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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 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 mar

Juan Martinez Senior EMC Engineer

JM/dmg Enclosure: Copy of Application Package



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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:

Subpart C of Part 15 of FCC Rules (CFR 47) RSS-Gen Issue 1, September 2005, "General Requirements and Information for the Certification of Radiocommunication Equipment" RSS-210, Issue 6, September 2005, "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"

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 man_

Juan Martinez Senior EMC Engineer

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



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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 C 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:

mar

Juan Martinez Senior EMC Engineer



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REVISION HISTORY

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

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SCOPE

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

Industry Canada RSS-Gen Issue 1 RSS 210 Issue 6 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment" FCC Part 15 Subpart C

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

ANSI C63.4:2003 RSS-212 Issue 1 Test Facilities and Test Methods for Radio Equipment

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.

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

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

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

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

STATEMENT OF COMPLIANCE

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

Industry Canada RSS-Gen Issue 1 RSS 210 Issue 6 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment" FCC Part 15 Subpart C

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

TEST RESULTS SUMMARY

FCC Rule Part	RSS Rule Part	Description	Description Measured Value / Comments		Result
15.247(a)	RSS 210 A8.2	Digital Modulation	Systems uses OFDM / DSSS techniques	-	Complies
15.247 (a) (2)	RSS 210 A8.2 (1)	6dB Bandwidth	N/A – Class II change will have not affect	>500kHz	Complies
	RSP100	99% Bandwidth	N/A – Class II change will have not affect	Information only	Complies
15.247 (b) (3)	RSS 210 A8.2 (4)	Output Power (multipoint systems)	18.8 dBm (.075 Watts) EIRP = 0.251 WNote 1	1Watt, EIRP limited to 4 Watts.	Complies
15.247(d)	RSS 210 A8.2 (2)	Power Spectral Density	-0.8 dBm/3kHz	8dBm/3kHz	Complies
15.247(c)	RSS 210 A8.5	Antenna Port Spurious Emissions 30MHz – 25 GHz	Refer to plots in test data	<-30dBc ^{Note 2}	Complies
15.247(c) / 15.209	RSS 210 A8.5	Radiated Spurious Emissions 30MHz – 25 GHz	53.6dBμV/m (478.6μV/m) @ 11570.9MHz (-0.4dB)	15.207 in restricted bands, all others <-30dBc ^{Note 2}	Complies

DIGITAL TRANSMISSION SYSTEMS (2400 - 2483.5MHz)

Note 1: EIRP calculated using antenna gain of 2.2 dBi for the highest EIRP multi-point system.

Note 2: Limit of -30dBc used because the power was measured using the UNII test procedure (maximum power averaged over a transmission burst) / RMS averaging over a time interval, as permitted under RSS 210 section A8.4(4).

FCC Rule Part	RSS Rule part	Description	Measured Value / Comments	Limit / Requirement	Result (margin)
15.203	-	RF Connector	Same as original application		Complies
15.109	RSS GEN 7.2.3 Table 1	Receiver spurious emissions	42.8dBµV/m (138.0µV/m) @ 11510.0MHz (-11.2dB)		Complies (- 0.4 dB)
15.207	RSS GEN Table 2	AC Conducted Emissions	N/A – Class II change will have not affect		Complies
15.247 (b) (5) 15.407 (f)	RSS 102	RF Exposure Requirements	Power stayed the same same exposure information from original application applies	Refer to OET 65, FCC Part 1 and RSS 102	Complies
	RSP 100 RSS GEN 7.1.5	User Manual	Same as original application	Statement required regarding non- interference	
	RSP 100 RSS GEN 7.1.5	User Manual	Same as original application	Statement required regarding detachable antenna	

GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS

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 Radiated Emissions	30 to 1000 1000 to 40000	$\begin{array}{c} \pm \ 3.6 \\ \pm \ 6.0 \end{array}$	

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	-	-

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	MY44420617			
		Sensor				

Config 2					
Manufacturer	Model	Description	Serial Number		
Dell	ZRS PT Build Unit Plan	P/N	2020537200004		
	Rev 07, Zanzibar A	HAQ00010001	No. 369		
Dell	PA-1131-02D	130W AC	CN-09Y819-71615-57C-		
	D P/N 9Y819	Adapter	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					
			Cable(s)		
Port	Connected To		Shielded or		
		Description	Unshielded	Length(m)	
EUT (Card)	Adexelec Adapter	r Direct Connection		-	
	Card				
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	120V/60Hz AC	AC Power Cord	Unshielded	2.0	
Input	Outlet				

Config 2

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

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



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

BANDWIDTH MEASUREMENTS

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

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 bands¹ (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

RECEIVER RADIATED SPURIOUS EMISSIONS SPECIFICATION LIMITS

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

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

OUTPUT POWER LIMITS – DIGITAL TRANSMISSION SYSTEMS

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

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

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

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

TRANSMIT MODE SPURIOUS RADIATED EMISSIONS LIMITS – FHSS and DTS SYSTEMS

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

SAMPLE CALCULATIONS - CONDUCTED EMISSIONS

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

$$R_r - S = M$$

where:

 $R_r =$ Receiver Reading in dBuV

S = Specification Limit in dBuV

M = Margin to Specification in +/- dB

SAMPLE CALCULATIONS - RADIATED EMISSIONS

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

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

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

where:

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

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

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

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

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

$$R_c = R_r + F_d$$

and

 $M = R_c - L_s$

where:

 R_r = Receiver Reading in dBuV/m

- F_d = Distance Factor in dB
- R_{c} = Corrected Reading in dBuV/m
- L_S = Specification Limit in dBuV/m
- M = Margin in dB Relative to Spec

SAMPLE CALCULATIONS - FIELD STRENGTH TO EIRP CONVERSION

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

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

where P is the eirp (Watts)

EXHIBIT 1: Test Equipment Calibration Data

1 Page

Radio Antenna Port (Powe Engineer: Mark Briggs	r and Spurious Emissions), 25-Aug-06			
Manufacturer Hewlett Packard	<u>Description</u> SpecAn 9 kHz - 40 GHz, Purple (SA40)	<u>Model #</u> 8564E(84125C)	<u>Asset #</u> 1771	<u>Cal Due</u> 04-Nov-06
Radiated Emissions, 30 - 1	,000 MHz, 25-Aug-06			
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 Emission	ons, 1000 - 18,000 MHz, 20-Sep-06			
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	<u>Description</u>	Model #	Asset #	<u>Ca</u> l 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	<u>Description</u>	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
Linco		0110	1001	To 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
		(0200)		

EXHIBIT 2: Test Measurement Data

127 Pages

Elliot	t	EM	C 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

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:	-

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

Manufaaturar	Madal	Description	Sorial Number	
Manulacturer	IVIOUEI	Description		FUUID
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.

