*EMC Test Report*
*Application for Grant of Equipment Authorization*
*Class II Permissive Change/Reassessment*
*Industry Canada RSS-Gen Issue 3 / RSS 210 Issue 8*
*FCC Part 15, Subpart E*

## *Model: BCM943228HM4L*

| | |
|---|---|
| IC CERTIFICATION #: | 4324A-BRCM1054 |
| FCC ID: | QDS-BRCM1054 |
| APPLICANT: | Broadcom Corporation<br>190 Mathilda Ave<br>Sunnyvale, CA 94086 |
| TEST SITE(S): | Elliott Laboratories<br>41039 Boyce Road.<br>Fremont, CA. 94538-2435 |
| IC SITE REGISTRATION #: | 2845B-3, 2845B-5 |
| REPORT DATE: | February 7, 2011 |
| FINAL TEST DATES: | January 25, 26, 27, 28, 2011 |

AUTHORIZED SIGNATORY:

Mark E Hill
Staff Engineer
Elliott Laboratories

Testing Cert #2016.01

## *REVISION HISTORY*

| Rev# | Date | Comments | Modified By |
|---|---|---|---|
| - | 2-7-2011 | First release | |

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## *SCOPE*

An electromagnetic emissions test has been performed on the Broadcom Corporation model BCM943228HM4L, pursuant to the following rules:

Industry Canada RSS-Gen Issue 3
RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart E requirements for UNII Devices (using FCC DA 02-2138, August 30, 2002)

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

ANSI C63.4:2003
FCC UNII test procedure 2002-08 DA-02-2138, August 2002

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.

## *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 BCM943228HM4L complied with the requirements of the following regulations:

RSS 210 Issue 8 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category I Equipment"
FCC Part 15, Subpart E requirements for UNII Devices

Maintenance of compliance is the responsibility of the manufacturer. Any modifications to the product should be assessed to determine their potential impact on the compliance status of the device with respect to the standards detailed in this test report.

The test results recorded herein are based on a single type test of Broadcom Corporation model BCM943228HM4L and therefore apply only to the tested sample. The sample was selected and prepared by Anne Liang of Broadcom Corporation.

## *DEVIATIONS FROM THE STANDARDS*

No deviations were made from the published requirements listed in the scope of this report.

## *TEST RESULTS SUMMARY*

### *UNII / LELAN DEVICES*

**Operation in the 5.15 – 5.25 GHz Band, 5.25 – 5.35 GHz Band, 5.47 – 5.725 GHz Bands**

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.407(e) | | Indoor operation only | N/A – Change would not impact original filing results | | |
| 15.407(a) (2) | | 26dB Bandwidth | N/A – Change would not impact original filing results | | |
| 15.407 (a) (1) and (2) | A9.2(1) and (2) | Output Power | N/A – Power verified to be within 0.5dB of the original filing prior to evaluation of spurious emissions. | | |
| 15.407 (a) (1) and (2) | - | Power Spectral Density | N/A – Change would not impact original filing results | | |
| - | A9.2(2) / A9.5 (2) | | | | |
| KDB 443999 | A9 | Non-operation in 5600 – 5650 MHz sub band | N/A – Change would not impact original filing results | | |

**Requirements for all U-NII/LELAN bands**

| FCC Rule Part | RSS Rule Part | Description | Measured Value / Comments | Limit / Requirement | Result |
|---|---|---|---|---|---|
| 15.407 | A9.5a | Modulation | N/A – Change would not impact original filing results | | |
| 15.407(b) (5) / 15.209 | A9.3 | Spurious Emissions | 53.8dBµV/m @ 11401.1MHz (-0.2dB) | Refer to page 21 | Complies |
| 15.407(a)(6) | - | Peak Excursion Ratio | N/A – Change would not impact original filing results | | |
| | A9.5 (3) | Channel Selection | Spurious emissions tested at outermost channels in each band | Device was tested on the top, bottom and center channels in each band | N/A |
| 15 | | | Measurements on three channels in each band | | Complies |
| 15.407 (c) | A9.5(4) | Operation in the absence of information to transmit | N/A – Change would not impact original filing results | | |
| 15.407 (g) | A9.5 (5) | Frequency Stability | N/A – Change would not impact original filing results | | |
| 15.407 (h1) | A9.4 | Transmit Power Control | N/A – Change would not impact original filing results | | |
| 15.407 (h2) | A9.4 | Dynamic frequency Selection (device without radar detection) | N/A – Change would not impact original filing results | | |
| | A9.9g | User Manual information | N/A – Change would not impact original filing results | | |

*GENERAL REQUIREMENTS APPLICABLE TO ALL BANDS*

| FCC Rule Part | RSS Rule part | Description | Measured Value / Comments | Limit / Requirement | Result (margin) |
|---|---|---|---|---|---|
| 15.203 | - | RF Connector | N/A – Change would not impact original filing results | | |
| 15.207 | RSS GEN Table 2 | AC Conducted Emissions | N/A – Change would not impact original filing results | | |
| 15.109 | RSS GEN 7.2.3 Table 1 | Receiver spurious emissions | N/A – Change would not impact original filing results | | |
| 15.247 (b) (5) 15.407 (f) | RSS 102 | RF Exposure Requirements | N/A – Change would not impact original filing results | | |
| - | RSP 100 RSS GEN 7.1.5 | User Manual | N/A – Change would not impact original filing results | | |
| - | RSP 100 RSS GEN 7.1.5 | User Manual | N/A – Change would not impact original filing results | | |
| - | RSP 100 RSS GEN 4.4.1 | 99% Bandwidth | N/A – Change would not impact original filing results | | |

*MEASUREMENT UNCERTAINTIES*

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

| Measurement Type | Measurement Unit | Frequency Range | Expanded Uncertainty |
|---|---|---|---|
| RF power, conducted (power meter) | dBm | 25 to 7000 MHz | ± 0.52 dB |
| RF power, conducted (Spectrum analyzer) | dBm | 25 to 7000 MHz | ± 0.7 dB |
| Conducted emission of transmitter | dBm | 25 to 26500 MHz | ± 0.7 dB |
| Conducted emission of receiver | dBm | 25 to 26500 MHz | ± 0.7 dB |
| Radiated emission (substitution method) | dBm | 25 to 26500 MHz | ± 2.5 dB |
| Radiated emission (field strength) | dBµV/m | 25 to 1000 MHz | ± 3.6 dB |
| | | 1000 to 40000 MHz | ± 6.0 dB |
| Conducted Emissions (AC Power) | dBµV | 0.15 to 30 MHz | ± 2.4 dB |

## *EQUIPMENT UNDER TEST (EUT) DETAILS*

### *GENERAL*

The Broadcom Corporation model BCM943228HM4L is a WLAN PCI-E Minicard, that is designed to enable WLAN connections when installed in PCs. 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 3.3Vdc, 800mA.

The sample was received on January 25, 2011 and tested on January 25, 26, 27, 28, 2011. The EUT consisted of the following component(s):

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Broadcom | BCM943228H M4L Murata FEM (C2PC) | 802.11abgn WLAN PCI-E Mini Card | - | QDS-BRCM1054 |

### *ANTENNA SYSTEM*

The EUT antenna is a 802.11abgn WLAN antenna. The antenna connects to the EUT via a non-standard u.FL antenna connector, thereby meeting the requirements of FCC 15.203.

### *ENCLOSURE*

The EUT has no enclosure. It is designed to be installed within the enclosure of a host computer.

### *MODIFICATIONS*

No modifications were made to the EUT during the time the product was at Elliott.

### *SUPPORT EQUIPMENT*

The following equipment was used as support equipment for testing:

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Lenovo | 4446 | Laptop | - | - |
| Catalyst | - | Extender Board | - | - |

No support equipment was used during testing.

*EUT INTERFACE PORTS*

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

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded or Unshielded | Length(m) |
| Extender Board | Laptop | - | - | - |
| Antenna A & B | EUT | - | - | - |
| AC Power | AC Mains | 2Wire | Unshielded | 0.8 |

*EUT OPERATION*

Prior to testing, the sample was configured using a gated average power meter to be within 0.5dB of the power levels listed in the operational description of the original filing. The power values listed in the operational description are equivalent to the power levels recorded in the original test reports

During testing, the EUT was configured to continuously transmit at the noted channel at the maximum output power. For 802.11b mode testing, the data rate was set to 1 Mb/s. For 802.11g mode, the data rate was set to 6 Mb/s. For 802.11n20 and 802.11n40, the data rate was set to MCS0. These data rates represent worse case, as they resulted in the highest output power.

Bandedge testing was performed for all modes, on all appropriate channels. Spurious emissions were performed on the worse case mode from the original filing.

## *TEST SITE*

### *GENERAL INFORMATION*

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

| Site | Registration Numbers | | Location |
|---|---|---|---|
| | FCC | Canada | |
| Chamber 3 | 769238 | 2845B-3 | 41039 Boyce Road<br>Fremont,<br>CA 94538-2435 |
| Chamber 5 | 211948 | 2845B-5 | |

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. The test site(s) contain separate areas for radiated and conducted emissions testing. Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements of ANSI C63.4:2003.

