

# FCC Test Report FCC Part 15.247 for DSSS systems

For
Wireless LAN PCI-E Mini Card

MODEL #: BCM94311MCG

Broadcom Corporation 190 Mathilda Place Sunnyvale, CA 94086 U.S.A

FCC ID: QDS-BRCM1020

TEST REPORT #: EMC\_BROAD\_033\_07002\_FCC15\_247\_b\_g\_BRCM1020 DATE: 2007-7-23





Bluetooth Qualification Test Facility (BQTF)



FCC listed: A2LA accredited

IC recognized # 3925

#### CETECOM Inc.

411 Dixon Landing Road • Milpitas, CA 95035 • U.S.A.

Phone: + 1 (408) 586 6200 • Fax: + 1 (408) 586 6299 • E-mail: info@cetecomusa.com • <a href="http://www.cetecom.com">http://www.cetecom.com</a> CETECOM Inc. is a Delaware Corporation with Corporation number: 2113686

Board of Directors: Dr. Harald Ansorge, Dr. Klaus Matkey, Hans Peter May

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| Test Report #: | <b>EMC</b> | <b>BROAD</b> | 033 | 07002 | FCC15 | 247 | b g | <b>BRCM1020</b> |
|----------------|------------|--------------|-----|-------|-------|-----|-----|-----------------|
|                |            |              |     |       |       |     |     |                 |

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1 Assessment

The following is in compliance with the applicable criteria specified in FCC rules Part 15.247 of the Code of Federal Regulations.

| Company             | Description                      | Model #     |  |
|---------------------|----------------------------------|-------------|--|
| Broadcom Coporation | Wireless LAN PCI-<br>E Mini Card | BCM94311MCG |  |

Technical responsibility for area of testing:

# Lothar Schmidt (Director Regulatory and

| 007-7-23                    | EMC & Radio | Antenna Services) |           |  |  |  |  |  |
|-----------------------------|-------------|-------------------|-----------|--|--|--|--|--|
| Date                        | Section     | Name              | Signature |  |  |  |  |  |
| This report is prepared by: |             |                   |           |  |  |  |  |  |

| Peter Mu  |             |                        |           |  |  |  |
|-----------|-------------|------------------------|-----------|--|--|--|
| 2007-7-23 | EMC & Radio | (EMC Project Engineer) |           |  |  |  |
| Date      | Section     | Name                   | Signature |  |  |  |

The test results of this test report relate exclusively to the test item specified in Identification of the Equipment under Test. The CETECOM Inc. USA does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples of the type of the equipment represented by the test item. The test report may only be reproduced or published in full. Reproduction or publication of extracts from the report requires the prior written approval of the CETECOM Inc USA.

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### **Administrative Data**

2.1 Identification of the Testing Laboratory

**Company Name: CETECOM Inc.** 

**Department: EMC** 

Address: 411 Dixon Landing Road

Milpitas, CA 95035

U.S.A.

+1 (408) 586 6200 **Telephone:** Fax: +1 (408) 586 6299 **Responsible Test Lab Lothar Schmidt** 

Manager:

Applicant's Name:

### 2.2 Identification of the Client

Address Line 1: 190 Mathilda Place Address Line 2: City/ Zip Code Sunnyvale, California 94086 Country: U.S.A

**Broadcom Corporation** 

**Contact Person: Daniel Lawless** 

408 922 5870 Phone No.: 408 543 3399 Fax:

dlawless@broadcom.com e-mail:

#### 2.3 **Identification of the Manufacturer**

Same as above applicant.

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#### 3 **Equipment under Test (EUT)**

3.1 Specification of the Equipment under Test

**Product Type Mini PCI Card** 

**Marketing Name:** 802.11g Wireless LAN PCI-E Mini Card

**Model No: BCM94311MCG** 

2400MHz - 2483.5MHz **Operating Frequency:** 

**Number of Channels:** 11

**Date of Test:** 2007-6-27 to 2007-7-18

**Type(s) of Modulation:** CCK, OFDM

**Antenna Type:** Foxconn WDAN-DWDS1-001-DF

22.35 dBm (0.172W)

EIRP WLAN 802.11b Chain A 2462MHz **Output Power1:** 

25.77 dBm (0.378W)

EIRP WLAN 802.11g Chain A 2462MHz

3.2 Specification of the Supporting Portable Platform

**Product Type Notebook PC Marketing Name: Dell XPS M1730 Model No:** Dell PP06XA

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**Subject Of Investigation** 

All testing was performed on the product referred to in Section 3 as EUT. EUT contains Broadcom BCM94311MCG WLAN module, FCC ID: QDS-BRCM1020 that supports the following mode and frequency bands:

2400-2483.5MHz: 802.11b, 802.11g

The objective of the measurements done by Cetecom Inc. was to measure the performance of the EUT operating under 802.11b/g mode in the 2400-2483.5MHz range as specified by requirements listed in FCC rules Part 15.247 of Title 47 of the Code of Federal Regulations. The maximization of portable equipment is conducted in accordance with ANSI C63.4

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5 Measurements

### 5.1 MAXIMUM PEAK OUTPUT POWER (RADIATED)

§ 15.247 (b) (1)

### **EIRP**:

### 802.11b

| TEST CONDITIONS         |                             | MAXIMUM PEAK OUTPUT POWER (dBm) |       |         |       |
|-------------------------|-----------------------------|---------------------------------|-------|---------|-------|
| Fre                     | quency (MI                  | Hz)                             | 2412  | 2437    | 2462  |
| Chain A                 | T <sub>nom</sub> (23)° C    | $\mathbf{V}_{\mathrm{nom}}$     | 13.38 | 20.7    | 22.35 |
| Chain B                 | T <sub>nom</sub> (23)°<br>C | $\mathbf{V}_{\mathrm{nom}}$     | 17.64 | 20.19   | 19.67 |
| Measurement uncertainty |                             |                                 |       | ±0.5dBm |       |

### 802.11g

| TEST CONDITIONS         |                             |                             | MAXIMUM PEAK OUTPUT POWER (dBm) |         |       |  |
|-------------------------|-----------------------------|-----------------------------|---------------------------------|---------|-------|--|
| Frequency (MHz)         |                             |                             | 2412                            | 2437    | 2462  |  |
| Chain A                 | T <sub>nom</sub> (23)°<br>C | $\mathbf{V}_{\mathrm{nom}}$ | 19.81                           | 25.49   | 25.77 |  |
| Chain B                 | T <sub>nom</sub> (23)°<br>C | $\mathbf{V}_{\mathrm{nom}}$ | 23.2                            | 25.31   | 22.66 |  |
| Measurement uncertainty |                             |                             |                                 | ±0.5dBm |       |  |

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### EIRP: 2412MHz (802.11b) Chain A

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11b, ch 1, chain a

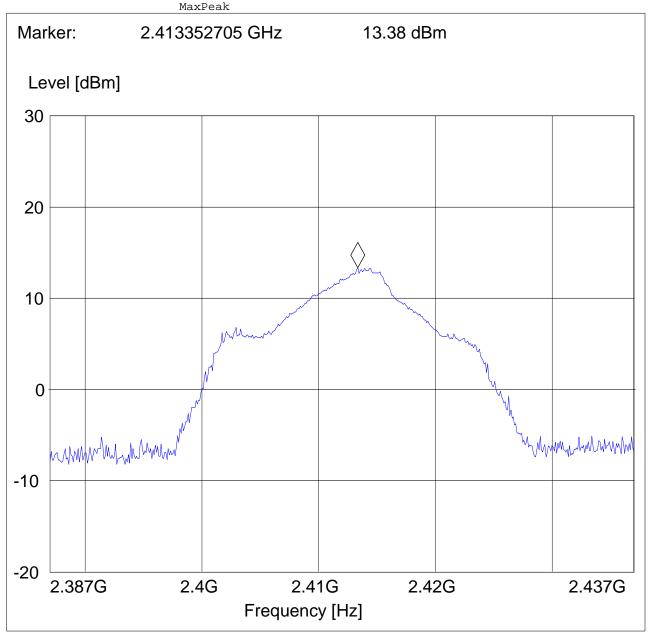
ANT Orientation: H EUT Orientation: H Test Engineer: Ed

Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH1"

Short Description: EIRP RLAN channel-2412 MHz Stop Detector Meas. IF Transducer Start Bandw. Frequency Frequency Time 2.4 GHz 2.4 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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### EIRP: 2412MHz (802.11b) Chain B

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11b, ch 1, chain b

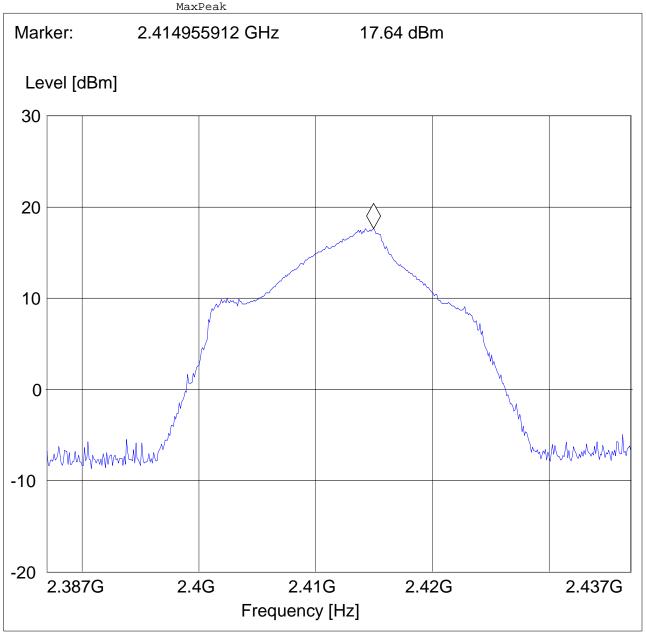
ANT Orientation: V EUT Orientation: H Test Engineer: Ed
Power Supply: AC

Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH1"

Short Description: EIRP RLAN channel-2412 MHz Stop Detector Meas. IF Transducer Start Frequency Frequency Bandw. Time 2.4 GHz 2.4 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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### EIRP: 2437MHz (802.11b) Chain A

Dell Siberia EUT: Customer: Broadcom

802.11b, ch 6, chain a Test Mode:

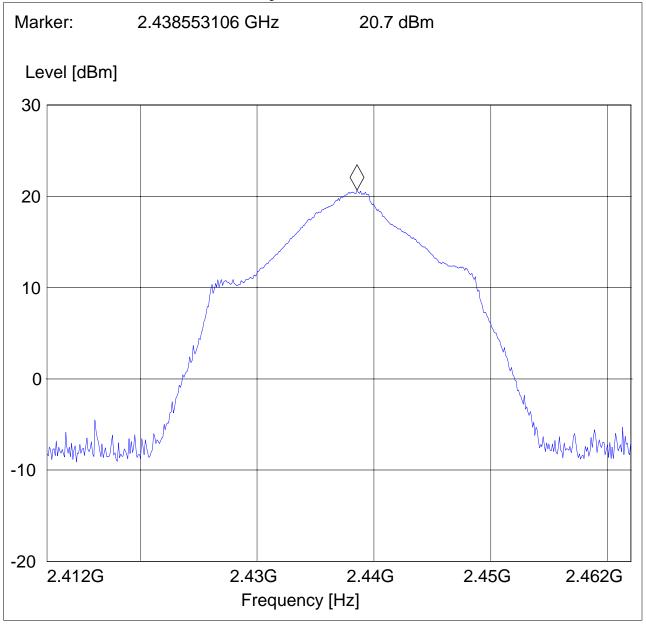
ANT Orientation: H EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH6"

