

# FCC TEST REPORT

**CATEGORY** : Module for Portable Host  
**PRODUCT NAME** : 802.11a/b/g RLAN module  
**FCC ID.** : H9P2121160  
**FILING TYPE** : Certification – Class II Permissive Change  
**BRAND NAME** : SYMBOL  
**TYPE NO.** : 21-21160  
**MODEL OF HOST** : MC3090 (with 11a/b/g module)  
**APPLICANT** : **SYMBOL Technologies, Inc.**  
One Symbol Plaza Holtsville, New York, 11742-1300 U.S.A  
**MANUFACTURER** : **Universal Scientific Industrial Co., Ltd.**  
141, Lane 351, Taiping Road, Sec.1, Tsao Yuen,  
Nan-Tou, 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 test report is only for the 802.11b/g part of the product, test result of 802.11a is in another separate test report.**

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

Without written approval of SPORTON, 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 / Supervisor  
Sporton International Inc.



Lab Code: 200079-0

**SPORTON International Inc.**

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## History of this test report

☒ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

## 1. General Description of Equipment under Test

### 1.1. Applicant

**SYMBOL Technologies, Inc.**

One Symbol Plaza Holtsville, New York, 11742-1300 U.S.A.

### 1.2. Manufacturer

**Universal Scientific Industrial Co., Ltd.**

141, Lane 351, Taiping, Sec. 1, Tsao Yuen, Nan-Tou, Taiwan, R.O.C.

### 1.3. Basic Description of Equipment under Test

The device supplied for testing was a 21-21160 RF Module which offers 2.4GHz and 5GHz wireless local area network connectivity employing IEEE 802.11 a/b/g technologies intended to be installed in mobile computer which is classified as portable device. The technical data has been listed on section " Features of Equipment under Test ". Accessories for RS232 or USB are available for connection with the computer.

### 1.4. Features of Equipment under Test

ITEMS	DESCRIPTION
Type of Modulation	DSSS (CCK / QPSK / BPSK ), OFDM (16, 64 QAM)
Number of Channel	11
Frequency Band	2400 ~ 2483.5 MHz
Carrier Frequencies	Please reference section 1.5.
Output Power	CCK :19.30dBm (peak) OFDM :19.07dBm (peak)
Channel Bandwidth	16 MHz
Function Type	Transceiver
Antenna / Gain	PIFA Antenna / 2.7dBi
Power Rating (DC/AC, Voltage)	3.3 VDC from host
Temperature Range (Operating)	-20 ~ +55 °C

### 1.5. Table for Carrier Frequencies

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

### 1.6. Information of EUT Slight Change

This product is an extension of original one reported under Sporton project number: 453101

Differences between the certified equipment and the application equipment:

Modifications	Description	Confirm Degrading Performance(s)
Relpace antennas	Old antenna : PIFA Antenna / 1dBi New antenna : PIFA Antenna / 2.7dBi	Band Edges of the Operation Frequency. AC Power Line Conducted Emission. Receiver Spurious Emissions.

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## 2. Test Configuration of the Equipment under Test

### 2.1. Description of the Test

- a. The EUT has been programmed to continuously transmit or receive during testing. The used peripherals as well as the configuration fulfill the requirements of ANSI C63.4:2003.
- b. Please see section 2.3 for the verified test modes.
- c. 3 meters measurement distance of semi-anechoic chamber was used in this test.

### 2.2. Frequency Range Investigated

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

### 2.3. Test Modes

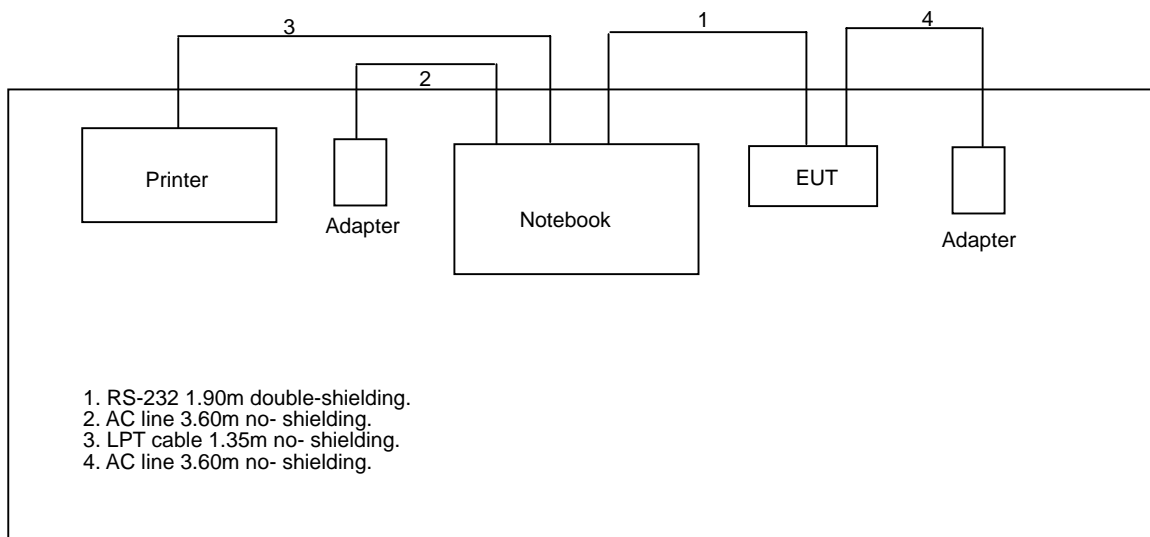
- a. EUT was placed outside the host and continuously transmitting RF modulated signal.
- b. For DSSS modulation, CCK (11Mbps) is the worst case on all test items.
- c. For OFDM modulation, BPSK (6Mbps) is the worst case on all test items.
- d. Frequency range of EUT is more than 10 MHz, the lowest, middle and highest channels of EUT were tested.
- e. Spurious emission below 1GHz is independent of channel selection and modulation types, there will be no effect on test results. So only channel 11 with OFDM modulation was tested.
- f. AC conduction emission is independent of channel selection and modulation types, there will be no effect on test results. So only channel 11 with CCK modulation was tested..

### 2.4. Description of Test Supporting Units

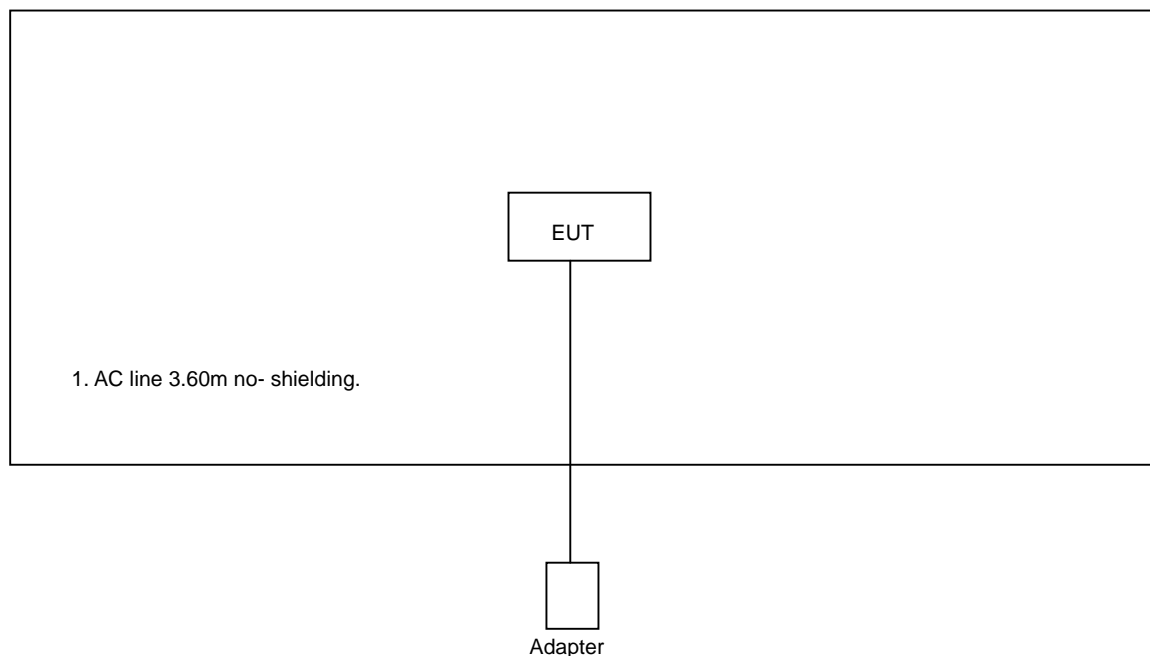
This test has not tested the perimeter.

## 2.5. Connection Diagram of Test System

### Conduction



### Radiation





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## **2.6. Test Software**

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



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### 3. Test Location and Standards

#### 3.1. Test Location

**Test Location** : Sporton Hwa Ya Testing Building  
**Address** : No. 52, Hwa Ya 1<sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao  
Yuan Hsien, Taiwan, R.O.C.  
Tel: +886 3 327 3456 Fax: +886 3 318 0055  
**Test Site No.** : CO02-LK, 03CH03-HY

#### 3.2. Test Conditions

Normal Voltage : 120V/60Hz (power adapter)  
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 15.247 )**

## 4. List of Measurements

### 4.1. Summary of the Test Results

Applied Standard: 47 CFR Part 15 and Part 2			
Paragraph	FCC Rule	Description of Test	Result
5.1	15.247(c)	Band Edges of the Operating Frequency	Pass
5.2	15.107/15.207	AC Power Line Conducted Emission	Pass
5.3	15.209/15.247(c)	Spurious Radiated Emission	Pass
5.4	15.203	Antenna Requirement	Pass

## 5. Test Result

### 5.1. Test of Band Edges Emission

#### 5.1.1. 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.

#### 5.1.2. Measuring Instruments

Item 5~18 of the table on section 6 for radiated measurement.

Item 19 of the table on section 6 for conducted measurement.

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

- Spectrum Analyzer : R&S FSP30 (Conducted Measurement)
  - Attenuation : Auto
  - Center Frequency : 2412 MHz / 2462 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 : 2412 MHz / 2462 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

#### 5.1.4. Test Procedures and Test Instruments Setting

##### Conducted Measurement

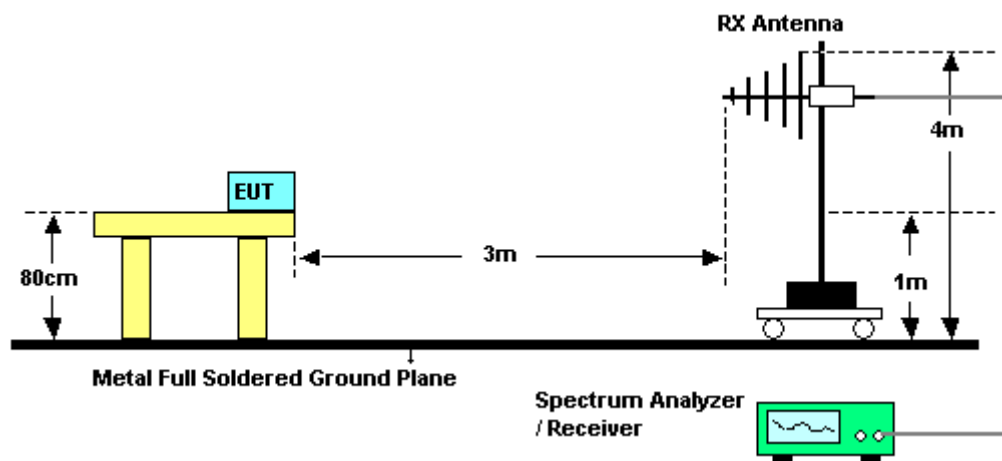
1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge. Then detector set to peak and max hold this 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

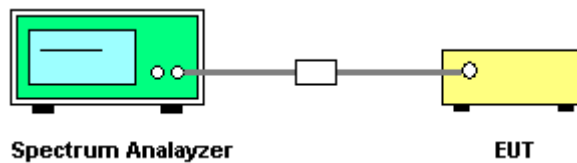
1. Configure the EUT according to ANSI C63.4.:2003
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of 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.

