# FCC 47 CFR PART 15 SUBPART C

# TEST REPORT

**For**

## Saitek A-350 Wireless Headphone

## Model: DM05-2

## Trade Name: N/A

*Prepared for*

**SAITEK ELECTRONICS(SHENZHEN) LTD.**
**139 DA BAO ROAD, DISTRICT 33,**
**BAO AN, SHENZHEN,**
**CHINA**

*Prepared by*

**COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.**
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**DASHUIKENG VILLAGE, GUANLAN TOWN, BAOAN**
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**LAB CODE:200577-0**

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# 1. TEST RESULT CERTIFICATION

**Applicant:** SAITEK ELECTRONICS(SHENZHEN) LTD.
139 DA BAO ROAD, DISTRICT 33, BAO AN,
SHENZHEN, CHINA

**Equipment Under Test:** Saitek A-350 Wireless Headphone

**Trade Name:** N/A

**Model:** DM05-2

**Date of Test:** October 27-November 11, 2005

| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULT** |
| FCC Part 15 Subpart C | No non-compliance noted |

## We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.4 and the energy emitted by the sample EUT tested as described in this report is in compliance with conducted and radiated emission limits of FCC Rules Part 15.207, 15.209 and 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

***Approved by:*** ***Tested By:*** Terry.Yang

**Terry.Yang/ Engineer**

**Clinton.Kao / EMC Manager**
**COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC.**

***Reviewed By*:**

**Eric.Wong / Assistant manager**
**COMPLIANCE CERTIFICATION SERVICES (SHENZHEN) INC..**

# 2. EUT DESCRIPTION

| | |
|---|---|
| **Product** | Saitek A-350 Wireless Headphone |
| **Trade Name** | N/A |
| **Model Number** | DM05-2 |
| **Model Discrepancy** | N/A |
| **Power Supply** | DCV power from the battery |
| **Frequency Range** | 2402 ~ 2480 MHz |
| **Transmit Power** | -7.66 dBm |
| **Modulation Technique** | FHSS |
| **Number of Channels** | 79 Channels |
| **Antenna Specification** | PCB Printed Antenna<br>Gain: 1 dBi (max) |
| **Temperature Range** | 0 ~ +55°C |

***Note:*** *This submittal(s) (test report) is intended for FCC ID: QIWDM05-2 filing to comply with Section 15.207, 15.209 and 15.247 of the FCC Part 15, Subpart C Rules.*

# 3. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4. Radiated testing was performed at an antenna to EUT distance 3 meters.

## 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed on RF field strength measurement to meet the Commissions requirement and operating in a manner that intends to maximize its emission characteristics in a continuous normal application.

## 3.2 EUT EXERCISE

The EUT was operated in the engineering mode to fix the Tx frequency that was for the purpose of the measurements.

According to its specifications, the EUT must comply with the requirements of the Section 15.207, 15.209 and 15.247 under the FCC Rules Part 15 Subpart C.

## 3.3 GENERAL TEST PROCEDURES

**Conducted Emissions**

The EUT is placed on the turntable, which is 0.8 m above ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4.Conducted emissions from the EUT measured in the frequency range between 0.15 MHz and 30MHz using CISPR Quasi-peak and average detector modes.

**Radiated Emissions**

The EUT is placed on a turn table, which is 0.8 m above ground plane. The turntable shall rotate 360 degrees to determine the position of maximum emission level. EUT is set 3m away from the receiving antenna, which varied from 1m to 4m to find out the highest emission. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical. In order to find out the max. emission, the relative positions of this hand-held transmitter (EUT) was rotated through three orthogonal axes according to the requirements in Section 13.1.4.1 of ANSI C63.4.

## 3.4 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

(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 |
| [1]0.495 - 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 - | 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 | ([2]) |
| 13.36 - 13.41 | 322 - 335.4 | | |

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

(b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

## 3.5 DESCRIPTION OF TEST MODES

The EUT has been tested under operating condition.

Test program used to control the EUT for staying in continuous transmitting and receiving mode is programmed.

Channel low, mid and high with highest data rate (worst case) are chosen for full testing.

# 4. INSTRUMENT CALIBRATION

The measuring equipment, which was utilized in performing the tests documented herein, has been calibrated in accordance with the manufacturer's recommendations for utilizing calibration equipment, which is traceable to recognized national standards.

# 5. FACILITIES AND ACCREDITATIONS

## 5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No. 6, Jinao industrial park, No.35 Jukeng Road, Dashuikeng Village, Guanlan Town, Baoan District, Shenzhen, China

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

## 5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of Linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with pre-selectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

## 5.3 LABORATORY ACCREDITATIONS AND LISTING

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200577-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission.

# 6. SETUP OF EQUIPMENT UNDER TEST

## 6.1 SETUP CONFIGURATION OF EUT

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

## 6.2 SUPPORT EQUIPMENT

| No | Equipment | Model | Serial No. | FCC ID | Trade Name | Data Cable | Power Cord |
|---|---|---|---|---|---|---|---|
| 1 | Notebook | 2672 | 992F2VG | DoC | IBM | N/A | Un-Shielded, 1.8m |

***Notes:***

1. *All the equipment/cables were placed in the worst-case configuration to maximize the emission during the test.*
2. *Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.*

# 7. FCC PART 15.247 REQUIREMENTS

## 7.1 PEAK POWER

### LIMIT

The maximum peak output power of the intentional radiator shall not exceed the following:

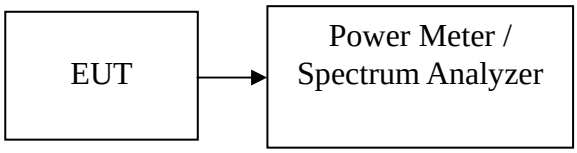
1. For systems using digital modulation in the bands of 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz: 1 watt.
2. Except as shown in paragraphs (b)(3) (i), (ii) and (iii) of this section, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2) of this section, as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| RF Power Meter & Sensor | Anritsu | ML2487A | 6K00001491 | 02/23/2006 |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

**Test Configuration**




### TEST PROCEDURE

The transmitter output is connected to the RF Power Meter. The RF Power Meter is set to the peak power detection.

### TEST RESULTS

*No non-compliance noted*

**Test Data**

| Channel | Frequency (MHz) | Reading Power (dBm) | Factor (dB) | Output Power (dBm) | Output Power (W) | Limit (W) | Result |
|---|---|---|---|---|---|---|---|
| Low | 2402 | -10.28 | 2.50 | -7.78 | 0.00017 | 1 | PASS |
| Mid | 2440 | -10.71 | 2.50 | -8.21 | 0.00015 | | PASS |
| High | 2480 | -11.35 | 2.50 | -8.85 | 0.00013 | | PASS |

## 7.2 PEAK POWER SPECTRAL DENSITY

## LIMIT

1. For direct sequence systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission.

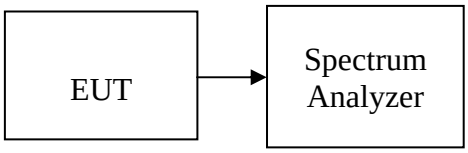
2. The direct sequence operating of the hybrid system, with the frequency hopping operation turned off, shall comply with the power density requirements of paragraph (d) of this section.

## MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US44300399 | 02/06/2006 |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

**Test Configuration**




## TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 3kHz, VBW = 10kHz, Span = 300kHz, Sweep=100s
4. Record the max. reading.
5. Repeat the above procedure until the measurements for all frequencies are completed.

## TEST RESULTS

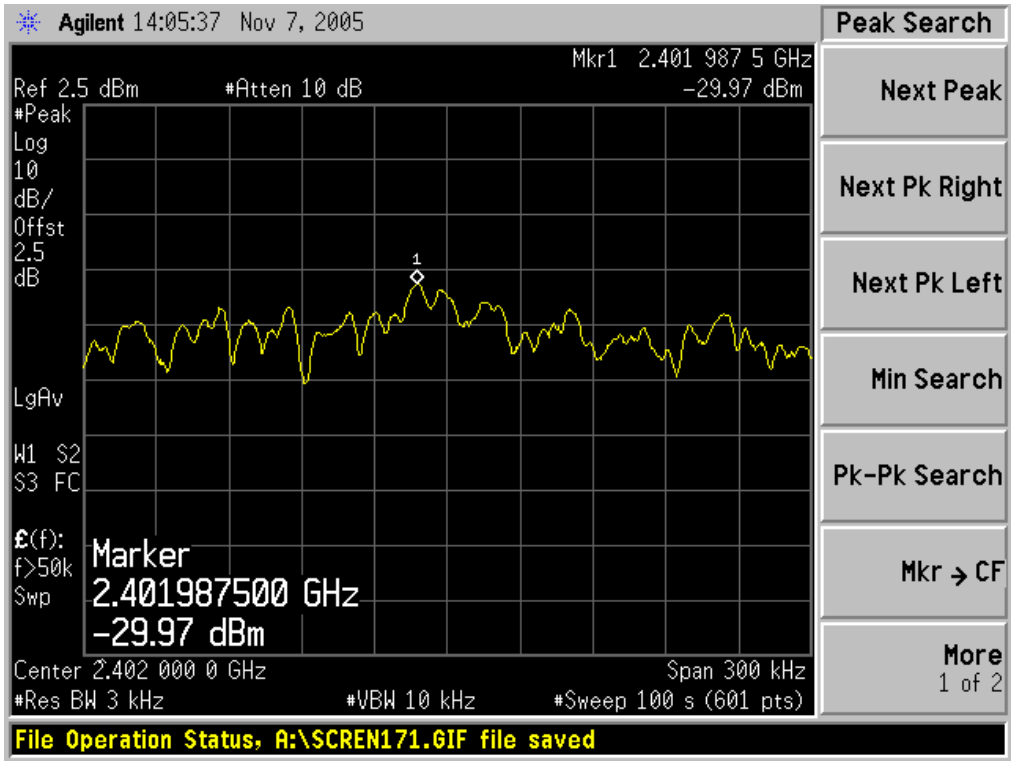
*No non-compliance noted*

**Test Data**

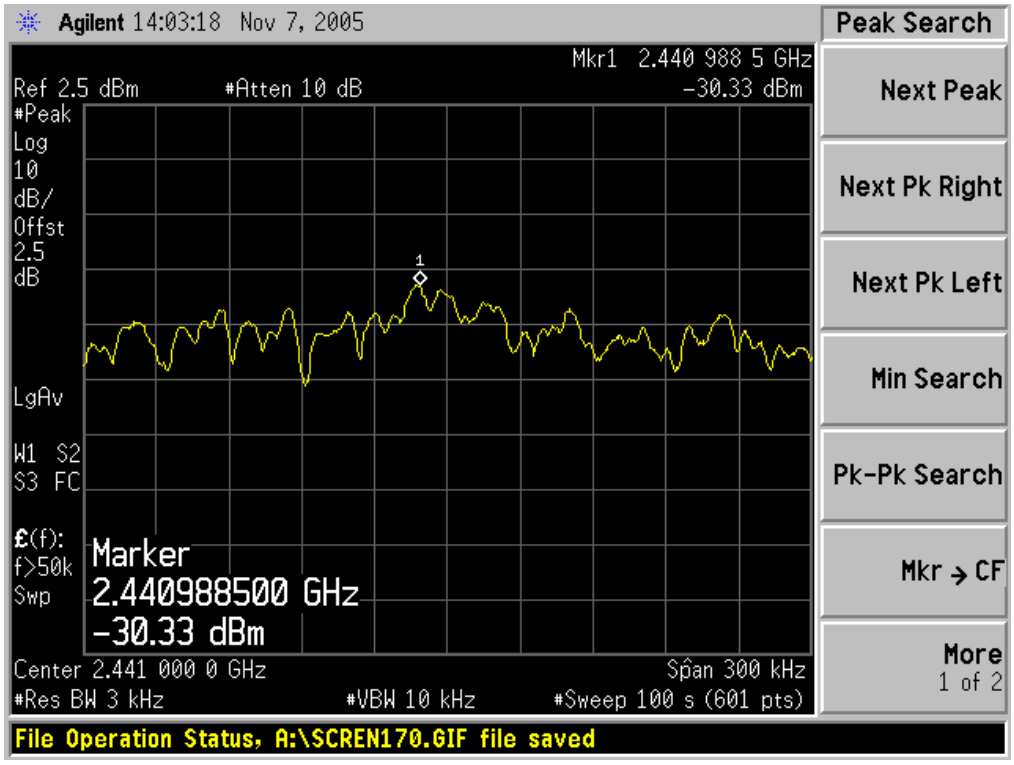
| Channel | Frequency | Reading (dBm) | Factor (dB) | PPSD (dBm) | Limit (dBm) | Result |
|---|---|---|---|---|---|---|
| Low | 2402 | -29.97 | 2.50 | -27.47 | 8.00 | PASS |
| Mid | 2440 | -30.33 | 2.50 | -27.83 | | PASS |
| High | 2480 | -30.44 | 2.50 | -27.94 | | PASS |

