FCC RADIO TEST REPORT

according to

47 CFR FCC Part 15 Subpart C

PRODUCT NAME	:	802.11g Outdoor AP
FCC ID.	:	RYK-OR100
FILING TYPE	:	New Application
BRAND NAME	:	SparkLAN
MODEL NAME	:	OR-100
RECEIVED DATE	:	July 13, 2005
TEST DATE	:	Aug. 02, 2005

APPLICANT	:	SparkLAN Communications, Inc. 3F, No. 246, Sec. 1, Neihu Road, Neihu District, Taipei, Taiwan, ROC 114
MANUFACTURER	:	Same as applicant

Statements:

The test result in this report refers exclusively to the presented test model / sample.
Without written approval of SPORTON International Inc., the test report shall not be reproduced except in full.

Certificate or Test Report could not be used by the applicant to claim the product endorsement by CNLA 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

Table of Contents

HISTORY OF THIS TEST REPORT

Original Report Issue Date: Apr. 03, 2007

Report No.: FR571317-01

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

according to

47 CFR FCC Part 15 Subpart C

PRODUCT NAME : 802.11g Outdoor AP

BRAND NAME : SparkLAN

MODEL NAME : OR-100

APPLICANT : SparkLAN Communications, Inc.

3F, No. 246, Sec. 1, Neihu Road, Neihu District, Taipei, Taiwan, ROC 114

MANUFACTURER : Same as 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 Subpart C**. Testing was carried out on Aug. 02, 2005 at SPORTON International Inc. LAB.

Wayne Hsu

1. General Description of Equipment under Test

1.1. Applicant

SparkLAN Communications, Inc.

3F, No. 246, Sec. 1, Neihu Road, Neihu District, Taipei, Taiwan, ROC 114

1.2. Manufacturer

Same as applicant

1.3. Basic Description of Equipment under Test

This product is a Wireless Access Point with 802.11b/g wireless solution. Besides, there are 2 antennas field in the EUT. 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	DSSS (CCK / DQPSK / DBPSK) OFDM (16QAM / 64QAM / DQPSK / DBPSK)
Number of Channels	11
Frequency Band	2400 MHz ~ 2483.5 MHz
Carrier Frequency Range	2412.0 MHz ~ 2462.0 MHz
Carrier Frequency	See section 1.6 for details
Data Rate	1, 2, 5.5, 11 Mbps - DSSS 6, 12, 18, 24, 36, 48, 54 Mbps - OFDM
Max. Conducted Output Power	DSSS : 23.97 dBm OFDM : 19.76 dBm
Antenna Type	See section 1.5 for details
Communication Type	Half-Duplex
Testing Duty Cycle	100.00%
Power Rating (DC/AC, Voltage)	48V DC from POE
Test Power Source	120.00V AC from power adapter
Power Adapter	Model: SA06L48-V INPUT: 100-240 V~0.6A, 50-60Hz OUTPUT: 48 V, 0.4A
Temperature Range (Operating)	-30 ~ 60 °C

1.5. Antenna Description

No.	Antenna Type	Gain (dBi)
1	Dipole Antenna (Outdoor Use)	9.00
2	Dipole Antenna (Outdoor Use)	6.00

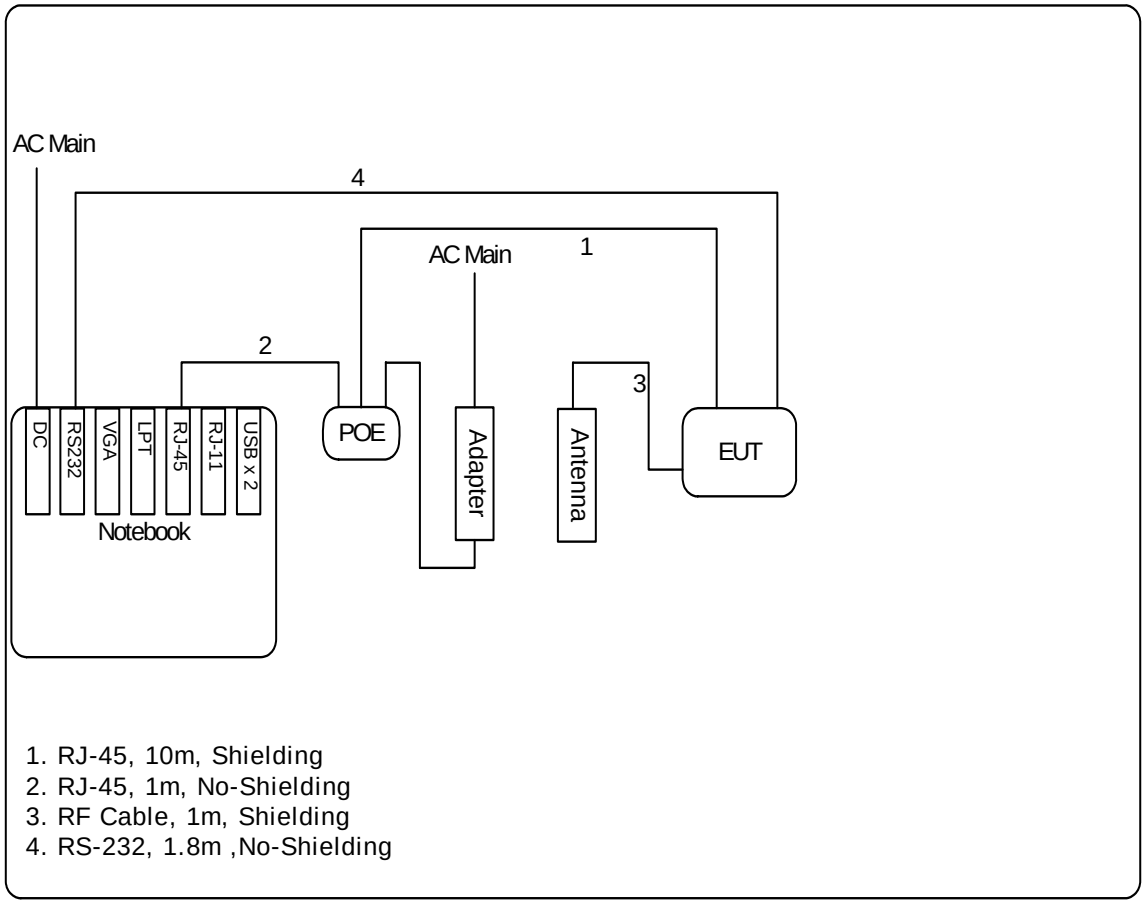
1.6. Table for Carrier Frequencies

Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	05	2432 MHz	09	2452 MHz
02	2417 MHz	06	2437 MHz	10	2457 MHz
03	2422 MHz	07	2442 MHz	11	2462 MHz
04	2427 MHz	08	2447 MHz	-	-

2. Test Configuration of the Equipment under Test

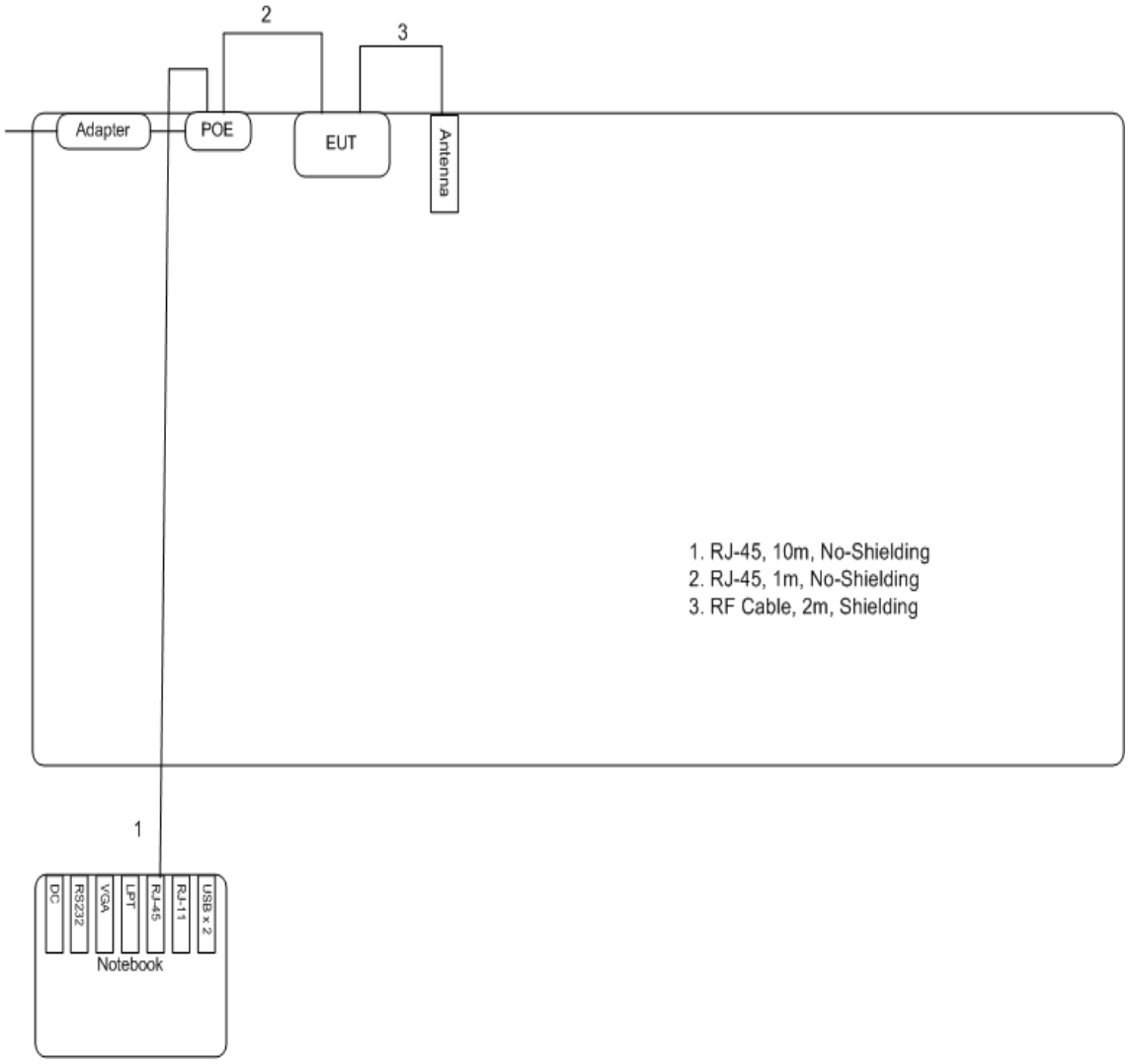
2.1. Test Configuration

2.1.1. Radiation Emissions Test Configuration



1. RJ-45, 10m, Shielding
2. RJ-45, 1m, No-Shielding
3. RF Cable, 1m, Shielding
4. RS-232, 1.8m ,No-Shielding

2.1.2. AC Power Line Conduction Emissions Test Configuration



2.2. Test Mode Description

1. For DSSS modulation, CCK (11 Mbps) is the worst case on all test items.
2. For OFDM modulation, BPSK (6 Mbps) is the worst case on all test items.
3. 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.
4. Spurious emission below 1GHz and AC Conduction Emission is independent of channel selection and modulation types. So only channel 06 with OFDM was tested.
5. For AC Conduction emission and Radiation Emission, the EUT was transmitting continuously.
6. EUT with outdoor use tested with outdoor use antenna (9dBi).

2.3. Description of Test Supporting Units

Support unit	Brand	Model No.	FCC ID
Notebook	DELL	PP01L (D505)	DoC
Printer	EPSON	LQ-300	DoC
Mouse	Microsoft	1004	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. 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

3.3. 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.

3.4. Frequency Range Investigated

Radiated emission test: from 9 kHz to 10th carrier harmonic

3.5. Test Distance

The test distance of radiated emission (9kHz~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.

3.6. 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 Parameter Table

Software Version : MP_TEST

Power Set CH01 / DSSS : 15
Power Set CH06 / DSSS : 15
Power Set CH11 / DSSS : 15
Power Set Ch01 / OFDM : 23
Power Set Ch06 / OFDM : 23
Power Set Ch11 / OFDM : 23

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 Edges Emission	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
5.8	2.1091	Maximum Permissible Exposure	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 6 dB bandwidth shall be at least 500 kHz.

5.1.2. Measuring Instruments

Table on section 6.

5.1.3. Description of Major Test Instruments Setting

- **Spectrum Analyzer** : R&S FSP30
  Attenuation : Auto
  Center Frequency : 2412 MHz / 2437 MHz / 2462 MHz
  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 width with level higher than 6dB below the peak level.
4. Repeat above 1~3 points for the lowest, middle and highest channel of the EUT.

5.1.5. Test Setup Layout

5.1.6. Test Criteria

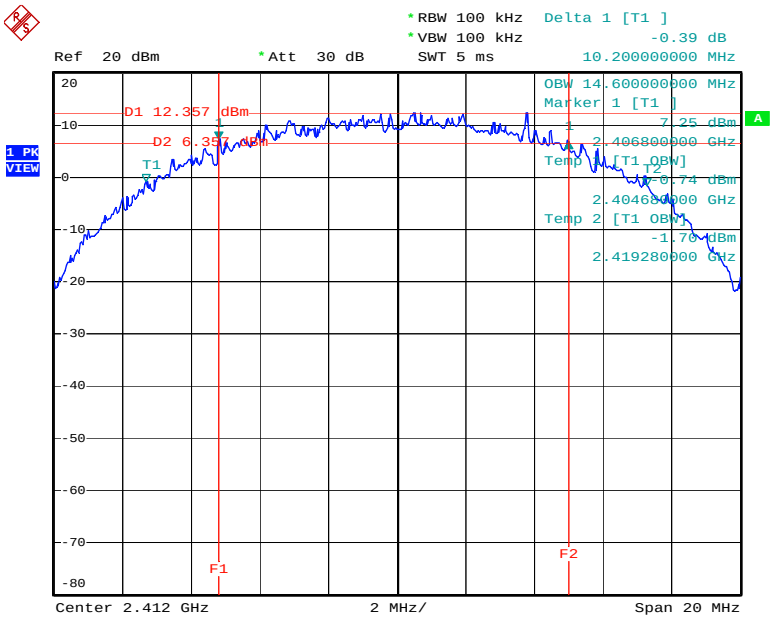
All test results complied with the requirements of 15.247(a)(2). Measurement Uncertainty is $1x10^{-5}$.

