# FCC TEST REPORT

| | | |
|---|---|---|
| **CATEGORY** | : | Mobile End Product |
| **PRODUCT NAME** | : | Wireless LAN AP |
| **FCC ID.** | : | NI3-SI-7800B |
| **FILING TYPE** | : | Certification |
| **BRAND NAME** | : | SENAO |
| **MODEL NAME** | : | SI-7800B |
| **APPLICANT** | : | **SENAO INTERNATIONAL CO., LTD.**<br>2FL, NO. 531 CHUNG CHENG RD., HSIN-TIEN, TAIPEI, TAIWAN, R.O.C. 231 |
| **MANUFACTURER** | : | Same as Applicant |
| **ISSUED BY** | : | **SPORTON INTERNATIONAL INC.**<br>6F, No. 106, Sec. 1, Hsin Tai Wu Rd., His Chih, Taipei Hsien, Taiwan, R.O.C. |

## Statements:

The test result in this report refers exclusively to the presented test model / sample.

Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

Certificate or Test Report could not be used by the applicant to claim the product endorsement by CNLA, NVLAP or any agency of U.S. government.

The test equipment used to perform the test are calibrated and traceable to NML/ROC or NIST/USA.

Dr. Alan Lane
Vice General Manager
Sporton International Inc.

Lab Code: 200079-0

# Table of Contents

# History of this test report

■ No additional attachment.

☐ Additional attachment were issued as following record:

| Attachment No. | Issue Date | Description |
|---|---|---|
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# 1. General Description of Equipment under Test

## 1.1. Applicant

SENAO INTERNATIONAL CO., LTD.
2FL, NO. 531 CHUNG CHENG RD., HSIN-TIEN, TAIPEI, TAIWAN, R.O.C. 231

## 1.2. Manufacturer

Same as 1.1

## 1.3. Basic Description of Equipment under Test

This product is a Wireless LAN AP with IEEE 802.11b wireless solution. This Wireless LAN AP is powered by an AC to DC adapter or by LAN (POE). The technical data has been listed on section " Features of Equipment under Test " .

## 1.4. Features of Equipment under Test

| ITEMS | DESCRIPTION |
|---|---|
| Type of Modulation | DBPSK,DQPSK,CCK (802.11b) |
| Number of Channels | 11 |
| Frequency Band | 2400MHz ~ 2483.5MHz |
| Carrier Frequency | Please reference section 1.5 |
| Channel Bandwidth | 11.84MHz |
| Output Power to Antenna | 17.54dBm |
| Antenna Type / Gain | Dipole Antenna / 2dBi |
| Function Type | Transceiver |
| Power Rating (DC/AC, Voltage) | 12 VDC |
| Temperature Range (Operating) | 0 ~ 55℃ |
| Humidity | 15% ~ 95% |

## 1.5. Table for Carrier Frequencies

| Channel | Frequency | Channel | Frequency | Channel | Frequency |
|---|---|---|---|---|---|
| 1 | 2412 MHz | 5 | 2432 MHz | 9 | 2452 MHz |
| 2 | 2417 MHz | 6 | 2437 MHz | 10 | 2457 MHz |
| 3 | 2422 MHz | 7 | 2442 MHz | 11 | 2462 MHz |
| 4 | 2427 MHz | 8 | 2447 MHz | | |

# 2. Test Configuration of the Equipment under Test

## 2.1. Description of the Test

a. The EUT has been associated with notebook and peripherals pursuant to ANSI C63.4-2001 and configuration operated in a manner which tended to maximize its emission characteristics in a typical application.
b. There are two selections on the power source for this EUT. One is AC to DC adapter and the other is POE.
c. There are 2 test modes:
   Mode 1: EUT powered by adapter. ( Normal test mode )
   Mode 2: EUT powered by POE. ( Test mode for extra testing )
d. Extra testing was done on Mode 2 for power line conduction and spurious emission below 1GHz.
e. Spurious emission below 1GHz is independent of channel selection, so only channel 11 was tested.
f. For spurious emission above 1GHz, lowest, middle and highest channel with 11Mbps data rate was tested, and only mode 1 was tested.
g. The configuration is operated in a manner which tends to maximize its emission characteristics in a typical application.
h. 3 meters measurement distance in semi-anechoic chamber was used in this test.

## 2.2. Frequency Range Investigated

a. Conducted power line test: from 150 kHz to 30 MHz
b. Radiated emission test: from 30 MHz to 25000 MHz

## 2.3. Description of Test Supporting Units

Support Unit 1. – Printer (EPSON)

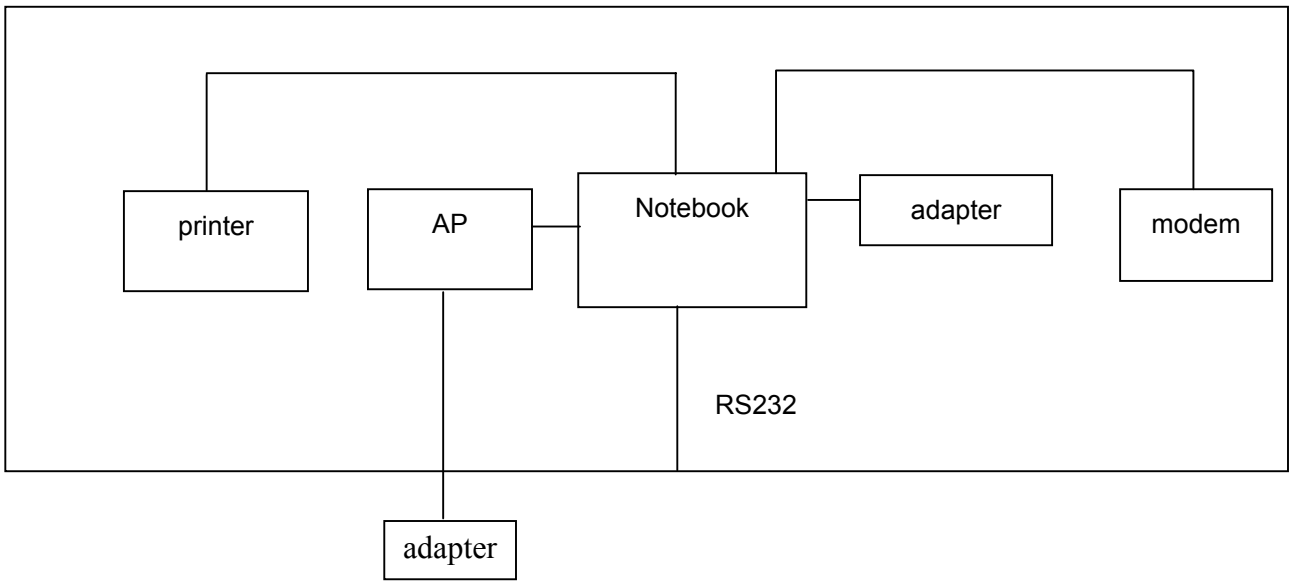
| | |
|---|---|
| FCC ID | : 38921023 |
| Model No. | : Stylus Color 680 |
| Serial No. | : SP0016 |
| Remark | : This support device was tested to comply with FCC standards and authorized under Declaration of Conformity and data cable is 1.35m of the shielded. |

Support Unit 2. – Modem (ACEEX)

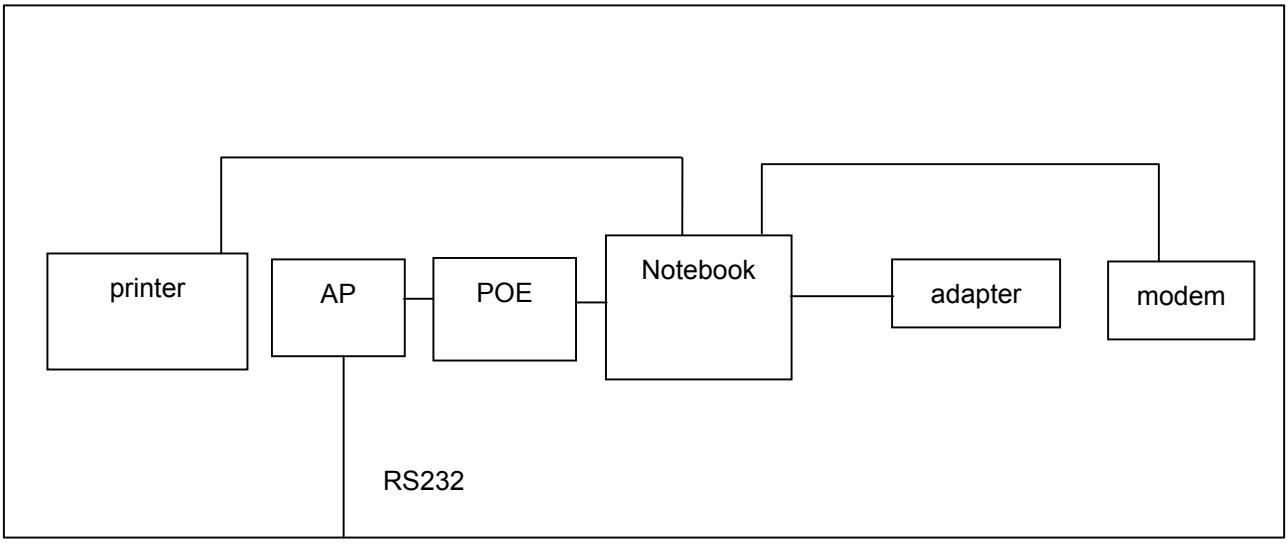
| | |
|---|---|
| FCC ID | : IFAXDM141 |
| Model No. | : OM141 |
| Serial No. | : N/A |
| Remark | : This support device was tested to comply with FCC standards and authorized under Declaration of Conformity. |

## 2.4. Connection Diagram of Test System

**Test Mode 1:** AP powered by Adapter




**Test Mode 2:** AP powered by POE



## 2.5. Test Software

Channel & Power Controlling Software: This was provided by the manufacturer and is able to let the test engineer select the operating channel as well as the RF output power. The parameters for channel selection is trying to offer the test engineer the ability to fix the operating channel for testing, both normal data and continuously transmitting modes are allowed, and that for RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

The software mentioned above was installed in the notebook. The channel and power setting of the Wireless LAN AP can be controlled by Notebook through LAN port.

