

## **EMISSIONS TEST REPORT FOR A LOW POWER TRANSMITTER**

### **I. GENERAL INFORMATION**

Requirement: FCC  
Test Requirements: FCC Part 15

Applicant: Silver Spring Networks  
575 Broadway Street  
Redwood City, CA 94063

**FCC ID:** OWS-NIC507  
**Model No.:** 174-000084

### **II. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)**

The Silver Spring Networks (SSN) model 174-000084 is a radio module for electric power meter communications use. The board incorporates a 900 MHz frequency hopping i210 Mesh radio and a 2.4GHz 802.15.4 Zigbee Home Area Network (HAN) radio.

### **III. TEST DATES AND TEST LOCATION**

Testing was performed on various dates between 22 August – 27 September 2008. Radiated, 2.4 GHz antenna conducted power, 2.4 GHz antenna conducted spurious, and AC line conducted emissions tests were performed at:

Compliance Certification Services  
47173 Benicia Street  
Fremont, CA 94538

All other antenna port conducted tests were performed at Silver Spring Networks.



T.N. Cokenias  
EMC Consultant/Agent for Silver Spring Networks

27 September 2008

### 15.203 Antenna connector requirement

The EUT uses a custom permanently attached integral antenna, a special sheet metal antenna manufactured by Silver Spring Networks for electric meters

| Antenna description                 | Mfr. | Model No. | Gain                                     |
|-------------------------------------|------|-----------|--|
| Built-in sheet metal electric meter | SSN  | n/a       | 2.4 dBi at 915 MHz<br>1.5 dBi at 2.4 GHz |

### TEST PROCEDURES

All tests were performed in accordance with the applicable procedures called out in the following documents, unless otherwise noted:

FCC 47CFR15

RSS-210 Issue 7: Low power license exempt radio frequency devices (July 2007)

RSS-212: Test Facilities and Test Methods for Radio Equipment

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.

For each radio, tests were performed at three frequencies:

2.4 GHz HAN Radio

Channel 11 (LOW) – 2405.8 MHz

Channel 18 (MID) – 2440.8 MHz

Channel 26 (HIGH) – 2480.9 MHz

900 MHz FHSS

Channel 0 (LOW) – 902.3 MHz

Channel 42 (MID) -914.9 MHz

Channel 82 (HIFH) – 926.9 MHz

### Test Equipment

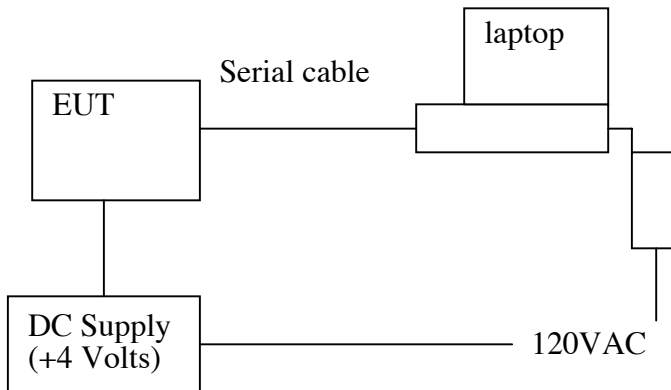
#### Compliance Certification Services:

| Equipment   | Mfr            | Model           | Asset No.  | Cal Due  |
|---|----------------|-----------------|------------|----------|
| Spectrum analyzer<br>(radiated emissions<br>2.4GHz Pout, spurs) | Agilent        | E4446A          | C01159     | 10/27/08 |
| EMI Receiver  | HP             | 8542E           | C00967     | 09/10/09 |
| Bilog antenna   | Sunol Sciences | JBI             | C01016     | 09/28/08 |
| Pre-amplifier   | Agilent        | HP8447D         | C00885     | 03/31/09 |
| Horn antenna  | EMCO           | 3115            | C00872     | 03/31/09 |
| Pre-amplifier   | Agilent        | HP 8449B        | C00749     | 09/27/08 |
| EMI Receiver  | R & S          | ESHS-20         | 827129/006 | 01/27/09 |
| LISN  | FCC            | LISN50/250-25-2 | 2023       | 09/27/08 |

#### Silver Spring Networks:

| Equipment         | Mfr     | Model  | Asset No. | Cal Date |
|-------------------|---------|--------|-----------|----------|
| Spectrum analyzer | Agilent | E44053 | 1077004   | 06/29/08 |

### Test Set-up Diagram



### Support Equipment

| Equipment       | Mfr      | Model      | Asset No.              |
|-----------------|----------|------------|------------------------|
| DC Power Supply | Agilent  | E3610A     | 2844                   |
| Laptop PC       | Dell     | PP01L      | TW-0791UH1280-OC9-6558 |
| AC/DC adapter   | CUI Inc. | DSA-60W-20 | 2607HB                 |

# 2.4 GHz HAN Radio Emissions Test Results

## TEST RESULTS

### Radiated Test Set-up, 30-26 GHz

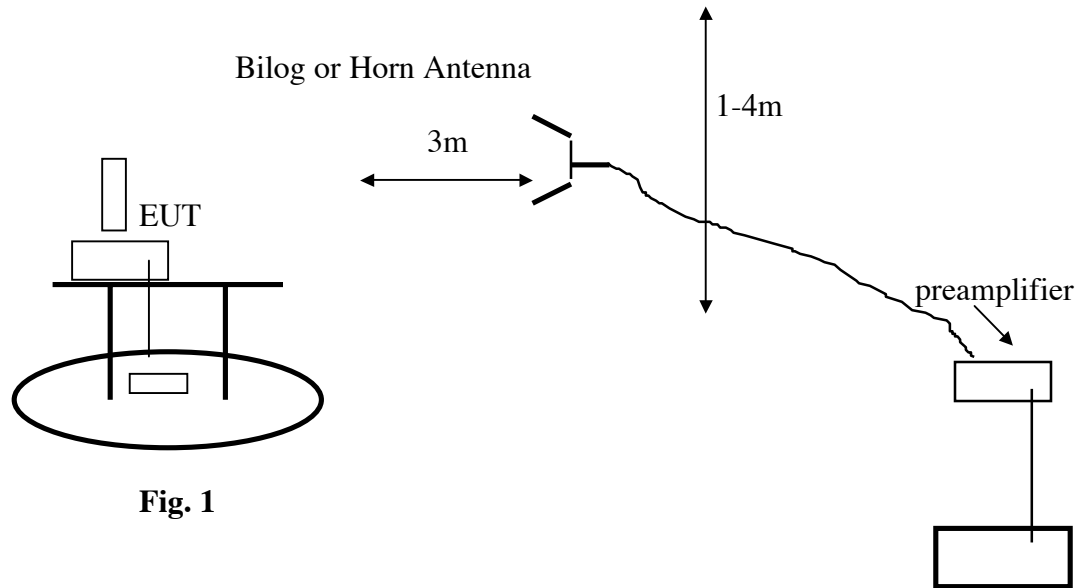


Fig. 1

### Test Procedures

Radiated emissions generated by the transmitter portion of the EUT were measured.

1. The EUT was placed on a wooden table resting on a turntable on the test site. The search antenna was placed 3m from the EUT. The EUT antenna was mounted in the with the EUT TX antenna pointed directly to the search antenna.
2. The turntable was slowly rotated to locate the direction of maximum emission at each emission falling in the restricted bands of 15.205.
3. Emissions were investigated to the 10<sup>th</sup> harmonic of the fundamental.
4. Once maximum direction was determined, the search antenna was raised and lowered in both vertical and horizontal polarizations. The maximum readings so obtained are recorded in the data listed below.

**Test Results:** Worst-case results are presented. Refer to data sheets below. Restricted band emissions meet 54 dBuV/m. Other undesired emissions from the transmitter meet the -20 dBc requirement in 15.247(d).

**15.205 Restricted Frequency Bands**

| <b>MHz</b>          | <b>MHz</b>          | <b>MHz</b>      | <b>GHz</b>    |
|---------------------|---------------------|-----------------|---------------|
| 0.090 - 0.110       | 16.42 - 16.423      | 399.9 - 410     | 4.5 - 5.15    |
| 0.495 - 0.505 (1)   | 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 -         | 2483.5 - 2500   | 17.7 - 21.4   |
| 8.37625 - 8.38675   | 156.52525           | 2655 - 2900     | 22.01 - 23.12 |
| 8.41425 - 8.41475   | 156.7 - 156.9       | 3260 - 3267     | 23.6 - 24.0   |
| 12.29 - 12.293      | 162.0125 - 167.17   | 3332 - 3339     | 31.2 - 31.8   |
| 12.51975 - 12.52025 | 167.72 - 173.2      | 3345.8 - 3358   | 36.43 - 36.5  |
| 12.57675 - 12.57725 | 240 - 285           | 3600 - 4400     |               |
| 13.36 - 13.41       | 322 - 335.4         |                 |               |

