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December 20, 2002

Chief, Equipment Authorization Branch,
Authorization and Evaluation Division,
Office of Engineering and Technology
FEDERAL COMMUNICATIONS COMMISSION
P.O. Box 358315
Pittsburgh, PA 15251-5315

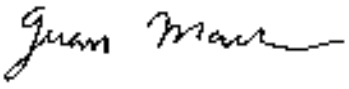
Gentlemen:

The enclosed documents constitute a formal submittal and application for a Grant of Equipment Authorization pursuant to Subpart E of Part 15 of FCC Rules (CFR 47) regarding intentional radiators. Data within this report demonstrates that the equipment tested complies with the FCC limits for intentional radiators.

This application is for a limited modular approval. As the device operates under two sections of the FCC's rules, it is considered a composite device. This application and report covers the operation of the device under part 15.407 for the frequency band 5150-5350 MHz.

Elliott Laboratories, as duly authorized agent prepared this submittal. A copy of the letter of our appointment as agent is enclosed.
If there are any questions or if further information is needed, please contact Elliott Laboratories for assistance.

Sincerely,



Juan Martinez
Sr. EMC Engineer

JM/
Enclosures: Agent Authorization Letter
Emissions Test Report with Exhibits

File: R49738

Elliott Laboratories Inc. 684 West Maude Avenue 408-245-7800 Phone
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Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to FCC Part 15, Subpart E (UNII Devices) and Industry Canada RSS 210 Issue 4 (LELEAN Devices) on the Broadcom Corporation Model: BCM94309MP in Dell PP05L laptop

FCC ID:	QDS-BRCM1007
GRANTEE:	Broadcom Corporation 400 East Caribbean Drive Sunnyvale, CA 94089
TEST SITE:	Elliott Laboratories, Inc. 684 W. Maude Avenue Sunnyvale, CA 94086
REPORT DATE:	December 20, 2002
FINAL TEST DATE:	December 11, December 12, December 16, December, 17 and December 18, 2002
AUTHORIZED SIGNATORY:	Juan Martinez Sr. EMC Engineer

DECLARATION OF COMPLIANCE

Equipment Name and Model:
BCM94309MP in Dell PP05L laptop

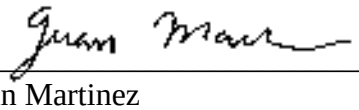
Manufacturer:
Broadcom Corporation
400 East Caribbean Drive
Sunnyvale, CA 94089

Tested to applicable standards:
RSS-210, Issue 4, December 2000 (Low Power License-Exempt Radiocommunication Devices)
FCC Part 15 Subpart E (UNII Devices)

Measurement Facility Description Filed With Department of Industry:

Departmental Acknowledgement Number: IC2845 **SV3** Dated July 30, 2001
Departmental Acknowledgement Number: IC2845 **SV4** Dated July 19, 2001

I declare that the testing was performed or supervised by me; that the test measurements were made in accordance with the above mentioned departmental standards (through the use of ANSI C63.4 as detailed in section 5.3 of RSS-210, Issue 4); and that the equipment performed in accordance with the data submitted in this report.

Signature	
Name	Juan Martinez
Title	Sr. EMC Engineer
Company	Elliott Laboratories Inc.
Address	684 W. Maude Ave Sunnyvale, CA 94086 USA
Date:	December 20, 2002

Maintenance of compliance with the above standards 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.).

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SCOPE

An electromagnetic emissions test has been performed on the Broadcom Corporation Mini PCI Transceiver model BCM94309MP in Dell PP05L laptop pursuant to Subpart E of Part 15 of FCC Rules for Unlicensed National Information Infrastructure (UNII) devices and RSS-210 Issue 4 for licence-exempt local area network (LELAN) devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-1992 as outlined in Elliott Laboratories test procedures.

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

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

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

The test results recorded herein are based on a single type test of the Broadcom Corporation model BCM94309MP in Dell PP05L laptop and therefore apply only to the tested sample. The sample was selected and prepared by David Boldy of Broadcom Corporation

OBJECTIVE

The primary objective of the manufacturer is compliance with Subpart E of Part 15 of FCC Rules for the radiated and conducted emissions of intentional radiators. Certification of these devices is required as a prerequisite to marketing as defined in Part 2 the FCC Rules.

Certification is a procedure where the manufacturer or a contracted laboratory makes measurements and submits the test data and technical information to the FCC. The FCC issues a grant of equipment authorization upon successful completion of their review of the submitted documents. Once the equipment authorization has been obtained, the label indicating compliance must be attached to all identical units that are subsequently manufactured.

SUMMARY OF RESULTS

FCC Part 15 Section	RSS 210 Section	Description	Comments	Result
Operation in the 5.15 – 5.25 GHz Band				
15.407 (d)		As the device operates in the 5.15 – 5.25 GHz band the antenna must be integral to the device.	Antenna Gain = 5.6 dBi The antenna is integral to the laptop computer	COMPLIES
15.407(e)		Indoor operation only	Refer to user's manual in Exhibit 6	COMPLIES
15.407(a) (1)	6.2.2(q1)(i)	Bandwidth	19.2 MHz (26dB), 18.2 MHz (20dB)	N/A
15.407(a) (1)	6.2.2(q1)(i)	Output Power	15.9 dBm @ 5180 MHz	COMPLIES
15.407(a) (1))	6.2.2(q1)(i)	Power Spectral Density	-5.2 dBm/MHz @ 5180 MHz	COMPLIES
15.407(b) (5) / 15.209	6.2.2(q1)(ii)	Spurious Emissions below 1GHz	-1.7 dB @ 138.100 MHz	COMPLIES
15.407(b) (2)	6.2.2(q1)(ii)	Spurious Emissions above 1GHz	-8.9 dB @ 15540 MHz	COMPLIES
Operation in the 5.25 – 5.35 GHz Band Note: The device is restricted to indoor use only, therefore the spectral density of spurious emissions in the 5.15 – 5.25 GHz band were limited to the power spectral limits for intentional signals detailed in FCC 15.407(a)(1) and RSS 210 6.2.2(q1) (i)				
		Maximum Antenna Gain /Integral Antenna	Antenna Gain = 5.6 dBi	COMPLIES
15.407(a) (2)	6.2.2(q1)(ii)	Bandwidth	30.0 MHz (26dB), 18.3 MHz (20dB)	N/A
15.407(a) (2)	6.2.2(q1)(ii)	Output Power	21.8 dBm @ 5320 MHz	COMPLIES
15.407(a) (2))	6.2.2(q1)(ii)	Power Spectral Density	-0.2 dBm/MHz @ 5320 MHz	COMPLIES
15.407(b) (5) / 15.209	6.2.2(q1)(ii)	Spurious Emissions below 1GHz	-1.7 dB @ 138.100 MHz	COMPLIES
15.407(b) (2)	6.2.2(q1)(ii)	Spurious Emissions above 1GHz	-4.1 dB @ 5350 MHz	COMPLIES

General requirements for all bands				
FCC Part 15 Section	RSS 210 Section	Description	Comments	Result
	6.2.2(q1)(iv)(a)	Digital Modulation	Digital Modulation is used, refer to the "Theory of Operations" (Exhibit 9) for a detailed explanation.	COMPLIES
	6.2.2(q1)(iv)(b)	Peak Spectral Density	11.7 dBm/MHz	COMPLIES
15.407(a)(6)		Peak Excursion Ratio	< 13 dB	COMPLIES
	6.2.2(q1)(iv)(c)	Channel Selection	The device was tested on the following channels: 36, 52 and 64. These channels represent the highest, lowest and center channels available.	N/A
15.407 (c)	6.2.2(q1)(iv)(d)	Automatic Discontinuation of Operation in the absence of information to transmit	Operation is discontinued in the absence of information to transmit, refer to the "Theory of Operations" in Exhibit 9 for a detailed explanation.	COMPLIES
15.407 (g)	6.2.2(q1)(iv)(e)	Frequency Stability	Frequency stability is 20 ppm, refer to the "Theory of Operations" in Exhibit 9 for a detailed analysis.	COMPLIES
	6.2.2(q1)(iv)(g)	User Manual information	All relevant statements have been included in the user's manuals. Refer to Exhibit 6 for details	COMPLIES
15.407 (f)	6.2.2(q1)(iv)(g)	RF Exposure Requirements	Refer to SAR Report in Exhibit 11	COMPLIES
15.407(b) / 15.207	6.6	AC Conducted Emissions	-16.0 dB @ 0.242 MHz	COMPLIES

MEASUREMENT UNCERTAINTIES

ISO Guide 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 NAMAS document NIS 81.

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

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Broadcom Corporation model BCM94309MP is a mini PCI Card dual band (802.11a, 802.11b and 802.11g) transceiver that is designed to be installed into a Dell PP05L laptop PC and connect to antennas mounted in the base of the Dell laptop. The host laptop was treated as table-top equipment during testing to simulate the end user environment.

The EUT has the following operating frequency ranges (as measured from center frequency of each channel): 2412 – 2462 MHz and 5180-5320 MHz. Operation on the channels from 2412-2462 MHz is to be certified under the FCC/Industry Canada rules for spread spectrum devices (FCC 15.247 and RSS 210 6.2.2(o)). Operation on the channels 5180-5320 MHz is to be certified under the FCC/Industry Canada rules for UNII and LELAN devices (FCC 15 E and RSS 210 6.2.2(q1)).

The EUT is intended for indoor use in laptop computers. As such it meets the requirements for the frequency band 2400-2450MHz detailed in RSS210 for unlicensed operation.

The sample was received on December 11, 2002 and tested on December 11, December 12, December 16, December, 17 and December 18, 2002. The EUT consisted of the following component(s):

Manufacturer/Model/Description	Serial Number	Proposed FCC ID #
Broadcom BCM94309MP Mini PCI Transceiver	None	QDS-BRCM1007

ENCLOSURE

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

MODIFICATIONS

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

SUPPORT EQUIPMENT

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

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	Inspiron 600M	Laptop	9T447X01	LNQTAI-36176-M5-E
US Robotics	Pilot 1000	PDA	6.0482E+11	MQ90001
HP	Thinkjet 2225C	Printer	2714540166	DS16XU2225

EUT INTERFACE PORTS

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

		Cable(s)		
Port	Connected To	Description	Shielded or Unshielded	Length(m)
Laptop serial	Palm	Multiconductor	Shieleded	1.5
Laptop Parallel	Printer	Multiconductor	Shieleded	1.5
Laptop Adapter	AC Mains	Two conductor	Unshielded	1.5

EUT OPERATION DURING TESTING

The radio was transmitting at full power on the specified channels with a 100 % duty cycle and at a data rates from 1 to 54 Mb/s. The channels were selected since they are at the top, near the center and at the bottom of the allocated bands. The radio uses 8-chip complementary code keying (CCK), 11-chip differential quadrature phase shift keying (DQPSK) modulation for 802.11b operation and Orthogonal Frequency Division Multiplexing (OFDM) for 802.11a and 802.11g operation.

For measurements of radiated emissions below 1GHz and AC conducted emissions, the host laptop was connected to two peripherals (PDA and Printer) and had a scrolling 'H' pattern displayed on the screen.

ANTENNA REQUIREMENTS

As the device is intended to operate in the 5.15 – 5.25 GHz band an integral antenna as detailed in 15.407 (d) and RSS-210 6.2.2(q1) (i) is required. The antenna for the device is an integral antenna built into the Dell laptop computer.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on December 11, December 12, December 16, December, 17 and December 18, 2002 at the Elliott Laboratories Open Area Test Sites #3 and 4 located at 684 West Maude Avenue, Sunnyvale, California. The test site contains separate areas for radiated and conducted emissions testing. Pursuant to section 2.948 of the Rules, construction, calibration, and equipment data has been filed with the Federal Communications Commission. In accordance with Industry Canada rules detailed in RSS 210 Issue 4 and RSS-212, construction, calibration, and equipment data for the test sites have been filed with the Federal Communications Commission.

The FCC 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 of predictable local TV, radio, and mobile communications traffic. The test site contains separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent FCC requirements.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4-1992. 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. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

An EMI receiver as specified in CISPR 16-1 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.

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.

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.

POWER METER

Either a spectrum analyzer or a power meter and thermister mount are used for all direct output power measurements from transmitters.

FILTERS/ATTENUATORS

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

ANTENNAS

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

ANTENNA MAST AND EQUIPMENT TURNTABLE

The antennas used to measure the radiated electric field strength are mounted on a non-conductive antenna mast equipped with a motor-drive to vary the antenna height.

ANSI C63.4 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material 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 FCC requires that interconnecting cables be connected to the available ports of the unit and that the placement of the unit and the attached cables simulate the worst case orientation that can be expected from a typical installation, so far as practicable. To this end, the position of the unit and associated cabling is varied within the guidelines of ANSI C63.4, and the worst case orientation is used for final measurements.

CONDUCTED EMISSIONS

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.

RADIATED EMISSIONS

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360˚, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit.

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

Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth which results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions which have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

CONDUCTED EMISSIONS FROM ANTENNA PORT

Direct measurements are performed with the antenna port of the EUT connected to either the power meter or spectrum analyzer via a suitable attenuator and/or filter. These are used to ensure that the front end of the measurement instrument is not overloaded by the fundamental transmission.

Measurement bandwidths (video and resolution) are set in accordance with FCC procedures for the type of radio being tested.

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

The limits for conducted emissions from the AC power port are given in units of microvolts, the limits for radiated electric field emissions are given in units of microvolts per meter at a specified test distance and the output power limits are given in temrs of Watts, milliwatts or dBm. 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.

Where the radiated electric field strength is expressed in terms of the equivalent isotropic radiated power (eirp) the following formula is used to determine the field strength limit in terms of microvolts per meter at a distance of 3m from the equipment under test:

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

where P is the eirp (Watts)

For reference, converting the voltage and electric field strength specification limits from linear to decibel form is accomplished by taking the base ten logarithm, then multiplying by 20. Conversion of power specification limits from linear units (in milliwatts) to decibel form (in dBm) is accomplished by taking the base ten logarithm, then multiplying by 10.

FCC 15.407 (a) OUTPUT POWER LIMITS

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
5150 - 5250	50mW (17 dBm)	4 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

RS-210 6.2.2(q1) OUTPUT POWER LIMITS

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
5150 - 5250	200mW (23 dBm)	10 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

For system using antennas with gains exceeding 6dBi, the output power and power spectral density limits are reduced by 1dB for every dB the antenna gain exceeds 6dBi. Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

SPURIOUS RADIATED EMISSIONS LIMITS

The table below shows the limits for unwanted (spurious) emissions falling in the restricted bands detailed in Part 15.205 and Industry Canada RSS-210 Table 2.

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

The table below shows the limits for unwanted (spurious) emissions outside of the restricted bands above 1GHz.

Operating Frequency (MHz)	EIRP Limit (dBm)	Equivalent Field Strength At 3m (dBuV/m)
5150 - 5250	-27 dBm	68.3 dBuV/m
5250 - 5350	-27 dBm (note 1)	68.3 dBuV/m
5725 – 5825	-27 dBm (note 2)	68.3 dBuV/m
	-17 dBm (note 3)	78.3 dBuV/m

Note 1: If operation is restricted to indoor use only then emissions in the band 5.15 – 5.25 GHz must meet the power spectral density limits for the intentional signals detailed in RSS 210 and FCC Subpart E for devices operating in the 5.15 – 5.25 Ghz band.
Note 2: Applies to spurious signals separated by more than 10 MHz from the allocated band.
Note 3: Applies to spurious signals within 10 MHz of the allocated band.

AC POWER PORT CONDUCTED EMISSIONS LIMITS

The table below shows the limits for emissions on the AC power line as detailed in FCC Part 15.205 and Industry Canada RSS-210 section 6.6.

Frequency Range (MHz)	Limit (uV)	Limit (dBuV)
0.450 to 30.000	250	48

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r - B = C$$

and

$$C - S = M$$

where:

R_r = Receiver Reading in dBuV

B = Broadband Correction Factor*

C = Corrected Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

* Broadband Level - Per ANSI C63.4, 13 dB may be subtracted from the quasi-peak level if it is determined that the emission is broadband in nature. If the signal level in the average mode is six dB or more below the signal level in the peak mode, the emission is classified as broadband.

SAMPLE CALCULATIONS - RADIATED EMISSIONS

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

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

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

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

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

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_c = Corrected Reading in dBuV/m

L_s = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radiated Emissions, 30 - 1000 MHz, 16-Dec-02
Engineer: rwong

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Elliott Laboratories	Biconical Antenna, 30-300 MHz	EL30.300	773	12	3/5/2002	3/5/2003
EMCO	Log Periodic Antenna, 0.2-2 GHz	3148	1321	12	4/23/2002	4/23/2003
Rohde & Schwarz	Test Receiver, 20-1300 MHz	ESVP	1317	12	5/3/2002	5/3/2003
Fischer Custom Comm.	LISN, Freq. 0.9 -30 MHz,16 Amp	FCC-LISN-50/250-16-2	1079	12	7/2/2002	7/2/2003
Rohde& Schwarz	Pulse Limiter	ESH3 Z2	1401	12	3/12/2002	3/12/2003
Rohde & Schwarz	Test Receiver, 0.009-30 MHz	ESH3	274	12	1/16/2002	1/16/2003

Conducted and Radiated Emissions, 17-Dec-02
Engineer: Chris

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Electro Metrics	Conical log spiral antenna	LCA-25	1291	12	3/25/2002	3/25/2003
Elliott Laboratories	Biconical Antenna, 30-300 MHz	DM-105-T1	382	12	9/5/2002	9/5/2003
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	786	12	3/2/2002	3/2/2003
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	787	12	12/4/2002	12/4/2003
Hewlett Packard	Microwave EMI test system (SA40, 9Hz - 40GHz), system 2	84125C	1410	12	4/2/2002	4/2/2003
Hewlett Packard	Microwave Preamplifier 0.5-26.5GHz	83017A	1257	12	10/7/2002	10/7/2003
Hewlett Packard	RF Preamplifier, 100 kHz - 1.3 GHz	8447D	999	12	4/24/2002	4/24/2003

Radiated Emissions, 1 - 40GHz, 17-Dec-02
Engineer: Chris

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
Hewlett Packard	Microwave EMI test system (SA40, 9Hz - 40GHz), system 2	84125C	1410	12	4/2/2002	4/2/2003
Hewlett Packard	Spectrum Analyzer, 26GHz	8563E	F1202LB	12	9/27/2002	9/27/2003

Conducted and Radiated Emissions, 18-Dec-02
Engineer: Jmartinez

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	487	12	4/22/2002	4/22/2003
Hewlett Packard	High Pass filter, 3.5GHz	P/N 84300-80038	1157	12	3/1/2002	3/1/2003
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	870	12	1/15/2002	1/15/2003
Hewlett Packard	Spectrum Analyzer, 9KHz - 22GHz	8593EM	1319	12	11/19/2002	11/19/2003
Hewlett Packard	Spectrum Analyzer 9kHz - 40 GHz	8564E (84125C)	1393	12	2/21/2002	2/21/2003

Conducted and Radiated Emissions, 19-Dec-02
Engineer: Chris

Manufacturer	Description	Model #	Assett #	Cal interval	Last Calibrated	Cal Due
EMCO	Horn Antenna, D. Ridge 1-18GHz	3115	786	12	3/2/2002	3/2/2003
Hewlett Packard	EMC Spectrum Analyzer 9kHz - 6.5GHz	8595EM	780	12	2/11/2002	2/11/2003
Hewlett Packard	High Pass filter, 3.5GHz	P/N 84300-80038	1157	12	3/1/2002	3/1/2003
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	12	8/14/2002	8/14/2003
Hewlett Packard	Spectrum Analyzer, 26GHz	8563E	F1202LB	12	9/27/2002	9/27/2003

EXHIBIT 2: Test Data Log Sheets

ELECTROMAGNETIC EMISSIONS

TEST LOG SHEETS

AND

MEASUREMENT DATA

T 49605 75 Pages

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Emissions Spec:	FCC Part 15 B, C & E, RSS-210	Class:	-
Immunity Spec:	N/A	Environment:	-

EMC Test Data

For The

Broadcom

Model

BCM94309MP

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Emissions Spec:	FCC Part 15 B, C & E, RSS-210	Class:	-
Immunity Spec:	N/A	Environment:	-

EUT INFORMATION

General Description

The EUT is a 802.11a/g/b mini PC card which is designed for wireless internet access for the laptop. Normally, the EUT would be table-top during operation. The EUT was treated as table-top equipment during testing to simulate the end user environment.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Broadcom	BCM94309MP	Mini PCI Transceiver		

Antenna

The EUT uses the antenna an antenna integral to the laptop with a gain of 5.6 dBi in the 5150 - 5350 MHz band and 1.45 dBi in the 2400 - 2483.5 MHz band.

The antenna connector used is non-standard antenna (Hirose U.FL series) to meet the requirements of FCC Part 15.203 and RSS-210

EUT Enclosure

The EUT does not have an enclosure as it is intended to be installed in a Dell alptop computer.

Modification History

Mod. #	Test	Date	Modification
1			

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EMC Test Data

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Emissions Spec:	FCC Part 15 B, C & E, RSS-210	Class:	-
Immunity Spec:	N/A	Environment:	-

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Emissions Spec:	FCC Part 15 B, C & E, RSS-210	Class:	-
Immunity Spec:	N/A	Environment:	-

Test Configuration #1

Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	Inspiron 600M	Laptop	9T447X01	LNQTAI-36176-M5-E
US Robotics	Pilot 1000	PDA	6.0482E+11	MQ90001
HP	Thinkjet 2225C	Printer	2714540166	DS16XU2225

Interface Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
Laptop serial	Palm	Multiconductor	Shieleded	1.5
Laptop Parallel	Printer	Multiconductor	Shieleded	1.5
Laptop Adapter	AC Mains	Two conductor	Unshielded	1.5

EUT Operation During Emissions Testing (Radio)

The radio was transmitting at full power on the specified channels with a 100 % duty cycle and at a data rates from 1 to 54 Mb/s. The channels were selected since they are at the top, near the center and at the bottom of the allocated bands. The radio uses 8-chip complementary code keying (CCK), 11-chip differential quadrature phase shift keying (DQPSK) modulation for 802.11b operation and Orthogonal Frequency Division Multiplexing (OFDM) for 802.11a and 802.11g operation.

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Conducted & Radiated Emissions

Test Specifics

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: 12/19/2002
Test Engineer: Chris Byleckie
Test Location: SVOATS #2

Config. Used: 1
Config Change:
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.

Ambient Conditions:

Temperature: 11.5°C
Rel. Humidity: 52%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, 30 - 24620 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	-3.5 dB @ 2390 MHz

Modifications Made During Testing:

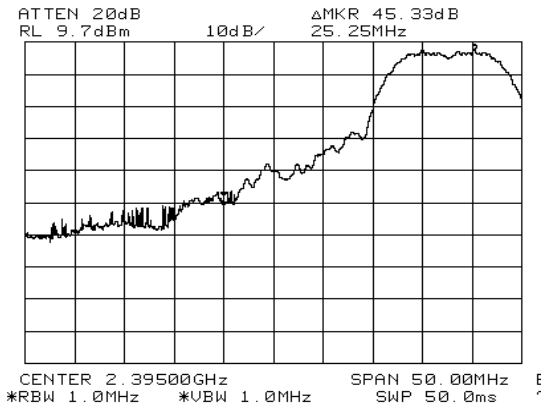
No modifications were made to the EUT during testing

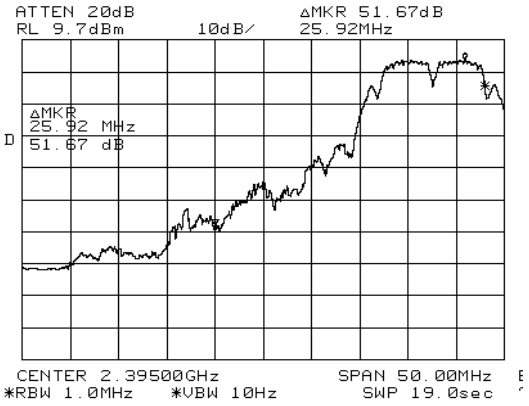
Deviations From The Standard

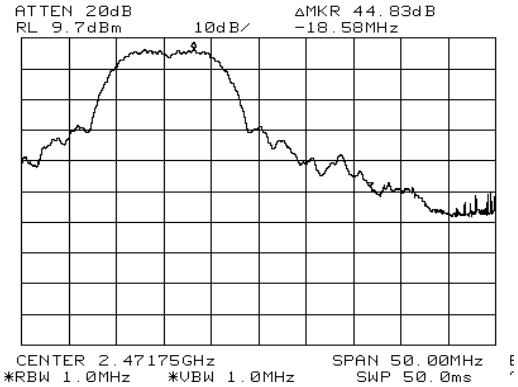
No deviations were made from the requirements of the standard.