# 3. Test Location and Standards

## 3.1. Test Location

**Test Location :** Sporton Hwa Ya Testing Building

**Address :** No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.
Tel: +886 3 327 3456 Fax: +886 3 318 0055

**Test Site No. :** CO04-HY, 03CH03-HY

## 3.2. Test Conditions

| | |
|---|---|
| Normal Voltage | : 120V/60Hz ( power adapter ) |
| Extreme Voltage | : 138V and 102V ( power adapter ) |
| Normal Temperature | : 20 ℃ |
| Extreme Temperature | : -20 ℃ and 50 ℃ |

## 3.3. Standards for Methods of Measurement

Here is the list of the standards followed in this test report.

**ANSI C63.4-2001**

**47 CFR Part 15 Subpart C ( Section 15.247 )**

## 3.4. DoC Statement

This EUT is also classified as a device of computer peripheral Class B which DoC has to be followed. It has been verified according to the rule of 47 CFR part 15 Subpart B, and found that all the requirements has been fulfilled.

# 4. List of Measurements

## 4.1. Summary of the Test Results

| Applied Standard: 47 CFR Part 15 and Part 2 | | | |
|---|---|---|---|
| **Paragraph** | **FCC Rule** | **Description of Test** | **Result** |
| 5.1 | 15.247(a)(2) | 6dB Spectrum Bandwidth (DSSS System) | Pass |
| 5.2 | 15.247(b) | Maximum Peak Output Power | Pass |
| 5.3 | 15.247(d) | Peak Power Spectral Density | Pass |
| 5.4 | 15.247(c) | Band Edges Emission | Pass |
| 5.5 | 15.107/15.207 | AC Power Line Conducted Emission | Pass |
| 5.6 | 15.209/15.247(c) | Spurious Radiated Emission | Pass |
| 5.7 | 15.203 | Antenna Requirement | Pass |

# 5. Test Result

## 5.1. Test of 6dB Spectrum Bandwidth ( DSSS System )

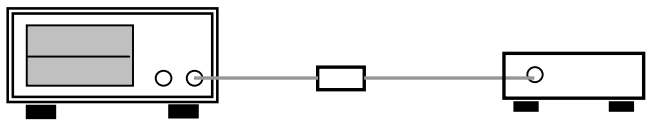
5.1.1. Measuring Instruments

Item 9 of the table on section 6.

5.1.2. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. The 6dB bandwidth is defined as the spectrum width with level higher than 6dB below the peak level.
4. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.1.3. Test Setup Layout



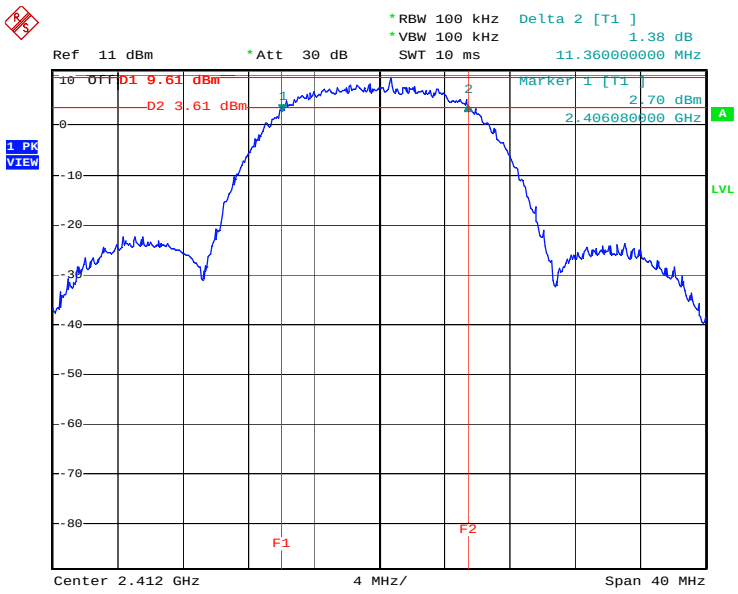
**Spectrum analyzer** **EUT**

5.1.4. Test Result : See spectrum analyzer plots below

- Temperature: 21.9°C
- Relative Humidity: 60 %
- Duty cycle of the equipment during the test: 100%

| Channel | Frequency (MHz) | 6dB Bandwidth (MHz) | Min. Limit (MHz) |
|---|---|---|---|
| 01 | 2412 | 11.36 | 0.5 |
| 06 | 2437 | 11.84 | 0.5 |
| 11 | 2462 | 12.26 | 0.5 |

(Channel 01) :

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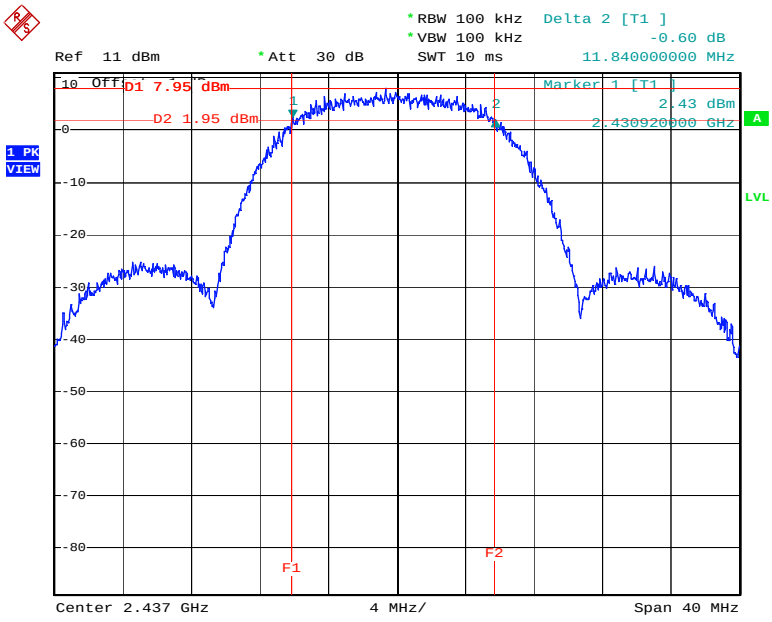
(Channel 06) :

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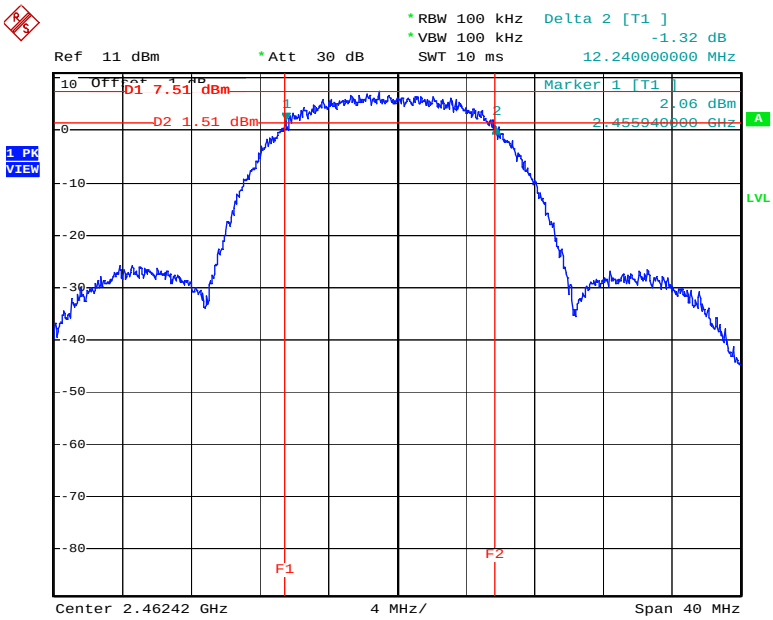
(Channel 11) :

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## 5.2. Test of Maximum Peak Output Power

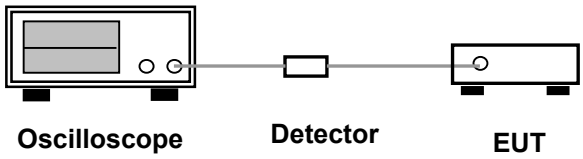
5.2.1. Measuring Instruments

Item 9 of the table on section 6.

5.2.2. Test Procedures

1. The transmitter output was connected to the vertical channel of the oscilloscope through a detector.
2. Observe the duty cycle X from the oscilloscope and the record the detected voltage level A.
3. Replace the EUT via the signal generator, calibrate the reading via the carrier frequency.
4. The duty cycle X has to be calibrated on the output power of the signal generator.
5. Repeated the 1~4 for the middle and highest channel of the EUT.

5.2.3. Test Setup Layout




5.2.4. Test Result：See spectrum analyzer plots below

- Temperature: 21.9°C
- Relative Humidity: 60 %
- Duty cycle of the equipment during the test : 100%

| Channel | Frequency (MHz) | Output Power (dBm) | Output Power (mWatt) | Limits (dBm ) |
|---|---|---|---|---|
| 01 | 2412 | 17.26 | 53.21 | 30 dBm |
| 06 | 2437 | 17.54 | 56.75 | 30 dBm |
| 11 | 2462 | 17.35 | 54.33 | 30 dBm |

## 5.3. Test of Peak Power Spectral Density

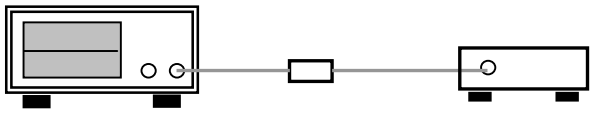
5.3.1. Measuring Instruments

Item 9 of the table on section 6.

5.3.2. Test Procedures

1. The transmitter output is connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 3kHz and VBW to 30kHz.
3. Mark the frequency with maximum peak power as the center of the display of the spectrum
4. Set the span to 1.5MHz and the sweep time to 500s and record the maximum peak value.
5. Repeated the 1~4 for the middle and highest channel of the EUT.