**15.209 General Field Strength Limits**

| <b>Frequency<br/>(MHz)</b> | <b>Field Strength<br/>(microvolts/meter)</b> | <b>Measurement Distance<br/>(meters)</b> |
|----------------------------|--|--|
| 0.009 - 0.490              | 2400/F(kHz)                                  | 300                                      |
| 0.490 - 1.705              | 24000/F(kHz)                                 | 30                                       |
| 1.705 - 30.0               | 30   | 30                                       |
| 30 - 88                    | 100 **                                       | 3  |
| 88 - 216                   | 150 **                                       | 3  |
| 216 - 960                  | 200 **                                       | 3  |
| Above 960                  | 500  | 3  |

### 2.4 GHz HAN Radiated Spurious

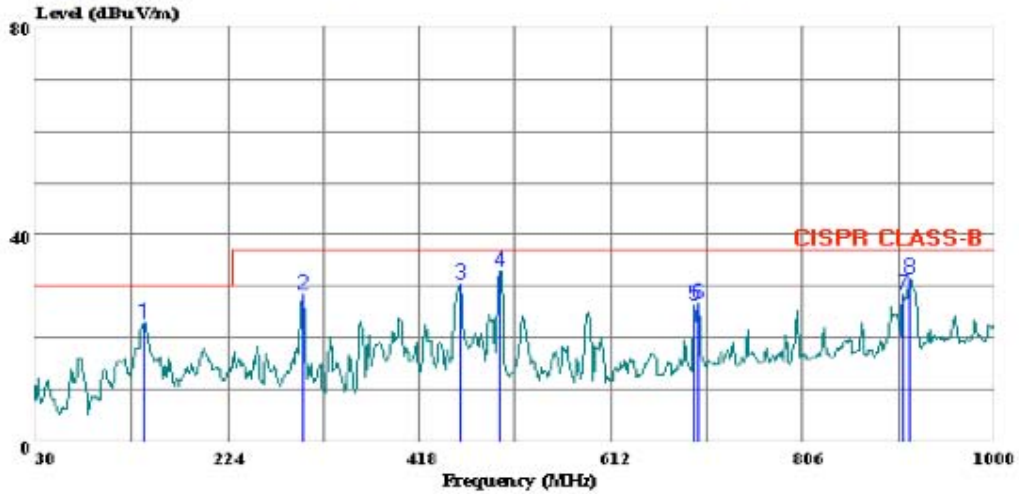
| High Frequency Measurement  |                       |                       |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
|---|-----------------------|-----------------------|--------------------------------|-----------------------|------------------------------|--------|-----------|------------------------|-------------|------------|---------------|----------------|-----------|---------------|-------------|--|-----------------------|-----|-------------|---------|------------------------------|------|---------------------|--------|------------------------------|--------|---------------------------|------|------------------|-----|------------------------------|---------|--------------------------|----|----------------|------|--------------------------------|--------|-----------------------|----|------------|-----|------------------|--|--|
| Compliance Certification Services, Morgan Hill Open Field Site  |                       |                       |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Company:  |                       | Silver Spring Network |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Project #:  |                       | 08U11890              |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Date:   |                       | 8/15/08               |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Test Engineer:  |                       | Thanh Nguyen          |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Configuration:  |                       | EUT at Y position     |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Mode:   |                       | Transmit 2.4GHz Band  |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Test Equipment:   |                       |                       |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Horn 1-18GHz  |                       |                       |                                | Pre-amplifier 1-26GHz |                              |        |           | Pre-amplifier 26-40GHz |             |            |               | Horn > 18GHz   |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| T60; S/N: 2238 @3m  |                       |                       |                                | T144 Miteq 3008A00931 |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Hi Frequency Cables   |                       |                       |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 2 foot cable  |                       |                       |                                | 3 foot cable          |                              |        |           | 12 foot cable          |             |            |               | HPF            |           | Reject Filter |             | <b>Peak Measurements</b><br>RBW=VBW=1MHz<br><b>Average Measurements</b><br>RBW=1MHz ; VBW=10Hz |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Gordon 187207002  |                       |                       |                                |                       |                              |        |           | Gordon 203134001       |             |            |               | HPF_4.0GHz     |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| f GHz   | Dist (m)              | Read Pk dBuV          | Read Avg. dBuV                 | AF dB/m               | CL dB                        | Amp dB | D Corr dB | Filtr dB               | Peak dBuV/m | Avg dBuV/m | Pk Lim dBuV/m | Avg Lim dBuV/m | Pk Mar dB | Avg Mar dB    | Notes (V/H) |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Channel setting ATSI07=11   |                       |                       |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| CH 2405.8 MHz   |                       |                       | ATS112 =9                      |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 4.812   | 3.0                   | 45.55                 | 35.38                          | 33.0                  | 10.9                         | -36.5  | 0.0       | 0.6                    | 53.6        | 43.4       | 74            | 54             | -20.4     | -10.6         | V           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 12.026  | 3.0                   | 42.53                 | 29.04                          | 37.5                  | 16.1                         | -35.4  | 0.0       | 0.9                    | 61.6        | 48.1       | 74            | 54             | -12.4     | -5.9          | V           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 4.812   | 3.0                   | 45.6                  | 35.5                           | 33.0                  | 10.9                         | -36.5  | 0.0       | 0.6                    | 53.7        | 43.5       | 74            | 54             | -20.3     | -10.5         | H           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 12.027  | 3.0                   | 41.9                  | 29.0                           | 37.5                  | 16.1                         | -35.4  | 0.0       | 0.9                    | 61.0        | 48.1       | 74            | 54             | -13.0     | -5.9          | H           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Channel setting ATSI07=18   |                       |                       |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Channel 2440.8MHz   |                       |                       | ATS 112=9                      |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 4.882   | 3.0                   | 43.35                 | 32.69                          | 33.1                  | 10.9                         | -36.5  | 0.0       | 0.6                    | 51.5        | 40.8       | 74            | 54             | -22.5     | -13.2         | V           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 7.322   | 3.0                   | 42.79                 | 30.99                          | 35.5                  | 12.7                         | -36.2  | 0.0       | 0.6                    | 55.4        | 43.6       | 74            | 54             | -18.6     | -10.4         | V           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 12.204  | 3.0                   | 41.28                 | 28.63                          | 37.4                  | 16.2                         | -35.4  | 0.0       | 0.9                    | 60.4        | 47.8       | 74            | 54             | -13.6     | -6.2          | V           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 4.882   | 3.0                   | 43.26                 | 33.21                          | 33.1                  | 10.9                         | -36.5  | 0.0       | 0.6                    | 51.4        | 41.4       | 74            | 54             | -22.6     | -12.6         | H           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 12.204  | 3.0                   | 41.67                 | 29.67                          | 37.4                  | 16.2                         | -35.4  | 0.0       | 0.9                    | 60.8        | 48.8       | 74            | 54             | -13.2     | -5.2          | H           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Channel Setting ATSI07=26   |                       |                       |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Channel 2480.9MHz   |                       |                       | ATS112=9                       |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 4.962   | 3.0                   | 45.13                 | 34.13                          | 33.1                  | 11.0                         | -36.5  | 0.0       | 0.6                    | 53.4        | 42.4       | 74            | 54             | -20.6     | -11.6         | V           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 7.443   | 3.0                   | 41.86                 | 30.12                          | 35.6                  | 12.7                         | -36.2  | 0.0       | 0.6                    | 54.6        | 42.9       | 74            | 54             | -19.4     | -11.1         | V           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 12.405  | 3.0                   | 41.85                 | 29.12                          | 37.4                  | 16.3                         | -35.4  | 0.0       | 0.9                    | 61.1        | 48.3       | 74            | 54             | -12.9     | -5.7          | V           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 4.962   | 3.0                   | 45.92                 | 36.38                          | 33.1                  | 11.0                         | -36.5  | 0.0       | 0.6                    | 54.2        | 44.7       | 74            | 54             | -19.8     | -9.3          | H           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 7.443   | 3.0                   | 43.33                 | 32.81                          | 35.6                  | 12.7                         | -36.2  | 0.0       | 0.6                    | 56.1        | 45.6       | 74            | 54             | -17.9     | -8.4          | H           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| 12.405  | 3.0                   | 41.85                 | 29.12                          | 37.4                  | 16.3                         | -35.4  | 0.0       | 0.9                    | 61.1        | 48.3       | 74            | 54             | -12.9     | -5.7          | H           |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| <table border="0"> <tr> <td>f</td> <td>Measurement Frequency</td> <td>Amp</td> <td>Preamp Gain</td> <td>Avg Lim</td> <td>Average Field Strength Limit</td> </tr> <tr> <td>Dist</td> <td>Distance to Antenna</td> <td>D Corr</td> <td>Distance Correct to 3 meters</td> <td>Pk Lim</td> <td>Peak Field Strength Limit</td> </tr> <tr> <td>Read</td> <td>Analyzer Reading</td> <td>Avg</td> <td>Average Field Strength @ 3 m</td> <td>Avg Mar</td> <td>Margin vs. Average Limit</td> </tr> <tr> <td>AF</td> <td>Antenna Factor</td> <td>Peak</td> <td>Calculated Peak Field Strength</td> <td>Pk Mar</td> <td>Margin vs. Peak Limit</td> </tr> <tr> <td>CL</td> <td>Cable Loss</td> <td>HPF</td> <td>High Pass Filter</td> <td></td> <td></td> </tr> </table> |                       |                       |                                |                       |                              |        |           |                        |             |            |               |                |           |               |             | f  | Measurement Frequency | Amp | Preamp Gain | Avg Lim | Average Field Strength Limit | Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | Pk Lim | Peak Field Strength Limit | Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | Avg Mar | Margin vs. Average Limit | AF | Antenna Factor | Peak | Calculated Peak Field Strength | Pk Mar | Margin vs. Peak Limit | CL | Cable Loss | HPF | High Pass Filter |  |  |
| f   | Measurement Frequency | Amp                   | Preamp Gain                    | Avg Lim               | Average Field Strength Limit |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Dist  | Distance to Antenna   | D Corr                | Distance Correct to 3 meters   | Pk Lim                | Peak Field Strength Limit    |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| Read  | Analyzer Reading      | Avg                   | Average Field Strength @ 3 m   | Avg Mar               | Margin vs. Average Limit     |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| AF  | Antenna Factor        | Peak                  | Calculated Peak Field Strength | Pk Mar                | Margin vs. Peak Limit        |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |
| CL  | Cable Loss            | HPF                   | High Pass Filter               |                       |                              |        |           |                        |             |            |               |                |           |               |             |  |                       |     |             |         |                              |      |                     |        |                              |        |                           |      |                  |     |                              |         |                          |    |                |      |                                |        |                       |    |            |     |                  |  |  |

