**FCC 47 CFR PART 15 SUBPART E**

# TEST REPORT

**For**

**Tatung Company**

**Tablet PC**

**Model No.: TATUNG: TTAB-B12D /
Electrovaya: SC 2000, SC 2010 /
RM: RTAB912-T01**

**Trade Name: TATUNG / Electrovaya / RM**

*Prepared for*

**TATUNG COMPANY
22 Chungshan N. Rd., 3 Sec.,
Taipei,Taiwan, 104, R.O.C.**

*Prepared by*

**Compliance Certification Services Inc.
No. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang,
Taoyuan Hsien, (338) Taiwan, R.O.C.
TEL: 886-3-324-0332
FAX: 886-3-324-5235**

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ILAC MRA

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# 1. TEST RESULT CERTIFICATION

| | |
|---|---|
| **Applicant:** | Tatung Company<br>22 Chungshan N. Rd., 3 Sec.,<br>Taipei, Taiwan, 104, R.O.C. |
| **Equipment Under Test:** | Tablet PC |
| **Trade Name:** | TATUNG / Electrovaya / RM |
| **Model No.:** | TATUNG: TTAB-B12D /<br>Electrovaya: SC 2000, SC 2010 /<br>RM: RTAB912-T01 |
| **Model Difference:** | All the above Models are same except the model designation |
| **Report Number:** | B30814207-RP |
| **Date of Test:** | August 18 ~ 24, 2003 |

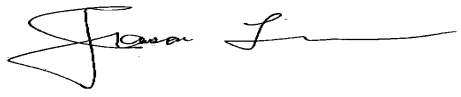
| APPLICABLE STANDARDS | |
|---|---|
| **STANDARD** | **TEST RESULT** |
| FCC Part 15 Subpart E | No non-compliance noted |

## We hereby certify that:

Compliance Certification Services Inc. tested the above equipment. 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 (1992) 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 15.407.

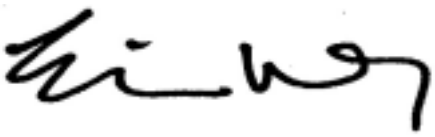
The test results of this report relate only to the tested sample identified in this report.

***Approved by:***



***Jonson Lee***
***Director of Linkou Laboratory***
***Compliance Certification Services Inc.***

***Reviewed by:***



***Eric Wong***
***Section Manager***
***Compliance Certification Services Inc.***

# 2. EUT DESCRIPTION

| | |
|---|---|
| **Product** | Tablet PC |
| **Trade Name** | TATUNG / Electrovaya/ RM |
| **Model No.** | TATUNG: TTAB-B12D /<br>Electrovaya: SC 2000, SC 2010 /<br>RM: RTAB912-T01 |
| **Model Difference** | All the above Models are same except the model designation |
| **Power Supply** | HIPRO / HP-OD042D031<br>Input: AC 100~240V, 1.2A, 50-60Hz<br>Output: DC 12V, 3.5mA |
| **Frequency Range** | 801.11a: 5.15 ~ 5.35GHz<br>801.11b: 2412 ~ 2462 MHz |
| **Transmit Power** | 801.11a: 14.32dBm<br>801.11b: 16.05 dBm |
| **Modulation Technique** | 801.11a: OFDM<br>801.11b: DSSS (CCK; DQPSK; DBPSK) |
| **Transmitting Speed** | 801.11a: 54 Mbps<br>801.11b: 11, 5, 5, 2, 1 Mbps |
| **Number of Channels** | 801.11a: Up to 8 non-overlapping Channels<br>801.11b: Up to 14 Channels |
| **Antenna Designation** | PIFA Antenna<br>Embedded non-user changeable, two provided.<br>Tx and Rx Diversity |
| **Antenna Board No.** | Main antenna (Gray color) P/N: 5773700051<br>AUX antenna (Block color) P/N: 5773700050 |

**Operation Frequency:**

| UNLICENSED NATIONAL INFORMATION INFRASTRUCTURE (U-NII) | |
|---|---|
| **CHANNEL** | **MHz** |
| 1 | 5180 |
| 2 | 5200 |
| 3 | 5220 |
| 4 | 5240 |
| 5 | 5260 |
| 6 | 5280 |
| 7 | 5300 |
| 8 | 5320 |

***Note:*** *This submittal(s) (test report) is intended for FCC ID: BJM-TTABB12DA filing to comply with Section 15.407 of the FCC Part 15, Subpart E Rules. The composite system (digital device) is in compliance with Subpart B authorized under a DoC procedure.*
***Note:*** *The 5.2 GHz U-NII band is applicable to this report; another bands of operation (2.4 GHz) is documented in a separate report.*

# 3. TEST METHODOLOGY

Both conducted and radiated testing was performed according to the procedures in ANSI C63.4-1992. Radiated testing was performed at an antenna to EUT distance 3 meters.

## 3.1 EUT CONFIGURATION

The EUT configuration for testing is installed for RF field strength measurement to meet the Commissions requirement, and is operated in a manner intended to generate the maximum emission in a continuous normal application.

## 3.2 EUT EXERCISE

The EUT (Tablet PC) is operated in the engineering mode to fix the Tx frequency for the purposes of measurement.

According to its specifications, the EUT must comply with the requirements of Section 15.407 under the FCC Rules Part 15 Subpart E. The composite system (Digital device) is in compliance with Subpart B authorized under the DoC procedure.

## 3.3 GENERAL TEST PROCEDURES

**Conducted Emissions**

The EUT is placed on the turntable, which is positioned at 0.8 m above the ground plane. According to the requirements in Section 13.1.4.1 of ANSI C63.4-1992, the conducted emission from the EUT is measured in the frequency range between 0.15 MHz and 30MHz, using the CISPR Quasi-Peak detector mode.

**Radiated Emissions**

The EUT is placed on the turntable, which is 0.8 m above the ground plane. The turntable is then rotated for 360 degrees to determine the proper orientation for the maximum emission level. The EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission level. And, each emission is to be maximized by changing the horizontal and vertical polarization of the receiving antenna. In order to find out the maximum emission level, the relative positions of the EUT was rotated in each of the three orthogonal axes, according to the requirements in Section 13.1.4.1 of ANSI C63.4-1992.

## 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 the operating condition.

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

Channel 1 (5180MHz), Channel 5 (5240MHz) and Channel 8 (5320MHz), which give the highest data rate of 54Mbps, 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. 81-1, Lane 210, Bade Rd. 2, Luchu Hsiang, Taoyuan Hsien, Taiwan, R.O.C.

☐ No. 199, Chunghsen Road, Hsintien City, Taipei Hsien, Taiwan, R.O.C.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4-1992 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: 200600-0 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 (Registration no: 93105 and 90471).

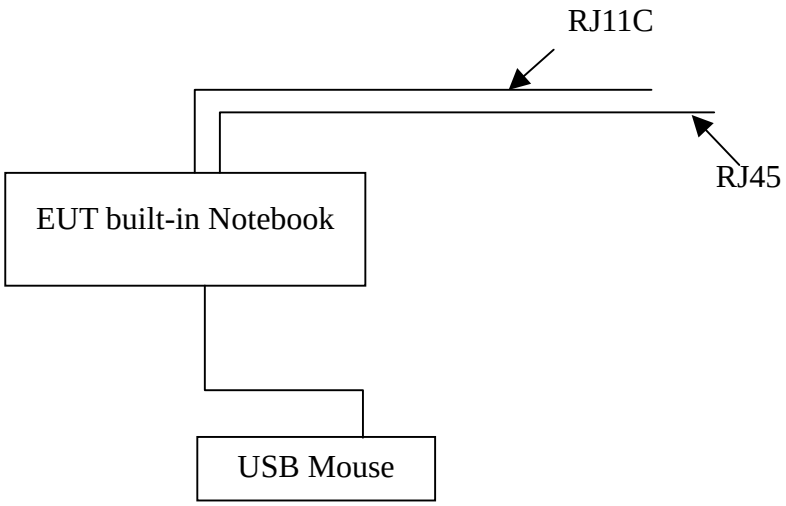
## 5.4 TABLE OF ACCREDITATIONS AND LISTINGS

| Country | Agency | Scope of Accreditation | Logo |
|---|---|---|---|
| USA | NVLAP* | EN 55011, EN 55014-1, AS/NZS 1044, CNS 13783-1, EN 55022, CNS 13438, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, FCC OST/MP-5, AS/NZS 3548IEC 61000-4-2, IEC 61000-4-3, IEC 61000-4-4, IEC 61000-4-5, IEC 61000-4-6, IEC 61000-4-8, IEC 61000-4-11 | NVLAP® 200600-0 |
| USA | FCC | 3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements | FC 93105, 90471 |
| Japan | VCCI | 4 3/10 meter Open Area Test Sites to perform conducted/radiated measurements | VCCI R-393/1066/725/879 C-402/747/912 |
| Norway | NEMKO | EN 50081-1/2, EN 50082-1/2, IEC 61000-6-1/2, EN 50091-2, EN 50130-4, EN 55011, EN 55013, EN 55014-1/2, EN 55015, EN 55022, EN 55024, EN 61000-3-2/3, EN 61326-1, IEC 61000-4-2/3/4/5/6/8/11, EN 60601-1-2, EN 300 328-2, EN 300 422-2, EN 301 419-1, EN 301 489-01/03/07/08/09/17, EN 301 419-2/3, EN 300 454-2, EN 301 357-2 | N ELA 124a ELA 124b ELA 124c |
| Taiwan | CNLA | EN 300 328-1, EN 300 328-2, EN 300 220-1, EN 300 220-2, EN 300 220-3, 47 CFR FCC Part 15 Subpart C, EN 61000-3-2, EN 61000-3-3, CNS 13439, CNS 13783-1, CNS 14115, CNS 13438, AS/NZS 3548, CNS 13022-1, IEC 1000-4-3/4/5/6/8/11, CNS 13022-2/3 | CNLA 0363 ILAC MRA |
| Taiwan | BSMI | CNS 13438, CNS 13783-1, CNS 13439, CNS 14115 | SL2-IS-E-0014 SL2-IN-E-0014 SL2-A1-E-0014 SL2-R1-E-0014 SL2-R2-E-0014 SL2-L1-E-0014 |
| Canada | Industry Canada | RSS212, Issue 1 | Canada IC 3991-3 IC 3991-4 |

** No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.*

# 6. SETUP OF EQUIPMENT UNDER TEST

## 6.1 SETUP CONFIGURATION OF EUT




## 6.2 SUPPORT EQUIPMENT

| Device Type | Brand | Model | FCC ID | Series No. | Data Cable | Power Cord |
|---|---|---|---|---|---|---|
| USB Mouse | Logitech | M-CAA43 | FCC DoC | PHB02400489 | N/A | Unshielded, 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 REQUIREMENTS

## 7.1 BAND EDGES MEASUREMENT

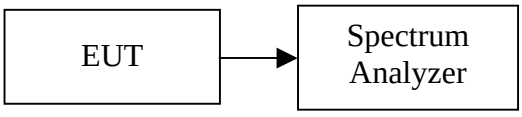
## LIMIT

According to §15.407(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 | US42510252 | 04/27/2004 |
| Spectrum Analyzer | R&S | FSP30 | 1093.4495.30 | 07/22/2004 |
| Low loss cable | Huber + Suhner | Sucoflex 104 | N/A | N/A |

## TEST CONFIGURATION




## TEST PROCEDURE

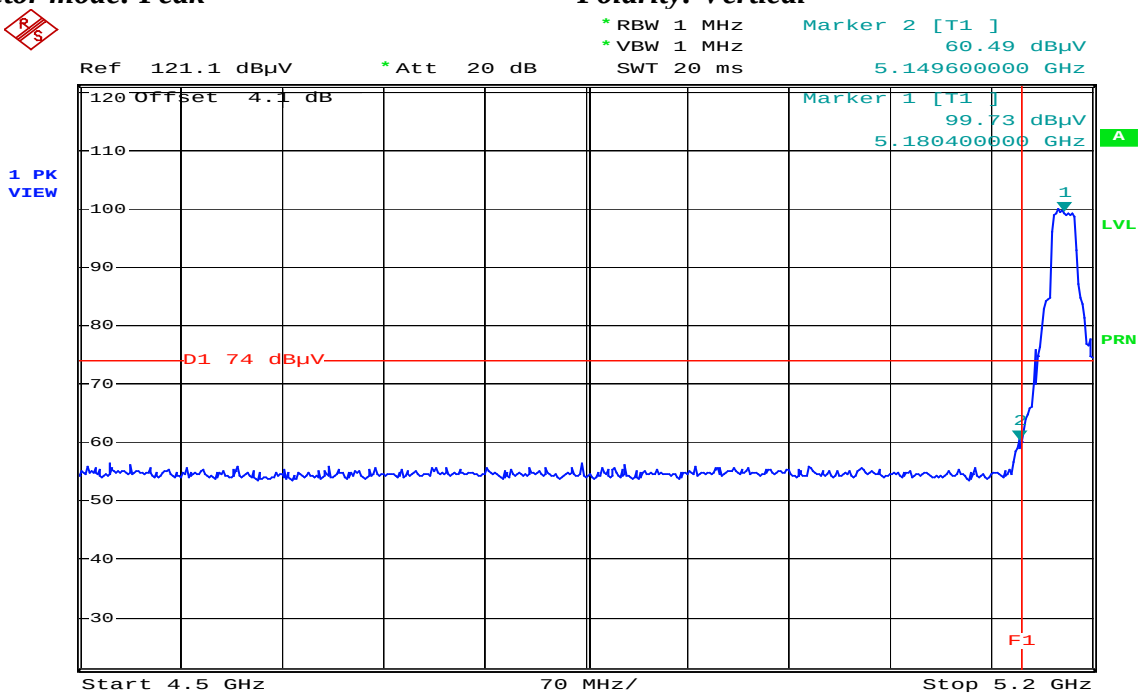
1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the 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.

# Band Edges (CH-Low)

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

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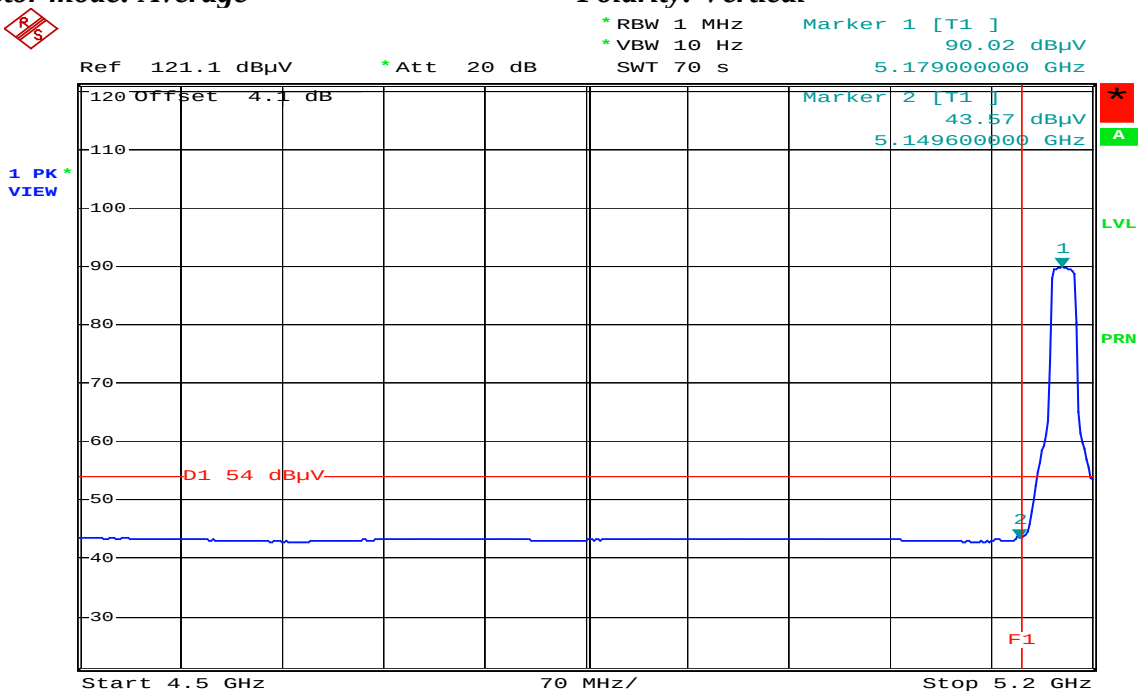
***Detector mode: Average*** ***Polarity: Vertical***

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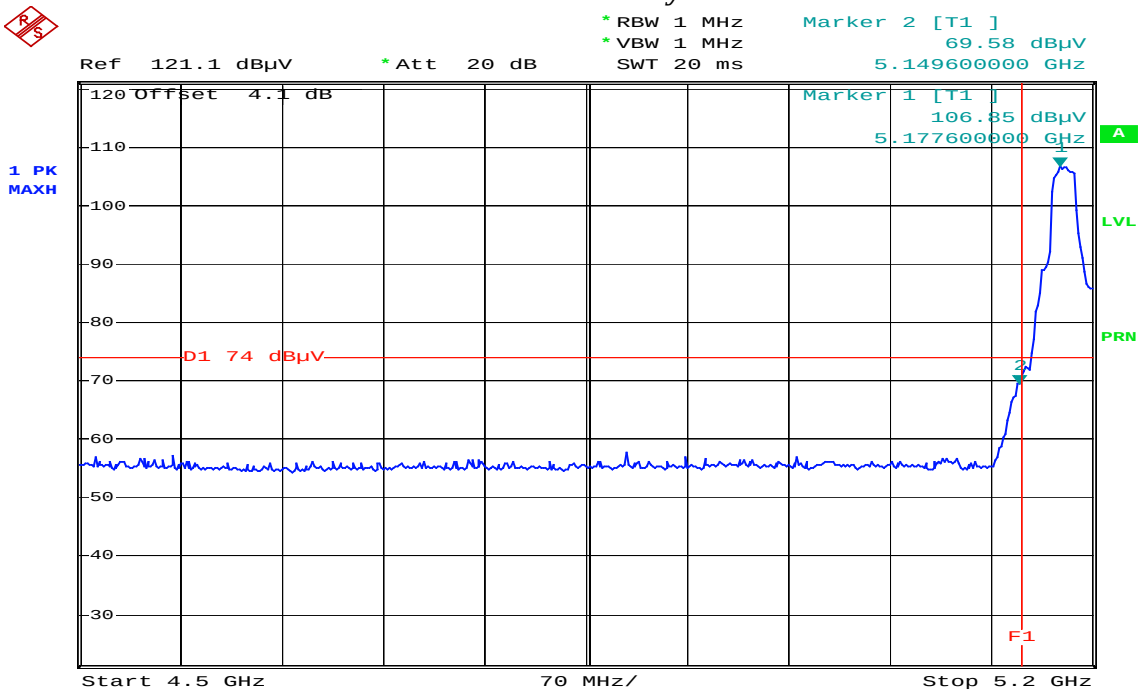
***Detector mode: Peak*** ***Polarity: Horizontal***

