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Electromagnetic Emissions Test Report
Application for Grant of Equipment Authorization
Class II Permissive Change
pursuant to
Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7
FCC Part 15 Subpart C
on the
Broadcom Corporation
Transmitter
Model: BCM92046MD_GEN

UPN:	4324A-BRCM1033
FCC ID:	QDS-BRCM1033
GRANTEE:	Broadcom Corporation 190 Mathilda Ave. Sunnyvale, CA 94086
TEST SITE(S):	Elliott Laboratories 684 W. Maude Ave Sunnyvale, CA 94086 IC Site Registration #: IC 2845-2
REPORT DATE:	January 8, 2009
REISSUE DATE:	February 2, 2009
FINAL TEST DATE:	December 22, December 24, 2008 and January 16, 2009
AUTHORIZED SIGNATORY:	David W. Bare Chief Engineer

ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Rev #	Date	Comments	Modified By
1	1/29/09	Initial Release	-
2	2/2/09	Corrected reference on page 7 from 15.207 to 15.209	dwb

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SCOPE

An electromagnetic emissions test has been performed on the Broadcom Corporation model BCM92046MD_GEN pursuant to the following rules:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in the following reference standards and as outlined in Elliott Laboratories test procedures:

ANSI C63.4:2003
FCC DTS Measurement Procedure KDB558074, March 2005

The intentional radiator above has been tested in a simulated typical installation to demonstrate compliance with the relevant Industry Canada performance and procedural standards.

Final system data was gathered in a mode that tended to maximize emissions by varying orientation of EUT, orientation of power and I/O cabling, antenna search height, and antenna polarization.

Every practical effort was made to perform an impartial test using appropriate test equipment of known calibration. All pertinent factors have been applied to reach the determination of compliance.

The test results recorded herein are based on a single type test of the Broadcom Corporation model BCM92046MD_GEN 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 manufacturer is compliance with the regulations outlined in the previous section.

Prior to marketing in the USA, all unlicensed transmitters and transceivers require certification. Receive-only devices operating between 30 MHz and 960 MHz are subject to either certification or a manufacturer's declaration of conformity, with all other receive-only devices exempt from the technical requirements.

Prior to marketing in Canada, Class I transmitters, receivers and transceivers require certification. Class II devices are required to meet the appropriate technical requirements but are exempt from certification requirements.

Certification is a procedure where the manufacturer submits test data and technical information to a certification body and receives a certificate or grant of equipment authorization upon successful completion of the certification body's review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units, which are subsequently manufactured.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

STATEMENT OF COMPLIANCE

The tested sample of Broadcom Corporation model BCM92046MD_GEN complied with the requirements of the following regulations:

Industry Canada RSS-Gen Issue 2
RSS 210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15 Subpart C

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product which may result in increased emissions should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing or I/O cable changes, etc.).

TEST RESULTS SUMMARY

FREQUENCY HOPPING SYSTEMS (2400 – 2483.5MHz)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247(a)	RSS 210 A8.2	Frequency hopping or Digital Modulation	Systems uses frequency hopping techniques	-	Complies
	RSP100	99% Bandwidth	No change from original submittal	Information only	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	5.6 dBm (0.0036 Watts) EIRP = 0.008 W Note 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	Based on the changes proposed, the conducted emissions would not be affected	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	52.0dBµV/m @ 7440.1MHz (-2.0dB)	15.209 in restricted bands, all others < -20dBc	Complies

Note 1: EIRP calculated using antenna gain of 3.5 dBi for the highest EIRP multi-point system.

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Integral antenna	Integral antenna or non-standard connector	Complies
	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	43.2dBµV/m @ 4883.4MHz (-10.8dB)	Refer to Standard	Complies
15.207	RSS GEN Table 2	AC Conducted Emissions	Based on the changes proposed, the conducted emissions would not be affected	Refer to standard	N/A
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	No change from original submittal	Refer to OET 65, FCC Part 1 and RSS 102	Complies
	RSP 100 RSS GEN 7.1.5	User Manual	No change from original submittal	Statement required regarding non-interference	Complies
	RSP 100 RSS GEN 7.1.5	User Manual	Integral antenna	Statement required regarding detachable antenna	N/A

MEASUREMENT UNCERTAINTIES

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence level and were calculated in accordance with UKAS document LAB 34.

Measurement Type	Frequency Range (MHz)	Calculated Uncertainty (dB)
Conducted Emissions	0.15 to 30	± 2.4
Radiated Emissions	0.015 to 30	± 3.0
Radiated Emissions	30 to 1000	± 3.6
Radiated Emissions	1000 to 40000	± 6.0

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Broadcom Corporation model BCM92046MD_GEN is a Bluetooth transceiver module intended for installation in a host device. Since the EUT could be used in any device, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The EUT receives 3.3V DC power from the host in which it is installed.

The sample was received on December 22, 2008 and tested on December 22, December 24, 2008 and January 16, 2009. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Broadcom	BCM92046MD_GEN	Bluetooth Transceiver Module	101	QDS-BRCM1033

ANTENNA SYSTEM

The antenna system used with the Broadcom Corporation model BCM92046MD_GEN consists of integral 3.5dBi antenna.

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	hepburn6C	Laptop	N/A	DoC

No remote support equipment was used during emissions testing.

