

*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: BCM943142Y*

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IC SITE REGISTRATION #: 2845B-5

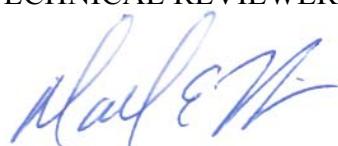
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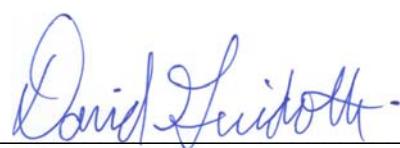
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REVISION HISTORY

Rev#	Date	Comments	Modified By
-	11-26-2013	First release	
1.0	12-10-13	Clarified the $\pi/4$ DQPSK modulation	MEH / DMG

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SCOPE

An electromagnetic emissions test has been performed on the Broadcom Corporation model BCM943142Y, 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 National Technical Systems - Silicon Valley test procedures:

ANSI C63.10-2009
FHSS test procedure DA 00-0705A1

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 BCM943142Y 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 BCM943142Y 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: 960 kHz 8PSK: 1390 kHz	Channel spacing > 2/3rds 20dB bandwidth	Complies
		Channel Separation	1 MHz		Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Channel Dwell Time (average time of occupancy)	Device complies with Bluetooth specifications with a minimum of 20 hopping channels	<0.4 second within a period of 0.4 x number of channels	Complies
					15 or more
15.247 (a) (1)	RSS 210 A8.1 (1)	Number of Channels	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: 0.1 dBm (0.0010 W) 8PSK: 1.7 dBm (0.0015 W) EIRP = 0.0035 W ^{Note 1}	1 Watt, EIRP limited to 4 Watts.	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	47.1 dB μ V/m @ 2483.5 MHz	15.207 in restricted bands, all others < -20dBc	Complies (-6.9 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 3.8 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	u.FL	Unique or integral antenna required	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	49.6 dB μ V @ 0.195 MHz	Refer to page 18	Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	N/A – receiver tunes above 960MHz		
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Refer to MPE calculations in Exhibit 11, for the mobile use condition. Refer to SAR report for the portable use condition.	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	GFSK: 903 kHz 8PSK: 1248 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 μ V/m	25 to 1000 MHz	± 3.6 dB
		1000 to 40000 MHz	± 6.0 dB
Conducted Emissions (AC Power)	dB μ V	0.15 to 30 MHz	± 2.4 dB

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

The Broadcom Corporation model BCM943142Y is a Broadcom 802.11bgn WLAN + Bluetooth NGFF1630 Mini Card. Since the EUT would be installed in a host device and 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 the host device.

The sample was received on November 6, 2013 and tested on November 8, 9, 11 and 13, 2013. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Broadcom	BCM943142Y	Broadcom 802.11bgn WLAN + Bluetooth NGFF1630 Mini Card	001018E2EB19 (BLE/BT)	QDS-BRCM1079

OTHER EUT DETAILS

802.11gbn, supports 20 and 40MHz operation
SISO operation only
WiFi – Tx diversity supported
Bluetooth operation limited to Aux port
WiFi and Bluetooth simultaneous transmission supported

ANTENNA SYSTEM

RF testing was performed using:
Ethertronics, model 1000802, 802.11abgn WLAN antenna, 3.8dBi @ 2.4GHz

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 – Bluetooth testing

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

Company	Model	Description	Serial Number	FCC ID
Broadcom	100-124289-0040 Rev02	Bluetooth test board	1765588	-
Dell	E6400	Laptop	DP3L9K1	-

SUPPORT EQUIPMENT – AC Conducted testing

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

Company	Model	Description	Serial Number	FCC ID
Broadcom	BCM0NGFF2EC_1	WiFi test board	1679910	-
Lenovo	G560	Laptop	CB06427398	
Hewlett Packard	Deskjet 5650	Printer	-	-

EUT INTERFACE PORTS – Bluetooth testing

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

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
Laptop – DC	AC/DC Adapter	Multiconductor	Unshielded	1.5
AC/DC Adapter	AC Mains	3wire	Unshielded	1.5
USB	Test Fixture	Multiconductor	Shielded	1.5

EUT INTERFACE PORTS – AC Conducted testing

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

Port	Connected To	Description	Cable(s)	
			Shielded or Unshielded	Length(m)
Laptop – DC	AC/DC Adapter	Multiconductor	Unshielded	1.5
AC/DC Adapter	AC Mains	3wire	Unshielded	1.5
PCIe	Test Fixture	Test Fixture	-	-
USB	Printer	Multiconductor	Shielded	1.5

EUT OPERATION

WiFi/Bluetooth (BLE) – during testing the EUT was configured to transmit continuously at the maximum power setting on the channel noted, at the data rate noted.

Testing was performed in the GFSK and 8PSK modulations. Testing of the 8PSK modulation was considered representative of $\pi/4$ DQPSK modulation.

AC Conducted Emissions testing – the EUT was configured to transmit on channel 6 at 2437MHz, 802.11b mode, 1Mb/s, maximum output power setting. The computer was configured to be exercised per ANSI C63.4.

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 5	211948	2845B-5	41039 Boyce Road Fremont, CA 94538-2435

ANSI C63.4 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.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.10. 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 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4.

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 C63.10 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 as specified in ANSI C63.4. 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 C63.10, 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.

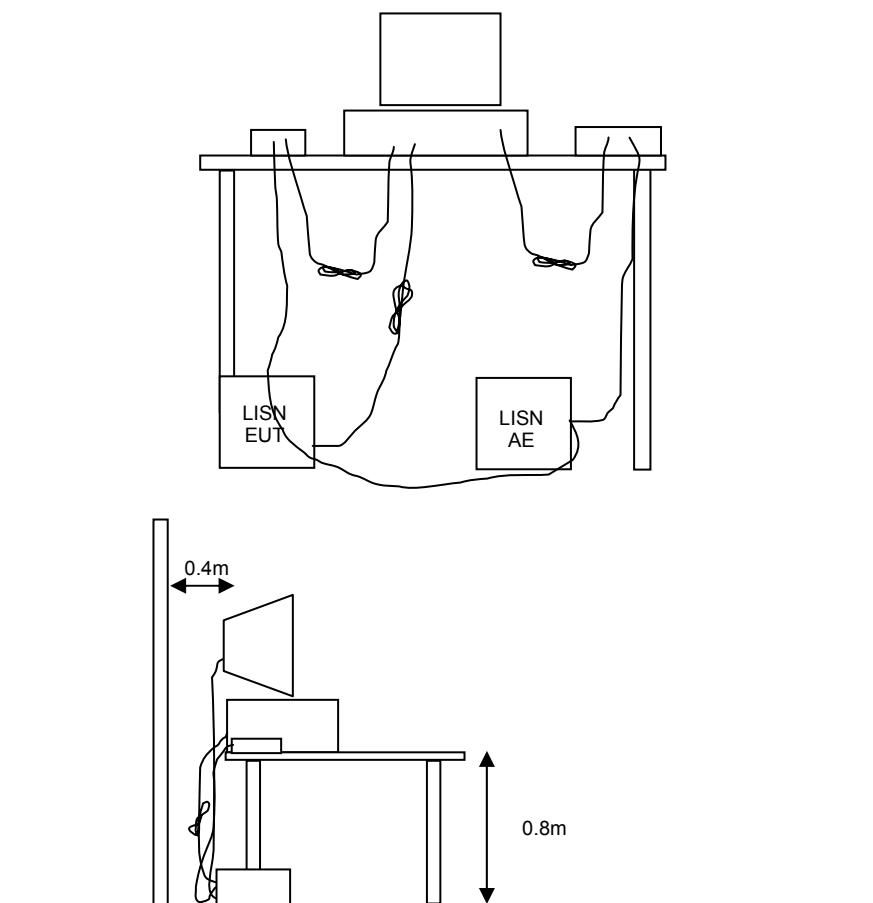


Figure 1 Typical Conducted Emissions Test Configuration

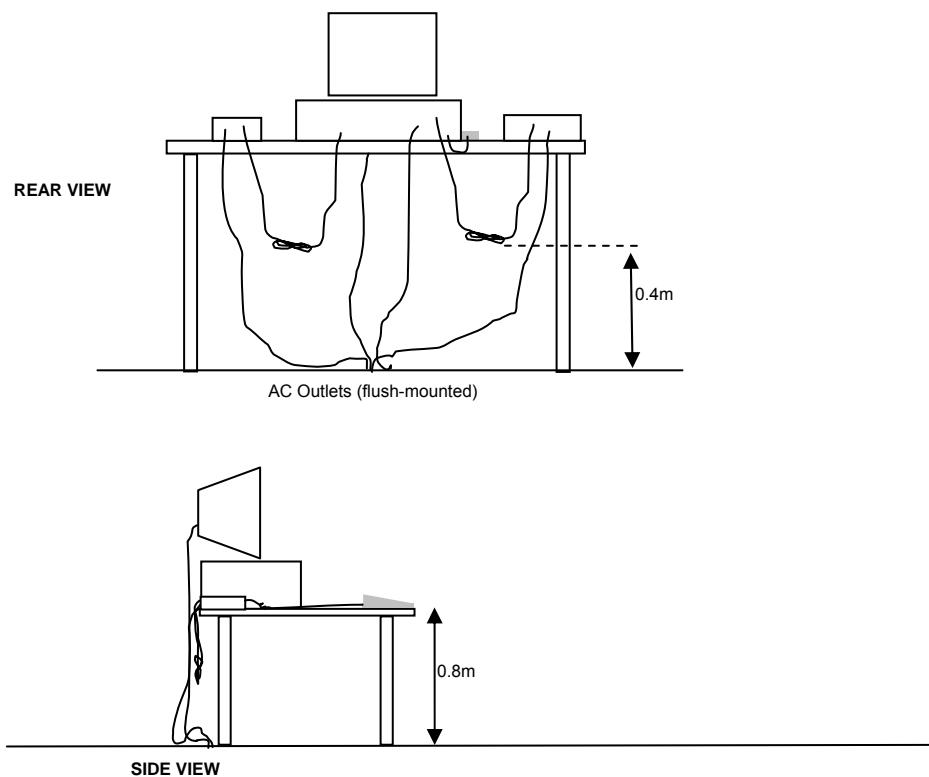
RADIATED EMISSIONS

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.

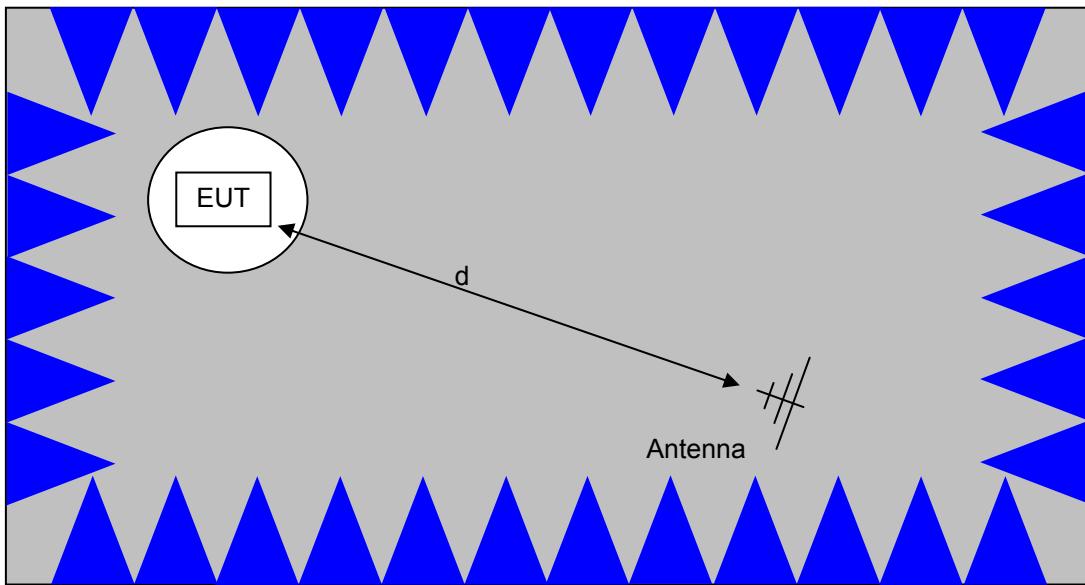
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

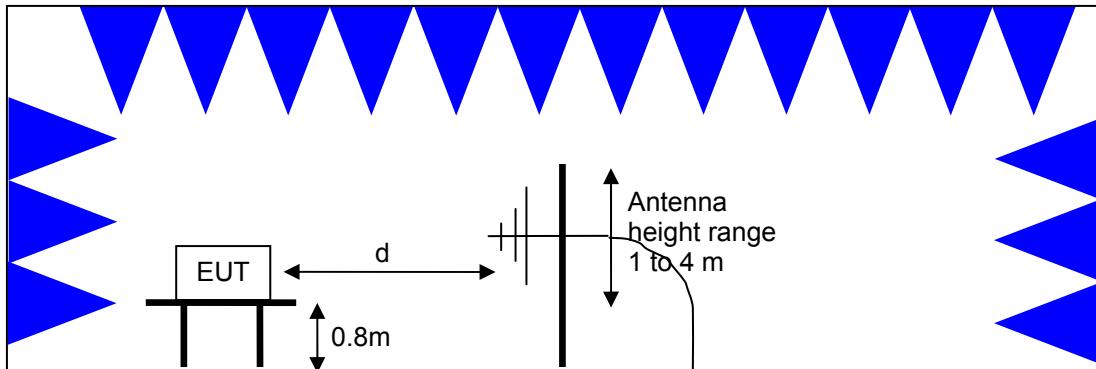


Typical Test Configuration for Radiated Field Strength Measurements



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.

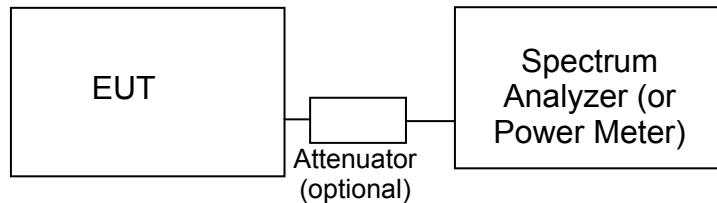
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



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 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, 26dB and/or 99% signal bandwidth are measured using the bandwidths recommended by ANSI C63.10 and 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 bands¹ (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

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

OUTPUT POWER LIMITS - 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	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 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).

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

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_f - S = M$$

where:

R_f = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

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

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

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

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

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

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

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

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

$$R_c = R_f + F_d$$

and

$$M = R_c - L_s$$

where:

R_f = 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

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Radiated Bandedge, 06-Nov-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Radiated BE Emissions, 07-Nov-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Radiated Emissions, 1000 - 25,000 MHz, 07-Nov-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/9/2014
Hewlett Packard	Head (Inc flex cable, (1742,1743) Blue)	84125C	1620	5/15/2014
Hewlett Packard	High Pass filter, 8.2 GHz (Purple System)	P/N 84300-80039	1767	12/5/2013
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2013
A. H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	6/28/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Radiated Emissions, 1,000 - 26,000 MHz, 08-Nov-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/9/2014
Hewlett Packard	HF Amplifier, 45 MHz -50 GHz (with 1620)	83051A (84125C)	1743	5/13/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2013
A. H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	6/28/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Radiated Emissions, 1,000 - 26,000 MHz, 09-Nov-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/9/2014
Hewlett Packard	HF Amplifier, 45 MHz -50 GHz (with 1620)	83051A (84125C)	1743	5/13/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2013
A. H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	6/28/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014

<u>Manufacturer</u>	<u>Description</u>	<u>Model</u>	<u>Asset #</u>	<u>Cal Due</u>
Radiated Emissions, 1,000 - 8,000 MHz, 11-Nov-13				
EMCO	Antenna, Horn, 1-18GHz	3115	868	6/19/2014
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	5/9/2014
Hewlett Packard	HF Amplifier, 45 MHz -50 GHz (with 1620)	83051A (84125C)	1743	5/13/2014
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	12/5/2013
A. H. Systems	Purple System Horn, 18-40GHz	SAS-574, p/n: 2581	2160	6/28/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Radiated Emissions, 30 - 1,000 MHz, 11-Nov-13				
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2014
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2197	2/7/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Radiated Emissions, 30 - 1,000 MHz, 11-Nov-13				
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2014
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2197	2/7/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	2238	9/18/2014
Conducted Emissions - AC Power Ports, 11-Nov-13				
EMCO	LISN, 10 kHz-100 MHz, 25A	3825/2	1292	2/14/2014
EMCO	LISN, 10 kHz-100 MHz	3825/2	1293	2/14/2014
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1401	5/15/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014
Radio Antenna Port (Power and Spurious Emissions), 13-Nov-13				
Rohde & Schwarz	Power Meter, Single Channel, +1795+1796	NRVS	1534	7/29/2014
Rohde & Schwarz	Power Sensor 100 uW - 2 Watts (w/ 20 dB pad, SN BJ5155)	NRV-Z32	1536	12/12/2013
Agilent Technologies	3Hz -44GHz PSA Spectrum Analyzer	E4446A	2796	1/28/2014
Radiated Emissions, 30 - 1,000 MHz, 13-Nov-13				
Com-Power	Preamplifier, 30-1000 MHz	PA-103	1632	7/6/2014
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2197	2/7/2014
Rohde & Schwarz	EMI Test Receiver, 20 Hz-40 GHz	ESIB40 (1088.7490.40)	2493	1/18/2014

Appendix B Test Data

T93842 Pages 25 - 76



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Product	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Emissions Standard(s):	15.247/RSS-210	Project Coordinator:	Irene
Immunity Standard(s):	-	Class:	-
		Environment:	-

EMC Test Data

For The

Broadcom Corporation

Product

BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)

Date of Last Test: 11/19/2013



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Duty Cycle

BLE MODE

Sample Notes

Sample S/N: 001018E2EB19

Software: Broadcom Blue Tool Version 1.4.3

Driver: BCM43142A0_001.001.011.0161.0180

Antenna: 1000802

Test Board: 100-124289-0040 Rev02(S/N: 765588)

Laptop: Dell E6400 (S/N: DP3L9K1)

Date of Test: 11/8/2013

Test Engineer: Jack Liu

Test Location: FT chamber#5

Duty cycle measurements performed on the worse case data rate for power.

