Elliott Laboratories LLC
www.elliottlabs.com
41039 Boyce Road
Fremont, CA 94538
510-578-3500 Phone
510-440-9525 Fax

Radio Test Report

FCC Part 90 Subpart Z
3650 MHz to 3700 MHz

Model: PowerBridgeM365

COMPANY:	Ubiquiti Networks 91 E. Tasman Drive San Jose, CA 95134
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road. Fremont, CA. 94538-2435
REPORT DATE:	April 18, 2011
FINAL TEST DATES:	March 5, 8, 11, 14 and 18, 2011

AUTHORIZED SIGNATORY:

David W. Bare
Chief Engineer
Elliott Laboratories

A2LA ACCREDITED
Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	04-18-2011	First release	

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SCOPE

Tests have been performed on the Ubiquiti Networks model PowerBridgeM365, pursuant to the relevant requirements of the following standard(s) in order to obtain device certification against the regulatory requirements of the Federal Communications Commission and Industry Canada.

- Code of Federal Regulations (CFR) Title 47 Part 2
- CFR 47 Part 90 (Private Land Mobile Radio Service) Subpart Z

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
ANSI TIA-603-C August 17, 2004

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

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 Ubiquiti Networks model PowerBridgeM365 and therefore apply only to the tested sample. The sample was selected and prepared by Jennifer Sanchez of Ubiquiti Networks.

OBJECTIVE

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

Prior to marketing in the USA, the device requires certification. Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification.

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 Ubiquiti Networks model PowerBridgeM365 complied with the requirements of the standards and frequency bands declared in the scope of this test report.

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.

DEVIATIONS FROM THE STANDARDS

No deviations were made from the published requirements listed in the scope of this report.

TEST RESULTS

FCC Part 90Z – Base and Fixed Stations, 3650 – 3700 MHz

FCC	Description	Measured	Limit	Result
Transmitter Modulation, output power and other characteristics				
§2.1033 (c) (5) § 90.1321(b)	Frequency ranges (Listed for each channel spacing)	5MHz 3653-3672MHz 10MHz 3655-3670MHz 20MHz 3660-3665MHz 25MHz 3662MHz	3650-3675 MHz Note 1	Complies
§2.1033 (c) (6) §2.1033 (c) (7) §2.1046 § 90.1321	EIRP – Total power (Maximum for each channel spacing)	5MHz: 35.6dBm 10MHz: 38.6dBm 20MHz: 41.6dBm 25MHz: 42.4dBm	25 Watts	Complies
	EIRP – PSD (Maximum)	5MHz: 29.8dBm/MHz 10MHz: 29.8dBm/MHz 20MHz: 29.9dBm/MHz 25MHz: 29.8dBm/MHz	30 dBm/MHz	Complies
§2.1033 (c) (4) §2.1047 § 90.210	Emission types	D7D	Must be Digital	-
	Emission mask	Device complies with spectral mask – refer to test data	Mask B	Complies
§2.1049	Occupied (99%) Bandwidth	5MHz: 4.2 MHz 10MHz: 8.5 MHz 20MHz: 16.8 MHz 25MHz: 20.9 MHz	Information only	-
Transmitter spurious emissions				
§2.1051 §2.1057 §90.1323	At the antenna terminals	-17.9 dBm	-13 dBm/MHz	Complies
	Radiated (eirp)	-46.8dBm		Complies
Receiver spurious emissions				
15.109	Field strength	Not applicable, note 2		
Other details				
§90.1319	Policies of use	Refer to operational description for details of the implementation.	Device must employ a contention-based protocol.	Complies
§2.1055 §90.213(a)	Frequency stability	7.1 ppm	To be specified in the station authorization	-
§1.1307(b) §2.1093 §90.1335	RF Exposure	Although RF exposure compliance is addressed at the time of licensing an MPE calculation has been provided to demonstrate compliance with limits at distances of 22cm or more from the antennas.		
§2.1033 (c) (8)	Final radio frequency amplifying circuit's dc voltages and currents for normal operation over the power range	4.5V, 300mA	Information only	-
-	Antenna Gain	This application is submitted for antennas of 23 dBi gain.		

Notes

1) The upper part of the allocated band from 3675 – 3700 MHz requires the device to use an unrestricted contention-based protocol. This system does not have such a protocol and so cannot use the upper portion of the band.
2) Receiver spurious emissions requirements only apply to devices that operate (tune) below 960MHz.

EXTREME CONDITIONS

Frequency stability is determined over extremes of temperature and voltage. The extremes of voltage were 85 to 115 percent of the nominal value.

The extremes of temperature were -30°C to +50°C as specified in FCC §2.1055(a)(1).

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 (based on a coverage factor (k=2) and were calculated in accordance with NAMAS document NIS 81 and M3003.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
RF frequency	Hz	25 to 7,000 MHz	1.7×10^{-7}
RF power, conducted	dBm	25 to 7,000 MHz	± 0.52 dB
Conducted emission of transmitter	dBm	25 to 40,000 MHz	± 0.7 dB
Conducted emission of receiver	dBm	25 to 40,000 MHz	± 0.7 dB
Radiated emission (substitution method)	dBm	25 to 40,000 MHz	± 2.5 dB
Radiated emission (field strength)	dBμV/m	25 to 1,000 MHz 1 to 40 GHz	± 3.6 dB ± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Ubiquiti Networks model PowerBridgeM365 is a Carrier Class 3.65GHz MIMO Bridging Station. Normally the EUT would be pole mounted. During testing the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 24V/1A POE.

The sample was received on March 5, 2011 and tested on March 5, 8, 11, 14 and 18, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Ubiquiti Networks	PowerBridge M365 PCB	MIMO Bridging Station	NA	SWX-M365P
Ubiquiti Networks	UBI-POE-24-1	PoE injector	NA	NA

OTHER EUT DETAILS

The antenna is integral to the device and has a gain of 23dBi.

ENCLOSURE

The EUT enclosure is primarily constructed of plastic. It measures approximately 45 cm wide by 42 cm deep by 3.5 cm high.

MODIFICATIONS

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

SUPPORT EQUIPMENT

No local support equipment was used during emissions testing.

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

Company	Model	Description	Serial Number	FCC ID
HP	G42	Laptop	-	-

EUT INTERFACE PORTS

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

Port		Cable(s)		
From	To	Description	Shielded/Unshielded	Length(m)
Ethernet	PoE injector	Cat 5	Unshielded	1
Ethernet (PoE injector)	Laptop	Cat 5	Unshielded	10
AC Power (PoE injector)	AC Mains	3 wire	Unshielded	0.5

Note: The USB port was not connected during testing. The manufacturer stated that this is for setup purposes, and therefore would not normally be connected.

EUT OPERATION

During emissions testing the EUT was transmitting at various frequencies, bandwidths & data rates.

TESTING

GENERAL INFORMATION

Antenna port measurements were taken at the Elliott Laboratories test site located at 41039 Boyce Road, Fremont, CA 94538-2435.

Radiated spurious emissions measurements were taken at the Elliott Laboratories Anechoic Chambers and/or Open Area Test Site(s) listed below. The sites conform to the requirements of ANSI C63.4: 2003 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are on file with the FCC and industry Canada.

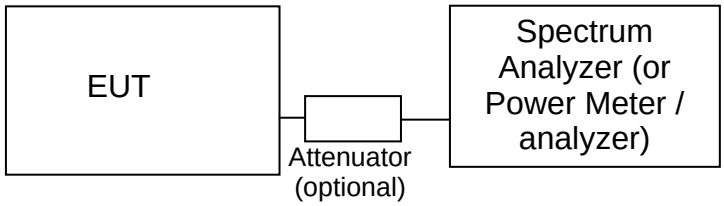
Site	Registration Numbers		Location
	FCC	Canada	
Chamber 3	769238	IC 2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 7	A2LA Accredited	IC 2845B-7	

In the case of Open Area Test Sites, ambient levels are at least 6 dB below the specification limits with the exception of predictable local TV, radio, and mobile communications traffic.

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

RF PORT MEASUREMENT PROCEDURES

Conducted measurements are performed with the EUT's rf input/output connected to the input of a spectrum analyzer, power meter or modulation analyzer. When required an attenuator, filter and/or dc block is placed between the EUT and the spectrum analyzer to avoid overloading the front end of the measurement device. Measurements are corrected for the insertion loss of the attenuators and cables inserted between the rf port of the EUT and the measurement equipment.



Test Configuration for Antenna Port Measurements

For devices with an integral antenna the output power and spurious emissions are measured as a field strength at a test distance of (typically) 3m and then converted to an eirp using a substitution measurement (refer to RADIATED EMISSIONS MEASUREMENTS). All other measurements are made as detailed below but with the test equipment connected to a measurement antenna directed at the EUT.

OUTPUT POWER

Output power is measured using a power meter and an average sensor head, a spectrum analyzer or a power meter and peak power sensor head as required by the relevant rule part(s). Where necessary measurements are gated to ensure power is only measured over periods that the device is transmitting.

Power measurements made directly on the rf power port are, when appropriate, converted to an EIRP by adding the gain of the highest gain antenna that can be used with the device under test, as specified by the manufacturer.

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. The measurement bandwidth is set to be at least 1% of the instrument's frequency span.

CONDUCTED SPURIOUS EMISSIONS

Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode measurements). Where the limits are expressed as an average power the spectrum analyzer is tunes to that frequency with a narrow span (wide enough to capture the emission and its sidebands) and the resolution and video bandwidths are adjusted as required by the reference measurement standards. For transmitter measurements the appropriate detector (average, peak, normal ,sample, quasi-peak) is used when making measurements for licensed devices. For receiver conducted spurious measurements the detector is set to peak.

TRANSMITTER MASK MEASUREMENTS

The transmitter mask measurements are made using resolution bandwidths as specified in the pertinent rule part(s). Where narrower bandwidths are used the measurement is corrected to account for the reduced bandwidth by either using the adjacent channel power function of the spectrum analyzer to sum the power across the required measurement bandwidth. The frequency span of the analyzer is set to ensure the fundamental signal and all significant sidebands are displayed.

The top of the mask may be set by the total output power of the signal, the power of the unmodulated signal or the peak value of the signal in the reference bandwidth being used for the mask measurement.

FREQUENCY STABILITY

The EUT is placed inside a temperature chamber with all support and test equipment located outside of the chamber. The temperature is varied across the specified frequency range in 10 degree increments with frequency measurements made at each temperature step. The EUT is allowed enough time to stabilize at each temperature variation.

The spectrum analyzer is configured to give a 5- or 6-digit display for the marker-frequency function. The spectrum analyzer's built-in frequency counter is used to measure the maximum deviation of the fundamental frequency at each temperature. Where possible the device is set to transmit an unmodulated signal. Where this is not possible the frequency drift is determined by finding a stable point on the signal (e.g. the null at the centre of an OFDM signal) or by calculating a centre frequency based on the upper and lower XdB points (where X is typically 6dB or 10dB) on the signal's skirts.

TRANSIENT FREQUENCY BEHAVIOR:

The TIA/EIA 603 procedure is used to determine compliance with transient frequency timing requirements as the radio is keyed on and off.

The EUTs rf output is connected via a combiner/splitter to the test receiver/spectrum analyzer and to a diode detector. The test receiver or spectrum analyzer video output is connected to an oscilloscope, which is triggered by the output from the diode detector.

Plots showing Ton, T1, and T2 are made when turning on the transmitter and showing T3 when turning off the transmitter.

RADIATED EMISSIONS MEASUREMENTS

Receiver radiated spurious emissions measurements are made in accordance with ANSI ANSI C63.4:2003 by measuring the field strength of the emissions from the device at a specific test distance and comparing them to a field strength limit. Where the field strength limit is specified at a longer distance than the measurement distance the measurement is extrapolated to the limit distance.

Transmitter radiated spurious emissions are initially measured as a field strength. The eirp or erp limit as specified in the relevant rule part(s) is converted to a field strength at the test distance and the emissions from the EUT are then compared to that limit. Emissions within 20dB of this limit are the subjected to a substitution measurement.

All radiated emissions measurements are performed in two phases. A preliminary scan of emissions is conducted in either an anechoic chamber or on an OATS during which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed across the complete frequency range of interest and at each operating frequency identified in the reference standard. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. Initial scans are made using a peak detector (RBW=VBW) and using scan rates to ensure that the EUT transmits before the sweep moves out of each resolution bandwidth (for transmit mode).

During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. For transmitter spurious emissions, where the limit is expressed as an effective radiated power, the eirp or erp is converted to a field strength limit.

Final measurements are made on an OATS or in a semi-anechoic chamber at the significant frequencies observed during the preliminary scan(s) using the same process of rotating the EUT and raising/lowering the measurement antenna to find the highest level of the emission. The field strength is recorded and, for receiver spurious emissions, compared to the field strength limit. For the final measurement the appropriate detectors (average, peak, normal, sample, quasi-peak) are used. For receiver measurements below 1GHz the detector is a Quasi-Peak detector, above 1GHz a peak detector is used and the peak value (RB=VB=1MHz) and average value (RB=1MHz, VB=10Hz) are recorded.

For transmitter spurious emissions, the radiated power of all emissions within 20dB of the calculated field strength limit are determined using a substitution measurement. The substitution measurement is made by replacing the EUT with an antenna of known gain (typically a dipole antenna or a double-ridged horn antenna), connected to a signal source. The output power of the signal generator is adjusted until the maximum field strength from the substitution antenna is similar to the field strength recorded from the EUT. The erp of the EUT is then calculated.

INSTRUMENTATION

An EMI receiver as specified in CISPR 16-1-1 is used for radiated emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7000 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.

For measurements above the frequency range of the receivers and for all conducted measurements a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis.

Measurement bandwidths for the test instruments are set in accordance with the requirements of the standards referenced in this document.

Software control is used to correct the measurements for transducer factors (e.g. antenna) and the insertion loss of cables, attenuators and other series elements to obtain the final measurement value. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are exported in a graphic and/or tabular format, as appropriate.

FILTERS/ATTENUATORS

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

ANTENNAS

A combination of biconical, log periodic or bi-log antennas are used to cover the range from 30 MHz to 1000 MHz. Broadband antennas or tuned dipole antennas are used over the entire 25 to 1000 MHz frequency range as the reference antenna for substitution measurements.

Above 1000 MHz, a dual-ridge guide horn antenna or octave horn antenna are used as reference and measurement antennas.

The antenna calibration factors are included in site factors that are programmed into the test receivers and instrument control software when measuring the radiated field strength.

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.

Table mounted devices are placed on a non-conductive table at a height of 80 centimeters above the floor. Floor mounted equipment is 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. The EUT is positioned on a motorized turntable to allow it to be rotated during testing to determine the angel with the highest level of emissions.

SAMPLE CALCULATIONS

SAMPLE CALCULATIONS - CONDUCTED SPURIOUS EMISSIONS

Measurements are compared directly to the conducted emissions specification limit (decibel form). The calculation is as follows:

$$R_r - S = M$$

where:

R_r = Measured value in dBm
S = Specification Limit in dBm
M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH

Measurements of radiated field strength are compared directly to the specification limit (decibel form). The receiver and/or control software 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 is sued when measurements are made at a test distance that is different to the specified limit distance 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:

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

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 –RADIATED POWER

The erp/eirp limits for transmitter spurious measurements are converted to a field strength in free space using the following formula:

$$E = \frac{\sqrt{30\ P\ G}}{d}$$

where:

E = Field Strength in V/m
P = Power in Watts
G = Gain of isotropic antenna (numeric gain) = 1
D = measurement distance in meters

The field strength limit is then converted to decibel form (dBuV/m) and the margin of a given emission peak relative to the limit is calculated (refer to *SAMPLE CALCULATIONS –RADIATED FIELD STRENGTH*).

When substitution measurements are required (all signals with less than 20dB of margin relative to the calculated field strength limit) the eirp of the spurious emission is calculated using:

$$P_{EUT} = P_S - (E_S - E_{EUT})$$

and

$$P_S = G + P_{in}$$

where:

P_S = effective isotropic radiated power of the substitution antenna (dBm)
P_{in} = power input to the substitution antenna (dBm)
G = gain of the substitution antenna (dBi)
E_S = field strength the substitution antenna (dBm) at eirp P_S
E_{EUT} = field strength measured from the EUT

Where necessary the effective isotropic radiated power is converted to effective radiated power by subtracting the gain of a dipole (2.2dBi) from the eirp value.

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

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

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

Appendix A Test Equipment Calibration Data

Radiated Emissions, 30 - 2,000 MHz, 05-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	11/2/2011
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	6/22/2012
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1632	4/23/2011
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
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2197	12/29/2011

Conducted Emissions - AC Power Ports, 05-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	LISN, 10 kHz-100 MHz	3825/2	1293	3/12/2011
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	11/2/2011
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	5/27/2011

Radio Antenna Port (Power and Spurious Emissions), 08-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	7/12/2011

Radio Antenna Port (Power and Spurious Emissions), 11-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, 30 - 18,000 MHz, 11-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12/8/2011
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/2/2012
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	7/12/2011
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	11/22/2011
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	6/24/2012
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103A	2359	2/15/2012

Radiated Emissions, 30 - 37,000 MHz, 14-Mar-11

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	5/26/2011
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	4/14/2011
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	6/22/2012
A.H. Systems	Red System Horn, 18-40GHz	SAS-574, p/n: 2581	2161	3/5/2011

Frequency Stability, 18-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
Thermotron	Temp Chamber (w/ F4 Watlow Controller)	S1.2	2170	7/1/2011

Appendix B Test Data

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

RSS 197 and FCC Part 90
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 , 14/2011
Test Engineer: R. Varelas, M. Birgani, J. Cadigal
Test Location: Chamber #7

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

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 outside the chamber.

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

Ambient Conditions:

Temperature: 20-25 °C
Rel. Humidity: 30-40 %

Summary of Results

Run #	Mode	Channel	BW		Test Performed	Limit	Result / Margin
-	Data Rate 0	All	All		Radiated Emissions, 30 MHz-37GHz	FCC 90.210 Mask B	48.4dBµV/m @ 54.30MHz (-33.8dB)

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.

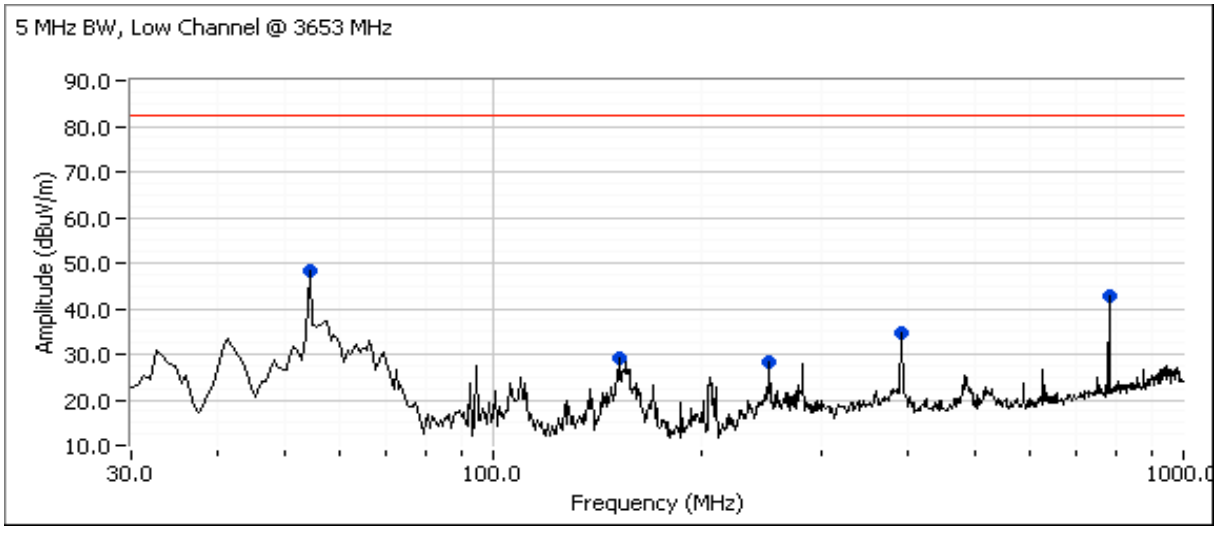
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 37000 MHz. Operating Mode: 5 MHz BW

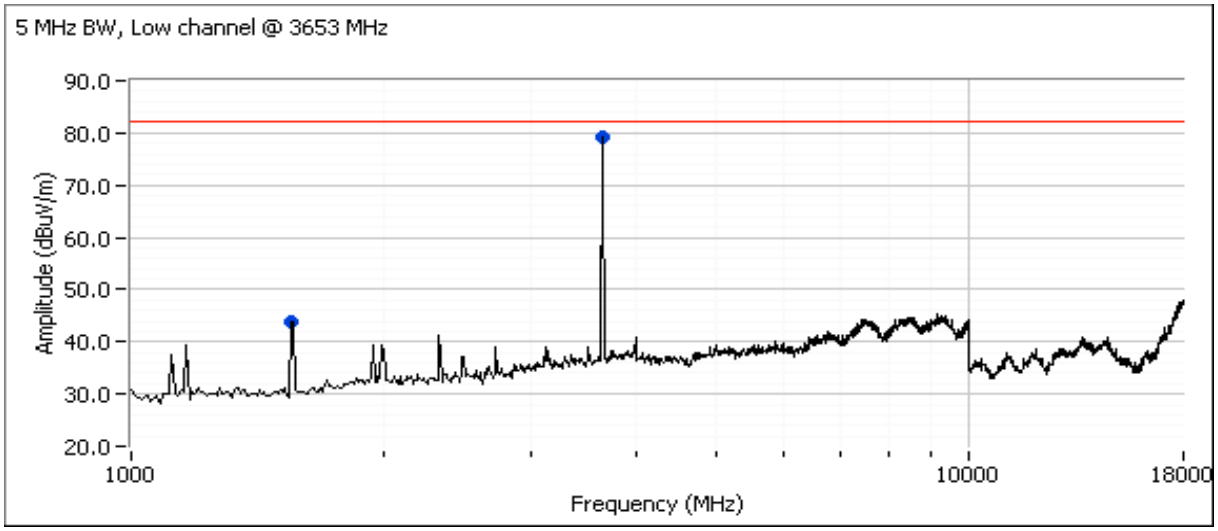
Frequency	Level	Pol	FCC 90.210		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
54.300	*48.4*	*V*	*82.2*	*-33.8*	*Peak*	*217*	*1.0*		*3653*
152.175	*29.0*	*H*	*82.2*	*-53.2*	*Peak*	*103*	*2.0*		*3653*
251.400	*28.5*	*H*	*82.2*	*-53.7*	*Peak*	*250*	*1.0*		*3653*
391.000	*34.7*	*V*	*82.2*	*-47.5*	*Peak*	*81*	*1.5*		*3653*
781.250	*42.8*	*V*	*82.2*	*-39.4*	*Peak*	*248*	*1.5*		*3653*
1550.000	*43.8*	*V*	*82.2*	*-38.4*	*Peak*	*126*	*1.0*		*3653*
3651.170	*79.2*	*H*	-	-	*Peak*	*87*	*1.6*	*Fundamental*	*3653*
1165.000	*42.7*	*V*	*82.2*	*-39.5*	*Peak*	*99*	*1.6*		*3662*
1559.170	*44.0*	*V*	*82.2*	*-38.2*	*Peak*	*114*	*1.6*		*3662*
3658.330	*78.7*	*H*	-	-	*Peak*	*48*	*1.0*	*Fundamental*	*3662*
1559.170	*43.0*	*V*	*82.2*	*-39.2*	*Peak*	*90*	*1.0*		*3672*
3667.500	*77.9*	*H*	-	-	*Peak*	*315*	*1.0*	*Fundamental*	*3672*

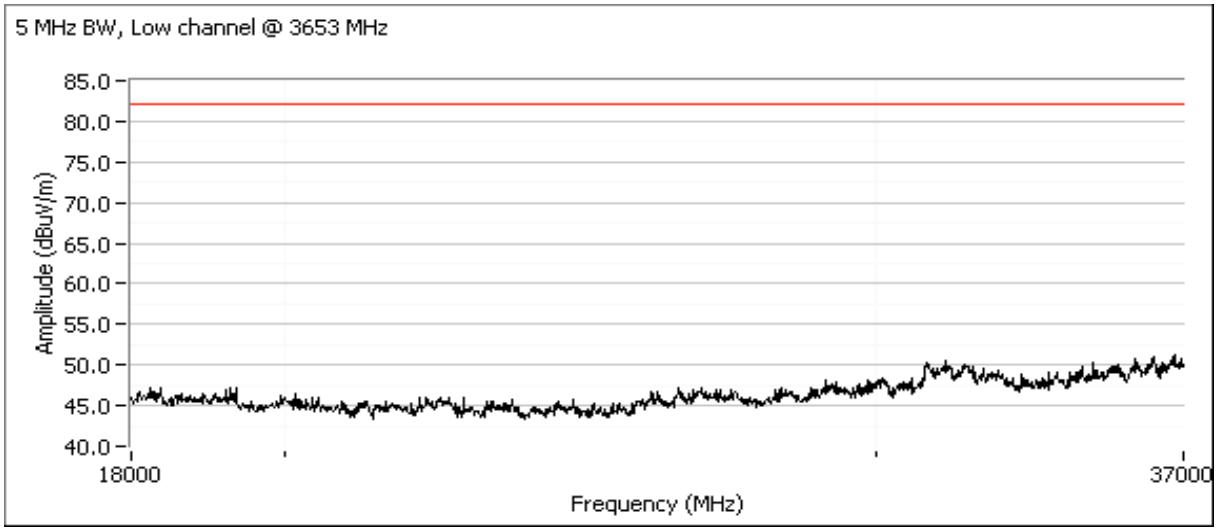
Note 1:	Based on the measurements at the 5MHz BW and 25MHz BW, 30-1000 MHz was not performed for this channel since changing BW and channel did not make any difference for radiated emissions.

