Elliott Laboratories Inc.
www.elliottlabs.com
684 West Maude Avenue
Sunnyvale, CA 94085-3518
408-245-7800 Phone
408-245-3499 Fax

August 31, 2006

David Boldy
Broadcom Corporation
190 Mathilda Avenue
Sunnyvale, CA 94086

Subject: FCC and Industry Canada Report, model BCM94321MC

Dear Mr. Boldy:

A report has been created detailing the results of the FCC and IC electromagnetic emissions testing performed on the BCM94321MC. This has been submitted to a TCB / Industry Canada to obtain the appropriate equipment certifications. Please find this report enclosed.

This application has been granted by the FCC and Industry Canada. Attached you will find the grants.

If you have any questions, please don't hesitate to call us at 408-245-7800.

Sincerely,

Juan Martinez
Senior EMC Engineer

JM/dmg
Enclosure: Copy of Application Package

Elliott Laboratories Inc.
www.elliottlabs.com
684 West Maude Avenue
Sunnyvale, CA 94085-3518
408-245-7800 Phone
408-245-3499 Fax

August 31, 2006

Elliott Laboratories, Inc.
684 West Maude Ave.
Sunnyvale, CA. 94085

Gentlemen:

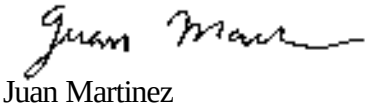
The enclosed documents constitute a formal submittal and application for a Grant of Equipment Authorization pursuant to the following:

Data within this report demonstrates that the equipment tested complies with the relevant limits for unlicensed wireless devices.

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
Senior EMC Engineer

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

Elliott Laboratories Inc.
www.elliottlabs.com
684 West Maude Avenue
Sunnyvale, CA 94085-3518
408-245-7800 Phone
408-245-3499 Fax

Electromagnetic Emissions Test Report and Application for Grant of Equipment Authorization pursuant to Industry Canada RSS-Gen Issue 1 / RSS 210 Issue 6 FCC Part 15 Subpart E on the Broadcom Corporation Transmitter Model: BCM94321MC

UPN:	4324A-BRCM1022
FCC ID:	QDS-BRCM1022
GRANTEE:	Broadcom Corporation 190 Mathilda Avenue Sunnyvale, CA 94086
TEST SITE:	Elliott Laboratories, Inc. 41039 Boyce Road Fremont, CA 94538
REPORT DATE:	August 31, 2006
FINAL TEST DATE:	August 10, August 11, August 14, August 15, August 17, August 24 and August 25, 2006

AUTHORIZED SIGNATORY: _____

Juan Martinez
Senior EMC Engineer

ACCREDITED

2016-01

REVISION HISTORY

Revision #	Date	Comments	Modified By
1	September 21, 2006	Initial Release	David Guidotti

TABLE OF CONTENTS

TABLE OF CONTENTS (Continued)

SCOPE

An electromagnetic emissions test has been performed on the Broadcom Corporation model BCM94321MC pursuant to the following rules:

FCC Part 15, Subpart E requirements for UNII Devices

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

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

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

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

The test results recorded herein are based on a single type test of the Broadcom Corporation model BCM94321MC 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 the regulations outlined in the previous section.

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

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

STATEMENT OF COMPLIANCE

The tested sample of Broadcom Corporation model BCM94321MC complied with the requirements of the following regulations:

FCC Part 15, Subpart E requirements for UNII Devices

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

TEST RESULTS SUMMARY

UNII / LELAN DEVICES

Operation in the 5.15 – 5.25 GHz Band

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
15.407(e)		Indoor operation only	Refer to user's manual	N/A	Complies
15.407(a) (1)		26dB Bandwidth	This is a Class II change all information is the same from previous original application	N/A – limits output power if < 20MHz	N/A
15.407(a) (1)	A9.2(1)	Output Power	15.5 dBm (0.355 W)		Complies
15.407(a) (1))	A9.2(1)	Power Spectral Density	0.98 dBm/MHz		Complies
	A9.5b	Peak Spectral Density	0.98 dBm/MHz	Shall not exceed the average value by more than 3dB	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)

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.407(a) (2)		26dB Bandwidth	This is a Class II change all information is the same from previous original application		N/A
15.407(a) (2)	A9.2(2)	Output Power	19.1 dBm (0.081 W)		Complies
15.407(a) (2))	A9.2(2)	Power Spectral Density	3.6 dBm/MHz		Complies
	A9.5b	Peak Spectral Density	3.6 dBm/MHz	Shall not exceed the average value by more than 3dB	Complies
15.407(a) (2))	A9.4	Dynamic frequency selection / Transmit power control	Not evaluated – this is not a requirement for new equipment until after January 2006 (FCC) / May 2008 (RSS)		N/A
15.407(a) (2))	A9.4	Dynamic frequency selection / Transmit power control	This is a Class II change all information is the same from previous original application		Complies

General requirements for all bands

FCC Rule Part	RSS Rule Part	Description	Measured Value / Comments	Limit / Requirement	Result
	A9.5a	Modulation	This is a Class II change all information is the same from previous original application	Digital modulation is required	Complies
	RSP 100	99% bandwidth	20MHz = 17.9 MHz 40 MHz = 36.4 MHz		
15.407(b) (5) / 15.209	A9.3	Spurious Emissions below 1GHz	38.3 dBuV/m @ 298.627 MHz		Complies (-7.7 dB)
15.407(b) (2)	A9.3	Spurious Emissions above 1GHz	52.9dBuV/m (441.57 uV/m) @ 10359 MHz		Complies (-1.1 dB)
15.407(a)(6)	-	Peak Excursion Ratio	12.24	< 13dB	Complies
	A9.5c	Channel Selection	The device was tested at the highest, lowest and center channels in each operating range.	Device shall be tested on the top, bottom and center channels in each band	N/A
15.407 (c)	A9.5d	Operation in the absence of information to transmit	This is a Class II change all information is the same from previous original application	Device shall automatically discontinue operation in the absence of information to transmit	Complies
15.407 (g)	A9.5e	Frequency Stability	This is a Class II change all information is the same from previous original application		Complies
	A9.9g	User Manual information	This is a Class II change all information is the same from previous original application		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 UKAS document LAB 34.

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

EQUIPMENT UNDER TEST (EUT) DETAILS

GENERAL

The Broadcom Corporation model BCM94321MC is a Broadcom 802.11ag/Draft 802.11n Wireless LAN PCI-E Mini Card that is designed to install in a laptop PC and provide wireless networking capabilities. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The electrical rating of the EUT is 3.3 VDC @ 600mA.

The sample was received on August 10, 2006 and tested on August 10, August 11, August 14, August 15, August 17, August 24 and August 25, 2006. The EUT consisted of the following component(s):

Manufacturer	Model	Description	Serial Number	FCC ID
Broadcom	BCM94321	WLAN module	-	-

OTHER EUT DETAILS

List any items from the test log.

ANTENNA SYSTEM

The antenna system used with the Broadcom Corporation model BCM94321MC consists of the original antenna. This is a class II change an antenna information is the same as the original application.

ENCLOSURE

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

MODIFICATIONS

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

SUPPORT EQUIPMENT

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

Config 1

Manufacturer	Model	Description	Serial Number
Dell	Inspiron 0000	Laptop PC	P/R Proto 2 Latitute Config 3
Dell	F9710	60W AC Adapter	CN-0F9710-71615-56H-5118 Rev A01
FoxConn	-	7.44 dBi PCB Antenna	-
Adexelec	PEX1-MINI Rev 02	Plug-In PCMCIA Adapter Card	-
Agilent	E4416A	Power Meter	MY45100591
Agilent	E9323A	Peak and Avg Power Sensor	MY44420617

Config 2

Manufacturer	Model	Description	Serial Number
Dell	ZRS PT Build Unit Plan Rev 07, Zanzibar A	P/N HAQ00010001	2020537200004 No. 369
Dell	PA-1131-02D D P/N 9Y819	130W AC Adapter	CN-09Y819-71615-57C-20A9 Rev 04

No equipment was used as remote support equipment for emissions testing:

EUT INTERFACE PORTS

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

Config 1

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT (Card)	Adexelec Adapter Card	Direct Connection	-	-
EUT Main Port	Antenna #1	Coaxial	Shielded	0.5
EUT Aux Port	Antenna #2	Coaxial	Shielded	0.5
Host Laptop DC Input	AC-DC Adapter	DC Leads	Unshielded	1.0
AC-DC Adapter AC Input	120V/60Hz AC Outlet	AC Power Cord	Unshielded	2.0

Config 2

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT (Card)	Installed Internally in Laptop	Direct Connection	-	-
Host Laptop DC Input	AC-DC Adapter	DC Leads	Unshielded	1.0
AC-DC Adapter AC Input	120V/60Hz AC Outlet	AC Power Cord	Unshielded	2.0

EUT OPERATION

During emissions testing the EUT was in continuous transmit mode or receive mode as noted.

TEST SITE

GENERAL INFORMATION

Final test measurements were taken on August 10, August 11, August 14, August 15, August 17, August 24 and August 25, 2006 at the Elliott Laboratories Anechoic Chambers 3, 4 and 5 located at 41039 Boyce Road, Fremont, California Pursuant to section 2.948 of the FCC's Rules and section 3.3 of RSP-100, construction, calibration, and equipment data has been filed with the Commission.

ANSI C63.4:2003 recommends that ambient noise at the test site be at least 6 dB below the allowable limits. Ambient levels are below this requirement with the exception 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 requirements of ANSI C63.4:2003 and RSS 212.

CONDUCTED EMISSIONS CONSIDERATIONS

Conducted emissions testing is performed in conformance with ANSI C63.4:2003 and RSS 212. Measurements are made with the EUT connected to the public power network through a nominal, standardized RF impedance, which is provided by a line impedance stabilization network, known as a LISN. A LISN is inserted in series with each current-carrying conductor in the EUT power cord.

RADIATED EMISSIONS CONSIDERATIONS

The FCC has determined that radiation measurements made in a shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an open field environment or in a semi-anechoic chamber. The test sites are maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4:2003 guidelines and meet the Normalized Site Attenuation (NSA) requirements of ANSI C63.4:2003 / RSS 212.

MEASUREMENT INSTRUMENTATION

RECEIVER SYSTEM

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

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

INSTRUMENT CONTROL COMPUTER

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

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

LINE IMPEDANCE STABILIZATION NETWORK (LISN)

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

FILTERS/ATTENUATORS

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

ANTENNAS

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

ANTENNA MAST AND EQUIPMENT TURNTABLE

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

ANSI C63.4:2003 and RSS 212 specify that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material from 3 to 12 mm if the device is normally used on a non-conductive floor. During radiated measurements, the EUT is positioned on a motorized turntable in conformance with this requirement.

INSTRUMENT CALIBRATION

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

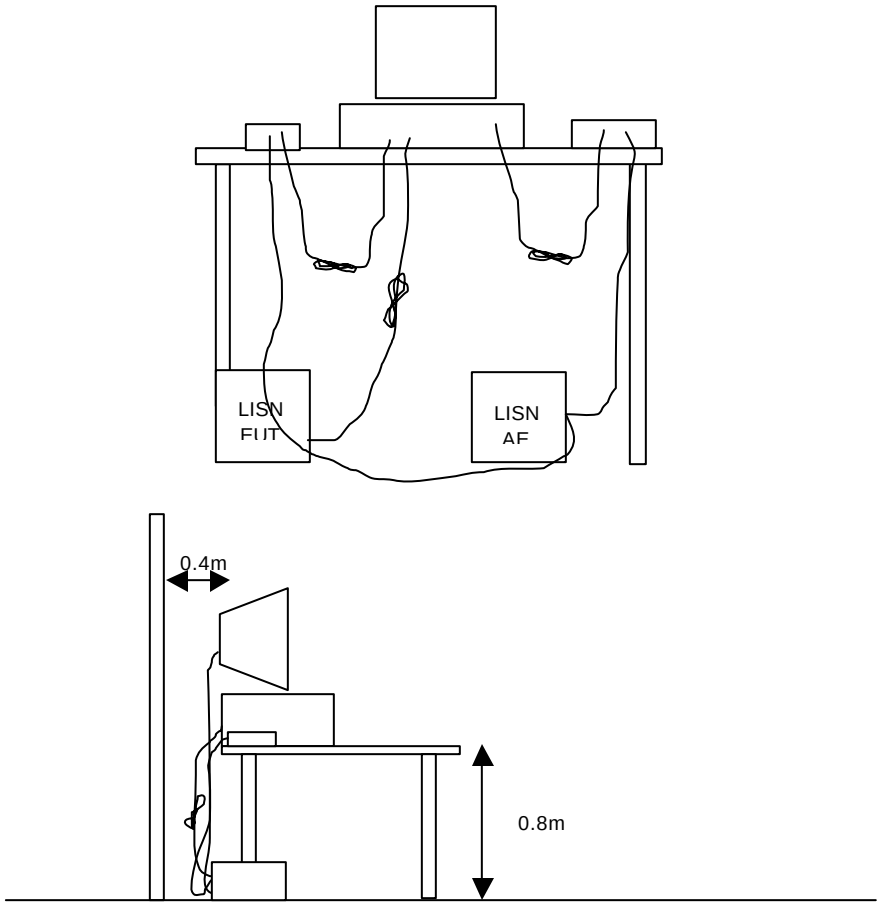
TEST PROCEDURES

EUT AND CABLE PLACEMENT

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

CONDUCTED EMISSIONS

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

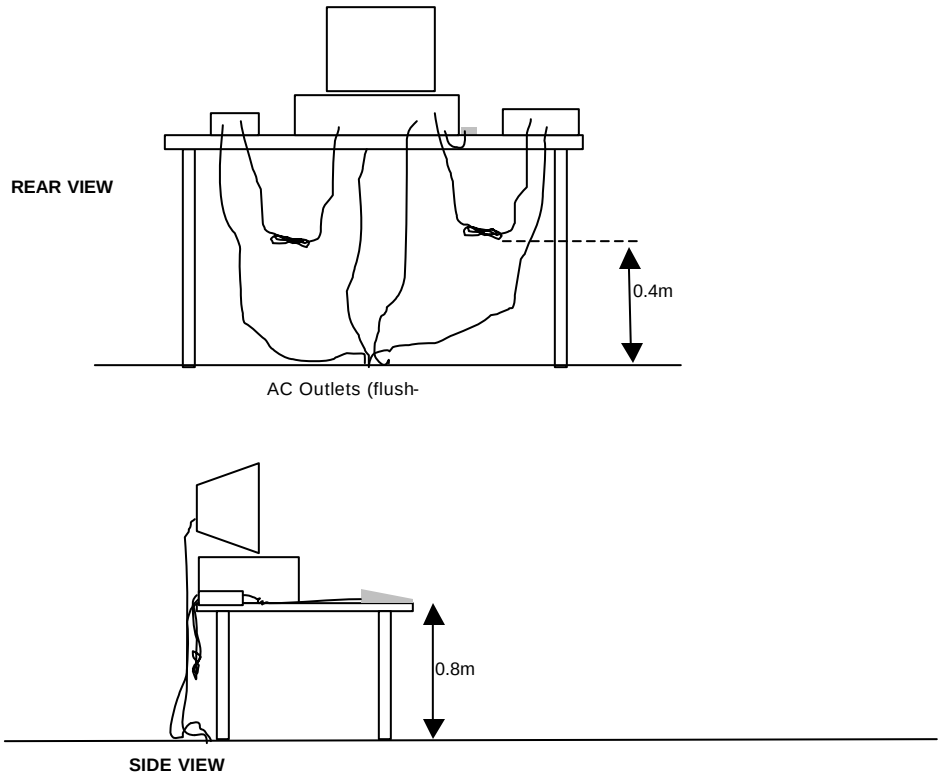


RADIATED EMISSIONS

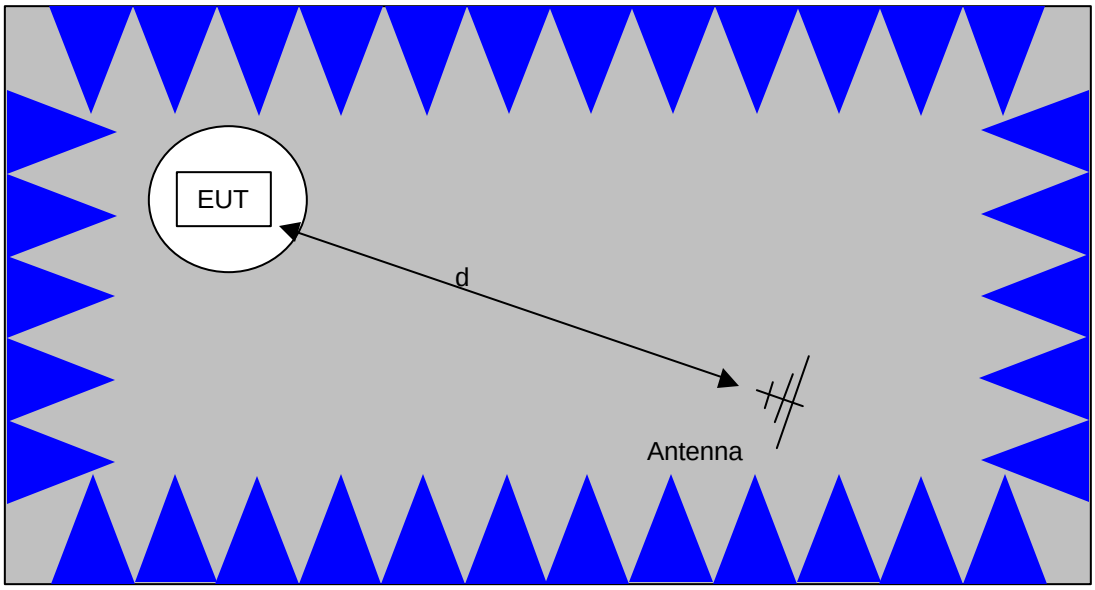
A preliminary scan of the radiated emissions is perfromed in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed, one scan for each antenna polarization (horizontal and vertical; loop parallel and perpendicular to the EUT).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

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

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

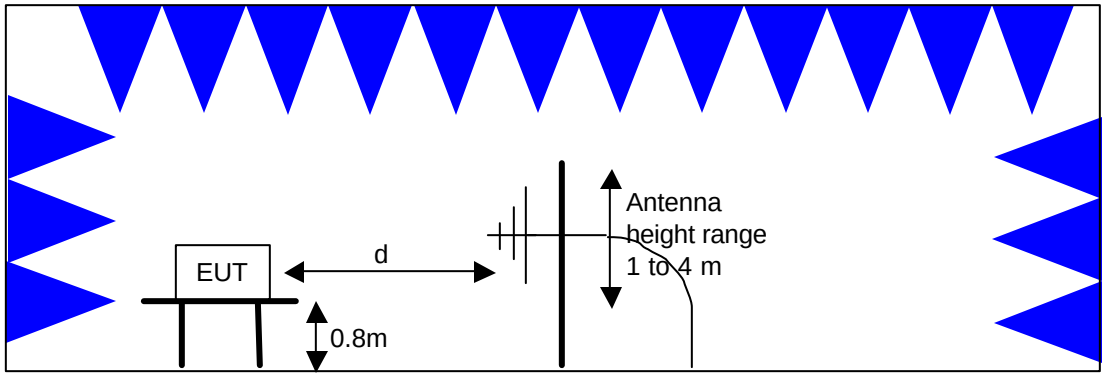


Typical Test Configuration for Radiated Field Strength Measurements



The anechoic materials on the walls and ceiling ensure compliance with the normalized site attenuation requirements of CISPR 16 / CISPR 22 / ANSI C63.4 for an alternate test site at the measurement distances used.

Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.



Test Configuration for Radiated Field Strength Measurements
Semi-Anechoic Chamber, Plan and Side Views

BANDWIDTH MEASUREMENTS

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

SPECIFICATION LIMITS AND SAMPLE CALCULATIONS

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

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

GENERAL TRANSMITTER RADIATED EMISSIONS SPECIFICATION LIMITS

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

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

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.

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

OUTPUT POWER AND SPURIOUS LIMITS –UNII DEVICES

The table below shows the limits for output power and output power density defined by FCC Part 15 Subpart E. 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)	10 dBm/MHz
5250 - 5350	250 mW (24 dBm)	11 dBm/MHz
5470 - 5725	250 mW (24 dBm)	11 dBm/MHz
5725 – 5825	1 Watts (30 dBm)	17 dBm/MHz

The peak excursion envelope is limited to 13dB.

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.

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r - S = M$$

where:

R_r = Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

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

A distance factor, when used for electric field measurements above 30MHz, is calculated by using the following formula:

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

where:

F_d = Distance Factor in dB

D_m = Measurement Distance in meters

D_s = Specification Distance in meters

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

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

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

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

$$R_C = R_r + F_d$$

and

$$M = R_C - L_S$$

where:

R_r = Receiver Reading in dBuV/m

F_d = Distance Factor in dB

R_C = Corrected Reading in dBuV/m

L_S = Specification Limit in dBuV/m

M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

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

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

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radio Antenna Port (Power and Spurious Emissions), 25-Aug-06
Engineer: Mark Briggs

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	SpecAn 9 kHz - 40 GHz, Purple (SA40)	8564E (84125C)	1771	04-Nov-06

Radiated Emissions, 30 - 1,000 MHz, 25-Aug-06
Engineer: Mark Briggs

Manufacturer	Description	Model #	Asset #	Cal Due
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1538	08-Aug-07
Com-Power Corp.	Pre Amplifier, 30-1000 MHz	PA-103	1632	12-Jun-07
Sunol Sciences	Biconilog, 30-3000 MHz	JB3	1657	21-Mar-07

Radiated Spurious Emissions, 1000 - 18,000 MHz, 20-Sep-06
Engineer: Juan Martinez

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	24-Apr-07
Hewlett Packard	SpecAn 30 Hz -40 GHz, SV (SA40) Red	8564E (84125C)	1148	19-May-07
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-May-07

Bandedge, 20-Sep-06
Engineer: Juan Martinez

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-May-07
Rohde & Schwarz	EMI Test Receiver, 20 Hz-7 GHz	ESIB7	1630	28-Dec-06

Radiated Emissions, 1-18 GHz, 11-Aug-06
Engineer: Conrad Chu

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	16-Jan-07
Hewlett Packard	High Pass filter, 8.2 GHz	P/N 84300-80039	1392	01-May-07
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FMT (SA40) Blue	8564E (84125C)	1393	10-Nov-06
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-May-07
Micro-Tronics	Band Reject Filter, 5725-5875 MHz	BRC50705-02	1728	09-Jun-07
Micro-Tronics	Band Reject Filter, 5150-5350 MHz	BRC50703-02	1729	09-Jun-07
Micro-Tronics	Band Reject Filter, 2400-2500 MHz	BRM50702-02	1731	09-Jun-07

Radiated Emissions, 1,000 - 18,000 MHz, 17-Aug-06
Engineer: Conrad Chu

Manufacturer	Description	Model #	Asset #	Cal Due
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	263	16-Jan-07
Hewlett Packard	SpecAn 9 kHz - 40 GHz, FMT (SA40) Blue	8564E (84125C)	1393	10-Nov-06
EMCO	Antenna, Horn, 1-18 GHz	3115	1561	10-May-07

Radiated Emissions, 1-18 GHz, 24-Aug-06
Engineer: Conrad Chu

Manufacturer	Description	Model #	Asset #	Cal Due
EMCO	Antenna, Horn, 1-18 GHz	3115	487	24-May-08
Hewlett Packard	Microwave Preamplifier, 1-26.5GHz	8449B	785	24-Apr-07
Hewlett Packard	SpecAn 9 kHz - 40 GHz, Purple (SA40)	8564E (84125C)	1771	04-Nov-06

EXHIBIT 2: Test Measurement Data

65 Pages

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	Test-Log Number:	T64985
		Project Manager:	-
Contact:	David Boldy		
Emissions Spec:	FCC 15.247, 15.401, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EMC Test Data

For The

Broadcom

Model

BCM94321 MC New version

Date of Last Test: 8/28/2006

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	Test-Log Number:	T64985
		Project Manager:	-
Contact:	David Boldy		
Emissions Spec:	FCC 15.247, 15.401, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

EUT INFORMATION

The client agreed provide the following information after the test session(s).

General Description

The EUT is a Broadcom 802.11ag/Draft 802.11n Wireless LAN PCI-E Mini Card that is designed to install in a laptop PC and provide wireless networking capabilities. Since the EUT would be placed on a table top during operation, the EUT was treated as table-top equipment during testing to simulate the end-user environment. The The electrical rating of the EUT is 3.3 VDC @ 600mA.

Equipment Under Test

Manufacturer	Model	Description	Serial Number	FCC ID
Broadcom	BCM94321	WLAN module	-	-

Other EUT Details

None

EUT Antenna (Intentional Radiators Only)

The EUT antenna is a Hiroshe connector (Antenna is the same as previous original application)

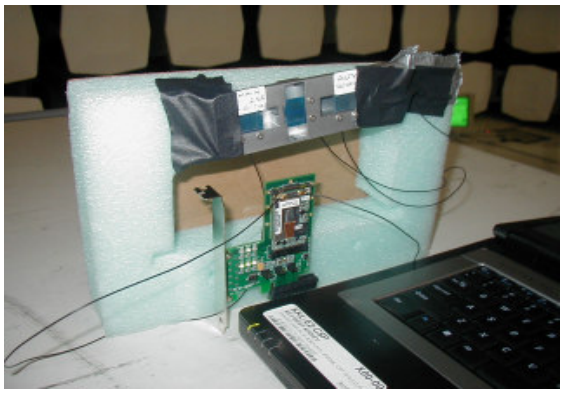
EUT Enclosure

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

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Project Manager:	-
Contact:	David Boldy		
Emissions Spec:	FCC 15.247, 15.401, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

Test Configuration #1

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



Local Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
Dell	Inspiron 0000	Laptop PC	P/R Proto 2 Latitute Config 3	-
Dell	F9710	60W AC Adapter	CN-0F9710-71615-56H-5118 Rev A01	-
FoxConn	-	7.44 dBi PCB Antenna	-	-
Adexelec	PEX1-MINI Rev 02	Plug-In PCMCIA Adapter Card	-	-
Agilent	E4416A	Power Meter	MY45100591	-
Agilent	E9323A	Peak and Avg Power Sensor	MY44420617	-

Remote Support Equipment

Manufacturer	Model	Description	Serial Number	FCC ID
None	-	-	-	-

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Project Manager:	-
Contact:	David Boldy		
Emissions Spec:	FCC 15.247, 15.401, RSS-210	Class:	Radio
Immunity Spec:	-	Environment:	-

Cabling and Ports

Port	Connected To	Cable(s)		
		Description	Shielded or Unshielded	Length(m)
EUT (Card)	Adexelec Adapter Card	Direct Connection	-	-
EUT Main Port	Antenna #1	Coaxial	Shielded	0.5
EUT Aux Port	Antenna #2	Coaxial	Shielded	0.5
Host Laptop DC Input	AC-DC Adapter	DC Leads	Unshielded	1.0
AC-DC Adapter AC Input	120V/60Hz AC Outlet	AC Power Cord	Unshielded	2.0

EUT Operation During Emissions Tests

During emissions testing the EUT was in continuous transmit mode or receive mode as noted.