#### 5.1.5. Test Setup

##### Radiated Method



### Conducted Method



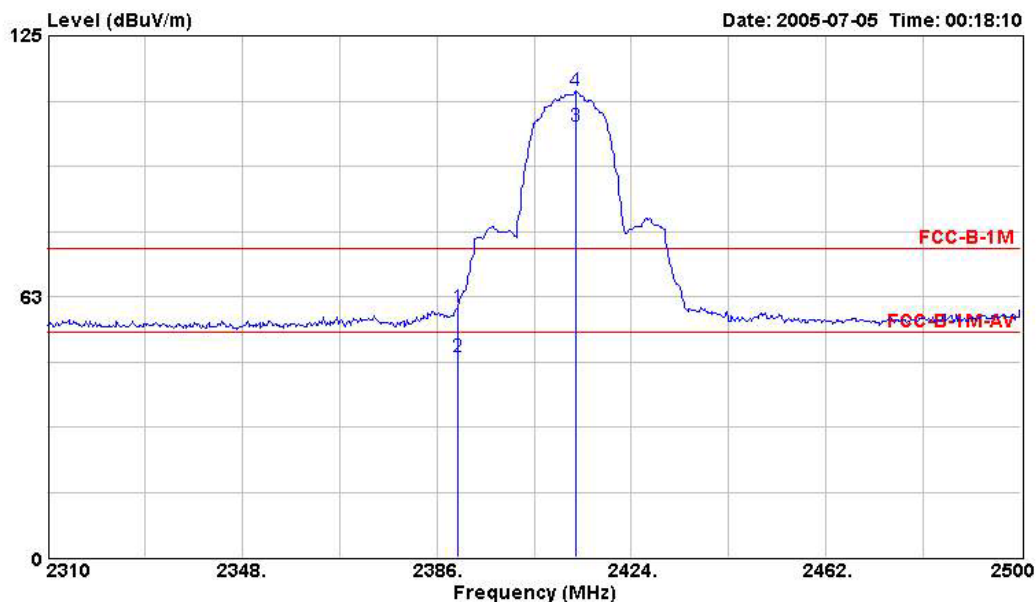
#### 5.1.6. Test Criteria

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

### 5.1.7. Note on Band edge Emission

Test Mode : 2412MHz

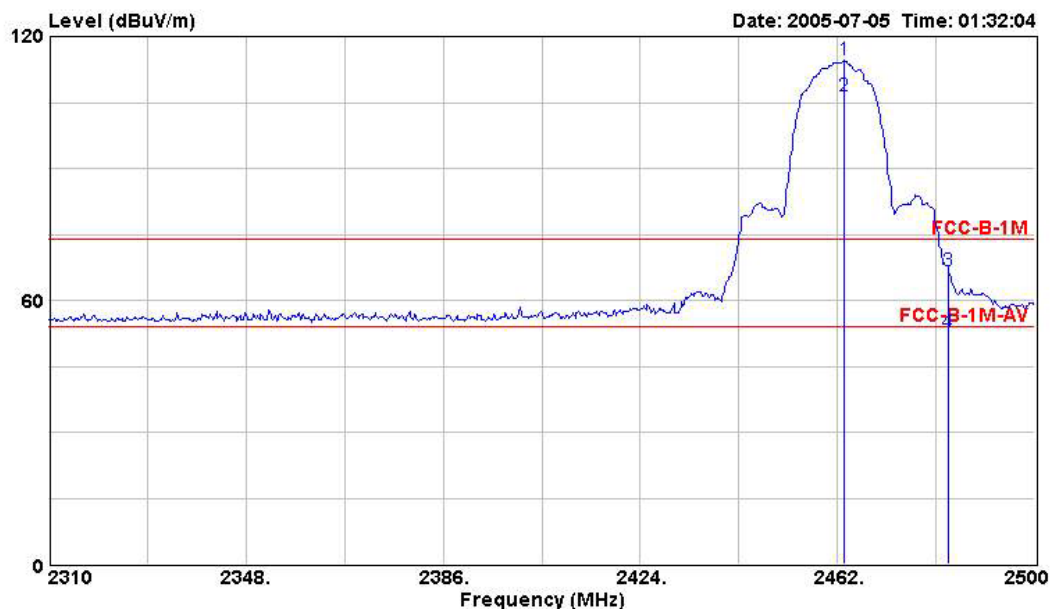
Modulation Type : CCK



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	2390.000	59.78	-14.22	29.66	74.00	30.12	1.90	0.00	Peak	---	---
2	2390.000	47.99	-6.01	17.87	54.00	30.12	1.90	0.00	Average	---	---

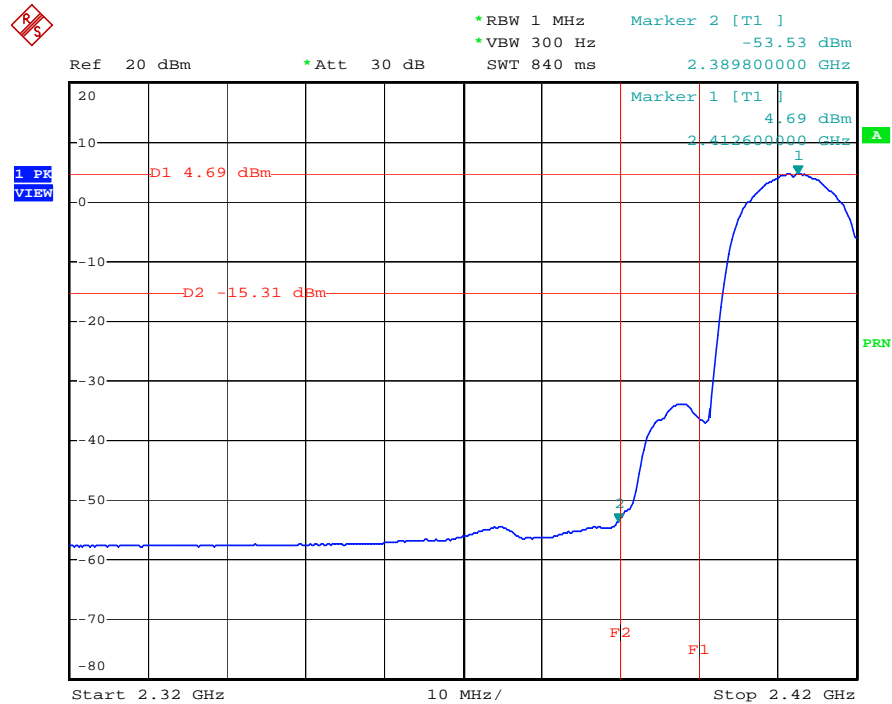


Test Mode : 2462MHz  
Modulation Type : CCK

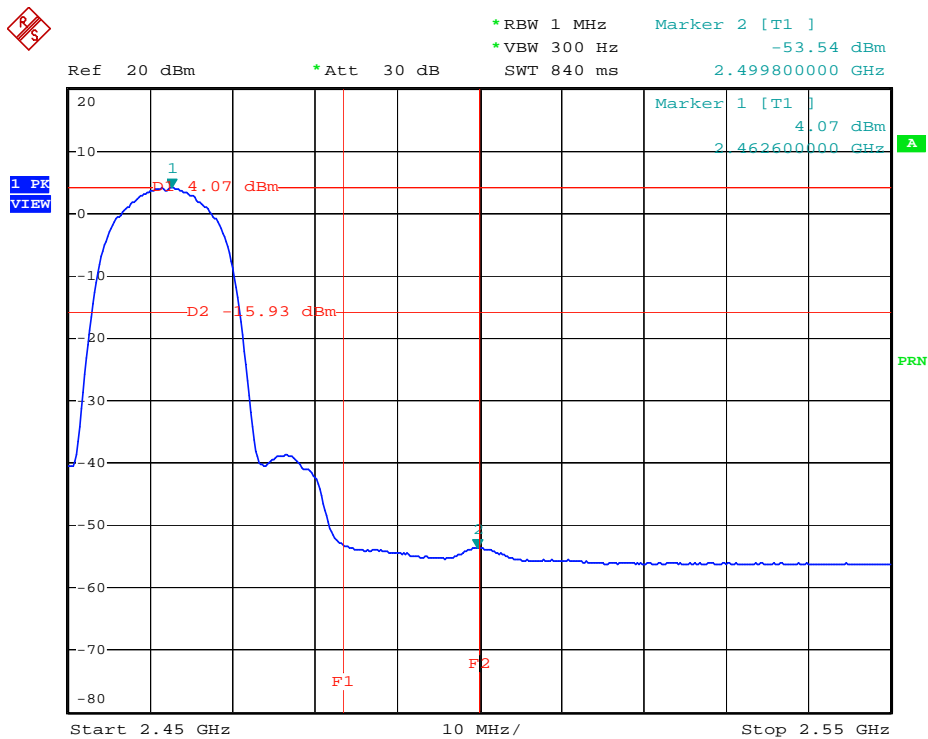


	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
3	2483.500	66.51	-7.49	36.18	74.00	30.33	1.96	0.00	Peak	---	---
4	2483.500	52.83	-1.17	22.50	54.00	30.33	1.96	0.00	Average	---	---

CCK (Channel 01) : 2412MHz



CCK (Channel 11) : 2462MHz



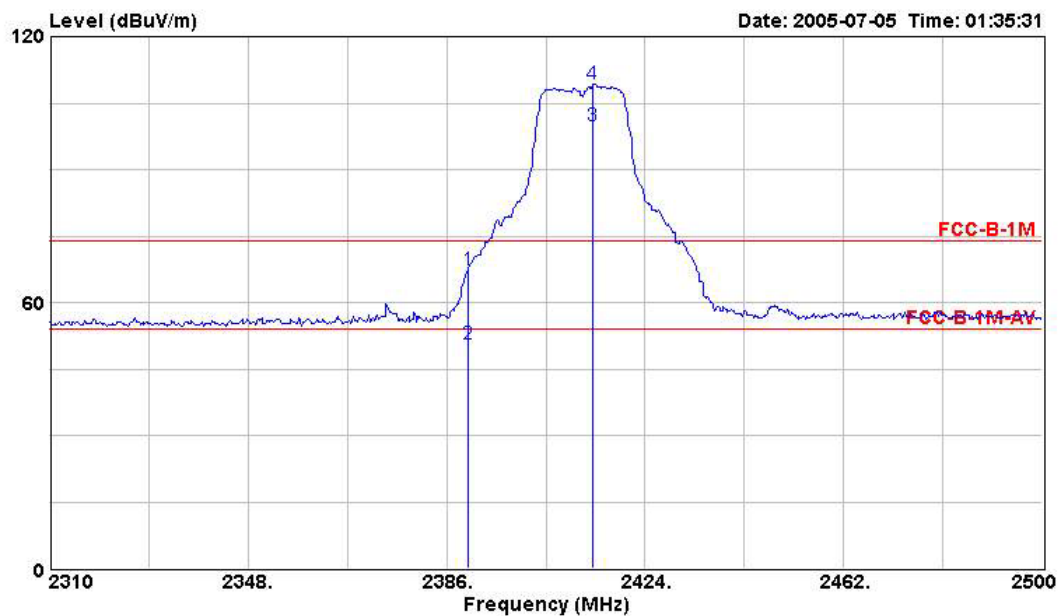
Observation : All emissions in the 100kHz bandwidth are 20dB lower than the carrier strength.