## Test Plot

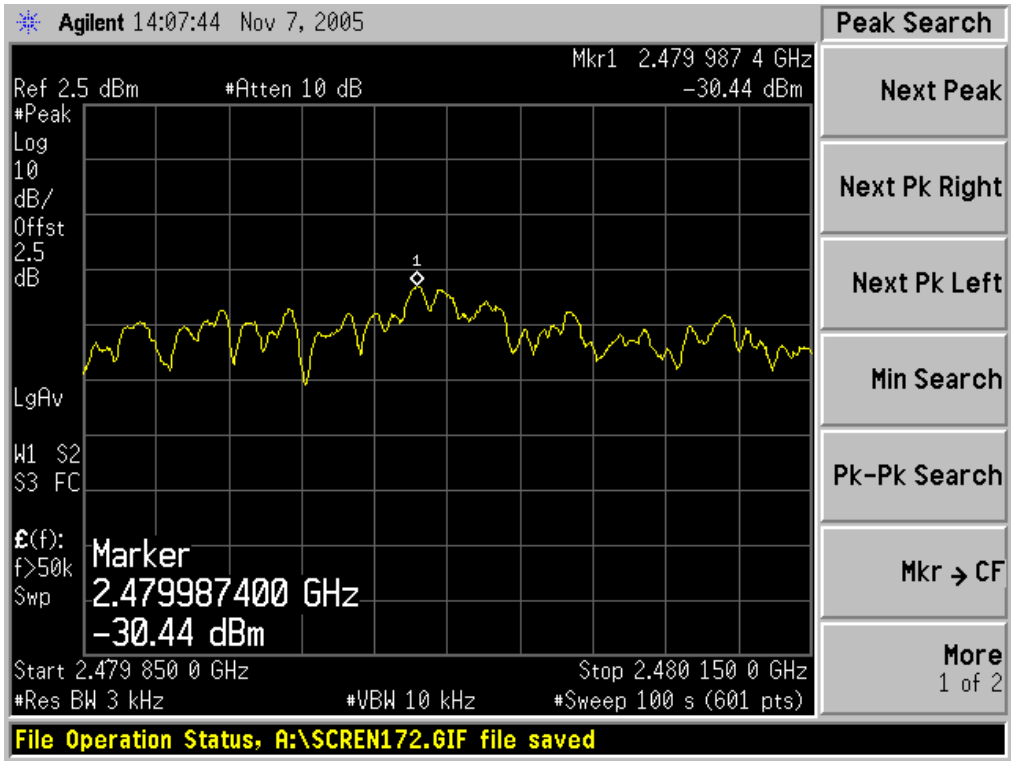
### PPSD (CH Low)




### PPSD (CH Mid)



**PPSD (CH High)**


Agilent 14:07:44 Nov 7, 2005
Peak Search
Mkr1 2.479 987 4 GHz
Ref 2.5 dBm
#Atten 10 dB
-30.44 dBm
#Peak
Log
10
dB/
Offst
2.5
dB
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
LgAv
W1 S2
S3 FC
£(f):
f>50k
Swp
Marker
2.479987400 GHz
-30.44 dBm
Start 2.479 850 0 GHz
Stop 2.480 150 0 GHz
#Res BW 3 kHz
#VBW 10 kHz
#Sweep 100 s (601 pts)
File Operation Status, A:\SCREN172.GIF file saved

## 7.3 BAND EDGES MEASUREMENT

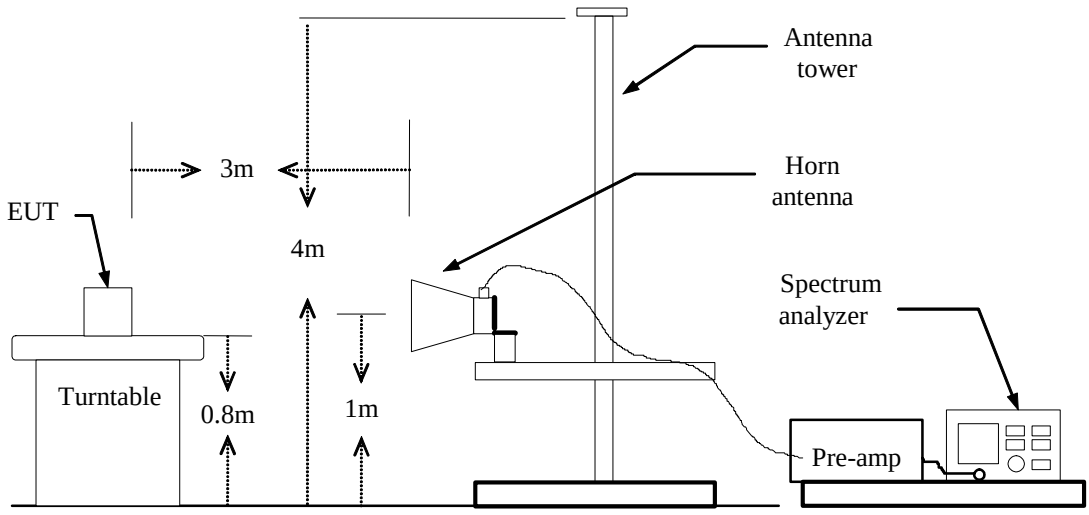
## LIMIT

According to §15.247(c), in any 100 kHz bandwidth outside the frequency bands in which the spread spectrum intentional radiator in operating, the radio frequency power that is produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level of the desired power, In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in15.209(a).

## MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US44300399 | 02/06/2006 |

**Test Configuration**




## TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the spectrum analyzer in the following setting in order to capture the lower and upper band-edges of the emission:
   (a) PEAK: RBW=VBW=1MHz / Sweep=AUTO
   (b) AVERAGE: RBW=1MHz / VBW=10Hz / Sweep=AUTO
5. Repeat the procedures until all the PEAK and AVERAGE versus POLARIZATION are measured.

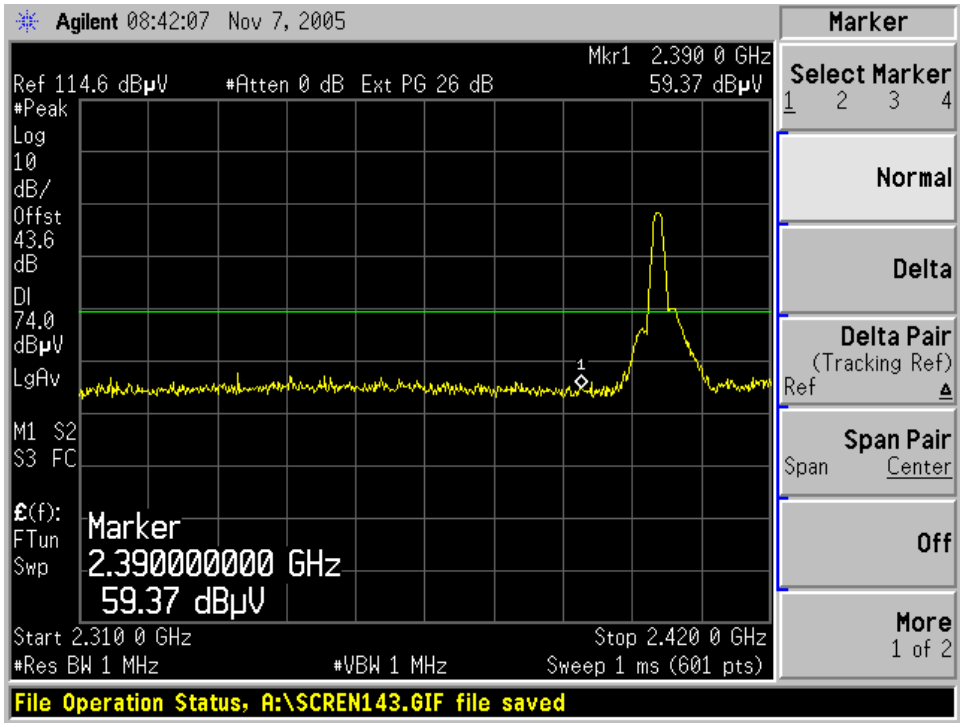
## TEST RESULTS

Refer to attach spectrum analyzer data chart.

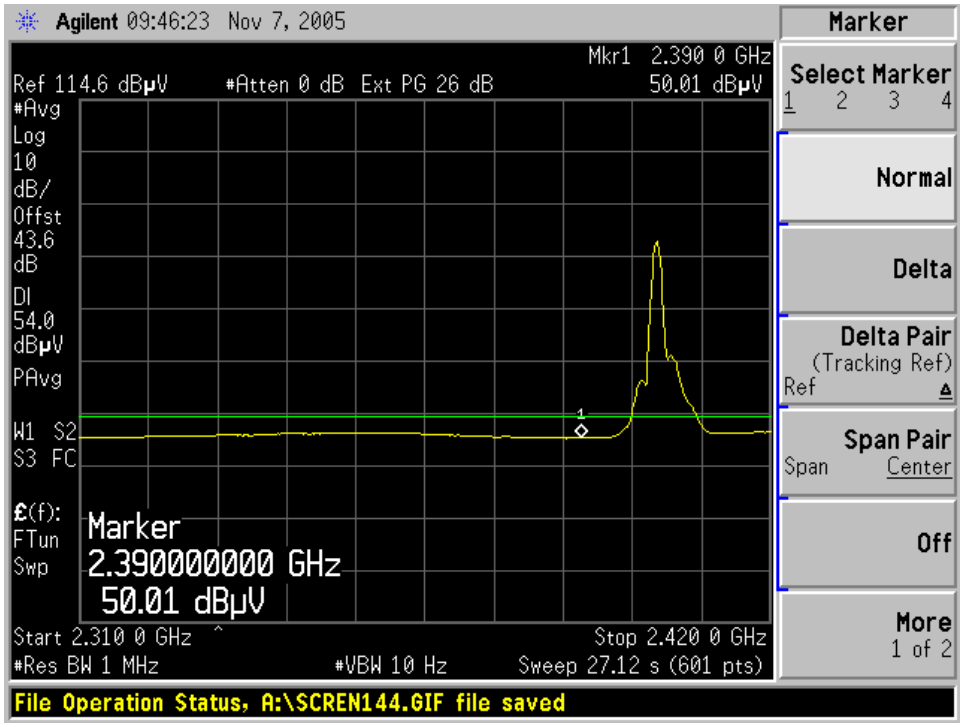
## Test Data

### Band Edges (CH-Low)

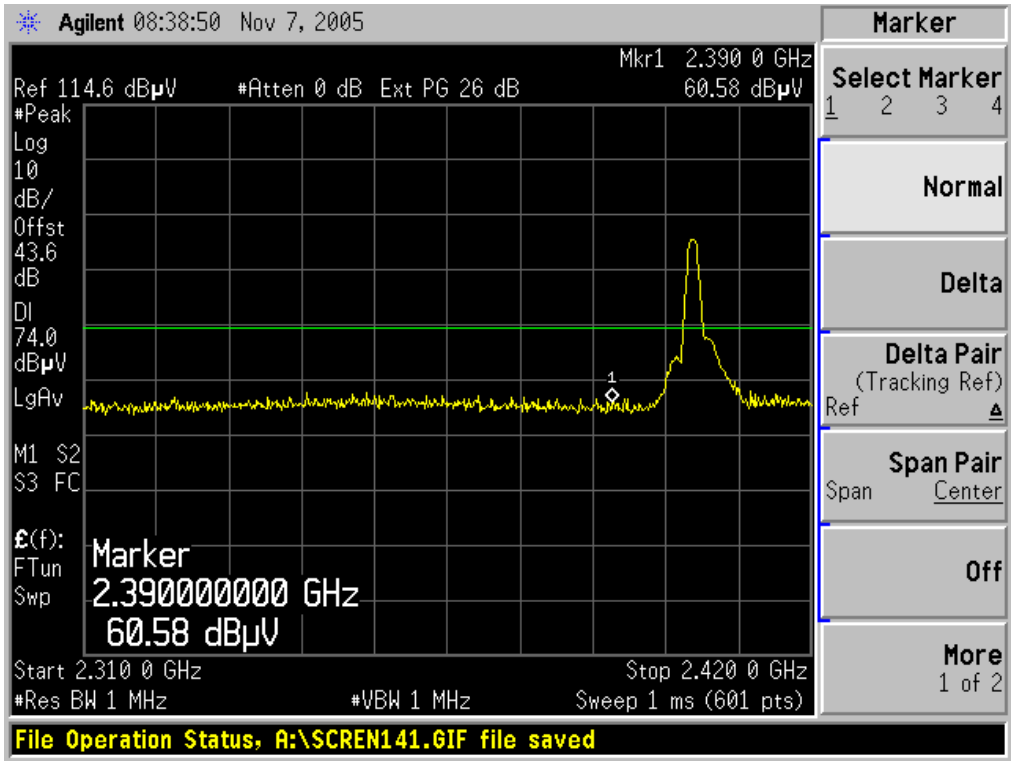
**Detector mode: Peak** **Polarity: Vertical**



