



FCC ID: S7X5801A01  
Issued on Sep. 15, 2005

Report No.: FR560207

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# FCC TEST REPORT

**CATEGORY** : Fixed

**PRODUCT NAME** : Wireless LAN Outdoor Bridge

**FCC ID.** : S7X5801A01

**FILING TYPE** : Certification

**BRAND NAME** : ALCON,PLANET,OvisLink,JAHT,GOLDENLINK

**MODEL NAME** : ALink-5801a, WAP-7000, WHB-5854A, JWP-9006BM,  
ANK-5800

**APPLICANT** : **ALCON Telecommunications Co., Ltd.**  
2F,No.480-5,Sec. 6,Yen-Ping N. Rd.,Shih-Lin  
111,Taipei,Taiwan,R.O.C.

**MANUFACTURER** : Same as the applicant

**ISSUED BY** : **SPORTON INTERNATIONAL INC.**  
6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien,  
Taiwan, R.O.C.

## Statements:

**Only the test result of 802.11a part (5725MHz ~ 5850MHz) is shown in this test report.**

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 NVLAP and any agency of U.S. government.

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



Lab Code: 200079-0

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**SPORTON International Inc.**

TEL : 886-2-2696-2468

FAX : 886-2-2696-2255



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## HISTORY OF THIS TEST REPORT

Received Date: Jun. 02, 2005

Test Date: Sep. 13, 2005

Original Report Issue Date: Sep. 15, 2005

Report No.: FR560207

☒ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description



FCC ID: S7X5801A01  
Issued on Sep. 15, 2005

Report No.: FR560207

## CERTIFICATE OF COMPLIANCE

with

### 47 CFR FCC Part 15 Subpart C ( Section 15.247 )

**PRODUCT NAME** : Wireless LAN Outdoor Bridge

**BRAND NAME** : ALCON,PLANET,OvisLink,JAHT,GOLDENLINK

**MODEL NAME** : ALink-5801a, WAP-7000, WHB-5854A, JWP-9006BM,  
ANK-5800

**APPLICANT** : **ALCON Telecommunications Co., Ltd.**  
2F,No.480-5,Sec. 6,Yen-Ping N. Rd.,Shih-Lin  
111,Taipei,Taiwan,R.O.C.

**MANUFACTURER** : Same as the applicant

### 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 Sep. 13, 2005 at SPORTON International Inc. LAB.

  
**Wayne Hsu / Supervisor**  
Sporton International Inc.



## 1. General Description of Equipment under Test

### 1.1. Applicant

ALCON Telecommunications Co., Ltd.

2F, No. 480-5, Sec. 6, Yen-Ping N. Rd., Shih-Lin 111, Taipei, Taiwan, R.O.C.

### 1.2. Manufacturer

Same as the applicant

### 1.3. Basic Description of Equipment under Test

This product is a WLAN outdoor bridge with 802.11a wireless solution. 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	OFDM (16QAM / 64QAM / DQPSK / DBPSK )
Number of Channels	5
Frequency Band	5725 MHz ~ 5850 MHz
Carrier Frequency	See section 1.6 for details
Data Rate	OFDM : 6, 12, 18, 24, 36, 48, 54Mbps
Max. Conducted Output Power	20.34dBm
Antenna Type	See section 1.5 for details
Communication Type	Half-Duplex
Testing Duty Cycle	100.00%
Power Rating (DC/AC, Voltage)	48 VDC from POE
Test Power Source	120.00V AC (Adapter of POE)
Temperature Range (Operating)	-30 ~ 70 °C



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## 1.5. Antenna Description

No.	Antenna Type	Gain (dBi)
1	GP ANTENNA	9.00dBi @5.0GHz

## 1.6. Table for Carrier Frequencies

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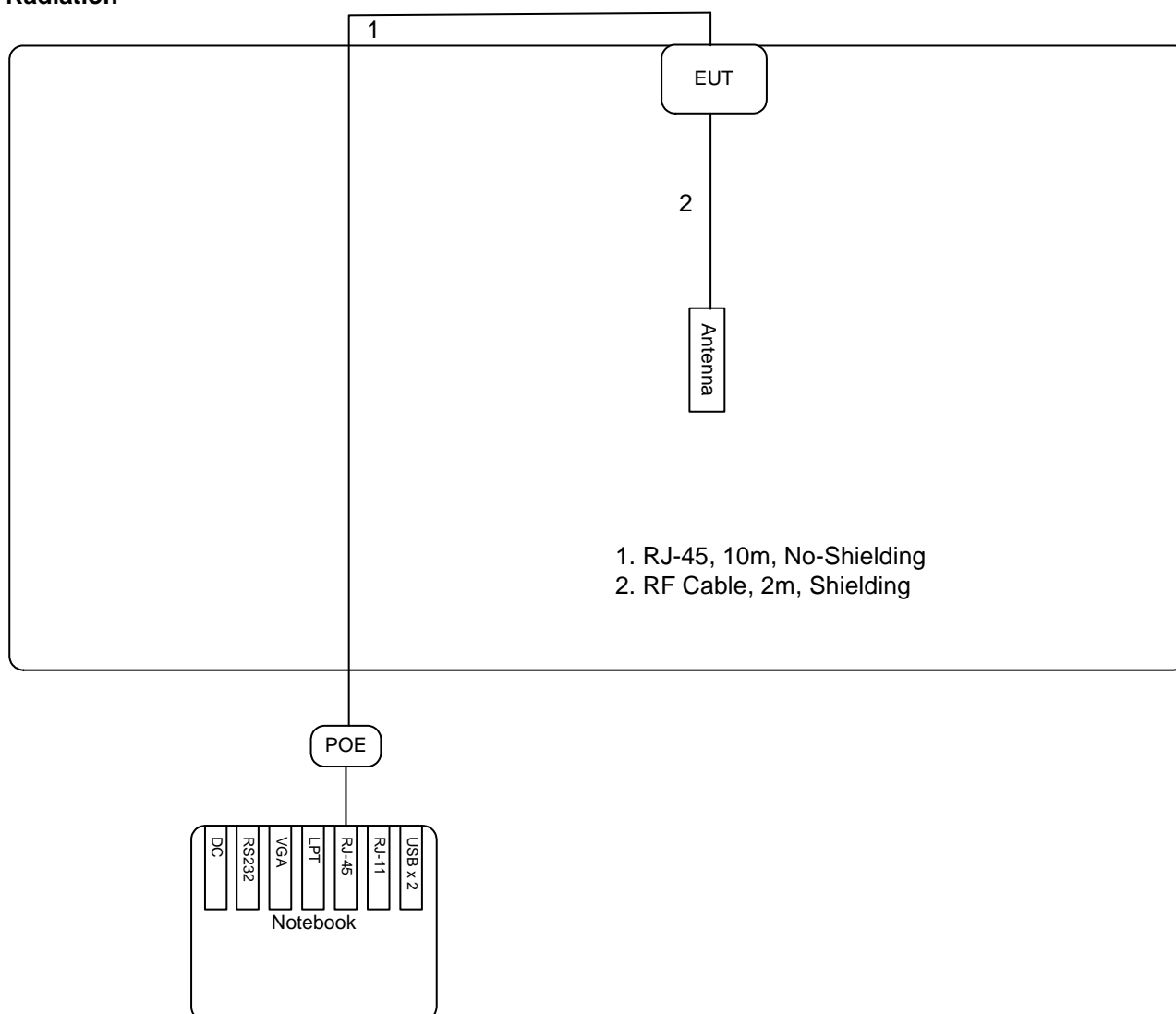
Frequency Bands	
5725MHz ~ 5850MHz	
Channel	Frequency
149	5745 MHz
153	5765 MHz
157	5785 MHz
161	5805 MHz
165	5825 MHz

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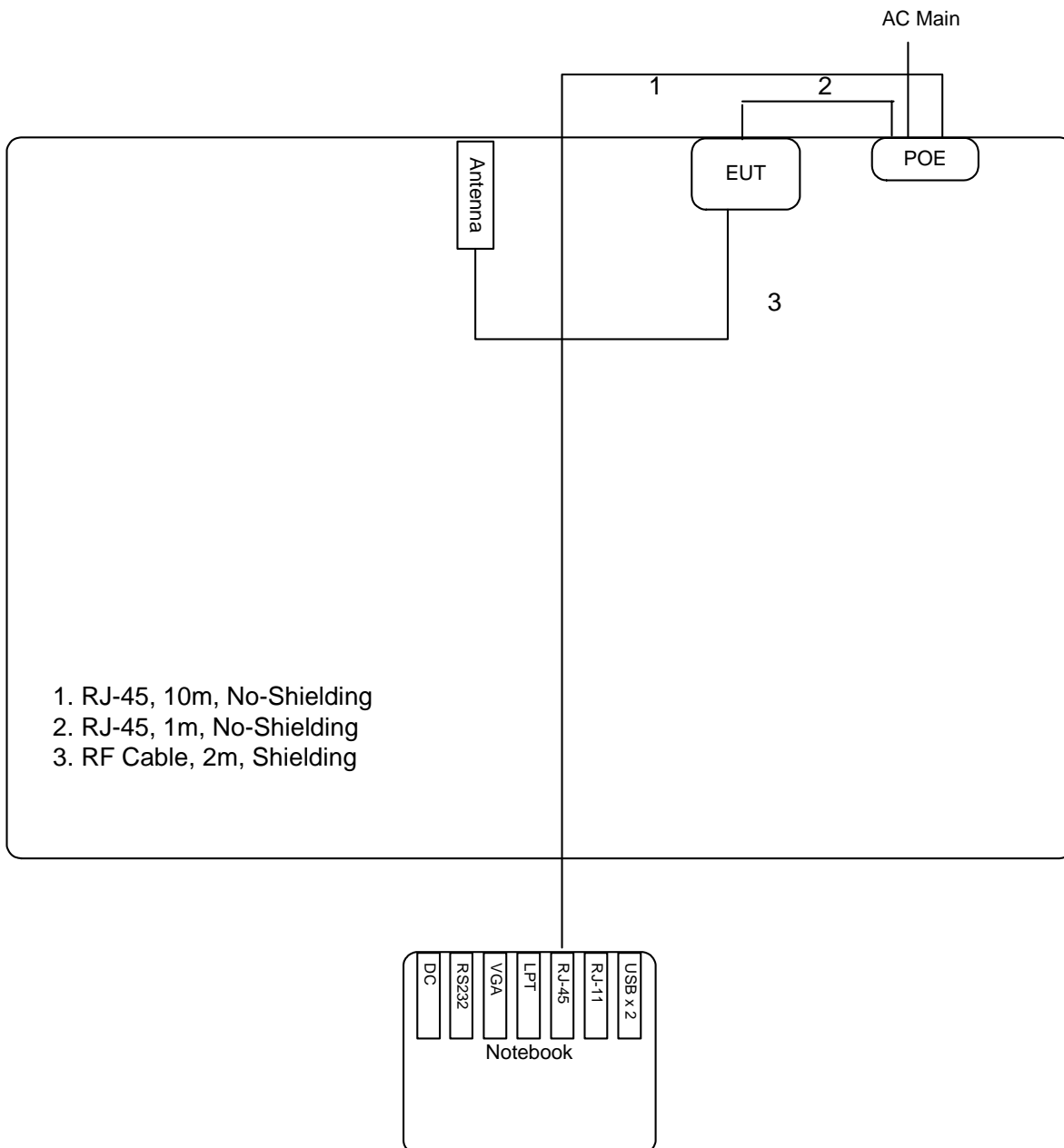
## 2. Test Configuration of the Equipment under Test

### 2.1. Connection Diagram of Test System

Radiation



## Conduction







## 2.2. The Test Mode Description

1. For OFDM modulation, BPSK is the worst case on all test items.
2. According to ANSI C63.4-2003: If frequency range of EUT is more than 10 MHz, we have to test the lowest, middle and highest channels of EUT.
3. Spurious emission below 1GHz is independent of channel selection and modulation types. So only channel 165/5825MHz was tested.
4. AC conduction emission is independent of channel selection and modulation types. So only channel 165/5825MHz with OFDM modulation was tested.

