



# FCC TEST REPORT

**CATEGORY** : Mobile  
**PRODUCT NAME** : 2.4/5.0 GHz IEEE 802.11 Super a+g 108Mbps Wireless LAN Router  
**FCC ID.** : SJ9-BLW54SAG  
**FILING TYPE** : Certification  
**BRAND NAME** : PLANEX  
**MODEL NAME** : BLW-54SAG  
**APPLICANT** : **Planex Communication Inc.**  
7F, No.108, Min-Chyuan Rd., Hsin-Tien, Taipei Hsien, Taiwan,  
R.O.C.  
**MANUFACTURER** : **Gemtek Technology Co., Ltd.**  
No.1, Jen-Ai Road, HsinChu Industrial Park, HuKou Hsiang,  
HsinChu Hsien, Taiwan, R.O.C.  
**ISSUED BY** : **SPORTON INTERNATIONAL INC.**  
6F, No. 106, Sec. 1, Hsin Tai Wu Rd., His Chih, Taipei Hsien,  
Taiwan, R.O.C.

## Statements:

**This report is only for the 802.11a (5150~5350 MHz) part of the test result.**

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.

  
Wayne Hsu



1190  
ILAC MRA



## Table of Contents

<b>HISTORY OF THIS TEST REPORT .....</b>	<b>II</b>
<b>CERTIFICATE OF COMPLIANCE.....</b>	<b>III</b>
<b>1. GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST.....</b>	<b>1</b>
1.1. Applicant .....	1
1.2. Manufacturer .....	1
1.3. Basic Description of Equipment under Test.....	1
1.4. Features of Equipment under Test .....	1
1.5. Antenna Description.....	2
1.6. Table for Carrier Frequencies .....	2
1.7. Table for Maximum Conducted Output Power .....	3
<b>2. TEST CONFIGURATION OF THE EQUIPMENT UNDER TEST .....</b>	<b>4</b>
2.1. Connection Diagram of Test System .....	4
2.2. The Test Mode Description .....	4
2.3. Description of Test Supporting Units .....	4
<b>3. GENERAL INFORMATION OF TEST .....</b>	<b>5</b>
3.1. Test Facility .....	5
3.2. Test Conditions .....	5
3.3. Standards for Methods of Measurement.....	5
3.4. DoC Statement .....	5
3.5. Frequency Range Investigated .....	5
3.6. Test Distance .....	5
3.7. Test Software.....	5
<b>4. LIST OF MEASUREMENTS .....</b>	<b>6</b>
4.1. Summary of the Test Results.....	6
<b>5. TEST RESULT .....</b>	<b>7</b>
5.1. Test of 26dB Spectrum Bandwidth .....	7
5.2. Test of Maximum Conducted Output Power .....	12
5.3. Test of Peak Power Spectral Density .....	17
5.4. Ratio of the Peak Excursion.....	22
5.5. Test of Band Edges Emission.....	27
5.6. Test of Frequency Stability .....	31
5.7. Test of AC Power Line Conducted Emission .....	33
5.8. Test of Spurious Radiated Emission.....	43
5.9. Antenna Requirements .....	53
5.10. RF Exposure .....	54
<b>6. LIST OF MEASURING EQUIPMENTS USED.....</b>	<b>56</b>
<b>7. COMPANY PROFILE.....</b>	<b>58</b>
7.1. Certificate of Accreditation .....	58
7.2. Test Location .....	58
<b>8. CNLA CERTIFICATE OF ACCREDITATION.....</b>	<b>59</b>
<b>APPENDIX A. PHOTOGRAPHS OF EUT .....</b>	<b>A1 ~ A16</b>



## HISTORY OF THIS TEST REPORT

Original Report Issue Date: Mar. 31, 2005

Report No.: FR522308

No additional attachment.

Additional attachment were issued as following record:

Attachment No.	Issue Date	Description



# CERTIFICATE OF COMPLIANCE

with

## 47 CFR FCC Part 15 Subpart C ( Section 15.407 )

**PRODUCT NAME** : 2.4/5.0 GHz IEEE 802.11 Super a+g 108Mbps Wireless LAN Router

**BRAND NAME** : PLANEX

**MODEL NAME** : BLW-54SAG

**APPLICANT** : **Planex Communication Inc.**  
7F, No.108, Min-Chyuan Rd., Hsin-Tien, Taipei Hsien,  
Taiwan, R.O.C.

**MANUFACTURER** : **Gemtek Technology Co., Ltd.**  
No.1, Jen-Ai Road, HsinChu Industrial Park, HuKou Hsiang,  
HsinChu Hsien, Taiwan, R.O.C.

### I **HEREBY** CERTIFY THAT:

The measurements shown in this test report were made in accordance with the procedures given in ANSI C63.4 - 2003 and all test are performed according to 47 CFR FCC Part 15. Testing was carried out on Mar. 31, 2005 at SPORTON International Inc. LAB.

A handwritten signature in blue ink, appearing to read 'Wayne Hsu', is written over a horizontal line. Below the line, the name 'Wayne Hsu' is printed in a standard font.

Wayne Hsu



## 1. General Description of Equipment under Test

### 1.1. Applicant

**Planex Communication Inc.**

7F, No.108, Min-Chyuan Rd., Hsin-Tien, Taipei Hsien, Taiwan, R.O.C.

### 1.2. Manufacturer

**Gemtek Technology Co., Ltd.**

No.1, Jen-Ai Road, HsinChu Industrial Park, HuKou Hsiang, HsinChu Hsien, Taiwan, R.O.C.

### 1.3. Basic Description of Equipment under Test

This product is a wireless router with 802.11a/b/g wireless solution. The technical data has been listed on section "Features of Equipment under Test". This report is for 5.15 ~ 5.35GHz of 802.11a configuration.

### 1.4. Features of Equipment under Test

Items	Description
Type of Modulation	OFDM (16QAM / 64QAM / DQPSK / DBPSK )
Number of Channels	11 (Normal: 8 channels, Turbo: 3 channels)
Frequency Band	5150MHz ~ 5250MHz, 5250MHz ~ 5350MHz
Carrier Frequency	See section 1.6 for details
Data Rate	108, 54, 48,36, 24,18,12, 6Mbps
Max. Conducted Output Power	See section 1.7 for details
Antenna Type	See section 1.5 for details
Communication Type	Half-Duplex
Testing Duty Cycle	100.00%
Power Rating (DC/AC, Voltage)	120.00 VAC power adapter (5VDC output)
Temperature Range (Operating)	0 ~ 40 °C
Power Adapter	Mode 1: LEADER (MU15-050250-C5), 100-240VAC Mode 2: LINKSYS (MU15-050250-C5), 100-240VAC Mode 3: LEADER (MT15-5050250A1), 100-120VAC



### 1.5. Antenna Description

No.	Antenna Type	Gain (dBi)
1	Dipole Antenna	2.00

### 1.6. Table for Carrier Frequencies

#### Normal Mode

5150MHz ~ 5250MHz		5250MHz ~ 5350MHz	
Channel	Frequency	Channel	Frequency
36	5180 MHz	52	5260 MHz
40	5200 MHz	56	5280 MHz
44	5220 MHz	60	5300 MHz
48	5240 MHz	64	5320 MHz

#### Turbo Mode

5150MHz ~ 5250MHz		5250MHz ~ 5350MHz	
Channel	Frequency	Channel	Frequency
42	5210 MHz	58	5290 MHz
50	5250 MHz		



### 1.7. Table for Maximum Conducted Output Power

#### Normal Mode

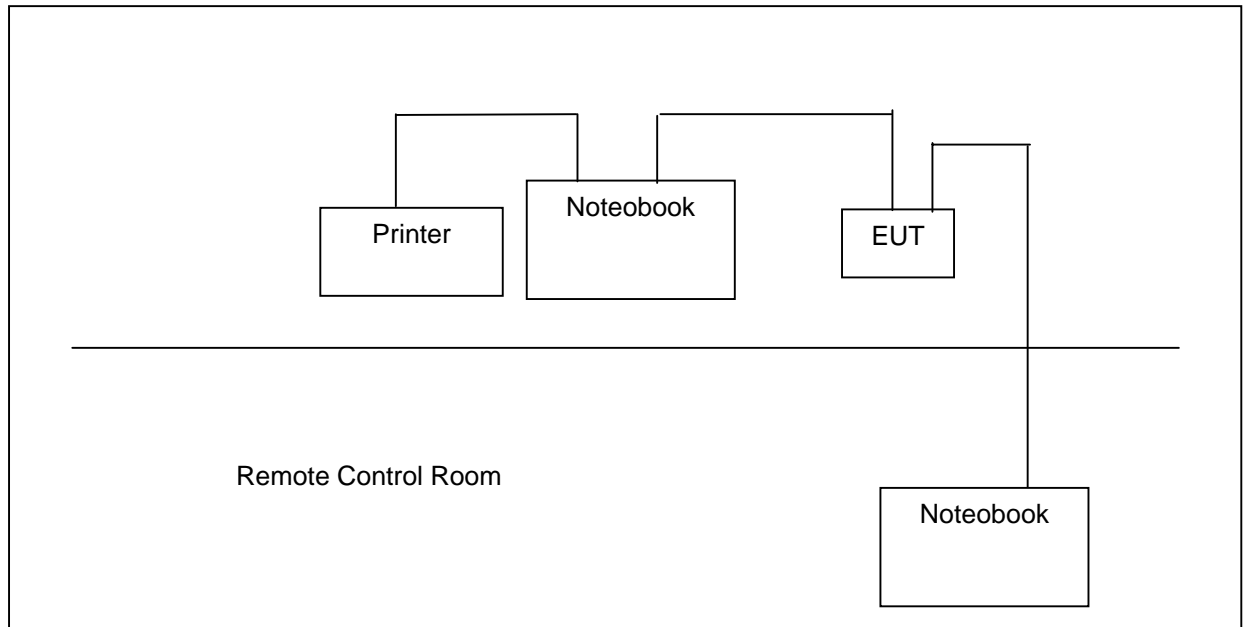
Maximum Conducted Output Power (dBm)	
Frequency Bands 5150MHz ~ 5250MHz	Frequency Bands 5250MHz ~ 5350MHz
16.20	16.51

#### Turbo Mode

Maximum Conducted Output Power (dBm)	
Frequency Bands 5150MHz ~ 5250MHz	Frequency Bands 5250MHz ~ 5350MHz
16.68	16.87

## 2. Test Configuration of the Equipment under Test

### 2.1. Connection Diagram of Test System



### 2.2. The Test Mode Description

1. For OFDM modulation, BPSK is the worst case on all test items.
2. Spurious emission below 1GHz is independent of channel selection, so only channel 36 was worst case tested.
3. AC conduction emission is independent of channel selection, so only channel 36 was worst case tested.
4. There are 3 power adapters used for AC conduction:
  - Mode 1: LEADER (MU15-050250-C5), 100-240VAC
  - Mode 2: LINKSYS (MU15-050250-C5), 100-240VAC
  - Mode 3: LEADER (MT15-5050250A1), 100-120VAC
5. There are 2 modes for radiation (below 1GHz) measurement:
  - Mode 1: LEADER (MU15-050250-C5), 100-240VAC, LINKSYS (MU15-050250-C5), 100-240VAC
  - Mode 2: LEADER (MT15-5050250A1), 100-120VAC

### 2.3. Description of Test Supporting Units

Support unit	Brand	Model No.	Serial No.	FCC ID	Data cable (m)
Notebook	DELL	D505	DoC	-	Notebook
Printer	EPSON	Stylus Color 680	DoC	1.35	Printer





### 3. General Information of Test

#### 3.1. Test Facility

**Test Site Location** : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiag, Tao Yuan Hsien, Taiwan, R.O.C.  
: TEL 886-3-327-3456  
: FAX 886-3-318-0055

**Test Site No** : 03CH01-HY / TH01-HY / CO01-HY

#### 3.2. Test Conditions

Normal Voltage : 120.00VAC  
Normal Temperature : 20°C

#### 3.3. Standards for Methods of Measurement

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

**ANSI C63.4-2003**  
**47 CFR Part 15 Subpart C ( Section 15.407 )**

#### 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.

#### 3.5. Frequency Range Investigated

Radiated emission test: from 30 MHz to 10th carrier harmonic

#### 3.6. Test Distance

The test distance of radiated emission (30MHz~1GHz) test from antenna to EUT is 3 M.  
The test distance of radiated emission (1GHz~10th carrier harmonic) test from antenna to EUT is 3 M.

#### 3.7. Test Software

During testing, 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.



## 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	15.407	26dB Spectrum Bandwidth	Pass
5.2	15.407	Maximum Conducted Output Power	Pass
5.3	15.407	Peak Power Spectral Density	Pass
5.4	15.407	Ratio of the Peak Excursion	Pass
5.5	15.407	Band Edges Emission	Pass
5.6	15.407	Test of Frequency Stability	Pass
5.7	15.407	AC Power Line Conducted Emission	Pass
5.8	15.209/15.407	Spurious Radiated Emission	Pass
5.9	15.203/15.407	Antenna Requirement	Pass

## 5. Test Result

### 5.1. Test of 26dB Spectrum Bandwidth

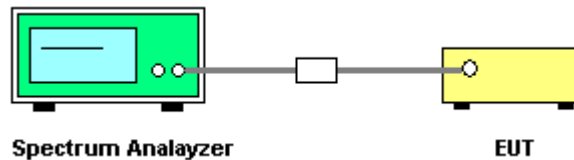
#### 5.1.1. Measuring Instruments

Item 18 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 300KHz and VBW to 1000KHz.
3. The spectrum width with level higher than 26dB below the peak level.