Notes: Measurements taken with maximum RBW/VBW settings allowed.

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
BLE	pkg size 37	0.62	Yes	0.63	2.08	4.17	1587.30

* Correction factor when using RMS/Power averaging - $10 \cdot \log(1/x)$

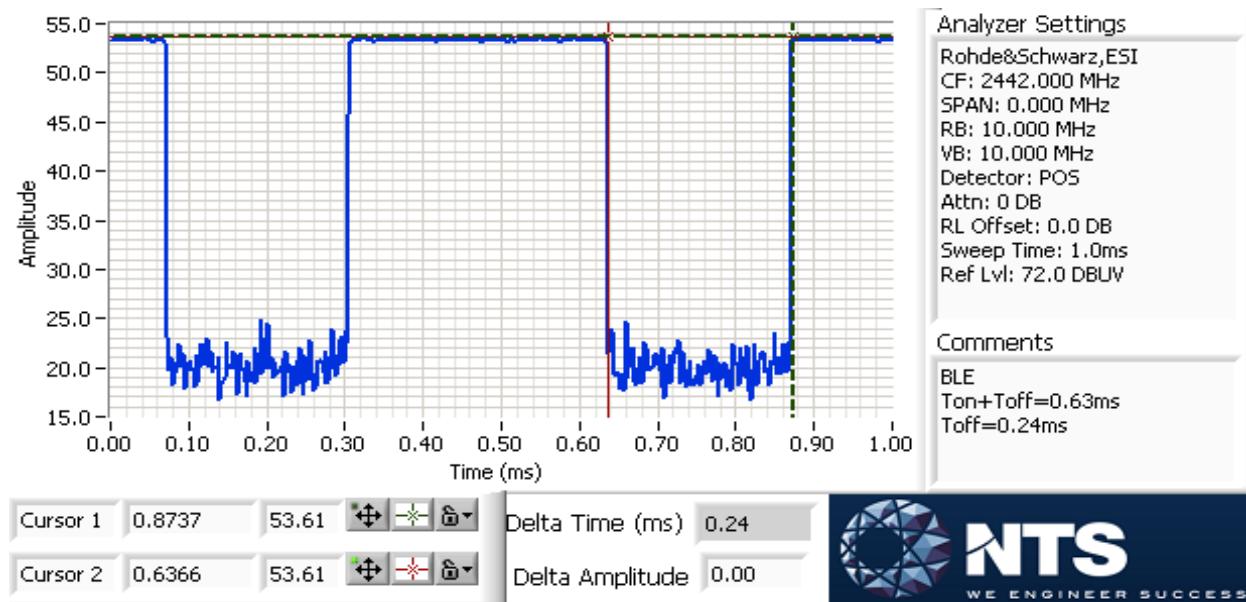
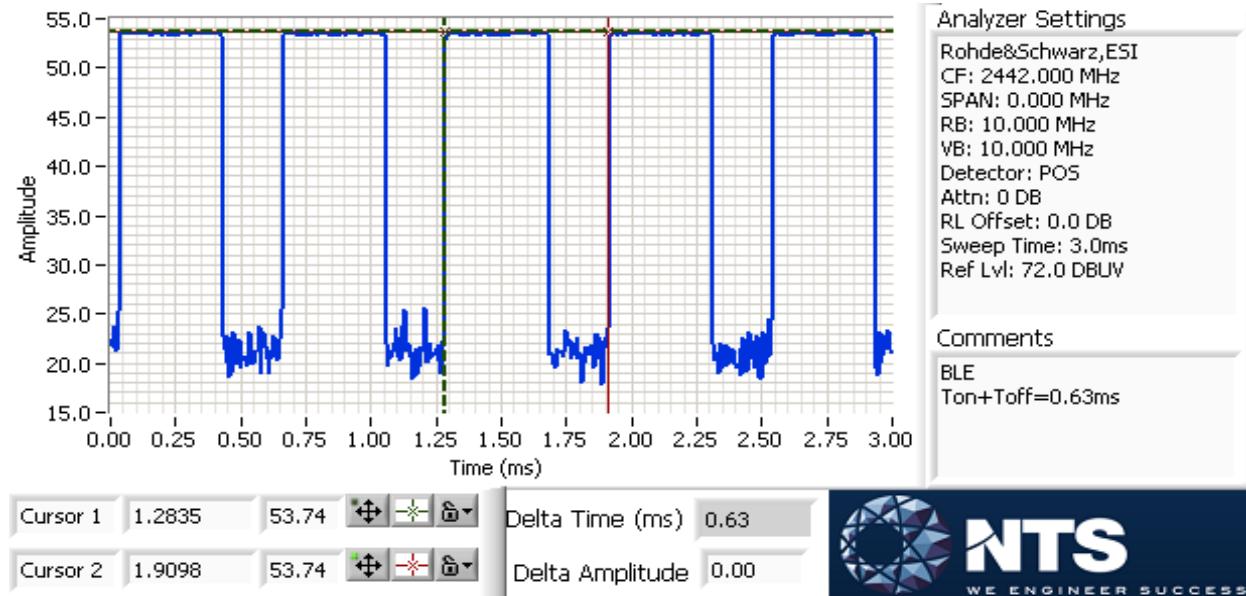
** Correction factor when using linear voltage average - $20 \cdot \log(1/x)$

T = Minimum transmission duration



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A





EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Bluetooth - Basic and EDR Modes

Sample Notes

Sample S/N: 001018E2EB19

Software: Broadcom Blue Tool Version 1.4.3

Driver: BCM43142A0_001.001.011.0161.0180

Antenna: 1725583-VS

Test Board: 100-124289-0040 Rev02(S/N: 765588)

Laptop: Dell E6400 (S/N: DP3L9K1)

Date of Test: 11/9/2013

Test Engineer: Jack Liu

Test Location: FT chamber#5

Duty cycle measurements performed on the worse case data rate for power.

Notes: Measurements taken with maximum RBW/VBW settings allowed.

	Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
Basic	GFSK	PRBS9	1.00					
EDR	8PSK	PRBS9	1.00					

* Correction factor when using RMS/Power averaging - $10 \cdot \log(1/x)$

** Correction factor when using linear voltage average - $20 \cdot \log(1/x)$

T = Minimum transmission duration



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Radiated 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.

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, unless otherwise noted.

Ambient Conditions:

Temperature: 23 °C
Rel. Humidity: 40 %

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

Run #	Mode	Channel	Power Setting	Measured Power	Test Performed	Limit	Result / Margin
1a	WiFi b Mode	6 - 2437MHz	-	-	Radiated Emissions 30 MHz - 1000 MHz	FCC Part 15.209 / 15.247(c)	43.0 dB μ V/m @ 199.41 MHz (-0.5 dB)
1b	WiFi g Mode	1 - 2412MHz	-	-	Radiated Emissions 30 MHz - 1000 MHz	FCC Part 15.209 / 15.247(c)	42.9 dB μ V/m @ 199.41 MHz (-0.6 dB)
2a	BT Basic GFSK	2402MHz	-	-	Radiated Emissions 30 MHz - 1000 MHz	FCC Part 15.209 / 15.247(c)	29.9 dB μ V/m @ 60.86 MHz (-10.1 dB)
2b	BT EDR 8PSK	2480MHz	-	-	Radiated Emissions 30 MHz - 1000 MHz	FCC Part 15.209 / 15.247(c)	29.5 dB μ V/m @ 60.17 MHz (-10.5 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.

Notes

Based on the testing, no significant radio related emissions can be observed below 1GHz. No further testing was performed.



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Sample Notes

(WiFi)

Sample S/N: 001018E2EB23

Driver: 6.30.223.181

Antenna: 1000802

Test Board: BCM9NGFF2EC_1 (S/N: 1679910)

Laptop: Lenovo G560 (S/N: CB06427398)

The Aux port (J2) was tested. This was the worse case port based on preliminary testing.

(Bluetooth)

Sample S/N: 001018E2EB19

Software: Broadcom Blue Tool Version 1.4.3

Driver: BCM43142A0_001.001.011.0161.0180

Antenna: 1000802

Test Board: 100-124289-0040 Rev02(S/N: 765588)

Laptop: Dell E6400 (S/N: DP3L9K1)

All testing performed on port J2. BT operation is limited to this port.

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle $\geq 98\%$ and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

2.4GHz band reject filter used

Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
11b	1 Mb/s	1.00	Yes	8.4	0.02	0.04	119.04762
11g	6 Mbps	0.97	Yes	1.41	0.12	0.24	709.21986
n20	MCS0	0.97	Yes	1.29	0.13	0.27	775.1938
n40	MCS0	0.95	Yes	0.62	0.24	0.48	1612.9032
BLE	pkg size 37	0.62	Yes	0.63	2.0827594	4.1655188	1587.3016
Basic	GFSK	PRBS9	1.00				
	EDR	PRBS9	1.00				



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Emission has duty cycle \geq 98%, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 3:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle $<$ 98% and is NOT constant, average measurement performed: RBW=1MHz, VBW $>$ 1/T, peak detector, linear average mode, sweep time auto, max hold. Max hold for 50*(1/DC) traces
Note 5:	Emission has duty cycle $<$ 98%, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Radiated Spurious Emissions, 30 - 1000 MHz. Operating Mode: WiFi Tx

Date of Test: 11/11/2013

Config. Used: 1

Test Engineer: Rafael Varelas

Config Change: none

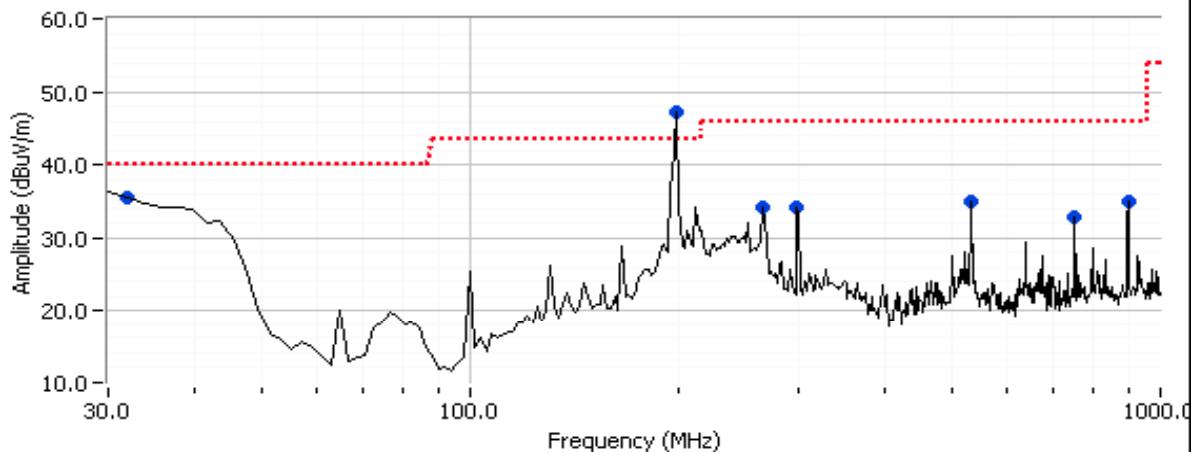
Test Location: FT Chamber #5

EUT Voltage: Powered by Host

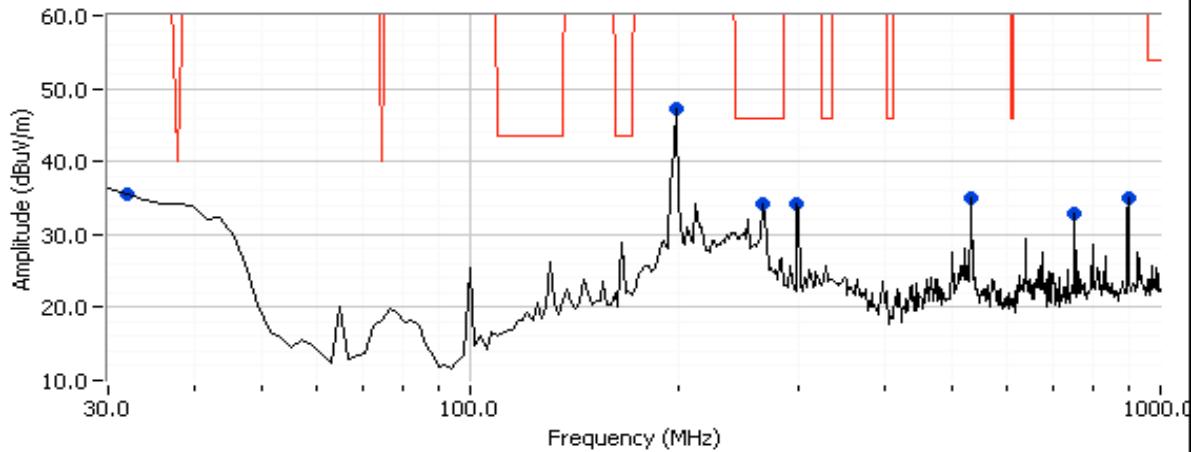
Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

Run #1a: Center Channel @ b mode, 2437 MHz

WiFi 802.11b Mode 2437MHz



WiFi 802.11b Mode 2437MHz





EMC Test Data

Client:	Broadcom Corporation				Job Number:	J93687	
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)				T-Log Number:	T93842	
Contact:	Anne Liang				Project Manager:	Sheareen Jacobs	
Standard:	15.247/RSS-210				Project Coordinator:	Irene	

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

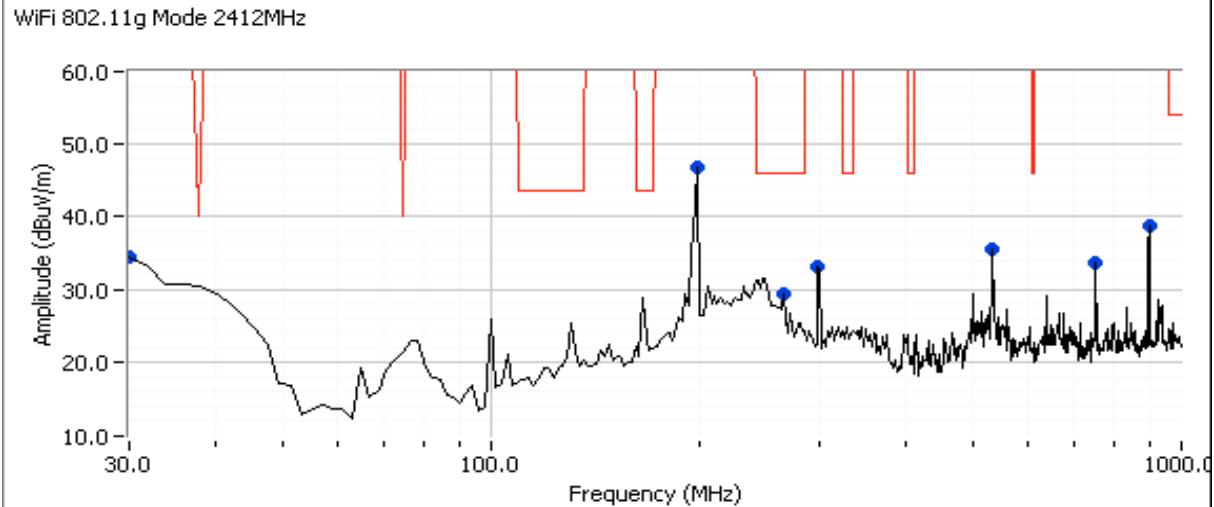
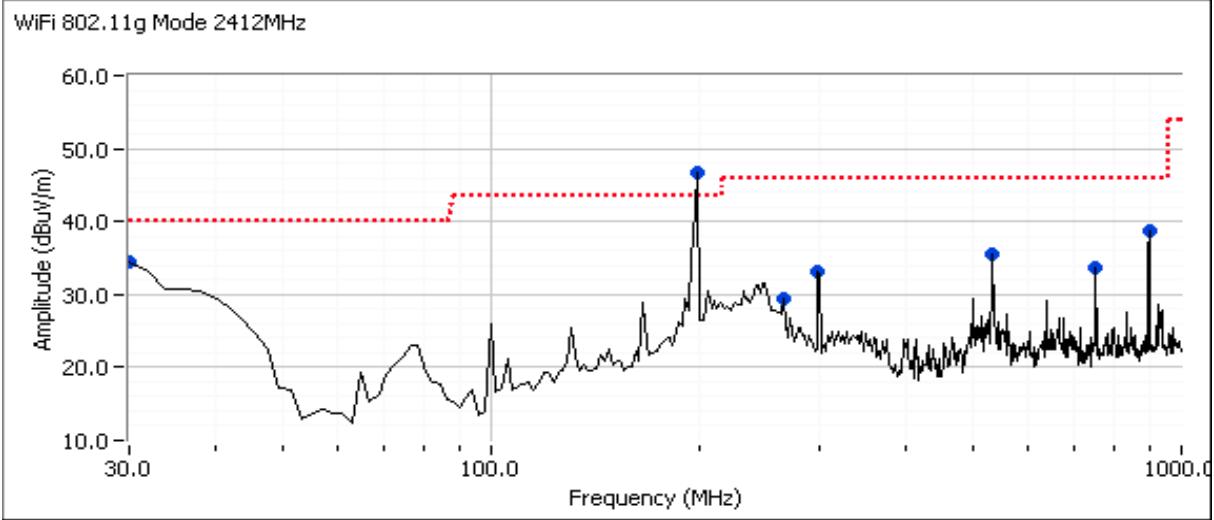
Frequency	Level	Pol	FCC 15.247 / 15.209	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
30.411	35.4	V	40.0	-4.6	Peak	174	1.0
199.408	47.3	H	43.5	3.8	Peak	107	1.5
265.812	34.1	H	46.0	-11.9	Peak	136	1.0
298.678	34.2	V	46.0	-11.8	Peak	244	1.0
532.954	34.9	H	46.0	-11.1	Peak	143	1.5
749.985	32.9	H	46.0	-13.1	Peak	182	1.0
900.006	35.0	H	46.0	-11.0	Peak	296	1.5