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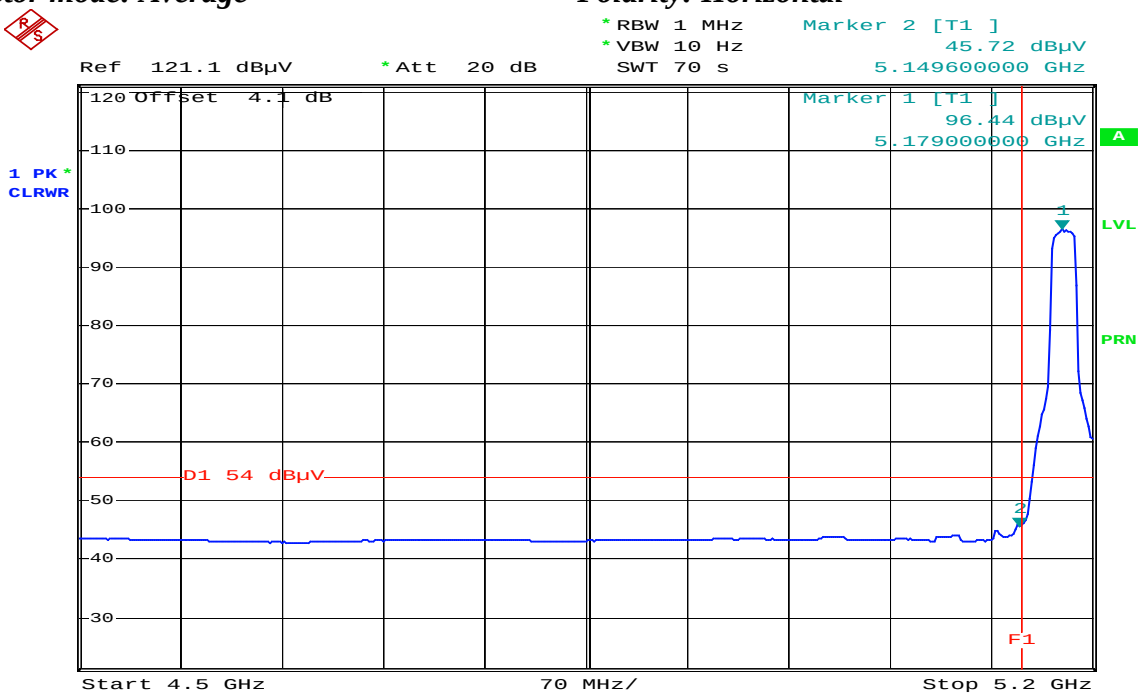
***Detector mode: Average*** ***Polarity: Horizontal***

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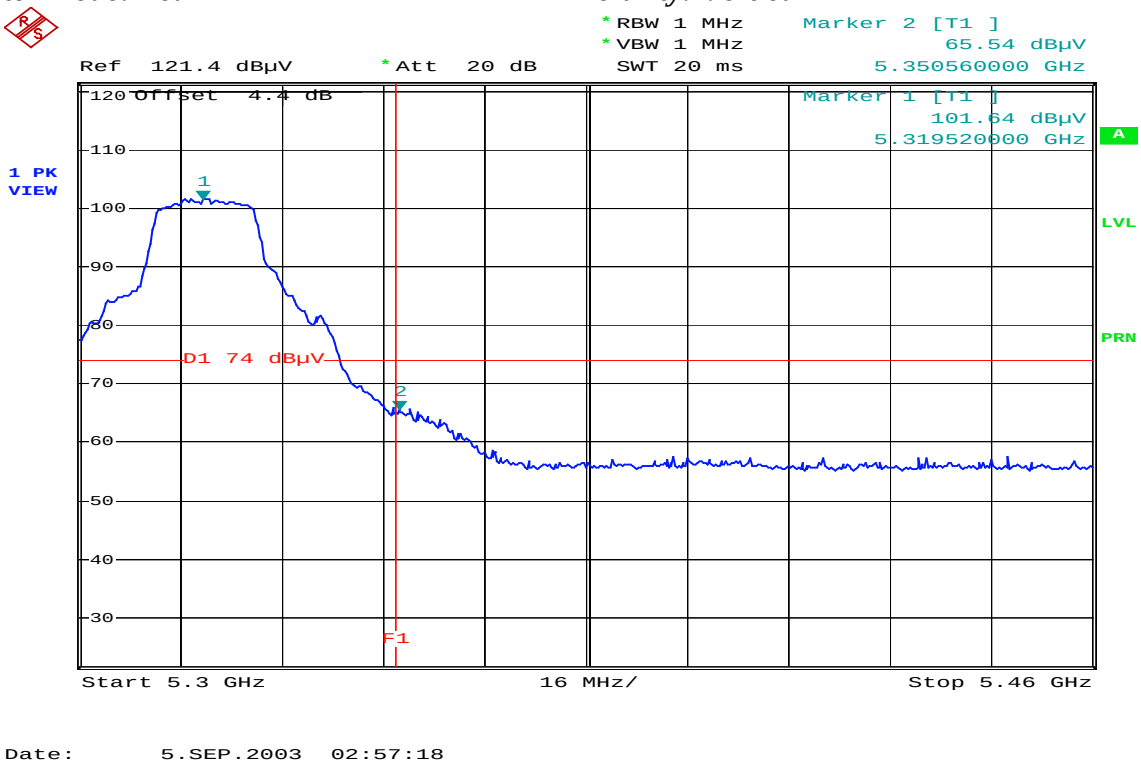
## Band Edges (CH-High)

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

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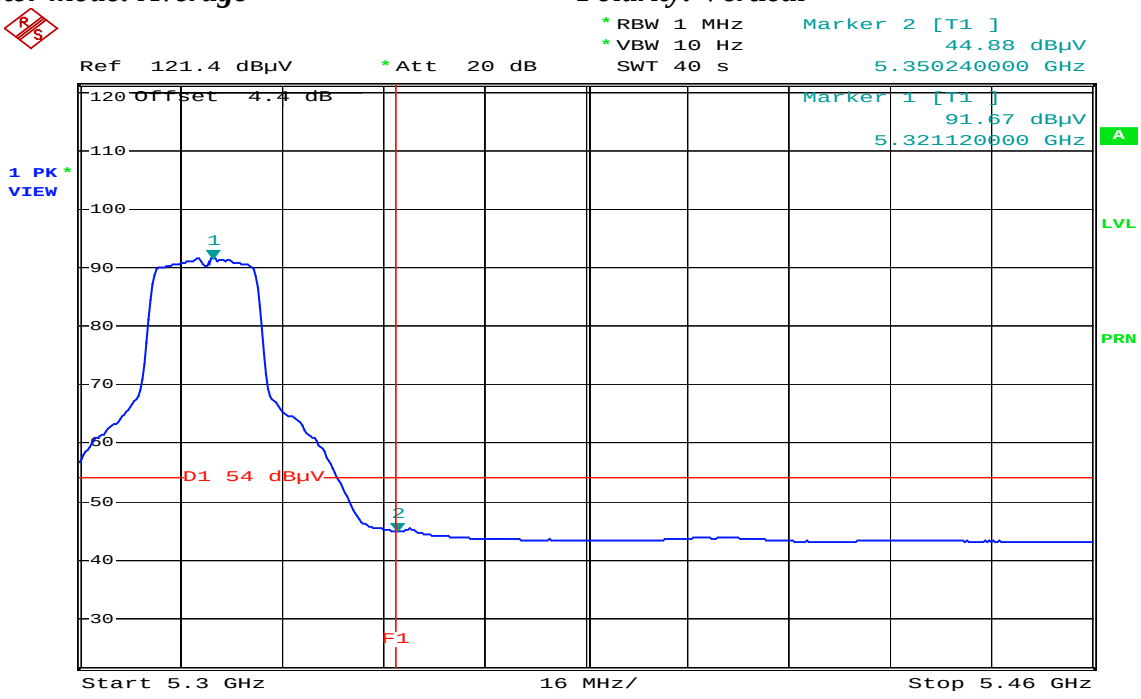
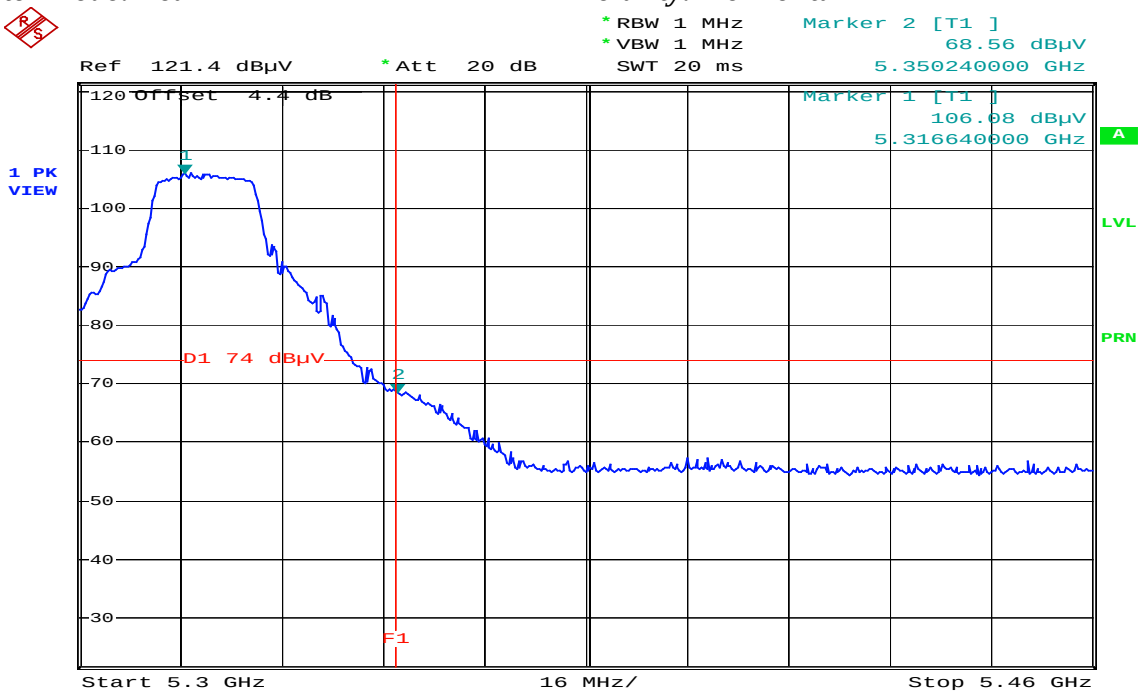
***Detector mode: Average*** ***Polarity: Vertical***



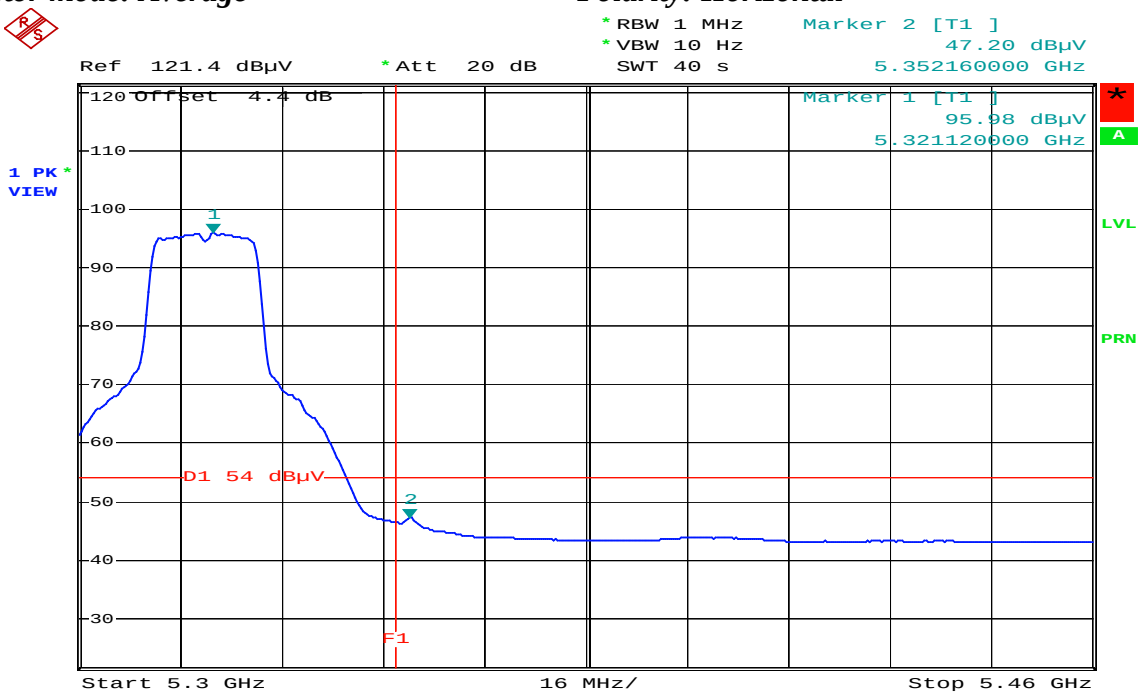

Date: 5.SEP.2003 02:45:59

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




Date: 5.SEP.2003 03:02:35

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




Date: 5.SEP.2003 03:04:04

## 7.2 POWERLINE CONDUCTED EMISSION (15.207)

### 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 (*Live Line* and *Neutral Line*) and ground at the power terminals.

### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| EMI Test Receiver | R&S | ESCS30 | 847793/012 | 12/20/2003 |
| LISN | R&S | ESH2-Z5 | 843285/010 | 12/15/2003 |
| LISN | EMCO | 3825/2 | 9003-1628 | 07/25/2004 |
| Spectrum Analyzer | ADVANTEST | R3261A | 91720031 | N/A |
| 2X2 WIRE ISN | R&S | ENY22 | 100020 | 06/19/2004 |
| FOUR WIRE ISN | R&S | ENY41 | 100006 | 06/19/2004 |

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

## TEST CONFIGURATION

1. The conducted emission tests were performed in the test site, using the setup in accordance with the ANSI C63.4-1992.
2. The EUT was plug-in the host PC via USB port. The host PC system was placed on the center of the back edge on the test table. The peripherals like modem, monitor printer, K/B, and mouse were placed on the side of the host PC system. The rear of the EUT and peripherals were placed flushed with the rear of the tabletop.
3. The keyboard was placed directly in the front of the monitor, flushed with the front tabletop. The mouse was placed next to the Keyboard, flushed with the back of keyboard.
4. The spacing between the peripherals was 10 centimeters.
5. External I/O cables were draped along the edge of the test table and bundle when necessary.
6. The host PC system was connected with 110Vac/60Hz power source.

*The EUT is set to transmit in a continuous mode.*

## 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:** | Tx + Rx mode | **Test Date:** | August 21, 2003 |
| **Temperature:** | 25°C | **Tested by:** | Jacky |
| **Humidity:** | 70 % RH | | |

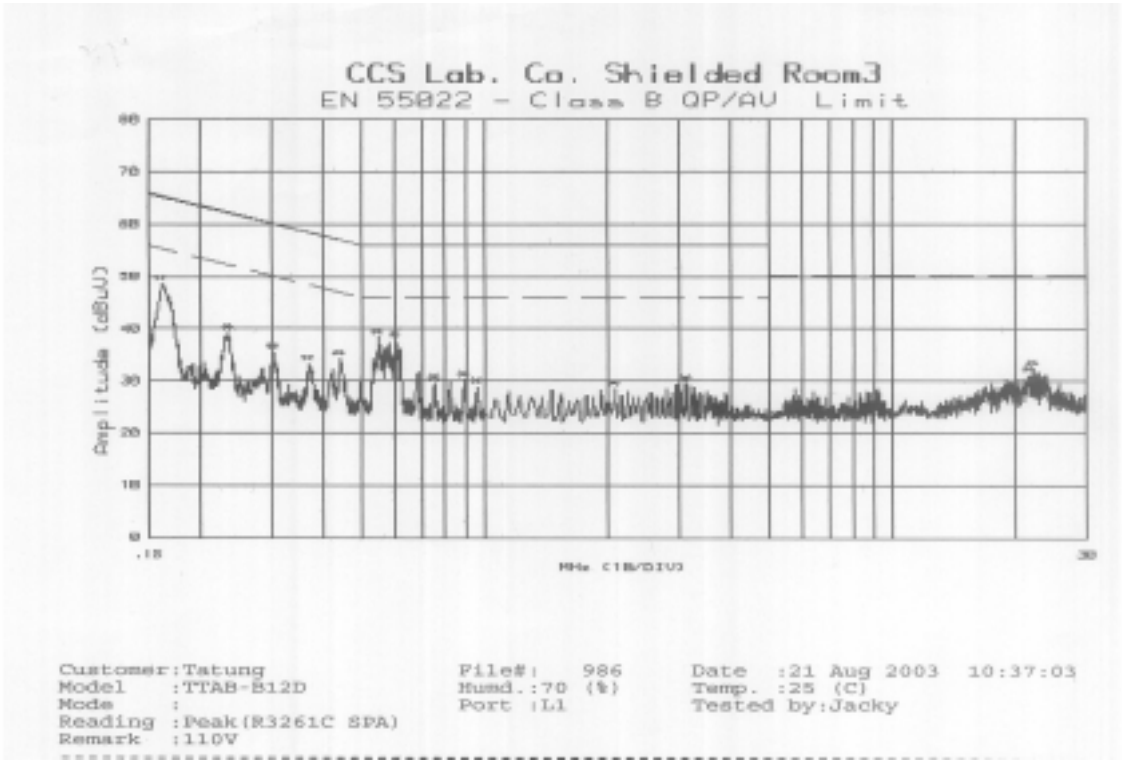
| FREQ MHz | P.K. Raw dBuV | Q.P. Raw dBuV | AVG Raw dBuV | Q.P. Limit dBuV | AVG Limit dBuV | Q.P. Margin dB | AVG Margin dB | NOTE |
|---|---|---|---|---|---|---|---|---|
| 0.162 | 48.60 | 40.30 | --- | 65.40 | 55.40 | -25.10 | --- | L1 |
| 0.236 | 39.20 | 38.20 | --- | 62.30 | 52.30 | -24.10 | --- | L1 |
| 0.303 | 35.40 | 36.70 | --- | 60.20 | 50.20 | -23.50 | --- | L1 |
| 0.370 | 33.20 | 30.40 | --- | 58.50 | 48.50 | -28.10 | --- | L1 |
| 0.442 | 34.20 | 38.10 | --- | 57.00 | 47.00 | -18.90 | --- | L1 |
| 0.550 | 38.40 | 37.30 | --- | 56.00 | 46.00 | -18.70 | --- | L1 |
| | | | | | | | | |
| 0.164 | 48.40 | 40.10 | --- | 65.30 | 55.30 | -25.20 | --- | L2 |
| 0.233 | 37.00 | 37.70 | --- | 62.40 | 52.40 | -24.70 | --- | L2 |
| 0.303 | 33.20 | 36.40 | --- | 60.20 | 50.20 | -23.80 | --- | L2 |
| 0.422 | 32.40 | 30.10 | --- | 57.40 | 47.40 | -27.30 | --- | L2 |
| 0.447 | 31.80 | 37.80 | --- | 56.90 | 46.90 | -19.10 | --- | L2 |
| 0.576 | 38.40 | 37.10 | --- | 56.00 | 46.00 | -18.90 | --- | L2 |