5.3.3. Test Setup Layout



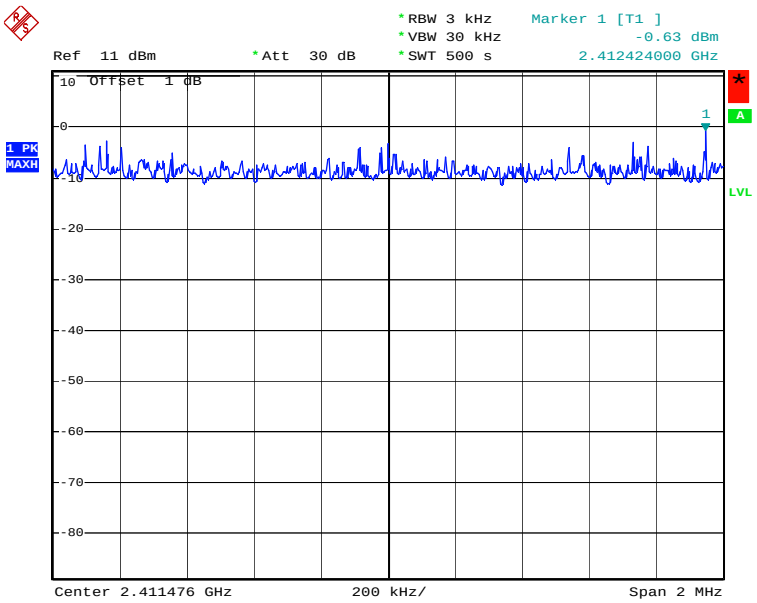
**Spectrum analyzer** **EUT**

5.3.4. Test Result : See spectrum analyzer plots below

- Temperature: 21.9°C
- Relative Humidity: 60 %
- Duty cycle of the equipment during the test: 100%

| Channel | Frequency (MHz) | Power Density (dBm) | Limits (dBm) |
|---|---|---|---|
| 01 | 2412 | -0.63 | 8 |
| 06 | 2437 | -3.78 | 8 |
| 11 | 2462 | -3.83 | 8 |

(Channel 01) :

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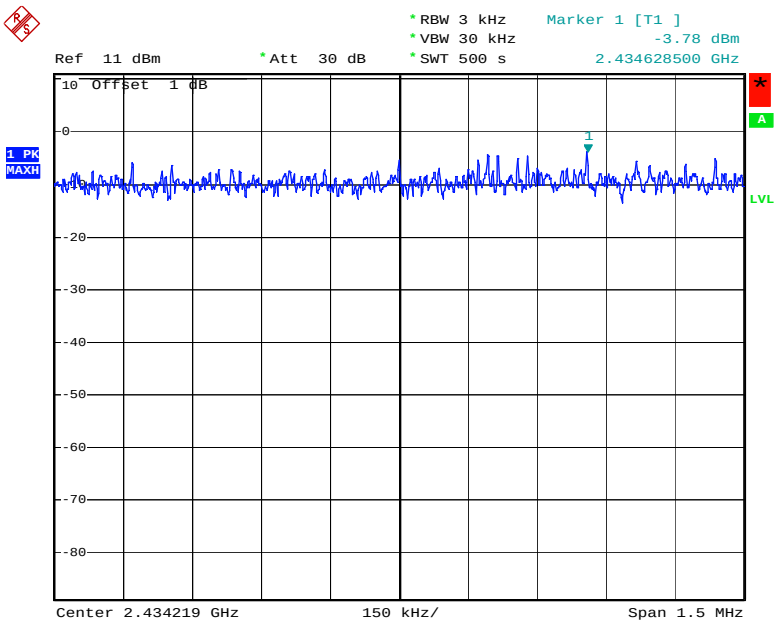
(Channel 06) :

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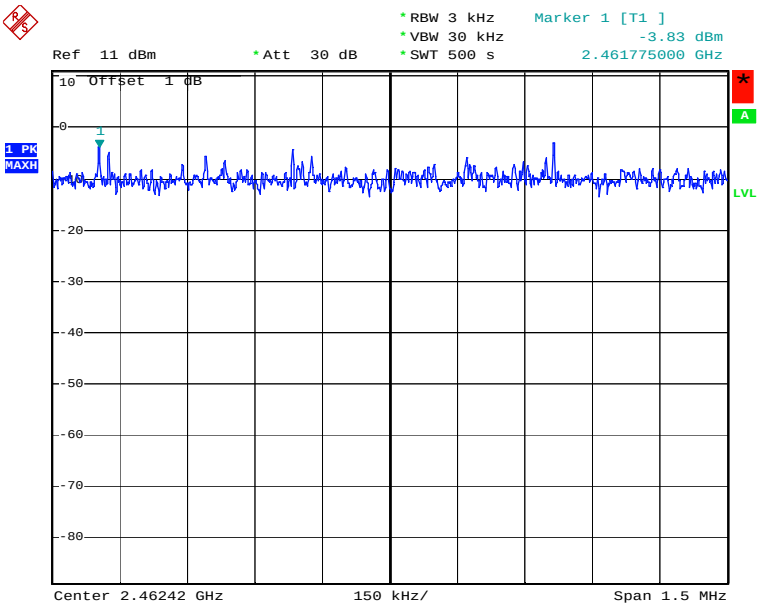
(Channel 11) :


*RBW 3 kHz
*VBW 30 kHz
*SWT 500 s
Marker 1 [T1 ]
-3.83 dBm
2.461775000 GHz
Ref 11 dBm
*Att 30 dB
10 Offset 1 dB
1 PK
MAXH
A
LVL
0
-20
-30
-40
-50
-60
-70
-80
Center 2.46242 GHz
150 kHz/
Span 1.5 MHz
Date: 24.JUN.2004 23:15:34

## 5.4. Test of Band Edges Emission

5.4.1. Measuring Instruments

Item 9 of the table on section 6.

5.4.2. Test Procedures

1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW of spectrum analyzer to 1MHz and VBW to 300kHz with convenient frequency span including 100MHz bandwidth from lower band edge.
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

5.4.3. Test Result

(A) Left Edge

The band edge emission plot shows 47.42dB delta between carrier maximum power and local maximum emission in the restricted band.

| CH01 Carrier power strength (dB $\mu$ V/m) | Delta (dB) | The maximum field strength in restrict band (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
|---|---|---|---|---|
| 100.50 | 47.42 | 53.08 | 54.00 | -0.92 |

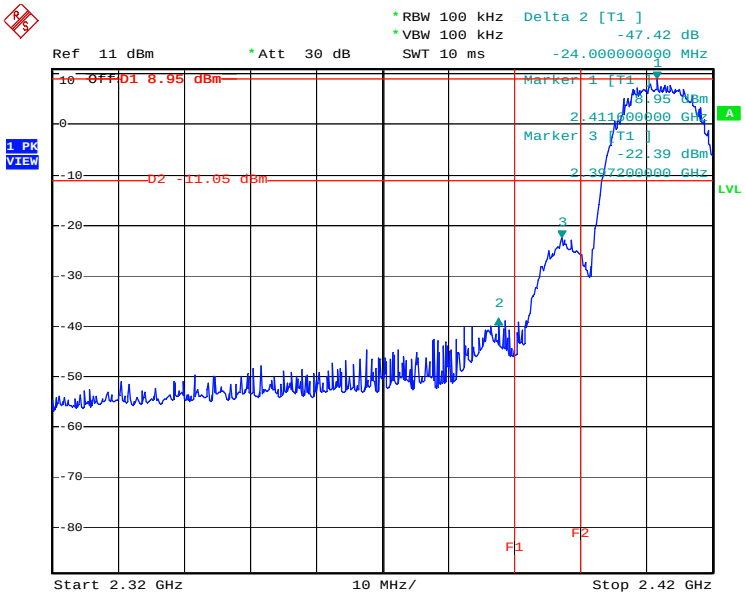
(B) Right Edge

The band edge emission plot shows 51.15dB delta between carrier maximum power and local maximum emission in the restricted band.

| CH11 Carrier power strength (dB $\mu$ V/m) | Delta (dB) | The maximum field strength in restrict band (dB $\mu$ V/m) | Limit (dB $\mu$ V/m) | Margin (dB) |
|---|---|---|---|---|
| 100.15 | 51.15 | 49.00 | 54.00 | -5.00 |

∗The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.

(Channel 01) :

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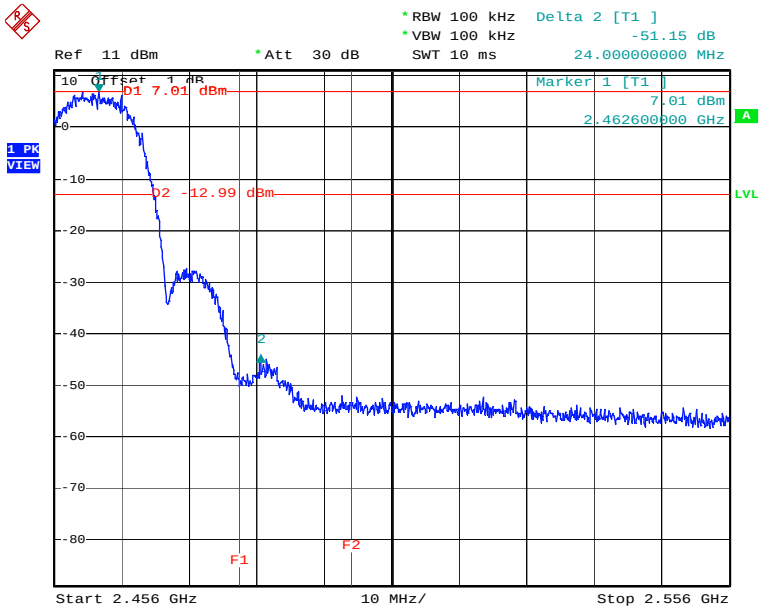
(Channel 11) :




Date: 24.JUN.2004 23:20:47

Observation : All emissions in the 100kHz bandwidth are 20dB lower than the carrier strength.

## 5.5. Test of AC Power Line Conducted Emission

5.5.1. Measuring Instruments

Please reference item 1~7 in chapter 6 for the instruments used for testing.

