

*EMC Test Report**Information Technology Equipment  
Class B Digital Device**FCC Part 15  
Industry Canada ICES-003, Issue 5**Model: BCM943142Y*

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FCC ID: QDS-BRCM1079

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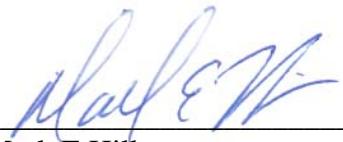
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**REVISION HISTORY**

Rev#	Date	Comments	Modified By
-	11-26-2013	First release	

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**SCOPE**

Governments and standards organizations around the world have published requirements regarding the electromagnetic compatibility (EMC) of electronic equipment. Testing has been performed on the Broadcom Corporation model BCM943142Y, pursuant to the following standards.

Standard	Title	Standard Date
FCC Part 15, Subpart B	Radio Frequency Devices	October 2012 as Amended
ICES-003, Issue 5	Information Technology Equipment (ITE) – Limits and methods of measurement	August 2012

All measurements and evaluations have been in accordance with these specifications, test procedures, and measurement guidelines as outlined in National Technical Systems - Silicon Valley test procedures, and in accordance with the standards referenced therein (refer to Appendix E).

**OBJECTIVE**

The objective of Broadcom Corporation is to verify compliance with FCC and Canada's requirements for digital devices.

**STATEMENT OF COMPLIANCE**

The tested sample of Broadcom Corporation model BCM943142Y complied with the requirements of:

Standard/Regulation	Equipment Type/Class	Standard Date
Subpart B of Part 15 of the FCC Rules (CFR title 47)	Class B	2011 as amended
ICES-003, Issue 5	Class B	2012

As specified in Section 15.101 of FCC Part 15, unintentional radiators shall be authorized prior to the initiation of marketing. Based on the description of the EUT, the following criteria per Section 15.101 of FCC Part 15 were applied to the EUT:

Type of device	Equipment authorization required
Class B personal computers and peripherals	Declaration of Conformity or Certification <i>[Certification was used]</i>

The test results recorded herein are based on a single type test of the Broadcom Corporation model BCM943142Y and therefore apply only to the tested sample(s). The sample was selected and prepared by Anne Liang of Broadcom Corporation.

Maintenance of compliance is the responsibility of the company. Any modification of the product that could result in increased emissions or susceptibility should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different enclosure, different line filter or power supply, harnessing and/or interface cable changes, etc.).

**DEVIATIONS FROM THE STANDARDS**

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

**INFORMATION TECHNOLOGY EQUIPMENT EMISSIONS TEST RESULTS**

The following emissions tests were performed on the Broadcom Corporation model BCM943142Y. The measurements were extracted from the data recorded during testing and represent the highest-amplitude emissions relative to the specification limits. The complete test data is provided in the appendices of this report.

**CONDUCTED EMISSIONS (MAINS PORT)**

Frequency Range Operating Voltage	Standard/Section	Requirement	Measurement Margin	Status
0.15-30 MHz, 120 V, 60 Hz	FCC § 15.107(a) (Class B)	0.15-0.5 MHz: 66-56 dB $\mu$ V QP 56-46 dB $\mu$ V Av 0.5-5.0 MHz: 56 dB $\mu$ V QP 46 dB $\mu$ V Av 5.0-30.0 MHz: 60 dB $\mu$ V QP 50 dB $\mu$ V Av	49.6 dB $\mu$ V @ 0.195 MHz -14.2 dB	Complied

**RADIATED EMISSIONS**

Frequency Range	Standard/Section	Requirement	Measurement Margin	Status
30-1000 MHz Bluetooth	FCC §15.109(g) Class B	30-230 MHz, 30 dB $\mu$ V/m 230-1000 MHz, 37 dB $\mu$ V/m (10 m limit)	36.6 dB $\mu$ V/m @ 671.99 MHz (-9.4 dB)	Complied
30-1000 MHz WiFi	FCC §15.109(g) Class B	30-230 MHz, 30 dB $\mu$ V/m 230-1000 MHz, 37 dB $\mu$ V/m (10 m limit)	42.5 dB $\mu$ V/m @ 199.19 MHz (-1.0 dB)	Complied

