FCC TEST REPORT

CATEGORY	:	Mobile
PRODUCT NAME	:	Connex QwikBridge
FCC ID.	:	S3W-CNX-QB-250-14
FILING TYPE	:	Certification
BRAND NAME	:	Connex QwikBridge
MODEL NAME	:	Connex QwikBridge
APPLICANT	:	**Pacific Wireless** 14575 South Centerpoint Way, Bluffdale UT 84065 USA
MANUFACTURER	:	ZINWELL CORPORATION 2,Wen-Hua Road, Hsinchu Industrial Park, Hsinchu Hsien, 303, Taiwan
ISSUED BY	:	**SPORTON INTERNATIONAL INC.** 6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

Statements:

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

Certificate or Test Report could not be used by the applicant to claim the product endorsement by 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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HISTORY OF THIS TEST REPORT

Received Date: Aug. 10, 2005
Test Date: Aug. 27, 2005
Original Report Issue Date: Aug. 30, 2005
Report No.: FR581009

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

with

47 CFR FCC Part 15 Subpart C

PRODUCT NAME	:	Connex QwikBridge
BRAND NAME	:	Connex QwikBridge
MODEL NAME	:	Connex QwikBridge
APPLICANT	:	**Pacific Wireless** 14575 South Centerpoint Way, Bluffdale UT 84065 USA
MANUFACTURER	:	ZINWELL CORPORATION 2,Wen-Hua Road, Hsinchu Industrial Park, Hsinchu Hsien, 303, Taiwan

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. 27, 2005 at SPORTON International Inc. LAB.

Wayne Hsu / Supervisor
Sporton International Inc.

1. General Description of Equipment under Test

1.1. Applicant

Pacific Wireless

14575 South Centerpoint Way, Bluffdale UT 84065 USA

1.2. Manufacturer

ZINWELL CORPORATION

2,Wen-Hua Road, Hsinchu Industrial Park, Hsinchu Hsien, 303, Taiwan

1.3. Basic Description of Equipment under Test

This product is a Wireless Bridge with 802.11b 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	DSSS (CCK / 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
Max. Conducted Output Power	21.39 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
Temperature Range (Operating)	-20 ~ 70 °C

1.5. Antenna Description

No.	Antenna Type	Gain (dBi)
1	Patch	14.00

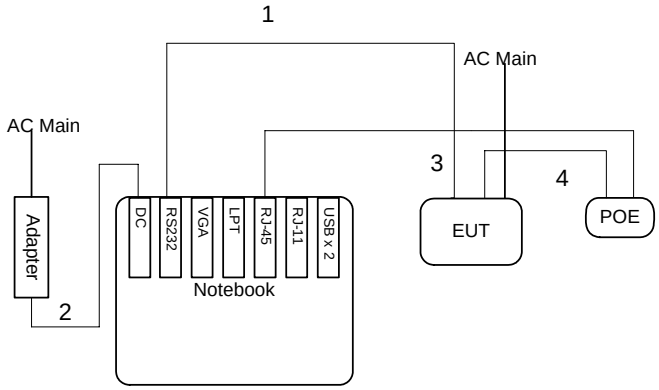
1.6. Table for Carrier Frequencies

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

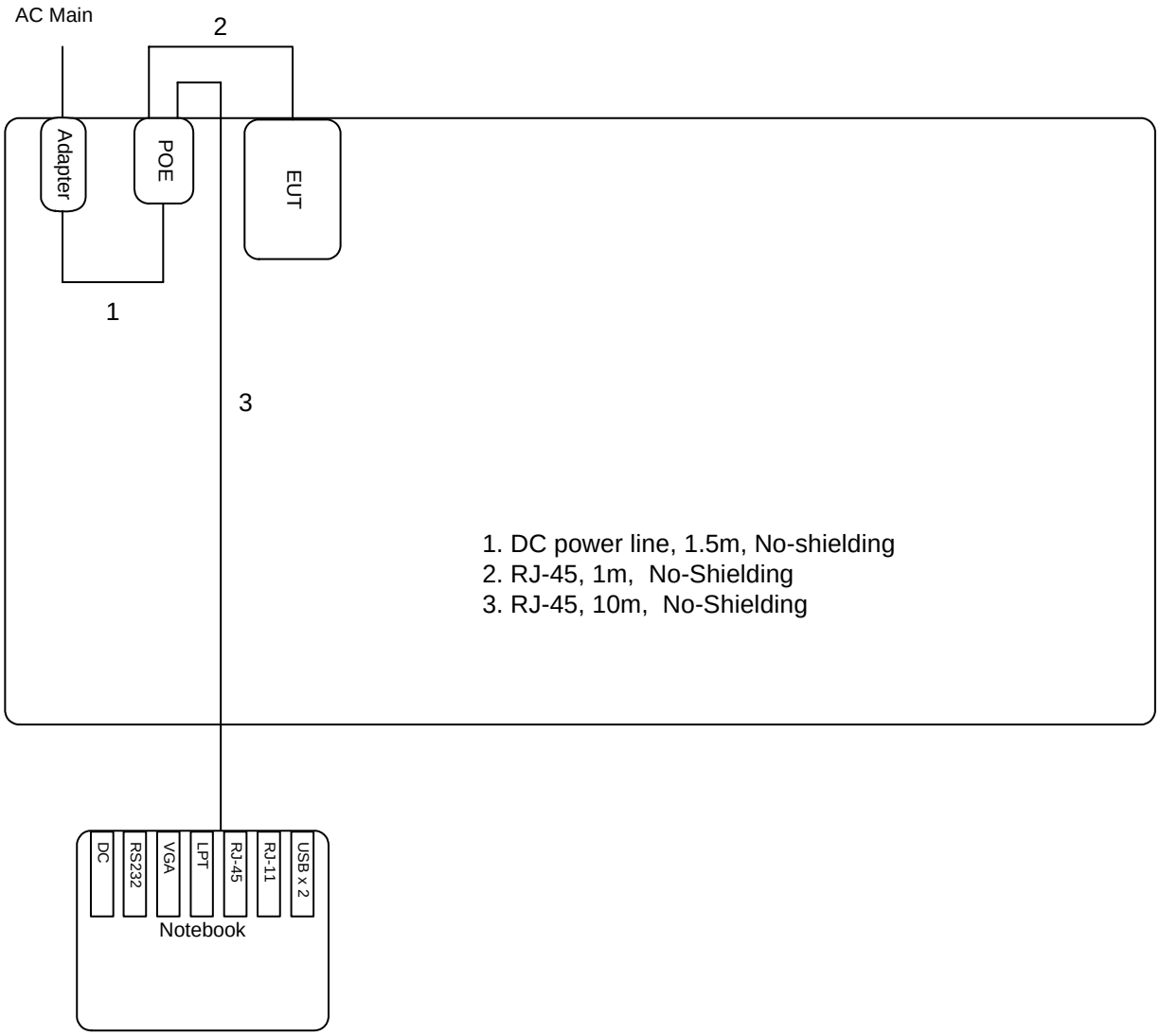
2.1. Test Configuration

Radiation Emissions Test Configuration



1. RS-232, 50cm,
2. DC power line, 1.5m, No-shielding
3. RJ-45, 1m, No-Shielding
4. RJ-45, 1m, No-Shielding

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. 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 and AC Conduction Emission is independent of channel selection and modulation types. So only channel 06 was tested.
4. For AC Conduction emission and Radiation Emission, the EUT was transmitting continuously.

2.3. Description of Test Supporting Units

Support unit	Brand	Model No.	FCC ID
Notebook	DELL	PP01L	DoC
POE	JET	SA06L48-V	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. Frequency Range Investigated

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

3.4. 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.

3.5. 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.

Test Software Version	ART			
Frequency	2412 MHz	2437 MHz	2462 MHz	Data Rate
IEEE 802.11b DSSS	3	6	6	11 Mbps

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.

