

*Application for Grant of Equipment Authorization
Pursuant to
FCC Part 15 Subpart B
On the
Broadcom Corporation
Digital Device
Model: BCM943224HMS*

FCC ID: QDS-BRCM1041

COMPANY: Broadcom Corporation
190 Mathilda Ave.
Sunnyvale, CA

TEST SITE(S): Elliott Laboratories
41039 Boyce Road.
Fremont, CA. 94538-2435
IC Site Registration #: IC 2845B-3,
IC 2845B-4, IC 2845B-5

REPORT DATE: March 2, 2009

FINAL TEST DATES: February 27, 2009

AUTHORIZED SIGNATORY:



Staff Engineer
Elliott Laboratories.



Testing Cert #2016-01

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REVISION HISTORY

Rev#	Date	Comments	Modified By
1		First release	

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SCOPE

The Federal Communications Commission (FCC) establishes rules and regulations regarding the electromagnetic emissions of all electronic devices. An electromagnetic emissions test has been performed on the Broadcom Corporation model BCM943224HMS pursuant to Subpart B of Part 15 of FCC Rules for digital devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-2003 as outlined in Elliott Laboratories test procedures. The test data has been provided as an appendix to this report for reference. Additionally the results are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003 (Issue 4, February 2004)

The digital device above has been tested in a simulated typical installation to demonstrate compliance with the relevant FCC 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.

The test results recorded herein are based on a single type test of the Broadcom Corporation model BCM943224HMS and therefore apply only to the tested sample. The sample was selected and prepared by Anne Liang of Broadcom Corporation.

OBJECTIVE

The primary objective of the company is compliance with Subpart B of Part 15 of FCC Rules for the radiated and conducted emissions of digital devices. Since the subject device is intended for operation in any environment including residential areas, equipment verification or certification is required.

Equipment verification is a procedure where the company or a contracted laboratory makes measurements and takes necessary steps to ensure that the equipment complies with the appropriate technical standards. Submittal of a sample unit or test data to the FCC is not required unless specifically requested by the Commission. Once equipment verification has been obtained, a label indicating compliance must be attached to all identical units subsequently manufactured. Specific cautionary information must also be included in the operator's manual. These FCC labeling requirements are included as an appendix to this report.

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 FCC compliance is the responsibility of the company. Any modification of the product that 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 and/or I/O cable changes, etc.).

EMISSION TEST RESULTS

The following emissions tests were performed on the Broadcom Corporation model BCM943224HMS. The measurements were extracted from the data recorded during testing and represent the highest amplitude emissions relative to the specification limits. The actual test results are contained in an appendix of this report.

CONDUCTED EMISSIONS (MAINS PORT)

Frequency Range Operating Voltage	Standard/Section	Requirement	Measurement	Margin	Status
0.15-30 MHz, 120V, 60Hz	FCC § 15.107(a) VCCI Table 4.2 (Class B)	0.15-0.5 MHz: 66-56 dB μ V QP 56-46 dB μ V Av 0.5-5.0 MHz: 56 dB μ V QP 46 dB μ V Av 5.0-30.0 MHz: 60 dB μ V QP 50 dB μ V Av	34.8dB μ V @ 3.622MHz	-11.2dB	Complied

RADIATED EMISSIONS

Frequency Range	Standard/Section	Requirement	Measurement	Margin	Status
30-1000 MHz	FCC §15.109(g)	30 – 230, 30 dB μ V/m 230 – 1000, 37 dB μ V/m (10m limit)	45.1dB μ V/m @498.041 MHz	-0.9dB	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 U_{cispr} and therefore no adjustment of the data for measurement uncertainty is required.

Measurement Type	Measurement Unit	Frequency Range	Expanded Uncertainty
Conducted Emissions	dB μ V or dB μ A	150kHz – 30MHz	\pm 2.2 dB
Radiated Electric Field	dB μ V/m	30 – 1000 MHz 1000 – 40,000 MHz	\pm 3.6 dB \pm 6.0 dB

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

The Broadcom Corporation model BCM943224HMS is a WLAN card designed to be installed in laptop computers. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 3.3 VDC.

The sample was received on December 17, 2008 and tested on February 27, 2009. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Broadcom	BCM943224 HMS	WLAN card	106 & 108	QDS- BRCM1041

ANTENNA SYSTEM

The antenna is integral to the device.

ENCLOSURE

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

MODIFICATIONS

The EUT did not require modifications during testing in order to comply with emissions specifications.

