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Electromagnetic Emissions Test Report
Application for Grant of Equipment Authorization
pursuant to
Industry Canada RSS-Gen Issue 2 / RSS 210 Issue 7
FCC Part 15 Subpart C
on the
Broadcom Corporation
Transmitter
Model: BCM92070MD_LENO

UPN:	4324A-BRCM1046
FCC ID:	QDS-BRCM1046
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:	April 20, 2009
FINAL TEST DATE:	April 8, April 10, April 14 and April 16, 2009
AUTHORIZED SIGNATORY:	Mark E. Hill Staff Engineer

ACCREDITED

Testing Cert #2016-01

REVISION HISTORY

Rev #	Date	Comments	Modified By
1	April 24, 2009	Initial Release	-

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

SCOPE

An electromagnetic emissions test has been performed on the Broadcom Corporation model BCM92070MD_LENO 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
FHSS test procedure DA 00-0705A1, March 2000

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 BCM92070MD_LENO and therefore apply only to the tested sample. The sample was selected and prepared by Pin Wen 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 BCM92070MD_LENO 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 SPREAD SPECTRUM (2400 – 2483.5 MHz, 15 channels or more)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.247 (a) (1)	RSS 210 A8.1 (1)	20dB Bandwidth	8PSK: 1467 kHz GFSK: 1150 kHz	Channel spacing > 20dB bandwidth or Channel spacing > 2/3 of 20dB bandwidth for devices with less than 125mW	Complies
		Channel Separation	1000 kHz		Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Channel Dwell Time (*average time of occupancy)*	<0.4s dwell time, the system uses BlueTooth algorithm and therefore, meets all requirements for channel dwell time.	<0.4 second within a period of 0.4 x number of channels	Complies
15.247 (a) (1) (iii)	RSS 210 A8.1 (4)	Number of Channels	Minimum of 20, with a maximum of 79	15 or more	Complies
15.247 (a) (1)	RSS 210 A8.1 (1)	Channel Utilization	The system uses the BlueTooth algorithm and, therefore, meets all requirements for channel utilization.	All channels shall, on average, be used equally	Complies
15.247 (b) (3)	RSS 210 A8.4 (2)	Output Power (multipoint systems)	8PSK: 4.86 dBm (3.06 mW) EIRP = 0.0065 W Note 1 GFSK: 2.78 dBm (1.90 mW) EIRP = 0.0041 W Note 1	125 mW	Complies
15.247(c)	RSS 210 A8.5	Spurious Emissions – 30MHz – 25GHz	All spurious emissions < -20dBc	< -20dBc	Complies
15.247(c) / 15.209	RSS 210 A8.5 Table 2, 3	Radiated Spurious Emissions 30MHz – 25GHz	52.7dBµV/m @ 2483.5MHz	15.207 in restricted bands, all others < -20dBc	Complies (-1.3dB)
15.247 (a) (1)	RSS 210 A8.1(2)	Receiver bandwidth	Refer to operational description	Shall match the channel bandwidth	Complies

Note 1: EIRP calculated using antenna gain of 3.3 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	-	Antenna chip	Permanently attached		Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	44.1dBµV/m @ 3037.5MHz	Refer to standard	Complies (- 9.9 dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	35.7dBµV @ 0.488MHz	Refer to standard	Complies (- 10.5 dB)
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	RSS 102 declaration and User Manual statements.	Refer to OET 65, FCC Part 1 and RSS 102	Complies
	RSP 100 RSS GEN 7.1.5	User Manual		Statement required regarding non-interference	Complies - Note 2

Note 2: Broadcom has provided instructions to integrator of the module.

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	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 BCM92070MD_LENO is a bluetooth module. Since the EUT would typically be placed in table top products, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The EUT receives power from its host. For testing purposes, the EUT was mounted to a test fixture that connected to a computer via USB.

The sample was received on April 8, 2009 and tested on April 8, April 10, April 14 and April 16, 2009. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	Bluetooth Address
Broadcom	BCM92070MD_LENO	Bluetooth Module	-	00242BEBE780
Broadcom	BCM92070MD_LENO	Bluetooth Module	-	00242BEBE794

ANTENNA SYSTEM

The antenna system used with the Broadcom Corporation model BCM92070MD_LENO consists of an integral antenna, 3.3dBi gain.

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	Laptop #2	HEP-E2-C1	-

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

Manufacturer	Model	Description	Serial Number	FCC ID
Linksys	EG005W	Switch	GGB1408 JJ	DoC

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)
EUT #1	Laptop #2 USB	Multiwire	Unshielded	1.0
AC Power Laptop	AC Mains	3Wire	Unshielded	1.0

EUT OPERATION

Unless otherwise stated, the EUT was configured to continuously hop on a single channel at maximum output power.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on April 8, April 10, April 14 and April 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 2845A-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.

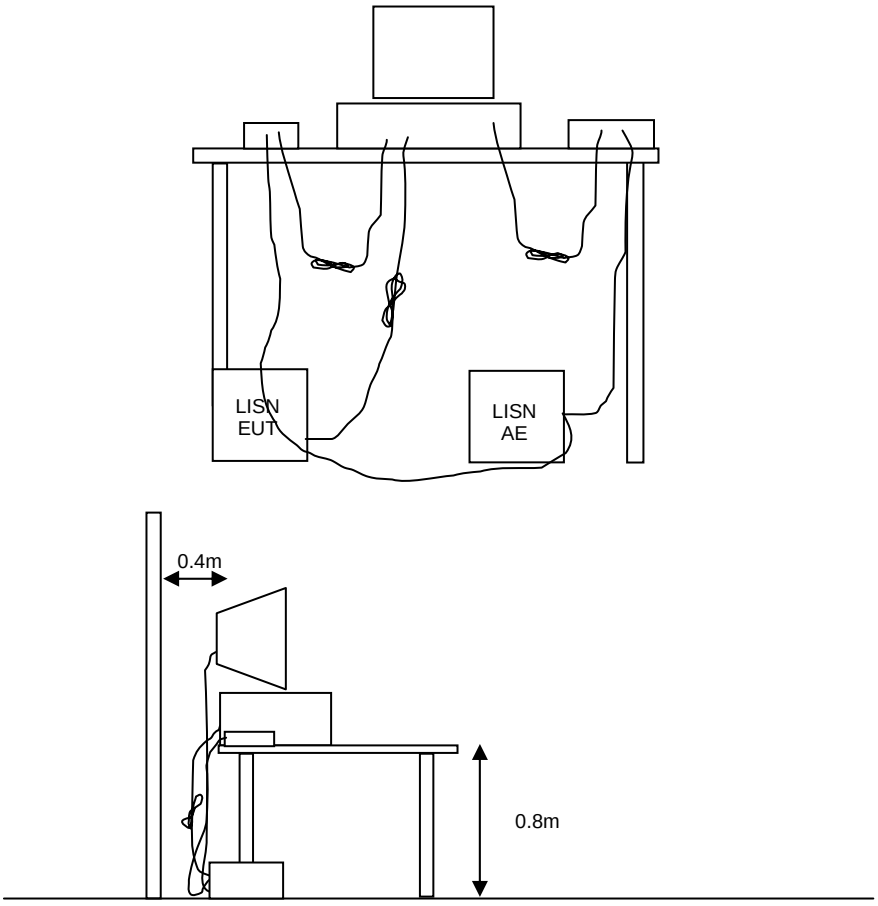
TEST PROCEDURES

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.

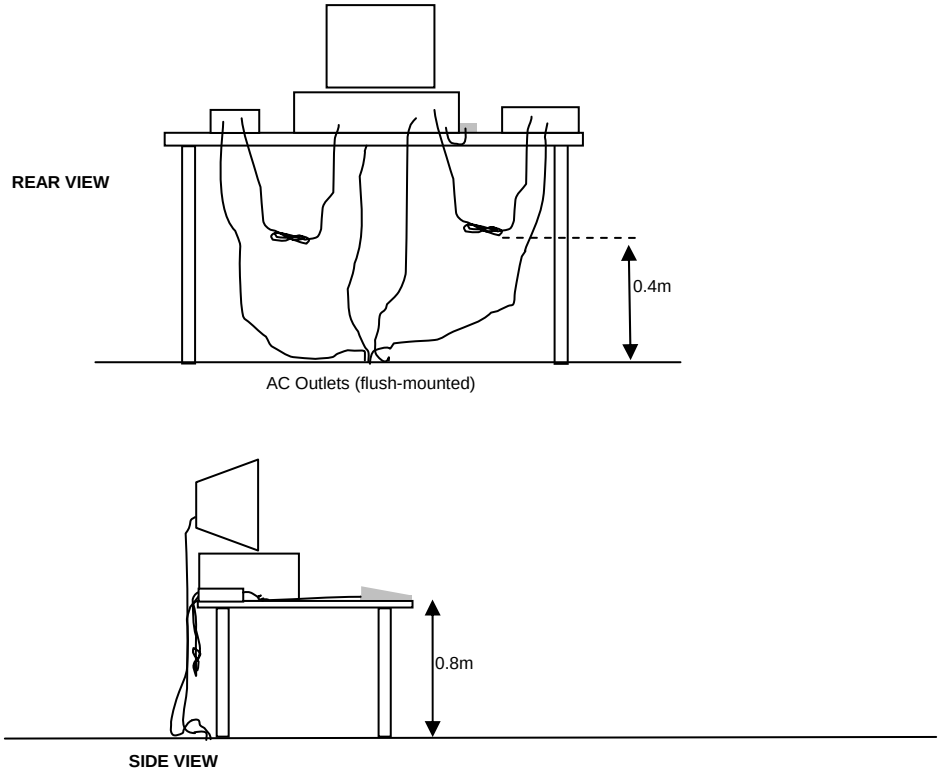


A preliminary scan of the radiated emissions is performed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT). 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.

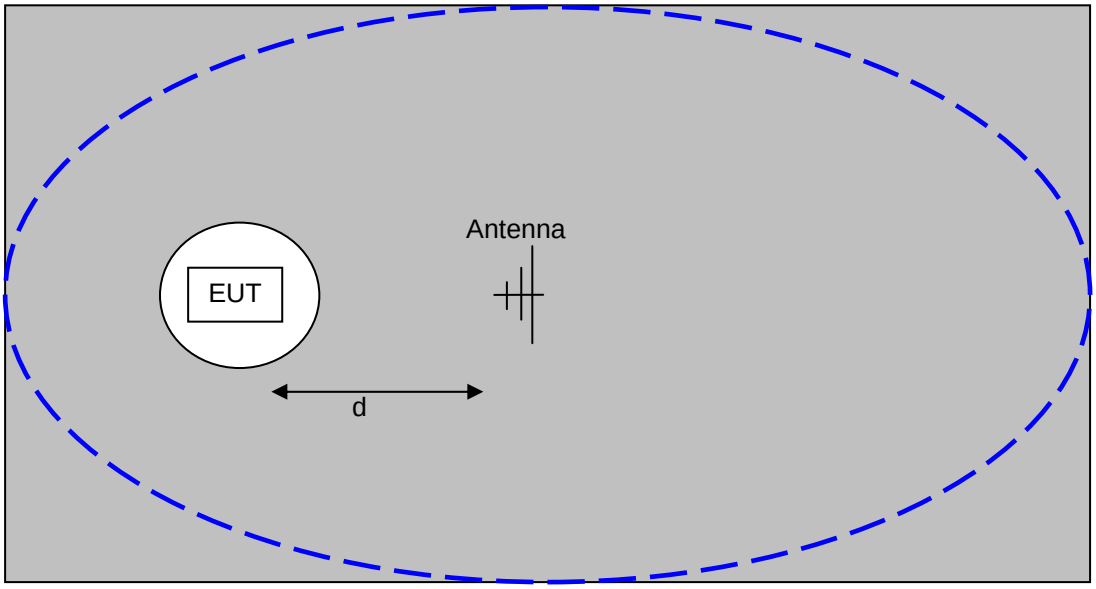
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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.

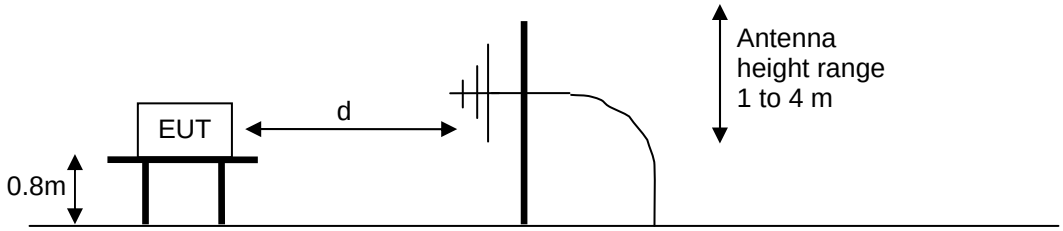
When testing above 18 GHz, the receive antenna is located at 1meter from the EUT and the antenna height is restricted to a maximum of 2.5 meters.



Typical Test Configuration for Radiated Field Strength Measurements



The ground plane extends beyond the ellipse defined in CISPR 16 / CISPR 22 / ANSI C63.4 and is large enough to accommodate test distances (d) of 3m and 10m. Refer to the test data tables for the actual measurement distance.



Test Configuration for Radiated Field Strength Measurements
OATS- Plan and Side Views

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.

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 – FHSS SYSTEMS

The table below shows the limits for output power based on the number of channels available for the hopping system.