Low Channel @ 3653.0 MHz



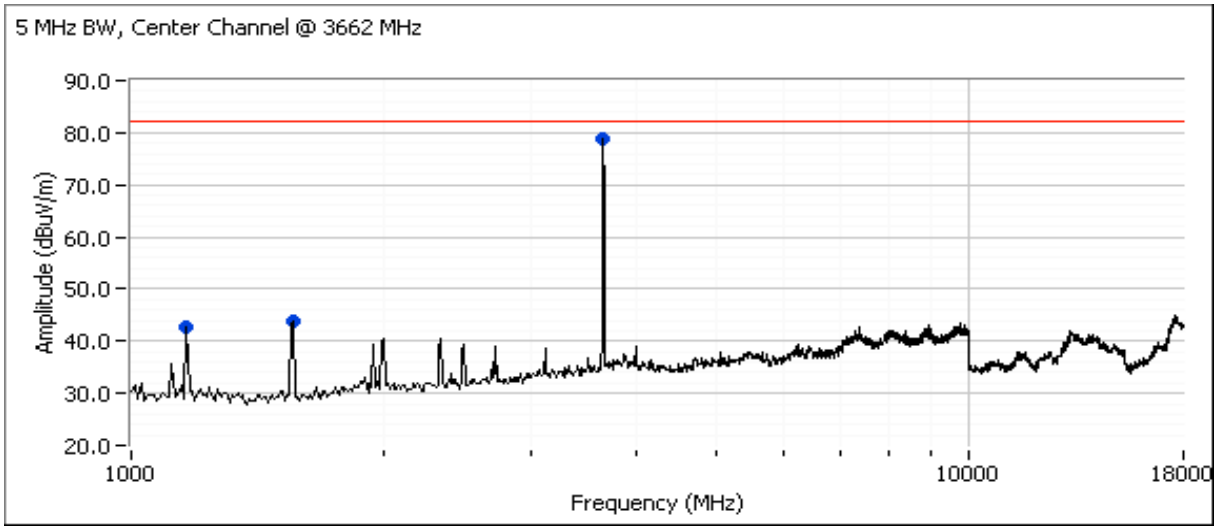
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

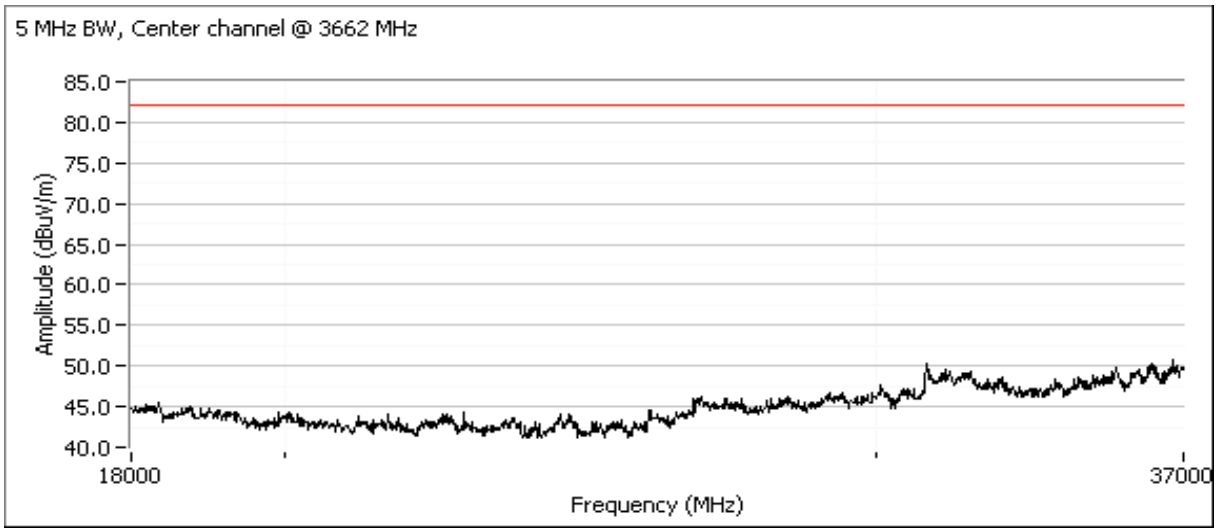




Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

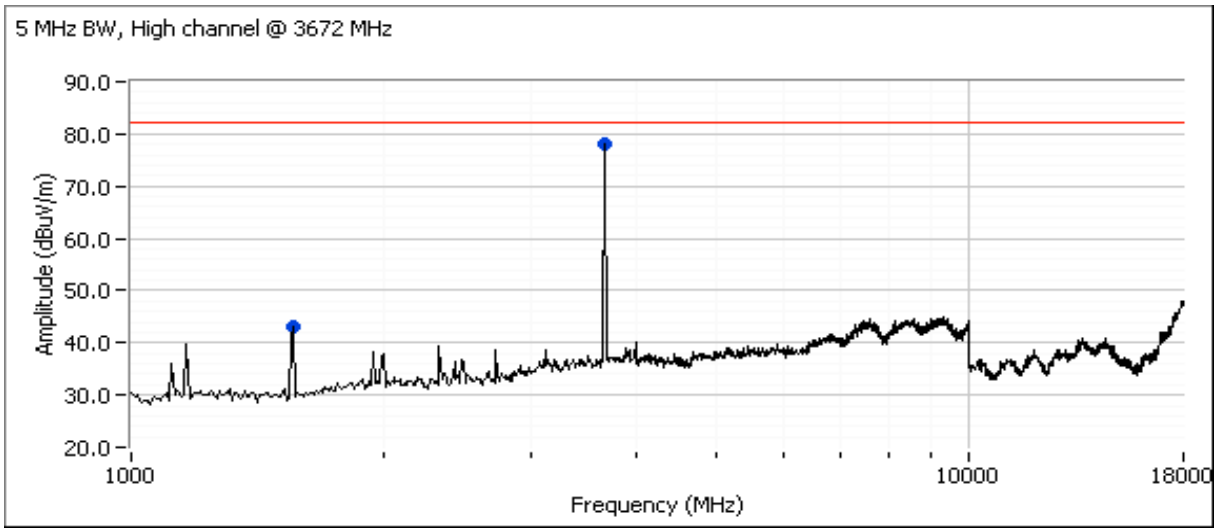
Center Channel @ 3662 MHz

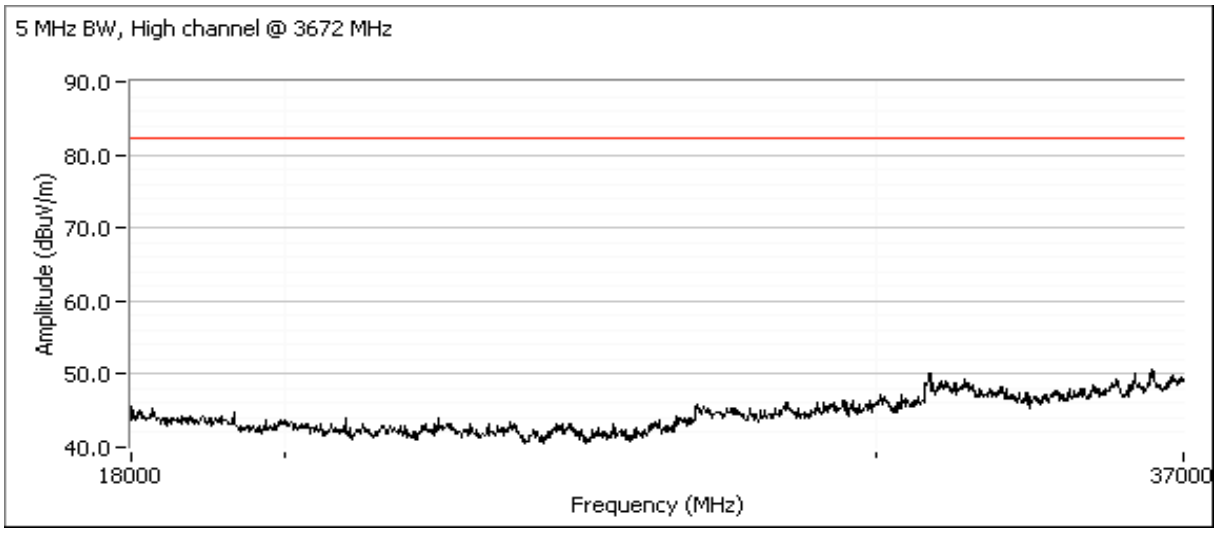




Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

High Channel @ 3672.0 MHz





Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

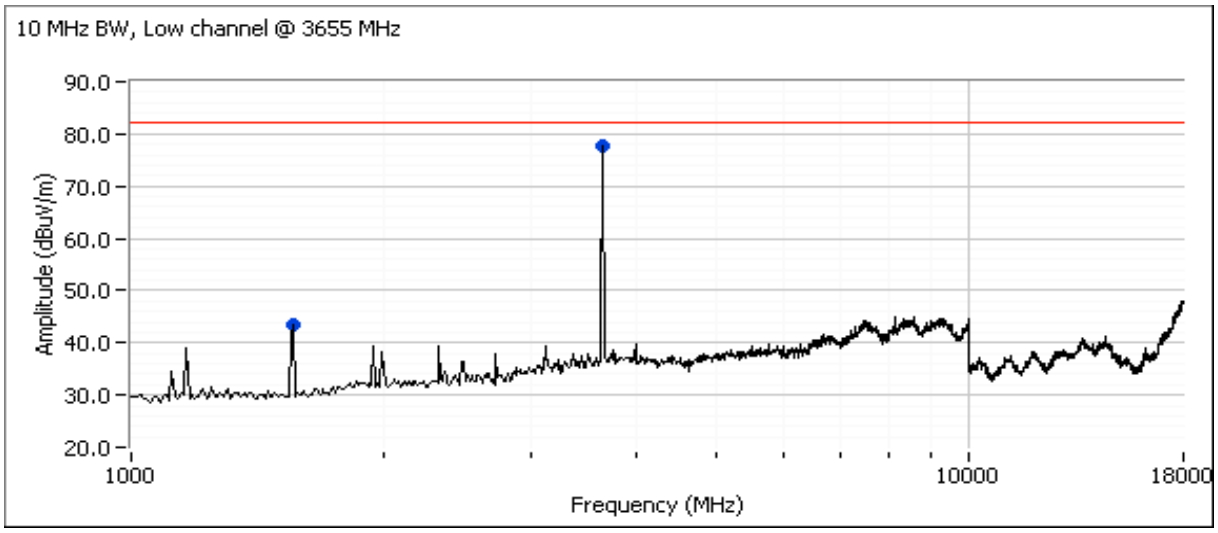
Run #2: Radiated Spurious Emissions, 30 - 37000 MHz. Operating Mode: 10 MHz BW

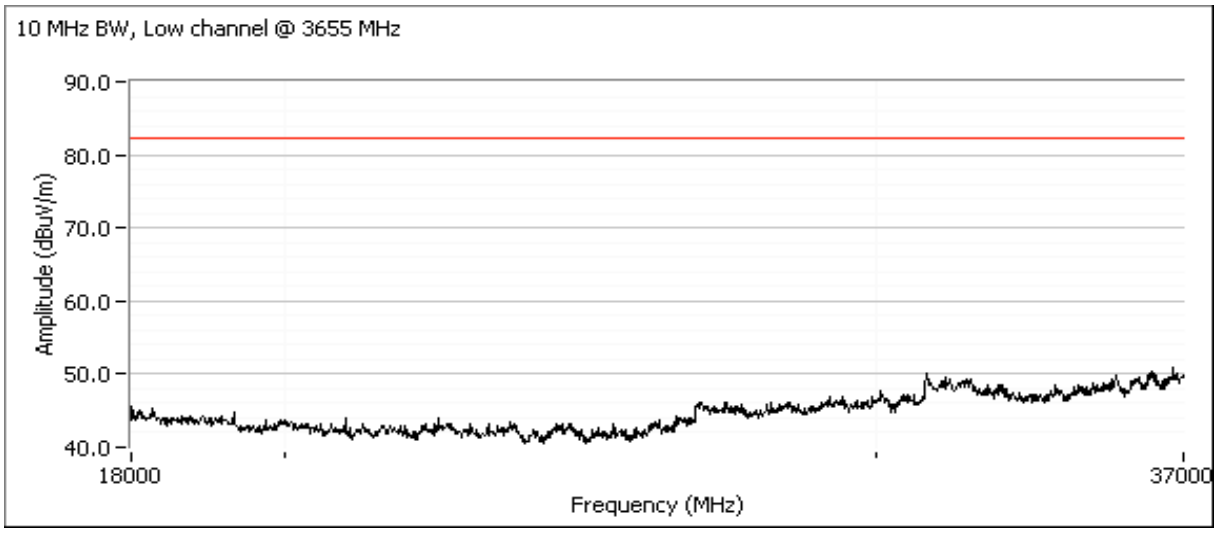
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
1559.170	*43.3*	*V*	*82.2*	*-38.9*	*Peak*	*83*	*1.0*		*3655*
3649.170	*77.7*	*H*	-	-	*Peak*	*65*	*1.0*	*Fundamental*	*3655*
1165.000	*42.9*	*V*	*82.2*	*-39.3*	*Peak*	*75*	*1.6*		*3662*
1559.170	*44.3*	*V*	*82.2*	*-37.9*	*Peak*	*94*	*1.6*		*3662*
3662.000	*78.7*	*H*	-	-	*Peak*	*53*	*1.0*	*Fundamental*	*3662*
1559.170	*43.0*	*V*	*82.2*	*-39.2*	*Peak*	*104*	*1.0*		*3670*
3667.500	*77.9*	*H*	-	-	*Peak*	*312*	*1.0*	*Fundamental*	*3670*

Note 1:	Based on the measurements at the 5MHz BW and 25MHz BW, 30-1000 MHz was not performed for this channel since changing BW and channel did not make any difference for radiated emissions.