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	Inspiron 630m	Laptop	-	-
Dell	-	External power supply	-	-
Canon	iP2600	Printer	-	-

The following remote support equipment was used during emissions testing.

Manufacturer	Model	Description	Serial Number	FCC ID
Netgear	GS605	Hub	-	-

EUT INTERFACE PORTS

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

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB/Laptop	Printer	USB cable	Shielded	1.5
Ethernet/Laptop	Hub	Cat-5	Unshielded	10.0
Adapter card	-	-	-	-
AC Power	AC Mains	3 wire	Unshielded	2.0

EUT OPERATION

During emissions testing the EUT was configured to transmit continuously, and the PC was configured with the FCC scrolling H routine.

EMISSIONS TEST SITE**GENERAL INFORMATION**

Final test measurements were taken on February 27, 2009 at the Elliott Laboratories Anechoic Chambers and/or Open Area Test Site(s) listed below. The test sites contain separate areas for radiated and conducted emissions testing. The sites conform to the requirements of ANSI C63.4: 2003 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz and CISPR 16-1-4:2007 - Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances. They are registered with the VCCI and are on file with the FCC and industry Canada.

Site	Registration Numbers			Location
	VCCI	FCC	Canada	
Chamber 3	R-1683 C-1795	769238	IC 2845B-3	41039 Boyce Road Fremont, CA 94538-2435
Chamber 4	R-1684 C-1796	211948	IC 2845B-4	

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

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4 and CISPR 22. 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. Telecommunication port measurements are made with the network cable connected through an ISN appropriate to the type of cable employed.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiated measurements made in a non-anechoic shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an Open Area Test Site or semi-anechoic chamber, as defined in ANSI C63.4. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1-1:2003 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

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 runs automated data collection programs that 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 emission 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.

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 biconical antenna is used to cover the range from 30 MHz to 300 MHz and a log periodic antenna is utilized from 300 MHz to 1000 MHz. Narrowband tuned dipole antennas are used over the entire 30 to 1000 MHz frequency range for precision measurements of field strength. Above 1000 MHz, a horn antenna is used. The antenna calibration factors are included in site factors that are programmed into the test receivers.

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. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

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.

CONDUCTED EMISSIONS (TELECOMMUNICATION PORTS)

Conducted emissions voltages are measured at a point 80 cm from the EUT. If conducted emission currents are measured, the current probe is located 70 cm from the EUT. 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. 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

Radiated emissions measurements are performed in two phases as well. 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 from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is 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 to determine the highest emission relative to the limit. 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 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.

When Testing above 18 GHz, the receive antenna is located at 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5m. Maximum emissions are found within this restricted range because emission levels decrease over distance and as the antenna is raised above 2.5m, the distance from the EUT increases. As a result of the increased measurement distance, at antenna heights above 2.5m, lower emission levels are measured as compared to emissions levels measured at antenna heights at 2.5m and below.

Emissions above 18 GHz are very directional therefore additional measures are taken to ensure correct measurement of the maximum EUT emissions. A preliminary near field scan using the appropriate horn antenna is performed from a distance of 30cm. Data is recorded to note the frequencies and angles of maximum radiation from the EUT. Final measurements are made with the antenna positioned at the projected angle and direction determined during the near field prescan from a distance of 1m. For EUT's higher than 1.6m above the ground plane, the antenna is mounted on the mast angled to maintain the point of maximum EUT emission noted during the near field measurement along the approximate centerline of the 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

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Conducted Emissions - AC Power Ports, 30-Jan-09**Engineer: rvarelas**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
EMCO	LISN, 10 kHz-100 MHz	3825/2	1292	22-Feb-09
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	19-Sep-09
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	06-Jun-09
Fischer Custom Comm	LISN, 25A, 150kHz to 30MHz, 25 Amp,	FCC-LISN-50-25-2-09	2001	15-Oct-09

Radiated Emissions, 30 - 1,000 MHz, 06-Feb-09**Engineer: skhushzad**

<u>Manufacturer</u>	<u>Description</u>	<u>Model #</u>	<u>Asset #</u>	<u>Cal Due</u>
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1543	14-Nov-09
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	22-Feb-09
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	23-May-10

EXHIBIT 2: Test Measurement Data

14 Pages



EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manager:	Eriksen / Washington
Contact:	Anne Liang		
Emissions Standard(s):	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Broadcom

Model

BCM943224HMS

Date of Last Test: 2/24/2009



EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manger:	Eriksen / Washington
Contact:	Anne Liang		
Emissions Standard(s):	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII
Immunity Standard(s):	-	Environment:	-

EUT INFORMATION

The following information was collected during the test session(s).