Operating Frequency (MHz)	Number of Channels	Output Power
902 – 928	≥ 50	1 Watt (30 dBm)
902 – 928	25 to 49	0.25 Watts (24 dBm)
2400 – 2483.5	≥ 75	1 Watt (30 dBm)
2400 – 2483.5	< 75	0.125 Watts (21 dBm)
5725 – 5850	75	1 Watt (30 dBm)

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

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

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

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

Conducted Emissions - AC Power Ports, 08-Apr-09
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Elliott Laboratories	LISN, FCC / CISPR	LISN-4, OATS	362	31-Jul-09
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	812	23-Feb-10
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	1316	06-Nov-09

Radiated Emissions, 30 - 25,000 MHz, 10-Apr-09
Engineer: Mehran Birgani

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	09-Oct-09
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-Mar-10
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-Jun-10

Radio Antenna Port (Power and Spurious Emissions), 14-Apr-09
Engineer: Suhaila Khushzad

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-Mar-10
Rohde & Schwarz	Power Meter, Single Channel, +1795+1796	NRVS	1534	06-Apr-10

Radiated Emissions, 1000 - 18,000 MHz, 16-Apr-09
Engineer: Suhaila Khushzad

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	09-Oct-09
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	12-Mar-10
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-Jun-10

Radiated Emissions, 30 - 1,000 MHz, 17-Apr-09
Engineer: jcaizzi

Manufacturer	Description	Model #	Asset #	Cal Due
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1549	23-May-09
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1756	10-Feb-10
Hewlett Packard	Preamplifier, 100 kHz - 1.3 GHz	8447D OPT	2115	19-Nov-09

Radiated Emissions, 30 - 1,000 MHz, 17-Apr-09
Engineer: Peter Sales

Manufacturer	Description	Model #	Asset #	Cal Due
Com-Power Corp.	Preamplifier, 30-1000 MHz	PA-103	1543	14-Nov-09
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1548	13-Jun-10
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	26-Feb-10

EXHIBIT 2: Test Measurement Data

35 Pages

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen	Project Manager:	Mark Hill
Emissions Standard(s):	FCC, RSS 210	Class:	B
Immunity Standard(s):	-	Environment:	-

EMC Test Data

For The

Broadcom

Model

BCM92070MD_LENO

Date of Last Test: 4/17/2009

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manger:	Dean Erikson
Contact:	Pin Wen		
Emissions Standard(s):	FCC, RSS 210	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 module with an integral antenna. The EUT receives power from its host. For testing purposes, the EUT was mounted to a test fixture that connected to a computer via USB.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	Bluetooth Address
Broadcom	BCM92070MD_LENO	Bluetooth Module	-	00242BEBE780
Broadcom	BCM92070MD_LENO	Bluetooth Module	-	00242BEBE794

EUT Antenna (Intentional Radiators Only)

The antenna is integral to the device. Antenna gain = 3.3dBi

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:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manger:	Dean Erikson
Contact:	Pin Wen		
Emissions Standard(s):	FCC, RSS 210	Class:	B
Immunity Standard(s):	-	Environment:	-

Test Configuration #1 (Emission)

Local Support Equipment

Manufacturer	Model	Description	Dell P/N	FCC ID
Dell	Inspiron	Laptop #2	HEP-E2-C1	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Linksys	EG005W	Switch	GGB1408 JJ	DoC

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT #1	Laptop #2 USB	Multiwire	Unshielded	1.0
AC Power Laptop	AC Mains	3Wire	Unshielded	1.0

EUT Operation During Emissions Tests

Unless otherwise stated, the EUT was configured to continuously hop on a single channel at maximum output power.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manger:	Dean Erikson
Contact:	Pin Wen		
Emissions Standard(s):	FCC, RSS 210	Class:	B
Immunity Standard(s):	-	Environment:	-

Test Configuration #1 (Emission)

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
HP	RX942AV	Laptop #2	Asset 1998	-
Netgear		Ethernet hub		-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Linksys	EG005W	Switch	GGB1408 JJ	DoC

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT #1	Laptop #2 USB	Multiwire	Unshielded	1.0
Laptop network (RJ-45)	Hub	Cat 5	Unshielded	1.0
Hub DC input	Hub pwr supply	2 wire	Unshielded	2.0
Hub pwr supply	AC Mains	Direct plug-in	NA	NA
Laptop DC input	Laptop pwr supply	2 wire	Unshielded	2.0
Laptop pwr supply	AC Mains	3Wire	Unshielded	2.0

EUT Operation During Emissions Tests

During emissions testing the EUT was in Rx mode at 2441 MHz.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

FCC 15.247 FHSS - Power, Bandwidth and Spurious Emissions (GFSK Mode)

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: 4/10/2009
Test Engineer: Mehran Birgani
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
Host EUT 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: 14 °C
Rel. Humidity: 63 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1(a-c)	30 - 25000 MHz Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	52.7dBµV/m (431.5µV/m) @ 2483.5MHz (-1.3dB)
1(d)	30 - 25000 MHz Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	> 20dB below the limit
2	Output Power	15.247(b)	-	2.78 dBm (1.90 mW)
3	20dB Bandwidth	15.247(a)	-	1150 kHz
3	99% bandwidth	15.247(a)	-	998 kHz
3	Channel Occupancy	15.247(a)	-	2.67ms
3	Number of Channels	15.247(a)	-	79 Channels

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:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

EUT was tested in 3 orientation (refer to run #1b) and worse case showed to be Upright. All other runs were tested at the worse case orientation.

Run #1a: Radiated Spurious Emissions, 30 - 25000 MHz. Low Channel @ 2402 MHz

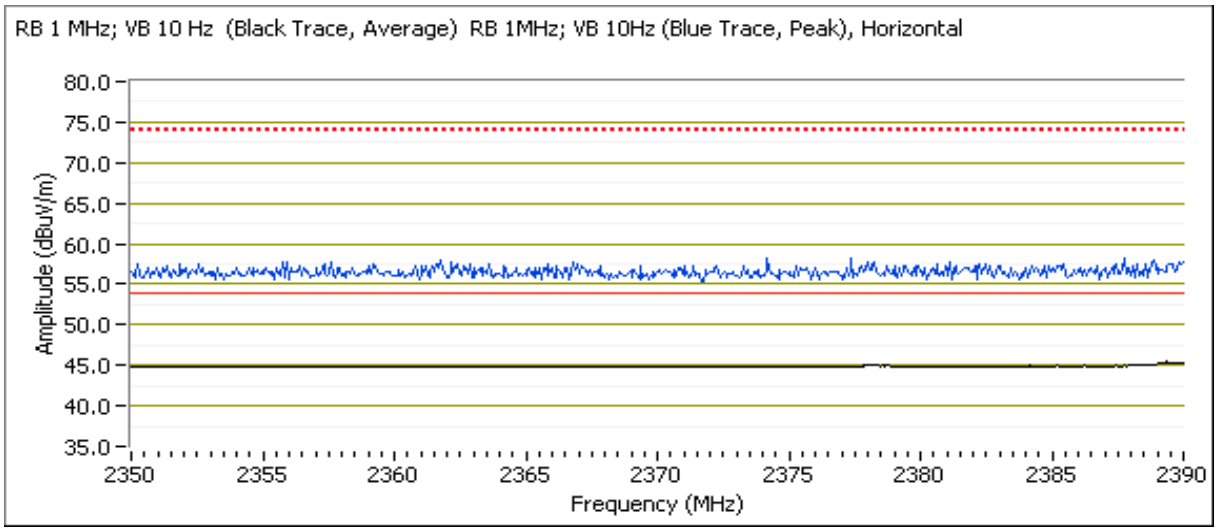
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2402.080	99.1	H	-	-	AVG	275	1.5	Upright
2402.250	99.7	H	-	-	PK	275	1.5	Upright
2402.080	89.2	V	-	-	AVG	354	1.0	Upright
2401.950	89.7	V	-	-	PK	354	1.0	Upright

Fundamental emission level @ 3m in 100kHz RBW:	98.9 dBµV/m	
Limit for emissions outside of restricted bands:	78.9 dBµV/m	Limit is -20dBc

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	
2389.330	46.7	H	54.0	-7.3	AVG	276	1.5	Upright
2354.330	57.7	H	74.0	-16.3	PK	276	1.5	Upright



Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Other 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	
4804.000	41.2	V	54.0	-12.8	AVG	78	1.1	
4804.020	43.9	H	54.0	-10.1	AVG	267	1.2	
7205.940	38.8	H	54.0	-15.2	AVG	73	1.1	Note 2
7206.890	36.6	V	54.0	-17.4	AVG	149	1.0	Note 2
4803.510	46.5	V	74.0	-27.5	PK	78	1.1	
4804.320	48.3	H	74.0	-25.7	PK	267	1.2	
7205.330	48.2	V	74.0	-25.8	PK	149	1.0	Note 2
7206.100	49.3	H	74.0	-24.7	PK	73	1.1	Note 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 signal was outside the restricted bands, but more restricted limit (15.209) was used.
Note 3:	The signals that were more than 20dB below the limit were not recorded.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30 - 25000 MHz. Center Channel @ 2441 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	
2441.050	90.2	V	-	-	AVG	355	1.0	Upright
2440.850	90.9	V	-	-	PK	355	1.0	Upright
2441.000	100.5	H	-	-	AVG	275	1.9	Upright
2441.110	100.9	H	-	-	PK	275	1.9	Upright
2441.040	95.6	V	-	-	AVG	82	1.5	Side
2440.940	95.9	V	-	-	PK	82	1.5	Side
2441.060	87.9	H	-	-	AVG	172	1.0	Side
2440.940	88.3	H	-	-	PK	172	1.0	Side
2441.080	92.6	V	-	-	AVG	80	1.0	Flat
2441.000	93.0	V	-	-	PK	80	1.0	Flat
2441.050	91.4	H	-	-	AVG	156	1.0	Flat
2440.910	91.9	H	-	-	PK	156	1.0	Flat

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	100.4	89.8
Limit for emissions outside of restricted bands:	80.4 dBµV/m	

Other 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	
4882.020	41.8	H	54.0	-12.2	AVG	206	1.2	
4882.040	37.9	V	54.0	-16.1	AVG	168	1.1	
7322.900	37.8	V	54.0	-16.2	AVG	50	1.0	
7322.950	40.8	H	54.0	-13.2	AVG	75	1.2	
4882.230	47.2	H	74.0	-26.8	PK	206	1.2	
4882.420	44.9	V	74.0	-29.1	PK	168	1.1	
7322.550	49.1	V	74.0	-24.9	PK	50	1.0	
7323.520	50.5	H	74.0	-23.5	PK	75	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 signals that were more than 20dB below the limit were not recorded.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 25000 MHz. High Channel @ 2480 MHz

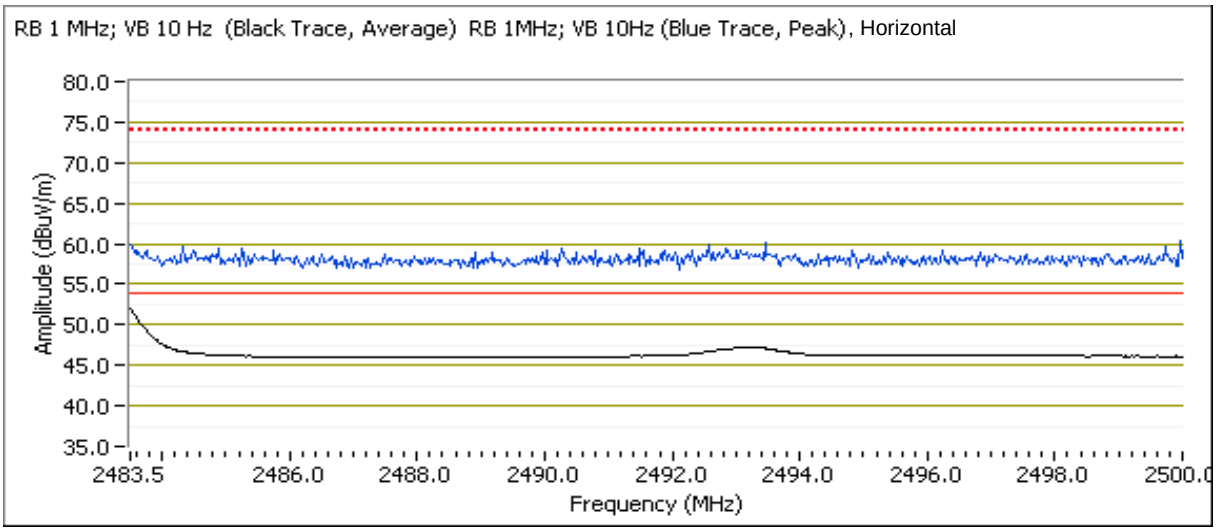
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.050	102.8	H	-	-	AVG	276	1.8	Upright
2479.870	103.2	H	-	-	PK	276	1.8	Upright
2480.050	90.5	V	-	-	AVG	349	1.0	Upright
2480.010	91.0	V	-	-	PK	349	1.0	Upright

Fundamental emission level @ 3m in 100kHz RBW:	102.0 dBµV/m	
Limit for emissions outside of restricted bands:	82.0 dBµV/m	Limit is -20dBc

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	52.7	H	54.0	-1.3	AVG	276	1.8	Upright
2497.850	59.0	H	74.0	-15.0	PK	276	1.8	Upright



Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Other 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	
4960.060	45.5	H	54.0	-8.5	AVG	162	1.5	
4960.030	41.6	V	54.0	-12.4	AVG	358	1.0	
7439.990	41.1	H	54.0	-12.9	AVG	64	1.2	
7439.520	37.8	V	54.0	-16.2	AVG	65	1.7	
7440.270	50.6	H	74.0	-23.4	PK	64	1.2	
4960.290	49.8	H	74.0	-24.2	PK	162	1.5	
7441.320	49.0	V	74.0	-25.0	PK	65	1.7	
4960.350	47.9	V	74.0	-26.1	PK	358	1.0	

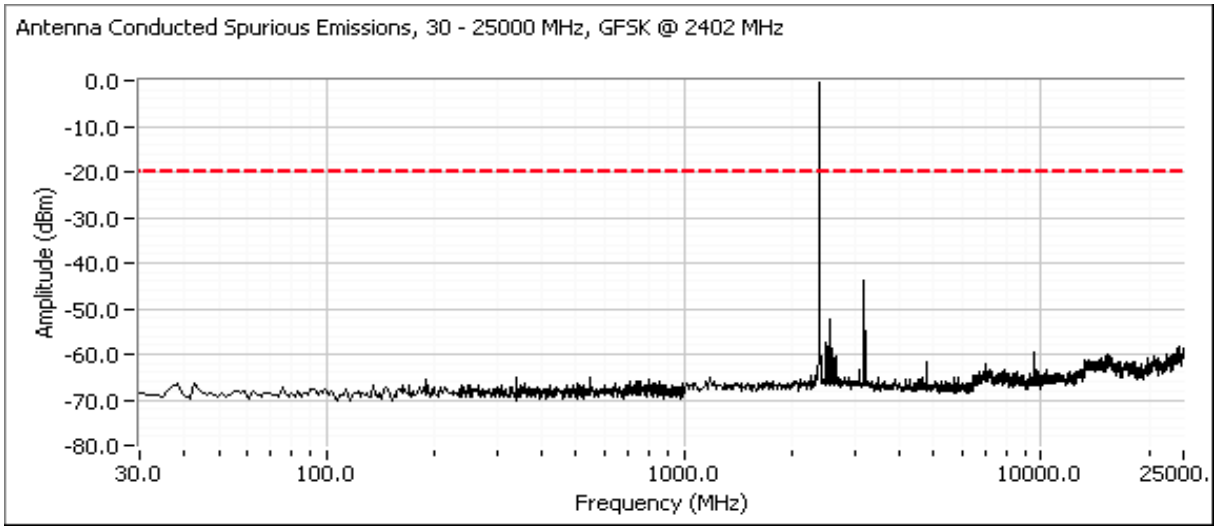
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.
Note 2:	The signals that were more than 20dB below the limit were not recorded.

