

*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: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card*

IC CERTIFICATION #: 4324A-BRCM1060  
 FCC ID: QDS-BRCM1060

APPLICANT: Broadcom Corporation  
 190 Mathilda Ave  
 Sunnyvale, CA 94086

TEST SITE(S): Elliott Laboratories  
 41039 Boyce Road.  
 Fremont, CA. 94538-2435

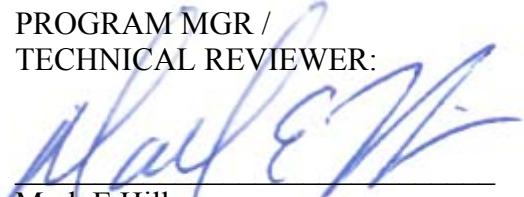
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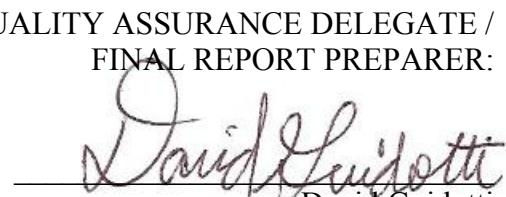
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PROGRAM MGR /  
 TECHNICAL REVIEWER:

  
 Mark E Hill  
 Staff Engineer

QUALITY ASSURANCE DELEGATE /  
 FINAL REPORT PREPARER:

  
 David Guidotti  
 Senior Technical Writer



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**REVISION HISTORY**

Rev#	Date	Comments	Modified By
-	08-11-2011	First release	

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## **SCOPE**

An electromagnetic emissions test has been performed on the Broadcom Corporation model BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card, 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 Elliott Laboratories test procedures:

ANSI C63.4:2003  
FHSS test procedure DA 00-0705A1, March 2000

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 Broadcom Corporation model BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card 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 Broadcom Corporation model BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card and therefore apply only to the tested sample. The sample was selected and prepared by Anne Liang of Broadcom Corporation.

## DEVIATIONS FROM THE STANDARDS

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

**TEST RESULTS SUMMARY****FREQUENCY HOPPING SPREAD SPECTRUM (2400 – 2483.5 MHz, 75 channels or more)**

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	GFSK: 967 kHz 8PSK: 1350 kHz	Channel spacing > 2/3 of the 20dB bandwidth	Complies
		Channel Separation	1000 kHz		Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Channel Dwell Time (average time of occupancy)	EUT complies with BlueTooth specification	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Number of Channels	max: 79 min: 20	15 or more	Complies
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization	The system uses the BlueTooth algorithm and, therefore, meets all requirements for channel utilization.	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (2)	Output Power (multipoint systems)	GFSK: 1.38 dBm (1.4 mW) 8PSK: 2.56 dBm (1.8 mW) EIRP = 0.004 W <sup>Note 1</sup>	0.125 W	Complies
15.247(c)	RSS 210 A8.5	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 25GHz	GFSK: 42.1dB $\mu$ V/m @ 9974.0MHz (-11.9dB) 8PSK: 34.5dB $\mu$ V/m @ 2500.1MHz (Margin: -19.5dB)	15.207 in restricted bands, all others < -20dBc	Complies (- ?? dB)
15.247 (a) (1)	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies

Note 1: EIRP calculated using antenna gain of 3.9 dBi.

**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 EUT has u.FL connectors	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	54.8dB $\mu$ V @ 0.151MHz (-11.1dB)	Refer to page 18	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	34.0dB $\mu$ V/m @ 30.94MHz (-6.0dB)	Refer to page 19	Complies
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	Refer to user's manual	Statement required regarding non-interference	Complies
-	RSP 100 RSS GEN 7.1.5	User Manual	Refer to user's manual	Statement for products with detachable antenna	Complies
-	RSP 100 RSS GEN 4.4.1	99% Bandwidth	GFSK: 865 kHz 8PSK: 1206 kHz	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)	dB $\mu$ V/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dB $\mu$ V	0.15 to 30 MHz	± 2.4 dB

**EQUIPMENT UNDER TEST (EUT) DETAILS****GENERAL**

The Broadcom Corporation model BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card is a WLAN+Bluetooth PCI-E Minicard, that is designed to enable WLAN or Bluetooth connections when installed in PCs. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 3.3Vdc, 800mA.

The sample was received on May 23, 2011 and tested on May 23, 26, 27, July 6, 21, 22, 24, 25, 28, August 1 and 4, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Broadcom	BCM943227H MB	2.4GHz WLAN + BT 4.0	-	QDS-BRC1060

**OTHER EUT DETAILS**

The Bluetooth is rev 4.0, supporting the basic, EDR and LE modes. The results for the basic and EDR modes are reported here. The results for the LE mode is reported in Elliott report R84071.

**ANTENNA SYSTEM**

The antennas connect to the EUT via non-standard u.FL antenna connectors, thereby meeting the requirements of FCC 15.203.

**ENCLOSURE**

The EUT does not have an enclosure as it is designed to be installed within the enclosure of a host computer or system.

**MODIFICATIONS**

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

**SUPPORT EQUIPMENT**

The following equipment was used as support equipment for testing:

Company	Model	Description	Serial Number	FCC ID
Lenovo	4446	Laptop	-	-
Catalyst	-	Extender Board	-	-

**EUT INTERFACE PORTS**

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

Port	Connected To	Description	Cable(s) Shielded or Unshielded	Length(m)
Extender Board	Laptop	-	-	-
Antenna A & B	EUT	-	-	-
AC Power	AC Mains	2Wire	Unshielded	0.8

**EUT OPERATION**

During radio emissions testing the EUT was set to constantly transmit a modulated signal at the highest power (setting 0) and frequency or set to receive on the center channel.

**TEST SITE****GENERAL INFORMATION**

Final test measurements were taken at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
Chamber 3	769238	2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	211948	2845B-4	
Chamber 5	211948	2845B-5	
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.

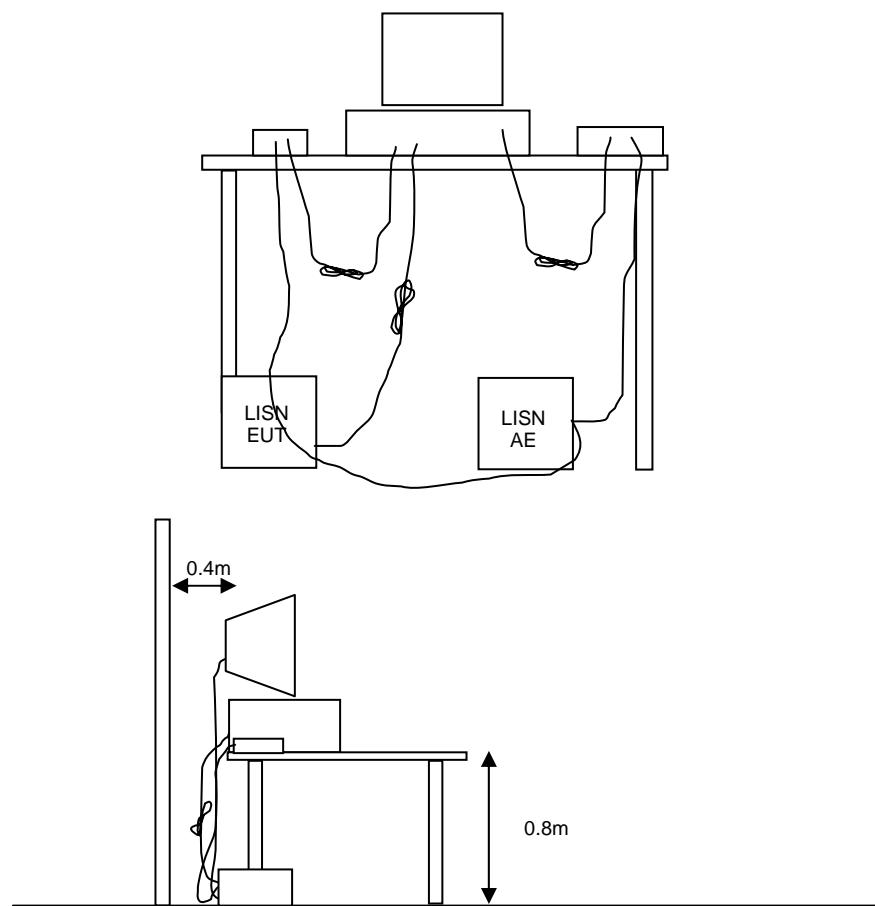


Figure 1 Typical Conducted Emissions Test Configuration

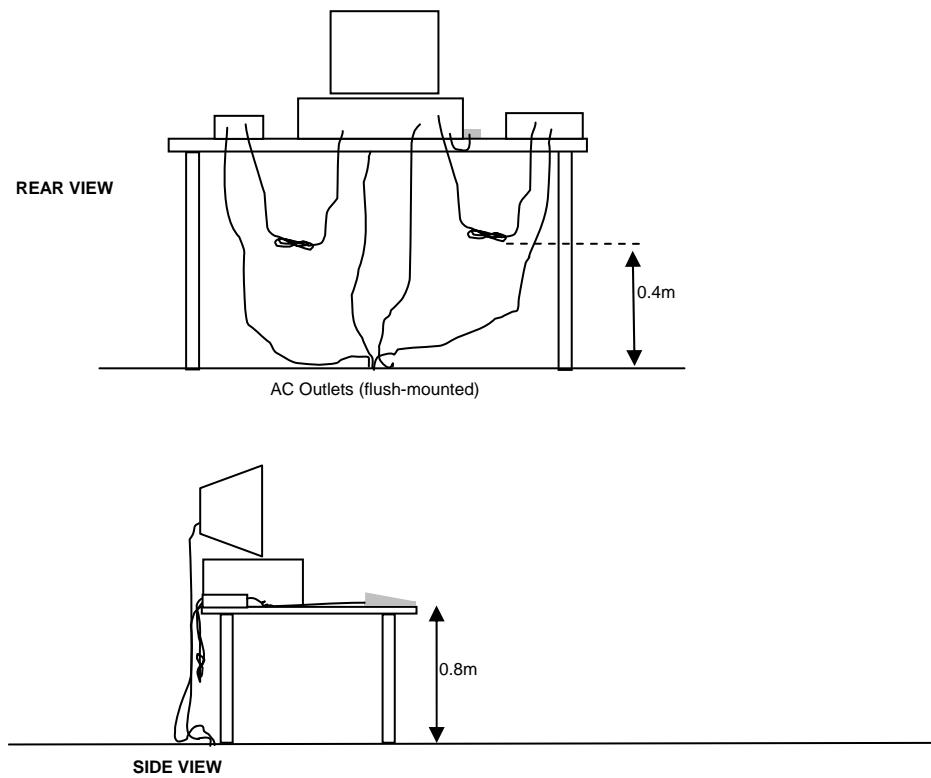
**RADIATED EMISSIONS**

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.

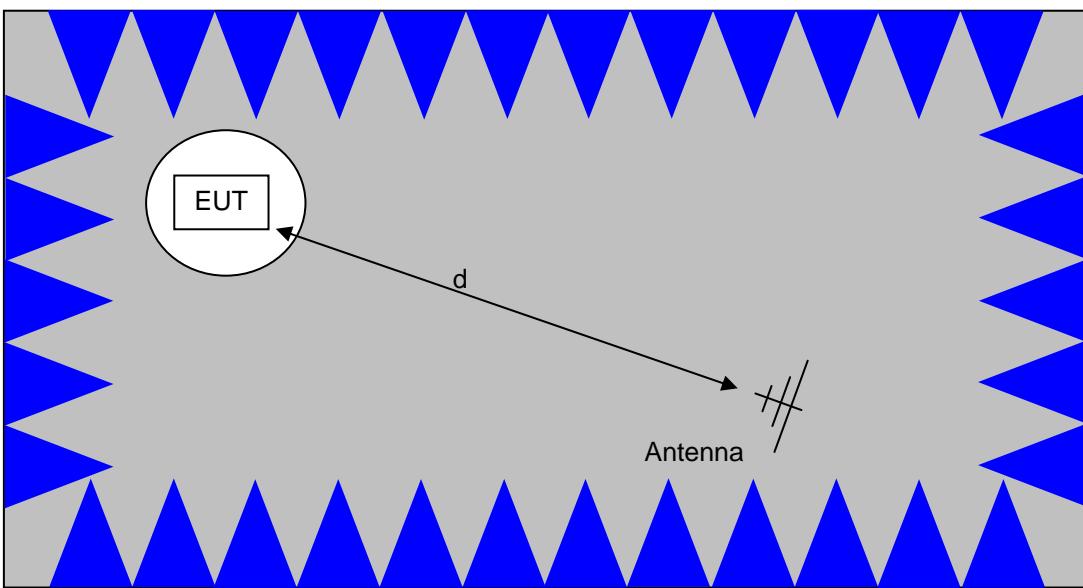
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

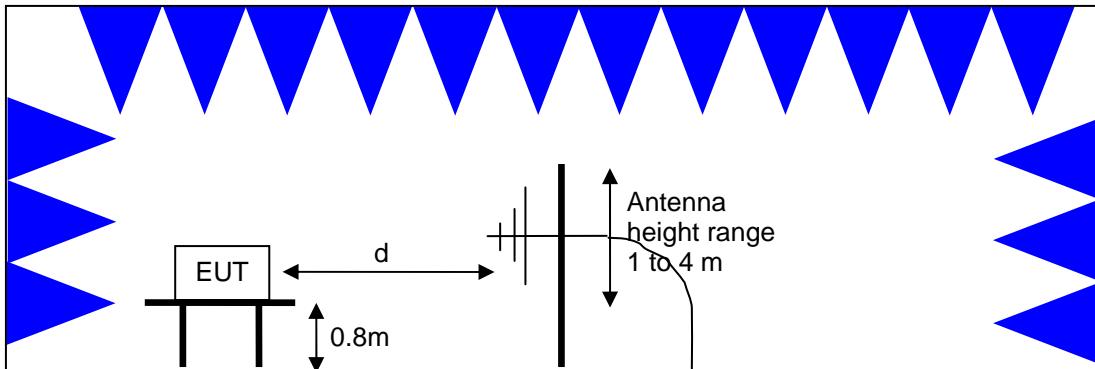


Typical Test Configuration for Radiated Field Strength Measurements



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

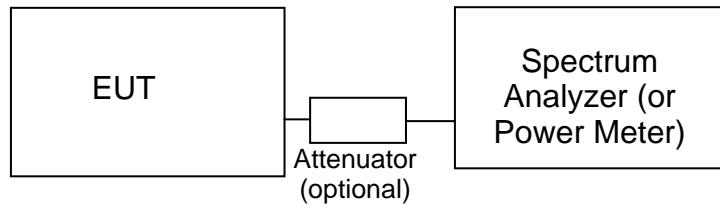
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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

***CONDUCTED EMISSIONS FROM ANTENNA PORT***

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

**Test Configuration for Antenna Port Measurements**

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

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

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

***BANDWIDTH MEASUREMENTS***

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

**SPECIFICATION LIMITS AND SAMPLE CALCULATIONS**

The limits for conducted emissions are given in units of microvolts, and the limits for radiated emissions are given in units of microvolts per meter at a specified test distance. Data is measured in the logarithmic form of decibels relative to one microvolt, or dB microvolts (dBuV). For radiated emissions, the measured data is converted to the field strength at the antenna in dB microvolts per meter (dBuV/m). The results are then converted to the linear forms of uV and uV/m for comparison to published specifications.