Radiated Emissions 30-1000 MHz



Compliance Certification Services  
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Data#: 18 File#: 08U11890.EMI Date: 08-22-2008 Time: 10:39:16



Trace: 17

Ref Trace:

Condition: CISPR CLASS-B HORIZONTAL  
 Test Operator:: William Zhuang  
 Project #: : 08U11890  
 Company: : Silver Spring  
 Configuration:: EUT with Laptop  
 Mode : : Tx, 802.15.4 2.4GHz, Ch. 1 Max Power  
 Target: : CISPR Class B

Page: 1

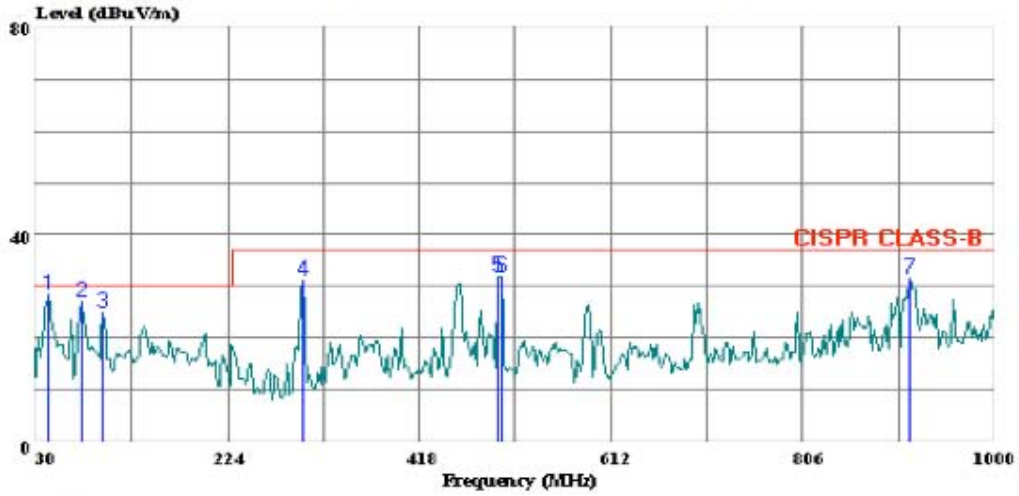
|      | Read    | Limit  | Over   |        |       |        |      |
|------|---------|--------|--------|--------|-------|--------|------|
| Freq | Level   | Factor | Level  | Line   | Limit | Remark |      |
| MHz  | dBuV    | dB     | dBuV/m | dBuV/m | dB    |        |      |
| 1    | 138.640 | 40.80  | -17.92 | 22.88  | 30.00 | -7.12  | Peak |
| 2    | 300.630 | 43.90  | -15.47 | 28.43  | 37.00 | -8.57  | Peak |
| 3    | 458.740 | 41.47  | -11.00 | 30.47  | 37.00 | -6.53  | Peak |
| 4    | 499.480 | 42.80  | -9.87  | 32.93  | 37.00 | -4.07  | Peak |
| 5    | 696.390 | 32.75  | -6.42  | 26.33  | 37.00 | -10.67 | Peak |
| 6    | 701.240 | 33.00  | -6.29  | 26.71  | 37.00 | -10.29 | Peak |
| 7    | 906.880 | 30.55  | -2.22  | 28.33  | 37.00 | -8.67  | Peak |
| 8    | 914.640 | 33.74  | -2.06  | 31.68  | 37.00 | -5.32  | Peak |





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Data#: 20 File#: 08U11890.EMI Date: 08-22-2008 Time: 10:46:05



Trace: 19

Ref Trace:

Condition: CISPR CLASS-B VERTICAL  
 Test Operator:: William Zhuang  
 Project #: : 08U11890  
 Company: : Silver Spring  
 Configuration: : EUT with Laptop  
 Mode : : Tx, 802.15.4 2.4GHz, Ch. 1 Max Power  
 Target: : CISPR Class B

Page: 1

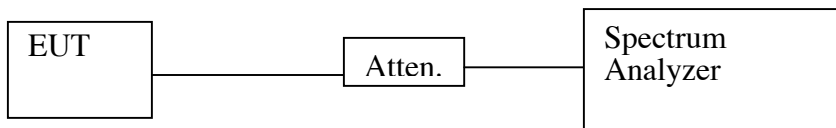
|      | Read    | Read   | Limit  | Over   |       |            |
|------|---------|--------|--------|--------|-------|------------|
| Freq | Level   | Factor | Level  | Line   | Limit | Remark     |
| MHz  | dBuV    | dB     | dBuV/m | dBuV/m | dB    |            |
| 1    | 43.580  | 49.03  | -20.69 | 28.34  | 30.00 | -1.66 Peak |
| 2    | 75.590  | 50.64  | -23.54 | 27.10  | 30.00 | -2.90 Peak |
| 3    | 96.930  | 46.65  | -21.85 | 24.80  | 30.00 | -5.20 Peak |
| 4    | 300.630 | 46.56  | -15.47 | 31.09  | 37.00 | -5.91 Peak |
| 5    | 497.540 | 41.95  | -9.94  | 32.01  | 37.00 | -4.99 Peak |
| 6    | 502.390 | 41.69  | -9.83  | 31.86  | 37.00 | -5.14 Peak |
| 7    | 914.640 | 33.72  | -2.06  | 31.66  | 37.00 | -5.34 Peak |

### 6dB Bandwidth for DTS

**Test Requirement: FCC: 15.247 (a)2**

**IC: RSS-210 Sec. 6.2.2(o)(iv)**

### Test Set-up



### Test Procedures

A modified EUT with a coaxial cable attached to the radio antenna port was configured on a test bench. The cable's SMA connector was connected to the spectrum analyzer. The EUT transmission was continuous at the LOW channel. While the transmitter broadcast a steady stream of digital data, the analyzer OCCUPIED BW function was activated to measure 6 dB BW and 99% BW.

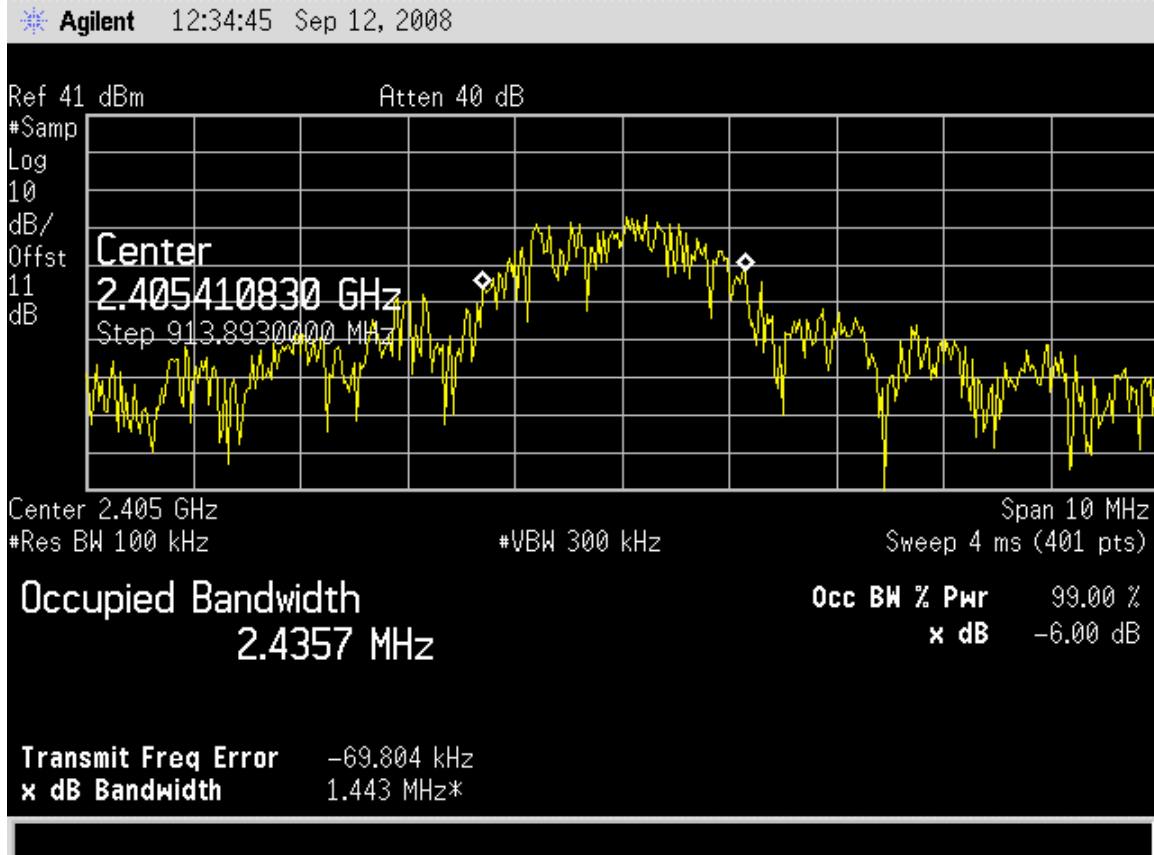
Test was repeated for MID and HIGH channels.

