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# *Application for Grant of Equipment Authorization*
# *Pursuant to*
# *FCC Part 15 Subpart B*
# *On the*
# *Broadcom Corporation*
# *Digital Device*
# *Model: BCM92070MD_REF12*

| | |
|---|---|
| FCC ID: | QDS-BRCM1049 |
| IC CERTIFICATION #: | 4324A-BRCM1049 |
| COMPANY: | Broadcom Corporation<br>190 Mathilda Ave.<br>Sunnyvale, CA 94086 |
| TEST SITE(S): | Elliott Laboratories<br>684 West Maude Avenue.<br>Sunnyvale, CA. 94085 |
| AND: | 41039 Boyce Road<br>Fremont, CA. 94538-2435 |
| IC SITE REGISTRATION #: | 2845A-2 and 2845B-5 |
| REPORT DATE: | August 20, 2009 |
| FINAL TEST DATES: | July 21 and August 19, 2009 |

AUTHORIZED SIGNATORY:

Mark E. Hill
Staff Engineer
Elliott Laboratories.

ACCREDITED

Testing Cert #2016-01

## *REVISION HISTORY*

| Rev# | Date | Comments | Modified By |
|---|---|---|---|
| | August 24, 2009 | First Release | |
| | | | |

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## *SCOPE*

The Federal Communications Commission (FCC) establishes rules and regulations regarding the electromagnetic emissions of all electronic devices. An electromagnetic emissions test has been performed on the Broadcom Corporation model BCM92070MD_REF12 pursuant to Subpart B of Part 15 of FCC Rules for digital devices. Conducted and radiated emissions data has been collected, reduced, and analyzed within this report in accordance with measurement guidelines set forth in ANSI C63.4-2003 as outlined in Elliott Laboratories test procedures. The test data has been provided as an appendix to this report for reference. Additionally the results are deemed satisfactory evidence of compliance with Industry Canada Interference-Causing Equipment Standard ICES-003 (Issue 4, February 2004).

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

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

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

The test results recorded herein are based on a single type test of the Broadcom Corporation model BCM92070MD_REF12 and therefore apply only to the tested sample. The sample was selected and prepared by Anne Liang of Broadcom Corporation.

## *OBJECTIVE*

The primary objective of the company is compliance with Subpart B of Part 15 of FCC Rules for the radiated and conducted emissions of digital devices. Since the subject device is intended for operation in any environment including residential areas, equipment verification or certification is required.

Equipment verification is a procedure where the company or a contracted laboratory makes measurements and takes necessary steps to ensure that the equipment complies with the appropriate technical standards. Submittal of a sample unit or test data to the FCC is not required unless specifically requested by the Commission. Once equipment verification has been obtained, a label indicating compliance must be attached to all identical units subsequently manufactured. Specific cautionary information must also be included in the operator's manual. These FCC labeling requirements are included as an appendix to this report.

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 FCC compliance is the responsibility of the company. Any modification of the product that 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 and/or I/O cable changes, etc.).

## *EMISSION TEST RESULTS*

The following emissions tests were performed on the Broadcom Corporation model BCM92070MD_REF12. The measurements were extracted from the data recorded during testing and represent the highest amplitude emissions relative to the specification limits. The actual test results are contained in an appendix of this report.

### *CONDUCTED EMISSIONS (MAINS PORT)*

| Frequency Range Operating Voltage | Standard/Section | Requirement | Measurement | Margin | Status |
|---|---|---|---|---|---|
| 0.15-30 MHz, 120V, 60Hz | FCC § 15.107(a) VCCI Table 4.2 (Class B) | 0.15-0.5 MHz: 66-56 dBµV QP 56-46 dBµV Av 0.5-5.0 MHz: 56 dBµV QP 46 dBµV Av 5.0-30.0 MHz: 60 dBµV QP 50 dBµV Av | 45.3dBµV @ 0.465MHz | -1.3dB | Complied |

### *RADIATED EMISSIONS*

| Frequency Range | Standard/Section | Requirement | Measurement | Margin | Status |
|---|---|---|---|---|---|
| 30-1000 MHz | FCC §15.109(g) | 30 – 230, 30 dBµV/m 230 – 1000, 37 dBµV/m (10m limit) | 34.8dBµV/m @581.375 MHz | -2.2dB | Complied |

### *MEASUREMENT UNCERTAINTIES*

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below were calculated using the approach described in CISPR 16-4-2:2003 using a coverage factor of k=2, which gives a level of confidence of approximately 95%. The levels were found to be below levels of *U*cispr and therefore no adjustment of the data for measurement uncertainty is required.

| Measurement Type | Measurement Unit | Frequency Range | Expanded Uncertainty |
|---|---|---|---|
| Conducted Emissions | dBuV or dBuA | 150kHz – 30MHz | ± 2.2 dB |
| Radiated Electric Field | dBuV/m | 30 – 1000 MHz | ± 3.6 dB |
| | | 1000 – 40,000 MHz | ± 6.0 dB |

## *EQUIPMENT UNDER TEST (EUT) DETAILS*

### *GENERAL*

The Broadcom Corporation model BCM92070MD_REF12 is a Bluetooth module. The EUT receives power from its host. For testing purposes, the EUT was mounted to a test fixture that connected to a computer via USB.