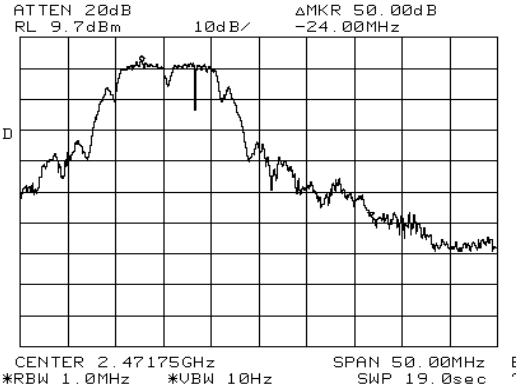
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Bandedge Plots (1Mb/s)









Fundamental Field Strength Measurements used for bandedge field strenegth calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.000	105.7	V	-	-	Pk	-	-	RBW = VBW = 1 MHz
2412.000	102.2	V	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
2462.000	102.6	V	-	-	Pk	-	-	RBW = VBW = 1 MHz
2462.000	97.9	V	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz

Elliott

EMC Test Data

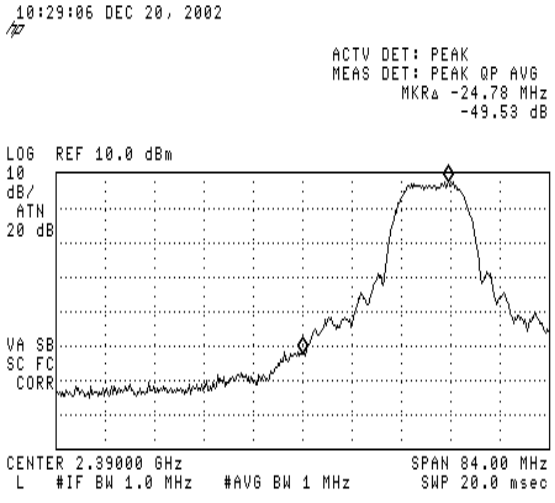
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

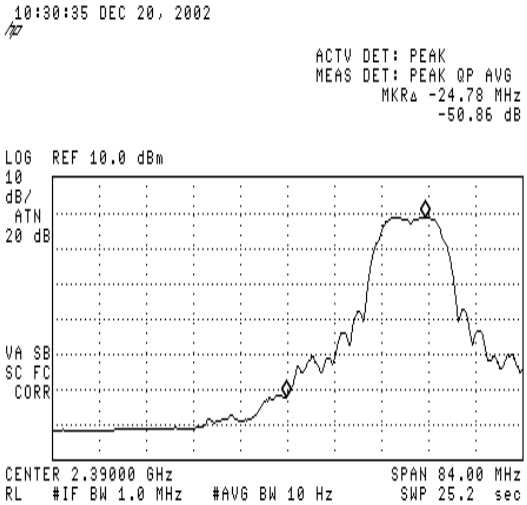
Band Edge Field Strength Calculations (1 Mb/s)

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.0	60.4	v	74.0	-13.6	Pk	-	-	Note 1
2390.0	50.5	v	54.0	-3.5	Avg	-	-	Note 1
2483.5	57.8	v	74.0	-16.2	Pk	-	-	Note 2
2483.5	47.9	v	54.0	-6.1	Avg	-	-	Note 2

Note 1:	EUT operating on the lowest channel available in the 2.4 - 2.4835 GHz band. Signal level calculated using the relative measurements in plots (45.3 dBc for peak and 51.7dBc for average) applied to the highest peak and average field strength measurements of the fundamental siganl level.
Note 2:	EUT operating on highest channel available in the 2.4 - 2.4835 GHz band. Signal level calculated using the relative measurements in plots (44.8 dBc for peak and 50.0dBc for average) applied to the highest peak and average field strength measurements of the fundamental siganl level.

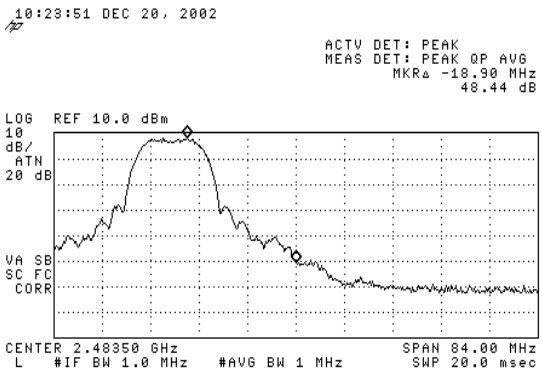
Bandedge Plots (11Mb/s)

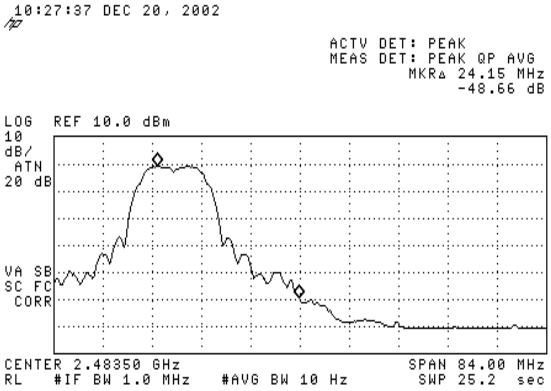




Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Bandedge Plots (11Mb/s)





Fundamental Field Strength Measurements used for bandedge field strenegth calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.000	108.1	V	-	-	Pk	-	-	RBW = VBW = 1 MHz
2412.000	98.4	V	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
2462.000	106.6	V	-	-	Pk	-	-	RBW = VBW = 1 MHz
2462.000	97.7	V	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz

Band Edge Field Strength Calculations (11 Mb/s)

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.0	58.6	v	74.0	-15.4	Pk	-	-	Note 1
2390.0	47.5	v	54.0	-6.5	Avg	-	-	Note 1
2483.5	58.2	v	74.0	-15.8	Pk	-	-	Note 2
2483.5	49.0	v	54.0	-5.0	Avg	-	-	Note 2

Note 1:	EUT operating on the lowest channel available in the 2.4 - 2.4835 GHz band. Signal level calculated using the relative measurements in plots (49.5 dBc for peak and 50.9 dBc for average) applied to the highest peak and average field strength measurements of the fundamental siganl level.
Note 2:	EUT operating on highest channel available in the 2.4 - 2.4835 GHz band. Signal level calculated using the relative measurements in plots (48.4 dBc for peak and 48.7 dBc for average) applied to the highest peak and average field strength measurements of the fundamental siganl level.

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30-25000 MHz. Low Channel @ 2412 MHz
Rate = 1Mb/s, Power=35

LO	**PK**	**43dB**	**Bandedge**	**61.5**	**Pk**
	Avg	**48dB**		**53.4**	**Avg**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.00	104.5	v	-	-	Pk	20	1.7	
2412.00	101.4	v	-	-	Avg	20	1.7	
2412.00	104.8	h	-	-	Pk	330	1.6	
2412.00	100.9	h	-	-	Avg	330	1.6	
4824.00	47.8	v	74.0	-26.2	Pk	350	1.1	
4824.00	37.2	v	54.0	-16.8	Avg	350	1.1	
12060.00	58.3	v	74.0	-15.7	Pk	350	1.1	
12060.00	44.9	v	54.0	-9.1	Avg	350	1.1	
14472.00	57.0	v	74.0	-17.0	Pk	350	1.1	
14472.00	45.3	v	54.0	-8.7	Avg	350	1.1	
4824.00	48.5	h	74.0	-25.5	Pk	130	1.2	
4824.00	36.1	h	54.0	-17.9	Avg	130	1.2	
12060.00	56.3	h	74.0	-17.7	Pk	130	1.2	
12060.00	44.1	h	54.0	-9.9	Avg	130	1.2	
14472.00	56.1	h	74.0	-17.9	Pk	130	1.2	
14472.00	43.9	h	54.0	-10.1	Avg	130	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.

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EMC Test Data

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #1b: Radiated Spurious Emissions, 30-25000 MHz. Center Channel @ 2437 MHz

	H	V
Fundamental emission level @ 3m in 100kHz RBW:		
Limit for emissions outside of restricted bands:	-20 dBµV/m	

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4874.00	49.6	v	74.0	-24.4	Pk			
4874.00	36.1	v	54.0	-17.9	Avg			
7311.00	53.8	v	74.0	-20.2	Pk			
7311.00	39.0	v	54.0	-15.0	Avg			
12185.00	54.9	v	74.0	-19.1	Pk			
12185.00	44.8	v	54.0	-9.2	Avg			
4874.00	48.1	h	74.0	-25.9	Pk			
4874.00	35.7	h	54.0	-18.3	Avg			
7311.00	51.9	h	74.0	-22.1	Pk			
7311.00	38.8	h	54.0	-15.2	Avg			
12185.00	54.7	h	74.0	-19.3	Pk			
12185.00	43.3	h	54.0	-10.7	Avg			

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:	

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EMC Test Data

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #1c: Radiated Spurious Emissions, 30-25000 MHz. High Channel @ 2462 MHz
Rate = 1Mb/s, Power=35

Hi	**PK**	**43dB**	**Bandedge**	**62.2**	**Pk**
	Avg	**48dB**		**53.9**	**Avg**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2462.00	102.9	v	-	-	Pk	60	1.8	
2462.00	99.9	v	-	-	Avg	60	1.8	
2462.00	105.2	h	-	-	Pk	330	1.9	
2462.00	101.9	h	-	-	Avg	330	1.9	
4924.00	48.5	v	74.0	-25.5	Pk	0	1.1	
4924.00	37.3	v	54.0	-16.7	Avg	0	1.1	
4924.00	48.2	h	74.0	-25.8	Pk	200	1.1	
4924.00	36.3	h	54.0	-17.7	Avg	200	1.1	
7386.00	52.9	v	74.0	-21.1	Pk			
7386.00	39.8	v	54.0	-14.2	Avg			
7386.00	52.5	h	74.0	-21.5	Pk			
7386.00	38.6	h	54.0	-15.4	Avg			
12310.00	56.5	v	74.0	-17.5	Pk			
12310.00	45.5	v	54.0	-8.5	Avg			
12310.00	54.9	h	74.0	-19.1	Pk			
12310.00	44.5	h	54.0	-9.5	Avg			

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:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Conducted & Radiated Emissions

Test Specifics

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

Date of Test: 12/18/2002
Test Engineer: jmartinez
Test Location: SVOATS #3

Config. Used: 1
Config Change:
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.

Ambient Conditions:

Temperature: 12°C
Rel. Humidity: 44%

Summary of Results

Run #	Test Performed	Limit	Result	Comment
1	RE, 30 - 24620 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	-0.4 dB @ 2390 MHz
2	6dB Bandwidth	15.247(a)	Pass	> 16 MHz
3	Output Power	15.247(b)	Pass	19.8 dBm @ 2437 MHz
4	Power Spectral Density (PSD)	15.247(d)	Pass	-11.7 dBm @ 2437 MHz
5	CE, 30 - 24620 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	> 20 dBc

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.

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #1a: Radiated Spurious Emissions, 30-24120 MHz. Low Channel @ 2412 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4824.000	46.6	v	74.0	-27.4	Pk	135	1.2	
4824.000	32.8	v	54.0	-21.2	Avg	135	1.2	
7236.000	51.3	v	74.0	-22.7	Pk	135	1.5	
7236.000	38.9	v	54.0	-15.1	Avg	135	1.5	
4824.000	46.5	h	74.0	-27.5	Pk	130	1.0	
4824.000	34.1	h	54.0	-19.9	Avg	130	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.

Run #1b: Radiated Spurious Emissions, 30-24370 MHz. Center Channel @ 2437 MHz

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4874.000	46.5	v	74.0	-27.5	Pk	95	1.8	
4874.000	34.0	v	54.0	-20.0	Avg	95	1.8	
7311.000	51.7	v	74.0	-22.3	Pk	330	1.5	
7311.000	39.2	v	54.0	-14.8	Avg	330	1.5	
4874.000	46.4	h	74.0	-27.6	Pk	190	1.2	
4874.000	34.1	h	54.0	-19.9	Avg	190	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.

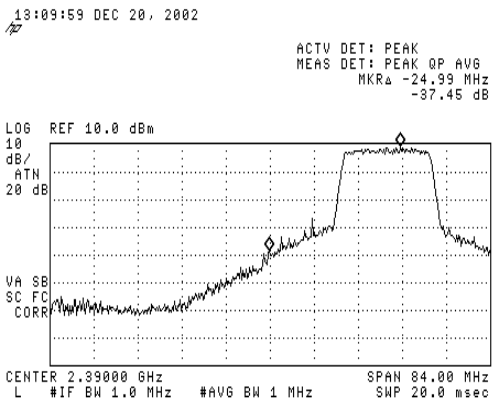
Run #1c: Radiated Spurious Emissions, 30-24620 MHz. High Channel @ 2462 MHz

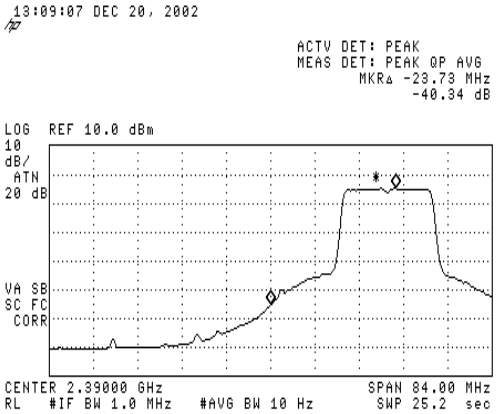
Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4924.000	46.4	v	74.0	-27.6	Pk	330	1.8	
4924.000	34.8	v	54.0	-19.2	Avg	330	1.8	
7386.000	51.8	v	74.0	-22.2	Pk	135	1.6	
7386.000	39.7	v	54.0	-14.3	Avg	135	1.6	
4924.000	47.3	h	74.0	-26.7	Pk	30	1.5	
4924.000	34.6	h	54.0	-19.4	Avg	30	1.5	

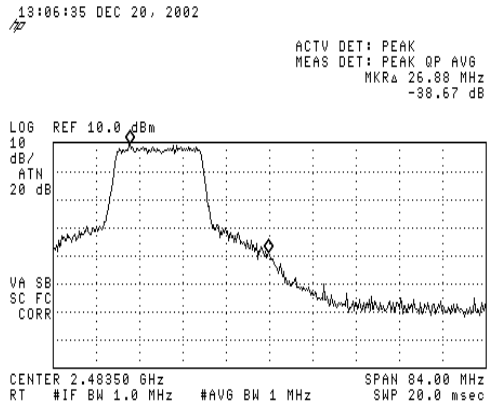
Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 20dB below the level of the fundamental.

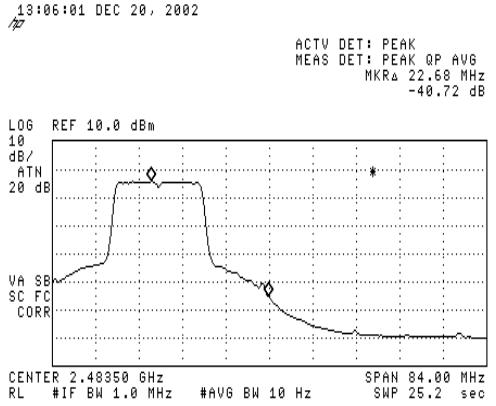
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Bandedge Plots









Fundamental Field Strength Measurements used for bandedge field strenegth calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2412.000	106.4	V	-	-	Pk	-	-	RBW = VBW = 1 MHz
2412.000	93.9	V	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz
2462.000	104.4	V	-	-	Pk	-	-	RBW = VBW = 1 MHz
2462.000	93.3	V	-	-	Avg	-	-	RBW = 1MHz, VBW = 10Hz

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #1d: Band Edge Field Strength Calculations

Frequency	Level	Pol	15.209 / 15.407		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
2390.0	68.9	v	74.0	-5.1	Pk	-	-	Note 1
2390.0	53.6	v	54.0	-0.4	Avg	-	-	Note 1
2483.5	65.7	v	74.0	-8.3	Pk	-	-	Note 2
2483.5	52.6	v	54.0	-1.4	Avg	-	-	Note 2

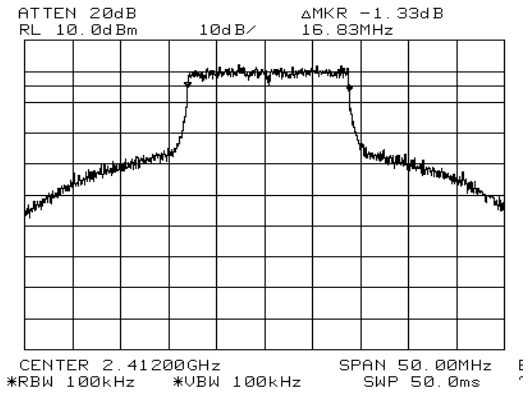
Note 1:	EUT operating on the lowest channel available in the 2.4 - 2.4835 GHz band. Signal level calculated using the relative measurements in plots (37.5 dBc for peak and 40.3 dBc for average) applied to the highest peak and average field strength measurements of the fundamental signal level.
Note 2:	EUT operating on the lowest channel available in the 2.4 - 2.4835 GHz band. Signal level calculated using the relative measurements in plots (38.7 dBc for peak and 40.7 dBc for average) applied to the highest peak and average field strength measurements of the fundamental signal level.

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

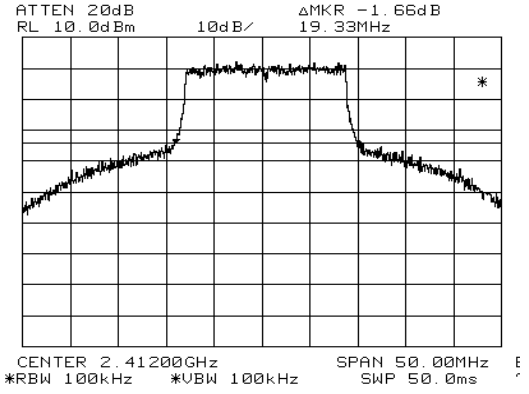
Run #2: Signal Bandwidth

Channel	Frequency	Resolution Bandwidth	6dB BW	26dB BW	99% BW
	(MHz)	(kHz)	(MHz)	(MHz)	(MHz)
Low	2412	100	16.8	19.3	16.7
Mid	2437	100	16.9	19.1	16.7
High	2462	100	16.7	18.8	16.6

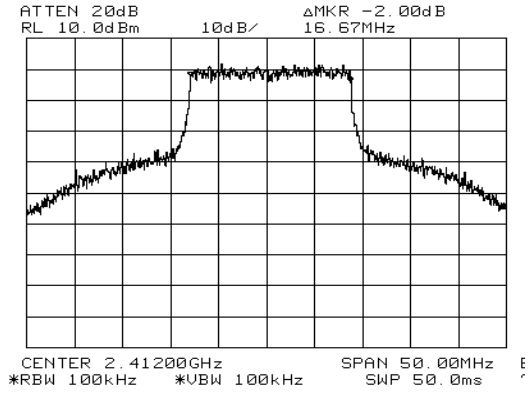
6-dB



26-dB

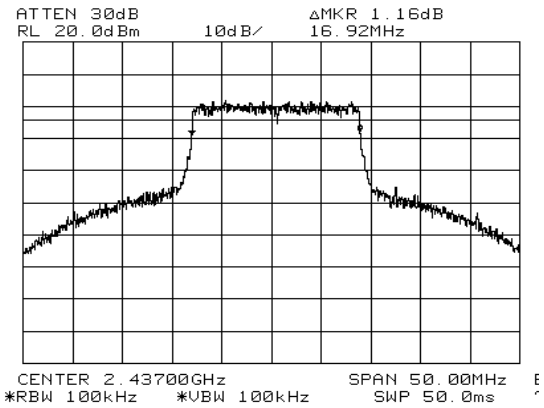


99%

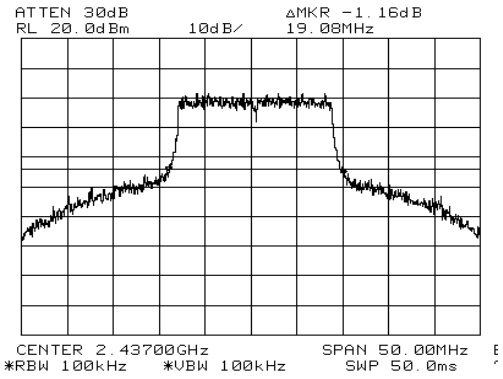


Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

6-dB



26-dB



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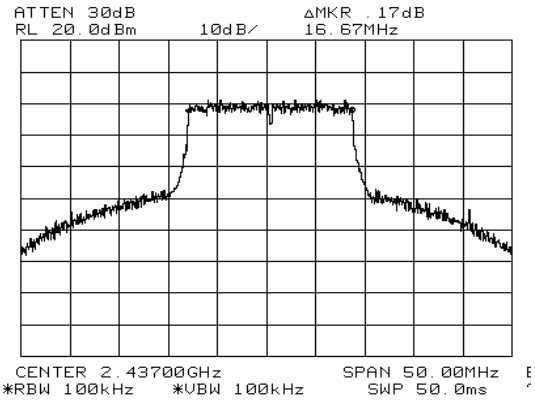
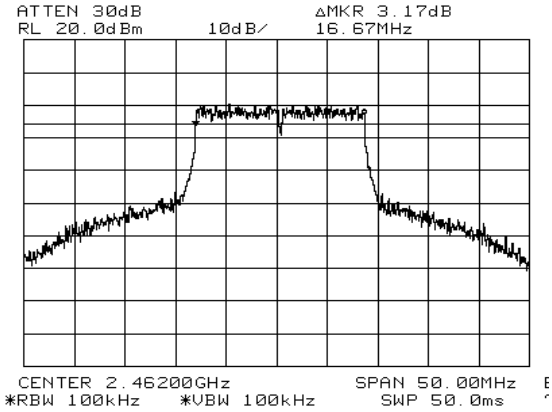
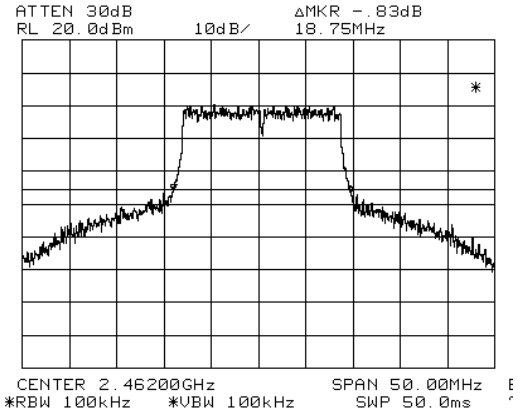


Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

6-dB



26-dB



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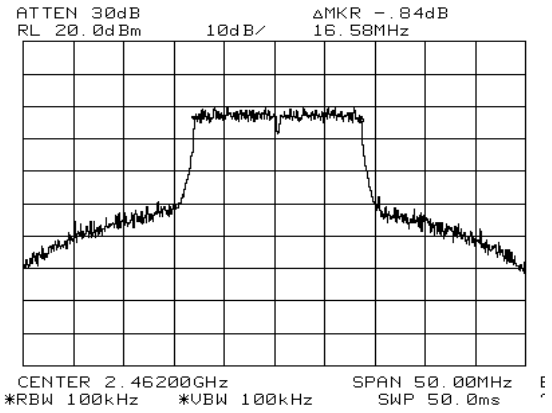


Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

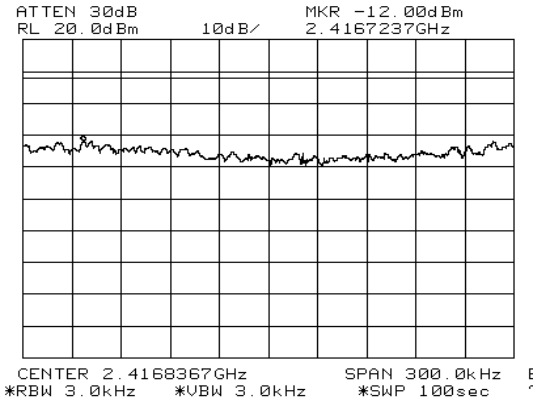
Run #3: Output Power

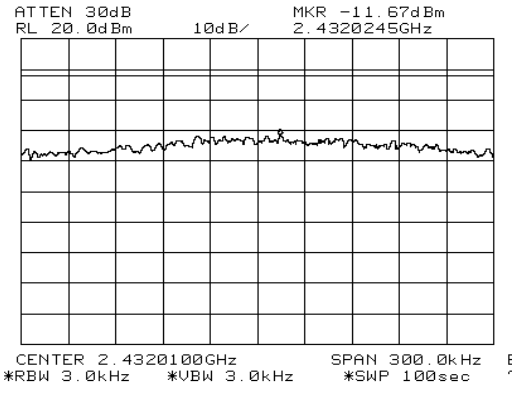
Channel	Frequency (MHz)	Output Power	Graph reference #
Low	2412	19.4	none
	2417	19.8	none
Mid	2437	19.8	none
	2457	19.7	none
High	2462	19.5	none

Note 1:	Measured using peak power meter
Note 2:	Meaximun ERP is 19.8+1.45 = 21.25 dBm.