General Description

The EUT is an 802.11ag/Draft 802.11n WLAN PCI-E minicard that is designed to enable wireless data transmissions in PCs. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 3.3Vdc from the host.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Broadcom	BCM943224HMS	802.11ag/Draft 802.11n WLAN PCI-E Minicard	-	QDS-BRCM1041

EUT Antenna (Intentional Radiators Only)

The EUT antenna is an 802.11a/b/g/n WLAN antenna, with peak gains for 3.9dBi/2.4GHz and 5.8dBi/5GHz.

The antenna connects to the EUT via a U.FL antenna connector, thereby meeting the requirements of FCC 15.203.

EUT Enclosure

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

Modification History

Mod. #	Test	Date	Modification
1			No modifications were made to the EUT during testing.
2			
3			

Modifications applied are assumed to be used on subsequent tests unless otherwise stated as a further modification.



EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manger:	Eriksen / Washington
Contact:	Anne Liang		
Emissions Standard(s):	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII
Immunity Standard(s):	-	Environment:	-

Test Configuration #2

The following information was collected during the test session(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	Inspiron	Laptop	-	-
Canon	iP2600	Printer	-	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Netgear	GS605	Hub	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB/Laptop	Printer	USB cable	Shielded	1.5
Ethernet/Laptop	Hub	Cat-5	Unshielded	10.0
Adapter card	-	-	-	-
AC Power	AC Mains	3 wire	Unshielded	2.0

EUT Operation During Emissions Tests

During emissions testing the EUT was continuously transmitting on the desired channel.



EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manger:	Eriksen / Washington
Contact:	Anne Liang		
Emissions Standard(s):	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII
Immunity Standard(s):	-	Environment:	-

Test Configuration #3

The following information was collected during the test session(s).

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	Inspiron	Laptop	814C40100252200122KS 00	-
Canon	Power Shot A400	Camera	0326229830	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Netgear	GS605	Hub	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB/Laptop	Printer	USB cable	Shielded	1.5
Ethernet/Laptop	Hub	Cat-5	Unshielded	10.0
Adapter card	Laptop	Card Slot	-	-
AC Power	AC Mains	3 wire	Unshielded	2.0

EUT Operation During Emissions Tests

During emissions testing the EUT was configured to transmit continuously, and the PC was configured with the FCC scrolling H routine.



EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
Contact:	Anne Liang	Account Manager:	Eriksen / Washington
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

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: 2/6/2009
Test Engineer: Suhaila Khushzad
Test Location: Chamber #3

Config. Used: 3
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

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

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 °C
Rel. Humidity: 42 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 1000 MHz, Maximized Emissions	FCC 15.209	Pass	44.9dB μ V/m @ 499.121MHz (-1.1dB)
2	RE, 30 - 1000 MHz, Maximized Emissions	FCC 15.209	Pass	45.1dB μ V/m @ 498.041MHz (-0.9dB)