The sample was received on April 8, 2009 and tested on July 21 and August 19, 2009. The EUT consisted of the following component(s):

| Company | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Broadcom | BCM92070MD_ REF12 | Bluetooth Module | - | QDS-BRCM1049 |

### *ANTENNA SYSTEM*

There are two antennas being evaluated: one internal trace antenna and one external antenna
Internal antenna gain = 1.75 dBi.
External antenna gain = 3.9 dBi

### *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:

CE

| Manufacturer | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Dell | Inspiron | Laptop #2 | HEP-E2-C1 | - |
| Broadcom | - | Test Fixture | - | - |
| Dell | - | Mouse | - | - |

RE

| Manufacturer | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Dell | Inspiron | Laptop -Master | 7N557 | - |
| Dell | HP-OQ065B83 | Power Supply | CN-ON2765-47890-43S-1042 | - |
| Dell | M-UVDEL1 | Mouse | LNA44603099 | - |
| Broadcom | - | Test Fixture | - | - |

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

CE

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

RE

| Manufacturer | Model | Description | Serial Number | FCC ID |
|---|---|---|---|---|
| Netgear | FS108 | Hub | FS18H2BC092554 | |
| CUI INC | DV-1280 | Power Supply | None | |

*EUT INTERFACE PORTS*

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

CE

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded or Unshielded | Length(m) |
| Ethernet | Switch | CAT 5 | Unshielded | 10.0 |
| Test Fixture | Laptop #2 USB | USB | Shielded | 1.0 |
| EUT #1 | Test Fixture | Multiwire | Unshielded | 0.2 |
| AC Power Laptop | AC Mains | 3Wire | Unshielded | 1.0 |

RE

| Port | Connected To | Cable(s) | | |
|---|---|---|---|---|
| | | Description | Shielded or Unshielded | Length(m) |
| Ethernet | Hub | CAT 5 | Unshielded | 10.0 |
| USB | Mouse | Multiwire | Shielded | 2.0 |
| USB | Test Fixture | Multiwire | Shielded | 2.0 |
| DC Power | Power Supply | 2 Wire | Unshielded | 2.0 |
| Power Adaptor | AC Mains | 3 Wire | Unshielded | 2.0 |
| Test Fixture | EUT | Multiwire | Unshielded | 0.2 |

*EUT OPERATION*

During conducted emissions testing, the EUT was configured to continuously hop on a single channel at maximum output power.

During radiated emissions testing the EUT was in Receive mode. The EUT was running "H" patterns.

## *EMISSIONS TEST SITE*

### *GENERAL INFORMATION*

Final test measurements were taken on July 21 and August 19, 2009 at the Elliott Laboratories Anechoic Chambers and/or Open Area Test Site(s) listed below. The test sites contain separate areas for radiated and conducted emissions testing. The sites conform to the requirements of ANSI C63.4: 2003 American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz and CISPR 16-1-4:2007 - Specification for radio disturbance and immunity measuring apparatus and methods Part 1-4: Radio disturbance and immunity measuring apparatus Ancillary equipment Radiated disturbances. They are registered with the VCCI and are on file with the FCC and industry Canada.

| Site | Registration Numbers | | Location |
|---|---|---|---|
| | FCC | Canada | |
| SVOATS #2 | 90593 | IC 2845A-2 | 684 West Maude Ave,<br>Sunnyvale<br>CA 94085-3518 |
| Chamber 5 | 211948 | IC 2845B-5 | 41039 Boyce Road<br>Fremont,<br>CA 94538-2435 |

Considerable engineering effort has been expended to ensure that the facilities conform to all pertinent requirements.

### *CONDUCTED EMISSIONS CONSIDERATIONS*

Conducted emissions testing is performed in conformance with ANSI C63.4 and CISPR 22. Mains port measurements are made with the EUT connected to the public power network through 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. Telecommunication port measurements are made with the network cable connected through an ISN appropriate to the type of cable employed.

### *RADIATED EMISSIONS CONSIDERATIONS*

The FCC has determined that radiated measurements made in a non-anechoic shielded enclosure are not suitable for determining levels of radiated emissions. Radiated measurements are performed in an Open Area Test Site or semi-anechoic chamber, as defined in ANSI C63.4. The test site is maintained free of conductive objects within the CISPR defined elliptical area incorporated in ANSI C63.4 guidelines.

