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EMC Test Report

Application for Grant of Equipment Authorization

Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8
FCC Part 15 Subpart C

Model: W0001

IC CERTIFICATION #:	8844A-W0001
FCC ID:	X6JW0001
APPLICANT:	Biscotti Inc. 5900 S. Lake Forest Dr., Suite 290 Allen, TX 75013
TEST SITE(S):	NTS Silicon Valley 41039 Boyce Road. Fremont, CA. 94538-2435
IC SITE REGISTRATION #:	2845B-3; 2845B-7
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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	02-06-2013	First release	

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SCOPE

An electromagnetic emissions test has been performed on the Biscotti Inc. model W0001, pursuant to the following rules:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

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

ANSI C63.4:2003
FCC DTS Measurement Procedure KDB558074, March 2005

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

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

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

OBJECTIVE

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

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

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

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

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

STATEMENT OF COMPLIANCE

The tested sample of Biscotti Inc. model W0001 complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any 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 Biscotti Inc. model W0001 and therefore apply only to the tested sample. The sample was selected and prepared by Nadeem Ahmed of Biscotti Inc..

DEVIATIONS FROM THE STANDARDS

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

TEST RESULTS SUMMARY

DIGITAL TRANSMISSION SYSTEMS (2400 – 2483.5MHz)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 210 A8.2	Digital Modulation	Systems uses OFDM / DSSS techniques	System must utilize a digital transmission technology	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	11b :9.99 MHz 11g: 16.32 MHz n20: 15.72 MHz n40: 36.31 MHz	>500kHz	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	11b: 18.2 dBm 11g: 22.6 dBm n20: 13.8 dBm n40: 14.3 dBm EIRP = 0.364 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	11b: -10 dBm/3kHz 11g: -0.5 dBm/3kHz n20: 2.5 dBm/1MHz n40: 0.2 dBm/1MHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	All emissions >20dBc or >30dBc	< -20dBc < -30dBc Note 2	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	53.9 dBµV/m @ 2483.9 MHz (-0.1 dB)	15.207 in restricted bands, all others < -20dBc <-30dBc Note 2	Complies

Note 1: EIRP calculated using antenna gain of 3 dBi for the highest EIRP system.
Note 2: A limit of -30dBc was used when power was measured using the UNII test procedure (maximum power averaged over a transmission burst). For other cases, a limit of -20dBc was applied.

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	11a: 16.27 MHz n20: 15.25 MHz n40: 35.75 MHz	>500kHz	Complies
15.247 (b)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	11a: 24.1 dBm n20: 16.7 dBm n40: 16.9 dBm EIRP = 0.348 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	11a: 3.1 dBm/1MHz n20: 6.6 dBm/1MHz n40: 4.3 dBm/1MHz	Maximum permitted is 8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions – 30MHz – 40 GHz	All spurious emissions < -20dBc	< -20dBc < -30dBc Note 2	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 40 GHz	47.4 dBµV/m @ 1500.0 MHz (-6.6 dB)	15.207 in restricted bands, all others < -20dBc <-30dBc Note 2	Complies

Note 1: EIRP calculated using antenna gain of 5.5 dBi for the highest EIRP system multi-point system.
Note 2: A limit of -30dBc was used when power was measured using the UNII test procedure (maximum power averaged over a transmission burst). For other cases, a limit of -20dBc was applied.

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	The module uses u.FL connectors	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	51.5dBµV @ 0.183MHz	Refer to page 18	Complies (-12.8dB)
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	-	-	N/A
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual		Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth (2.4GHz)	11b: 13.5 MHz 11g: 17.5 MHz n20: 18.8 MHz n40: 37.0 MHz	Information only	N/A
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth (5.8GHz)	11a: 20.8 MHz n20: 20.8 MHz n40: 38.1 MHz	Information only	N/A

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 Biscotti Inc. model W0001 is an 802.11abgn (2x2) radio module. Since the EUT would be placed on a tabletop during operation, the EUT was treated as tabletop equipment during testing to simulate the end-user environment. The EUT is powered from a host device.

The sample was received on October 7 2012 and tested on October 7, November 7, 8, December 8, 13, 17, 18, 19, 27 and 28, 2012. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Biscotti Inc.	TV Phone (2nd Generation)	802.11abgn 2x2Module	(MAC): B0.EE.45.03.16.B3	X6JW0001

ANTENNA SYSTEM

The EUT was tested with the following antenna:

Taoglas, FXP831.07.0100C0, 3dBi @ 2.4GHz, 5.5dBi @ 5GHz, dipole antenna

ENCLOSURE

The EUT has no enclosure. It is designed to be installed within the enclosure of a host computer.

MODIFICATIONS

No modifications were made to the EUT during the time the product was at NTS Silicon Valley.

SUPPORT EQUIPMENT

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Dell	Inspiron M5040	Laptop	20131950925	-

No remote support equipment was used during testing.

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT	Laptop (USB)	USB	Shielded	1
Laptop	AC Mains	3 Wire	Unshielded	1.5

EUT OPERATION

During testing, the EUT was configured to continuously transmit at the noted power at the lowest data rate, as this resulted in the highest output power; 1Mb/s for 11b, 6Mb/s for 11g, MCS0 for n20 and n40.

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 7	A2LA accreditation	2845B-7	

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.

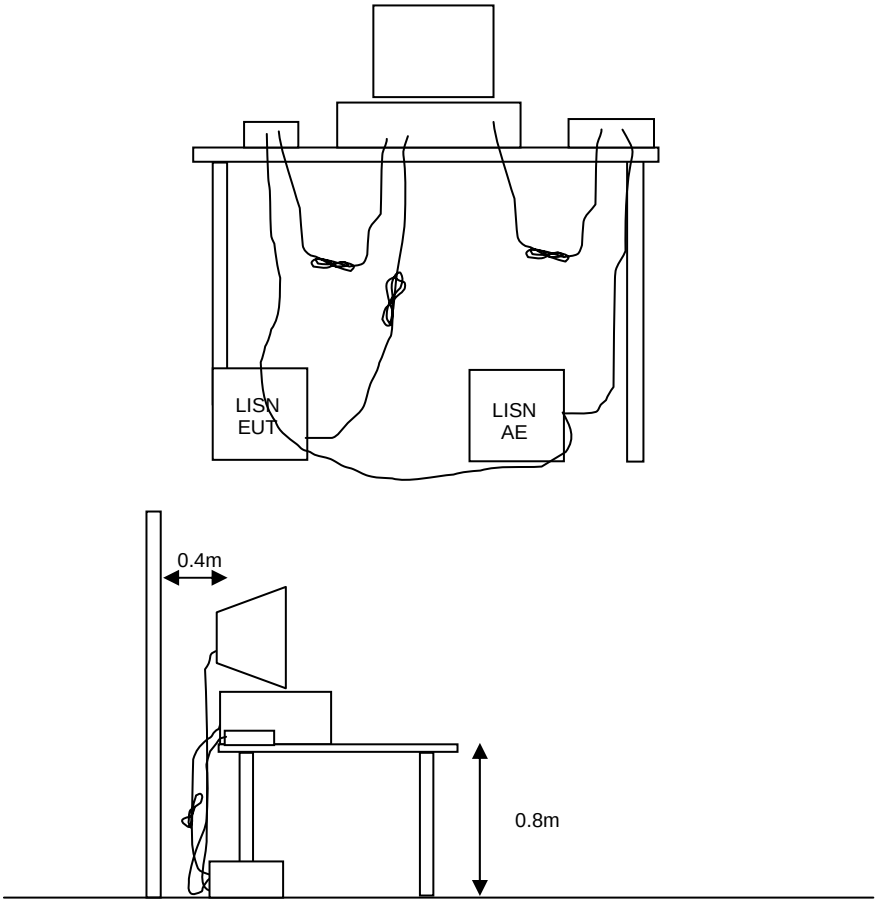


Figure 1 Typical Conducted Emissions Test Configuration

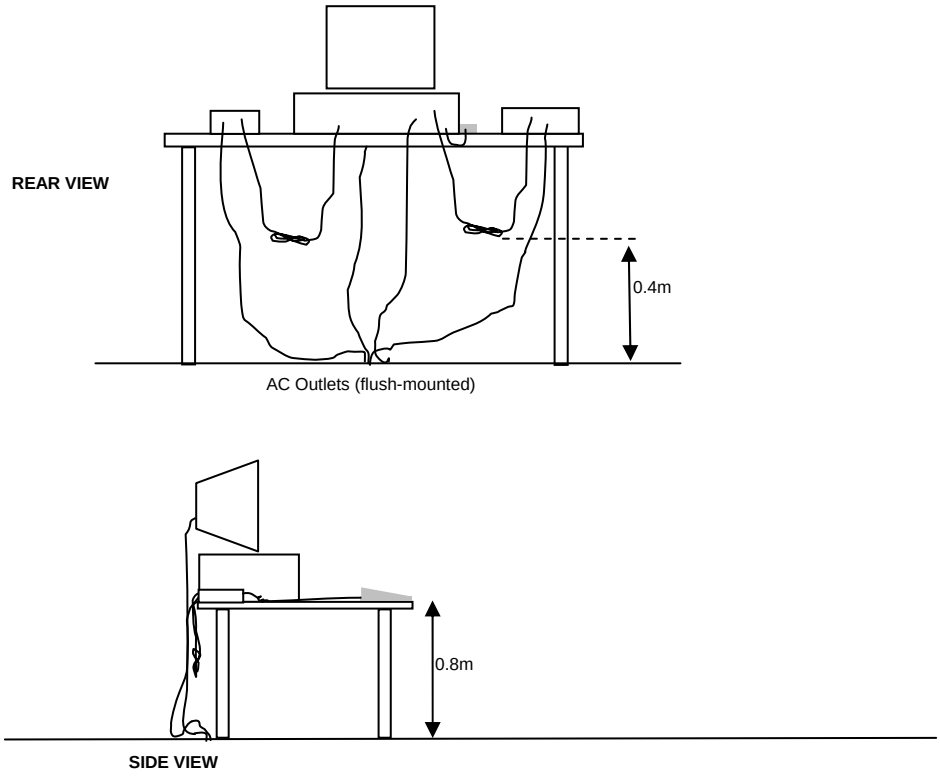
RADIATED EMISSIONS

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.

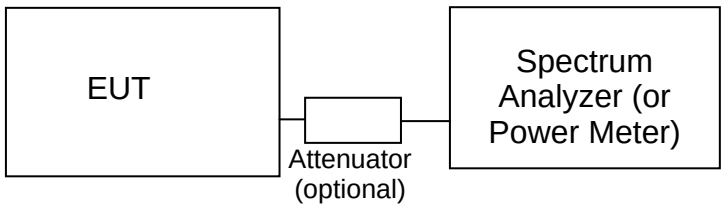
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements

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 NTS Silicon Valley'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:

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

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

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

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

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

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

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

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

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

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

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

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

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

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

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

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

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

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

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

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

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

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

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

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

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

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

Manufacturer	Description	Model	Asset #	Cal Due
Radiated Emissions, 1,000 - 6,500 MHz, 07-Nov-12				
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	5/21/2013
Radiated Emissions, 1,000 - 26,500 MHz, 08-Nov-12				
Hewlett Packard	Head (Inc flex cable, 1143, 2198) Red	84125C	1145	7/5/2013
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2013
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1683	8/2/2013
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	5/21/2013
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	11/22/2012
A.H. Systems	Red System Horn, 18-40GHz	SAS-574, p/n: 2581	2161	3/20/2013
Radiated Emissions, 1,000 - 40,000 MHz, 09-Nov-12				
Hewlett Packard	Head (Inc flex cable, 1143, 2198) Red	84125C	1145	7/5/2013
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2013
Hewlett Packard	High Pass filter, 8.2 GHz (Blu System)	P/N 84300-80039 (84125C)	1392	5/18/2013
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	5/21/2013
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	11/22/2012
A.H. Systems	Red System Horn, 18-40GHz	SAS-574, p/n: 2581	2161	3/20/2013
Micro-Tronics	Band Reject Filter, 5470-5725 MHz	BRC50704-02	2240	10/4/2013
DFS, 14-Nov-12				
Hewlett Packard	EMC Spectrum Analyzer, 9 kHz - 6.5 GHz	8595EM	780	1/25/2013
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	9/26/2014
EMCO	Antenna, Horn, 1-18 GHz	3117	1662	5/25/2014
Agilent	PSG Vector Signal Generator (250kHz - 20GHz)	E8267C	1877	5/11/2013
Tektronix	500MHz, 2CH, 5GS/s Scope	TDS5052B	2118	10/22/2013
Radiated Emissions, 1 - 18 GHz, 27-Nov-12				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2013
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	1682	3/23/2013
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2012
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	2239	10/4/2013
Radiated Emissions, 1000 - 40,000MHz, 29-Nov-12				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014

Manufacturer	Description	Model	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	5/18/2013
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2013
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	2239	10/4/2013
Radiated Emissions, 1000 - 40000MHz, 04-Dec-12				
EMCO	Antenna, Horn, 1-18 GHz	3115	487	7/19/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	11/9/2013
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	9/14/2013
Radiated Emissions, 1000 - 40,000 MHz, 14-Dec-12				
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	8/23/2014
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	1680	8/2/2013
Micro-Tronics	Band Reject Filter, 5470-5725 MHz	BRC50704-02	1730	8/2/2013
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	5/1/2013
A.H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	4/17/2013
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	2415	8/10/2013
Radiated Emissions, 1,000 - 18,000 MHz, 18-Dec-12				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	3/29/2013
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/1/2013
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	2241	10/4/2013
Radiated Emissions, 1,000 - 40,000 MHz, 18-Dec-12				
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	3/29/2013
EMCO	Antenna, Horn, 1-18 GHz (SA40-Blu)	3115	1386	9/26/2014
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	7/12/2014
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	2241	10/4/2013
Conducted Emissions - AC Power Ports, 19-Dec-12				
EMCO	LISN, 10 kHz-100 MHz, 25A	3825/2	1292	2/16/2013
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	5/22/2013
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	5/31/2013
Radio Antenna Port (Power and Spurious Emissions), 28-Dec-12				
Agilent	50GHz PSA Spectrum Analyzer	E4448A-M27	199979	11/15/2013
Radio Antenna Port (Power and Spurious Emissions), 07-Jan-13				
Agilent	50GHz PSA Spectrum Analyzer	E4448A-M27	199979	11/15/2013

Appendix B Test Data

T89809 Pages 26 - 117

Client:	Biscotti, Inc.	Job Number:	J89805
Product	W0001 - Module	T-Log Number:	T89809
	802.11abgn 2x2	Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Emissions Standard(s):	FCC 15.247, 15.E	Class:	-
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Biscotti, Inc.

Product

W0001 - Module
802.11abgn 2x2

Date of Last Test: 1/7/2013

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	-

Conducted Emissions

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

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: 12/19/2012
Test Engineer: M. Birgani
Test Location: Fremont Chamber #3
Config. Used: 1
Config Change: HP laptop was used.
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and host system were located on a wooden table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN.

Ambient Conditions:

Temperature: 13-18 °C
Rel. Humidity: 35-45 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	Class B	PASS	51.5dBµV @ 0.183MHz (-12.8dB)

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:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	-

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Preliminary peak readings captured during pre-scan (peak readings vs. average limit)

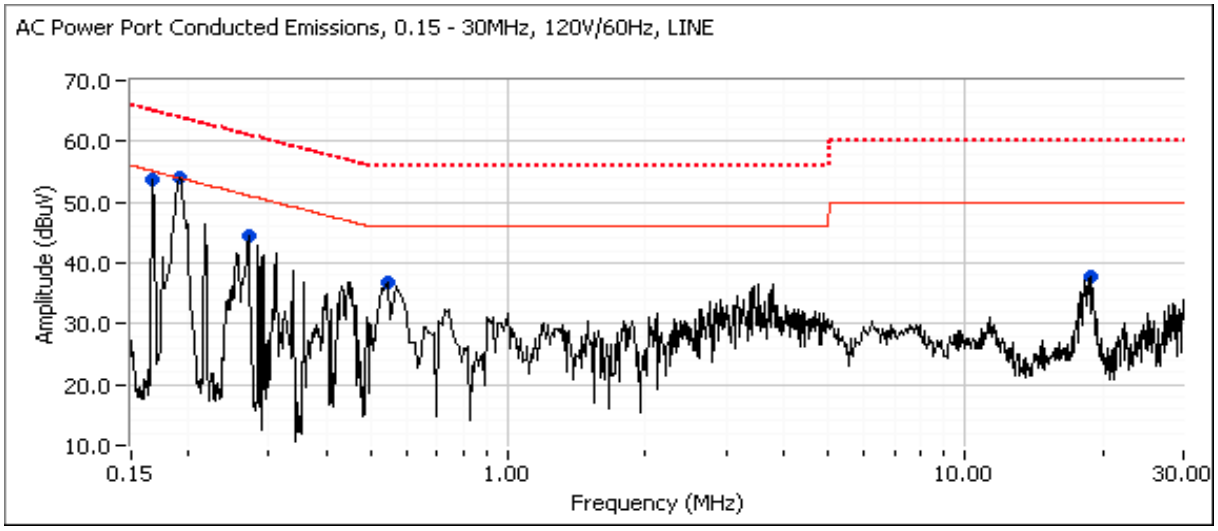
Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.194	54.0	Line	54.0	0.0	Peak	
0.164	53.8	Line	55.1	-1.3	Peak	
0.183	50.8	Neutral	54.2	-3.4	Peak	
0.219	47.5	Neutral	52.9	-5.4	Peak	
0.269	44.4	Line	51.1	-6.7	Peak	
0.258	44.6	Neutral	51.4	-6.8	Peak	
0.552	36.7	Line	46.0	-9.3	Peak	
18.656	40.2	Neutral	50.0	-9.8	Peak	
0.556	35.7	Neutral	46.0	-10.3	Peak	

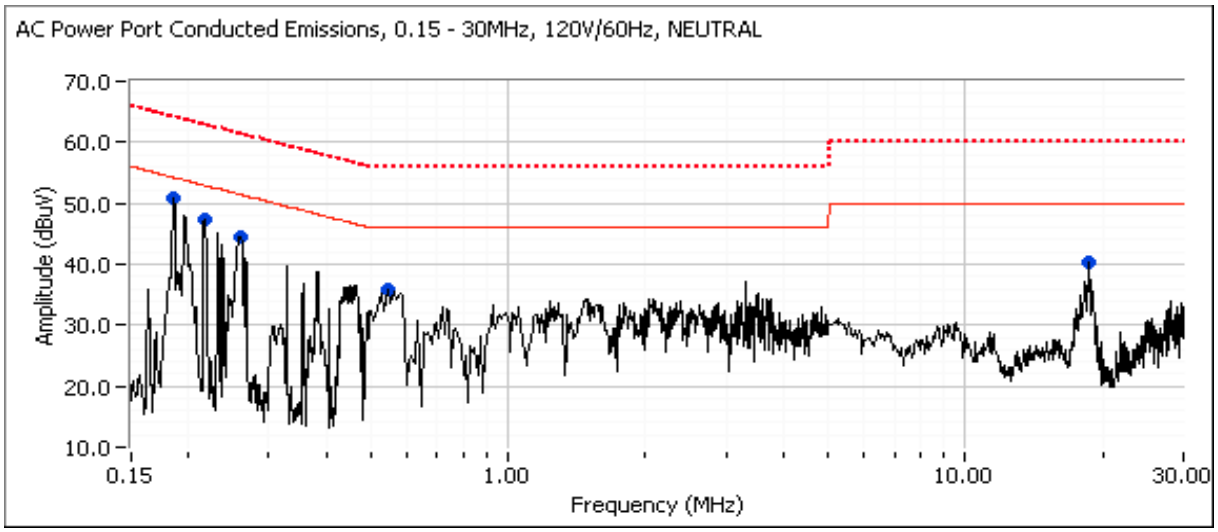
Final quasi-peak and average readings

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.183	51.5	Neutral	64.3	-12.8	QP	QP (1.00s)
0.194	50.1	Line	63.9	-13.8	QP	QP (1.00s)
0.164	47.5	Line	65.3	-17.8	QP	QP (1.00s)
0.183	36.0	Neutral	54.3	-18.3	AVG	AVG (0.10s)
0.194	35.3	Line	53.9	-18.6	AVG	AVG (0.10s)
0.258	41.6	Neutral	61.5	-19.9	QP	QP (1.00s)
0.556	34.6	Neutral	56.0	-21.4	QP	QP (1.00s)
0.219	41.4	Neutral	62.9	-21.5	QP	QP (1.00s)
0.552	34.4	Line	56.0	-21.6	QP	QP (1.00s)
18.656	27.9	Neutral	50.0	-22.1	AVG	AVG (0.10s)
0.269	37.8	Line	61.1	-23.3	QP	QP (1.00s)
0.556	22.3	Neutral	46.0	-23.7	AVG	AVG (0.10s)
0.552	22.2	Line	46.0	-23.8	AVG	AVG (0.10s)
0.258	26.6	Neutral	51.5	-24.9	AVG	AVG (0.10s)
18.656	34.3	Neutral	60.0	-25.7	QP	QP (1.00s)
0.269	19.1	Line	51.1	-32.0	AVG	AVG (0.10s)
0.164	20.4	Line	55.3	-34.9	AVG	AVG (0.10s)
0.219	16.6	Neutral	52.9	-36.3	AVG	AVG (0.10s)

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	-

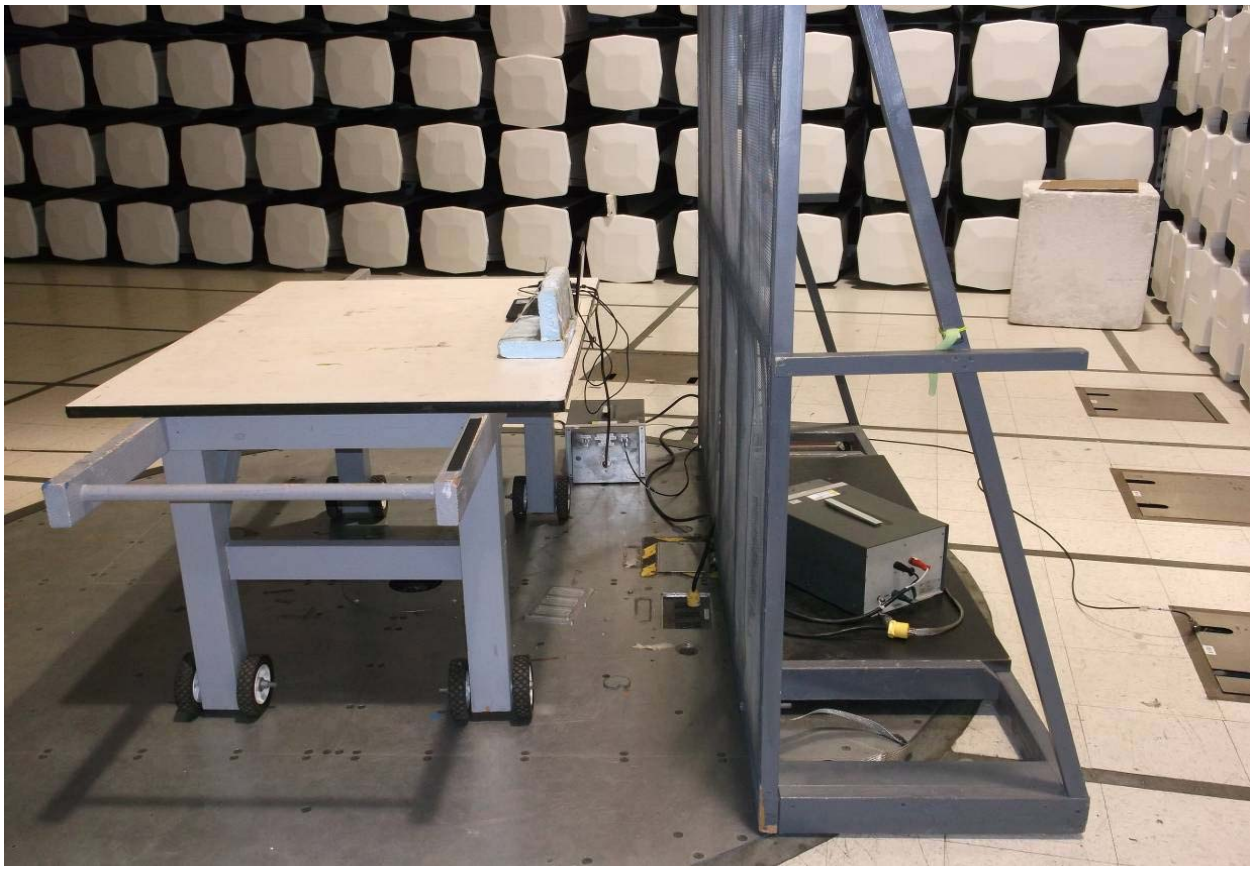
Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz





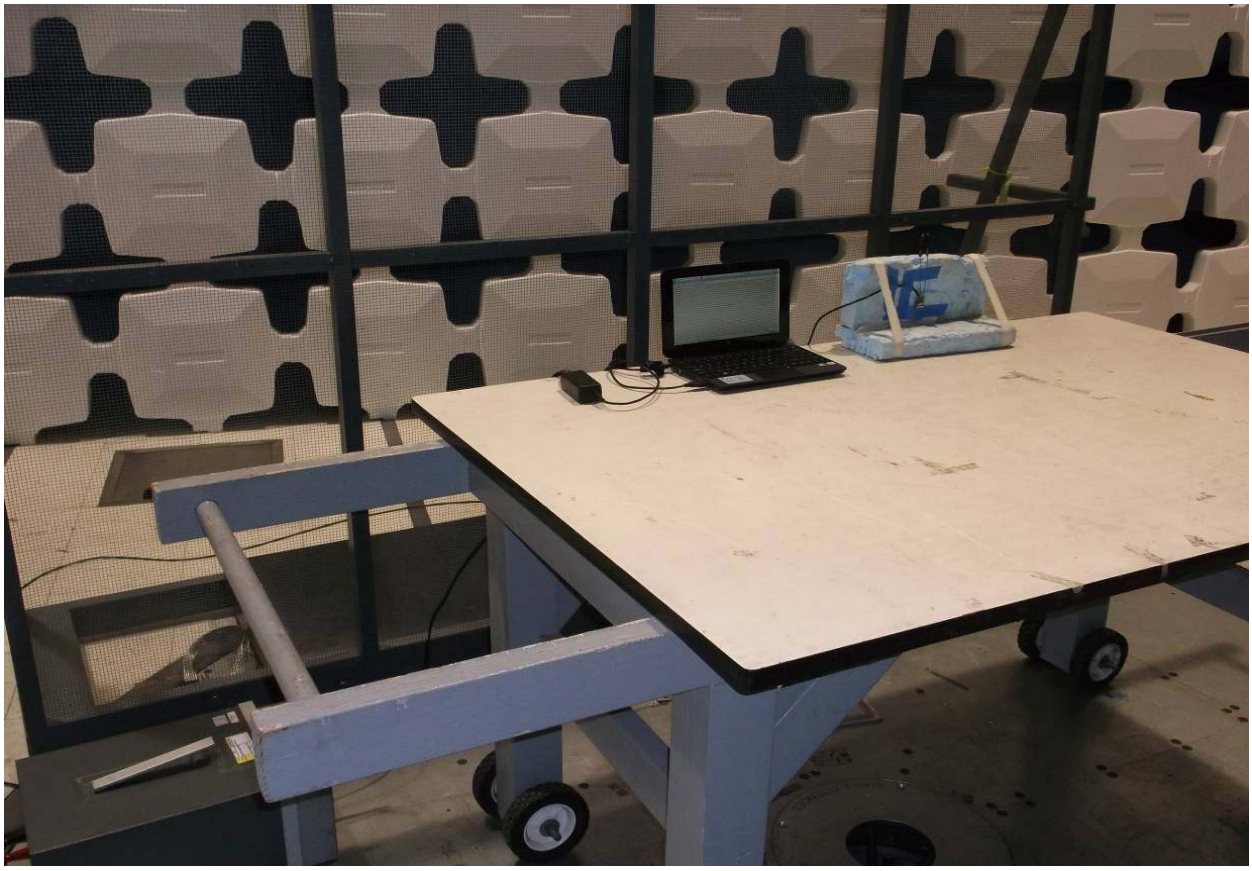
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	-

Test Configuration Photograph #1
(Conducted Emissions - Power Port)



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	-

Test Configuration Photograph #2
(Conducted Emissions - Power Port)



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

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

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

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

Ambient Conditions:

Temperature: 18-23 °C

Rel. Humidity: 35-45 %

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.

Sample Notes:

SAMPLE S/N: (NTS 2012-2239)

EUT Firmware: 14.1.11.132

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

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

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
Run # 1	802.11b Chain A	#1 2412MHz	20.0	15.7	Restricted Band Edge at 2390 MHz	15.209	33.6 dBµV/m @ 2386.3 MHz (-20.4 dB)
		#11 2462MHz	20.0	15.1	Restricted Band Edge at 2483.5 MHz	15.209	37.5 dBµV/m @ 2487.9 MHz (-16.5 dB)
Run # 2	802.11g Chain A	#1 2412MHz	20.0	15.6	Restricted Band Edge at 2390 MHz	15.209	49.5 dBµV/m @ 2390.0 MHz (-4.5 dB)
		#11 2462MHz	20.0	14.9	Restricted Band Edge at 2483.5 MHz	15.209	52.6 dBµV/m @ 2483.5 MHz (-1.4 dB)
Run # 3	n20 Chain A+B	#1 2412MHz	14.0	11.8/11.8	Restricted Band Edge at 2390 MHz	15.209	34.5 dBµV/m @ 2389.9 MHz (-19.5 dB)
		#11 2462MHz	14.0	10.8/10.9	Restricted Band Edge at 2483.5 MHz	15.209	46.9 dBµV/m @ 2483.5 MHz (-7.1 dB)
Run # 4	n40 Chain A+B	#3 2422MHz	14.0	12.3/12.4	Restricted Band Edge at 2390 MHz	15.209	51.3 dBµV/m @ 2389.4 MHz (-2.7 dB)
		#9 2452MHz	14.0	10.9/10.9	Restricted Band Edge at 2483.5 MHz	15.209	53.9 dBµV/m @ 2483.9 MHz (-0.1 dB)

Measured Power: Power measured using wideband average power meter, for reference purposes only

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 1, Band Edge Field Strength - 802.11b, Chain A

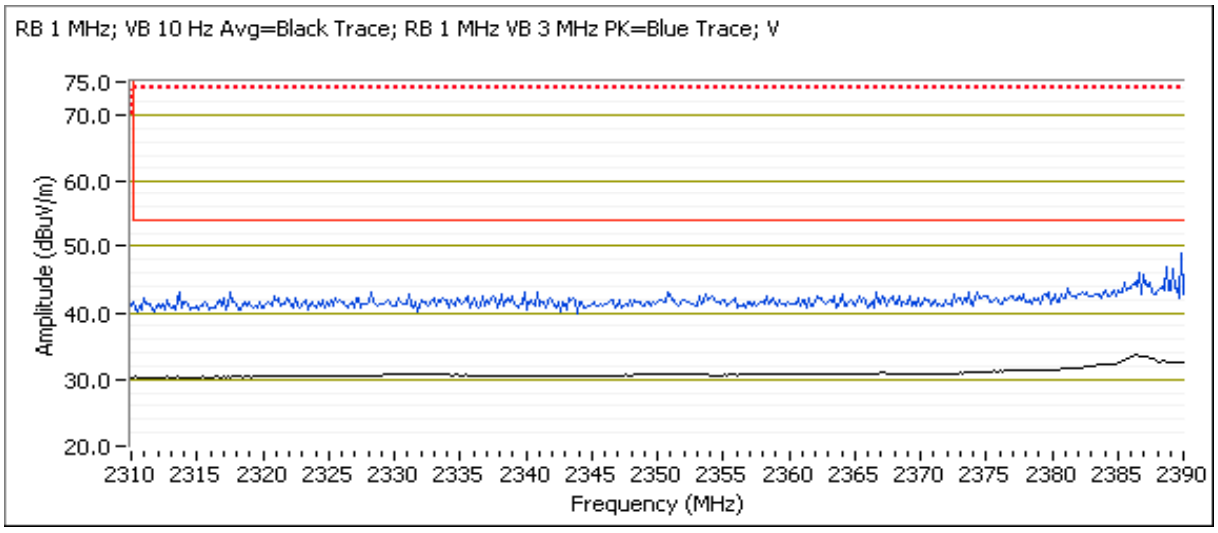
Date of Test: 11/8/2012 Test Location: FT 7

Test Engineer: Jack Liu Config Change: none

Run # 1a, EUT on Channel #1 2412MHz - 802.11b, Chain A

2390 MHz Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2386.310	33.6	V	54.0	-20.4	AVG	126	1.7	POS; RB 1 MHz; VB: 10 Hz
2386.310	43.5	V	74.0	-30.5	PK	126	1.7	POS; RB 1 MHz; VB: 3 MHz
2386.310	32.0	H	54.0	-22.0	AVG	118	1.1	POS; RB 1 MHz; VB: 10 Hz
2389.520	42.9	H	74.0	-31.1	PK	118	1.1	POS; RB 1 MHz; VB: 3 MHz

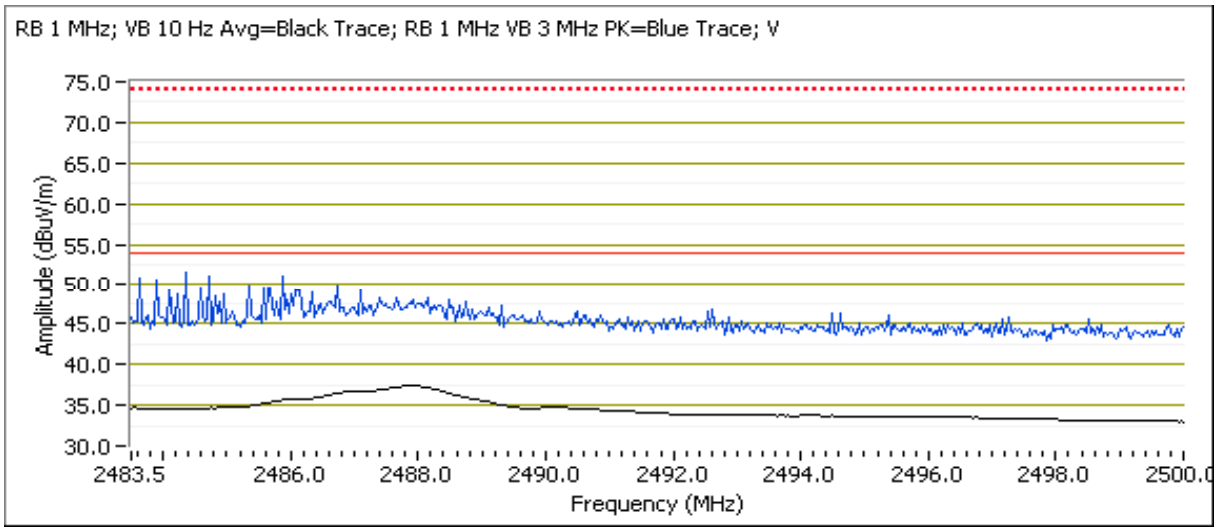


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 1b, EUT on Channel #11 2462MHz - 802.11b, Chain A

2483.5 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2487.860	37.5	V	54.0	-16.5	AVG	226	1.4	POS; RB 1 MHz; VB: 10 Hz
2486.770	47.0	V	74.0	-27.0	PK	226	1.4	POS; RB 1 MHz; VB: 3 MHz
2487.900	34.2	H	54.0	-19.8	AVG	107	1.0	POS; RB 1 MHz; VB: 10 Hz
2486.740	44.5	H	74.0	-29.5	PK	107	1.0	POS; RB 1 MHz; VB: 3 MHz