Run #3: Power Spectral Density

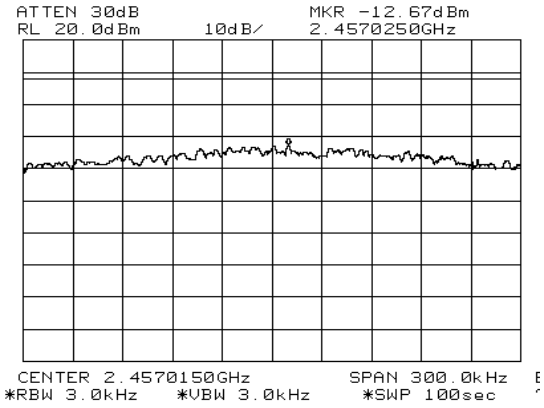
Channel	Frequency (MHz)	Res BW	P.S.D. dBm (averaged over 1 second in a 3kHz bandwidth)	Graph reference #
Low	2412	3 kHz	-12.1 dBm	See below
Mid	2437	3 kHz	-11.7 dBm	See below
High	2462	3 kHz	-12.1 dBm	See below





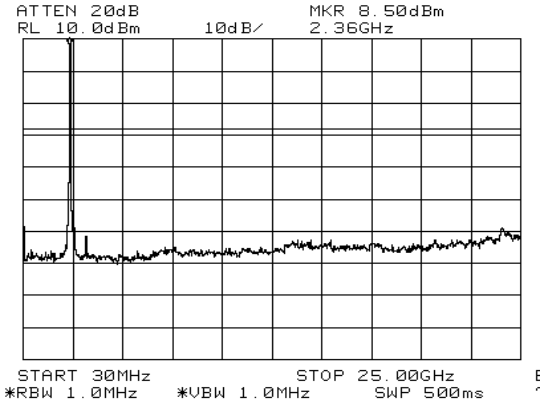
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #3: Power Spectral Density Cont'

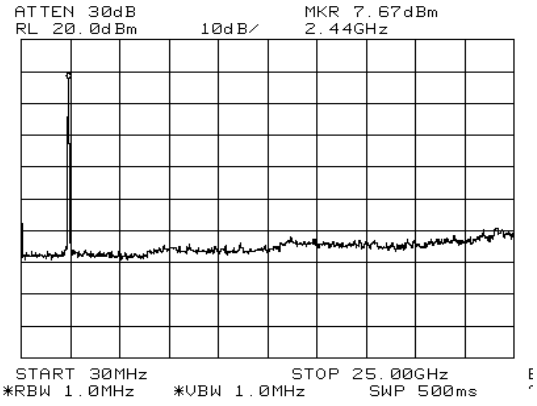


Run #5: Out of Band

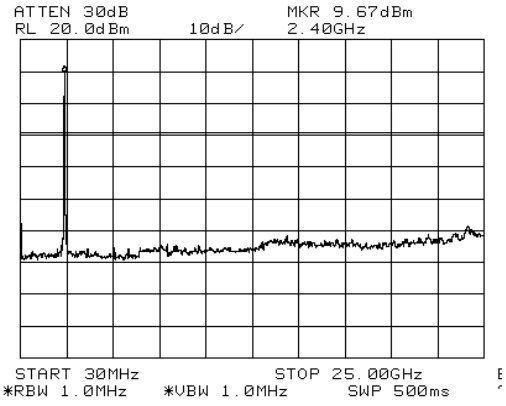
Low



Middle



High Channel



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Conducted & Radiated Emissions

Test Specifics

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: 12/17/2002
Test Engineer: Chris Byleckie
Test Location: Chamber #2
Config. Used: 1
Config Change:
EUT Voltage: 120V/60Hz

General Test Configuration

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 and cables used.

Ambient Conditions:

Temperature: 24°C
Rel. Humidity: 80%

Summary of Results

Run #	Test Performed	Limit	Result	Comments
1	Output Power	15.407(a) (1), (2)	Pass	21.8 dBm
2	Power Spectral Density (PSD)	15.407(a) (1), (2)	Pass	-0.2 dBm/MHz
3	26 dB Bandwidth	15.407	Pass	> 20 MHz
3	20 dB Bandwidth	RSS 210	Pass	> 20 MHz
4	Peak Excursion Envelope	15.407(a) (6)	Pass	Peak to average excursion < 13dB
5	Antenna Conducted - Out of Band Spurious	15.407(b)	Pass	All emissions below the -27dBm/MHz limit
6	Radiated - Out of Band Spurious	15.407(b)	Pass	All emissions below the 15.209 limit

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

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.

Run #1a: Output Power Data Rate 54Mb/s

The minimum VBW required for power measurements using a spectrum analyzer is 1/T, where T is the pulse transmission rate.

Pulse Transmission Rate: 4.0 uS
Minimum VBW: 250 kHz
VBW Used: 300 kHz

Antenna Gain: 5.6 dBi

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm) (note 3)	Comments
36	5180	15.0	17.0	Note 2, 4
52	5260	21.5	24.0	Note 2 (15.8 dBm avg)
64	5320	21.8	24.0	Note 2

Note 1:	Measured using spectrum analyzer's power measurement function (RBW = 1MHz, VBW =300kHz)
Note 2:	Measured using a Rohde & Schwartz Power Meter with a peak power sensor
Note 3:	RSS 210 limit is 23dBm in the 5.15 to 5.25 GHz band, 6dB higher than the FCC limit. This limit is based on the emission bandwidth and operating frequency.
Note 4:	Used a 3dB pad. Clients software did not have enough control to set the Pout for both data rates

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #1b: Output Power Data Rate 6Mb/s

The minimum VBW required for power measurements using a spectrum analyzer is 1/T, where T is the pulse transmission rate.

Pulse Transmission Rate: 4.0 uS
Minimum VBW: 250 kHz
VBW Used: 300 kHz

Antenna Gain: 5.6 dBi

Channel	Frequency (MHz)	Output Power (dBm)	Limit (dBm) (note 3)	Comments
36	5180	15.9	17.0	Note 2,4
52	5260	21.9	24.0	Note 2
64	5320	22.0	24.0	Note 2

Note 1:	Measured using spectrum analyzer's power measurement function (RBW = 1MHz, VBW =300kHz)
Note 2:	Measured using a Rhode & Schwarz Power Meter with a peak power sensor
Note 3:	RSS 210 limit is 23dBm in the 5.15 to 5.25 GHz band, 6dB higher than the FCC limit. This limit is based on the emission bandwidth and operating frequency.
Note 4:	Used a 3dB pad. Clients software did not have enough control to set the Pout for both data rates

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #2: Bandwdith Power Spectral Density Data Rate 54Mb/s

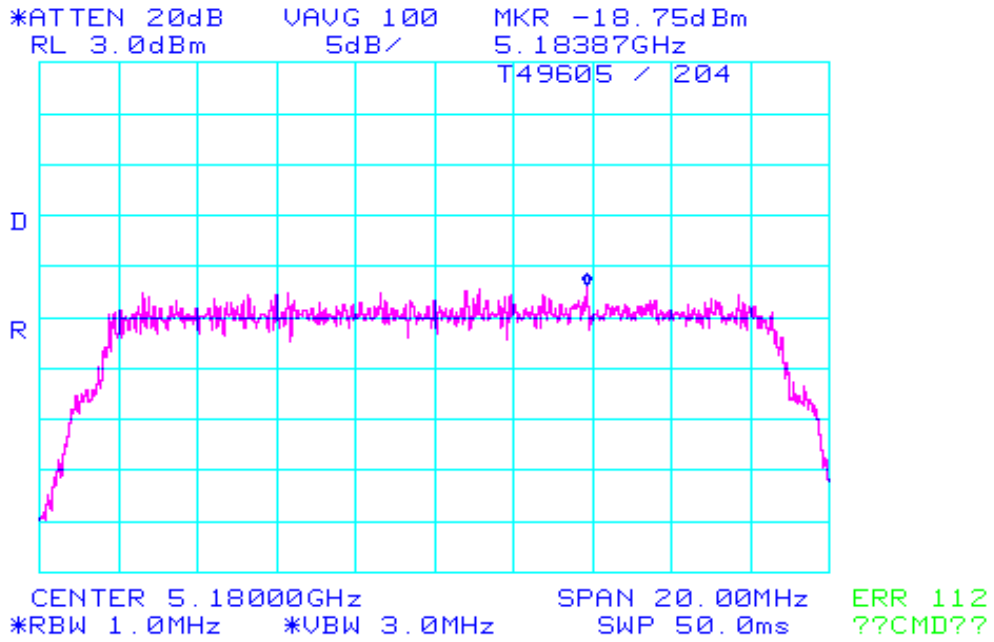
Antenna Gain: 5.6 dBi

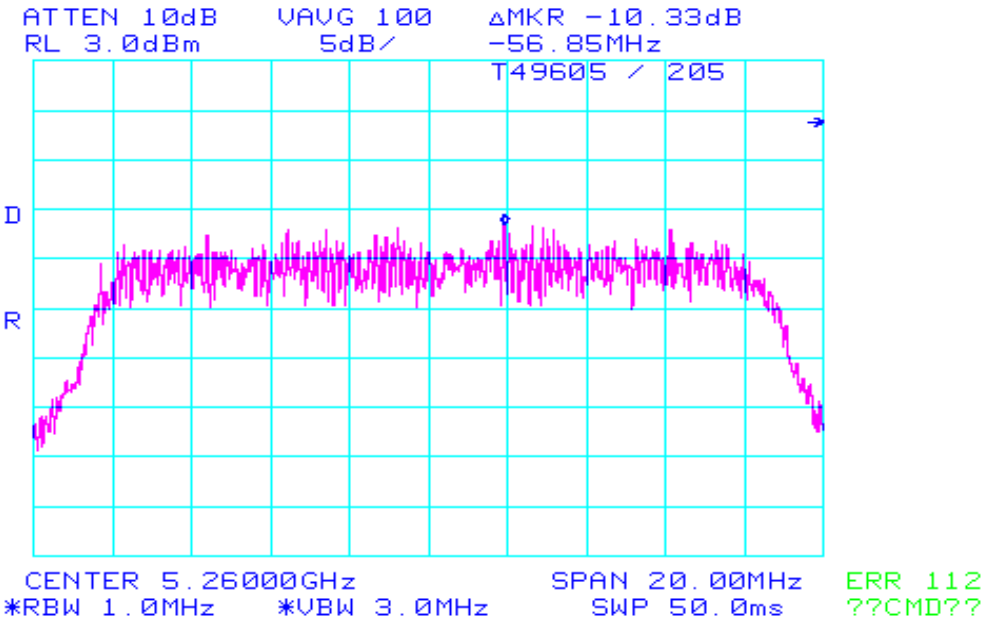
Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)				
		Peak PSD[2]		Peak PSD[2]		
		Measured	Limit	Calculated	RSS210 check	Graph Reference
36	5180	-18.8	4.0			T49605/204
52	5260	-10.3	11.0			T49605/205
64	5320	-10.4	11.0			T49605/206

Note 1:	RBW = Resolution bandwidth used on the spectrum analyzer to measure the signal bandwidth. This is at least 1% of the 26dB emission bandwidth
Note 2:	Average PSD is calculated for RSS210 and is the equal to the output power divided by the emissions 99% power bandwidth. The Peak PSD was measured using RBW = 1MHz, VBW >=3MHz, video averaging ON as the EUT was continuously transmitting. There was no need to time gate the analyzer or use other techniques as the EUT was continuously transmitting.

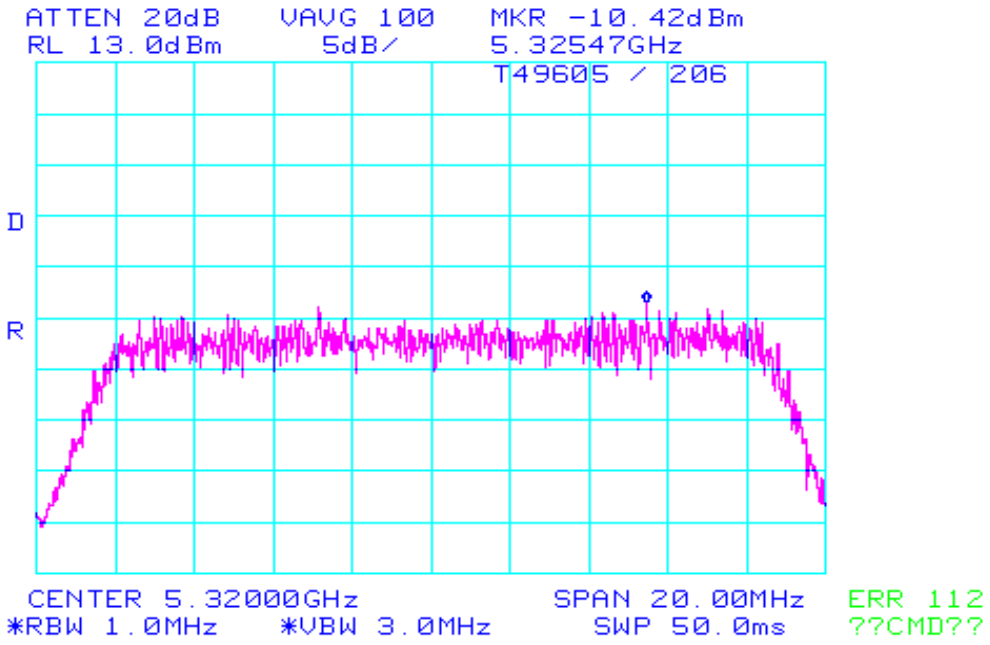
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Plots Showing Power Spectral Density (RBW = 1MHz, VBW = 3 MHz, video averaging ON)





Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



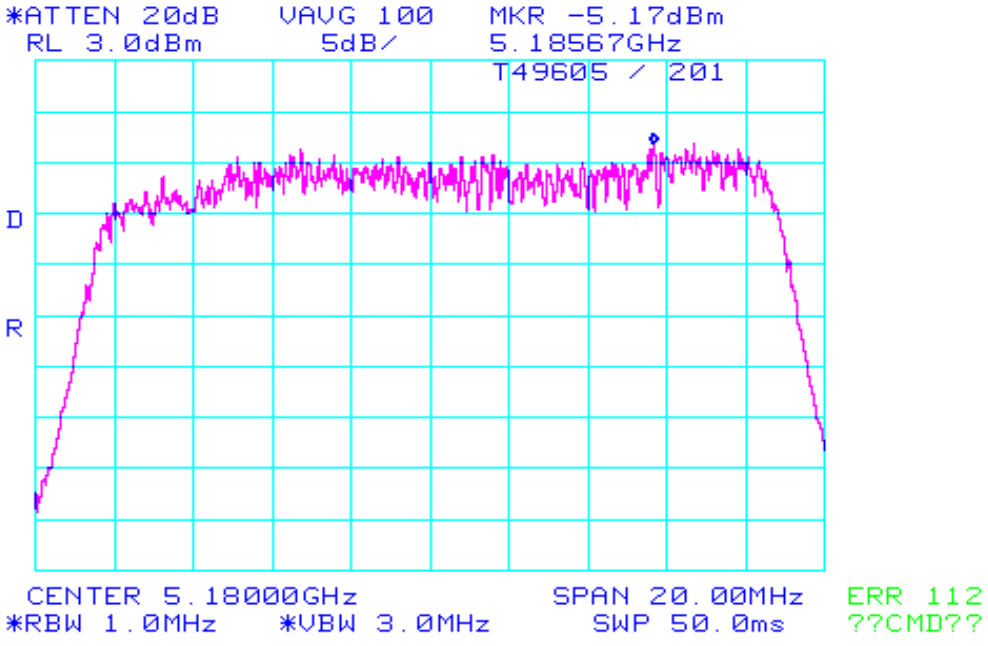
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #2: Bandwdith Power Spectral Density Data Rate 6Mb/s

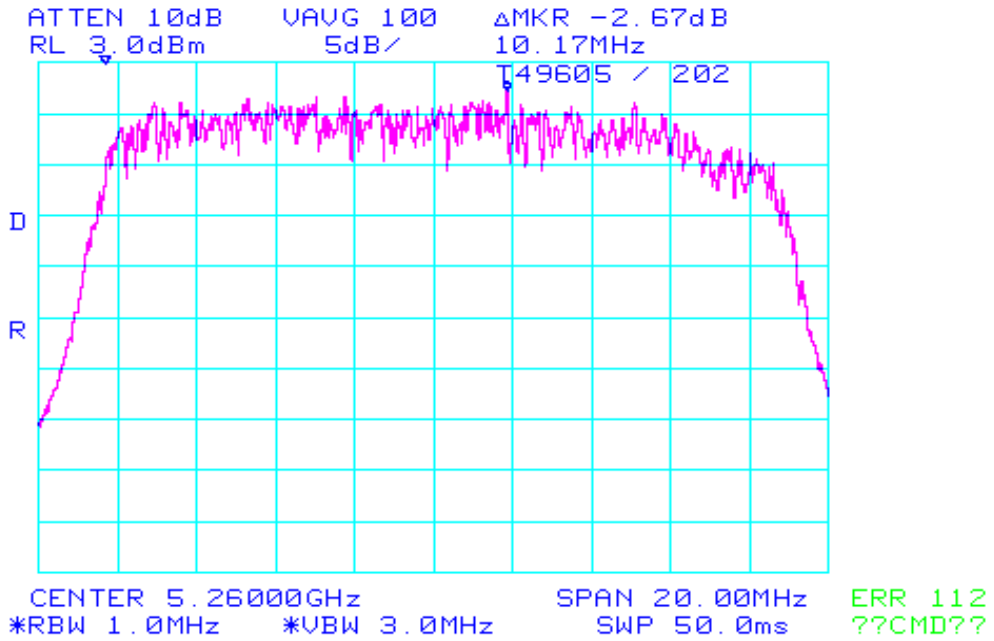
Antenna Gain: 5.6 dBi

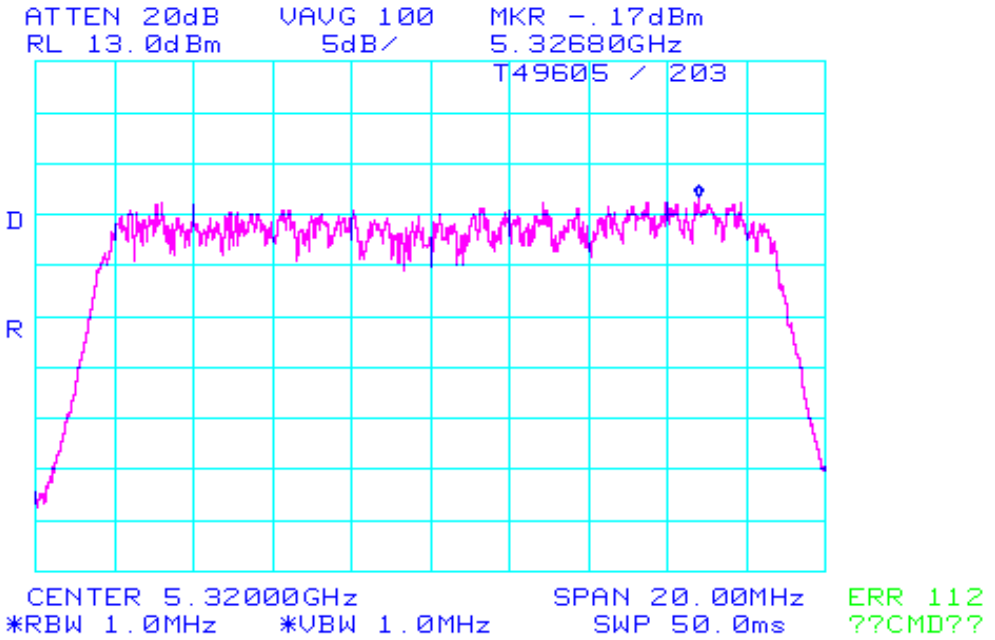
Channel	Frequency (MHz)	Power Spectral Density (dBm/MHz)				
		Peak PSD[2]		Peak PSD[2]		
		Measured	Limit	Calculated	RSS210 check	Graph Reference
36	5180	-5.2	4.0			T49605/201
52	5260	-2.7	11.0			T49605/202
64	5320	-0.2	11.0			T49605/203

Note 1:	RBW = Resolution bandwidth used on the spectrum analyzer to measure the signal bandwidth. This is at least 1% of the 26dB emission bandwidth
Note 2:	Average PSD is calculated for RSS210 and is the equal to the output power divided by the emissions 99% power bandwidth. The Peak PSD was measured using RBW = 1MHz, VBW >=3MHz, video averaging ON as the EUT was continuously transmitting. There was no need to time gate the analyzer or use other techniques as the EUT was continuously transmitting.