### *CONDUCTED EMISSIONS CONSIDERATIONS*

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

### *RADIATED EMISSIONS CONSIDERATIONS*

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

## *MEASUREMENT INSTRUMENTATION*

### *RECEIVER SYSTEM*

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

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

### *INSTRUMENT CONTROL COMPUTER*

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

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

### *LINE IMPEDANCE STABILIZATION NETWORK (LISN)*

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

*FILTERS/ATTENUATORS*

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

*ANTENNAS*

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

*ANTENNA MAST AND EQUIPMENT TURNTABLE*

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

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

*INSTRUMENT CALIBRATION*

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

## *TEST PROCEDURES*

### *EUT AND CABLE PLACEMENT*

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

### *CONDUCTED EMISSIONS*

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

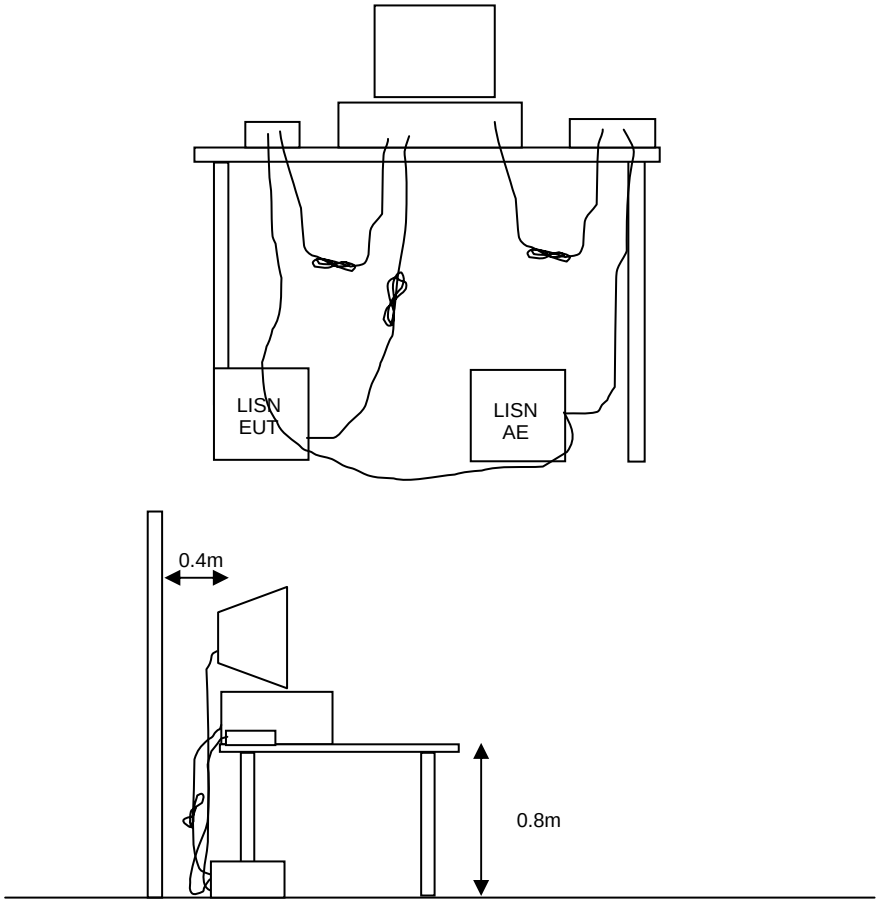



**Figure 1 Typical Conducted Emissions Test Configuration**

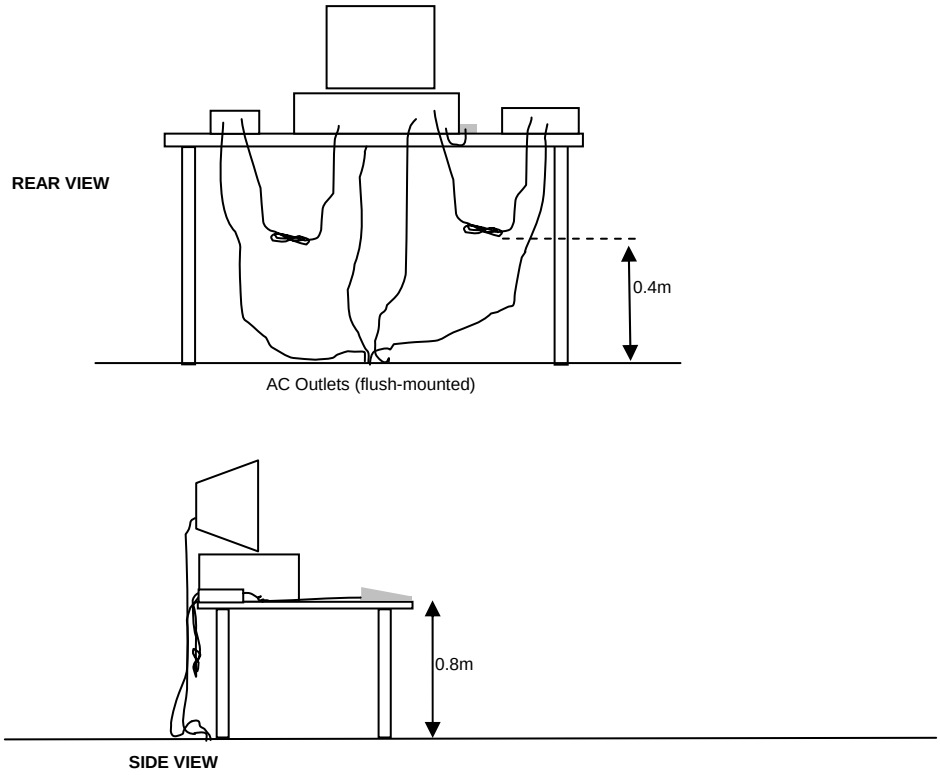
*RADIATED EMISSIONS*

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

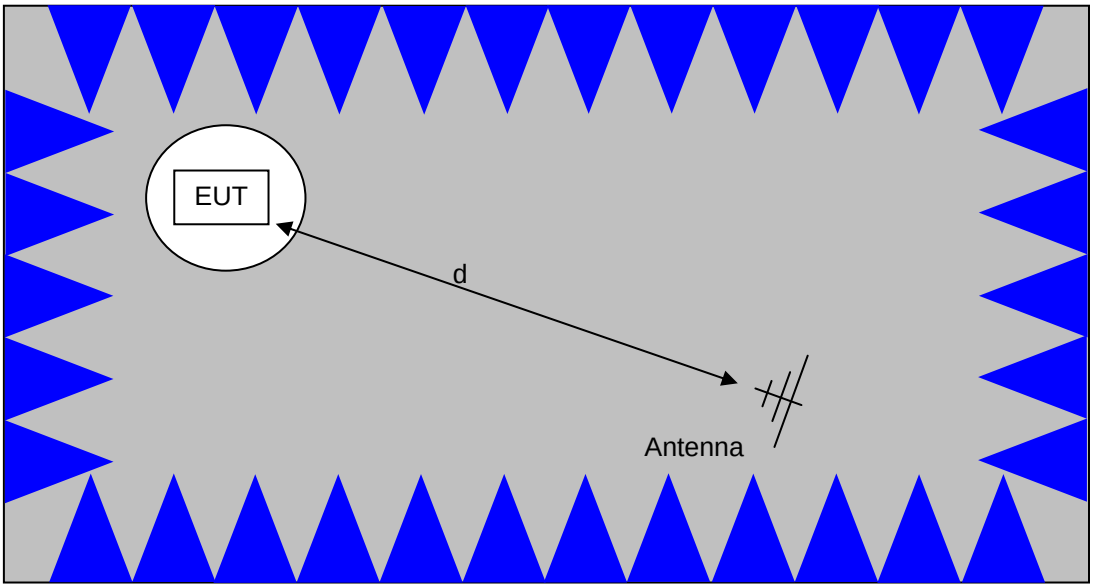
A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT.

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

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

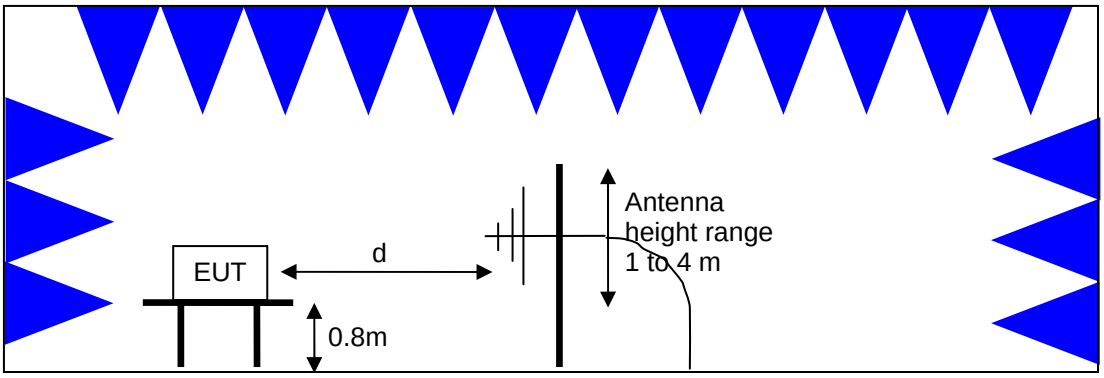



Typical Test Configuration for Radiated Field Strength Measurements




The 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.

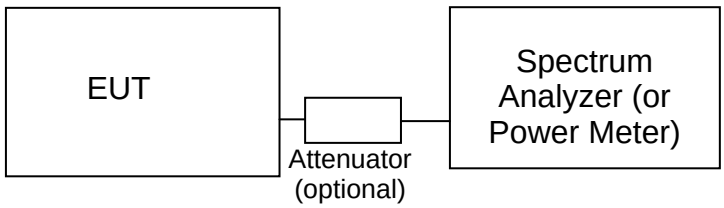
Floor-standing equipment is placed on the floor with insulating supports between the unit and the ground plane.




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

*CONDUCTED EMISSIONS FROM ANTENNA PORT*

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




Test Configuration for Antenna Port Measurements

Measurement bandwidths (video and resolution) are set in accordance with the relevant standards and Elliott's test procedures for the type of radio being tested. When power measurements are made using a resolution bandwidth less than the signal bandwidth the power is calculated by summing the power across the signal bandwidth using either the analyzer channel power function or by capturing the trace data and calculating the power using software. In both cases the summed power is corrected to account for the equivalent noise bandwidth (ENBW) of the resolution bandwidth used.

If power averaging is used (typically for certain digital modulation techniques), the EUT is configured to transmit continuously. Power averaging is performed using either the built-in function of the analyzer or, if the analyzer does not feature power averaging, using external software. In both cases the average power is calculated over a number of sweeps (typically 100). When the EUT cannot be configured to continuously transmit then either the analyzer is configured to perform a gated sweep to ensure that the power is averaged over periods that the device is transmitting or power averaging is disabled and a max-hold feature is used.

If a power meter is used to make output power measurements the sensor head type (peak or average) is stated in the test data table.

*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:

*CONDUCTED EMISSIONS SPECIFICATION LIMITS: FCC 15.207; FCC 15.107(a), RSS GEN*

The table below shows the limits for the emissions on the AC power line from an intentional radiator and a receiver.

| Frequency (MHz) | Average Limit (dBuV) | Quasi Peak Limit (dBuV) |
|---|---|---|
| 0.150 to 0.500 | Linear decrease on logarithmic frequency axis between 56.0 and 46.0 | Linear decrease on logarithmic frequency axis between 66.0 and 56.0 |
| 0.500 to 5.000 | 46.0 | 56.0 |
| 5.000 to 30.000 | 50.0 | 60.0 |

*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 |

*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 |

*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 |

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

| | | |
|---|---|---|
| 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.

The peak excursion envelope is limited to 13dB.

*OUTPUT POWER LIMITS –LELAN DEVICES*

The table below shows the limits for output power and output power density defined by RSS 210. Where the signal bandwidth is less than 20 MHz the maximum output power is reduced to the power spectral density limit plus 10 times the log of the bandwidth (in MHz).

| Operating Frequency (MHz) | Output Power | Power Spectral Density |
|---|---|---|
| 5150 – 5250 | 200mW (23 dBm) eirp | 10 dBm/MHz eirp |
| 5250 – 5350 | 250 mW (24 dBm)[2]<br>1W (30dBm) eirp | 11 dBm/MHz |
| 5470 – 5725 | 250 mW (24 dBm)[3]<br>1W (30dBm) eirp | 11 dBm/MHz |
| 5725 – 5825 | 1 Watts (30 dBm)<br>4W eirp | 17 dBm/MHz |

In addition, the power spectral density limit shall be reduced by 1dB for every dB the highest power spectral density exceeds the "average" power spectral density ) by more than 3dB. The "average" power spectral density is determined by dividing the output power by 10log(EBW) where EBW is the 99% power bandwidth.

Fixed point-to-point applications using the 5725 – 5825 MHz band may use antennas with gains of up to 23dBi without this limitation. If the gain exceeds 23dBi then the output power limit of 1 Watt is reduced by 1dB for every dB the gain exceeds 23dBi.

*SPURIOUS EMISSIONS LIMITS –UNII and LELAN DEVICES*

The spurious emissions limits for signals below 1GHz are the FCC/RSS-GEN general limits. For emissions above 1GHz, signals in restricted bands are subject to the FCC/RSS GEN general limits. All other signals have a limit of –27dBm/MHz, which is a field strength of 68.3dBuV/m/MHz at a distance of 3m. This is an average limit so the peak value of the emission may not exceed –7dBm/MHz (88.3dBuV/m/MHz at a distance of 3m). For devices operating in the 5725-5850Mhz bands under the LELAN/UNII rules, the limit within 10Mhz of the allocated band is increased to –17dBm/MHz.

[2] If EIRP exceeds 500mW the device must employ TPC
[3] If EIRP exceeds 500mW the device must employ TPC

*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 d (meters) from the equipment under test:

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

where P is the eirp (Watts)

For a measurement at 3m the conversion from a logarithmic value for field strength (dBuV/m) to an eirp power (dBm) is -95.3dB.

# *Appendix A Test Equipment Calibration Data*

**Radiated Emissions, Bandedge 2.4GHz, 25-Jan-11**

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 786 | 12/11/2011 |
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB7 | 1630 | 3/31/2011 |

**Radiated Emissions, 1000 - 26,500 MHz, 27-Jan-11**

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 786 | 12/11/2011 |
| Hewlett Packard | Head (Inc W1-W4, 1143, 2198) Red | 84125C | 1145 | 2/13/2011 |
| Hewlett Packard | SpecAn 30 Hz -40 GHz, SV (SA40) Red | 8564E (84125C) | 1148 | 7/12/2011 |
| A.H. Systems | Spare System Horn, 18-40GHz | SAS-574, p/n: 2581 | 2162 | 2/19/2011 |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 2199 | 2/11/2011 |
| Micro-Tronics | Band Reject Filter, 2400-2500 MHz | BRM50702-02 | 2249 | 10/11/2011 |

**Radiated Emissions, 1000 - 18,000 MHz, 28-Jan-11**

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 786 | 12/11/2011 |
| Hewlett Packard | SpecAn 30 Hz -40 GHz, SV (SA40) Red | 8564E (84125C) | 1148 | 7/12/2011 |
| Micro-Tronics | Band Reject Filter, 5150-5350 MHz | BRC50703-02 | 1729 | 9/3/2011 |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 2199 | 2/11/2011 |

**Radiated Emissions, 1000 - 18,000 MHz, 31-Jan-11**

| Manufacturer | Description | Model | Asset # | Cal Due |
|---|---|---|---|---|
| EMCO | Antenna, Horn, 1-18 GHz | 3115 | 487 | 7/6/2012 |
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 785 | 5/26/2011 |
| Hewlett Packard | SpecAn 30 Hz -40 GHz, SV (SA40) Red | 8564E (84125C) | 1148 | 7/12/2011 |
| Hewlett Packard | High Pass filter, 8.2 GHz (Blu System) | P/N 84300-80039 (84125C) | 1392 | 5/17/2011 |
| Micro-Tronics | Band Reject Filter, 5725-5875 MHz | BRC50705-02 | 1728 | 1/31/2011 |

# *Appendix B Test Data*

T81881 32 Pages

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | - |
| Emissions Standard(s): | FCC 15.247/15/407 | Class: | - |
| Immunity Standard(s): | - | Environment: | - |

# EMC Test Data

For The

# Broadcom

Model

BCM943228HM4L Murata FEM (C2PC)

Date of Last Test: 1/31/2011

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

# RSS 210 and FCC 15.407 (UNII) Radiated Spurious Emissions

## Test Specific Details

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

Date of Test: 1/25/2011 0:35
Test Engineer: Rafael Varelas
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: 20.8 °C
Rel. Humidity: 35 %

## Summary of Results

| Run # | Mode | Channel | Power Setting | Measured Power | Test Performed | Limit | Result / Margin |
|---|---|---|---|---|---|---|---|
| 1a | 802.11a Chain A | 5150-5250 Low | - | - | Restricted Band Edge at 5150 MHz | 15.209 | 48.3dBµV/m @ 5150.1MHz (-5.7dB) |
| 1b | 802.11a Chain A | 5250-5350 High | - | - | Restricted Band Edge at 5350 MHz | 15.209 | 49.7dBµV/m @ 5352.0MHz (-4.3dB) |
| 2 | 802.11a Chain A | 5470-5725 Low | - | - | Restricted Band Edge at 5460 MHz | 15.209 | 52.5dBµV/m @ 5460.1MHz (-1.5dB) |
| | 802.11a Chain A | 5470-5725 Low | - | - | Band Edge 5460 - 5470 MHz | 15E | 78.3dBµV/m @ 5469.5MHz (-10.0dB) |
| 3a | 802.11n20 Chain A+B | 5150-5250 Low | - | - | Restricted Band Edge at 5150 MHz | 15.209 | 46.6dBµV/m @ 5147.9MHz (-7.4dB) |
| 3b | 802.11n20 Chain A+B | 5250-5350 High | - | - | Restricted Band Edge at 5350 MHz | 15.209 | 51.1dBµV/m @ 5351.7MHz (-2.9dB) |
| 4 | 802.11n20 Chain A+B | 5470-5725 Low | - | - | Restricted Band Edge at 5460 MHz | 15.209 | 53.3dBµV/m @ 5460.1MHz (-0.7dB) |
| | 802.11n20 Chain A+B | 5470-5725 Low | - | - | Band Edge 5460 - 5470 MHz | 15E | 78.7dBµV/m @ 5467.1MHz (-9.6dB) |

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 5a | 802.11n40 Chain A+B | 5150-5250 Low | - | - | Restricted Band Edge at 5150 MHz | 15.209 | 49.6dBµV/m @ 5150.0MHz (-4.4dB) |
| 5b | 802.11n40 Chain A+B | 5250-5350 High | - | - | Restricted Band Edge at 5350 MHz | 15.209 | 53.7dBµV/m @ 5350.4MHz (-0.3dB) |
| 6 | 802.11n40 Chain A+B | 5470-5725 Low | - | - | Restricted Band Edge at 5460 MHz | 15.209 | 52.8dBµV/m @ 5460.1MHz (-1.2dB) |
| | 802.11n40 Chain A+B | 5470-5725 Low | - | - | Band Edge 5460 - 5470 MHz | 15E | 61.2dBµV/m @ 5470.0MHz (-7.1dB) |

