



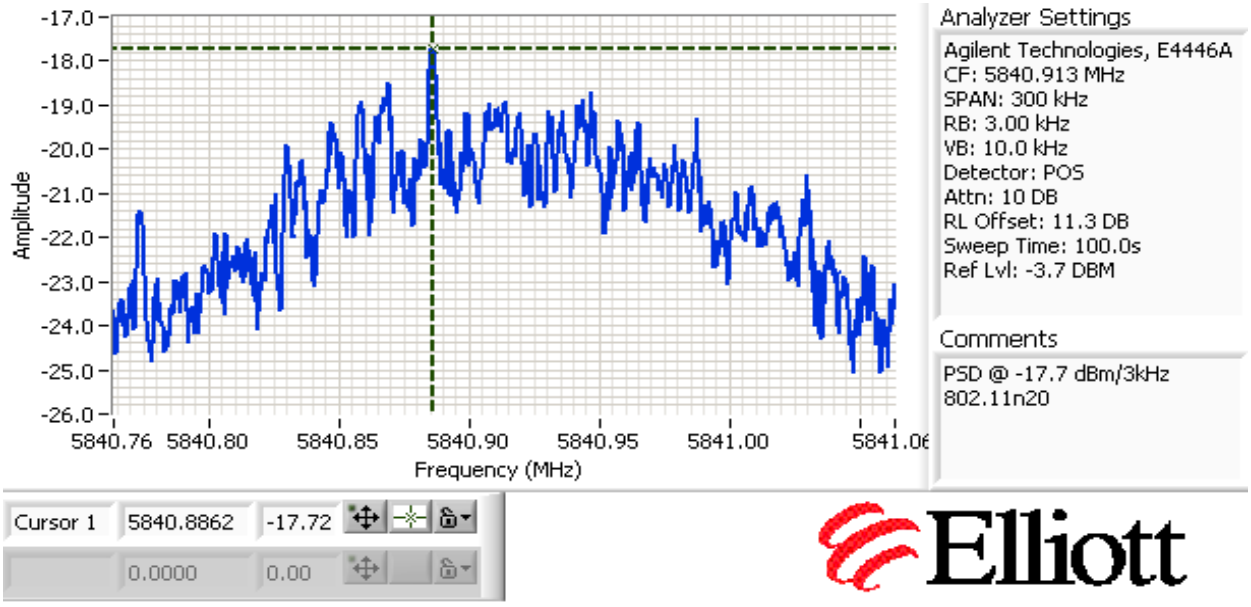


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

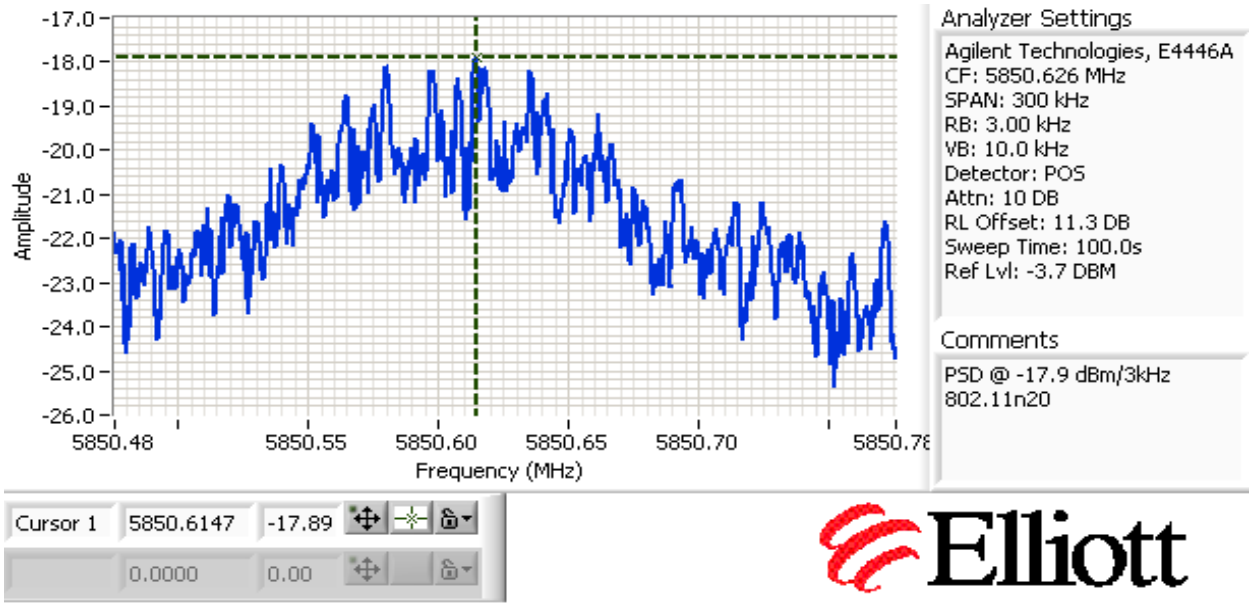
Run #2: Power spectral Density

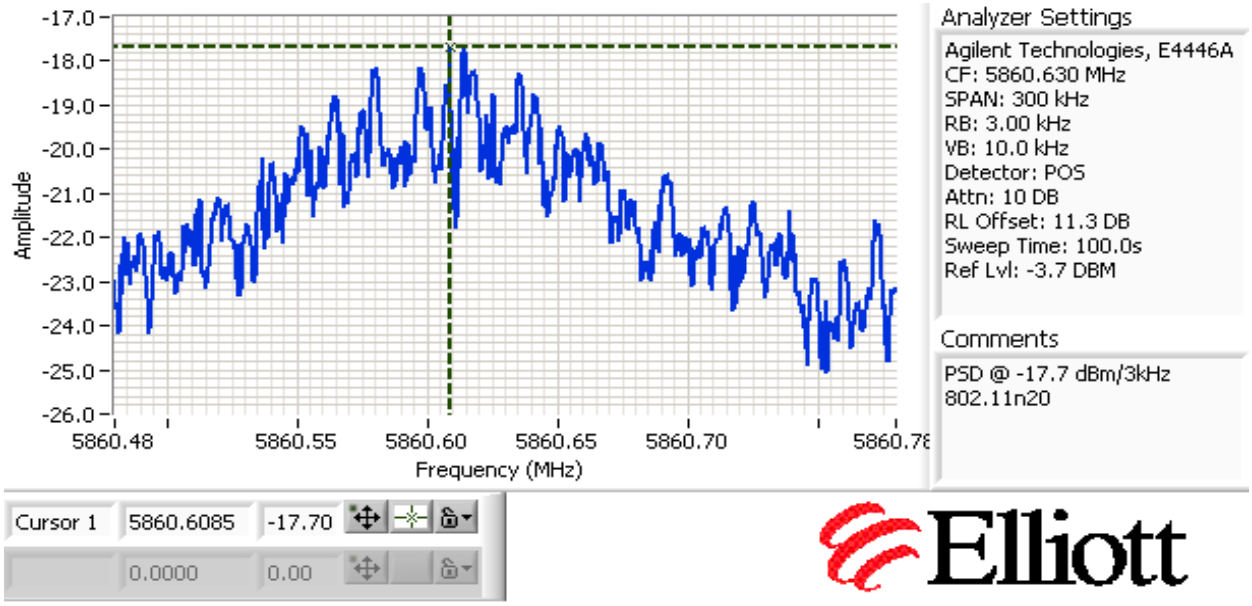
Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
17	5840	-17.7	8.0	Pass
17	5850	-17.9	8.0	Pass
17	5860	-17.7	8.0	Pass

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:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A