Short Description: EIRP RLAN channel-2437 MHz Stop Detector Meas. IF Transducer Start Frequency Frequency Bandw. Time MaxPeak 2.4 GHz 2.5 GHz Coupled 10 MHz DUMMY-DBM



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### EIRP: 2437MHz (802.11b) Chain B

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11b, ch 6, chain b

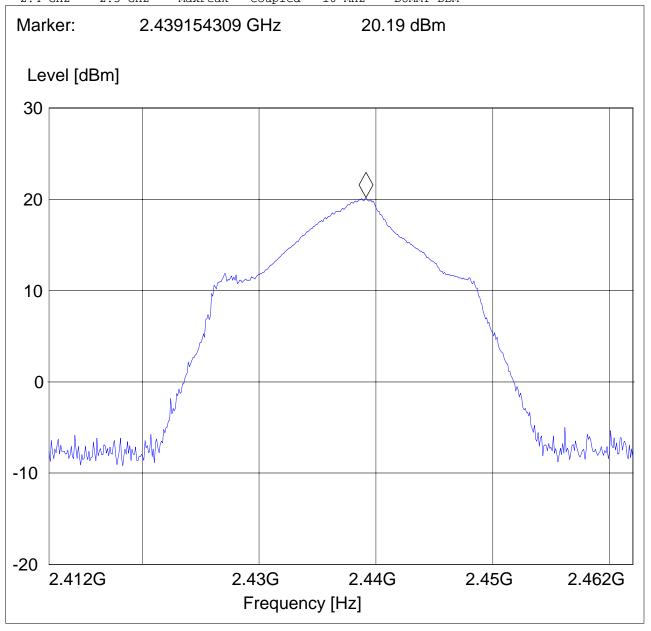
ANT Orientation: V EUT Orientation: H Test Engineer: Ed
Power Supply: AC

Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH6"

Short Description: EIRP RLAN channel-2437 MHz Stop Detector Meas. IF Transducer Start Frequency Frequency Bandw. Time MaxPeak 2.4 GHz 2.5 GHz Coupled 10 MHz DUMMY-DBM



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### EIRP: 2462MHz (802.11b) Chain A

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11b, ch 11, chain a

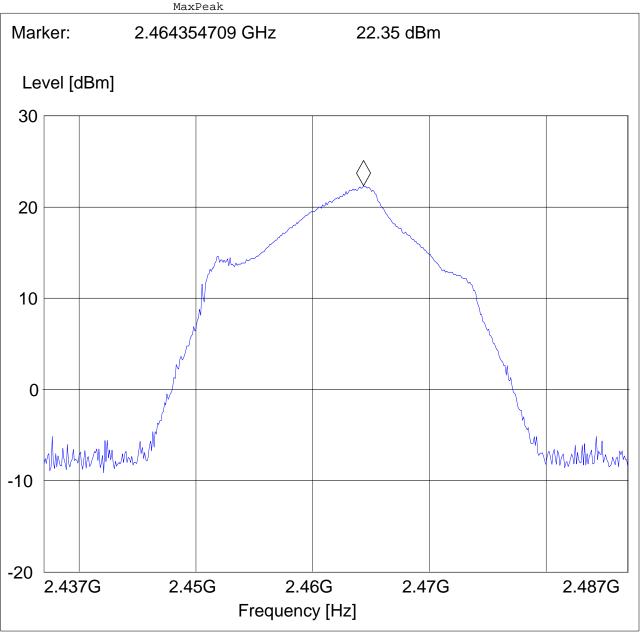
ANT Orientation: H EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH11"

Short Description: EIRP RLAN channel-2462 MHz Stop Detector Meas. IF Transducer Start Frequency Frequency Bandw. Time 2.4 GHz 2.5 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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### EIRP: 2462MHz (802.11b) Chain B

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11b, ch 11, chain b

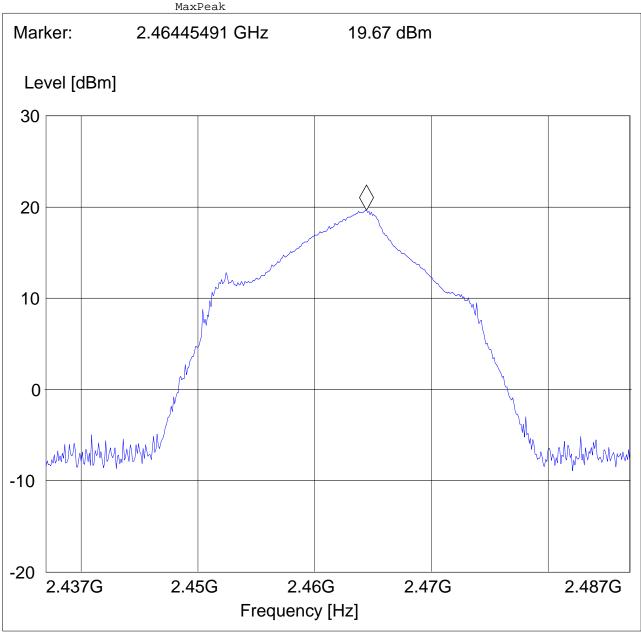
ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH11"

Short Description: EIRP RLAN channel-2462 MHz Stop Detector Meas. IF Transducer Start Bandw. Frequency Frequency Time 2.4 GHz 2.5 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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### EIRP: 2412MHz (802.11g) Chain A

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11q, ch 1, chain a

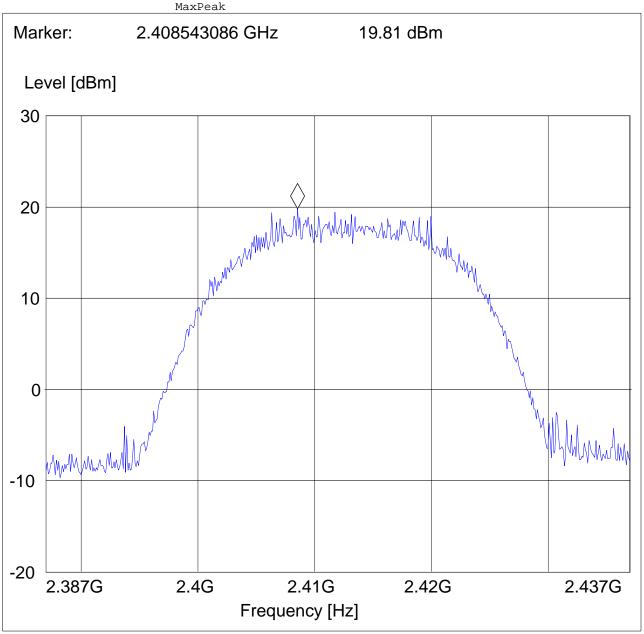
ANT Orientation: H EUT Orientation: H Test Engineer: Ed

Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH1"

Short Description: EIRP RLAN channel-2412 MHz Stop IF Transducer Start Detector Meas. Frequency Frequency Bandw. Time 2.4 GHz 2.4 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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### EIRP: 2412MHz (802.11g) Chain B

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11q, ch 1, chain b

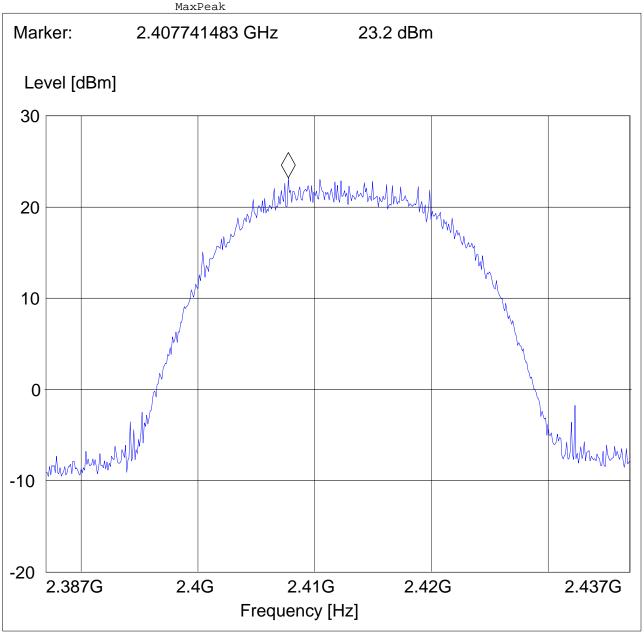
ANT Orientation: V EUT Orientation: H Test Engineer: Ed
Power Supply: AC

Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH1"

Short Description: EIRP RLAN channel-2412 MHz Stop IF Transducer Start Detector Meas. Frequency Frequency Bandw. Time 2.4 GHz 2.4 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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EIRP: 2437MHz (802.11g) Chain A

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11q, ch 6, chain a

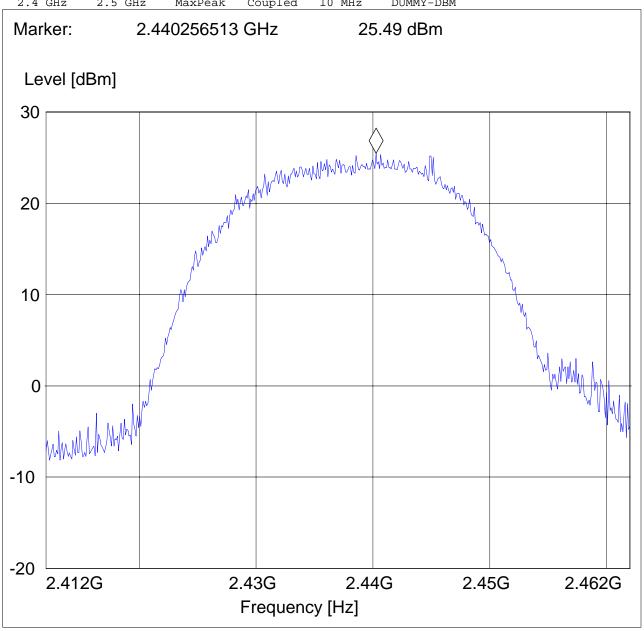
ANT Orientation: H EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH6"

Short Description: EIRP RLAN channel-2437 MHz Start Stop Detector Meas. IF Transducer Frequency Frequency Bandw. Time 2.4 GHz 2.5 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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### EIRP: 2437MHz (802.11g) Chain B