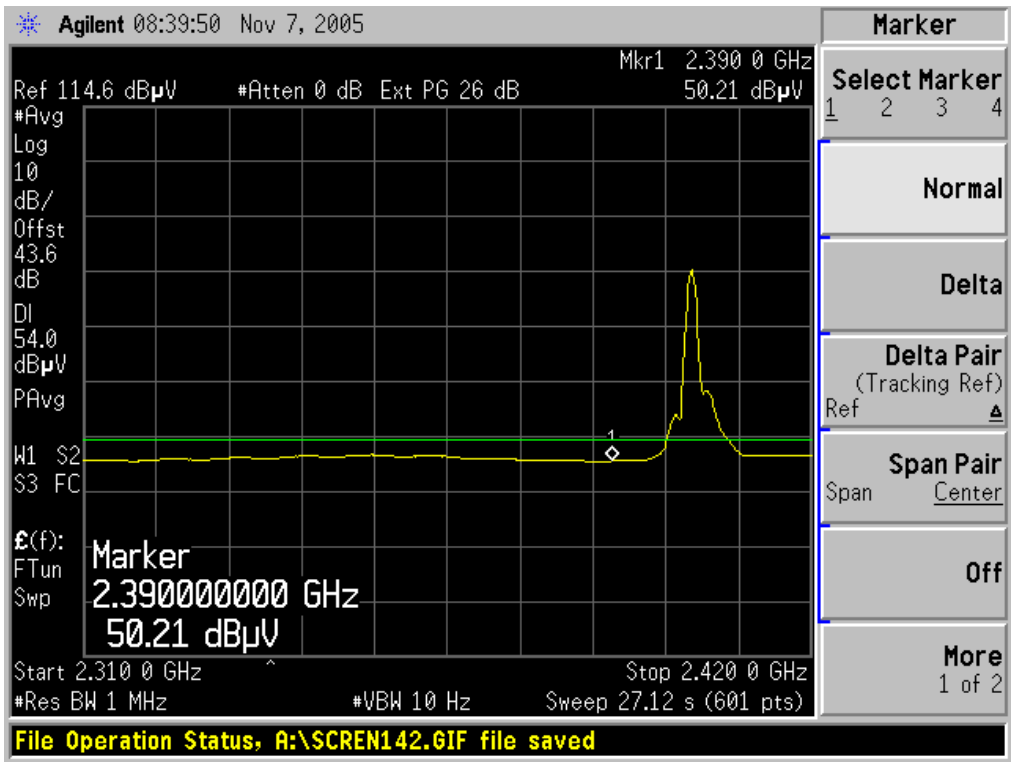

**Detector mode: Average** **Polarity: Vertical**



**Detector mode: Peak** **Polarity: Horizontal**

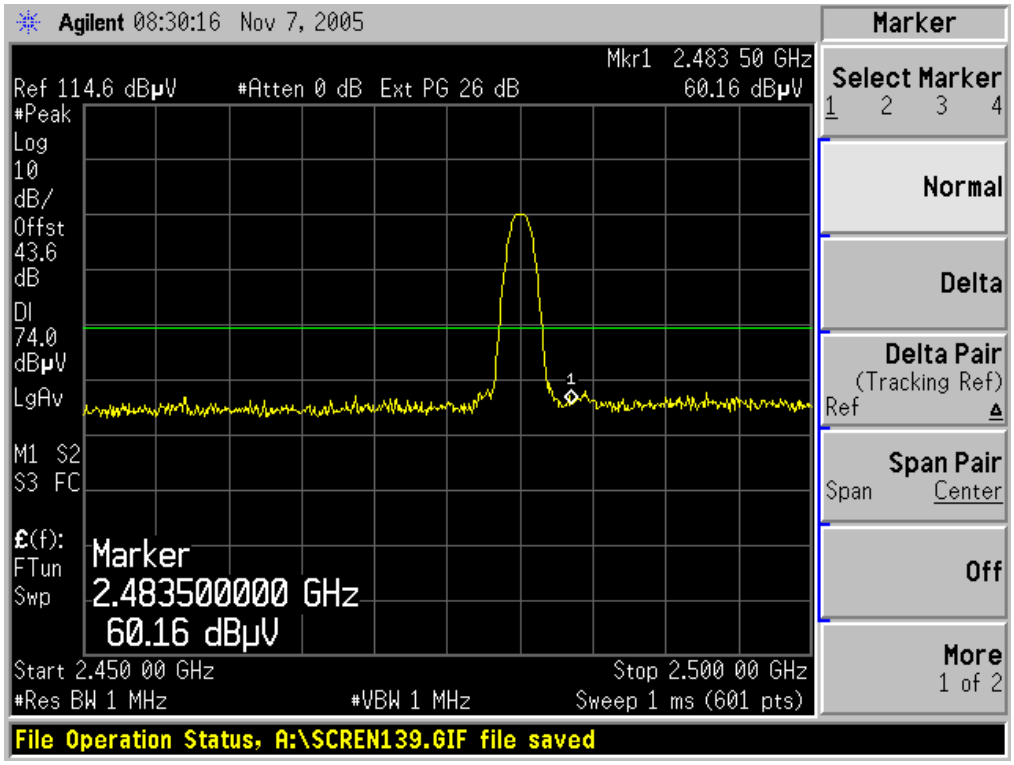



**Detector mode: Average** **Polarity: Horizontal**

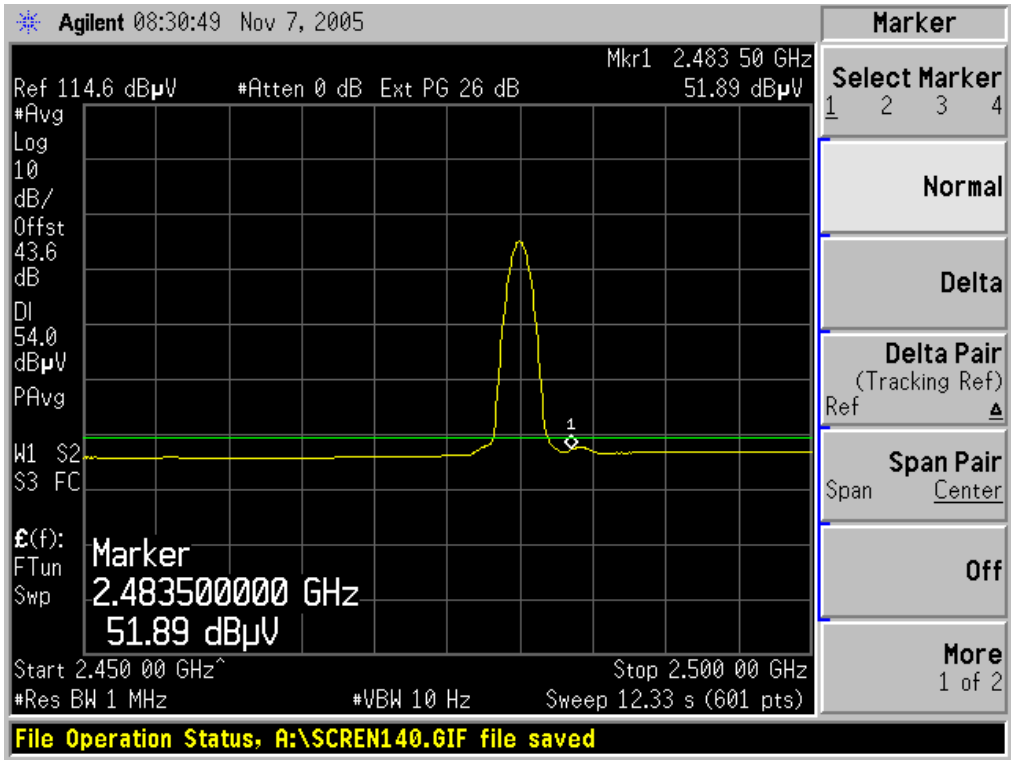


**Band Edges (CH-High)**

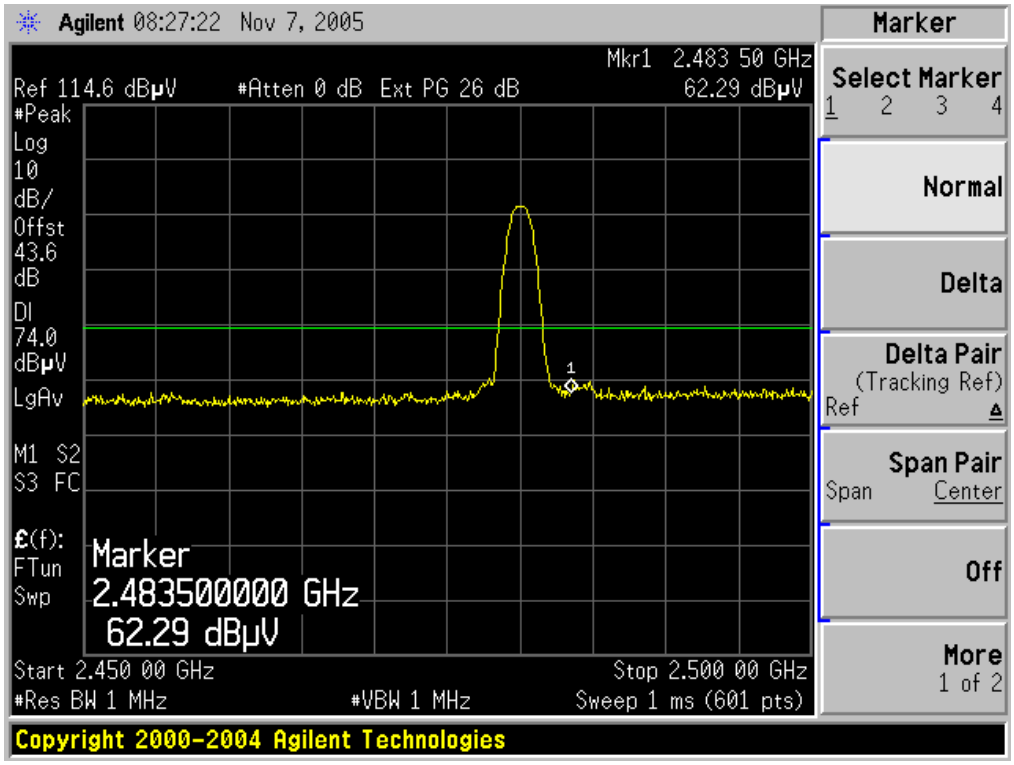
**Detector mode: Peak** **Polarity: Vertical**



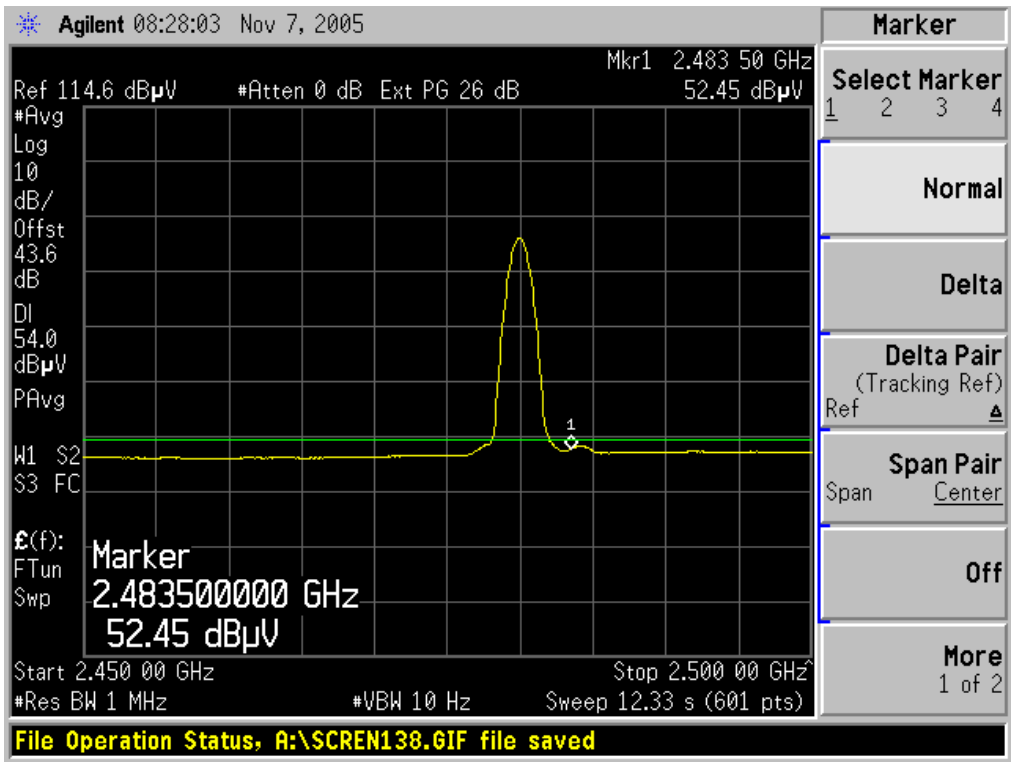

**Detector mode: Average** **Polarity: Vertical**



**Detector mode: Peak** **Polarity: Horizontal**




**Detector mode: Average** **Polarity: Horizontal**



## 7.4 FREQUENCY SEPARATION

## LIMIT

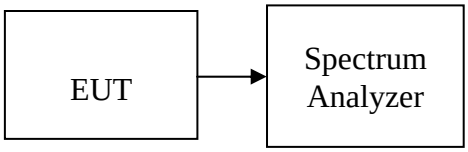
According to §15.247(a)(1), Frequency hopping systems shall have hopping channel carrier frequencies separated by minimum of 25kHz or the 20dB bandwidth of the hopping channel, whichever is greater.

## MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 04/28/2006 |
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/22/2006 |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

**Test Configuration**




## TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = middle of hopping channel.
4. Set the spectrum analyzer as RBW, VBW=100kHz, Adjust Span to 5 MHz, Sweep = auto.
5. Max hold. Mark 3 Peaks of hopping channel and record the 3 peaks frequency.

## TEST RESULTS

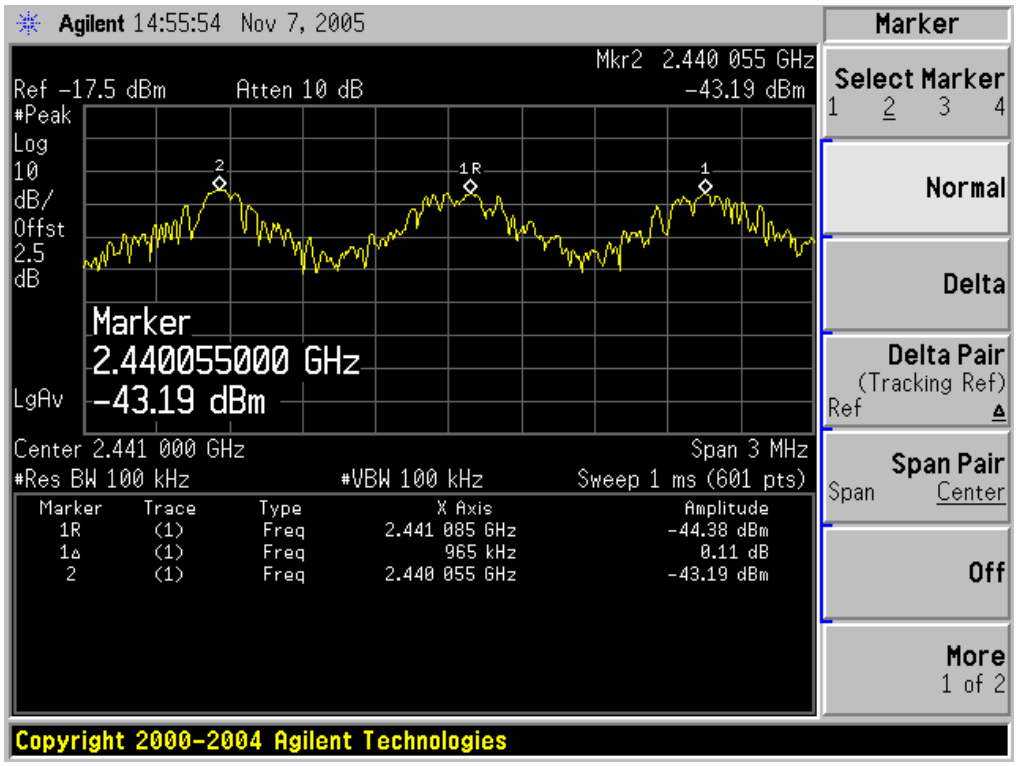
*No non-compliance noted*

**Test Data**

| Channel Separation (MHz) | Limit (kHz) | Result |
|---|---|---|
| 0.965 | 775kHz (20dB BW) | Pass |