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	EUT	Multiwire with ferrite bead	Shielded	0.6
Host AC Power	AC Mains	Multiwire	Unshielded	0.8

EUT OPERATION

During emissions testing the EUT was set to transmit continuously on low, middle, and high channel at previous approved power levels.

PROPOSED MODIFICATION DETAILS

GENERAL

This section details the modifications to the Broadcom Corporation model BCM92046MD_GEN being proposed. All performance and construction deviations from the characteristics originally reported to the FCC are addressed

PRINTED WIRING BOARD LAYOUT

The printing wiring board was changed to accommodate a different host connector and the board size was reduced in length.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on December 22, December 24, 2008 and January 16, 2009 at the test sites listed below. Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission and with industry Canada.

Site	Registration Numbers		Location
	FCC	Canada	
SVOATS #2	90593	IC 2845-2	684 West Maude Ave, Sunnyvale CA 94085-3518

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception, on OATS sites, of predictable local TV, radio, and mobile communications traffic. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 2000 MHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements. If the repetition frequency of the signal being measured is below 20Hz, peak measurements are made in lieu of Quasi-Peak measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz, unless the signal is pulsed in which case the average (or video) bandwidth of the measuring instrument is reduced to onset of pulse desensitization and then increased.

INSTRUMENT CONTROL COMPUTER

The receivers utilize either a Rohde & Schwarz EZM Spectrum Monitor/Controller or contain an internal Spectrum Monitor/Controller to view and convert the receiver measurements to the field strength at an antenna or voltage developed at the LISN measurement port, which is then compared directly with the appropriate specification limit. This provides faster, more accurate readings by performing the conversions described under Sample Calculations within the Test Procedures section of this report. Results are printed in a graphic and/or tabular format, as appropriate. A personal computer is used to record all measurements made with the receivers.

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer run automated data collection programs which control the receivers. This provides added accuracy since all site correction factors, such as cable loss and antenna factors are added automatically.

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

Line conducted measurements utilize a fifty microhenry Line Impedance Stabilization Network as the monitoring point. The LISN used also contains a 250 uH CISPR adapter. This network provides for calibrated radio frequency noise measurements by the design of the internal low pass and high pass filters on the EUT and measurement ports, respectively.

FILTERS/ATTENUATORS

External filters and precision attenuators are often connected between the receiving antenna or LISN and the receiver. This eliminates saturation effects and non-linear operation due to high amplitude transient events.

ANTENNAS

A loop antenna is used below 30 MHz. For the measurement range 30 MHz to 1000 MHz either a combination of a biconical antenna and a log periodic or a bi-log antenna is used. Above 1000 MHz, horn antennas are used. The antenna calibration factors to convert the received voltage to an electric field strength are included with appropriate cable loss and amplifier gain factors to determine an overall site factor, which is then programmed into the test receivers or incorporated into the test software.

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height. Measurements below 30 MHz are made with the loop antenna at a fixed height of 1m above the ground plane.

ANSI C63.4:2003 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

All test equipment is regularly checked to ensure that performance is maintained in accordance with the manufacturer's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An exhibit of this report contains the list of test equipment used and calibration information.

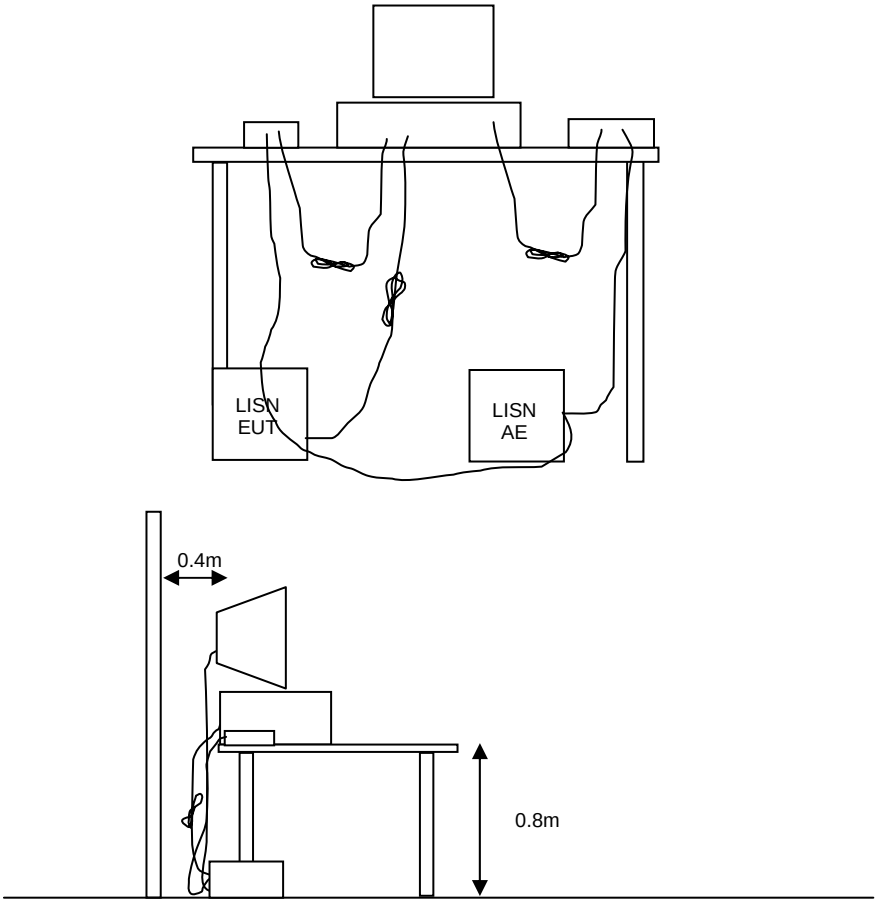
TEST PROCEDURES

EUT AND CABLE PLACEMENT

The regulations require that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4:2003, and the worst-case orientation is used for final measurements.