Modifications Made During Testing

No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

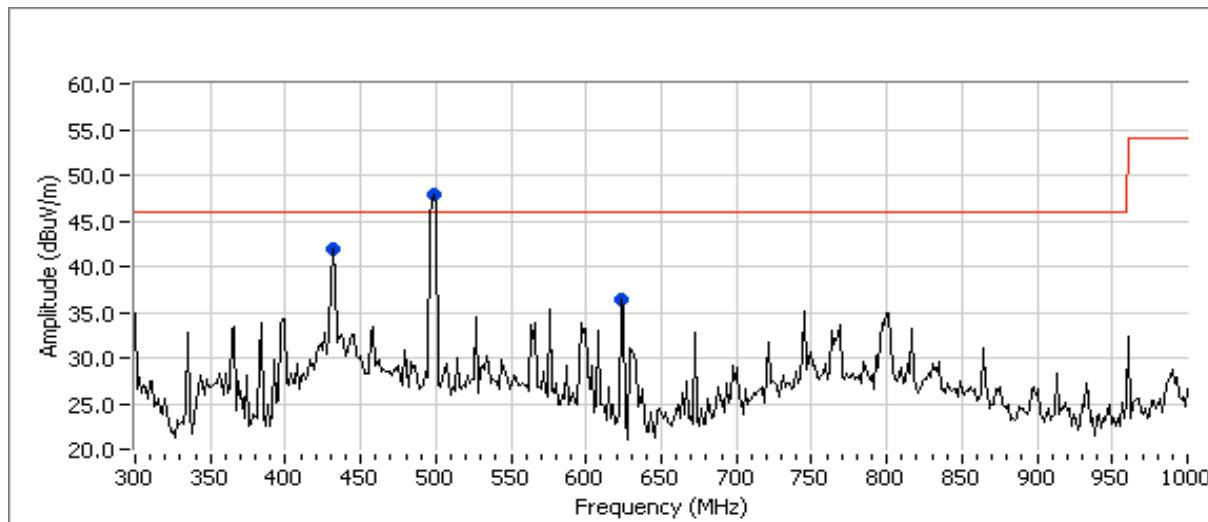
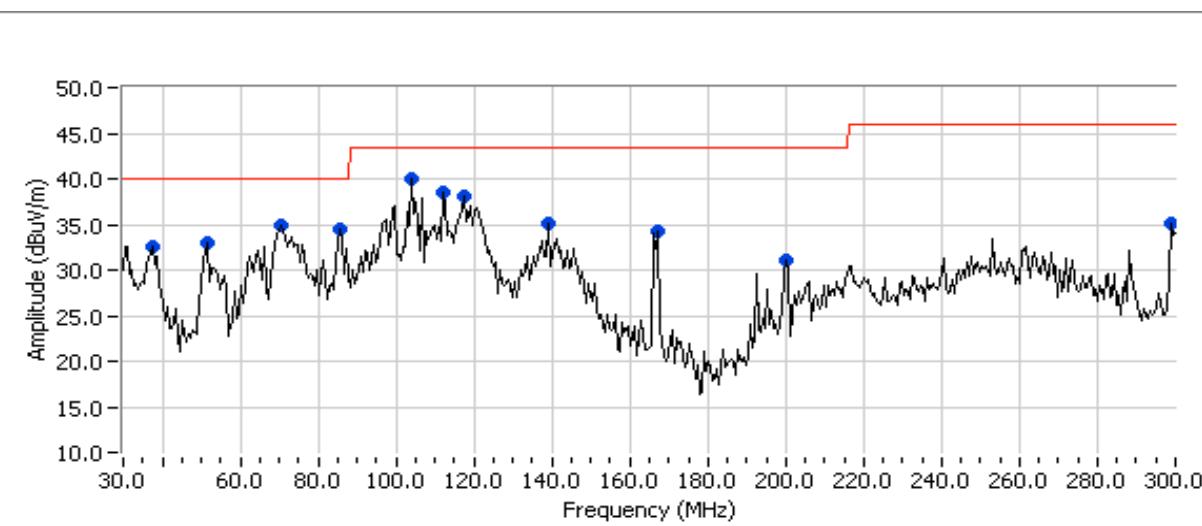
Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manager:	Eriksen / Washington
Contact:	Anne Liang		
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

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

CDD 20MHz Mode at 5600 MHz

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Two scans to show no change in emissions for the following modes: CDD 20MHz mode @ 5600 MHz, 802.11b mode @ 2437 MHz





EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manager:	Eriksen / Washington
Contact:	Anne Liang		
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

Continuation of Run #1

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
499.121	47.8	V	46.0	1.8	Peak	113	1.5	
105.586	40.0	V	43.5	-3.5	Peak	274	1.5	
432.003	42.0	H	46.0	-4.0	Peak	151	2.0	
113.297	38.5	V	43.5	-5.0	Peak	202	1.0	
72.301	34.8	V	40.0	-5.2	Peak	280	2.0	
86.058	34.5	V	40.0	-5.5	Peak	112	1.0	
120.435	38.0	V	43.5	-5.5	Peak	205	1.0	
51.804	32.9	V	40.0	-7.1	Peak	92	1.0	
38.950	32.5	V	40.0	-7.5	Peak	65	1.0	
137.365	35.1	H	43.5	-8.4	Peak	40	1.5	
166.281	34.2	H	43.5	-9.3	Peak	216	1.5	
624.002	36.3	H	46.0	-9.7	Peak	111	1.0	
299.765	35.1	H	46.0	-10.9	Peak	77	1.0	
200.001	31.0	H	43.5	-12.5	Peak	113	1.0	

Preliminary quasi-peak readings (no manipulation of EUT interface cables) - mode with highest emissions