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:	-

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	MY44420617	-
		Sensor		

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
	1		1	

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 .

Elliott		EM	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		

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:	<mark>19</mark> °C	
	Rel. Humidity:	<mark>54</mark> %	

Client: Broadco	Client: Broadcom			Job Number: J649	
Model: BCM94321 MC New version Contact: David Boldy			T-Log Number: Account Manager:		T64985
					-
Standard: FCC 15.247, 15.401, RSS-210				Class:	Radio
Summary of Re	sults				
Dup #	Teet Derformed	Limit	Booult		arain
ard s/n 837 w/ ga	asket added to laptop coverplate o	ver wireless card	Result	IVIC	argin
		RSS-Gen		42.80	lBµV/m
1	802.11n 40 MHz, Ch 151		Pass	(138.0µV/m) @	
				11510.0M	Hz (-11.2dB)
<u> </u>		RSS-Gen		38.90	lBµV/m
2	802.11n 40 MHz, Ch 118		Pass	(88.1µV/m)@	
				0090.010F	$\frac{12(-10.10D)}{12(-10.10D)}$
3	802.11n 40 MHz, Ch 54	RSS-Gen	Pass	(124.5)	uV/m) @
				10540.1M	Hz (-12.1dB)
		RSS-Gen	Pass	34.50	lBµV/m
4	801.11n 40 MHz, Ch 6			(53.1µV/m) @	
				48/4.0MF	1z (-19.5dB)
5	802 11n 20 MHz Ch 120	RSS-Gen	Pass	(85.1)	ıБµ v/III ıV/m) @
Ū	002.111120 Wi12, 011 120		1 455	5600.0MF	Iz (-15.4dB)
		RSS-Gen		43.20	lBµV/m
6	802.11n 20 MHz, Ch 52		Pass	(144.5	µV/m) @
				10520.0M	Hz (-10.8dB)
	802.11a, Ch 52	RSS-Gen	Pass	42.60	lBµV/m
7				(134.9)	µV/m)@
				10520.0M	HZ (-11.40B)

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: Radio

EMC Test Data

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								

		<u> </u>						
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	Н	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	Н	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	Н	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	Н	74.0	-34.4	PK	186	1.2	fundamental

E	Ellic	ott						EM	C Tes	t Data
Client:	Broadcom	۱					J	lob Number:	J64973	
							T-L	og Number:	T64985	
Model:	BCM9432	1 MC Ne	ew version				Accou	nt Manager:	-	
Contact:	David Bol	dv						Ū		
Standard	FCC 15.2	47. 15.40)1. RSS-21()				Class:	Radio	
otandara.		,	.,	-			0.0001			
Operating EUT Serial Model #BC A23 PA wit	Mode: Rx No: 837 M94321M h Apple S	: Mode, 8 C ROM se	802.11n 40 ttings, B1 \$	MHz, Chan Silicon	nel 118					
	Free	quency F	Range	Test D	Limit Di	stance	Extrapola	tion Factor	1	
	1	000-180	00		1 3			-!	9.5	
Preliminary	y peak rea	dings ca	aptured dur	ing pre-sca	an					
Frequency	Level	Pol	RSS	-Gen	Detector	Azimuth	Height	Comments		
MHz	dBµV/m	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters			
No prescan	performed	I. Measu	ured fundam	ental and 2	nd harmonic	only				
Final peak	and avera	ge read	ings							
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 t	o FoxCon	n A23B1	production	n sample v	5.13, s/n 6F6	532058LWQ		ļ		
11180.020	34.5 20.0	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	190	1.1			
11180.040	40.7	Н	/4.0	-33.3	۲K	183	1.1			

Client:BroadcomJob Number:J64973Model:BCM94321 MC New versionT-Log Number:T64985Account Manager:-

Contact: David Boldy

Standard: FCC 15.247, 15.401, RSS-210

Class: Radio

EMC Test Data

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								

		<u> </u>						
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	Н	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	Н	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	Н	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	Н	74.0	-35.9	PK	203	1.0	fundamental

Elliott Client: Broadcom T-Log Number: T64985 Model: BCM94321 MC New version Account Manager:

Contact: David Boldy

Standard: FCC 15.247, 15.401, RSS-210

Class: Radio

Job Number: J64973

EMC Test Data

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								

		<u> </u>						
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	Н	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	Н	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	Н	74.0	-36.5	PK	140	1.0	2nd harmonic
2436.990	33.5	Н	74.0	-40.5	PK	201	1.0	fundamental
2437.080	33.1	V	74.0	-40.9	PK	203	1.0	fundamental