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



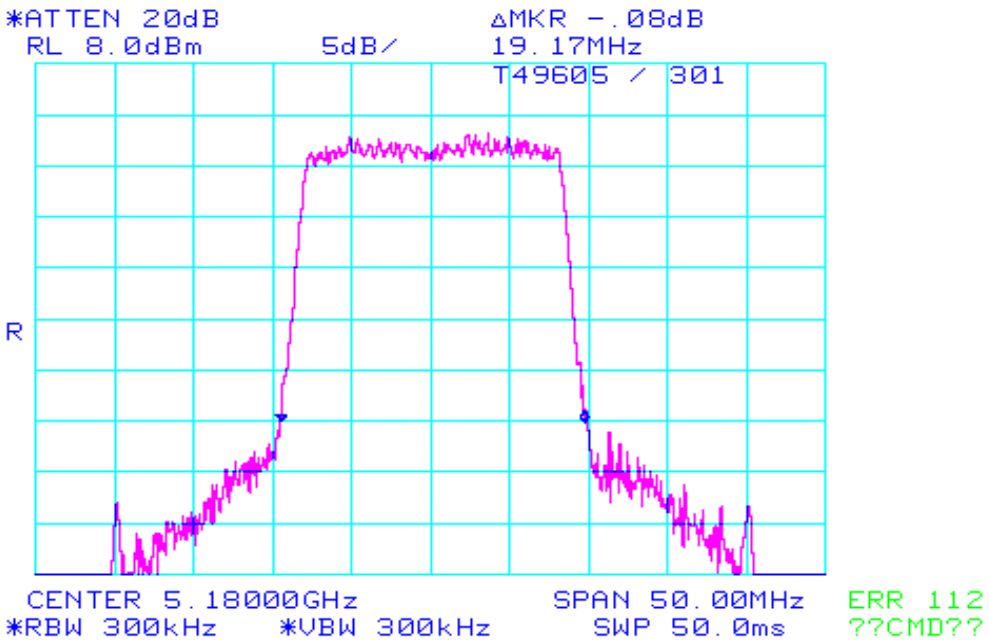


Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

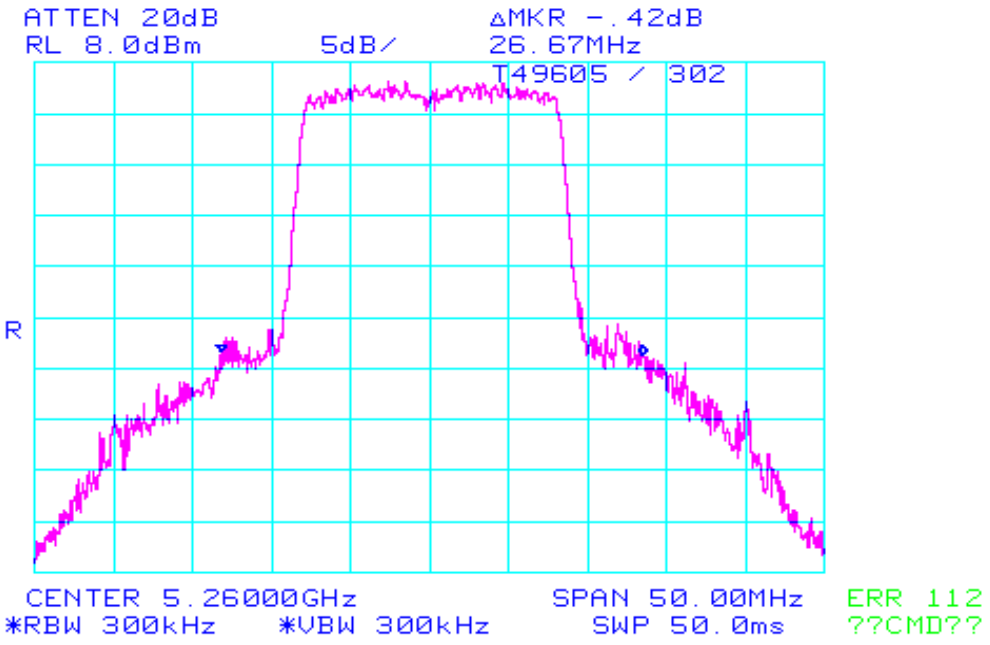
Run #3: Signal Bandwidth Data Rate 6MB

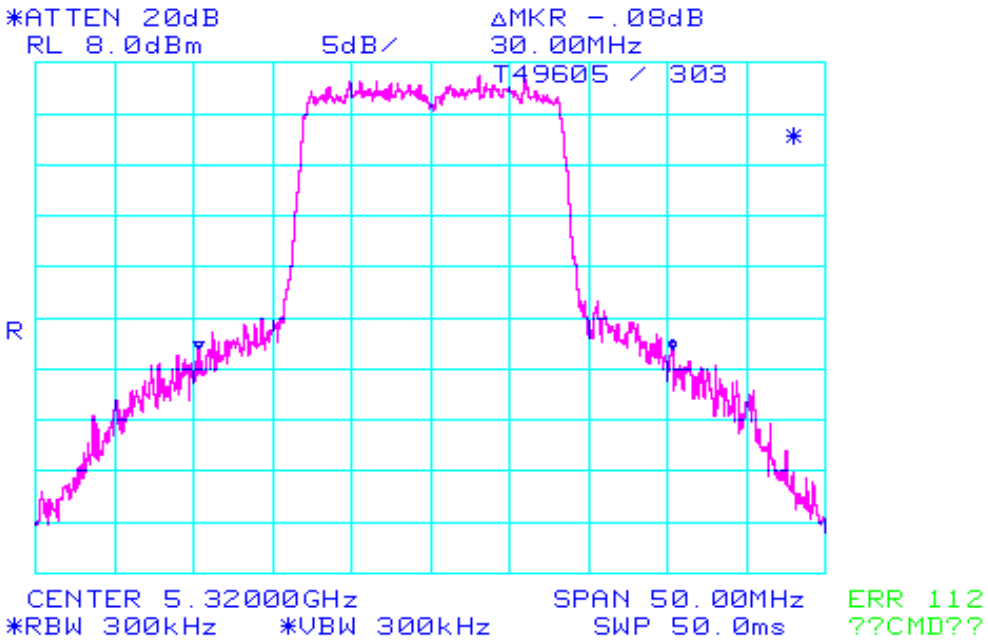
Channel	Frequency (MHz)	Resolution Bandwidth	26 dB Signal Bandwidth (MHz)	20 dB Signal Bandwidth (MHz)	Graph reference #
36	5180	300 kHz	19.2	18.2	T49605/301
52	5260	300 kHz	26.7	18.3	T49605/302
64	5320	300 kHz	30	18.3	T49605/303

Plots Showing Signal Bandwidth



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

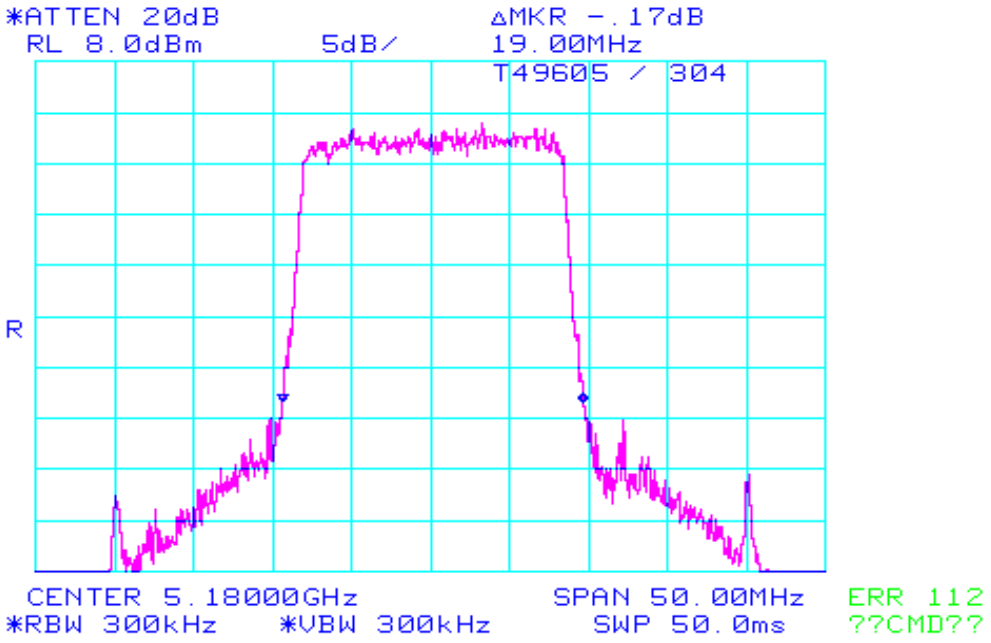




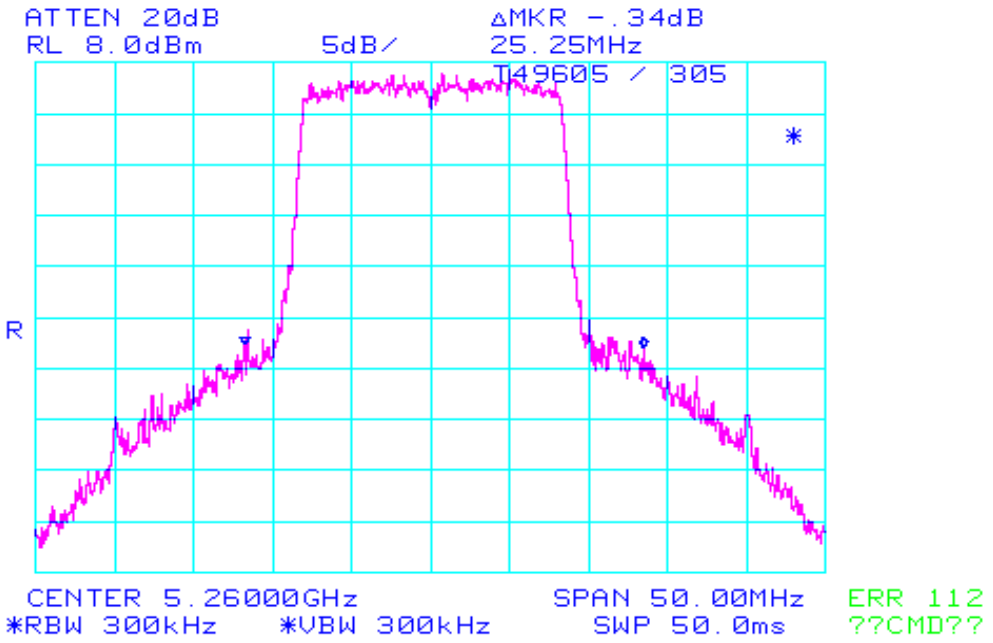
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

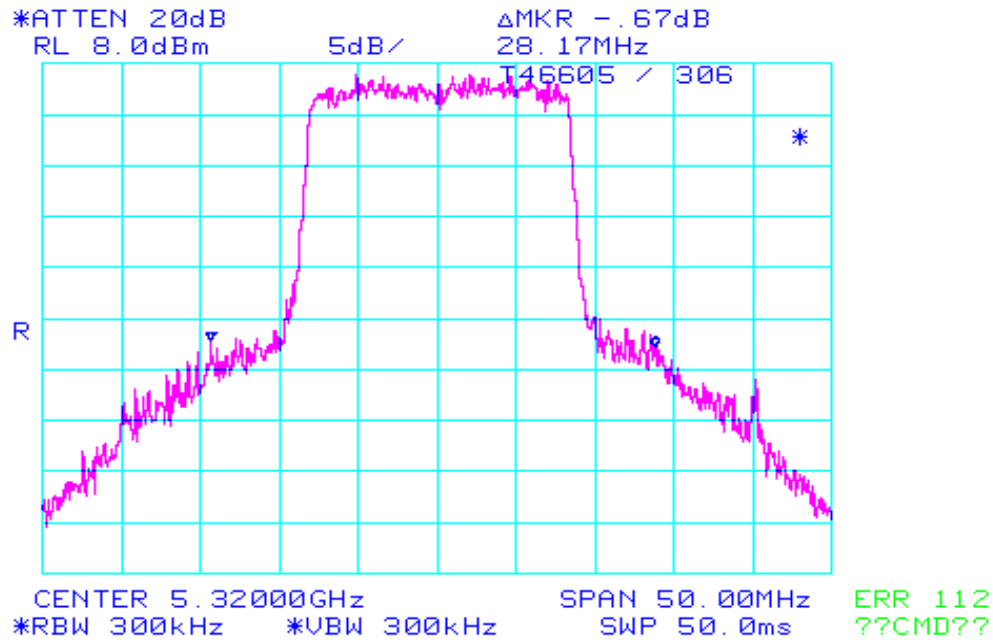
Run #3: Signal Bandwidth Data Rate 54MB

Channel	Frequency (MHz)	Resolution Bandwidth	26 dB Signal Bandwidth (MHz)	20 dB Signal Bandwidth (MHz)	Graph reference #
36	5180	300 kHz	19.0	18	T49605/304
52	5260	300 kHz	25.3	18.4	T49605/305
64	5320	300 kHz	28.2	18	T49605/306



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A





Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

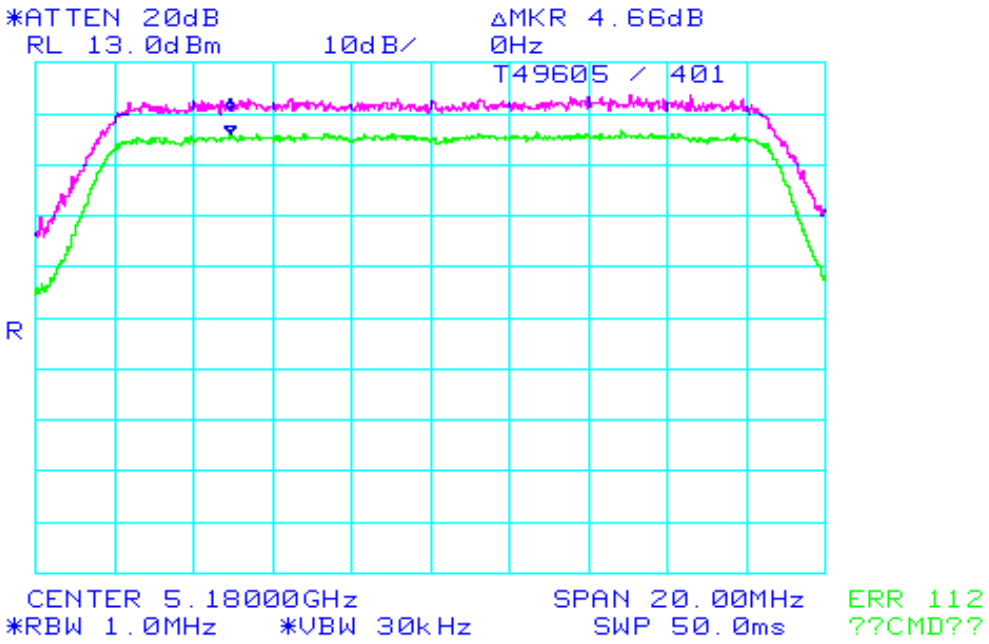
Run #4: Peak Excursion Measurement Data Rate 54 MBp/s

Plots Showing Peak Excursion

Trace A: RBW = VBW = 1MHz

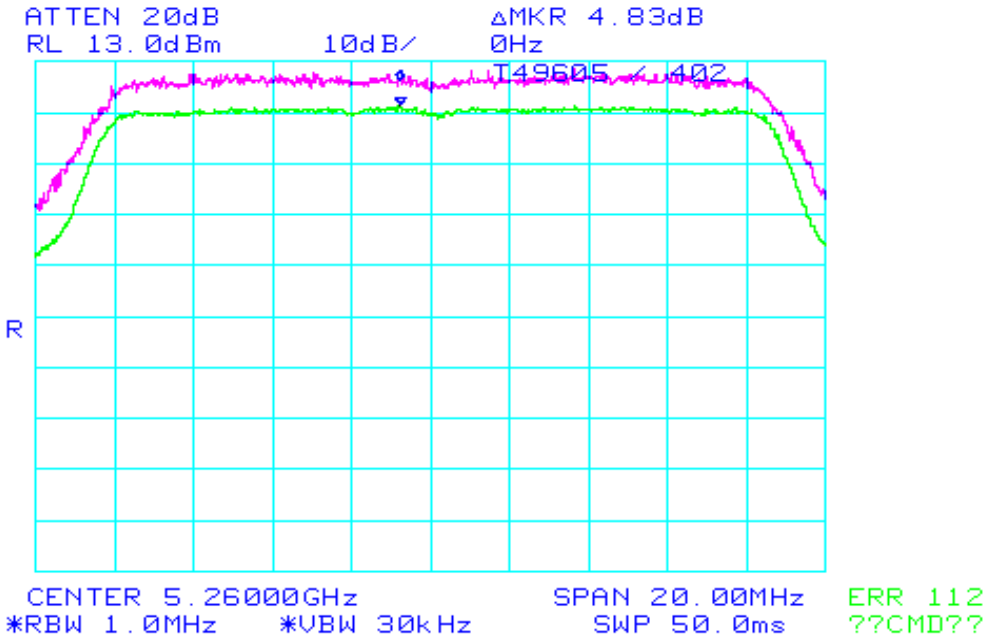
Trace B: RBW = 1 MHz, VBW = 30kHz

Peak Excursion = 4.66 dB.

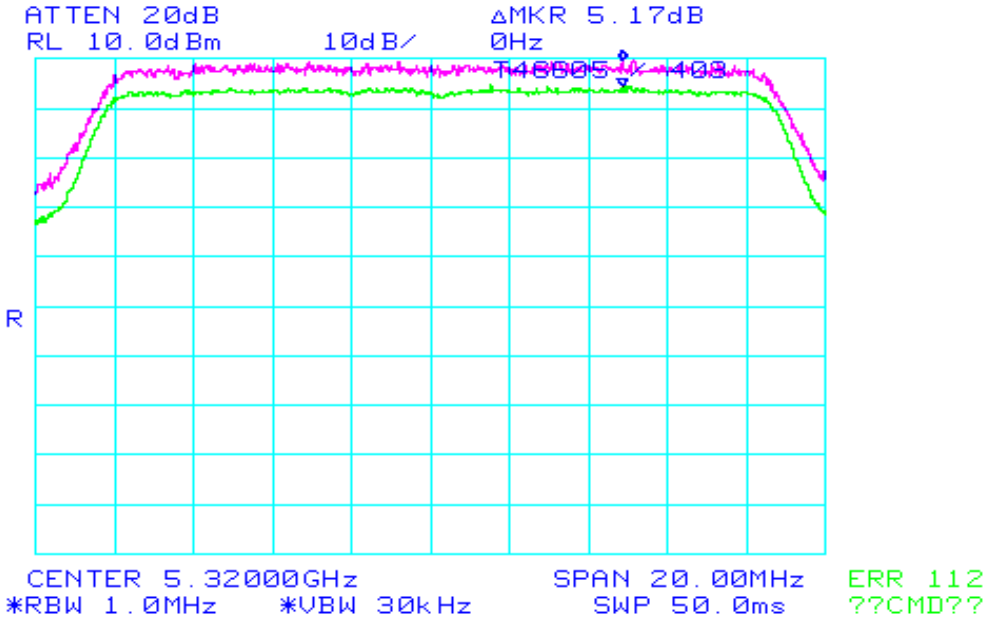


Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Peak Excursion = 5.34 dB.



Peak Excursion = 5.17 dB.



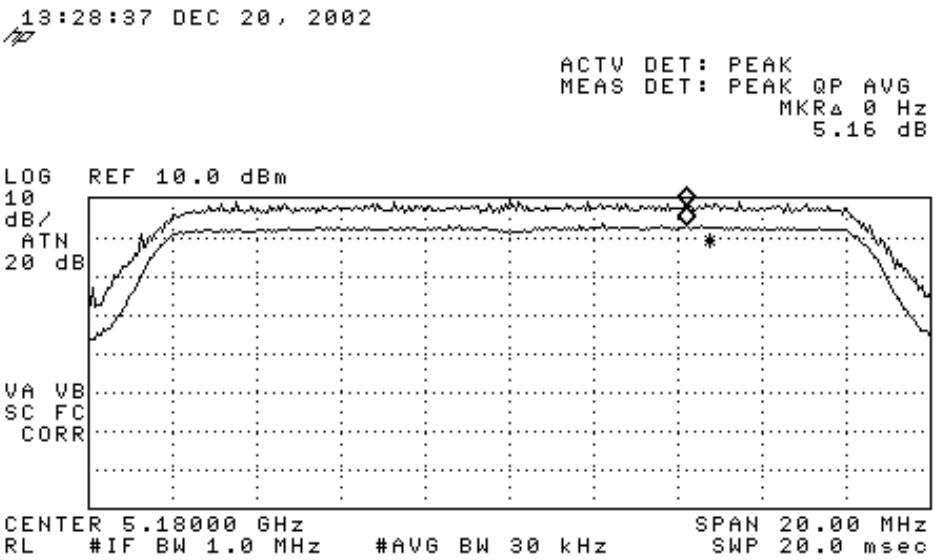
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

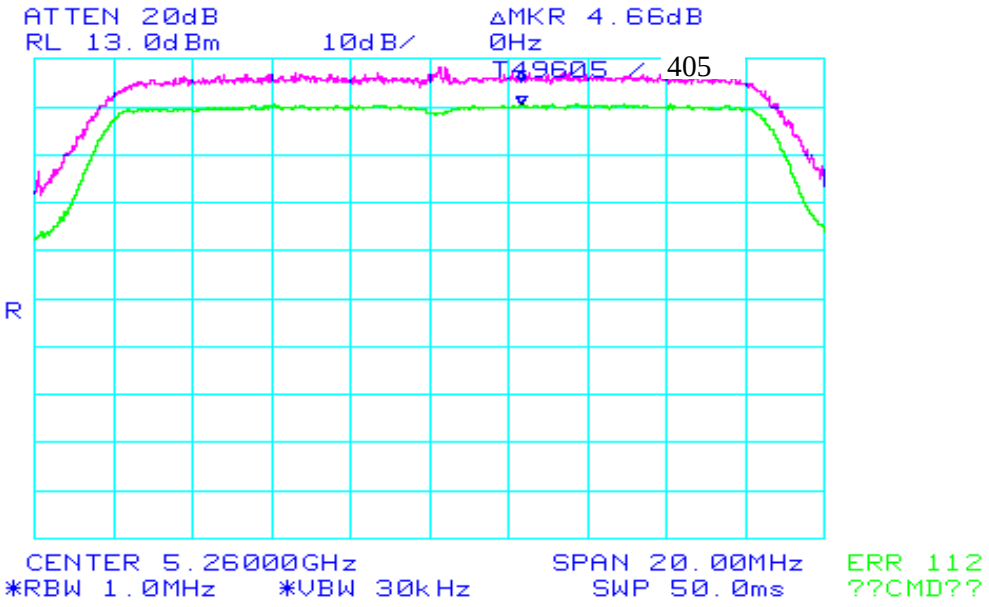
Run #4: Peak Excursion Measurement Data Rate 6 MBp/s

Plots Showing Peak Excursion

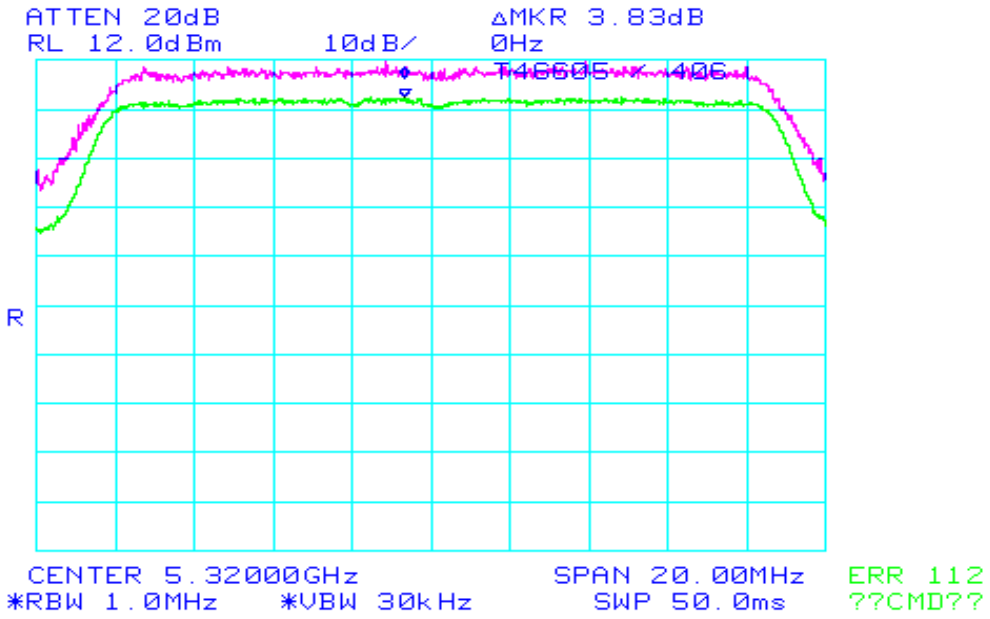
Trace A: RBW = VBW = 1MHz

Trace B: RBW = 1 MHz, VBW = 30kHz





Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #5a: Out Of Band Spurious Emissions - Antenna Conducted Data Rate 54Mb/s

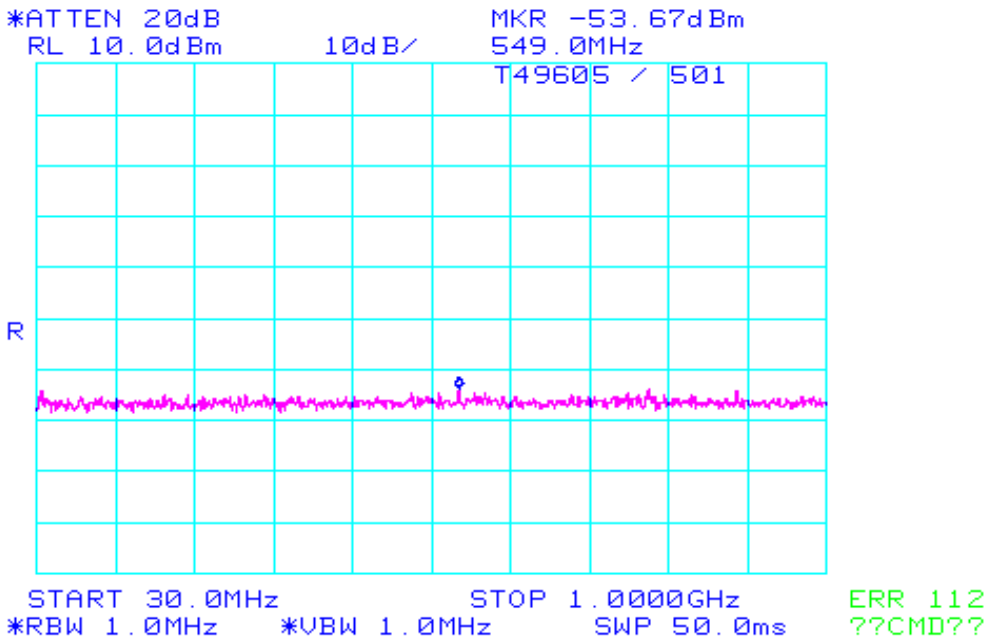
The antenna gain of the radios integral antenna is 5.6 dBi. The EIRP limit is -27dBm/MHz for all out of band signals that do not fall in restricted bands. A limit of -32.6 dBm was, therefore, used for signals not in restricted bands and close to the intentional band with the assumption that the antenna gain was equal to 5.6 within 100 MHz of the upper and lower band edges. For signals removed from the band edge by more than 100MHz, radiated measurements were made (refer to run #6) if the signal amplitude exceeded -37dBm.