## 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: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

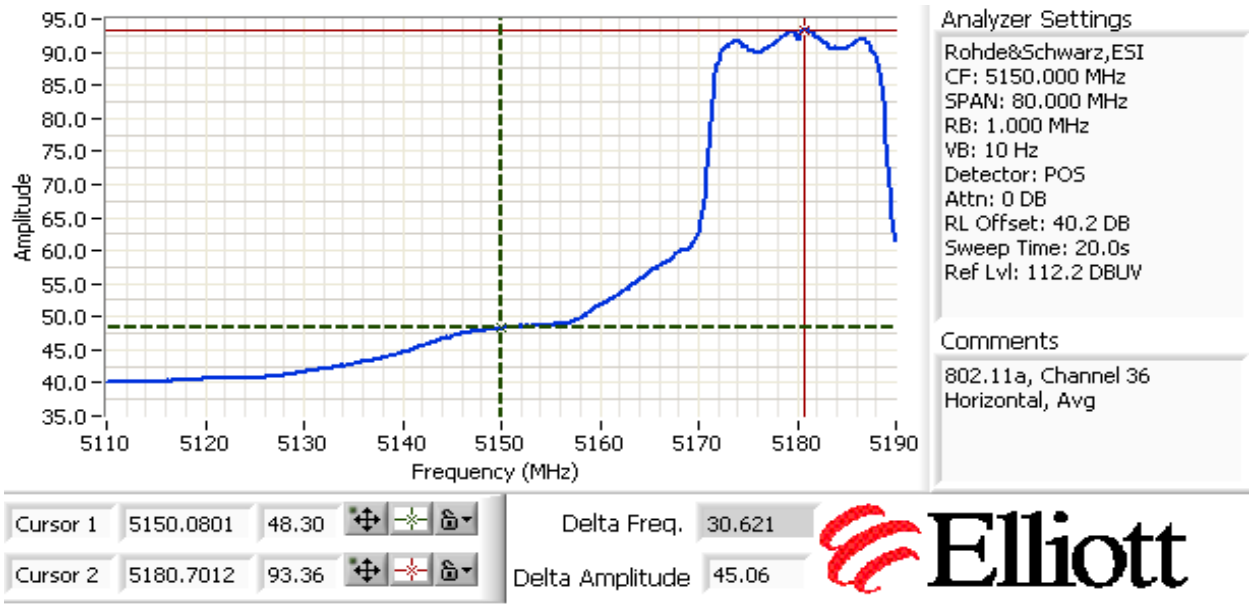
Run #1, Radiated Spurious Emissions, 802.11a BE

Date of Test: 1/25/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

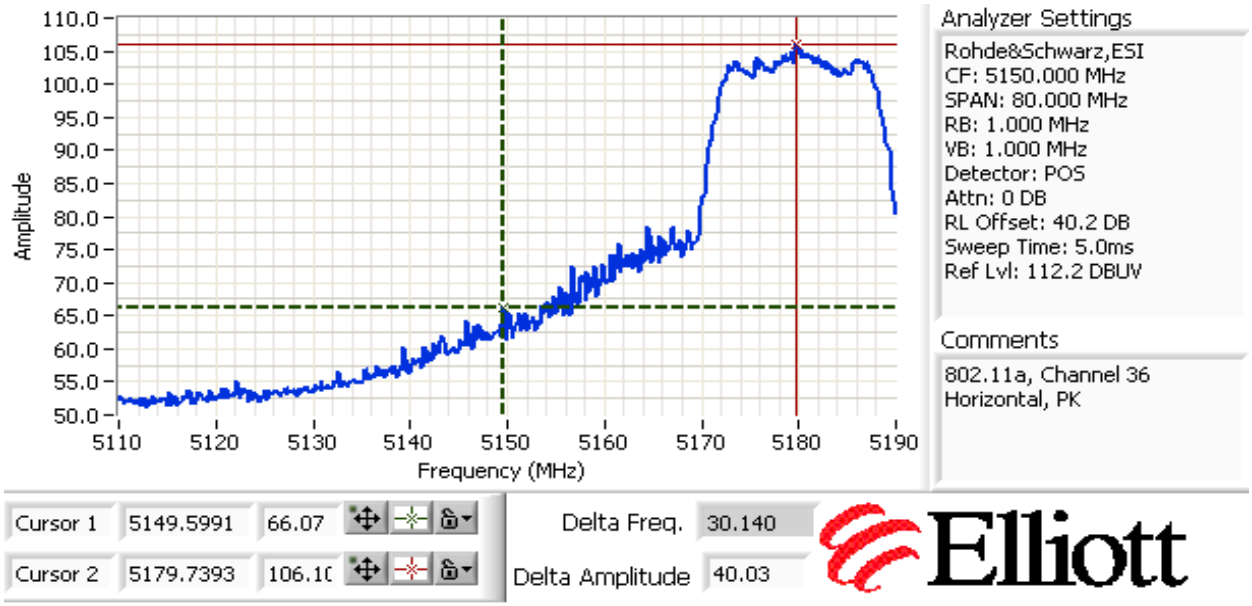
Run #1a: Low Channel

*5150 MHz Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5150.080 | 48.3 | H | 54.0 | -5.7 | Avg | 323 | 1.0 | |
| 5149.599 | 66.1 | H | 74.0 | -7.9 | PK | 323 | 1.0 | |
| 5148.637 | 47.5 | V | 54.0 | -6.5 | Avg | 268 | 1.0 | |
| 5147.515 | 63.6 | V | 74.0 | -10.4 | PK | 268 | 1.0 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

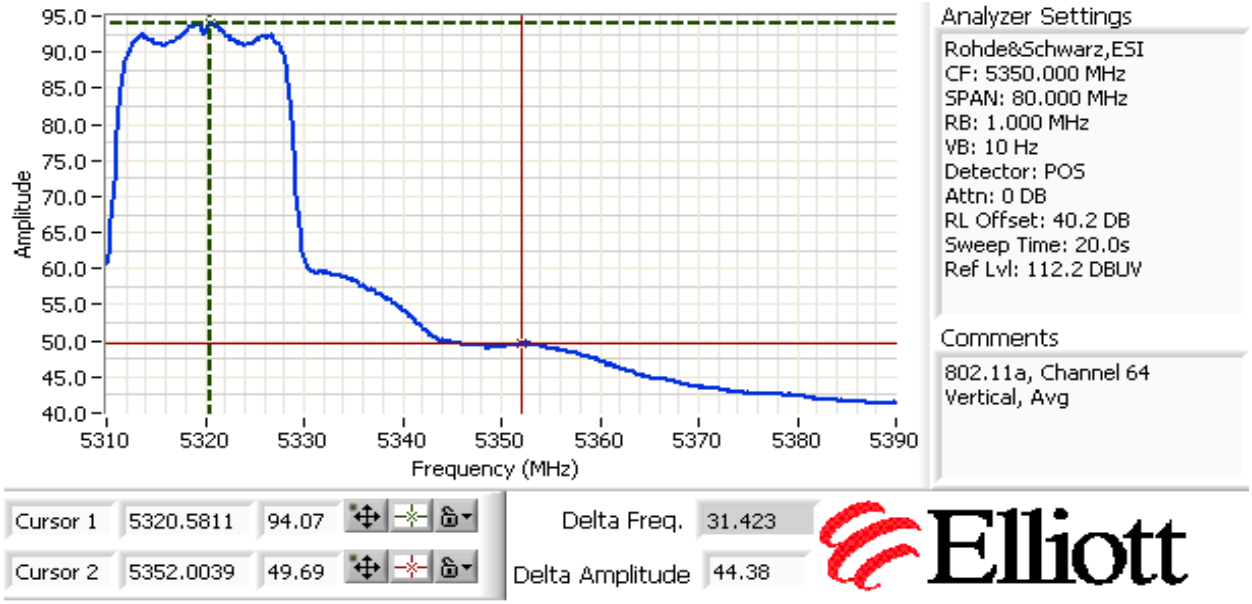


| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

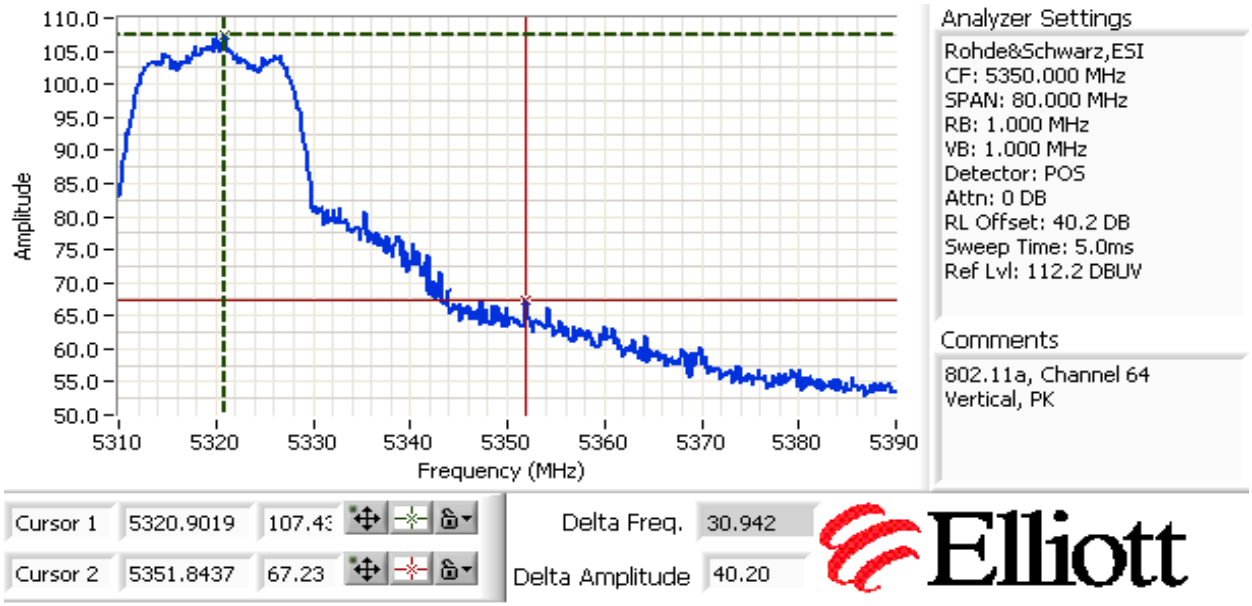
Run #1b: High Channel

*5350 MHz Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5352.004 | 49.7 | V | 54.0 | -4.3 | Avg | 269 | 1.2 | |
| 5351.844 | 67.2 | V | 74.0 | -6.8 | PK | 269 | 1.2 | |
| 5350.080 | 48.0 | H | 54.0 | -6.0 | Avg | 317 | 1.1 | |
| 5352.004 | 64.8 | H | 74.0 | -9.2 | PK | 317 | 1.1 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

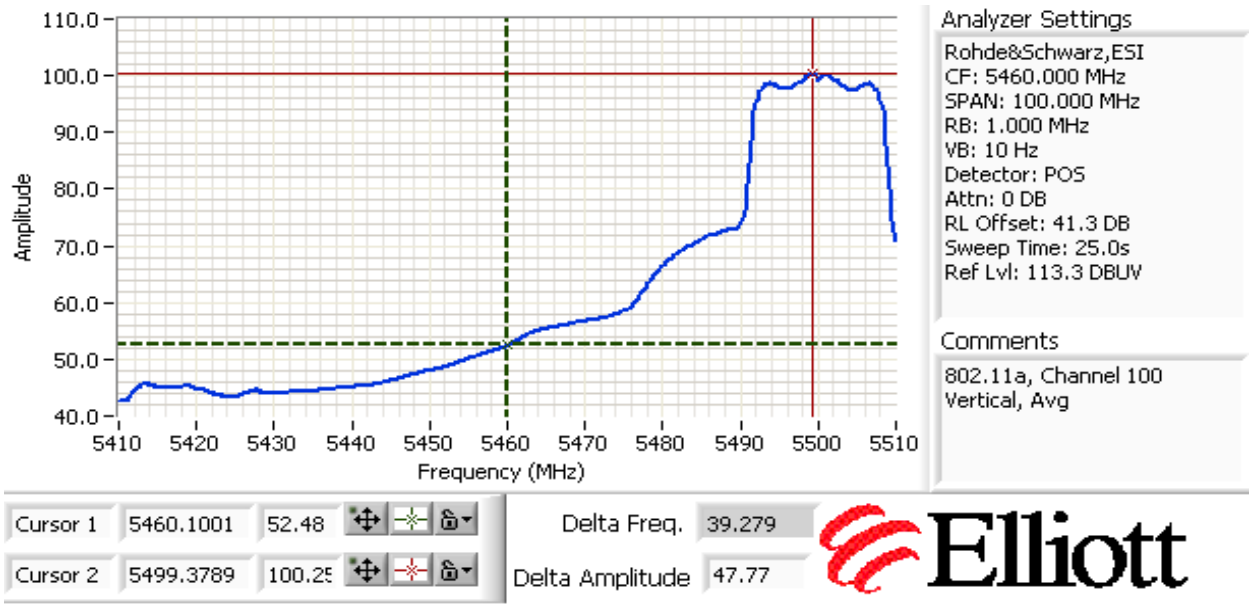
Run #2, Radiated Spurious Emissions, 802.11a BE