Final peak and average readings

Frequency	Level	Pol	FCC 15.247 / 15.209	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
199.408	43.0	H	43.5	-0.5	QP	120	1.6
265.812	27.2	H	46.0	-18.8	QP	131	1.0
532.954	26.5	H	46.0	-19.5	QP	183	1.5
30.411	30.9	V	40.0	-9.1	QP	159	1.0
749.985	34.1	H	46.0	-11.9	QP	181	1.0
298.678	22.9	V	46.0	-23.1	QP	240	1.4
900.006	20.1	H	46.0	-25.9	QP	315	1.0

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1b: Low Channel @ g mode, 2412 MHz





EMC Test Data

Client:	Broadcom Corporation				Job Number:	J93687	
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)				T-Log Number:	T93842	
Contact:	Anne Liang				Project Manager:	Sheareen Jacobs	
Standard:	15.247/RSS-210				Project Coordinator:	Irene	

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

Frequency	Level	Pol	FCC 15.247 / 15.209	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
30.753	34.6	V	40.0	-5.4	Peak	101	1.0
199.183	46.8	H	43.5	3.3	Peak	121	1.5
265.708	29.3	H	46.0	-16.7	Peak	244	1.0
299.750	33.1	H	46.0	-12.9	Peak	279	1.5
532.954	35.5	H	46.0	-10.5	Peak	157	1.5
749.985	33.7	H	46.0	-12.3	Peak	174	1.0
899.976	38.8	H	46.0	-7.2	Peak	141	1.5

Final peak and average readings

Frequency	Level	Pol	FCC 15.247 / 15.209	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
199.408	42.9	H	43.5	-0.6	QP	123	1.6
299.750	34.5	H	46.0	-11.5	QP	265	1.0
265.708	26.3	H	46.0	-19.7	QP	266	1.2
749.985	33.6	H	46.0	-12.4	QP	195	1.0
532.954	23.4	H	46.0	-22.6	QP	190	1.9
899.976	20.8	H	46.0	-25.2	QP	117	1.0
30.753	29.5	V	40.0	-10.5	QP	107	1.0

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2: Radiated Spurious Emissions, 30 - 1000 MHz. Operating Mode: BT Tx

Date of Test: 11/11/2013

Config. Used: 1

Test Engineer: Rafael Varelas

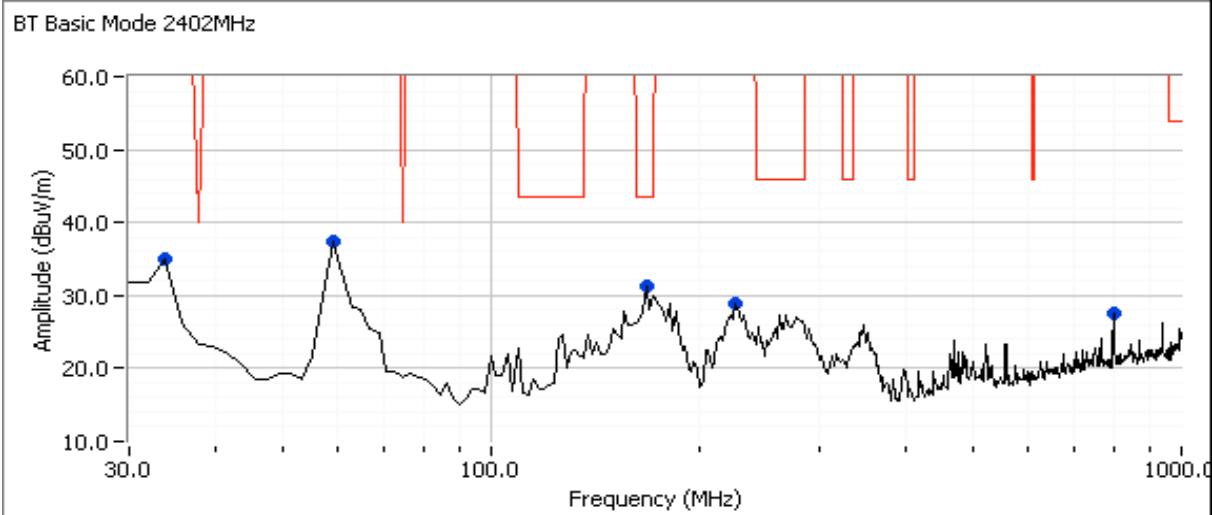
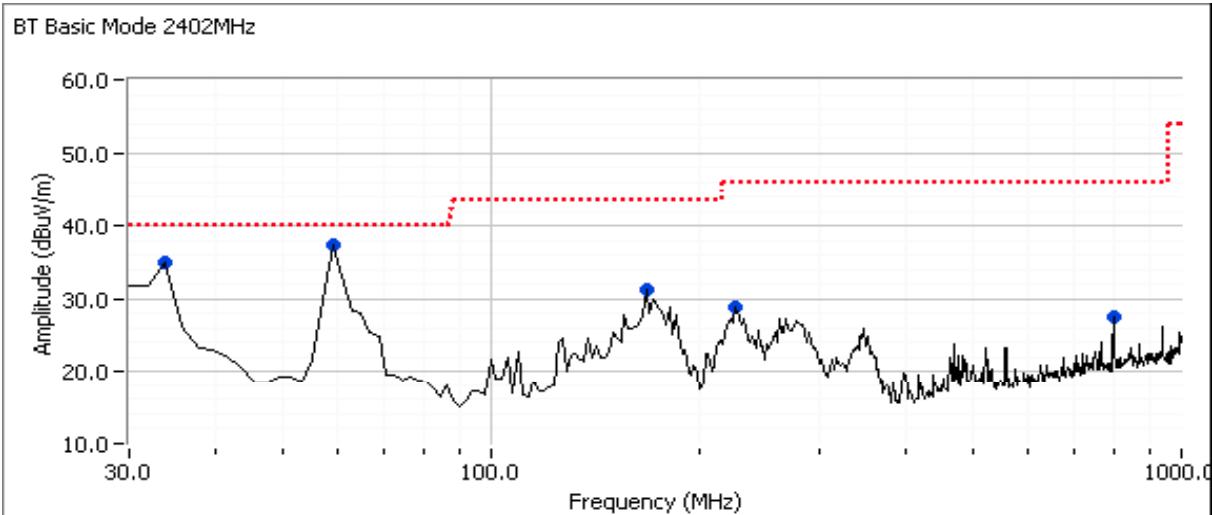
Config Change: none

Test Location: FT Chamber #5

EUT Voltage: Powered by Host

Test Parameters for Preliminary Scan(s)			
Frequency Range (MHz)	Prescan Distance (meters)	Limit Distance (meters)	Extrapolation Factor (dB, applied to data)
30 - 1000	3	3	0.0

Run #2a: Low Channel @ BT Basic mode, 2402 MHz





EMC Test Data

Client:	Broadcom Corporation			Job Number:	J93687	
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)			T-Log Number:	T93842	
Contact:	Anne Liang			Project Manager:	Sheareen Jacobs	
Standard:	15.247/RSS-210			Project Coordinator:	Irene	

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

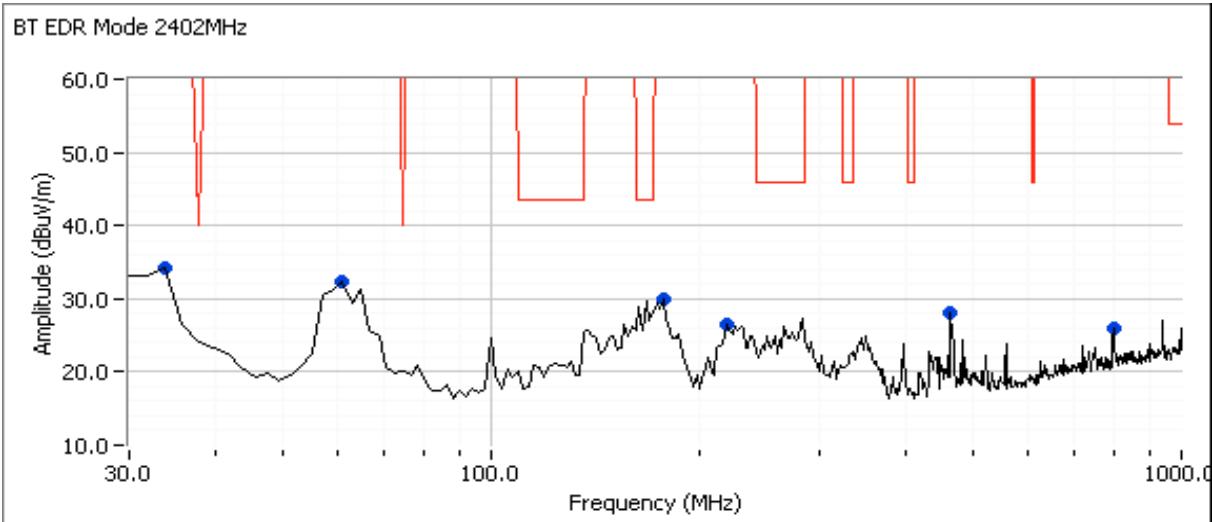
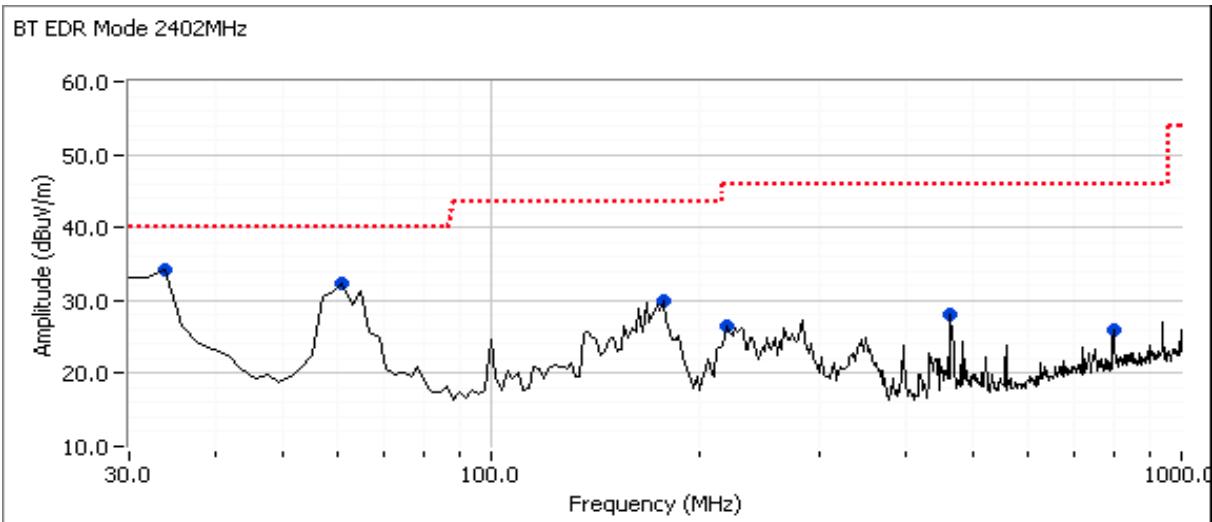
Frequency	Level	Pol	FCC 15.247 / 15.209	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
33.191	35.0	V	40.0	-5.0	Peak	96	1.0
60.859	37.3	V	40.0	-2.7	Peak	92	1.0
167.994	31.2	H	43.5	-12.3	Peak	224	2.0
226.909	28.8	V	46.0	-17.2	Peak	232	1.0
798.645	27.6	V	46.0	-18.4	Peak	236	1.0

Final readings

Frequency	Level	Pol	FCC 15.247 / 15.209	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
60.859	29.9	V	40.0	-10.1	QP	97	1.0
798.645	23.2	V	46.0	-22.8	QP	238	1.0
226.909	24.3	V	46.0	-21.7	QP	245	1.0
167.994	29.0	H	43.5	-14.5	QP	206	1.5
33.191	27.8	V	40.0	-12.2	QP	101	1.0

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2b: High Channel @ BT EDR mode, 2480 MHz





EMC Test Data

Client:	Broadcom Corporation				Job Number:	J93687	
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)				T-Log Number:	T93842	
Contact:	Anne Liang				Project Manager:	Sheareen Jacobs	
Standard:	15.247/RSS-210				Project Coordinator:	Irene	

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

Frequency	Level	Pol	FCC 15.247 / 15.209	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
32.291	34.2	V	40.0	-5.8	Peak	24	1.5
60.171	32.4	V	40.0	-7.6	Peak	64	1.0
177.644	29.9	H	43.5	-13.6	Peak	2	1.5
221.501	26.5	V	46.0	-19.5	Peak	47	1.0
465.929	28.2	H	46.0	-17.8	Peak	208	1.0
800.044	26.0	V	46.0	-20.0	Peak	198	1.0

Final peak and average readings

Frequency	Level	Pol	FCC 15.247 / 15.209	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
60.171	29.5	V	40.0	-10.5	QP	67	1.0
177.644	24.4	H	43.5	-19.1	QP	11	1.7
32.291	26.4	V	40.0	-13.6	QP	27	1.0
221.501	21.4	V	46.0	-24.6	QP	67	1.0
800.044	18.8	V	46.0	-27.2	QP	221	1.0
465.929	21.1	H	46.0	-24.9	QP	207	1.0



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions (Bluetooth - Basic/EDR FHSS modes)

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, unless otherwise noted.

Ambient Conditions:

Temperature: 23 °C
Rel. Humidity: 40 %

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

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	Basic Rate	2402MHz		default	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	46.9 dB μ V/m @ 2350.0 MHz (-7.1 dB)
				default	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	38.6 dB μ V/m @ 4803.9 MHz (-15.4 dB)
	Basic Rate	2442MHz		default	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	38.1 dB μ V/m @ 4883.9 MHz (-15.9 dB)
	Basic Rate	2480MHz		default	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	46.3 dB μ V/m @ 2483.6 MHz (-7.7 dB)
				default	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	39.3 dB μ V/m @ 4960.0 MHz (-14.7 dB)
2	EDR	2402MHz		default	Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	47.0 dB μ V/m @ 2350.7 MHz (-7.0 dB)
				default	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	37.6 dB μ V/m @ 4803.9 MHz (-16.4 dB)
	EDR	2442MHz		default	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	35.9 dB μ V/m @ 4883.9 MHz (-18.1 dB)
	EDR	2480MHz		default	Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	47.1 dB μ V/m @ 2483.5 MHz (-6.9 dB)
				default	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	35.4 dB μ V/m @ 4960.0 MHz (-18.6 dB)



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		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.

Sample Notes

Sample S/N: 001018E2EB19

Software: Broadcom Blue Tool Version 1.4.3

Driver: BCM43142A0_001.001.011.0161.0180

Antenna: 1000802

Test Board: 100-124289-0040 Rev02(S/N: 765588)

Laptop: Dell E6400 (S/N: DP3L9K1)

All testing performed on port J2. BT operation is limited to this port.

Procedure Comments:

Measurements performed in accordance with DA 00-0705

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle $\geq 98\%$ and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

2.4GHz band reject filter used

	Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
Basic	GFSK	1Mb/s	1.00					
EDR	8PSK	3Mb/s	1.00					

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Emission has duty cycle $\geq 98\%$, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 3:	Emission has duty cycle $< 98\%$, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle $< 98\%$ and is NOT constant, average measurement performed: RBW=1MHz, VBW > 1/T, peak detector, linear average mode, sweep time auto, max hold. Max hold for $50*(1/DC)$ traces
Note 5:	Emission has duty cycle $< 98\%$, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: Basic Rate

Date of Test: 11/9/2013

Config. Used: 2

Test Engineer: Jack Liu / R. Varelas

Config Change: none

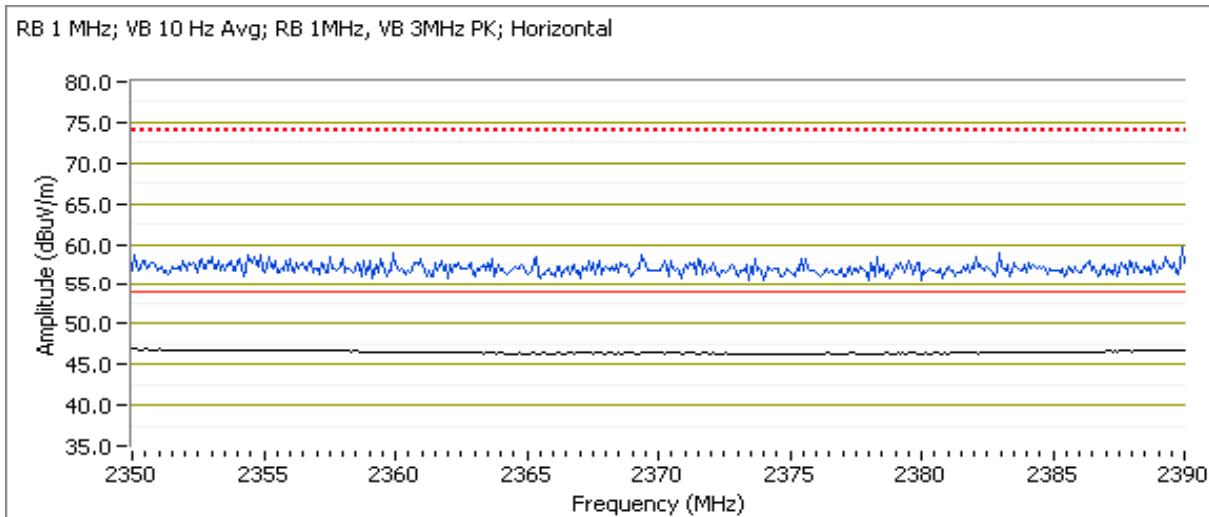
Test Location: FT chamber#5

EUT Voltage: Powered by Host

Run #1a: Low Channel

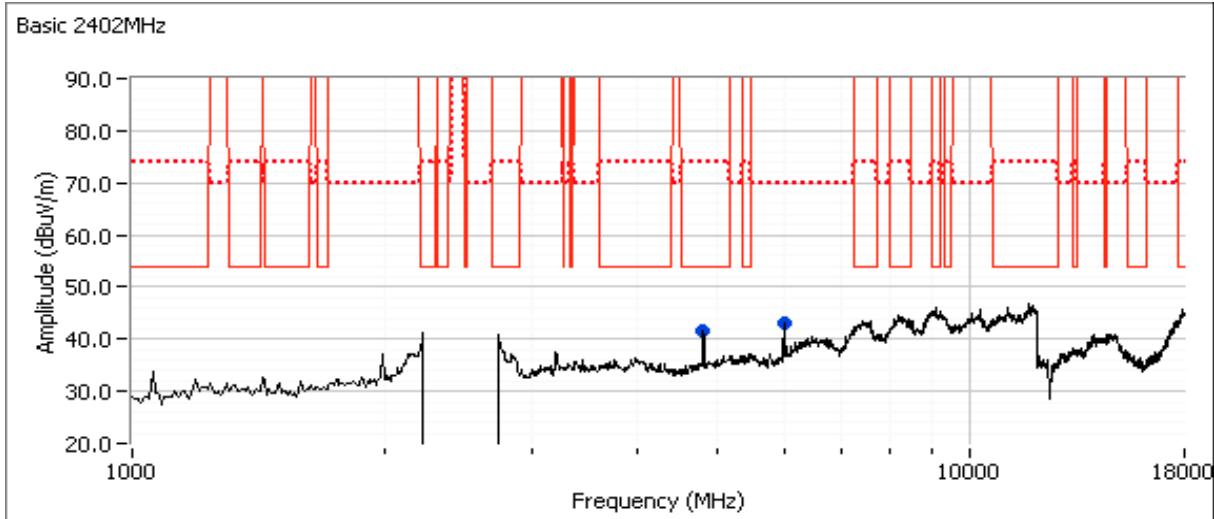
Channel: 2402MHz Mode: Basic Rate
Tx Chain: Aux - J2 Data Rate: 1Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength



Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2350.000	46.9	H	54.0	-7.1	AVG	112	1.0
2389.360	58.5	H	74.0	-15.5	PK	112	1.0
2350.000	46.9	V	54.0	-7.1	AVG	33	2.0
2372.280	58.4	V	74.0	-15.6	PK	33	2.0

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

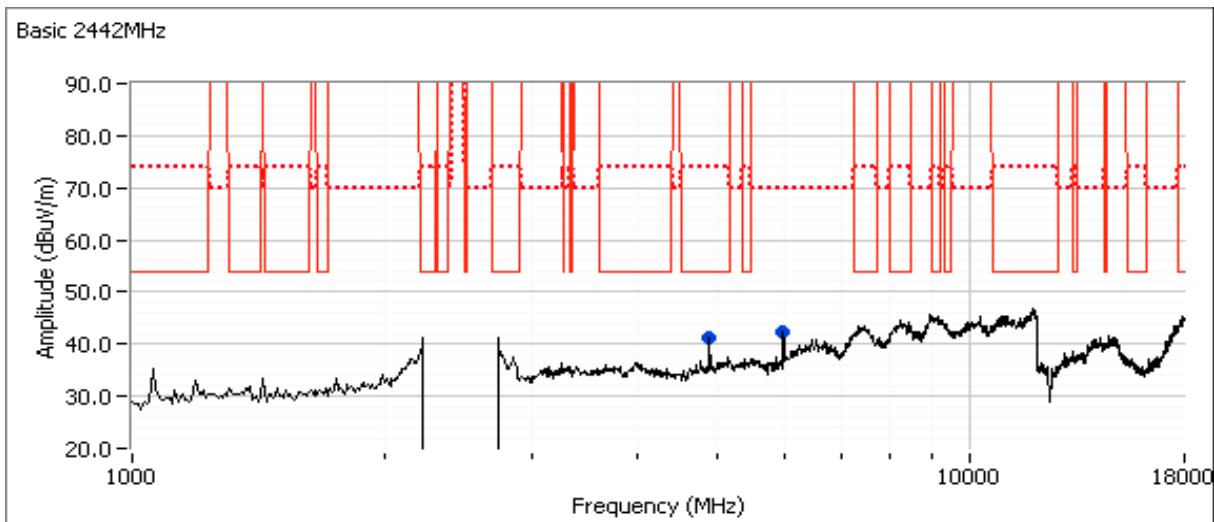


Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments	
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4803.920	38.6	H	54.0	-15.4	AVG	360	1.0	RB 1 MHz;VB 10 Hz;Peak
4804.350	45.8	H	74.0	-28.2	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak
5996.500	34.4	V	54.0	-19.6	AVG	124	1.0	Note 1
5996.270	45.5	V	74.0	-28.5	PK	124	1.0	Note 1

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1b: Center Channel

Channel: 2442MHz Mode: Basic Rate
Tx Chain: Aux - J2 Data Rate: 1Mb/s



Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB _{UV} /m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4883.900	38.1	H	54.0	-15.9	AVG	11	1.0	RB 1 MHz;VB 10 Hz;Peak
4884.280	45.5	H	74.0	-28.5	PK	11	1.0	RB 1 MHz;VB 3 MHz;Peak
5996.030	35.0	V	54.0	-19.0	AVG	122	1.0	Note 1
5997.860	46.8	V	74.0	-27.2	PK	122	1.0	Note 1

Note: Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range



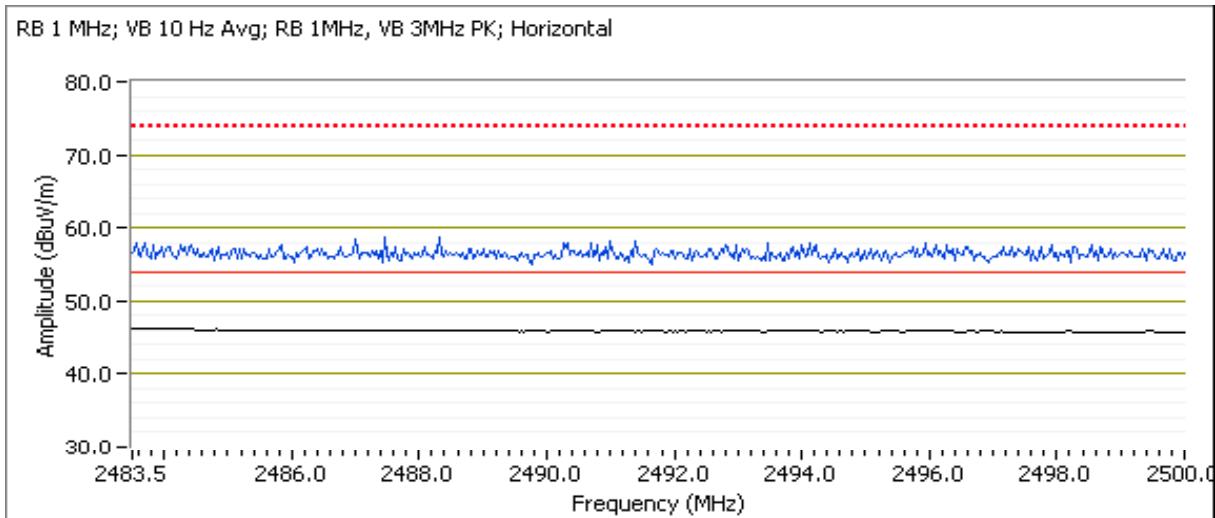
EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1c: High Channel

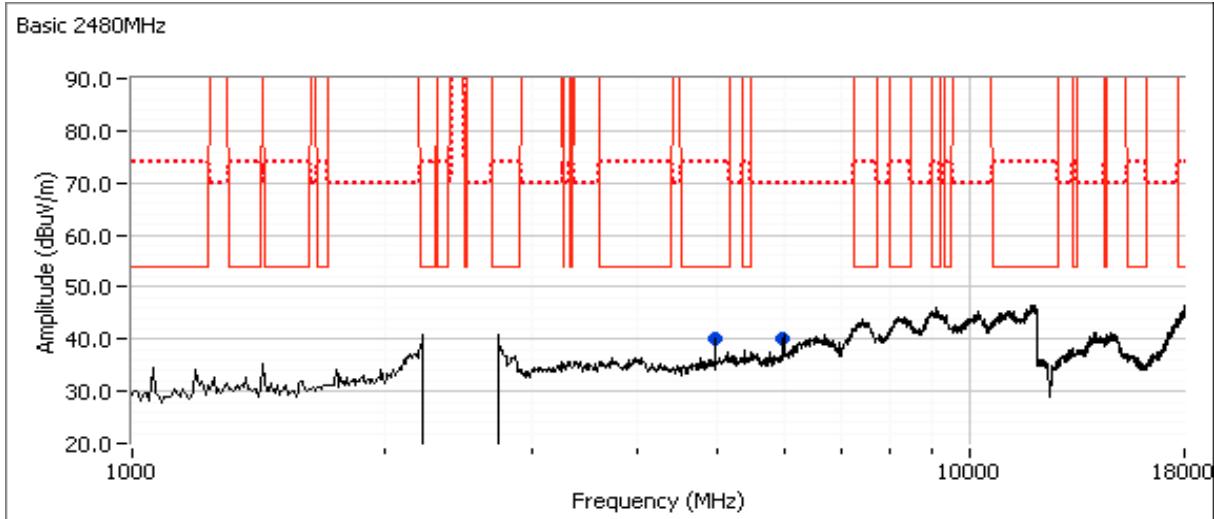
Channel: 2480MHz Mode: Basic Rate
 Tx Chain: Aux - J2 Data Rate: 1Mb/s

Band Edge Signal Field Strength - Direct measurement of field strength



Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2483.570	46.3	H	54.0	-7.7	AVG	164	1.7
2498.250	57.9	H	74.0	-16.1	PK	164	1.7
2483.500	46.0	V	54.0	-8.0	AVG	166	1.0
2484.530	57.2	V	74.0	-16.8	PK	166	1.0

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A



Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments	
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4959.950	39.3	H	54.0	-14.7	AVG	14	1.0	RB 1 MHz;VB 10 Hz;Peak
4959.550	46.3	H	74.0	-27.7	PK	14	1.0	RB 1 MHz;VB 3 MHz;Peak
5995.860	35.2	V	54.0	-18.8	AVG	127	1.0	Note 1
5995.500	47.1	V	74.0	-26.9	PK	127	1.0	Note 1



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2: Radiated Spurious Emissions, 1,000 - 25000 MHz. Operating Mode: EDR

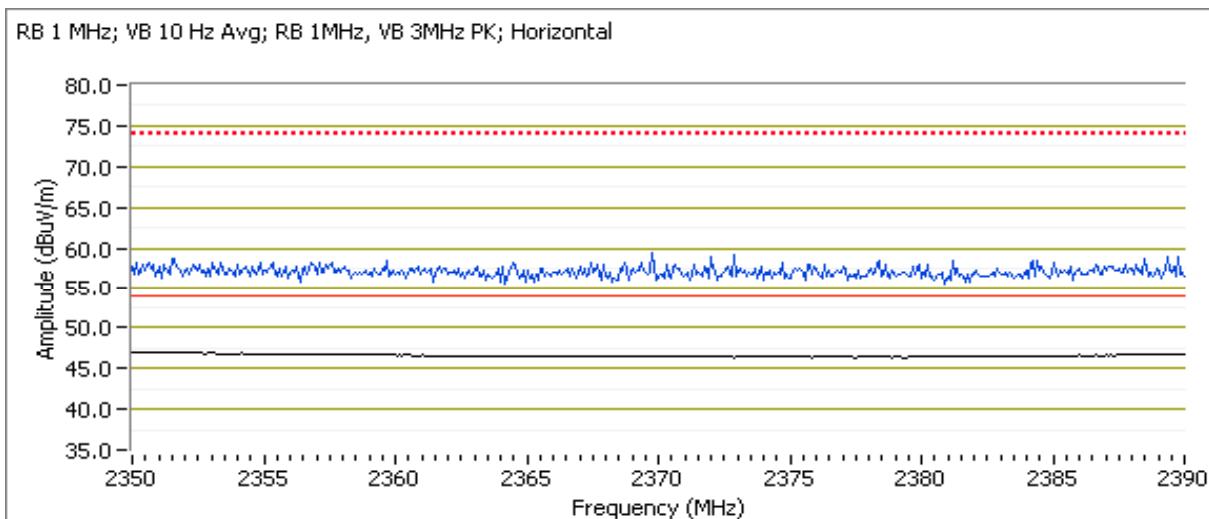
Date of Test: 11/9/2013
 Test Engineer: Jack Liu / R. Varelas
 Test Location: FT chamber#5

Config. Used: 2
 Config Change: none
 EUT Voltage: Powered by Host

Run #2a: Low Channel

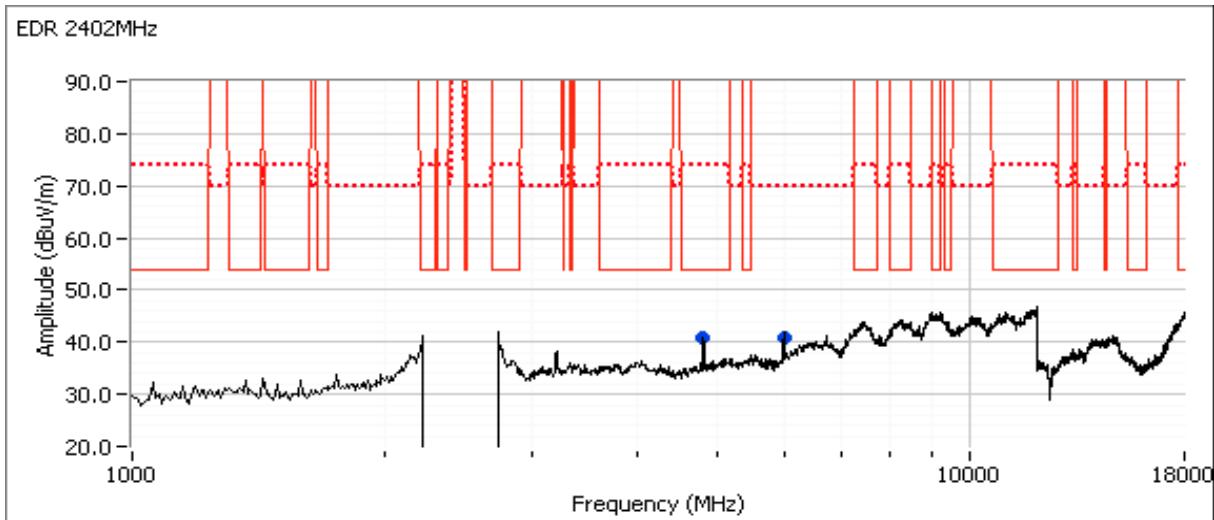
Channel: 2402MHz Mode: EDR
 Tx Chain: Aux - J2 Data Rate: 3Mb/s

Band Edge Signal Field Strength



Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2350.720	47.0	H	54.0	-7.0	AVG	0	1.0
2363.710	58.0	H	74.0	-16.0	PK	0	1.0
2350.160	46.9	V	54.0	-7.1	AVG	359	1.0
2358.340	58.2	V	74.0	-15.8	PK	359	1.0

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

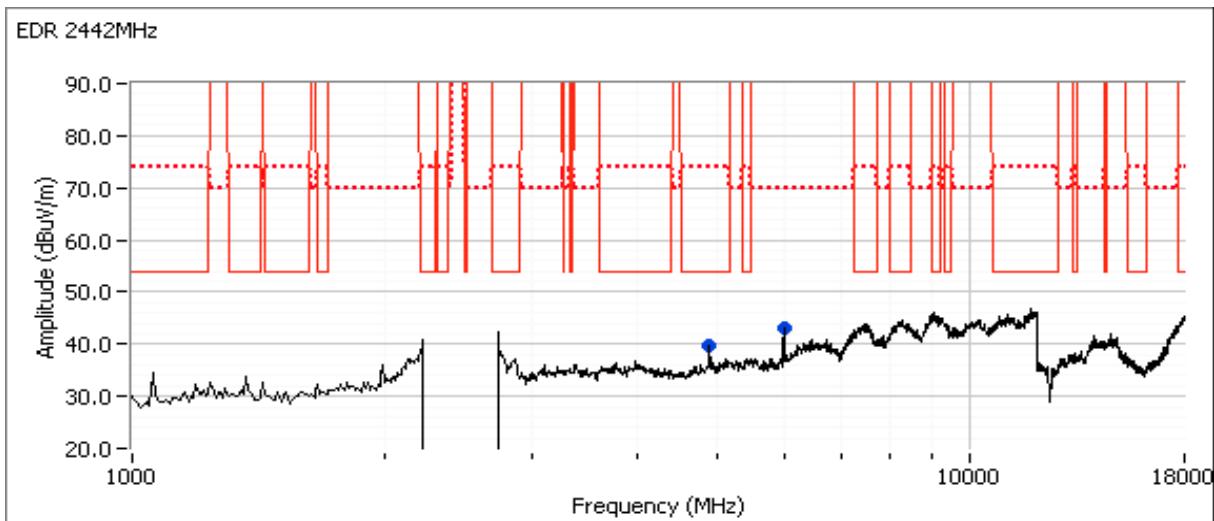


Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments	
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4803.920	37.6	H	54.0	-16.4	AVG	360	1.0	RB 1 MHz;VB 10 Hz;Peak
4803.970	46.7	H	74.0	-27.3	PK	360	1.0	RB 1 MHz;VB 3 MHz;Peak
5995.840	35.1	V	54.0	-18.9	AVG	124	1.0	Note 1
5991.640	47.3	V	74.0	-26.7	PK	124	1.0	Note 1