5.1.8. Note on Band edge Emission

Test Mode : 2412MHz

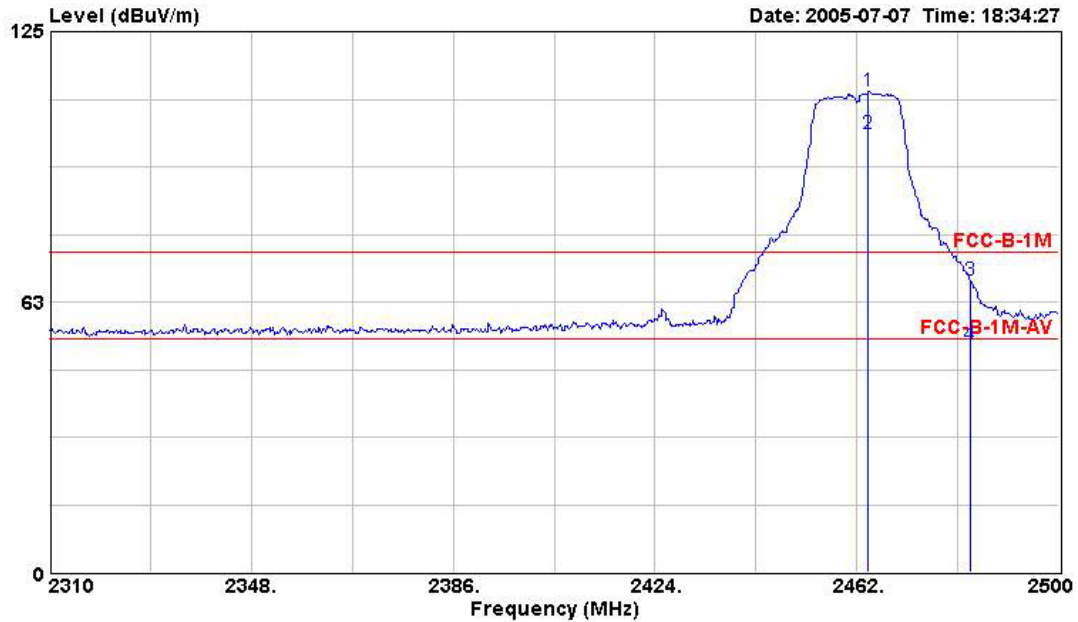
Modulation Type : OFDM



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamplifier Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	2390.000	67.29	-6.71	37.17	74.00	30.12	1.90	0.00	Peak	---	---
2	2390.000	50.67	-3.33	20.55	54.00	30.12	1.90	0.00	Average	---	---

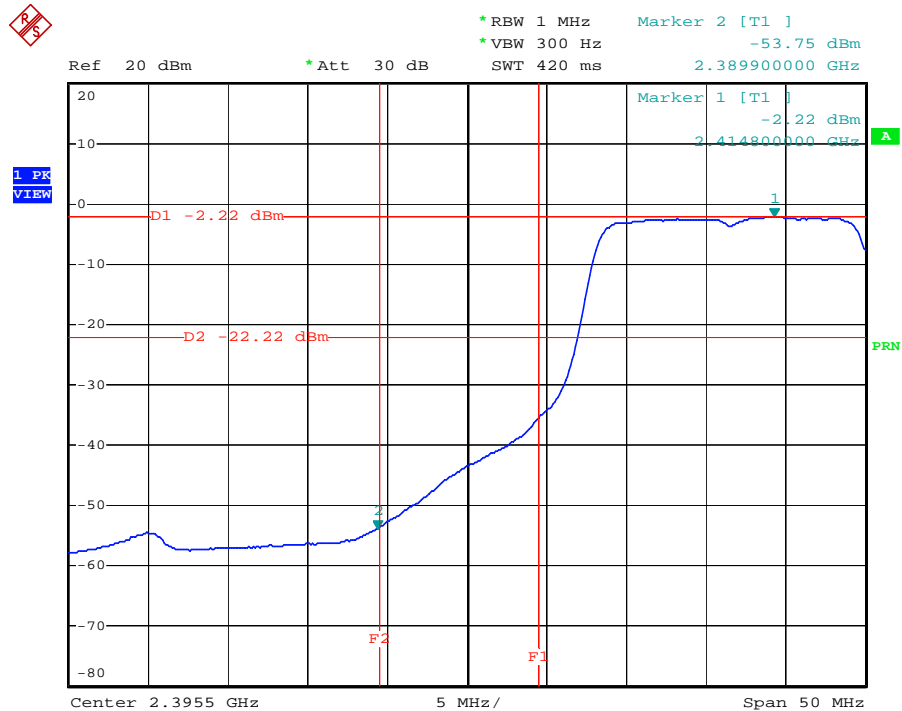
Test Mode : 2462MHz

Modulation Type : OFDM

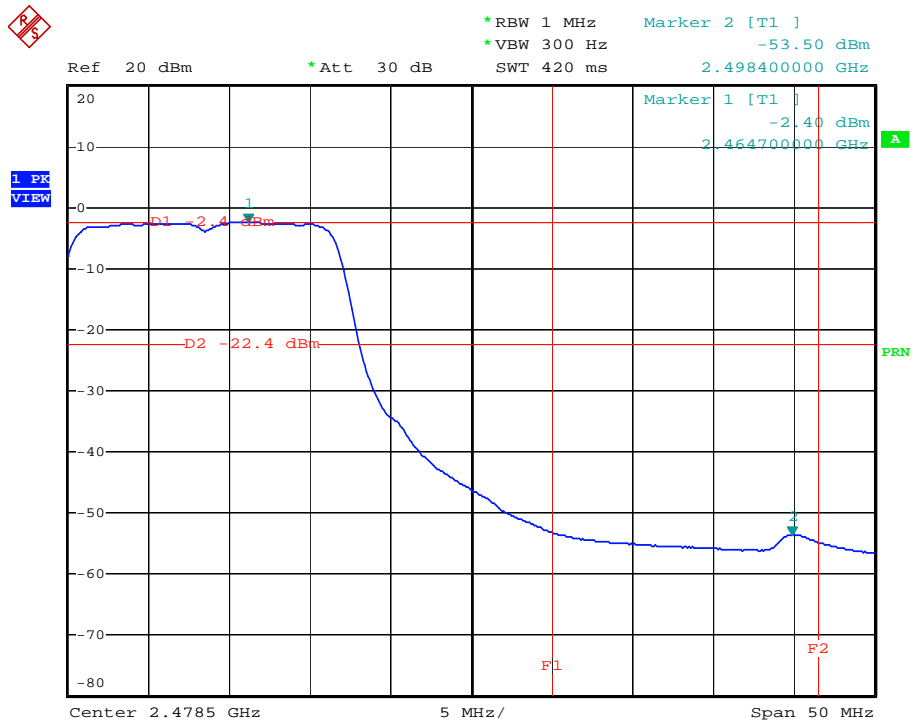


	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
3	2483.500	67.44	-6.56	37.11	74.00	30.33	1.96	0.00	Peak	---	---
4	2483.500	52.76	-1.24	22.43	54.00	30.33	1.96	0.00	Average	---	---

OFDM (Channel 01) : 2412MHz



OFDM (Channel 11) : 2462MHz



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

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## 5.2. Test of AC Power Line Conducted Emission

### 5.2.1. Measuring Instruments

Please reference item 1~4 in chapter 6 for the instruments used for testing.

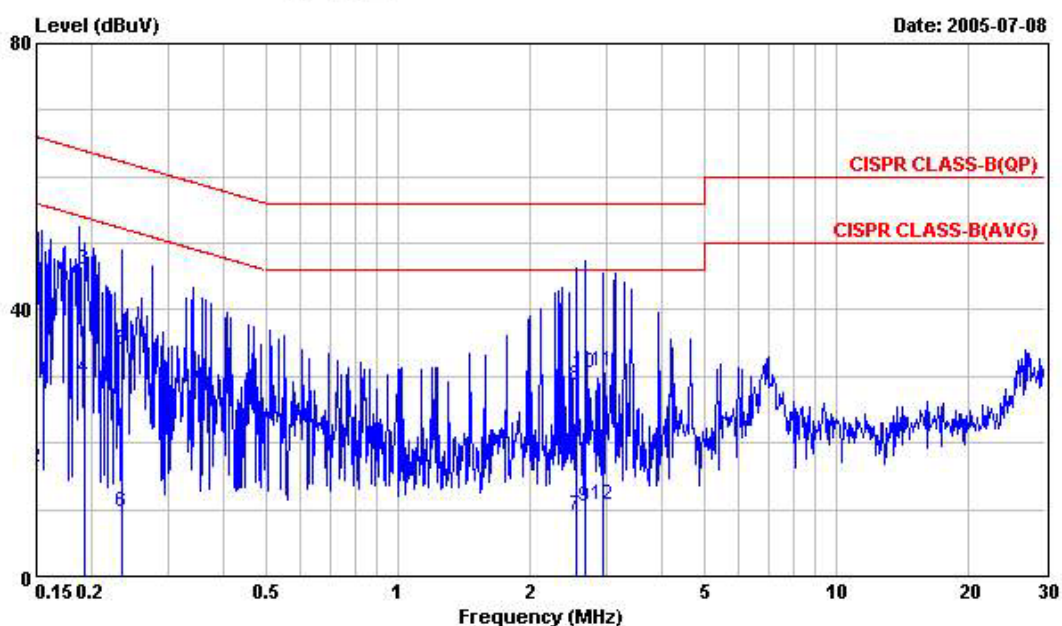
### 5.2.2. Test Procedures

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. 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.

### 5.2.3. Test Result of Conducted Emission

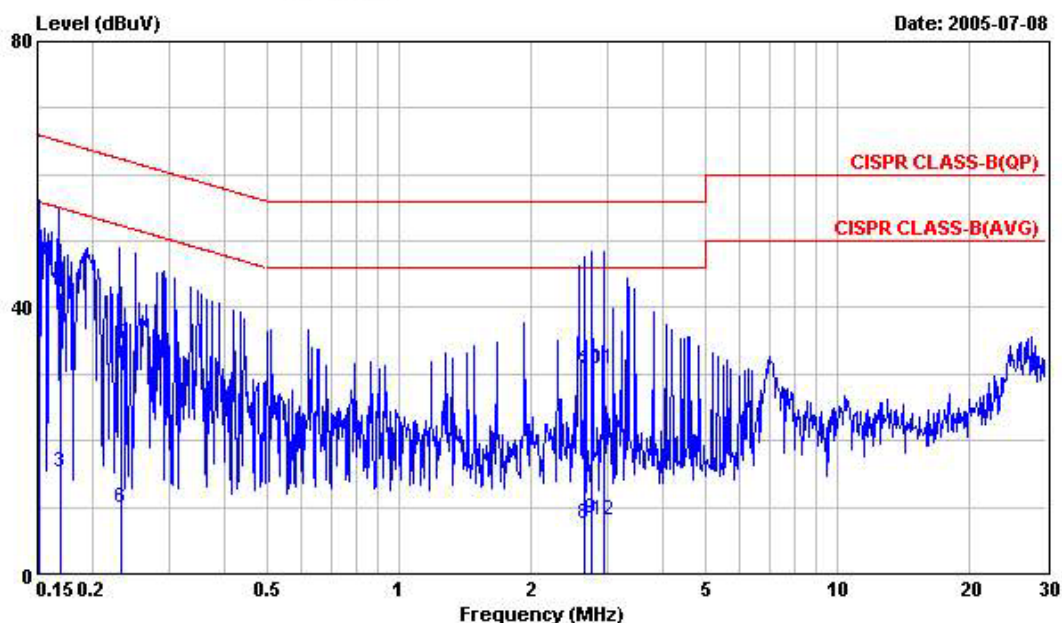
Test Mode	RF Link	Tested By	Sky Wu
Temperature / Humidity	28 deg. C / 40%		

#### Line to Ground



	Freq	Level	Over Limit	Limit Line	Read Level	Cable Loss Factor	LISN Factor	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.150	43.16	-22.84	66.00	43.06	0.10	0.00	QP
2	0.150	16.19	-39.81	56.00	16.09	0.10	0.00	Average
3	0.193	46.10	-17.79	63.89	46.00	0.10	0.00	QP
4	0.193	29.63	-24.26	53.89	29.53	0.10	0.00	Average
5	0.235	33.85	-28.42	62.27	33.74	0.11	0.01	QP
6	0.235	9.74	-42.53	52.27	9.63	0.11	0.01	Average
7	2.570	9.10	-36.90	46.00	8.88	0.22	0.08	Average
8	2.570	28.76	-27.24	56.00	28.54	0.22	0.08	QP
9	2.690	10.38	-35.62	46.00	10.17	0.21	0.07	Average
10	2.690	30.63	-25.37	56.00	30.42	0.21	0.07	QP
11	2.950	30.77	-25.23	56.00	30.55	0.22	0.06	QP
12	2.950	10.62	-35.38	46.00	10.40	0.22	0.06	Average