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11q, ch 6, chain b

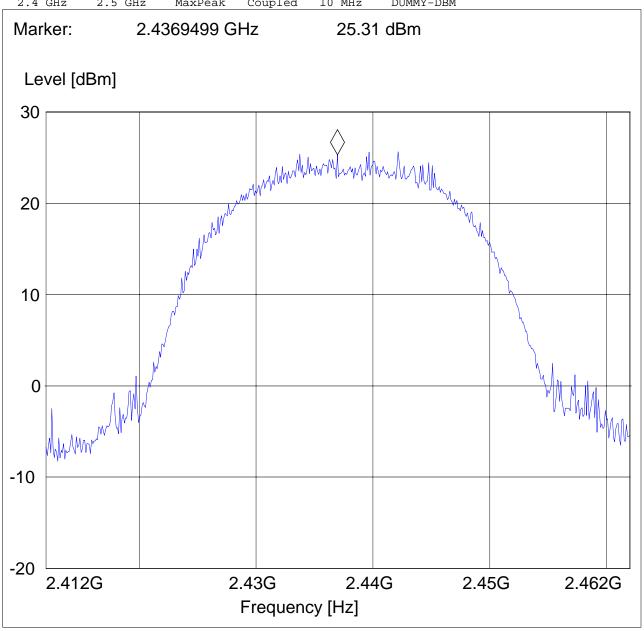
ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH6"

Short Description: EIRP RLAN channel-2437 MHz Start Stop Detector Meas. IF Transducer Bandw. Frequency Frequency Time MaxPeak 2.4 GHz 2.5 GHz Coupled 10 MHz DUMMY-DBM



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### EIRP: 2462MHz (802.11g) Chain A

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11q, ch 11, chain a

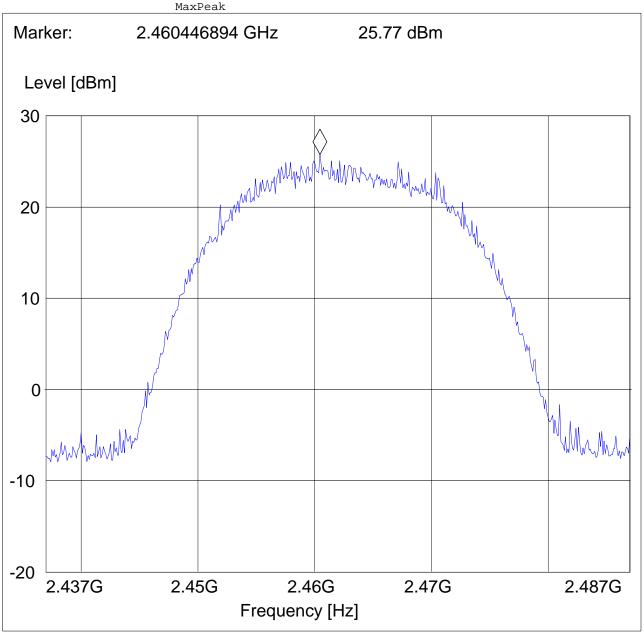
ANT Orientation: H EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH11"

Short Description: EIRP RLAN channel-2462 MHz Start Stop IF Transducer Detector Meas. Frequency Frequency Bandw. Time 2.4 GHz 2.5 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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### EIRP: 2462MHz (802.11g) Chain B

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11q, ch 11, chain b

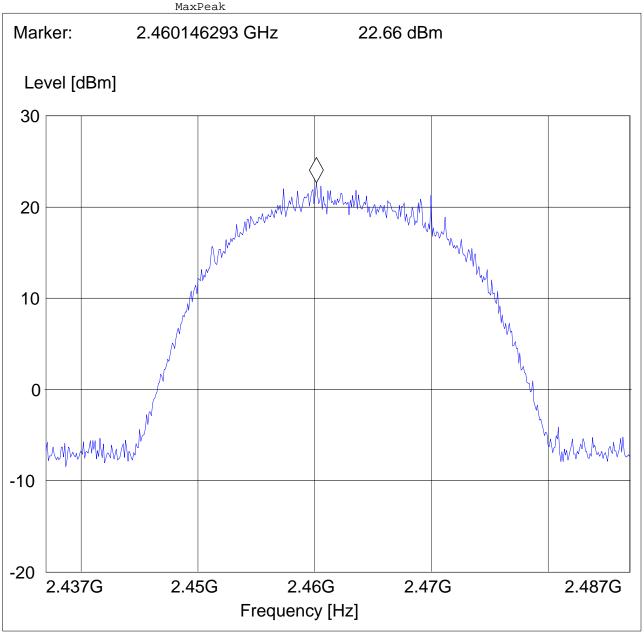
ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

Comments:

#### SWEEP TABLE: "EIRP RLAN CH11"

Short Description: EIRP RLAN channel-2462 MHz Stop Detector Meas. IF Transducer Start Frequency Frequency Bandw. Time 2.4 GHz 2.5 GHz MaxPeak Coupled 10 MHz DUMMY-DBM



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#### 5.2 RESTRICTED BAND EDGE COMPLIANCE RADIATED §15.247/15.205

#### **5.2.1 LIMITS**

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz                   | MHz             | GHz           |
|---------------------|-----------------------|-----------------|---------------|
| 0.090 - 0.110       | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15    |
| 10.495 - 0.505      | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46   |
| 2.1735 - 2.1905     | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75   |
| 4.125 - 4.128       | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5   |
| 4.17725 - 4.17775   | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2     |
| 4.20725 - 4.20775   | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5     |
| 6.215 - 6.218       | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7   |
| 6.26775 - 6.26825   | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4  |
| 6.31175 - 6.31225   | 123 - 138             | 2200 - 2300     | 14.47 - 14.5  |
| 8.291 - 8.294       | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2  |
| 8.362 - 8.366       | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4   |
| 8.37625 - 8.38675   | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12 |
| 8.41425 - 8.41475   | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0   |
| 12.29 - 12.293      | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8   |
| 12.51975 - 12.52025 | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5  |
| 12.57675 - 12.57725 | 322 - 335.4           | 3600 - 4400     | (2)           |
| 13.36 - 13.41       |                       |                 |               |

<sup>\*</sup>PEAK LIMIT= 74dBuV/m

### **Notes:**

- 1. Radiated emissions are maximized by rotating the EUT 360° at 0.5 meter height increments between 1 and 4 meters.
- 2. Measurements were performed with the EUT in X, Y and Z orientations with the measurement antenna in both horizontal and vertical polarity. The plots below show the results of the worst case orientation and polarity.

<sup>\*</sup>AVG. LIMIT= 54dBuV/m

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5.2.2 Results Lower Restricted Band 2310 MHz to 2390 MHz 802.11b (2412MHz) PEAK Chain A

Dell Siberia

Customer: Broadcom Test Mode: 802.11b, ch 1, chain a

ANT Orientation: H EUT Orientation: H Test Engineer: Ed

AC Adapter Power Supply:

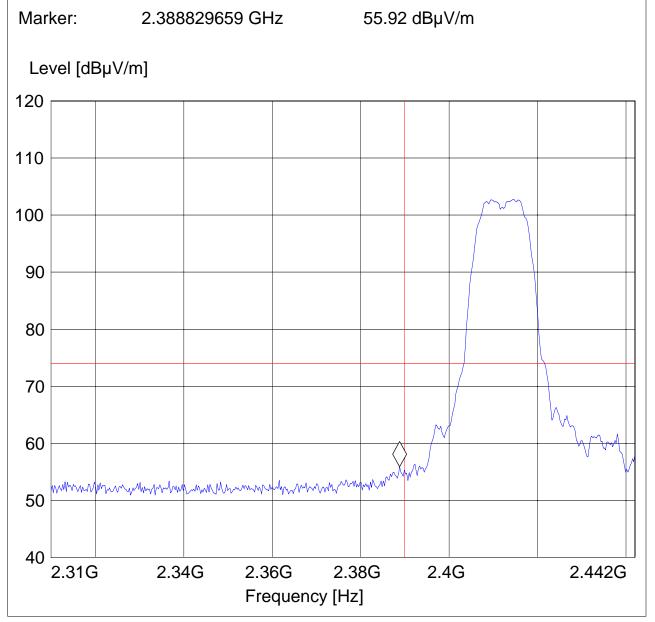
Comments:

SWEEP TABLE: "FCC15.247 LBE\_PK"

Start Stop Detector Meas.  $_{
m IF}$ Transducer

Time Frequency Frequency Bandw.

Coupled #326horn\_AF\_vert 2.3 GHz 2.4 GHz MaxPeak 1 MHz



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### 802.11b (2412MHz) AVG Chain A

Dell Siberia Broadcom Customer:

802.11b, ch 1, chain a Test Mode:

ANT Orientation: H EUT Orientation: H Test Engineer: Ed Power Supply: AC

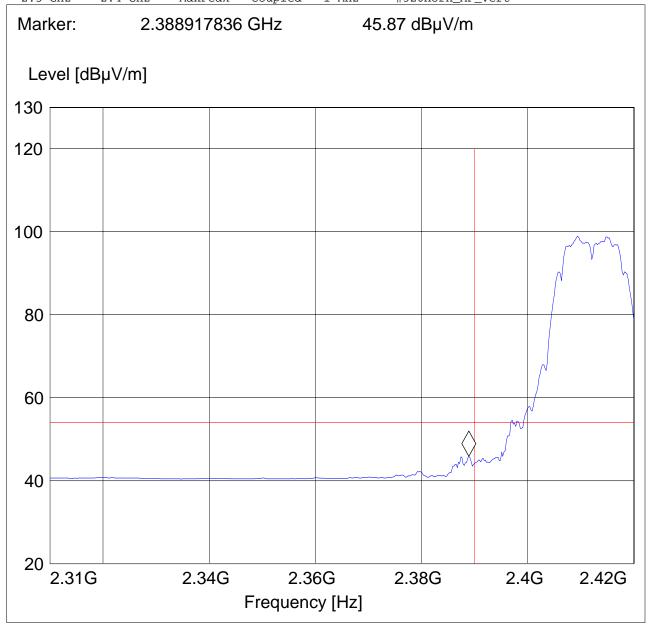
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 LBE\_AVG"

Detector Meas. IF Transducer Start Stop Time Bandw.

Frequency Frequency MaxPeak 1 MHz #326horn\_AF\_vert 2.3 GHz 2.4 GHz Coupled



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### 802.11b (2412MHz) PEAK Chain B

Dell Siberia Customer: Broadcom

802.11b, ch 1, chain b Test Mode:

ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

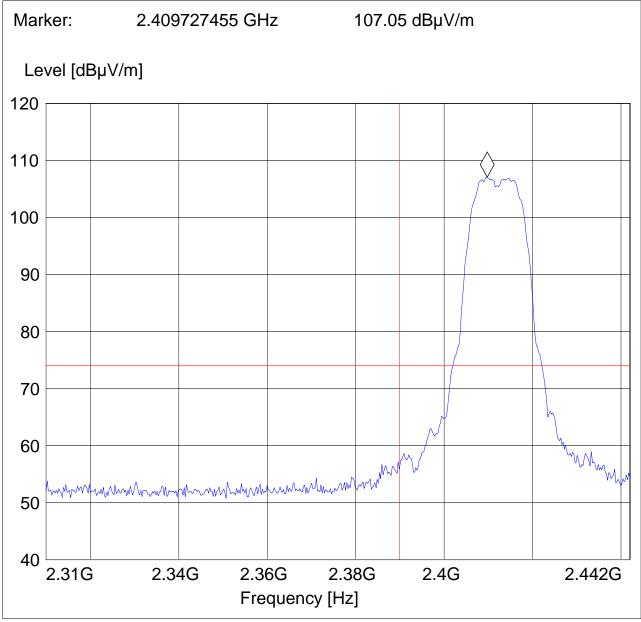
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 LBE PK"

IF Transducer Start Stop Detector Meas. Frequency Frequency Time Bandw.