5.1.7. Test Result

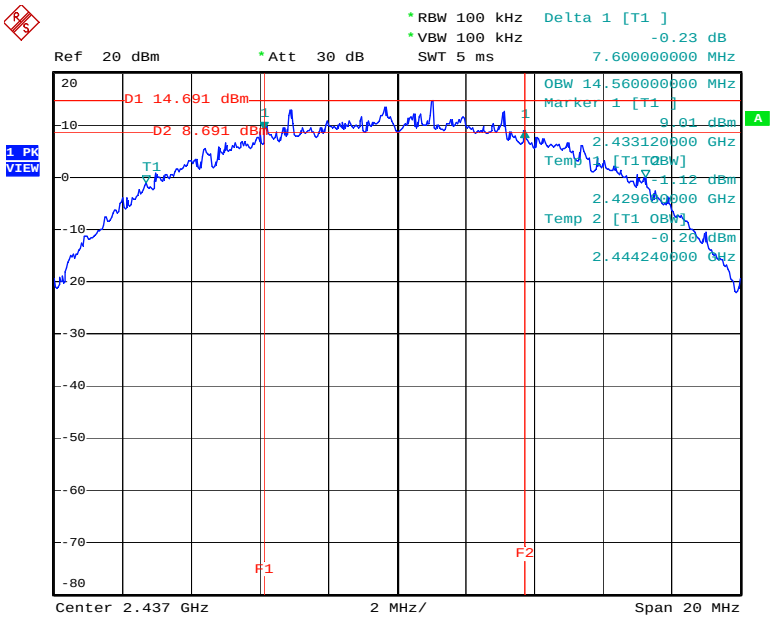
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	6dB Bandwidth	99% Occupied Bandwidth (MHz)	Min. Limit
DSSS	01	2412 MHz	10.20	14.60	0.5
DSSS	06	2437 MHz	7.60	14.56	0.5
DSSS	11	2462 MHz	8.16	14.72	0.5
OFDM	01	2412 MHz	15.72	16.32	0.5
OFDM	06	2437 MHz	15.76	16.32	0.5
OFDM	11	2462 MHz	15.68	16.36	0.5

Modulation Type: DSSS (Channel 01)：



Modulation Type: DSSS (Channel 06) :



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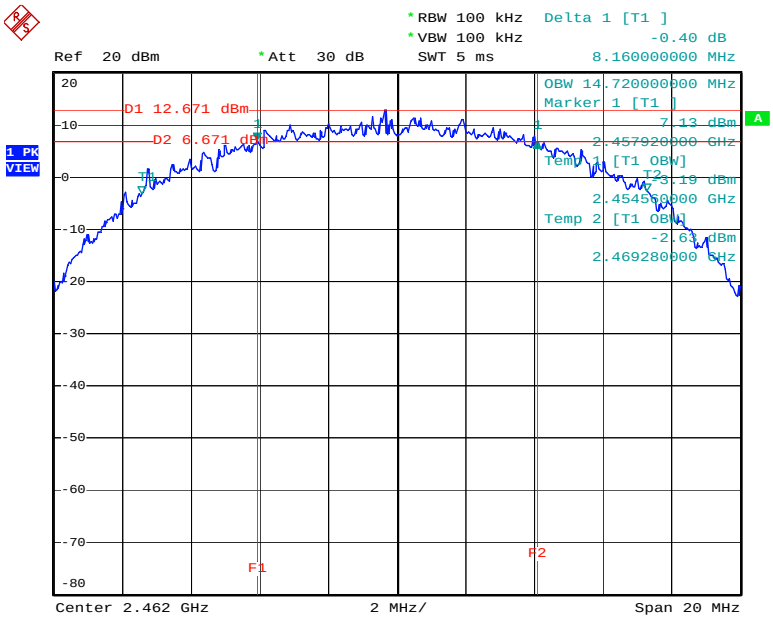
Modulation Type: DSSS (Channel 11) :



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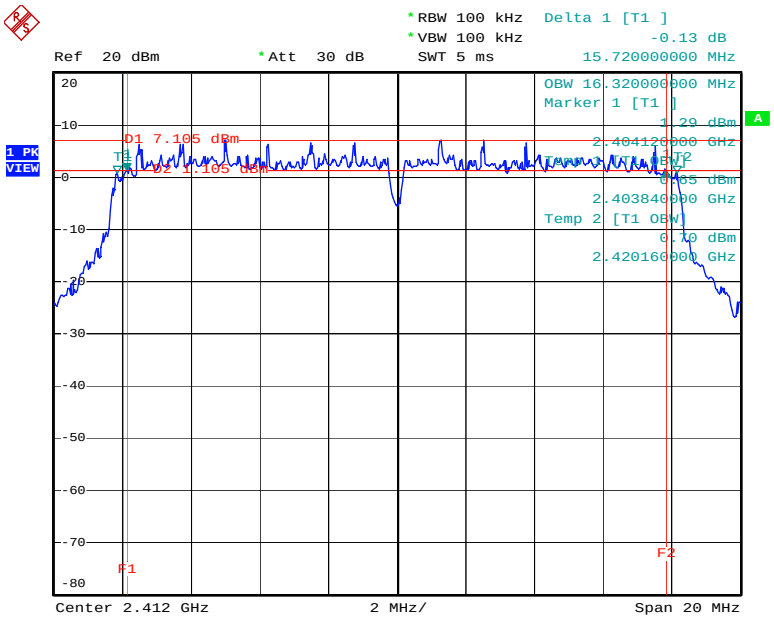
Modulation Type: OFDM (Channel 01)：



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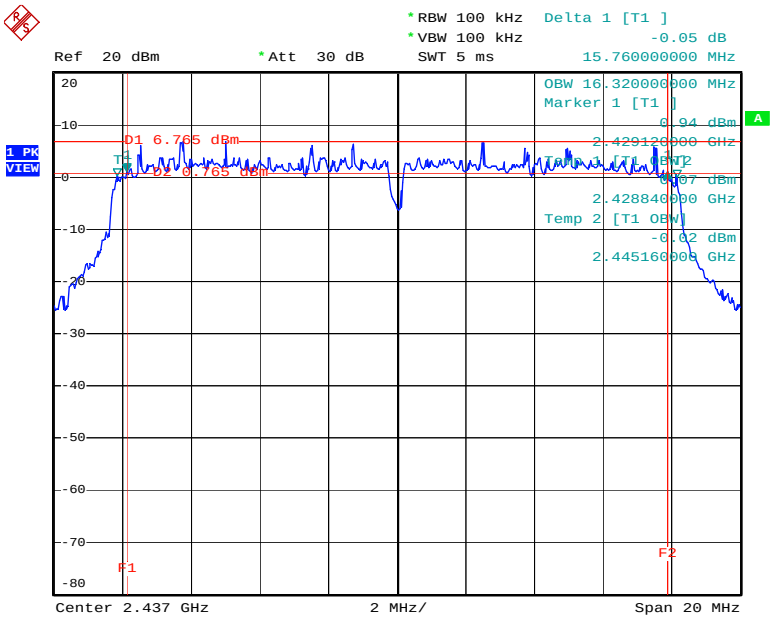
Modulation Type: OFDM (Channel 06)：



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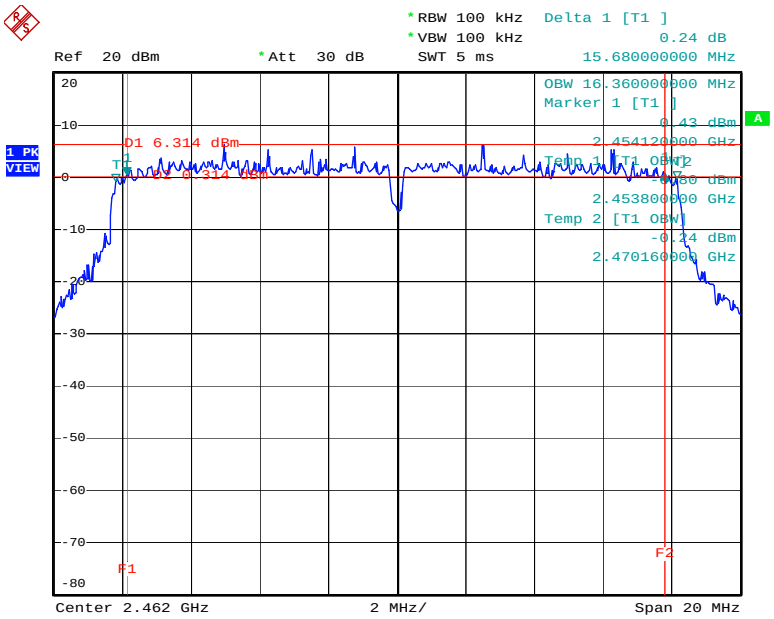
Modulation Type: OFDM (Channel 11)：



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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

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: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
DSSS	01	2412 MHz	23.97	27
DSSS	06	2437 MHz	23.72	27
DSSS	11	2462 MHz	23.19	27
OFDM	01	2412 MHz	19.76	27
OFDM	06	2437 MHz	19.23	27
OFDM	11	2462 MHz	18.96	27

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

Table on section 6.

5.3.3. Description of Major Test Instruments Setting

- **Spectrum Analyzer** : R&S FSP30
  Attenuation : Auto
  Center Frequency : 2412 MHz / 2437 MHz / 2462 MHz
  Span Frequency : 1.5MHz
  RB : 3 kHz
  VB : 30 kHz
  Detector : Peak
  Trace : Max Hold
  Sweep Time : 500s

5.3.4. Test Procedures

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

5.3.5. Test Setup Layout

5.3.6. Test Criteria

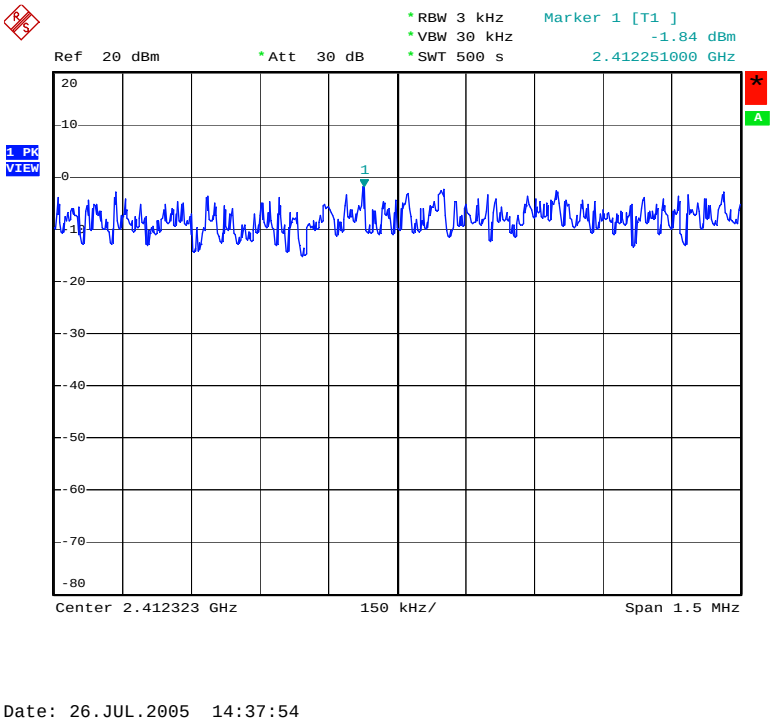
All test results complied with the requirements of 15.247(e). Measurement Uncertainty is 1.5dB.

5.3.7. Test Result

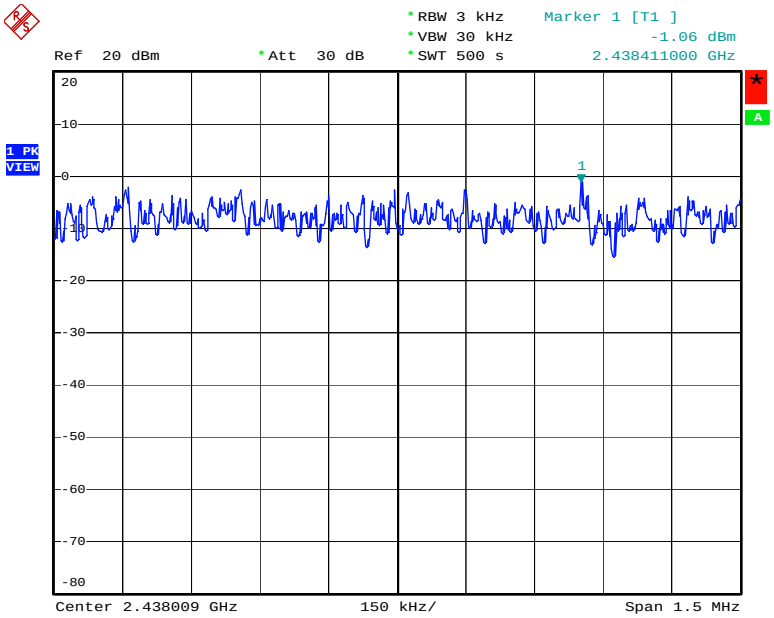
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	Power Density (dBm)	Limits (dBm)
DSSS	01	2412 MHz	-1.84	8
DSSS	06	2437 MHz	-1.06	8
DSSS	11	2462 MHz	-1.72	8
OFDM	01	2412 MHz	-8.12	8
OFDM	06	2437 MHz	-8.16	8
OFDM	11	2462 MHz	-8.53	8

Modulation Type: DSSS (Channel 01)：



Modulation Type: DSSS (Channel 06) :