Date of Test: 1/25/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

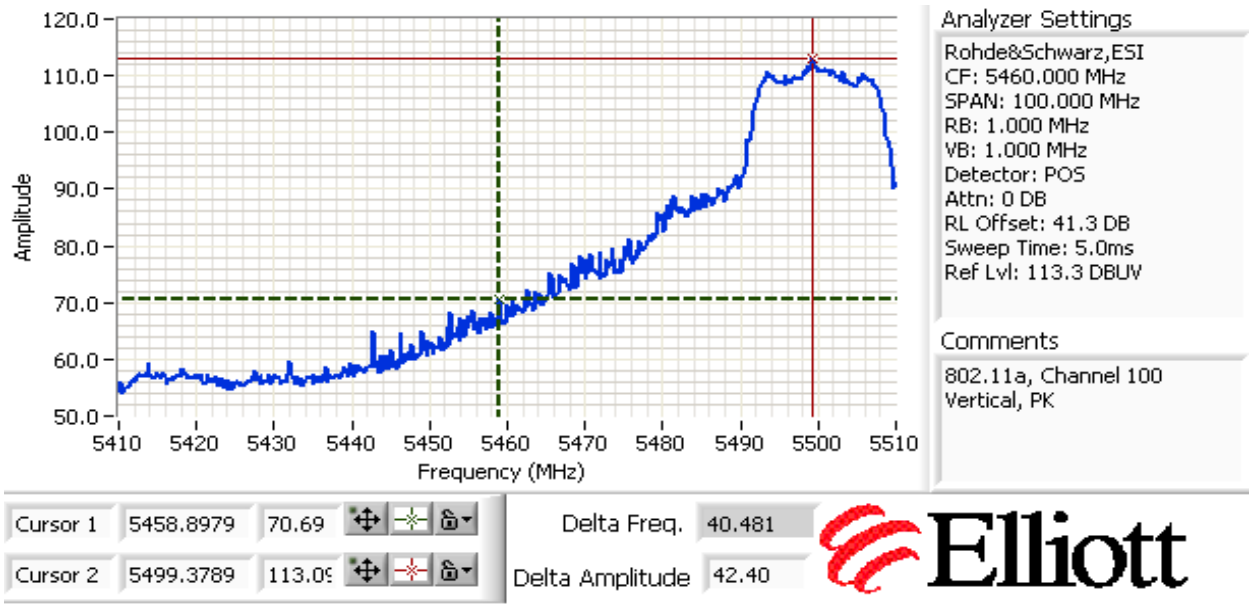
Low Channel

*5350-5460 MHz Restricted Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5460.100 | 52.5 | V | 54.0 | -1.5 | Avg | 281 | 1.3 | |
| 5458.898 | 70.7 | V | 74.0 | -3.3 | PK | 281 | 1.3 | |
| 5460.100 | 51.3 | H | 54.0 | -2.8 | Avg | 332 | 1.1 | |
| 5457.695 | 69.4 | H | 74.0 | -4.6 | PK | 332 | 1.1 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

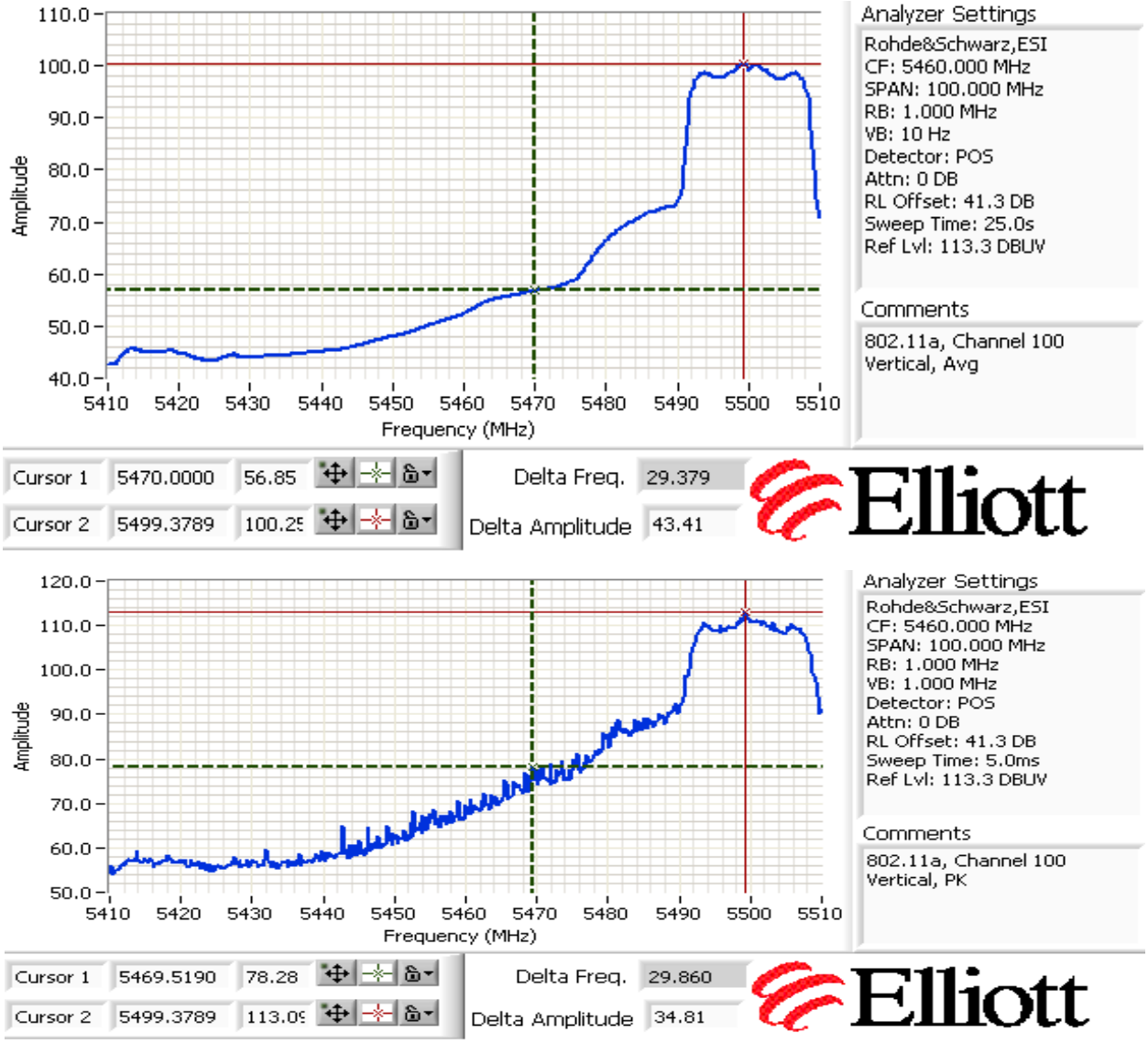


# EMC Test Data

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

*5460 - 5470 MHz Band Edge Radiated Field Strength*

| Frequency | Level | Pol | 15 E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5469.519 | 78.3 | V | 88.3 | -10.0 | Pk | 281 | 1.3 | |
| 5470.000 | 56.9 | V | 68.3 | -11.5 | Avg | 281 | 1.3 | |
| 5470.000 | 55.7 | H | 68.3 | -12.6 | Avg | 332 | 1.1 | |
| 5468.918 | 76.7 | H | 88.3 | -11.6 | Pk | 332 | 1.1 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #3, Radiated Spurious Emissions, 802.11n20 BE

Date of Test: 1/25/2011

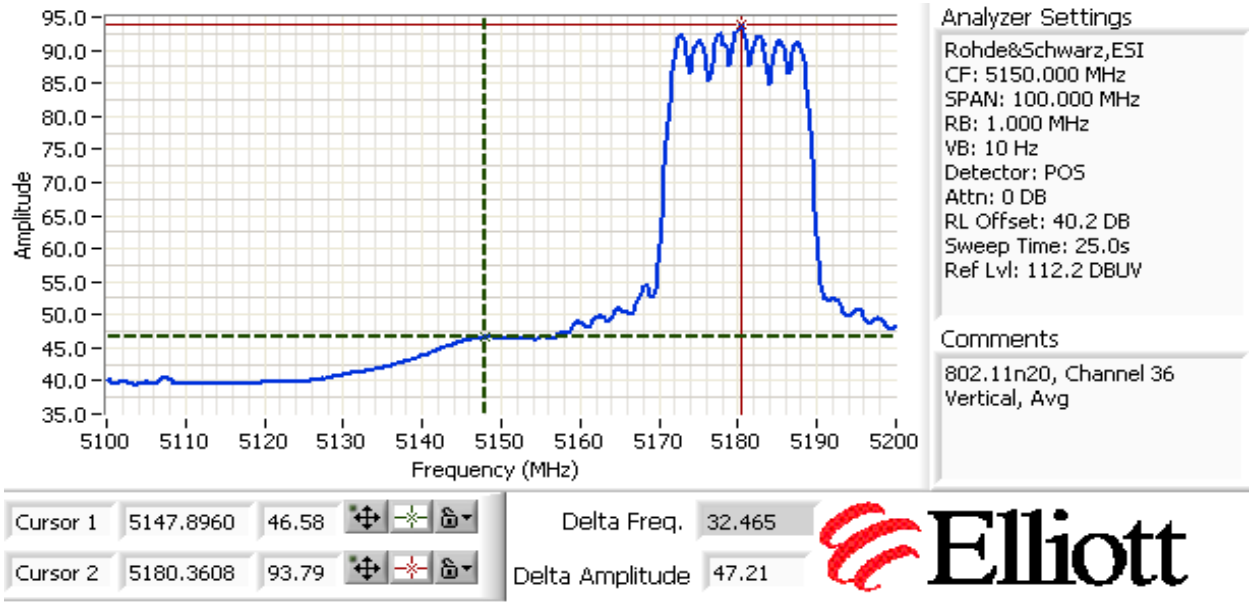
Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

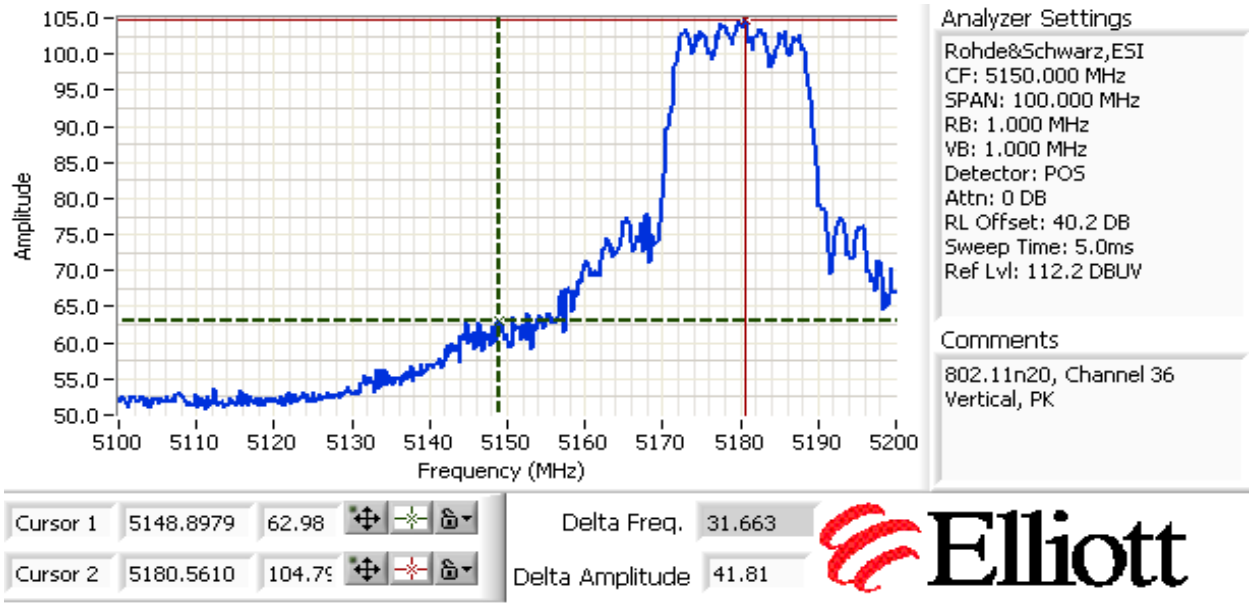
Run #3a: Low Channel

*5150 MHz Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5147.896 | 46.6 | V | 54.0 | -7.4 | Avg | 264 | 1.6 | |
| 5148.898 | 63.0 | V | 74.0 | -11.0 | PK | 264 | 1.6 | |
| 5149.900 | 46.5 | H | 54.0 | -7.6 | Avg | 302 | 1.3 | |
| 5146.092 | 63.0 | H | 74.0 | -11.0 | PK | 302 | 1.3 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

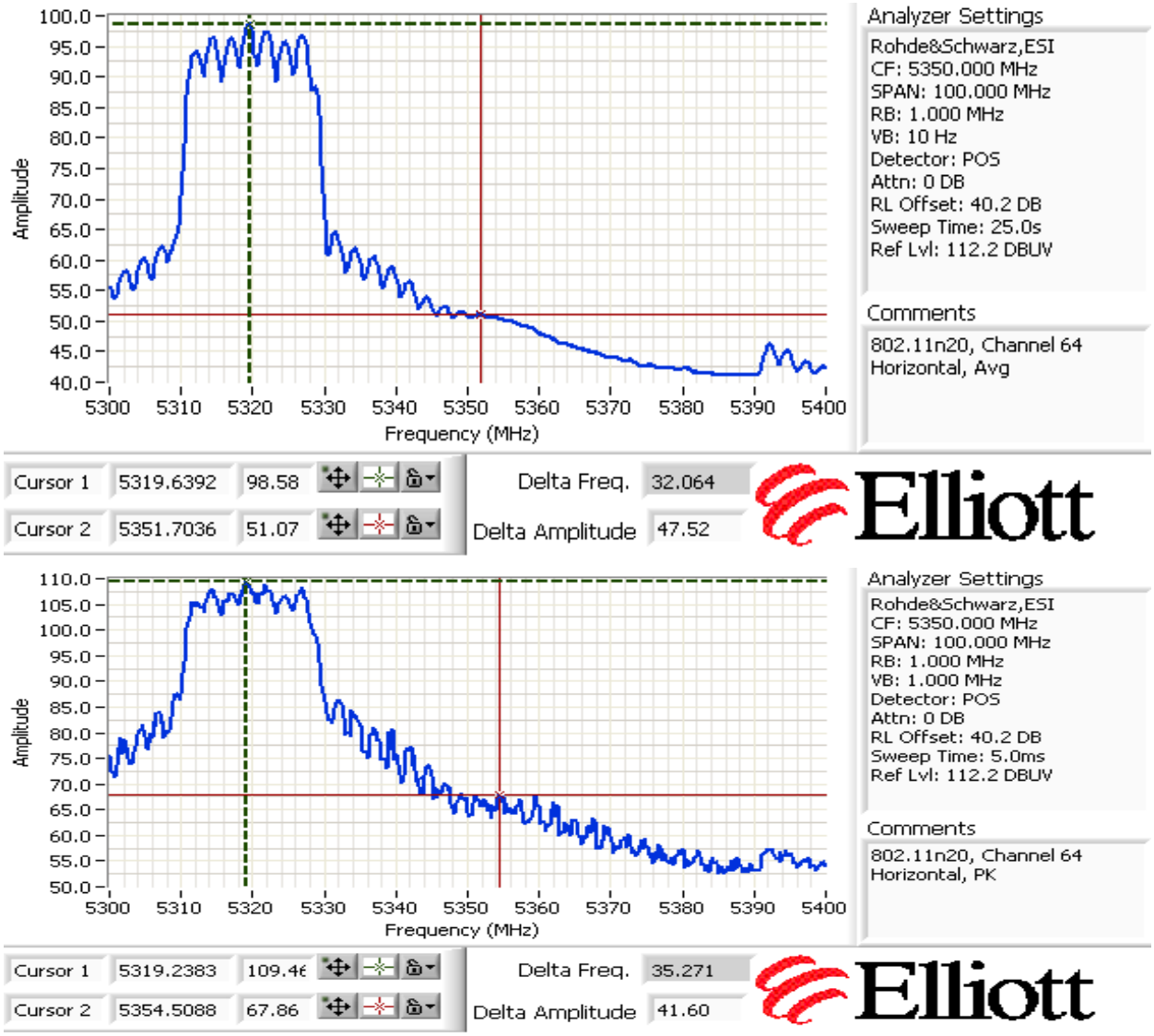


| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #3b: High Channel

*5350 MHz Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5351.704 | 51.1 | H | 54.0 | -2.9 | Avg | 314 | 1.0 | |
| 5354.509 | 67.9 | H | 74.0 | -6.1 | PK | 314 | 1.0 | |
| 5350.100 | 51.0 | V | 54.0 | -3.0 | Avg | 261 | 1.3 | |
| 5352.906 | 67.4 | V | 74.0 | -6.6 | PK | 261 | 1.3 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #4, Radiated Spurious Emissions, 802.11n20 BE