**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 were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of  $k=2$ , which gives a level of confidence of approximately 95%. The levels were found to be below levels of CISPR and therefore no adjustment of the data for measurement uncertainty is required.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
Conducted Emissions	dB <sub>u</sub> V or dB <sub>u</sub> A	150 kHz – 30 MHz	± 2.2 dB
Radiated Electric Field	dB <sub>u</sub> V/m	30-1000 MHz 1000-40,000 MHz	± 3.6 dB ± 6.0 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 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
			001018E2EB23 (WiFi)	

**HIGHEST EUT INTERNAL SOURCE**

The highest internal source of an EUT is defined as the highest frequency generated or used within the EUT or on which the EUT operates or tunes. The highest internal source determines the frequency range of test for radiated emissions.

The highest internal source of the EUT was declared to be less than 108 MHz.

Based on the declared highest internal source, the upper frequency range of measurement for the current project were:

**FCC Part 15, Subpart B**

Highest Internal Source (MHz)	Upper Frequency Range of Measurement (MHz)	Applicability
Below 1.705	30	
1.705 – 108	1000	
108 – 500	2000	
500 – 1000	5000	
Above 1000	5th harmonic of the highest internal source or 40 GHz, whichever is lower	X

**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 National Technical Systems - Silicon Valley.

**SUPPORT EQUIPMENT – WiFi 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	-	-

**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	-
Hewlett Packard	Deskjet 5650	Printer	-	-

**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 – WiFi 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 slot	Test Fixture	-	-	-
Laptop – USB	Printer	Multiconductor	Shielded	1.5m

***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
Laptop - USB	Test Fixture	Multiconductor	Shielded	1.5
Laptop – USB	Printer	Multiconductor	Shielded	1.5m

***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***

During testing (WiFi mode for radiated emissions and AC conducted mode 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.

During testing (BT mode for radiated emissions), the EUT was configured to transmit on channel 2441MHz, GFSK mode, 1Mb/s, maximum output power setting. The computer was configured to be exercised per ANSI C63.4.

**EMISSIONS TESTING****RADIATED AND CONDUCTED EMISSIONS**

Final test measurements were taken at the National Technical Systems - Silicon Valley Anechoic Chambers listed below. The test sites contain separate areas for radiated and conducted emissions testing. The sites conform to the requirements of ANSI C63.4: 2009 *American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz* and CISPR 16-1-4:2007 - *Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances*. They are registered with the VCCI and are on file with the FCC and Industry Canada.

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

**RADIATED EMISSIONS CONSIDERATIONS**

Radiated emissions measurements were made with the EUT powered from a supply voltage within the expected tolerances of each nominal operating voltage/frequency for each geographical regions covered by the scope of the standards referenced in this report.

**CONDUCTED EMISSIONS CONSIDERATIONS**

Conducted emissions tests are performed in conformance with ANSI C63.4 and Subpart B of Part 15 of FCC Rules for Digital Devices.

Mains port measurements are made with the EUT connected to the public power network through 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.

**EMISSIONS MEASUREMENT INSTRUMENTATION****RECEIVER SYSTEM**

An EMI receiver as specified in CISPR 16-1-1:2006 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7 GHz. 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.

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 1000 MHz 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.

**INSTRUMENT CONTROL COMPUTER**

Measurements are converted to the field strength at an antenna or voltage developed at the LISN (or ISN) measurement port, which is then compared directly with the appropriate specification limit under software control of the test receivers and spectrum analyzers. 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 emission measurements utilize a fifty micro-Henry 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.

**IMPEDANCE STABILIZATION NETWORK (ISN)**

Telecommunication port conducted emission measurements utilize an Impedance Stabilization Network with a 150-ohm termination impedance and specific longitudinal conversion loss as the voltage monitoring point. This network provides for calibrated radio-frequency noise measurements by the design of the internal circuitry on the EUT and measurement ports, respectively. For current measurements, a current probe with a uniform frequency response and less than 1-ohm insertion impedance is used.

**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 bilog antenna or combination of biconical and log periodic antennas are used to cover the range from 30 MHz to 1000 MHz. Narrowband tuned dipole antennas may be used over the entire 30 to 1000 MHz frequency range for precision measurements of field strength. Above 1000 MHz, horn antennas are used. The antenna calibration factors are included in site factors that are programmed into the test receivers or data collection 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.