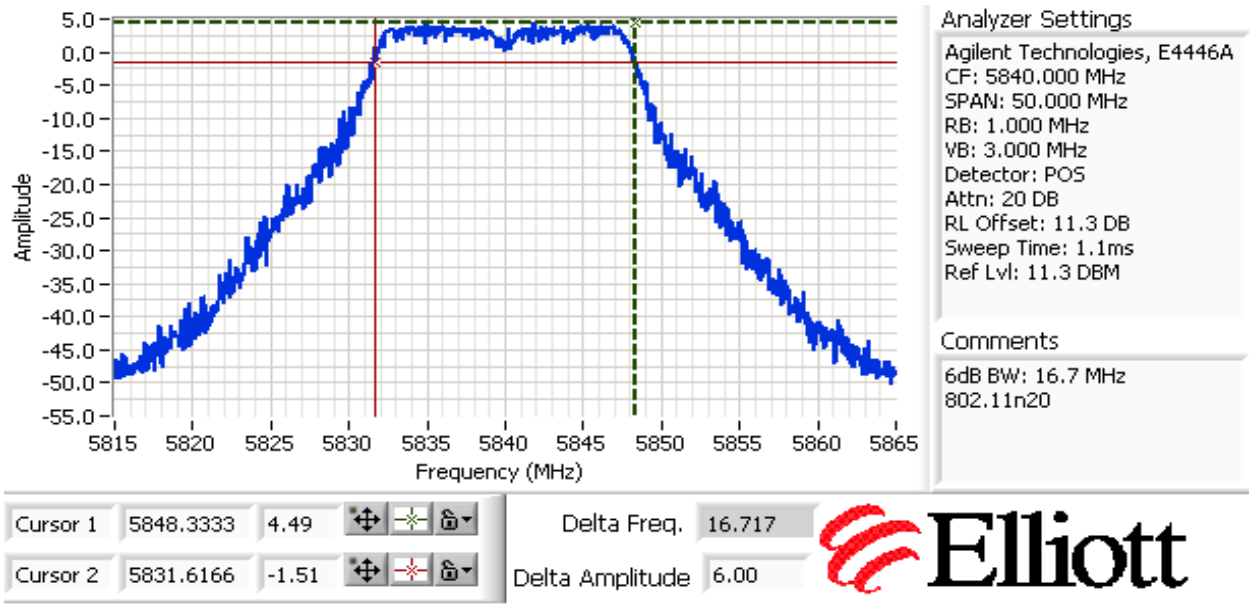


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

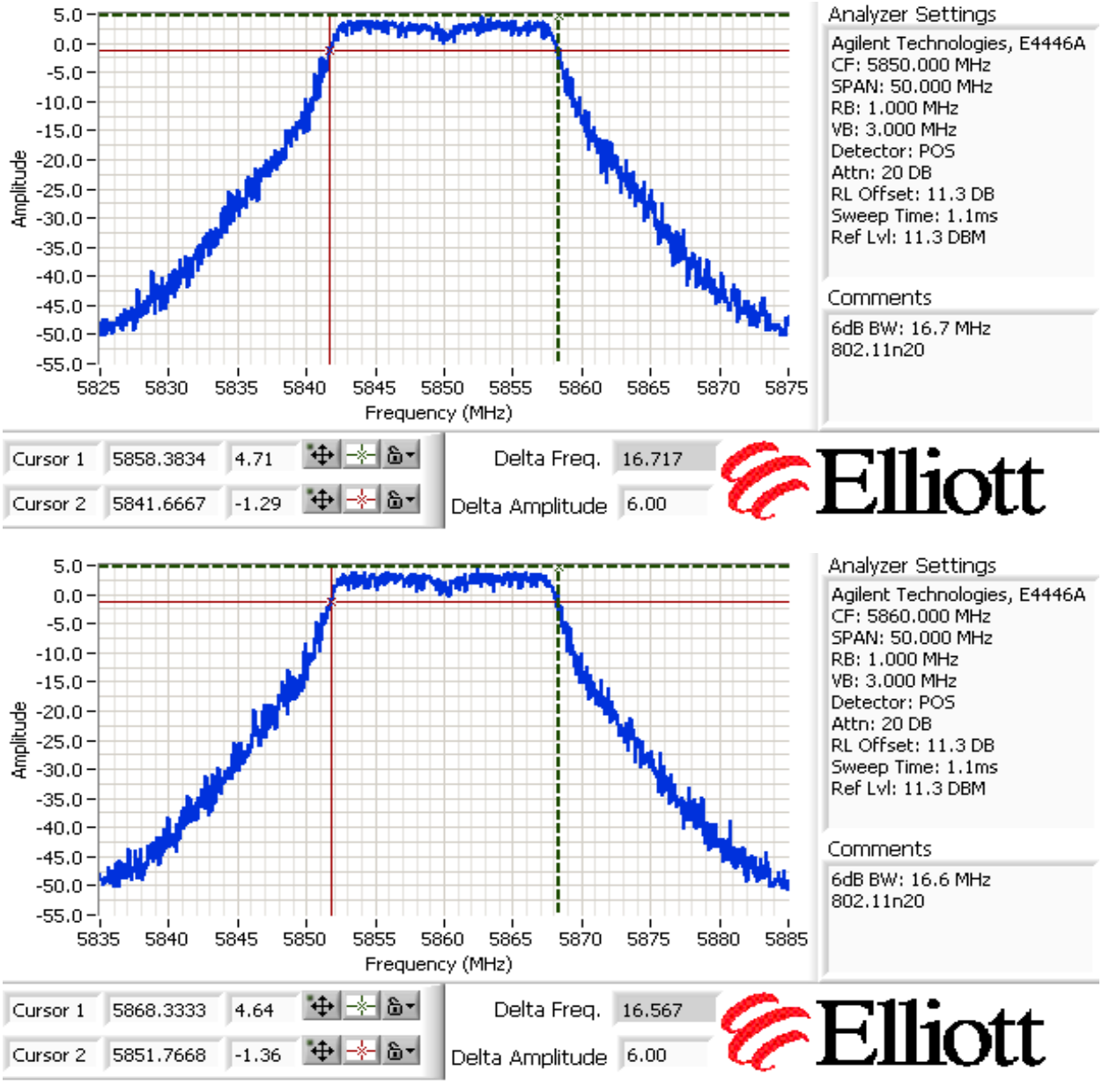
Run #3: Signal Bandwidth

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz) 6dB	99%
17	5840	1MHz	16.7	18.7
17	5850	1MHz	16.7	18.6
17	5860	1MHz	16.6	18.4