#### 5.1.3. Test Setup Layout



#### 5.1.4. Test Result: See spectrum analyzer plots below

- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

#### Normal Mode

Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Calculated Power Limit (dBm)	Applied Power Limit (dBm)
36	5180 MHz	25.44	18.05	17
52	5260 MHz	24.64	24.92	24
64	5320 MHz	24.96	30.92	24

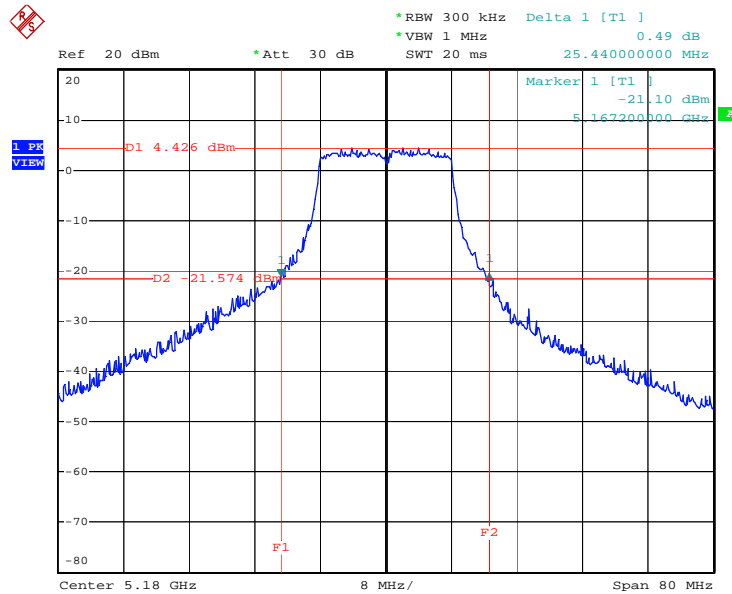
#### Turbo Mode

Channel No.	Frequency (MHz)	26dB Bandwidth (MHz)	Calculated Power Limit (dBm)	Applied Power Limit (dBm)
42	5210 MHz	46.40	20.67	17
50	5250 MHz	46.80	20.70	17
58	5290 MHz	46.20	27.65	24



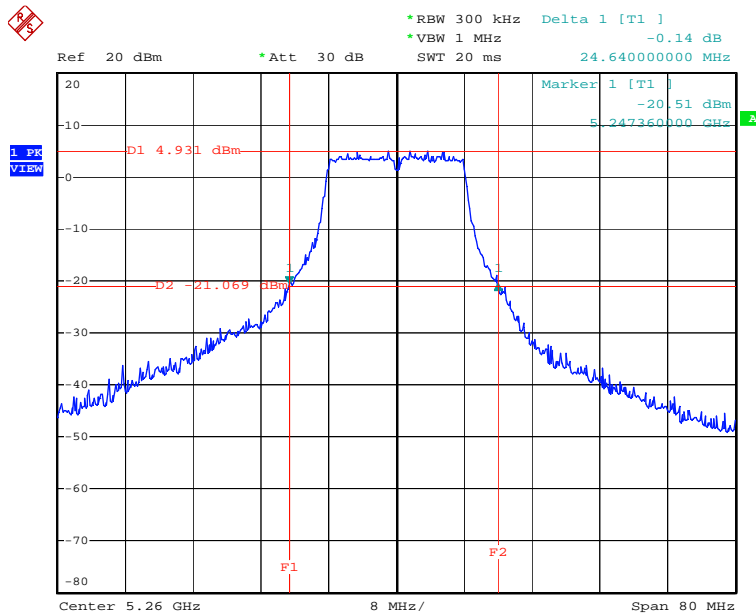
Normal Mode

Channel: 36 / 5180 MHz



Date: 25.MAR.2005 09:11:04

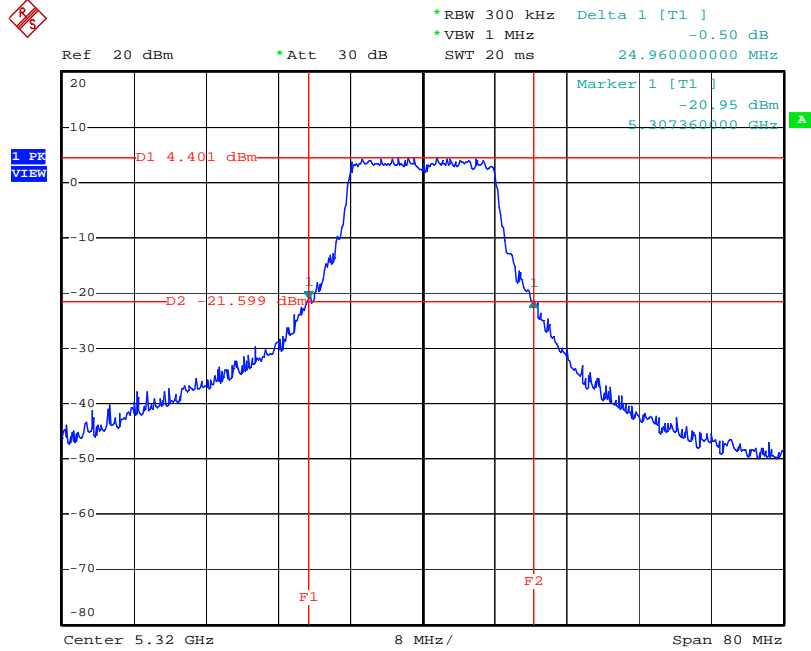
Channel: 52 / 5260 MHz



Date: 25.MAR.2005 08:50:43



Channel: 64 / 5320 MHz

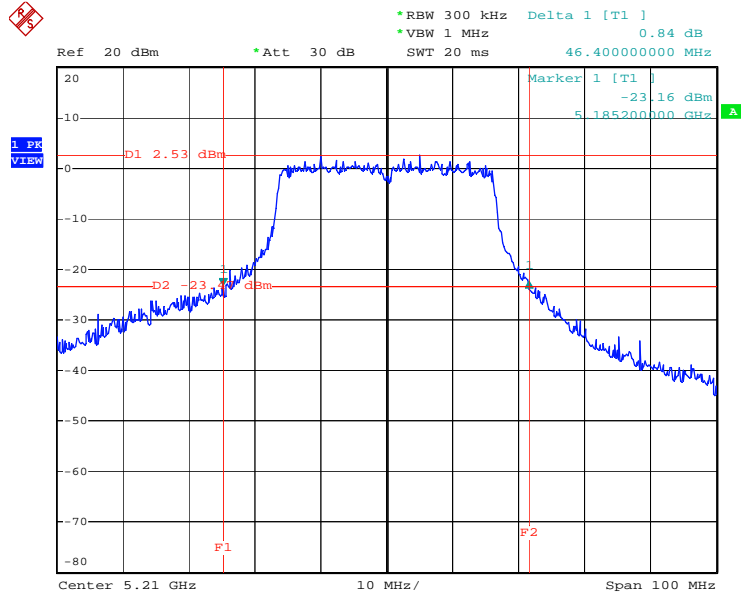


Date: 25.MAR.2005 08:53:39



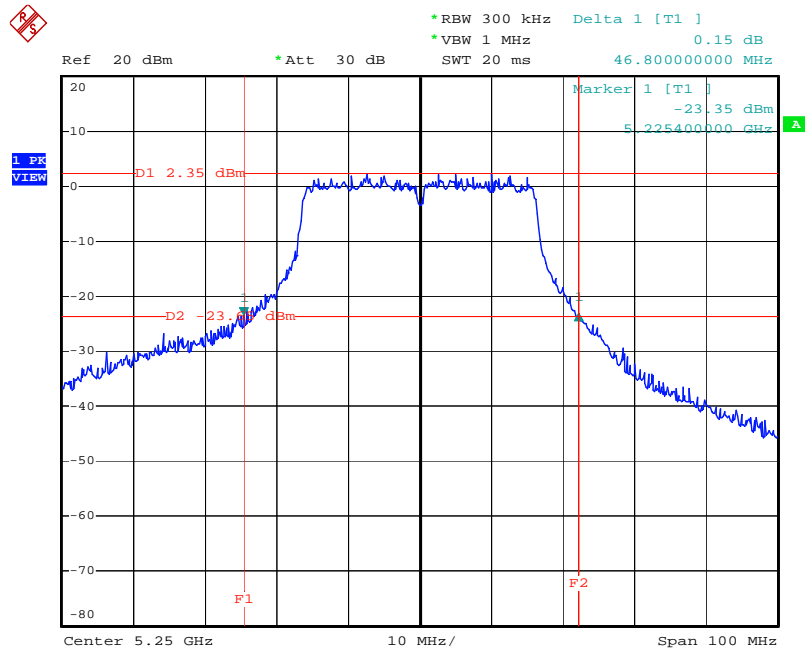
Turbo Mode

Channel: 42 / 5210 MHz



Date: 25.MAR.2005 08:57:51

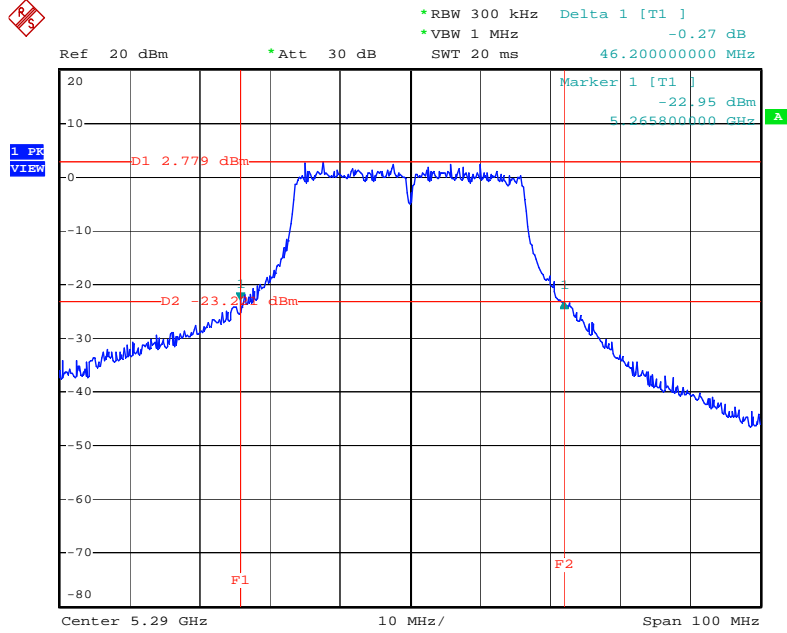
Channel: 50 / 5250 MHz



Date: 25.MAR.2005 09:02:19



Channel: 58 / 5290 MHz



Date: 25.MAR.2005 09:03:37

## 5.2. Test of Maximum Conducted Output Power

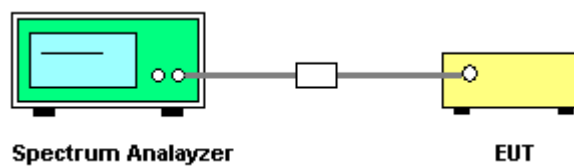
### 5.2.1. Measuring Instruments

Item 18 of the table on section 6.

### 5.2.2. Test Procedures

1. According to FCC DA 02-2138 test procedure, EUT was connected to spectrum analyzer. Then used the channel power function of spectrum analyzer and calculated total average power with spectrum range more than 26dB bandwidth.
2. Repeated point 1 for the middle and highest channel of the EUT.

### 5.2.3. Test Setup Layout



### 5.2.4. Test Result of Conducted Power

- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

#### Normal Mode

Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
36	5180 MHz	16.20	17
52	5260 MHz	16.51	24
64	5320 MHz	16.30	24

#### Turbo Mode

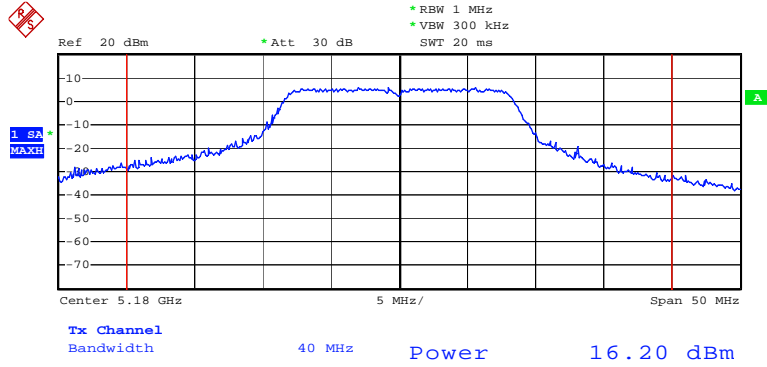
Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
42	5210 MHz	16.68	17
50	5250 MHz	16.87	17
58	5290 MHz	16.69	24