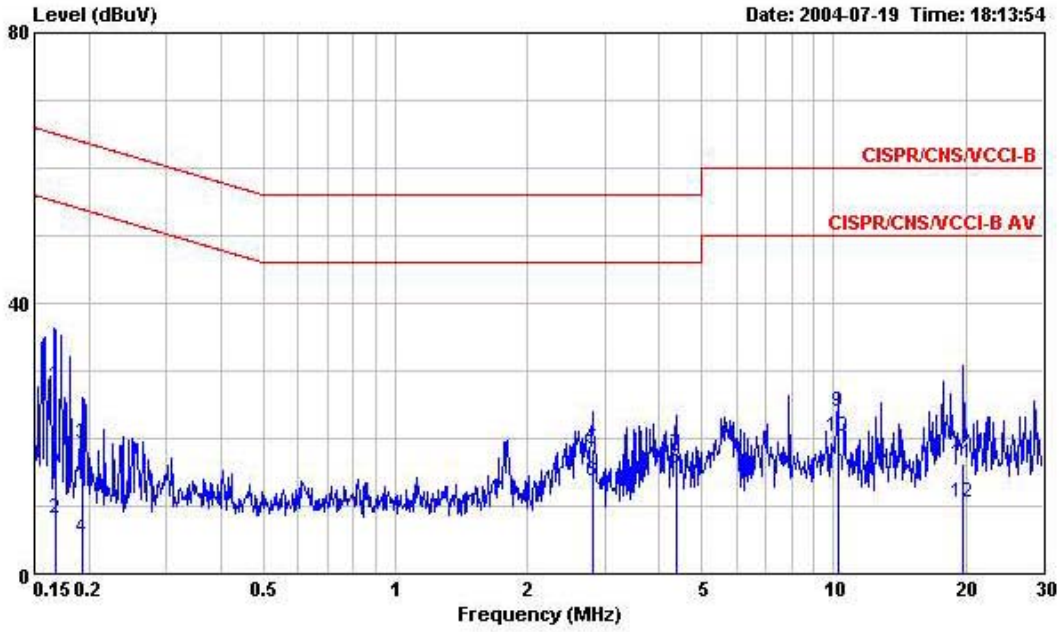
5.5.2. Test Procedures

1. Configure the EUT according to ANSI C63.4.
2. The EUT has to be placed 0.4 meter far from the conducting wall of the shielding room and at least 80 centimeters from any other grounded conducting surface.
3. Connect EUT to the power mains through a line impedance stabilization network (LISN).
4. All the support units are connected to the other LISNs. The LISN should provides 50uH/50ohms coupling impedance.
5. The frequency range from 150 KHz to 30 MHz was searched.
6. Use the Channel & Power Controlling software to make the EUT working on selected channel and expected output power, then use the “H” Patter Generator software to make the supporting equipments stay on working condition.
7. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
8. The measurement has to be done between each power line and ground at the power terminal for each RF channel. Only one RF channel has to be investigated since this test is independent with the RF channel selection.

5.5.3. Test Result of Conducted Emission

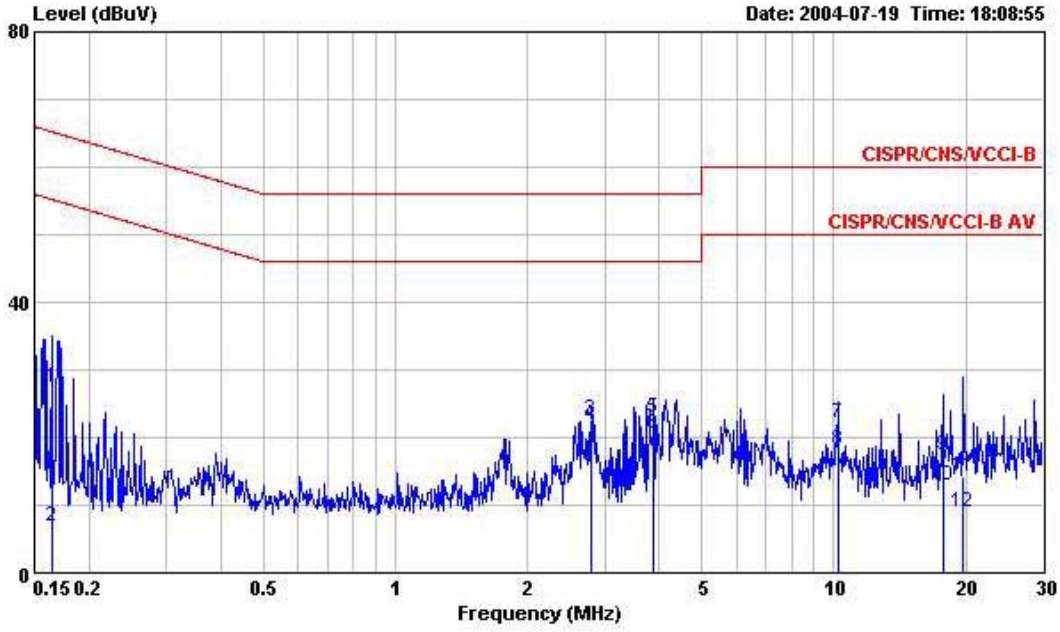
| Test Mode | Mode 1 | Tested By | Jason Chang |
|---|---|---|---|
| Temperature / Humidity | 24 deg. C / 60% | | |

***Line to Ground***




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.1678780 | 27.77 | -37.29 | 65.06 | 27.66 | 0.10 | 0.01 | QP |
| 2 | 0.1678780 | 8.04 | -47.02 | 55.06 | 7.93 | 0.10 | 0.01 | Average |
| 3 | 0.1934380 | 19.30 | -44.59 | 63.89 | 19.19 | 0.10 | 0.01 | QP |
| 4 | 0.1934380 | 5.30 | -48.59 | 53.89 | 5.19 | 0.10 | 0.01 | Average |
| 5 | 2.810 | 18.29 | -37.71 | 56.00 | 18.10 | 0.15 | 0.04 | QP |
| 6 | 2.810 | 13.65 | -32.35 | 46.00 | 13.46 | 0.15 | 0.04 | Average |
| 7 | 4.361 | 17.64 | -38.36 | 56.00 | 17.37 | 0.20 | 0.07 | QP |
| 8 | 4.361 | 15.48 | -30.52 | 46.00 | 15.21 | 0.20 | 0.07 | Average |
| 9 | 10.242 | 23.82 | -36.18 | 60.00 | 23.51 | 0.20 | 0.11 | QP |
| 10 | 10.242 | 20.34 | -29.66 | 50.00 | 20.03 | 0.20 | 0.11 | Average |
| 11 | 19.740 | 16.38 | -43.62 | 60.00 | 15.89 | 0.29 | 0.20 | QP |
| 12 | 19.740 | 10.64 | -39.36 | 50.00 | 10.15 | 0.29 | 0.20 | Average |

***Neutral to Ground***



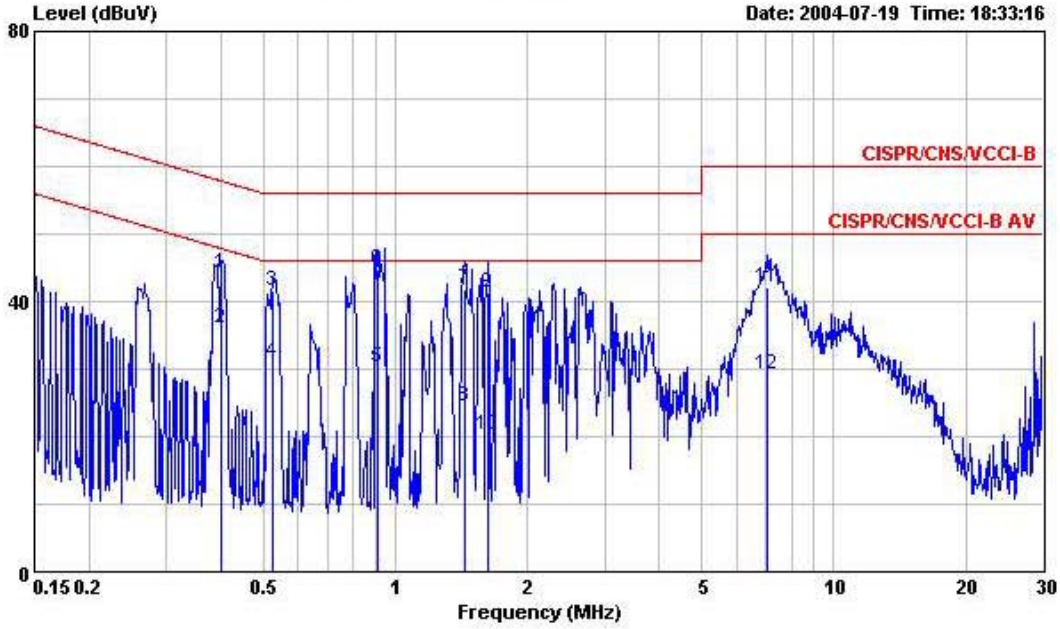

| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.1641380 | 27.26 | -37.99 | 65.25 | 27.15 | 0.10 | 0.01 | QP |
| 2 | 0.1641380 | 6.82 | -48.43 | 55.25 | 6.71 | 0.10 | 0.01 | Average |
| 3 | 2.806 | 22.72 | -33.28 | 56.00 | 22.58 | 0.10 | 0.04 | QP |
| 4 | 2.806 | 21.93 | -24.07 | 46.00 | 21.79 | 0.10 | 0.04 | Average |
| 5 | 3.866 | 22.78 | -33.22 | 56.00 | 22.61 | 0.10 | 0.07 | QP |
| 6 | 3.866 | 20.53 | -25.47 | 46.00 | 20.36 | 0.10 | 0.07 | Average |
| 7 | 10.240 | 22.11 | -37.89 | 60.00 | 21.80 | 0.20 | 0.11 | QP |
| 8 | 10.240 | 18.19 | -31.81 | 50.00 | 17.88 | 0.20 | 0.11 | Average |
| 9 | 17.755 | 17.25 | -42.75 | 60.00 | 16.81 | 0.26 | 0.18 | QP |
| 10 | 17.755 | 12.80 | -37.20 | 50.00 | 12.36 | 0.26 | 0.18 | Average |
| 11 | 19.740 | 14.22 | -45.78 | 60.00 | 13.73 | 0.29 | 0.20 | QP |
| 12 | 19.740 | 9.01 | -40.99 | 50.00 | 8.52 | 0.29 | 0.20 | Average |