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

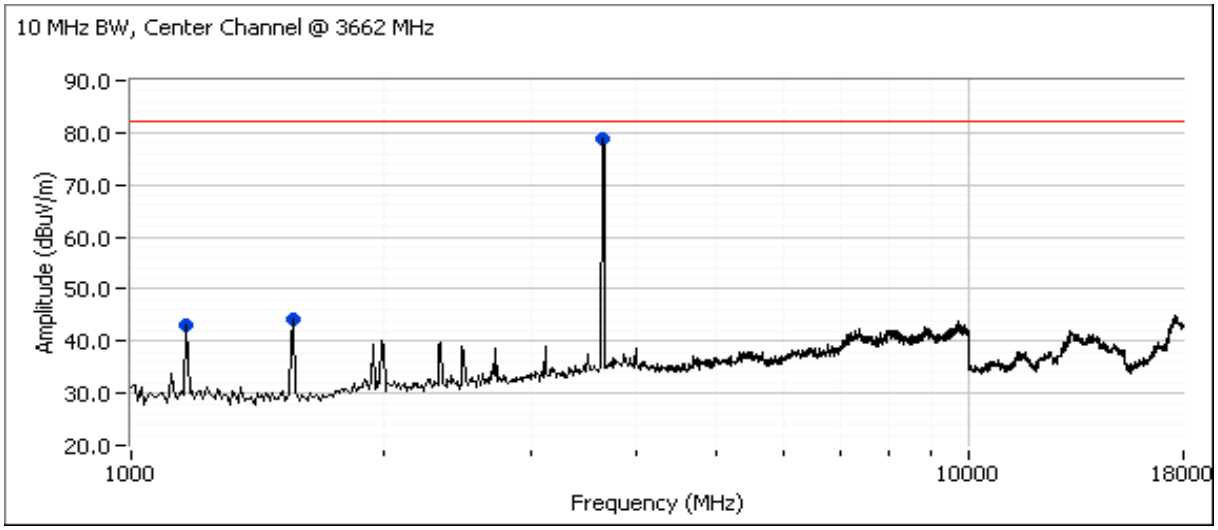
Low Channel @ 3655 MHz

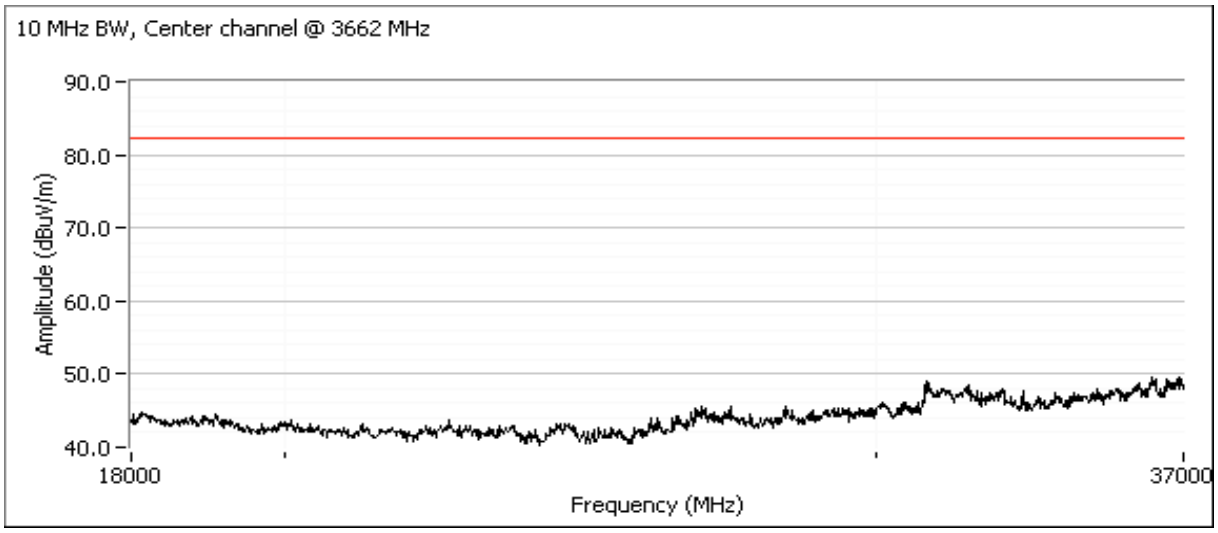




Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

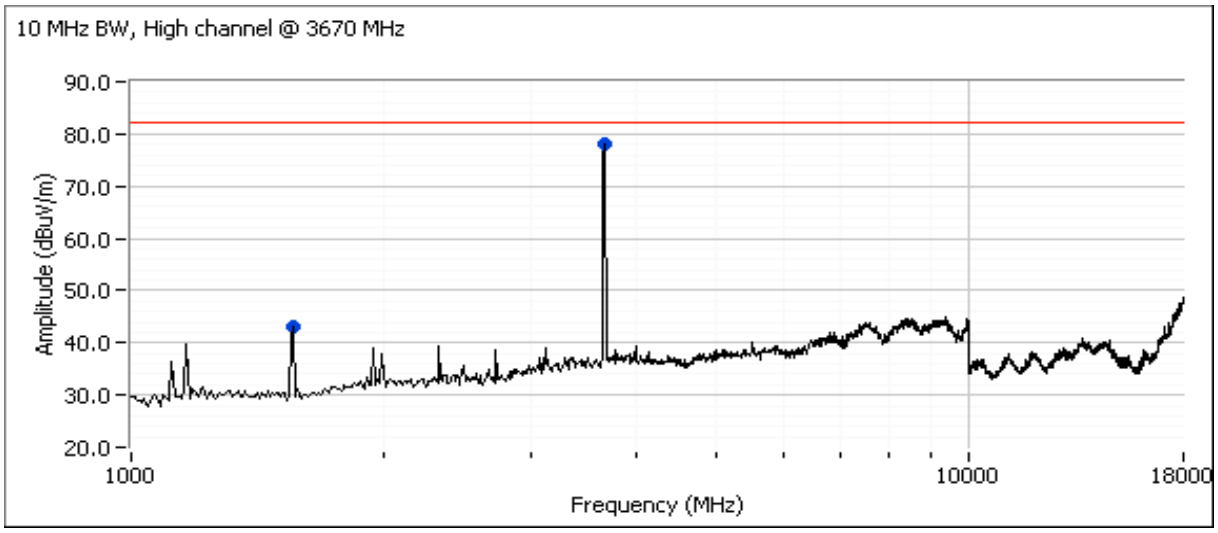
Center Channel @ 3662 MHz

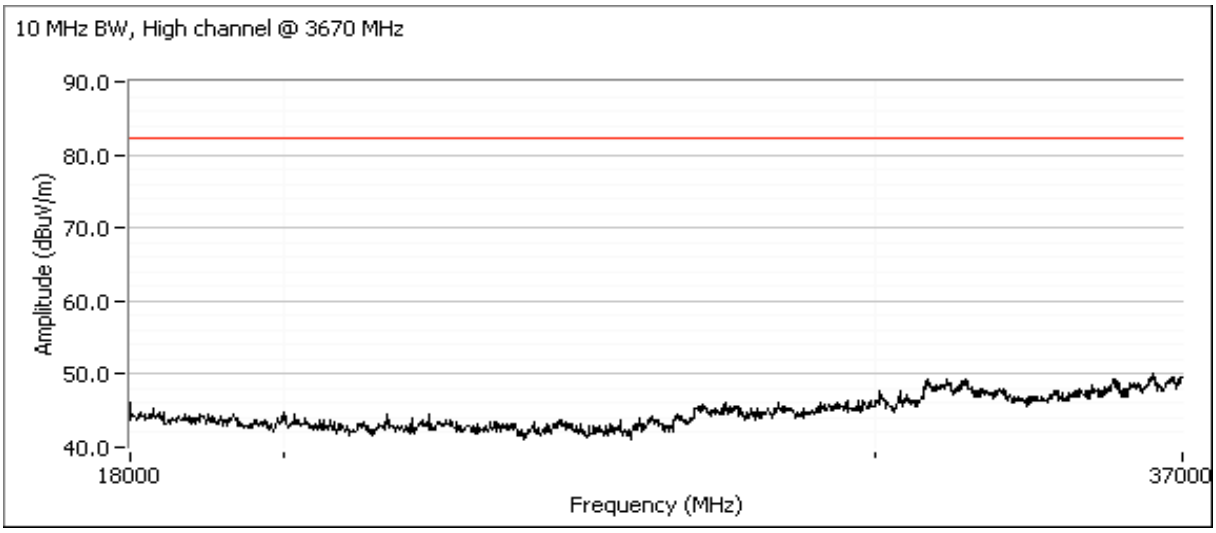




Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

High Channel @ 3670 MHz

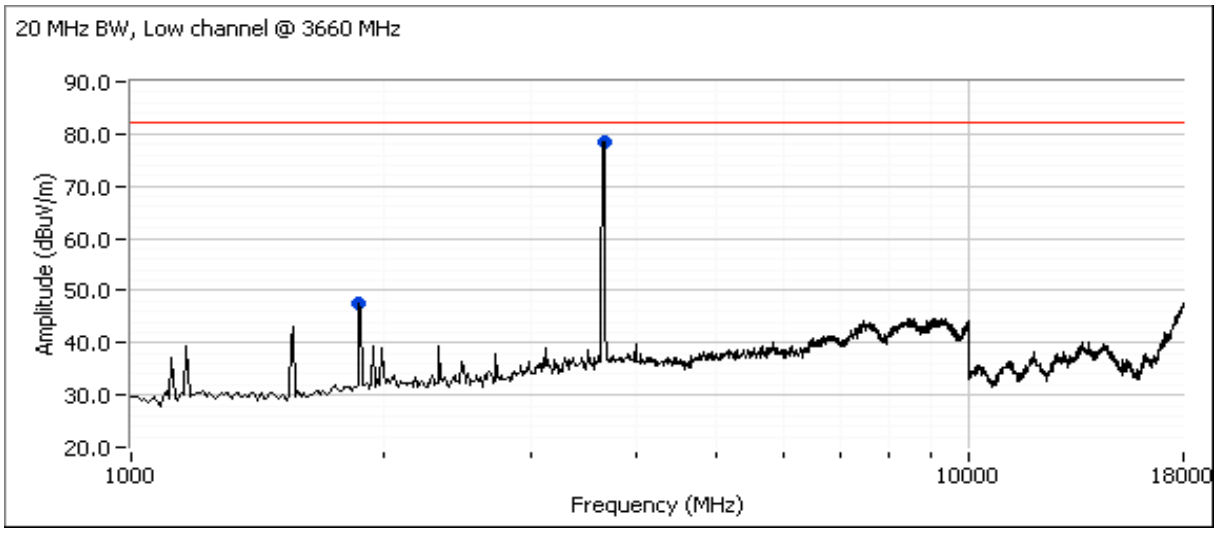


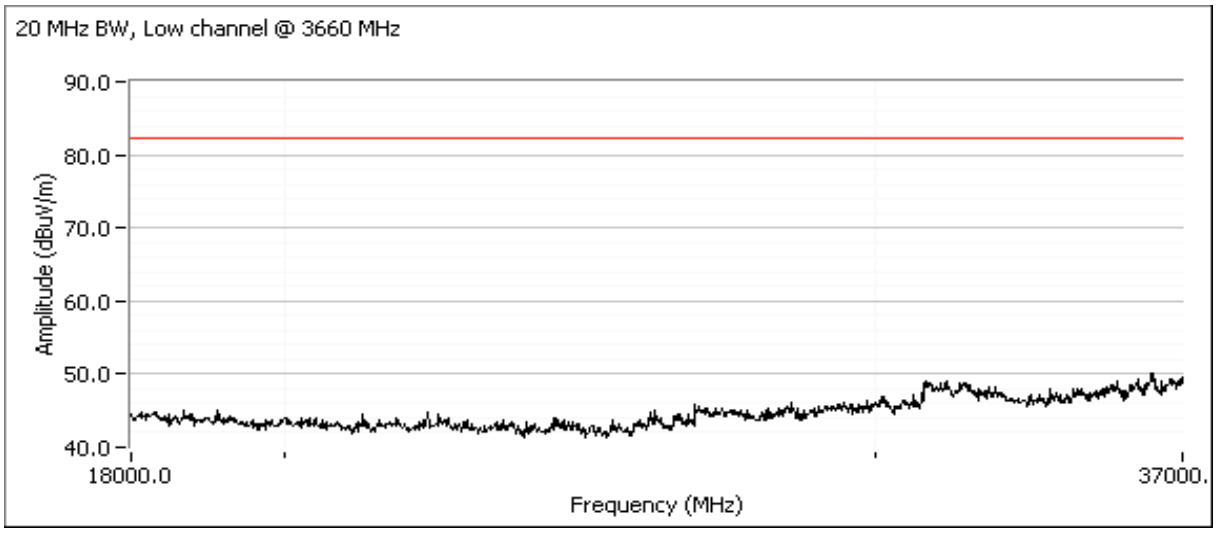


Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

Run #3: Radiated Spurious Emissions, 30 - 37000 MHz. Operating Mode: 20 MHz BW

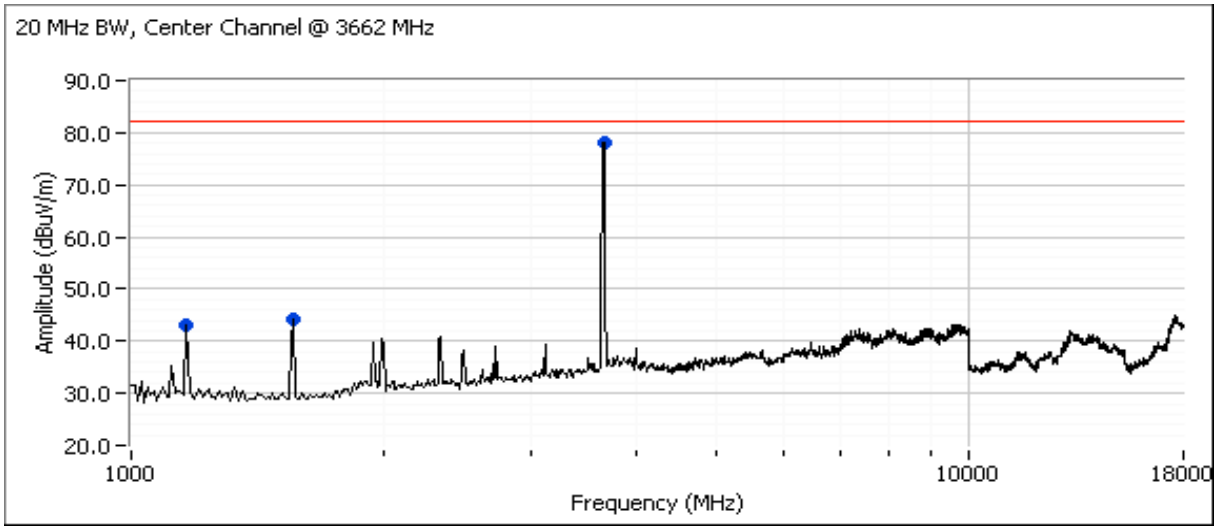
Low Channel @ 3660 MHz

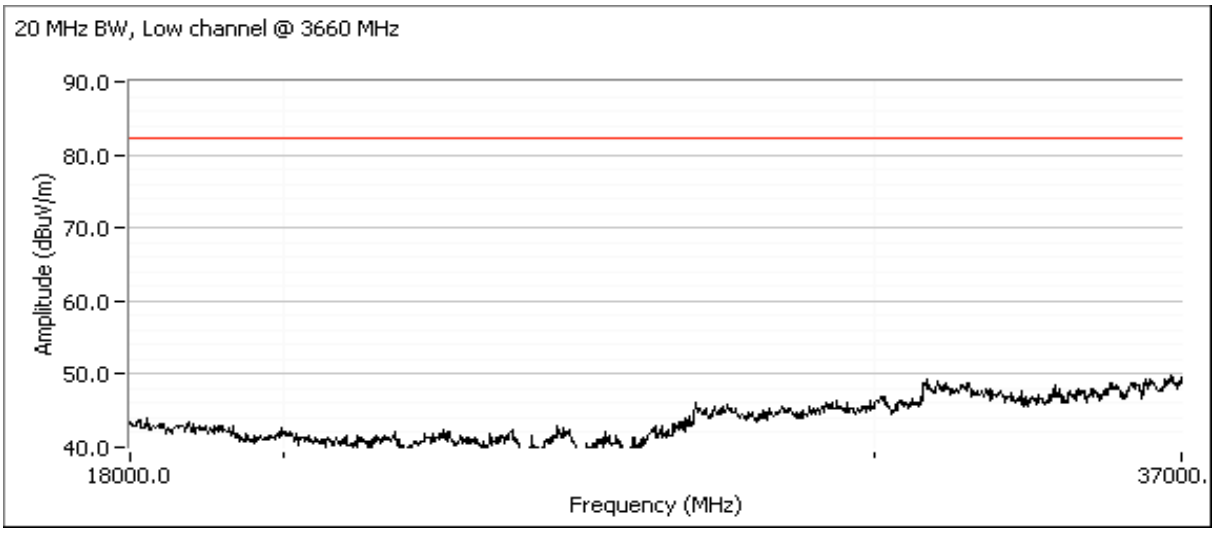




Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

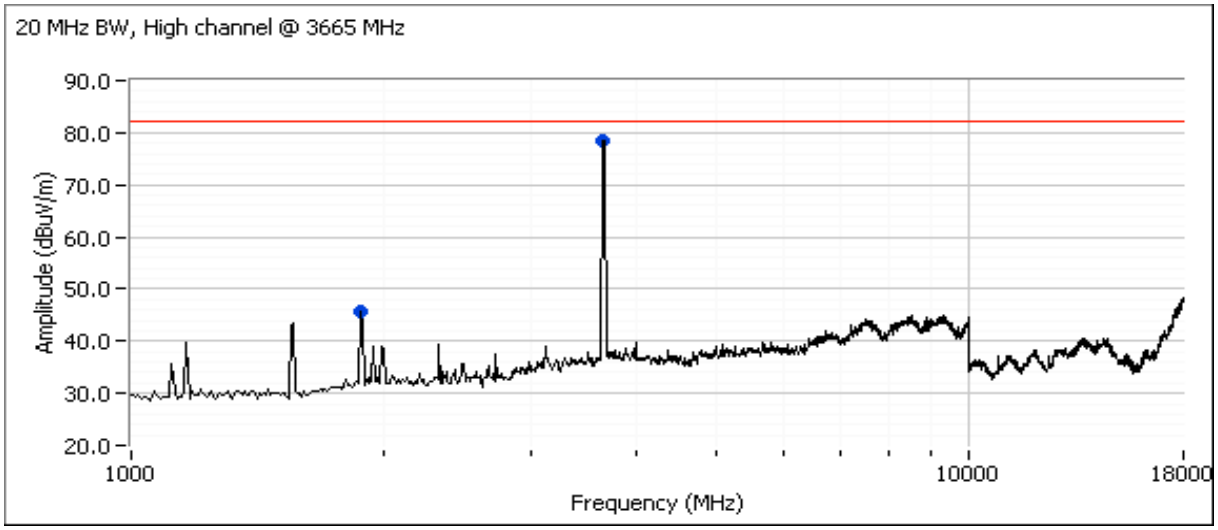
Center Channel @ 3662 MHz

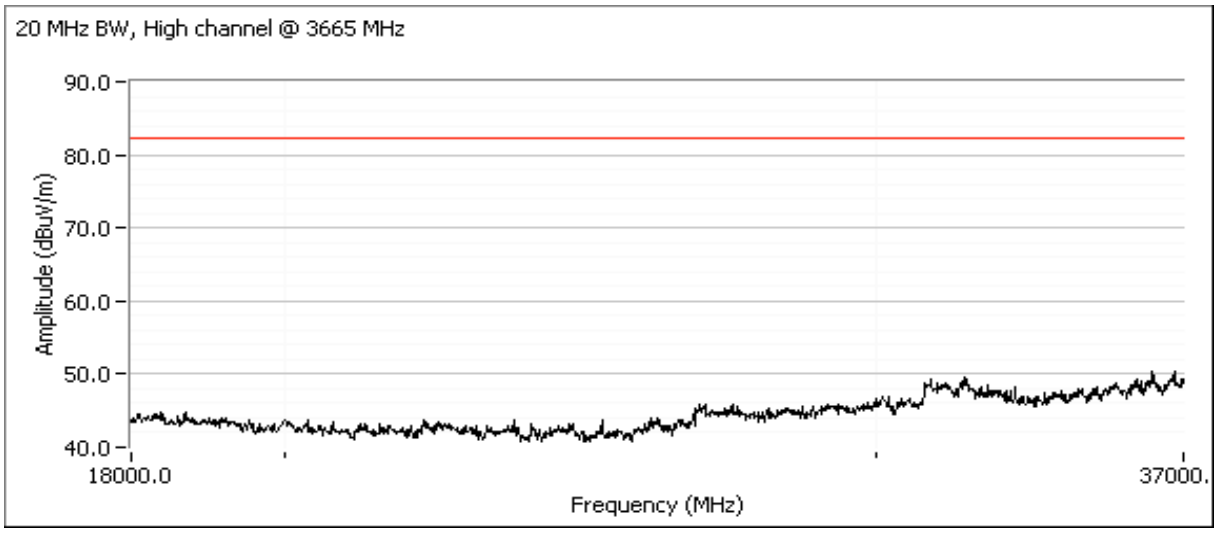




Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

High Channel @ 3665 MHz





Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

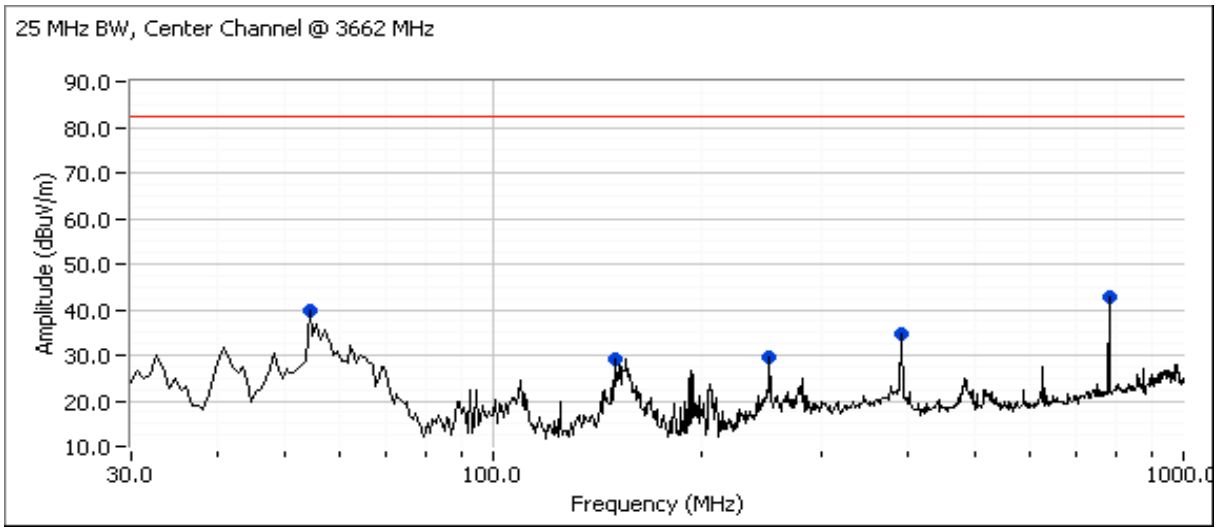
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
1870.830	*47.7*	*V*	*82.2*	*-34.5*	*Peak*	*46*	*2.5*		*3660*
3667.500	*78.4*	*H*	-	-	*Peak*	*325*	*1.0*	*Fundamental*	*3660*
1165.000	*42.9*	*V*	*82.2*	*-39.3*	*Peak*	*79*	*1.6*		*3662*
1559.170	*44.3*	*V*	*82.2*	*-37.9*	*Peak*	*67*	*1.6*		*3662*
3662.000	*78.1*	*H*	-	-	*Peak*	*64*	*1.0*	*Fundamental*	*3662*
1880.000	*45.7*	*V*	*82.2*	*-36.5*	*Peak*	*325*	*2.2*		*3665*
3658.330	*78.6*	*H*	-	-	*Peak*	*319*	*1.0*	*Fundamental*	*3665*

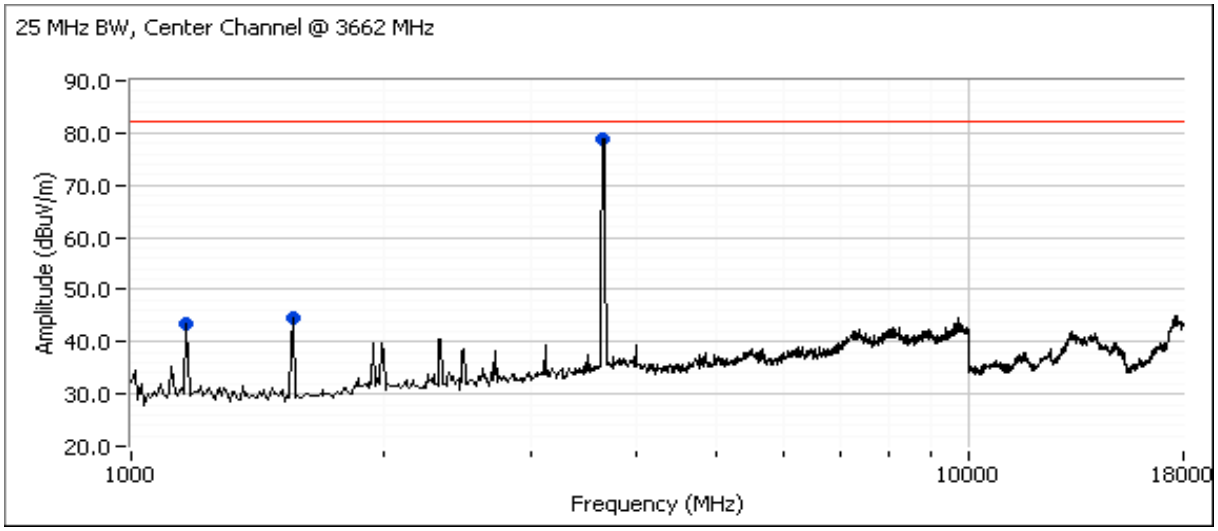
Note 1:	Based on the measurements at the 5MHz BW and 25MHz BW, 30-1000 MHz was not performed for this channel since changing BW and channel did not make any difference for radiated emissions.

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

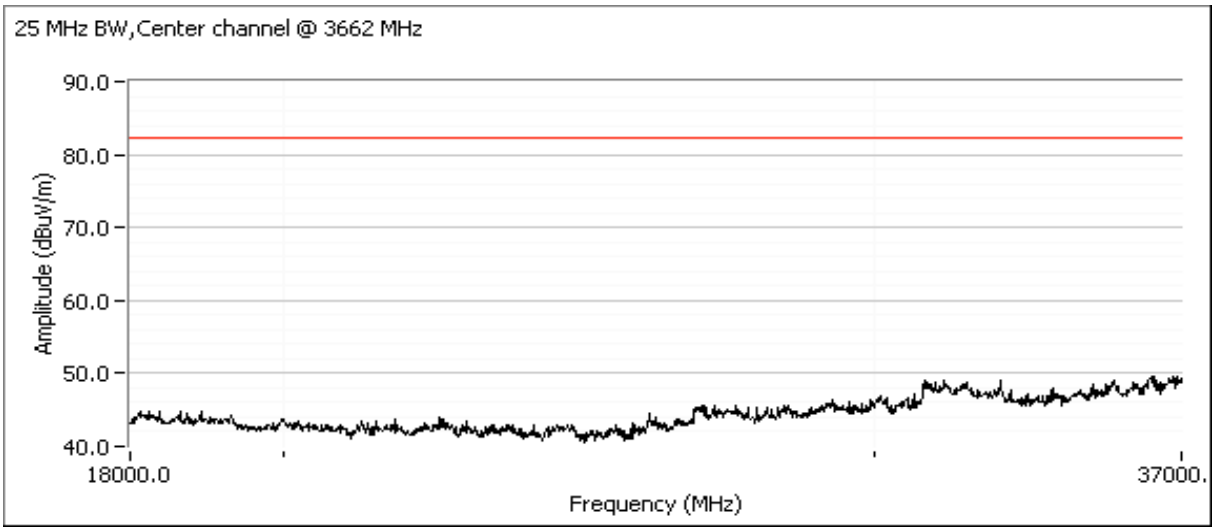
Run #4: Radiated Spurious Emissions, 30 - 37000 MHz. Operating Mode: 25 MHz BW

Center Channel @ 3662 MHz





Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
54.300	*39.8*	*V*	*82.2*	*-42.4*	*Peak*	*186*	*2.0*		*3662*
150.150	*29.3*	*H*	*82.2*	*-52.9*	*Peak*	*302*	*2.5*		*3662*
251.400	*29.6*	*H*	*82.2*	*-52.6*	*Peak*	*276*	*1.0*		*3662*
391.000	*34.7*	*V*	*82.2*	*-47.5*	*Peak*	*80*	*1.5*		*3662*
781.250	*42.6*	*V*	*82.2*	*-39.6*	*Peak*	*251*	*1.5*		*3662*
1165.000	*43.4*	*V*	*82.2*	*-38.8*	*Peak*	*100*	*1.6*		*3662*
1559.170	*44.5*	*V*	*82.2*	*-37.7*	*Peak*	*91*	*1.6*		*3662*
3662.000	*78.8*	*H*	*-*	*-*	*Peak*	*41*	*1.0*	*Fundamental*	*3662*

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

Run #5: Radiated Spurious Emissions, Transmit Mode: Substitution Measurements

Frequency	Level	Pol	FCC 90.210		Detector	Azimuth	Height	Comments	Channel
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters		
54.300	48.4	V	82.2	-33.8	Peak	217	1.0		3653

Horizontal & Vertical

Frequency	Substitution measurements			Site	EUT measurements			eirp Limit	erp Limit	Margin
MHz	Pin[1]	Gain[2]	FS[3]	Factor[4]	FS[5]	eirp (dBm)	erp (dBm)	dBm	dBm	dB
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters			
All signals were more than 20dB below the computed FS limit										

Note 1:	Pin is the input power (dBm) to the substitution antenna
Note 2:	Gain is the gain (dBi) for the substitution antenna. A dipole has a gain of 2.2dBi.
Note 3:	FS is the field strength (dBuV/m) measured from the substitution antenna.
Note 4:	Site Factor - this is the site factor to convert from a field strength in dBuV/m to an eirp in dBm.
Note 5:	EUT field strength as measured during initial run.