## 2.3. Description of Test Supporting Units

Support unit	Brand	Model No.	FCC ID
Notebook	DELL	PP01L (D505)	DoC
Notebook	COMPAQ	PP2150 (1500)	DoC



### 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** : 03CH03-HY / TH01-HY / CO04-HY

#### 3.2. Test Conditions

Normal Voltage : 120.00VAC (adapter of POE)  
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 FCC Part 15 Subpart C**

#### 3.4. Frequency Range Investigated

Radiated emission test: from 30 MHz to 10th carrier harmonic or 40GHz at most.

#### 3.5. 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 or 40GHz at most) test from antenna to EUT is 1 M.

#### 3.6. 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.

Power Parameters of IEEE 802.11a

Test Software Version	ART			
Frequency	5745 MHz	5785 MHz	5825 MHz	Data Rate
IEEE 802.11a OFDM	23	23	23	6 Mbps



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## 4. List of Measurements

### 4.1. Summary of the Test Results

Applied Standard: 47 CFR FCC Part 15 Subpart C			
Paragraph	FCC Section	Description of Test	Result
5.1	15.247(a)(2)	6dB Spectrum Bandwidth	Pass
5.2	15.247(b)(3)	Maximum Peak Conducted Output Power	Pass
5.3	15.247(e)	Peak Power Spectral Density	Pass
5.4	15.247(d)	Band Edge Emissions	Pass
5.5	15.207	AC Power Line Conducted Emission	Pass
5.6	15.247(d)	Spurious Radiated Emission	Pass
5.7	15.203/15.247(b)/(c)	Antenna Requirement	Pass

## 5. Test Result

### 5.1. Test of 6dB Spectrum Bandwidth

#### 5.1.1. Applicable Standard

Section 15.247(a)(2): For digital modulation systems, the minimum 6dB bandwidth shall be at least 500 kHz.

#### 5.1.2. Measuring Instruments

Item 20 of the table on section 6.

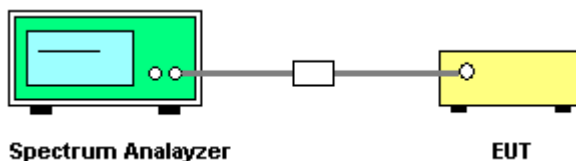
#### 5.1.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
- Attenuation : Auto
- Center Frequency : 5745MHz / 5785MHz / 5825MHz
- Span Frequency : > 6dB Bandwidth
- RB : 100 kHz
- VB : 100 kHz
- Detector : Peak
- Trace : Max Hold
- Sweep Time : Auto

#### 5.1.4. 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. Trace to Max hold and Detector PK.
3. The 6dB bandwidth is the spectrum range with level higher than 6dB below the peak level.
4. Repeat points 1~3 for the lowest, middle and highest channel of the EUT.

#### 5.1.5. Test Setup Layout



#### 5.1.6. Test Criteria

All test results complied with the requirements of 15.247(a)(2). Measurement Uncertainty is  $1 \times 10^{-5}$ .

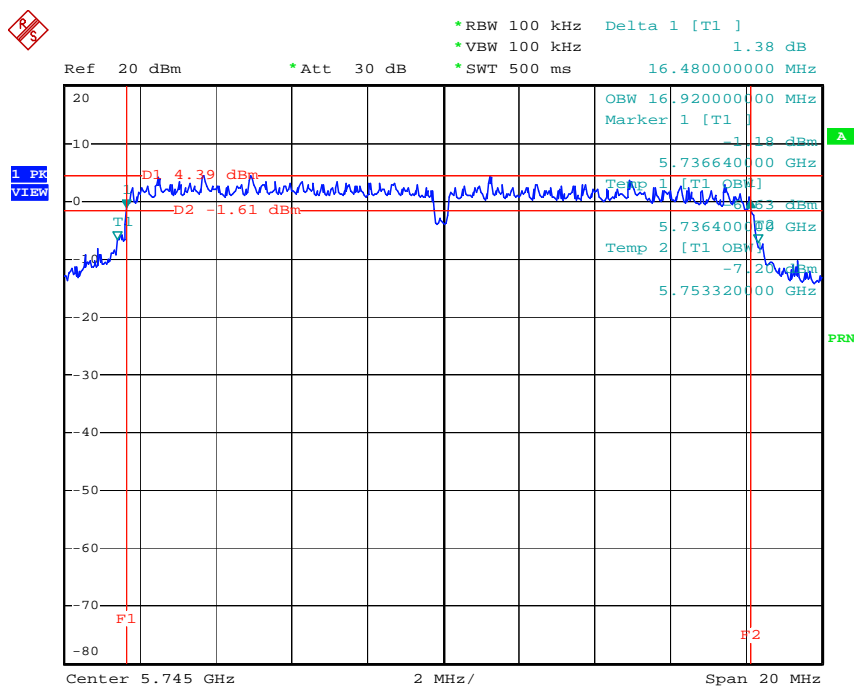


#### 5.1.7. Test Result

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Eason Lu

Modulation Type	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	99% Bandwidth (MHz)	Min. Limit (MHz)
OFDM	149	5745 MHz	16.48	16.92	0.5
OFDM	157	5785 MHz	16.36	16.84	0.5
OFDM	165	5825 MHz	16.52	16.88	0.5

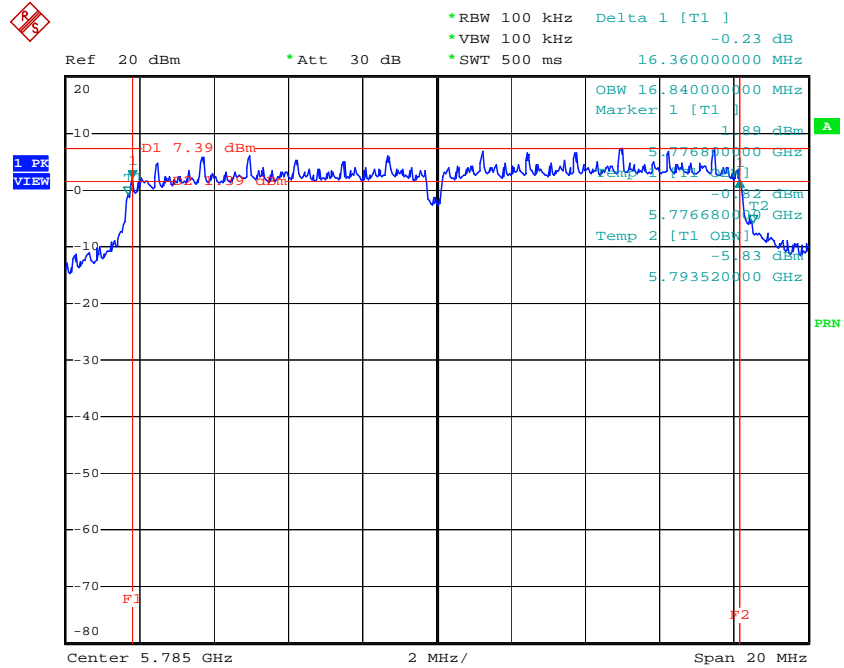
Modulation Type: OFDM (Channel 149 / 5745 MHz) :



Date: 17.AUG.2005 23:49:34

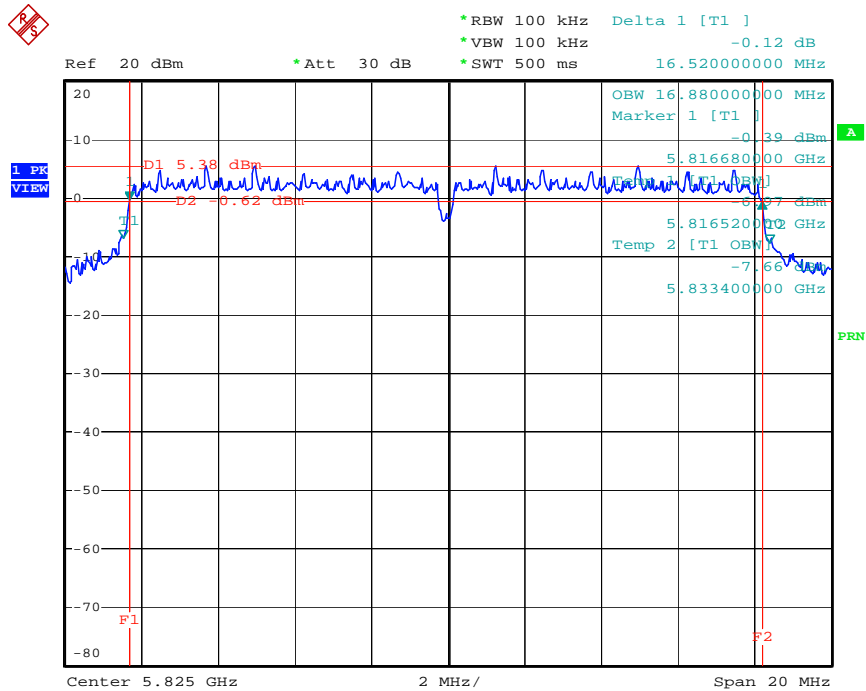


Modulation Type: OFDM (Channel 157 / 5785 MHz) :



Date: 17.AUG.2005 23:59:11

Modulation Type: OFDM (Channel 165 / 5825 MHz) :



Date: 18.AUG.2005 00:00:40

## 5.2. Test of Maximum Peak Conducted Output Power

### 5.2.1. Applicable Standard

Section 15.247(b)(3): The maximum peak output power shall not exceed 1 watt (30dBm). Except as shown below, if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the above stated values by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

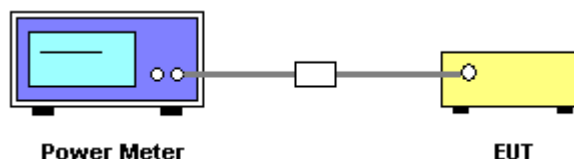
### 5.2.2. Measuring Instruments

Item 21, 23 of the table on section 6.

### 5.2.3. Test Procedures and Test Instruments Setting

1. The transmitter output was connected to the peak power meter through an attenuator.
2. Repeated point 1 for the lowest, middle and highest channel of the EUT.

### 5.2.4. Test Setup Layout



### 5.2.5. Test Criteria

All test results complied with the requirements of 15.247(b)(3). Measurement Uncertainty is 1.5dB.

### 5.2.6. Test Result of Conducted Power

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Eason Lu

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
OFDM	149	5745 MHz	19.73	21
OFDM	157	5785 MHz	20.14	21
OFDM	165	5825 MHz	20.34	21

### 5.3. Test of Peak Power Spectral Density

#### 5.3.1. Applicable Standard

Section 15.247(e): For digital modulation systems, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

#### 5.3.2. Measuring Instruments

Item 20 of the table on section 6.