Date of Test: 1/25/2011

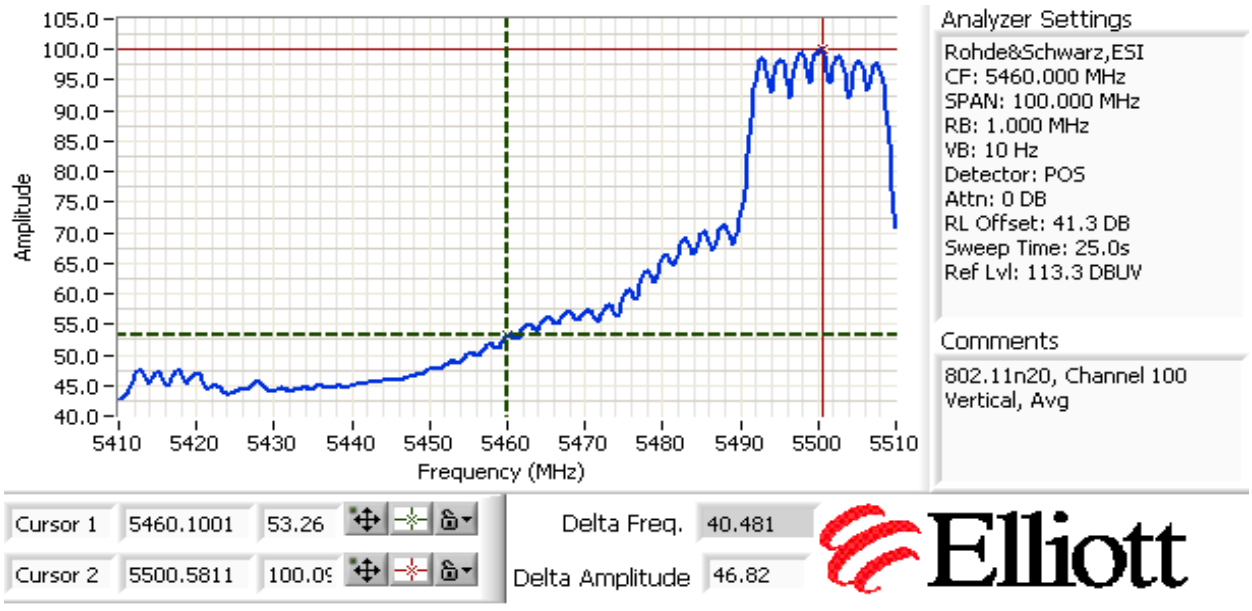
Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

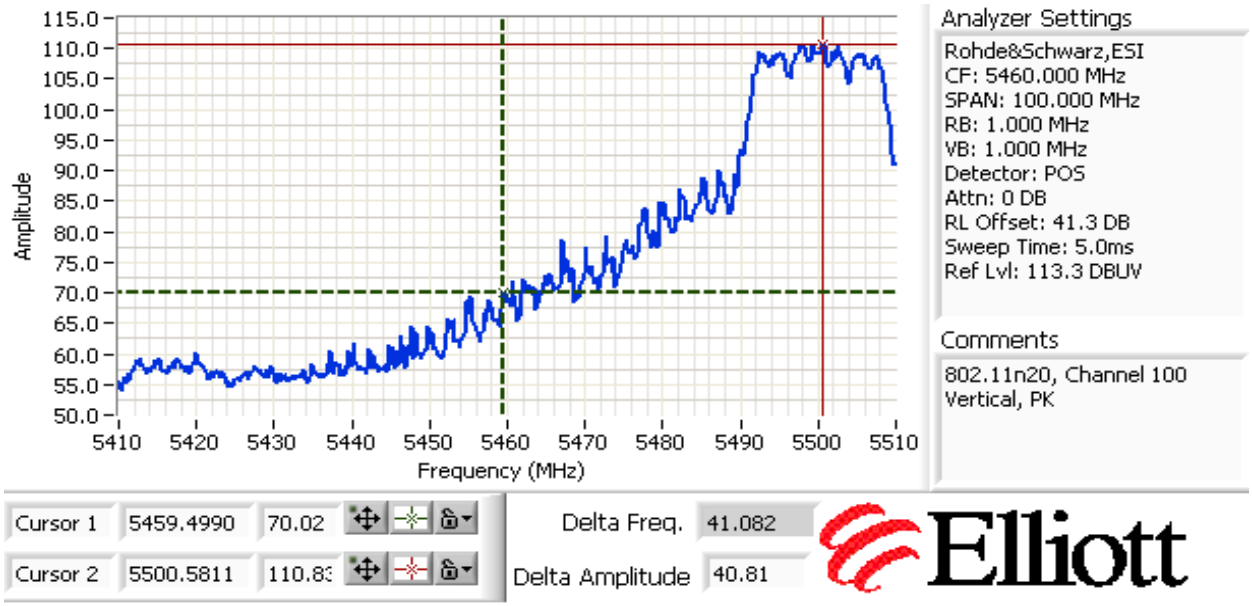
Low Channel

*5350-5460 MHz Restricted Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5460.100 | 53.3 | V | 54.0 | -0.7 | Avg | 280 | 1.6 | |
| 5459.499 | 70.0 | V | 74.0 | -4.0 | PK | 280 | 1.6 | |
| 5459.299 | 51.3 | H | 54.0 | -2.7 | Avg | 313 | 1.0 | |
| 5459.499 | 68.5 | H | 74.0 | -5.5 | PK | 313 | 1.0 | |



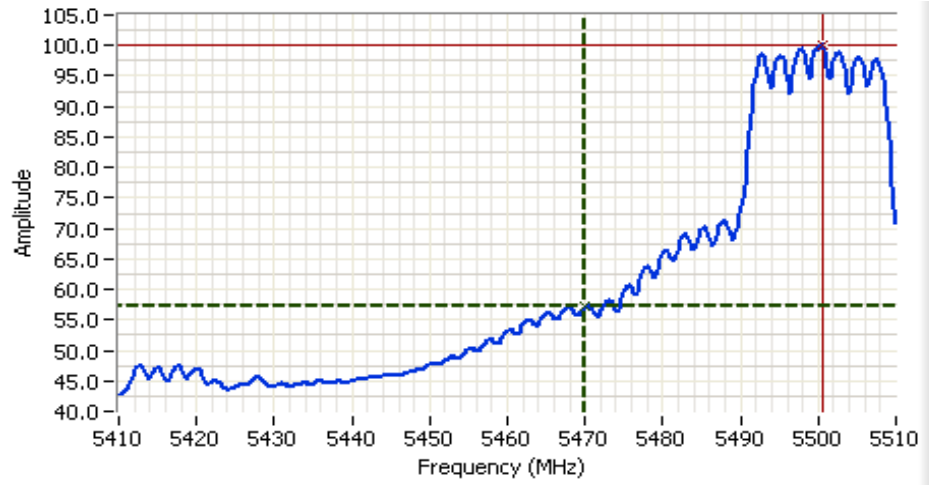
| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

*5460 - 5470 MHz Band Edge Radiated Field Strength*

| Frequency | Level | Pol | 15 E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5467.114 | 78.7 | V | 88.3 | -9.6 | Pk | 280 | 1.6 | |
| 5470.000 | 57.2 | V | 68.3 | -11.1 | Avg | 280 | 1.6 | |
| 5469.519 | 56.0 | H | 68.3 | -12.3 | Avg | 313 | 1.0 | |
| 5467.315 | 74.8 | H | 88.3 | -13.5 | Pk | 313 | 1.0 | |

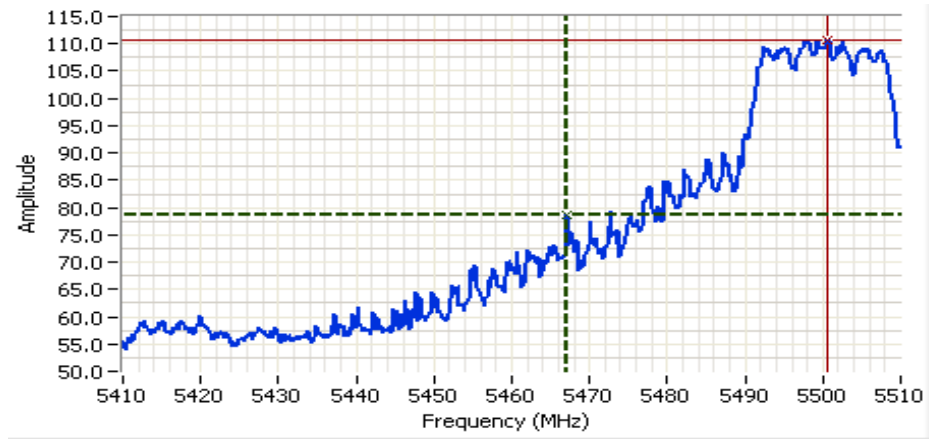



Analyzer Settings
Rohde&Schwarz,ESI
CF: 5460.000 MHz
SPAN: 100.000 MHz
RB: 1.000 MHz
VB: 10 Hz
Detector: POS
Attn: 0 DB
RL Offset: 41.3 DB
Sweep Time: 25.0s
Ref Lvl: 113.3 DBUV

Comments
802.11n20, Channel 100
Vertical, Avg

| | | | | |
|---|---|---|---|---|
| Cursor 1 | 5470.0000 | 57.21 | Delta Freq. | 30.581 |
| Cursor 2 | 5500.5811 | 100.09 | Delta Amplitude | 42.88 |

Elliott




Analyzer Settings
Rohde&Schwarz,ESI
CF: 5460.000 MHz
SPAN: 100.000 MHz
RB: 1.000 MHz
VB: 1.000 MHz
Detector: POS
Attn: 0 DB
RL Offset: 41.3 DB
Sweep Time: 5.0ms
Ref Lvl: 113.3 DBUV

Comments
802.11n20, Channel 100
Vertical, PK

| | | | | |
|---|---|---|---|---|
| Cursor 1 | 5467.1143 | 78.67 | Delta Freq. | 33.467 |
| Cursor 2 | 5500.5811 | 110.83 | Delta Amplitude | 32.17 |

Elliott

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #5, Radiated Spurious Emissions, 802.11n40 BE

Date of Test: 1/25/2011

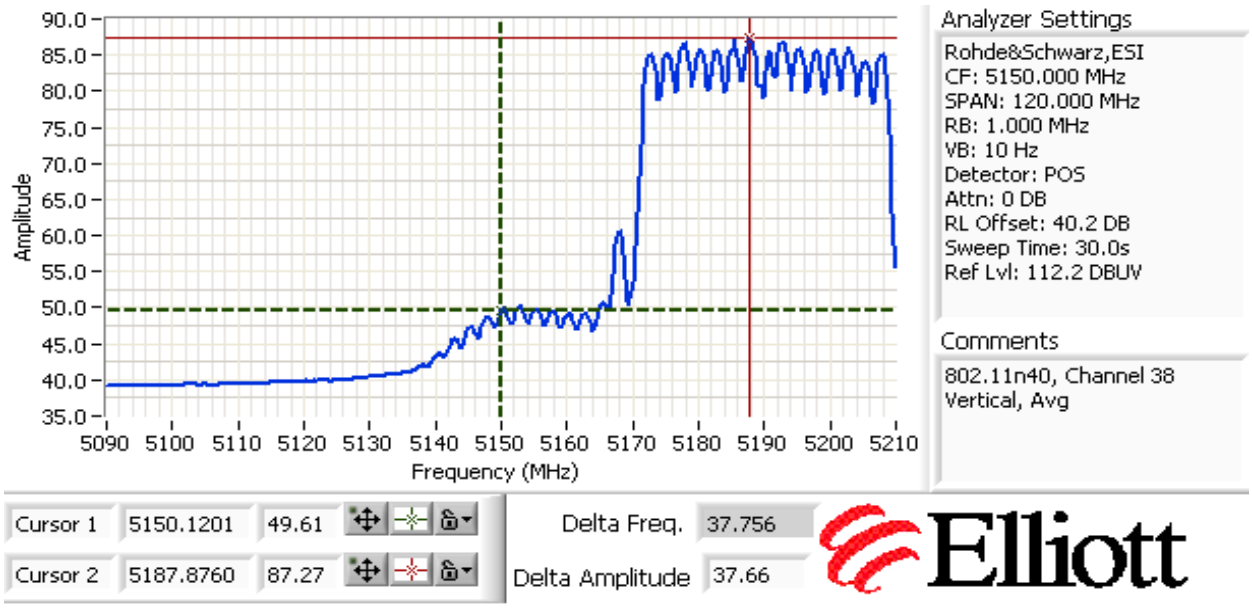
Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