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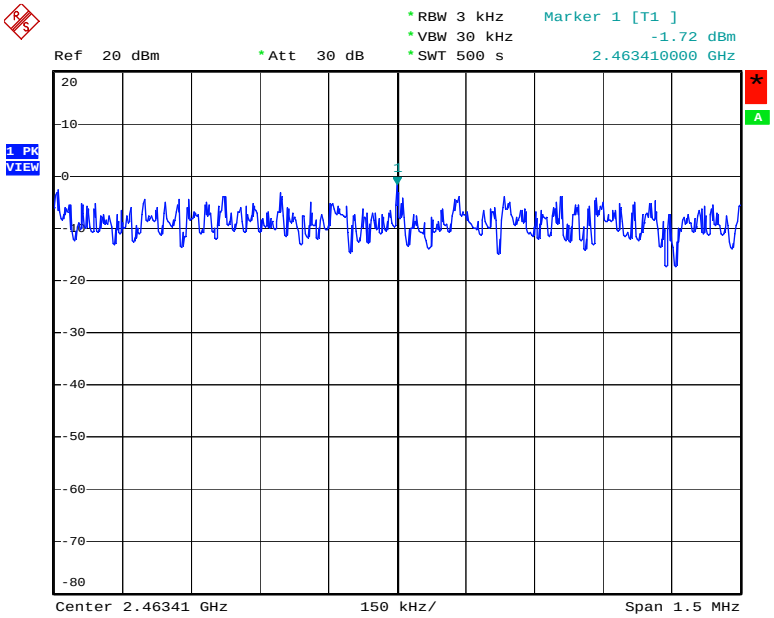
Modulation Type: DSSS (Channel 11) :



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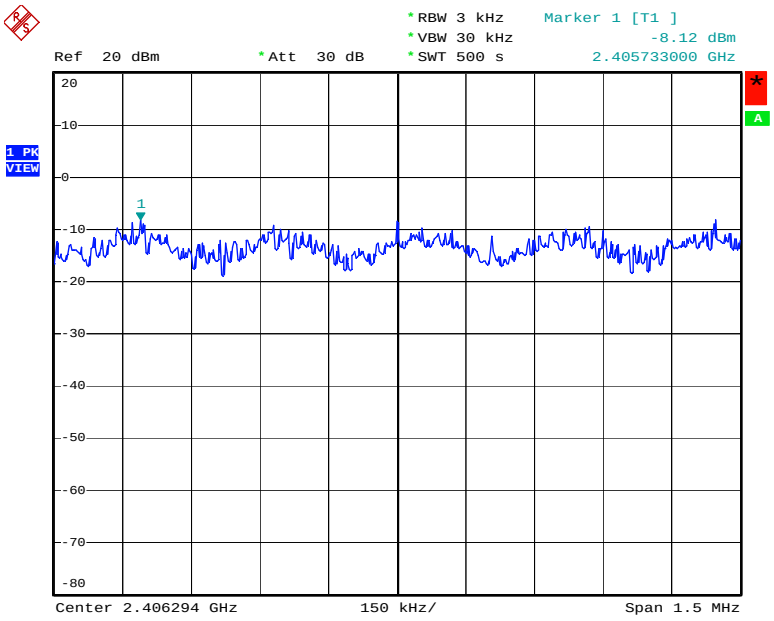
Modulation Type: OFDM (Channel 01)：



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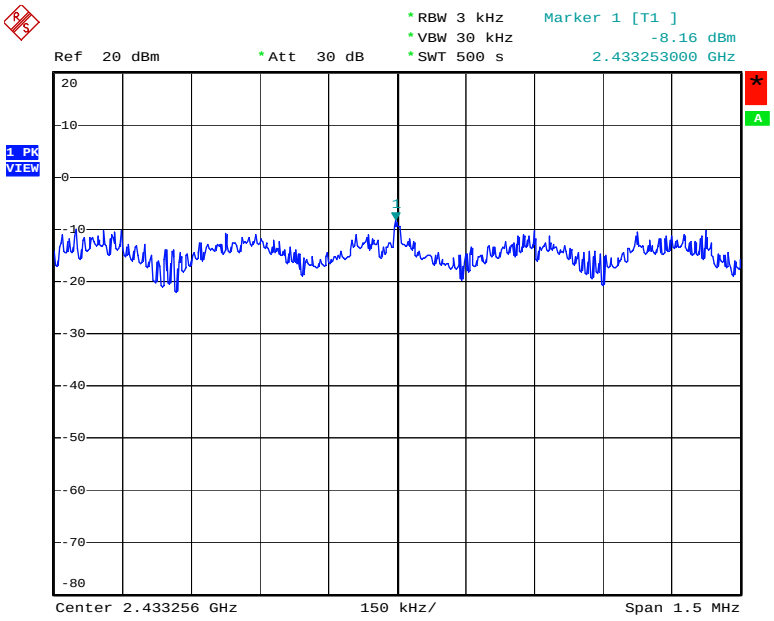
Modulation Type: OFDM (Channel 06)：



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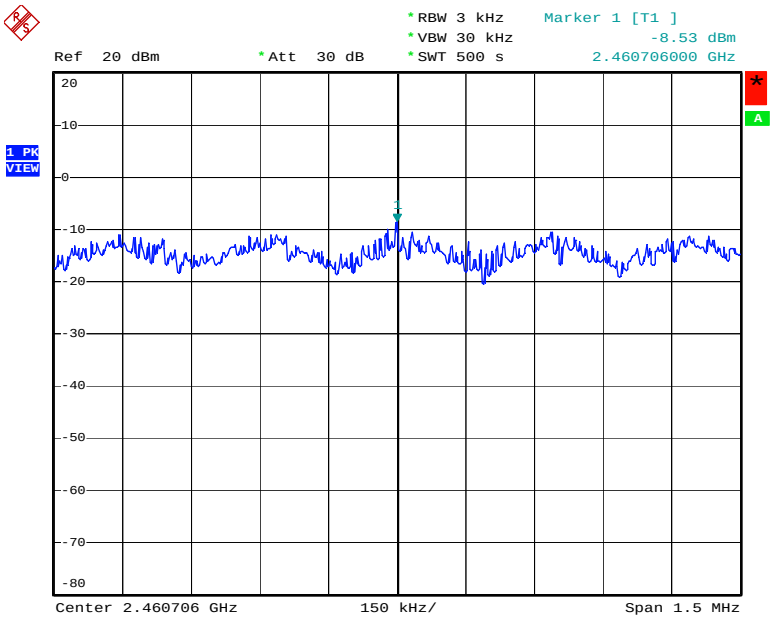
Modulation Type: OFDM (Channel 11)：



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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

Table on section 6.

5.4.3. 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

5.4.4. Test Procedures and Test Instruments Setting

Conducted Measurement

8. The transmitter is set to the lowest channel.
9. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
10. 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.
11. The lowest band edges emission was measured and recorded.

12.The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement

13.Configure the EUT according to ANSI C63.4-2003.

14.The turntable was rotated by 360 degrees to determine the position of the highest radiation.

15.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.

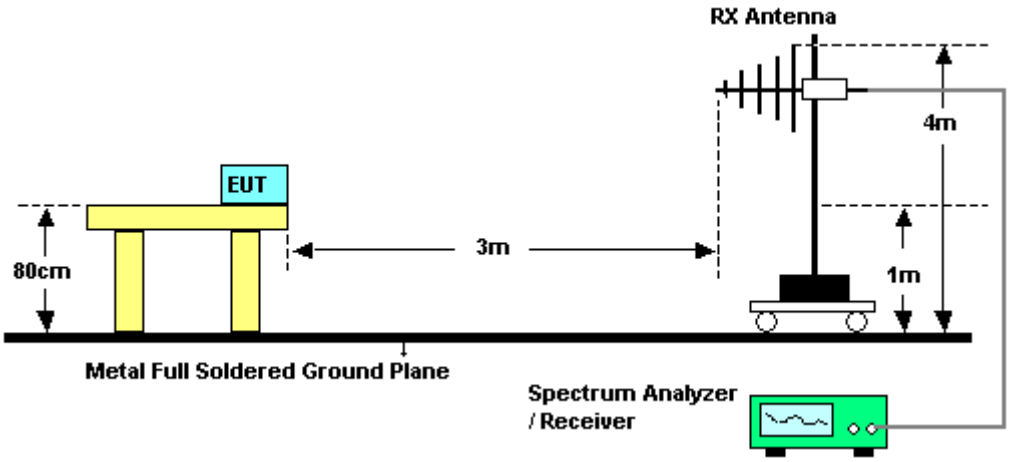
16.For band edge emission, the antenna tower was scan (from 1 M to 4 M) and then the turn table was rotated (from 0 degree to 360 degrees) to find the maximum reading.

17.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.

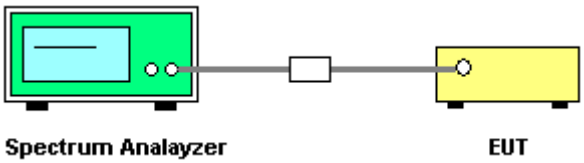
18.Repeated item 2~5.

5.4.5. Test Setup

Radiated Method



Conducted Method



5.4.6. Test Criteria

All test results complied with the requirements of 15.247(d). Measurement Uncertainty is $1x10^{-5}$.

5.4.7. Test Result of Radiated Emission

- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu
- Modulation Type: DSSS
- Test Channel: CH 01 / 2412 MHz
- Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2390.000	47.50	-6.50	54.00	28.13	2.00	0.00	17.37	VERTICAL	AVERAGE
2 !	2390.000	68.14	-5.86	74.00	28.13	2.00	0.00	38.00	VERTICAL	PEAK

- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu
- Modulation Type: DSSS
- Test Channel: CH 11 / 2462 MHz
- Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	2483.500	49.47	-4.53	54.00	28.36	2.04	0.00	19.07	VERTICAL	AVERAGE
2 X	2483.500	63.51	-10.49	74.00	28.36	2.04	0.00	33.11	VERTICAL	PEAK

- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu
- Modulation Type: OFDM
- Test Channel: CH 01 / 2412 MHz
- Polarization: Vertical

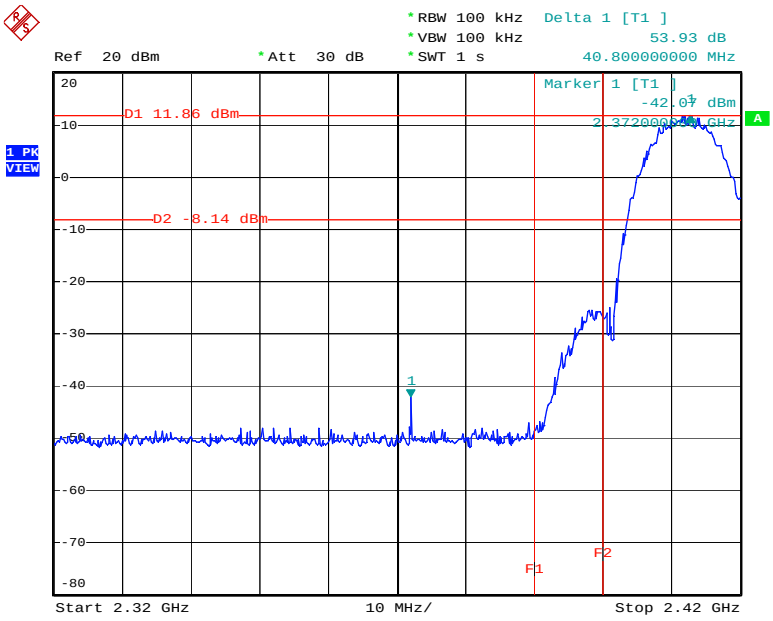
	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2390.000	46.62	-7.38	54.00	28.13	2.00	0.00	16.48	VERTICAL	AVERAGE
2	2390.000	63.49	-10.51	74.00	28.13	2.00	0.00	33.36	VERTICAL	PEAK

- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu
- Modulation Type: OFDM
- Test Channel: CH 11 / 2462 MHz
- Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	2483.500	70.06	-3.94	74.00	28.36	2.04	0.00	39.66	VERTICAL	PEAK
2 X	2483.500	52.13	-1.87	54.00	28.36	2.04	0.00	21.73	VERTICAL	AVERAGE

Test Result of Conducted Emission

Modulation Type: DSSS (Channel 01)：



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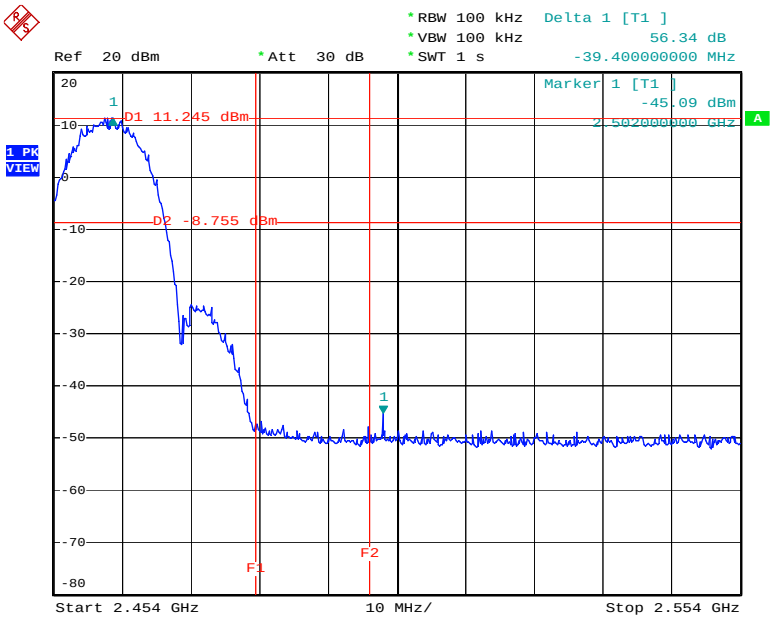
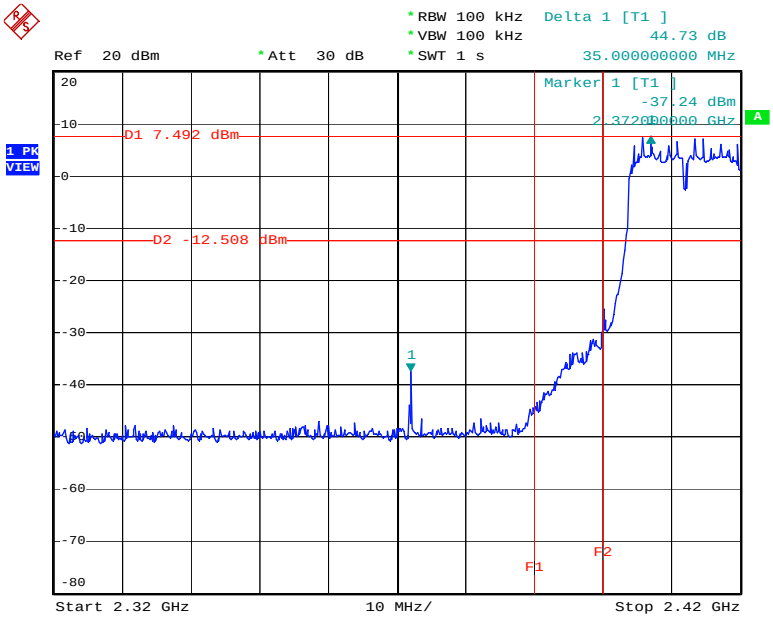