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

RSS-197 and FCC 90Z - 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: 3/5/2011
Test Engineer: Rafael Varelas
Test Location: FT Lab #4

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

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
2	Power	Part 90	Pass	5 MHz: 35.6dBm 10 MHz: 38.6dBm 20 MHz: 41.6dBm 25 MHz: 42.4dBm
2	PSD	1 Watt/MHz 90.1321(a)	Pass	5 MHz: 29.8dBm/MHz 10 MHz: 29.8dBm/MHz 20 MHz: 29.9dBm/MHz 25 MHz: 29.8dBm/MHz
2	99% Bandwidth	-	N/A	5 MHz: 4.2 MHz 10 MHz: 8.5 MHz 20 MHz: 16.8 MHz 25 MHz: 20.9 MHz
3	Antenna Conducted Out of Band Spurious	-13dBm/MHz	Pass	All emissions below the -13dBm/MHz limit

General Test Configuration

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

Ambient Conditions:

Temperature: 21.3 °C
Rel. Humidity: 37 %

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 Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

Run #1: Output Power and Power Spectral Density - MIMO Systems

Power

Frequency (MHz)	Software Setting[1]	Modulation	Measured Output Power[2] dBm			Total		Limit (dBm)	Max Power (W)	Pass or Fail
			Chain 1	Chain 2	Chain 3	mW	dBm			
5 MHz Mode										
3662	20	Data Rate 0	15.3	-5.5		34.2	15.3	-	-	-
3662	20	Data Rate 5	15.2	-5.6		33.4	15.2	-		-
3662	20	Data Rate10	14.7	-5.8		29.8	14.7	-		-

PSD

Frequency (MHz)	99%[4] BW	Modulation	PSD[3] dBm/MHz			Total PSD		Limit		Pass or Fail
			Chain 1	Chain 2	Chain 3	mW/MHz	dBm/MHz			
5 MHz Mode										
3662	-	Data Rate 0	8.2	4.1		9.2	9.6	-	-	-
3662	-	Data Rate 5	7.8	4.0		8.5	9.3	-	-	-
3662	-	Data Rate10	7.5	3.9		8.1	9.1	-	-	-

Note 1:	Power setting is the software setting used to set the output power.
Note 2:	Output power measured using RBW=100kHz VBW=300kHz , detector = rms, sweep time 10 seconds, max hold. The total power was integrated over the span (span > 2x channel bandwidth). Transmitted signal was not continuous but the analyzer was configured with a gated sweep such that the analyzer was only sweeping when the device was transmitting. The plot for the channel with the highest power is provided below.
Note 3:	The psd was measured using the following analyzer settings: RB=1MHz, VB=3MHz, detector = rms, sweep time 10 seconds, max hold. Multiple sweeps were made until the display had no new "peaks". The plot for the channel with the highest power is provided below.
Note 4:	99% Bandwidth measured in accordance with RSS GEN - RB > 1% of span and VB >=3xRB
Note 5:	For MIMO systems the total output power and total PSD are calculated form the sum of the powers of the individual chains (in linear terms).
Note 6:	Based on above results, Power and PSD for all types of modulations. Datarate 0 had highest PSD and Power values. Higher datgarates had lower PSD and Power values and thus all other BW mode testing was performed using the lowest data rate.

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

Run #2: Bandwidth, Output Power and Power Spectral Density - MIMO Systems

Limits from 90.321(a): Base and fixed stations are limited to 25 watts/25 MHz equivalent isotropically radiated power (EIRP). In any event, the peak EIRP power density shall not exceed 1 Watt in any one-megahertz slice of spectrum (30dBm/MHz).

	Chain 1	Chain 2	Chain 3	Coherent	Effective[5]	EIRP (mW)	EIRP (dBm)
Antenna Gain (dBi):	20	20		Yes	23.0	17576.5	42.4

Power - Limit accounts for maximum antenna gain at this power setting.

Frequency (MHz)	Software Setting[1]	Modulation	Measured Output Power[2] dBm			Total		EIRP	Limit (eirp)	Pass or Fail
			Chain 1	Chain 2	Chain 3	mW	dBm	dBm	dBm	
5 MHz Mode										
3653	10,17	Data Rate 0	9.2	10.0		18.3	12.6	35.6	44.0	PASS
3662	11,16	Data Rate 0	9.8	9.4		18.3	12.6	35.6	44.0	PASS
3672	11,16	Data Rate 0	9.6	9.6		18.2	12.6	35.6	44.0	PASS
10 MHz Mode										
3655	15,23	Data Rate 0	12.2	12.5		34.4	15.4	38.4	44.0	PASS
3662	15,23	Data Rate 0	12.6	12.5		36.0	15.6	38.6	44.0	PASS
3670	16,22	Data Rate 0	12.6	12.1		34.4	15.4	38.4	44.0	PASS
20 MHz Mode										
3660	23,29	Data Rate 0	15.4	15.8		72.7	18.6	41.6	44.0	PASS
3662	22,28	Data Rate 0	15.1	15.2		65.5	18.2	41.2	44.0	PASS
3665	22,29	Data Rate 0	15.0	15.7		68.8	18.4	41.4	44.0	PASS
25 MHz Mode										
3662	24,31	Data Rate 0	15.9	16.9		87.9	19.4	42.4	44.0	PASS

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

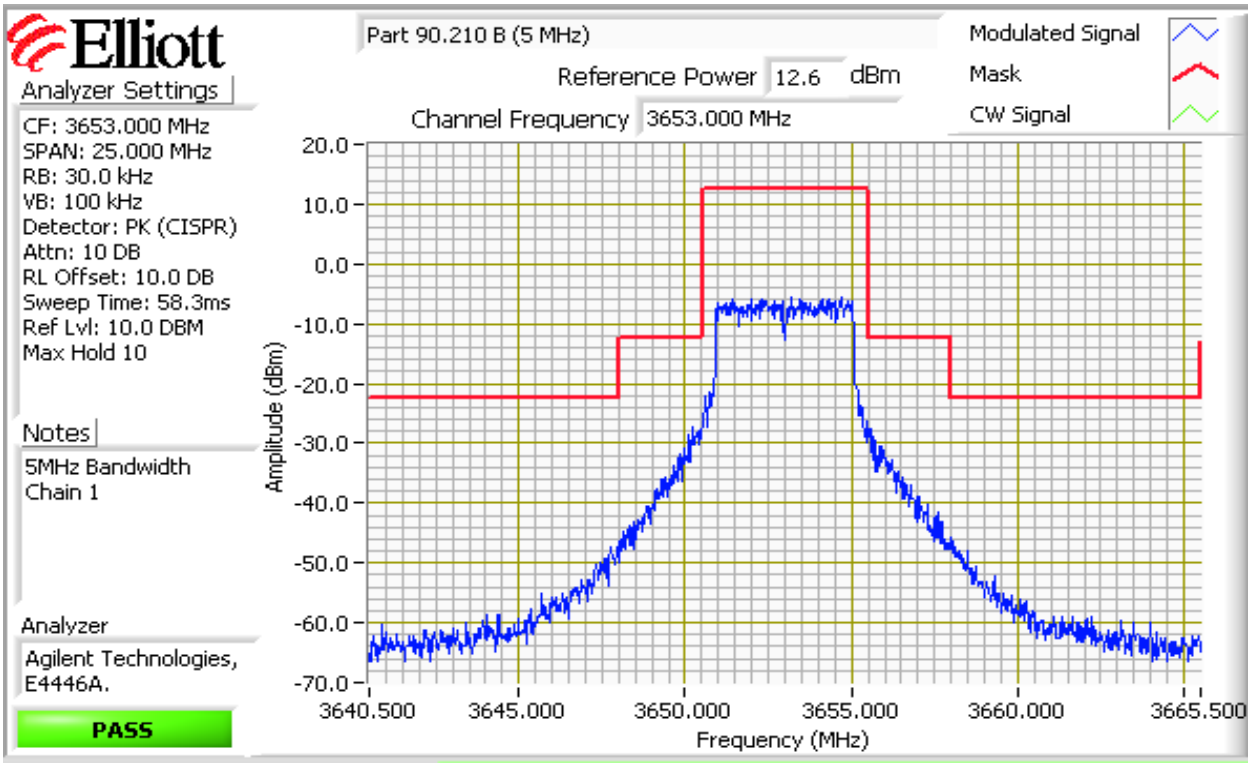
PSD

Frequency (MHz)	99%[4] BW	Modulation	PSD[2] dBm/MHz			Total PSD		PSD EIRP	Limit (eirp)	Pass or Fail
			Chain 1	Chain 2	Chain 3	mW/MHz	dBm/MHz	dBm/MHz	dBm/MHz	
5 MHz Mode										
3653	4.2	Data Rate 0	3.3	4.0		4.6	6.7	29.7	30.0	PASS
3662	4.2	Data Rate 0	3.9	3.7		4.8	6.8	29.8	30.0	PASS
3672	4.2	Data Rate 0	3.8	3.5		4.6	6.7	29.7	30.0	PASS
10 MHz Mode										
3655	8.5	Data Rate 0	3.7	3.8		4.7	6.8	29.8	30.0	PASS
3662	8.5	Data Rate 0	4.0	3.7		4.8	6.8	29.8	30.0	PASS
3670	8.5	Data Rate 0	3.9	3.6		4.7	6.8	29.8	30.0	PASS
20 MHz Mode										
3660	16.8	Data Rate 0	3.8	4.0		4.9	6.9	29.9	30.0	PASS
3662	16.8	Data Rate 0	3.7	3.7		4.7	6.7	29.7	30.0	PASS
3665	16.8	Data Rate 0	3.5	4.0		4.8	6.8	29.8	30.0	PASS
25 MHz Mode										
3662	20.9	Data Rate 0	3.5	4.1		4.8	6.8	29.8	30.0	PASS

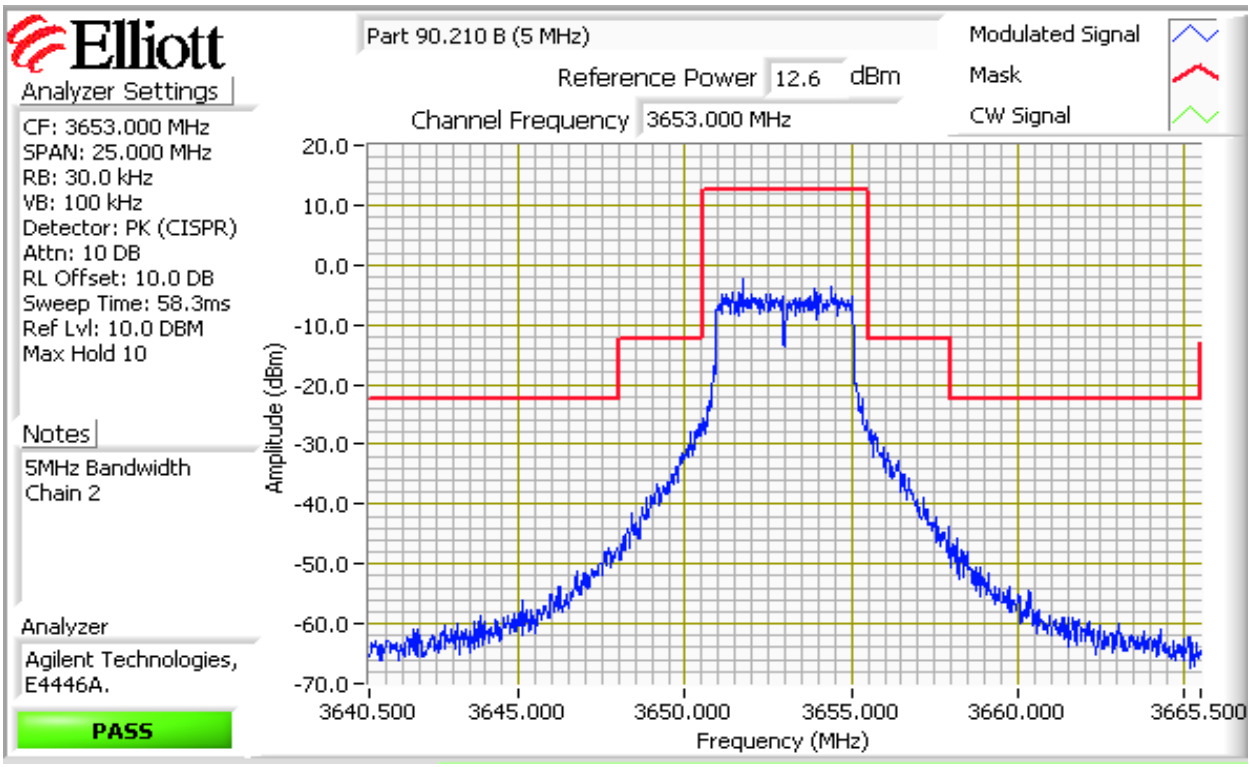
Note 1:	Power setting is the software setting used to set the output power.
Note 2:	Output power measured using RBW=100kHz VBW=300kHz , detector = rms, sweep time 10 seconds, max hold. The total power was integrated over the span (span > 2x channel bandwidth). Transmitted signal was not continuous but the analyzer was configured with a gated sweep such that the analyzer was only sweeping when the device was transmitting. The plot for the channel with the highest power is provided below.
Note 3:	The psd was measured using the following analyzer settings: RB=1MHz, VB=3MHz, detector = rms, sweep time 10 seconds, max hold. Multiple sweeps were made until the display had no new "peaks". The plot for the channel with the highest power is provided below.
Note 4:	99% Bandwidth measured in accordance with RSS GEN - RB > 1% of span and VB >=3xRB
Note 5:	For MIMO systems the total output power and total PSD are calculated form the sum of the powers of the individual chains (in linear terms). The antenna gain used to determine the EIRP and limits for PSD/Output power depends on the operating mode of the MIMO device. If the signals on the non-coherent between the transmit chains then the gain used to determine the limits is the highest gain of the individual chains and the EIRP is the sum of the products of gain and power on each chain. If the signals are coherent then the effective antenna gain is the sum (in linear terms) of the gains for each chain and the EIRP is the product of the effective gain and total power.

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

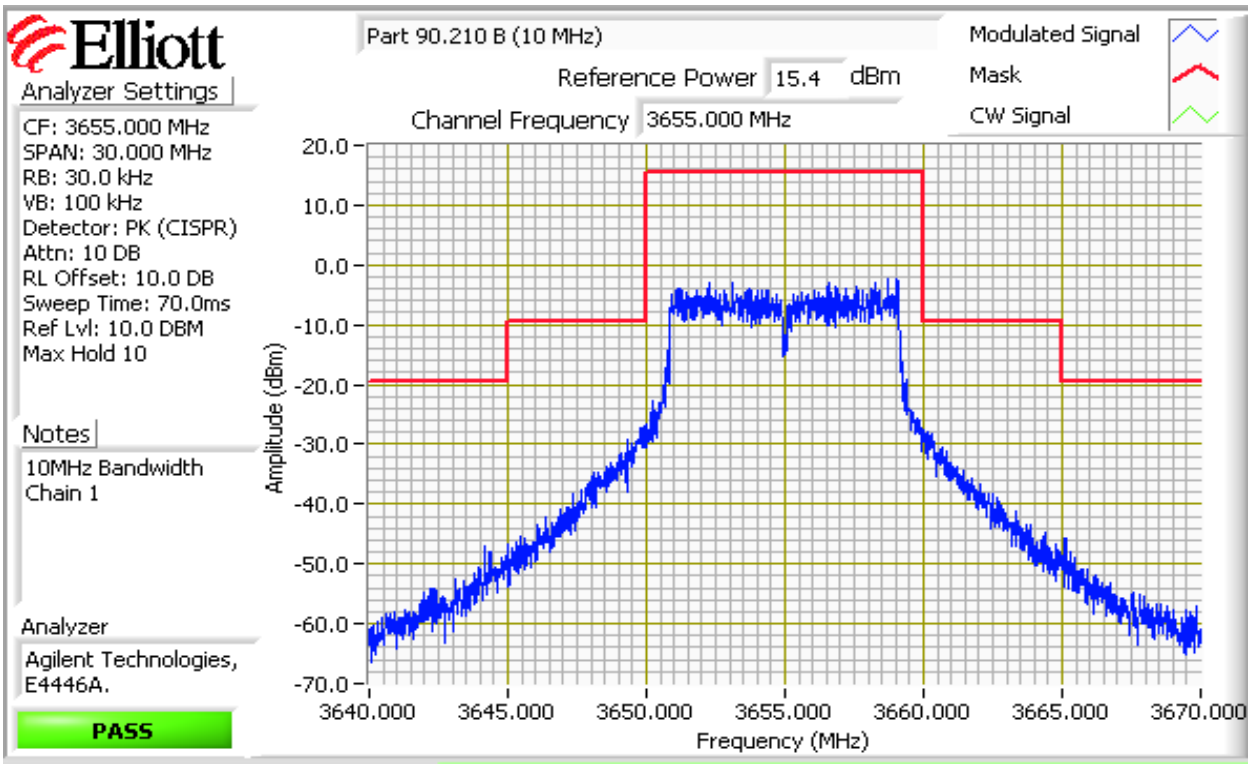
Run #3: Unwanted emissions (Mask), MCS 0 at power setting used for Power measurements



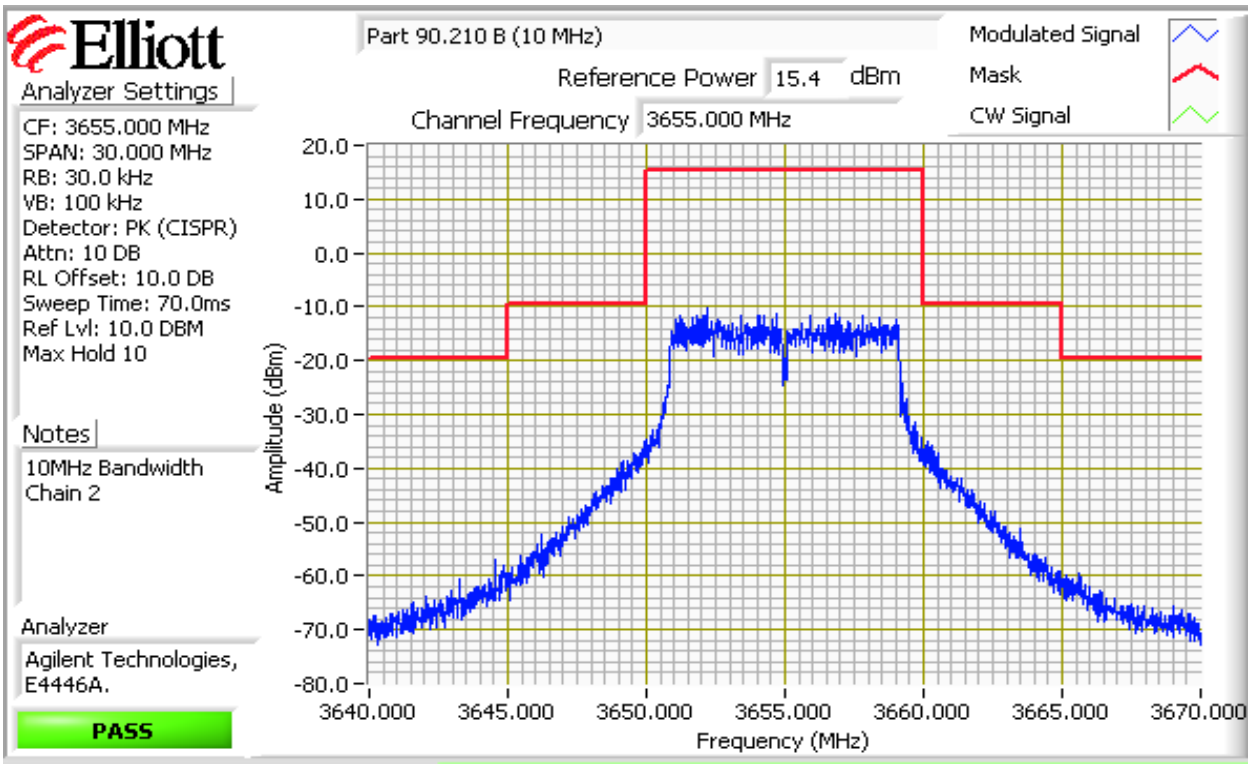
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



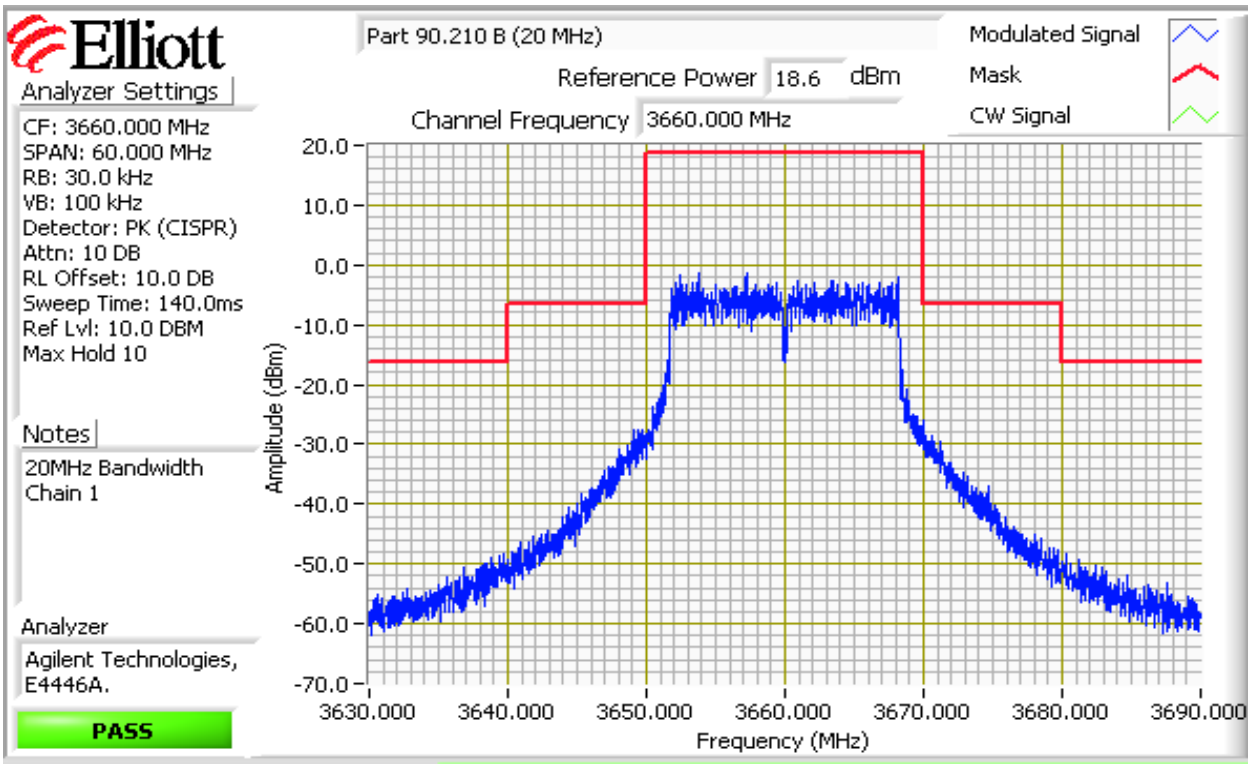
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



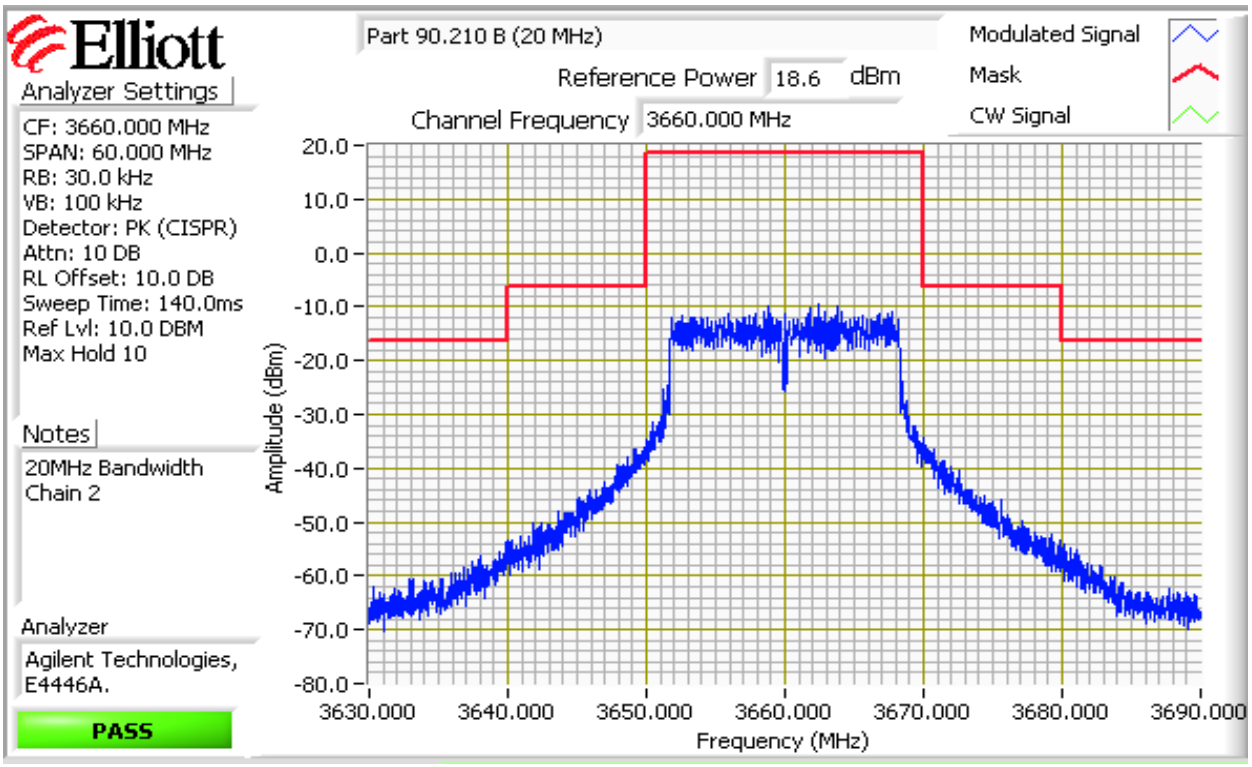
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