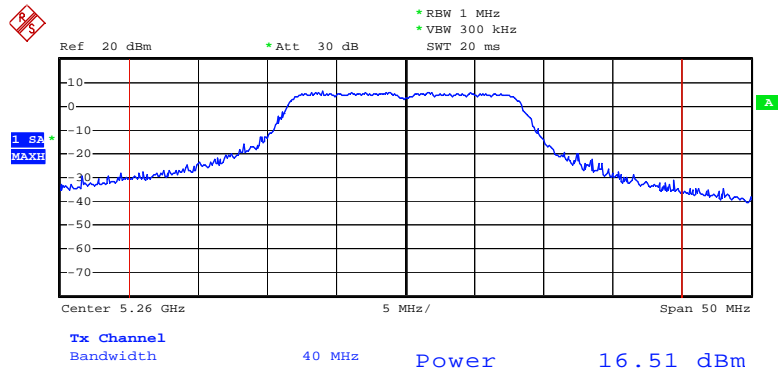
Normal Mode

Channel: 36 / 5180 MHz



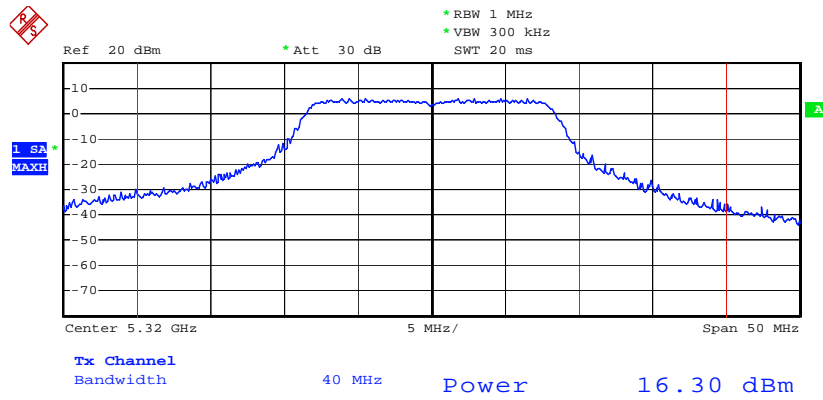
Date: 25.MAR.2005 09:11:27

Channel: 52 / 5260 MHz



Date: 25.MAR.2005 08:51:06

Channel: 64 / 5320 MHz

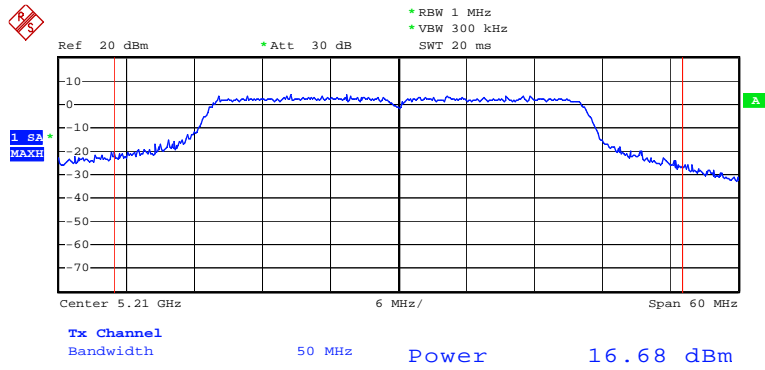


Date: 25.MAR.2005 08:54:03



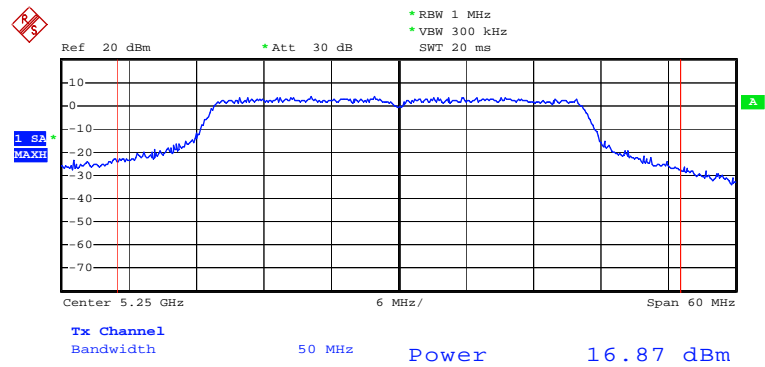
**Turbo Mode**

Channel: 42 / 5210 MHz



Date: 25.MAR.2005 08:58:15

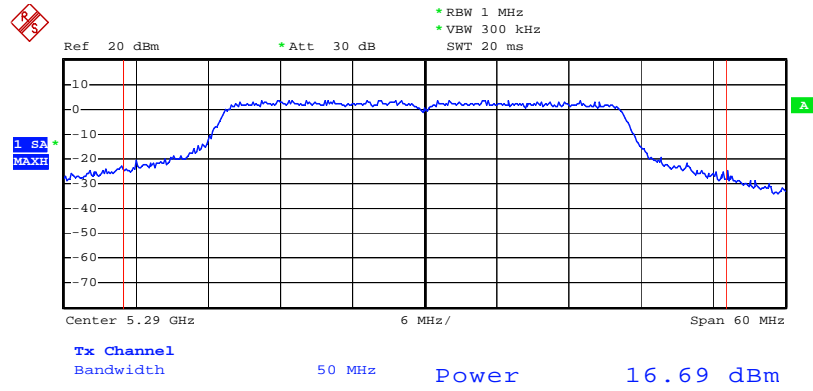
Channel: 50 / 5250 MHz



Date: 25.MAR.2005 09:02:42



Channel: 58 / 5290 MHz



Date: 25.MAR.2005 09:04:01

### 5.3. Test of Peak Power Spectral Density

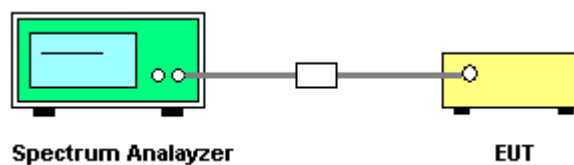
#### 5.3.1. Measuring Instruments

Item 18 of the table on section 6.

#### 5.3.2. Test Procedures

1. According to FCC DA 02-2138 test procedure, EUT was connected to the spectrum analyzer. Then used the same setup as that for power measurement.
2. Repeated point 1 for the middle and highest channel of the EUT.

#### 5.3.3. Test Setup Layout



#### 5.3.4. Test Result of conducted peak power spectral density

- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

#### Normal Mode

Channel No.	Frequency (MHz)	Power Density (dBm)	Limits (dBm)
36	5180 MHz	-0.19	4
52	5260 MHz	0.13	11
64	5320 MHz	-0.23	11

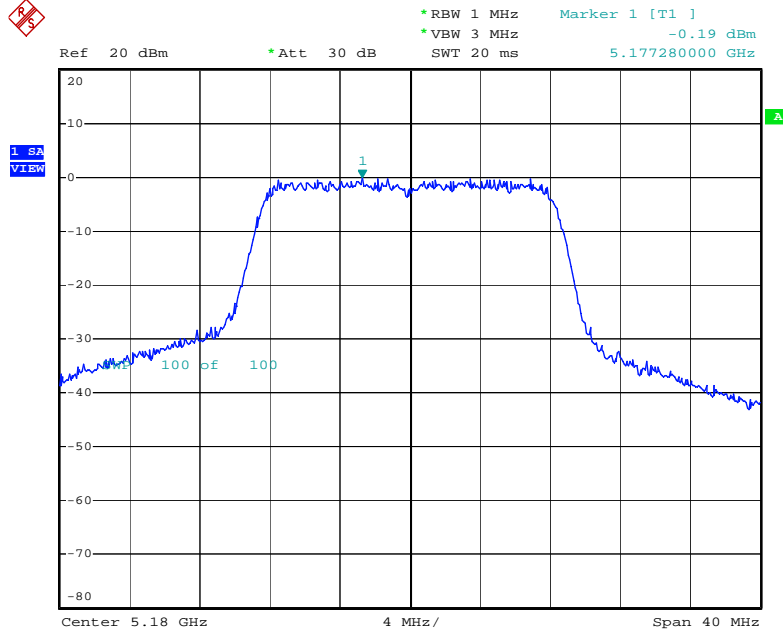
#### Turbo Mode

Channel No.	Frequency (MHz)	Power Density (dBm)	Limits (dBm)
42	5210 MHz	-3.37	4
50	5250 MHz	-2.00	4
58	5290 MHz	-2.58	11



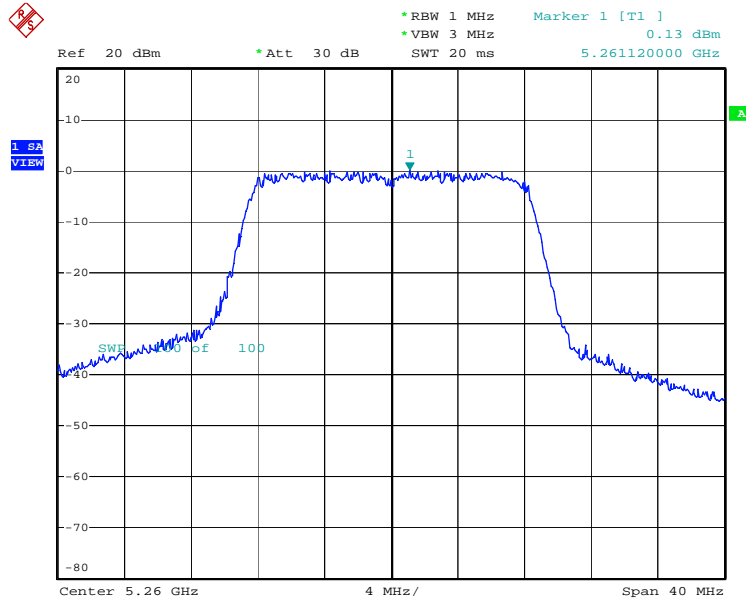
Normal Mode

Channel: 36 / 5180 MHz



Date: 25.MAR.2005 09:11:10

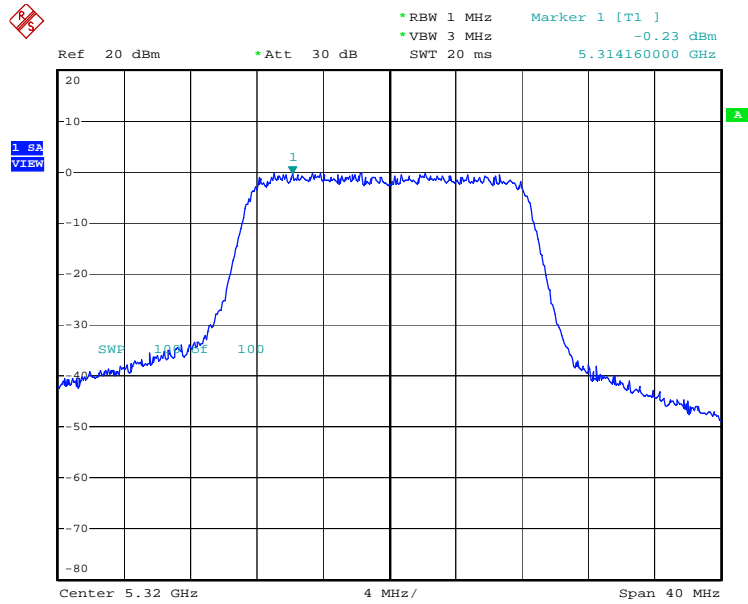
Channel: 52 / 5260 MHz



Date: 25.MAR.2005 08:50:49



Channel: 64 / 5320 MHz

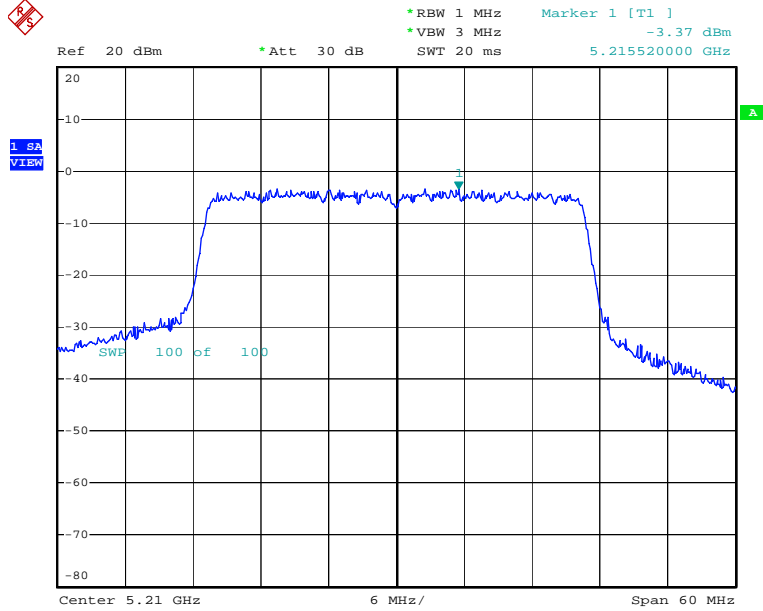


Date: 25.MAR.2005 08:53:45



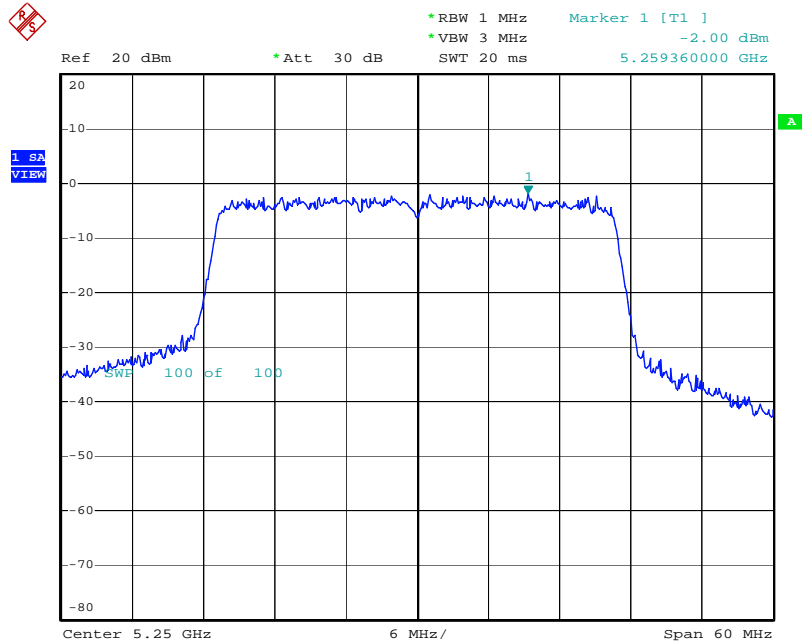
Turbo Mode

Channel: 42 / 5210 MHz



Date: 25.MAR.2005 08:57:57

Channel: 50 / 5250 MHz

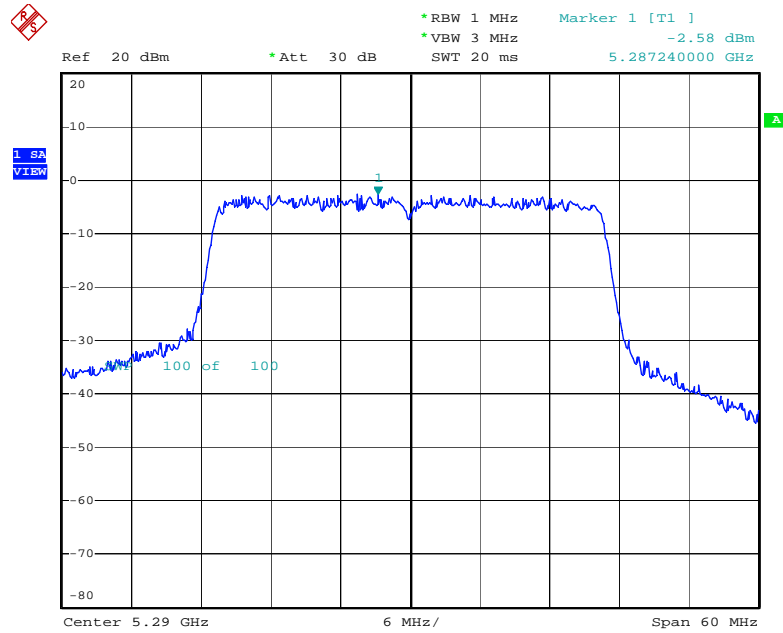


Date: 25.MAR.2005 09:02:25





Channel: 58 / 5290 MHz



Date: 25.MAR.2005 09:03:43

## 5.4. Ratio of the Peak Excursion

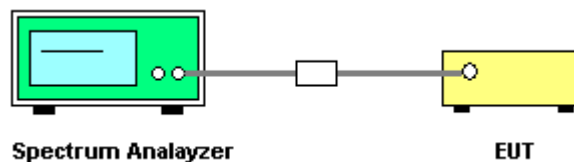
### 5.4.1. Measuring Instruments

Item 18 of the table on section 6.

### 5.4.2. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Trace 1: Set RBW of spectrum analyzer to 1000kHz and VBW to 3000kHz.
3. Use peak detector mode, Max-hold and search the peak of trace 1.
4. Trace 2: Set RBW of spectrum analyzer to 1000kHz and VBW to 300kHz.
5. Use sample detector mode, trace max-hold and search the peak of trace 2
6. The delta limits is 13dB between trace 1 and trace 2 of the peak value.