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
499.121	44.9	V	46.0	-1.1	QP	115	1.2	QP (1.00s)
432.003	41.3	H	46.0	-4.7	QP	114	1.7	QP (1.00s)
86.058	32.7	V	40.0	-7.3	QP	151	1.0	QP (1.00s)
624.002	36.1	H	46.0	-9.9	QP	111	1.0	QP (1.00s)
51.804	30.0	V	40.0	-10.0	QP	133	1.0	QP (1.00s)
166.281	32.5	H	43.5	-11.0	QP	218	1.5	QP (1.00s)
299.765	34.3	H	46.0	-11.7	QP	80	1.0	QP (1.00s)
137.365	31.3	H	43.5	-12.2	QP	60	2.0	QP (1.00s)
38.950	26.7	V	40.0	-13.3	QP	104	1.0	QP (1.00s)
72.301	26.7	V	40.0	-13.3	QP	276	1.5	QP (1.00s)
113.297	29.8	V	43.5	-13.7	QP	241	1.0	QP (1.00s)
200.001	29.0	H	43.5	-14.5	QP	94	1.5	QP (1.00s)
120.435	28.4	V	43.5	-15.1	QP	244	1.0	QP (1.00s)
105.586	26.6	V	43.5	-16.9	QP	314	1.0	QP (1.00s)



EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manager:	Eriksen / Washington
Contact:	Anne Liang		
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

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

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
499.121	44.9	V	46.0	-1.1	QP	110	1.3	QP (1.00s)
432.003	41.4	H	46.0	-4.6	QP	117	1.8	QP (1.00s)
86.058	32.9	V	40.0	-7.1	QP	150	1.0	QP (1.00s)
624.002	36.1	H	46.0	-9.9	QP	105	1.0	QP (1.00s)
51.804	30.0	V	40.0	-10.0	QP	130	1.0	QP (1.00s)
166.281	32.5	H	43.5	-11.0	QP	214	1.5	QP (1.00s)

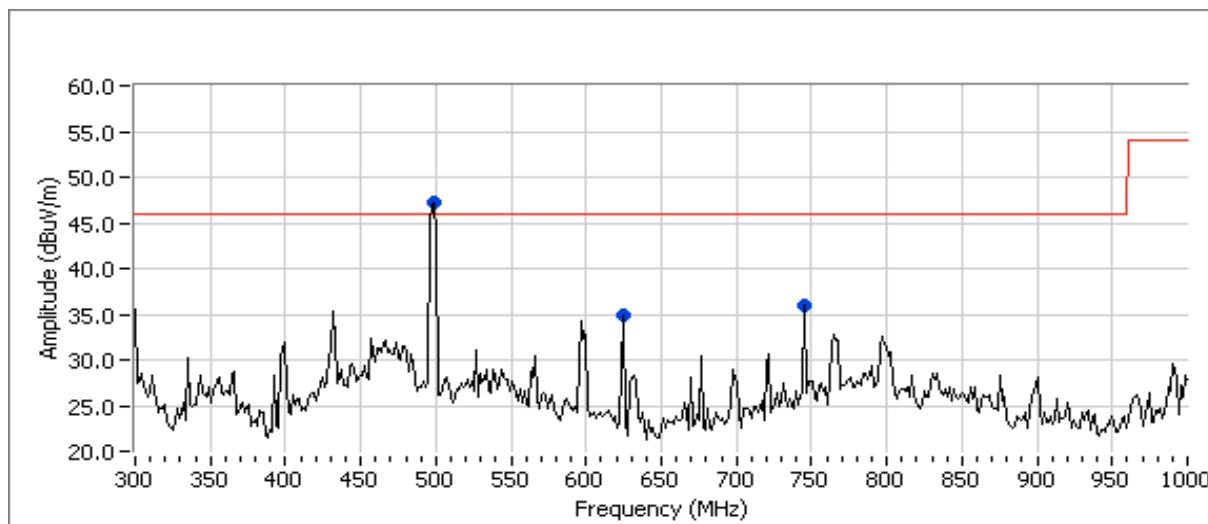
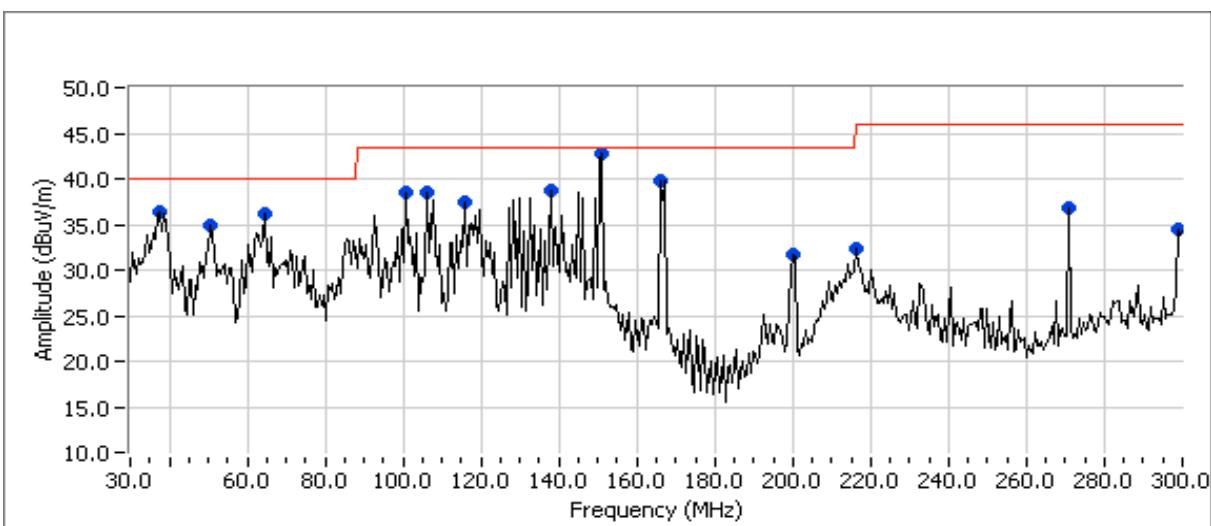
Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manager:	Eriksen / Washington
Contact:	Anne Liang		
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