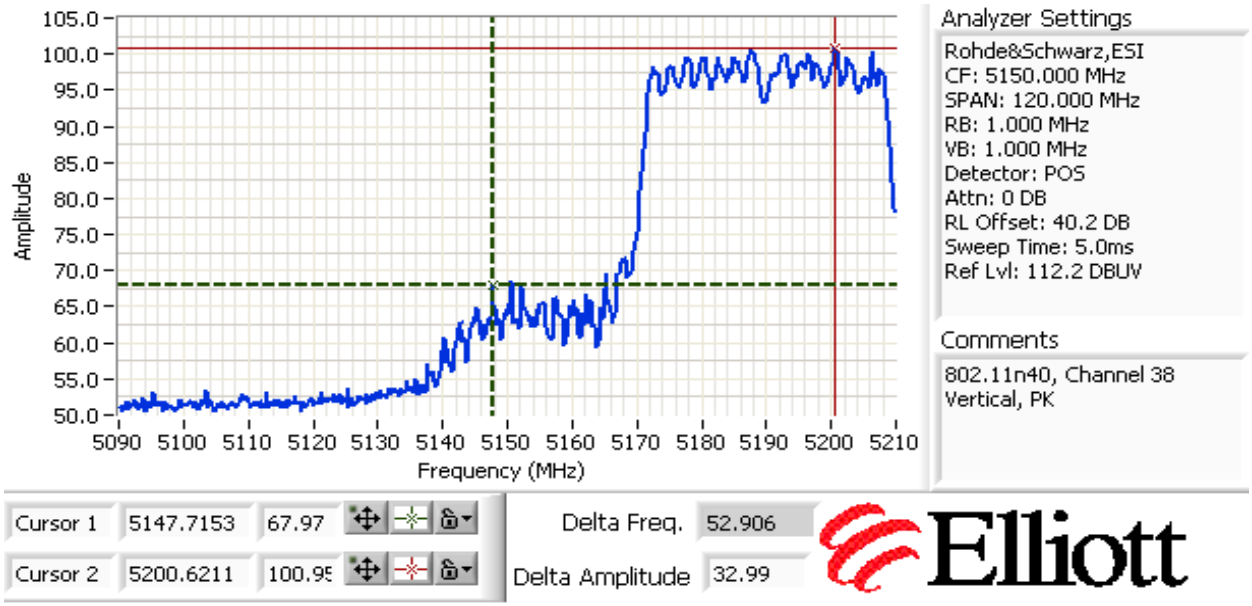
Run #5a: Low Channel

*5150 MHz Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5150.000 | 49.6 | V | 54.0 | -4.4 | Avg | 266 | 1.7 | |
| 5147.715 | 68.0 | V | 74.0 | -6.0 | PK | 266 | 1.7 | |
| 5149.639 | 49.6 | H | 54.0 | -4.4 | Avg | 315 | 1.1 | |
| 5144.589 | 66.0 | H | 74.0 | -8.0 | PK | 315 | 1.1 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

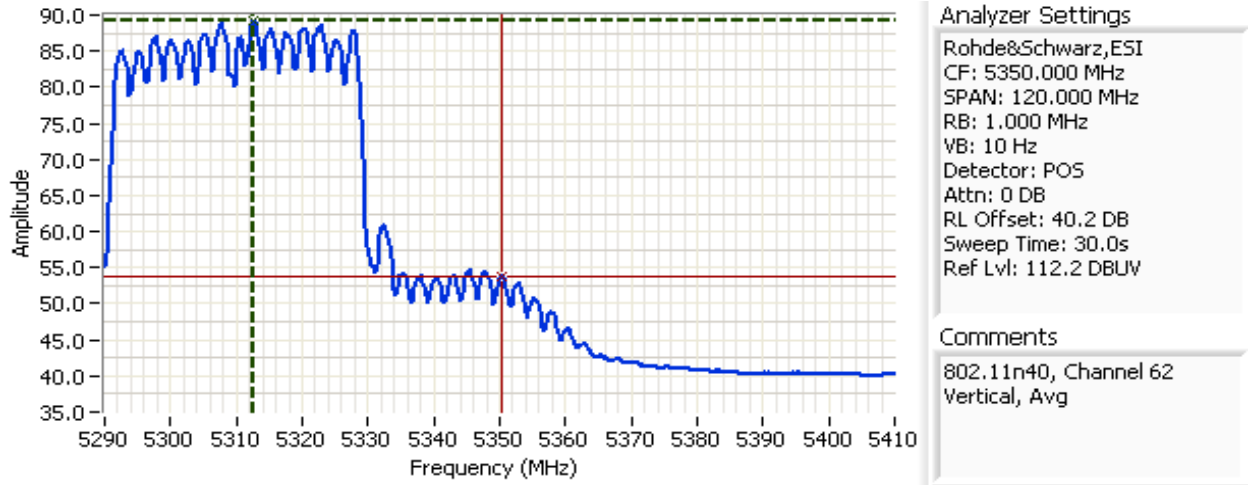


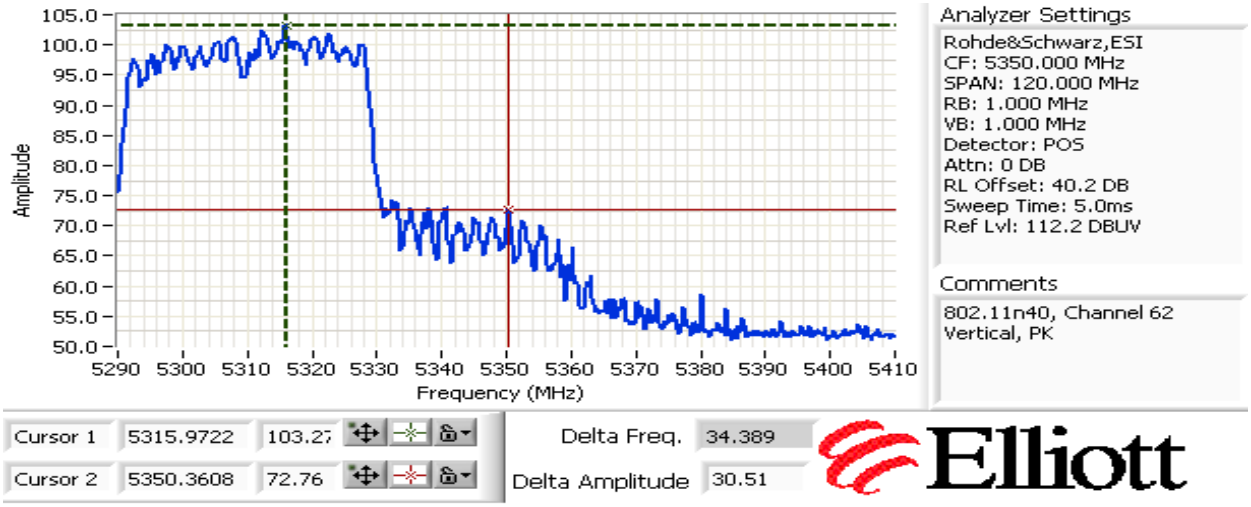
| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #5b: High Channel

*5350 MHz Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5350.361 | 53.7 | V | 54.0 | -0.3 | Avg | 268 | 1.5 | |
| 5350.361 | 72.8 | V | 74.0 | -1.2 | PK | 268 | 1.5 | |
| 5350.120 | 53.6 | H | 54.0 | -0.5 | Avg | 310 | 1.0 | |
| 5351.563 | 71.1 | H | 74.0 | -3.0 | PK | 310 | 1.0 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #6, Radiated Spurious Emissions, 802.11n40 BE

Date of Test: 1/25/2011

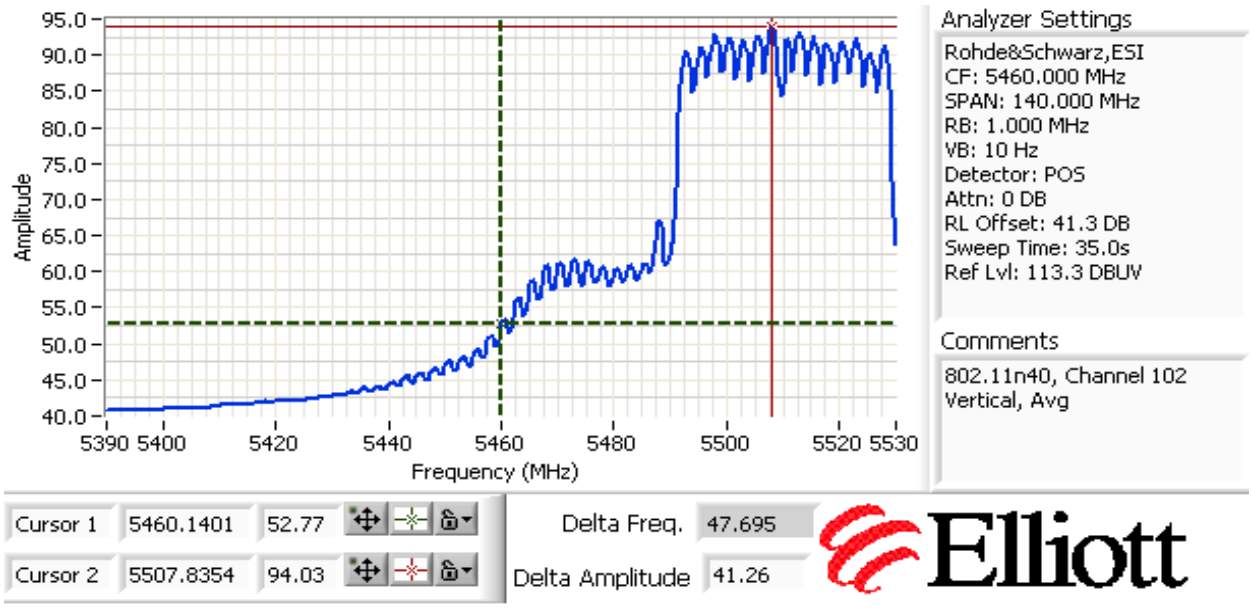
Test Engineer: Rafael Varelas

Test Location: FT Chamber #3

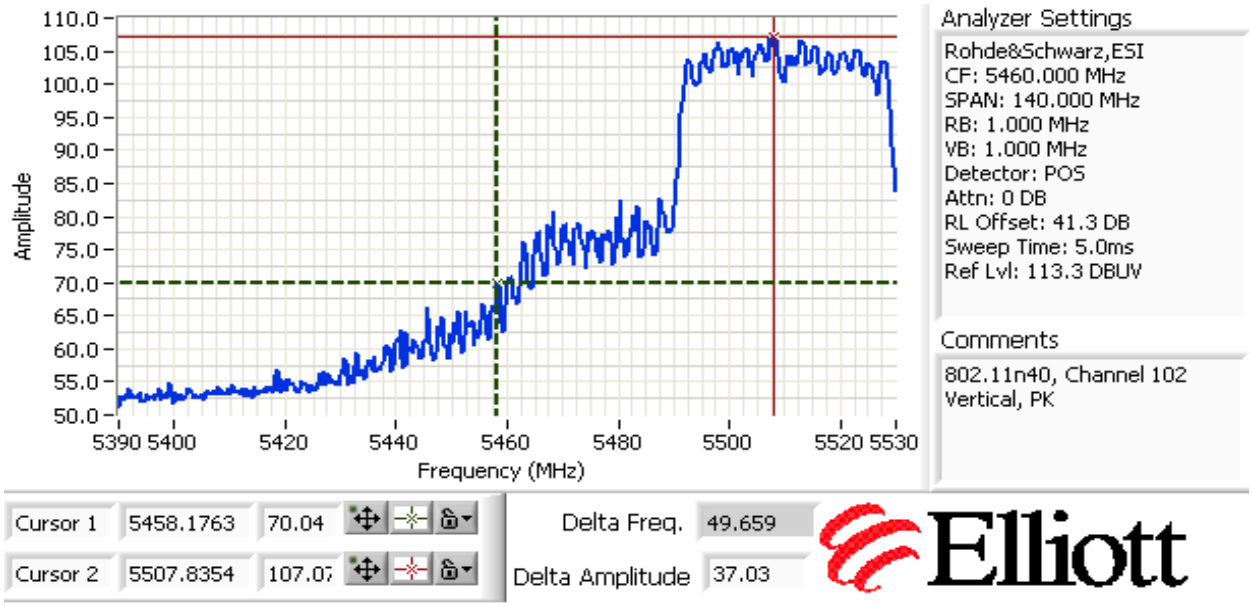
Low Channel

*5350-5460 MHz Restricted Band Edge Signal Radiated Field Strength*

| Frequency | Level | Pol | FCC 15.209 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5460.140 | 52.8 | V | 54.0 | -1.2 | Avg | 281 | 1.6 | |
| 5458.176 | 70.0 | V | 74.0 | -4.0 | PK | 281 | 1.6 | |
| 5459.579 | 49.5 | H | 54.0 | -4.5 | Avg | 330 | 1.2 | |
| 5459.299 | 69.0 | H | 74.0 | -5.0 | PK | 330 | 1.2 | |