For reference, converting the specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. These limits in both linear and logarithmic form are as follows:

***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<sup>1</sup> (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 <sub>KHz</sub> @ 300m	67.6-20*log <sub>10</sub> (F <sub>KHz</sub> ) @ 300m
0.490-1.705	24000/F <sub>KHz</sub> @ 30m	87.6-20*log <sub>10</sub> (F <sub>KHz</sub> ) @ 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

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

**OUTPUT POWER LIMITS - FHSS SYSTEMS**

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

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

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

**TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS - FHSS and DTS SYSTEMS**

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

**SAMPLE CALCULATIONS - CONDUCTED EMISSIONS**

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

$$R_f - S = M$$

where:

$R_f$  = Receiver Reading in dBuV

$S$  = Specification Limit in dBuV

$M$  = Margin to Specification in +/- dB

**SAMPLE CALCULATIONS - RADIATED EMISSIONS**

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

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

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

where:

$F_d$  = Distance Factor in dB

$D_m$  = Measurement Distance in meters

$D_s$  = Specification Distance in meters

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

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

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

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

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

$R_r$  = Receiver Reading in dBuV/m

$F_d$  = Distance Factor in dB

$R_c$  = Corrected Reading in dBuV/m

$L_s$  = Specification Limit in dBuV/m

$M$  = Margin in dB Relative to Spec

**SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION**

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

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

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****Antenna port measurements, 25-May-2011**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	11/22/2011
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	01-Dec-11
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	13-Sep-11

**Radiated Emissions, 30 - 1,000 MHz, 26-May-11**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	EMC Spectrum Analyzer, 9 KHz - 22 GHz	8593EM	1319	11/22/2011
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	1/17/2012
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	6/24/2012
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103A	2359	2/15/2012

**Conducted Emissions - AC Power Ports, 27-May-11**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	372	1/25/2012
EMCO	LISN, 10 kHz-100 MHz	3825/2	1292	3/1/2012
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	11/2/2011

**Radiated Emissions, 1000 - 25,000 MHz, 01-Aug-11**

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	5/18/2012
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/8/2012
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	8/14/2011
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	4/6/2012
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	10/1/2011

*Appendix B Test Data*

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## EMC Test Data

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Emissions Standard(s):	FCC 15.247/RSS-210	Class:	-
Immunity Standard(s):	-	Environment:	-

## EMC Test Data

For The

### Broadcom Corporation

Model

BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card

Date of Last Test: 8/9/2011



## *EMC Test Data*

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
		Account Manager:	Sheareen Washington
Contact:	Anne Liang		
Standard:	FCC 15.247/RSS-210	Class:	N/A

## FCC 15.247 FHSS - Power, 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.

Config Change: 120V/60Hz      Config Change: 1

## General Test Configuration

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

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

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

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

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

## Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	30 - 26500 MHz - Transmitter Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	42.1dB $\mu$ V/m @ 9974.0MHz (-11.9dB)
2	30 - 8000 MHz - Receiver Radiated Spurious Emissions	FCC Part 15.109 / RSS GEN	Pass	34.0dB $\mu$ V/m @ 30.94MHz (-6.0dB)

### Modifications Made During Testing:

No modifications were made to the EUT during testing

## Deviations From The Standard

No deviations were made from the requirements of the standard.

Not e - Preliminary scans showed no emissions below 1 GHz and above 18GHz from the radio



## EMC Test Data

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

### Run #1: Radiated Spurious Emissions, 30 - 26500 MHz.

Date of Test: 8/1/2011  
 Test Engineer: J. Caizzi, M. Birgani

Test Location: FT5

### Run #1a: Low Channel @ 2402 MHz

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

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.030	90.1	V	-	-	Pk	169	1.00	POS; RB 100 kHz; VB: 100 kHz
2402.050	91.3	V	-	-	AVG	169	1.00	
2401.810	92.2	V	-	-	PK	169	1.00	
2401.970	90.5	H	-	-	Pk	253	1.08	POS; RB 100 kHz; VB: 100 kHz
2402.050	91.0	H	-	-	AVG	253	1.08	
2401.850	91.9	H	-	-	PK	253	1.08	

Fundamental emission level @ 3m in 100kHz RBW: 90.5 dB $\mu$ V/m

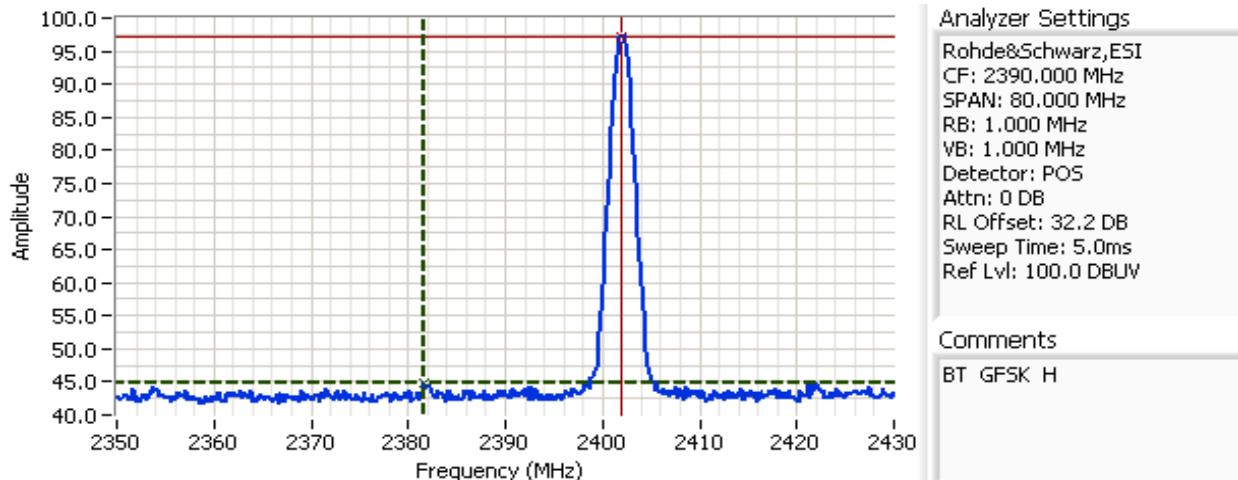
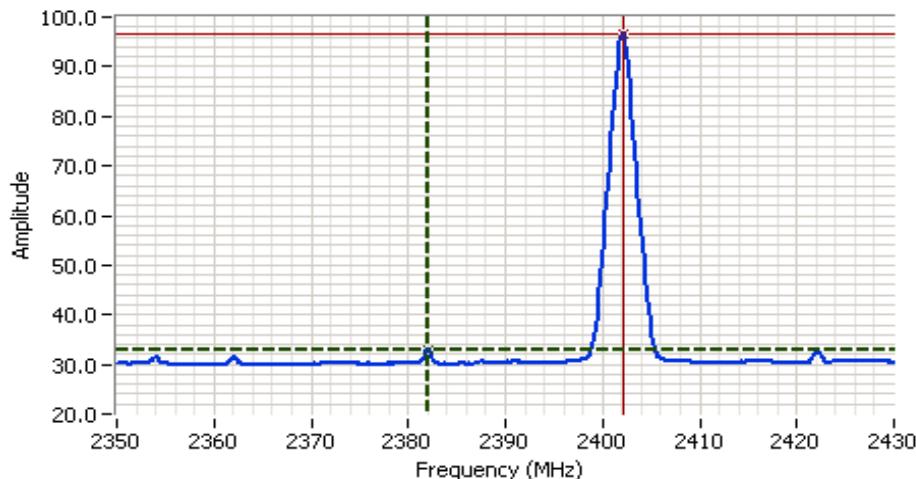
Limit for emissions outside of restricted bands: 70.5 dB $\mu$ V/m

Limit is -20dBc

### Band Edge Signal Field Strength - Direct measurement of field strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2382.064	32.9	H	54.0	-21.2	Avg	143	1.13	
2381.583	44.7	H	74.0	-29.3	Pk	143	1.13	
2354.008	30.2	V	54.0	-23.8	Avg	360	1.01	
2387.034	44.0	V	74.0	-30.0	Pk	360	1.01	

Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A



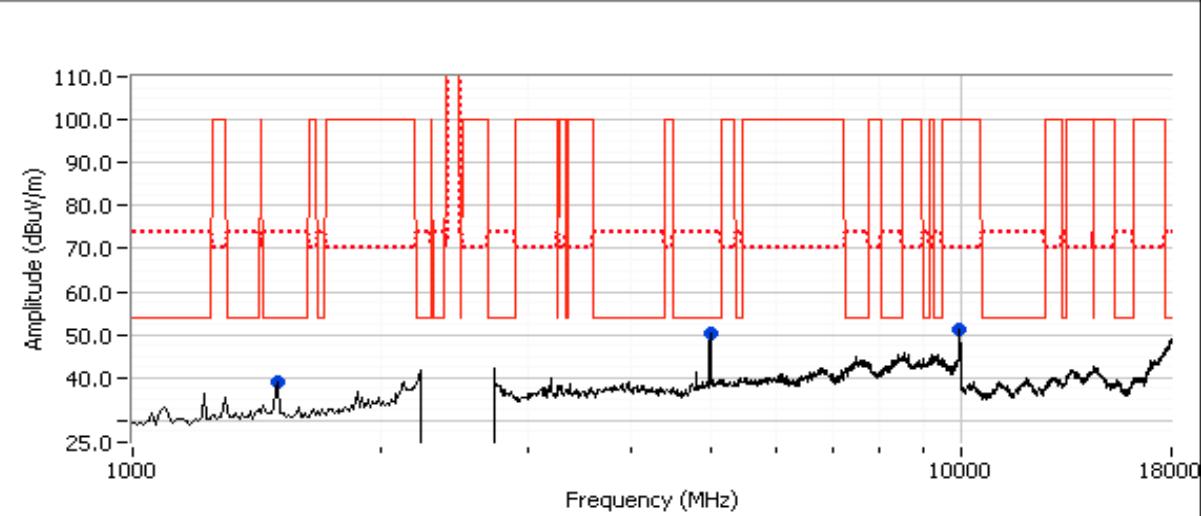
Client:	Broadcom Corporation				Job Number:	J83157	
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card				T-Log Number:	T83268	
Contact:	Anne Liang				Account Manager:	Sheareen Washington	
Standard:	FCC 15.247/RSS-210				Class:	N/A	

**Other Spurious Emissions**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
9974.030	42.1	V	54.0	-11.9	AVG	13	1.7	RB 1 MHz;VB 10 Hz;Pk, note 2
9979.630	59.0	V	74.0	-15.0	PK	13	1.7	RB 1 MHz;VB 3 MHz;Pk, note 2
4986.360	37.7	V	54.0	-16.3	AVG	40	1.0	RB 1 MHz;VB 10 Hz;Pk
4979.660	54.7	V	74.0	-19.3	PK	40	1.0	RB 1 MHz;VB 3 MHz;Pk
1496.030	31.4	H	54.0	-22.6	AVG	11	1.0	RB 1 MHz;VB 10 Hz;Pk
1498.570	45.3	H	74.0	-28.7	PK	11	1.0	RB 1 MHz;VB 3 MHz;Pk

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

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



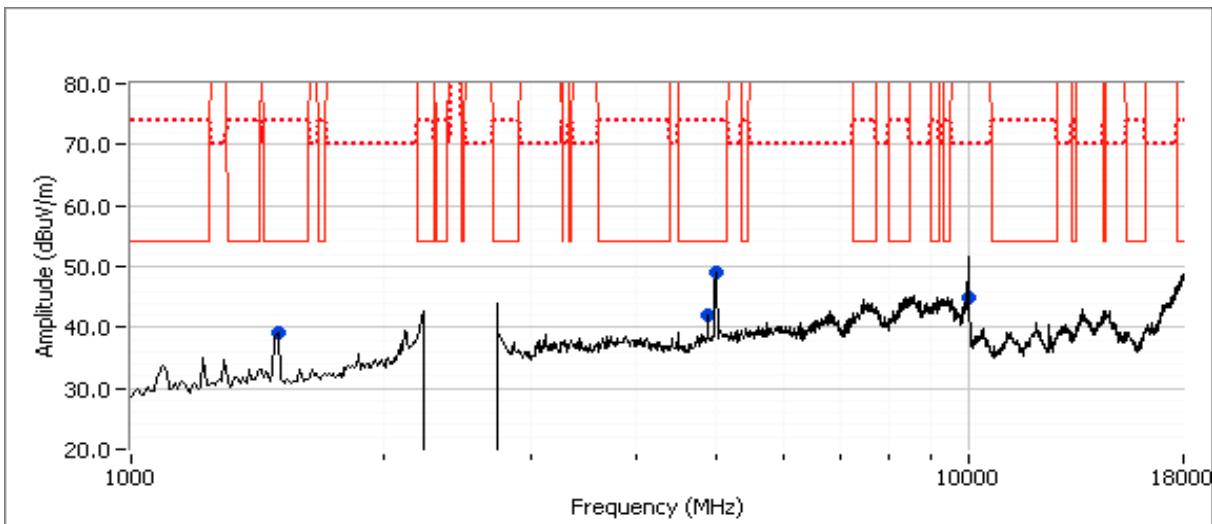
Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Run #1b: Center Channel @ 2441 MHz**

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	95.9	93.5
Limit for emissions outside of restricted bands:	75.9 dB $\mu$ V/m	

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4882.020	40.7	V	54.0	-13.3	AVG	111	1.06	
1495.000	39.1	H	54.0	-14.9	PK	206	1.0	Peak reading with average limit
4978.970	39.1	V	54.0	-14.9	AVG	39	1.01	
4975.970	56.7	V	74.0	-17.3	PK	39	1.01	
4882.280	47.9	V	74.0	-26.1	PK	111	1.06	
9996.700	46.7	V	75.9	-29.2	Pk	14	1.66	RB 100 kHz;VB 100 kHz;Pk

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.



Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Run #1c: High Channel @ 2480 MHz**
**Fundamental Signal Field Strength:** Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.030	89.8	V	-	-	Pk	11	1.11	POS; RB 100 kHz; VB: 100 kHz
2480.050	90.2	V	-	-	AVG	11	1.11	
2479.810	91.0	V	-	-	PK	11	1.11	
2479.950	97.0	H	-	-	Pk	117	1.07	POS; RB 100 kHz; VB: 100 kHz
2480.050	97.1	H	-	-	AVG	117	1.07	
2479.790	98.0	H	-	-	PK	117	1.07	

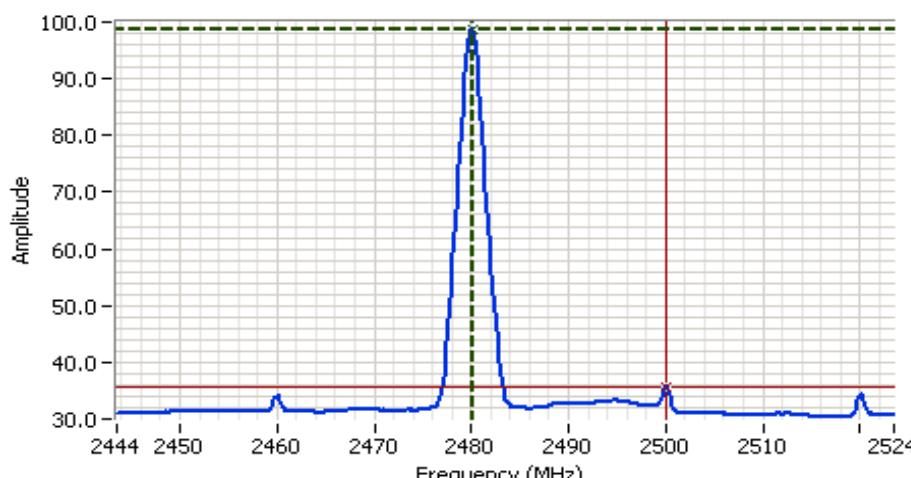
Fundamental emission level @ 3m in 100kHz RBW: 97.0 dB $\mu$ V/m

Limit for emissions outside of restricted bands: 77.0 dB $\mu$ V/m

Limit is -20dBc

**Band Edge Signal Field Strength**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2500.093	35.6	H	54.0	-18.5	Avg	114	1.06	
2496.887	50.8	H	74.0	-23.2	Pk	114	1.06	
2494.482	33.6	V	54.0	-20.5	Avg	130	1.05	
2494.642	53.4	V	74.0	-20.6	Pk	130	1.05	


**Analyzer Settings**

Rohde&Schwarz,ESI  
CF: 2483.500 MHz  
SPAN: 80.000 MHz  
RB: 1.000 MHz  
VB: 10 Hz  
Detector: POS  
Attn: 0 DB  
RL Offset: 32.6 DB  
Sweep Time: 20.0s  
Ref Lvl: 100.0 DBUV

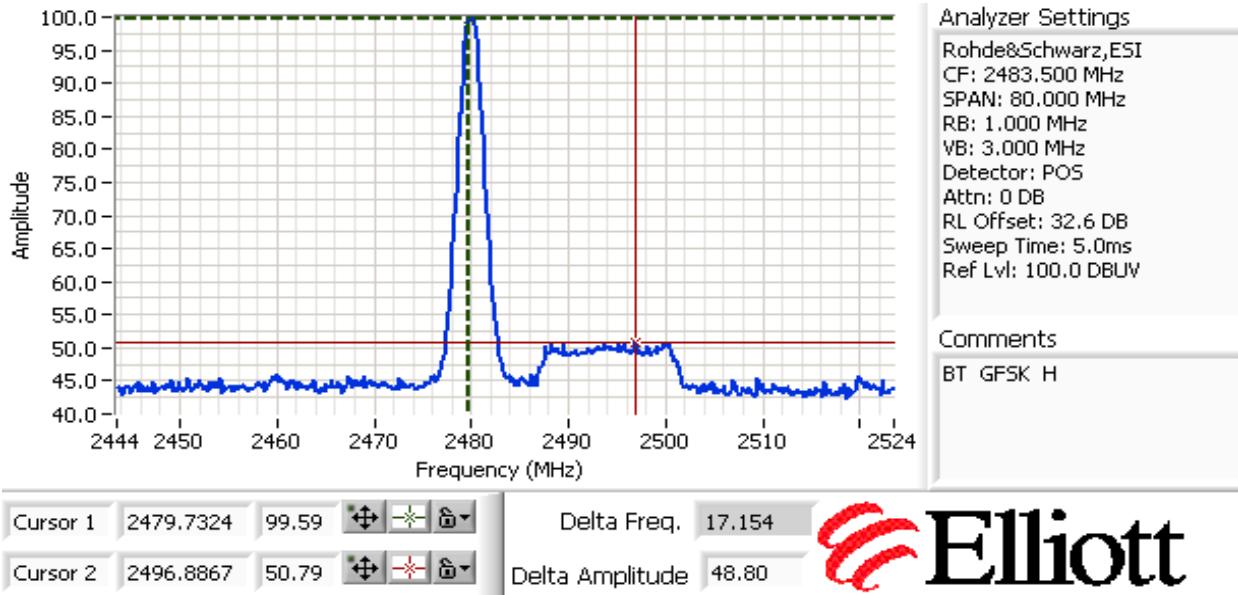
**Comments**

BT GFSK H

Cursor 1 2480.0532 98.78   
Cursor 2 2500.0933 35.55 

Delta Freq. 20.040  
Delta Amplitude 63.23

Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A



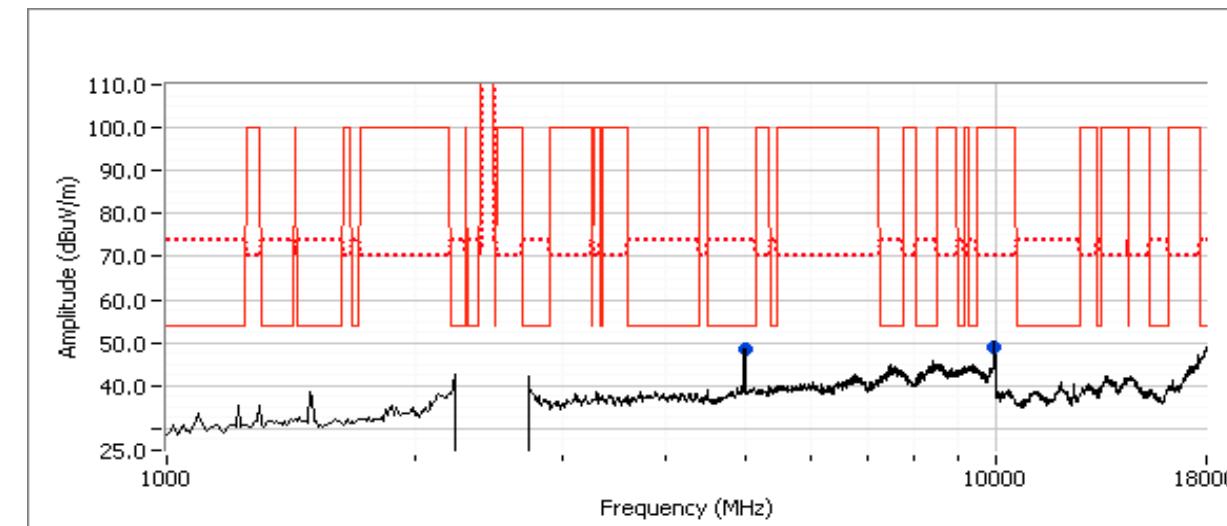
Client:	Broadcom Corporation				Job Number:	J83157	
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card				T-Log Number:	T83268	
Contact:	Anne Liang				Account Manager:	Sheareen Washington	
Standard:	FCC 15.247/RSS-210				Class:	N/A	

**Other Spurious Emissions**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4977.080	39.2	V	54.0	-14.8	AVG	41	1.0	RB 1 MHz;VB 10 Hz;Pk
4976.740	56.8	V	74.0	-17.2	PK	41	1.0	RB 1 MHz;VB 3 MHz;Pk
9991.400	51.7	V	77.0	-25.3	PK	157	1.0	RB 1 MHz;VB 3 MHz;Pk, note 2

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

Note 2: Emission in non-restricted band, measured with RBW=1MHz as worse case.



Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Run #2: Receiver Radiated Spurious Emissions, 30 - 8000 MHz.**

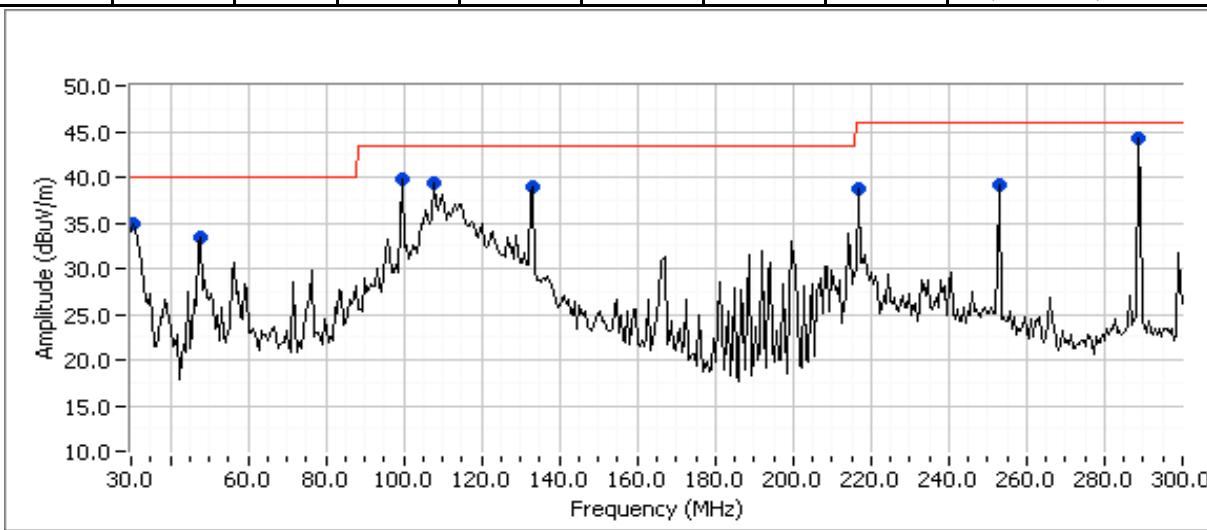
Date of Test: 8/3/2011

Test Location: FT Chamber#4

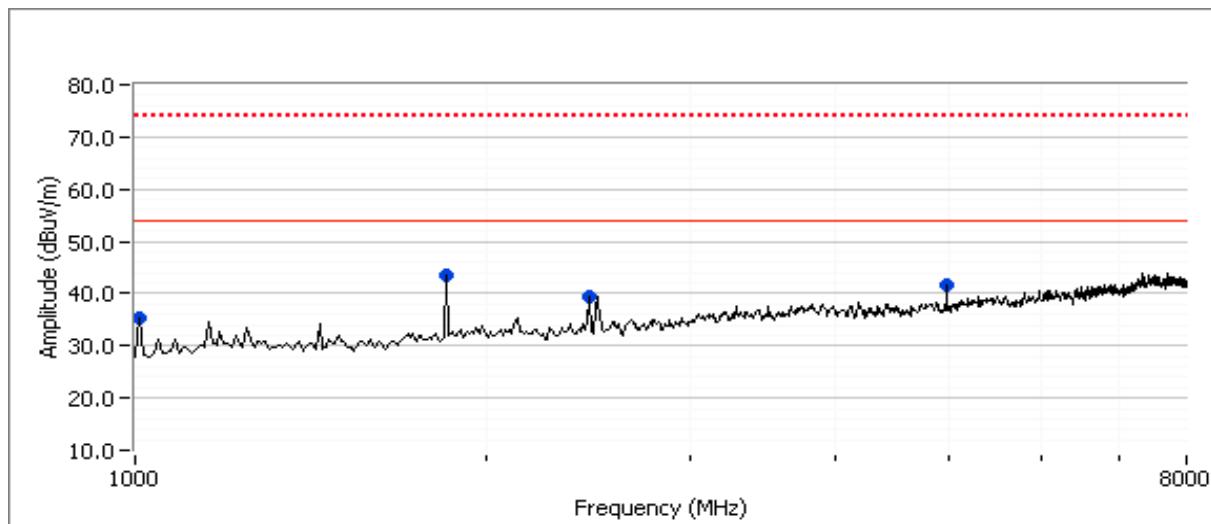
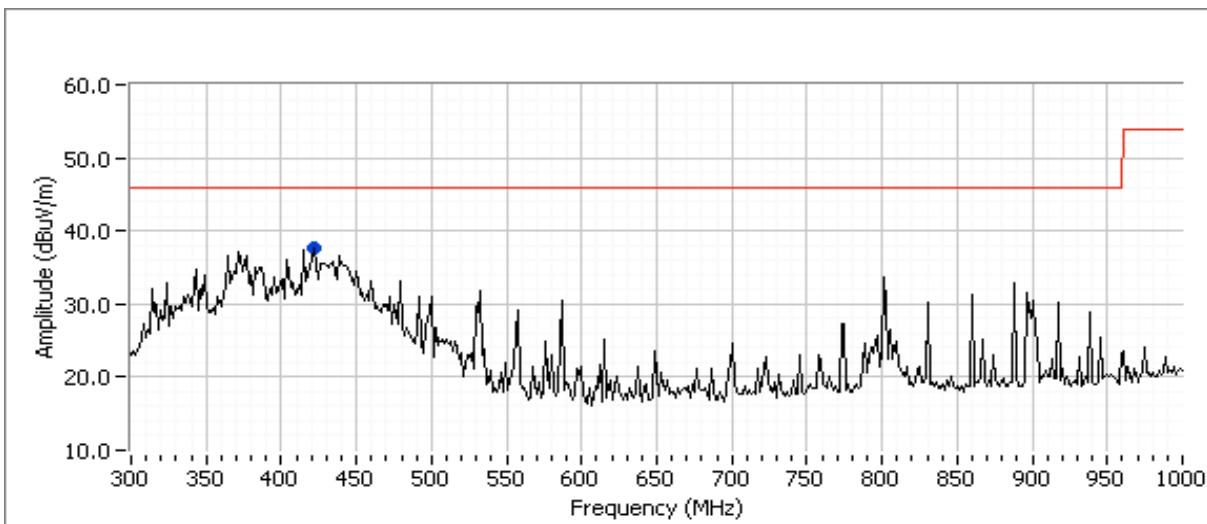
Test Engineer: Joseph Cadigal

**Run #2b: Receiver Radiated Spurious Emissions, 30 - 8000 MHz. Low Channel @ 2402 MHz**

Frequency	Level	Pol	15.109 / RSS GEN	Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
30.942	34.0	V	40.0	-6.0	QP	330	1.0
132.993	36.2	H	43.5	-7.3	QP	17	2.0
107.833	36.0	H	43.5	-7.5	QP	29	3.0
100.011	26.2	H	43.5	-17.3	QP	60	3.5
47.790	20.9	V	40.0	-19.1	QP	315	2.0
1010.010	32.9	V	54.0	-21.1	AVG	302	1.2
4982.170	32.4	V	54.0	-21.6	AVG	61	1.6
216.430	21.7	H	46.0	-24.3	QP	252	1.0
4982.110	49.6	V	74.0	-24.4	PK	61	1.6
422.849	21.0	H	46.0	-25.0	QP	69	2.0
2454.350	28.3	V	54.0	-25.7	AVG	197	1.5
1857.460	26.4	V	54.0	-27.6	AVG	88	2.2
288.580	15.4	H	46.0	-30.6	QP	283	1.0
252.483	15.4	H	46.0	-30.6	QP	294	1.0
1010.190	40.7	V	74.0	-33.3	PK	302	1.2
2454.330	39.8	V	74.0	-34.2	PK	197	1.5
1857.990	38.6	V	74.0	-35.4	PK	88	2.2



Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A





## *EMC Test Data*

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

## FCC 15.247 FHSS - Power, 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.

Config Change: 120V/60Hz      Config Change: 1

## General Test Configuration

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

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

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

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

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

## Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	30 - 26500 MHz - Transmitter Radiated Spurious Emissions	FCC Part 15.209 / 15.247( c)	Pass	34.5dB $\mu$ V/m @ 2500.1MHz (Margin: -19.5dB)

### Modifications Made During Testing:

No modifications were made to the EUT during testing

## Deviations From The Standard

No deviations were made from the requirements of the standard.