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #2b: Center Channel

Channel: 2442MHz Mode: EDR
Tx Chain: Aux - J2 Data Rate: 3Mb/s



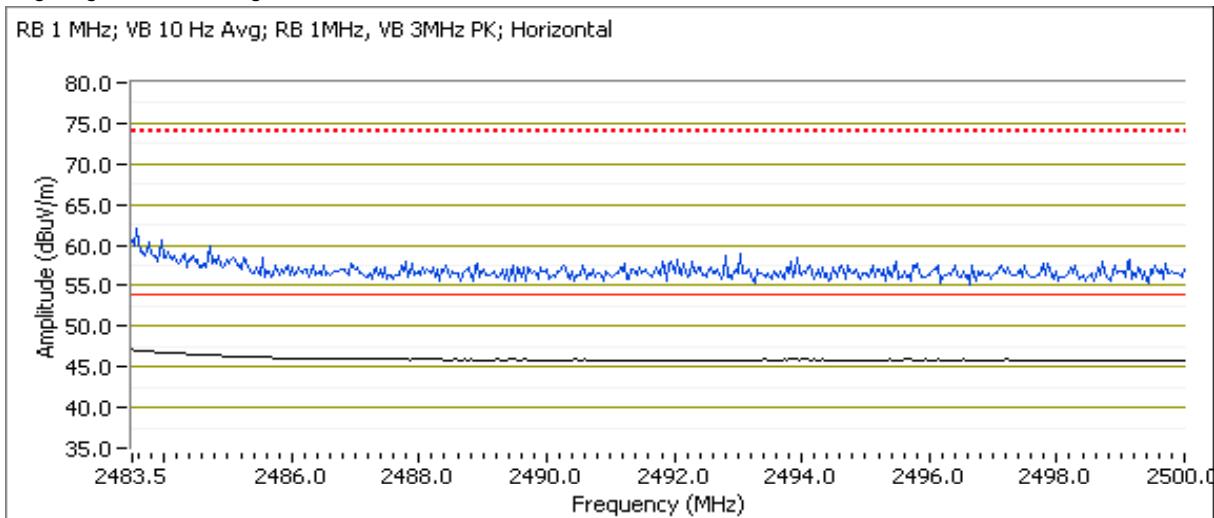
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB _L V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4883.930	35.9	V	54.0	-18.1	AVG	127	1.0	RB 1 MHz;VB 10 Hz;Peak
4883.780	45.6	V	74.0	-28.4	PK	127	1.0	RB 1 MHz;VB 3 MHz;Peak
5995.900	35.0	V	54.0	-19.0	AVG	125	1.0	Note 1
5997.700	46.5	V	74.0	-27.5	PK	125	1.0	Note 1

Note: Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

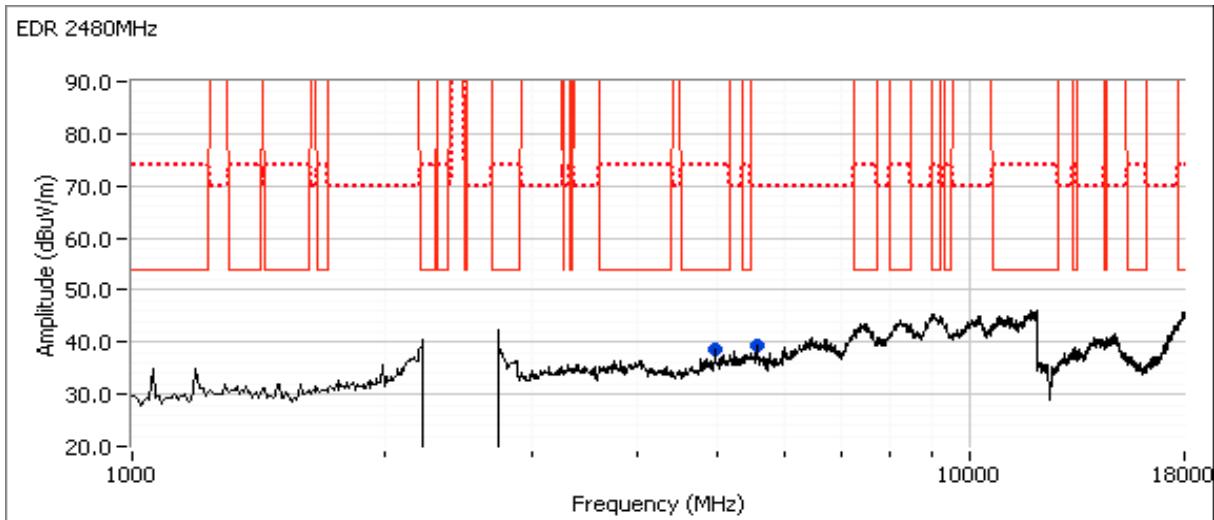
Run #2c: High Channel

Channel: 2480MHz Mode: EDR
Tx Chain: Aux - J2 Data Rate: 3Mb/s

Band Edge Signal Field Strength


Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
2483.500	47.1	H	54.0	-6.9	AVG	190	1.0
2483.730	58.4	H	74.0	-15.6	PK	190	1.0
2483.570	46.1	V	54.0	-7.9	AVG	37	1.5
2497.390	57.6	V	74.0	-16.4	PK	37	1.5

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A



Frequency	Level	Pol	15.209 / 15.247	Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters
4960.030	35.4	V	54.0	-18.6	AVG	85	1.9
4959.930	44.9	V	74.0	-29.1	PK	85	1.9
5564.150	31.1	V	54.0	-22.9	AVG	48	1.0
5557.690	42.3	V	74.0	-31.7	PK	48	1.0



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
		Project Manager:	Sheareen Jacobs
Contact:	Anne Liang	Project Coordinator:	Irene
Standard:	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: 11/13/2013 Config. Used: 2
Test Engineer: Rafael Varelas Config Change: None
Test Location: FT Lab #4A Host Unit Voltage Host Laptop (120/60Hz)

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: 22.3 °C
Rel. Humidity: 41 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	30 - 25000 MHz - Transmitter Conducted Spurious Emissions	FCC Part 15.247(c)	Pass	All Emissions below -20dBc Limit
2	Output Power	15.247(b)	Pass	GFSK: 0.1 dBm (0.0010 W) 8PSK: 1.7 dBm (0.0015 W)
3	20dB Bandwidth	15.247(a)	Pass	GFSK: 960 kHz 8PSK: 1390 KHz
3	99% bandwidth	15.247(a)	Pass	GFSK: 903 kHz 8PSK: 1248 KHz
4	Channel Occupancy	15.247(a)	Pass	1 MHz
4	Number of Channels	15.247(a)	Pass	79 Channels



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		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.

Sample Notes

Sample S/N: 001018E2EB19

Software: Broadcom Blue Tool Version 1.4.3

Driver: BCM43142A0_001.001.011.0161.0180

Antenna: 1000802

Test Board: 100-124289-0040 Rev02(S/N: 765588)

Laptop: Dell E6400 (S/N: DP3L9K1)

All testing performed on port J2. BT operation is limited to this port.

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

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

Date of Test: 11/13/2013

Test Engineer: Rafael Varelas

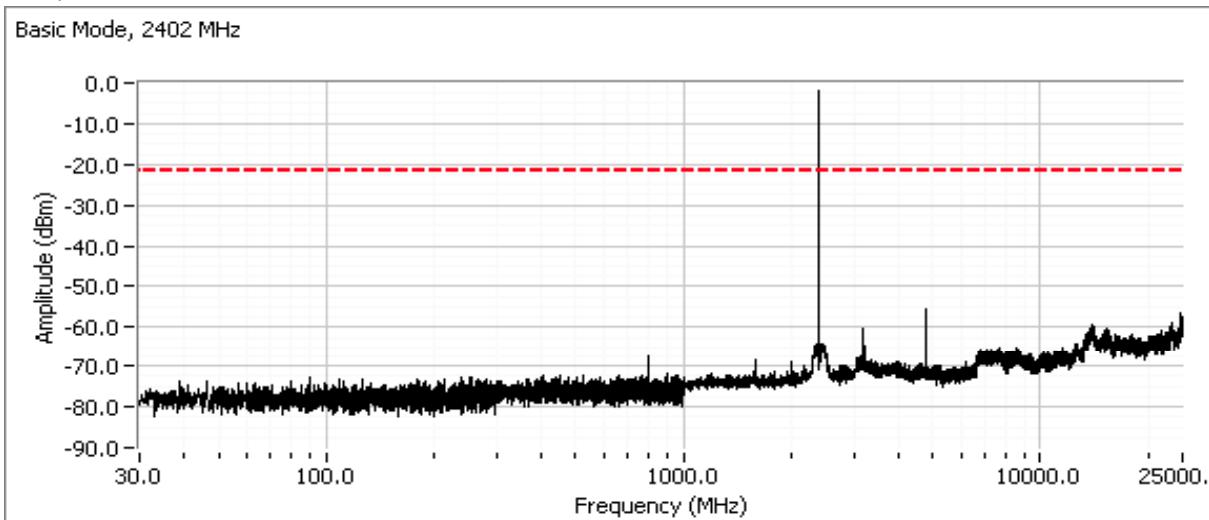
Test Location: FT Lab #4A

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 with the hopping feature disabled.

Basic Mode

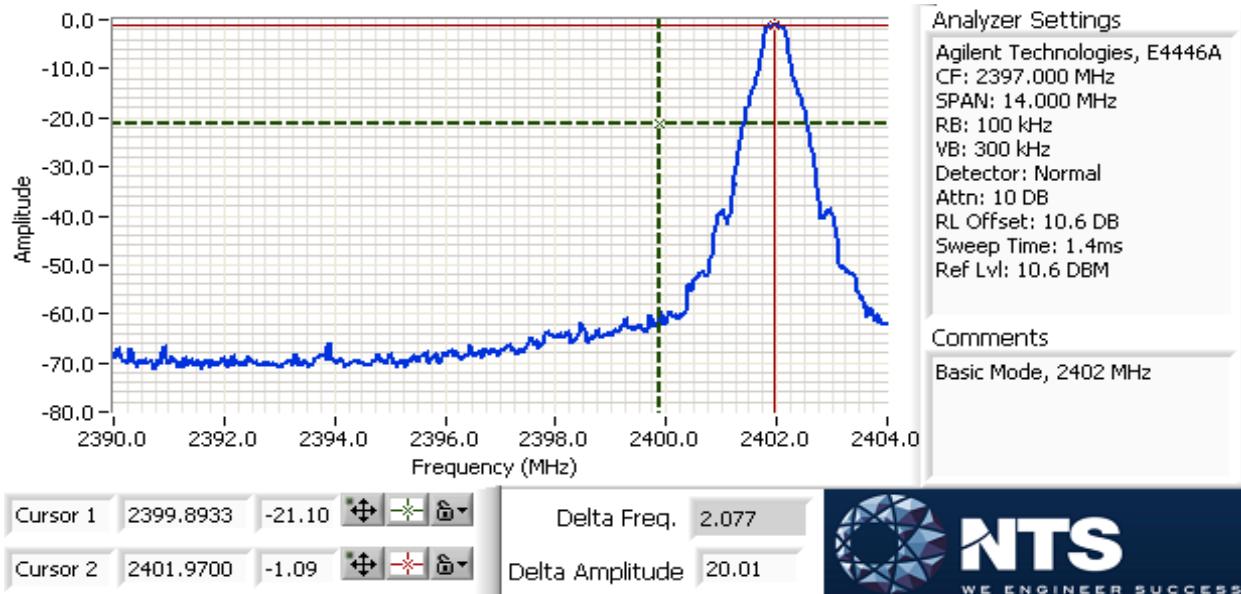
Low channel

Broadband plot

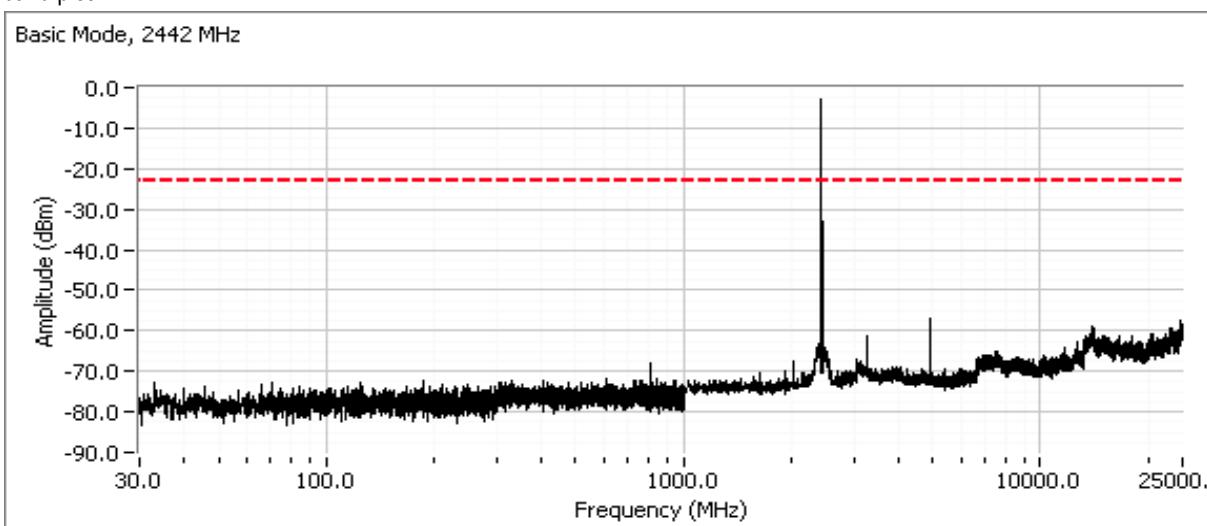


Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Plot showing -20dBc at the lower band edge