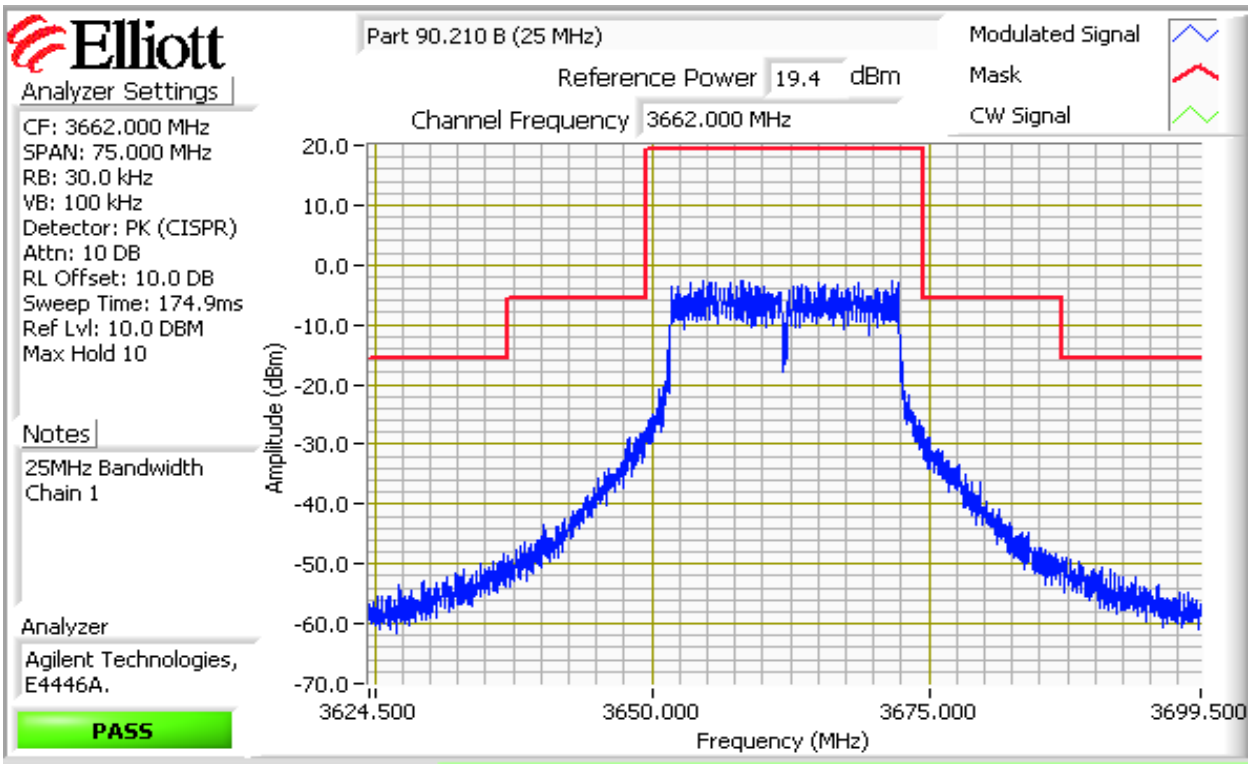
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



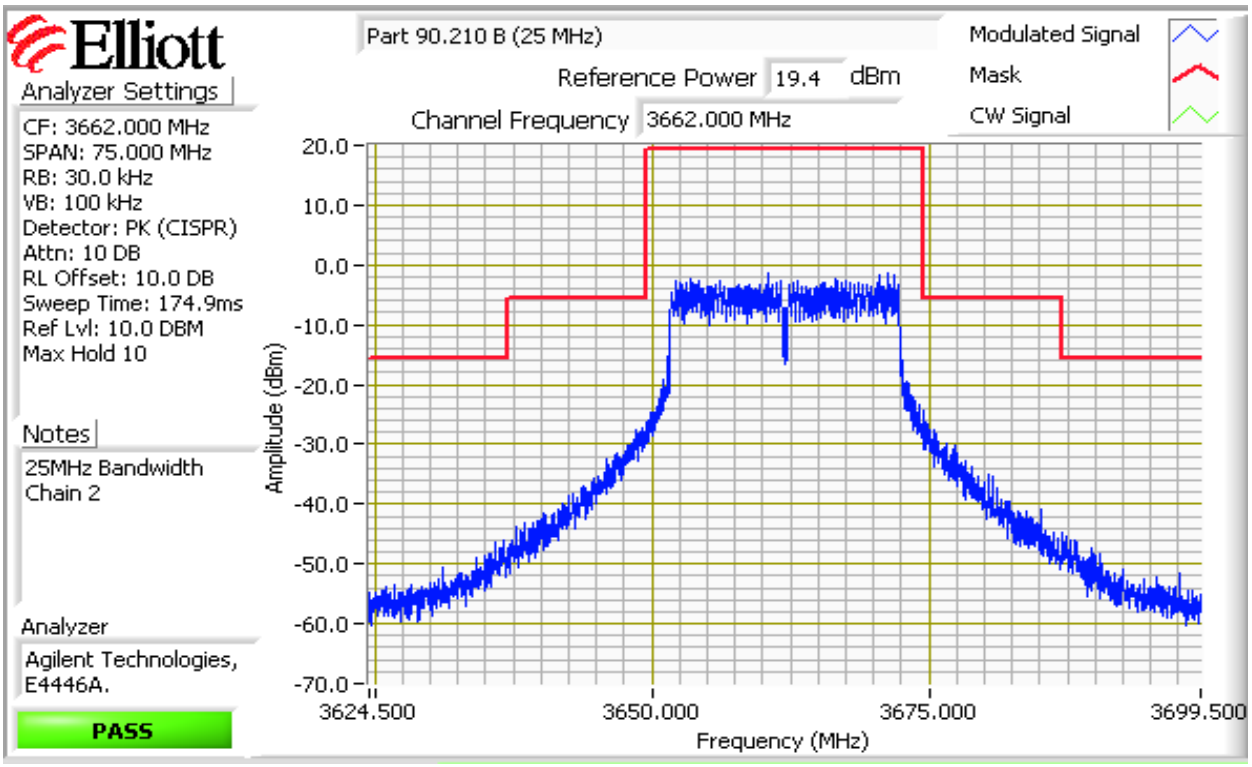
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

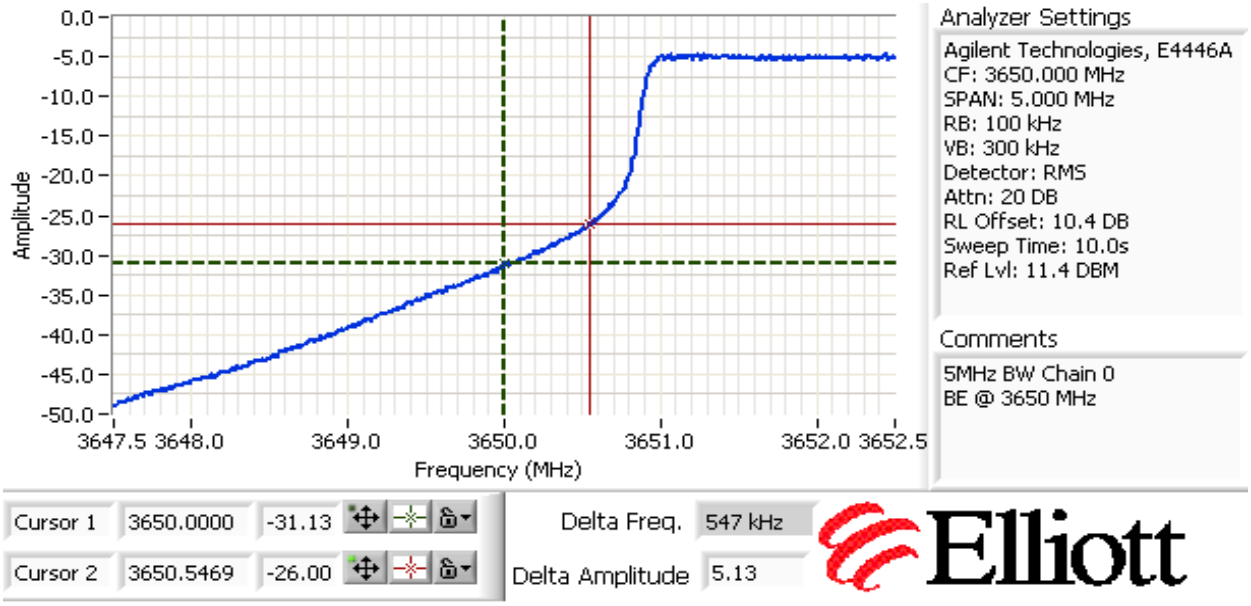
Run #3: Unwanted emissions, Data Rate 0 at power setting used for Power measurements

Number of transmit chains:	2	
Spurious Limit:	-23.0	dBm/100kHz (-13dBm/MHz) eirp
Adjustment for 2 chains:	-3.0	dB adjustment for multiple chains.
Limit Used On Plots	-26.0	dBm/100 kHz

MIMO Devices: The plots were obtained for the chain with the highest PSD and the limit was adjusted to account for all chains transmitting simultaneously

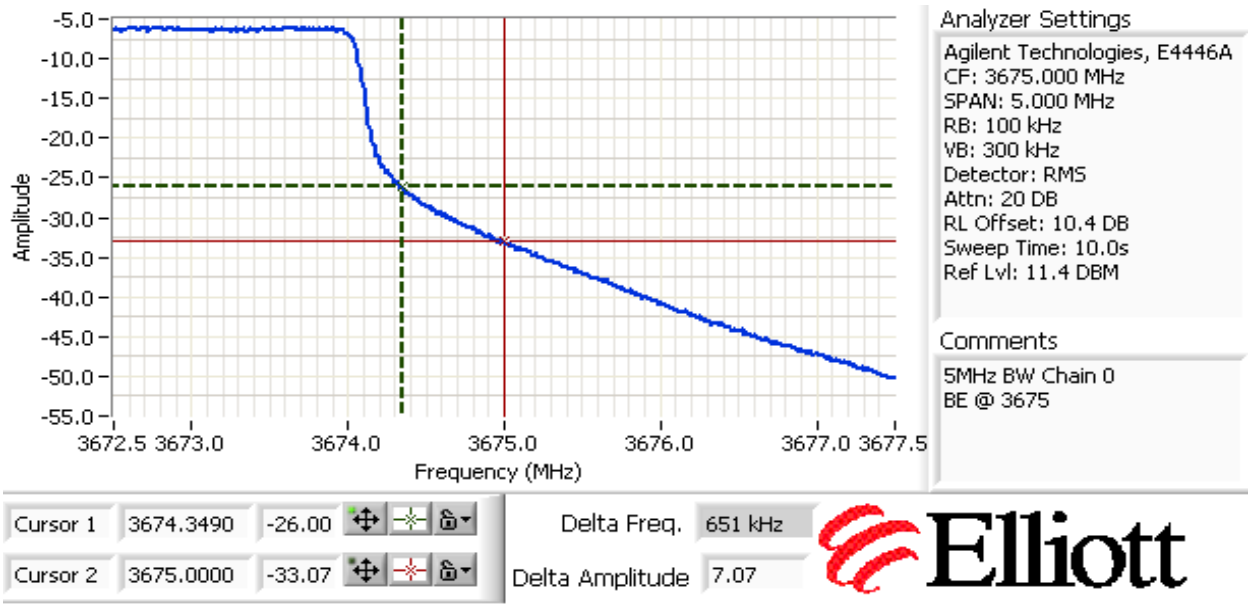
Band edge Measurements

5MHz BW



Plot for low channel (3653 MHz), power setting(s) = 17, BW= 5.0, MOD=Data Rate 0
-31.3dBm in 100 kHz (corrected by 10*log(100kHz/1MHz)) yeilds -21.3dBm in 1 MHz

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

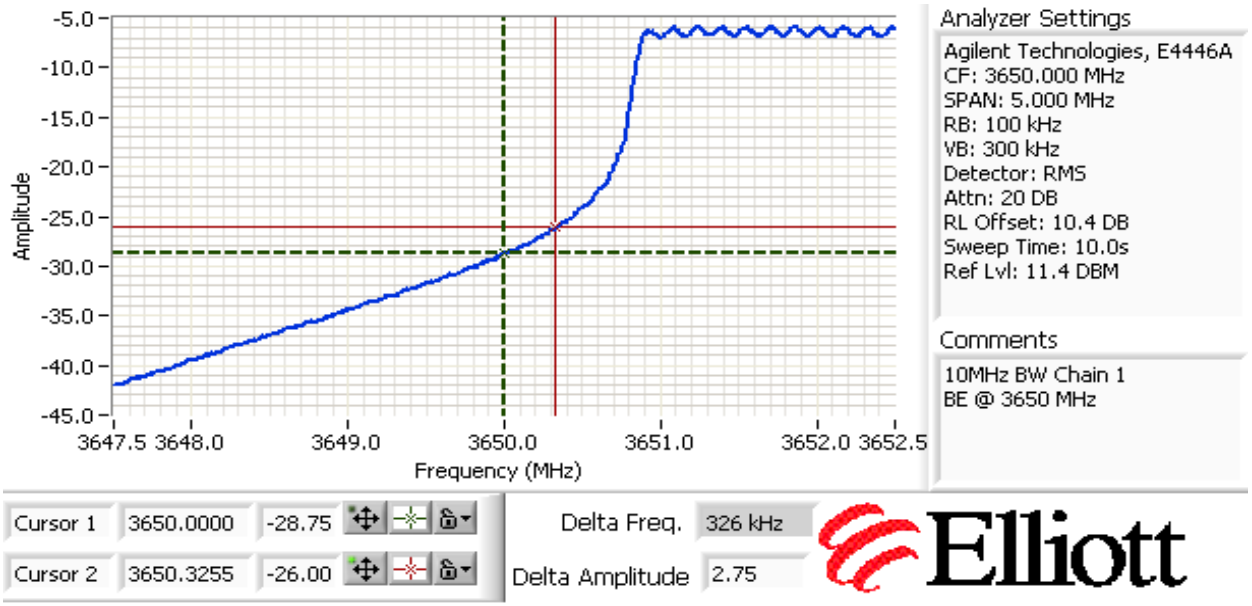


Plot for high channel (3672 MHz), power setting(s) = 11, BW= 5.0, MOD=Data Rate 0
-33.1dBm in 100 kHz (corrected by 10*log(100kHz/1MHz)) yeilds -23.1dBm in 1 MHz

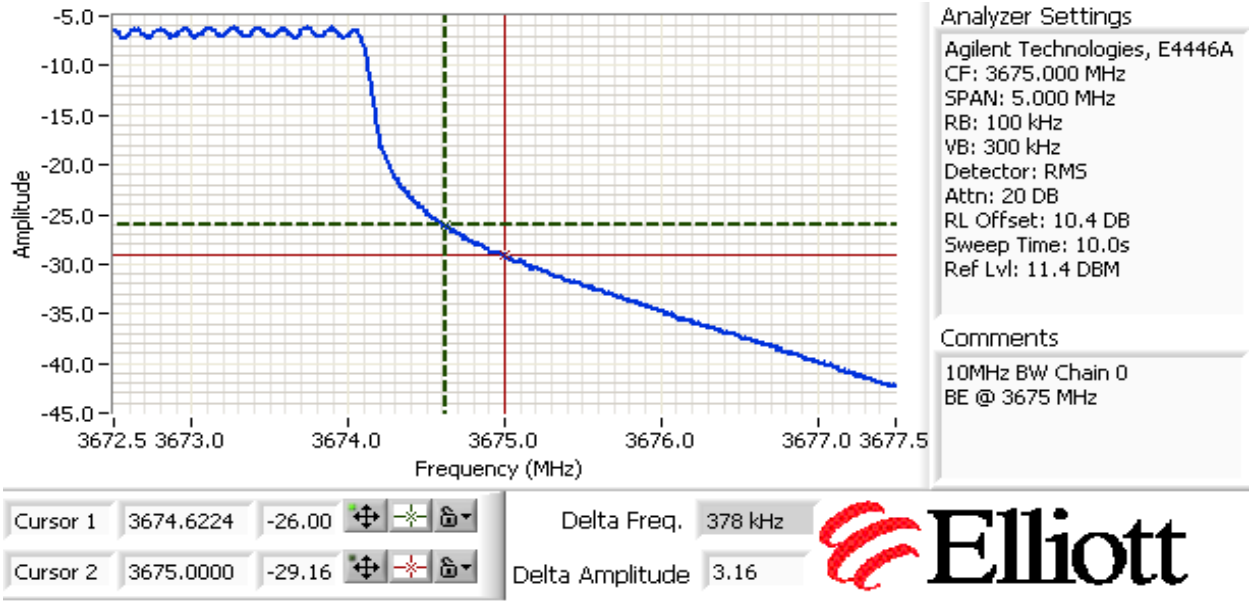
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