Not e - Preliminary scans showed no emissions below 1 GHz and above 18GHz from the radio



## EMC Test Data

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

### Run #1: Radiated Spurious Emissions, 30 - 26500 MHz.

Date of Test: 8/1/2011  
 Test Engineer: J. Caizzi, M. Birgani

Test Location: FT5

### Run #1a: Low Channel @ 2402 MHz

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

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.730	93.5	V	120.0	-26.5	Pk	172	1.00	POS; RB 100 kHz; VB: 100 kHz
2402.090	93.4	V	120.0	-26.6	AVG	172	1.00	
2401.810	97.7	V	120.0	-22.3	PK	172	1.00	
2401.910	92.6	H	120.0	-27.4	Pk	246	1.07	POS; RB 100 kHz; VB: 100 kHz
2402.070	92.9	H	120.0	-27.1	AVG	246	1.07	
2402.010	97.3	H	120.0	-22.7	PK	246	1.07	

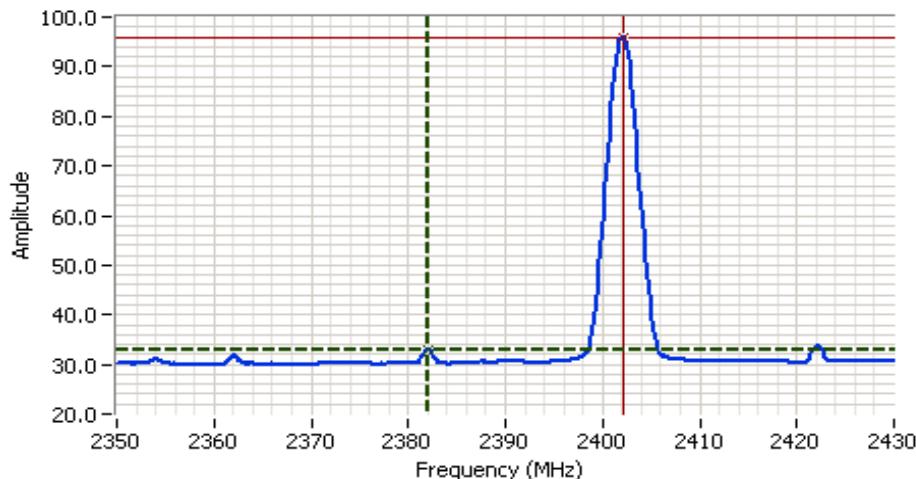
Fundamental emission level @ 3m in 100kHz RBW: 93.5 dB $\mu$ V/m

Limit for emissions outside of restricted bands: 73.5 dB $\mu$ V/m Limit is -20dBc (Peak power measurement)

### Band Edge Signal Field Strength - Direct measurement of field strength

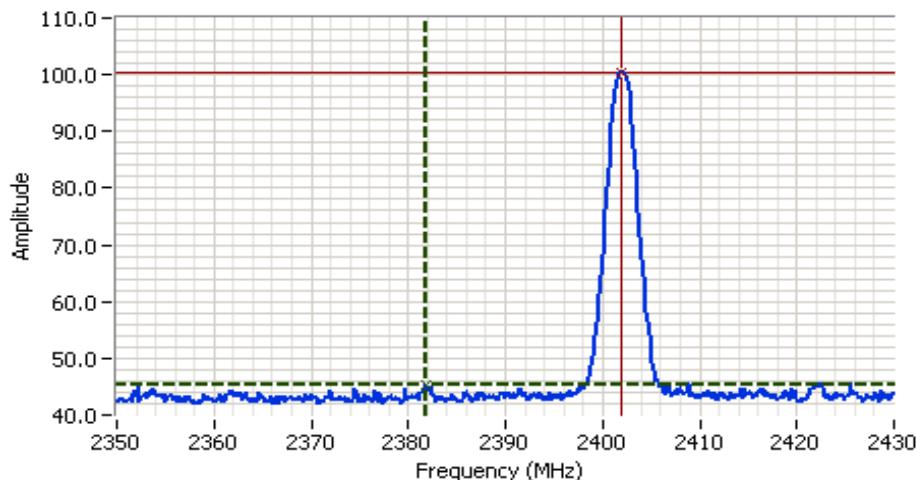
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2382.064	32.9	H	54.0	-21.1	Avg	137	1.09	
2381.904	45.5	H	74.0	-28.6	Pk	137	1.09	
2382.064	30.8	V	54.0	-23.2	Avg	131	1.10	
2371.162	44.7	V	74.0	-29.3	Pk	131	1.10	

Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A



Cursor 1 2382.0642 32.93  Delta Freq. 20.040

Cursor 2 2402.1042 95.93  Delta Amplitude 63.00

Cursor 1 2381.9038 45.45  Delta Freq. 20.040

Cursor 2 2401.9438 100.29  Delta Amplitude 54.84

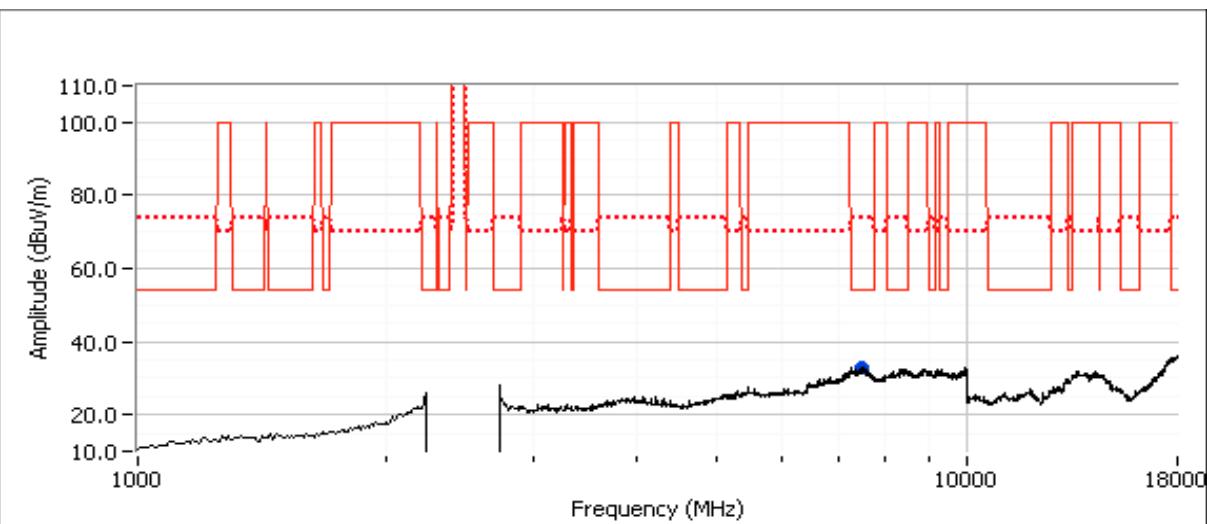


Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Other Spurious Emissions**

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters
7462.500	33.1	V	54.0	-20.9	Peak	244	1.5 Peak reading with average limit

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.



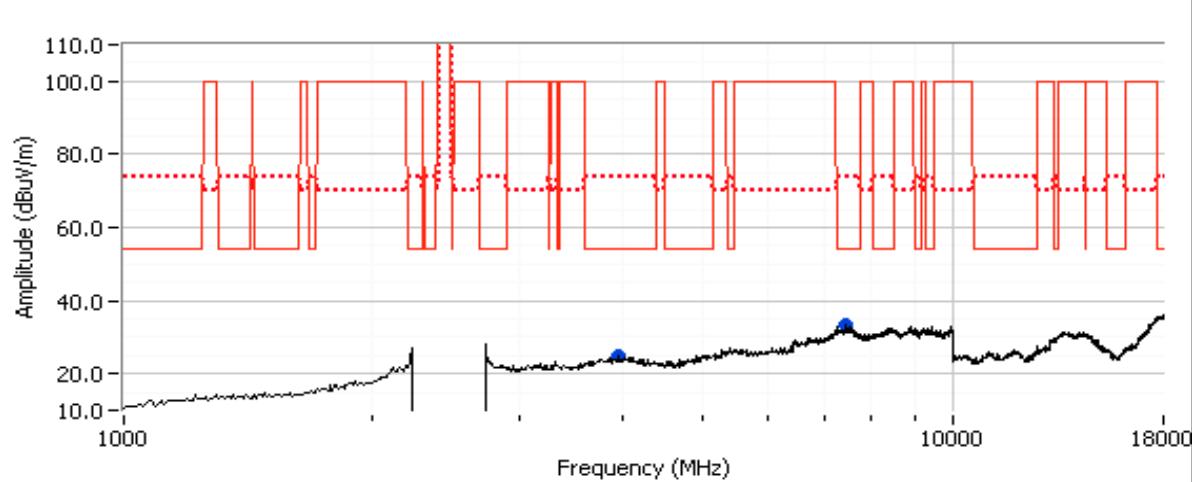
Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Run #1b: Center Channel @ 2441 MHz**

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	94.9	91.9
Limit for emissions outside of restricted bands:	74.9 dB $\mu$ V/m	

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters
3960.830	24.9	H	54.0	-29.1	Peak	16	2.0
7433.330	33.2	V	54.0	-20.8	Peak	41	2.0

Note 1: For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.



Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Run #1c: High Channel @ 2480 MHz**
**Fundamental Signal Field Strength:** Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2479.650	88.6	V	120.0	-31.4	Pk	223	1.31	POS; RB 100 kHz; VB: 100 kHz
2480.090	89.8	V	120.0	-30.2	AVG	223	1.31	POS; RB 1 MHz; VB: 10 Hz
2479.790	94.2	V	120.0	-25.8	PK	223	1.31	POS; RB 1 MHz; VB: 10 MHz
2479.830	94.8	H	120.0	-25.2	Pk	98	1.05	POS; RB 100 kHz; VB: 100 kHz
2480.070	95.6	H	120.0	-24.4	AVG	98	1.05	POS; RB 1 MHz; VB: 10 Hz
2479.830	100.1	H	120.0	-19.9	PK	98	1.05	POS; RB 1 MHz; VB: 10 MHz

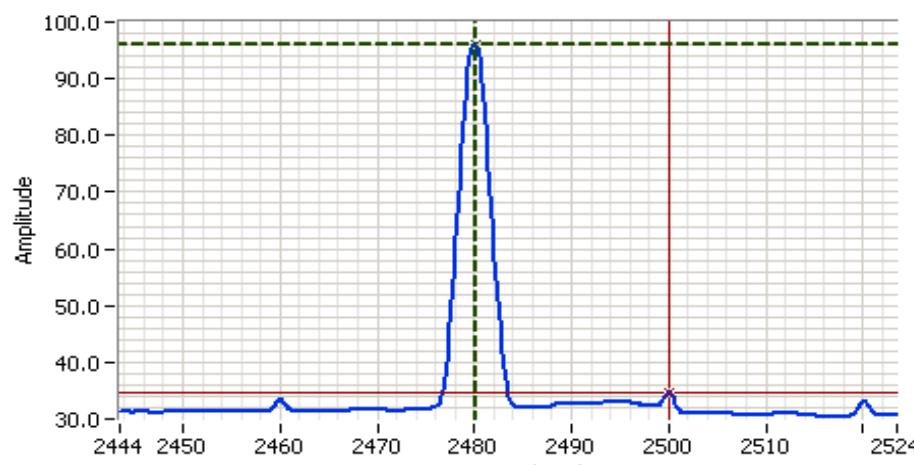
Fundamental emission level @ 3m in 100kHz RBW: 94.8 dB $\mu$ V/m

Limit for emissions outside of restricted bands: 74.8 dB $\mu$ V/m

Limit is -20dBc

**Band Edge Signal Field Strength**

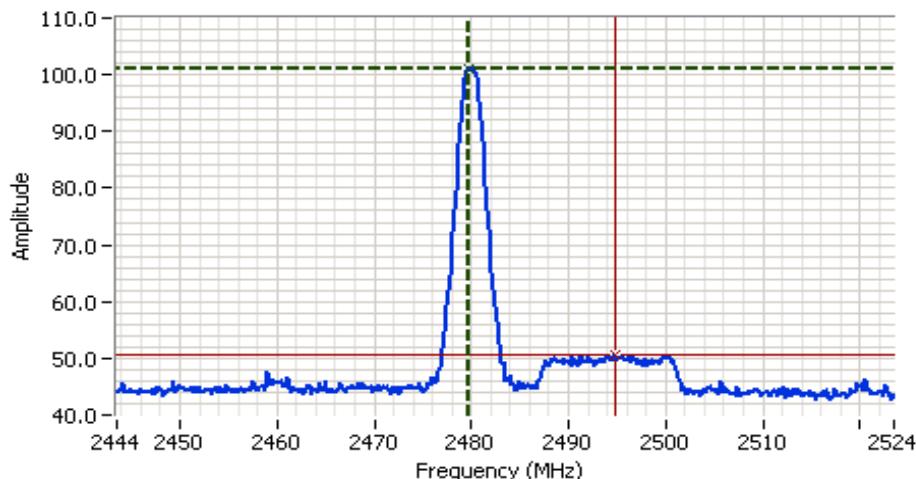
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2500.093	34.5	H	54.0	-19.5	Avg	109	1.04	
2494.482	33.7	V	54.0	-20.3	Avg	126	1.02	
2488.230	53.3	V	74.0	-20.7	Pk	126	1.02	
2494.803	50.6	H	74.0	-23.4	Pk	109	1.04	



Cursor 1 2480.0532 95.93 Delta Freq. 20.040  
Cursor 2 2500.0933 34.50 Delta Amplitude 61.43



Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A


**Analyzer Settings**

Rohde&Schwarz,ESI  
 CF: 2483.500 MHz  
 SPAN: 80.000 MHz  
 RB: 1.000 MHz  
 VB: 3.000 MHz  
 Detector: POS  
 Attn: 0 dB  
 RL Offset: 32.6 dB  
 Sweep Time: 5.0ms  
 Ref Lvl: 104.6 dBUV

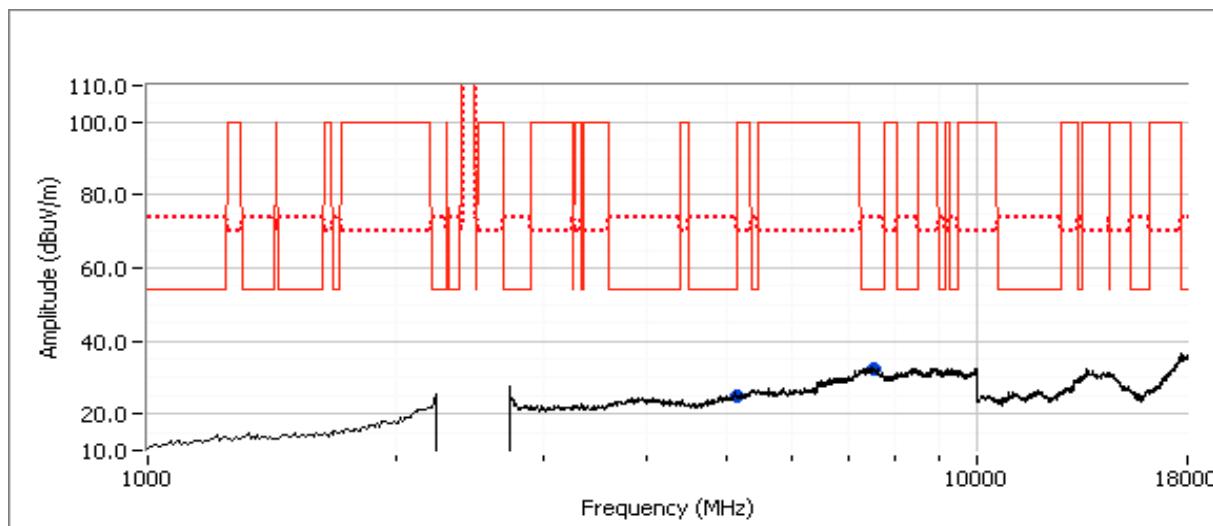
**Comments**

BT 8PSK H

Cursor 1 2479.7324 101.00  Delta Freq. 15.070  
 Cursor 2 2494.8025 50.63  Delta Amplitude 50.37