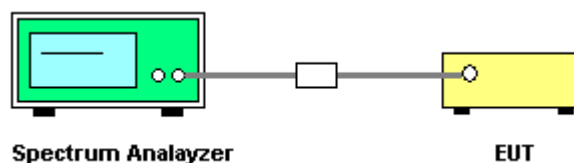
#### 5.3.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
- Attenuation : Auto
- Center Frequency : 5745MHz / 5785MHz / 5825MHz
- Span Frequency : 1.5MHz
- RB : 3 kHz
- VB : 30 kHz
- Detector : Peak
- Trace : Max Hold
- Sweep Time : 500s

#### 5.3.4. 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. Set Detector to Peak, Trace to Max Hold.
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 point 1~4 for the lowest, middle and highest channel of the EUT.

#### 5.3.5. Test Setup Layout



#### 5.3.6. Test Criteria

All test results complied with the requirements of 15.247(e). Measurement Uncertainty is 1.5dB.



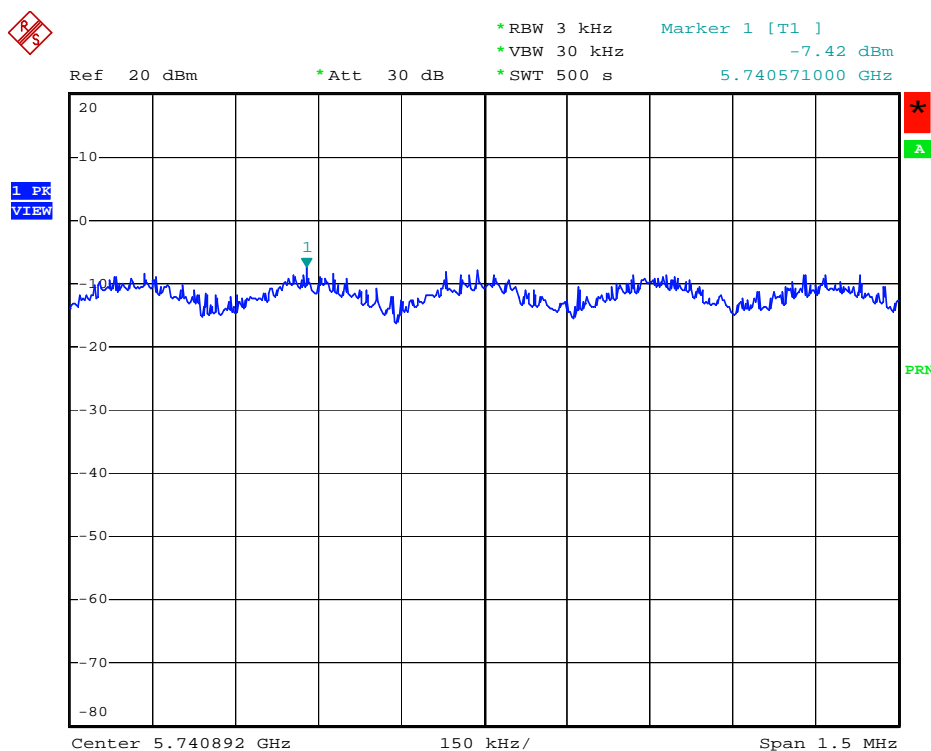


### 5.3.7. Test Result

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Eason Lu

Modulation Type	Channel	Frequency (MHz)	Power Density (dBm)	Limits (dBm)
OFDM	149	5745 MHz	-7.42	5
OFDM	157	5785 MHz	-5.44	5
OFDM	165	5825 MHz	-7.06	5

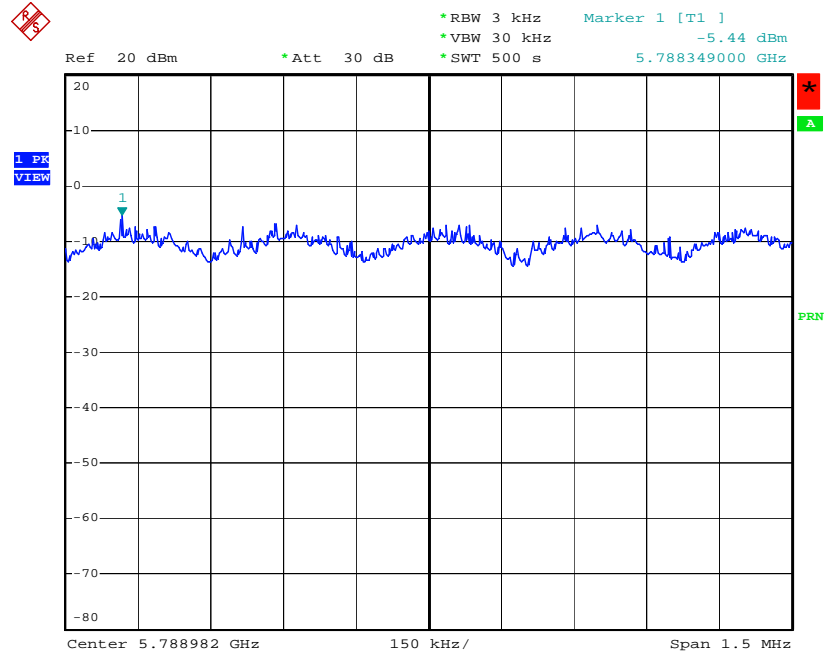
Modulation Type: OFDM (Channel 149 / 5745 MHz) :



Date: 17.AUG.2005 23:55:07

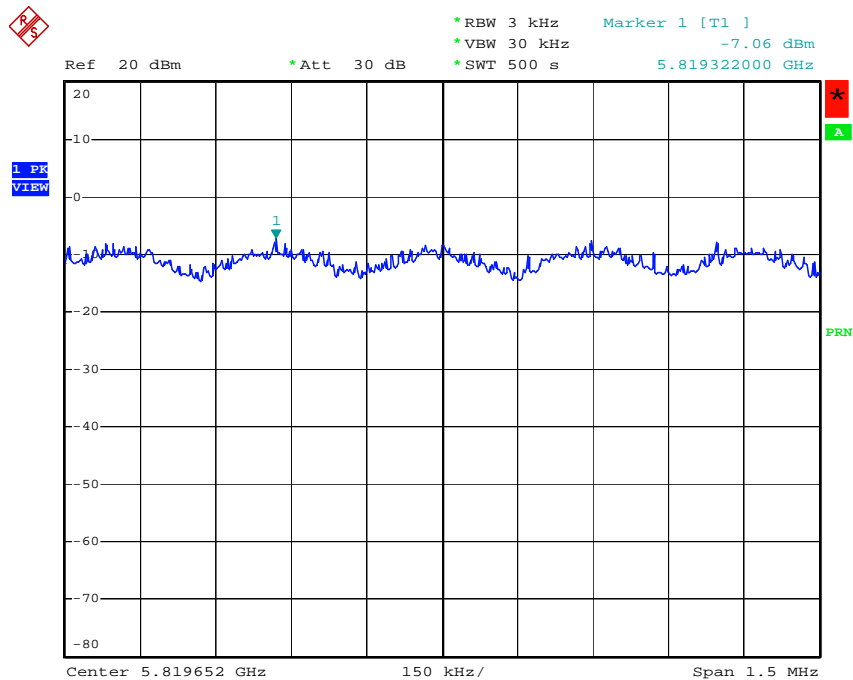


Modulation Type: OFDM (Channel 157 / 5785 MHz) :



Date: 17.AUG.2005 23:57:08

Modulation Type: OFDM (Channel 165 / 5825 MHz) :



Date: 18.AUG.2005 00:03:55

## 5.4. Test of Band Edges Emission

### 5.4.1. Applicable Standard

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

### 5.4.2. Measuring Instruments

Item 6~19 of the table on section 6 for radiated measurement.

Item 20 of the table on section 6 for conducted measurement.

### 5.4.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40 (Conducted Measurement)
  - Attenuation : Auto
  - Center Frequency : 5745 MHz / 5825 MHz
  - Span Frequency : 100MHz
  - RB : 100 kHz
  - VB : 100 kHz
  - Detector : Peak
  - Trace : Max Hold
  - Sweep Time : Auto
- Spectrum Analyzer : R&S FSP40 (Radiated Measurement)
  - Attenuation : Auto
  - Center Frequency : 5745 MHz / 5825 MHz
  - Span Frequency : 100MHz
  - RB : 1 MHz for PK value / 1 MHz for AV value
  - VB : 1 MHz for PK value / 10 Hz for AV value
  - Detector : Peak
  - Trace : Max Hold
  - Sweep Time : Auto

### 5.4.4. Test Procedures and Test Instruments Setting

#### Conducted Measurement

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 and VBW of spectrum analyzer to 100KHz with convenient frequency span including

100MHz bandwidth from lower band edge. Then detector set to peak and max hold tHsi trace.

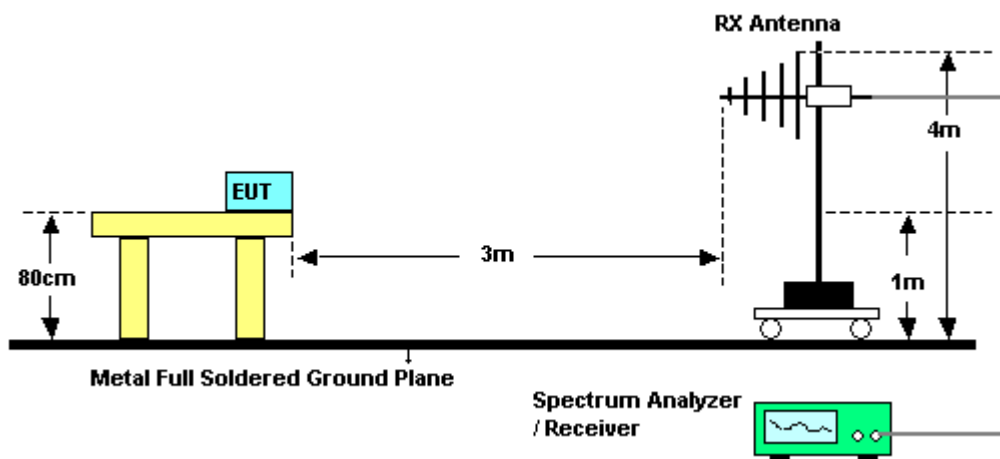
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

#### **Radiated Measurement**

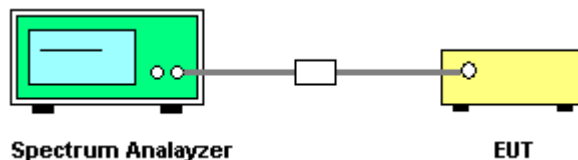
1. Configure the EUT according to ANSI C63.4-2003.
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
4. For band edge 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.
5. For band edge emission in restriction bands, use 10Hz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1 MHz RBW for reading under PK.
6. The transmitter set to the highest channel and repeated 2~5.