**Test Results.** No non-compliance noted. Refer to data sheets below.

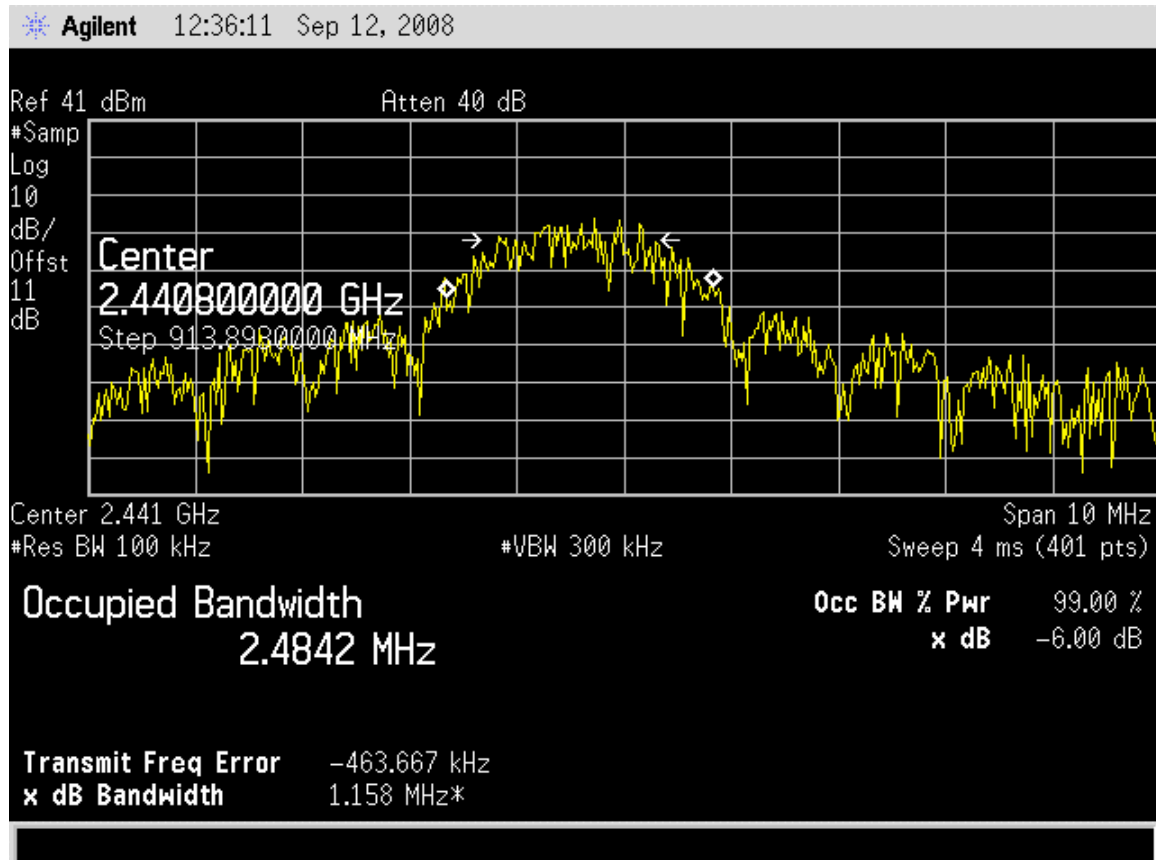
Minimum 6 dB BW: 1.158 MHz

Minimum Required: 500 kHz

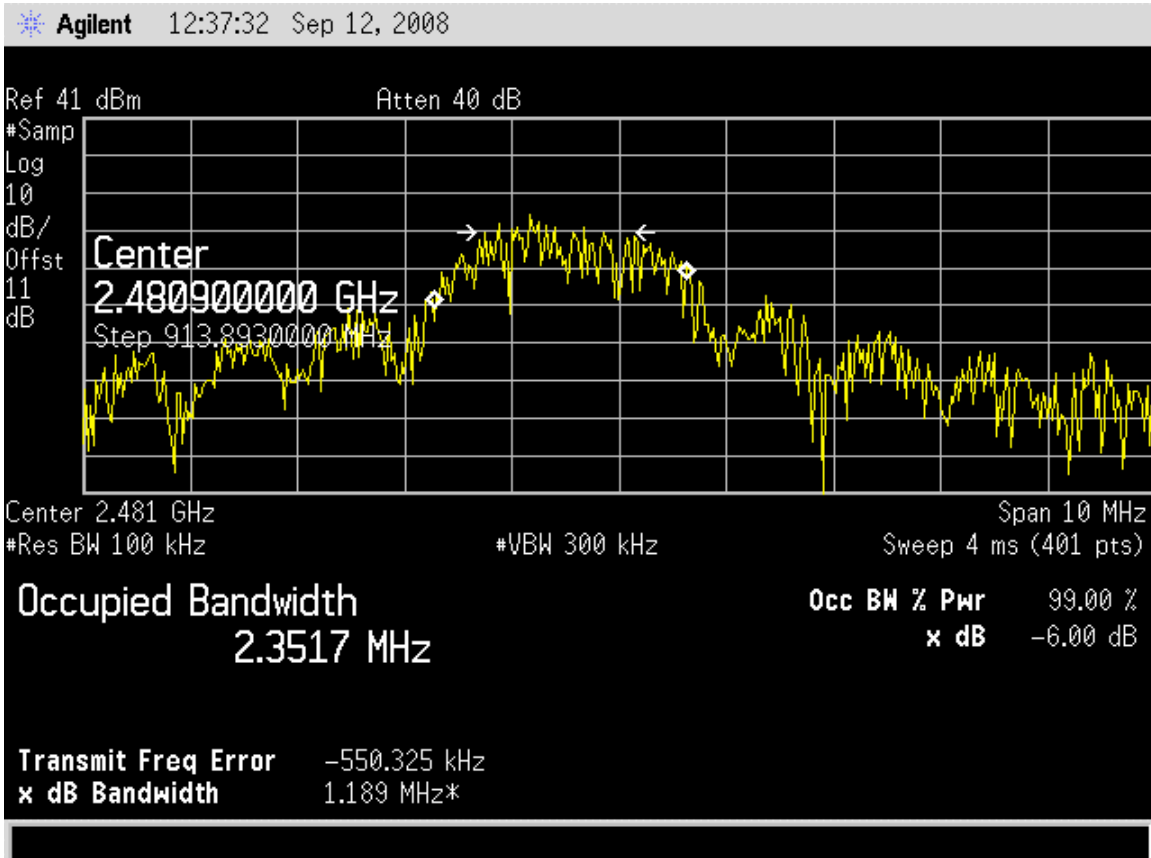
### 6dB Bandwidth LOW Channel



### 6 dB BW, MID Channel

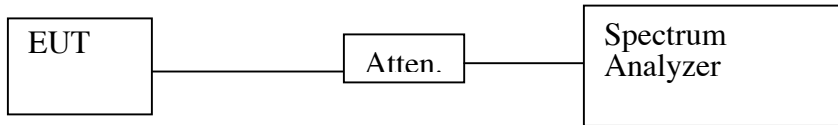


### 6 dB BW, HIGH Channel



## 99% Bandwidth

### Test Setup



### Limit

None: for reporting purposes only.