***Note:***

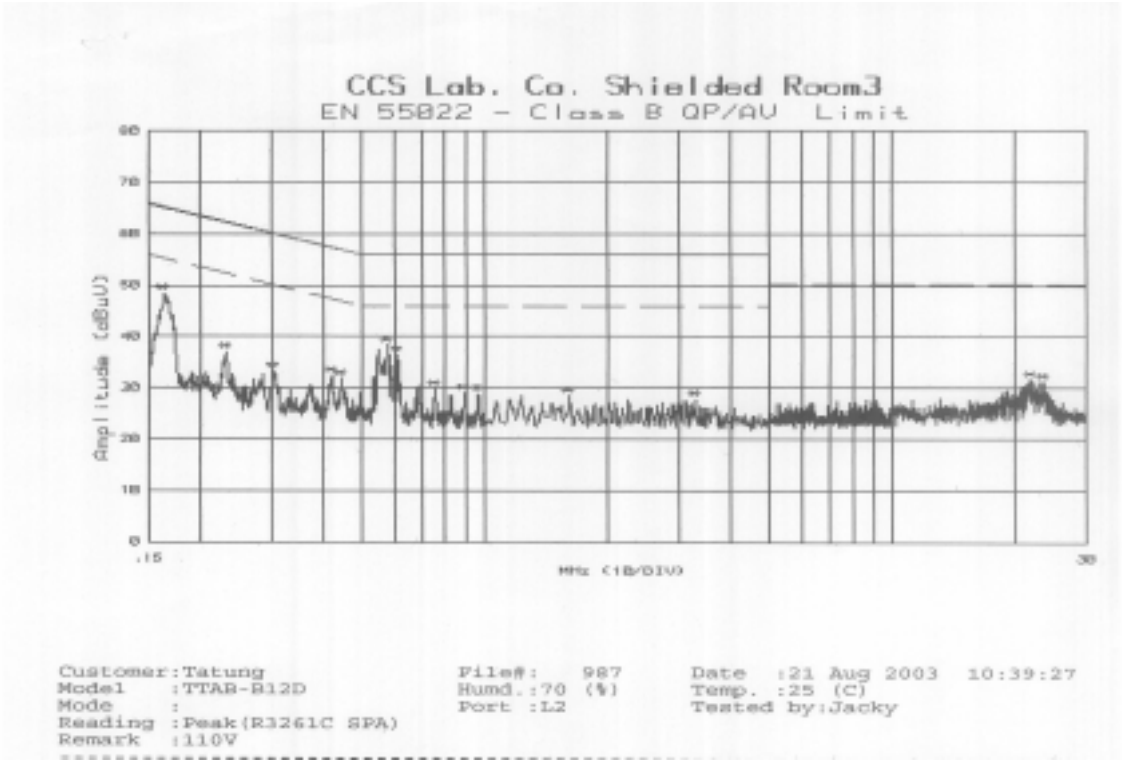
1. *Measuring frequencies from 0.15 MHz to 30MHz.*
2. *The emissions measured in frequency range from 0.15 MHz to 30MHz were made with an instrument using Quasi-Peak detector and Average detector.*
3. *"---" denotes the emission level was or more than 2dB below the Average limit*
4. *The IF bandwidth of SPA between 0.15MHz to 30MHz was 10KHz; the IF bandwidth of Test Receiver between 0.15MHz to 30MHz was 9KHz;*
5. *L1 = Line One (Live Line) / L2 = Line Two (Neutral Line)*

# Test Data Plots

***Conducted emissions (Line 1)***




***Conducted emissions (Line 2)***



## 7.3 26 dB EMISSION BANDWITH (15.403)

### LIMIT

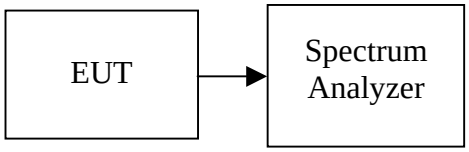
For purposes of this subpart, the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 04/27/2004 |
| Low Loss Cable | Huber + Suhner | Sucoflex 104 | N/A | N/A |

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

### TEST CONFIGURATION




### TEST PROCEDURE

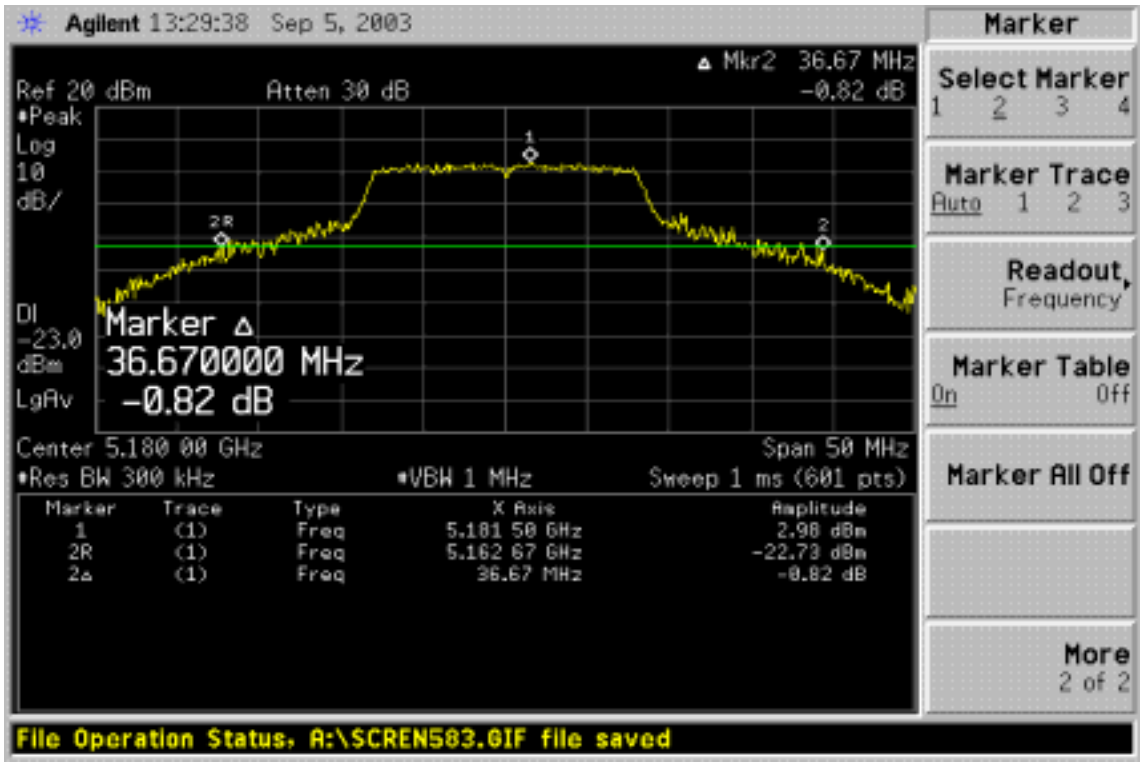
1. Place the EUT on the table and set it in the transmitting mode.
2. Remove the antenna from the EUT and then connect a low-loss RF cable from the antenna port to the spectrum analyzer.
3. Set the spectrum analyzer as RBW = 1%EBW, VBW = RBW, Span = 50MHz / 100MHz (Turbo Mode), and Sweep = auto.
4. Mark the peak frequency and –26dBc (upper and lower) frequency.
5. Repeat until all the rest channels were investigated.

### TEST RESULTS

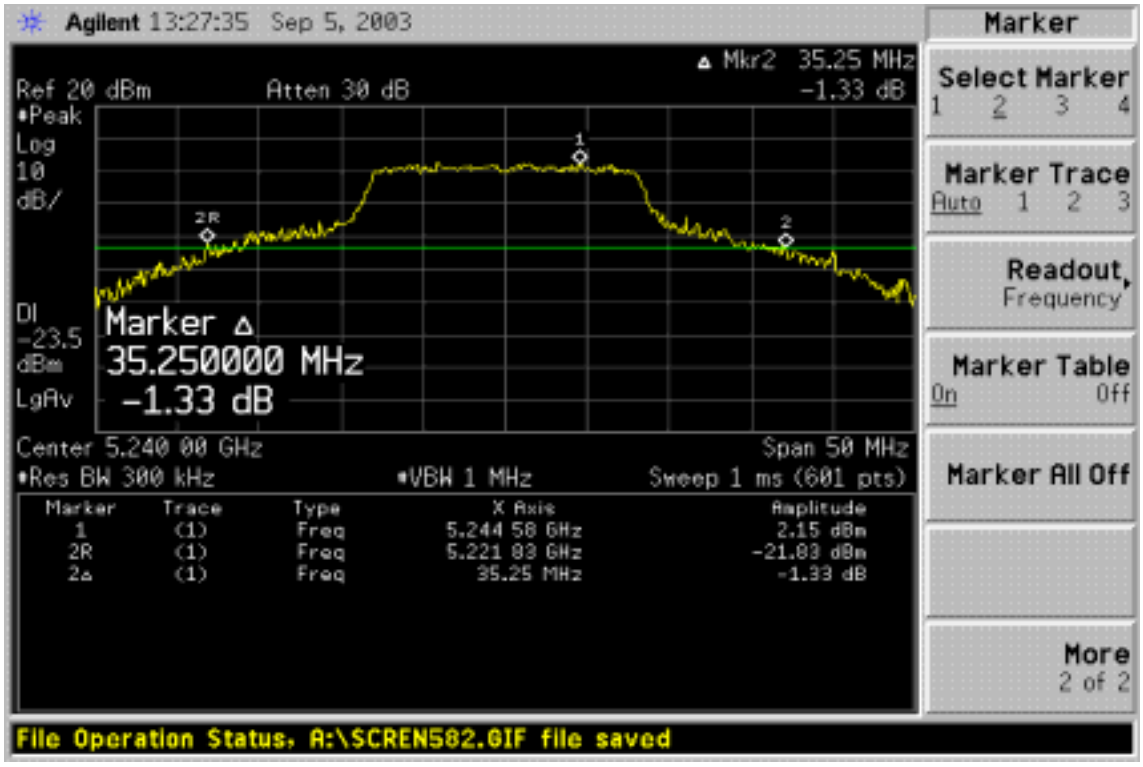
| Channel | Frequency (MHz) | Bandwidth (B) (MHz) |
|---|---|---|
| Low | 5180 | 36.67 |
| Mid | 5240 | 35.25 |
| High | 5320 | 36.17 |

# Test Plot

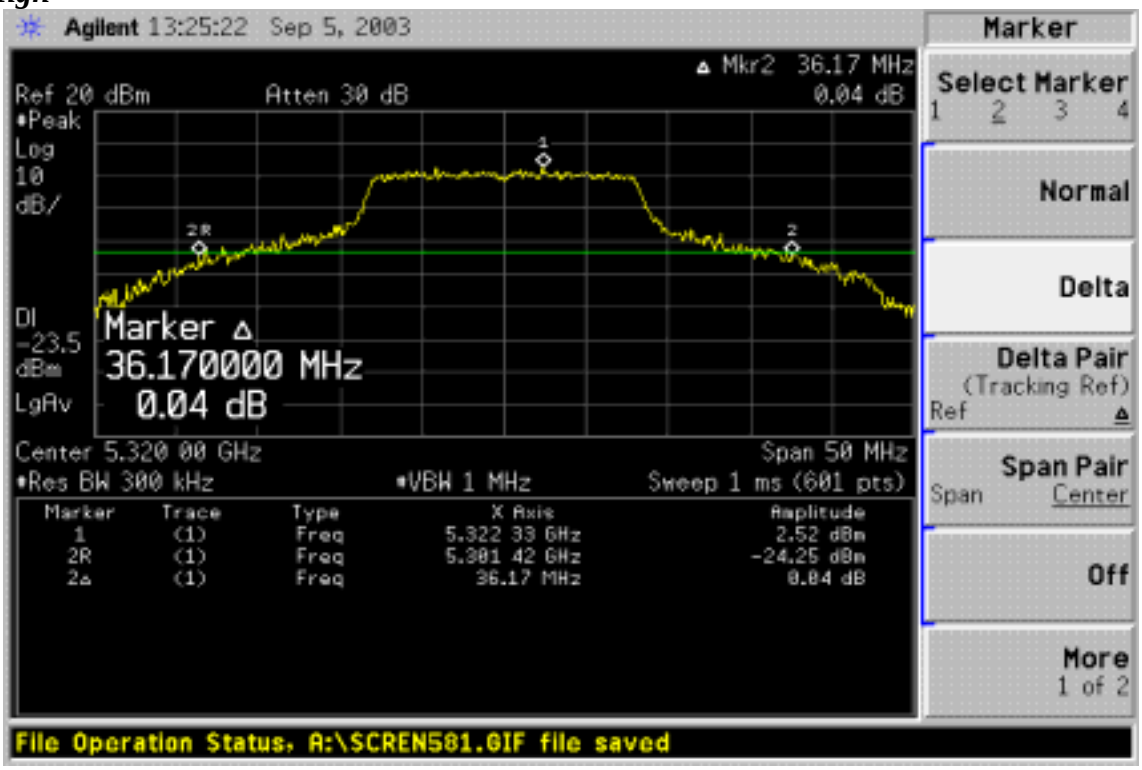
***CH Low***




***CH Mid***



***CH High***


Agilent 13:25:22 Sep 5, 2003
Ref 20 dBm
Atten 30 dB
Mkr2 36.17 MHz
0.04 dB
#Peak
Log
10
dB/
Marker Δ
36.170000 MHz
0.04 dB
Center 5.320 00 GHz
Span 50 MHz
#Res BW 300 kHz
#VBW 1 MHz
Sweep 1 ms (601 pts)
Marker Trace Type X Axis Amplitude
1 (1) Freq 5.322 33 GHz 2.52 dBm
2R (1) Freq 5.301 42 GHz -24.25 dBm
2Δ (1) Freq 36.17 MHz 0.04 dB
Marker
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:\SCREN501.GIF file saved

## 7.4 PEAK POWER (15.407)

## LIMIT

- For the band 5.15-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50mW (17dBm) or 4dBm + 10log B, where B is the 26dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4dBm in any 1 MHz band.
- For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250mW (24dBm) or 11dBm + 10logB, where B is the 26dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11dBm in any 1 MHz band.
- For the band 5.725-5.825 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 1mW (30dBm) or 17dBm + 10logB, where B is the 26dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 17dBm in any 1 MHz band.

*If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.* The peak power shall not exceeded the limit as follows:

**Specified Limit of the Peak Power**

| Channel | Frequency (MHz) | 10 Log B (dB) | 4 + 10 Log B or 11 + 10 Log B (dBm) | Power Limit (dBm) |
|---|---|---|---|---|
| Low | 5180 | 14.8 | 18.8 | 17 |
| Middle | 5240 | 15.51 | 26.51 | 17 |
| High | 5320 | 14.73 | 25.73 | 24 |

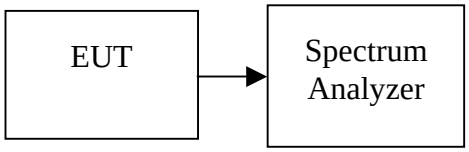
*(Note: Maximum antenna gain = 1.68dBi, therefore there is no reduction due to antenna gain.)*

## MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 04/27/2004 |
| Low Loss Cable | Huber + Suhner | Sucoflex 104 | N/A | N/A |

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

## TEST CONFIGURATION




*The EUT was connected to a spectrum analyzer through a 50Ω RF cable.*

## TEST PROCEDURE

Set span to encompass the entire emission bandwidth (EBW) of the signal.

Set RBW = 1 MHz / Set VBW = 3 MHz.

Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode. Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to "free run". Trace average 100 traces in power averaging mode. Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer's band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

## TEST RESULTS

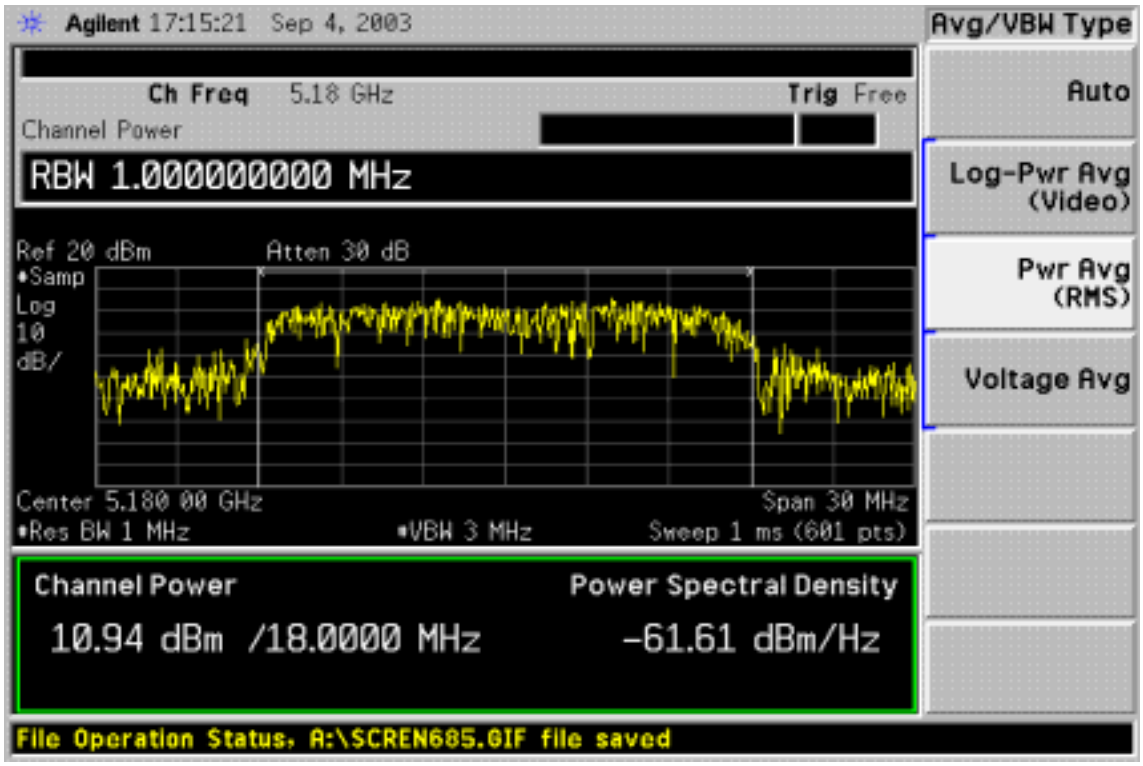
*No non-compliance noted*

## TEST DATA

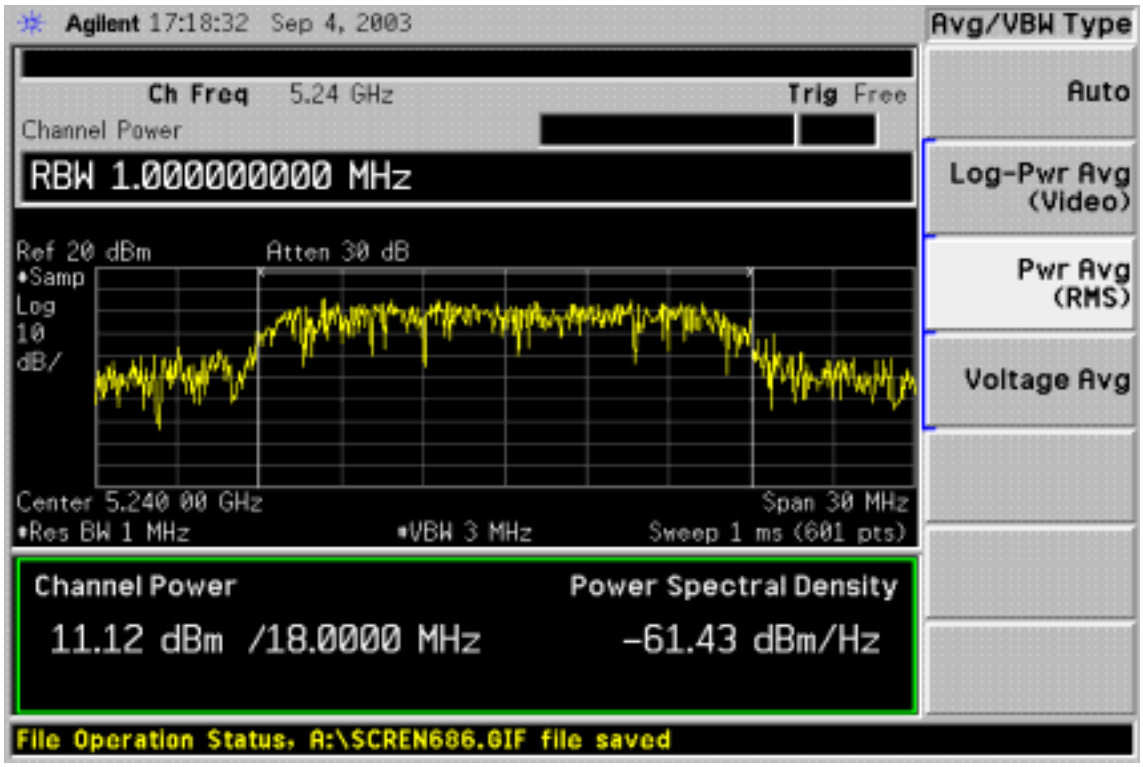
| Channel | Frequency (MHz) | Reading (dBm) | Cable Loss (dB) | Output Power (dBm) | Limit (dBm) |
|---|---|---|---|---|---|
| Low | 5180 | 10.94 | 3.20 | 14.14 | 17 |
| Mid | 5240 | 11.12 | 3.20 | 14.32 | 17 |
| High | 5320 | 11.04 | 3.20 | 14.24 | 24 |