MaxPeak #326horn\_AF\_vert 2.3 GHz 2.4 GHz Coupled 1 MHz



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### 802.11b (2412MHz) AVG Chain B

Dell Siberia Broadcom Customer:

802.11b, ch 1, chain b Test Mode:

ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

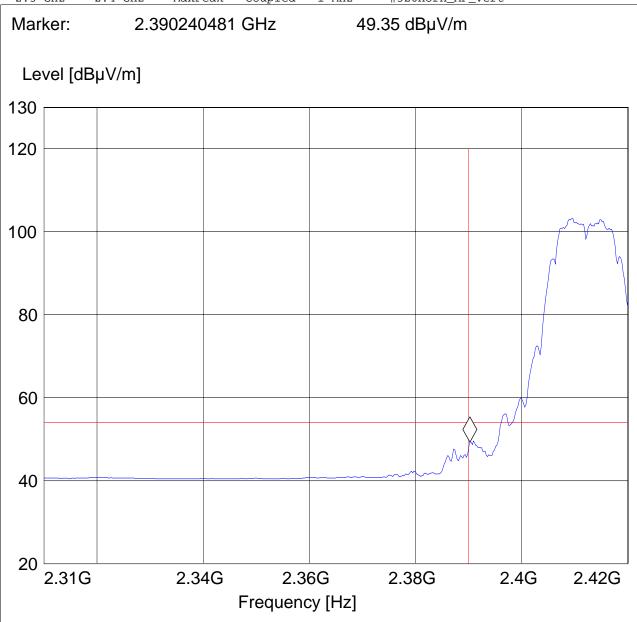
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 LBE\_AVG"

IF Transducer Start Stop Detector Meas. Time Bandw.

Frequency Frequency MaxPeak 1 MHz #326horn\_AF\_vert 2.3 GHz 2.4 GHz Coupled



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802.11g (2412MHz) PEAK Chain A

Dell Siberia Customer: Broadcom

802.11q, ch 1, chain a Test Mode:

ANT Orientation: H EUT Orientation: H Test Engineer:
Power Supply: Ed

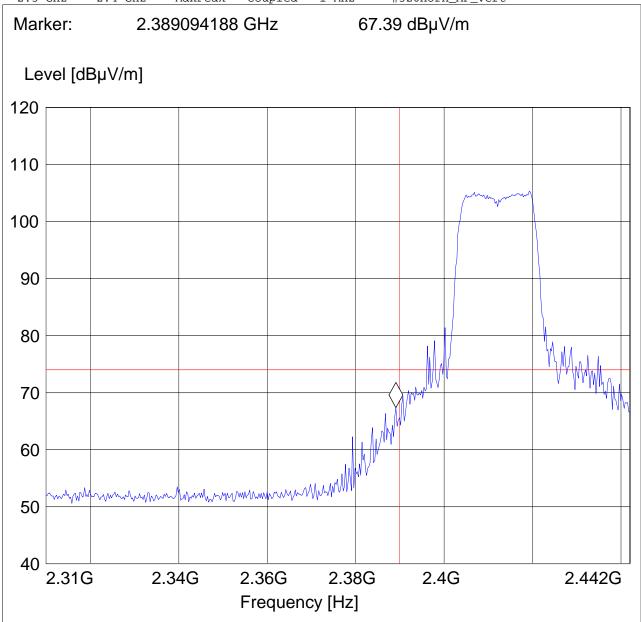
Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 LBE PK"

Start Stop IF Transducer Detector Meas. Frequency Frequency Bandw.

2.3 GHz MaxPeak #326horn\_AF\_vert 2.4 GHz Coupled 1 MHz



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802.11g (2412MHz) AVG Chain A

Dell Siberia Customer: Broadcom

802.11g, ch 1, chain a Test Mode:

ANT Orientation: H EUT Orientation: H

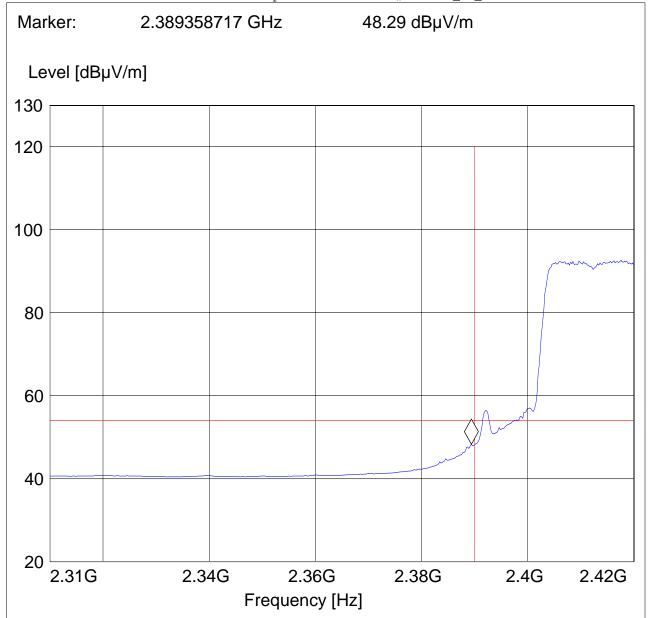
Test Engineer: Ed Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 LBE\_AVG"

Detector Meas. IF Transducer Start Stop Frequency Frequency Time Bandw.

MaxPeak 1 MHz #326horn\_AF\_vert 2.3 GHz 2.4 GHz Coupled



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### 802.11g (2412MHz) PEAK Chain B

Dell Siberia Customer: Broadcom

802.11q, ch 1, chain b Test Mode:

ANT Orientation: V EUT Orientation: H Test Engineer: Ed

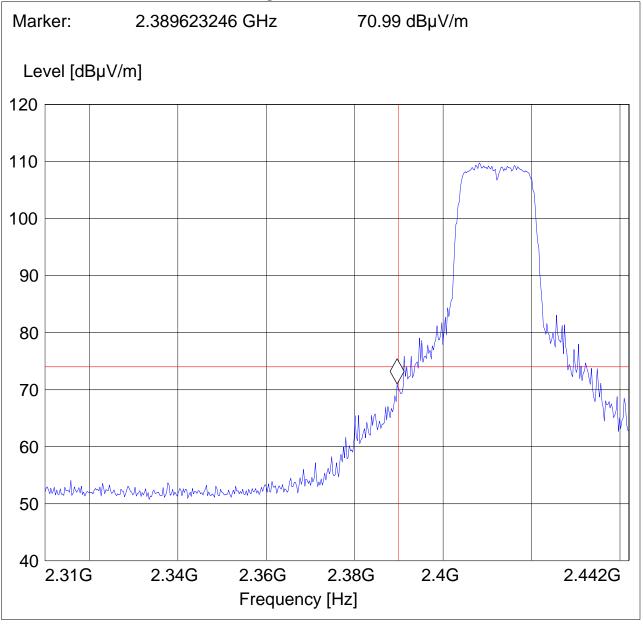
Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 LBE PK"

Start IF Transducer Stop Detector Meas. Frequency Frequency Bandw.

2.3 GHz MaxPeak #326horn\_AF\_vert 2.4 GHz Coupled 1 MHz



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### 802.11g (2412MHz) AVG Chain B

Dell Siberia Customer: Broadcom

802.11g, ch 1, chain b Test Mode:

ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

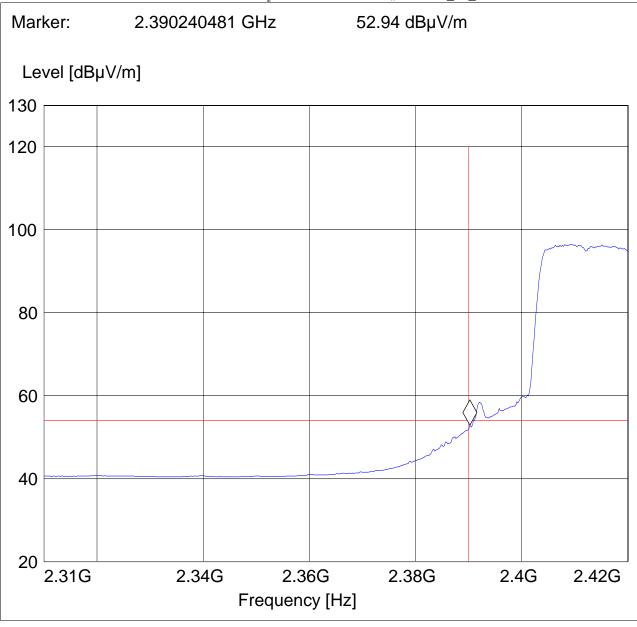
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 LBE\_AVG"

IF Transducer Start Stop Detector Meas. Frequency Frequency Time Bandw.

MaxPeak 1 MHz #326horn\_AF\_vert 2.3 GHz 2.4 GHz Coupled



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5.2.3 Results Upper Restricted Band 2483.5 MHz to 2500 MHz 802.11b (2462MHz) PEAK Chain A

Dell Siberia Customer: Broadcom

Test Mode: 802.11b, ch 11, chain a

ANT Orientation: H EUT Orientation: H Test Engineer: Ed

AC Adapter Power Supply:

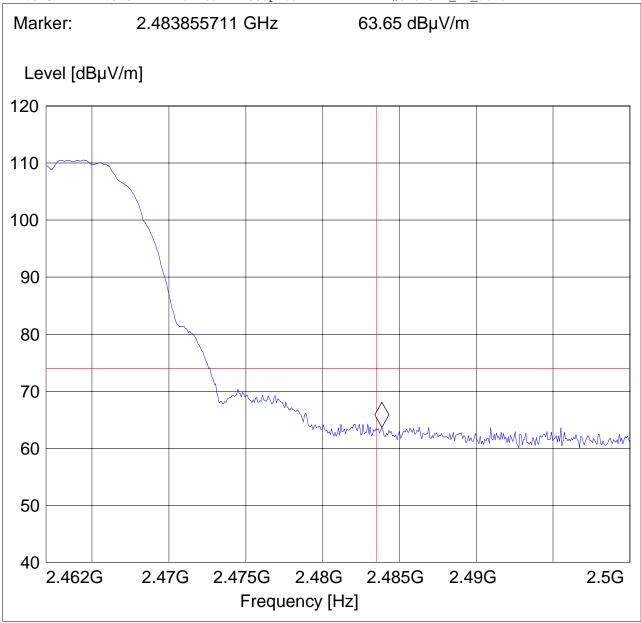
Comments:

SWEEP TABLE: "FCC15.247 HBE\_PK"

Start Stop Detector Meas. IF Transducer

Frequency Frequency Time Bandw.