Run #2: Preliminary Radiated Emissions, 30 - 1000 MHz

802.11b Mode at 2437 MHz

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Two scans to show no change in emissions for the following modes: CDD 20MHz mode @ 5600 MHz, 802.11b mode @ 2437 MHz





EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manager:	Eriksen / Washington
Contact:	Anne Liang		
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

Continuation of Run #2

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
498.041	47.3	H	46.0	1.3	Peak	260	2.0	
149.899	42.7	H	43.5	-0.8	Peak	236	1.5	
37.545	36.3	V	40.0	-3.7	Peak	51	1.0	
166.223	39.8	H	43.5	-3.7	Peak	48	1.5	
66.218	36.1	V	40.0	-3.9	Peak	79	1.0	
138.067	38.8	H	43.5	-4.7	Peak	9	2.0	
101.876	38.6	H	43.5	-4.9	Peak	175	3.0	
104.192	38.6	H	43.5	-4.9	Peak	13	3.0	
50.424	34.8	V	40.0	-5.2	Peak	85	1.0	
113.110	37.4	H	43.5	-6.1	Peak	194	2.5	
273.133	36.8	H	46.0	-9.2	Peak	21	1.5	
750.013	35.9	V	46.0	-10.1	Peak	179	2.0	
625.003	35.0	V	46.0	-11.0	Peak	325	1.0	
299.765	34.5	H	46.0	-11.5	Peak	77	1.0	
200.013	31.7	H	43.5	-11.8	Peak	12	1.0	
215.995	32.4	H	46.0	-13.6	Peak	354	1.5	

Preliminary quasi-peak readings (no manipulation of EUT interface cables) - mode with highest emissions

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
498.041	45.0	H	46.0	-1.0	QP	256	1.7	QP (1.00s)
166.223	37.3	H	43.5	-6.2	QP	65	1.5	QP (1.00s)
66.218	32.3	V	40.0	-7.7	QP	96	1.1	QP (1.00s)
37.545	31.9	V	40.0	-8.1	QP	90	1.0	QP (1.00s)
50.424	31.8	V	40.0	-8.2	QP	125	1.0	QP (1.00s)
625.003	35.0	V	46.0	-11.0	QP	357	1.0	QP (1.00s)
299.765	34.7	H	46.0	-11.3	QP	76	1.0	QP (1.00s)
215.995	31.7	H	43.5	-11.8	QP	335	1.5	QP (1.00s)
200.013	30.3	H	43.5	-13.2	QP	9	1.3	QP (1.00s)
138.067	27.4	H	43.5	-16.1	QP	49	2.0	QP (1.00s)
149.899	26.7	H	43.5	-16.8	QP	224	1.7	QP (1.00s)
113.110	23.5	H	43.5	-20.0	QP	181	2.0	QP (1.00s)
101.876	23.2	H	43.5	-20.3	QP	169	3.0	QP (1.00s)
750.013	21.3	V	46.0	-24.7	QP	174	1.6	QP (1.00s)
273.133	21.0	H	46.0	-25.0	QP	61	1.0	QP (1.00s)
104.192	16.3	H	43.5	-27.2	QP	12	2.9	QP (1.00s)



EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
		Account Manager:	Eriksen / Washington
Contact:	Anne Liang		
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

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

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Frequency	Level	Pol	FCC 15.209		Detector	Azimuth	Height	Comments
MHz	dB μ V/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
498.041	45.1	H	46.0	-0.9	QP	253	1.7	QP (1.00s)
166.223	37.3	H	43.5	-6.2	QP	72	1.5	QP (1.00s)
66.218	32.5	V	40.0	-7.5	QP	95	1.1	QP (1.00s)
50.424	32.4	V	40.0	-7.6	QP	122	1.0	QP (1.00s)
37.545	32.0	V	40.0	-8.0	QP	89	1.0	QP (1.00s)
625.003	35.8	V	46.0	-10.2	QP	329	1.0	QP (1.00s)



EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
Contact:	Anne Liang	Account Manager:	Eriksen / Washington
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

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: 1/29/2009 Config. Used: 2
Test Engineer: Rafael Varelas Config Change: None
Test Location: FT Chamber #4 Host Unit Voltage 110V/60Hz

General Test Configuration

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

Ambient Conditions: Temperature: 20.3 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,110V/60Hz	FCC 15.207, RSS 210, LP0002	Pass	34.8dB μ V @ 3.622MHz (-11.2dB)

Modifications Made During Testing

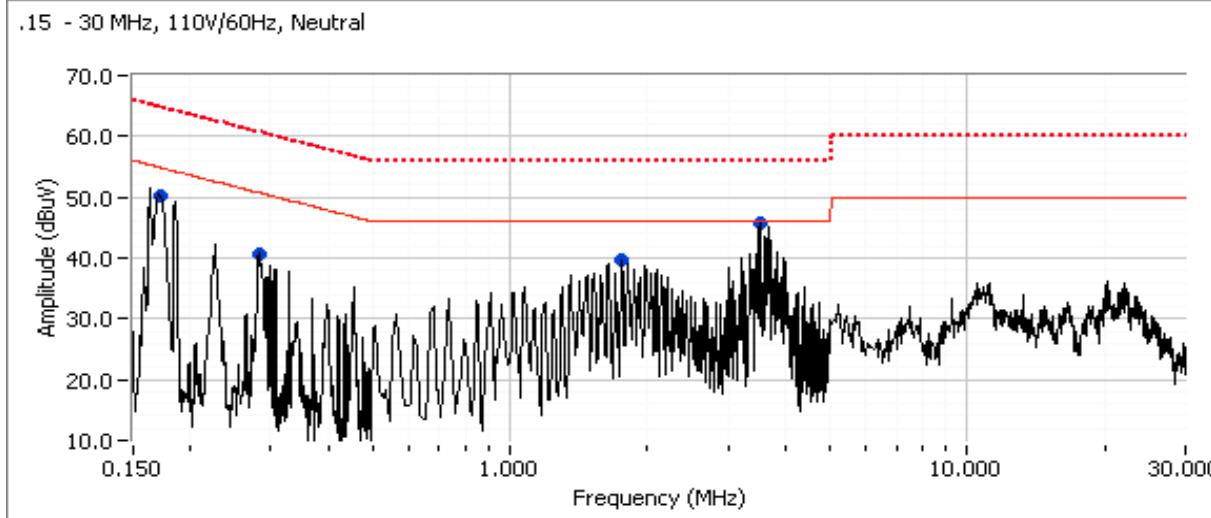
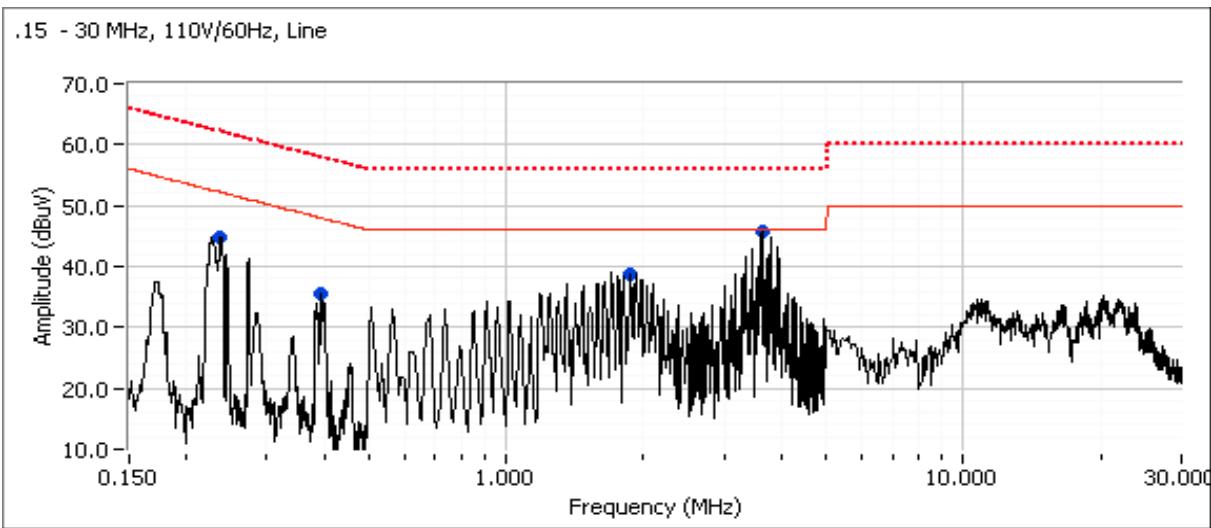
No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
Contact:	Anne Liang	Account Manager:	Eriksen / Washington
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 110V/60Hz