CONDUCTED EMISSIONS

Conducted emissions are measured at the plug end of the power cord supplied with the EUT. Excess power cord length is wrapped in a bundle between 30 and 40 centimeters in length near the center of the cord. Preliminary measurements are made to determine the highest amplitude emission relative to the specification limit for all the modes of operation. Placement of system components and varying of cable positions are performed in each mode. A final peak mode scan is then performed in the position and mode for which the highest emission was noted on all current carrying conductors of the power cord.

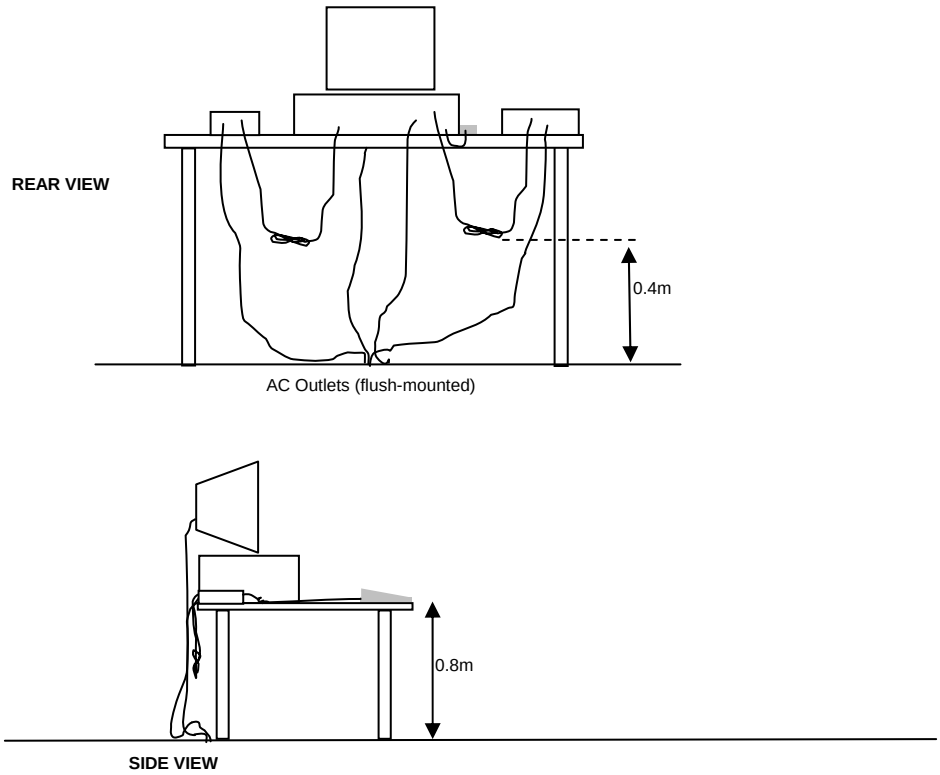


A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied (for measurements above 30 MHz) and cable positions are varied to determine the highest emission relative to the limit. Preliminary scans may be performed in a fully anechoic chamber for the purposes of identifying the frequencies of the highest emissions from the EUT.

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

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth, which results in the highest emission is then maintained while varying the antenna height from one to four meters (for measurements above 30 MHz, measurements below 30 MHz are made with the loop antenna at a fixed height of 1m). The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain.

When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements

BANDWIDTH MEASUREMENTS

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

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

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

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

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from transmitters that fall in restricted bands[1] (with the exception of transmitters operating under FCC Part 15 Subpart D and RSS 210 Annex 9), the limits for all emissions from a low power device operating under the general rules of RSS 310 (tables 3 and 4), RSS 210 (table 2) and FCC Part 15 Subpart C section 15.209.

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

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

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

The table below shows the limits for the spurious emissions from receivers as detailed in FCC Part 15.109, RSS 210 Table 2, RSS GEN Table 1 and RSS 310 Table 3. Note that receivers operating outside of the frequency range 30 MHz – 960 MHz are exempt from the requirements of 15.109.

Frequency Range (MHz)	Limit (uV/m @ 3m)	Limit (dBuV/m @ 3m)
30 to 88	100	40
88 to 216	150	43.5
216 to 960	200	46.0
Above 960	500	54.0

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

The table below shows the limits for output power and output power density. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

Operating Frequency (MHz)	Output Power	Power Spectral Density
902 – 928	1 Watt (30 dBm)	8 dBm/3kHz
2400 – 2483.5	1 Watt (30 dBm)	8 dBm/3kHz
5725 – 5850	1 Watt (30 dBm)	8 dBm/3kHz

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

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

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

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r - S = M$$

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 above 30MHz, 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