Test Engineer : Jason

Jason Chang

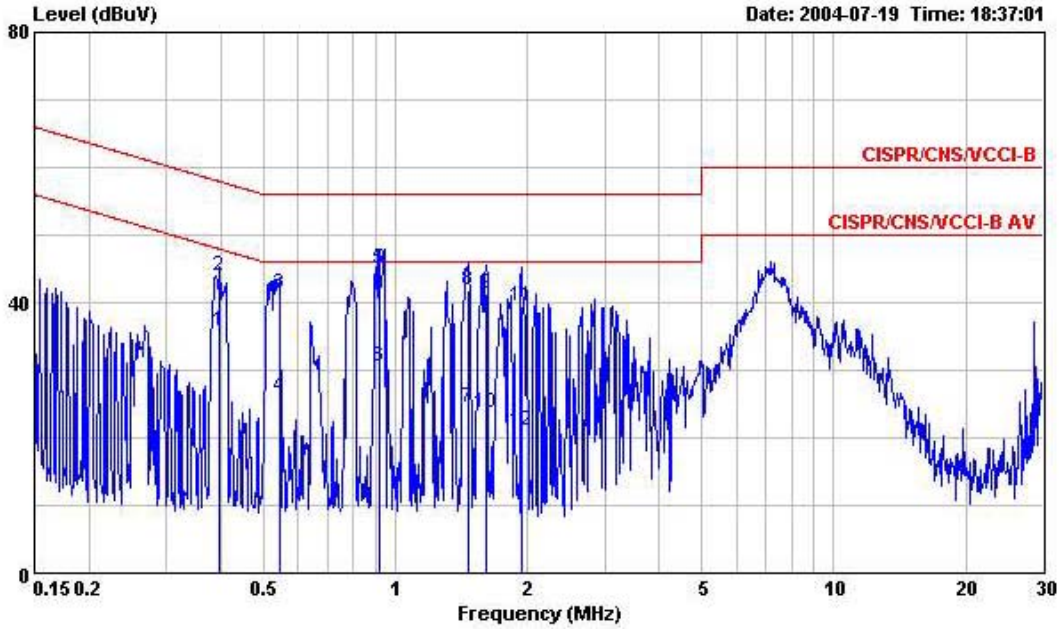
| Test Mode | Mode 2 | Tested By | Jason Chang |
|---|---|---|---|
| Temperature / Humidity | 24 deg. C / 60% | | |

***Line to Ground***




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.3997440 | 44.22 | -13.64 | 57.86 | 44.10 | 0.10 | 0.02 | QP |
| 2 | 0.3997440 | 36.07 | -11.79 | 47.86 | 35.95 | 0.10 | 0.02 | Average |
| 3 | 0.5237620 | 41.49 | -14.51 | 56.00 | 41.36 | 0.10 | 0.03 | QP |
| 4 | 0.5237620 | 31.05 | -14.95 | 46.00 | 30.92 | 0.10 | 0.03 | Average |
| 5 | 0.9135710 | 30.31 | -15.69 | 46.00 | 30.17 | 0.10 | 0.04 | Average |
| 6 | 0.9135710 | 44.86 | -11.14 | 56.00 | 44.72 | 0.10 | 0.04 | QP |
| 7 | 1.440 | 41.87 | -14.13 | 56.00 | 41.74 | 0.10 | 0.03 | QP |
| 8 | 1.440 | 24.52 | -21.48 | 46.00 | 24.39 | 0.10 | 0.03 | Average |
| 9 | 1.630 | 41.34 | -14.66 | 56.00 | 41.21 | 0.10 | 0.03 | QP |
| 10 | 1.630 | 20.31 | -25.69 | 46.00 | 20.18 | 0.10 | 0.03 | Average |
| 11 | 7.060 | 42.06 | -17.94 | 60.00 | 41.77 | 0.20 | 0.09 | QP |
| 12 | 7.060 | 29.18 | -20.82 | 50.00 | 28.89 | 0.20 | 0.09 | Average |

***Neutral to Ground***




| | Freq | Level | Over Limit | Limit Line | Read Level | LISN Factor | Cable Loss | Remark |
|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV | dB | dBuV | dBuV | dB | dB | |
| 1 | 0.3976320 | 35.78 | -12.12 | 47.90 | 35.66 | 0.10 | 0.02 | Average |
| 2 | 0.3976320 | 43.82 | -14.08 | 57.90 | 43.70 | 0.10 | 0.02 | QP |
| 3 | 0.5435530 | 41.37 | -14.63 | 56.00 | 41.24 | 0.10 | 0.03 | QP |
| 4 | 0.5435530 | 25.96 | -20.04 | 46.00 | 25.83 | 0.10 | 0.03 | Average |
| 5 | @0.9184250 | 45.00 | -11.00 | 56.00 | 44.86 | 0.10 | 0.04 | QP |
| 6 | 0.9184250 | 30.44 | -15.56 | 46.00 | 30.30 | 0.10 | 0.04 | Average |
| 7 | 1.470 | 24.47 | -21.53 | 46.00 | 24.34 | 0.10 | 0.03 | Average |
| 8 | 1.470 | 41.78 | -14.22 | 56.00 | 41.65 | 0.10 | 0.03 | QP |
| 9 | 1.610 | 41.34 | -14.66 | 56.00 | 41.21 | 0.10 | 0.03 | QP |
| 10 | 1.610 | 23.66 | -22.34 | 46.00 | 23.53 | 0.10 | 0.03 | Average |
| 11 | 1.940 | 39.48 | -16.52 | 56.00 | 39.36 | 0.10 | 0.02 | QP |
| 12 | 1.940 | 21.07 | -24.93 | 46.00 | 20.95 | 0.10 | 0.02 | Average |

Test Engineer : Jason

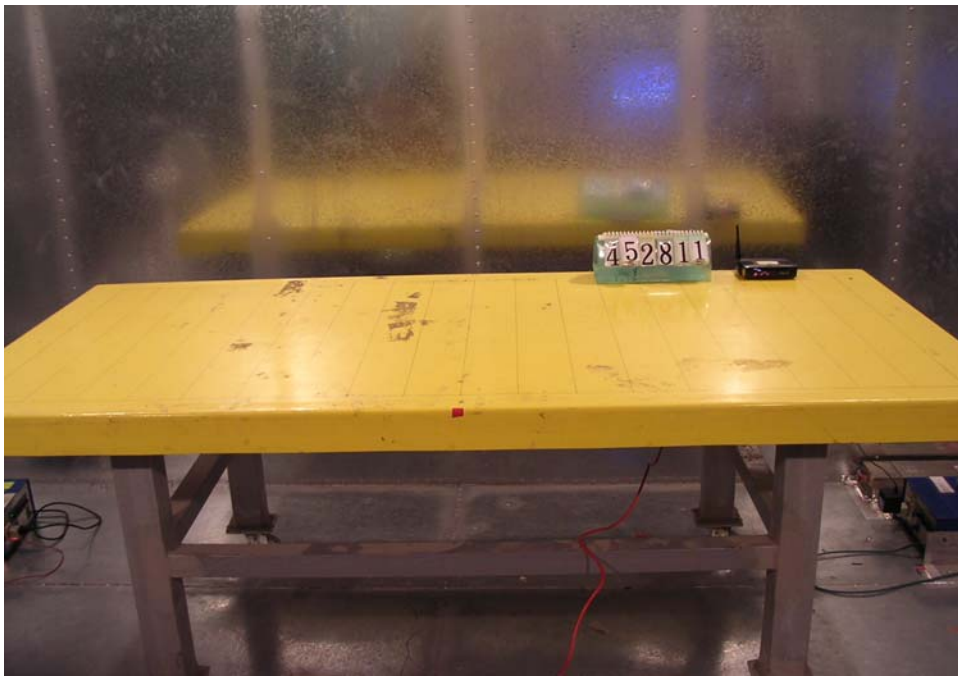
Jason Chang

5.5.4. Photographs of Conducted Emission Test Configuration

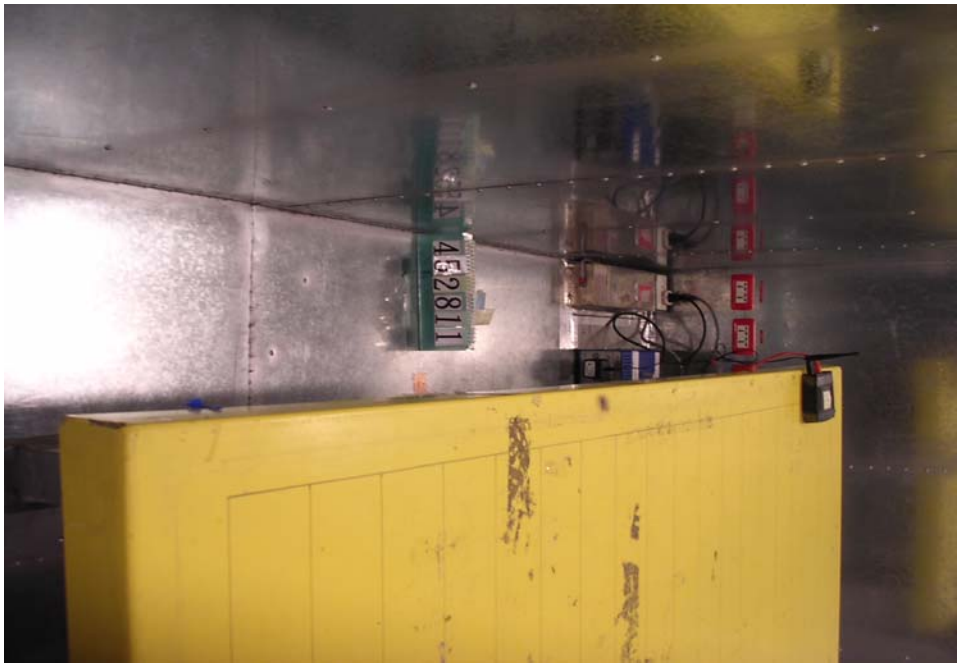
- The photographs show the configuration that generates the maximum emission.