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



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

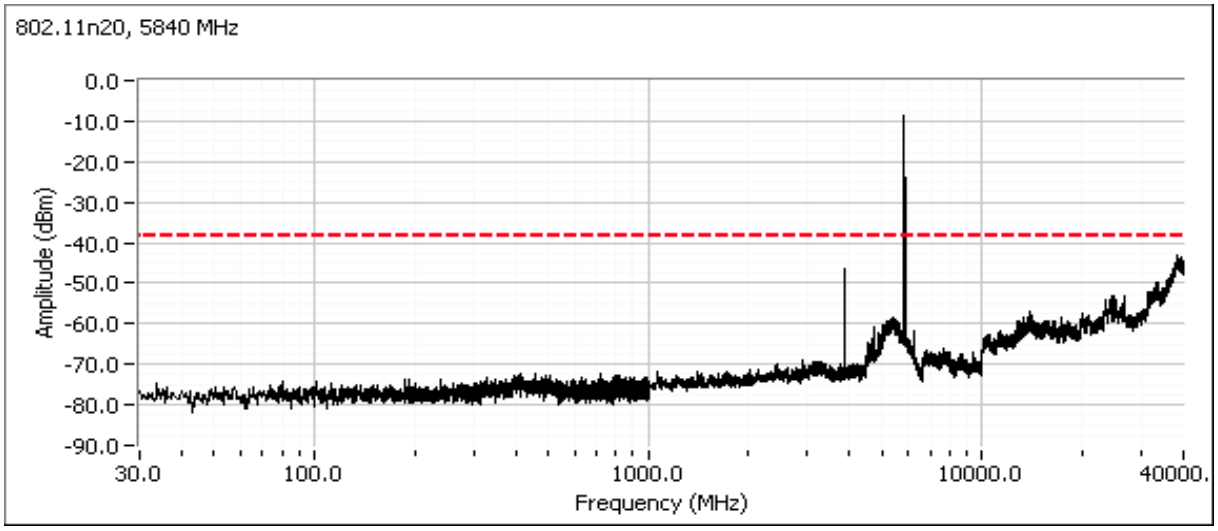


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

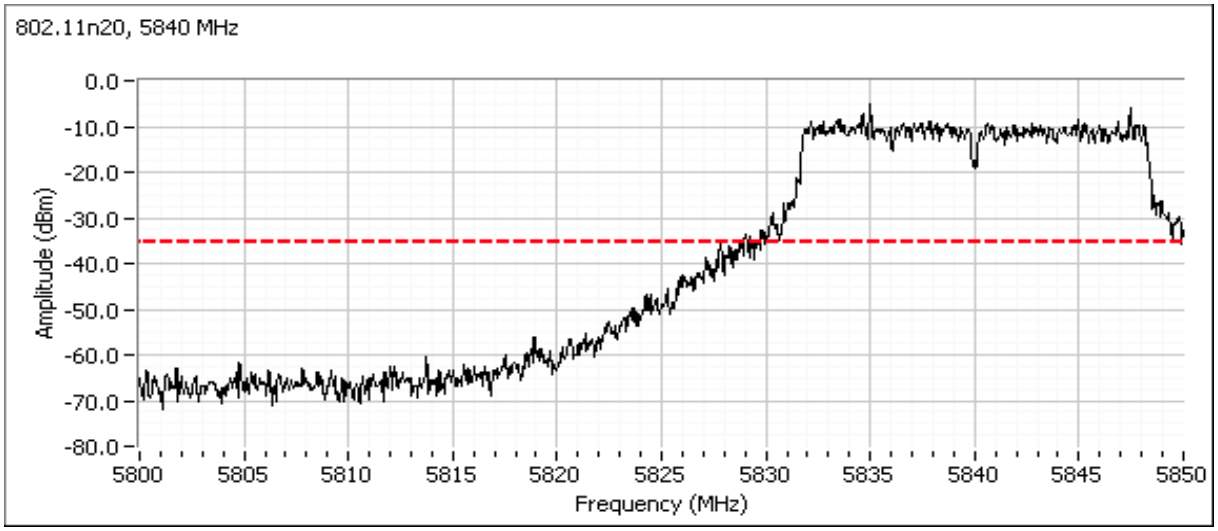
Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Limit	Result
5840	-30dBc	Pass
5850	-30dBc	Pass
5860	-30dBc	Pass

Plots for low channel, power setting(s) = 17

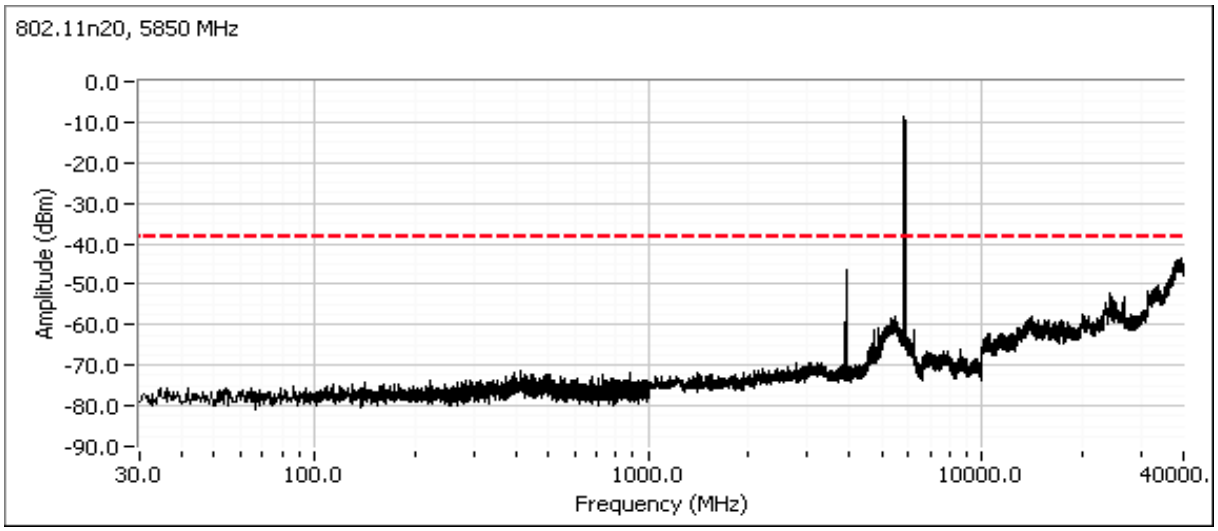


Additional plot from 5800 - 5850 MHz showing compliance with -30dBc at the band edge.

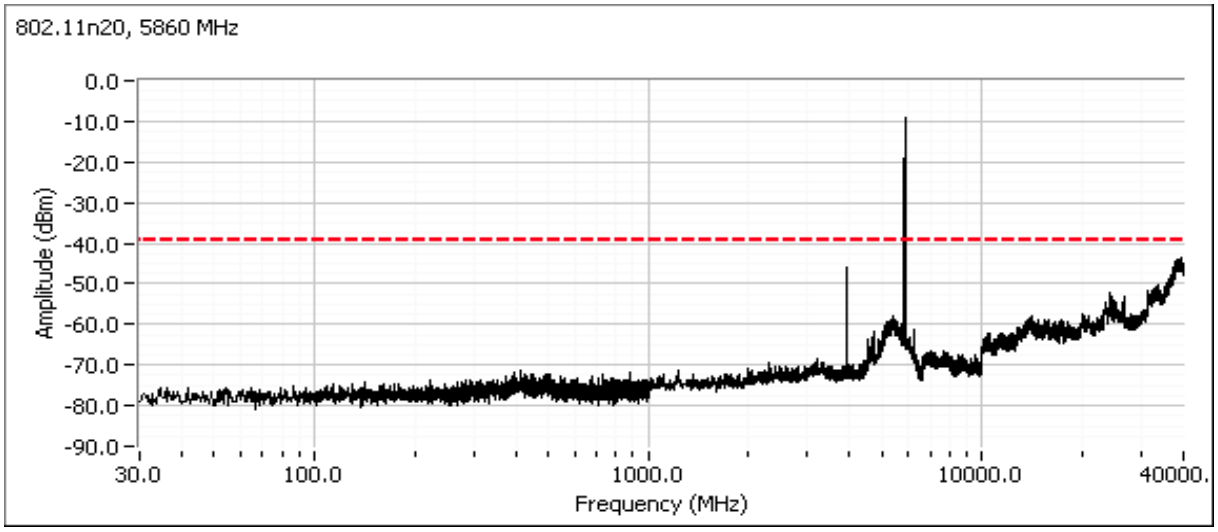


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Plots for center channel, power setting(s) = 17

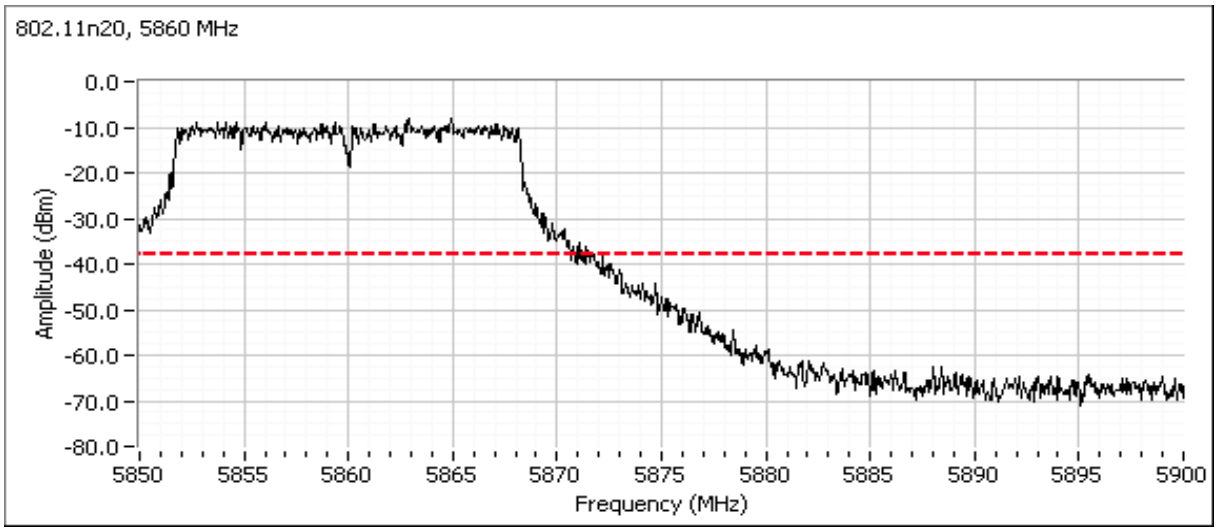


Plots for high channel, power setting(s) = 17



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Additional plot from 5850 - 5900 MHz showing compliance with -30dBc at the band edge.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

India (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: 3/2/2011
Test Engineer: Rafael Varelas
Test Location: FT Lab #4