E	Ellic	ott						EM	C Tes	t Data
Client:	Broadcom	I						Job Number:	J64973	
							T-L	og Number:	T64985	
Model:	BCM9432	21 MC Ne	ew version				Accou	Int Manager:	-	
Contact:	David Bol	dv						Ū		
Standard [.]	FCC 15.2	47. 15.40)1. RSS-21()				Class:	Radio	
otariaara.		,	- ,	-						
EUT Serial Model #BC A23 PA wit	No: 837 M94321M h Apple S	C ROM se	ttings, B1 S	Silicon						
	Frequency Range Test Distance Limit D							Extrapola	tion Factor	1
	1000-18000 1				3	}	-	9.5	-	
Preliminary	/ peak rea	dings ca	aptured du	ring pre-sca	an					
Frequency	Level	Pol	RSS	-Gen	Detector	Azimuth	Height	Comments		
MHz	$dB\mu V/m$	v/h	Limit	Margin	Pk/QP/Avg	degrees	meters			
No prescan	performed	I. Meası	ured fundam	ental and 2	nd harmonic	only				
Final peak	and avera	ide readi	inas							
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	Н	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	Η	74.0	-32.2	PK	195	1.0			
5600.000	41.0	V	74.0	-33.0	PK	343	1.0			
Switched to	o FoxCon	n A23B1	production	n sample v	5.13, s/n 6F6	632058LWQ	XE			-
11200.030	32.0	V	54.0	-22.0	AVG	194	1.0			
11200.030	29.9	Н	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	Н	74.0	-33.0	PK	131	1.0	1		

Client:BroadcomJob Number:J64973Model:BCM94321 MC New versionT-Log Number:T64985Contact:David BoldyAccount Manager:-Standard:FCC 15.247, 15.401, RSS-210Class: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								

		<u> </u>						
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	Н	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	Н	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	Н	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	Н	74.0	-36.3	PK	203	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: Radio

Coperating 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								

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	Н	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	Н	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	Н	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	Н	74.0	-36.0	PK	127	1.0	

Elli	ott			EM	C Test Dat
Client: Broadcom	l		J	ob Number:	J64973
Model: BCM9432	1 MC New version		T-Lo	og Number:	T64985
Cantasti Dovid Pol	d.,		Accour	nt Manager:	-
Standard: FCC 15.2	47. 15.401. RSS-210		Class:	N/A	
	,,				
		Bandedges			
est specifics					
Objective:	The objective of this test session specification listed above.	n is to perform final qualif	ication testir	ng of the EU	T with respect to the
Date of Test:	8/21/2006	Config. Used:	1		
Test Engineer:	Juan Martinez	Config Change:	None		
Test Location:	Fremont Chamber #3	EUT Voltage:	120V/60Hz		
Ambient Condition	ms: Temperature:	19 °C	Irom the EC	JI.	
Summary of Res	ults	41 70			
Run #	Test Performed	Limit	Pass / Fail	Result	/ Margin
1 - 14	Bandedges	FCC Part 15.209 / 15.247(c)	Pass	Refer to in	dividual runs
Iodifications Ma lo modifications were Deviations From lo deviations were ma	de During Testing: made to the EUT during testing The Standard ade from the requirements of the	e standard.			





























Elliott EMC Test Data Client: Broadcom Job Number: J64973 T-Log Number: T64985 Model: BCM94321 MC New version 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 The objective of this test session is to perform engineering evaluation testing of the EUT with respect to Objective: the specification listed above. Date of Test: 8/17/2006 Config. Used: 1 Config Change: None Test Engineer: Juan Martinez EUT Voltage: 120V/60Hz Test Location: Fremont Chamber #3 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:	<mark>18</mark> °C
	Rel. Humidity:	<mark>45</mark> %

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.















E	Ellic	ott						EM	C Test Data
Client:	Broadcom	1					J	ob Number:	J64973
Ma -La l	DOMONO						T-L	og Number:	T64985
wodel:	BCIN9432		ew version				Accour	nt Manager:	-
Contact:	David Bol	dy							
Standard:	FCC 15.2	47, 15.40	01, 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	Н	54.0	-2.6	AVG	282	1.4	taken 8/18	19.2 dBm
4824.0000	53.7	Н	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		84.2	-15.1	Peak	269	1.2		
560 B1/A23	802.11b	(Ch. 6)	54.0	0 -	A1/0				
/30/.8400	50.3	V	54.0	-3.7	AVG	233	1.2		
/30/.8400	54.0	V	/4.0	-20.0	PK	233	1.2		
48/3.9600	51.7		54.0	-2.3	AVG	280	1.0		
48/3.9600	52.7	H	/4.U	-21.3	PK De ali	280	1.0		
9/40.000	05.6		54.0	11.6	Peak	263	1.0		
300 B1/A23	6U2.11b	(Un. 11)	E4.0	2.0	A) (O	054	4.0	10 40	
1 300.1 0U	51.0	V	54.U	-3.0	AVG	251	1.0	19 aBm	
1300.100	50.2	V	/4.U 9/ 0	-1/.ð	PK Dook	251 070	1.0	19 0BW	
3040.000 1023 070	01.0 52.0	V L	04.Z	-10.0 0 Q		212	1.0	Measured	at 1 motor (10 dDm)
4923.970	53.Z		7/ 0	-0.0 _20.0		211 977	1.0	Measured	at 1 meter (19 UDIII)
560 R1/A22	(802 11a	Ch 1) 1	76dBm	-20.0	EN	211	1.0	weasuled a	
4823 93	<u>1</u> 052.119	, сл. ту т	54 0	-4 5	A\/G	288	1 0		
4823.93	51 1	Н	74.0	-22.9	PK	288	1.0		
7231.31	47 0	V	54.0	-7 0	A\/G	200	1.0	L	
7231.31	59.2	V	74 0	-14.8	PK	241	1.0	L	
9640.00	56.6	V	84.2	-27.6	Peak	263	1.0		
560 B1/A23	(802.11a	. Ch. 6) 1	7.6 dBm			200			
7313.73	45.2	V	54.0	-8.8	AVG	234	1.2	l	
7313.73	57.6	V	74.0	-16.4	PK	234	1.2		
4873.99	51.3	Н	54.0	-2.7	AVG	279	1.0		
4873.99	52.5	Н	74.0	-21.5	PK	279	1.0		
9740.00	59.1	V	82.7	-23.6	Peak	268	1.8		
560 B1/A23	6 (802.11 <u>g</u>	, Ch. 11)	17.6 dBm						
4 <u>92</u> 3.97	53.3	_ H Ó	54.0	-0.7	AVG	278	1.0		
4 <u>92</u> 3.97	54.4	Н	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	8 (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		

