EMC Test Report

Information Technology Equipment
Class B Digital Device

FCC Part 15
Industry Canada ICES 003

Model: Bluetooth module, BCM92070MD_REF12

COMPANY:	Broadcom Corporation 190 Mathilda Ave Sunnyvale, CA 94086
TEST SITE(S):	Elliott Laboratories 41039 Boyce Road Fremont, CA. 94538-2435
REPORT DATE:	July 6, 2011
FINAL TEST DATES:	June 22, 2011

AUTHORIZED SIGNATORY:

David W. Bare
Chief Engineer
Elliott Laboratories LLC, An NTS Company

ACCREDITED
Testing Cert #2016.01

REVISION HISTORY

Rev#	Date	Comments	Modified By
-	07-06-2011	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 Bluetooth module, BCM92070MD_REF12, pursuant to the following standards.

Standard	Title	Standard Date
FCC Part 15, Subpart B	Radio Frequency Devices	October 2009 as Amended
ICES-003, Issue 4	Digital apparatus	2004

All measurements and evaluations have been in accordance with these specifications, test procedures, and measurement guidelines as outlined in Elliott Laboratories 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 requirements for digital devices and Canada's requirements for digital devices.

STATEMENT OF COMPLIANCE

The tested sample of Broadcom Corporation model Bluetooth module, BCM92070MD_REF12 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	2009 as amended
ICES-003, Issue 4	Class B	2004

The test results recorded herein are based on a single type test of the Broadcom Corporation model Bluetooth module, BCM92070MD_REF12 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 Bluetooth module, BCM92070MD_REF12. 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, 120V, 60Hz	FCC § 15.107(a) (Class B)	0.15-0.5 MHz: 66-56 dBµV QP 56-46 dBµV Av 0.5-5.0 MHz: 56 dBµV QP 46 dBµV Av 5.0-30.0 MHz: 60 dBµV QP 50 dBµV Av	37.8dBµV @ 16.899MHz	-12.2dB	Complied

RADIATED EMISSIONS

Frequency Range	Standard/Section	Requirement	Measurement	Margin	Status
30-1000 MHz	FCC §15.109(g) Class B	30 – 230, 30 dBµV/m 230 – 1000, 37 dBµV/m (10m limit)	37.6dBµV/m @41.37 MHz	-2.4dB	Complied
1000-40000 MHz Note 1	FCC §15.109(a) Class B	54.0 dBµV/m Av 74.0 dBµV/m Pk (3m limit)	N/A – Note 1		
Note 1 Testing above 1GHz against FCC 15.109(a) requirements was not required because the highest frequency generated in the EUT was declared to be less than 108 MHz.					

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	dBuV or dBuA	150kHz – 30MHz	± 2.2 dB
Radiated Electric Field	dBuV/m	30 – 1000 MHz	± 3.6 dB
		1000 – 40,000 MHz	± 6.0 dB

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Broadcom Corporation model Bluetooth module, BCM92070MD_REF12 is a Bluetooth radio module that is designed to be installed in other equipment. Since the EUT would normally be placed in a product used on a table 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 Volts DC.

The sample was received on June 15, 2011 and tested on June 22, 2011. The EUT consisted of the following component(s):

Company	Model	Description	Serial Number	FCC ID
Broadcom	BRC92070MD_ REF12	Bluetooth radio module	-	TBD

OTHER EUT DETAILS

Internal antenna gain = 1.75 dBi.
External antenna gain = 3.9 dBi
The antenna connects to the EUT via a non-standard unique I-PEX antenna connector, thereby meeting the requirements of FCC 15.203.