#### 5.4.5. Test Setup

##### **Radiated Method**



##### **Conducted Method**



#### 5.4.6. Test Criteria

1. All test results complied with the requirements of 15.247(d). Measurement Uncertainty is  $1 \times 10^{-5}$ .



#### 5.4.7. Test Result

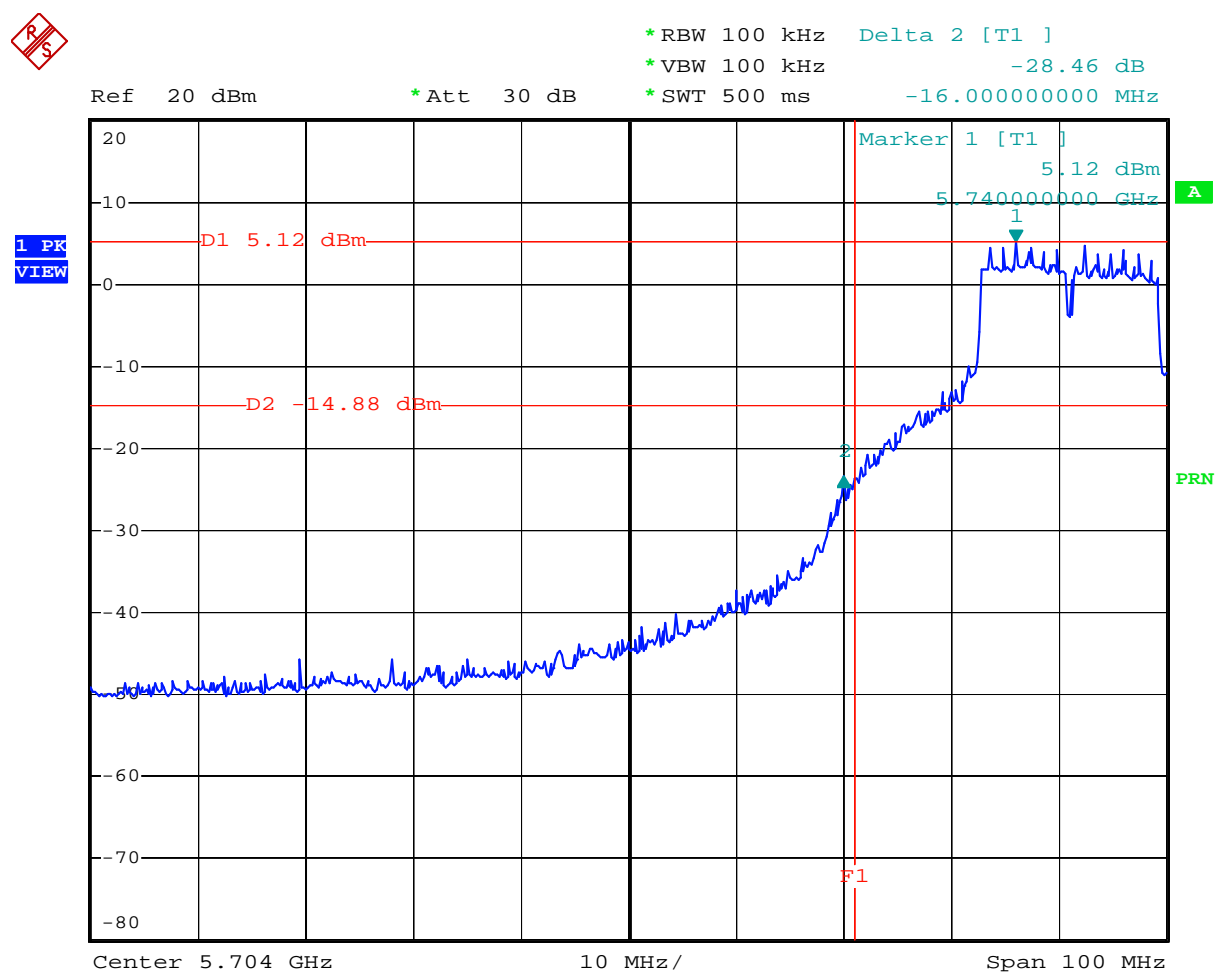
Temperature: 26°C

Relative Humidity: 64%

Duty Cycle of the Equipment During the Test: 100.00%

Test Engineer: Eason Lu

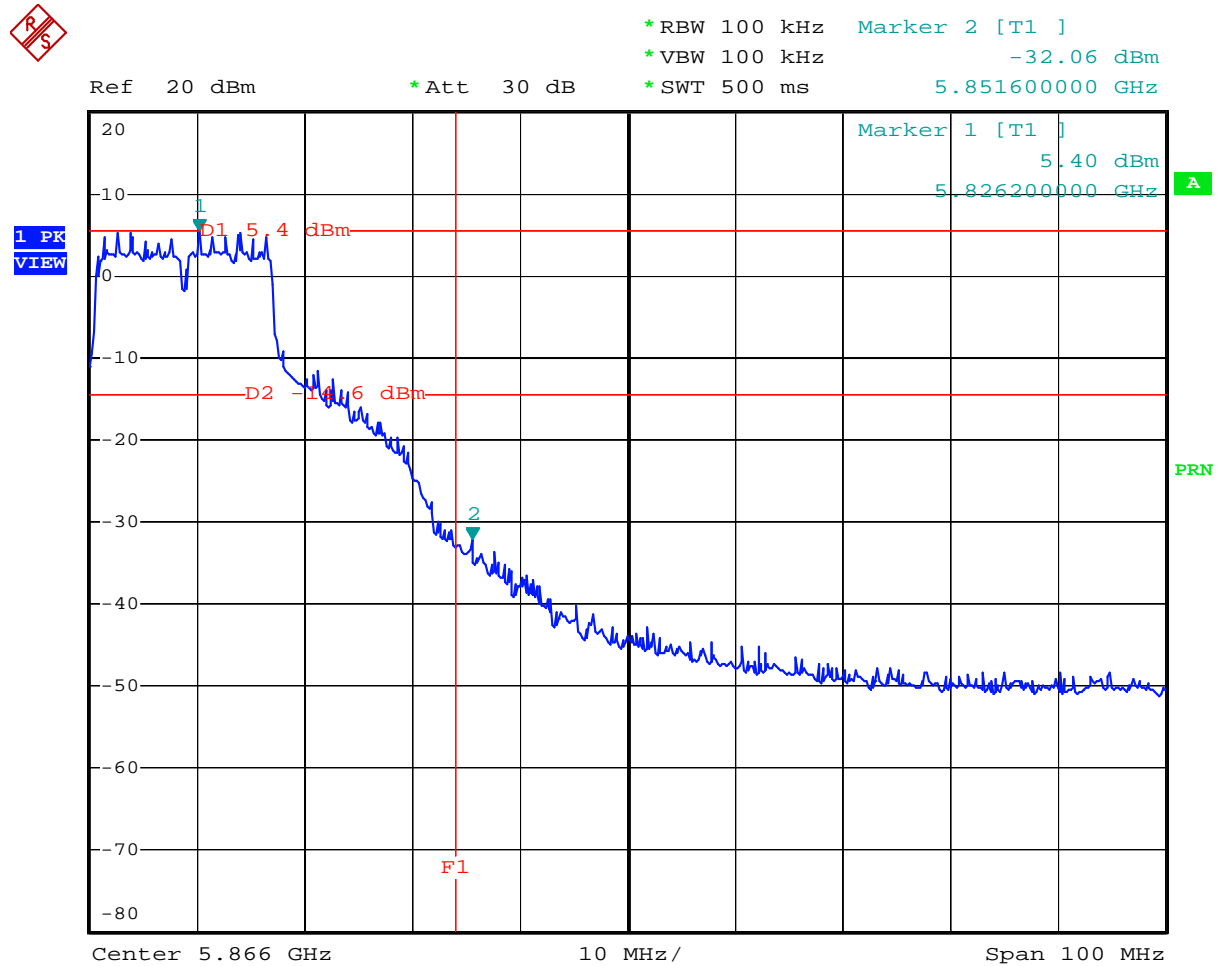
Modulation Type: OFDM (Channel 149 / 5745 MHz) :



Date: 17.AUG.2005 23:53:34



Modulation Type: OFDM (Channel 165 / 5825 MHz) :



Date: 18.AUG.2005 00:02:02

## 5.5. Test of AC Power Line Conducted Emission

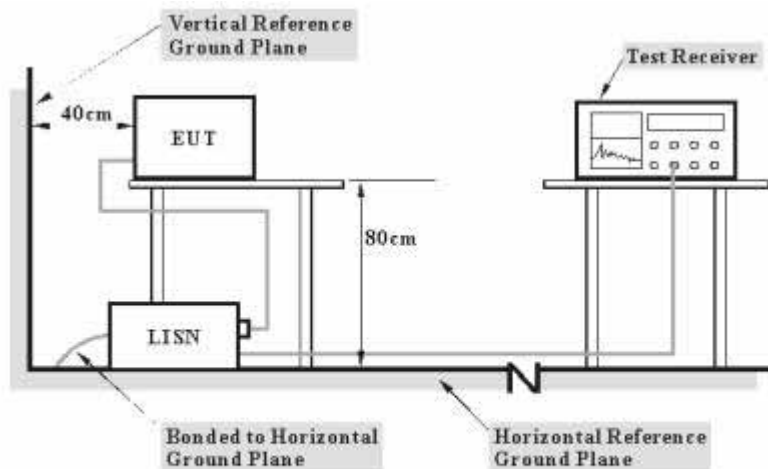
### 5.5.1. Measuring Instruments

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

### 5.5.2. Test Procedures

1. Configure the EUT according to ANSI C63.4-2003.
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. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
7. 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 Setup Layout

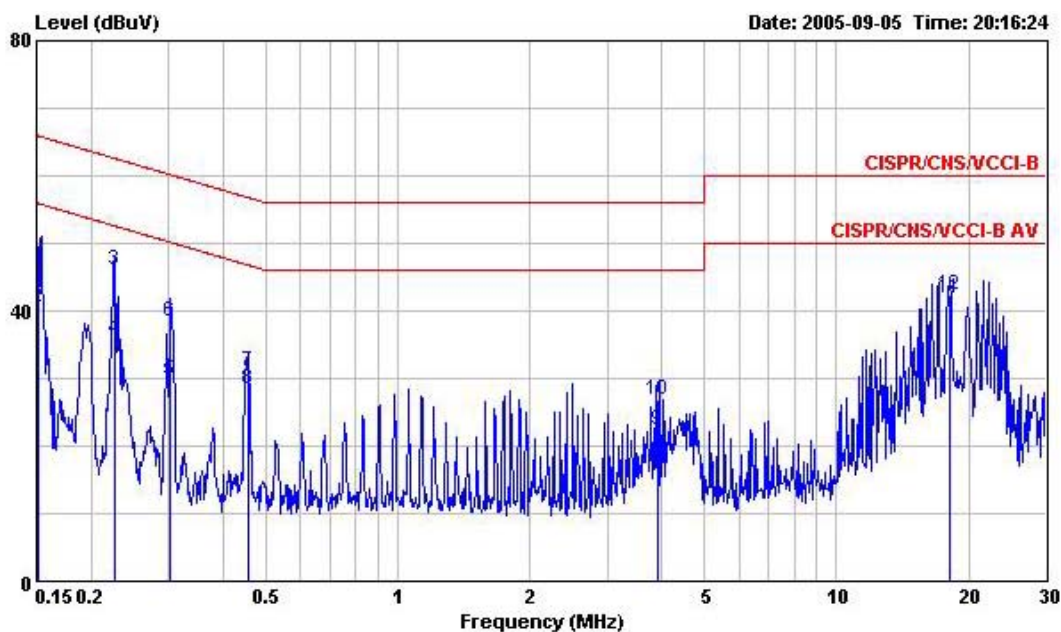


Note: 1. Support units were connected to second LISN.  
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