**Other Spurious Emissions**

Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters
5134.170	24.7	V	54.0	-29.3	Peak	302	1.0
7526.670	32.4	H	54.0	-21.6	Peak	262	2.0





## EMC Test Data

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

### FCC 15.247 FHSS - Power, 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: 5/25/2011 19:40

Config. Used: 1

Test Engineer: Rafael Varelas

Config Change: None

Test Location: Fremont Chamber #4

EUT Voltage: 120V/60Hz

#### General Test Configuration

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

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

#### Ambient Conditions:

Temperature: 20.6 °C  
Rel. Humidity: 34 %

#### Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Spurious Emissions, 30-26000 MHz	15.247(d)	Pass	All emissions >20dB below fundamental
2	Output Power	15.247(b)	Pass	1.38 dBm (1.4 mW)
3	20dB Bandwidth	15.247(a)	Pass	967 kHz
3	99% bandwidth	15.247(a)	Pass	865 kHz
3	Channel spacing	15.247(a)	Pass	1 MHz
3	Number of Channels	15.247(a)	Pass	79 Channels

#### Modifications Made During Testing:

No modifications were made to the EUT during testing

#### Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

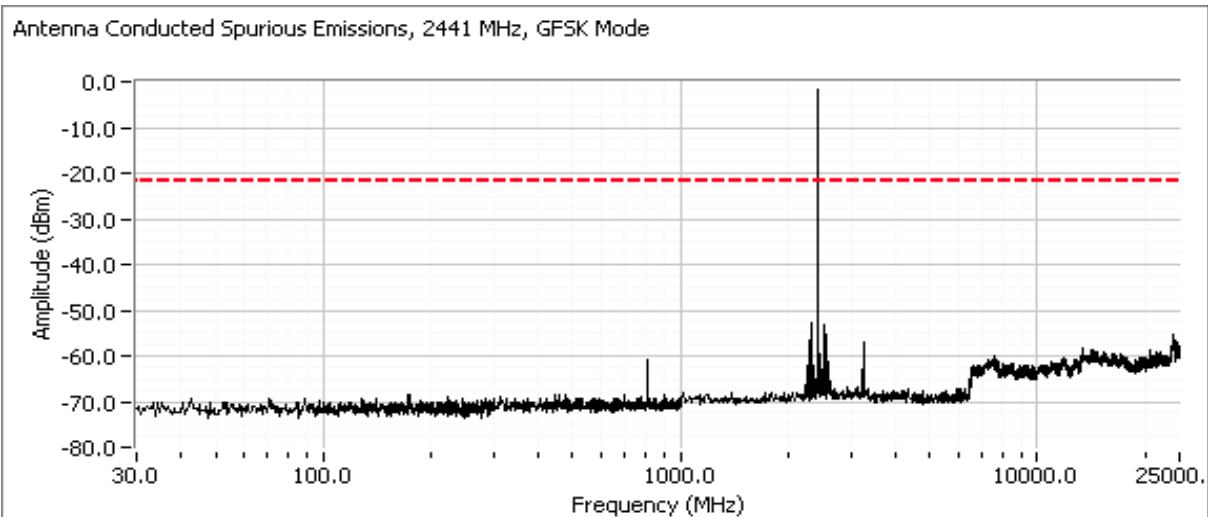
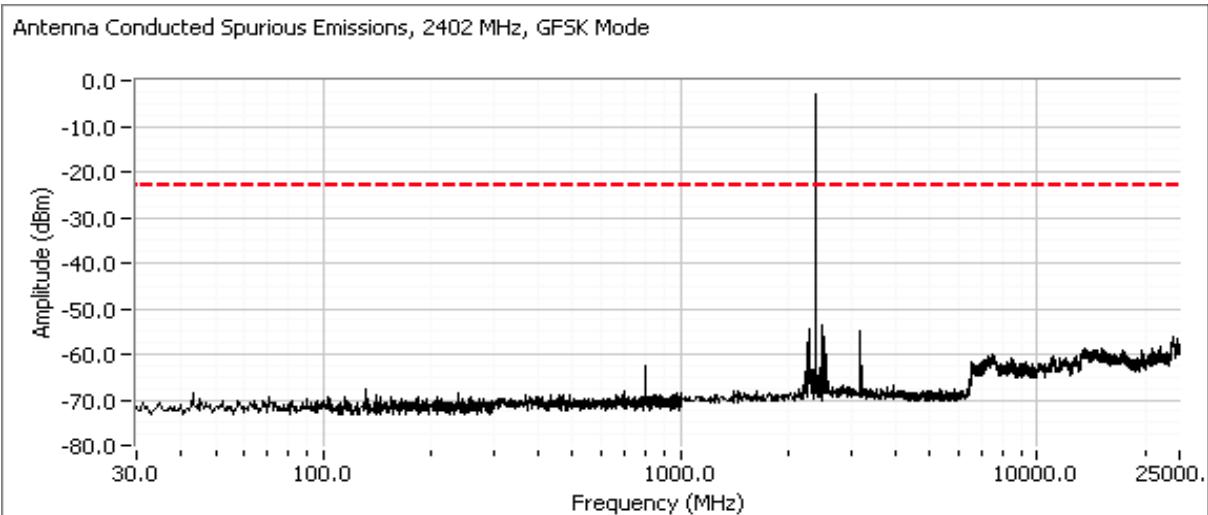
**Run #1: Antenna Conducted Spurious Emissions, 30 - 26000 MHz.**

Date of Test: 5/25/2011

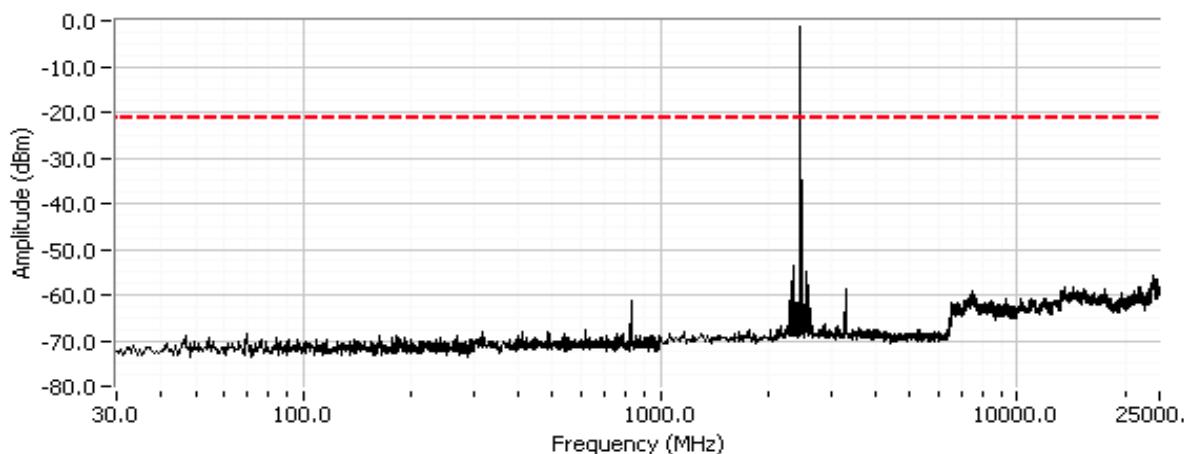
Test Engineer: Rafael Varelas

Test Location: FT Chamber #4

Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level.



Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Antenna Conducted Spurious Emissions, 2480 MHz, GFSK Mode**

**Run #2: Output Power**

Date of Test: 5/25/2011

Test Engineer: Rafael Varelas

Test Location: FT Chamber #4

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

Maximum antenna gain: 3.9 dBi

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	2402	-	0.1	0.0010	0.0025
Mid	2441	-	0.83	0.0012	0.0030
High	2480	-	1.38	0.0014	0.0034

Power measured using a peak power meter

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Run #3: Bandwidth, Channel Occupancy, Spacing and Number of Channels**

Date of Test: 5/25/2011

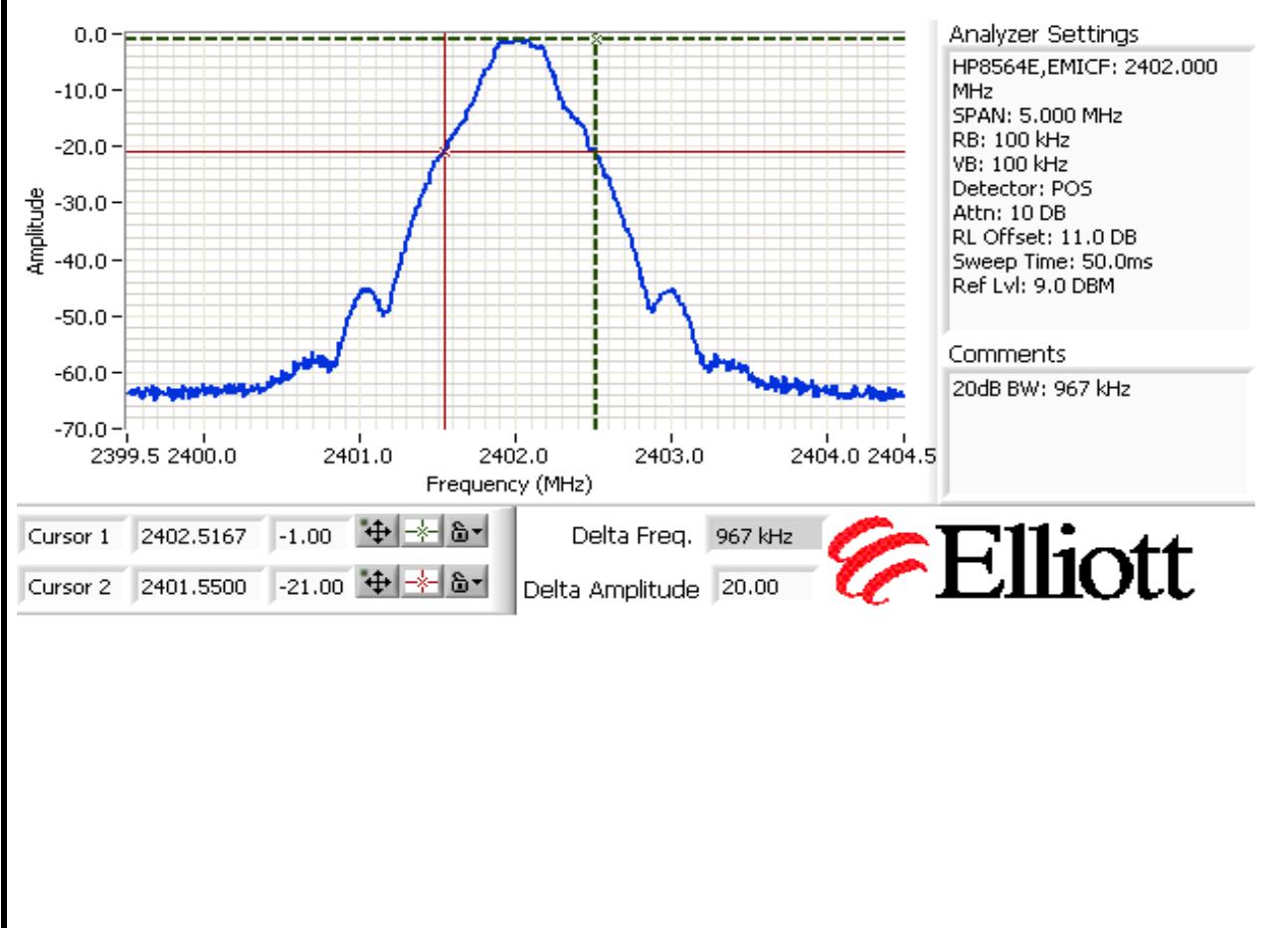
Test Engineer: Rafael Varelas

Test Location: FT Chamber #4

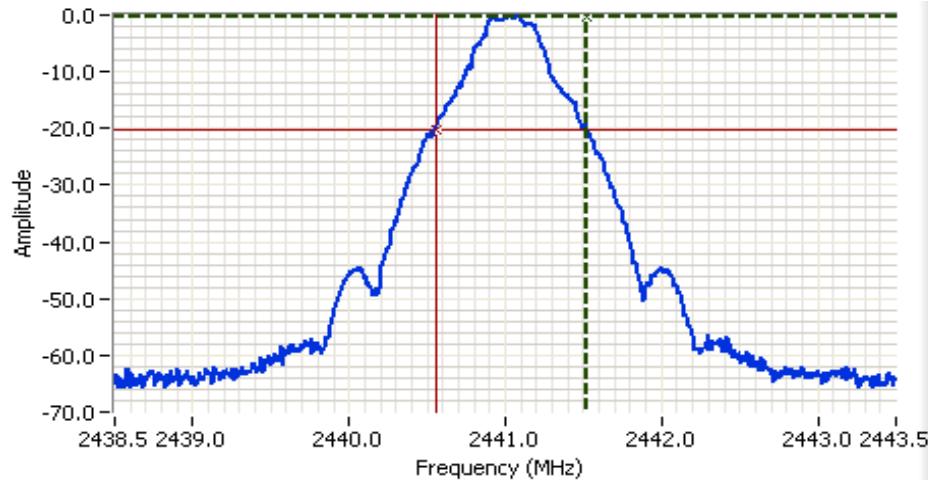
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	100kHz	967	100kHz	865
Mid	2441	100kHz	958	100kHz	865
High	2480	100kHz	967	100kHz	857

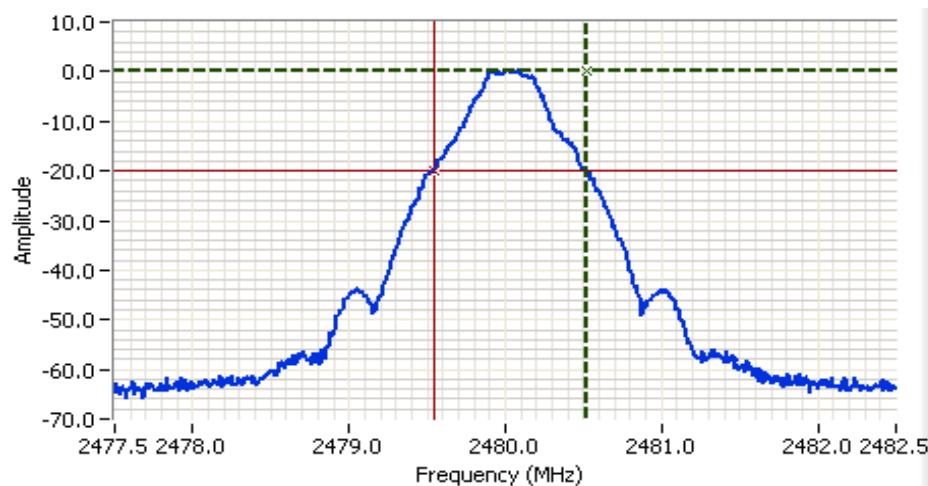
Note 1: 20dB bandwidth measured using RB = 100kHz, VB = 100kHz (VB &gt; RB)

Note 2: 99% bandwidth measured using RB = 100kHz, VB = 300kHz (VB &gt;=3RB)