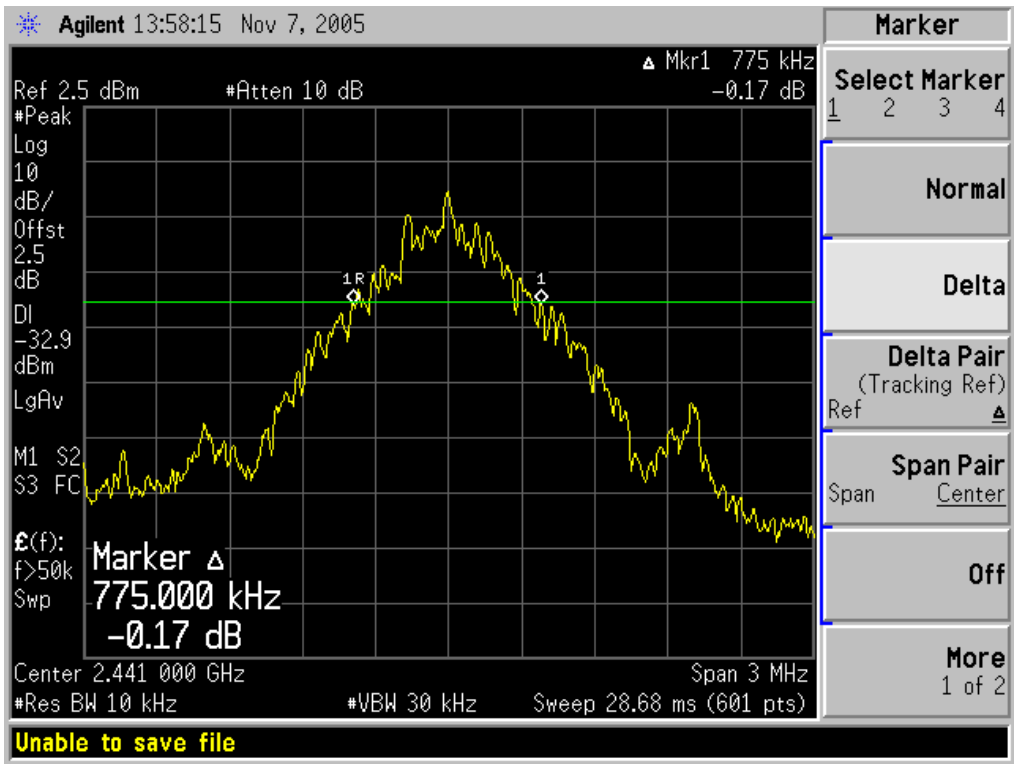
## Test Plot

## Measurement of Channel Separation




## Test Plot

## 20 dB bandwidth



## 7.5 NUMBER OF HOPPING FREQUENCY

## LIMIT

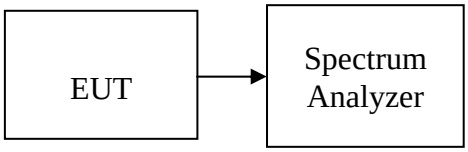
According to §15.247(a)(1)(ii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands shall use at least 15 hopping frequencies.

## MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 04/28/2006 |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

**Test Configuration**




## TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set spectrum analyzer Start=2400MHz, Stop = 2441.5MHz, Sweep = 250s and Start=2441.5MHz, Stop = 2483.5MHz, Sweep = 250s.
4. Set the spectrum analyzer as RBW, VBW=100kHz,
5. Max hold, view and count how many channel in the band.

## TEST RESULTS

*No non-compliance noted*

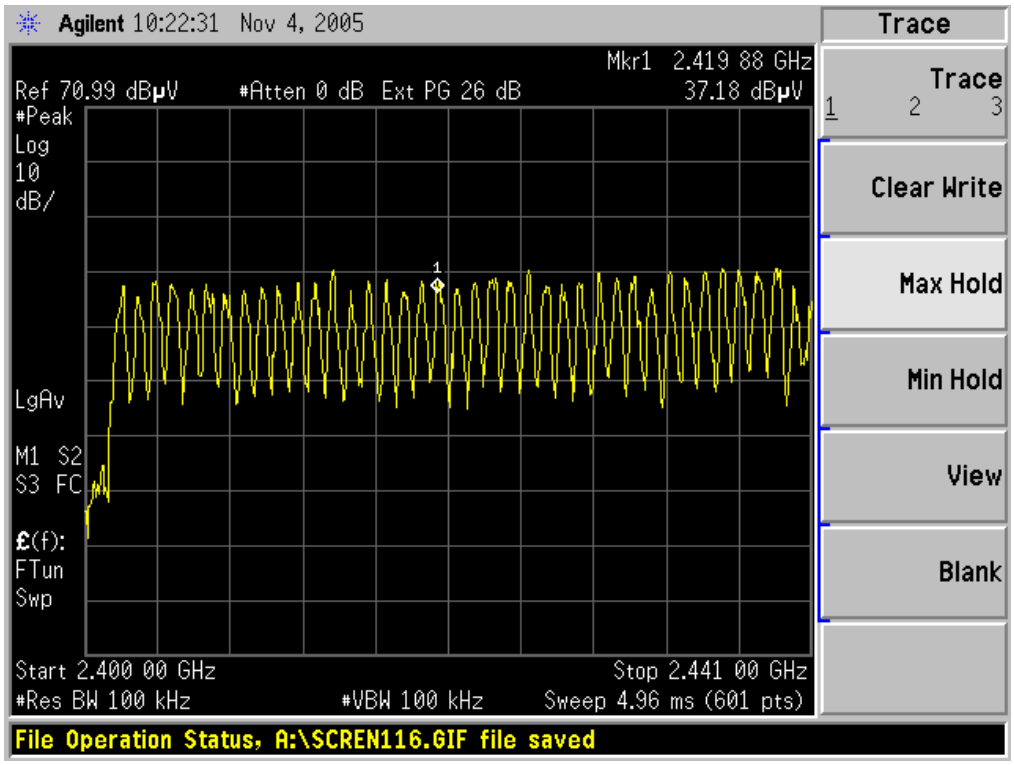
**Test Data**

| Result (No. of CH) | Limit (No. of CH) | Result |
|---|---|---|
| 79 | >15 | PASS |

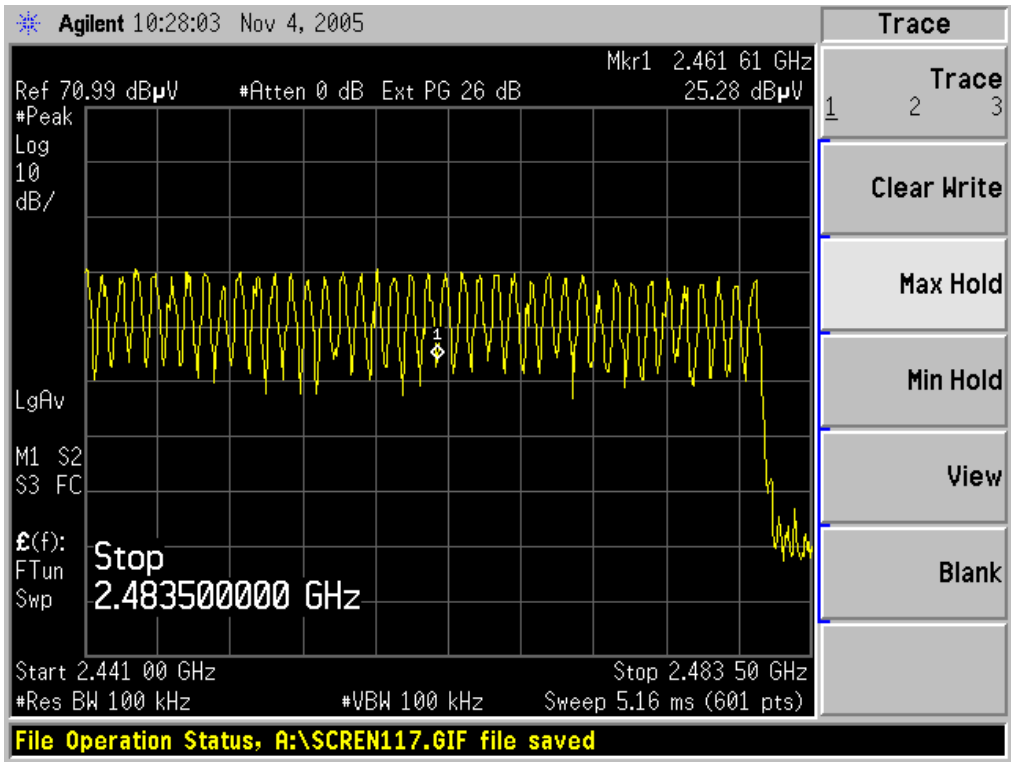
## Test Plot

## Channel Number

### 2.4 GHz – 2.441 GHz




### 2.441 GHz – 2.4835 GHz



# 7.6TIME OF OCCUPANCY (DWELL TIME)

## LIMIT

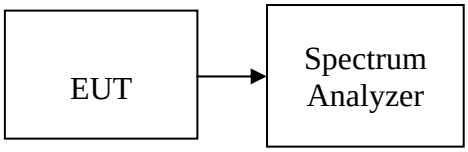
According to §15.247(a)(1)(iii), Frequency hopping systems operating in the 2400MHz-2483.5 MHz bands. The average time of occupancy on any channels shall not greater than 0.4 s within a period 0.4 s multiplied by the number of hopping channels employed.

## MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | MY43360131 | 01/10/2006 |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

**Test Configuration**




## TEST PROCEDURE

1. Place the EUT on the table and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.
3. Set center frequency of spectrum analyzer = operating frequency.
4. Set the spectrum analyzer as RBW, VBW=1MHz, Span = 0Hz, Sweep = auto.
5. Repeat above procedures until all frequency measured were complete.

# TEST RESULTS

*No non-compliance noted*

**Test Data**

**DH 1**

CH Low: 0.42 * (1600/2)/79 * 31.6 = 134.4 (ms)
CH Mid: 0.42 * (1600/2)/79 * 31.6 = 134.4 (ms)
CH High: 0.42 * (1600/2)/79 * 31.6 = 134.4 (ms)

| CH | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Result |
|---|---|---|---|---|---|
| Low | 0.42 | 134.40 | 31.60 | 400.00 | PASS |
| Mid | 0.42 | 134.40 | 31.60 | | PASS |
| High | 0.42 | 134.40 | 31.60 | | PASS |

**DH 3**

CH Low: 1.02 * (1600/4)/79 * 31.6 = 163.1 (ms)
CH Mid: 1.02 * (1600/4)/79 * 31.6 = 163.1 (ms)
CH High: 1.02 * (1600/4)/79 * 31.6 = 163.1 (ms)

| CH | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Result |
|---|---|---|---|---|---|
| Low | 1.02 | 163.10 | 31.60 | 400.00 | PASS |
| Mid | 1.02 | 163.10 | 31.60 | | PASS |
| High | 1.02 | 163.10 | 31.60 | | PASS |

**DH 5**

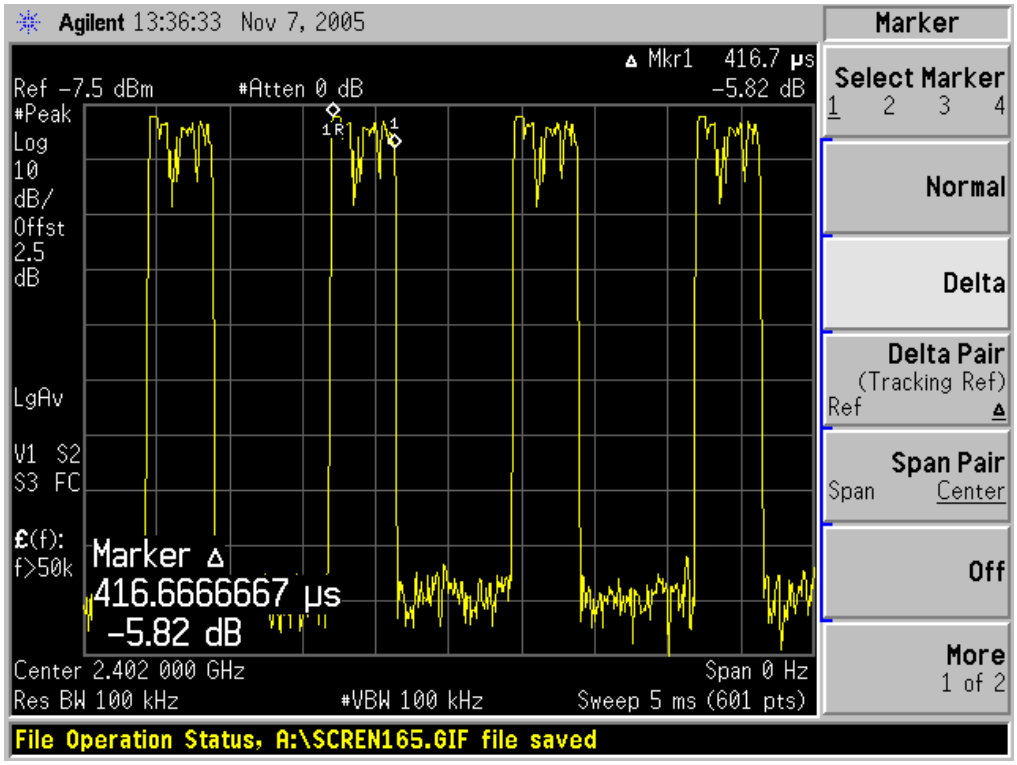
CH Low: 2.91 * (1600/6)/79 * 31.6 = 245.2 (ms)
CH Mid: 2.91 * (1600/6)/79 * 31.6 = 245.2 (ms)
CH High: 2.91 * (1600/6)/79 * 31.6 = 245.2 (ms)

| CH | Pulse Time (ms) | Total of Dwell (ms) | Period Time (s) | Limit (ms) | Result |
|---|---|---|---|---|---|
| Low | 2.91 | 245.20 | 31.60 | 400.00 | PASS |
| Mid | 2.91 | 245.20 | 31.60 | | PASS |
| High | 2.91 | 245.20 | 31.60 | | PASS |