Config. Used: 1
Config Change: none
EUT Voltage: POE

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: 20.4 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
1	17		Output Power	36dBm EIRP	Pass	36 dBm
2	17		Power spectral Density (PSD)	8dBm/3kHz	Pass	-17.3 dBm/3kHz
3	17		Minimum 6dB Bandwidth		Pass	17.9 MHz
3	17		99% Bandwidth		-	17.5 MHz
4	17		Spurious emissions	-30dBc	Pass	All emissions below the limit

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Run #1: Output Power

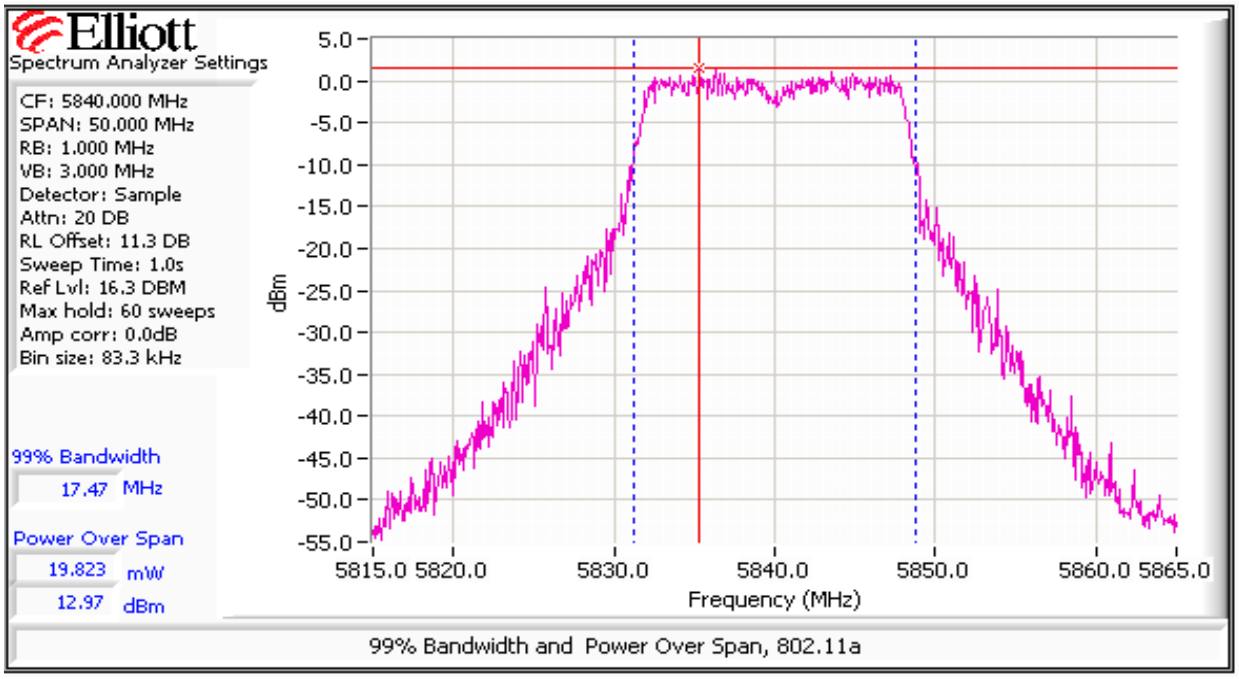
EIRP can not exceed 36 dBm - adjust power so that you are just at or below 36dBm EIRP. Record the PDAC settings

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP [Note 2] dBm	EIRP W	Output Power (dBm) [3]	Output Power mW
17	5840	12.97	19.82	23.0	Pass	36.0	3.954		
17	5850	12.89	19.45	23.0	Pass	35.9	3.882		
17	5860	12.96	19.77	23.0	Pass	36.0	3.945		

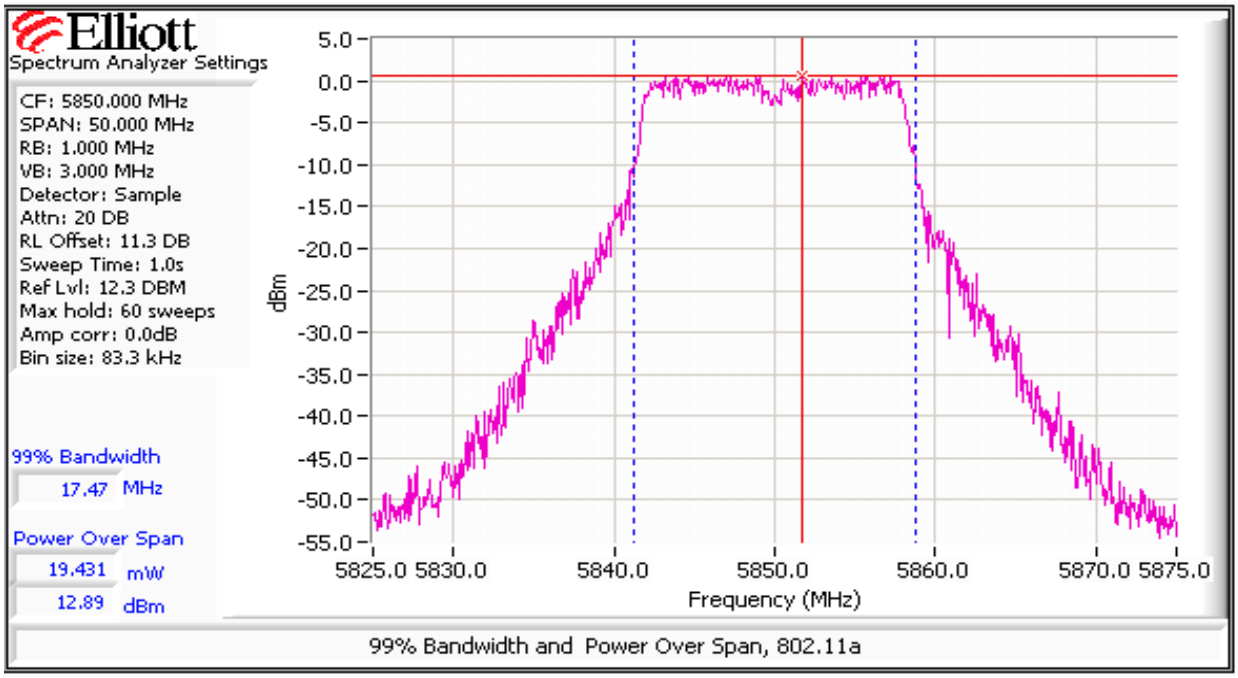
Alternate Power settings for higher gain antenna

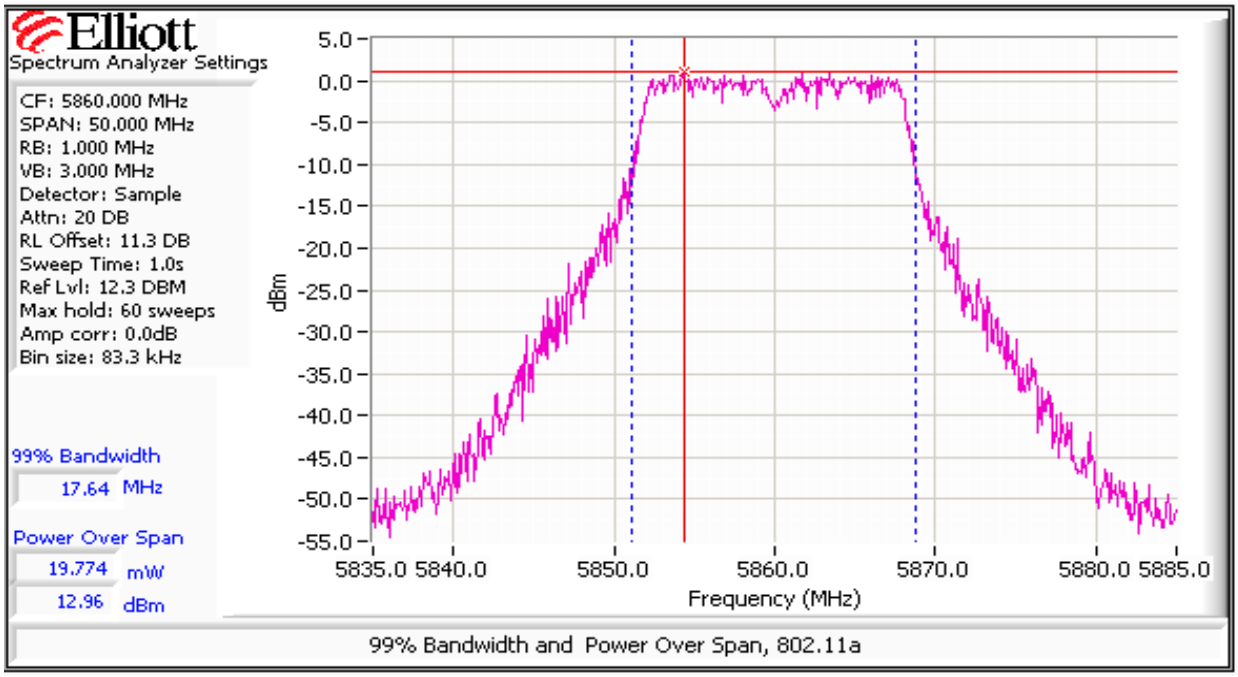
Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP [Note 2] dBm	EIRP W	Output Power (dBm) [3]	Output Power mW
8	5840	7.89	6.2	28.0	Pass	35.9	3.882		
8	5850	7.95	6.2	28.0	Pass	36.0	3.936		
8	5860	7.88	6.1	28.0	Pass	35.9	3.873		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, sample detector, max hold and power integration over 50 MHz (option #2, method 3 in KDB 558074, equivalent to method 3 of DA-02-2138A1 for U-NII devices). Spurious limit becomes -30dBc.
Note 2:	Power setting - the software power setting used during testing, included for reference only.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A