ENCLOSURE

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

MODIFICATIONS

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

SUPPORT EQUIPMENT

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

Company	Model	Description	Serial Number	FCC ID
Hewlett Packard	Pavillion dv6000	Laptop	CNF7120Y9G	-

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

Company	Model	Description	Serial Number	FCC ID
Netgear	RP614v3	Network Switch	RP6114A0B039 891	-

INTERFACE PORTS

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

Port		Cable(s)		
From	To	Description	Shielded/Unshielded	Length(m)
Antenna	Antenna	Coax	Shielded	0.3
Power/Data	Adapter board	Multiwire	Unshielded	0.2
USB	Adapter board	Multiwire	Shielded	1.5
Laptop Network	Remote Switch	CAT 5	Unshielded	15
Laptop DC Power	AC Adapter	Two wire with ferrite	Unshielded	1.5
AC Adapter Power	AC Mains	Three wire	Unshielded	1.5

EUT OPERATION

For digital device testing, the EUT was set to receive on the center channel, the Ethernet port was in linked state and H characters were displayed in a window on the laptop screen. A USB cable was connected between the Host Laptop to the adaptor board to communicate with the Bluetooth device via the Bluetool software.

EMISSIONS TESTING

RADIATED AND CONDUCTED EMISSIONS

Final test measurements were taken at the Elliott Laboratories 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: 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 4	R-1684 G-57 C-1796 T-1640	211948	IC 2845B-4	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 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 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.

Telecommunication port measurements are made with the unshielded network cable connected through an impedance stabilization network (ISN) appropriate to the type of cable employed. Where no suitable ISN is available measurements are made using a capacitive voltage probe (CVP) and a current probe. If shielded cables are specified for the port under test the measurement is made of the noise voltage on the shield of the cable via a 100 ohm resistor.

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 biconnical 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, CISPR 22 and KN22 specify 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, CISPR 22 and KN22, 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 (SEMI-ANECHOIC and/or OATS TEST ENVIRONMENT)

Radiated emissions measurements in a semi-anechoic environment are performed in two phases (preliminary scan and final maximization). Final maximization may be performed on an OATS.

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 from 30 MHz up to the frequency required by the regulations specified on page 1. One or more of these are performed 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 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 if required. 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

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.

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

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.

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:

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

where:

F_d = Distance Factor in dB
D_m = Measurement Distance in meters
D_s = Specification Distance in meters

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

Radiated Emissions, 30 - 1,000 MHz, 22-Jun-11

Manufacturer	Description	Model	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	11/2/2011
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT 010	1826	5/17/2012
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	2197	12/29/2011

Conducted Emissions - AC Power Ports, 22-Jun-11

Manufacturer	Description	Model	Asset #	Cal Due
EMCO	LISN, 10 kHz-100 MHz	3825/2	1292	3/1/2012
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	11/2/2011
Rohde & Schwarz	Pulse Limiter	ESH3 Z2	1594	5/17/2012

Appendix B Test Data

T83604 Pages 16 - 24

Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		-
Emissions Standard(s):	FCC 15.247, RSS-210, LP0002	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Broadcom

Model

BRC92070MD_REF12

Date of Last Test: 6/28/2011

Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		
Standard:	FCC 15.247, RSS-210, LP0002	Class:	B

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: 6/22/2011
Test Engineer: Suresh Kondapalli
Test Location: Ch #4
Config. Used: 1
Config Change: None
EUT Voltage: 3.3V DC from Host

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 where 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: 23 °C
Rel. Humidity: 42 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	Radiated Emissions 30 - 1000 MHz, Preliminary	Class B	Eval	-
2	Radiated Emissions 30 - 1000 MHz, Maximized	Class B	Pass	37.6dBµV/m @ 41.37MHz (-2.4dB)

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.