## Test Plot

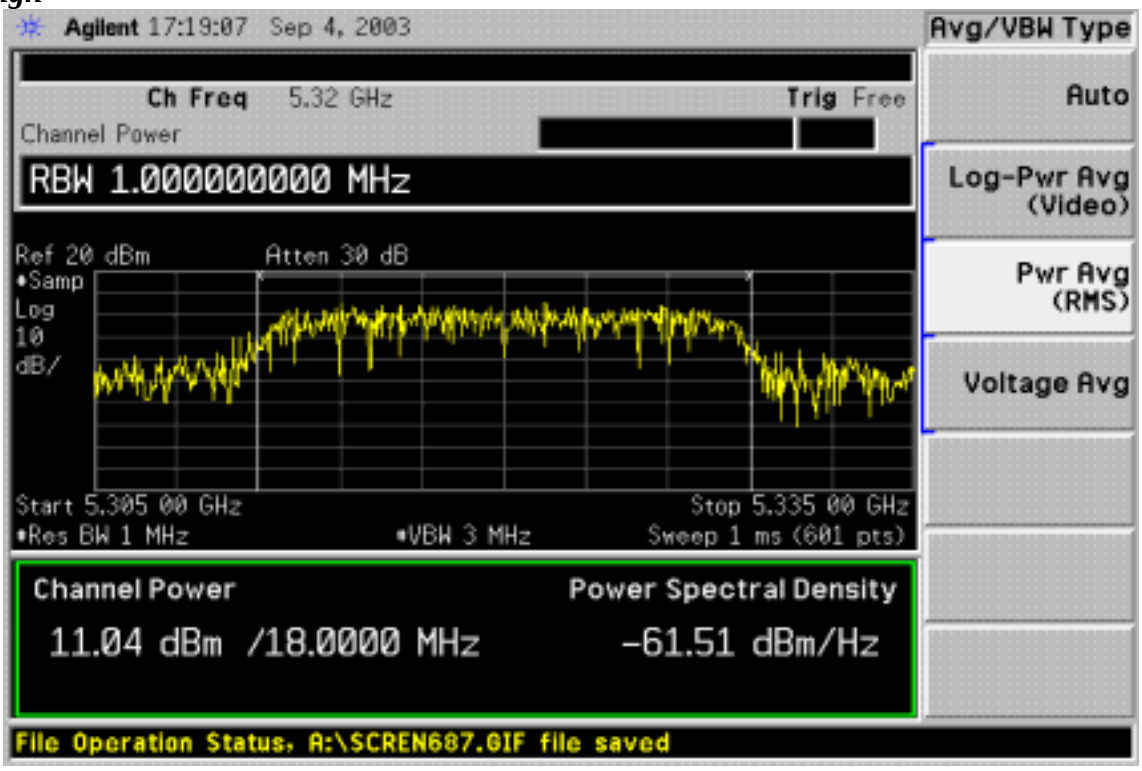
***Ch Low***




***Ch Mid***



***Ch High***


Agilent 17:19:07 Sep 4, 2003
Ch Freq 5.32 GHz
Trig Free
Channel Power
RBW 1.000000000 MHz
Ref 20 dBm
Atten 30 dB
•Samp
Log
10
dB/
Start 5.305 00 GHz
Stop 5.335 00 GHz
•Res BW 1 MHz
•VBW 3 MHz
Sweep 1 ms (601 pts)
Channel Power
11.04 dBm /18.0000 MHz
Power Spectral Density
-61.51 dBm/Hz
File Operation Status, A:\SCREN687.GIF file saved
Avg/VBW Type
Auto
Log-Pwr Avg (Video)
Pwr Avg (RMS)
Voltage Avg

## 7.5 PEAK POWER SPECTRAL DENSITY (15.407)

### LIMIT

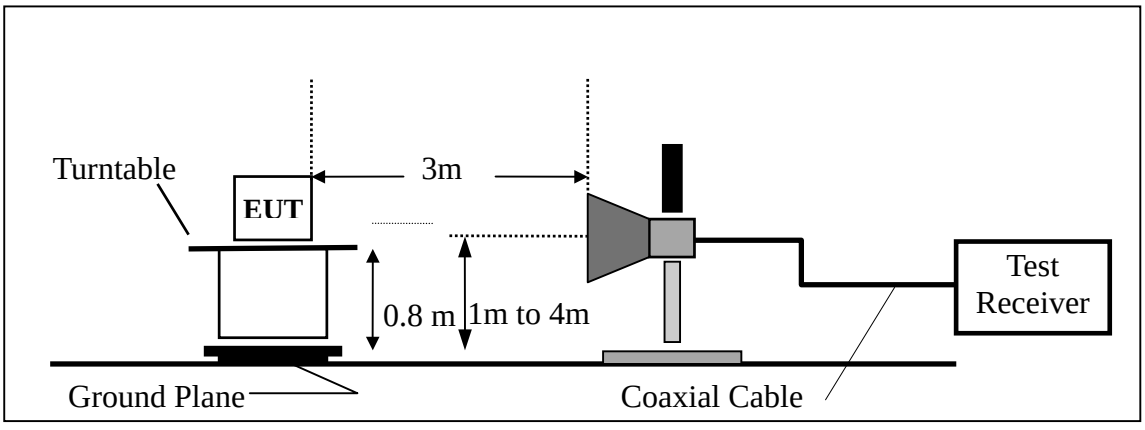
- For the band 5.15-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 50mW or 4dBm + 10logB, where B is the 26dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 4dBm in any 1MHz band.
- For the band 5.25-5.35 GHz, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250mW or 11dBm + 10logB, where B is the 26dB emission bandwidth in MHz. In addition, the peak power spectral density shall not exceed 11dBm in any 1MHz band.

*If transmitting antennas of directional gain greater than 6dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.*

### MEASUREMENT EQUIPMENT USED

| EQUIPMENT TYPE | MFR | Model No. | Serial No. | Cal. Due. |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 04/27/2004 |
| Low Loss Cable | Huber + Suhner | Sucoflex 104 | N/A | N/A |

### TEST CONFIGURATION



## TEST PROCEDURE

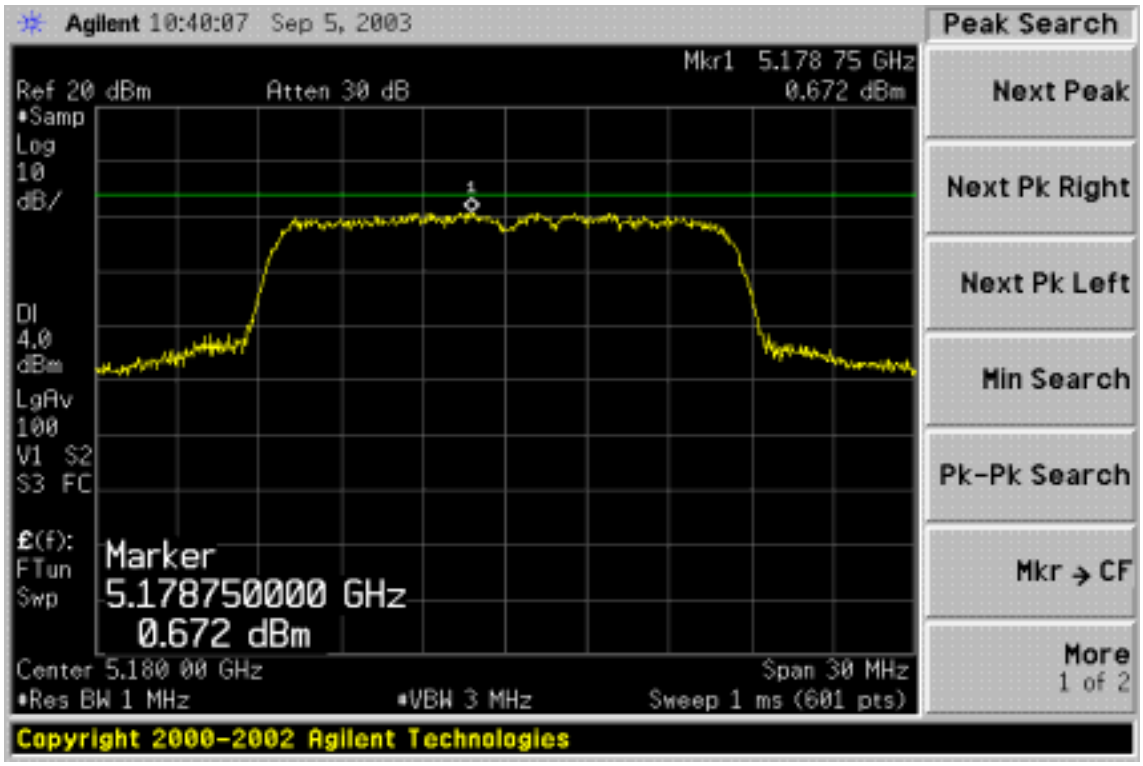
1. The EUT is placed on a turntable, which is 0.8m above the ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emission.
4. Set the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

## TEST RESULTS

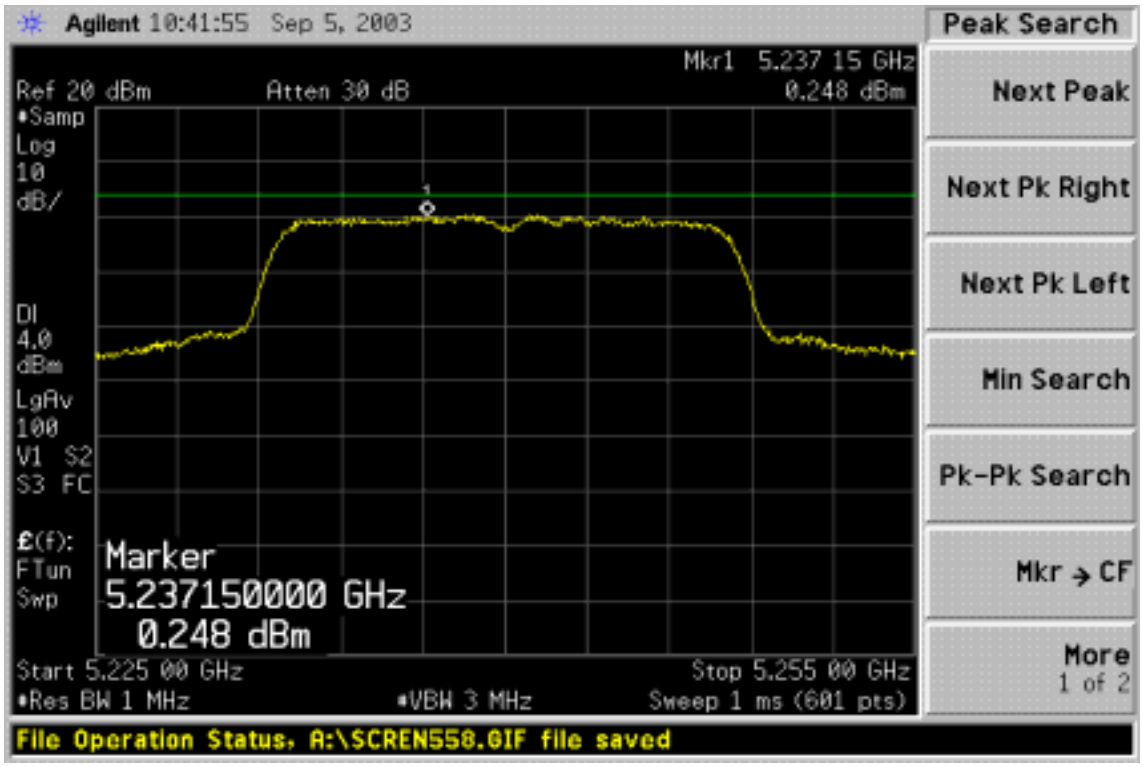
| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 0.672 | 4 | -3.328 |
| Mid | 5240 | 0.248 | 4 | -3.752 |
| High | 5320 | 0.256 | 11 | -10.744 |

## Test Plot

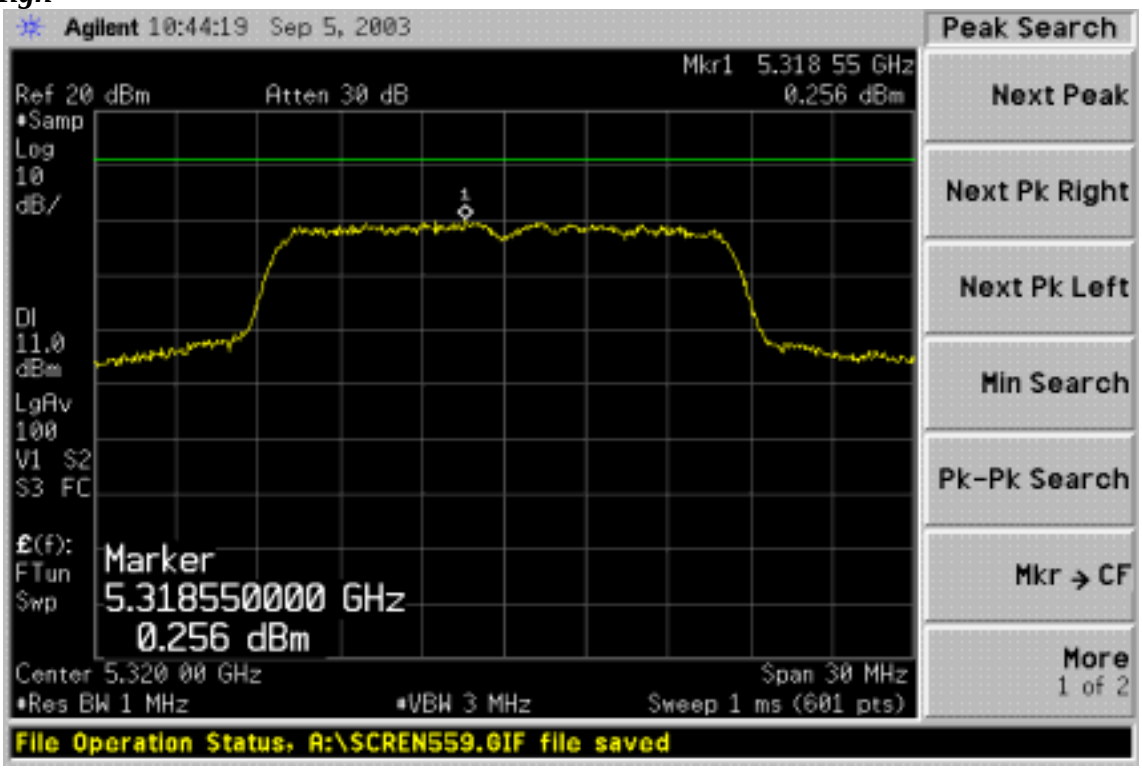
***CH-Low***




***CH-Mid***



***CH-High***


Agilent 10:44:19 Sep 5, 2003
Mkr1 5.318 55 GHz
0.256 dBm
Ref 20 dBm
Atten 30 dB
#Samp
Log
10
dB/
1
Dl
11.0
dBm
LgAv
100
V1 S2
S3 FC
£(f):
FTun
Swp
Marker
5.318550000 GHz
0.256 dBm
Center 5.320 00 GHz
Span 30 MHz
#Res BW 1 MHz
#VBW 3 MHz
Sweep 1 ms (601 pts)
Peak Search
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
File Operation Status, A:\SCREN559.0IF file saved

## 7.6 PEAK EXCURSION (15.407)

### LIMIT

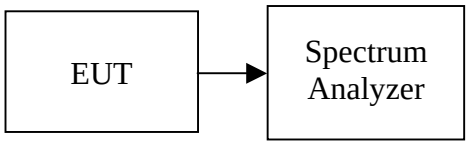
The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 04/27/2004 |
| Low-Loss RF Cable | Huber + Suhner | Sucoflex 104 | N/A | N/A |

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

### TEST CONFIGURATION




### TEST PROCEDURE

The test is performed in accordance with <FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices> – Part 15, Subpart E, August 2002.

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 spectrum.
3. Trace A, Set RBW =1MHz, VBW = 3MHz, Span = 25MHz (Base Mode) / 50MHz (Turbo Mode), Max. hold.
4. Trace B, Set RBW = 1MHz, VBW = 30kHz, Span = 25MHz (Base Mode) / 50MHz(Turbo Mode), Max. hold.
5. Delta Mark trace A Maximum frequency and trace B same frequency.
6. Repeat the above procedure until measurements for all frequencies were complete.