ANSI C63.4 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 up to 12-mm thick 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 company's specifications. An appendix of this report contains the list of test equipment used and calibration information.

***EMISSIONS TEST PROCEDURES******EUT AND CABLE PLACEMENT***

The standards 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, and the worst-case orientation is used for final measurements.

***CONDUCTED EMISSIONS (MAINS)***

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. Emissions that have peak values close to the specification limit are also measured in the quasi-peak and average detection modes to determine compliance except when the amplitude of the emission when measured with the quasi-peak detector is more than 10 dB below the specification limit for average measurements. In this case only quasi-peak measurements are performed.

**RADIATED EMISSIONS****General**

FCC Part 15 references the test methods of ANSI C63.4-2003 (American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz) for emissions measurements. However FCC Public Notice DA 09-2478 (released on November 25, 2009) clarifies measurements made to determine compliance may be performed using the test methods of either the 2003 or 2009 version of the ANSI C63.4 document.

For the current project, the test methods of ANSI C63.4-2009 were used. As the two versions of ANSI C63.4 specify different usage of floor absorbers during radiated emissions testing, the table below has been included for clarification:

Frequency Range	ANSI C63.4-2003	ANSI C63.4-2009
30-1000 MHz	No floor absorbers used	No floor absorbers used
Above 1000 MHz	No floor absorbers used	"Free space" test environment with floor absorbers placed between antenna and EUT in accordance with CISPR 16-1-4

Radiated emissions measurements are performed in two phases, preliminary scan and final maximization.

**Preliminary Scan**

A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one or more of these with the antenna polarized vertically and one or more of these are performed with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied as necessary to determine the highest emission relative to the limit.

Note that for the frequency range of 1-6 GHz in the "free space" test environment, CISPR 22 allows the antenna to be set at fixed height equal to the center height of the EUT, except for cases where additional scans are necessary with the antenna height adjusted up and down to ensure the measurement antenna illuminates the entire height of the EUT. However, in cases where a single "free space" test is performed in the 1-6 GHz frequency to simultaneously meet the requirements of FCC Part 15 (ANSI C63.4-2009 test methods) and CISPR 22, the antenna height is by default varied since required by ANSI C63.4.

In the frequency range of 30-1000 MHz, a speaker (with demodulation) is provided in the receiver to aid in discriminating between EUT and ambient emissions if required. Other possible methods for discriminating between EUT and ambient emissions involve scanning with near-field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

## Final Maximization

During final maximization, 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 that results in the highest emission is then maintained while varying the antenna height from one to four meters. 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. Emissions that have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

Final measurements in the frequency range of 30-1000 MHz are made using a quasi-peak detector and compared to the quasi-peak limit. Final measurements above 1 GHz are made using average and peak detectors and compared to the average and peak limits respectively.

When testing above 1 GHz, the receive antenna is restricted to a maximum height of 2.5 m. Maximum emissions are found within this restricted range because emission levels decrease over distance and as the antenna is raised above 2.5 m, the distance from the EUT increases. As a result of the increased measurement distance, at antenna heights above 2.5 m, lower emission levels are measured as compared to emissions levels measured at antenna heights at 2.5 m and below. Final measurements are captured at 3 meters test distance except in cases where a closer test distance is required due to noise-floor considerations of the test-and-measurement equipment.

For measurements above 1 GHz every effort is made to ensure the EUT remains within the cone of radiation of the measurement antenna (i.e. 3 dB beam-width of the antenna). This may include rotating the product and/or angling the measurement antenna.

**SAMPLE CALCULATIONS****SAMPLE CALCULATIONS - CONDUCTED EMISSIONS**

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

$$R_r - S = M$$

where:

$R_r$  = Receiver Reading in dBuV

$S$  = Specification Limit in dBuV

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

**SAMPLE CALCULATIONS - RADIATED EMISSIONS**

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

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

## Appendix A Test Equipment Calibration Data

**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

**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*

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## *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
		Project Manager:	Sheareen Jacobs
Contact:	Anne Liang	Project Coordinator:	Irene
Standard:	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: 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 <sub>μ</sub> 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