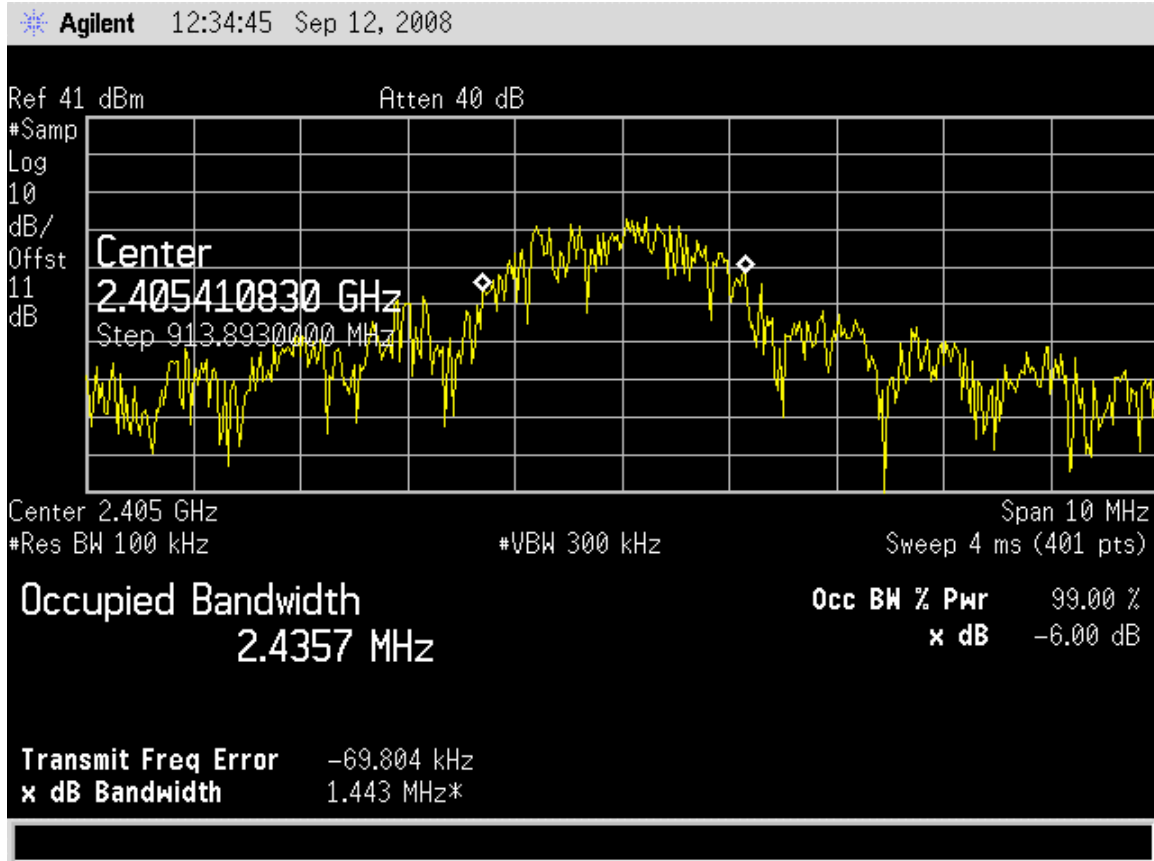
### Test Procedure

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal OCCUPIED BW function was utilized.

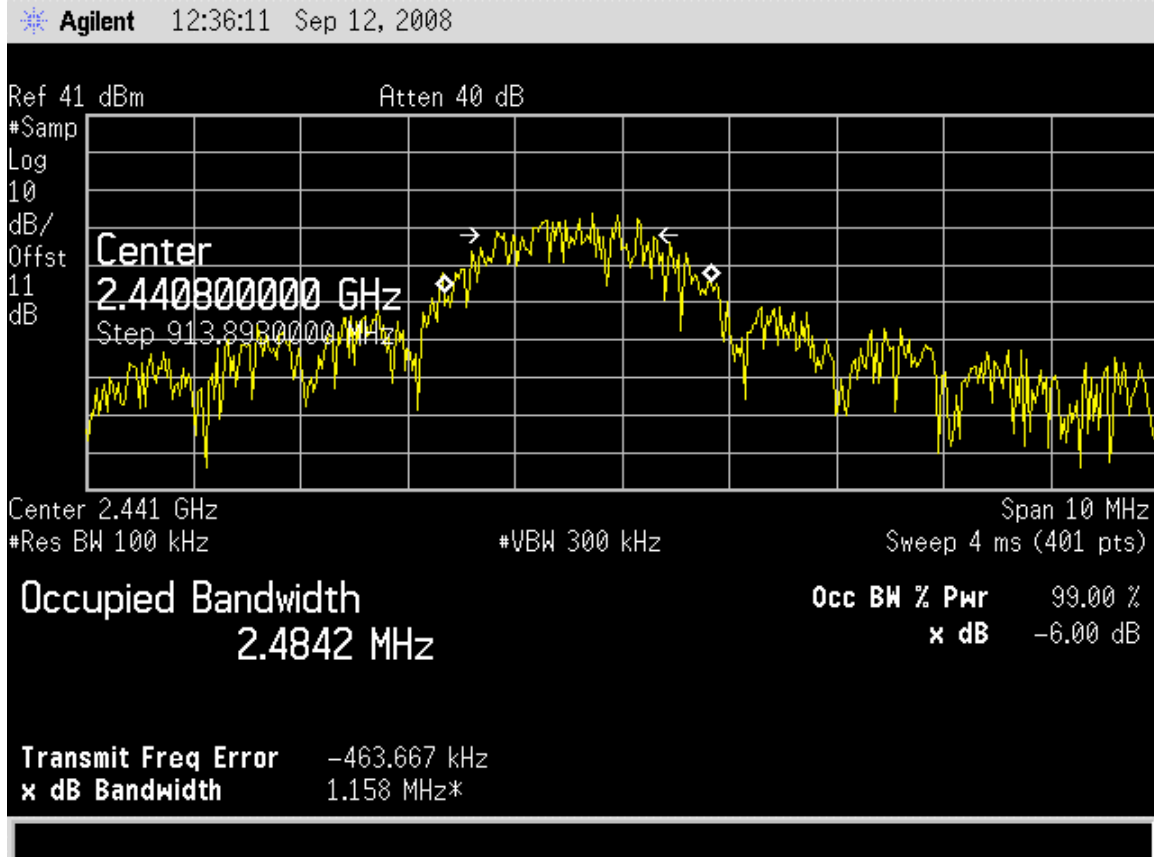
### Test Results

Refer to spectrum analyzer charts below. 99% bandwidth approximately 2.4 MHz.