E	Ellic	ott						EMC Test Data	
Client:	Broadcom	1					J	ob Number: J64973	
Model.	BCM9432	1 MC Ne	w version				T-Log Number: T64985		
would.	501010702						Account Manager: -		
Contact:	David Bol	dy							
Standard:	FCC 15.2	47, 15.40	01, RSS-210					Class: N/A	
560 D4/A00	002 44-	Ch 50							
10520 15	602.11a	, Cn. 52)	54.0	07		257	1.0		
10520.15	40.0	V	04.0 74.0	-0.7		207	1.0		
10520.15 560 B1/A23	02.5	Ch 62)	74.0	-11.0	Γſ	201	1.0		
10641 83	47.8	V	54.0	-6.2	۵VG	252	11		
10641.83	64.9	V	74.0	_9.1	PK	252	1.1		
560 B1/A23	3 (802.11a	Ch.149) 17.5	0.1		202	1.1		
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	8 (802.11a	. Ch.157) 17.5	0.0		201			
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	8 (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	8 (802.11n	20 MHz,	, Ch.1) 15.5						
4823.99	41.1	V	54.0	-12.9	AVG	43	1.0		
4823.9 ⁹	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	8 (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	Н	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	8 (802.11n	20 MHz,	, Ch.11) 15.	5					
4923.96	53.3	Н	54.0	-0.7	AVG	276	1.0		
4923.96	54.2	H	74.0	-19.8	PK	276	1.0		
/382.83	45.4	V	54.0	-8.6	AVG	240	1.0		
/382.83	57.8	V	74.0	-16.2	۲K	240	1.0		
560 B1/A23	s (802.11n	20 MHz,	Ch.36) 16	10.1	AV (0	07.1			
10360.32	55.1		68.2	-13.1	AVG	2/4	1.0	Non-Restricted	
300 B1/A23	ο (δU2.11n	<u>20 MHz,</u>	un.52) 15	E 0	A)/O	054	4.0		
10514.91	48.1	V	54.U	-5.9	AVG	254	1.0		
10014.91	05.0	V 20 MU-	(4.U	-ŏ.4	۲ň	254	1.0		
10620 02	50 02.11N	20 WHZ,	540	17	A)/C	050	1.0		
10039.92	52.3	V	04.U	-1./		202	1.0		
10039.92	0/.0	 20 M⊔~	(4.0 Ch 140) 45	-0.4	۲Ň	202	1.0		
11/20 21	/7 Q	20 ΙΨΙΠΖ,	5/10	-6.2	<u>۵\/C</u>	310	1 0		
11403.04	47.0	v	J4.U	-0.2	AVU	510	1.0		

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E	Ellic	ott						EMO	C Test Data
Client:	Broadcom	ı					Job	Number: J	64973
Model:	BCM9432	21 MC Ne	ew version			_	T-Log	Number: 1	64985
						Account I	Manager: -		
Contact:	David Bol	dy							
Standard:	FCC 15.2	47, 15.40	01, RSS-210	0				Class: N	N/A
11489.84	61.2	V	74.0	-12.8	PK	310	1.0		
560 B1/A23	8 (802.11n	20 MHz,	, Ch.157) 15	5					
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	<u>8 (802.11n</u>	20 MHz	<u>, Ch.165) 15</u>	5					
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	8 (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	/4.0	-8.9	PK	256	1.0		
560 B1/A23	8 (802.11n	40 MHZ,	, Ch.54) 15	.5	AV/0	000	1.0		
10539.90	40.5	V	54.0	-7.5	AVG	230	1.2		
10039.90	49.3	V 40 MU-	(4.0 Ch 62) 45	-24.1	PN	230	1.Z		
10620 17	002.111	40 MITZ	54 0	.) 05	AVC	256	1.6		
10020.17	40.0	V	04.0 74.0	-0.0		250	1.0		
560 B1/A23	00.0 2 (802 11n	 ∕0 M⊔-	Ch 3) 13	-21.0	F IX	230	1.0		
1811 00	<u>лал</u>	40 WITZ,	5/ 0	-16	AVG	277	1.0		
4844 00	50.8	Н	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	н	78.2	-22.0	Peak	238	1.2		
560 B1/A23	8 (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	Н	54.0	-2.1	AVG	281	1.0		
4873.94	53.1	Н	74.0	-20.9	PK	281	1.0		
9780.00	52.5	V	78.2	-25.7	Peak	275	1.4		
560 B1/A23	8 (802.11n	40 MHz	, Ch.9) 13						
7382.53	36.3	Н	54.0	-17.7	AVG	170	1.0		
7382.53	48.2	Н	74.0	-25.8	PK	170	1.0		
4903.98	51.7	Н	54.0	-2.3	AVG	275	1.0		
4903.98	52.8	Н	74.0	-21.2	PK	275	1.0		
9840.00	56.4	V	78.2	-21.8	Peak	259	1.4		
560 B1/A23	8 (802.11n	40 MHz,	, Ch.151) 15	5					
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	8 (802.11n	40 MHz,	, Ch.159) 15	5					
11589.86	44.7	H	54.0	-9.3	AVG	289	1.2		
11589.86	56.4	Η	/4.0	-17.6	PK	289	1.2		

E	Elliott	EM	C Test Data
Client	Broadcom	Job Number:	J64973
		T-Log Number:	T64985
Model	BCM94321 MC New version	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	e limit was set 30dB below
Note 0	the level of the fundamental and measured in 100kHz.	d band limit was used	
Note 2: Note 3:	Signal is not in a restricted band but the more stringent restricted band but the more stringent restricted band but the area after the ard barmonic fr	or 2 4GHz and after the 2nd	harmonic for 5GHz

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

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements Power, Bandwidth and Spurious Emissions (802.11a)

Test specifics

Elliott

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 Test Engineer: Juan Martinez Test Location: Fremont Chamber #4 Config. Used: 1 Config Change: None EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was connected to the standard(s)trum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:	Temperature:	- °C	
	Rel. Humidity:	- %	

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power	15.247(b)	Pass	17.7 dBm
2	Power standard(s)tral Density	15.247(d)	Pass	-5.17dBm/3kHz
3	6dB Bandwidth	15.247(a)	Pass	Refer to plots
3	99% Bandwidth	RSS GEN	-	Refer to plots
4	Spurious emissions	15.247(b)	Pass	Refer to plots

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.