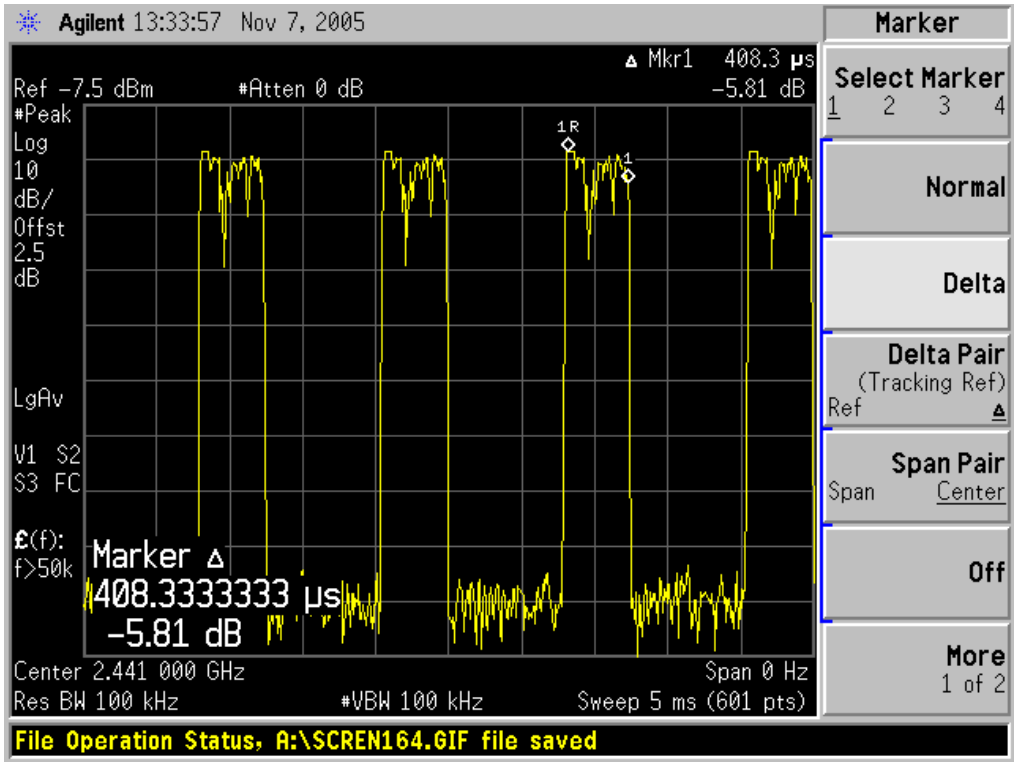
**Test Plot**

**DH 1**

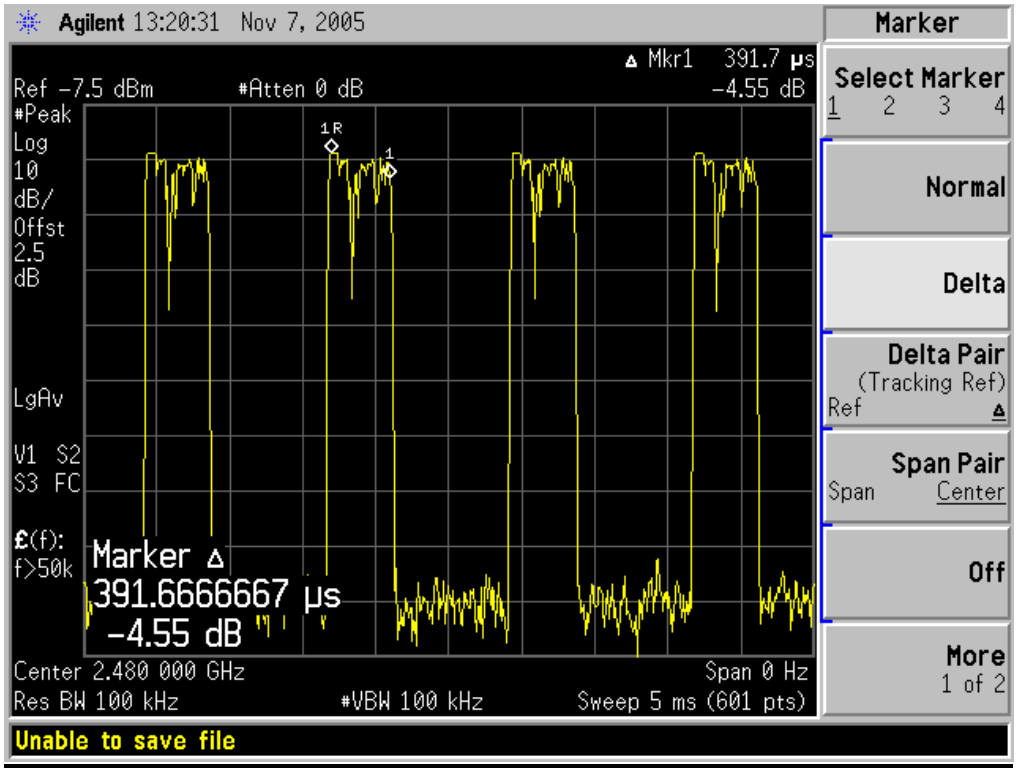
**(CH Low)**




**(CH Mid)**

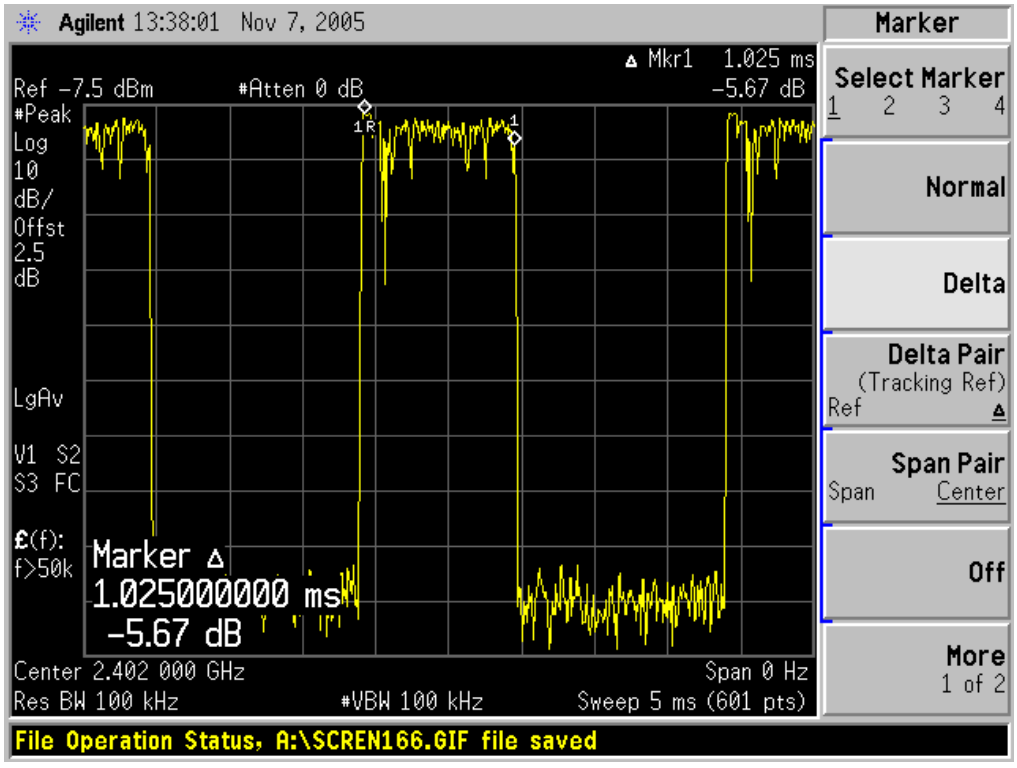


**(CH High)**

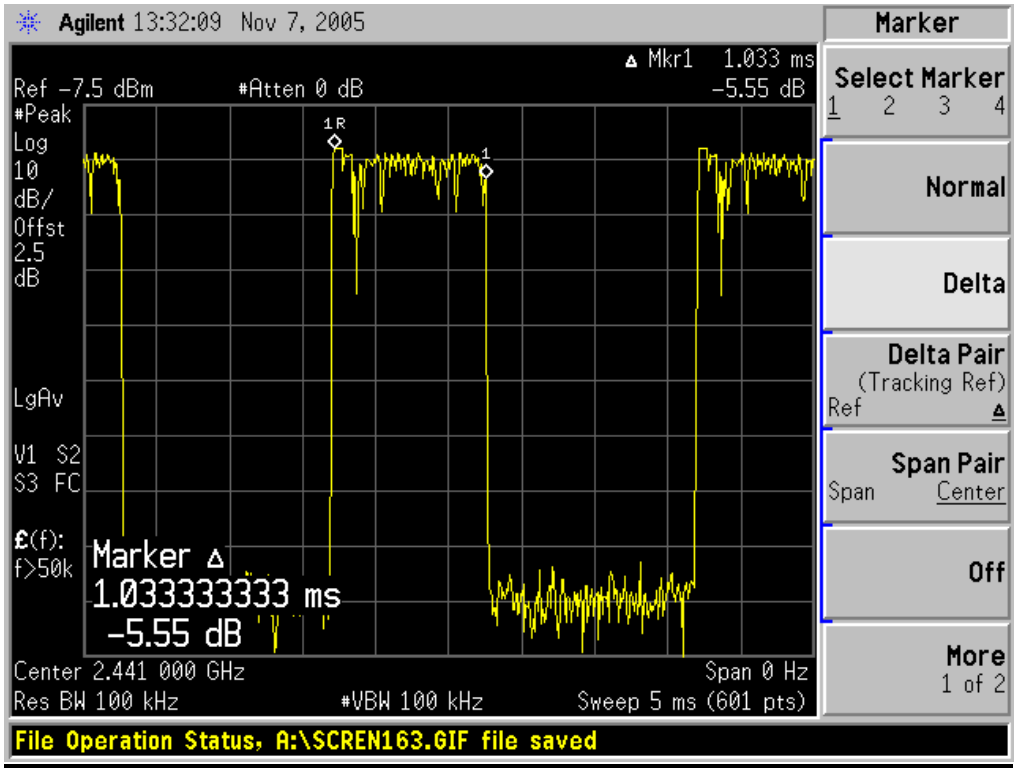



**DH 3**

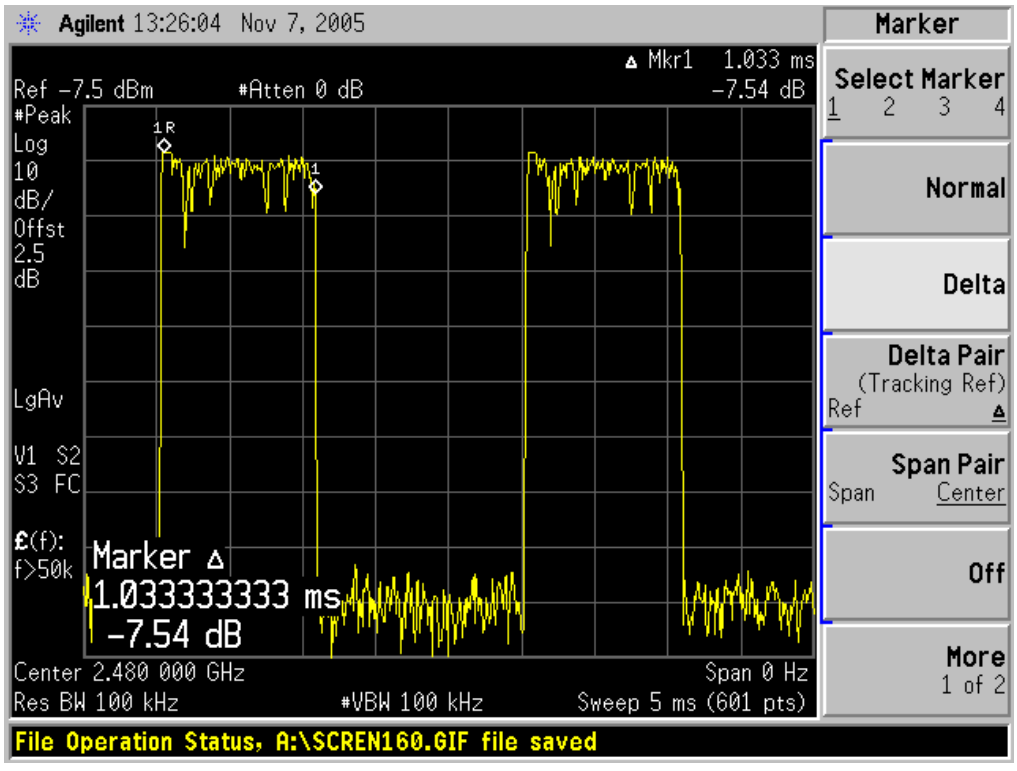
**(CH Low)**



**(CH Mid)**

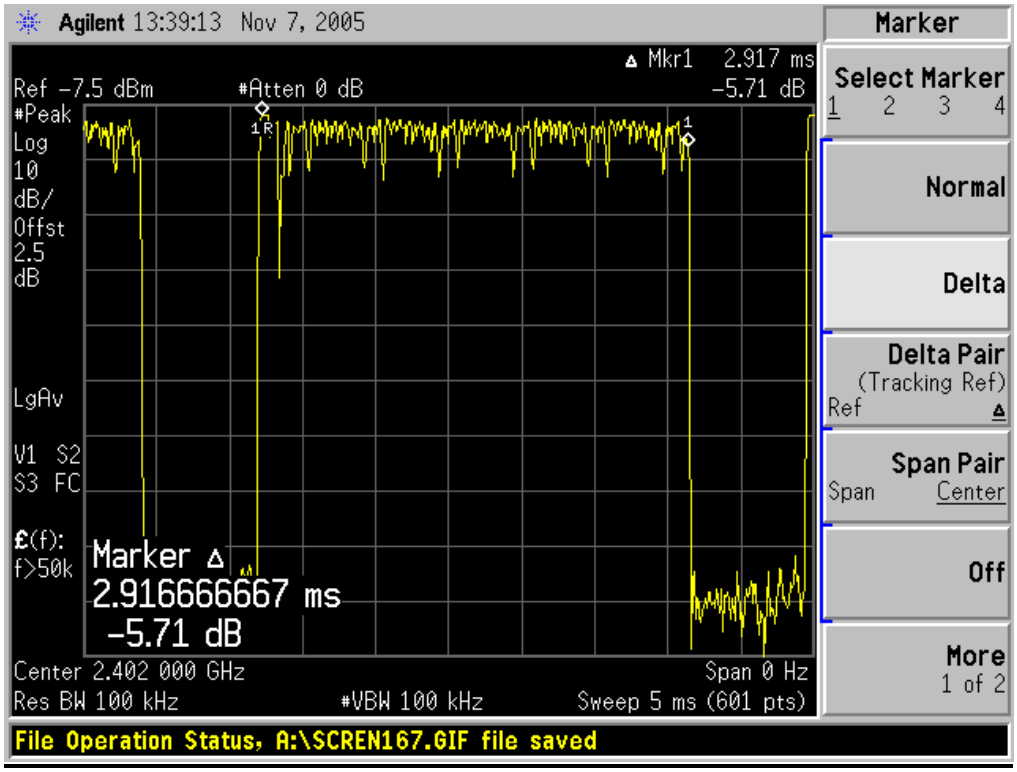



**(CH High)**

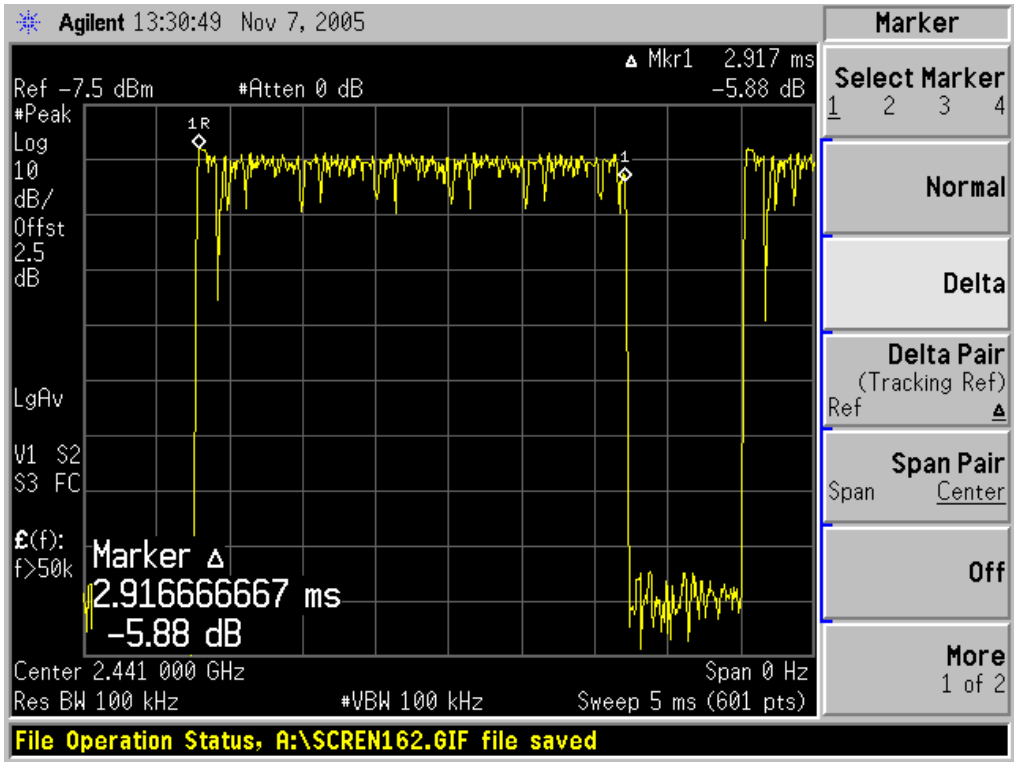


**DH 5**

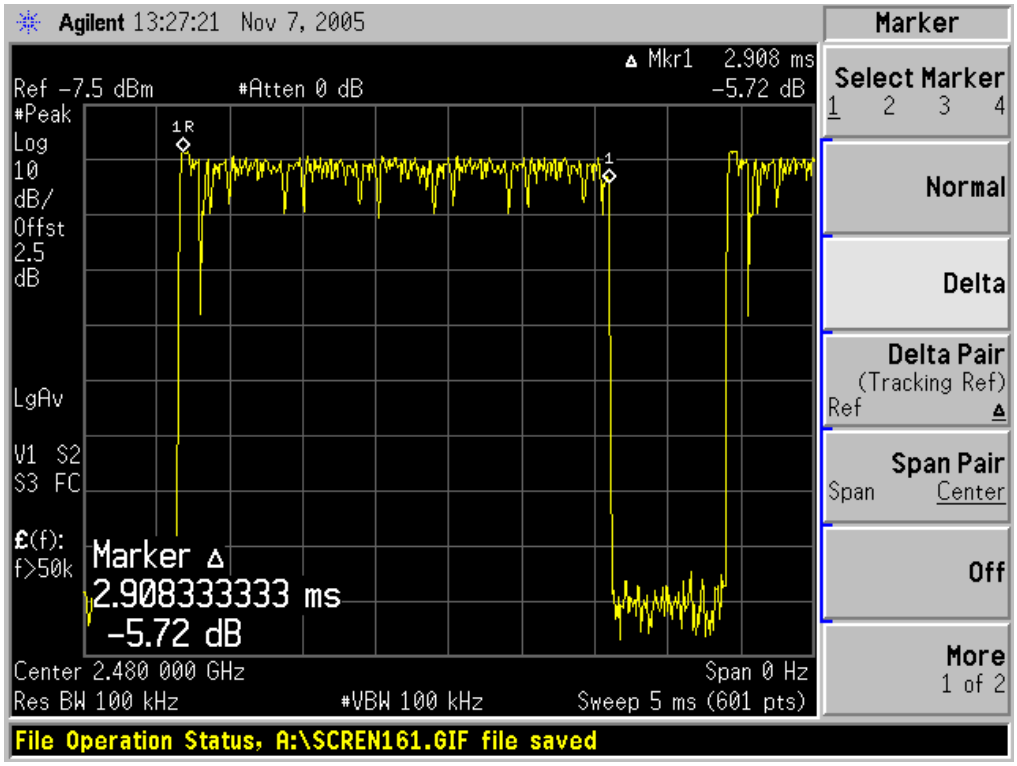
**(CH Low)**




**(CH Mid)**



**(CH High)**


Agilent 13:27:21 Nov 7, 2005
Marker
Mkr1 2.908 ms
Ref -7.5 dBm
#Atten 0 dB
-5.72 dB
#Peak
Log
10
dB/
Offst
2.5
dB
1R
1
LgAv
V1 S2
S3 FC
£(f):
f>50k
Marker Δ
2.908333333 ms
-5.72 dB
Center 2.480 000 GHz
Span 0 Hz
Res BW 100 kHz
#VBW 100 kHz
Sweep 5 ms (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN161.GIF file saved

# SPURIOUS EMISSIONS

## 7.7 Conducted Measurement

## LIMIT

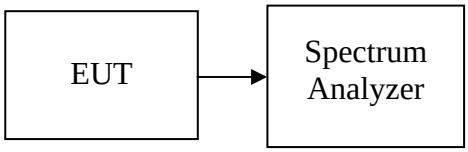
In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

## MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US44300399 | 02/06/2006 |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

**Test Configuration**




## TEST PROCEDURE

Conducted RF measurements of the transmitter output were made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 100 KHz. The video bandwidth is set to 100 KHz.

Measurements are made over the 30MHz to 26GHzrange with the transmitter set to the lowest, middle, and highest channels.