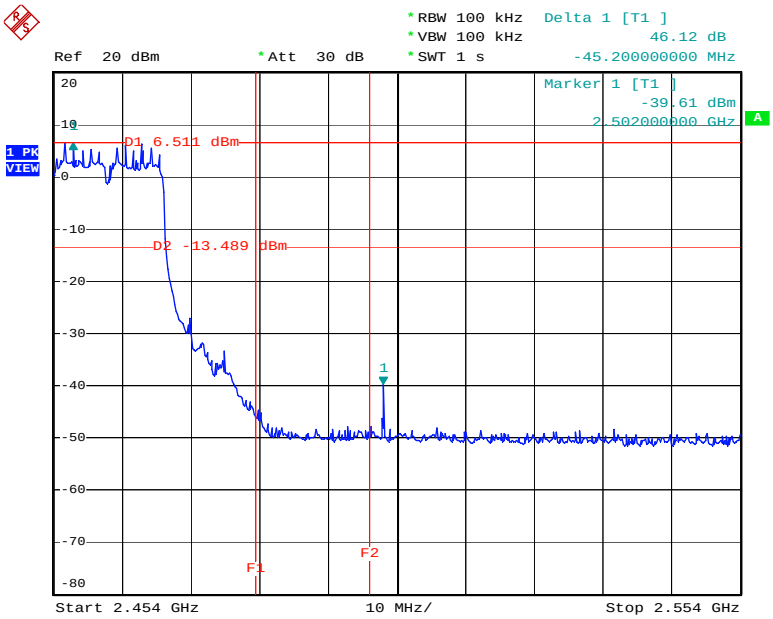
Date: 26.JUL.2005 14:41:22

Modulation Type: OFDM (Channel 01)：



Date: 26.JUL.2005 14:32:59

Modulation Type: OFDM (Channel 11)：



Date: 26.JUL.2005 14:34:36

5.5. Test of AC Power Line Conducted Emission

5.5.1. Applicable Standard

Section 15.207: For a Low-power Radio-frequency Device is designed to be connected to the AC power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed below limits table.

Frequency (MHz)	QP Limit (dBuV)	AV Limit (dBuV)
0.15~0.5	66~56	56~46
0.5~5	56	46
5~30	60	50

5.5.2. Measuring Instruments

Please refer to table on section 6.

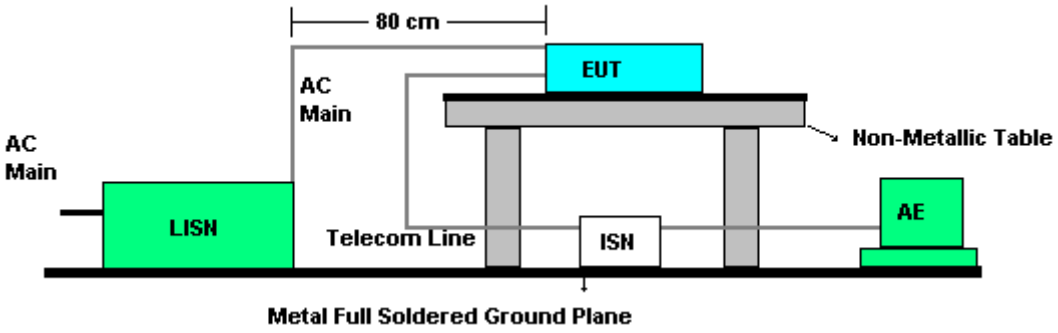
5.5.3. Description of Major Test Instruments Setting

- Test Receiver : R&S ESCS 30
  Attenuation : 10 dB
  Start Frequency : 0.15 MHz
  Stop Frequency : 30 MHz
  IF Bandwidth : 9 KHz

5.5.4. Test Procedures

19. Configure the EUT according to ANSI C63.4-2003.
20. 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.
21. Connect EUT to the power mains through a line impedance stabilization network (LISN)
22. All the support units are connected to the other LISNs. The LISN should provide 50uH/50ohms coupling impedance.
23. The frequency range from 150 KHz to 30 MHz was searched.
24. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
25. 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.

5.5.5. Test Setup Layout



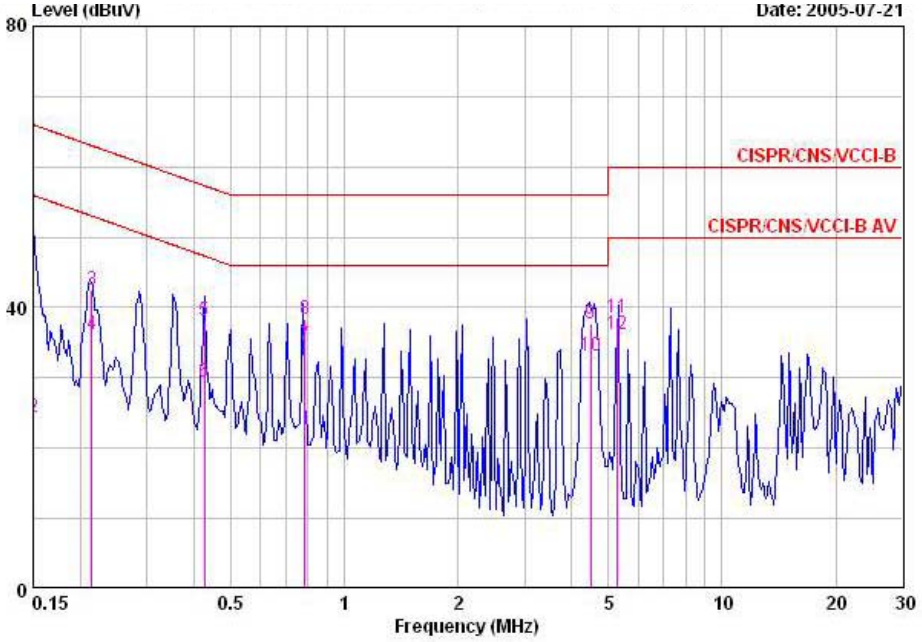
5.5.6. Test Criteria

All test results complied with the requirements of 15.207. Measurement Uncertainty is 2.26dB.

5.5.7. Test Result of Conducted Emission

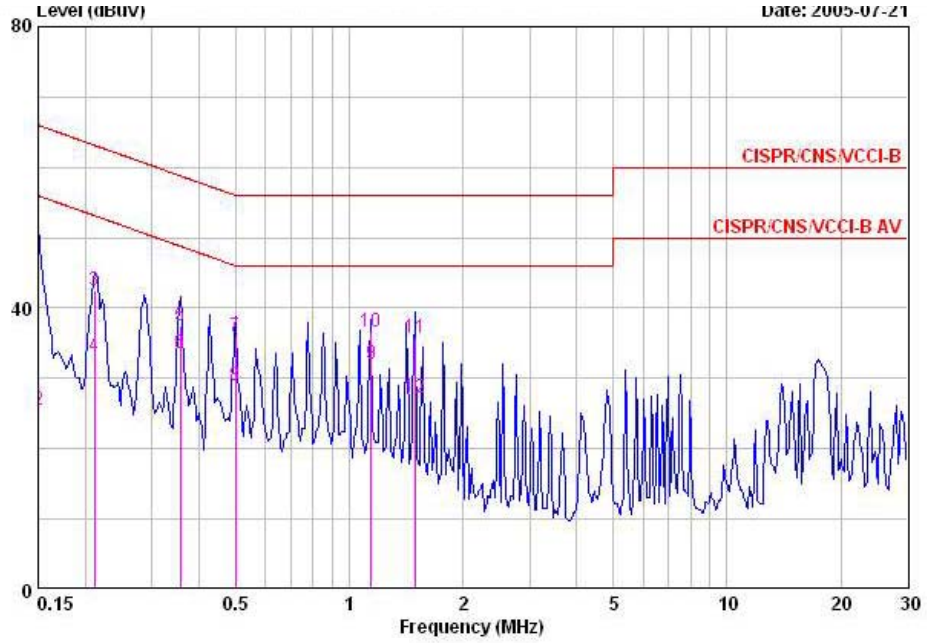
- Temperature: 28°C
- Relative Humidity: 60%
- Test Engineer: Steven Lu
- Modulation Type: OFDM
- Test Channel: CH 06 / 2437 MHz

Line to Ground



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15000	43.67	-22.33	66.00	41.47	2.00	0.20	QP
2	0.15000	24.41	-31.59	56.00	22.21	2.00	0.20	AVERAGE
3	0.21467	42.46	-20.56	63.02	41.11	1.15	0.20	QP
4	0.21467	36.20	-16.82	53.02	34.85	1.15	0.20	AVERAGE
5	0.42599	38.12	-19.21	57.33	37.42	0.50	0.20	QP
6	0.42599	29.49	-17.84	47.33	28.79	0.50	0.20	AVERAGE
7 @	0.78444	34.62	-11.38	46.00	34.12	0.30	0.20	AVERAGE
8	0.78444	38.29	-17.71	56.00	37.79	0.30	0.20	QP
9	4.487	37.67	-18.33	56.00	37.07	0.30	0.30	QP
10	4.487	33.15	-12.85	46.00	32.55	0.30	0.30	AVERAGE
11	5.268	38.54	-21.46	60.00	37.94	0.30	0.30	QP
12	5.268	36.09	-13.91	50.00	35.49	0.30	0.30	AVERAGE