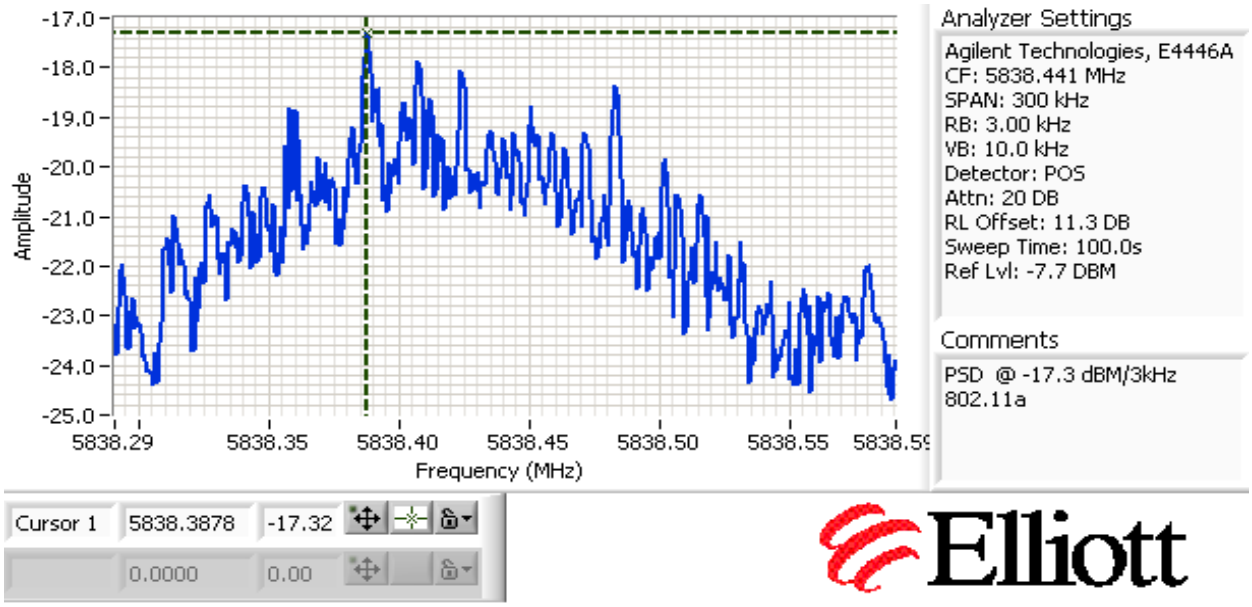


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

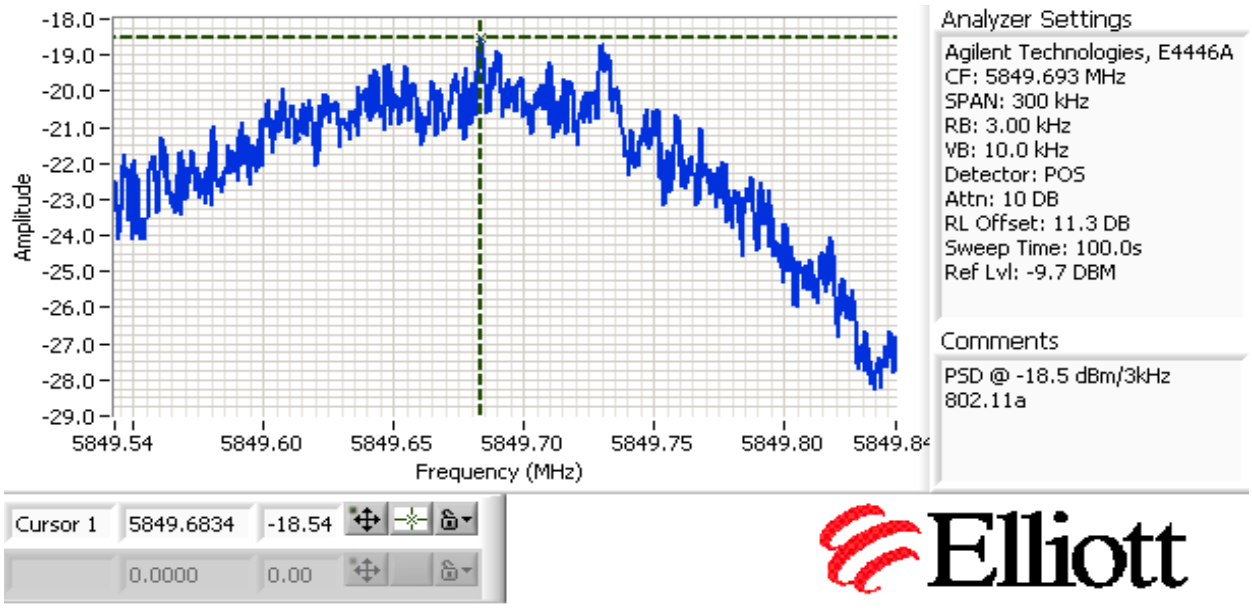
Run #2: Power spectral Density

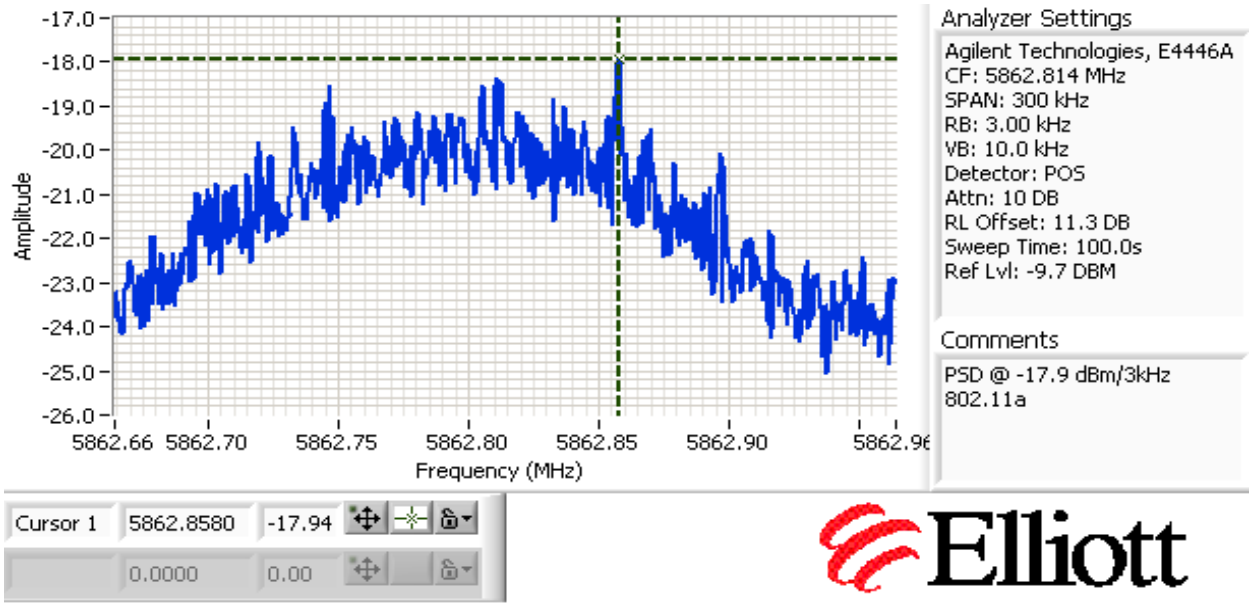
Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
17	5840	-17.3	8.0	Pass
17	5850	-18.5	8.0	Pass
17	5860	-17.9	8.0	Pass