2.5 GHz #326horn\_AF\_vert 2.5 GHz MaxPeak Coupled 1 MHz



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### 802.11b (2462MHz) AVG Chain A

Dell Siberia Broadcom Customer:

802.11b, ch 11, chain a Test Mode:

ANT Orientation: H EUT Orientation: H Test Engineer: Ed Power Supply: AC

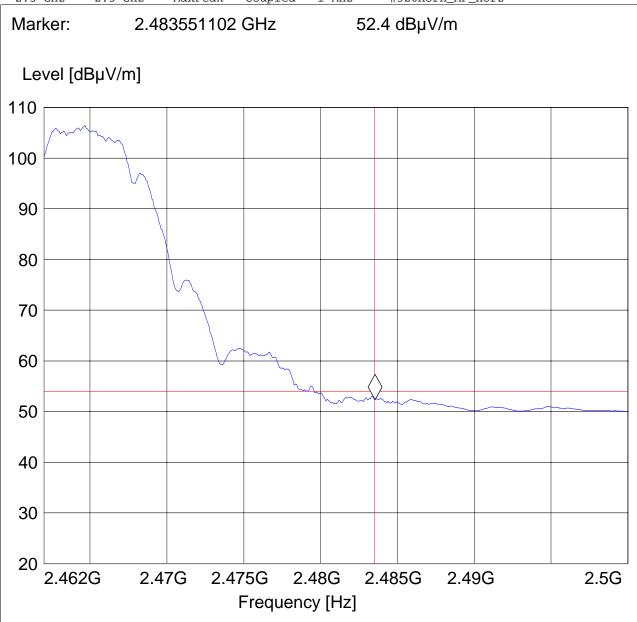
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 HBE\_AVG"

IF Transducer Start Stop Detector Meas. Frequency Frequency Time Bandw.

<u>Max</u>Peak 2.5 GHz 1 MHz #326horn\_AF\_horz 2.5 GHz Coupled



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### 802.11b (2462MHz) PEAK Chain B

Dell Siberia Customer: Broadcom

802.11b, ch 11, chain b Test Mode:

ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

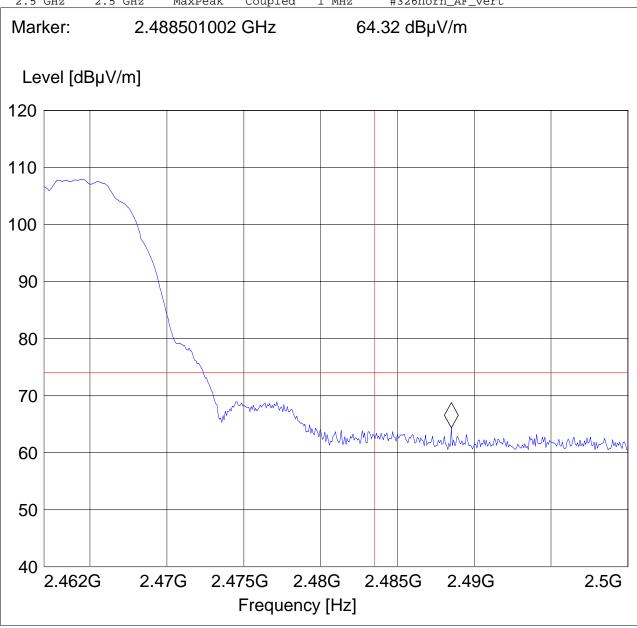
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 HBE PK"

IF Transducer Start Stop Detector Meas. Frequency Frequency Time Bandw.

MaxPeak 2.5 GHz #326horn\_AF\_vert 2.5 GHz Coupled 1 MHz



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802.11b (2462MHz) AVG Chain B

Dell Siberia Broadcom Customer:

802.11b, ch 11, chain b Test Mode:

ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

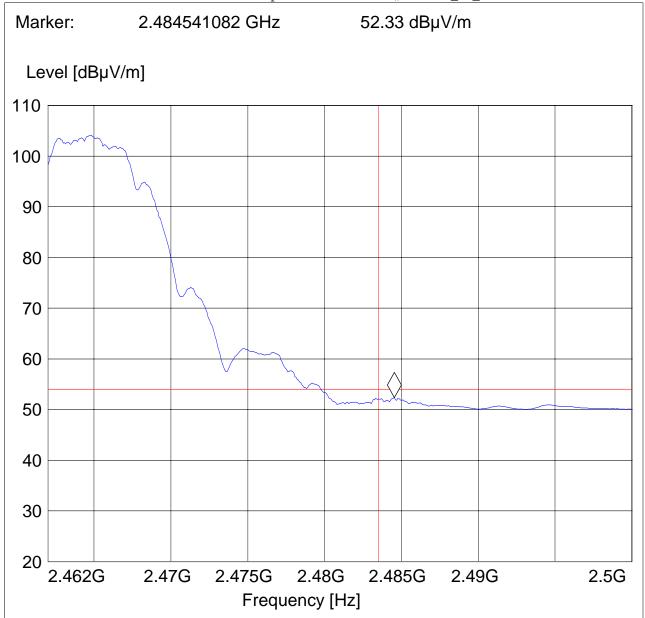
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 HBE\_AVG"

Start IF Transducer Stop Detector Meas. Frequency Frequency Time Bandw.

2.5 GHz MaxPeak #326horn\_AF\_horz 2.5 GHz Coupled 1 MHz



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### 802.11g (2462MHz) PEAK Chain A

Dell Siberia Broadcom Customer:

802.11q, ch 11, chain a Test Mode:

ANT Orientation: H EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 HBE PK"

Detector Meas. IF Transducer Start Stop Frequency Frequency Bandw.

MaxPeak 2.5 GHz #326horn\_AF\_vert 2.5 GHz Coupled 1 MHz Marker: 2.483703407 GHz  $71.2 \text{ dB}\mu\text{V/m}$ Level [dBµV/m] 120 110 100 90 80 70 60 50 40 2.462G 2.47G 2.475G 2.48G 2.485G 2.49G 2.5G Frequency [Hz]

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### 802.11g (2462MHz) AVG Chain A

Dell Siberia Broadcom Customer:

802.11q, ch 11, chain a Test Mode:

ANT Orientation: H EUT Orientation: H Test Engineer: Ed Power Supply: AC

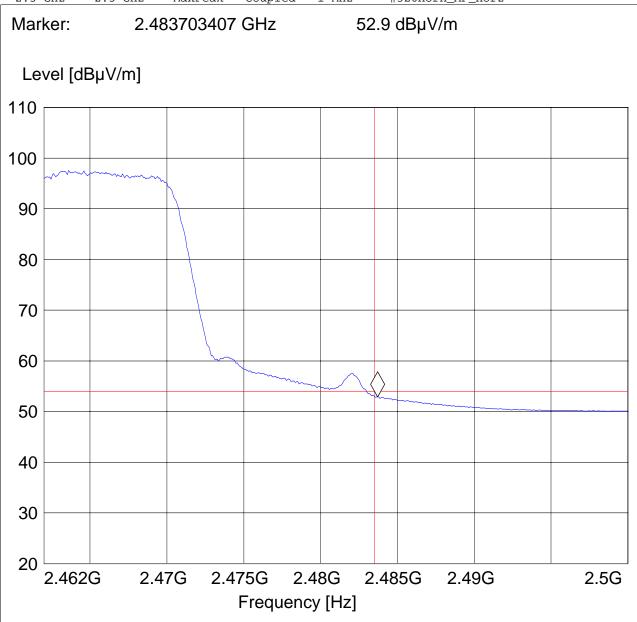
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 HBE\_AVG"

Stop Detector Meas. IF Transducer Start Frequency Frequency Time Bandw.

2.5 GHz MaxPeak Coupled 1 MHz #326horn\_AF\_horz 2.5 GHz



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802.11g (2462MHz) PEAK Chain B

Dell Siberia Broadcom Customer:

Test Mode: 802.11q, ch 11, chain b

ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

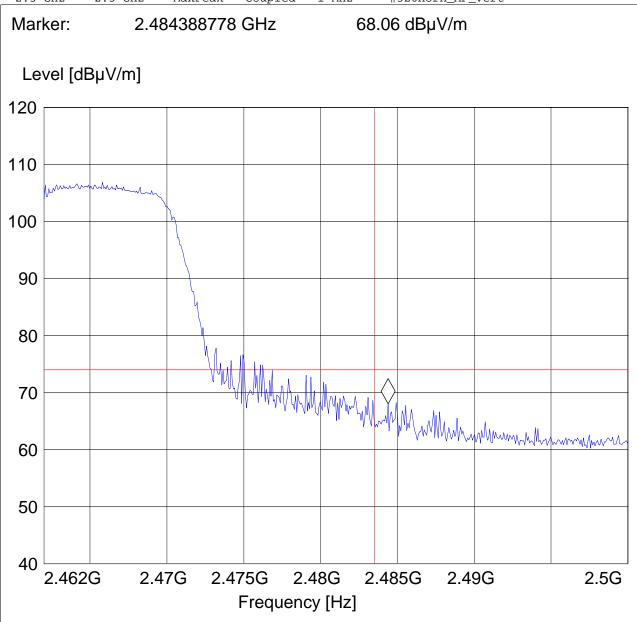
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 HBE PK"

Detector Meas. IF Transducer Start Stop Frequency Frequency Time Bandw.

2.5 GHz MaxPeak #326horn\_AF\_vert 2.5 GHz Coupled 1 MHz



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### 802.11g (2462MHz) AVG Chain B

Dell Siberia Broadcom Customer:

Test Mode: 802.11q, ch 11, chain b

ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

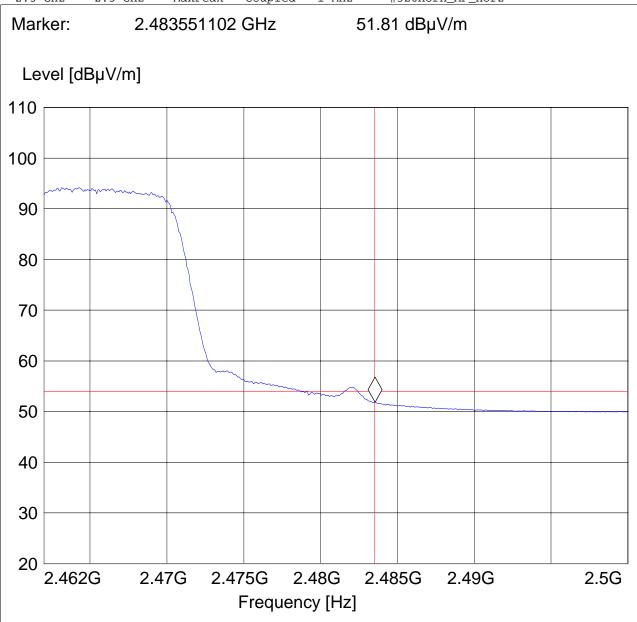
AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247 HBE\_AVG"

Detector Meas. Stop IF Transducer Start Frequency Frequency Time Bandw.