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 2, Band Edge Field Strength - 802.11g, Chain A

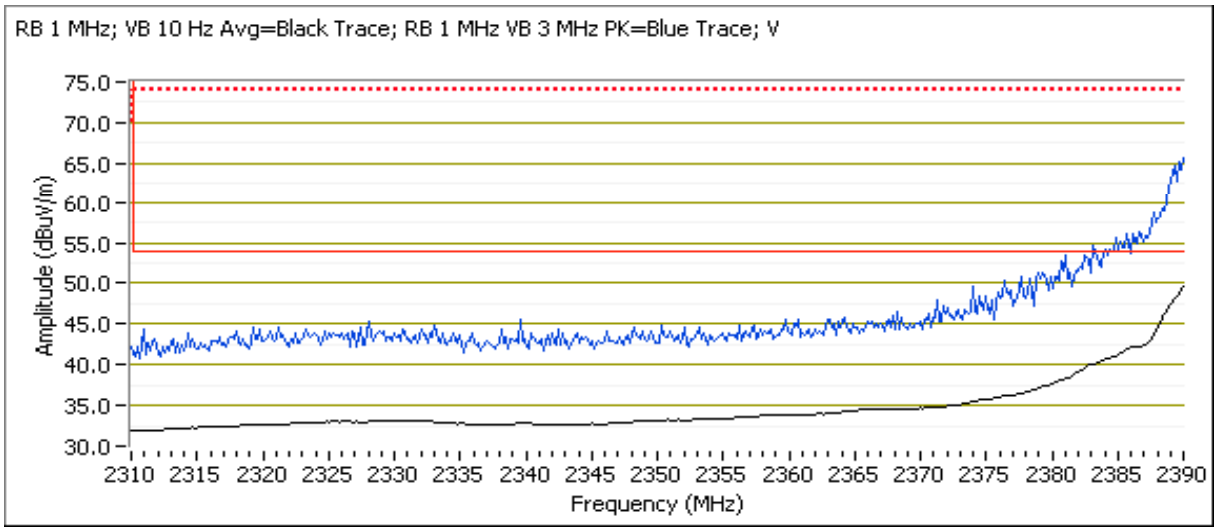
Date of Test: 11/8/2012 Test Location: FT 7

Test Engineer: Jack Liu Config Change: none

Run # 2a, EUT on Channel #1 2412MHz - 802.11g, Chain A

2390 MHz Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.000	49.5	V	54.0	-4.5	AVG	243	1.4	POS; RB 1 MHz; VB: 10 Hz
2389.520	61.9	V	74.0	-12.1	PK	243	1.4	POS; RB 1 MHz; VB: 3 MHz
2390.000	47.6	H	54.0	-6.4	AVG	102	1.1	POS; RB 1 MHz; VB: 10 Hz
2389.360	62.1	H	74.0	-11.9	PK	102	1.1	POS; RB 1 MHz; VB: 3 MHz

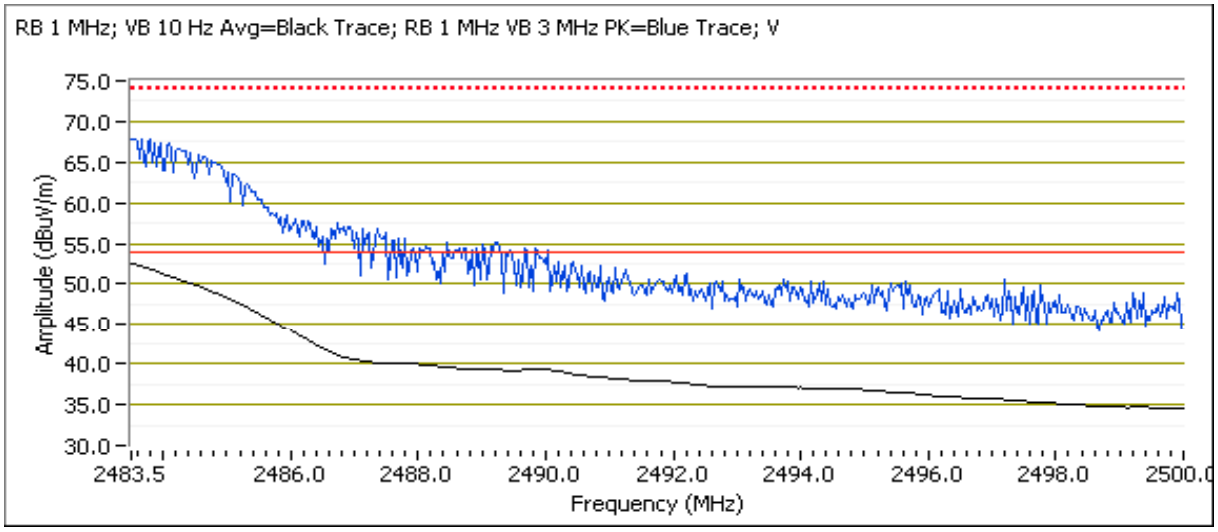


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 2b, EUT on Channel #11 2462MHz - 802.11g, Chain A

2483.5 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	52.6	V	54.0	-1.4	AVG	225	1.1	POS; RB 1 MHz; VB: 10 Hz
2483.830	67.6	V	74.0	-6.4	PK	225	1.1	POS; RB 1 MHz; VB: 3 MHz
2483.500	48.3	H	54.0	-5.7	AVG	93	1.0	POS; RB 1 MHz; VB: 10 Hz
2483.900	63.0	H	74.0	-11.0	PK	93	1.0	POS; RB 1 MHz; VB: 3 MHz



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 3, Band Edge Field Strength - n20, Chain A+B

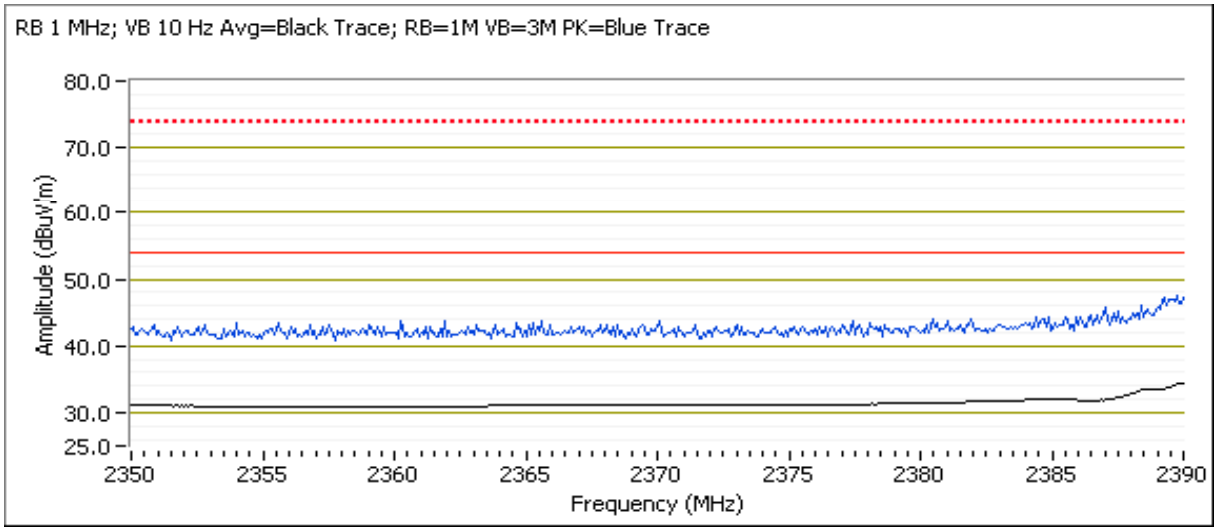
Date of Test: 10/7/2012 Test Location: FT Chamber #7

Test Engineer: M. Birgani Config Change: none

Run # 3a, EUT on Channel #1 2412MHz - n20, Chain A+B

2390 MHz Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.920	34.5	V	54.0	-19.5	AVG	70	1.0	POS; RB 1 MHz; VB: 10 Hz
2390.000	32.7	H	54.0	-21.3	AVG	266	1.0	POS; RB 1 MHz; VB: 10 Hz
2389.200	46.7	V	74.0	-27.3	PK	70	1.0	POS; RB 1 MHz; VB: 3 MHz
2389.760	43.8	H	74.0	-30.2	PK	266	1.0	POS; RB 1 MHz; VB: 3 MHz

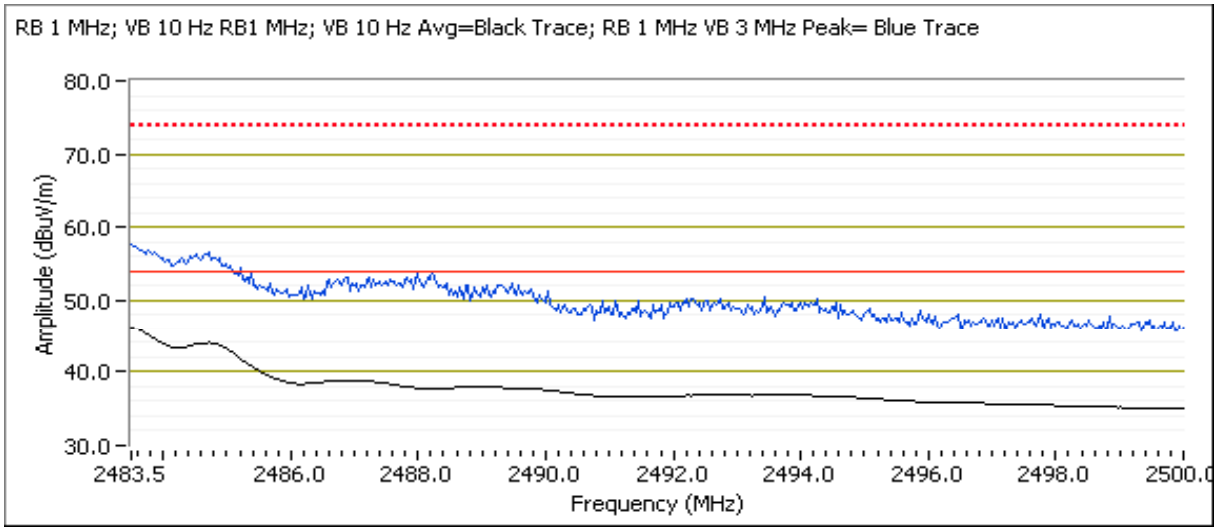


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 3b, EUT on Channel #11 2462MHz - n20, Chain A+B

2483.5 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	46.9	V	54.0	-7.1	AVG	158	1.4	POS; RB 1 MHz; VB: 10 Hz
2484.720	40.0	H	54.0	-14.0	AVG	63	1.0	POS; RB 1 MHz; VB: 10 Hz
2483.500	57.8	V	74.0	-16.2	PK	158	1.4	POS; RB 1 MHz; VB: 3 MHz
2484.460	51.5	H	74.0	-22.5	PK	63	1.0	POS; RB 1 MHz; VB: 3 MHz



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 4, Band Edge Field Strength - n40, Chain A

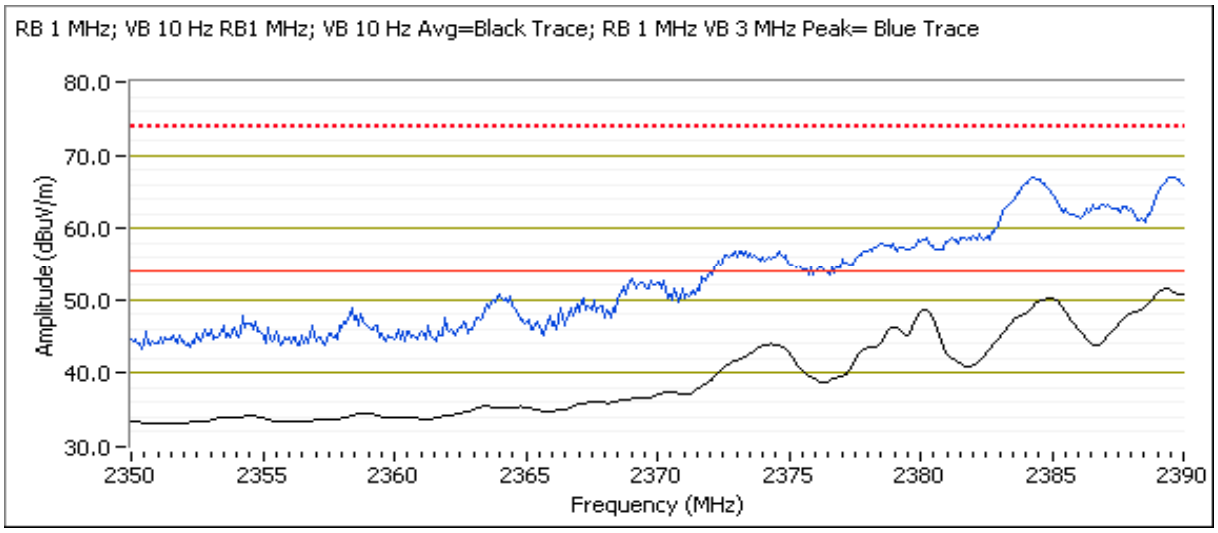
Date of Test: 10/7/2012 Test Location: FT Chamber #7

Test Engineer: M. Birgani Config Change: none

Run # 4a, EUT on Channel #3 2422MHz - n40, Chain A

2390 MHz Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.360	51.3	V	54.0	-2.7	AVG	27	1.0	POS; RB 1 MHz; VB: 10 Hz
2389.680	66.3	V	74.0	-7.7	PK	27	1.0	POS; RB 1 MHz; VB: 3 MHz

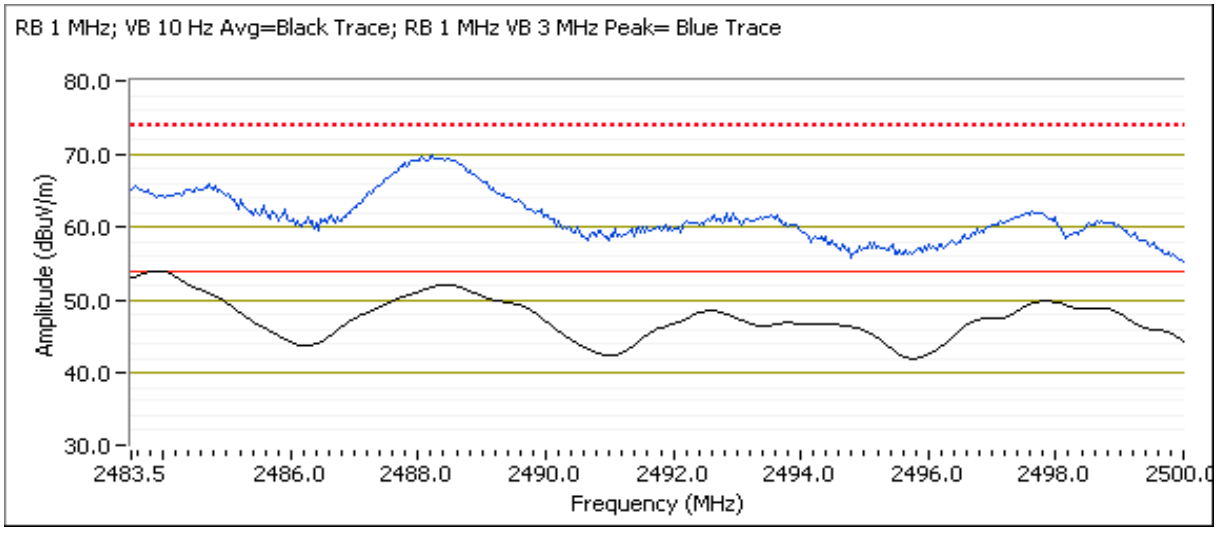


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 4b, EUT on Channel #9 2452MHz - n40, Chain A

2483.5 MHz Band Edge Signal Radiated Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.900	53.9	V	54.0	-0.1	AVG	204	1.1	POS; RB 1 MHz; VB: 10 Hz
2488.330	69.4	V	74.0	-4.6	PK	204	1.1	POS; RB 1 MHz; VB: 3 MHz



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

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

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

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

Ambient Conditions:

Temperature: 18-23 °C

Rel. Humidity: 35-45 %

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.

Sample Notes:

SAMPLE S/N: (NTS 2012-2239)

EUT Firmware: 14.1.11.132

Notes:

No radio related emissions observed below 1GHz or above 18GHz in preliminary measurements.

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

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

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
Run # 2	802.11g Chain A	#1 2412MHz	20.0	15.6	Radiated Emissions 1 - 26 GHz	FCC 15.209 / 15.247	37.9 dBµV/m @ 4826.9 MHz (-16.1 dB)
		#6 2437MHz	20.0	15.0			41.3 dBµV/m @ 1500.1 MHz (-12.7 dB)
		#11 2462MHz	20.0	14.9			38.3 dBµV/m @ 1500.1 MHz (-15.7 dB)
Run # 3	802.11n20 Chain A+B	#1 2412MHz	14.0	11.8/11.8	Radiated Emissions 1 - 26 GHz	FCC 15.209 / 15.247	40.4 dBµV/m @ 1500.1 MHz (-13.6 dB)
		#6 2437MHz	14.0	11.4/11.2			37.8 dBµV/m @ 1500.1 MHz (-16.2 dB)
		#11 2462MHz	14.0	10.8/10.9			41.0 dBµV/m @ 1500.0 MHz (-13.0 dB)
Run # 4	802.11n40 Chain A+B	#3 2422MHz	14.0	12.3/12.4	Radiated Emissions 1 - 26 GHz	FCC 15.209 / 15.247	41.0 dBµV/m @ 1500.1 MHz (-13.0 dB)
		#6 2437MHz	14.0	11.9/12.0			40.3 dBµV/m @ 1500.0 MHz (-13.7 dB)
		#9 2452MHz	14.0	10.9/10.9			42.1 dBµV/m @ 1500.0 MHz (-11.9 dB)
Run #5	802.11b Chain A	#1 2412MHz	20.0	15.3	Radiated Emissions 1 - 26 GHz	FCC 15.209 / 15.247	53.3 dBµV/m @ 4824.0 MHz (-0.7 dB)
		#6 2437MHz	20.0	14.7			53.8 dBµV/m @ 4874.0 MHz (-0.2 dB)
		#11 2462MHz	20.0	14.3			48.1 dBµV/m @ 4924.0 MHz (-5.9 dB)

Measured Power: Power measured using wideband average power meter, for reference purposes only

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 2, Radiated Spurious Emissions, 1-26GHz, 802.11g, Chain A

Date of Test: 11/8/2012 Test Location: FT7

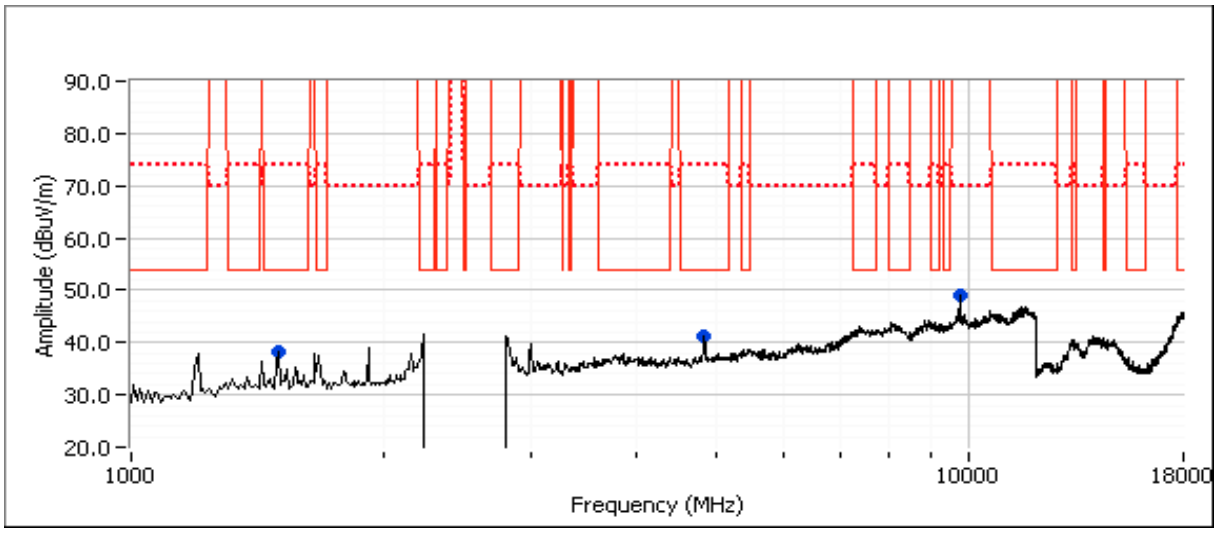
Test Engineer: Jack Liu Config Change: None

Run # 2a, EUT on Channel #1 2412MHz - 802.11g, Chain A

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4826.930	37.9	V	54.0	-16.1	AVG	60	1.3	RB 1 MHz;VB 10 Hz;Peak
4818.670	48.4	V	74.0	-25.6	PK	60	1.3	RB 1 MHz;VB 3 MHz;Peak
1500.120	38.5	V	54.0	-15.5	AVG	28	1.2	RB 1 MHz;VB 10 Hz;Peak
1500.320	45.8	V	74.0	-28.2	PK	28	1.2	RB 1 MHz;VB 3 MHz;Peak
9730.000	49.2	V	-	-	Peak	165	2.2	Note 1

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.



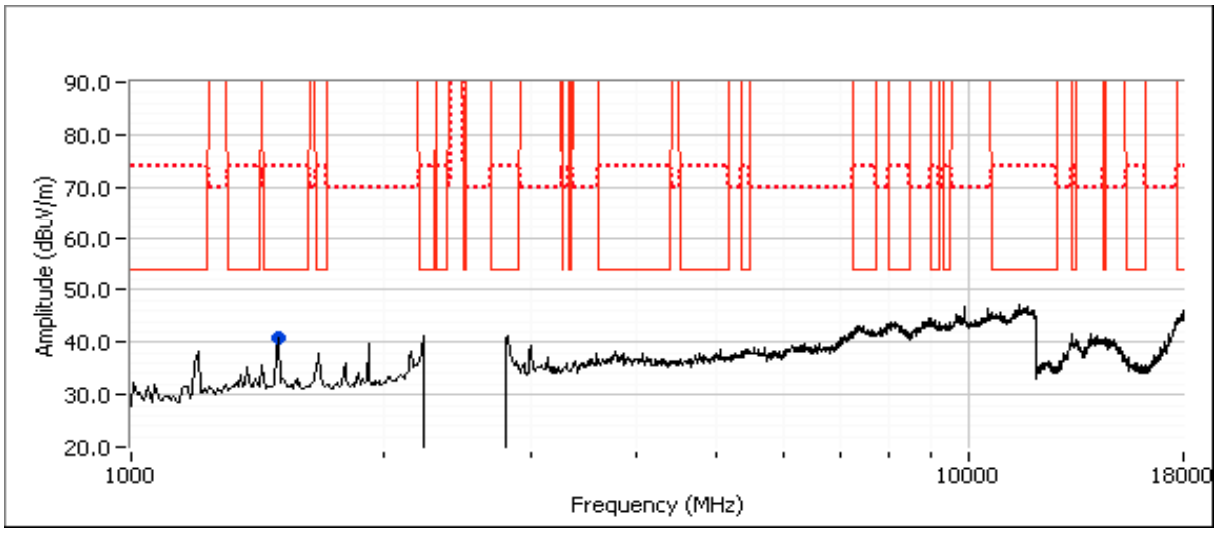
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 2b: , EUT on Channel #6 2437MHz - 802.11g, Chain A

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1500.120	41.3	V	54.0	-12.7	AVG	211	1.0	RB 1 MHz;VB 10 Hz;Peak
1500.030	48.6	V	74.0	-25.4	PK	211	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Scans made between 18 - 25GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no signifcant emissions in this frequency range



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 2c: , EUT on Channel #11 2462MHz - 802.11g, Chain A

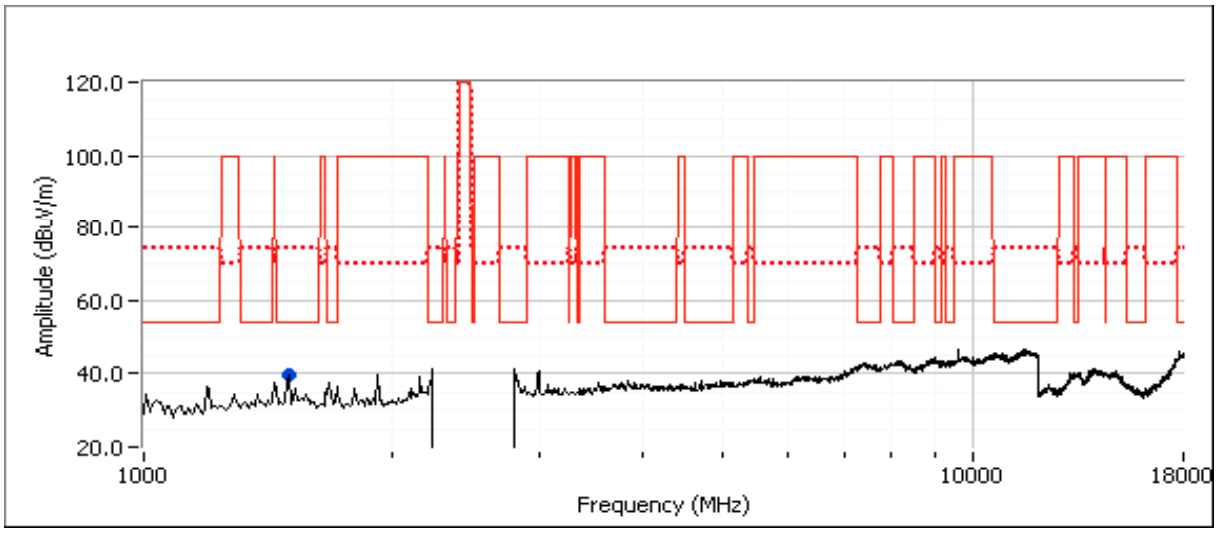
Date of Test: 11/7/2012 Test Location: FT Chamber#7

Test Engineer: Rafael Varelas Config Change: none

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1500.050	38.3	V	54.0	-15.7	AVG	12	1.5	RB 1 MHz;VB 10 Hz;Peak
1500.120	45.5	V	74.0	-28.5	PK	12	1.5	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 3, Radiated Spurious Emissions, 1-26GHz, 802.11n20, Chain A+B

Date of Test: 11/7/2012 Test Location: FT Chamber#7

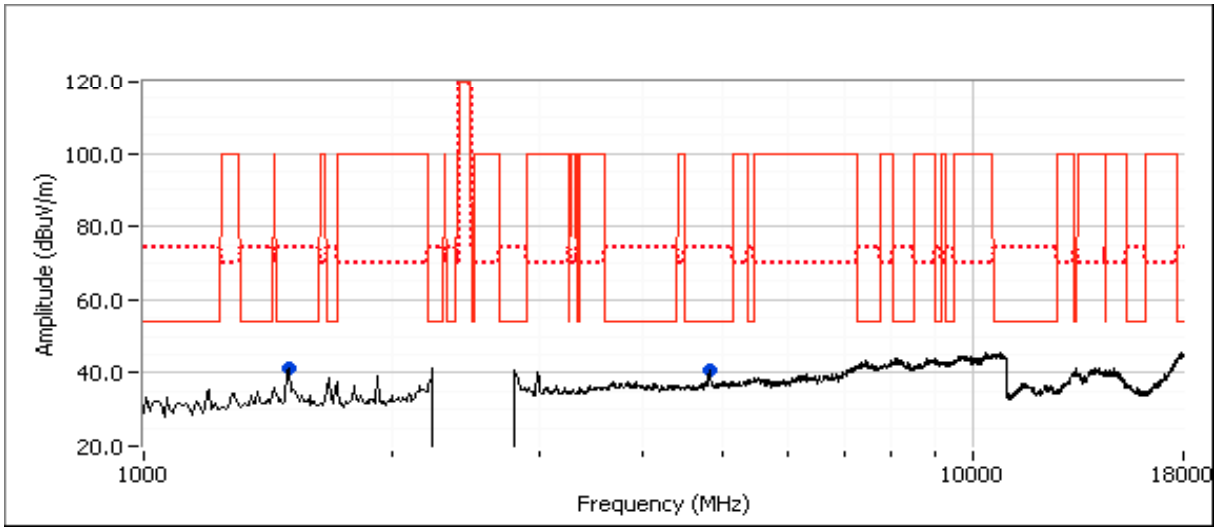
Test Engineer: Joseph Cadigal Config Change: none

Run # 3a, EUT on Channel #1 2412MHz - 802.11n20, Chain A+B

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1500.100	40.4	V	54.0	-13.6	AVG	15	1.3	RB 1 MHz;VB 10 Hz;Peak
4831.800	35.3	V	54.0	-18.7	AVG	163	1.0	RB 1 MHz;VB 10 Hz;Peak
1499.940	47.0	V	74.0	-27.0	PK	15	1.3	RB 1 MHz;VB 3 MHz;Peak
4831.800	46.2	V	74.0	-27.8	PK	163	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 3b: , EUT on Channel #6 2437MHz - 802.11n20, Chain A+B

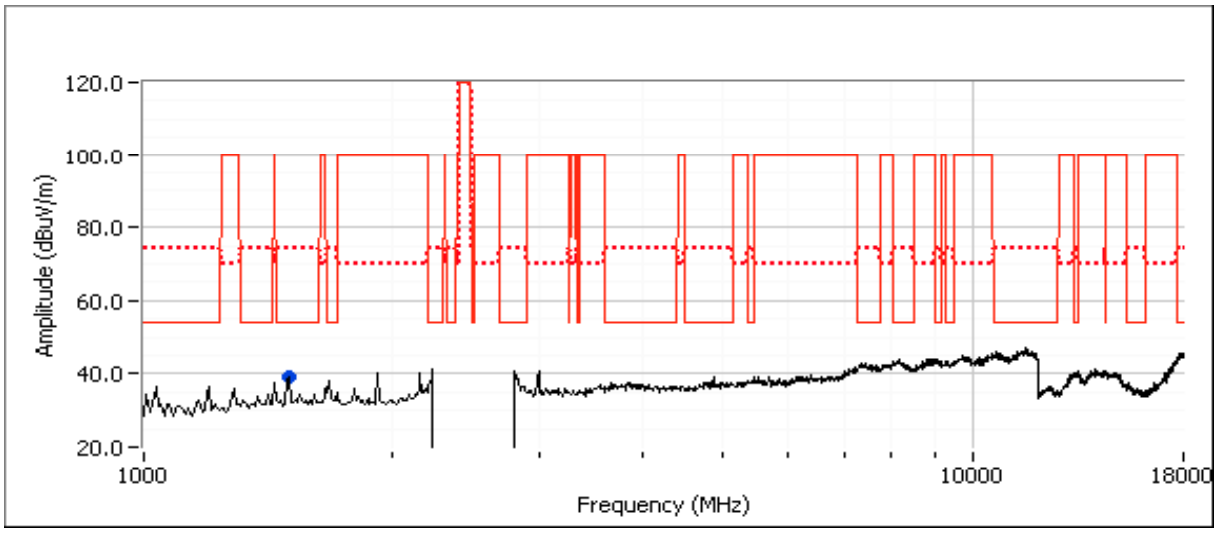
Date of Test: 11/7/2012 Test Location: FT Chamber#7

Test Engineer: Rafael Varelas Config Change: none

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1500.100	37.8	V	54.0	-16.2	AVG	220	1.0	RB 1 MHz;VB 10 Hz;Peak
1499.910	45.9	V	74.0	-28.1	PK	220	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Scans made between 18 - 26GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no signifcant emissions in this frequency range



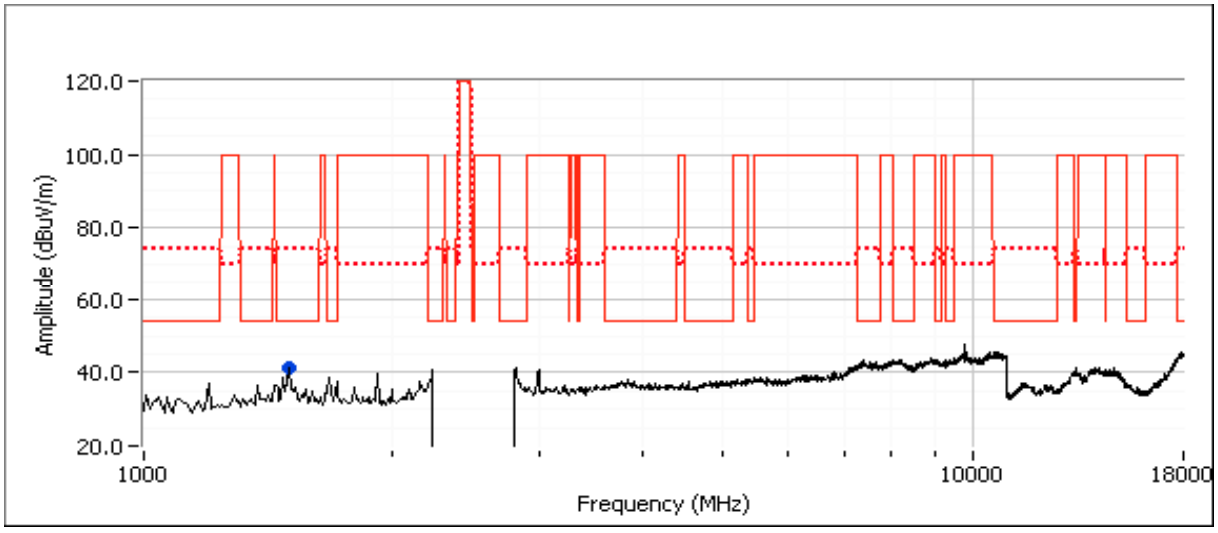
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 3c: , EUT on Channel #11 2462MHz - 802.11n20, Chain A+B

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1499.990	41.0	V	54.0	-13.0	AVG	20	1.3	RB 1 MHz;VB 10 Hz;Peak
1500.140	48.6	V	74.0	-25.4	PK	20	1.3	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 4, Radiated Spurious Emissions, 1-26GHz, 802.11n40, Chain A+B

Date of Test: 11/7/2012 Test Location: FT Chamber#7

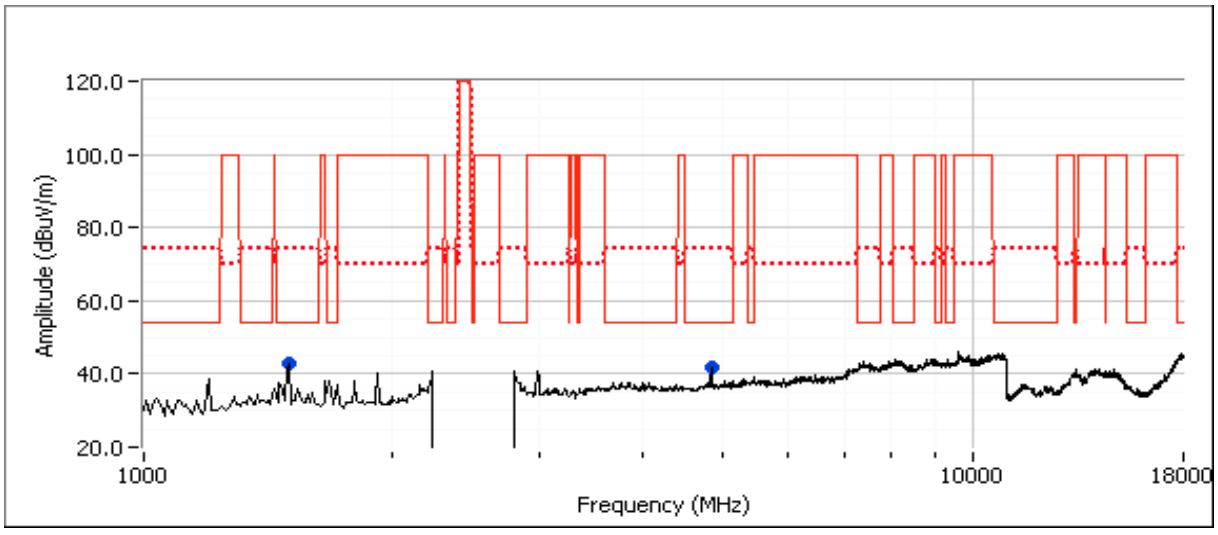
Test Engineer: Joseph Cadigal Config Change: none

Run # 4a, EUT on Channel #3 2422MHz - 802.11n40, Chain A+B

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1500.050	41.0	V	54.0	-13.0	AVG	197	1.0	RB 1 MHz;VB 10 Hz;Peak
4835.310	36.9	V	54.0	-17.1	AVG	280	1.3	RB 1 MHz;VB 10 Hz;Peak
4835.010	48.7	V	74.0	-25.3	PK	280	1.3	RB 1 MHz;VB 3 MHz;Peak
1499.660	47.8	V	74.0	-26.2	PK	197	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.



