FCC TEST REPORT

CATEGORY	:	Portable
PRODUCT NAME	:	GPS PDA WITH IEEE 802.11B WLAN AND BLUETOOTH
FCC ID.	:	NM8GL
FILING TYPE	:	Certification
BRAND NAME	:	High Tech Computer, Corp.
MODEL NAME	:	GALA100
APPLICANT	:	**High Tech Computer, Corp.** 23 Hsin Hua Rd., Taoyuan 330, Taiwan
MANUFACTURER	:	**Same as the applicant**
ISSUED BY	:	**SPORTON INTERNATIONAL INC.** 6F, No. 106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

Statements:

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: Jul. 5, 2005
Test Date: Jul. 09, 2005
Original Report Issue Date: Jul. 14, 2005
Report No.: FR570506

■ 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

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BRAND NAME	:	High Tech Computer, Corp.
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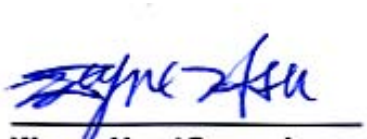
I **HEREBY** CERTIFY THAT:

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 Jul. 09, 2005 at SPORTON International Inc. LAB.



Wayne Hsu / Supervisor
Sporton International Inc.

1. General Description of Equipment under Test

1.1. Applicant

High Tech Computer, Corp.
23 Hsin Hua Rd., Taoyuan 330, Taiwan

1.2. Manufacturer

Same as the applicant

1.3. Basic Description of Equipment under Test

This product is a PDA with IEEE 802.11b WLAN and Bluetooth function. The radio technical data has been listed on section " Features of Equipment under Test ". This PDA is able to transmit data with the computer via the USB port of the computer. Besides, this PDA is with GPS function.

1.4. Features of Equipment under Test

Items	Description
Type of Modulation	WLAN: DSSS BLUETOOTH: GFSK
Number of Channels	WLAN: 11 BLUETOOTH: 79
Frequency Band (Bluetooth)	WLAN: 2412MHz ~ 2462MHz BLUETOOTH: 2402 MHz ~ 2480 MHz
Carrier Frequency	See section 1.5 for details
Channel Bandwidth	WLAN: 22MHz BLUETOOTH: 1MHz
Data Rate	WLAN : 1, 2, 5.5, 11Mbps Bluetooth: 1Mbps
Max. Output Power (in EIRP)	WLAN: 16.11 dBm BLUETOOTH: -0.28 dBm
Antenna Type / Gain	WLAN: PIFA Antenna / 0 dBi BLUETOOTH: Chip Antenna / 0 dBi
Function Type	Transceiver
Power Rating (DC/AC, Voltage)	3.7V DC (From Battery), 5V DC (From Adapter)
Test Power Source	110V AC (Adapter)
Temperature Range (Operating)	0 ~ 50 ℃

1.5. Table for Carrier Frequencies

WLAN Function

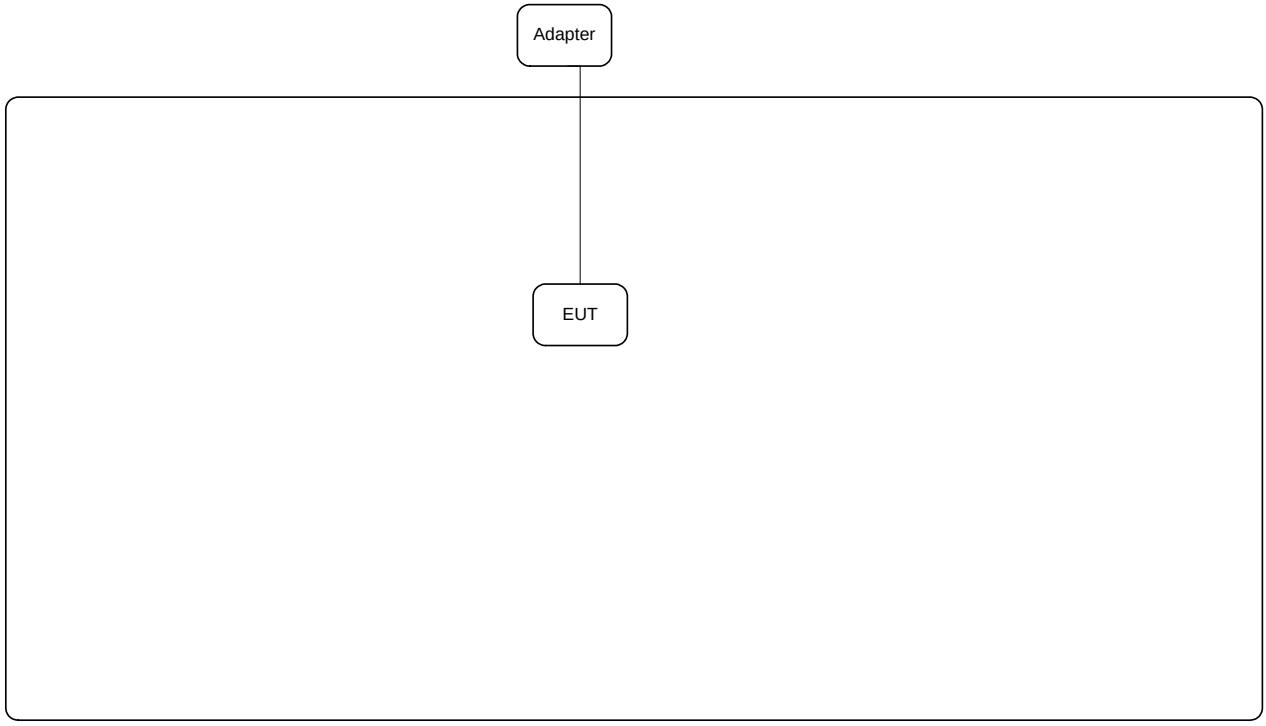
Channel	Frequency	Channel	Frequency	Channel	Frequency
01	2412 MHz	05	2432 MHz	09	2452 MHz
02	2417 MHz	06	2437 MHz	10	2457 MHz
03	2422 MHz	07	2442 MHz	11	2462 MHz
04	2427 MHz	08	2447 MHz		