## *MEASUREMENT INSTRUMENTATION*

### *RECEIVER SYSTEM*

An EMI receiver as specified in CISPR 16-1-1:2003 is used for emissions measurements. The receivers used can measure over the frequency range of 9 kHz up to 7 GHz. These receivers allow both ease of measurement and high accuracy to be achieved. The receivers have Peak, Average, and CISPR (Quasi-peak) detectors built into their design so no external adapters are necessary. The receiver automatically sets the required bandwidth for the CISPR detector used during measurements.

For measurements above the frequency range of the receivers, a spectrum analyzer is utilized because it provides visibility of the entire spectrum along with the precision and versatility required to support engineering analysis. Average measurements above 1000 MHz are performed on the spectrum analyzer using the linear-average method with a resolution bandwidth of 1 MHz and a video bandwidth of 10 Hz.

### *INSTRUMENT CONTROL COMPUTER*

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

The Spectrum Monitor provides a visual display of the signal being measured. In addition, the controller or a personal computer runs automated data collection programs that 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 emission 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.

*IMPEDANCE STABILIZATION NETWORK (ISN)*

Telecommunication port conducted emission measurements utilize an Impedance Stabilization Network with a 150 ohm termination impedance and specific longitudinal conversion loss as the voltage monitoring point. This network provides for calibrated radio frequency noise measurements by the design of the internal circuitry on the EUT and measurement ports, respectively. For current measurements, a current probe with a uniform frequency response and less than 1 ohm insertion impedance is used.

*FILTERS/ATTENUATORS*

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

*ANTENNAS*

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

*ANTENNA MAST AND EQUIPMENT TURNTABLE*

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

ANSI C63.4 specifies that the test height above ground for table mounted devices shall be 80 centimeters. Floor mounted equipment shall be placed on the ground plane if the device is normally used on a conductive floor or separated from the ground plane by insulating material up to 12 mm thick 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 company's specifications. All antennas are calibrated at regular intervals with respect to tuned half-wave dipoles. An appendix of this report contains the list of test equipment used and calibration information.

## *TEST PROCEDURES*

### *EUT AND CABLE PLACEMENT*

The standards 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, and the worst case orientation is used for final measurements.

### *CONDUCTED EMISSIONS (MAINS)*

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. Emissions that have peak values close to the specification limit are also measured in the quasi-peak and average detection modes to determine compliance except when the amplitude of the emission when measured with the quasi-peak detector is more than 10 dB below the specification limit for average measurements. In this case only quasi-peak measurements are performed.

### *CONDUCTED EMISSIONS (TELECOMMUNICATION PORTS)*

Conducted emissions voltages are measured at a point 80 cm from the EUT. If conducted emission currents are measured, the current probe is located 70 cm from the EUT. 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. Emissions that have peak values close to the specification limit are also measured in the quasi-peak and average detection modes to determine compliance except when the amplitude of the emission when measured with the quasi-peak detector is more than 10 dB below the specification limit for average measurements. In this case only quasi-peak measurements are performed.

*RADIATED EMISSIONS*

Radiated emissions measurements are performed in two phases as well. A preliminary scan of emissions is conducted in which all significant EUT frequencies are identified with the system in a nominal configuration. At least two scans are performed from 30 MHz up to the frequency required by the regulation specified on page 1. One or more of these is with the antenna polarized vertically while the one or more of these is with the antenna polarized horizontally. During the preliminary scans, the EUT is rotated through 360°, the antenna height is varied and cable positions are varied to determine the highest emission relative to the limit. A speaker is provided in the receiver to aid in discriminating between EUT and ambient emissions. Other methods used during the preliminary scan for EUT emissions involve scanning with near field magnetic loops, monitoring I/O cables with RF current clamps, and cycling power to the EUT. Final maximization is a phase in which the highest amplitude emissions identified in the spectral search are viewed while the EUT azimuth angle is varied from 0 to 360 degrees relative to the receiving antenna. The azimuth that results in the highest emission is then maintained while varying the antenna height from one to four meters. The result is the identification of the highest amplitude for each of the highest peaks. Each recorded level is corrected in the receiver using appropriate factors for cables, connectors, antennas, and preamplifier gain. Emissions that have values close to the specification limit may also be measured with a tuned dipole antenna to determine compliance.

When Testing above 18 GHz, the receive antenna is located at 1 meter from the EUT and the antenna height is restricted to a maximum of 2.5m. Maximum emissions are found within this restricted range because emission levels decrease over distance and as the antenna is raised above 2.5m, the distance from the EUT increases. As a result of the increased measurement distance, at antenna heights above 2.5m, lower emission levels are measured as compared to emissions levels measured at antenna heights at 2.5m and below.