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

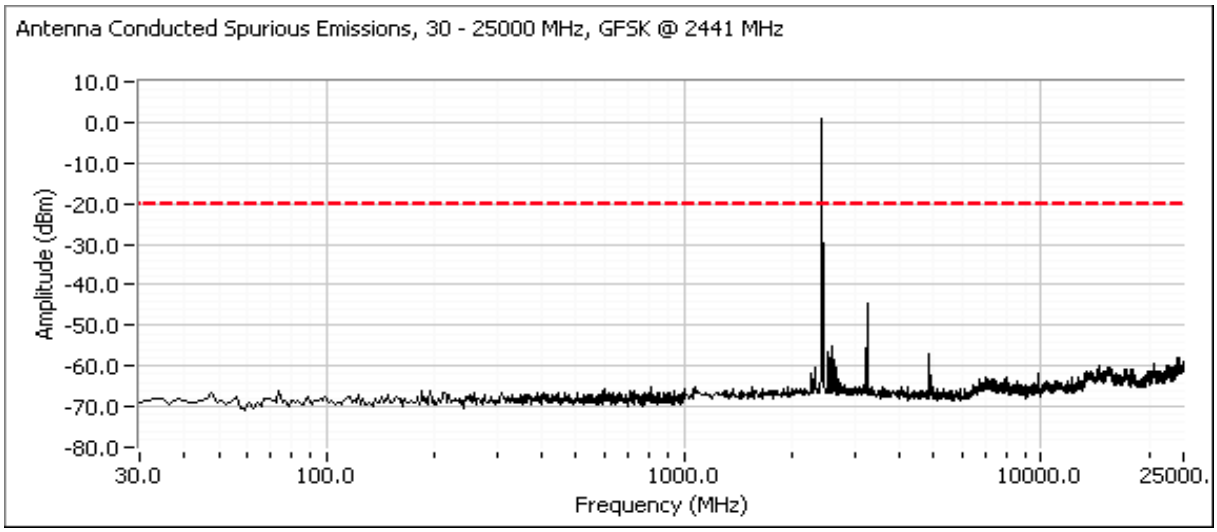
Date of Test: 4/14/2009
Test Engineer: Suhaila Khushzad
Test Location: SVOATS #2

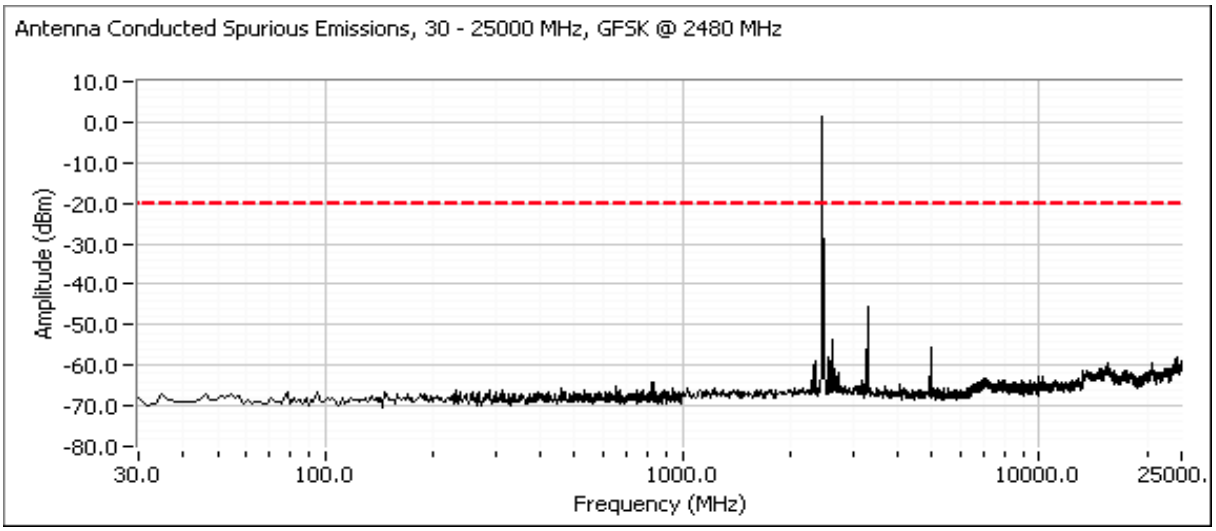
Config. Used: 1
Config Change: None
Host EUT Voltage: 120V/60Hz

Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level.



Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A





Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Run #2: Output Power

Date of Test: 4/14/2009 Config. Used: 1
Test Engineer: Suhaila Khushzad Config Change: None
Test Location: SVOATS #2 Host EUT Voltage: 120V/60Hz
Maximum antenna gain: 3.3 dBi

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	2402	-	1.29	0.00134586	0.0028774
Mid	2441	-	2.18	0.001651962	0.0035318
High	2480	-	2.78	0.001896706	0.0040551

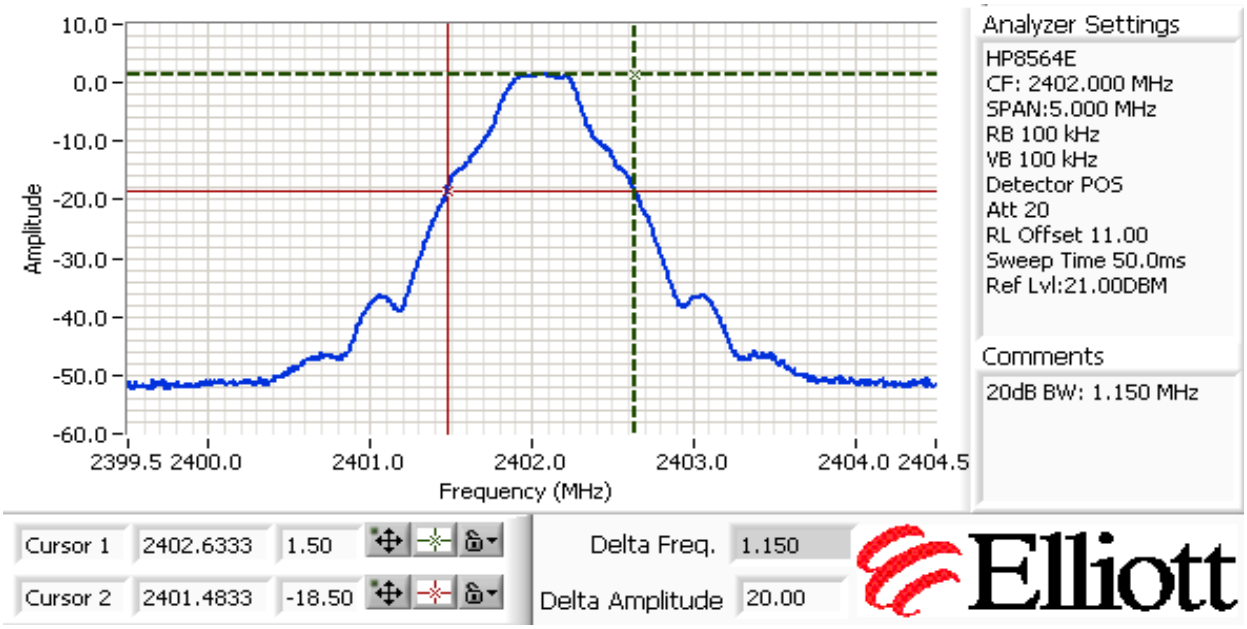
Note 1:	Power measured using a peak power meter.

Run #3: Bandwidth, Channel Occupancy, Spacing and Number of Channels

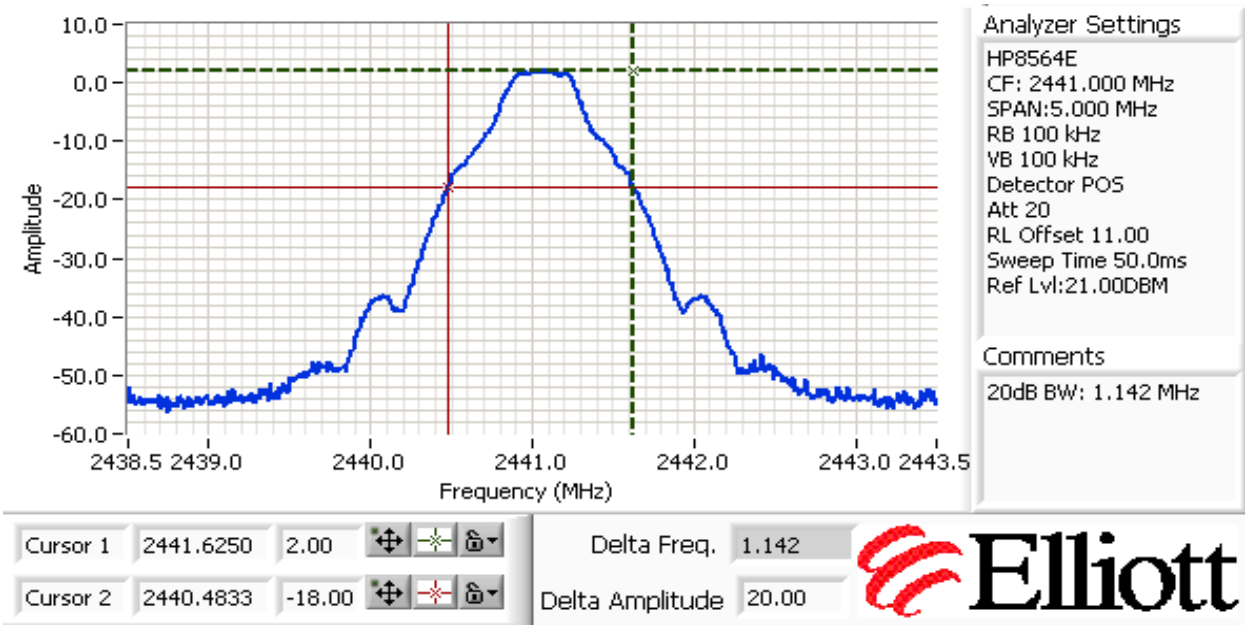
Date of Test: 4/14/2009 Config. Used: 1
Test Engineer: Suhaila Khushzad Config Change: None
Test Location: SVOATS #2 Host EUT Voltage: 120V/60Hz

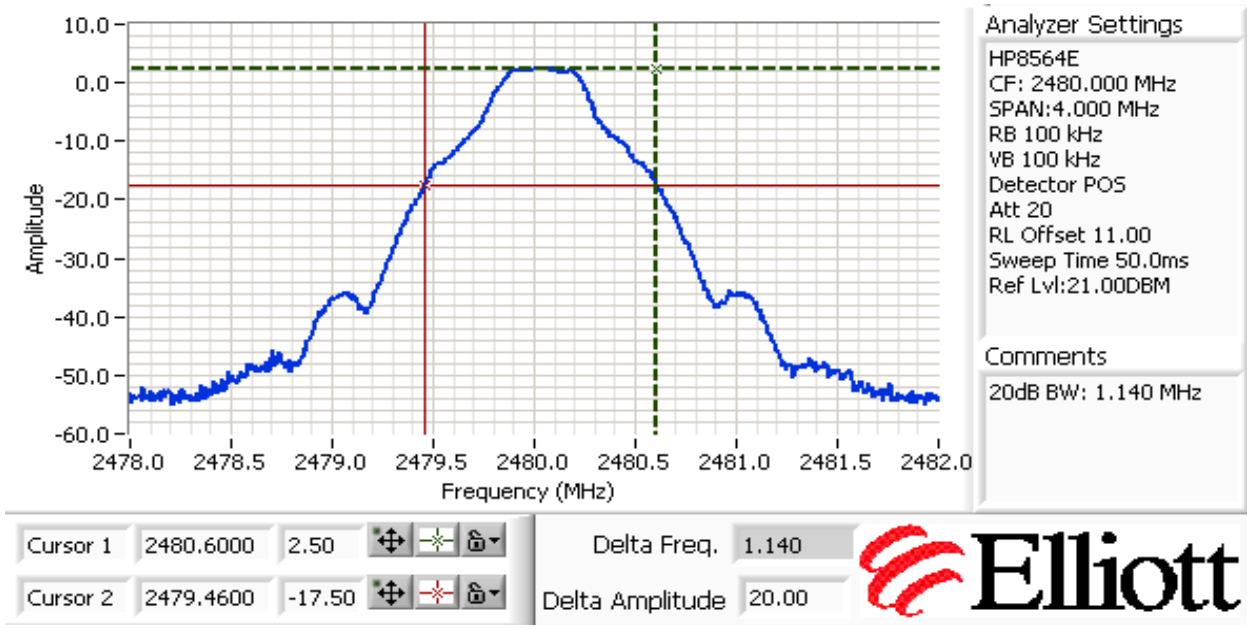
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	100kHz	1150	100KHz	998
Mid	2441	100kHz	1142	100KHz	998
High	2480	100kHz	1140	100KHz	990

Note 1:	20dB bandwidth measured using RB = 100kHz, VB = 100kHz (VB > RB)
Note 2:	99% bandwidth measured using RB = 1 MHz, VB = 3 MHz (VB >=3RB)