### 5.4.3. Test Setup Layout



### 5.4.4. Test Result of conducted peak power spectral density

- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

#### Normal Mode

Channel No.	Frequency (MHz)	Peak Excursion (dB)	Max. Limits (dB)
36	5180 MHz	5.68	13
52	5260 MHz	5.13	13
64	5320 MHz	5.27	13

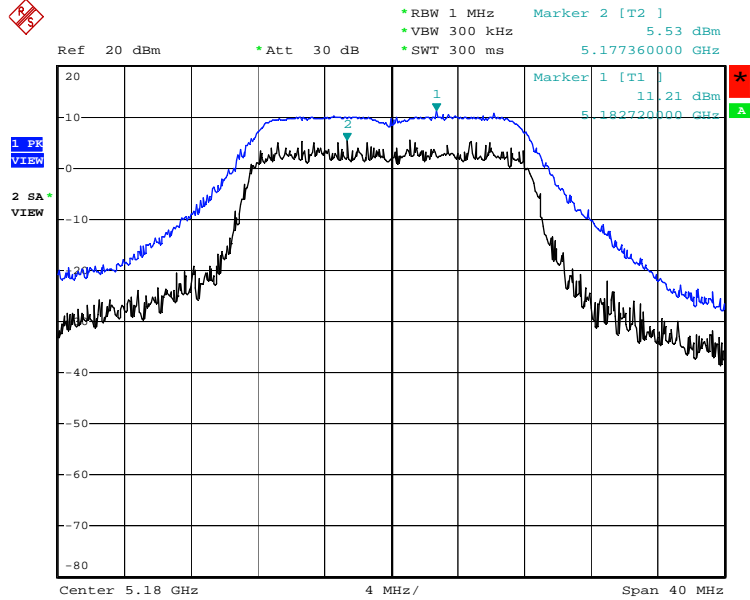
#### Turbo Mode

Channel No.	Frequency (MHz)	Peak Excursion (dB)	Max. Limits (dB)
42	5210 MHz	5.35	13
50	5250 MHz	4.80	13
58	5290 MHz	4.14	13



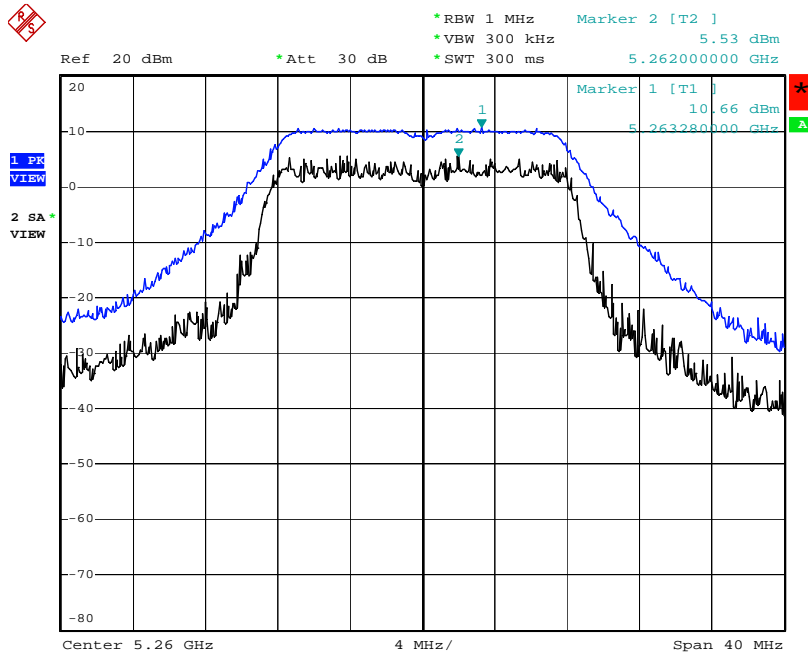
Normal Mode

Channel: 36 / 5180 MHz



Date: 25.MAR.2005 09:11:39

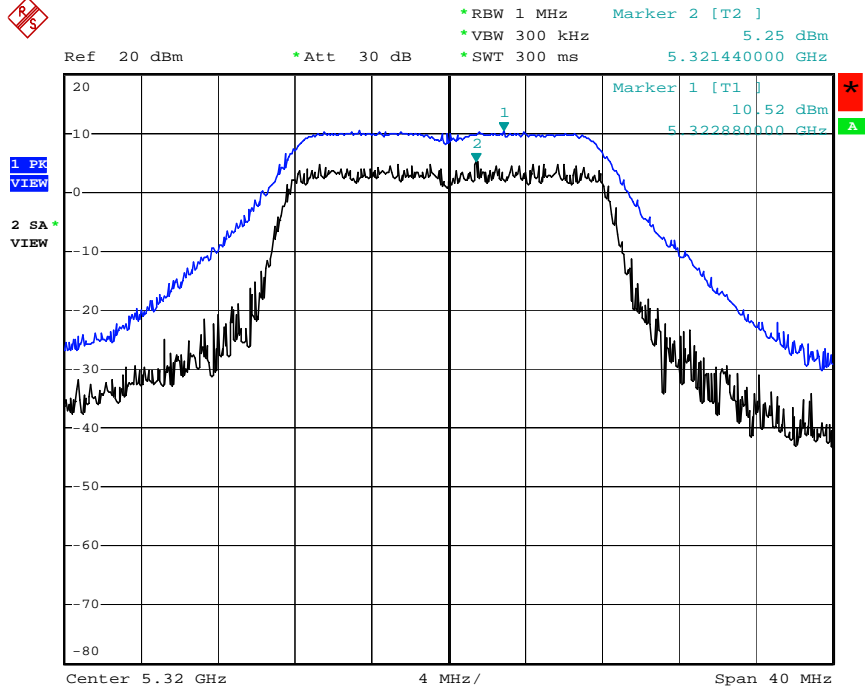
Channel: 52 / 5260 MHz



Date: 25.MAR.2005 08:51:18



Channel: 64 / 5320 MHz

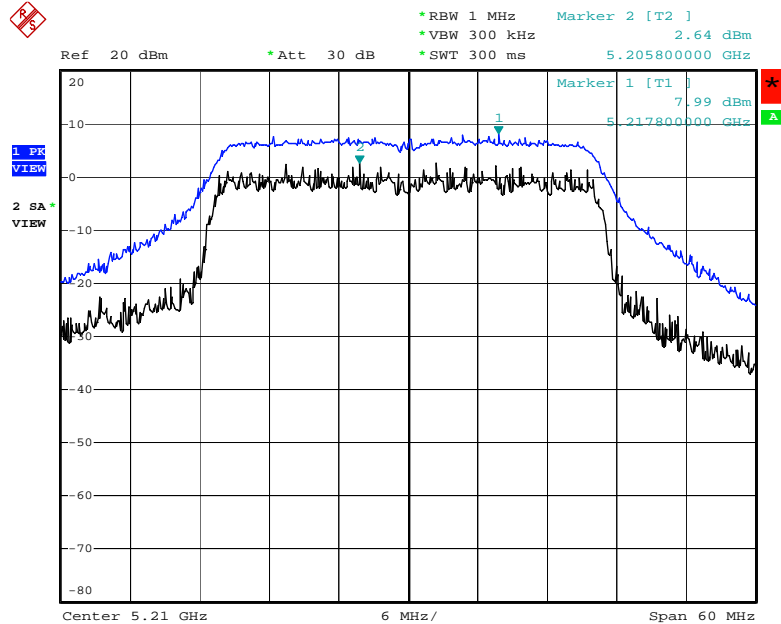


Date: 25.MAR.2005 08:54:14



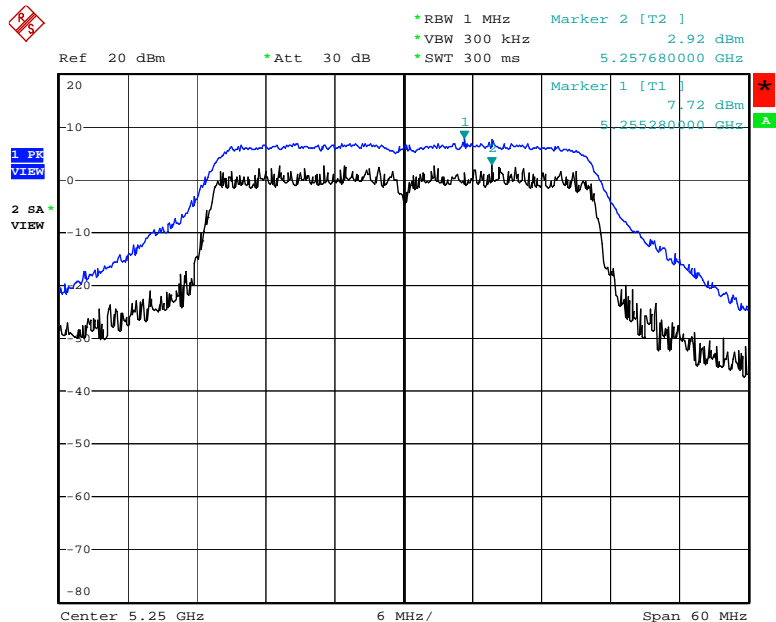
Turbo Mode

Channel: 42 / 5210 MHz



Date: 25.MAR.2005 08:58:26

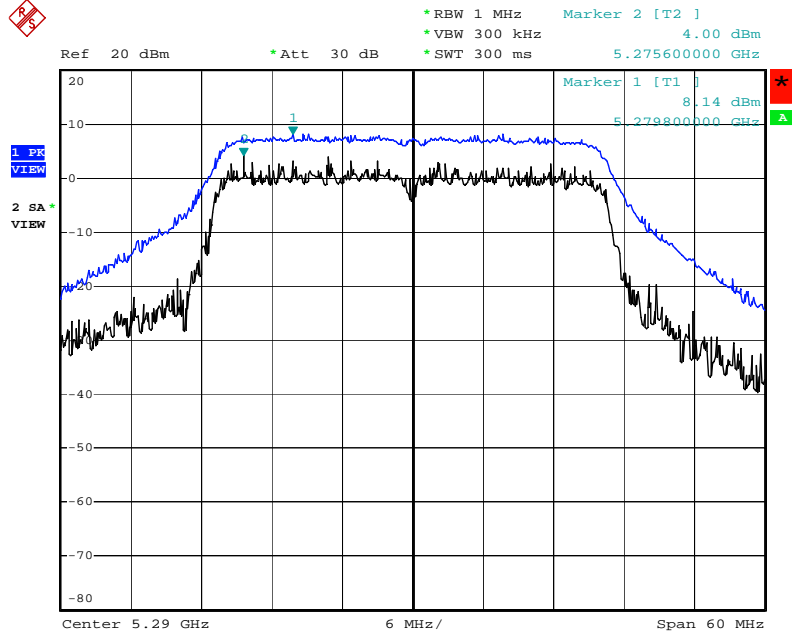
Channel: 50 / 5250 MHz



Date: 25.MAR.2005 09:02:54



Channel: 58 / 5290 MHz



Date: 25.MAR.2005 09:04:12

## 5.5. Test of Band Edges Emission

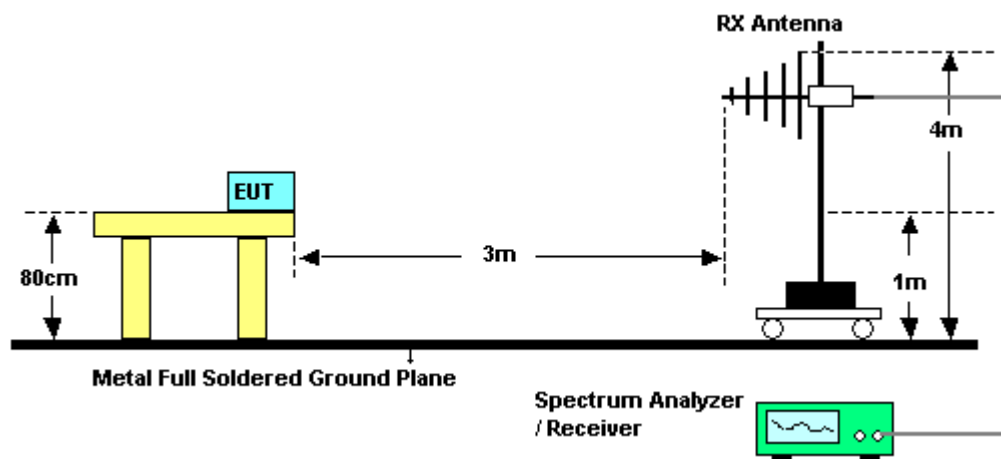
### 5.5.1. Measuring Instruments

Please reference item 6~17 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 was placed on the top of the turntable 0.8 meter above ground.
3. 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 turntable.
4. The transmitter is set to the lowest channel of each band.
5. The turntable was rotated 360 degrees to determine the position of the highest radiation.
6. Set both RBW and VBW of spectrum analyzer to 1MHz with convenient frequency span including 1MHz bandwidth from lower band edge.
7. 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. Record the maximum value of band-edge.
8. Remove the transmitter and replace it with a broadband substitution antenna.
9. With the substitution antennas at maximum polarized and with the signal generator tuned to a particular fundamental frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading (item 6). This should be done carefully repeating the adjustment of the test antenna and generator output.
10.  $P_d(\text{dBm}) = P_g(\text{dBm}) - \text{cable loss (dB)} + \text{antenna gain (dBi)}$ .  $P_d$  is the dipole equivalent power and  $P_g$  is the generator output power into the substitution antenna.
11. The lowest and highest channels of band edges of each band emission was measured and recorded.

### 5.5.3. Test Setup Layout





5.5.4. Test Result

- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**Normal Mode**

Ant. No.	Gain (dBi)	Test Ch.	Freq. (MHz)	Level* (dBm/MHz)	Margin (dB)	Limit (dBm/MHz)
1	2.00	36	5148.6	-28.56	-1.56	-27
1	2.00	64	5351.8	-36.24	-9.24	-27

Level\*: The max EIRP emission in the band-edge.

**Turbo Mode**

Ant. No.	Gain (dBi)	Test Ch.	Freq. (MHz)	Level* (dBm/MHz)	Margin (dB)	Limit (dBm/MHz)
1	2.00	42	5148.0	-29.83	-2.83	-27
1	2.00	58	5354.0	-40.69	-13.69	-27

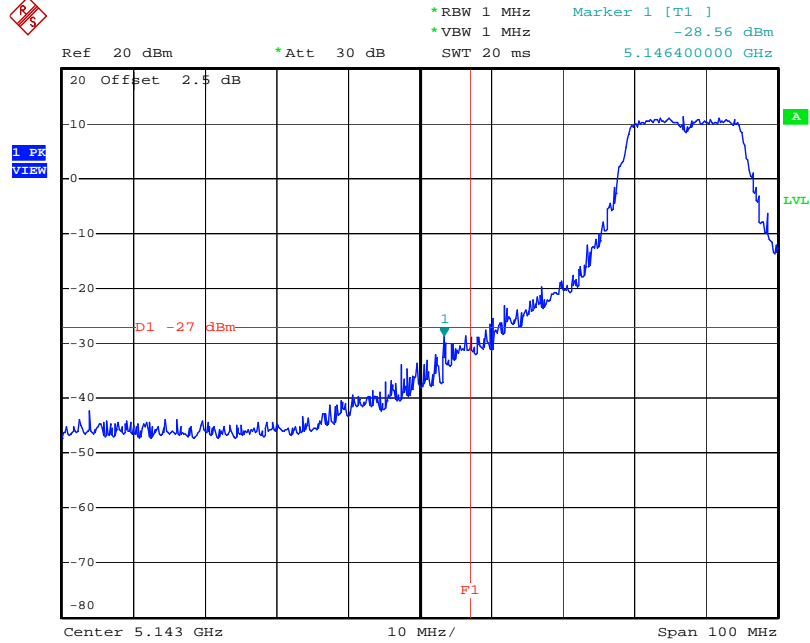
Level\*: The max EIRP emission in the band-edge.