Emissions above 18 GHz are very directional therefore additional measures are taken to ensure correct measurement of the maximum EUT emissions. A preliminary near field scan using the appropriate horn antenna is performed from a distance of 30cm. Data is recorded to note the frequencies and angles of maximum radiation from the EUT. Final measurements are made with the antenna positioned at the projected angle and direction determined during the near field prescan from a distance of 1m. For EUT's higher than 1.6m above the ground plane, the antenna is mounted on the mast angled to maintain the point of maximum EUT emission noted during the near field measurement along the approximate centerline of the antenna.

## *SAMPLE CALCULATIONS*

### *SAMPLE CALCULATIONS - CONDUCTED EMISSIONS*

Receiver readings are compared directly to the conducted emissions specification limit (decibel form). The calculation is 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, is calculated by using the following formula:

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

where:

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

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

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

$$R_c = R_r + F_d$$

and

$$M = R_c - L_s$$

where:

$R_r$ = Receiver Reading in dBuV/m
$F_d$ = Distance Factor in dB
$R_c$ = Corrected Reading in dBuV/m
$L_s$ = Specification Limit in dBuV/m
M = Margin in dB Relative to Spec

# *EXHIBIT 1: Test Equipment Calibration Data*

1 Page

**Radiated Emissions, 30 - 25,000 MHz, 21-Jul-09**
**Engineer: Rafael Varelas**

| Manufacturer | Description | Model # | Asset # | Cal Due |
|---|---|---|---|---|
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 870 | 09-Oct-09 |
| EMCO | Antenna, Horn, 1-18 GHz (SA40-Red) | 3115 | 1142 | 15-Jul-10 |
| Hewlett Packard | SpecAn 30 Hz -40 GHz, SV (SA40) Red | 8564E (84125C) | 1148 | 12-Mar-10 |
| Hewlett Packard | High Pass filter, 3.5 GHz (Red System) | P/N 84300-80038 (84125C) | 1403 | 28-Aug-09 |

**Conducted Emissions - AC Power Ports, 22-Jul-09**
**Engineer: Vishal Narayan**

| Manufacturer | Description | Model # | Asset # | Cal Due |
|---|---|---|---|---|
| Elliott Laboratories | LISN, FCC / CISPR | LISN-3, OATS | 304 | 31-Jul-09 |
| Rohde& Schwarz | Pulse Limiter | ESH3 Z2 | 812 | 23-Feb-10 |
| Rohde & Schwarz | Test Receiver, 0.009-2750 MHz | ESN | 1332 | 14-Apr-10 |

**Radiated Emissions, 30 - 25,000 MHz, 24-Jul-09**
**Engineer: Joseph Cadigal**

| Manufacturer | Description | Model # | Asset # | Cal Due |
|---|---|---|---|---|
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 870 | 09-Oct-09 |
| Hewlett Packard | EMC Spectrum Analyzer, 9 KHz-26.5 GHz | 8593EM | 1141 | 29-Dec-09 |
| EMCO | Antenna, Horn, 1-18 GHz (SA40-Red) | 3115 | 1142 | 15-Jul-10 |
| Hewlett Packard | High Pass filter, 3.5 GHz (Red System) | P/N 84300-80038 (84125C) | 1403 | 28-Aug-09 |

**Radiated Emissions, 30 - 18,000 MHz, 24-Jul-09**
**Engineer: Rafael Varelas**

| Manufacturer | Description | Model # | Asset # | Cal Due |
|---|---|---|---|---|
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 870 | 09-Oct-09 |
| Hewlett Packard | EMC Spectrum Analyzer, 9 KHz-26.5 GHz | 8593EM | 1141 | 29-Dec-09 |
| EMCO | Antenna, Horn, 1-18 GHz (SA40-Red) | 3115 | 1142 | 15-Jul-10 |

**Radiated Emissions, 30 - 25,000 MHz, 09-Aug-09**
**Engineer: Rafael Varelas**

| Manufacturer | Description | Model # | Asset # | Cal Due |
|---|---|---|---|---|
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 870 | 09-Oct-09 |
| EMCO | Antenna, Horn, 1-18 GHz (SA40-Red) | 3115 | 1142 | 15-Jul-10 |
| Hewlett Packard | SpecAn 30 Hz -40 GHz, SV (SA40) Red | 8564E (84125C) | 1148 | 12-Mar-10 |
| Hewlett Packard | High Pass filter, 3.5 GHz (Red System) | P/N 84300-80038 (84125C) | 1403 | 29-Jul-10 |
| Rohde & Schwarz | Power Sensor 100 uW - 2 Watts | NRV-Z32 | 1423 | 07-Nov-09 |
| Rohde & Schwarz | Power Meter, Single Channel, +1795+1796 | NRVS | 1534 | 06-Apr-10 |