2.5 GHz MaxPeak Coupled 1 MHz #326horn\_AF\_horz 2.5 GHz



:



### 5.3 TRANSMITTER SPURIOUS EMISSIONS RADIATED § 15.247/15.205/15.209

### **5.3.1 LIMITS**

(a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

| MHz                 | MHz MHz MHz           |                 | GHz              |  |
|---------------------|-----------------------|-----------------|------------------|--|
| 0.090 - 0.110       | 16.42 - 16.423        | 399.9 - 410     | 4.5 - 5.15       |  |
| 10.495 - 0.505      | 16.69475 - 16.69525   | 608 - 614       | 5.35 - 5.46      |  |
| 2.1735 - 2.1905     | 16.80425 - 16.80475   | 960 - 1240      | 7.25 - 7.75      |  |
| 4.125 - 4.128       | 25.5 - 25.67          | 1300 - 1427     | 8.025 - 8.5      |  |
| 4.17725 - 4.17775   | 37.5 - 38.25          | 1435 - 1626.5   | 9.0 - 9.2        |  |
| 4.20725 - 4.20775   | 73 - 74.6             | 1645.5 - 1646.5 | 9.3 - 9.5        |  |
| 6.215 - 6.218       | 74.8 - 75.2           | 1660 - 1710     | 10.6 - 12.7      |  |
| 6.26775 - 6.26825   | 108 - 121.94          | 1718.8 - 1722.2 | 13.25 - 13.4     |  |
| 6.31175 - 6.31225   | 123 - 138             | 2200 - 2300     | 14.47 - 14.5     |  |
| 8.291 - 8.294       | 149.9 - 150.05        | 2310 - 2390     | 15.35 - 16.2     |  |
| 8.362 - 8.366       | 156.52475 - 156.52525 | 2483.5 - 2500   | 17.7 - 21.4      |  |
| 8.37625 - 8.38675   | 156.7 - 156.9         | 2690 - 2900     | 22.01 - 23.12    |  |
| 8.41425 - 8.41475   | 162.0125 - 167.17     | 3260 - 3267     | 23.6 - 24.0      |  |
| 12.29 - 12.293      | 167.72 - 173.2        | 3332 - 3339     | 31.2 - 31.8      |  |
| 12.51975 - 12.52025 | 240 - 285             | 3345.8 - 3358   | 36.43 - 36.5     |  |
| 12.57675 - 12.57725 | 322 - 335.4           | 3600 - 4400     | ( <sup>2</sup> ) |  |
| 13.36 - 13.41       |                       |                 |                  |  |

<sup>\*</sup>PEAK LIMIT= 74dBuV/m AVG. LIMIT= 54dBuV/m

### **Notes:**

- 1. The radiated emissions were done with different settings, using the relevant pre-amplifiers for the relevant frequency ranges. This is the reason that the graphs show different noise levels. In the range between 3 and 25 GHz very short cable connections to the antenna was used to minimize the noise level.
- 2. All measurements are done in peak mode using an average limit, unless specified with the plots.
- 3. Radiated emissions are maximized by rotating the EUT 360° at 0.5 meter height increments between 1 and 4 meters.
- 4. Measurements were performed with the EUT in X, Y and Z orientations with the measurement antenna in both horizontal and vertical polarity. The plots below show the results of the worst case orientation and polarity
- 5. After maximization it is determined that 802.11g mode has worse case emission and only this mode is reported here.

Results for the radiated measurements below 30MHz according § 15.33

| Frequency    | Measured values                       | Remarks                                   |  |  |
|--------------|---------------------------------------|---|--|--|
| 9KHz – 30MHz | No emissions found, caused by the EUT | This is valid for all the tested channels |  |  |

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### 5.3.2 RESULTS

### 30MHz - 1GHz Chain A, Antenna: vertical

Note: This plot is valid for low, mid, high channels (worst-case plot)

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11g, ch 6, chain a

ANT Orientation: V EUT Orientation: H Test Engineer: Ed Power Supply: AC

AC Adapter

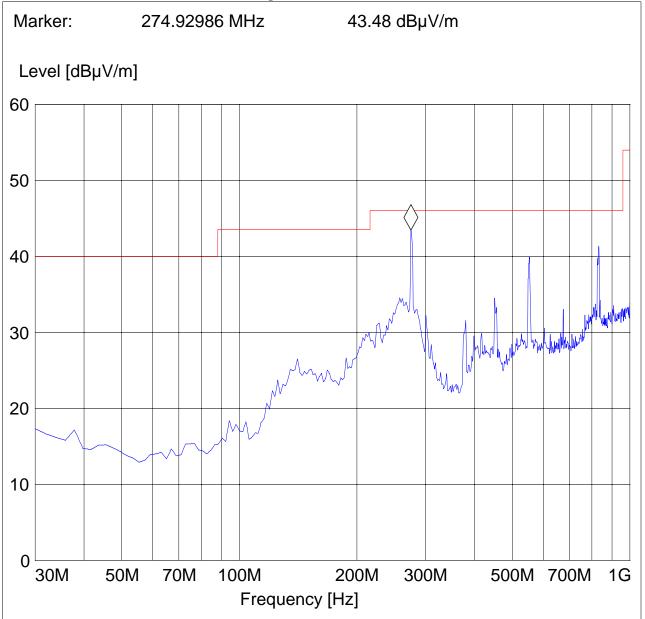
Comments: new module from Broadcom

#### SWEEP TABLE: "FCC15.247\_30M-1G\_Ver"

Start Stop Detector Meas. IF Transducer

Bandw. Frequency Frequency Time

30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186\_Vert



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30MHz - 1GHz Chain A, Antenna: horizontal

Note: This plot is valid for low, mid, high channels (worst-case plot)

Dell Siberia EUT: Customer: Broadcom

802.11b, ch 6, chain a Test Mode:

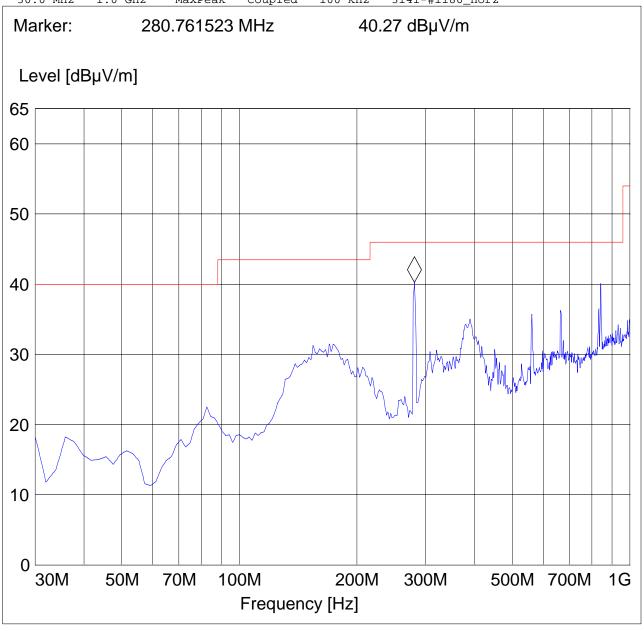
ANT Orientation: H EUT Orientation: H Test Engineer: Ed

Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247\_30M-1G\_Hor"

Detector Meas. Start Stop IF Transducer Frequency Frequency Time Bandw. 30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186\_Horz



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### 1-18GHz (2412MHz) Chain A

Note: The peak above the limit line is the carrier freq. Note: Peak Reading vs. Average limit

EUT / Description: Dell Siberia

Manufacturer: Broadcom

Test mode: 802.11b, ch 1, chain a

ANT Orientation: : H EUT Orientation:: Test Engineer: Ed

AC Adapter Voltage:

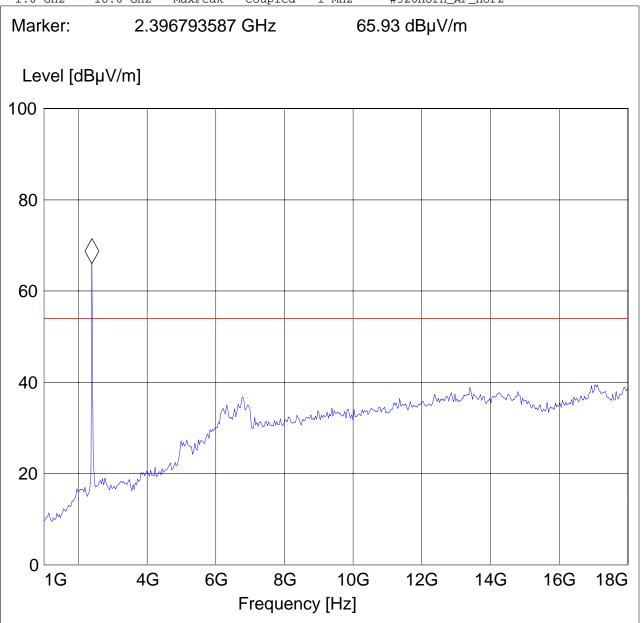
Comments:: marker is on uplink sig.

SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Meas. IF Transducer Detector

Frequency Frequency Bandw. Time

1.0 GHz 18.0 GHz MaxPeak 1 MHz #326horn\_AF\_horz Coupled



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### 1-18GHz (2437MHz) Chain A

Note: The peak above the limit line is the carrier freq. Note: Peak Reading vs. Average limit

EUT / Description: Dell Siberia

Manufacturer: Broadcom

Test mode: 802.11b, ch 6, chain a

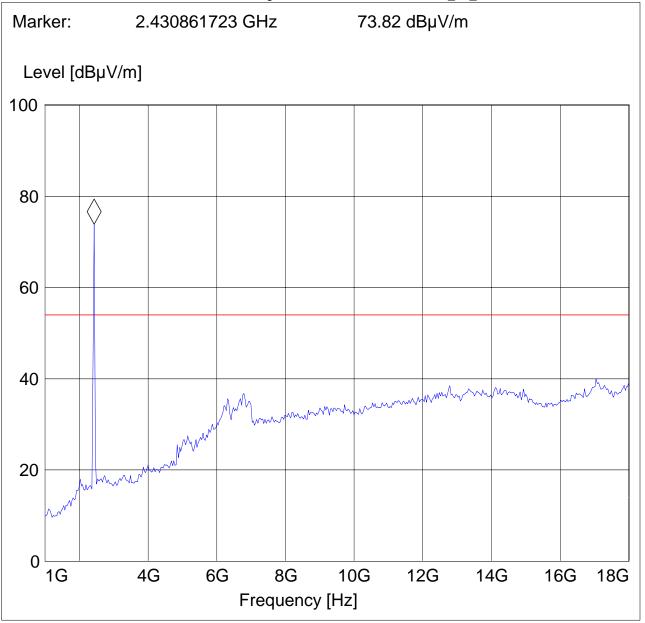
ANT Orientation: : H EUT Orientation:: Test Engineer: Ed

AC Adapter Voltage:

Comments:: marker is on uplink sig.