**Neutral to Ground**



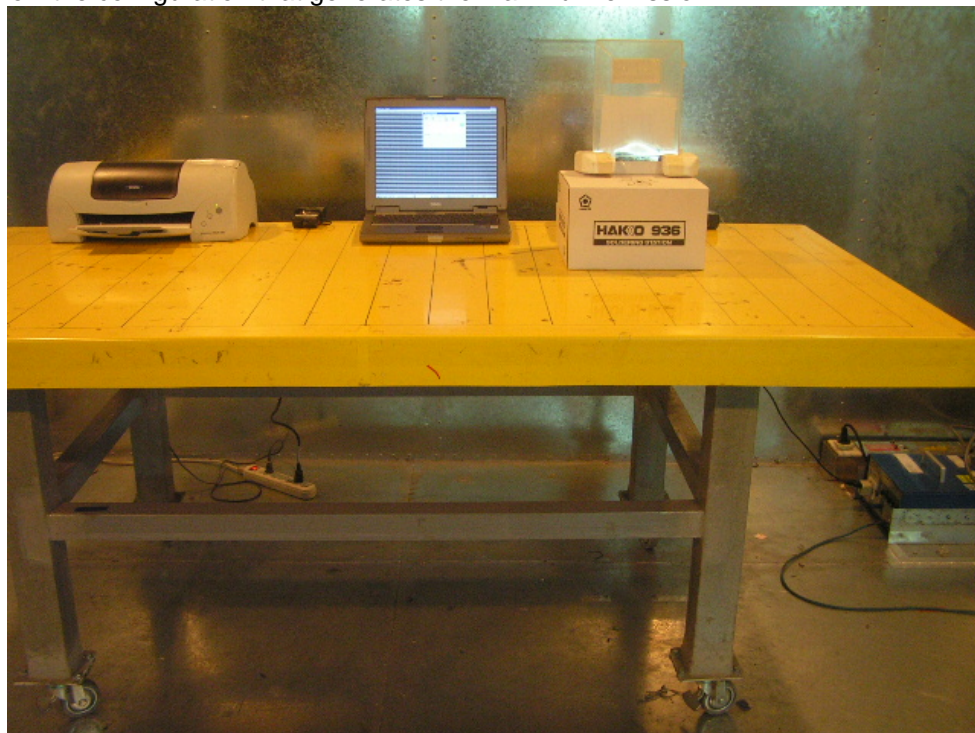
	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Cable Loss	LISN Factor	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	dB	
1	0.152	16.36	-39.53	55.89	16.26	0.10	0.00	0.10	Average
2	0.152	43.76	-22.13	65.89	43.66	0.10	0.00	0.10	QP
3	0.169	15.18	-39.83	55.01	15.08	0.10	0.00	0.10	Average
4	0.169	42.37	-22.64	65.01	42.27	0.10	0.00	0.10	QP
5	0.232	34.48	-27.90	62.38	34.37	0.11	0.01	0.10	QP
6	0.232	9.78	-42.60	52.38	9.67	0.11	0.01	0.10	Average
7	2.660	29.95	-26.05	56.00	29.74	0.21	0.07	0.14	QP
8	2.660	7.53	-38.47	46.00	7.32	0.21	0.07	0.14	Average
9	2.760	8.17	-37.83	46.00	7.95	0.22	0.07	0.15	Average
10	2.760	30.86	-25.14	56.00	30.64	0.22	0.07	0.15	QP
11	2.930	30.68	-25.32	56.00	30.47	0.21	0.06	0.15	QP
12	2.930	7.99	-38.01	46.00	7.78	0.21	0.06	0.15	Average



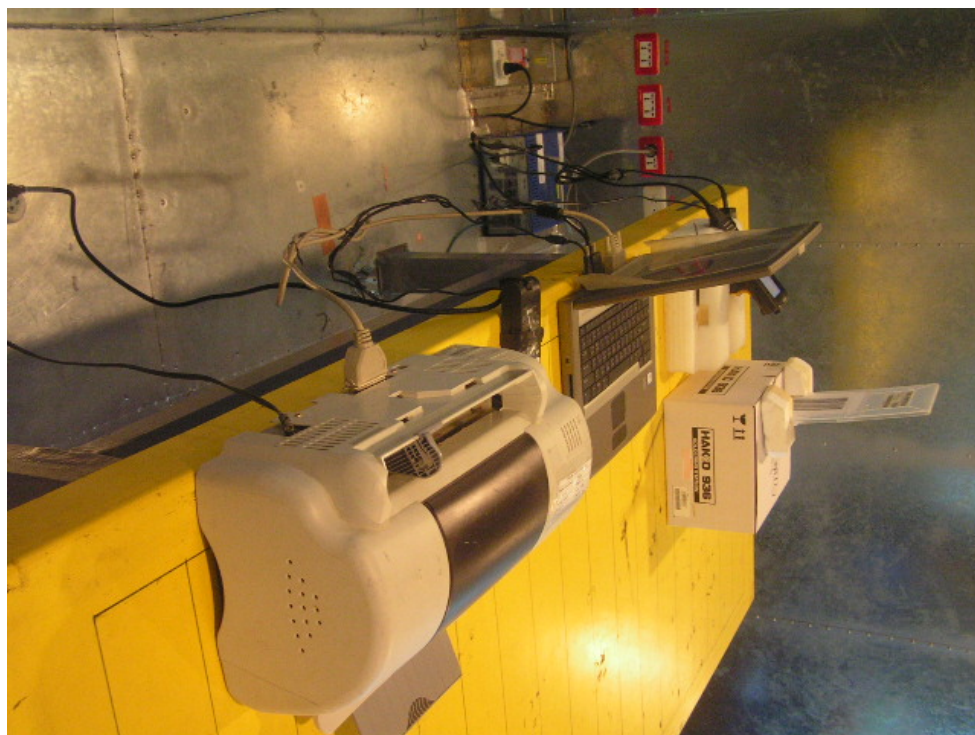
#### 5.2.4. Photographs of Conduction Emission Test Configuration

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

FRONT VIEW



REAR VIEW



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### 5.3. Test of Spurious Radiated Emission

#### 5.3.1. Measuring Instruments

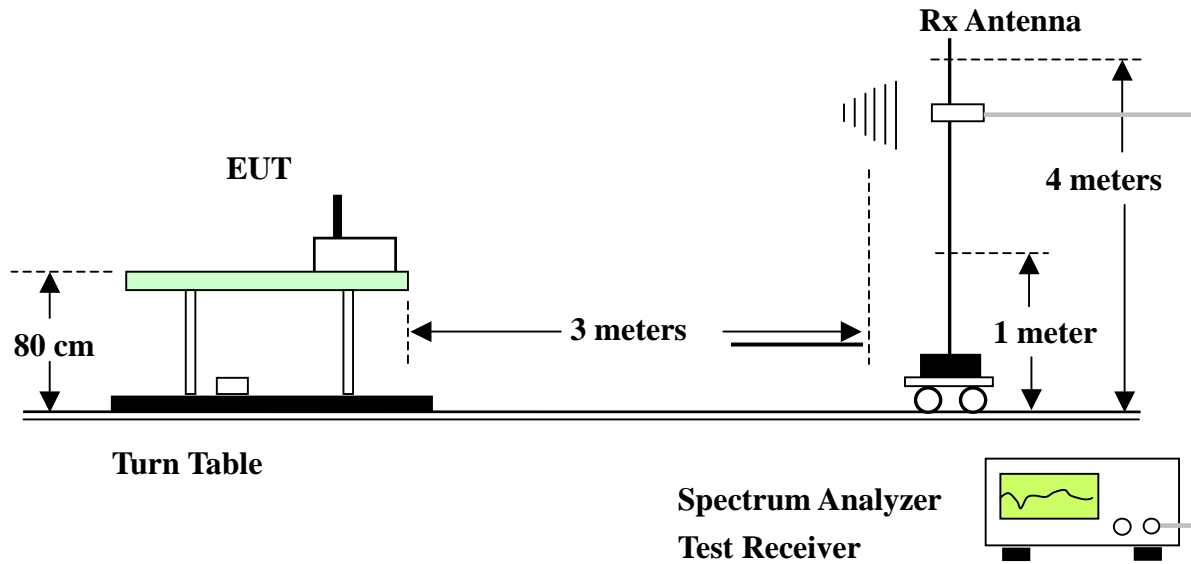
Please reference item 5~18 in chapter 6 for the instruments used for testing.

#### 5.3.2. Test Procedures

1. Configure the EUT according to ANSI C63.4.:2003
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 300Hz 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.



### 5.3.3. Test Setup Layout





#### 5.3.4. Test Results and Limit

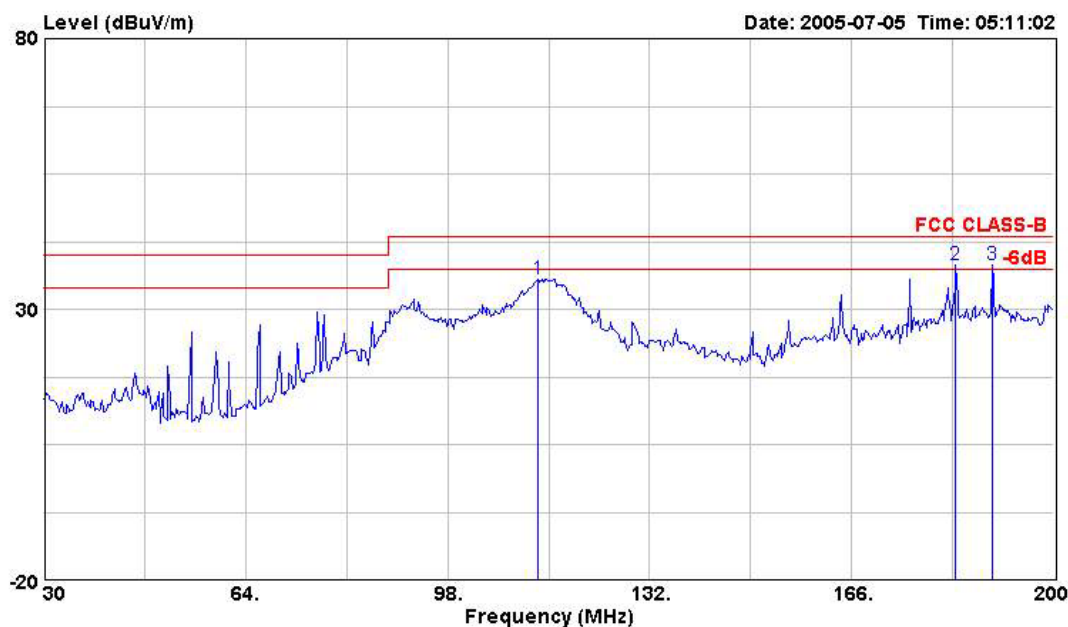
**Note:**

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

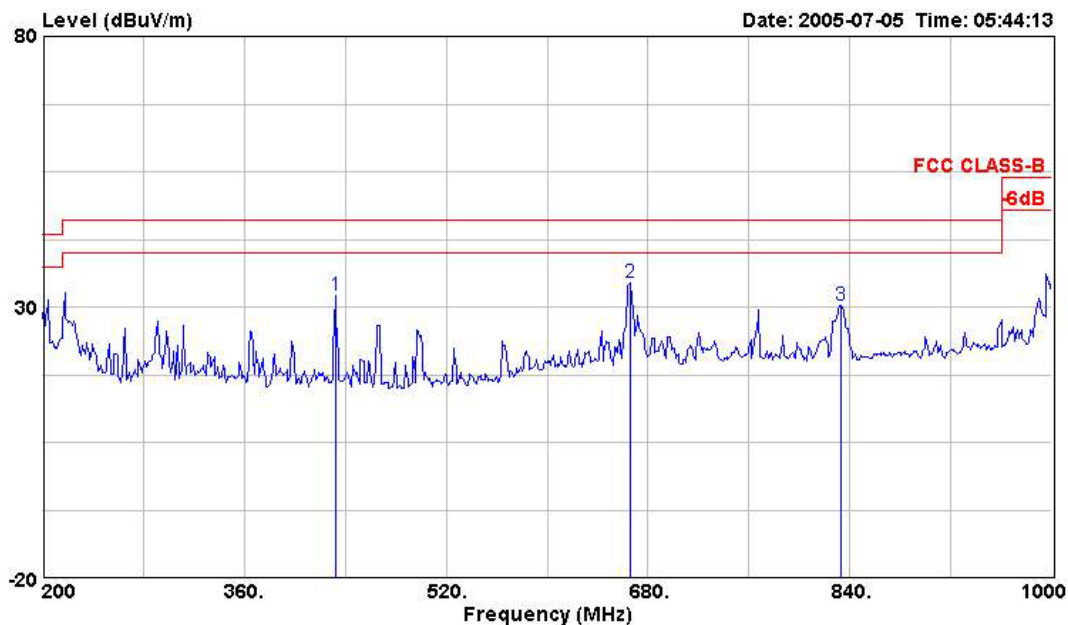
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