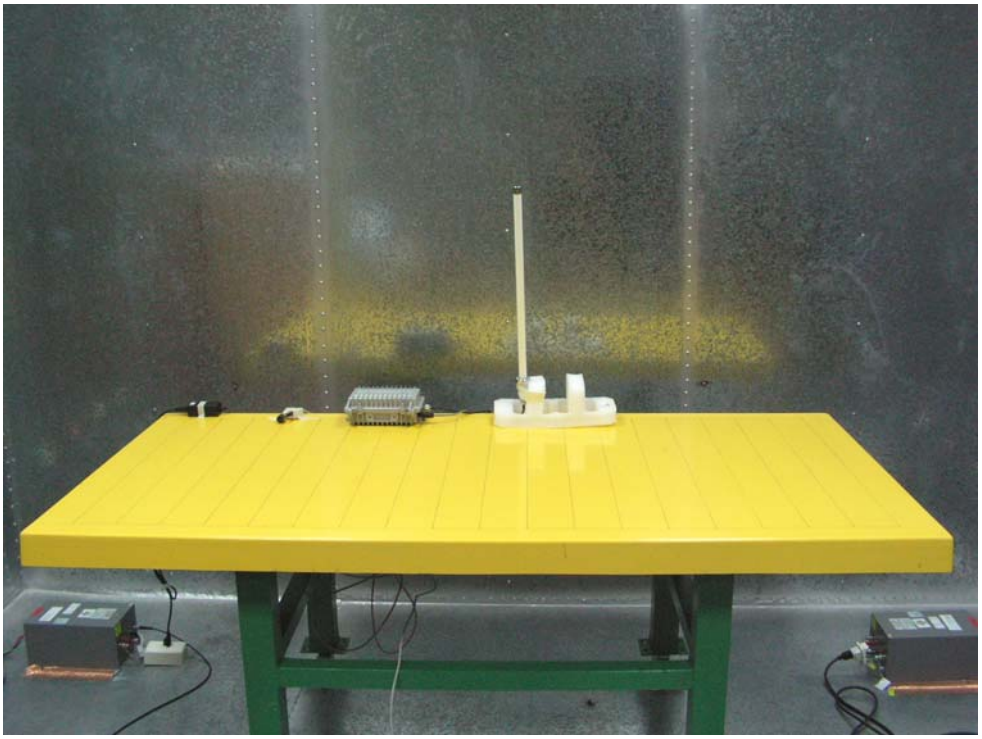
Neutral to Ground



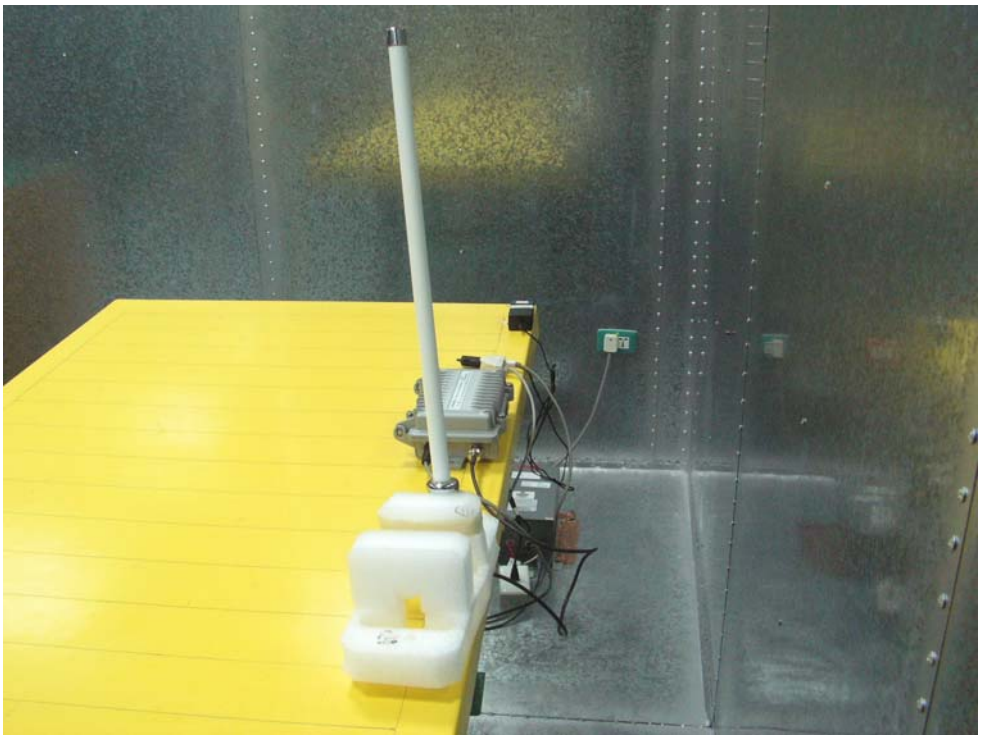
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15000	43.82	-22.18	66.00	41.72	1.90	0.20	QP
2	0.15000	25.46	-30.54	56.00	23.36	1.90	0.20	AVERAGE
3	0.21167	42.42	-20.72	63.14	41.13	1.09	0.20	QP
4	0.21167	33.12	-20.02	53.14	31.83	1.09	0.20	AVERAGE
5	0.35765	37.46	-21.32	58.78	36.66	0.60	0.20	QP
6	0.35765	33.59	-15.19	48.78	32.79	0.60	0.20	AVERAGE
7	0.49937	35.91	-20.10	56.01	35.41	0.30	0.20	QP
8	0.49937	29.04	-16.97	46.01	28.54	0.30	0.20	AVERAGE
9 @	1.142	32.05	-13.95	46.00	31.58	0.30	0.17	AVERAGE
10	1.142	36.66	-19.34	56.00	36.19	0.30	0.17	QP
11	1.498	35.65	-20.35	56.00	35.25	0.30	0.10	QP
12	1.498	27.33	-18.67	46.00	26.93	0.30	0.10	AVERAGE

5.5.8. Photographs of Conducted Emission Test Configuration

FRONT VIEW



REAR VIEW



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 refer to table on section 6.

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

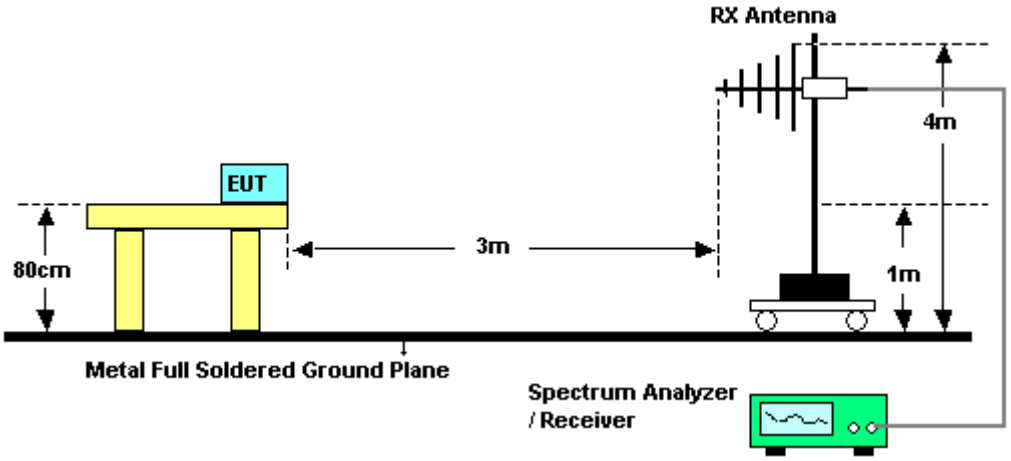
- **Test Receiver** : R&S ESCS 30
  Attenuation : Auto
  Start Frequency : 9 KHz
  Stop Frequency : 1000 MHz
  RB : 120 KHz for QP or PK

5.6.4. Test Procedures

26. Configure the EUT according to ANSI C63.4-2003.
27. The EUT was placed on the top of the turntable 0.8 meter above ground.
28. 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.
29. Power on the EUT and all the supporting units.
30. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
31. 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.
32. 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.
33. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
34. For emission above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.

35. 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.
36. 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. All test results complied with the requirements of 15.247(d). Measurement Uncertainty is 2.54dB.

5.6.7. Test results for CH06/ 2437MHz (For Emissions below 30MHz)

Temperature	28℃	**Humidity**	60%
Test Engineer	Steven Lu		

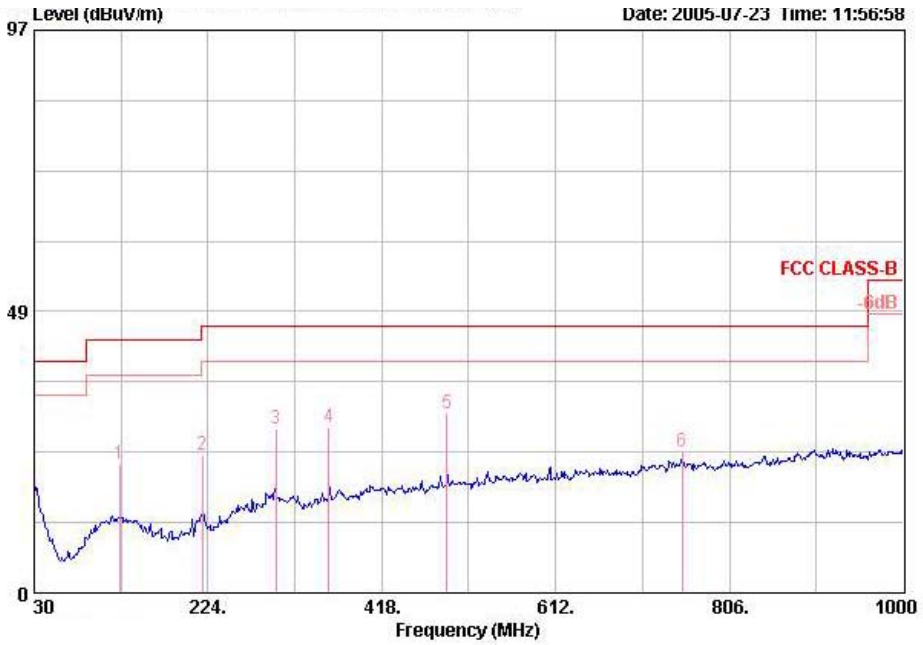
Freq. (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:
The amplitude of spurious emissions that are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

5.6.8. Test Results for CH 06 / 2437 MHz (for emission below 1GHz)

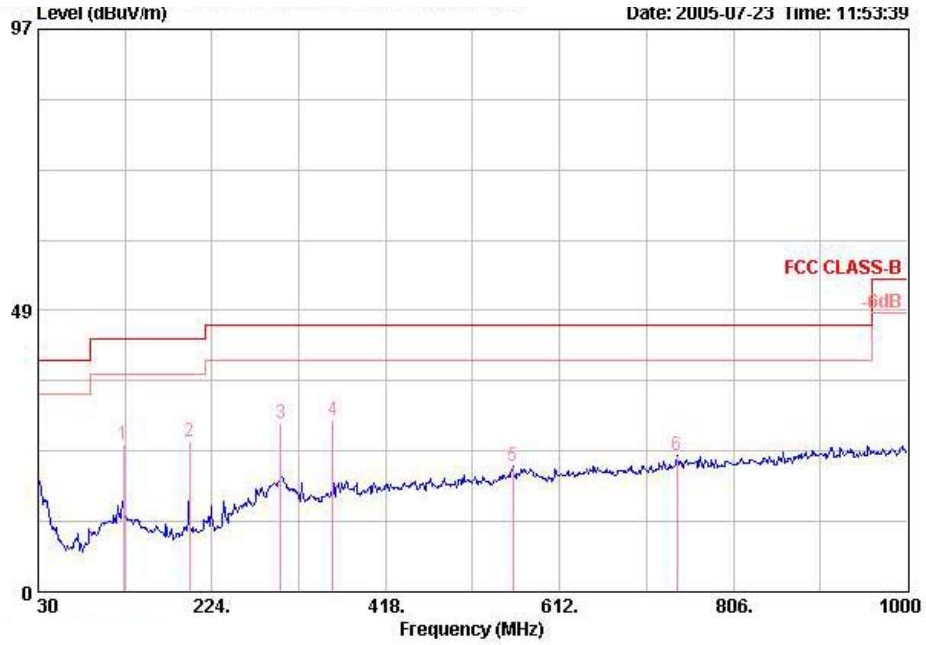
- Modulation Type: OFDM
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	125.060	22.33	-21.17	43.50	11.85	0.89	30.03	39.62	HORIZONTAL	Peak
2	218.180	23.89	-22.11	46.00	8.44	1.16	30.01	44.30	HORIZONTAL	Peak
3	299.660	28.38	-17.62	46.00	13.00	1.37	30.16	44.17	HORIZONTAL	Peak
4	358.830	28.65	-17.35	46.00	14.76	1.50	30.57	42.96	HORIZONTAL	Peak
5	490.750	30.92	-15.08	46.00	17.21	1.75	30.57	42.53	HORIZONTAL	Peak
6	753.620	24.30	-21.70	46.00	19.91	2.16	30.07	32.30	HORIZONTAL	Peak

(B) Polarization: Vertical



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	125.060	25.42	-18.08	43.50	11.85	0.89	30.03	42.70	VERTICAL	Peak
2	198.780	26.03	-17.47	43.50	8.79	1.11	30.00	46.12	VERTICAL	Peak
3	300.630	28.97	-17.03	46.00	13.04	1.37	30.17	44.74	VERTICAL	Peak
4	358.830	29.65	-16.35	46.00	14.76	1.50	30.57	43.96	VERTICAL	Peak
5	559.620	21.67	-24.33	46.00	18.65	1.88	30.68	31.82	VERTICAL	Peak
6	742.950	23.48	-22.52	46.00	19.96	2.15	30.11	31.49	VERTICAL	Peak

Note:

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

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

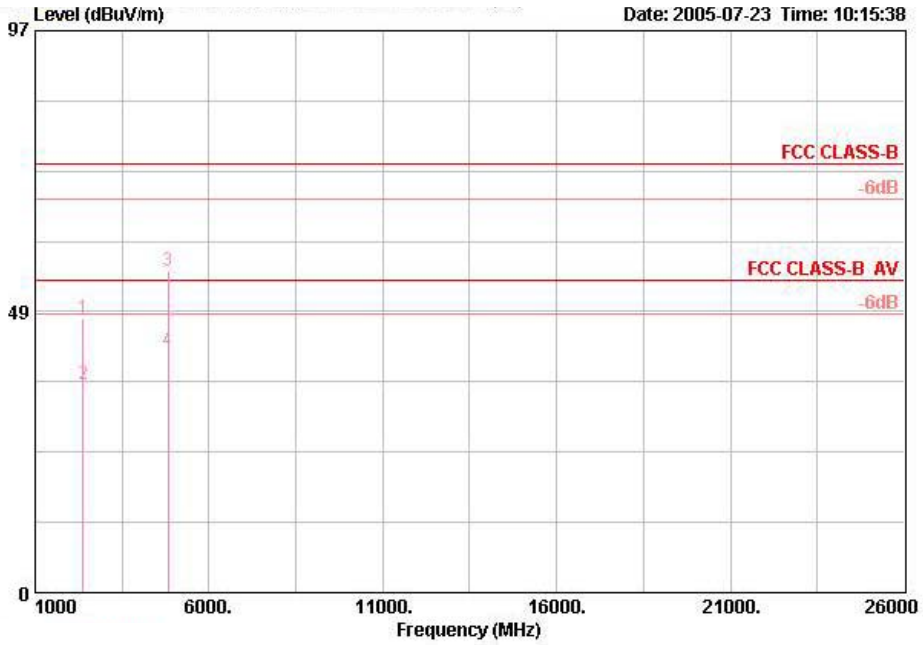
Results for the radiated measurement below 30MHz, no emissions found and caused by the EUT.