**Radio Spurious Emissions, 10-Aug-09**
**Engineer: Suhaila Khushzad**

| Manufacturer | Description | Model # | Asset # | Cal Due |
|---|---|---|---|---|
| Hewlett Packard | Microwave Preamplifier, 1-26.5GHz | 8449B | 870 | 09-Oct-09 |
| EMCO | Antenna, Horn, 1-18 GHz (SA40-Red) | 3115 | 1142 | 15-Jul-10 |
| Hewlett Packard | SpecAn 30 Hz -40 GHz, SV (SA40) Red | 8564E (84125C) | 1148 | 12-Mar-10 |
| Micro-Tronics | Band Reject Filter, 2400-2500 MHz | BRM50702-02 | 1683 | 29-Jul-10 |

**Radiated Emissions, 30 - 1,000 MHz, 19-Aug-09**
**Engineer: Vishal Narayan**

| Manufacturer | Description | Model # | Asset # | Cal Due |
|---|---|---|---|---|
| Rohde & Schwarz | EMI Test Receiver, 20 Hz-7 GHz | ESIB7 | 1538 | 19-Sep-09 |
| Com-Power Corp. | Preamplifier, 30-1000 MHz | PA-103 | 1632 | 13-Apr-10 |
| Sunol Sciences | Biconilog, 30-3000 MHz | JB3 | 1657 | 23-May-10 |

# *EXHIBIT 2: Test Measurement Data*

7 Pages

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J76100 |
| Model: | BCM92070MD_REF12 | T-Log Number: | T76154 |
| | | Account Manager: | Dean Erikson |
| Contact: | Anne Liang/Juan Martinez | Project Engineer: | Mark Hill |
| Emissions Standard(s): | FCC, RSS 210 | Class: | B |
| Immunity Standard(s): | - | Environment: | - |

# EMC Test Data

For The

# Broadcom

Model

BCM92070MD_REF12

Date of Last Test: 8/19/2009

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J76100 |
| Model: | BCM92070MD_REF12 | T-Log Number: | T76154 |
| | | Account Manager: | Dean Erikson |
| Contact: | Anne Liang/Juan Martinez | | |
| Standard: | FCC, RSS 210 | Class: | B |

# Radiated Emissions

***(Elliott Laboratories Fremont Facility, Semi-Anechoic Chamber)***

## 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: 8/19/2009
Test Engineer: Vishal Narayan
Test Location: Fremont Chamber #5

Config. Used: 3
Config Change: None
EUT Voltage: 230V/50Hz

## 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: 20 °C
Rel. Humidity: 40 %

## Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|---|---|---|---|---|
| 1 | RE, 30 - 1000 MHz, Preliminary Scan | EN55022 Class B | Pass | 34.2dBµV/m @ 581.375MHz (-2.8dB) |
| 2 | RE, 30 - 1000 MHz, Maximized Emissions | EN55022 Class B | Pass | 34.8dBµV/m @ 581.375MHz (-2.2dB) |