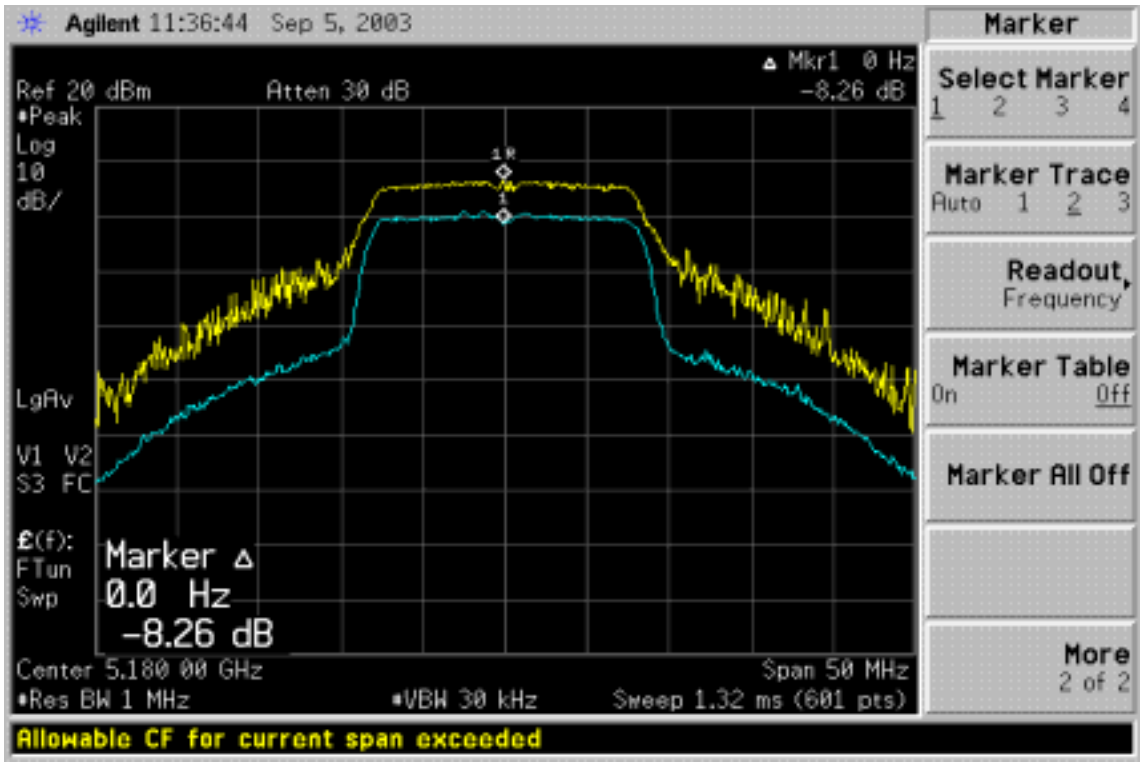
### TEST RESULTS

| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | -8.26 | 13 | -21.26 |
| Mid | 5240 | -7.50 | 13 | -20.50 |
| High | 5320 | -7.61 | 13 | -20.61 |

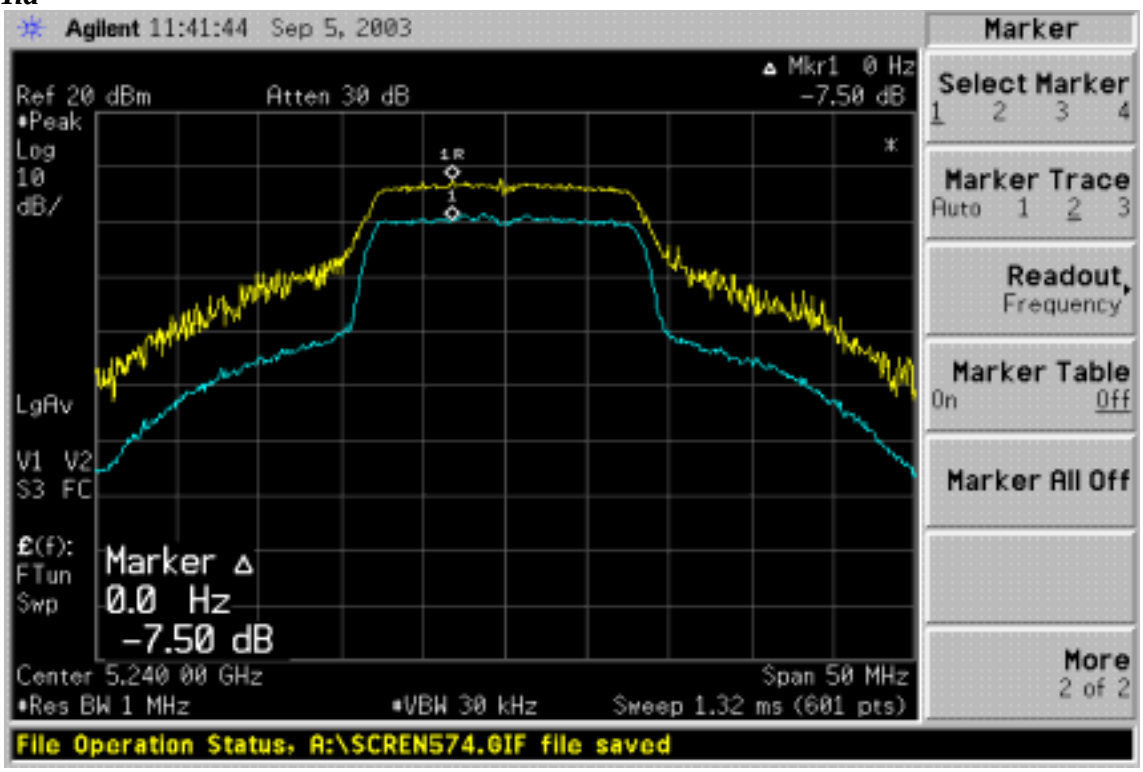
*(Note: Maximum antenna gain = 1.68 dBi, therefore there is no reduction due to antenna gain.)*

## Test Plot

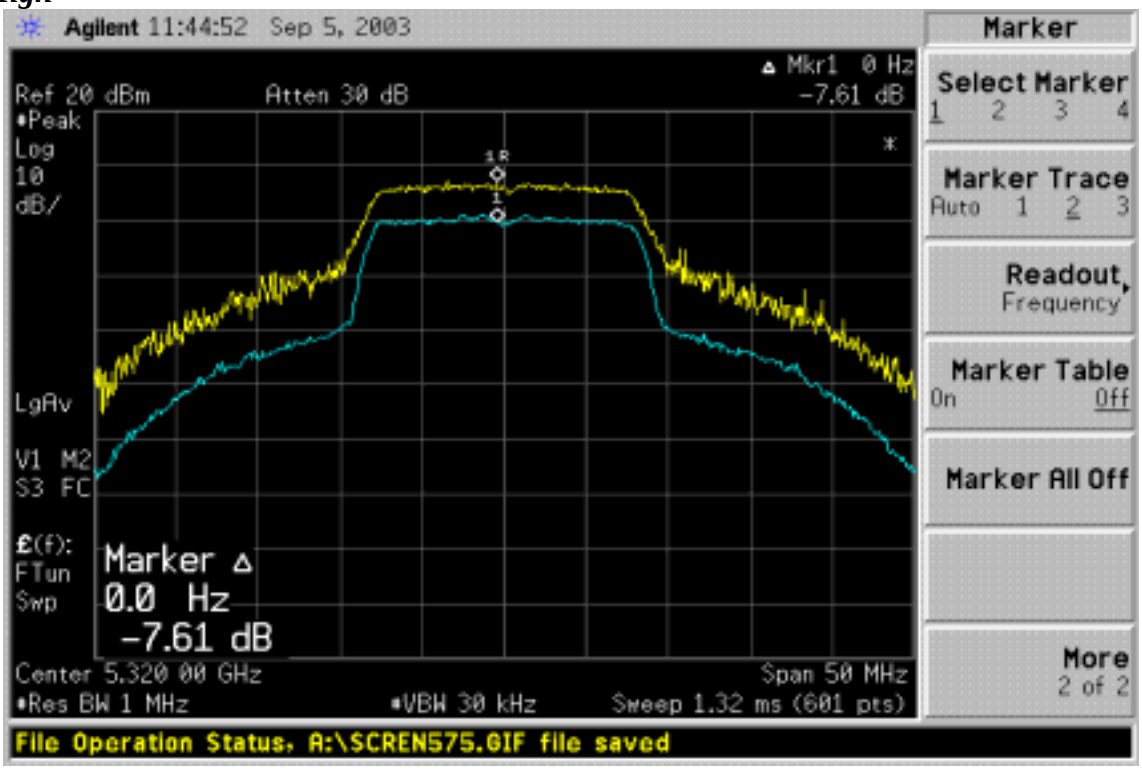
***CH-Low***




***CH-Mid***



***CH-High***


Agilent 11:44:52 Sep 5, 2003
Ref 20 dBm
Atten 30 dB
Mkr1 0 Hz
-7.61 dB
#Peak
Log
10
dB/
LgAv
V1 M2
S3 FC
£(f):
FTun
Swp
Marker Δ
0.0 Hz
-7.61 dB
Center 5.320 00 GHz
#Res BW 1 MHz
#VBW 30 kHz
Span 50 MHz
Sweep 1.32 ms (601 pts)
Marker
Select Marker
1 2 3 4
Marker Trace
Auto 1 2 3
Readout
Frequency
Marker Table
On Off
Marker All Off
More
2 of 2
File Operation Status, A:\SCREN575.GIF file saved

## 7.7 CONDUCTED UNDESIRABLE EMISSION (15.407)

### LIMIT

Transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm / MHz. Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.

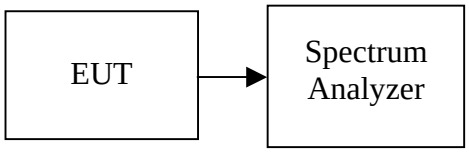
The provisions of §15.205 apply to intentional radiators operating under this section.

### MEASUREMENT EQUIPMENT USED

| Name of Equipment | Manufacturer | Model | Serial Number | Calibration Due |
|---|---|---|---|---|
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 04/27/2004 |
| Low-Loss RF Cable | Huber + Suhner | Sucoflex 104 | N/A | N/A |

***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 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

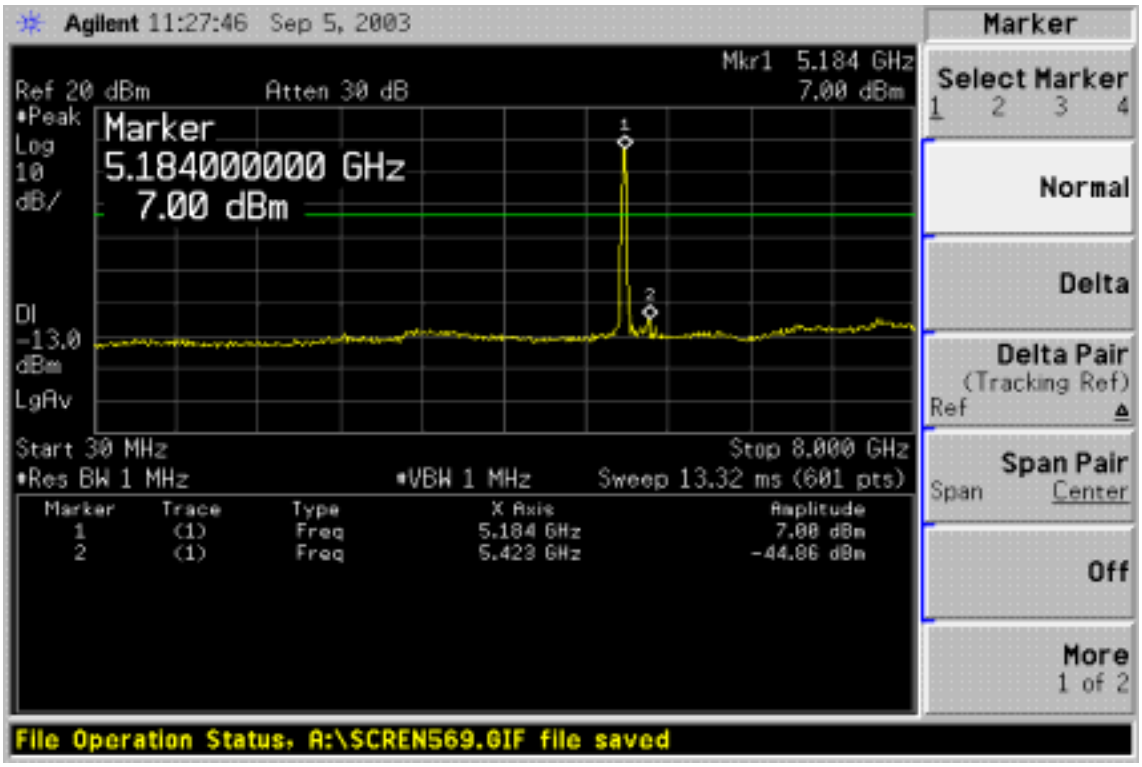
### TEST RESULTS

***No non-compliance noted***
*(**Note:** Maximum antenna gain =1.68 dBi, therefore there is no reduction due to antenna gain.)*