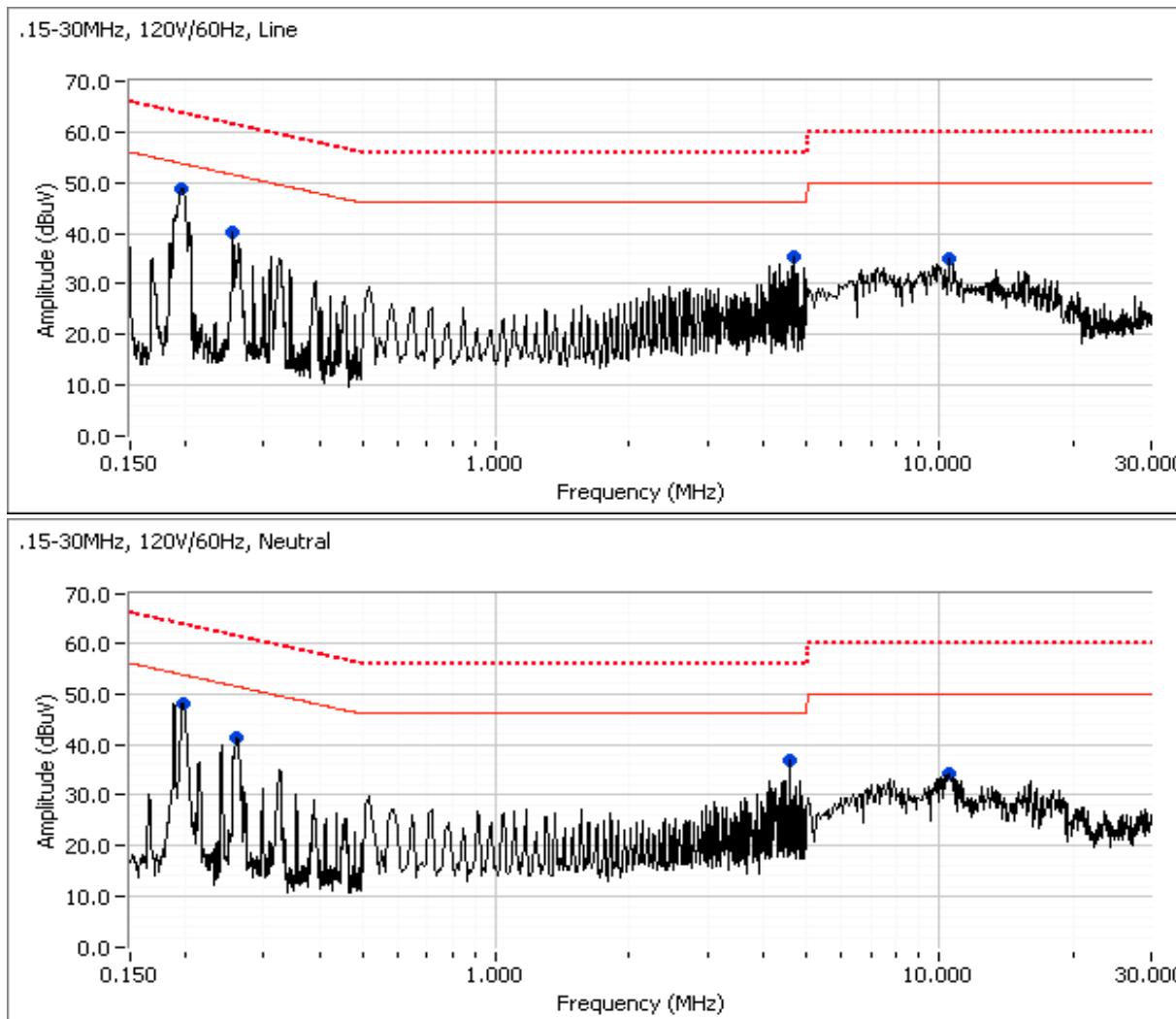
Antenna: 1000802

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
		Class:	-

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 $\mu$ 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 $\mu$ 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)



## 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:	-

### 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.

Date of Test: 11/13/2013

Config. Used: #3 for WiFi & #4 for BT

Test Engineer: Rafael Varelas

Config Change: None

Test Location: FT Chamber #5

Host Unit Voltage Host Laptop (120V/60Hz)

#### General Test Configuration

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

The test distance and extrapolation factor (if applicable) are detailed under each run description.