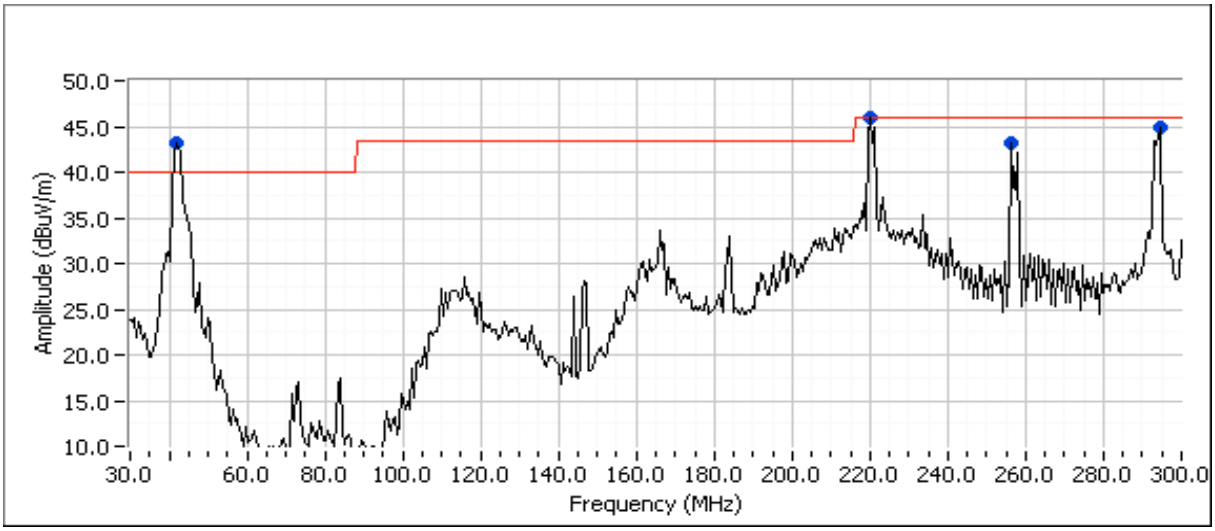
Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		
Standard:	FCC 15.247, RSS-210, LP0002	Class:	B

Run #1: Preliminary Radiated Emissions, 30 - 1000 MHz Digital device/ Receive mode at Center channel 2440

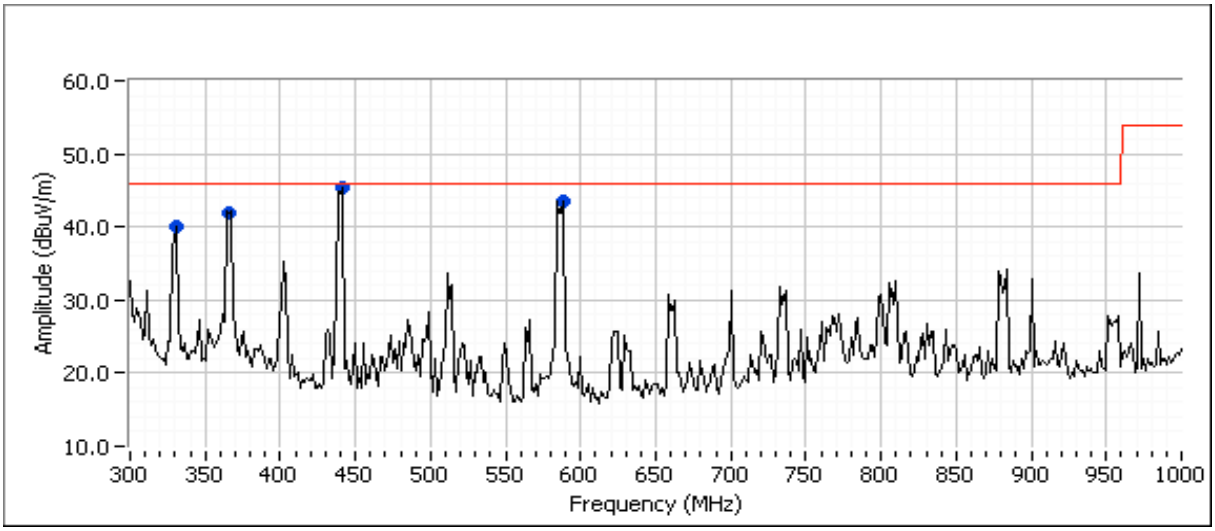
Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
30 - 1000 MHz	3	3	0.0