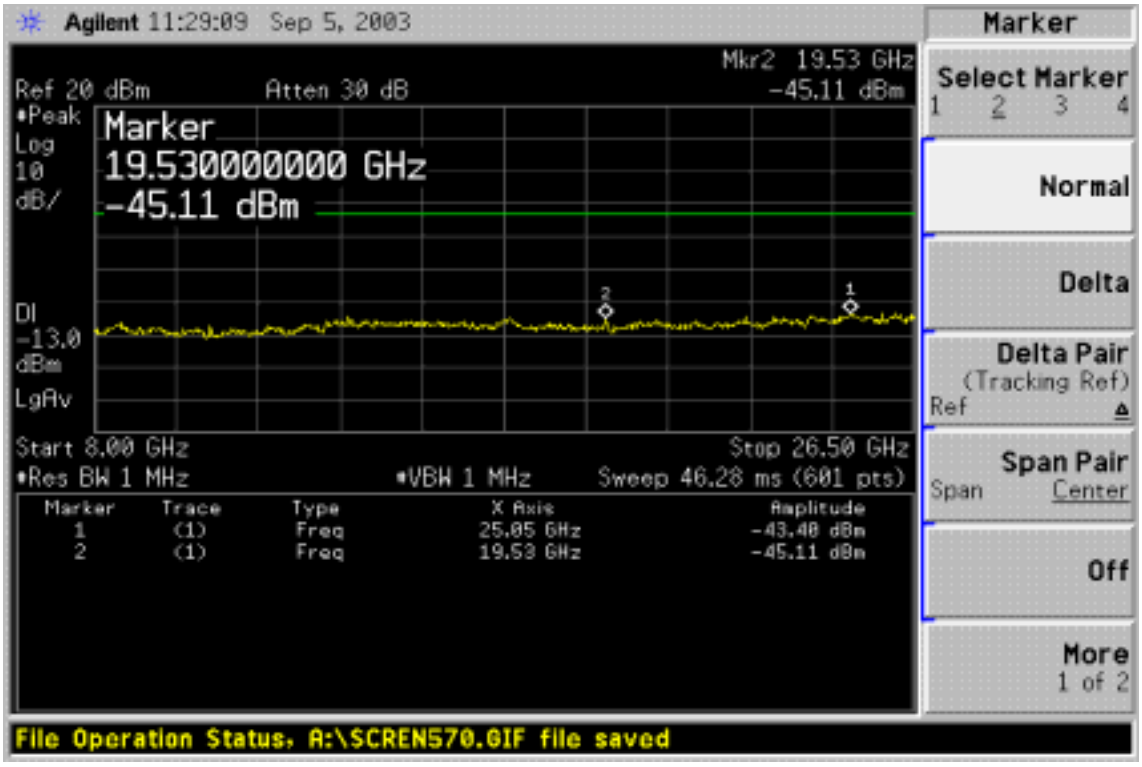
## Test Plot

***Ch Low***

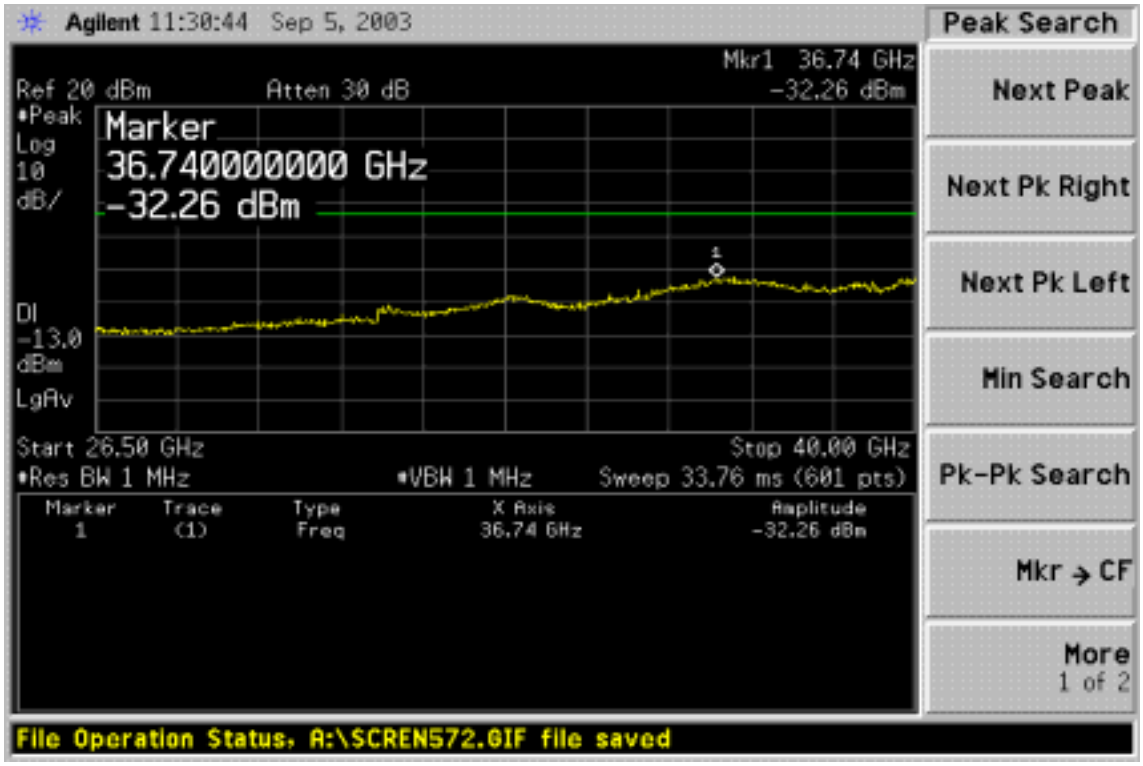
***30MHz ~ 8GHz***




***8GHz ~ 26.50GHz***

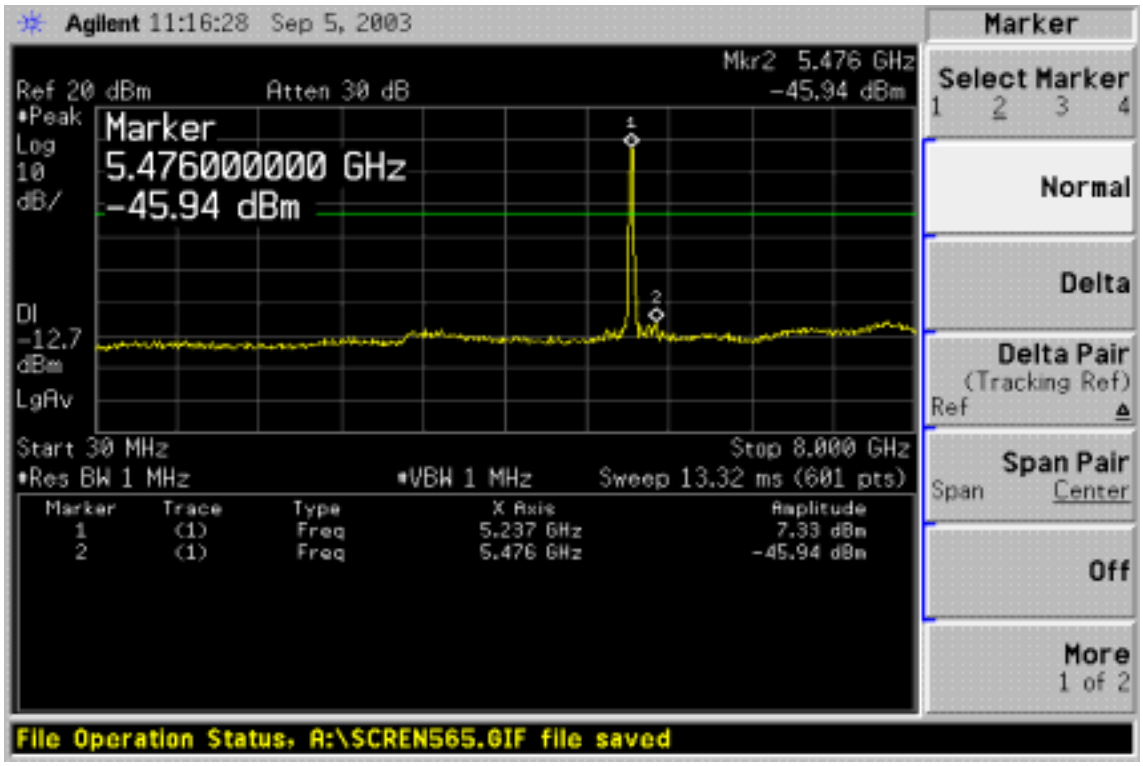


***26.5GHz ~ 40GHz***

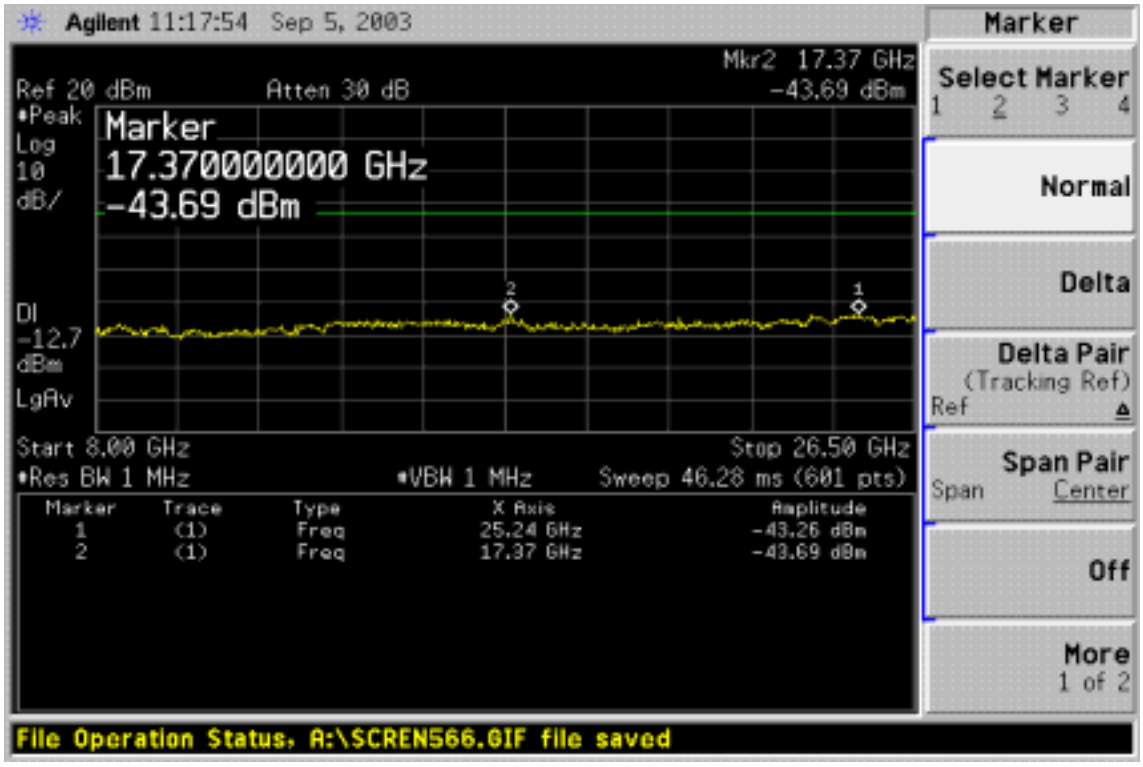


***Ch Mid***

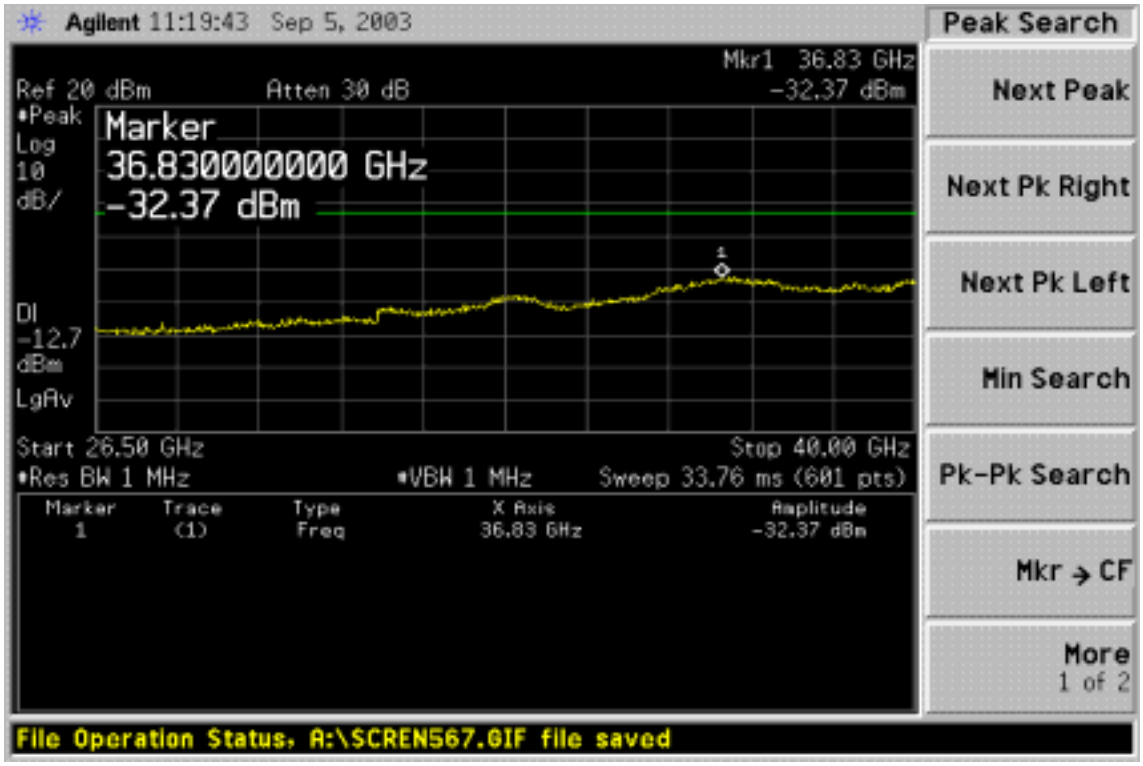
***30MHz ~ 8GHz***




***8GHz ~ 26.50GHz***

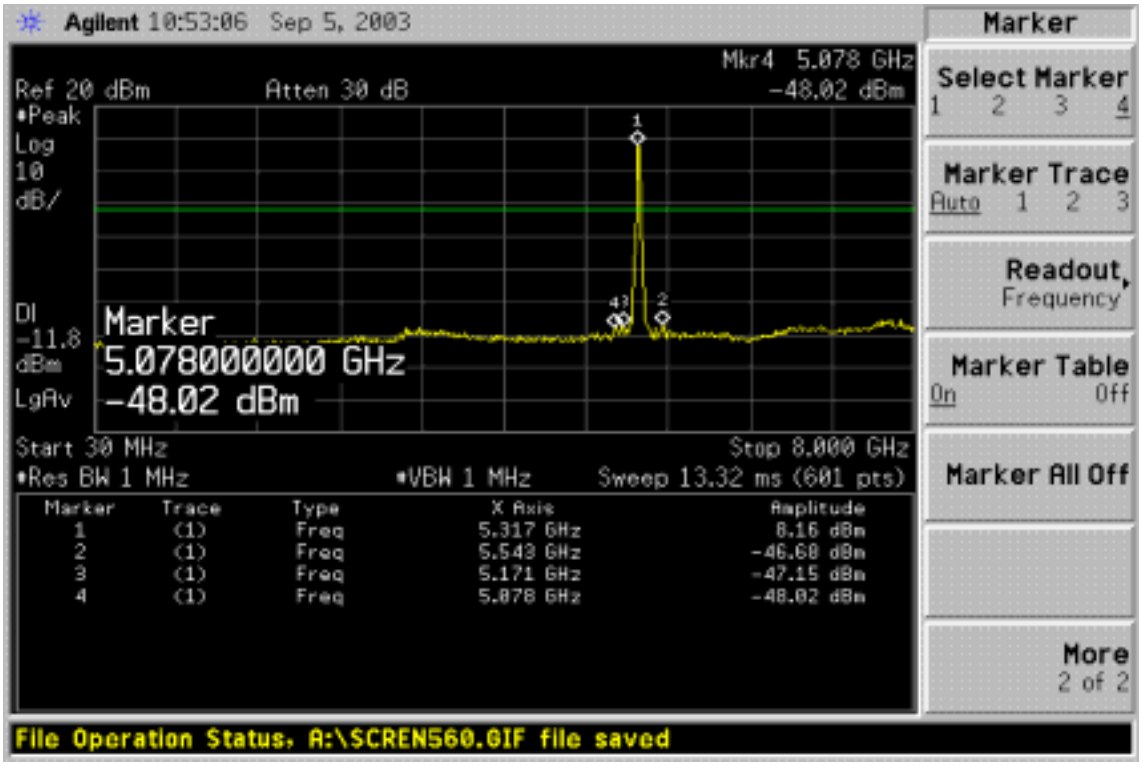


***26.5GHz ~ 40GHz***

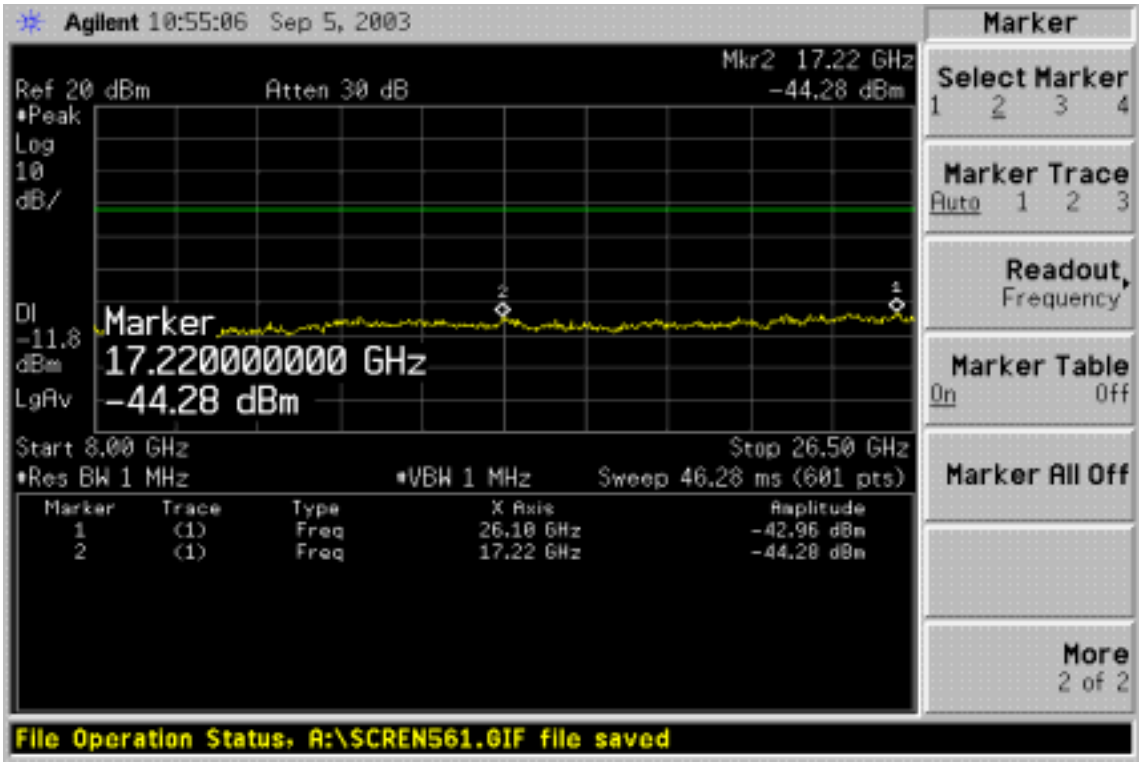


***Ch High***

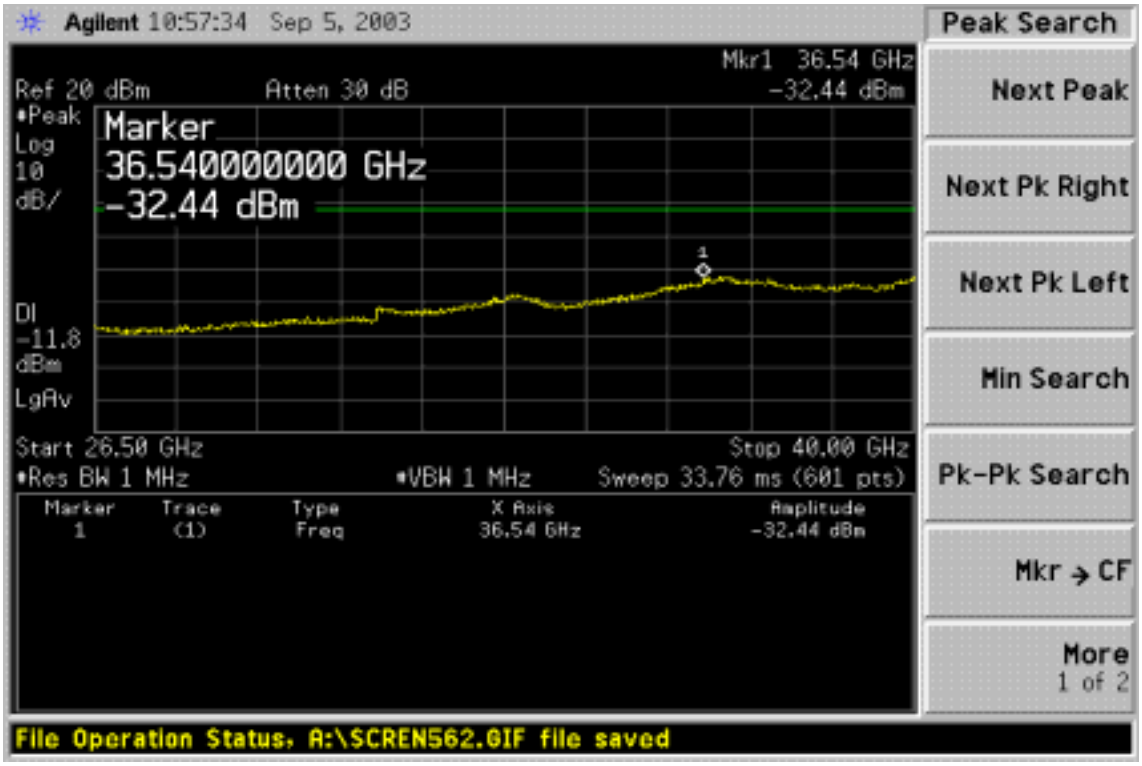
***30MHz ~ 8GHz***




***8GHz ~ 26.50GHz***



***26.5GHz ~ 40GHz***



## 7.8 RADIATED UNDESIRABLE EMISSION (15.407)

## LIMIT

For transmitters operating in the 5.15-5.35 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27dBm / MHz. Unwanted emissions below 1 GHz must comply with the general field strength limits set forth in §15.209. Further, any U-NII devices using an AC power line are required to comply also with the conducted limits set forth in §15.207.
The provisions of §15.205 apply to intentional radiators operating under this section. The EUT is set to transmit in a continuous mode.

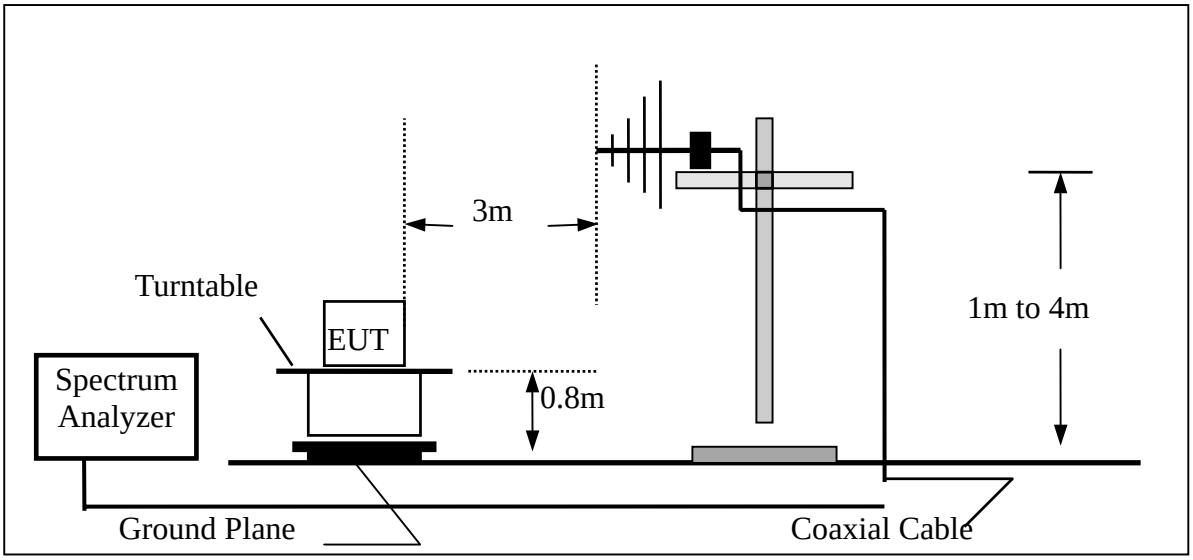
## MEASUREMENT EQUIPMENT USED

| Open Area Test Site # 3 | | | | |
|---|---|---|---|---|
| **Name of Equipment** | **Manufacturer** | **Model** | **Serial Number** | **Calibration Due** |
| Spectrum Analyzer | Agilent | E4446A | US42510252 | 04/27/2004 |
| EMI Test Receiver | R&S | ESVS20 | 838804/004 | 01/04/2004 |
| Pre-Amplifier | HP | 8447D | 2944A09173 | 03/03/2004 |
| Bilog Antenna | SCHWAZBECK | VULB9163 | 145 | 07/05/2004 |
| Turn Table | EMCO | 2081-1.21 | 9709-1885 | N.C.R |
| Antenna Tower | EMCO | 2075-2 | 9707-2060 | N.C.R |
| Controller | EMCO | 2090 | 9709-1256 | N.C.R |
| RF Switch | ANRITSU | MP59B | M53867 | N.C.R |
| Site NSA | C&C | N/A | N/A | 09/06/2004 |
| Horn antenna | Schwarzbeck | BBHA 9120 | D210 | 02/23/2004 |
| Loop Antenna | EMCO | 6502 | 2356 | 07/10/2004 |
| Pre-Amplifier | HP | 8449B | 3008B00965 | 10/02/2003 |