E	Elliott						EM	C Test	t Data
Client:	Broadcom					Job Number: J64973			
						T-Log Number: T64985			
Model:	odel: BCM94321 MC New version				Accou	nt Manager:	-		
Contact:	David Boldy								
Standard:	FCC 15.247, 15.40	1, RSS-210					Class:	N/A	
Run #1: O	utput Power								
Power	Frequency (MHz)	Output I	Power	Antenna	Pocult	EIRF	Note 2	Output	Power
Setting ²	Fiequency (IVII IZ)	(dBm) ¹	mW	Gain (dBi)	Result	dBm	W	(dBm) ³	mW
	5745	17.6	57.5	2.2	Pass	19.8	0.095		
	5785	17.7	58.2	2.2	Pass	19.9	0.097		
	5825	17.5	56.8	2.2	Pass	19.7	0.094		
Note 1:	Output power mea RBW=1MHz, VB=3 analyzer was confi transmitting) and p The output power I Power setting - the	sured using a 3 MHz, samp gured with a ower integration imit is 30dBn software pot	a spectrum le detector gated swea tion over 30 n wer setting	analyzer (se , power aver ep such that) MHz used during	ae plots below aging on (tra the analyzer	w): nsmitted sig was only sy	nal was not weeping whe	continuous b en the device	ut the ESI was


















Elliott

EMC Test Data

Client: Broadcom

Contact: David Boldy

Model: BCM94321 MC New version

Class: N/A

Job Number: J64973 T-Log Number: T64985

Account Manager:

Standard: FCC 15.247, 15.401, RSS-210 Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Limit	Result
5745	-30dBc	Refer to plots
5785	-30dBc	Refer to plots
5825	-30dBc	Refer to plots







EMC Test Data

 Client:
 Broadcom
 Job Number:
 J64973

 Model:
 BCM94321 MC New version
 T-Log Number:
 T64985

 Contact:
 David Boldy
 Account Manager:

 Standard:
 FCC 15.247, 15.401, RSS-210
 Class:
 N/A

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements MIMO and Smart Antenna Systems (802.11n 20 MHz) (5GHz) Power, Bandwidth and Spurious Emissions

Test specifics

Elliott

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

Config. Used: 1

Config Change: None

EUT Voltage: 120V/60Hz

Date of Test: 8/16/2006 Test Engineer: Juan Martinez Test Location: Fremont Chamber #3

General Test Configuration

The EUT was connected to the standard(s)trum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:	Temperature:	- °C
	Rel. Humidity:	- %

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power	15.247(b)	Pass	18.2 dBm
2	Power spectral Density (PSD)	15.247(d)	Pass	0.2 dBm/3kHz
3	6dB Bandwidth	15.247(a)	Pass	Not Applicable
3	99% Bandwidth	RSS GEN	-	Not Applicable
4	Spurious emissions	15.247(b)	Pass	Refer to plots

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

PSD measurements to confirm the PSD with the alternate PA remained compliant. Tests were performed on three channels in 20MHz mode and center channel in 40MHz mode (to demonstrate that 20MHz mode was worst case).

6dB and 99% bandwidth measurements performed on at least the center channel in both 20Mhz and 40Mhz to verify bandwidths. Changing the PA should have no significant effect on signal bandwidth unless the PA was overloaded.

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.

Elliott

EMC Test Data

<u> </u>			
Client:	Broadcom	Job Number:	J64973
Model: BCM94321 MC New	PCM04321 MC New vorsion	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, 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 #1: Output Power

Transmitted signal on chain is coherent ? y

Regulatory Power Measurements:

Mode	Erequency (MHz) Output Power (dBm) Note 1		Antenna Gain (dBi) Note 3			EIRP Note 2			
	Frequency (IVITZ)	Chain 1	Chain 2	Total	Chain 1	Chain 2	Total	dBm	W
20MHz n	5745	15.2	15.2	18.2	7.4	7.4	10.5	28.7	0.735
20MHz n	5785	15.0	15.1	18.1	7.4	7.4	10.5	28.5	0.710
20MHz n	5825	15.2	15.0	18.1	7.4	7.4	10.5	28.6	0.718
40MHz n	5755	15.1	15.0	18.1	7.4	7.4	10.5	28.5	0.710

	Output power measured using a spectrum analyzer to verify power was within 0.5dB of oringally reported power.
Note 1:	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 50 MHz

EIRP - if transmit chains are coherent then the EIRP is calculated from the sum of the antenna gains plus the total power (i.e. beam-forming is assumed because of coherency on the chains). If the individual chains are incoherent then the EIRP is calculated from the sum of the individual EIRPs for each chain.

If the transmit chains are coherent then the total system antenna gain is the sum of the numeric gains for each Note 3: antenna. If the transmit chains are incoherent then the system antenna gain is not applicable as each transmit chain can be treated independently.