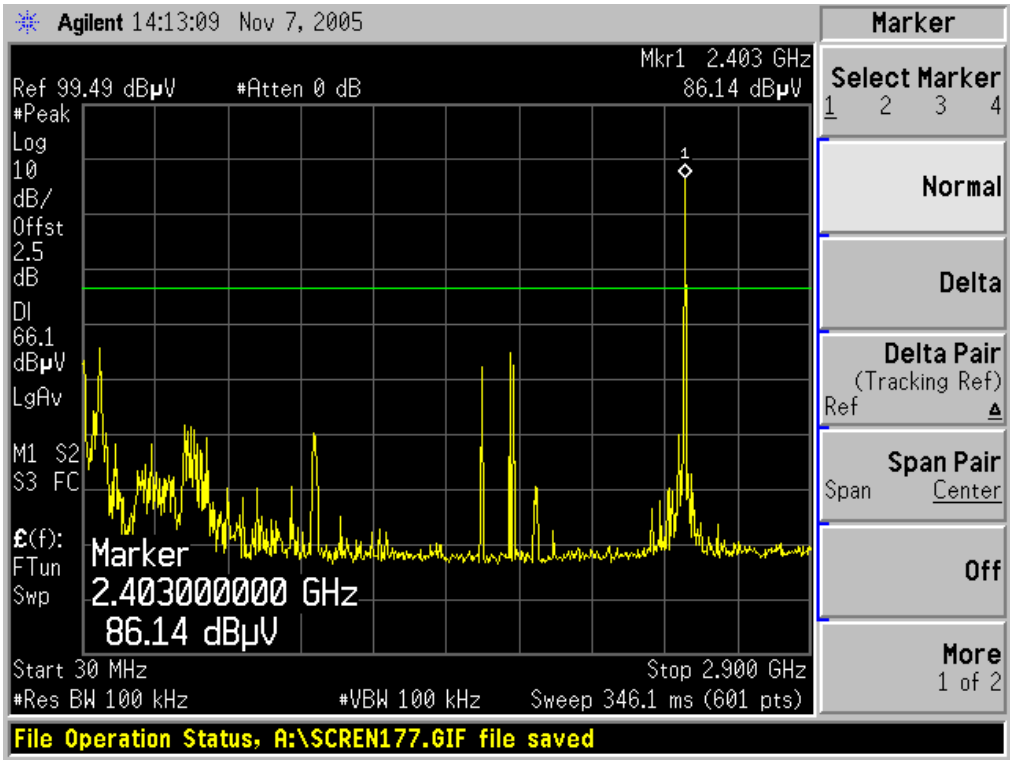
## TEST RESULTS

*No non-compliance noted*

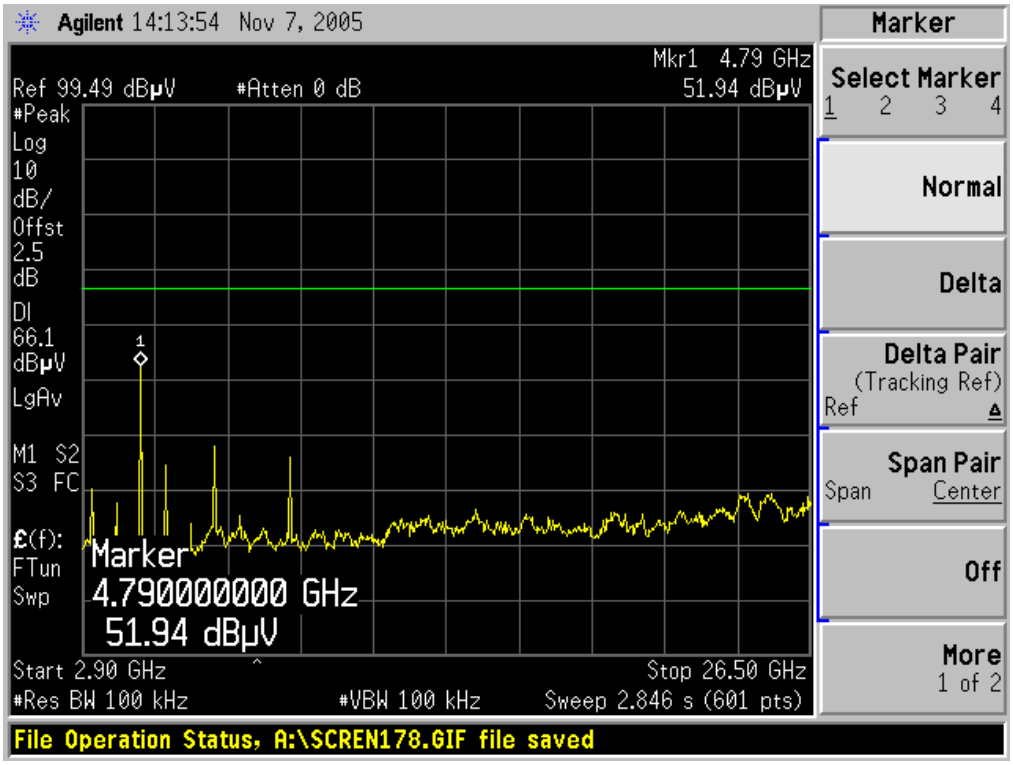
**Test Plot**

**CH Low**

**30MHz – 2.9GHz**

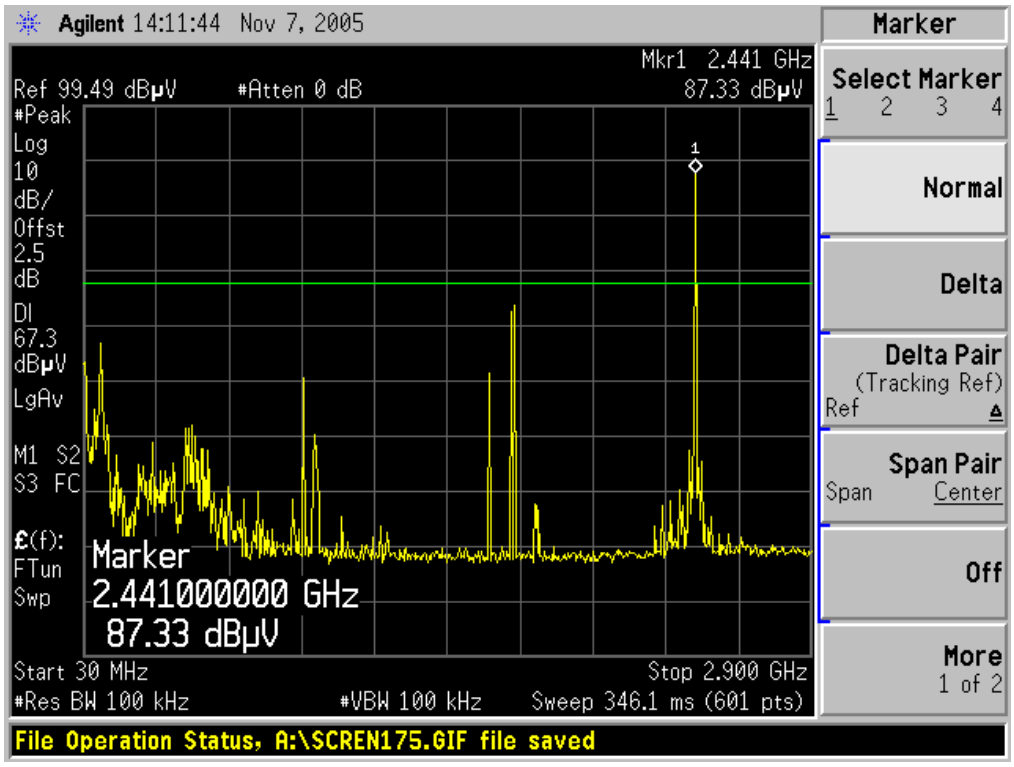



**2.9GHz – 26.5GHz**

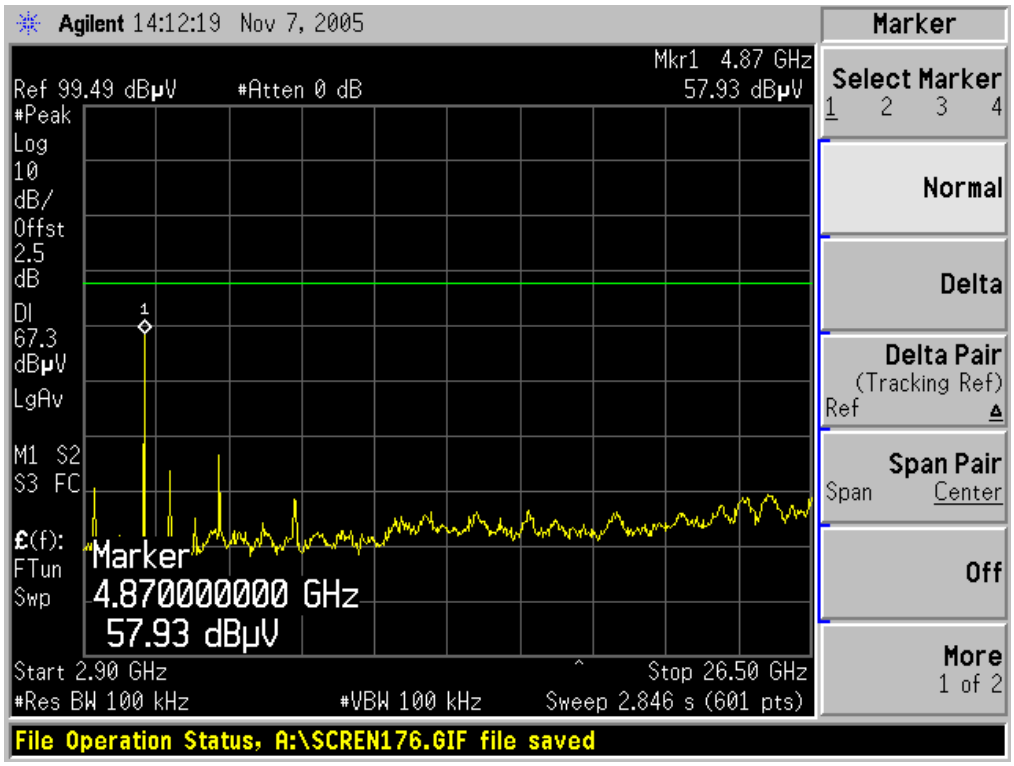


## CH Mid

### 30MHz – 2.9GHz

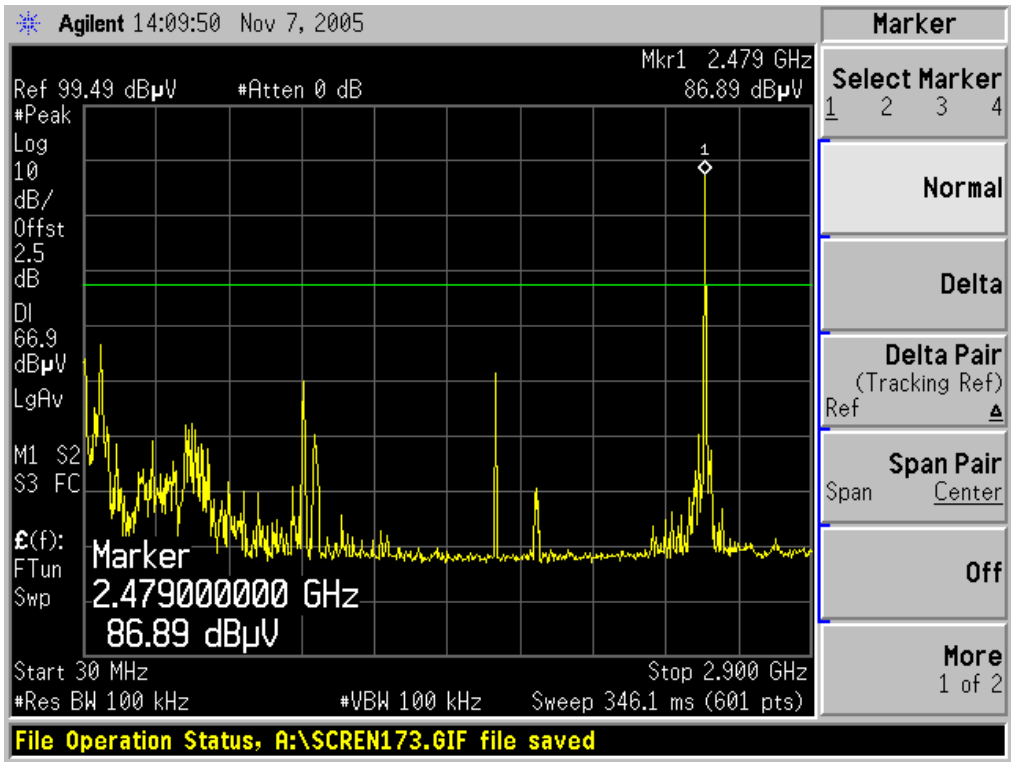



### 2.9GHz – 26.5GHz

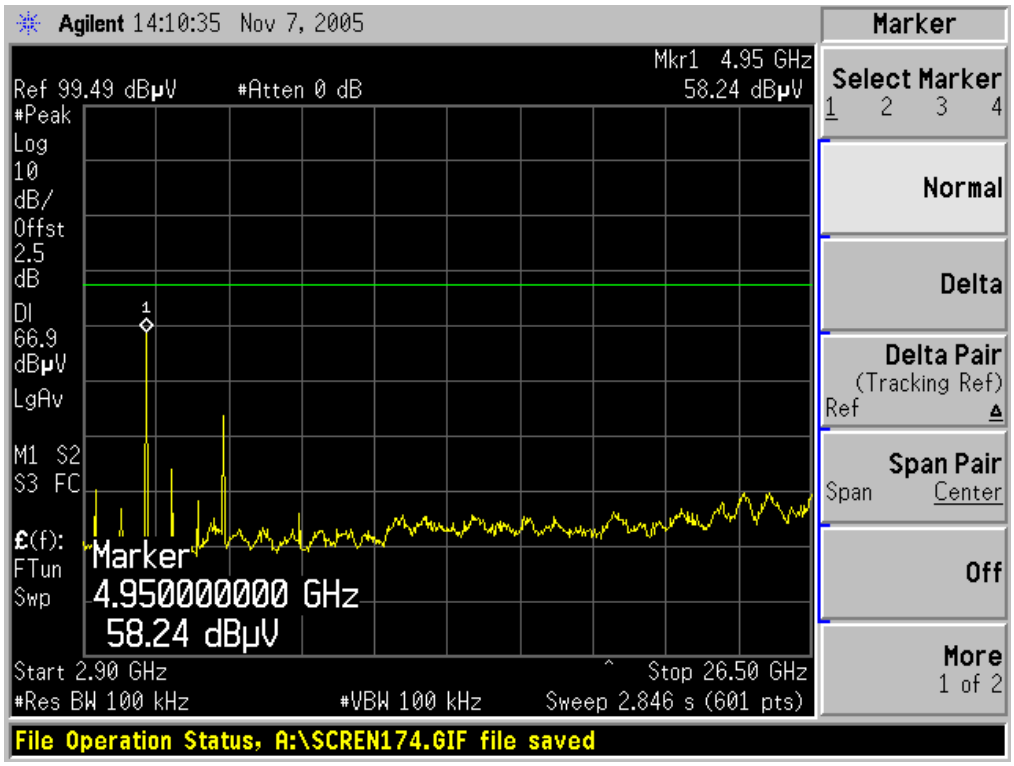


## CH High

### 30MHz – 2.9GHz




### 2.9GHz – 26.5GHz



## 7.7.2 Radiated Emissions

## LIMIT

1. Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

| Frequency (MHz) | Field Strength (mV/m) | Measurement Distance (m) |
|---|---|---|
| 30-88 | 100* | 3 |
| 88-216 | 150* | 3 |
| 216-960 | 200* | 3 |
| Above 960 | 500 | 3 |

***Note:*** *Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.*

2. In the above emission table, the tighter limit applies at the band edges.

| Frequency (Hz) | Field Strength (μV/m at 3-meter) | Field Strength (dBμV/m at 3-meter) |
|---|---|---|
| 30-88 | 100 | 40 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46 |
| Above 960 | 500 | 54 |

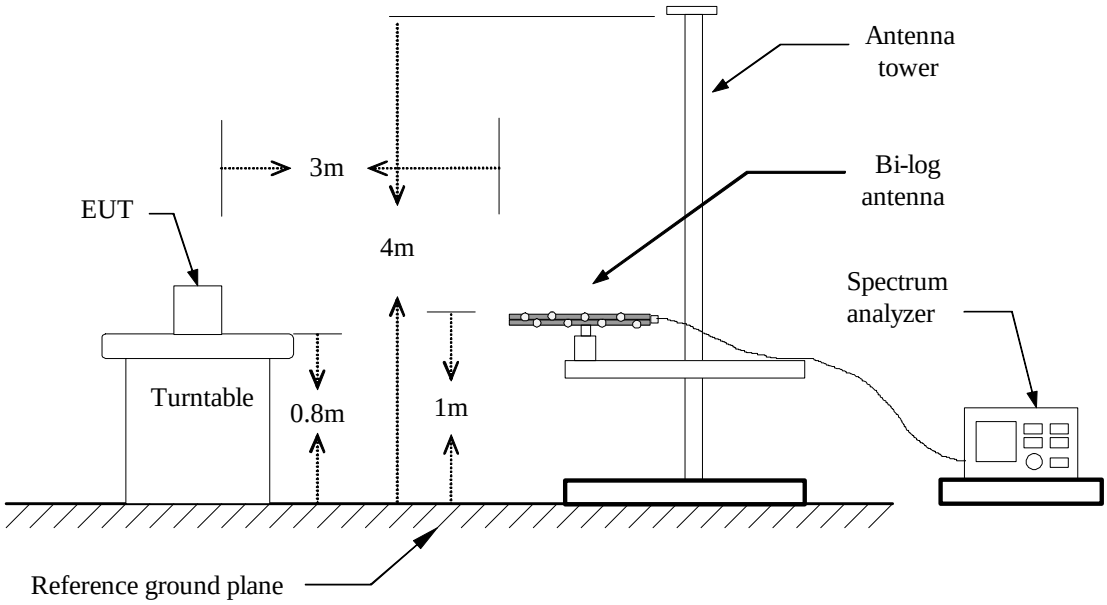
# MEASUREMENT EQUIPMENT USED

| RF CHAMBER II | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | Agilent | E4446A | US44300399 | 02/06/2006 |
| EMI Test Receiver | R&S | ESCI | 1166.595K03 | 01/13/2006 |
| Pre-Amplifier | MITEQ | N/A | AFS42-00102650 -42-10P-42 | 02/14/2006 |
| Bilog Antenna | EMCO | 3142C | 920250 | 06/09/2006 |
| Turn Table | EMCO | 2081-1.21 | N/A | N.C.R |
| Antenna Tower | CT | N/A | N/A | N.C.R |
| Controller | CT | N/A | N/A | N.C.R |
| RF Comm. Test set | HP | 8920B | US36142090 | N.C.R |
| Site NSA | C&C | N/A | N/A | 09/06/2006 |
| Horn Antenna | TRC | N/A | N/A | 03/04/2006 |

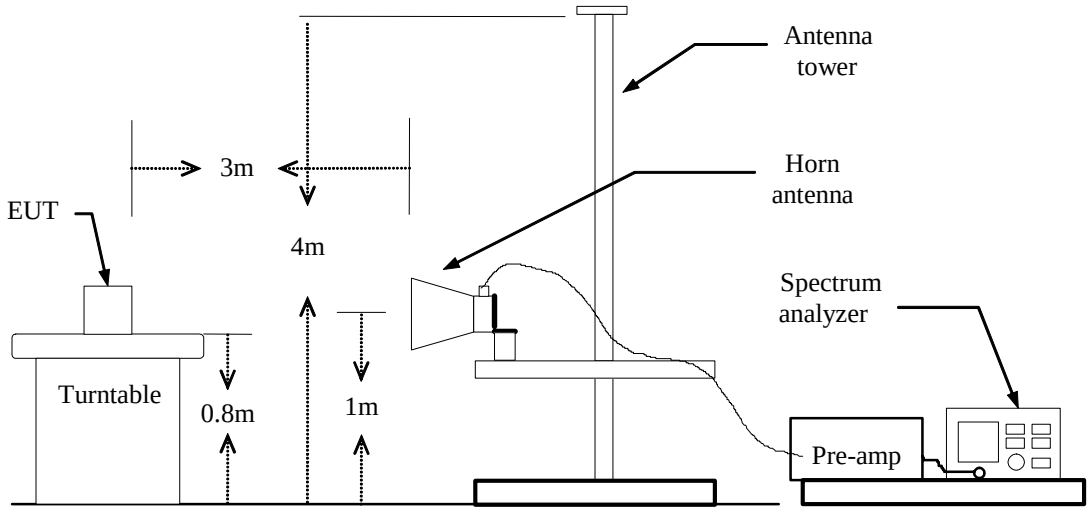
***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

## Test Configuration

**Below 1 GHz**



**Above 1 GHz**




## TEST PROCEDURE

1. The EUT is placed on a turntable, which is 0.8m above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Repeat above procedures until the measurements for all frequencies are complete.