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

$$F_d = 40*LOG_{10} (D_m/D_s)$$

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

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

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp), or where a field strength measurement of output power is made in lieu of a direct measurement, the following formula is used to convert between eirp and field strength at a distance of 3m from the equipment under test:

$$E = \frac{1000000 \sqrt{30 P}}{3} \text{ microvolts per meter}$$

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 1000 - 12,000 MHz, 22-Dec-08
Engineer: jcaizzi

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18GHz	3115	868	10-Jun-10
Hewlett Packard	SpectAn 9 kHz - 40 GHz, FT (SA40) Blue	8564E (84125C)	1393	15-Jan-09
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	1780	13-Nov-09

Radiated Emissions, 25 - 12,750 MHz, 24-Dec-08
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	Log Periodic Antenna 300-1000 MHz	EL300.1000	55	27-Feb-09
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	06-Jun-09
EMCO	Biconical Antenna, 30-300 MHz	3110B	801	19-Sep-09
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	15-Jul-10
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	20-Oct-09
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT 010	1826	29-May-09

Radiated Emissions, 25 - 12,750 MHz, 24-Dec-08
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	54	26-Mar-09
EMCO	Antenna, Horn, 1-18 GHz	3115	487	15-Jul-10
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	29-Jan-09
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1347	17-Jan-09
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1404	09-Apr-09
Rohde & Schwarz	Power Meter, Single Channel	NRVS	1422	04-Nov-09
Rohde & Schwarz	Signal Generator, 9 kHz-1.04 GHz	SMY01	1450	05-Nov-09
EMCO	Biconical Antenna, 30-300 MHz	3110B	1498	18-Apr-09
Rohde & Schwarz	Power Sensor, 1 nW-20 mW, 10 MHz-18 GHz, 50ohms	NRV-Z1	2114	18-Sep-09

Radiated Emissions, 1000 - 10,000 MHz, 16-Jan-09
Engineer: Rafael Varelas

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	09-Oct-09
EMCO	Antenna, Horn, 1-18 GHz (SA40-Red)	3115	1142	15-Jul-10
Hewlett Packard	SpecAn 9 kHz - 40 GHz, (SA40) Purple	8564E (84125C)	1771	20-Oct-09

Conducted Emissions - AC Power Ports, 26-Jan-09
Engineer: Suhaila Khushzad

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	LISN, FCC / CISPR	LISN-4, OATS	362	31-Jul-09
Hewlett Packard	EMC Spectrum Analyzer, 9 kHz - 6.5 GHz	8595EM	780	30-Dec-09
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	812	12-Feb-09
Rohde & Schwarz	Test Receiver, 0.009-2750 MHz	ESN	1332	29-Jan-09

EXHIBIT 2: Test Measurement Data

11 Pages

Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		-
Emissions Standard(s):	EN 300 328, FCC 15.247	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Broadcom

Model

BCM92046MD_GEN

Date of Last Test: 1/26/2009

Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manger:	Dean Eriksen
Contact:	Juan Martinez		
Emissions Standard(s):	EN 300 328, FCC 15.247	Class:	B
Immunity Standard(s):	-	Environment:	-

EUT INFORMATION

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

General Description

The EUT is a Bluetooth transceiver module intended for installation in a host device. Since the EUT could be used in any device, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The EUT receives 3.3V DC power from the host in which it is installed.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Broadcom	BCM92046MD_GEN	Bluetooth Transceiver Module	101	QDS-BRCM1033

Other EUT Details

The following EUT details should be noted: None

EUT Antenna (Intentional Radiators Only)

The antenna is integral to the device and has a gain of 3.5dBi.

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.

Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manger:	Dean Eriksen
Contact:	Juan Martinez		
Emissions Standard(s):	EN 300 328, FCC 15.247	Class:	B
Immunity Standard(s):	-	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	hepburn6C	Laptop	N/A	DoC

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
-	-	-	-	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
USB	EUT	Multiwire with ferrite bead	Shielded	0.6
Host AC Power	AC Mains	Multiwire	Unshielded	0.8

EUT Operation During Emissions Tests

During transmit mode testing the EUT was set to transmit continuously on low, middle, and high channel at previous approved power levels. During receive mode testing, the EUT was set to receive mode and the host was displaying a window of H characters and sending data out the Ethernet port.

Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		
Standard:	EN 300 328, FCC 15.247	Class:	N/A

RSS 210 and FCC 15.247 Radiated Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/24/2008
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
EUT Voltage: Powered from laptop via USB

General Test Configuration

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

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

Ambient Conditions:

Temperature: 19.4 °C
Rel. Humidity: 41 %

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

Run #	Mode	Channel	Power Setting		Test Performed	Limit	Result / Margin
1a	8PSK	low	0		Restricted Band Edge (2390 MHz)	FCC Part 15.209 / 15.247(c)	45.1dBµV/m @ 2389.8MHz (-8.9dB)
1c	8PSK	high	0		Restricted Band Edge (2483.5 MHz)	FCC Part 15.209 / 15.247(c)	46.7dBµV/m @ 2483.5MHz (-7.3dB)

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:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		
Standard:	EN 300 328, FCC 15.247	Class:	N/A