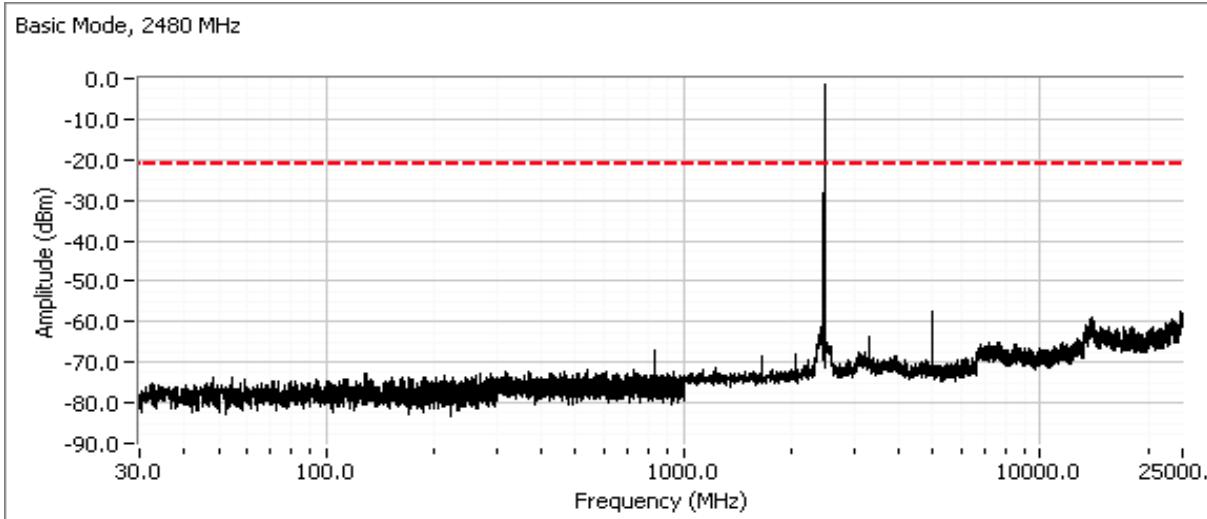


Center channel
Broadband plot

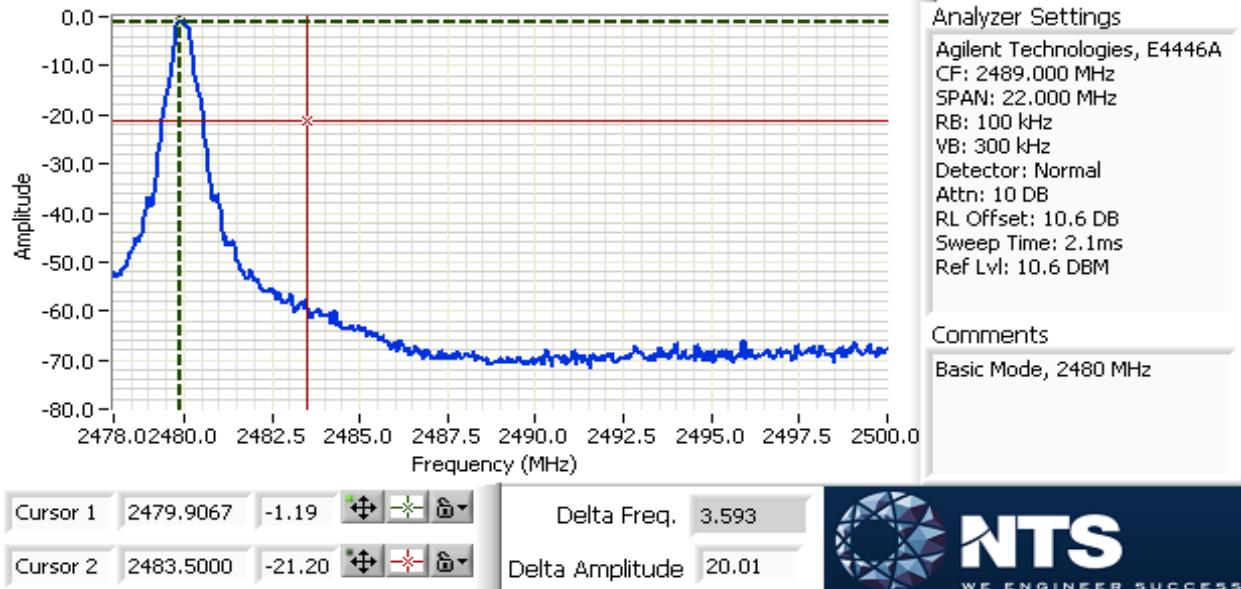


Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

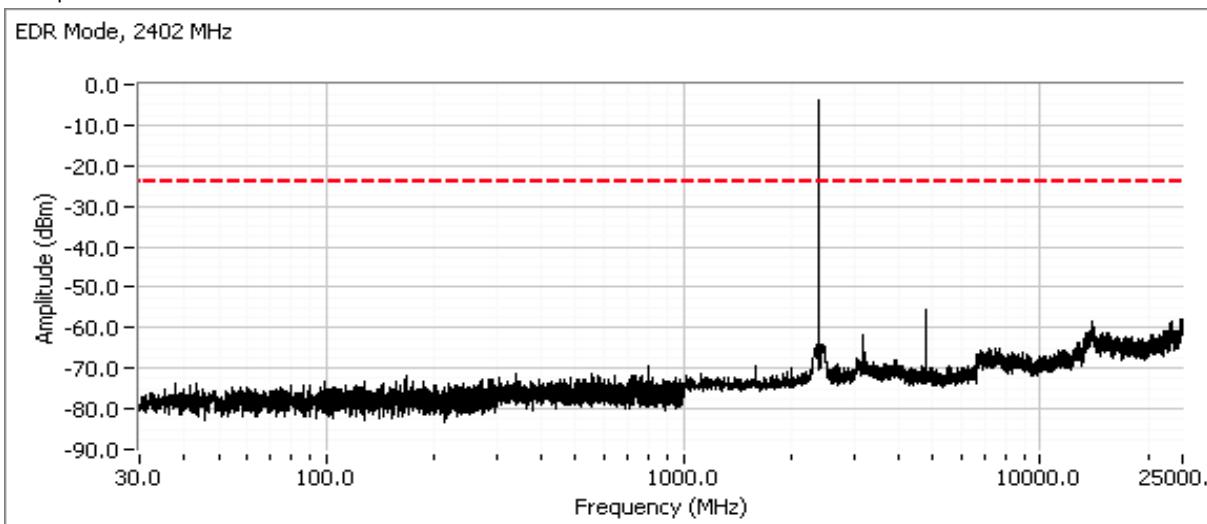
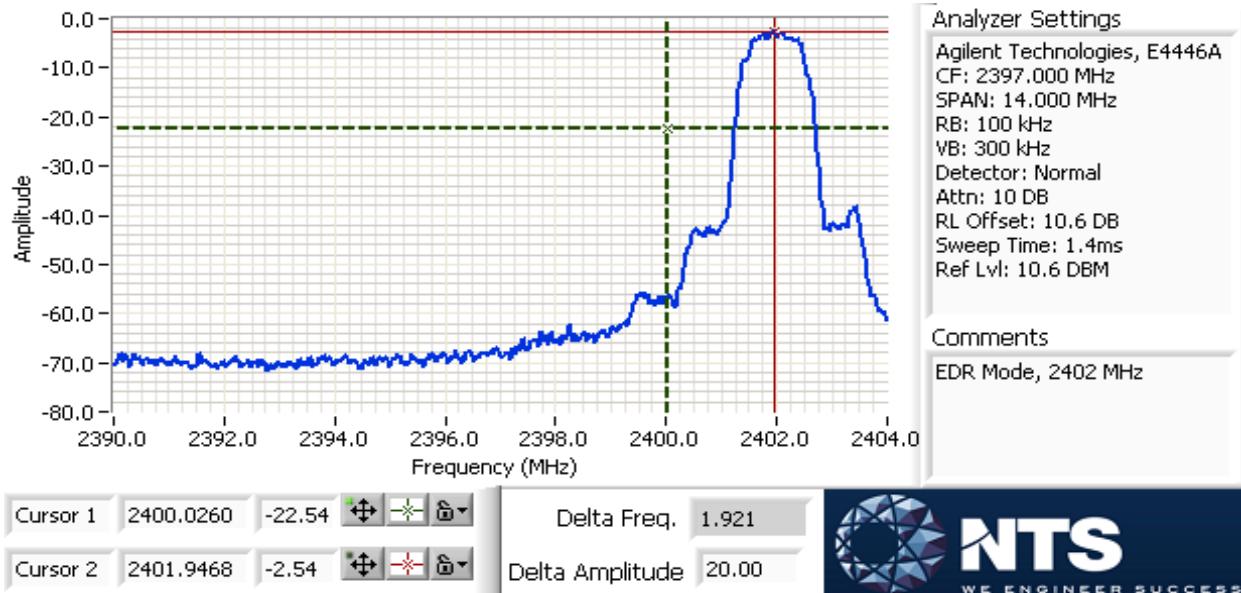
High channel
Broadband plot



Plot showing -20dBc at the upper band edge



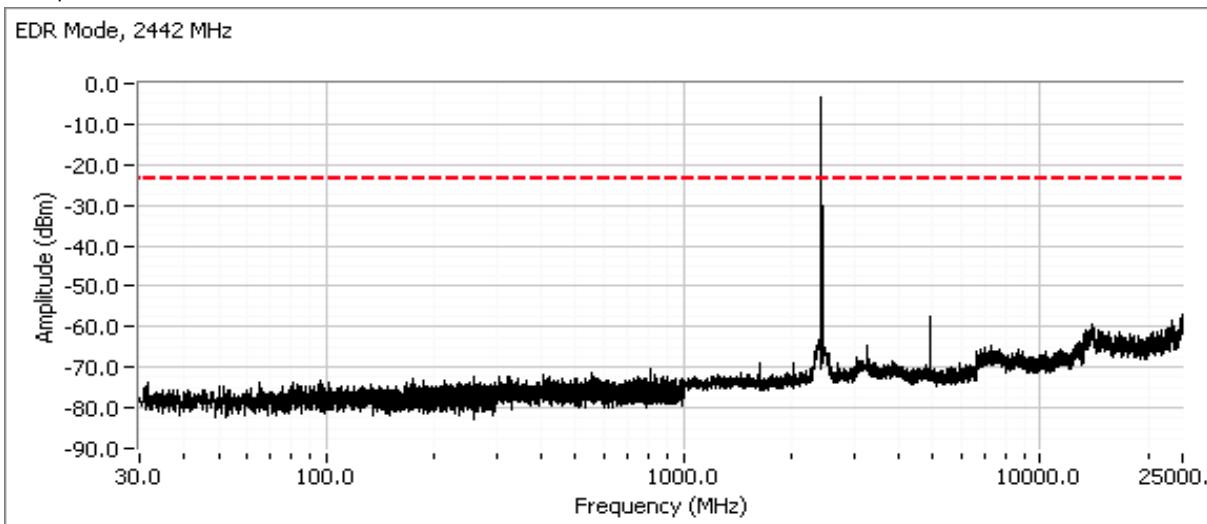
Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

EDR Mode
Low channel
Broadband plot

Plot showing -20dBc at the lower band edge


Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

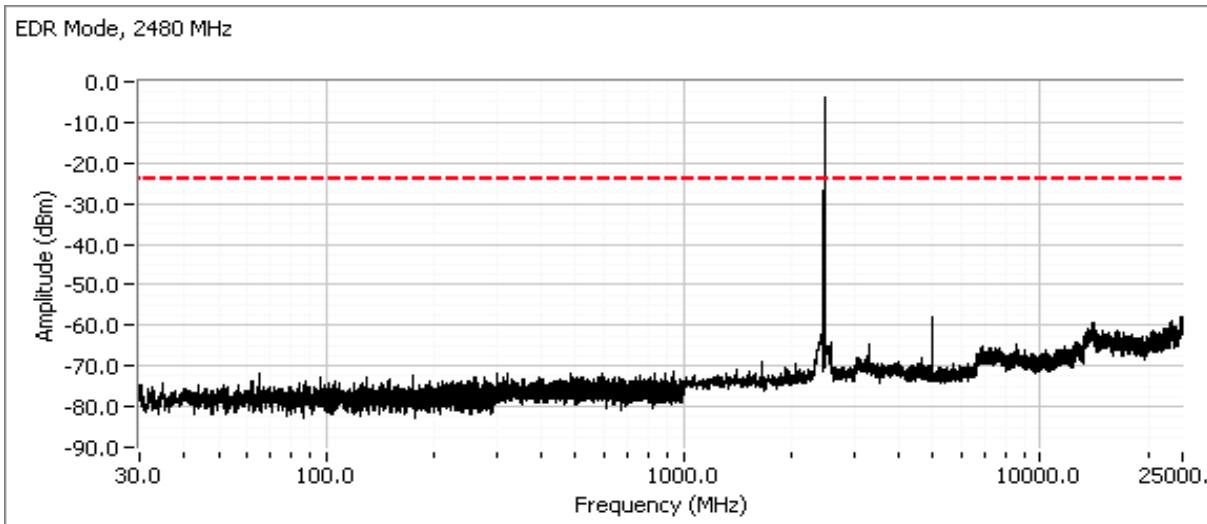
Center channel

Broadband plot



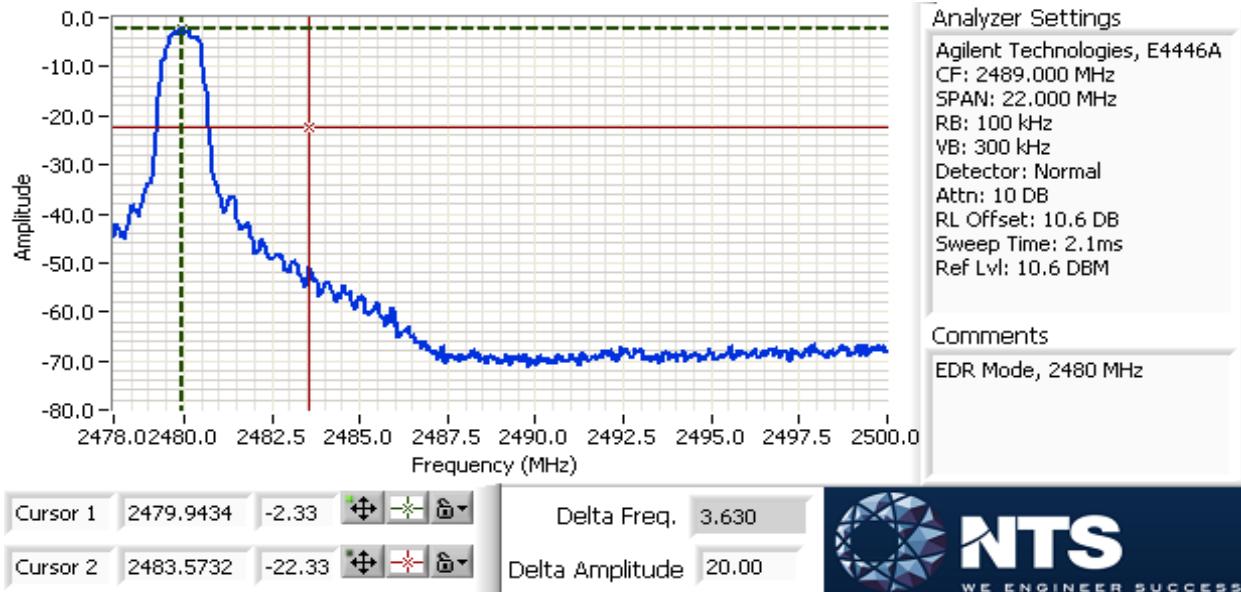
High channel

Broadband plot



Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Plot showing -20dBc at the upper band edge





EMC Test Data

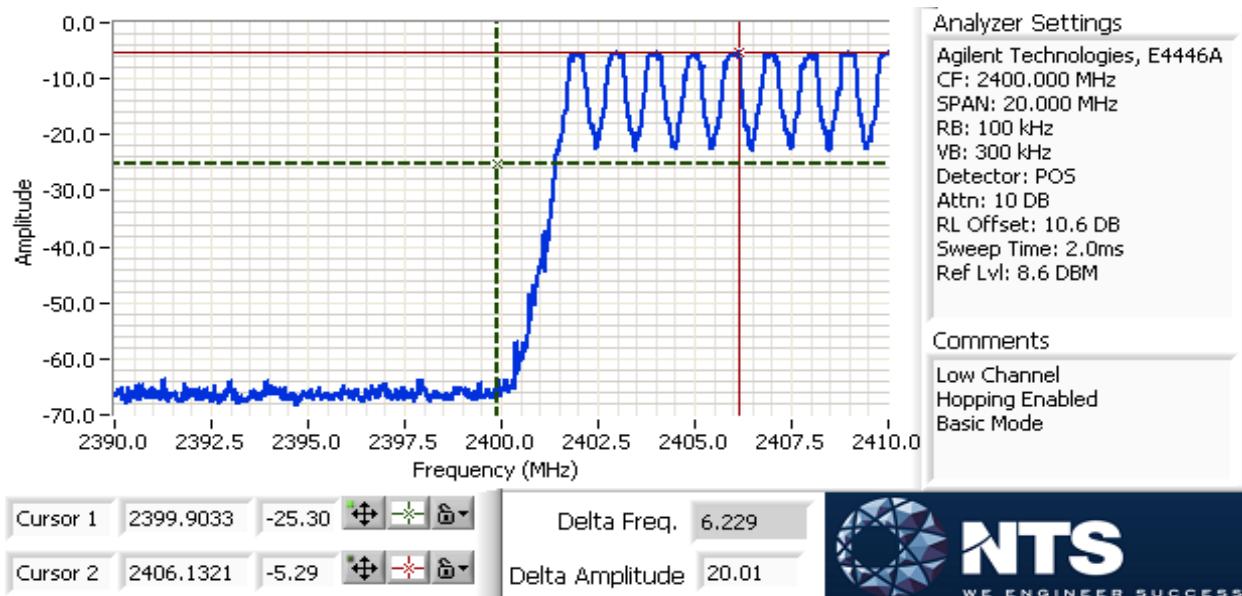
Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

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 with the hopping feature enabled to show compliance with the -20dBC requirement at the allocated band edge. The spectrum analyzer is left in max hold mode until the trace stabilizes.