**Mode 1**

FRONT VIEW



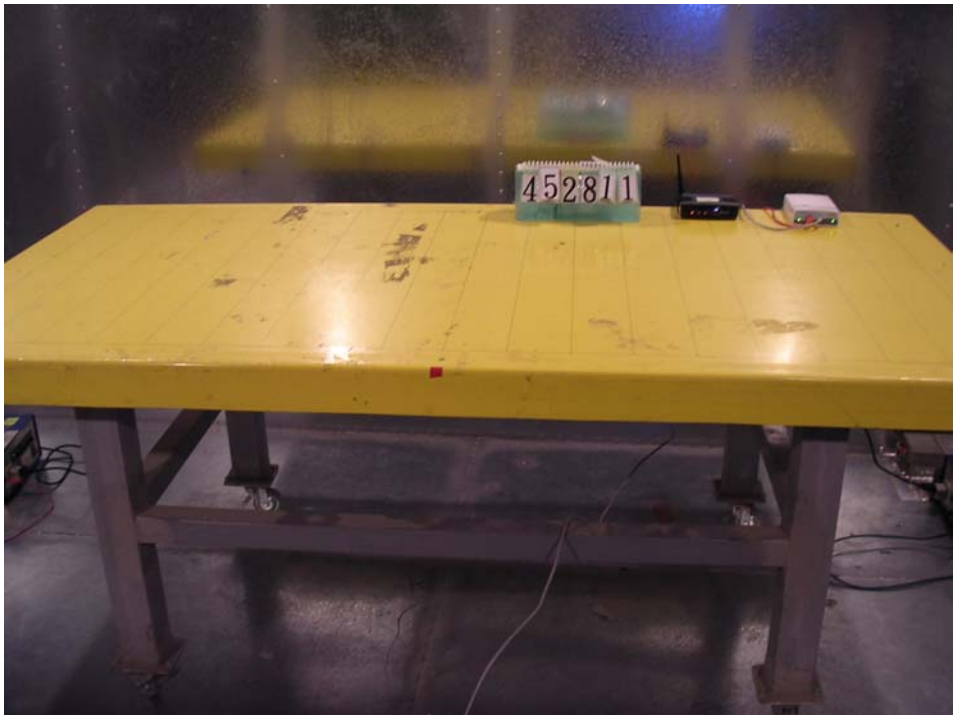

REAR VIEW



SIDE VIEW

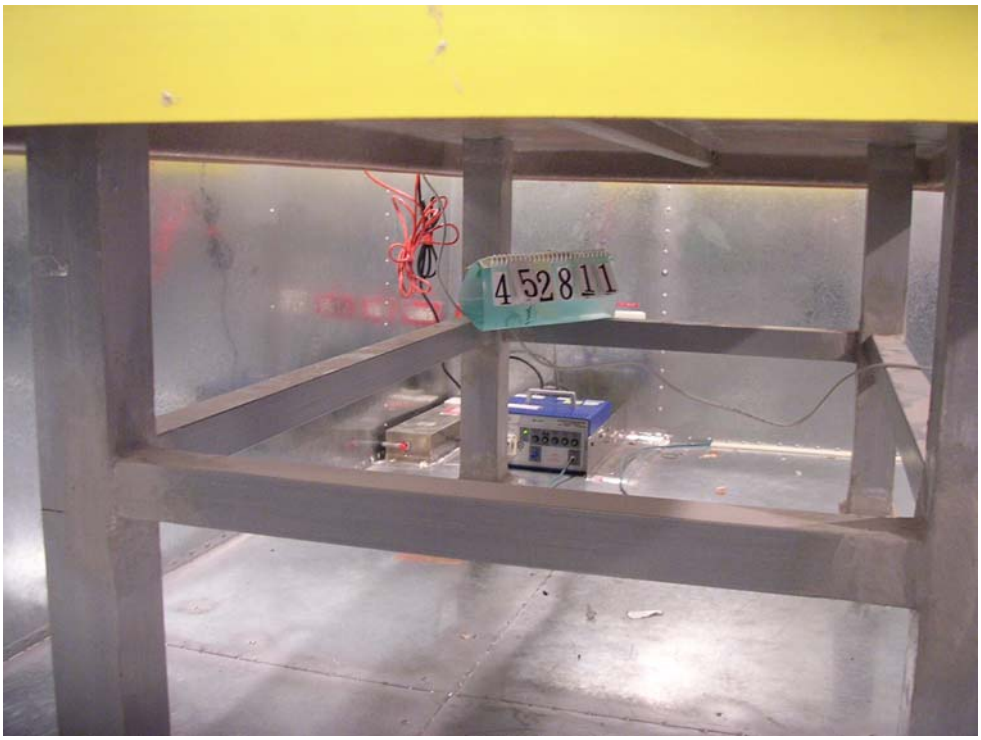
- The photographs show the configuration that generates the maximum emission.
  **Mode 2**

FRONT VIEW




REAR VIEW

SIDE VIEW



## 5.6. Test of Spurious Radiated Emission

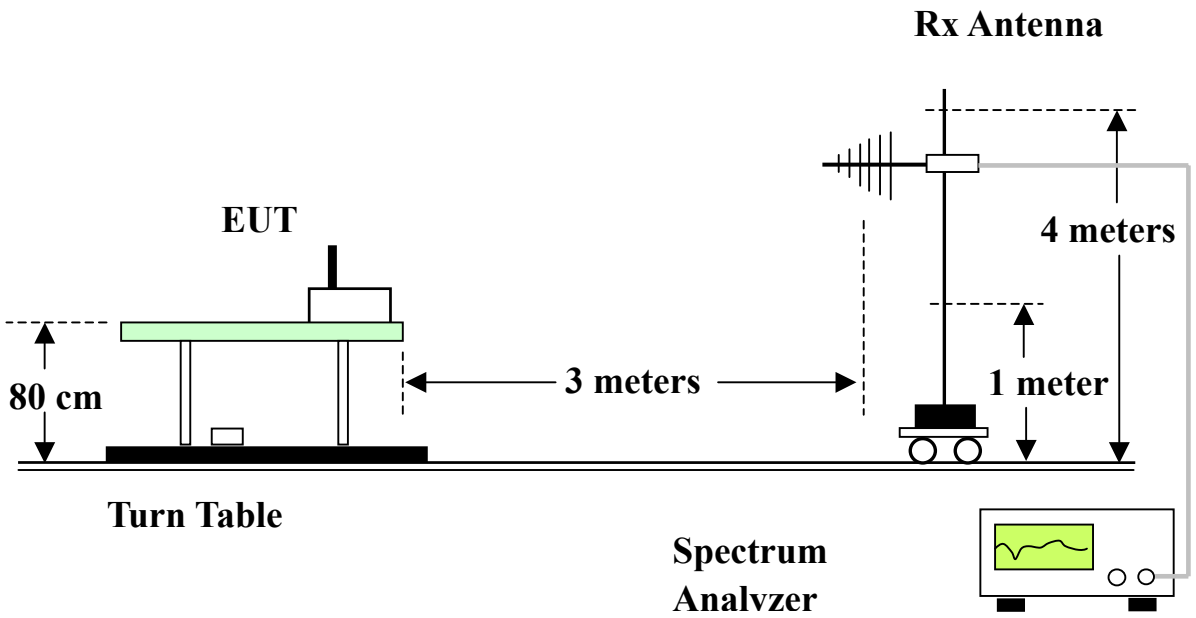
5.6.1. Measuring Instruments

Please reference item 8~19 in chapter 6 for the instruments used for testing.

5.6.2. Test Procedures

a) Configure the EUT according to ANSI C63.4.
b) The EUT was placed on the top of the turn table 0.8 meter above ground.
c) The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turn table.
d) Power on the EUT and all the supporting units.
e) The turn table was rotated by 360 degrees to determine the position of the highest radiation.
f) The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
g) For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.
h) Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
i) For emission above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
j) If the emission level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz and average method for above the 1GHz. the reported.
k) For testing above 1GHz, the emission level of the EUT in peak mode was 20dB higher than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

5.6.3. Test Setup Layout



5.6.4. Test Results and Limit

**Note:**
Emission level (dBuV/m) = 20 log Emission level (uV/m)
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

| **Test Mode** | Mode 1 CH11 | **Temperature** | 25 deg. C | **Tested By** | Steve Chen |
|---|---|---|---|---|---|
| **Freq. Range** | 30MHz~1GHz | **Humidity** | 64% | | |

***(A) Polarization: Horizontal***

| | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | 82.190 | 26.00 | -14.00 | 40.00 | 42.72 | 9.65 | 1.56 | 27.93 | Peak | --- | --- |
| 2 | 123.500 | 27.21 | -16.29 | 43.50 | 42.22 | 10.86 | 1.98 | 27.85 | Peak | --- | --- |
| 3 | 143.900 | 26.52 | -16.98 | 43.50 | 40.22 | 11.99 | 2.12 | 27.81 | Peak | --- | --- |
| 1 | 320.000 | 33.43 | -12.57 | 46.00 | 43.26 | 14.37 | 3.20 | 27.40 | Peak | --- | --- |
| 2 | 576.000 | 35.26 | -10.74 | 46.00 | 41.41 | 18.41 | 4.22 | 28.78 | Peak | --- | --- |
| 3 | 938.400 | 37.58 | -8.42 | 46.00 | 38.73 | 21.66 | 5.45 | 28.26 | Peak | 100 | 53 |

***(B) Polarization: Vertical***

| | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | 60.260 | 31.13 | -8.87 | 40.00 | 47.66 | 10.15 | 1.30 | 27.98 | Peak | --- | --- |
| 2 | 79.470 | 26.78 | -13.22 | 40.00 | 43.73 | 9.45 | 1.54 | 27.94 | Peak | --- | --- |
| 3 | 144.750 | 32.14 | -11.36 | 43.50 | 45.77 | 12.04 | 2.14 | 27.81 | Peak | --- | --- |
| 1 | 320.000 | 32.20 | -13.80 | 46.00 | 42.03 | 14.37 | 3.20 | 27.40 | Peak | --- | --- |
| 2 | 899.200 | 30.14 | -15.86 | 46.00 | 32.02 | 21.08 | 5.34 | 28.30 | Peak | --- | --- |
| 3 | 938.400 | 37.48 | -8.52 | 46.00 | 38.63 | 21.66 | 5.45 | 28.26 | Peak | --- | --- |

| Test Mode | Mode 2 CH11 | Temperature | 25 deg. C | Tested By | Steve Chen |
|---|---|---|---|---|---|
| Freq. Range | 30MHz~1GHz | Humidity | 64% | | |

***(A) Polarization: Horizontal***

| | | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | ! | 106.500 | 40.41 | -3.09 | 43.50 | 56.24 | 10.22 | 1.84 | 27.89 | QP | 152 | 169 |
| 2 | ! | 111.430 | 40.31 | -3.19 | 43.50 | 55.85 | 10.46 | 1.88 | 27.88 | QP | --- | --- |
| 3 | ! | 198.300 | 39.19 | -4.31 | 43.50 | 49.57 | 14.76 | 2.56 | 27.70 | QP | --- | --- |
| 1 | | 265.600 | 37.03 | -8.97 | 46.00 | 49.04 | 12.50 | 2.93 | 27.44 | QP | --- | --- |
| 2 | | 829.600 | 37.83 | -8.17 | 46.00 | 40.61 | 20.67 | 5.20 | 28.65 | QP | --- | --- |
| 3 | | 996.000 | 38.49 | -15.51 | 54.00 | 38.81 | 22.20 | 5.68 | 28.20 | QP | --- | --- |