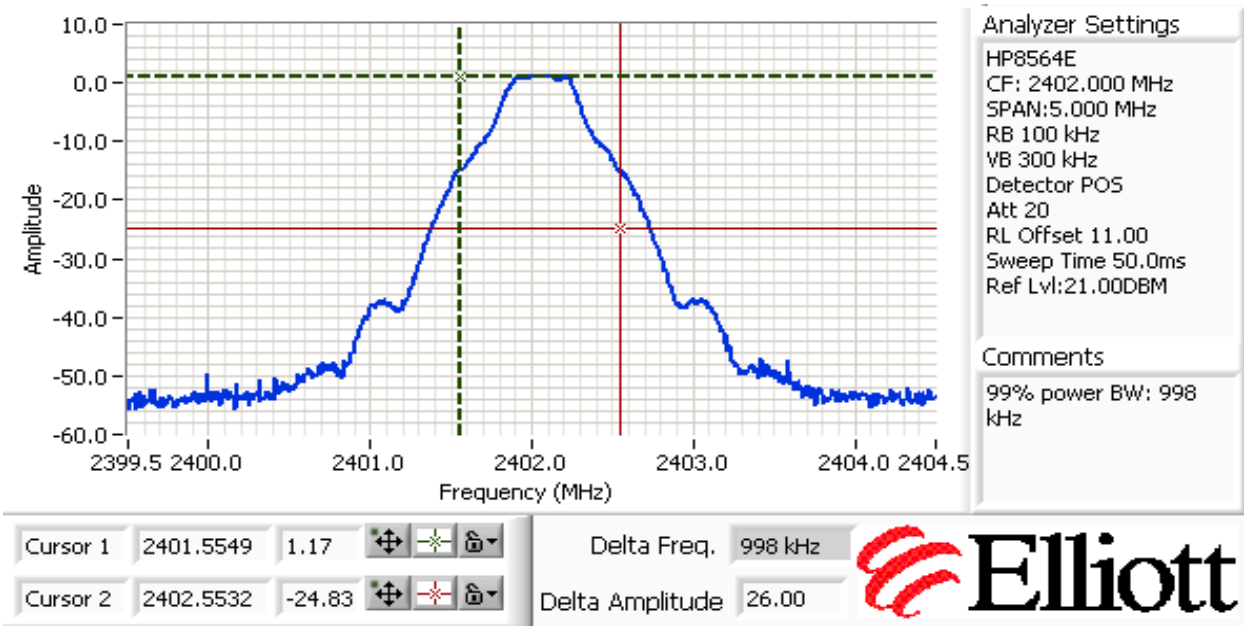


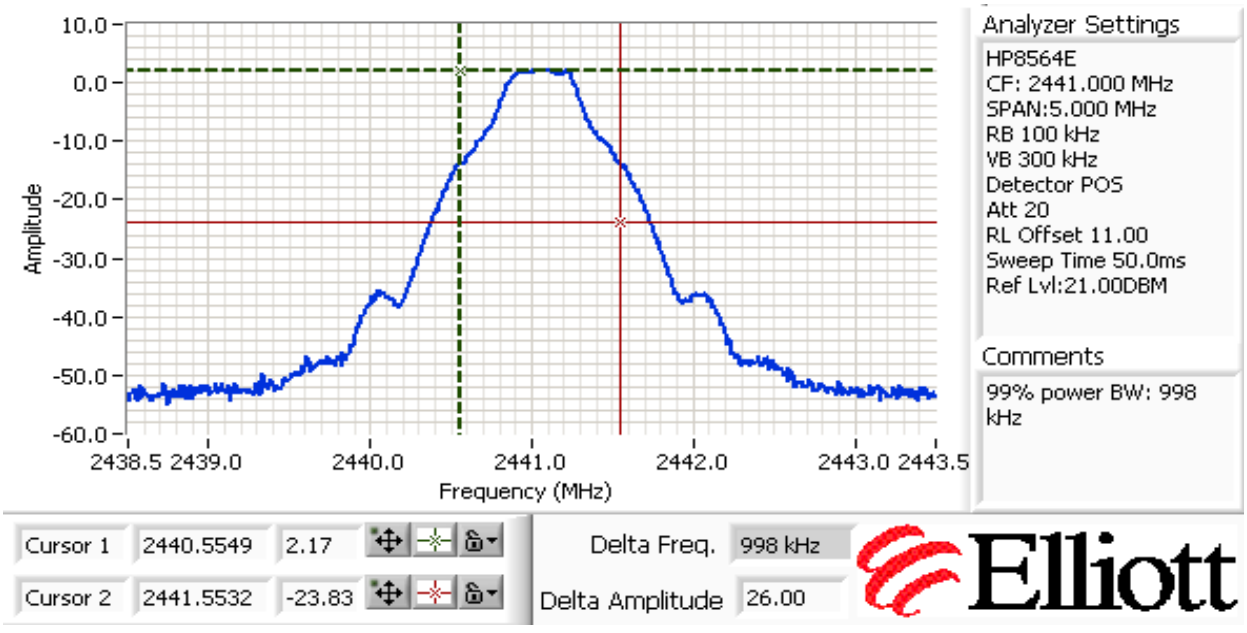
Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A



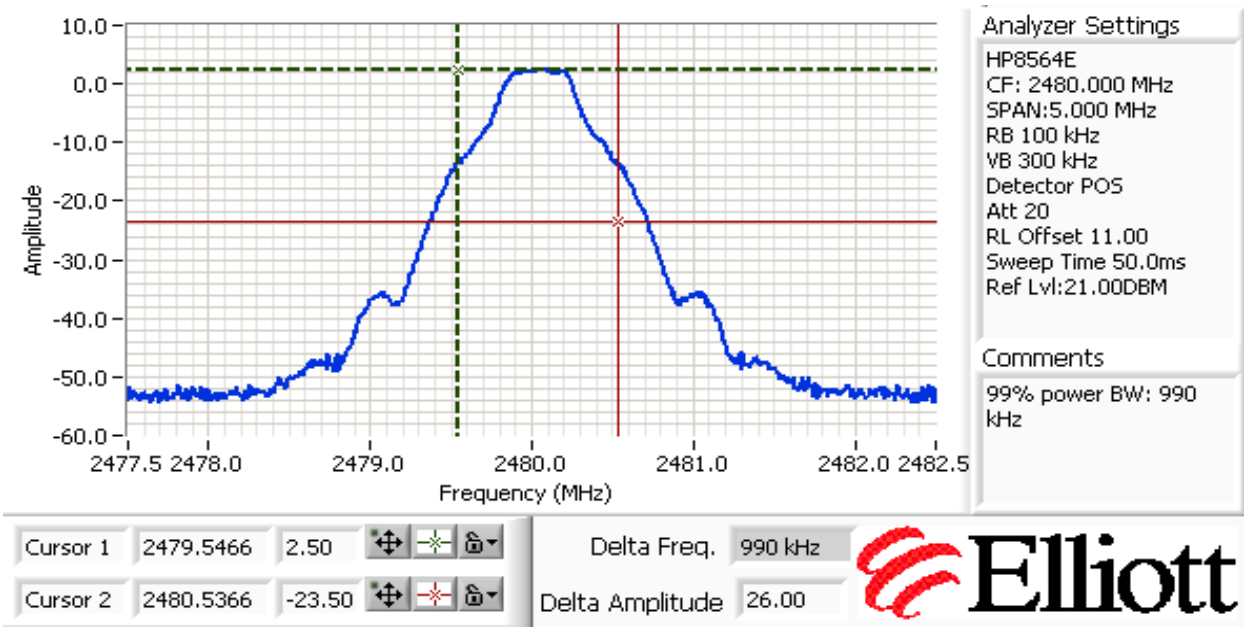


Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A





Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A



Date of Test: 4/14/2009
Test Engineer: Rafael Varelas
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
Host EUT Voltage: 120V/60Hz

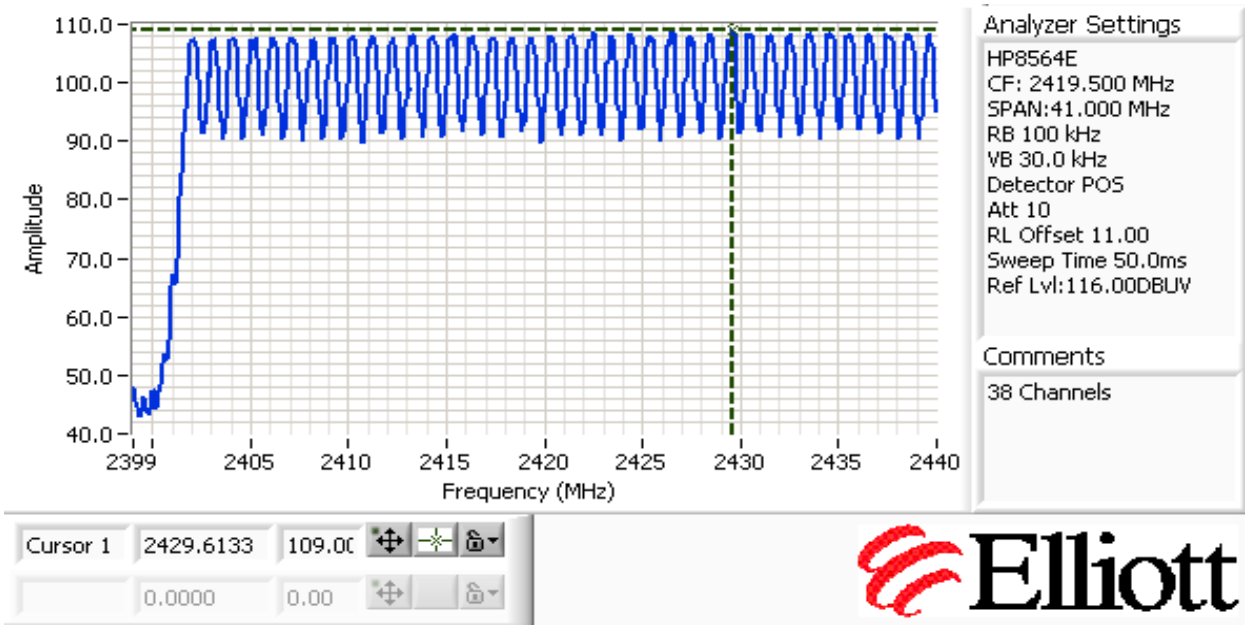
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)

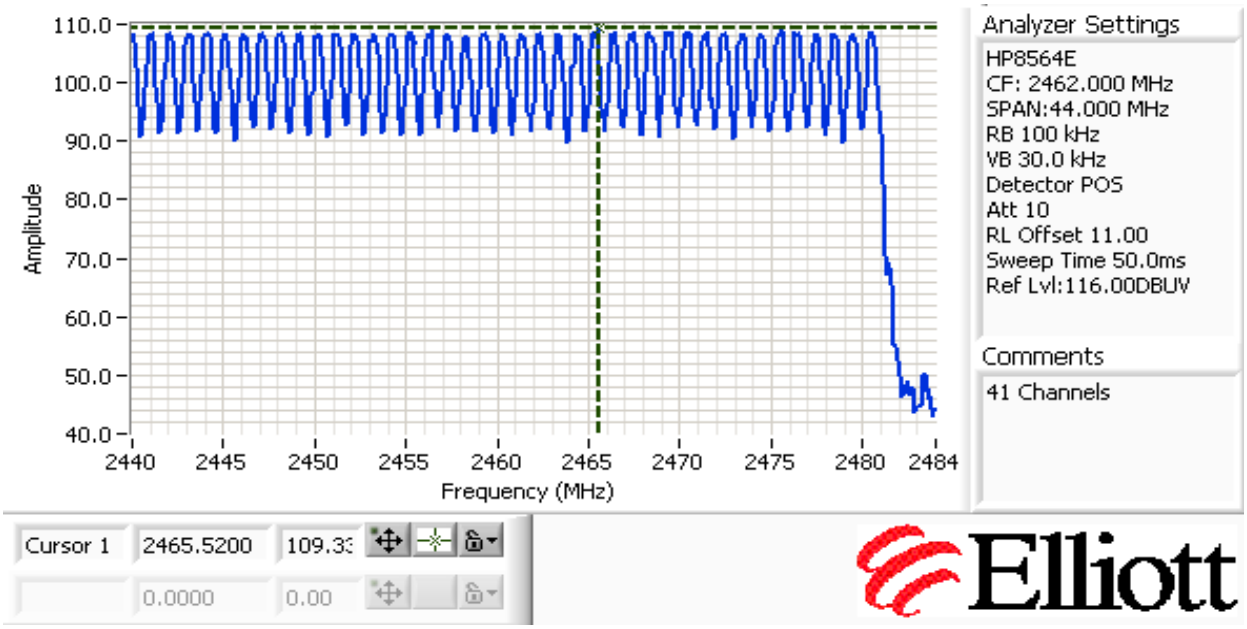
The channel dwell time is calculated from the transmit time on a channel mulitplied by the number of times a channel could be used in a period of 0.4 times the number of channels, N (i.e. 0.4N divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 0.4N, in which case the channel dwell time is the transmit time on a channel.