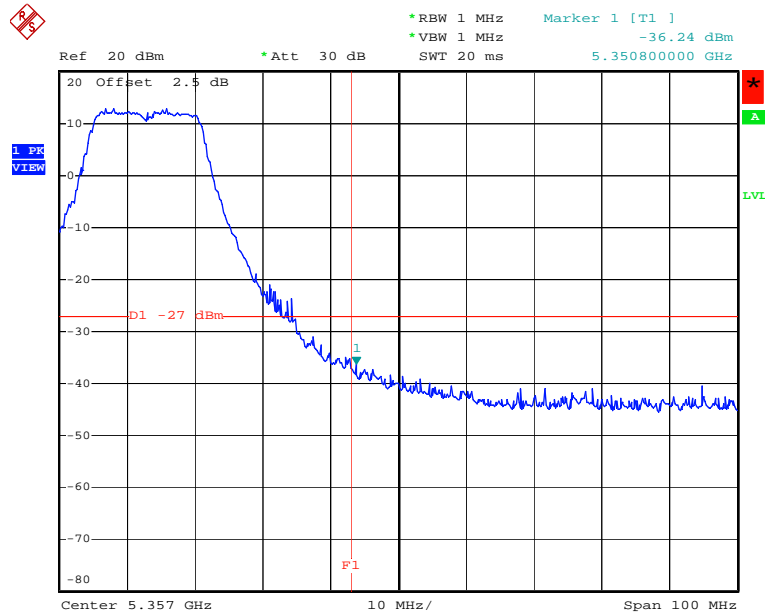
Normal Mode

Channel: 36 / 5180 MHz



Date: 25.MAR.2005 10:02:15

Channel: 64 / 5320 MHz

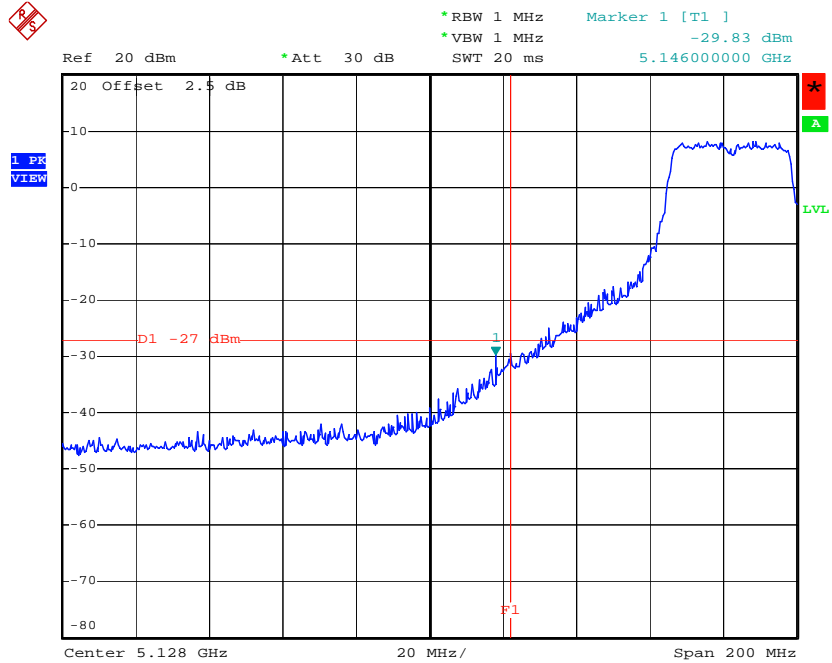


Date: 25.MAR.2005 10:01:00



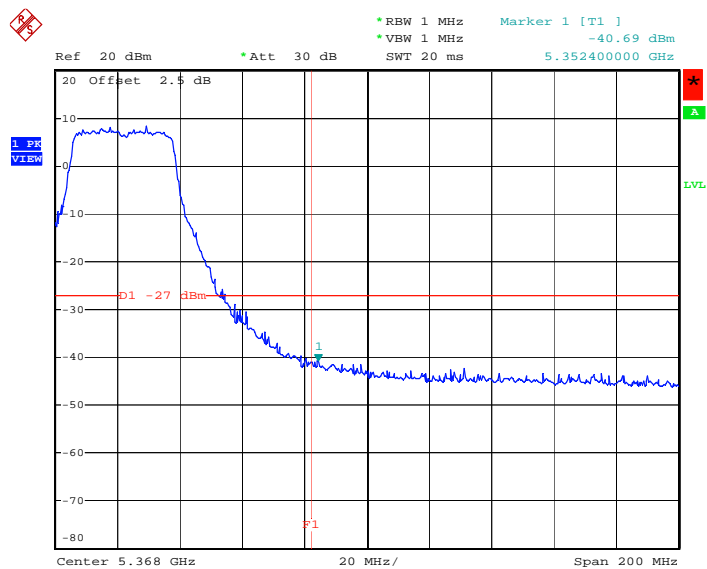
Turbo Mode

Channel: 42 / 5210 MHz



Date: 25.MAR.2005 10:04:49

Channel: 58 / 5290 MHz



Date: 25.MAR.2005 10:07:12

## 5.6. Test of Frequency Stability

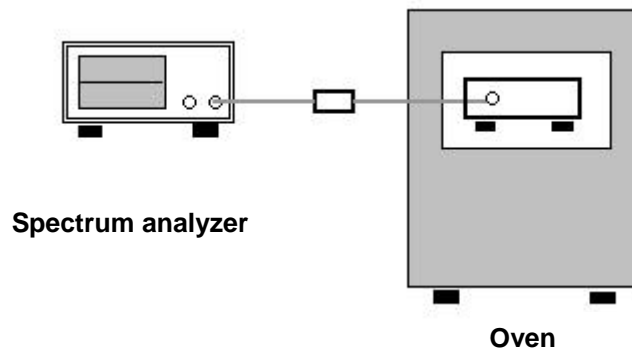
### 5.6.1. Measuring Instruments

Item 18 of the table on section 6.

### 5.6.2. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 10kHz and VBW to 10kHz.
3. Using mark function to read the un-modulation carrier frequency with max power.
4. The test extreme voltage is, according to 2.1055(d)(1), to from 85 to 115 percent of the nominal value.
5. Extreme temperature rule is, according to 2.1055(a)(1), -30°C~50°C.

### 5.6.3. Test Setup Layout



### 5.6.4. Test Result

- Modulation Type: Un-Modulated Carrier
- Temperature: 25°C
- Relative Humidity: 62 %
- Duty cycle of the equipment during the test: 100%60

#### Voltage vs. Frequency Stability

Voltage	Measurement Frequency (MHz)
(V)	<b>5260.0000</b>
138	5260.0130
120.00	5260.0130
102	5260.0025
Max. Deviation (MHz)	<b>0.0130</b>
Max. Deviation (ppm)	<b>2.47</b>



**Temperature vs. Frequency Stability**

<b>Temperature</b>	<b>Measurement Frequency (MHz)</b>
<b>(°C)</b>	<b>5260.0000</b>
-30	5260.0130
-20	5260.0130
-10	5260.0025
0	5260.0130
10	5260.0258
20	5260.0025
30	5260.0130
40	5260.0130
50	5260.0025
Max. Deviation (MHz)	<b>0.0258</b>
Max. Deviation (ppm)	<b>4.90</b>

## 5.7. Test of AC Power Line Conducted Emission

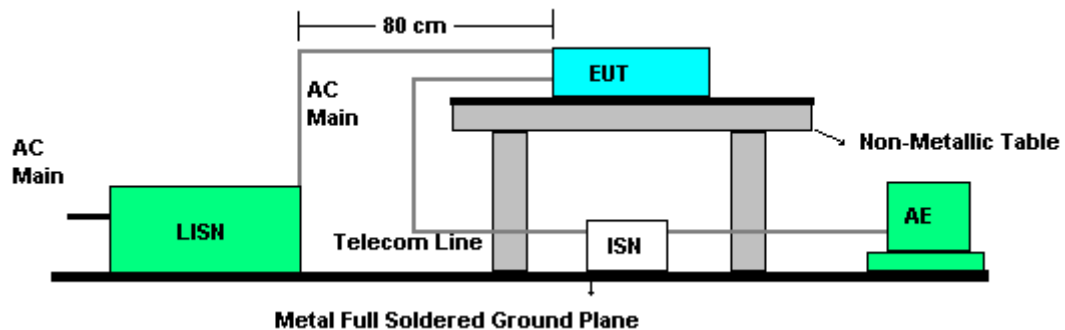
### 5.7.1. Measuring Instruments

Please reference item 1~5 in chapter 6 for the instruments used for testing.

### 5.7.2. 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.

### 5.7.3. Test Setup Layout



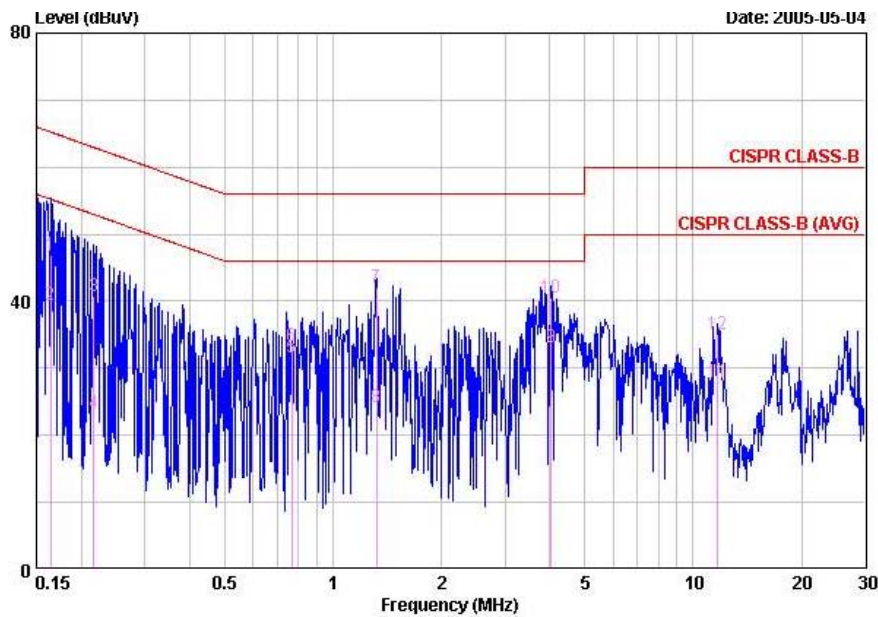


5.7.4. Test Result of Conducted Emission

5.7.5. Test Result of Conducted Emission for CH 36

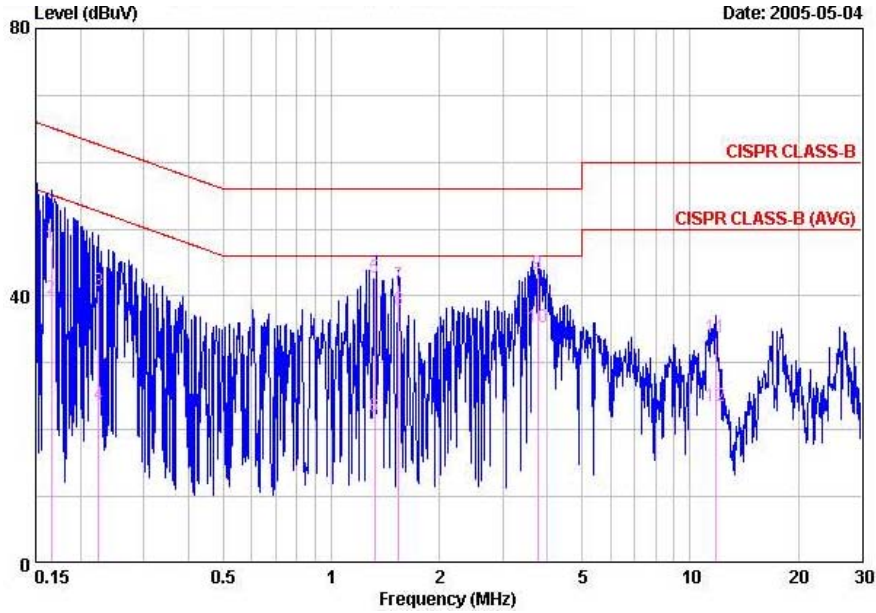
- Mode 1
- Temperature: 20°C
- Relative Humidity: 68%
- Test Engineer: Steven Lu

**Line to Ground**



	Frequency (MHz)	Level (dBUV)	Over Limit (dB)	Limit Line (dBUV)	Read Level (dBUV)	LISN Factor (dB)	Cable Loss (dB)	Remark
1	0.16414	46.92	-18.33	65.25	46.72	0.20	0	QP
2	0.16414	39.44	-15.81	55.25	39.24	0.20	0	AVERAGE
3	0.2162	40.68	-22.28	62.96	40.49	0.19	0	QP
4	0.2162	23.32	-29.64	52.96	23.13	0.19	0	AVERAGE
5	0.7679	31.53	-14.47	46.00	31.43	0.10	0	AVERAGE
6	0.7679	33.27	-22.73	56.00	33.17	0.10	0	QP
7	1.3180	41.97	-14.03	56.00	41.87	0.10	0	QP
8	1.3180	24.29	-21.71	46.00	24.19	0.10	0	AVERAGE
9	4.0330	33.21	-12.79	46.00	33.11	0.10	0	AVERAGE
10	4.0330	40.44	-15.56	56.00	40.34	0.10	0	QP
11	11.6940	27.92	-22.08	50.00	27.82	0.10	0	AVERAGE
12	11.6940	35.04	-24.96	60.00	34.94	0.10	0	QP

**Neutral to Ground**

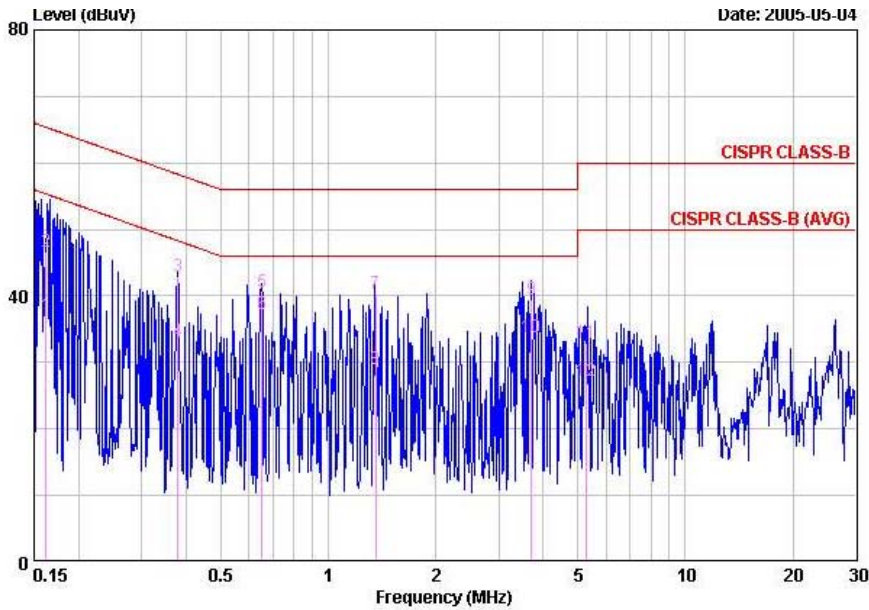


	Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Read Level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Remark
1	0.16589	47.41	-17.75	65.16	47.15	0.26	0	QP
2	0.16589	39.60	-15.56	55.16	39.34	0.26	0	AVERAGE
3	0.22437	40.77	-21.89	62.66	40.59	0.18	0	QP
4	0.22437	23.70	-28.96	52.66	23.52	0.18	0	AVERAGE
5	1.32000	42.80	-13.20	56.00	42.70	0.10	0	QP
6	1.32000	22.01	-23.99	46.00	21.91	0.10	0	AVERAGE
7	1.54400	41.68	-14.32	56.00	41.58	0.10	0	QP
8	1.54400	37.93	-8.07	46.00	37.83	0.10	0	AVERAGE
9	3.75900	43.44	-12.56	56.00	43.34	0.10	0	QP
10	3.75900	35.31	-10.69	46.00	35.21	0.10	0	AVERAGE
11	11.78700	33.86	-26.14	60.00	33.76	0.10	0	QP
12	11.78700	23.55	-26.45	50.00	23.45	0.10	0	AVERAGE