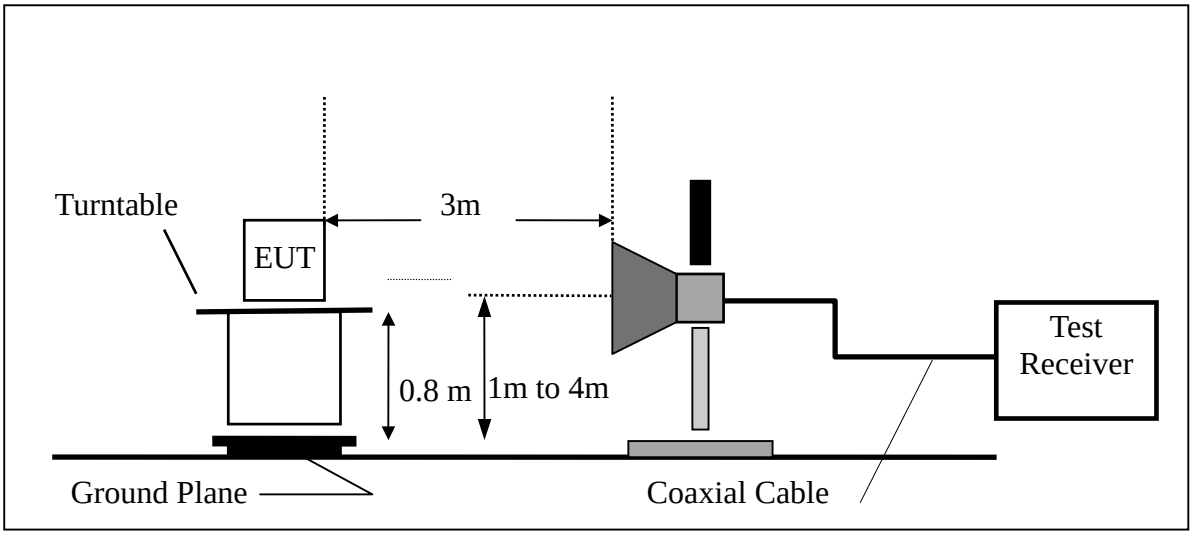
***Remark:*** *Each piece of equipment is scheduled for calibration once a year.*

# TEST CONFIGURATION

**For Frequencies Below 1 GHz**




**For Frequencies 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.

***Note:*** *The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 100kHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.*

# FACTOR CALCULATION

The Factor is calculated by adding the Antenna Factor and Cable Factor and subtracting the Amplifier Gain and Duty Cycle Correction Factor (if any) from the measured reading. The basic equation with a sample calculation is as follows:

*F = AF + CL - AG*

*Where F = Factor*
*E = Field Strength in Volts / meter*
*AF = Antenna factor*
*CL = Cable attenuation factor (cable loss)*
*AG = Amplifier gain*

## EIRP Calculation

Given $E = \frac{\sqrt{(30 \times P \times G}}{d}$

*Where E = Field strength (Volts/Meter)*
*P = Power (Watts)*
*G = Numeric antenna gain*
*d = Distance (Meter)*

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields

$$P \times G = \frac{(d \times E)^2}{30}$$

Re-arranging the terms yields

*P (mW) = P (W) / 1000 and*
*d (cm) =100 * d (m)*

Converting to the logarithmic form and changing to units of mW and µV/m, using

*P (mW) = P (W) / 1000 and E (uV/m) = E (V/m) / 1000000*

Yields

$$10\log(P \times G) = 10\log d^2 + 10\log E^2 - 10\log 30 - 10\log 10^9 = 20\log d + 20\log E - 104.77$$

*Where 10 log (P * G) is PG in dBm and 20 log (E) is E in dBuV/m*

Since

*EIRP = P * G*

Then, at a specification distance of 3 meters, the EIRP, in terms of field strength, is

*EIRP (dBm) = P * G (dBm) = E (dBuV/m) – 95.2*

# TEST RESULTS

***Radiated Spurious Emission Measurement Result (Below 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX CH Low Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Ver./Hor. |

| Freq. (MHz) | Ant.Pol. V/H | Detector Mode (PK/QP) | Reading (dBuV) | Factor (dB) | Actual FS (dBuV/m) | Limit3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 105.60 | V | Peak | 20.23 | 13.48 | 33.71 | 43.50 | -9.79 |
| 300.00 | V | Peak | 7.92 | 16.68 | 24.60 | 46.00 | -21.40 |
| 627.60 | V | Peak | 1.81 | 25.10 | 26.91 | 46.00 | -19.09 |
| 651.40 | V | Peak | 1.98 | 24.90 | 26.88 | 46.00 | -19.12 |
| 676.60 | V | Peak | 3.62 | 25.35 | 28.97 | 46.00 | -17.03 |
| 913.20 | V | Peak | -1.35 | 28.34 | 26.99 | 46.00 | -19.01 |
| 93.18 | H | Peak | 16.25 | 12.74 | 28.99 | 43.50 | -14.51 |
| 602.40 | H | Peak | 0.83 | 25.35 | 26.18 | 46.00 | -19.82 |
| 627.60 | H | Peak | 2.30 | 25.10 | 27.40 | 46.00 | -18.60 |
| 651.40 | H | Peak | 0.89 | 24.90 | 25.79 | 46.00 | -20.21 |
| 798.40 | H | Peak | 0.10 | 26.13 | 26.23 | 46.00 | -19.77 |
| 913.20 | H | Peak | -1.69 | 28.34 | 26.65 | 46.00 | -19.35 |

Remark:

(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.

(5) Emission level = Reading value + Factor

***Radiated Spurious Emission Measurement Result (Below 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX CH Mid Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Ver./Hor. |

| Freq. (MHz) | Ant.Pol. V/H | Detector Mode (PK/QP) | Reading (dBuV) | Factor (dB) | Actual FS (dBuV/m) | Limit3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 105.06 | V | Peak | 20.67 | 13.48 | 34.15 | 43.50 | -9.35 |
| 602.40 | V | Peak | 1.47 | 25.35 | 26.82 | 46.00 | -19.18 |
| 638.80 | V | Peak | 1.67 | 24.99 | 26.66 | 46.00 | -19.34 |
| 676.60 | V | Peak | 1.82 | 25.35 | 27.17 | 46.00 | -18.83 |
| 848.80 | V | Peak | -0.49 | 27.25 | 26.76 | 46.00 | -19.24 |
| 913.20 | V | Peak | -1.77 | 28.34 | 26.57 | 46.00 | -19.43 |
| 102.36 | H | Peak | 15.95 | 13.83 | 29.78 | 43.50 | -13.72 |
| 602.40 | H | Peak | 0.96 | 25.35 | 26.31 | 46.00 | -19.69 |
| 626.20 | H | Peak | 2.93 | 25.11 | 28.04 | 46.00 | -17.96 |
| 638.80 | H | Peak | 1.63 | 24.99 | 26.62 | 46.00 | -19.38 |
| 798.40 | H | Peak | 0.25 | 26.13 | 26.38 | 46.00 | -19.62 |
| 913.20 | H | Peak | -0.80 | 28.34 | 27.54 | 46.00 | -18.46 |

Remark:

(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.

(5) Emission level = Reading value + Factor

***Radiated Spurious Emission Measurement Result (Below 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX CH High Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Ver./Hor. |

| Freq. (MHz) | Ant.Pol. V/H | Detector Mode (PK/QP) | Reading (dBuV) | Factor (dB) | Actual FS (dBuV/m) | Limit3m (dBuV/m) | Safe Margin (dB) |
|---|---|---|---|---|---|---|---|
| 107.22 | V | Peak | 19.52 | 13.21 | 32.73 | 43.50 | -10.77 |
| 455.40 | V | Peak | 3.93 | 20.42 | 24.35 | 46.00 | -21.65 |
| 627.60 | V | Peak | 0.68 | 25.10 | 25.78 | 46.00 | -20.22 |
| 651.40 | V | Peak | 1.38 | 24.90 | 26.28 | 46.00 | -19.72 |
| 676.00 | V | Peak | 2.46 | 25.35 | 27.81 | 46.00 | -18.19 |
| 913.20 | V | Peak | -1.47 | 28.34 | 26.87 | 46.00 | -19.13 |
| 102.90 | H | Peak | 16.03 | 13.76 | 29.79 | 43.50 | -13.71 |
| 602.40 | H | Peak | -0.05 | 25.35 | 25.30 | 46.00 | -20.70 |
| 627.60 | H | Peak | 1.45 | 25.10 | 26.55 | 46.00 | -19.45 |
| 651.40 | H | Peak | 0.74 | 24.90 | 25.64 | 46.00 | -20.36 |
| 676.60 | H | Peak | 0.05 | 25.35 | 25.40 | 46.00 | -20.60 |
| 913.20 | H | Peak | -0.72 | 28.34 | 27.62 | 46.00 | -18.38 |

Remark:

(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.

(5) Emission level = Reading value + Factor

***Radiated Spurious Emission Measurement Result (Above 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX Low Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Vertical |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1266.67 | 43.50 | --- | -8.78 | 34.72 | --- | 74.00 | 54.00 | -19.28 | Peak |
| 1366.67 | 42.67 | --- | -8.39 | 34.28 | --- | 74.00 | 54.00 | -19.72 | Peak |
| 10360.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 15540.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 20720.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 25900.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 31080.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 36260.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 41440.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 46620.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 51800.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |

Remark:

(1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(2) 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.

(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 Emission.

(4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms. Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

(5) Emission(dBuV/m)=Reading(dBuV)+Cable loss(dB)+Ant.Fact.(dB/m)-Pre-amp.(dB)

***Radiated Spurious Emission Measurement Result (Above 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX Low Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Horizontal |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 10360.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 15540.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 20720.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 25900.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 31080.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 36260.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 41440.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 46620.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 51800.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |

Remark:

(1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(2) 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.

(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 Emission.

(4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms. Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

(5) Emission(dBuV/m)=Reading(dBuV)+Cable loss(dB)+Ant.Fact.(dB/m)-Pre-amp.(dB)

***Radiated Spurious Emission Measurement Result (Above 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX Mid Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Vertical |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1064.00 | 43.48 | --- | -9.98 | 33.50 | --- | 74.00 | 54.00 | -20.50 | Peak |
| 10520.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 15780.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 21040.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 26300.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 31560.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 36820.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 42080.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 47340.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 52600.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |

Remark:

(1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(2) 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.

(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 Emission.

(4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms. Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

(5) Emission(dBuV/m)=Reading(dBuV)+Cable loss(dB)+Ant.Fact.(dB/m)-Pre-amp.(dB)

***Radiated Spurious Emission Measurement Result (Above 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX Mid Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Horizontal |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 10520.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 15780.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 21040.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 26300.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 31560.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 36820.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 42080.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 47340.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 52600.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |

Remark:

(1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(2) 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.

(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 Emission.

(4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms. Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

(5) Emission(dBuV/m)=Reading(dBuV)+Cable loss(dB)+Ant.Fact.(dB/m)-Pre-amp.(dB)

***Radiated Spurious Emission Measurement Result (Above 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX High Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Vertical |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1064.00 | 44.04 | --- | -9.98 | 34.06 | --- | 74.00 | 54.00 | -19.94 | Peak |
| 1332.00 | 42.69 | --- | -8.53 | 34.16 | --- | 74.00 | 54.00 | -19.84 | Peak |
| 10640.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 15960.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 21280.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 26600.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 31920.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 37240.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 42560.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 47880.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 53200.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |

Remark:

(1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(2) 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.

(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 Emission.

(4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms. Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

(5) Emission(dBuV/m)=Reading(dBuV)+Cable loss(dB)+Ant.Fact.(dB/m)-Pre-amp.(dB)

***Radiated Spurious Emission Measurement Result (Above 1GHz)***

| | | | |
|---|---|---|---|
| Operation Mode: | TX High Mode | Test Date: | August 24, 2003 |
| Temperature: | 30°C | Tested By: | Jacky |
| Humidity: | 70 % | Pol: | Horizontal |

| Freq. (MHz) | Peak Reading (dBuV) | AV Reading (dBuV) | Ant./CL CF(dB) | Actual FS Peak (dBuV/m) | Actual FS AV (dBuV/m) | Peak Limit (dBuV/m) | AV Limit (dBuV/m) | Margin (dB) | Remark |
|---|---|---|---|---|---|---|---|---|---|
| 1064.00 | 43.31 | --- | -9.98 | 33.33 | --- | 74.00 | 54.00 | -20.67 | Peak |
| 10640.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 15960.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 21280.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 26600.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 31920.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 37240.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 42560.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 47880.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |
| 53200.00 | -- | -- | -- | -- | -- | 74.00 | 54.00 | -- | -- |

Remark:

(1) Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.

(2) 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.

(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 Emission.

(4) Spectrum Peak Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 1MHz, Sweep time= 200 ms. Spectrum AV Setting 1GHz- 26GHz, RBW= 1MHz, VBW= 10Hz, Sweep time= 200 ms.

(5) Emission(dBuV/m)=Reading(dBuV)+Cable loss(dB)+Ant.Fact.(dB/m)-Pre-amp.(dB)

## 7.9 TRANSMISSION IN ABSENCE OF DATA (15.407)

### LIMIT

The device shall automatically discontinue transmission in case of either absence of information to transmit or operation failure. These provisions are not intended to preclude the transmission of control or signaling information or the use of repetitive codes used by certain digital technologies to complete frame or burst intervals. Applicants shall include in their application for equipment authorization a description of how this requirement is met.

### TEST RESULTS

*No non-compliance noted*

***Note:*** *For the details, refer to the theory of the operation.*

## 7.10 FREQUENCY STABILITY (15.407)

### LIMIT

Manufacturers of U-NII devices are responsible for ensuring frequency stability such that an emission is maintained within the band of operation under all conditions of normal operation as specified in the user's manual.

Referring to the theory of operation, the crystal used to set the frequency has a temperature coefficient of +/- 20 ppm over the specified rated temperature range. For a transmitter fundamental frequency of 5.35 GHz, this corresponds to +/- 107 kHz.

### TEST RESULTS

No non-compliance noted

***Note:*** *An examination of the band-edge plots shows that the emission will stay within the authorized band over the entire temperature range.*

## 7.11 ANTENNA REQUIREMENT (15.407)

### LIMIT

According to FCC Part 15.407(d), any U-NII device that operates in the 5.15-5.35 GHz band shall use a transmitting antenna that is an integral part of the device.

### TEST RESULTS

*No non-compliance noted*

The antenna connector is designed with a unique connector and replacement of it by the user is not considered. For details, refer to the EUT photos.

## 7.12 RADIO FREQUENCY EXPOSURE (15.407)

### LIMIT

U-NII devices are subject to the radio frequency radiation exposure requirements specified in §1.1307(b), §2.1091 and §2.1093 of this chapter, as appropriate. All equipment shall be considered to operate in a "general population/uncontrolled" environment. Applications for equipment authorization of devices operating under this section must contain a statement confirming compliance with these requirements for both fundamental emissions and unwanted emissions. Technical information showing the basis for this statement must be submitted to the Commission upon request.

### EUT SPECIFICATION

| | |
|---|---|
| EUT | Tablet PC |
| Frequency band (Operating) | ☒ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz<br>☐ Others _____ |
| Device category | ☒ Portable (<20cm separation)<br>☐ Mobile (>20cm separation)<br>☐ Others _____ |
| Exposure classification | General Population/Uncontrolled exposure *(S=1mW/cm$^2$)* |
| Antenna diversity | ☐ Single antenna<br>☒ Multiple antennas<br>☐ Tx diversity<br>☐ Rx diversity<br>☒ Tx/Rx diversity |
| Max. output power | 14.32dBm (27.04mW) |
| Antenna gain (Max) | 1.68dBi (Numeric gain:1.47) |
| Evaluation applied | ☐ MPE Evaluation<br>☒ SAR Evaluation* |

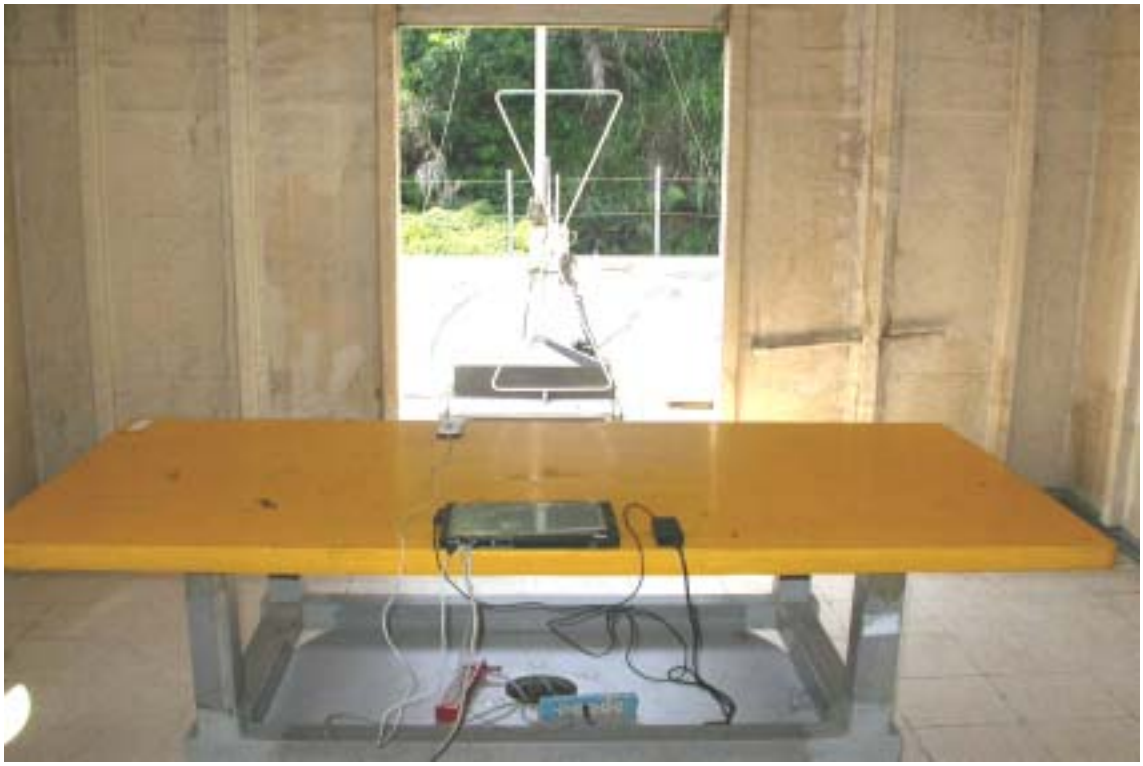
***Note:***
1. **The maximum output power is 14.32dBm (27.04mW) at 5240MHz, which is greater than general population low threshold 60/F (60/5.240=11.45mW), SAR is required.*
2. *For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.*