## Modifications Made During Testing

No modifications were made to the EUT during testing

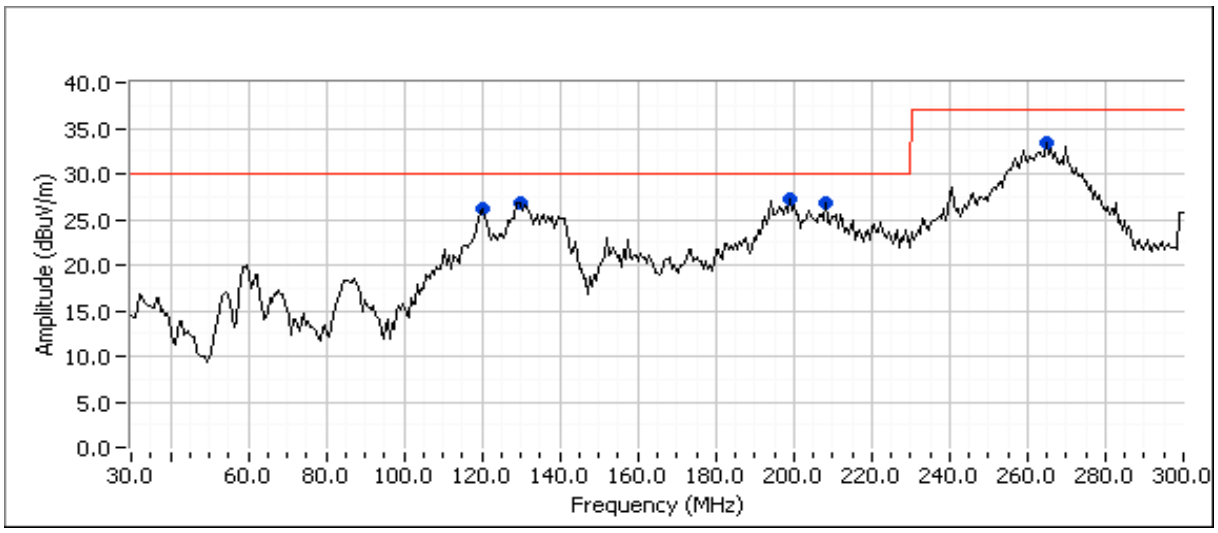
## Deviations From The Standard

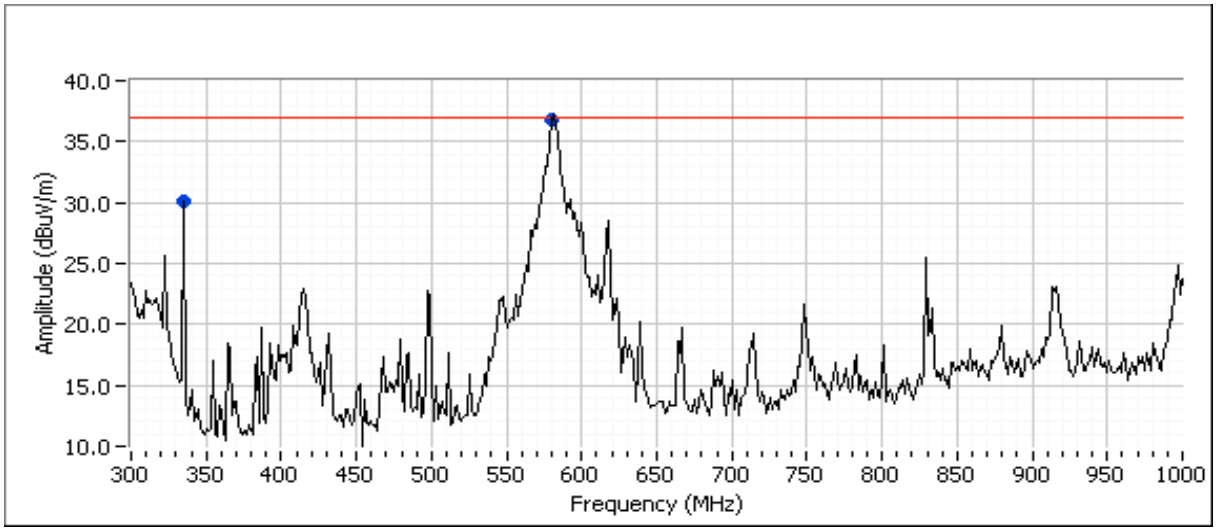
No deviations were made from the requirements of the standard.

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J76100 |
| Model: | BCM92070MD_REF12 | T-Log Number: | T76154 |
| | | Account Manager: | Dean Erikson |
| Contact: | Anne Liang/Juan Martinez | | |
| Standard: | FCC, RSS 210 | Class: | B |

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

| Frequency Range | Test Distance | Limit Distance | Extrapolation Factor |
|---|---|---|---|
| 30 - 1000 MHz | 5 | 10 | -6.0 |



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J76100 |
| Model: | BCM92070MD_REF12 | T-Log Number: | T76154 |
| | | Account Manager: | Dean Erikson |
| Contact: | Anne Liang/Juan Martinez | | |
| Standard: | FCC, RSS 210 | Class: | B |

Continuation of Run #1

Preliminary peak readings captured during pre-scan

| Frequency | Level | Pol | EN55022 Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 581.375 | 36.8 | V | 37.0 | -0.2 | Peak | 56 | 1.5 | |
| *198.818* | 27.2 | H | 30.0 | -2.8 | Peak | 254 | 2.5 | |
| 206.793 | 26.9 | H | 30.0 | -3.1 | Peak | 238 | 2.5 | |
| 129.700 | 26.9 | V | 30.0 | -3.1 | Peak | 352 | 1.0 | |
| 264.776 | 33.3 | H | 37.0 | -3.7 | Peak | 74 | 2.0 | |
| 120.653 | 26.1 | V | 30.0 | -3.9 | Peak | 192 | 1.0 | |
| 335.996 | 30.1 | H | 37.0 | -6.9 | Peak | 181 | 1.5 | |

Preliminary quasi-peak readings (no manipulation of EUT interface cables)

| Frequency | Level | Pol | EN55022 Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 581.375 | 34.2 | V | 37.0 | -2.8 | QP | 53 | 1.5 | QP (1.00s) |
| 129.700 | 24.2 | V | 30.0 | -5.8 | QP | 349 | 1.0 | QP (1.00s) |
| 206.793 | 23.3 | H | 30.0 | -6.7 | QP | 239 | 2.5 | QP (1.00s) |
| 198.818 | 23.3 | H | 30.0 | -6.7 | QP | 255 | 2.5 | QP (1.00s) |
| 264.776 | 30.2 | H | 37.0 | -6.8 | QP | 76 | 2.0 | QP (1.00s) |
| 335.996 | 29.6 | H | 37.0 | -7.4 | QP | 183 | 1.5 | QP (1.00s) |
| 120.653 | 21.0 | V | 30.0 | -9.0 | QP | 194 | 1.0 | QP (1.00s) |