- Mode 2
- Temperature: 20°C
- Relative Humidity: 68%
- Test Engineer: Steven Lu

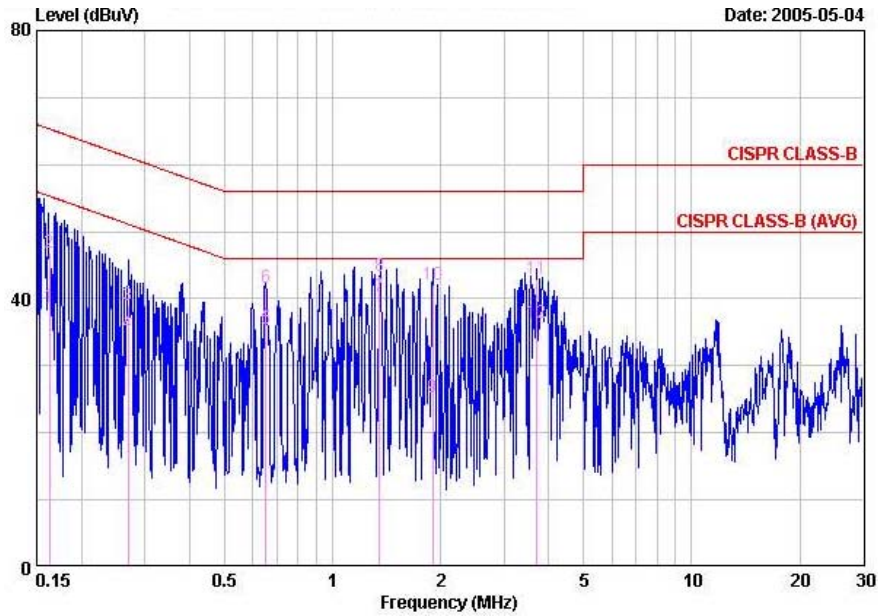
**Line to Ground**



	Frequency (MHz)	Level (dBUV)	Over Limit (dB)	Limit Line (dBUV)	Read Level (dBUV)	LISN Factor (dB)	Cable Loss (dB)	Remark
1	0.16239	37.13	-18.21	55.34	36.93	0.20	0	AVERAGE
2	0.16239	46.64	-18.70	65.34	46.44	0.20	0	QP
3	0.37912	43.05	-15.25	58.30	42.94	0.11	0	QP
4	0.37912	33.12	-15.18	48.30	33.01	0.11	0	AVERAGE
5	0.65084	40.53	-15.47	56.00	40.43	0.10	0	QP
6	0.65084	37.30	-8.70	46.00	37.20	0.10	0	AVERAGE
7	1.35500	40.37	-15.63	56.00	40.27	0.10	0	QP
8	1.35500	28.97	-17.03	46.00	28.87	0.10	0	AVERAGE
9	3.70000	39.55	-16.45	56.00	39.45	0.10	0	QP
10	3.70000	33.7	-12.30	46.00	33.60	0.10	0	AVERAGE
11	5.28300	32.97	-27.03	60.00	32.87	0.10	0	QP
12	5.28300	27.26	-22.74	50.00	27.16	0.10	0	AVERAGE



**Neutral to Ground**

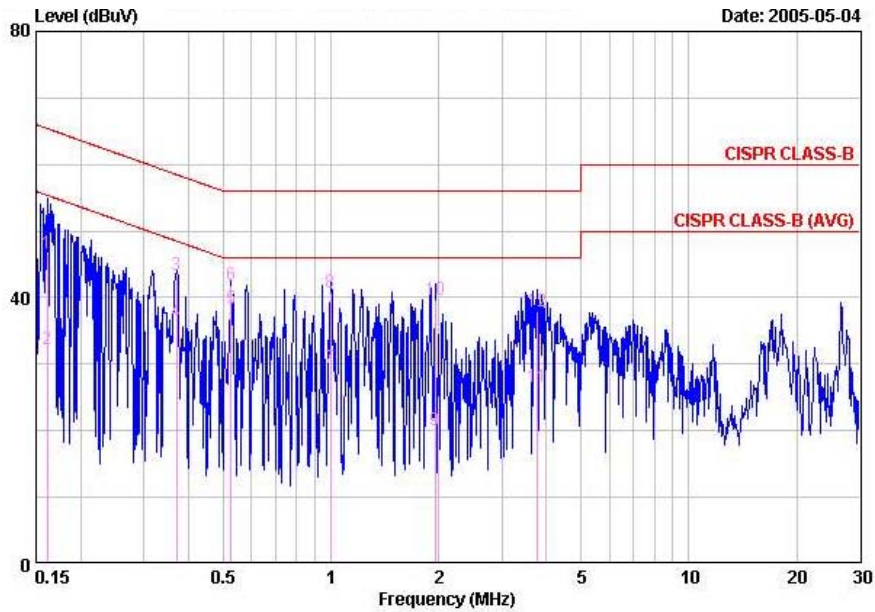


	Frequency (MHz)	Level (dBUV)	Over Limit (dB)	Limit Line (dBUV)	Read Level (dBUV)	LISN Factor (dB)	Cable Loss (dB)	Remark
1	0.16270	38.81	-16.51	55.32	38.54	0.27	0	AVERAGE
2	0.16270	46.83	-18.49	65.32	46.56	0.27	0	QP
3	0.27009	38.97	-22.15	61.12	38.81	0.16	0	QP
4	0.27009	34.96	-16.16	51.12	34.80	0.16	0	AVERAGE
5	0.65084	35.46	-10.54	46.00	35.36	0.10	0	AVERAGE
6	0.65084	41.60	-14.40	56.00	41.50	0.10	0	QP
7	1.35400	40.33	-5.67	46.00	40.23	0.10	0	AVERAGE
8	1.35400	43.28	-12.72	56.00	43.18	0.10	0	QP
9	1.89800	25.31	-20.69	46.00	25.21	0.10	0	AVERAGE
10	1.89800	42.17	-13.83	56.00	42.07	0.10	0	QP
11	3.70000	42.93	-13.07	56.00	42.83	0.10	0	QP
12	3.70000	36.46	-9.54	46.00	36.36	0.10	0	AVERAGE



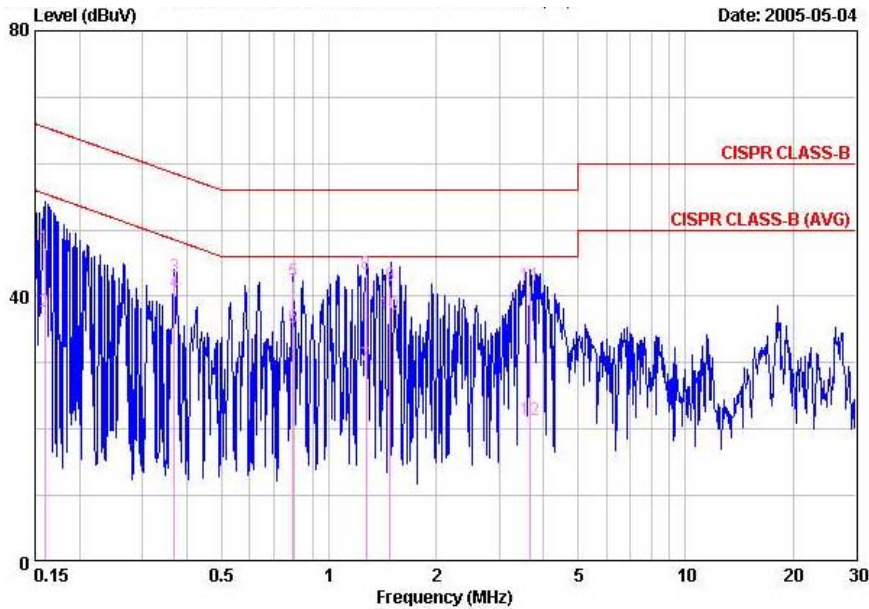
- Mode 3
- Temperature: 20°C
- Relative Humidity: 68%
- Test Engineer: Steven Lu

**Line to Ground**



	Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Read Level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Remark
1	0.16155	46.64	-18.74	65.38	46.44	0.20	0	QP
2	0.16155	32.32	-23.06	55.38	32.12	0.20	0	AVERAGE
3	0.37117	43.35	-15.12	58.47	43.24	0.11	0	QP
4	0.37117	36.39	-12.08	48.47	36.28	0.11	0	AVERAGE
5	0.52655	38.35	-7.65	46.00	38.25	0.10	0	AVERAGE
6	0.52655	41.82	-14.18	56.00	41.72	0.10	0	QP
7	0.99968	29.46	-16.54	46.00	29.36	0.10	0	AVERAGE
8	0.99968	40.70	-15.30	56.00	40.6	0.10	0	QP
9	1.95900	20.15	-25.85	46.00	20.05	0.10	0	AVERAGE
10	1.95900	39.65	-16.35	56.00	39.55	0.10	0	QP
11	3.77300	26.52	-19.48	46.00	26.42	0.10	0	AVERAGE
12	3.77300	37.83	-18.17	56.00	37.73	0.10	0	QP

**Neutral to Ground**



	Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Read Level (dBuV)	LISN Factor (dB)	Cable Loss (dB)	Remark
1	0.15985	47.29	-18.18	65.47	47.01	0.28	0	QP
2	0.15985	37.82	-17.65	55.47	37.54	0.28	0	AVERAGE
3	0.3692	43.05	-15.47	58.52	42.94	0.11	0	QP
4	0.3692	40.51	-8.01	48.52	40.4	0.11	0	AVERAGE
5	0.7918	42.27	-13.73	56.00	42.17	0.10	0	QP
6	0.7918	35.40	-10.6	46.00	35.30	0.10	0	AVERAGE
7	1.2700	29.75	-16.25	46.00	29.65	0.10	0	AVERAGE
8	1.2700	43.38	-12.62	56.00	43.28	0.10	0	QP
9	1.4830	41.68	-14.32	56.00	41.58	0.10	0	QP
10	1.4830	37.34	-8.66	46.00	37.24	0.10	0	AVERAGE
11	3.6740	41.62	-14.38	56.00	41.52	0.10	0	QP
12	3.6740	21.31	-24.69	46.00	21.21	0.10	0	AVERAGE

Note:

Corrected Reading: Probe (LISN / ISN) Factor + Cable Loss + Read Level = Level.

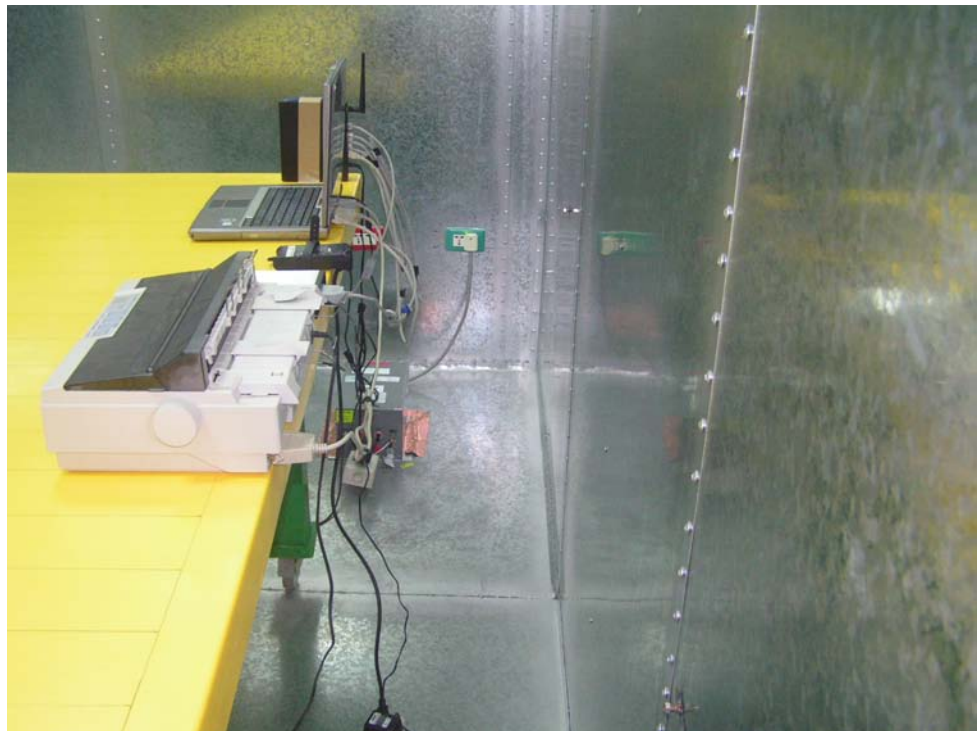
5.7.6. Photographs of Conducted Emission Test Configuration