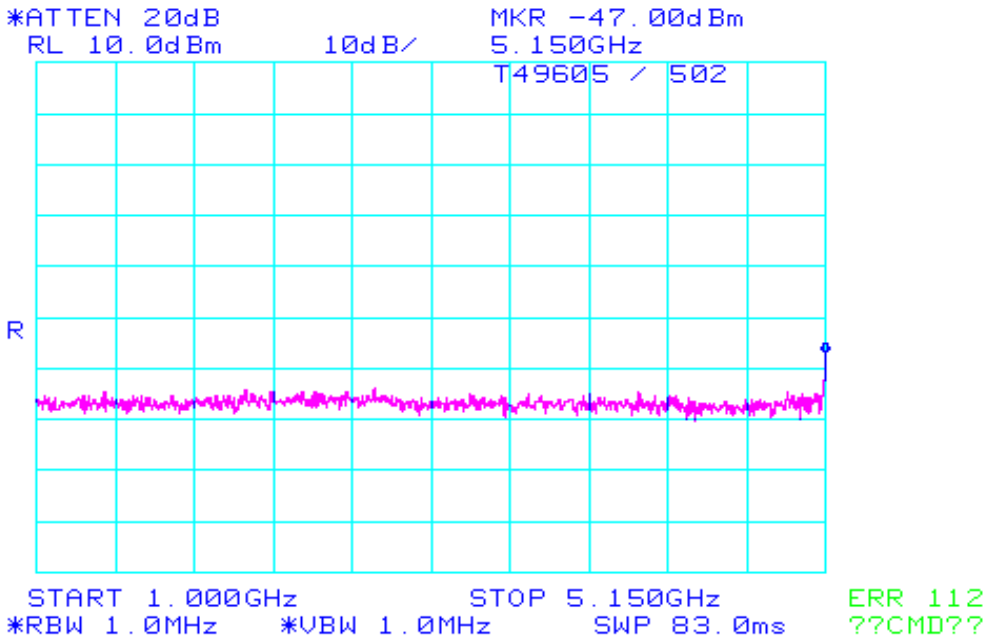
Channel	Frequency (MHz)	Frequency Range	Highest Spurious Signal	Graph reference #
36	5180	30 - 1000 MHz	Note 4	T49605/501
		1 to 5.15 GHz	-47 dBm @ 5150	T49605/502
		5.25 to 10 GHz	-34.3 dBm @ 6905	T49605/503
		10 GHz to 20 GHz	-40.8 dBm @ 10350	T49605/504
		20 GHz to 40 GHz	-42.2 dBm @ 36500	T49605/505
52	5260	30 - 1000 MHz	Note 4	T49605/506
		1 to 5.25 GHz	-53.8 dBm @ 3763	T49605/507
		5.35 to 10 GHz	-32.3 dB @ 7016	T49605/508
		10 GHz to 20 GHz	-49.7 dBm @ 13730	T49605/509
		20 GHz to 40 GHz	-43.2 dBm @ 37430	T49605/510
64	5320	30 - 1000 MHz	Note 4	T49605/511
		1 to 5.25 GHz	-51.7 dBm @ 5250	T49605/512
		5.35 to 10 GHz	-31.0 dBm @ 5350	T49605/513
		10 GHz to 20 GHz	-49.0 dBm @ 10630	T49605/514
		20 GHz to 40 GHz	-42.3 dBm @ 36900	T49605/515

Note 1:	Signal is in a restricted band. Refer to run #6 for field strength measurements.
Note 2:	Signal is not in restricted band. Limit is -27dBm eirp. As the signal strength is significantly lower than -27dBm no field strength measurements required.
Note 3:	Signal is not in restricted band. Limit is -27dBm eirp. Although the signal strength is significantly lower than -27dBm field strength measurements were made (refer to run #6)
Note 4:	All spurious signals in this frequency band measured during digital device radiated emissions test.

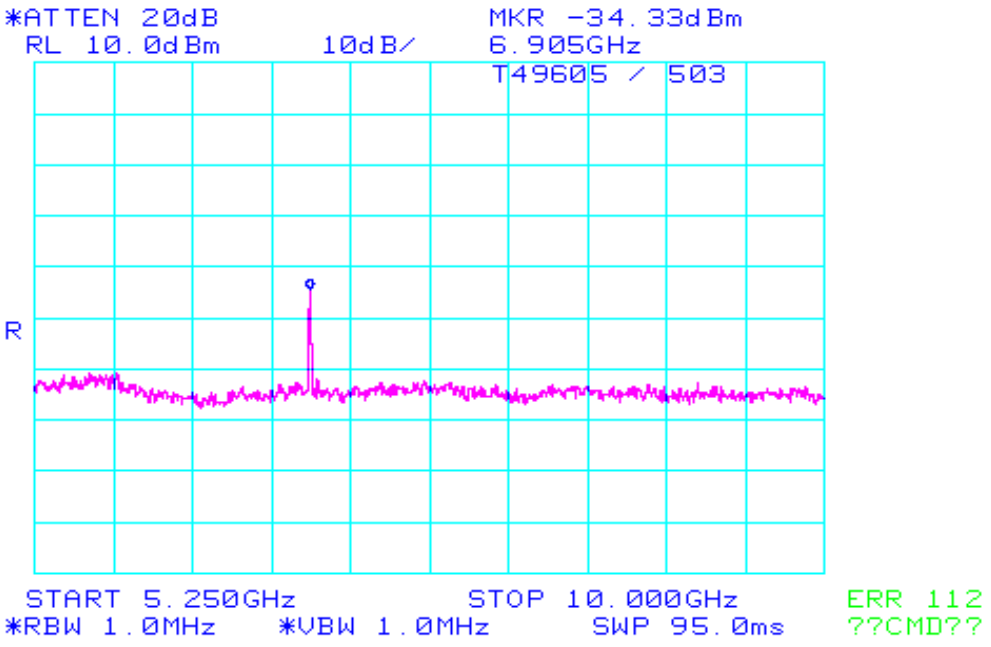
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

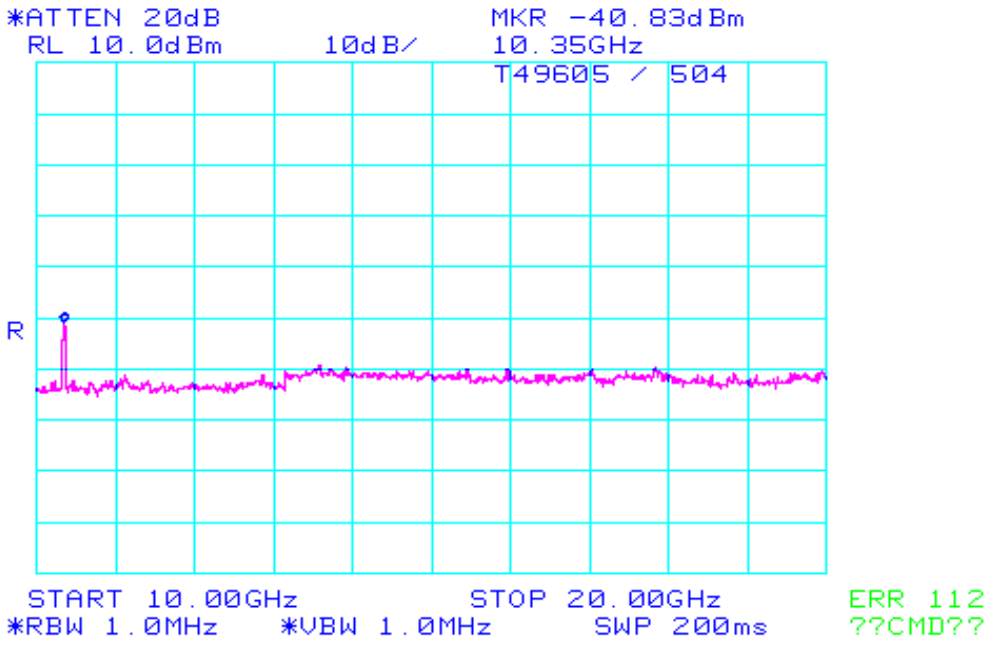
Plots Showing Out-Of-Band Emissions (RBW=VBW=1MHz) Data Rate 54



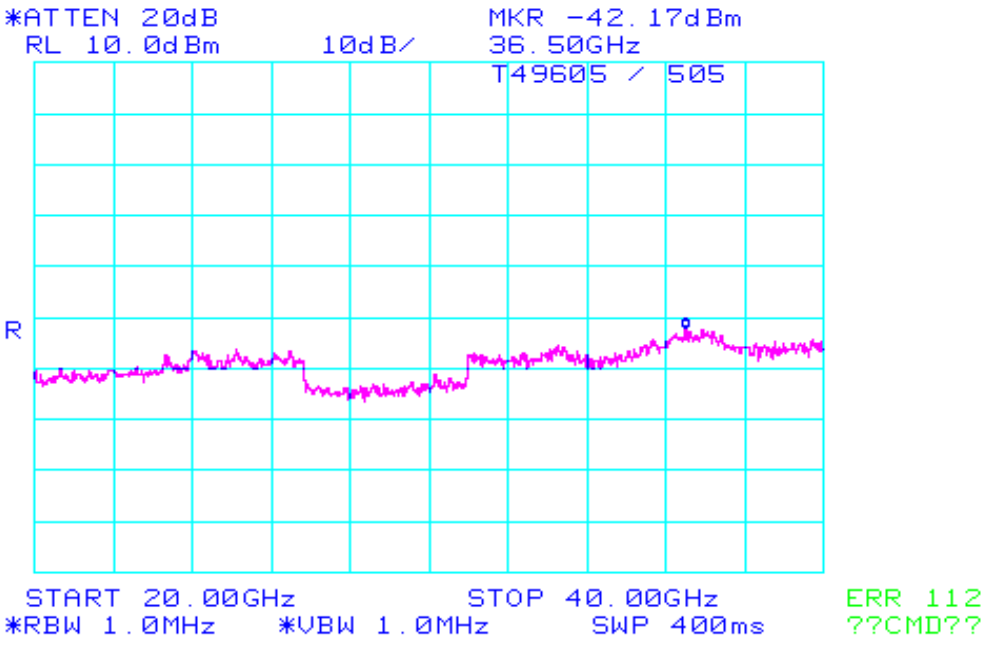


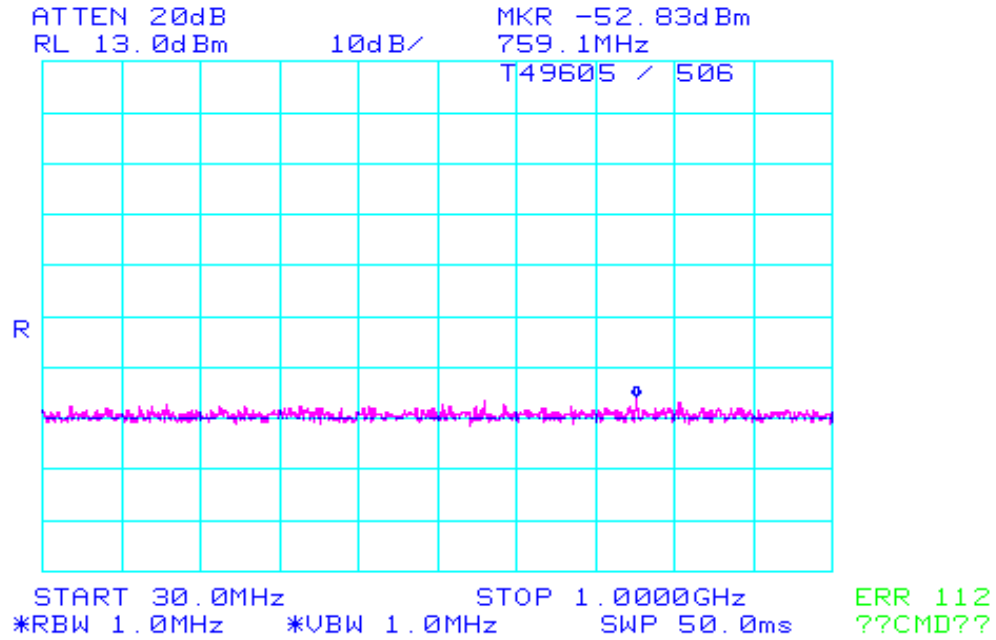
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



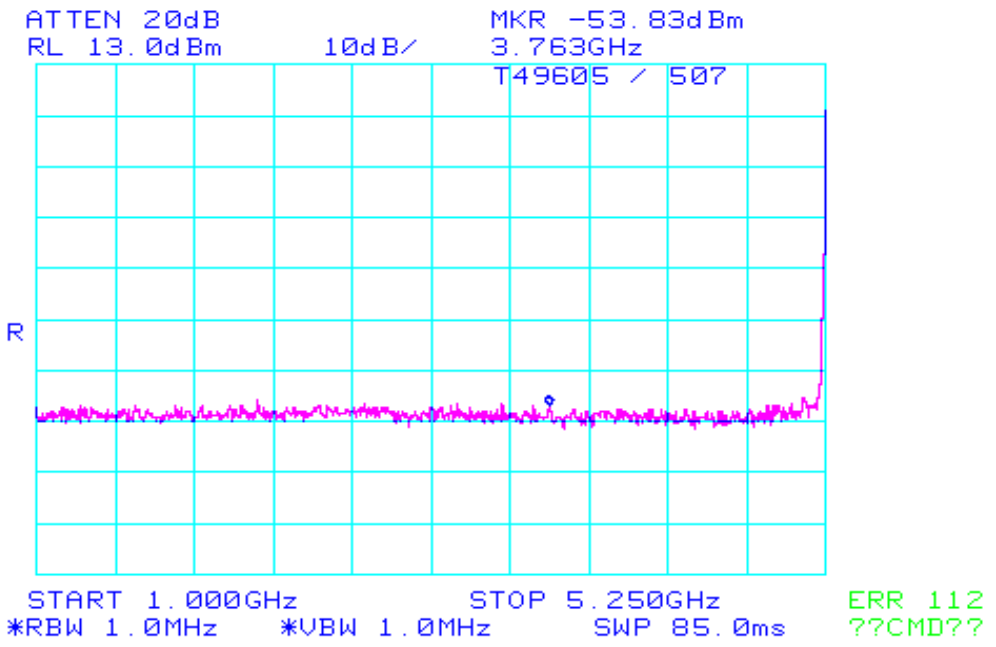


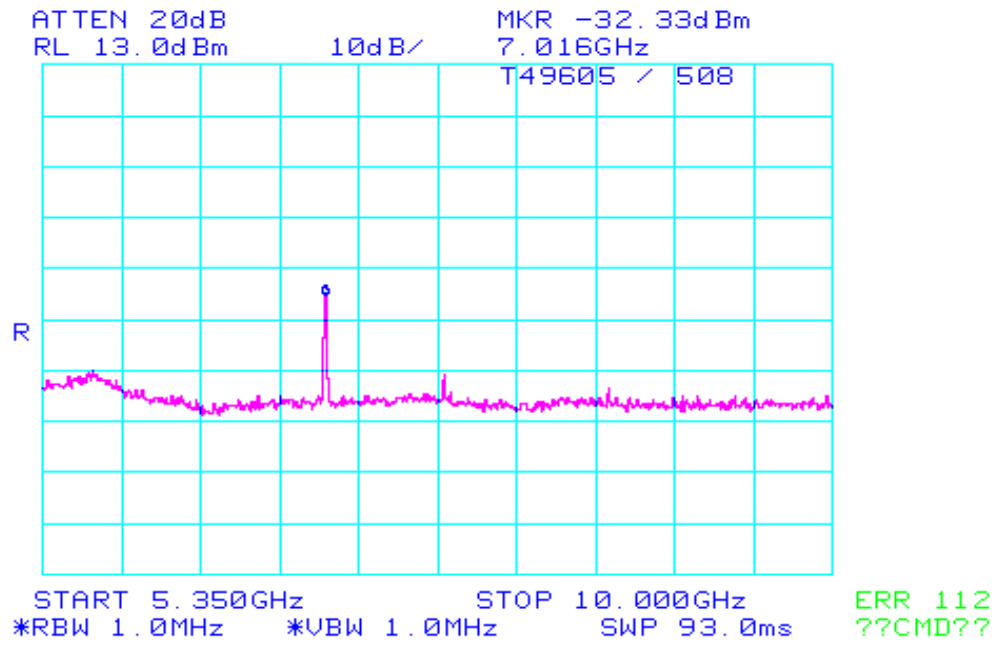
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



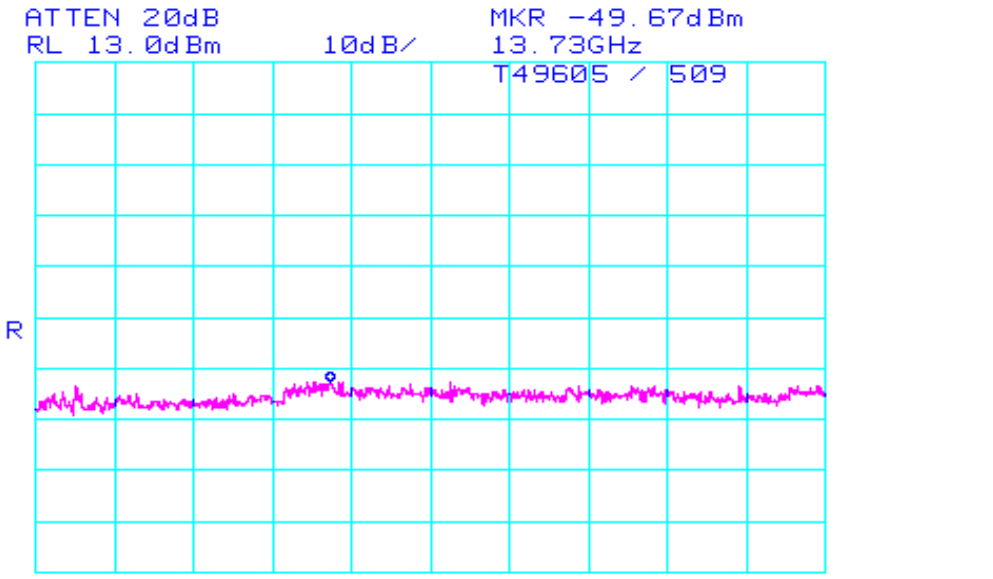


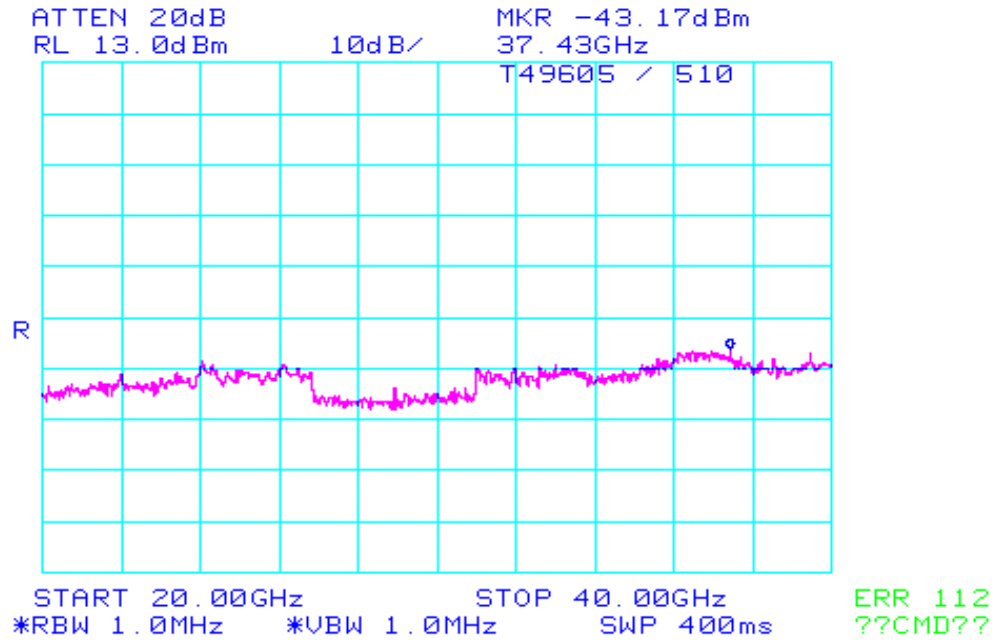
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



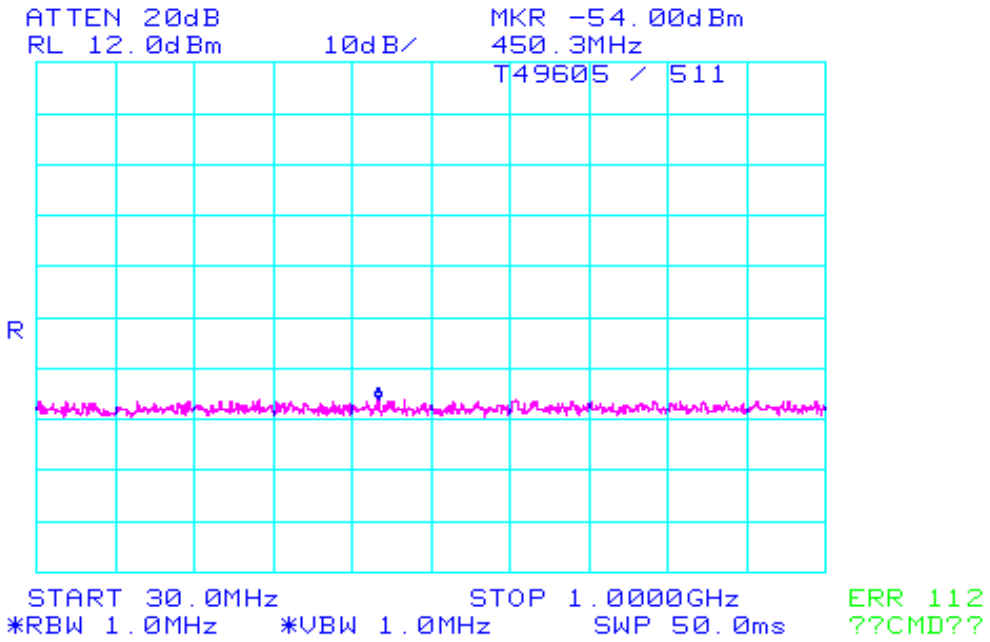


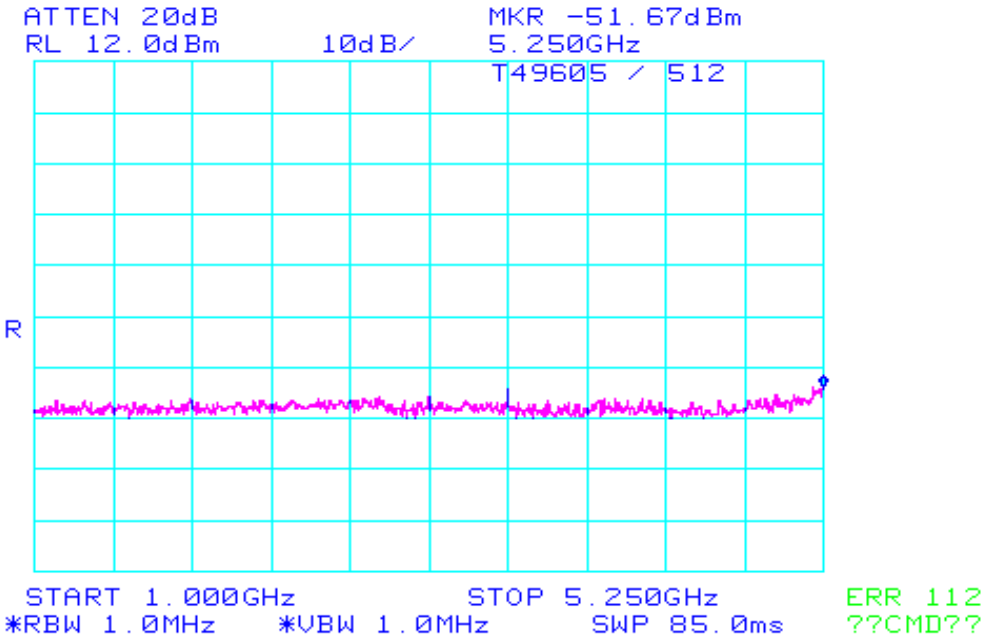
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