EMC Test Data

Client:	Broadcom	Job Number:	J74037
Model:	BCM943224HMS	T-Log Number:	T74145
Contact:	Anne Liang	Account Manager:	Eriksen / Washington
Standard:	FCC 15.247, FCC 15E, RSS 210, LP0002	Class:	DTS/NII

Run #1: Continued

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

Frequency MHz	Level dB _μ V	AC Line	FCC/RSS 210/LP0002 Limit	Margin	Detector QP/Ave	Comments
0.237	44.9	Line 1	52.2	-7.3	Peak	
0.395	35.5	Line 1	48.0	-12.5	Peak	
3.622	45.8	Line 1	46.0	-0.2	Peak	
1.868	38.8	Line 1	46.0	-7.2	Peak	
0.170	50.3	Neutral	54.9	-4.6	Peak	
0.283	40.7	Neutral	50.7	-10.0	Peak	
3.499	45.9	Neutral	46.0	-0.1	Peak	
1.754	39.8	Neutral	46.0	-6.2	Peak	

Final quasi-peak and average readings

Frequency MHz	Level dB _μ V	AC Line	FCC/RSS 210/LP0002 Limit	Margin	Detector QP/Ave	Comments
3.622	34.8	Line 1	46.0	-11.2	AVG	AVG (0.10s)
1.754	34.6	Neutral	46.0	-11.4	AVG	AVG (0.10s)
3.622	44.5	Line 1	56.0	-11.5	QP	QP (1.00s)
1.868	33.7	Line 1	46.0	-12.3	AVG	AVG (0.10s)
0.170	50.2	Neutral	65.0	-14.8	QP	QP (1.00s)
0.170	39.5	Neutral	55.0	-15.5	AVG	AVG (0.10s)
1.754	38.0	Neutral	56.0	-18.0	QP	QP (1.00s)
1.868	37.3	Line 1	56.0	-18.7	QP	QP (1.00s)
3.499	37.0	Neutral	56.0	-19.0	QP	QP (1.00s)
3.499	25.2	Neutral	46.0	-20.8	AVG	AVG (0.10s)
0.237	37.7	Line 1	62.2	-24.5	QP	QP (1.00s)
0.237	16.9	Line 1	52.2	-35.3	AVG	AVG (0.10s)

EXHIBIT 3: Photographs of Test Configurations

EXHIBIT 4: Proposed FCC ID Label & Label Location

EXHIBIT 5: Detailed Photographs
of Broadcom Corporation Model BCM943224HMSConstruction

EXHIBIT 6: Operator's Manual
for Broadcom Corporation Model BCM943224HMS

EXHIBIT 7: Block Diagram
of Broadcom Corporation Model BCM943224HMS

EXHIBIT 8: Schematic Diagrams
for Broadcom Corporation Model BCM943224HMS

EXHIBIT 9: Theory of Operation
for Broadcom Corporation Model BCM943224HMS

EXHIBIT 10: RF Exposure Information