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:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A



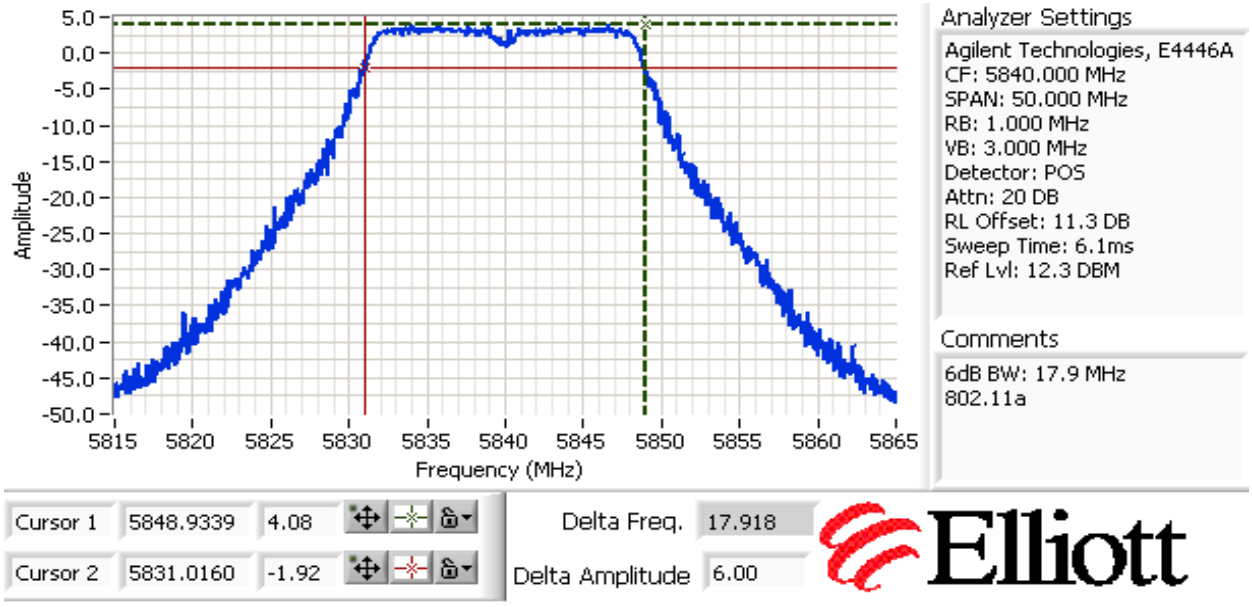


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

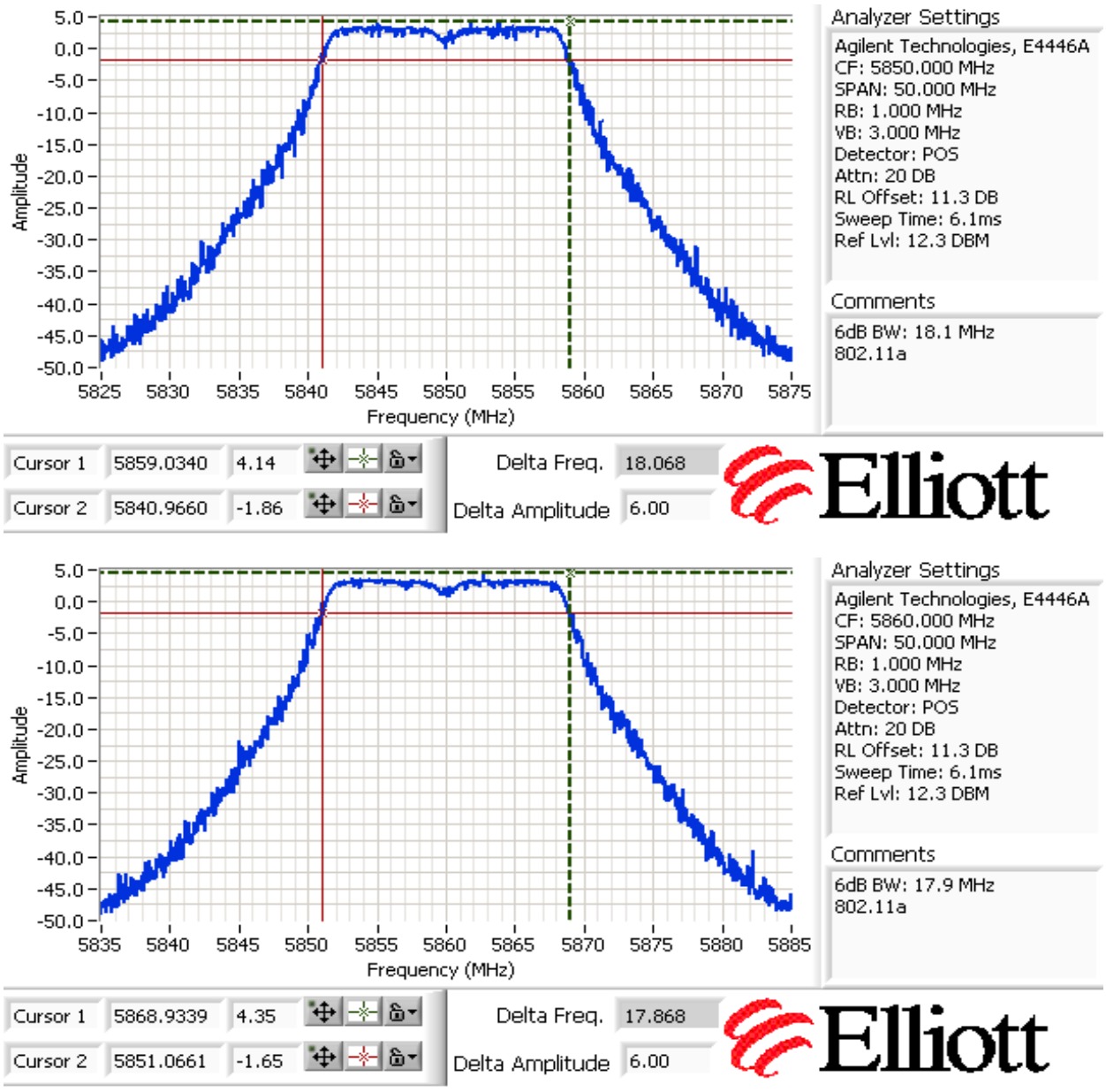
Run #3: Signal Bandwidth

Power Setting	Frequency (MHz)	Resolution Bandwidth	Bandwidth (MHz)	
			6dB	99%
17	5840	1MHz	17.9	17.5
17	5850	1MHz	18.1	17.5
17	5860	1MHz	17.9	17.6