E	Ellic	ott					EM	C Test Data
Client:	Broadcom	1				J	lob Number:	J64973
						T-L	.oa Number:	T64985
Model:	BCM9432	1 MC New version				Accou	nt Manager:	-
Contact:	Contact: David Boldy							
Standard:	Standard: FCC 15.247, 15.401, RSS-210 Run #4: Power Spectral Density						Class:	N/A
Run #4: Power Spectral Density								
Modo	Dowor		Der		Note 1	Limit	Pocult	1
NOUE	Fower	Frequency (MHz)	FOL	udiii/sknz)	LIIIII	Result	
	Setting		Chain 1	Chain 2	Total	dBm/3kHz		
n 20MHz	18.2	5745	-8.2	-8.3	0.2	8.0	Pass	
n 20MHz	18.1	5785	-6.0	-5.3	-0.7	8.0	Pass	
n 20MHz	18.1	5825	-6.0	-5.3	-0.7	8.0	Pass	
n 40MHz	18.1	5755	-12.2	-11.2	-1.0	8.0	Pass	









E	Elliott	EM	C Test Data
Client	Broadcom	Job Number:	J64973
Model	BCM94321 MC New version	T-Log Number: Account Manager:	T64985 -
Contact	David Boldy	g	
Standard	FCC 15.247, 15.401, RSS-210	Class:	N/A
Run #3: S	gnal Bandwidth		
Noto 1:	Proposed changes would not affect signal handiwdths previously report	od	
NOLE T.	Froposed changes would not anect signal bandiwdths previously report	eu.	

E	Elliott		EM	C Test Data
Client:	Broadcom		Job Number:	J64973
			T-Log Number:	T64985
Model:	BCM94321 MC New version		Account Manager:	-
Contact:	David Boldy			
Standard:	FCC 15.247, 15.401, RSS-210		Class:	N/A
Run #4: O	ut of Band Spurious Emissions			
	Frequency (MHz)	Limit	Result	
	5745	-30dBc	Refer to plots	
	5785	-30dBc	Refer to plots	
	5825	-30dBc	Refer to plots	
	5785	-30dBc	Refer to plots	









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

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements Power, Bandwidth and Spurious Emissions (802.11g)

Test specifics

Elliott

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: 8/14/2006 Test Engineer: Juan Martinez Test Location: Fremont Chamber #5 Config. Used: 1 Config Change: None EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was connected to the standard(s)trum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

mbient Conditions:	Temperature:	- °C	
	Rel. Humidity:	- %	

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power	15.247(b)	Pass	17.5 dBm
2	Power standard(s)tral Density	15.247(d)	Pass	-0.8 dBm/3kHz
3	6dB Bandwidth	15.247(a)	Pass	Refer to plots
3	99% Bandwidth	RSS GEN	-	Refer to plots
4	Spurious emissions	15.247(b)	Pass	Refer to plots

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.

E	Elliott						EM	C Test	Data
Client:	Broadcom					J	ob Number:	J64973	
Model:	BCM94321 MC New version					T-L Accou	og Number: nt Manager:	T64985 -	
Contact:	David Boldv								
Standard:	FCC 15 247 15 40)1 RSS-210)				Class.	N/A	
Bun #1: O	utput Power	,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,					01000.		
Rull #1. O	ulpul Power								
Power	Contraction Contra					FIRE	Note 2	Output	Power
Setting ²	Frequency (MHz)	(dBm) ¹	mW	Gain (dBi)	Result	dBm	W	(dBm) ³	mW
0x3e00	2412	(ubiii) 16.6	45.7	22	Pass	18.8	0.075	(ubiii)	
0x3	2437	17.5	56.4	2.2	Pass	19.7	0.094		
0/10	2462	15.7	36.7	2.2	Pass	17.9	0.061		
Note 1:	RBW=1MHz, VB=3 analyzer was confi transmitting) and p The output power I	3 MHz, samp gured with a ower integra imit is 30dBi	ble detector gated sweet ation over 30 m	, power aver ep such that 0 MHz	aging on (tra the analyzer	nsmitted sig was only s	gnal was not weeping who	continuous b en the device	ut the ESI was
Note 2:	Power setting - the	software po	ower setting	used during	i testing, inclu	uded for refe	erence only.		











6 F	Ellic	ott				EM	C Test Data
Client: Broadcom						Job Number:	J64973
					T-Log Number:	T64985	
Model: BCM94321 MC New version						Account Manager:	-
Contact: David Boldy							
Standard: FCC 15.247, 15.401, RSS-210						Class:	N/A
Run #3: Signal Bandwidth							
	Power		Resolution	Bandwir	th (MHz)	1	
	Setting	Frequency (MHz)	Bandwidth	6dB	99%		
	<u>U</u>	2412	100 kHz	16.4	20		
		2437	100 kHz	16.5	19.83		
		2462	100 kHz	16.42	20	J	
Note 1:	e 1: 99% bandwidth measured in accordance with RSS GEN, with RB > 1% of the span and VB > 3xRB						






Elliott

EMC Test Data

Client: Broadcom

Contact: David Boldy

Model: BCM94321 MC New version

Class: N/A

Job Number: J64973 T-Log Number: T64985

Account Manager:

Standard: FCC 15.247, 15.401, RSS-210 Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Limit	Result
2412	-30dBc	Refer to plots
2437	-30dBc	Refer to plots
2462	-30dBc	Refer to plots







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

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements Power, Bandwidth and Spurious Emissions (802.11b)

Test specifics

Elliott

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: 8/14/2006 Test Engineer: Juan Martinez Test Location: Fremont Chamber #5 Config. Used: 1 Config Change: None EUT Voltage: 120V/60Hz

General Test Configuration

The EUT was connected to the standard(s)trum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:	Temperature:	- °C	
	Rel. Humidity:	- %	

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power	15.247(b)	Pass	19.4 dBm
2	Power standard(s)tral Density	15.247(d)	Pass	-1.1 dBm/3kHz
3	6dB Bandwidth	15.247(a)	Pass	Refer to plots
3	99% Bandwidth	RSS GEN	-	Refer to plots
4	Spurious emissions	15.247(b)	Pass	Refer to plots

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.