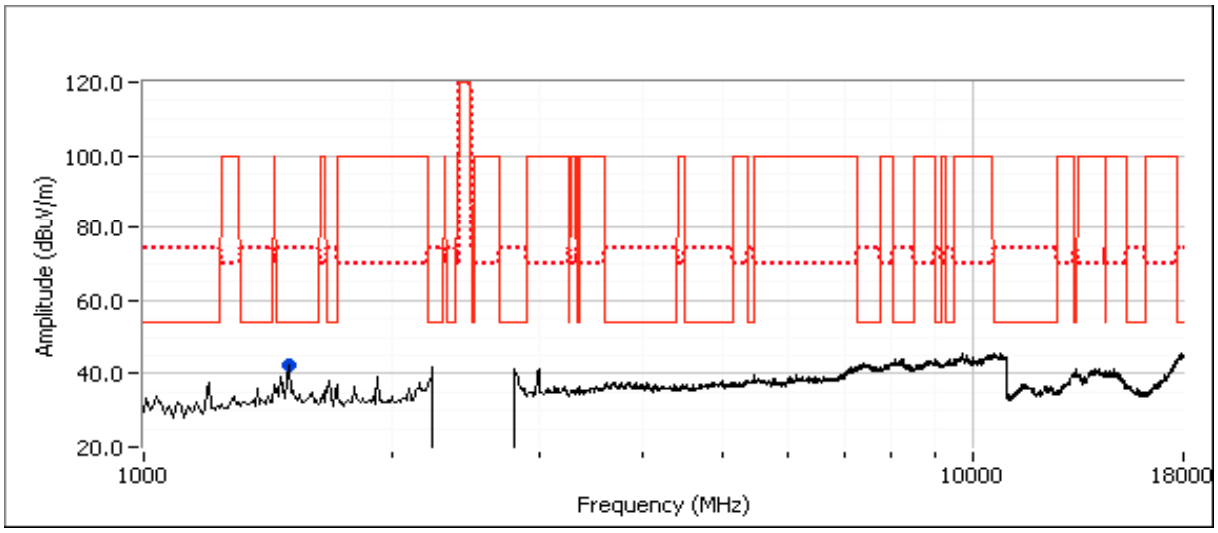
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 4b: , EUT on Channel #6 2437MHz - 802.11n40, Chain A+B

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1500.010	40.3	V	54.0	-13.7	AVG	34	1.3	RB 1 MHz;VB 10 Hz;Peak
1500.270	46.4	V	74.0	-27.6	PK	34	1.3	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Scans made between 18 - 26GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no signifcant emissions in this frequency range



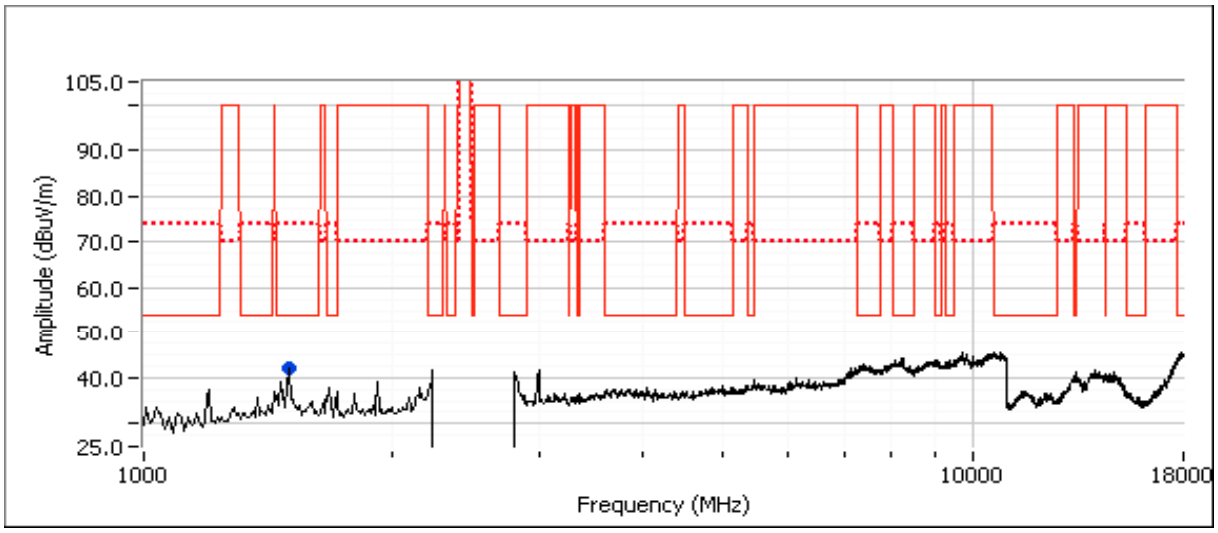
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run # 4c: , EUT on Channel #9 2452MHz - 802.11n40, Chain A+B

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1500.000	42.1	V	54.0	-11.9	Peak	30	1.3	Peak reading with average limit

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #5, Radiated Spurious Emissions, 1-26GHz, 802.11b, Chain A

Date of Test: 12/13/2012 Test Location: FT7

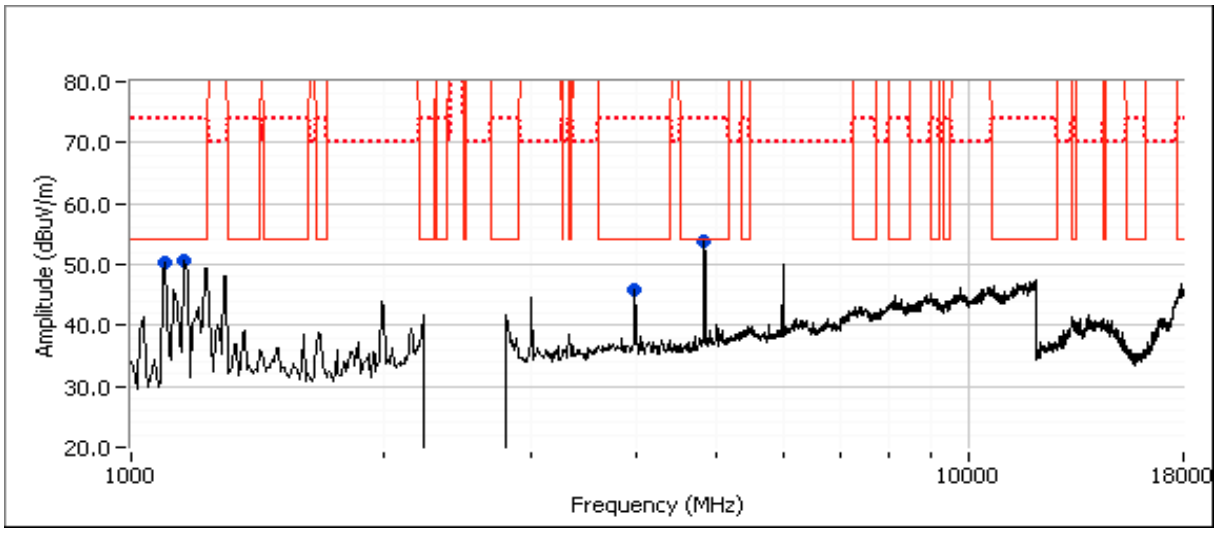
Test Engineer: Rafael Varelas Config Change: None

Run #1a, EUT on Channel #1 2412MHz - 802.11b, Chain A

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4823.960	53.3	V	54.0	-0.7	AVG	220	1.0	RB 1 MHz;VB 10 Hz;Peak
4823.960	55.5	V	74.0	-18.5	PK	220	1.0	RB 1 MHz;VB 3 MHz;Peak
1164.060	39.2	V	54.0	-14.8	AVG	206	1.2	RB 1 MHz;VB 10 Hz;Peak
1162.070	55.5	V	74.0	-18.5	PK	206	1.2	RB 1 MHz;VB 3 MHz;Peak
1099.710	40.5	V	54.0	-13.5	AVG	210	1.1	RB 1 MHz;VB 10 Hz;Peak
1099.910	54.6	V	74.0	-19.4	PK	210	1.1	RB 1 MHz;VB 3 MHz;Peak
3992.490	34.8	V	54.0	-19.2	AVG	195	1.0	RB 1 MHz;VB 10 Hz;Peak
3983.590	52.7	V	74.0	-21.3	PK	195	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.



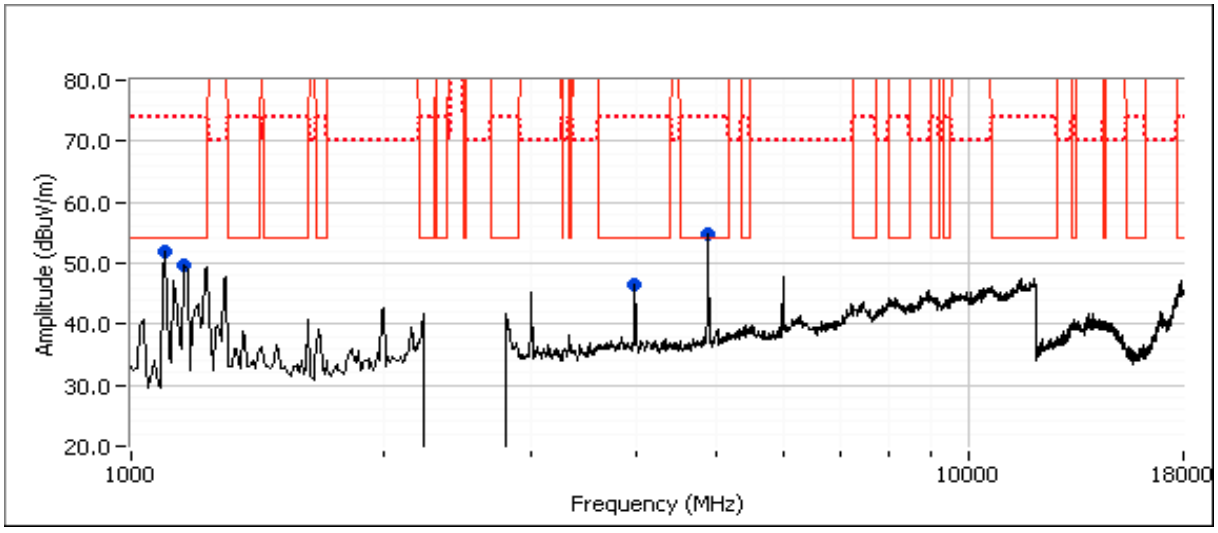
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #1b: , EUT on Channel #6 2437MHz - 802.11b, Chain A

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4873.990	53.8	V	54.0	-0.2	AVG	218	1.0	RB 1 MHz;VB 10 Hz;Peak
4874.000	56.0	V	74.0	-18.0	PK	218	1.0	RB 1 MHz;VB 3 MHz;Peak
1099.770	40.7	V	54.0	-13.3	AVG	208	1.0	RB 1 MHz;VB 10 Hz;Peak
1099.970	54.6	V	74.0	-19.4	PK	208	1.0	RB 1 MHz;VB 3 MHz;Peak
3992.070	34.9	V	54.0	-19.1	AVG	192	1.0	RB 1 MHz;VB 10 Hz;Peak
3989.470	52.9	V	74.0	-21.1	PK	192	1.0	RB 1 MHz;VB 3 MHz;Peak
1164.050	40.7	H	54.0	-13.3	AVG	173	1.4	RB 1 MHz;VB 10 Hz;Peak
1161.790	54.1	H	74.0	-19.9	PK	173	1.4	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.
Note 2:	Scans made between 18 - 25GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no signifcant emissions in this frequency range



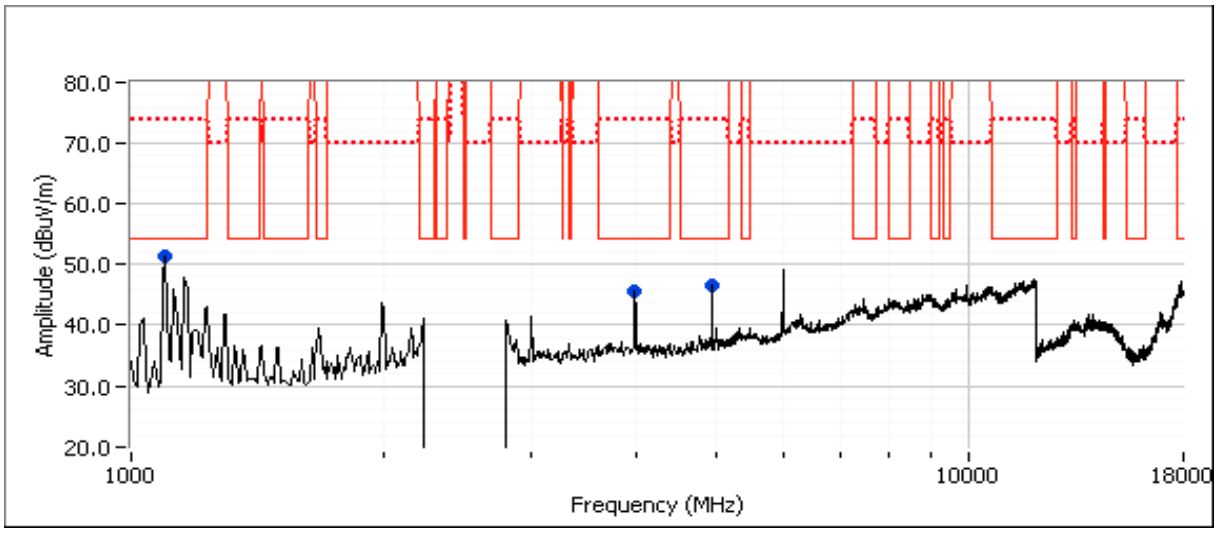
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #5c: , EUT on Channel #11 2462MHz - 802.11b, Chain A

Spurious Radiated Emissions:

Frequency	Level	Pol	15.209/15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4923.960	48.1	V	54.0	-5.9	AVG	212	1.2	RB 1 MHz;VB 10 Hz;Peak
4923.990	51.5	V	74.0	-22.5	PK	212	1.2	RB 1 MHz;VB 3 MHz;Peak
3991.090	34.8	V	54.0	-19.2	AVG	182	1.0	RB 1 MHz;VB 10 Hz;Peak
3984.390	52.8	V	74.0	-21.2	PK	182	1.0	RB 1 MHz;VB 3 MHz;Peak
1099.680	42.1	V	54.0	-11.9	AVG	209	1.0	RB 1 MHz;VB 10 Hz;Peak
1099.820	54.7	V	74.0	-19.3	PK	209	1.0	RB 1 MHz;VB 3 MHz;Peak

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit is -30dBc for peak measurements in a measurement bandwidth of 100kHz.



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements

Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

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

Date of Test: 12/27/2012, 12/28/2012
Test Engineer: Mark Hill / Deniz Demirci
Test Location: FT Lab# 4a

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

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: 23 °C
Rel. Humidity: 38 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
Chain A						
1	20	-	Output Power	15.247(b)	Pass	11b: 18.2 dBm 11g: 22.6 dBm
2	20	-	Power spectral Density (PSD)	15.247(d)	Pass	11b: -10 dBm/3kHz 11g: -0.5 dBm/3kHz
Chain A + B						
1	14	-	Output Power	15.247(b)	Pass	n20: 13.8 dBm n40: 14.3 dBm
2	14	-	Power spectral Density (PSD)	15.247(d)	Pass	n20: 2.5 dBm/1MHz n40: 0.2 dBm/1MHz
Applicable to both modes						
3	20/14		Minimum 6dB Bandwidth	15.247(a)		11b :9.99 MHz 11g: 16.32 MHz n20: 15.72 MHz n40: 36.31 MHz

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Summary of Results (continued)

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
3	20/14		99% Bandwidth	RSS GEN	-	11b: 13.5 MHz 11g: 17.5 MHz n20: 18.8 MHz n40: 37.0 MHz
4	-	-	Spurious emissions	15.247(b)	Pass	All emissions >20dBc or >30dBc

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.

Notes:

Chain A = J3, Chain B = J2

Sample Notes:

SAMPLE S/N: (MAC): B0.EE.45.03.16.B3
EUT SOFTWARE: 14.1.11.132

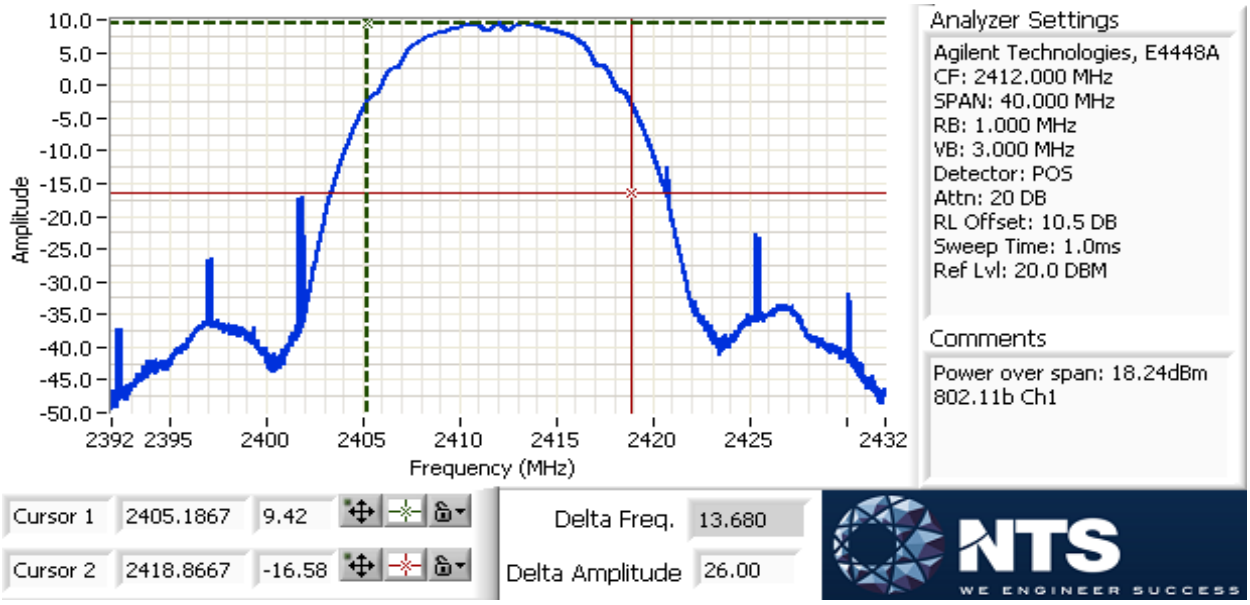
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

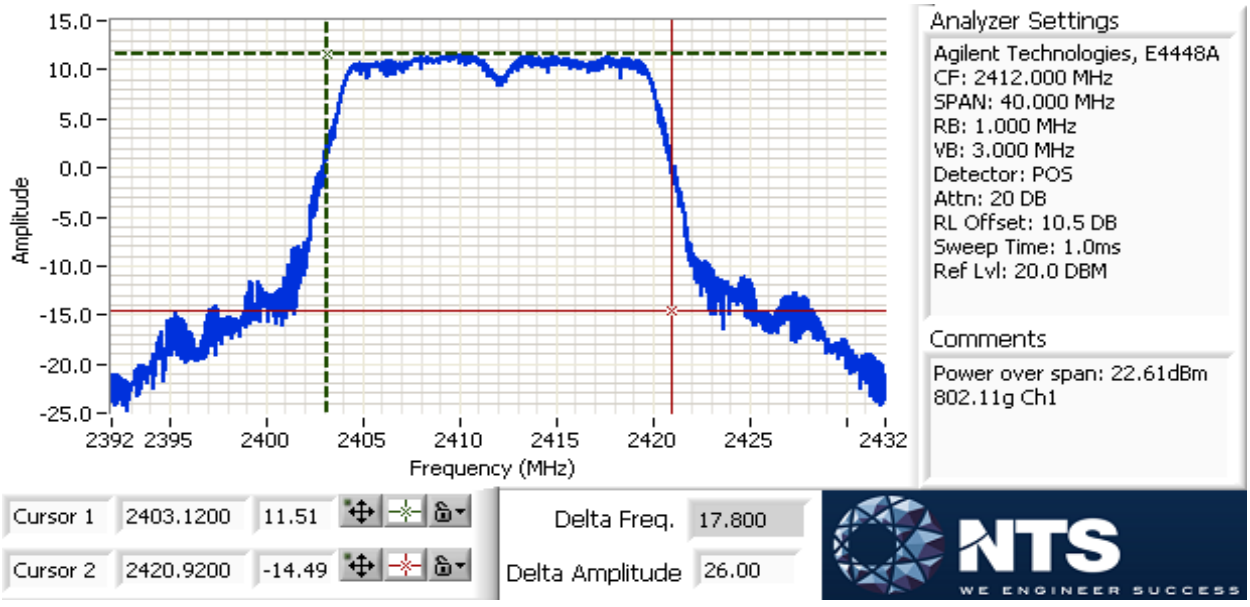
Run #1: Output Power

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP [Note 2] dBm	EIRP W	Output Power (dBm) [3]	Output Power mW
802.11b									
20	2412	18.2	66.7	3.0	Pass	21.2	0.133		
20	2437	17.6	57.8	3.0	Pass	20.6	0.115		
20	2462	17.9	61.0	3.0	Pass	20.9	0.122		
802.11g									
20	2412	22.6	182.4	3.0	Pass	25.6	0.364		
20	2437	22.1	161.4	3.0	Pass	25.1	0.322		
20	2462	21.6	143.5	3.0	Pass	24.6	0.286		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, peak detector, and power integration over 14 MHz/802.11b, 18 MHz/802.11g, (option #2 of Maximum Peak Conducted Output Power in KDB 558074).

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #1: Output Power - Chain A + B

Operating Mode: n20

Transmitted signal on chain is coherent ? No

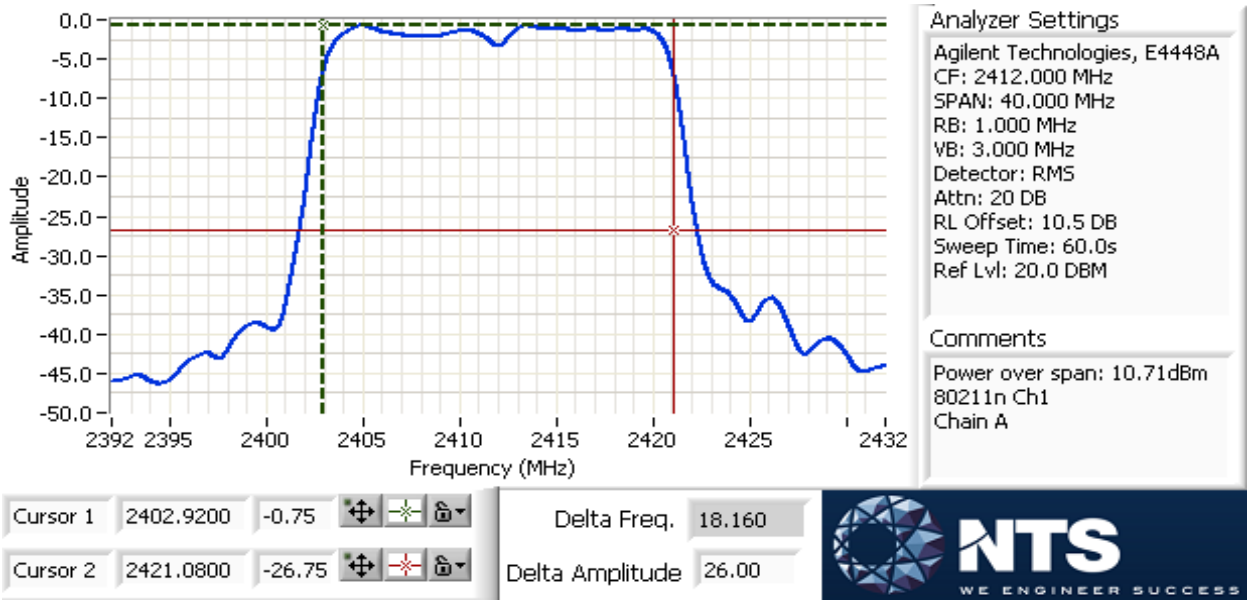
2412 MHz	Chain A	Chain B	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	14	14						
Output Power (dBm) Note 1	10.7	10.9			13.8 dBm	0.024 W	30.0 dBm	0.998 W
Antenna Gain (dBi) Note 2	3	3			6.0 dBi	6.0 dBi	Pass	
eirp (dBm) Note 2	13.71	13.85			19.8 dBm	0.096 W		

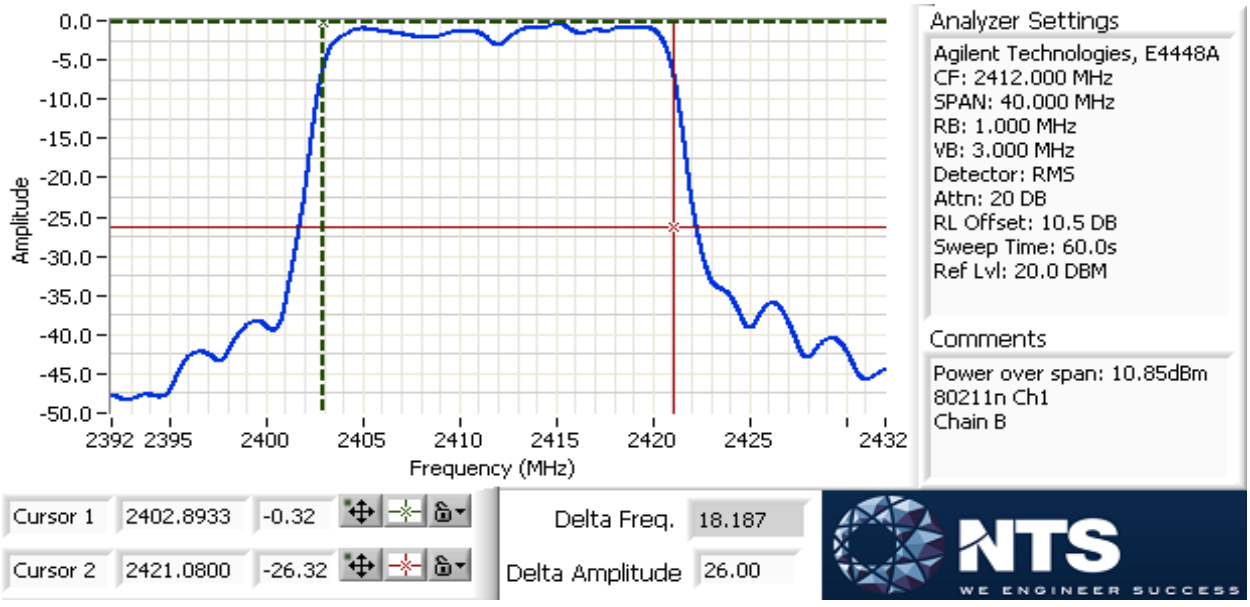
2437 MHz	Chain A	Chain B	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	14	14						
Output Power (dBm) Note 1	10.9	10.1			13.5 dBm	0.022 W	30.0 dBm	0.998 W
Antenna Gain (dBi) Note 2	3	3			6.0 dBi	6.0 dBi	Pass	
eirp (dBm) Note 2	13.9	13.05			19.5 dBm	0.089 W		

2462 MHz	Chain A	Chain B	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	14	14						
Output Power (dBm) Note 1	10.0	9.4			12.7 dBm	0.019 W	30.0 dBm	0.998 W
Antenna Gain (dBi) Note 2	3	3			6.0 dBi	6.0 dBi	Pass	
eirp (dBm) Note 2	12.98	12.38			18.7 dBm	0.074 W		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, RMS detector, and power integration function (option #2 of Maximum Conducted Output Power in KDB 558074).

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Operating Mode: n40
Transmitted signal on chain is coherent ? No

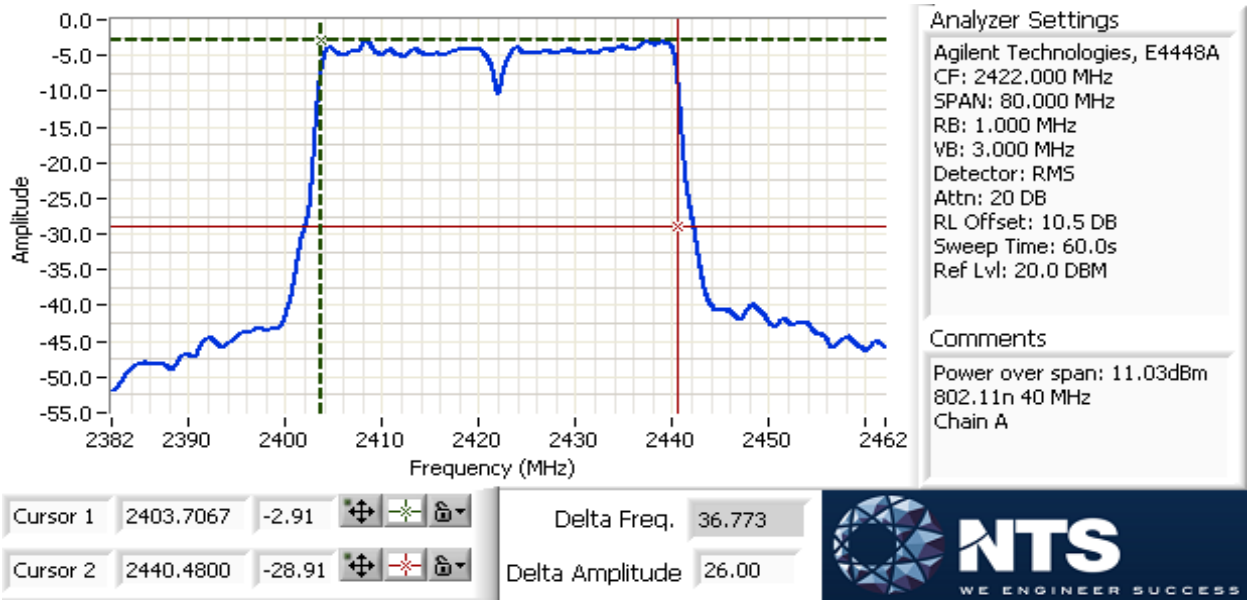
2422 MHz	Chain A	Chain B	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	14	14						
Output Power (dBm) Note 1	11.0	11.5			14.3 dBm	0.027 W	30.0 dBm	0.998 W
Antenna Gain (dBi) Note 2	3	3			6.0 dBi	6.0 dBi	Pass	
eirp (dBm) Note 2	14.03	14.48			20.3 dBm	0.107 W		

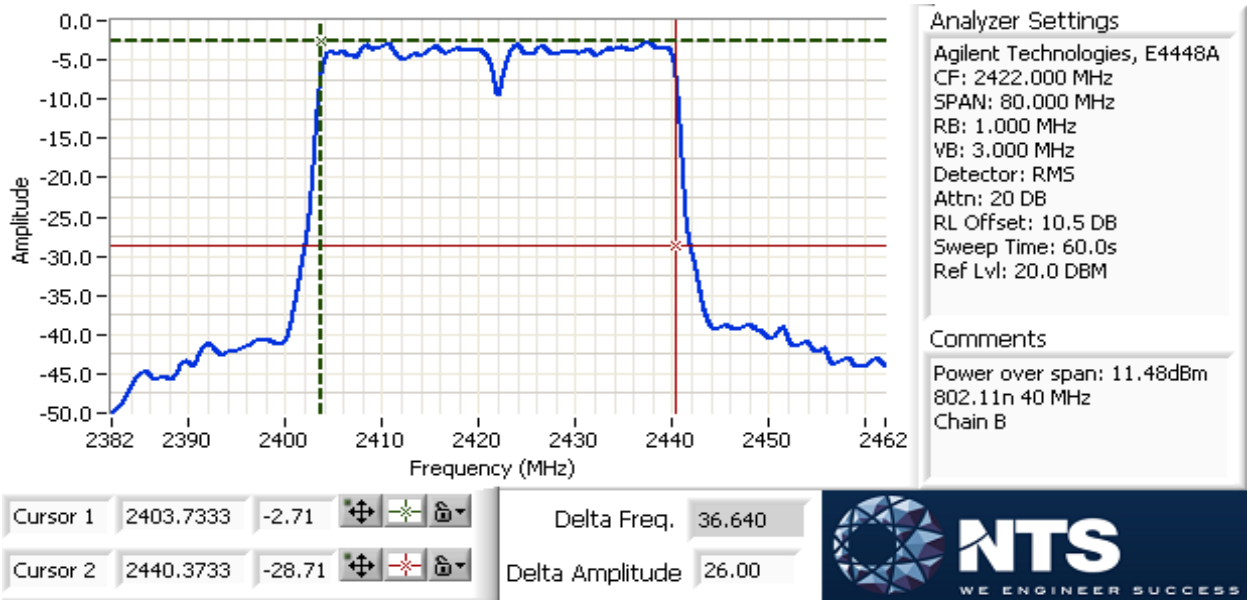
2437 MHz	Chain A	Chain B	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	14	14						
Output Power (dBm) Note 1	10.5	10.7			13.6 dBm	0.023 W	30.0 dBm	0.998 W
Antenna Gain (dBi) Note 2	3	3			6.0 dBi	6.0 dBi	Pass	
eirp (dBm) Note 2	13.51	13.73			19.6 dBm	0.092 W		

2452 MHz	Chain A	Chain B	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	14	14						
Output Power (dBm) Note 1	10.0	10.2			13.1 dBm	0.020 W	30.0 dBm	0.998 W
Antenna Gain (dBi) Note 2	3	3			6.0 dBi	6.0 dBi	Pass	
eirp (dBm) Note 2	12.99	13.17			19.1 dBm	0.081 W		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, RMS detector, and power integration over 19 MHz/802.11n20, 37 MHz/802.11n40, (option #2 of Maximum Conducted Output Power in KDB 558074).