Modulation Type	OFDM				
Test Mode	CH 2437MHz	Temperature	26.5 deg. C	Tested By	Ted Chiu
Freq. Range	30MHz~1GHz	Humidity	51%		

**(A) Polarization: Horizontal**

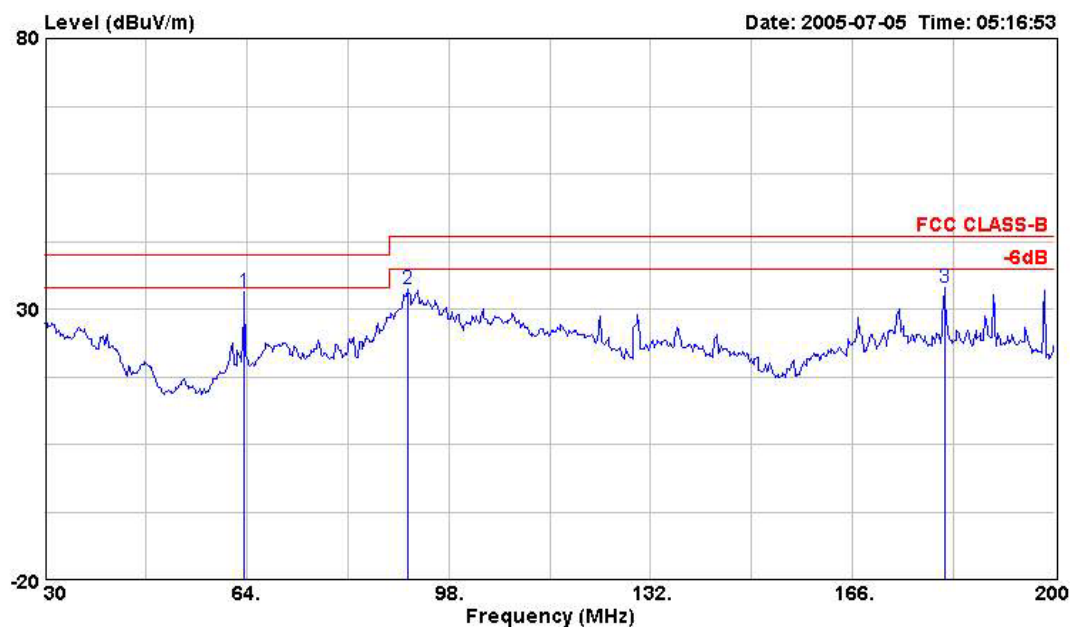


	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	113.300	35.63	-7.87	53.93	43.50	-18.30	1.05	30.29	Peak	---	---
2 !	183.510	38.16	-5.34	52.46	43.50	-14.30	1.27	30.05	Peak	---	---
3 !	189.630	38.13	-5.37	51.99	43.50	-13.86	1.27	30.10	Peak	---	---

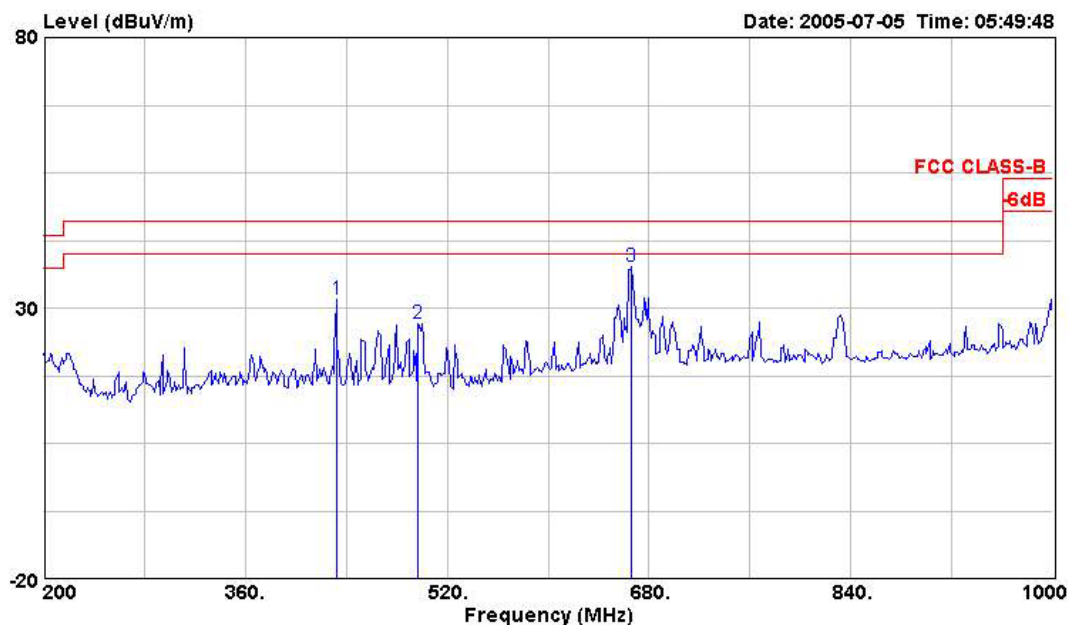


	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	432.000	32.19	-13.81	44.27	46.00	-12.08	2.04	30.66	Peak	---	---
2	665.600	34.47	-11.53	41.90	46.00	-7.43	2.52	30.54	Peak	---	---
3	832.800	30.35	-15.65	36.05	46.00	-5.70	2.88	30.41	Peak	---	---

(B) Polarization: Vertical



	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	63.660	33.16	-6.84	52.65	40.00	-19.49	0.81	30.54	Peak	---	---
2	91.030	33.59	-9.91	53.62	43.50	-20.03	0.91	29.49	Peak	---	---
3	181.470	33.96	-9.54	48.41	43.50	-14.45	1.27	30.03	Peak	---	---

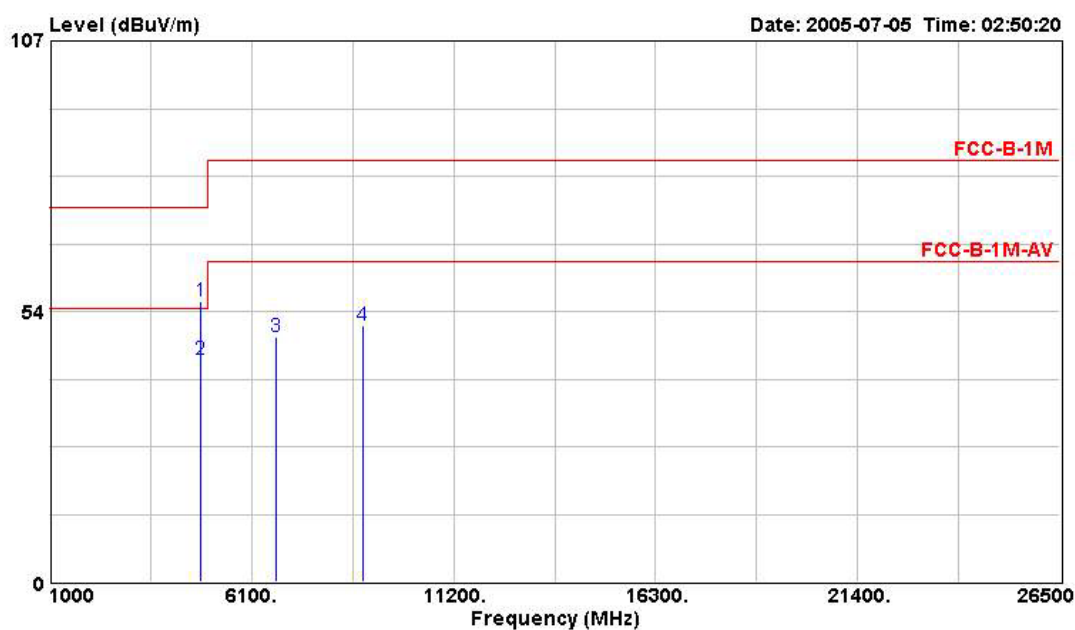


	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	432.000	31.52	-14.48	43.60	46.00	-12.08	2.04	30.66	Peak	---	---
2	496.800	27.24	-18.76	39.82	46.00	-12.58	2.17	30.78	Peak	---	---
3	666.400	37.65	-8.35	45.08	46.00	-7.43	2.52	30.54	Peak	---	---



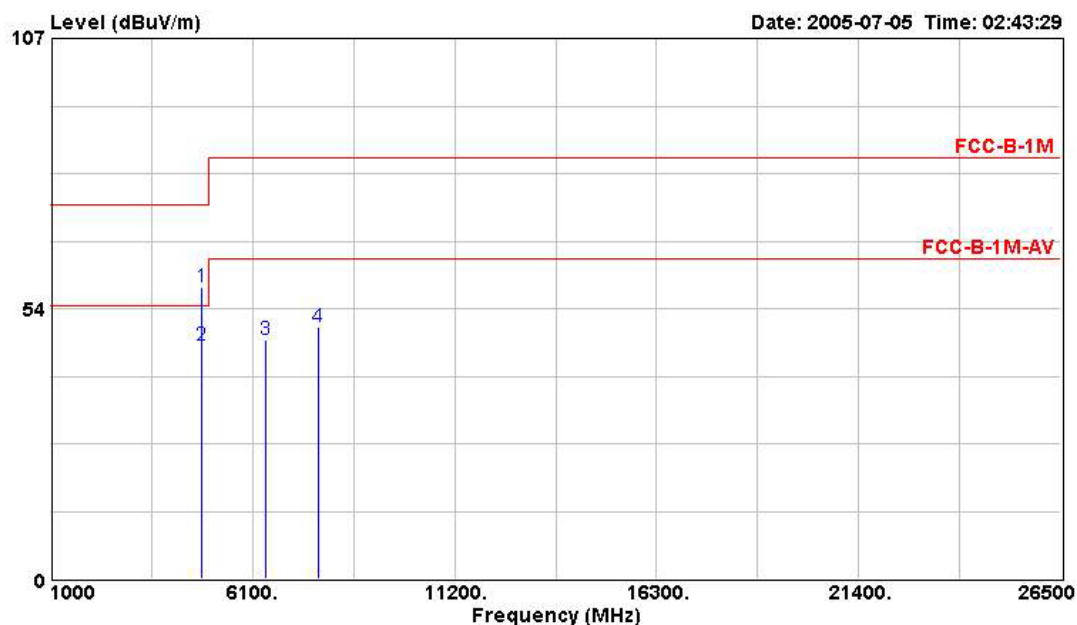
Modulation Type	CCK				
Test Mode	CH 2412MHz	Temperature	26.5 deg. C	Tested By	Ted Chiu
Freq. Range	1GHz~25GHz	Humidity	51%		