10MHz BW

Power setting 23

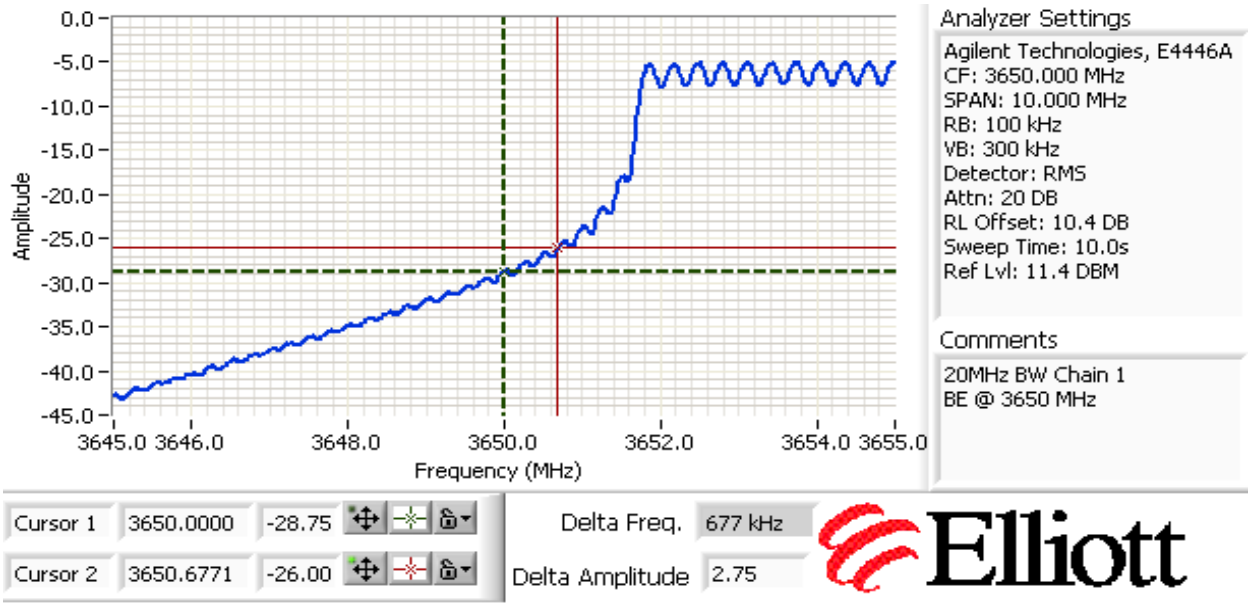


Power setting 16

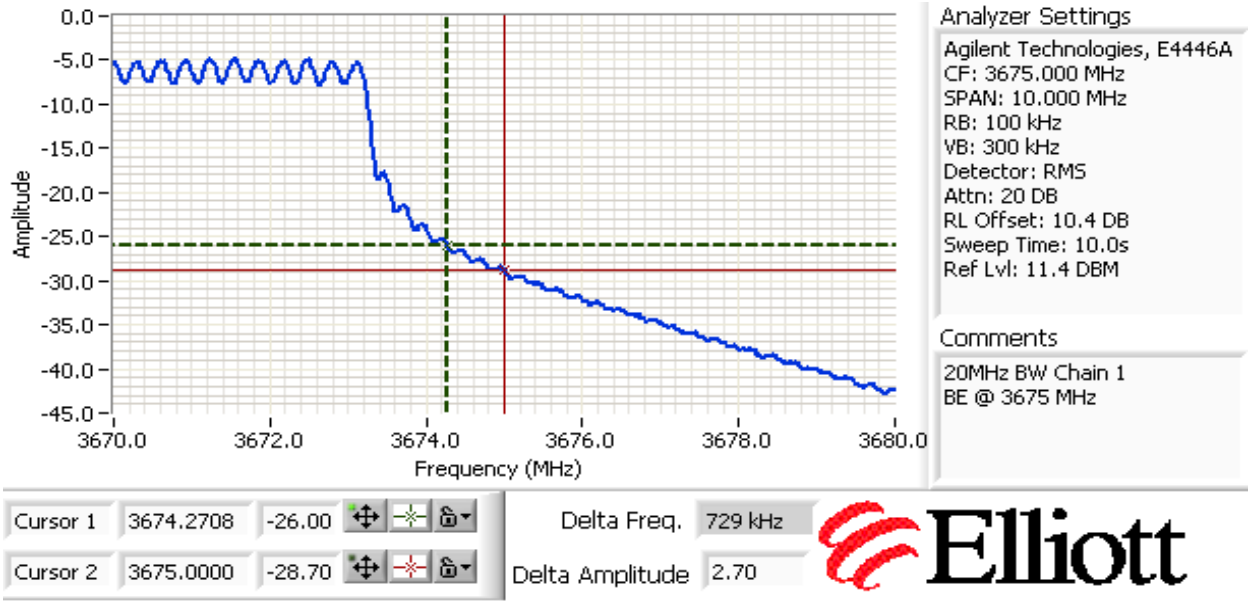


Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

20MHz BW
Power setting 29

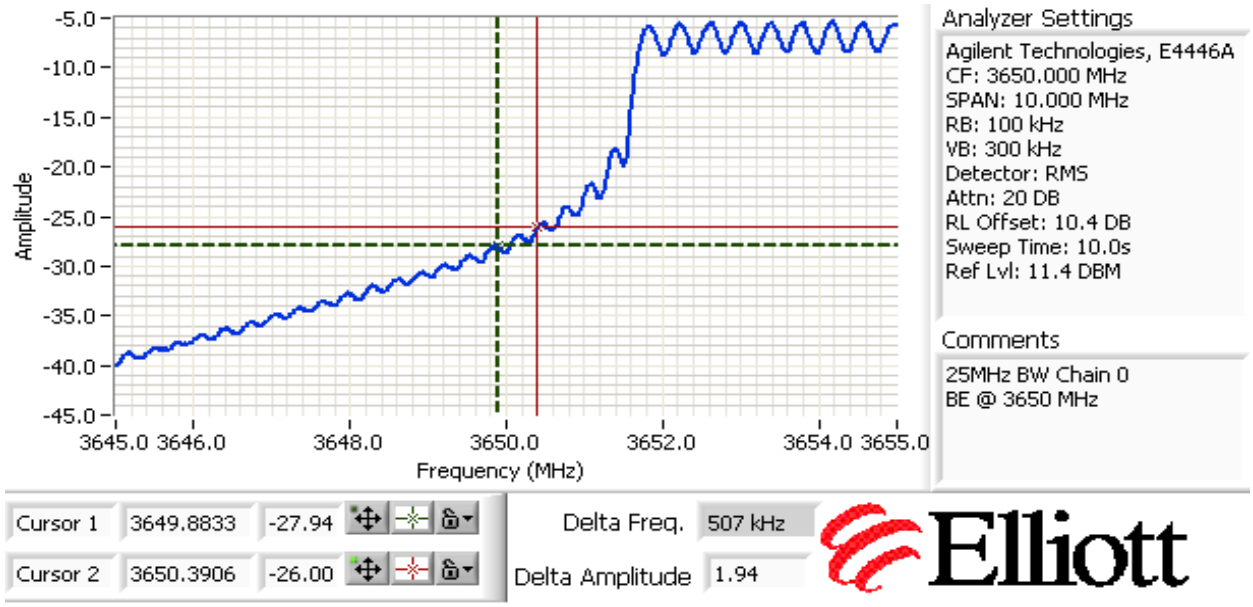


Power setting 29

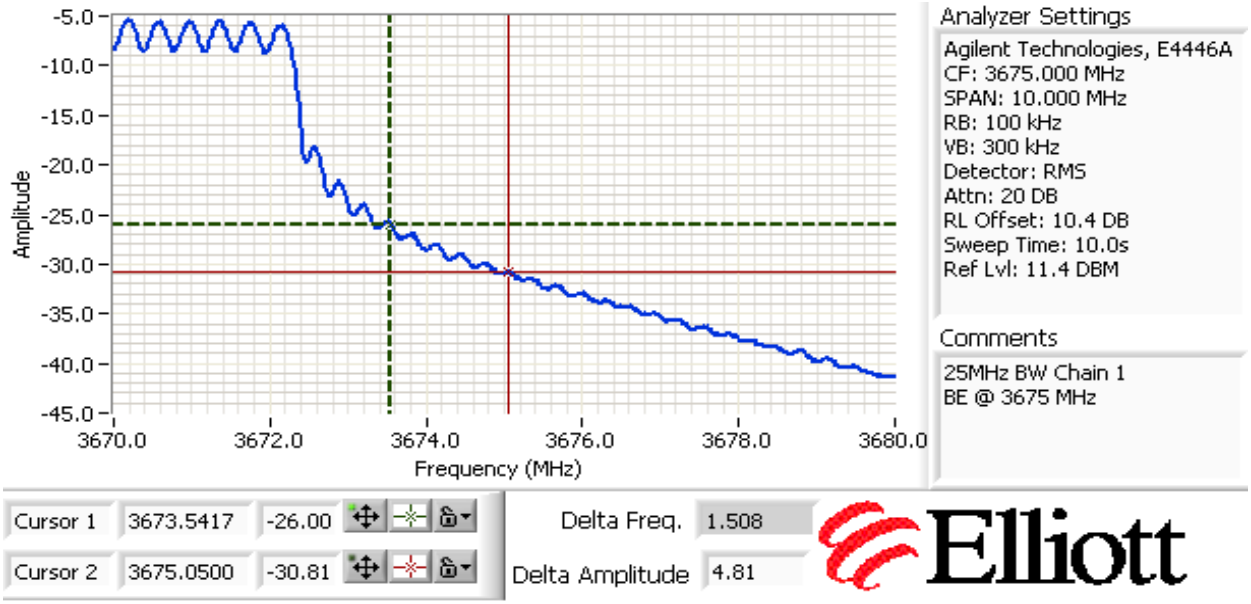


Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

25MHz BW
Power setting 31



Power setting 31



Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

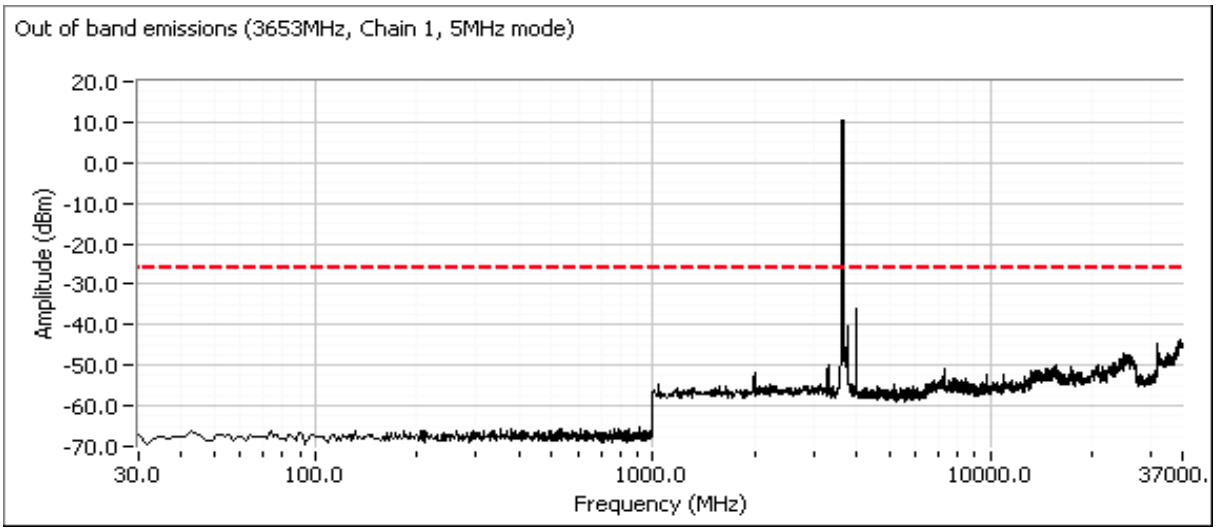
Run #3: Unwanted emissions, Data Rate 0 at power setting used for Power measurements

Date of Test:	3/8/2011	Config. Used:	1
Test Engineer:	Joseph Cadigal	Config Change:	none
Test Location:	FT Chamber#7	EUT Voltage:	POE

Number of transmit chains:	2	
Spurious Limit:	-13.0	dBm/MHz eirp = -23dBm/100kHz
Adjustment for 2 chains:	-3.0	dB adjustment for multiple chains.
Limit Used On Plots	-26.0	dBm/100 kHz

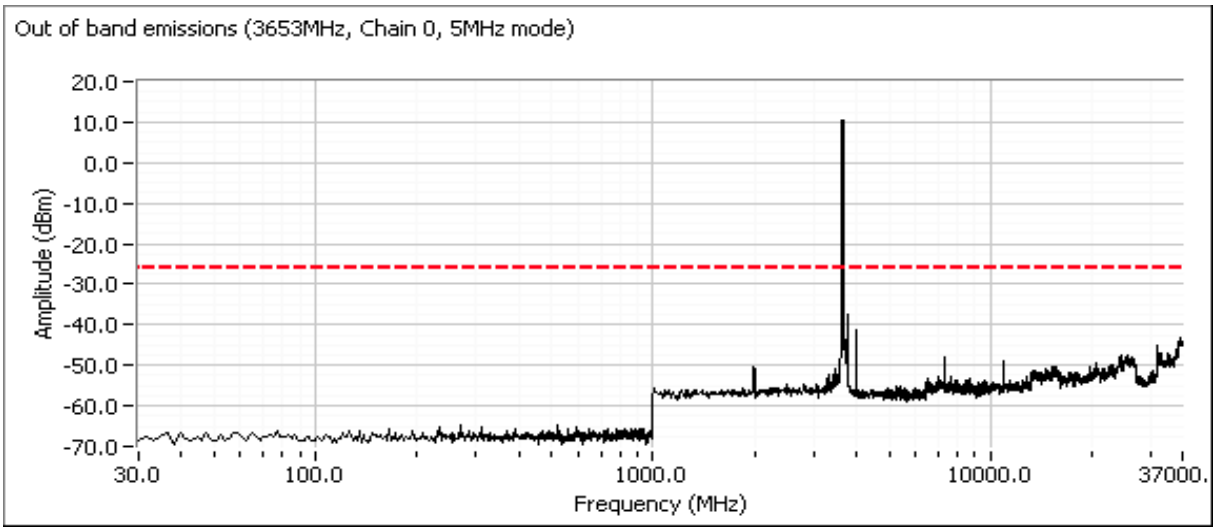
MIMO Devices: The plots were obtained for each chain individually and the limit was adjusted to account for all chains transmitting simultaneously, RBW=VBW=1MHz above 1 GHz and 100 kHz below 1 GHz.

Low channel
pcdac =17



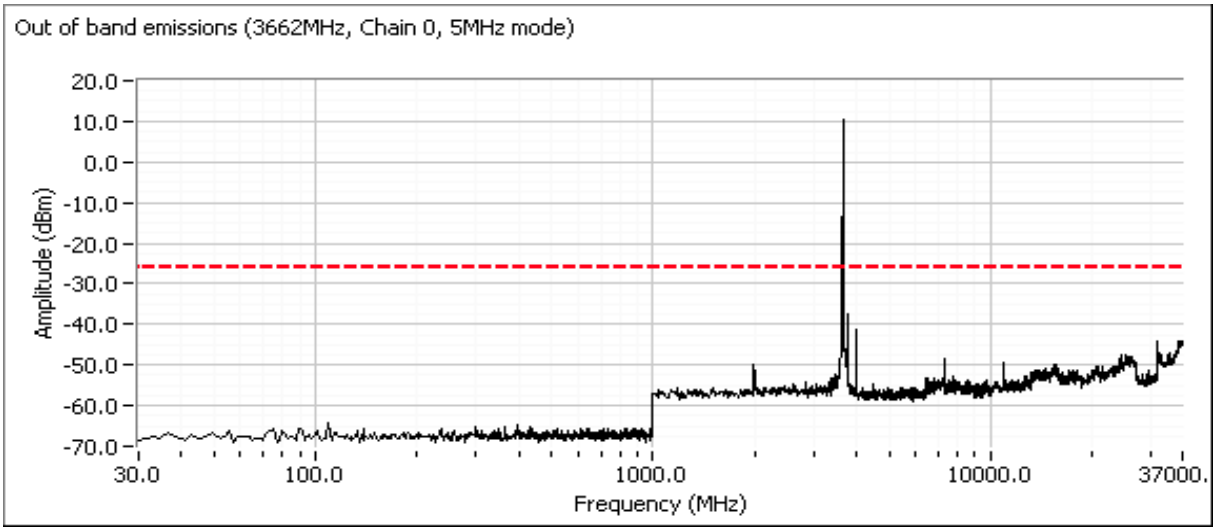
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

pcdac =10



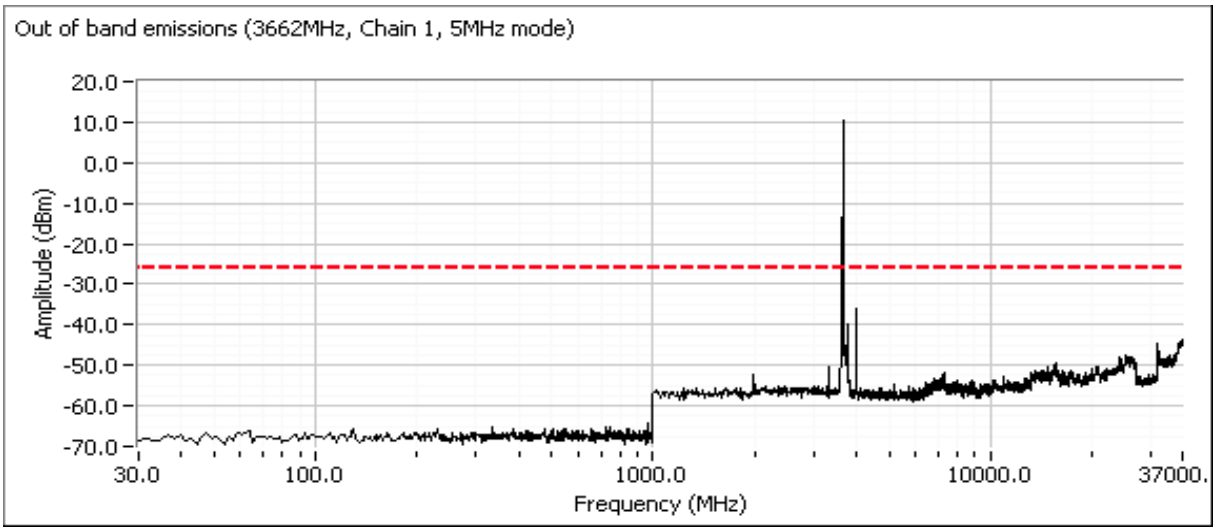
Center channel

pcdac = 11



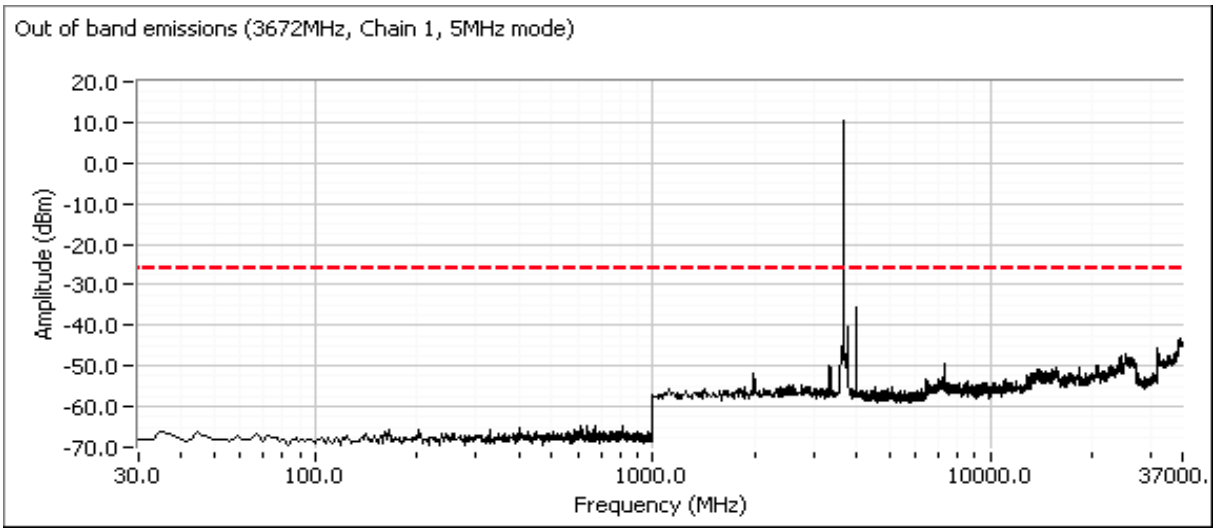
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

pcdac = 16



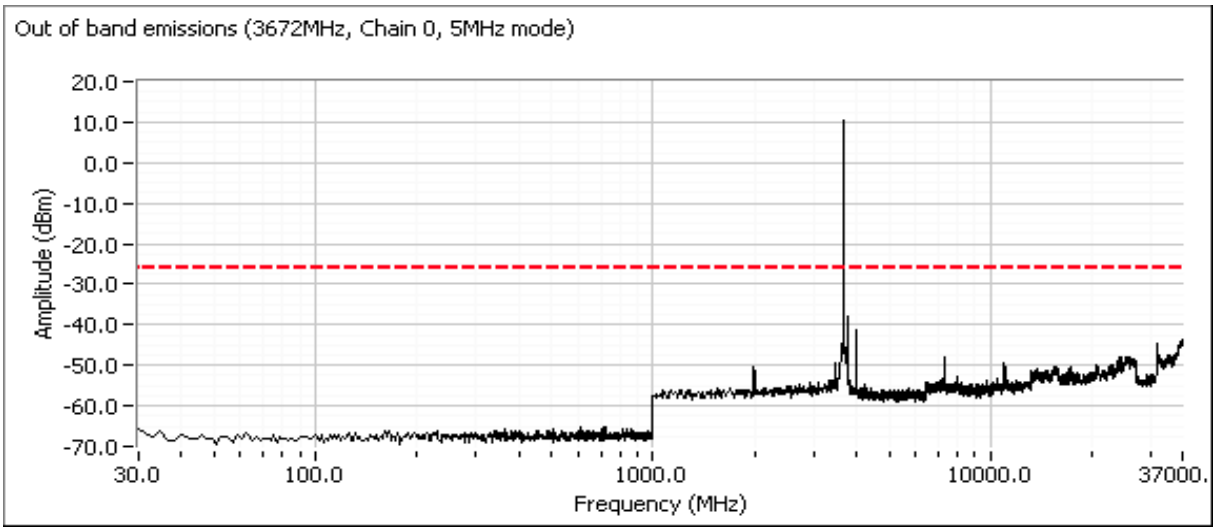
High channel

pcdac = 16



Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

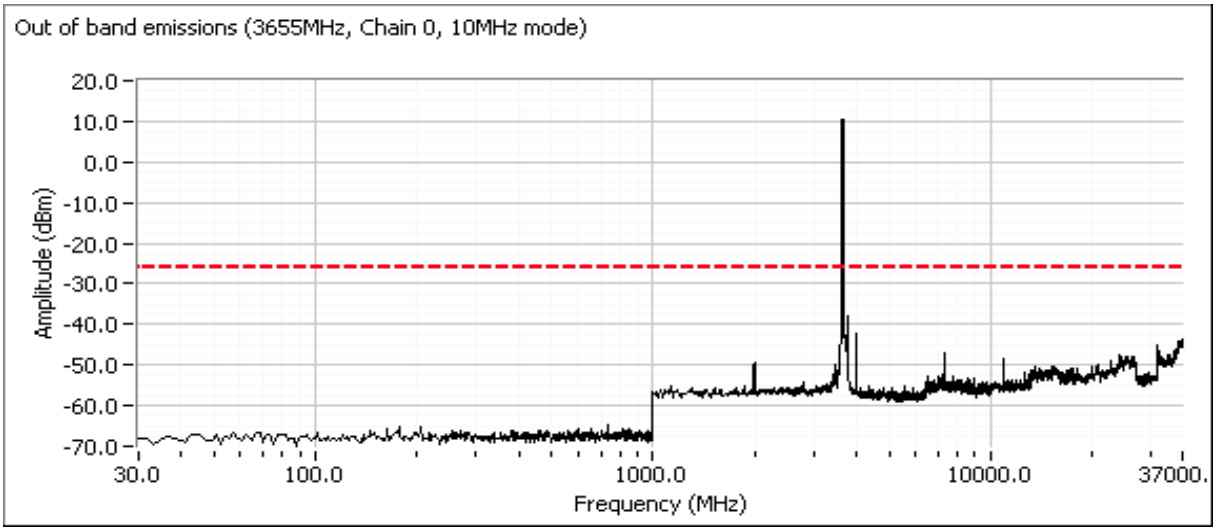
pcdac = 11



10 MHz Mode

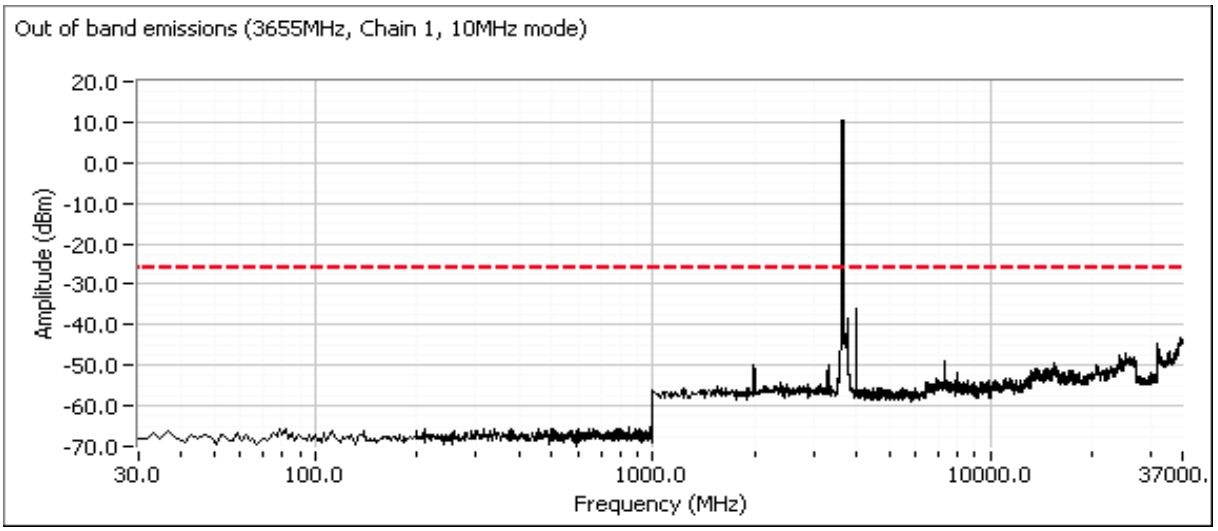
Low channel

pcdac = 15



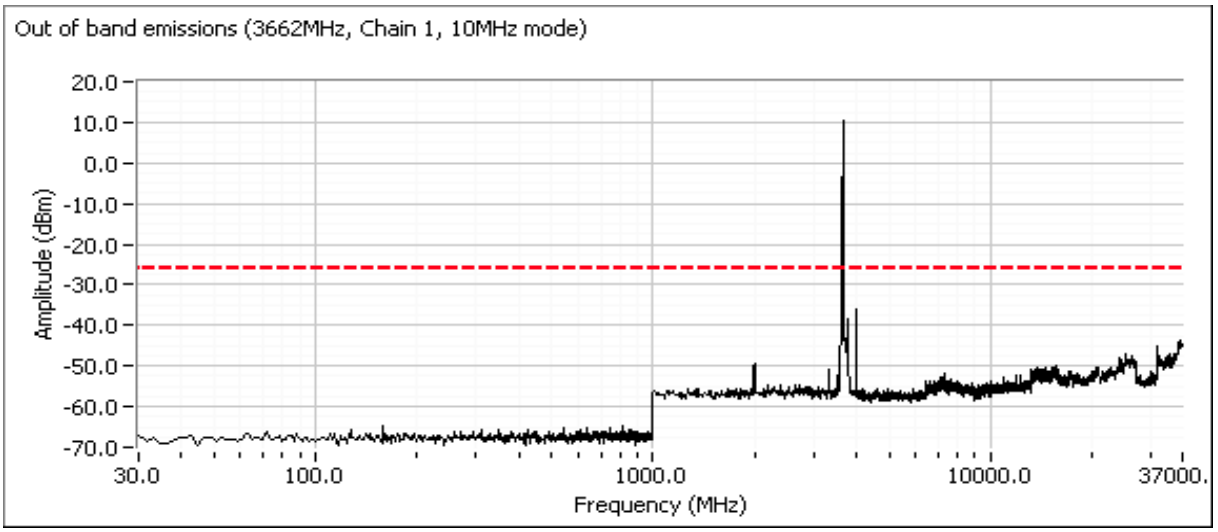
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