Run #1: Radiated Spurious Emissions, fundamental and bandedge

Run #1a: Low Channel @ 2402 MHz

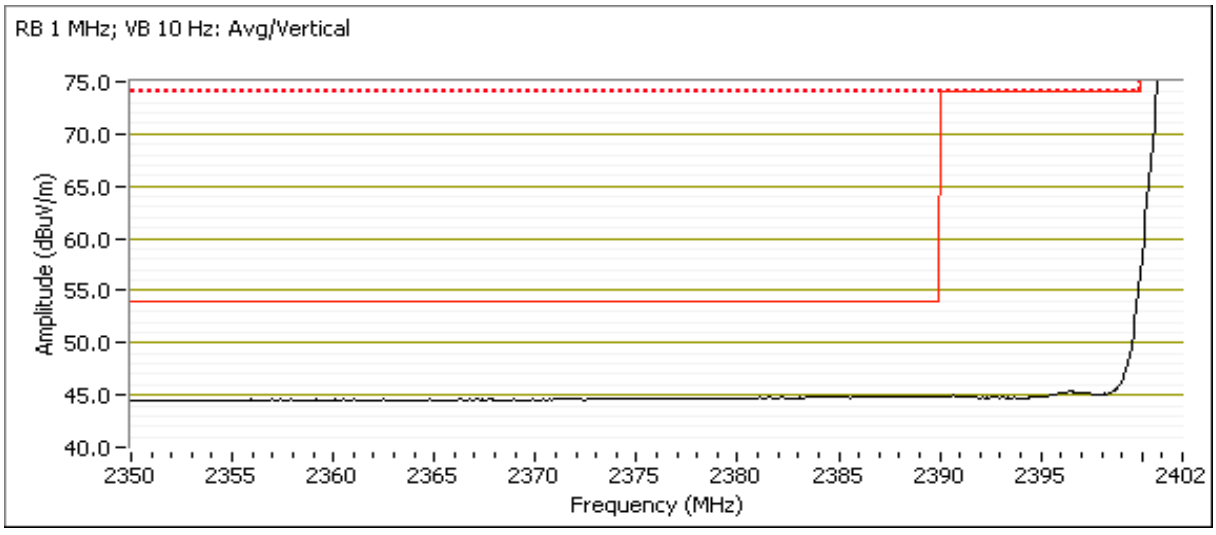
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.030	101.5	V	120.0	-18.5	AVG	162	1.1	RB 1 MHz; VB: 10 Hz
2402.210	104.5	V	120.0	-15.5	PK	162	1.1	RB 1 MHz; VB: 1 MHz
2402.020	97.4	H	120.0	-22.6	AVG	191	1.9	RB 1 MHz; VB: 10 Hz
2401.830	100.3	H	120.0	-19.7	PK	191	1.9	RB 1 MHz; VB: 1 MHz

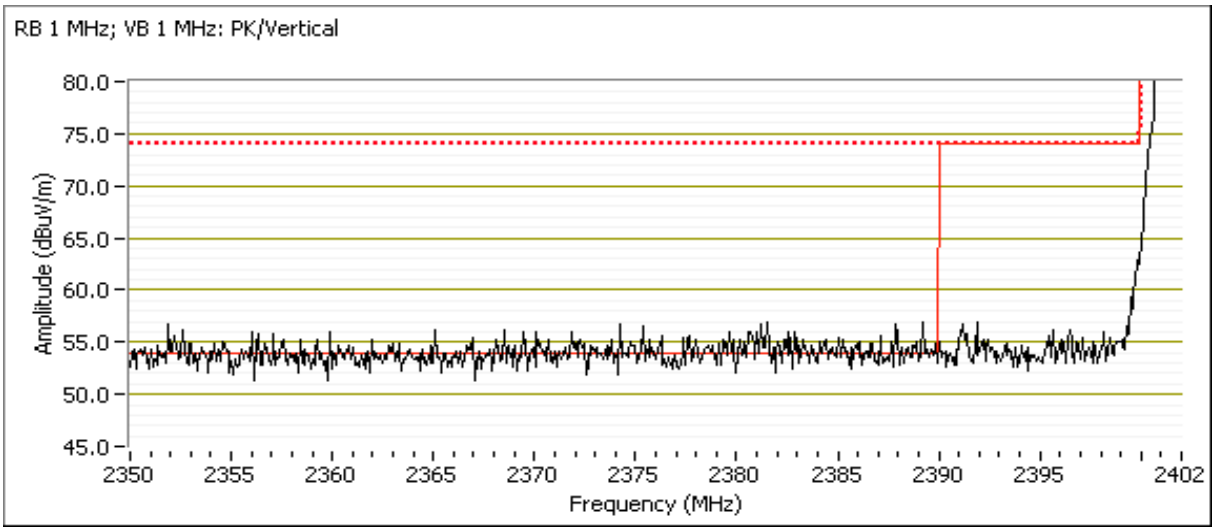
Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2389.820	45.1	V	54.0	-8.9	Avg	162	1.1	RB 1 MHz; VB: 10 Hz
2389.940	58.3	V	74.0	-15.7	PK	162	1.1	RB 1 MHz; VB: 1 MHz
2387.280	44.7	H	54.0	-9.3	Avg	191	1.9	RB 1 MHz; VB: 10 Hz
2389.640	57.2	H	74.0	-16.8	PK	191	1.9	RB 1 MHz; VB: 1 MHz

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.



Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		
Standard:	EN 300 328, FCC 15.247	Class:	N/A



Run #1b: High Channel @ 2480 MHz

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

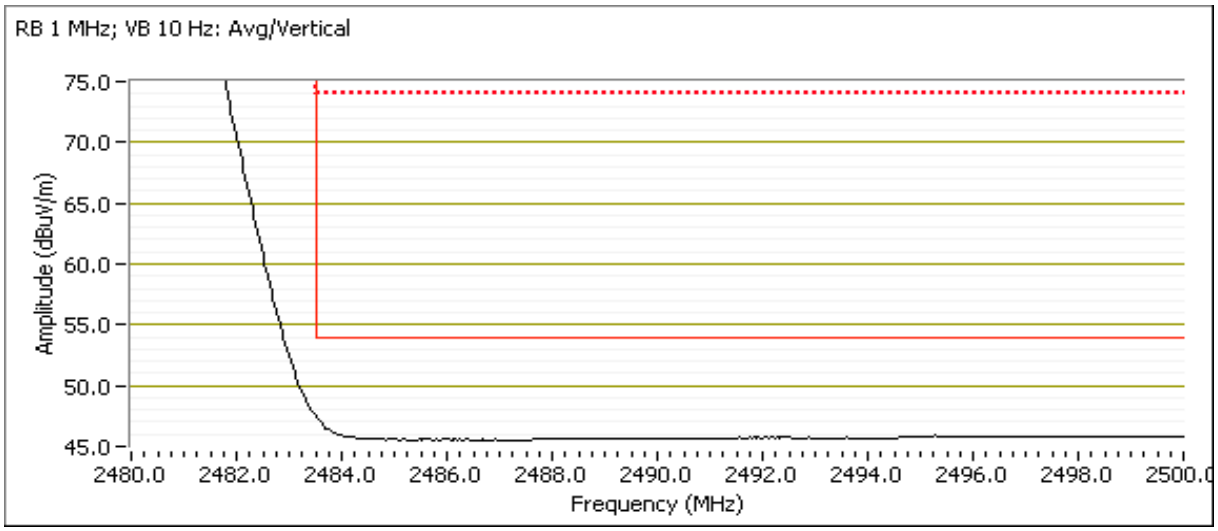
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.000	100.4	V	120.0	-19.6	AVG	170	1.0	RB 1 MHz; VB: 10 Hz
2479.820	103.6	V	120.0	-16.4	PK	170	1.0	RB 1 MHz; VB: 1 MHz
2480.000	94.4	H	120.0	-25.6	AVG	175	1.8	RB 1 MHz; VB: 10 Hz
2479.870	97.6	H	120.0	-22.4	PK	175	1.8	RB 1 MHz; VB: 1 MHz

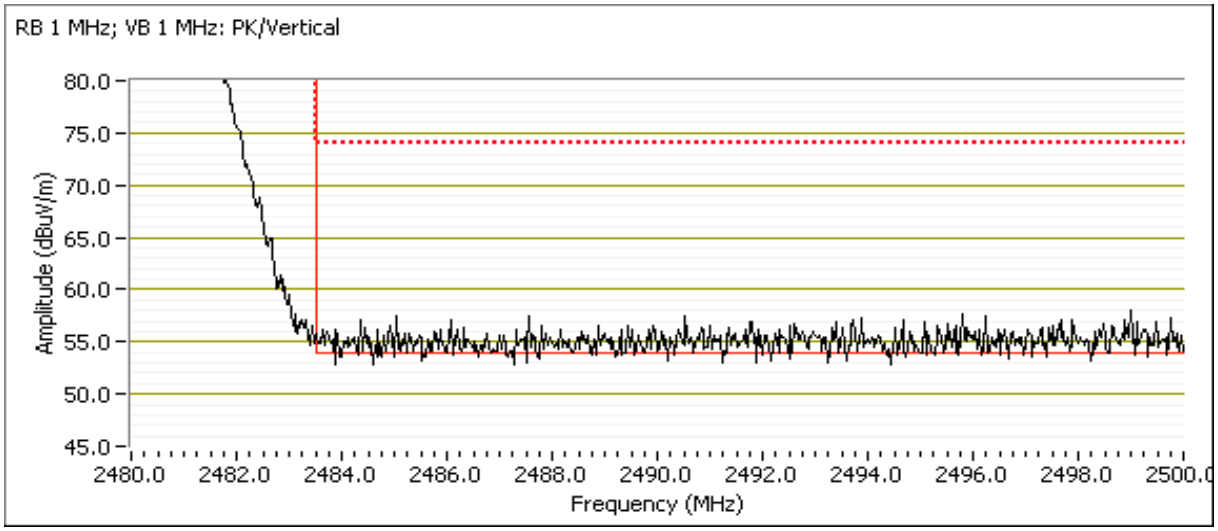
Band Edge Signal Field Strength

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2483.500	46.7	V	54.0	-7.3	Avg	170	1.0	RB 1 MHz; VB: 10 Hz
2484.420	59.2	V	74.0	-14.8	PK	170	1.0	RB 1 MHz; VB: 1 MHz
2483.500	45.5	H	54.0	-8.5	Avg	175	1.9	RB 1 MHz; VB: 10 Hz
2483.530	57.8	H	74.0	-16.2	PK	175	1.8	RB 1 MHz; VB: 1 MHz

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.

Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		
Standard:	EN 300 328, FCC 15.247	Class:	N/A





Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		
Standard:	EN 300 328, FCC 15.247	Class:	N/A

FCC 15.247 FHSS - Power and Spurious Emissions

Test Specific Details

Objective: The objective of this test session is to perform final qualification testing of the EUT with respect to the specification listed above.