**Mode 1**

FRONT VIEW



REAR VIEW

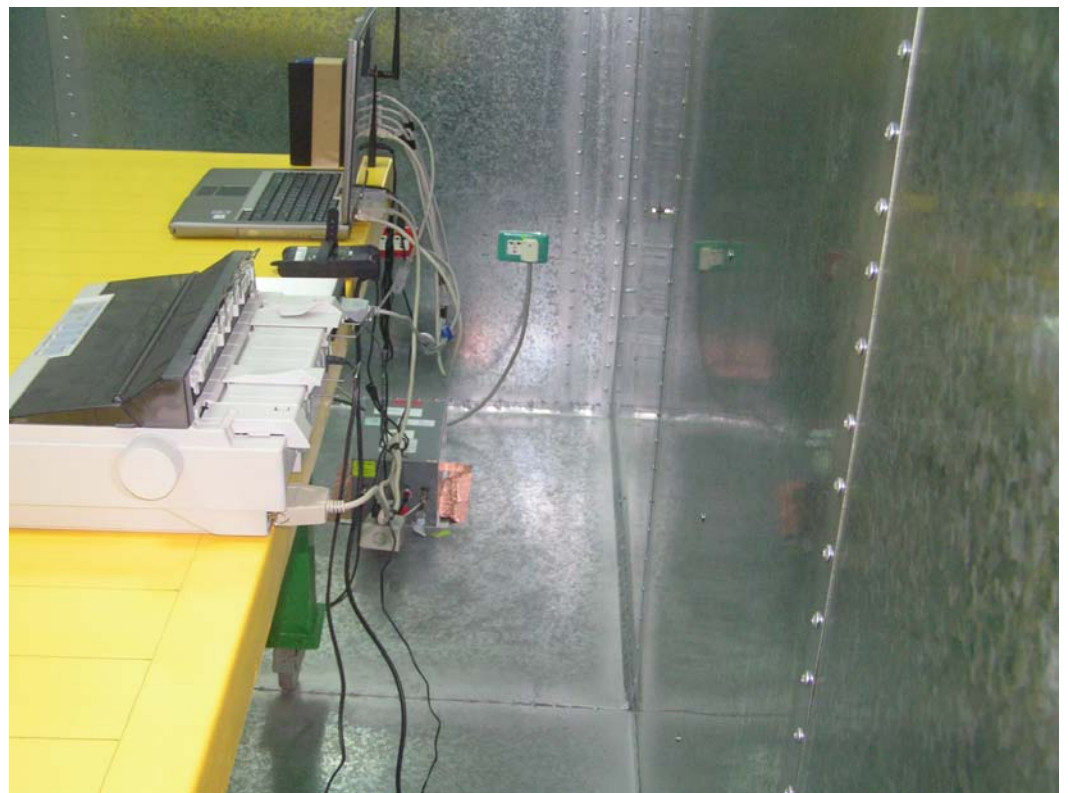


Mode 2

FRONT VIEW



REAR VIEW

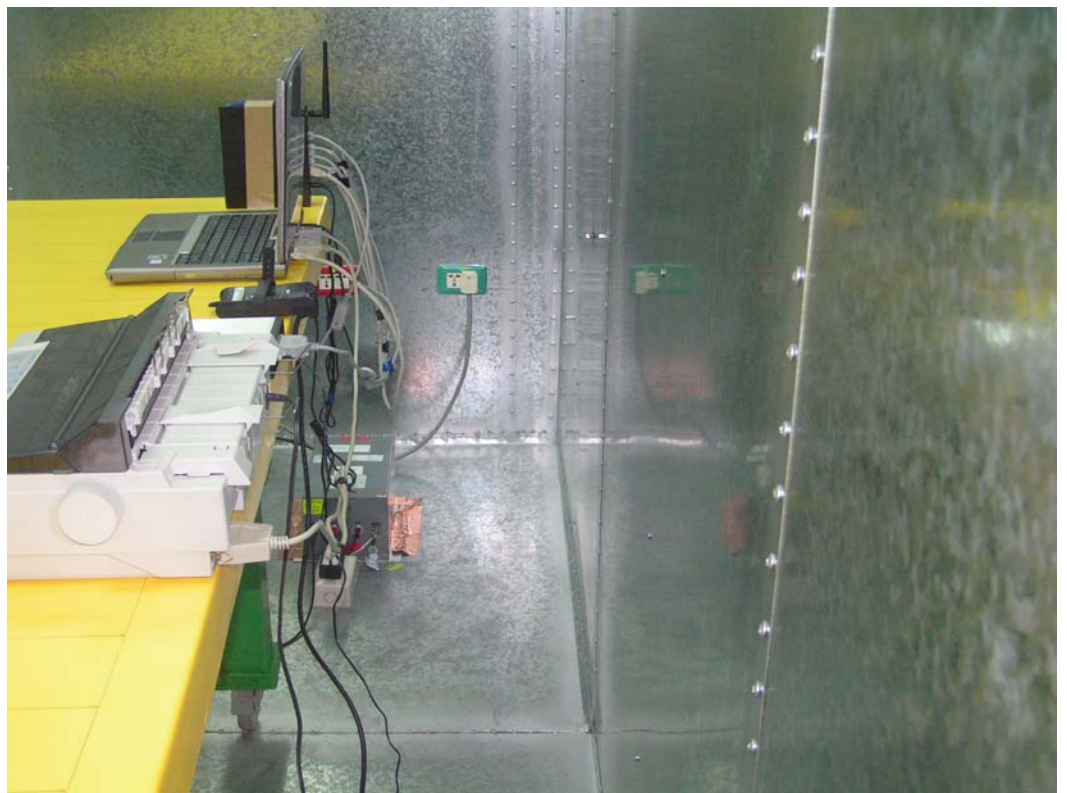


Mode 3

FRONT VIEW



REAR VIEW



## 5.8. Test of Spurious Radiated Emission

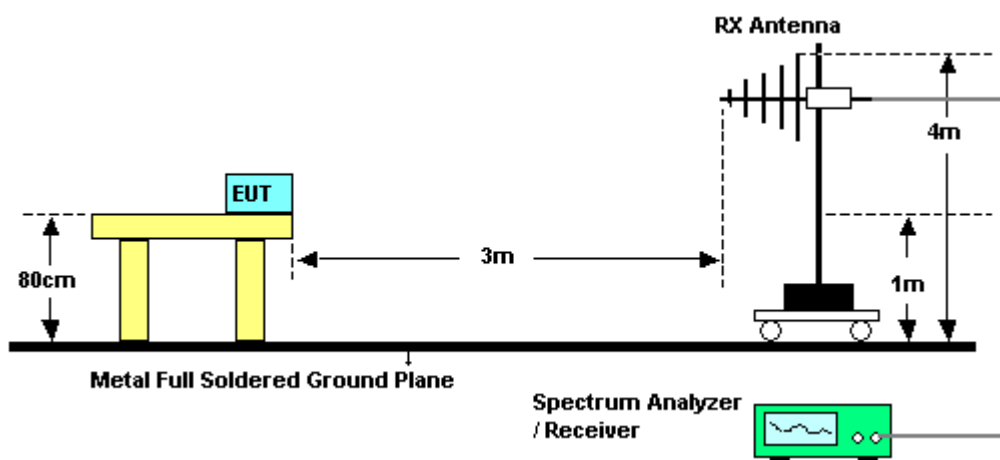
### 5.8.1. Measuring Instruments

Please reference item 6~17 in chapter 6 for the instruments used for testing.

### 5.8.2. Test Procedures

1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on the top of the turn table 0.8 meter above ground.
3. 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.
4. Power on the EUT and all the supporting units.
5. The turn table was rotated by 360 degrees to determine the position of the highest radiation.
6. 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.
7. 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.
8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
9. For emission above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
10. 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.
11. 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.

### 5.8.3. Test Setup Layout





5.8.4. Test Results for CH 36/ 5180 MHz (for emission below 1GHz)

- Mode 1
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**(A) Polarization: Horizontal**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	249.220	34.56	-11.44	46.00	11.99	1.24	30.13	51.46	HORIZONTAL	Peak
2 @	327.790	35.16	-10.84	46.00	13.82	1.43	30.48	50.39	HORIZONTAL	Peak
3 @	498.510	40.63	-5.37	46.00	17.36	1.77	30.53	52.03	HORIZONTAL	Peak
4 @	770.110	35.87	-10.13	46.00	19.92	2.19	30.09	43.85	HORIZONTAL	Peak
5 @	881.660	38.69	-7.31	46.00	20.32	2.39	29.18	45.15	HORIZONTAL	Peak
6 @	990.300	40.33	-13.67	54.00	20.90	2.52	28.66	45.57	HORIZONTAL	Peak

**(B) Polarization: Vertical**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	109.540	32.87	-10.63	43.50	11.50	0.84	30.07	50.60	VERTICAL	Peak
2 @	327.790	32.56	-13.44	46.00	13.82	1.43	30.48	47.79	VERTICAL	Peak
3 @	498.510	37.25	-8.75	46.00	17.36	1.77	30.53	48.65	VERTICAL	Peak
4 @	548.950	35.33	-10.67	46.00	18.28	1.87	30.63	45.81	VERTICAL	Peak
5 @	770.110	35.92	-10.08	46.00	19.92	2.19	30.09	43.89	VERTICAL	Peak
6 @	881.660	37.89	-8.11	46.00	20.32	2.39	29.18	44.35	VERTICAL	Peak

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level





- Mode 2
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**(A) Polarization: Horizontal**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	319.060	29.85	-16.15	46.00	13.67	1.41	30.39	45.16	HORIZONTAL	Peak
2	330.700	31.28	-14.72	46.00	13.87	1.43	30.50	46.48	HORIZONTAL	Peak
3	400.540	33.63	-12.37	46.00	15.94	1.59	30.35	46.45	HORIZONTAL	Peak
4	498.510	36.32	-9.68	46.00	17.36	1.77	30.53	47.72	HORIZONTAL	Peak
5	548.950	30.93	-15.07	46.00	18.28	1.87	30.63	41.41	HORIZONTAL	Peak
6	770.110	37.07	-8.93	46.00	19.92	2.19	30.09	45.05	HORIZONTAL	Peak
7	881.660	37.59	-8.41	46.00	20.32	2.39	29.18	44.06	HORIZONTAL	Peak
8	991.270	37.84	-16.16	54.00	20.90	2.52	28.65	43.06	HORIZONTAL	Peak
9	1000.000	40.42	-13.58	54.00	20.90	2.53	28.56	45.55	HORIZONTAL	Peak

**(B) Polarization: Vertical**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	43.580	37.34	-2.66	40.00	10.30	0.56	29.83	56.31	VERTICAL	Peak
2 !	83.350	36.14	-3.86	40.00	7.40	0.73	29.97	57.98	VERTICAL	Peak
3	109.540	33.41	-10.09	43.50	11.50	0.84	30.07	51.14	VERTICAL	Peak
4	249.220	30.03	-15.97	46.00	11.99	1.24	30.13	46.93	VERTICAL	Peak
5	498.510	39.17	-6.83	46.00	17.36	1.77	30.53	50.58	VERTICAL	Peak
6 !	548.950	40.81	-5.19	46.00	18.28	1.87	30.63	51.29	VERTICAL	Peak
7	660.500	34.38	-11.62	46.00	18.90	2.05	30.34	43.78	VERTICAL	Peak
8	991.270	38.88	-15.12	54.00	20.90	2.52	28.65	44.11	VERTICAL	Peak

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level



5.8.5. Test Results for CH 36 / 5180 MHz (for emission above 1GHz)

- **Normal Mode**
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**(A) Polarization: Horizontal**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	1120.010	42.61	-11.39	54.00	24.14	1.04	39.43	56.86	HORIZONTAL	AVERAGE
2	1120.050	44.73	-29.27	74.00	24.14	1.04	39.43	58.98	HORIZONTAL	PEAK
3 @	3453.330	35.12	-18.88	54.00	31.19	2.37	40.31	41.87	HORIZONTAL	AVERAGE
4	3453.580	43.12	-30.88	74.00	31.19	2.37	40.31	49.87	HORIZONTAL	PEAK
5 @	10361.620	38.04	-15.96	54.00	39.34	5.19	38.64	32.16	HORIZONTAL	AVERAGE
6	10363.420	50.02	-23.98	74.00	39.34	5.19	38.64	44.13	HORIZONTAL	PEAK

**(B) Polarization: Vertical**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1119.920	42.50	-31.50	74.00	24.14	1.04	39.43	56.75	VERTICAL	PEAK
2 @	1119.990	39.95	-14.05	54.00	24.14	1.04	39.43	54.20	VERTICAL	AVERAGE
3 @	3453.370	37.68	-16.32	54.00	31.19	2.37	40.31	44.44	VERTICAL	AVERAGE
4	3453.460	44.32	-29.68	74.00	31.19	2.37	40.31	51.07	VERTICAL	PEAK
5 @	10360.680	40.64	-13.36	54.00	39.34	5.19	38.64	34.75	VERTICAL	AVERAGE
6	10360.780	53.76	-20.24	74.00	39.34	5.19	38.64	47.87	VERTICAL	PEAK

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level



5.8.6. Test Results for CH 52 / 5260 MHz (for emission above 1GHz)

- **Normal Mode**
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**(A) Polarization: Horizontal**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1200.000	45.36	-28.64	74.00	24.38	1.11	39.43	59.31	HORIZONTAL	Peak
2 @	1200.000	43.25	-10.75	54.00	24.38	1.11	39.43	57.20	HORIZONTAL	Average
3 @	3506.000	36.25	-17.75	54.00	31.30	2.44	40.37	42.88	HORIZONTAL	Average
4	3506.000	43.66	-30.34	74.00	31.30	2.44	40.37	50.29	HORIZONTAL	Peak
5	10520.000	50.21	-23.79	74.00	39.47	5.39	38.60	43.95	HORIZONTAL	Peak
6 @	10520.000	39.17	-14.83	54.00	39.47	5.39	38.60	32.91	HORIZONTAL	Average

**(B) Polarization: Vertical**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	1200.000	39.68	-14.32	54.00	24.38	1.11	39.43	53.63	VERTICAL	Average
2	1200.000	42.36	-31.64	74.00	24.38	1.11	39.43	56.31	VERTICAL	Peak
3 @	3506.000	37.58	-16.42	54.00	31.30	2.44	40.37	44.21	VERTICAL	Average
4	3506.000	44.52	-29.48	74.00	31.30	2.44	40.37	51.15	VERTICAL	Peak
5	10520.000	53.66	-20.34	74.00	39.49	5.38	38.55	47.34	VERTICAL	Peak
6 @	10520.000	41.25	-12.75	54.00	39.49	5.38	38.55	34.93	VERTICAL	Average

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level



5.8.7. Test Results for CH 64 / 5320 MHz (for emission above 1GHz)

- **Normal Mode**
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**(A) Polarization: Horizontal**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1200.000	45.21	-28.79	74.00	24.38	1.11	39.43	59.16	HORIZONTAL	Peak
2 @	1200.000	43.28	-10.72	54.00	24.38	1.11	39.43	57.23	HORIZONTAL	Average
3 @	3546.000	36.87	-17.13	54.00	31.44	2.48	40.44	43.38	HORIZONTAL	Average
4	3546.000	44.47	-29.53	74.00	31.44	2.48	40.44	50.98	HORIZONTAL	Peak
5	10640.000	51.28	-22.72	74.00	39.42	5.42	38.68	45.13	HORIZONTAL	Peak
6 @	10640.000	38.98	-15.02	54.00	39.42	5.42	38.68	32.83	HORIZONTAL	Average

**(B) Polarization: Vertical**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1200.000	42.17	-31.83	74.00	24.38	1.11	39.43	56.12	VERTICAL	Peak
2 @	1200.000	39.54	-14.46	54.00	24.38	1.11	39.43	53.49	VERTICAL	Average
3	3456.000	45.36	-28.64	74.00	31.19	2.37	40.31	52.11	VERTICAL	Peak
4 @	3456.000	38.61	-15.39	54.00	31.19	2.37	40.31	45.36	VERTICAL	Average
5 @	10640.000	41.15	-12.85	54.00	39.42	5.42	38.68	35.00	VERTICAL	Average
6 @	10640.000	54.58	-19.42	74.00	39.42	5.42	38.68	48.43	VERTICAL	Peak