### 99% Bandwidth LOW Channel

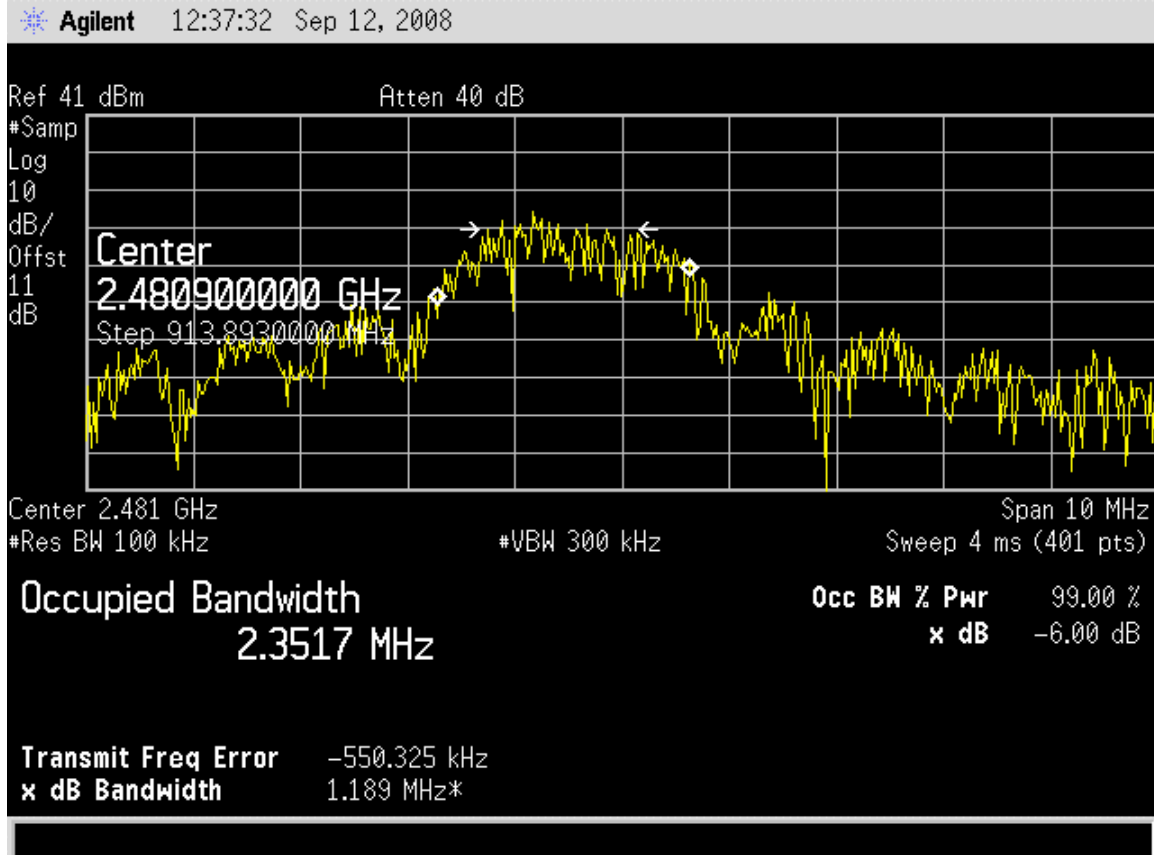


### 99% Bandwidth MID Channel





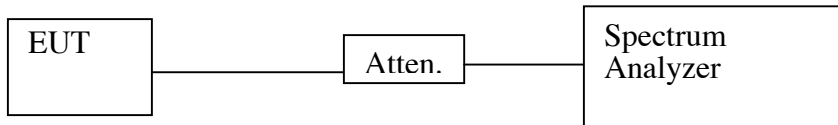
### 99% Bandwidth HIGH Channel



## RF Power Output

**Test Requirement:** FCC: 15.247(b)  
IC: RSS-210 Sec. 6.2.2(o)(iv)

## Test Setup



## Test Procedures

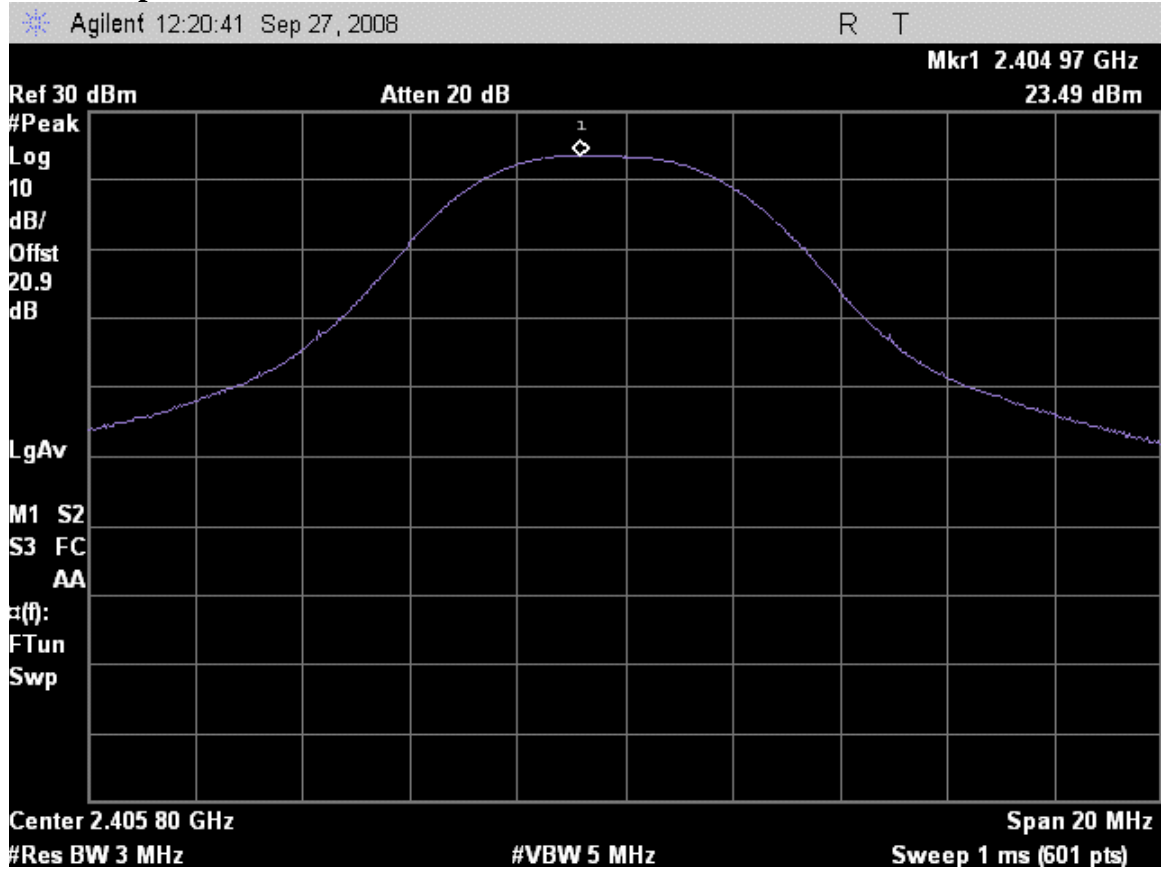
1. The EUT was configured on a test bench. RBW was set to a value higher than the 2.5 MHz 99% band width: RBW=3 MHz, VBW=8 MHz
2. The spectrum analyzer detector was set to PEAK and the highest value was recorded using the analyzer PEAK SEARCH function.

## Test Results

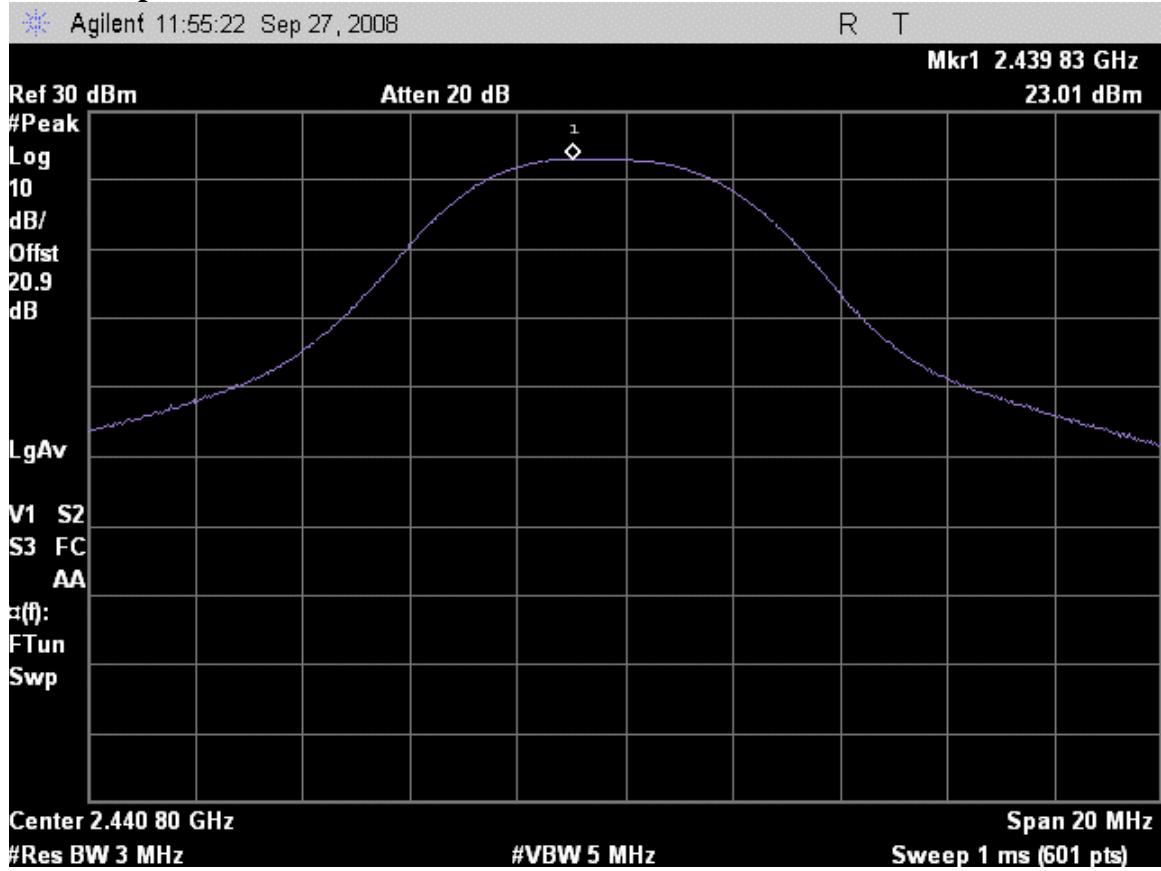
Refer to spectrum analyzer graphs. Reference level offset corrects for external attenuation and cable loss.

| Channel | Frequency, MHz | Output Power, dBm |
|---------|----------------|-------------------|
| Low     | 2405.8         | 23.49             |
| Mid     | 2440.8         | 23.01             |
| High    | 2480.9         | 22.15             |