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #2: Power spectral Density (802.11b and 802.11g modes)

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
802.11b				
20	2412	-11.5	8.0	Pass
20	2437	-10.0	8.0	Pass
20	2462	-12.1	8.0	Pass
802.11g				
20	2412	-0.5	8.0	Pass
20	2437	-1.4	8.0	Pass
20	2462	-3.2	8.0	Pass

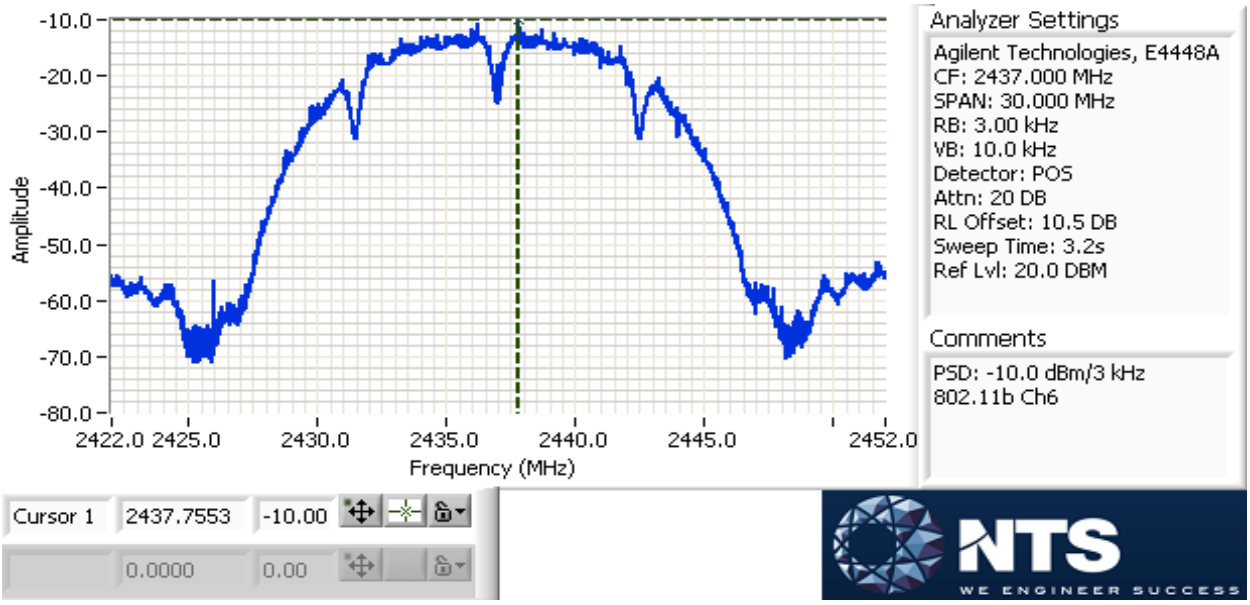
Note 1:	Power spectral density measured using RB=3 kHz, VB=10 kHz, analyzer with peak detector (option #1 in KDB 558074).

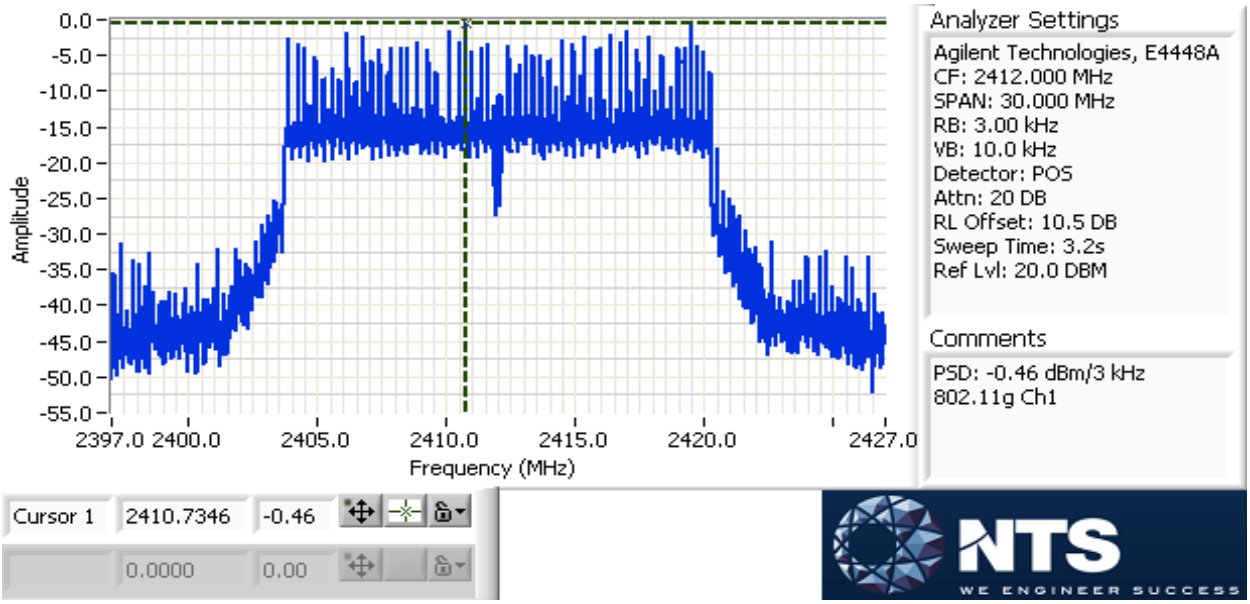
Run #2: Power spectral Density (802.11n mode)

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain A	Chain B	Chain 3	Chain 4	Total		
n20								
14	2412	-0.8	-0.3			2.5	8.0	Pass
14	2437	-0.4	-1.1			2.3	8.0	Pass
14	2462	-1.3	-1.9			1.5	8.0	Pass
n40								
14	2422	-2.9	-2.7			0.2	8.0	Pass
14	2437	-3.3	-3.6			-0.4	8.0	Pass
14	2452	-3.7	-4.1			-0.9	8.0	Pass

Note 1:	Power spectral density measured using RBW= 1 MHz, VBW= 3 MHz, analyzer with RMS detector (option #3 in KDB 558074, See Output Power measurements) Measured values do not exceed the limit defined with 3 kHz RBW hence further measurements are not required.

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





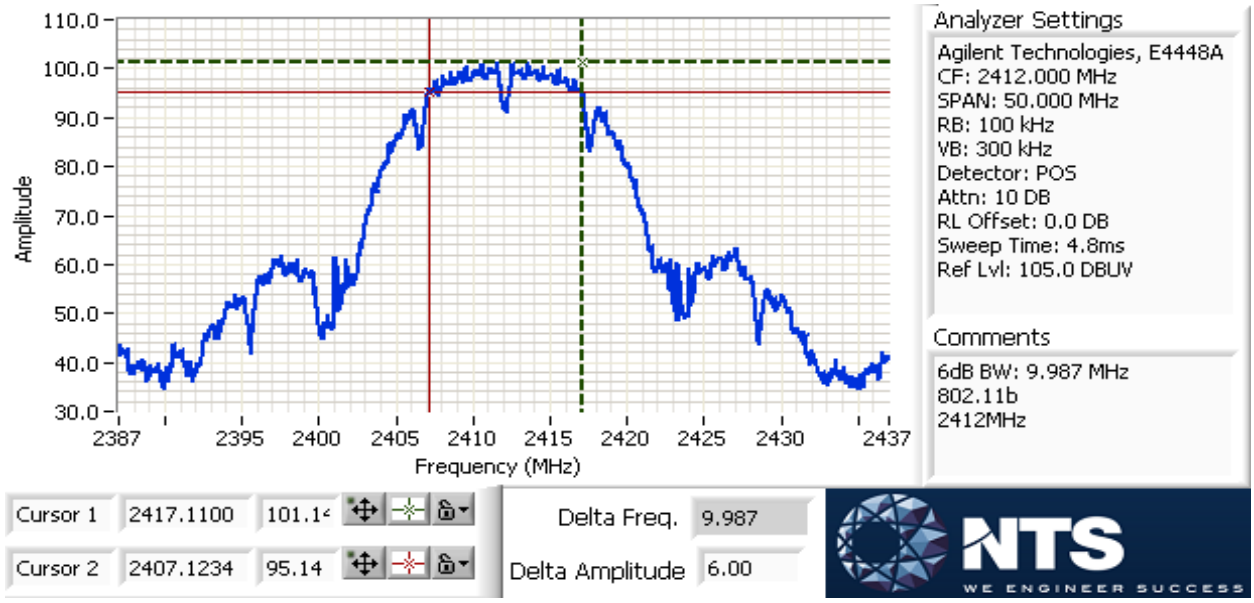
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

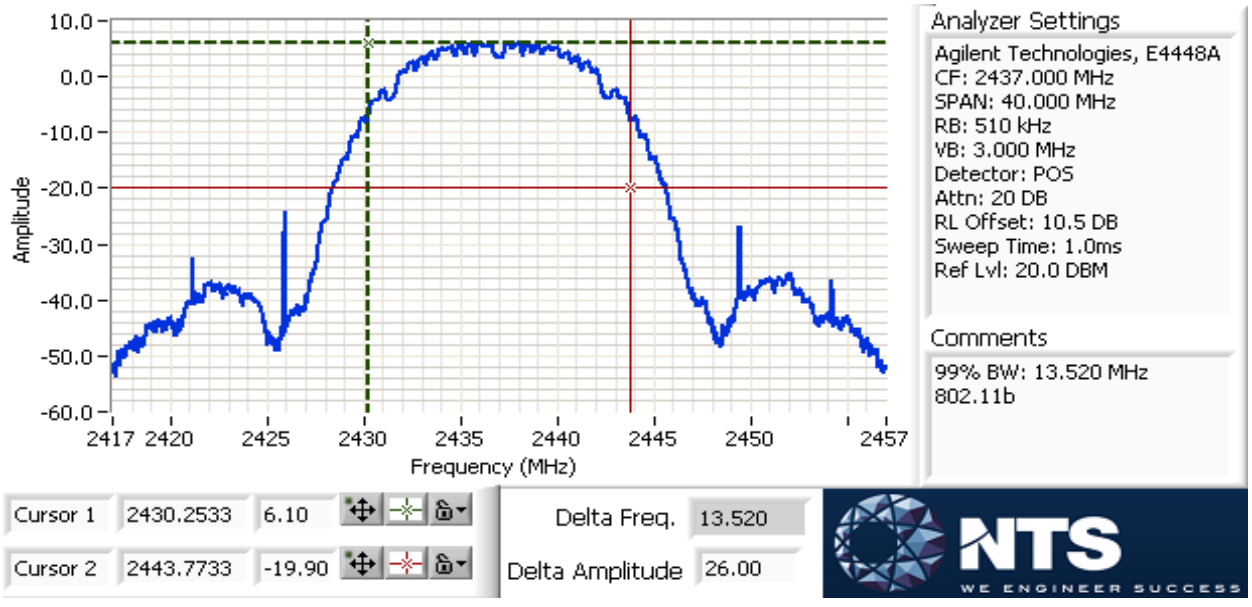
Run #3: Signal Bandwidth

Power Setting	Mode	Frequency (MHz)	RBW (kHz)	6dB BW (MHz)	RBW (kHz)	99% BW (MHz)
20	b	2412	100	9.99		
20	b	2437	100	10.05	510	13.5
20	b	2462	100	9.99		
20	g	2412	100	16.34		
20	g	2437	100	16.32	510	17.5
20	g	2462	100	16.32		
14	n20	2412	100	15.76		
14	n20	2437	100	15.72	510	18.8
14	n20	2462	100	16.34		
14	n40	2422	100	36.31		
14	n40	2437	100	36.31	1000	37.0
14	n40	2452	100	36.31		

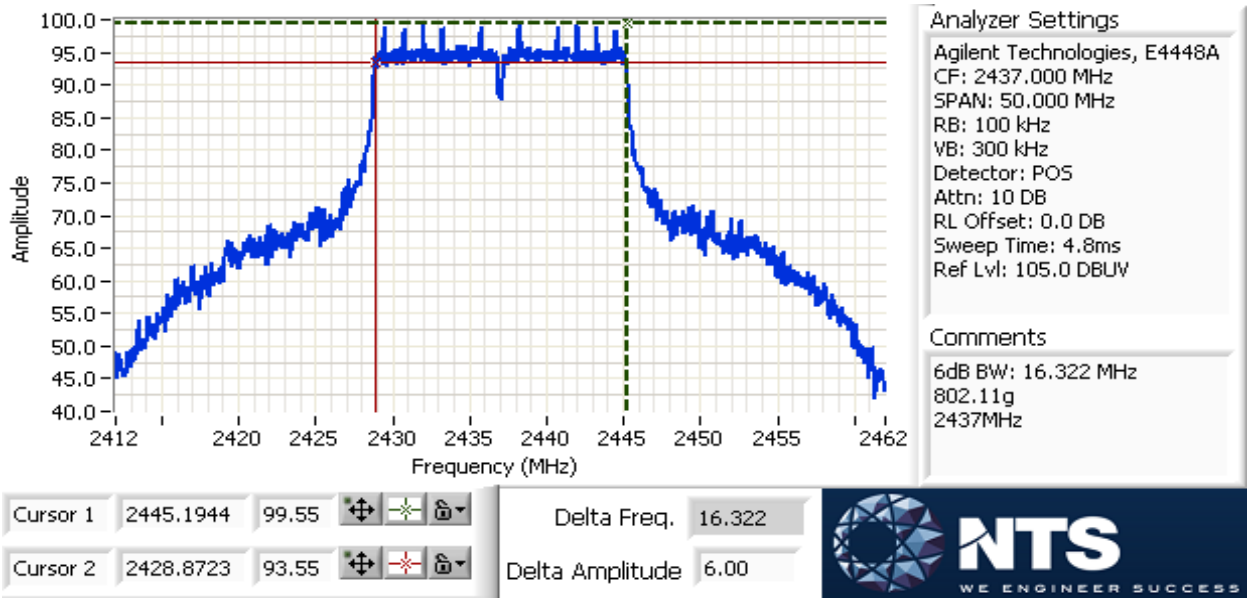
Note 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB

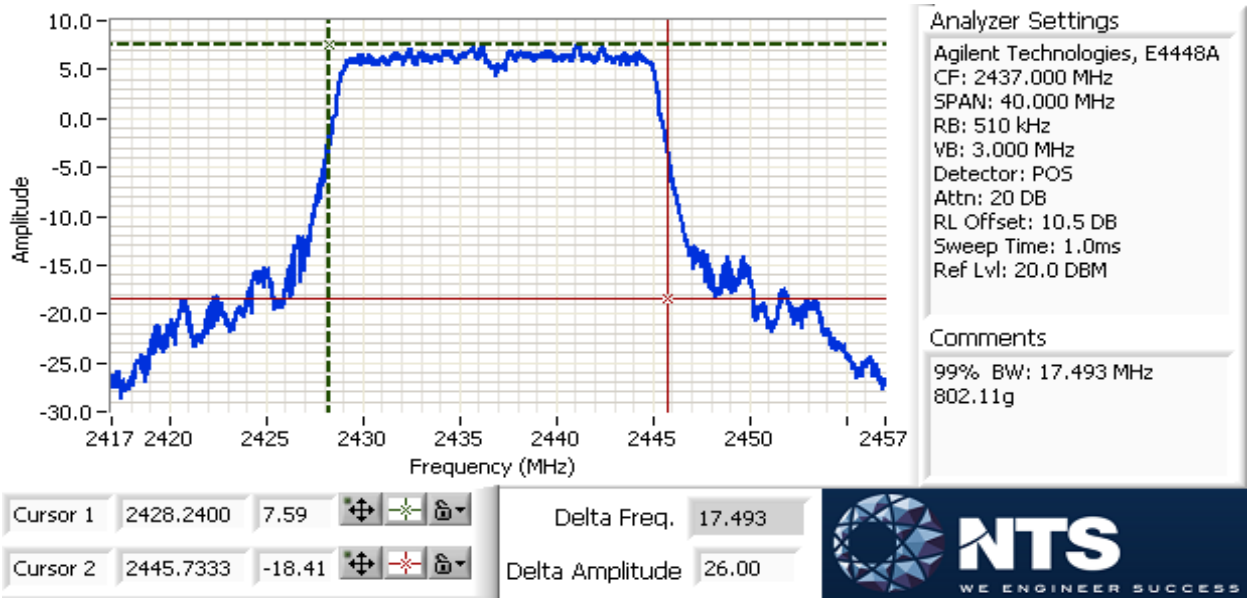
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A



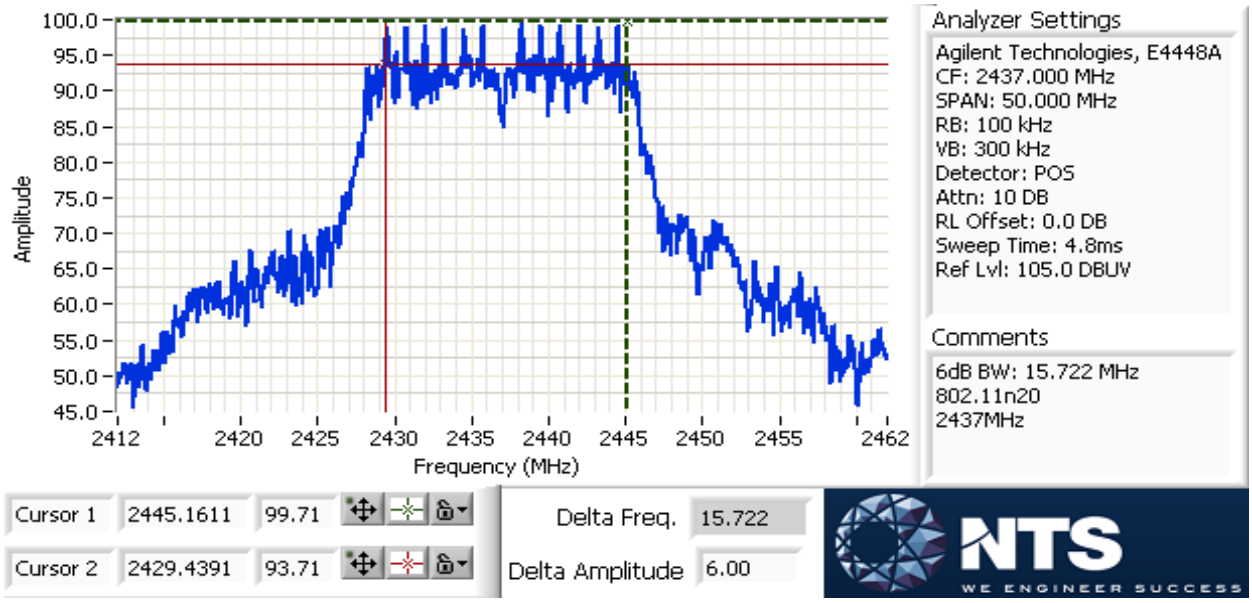


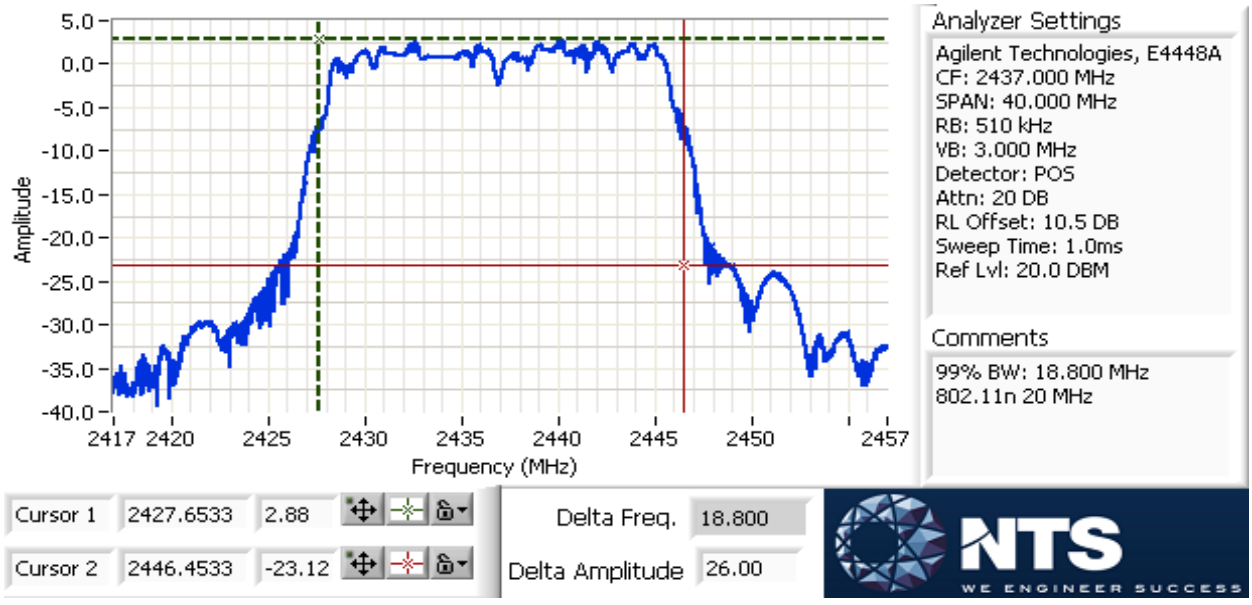
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A



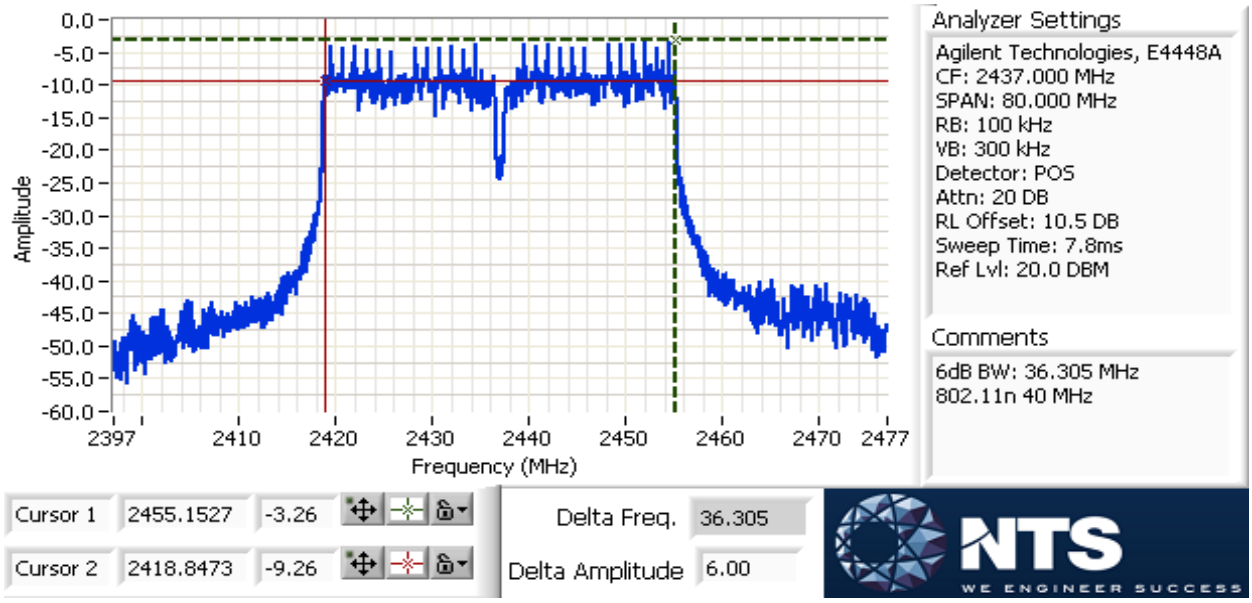


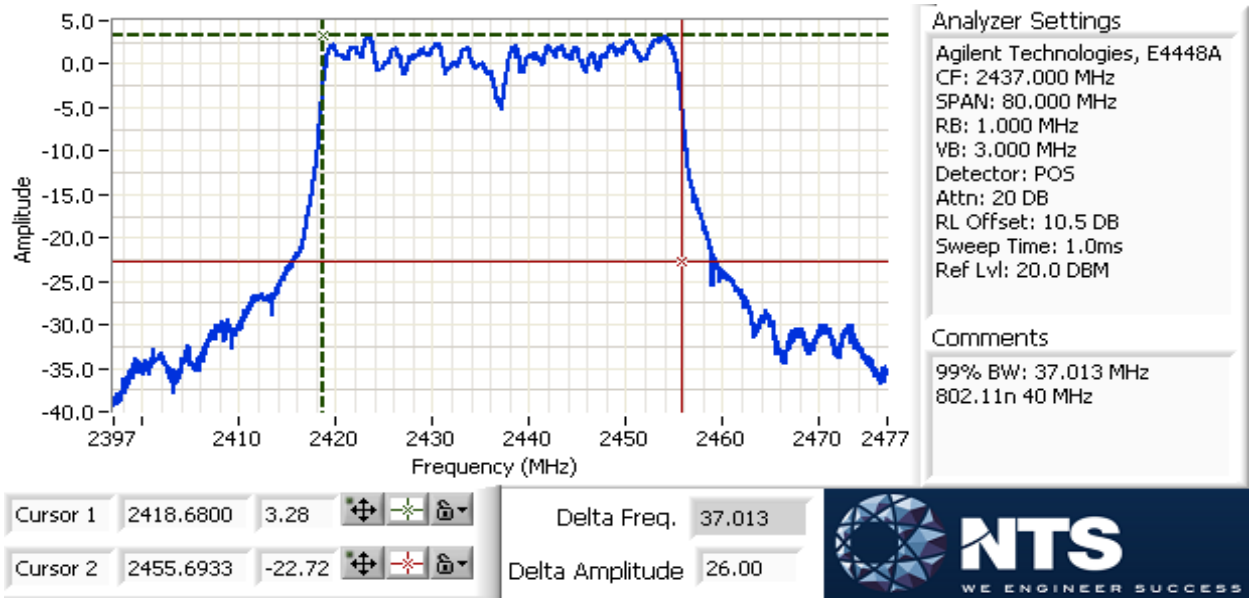
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

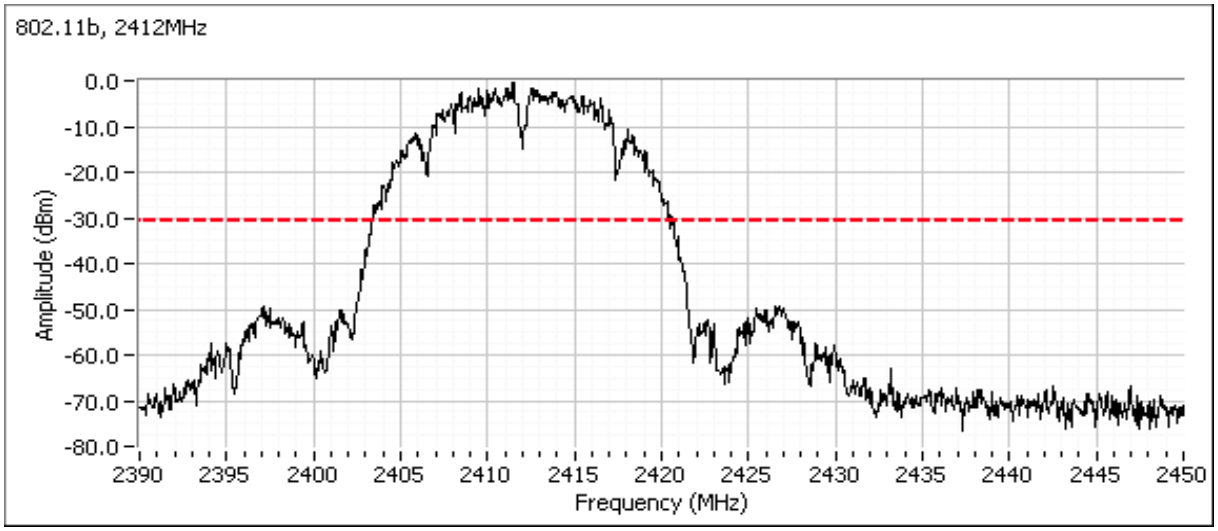
Run #4: Out of Band Spurious Emissions

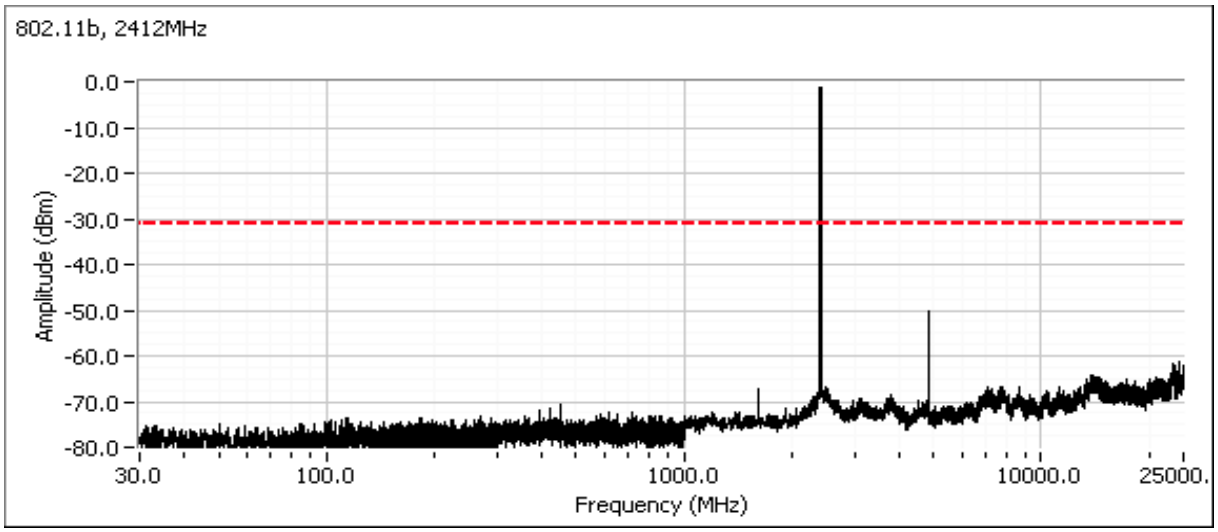
Mode	Power Setting	Frequency (MHz)	Limit	Result
11b	20	2412	-30dBc	Pass
11b	20	2437	-30dBc	Pass
11b	20	2462	-30dBc	Pass
11g	20	2412	-20dBc	Pass
11g	20	2437	-20dBc	Pass
11g	20	2462	-20dBc	Pass
n20	14	2412	-30dBc	Pass
n20	14	2437	-30dBc	Pass
n20	14	2462	-30dBc	Pass
n40	14	2422	-30dBc	Pass
n40	14	2437	-30dBc	Pass
n40	14	2452	-30dBc	Pass

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

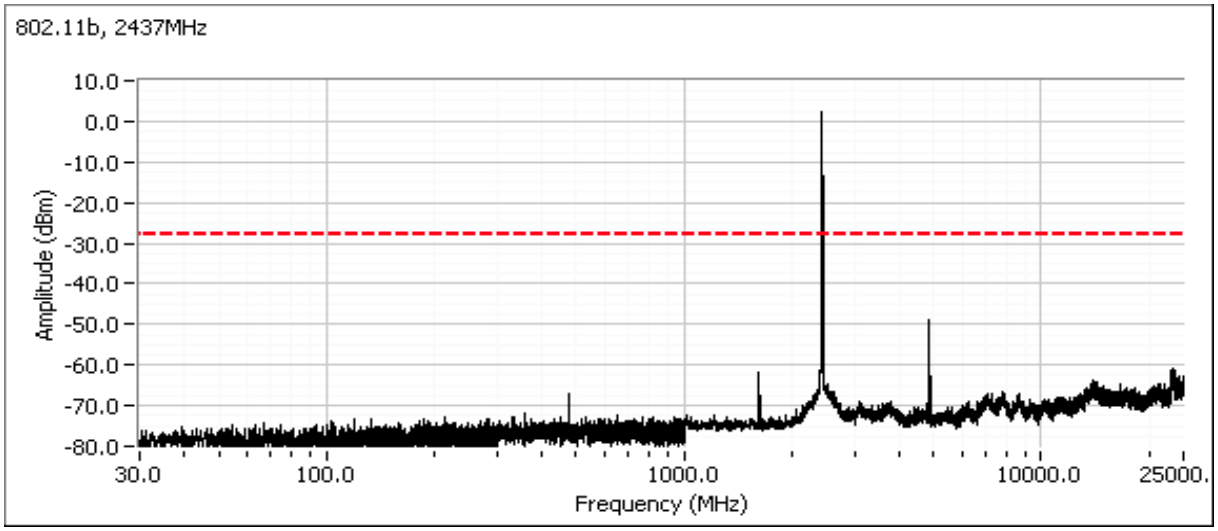
Plots for 802.11b

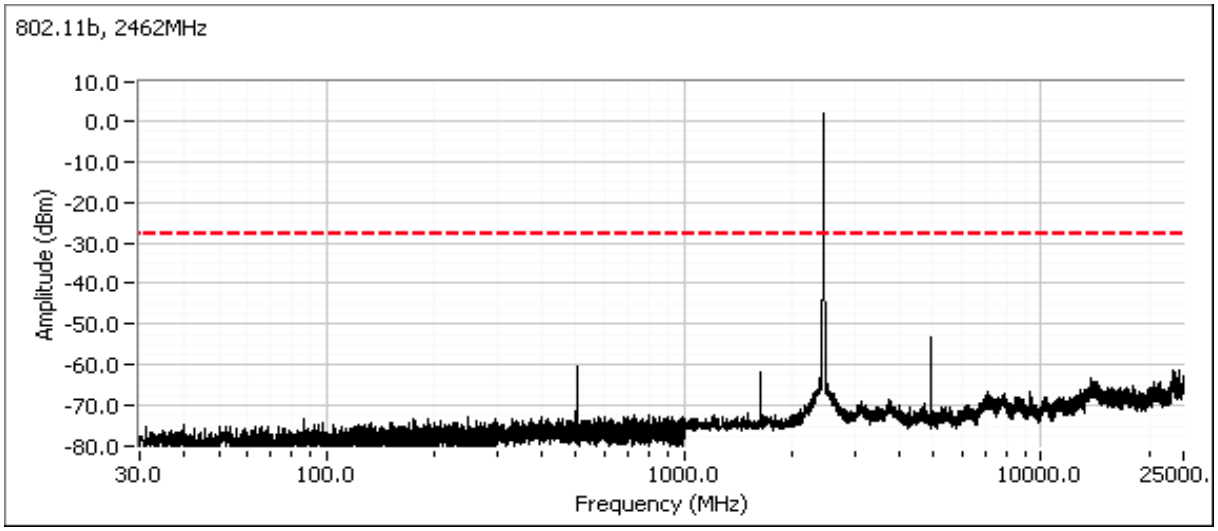
Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