pcdac = 23



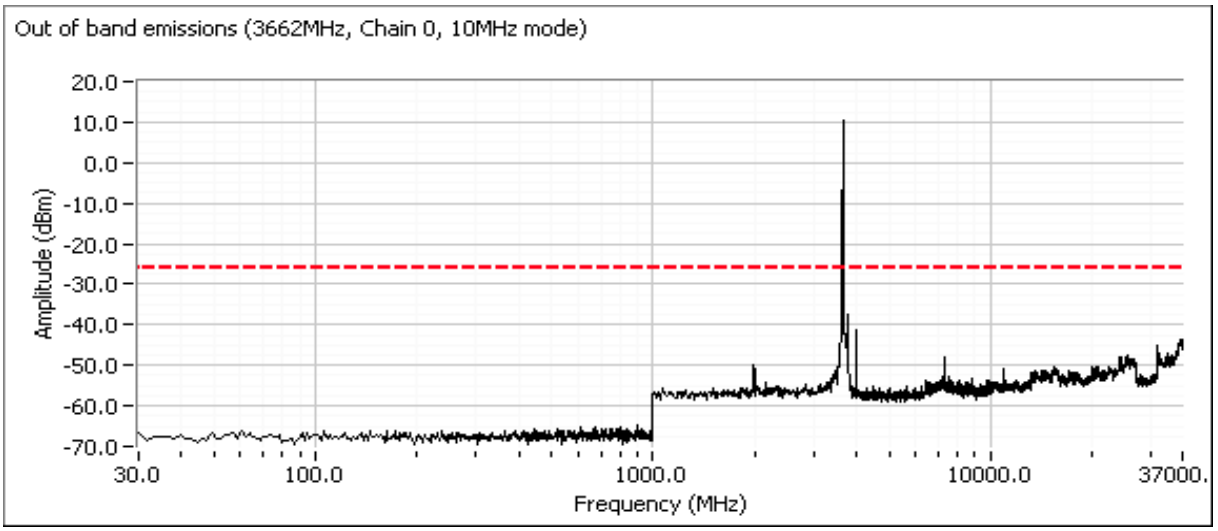
Center channel

pcdac =23



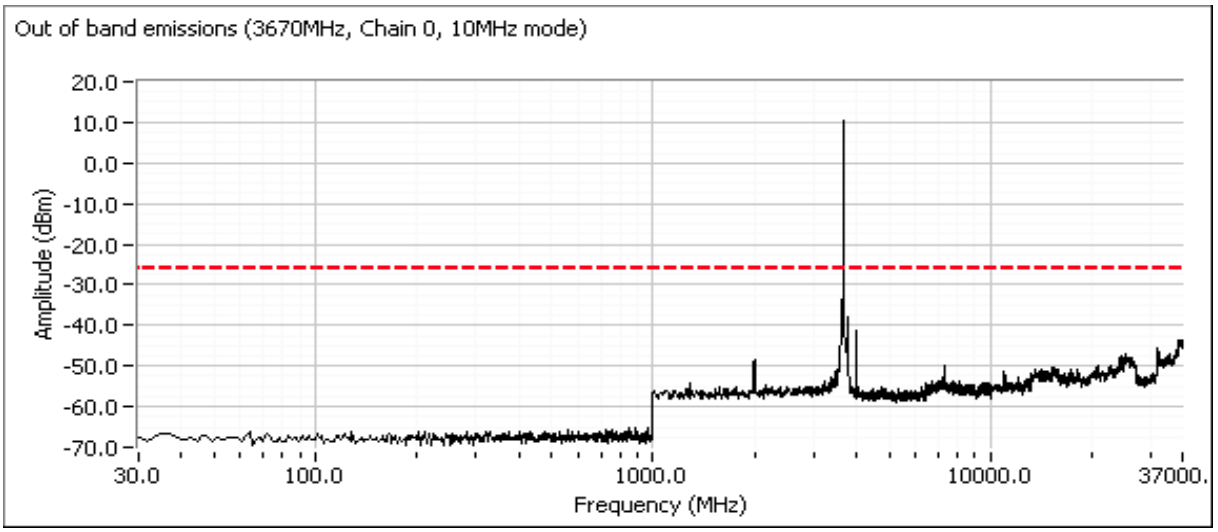
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

pcdac =15



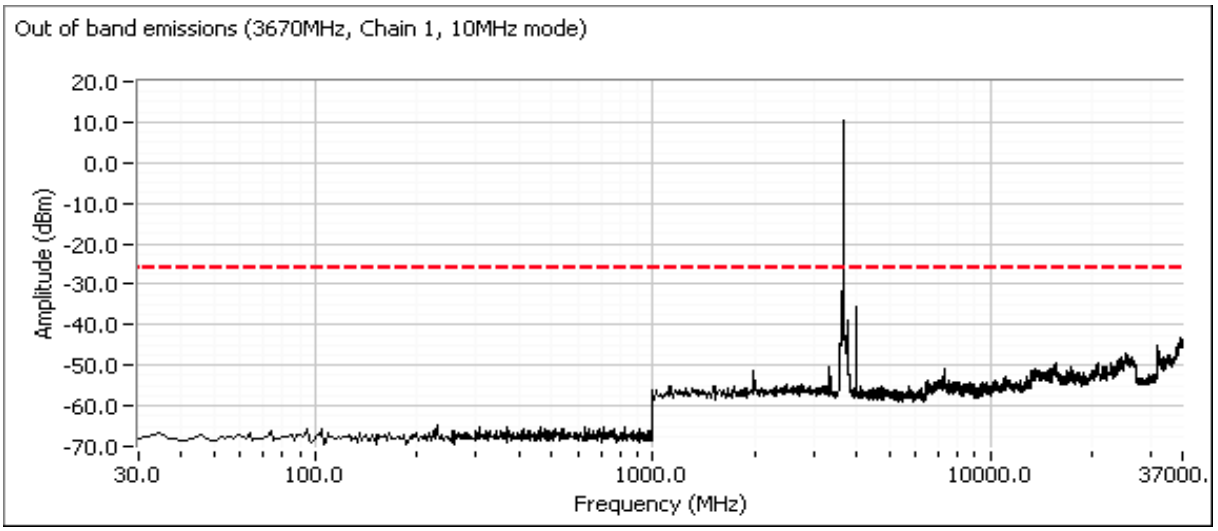
High channel

pcdac = 16



Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

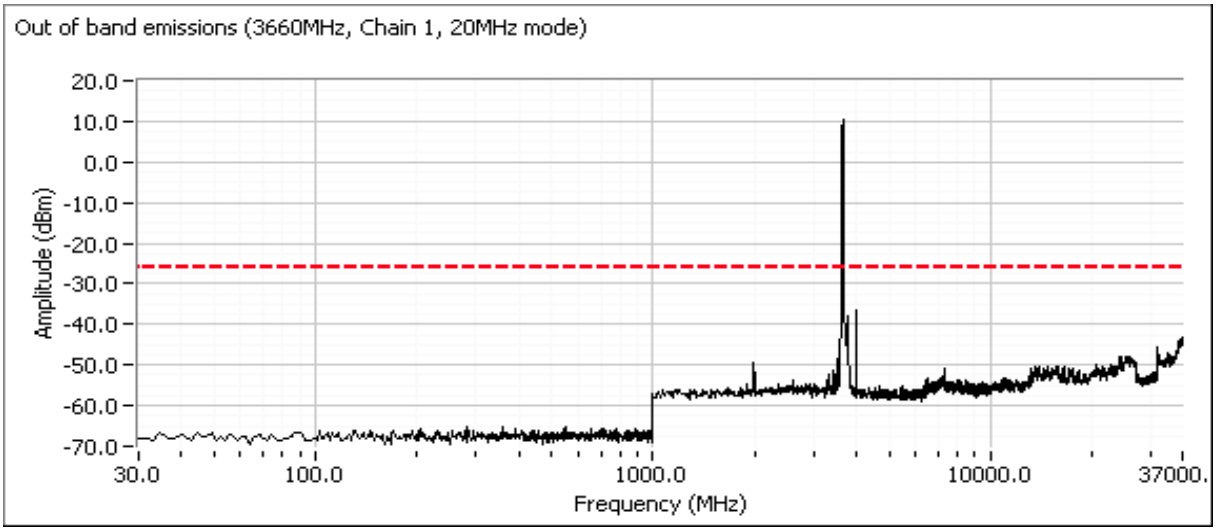
pcdac = 22



20 MHz Mode

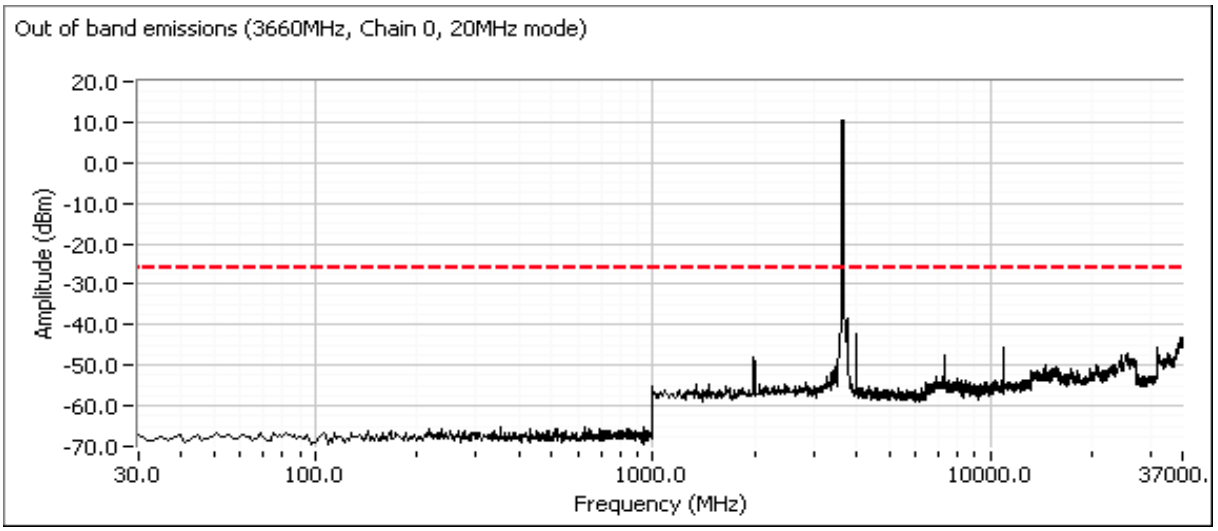
Low channel

pcdac = 29



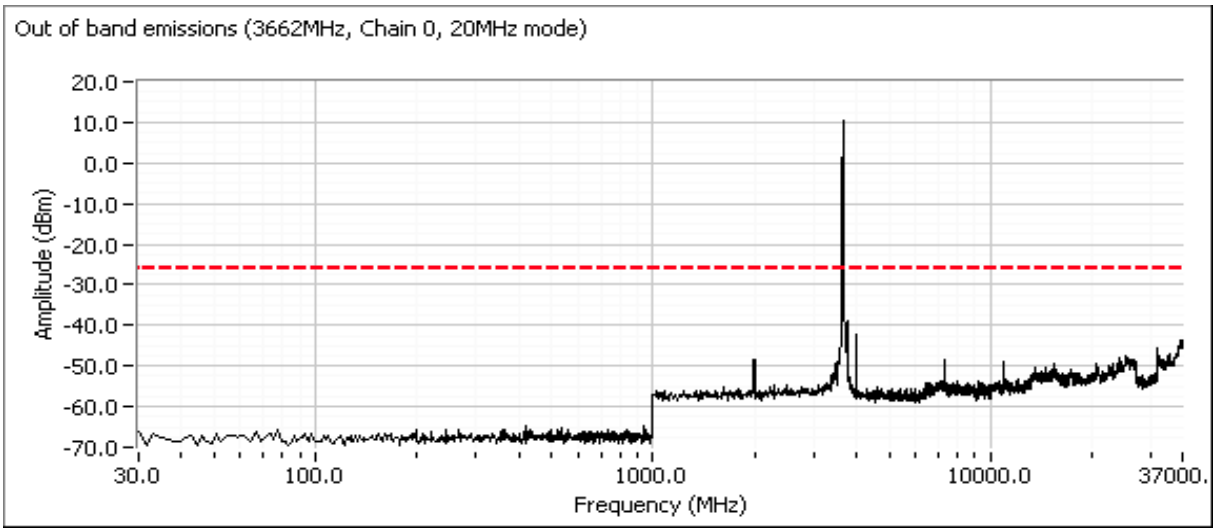
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

pcdac = 23



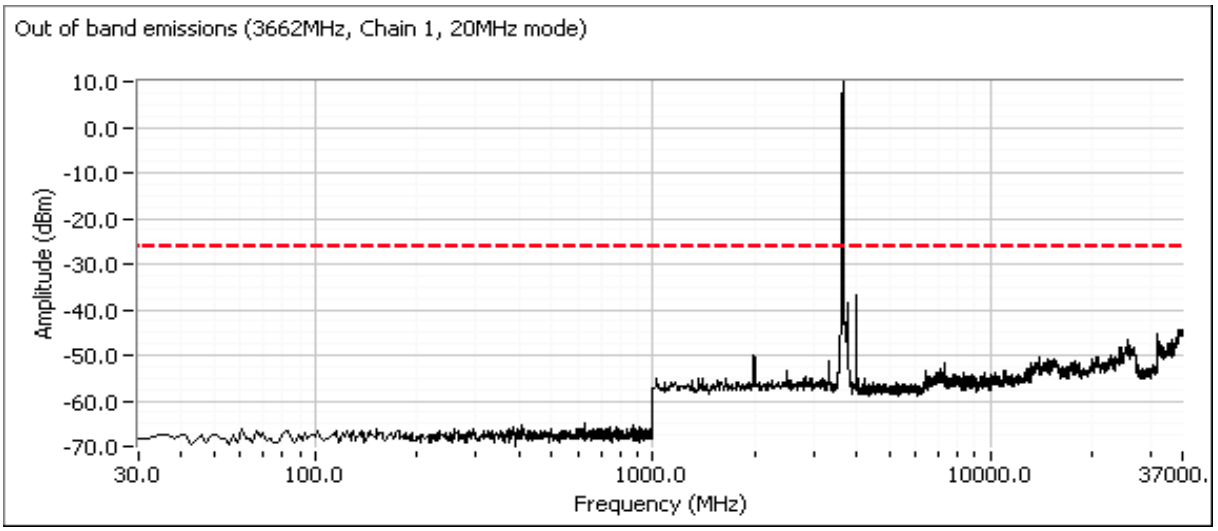
Center channel

pcdac = 22



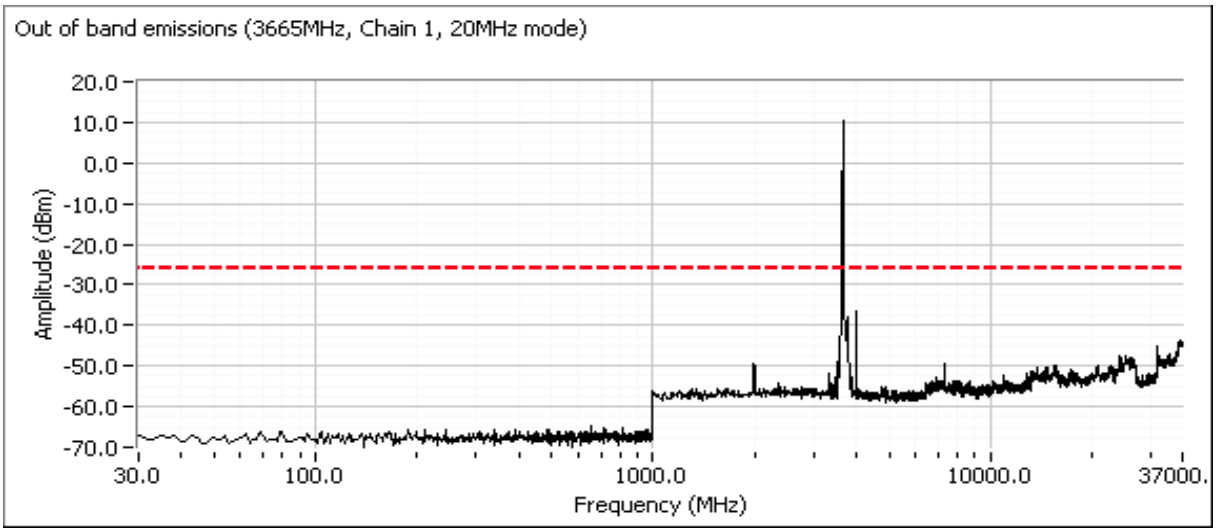
Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

pcdac = 28



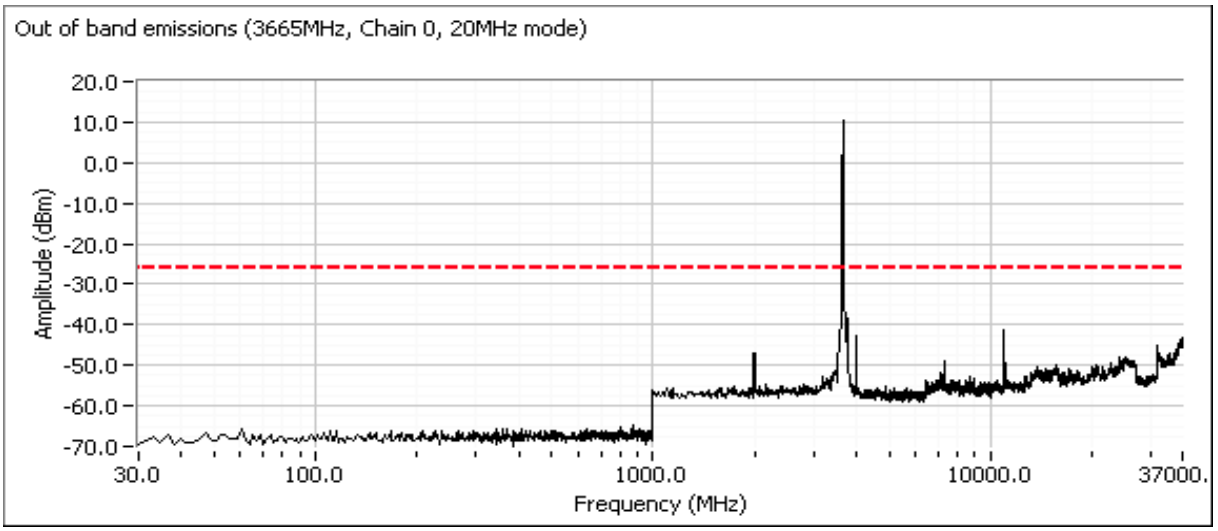
High channel

pcdac = 29

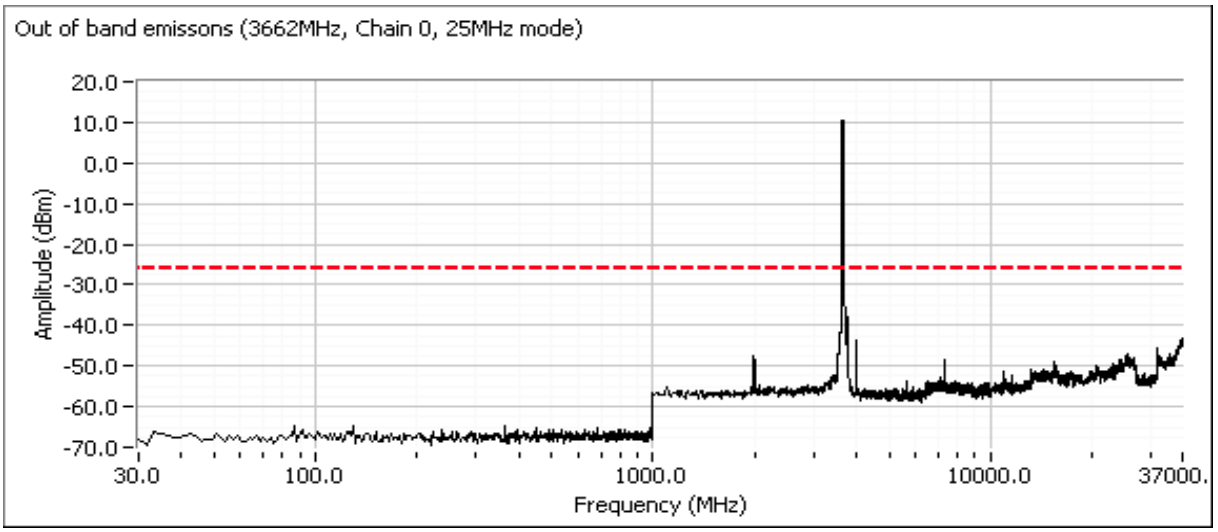


Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

pcdac = 22

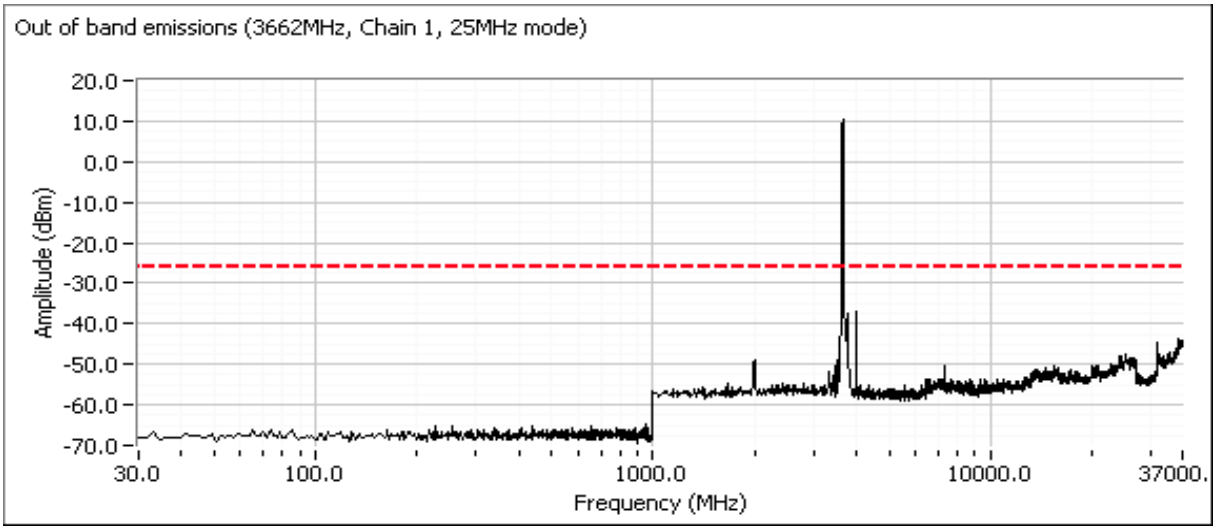


25 MHz Mode
pcdac = 24



Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

pcdac = 31



Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

RSS 197 and FCC Part 90
Frequency Stability

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: 3/18/11
Test Engineer: Mark Hill
Test Location: FT Lab#4

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

General Test Configuration

The EUT's RF port was connected to the measurement instrument's RF port, via an attenuator or dc-block if necessary. The EUT was placed inside an environmental chamber.

Ambient Conditions:

Temperature: - °C
Rel. Humidity: - %

Summary of Results

Run #	Test Performed	Limit	Result	Value / Margin
1-2	Frequency and Voltage Stability	Part 90.213	Pass	26080 Hz / 7.12 ppm

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 Networks	Job Number:	J82270
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Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

Run #1: Temperature Vs. Frequency (Fixed stations in the 3650-3675 MHz band)

Note 1:	For all tests: Measurements performed on the un-suppressed carrier in the modulated emissions envelope. Analyzer settings were as follow: RBW=VBW= 1kHz and Span=50kHz.
Note 2:	Frequency stability is to be specified in the station authorization.