Date of Test: 12/22/2008 8:00
Test Engineer: John Caizzi
Test Location: Fremont Chamber #4
Config. Used: 1
Config Change: none
Host System Voltage: 120V/60Hz

General Test Configuration

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

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

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

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

Ambient Conditions:

Temperature: 20 °C
Rel. Humidity: 34 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	1000 - 12,000 MHz Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	52.0dBµV/m @ 7440.1MHz (-2.0dB)
2	Output Power	15.247(b)	Pass	5.6 dBm (3.6 mW)

Modifications Made During Testing:

Modifications are detailed under each run description.

Deviations From The Standard

No deviations were made from the requirements of the standard.

Test Notes

Previous testing showed that no emissions above the noise floor of the measurment system were present from 12 - 25 GHz.

Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		
Standard:	EN 300 328, FCC 15.247	Class:	N/A

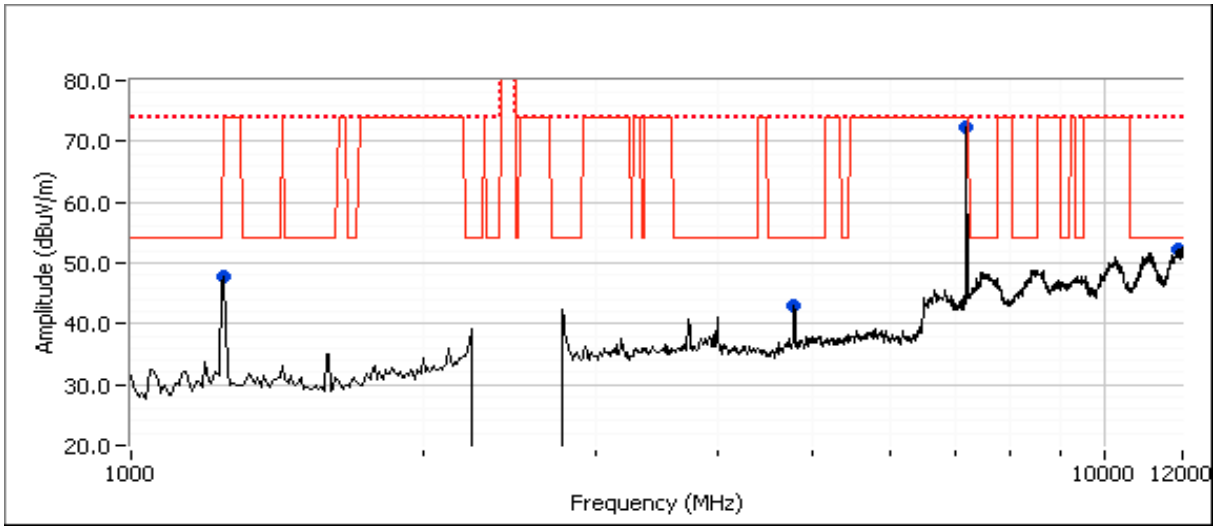
Run #1a: Radiated Spurious Emissions, 1000 - 12,000 MHz. Lowest Channel @ 2402 MHz

Fundamental emission level @ 3m in 100kHz RBW:	104.5		
Limit for emissions outside of restricted bands:	84.5	dBµV/m	Limit is -20dBc

Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4795.000	43.0	V	54.0	-11.0	Peak	86	1.2	
11893.860	41.2	H	54.0	-12.8	AVG	160	1.8	Measurement system noise floor.
7206.060	66.1	H	84.5	-18.4	Pk	197	1.2	RB 100 kHz; VB: 100 kHz
11901.930	52.5	H	74.0	-21.5	PK	160	1.8	Measurement system noise floor.
1245.520	39.9	V	84.5	-44.6	Pk	342	1.0	RB 100 kHz; VB: 100 kHz

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

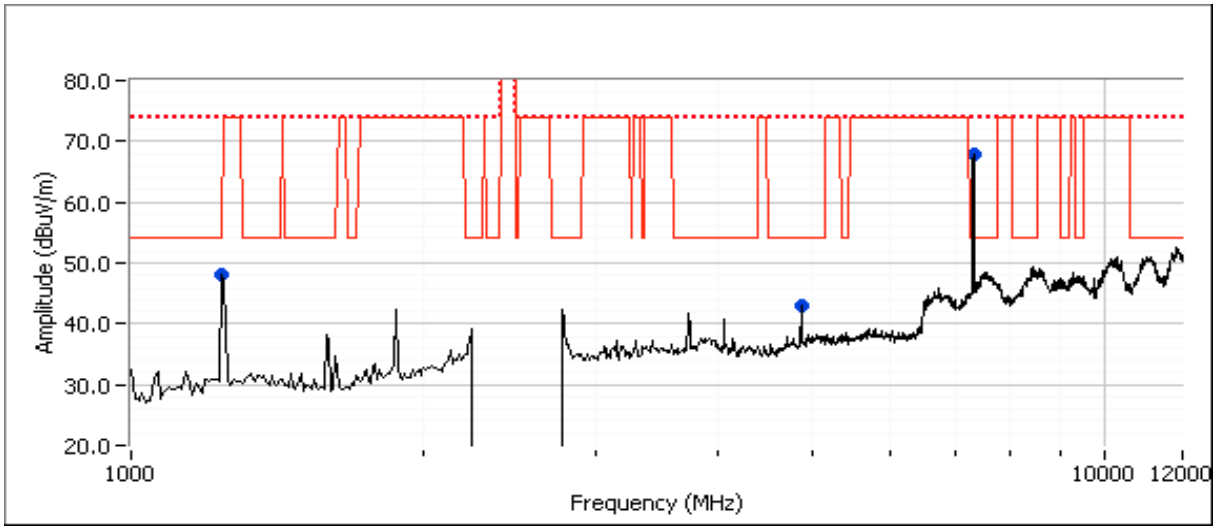


Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		
Standard:	EN 300 328, FCC 15.247	Class:	N/A