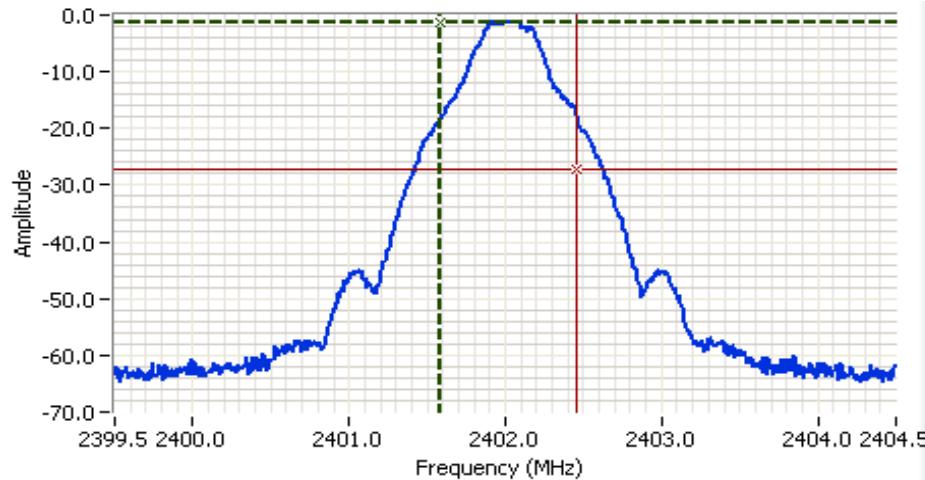


Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A



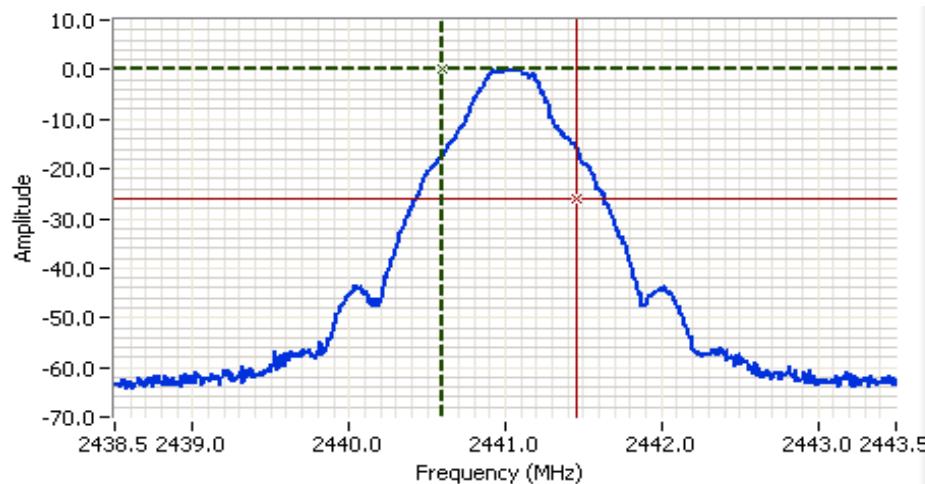



Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A



Cursor 1 2401.5882 -1.17   
 Cursor 2 2402.4534 -27.17 

Delta Freq. 865 kHz  
Delta Amplitude 26.00

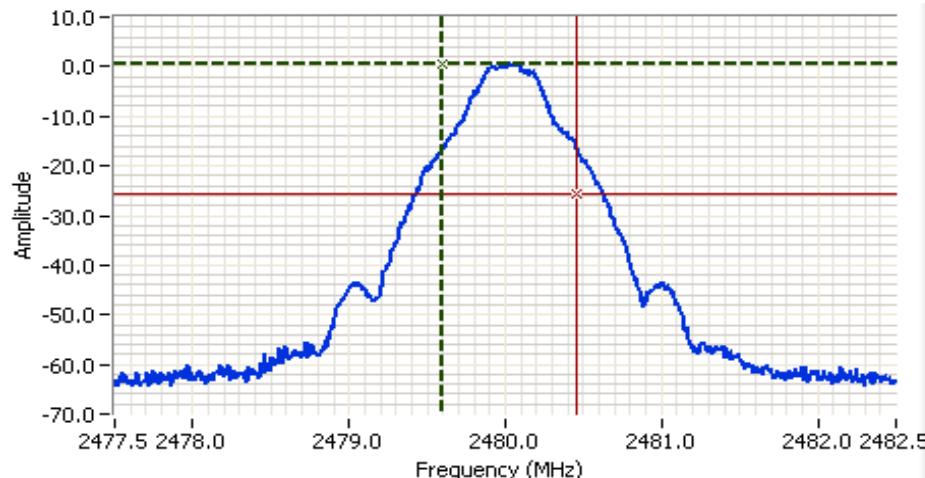



Cursor 1 2440.5965 0.00   
 Cursor 2 2441.4617 -26.00 

Delta Freq. 865 kHz  
Delta Amplitude 26.00



Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A



Cursor 1 2479.5965 0.33   
 Cursor 2 2480.4534 -25.67 

Delta Freq. 857 kHz  
 Delta Amplitude 26.00

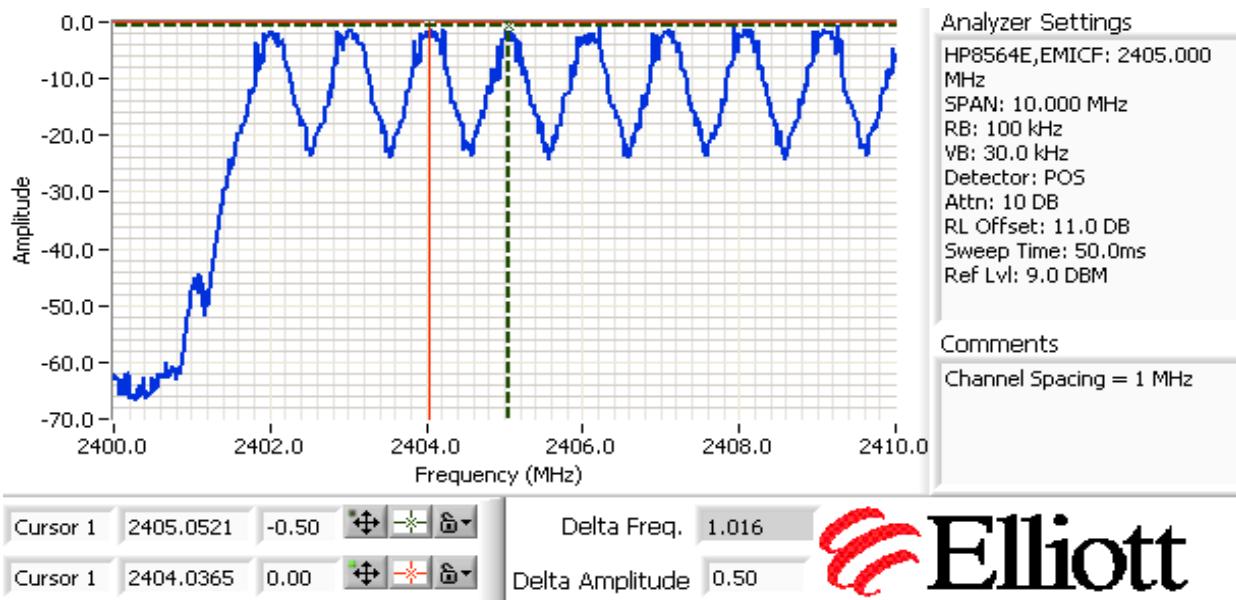


Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

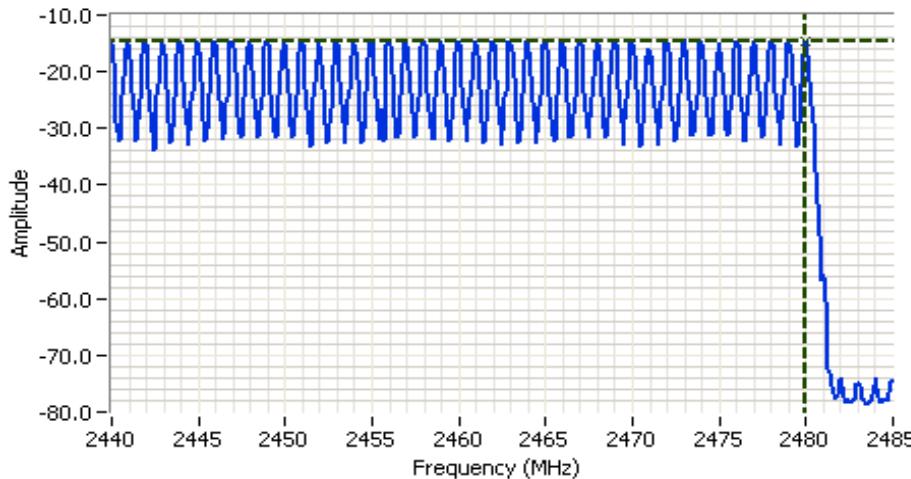
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)

Results: EUT complies with the Bluetooth protocol which ensures compliance with the timing requirements of 15.247. Plots are provided for channel spacing and number of channels.



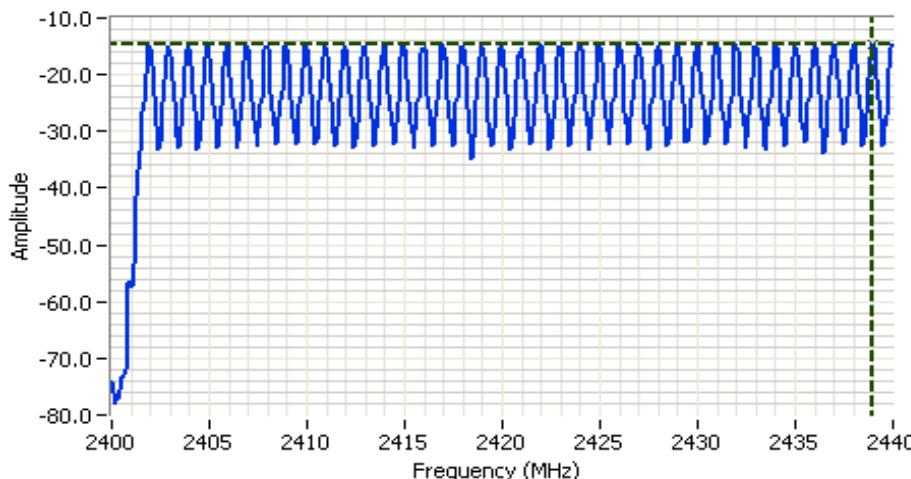
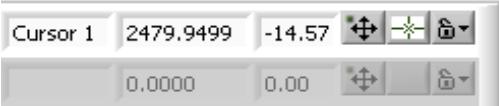
Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A


**Analyzer Settings**

Rohde&Schwarz,ESI  
 CF: 2462.500 MHz  
 SPAN: 45,000 MHz  
 RB: 100 kHz  
 VB: 3.00 kHz  
 Detector: POS  
 Attn: 20 dB  
 RL Offset: 0.0 dB  
 Sweep Time: 0.4s  
 Ref Lvl: -7.0 dBm

**Comments**

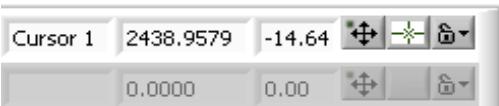
Number of Channels = 40  
 2440-2480 MHz  
 Basic Mode


**Analyzer Settings**

Rohde&Schwarz,ESI  
 CF: 2420.000 MHz  
 SPAN: 40,000 MHz  
 RB: 100 kHz  
 VB: 3.00 kHz  
 Detector: POS  
 Attn: 20 dB  
 RL Offset: 0.0 dB  
 Sweep Time: 0.3s  
 Ref Lvl: -7.0 dBm

**Comments**

Number of Channels = 39  
 2400-2440 MHz  
 Basic Mode





## EMC Test Data

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

### FCC 15.247 FHSS - Power, 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: 5/25/2011 19:40

Config. Used: 1

Test Engineer: Rafael Varelas

Config Change: None

Test Location: Fremont Chamber #4

EUT Voltage: 120V/60Hz

#### General Test Configuration

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

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

#### Ambient Conditions:

Temperature: 20.6 °C  
Rel. Humidity: 34 %

#### Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Spurious Emissions, 30-26000 MHz	15.247(d)	Pass	All emissions >20dB below fundamental
2	Output Power	15.247(b)	Pass	2.56 dBm ( 1.8 mW)
3	20dB Bandwidth	15.247(a)	Pass	1350 kHz
3	99% bandwidth	15.247(a)	Pass	1206 kHz
3	Channel spacing	15.247(a)	Pass	1 MHz
3	Number of Channels	15.247(a)	Pass	79 Channels

#### Modifications Made During Testing:

No modifications were made to the EUT during testing

#### Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

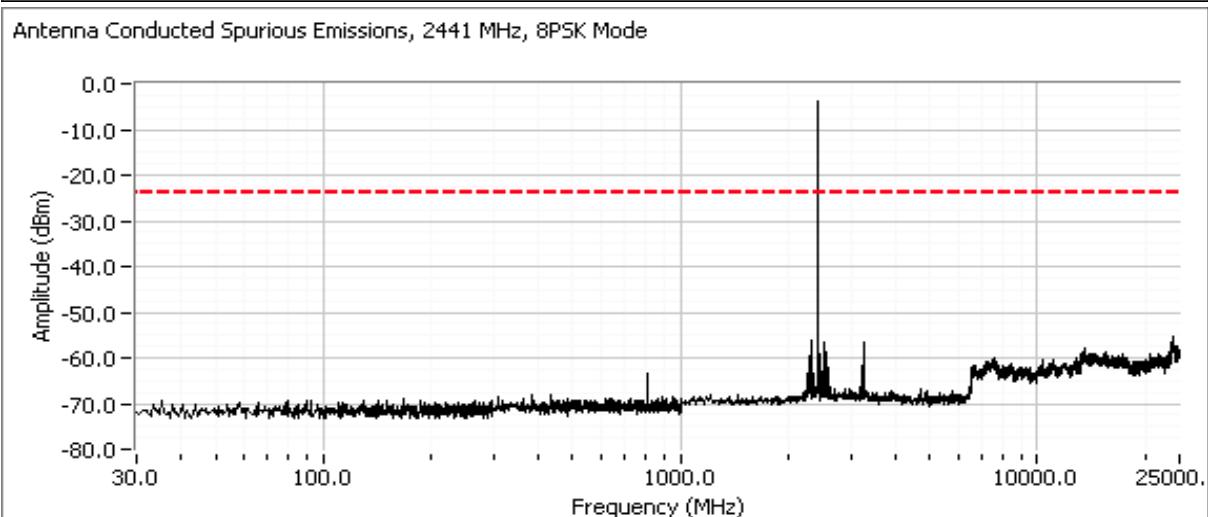
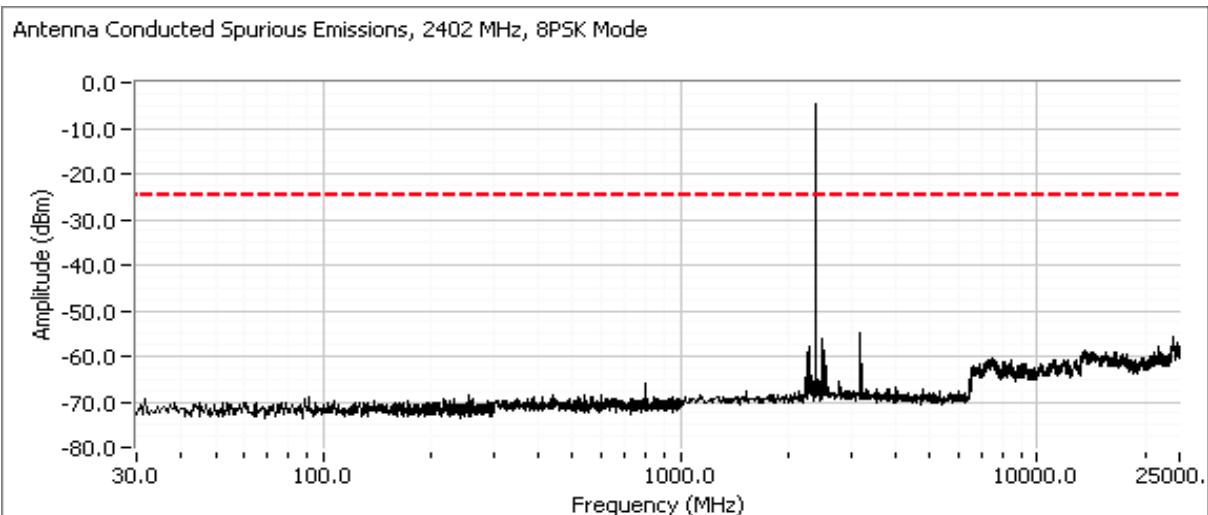
**Run #1: Antenna Conducted Spurious Emissions, 30 - 25000 MHz.**