The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

5.6.9. Test Results for CH 01 / 2412 MHz (for emission above 1GHz)

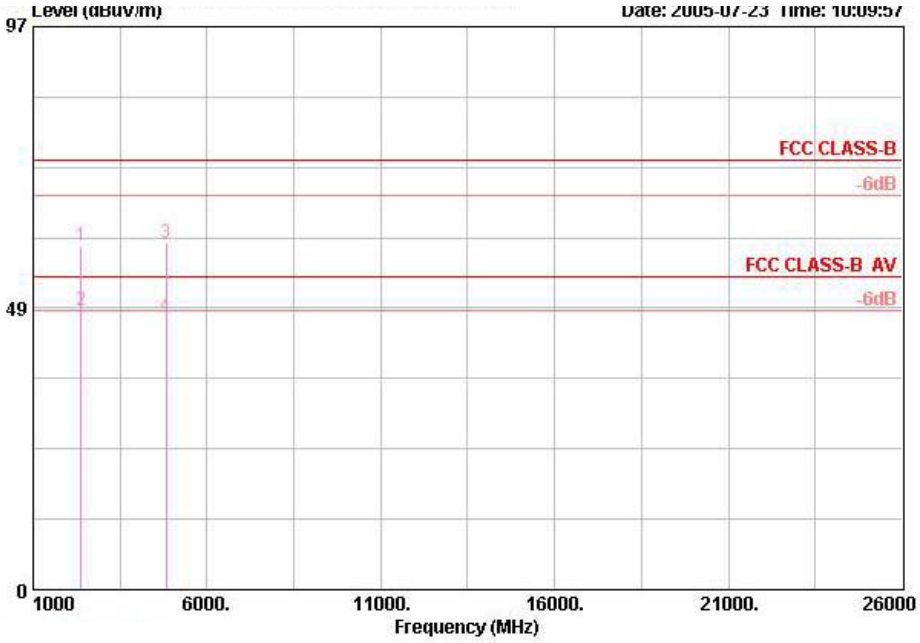
- Modulation Type: DSSS
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2371.900	47.38	-26.62	74.00	28.09	1.98	34.98	52.29	HORIZONTAL	PEAK
2	2371.980	36.01	-17.99	54.00	28.09	1.98	34.98	40.91	HORIZONTAL	AVERAGE
3	4823.860	55.39	-18.61	74.00	33.22	3.20	35.10	54.06	HORIZONTAL	PEAK
4	4824.320	41.76	-12.24	54.00	33.22	3.20	35.10	40.44	HORIZONTAL	AVERAGE

(B) Polarization: Vertical

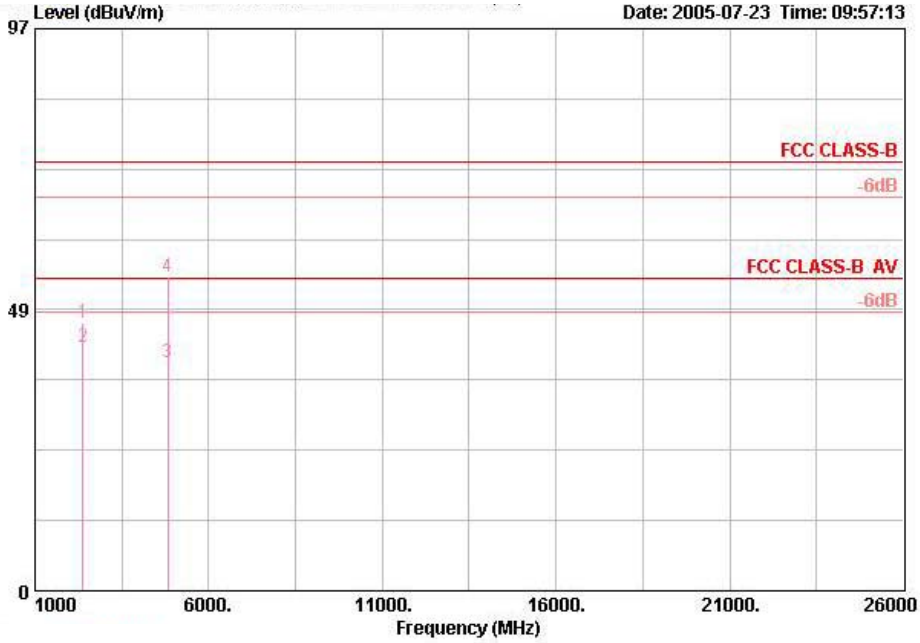


	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2371.960	59.12	-14.88	74.00	28.09	1.98	34.98	64.02	VERTICAL	PEAK
2 !	2371.970	48.22	-5.78	54.00	28.09	1.98	34.98	53.12	VERTICAL	AVERAGE
3	4824.110	59.68	-14.32	74.00	33.22	3.20	35.10	58.35	VERTICAL	PEAK
4	4824.550	46.93	-7.07	54.00	33.22	3.20	35.10	45.60	VERTICAL	AVERAGE

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

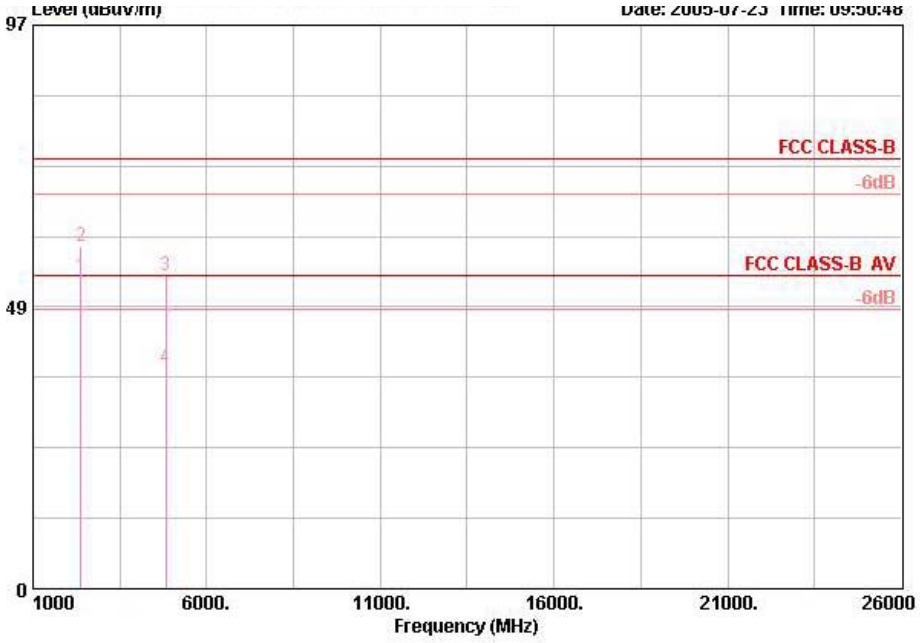
- Modulation Type: OFDM
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2371.960	46.36	-27.64	74.00	28.09	1.98	34.98	51.26	HORIZONTAL	PEAK
2	2371.960	41.90	-12.10	54.00	28.09	1.98	34.98	46.81	HORIZONTAL	AVERAGE
3	4823.860	39.50	-14.50	54.00	33.22	3.20	35.10	38.18	HORIZONTAL	Average
4	4823.860	54.30	-19.70	74.00	33.22	3.20	35.10	52.98	HORIZONTAL	Peak

(B) Polarization: Vertical



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 !	2371.960	53.56	-0.44	54.00	28.09	1.98	34.98	58.46	VERTICAL	AVERAGE
2	2371.960	58.91	-15.09	74.00	28.09	1.98	34.98	63.81	VERTICAL	PEAK
3	4824.300	53.87	-20.13	74.00	33.22	3.20	35.10	52.55	VERTICAL	Peak
4	4824.300	38.00	-16.00	54.00	33.22	3.20	35.10	36.68	VERTICAL	Average

Note:

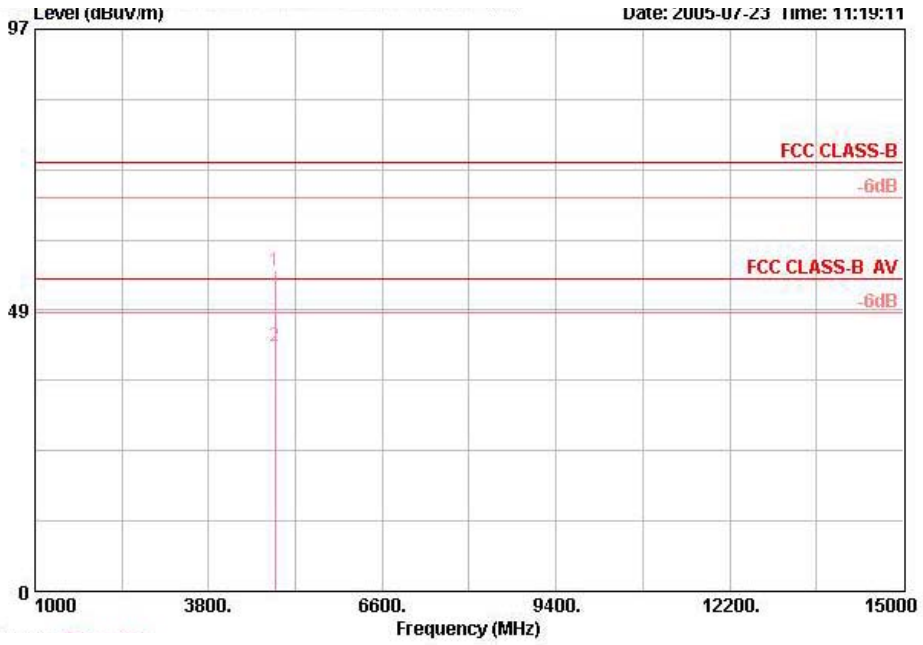
Emission level (dBuV/m) = 20 log Emission level (uV/m)

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

5.6.10. Test Results for CH 06 / 2437 MHz (for emission above 1GHz)

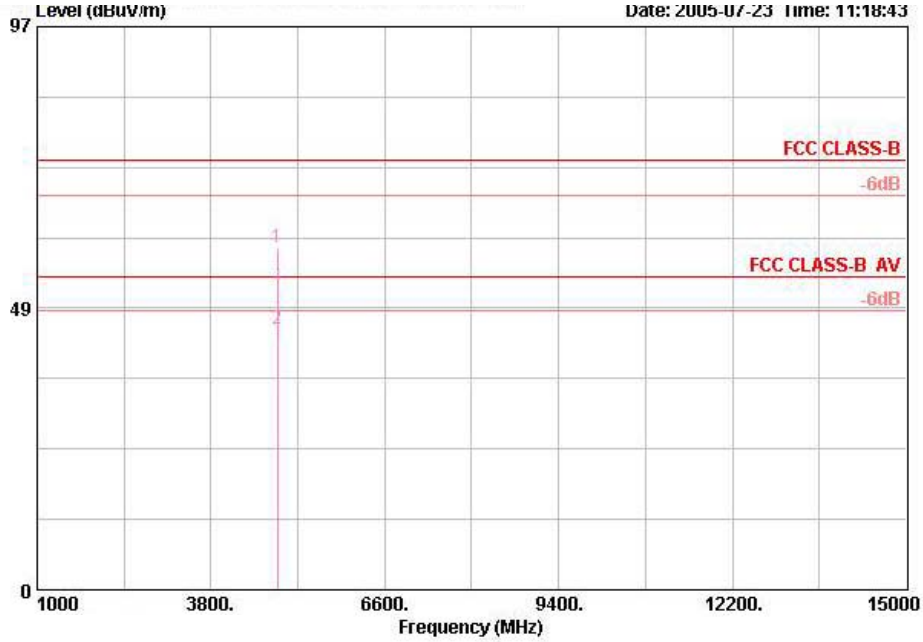
- Modulation Type: DSSS
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	4874.310	55.30	-18.70	74.00	33.33	3.22	35.10	53.85	HORIZONTAL	Peak
2	4874.310	42.30	-11.70	54.00	33.33	3.22	35.10	40.85	HORIZONTAL	Average

(B) Polarization: Vertical



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	4874.100	59.00	-15.00	74.00	33.33	3.22	35.10	57.55	VERTICAL	Peak
2	4874.100	45.00	-9.00	54.00	33.33	3.22	35.10	43.55	VERTICAL	Average

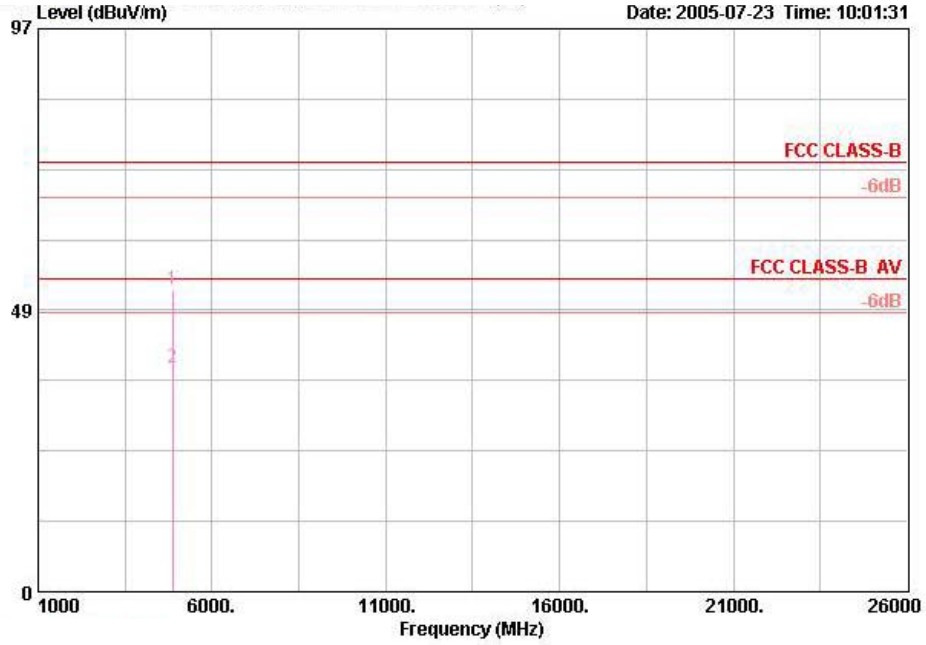
Note:

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

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

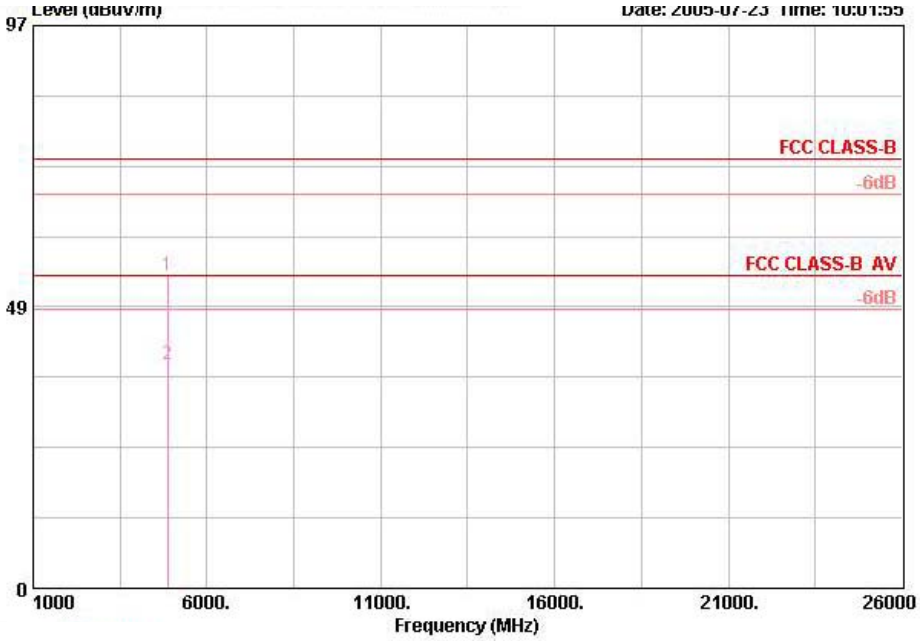
- Modulation Type: OFDM
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	4874.300	52.20	-21.80	74.00	33.33	3.22	35.10	50.75	HORIZONTAL	Peak
2	4874.300	38.50	-15.50	54.00	33.33	3.22	35.10	37.05	HORIZONTAL	Average