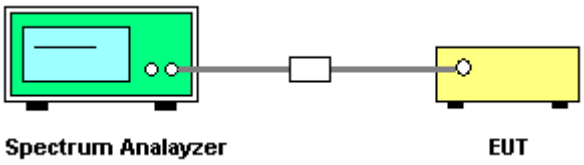
5.1.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
  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

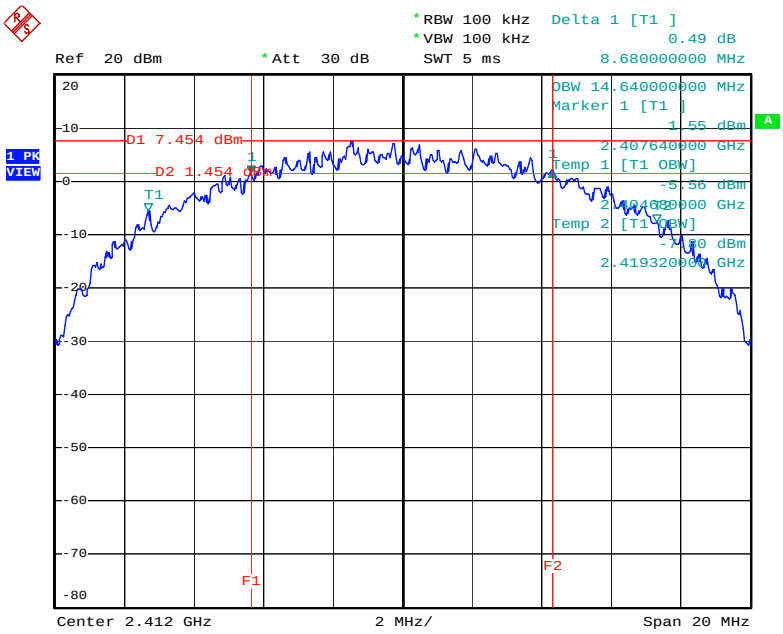
All test results complied with the requirements of 15.247(a)(2). Measurement Uncertainty is $1x10^{-5}$.

5.1.7. Test Result

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

Modulation Type	Channel No.	Frequency (MHz)	6dB Bandwidth	99% Bandwidth	Min. Limit
DSSS	01	2412 MHz	8.68	14.64	0.5
DSSS	06	2437 MHz	8.72	14.64	0.5
DSSS	11	2462 MHz	8.72	14.68	0.5

Modulation Type: DSSS (Channel 01)：



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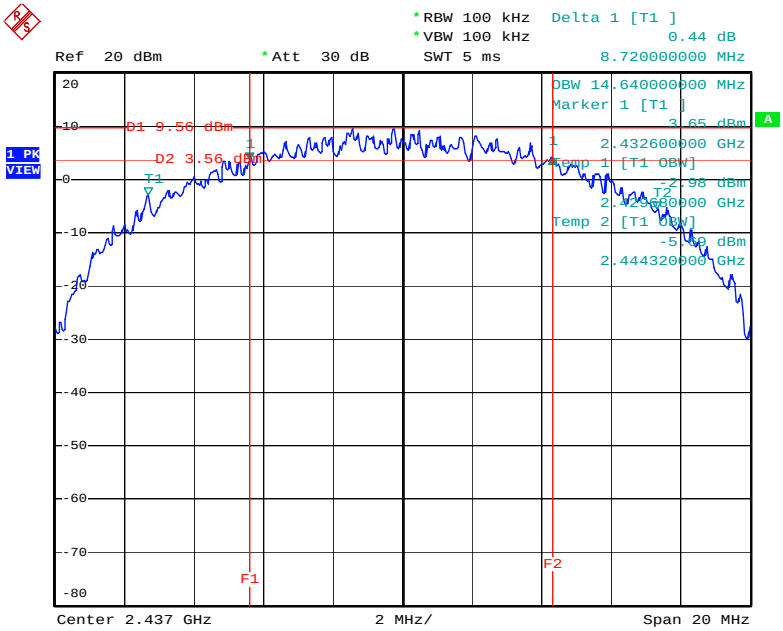
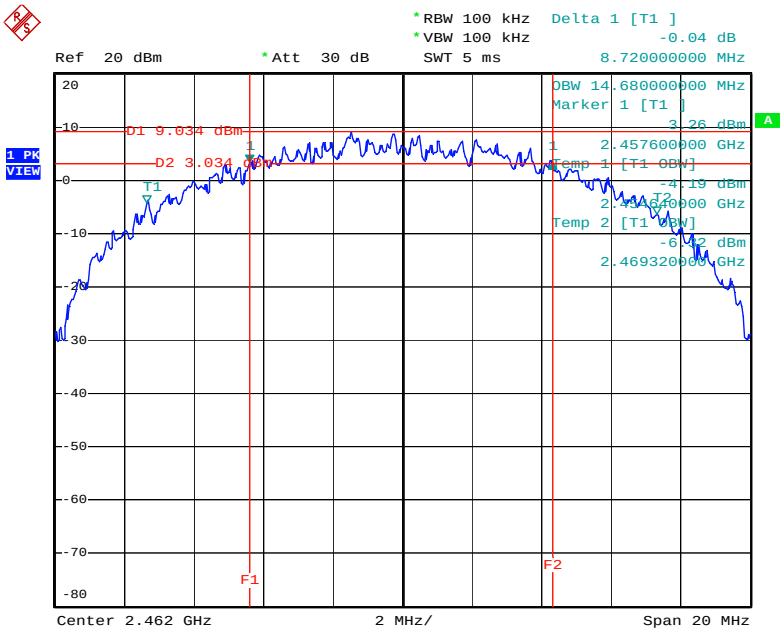
Modulation Type: DSSS (Channel 06)：



Date: 25.AUG.2005 10:21:28

Modulation Type: DSSS (Channel 11)：



Date: 25.AUG.2005 10:23:23

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.

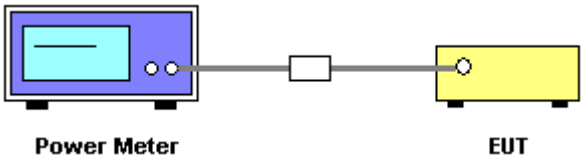
5.2.2. Measuring Instruments

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: Leo Hung

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
DSSS	01	2412 MHz	19.01	22.00
DSSS	06	2437 MHz	21.39	22.00
DSSS	11	2462 MHz	20.65	22.00

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.

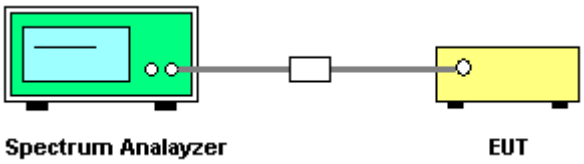
5.3.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
  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

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 points 1~4 for the lowest, middle and highest channel of the EUT.

5.3.5. Test Setup Layout



5.3.6. Test Criteria

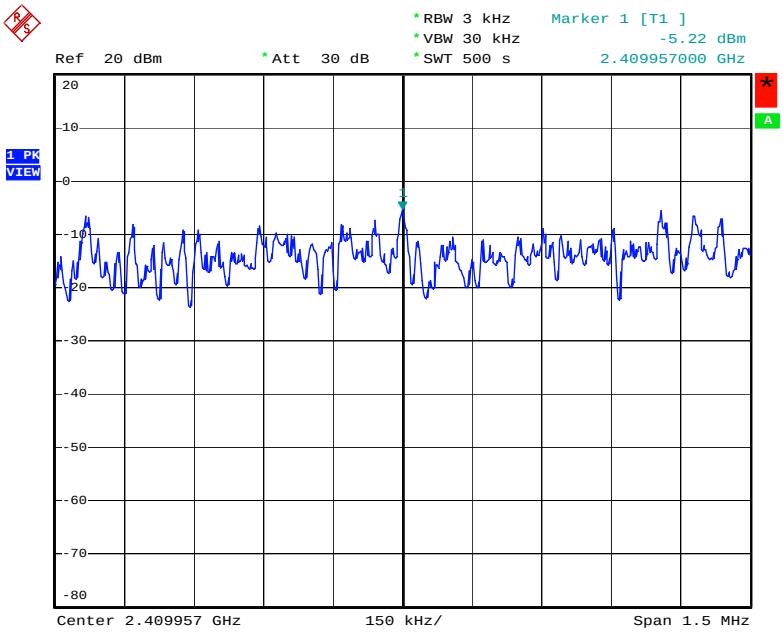
All test results complied with the requirements of 15.247(e). Measurement Uncertainty is 1.5dB.