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



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

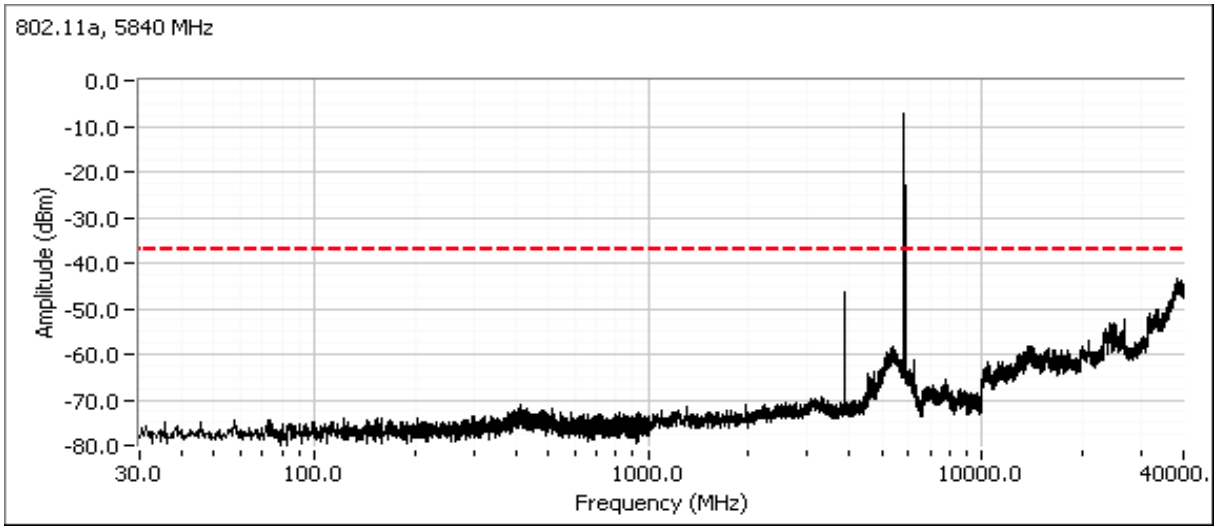


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

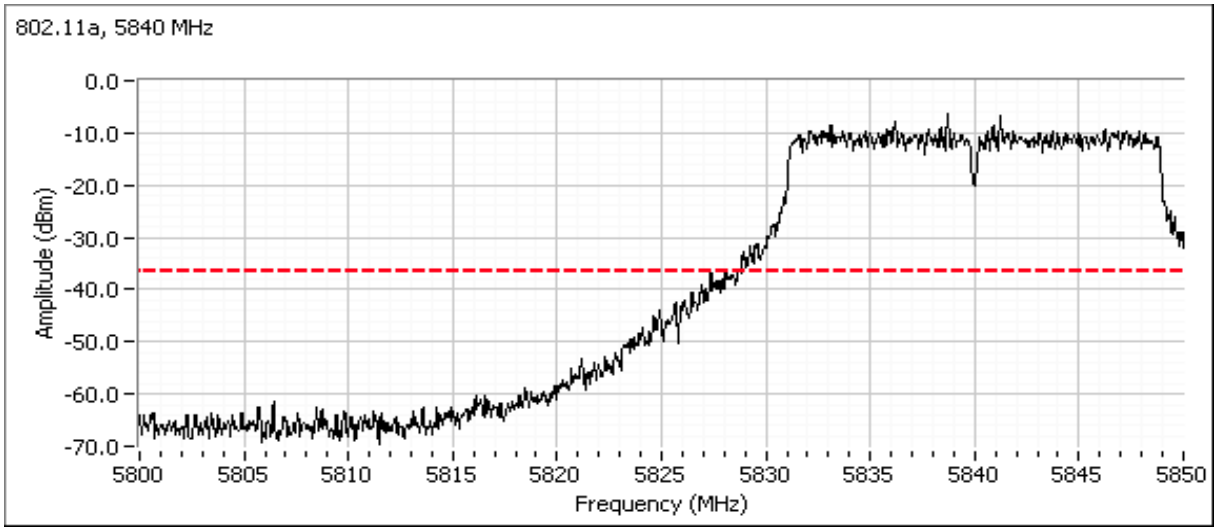
Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Limit	Result
5840	-30dBc	Pass
5850	-30dBc	Pass
5860	-30dBc	Pass

Plots for low channel, power setting(s) = 17

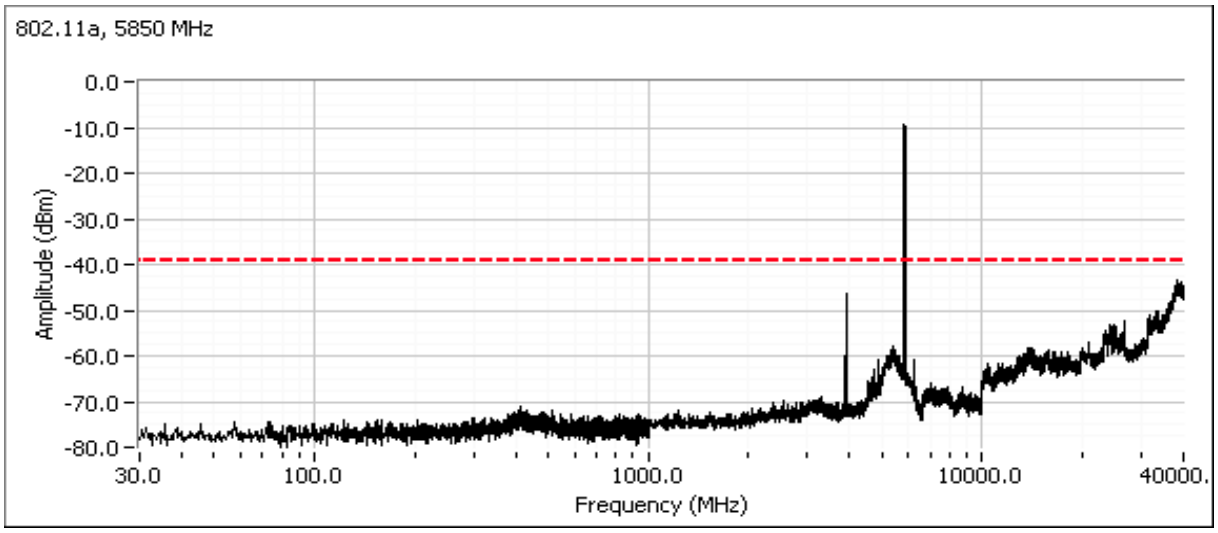


Additional plot from 5800 - 5860 MHz showing compliance with -30dBc at the band edge.

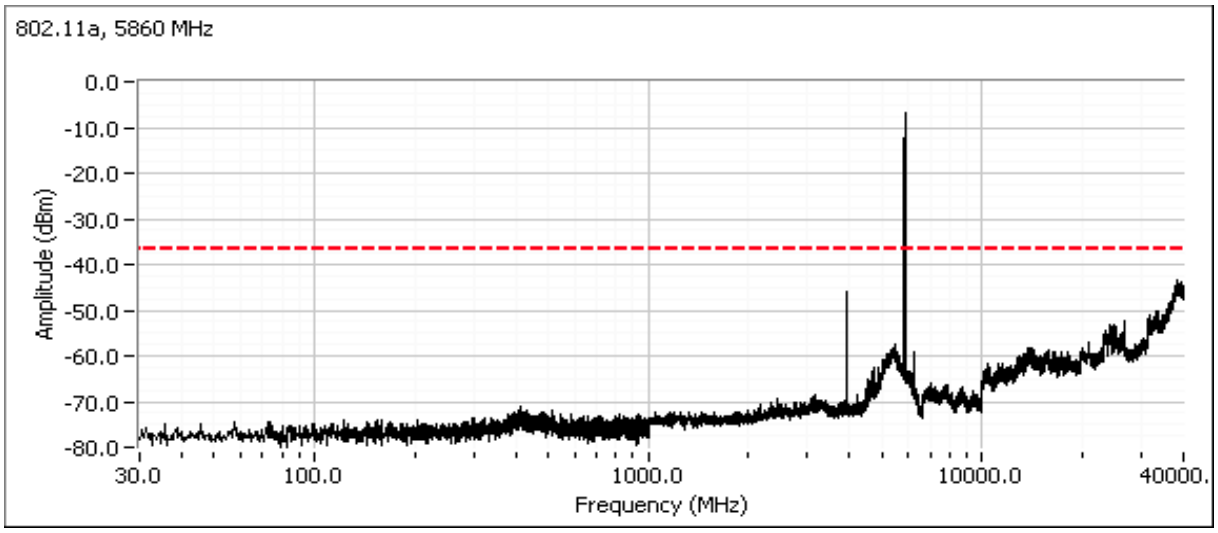


Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Plots for center channel, power setting(s) = 17