# TEST RESULTS

## Below 1 GHz

**Operation Mode:** CH Low **Test Date:** November 03, 2005

**Temperature:** 20°C **Tested by:** Terry

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Freq. (MHz) | Ant.Pol. H/V | Detector Mode (PK/QP) | Reading (dBuV) | Factor (dB) | Actual FS (dBuV/m) | Limit 3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 121.80 | V | Peak | 26.62 | 12.34 | 38.96 | 43.50 | -4.54 |
| 167.70 | V | Peak | 23.65 | 10.90 | 34.55 | 43.50 | -8.95 |
| 235.87 | V | Peak | 22.27 | 9.61 | 31.88 | 46.00 | -14.12 |
| 443.50 | V | Peak | 21.72 | 15.80 | 37.52 | 46.00 | -8.48 |
| 515.25 | V | Peak | 20.14 | 20.95 | 41.09 | 46.00 | -4.91 |
| 671.00 | V | Peak | 15.70 | 27.11 | 42.81 | 46.00 | -3.19 |
| | | | | | | | |
| 96.15 | H | Peak | 28.50 | 10.72 | 39.22 | 43.50 | -4.28 |
| 156.90 | H | Peak | 26.68 | 11.94 | 38.62 | 43.50 | -4.88 |
| 239.92 | H | Peak | 28.68 | 12.45 | 41.13 | 46.00 | -4.87 |
| 335.00 | H | Peak | 19.44 | 19.65 | 39.09 | 46.00 | -6.91 |
| 455.75 | H | Peak | 22.24 | 18.86 | 41.10 | 46.00 | -4.90 |
| 503.00 | H | Peak | 20.55 | 20.53 | 41.08 | 46.00 | -4.92 |

***Notes:***

1. *Measuring frequencies from 30 MHz to the 1GHz.*
2. *Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*
3. *Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*
4. *The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.*

**Operation Mode:** CH Mid **Test Date:** November 03, 2005

**Temperature:** 20°C **Tested by:** Terry

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Freq. (MHz) | Ant.Pol. H/V | Detector Mode (PK/QP) | Reading (dBuV) | Factor (dB) | Actual FS (dBuV/m) | Limit 3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 119.77 | V | Peak | 26.59 | 12.45 | 39.04 | 43.50 | -4.46 |
| 167.70 | V | Peak | 23.89 | 10.90 | 34.79 | 43.50 | -8.71 |
| 303.50 | V | Peak | 23.92 | 12.73 | 36.66 | 46.00 | -9.34 |
| 443.50 | V | Peak | 21.81 | 15.80 | 37.61 | 46.00 | -8.39 |
| 515.25 | V | Peak | 20.01 | 20.95 | 40.96 | 46.00 | -5.04 |
| 671.00 | V | Peak | 16.25 | 27.11 | 43.36 | 46.00 | -2.64 |
| 100.20 | H | Peak | 28.41 | 12.34 | 40.75 | 43.50 | -2.75 |
| 162.97 | H | Peak | 28.45 | 12.33 | 40.78 | 43.50 | -2.72 |
| 239.92 | H | Peak | 28.83 | 12.45 | 41.28 | 46.00 | -4.72 |
| 319.25 | H | Peak | 23.00 | 20.42 | 43.42 | 46.00 | -2.58 |
| 503.00 | H | Peak | 21.87 | 20.53 | 42.40 | 46.00 | -3.60 |
| 599.25 | H | Peak | 20.97 | 22.75 | 43.72 | 46.00 | -2.28 |

***Notes:***

*1. Measuring frequencies from 30 MHz to the 1GHz.*

*2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*

*3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

*4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.*

**Operation Mode:** CH High **Test Date:** November 03, 2005

**Temperature:** 20°C **Tested by:** Terry

**Humidity:** 55 % RH **Polarity:** Ver. / Hor.

| Freq. (MHz) | Ant.Pol. H/V | Detector Mode (PK/QP) | Reading (dBuV) | Factor (dB) | Actual FS (dBuV/m) | Limit 3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 120.45 | V | Peak | 27.20 | 12.46 | 39.66 | 43.50 | -3.84 |
| 167.70 | V | Peak | 24.73 | 10.90 | 35.63 | 43.50 | -7.87 |
| 234.52 | V | Peak | 22.88 | 8.96 | 31.84 | 46.00 | -14.16 |
| 443.50 | V | Peak | 21.87 | 15.80 | 37.67 | 46.00 | -8.33 |
| 515.25 | V | Peak | 19.90 | 20.95 | 40.85 | 46.00 | -5.15 |
| 671.00 | V | Peak | 16.41 | 27.11 | 43.52 | 46.00 | -2.48 |
| | | | | | | | |
| 100.87 | H | Quasi-peak | 29.32 | 12.48 | 41.80 | 43.50 | -1.70 |
| 156.90 | H | Peak | 26.50 | 11.94 | 38.44 | 43.50 | -5.06 |
| 236.55 | H | Peak | 29.37 | 10.09 | 39.46 | 46.00 | -6.54 |
| 319.25 | H | Peak | 21.05 | 20.42 | 41.47 | 46.00 | -4.53 |
| 455.75 | H | Peak | 22.49 | 18.86 | 41.35 | 46.00 | -4.65 |
| 527.50 | H | Peak | 20.98 | 22.43 | 43.41 | 46.00 | -2.59 |

***Notes:***

*1. Measuring frequencies from 30 MHz to the 1GHz.*

*2. Radiated emissions measured in frequency range from 30 MHz to 1000MHz were made with an instrument using Peak detector mode.*

*3. Data of measurement within this frequency range shown " --- " in the table above means the reading of emissions are attenuated more than 20dB below the permissible limits or the field strength is too small to be measured.*

*4. The IF bandwidth of SPA between 30MHz to 1GHz was 100kHz.*

**Above 1 GHz**

**Operation Mode:** CH Low **Test Date:** November 03, 2005

**Temperature:** 20°C **Tested by:** Terry

**Humidity:** 60 % RH **Polarity:** Ver. / Hor.

| Freq. (MHz) | Ant. Pol H/V | Peak Reading (dBuV) | AV Reading (dBuV) | Ant. / CL CF (dB) | Actual Fs | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | | |
| 4800.00 | V | 21.53 | --- | 5.91 | 27.44 | --- | 74.00 | 54.00 | -46.56 | Peak |
| 7241.66 | V | 19.34 | --- | 13.06 | 32.40 | --- | 74.00 | 54.00 | -41.60 | Peak |
| N/A | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 1603.33 | H | 34.77 | --- | -0.88 | 33.89 | --- | 74.00 | 54.00 | -40.11 | Peak |
| 7225.00 | H | 19.16 | --- | 13.04 | 32.20 | --- | 74.00 | 54.00 | -41.80 | Peak |
| N/A | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

***Notes:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   *a. Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.*
   *b. AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.*

**Operation Mode:** CH Mid **Test Date:** November 03, 2005

**Temperature:** 20°C **Tested by:** Terry

**Humidity:** 60 % RH **Polarity:** Ver. / Hor.

| Freq. (MHz) | Ant. Pol H/V | Peak Reading (dBuV) | AV Reading (dBuV) | Ant. / CL CF (dB) | Actual Fs | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | | |
| 4883.33 | V | 22.74 | --- | 6.76 | 29.50 | --- | 74.00 | 54.00 | -44.50 | Peak |
| 7366.66 | V | 19.39 | --- | 13.13 | 32.52 | --- | 74.00 | 54.00 | -41.48 | Peak |
| N/A | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 1626.66 | H | 32.69 | --- | -0.86 | 31.83 | --- | 74.00 | 54.00 | -42.17 | Peak |
| 7158.33 | H | 18.80 | --- | 13.04 | 31.84 | --- | 74.00 | 54.00 | -42.16 | Peak |
| N/A | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

***Notes:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   a. *Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.*
   b. *AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.*

**Operation Mode:** CH High **Test Date:** November 03, 2005

**Temperature:** 20°C **Tested by:** Terry

**Humidity:** 60 % RH **Polarity:** Ver. / Hor.

| Freq. (MHz) | Ant. Pol H/V | Peak Reading (dBuV) | AV Reading (dBuV) | Ant. / CL CF (dB) | Actual Fs | | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Peak (dBuV/m) | AV (dBuV/m) | | | | |
| 4958.33 | V | 24.07 | --- | 7.52 | 31.59 | --- | 74.00 | 54.00 | -42.41 | Peak |
| 7416.66 | V | 19.39 | --- | 13.02 | 32.41 | --- | 74.00 | 54.00 | -41.59 | Peak |
| N/A | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| 1653.33 | H | 34.09 | --- | -0.83 | 33.26 | --- | 74.00 | 54.00 | -40.74 | Peak |
| 7383.33 | H | 19.39 | --- | 13.14 | 32.53 | --- | 74.00 | 54.00 | -41.47 | Peak |
| N/A | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |

***Notes:***

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *Measurements above show only up to 6 maximum emissions noted, or would be lesser if no specific emissions from the EUT are recorded (ie: margin>20dB from the applicable limit) and considered that's already beyond the background noise floor.*
3. *Radiated emissions measured in frequency above 1000MHz were made with an instrument using Peak detector mode and average detector mode of the emission shown in Actual FS column.*
4. *Spectrum setting:*
   a. *Peak Setting 1GHz - 26GHz, RBW = 1MHz, VBW = 1MHz, Sweep time = 200 ms.*
   b. *AV Setting 1GH z- 26GHz, RBW = 1MHz, VBW = 10Hz, Sweep time = 200 ms.*

# 7.8 POWERLINE CONDUCTED EMISSIONS

## LIMIT

For an intentional radiator which 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 250 microvolts (The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz). The limits at specific frequency range is listed as follows:

| Frequency Range (MHz) | Limits (dBμV) | |
|---|---|---|
| | Quasi-peak | Average |
| 0.15 to 0.50 | 66 to 56 | 56 to 46 |
| 0.50 to 5 | 56 | 46 |
| 5 to 30 | 60 | 50 |

Compliance with this provision shall be based on the measurement of the radio frequency voltage between each power line (LINE and NEUTRAL) and ground at the power terminals.

## MEASUREMENT EQUIPMENT USED

| Conducted Emission Test Site G | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | ADVANTEST | R3132 | 120901472 | 06/09/2006 |
| EMI Test Receiver | SCHAFFNER | SCR3501 | 401 | 02/26/2006 |
| LISN | EMCO | 3825/2 | 1371 | 02/26/2006 |
| LISN | EMCO | 3825/2 | 8901-1459 | 02/26/2006 |

***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

### Test Configuration

See test photographs attached in Appendix 1 for the actual connections between EUT and support equipment.

## TEST PROCEDURE

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete.

## TEST RESULTS

The initial step in collecting conducted data is a spectrum analyzer peak scan of the measurement range. Significant peaks are then marked as shown on the following data page, and these signals are then quasi-peaked.

| | | | |
|---|---|---|---|
| **Operation Mode:** | Normal | **Test Date:** | November 03, 2005 |
| **Temperature:** | 22°C | **Humidity:** | 67% RH |
| **Tested by:** | Terry | | |

| FREQ MHz | PEAK RAW dBuV | Q.P. RAW dBuV | AVG RAW dBuV | Q.P. Limit dBuV | AVG Limit dBuV | Q.P. Margin dB | AVG Margin dB | NOTE |
|---|---|---|---|---|---|---|---|---|
| 0.357 | 45.05 | --- | --- | 60.07 | 50.07 | --- | -5.02 | L1 |
| 0.594 | 40.83 | --- | --- | 56.00 | 46.00 | --- | -5.17 | L1 |
| 1.492 | 40.41 | --- | --- | 56.00 | 46.00 | --- | -5.59 | L1 |
| 11.899 | 32.01 | --- | --- | 60.00 | 50.00 | --- | -17.99 | L1 |
| 17.895 | 39.82 | --- | --- | 60.00 | 50.00 | --- | -10.18 | L1 |
| 21.695 | 36.66 | --- | --- | 60.00 | 50.00 | --- | -13.34 | L1 |
| | | | | | | | | |
| 0.357 | 43.29 | --- | --- | 60.07 | 50.07 | --- | -6.78 | L2 |
| 0.565 | 39.31 | --- | --- | 56.00 | 46.00 | --- | -6.69 | L2 |
| 1.614 | 38.53 | --- | --- | 56.00 | 46.00 | --- | -7.47 | L2 |
| 2.561 | 35.02 | --- | --- | 56.00 | 46.00 | --- | -10.98 | L2 |
| 17.895 | 37.60 | --- | --- | 60.00 | 50.00 | --- | -12.40 | L2 |
| 21.679 | 33.34 | --- | --- | 60.00 | 50.00 | --- | -16.66 | L2 |

***Note:***

1. *The measuring frequencies range between 0.15 MHz and 30 MHz.*
2. *The emissions measured in the frequency range between 0.15 MHz and 30MHz were made with an instrument using Quasi-peak detector and Average detector.*
3. *"---" denotes the emission level was or more than 2dB below the Average limit, and no re-check was made.*
4. *The IF bandwidth of SPA between 0.15MHz and 30MHz was 10KHz. The IF bandwidth of Test Receiver between 0.15MHz and 30MHz was 9KHz.*
5. *L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

# APPENDIX 1
# PHOTOGRPHS OF TEST SETUP

## Radiated Emission Set up Photos

# Conducted Emission Set Up Photos