Note, preliminary testing indicates that the emissions were maximized by orientation of the EUT and elevation of the measurement antenna. Maximized testing indicated that the emissions were maximized by orientation of the EUT, elevation of the measurement antenna, and manipulation of the EUT's interface cables.

#### Ambient Conditions:

Temperature: 20.9 °C

Rel. Humidity: 38 %

#### Summary of Results (ANSI C63.4:2009)

Run #	Test Performed	Limit	Result	Margin
2 (Bluetooth)	Radiated Emissions 30 - 1000 MHz, Maximized	Class B	Pass	36.6 dB $\mu$ V/m @ 671.99 MHz (-9.4 dB)
4 (WiFi)	Radiated Emissions 30 - 1000 MHz, Maximized	Class B	Pass	42.5 dB $\mu$ V/m @ 199.19 MHz (-1.0 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:	-

### Sample Notes

#### (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)

#### (WiFi)

Sample S/N: 001018E2EB23

Driver: 6.30.223.181

Antenna: 1725583-VS

Test Board: BCM0NGFF2EC\_1 (S/N: 1679910)

Laptop: Lenovo G560 (S/N: CB06427398)



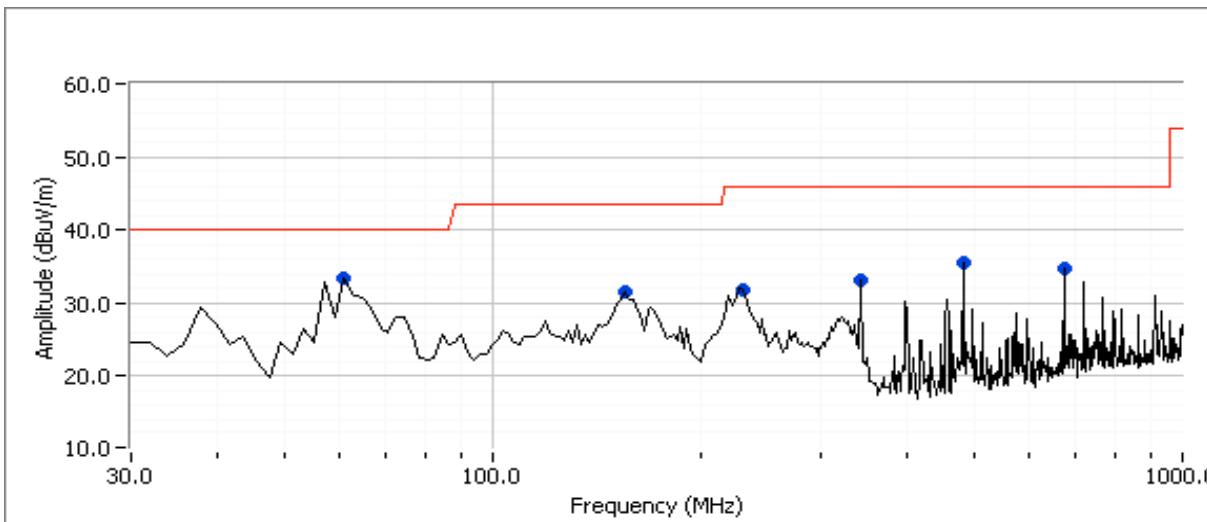
## EMC Test Data

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:	-

### Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz

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

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



### Preliminary peak readings captured during pre-scan

Frequency MHz	Level dB $\mu$ V/m	Pol v/h	Class B		Detector	Azimuth degrees	Height meters	Comments
			Limit	Margin				
62.196	33.4	V	40.0	-6.6	Peak	172	2.0	
156.006	31.5	H	43.5	-12.0	Peak	158	1.0	
230.749	31.7	V	46.0	-14.3	Peak	113	1.5	
340.948	33.1	V	46.0	-12.9	Peak	132	1.0	
479.991	35.4	H	46.0	-10.6	Peak	64	1.0	
671.992	34.7	H	46.0	-11.3	Peak	92	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: -