Temperature	Reference Frequency	Measured frequency	Drift	Limit
(Celsius)	(MHz)	(MHz)	(Hz)	(Hz)
-30	3661.99049	3662.01516	24670	Note 2
-20	3661.99049	3662.01657	26080	Note 2
-10	3661.99049	3662.01307	22580	Note 2
0	3661.99049	3662.00623	15740	Note 2
10	3661.99049	3661.99814	7650	Note 2
20	3661.99049	3661.99049	0	Note 2
30	3661.99049	3661.98580	4690	Note 2
40	3661.99049	3661.98505	5440	Note 2
50	3661.99049	3661.99013	360	Note 2

Run #2: Voltage Vs. Frequency

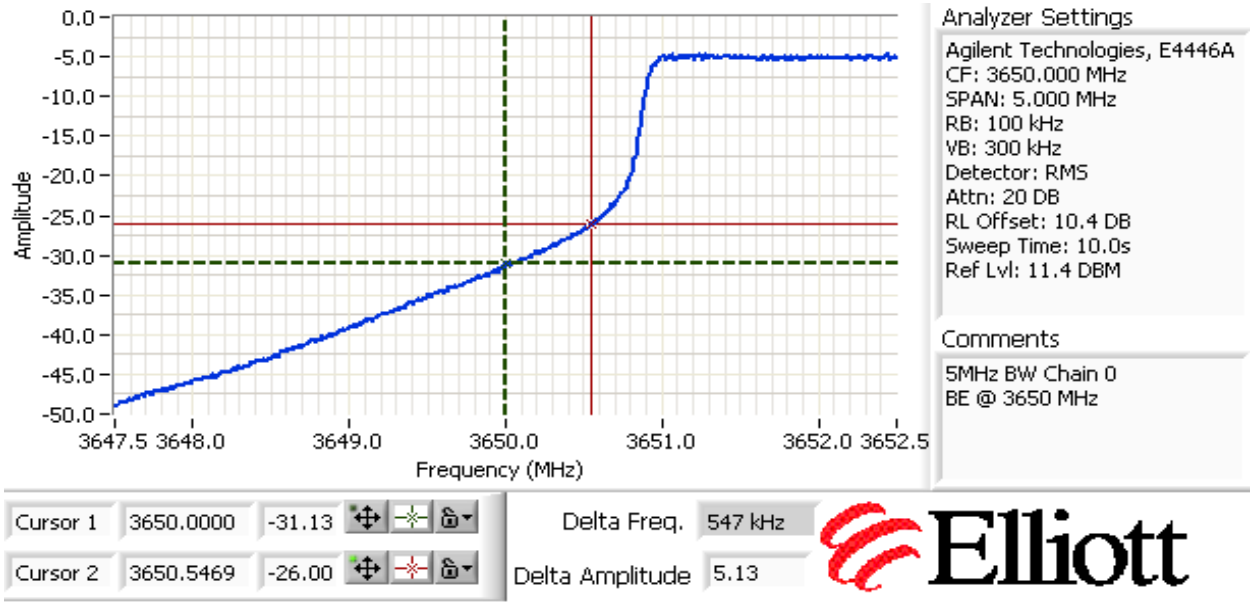
Nominal Voltage is 120Vac.

Voltage	Reference Frequency	Frequency Drift	Drift	Limit
(AC)	(MHz)	(MHz)	(Hz)	(Hz)
85%	3661.99049	3661.99007	420	Note 2
115%	3661.99049	3661.99016	330	Note 2

Worst case drift: 26080 Hz
7.12 ppm

Client:	Ubiquiti Networks	Job Number:	J82270
Model:	PowerBridge M365	T-Log Number:	T82342
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A

Plots below show band edge amplitudes for worst case modulation at each BW. Adding worst case drift to show compliance with frequency stability requirements.



Plot of emissions at point when 43 + 10*log(p) limit is exceeded (-26.0dBm in 100 kHz ~ -16dBm in 1 MHz, adjusted for two transmit chains)

Freq. (MHz)	Modulation	Channel bandiwdth	Software setting[1]	Unwanted emission reference point	Worst case drift (Hz)	F_L
3653	MCS0	5MHz	10	3650.5469	26080	3650.5208

Note 1:	Power setting is the software setting used to set the output power.

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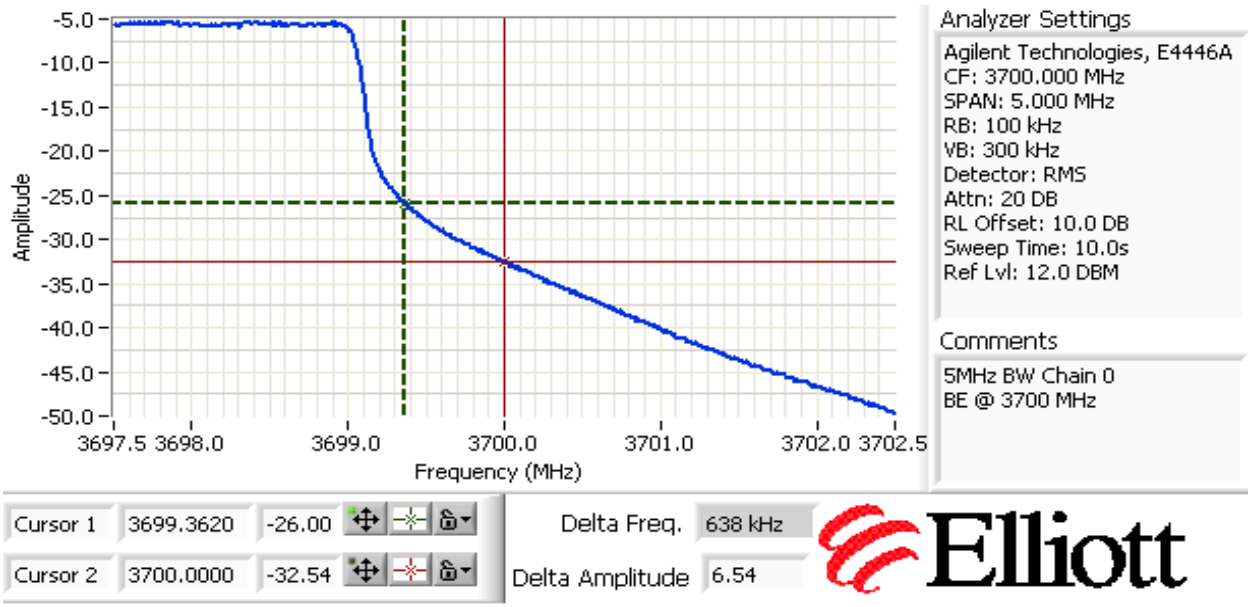
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Plot of emissions at point when 43 + 10*log(p) limit is exceeded (-26.0dBm in 100 kHz ~ -16dBm in 1 MHz, adjusted for two transmit chains)

Freq. (MHz)	Modulation	Channel bandiwdth	Software setting[1]	Unwanted emissiom reference point	Worst case drift (Hz)	F_H
3697	MCS0	5MHz	11	3699.3620	26080	3699.3881

Note 1:	Power setting is the software setting used to set the output power.

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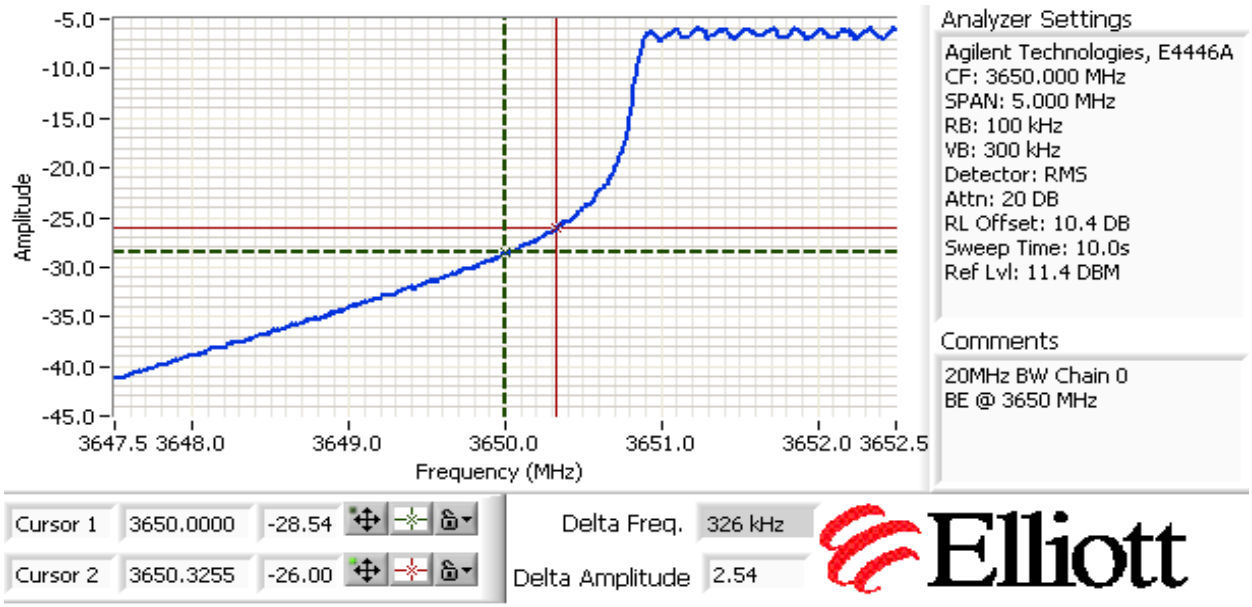
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Plot of emissions at point when 43 + 10*log(p) limit is exceeded (-26.0dBm in 100 kHz ~ -16dBm in 1 MHz, adjusted for two transmit chains)

Freq. (MHz)	Modulation	Channel bandiwdth	Software setting[1]	Unwanted emission reference point	Worst case drift (Hz)	F_L
3655	MCS0	10MHz	15	3650.3255	26080	3650.2994

Note 1:	Power setting is the software setting used to set the output power.

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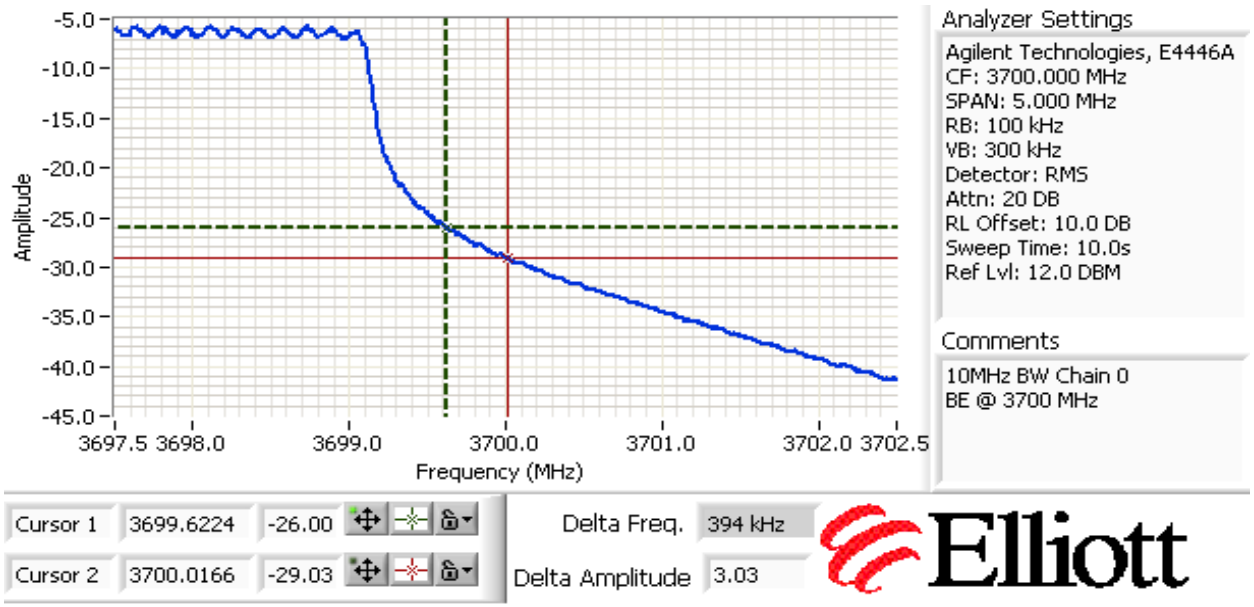
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Plot of emissions at point when 43 + 10*log(p) limit is exceeded (-26.0dBm in 100 kHz ~ -16dBm in 1 MHz, adjusted for two transmit chains)

Freq. (MHz)	Modulation	Channel bandiwdth	Software setting[1]	Unwanted emissiom reference point	Worst case drift (Hz)	F_H
3695	MCS0	10MHz	14	3699.6224	26080	3699.6485

Note 1:	Power setting is the software setting used to set the output power.

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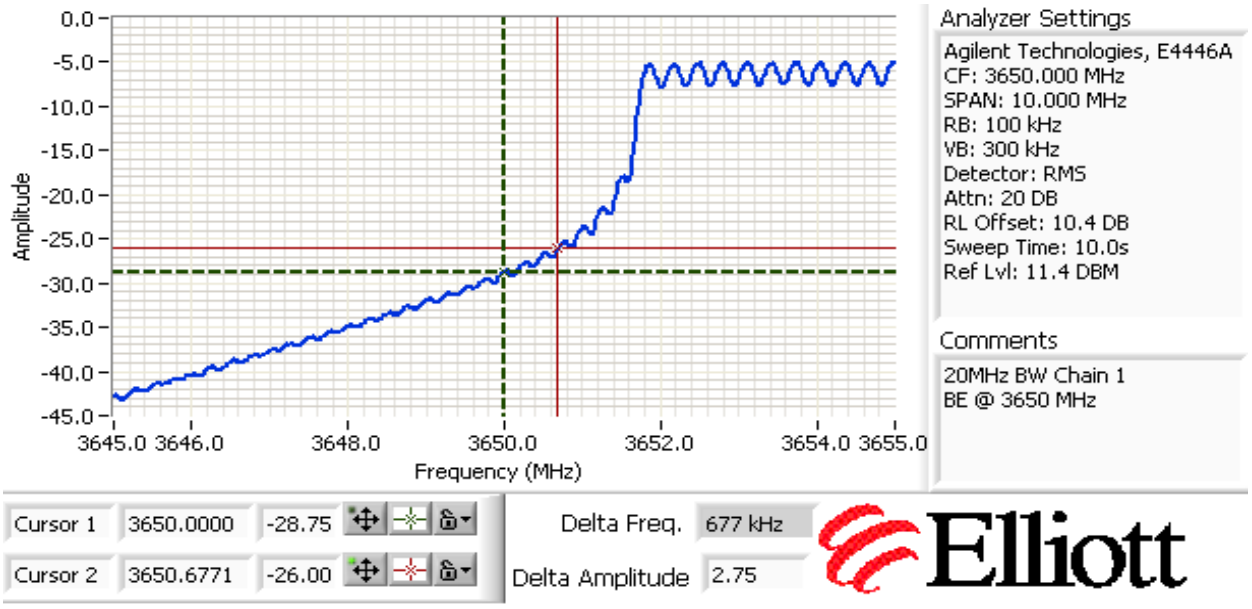
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Plot of emissions at point when 43 + 10*log(p) limit is exceeded (-26.0dBm in 100 kHz ~ -16dBm in 1 MHz, adjusted for two transmit chains)

Freq. (MHz)	Modulation	Channel bandiwdth	Software setting[1]	Unwanted emission reference point	Worst case drift (Hz)	F_L
3660	MCS0	20MHz	29	3650.6771	26080	3650.6510

Note 1:	Power setting is the software setting used to set the output power.

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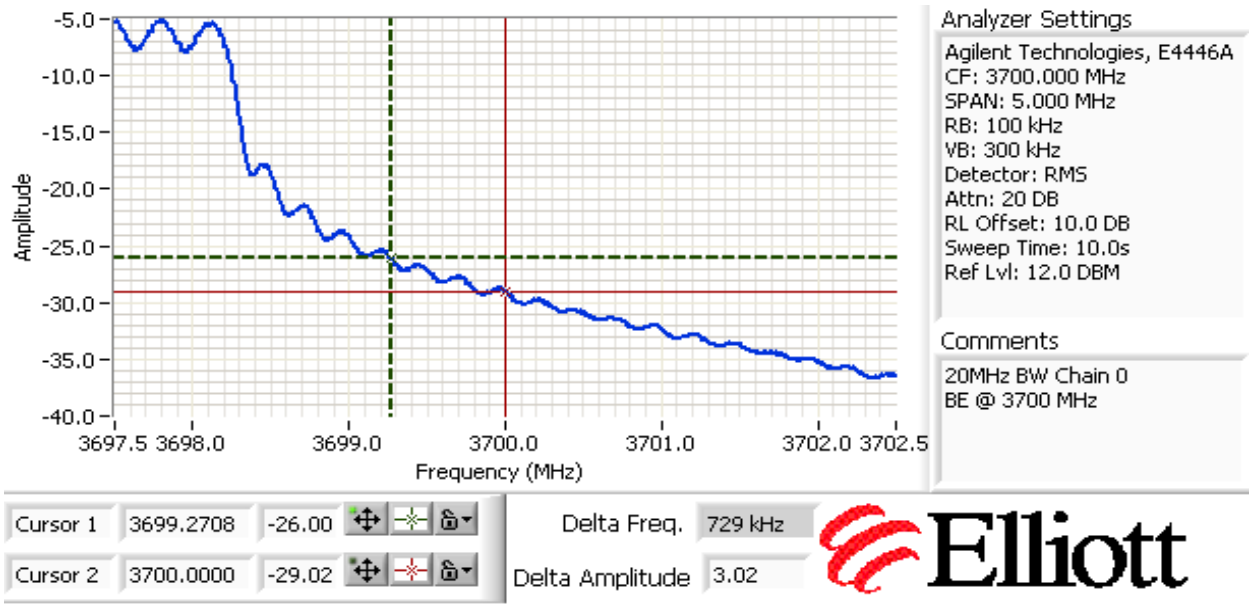
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Plot of emissions at point when 43 + 10*log(p) limit is exceeded (-26.0dBm in 100 kHz ~ -16dBm in 1 MHz, adjusted for two transmit chains)

Freq. (MHz)	Modulation	Channel bandiwdth	Software setting[1]	Unwanted emissiom reference point	Worst case drift (Hz)	F_H
3690	MCS0	20MHz	21	3699.2708	26080	3699.2969

Note 1:	Power setting is the software setting used to set the output power.

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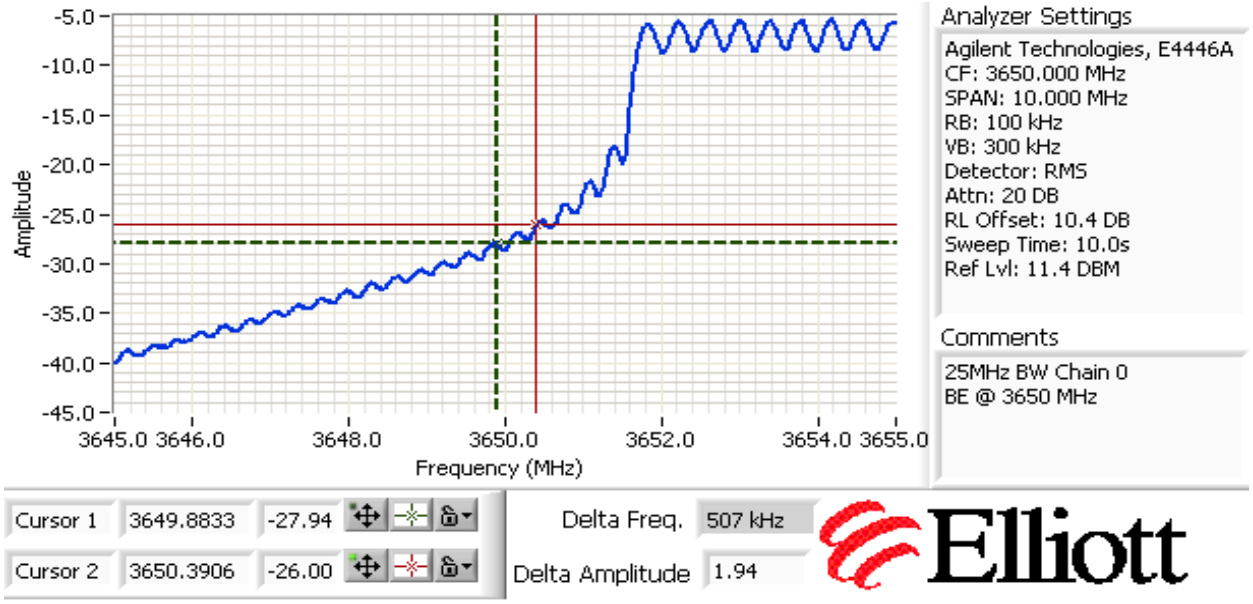
		Account Manager:	Susan Pelzl
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Plot of emissions at point when 43 + 10*log(p) limit is exceeded (-26.0dBm in 100 kHz ~ -16dBm in 1 MHz, adjusted for two transmit chains)

Freq. (MHz)	Modulation	Channel bandiwdth	Software setting[1]	Unwanted emission reference point	Worst case drift (Hz)	F_L
3662	MCS0	25MHz	24	3650.3906	26080	3650.3645

Note 1:	Power setting is the software setting used to set the output power.

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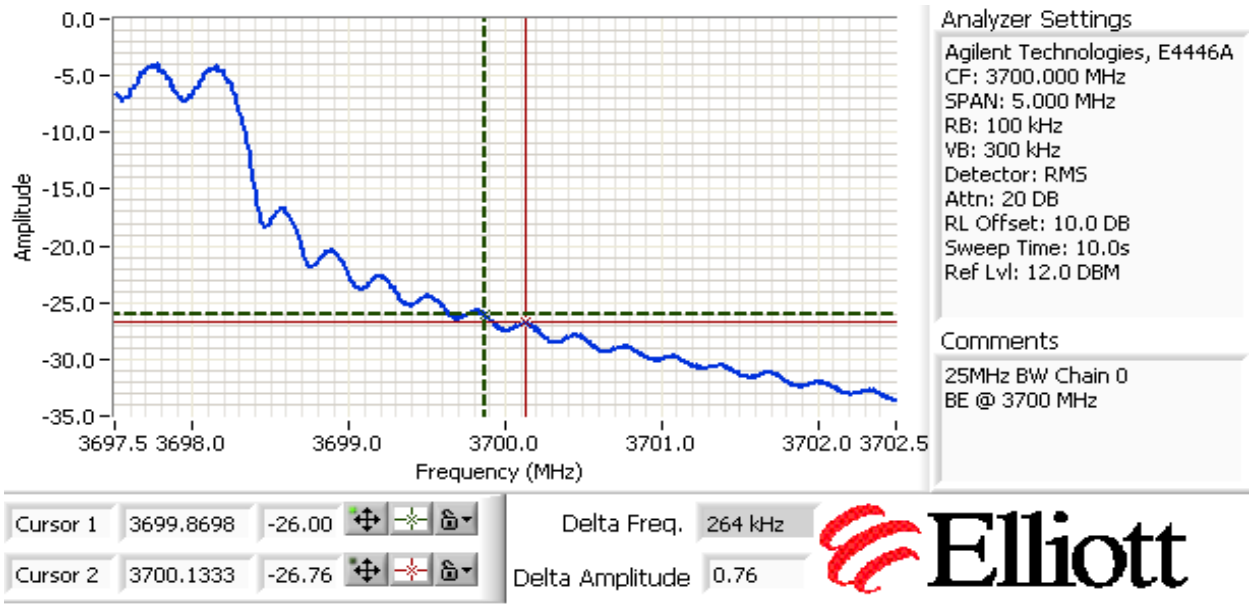
Contact:	Jennifer Sanchez		
Standard:	FCC 15B, 90Z, RSS 197	Class:	N/A



Plot of emissions at point when 43 + 10*log(p) limit is exceeded (-26.0dBm in 100 kHz ~ -16dBm in 1 MHz, adjusted for two transmit chains)

Freq. (MHz)	Modulation	Channel bandiwdth	Software setting[1]	Unwanted emissiom reference point	Worst case drift (Hz)	F_H
3688	MCS0	25MHz	24	3699.8698	26080	3699.8959

Note 1:	Power setting is the software setting used to set the output power.

END OF REPORT

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