Date of Test: 5/25/2011

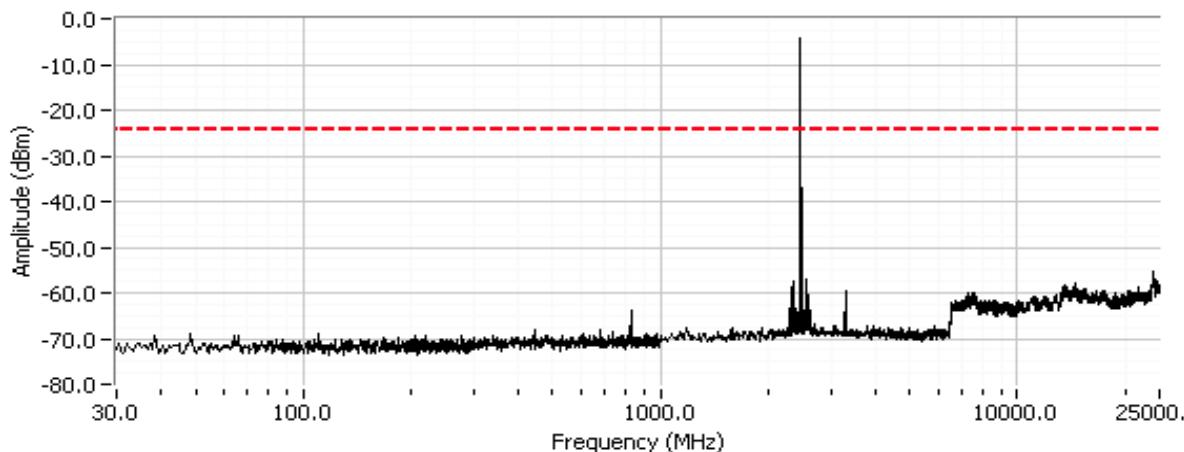
Test Engineer: Rafael Varelas

Test Location: FT Chamber #4

Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level.



Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Antenna Conducted Spurious Emissions, 2480 MHz, 8PSK Mode**

**Run #2: Output Power**

Date of Test: 5/25/2011

Test Engineer: Rafael Varelas

Test Location: FT Chamber #4

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

Maximum antenna gain: 3.9 dBi

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	2402	-	1.35	0.0014	0.0033
Mid	2441	-	2.04	0.0016	0.0039
High	2480	-	2.56	0.0018	0.0044

Power measured using a peak power meter

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

**Run #3: Bandwidth, Channel Occupancy, Spacing and Number of Channels**

Date of Test: 5/25/2011

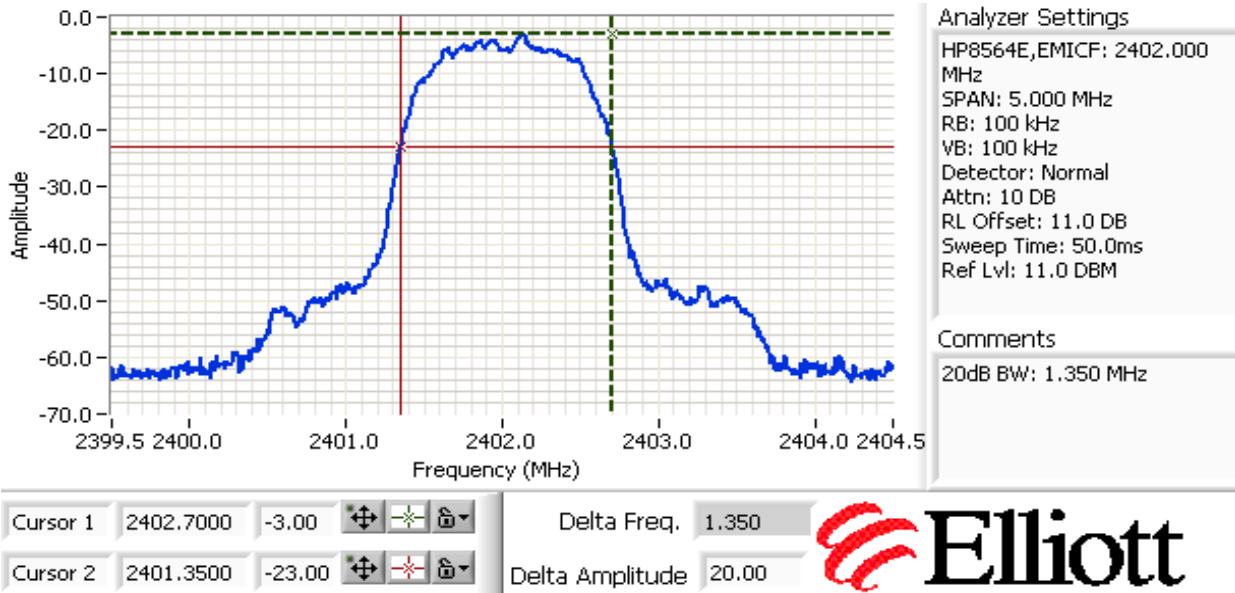
Test Engineer: Rafael Varelas

Test Location: FT Chamber #4

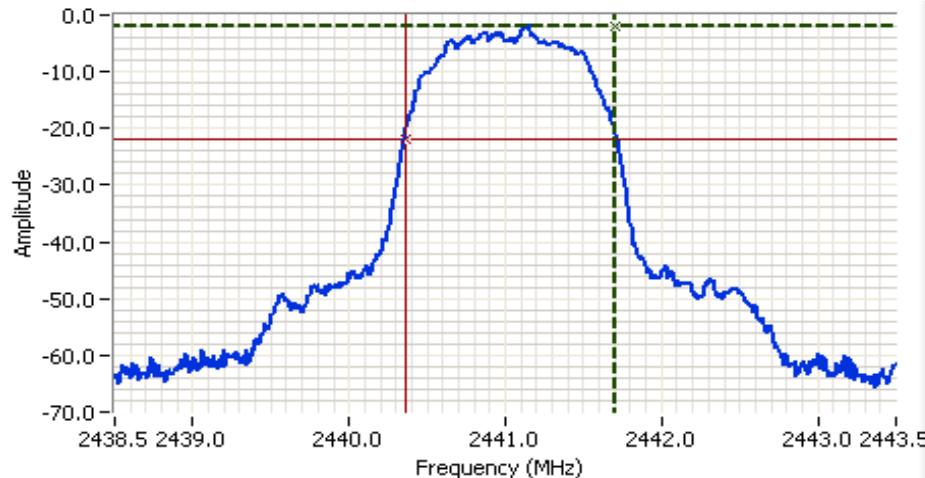
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	100kHz	1350	100kHz	1198
Mid	2441	100kHz	1350	100kHz	1198
High	2480	100kHz	1350	100kHz	1206

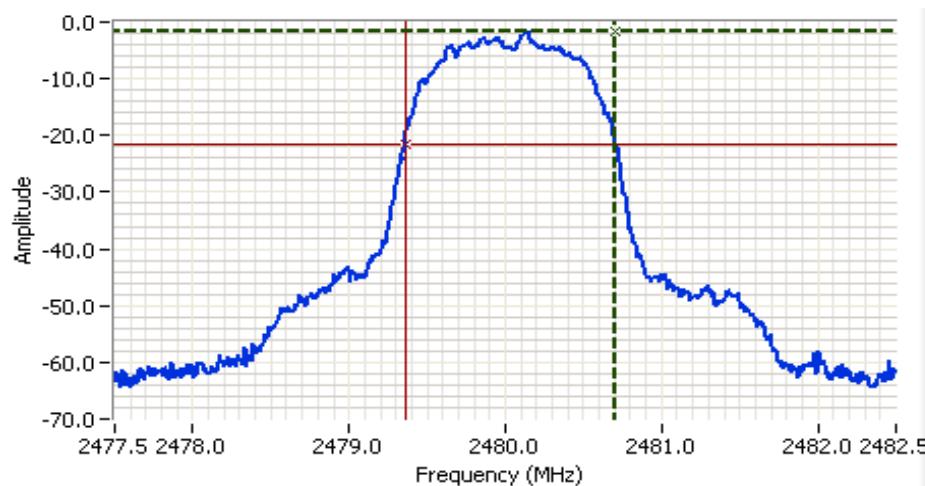
Note 1: 20dB bandwidth measured using RB = 100kHz, VB = 100kHz (VB &gt; RB)

Note 2: 99% bandwidth measured using RB = 100kHz, VB = 300kHz (VB &gt;=3RB)

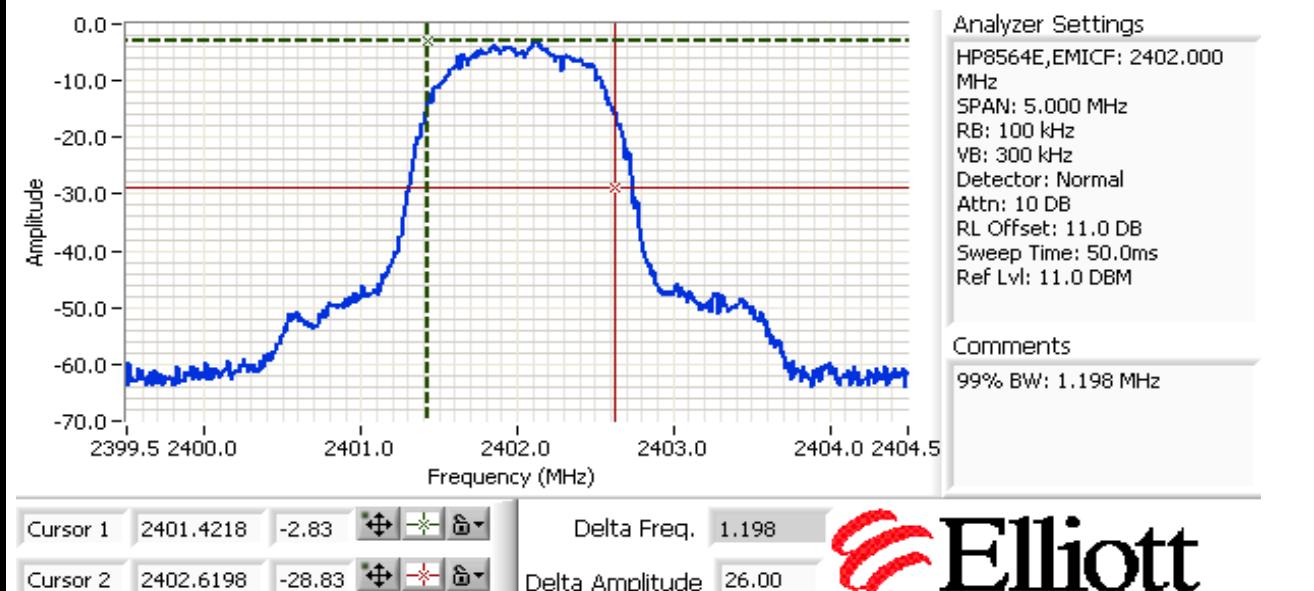
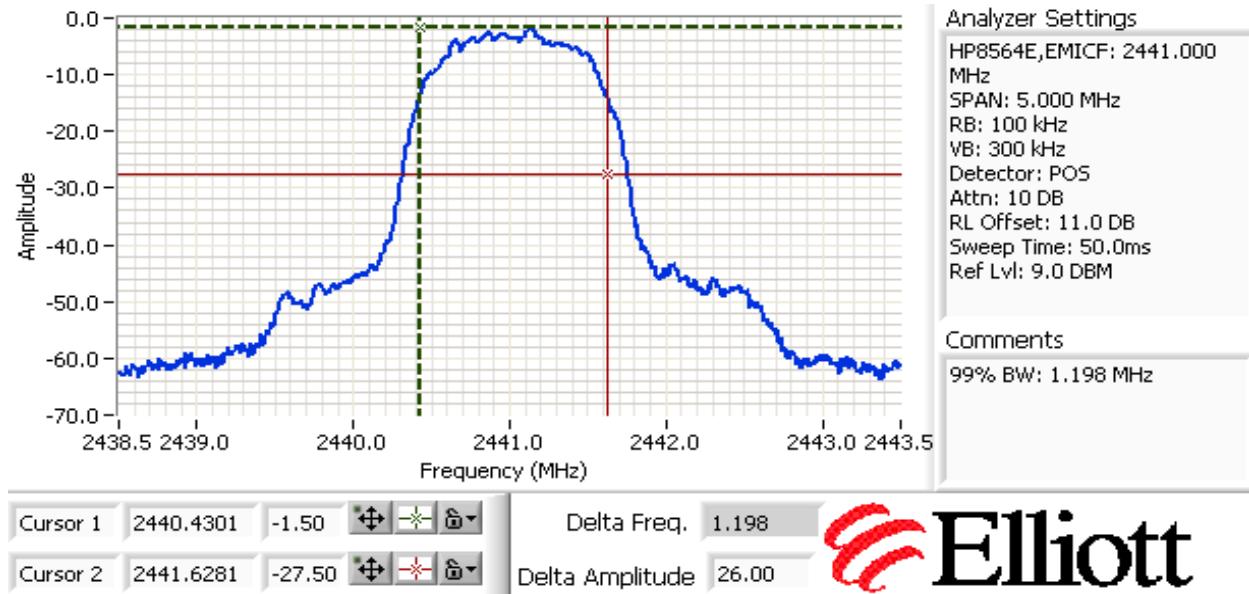


Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A

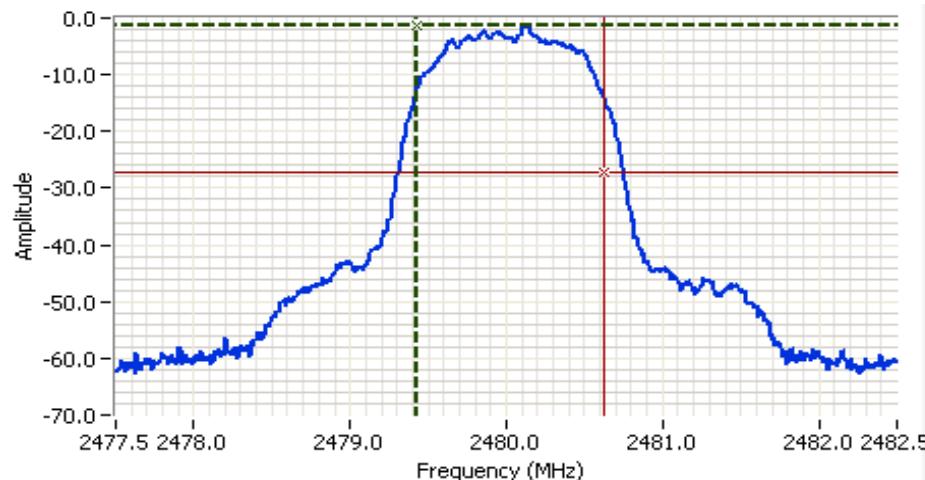


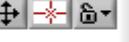



Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A



Client: Broadcom Corporation	Job Number: J83157
Model: BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number: T83268
Contact: Anne Liang	Account Manager: Sheareen Washington
Standard: FCC 15.247/RSS-210	Class: N/A