E	Elliott						EM	C Test	Data	
Client:	Broadcom					J	Job Number: J64973			
							og Number:	T64985		
Model:	BCM94321 MC New version						nt Manager:	-		
Contact:	David Boldy									
Standard:	Standard: FCC 15.247, 15.401, RSS-210							N/A		
Run #1: 0	utput Power					I.				
		• • • • •	_				Note 2	• • • •	_	
Power	Frequency (MHz)	Output F	Power	Antenna	Result	EIRF		Output Power		
Setting ²		(dBm) '	mW	Gain (dBi)		dBm	W	(dBm) ိ	mW	
	2412	18.4	69.7	2.2	Pass	20.6	0.116			
	2437	19.4	87.7	2.2	Pass	21.6	0.146			
	2402	16.6	45.8	2.2	Pass	18.8	0.076			
Note 1:	Output power mea RBW=1MHz, VB=3 analyzer was confi- transmitting) and p The output power I	sured using a 3 MHz, sampl gured with a ower integrat imit is 30dBm software pop	a spectrum le detector gated swe tion over 30 n wer setting	analyzer (se , power aver ep such that) MHz	ee plots below aging on (tra the analyzer	w): nsmitted sig was only s	gnal was not weeping whe	continuous been the device	ut the ESI was	
11010 2.	i olioi ootalig alo		iter eetanig	dood damig	tooting, more					











6	Ellic	ott				EM	C Test Data
Client:	Broadcom	1				Job Number:	J64973
	DOM 0					T-Log Number:	T64985
Model:	BCM9432	1 MC New version				Account Manager:	-
Contact:	David Bol	dy					
Standard:	FCC 15.24	47, 15.401, RSS-210)	Class:	N/A		
Run #3: Si	gnal Band	lwidth					
	Power		Resolution	Bandwir	th (MHz)	1	
	Settina	Frequency (MHz)	Bandwidth	6dB	99%		
		2412	100 kHz	10.2	15.3		
		2437	100 kHz	10.0	15.2		
		2462	100 kHz	10.2	16.8		
Note 1:	99% band	width measured in a	ccordance w	ith RSS GE	N. with RB	> 1% of the span and VB	3 > 3xRB
						•	







Client: Broadcom

Contact: David Boldy

EMC Test Data

.....

Model: BCM94321 MC New version

Class: N/A

Job Number: J64973 T-Log Number: T64985

Account Manager:

Standard: FCC 15.247, 15.401, RSS-210
Run #4: Out of Band Spurious Emissions

Frequency (MHz)	Limit	Result
2412	-30dBc	Refer to plot
2437	-30dBc	Refer to plot
2462	-30dBc	Refer to plot







Elliott EMC Test Data Job Number: J64973 T-Log Number: T64985 Model: BCM94321 MC New version Account Manager: Class: N/A

Standard: FCC 15.247, 15.401, RSS-210

RSS 210 and FCC 15.247 (DTS) Antenna Port Measurements MIMO (802.11n 20 MHz), 2.4GHz Power, Bandwidth and Spurious Emissions

Test specifics

Client: Broadcom

Contact: David Boldy

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

Config. Used: 1

Config Change: None

EUT Voltage: 120V/60Hz

Date of Test: 8/16/2006 Test Engineer: Juan Martinez Test Location: Fremont Chamber #3

General Test Configuration

The EUT was connected to the standard(s)trum analyzer or power meter via a suitable attenuator. All measurements were made on a single chain.

All measurements have been corrected to allow for the external attenuators used.

Ambient Conditions:	Temperature:	- °C	
	Rel. Humidity:	- %	

Summary of Results

Run #	Test Performed	Limit	Pass / Fail	Result / Margin
1	Output Power	15.247(b)	Pass	24dBm combined
2	Power standard(s)tral Density	15.247(d)	Pass	-2.2dBm/kHz
3	6dB Bandwidth	15.247(a)	Pass	Refer to plots
3	99% Bandwidth	RSS GEN	-	Refer to plots
4	Spurious emissions	15.247(b)	Pass	Refer to plots

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

PSD measurements to confirm the PSD with the alternate PA remained compliant. Tests were performed on three channels in 20MHz mode and center channel in 40MHz mode (to demonstrate that 20MHz mode was worst case).

6dB and 99% bandwidth measurements performed on at least the center channel in both 20Mhz and 40Mhz to verify bandwidths. Changing the PA should have no significant effect on signal bandwidth unless the PA was overloaded.

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.

EMC Test Data

<u> </u>			
Client:	Broadcom	Job Number:	J64973
Model:	PCM04321 MC New vorsion	T-Log Number:	T64985
		Account Manager:	-
Contact:	David Boldy		
Standard:	FCC 15.247, 15.401, 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 #1: Output Power

Transmitted signal on chain is coherent ? Y

Regulatory Power Measurements:

Mode	Mode Craguanay (MUT) Output		t Power (dBm) ^{Note 1}		Antenna Gain (dBi) ^{Note 3}			EIRP Note 2	
	Frequency (MHZ)	Chain 1	Chain 2	Total	Chain 1	Chain 2	Total	dBm	W
20MHz n	2412	14.1	14.1	17.1	2.2	2.2	5.2	22.3	0.169
20MHz n	2437	15.9	15.7	18.8	2.2	2.2	5.2	24.0	0.251
20MHz n	2462	13.6	13.8	16.7	2.2	2.0	5.1	21.8	0.151
40MHz n	2437	13.2	13.0	16.1	2.2	2.2	5.2	21.3	0.135
(No plots fo	r 40MHz mode)								
	Output power mea	sured using	a spectrum	analyzer (s	ee plots belov	w):			
	RBW=1MHz, VB=3	3 MHz, sam	ple detector	, power ave	raging on (tra	nsmitted sig	inal was not	continuous b	out the ESI
Note 1:	analyzer was confi	aured with a	a gated swe	ep such that	t the analyzer	was only sv	weeping whe	en the device	was
	transmitting) and power integration over 30 MHz								
	The output power limit is 30dBm								
	FIRP - if transmit chains are coherent then the FIRP is calculated from the sum of the antenna gains plus the total								
Note 2.	2. nower (i.e. beam-forming is assumed because of coherency on the chains). If the individual chains are incoherent								
1000 2.	then the FIRP is c	alculated fro	m the sum (of the indivic	fual FIRPs for	r each chair	10 110111000		
	If the transmit chai	ne are cohe	rent then th		m antenna os	ain is the sur	n of the nur	neric gains fo	r each
Note 3:	antenna If the trai	nemit chaine		rent then th	e svetom ante	anna aain ie	not annlicat	nene yanta te	ansmit chain
NOLE J.	antenna. In the trai	nondently			e system ante	filla yain is	not applicat		
	Dower setting if a	spendentry.	hor the car	o nower set	Hina was usor	d for each cl	ooin If mult	inlo numbere	the nower
Noto 1:	Fower setting - in a		Del ule sam		uny was used	1 101 Eauli u	Idlli. Il Illui. Sotting v for	chain 1 now	the power
NOLE 4.	for aboin 2	all is separ	aleu by a co	illina (e.y. i	(,y would liful	cate power a	setting x to	chain i, powe	er setting y
	for chain 2.								
1									