#### SWEEP TABLE: "FCC 15.407 1-18G"

Stop Start Detector Meas. ΙF Transducer Frequency Frequency Time Bandw. 1 MHz #326horn\_AF\_horz 1.0 GHz 18.0 GHz MaxPeak Coupled



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1-18GHz (2462MHz) Chain A

Note: The peak above the limit line is the carrier freq. Note: Peak Reading vs. Average limit

EUT / Description: Dell Siberia

Manufacturer: Broadcom

Test mode: 802.11b, ch 11, chain a

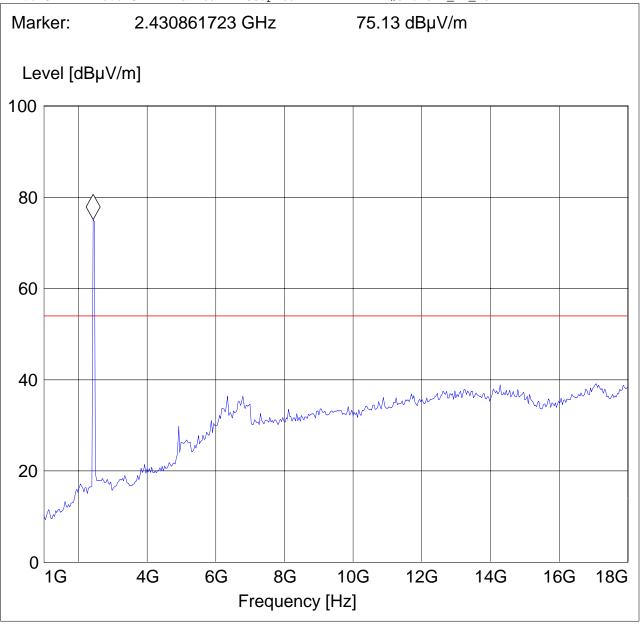
ANT Orientation: : H EUT Orientation:: Test Engineer: Ed

AC Adapter Voltage:

Comments:: marker is on uplink sig.

#### SWEEP TABLE: "FCC 15.407 1-18G"

Stop Start Detector Meas. ΙF Transducer Frequency Frequency Time Bandw. 1 MHz #326horn\_AF\_horz 1.0 GHz 18.0 GHz MaxPeak Coupled



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### 18-25GHz Chain A

Note: This plot is valid for low, mid, high channels (worst-case plot)Note: Peak Reading vs. Average limit

Dell Siberia EUT: Customer: Broadcom

802.11b, ch 11, chain a Test Mode:

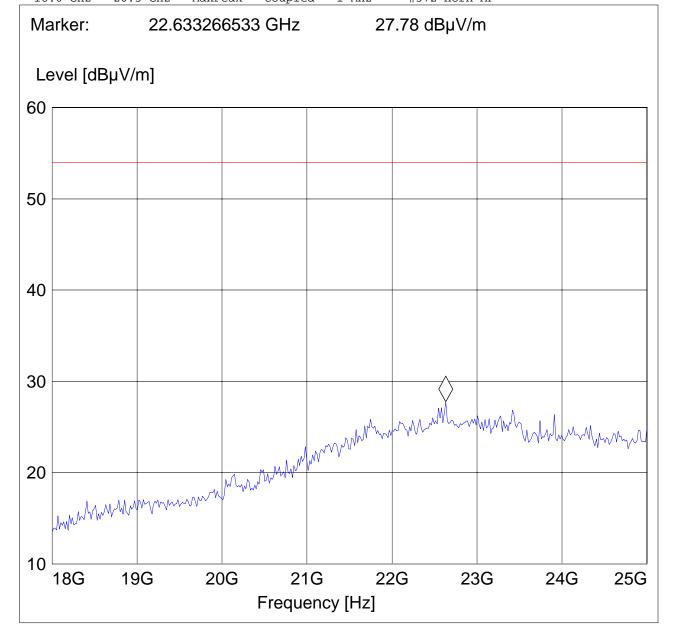
ANT Orientation: V EUT Orientation: H Test Engineer: Ed

Power Supply: AC Adapter

Comments:

#### SWEEP TABLE: "FCC15.247\_18-26.5G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw. 18.0 GHz 26.5 GHz MaxPeak Coupled 1 MHz #572 horn AF



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### 30MHz - 1GHz Chain B

**Antenna: vertical** 

Note: This plot is valid for low, mid, high channels (worst-case plot)

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11g, ch 11, chain b

ANT Orientation: V EUT Orientation: H

Test Engineer: Ed Power Supply: AC Adapter

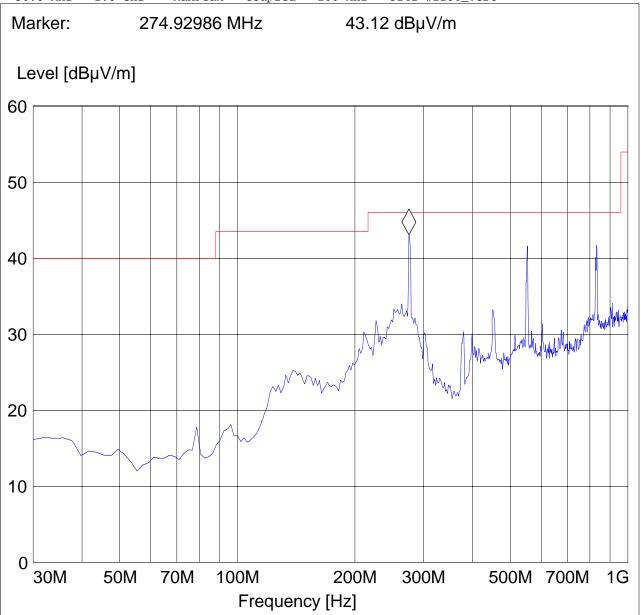
new module from Broadcom Comments:

#### SWEEP TABLE: "FCC15.247\_30M-1G\_Ver"

Start Stop Detector Meas. IF Transducer

Bandw. Frequency Frequency Time

30.0 MHz 1.0 GHz MaxPeak Coupled 100 kHz 3141-#1186\_Vert



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30MHz - 1GHz Chain B

## **Antenna: horizontal**

Note: This plot is valid for low, mid, high channels (worst-case plot)

Dell Siberia EUT: Customer: Broadcom

Test Mode: 802.11g, ch 11, chain b

ANT Orientation: H EUT Orientation: H Test Engineer: Ed

Power Supply: AC Adapter

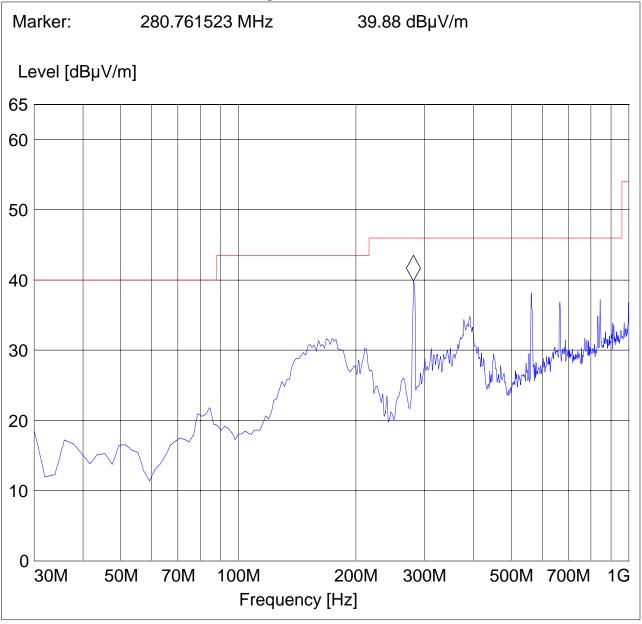
Comments:

#### SWEEP TABLE: "FCC15.247\_30M-1G\_Hor"

Detector Meas. Start Stop ΙF Transducer

Frequency Frequency Time Bandw.

30.0 MHz MaxPeak Coupled 100 kHz 3141-#1186\_Horz 1.0 GHz



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### 1-18GHz (2412MHz) Chain B

Note: The peak above the limit line is the carrier freq. Note: Peak Reading vs. Average limit

EUT / Description: Dell Siberia

Manufacturer: Broadcom

Test mode: 802.11g, ch 1, chain b

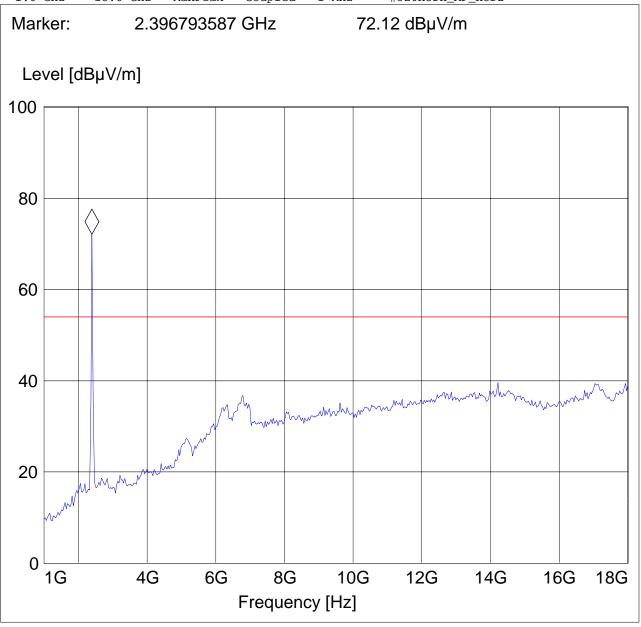
ANT Orientation: : V EUT Orientation:: Test Engineer: Ed

Voltage: AC Adapter

Comments::

#### SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. ΙF Transducer Frequency Frequency Time Bandw. MaxPeak 1 MHz #326horn\_AF\_horz 1.0 GHz 18.0 GHz Coupled



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### 1-18GHz (2437MHz) Chain B

Note: The peak above the limit line is the carrier freq. Note: Peak Reading vs. Average limit CETECOM Inc., 411 Dixon Landing Road; Milpitas, CA 95035

EUT / Description: Dell Siberia Manufacturer: Broadcom

802.11g, ch 6, chain b Test mode:

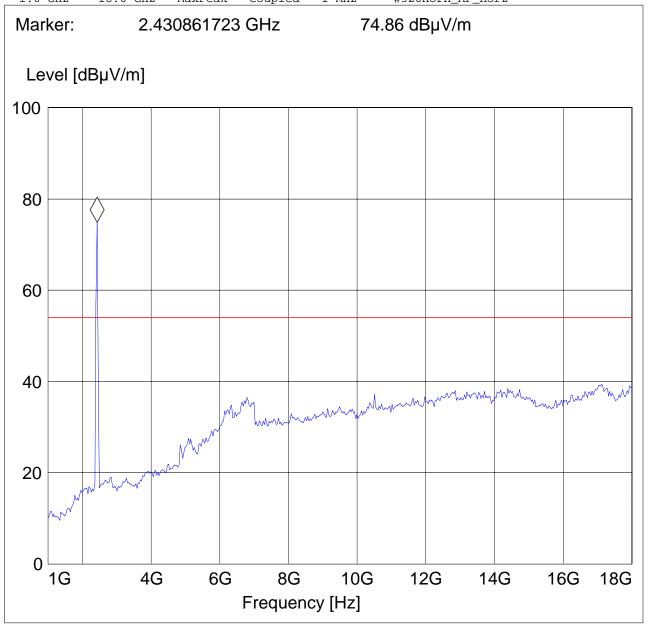
ANT Orientation: : V EUT Orientation:: H Test Engineer: Ed

AC Adapter Voltage:

Comments::

#### SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. IF Transducer Bandw. Frequency Frequency Time 1.0 GHz 18.0 GHz MaxPeak Coupled 1 MHz #326horn\_AF\_horz



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### 1-18GHz (2462MHz) Chain B

Note: The peak above the limit line is the carrier freq. Note: Peak Reading vs. Average limit

EUT / Description: Dell Siberia

Manufacturer: Broadcom

Test mode: 802.11g, ch 11, chain b

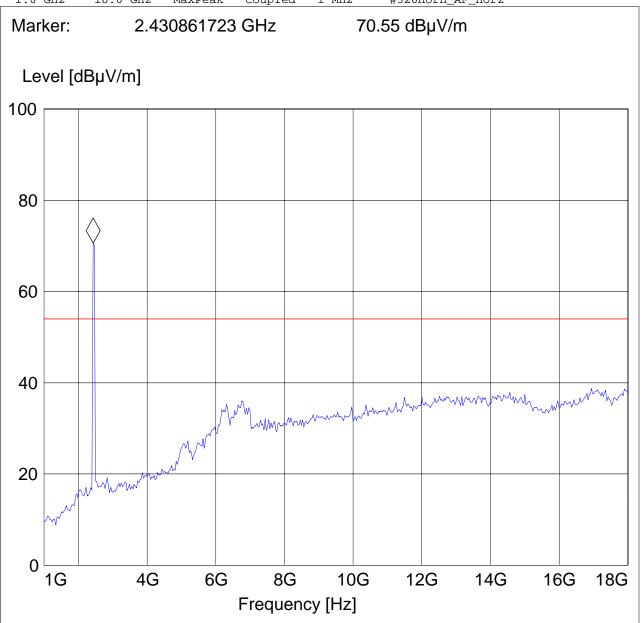
ANT Orientation: : V EUT Orientation:: Test Engineer: Ed

Voltage: AC Adapter

Comments::

#### SWEEP TABLE: "FCC 15.407 1-18G"

Start Stop Detector Meas. ΙF Transducer Frequency Frequency Time Bandw. 1 MHz #326horn\_AF\_horz 1.0 GHz 18.0 GHz MaxPeak Coupled



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### 18-25GHz Chain B

Note: This plot is valid for low, mid, high channels (worst-case plot)Note: Peak Reading vs.

Average limit

Dell Siberia EUT: Customer: Broadcom

802.11g, ch 1, chain b Test Mode:

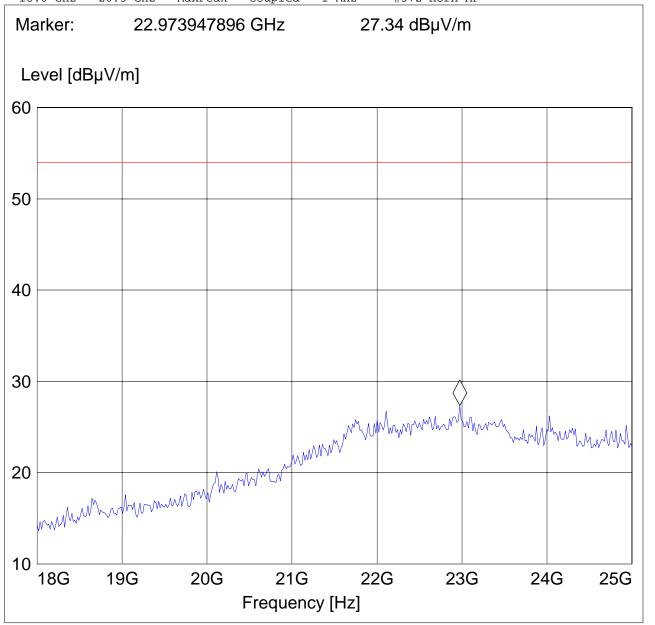
ANT Orientation: V EUT Orientation: H Test Engineer: Ed

Power Supply: AC Adapter

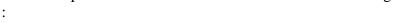
Comments:

#### SWEEP TABLE: "FCC15.247\_18-26.5G"

Start Stop Detector Meas. IF Transducer Frequency Frequency Time Bandw. 18.0 GHz 26.5 GHz MaxPeak Coupled 1 MHz #572 horn AF



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### 5.4 AC POWER LINE CONDUCTED EMISSIONS § 15.107/207

### **5.4.1** Limits

Technical specification: 15.107 / 15.207 (Revised as of August 20, 2002)

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequency ranges.

### Limit

| Frequency of Emission (MHz)                 | Conducted Limit (dBµV) |           |  |  |
|---|------------------------|-----------|--|--|
|   | Quasi-Peak             | Average   |  |  |
| 0.15 - 0.5                                  | 66 to 56*              | 56 to 46* |  |  |
| 0.5 - 5                                     | 56                     | 46        |  |  |
| 5 – 30                                      | 60                     | 50        |  |  |
| * Decreases with logarithm of the frequency |                        |           |  |  |

**ANALYZER SETTINGS: RBW = 10KHz** 

VBW = 10KHz

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5.4.2 Results, Line:

EUT: Dell Siberia Manufacturer: Broadcom Operating Condition: WLAN ANT Orientation:: CONDUCTED

EUT Orientation:: H
Test Engineer:: Peter Mu
Power Supply:: AC Adaptor

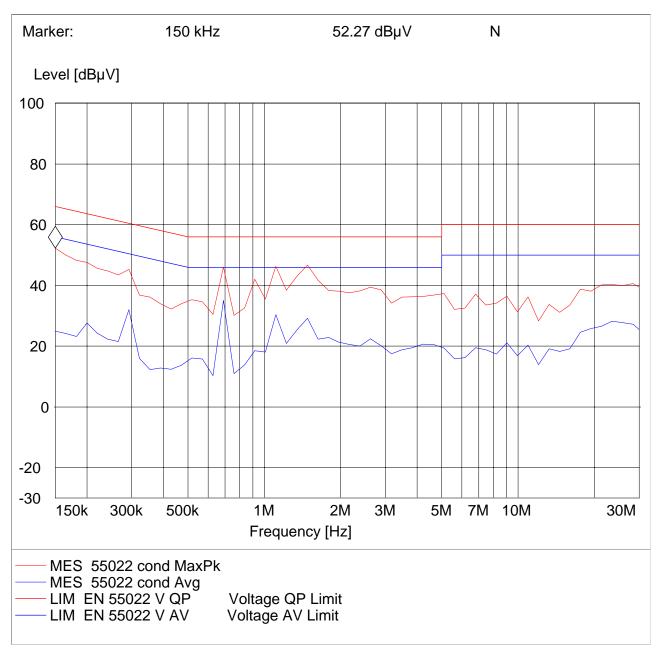
Comments: : LINE

SWEEP TABLE: "55022 cond"

Short Description: EN 55022 for 150KHz-30MHz

Unit: dΒμV

> Mode: Detector:



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**Neutral:** 

EUT: Dell Siberia Manufacturer: Broadcom Operating Condition: WLAN ANT Orientation:: CONDUCTED

EUT Orientation:: H
Test Engineer:: Peter Mu
Power Supply:: AC Adaptor

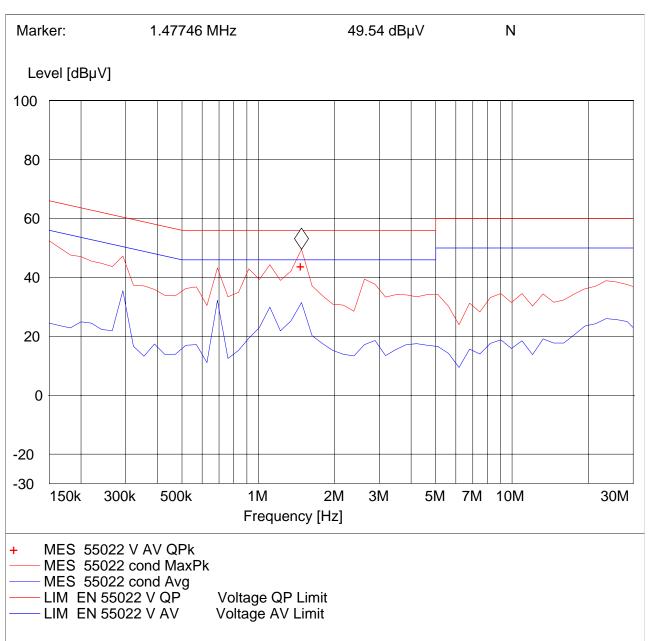
Comments: :

SWEEP TABLE: "55022 cond"

Short Description: EN 55022 for 150KHz-30MHz

Unit: dΒμV

> Detector: Mode:



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### 6 TEST EQUIPMENT AND ANCILLARIES USED FOR TESTS

| No | Instrument/Ancillary            | Type         | Manufacturer    | Serial No.   | Cal Due     | Interval |
|----|---------------------------------|--------------|-----------------|--------------|-------------|----------|
| 01 | Spectrum Analyzer               | ESIB 40      | Rohde & Schwarz | 100107       | May 2008    | 1 year   |
| 02 | Spectrum Analyzer               | FSEM 30      | Rohde & Schwarz | 100017       | August 2008 | 1 year   |
| 03 | Signal Generator                | SMY02        | Rohde & Schwarz | 836878/011   | May 2008    | 1 year   |
| 04 | Power-Meter                     | NRVD         | Rohde & Schwarz | 0857.8008.02 | May 2008    | 1 year   |
| 05 | Biconilog Antenna               | 3141         | EMCO            | 0005-1186    | June 2008   | 1 year   |
| 06 | Horn Antenna (1-<br>18GHz)      | SAS-200/571  | AH Systems      | 325          | June 2008   | 1 year   |
| 07 | Horn Antenna (18-<br>26.5GHz)   | 3160-09      | EMCO            | 1240         | June 2008   | 1 year   |
| 08 | Power Splitter                  | 11667B       | Hewlett Packard | 645348       | n/a         | n/a      |
| 09 | Climatic Chamber                | VT4004       | Voltsch         | G1115        | May 2008    | 1 year   |
| 10 | High Pass Filter                | 5HC2700      | Trilithic Inc.  | 9926013      | n/a         | n/a      |
| 11 | High Pass Filter                | 4HC1600      | Trilithic Inc.  | 9922307      | n/a         | n/a      |
| 12 | Pre-Amplifier                   | JS4-00102600 | Miteq           | 00616        | May 2008    | 1 year   |
| 13 | Power Sensor                    | URV5-Z2      | Rohde & Schwarz | DE30807      | May 2008    | 1 year   |
| 14 | Digital Radio Comm.<br>Tester   | CMD-55       | Rohde & Schwarz | 847958/008   | May 2008    | 1 year   |
| 15 | Universal Radio Comm.<br>Tester | CMU 200      | Rohde & Schwarz | 832221/06    | May 2008    | 1 year   |
| 16 | LISN                            | ESH3-Z5      | Rohde & Schwarz | 836679/003   | May 2008    | 1 year   |
| 17 | Loop Antenna                    | 6512         | EMCO            | 00049838     | July 2008   | 2 years  |

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#### **BLOCK DIAGRAMS** 7

## **Radiated Testing**

### **ANECHOIC CHAMBER**