Basic Mode

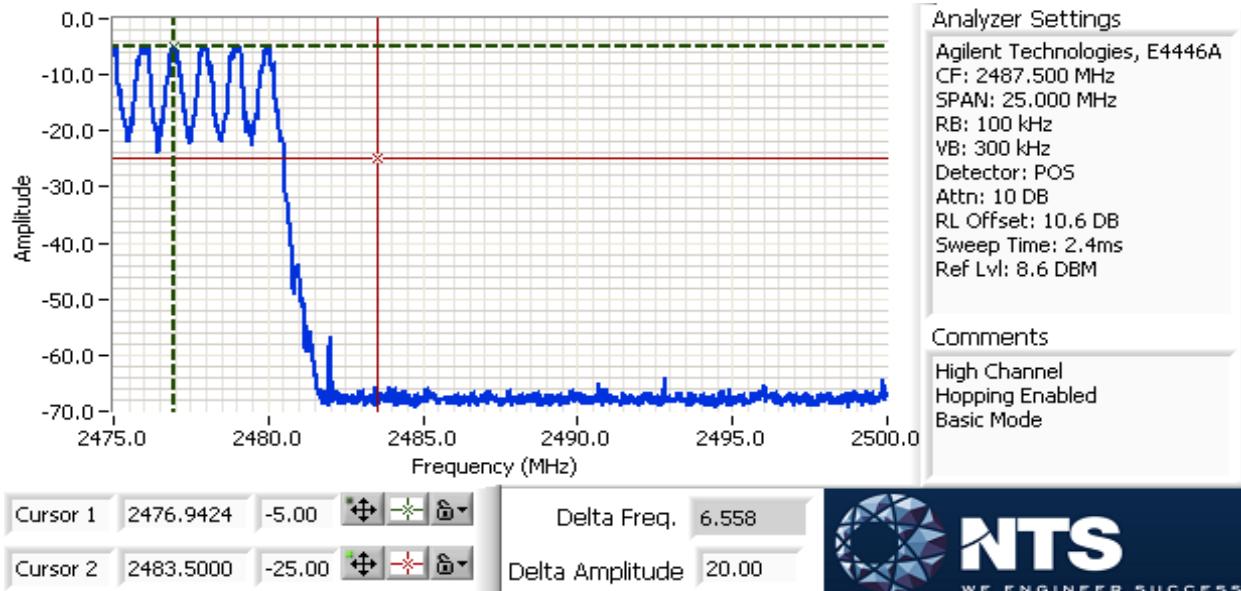
Low channel, hopping enabled

Plot showing -20dBC at the lower band edge



Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

High channel, hopping enabled
Plot showing -20dBc at the upper band edge

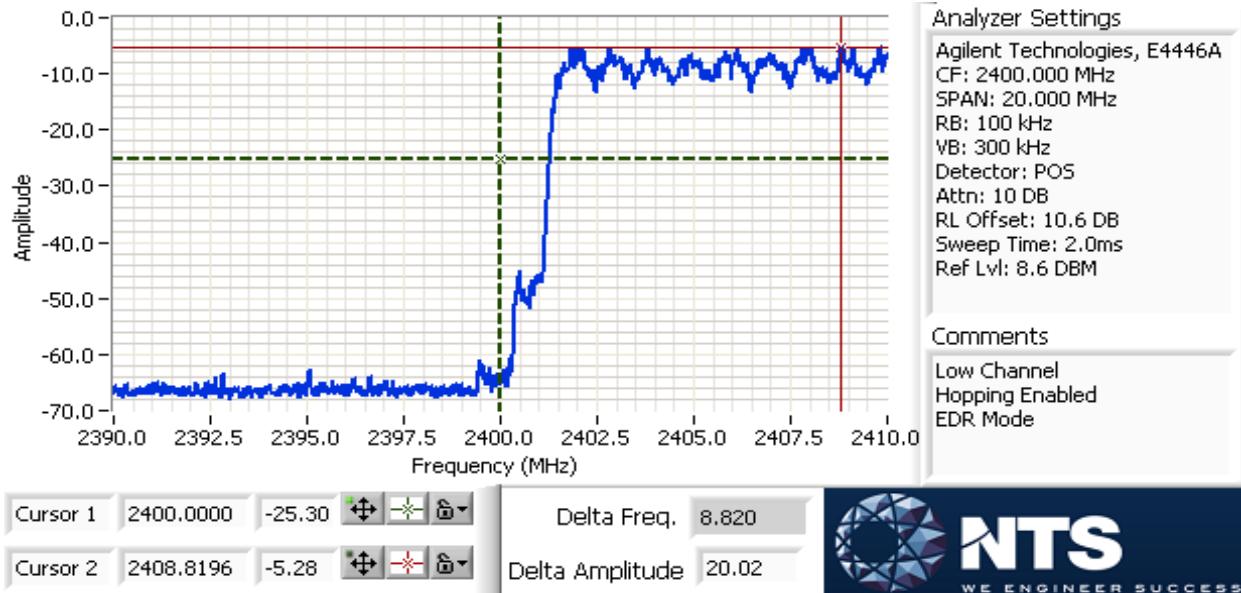


Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

EDR Mode

Low channel, hopping enabled

Plot showing -20dBc at the lower band edge

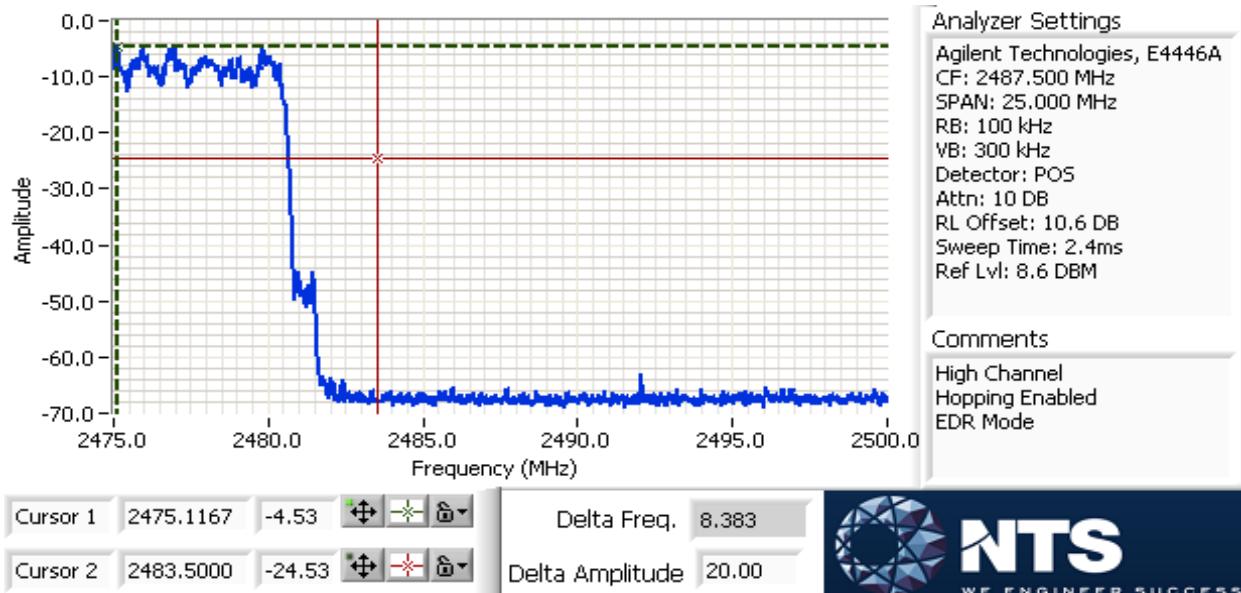




EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

High channel, hopping enabled
Plot showing -20dBc at the upper band edge



Run #2: Output Power

Date of Test: 11/13/2013

Test Engineer: Rafael Varelas

Test Location: FT Lab #4A

For frequency hopping systems operating in the 2400-2483.5 MHz band, with channel separation > 2/3 of the 20dB BW: 0.125 watts.
Power measured with a peak power meter.

Maximum antenna gain: 3.8 dBi

Channel	Frequency (MHz)	Mode	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	2402	GFSK	-0.1	0.00098	0.0023
Mid	2442	GFSK	-0.4	0.00091	0.0022
High	2480	GFSK	0.1	0.00102	0.0025
Low	2402	8PSK	1.3	0.00135	0.0032
Mid	2442	8PSK	1.2	0.00132	0.0032
High	2480	8PSK	1.7	0.00148	0.0035



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

Run #3: Bandwidth

Date of Test: 11/13/2013

Test Engineer: Rafael Varelas

Test Location: FT Lab #4A

Mode: GFSK

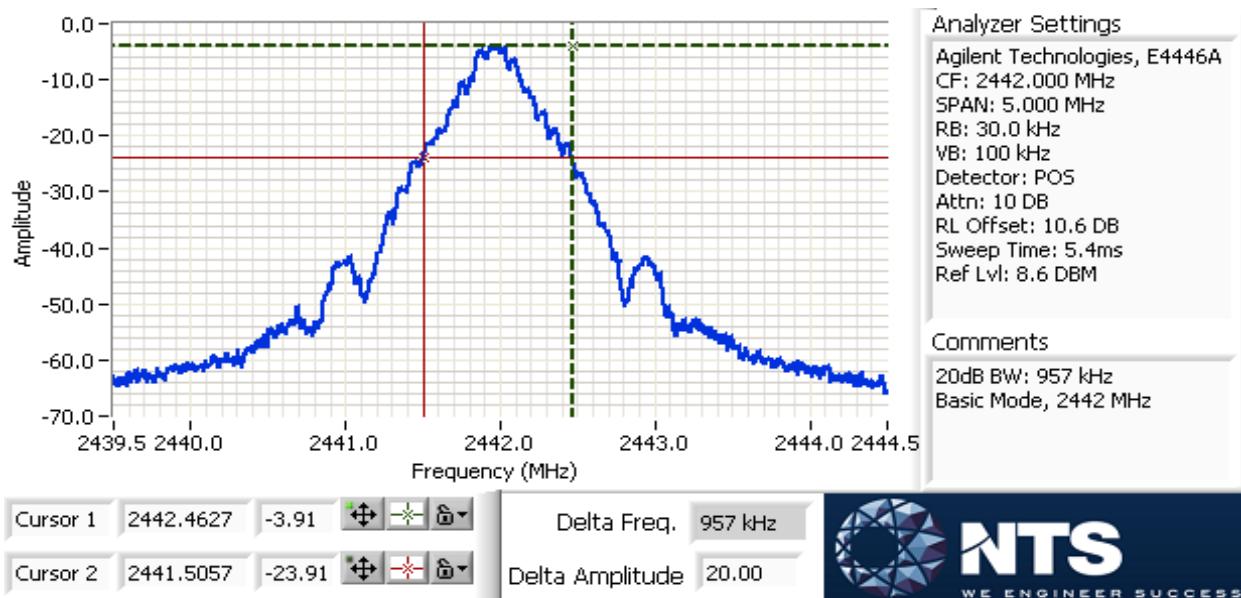
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	30kHz	960	30kHz	895
Mid	2442	30kHz	957	30kHz	903
High	2480	30kHz	959	30kHz	903

Mode: 8PSK

Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	30kHz	1384	30kHz	1238
Mid	2442	30kHz	1390	30kHz	1248
High	2480	30kHz	1389	30kHz	1248

Note 1: 20dB bandwidth measured using RB = 30kHz, VB = 100kHz (VB > RB)

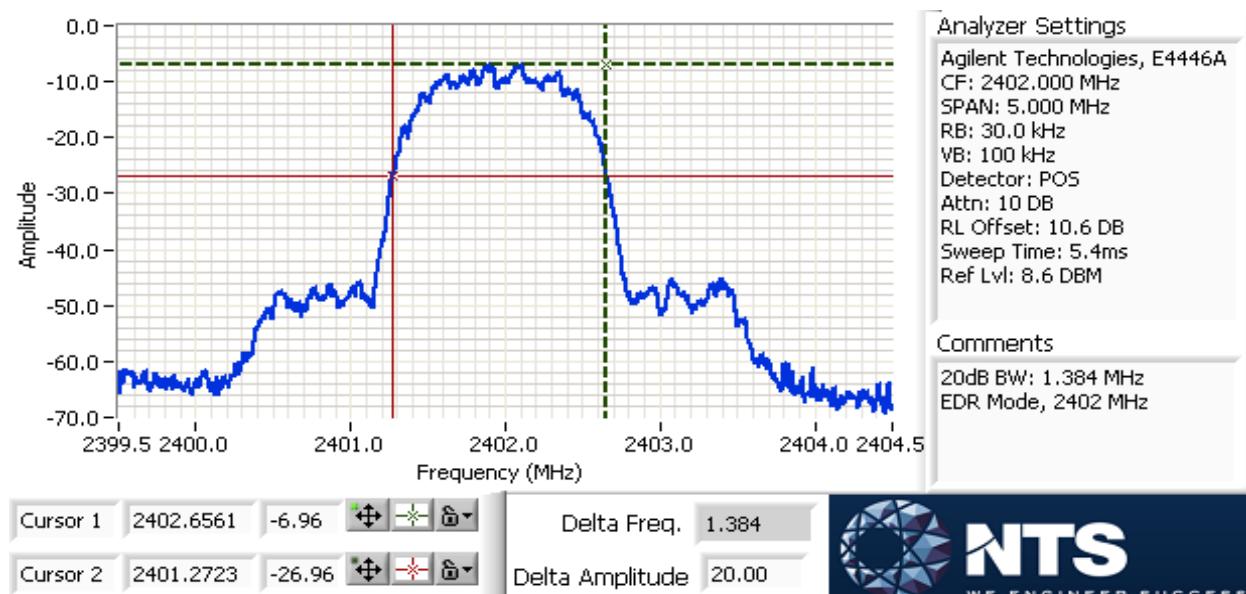
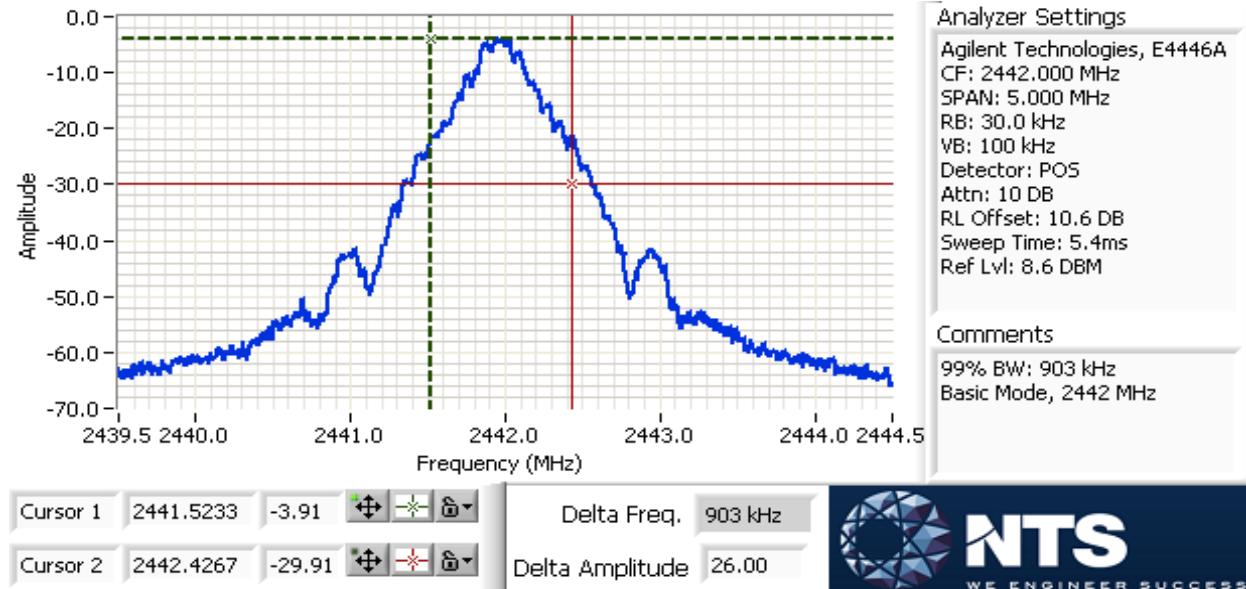
Note 2: 99% bandwidth measured using RB = 30kHz, VB = 100kHz (VB >=3RB)





EMC Test Data

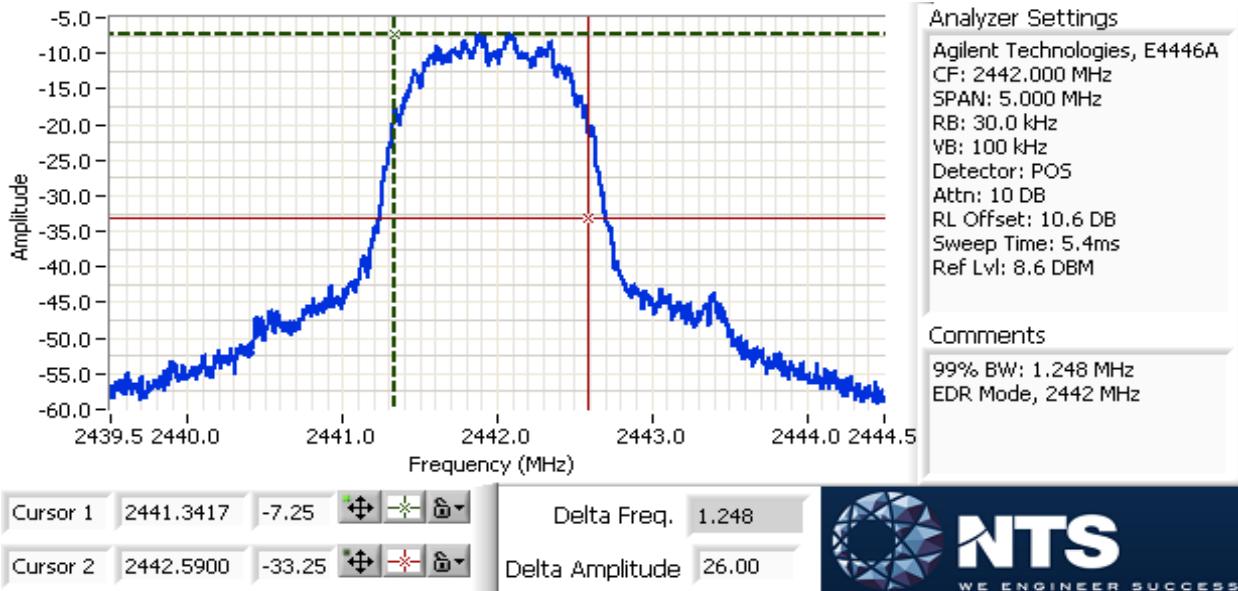
Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A





EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A





EMC Test Data

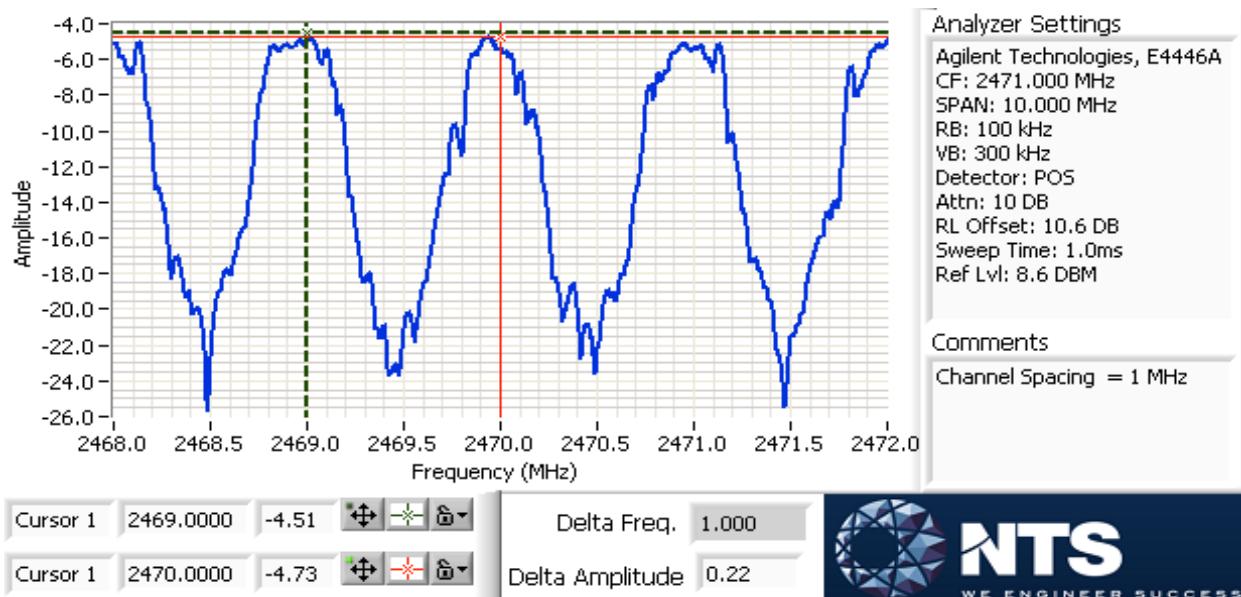
Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
			Class: N/A

Run #4: Channel Occupancy, Spacing and Number of Channels

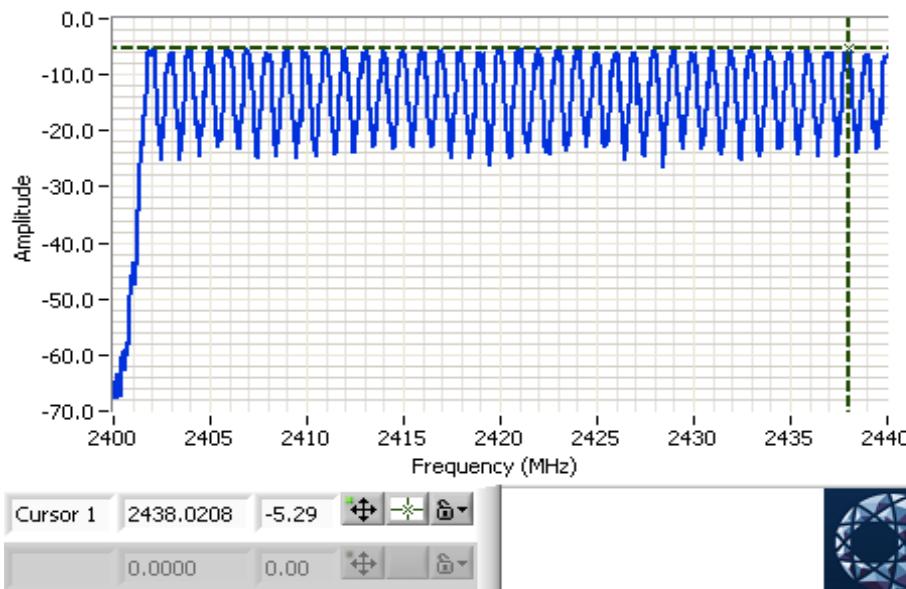
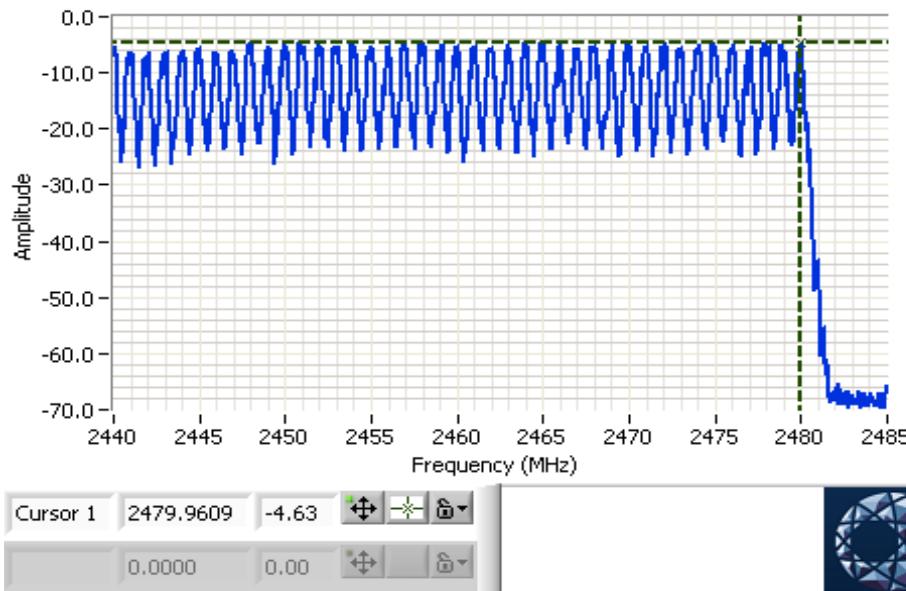
Date of Test: 11/13/2013

Test Engineer: Rafael Varelas

Test Location: FT Lab #4A



Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A





EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		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, unless otherwise noted.