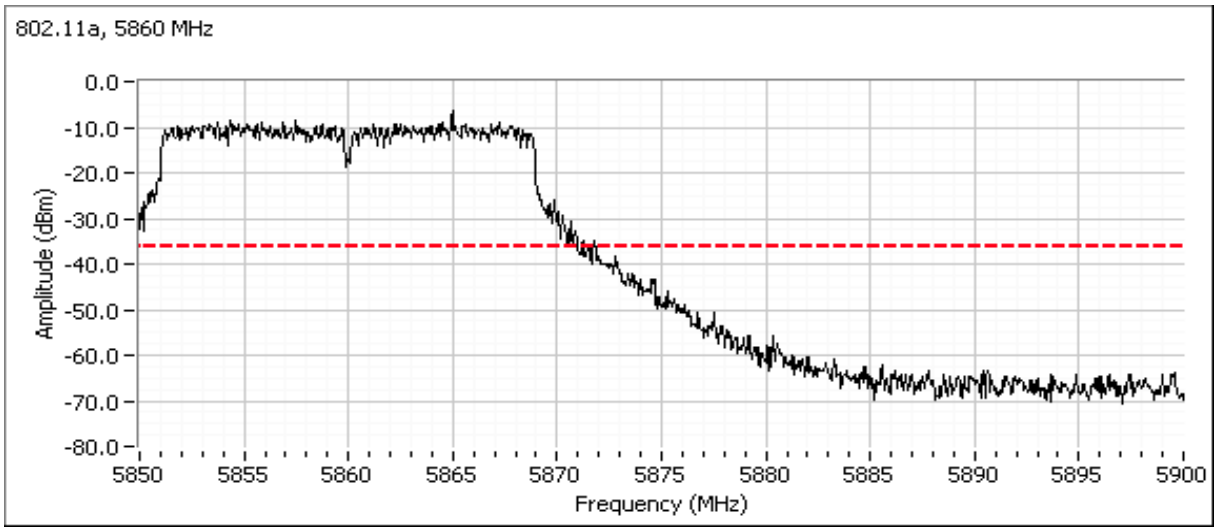


Plots for high channel, power setting(s) = 17



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Additional plot from 5850 - 5900 MHz showing compliance with -30dBc at the band edge.



Client:	Ubiquiti	Job Number:	J82286
Model:	AirGridM5-HP	T-Log Number:	T82326
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	India Radio	Class:	N/A

Maximum Permissible Exposure

Test Specific Details

Date of Test: 3/9/2011
Test Engineer: Mark Briggs

General Test Configuration

Calculation uses the free space transmission formula:

$$S = (PG)/(4\ \pi d^2)$$

Where: S is power density (W/m^2), P is output power (W), G is antenna gain relative to isotropic, d is separation distance from the transmitting antenna (m).

Summary of Results

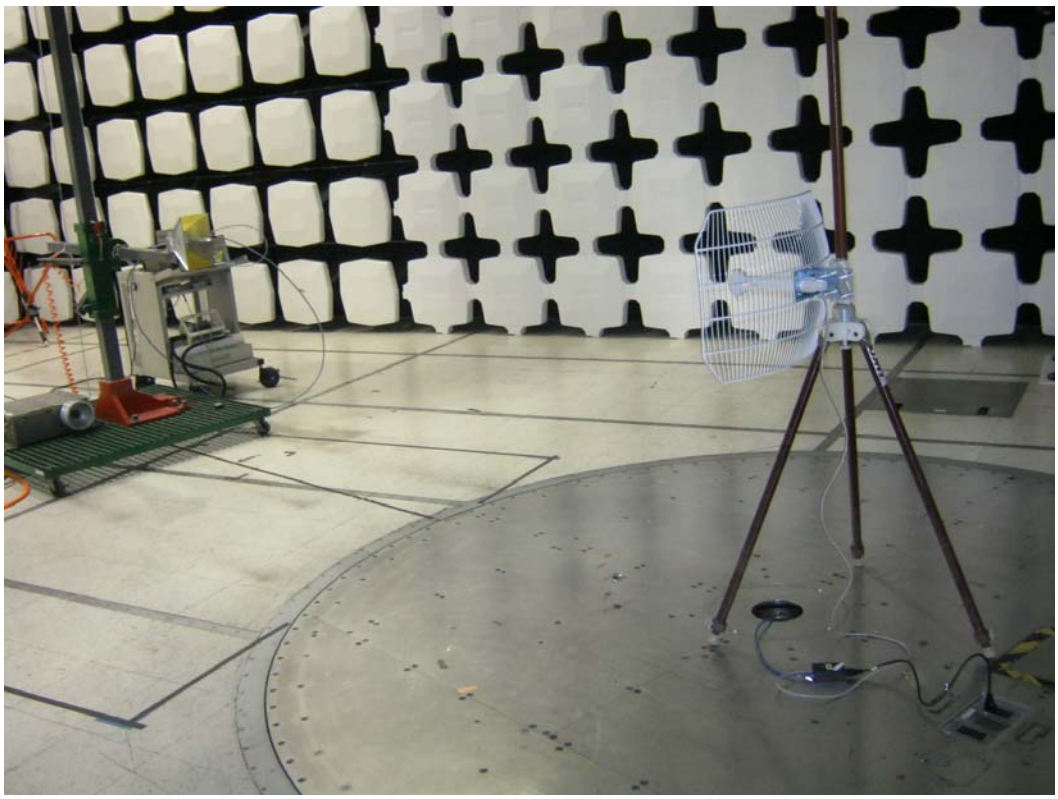
Device complies with Power Density requirements at 20cm separation:	Yes

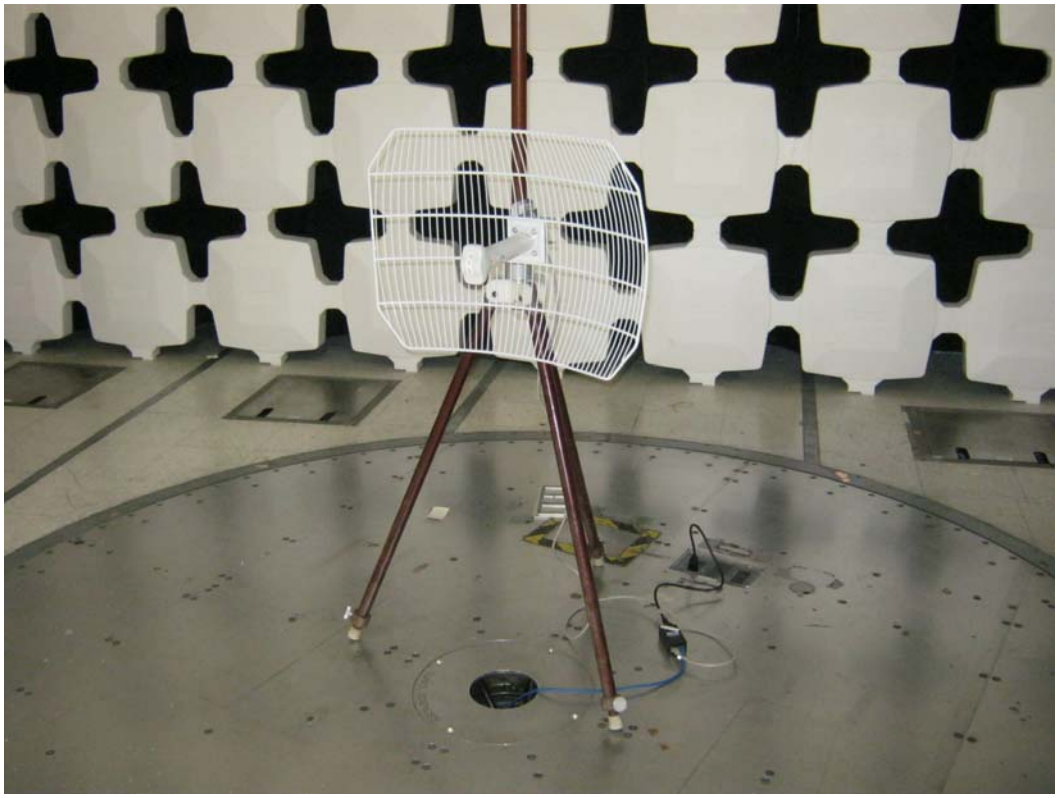
Use: General
Antenna: 23dBi or 28dBi, max eirp in either case is 3.96W

USE THIS FOR 1.5-15 GHz single transmitters

Freq. MHz	EUT Power dBm	EUT Power mW*	Cable Loss dB	Ant Gain dBi	Power at Ant dBm	EIRP mW	Power Density (S) at 20 cm mW/cm^2	MPE Limit at 20 cm mW/cm^2
5850	8.0	6.3	0	28	8.0	3962.78	0.788	1.000
5850	13.0	19.8	0	23	13.0	3953.67	0.787	1.000

Appendix C Test Data and Test Configuration Photographs





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