#### 5.5.4. Test Result of Conducted Emission

- Temperature: 26°C
- Relative Humidity: 64%
- Test Engineer: Sky Wu

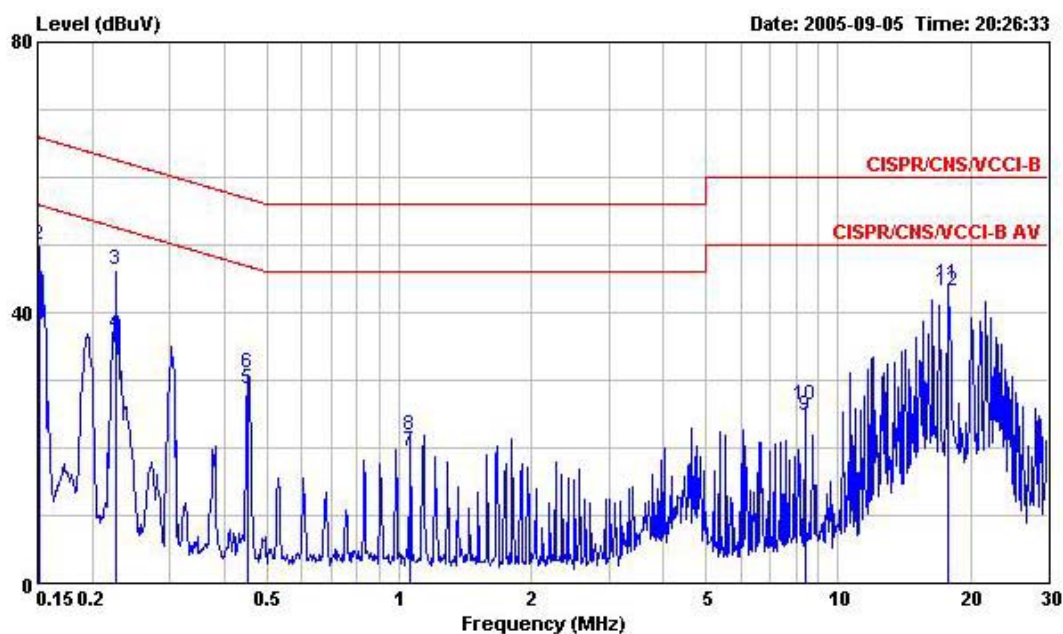
##### Line to Ground



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1514670	49.77	-16.15	65.92	49.18	0.06	0.53	QP
2	0.1514670	40.42	-15.50	55.92	39.83	0.06	0.53	Average
3	0.2267630	45.99	-16.58	62.57	45.69	0.06	0.24	QP
4	0.2267630	35.75	-16.82	52.57	35.45	0.06	0.24	Average
5	0.3034790	29.77	-20.38	50.15	29.39	0.06	0.32	Average
6	0.3034790	38.49	-21.66	60.15	38.11	0.06	0.32	QP
7	0.4563500	31.17	-25.59	56.76	30.88	0.06	0.23	QP
8	0.4563500	28.34	-18.42	46.76	28.05	0.06	0.23	Average
9	3.931	22.34	-23.66	46.00	21.83	0.21	0.30	Average
10	3.931	26.72	-29.28	56.00	26.21	0.21	0.30	QP
11	18.138	41.73	-8.27	50.00	41.12	0.28	0.33	Average
12	18.138	42.29	-17.71	60.00	41.68	0.28	0.33	QP



**Neutral to Ground**



	Freq	Level	Over	Limit	Read	LISN	Cable	
	MHz	dBuV	Limit	Line	Level	Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1515980	41.61	-14.30	55.91	40.97	0.11	0.53	Average
2	0.1515980	50.11	-15.80	65.91	49.47	0.11	0.53	QP
3	0.2257630	46.32	-16.28	62.60	45.97	0.11	0.24	QP
4	0.2257630	36.75	-15.85	52.60	36.40	0.11	0.24	Average
5	0.4526690	28.58	-18.25	46.83	28.23	0.11	0.24	Average
6	0.4526690	31.16	-25.67	56.83	30.81	0.11	0.24	QP
7	1.060	19.56	-26.44	46.00	18.73	0.23	0.60	Average
8	1.060	21.74	-34.26	56.00	20.91	0.23	0.60	QP
9	8.395	24.84	-25.16	50.00	24.21	0.31	0.32	Average
10	8.395	26.41	-33.59	60.00	25.78	0.31	0.32	QP
11	17.845	44.14	-15.86	60.00	43.40	0.39	0.35	QP
12	17.845	43.15	-6.85	50.00	42.41	0.39	0.35	Average

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5.5.5. Photographs of Conducted Emission Test Configuration

FRONT VIEW



REAR VIEW





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## 5.6. Test of Spurious Radiated Emission

### 5.6.1. Applicable Standard

Section 15.247(d): In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. In addition, radiated emissions that fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209.

### 5.6.2. Measuring Instruments

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

### 5.6.3. Description of Major Test Instruments Setting

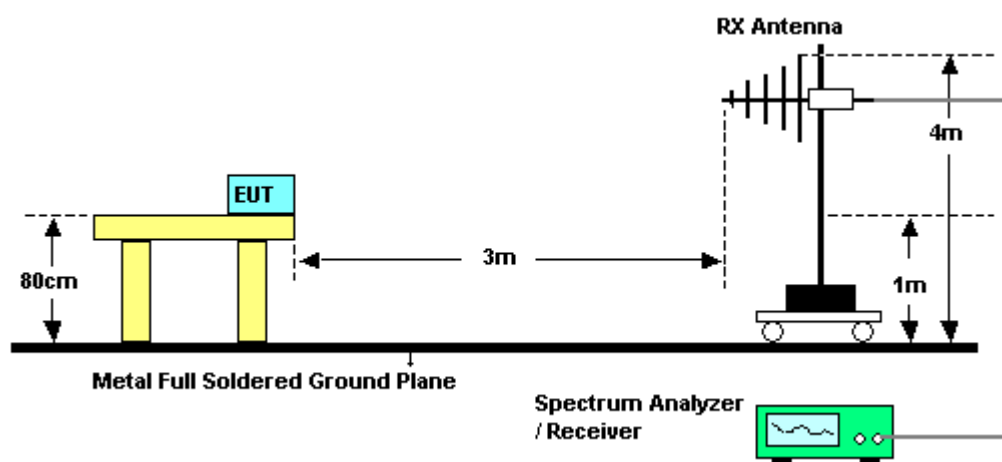
- Spectrum Analyzer : R&S FSP40
  - Attenuation : Auto
  - Start Frequency : 1000 MHz
  - Stop Frequency : 10th carrier harmonic
  - RB / VB : 1 MHz / 1MHz for Peak
  - RB / VB : 1 MHz / 10Hz for Average
- Test Receiver : R&S ESCS 30
  - Attenuation : Auto
  - Start Frequency : 30 MHz
  - Stop Frequency : 1000 MHz
  - RB : 120 KHz for QP or PK

### 5.6.4. Test Procedures

1. Configure the EUT according to ANSI C63.4-2003.
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. Power on the EUT and all the supporting units.
5. The turntable 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 turntable 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.

#### 5.6.5. Test Setup Layout



#### 5.6.6. Test Criteria

All test results complied with the requirements of 15.247(d). Measurement Uncertainty is 2.26dB.

#### 5.6.7. Results of Radiated Emissions (9kHz~30MHz)

<b>Temperature</b>	26	<b>Humidity</b>	64%
<b>Test Engineer</b>	Ted Chiu	<b>Configurations</b>	CH 165 / 5825MHz

Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.

Distance extrapolation factor =  $40 \log (\text{specific distance} / \text{test distance})$  (dB);

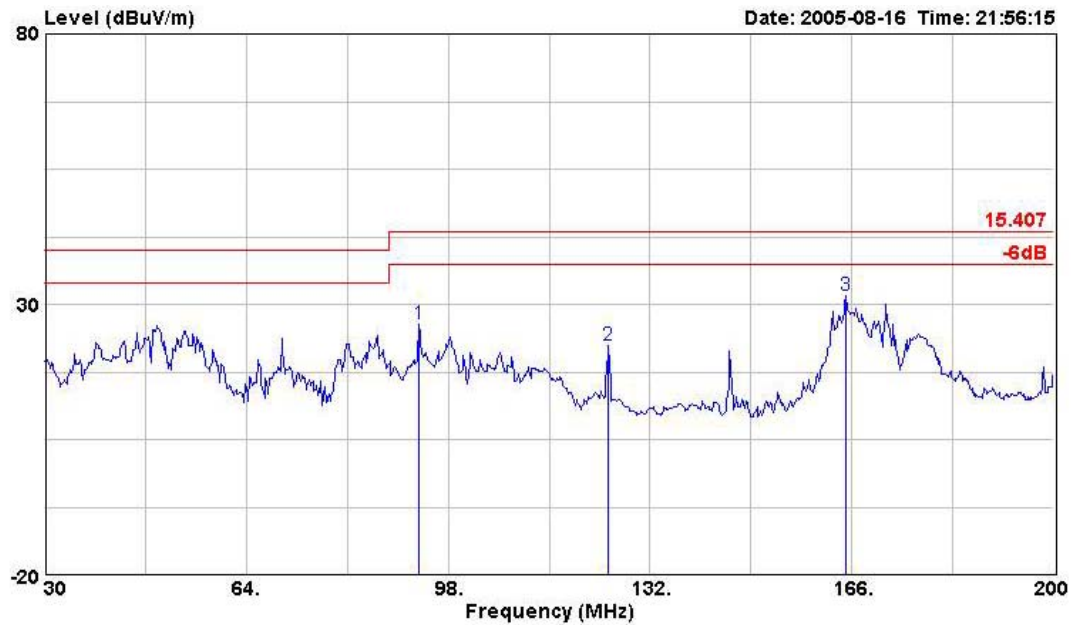
Limit line = specific limits (dBuV) + distance extrapolation factor.



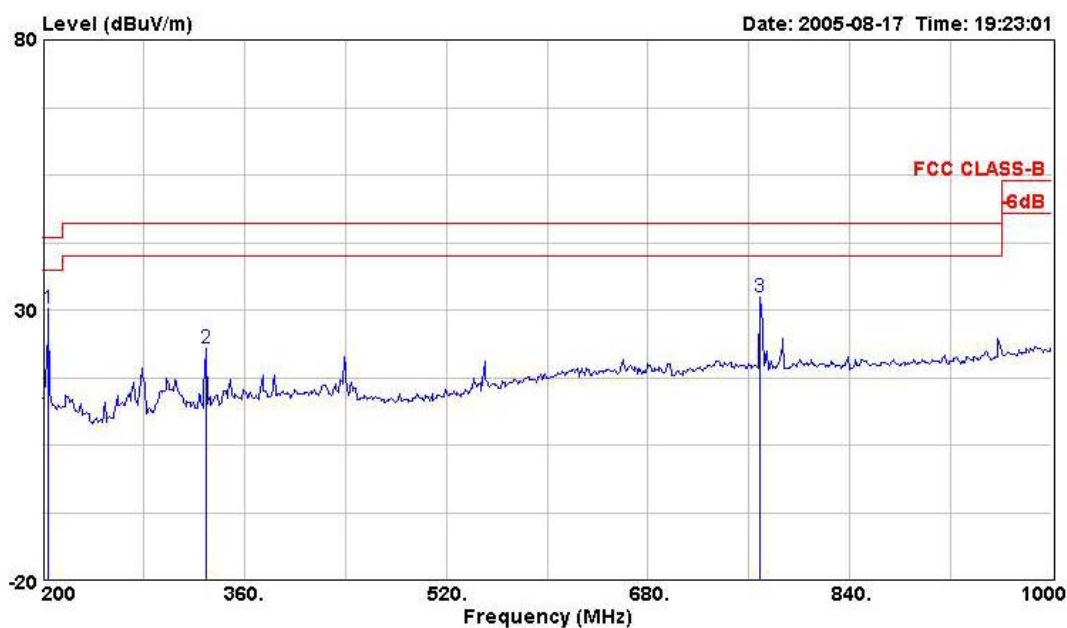
5.6.8. Test Results for CH 165 / 5825MHz (for emission below 1GHz)