Maximum 20dB bandwidth:	1150	kHz	
Channel spacing:	1000	kHz	Pass
Transmission time per hop:	2.9	ms	
The time between successive hops on a channel:	15.8	ms	
Number of channels (N):	79		Pass
Channel dwell time in 31.6 seconds:	<400	ms	Pass

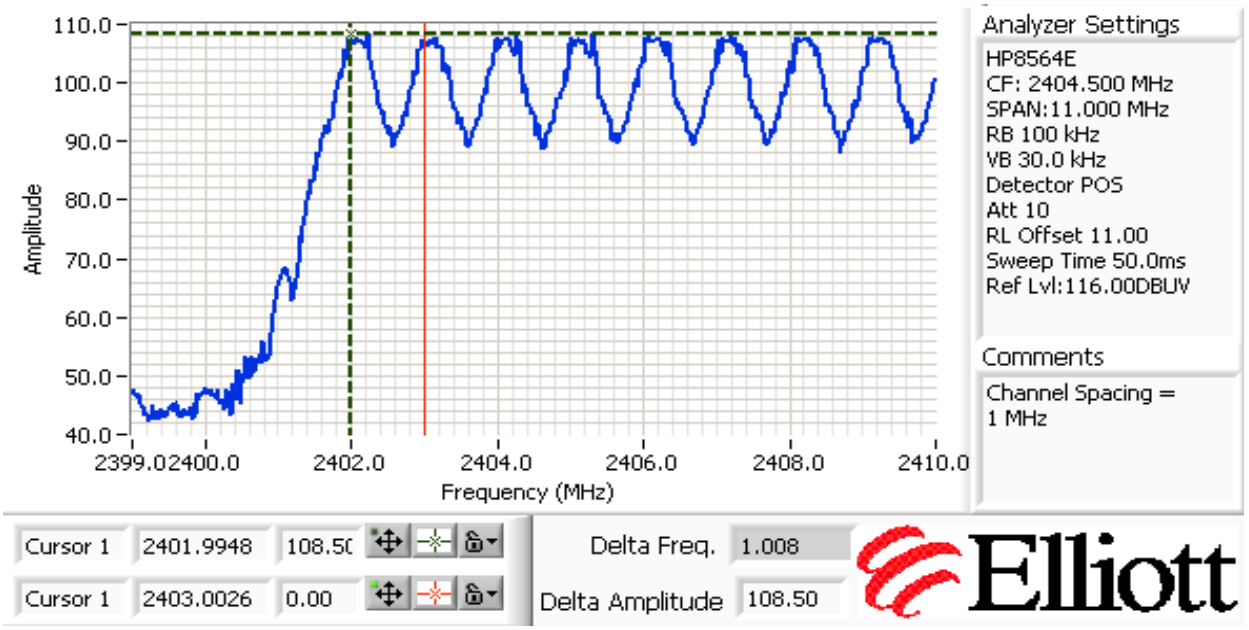
Note:	Since the dwell time per hop is less then 0.4 seconds and the operation description details that all channels are used equally, then compliance with the 0.4 s per 0.4 * # of channels is automatic, independent of the time between hops on the same channel.

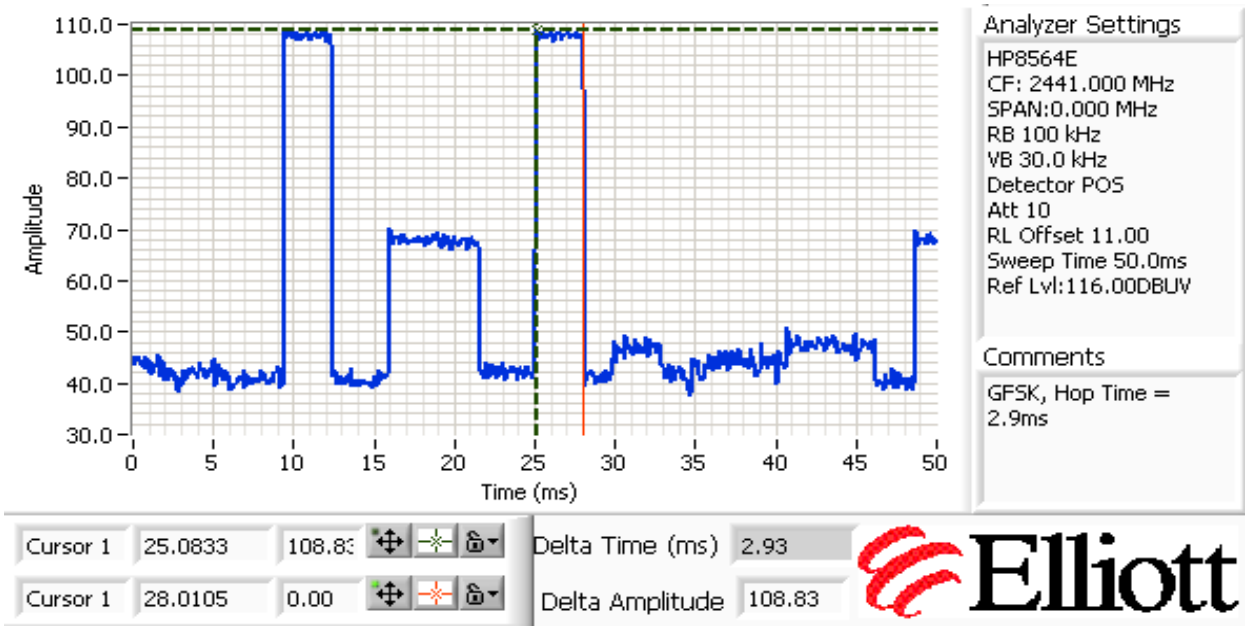
Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A





Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A





Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

FCC 15.247 FHSS - Power, Bandwidth and Spurious Emissions (8PSK Mode)

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: 4/10/2009
Test Engineer: Mehran Birgani
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
Host EUT 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: 14 °C
Rel. Humidity: 63 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1(a-c)	30 - 25000 MHz Radiated Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	46.6dBµV/m (213.8µV/m) @ 2389.6MHz (-7.4dB)
1(d)	Antenna Conducted Spurious Emissions, 30 - 25000 MHz	FCC Part 15.209 / 15.247(c)	Pass	> 20dB below the limit
2	Output Power	15.247(b)	-	4.86 dBm (3.06mW)
3	20dB Bandwidth	15.247(a)	-	1467 kHz
3	99% bandwidth	15.247(a)	-	1281 kHz
3	Channel Occupancy	15.247(a)	-	2.83ms
3	Number of Channels	15.247(a)	-	79 Channels

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:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

EUT was tested in 3 orientation (refer to run #1b of GFSK Mode) and worse case showed to be Upright. All other runs were tested at the worse case orientation.

Run #1a: Radiated Spurious Emissions, 30 - 25000 MHz. Low Channel @ 2402 MHz

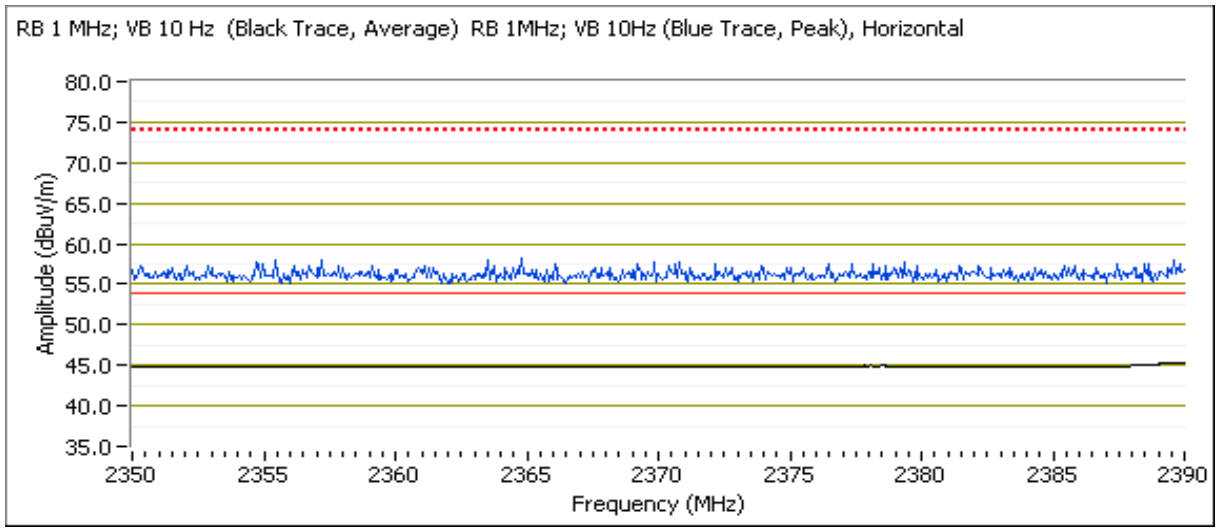
Fundamental Signal Field Strength: Peak and average values measured in 1 MHz, and peak value measured in 100kHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2401.990	98.5	H	-	-	AVG	274	1.5	Upright
2402.050	101.7	H	-	-	PK	274	1.5	Upright
2402.060	88.0	V	-	-	AVG	354	1.0	Upright
2402.130	91.3	V	-	-	PK	354	1.0	Upright

Fundamental emission level @ 3m in 100kHz RBW:	97.4 dBµV/m	
Limit for emissions outside of restricted bands:	77.4 dBµV/m	Limit is -20dBc

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	
2389.600	46.6	H	54.0	-7.4	AVG	274	1.5	Upright
2357.670	57.3	H	74.0	-16.7	PK	274	1.5	Upright



Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Other 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	
4804.040	43.0	H	54.0	-11.0	AVG	266	1.2	
4803.980	40.0	V	54.0	-14.0	AVG	78	1.1	
7205.920	38.9	H	54.0	-15.1	AVG	73	1.1	Note 2
7206.600	36.6	V	54.0	-17.4	AVG	150	1.0	Note 2
4803.900	49.8	H	74.0	-24.2	PK	266	1.2	
7206.620	49.4	H	74.0	-24.6	PK	73	1.1	Note 2
7205.630	48.4	V	74.0	-25.6	PK	150	1.0	Note 2
4803.710	47.3	V	74.0	-26.7	PK	78	1.1	

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 signal was outside the restricted bands, but more restricted limit (15.209) was used.
Note 3:	The signals that were more than 20dB below the limit were not recorded.

Run #1b: Radiated Spurious Emissions, 30 - 25000 MHz. Center Channel @ 2441 MHz

	H	V
Fundamental emission level @ 3m in 100kHz RBW:	98.7	86.7
Limit for emissions outside of restricted bands:	78.7 dBµV/m	

Other 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	
7322.920	41.1	H	54.0	-12.9	AVG	75	1.2	
4882.040	39.7	H	54.0	-14.3	AVG	211	1.2	
4882.040	37.9	V	54.0	-16.1	AVG	168	1.1	
7322.900	37.8	V	54.0	-16.2	AVG	50	1.0	
7323.000	51.9	H	74.0	-22.1	PK	75	1.2	
7322.550	49.1	V	74.0	-24.9	PK	50	1.0	
4882.170	47.1	H	74.0	-26.9	PK	211	1.2	
4882.420	44.9	V	74.0	-29.1	PK	168	1.1	

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 signals that were more than 20dB below the limit were not recorded.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30 - 25000 MHz. High Channel @ 2480 MHz

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

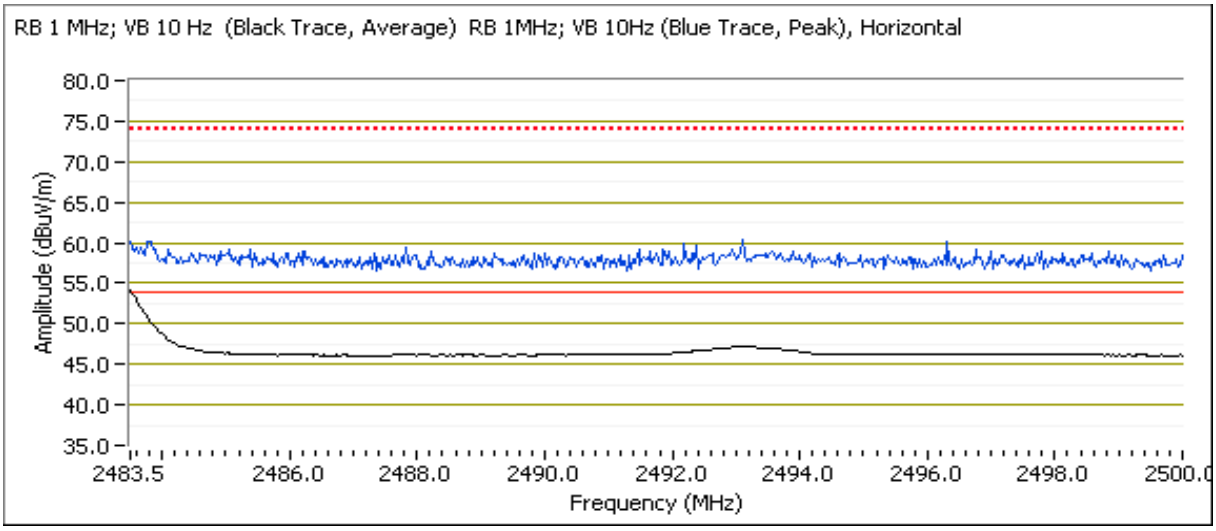
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
2480.010	102.0	H	-	-	AVG	274	1.8	Upright
2480.040	105.3	H	-	-	PK	274	1.8	Upright
2480.000	90.2	V	-	-	AVG	350	1.0	Upright
2480.010	93.6	V	-	-	PK	350	1.0	Upright

Fundamental emission level @ 3m in 100kHz RBW:	101.0 dBµV/m	
Limit for emissions outside of restricted bands:	81 dBµV/m	Limit is -20dBc

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	
2483.690	59.2	H	74.0	-14.8	PK	274	1.8	Upright
2483.500	37.5	H	54.0	-16.5	AVG	274	1.8	Upright, Note 1

Note 1:	Average reading was corrected by 16.7dB for duty cycle correction. See operational description.



Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Other Spurious Emissions

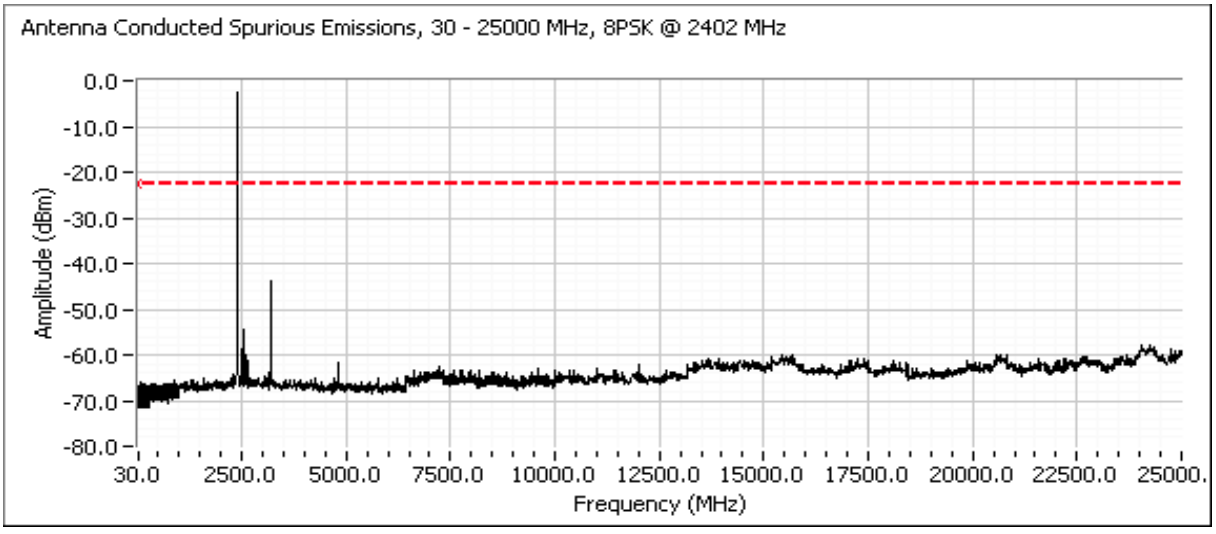
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	V/H	Limit	Margin	Pk/QP/Avg	degrees	meters	
4960.010	44.5	H	54.0	-9.5	AVG	162	1.5	
4960.020	40.4	V	54.0	-13.6	AVG	358	1.0	
7439.900	38.0	V	54.0	-16.0	AVG	65	1.7	
7439.940	41.4	H	54.0	-12.6	AVG	64	1.2	
4959.970	51.2	H	74.0	-22.8	PK	162	1.5	
4960.110	49.2	V	74.0	-24.8	PK	358	1.0	
7439.930	51.7	H	74.0	-22.3	PK	64	1.2	
7441.030	49.1	V	74.0	-24.9	PK	65	1.7	

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 signals that were more than 20dB below the limit were not recorded.

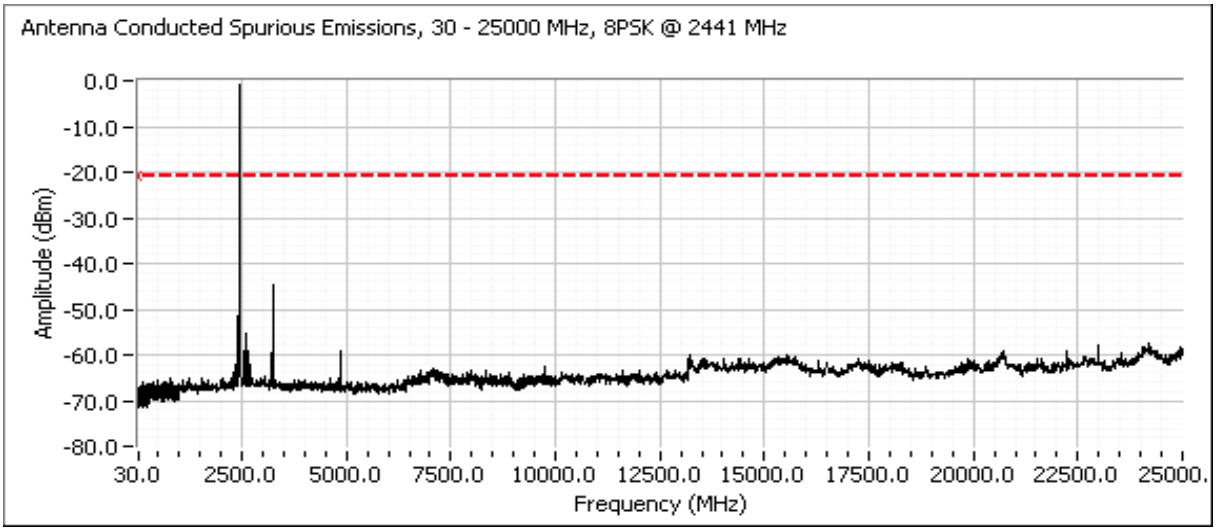
Run #1d: Antenna Conducted Spurious Emissions, 30 - 25000 MHz.
Refer to plots below. Scans made using RBW=VB=100 KHz with the limit line set at 20dB below the highest in-band signal level.

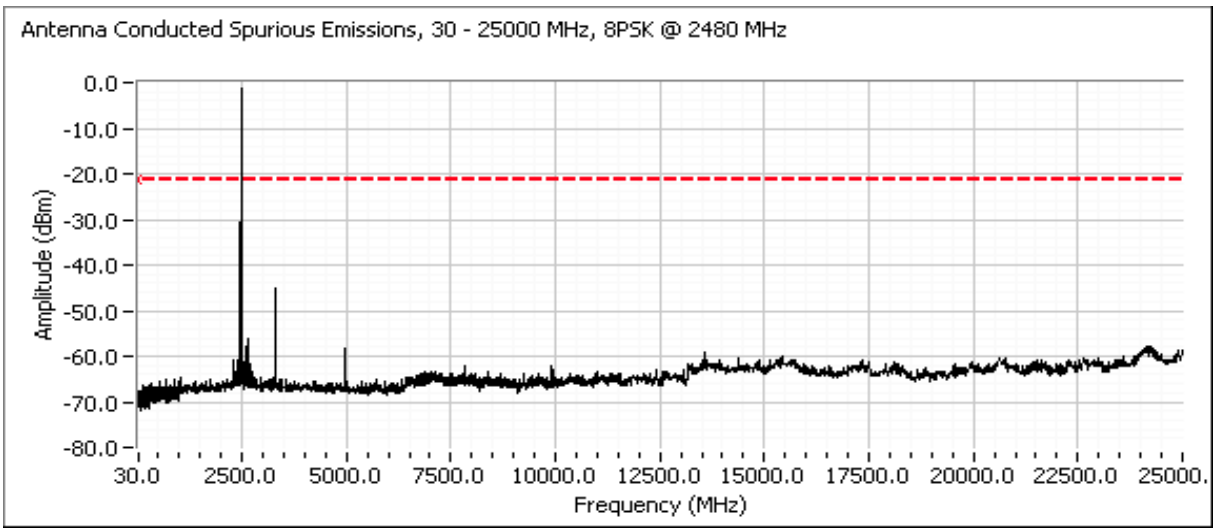
Date of Test: 4/14/2009
Test Engineer: Suhaila Khushzad
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
Host EUT Voltage: 120V/60Hz



Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A





Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Run #2: Output Power

Date of Test: 4/14/2009 Config. Used: 1
Test Engineer: Suhaila Khushzad Config Change: None
Test Location: SVOATS #2 Host EUT Voltage: 120V/60Hz
Maximum antenna gain: 3.3 dBi

Channel	Frequency (MHz)	Res BW	Output Power (dBm)	Output Power (W)	EIRP (W)
Low	2402	-	3.29	0.002133045	0.0045604
Mid	2441	-	4.25	0.002660725	0.0056885
High	2480	-	4.86	0.003061963	0.0065464

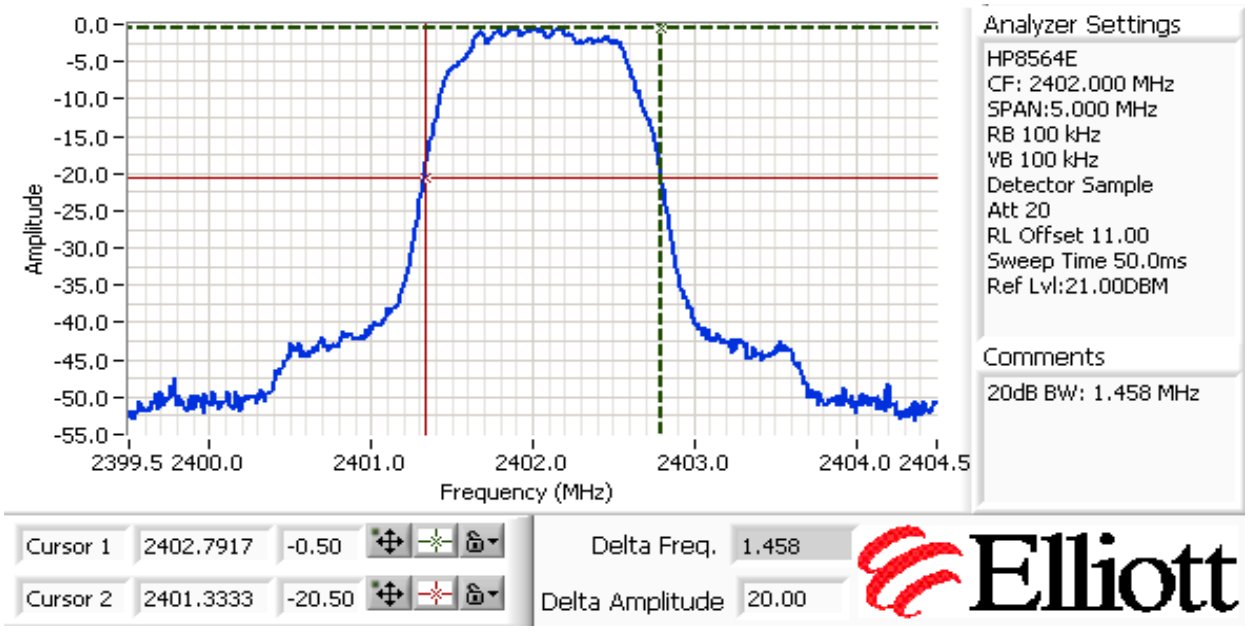
Note 1: Power measured using a peak power meter.

Run #3: Bandwidth, Channel Occupancy, Spacing and Number of Channels

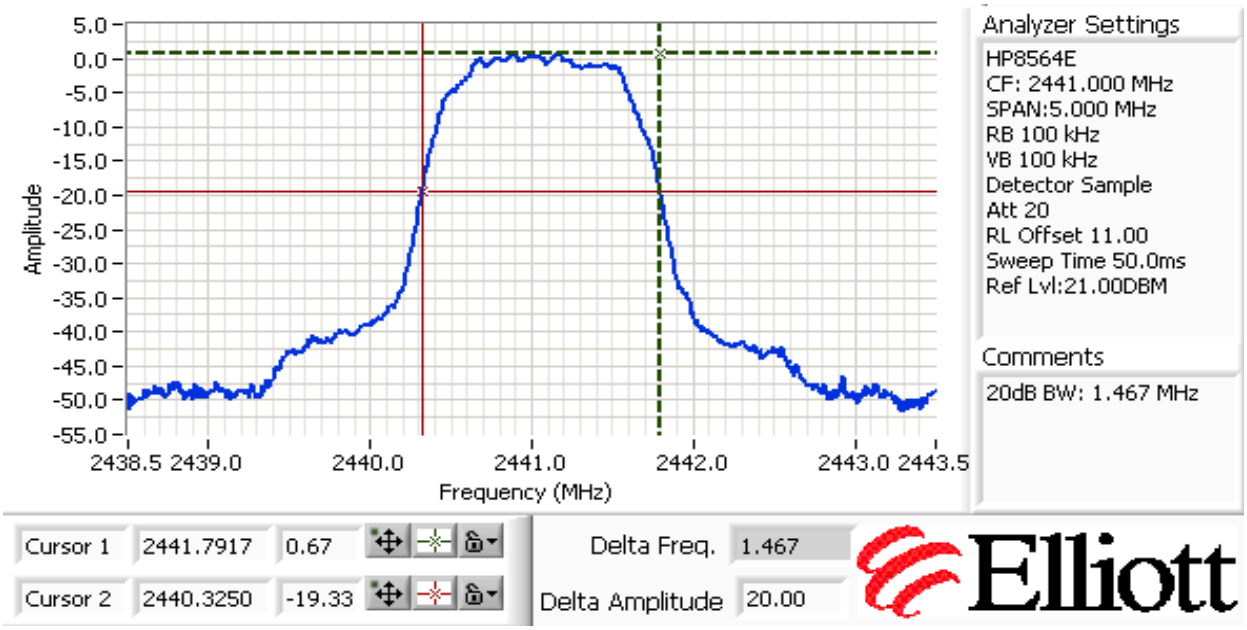
Date of Test: 4/14/2009 Config. Used: 1
Test Engineer: Suhaila Khushzad Config Change: None
Test Location: SVOATS #2 Host EUT Voltage: 120V/60Hz

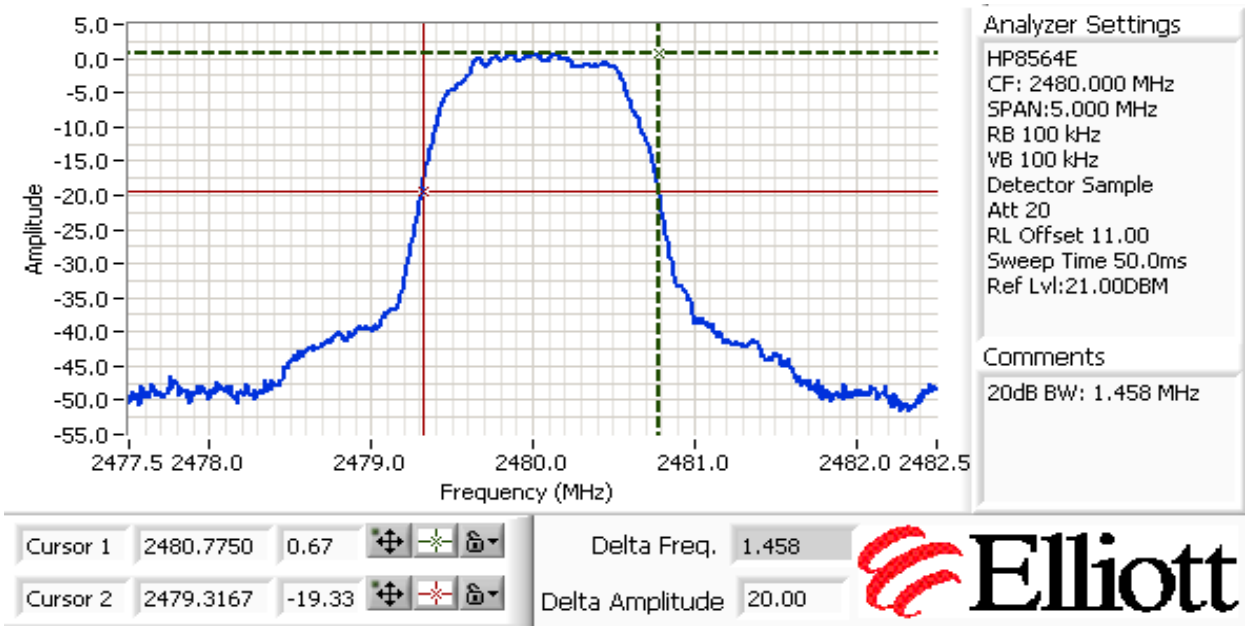
Channel	Frequency (MHz)	Resolution Bandwidth	20dB Bandwidth (kHz)	Resolution Bandwidth	99% Bandwidth (kHz)
Low	2402	100kHz	1458	100kHz	1281
Mid	2441	100kHz	1467	100kHz	1281
High	2480	100kHz	1458	100kHz	1273