Cursor 1 2479.4218 -1.33   
 Cursor 2 2480.6281 -27.33 

Delta Freq. 1.206  
 Delta Amplitude 26.00

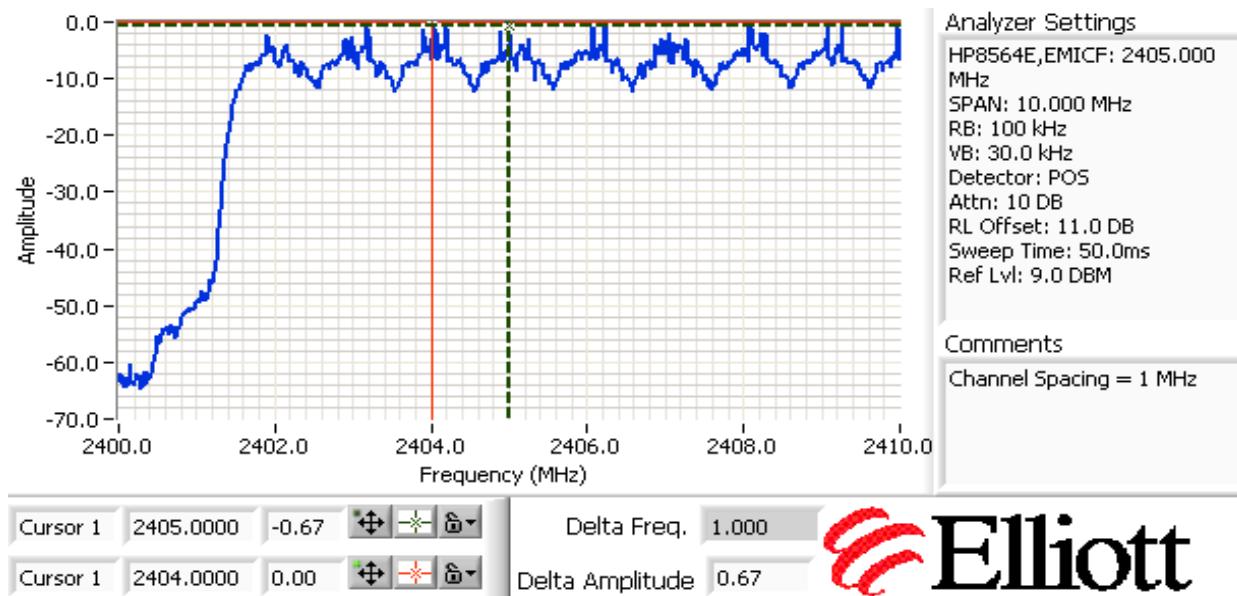


Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	N/A

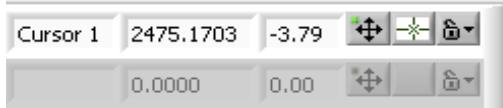
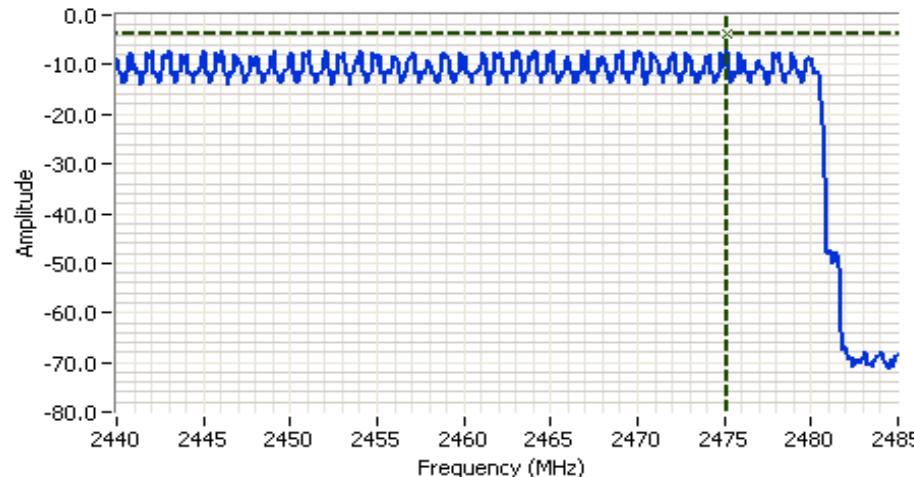
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.

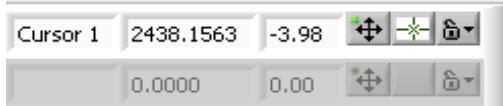
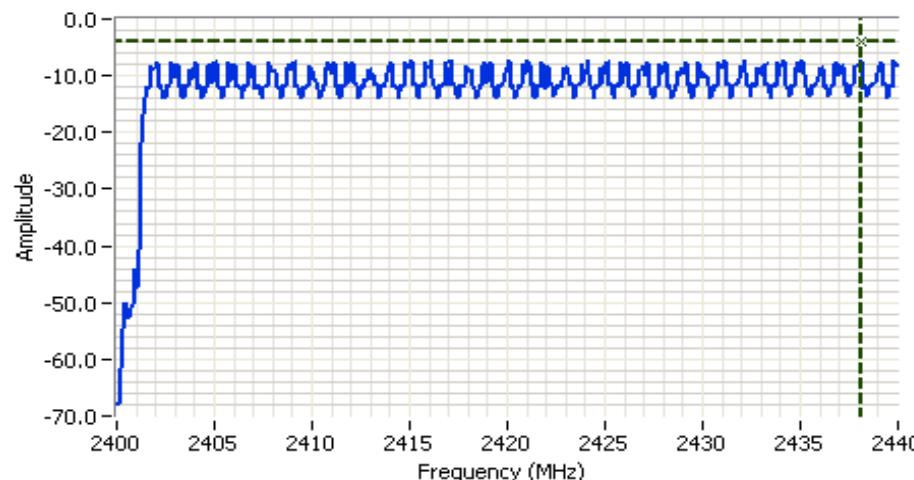
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)

Results: EUT complies with the Bluetooth protocol which ensures compliance with the timing requirements of 15.247. Plots are provided for channel spacing and number of channels.



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Standard:	FCC 15.247/RSS-210	Class:	N/A








## *EMC Test Data*

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	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: 5/23/2011

Config. Used: 1

Test Engineer: Suresh Kondapalli

Config Change: None

Test Location: Fremont Chamber #5

EUT Voltage: Refer to individual run

## General Test Configuration

For tabletop equipment, the EUT was located on a wooden table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment. Remote support equipment was located outside of the semi-anechoic chamber. Any cables running to remote support equipment were routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

Ambient Conditions: Temperature: 22 °C  
Rel. Humidity: 35 %

## Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 120V/60Hz	Class B	PASS	54.8dB $\mu$ V @ 0.151MHz (-11.1dB)

## Modifications Made During Testing

No modifications were made to the EUT during testing

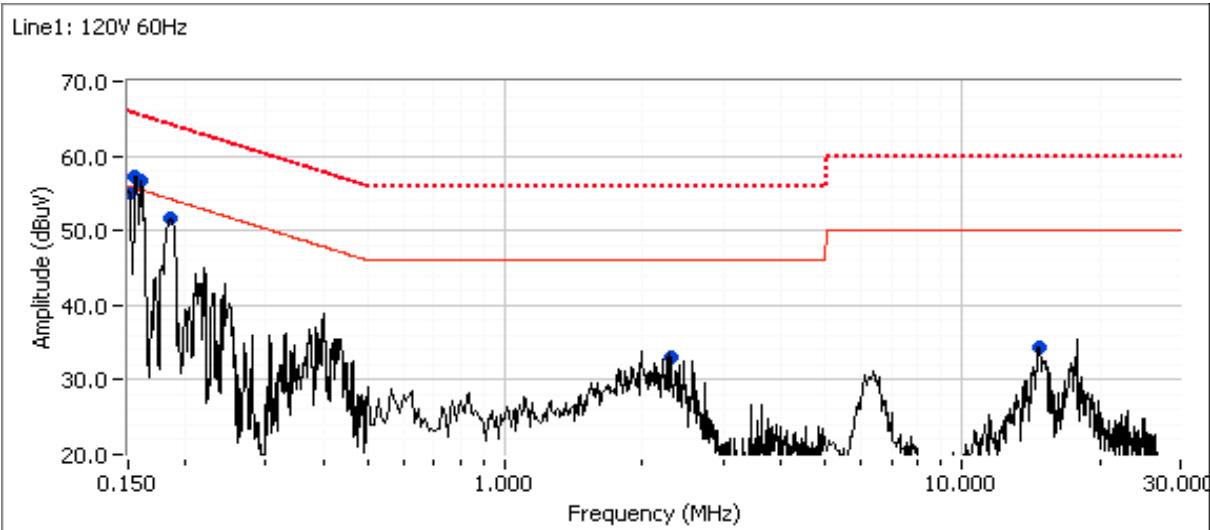
## Deviations From The Standard

No deviations were made from the requirements of the standard.

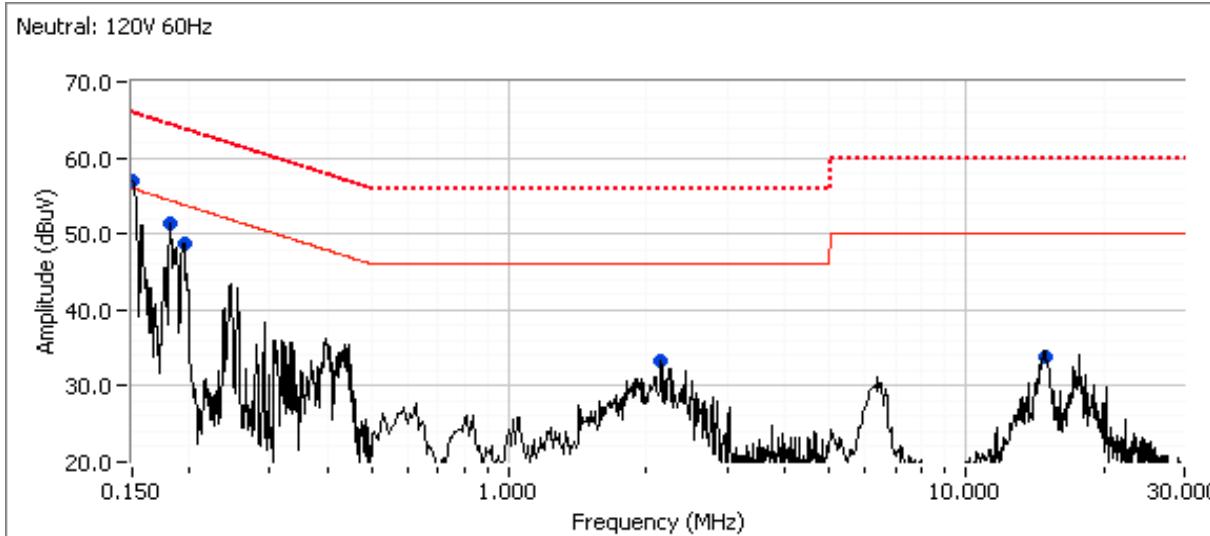
Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	-

**Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz**
**Preliminary peak readings captured during pre-scan (peak readings vs. average limit)**

Frequency MHz	Level dB $\mu$ V	AC Line	Class B		Detector QP/Ave	Comments
			Limit	Margin		
0.151	55.1	Line 1	55.9	-0.8	Peak	
0.156	57.2	Line 1	55.7	1.5	Peak	
0.161	56.7	Line 1	55.4	1.3	Peak	
0.185	51.6	Line 1	54.3	-2.7	Peak	
2.304	33.0	Line 1	46.0	-13.0	Peak	
14.719	34.3	Line 1	50.0	-15.7	Peak	
0.195	48.7	Neutral	53.8	-5.1	Peak	
0.151	57.1	Neutral	56.0	1.1	Peak	
0.195	48.7	Neutral	53.8	-5.1	Peak	
0.182	51.3	Neutral	54.4	-3.1	Peak	
2.150	33.2	Neutral	46.0	-12.8	Peak	
14.845	33.9	Neutral	50.0	-16.1	Peak	



Client:	Broadcom Corporation	Job Number:	J83157
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Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	-





## EMC Test Data

Client:	Broadcom Corporation	Job Number:	J83157
Model:	BCM943227HMB 802.11bgn WLAN + Bluetooth Mini Card	T-Log Number:	T83268
Contact:	Anne Liang	Account Manager:	Sheareen Washington
Standard:	FCC 15.247/RSS-210	Class:	-

### Final quasi-peak and average readings

Frequency MHz	Level dB $\mu$ V	AC Line	Class B Limit	Margin	Detector	Comments
0.151	54.8	Neutral	65.9	-11.1	QP	QP (1.00s)
0.151	54.5	Line 1	65.9	-11.4	QP	QP (1.00s)
0.160	52.9	Line 1	65.5	-12.6	QP	QP (1.00s)
0.156	52.9	Line 1	65.7	-12.8	QP	QP (1.00s)
0.186	49.6	Line 1	64.2	-14.6	QP	QP (1.00s)
0.182	48.9	Neutral	64.4	-15.5	QP	QP (1.00s)
0.195	47.0	Neutral	63.8	-16.8	QP	QP (1.00s)
0.195	47.0	Neutral	63.8	-16.8	QP	QP (1.00s)
0.151	35.3	Line 1	55.9	-20.6	AVG	AVG (0.10s)
0.156	35.0	Line 1	55.7	-20.7	AVG	AVG (0.10s)
0.160	34.7	Line 1	55.5	-20.8	AVG	AVG (0.10s)
0.186	33.2	Line 1	54.2	-21.0	AVG	AVG (0.10s)
0.151	34.5	Neutral	55.9	-21.4	AVG	AVG (0.10s)
0.182	32.2	Neutral	54.4	-22.2	AVG	AVG (0.10s)
0.195	31.1	Neutral	53.8	-22.7	AVG	AVG (0.10s)
2.150	22.4	Neutral	46.0	-23.6	AVG	AVG (0.10s)
0.195	29.9	Neutral	53.8	-23.9	AVG	AVG (0.10s)
2.296	21.2	Line 1	46.0	-24.8	AVG	AVG (0.10s)
14.845	24.0	Neutral	50.0	-26.0	AVG	AVG (0.10s)
14.678	23.7	Line 1	50.0	-26.3	AVG	AVG (0.10s)
2.150	28.3	Neutral	56.0	-27.7	QP	QP (1.00s)
2.296	27.6	Line 1	56.0	-28.4	QP	QP (1.00s)
14.845	31.5	Neutral	60.0	-28.5	QP	QP (1.00s)
14.678	31.2	Line 1	60.0	-28.8	QP	QP (1.00s)

*End of Report*

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