5.3.7. Test Result

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

Modulation Type	Channel No.	Frequency (MHz)	Power Density (dBm)	Limits (dBm)
DSSS	01	2412 MHz	-5.22	8
DSSS	06	2437 MHz	-2.94	8
DSSS	11	2462 MHz	-3.50	8

Modulation Type: DSSS (Channel 01)：



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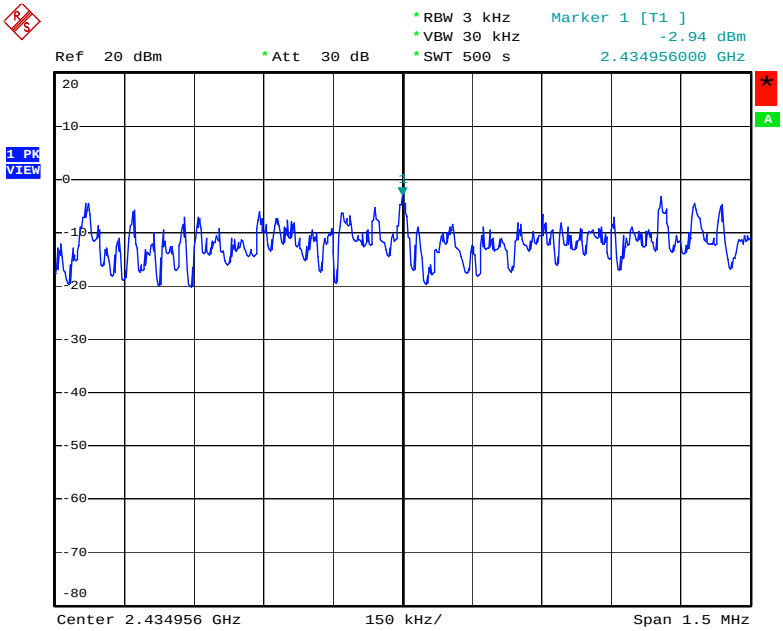
Modulation Type: DSSS (Channel 06)：



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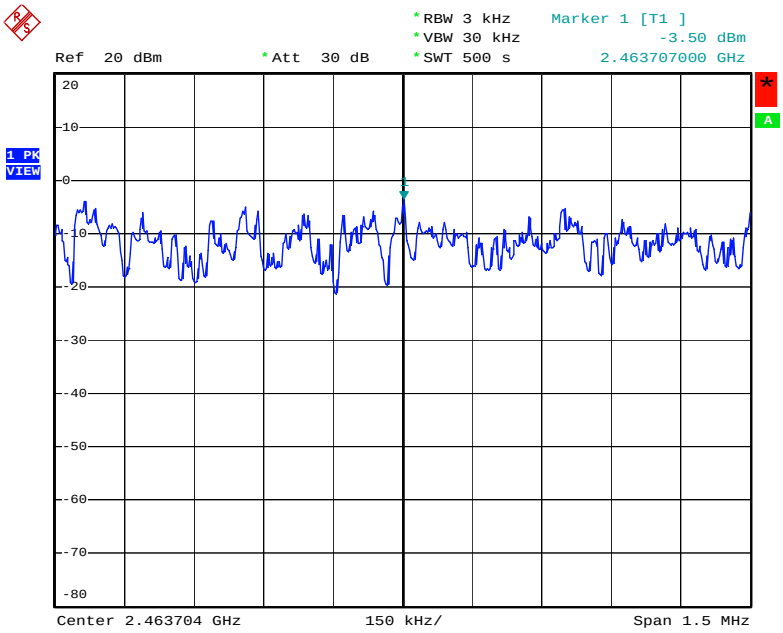
Modulation Type: DSSS (Channel 11)：



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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 FSP40 (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

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.

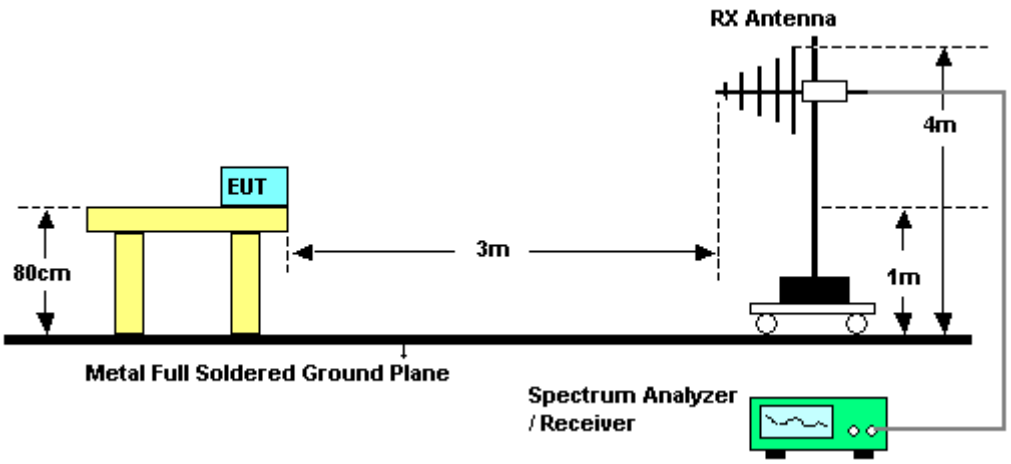
5. The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement

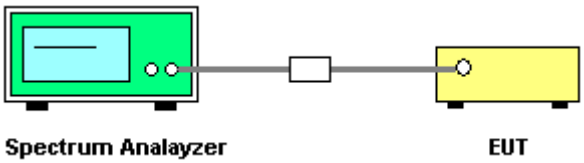
1. Configure the EUT according to ANSI C63.4-2003.
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of 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.
6. The transmitter set to the highest channel and repeated 2~5.