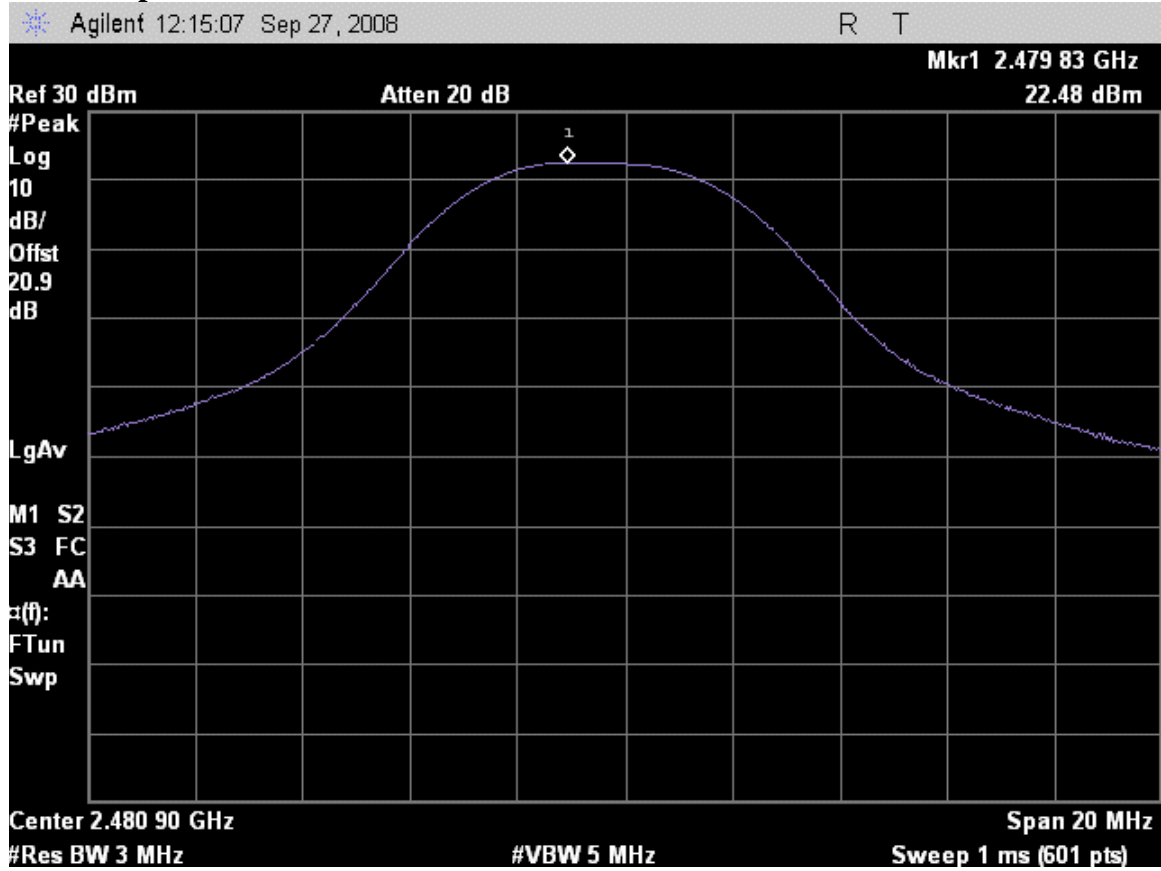
### Peak Output Power LOW Channel



### Peak Output Power MID Channel



### Peak Output Power HIGH Channel

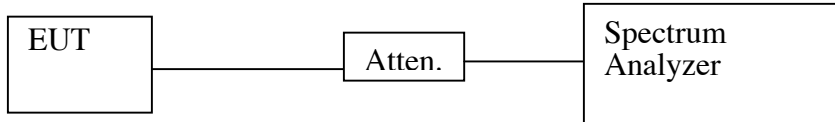


## Spurious Emissions, Conducted

Test Requirement: FCC: 15.247(d)

IC: RSS-210 Sec. 6.2.2(o)(e1)

### Test Setup



### Test Procedure

1. The EUT was configured on a test bench. The cable was connected between the EUT antenna port and the spectrum analyzer input port.

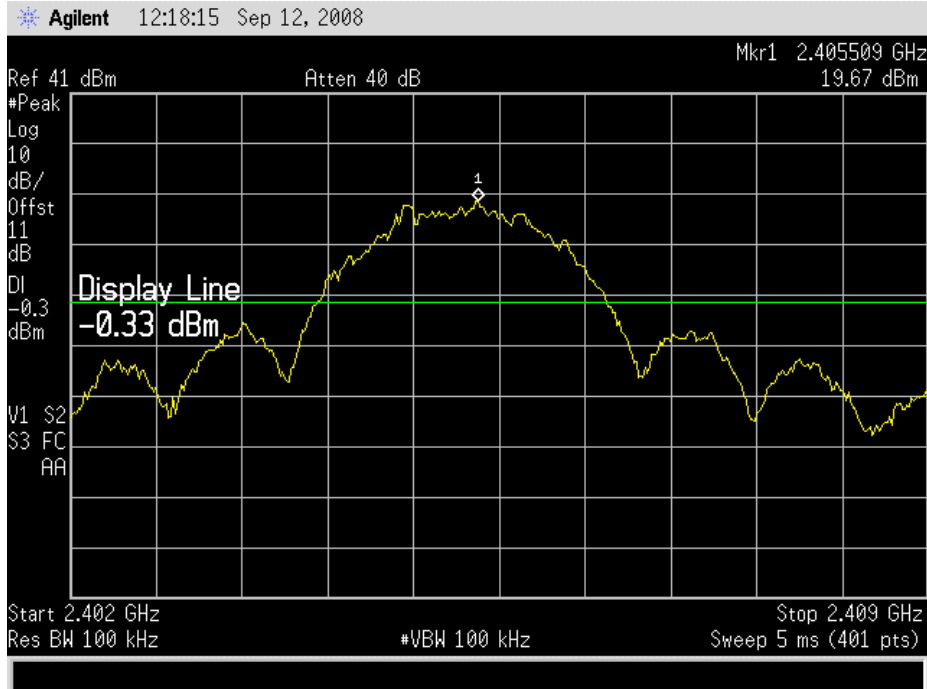
Spectrum analyzer RES BW was set to 100 kHz. While the transmitter broadcast a steady stream of digital data, the analyzer MAX HOLD function was used to capture the envelope of the transmission.

Readings were taken out to 10fo.

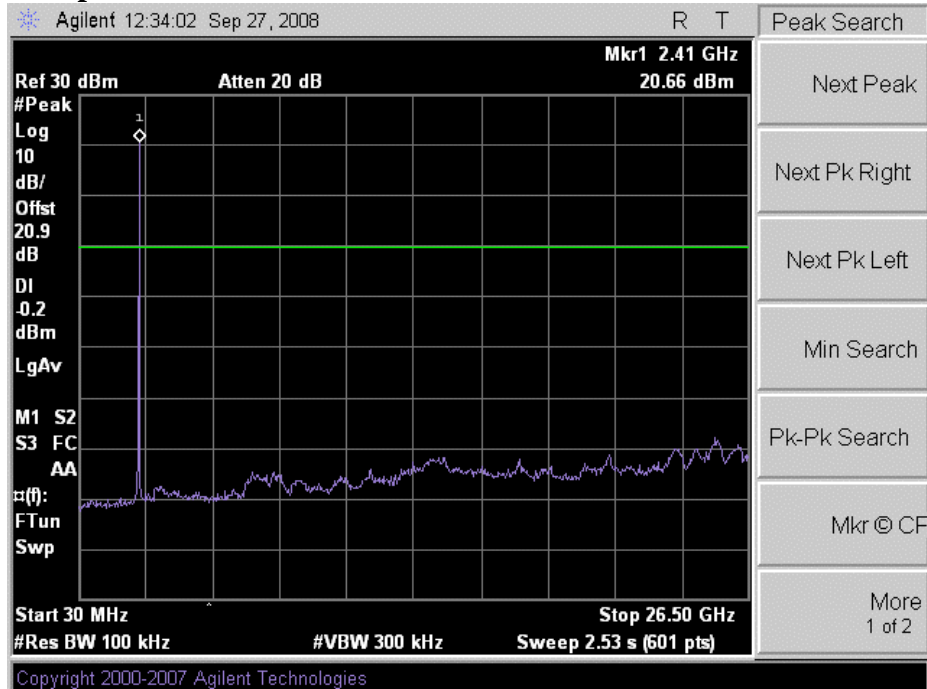
### Test Results

Refer to spectrum analyzer plots. Data shows out of band emissions are suppressed well below the -20 dBc minimum required by the Rules.