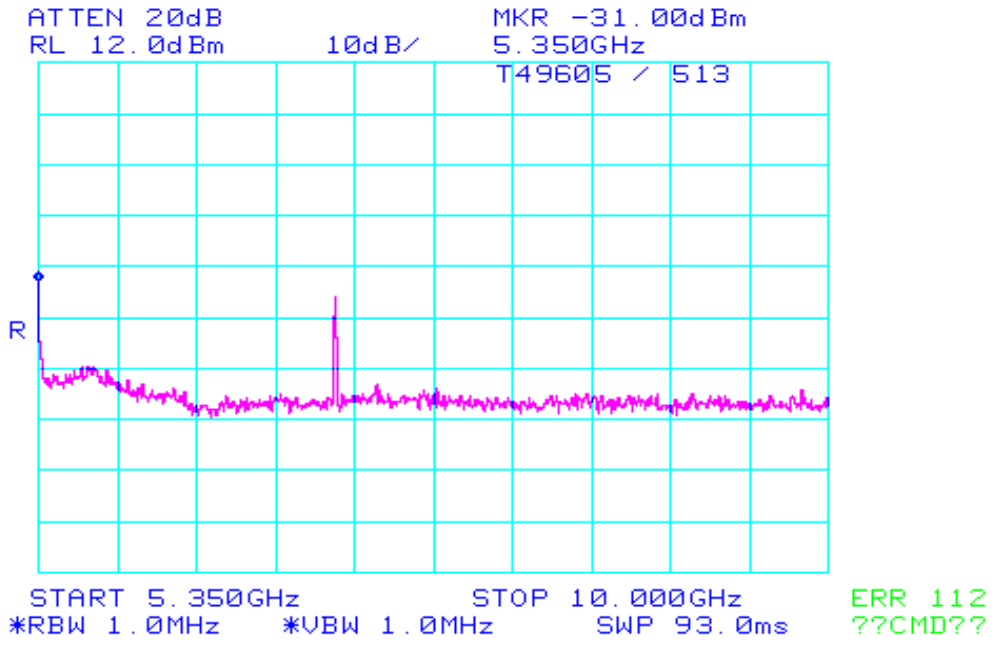


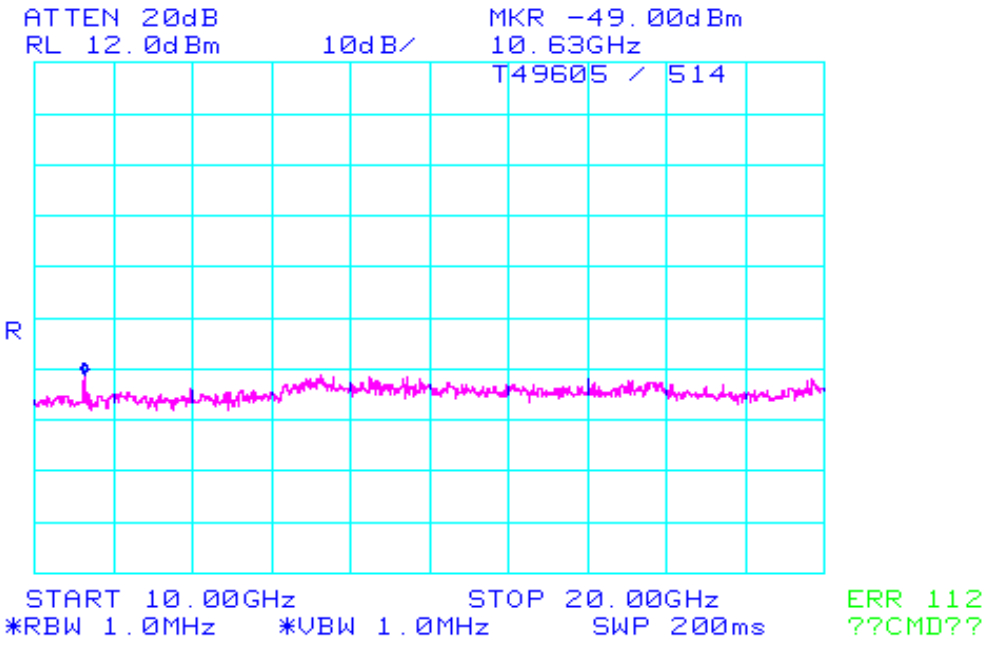
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



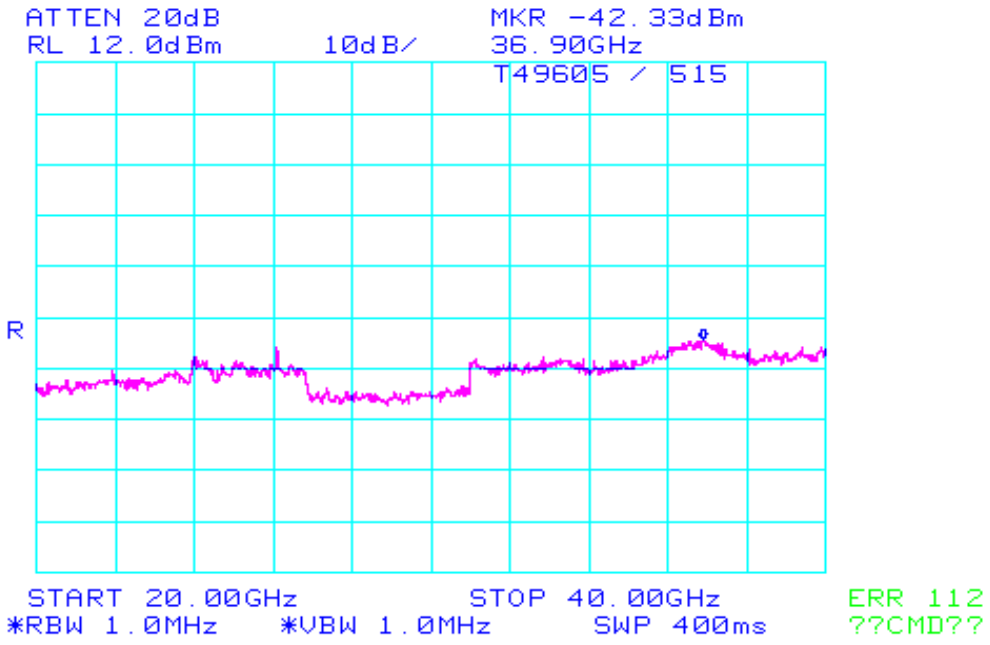


Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A





Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

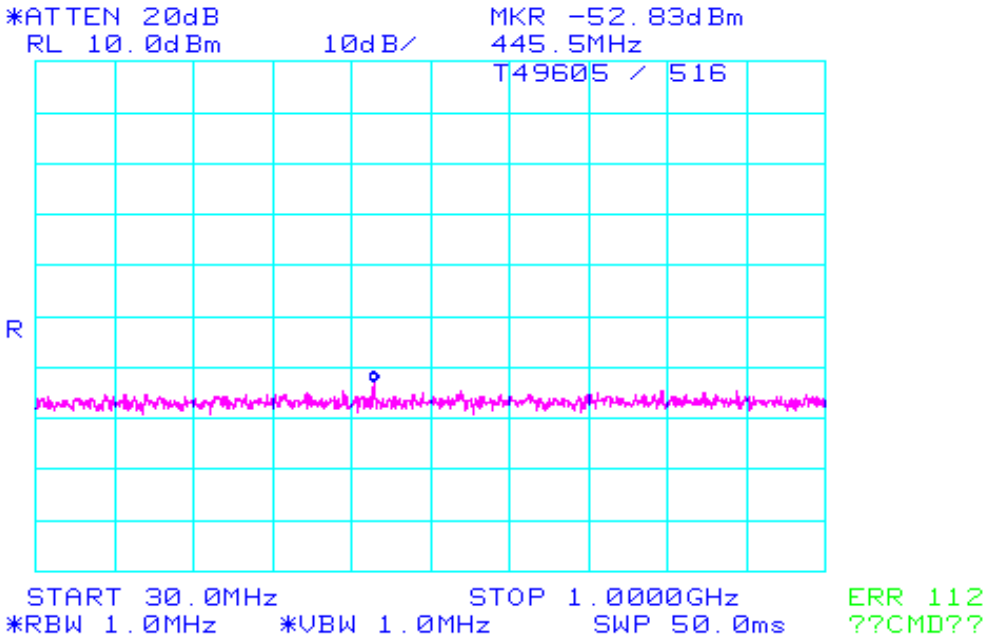
Run #5b: Out Of Band Spurious Emissions - Antenna Conducted Data Rate 6Mb/s

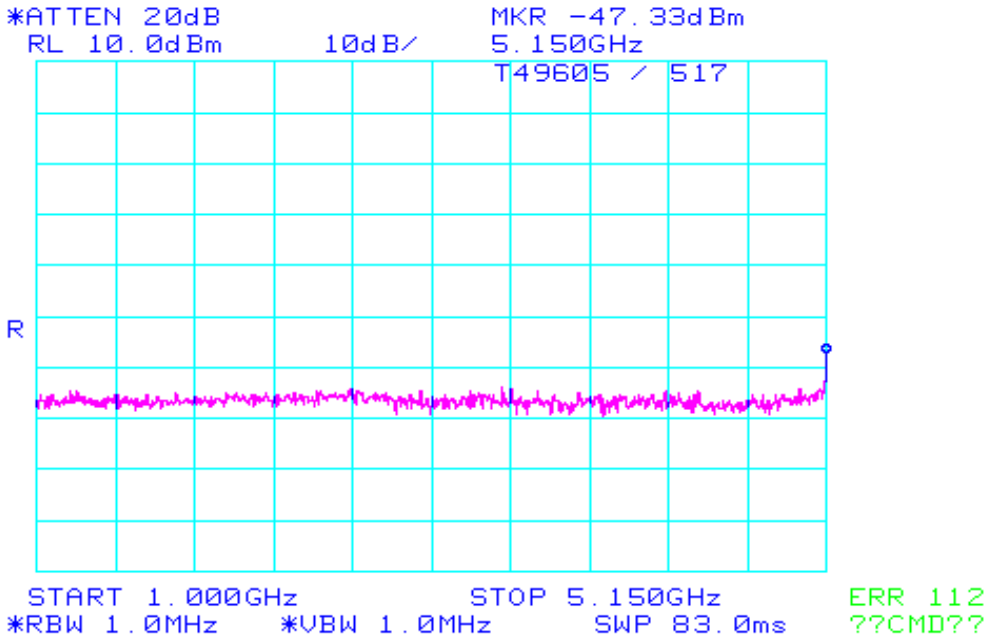
Channel	Frequency (MHz)	Frequency Range	Highest Spurious Signal	Graph reference #
36	5180	30 - 1000 MHz	Note 4	T49605/516
		1 to 5.15 GHz	-47.3 dBm @ 5150	T49605/517
		5.25 to 10 GHz	-35.3 dBm @ 6913	T49605/518
		10 GHz to 20 GHz	-46.7 dBm @ 10370	T49605/519
		20 GHz to 40 GHz	-41.8 dBm @ 36970	T49605/520
52	5260	30 - 1000 MHz	Note 4	T49605/521
		1 to 5.25 GHz	-52.2 dBm @ 3508	T49605/522
		5.35 to 10 GHz	-32.5 dBm @ 7016	T49605/523
		10 GHz to 20 GHz	-48.8 dBm @ 17830	T49605/524
		20 GHz to 40 GHz	-42.7 dBm @ 36930	T49605/525
64	5320	30 - 1000 MHz	Note 4	T49605/526
		1 to 5.25 GHz	-52.2 dBm @ 3550	T49605/527
		5.35 to 10 GHz	-32.0 dBm @ 5350	T49605/528
		10 GHz to 20 GHz	-45.8 dBm @ 10630	T49605/529
		20 GHz to 40 GHz	-41.8 dBm @ 36400	T49605/530

Note 1:	Signal is in a restricted band. Refer to run #6 for field strength measurements.
Note 2:	Signal is not in restricted band. Limit is -27dBm eirp. As the signal strength is significantly lower than -27dBm no field strength measurements required.
Note 3:	Signal is not in restricted band. Limit is -27dBm eirp. Although the signal strength is significantly lower than -27dBm field strength measurements were made (refer to run #6)
Note 4:	All spurious signals in this frequency band measured during digital device radiated emissions test.

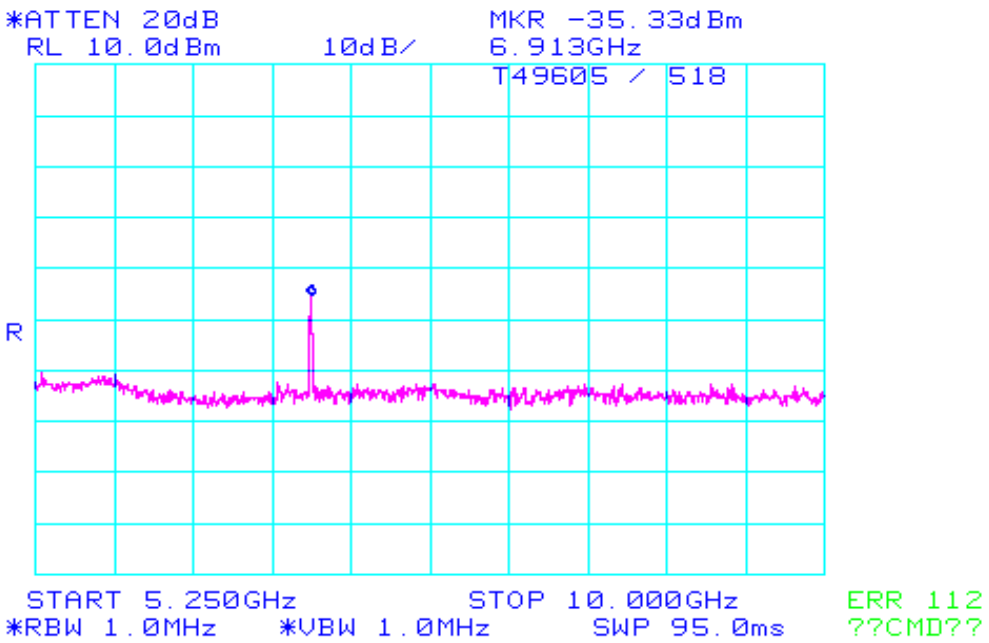
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

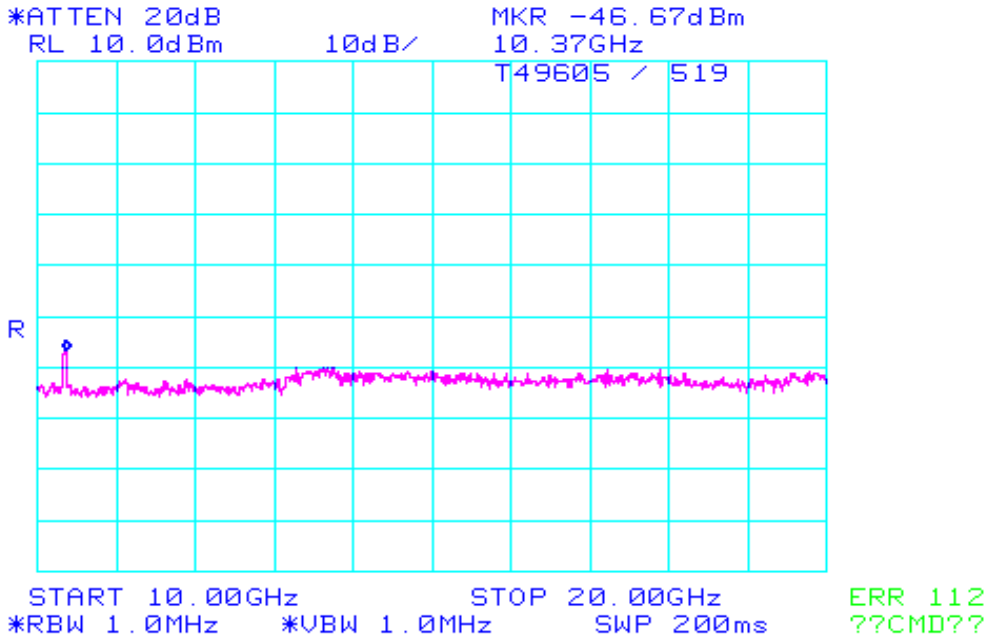
Plots Showing Out-Of-Band Emissions (RBW=VBW=1MHz) Data Rate 6



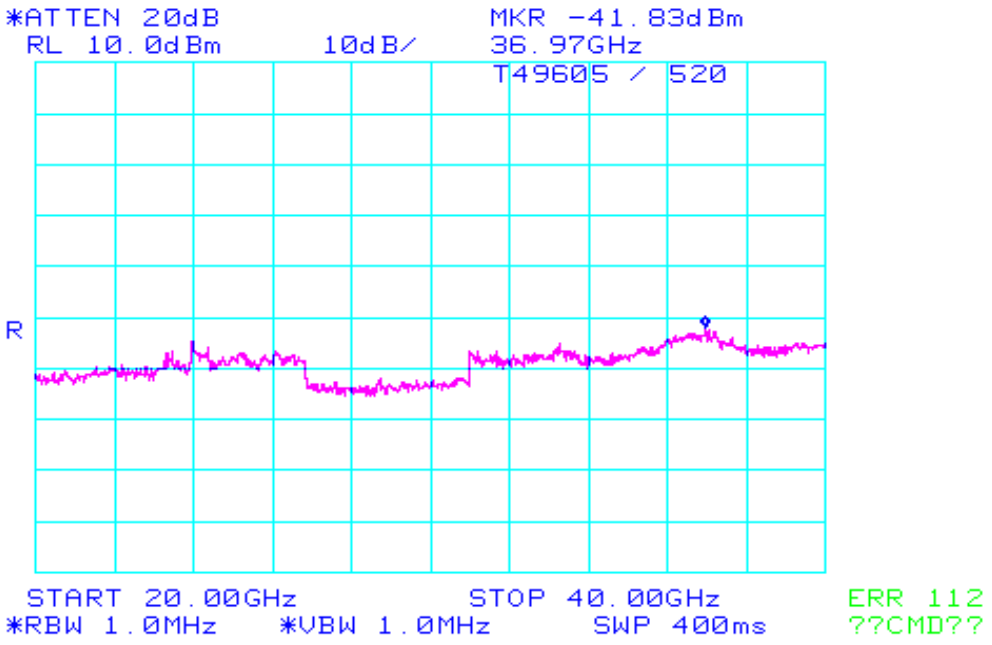


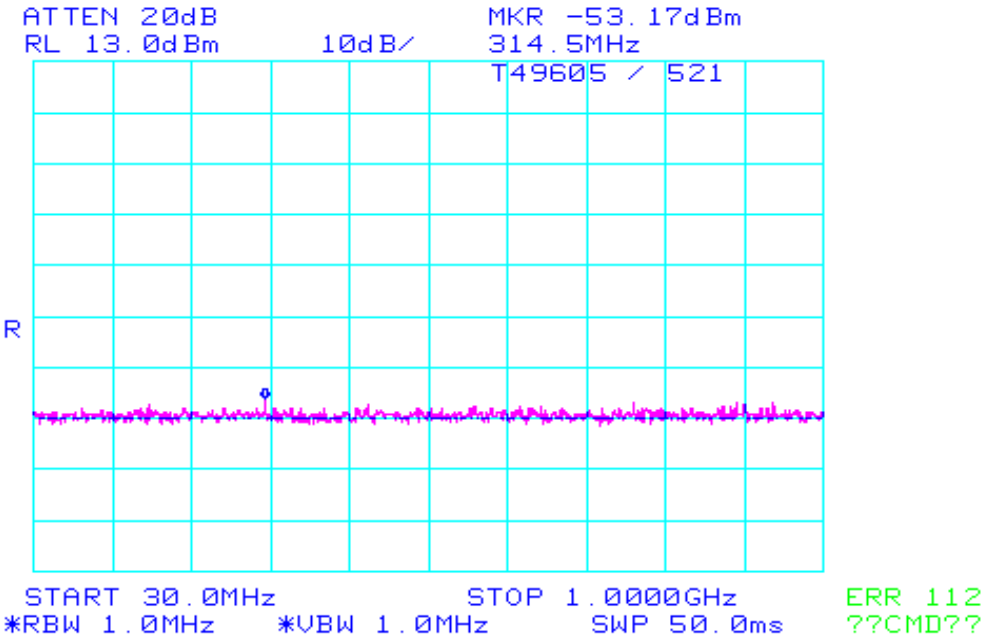
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



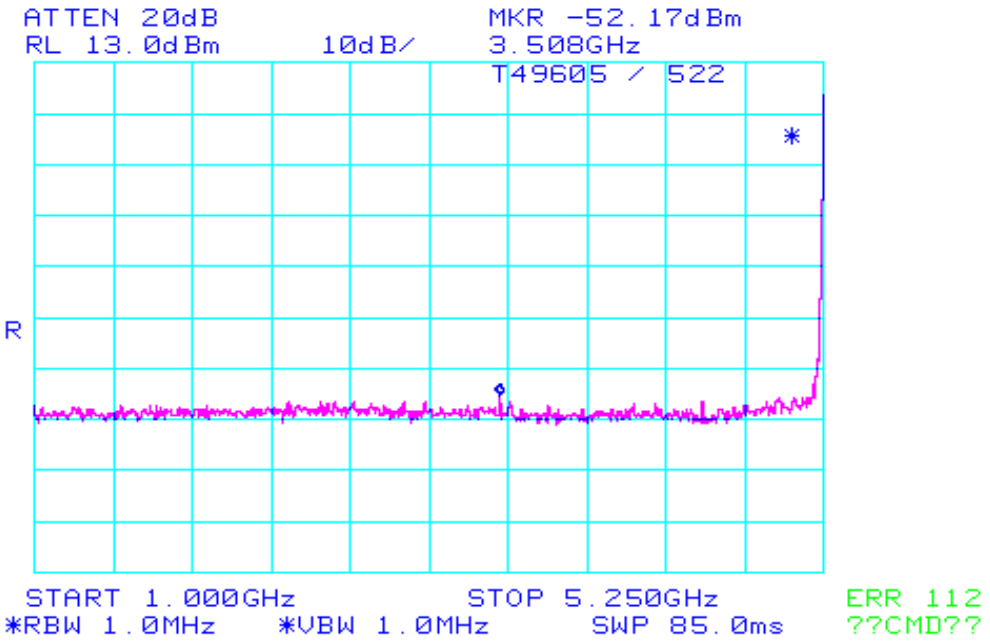


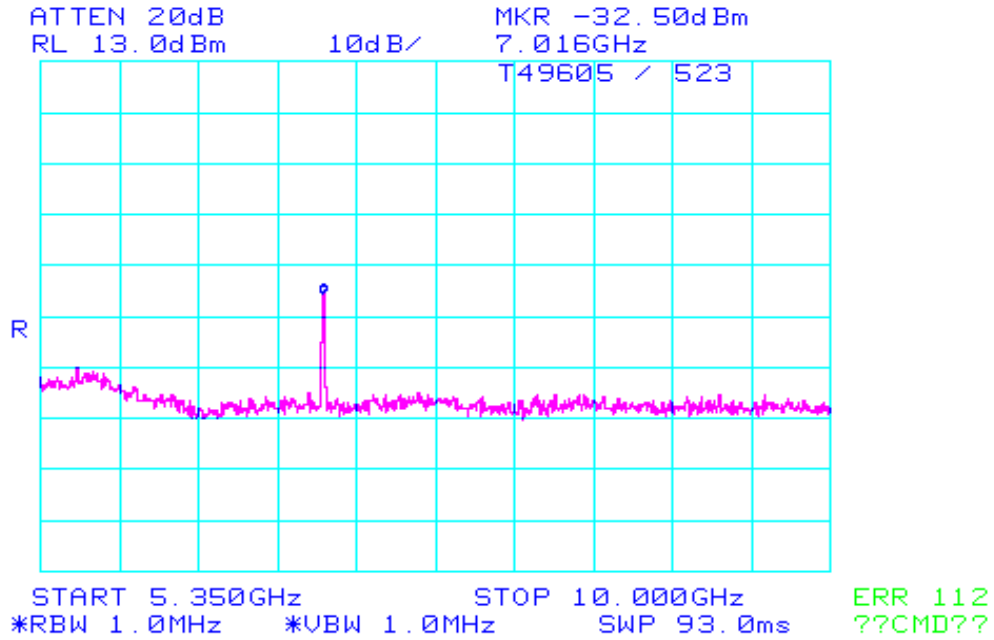
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