Run #1b: Radiated Spurious Emissions, 1000 - 12,000 MHz. Center Channel @ 2441 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7323.070	50.9	H	54.0	-3.1	AVG	196	1.2	Duty cycle corr. factor = -11.0dB
7322.880	71.1	H	74.0	-2.9	PK	196	1.2	
1238.330	48.0	V	54.0	-6.0	Peak	344	1.0	
4877.500	42.9	V	54.0	-11.1	Peak	92	1.6	

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



Client:	Broadcom	Job Number:	J73989
Model:	BCM92046MD_GEN	T-Log Number:	T74142
		Account Manager:	Dean Eriksen
Contact:	Juan Martinez		
Standard:	EN 300 328, FCC 15.247	Class:	N/A

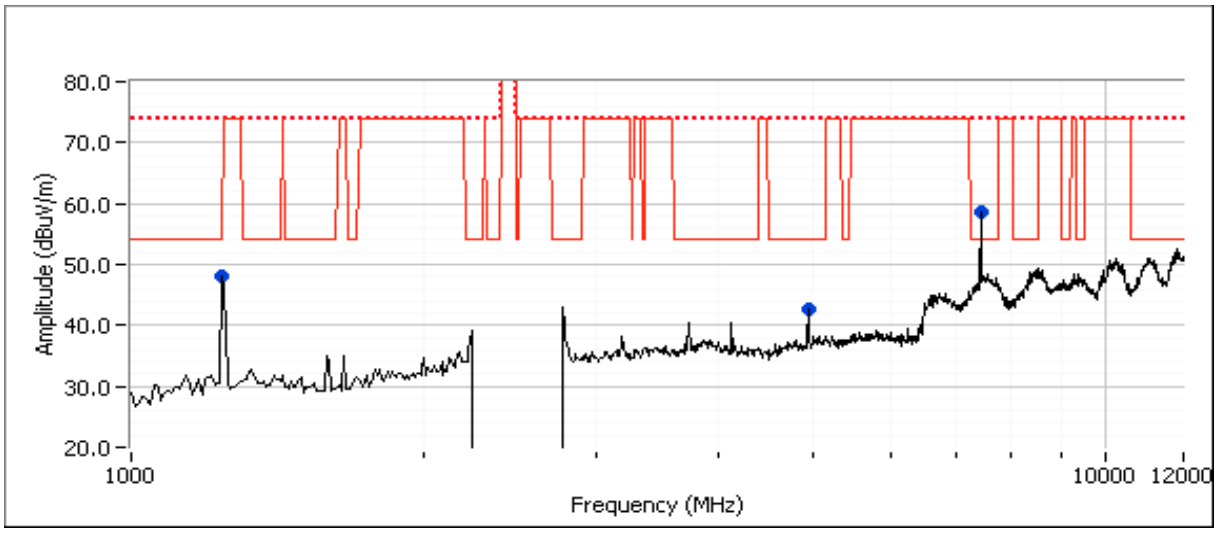
Run #1c: Radiated Spurious Emissions, 1000 - 12,000 MHz. High Channel @ 2480 MHz

Fundamental emission level @ 3m in 100kHz RBW:	103.6	
Limit for emissions outside of restricted bands:	83.6 dBµV/m	Limit is -20dBc

Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
7440.070	52.0	H	54.0	-2.0	AVG	197	1.1	
7439.930	62.8	H	74.0	-11.2	PK	197	1.1	
1244.660	42.8	V	83.6	-40.8	Pk	341	1.0	RB 100 kHz; VB: 100 kHz
4950.830	42.7	V	54.0	-11.3	Peak	278	1.2	

Note 1	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2	The fundamental was not measured, per customer request, so limits & margins in non-restricted bands could not be exactly determined.



Run #2: Output Power

8PSK Mode

Power Setting[2]	Frequency (MHz)	Output Power (dBm) [1]	Output Power mW	Antenna Gain (dBi)	Result	EIRP dBm	EIRP W		
0	2402	5.6	3.6	3.5	Pass	9.1	0.008		
0	2441	5.4	3.5	3.5	Pass	8.9	0.008		
0	2480	4.6	2.9	3.5	Pass	8.1	0.006		

Note 1:	Output power measured using a spectrum analyzer with 2 MHz RBW and 3 MHz VBW
Note 2:	Power setting - the software power setting used during testing, included for reference only.

EXHIBIT 3: Photographs of Test Configurations

EXHIBIT 4: Detailed Photographs of Broadcom Corporation Model BCM92046MD_GEN Construction

EXHIBIT 5: Schematic Diagrams for Broadcom Corporation Model BCM92046MD_GEN