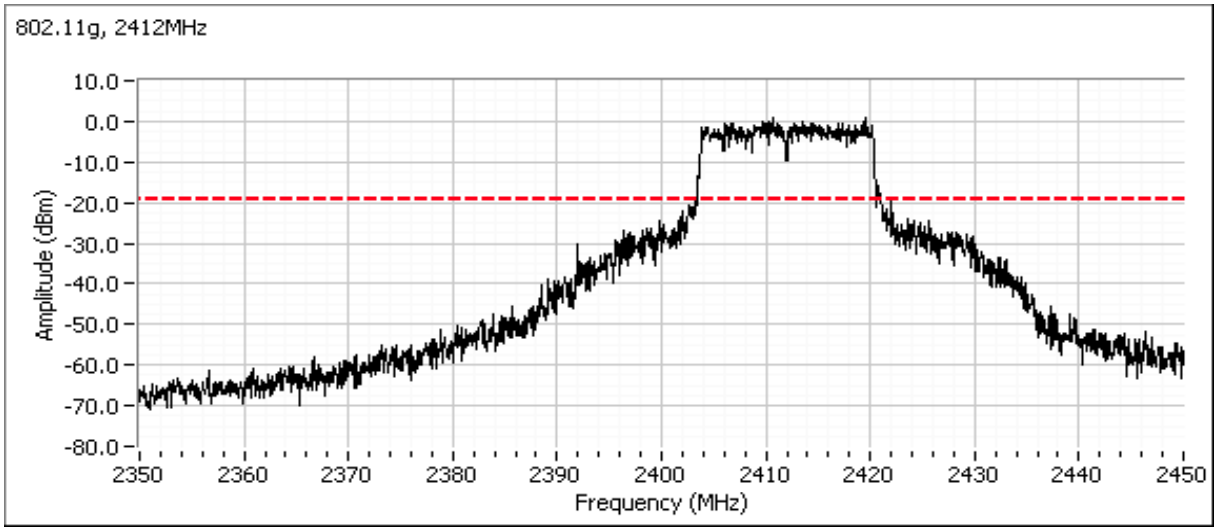


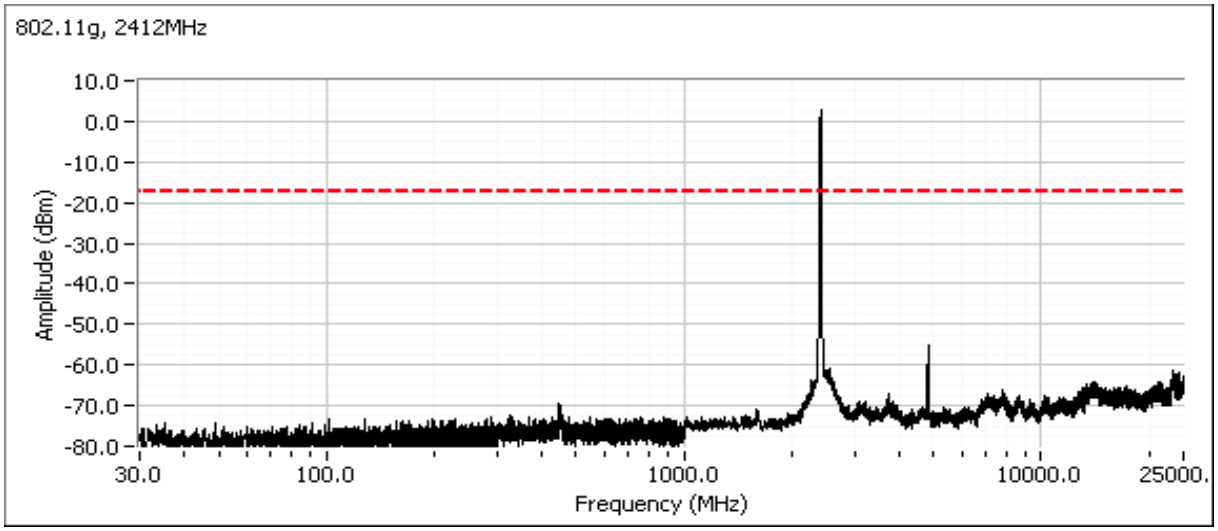


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

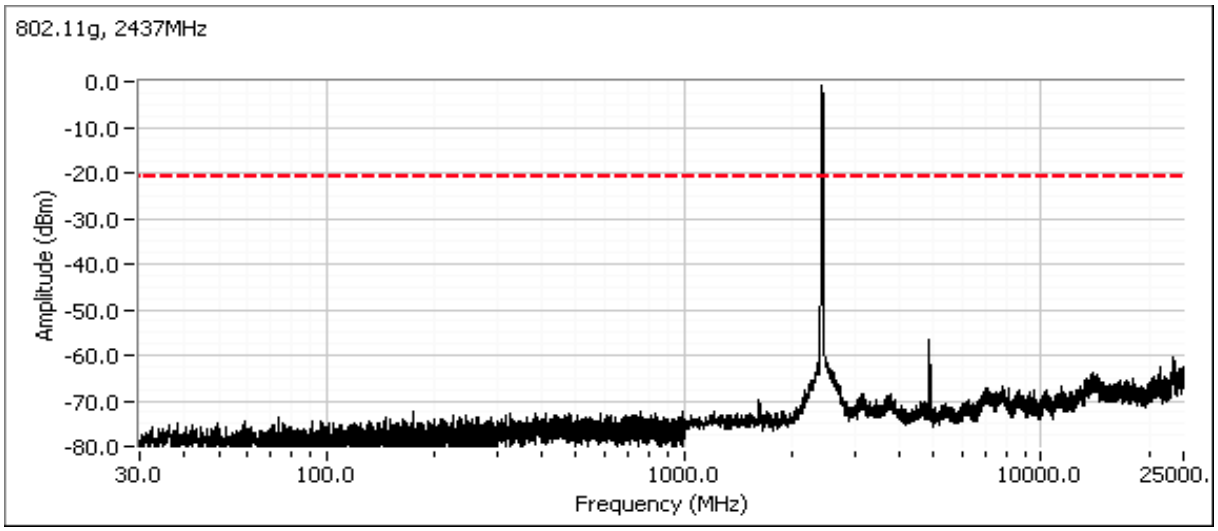
Plots for 802.11g

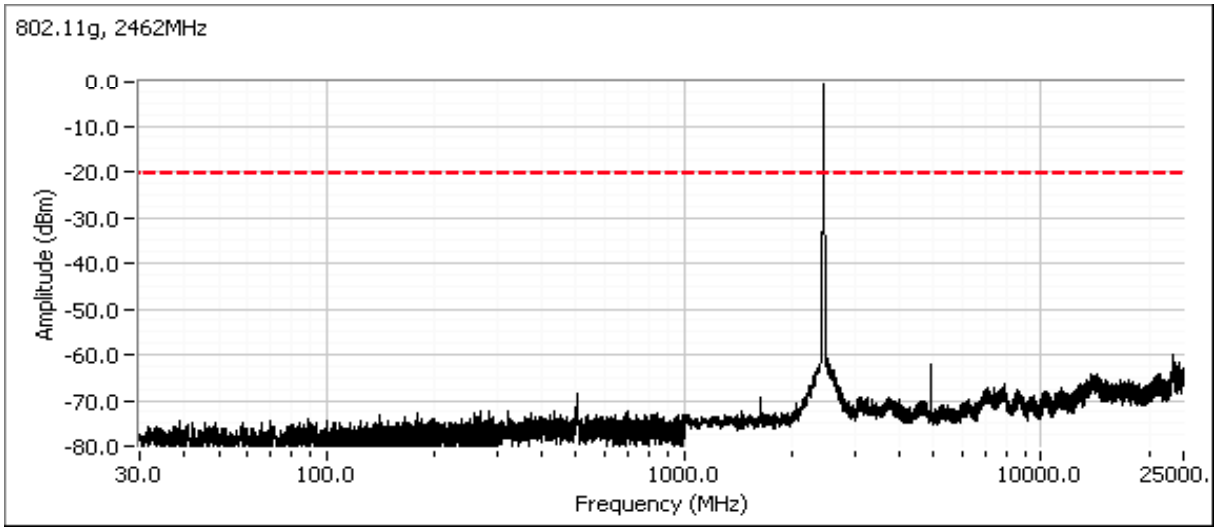
Additional plot showing compliance with -20dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

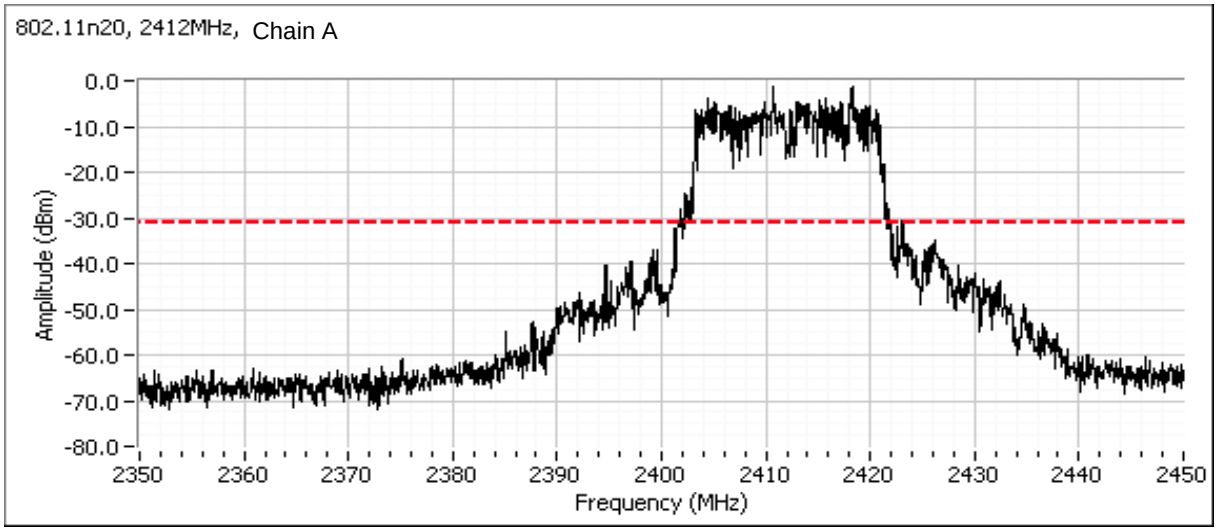


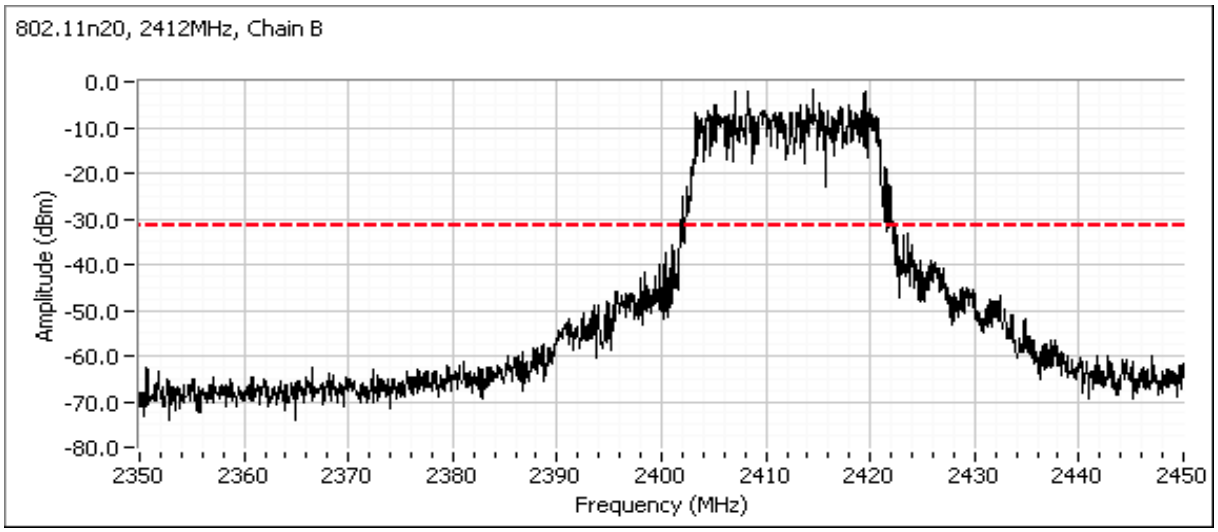


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

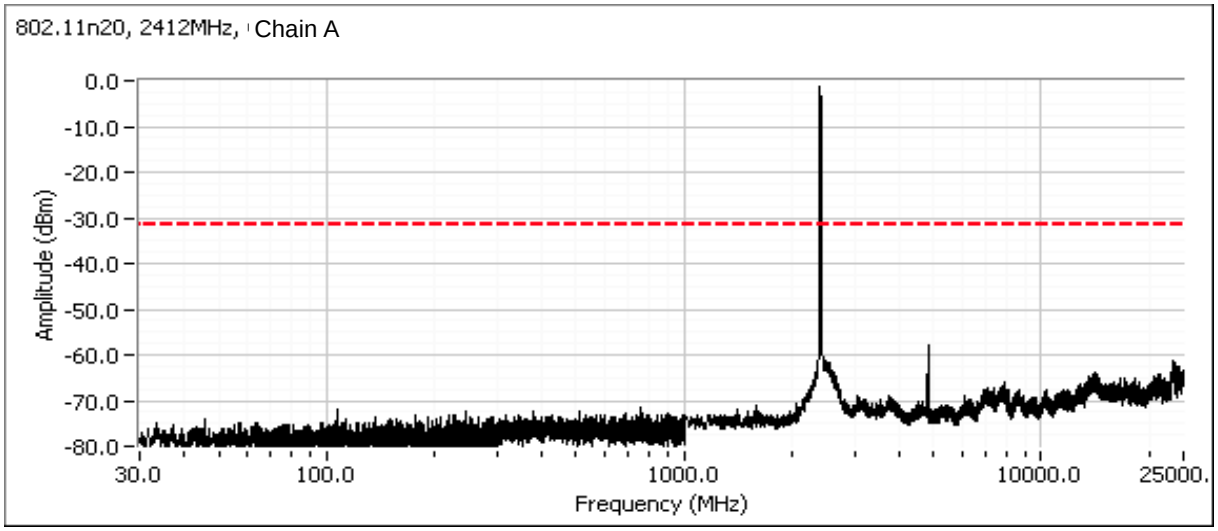
Plots for n20

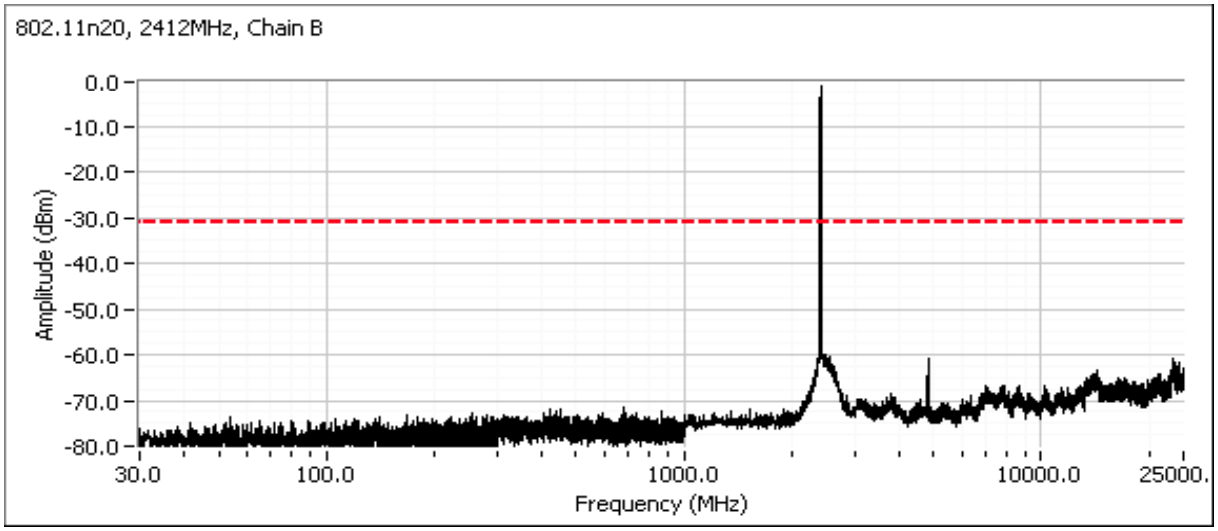
Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.



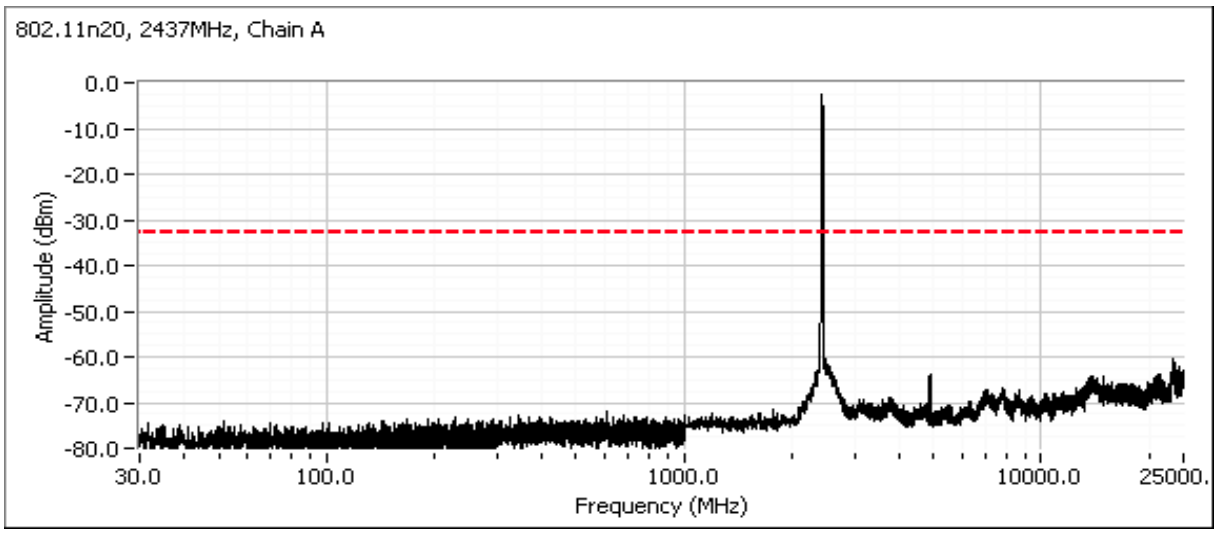


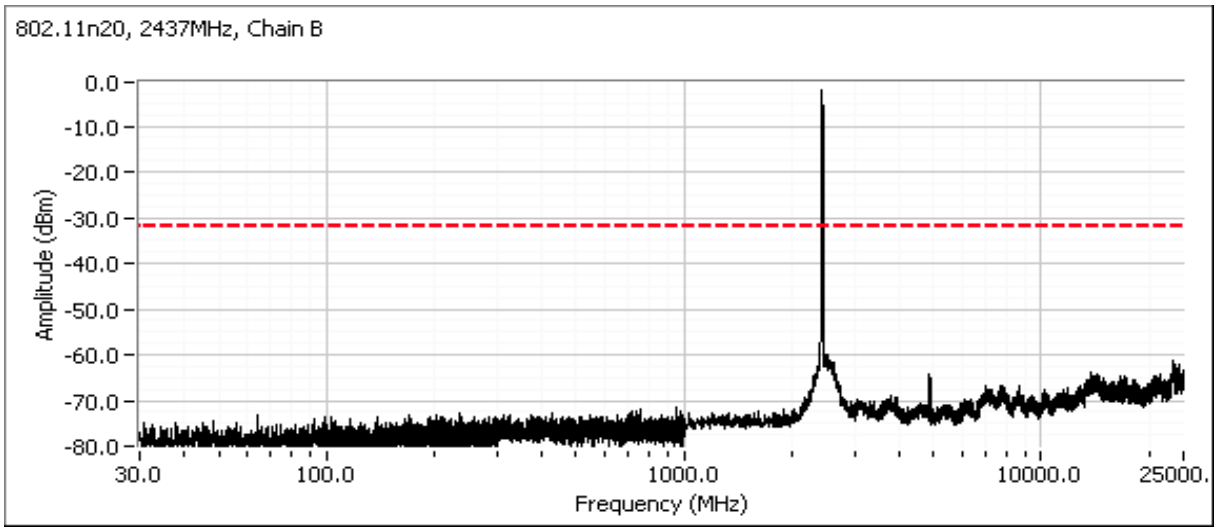
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A



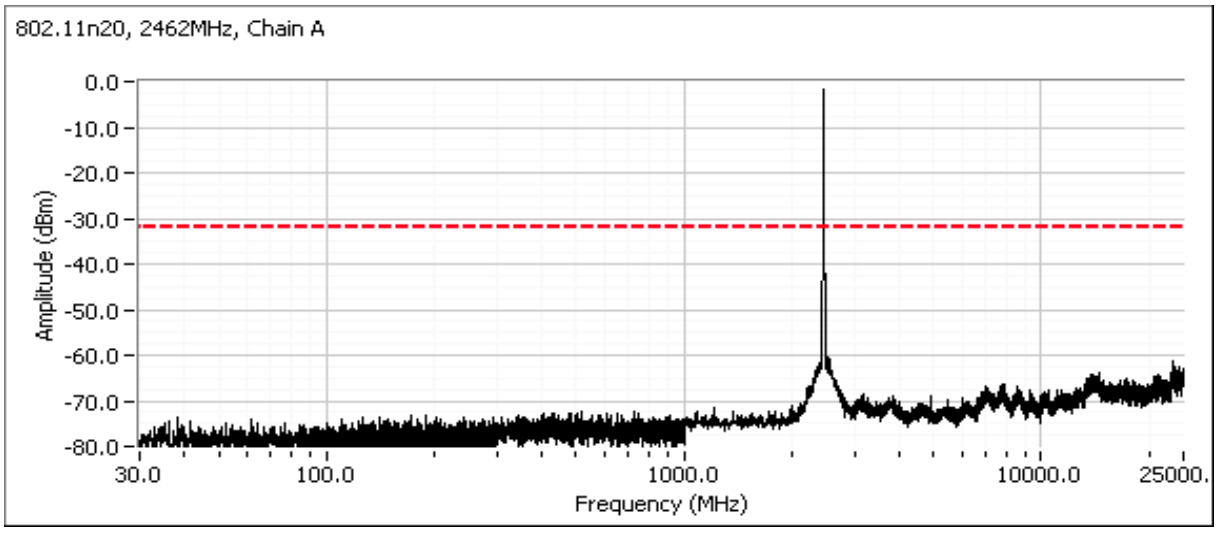


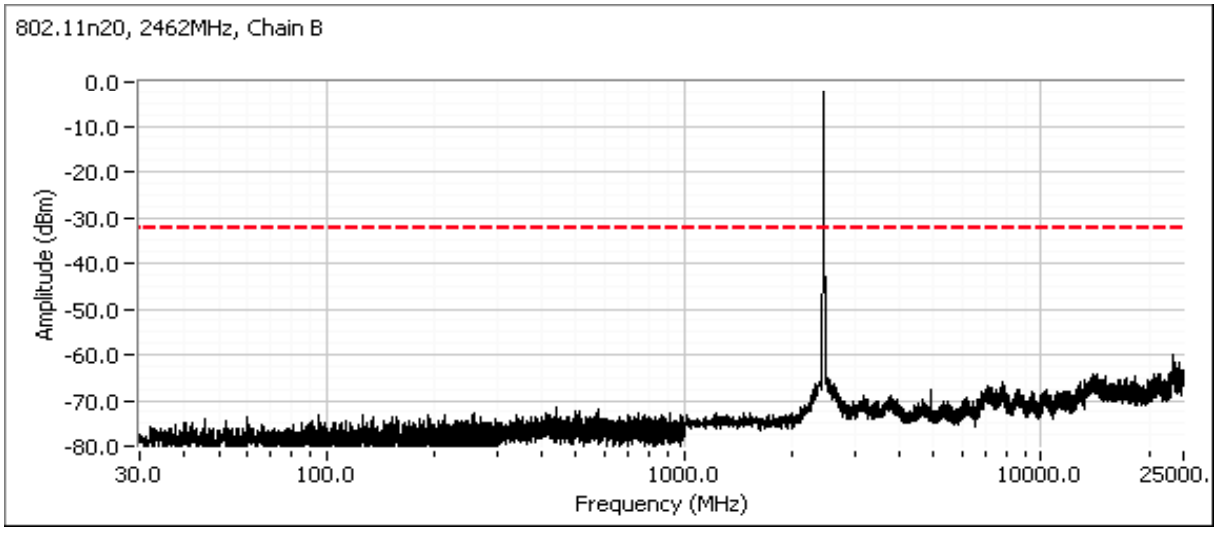
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

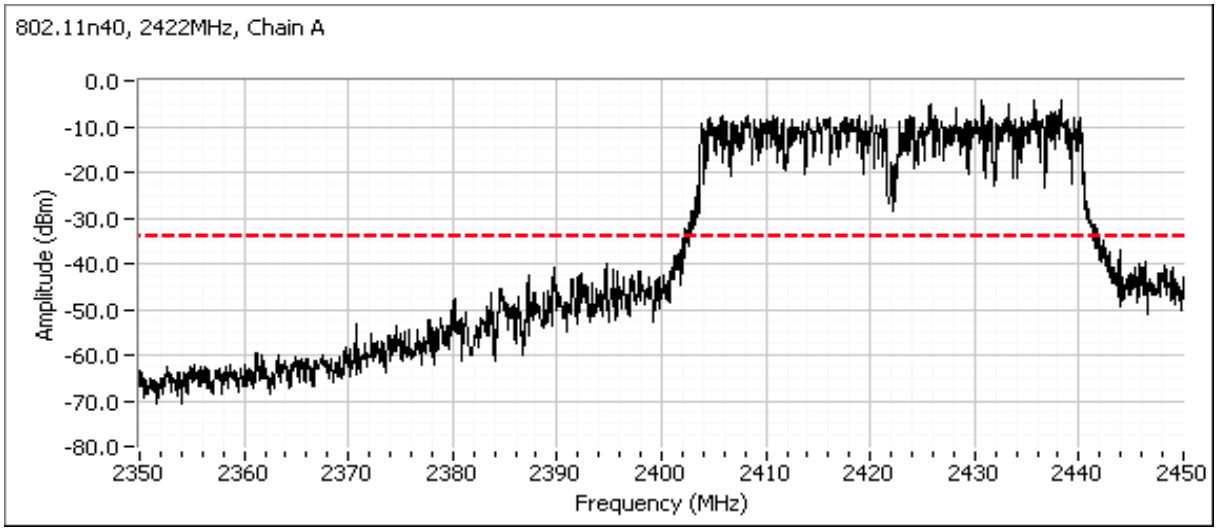


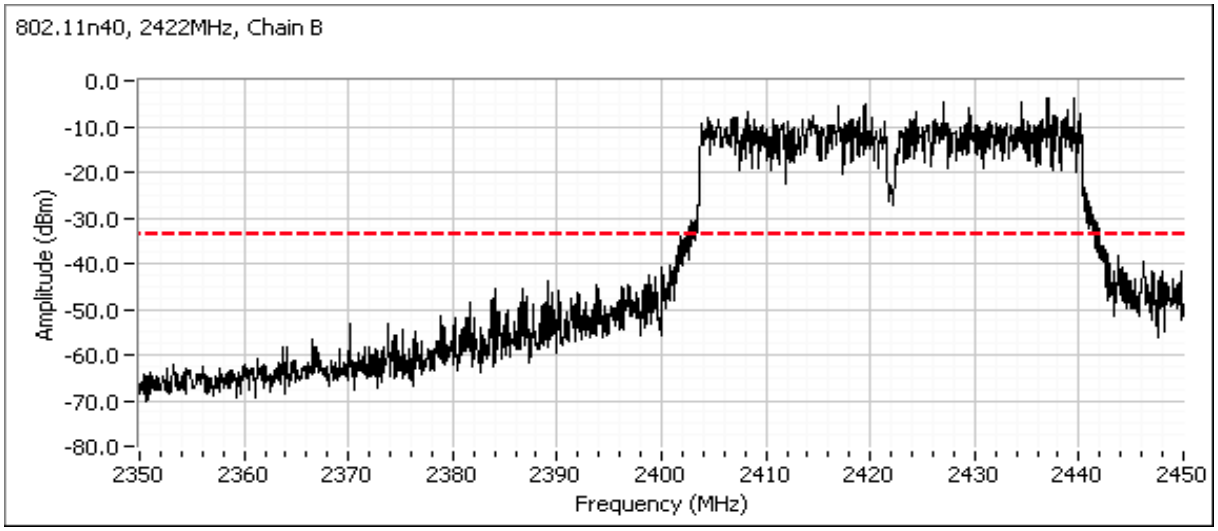


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

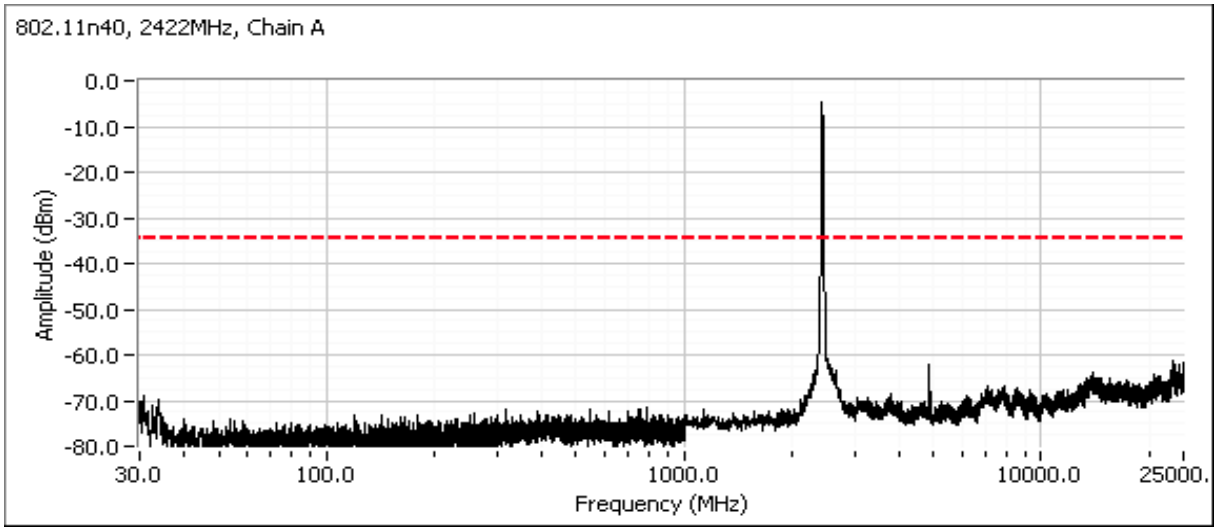
Plots for n40

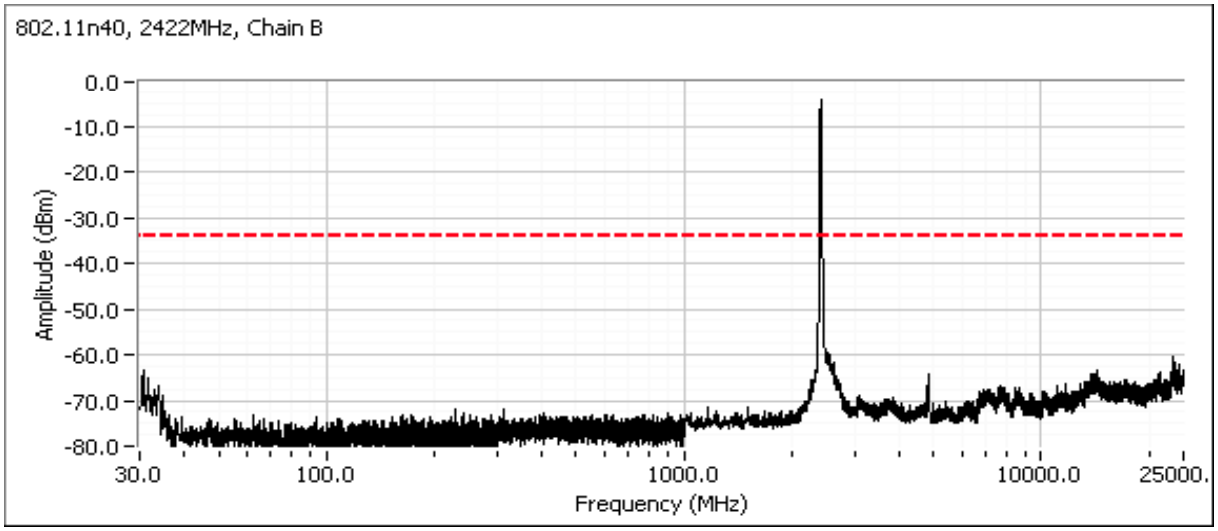
Additional plot showing compliance with -30dBc limit from 2390 MHz to 2400 MHz. Radiated measurements used to show compliance with the limits in the restricted band below 2390 MHz.