***(B) Polarization: Vertical***

| | | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | ! | 33.910 | 35.80 | -4.20 | 40.00 | 49.57 | 13.27 | 1.00 | 28.04 | QP | --- | --- |
| 2 | ! | 106.500 | 40.17 | -3.33 | 43.50 | 56.00 | 10.22 | 1.84 | 27.89 | QP | --- | --- |
| 3 | ! | 112.620 | 37.86 | -5.64 | 43.50 | 53.36 | 10.48 | 1.89 | 27.87 | QP | --- | --- |
| 1 | | 551.200 | 33.68 | -12.32 | 46.00 | 40.48 | 17.80 | 4.15 | 28.75 | QP | --- | --- |
| 2 | | 666.400 | 36.21 | -9.79 | 46.00 | 41.17 | 19.12 | 4.65 | 28.73 | QP | --- | --- |
| 3 | | 1000.000 | 39.59 | -14.41 | 54.00 | 39.87 | 22.23 | 5.69 | 28.20 | QP | --- | --- |

| Test Mode | Mode 1 CH01 | Temperature | 25 deg. C | Tested By | Steve Chen |
|---|---|---|---|---|---|
| Freq. Range | 1GHz~25GHz | Humidity | 64% | | |

***(A) Polarization: Horizontal***

| | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | 1564.000 | 38.06 | -15.94 | 54.00 | 51.73 | 25.49 | 1.49 | 40.65 | Average | --- | --- |
| 2 | 1590.000 | 38.97 | -15.03 | 54.00 | 52.54 | 25.59 | 1.50 | 40.66 | Average | --- | --- |
| 3 | 2372.000 | 45.95 | -8.05 | 54.00 | 57.29 | 28.09 | 1.70 | 41.13 | Average | --- | --- |
| 1 | 4822.000 | 47.23 | -6.77 | 54.00 | 53.90 | 33.23 | 2.47 | 42.37 | Average | --- | --- |

***(B) Polarization: Vertical***

| | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | 1588.000 | 43.97 | -10.03 | 54.00 | 57.55 | 25.58 | 1.50 | 40.66 | Average | --- | --- |
| 2 | 2324.000 | 57.70 | -16.30 | 74.00 | 69.11 | 27.97 | 1.72 | 41.10 | Peak | --- | --- |
| 3 | 2324.000 | 47.89 | -6.11 | 54.00 | 59.30 | 27.97 | 1.72 | 41.10 | Average | --- | --- |
| 4 | 2508.000 | 47.94 | -6.06 | 54.00 | 58.81 | 28.47 | 1.86 | 41.20 | Average | 102 | 151 |
| 1 | 4822.000 | 51.84 | -22.16 | 74.00 | 58.51 | 33.23 | 2.47 | 42.37 | Peak | --- | --- |
| 2 | 4822.000 | 47.51 | -6.49 | 54.00 | 54.18 | 33.23 | 2.47 | 42.37 | Average | --- | --- |

| Test Mode | Mode 1 CH06 | Temperature | 25 deg. C | Tested By | Steve Chen |
|---|---|---|---|---|---|
| Freq. Range | 1GHz~25GHz | Humidity | 64% | | |

***(A) Polarization: Horizontal***

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1196.000 | 37.75 | -16.25 | 54.00 | 52.46 | 24.38 | 1.22 | 40.31 | Average | --- | --- |
| 2 | 2372.000 | 45.05 | -8.95 | 54.00 | 56.39 | 28.09 | 1.70 | 41.13 | Average | --- | --- |
| 3 | 2508.000 | 40.51 | -13.49 | 54.00 | 51.38 | 28.47 | 1.86 | 41.20 | Average | --- | --- |
| 1 | 4876.000 | 45.25 | -8.75 | 54.00 | 51.82 | 33.35 | 2.52 | 42.44 | Average | --- | --- |

***(B) Polarization: Vertical***

| | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | 1588.000 | 44.00 | -10.00 | 54.00 | 57.58 | 25.58 | 1.50 | 40.66 | Average | --- | --- |
| 2 | 2348.000 | 57.40 | -16.60 | 74.00 | 68.81 | 28.03 | 1.68 | 41.12 | Peak | --- | --- |
| 3 | 2348.000 | 44.75 | -9.25 | 54.00 | 56.16 | 28.03 | 1.68 | 41.12 | Average | --- | --- |
| 4 | 2526.000 | 49.68 | -4.32 | 54.00 | 60.48 | 28.53 | 1.87 | 41.20 | Average | --- | --- |
| 1 | 4876.000 | 50.65 | -3.35 | 54.00 | 57.22 | 33.35 | 2.52 | 42.44 | Average | 105 | 216 |

| Test Mode | Mode 1 CH11 | Temperature | 25 deg. C | Tested By | Steve Chen |
|---|---|---|---|---|---|
| Freq. Range | 1GHz~25GHz | Humidity | 64% | | |

***(A) Polarization: Horizontal***

| | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | 1564.000 | 38.82 | -15.18 | 54.00 | 52.49 | 25.49 | 1.49 | 40.65 | Average | --- | --- |
| 2 | 2310.000 | 45.69 | -8.31 | 54.00 | 57.10 | 27.93 | 1.75 | 41.09 | Average | --- | --- |
| 3 | 2508.000 | 41.17 | -12.83 | 54.00 | 52.04 | 28.47 | 1.86 | 41.20 | Average | --- | --- |
| 1 | 4924.000 | 45.26 | -8.74 | 54.00 | 51.84 | 33.46 | 2.47 | 42.51 | Average | --- | --- |

***(B) Polarization: Vertical***

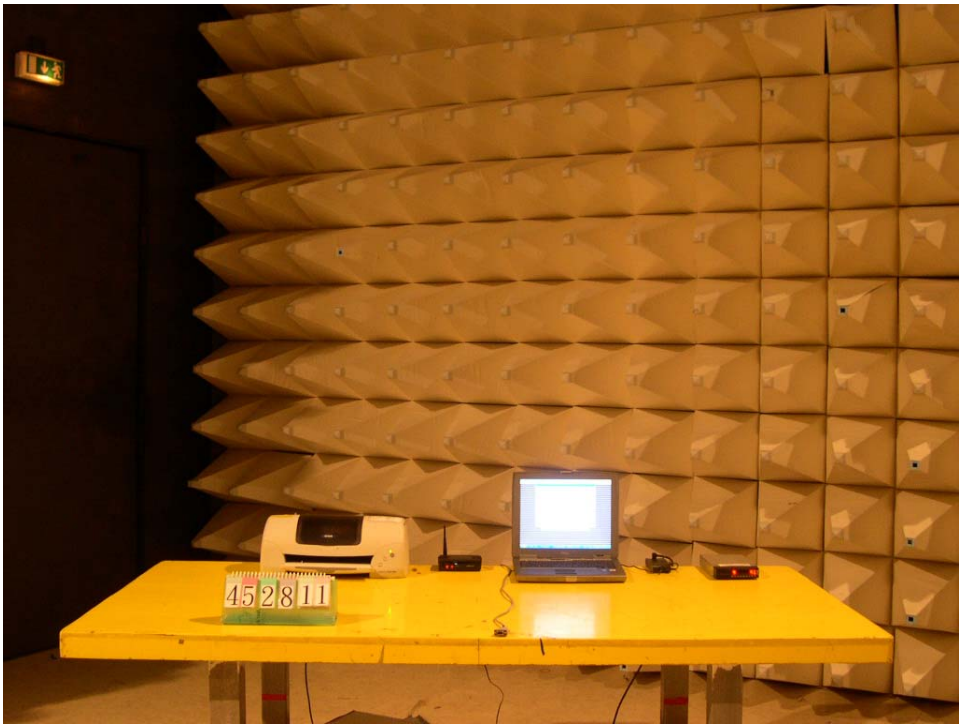
| | Freq | Level | Over Limit | Limit Line | Read Level | Probe Factor | Cable Loss | Preamp Factor | Remark | Ant Pos | Table Pos |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MHz | dBuV/m | dB | dBuV/m | dBuV | dB | dB | dB | | cm | deg |
| 1 | 1596.000 | 43.58 | -10.42 | 54.00 | 57.12 | 25.61 | 1.51 | 40.66 | Average | --- | --- |
| 2 | 2342.000 | 56.47 | -17.53 | 74.00 | 67.88 | 28.01 | 1.69 | 41.11 | Peak | --- | --- |
| 3 | 2342.000 | 44.72 | -9.28 | 54.00 | 56.13 | 28.01 | 1.69 | 41.11 | Average | --- | --- |
| 4 | 2510.000 | 49.17 | -4.83 | 54.00 | 60.04 | 28.47 | 1.86 | 41.20 | Average | 107 | 218 |
| 1 | 4924.000 | 48.21 | -5.79 | 54.00 | 54.79 | 33.46 | 2.47 | 42.51 | Average | --- | --- |

5.6.5. Photographs of Radiated Emission Test Configuration

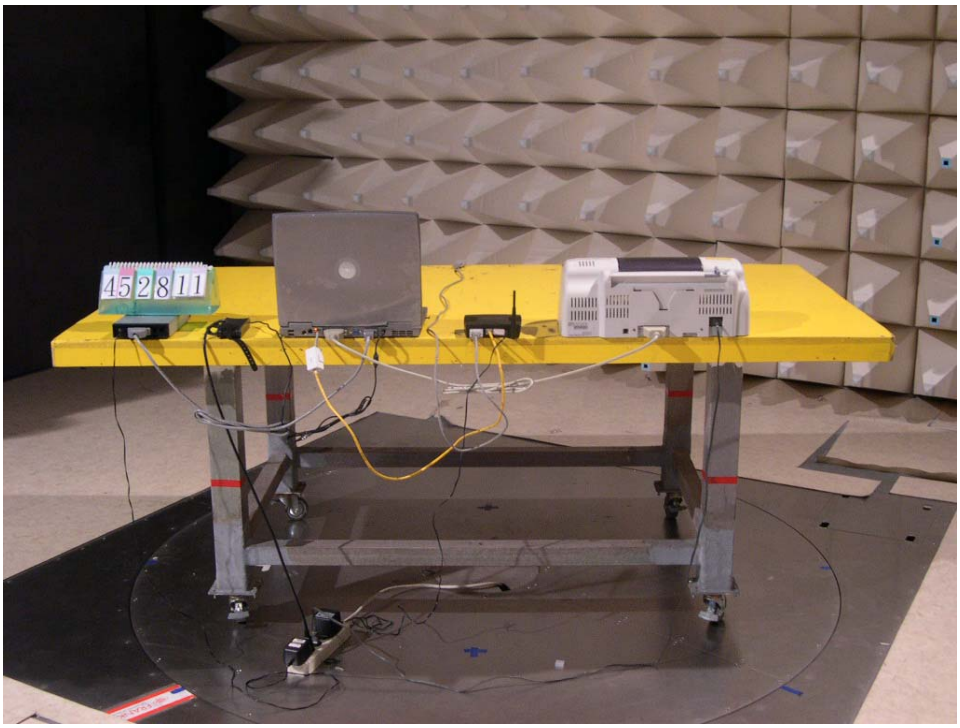
- The photographs show the configuration that generates the maximum emission.