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Ted Chiu

(A) Polarization: Horizontal



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	93.070	26.25	-17.25	46.25	43.50	0.92	8.66	29.58	Peak	---	---
2	125.030	22.36	-21.14	39.55	43.50	1.11	12.20	30.50	Peak	---	---
3	164.980	31.67	-11.83	47.41	43.50	1.28	13.14	30.16	Peak	---	---

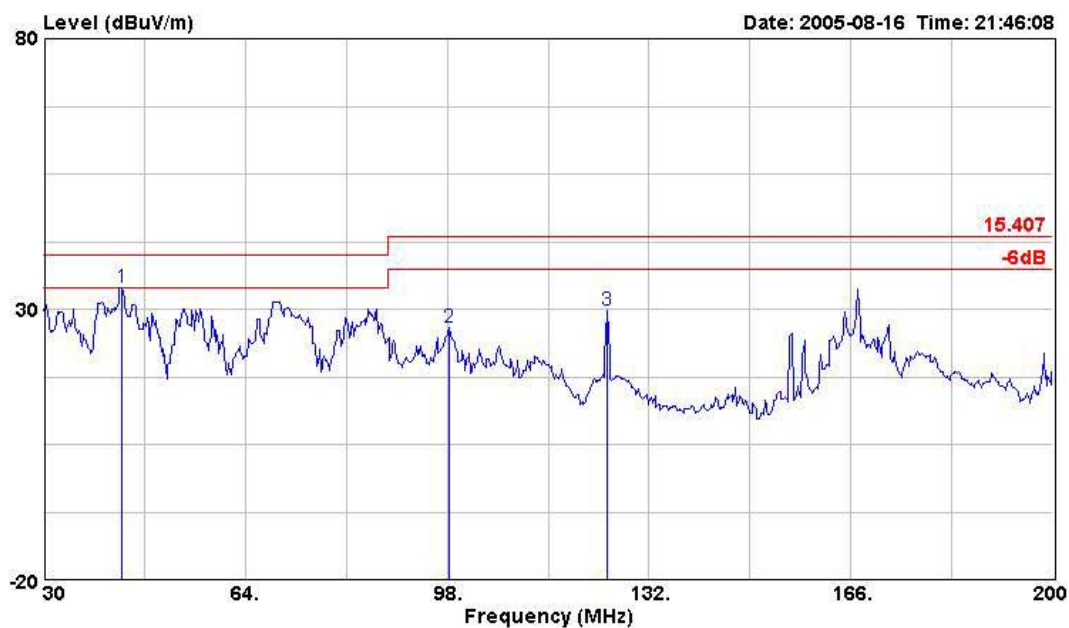


		Freq	Level	Over Limit	Read Level	Limit Line	CableAntenna Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
		MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	0	204.800	30.24	-13.26	43.98	43.50	1.24	15.82	30.80	Peak	---	---
2	0	329.600	22.80	-23.20	37.11	46.00	1.76	14.69	30.76	Peak	---	---
3	0	768.800	32.29	-13.71	38.50	46.00	2.79	21.53	30.53	Peak	---	---

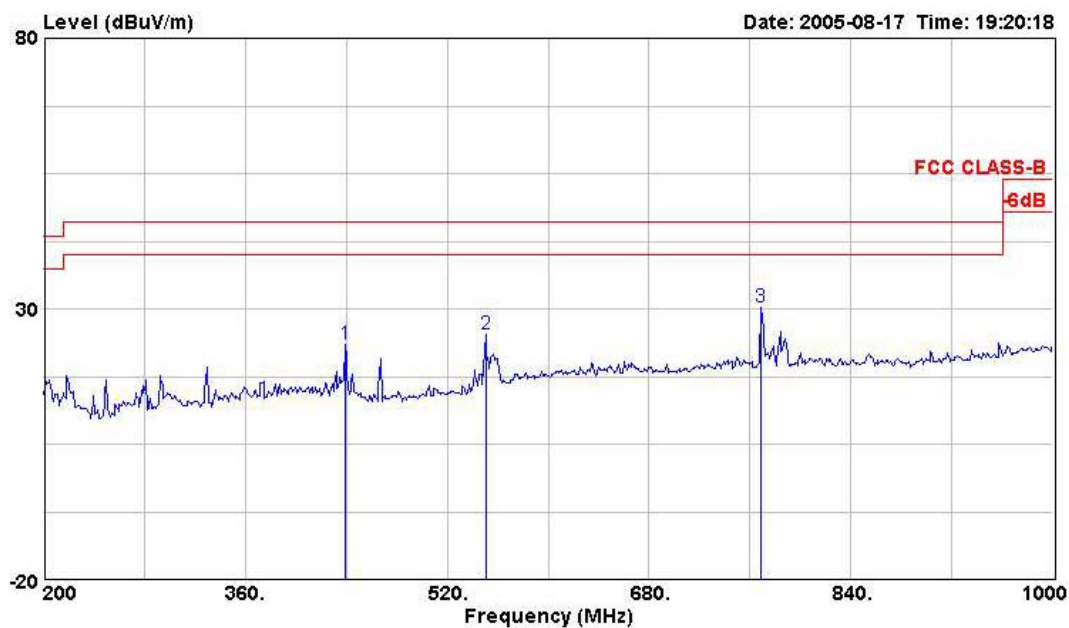




(B) Polarization: Vertical



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	43.260	34.01	-5.99	51.23	40.00	0.65	12.47	30.34	Peak	---	---
2	98.340	26.48	-17.02	46.88	43.50	0.94	8.91	30.26	Peak	---	---
3	125.030	29.86	-13.64	47.05	43.50	1.11	12.20	30.50	Peak	---	---



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	0	439.200	23.46	-22.54	35.60	46.00	2.11	16.49	30.74 Peak	---	---
2	0	550.400	25.34	-20.66	36.03	46.00	2.24	18.24	31.17 Peak	---	---
3	0	768.800	30.17	-15.83	36.38	46.00	2.79	21.53	30.53 Peak	---	---

Note:

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

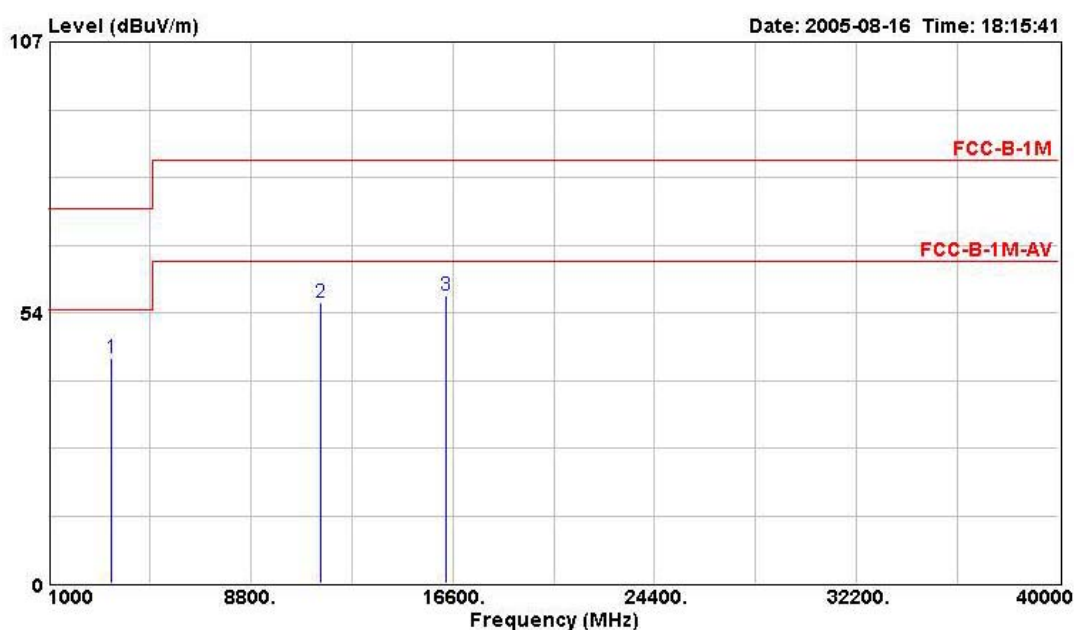
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level



5.6.9. Test Results for CH 149 / 5745MHz (for emission above 1GHz)

- Modulation Type: OFDM
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Ted Chiu

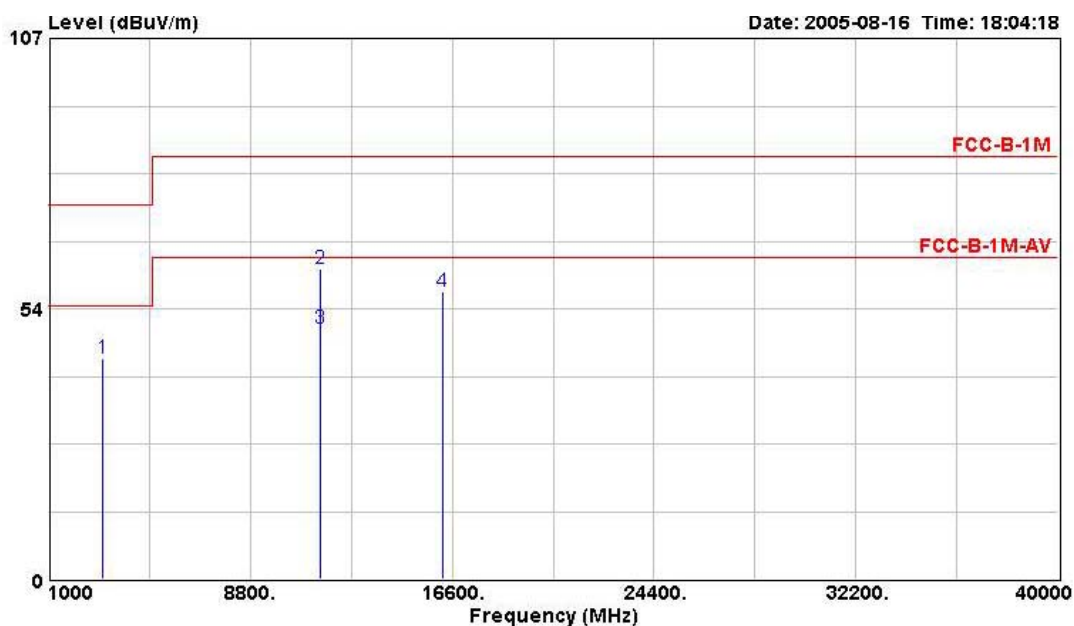
**(A) Polarization: Horizontal**



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	3414.000	44.44	-29.56	43.80	74.00	2.33	31.01	32.70	PEAK	---	---
2	11500.000	55.54	-28.00	43.89	83.54	4.73	39.30	32.38	PEAK	---	---
3	16324.000	56.94	-26.60	46.83	83.54	5.13	37.57	32.59	PEAK	---	---



(B) Polarization: Vertical



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	3099.000	43.52	-30.48	43.68	74.00	2.24	30.29	32.68	PEAK	---	---
2 0	11492.000	61.34	-22.20	49.71	83.54	4.73	39.28	32.38	PEAK	---	---
3 0	11492.000	49.61	-13.93	37.98	63.54	4.73	39.28	32.38	Average	---	---
4	16228.000	56.75	-26.79	46.89	83.54	5.14	37.42	32.70	PEAK	---	---

Note:

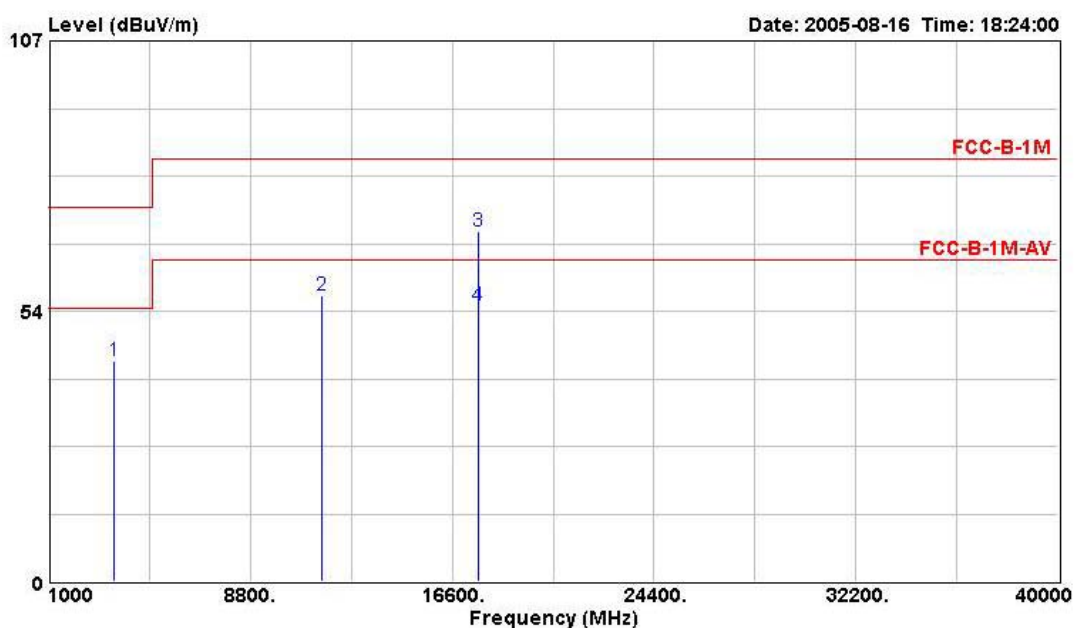
Emission level (dBuV/m) = 20 log Emission level (uV/m)

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

5.6.10. Test Results for CH 157 / 5785MHz (for emission above 1GHz)

- Modulation Type: OFDM
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Ted Chiu

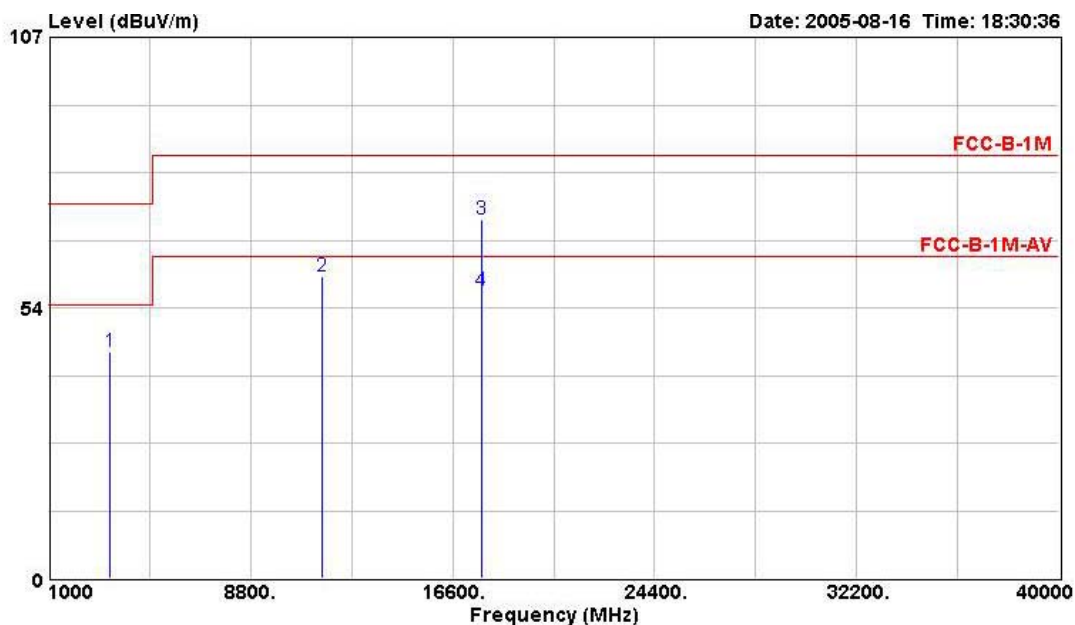
**(A) Polarization: Horizontal**



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp	Remark	Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor		Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	3510.000	43.74	-30.26	42.84	74.00	2.35	31.25	32.70	PEAK	---	---
2	11576.000	56.59	-26.95	44.98	83.54	4.71	39.30	32.40	PEAK	---	---
3	17632.000	69.28	-14.26	46.93	83.54	9.23	45.06	31.93	PEAK	---	---
4	17632.000	54.63	-8.91	32.27	63.54	9.23	45.06	31.93	Average	---	---



(B) Polarization: Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	3387.000	44.68	-29.32	44.12	74.00	2.31	30.93	32.70	PEAK	---	---
2	11564.000	59.58	-23.96	47.95	83.54	4.72	39.30	32.39	PEAK	---	---
3	17740.000	70.92	-12.62	46.65	83.54	10.01	46.22	31.95	PEAK	---	---
4	17740.000	56.97	-6.57	32.69	63.54	10.01	46.22	31.95	Average	---	---

Note:

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

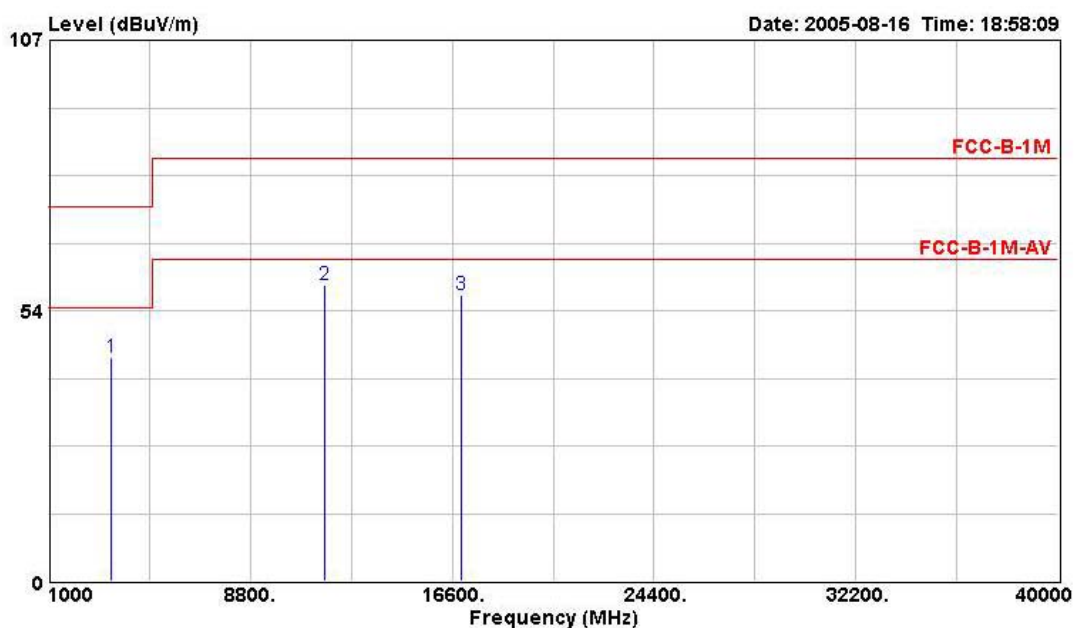
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level



5.6.11. Test Results for CH 165/ 5825MHz (for emission above 1GHz)

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Ted Chiu

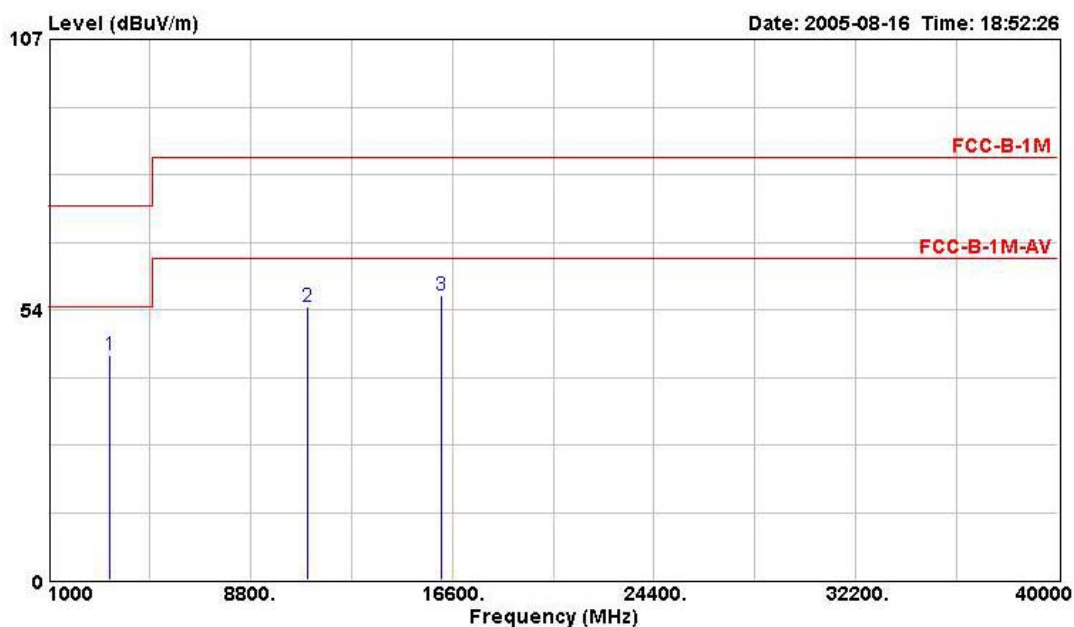
(A) Polarization: Horizontal



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	3411.000	44.33	-29.67	43.70	74.00	2.33	31.01	32.70	PEAK	---	---
2	11652.000	58.68	-24.86	47.10	83.54	4.69	39.30	32.41	PEAK	---	---
3	16948.000	56.60	-26.94	43.72	83.54	5.06	39.96	32.14	PEAK	---	---



(B) Polarization: Vertical



	Freq	Level	Over	Read	Limit	Cable	Antenna	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Loss	Factor	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	3387.000	44.48	-29.52	43.93	74.00	2.31	30.93	32.70	PEAK	---	---
2	11000.000	54.20	-29.34	43.03	83.54	4.84	38.60	32.28	PEAK	---	---
3	16204.000	56.41	-27.13	46.63	83.54	5.14	37.36	32.72	PEAK	---	---