Ambient Conditions:

Temperature: 20.5 °C
Rel. Humidity: 38 %

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

Run #	Mode	Channel	Target Power	Power Setting	Test Performed	Limit	Result / Margin
1	11b BT-Basic	2412MHz 2480MHz	-	-	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	52.1 dB μ V/m @ 4823.9 MHz (-1.9 dB)
	11b BT-Basic	2472MHz 2402MHz	-	-	Radiated Emissions, 1 - 25 GHz	FCC Part 15.209 / 15.247(c)	52.3 dB μ V/m @ 4943.9 MHz (-1.7 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.



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Sample Notes

Sample S/N: 001018E2EB21

Driver: 6.30.223.181

Antenna: 1000802

The Aux port (J2) was configured for BT and the Main port (J1) was configured for WiFi.

Procedure Comments:

Measurements performed in accordance with FCC KDB 558074

Peak measurements performed with: RBW=1MHz, VBW=3MHz, peak detector, max hold, auto sweep time

Unless otherwise stated/noted, emission has duty cycle $\geq 98\%$ and was measured using RBW=1MHz, VBW=10Hz, peak detector, linear average mode, auto sweep time, max hold.

2.4GHz band reject filter used

	Mode	Data Rate	Duty Cycle (x)	Constant DC?	T (ms)	Pwr Cor Factor*	Lin Volt Cor Factor**	Min VBW for FS (Hz)
	11b	1 Mb/s	1.00	Yes	8.4	0.02	0.04	119.04762
Basic	GFSK	PRBS9	1.00					

Measurement Specific Notes:

Note 1:	Emission in non-restricted band, but limit of 15.209 used.
Note 2:	Emission in non-restricted band, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Emission has duty cycle $\geq 98\%$, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces
Note 3:	Emission has duty cycle $< 98\%$, but constant, average measurement performed: RBW=1MHz, VBW=10Hz, peak detector, linear averaging, auto sweep, trace average 100 traces, measurement corrected by Linear Voltage correction factor
Note 4:	Emission has duty cycle $< 98\%$ and is NOT constant, average measurement performed: RBW=1MHz, VBW $> 1/T$, peak detector, linear average mode, sweep time auto, max hold. Max hold for $50*(1/DC)$ traces
Note 5:	Emission has duty cycle $< 98\%$, but constant, average measurement performed: RBW=1MHz, VBW=3MHz, RMS, Power averaging, auto sweep, trace average 100 traces, measurement corrected by Pwr correction factor
Note 6:	Plots of the average and peak bandedge do not account for any duty cycle correction. Refer to the tabular results for final measurements.

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

Run #1: Radiated Spurious Emissions, 1,000 - 25000 MHz. Intermodulations

Date of Test: 11/19/2013 0:00

Config. Used: 1

Test Engineer: Rafael Varelas

Config Change: None

Test Location: FT Chamber #5

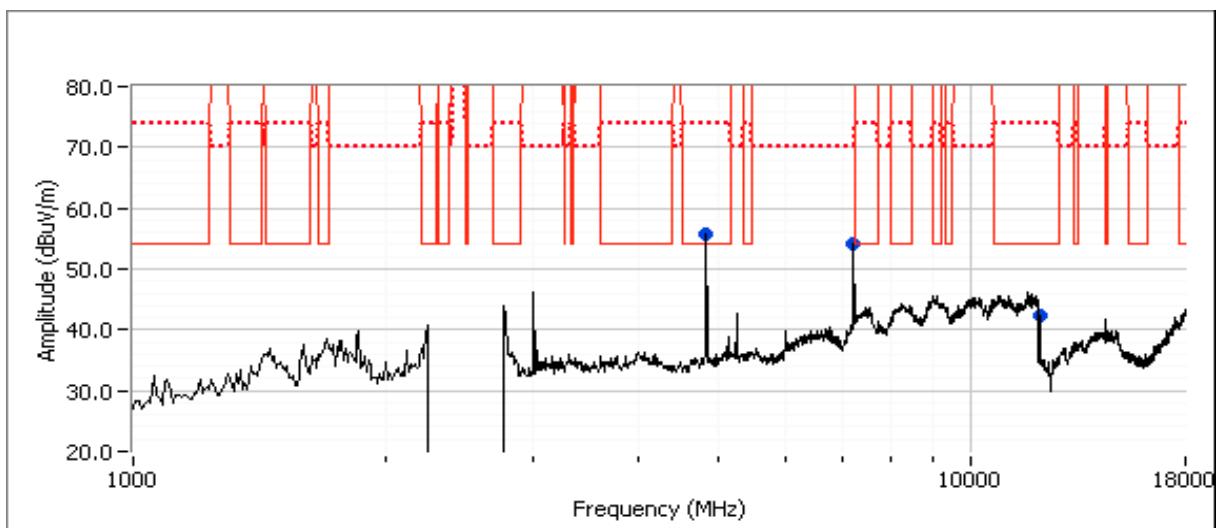
Host Unit Voltage 120V/60Hz

Run #1a: Low Channel (WiFi) and High Channel (BT)

 Channel: 1 Mode: b
 Tx Chain: Main Data Rate: 1 Mb/s

 Channel: 2480 MHz Mode: Basic
 Tx Chain: Aux Data Rate: 1 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4823.940	52.1	V	54.0	-1.9	AVG	178	1.1	RB 1 MHz;VB 10 Hz;Peak
4823.960	55.3	V	74.0	-18.7	PK	178	1.1	RB 1 MHz;VB 3 MHz;Peak
7235.140	51.4	V	54.0	-2.6	AVG	57	1.7	Note 1
7234.940	57.7	V	74.0	-12.3	PK	57	1.7	Note 1
12058.950	45.7	V	54.0	-8.3	AVG	342	1.5	RB 1 MHz;VB 10 Hz;Peak
12060.450	54.4	V	74.0	-19.6	PK	342	1.5	RB 1 MHz;VB 3 MHz;Peak



Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	N/A

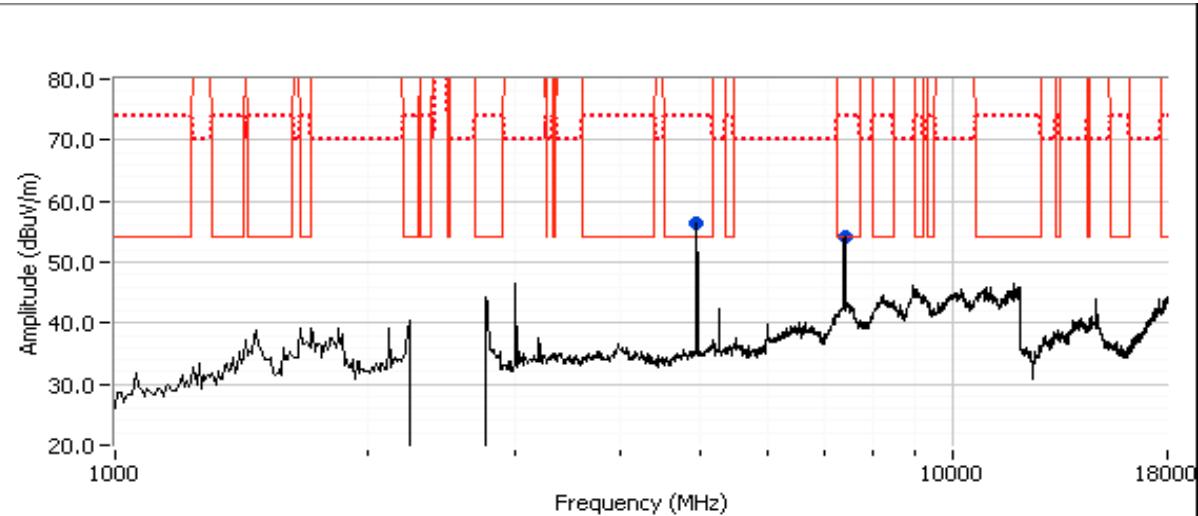
Run #1b: High Channel (WiFi) and Low Channel (BT)

Channel: 13 Mode: b
 Tx Chain: Main Data Rate: 1 Mb/s

Channel: 2402 Mode: Basic
 Tx Chain: Aux Data Rate: 1 Mb/s

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4943.930	52.3	V	54.0	-1.7	AVG	185	1.1	
4944.000	55.5	V	74.0	-18.5	PK	185	1.1	
7415.130	51.7	V	54.0	-2.3	AVG	106	1.0	
7416.430	57.1	V	74.0	-16.9	PK	106	1.0	

Note: Scans made between 18 - 25 GHz with the measurement antenna moved around the card and its antennas 20-50cm from the device indicated there were no significant emissions in this frequency range





EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene

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: 11/11/2013 Config. Used: 3
Test Engineer: Rafael Varelas Config Change: None
Test Location: FT Chamber #5 Host Unit Voltage 120V/60Hz

General Test Configuration

For tabletop equipment, 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. 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: 21.8 °C
Rel. Humidity: 36 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 120V/60Hz	FCC 15.207	Pass	49.6 dB μ V @ 0.195 MHz (-14.2dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.



EMC Test Data

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene
		Class:	-

Notes

EUT was configured to transmit on channel 6, 802.11b mode, maximum power

EUT is a PC peripheral, Host PC configured with two external peripheral devices of different I/O protocols, FCC H-Pattern running

Sample Notes

(WiFi)

Sample S/N: 001018E2EB23

Driver: 6.30.223.181

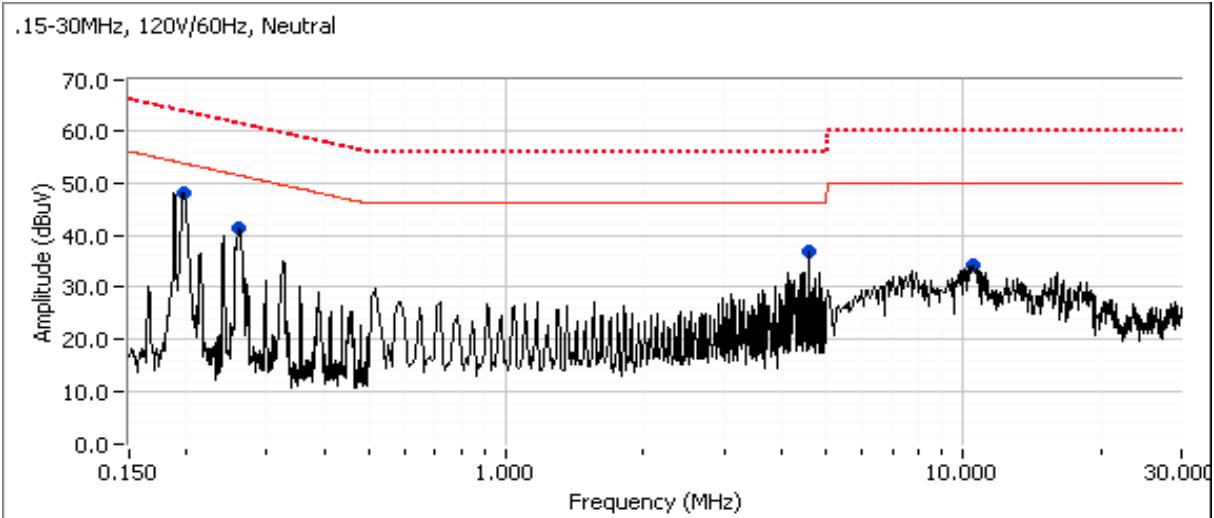
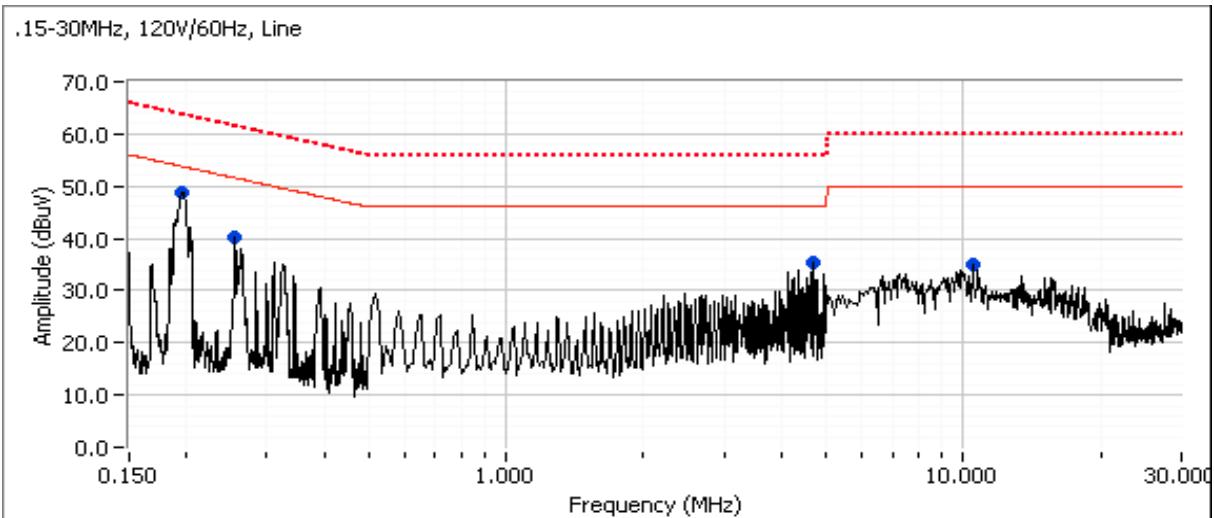
Antenna: 1000802

Test Board: BCM9NGFF2EC_1 (S/N: 1679910)

Laptop: Lenovo G560 (S/N: CB06427398)

Client:	Broadcom Corporation	Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)	T-Log Number:	T93842
Contact:	Anne Liang	Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210	Project Coordinator:	Irene

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





EMC Test Data

Client:	Broadcom Corporation				Job Number:	J93687
Model:	BCM943142Y (802.11bgn WLAN + Bluetooth NGFF1630 Mini Card)				T-Log Number:	T93842
Contact:	Anne Liang				Project Manager:	Sheareen Jacobs
Standard:	15.247/RSS-210				Project Coordinator:	Irene

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

Frequency MHz	Level dB μ V	AC Line	FCC 15.207 Limit	Detector QP/Ave	Comments
0.195	48.8	Line 1	53.8	-5.0	Peak
0.257	40.3	Line 1	51.6	-11.3	Peak
4.673	35.4	Line 1	46.0	-10.6	Peak
10.704	34.9	Line 1	50.0	-15.1	Peak
0.196	48.1	Neutral	53.7	-5.6	Peak
0.259	41.2	Neutral	51.4	-10.2	Peak
4.604	36.9	Neutral	46.0	-9.1	Peak
10.447	34.1	Neutral	50.0	-15.9	Peak

Final quasi-peak and average readings

Frequency MHz	Level dB μ V	AC Line	FCC 15.207 Limit	Detector QP/Ave	Comments
0.195	49.6	Line 1	63.8	-14.2	QP (1.00s)
0.196	48.4	Neutral	63.8	-15.4	QP (1.00s)
0.195	35.1	Line 1	53.8	-18.7	AVG (0.10s)
0.196	34.6	Neutral	53.8	-19.2	AVG (0.10s)
0.259	40.1	Neutral	61.5	-21.4	QP (1.00s)
0.259	29.8	Neutral	51.5	-21.7	AVG (0.10s)
0.257	39.0	Line 1	61.5	-22.5	QP (1.00s)
0.257	28.3	Line 1	51.5	-23.2	AVG (0.10s)
4.604	22.7	Neutral	46.0	-23.3	AVG (0.10s)
4.673	32.4	Line 1	56.0	-23.6	QP (1.00s)
4.604	31.7	Neutral	56.0	-24.3	QP (1.00s)
4.673	19.0	Line 1	46.0	-27.0	AVG (0.10s)
10.704	21.5	Line 1	50.0	-28.5	AVG (0.10s)
10.447	20.7	Neutral	50.0	-29.3	AVG (0.10s)
10.704	30.6	Line 1	60.0	-29.4	QP (1.00s)
10.447	30.6	Neutral	60.0	-29.4	QP (1.00s)

End of Report

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