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level



5.8.8. Test Results for CH 42 / 5210 MHz (for emission above 1GHz)

- **Turbo Mode**
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**(A) Polarization: Horizontal**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1120.000	45.54	-28.46	74.00	24.14	1.04	39.43	59.79	HORIZONTAL	Peak
2 @	1120.000	42.57	-11.43	54.00	24.14	1.04	39.43	56.82	HORIZONTAL	Average
3 @	3473.000	36.69	-17.31	54.00	31.22	2.37	40.34	43.43	HORIZONTAL	Average
4	3473.000	44.47	-29.53	74.00	31.22	2.37	40.34	51.21	HORIZONTAL	Peak
5	10420.000	50.36	-23.64	74.00	39.40	5.28	38.60	44.28	HORIZONTAL	Peak
6 @	10420.000	38.96	-15.04	54.00	39.40	5.28	38.60	32.88	HORIZONTAL	Average

**(B) Polarization: Vertical**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1200.000	43.32	-30.68	74.00	24.38	1.11	39.43	57.27	VERTICAL	Peak
2 @	1200.000	38.99	-15.01	54.00	24.38	1.11	39.43	52.94	VERTICAL	Average
3	3473.000	44.24	-29.76	74.00	31.22	2.37	40.34	50.98	VERTICAL	Peak
4 @	3473.000	38.21	-15.79	54.00	31.22	2.37	40.34	44.95	VERTICAL	Average
5	10420.000	53.22	-20.78	74.00	39.40	5.28	38.60	47.14	VERTICAL	Peak
6 @	10420.000	41.17	-12.83	54.00	39.40	5.28	38.60	35.09	VERTICAL	Average

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level



5.8.9. Test Results for CH 50 / 5250 MHz (for emission above 1GHz)

- **Turbo Mode**
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**(A) Polarization: Horizontal**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1200.000	44.57	-29.43	74.00	24.38	1.11	39.43	58.52	HORIZONTAL	Peak
2 @	1200.000	43.17	-10.83	54.00	24.38	1.11	39.43	57.12	HORIZONTAL	Average
3 @	3500.000	35.70	-18.30	54.00	31.30	2.44	40.37	42.33	HORIZONTAL	Average
4	3500.000	44.58	-29.42	74.00	31.30	2.44	40.37	51.21	HORIZONTAL	Peak
5	10500.000	51.25	-22.75	74.00	39.50	5.38	38.54	44.91	HORIZONTAL	Peak
6 @	10500.000	38.95	-15.05	54.00	39.50	5.38	38.54	32.61	HORIZONTAL	Average

**(B) Polarization: Vertical**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1200.000	43.11	-30.89	74.00	24.38	1.11	39.43	57.06	VERTICAL	Peak
2 @	1200.000	40.26	-13.74	54.00	24.38	1.11	39.43	54.21	VERTICAL	Average
3	3500.000	45.72	-28.28	74.00	31.30	2.44	40.37	52.35	VERTICAL	Peak
4 @	3500.000	38.58	-15.42	54.00	31.30	2.44	40.37	45.21	VERTICAL	Average
5 @	10500.000	40.85	-13.15	54.00	39.50	5.38	38.54	34.51	VERTICAL	Average
6	10500.000	53.28	-20.72	74.00	39.50	5.38	38.54	46.94	VERTICAL	Peak

Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level



5.8.10. Test Results for CH 58 / 5290 MHz (for emission above 1GHz)

- **Turbo Mode**
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

**(A) Polarization: Horizontal**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1200.000	44.58	-29.42	74.00	24.38	1.11	39.43	58.53	HORIZONTAL	Peak
2 @	1200.000	41.88	-12.12	54.00	24.38	1.11	39.43	55.83	HORIZONTAL	Average
3 @	3526.000	36.65	-17.35	54.00	31.40	2.48	40.39	43.16	HORIZONTAL	Average
4	3526.000	44.23	-29.77	74.00	31.40	2.48	40.39	50.74	HORIZONTAL	Peak
5	10580.000	50.36	-23.64	74.00	39.45	5.40	38.61	44.12	HORIZONTAL	Peak
6 @	10580.000	39.96	-14.04	54.00	39.45	5.40	38.61	33.72	HORIZONTAL	Average

**(B) Polarization: Vertical**

	Freq	Level	Over Limit	Limit	Antenna Line Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	1200.000	43.82	-30.18	74.00	24.38	1.11	39.43	57.77	VERTICAL	Peak
2 @	1200.000	40.25	-13.75	54.00	24.38	1.11	39.43	54.20	VERTICAL	Average
3 @	3526.000	38.27	-15.73	54.00	31.40	2.48	40.39	44.78	VERTICAL	Average
4	3526.000	45.28	-28.72	74.00	31.40	2.48	40.39	51.79	VERTICAL	Peak
5	10580.000	53.58	-20.42	74.00	39.45	5.40	38.61	47.34	VERTICAL	Peak
6 @	10580.000	40.84	-13.16	54.00	39.45	5.40	38.61	34.60	VERTICAL	Average

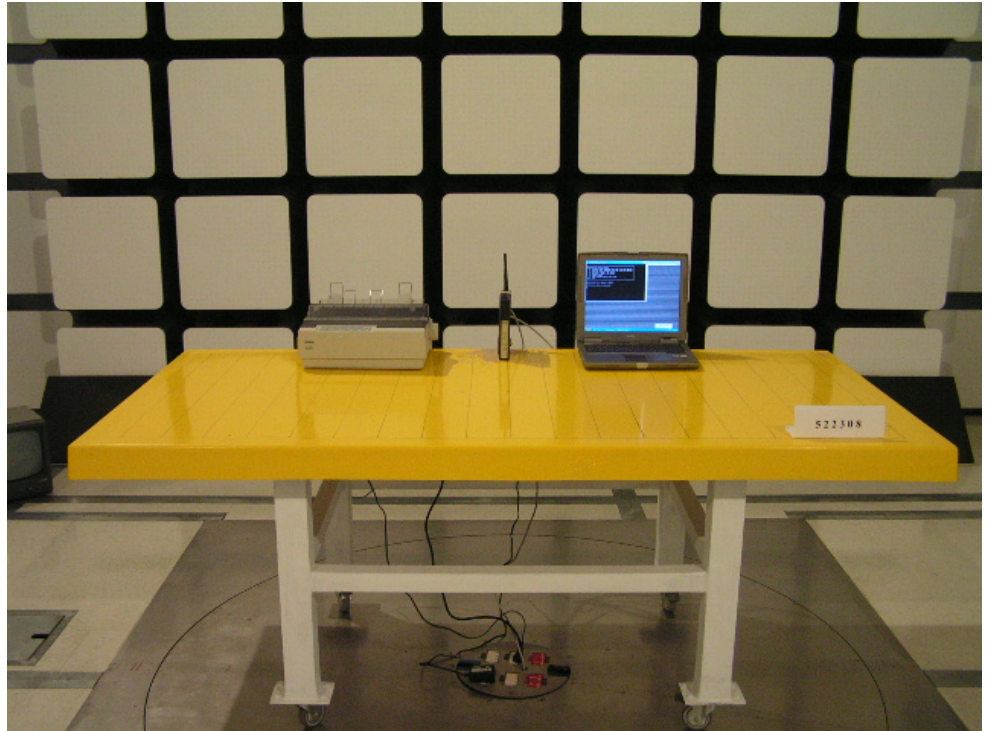
Note:

Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

5.8.11. Photographs of Radiated Emission Test Configuration

FRONT VIEW



REAR VIEW







## **5.9. Antenna Requirements**

### **5.9.1. 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 15.407:

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.

### **5.9.2. Antenna Connected Construction**

There is reversed SMA connector for the dipole antenna.

## 6. RF Exposure

### 6.1.1. Limit For Maximum Permissible Exposure (MPE)

This product can be classified as mobile device, so the 20cm separation distance warning is required. In this section, the power density at 20cm location is calculated to examine if it is lower than the limit.

#### (A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

#### (B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S ( minutes )
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

F = frequency in MHz

\*Plane-wave equivalent power density

### 6.1.2. MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (mW/cm}^2\text{)} = \frac{E^2}{377}$$

**E** = Electric field (V/m)

**P** = Peak RF output power (mW)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

From the peak EUT RF output power, the minimum mobile separation distance, d=20cm, as well as the gain of the used antenna, the RF power density can be obtained.



6.1.3. Calculated Result and Limit

- Modulation Type: OFDM
- Temperature: 16°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung

Channel No.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power ( mW )	Power Density (S) (mW/cm <sup>2</sup> )	Limit of Power Density (S) (mW/cm <sup>2</sup> )
5180MHz	2.00	1.58	16.20	41.69	0.0131	1
5260MHz	2.00	1.58	16.51	44.77	0.0141	1
5320MHz	2.00	1.58	16.30	42.66	0.0134	1

## 7. List of Measuring Equipments Used

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
1	EMC Receiver	R&S	ESCS 30	100132	9 KHz – 2.75 GHz	Jun. 23, 2004	Conduction (CO01-HY)
2	LISN	MessTec	NNB-2/16Z	2001/008	9 KHz – 30 MHz	Jun. 09, 2004	Conduction (CO01-HY)
3	LISN (Support Unit)	MessTec	NNB-2/16Z	2001/009	9 KHz – 30 MHz	Apr. 19, 2004	Conduction (CO01-HY)
4	EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A	Conduction (CO01-HY)
5	EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A	Conduction (CO01-HY)
6	RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9KHz~30MHz	Dec. 23, 2004	Conduction (CO01-HY)
7	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2004	Radiation (03CH03-HY)
8	Spectrum analyzer	R&S	FSP40	100004	9KHz~40GHz	Aug. 31, 2004	Radiation (03CH03-HY)
9	Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Nov. 04, 2004	Radiation (03CH03-HY)
10	Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz – 200MHz	Jul. 28, 2004	Radiation (03CH03-HY)
11	Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz -1GHz	Jul. 28, 2004	Radiation (03CH03-HY)
12	RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Dec. 02, 2004	Radiation (03CH03-HY)
13	Amplifier	MITEQ	AFS44	849984	100MHz~26.5GHz	Mar. 25, 2005	Radiation (03CH03-HY)
14	Horn Antenna	EMCO	3115	6741	1GHz – 18GHz	Apr. 07, 2004	Radiation (03CH03-HY)
15	Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
16	Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
17	Horn Antenna	Schwarzbeck	BBHA9170	154	18GHz~40GHz	Jun. 09, 2004	Radiation (03CH03-HY)
18	RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Dec. 04, 2004	Radiation (03CH03-HY)

※ Calibration Interval of instruments listed above is one year.



Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
19	Spectrum analyzer	R&S	FSP7	838858/014	9KHZ~7GHZ	Sep. 02, 2004	Conducted (TH01-HY)
20	Power meter	R&S	NRVS	100444	DC~40GHz	Jun. 15, 2004	Conducted (TH01-HY)
21	Power sensor	R&S	NRV-Z55	100049	DC~40GHz	Jun. 15, 2004	Conducted (TH01-HY)
22	Power Sensor	R&S	NRV-Z32	100057	30MHz-6GHz	Jun. 15, 2004	Conducted (TH01-HY)
23	DC power source	HPC	HPA-500W	HPA-9100024	AC 0~300V	Jun. 16, 2004	Conducted (TH01-HY)
24	DC power source	G.W.	GPC-6030D	C671845	DC 1V~60V	Nov. 05, 2004	Conducted (TH01-HY)
25	Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Sep. 30, 2004	Conducted (TH01-HY)
26	RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz~7GHz	Jan. 01, 2005	Conducted (TH01-HY)
27	RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz~1GHz	Jan. 01, 2005	Conducted (TH01-HY)

※ Calibration Interval of instruments listed above is one year.



## 8. Company Profile

SPORTON Lab. was established in 1986 with one shielded room: the first private EMI test facility, offering local manufacturers an alternative EMI test facility apart from ERSO. In 1988, one 3M and 10M/3M open area test site were setup and also obtained official accreditation from FCC, VCCI and NEMKO. In 1993, a Safety laboratory was founded and obtained accreditation from UL of USA, CSA of Canada and TUV (Rhineland & PS) of Germany. In 1995, one EMC lab, including EMI and EMS test facilities was setup. In 1997, SPORTON Group has provided financial expense to relocate the headquarter to Orient Scientific Park in Taipei Hsien to offer more comprehensive, more qualified and better service to local suppliers and manufactures. In 1999, Safety Group and Component Group were setup. In 2001, SPORTON has established 3M/10M chamber in Hwa Ya Technology Park.

### 8.1. Certificate of Accreditation

Taiwan	BSMI, CNLA, DGT
USA	FCC, NVLAP, UL
EU	Nemko, TUV
Japan	VCCI
Canada	Industry Canada

### 8.2. Test Location

SHIJR	ADD : 6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. TEL : 02-2696-2468 FAX : 02-2696-2255
HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 03-327-3456 FAX : 03-318-0055
LINKOU	ADD : No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C TEL : 02-2601-1640 FAX : 02-2601-1695
DUNGHU	ADD : No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. TEL : 02-2631-4739 FAX : 02-2631-9740
JUNGHE	ADD : 7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. TEL : 02-8227-2020 FAX : 02-8227-2626
NEIHU	ADD : 4Fl., No. 339, Hsin Hu 2 <sup>nd</sup> Rd., Taipei 114, Taiwan, R.O.C. TEL : 02-2794-8886 FAX : 02-2794-9777

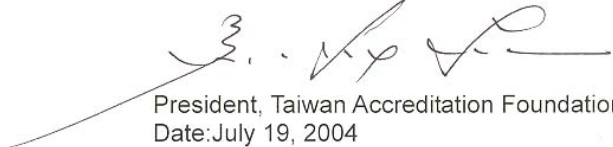
## 9. CNLA Certificate of Accreditation

Test Lab. : Sporton International Inc.  
Accreditation Number : 1190  
Originally Accredited : 2003/12/15  
Effective Period : 2003/12/15~2006/12/14  
Accredited Scope : FCC Part 15C/E (9kHz~40GHz)



Taiwan Accreditation Foundation  
Chinese National Laboratory Accreditation  
Certificate of Accreditation

Accreditation Criteria: ISO 17025  
Accreditation Number: 1190  
Organization/Laboratory: EMC & Wireless Communications Laboratory, Sporton International Inc.  
Originally Accredited: December 15, 2003  
Effective Period: December 15, 2003 To December 14, 2006  
Accredited Scope: Electrical Testing Field, 7 items, details shown in the following pages.  
Specific Accreditation Program: Recognition and Approval of Designated Laboratory for Commodities Inspection

  
President, Taiwan Accreditation Foundation  
Date: July 19, 2004

(This document is invalid unless accompanied by all 4 pages)

CNLA-ZL03191E Page 1 of 4