(B) Polarization: Vertical



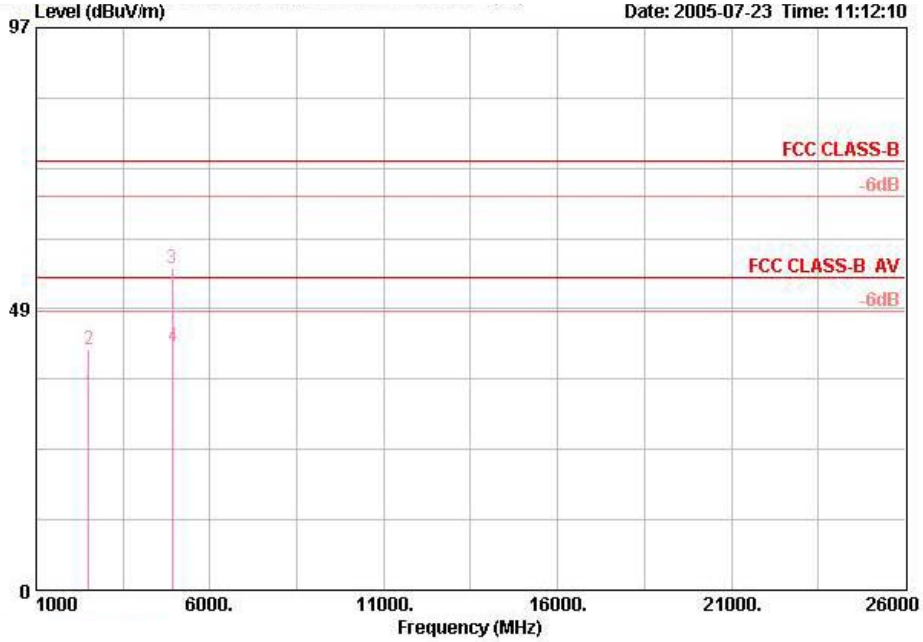
	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	4874.310	53.95	-20.05	74.00	33.33	3.22	35.10	52.50	VERTICAL	Peak
2	4874.310	38.67	-15.33	54.00	33.33	3.22	35.10	37.22	VERTICAL	Average

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

5.6.11. Test Results for CH 11 / 2462 MHz (for emission above 1GHz)

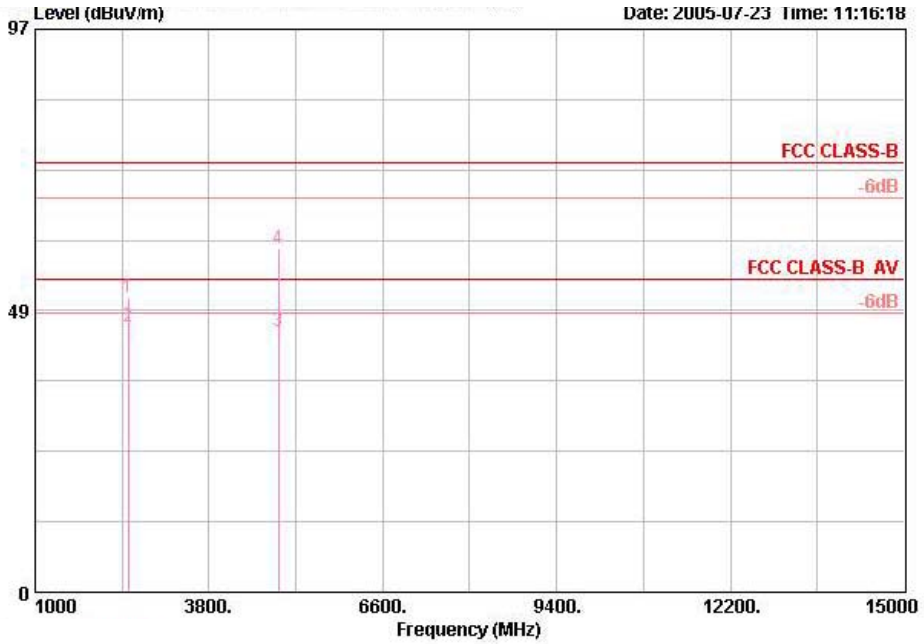
- Modulation Type: DSSS
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2502.020	33.76	-20.24	54.00	28.40	2.00	35.00	38.36	HORIZONTAL	AVERAGE
2	2502.020	41.50	-32.50	74.00	28.40	2.00	35.00	46.10	HORIZONTAL	PEAK
3	4923.880	55.42	-18.58	74.00	33.45	3.25	35.10	53.82	HORIZONTAL	PEAK
4	4924.400	42.08	-11.92	54.00	33.45	3.25	35.10	40.49	HORIZONTAL	AVERAGE

(B) Polarization: Vertical

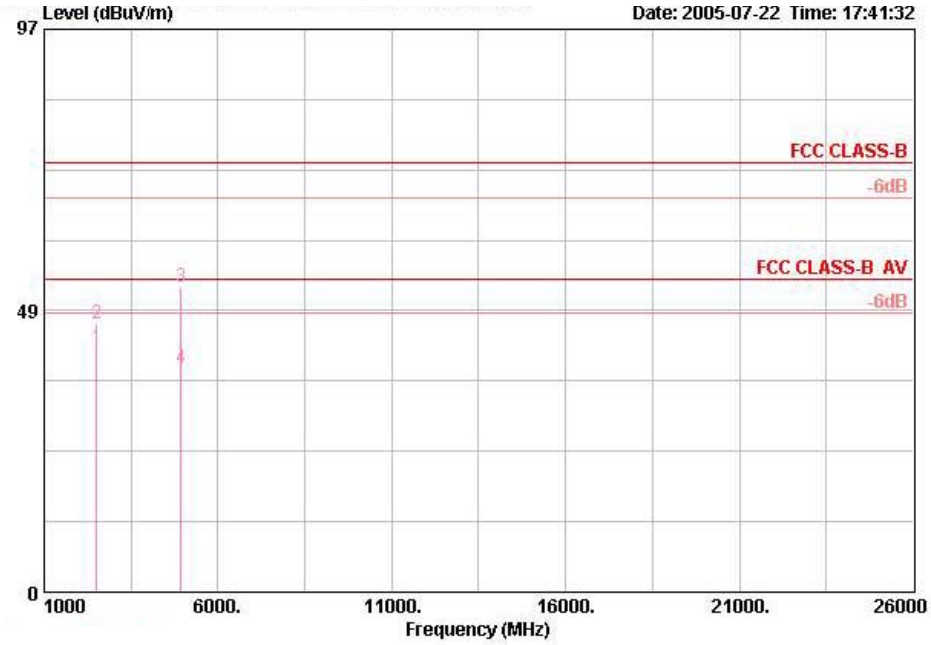


	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2501.980	50.72	-23.28	74.00	28.40	2.00	35.00	55.31	VERTICAL	PEAK
2	2501.980	45.85	-8.15	54.00	28.40	2.00	35.00	50.44	VERTICAL	AVERAGE
3	4923.480	45.04	-8.96	54.00	33.45	3.25	35.10	43.44	VERTICAL	AVERAGE
4	4923.920	59.17	-14.83	74.00	33.45	3.25	35.10	57.58	VERTICAL	PEAK

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

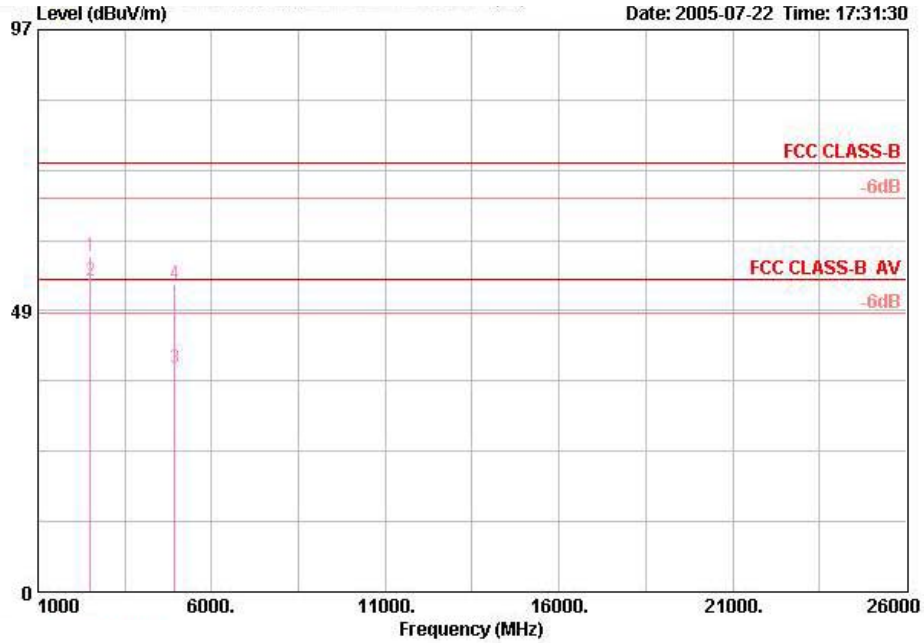
- Modulation Type: OFDM
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2501.970	41.97	-12.03	54.00	28.40	2.00	35.00	46.57	HORIZONTAL	AVERAGE
2	2502.040	46.38	-27.62	74.00	28.40	2.00	35.00	50.98	HORIZONTAL	PEAK
3	4924.320	52.72	-21.28	74.00	33.45	3.25	35.10	51.12	HORIZONTAL	PEAK
4	4925.920	38.69	-15.31	54.00	33.45	3.25	35.10	37.09	HORIZONTAL	AVERAGE

(B) Polarization: Vertical



	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	2501.920	57.97	-16.03	74.00	28.40	2.00	35.00	62.56	VERTICAL	PEAK
2 !	2501.960	53.63	-0.37	54.00	28.40	2.00	35.00	58.23	VERTICAL	AVERAGE
3	4925.960	38.56	-15.44	54.00	33.45	3.25	35.10	36.96	VERTICAL	AVERAGE
4	4926.280	53.18	-20.82	74.00	33.45	3.25	35.10	51.59	VERTICAL	PEAK

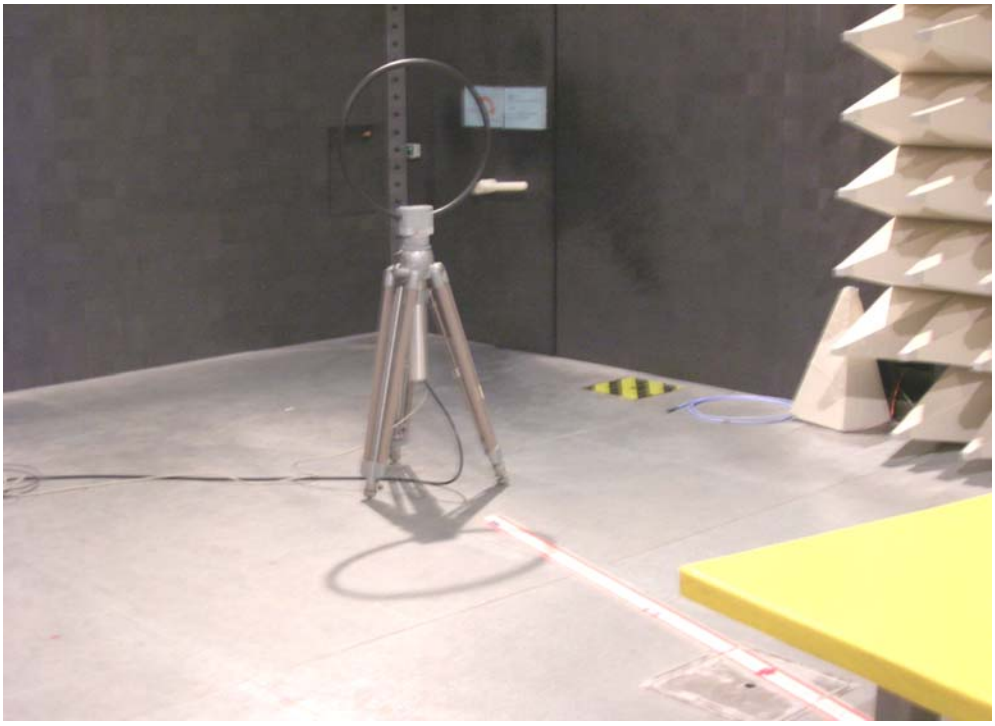
Note:

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

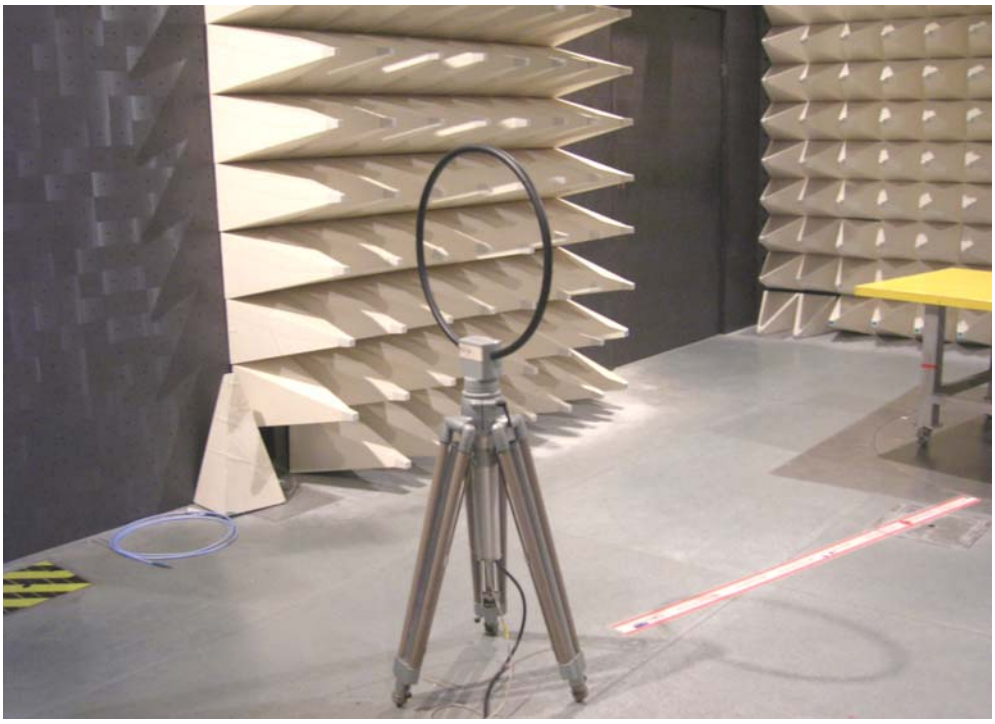
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