EUT Operation During Immunity Tests

During immunity test the EUT will be exercised by TBD .

Normal operation is indicated by TBD and shall be monitored by TBD .

Performance Criteria for Immunity Tests

Criterion A:

During and after testing the EUT shall continue to TBD .

Criterion B:

During application of the transient test, degradation of performance including TBD is allowed provided that the EUT self-recovers to normal operation after testing without any operator intervention.

Criterion C:

Loss of function is allowed provided that normal operation can be restored by TBD .

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

RX Radiated Emissions

(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)

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: 8/24/2006
Test Engineer: Conrad Chu
Test Location: Fremont Chamber #3

Config. Used: 1
Config Change: None
EUT Voltage: DC powered by host PC

General Test Configuration

The EUT and any local support equipment were located on the turntable for radiated emissions testing. Any remote support equipment was located outside the semi-anechoic chamber. Any cables running to remote support equipment where routed through metal conduit and when possible passed through a ferrite clamp upon exiting the chamber.

The test distance and extrapolation factor (if applicable) are detailed under each run description.

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

Ambient Conditions:

Temperature: 19 °C
Rel. Humidity: 54 %

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

Summary of Results

Run #	Test Performed	Limit	Result	Margin
Card s/n 837 w/ gasket added to laptop coverplate over wireless card				
1	802.11n 40 MHz, Ch 151	RSS-Gen	Pass	42.8dBµV/m (138.0µV/m) @ 11510.0MHz (-11.2dB)
2	802.11n 40 MHz, Ch 118	RSS-Gen	Pass	38.9dBµV/m (88.1µV/m) @ 5590.0MHz (-15.1dB)
3	802.11n 40 MHz, Ch 54	RSS-Gen	Pass	41.9dBµV/m (124.5µV/m) @ 10540.1MHz (-12.1dB)
4	801.11n 40 MHz, Ch 6	RSS-Gen	Pass	34.5dBµV/m (53.1µV/m) @ 4874.0MHz (-19.5dB)
5	802.11n 20 MHz, Ch 120	RSS-Gen	Pass	38.6dBµV/m (85.1µV/m) @ 5600.0MHz (-15.4dB)
6	802.11n 20 MHz, Ch 52	RSS-Gen	Pass	43.2dBµV/m (144.5µV/m) @ 10520.0MHz (-10.8dB)
7	802.11a, Ch 52	RSS-Gen	Pass	42.6dBµV/m (134.9µV/m) @ 10520.0MHz (-11.4dB)

Modifications Made During Testing

Please refer to run for description of modification

Deviations From The Standard

No deviations were made from the requirements of the standard.

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

Run #1: Maximized Readings, 1000 - 12750 MHz
Operating Mode: Rx Mode, 802.11n 40 MHz, Channel 151
EUT Serial No: 837
Model #BCM94321MC
A23 PA with Apple SROM settings, B1 Silicon

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000-18000	1	3	-9.5

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
No prescan performed. Measured fundamental and 2nd harmonic only								

Final peak and average readings

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
11510.020	42.8	V	54.0	-11.2	AVG	148	1.0	2nd harmonic
11509.970	38.1	H	54.0	-15.9	AVG	126	1.0	2nd harmonic
5755.020	37.5	V	54.0	-16.5	AVG	149	1.0	fundamental
5755.030	35.6	H	54.0	-18.4	AVG	186	1.2	fundamental
11510.020	47.1	V	74.0	-26.9	PK	148	1.0	2nd harmonic
11509.970	44.4	H	74.0	-29.6	PK	126	1.0	2nd harmonic
5755.020	40.7	V	74.0	-33.3	PK	149	1.0	fundamental
5755.030	39.6	H	74.0	-34.4	PK	186	1.2	fundamental

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

Run #2: Maximized Readings, 1000 - 12750 MHz
Operating Mode: Rx Mode, 802.11n 40 MHz, Channel 118
EUT Serial No: 837
Model #BCM94321MC
A23 PA with Apple SROM settings, B1 Silicon

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000-18000	1	3	-9.5

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
No prescan performed. Measured fundamental and 2nd harmonic only								

Final peak and average readings

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5590.010	38.9	H	54.0	-15.1	AVG	194	1.0	
5589.990	38.1	V	54.0	-15.9	AVG	344	1.0	
5590.010	42.2	H	74.0	-31.8	PK	194	1.0	
5589.990	41.8	V	74.0	-32.2	PK	344	1.0	
Switched to FoxConn A23B1 production sample v5.13, s/n 6F632058LWQXE								
11180.020	34.5	V	54.0	-19.5	AVG	196	1.1	
11180.040	30.2	H	54.0	-23.8	AVG	183	1.1	
11180.020	43.3	V	74.0	-30.7	PK	196	1.1	
11180.040	40.7	H	74.0	-33.3	PK	183	1.1	

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

Run #3: Maximized Readings, 1000 - 12750 MHz
Operating Mode: Rx Mode, 802.11n 40 MHz, Channel 54
EUT Serial No: 837
Model #BCM94321MC
A23 PA with Apple SROM settings, B1 Silicon

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000-18000	1	3	-9.5

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
No prescan performed. Measured fundamental and 2nd harmonic only								

Final peak and average readings

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
10540.050	41.9	H	54.0	-12.1	AVG	217	1.0	2nd harmonic
5270.010	37.6	V	54.0	-16.4	AVG	94	1.1	fundamental
5270.010	33.4	H	54.0	-20.6	AVG	203	1.0	fundamental
10539.990	47.8	V	74.0	-26.2	PK	171	1.0	2nd harmonic
10540.050	46.2	H	74.0	-27.8	PK	217	1.0	2nd harmonic
10539.990	44.8	V	74.0	-29.2	AVG	171	1.0	2nd harmonic
5270.010	41.3	V	74.0	-32.7	PK	94	1.1	fundamental
5270.010	38.1	H	74.0	-35.9	PK	203	1.0	fundamental

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

Run #4: Maximized Readings, 1000 - 12750 MHz
Operating Mode: Rx Mode, 802.11n 40 MHz, Channel 6
EUT Serial No: 837
Model #BCM94321MC
A23 PA with Apple SROM settings, B1 Silicon

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000-18000	1	3	-9.5

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
No prescan performed. Measured fundamental and 2nd harmonic only								

Final peak and average readings

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
4874.030	34.5	V	54.0	-19.5	AVG	325	1.3	2nd harmonic
4874.010	33.1	H	54.0	-20.9	AVG	140	1.0	2nd harmonic
2437.080	27.4	V	54.0	-26.6	AVG	203	1.0	fundamental
2436.990	27.2	H	54.0	-26.8	AVG	201	1.0	fundamental
4874.030	38.6	V	74.0	-35.4	PK	325	1.3	2nd harmonic
4874.010	37.5	H	74.0	-36.5	PK	140	1.0	2nd harmonic
2436.990	33.5	H	74.0	-40.5	PK	201	1.0	fundamental
2437.080	33.1	V	74.0	-40.9	PK	203	1.0	fundamental

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

Run #5: Maximized Readings, 1000 - 12750 MHz
Operating Mode: Rx Mode, 802.11n 20 MHz, Channel 120
EUT Serial No: 837
Model #BCM94321MC
A23 PA with Apple SROM settings, B1 Silicon

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000-18000	1	3	-9.5

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
No prescan performed. Measured fundamental and 2nd harmonic only								

Final peak and average readings

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
5600.020	38.6	H	54.0	-15.4	AVG	195	1.0	
5600.000	38.0	V	54.0	-16.0	AVG	343	1.0	
5600.020	41.8	H	74.0	-32.2	PK	195	1.0	
5600.000	41.0	V	74.0	-33.0	PK	343	1.0	
Switched to FoxConn A23B1 production sample v5.13, s/n 6F632058LWQXE								
11200.030	32.0	V	54.0	-22.0	AVG	194	1.0	
11200.030	29.9	H	54.0	-24.1	AVG	131	1.0	
11200.030	41.5	V	74.0	-32.5	PK	194	1.0	
11200.030	41.0	H	74.0	-33.0	PK	131	1.0	

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

Run #6: Maximized Readings, 1000 - 12750 MHz
Operating Mode: Rx Mode, 802.11n 20 MHz, Channel 52
EUT Serial No: 837
Model #BCM94321MC
A23 PA with Apple SROM settings, B1 Silicon

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000-18000	1	3	-9.5

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
No prescan performed. Measured fundamental and 2nd harmonic only								

Final peak and average readings

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
10519.950	43.2	V	54.0	-10.8	AVG	17	1.0	
10519.980	39.6	H	54.0	-14.4	AVG	101	1.0	
5259.980	35.9	V	54.0	-18.1	AVG	92	1.0	
5260.020	32.0	H	54.0	-22.0	AVG	203	1.0	
10519.950	46.9	V	74.0	-27.1	PK	17	1.0	
10519.980	44.9	H	74.0	-29.1	PK	101	1.0	
5259.980	40.0	V	74.0	-34.0	PK	92	1.0	
5260.020	37.7	H	74.0	-36.3	PK	203	1.0	

Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	Radio

Run #7: Maximized Readings, 1000 - 12750 MHz
Operating Mode: Rx Mode, 802.11a, Channel 52
EUT Serial No: 837
Model #BCM94321MC
A23 PA with Apple SROM settings, B1 Silicon

Frequency Range	Test Distance	Limit Distance	Extrapolation Factor
1000-18000	1	3	-9.5

Preliminary peak readings captured during pre-scan

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
No prescan performed. Measured fundamental and 2nd harmonic only								

Final peak and average readings

Frequency	Level	Pol	RSS-Gen		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
10519.970	42.6	V	54.0	-11.4	AVG	16	1.0	
10519.970	40.1	H	54.0	-13.9	AVG	143	1.0	
5259.990	36.0	V	54.0	-18.0	AVG	94	1.0	
5260.040	31.9	H	54.0	-22.1	AVG	127	1.0	
10519.970	46.6	V	74.0	-27.4	PK	16	1.0	
10519.970	45.2	H	74.0	-28.8	PK	143	1.0	
5259.990	40.5	V	74.0	-33.5	PK	94	1.0	
5260.040	38.0	H	74.0	-36.0	PK	127	1.0	

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Bandedges

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: 8/21/2006
Test Engineer: Juan Martinez
Test Location: Fremont Chamber #3
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 spurious emissions testing.

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

Ambient Conditions:

Temperature: 19 °C
Rel. Humidity: 41 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1 - 14	Bandedges	FCC Part 15.209 / 15.247(c)	Pass	Refer to individual runs

Modifications Made During Testing:

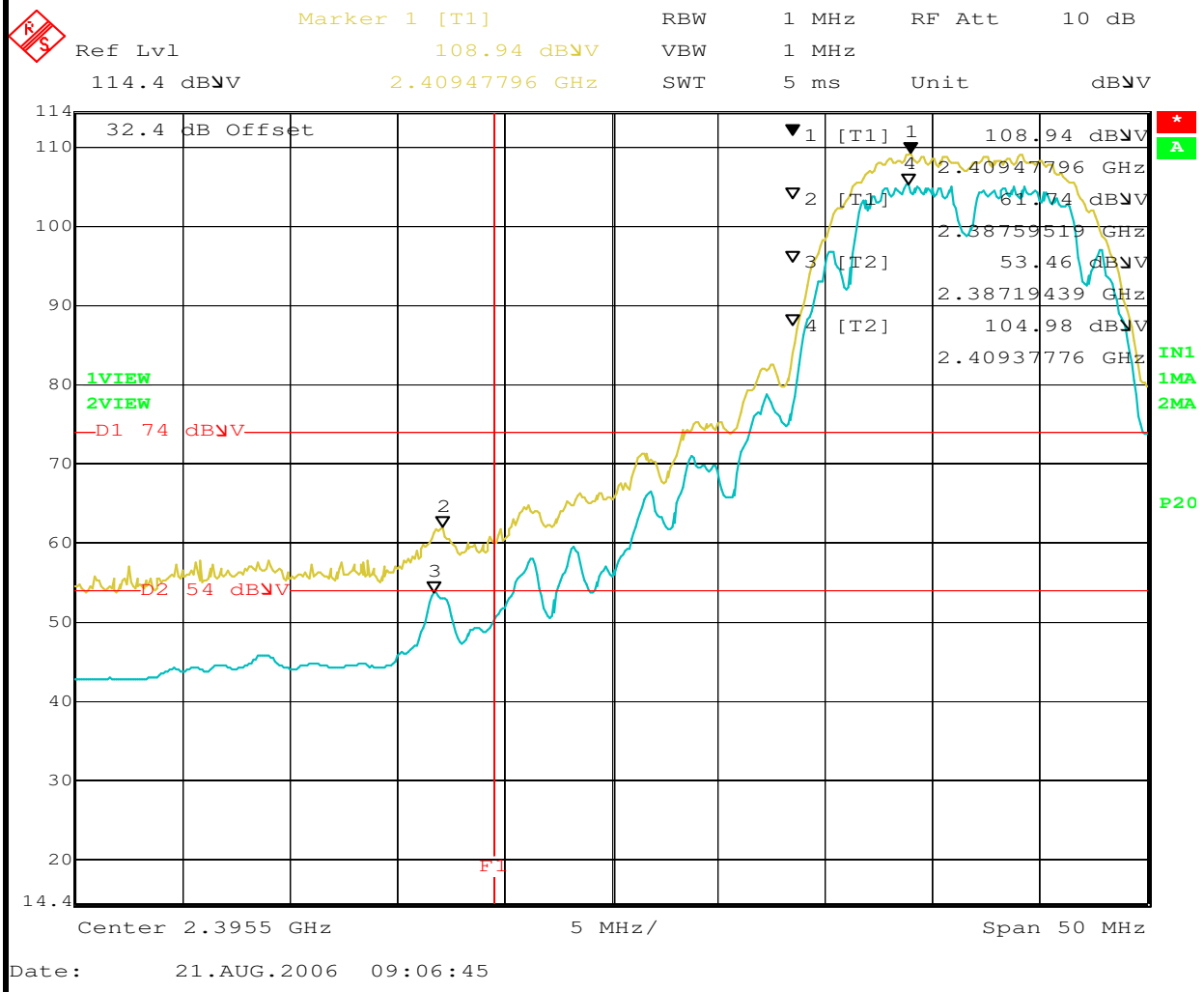
No modifications were made to the EUT during testing

Deviations From The Standard

No deviations were made from the requirements of the standard.

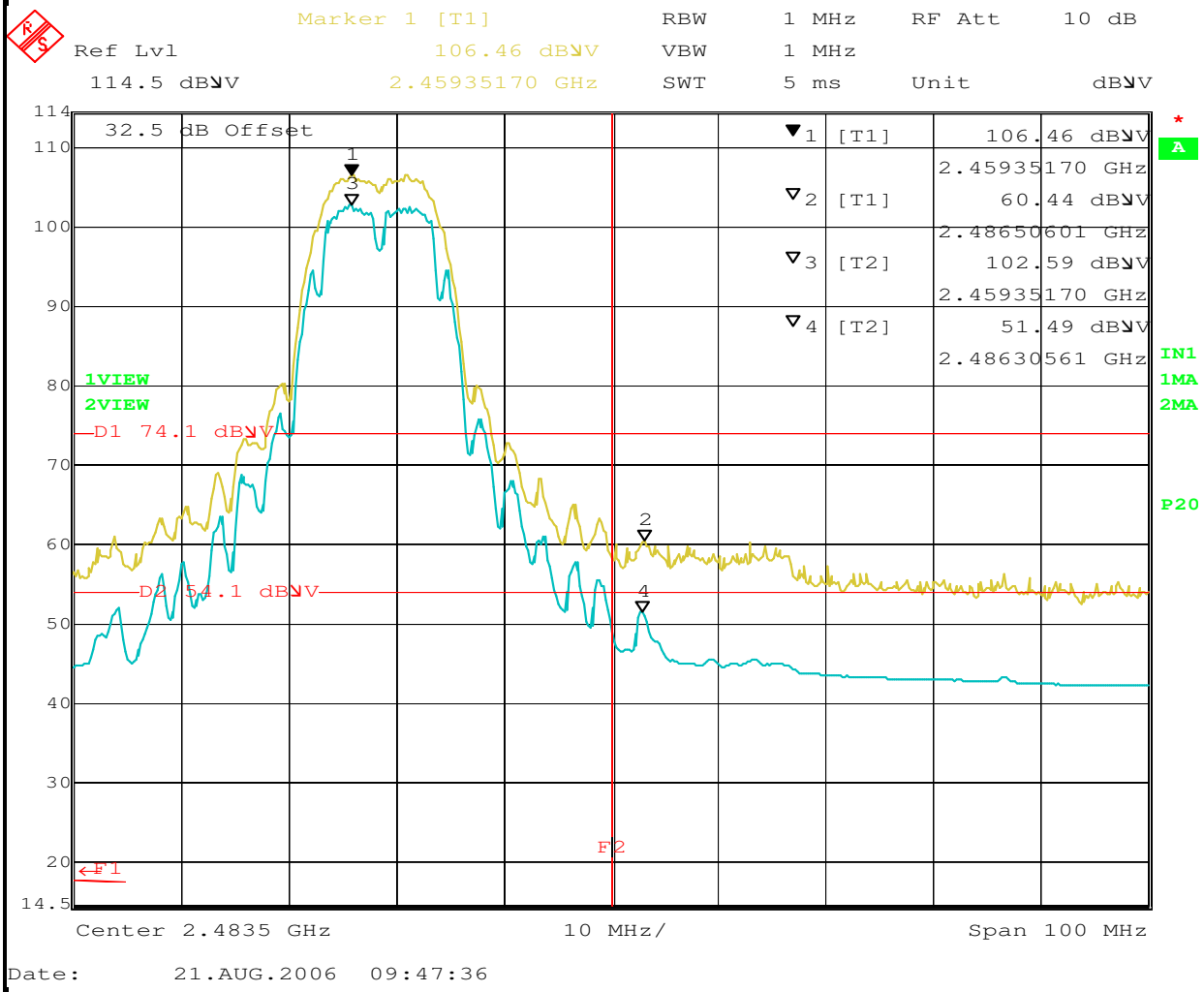
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Bandedge Signal Field Strength:
Run #1: Low Channel @ 2412 MHz (802.11b), 18 dBm



Elliott	EMC Test Data		
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

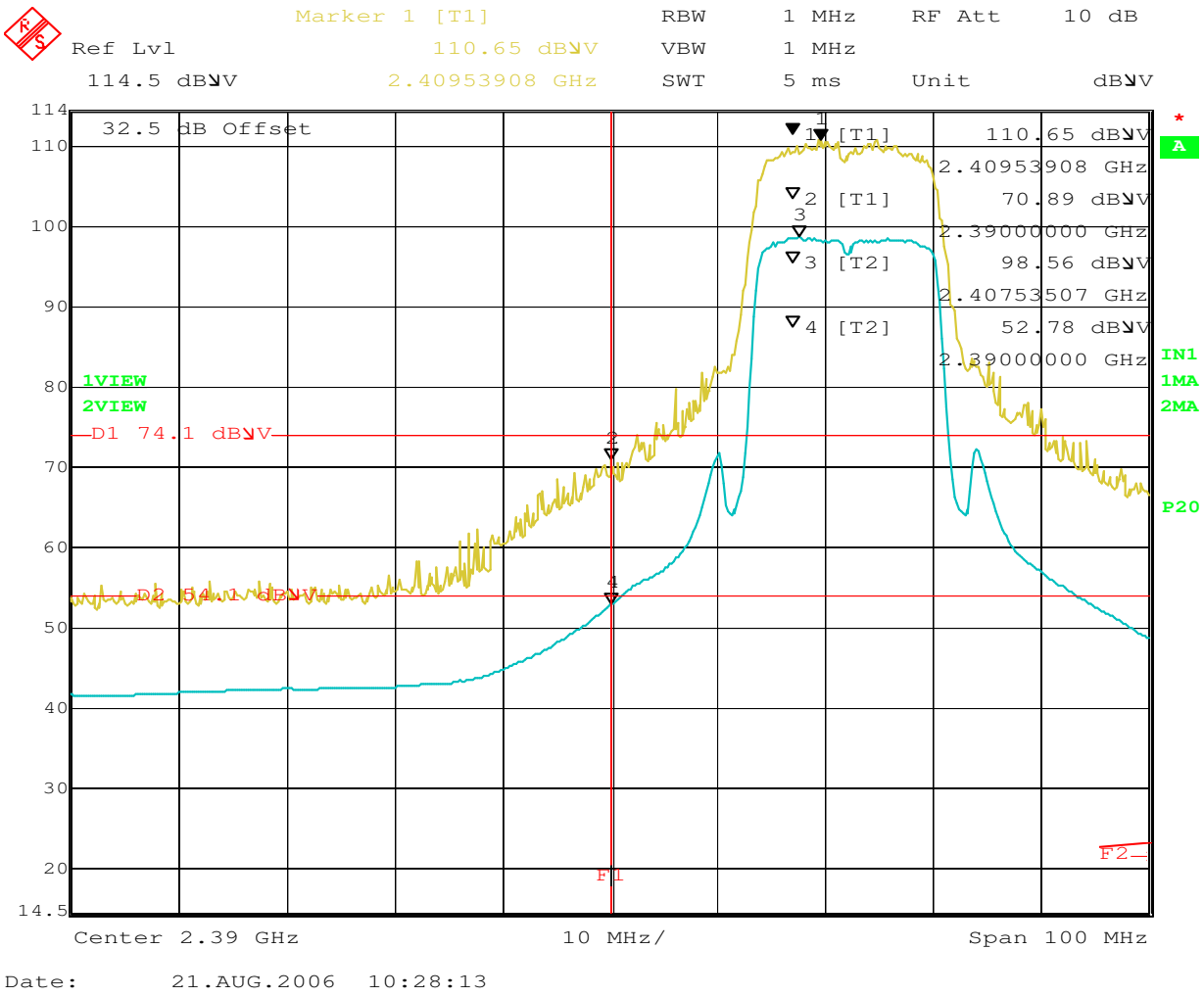
Run #2: High Channel @ 2462 MHz (802.11b), 16 dBm



EMC Test Data

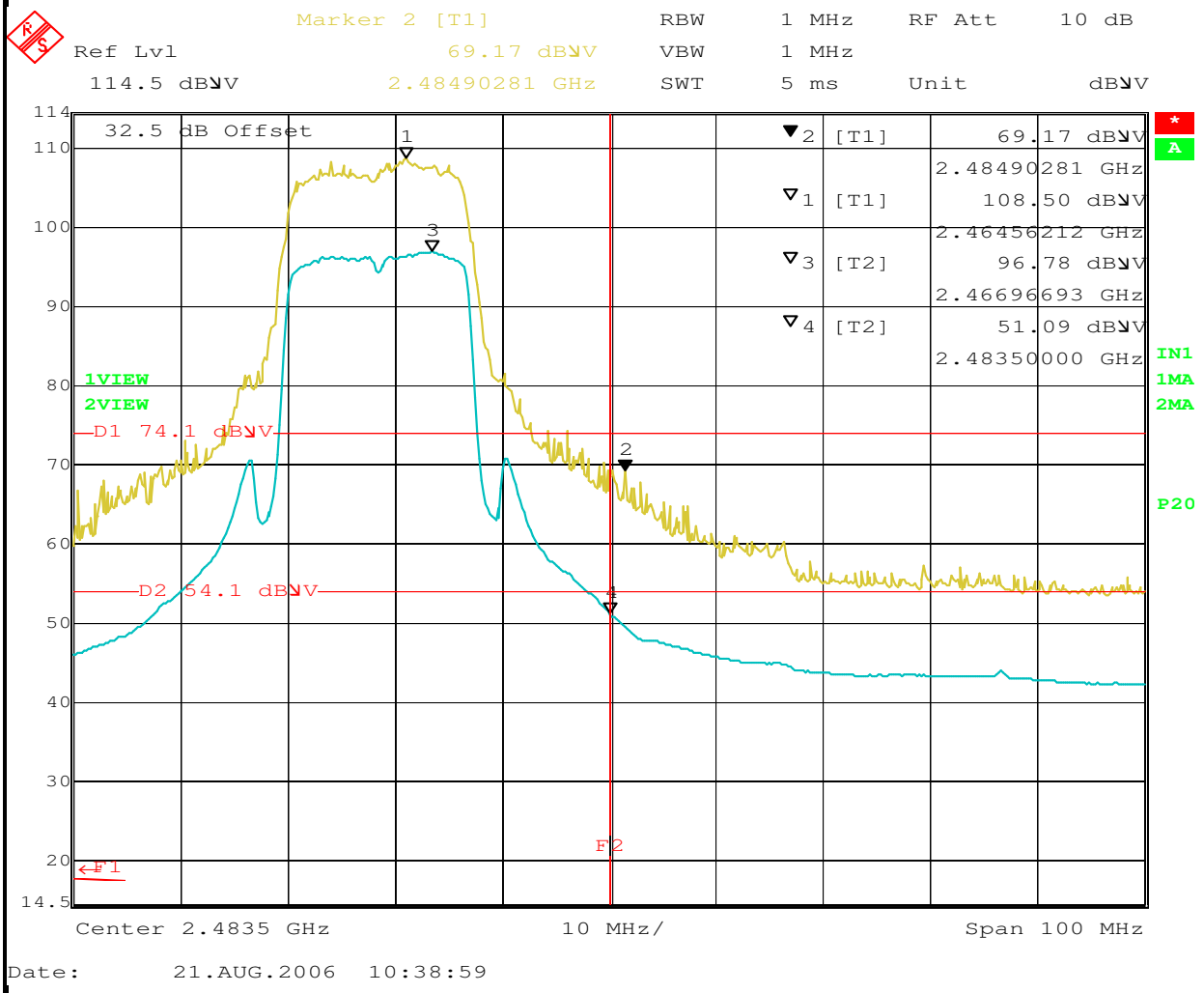
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #3: Low Channel @ 2412 MHz (802.11g), 16.5 dBm



Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

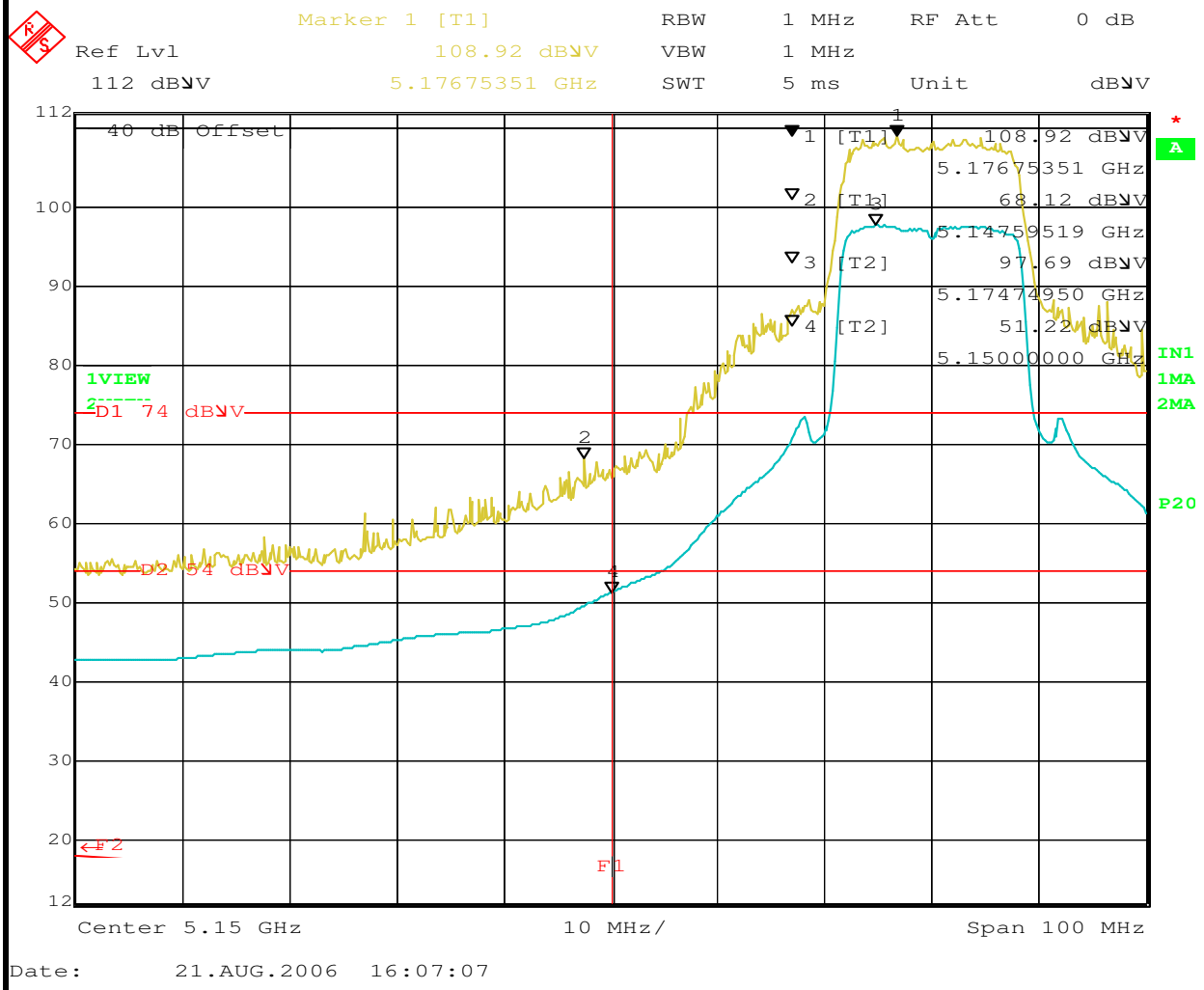
Run #4: High Channel @ 2462 MHz (802.11g), 15.5 dBm



EMC Test Data

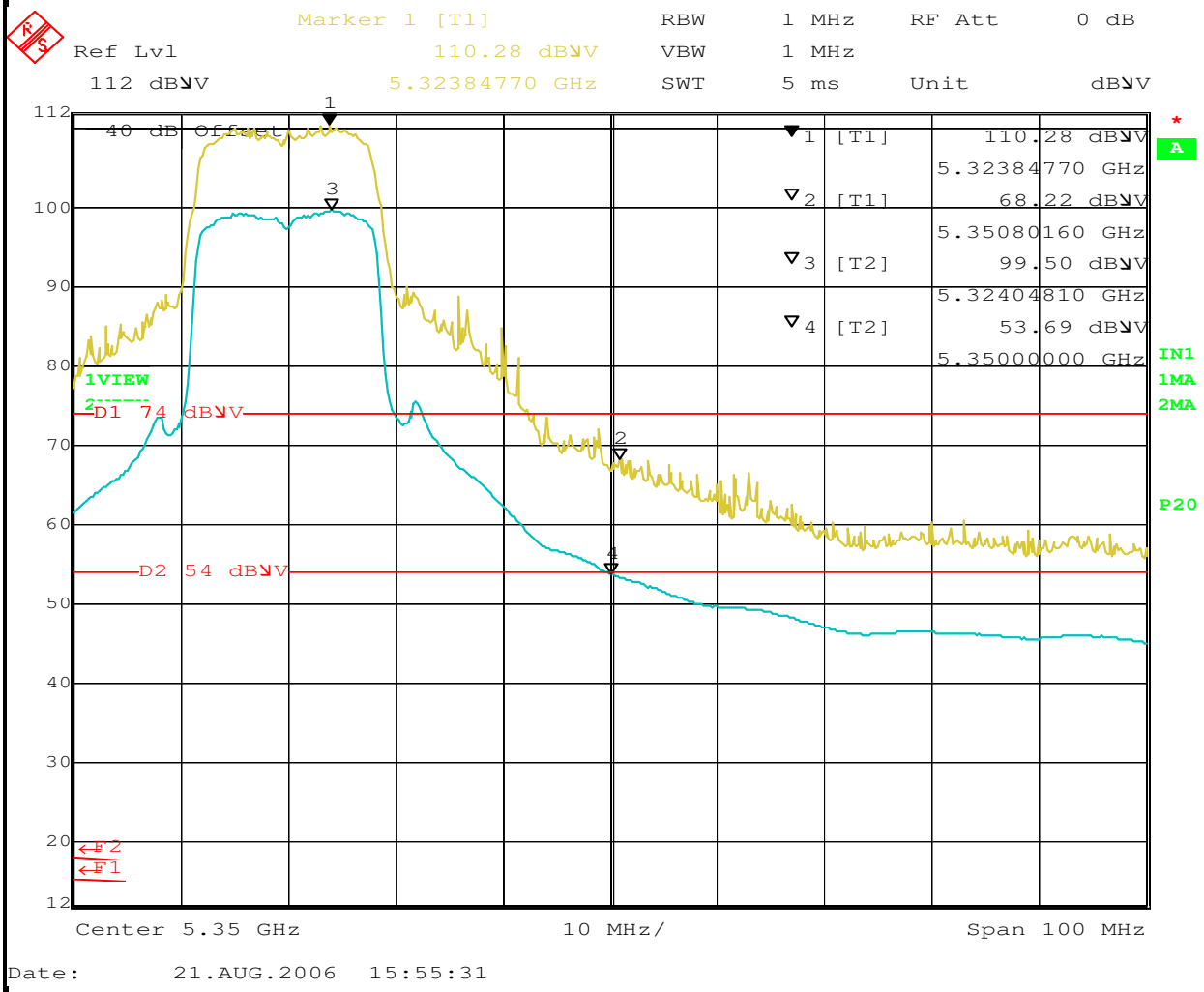
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #5: Channel @ 5180 MHz (802.11a), 15.5 dBm



Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

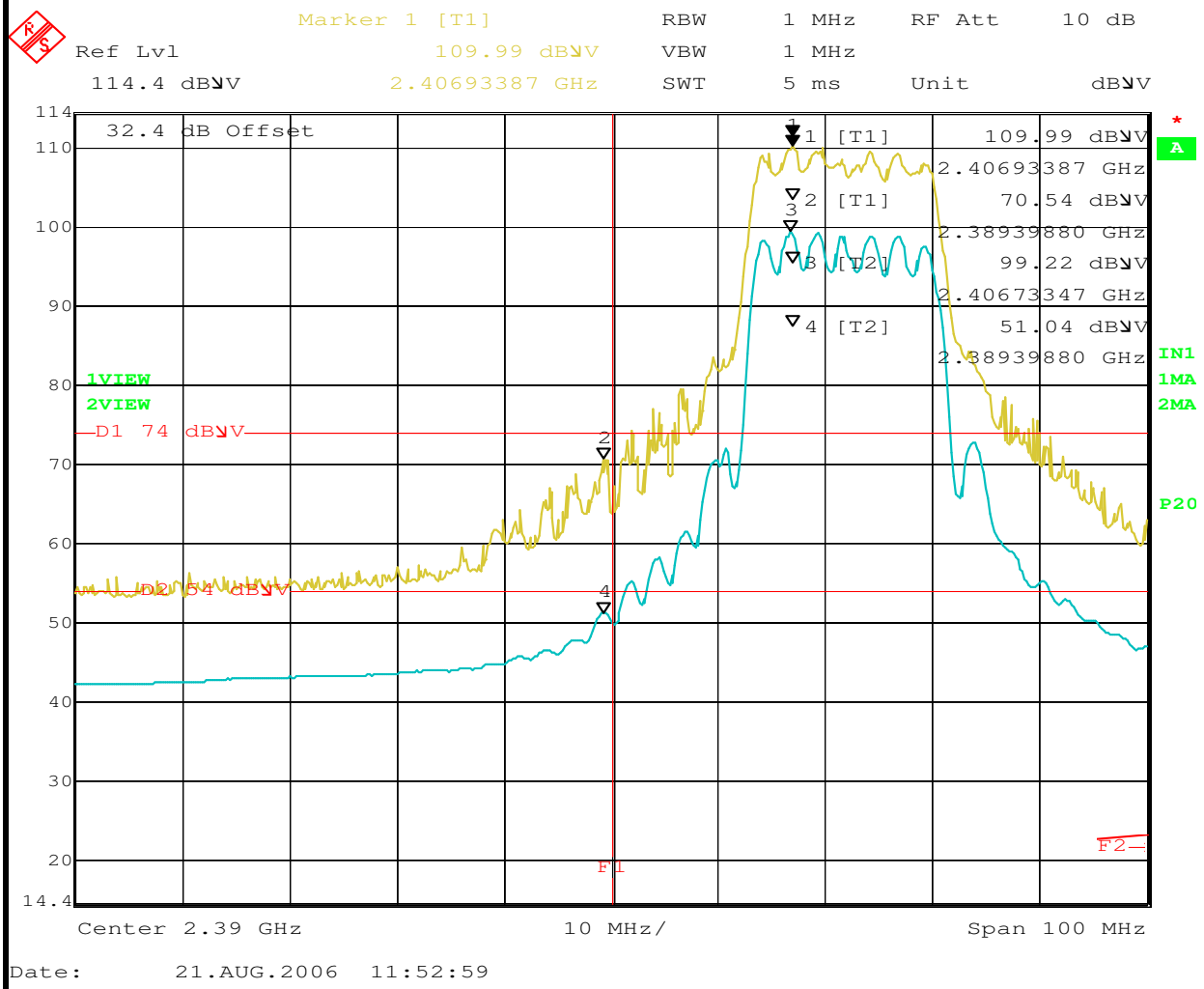
Run #6: Channel @ 5320 MHz (802.11a), 15.5 dBm



EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

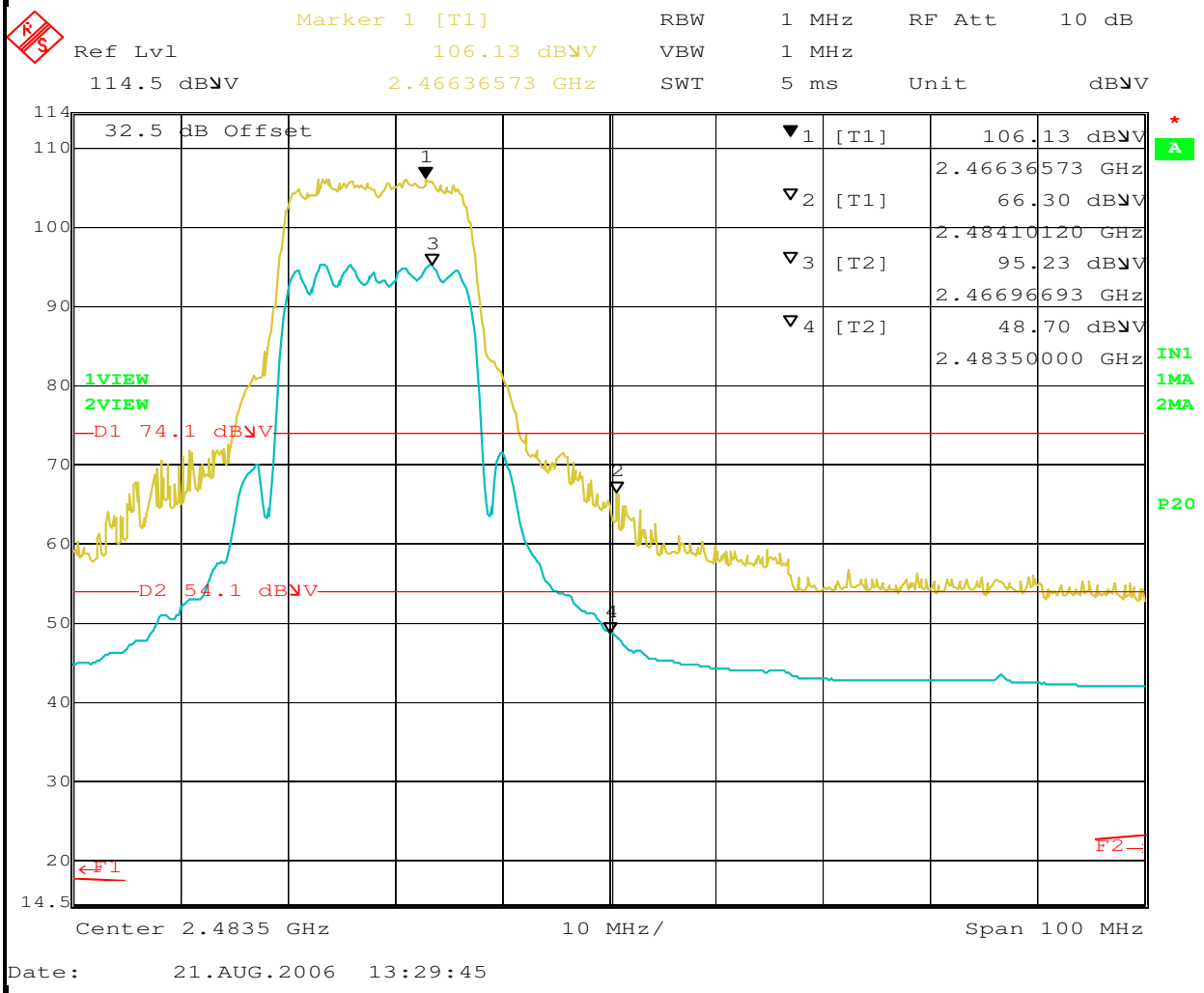
Run #7: Channel @ 2412 MHz (802.11n 20 MHz), 14 dBm



EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

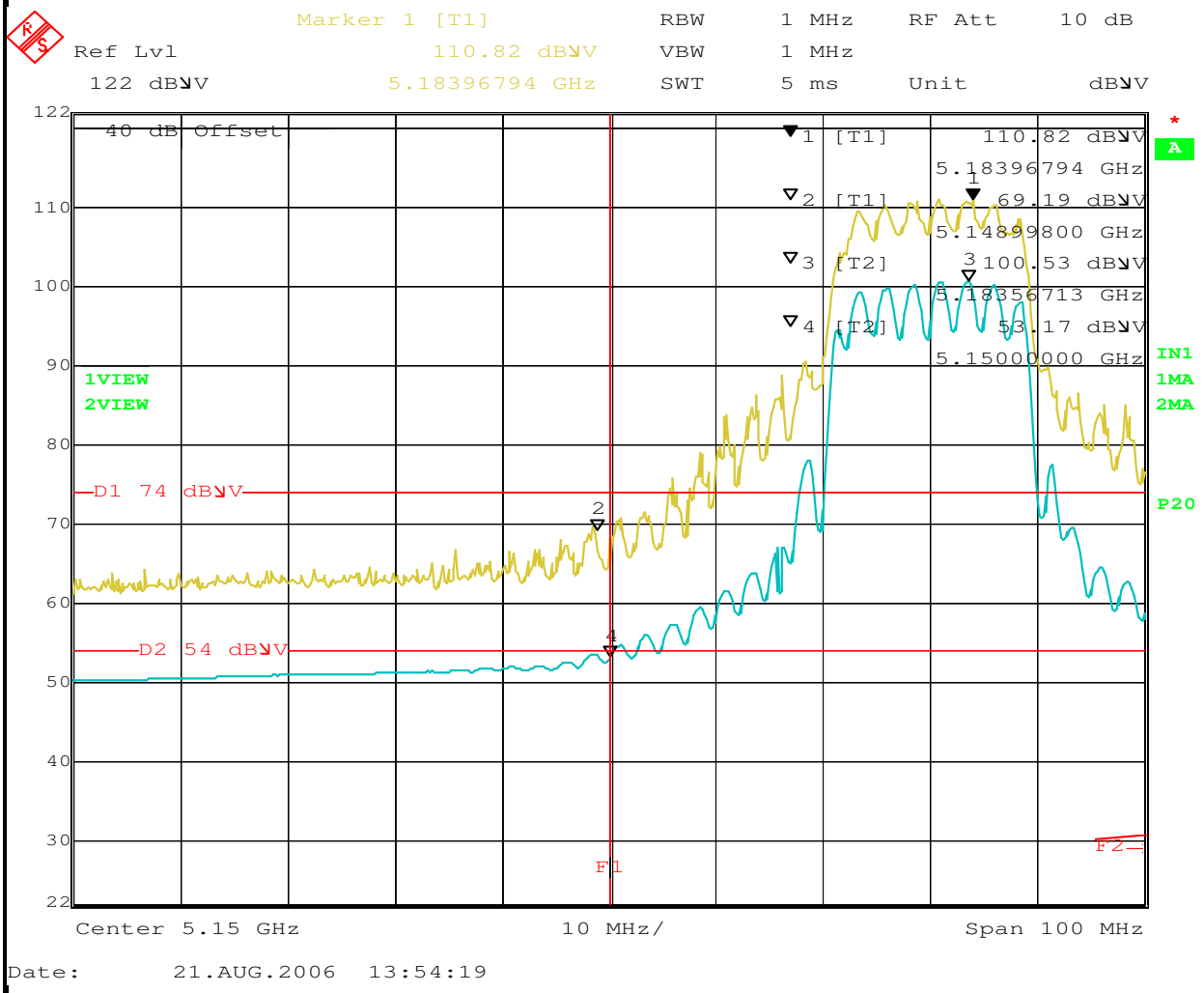
Run #8: Channel @ 2462 MHz (802.11n 20 MHz), 13.5 dBm



EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

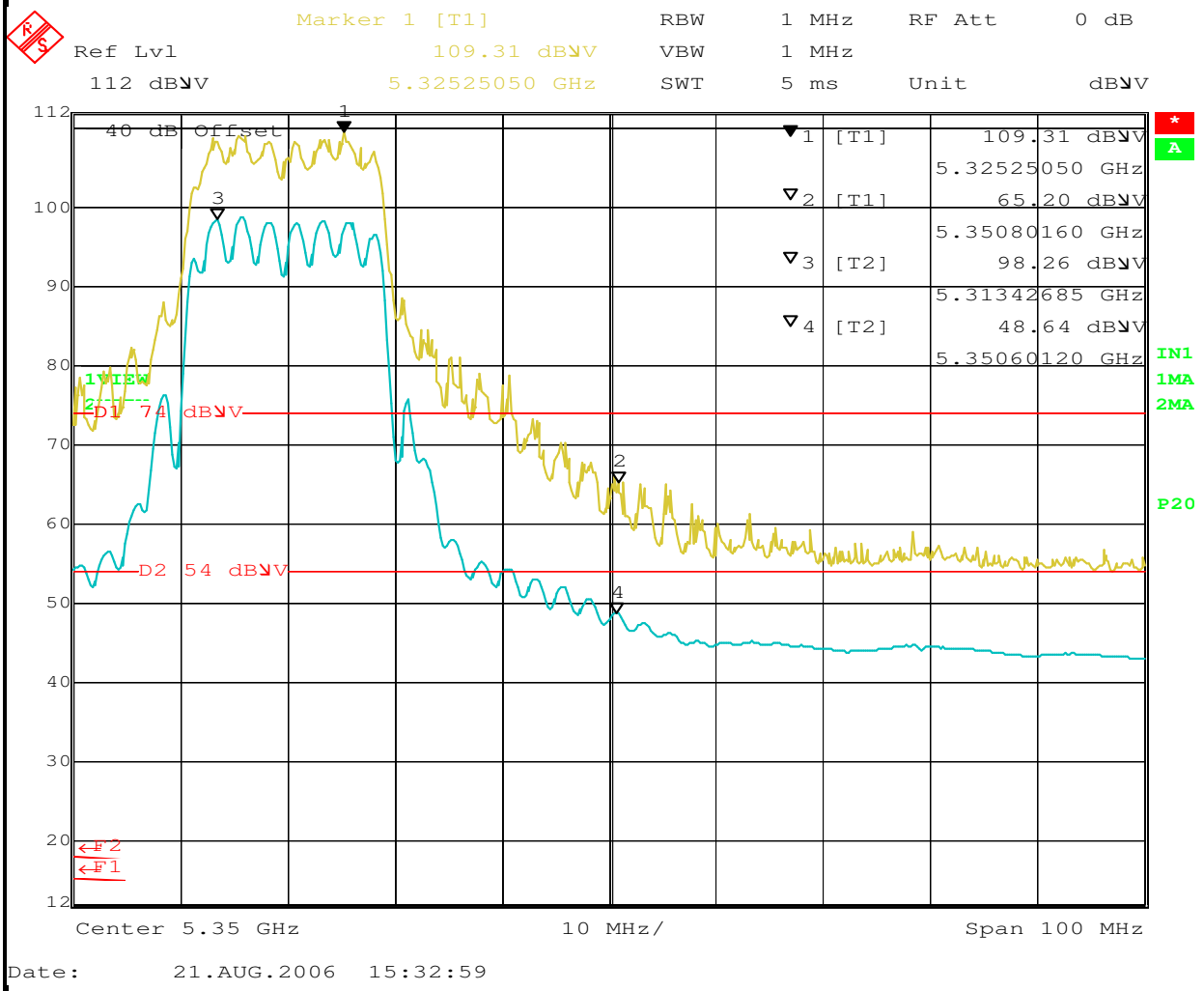
Run #9: Channel @ 5180 MHz (802.11n 20 MHz), 13.5 dBm



Date: 21.AUG.2006 13:54:19

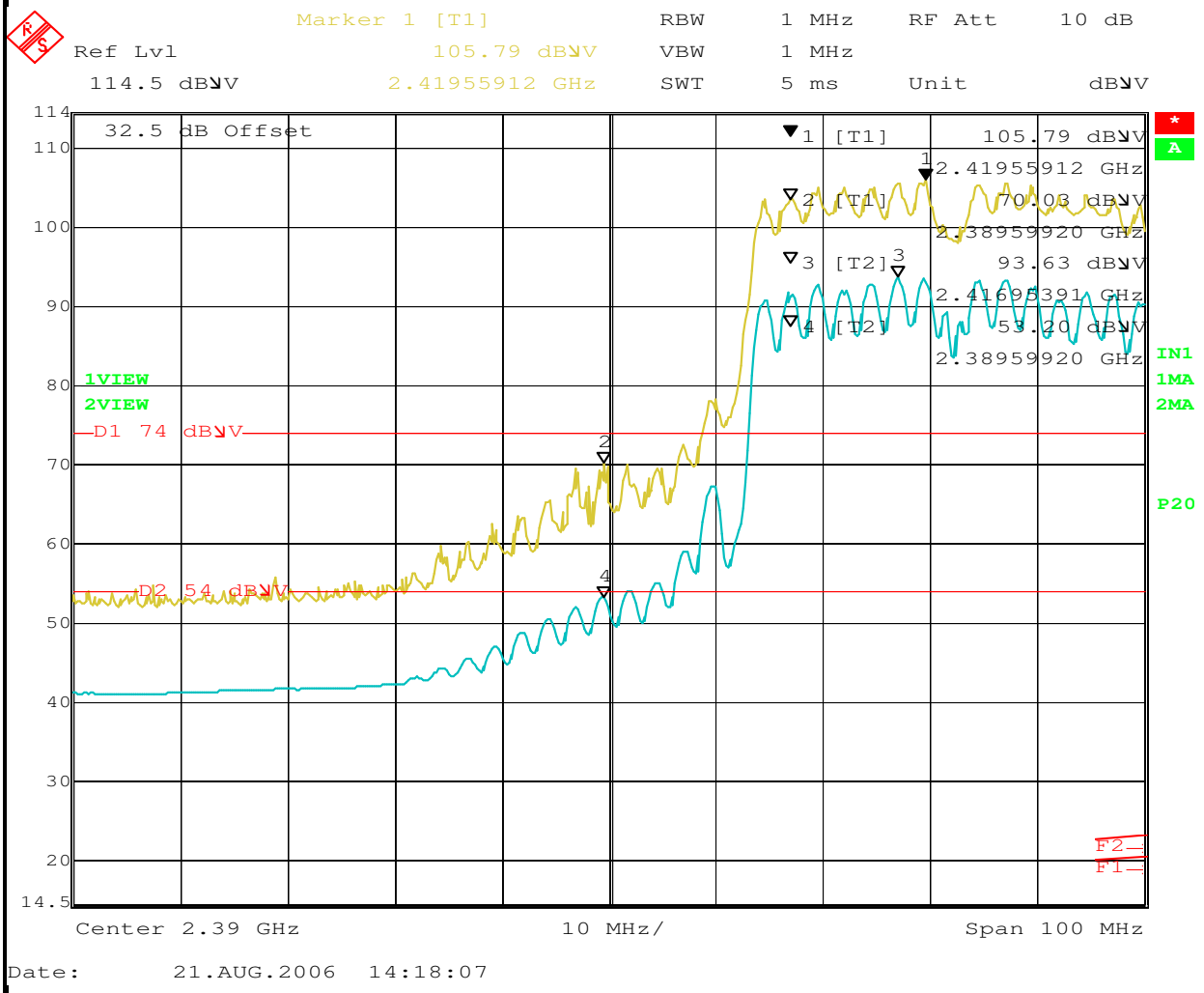
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #10: Channel @ 5320 MHz (802.11n 20 MHz), 13 dBm



Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

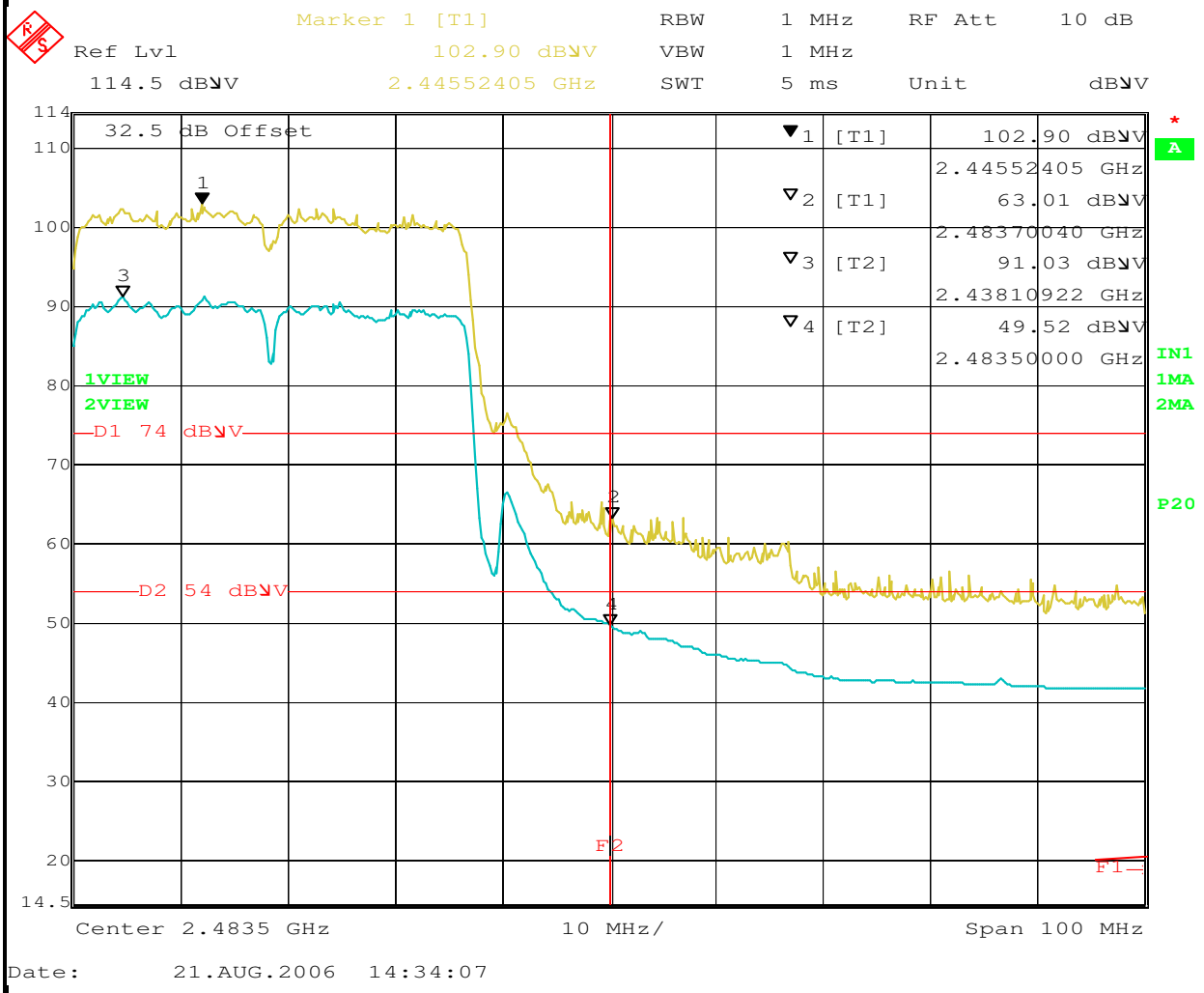
Run #11: Channel @ 2432 MHz (802.11n 40 MHz), 12.5 dBm



EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

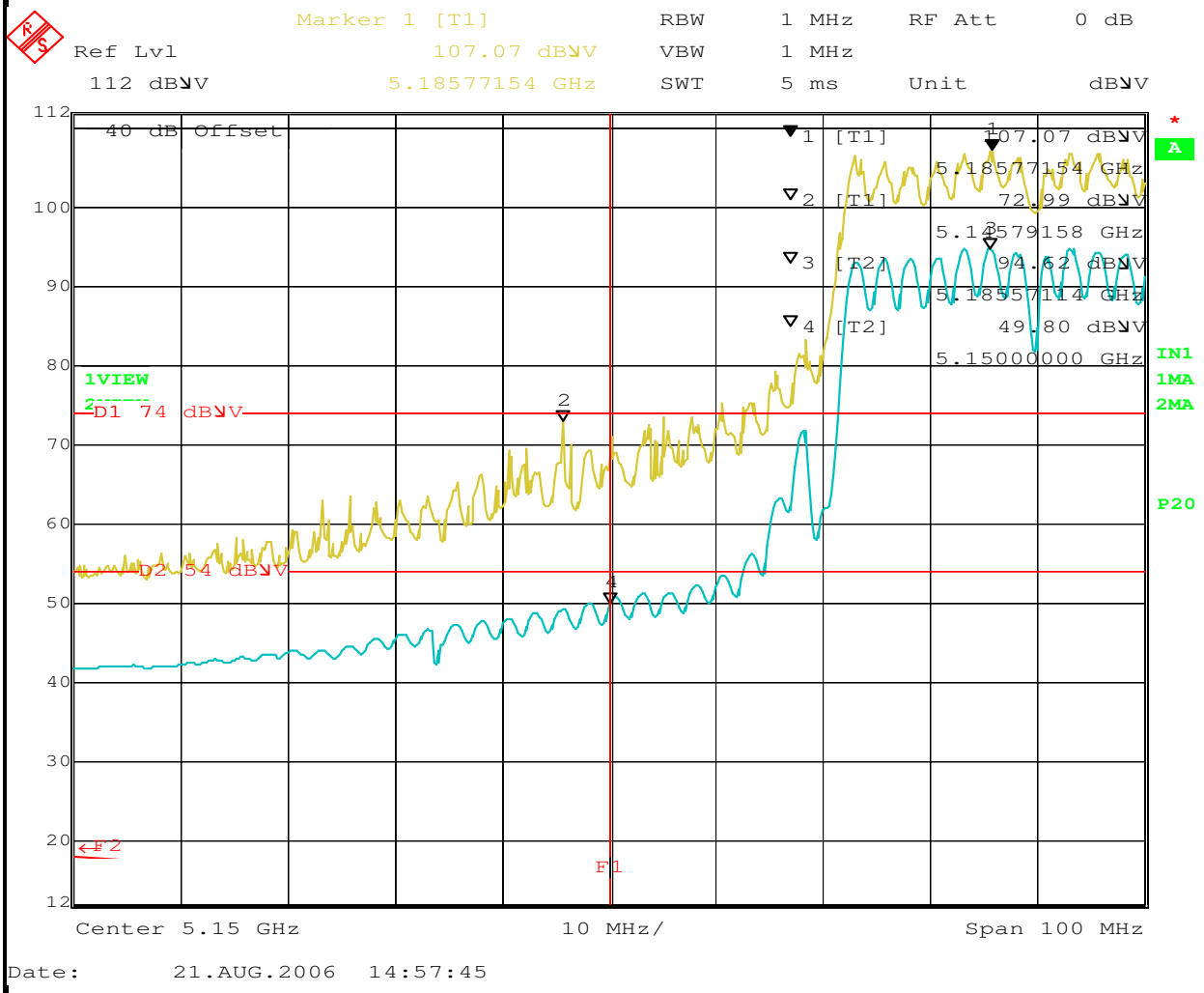
Run #12: Channel @ 2442 MHz (802.11n 40 MHz), 12 dBm



EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

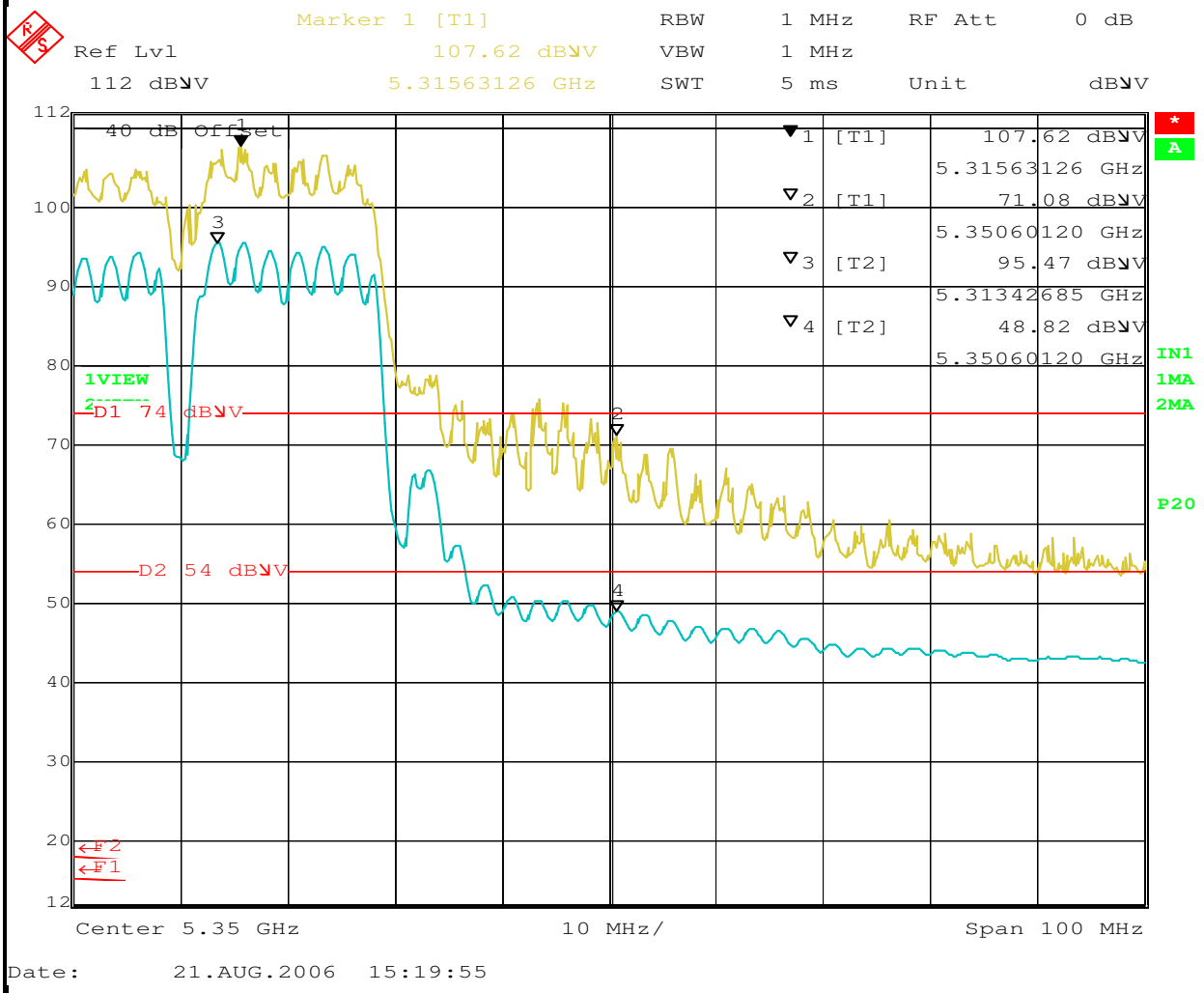
Run #13: Channel @ 5200 MHz (802.11n 40 MHz), 12 dBm



EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #14: Channel @ 5300 MHz (802.11n 40 MHz), 12 dBm



Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

RSS 210 and FCC 15.247 Radiated Spurious 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: 8/17/2006
Test Engineer: Juan Martinez
Test Location: Fremont Chamber #3

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 spurious emissions testing.

For radiated emissions testing the measurement antenna was located 1 meter from the EUT. Readings were exptrapolated to 3 meters by subtractin 9.5 dB.

Ambient Conditions:

Temperature: 18 °C
Rel. Humidity: 45 %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1 (802.11b/g/a Mode)	RE, 4000 - 10,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.247(c)	Pass	53.6dBµV/m (478.6µV/m) @ 11570.9MHz (-0.4dB)
1 (802.11a/n Mode)	RE, 10,000 - 18,000 MHz - Spurious Emissions	FCC Part 15.209 / 15.401	Pass	52.9dBµV/m (441.6µV/m) @ 10359.8MHz (-1.1dB)

Modifications Made During Testing:

No modifications were made to the EUT during testing

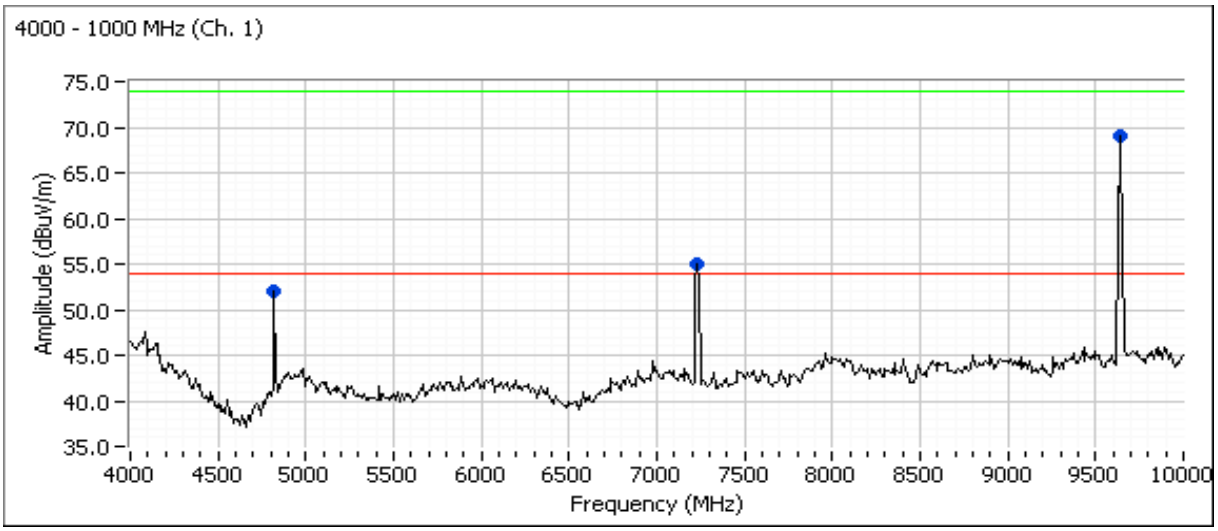
Deviations From The Standard

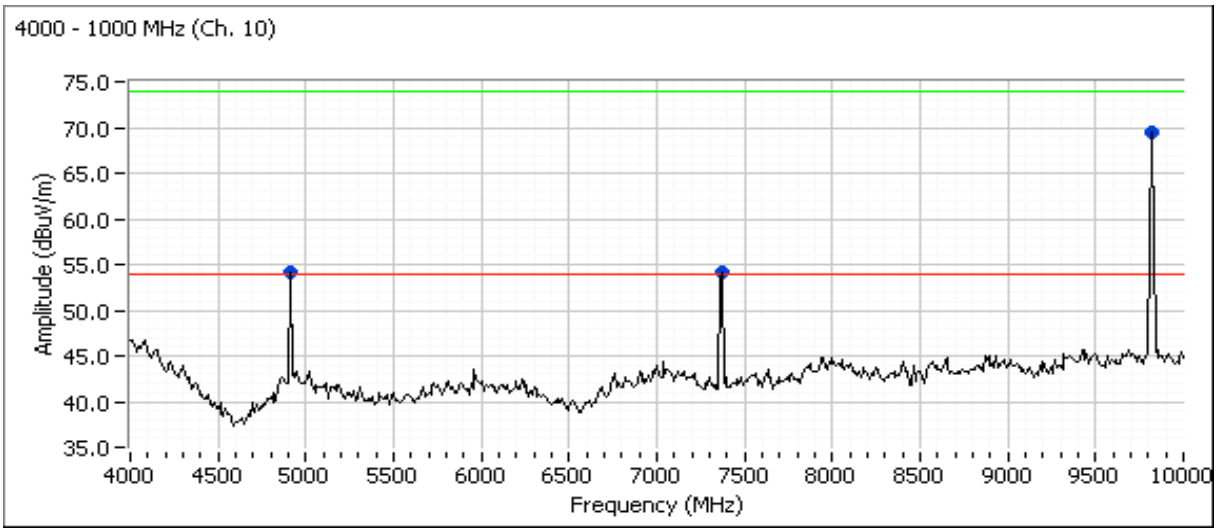
No deviations were made from the requirements of the standard.

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

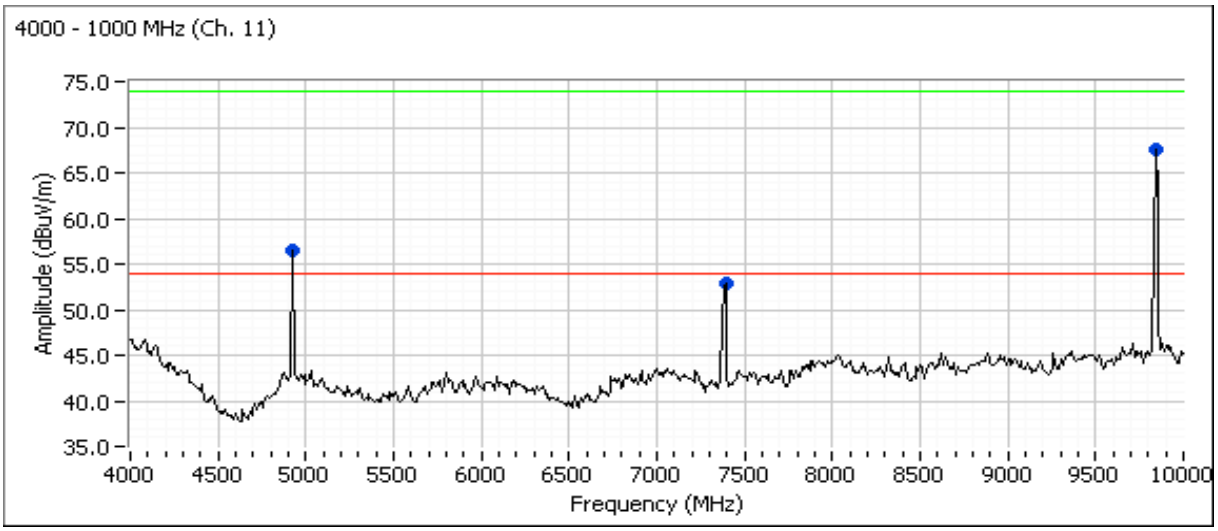
Run #1: Radiated Spurious Emissions, 4000 - 10,000 MHz. Operating Mode: 802.11b

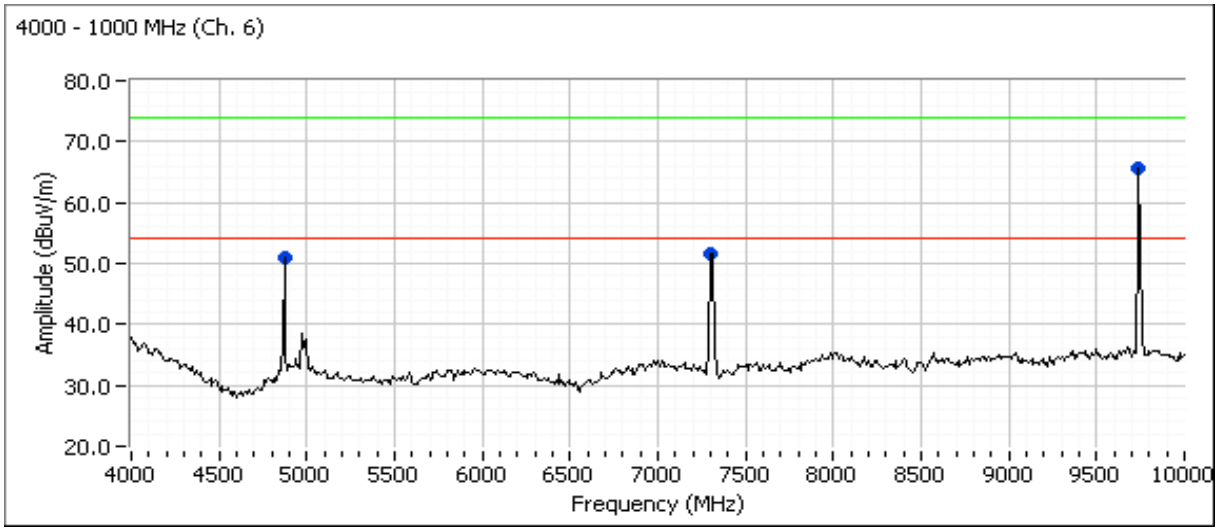
560 A1/A23 802.11b



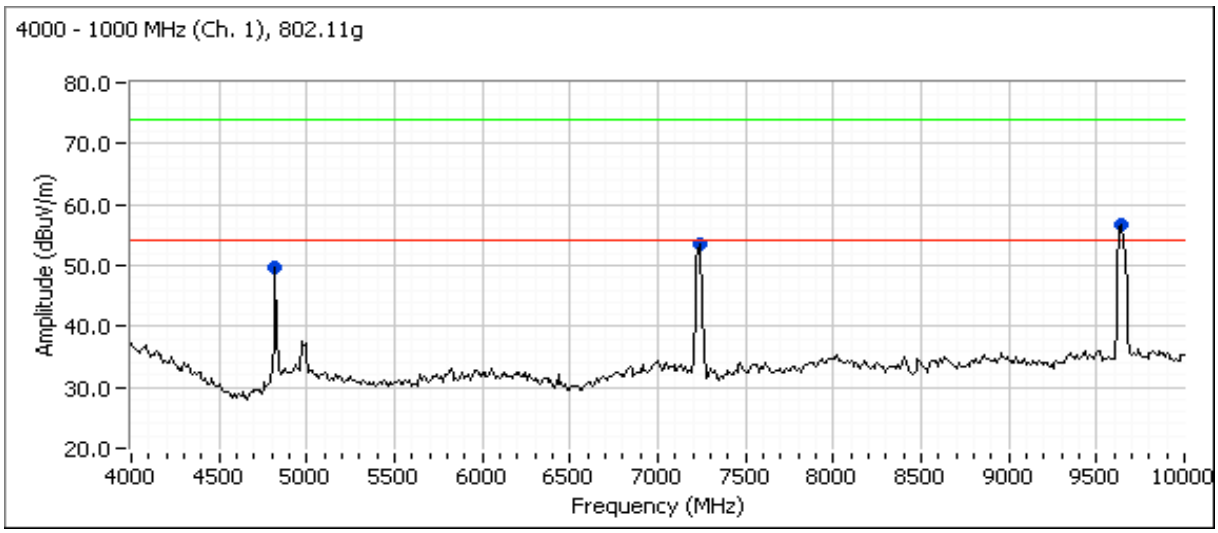


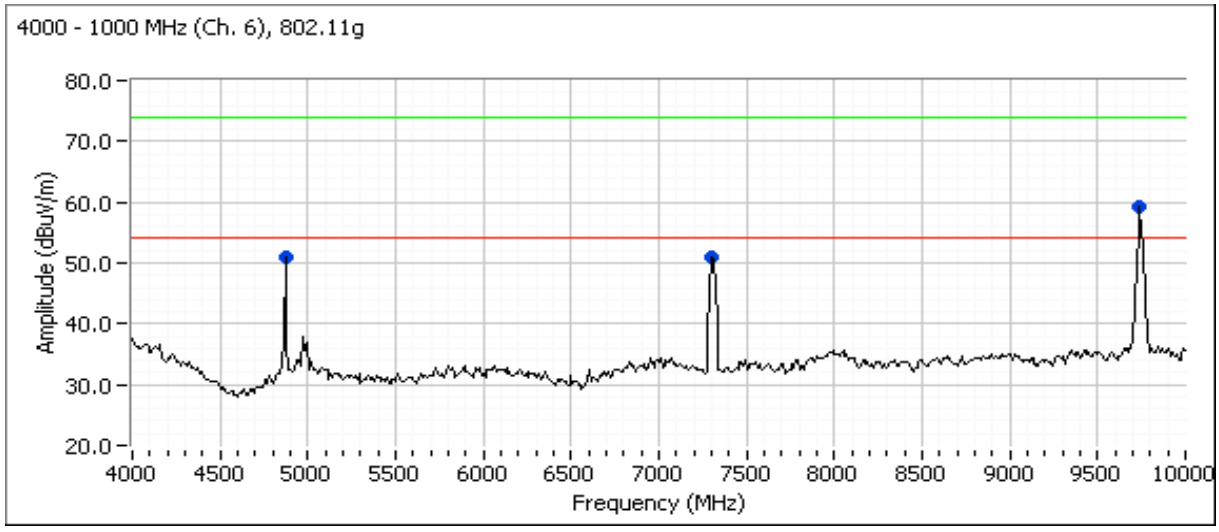
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