5.4.5. Test Setup

Radiated Method



Conducted Method

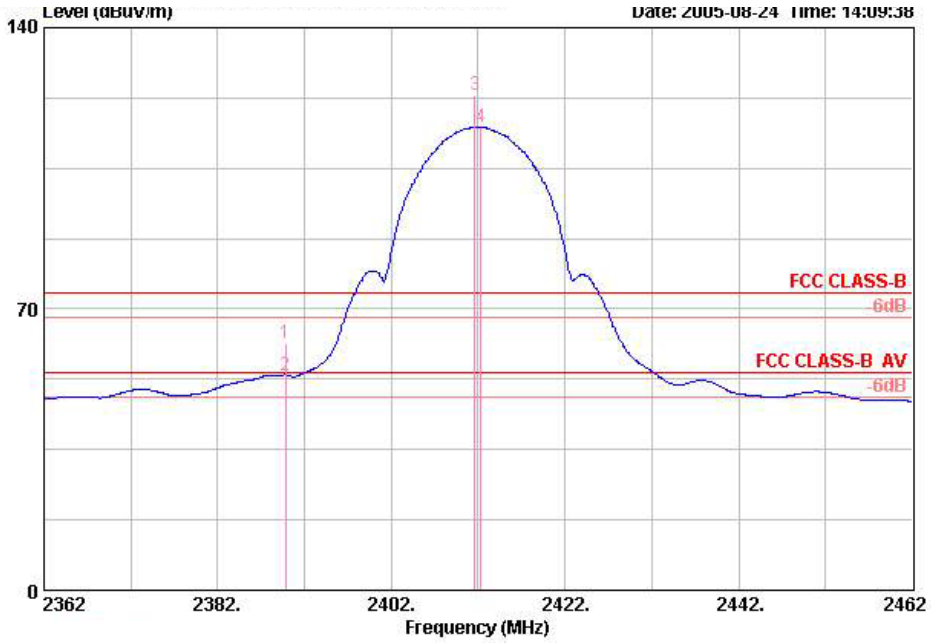


5.4.6. Test Criteria

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

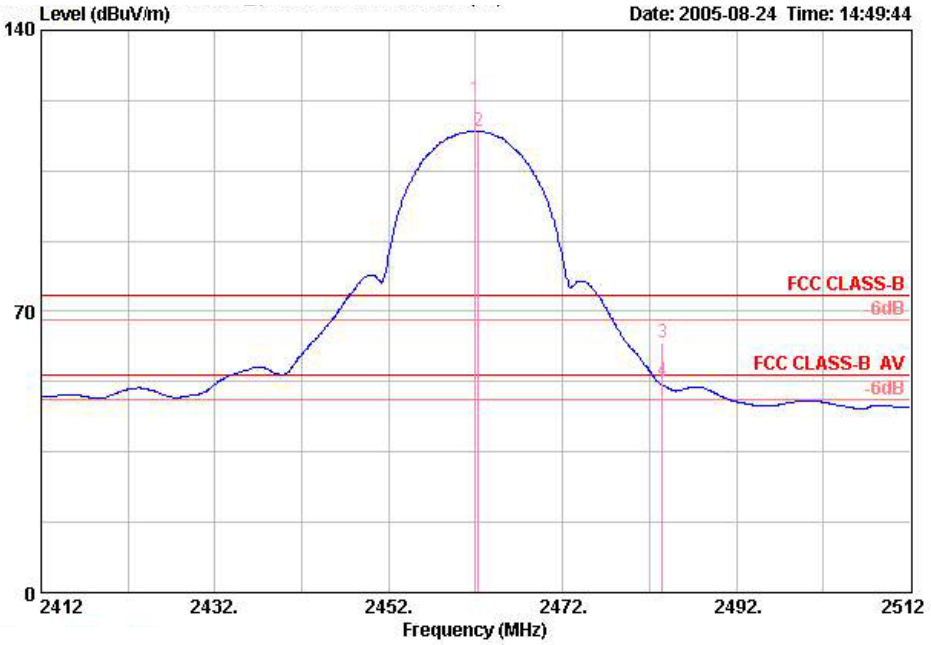
5.4.7. Test Result of Radiated Emission

- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung
- Test Channel: CH 01 / 2412 MHz



	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	2389.800	61.58	-12.42	74.00	28.13	2.00	0.00	31.45	VERTICAL	PEAK
2 !	2389.800	53.59	-0.41	54.00	28.13	2.00	0.00	23.45	VERTICAL	AVERAGE

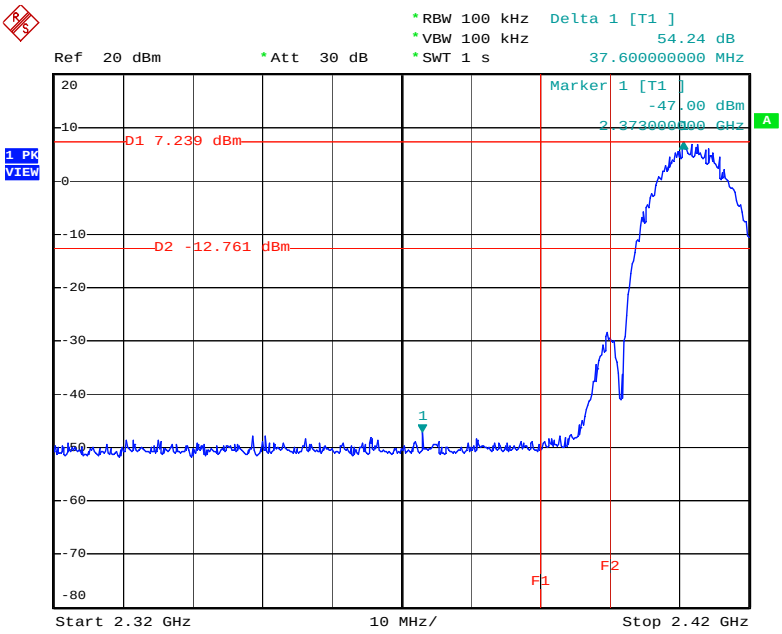
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Leo Hung
- Test Channel: CH 11 / 2462 MHz



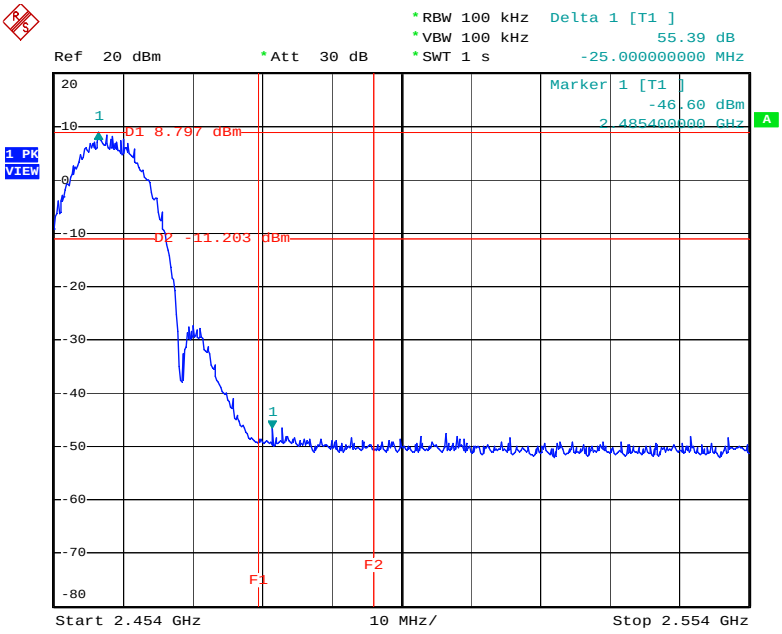
Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
2483.500	62.19	-11.81	74.00	28.36	2.04	0.00	31.79	VERTICAL	PEAK
2483.500	52.51	-1.49	54.00	28.36	2.04	0.00	22.12	VERTICAL	AVERAGE

5.4.8. Test Result of Conducted Emission

Modulation Type: DSSS (Channel 01)：



5.4.9. Modulation Type: DSSS (Channel 11)：



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.

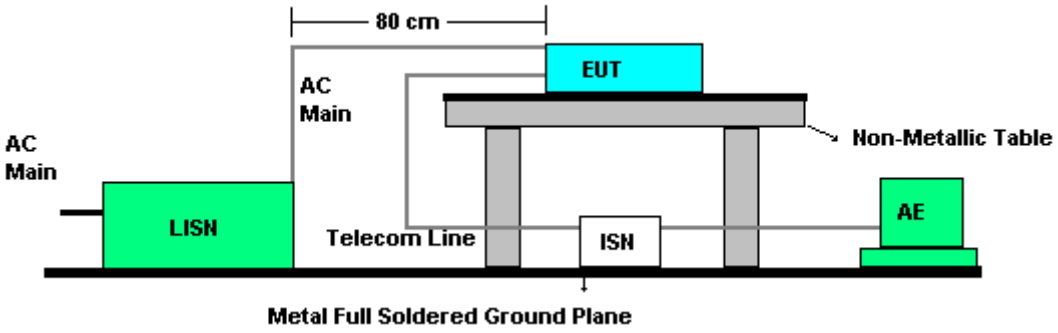
5.5.3. Description of Major Test Instruments Setting

- 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

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 provide 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.

5.5.5. Test Setup Layout



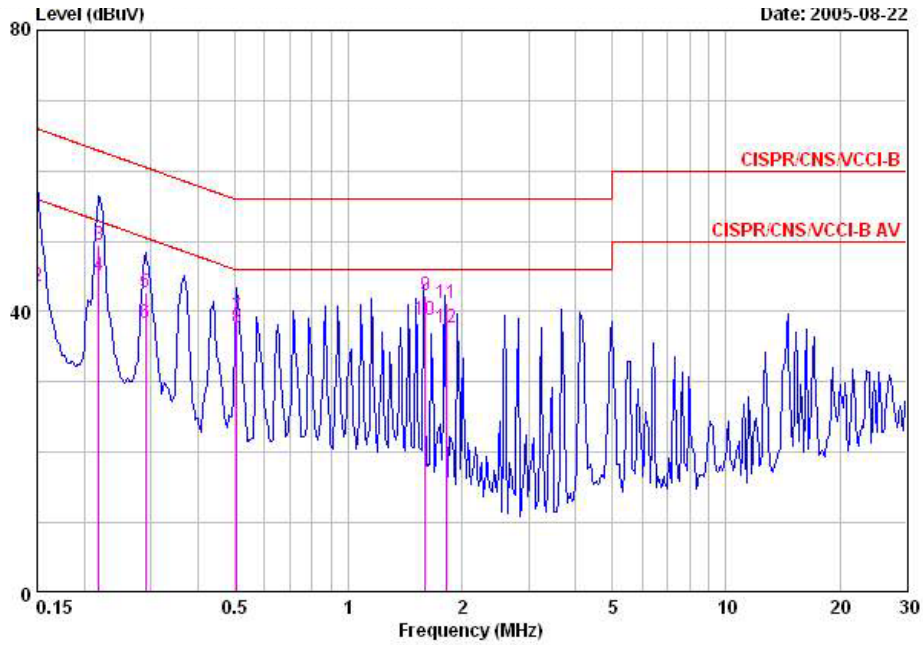
5.5.6. Test Criteria

All test results complied with the requirements of 15.207. Measurement Uncertainty is 2.54dB.