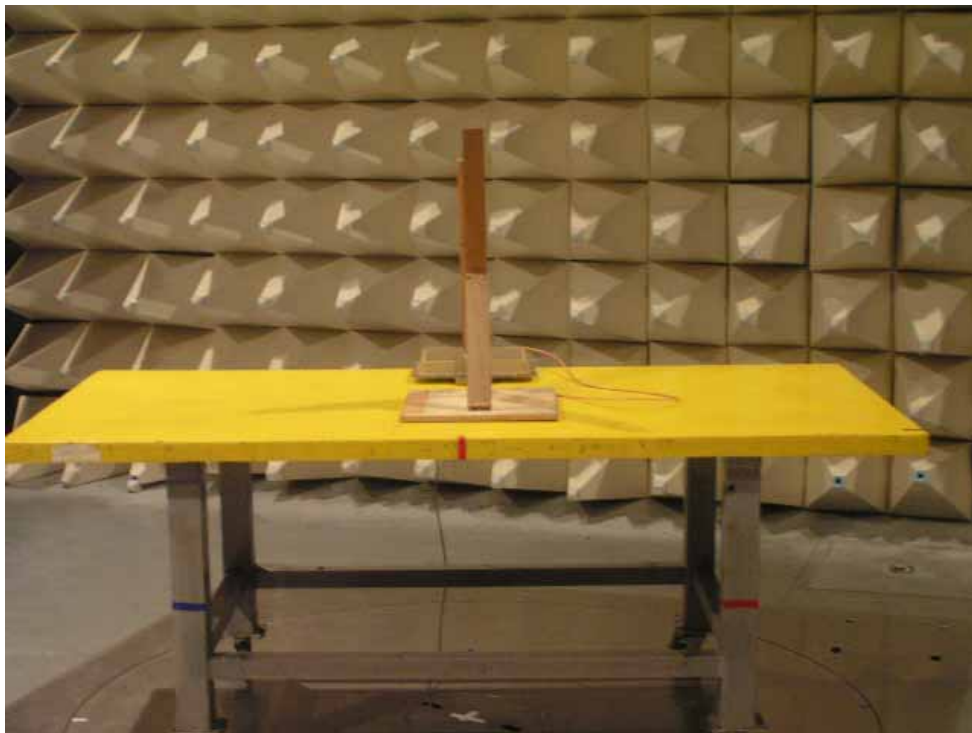
Note:

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

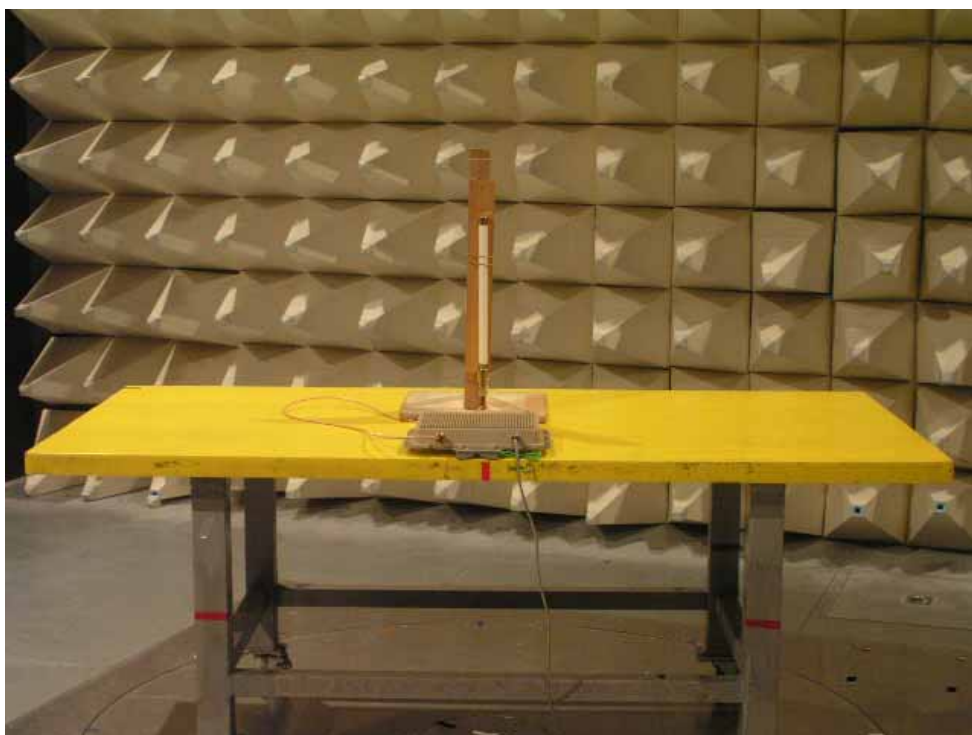
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

5.6.12. Photographs of Radiated Emission Test Configuration

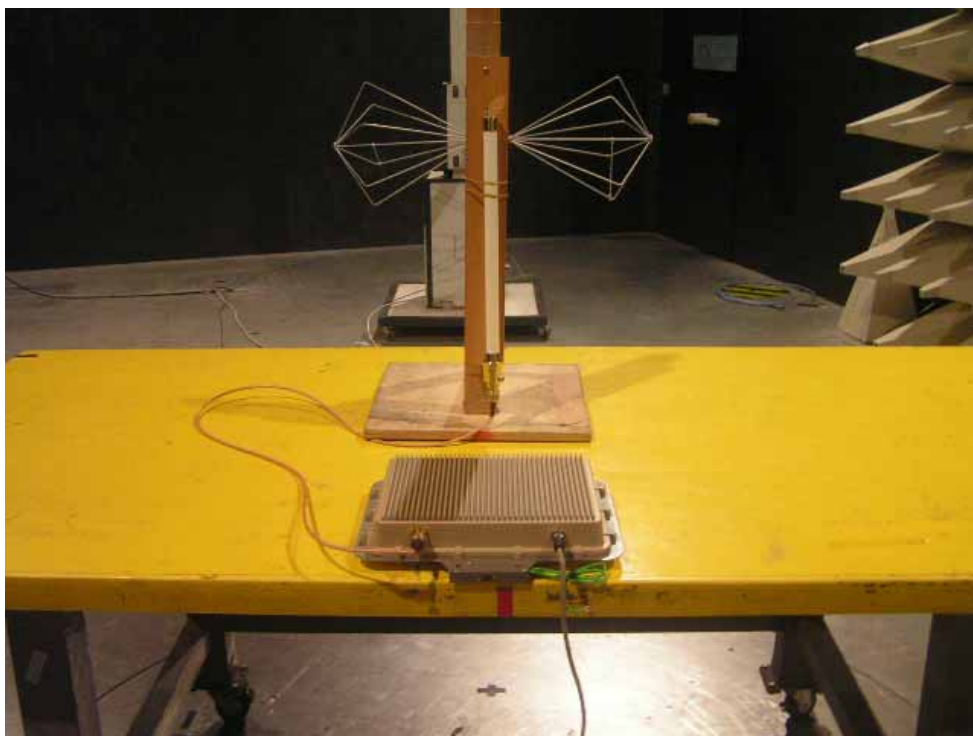
FRONT VIEW



REAR VIEW











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## **5.7. Antenna Requirements**

### **5.7.1. Standard Applicable**

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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Section 15.247(b)/(c):

Case 1: 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.

Case 2: 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.

Case 3: Systems operating in the 5725-5850 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi without any corresponding reduction in transmitter conducted output power.

### **5.7.2. Antenna Connected Construction**

N-RP (Female) is used for the GP Antenna.

EUT complies with Case 1 situation. Therefore peak conducted power limit shall be degraded accordingly. The antenna gain is 12 dBi and the conducted power limit shall be 24dBm.

### **5.7.3. Test Criteria**

All test results complied with the requirements of 15.203/15.247(b)/(c).

## 5.8. RF Exposure

### 5.8.1. 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

### 5.8.2. MPE Calculation Method

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

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

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

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

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

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=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.



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5.8.3. Calculated Result and Limit

- Modulation Type: OFDM
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Eason Lu

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> )
149	9.00	15.85	19.73	93.97	0.2965	1
157	9.00	15.85	20.14	103.28	0.3258	1
165	9.00	15.85	20.34	108.14	0.3412	1

## 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	9kHz – 2.75GHz	Feb. 19, 2005	Conduction (CO04-HY)
2	LISN	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Mar. 15, 2005	Conduction (CO04-HY)
3	LISN (Support Unit)	PIC	NNB-2/16Z	2001/008	9kHz – 30MHz	May 06, 2005	Conduction (CO04-HY)
4	EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
5	RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9kHz – 30MHz	Dec. 23, 2004	Conduction (CO04-HY)
6	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Jun. 16, 2005	Radiation (03CH03-HY)
7	Spectrum Analyzer	R&S	FSP40	100019	9KHZ~40GHz	Jul. 21, 2005	Radiation (03CH03-HY)
8	Amplifier	SCHAFFNER	CPA9231A	18667	9KHZ ~ 2GHz	Jan. 10, 2005	Radiation (03CH03-HY)
9	Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	May 31, 2005	Radiation (03CH03-HY)
10	Amplifier	MITEQ	AMF-6F-260400	923364	26.5GHz ~ 40GHz	Jan. 05, 2004*	Radiation (03CH03-HY)
11	Loop Antenna	R&S	HFH2-Z2	860004/001	9kHz ~ 30MHz	May 24, 2004*	Radiation (03CH03-HY)
12	Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz ~ 200MHz	Jul. 22, 2005	Radiation (03CH03-HY)
13	Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz ~ 1GHz	Jul. 22, 2005	Radiation (03CH03-HY)
14	Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	Apr. 22, 2005	Radiation (03CH03-HY)
15	Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jun. 09, 2004*	Radiation (03CH03-HY)
16	RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Feb. 22, 2005	Radiation (03CH03-HY)
17	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec.01, 2004	Radiation (03CH03-HY)
18	Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
19	Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)

※ Calibration Interval of instruments listed above is one year.

\* Calibration Interval of instruments listed above is two year.



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Issued on Sep. 15, 2005

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Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
20	Spectrum Analyzer	R&S	FSP40	100019	9KHZ~40GHz	Jul. 21, 2005	Conducted (TH01-HY)
21	Power Meter	R&S	NRVS	100444	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
22	Power Sensor	R&S	NRV-Z55	100049	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
23	Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Apr. 28, 2005	Conducted (TH01-HY)
24	AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 – 300V	Apr. 21, 2005	Conducted (TH01-HY)
25	DC Power Source	G.W.	GPC-6030D	C671845	DC 1V – 60V	Dec. 28, 2004	Conducted (TH01-HY)
26	Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2004	Conducted (TH01-HY)
27	RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz – 7GHz	Jan. 01, 2005	Conducted (TH01-HY)
28	RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz – 1GHz	Jan. 01, 2005	Conducted (TH01-HY)
29	Data Generator	Tektronix	J310345	J310345	400Mbps	Dec. 21, 2004	Conducted (TH01-HY)
30	OscilloScope	Tektronix	TDS1012	C038520	100MHz-1Gs/s	Jan. 02, 2005	Conducted (TH01-HY)

※ Calibration Interval of instruments listed above is one year.

## 7. 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.

### 7.1. Certificate of Accreditation

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

### 7.2. 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

## 8. Certificate of NVLAP Accreditation

United States Department of Commerce National Institute of Standards and Technology	
<b>NVLAP</b> <sup>®</sup>	
ISO/IEC 17025:1999 ISO 9002:1994	<b>Certificate of Accreditation</b>
	
<b>SPORTON INTERNATIONAL, INC.</b> TAIPEI HSIEN 221 TAIWAN	
<i>is recognized by the National Voluntary Laboratory Accreditation Program for satisfactory compliance with criteria set forth in NIST Handbook 150:2001, all requirements of ISO/IEC 17025:1999, and relevant requirements of ISO 9002:1994. Accreditation is awarded for specific services, listed on the Scope of Accreditation, for:</i>	
<b>ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS</b>	
December 31, 2005 <i>Effective through</i>	 For the National Institute of Standards and Technology NVLAP Lab Code: 200079-0

NVLAP-01C (06-01)