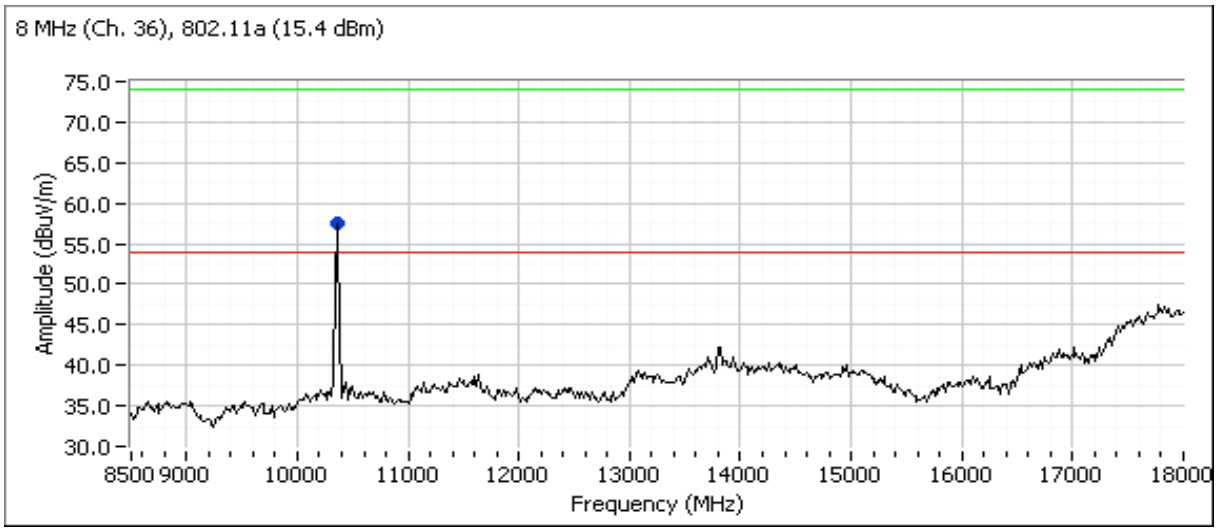


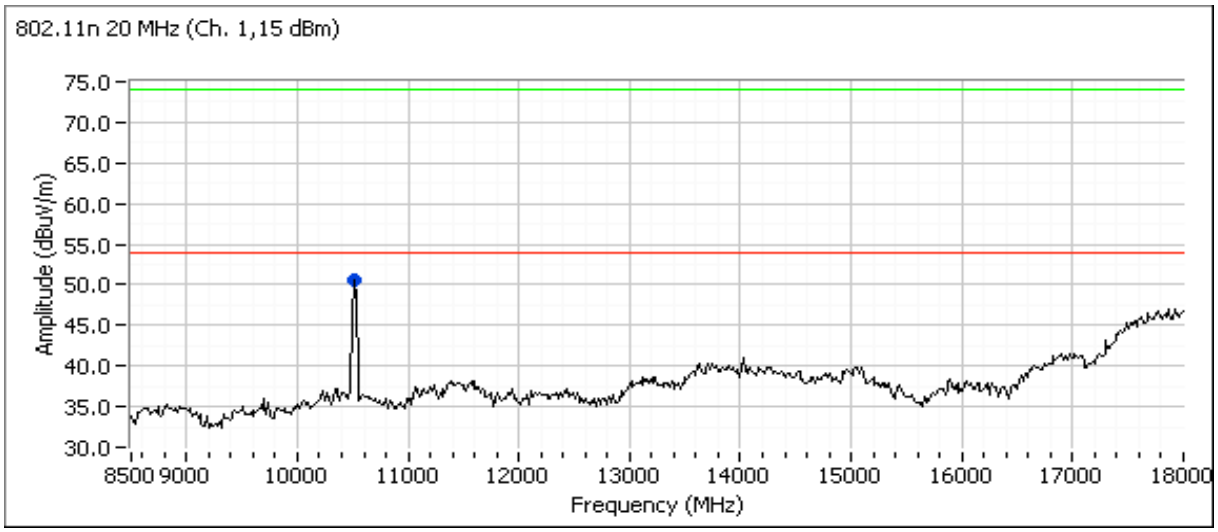
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



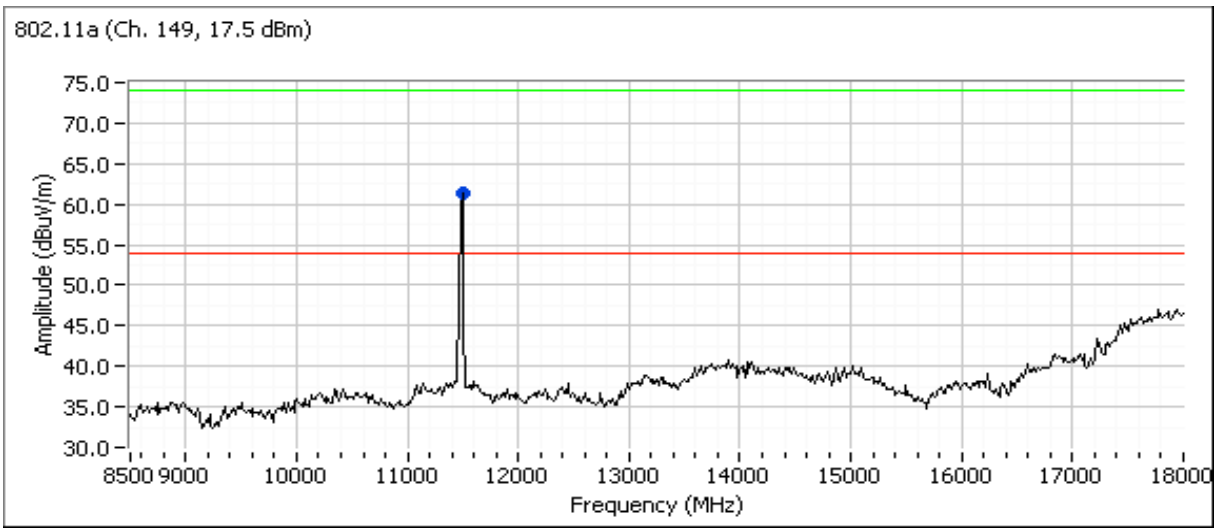


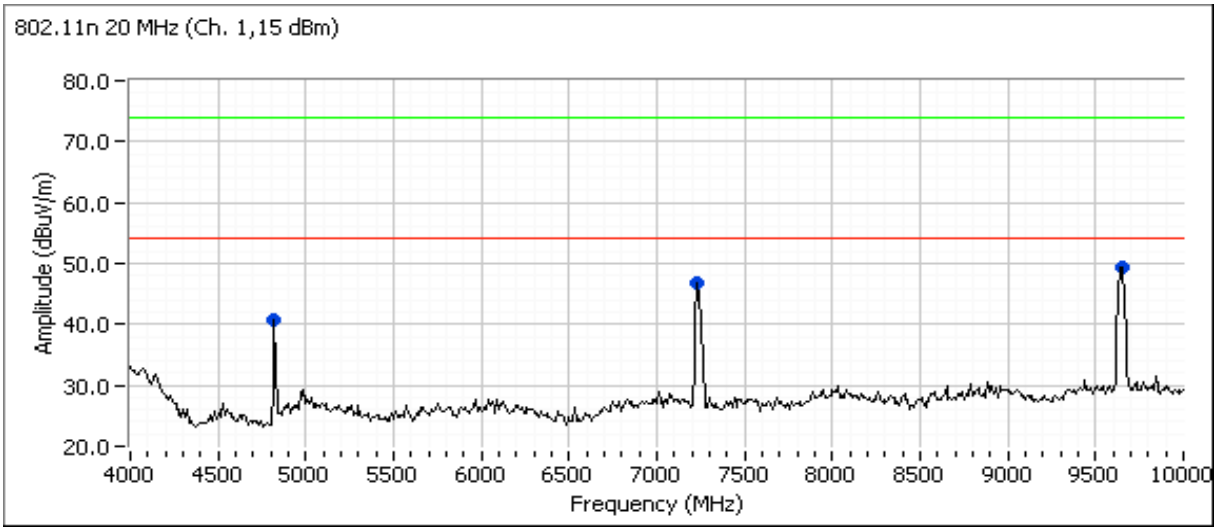
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



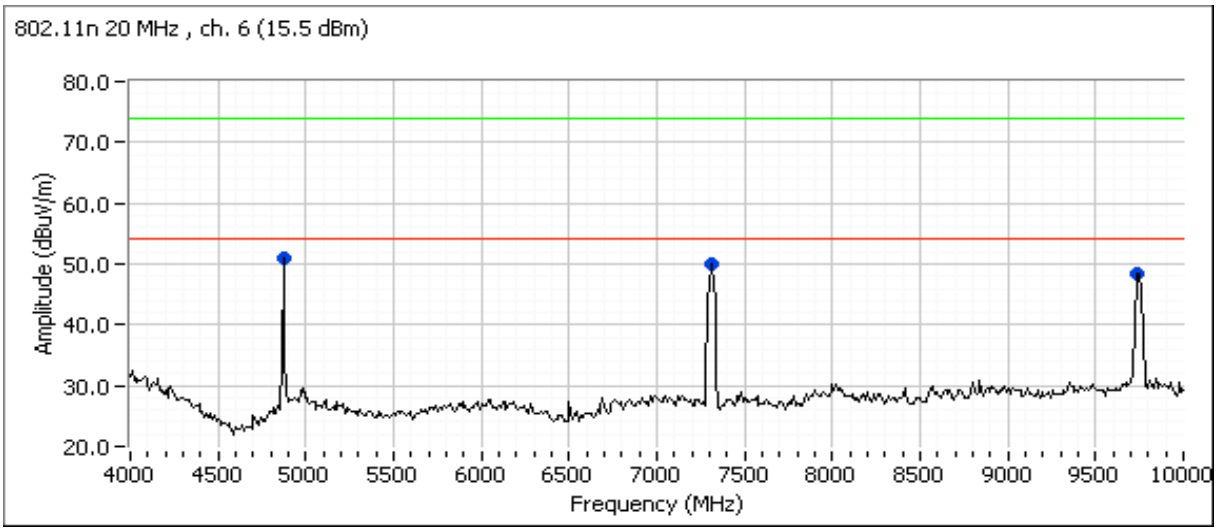


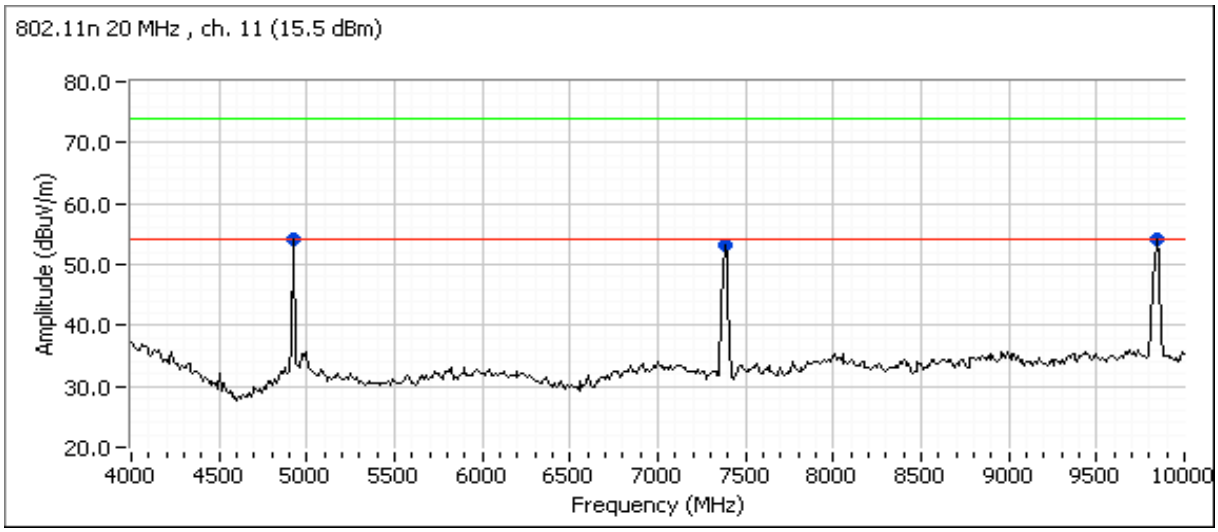
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



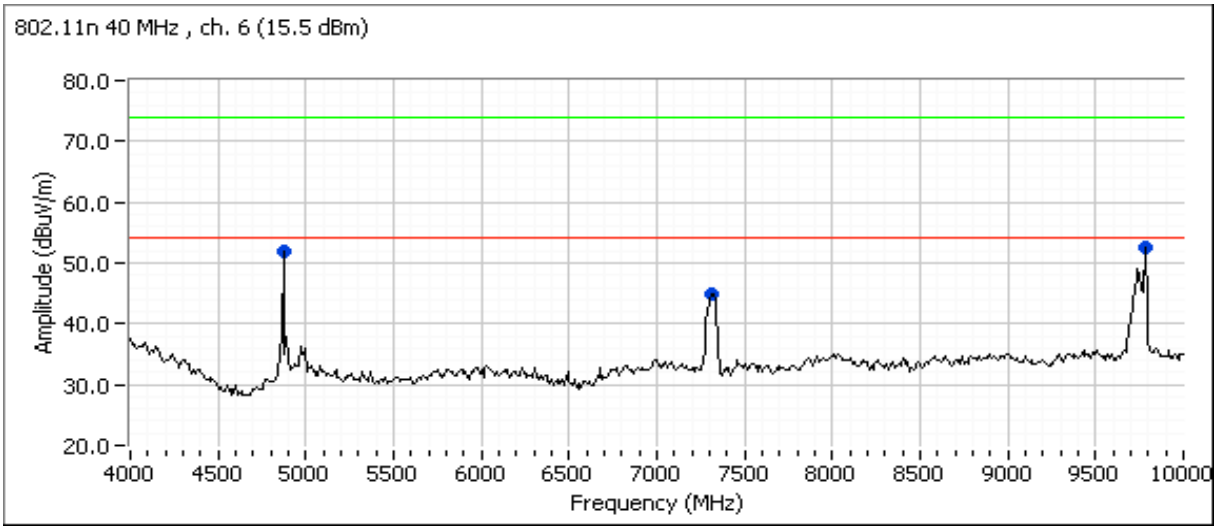


Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A





Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Other Spurious Emissions

Frequency	Level	Pol	15.209 / 15.247		Detector	Azimuth	Height	Comments
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters	
560 B1/A23 802.11b (Ch. 1)								
4824.0000	51.4	H	54.0	-2.6	AVG	282	1.4	taken 8/18 19.2 dBm
4824.0000	53.7	H	74.0	-20.3	PK	282	1.4	taken 8/18 19.2 dBm
7232.8100	53.5	V	54.0	-0.5	AVG	277	1.0	taken 8/18 19.2 dBm
7232.8100	58.4	V	74.0	-15.6	PK	277	1.0	taken 8/18 19.2 dBm
9640.000	69.1	V	84.2	-15.1	Peak	269	1.2	
560 B1/A23 802.11b (Ch. 6)								
7307.8400	50.3	V	54.0	-3.7	AVG	233	1.2	
7307.8400	54.0	V	74.0	-20.0	PK	233	1.2	
4873.9600	51.7	H	54.0	-2.3	AVG	280	1.0	
4873.9600	52.7	H	74.0	-21.3	PK	280	1.0	
9740.000	65.6	V	54.0	11.6	Peak	263	1.0	
560 B1/A23 802.11b (Ch. 11)								
7386.780	51.0	V	54.0	-3.0	AVG	251	1.0	19 dBm
7386.780	56.2	V	74.0	-17.8	PK	251	1.0	19 dBm
9840.000	67.6	V	84.2	-16.6	Peak	272	1.6	
4923.970	53.2	H	54.0	-0.8	AVG	277	1.0	Measured at 1 meter (19 dBm)
4923.970	54.0	H	74.0	-20.0	PK	277	1.0	Measured at 1 meter (19 dBm)
560 B1/A23 (802.11g, Ch. 1) 17.6 dBm								
4823.93	49.5	H	54.0	-4.5	AVG	288	1.0	
4823.93	51.1	H	74.0	-22.9	PK	288	1.0	
7231.31	47.0	V	54.0	-7.0	AVG	241	1.0	
7231.31	59.2	V	74.0	-14.8	PK	241	1.0	
9640.00	56.6	V	84.2	-27.6	Peak	263	1.0	
560 B1/A23 (802.11g, Ch. 6) 17.6 dBm								
7313.73	45.2	V	54.0	-8.8	AVG	234	1.2	
7313.73	57.6	V	74.0	-16.4	PK	234	1.2	
4873.99	51.3	H	54.0	-2.7	AVG	279	1.0	
4873.99	52.5	H	74.0	-21.5	PK	279	1.0	
9740.00	59.1	V	82.7	-23.6	Peak	268	1.8	
560 B1/A23 (802.11g, Ch. 11) 17.6 dBm								
4923.97	53.3	H	54.0	-0.7	AVG	278	1.0	
4923.97	54.4	H	74.0	-19.6	PK	278	1.0	
7380.00	49.9	V	54.0	-4.1	Peak	251	1.2	
9840.00	60.4	V	82.7	-22.3	Peak	285	1.4	
560 B1/A23 (802.11a, Ch. 36)								
10359.75	52.9	V	54.0	-1.1	AVG	263	1.0	
10359.75	71.3	V	74.0	-2.7	PK	263	1.0	

Client:	Broadcom					Job Number:	J64973	
Model:	BCM94321 MC New version					T-Log Number:	T64985	
						Account Manager:	-	
Contact:	David Boldy							
Standard:	FCC 15.247, 15.401, RSS-210					Class:	N/A	

560 B1/A23 (802.11a, Ch. 52)								
10520.15	45.3	V	54.0	-8.7	AVG	257	1.0	
10520.15	62.5	V	74.0	-11.5	PK	257	1.0	
560 B1/A23 (802.11a, Ch. 62)								
10641.83	47.8	V	54.0	-6.2	AVG	252	1.1	
10641.83	64.9	V	74.0	-9.1	PK	252	1.1	
560 B1/A23 (802.11a, Ch.149) 17.5								
11490.25	53.5	V	54.0	-0.5	AVG	254	1.2	
11490.25	68.0	V	74.0	-6.0	PK	254	1.2	
560 B1/A23 (802.11a, Ch.157) 17.5								
11570.92	53.6	V	54.0	-0.4	AVG	313	1.0	
11570.92	67.9	V	74.0	-6.1	PK	313	1.0	
560 B1/A23 (802.11a, Ch.165) 17.5								
11649.38	51.0	V	54.0	-3.0	AVG	255	1.0	
11649.38	65.3	V	74.0	-8.7	PK	255	1.0	
560 B1/A23 (802.11n 20 MHz, Ch.1) 15.5								
4823.99	41.1	V	54.0	-12.9	AVG	43	1.0	
4823.99	46.6	V	74.0	-27.4	PK	43	1.0	
7233.99	44.1	V	54.0	-9.9	AVG	249	1.0	
7233.99	58.6	V	74.0	-15.4	PK	249	1.0	
560 B1/A23 (802.11n 20 MHz, Ch.6) 15.5								
4873.98	51.1	H	54.0	-2.9	AVG	283	1.0	
4873.98	52.8	H	74.0	-21.2	PK	283	1.0	
7308.89	49.0	V	54.0	-5.0	AVG	232	1.0	
7308.89	61.2	V	74.0	-12.8	PK	232	1.0	
9740.00	48.4	V	80.7	-32.3	Peak	270	1.0	
560 B1/A23 (802.11n 20 MHz, Ch.11) 15.5								
4923.96	53.3	H	54.0	-0.7	AVG	276	1.0	
4923.96	54.2	H	74.0	-19.8	PK	276	1.0	
7382.83	45.4	V	54.0	-8.6	AVG	240	1.0	
7382.83	57.8	V	74.0	-16.2	PK	240	1.0	
560 B1/A23 (802.11n 20 MHz, Ch.36) 16								
10360.32	55.1	V	68.2	-13.1	AVG	274	1.0	Non-Restricted
560 B1/A23 (802.11n 20 MHz, Ch.52) 15								
10514.91	48.1	V	54.0	-5.9	AVG	254	1.0	
10514.91	65.6	V	74.0	-8.4	PK	254	1.0	
560 B1/A23 (802.11n 20 MHz, Ch.64) 16								
10639.92	52.3	V	54.0	-1.7	AVG	252	1.0	
10639.92	67.6	V	74.0	-6.4	PK	252	1.0	
560 B1/A23 (802.11n 20 MHz, Ch.149) 15								
11489.84	47.8	V	54.0	-6.2	AVG	310	1.0	

Client:	Broadcom						Job Number:	J64973
Model:	BCM94321 MC New version						T-Log Number:	T64985
							Account Manager:	-
Contact:	David Boldy							
Standard:	FCC 15.247, 15.401, RSS-210						Class:	N/A

11489.84	61.2	V	74.0	-12.8	PK	310	1.0	
560 B1/A23 (802.11n 20 MHz, Ch.157) 15								
11569.66	47.0	V	54.0	-7.0	AVG	310	1.2	
11569.66	60.7	V	74.0	-13.3	PK	310	1.2	
560 B1/A23 (802.11n 20 MHz, Ch.165) 15								
11650.08	47.6	V	54.0	-6.4	AVG	254	1.0	
11650.08	60.5	V	74.0	-13.5	PK	254	1.0	
560 B1/A23 (802.11n 40 MHz, Ch.38) 15.5								
10384.27	50.2	V	54.0	-3.8	AVG	256	1.0	
10384.27	65.1	V	74.0	-8.9	PK	256	1.0	
560 B1/A23 (802.11n 40 MHz, Ch.54) 15.5								
10539.90	46.5	V	54.0	-7.5	AVG	236	1.2	
10539.90	49.3	V	74.0	-24.7	PK	236	1.2	
560 B1/A23 (802.11n 40 MHz, Ch.62) 15.5								
10620.17	45.5	V	54.0	-8.5	AVG	256	1.6	
10620.17	53.0	V	74.0	-21.0	PK	256	1.6	
560 B1/A23 (802.11n 40 MHz, Ch.3) 13								
4844.00	49.4	H	54.0	-4.6	AVG	277	1.0	
4844.00	50.8	H	74.0	-23.2	PK	277	1.0	
7265.29	38.2	V	54.0	-15.8	AVG	222	1.0	
7265.29	50.9	V	74.0	-23.1	PK	222	1.0	
9720.00	56.2	H	78.2	-22.0	Peak	238	1.2	
560 B1/A23 (802.11n 40 MHz, Ch.6) 13								
7339.61	36.5	V	54.0	-17.5	AVG	310	1.0	
7339.61	48.9	V	74.0	-25.1	PK	310	1.0	
4873.94	51.9	H	54.0	-2.1	AVG	281	1.0	
4873.94	53.1	H	74.0	-20.9	PK	281	1.0	
9780.00	52.5	V	78.2	-25.7	Peak	275	1.4	
560 B1/A23 (802.11n 40 MHz, Ch.9) 13								
7382.53	36.3	H	54.0	-17.7	AVG	170	1.0	
7382.53	48.2	H	74.0	-25.8	PK	170	1.0	
4903.98	51.7	H	54.0	-2.3	AVG	275	1.0	
4903.98	52.8	H	74.0	-21.2	PK	275	1.0	
9840.00	56.4	V	78.2	-21.8	Peak	259	1.4	
560 B1/A23 (802.11n 40 MHz, Ch.151) 15								
11509.94	50.0	H	54.0	-4.0	AVG	215	1.0	
11509.94	57.2	H	74.0	-16.8	PK	215	1.0	
560 B1/A23 (802.11n 40 MHz, Ch.159) 15								
11589.86	44.7	H	54.0	-9.3	AVG	289	1.2	
11589.86	56.4	H	74.0	-17.6	PK	289	1.2	

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Note 1:	For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the limit was set 30dB below the level of the fundamental and measured in 100kHz.
Note 2:	Signal is not in a restricted band but the more stringent restricted band limit was used.
Note 3:	No other harmonic emissions detected after the 3rd harmonic for 2.4GHz and after the 2nd harmonic for 5GHz.