(A) Polarization: Horizontal



	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4824.000	55.56	-18.44	52.14	74.00	3.42	2.84	32.54	PEAK	---	---
2	4824.000	44.01	-9.99	40.59	54.00	3.42	2.84	32.54	Average	---	---
3	6732.000	48.49	-34.91	42.44	83.40	6.05	3.47	32.21	PEAK	---	---
4	8908.000	50.81	-32.59	42.12	83.40	8.69	4.05	33.26	PEAK	---	---

(B) Polarization: Vertical

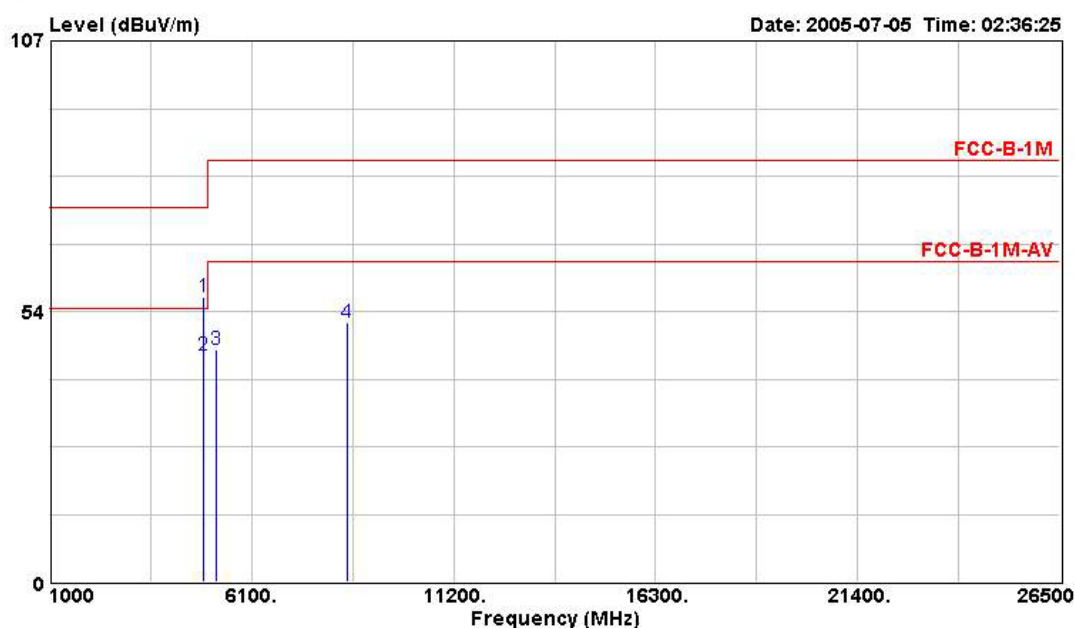


	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4824.000	57.61	-16.39	54.19	74.00	3.42	2.84	32.54	PEAK	---	---
2	4824.000	46.13	-7.87	42.71	54.00	3.42	2.84	32.54	Average	---	---
3	6420.000	47.45	-35.95	42.24	83.40	5.21	3.38	32.47	PEAK	---	---
4	7776.000	49.81	-33.59	42.09	83.40	7.72	3.81	32.98	PEAK	---	---



Modulation Type	CCK				
Test Mode	CH 2437MHz	Temperature	26.5 deg. C	Tested By	Ted Chiu
Freq. Range	1GHz~25GHz	Humidity	51%		

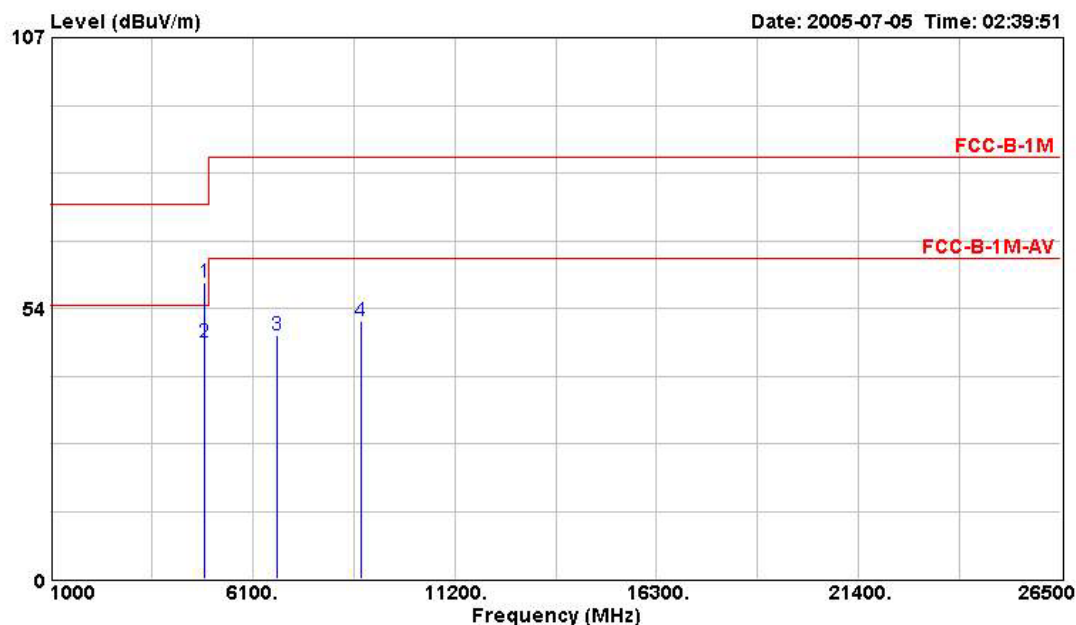
(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4876.000	56.42	-17.58	52.89	74.00	3.53	2.87	32.55	PEAK	---	---
2	4876.000	44.73	-9.27	41.20	54.00	3.53	2.87	32.55	Average	---	---
3	5220.000	45.87	-37.53	41.77	83.40	4.10	3.00	32.64	PEAK	---	---
4	8504.000	51.16	-32.24	42.28	83.40	8.88	3.98	33.00	PEAK	---	---



(B) Polarization: Vertical

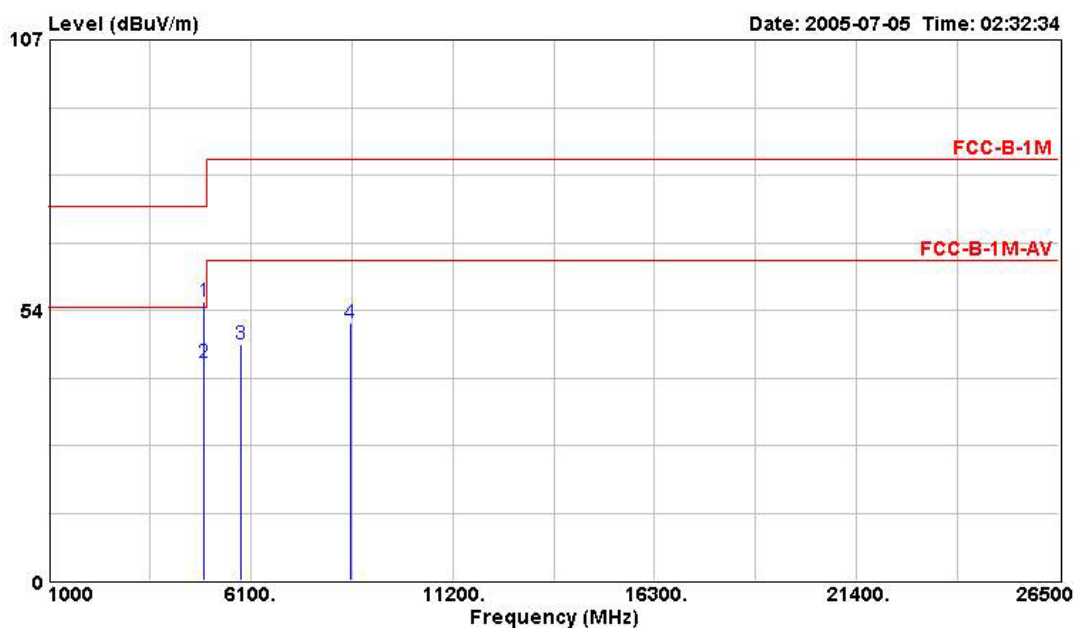


	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4876.000	58.61	-15.39	55.08	74.00	3.53	2.87	32.55	PEAK	---	---
2	4876.000	46.78	-7.22	43.25	54.00	3.53	2.87	32.55	Average	---	---
3	6732.000	48.16	-35.24	42.11	83.40	6.05	3.47	32.21	PEAK	---	---
4	8840.000	51.07	-32.33	42.34	83.40	8.73	4.04	33.21	PEAK	---	---



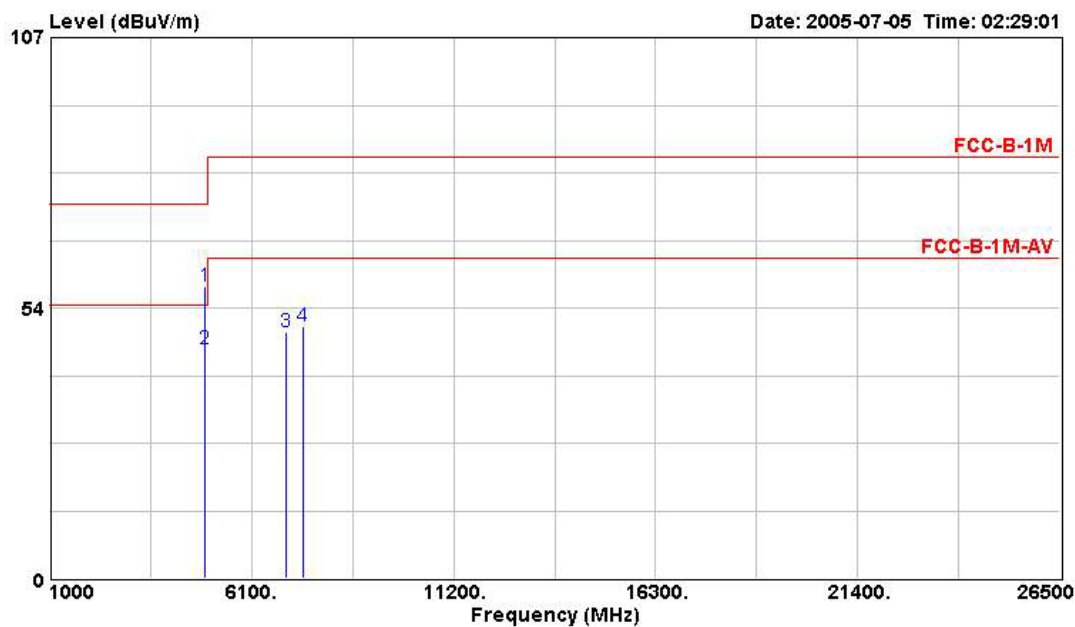
Modulation Type	CCK				
Test Mode	CH 2462MHz	Temperature	26.5 deg. C	Tested By	Ted Chiu
Freq. Range	1GHz~25GHz	Humidity	51%		

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4928.000	55.19	-18.81	51.56	74.00	3.63	2.89	32.55	PEAK	---	---
2	4928.000	43.06	-10.94	39.43	54.00	3.63	2.89	32.55	Average	---	---
3	5844.000	46.85	-36.55	41.95	83.40	4.90	3.21	32.58	PEAK	---	---
4	8620.000	50.86	-32.54	42.04	83.40	8.82	4.00	33.08	PEAK	---	---