### Lower band edge, -20 dBc, LOW Channel



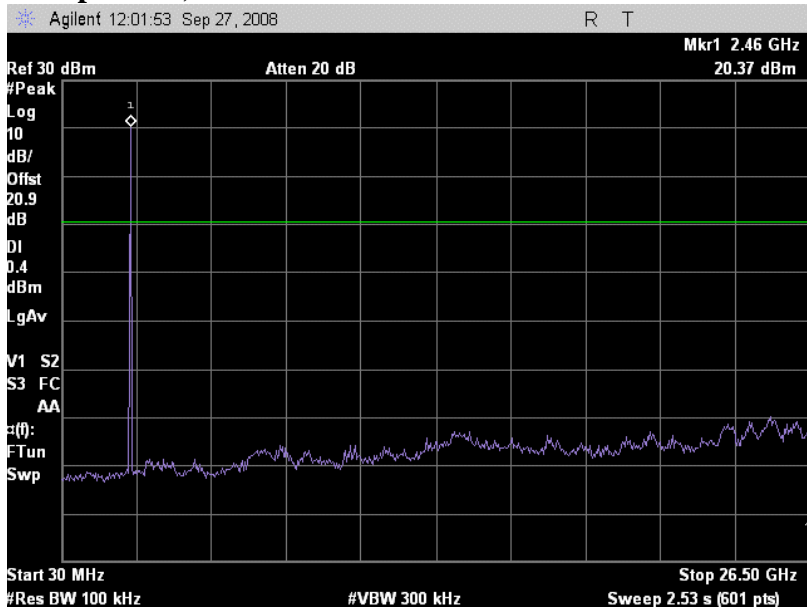
### TX Spurious Emissions LOW Channel



### -20 dBc MID Channel Reference



### TX Spurious, MID Channel

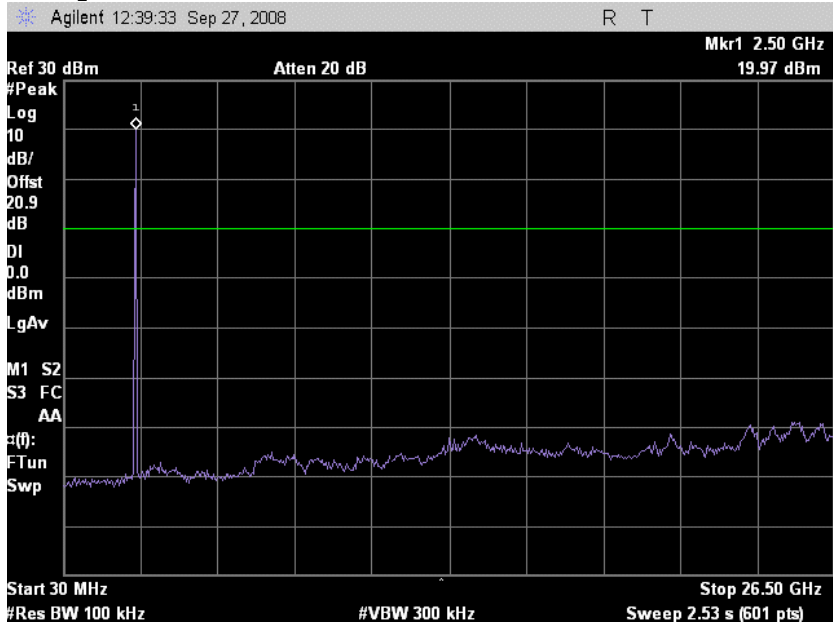




### Upper band edge, -20 dBc HIGH Channel



### TX Spurious, HIGH Channel

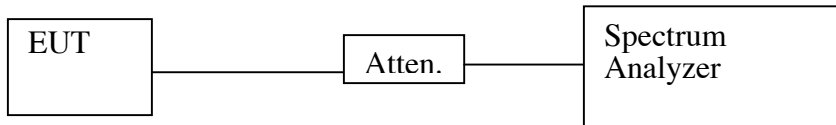


## Power Spectral Density

**Test Requirement: 15.247(e)**

**RSS-210 Sec. 6.2.2(o)(iv)**

### Test Setup



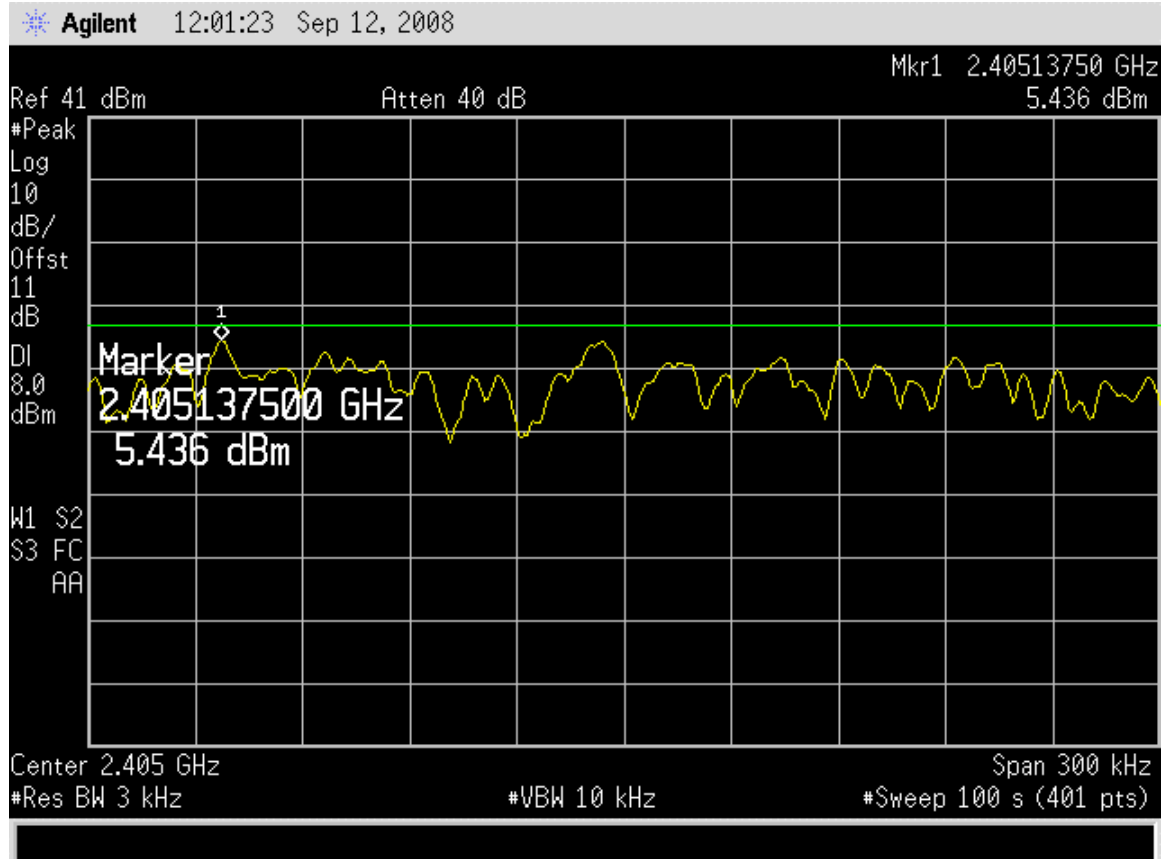
### Test Procedure

1. Determine frequency at which maximum emission occurs during pre-scan.
2. Reduce SPAN to 300 kHz, while adjusting tuning frequency so that peak remains at center of screen.
3. Set RES BW = 3 kHz, VID BW = 10 kHz, SWEEP = 100 sec.
4. Record highest reading and compare to 8 dBm limit.

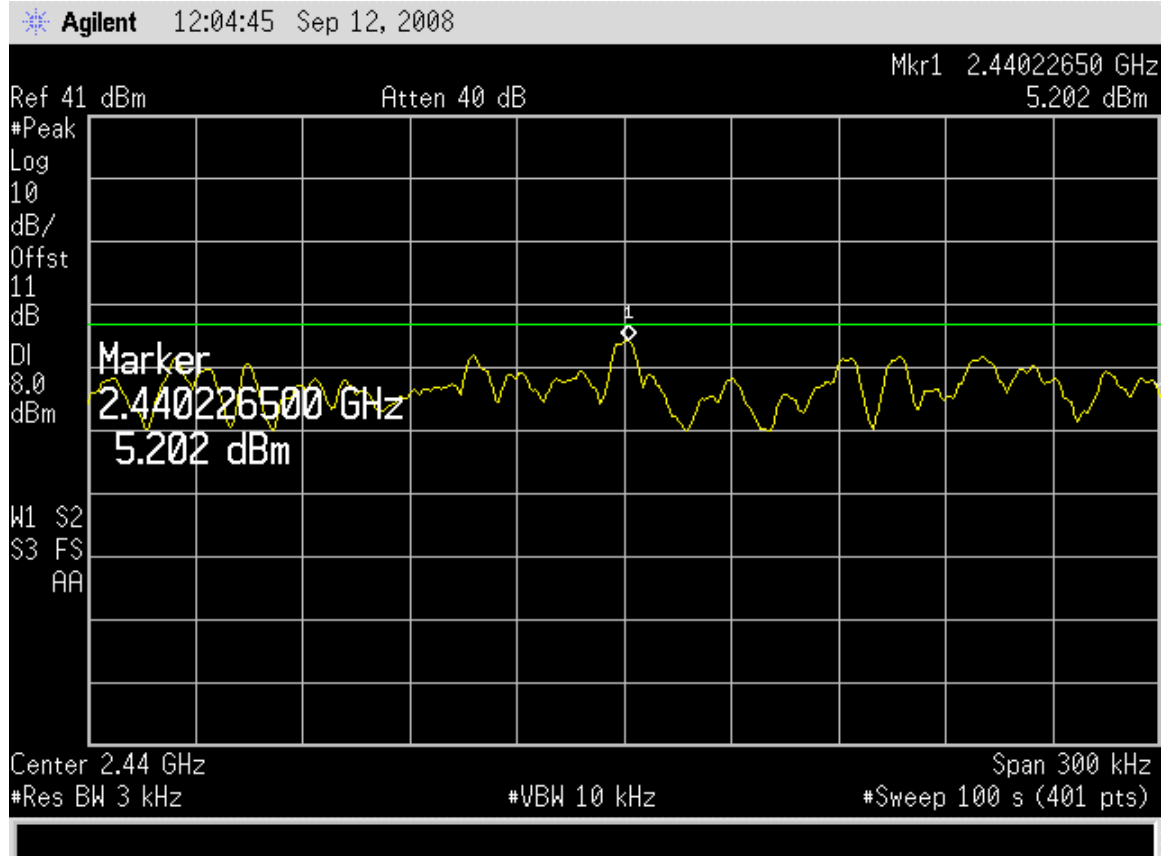
### Test Results

Maximum PSD was 5.4 dBm. Refer to attached spectrum analyzer chart.

### Power Spectral Density LOW Channel



### Power Spectral Density MID Channel



### Power Spectral Density HIGH Channel