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

FCC Part 15 Subpart E Tests

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: 8/15/2006 8:47
Test Engineer: Juan Martinez
Test Location: Fremont Chamber #4

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 standard(s)trum 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: - °C
Rel. Humidity: - %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5150 - 5350MHz	15.407(a) (1), (2)	Pass	15.9dBm
1	PSD, 5150 - 5250MHz	15.407(a) (1), (2)	Pass	2.6dBm/MHz
1	PSD, 5250 - 5350MHz	15.407(a) (1), (2)	Pass	4.5dBm/MHz
1	26dB Bandwidth	15.407	-	> 20 MHz
1	99% Bandwidth	RSS 210	-	17.6 MHz
2	Peak Excursion Envelope	15.407(a) (6)	Pass	11.2dB
3	Antenna Conducted - Out of Band Spurious	15.407(b)	Pass	All emissions below the -27dBm/MHz eirp limit

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:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #1: Bandwidth, Output Power and Power spectral Density

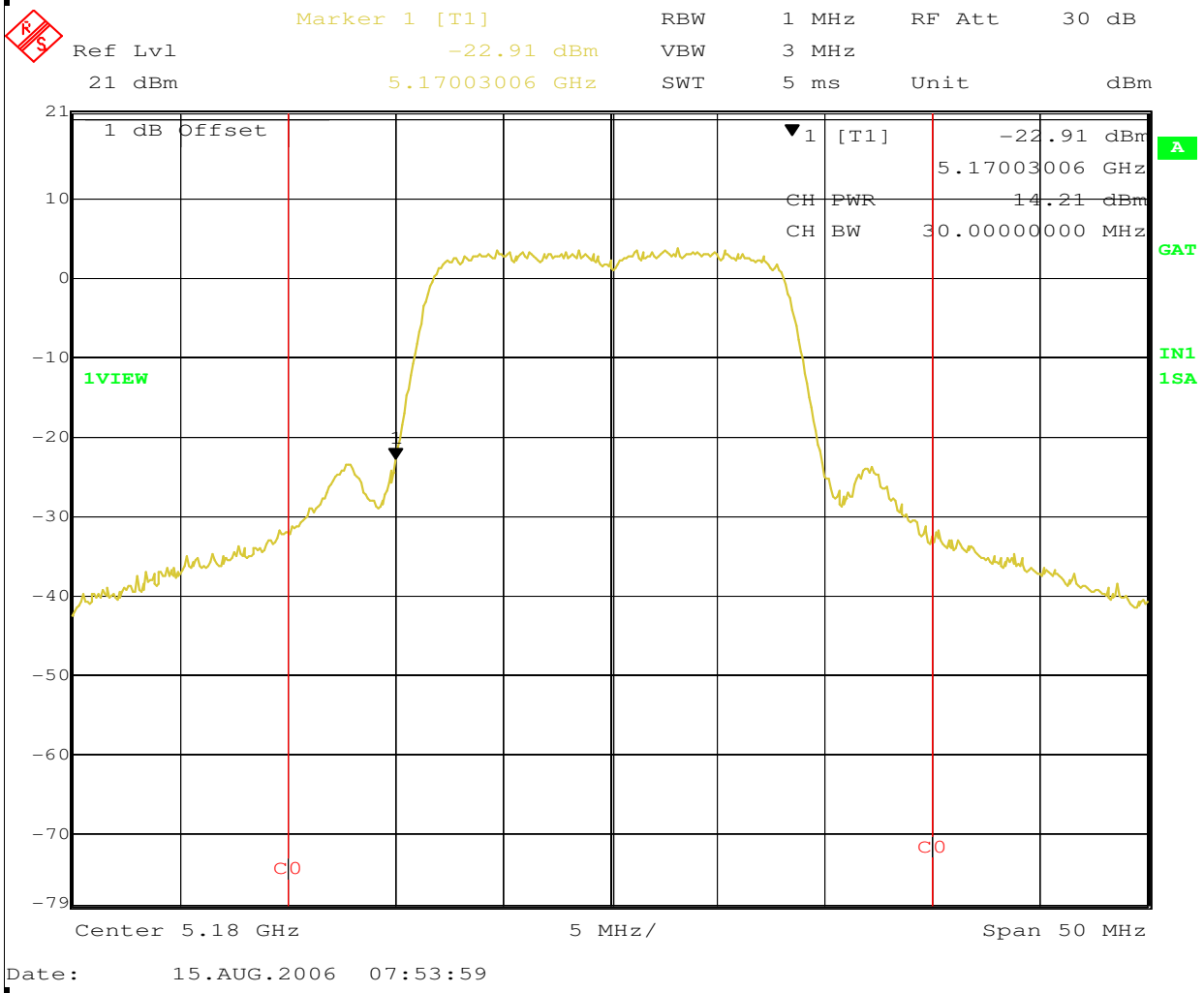
Antenna Gain: 7.44 dBi

Frequency (MHz)	Software Setting	Bandwidth		Output Power[1] dBm		Power (Watts)	PSD[2] dBm/MHz			Result
		26dB	99%[4]	Measured	Limit		Measured	FCC Limit	RSS Limit[3]	
5180	-	28.2	17.5	14.2	15.5	0.026	2.6	2.6	4.8	Pass
5260	-	34.7	17.6	15.6	22.5	0.036	4.4	9.6	6.1	Pass
5320	-	32.8	17.3	15.9	22.5	0.039	4.5	9.6	6.5	Pass

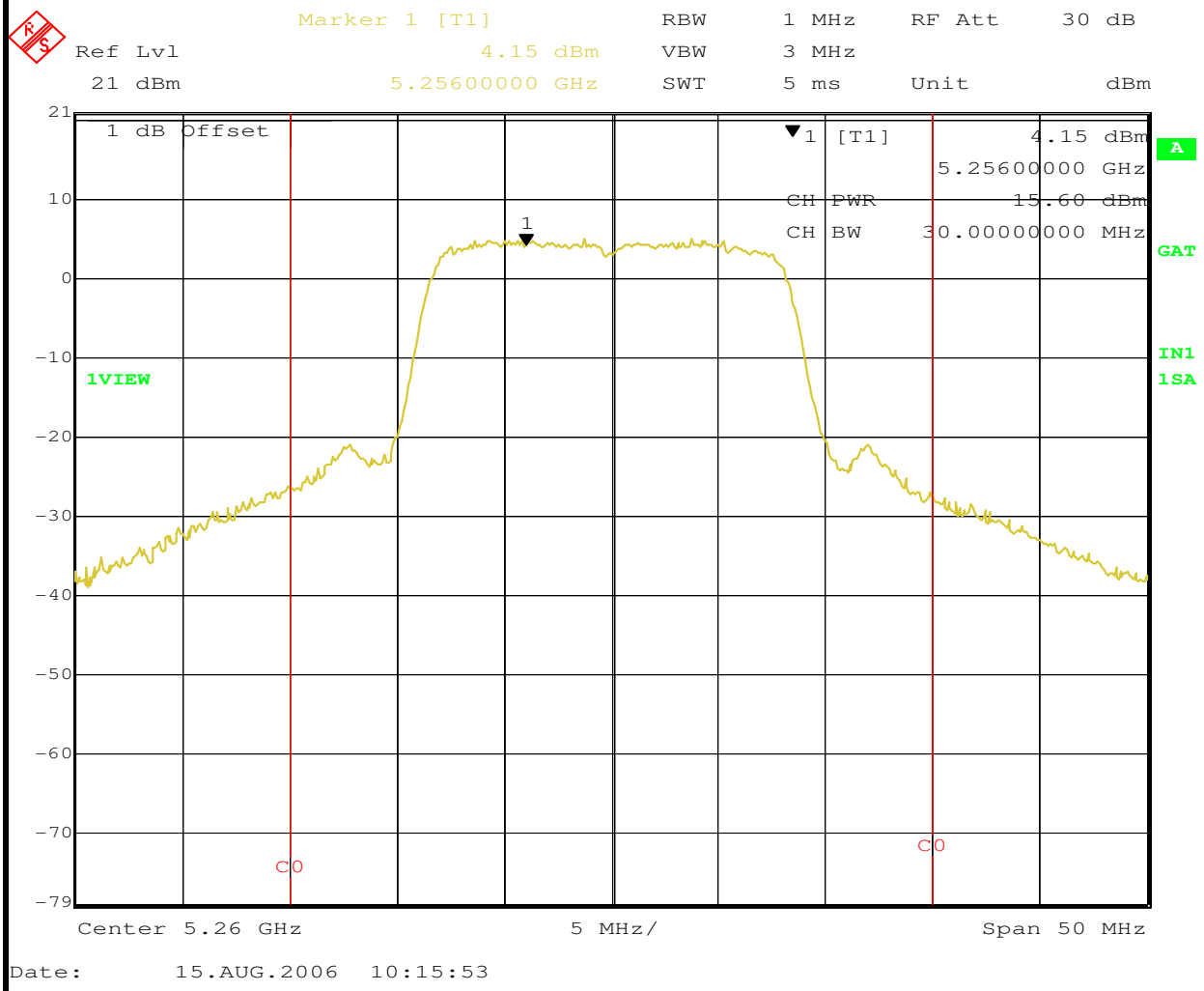
Note 1:	Output power measured using a spectrum analyzer (see plots below): RBW=1MHz, VB=3 MHz, sample detector, power averaging on (transmitted signal was not continuous but the ESI analyzer was configured with a gated sweep such that the analyzer was only sweeping when the device was transmitting) and power integration over 30 MHz The output power limit is (Refer to table above)
Note 2:	Measured using the same analyzer settings used for output power.
Note 3:	For RSS210 the measured value of the PSD (see note 3) must not exceed the average value (calculated from the measured power divided by the measured 99% bandwidth) by more than 3dB.
Note 4:	99% Bandwidth measured in accordance with RSS GEN - RB > 1% of span and VB >=3xRB

EMC Test Data

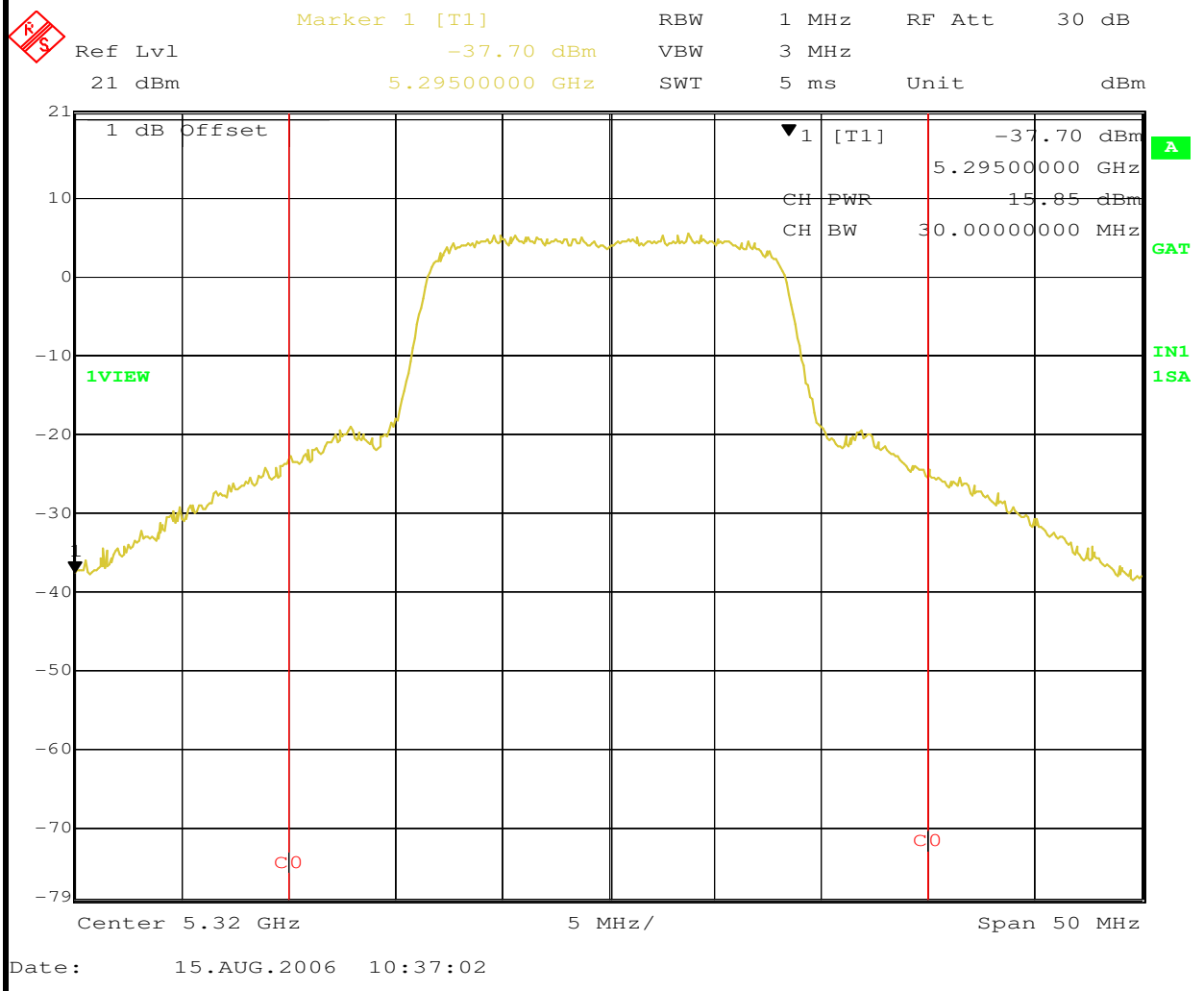
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



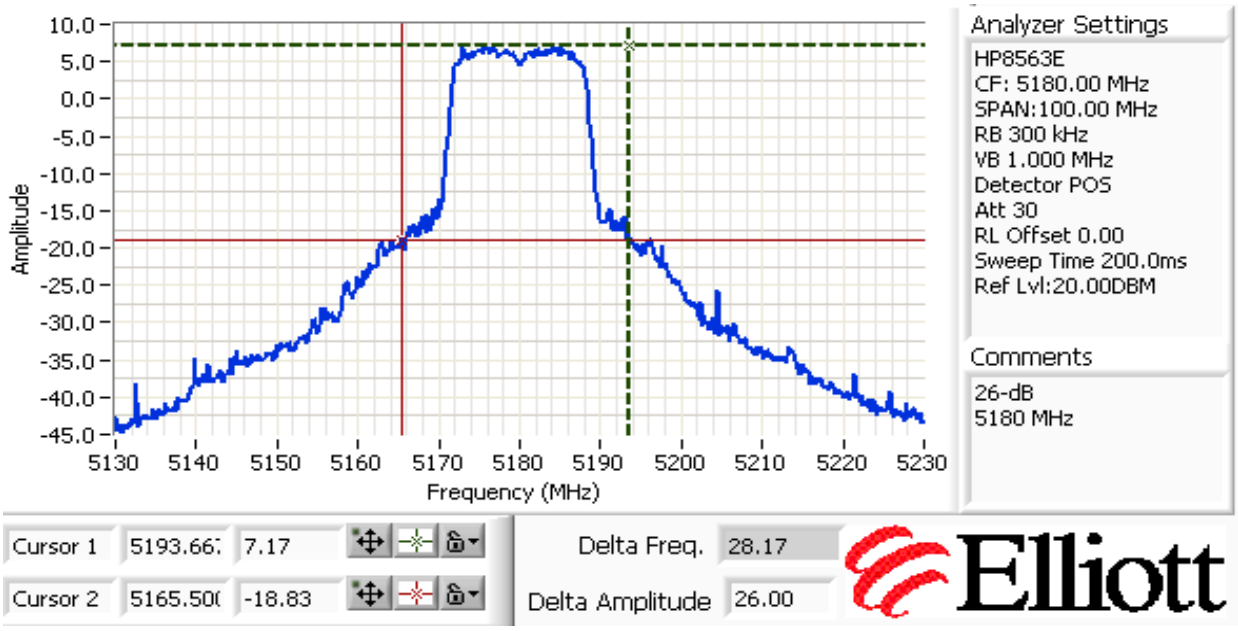
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

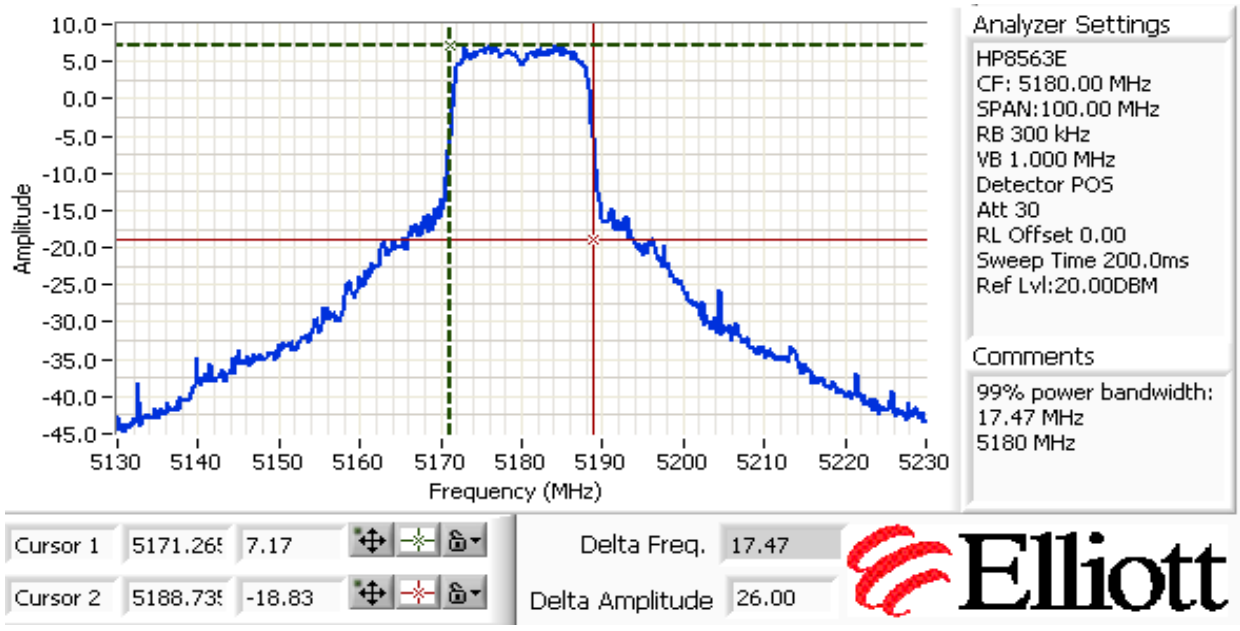


Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

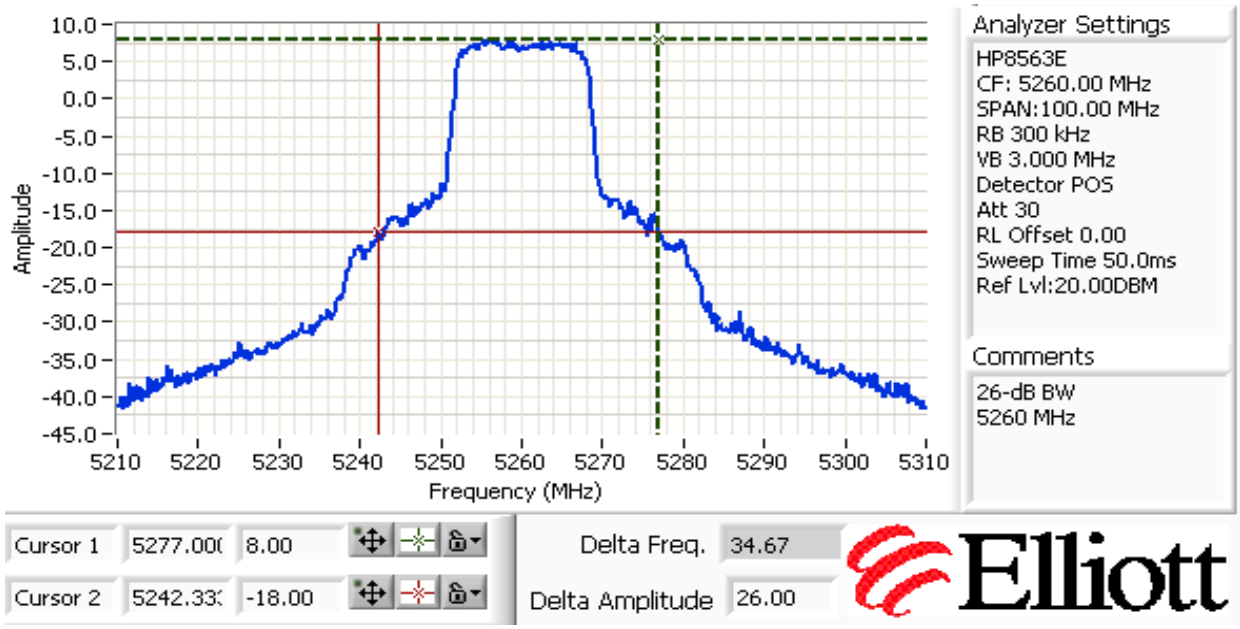


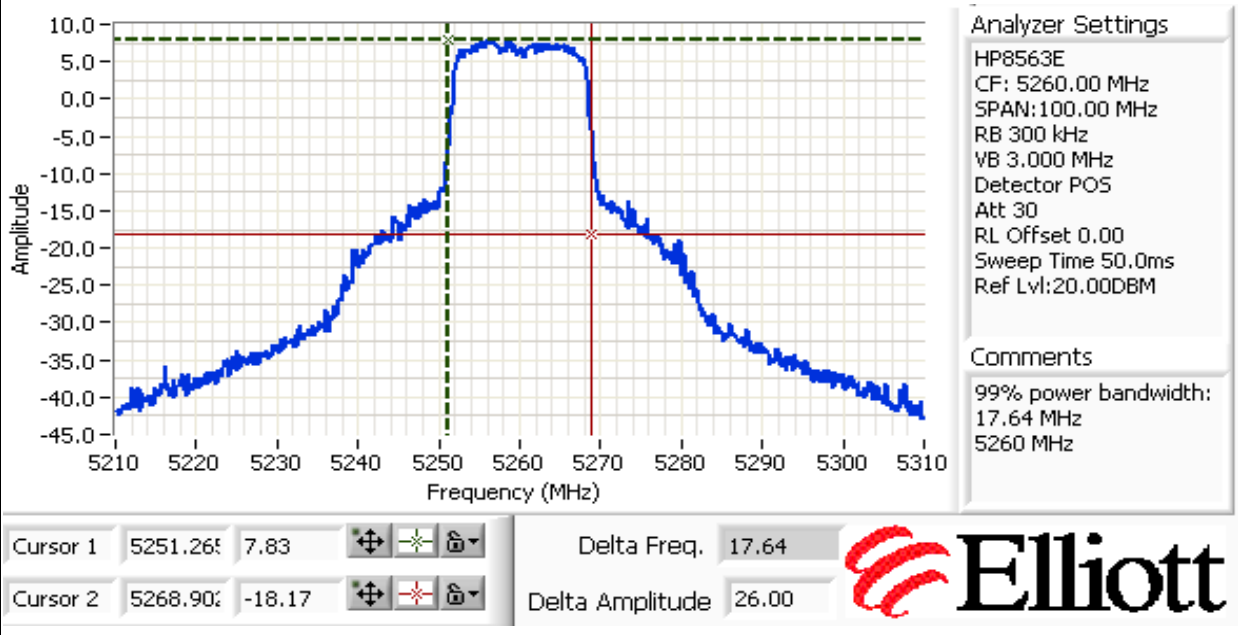
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



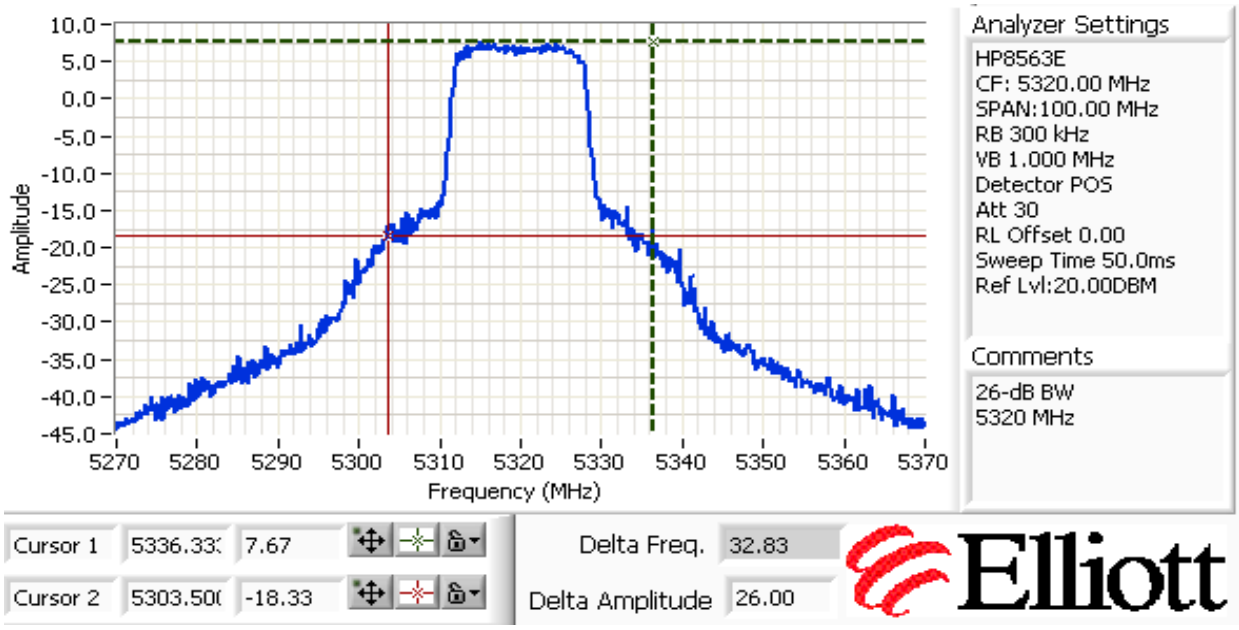


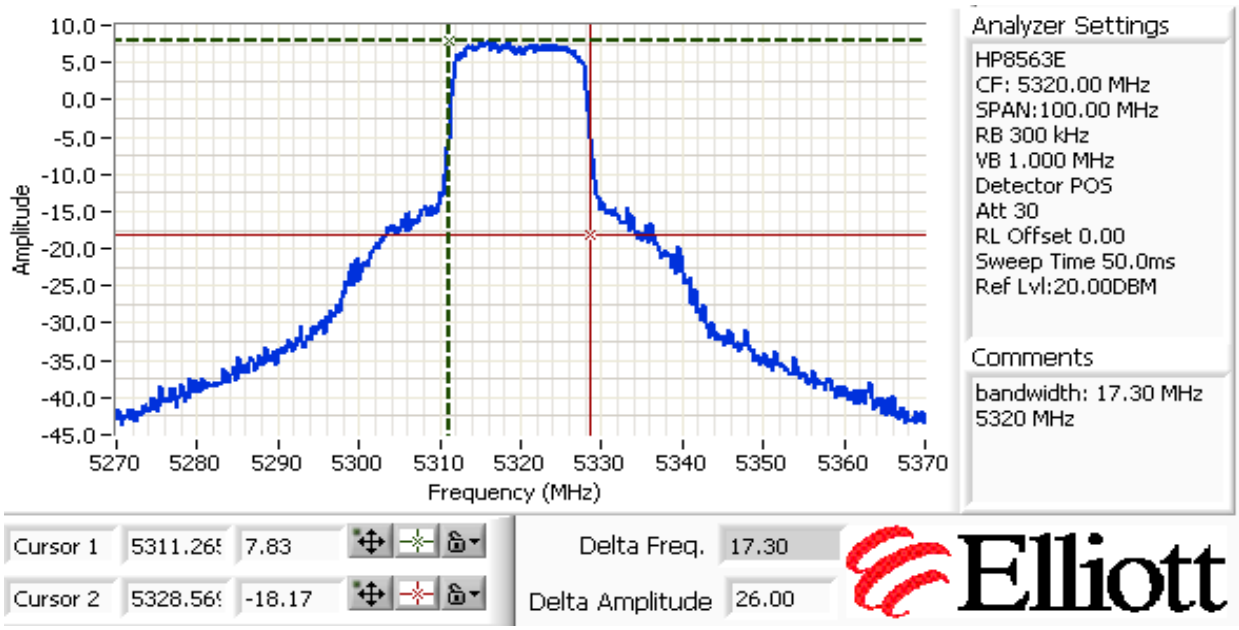
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A





Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A





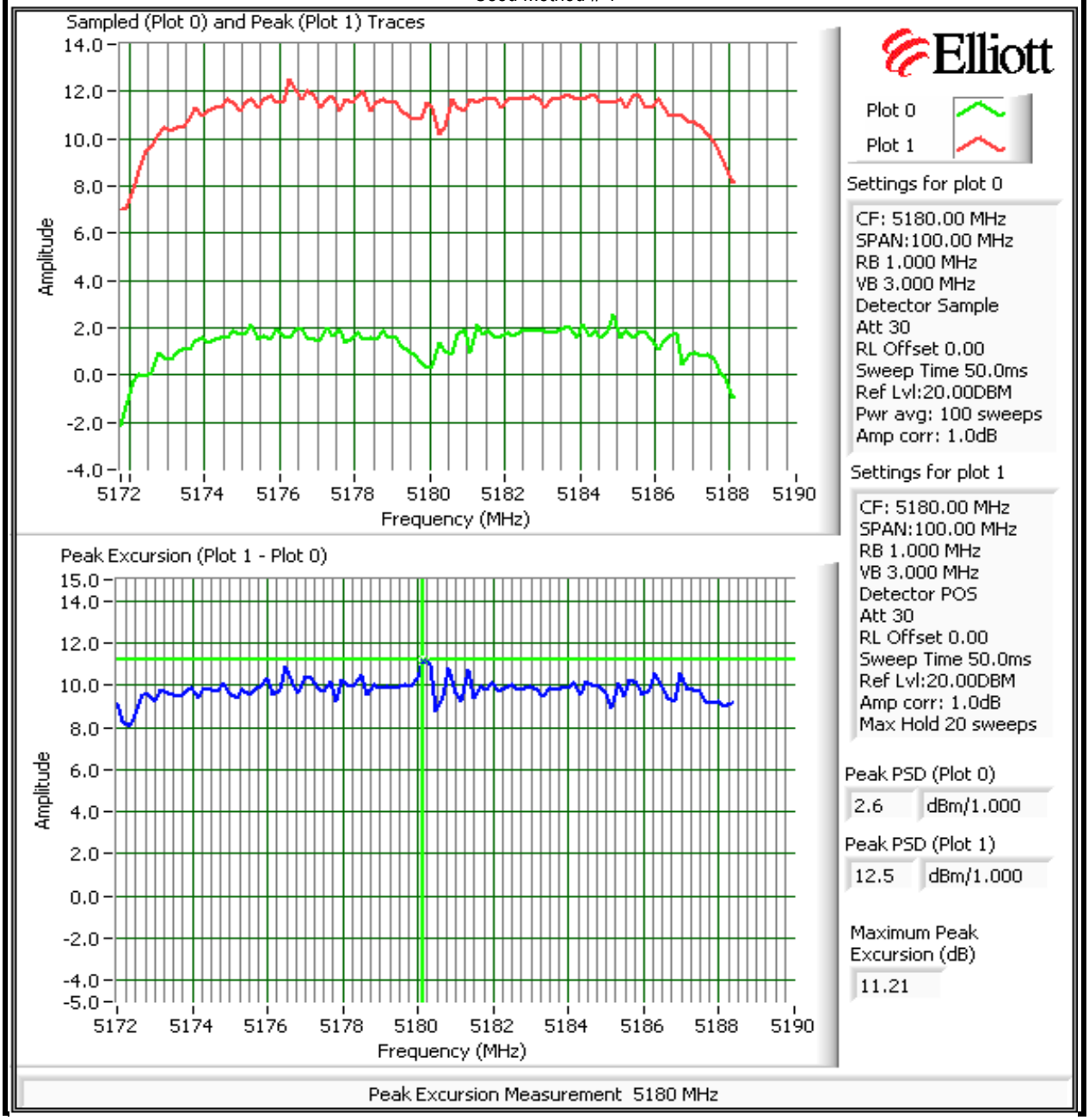
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #2: Peak Excursion Measurement

Plots Showing Peak Excursion

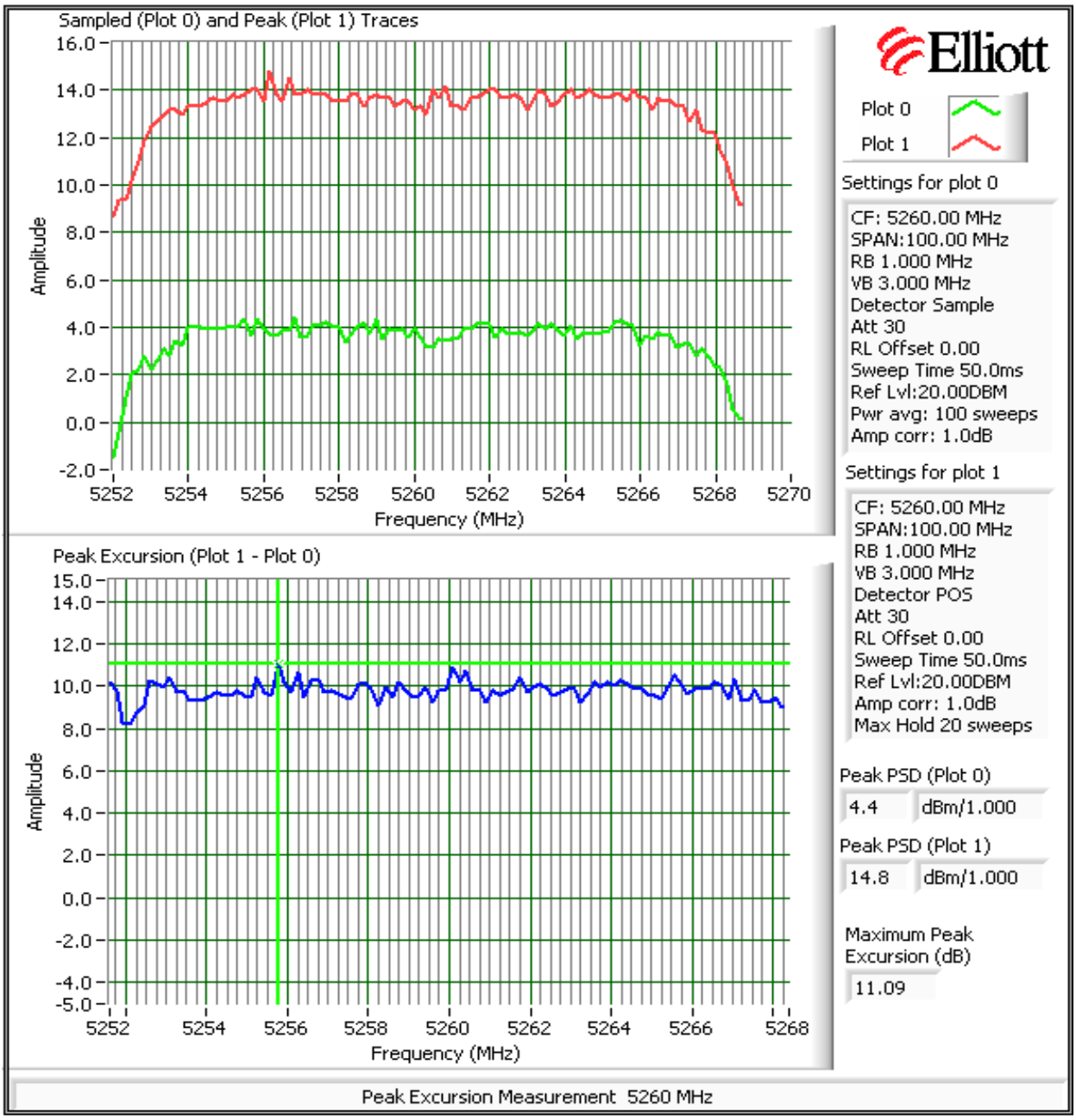
Trace 1: RBW = 1MHz VBW = 3MHz

Used Method # 1

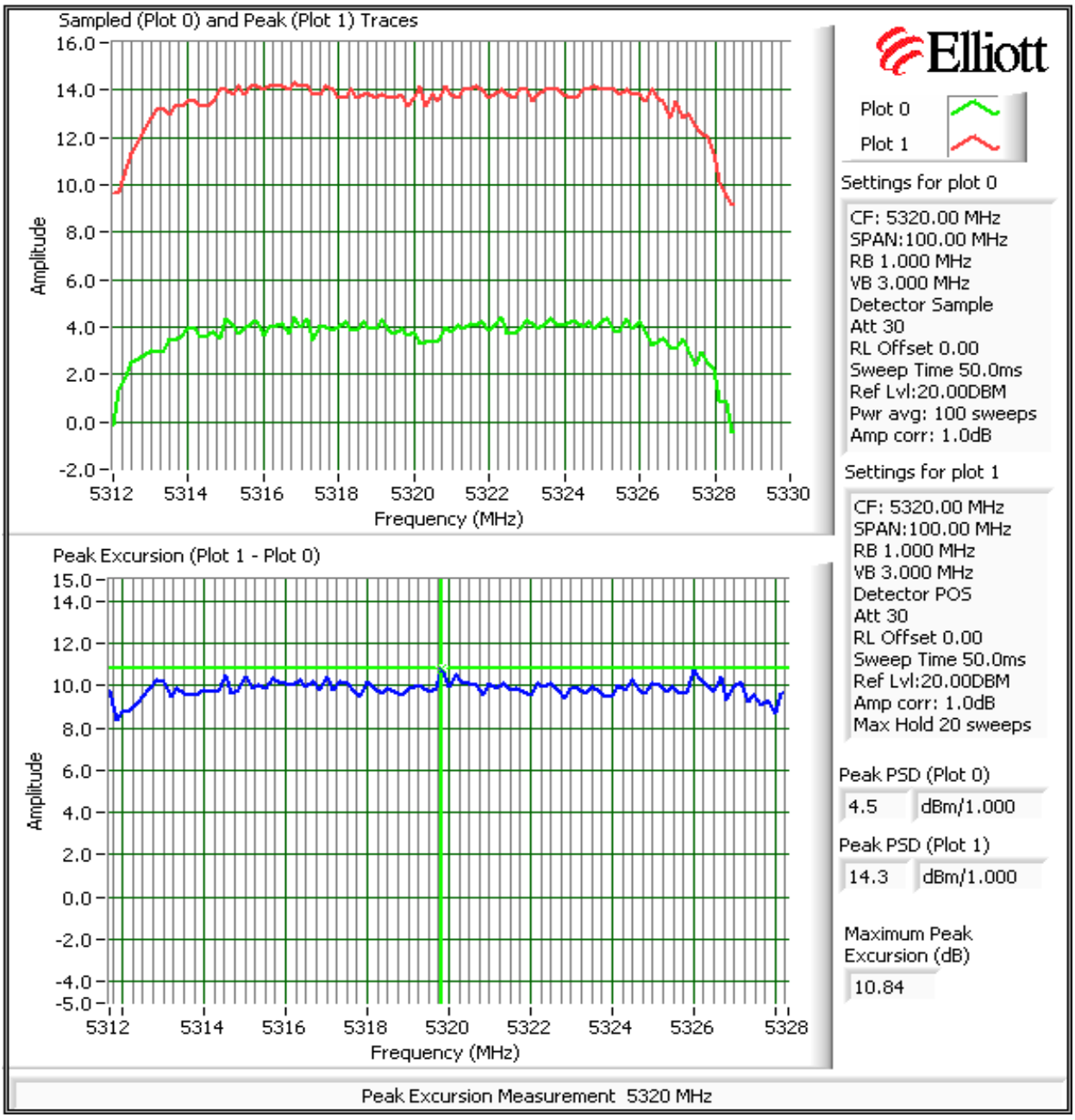


EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



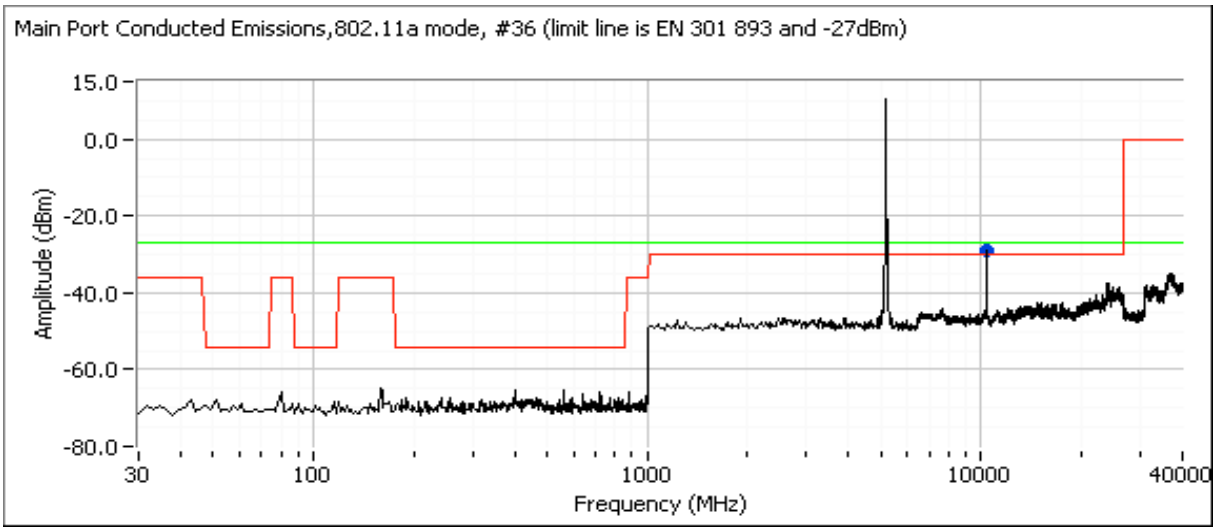
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #3: Out Of Band Spurious Emissions - Antenna Conducted

Maximum Antenna Gain:	6.2	dBi
Spurious Limit:	-27	dBm/MHz eirp
Limit To Apply to Plots [Note 1]:	-33.2	dBm/MHz

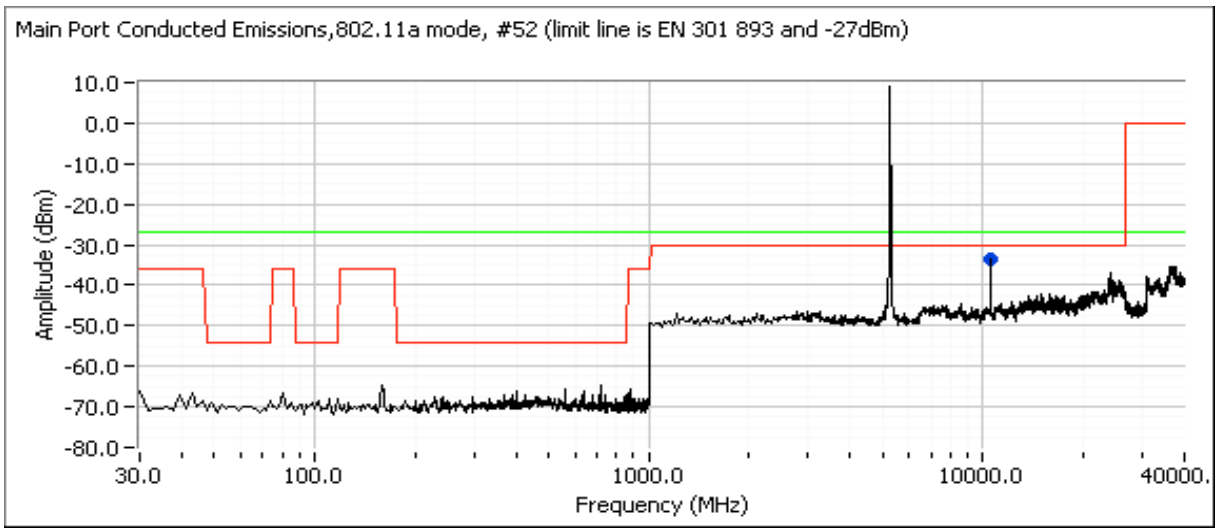
Note 1:	The -27dBm/MHz limit is an eirp limit. The limit for antenna port conducted measurements is adjusted to take into consideration the maximum antenna gain (limit = -27dBm - antenna gain). Radiated field strength measurements for signals more than 50MHz from the bands and that are close to the limit are made to determine compliance as the antenna gain is not known at these frequencies.
Note 2:	All spurious signals below 1GHz are measured during digital device radiated emissions test.
Note 3:	Signals within 10MHz of the 5.725 or 5.825 Band edge are subject to a limit of -17dBm EIRP
Note 4:	If the device is for outdoor use then the -27dBm eirp limit also applies in the 5150 - 5250 MHz band.
Note 5:	Signals that fall in the restricted bands of 15.205 are subject to the limit of 15.209.

Plots Showing Out-Of-Band Emissions (RBW=VBW=1MHz), #36, Power = 15.5dBm

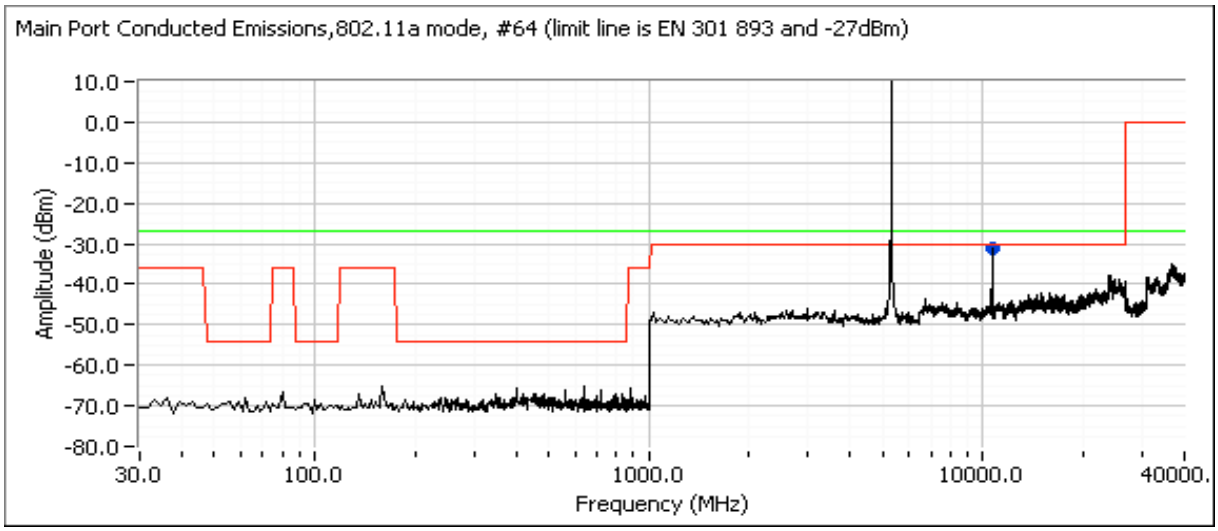


Note - emission at 10.36 GHz which exceeds -33.2dBm (level = -28.8dBm) was measured as a radiated field strength and met the more stringent 15.209 limit with the antenna connected, therefore system complies.

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



Note - emission at the second harmonic GHz is below the -33.2dBm (level = -33.8dBm). Signal was also measured as a radiated field strength and met the more stringent 15.209 limit with the antenna connected, therefore system complies.



Note - emission at the second harmonic GHz which exceeds -33.2dBm (level = -31.3dBm) was measured as a radiated field strength and met the more stringent 15.209 limit with the antenna connected, therefore system complies.

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

RSS 210 and FCC 15 Subpart E (UNII) Antenna Port Measurements
MIMO (802.11n MHz)
Power, Bandwidth, and Spurious 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: 8/16/2006 9:00
Test Engineer: Juan Martinez
Test Location: Fremont Chamber #3

Config. Used: 1
Config Change: None
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 standard(s)trum 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: - °C
Rel. Humidity: - %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Power, 5150 - 5250MHz	15.407(a) (1), (2)	Pass	16.5 dBm
1	Power, 5250 - 5350MHz	15.407(a) (1), (2)	Pass	19.1dBm
1	PSD, 5150 - 5350MHz	15.407(a) (1), (2)	Pass	.98dBm/MHz
1	PSD, 5250 - 5350MHz	15.407(a) (1), (2)	Pass	3.6dBm/MHz
1	26dB Bandwidth	15.407	-	Not teted
1	99% Bandwidth	RSS 210	-	Not teted
2	Peak Excursion Envelope	15.407(a) (6)	Pass	< 13dB
3	Antenna Conducted - Out of Band Spurious	15.407(b)	Pass	All emissions below the -27dBm/MHz limit

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Output power measurements to confirm output power for each channel was at the previously certified level +/- 0.5dB. Power measurements were made prior to each set of conducted and radiated spurious emissions test to verify output power was within +/-0.5dB of the previously certified level

The proposed change should not affect the previously reported measurements for PSD. PSD measurements were performed on the center channel in 20MHz mode to demonstrate that the device continued to comply with the PSD requirements. 40MHz mode has a lower PSD.

6dB and 99% bandwidth measurements originally reported would not be affected by the proposed changes to the device.

Spurious emissions on the antenna port were measured on the top, bottom and center channels in 20MHz mode and repeated on 40MHz mode, center channel to demonstrate that the 20 MHz mode was the worst case.

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:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #1: Bandwidth, Output Power and Power standard(s)tral Density
Run #1: Output Power
Transmitted signal on chain is coherent ? Yes
Regulatory Power Measurements:

Mode	Frequency (MHz)	Output Power (dBm) Note 1			Antenna Gain (dBi) Note 3			EIRP Note 2	
		Chain 1	Chain 2	Total	Chain 1	Chain 2	Total	dBm	W
20MHz n	5180	13.5	13.5	16.5	6.2	6.2	9.2	22.7	0.187
20MHz n	5260	16.1	16.1	19.1	6.2	6.2	9.2	25.3	0.340
40MHz n	5270	15.8	15.5	18.7	6.2	6.2	9.2	24.9	0.306
20MHz n	5320	16.0	15.9	19.0	6.2	6.2	9.2	25.2	0.328

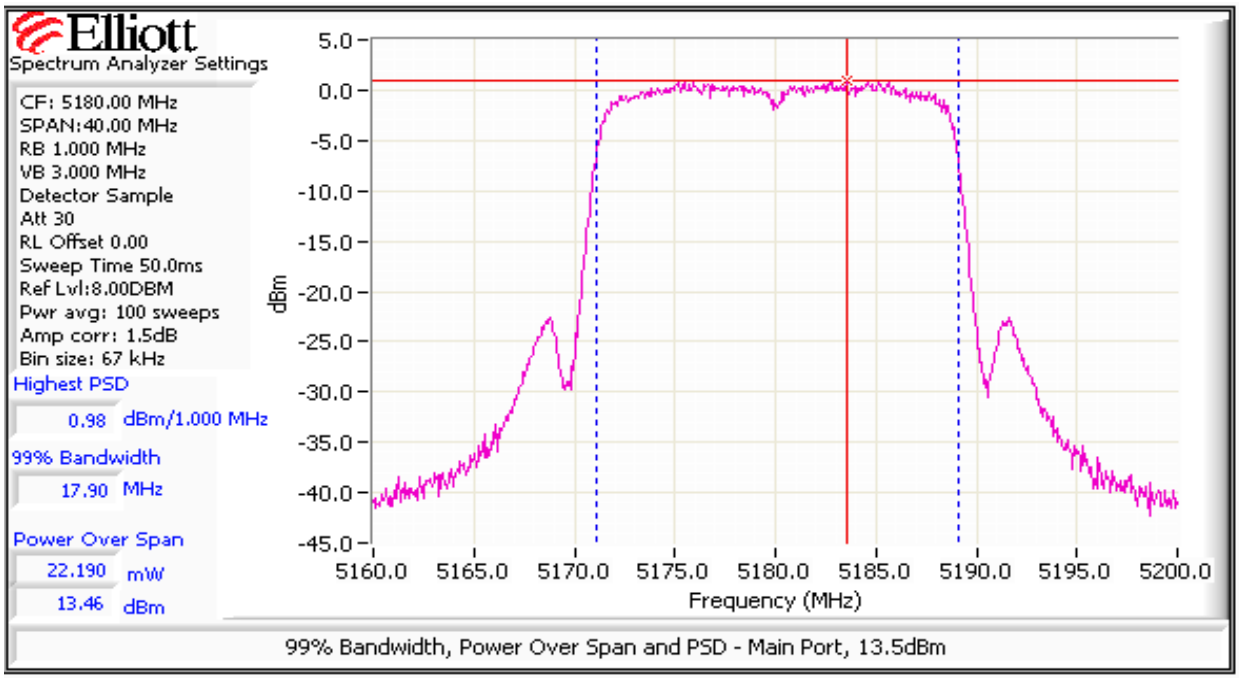
Note 1:	For 5180 MHz, the power, radiated harmonic emissions, and Bandedges were tested above and beyong what was previously certified. The applicant further states that the power will certainly be lowered to reflect what was previously approved too.