**(B) Polarization: Vertical**

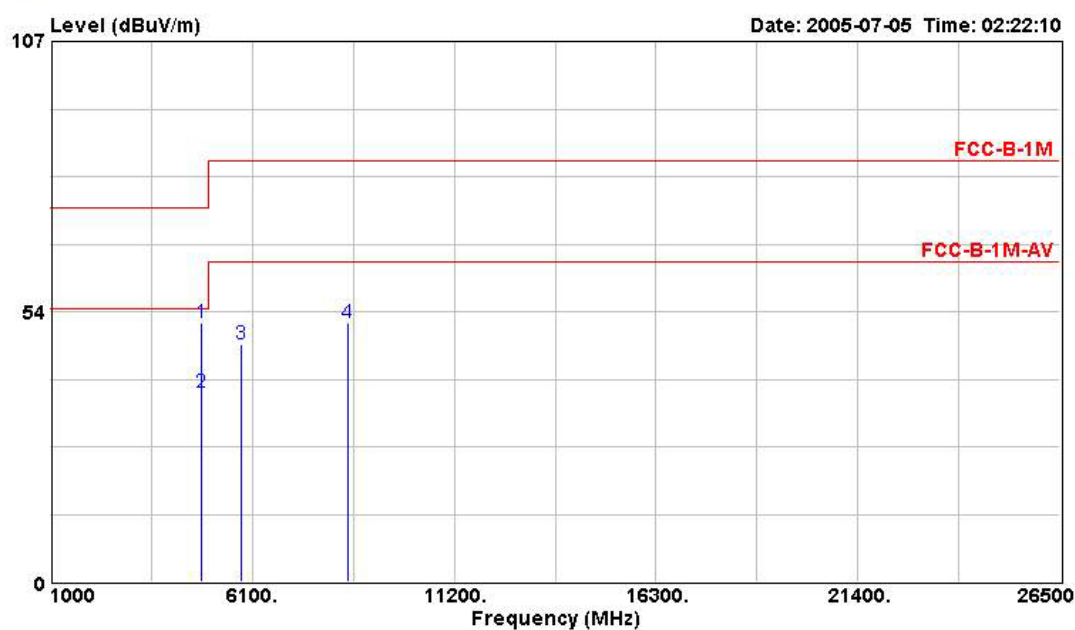


	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4928.000	57.61	-16.39	53.98	74.00	3.63	2.89	32.55	PEAK	---	---
2	4928.000	45.42	-8.58	41.79	54.00	3.63	2.89	32.55	Average	---	---
3	6968.000	48.85	-34.55	41.97	83.40	6.89	3.53	31.97	PEAK	---	---
4	7384.000	49.82	-33.58	42.50	83.40	7.31	3.68	32.71	PEAK	---	---



Modulation Type	OFDM				
Test Mode	CH 2412MHz	Temperature	26.5 deg. C	Tested By	Ted Chiu
Freq. Range	1GHz~25GHz	Humidity	51%		

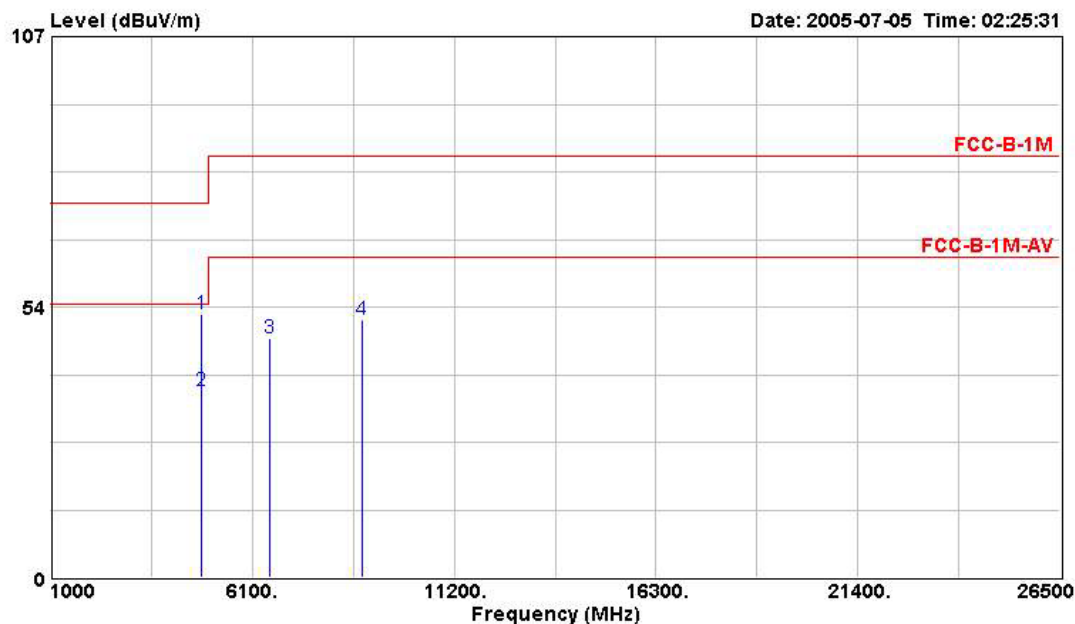
(A) Polarization: Horizontal



	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4828.000	51.13	-22.87	47.71	74.00	3.42	2.84	32.54	PEAK	---	---
2	4828.000	37.57	-16.43	34.15	54.00	3.42	2.84	32.54	Average	---	---
3	5808.000	46.94	-36.46	42.08	83.40	4.87	3.20	32.59	PEAK	---	---
4	8532.000	51.32	-32.08	42.45	83.40	8.87	3.98	33.02	PEAK	---	---



(B) Polarization: Vertical

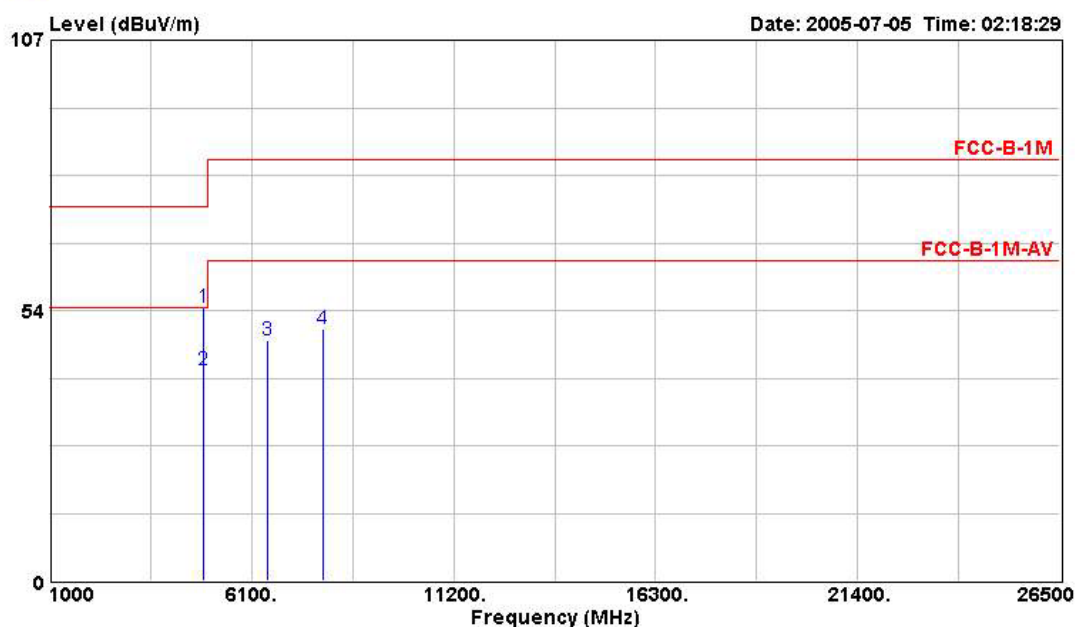


	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4828.000	52.24	-21.76	48.82	74.00	3.42	2.84	32.54	PEAK	---	---
2	4828.000	37.03	-16.97	33.61	54.00	3.42	2.84	32.54	Average	---	---
3	6536.000	47.25	-36.15	41.90	83.40	5.36	3.41	32.43	PEAK	---	---
4	8876.000	50.87	-32.53	42.16	83.40	8.71	4.05	33.24	PEAK	---	---



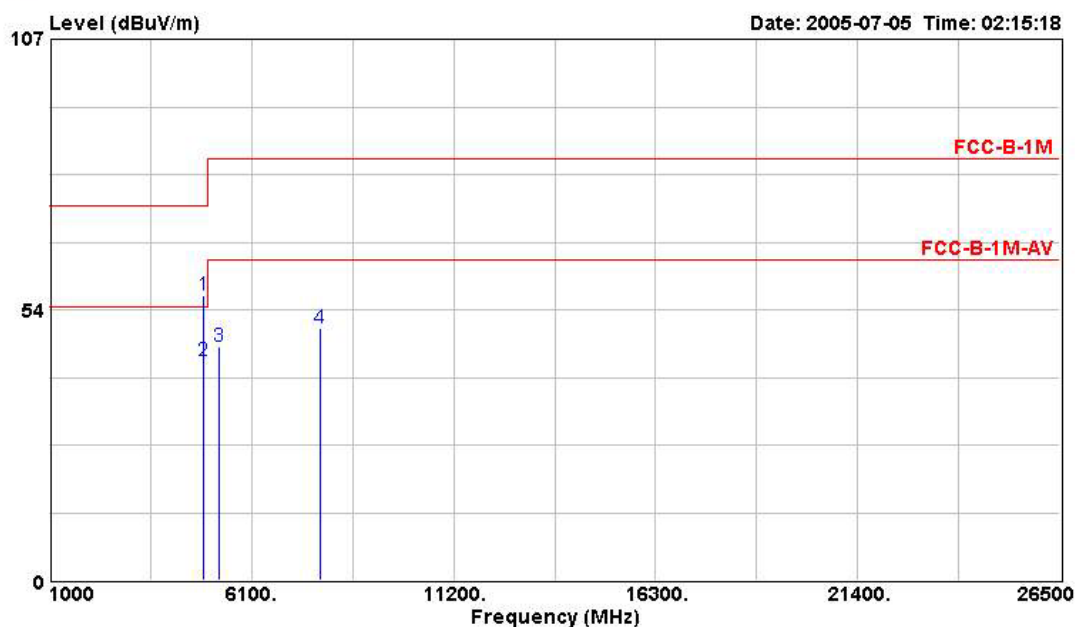
Modulation Type	OFDM				
Test Mode	CH 2437MHz	Temperature	26.5 deg. C	Tested By	Ted Chiu
Freq. Range	1GHz~25GHz	Humidity	51%		

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4876.000	54.02	-19.98	50.49	74.00	3.53	2.87	32.55	PEAK	---	---
2	4876.000	41.75	-12.25	38.22	54.00	3.53	2.87	32.55	Average	---	---
3	6496.000	47.66	-35.74	42.42	83.40	5.24	3.40	32.46	PEAK	---	---
4	7908.000	49.90	-33.50	42.03	83.40	7.87	3.85	32.98	PEAK	---	---