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
41.904	43.2	H	40.0	3.2	Peak	323	1.0	
219.920	45.9	H	46.0	-0.1	Peak	196	1.0	
441.683	45.4	H	46.0	-0.6	Peak	191	1.0	
294.589	45.0	H	46.0	-1.0	Peak	215	1.0	
588.978	43.4	H	46.0	-2.6	Peak	208	1.0	
256.172	43.2	H	46.0	-2.8	Peak	183	1.0	
365.932	41.9	H	46.0	-4.1	Peak	223	1.0	
330.862	40.1	H	46.0	-5.9	Peak	236	1.0	



Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		
Standard:	FCC 15.247, RSS-210, LP0002	Class:	B



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

Frequency	Level	Pol	Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
41.368	37.6	H	40.0	-2.4	QP	347	1.0	QP (1.00s)
219.941	42.3	H	46.0	-3.7	QP	211	1.0	QP (1.00s)
440.771	41.5	H	46.0	-4.5	QP	196	1.0	QP (1.00s)
294.049	41.2	H	46.0	-4.8	QP	184	1.0	QP (1.00s)
588.122	39.4	H	46.0	-6.6	QP	207	1.0	QP (1.00s)
367.332	37.9	H	46.0	-8.1	QP	217	1.0	QP (1.00s)
256.004	33.8	H	46.0	-12.2	QP	185	1.0	QP (1.00s)
330.713	31.4	H	46.0	-14.6	QP	236	1.0	QP (1.00s)

Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		
Standard:	FCC 15.247, RSS-210, LP0002	Class:	B

Run #2: Maximized Readings From Run #1

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	Class B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
41.368	37.6	H	40.0	-2.4	QP	347	1.0	QP (1.00s)
219.941	42.3	H	46.0	-3.7	QP	211	1.0	QP (1.00s)
440.771	41.5	H	46.0	-4.5	QP	196	1.0	QP (1.00s)
294.049	41.2	H	46.0	-4.8	QP	184	1.0	QP (1.00s)
588.122	39.4	H	46.0	-6.6	QP	207	1.0	QP (1.00s)
367.332	37.9	H	46.0	-8.1	QP	217	1.0	QP (1.00s)
256.004	33.8	H	46.0	-12.2	QP	185	1.0	QP (1.00s)
330.713	31.4	H	46.0	-14.6	QP	236	1.0	QP (1.00s)

Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		
Standard:	FCC 15.247, RSS-210, LP0002	Class:	B

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: 6/22/2011
Test Engineer: Michael Findley
Test Location: Fremont Chamber #4
Config. Used: 1
Config Change: none
Host Voltage: 120V/60Hz

General Test Configuration

For tabletop equipment, the host system was located on a styro foam table inside the semi-anechoic chamber, 40 cm from a vertical coupling plane and 80cm from the LISN.

Ambient Conditions:

Temperature: 19 °C
Rel. Humidity: 35 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power,120V/60Hz	Class B	Pass	37.8dBµV @ 16.899MHz (-12.2dB)