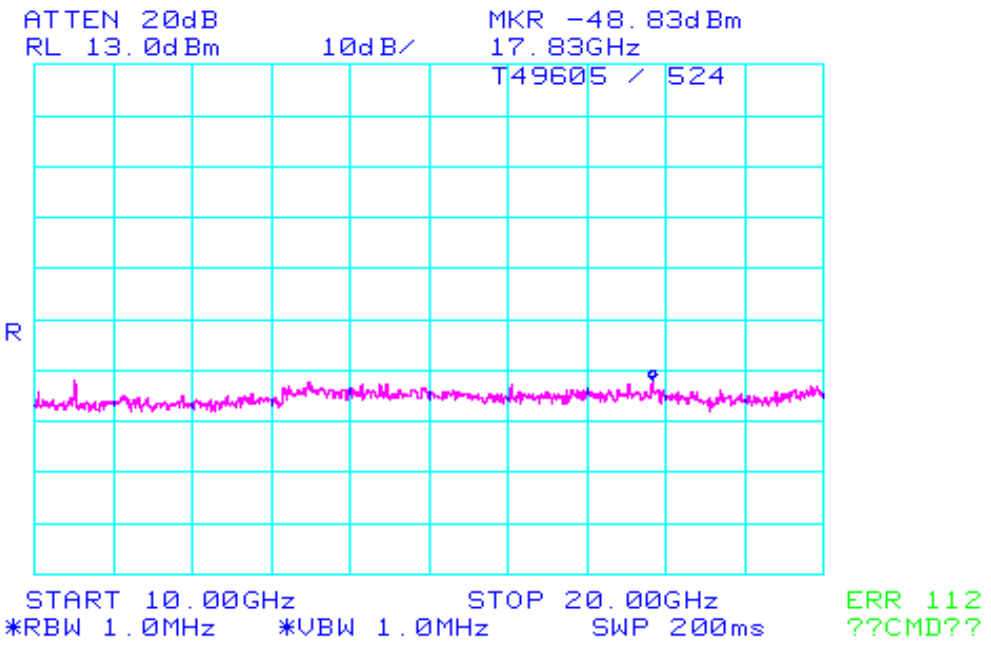


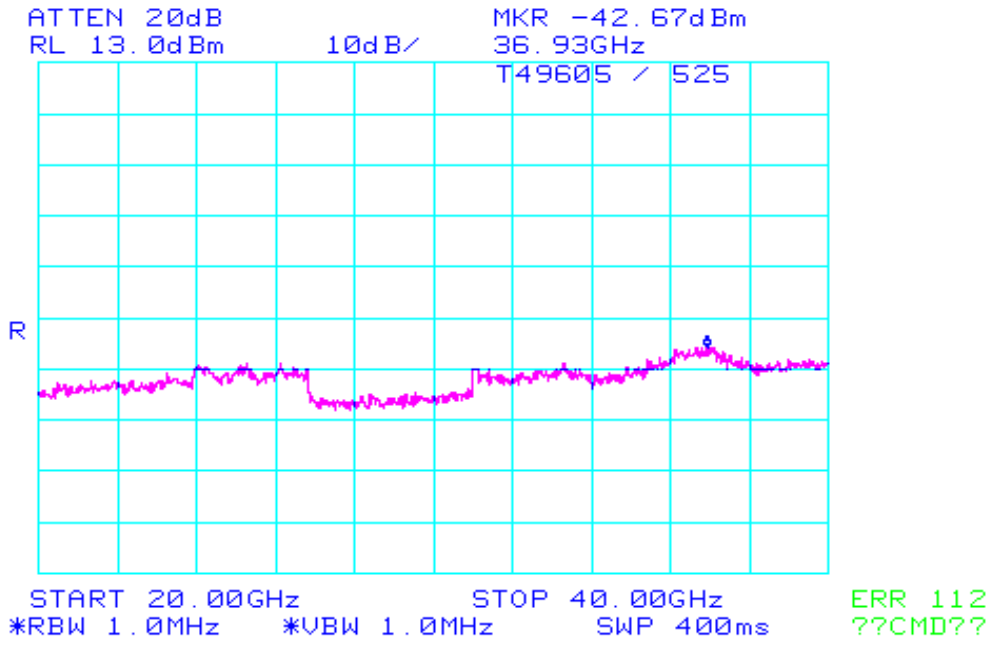
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



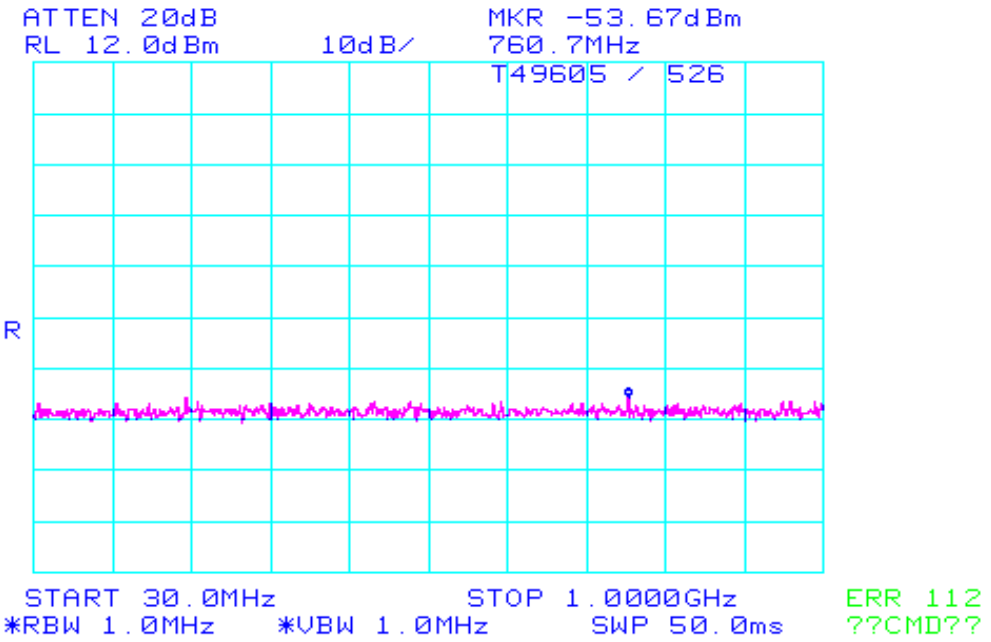


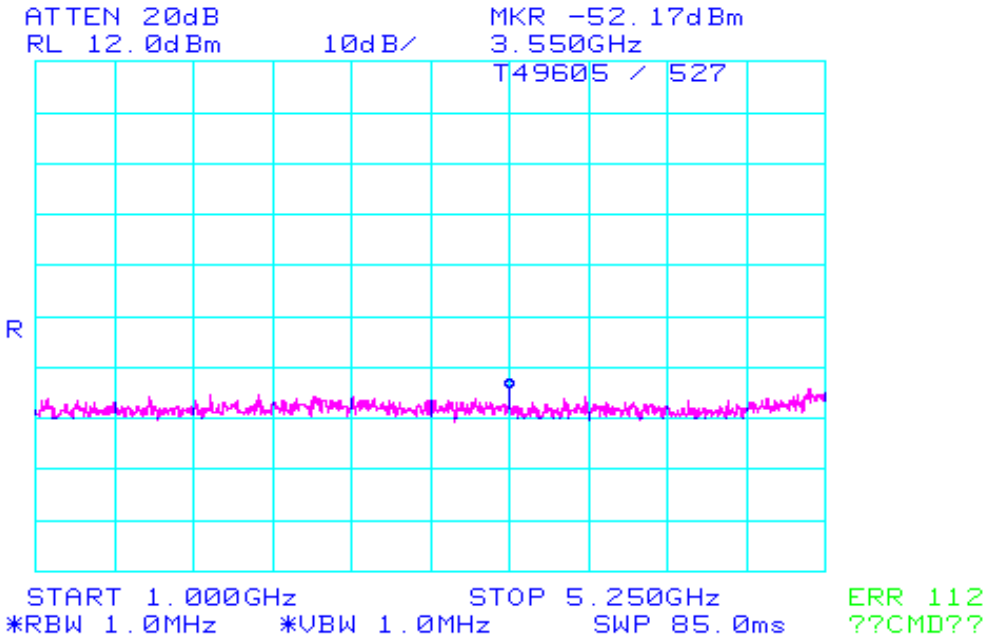
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



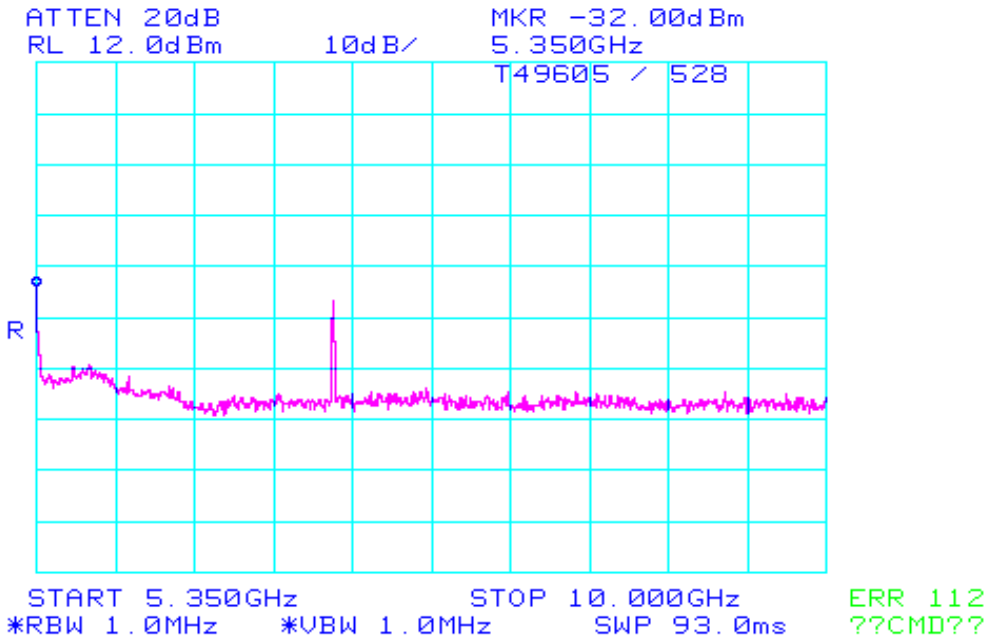


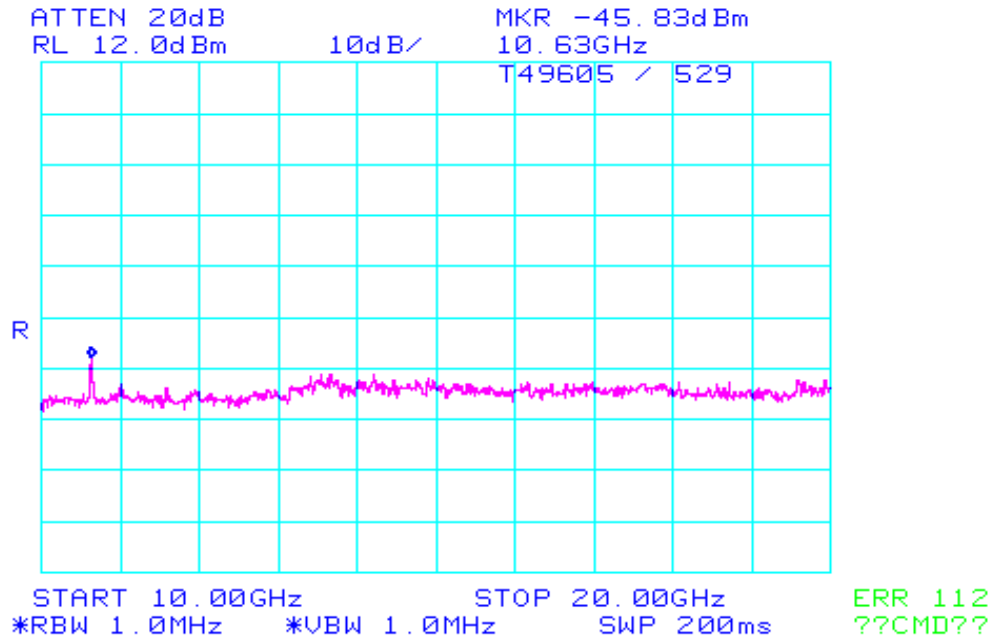
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



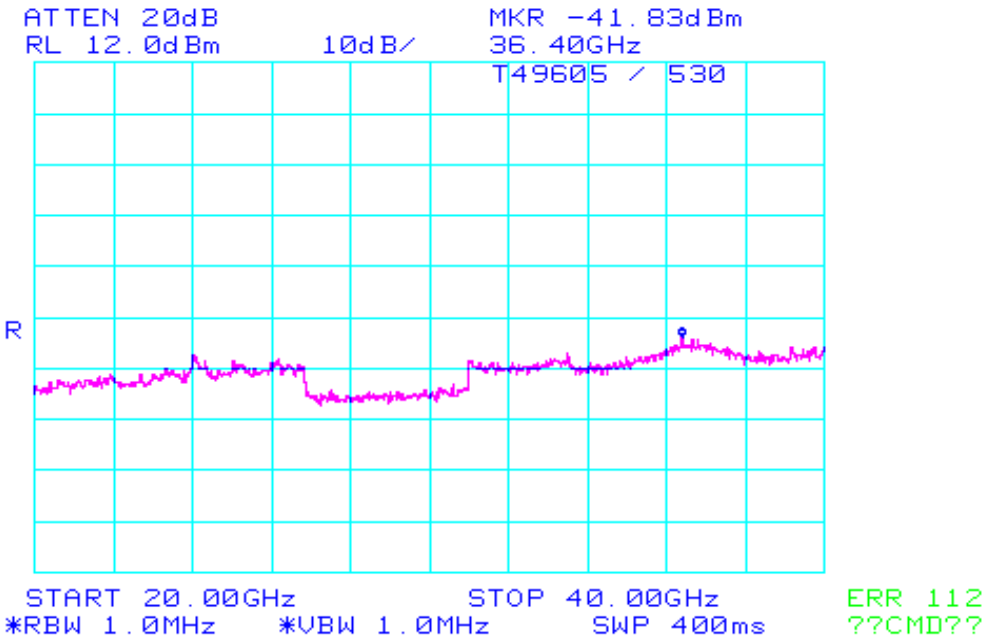


Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A





Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

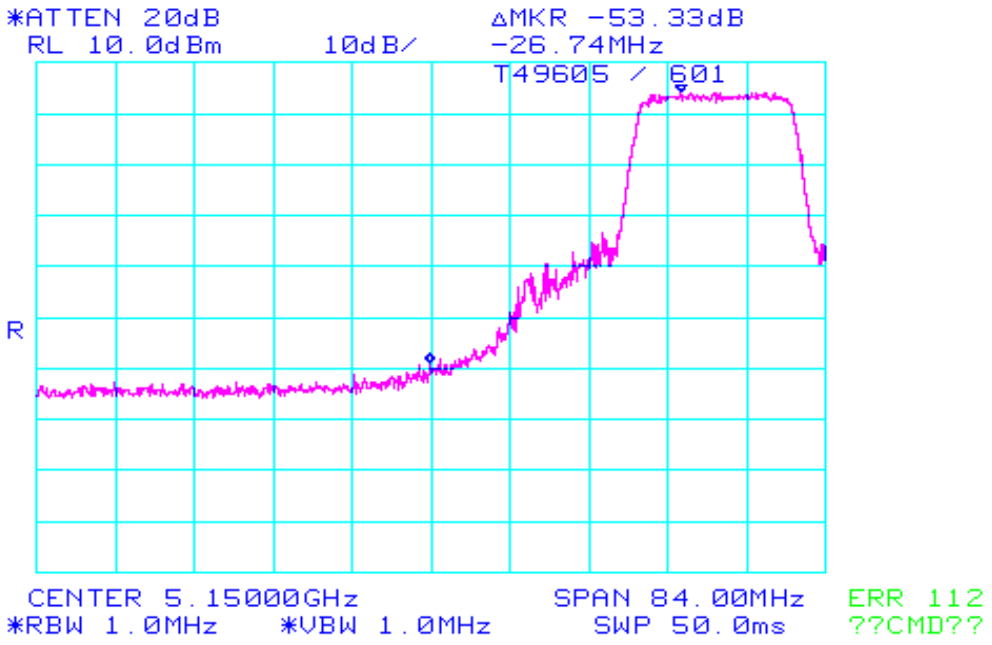
Run #6a: Band Edge Measurements

For signals in the restricted bands immediately above and below the 5.15 to 5.35 GHz allocated band a measurement was made of the amplitude of the spurious emissions with respect to the intentional signals. The relative amplitude, in dBc, was then applied to the average and peak field strength of the intentional signal made on the OATS to calculate the field strength of the unintentional signals.

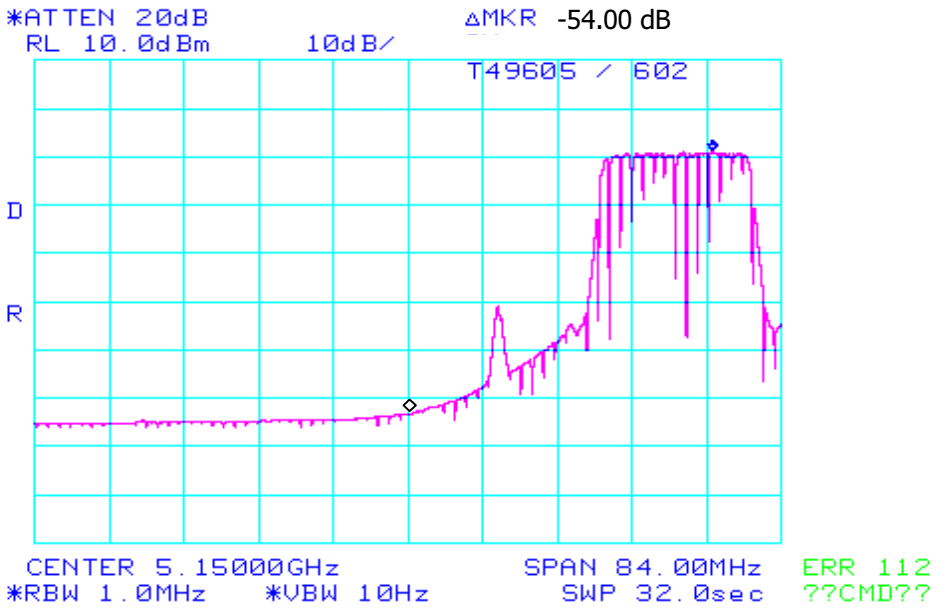
Plots Showing Out-Of-Band Emissions (Peak RBW=VBW=1MHz; Average RBW = 1MHz, VBW = 10Hz)

5.15 GHz band edge, EUT operating on the lowest channel Data Rate 6

The highest signal within 50 MHz of the 5.15 GHz band edge was -53.3 dBc (Peak) / -54.0 dBc (Average)

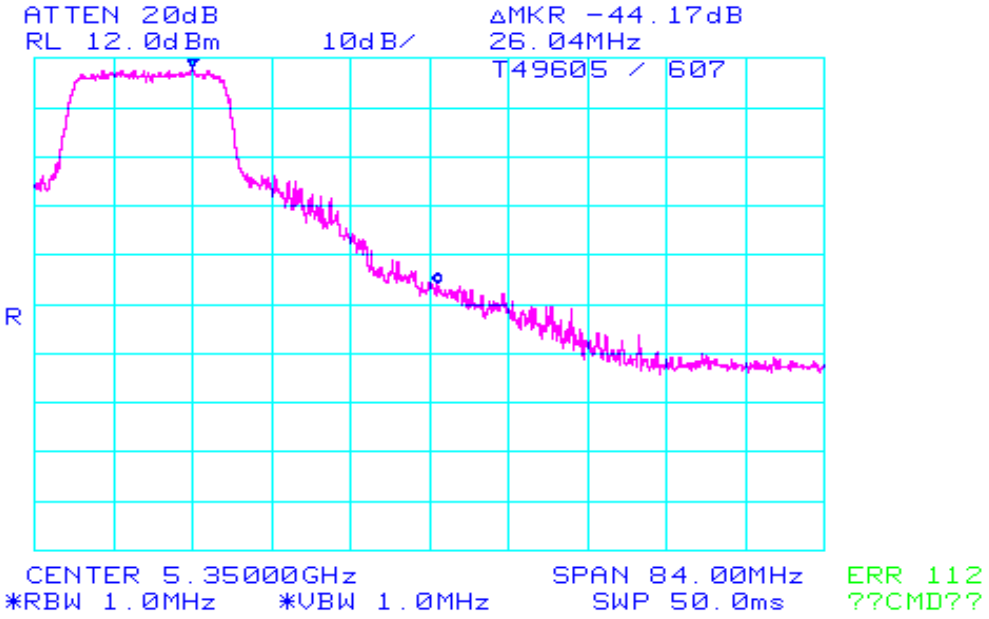


Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

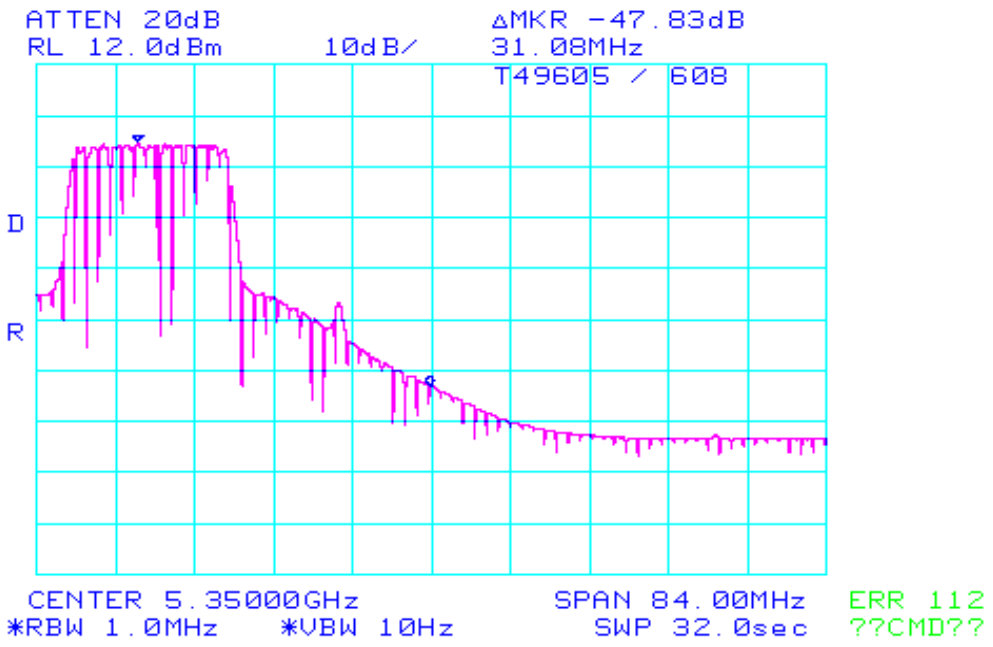


5.35 GHz band edge EUT operating on channel 64 (highest channel): 6MBp/s

The highest signal in the 5.35 to 5.46 GHz band was -44.2 dBc (Peak) / -47.8 dBc (Average)



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A



Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #6b: Radiated Spurious Emissions, 30-40000 MHz. Low Channel @ 5180 MHz
Rate = 6Mb/s, 15.3 dBm Avgpwr

					dBµV/m	
Bandedge	**LO**	**PK**	**53.3dB**	**Bandedge**	**53.1**	**Pk**
Correction		**Avg**	**54.0dB**		**37.8**	**Avg**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5180.000	102.9	v	-	-	Pk	10	1.8	
5180.000	87.8	v	-	-	Avg	10	1.8	
5180.000	106.4	h	-	-	Pk	280	1.8	
5180.000	91.8	h	-	-	Avg	280	1.8	
15540.000	57.3	v	74.0	-16.7	Pk	0	1.0	
15540.000	44.6	v	54.0	-9.4	Avg	0	1.0	
15540.000	58.4	h	74.0	-15.6	Pk	15	1.0	
15540.000	45.1	h	54.0	-8.9	Avg	15	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set at -27dBm/MHz.