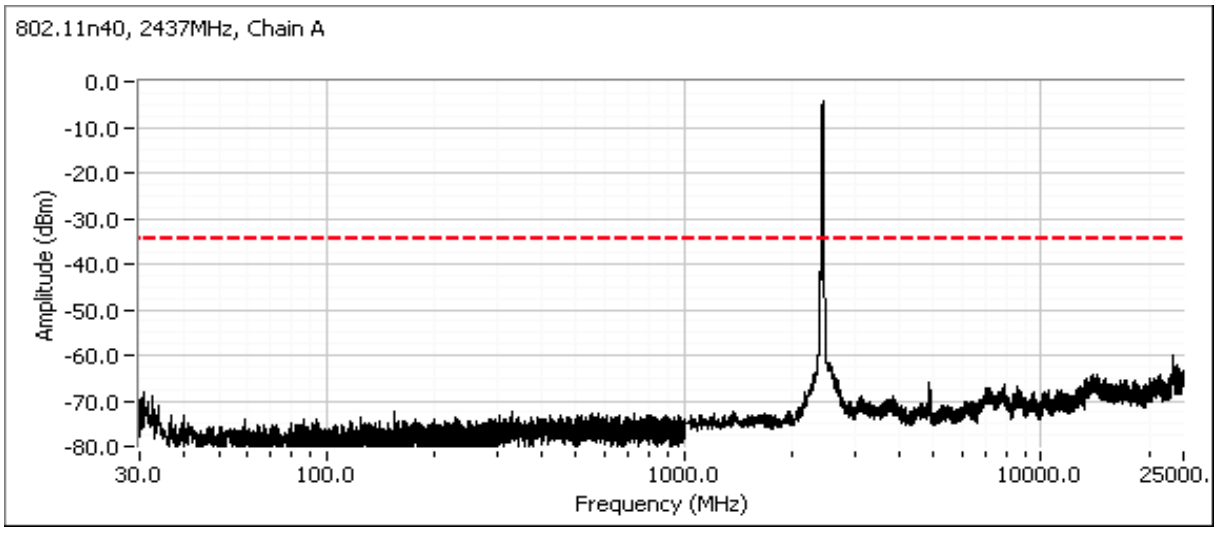


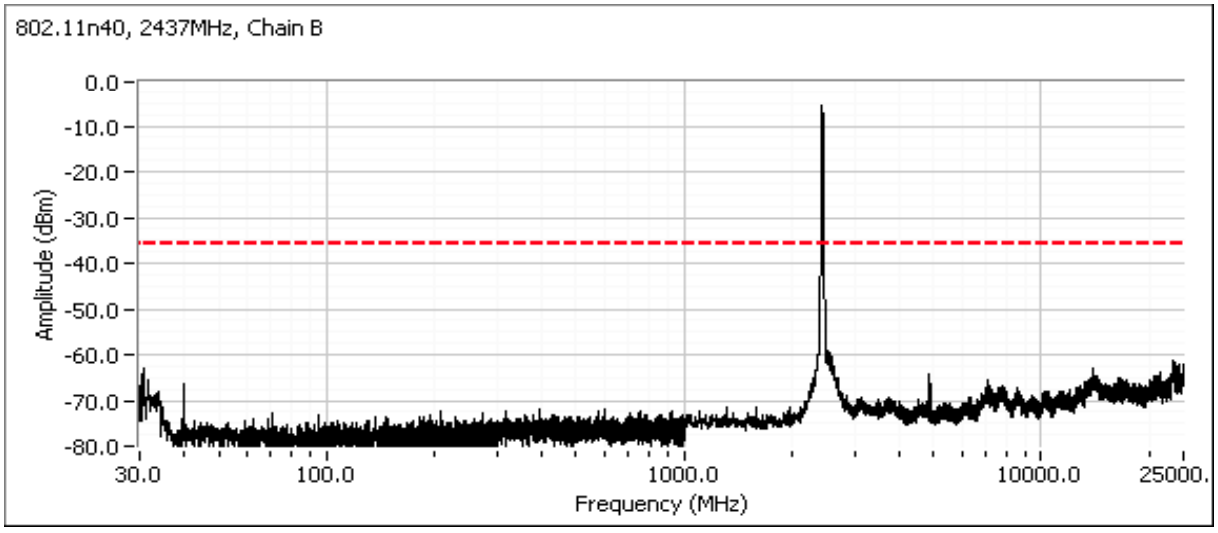
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A



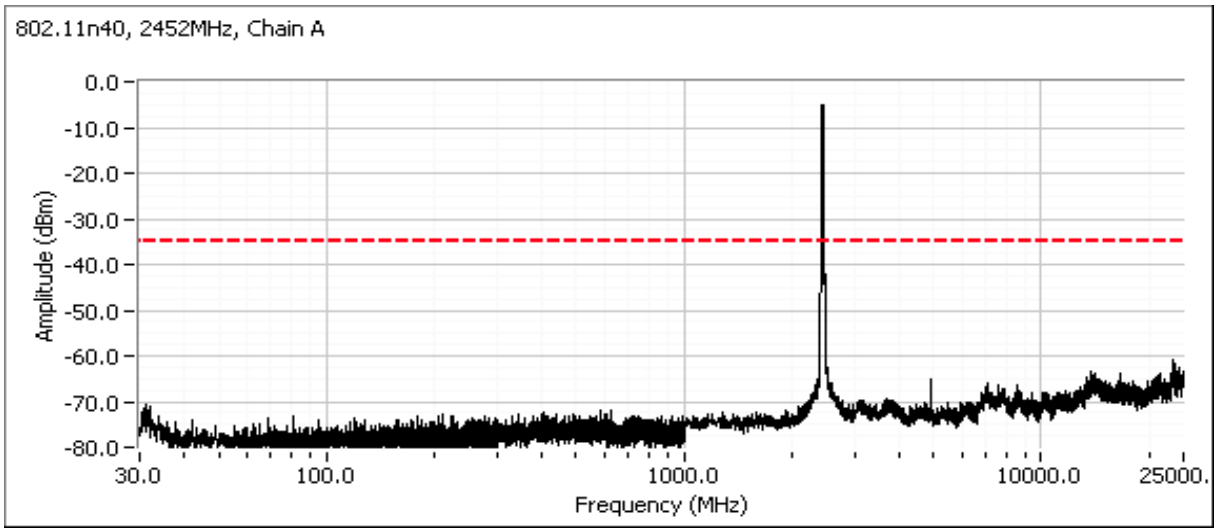


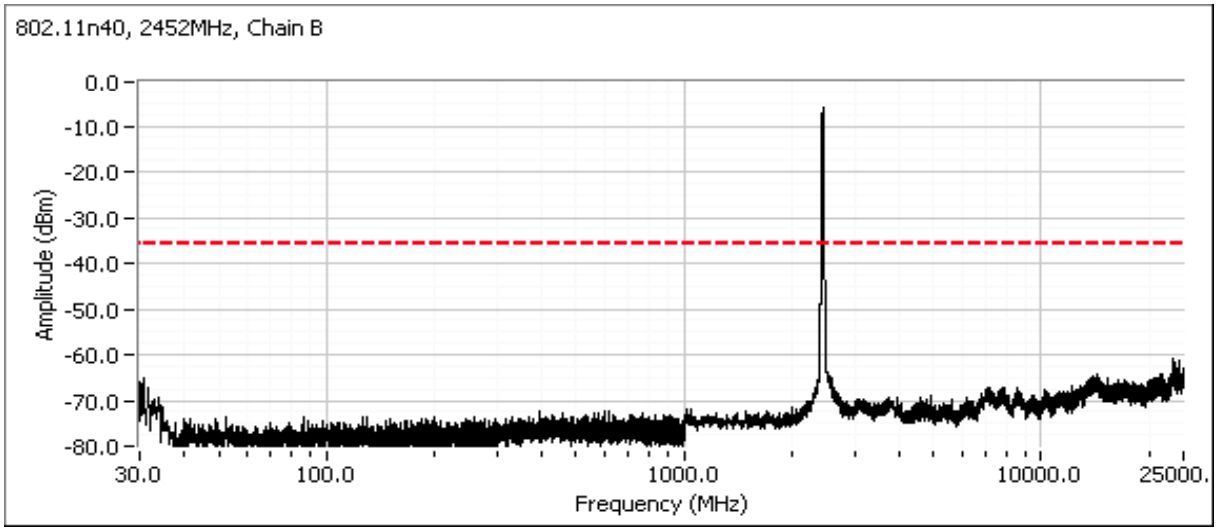
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

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

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing.

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

Ambient Conditions:

Temperature: 12-17 °C

Rel. Humidity: 35-45 %

Summary of Results - Device Operating in the 5725 - 5850 MHz Band

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1	11a	5745MHz	16		Radiated Emissions 1 - 40GHz	FCC Part 15.209 / 15.247(c)	42.3 dBµV/m @ 1187.1 MHz (-11.7 dB)
	11a	5785MHz	16		Radiated Emissions 1 - 40GHz	FCC Part 15.209 / 15.247(c)	42.3 dBµV/m @ 1187.1 MHz (-11.7 dB)
	11a	5825MHz	16		Radiated Emissions 1 - 40GHz	FCC Part 15.209 / 15.247(c)	43.6 dBµV/m @ 1200.0 MHz (-10.4 dB)
2	n20	5745MHz	16		Radiated Emissions 1 - 40GHz	FCC Part 15.209 / 15.247(c)	44.4 dBµV/m @ 1491.7 MHz (-9.6 dB)
	n20	5785MHz	16		Radiated Emissions 1 - 40GHz	FCC Part 15.209 / 15.247(c)	44.1 dBµV/m @ 1200.0 MHz (-9.9 dB)
	n20	5825MHz	16		Radiated Emissions 1 - 40GHz	FCC Part 15.209 / 15.247(c)	47.4 dBµV/m @ 1500.0 MHz (-6.6 dB)
3	n40	5755MHz	16		Radiated Emissions 1 - 40GHz	FCC Part 15.209 / 15.247(c)	44.7 dBµV/m @ 1491.7 MHz (-9.3 dB)
	n40	5795MHz	16		Radiated Emissions 1 - 40GHz	FCC Part 15.209 / 15.247(c)	44.5 dBµV/m @ 1491.7 MHz (-9.5 dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Note 1: HP laptop model Mini 210-1010NR with NTS number 2012-1948 was used during the scan.
Note 2: Near field probe showed no significant emission from 18-40GHz
Note 3: Preliminary testing showed no radio related emissions below 1GHz

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 40000 MHz. Operating Mode: 802.11a

Date of Test: 12/17/12 Test Location: FT Chamber #3

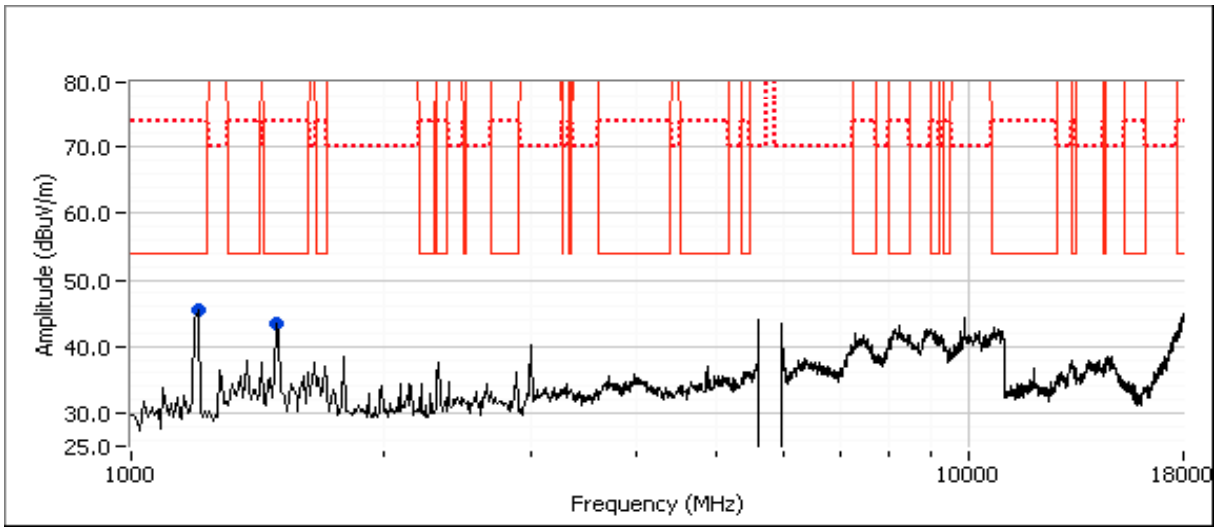
Test Engineer: M. Birgani Host EUT Voltage: 120V, 60Hz

Run #1a: Low Channel @ 5745 MHz

Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1187.05	42.3	V	54.0	-11.7	AVG	10	1.4	RB 1 MHz;VB 10 Hz;Peak
1485.12	38.4	V	54.0	-15.6	AVG	209	1.8	RB 1 MHz;VB 10 Hz;Peak
1192.03	55.3	V	74.0	-18.7	PK	10	1.4	RB 1 MHz;VB 3 MHz;Peak
1100.06	47.4	V	74.0	-26.6	PK	209	1.8	RB 1 MHz;VB 3 MHz;Peak

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.

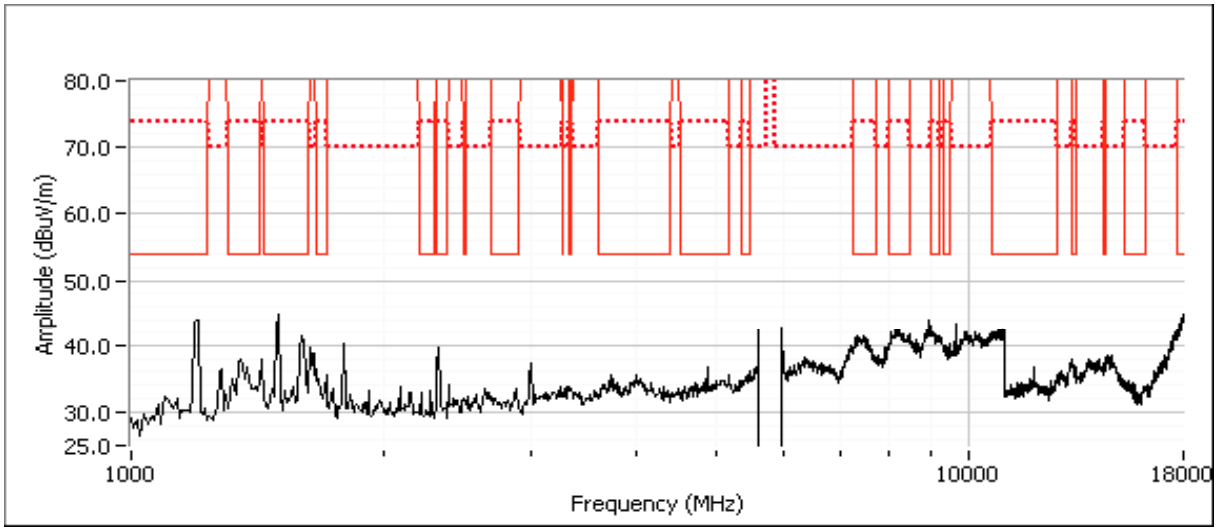


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #1b: Center Channel @ 5785 MHz
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
All signals were more than 10dB below the limit (Highest signals were digital signals and measured on run 1a)								

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.

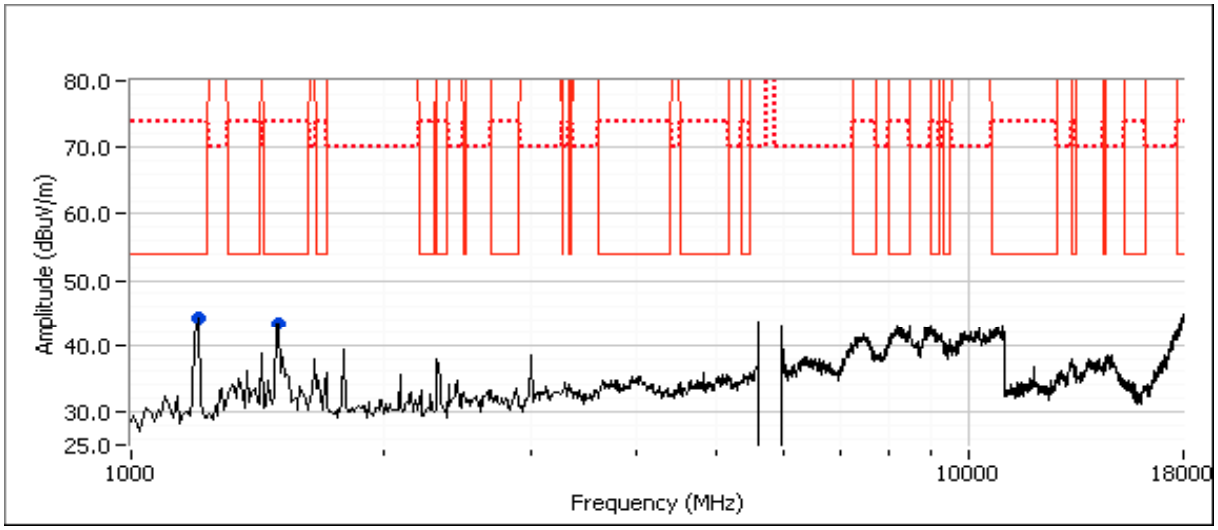


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #1c: High Channel @ 5825 MHz
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1200.000	43.6	V	54.0	-10.4	Peak	174	1.3	Peak reading with average limit
1500.000	43.4	V	54.0	-10.6	Peak	189	1.0	Peak reading with average limit

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



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #2: Radiated Spurious Emissions, 30 - 40000 MHz. Operating Mode: 802.11n20

Date of Test: 12/17/12 Test Location: FT Chamber #3

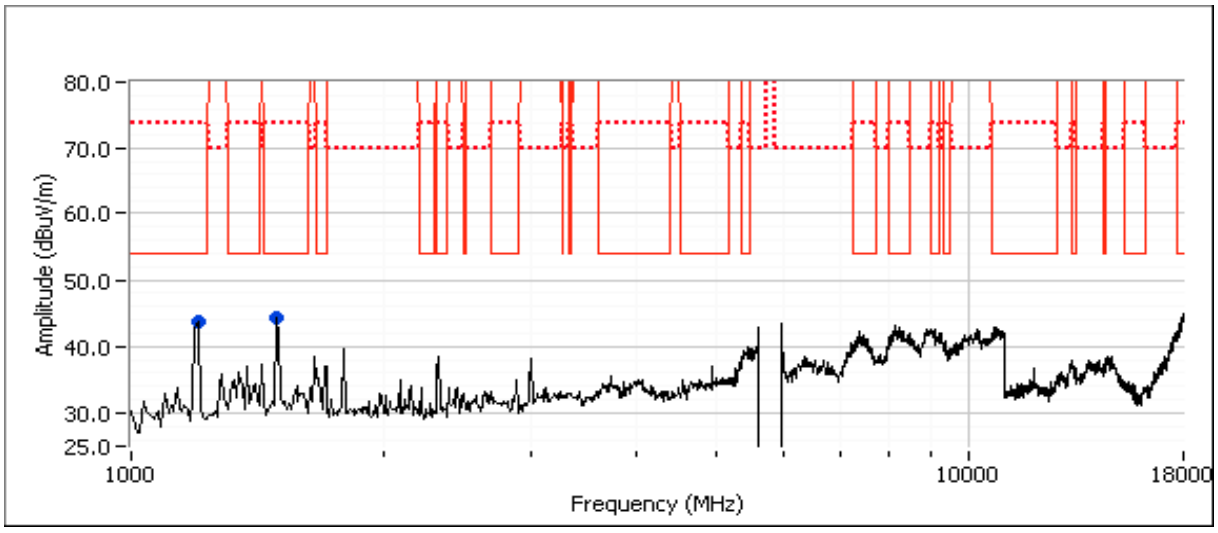
Test Engineer: M. Birgani Host EUT Voltage: 120V, 60Hz

Run #2a: Low Channel @ 5745 MHz

Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1491.670	44.4	V	54.0	-9.6	Peak	177	1.0	Peak reading with average limit
1200.000	43.7	V	54.0	-10.3	Peak	173	1.3	Peak reading with average limit

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 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.

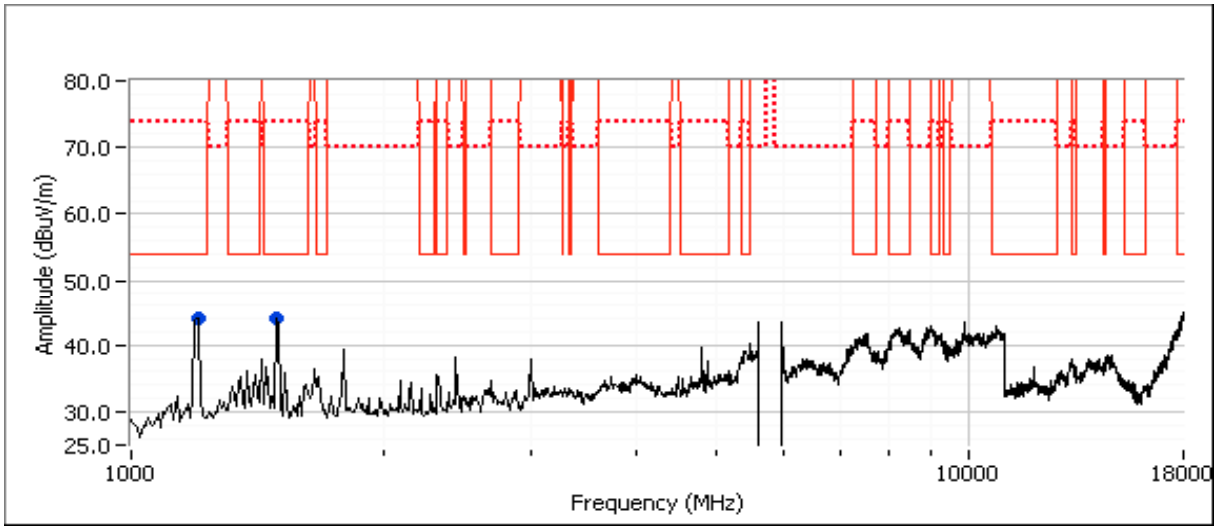


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #2b: Center Channel @ 5785 MHz
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1200.000	44.1	V	54.0	-9.9	Peak	173	1.3	Peak reading with average limit
1491.670	43.9	V	54.0	-10.1	Peak	183	1.0	Peak reading with average limit

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 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.

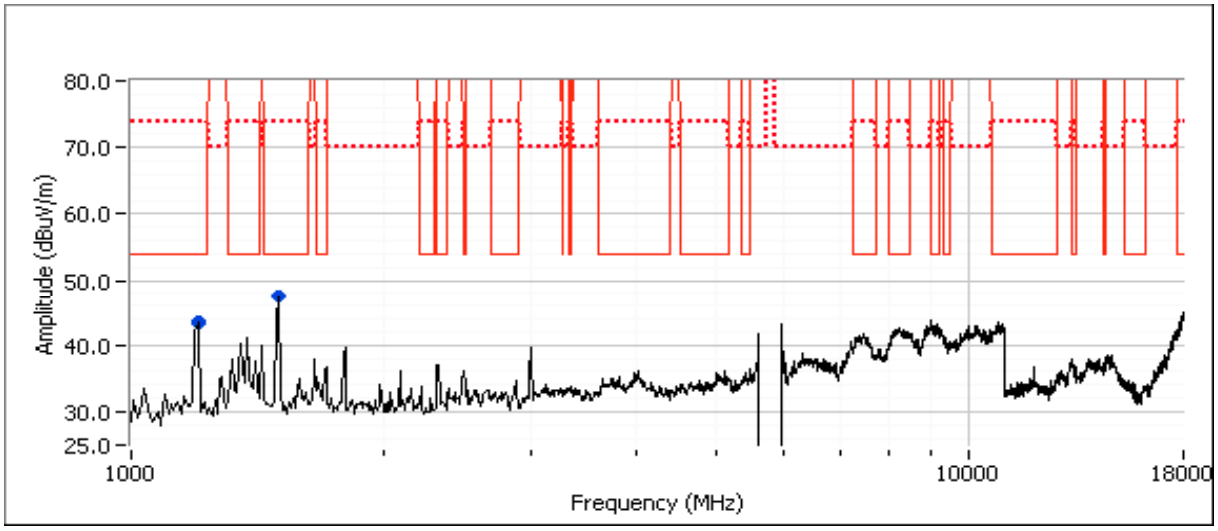


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #2c: High Channel @ 5825 MHz
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1500.000	47.4	V	54.0	-6.6	Peak	181	1.0	Peak reading with average limit
1200.000	43.4	V	54.0	-10.6	Peak	172	1.0	Peak reading with average limit

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 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:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #3: Radiated Spurious Emissions, 30 - 40000 MHz. Operating Mode: 802.11n40

Date of Test: 12/18/12 Test Location: FT Chamber #3

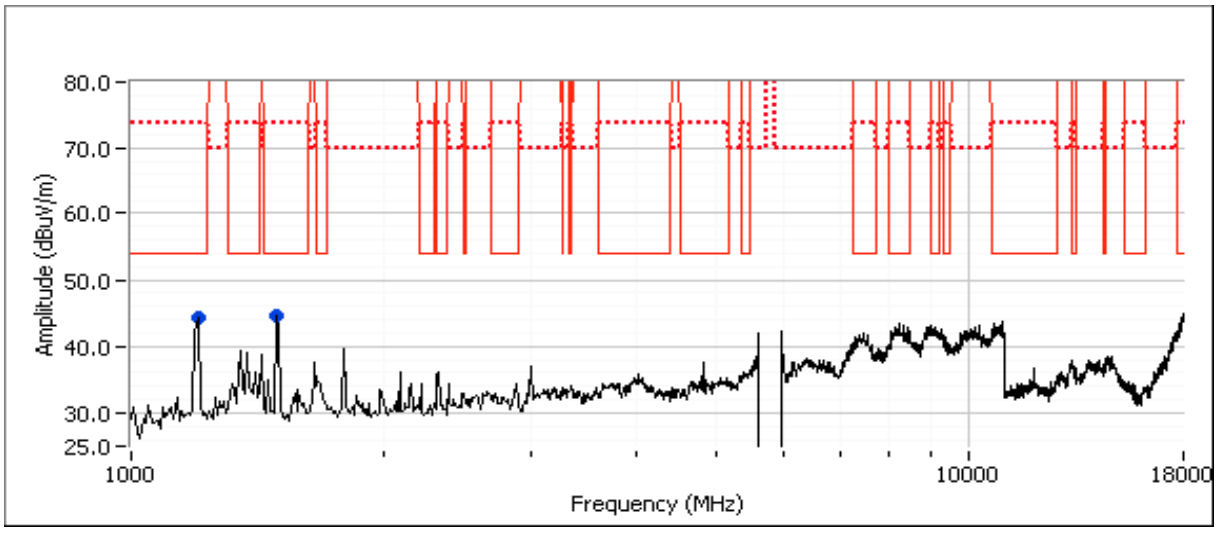
Test Engineer: M. Birgani Host EUT Voltage: 120V, 60Hz

Run #3a: Low Channel @ 5755 MHz

Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1491.670	44.7	V	54.0	-9.3	Peak	188	1.0	Peak reading with average limit
1200.000	44.2	V	54.0	-9.8	Peak	188	1.0	Peak reading with average limit

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 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.

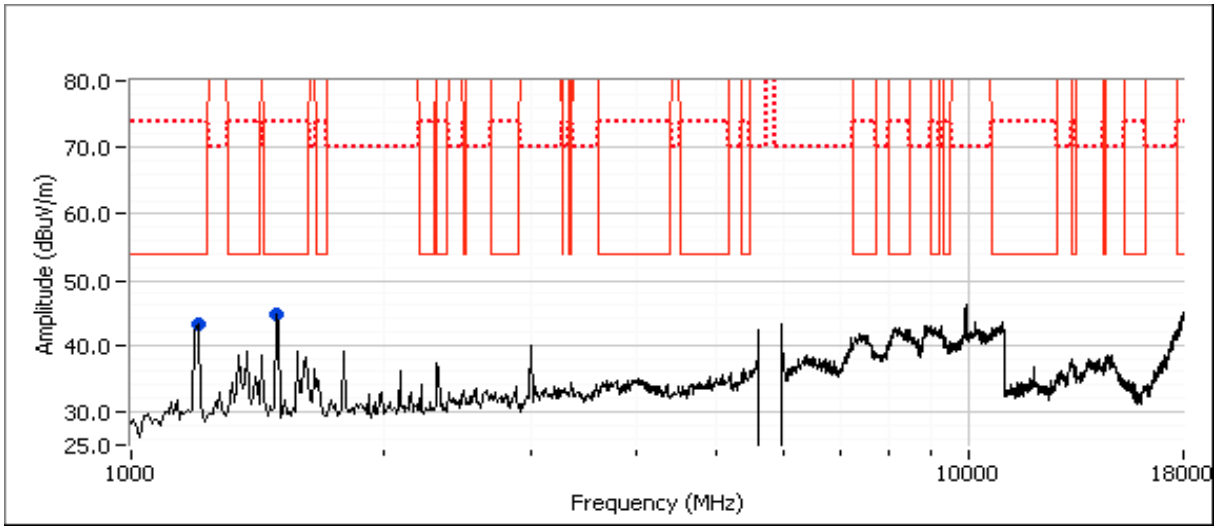


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #3c: High Channel @ 5795 MHz
Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
1491.670	44.5	V	54.0	-9.5	Peak	181	1.0	Peak reading with average limit
1200.000	43.1	V	54.0	-10.9	Peak	163	1.0	Peak reading with average limit

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 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:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements

Power, PSD, Bandwidth and Spurious Emissions

Test Specific Details

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

Date of Test: 12/27/2012, 12/28/2012
Test Engineer: Mark Hill / Deniz Demirci
Test Location: FT Lab# 4a

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

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: 23 °C
Rel. Humidity: 38 %

Summary of Results

Run #	Pwr setting	Avg Pwr	Test Performed	Limit	Pass / Fail	Result / Margin
Chain A						
1	-	-	Output Power	15.247(b)	Pass	11a: 13.8 dBm
2	-	-	Power spectral Density (PSD)	15.247(d)	Pass	11a: 3.1 dBm/1MHz
Chain A + B						
1	-	-	Output Power	15.247(b)	Pass	n20: 16.7 dBm n40: 16.9 dBm
2	-	-	Power spectral Density (PSD)	15.247(d)	Pass	n20: 6.6 dBm/1MHz n40: 4.3 dBm/1MHz
Applicable to both modes						
3	-	-	Minimum 6dB Bandwidth	15.247(a)		11a: 16.27 MHz n20: 15.25 MHz n40: 35.75 MHz
3	-	-	99% Bandwidth	RSS GEN	-	11a: 20.8 MHz n20: 20.8 MHz n40: 38.1 MHz
4	-	-	Spurious emissions	15.247(b)	Pass	All emissions >20dBc or >30dBc

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

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.

Notes:

Chain A = J3, Chain B = J2

Sample Notes:

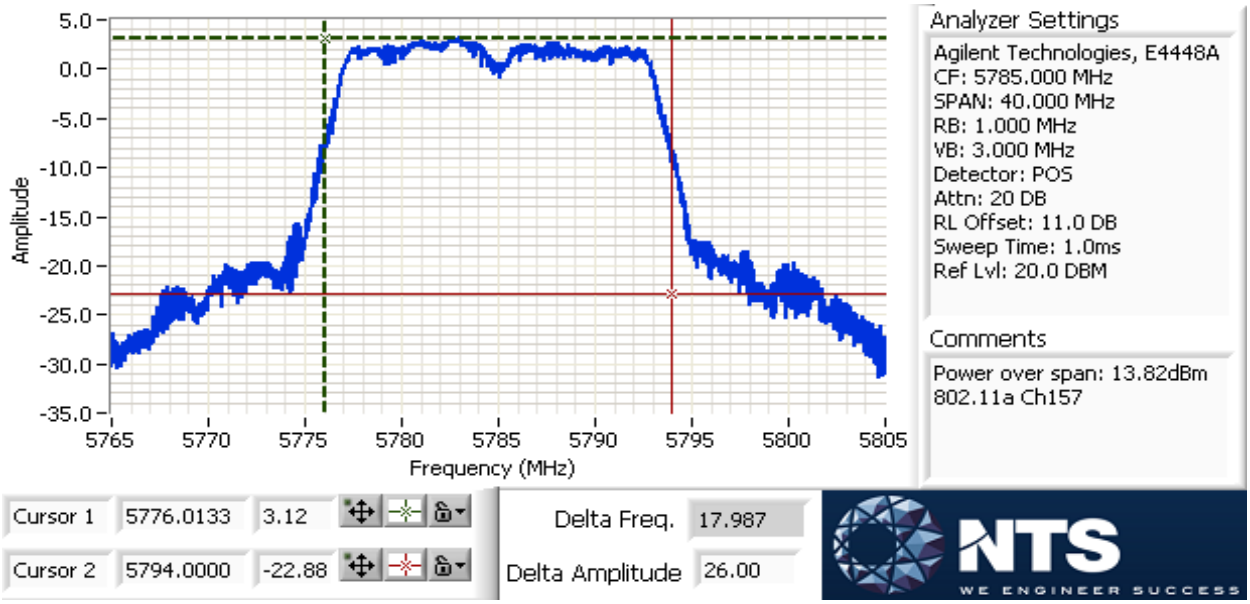
SAMPLE S/N: (MAC): B0.EE.45.03.16.B3
EUT SOFTWARE: 14.1.11.132

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	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 W	Output Power (dBm) [3]	Output Power mW
802.11a									
16	5745	13.5	22.2	5.5	Pass	19.0	0.079		
16	5785	13.8	24.1	5.5	Pass	19.3	0.086		
16	5825	13.1	20.4	5.5	Pass	18.6	0.072		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, peak detector, and power integration over 18 MHz, (option #2 of Maximum Peak Conducted Output Power in KDB 558074).



Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #1: Output Power - Chain A + B

Operating Mode: n20

Transmitted signal on chain is coherent ? no

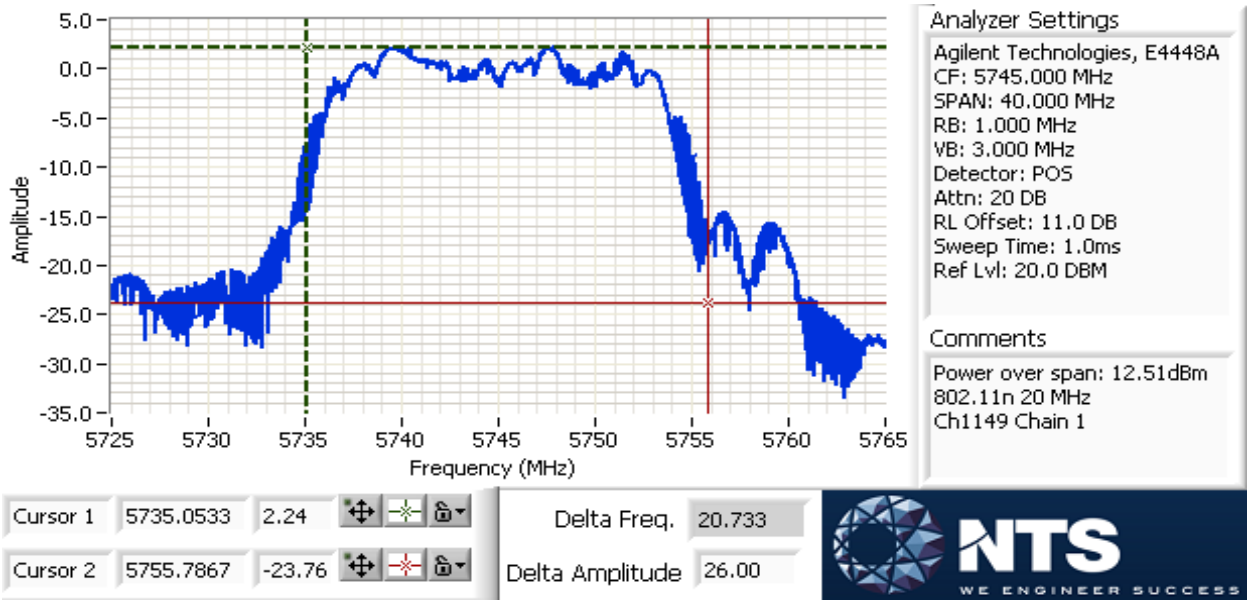
5745 MHz	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	16	16						
Output Power (dBm) Note 1	12.5	14.6			16.7 dBm	0.047 W	27.5 dBm	0.561 W
Antenna Gain (dBi) Note 2	5.5	5.5			8.5 dBi	5.5 dBi	Pass	
eirp (dBm) Note 2	18.0	20.1			22.2 dBm	0.165 W		

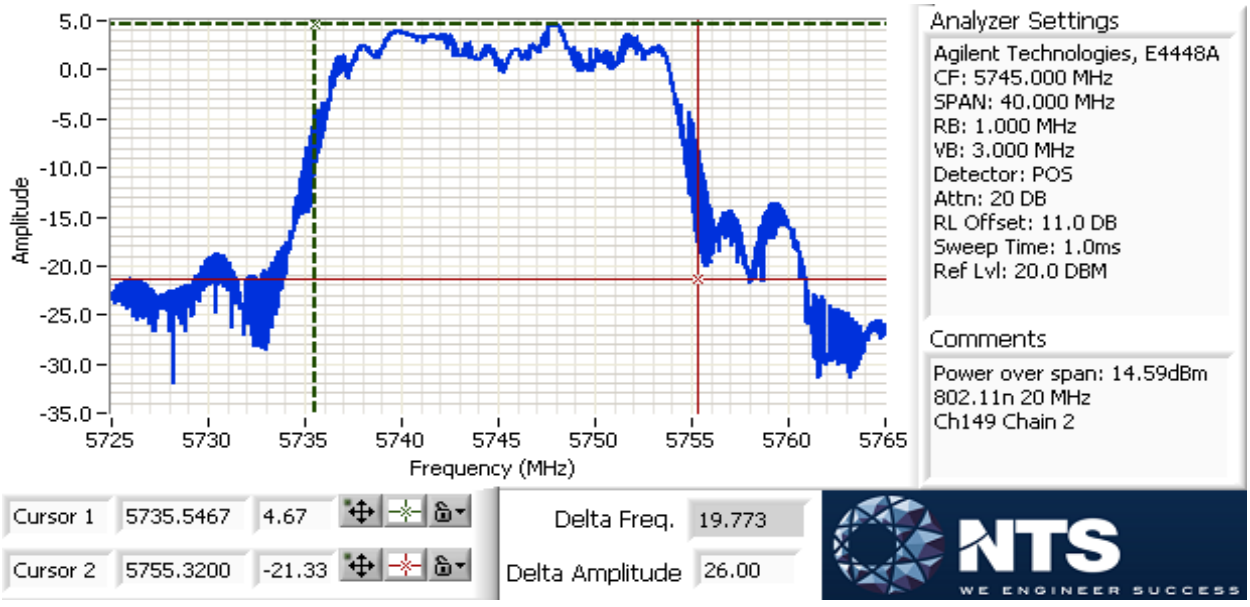
5785 MHz	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	16	16						
Output Power (dBm) Note 1	12.6	14.1			16.4 dBm	0.044 W	27.5 dBm	0.561 W
Antenna Gain (dBi) Note 2	5.5	5.5			8.5 dBi	5.5 dBi	Pass	
eirp (dBm) Note 2	18.1	19.6			21.9 dBm	0.155 W		

5825 MHz	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	16	16						
Output Power (dBm) Note 1	12.0	12.7			15.3 dBm	0.034 W	27.5 dBm	0.561 W
Antenna Gain (dBi) Note 2	5.5	5.5			8.5 dBi	5.5 dBi	Pass	
eirp (dBm) Note 2	17.5	18.2			20.8 dBm	0.121 W		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, peak detector, and power integration over 20 MHz, (option #2 of Maximum Peak Conducted Output Power in KDB 558074).