Modifications Made During Testing

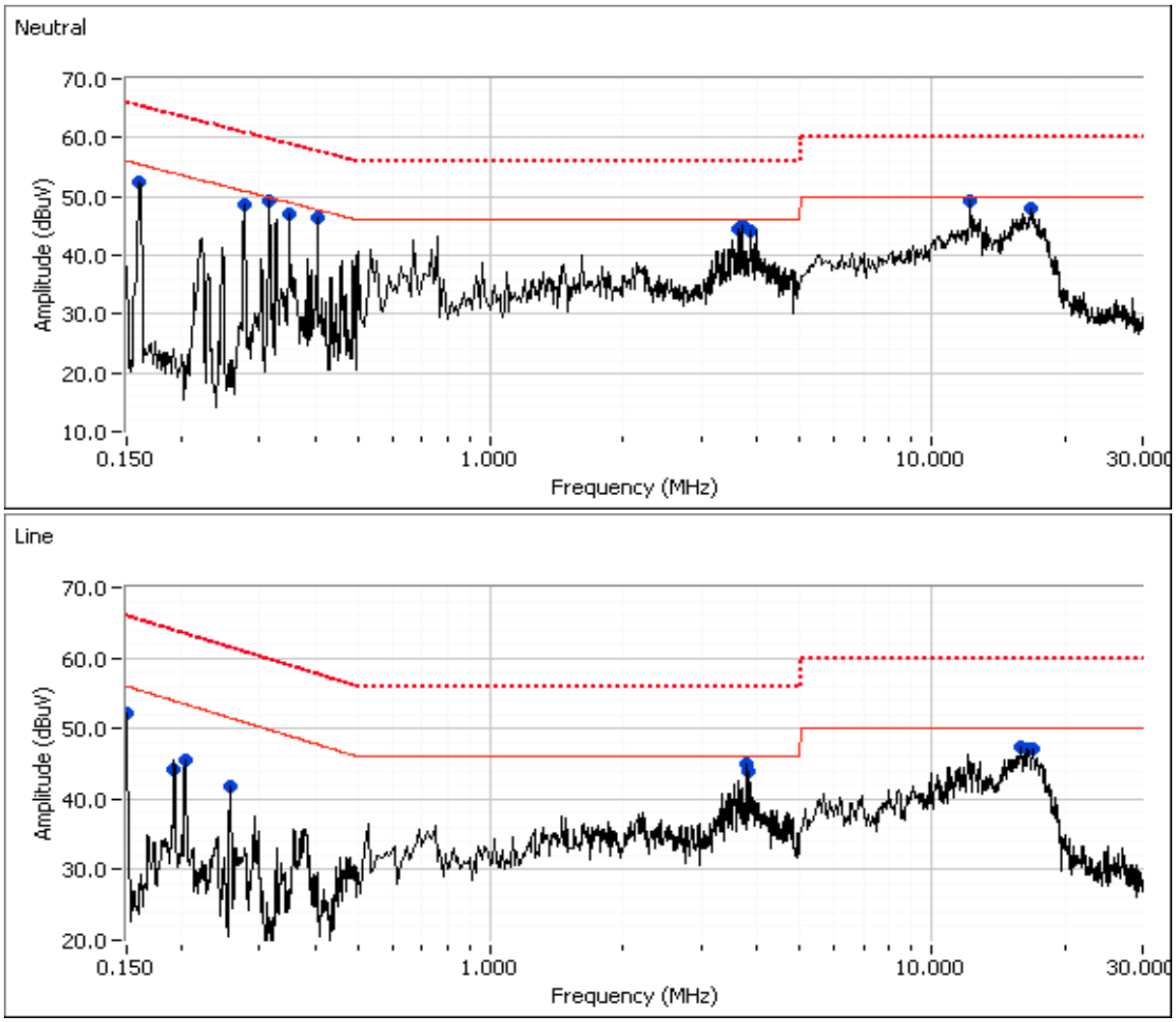
No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		
Standard:	FCC 15.247, RSS-210, LP0002	Class:	B

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



Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		
Standard:	FCC 15.247, RSS-210, LP0002	Class:	B

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

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.313	49.2	Neutral	49.8	-0.6	Peak	
0.348	47.1	Neutral	48.9	-1.8	Peak	
0.408	46.3	Neutral	47.7	-1.4	Peak	
0.280	48.7	Neutral	50.9	-2.2	Peak	
0.158	52.5	Neutral	55.4	-2.9	Peak	
3.612	44.4	Neutral	46.0	-1.6	Peak	
3.706	45.0	Neutral	46.0	-1.0	Peak	
3.887	44.3	Neutral	46.0	-1.7	Peak	
12.125	49.1	Neutral	50.0	-0.9	Peak	
16.663	47.9	Neutral	50.0	-2.1	Peak	
0.152	52.1	Line	56.0	-3.9	Peak	
0.192	44.2	Line	54.0	-9.8	Peak	
0.206	45.4	Line	53.4	-8.0	Peak	
0.260	41.7	Line	51.5	-9.8	Peak	
3.846	44.0	Line	46.0	-2.0	Peak	
3.786	45.0	Line	46.0	-1.0	Peak	
15.941	47.3	Line	50.0	-2.7	Peak	
16.233	47.0	Line	50.0	-3.0	Peak	
16.899	47.0	Line	50.0	-3.0	Peak	