5.6.12. Photographs of Radiated Emission Test Configuration

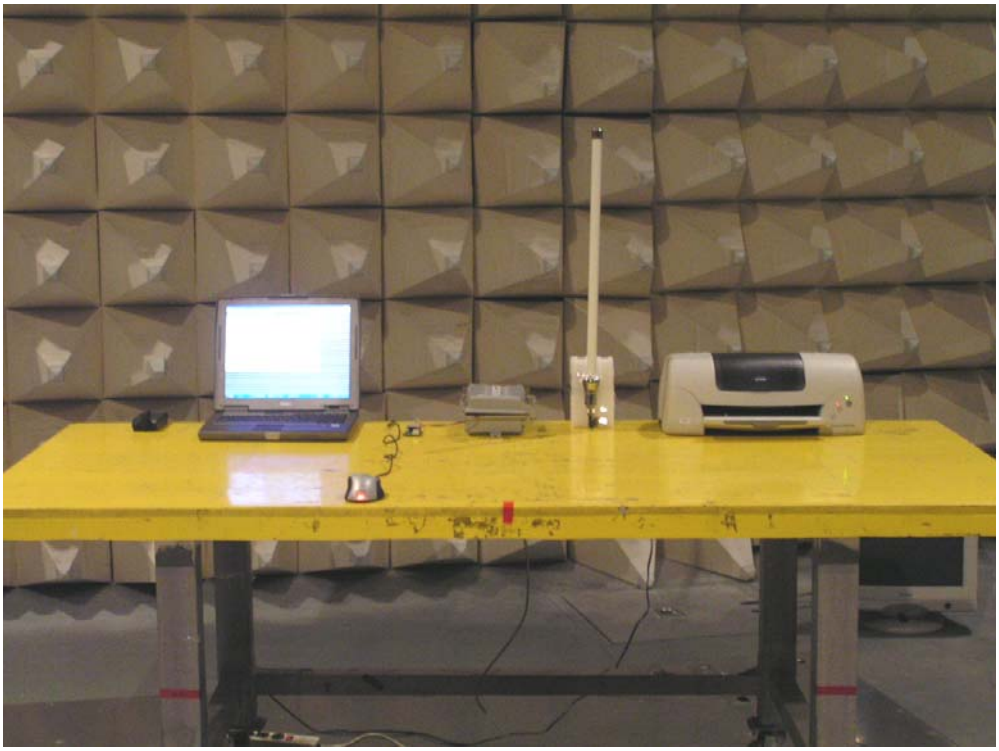
FRONT VIEW



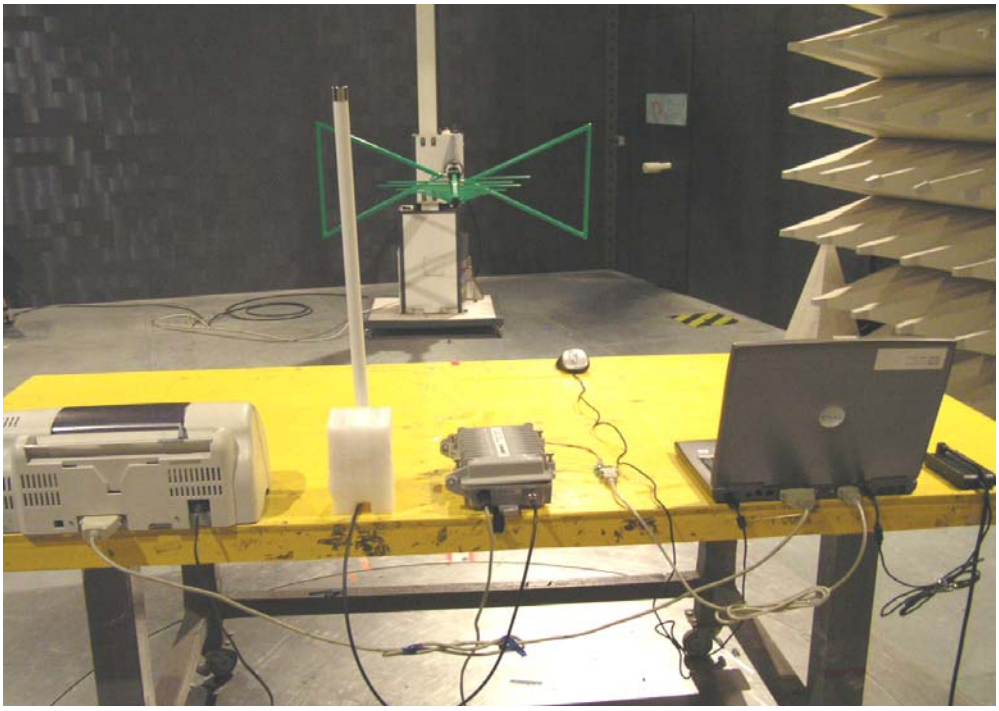
REAR VIEW



FRONT VIEW



REAR VIEW



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):

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

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

5.7.2. Antenna Connected Construction

N-type antenna connector is the connector for oudoor antenna.

Reverse SMA antenna connector is the connector for indoor antenna.

5.7.3. Antenna Gain

Antenna gain of EUT is more than 6dBi. Antenna report of manufacturer will have more detail antenna gain or antenna pattern.

5.7.4. 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/ cm²)	Averaging Time |E|²,|H|² 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/cm²)	Averaging Time |E|²,|H|² 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 (V/m) $= \frac{\sqrt{30 \times P \times G}}{d}$ Power Density: *Pd* (mW/cm²) $= \frac{E^2}{377}$

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 (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=20cm, as well as the gain of the used antenna, the RF power density can be obtained.

5.8.3. Calculated Result and Limit

- Modulation Type: DSSS
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

Channel No.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)
01	9.00	7.94	23.97	249.46	0.3943	**1**
06	9.00	7.94	23.72	235.50	0.3722	**1**
11	9.00	7.94	23.19	208.45	0.3294	**1**

- Modulation Type: OFDM
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Steven Lu

Channel No.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)
01	9.00	7.94	19.76	94.62	0.1495	**1**
06	9.00	7.94	19.23	83.75	0.1324	**1**
11	9.00	7.94	18.96	78.70	0.1244	**1**

6. List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Feb. 16, 2005	Conduction (CO04-HY)
LISN	MessTec	NNB-2/16Z	2001/004	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	99041	9kHz – 30MHz	May. 05, 2005	Conduction (CO04-HY)
RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz ~ 1GHz 3m	Jun. 16, 2005	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP40	100004	9KHZ ~ 40GHz	Aug. 31, 2004	Radiation (03CH03-HY)
Amplifier	SCHAFFNER	CPA9231A	18667	9KHz ~ 2GHz	Jan. 10, 2005	Radiation (03CH03-HY)
Amplifier	Agilent	8449B	3008A02120	1GHz ~ 26.5GHz	May 31, 2005	Radiation (03CH03-HY)
Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz ~ 200MHz	Jul. 22, 2005	Radiation (03CH03-HY)
Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz ~ 1GHz	Jul. 22, 2005	Radiation (03CH03-HY)
Horn Antenna	EMCO	3115	6741	1GHz ~ 18GHz	Apr. 22, 2005	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz ~ 1GHz	Feb. 22, 2005	Radiation (03CH03-HY)
RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1GHz ~ 40GHz	Dec.01, 2004	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
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.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Amplifier	MITEQ	AMF-6F-260400	923364	26.5GHz ~ 40GHz	Jan. 05, 2004*	Radiation (03CH03-HY)
Loop Antenna	R&S	HFH2-Z2	860004/001	9kHz ~ 30MHz	May 24, 2004*	Radiation (03CH03-HY)
Horn Antenna	SCHWARZBECK	BBHA9170	BBHA9170154	15GHz ~ 40GHz	Jun. 09, 2004*	Radiation (03CH03-HY)

※ Calibration Interval of instruments listed above is two year.

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum analyzer	R&S	FSP30	100023	9kHz ~ 30GHz	Aug. 02, 2004	Conducted (TH01-HY)
Power meter	R&S	NRVS	100444	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
Power sensor	R&S	NRV-Z55	100049	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Apr. 28, 2005	Conducted (TH01-HY)
AC power source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Apr. 21, 2005	Conducted (TH01-HY)
DC power source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Nov. 28, 2004	Conducted (TH01-HY)
Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2004	Conducted (TH01-HY)
RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Jan. 01, 2005	Conducted (TH01-HY)
RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Jan. 01, 2005	Conducted (TH01-HY)
Oscilloscope	Tektronix	TDS1012	CO38515	100MHz / 1GS/s	Apr. 15, 2005	Conducted (TH01-HY)
Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Dec. 31, 2004	Conducted (TH01-HY)
Data Generator	Tektronix	DG2030	063-2920-50	0.1Hz~400MHz	Jun. 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 familial 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.

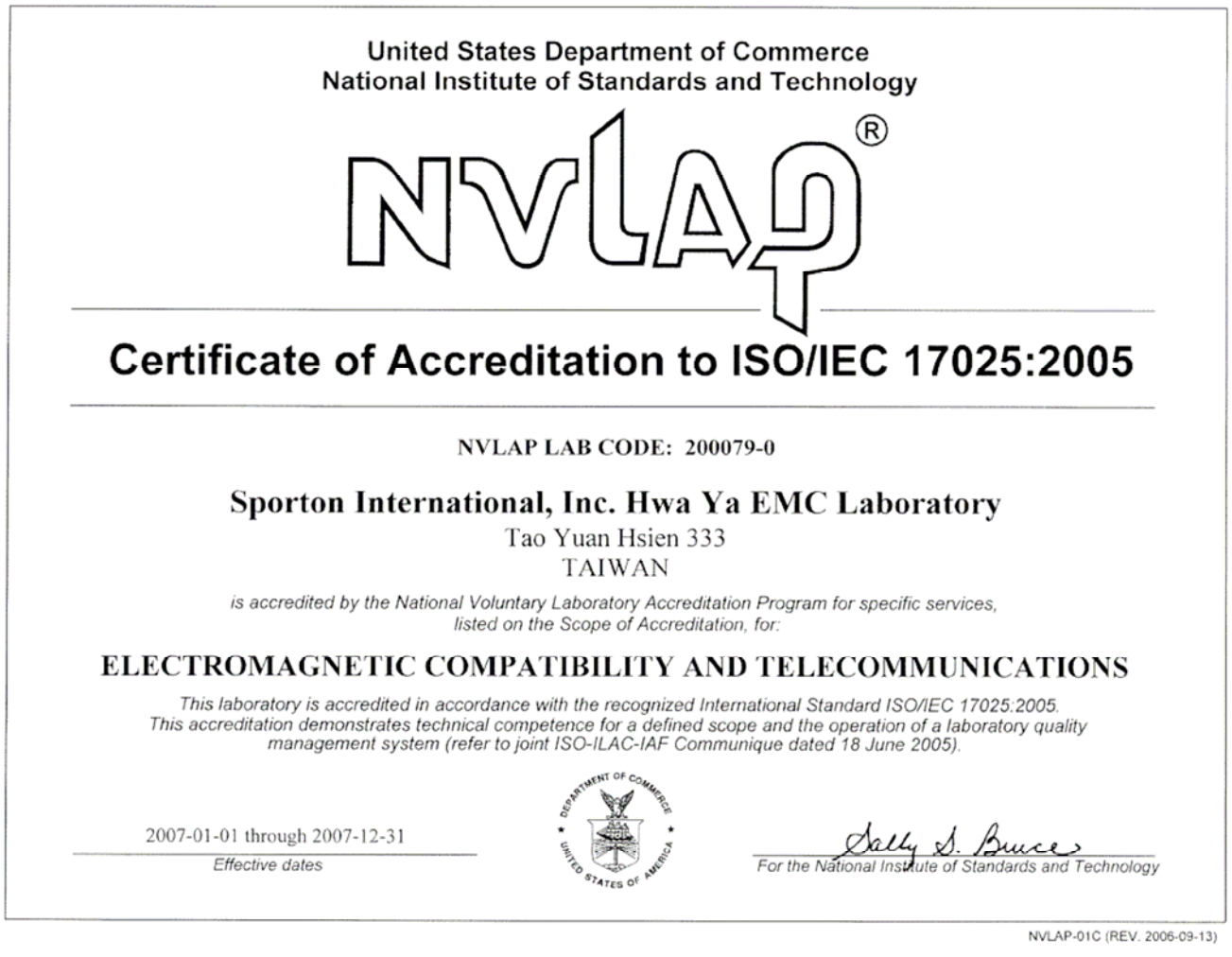
7.1. Certificate of Accreditation

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 2nd 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

NVLAP®

Certificate of Accreditation to ISO/IEC 17025:2005

NVLAP LAB CODE: 200079-0

Sporton International, Inc. Hwa Ya EMC Laboratory
Tao Yuan Hsien 333
TAIWAN

is accredited by the National Voluntary Laboratory Accreditation Program for specific services, listed on the Scope of Accreditation, for:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communique dated 18 June 2005).

2007-01-01 through 2007-12-31
Effective dates

Sally S. Bruce
For the National Institute of Standards and Technology

NVLAP-01C (REV. 2006-09-13)