Elliott Broadcom BCM94321 MC N David Boldy FCC 15.247, 15.4 ower Spectral Der Frequency (MHz) 2412	oadcom CM94321 MC New version avid Boldy CC 15.247, 15.401, RSS-210 er Spectral Density PSD (c				Jol	EM	C Test Data		
: Broadcom : BCM94321 MC N : David Boldy : FCC 15.247, 15.4 Power Spectral Der Frequency (MHz) 2412	oadcom CM94321 MC New version avid Boldy CC 15.247, 15.401, RSS-210 er Spectral Density PSD (c				Joł				
: BCM94321 MC N : David Boldy : FCC 15.247, 15.4 'ower Spectral Der Frequency (MHz) 2412	CM94321 MC New version avid Boldy CC 15.247, 15.401, RSS-210 er Spectral Density requency (MHz) PSD (c					Number:	J64973		
: BCM94321 MC N : David Boldy : FCC 15.247, 15.4 : bower Spectral Der Frequency (MHz) 2412	avid Boldy CC 15.247, 15.401, RSS-210 er Spectral Density PSD (c				T-Log	g Number:	T64985		
: David Boldy : FCC 15.247, 15.4 'ower Spectral Der Frequency (MHz) 2412	avid Boldy CC 15.247, 15.401, RSS-210 er Spectral Density requency (MHz) PSD (c								
FCC 15.247, 15.4 Fower Spectral Der Frequency (MHz)	er Spectral Density PSD (c								
Frequency (MHz)	er Spectral Density					Class:	N/A		
Frequency (MHz) 2412	PSD (c								
2412	Chain 1	JBm/3kHz) Chain 2	Note 1 Total	Limit dBm/3kHz	Result				
	2412 -5.5	-7.7	-3.4	8.0	Pass				
2437	2437 -3.7	-7.7	-2.2	8.0	Pass				
2462	2462 -5.5	-6.2	-2.8	8.0	Pass				
2437	2437 -12.8	-12.5	-9.6	8.0	Pass				
Power standard(s time set to ensure determined from p the signal.	wer standard(s)tral density m ne set to ensure a dwell time c termined from preliminary sca e signal.	easured us of at least 1 ans using R	sing RB=3 k second pe B=3kHz us	Hz, VB=10kH r 3kHz. The n ing multiple s	Iz, analyzer w neasurement weeps at a fa	vith peak d is made at ster rate o	etector and with a sweep the frequency of PPSD ver the 6dB bandwidth of		









6]	Ellic	ott					EM	C Test Data
Client: Broadcom						Job Number: J64973		
						T-Log Number: T64985		
							t Manager:	-
Contac	t: David Bol	dy						
Standard: FCC 15.247, 15.401, RSS-210							Class:	N/A
Run #3: S	Signal Banc	lwidth	F					
				Main Bandwidth (MH=)		Aux		
	Mode	Frequency (MHz)	Resolution	6dB	ith (IVIHZ) 00%	Bandwidi 6dB	(IVIHZ) 00%	
	20MHz n	2412	100 kHz	16.83	23.7	16.83	23.5	
	20MHz n	2437	100 kHz	15.17	21.3	16.17	23.0	
	20MHz n	2462	100 kHz	17.33	21.2	17.17	23.3	
lata 1:	Macaura	on o gingle sheir						
lote 2:	99% hand	width measured in a	accordance w	ith RSS GE	N with RB >	> 1% of the s	nan and VF	R > 3xRB












_								
6	Ellic	ott				EM	C Test	Data
Client:	nt: Broadcom					Job Number: J64973		
Madala						T-Log Number: T6		
Model: BCM94321 MC New Version					Account Manager: -			
Contact: David Boldy								
Standard: FCC 15.247, 15.401, RSS-210						Class: N/A		
Run #4: O	ut of Band	l Spurio	us Emissions					
Power So #1	etting Per #2	Chain #3	Frequency (MHz)	Limit	Mode	Re	esult	
			2412	-30dBc	20MHz	All spurs b	elow -30dBc	
			2437	-30dBc	20MHz	All spurs b	elow -30dBc	
			2437	-30dBc	40MHz	All spurs b	elow -30dBc	
			2462	-30dBc	20MHz	All spurs b	elow -30dBc	
Note 1:	Measured	on each	n chain individually					
			•					















EXHIBIT 3: Photographs of Test Configurations

Pages

EXHIBIT 4: Proposed FCC ID Label & Label Location

EXHIBIT 5: Detailed Photographs of Broadcom Corporation Model BCM94321MCConstruction

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

EXHIBIT 7: Block Diagram of Broadcom Corporation Model BCM94321MC

EXHIBIT 8: Schematic Diagrams for Broadcom Corporation Model BCM94321MC

EXHIBIT 9: Theory of Operation for Broadcom Corporation Model BCM94321MC

EXHIBIT 10: Advertising Literature

EXHIBIT 11: RF Exposure Information