Note 1: 20dB bandwidth measured using RB = 100kHz, VB = 100kHz (VB > RB)
Note 2: 99% bandwidth measured using RB = 100kHz, VB = 300kHz (VB >=3RB)

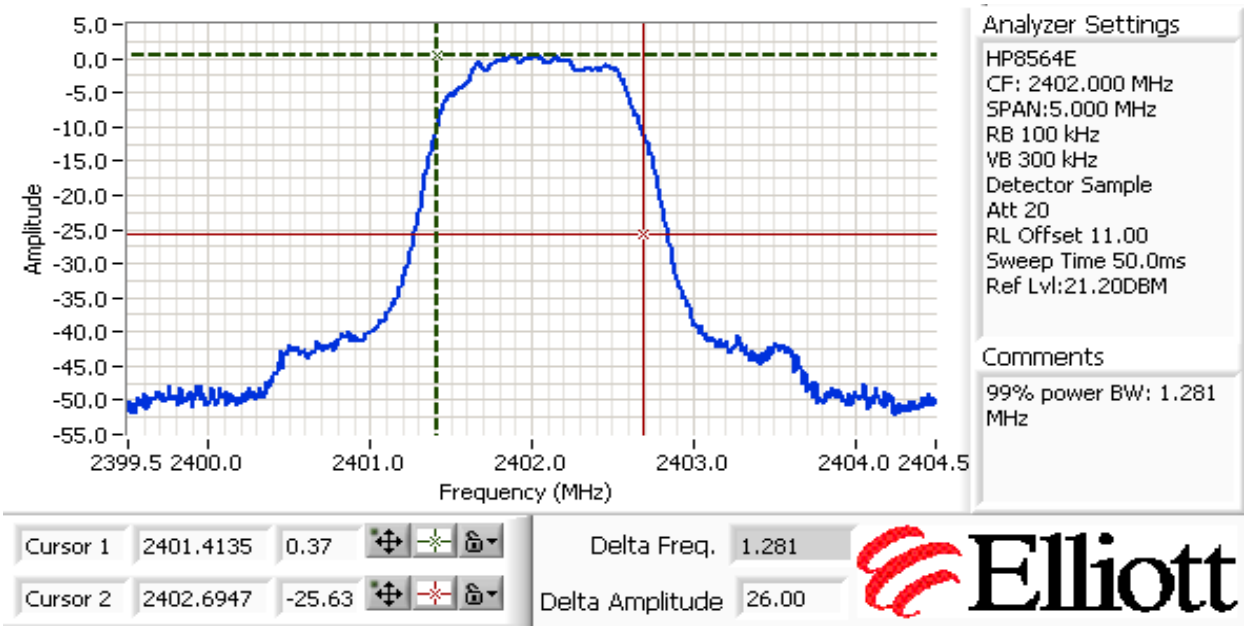


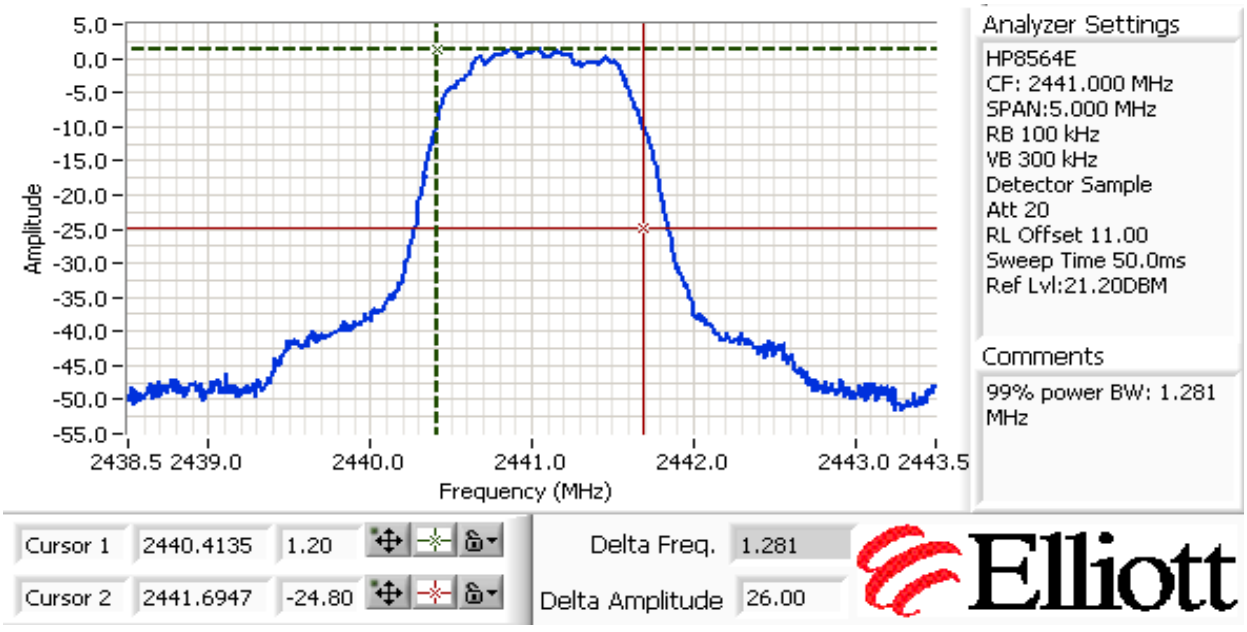
Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A



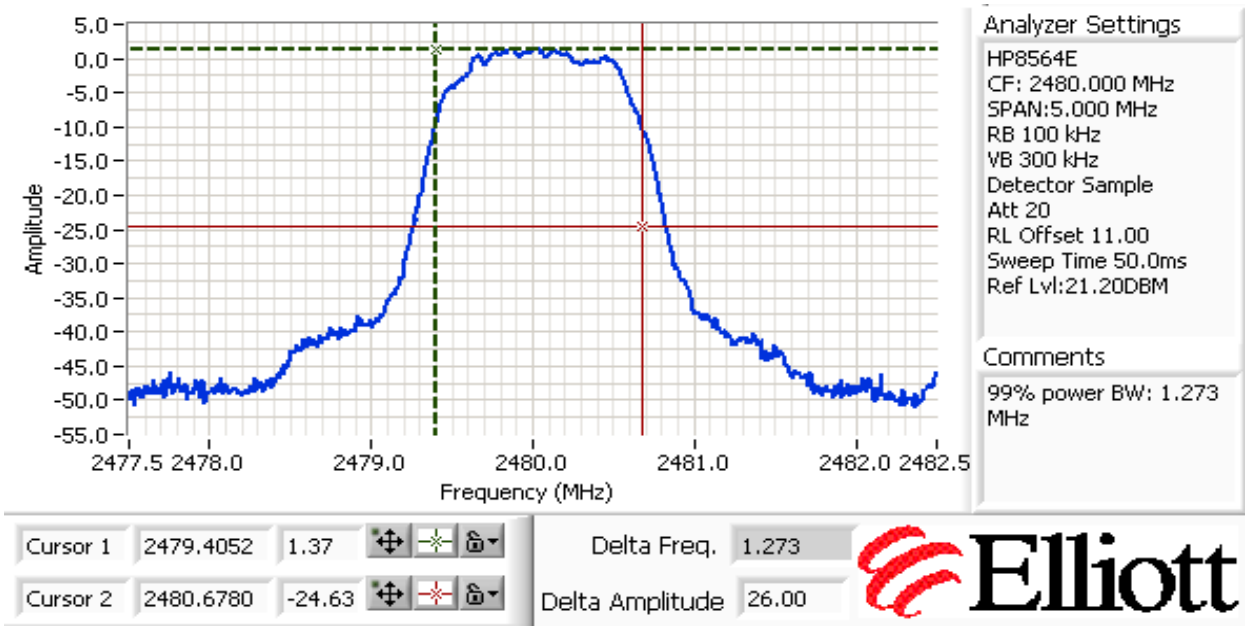


Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A





Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A



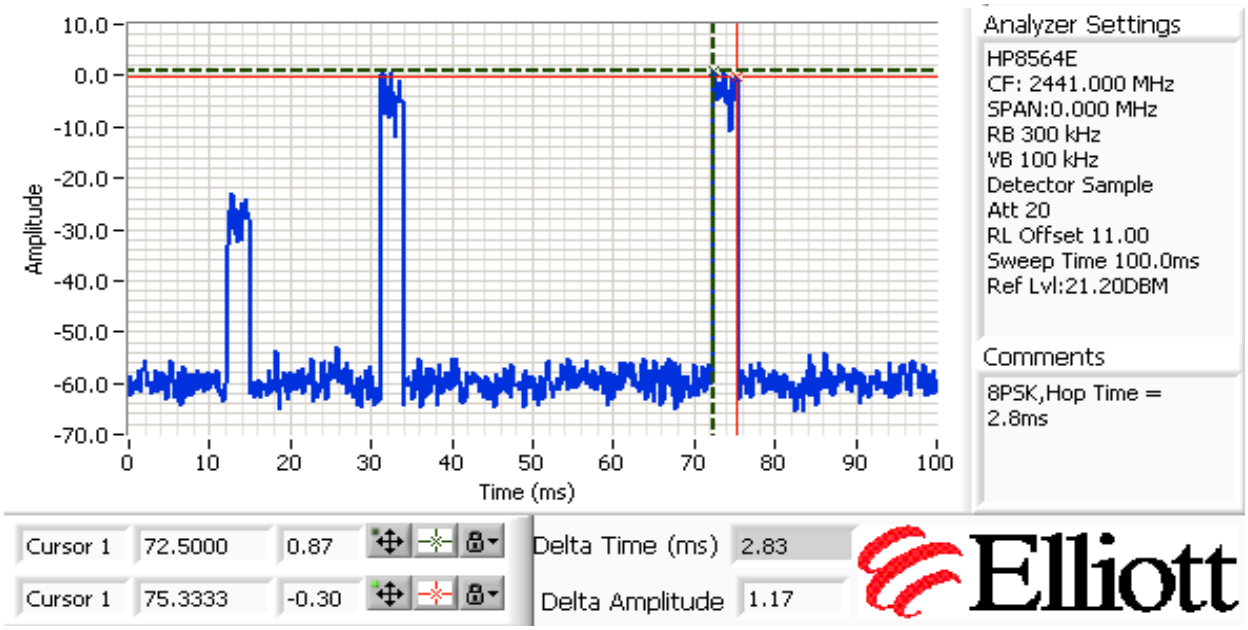
Frequency hopping systems in the 2400-2483.5 MHz band shall use at least 15 channels.
The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed. (Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.)
The channel dwell time is calculated from the transmit time on a channel mulitplied by the number of times a channel could be used in a period of 0.4 times the number of channels, N (i.e. 0.4N divided by the time between successive hops, rounded up to the closest integer), unless the time between successive hops exceeds 0.4N, in which case the channel dwell time is the transmit time on a channel.

Maximum 20dB bandwidth:	1467	kHz	
Channel spacing:	1000	kHz	Pass
Transmission time per hop:	2.8	ms	
The time between successive hops on a channel:		ms	
Number of channels (N):	79		Pass
Channel dwell time in 31.6 seconds:	<400	ms	Pass

Note:	Since the dwell time per hop is less then 0.4 seconds and the operation description details that all channels are used equally, then compliance with the 0.4 s per 0.4 * # of channels is automatic, independent of the time between hops on the same channel.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Note: The number of channels and the channel spacings for 8PSK mode is the same as GFSK.



Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

RSS 210 and FCC 15.247 (DTS) Radiated Spurious Emissions

Test Specific Details

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

Date of Test: 4/16/2009
Test Engineer: Suhaila Khushzad
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
Host Unit Voltage 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on the turntable for radiated spurious emissions testing. All remote support equipment was located approximately 30 meters from the EUT with all I/O connections running on top of the groundplane or routed in overhead in the GR-1089 test configuration.

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

Ambient Conditions:

Temperature: 13 °C
Rel. Humidity: 58 %

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

Run #	Test Performed	Limit	Result	Margin
1	RE, 1000 -18000 MHz, Maximized Emissions	RSS-GEN	Pass	44.1dBµV/m @ 3037.5MHz (-9.9dB)

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.