5.5.7. Test Result of Conducted Emission

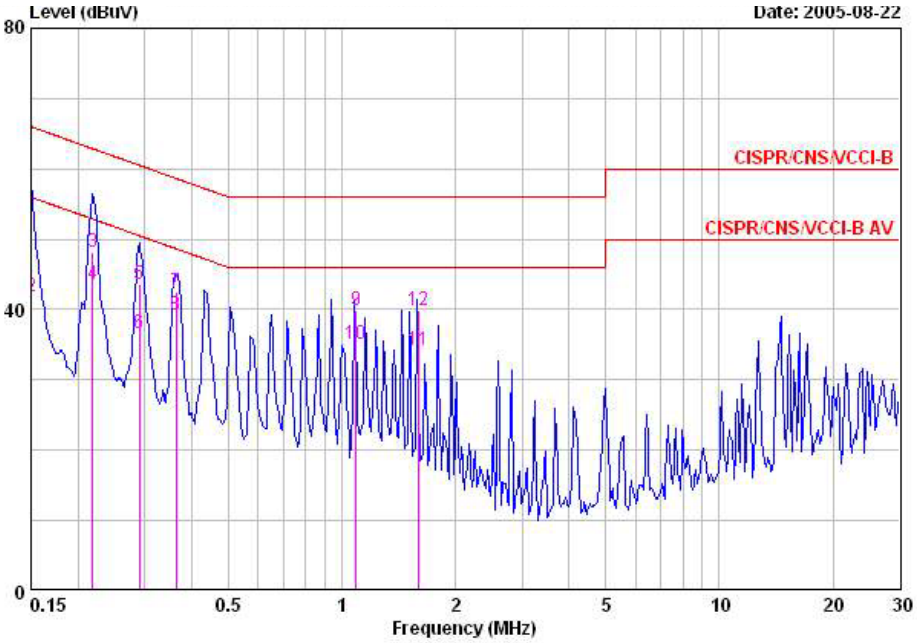
- Temperature: 28°C
- Relative Humidity: 60%
- Test Engineer: Stan Peng
- Test Channel: CH 06 / 2437 MHz

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	51.79	-14.21	66.00	49.59	2.00	0.20	QP
2	0.15000	43.54	-12.46	56.00	41.34	2.00	0.20	AVERAGE
3	0.21851	49.40	-13.47	62.88	48.09	1.11	0.20	QP
4 @	0.21851	45.21	-7.66	52.88	43.90	1.11	0.20	AVERAGE
5	0.29088	42.69	-17.81	60.50	41.69	0.80	0.20	QP
6	0.29088	38.33	-12.17	50.50	37.33	0.80	0.20	AVERAGE
7	0.50737	39.13	-16.87	56.00	38.53	0.40	0.20	QP
8 @	0.50737	37.62	-8.38	46.00	37.02	0.40	0.20	AVERAGE
9	1.597	42.39	-13.61	56.00	41.97	0.30	0.12	QP
10 @	1.597	38.86	-7.14	46.00	38.44	0.30	0.12	AVERAGE
11	1.814	41.25	-14.75	56.00	40.79	0.30	0.16	QP
12 @	1.814	37.79	-8.21	46.00	37.33	0.30	0.16	AVERAGE

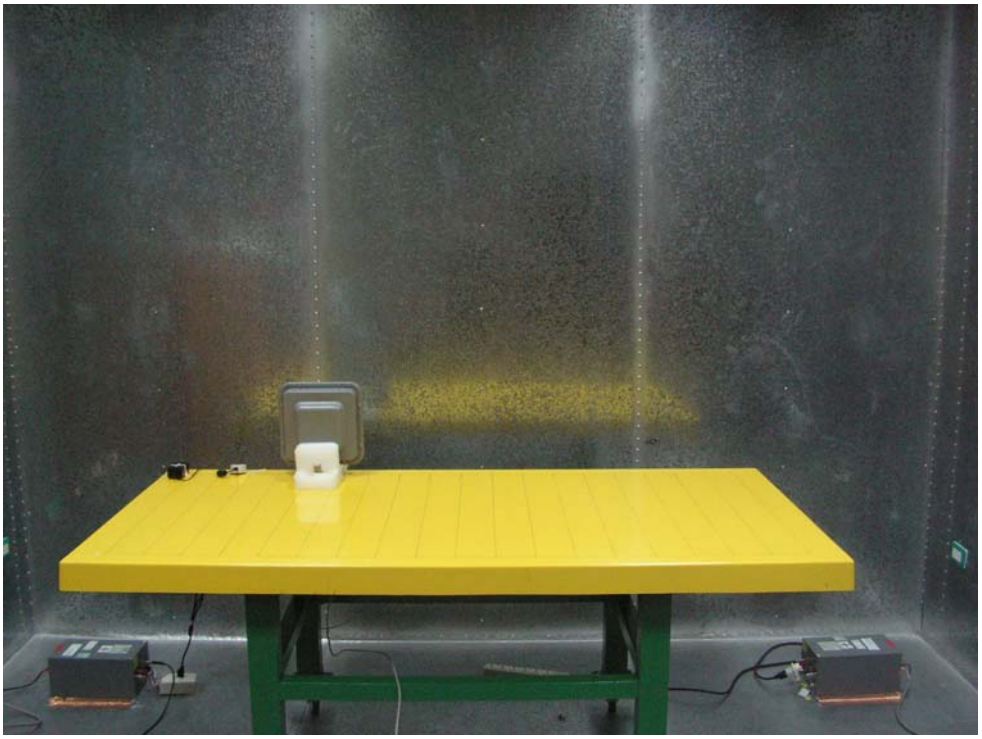
Neutral to Ground



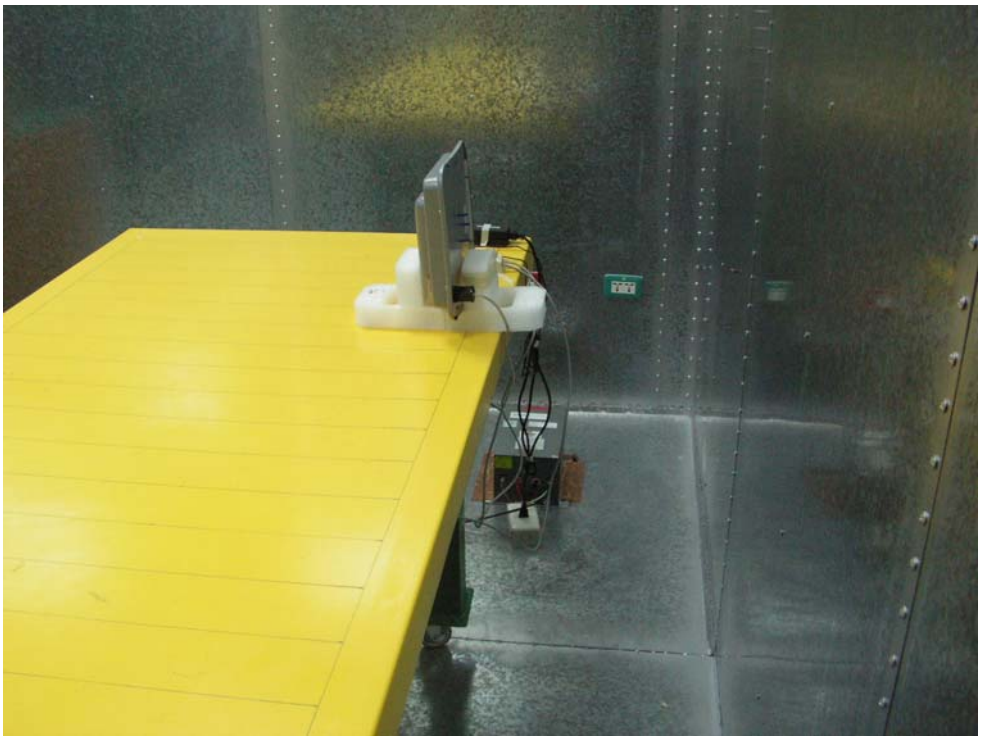
	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15000	52.22	-13.78	66.00	50.12	1.90	0.20	QP
2	0.15000	41.82	-14.18	56.00	39.72	1.90	0.20	AVERAGE
3	0.21851	48.16	-14.71	62.88	46.95	1.01	0.20	QP
4 @	0.21851	43.65	-9.22	52.88	42.44	1.01	0.20	AVERAGE
5	0.29088	43.61	-16.89	60.50	42.72	0.69	0.20	QP
6	0.29088	36.60	-13.90	50.50	35.71	0.69	0.20	AVERAGE
7	0.36338	42.40	-16.25	58.65	41.64	0.56	0.20	QP
8	0.36338	39.30	-9.35	48.65	38.54	0.56	0.20	AVERAGE
9	1.088	39.80	-16.20	56.00	39.32	0.30	0.18	QP
10	1.088	34.99	-11.01	46.00	34.51	0.30	0.18	AVERAGE
11	1.596	34.29	-11.71	46.00	33.89	0.28	0.12	AVERAGE
12	1.596	39.84	-16.16	56.00	39.44	0.28	0.12	QP