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

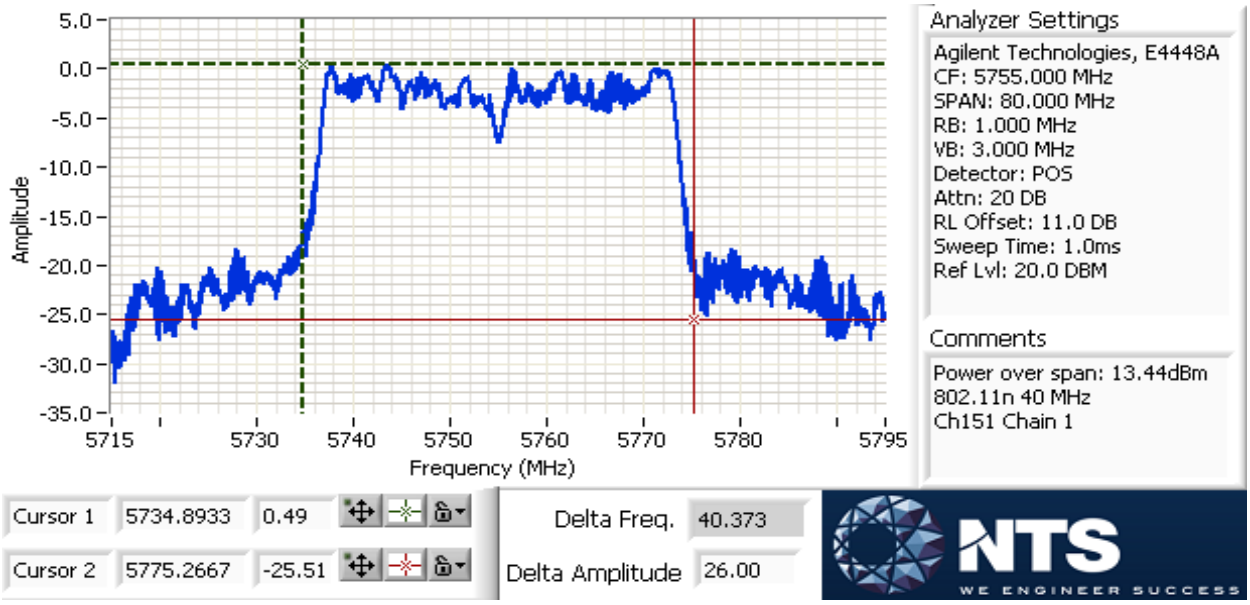
Operating Mode: n40
Transmitted signal on chain is coherent ? no

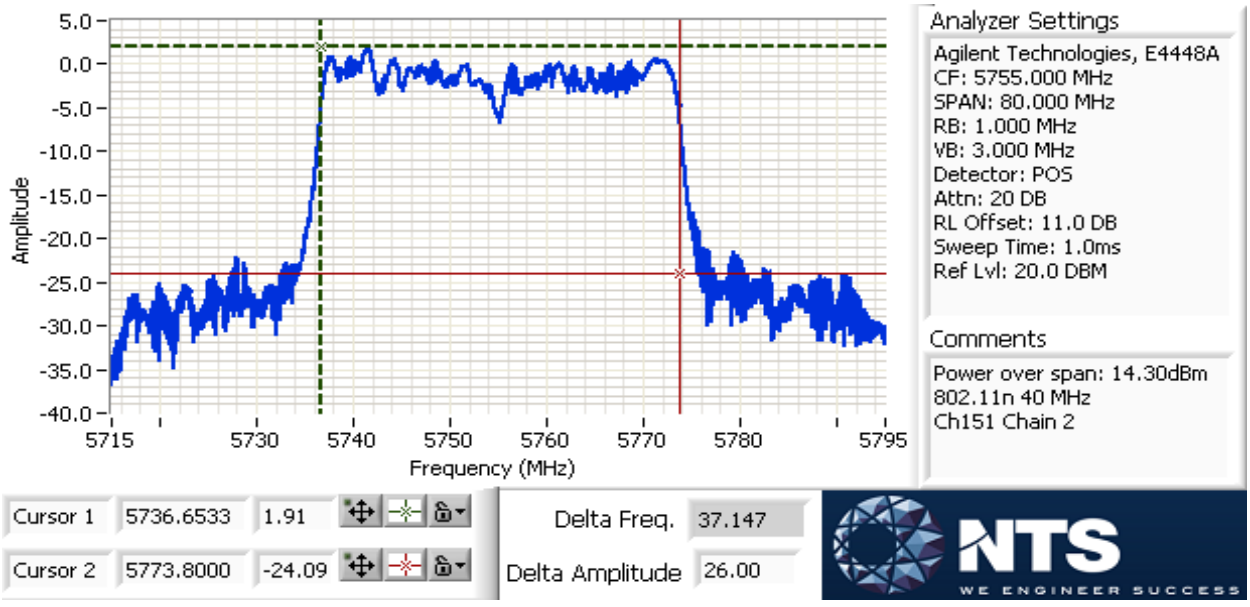
5755 MHz	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	16	16						
Output Power (dBm) Note 1	13.4	14.3			16.9 dBm	0.049 W	27.5 dBm	0.561 W
Antenna Gain (dBi) Note 2	5.5	5.5			8.5 dBi	5.5 dBi	Pass	
eirp (dBm) Note 2	18.9	19.8			22.4 dBm	0.174 W		

5795 MHz	Chain 1	Chain 2	Chain 3	Chain 4	Total Across All Chains		Limit	
Power Setting Note 3	16	16						
Output Power (dBm) Note 1	12.5	14.0			16.3 dBm	0.043 W	27.5 dBm	0.561 W
Antenna Gain (dBi) Note 2	5.5	5.5			8.5 dBi	5.5 dBi	Pass	
eirp (dBm) Note 2	18.0	19.5			21.8 dBm	0.152 W		

Note 1:	Output power measured using a spectrum analyzer (see plots below) with RBW=1MHz, VB=3 MHz, peak detector, and power integration over 40MHz, (option #2 of Maximum Peak Conducted Output Power in KDB 558074).

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Run #2: Power spectral Density

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1	Limit dBm/3kHz	Result
802.11a				
16	5745	2.3	8.0	Pass
16	5785	3.1	8.0	Pass
16	5825	2.2	8.0	Pass

Power Setting	Frequency (MHz)	PSD (dBm/3kHz) Note 1					Limit dBm/3kHz	Result
		Chain 1	Chain 2	Chain 3	Chain 4	Total		
n20								
16	5745	2.2	4.7			6.6	8.0	Pass
16	5785	2.4	4.4			6.5	8.0	Pass
16	5825	2.0	2.8			5.4	8.0	Pass
n40								
16	5755	0.5	1.9			4.3	8.0	Pass
16	5795	-0.4	0.5			3.1	8.0	Pass

Note 1:	Power spectral density measured using RBW= 1 MHz, VBW= 3 MHz, analyzer with peak detector (option #1 in KDB 558074, See Output Power measurements) Measured values do not exceed the limit defined with 3 kHz RBW hence further measurements are not required.

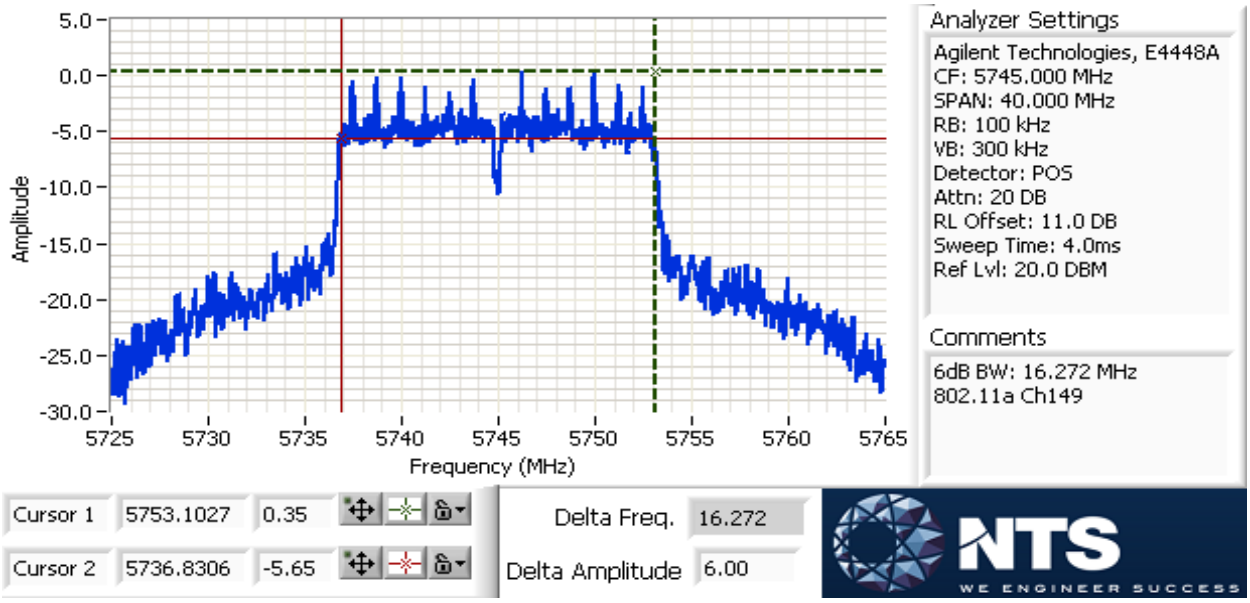
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

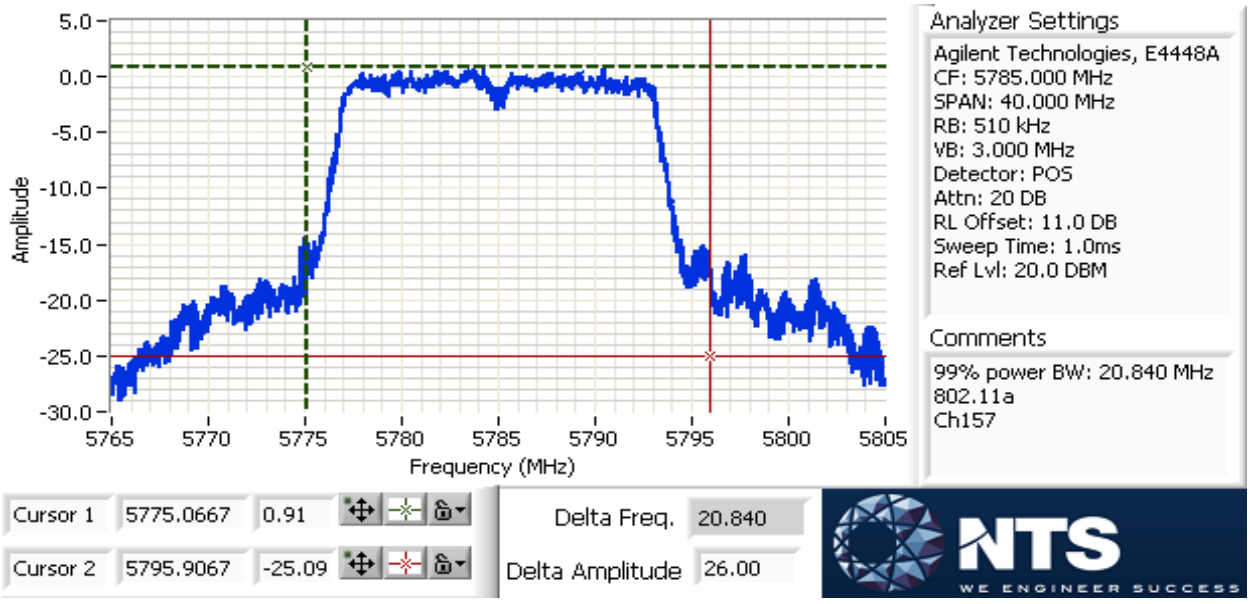
Run #3: Signal Bandwidth

Power Setting	Mode	Frequency (MHz)	RBW (kHz)	6dB BW (MHz)	RBW (kHz)	99% BW (MHz)
16	a	5745	100	16.27		
16	a	5785	100	16.34	510	20.8
16	a	5825	100	16.31		
16	n20	5745	100	15.25		
16	n20	5785	100	15.25	510	20.8
16	n20	5825	100	16.29		
16	n40	5755	100	36.31	1000	38.1
16	n40	5795	100	35.75		

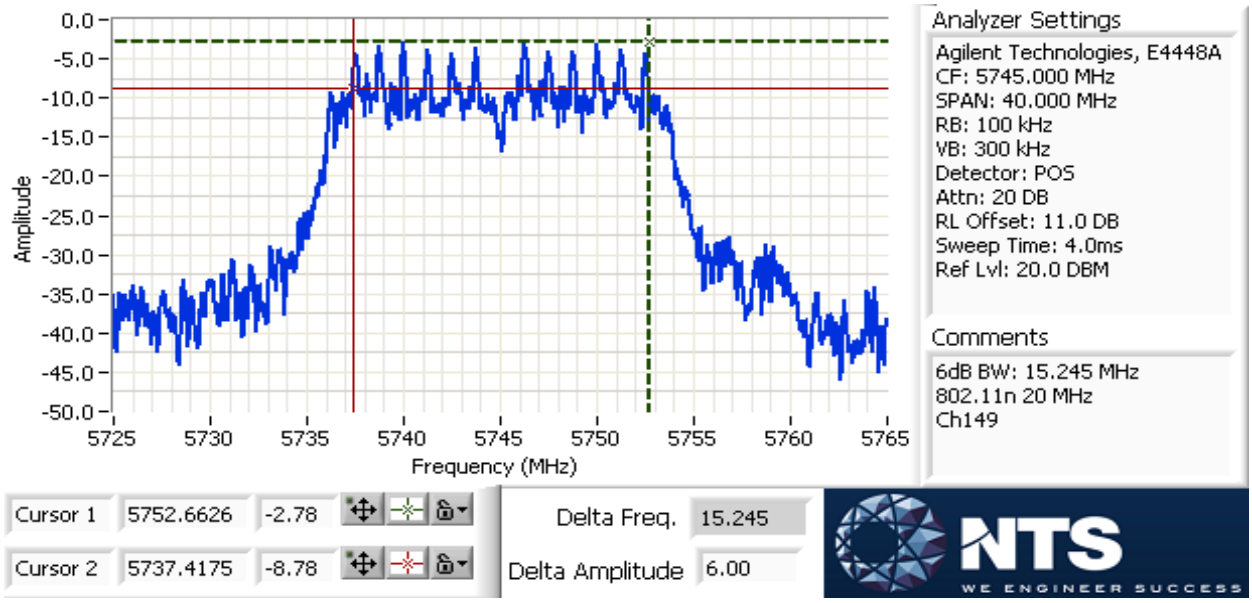
Note 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB

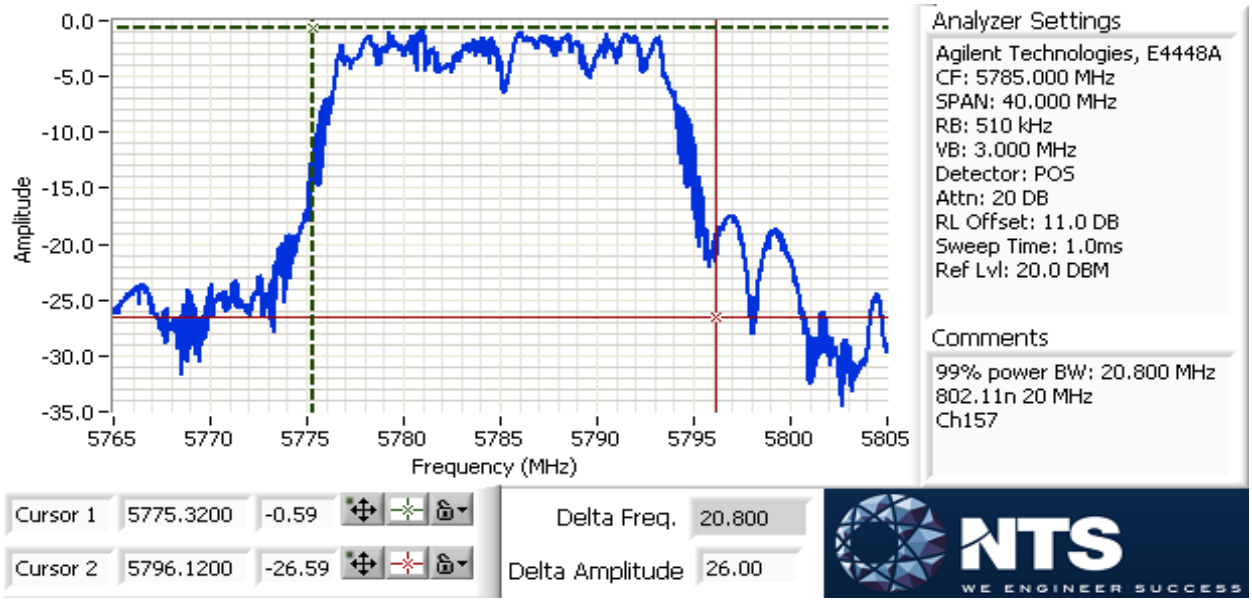
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A



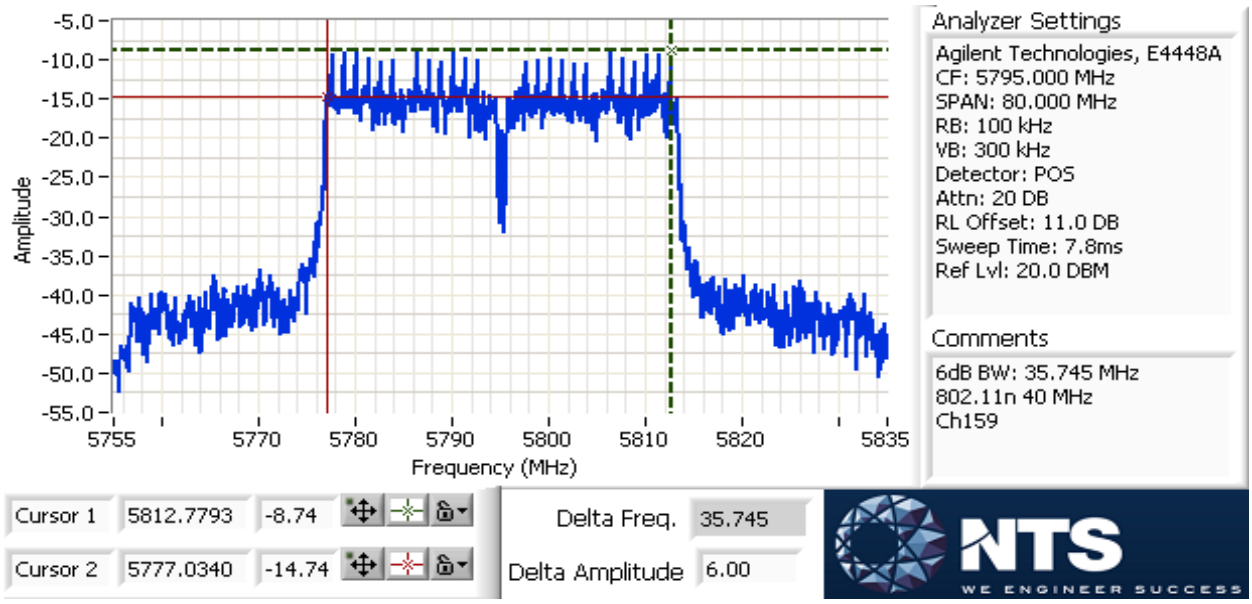


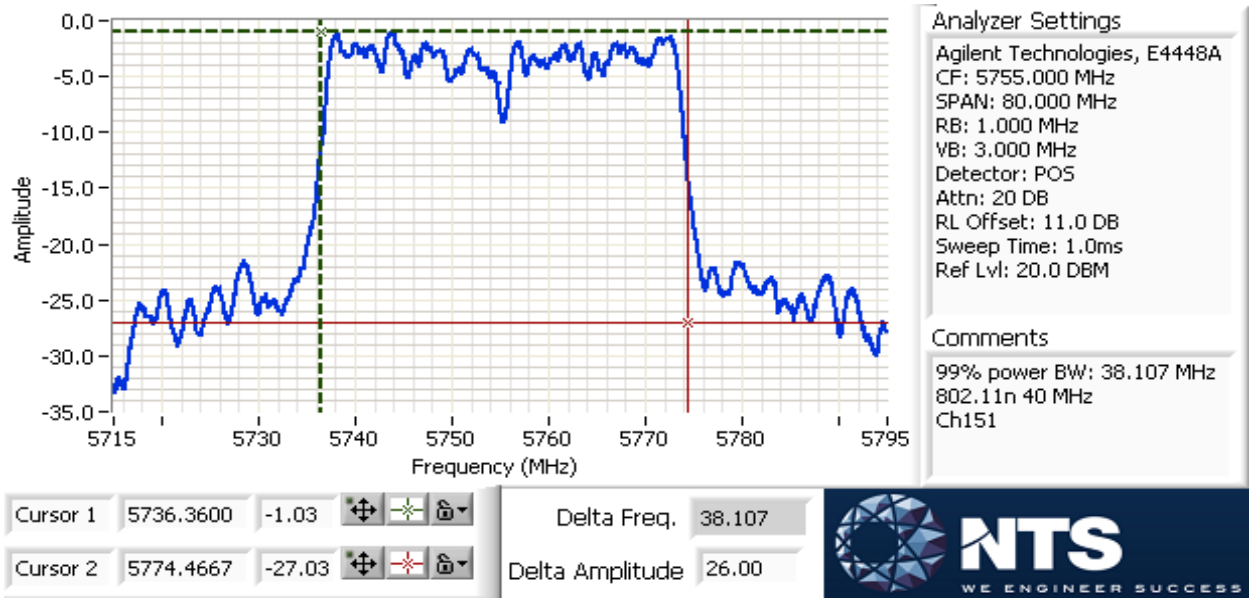
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

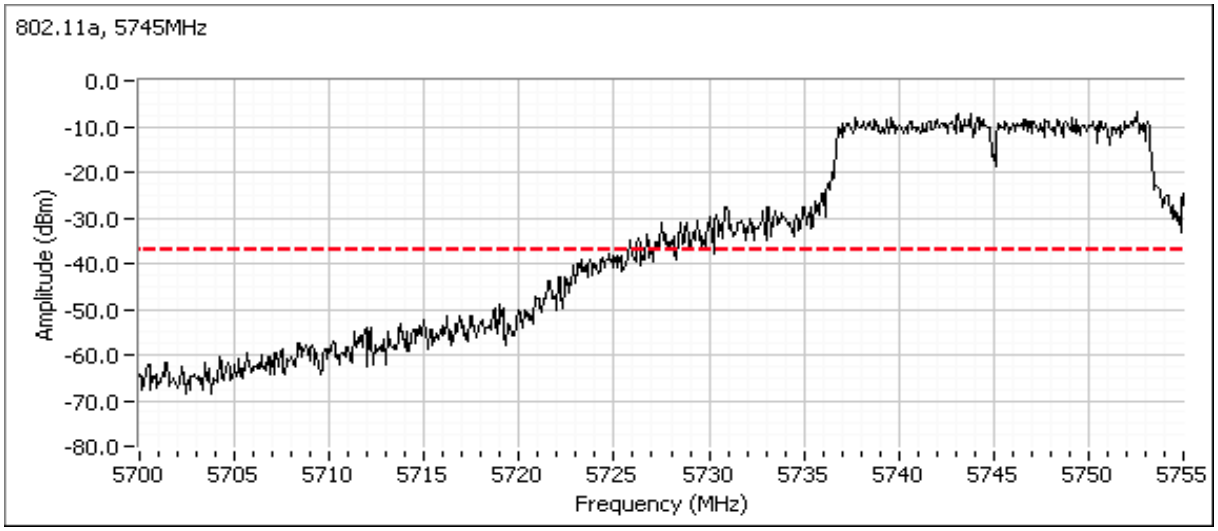
Run #4: Out of Band Spurious Emissions

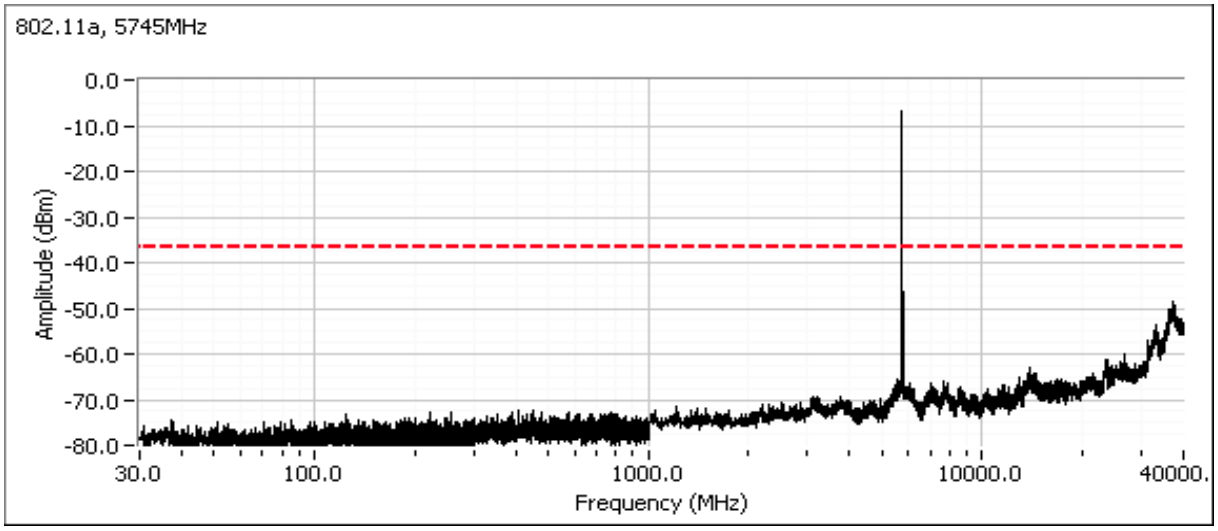
Mode	Power Setting	Frequency (MHz)	Limit	Result
11a	16	5745	-30dBc	Pass
11a	16	5785	-30dBc	Pass
11a	16	5825	-30dBc	Pass
n20	16	5745	-20dBc	Pass
n20	16	5785	-20dBc	Pass
n20	16	5825	-20dBc	Pass
n40	16	5755	-20dBc	Pass
n40	16	5795	-20dBc	Pass

Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

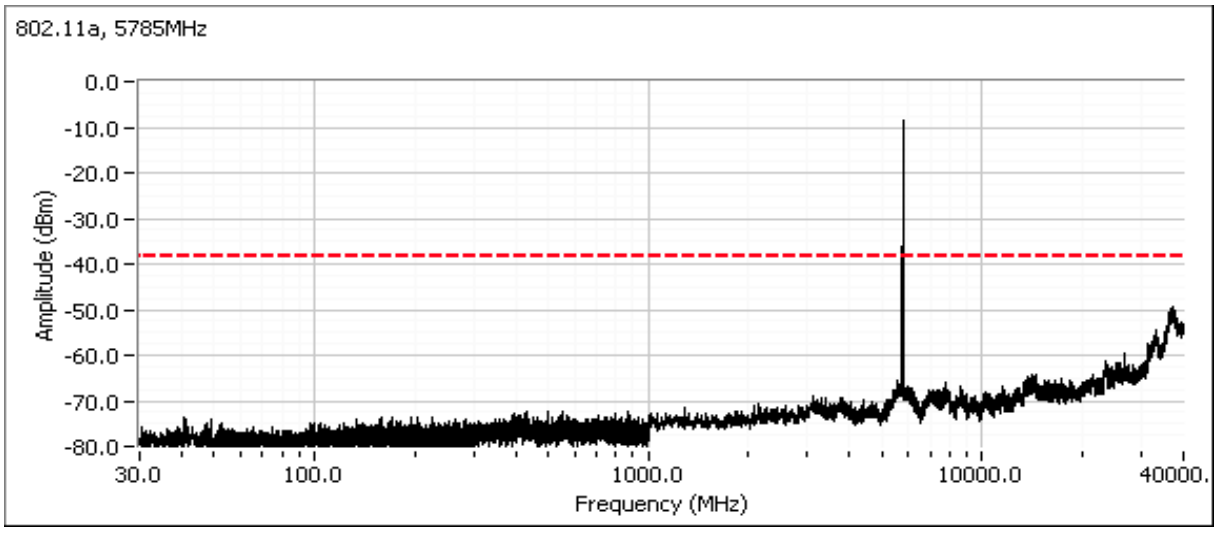
Plots for 802.11a

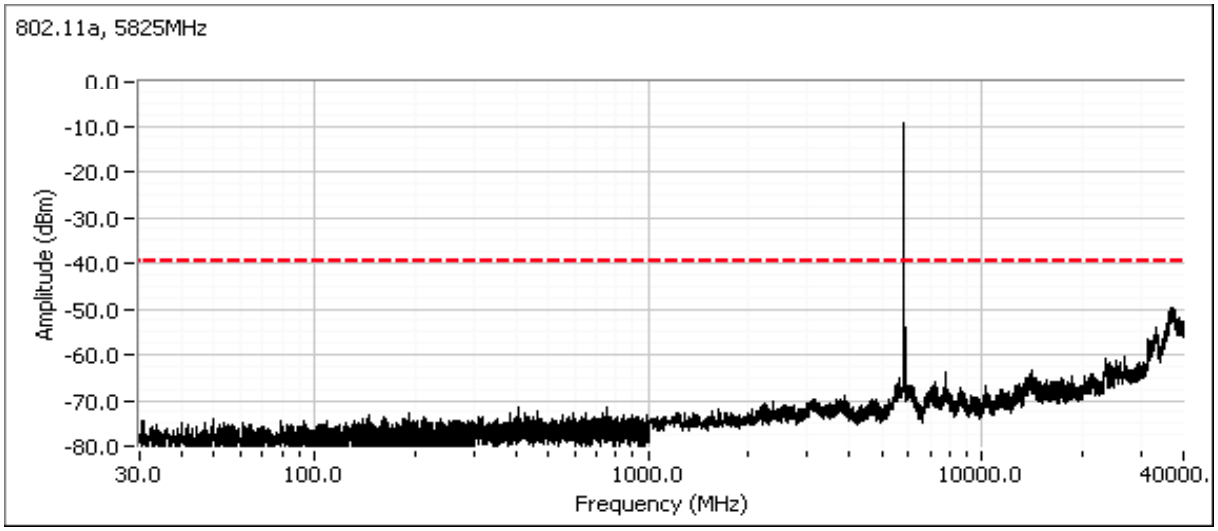
Additional plot showing compliance with -30dBc at the band edge.





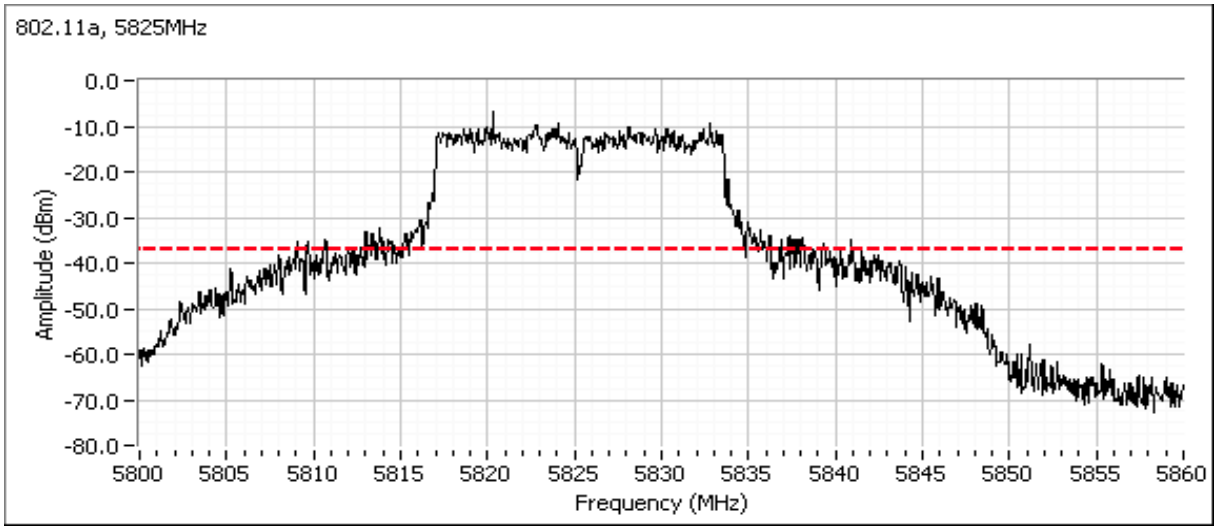
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

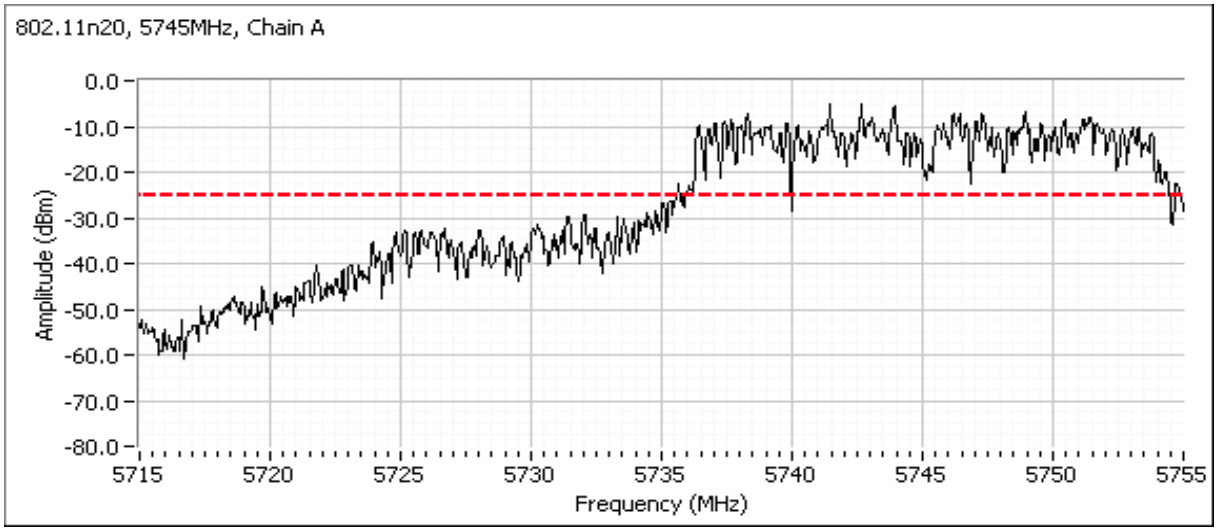
Additional plot showing compliance with -30dBc at the band edge.