Note: No radio related emissions detected below 1 GHz.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen		
Standard:	FCC, RSS 210	Class:	N/A

Run #1: Radiated Spurious Emissions, 1000 - 18000 MHz. Operating Mode: Rx
EUT at 2441 MHz

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000 -18000 MHz	3	3	0.0

Rx Mode 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	
3037.530	44.1	V	54.0	-9.9	AVG	192	2.2	RB 1 MHz; VB: 10 Hz
12205.000	39.9	H	54.0	-14.1	AVG	360	1.0	RB 1 MHz; VB: 10 Hz
12205.030	39.8	V	54.0	-14.2	AVG	27	1.0	RB 1 MHz; VB: 10 Hz
3036.210	58.8	V	74.0	-15.2	PK	192	2.2	RB 1 MHz; VB: 1 MHz
9752.540	38.2	H	54.0	-15.8	AVG	152	1.0	RB 1 MHz; VB: 10 Hz
9752.650	38.1	V	54.0	-15.9	AVG	6	1.0	RB 1 MHz; VB: 10 Hz
7332.240	37.3	V	54.0	-16.7	AVG	216	2.3	RB 1 MHz; VB: 10 Hz
7331.280	37.2	H	54.0	-16.8	AVG	25	1.0	RB 1 MHz; VB: 10 Hz
4492.090	34.6	V	54.0	-19.4	AVG	136	1.0	RB 1 MHz; VB: 10 Hz
4880.220	31.1	V	54.0	-22.9	AVG	34	1.0	RB 1 MHz; VB: 10 Hz
4880.500	31.0	H	54.0	-23.0	AVG	105	1.0	RB 1 MHz; VB: 10 Hz
12205.340	50.9	H	74.0	-23.1	PK	360	1.0	RB 1 MHz; VB: 1 MHz
12208.340	50.8	V	74.0	-23.2	PK	27	1.0	RB 1 MHz; VB: 1 MHz
9760.400	49.7	H	74.0	-24.3	PK	152	1.0	RB 1 MHz; VB: 1 MHz
7331.430	49.1	V	74.0	-24.9	PK	216	2.3	RB 1 MHz; VB: 1 MHz
9763.730	49.0	V	74.0	-25.0	PK	6	1.0	RB 1 MHz; VB: 1 MHz
7333.660	48.4	H	74.0	-25.6	PK	25	1.0	RB 1 MHz; VB: 1 MHz
4491.540	42.9	V	74.0	-31.1	PK	136	1.0	RB 1 MHz; VB: 1 MHz
4886.210	42.4	V	74.0	-31.6	PK	34	1.0	RB 1 MHz; VB: 1 MHz
4881.600	41.8	H	74.0	-32.2	PK	105	1.0	RB 1 MHz; VB: 1 MHz

Note 1:	Above 1 GHz, the FCC specifies the limit as an average measurement. In addition, the FCC states that the peak reading of any emission above 1 GHz, can not exceed the average limit by more than 20 dB.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen	Project Manager:	Mark Hill
Standard:	FCC, RSS 210	Class:	B

Conducted Emissions - Power Ports

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: 4/8/2009
Test Engineer: Mehran Birgani
Test Location: SVOATS #2

Config. Used: 1
Config Change: None
Host EUT Voltage: Refer to individual run

General Test Configuration

The EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. Remote support equipment was located approximately 30 meters from the test area. All I/O connections were running on top of the groundplane.

Ambient Conditions:

Temperature: 15 °C
Rel. Humidity: 59 %

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power, 230V/50Hz	EN 55022 Class B	Pass	39.8dBµV @ 0.487MHz (-6.4dB)
2	CE, AC Power,120V/60Hz	EN 55022 Class B	Pass	35.7dBµV @ 0.488MHz (-10.5dB)

Modifications Made During Testing

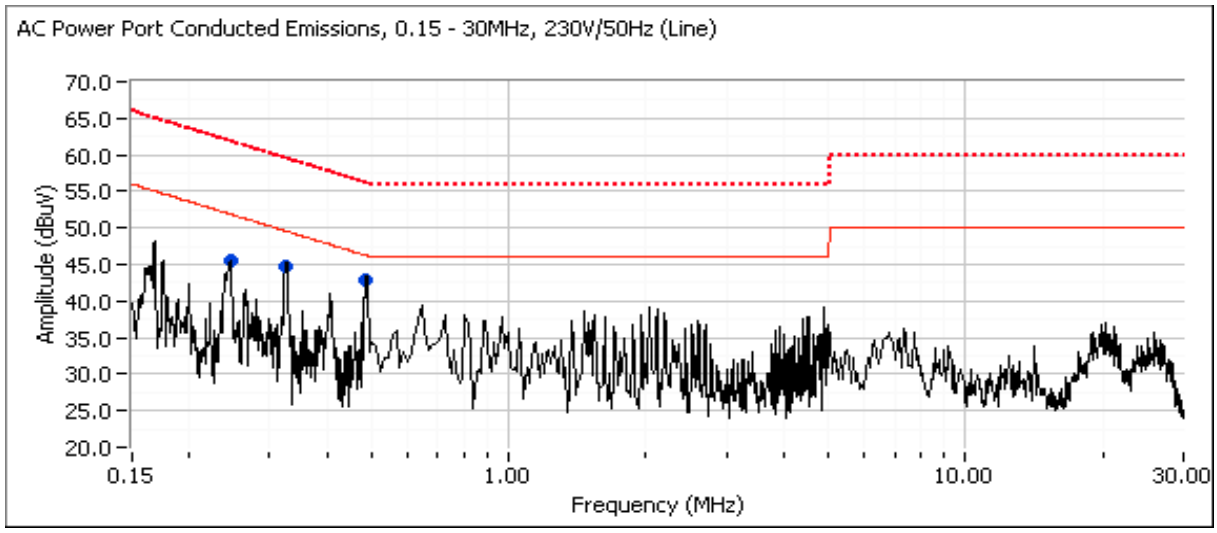
No modifications were made to the EUT during testing

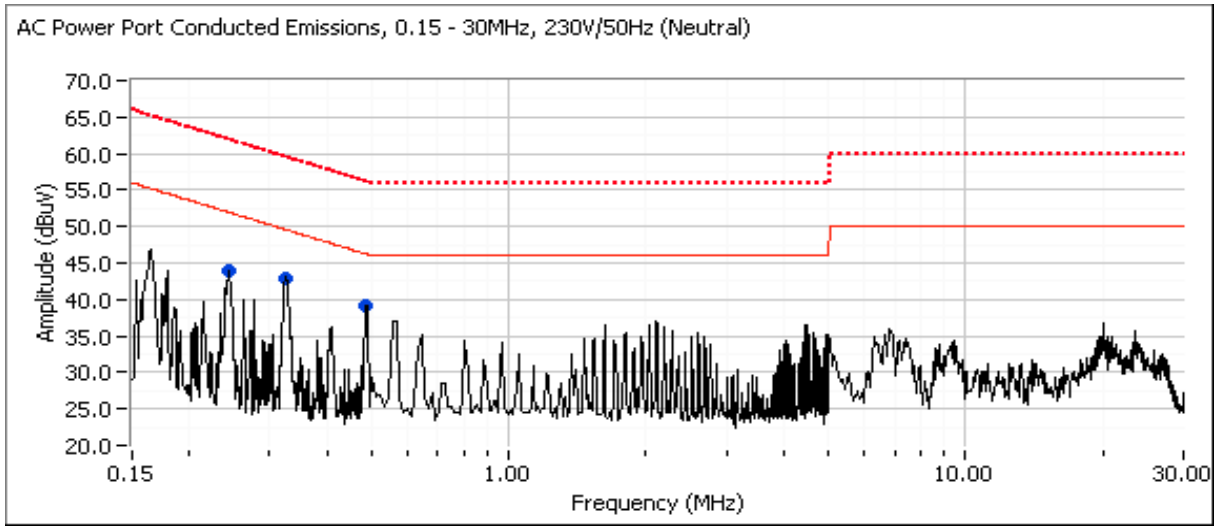
Deviations From The Standard

No deviations were made from the requirements of the standard.

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen	Project Manager:	Mark Hill
Standard:	FCC, RSS 210	Class:	B

Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz





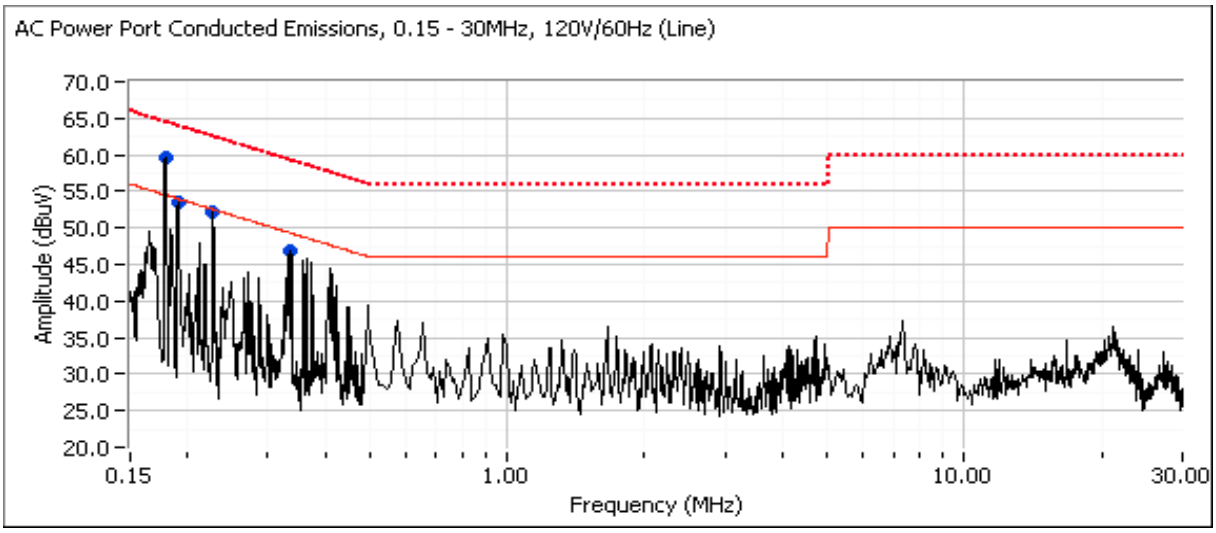
Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen	Project Manager:	Mark Hill
Standard:	FCC, RSS 210	Class:	B

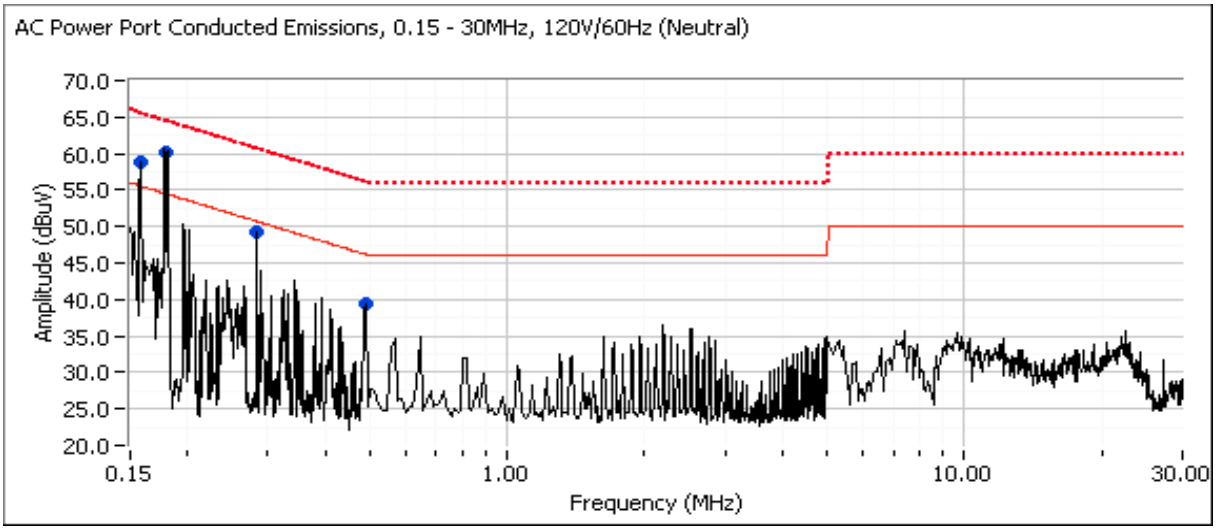
Run #1: AC Power Port Conducted Emissions, 0.15 - 30MHz, 230V/50Hz

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.244	40.7	Line	52.0	-11.3	AVG	
0.246	38.7	Neutral	51.9	-13.2	AVG	
0.324	39.3	Neutral	49.6	-10.3	AVG	
0.325	41.8	Line	49.6	-7.8	AVG	
0.487	39.8	Line	46.2	-6.4	AVG	
0.487	35.2	Neutral	46.2	-11.0	AVG	
0.244	42.8	Line	62.0	-19.2	QP	
0.246	40.5	Neutral	61.9	-21.4	QP	
0.324	41.4	Neutral	59.6	-18.2	QP	
0.325	43.5	Line	59.6	-16.1	QP	
0.487	41.0	Line	56.2	-15.2	QP	
0.487	37.6	Neutral	56.2	-18.6	QP	

Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen	Project Manager:	Mark Hill
Standard:	FCC, RSS 210	Class:	B

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz





Client:	Broadcom	Job Number:	J75022
Model:	BCM92070MD_LENO	T-Log Number:	T75148
		Account Manager:	Dean Erikson
Contact:	Pin Wen	Project Manager:	Mark Hill
Standard:	FCC, RSS 210	Class:	B

Run #2: AC Power Port Conducted Emissions, 0.15 - 30MHz, 120V/60Hz

Frequency	Level	AC	EN 55022 Class B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.153	25.1	Neutral	55.8	-30.7	AVG	
0.163	40.7	Neutral	55.3	-14.6	AVG	
0.178	23.2	Line	54.6	-31.4	AVG	
0.189	22.3	Line	54.1	-31.8	AVG	
0.229	21.5	Line	52.5	-31.0	AVG	
0.282	18.1	Neutral	50.8	-32.7	AVG	
0.335	29.0	Line	49.3	-20.3	AVG	
0.488	35.7	Neutral	46.2	-10.5	AVG	
0.153	54.1	Neutral	65.8	-11.7	QP	
0.163	50.3	Neutral	65.3	-15.0	QP	
0.178	51.6	Line	64.6	-13.0	QP	
0.189	47.9	Line	64.1	-16.2	QP	
0.229	45.0	Line	62.5	-17.5	QP	
0.282	42.6	Neutral	60.8	-18.2	QP	
0.335	35.8	Line	59.3	-23.5	QP	
0.488	37.4	Neutral	56.2	-18.8	QP	

EXHIBIT 3: Photographs of Test Configurations

EXHIBIT 4: Proposed FCC ID Label & Label Location

EXHIBIT 5: Detailed Photographs of Broadcom Corporation Model BCM9207MD0_LENOConstruction

EXHIBIT 6: Operator's Manual for Broadcom Corporation Model BCM9207MD0_LENO

EXHIBIT 7: Block Diagram of Broadcom Corporation Model BCM9207MD0_LENO

EXHIBIT 8: Schematic Diagrams for Broadcom Corporation Model BCM9207MD0_LENO

EXHIBIT 9: Theory of Operation for Broadcom Corporation Model BCM9207MD0_LENO

EXHIBIT 10: RF Exposure Information