Run #6c: Radiated Spurious Emissions, 30-40000 MHz. Center Channel @ 5260 MHz
Rate = 6Mb/s, 15.3 dBm Avgpwr

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
15780.000	58.6	v	74.0	-15.4	Pk	260	1.3	
15780.000	45.8	v	54.0	-8.2	Avg	260	1.3	
15780.000	57.8	h	74.0	-16.2	Pk	0	1.3	
15780.000	45.2	h	54.0	-8.8	Avg	0	1.3	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set at -27dBm/MHz.

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #6d: Radiated Spurious Emissions, 30-40000 MHz. High Channel @ 5320 MHz
Rate = 6Mb/s, 15.3 dBm Avgpwr

					dBµV/m	
Bandedge	**Hi**	**PK**	**44.2dB**	**Bandedge**	**64.8**	**Pk**
Correction		**Avg**	**47.8dB**	**Levels**	**49.9**	**Avg**

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5320.000	107.7	v	-	-	Pk	240	1.4	
5320.000	97.5	v	-	-	Avg	240	1.4	
5320.000	109.0	h	-	-	Pk	100	2.1	
5320.000	97.7	h	-	-	Avg	100	2.1	
10640.000	60.3	v	74.0	-13.7	Pk	10	1.0	
10640.000	46.5	v	54.0	-7.5	Avg	10	1.0	
15960.000	58.4	v	74.0	-15.6	Pk	35	1.0	
15960.000	46.2	v	54.0	-7.8	Avg	35	1.0	
10640.000	60.5	h	74.0	-13.5	Pk	40	1.2	
10640.000	46.7	h	54.0	-7.3	Avg	40	1.2	
15960.000	59.2	h	74.0	-14.8	Pk	300	1.0	
15960.000	46.7	h	54.0	-7.3	Avg	300	1.0	

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set at -27dBm/MHz.

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Conducted Emissions

Test Specifics

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: 12/17/2002
Test Engineer: Chris Byleckie
Test Location: SVOATS #2

Config. Used: 1
Config Change:
EUT Voltage: 120V/60Hz

General Test Configuration

The EUT and all local support equipment were located on a table for spurious emissions testing.

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.

Ambient Conditions:

Temperature: 22°C
Rel. Humidity: 42%

Summary of Results

Run #	Test Performed	Limit	Result	Comment
1	CE, 30 - 24620 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	> 20 dBc
2	6dB Bandwidth	15.247(a)	Pass	> 10 MHz BW
3	Output Power	15.247(b)	Pass	17.6 dBm
4	Power Spectral Density (PSD)	15.247(d)	Pass	-8.1 dBm

Modifications Made During Testing:

No modifications were made to the EUT during testing

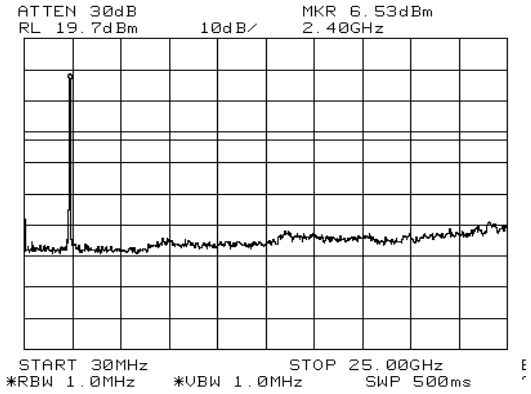
Deviations From The Standard

No deviations were made from the requirements of the standard.

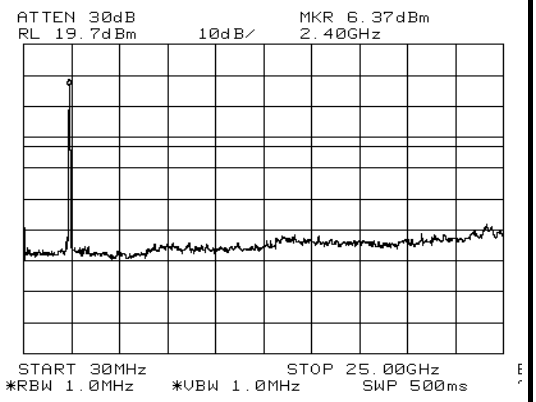
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #1a: Out of Band (1Mb/s)

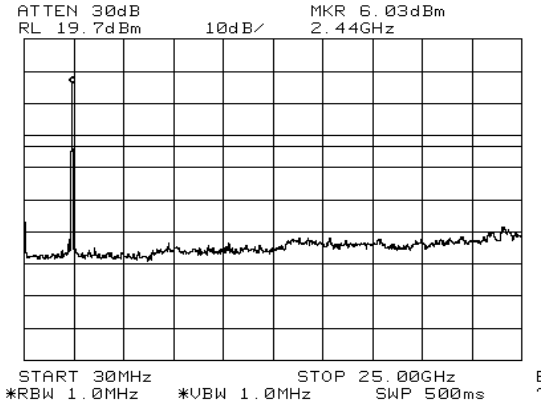
Low



Middle



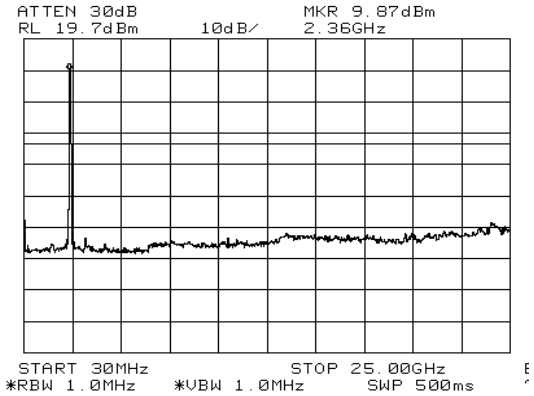
High



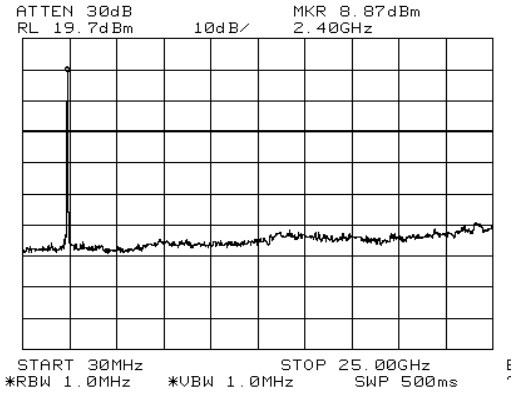
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #1b: Out of Band (11Mb/s)

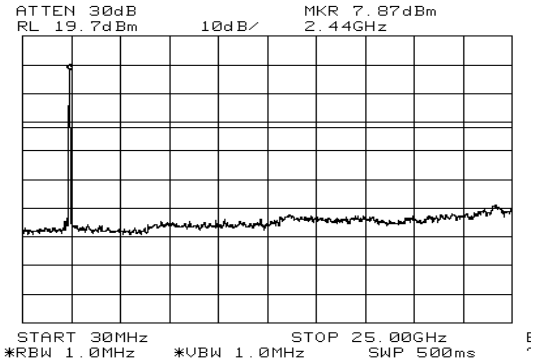
Low



Middle



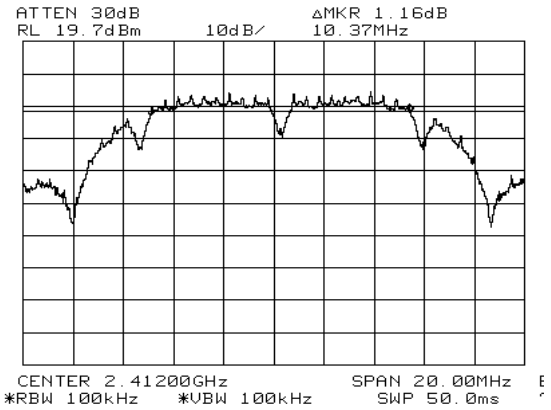
High

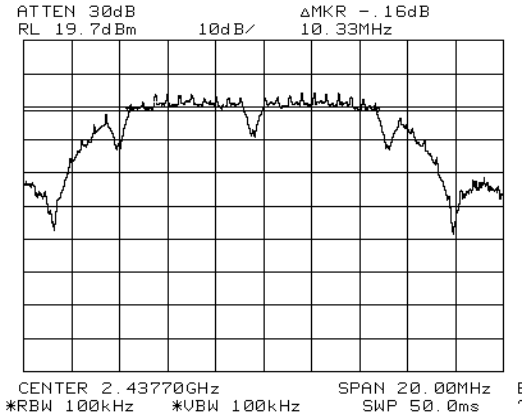


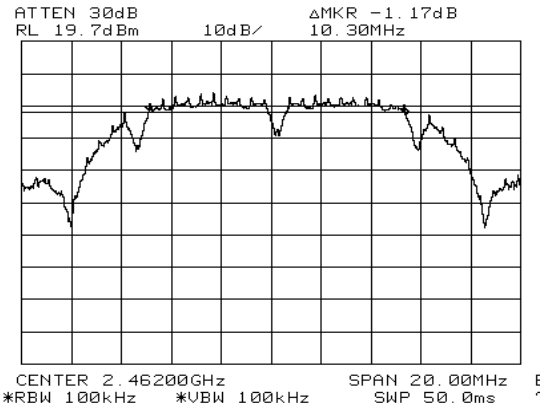
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #2a: Signal Bandwidth (1Mb/s)

Channel	Frequency (MHz)	Resolution Bandwidth	6dB Signal Bandwidth	Graph reference #
Low	2412	100 kHz	10.37 MHz	See plots below
Mid	2437	100 kHz	10.33 MHz	See plots below
High	2462	100 kHz	10.30 MHz	See plots below



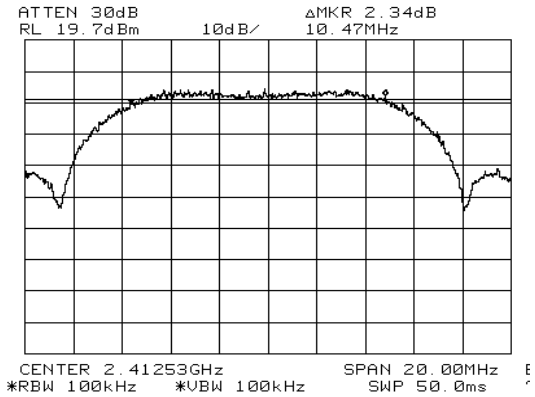


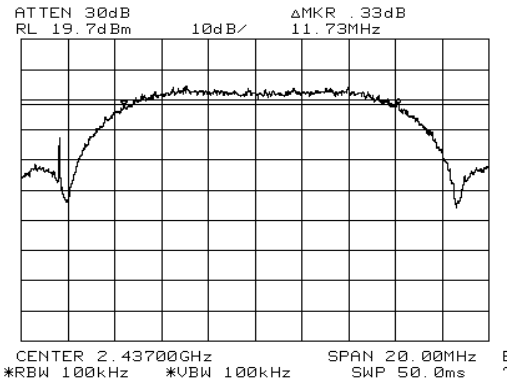


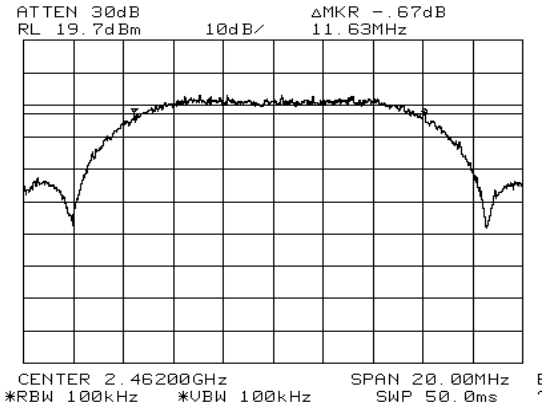
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #2b: Signal Bandwidth (11Mb/s)

Channel	Frequency (MHz)	Resolution Bandwidth	6dB Signal Bandwidth	Graph reference #
Low	2412	100 kHz	10.47	See plots below
Mid	2437	100 kHz	11.73	See plots below
High	2462	100 kHz	11.63	See plots below







Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #3a: Output Power 1Mb/s

Channel	Frequency (MHz)	Output Power	Graph reference #
Low	2412	17.3	None
Mid	2437	17.0	None
High	2462	16.4	None

Run #3b: Output Power 11Mb/s

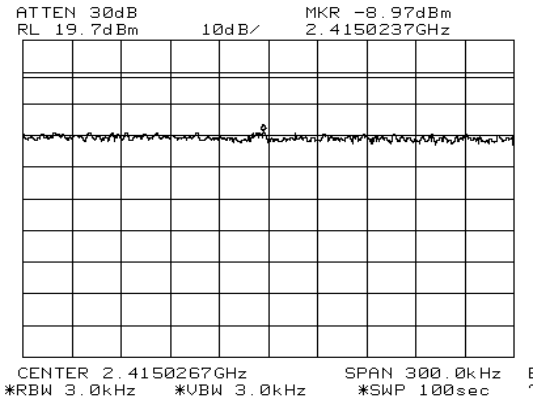
Channel	Frequency (MHz)	Output Power	Graph reference #
Low	2412	17.6	None
Mid	2437	17.3	None
High	2462	16.8	None

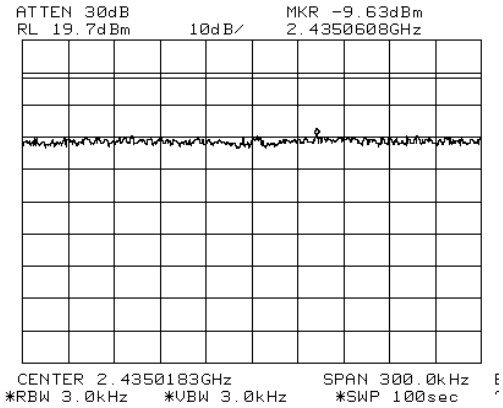
Note 1:	Measured using peak power meter
Note 2:	Meaximun ERP is 17.6+1.45 = 19.05 dBm.

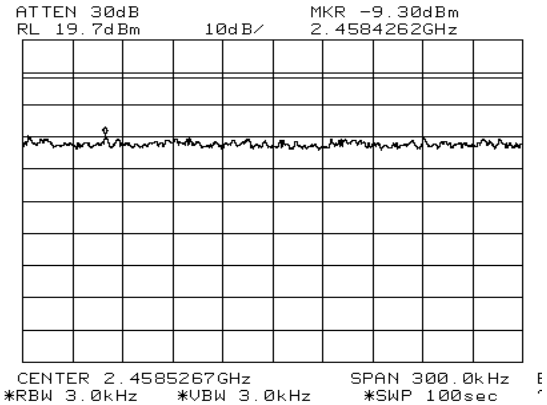
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #4a: Power Spectral Density 1 Mb/s

Channel	Frequency (MHz)	Res BW	P.S.D. dBm (averaged over 1 second in a 3kHz bandwidth)	Graph reference #
Low	2412	3.0 kHZ	-8.97	see plots below
Mid	2437	3.0 kHZ	-9.63	see plots below
High	2462	3.0 kHZ	-9.30	see plots below



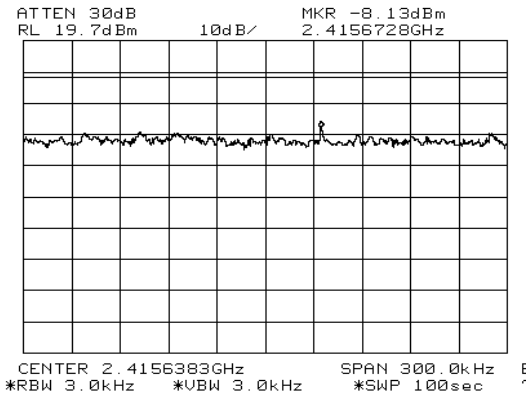


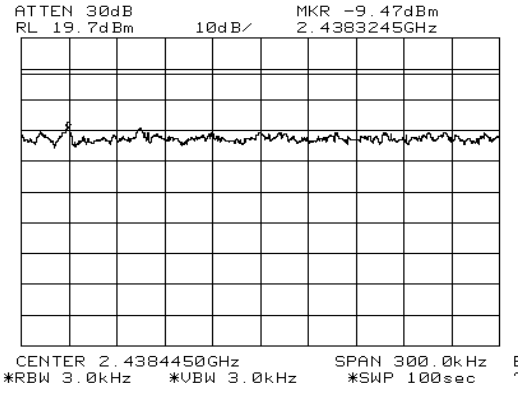


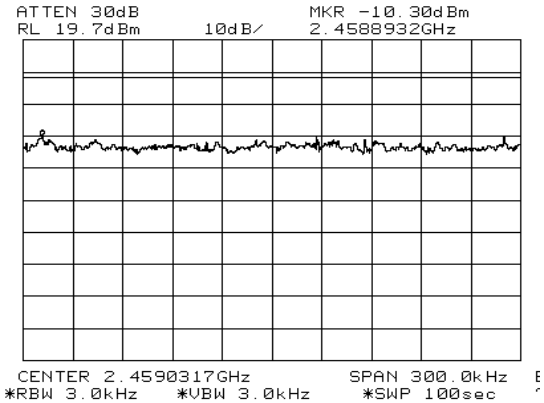
Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	N/A

Run #4b: Power Spectral Density 11 Mb/s

Channel	Frequency (MHz)	Res BW	P.S.D. (averaged over 1 second in a 3kHz bandwidth)	Graph reference #
Low	2412	3.0 kHZ	-8.13	see plots below
Mid	2437	3.0 kHZ	-9.47	see plots below
High	2462	3.0 kHZ	-10.3	see plots below







Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	-

Conducted Emissions - Power Ports

Test Specifics

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: 12/16/2002
Test Engineer: Rod Wong
Test Location: CCA #1

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

General Test Configuration

For tabletop equipment, the EUT was located on a wooden table, 40 cm from a vertical coupling plane and 80cm from the LISN. A second LISN was used for all local support equipment.

Ambient Conditions:

Temperature: 21°C
Rel. Humidity: 46%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	CE, AC Power 230V/50Hz	FCC B	Pass	See individual runs
2	CE, AC Power 120V/60Hz	FCC B	Pass	See individual runs

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.

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	-

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

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.591	46.7	Line 1	56.0	-9.3	QP	
0.211	40.4	Neutral	53.2	-12.8	AV	
0.586	42.9	Neutral	56.0	-13.1	QP	
0.591	32.1	Line 1	46.0	-13.9	AV	
0.165	49.3	Line 1	65.2	-15.9	QP	
0.586	30.0	Neutral	46.0	-16.0	AV	
0.211	45.9	Neutral	63.2	-17.3	QP	
0.240	41.1	Line 1	62.1	-21.0	QP	
0.640	30.3	Line 1	56.0	-25.7	QP	
0.820	26.4	Line 1	56.0	-29.6	QP	
5.779	30.1	Neutral	60.0	-29.9	QP	
0.790	25.2	Neutral	56.0	-30.8	QP	
0.640	14.0	Line 1	46.0	-32.0	AV	
5.779	17.5	Neutral	50.0	-32.5	AV	
0.165	22.6	Line 1	55.2	-32.6	AV	
0.240	19.3	Line 1	52.1	-32.8	AV	
0.820	12.3	Line 1	46.0	-33.7	AV	
0.790	11.4	Neutral	46.0	-34.6	AV	

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

Frequency	Level	AC	EN55022 B		Detector	Comments
MHz	dBµV	Line	Limit	Margin	QP/Ave	
0.242	46.1	Neutral	62.1	-16.0	QP	
0.534	39.3	Neutral	56.0	-16.7	QP	
0.614	38.6	Line 1	56.0	-17.4	QP	
23.119	42.3	Neutral	60.0	-17.7	QP	
23.554	41.9	Line 1	60.0	-18.1	QP	
0.247	31.8	Line 1	51.9	-20.1	AV	
23.119	28.5	Neutral	50.0	-21.5	AV	
23.554	27.6	Line 1	50.0	-22.4	AV	
0.242	28.6	Neutral	52.1	-23.5	AV	
0.534	19.3	Neutral	46.0	-26.7	AV	
0.614	18.9	Line 1	46.0	-27.1	AV	
0.247	9.0	Line 1	61.9	-52.9	QP	

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	-

Radiated Emissions

Test Specifics

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: 12/16/2002
Test Engineer: Rod Wong
Test Location: SVOATS #4

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

General Test Configuration

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

On the OATS, the measurement antenna was located 10 meters from the EUT for the measurement range 30 - 1000 MHz and 3m from the EUT for the frequency range 1 - 10 GHz.

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

Note, for testing 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.

Ambient Conditions:

Temperature: 15.6°C
Rel. Humidity: 59%

Summary of Results

Run #	Test Performed	Limit	Result	Margin
1	RE, Preliminary Scan 30 - 1000 MHz	FCC B	Eval	Refer to individual runs
2	RE, 30 - 1000MHz - Maximized Emissions	FCC B	Pass	-1.7dB @ 138.100MHz

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.

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

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J49585
Model:	BCM94309MP	T-Log Number:	T49605
		Proj Eng:	David Bare
Contact:	David Moldy		
Spec:	FCC Part 15 B, C & E, RSS-210	Class:	-

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
138.100	39.7	V	43.5	-3.8	QP	231	1.0	
153.300	36.1	H	43.5	-7.4	QP	0	1.9	
167.980	29.9	V	43.5	-13.6	QP	293	1.5	
239.996	30.4	V	46.0	-15.6	QP	98	1.9	
63.984	24.3	V	40.0	-15.7	QP	142	2.4	
138.100	25.4	H	43.5	-18.1	QP	89	2.2	
455.980	26.6	H	46.0	-19.4	QP	327	2.0	
164.843	24.0	H	43.5	-19.5	QP	98	2.9	
360.000	23.8	H	46.0	-22.2	QP	0	2.5	
263.996	23.7	V	46.0	-22.3	QP	230	1.2	

Run #2: Maximized Readings From Run #1

Frequency	Level	Pol	FCC B		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
138.100	41.8	V	43.5	-1.7	QP	231	1.0	
153.300	37.0	H	43.5	-6.5	QP	0	1.9	
63.984	26.5	V	40.0	-13.5	QP	142	2.4	
167.980	29.9	V	43.5	-13.6	QP	293	1.5	
138.100	28.7	H	43.5	-14.8	QP	89	2.2	
239.996	30.4	V	46.0	-15.6	QP	98	1.9	

EXHIBIT 3: Test Configuration Photographs

Uploaded as a separate document

EXHIBIT 4: Proposed FCC ID Label & Label Location

Uploaded as a separate document

EXHIBIT 5: Detailed Photographs of Broadcom Corporation Model BCM94309MP Construction

Uploaded as a separate document

EXHIBIT 6: Operator's Manual for Broadcom Corporation Model BCM94309MP

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EXHIBIT 7: Block Diagram of Broadcom Corporation Model BCM94309MP

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EXHIBIT 8: Schematic Diagrams for Broadcom Corporation Model BCM94309MP

Uploaded as a separate document

EXHIBIT 9: Theory of Operation for Broadcom Corporation Model BCM94309MP

Uploaded as a separate document

EXHIBIT 10: RF Exposure Information

Uploaded as a separate document