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 : 30 MHz
  Stop Frequency : 1000 MHz
  RB : 120 KHz for QP or PK

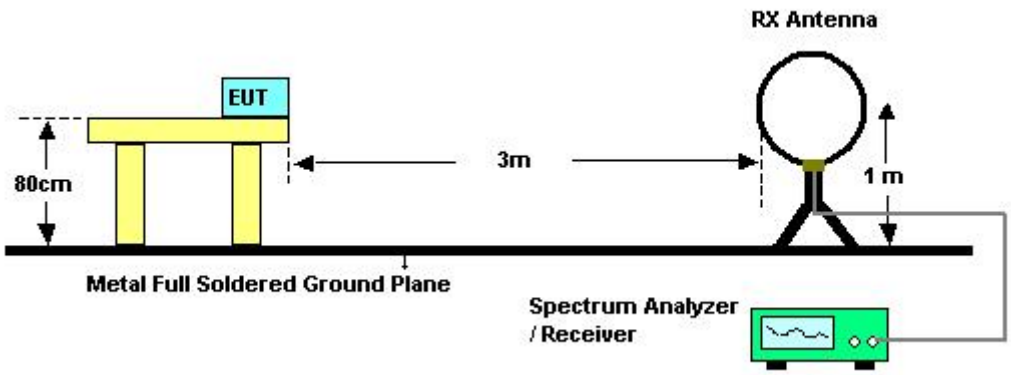
5.6.4. Test Procedures

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.

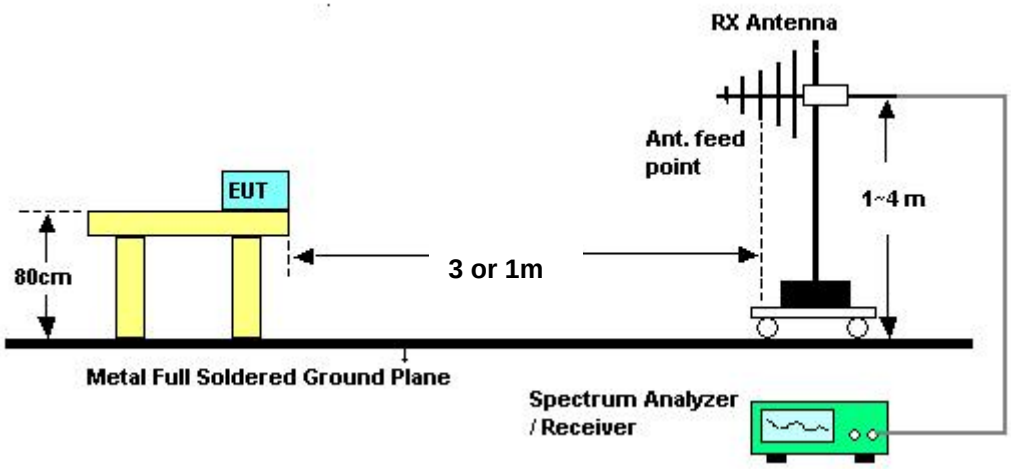
10. If the emission level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz and average 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

For radiated emissions below 30MHz



For radiated emissions above 30MHz



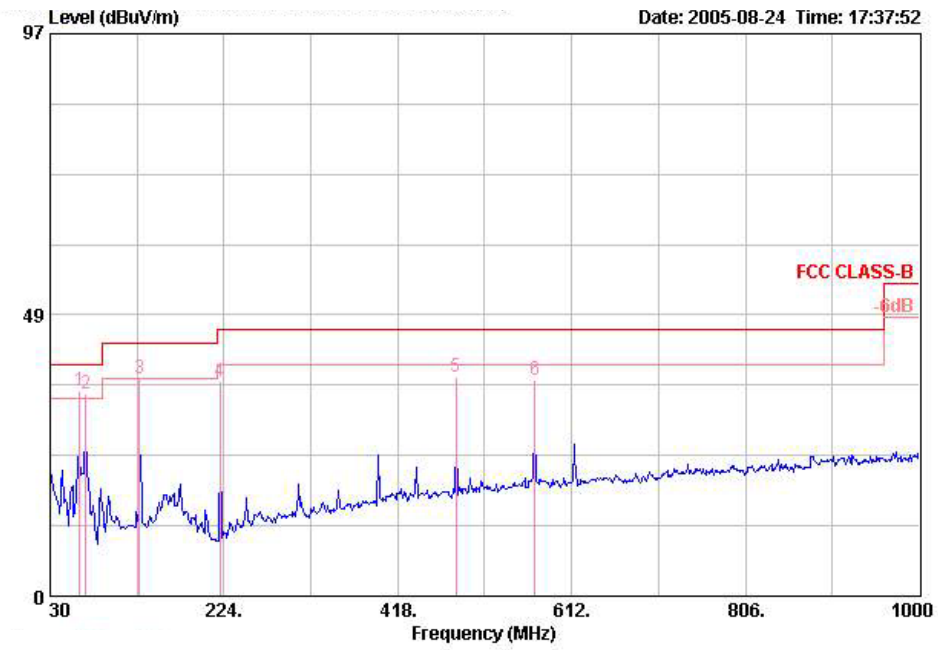
5.6.6. Test Criteria

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

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

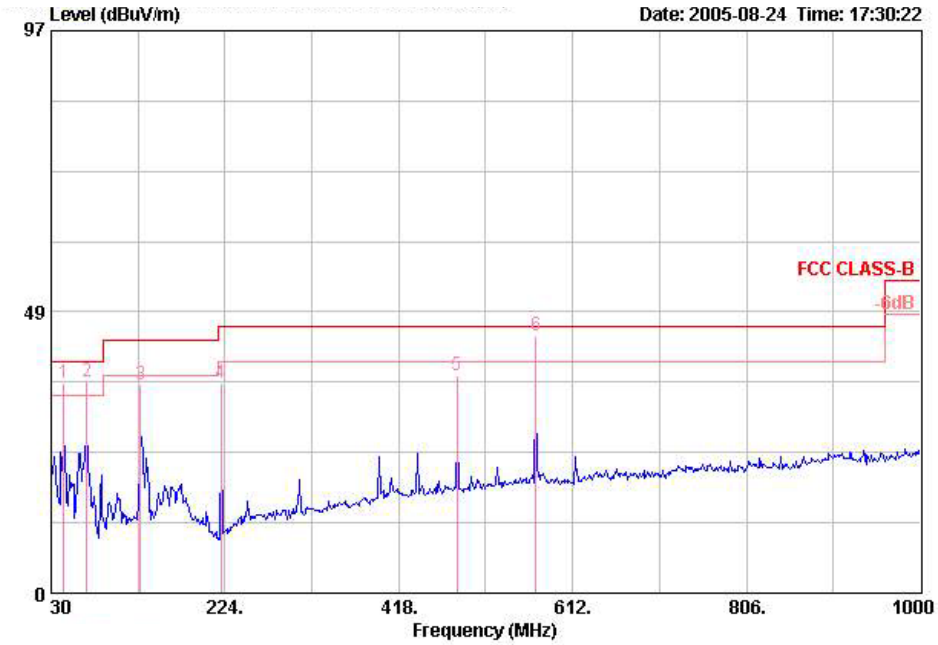
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Rush Kao