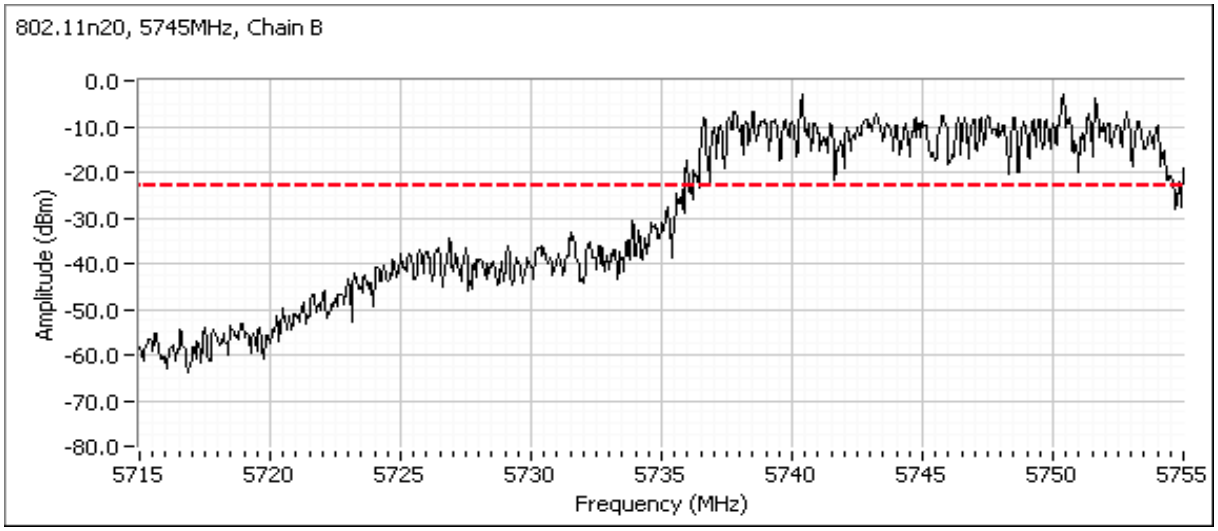


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

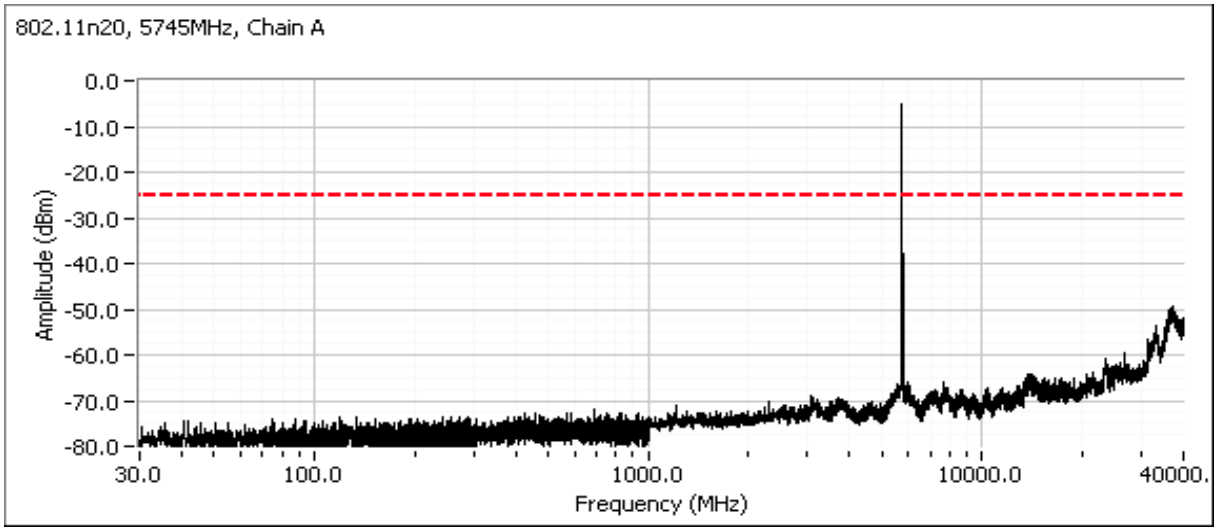
Plots for 802.11n20

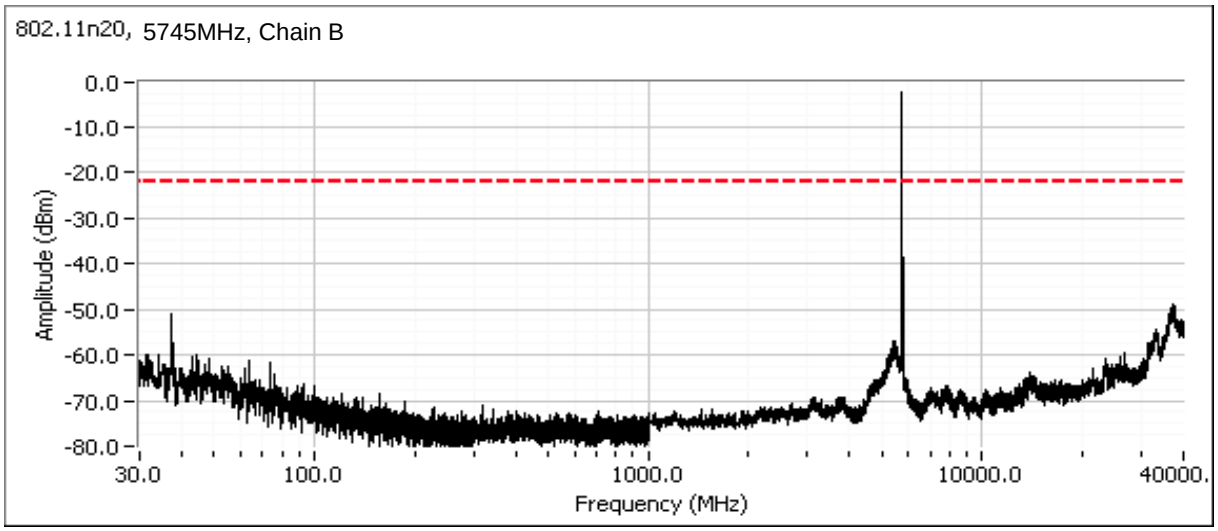
Additional plot showing compliance with -20dBc at the band edge.



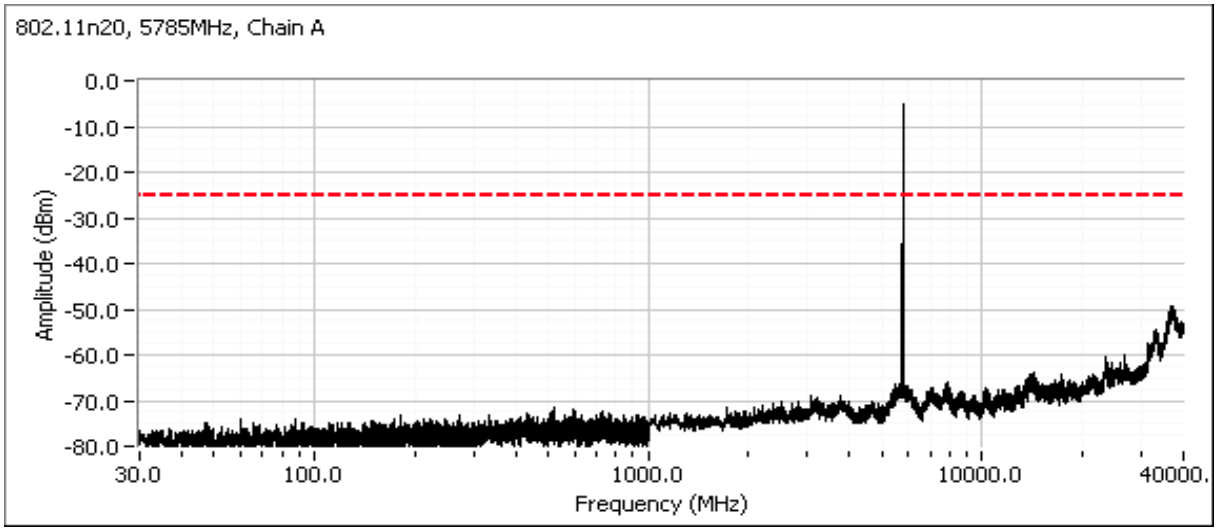


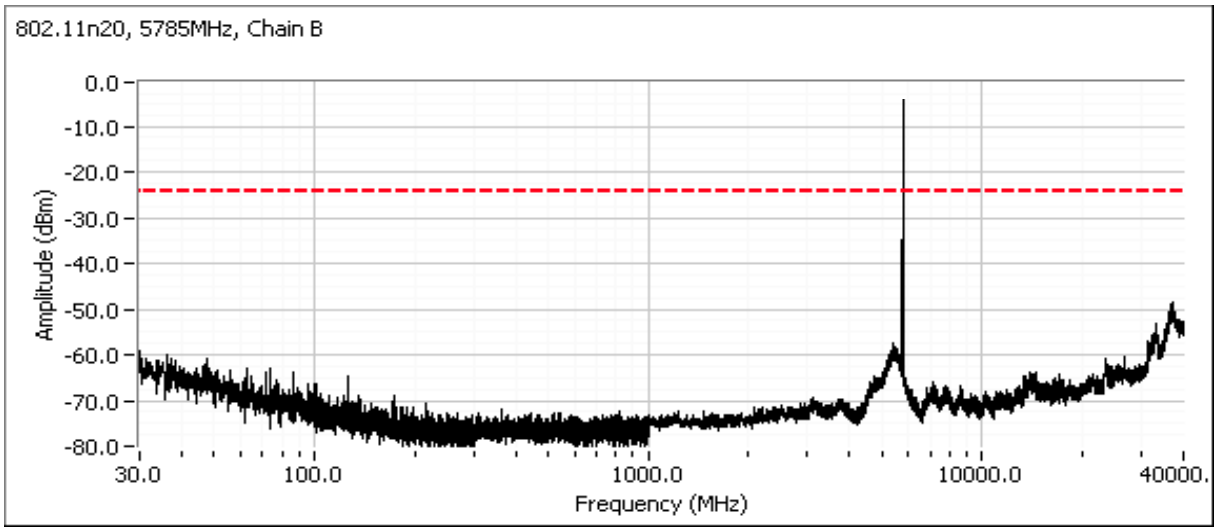
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A



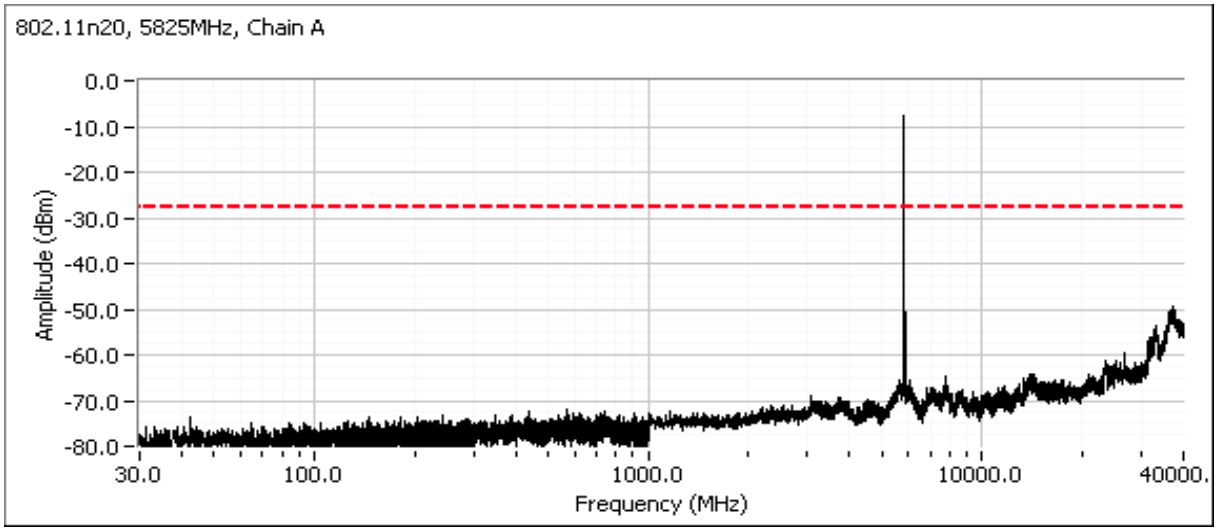


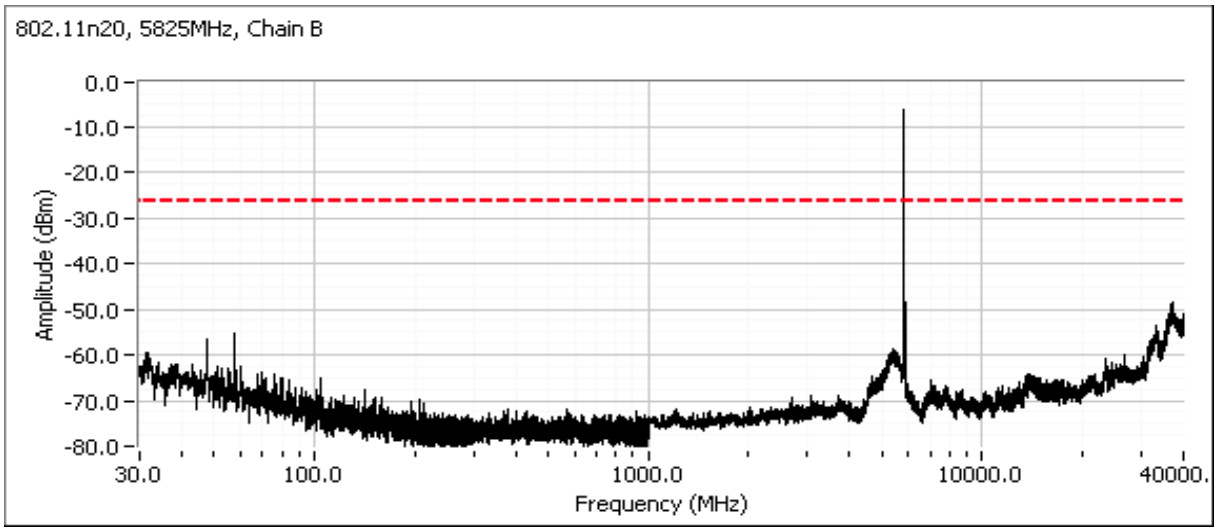
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





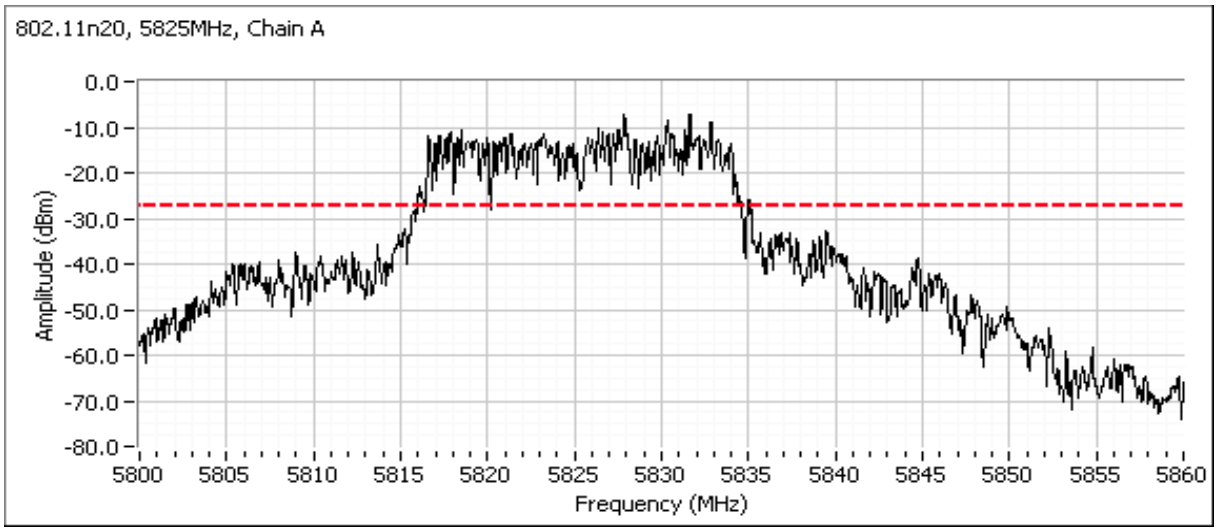
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

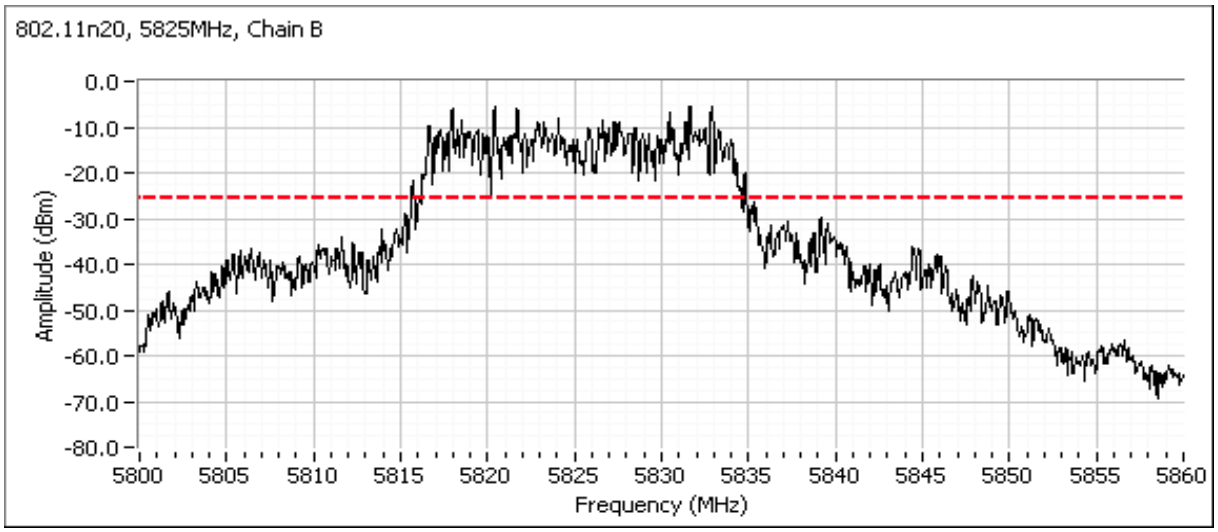




Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Additional plot showing compliance with -20dBc at the band edge.

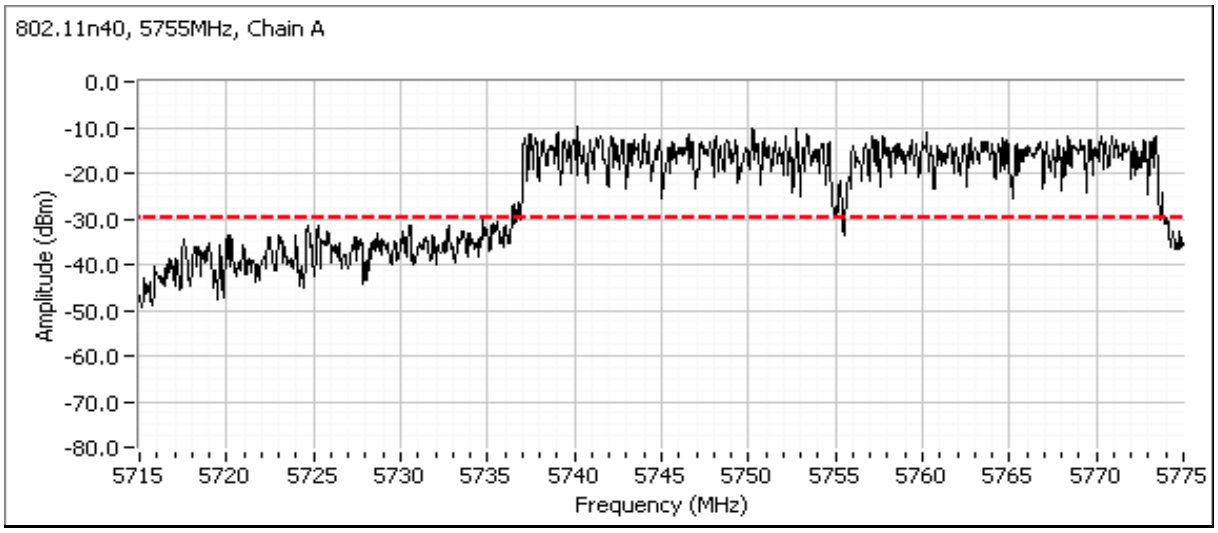


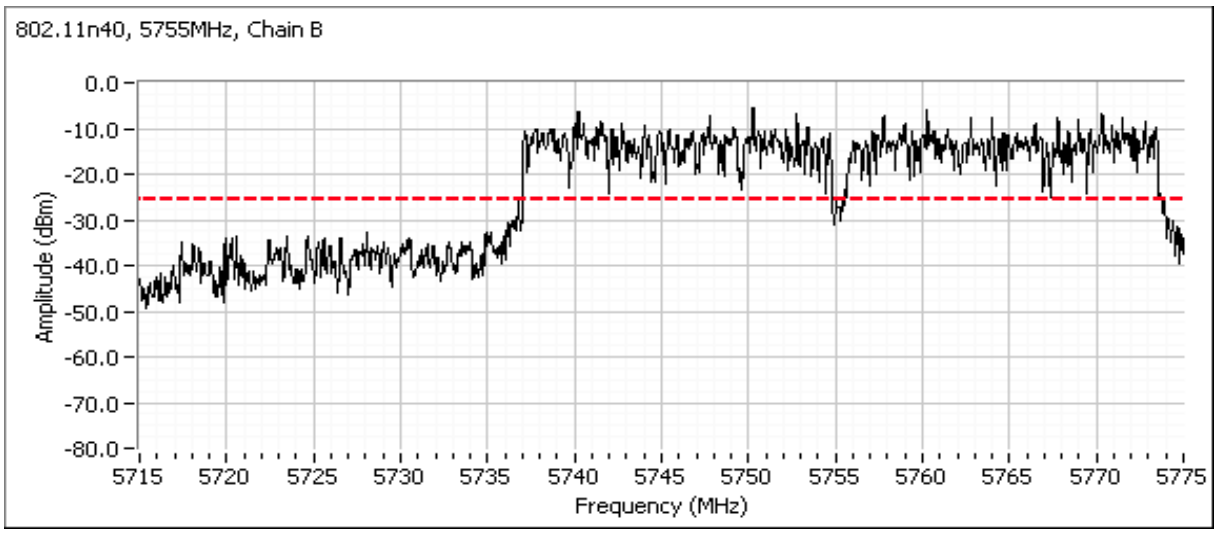


Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

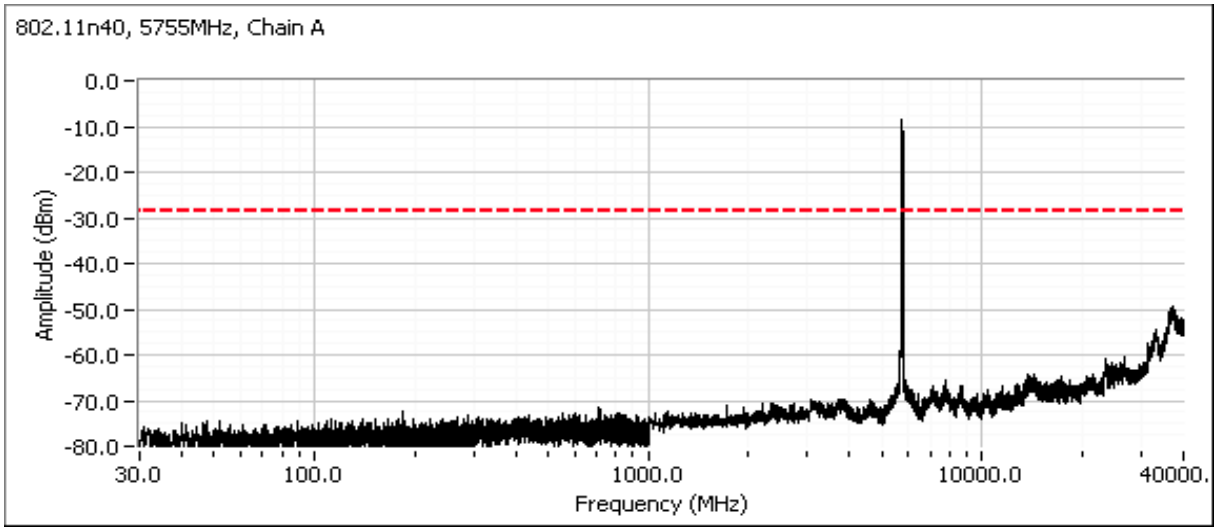
Plots for 802.11n40

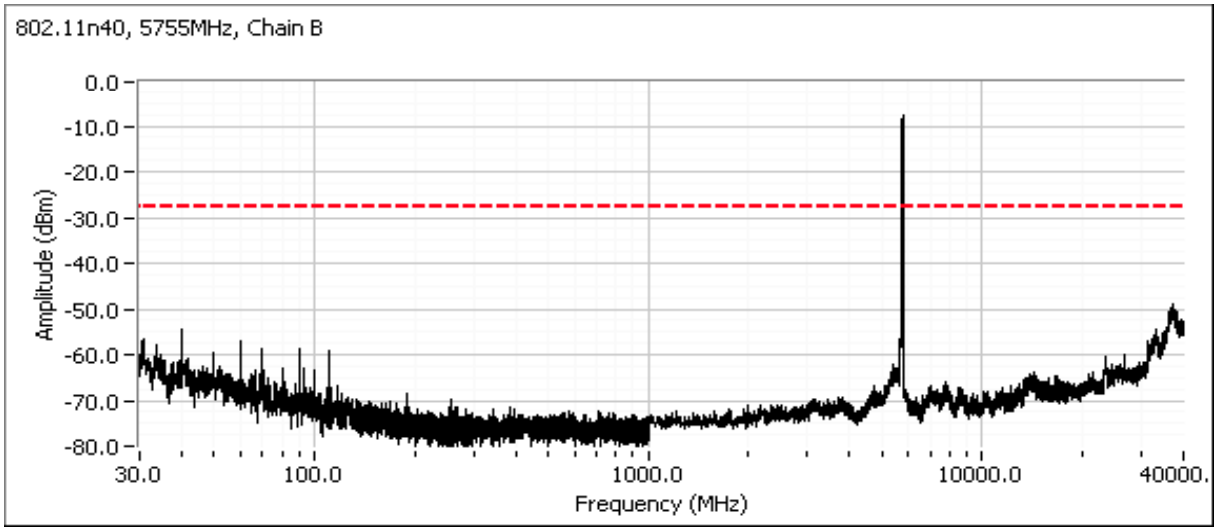
Additional plots showing compliance with -20dBc at the band edge.



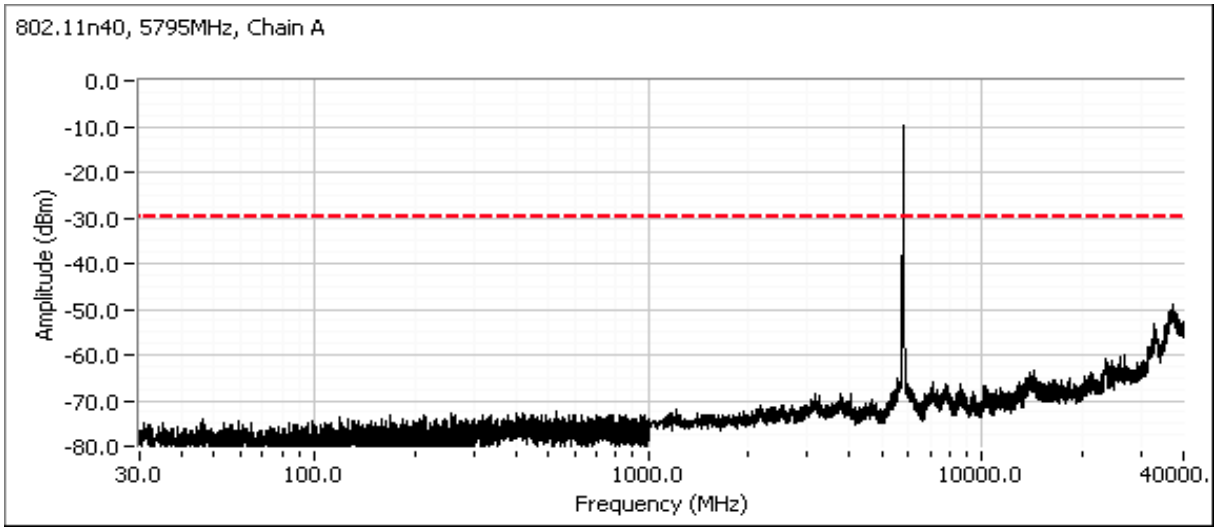


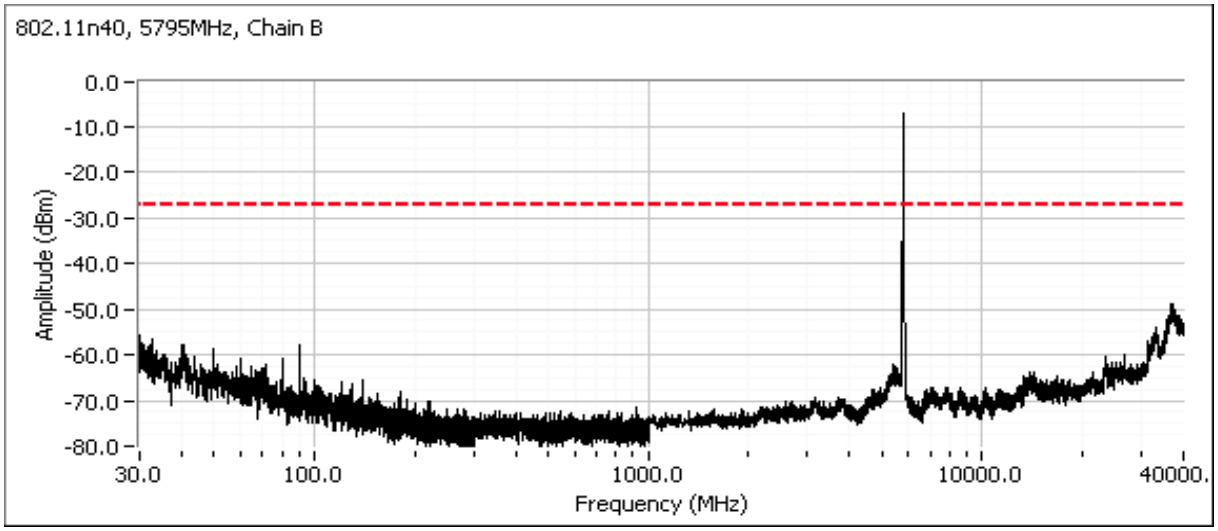
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A





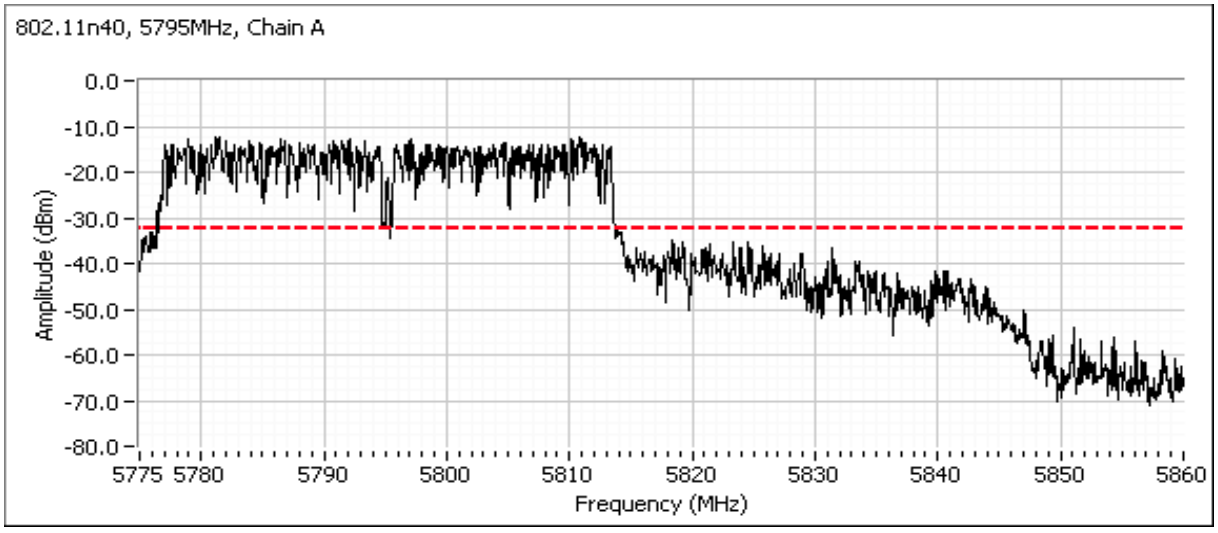
Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

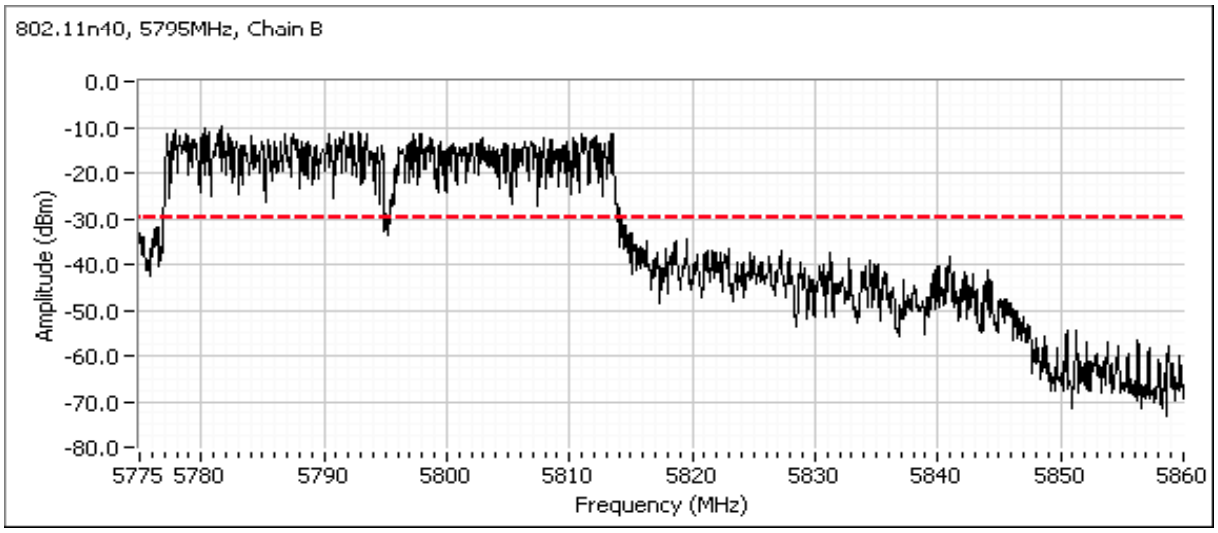




Client:	Biscotti, Inc.	Job Number:	J89805
Model:	W0001 - Module 802.11abgn 2x2	T-Log Number:	T89809
		Account Manager:	Deepa Shetty
Contact:	Nadeem Ahmed		
Standard:	FCC 15.247, 15.E	Class:	N/A

Additional plot showing compliance with -20dBc at the band edge.





End of Report

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