Run #2: Maximized Readings From Run #1

Maximized quasi-peak readings (includes manipulation of EUT interface cables)

| Frequency | Level | Pol | EN55022 Class B | | Detector | Azimuth | Height | Comments |
|---|---|---|---|---|---|---|---|---|
| MHz | dBµV/m | v/h | Limit | Margin | Pk/QP/Avg | degrees | meters | |
| 581.375 | 34.8 | V | 37.0 | -2.2 | QP | 56 | 1.5 | QP (1.00s) |
| 206.793 | 23.3 | H | 30.0 | -6.7 | QP | 239 | 2.5 | QP (1.00s) |
| 198.818 | 23.3 | H | 30.0 | -6.7 | QP | 255 | 2.5 | QP (1.00s) |
| 264.776 | 30.2 | H | 37.0 | -6.8 | QP | 76 | 2.0 | QP (1.00s) |
| 335.996 | 29.6 | H | 37.0 | -7.4 | QP | 183 | 1.5 | QP (1.00s) |
| 120.653 | 21.0 | V | 30.0 | -9.0 | QP | 194 | 1.0 | QP (1.00s) |

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J76100 |
| Model: | BCM92070MD_REF12 | T-Log Number: | T76154 |
| | | Account Manager: | Dean Erikson |
| Contact: | Anne Liang/Juan Martinez | | |
| Standard: | FCC, RSS 210 | Class: | B |

# Conducted Emissions - Power Ports

## Test Specific Details

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

Date of Test: 7/21/2009 21:42
Test Engineer: Vishal Narayan
Test Location: SVOATS #2

Config. Used: 2
Config Change: None
EUT Voltage: 230V/50Hz and 120V/60Hz

## General Test Configuration

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

## Ambient Conditions:

Temperature: 16 °C
Rel. Humidity: 83 %

## Summary of Results

| Run # | Test Performed | Limit | Result | Margin |
|---|---|---|---|---|
| 2 | CE, AC Power,120V/60Hz | EN55022 Class B | Pass | 45.3dBµV @ 0.465MHz (-1.3dB) |

## Modifications Made During Testing

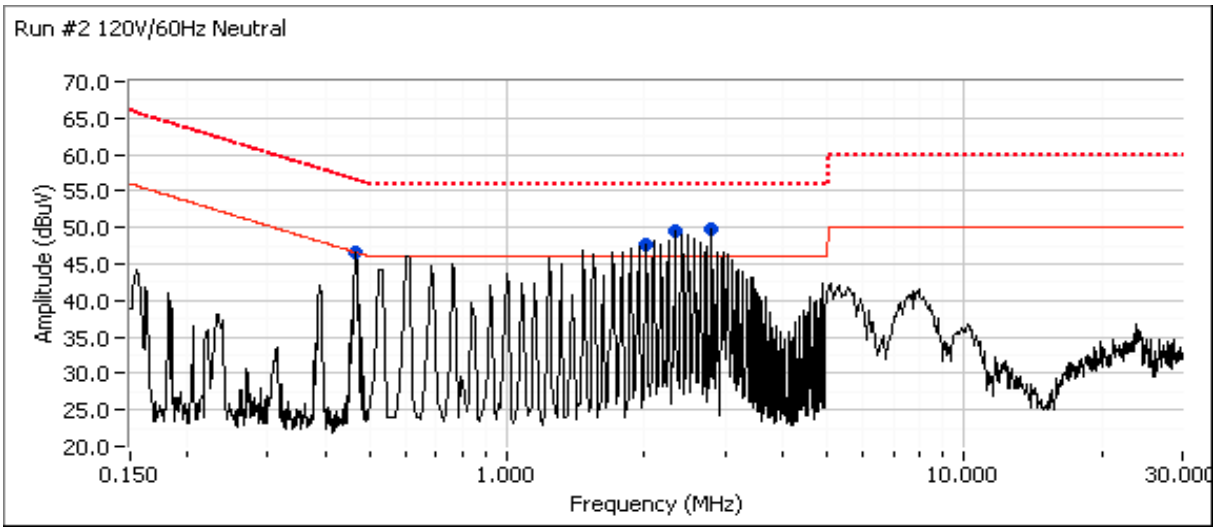
No modifications were made to the EUT during testing