### TEST RESULTS

No non-compliance noted

***Note:*** *Please refer to the separate SAR report.*

# APPENDIX 1
## PHOTOGRPHS OF TEST SETUP



# APPENDIX 2
# EXTERNAL PHOTOGRPHS

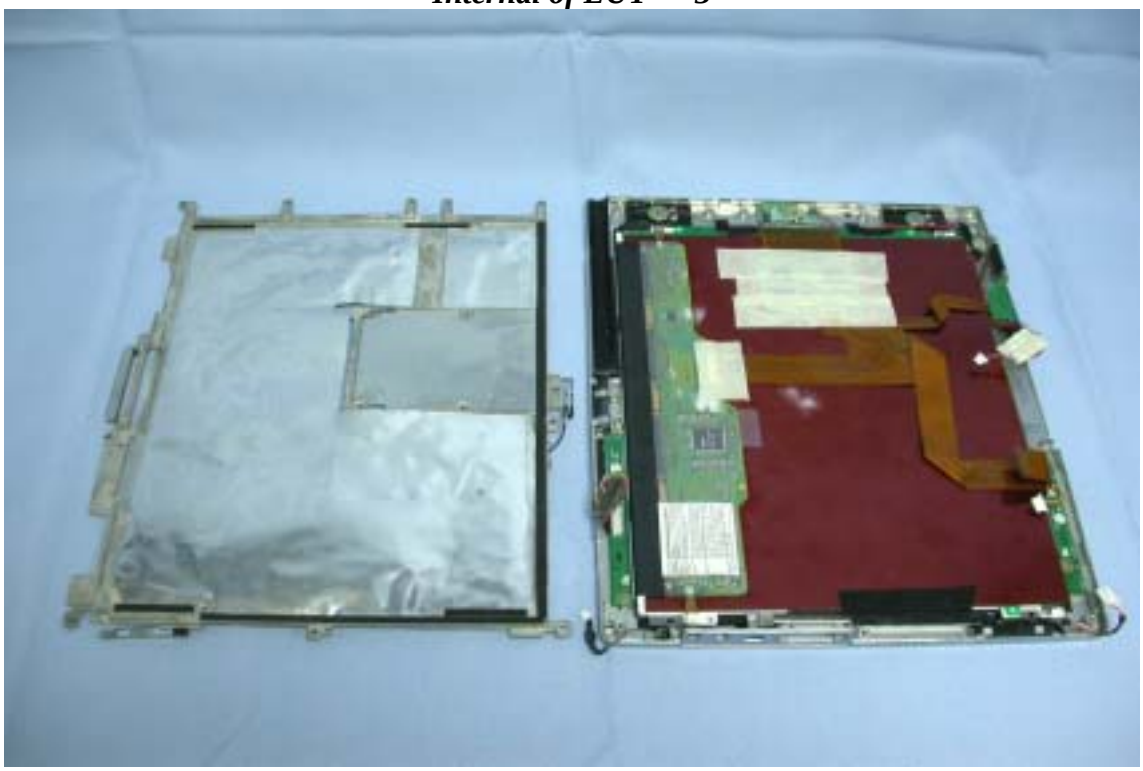

HIPRO
AC ADAPTER 42W MAX.
MODEL:HP-OD042D03 REV:X01
WARNING
SN:F3-02 08000326
91-58683
LPS
CS
MADE IN CHINA

# APPENDIX 3
# INTERNAL PHOTOGRPHS OF EUT

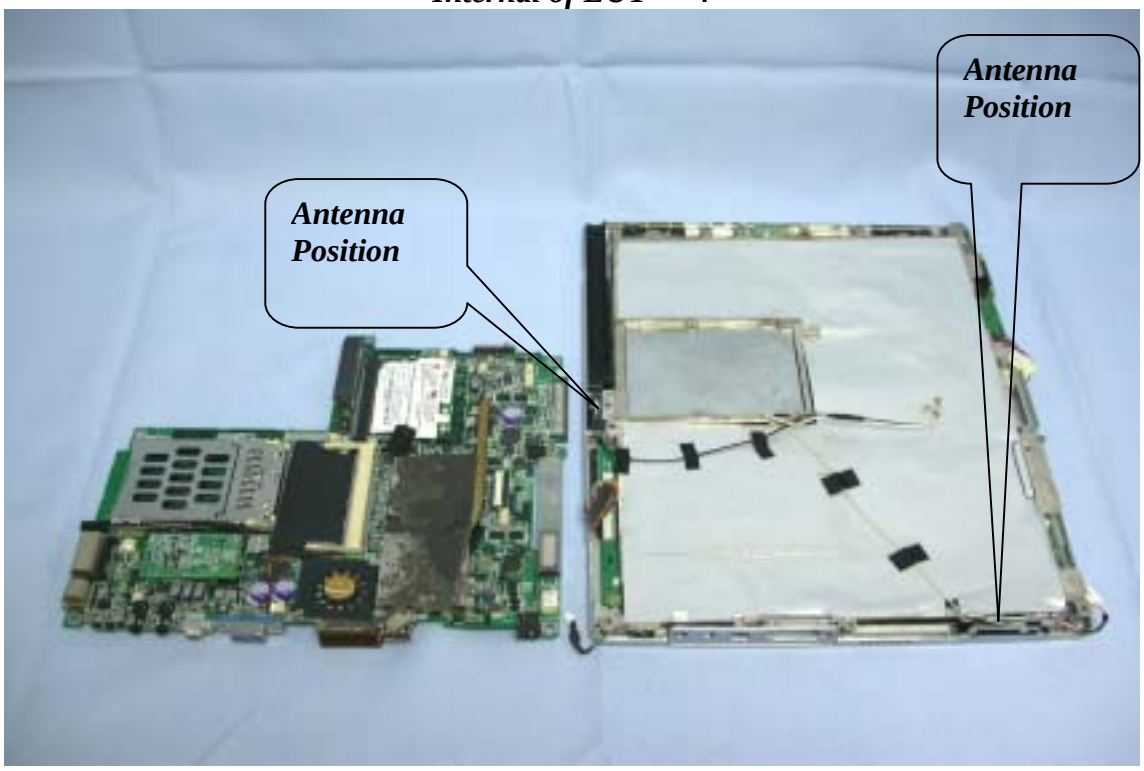
***Internal of EUT --- 1***

***Internal of EUT --- 2***

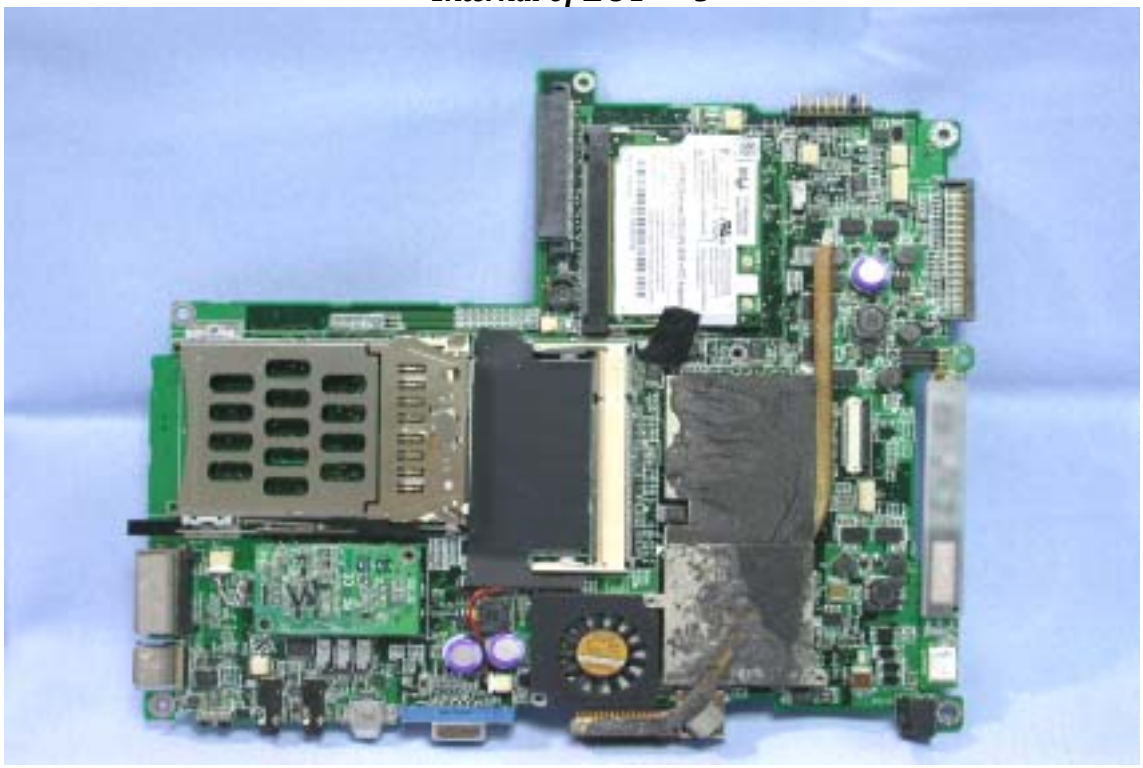
***Internal of EUT --- 3***



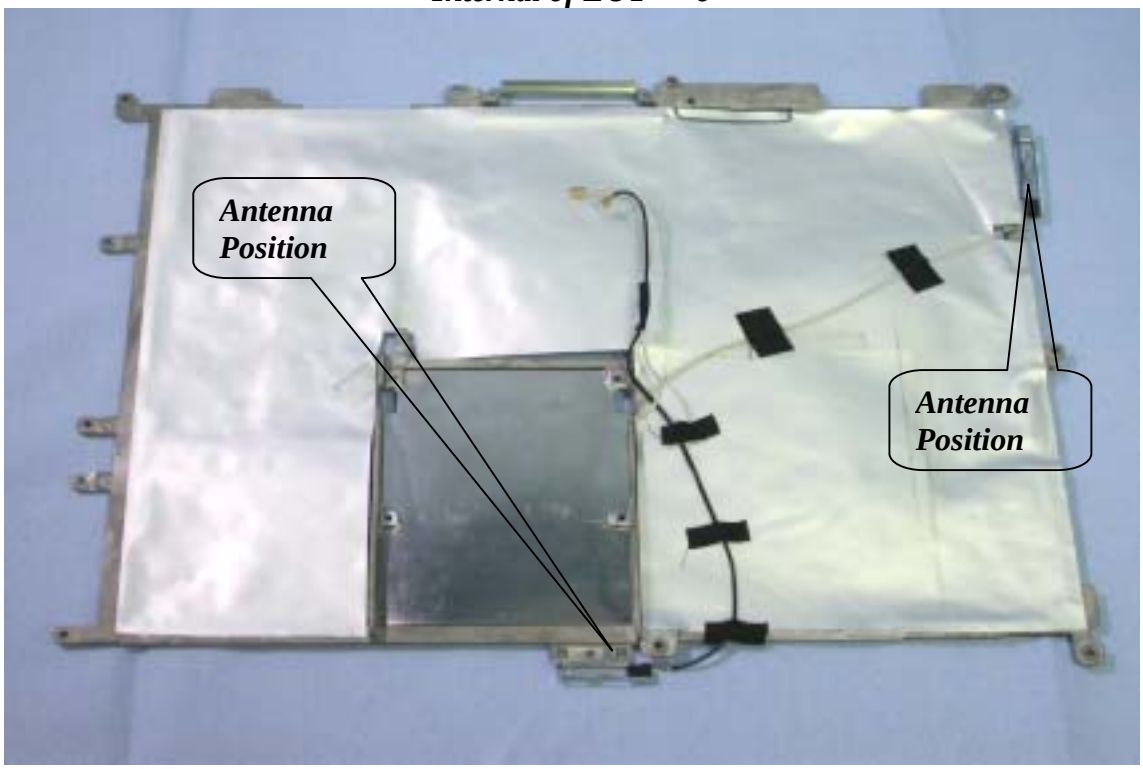
***Internal of EUT --- 4***



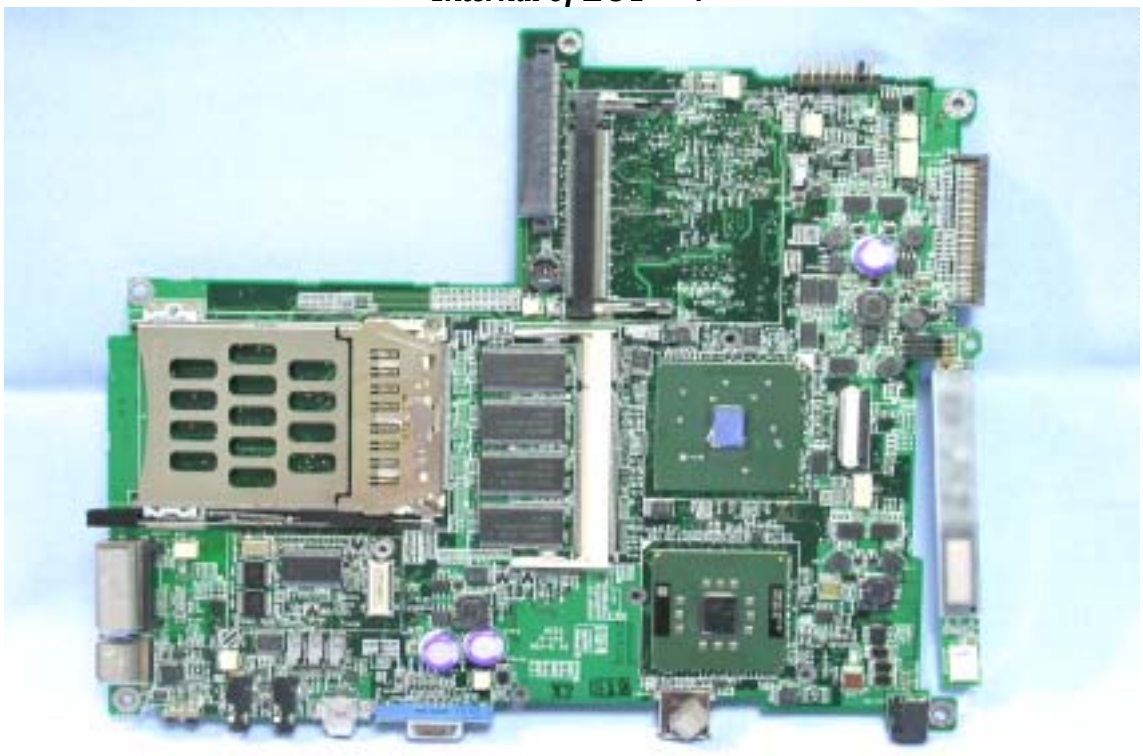
***Internal of EUT --- 5***



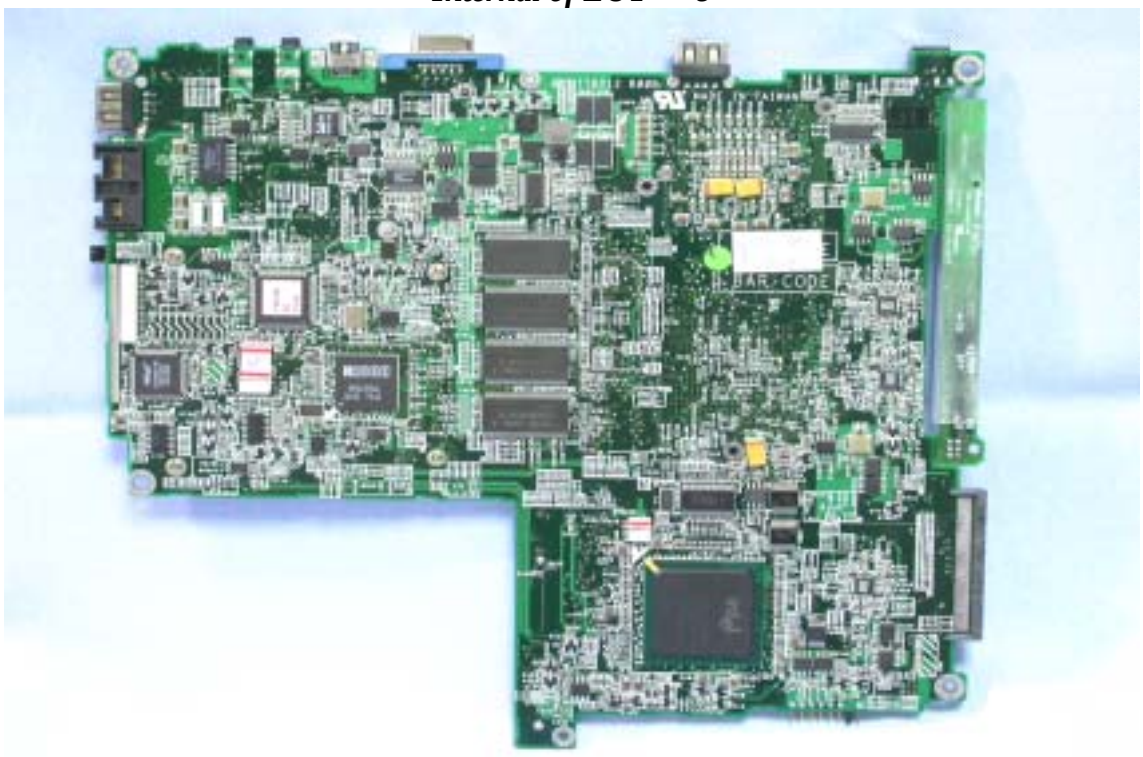
***Internal of EUT --- 6***



***Internal of EUT --- 7***

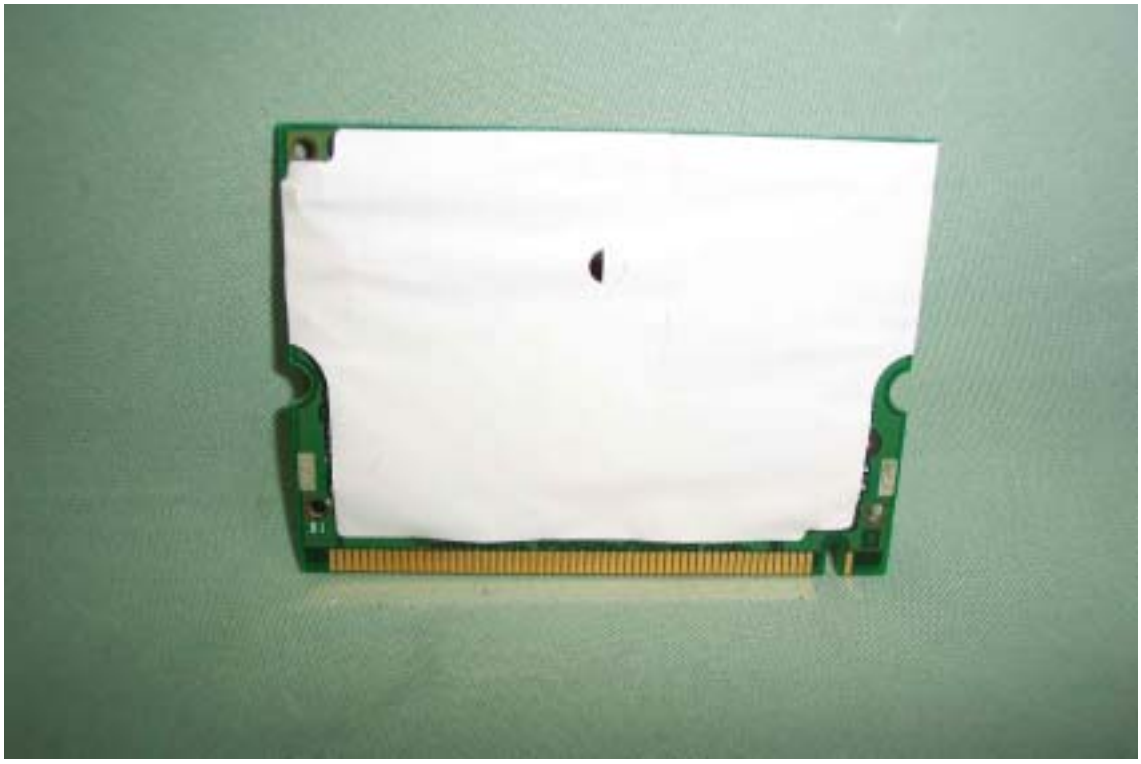


***Internal of EUT --- 8***



***Module --- 1***


***Module --- 2***



***Module --- 3***


***Module --- 4***

***Module --- 5***