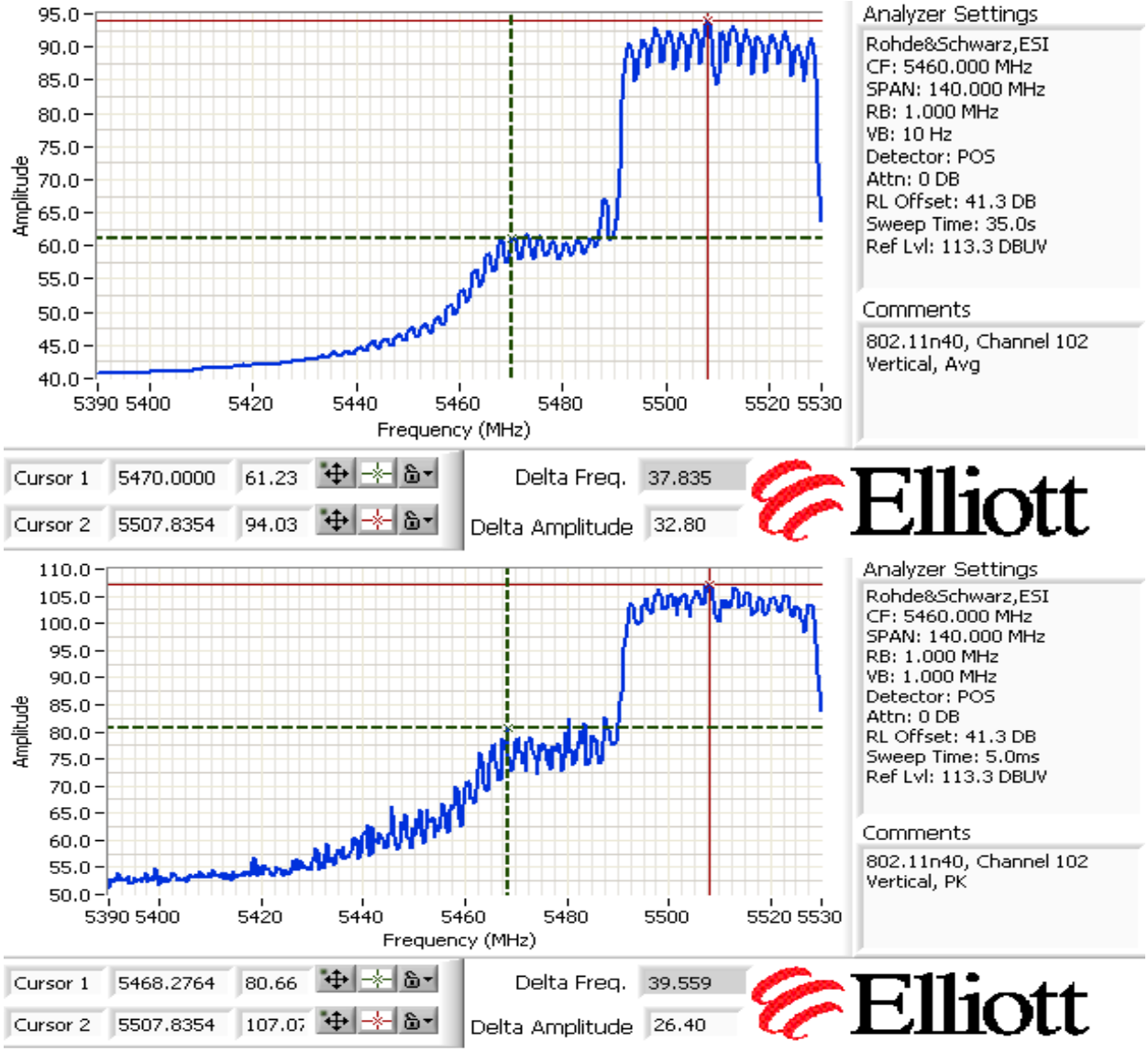
| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

*5460 - 5470 MHz Band Edge Radiated Field Strength*

| Frequency | Level | Pol | 15 E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 5470.000 | 61.2 | V | 68.3 | -7.1 | Avg | 281 | 1.6 | |
| 5468.276 | 80.7 | V | 88.3 | -7.6 | Pk | 281 | 1.6 | |
| 5469.118 | 58.1 | H | 68.3 | -10.2 | Avg | 330 | 1.2 | |
| 5468.838 | 78.9 | H | 88.3 | -9.4 | Pk | 330 | 1.2 | |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

# RSS 210 and FCC 15.407 (UNII) Radiated Spurious Emissions

## Test Specific Details

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

## 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: 15-20 °C

Rel. Humidity: 30-50 %

## Summary of Results

| Run # | Mode | Channel | Power Setting | Measured Power | Test Performed | Limit | Result / Margin |
|---|---|---|---|---|---|---|---|
| 1 | 802.11a Chain A | 5150-5250 Low | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 39.8dBµV/m @ 2496.0MHz (-14.2dB) |
| | 802.11a Chain A | 5150-5250 Center | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 42.9dBµV/m @ 2495.7MHz (-11.1dB) |
| | 802.11a Chain A | 5150-5250 High | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 39.6dBµV/m @ 2491.6MHz (-14.4dB) |
| 2 | 802.11a Chain A | 5250-5350 Low | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 47.0dBµV/m @ 15778.6MHz (-7.0dB) |
| | 802.11a Chain A | 5250-5350 Center | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 48.2dBµV/m @ 10600.1MHz (-5.8dB) |
| | 802.11a Chain A | 5250-5350 High | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 43.3dBµV/m @ 10641.0MHz (-10.7dB) |
| 3 | 802.11a Chain A | 5470-5725 Low | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 49.3dBµV/m @ 11000.9MHz (-4.7dB) |
| | 802.11a Chain A | 5470-5725 Center | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 53.7dBµV/m @ 11200.5MHz (-0.3dB) |
| | 802.11a Chain A | 5470-5725 High | - | - | Radiated Emissions, 1 - 18 GHz | FCC 15.209 / 15 E | 53.8dBµV/m @ 11401.1MHz (-0.2dB) |

## 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: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Note: Preliminary testing showed that no emissions were observed below 1 GHz or above 18 GHz.

Run #1, Radiated Spurious Emissions, 30 - 40,000 MHz. Operation in the 5150-5250 MHz Band - 802.11a

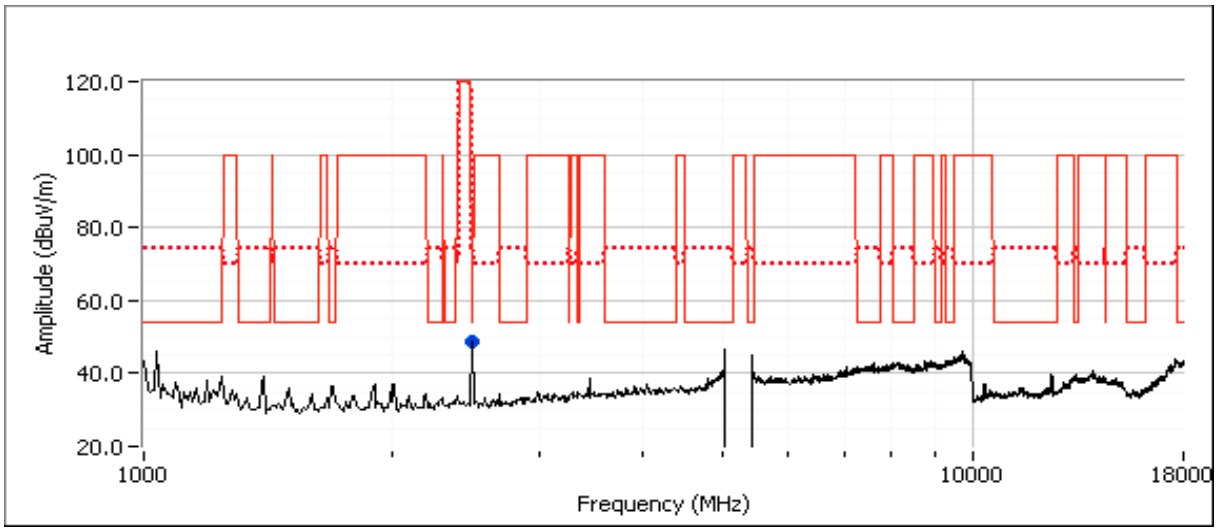
Date of Test: 1/27/2011
Test Engineer: Mehran Birgani
Test Location: FT Chamber #3

Run #1a: Low Channel @ 5180 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2495.960 | 39.8 | H | 54.0 | -14.2 | AVG | 246 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2493.630 | 56.6 | H | 74.0 | -17.4 | PK | 246 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |



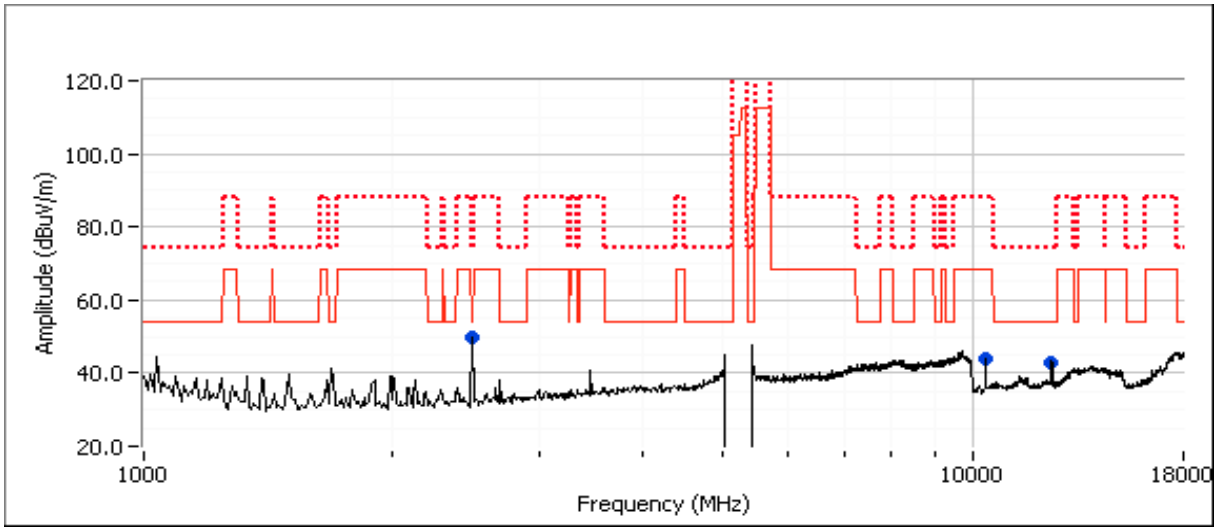
| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #1b: Center Channel @ 5200 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2495.740 | 42.9 | H | 54.0 | -11.1 | AVG | 332 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2498.370 | 57.1 | H | 74.0 | -16.9 | PK | 332 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 10397.540 | 43.9 | V | 68.3 | -24.4 | Peak | 6 | 1.3 | |
| 12477.240 | 42.3 | V | 54.0 | -11.7 | AVG | 85 | 1.7 | RB 1 MHz;VB 10 Hz;Pk |
| 12476.110 | 56.1 | V | 74.0 | -17.9 | PK | 85 | 1.7 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |



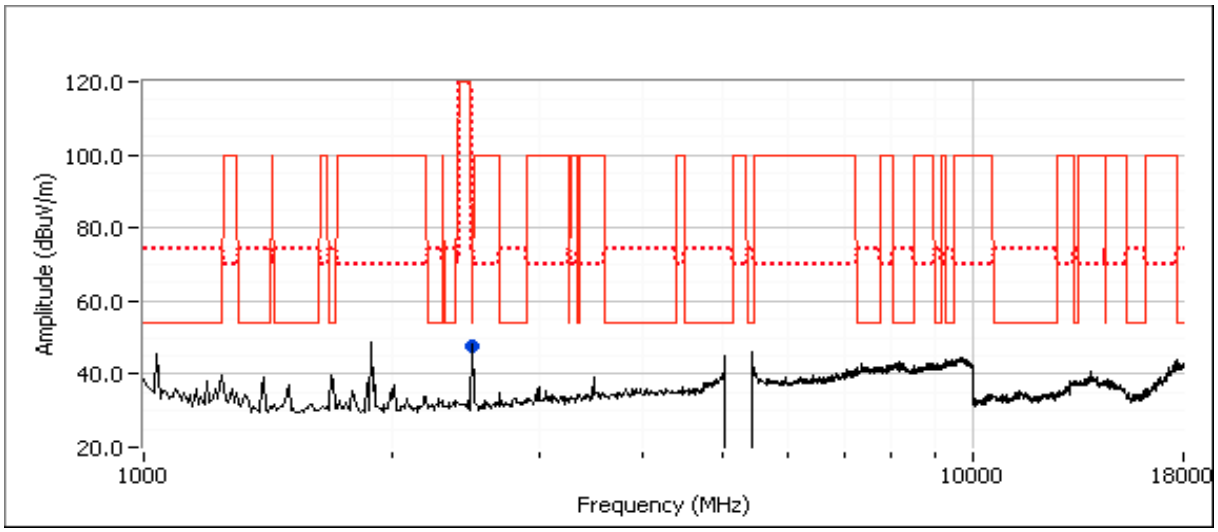
| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #1c: High Channel @ 5240 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 2491.600 | 39.6 | H | 54.0 | -14.4 | AVG | 236 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2491.180 | 56.0 | H | 74.0 | -18.0 | PK | 236 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #2, Radiated Spurious Emissions, 30 - 40,000 MHz. Operation in the 5250-5350 MHz Band

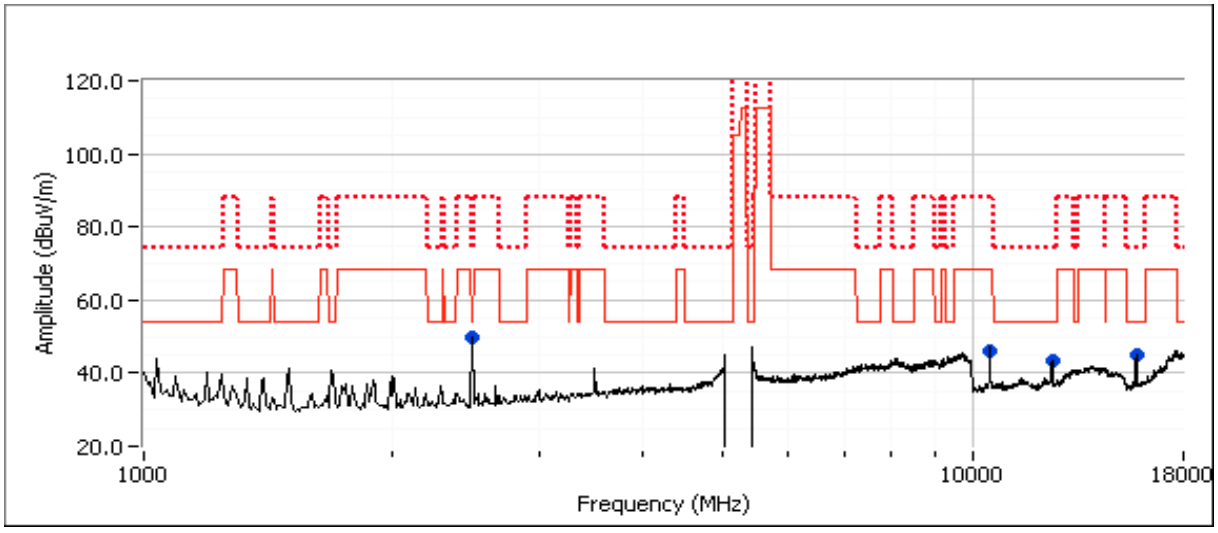
Date of Test: 1/28/2011
Test Engineer: Rafael Varelas
Test Location: FT Chamber #3