### Preliminary quasi-peak readings (no manipulation of EUT interface cables)

Frequency	Level	Pol	Class B		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
479.991	36.4	H	46.0	-9.6	QP	56	1.0	QP (1.00s)
671.992	36.6	H	46.0	-9.4	QP	98	1.1	QP (1.00s)
230.749	31.0	V	46.0	-15.0	QP	130	1.5	QP (1.00s)
340.948	24.8	V	46.0	-21.2	QP	137	1.0	QP (1.00s)
156.006	29.4	H	43.5	-14.1	QP	159	1.0	QP (1.00s)
62.196	28.1	V	40.0	-11.9	QP	175	2.0	QP (1.00s)

### Run #2: Maximized Readings From Run #1

#### BT Configuration

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

### Maximized quasi-peak readings (includes manipulation of EUT interface cables)

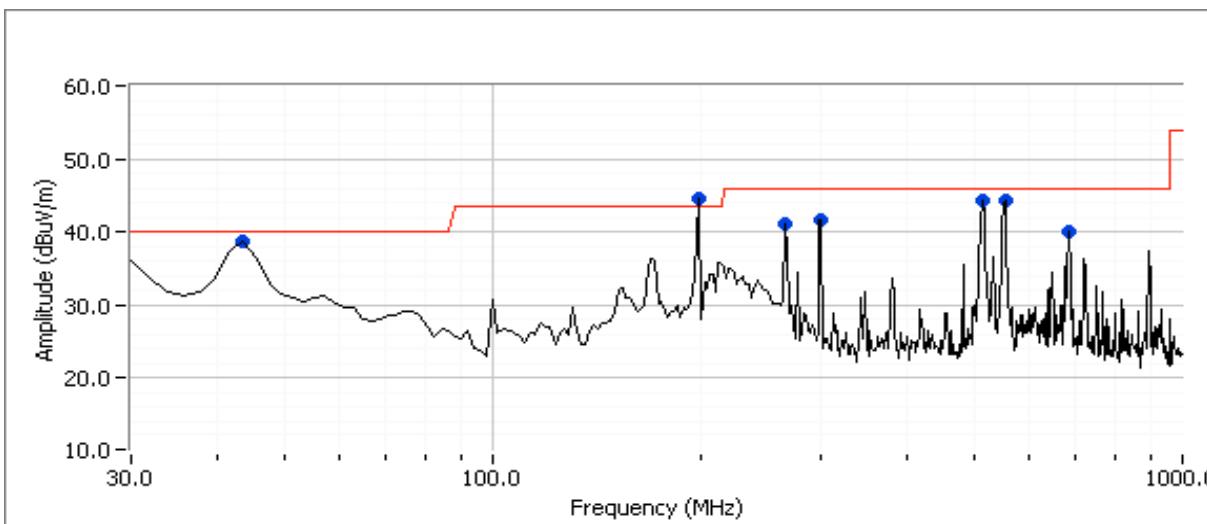
Frequency	Level	Pol	Class B		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
671.992	36.6	H	46.0	-9.4	QP	98	1.1	QP (1.00s)
479.991	36.4	H	46.0	-9.6	QP	56	1.0	QP (1.00s)
62.196	28.1	V	40.0	-11.9	QP	175	2.0	QP (1.00s)
156.006	29.4	H	43.5	-14.1	QP	159	1.0	QP (1.00s)
230.749	31.0	V	46.0	-15.0	QP	130	1.5	QP (1.00s)
340.948	24.8	V	46.0	-21.2	QP	137	1.0	QP (1.00s)

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:	-

**Run #3: Preliminary Radiated Emissions, 30 - 1000 MHz**

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

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


**Preliminary peak readings captured during pre-scan**

Frequency MHz	Level dB $\mu$ V/m	Pol v/h	Class B		Detector	Azimuth degrees	Height meters	Comments
			Limit	Margin				
44.363	38.7	H	40.0	-1.3	Peak	261	1.0	
199.186	44.6	V	43.5	1.1	Peak	220	1.5	
265.869	41.0	V	46.0	-5.0	Peak	185	1.0	
299.629	41.7	V	46.0	-4.3	Peak	351	1.0	
511.979	44.3	H	46.0	-1.7	Peak	153	1.0	
549.932	44.3	H	46.0	-1.7	Peak	183	1.0	
684.456	40.0	H	46.0	-6.0	Peak	256	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: -