(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 @	62.800	35.42	-4.58	40.00	5.10	0.66	29.88	59.54	HORIZONTAL	Peak
2 !	70.140	35.01	-4.99	40.00	5.40	0.69	29.91	58.83	HORIZONTAL	Peak
3 !	129.900	37.59	-5.91	43.50	11.80	0.90	30.03	54.92	HORIZONTAL	Peak
4	219.150	37.03	-8.97	46.00	8.47	1.17	30.02	57.41	HORIZONTAL	Peak
5	482.990	37.77	-8.23	46.00	17.11	1.74	30.61	49.52	HORIZONTAL	Peak
6	571.260	37.14	-8.86	46.00	18.65	1.89	30.74	47.34	HORIZONTAL	Peak

(B) Polarization: Vertical



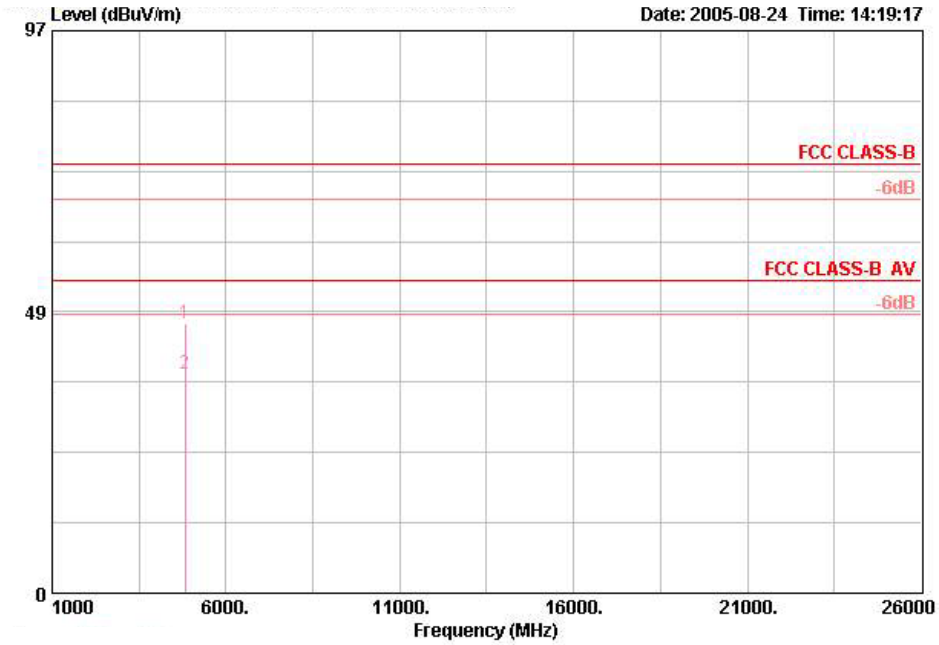
	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	44.420	36.25	-3.75	40.00	9.80	0.57	29.83	55.71	VERTICAL	Peak
2 @	69.770	36.60	-3.40	40.00	5.40	0.69	29.91	60.42	VERTICAL	Peak
3	129.680	36.02	-7.48	43.50	11.80	0.90	30.03	53.35	VERTICAL	Peak
4	219.370	36.28	-9.72	46.00	8.47	1.17	30.02	56.66	VERTICAL	Peak
5	482.990	37.64	-8.36	46.00	17.11	1.74	30.61	49.39	VERTICAL	Peak
6 @	571.450	44.35	-1.65	46.00	18.65	1.89	30.74	54.55	VERTICAL	QP

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.

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

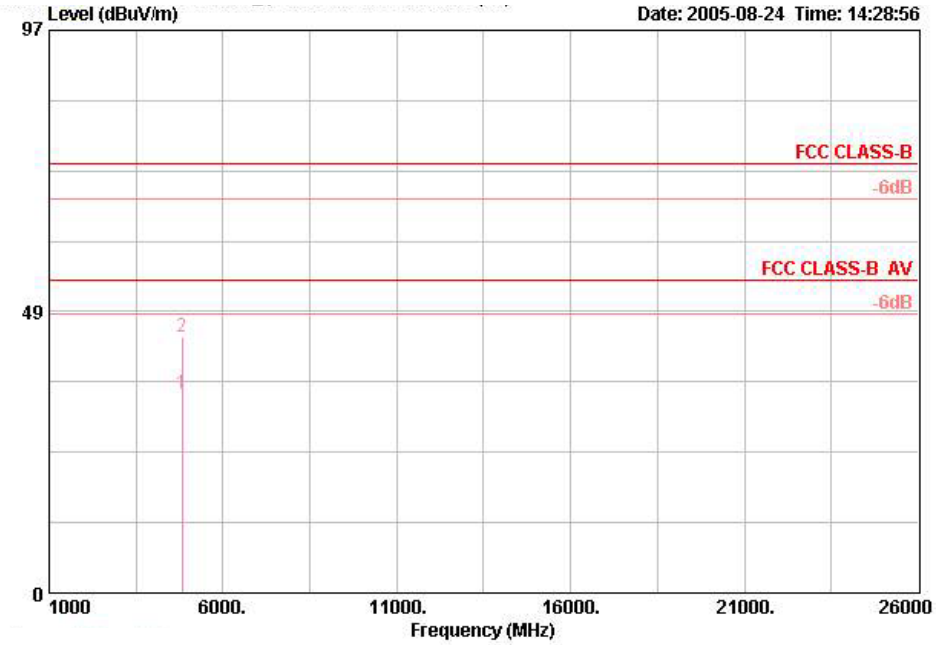
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Rush Kao

(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	4823.640	46.44	-27.56	74.00	33.22	3.20	35.10	45.11	HORIZONTAL	PEAK
2	4824.040	37.71	-16.29	54.00	33.22	3.20	35.10	36.38	HORIZONTAL	AVERAGE

(B) Polarization: Vertical



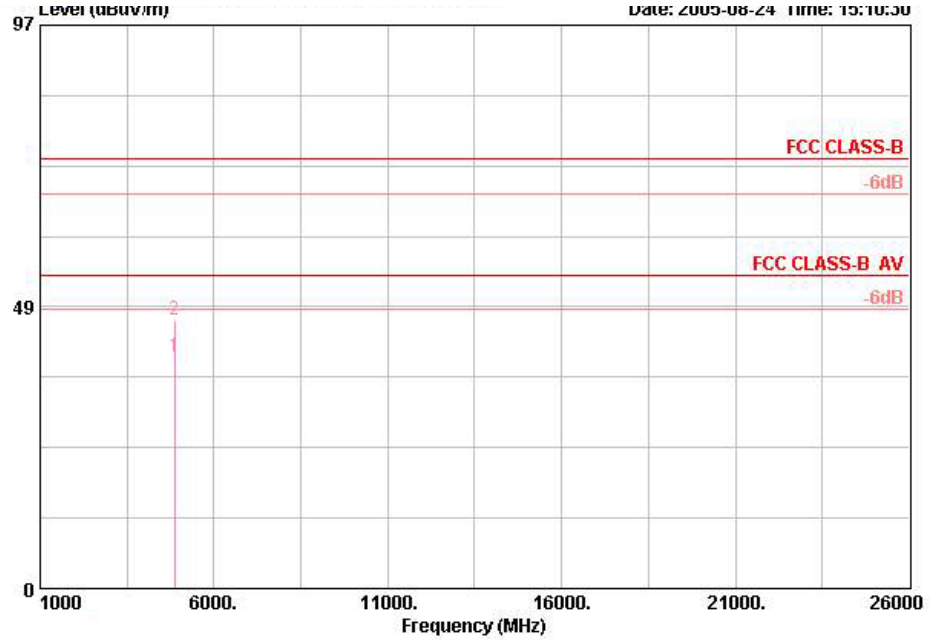
	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	4824.000	34.26	-19.74	54.00	33.22	3.20	35.10	32.93	VERTICAL	AVERAGE
2	4824.000	44.25	-29.75	74.00	33.22	3.20	35.10	42.92	VERTICAL	PEAK