Run #2a: Low Channel @ 5260 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 15778.570 | 47.0 | V | 54.0 | -7.0 | AVG | 10 | 1.1 | RB 1 MHz;VB 10 Hz;Pk |
| 15778.140 | 58.9 | V | 74.0 | -15.1 | PK | 10 | 1.1 | RB 1 MHz;VB 3 MHz;Pk |
| 2495.630 | 42.6 | H | 54.0 | -11.4 | AVG | 330 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2496.560 | 57.1 | H | 74.0 | -16.9 | PK | 330 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 10520.490 | 46.1 | V | 68.3 | -22.2 | Peak | 194 | 1.3 | |
| 12485.110 | 41.1 | V | 54.0 | -12.9 | AVG | 15 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 12486.590 | 52.3 | V | 74.0 | -21.7 | PK | 15 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |



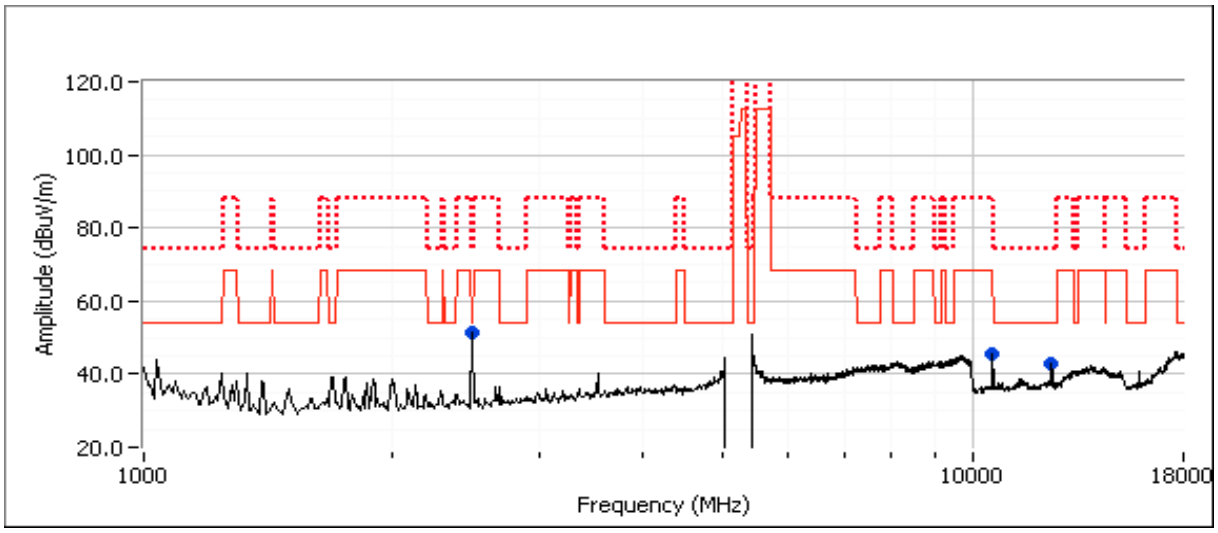
| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #2b: Center Channel @ 5300 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 10600.090 | 48.2 | V | 54.0 | -5.8 | AVG | 10 | 1.4 | RB 1 MHz;VB 10 Hz;Pk |
| 10599.020 | 60.4 | V | 74.0 | -13.6 | PK | 10 | 1.4 | RB 1 MHz;VB 3 MHz;Pk |
| 2494.920 | 42.8 | H | 54.0 | -11.2 | AVG | 329 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2494.220 | 57.5 | H | 74.0 | -16.5 | PK | 329 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 12476.930 | 42.1 | V | 54.0 | -11.9 | AVG | 87 | 2.0 | RB 1 MHz;VB 10 Hz;Pk |
| 12491.870 | 55.9 | V | 74.0 | -18.1 | PK | 87 | 2.0 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |



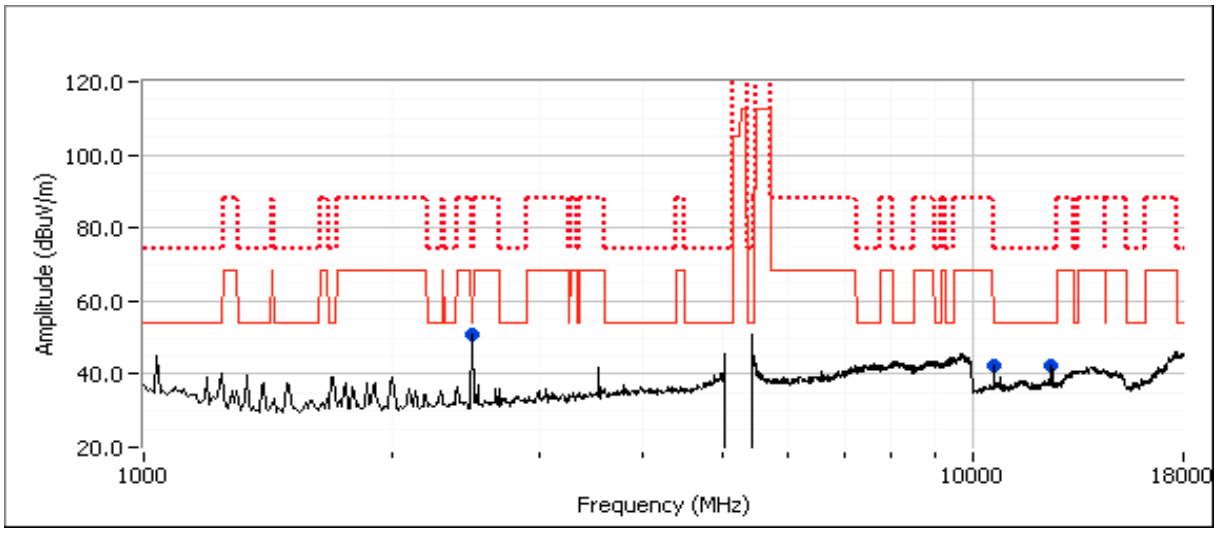
| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #2c: High Channel @ 5320 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 10640.960 | 43.3 | V | 54.0 | -10.7 | AVG | 183 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 10637.090 | 54.4 | V | 74.0 | -19.6 | PK | 183 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 2496.110 | 43.3 | H | 54.0 | -10.7 | AVG | 329 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2493.240 | 57.6 | H | 74.0 | -16.4 | PK | 329 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 12481.630 | 42.1 | V | 54.0 | -11.9 | AVG | 84 | 2.0 | RB 1 MHz;VB 10 Hz;Pk |
| 12482.060 | 55.7 | V | 74.0 | -18.3 | PK | 84 | 2.0 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #3, Radiated Spurious Emissions, 30 - 40,000 MHz. Operation in the 5470-5725 MHz Band

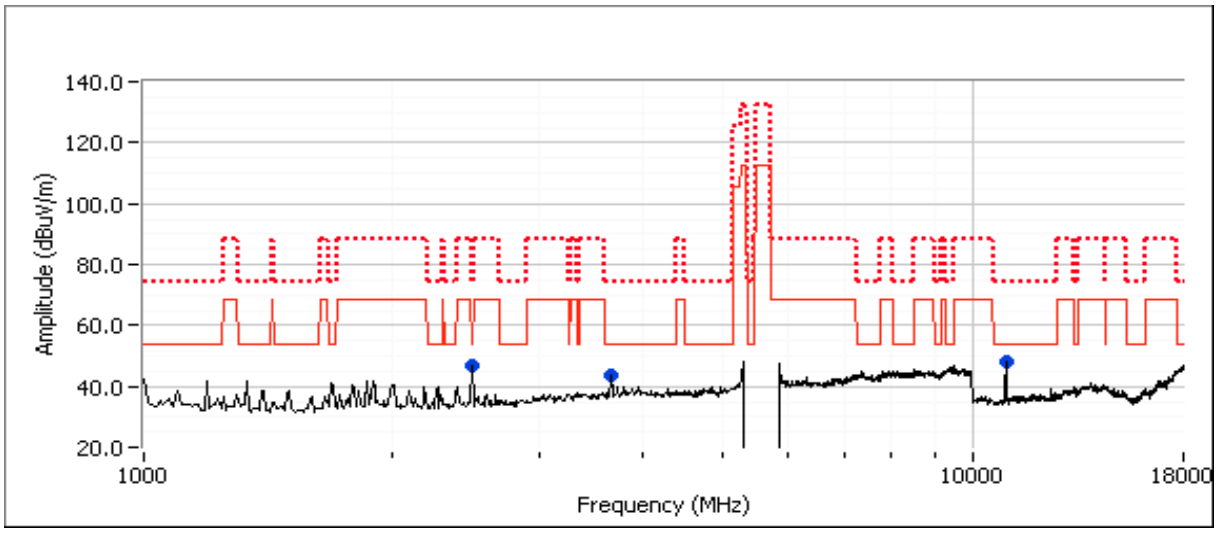
Date of Test: 1/31/2011
Test Engineer: Mehran Birgani
Test Location: FT Chamber #5

Run #3a: Low Channel @ 5500 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 11000.870 | 49.3 | V | 54.0 | -4.7 | AVG | 349 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 3666.710 | 41.6 | H | 54.0 | -12.4 | AVG | 293 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 11008.970 | 60.9 | V | 74.0 | -13.1 | PK | 349 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 2490.490 | 38.9 | V | 54.0 | -15.1 | AVG | 15 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2490.090 | 54.1 | V | 74.0 | -19.9 | PK | 15 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 3666.510 | 48.4 | H | 74.0 | -25.6 | PK | 293 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |



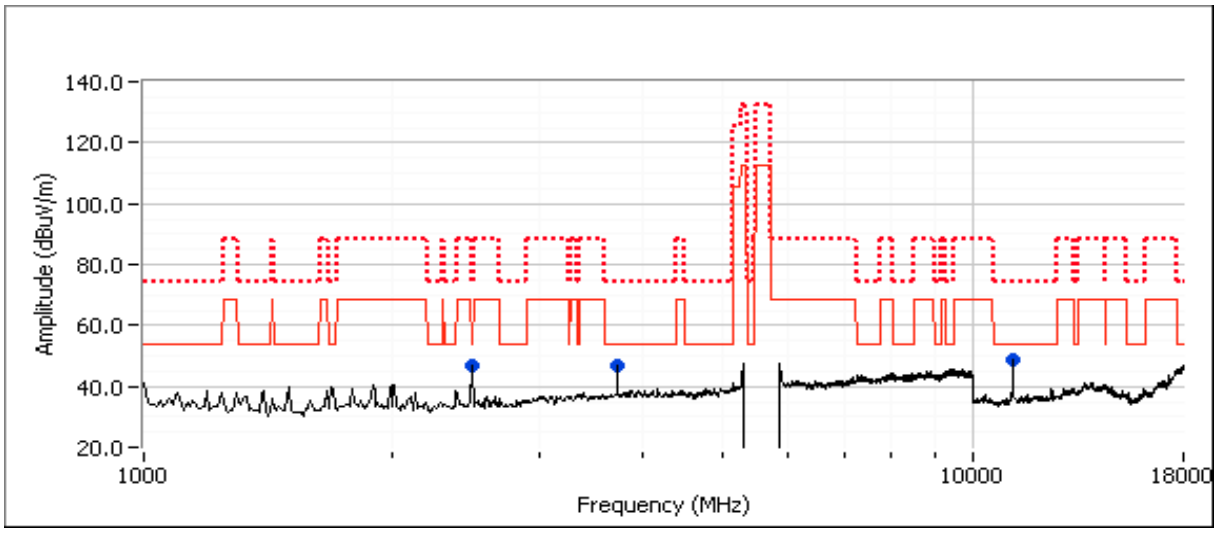
| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #3b: Center Channel @ 5600 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15E | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 11200.540 | 53.7 | V | 54.0 | -0.3 | AVG | 173 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 11193.900 | 66.3 | V | 74.0 | -7.7 | PK | 173 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 3733.320 | 45.1 | H | 54.0 | -8.9 | AVG | 319 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2490.860 | 38.0 | H | 54.0 | -16.0 | AVG | 240 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2489.120 | 54.0 | H | 74.0 | -20.0 | PK | 240 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 3733.220 | 50.0 | H | 74.0 | -24.0 | PK | 319 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J81733 |
| Model: | BCM943228HM4L Murata FEM (C2PC) | T-Log Number: | T81881 |
| | | Account Manager: | Shareen Washington |
| Contact: | Anne Liang/Pete Krebill | | |
| Standard: | FCC 15.247/15/407 | Class: | N/A |

Run #3c: High Channel @ 5700 MHz

*Spurious Radiated Emissions:*

| Frequency | Level | Pol | 15.209 / 15.247 | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 11401.070 | 53.8 | V | 54.0 | -0.2 | AVG | 181 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 11406.230 | 67.5 | V | 74.0 | -6.5 | PK | 181 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 2491.620 | 43.3 | H | 54.0 | -10.7 | AVG | 235 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 2494.220 | 60.1 | H | 74.0 | -13.9 | PK | 235 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |
| 3799.980 | 49.8 | H | 54.0 | -4.2 | AVG | 223 | 1.0 | RB 1 MHz;VB 10 Hz;Pk |
| 3800.010 | 53.1 | H | 74.0 | -20.9 | PK | 223 | 1.0 | RB 1 MHz;VB 3 MHz;Pk |

| | |
|---|---|
| Note 1: | For emissions in restricted bands, the limit of 15.209 was used. For all other emissions, the average limit was set to -27dBm/MHz (~68dBuV/m). |