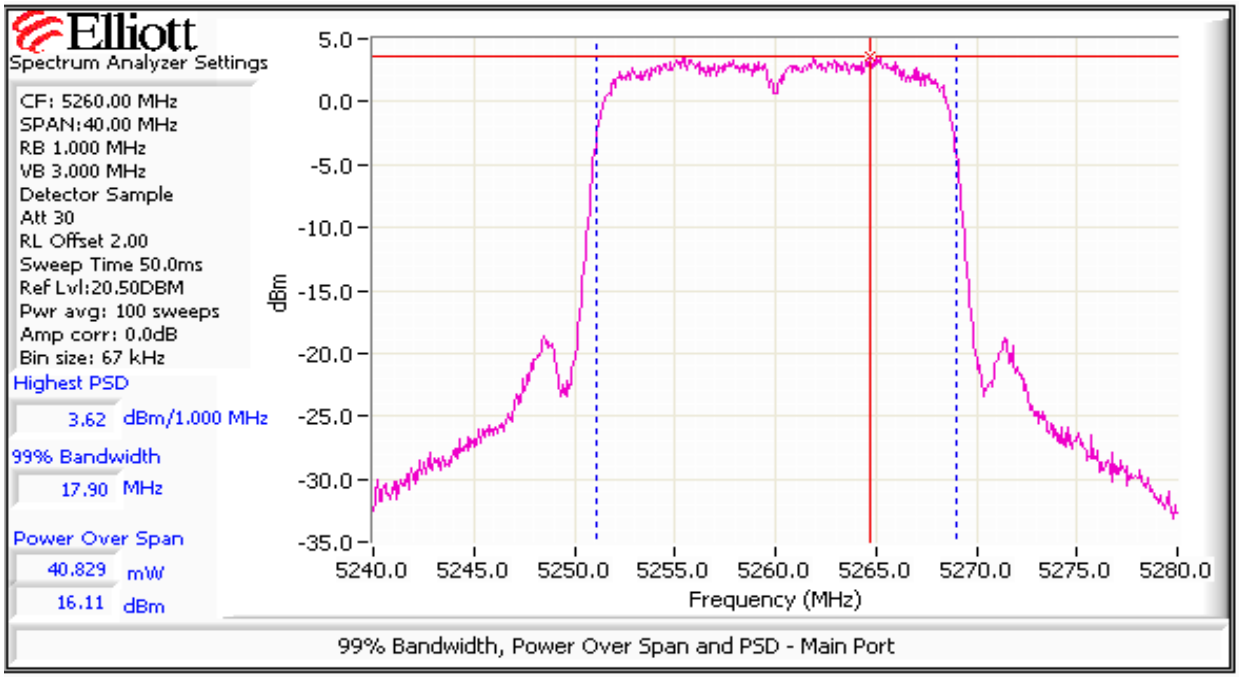
Antenna Gain: 7.44 dBi

Frequency (MHz)	Mode	Bandwidth		Output Power[1] dBm		Power (Watts)	PSD[2] dBm/MHz			Result
		26dB	99%[4]	Measured	Limit		Measured	FCC Limit	RSS Limit[3]	
5180	20MHz	-	17.9	16.5	17.0	0.045	0.98	2.56	4.0	Pass
5260	20MHz	-	17.9	19.1	24.0	0.081	3.60	9.56	6.3	Pass
5270	40MHz	-	36.4	18.7	24.0	0.074	0.80	9.56	3.5	Pass
5320	20MHz	-	17.9	19.0	24.0	0.079	3.52	9.56	6.5	Pass

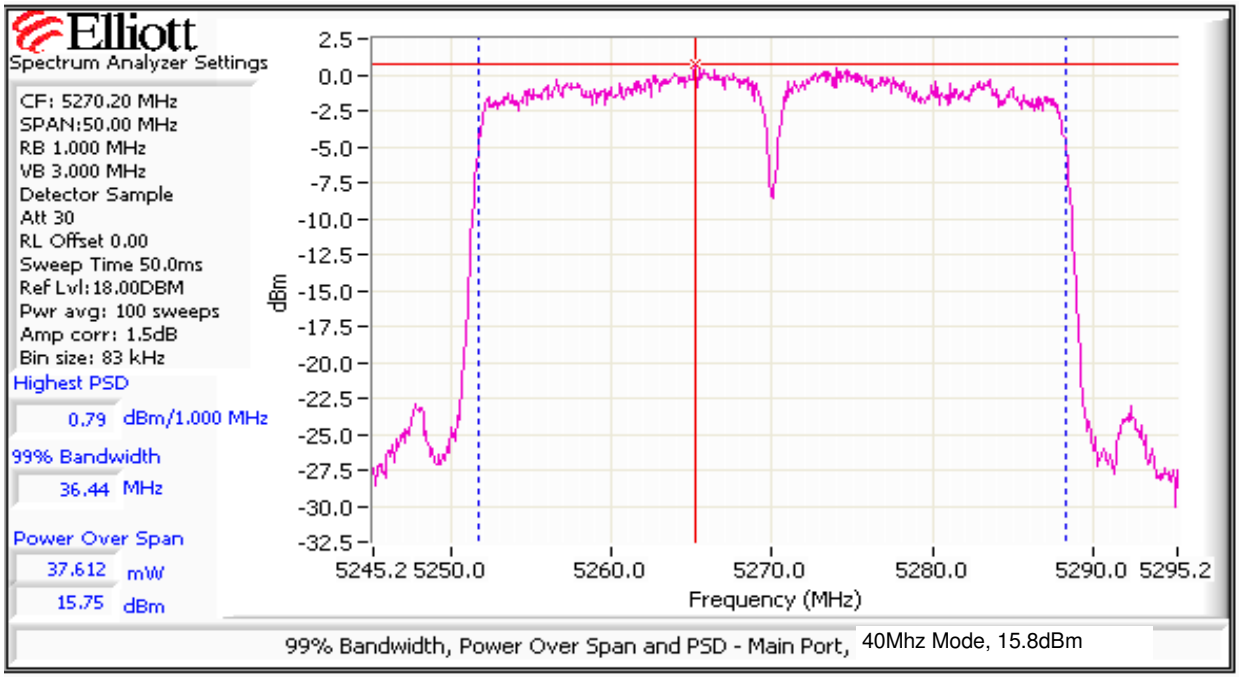
Note 1:	Output power measured using a spectrum analyzer (see plots below): RBW=1MHz, VB=3 MHz, sample detector, power averaging on and power integration over 40 MHz (for 20Mhz mode) or 50Mhz (40MHz mode). Second table shows the combined output power over both chains.
Note 2:	Measured using the same analyzer settings used for output power.
Note 3:	For RSS210 the measured value of the PSD (see note 3) must not exceed the average value (calculated from the measured power on a single chain divided by the measured 99% bandwidth) by more than 3dB.
Note 4:	99% Bandwidth measured in accordance with RSS GEN - RB > 1% of span and VB >=3xRB

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



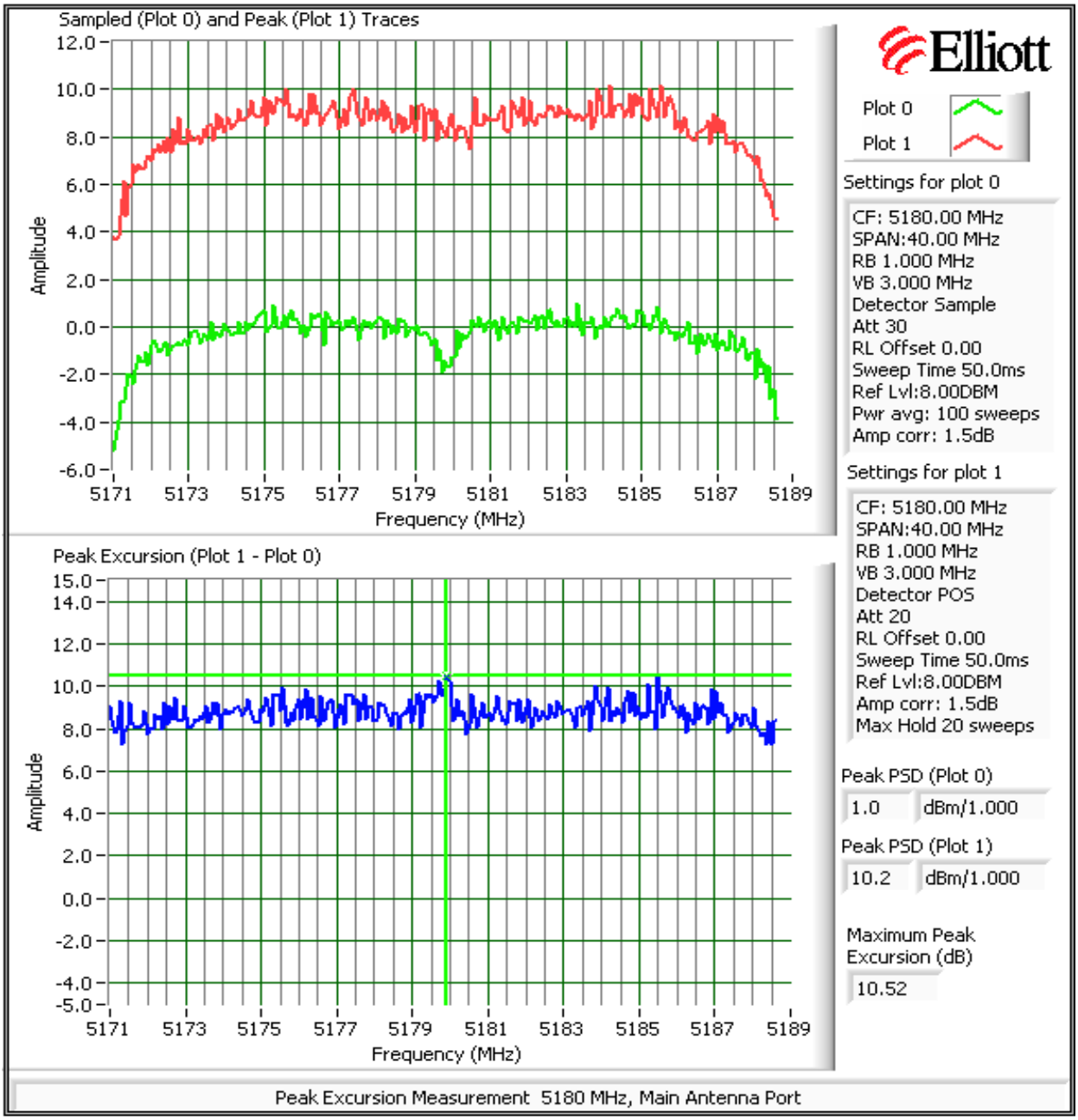


Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



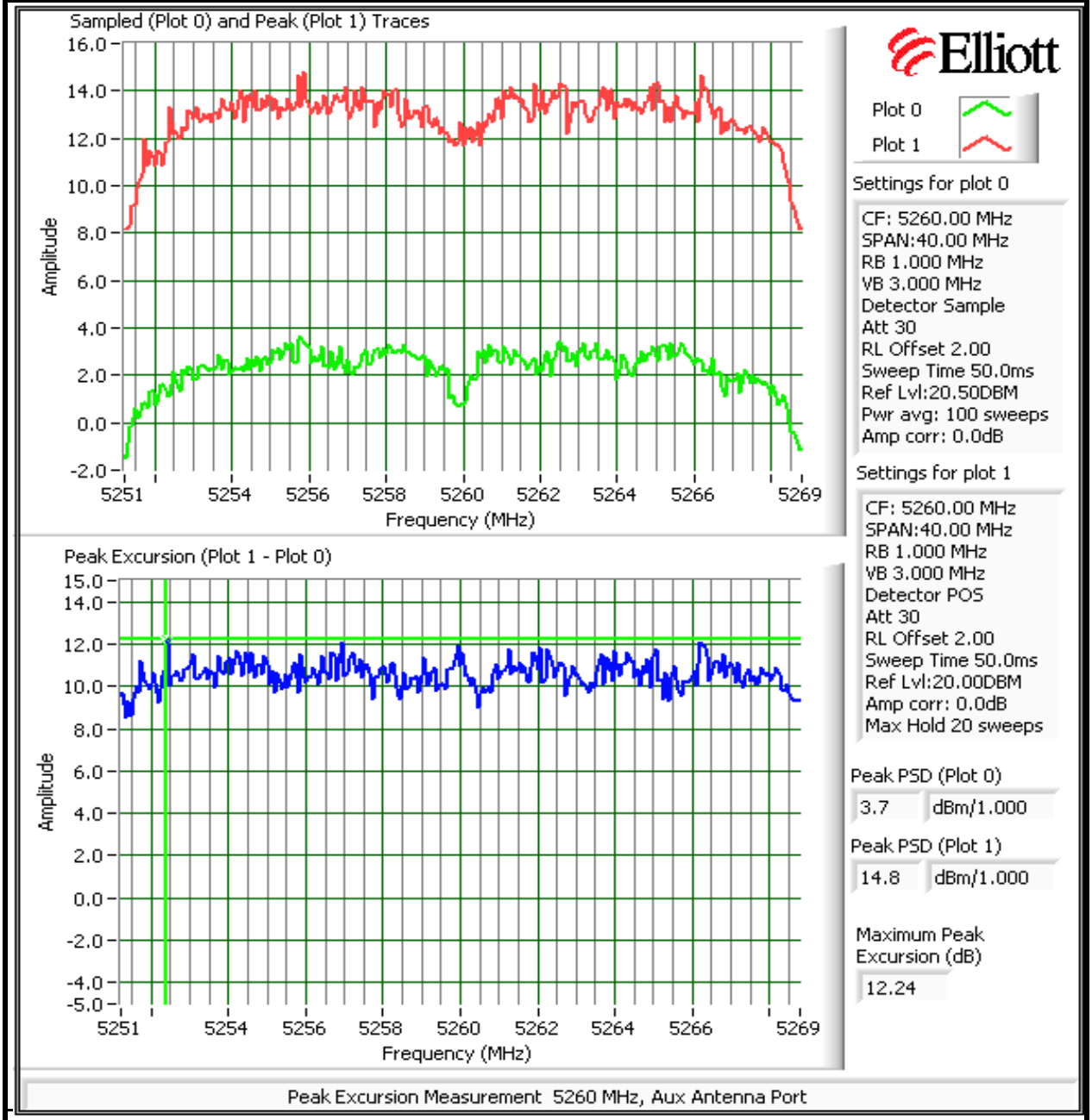
Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #2: Peak Excursion Measurement



EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A



Note 1: Proposed change to PA would not affect the peak excursion measurments originally reported. Graph for low and center channels provided for reference only.

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Run #3: Out Of Band Spurious Emissions - Antenna Conducted

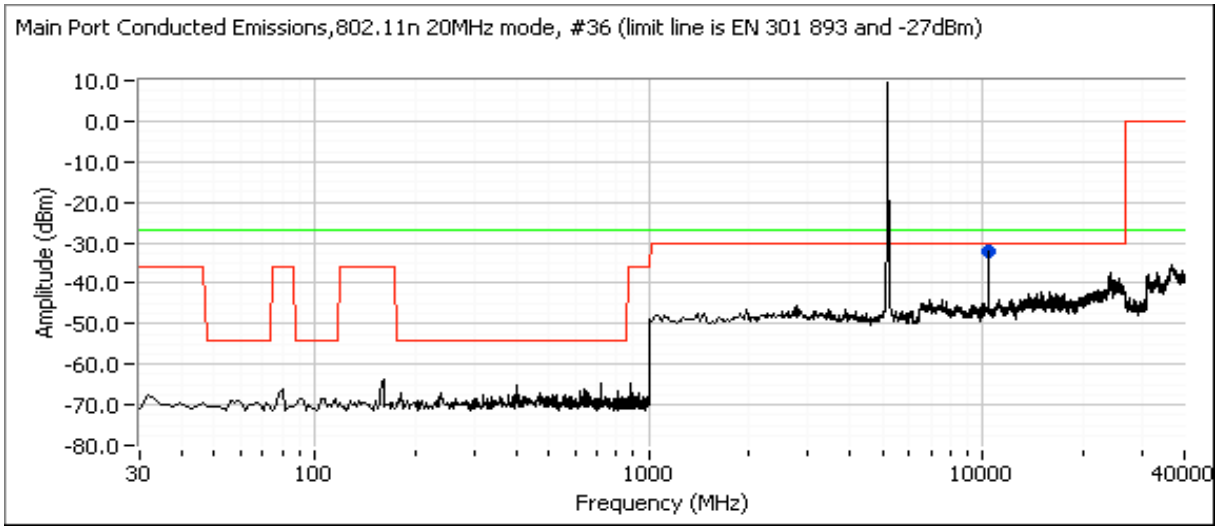
Maximum Antenna Gain:	7.44	dBi
Spurious Limit:	-27	dBm/MHz eirp
Limit Used On Plots [Note 1]:	-34.44	dBm/MHz

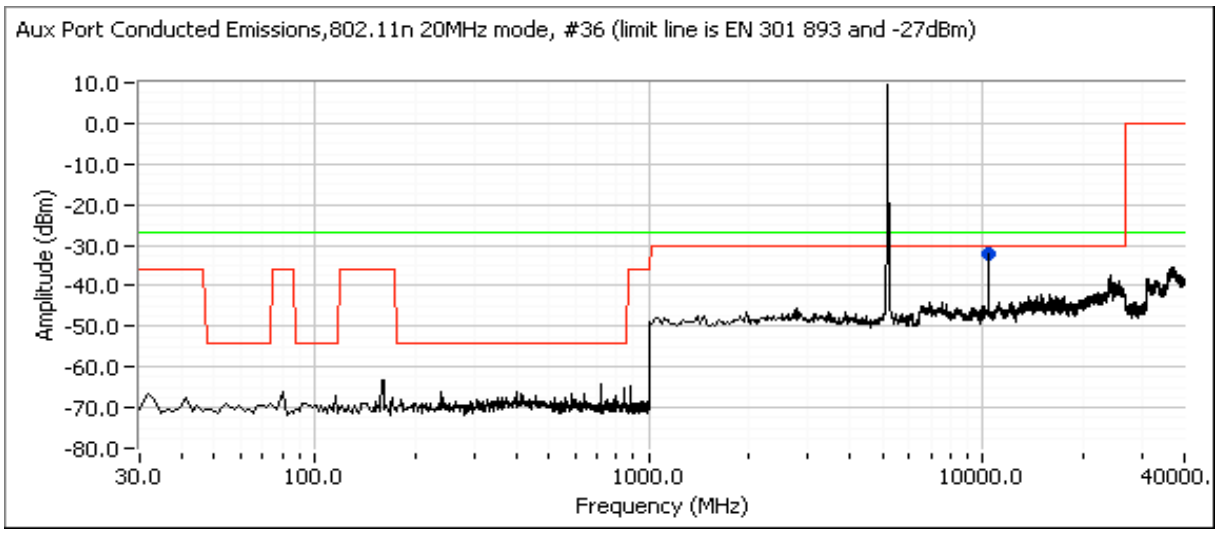
Note 1:	The -27dBm/MHz limit is an eirp limit. The limit for antenna port conducted measurements is adjusted to take into consideration the maximum antenna gain (limit = -27dBm - antenna gain). Radiated field strength measurements for signals more than 50MHz from the bands and that are close to the limit are made to determine compliance as the antenna gain is not known at these frequencies.
Note 2:	Signals that fall in the restricted bands of 15.205 are subject to the limit of 15.209.

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

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

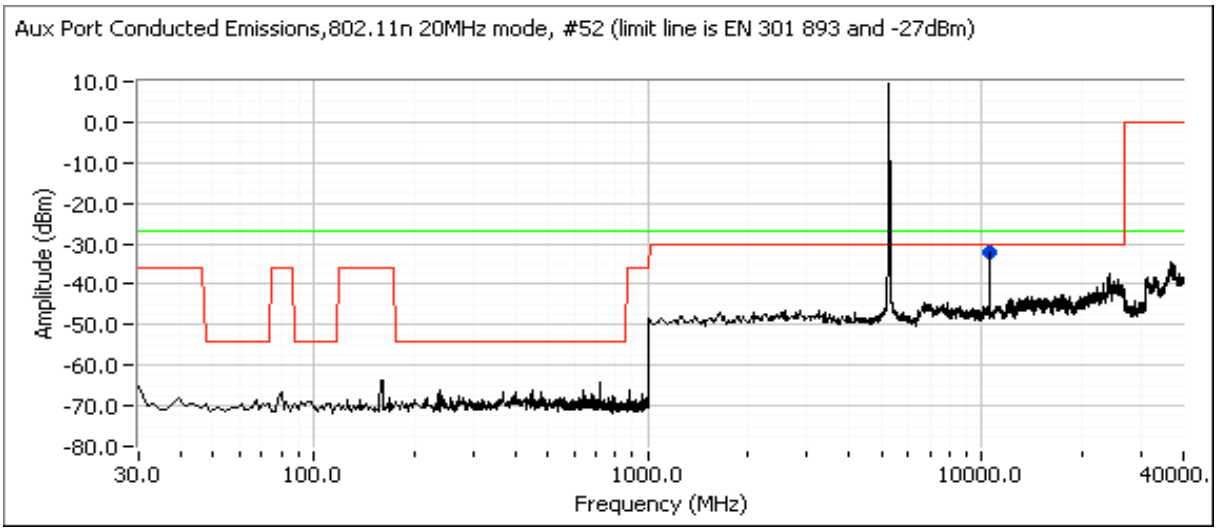
All spurious measurements made with channel power set to 16dBm (which is higher than the actual power used in the 5150 - 5250 MHz band).



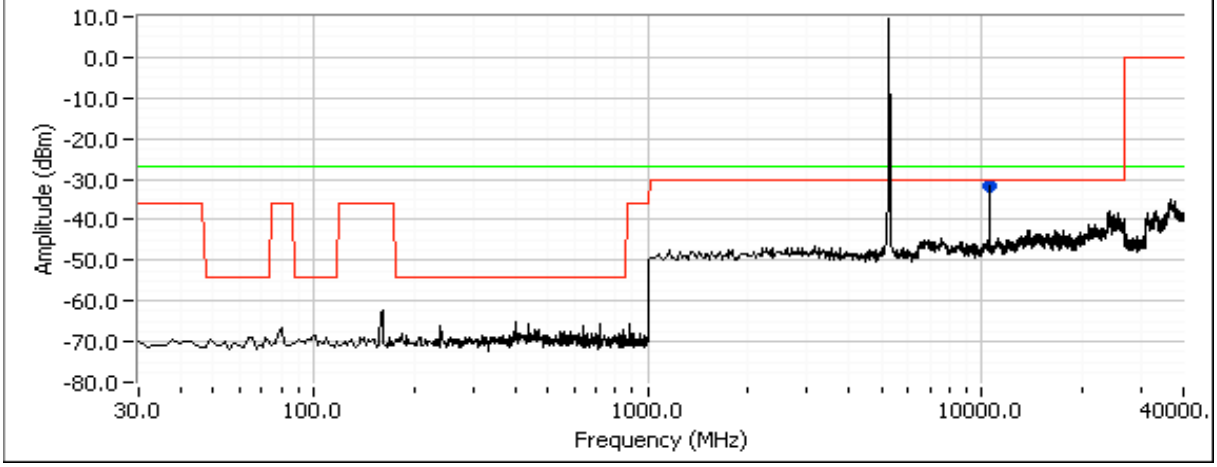


Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

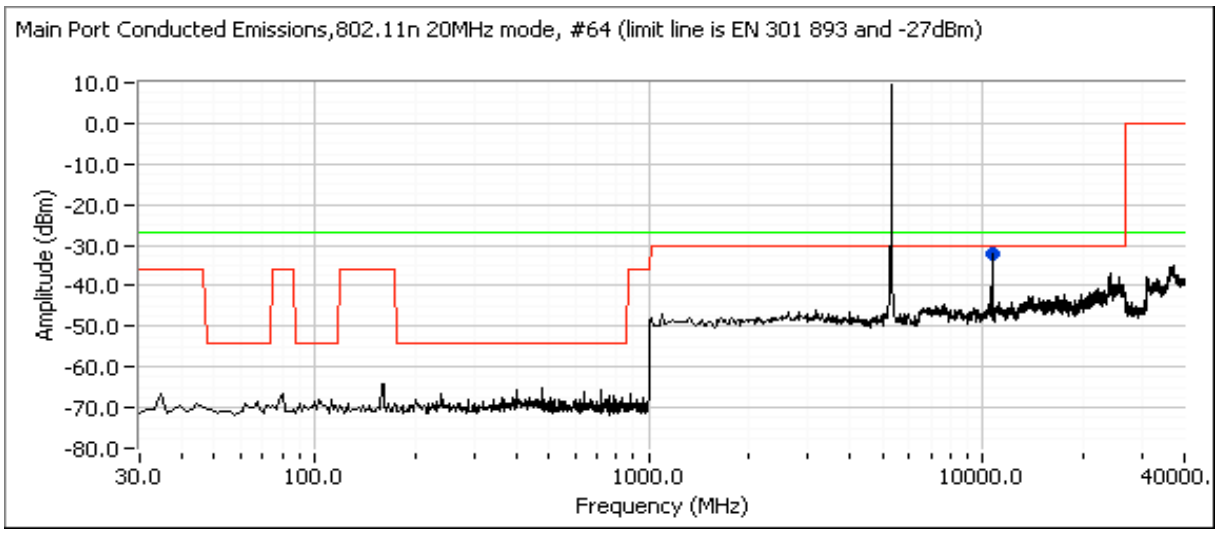
Aux Port Conducted Emissions,802.11n 20MHz mode, #52 (limit line is EN 301 893 and -27dBm)

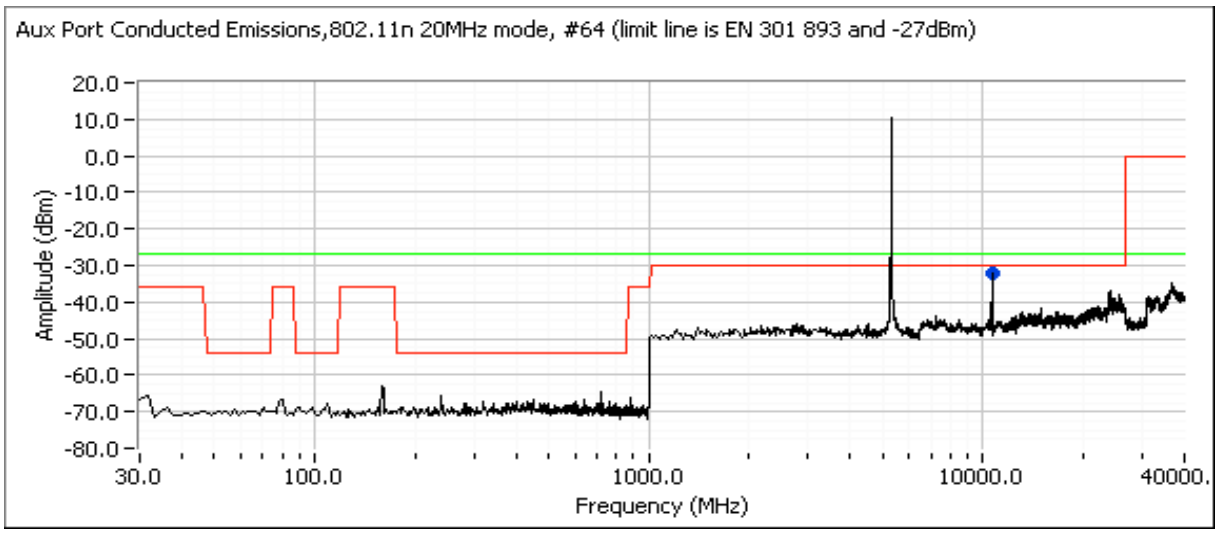


Main Port Conducted Emissions,802.11n 20MHz mode, #52 (limit line is EN 301 893 and -27dBm)



Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A





Elliott

EMC Test Data

Client:	Broadcom	Job Number:	J64973
Model:	BCM94321 MC New version	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, RSS-210	Class:	N/A

Frequency	Level	Pol	15 E		Detector	Comments
MHz	dBmV/m	v/h	Limit	Margin	Pk/QP/Avg	
10368.33	-32.3	RF Port	-34.4	2.1	Peak	#36, 20MHz Main
10350.00	-31.2	RF Port	-34.4	3.2	Peak	#36, 20MHz Aux
10515.00	-32	RF Port	-34.4	2.4	Peak	#52, 20MHz Aux
10515.00	-31.8	RF Port	-34.4	2.6	Peak	#52, 20MHz Main
10643.33	-32.3	RF Port	-34.4	2.1	Peak	#64, 20MHz Main
10643.33	-32.3	RF Port	-34.4	2.1	Peak	#64, 20MHz Aux
10515.00	-36.2	RF Port	-34.4	-1.8	Peak	#54, 40MHz Main
23893.33	-36.2	RF Port	-34.4	-1.8	Peak	#54, 40MHz Main
10533.33	-34.7	RF Port	-34.4	-0.3	Peak	#54, 40MHz Main
10551.67	-36.8	RF Port	-34.4	-2.4	Peak	#54, 40MHz Aux

Note - all conducted emissions assume the antenna gain is 7.4dBi outside the band. All of the above emissions were measured radiated with the antenna connected to verify compliance with the rerquirements of 15 E.

EXHIBIT 3: Photographs of Test Configurations

Pages

EXHIBIT 4: Proposed FCC ID Label & Label Location

Unchanged from previous application

EXHIBIT 5: Detailed Photographs of Broadcom Corporation Model BCM94321MCConstruction

Unchanged from previous application

EXHIBIT 6: Operator's Manual for Broadcom Corporation Model BCM94321MC

Unchanged from previous application

EXHIBIT 7: Block Diagram of Broadcom Corporation Model BCM94321MC

Unchanged from previous application

EXHIBIT 8: Schematic Diagrams for Broadcom Corporation Model BCM94321MC

Unchanged from previous application

EXHIBIT 9: Theory of Operation for Broadcom Corporation Model BCM94321MC

Unchanged from previous application

EXHIBIT 10: Advertising Literature

Unchanged from previous application

EXHIBIT 11: RF Exposure Information

Unchanged from previous application