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

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

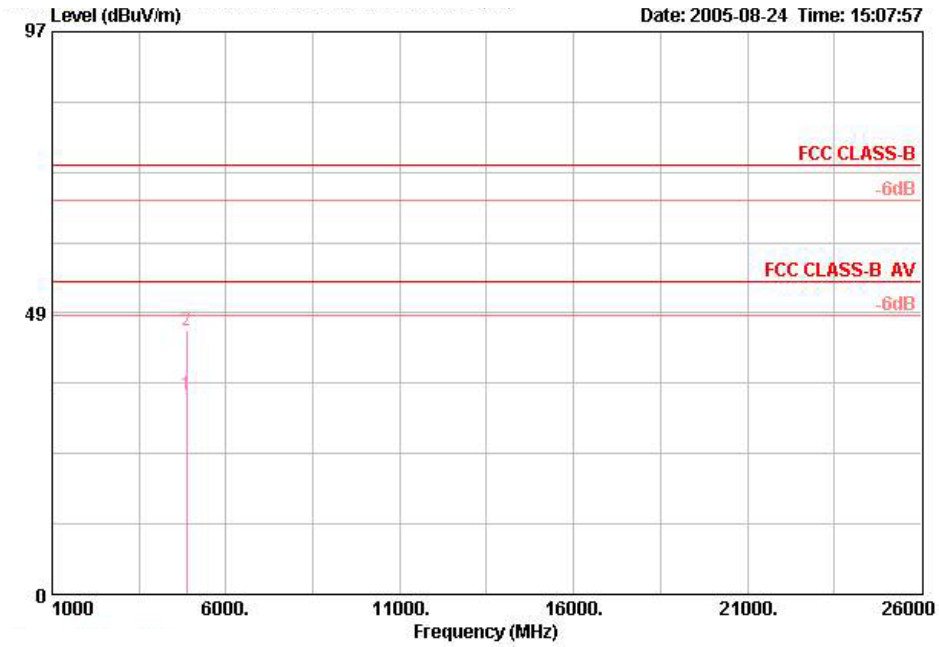
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Rush Kao

(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	4873.940	39.87	-14.13	54.00	33.33	3.22	35.10	38.41	HORIZONTAL	AVERAGE
2	4873.940	46.24	-27.76	74.00	33.33	3.22	35.10	44.79	HORIZONTAL	PEAK

(B) Polarization: Vertical



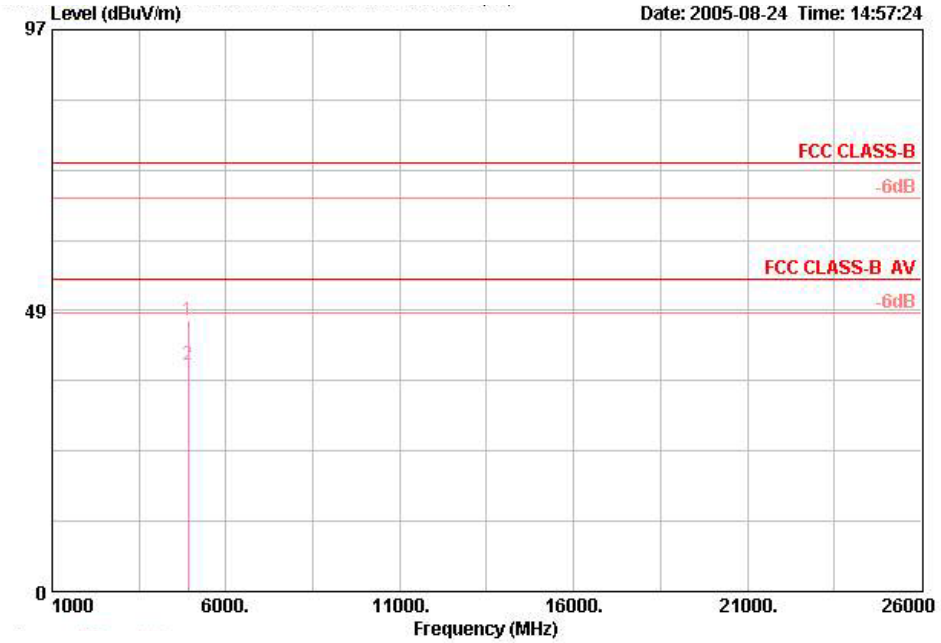
	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	4874.030	34.39	-19.61	54.00	33.33	3.22	35.10	32.93	VERTICAL	AVERAGE
2	4874.080	45.57	-28.43	74.00	33.33	3.22	35.10	44.12	VERTICAL	PEAK

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

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

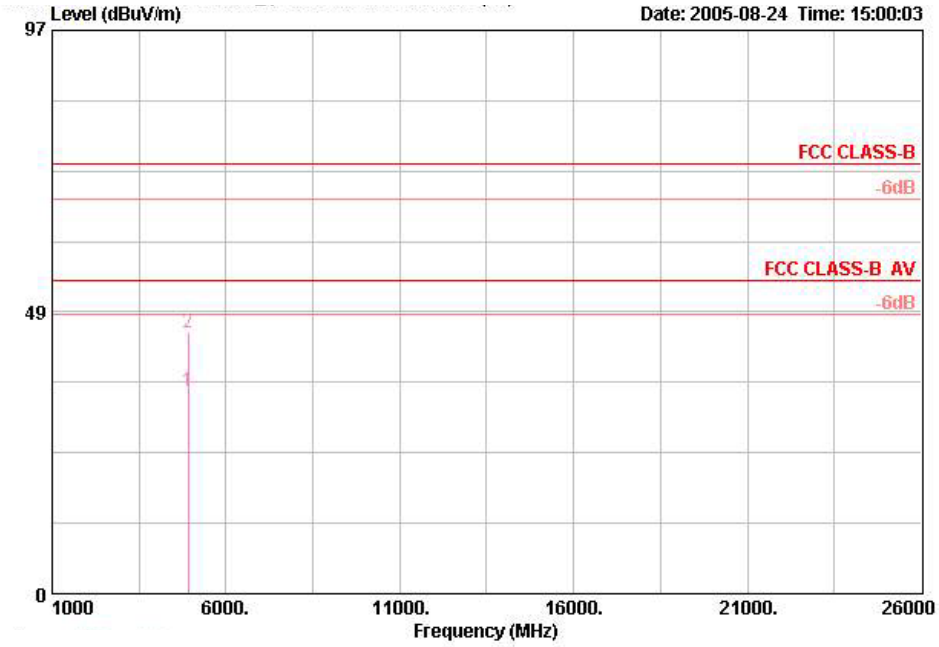
- Temperature: 28°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100.00%
- Test Engineer: Rush Kao

(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	4923.930	46.74	-27.26	74.00	33.45	3.25	35.10	45.15	HORIZONTAL	PEAK
2	4923.950	39.01	-14.99	54.00	33.45	3.25	35.10	37.42	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	4923.890	34.99	-19.01	54.00	33.45	3.25	35.10	33.40	VERTICAL	AVERAGE
2	4923.890	44.91	-29.09	74.00	33.45	3.25	35.10	43.31	VERTICAL	PEAK

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

5.6.11. Photographs of Radiated Emission Test Configuration

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

The patch antenna for the EUT is with SMA connector.

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

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

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)
14	25.1189	21.3900	137.7209	0.688574	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	FSP40	100004	9KHZ~40GHz	Aug. 31, 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®

ISO/IEC 17025:1999
ISO 9002:1994

Certificate of Accreditation

DEPARTMENT OF COMMERCE ★ UNITED STATES OF AMERICA ★

SPORTON INTERNATIONAL, INC.
TAIPEI HSIEN 221
TAIWAN

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:

ELECTROMAGNETIC COMPATIBILITY AND TELECOMMUNICATIONS

December 31, 2005
Effective through

For the National Institute of Standards and Technology
NVLAP Lab Code: 200079-0

NVLAP-01C (06-01)