### Preliminary quasi-peak readings (no manipulation of EUT interface cables)

Frequency	Level	Pol	Class B		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
511.979	37.4	H	46.0	-8.6	QP	160	1.0	QP (1.00s)
549.932	38.6	H	46.0	-7.4	QP	180	1.0	QP (1.00s)
265.869	33.1	V	46.0	-12.9	QP	176	1.1	QP (1.00s)
199.186	42.5	V	43.5	-1.0	QP	220	1.0	QP (1.00s)
684.456	34.5	H	46.0	-11.5	QP	260	1.0	QP (1.00s)
44.363	37.6	H	40.0	-2.4	QP	260	1.0	QP (1.00s)
299.629	35.8	V	46.0	-10.2	QP	353	1.0	QP (1.00s)

### Run #4: Maximized Readings From Run #3

#### WiFi Configuration

Test Parameters for Maximized Reading(s)			
Frequency Range (MHz)		Test Distance (meters)	Limit Distance (meters)
30 - 1000		3	3
			0.0

### Maximized quasi-peak readings (includes manipulation of EUT interface cables)

Frequency	Level	Pol	Class B		Detector	Azimuth	Height	Comments
MHz	dB $\mu$ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
199.186	42.5	V	43.5	-1.0	QP	220	1.0	QP (1.00s)
44.363	37.6	H	40.0	-2.4	QP	260	1.0	QP (1.00s)
549.932	38.6	H	46.0	-7.4	QP	180	1.0	QP (1.00s)
511.979	37.4	H	46.0	-8.6	QP	160	1.0	QP (1.00s)
299.629	35.8	V	46.0	-10.2	QP	353	1.0	QP (1.00s)
684.456	34.5	H	46.0	-11.5	QP	260	1.0	QP (1.00s)
265.869	33.1	V	46.0	-12.9	QP	176	1.1	QP (1.00s)

## Appendix C Product Labeling Requirements

The following information has been provided to clarify notification, equipment labeling requirements and information that must be included in the operator's manual. These requirements may be found in the standards/regulations listed in the scope of this report.

### *Label Location*

The required label(s) must be in a *conspicuous location* on the product, which is defined as any location readily visible to the user of the device without the use of tools.

### *Label Attachment*

The label(s) must be *permanently attached* to the product, which is defined as attached such that it can normally be expected to remain fastened to the equipment during the equipment's expected useful life. A paper gum label will generally not meet this condition.

### *United States Class B Label*

FCC ID: ABC1234567

This device complies with Part 15 of FCC Rules. Operation is subject to the following two conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

The FCC Identifier is comprised of the grantee code (in the example above **ABC**) that was assigned by the FCC plus a unique alpha-numeric specific to the product being certified. The ID must appear on the device.

If the device is too small or for such use that it is not practicable to place the US label statement on it, the statement shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed

### *Industry Canada*

For ICES-003 (ITE) Issue 5, the product must be labeled with the following Industry Canada ICES-003 Compliance Label:

CAN ICES-3 (\*)/NMB-3(\*)

\*Insert either "A" or "B" but not both to identify the applicable Class of ITE.

If there is limited space on the product then the text may be placed in the manual.

## Appendix D User Manual Regulatory Statements

Where special accessories, such as shielded cables, are required in order to meet the emission limits, appropriate instructions regarding the need to use such accessories must be contained on the first page of text concerned with the installation of the device in the operator's manual.

A requirement by FCC regulations, and recommended for all regulatory markets, is a cautionary statement to the end user that changes or modifications to the device not expressly approved by you, the manufacturer, could void their right to operate the equipment.

### *United States Class B Manual Statement*

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try and correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and the receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Note: Additional information about corrective measures may also be provided to the user at the company's option.

The FCC has indicated that the radio interference statement be bound in the same manner as the operator's manual. Thus, a loose-leaf insert page in a bound or center-spine and stapled manual would not meet this condition.

## Appendix E Basic and Reference Standards

### Subpart B of Part 15 of FCC Rules for digital devices.

FCC Part 15 Subpart B references the use of ANSI C63.4–2003: “*Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz*” for the purposes of evaluating the radiated and conducted emissions from digital devices.

*End of Report*

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