(B) Polarization: Vertical

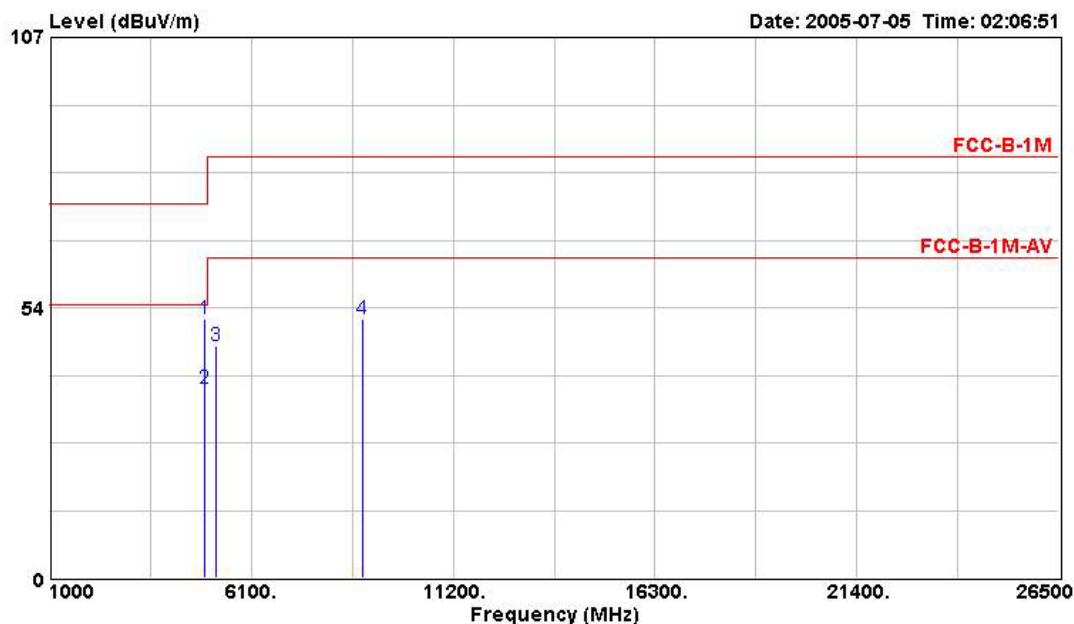


	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4876.000	56.24	-17.76	52.71	74.00	3.53	2.87	32.55	PEAK	---	---
2	4876.000	43.48	-10.52	39.95	54.00	3.53	2.87	32.55	Average	---	---
3	5272.000	46.18	-37.22	42.01	83.40	4.16	3.01	32.68	PEAK	---	---
4	7816.000	49.80	-33.60	42.04	83.40	7.76	3.82	32.98	PEAK	---	---



Modulation Type	OFDM				
Test Mode	CH 2462MHz	Temperature	26.5 deg. C	Tested By	Ted Chiu
Freq. Range	1GHz~25GHz	Humidity	51%		

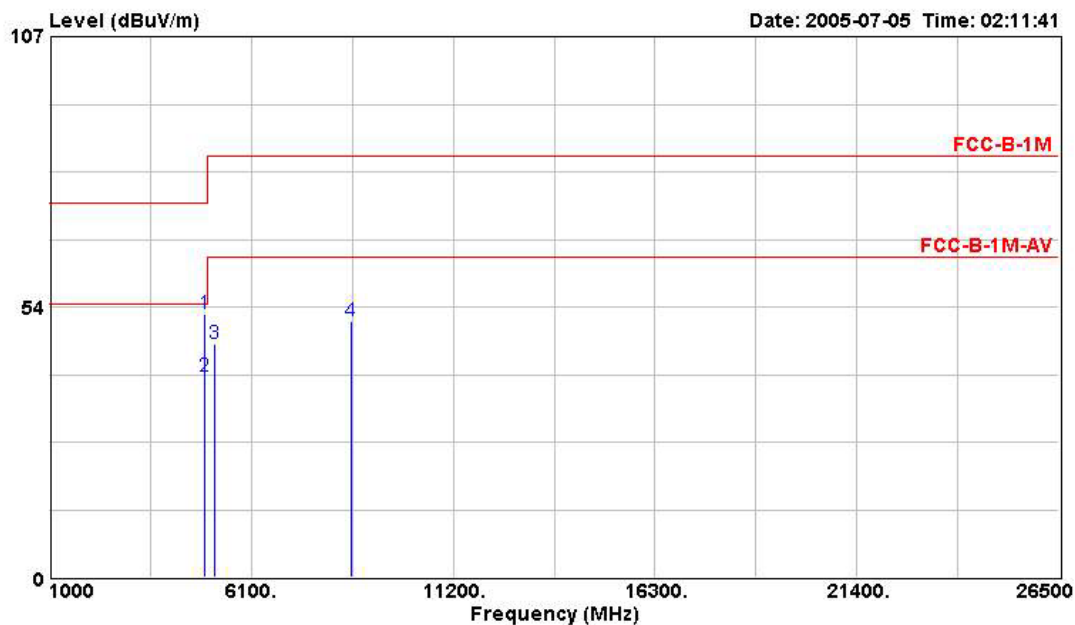
(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamplifier	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4928.000	51.26	-22.74	47.64	74.00	3.63	2.89	32.55	PEAK	---	---
2	4928.000	37.58	-16.42	33.95	54.00	3.63	2.89	32.55	Average	---	---
3	5200.000	46.01	-37.39	41.94	83.40	4.06	2.99	32.64	PEAK	---	---
4	8896.000	51.21	-32.19	42.52	83.40	8.69	4.05	33.26	PEAK	---	---



(B) Polarization: Vertical

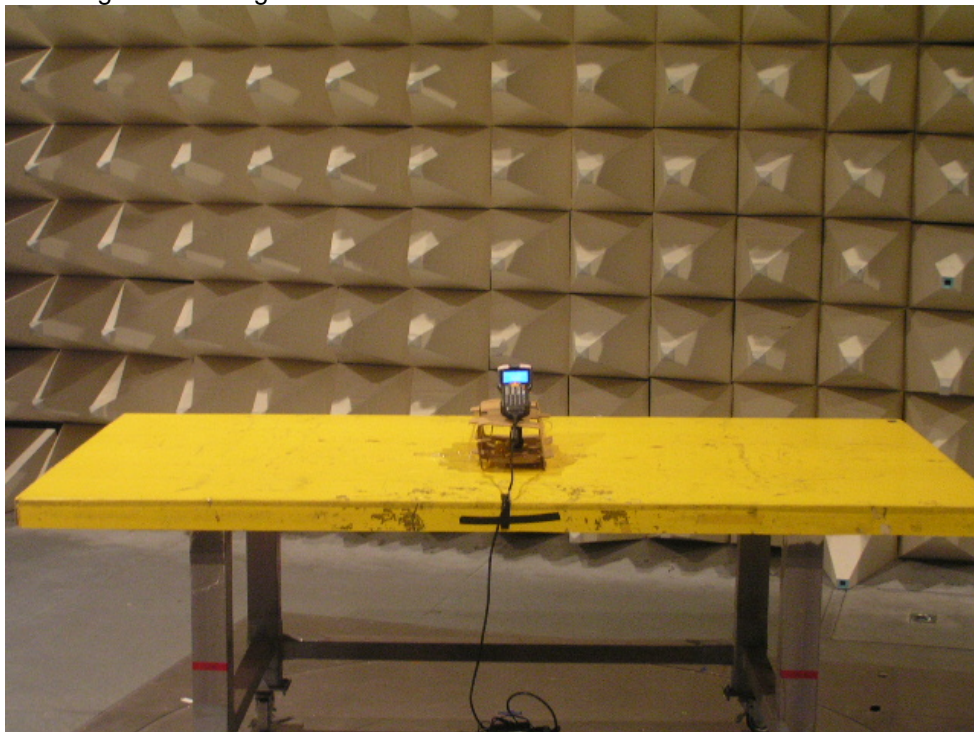


	Freq	Level	Over	Read	Limit		Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Level	Line	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB		cm	deg
1	4928.000	52.18	-21.82	48.55	74.00	3.63	2.89	32.55	PEAK	---	---
2	4928.000	39.62	-14.38	35.99	54.00	3.63	2.89	32.55	Average	---	---
3	5164.000	46.27	-37.13	42.25	83.40	4.02	2.97	32.62	PEAK	---	---
4	8616.000	50.83	-32.57	42.02	83.40	8.82	4.00	33.08	PEAK	---	---

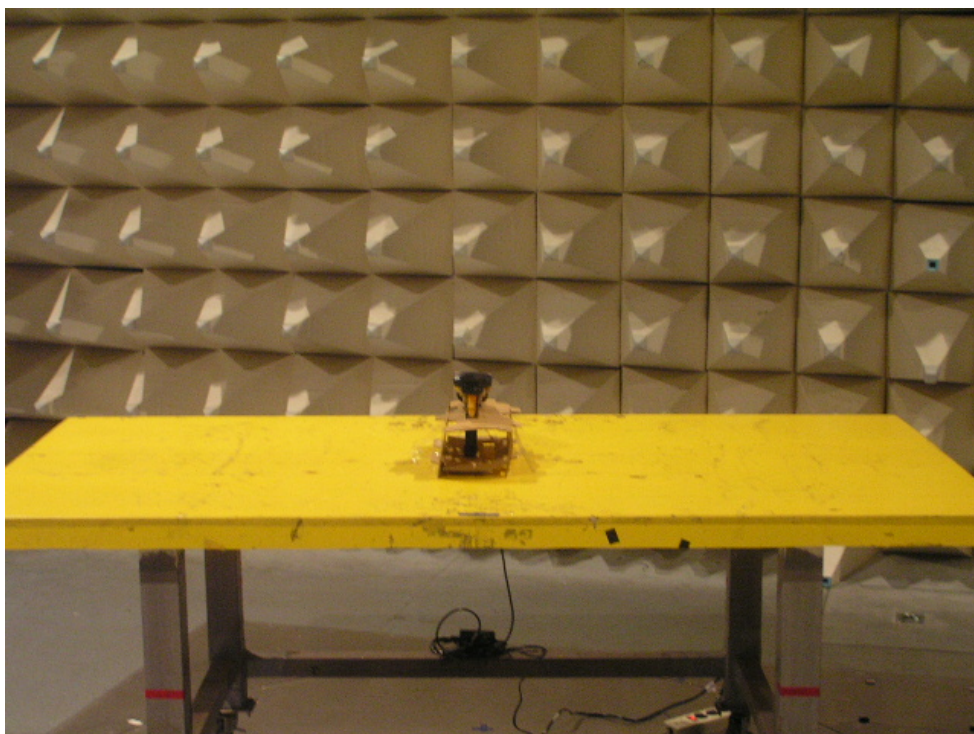
### 5.3.5. Photographs of Radiated Emission Test Configuration

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

FRONT VIEW



REAR VIEW





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## **5.4. Antenna Requirements**

### **5.4.1. Standard Applicable**

47 CFR Part15 Section 15.203:

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

47 CFR Part15 Section 15.247 (b):

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

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

### **5.4.2. Antenna Connected Construction**

The antenna used in this product is PIFA antenna, antenna connector Hirose (U.FL-R-SMT).

## 6. List of Measuring Equipments Used

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
1	Receiver	R&S	ESCS 30	100168	9kHz ~ 2.75GHz	Dec. 09, 2004	Conduction (CO02-LK)
2	LISN	Rolf Heine	NNB-2/16Z	98087	9kHz ~ 30MHz	Aug. 30, 2004	Conduction (CO02-LK)
3	LISN	Rolf Heine	NNB-2/16Z	98009	9kHz ~ 30MHz	Aug. 30, 2004	Conduction (CO02-LK)
4	RF Cable-CON	Suhner Switzerland	RG223/U	CB018	9kHz ~ 30MHz	Feb. 04, 2005	Conduction (CO02-LK)
5	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Jun. 16, 2005	Radiation (03CH03-HY)
6	Spectrum analyzer	R&S	FSP40	100004	9KHZ ~ 40GHz	Aug. 31, 2004	Radiation (03CH03-HY)
7	Amplifier	SCHAFFNER	CPA9231A	18667	9KHz ~ 2GHz	Jan. 10, 2005	Radiation (03CH03-HY)
8	Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	May 31, 2005	Radiation (03CH03-HY)
9	Amplifier	MITEQ	AMF-6F-260400	923364	26.5GHz ~ 40GHz	Jan. 05, 2004*	Radiation (03CH03-HY)
10	Loop Antenna	R&S	HFH2-Z2	860004/001	9kHz ~ 30MHz	May 24, 2004*	Radiation (03CH03-HY)
11	Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz ~ 200MHz	Jul. 28, 2004	Radiation (03CH03-HY)
12	Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz ~ 1GHz	Jul. 28, 2004	Radiation (03CH03-HY)
13	Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	Apr. 22, 2005	Radiation (03CH03-HY)
14	Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jun. 09, 2004*	Radiation (03CH03-HY)
15	RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Feb. 22, 2005	Radiation (03CH03-HY)
16	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec.01, 2004	Radiation (03CH03-HY)
17	Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
18	Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
19	Spectrum analyzer	R&S	FSP30	100023	9kHz ~ 30GHz	Aug. 02, 2004	Conducted (TH01-HY)

※ Calibration Interval of instruments listed above is one year.

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