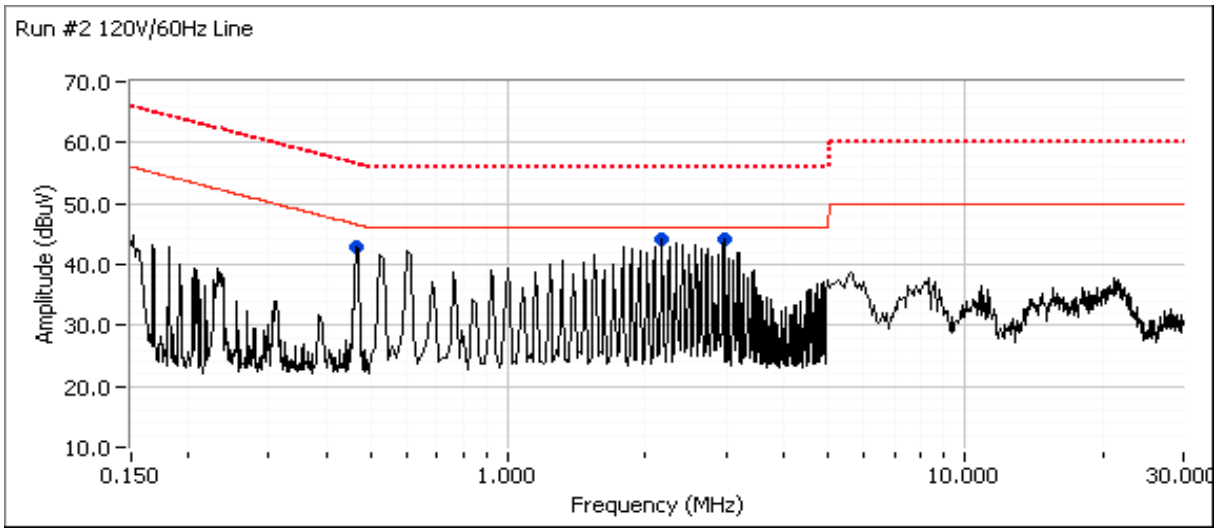
## Deviations From The Standard

No deviations were made from the requirements of the standard.

| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J76100 |
| Model: | BCM92070MD_REF12 | T-Log Number: | T76154 |
| | | Account Manager: | Dean Erikson |
| Contact: | Anne Liang/Juan Martinez | | |
| Standard: | FCC, RSS 210 | Class: | B |

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



| | | | |
|---|---|---|---|
| Client: | Broadcom | Job Number: | J76100 |
| Model: | BCM92070MD_REF12 | T-Log Number: | T76154 |
| | | Account Manager: | Dean Erikson |
| Contact: | Anne Liang/Juan Martinez | | |
| Standard: | FCC, RSS 210 | Class: | B |

Continuation of Run #2

| Frequency | Level | AC | EN55022 B | | Detector | Comments |
|---|---|---|---|---|---|---|
| MHz | dBµV | Line | Limit | Margin | QP/Ave | |
| 0.465 | 45.3 | Neutral | 46.6 | -1.3 | AVG | AVG (0.10s) |
| 0.465 | 41.7 | Line | 46.6 | -4.9 | AVG | AVG (0.10s) |
| 2.790 | 40.2 | Neutral | 46.0 | -5.8 | AVG | AVG (0.10s) |
| 2.170 | 39.5 | Line | 46.0 | -6.5 | AVG | AVG (0.10s) |
| 2.327 | 38.1 | Neutral | 46.0 | -7.9 | AVG | AVG (0.10s) |
| 2.017 | 37.4 | Neutral | 46.0 | -8.6 | AVG | AVG (0.10s) |
| 2.945 | 37.4 | Line | 46.0 | -8.6 | AVG | AVG (0.10s) |
| 0.465 | 45.3 | Neutral | 56.6 | -11.3 | QP | QP (1.00s) |
| 2.790 | 44.2 | Neutral | 56.0 | -11.8 | QP | QP (1.00s) |
| 2.327 | 42.6 | Neutral | 56.0 | -13.4 | QP | QP (1.00s) |
| 2.170 | 41.9 | Line | 56.0 | -14.1 | QP | QP (1.00s) |
| 2.017 | 41.6 | Neutral | 56.0 | -14.4 | QP | QP (1.00s) |
| 0.465 | 41.8 | Line | 56.6 | -14.8 | QP | QP (1.00s) |
| 2.945 | 40.4 | Line | 56.0 | -15.6 | QP | QP (1.00s) |

# *EXHIBIT 3: Photographs of Test Configurations*

Uploaded as a separate exhibit

## *EXHIBIT 4: Proposed FCC ID Label & Label Location*

Uploaded as a separate exhibit

# *EXHIBIT 5: Detailed Photographs*

Uploaded as a separate exhibit

# *EXHIBIT 6: Operator's Manual*

Uploaded as a separate exhibit

## *EXHIBIT 7: Block Diagram*

Uploaded as a separate exhibit

# *EXHIBIT 8: Schematic Diagrams*

Uploaded as a separate exhibit

# *EXHIBIT 9: Theory of Operation*

Uploaded as a separate exhibit