**Mode 1**

FRONT VIEW



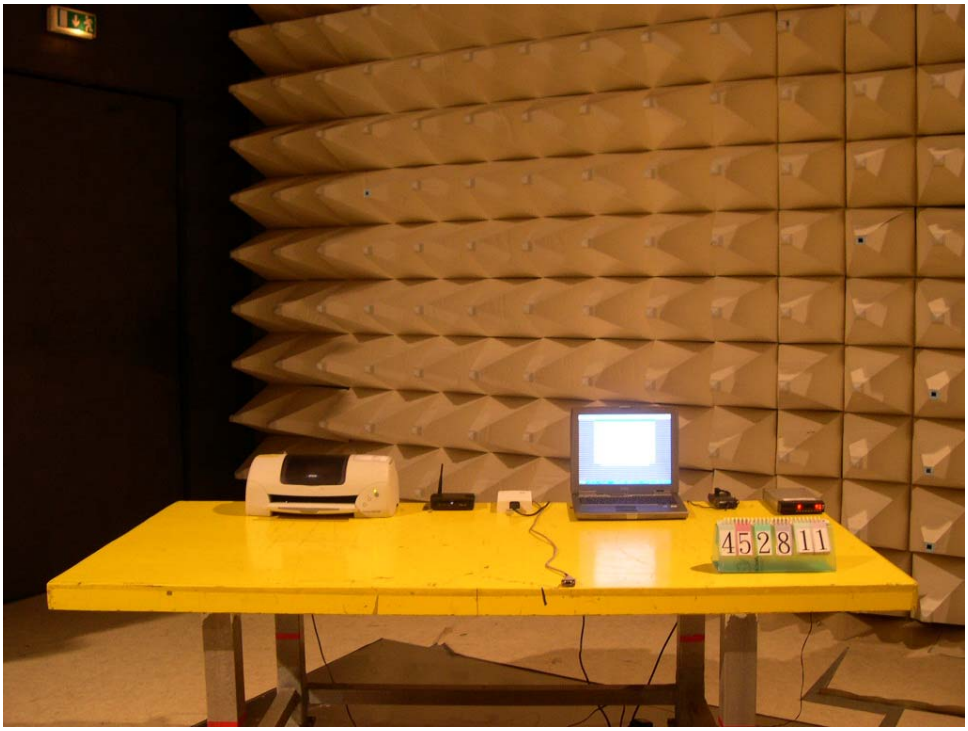

REAR VIEW



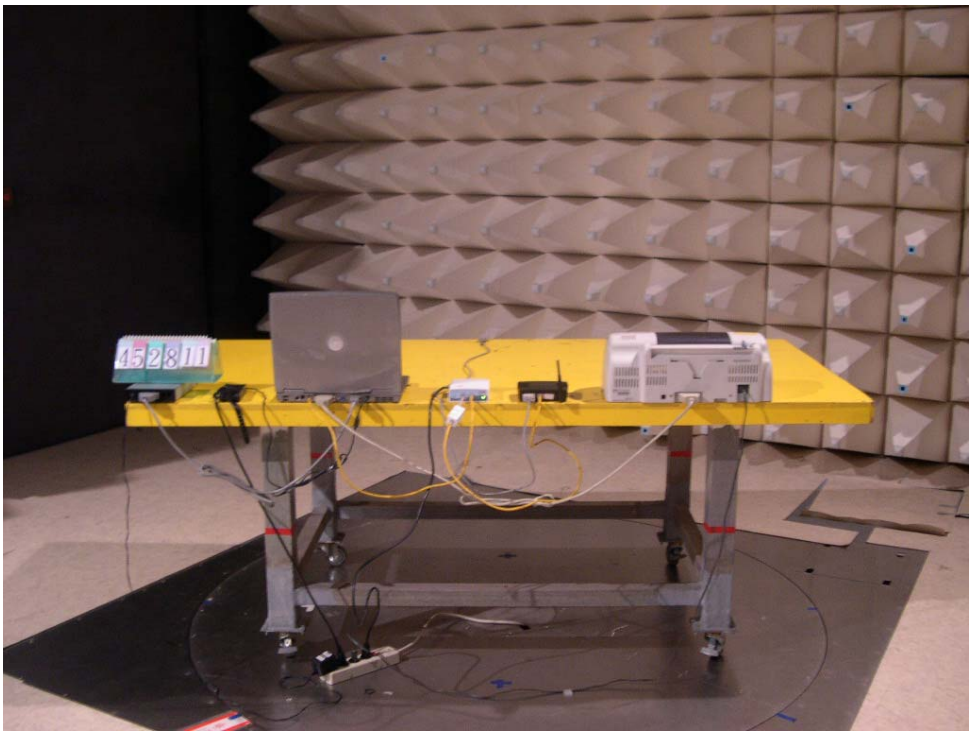
- The photographs show the configuration that generates the maximum emission.

**Mode 2**

FRONT VIEW




REAR VIEW



## 5.7. Antenna Requirements

5.7.1. Standard Applicable

47 CFR Part15 Section 15.203:

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

47 CFR Part15 Section 15.247 (b):

If transmitting antennas of directional gain greater than 6 dBi are used, the peak output power from the intentional radiator shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

If the intentional radiator is used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

5.7.2. Antenna Connected Construction

The maximum antenna gain used in this product is dipole antenna, and USL is the antenna connector in this equipment.

# 6. List of Measuring Equipments Used

| Items | Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|---|
| 1 | EMC Receiver | R&S | ESCS 30 | 100174 | 9 KHz – 2.75 GHz | Feb. 16, 2004 | Conduction (CO04-HY) |
| 2 | LISN | MessTec | NNB-2/16Z | 2001/004 | 9 KHz – 30 MHz | Jun. 09, 2004 | Conduction (CO04-HY) |
| 3 | LISN (Support Unit) | MessTec | NNB-2/16Z | 99041 | 9 KHz – 30 MHz | Apr. 27, 2004 | Conduction (CO04-HY) |
| 4 | EMI Filter | LINDGREN | LRE-2030 | 2651 | < 450 Hz | N/A | Conduction (CO04-HY) |
| 5 | RF Cable-CON | UTIFLEX | 3102-26886-4 | CB044 | 9KHz~30MHz | Apr. 21, 2004 | Conduction (CO04-HY) |
| 6 | 3m Semi Anechoic Chamber | SIDT FRANKONIA | SAC-3M | 03CH03-HY | 30MHz~1GHz 3m | Jun. 20, 2004 | Radiation (03CH03-HY) |
| 7 | Spectrum analyzer | R&S | FSP40 | 100004 | 9KHZ~40GHz | Aug. 23, 2003 | Radiation (03CH03-HY) |
| 8 | Amplifier | HP | 8447D | 2944A09072 | 100KHz – 1.3GHz | Nov. 05, 2003 | Radiation (03CH03-HY) |
| 9 | Biconical Antenna | SCHWARZBECK | VHBB 9124 | 301 | 30MHz –200MHz | Jul. 24, 2003 | Radiation (03CH03-HY) |
| 10 | Log Antenna | SCHWARZBECK | VUSLP 9111 | 221 | 200MHz -1GHz | Jul. 24, 2003 | Radiation (03CH03-HY) |
| 11 | RF Cable-R03m | Jye Bao | RG142 | CB021 | 30MHz~1GHz | Dec. 03, 2003 | Radiation (03CH03-HY) |
| 12 | Amplifier | MITEQ | AFS44 | 879981 | 100MHz~26.5GHz | Jul. 23, 2003 | Radiation (03CH03-HY) |
| 13 | Horn Antenna | EMCO | 3115 | 6821 | 1GHz – 18GHz | Sep. 12, 2003 | Radiation (03CH03-HY) |
| 14 | Turn Table | HD | DS 420 | 420/650/00 | 0 ~ 360 degree | N/A | Radiation (03CH03-HY) |
| 15 | Antenna Mast | HD | MA 240 | 240/560/00 | 1 m - 4 m | N/A | Radiation (03CH03-HY) |
| 16 | Horn Antenna | Schwarzbeck | BBHA9170 | 154 | 15GHz~40GHz | Jun. 01, 2004 | Radiation (03CH03-HY) |
| 17 | RF Cable-HIGH | Jye Bao | RG142 | CB030-HIGH | 1GHz~29.5GHz | Dec. 05, 2003 | Radiation (03CH03-HY) |

※ Calibration Interval of instruments listed above is one year.

| Items | Instrument | Manufacturer | Model No. | Serial No. | Characteristics | Calibration Date | Remark |
|---|---|---|---|---|---|---|---|
| 18 | Spectrum analyzer | R&S | FSP7 | 838858/014 | 9KHZ~7GHZ | Sep. 03, 2003 | Conducted (TH01-HY) |
| 19 | Power meter | R&S | NRVS | 100967 | DC~40GHz | Mar. 02, 2004 | Conducted (TH01-HY) |
| 20 | Power sensor | R&S | NRV-Z51 | 100666 | DC~40GHz | Mar 18, 2004 | Conducted (TH01-HY) |
| 21 | Power Sensor | R&S | NRV-Z32 | 836953/060 | 30MHz-6GHz | Mar. 11, 2004 | Conducted (TH01-HY) |
| 22 | AC power source | G.W. | GPC-6030D | C671845 | DC 1V~60V | Nov. 06, 2003 | Conducted (TH01-HY) |
| 23 | Temp. and Humidity Chamber | KSON | THS-C3L | 612 | N/A | Oct. 01, 2003 | Conducted (TH01-HY) |
| 24 | RF CABLE-1m | Jye Bao | RG142 | CB034-1m | 20MHz~7GHz | Jan. 01, 2004 | Conducted (TH01-HY) |
| 25 | RF CABLE-2m | Jye Bao | RG142 | CB035-2m | 20MHz~1GHz | Jan. 01, 2004 | Conducted (TH01-HY) |

※ Calibration Interval of instruments listed above is one year.