Client:	Broadcom	Job Number:	J83573
Model:	BRC92070MD_REF12	T-Log Number:	T83604
		Account Manager:	Sheareen Washington
Contact:	Juan Martinez		
Standard:	FCC 15.247, RSS-210, LP0002	Class:	B

Final quasi-peak and average readings

Frequency	Level	AC	Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
16.899	37.8	Line	50.0	-12.2	AVG	AVG (0.10s)
16.233	37.3	Line	50.0	-12.7	AVG	AVG (0.10s)
16.663	37.2	Neutral	50.0	-12.8	AVG	AVG (0.10s)
0.408	44.9	Neutral	57.7	-12.8	QP	QP (1.00s)
15.941	36.9	Line	50.0	-13.1	AVG	AVG (0.10s)
12.125	36.2	Neutral	50.0	-13.8	AVG	AVG (0.10s)
0.152	51.5	Line	65.9	-14.4	QP	QP (1.00s)
3.612	30.9	Neutral	46.0	-15.1	AVG	AVG (0.10s)
3.706	30.8	Neutral	46.0	-15.2	AVG	AVG (0.10s)
3.887	30.4	Neutral	46.0	-15.6	AVG	AVG (0.10s)
3.786	30.4	Line	46.0	-15.6	AVG	AVG (0.10s)
0.280	45.0	Neutral	60.8	-15.8	QP	QP (1.00s)
3.846	30.0	Line	46.0	-16.0	AVG	AVG (0.10s)
0.348	42.9	Neutral	59.0	-16.1	QP	QP (1.00s)
3.612	39.8	Neutral	56.0	-16.2	QP	QP (1.00s)
3.706	39.7	Neutral	56.0	-16.3	QP	QP (1.00s)
16.899	43.7	Line	60.0	-16.3	QP	QP (1.00s)
16.663	43.2	Neutral	60.0	-16.8	QP	QP (1.00s)
16.233	43.1	Line	60.0	-16.9	QP	QP (1.00s)
15.941	43.0	Line	60.0	-17.0	QP	QP (1.00s)
0.158	48.1	Neutral	65.6	-17.5	QP	QP (1.00s)
3.887	38.4	Neutral	56.0	-17.6	QP	QP (1.00s)
12.125	42.4	Neutral	60.0	-17.6	QP	QP (1.00s)
3.786	38.2	Line	56.0	-17.8	QP	QP (1.00s)
3.846	38.1	Line	56.0	-17.9	QP	QP (1.00s)
0.313	41.8	Neutral	59.9	-18.1	QP	QP (1.00s)
0.348	28.3	Neutral	49.0	-20.7	AVG	AVG (0.10s)
0.408	24.7	Neutral	47.7	-23.0	AVG	AVG (0.10s)
0.260	38.3	Line	61.4	-23.1	QP	QP (1.00s)
0.192	40.0	Line	63.9	-23.9	QP	QP (1.00s)
0.206	38.8	Line	63.4	-24.6	QP	QP (1.00s)
0.313	24.4	Neutral	49.9	-25.5	AVG	AVG (0.10s)
0.206	27.9	Line	53.4	-25.5	AVG	AVG (0.10s)
0.192	28.2	Line	53.9	-25.7	AVG	AVG (0.10s)
0.280	22.9	Neutral	50.8	-27.9	AVG	AVG (0.10s)
0.260	22.3	Line	51.4	-29.1	AVG	AVG (0.10s)

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 (digital apparatus), the product must be labeled with a notice indicating compliance e.g.

> This Class B digital apparatus complies with Canadian ICES-003
>
> Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada

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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marks the last page of this test report.