BLUETOOTH Function

Channel	Frequency	Channel	Frequency	Channel	Frequency
00	2402 MHz	27	2429 MHz	54	2456 MHz
01	2403 MHz	28	2430 MHz	55	2457 MHz
02	2404 MHz	29	2431 MHz	56	2458 MHz
03	2405 MHz	30	2432 MHz	57	2459 MHz
04	2406 MHz	31	2433 MHz	58	2460 MHz
05	2407 MHz	32	2434 MHz	59	2461 MHz
06	2408 MHz	33	2435 MHz	60	2462 MHz
07	2409 MHz	34	2436 MHz	61	2463 MHz
08	2410 MHz	35	2437 MHz	62	2464 MHz
09	2411 MHz	36	2438 MHz	63	2465 MHz
10	2412 MHz	37	2439 MHz	64	2466 MHz
11	2413 MHz	38	2440 MHz	65	2467 MHz
12	2414 MHz	39	2441 MHz	66	2468 MHz
13	2415 MHz	40	2442 MHz	67	2469 MHz
14	2416 MHz	41	2443 MHz	68	2470 MHz
15	2417 MHz	42	2444 MHz	69	2471 MHz
16	2418 MHz	43	2445 MHz	70	2472 MHz
17	2419 MHz	44	2446 MHz	71	2473 MHz
18	2420 MHz	45	2447 MHz	72	2474 MHz
19	2421 MHz	46	2448 MHz	73	2475 MHz
20	2422 MHz	47	2449 MHz	74	2476 MHz
21	2423 MHz	48	2450 MHz	75	2477 MHz
22	2424 MHz	49	2451 MHz	76	2478 MHz
23	2425 MHz	50	2452 MHz	77	2479 MHz
24	2426 MHz	51	2453 MHz	78	2480 MHz
25	2427 MHz	52	2454 MHz		
26	2428 MHz	53	2455 MHz		

2. Test Configuration of the Equipment under Test

2.1. Connection Diagram of Conducted Test System



2.2. The Test Mode Description

1. For DSSS modulation, CCK is the worst case on all test items.
2. For FHSS modulation, GFSK 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. For WLAN, spurious emission below 1GHz is independent of channel selection, so only channel 6 with CCK modulation was tested. Among X, Y, and Z axes, Y axis was verified as the worst case to be measured.
5. For BLUTOOTH, spurious emission below 1GHz is independent of channel selection, so only channel 39 was tested.
6. AC conduction emission measurement is independent of channel selection and only the configuration which the EUT is charged by the adapter (adapter charging mode) was measured as the worst case.

2.3. Description of Test Supporting Units

NA

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 30 MHz to 10th carrier harmonic.

3.4. Test Distance

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

3.5. Test Software

An executive program, EMITEST.EXE under Microsoft Windows Mobile VerS.O, which generates a complete line of continuously repeating " H " pattern was used as the test software.

Conducted Emission:
At the same time, the following programs were executed:
- Executed one self-test program to keep sending signals.

Radiated Emission:
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.
WLAN:

Test Software Version	Radiocontrolice			
Frequency	2412 MHz	2437 MHz	2462 MHz	Data Rate
IEEE 802.11b DSSS	TXGC:32	TXGC:32	TXGC:33	11 Mbps

Bluetooth:

Test Software Version	BTTestMode2		
Frequency	2402 MHz	2441 MHz	2480 MHz
Parameters	7	7	7

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 (WLAN)	Pass
5.2	15.247(b)(3)	Maximum Peak Conducted Output Power (WLAN)	Pass
5.3	15.247(e)	Peak Power Spectral Density (WLAN)	Pass
5.4	15.247(d)	Band Edges Emission (WLAN)	Pass
5.5	15.247(a)(1)	Hopping Channel Bandwidth (Bluetooth)	Pass
5.6	15.247(b)(1)	Number of Hopping Frequency Used (Bluetooth)	Pass
5.7	15.247(a)(1)	Hopping Channel Separation (Bluetooth)	Pass
5.8	15.247(a)(1)(iii)	Dwell Time of Each Frequency (Bluetooth)	Pass
5.9	15.247(b)(1)	Maximum Peak Output Power (Bluetooth)	Pass
5.10	15.247(d)	Band Edges Emission (Bluetooth)	Pass
5.11	15.207	AC Power Line Conducted Emission	Pass
5.12	15.247(d)	Spurious Radiated Emission	Pass
5.13	15.203/15.247(b)/(c)	Antenna Requirement	Pass

5. Test Result

5.1. Test of 6dB Spectrum Bandwidth (WLAN)

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

Item 18 of the 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 : > 20dB Bandwidth
  RB : 30 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 30KHz and VBW to 100KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time to Auto.
4. The 6dB spectrum width is defined as the width with level higher than 6dB below the peak level.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.1.5. Test Setup Layout

5.1.6. Test Criteria

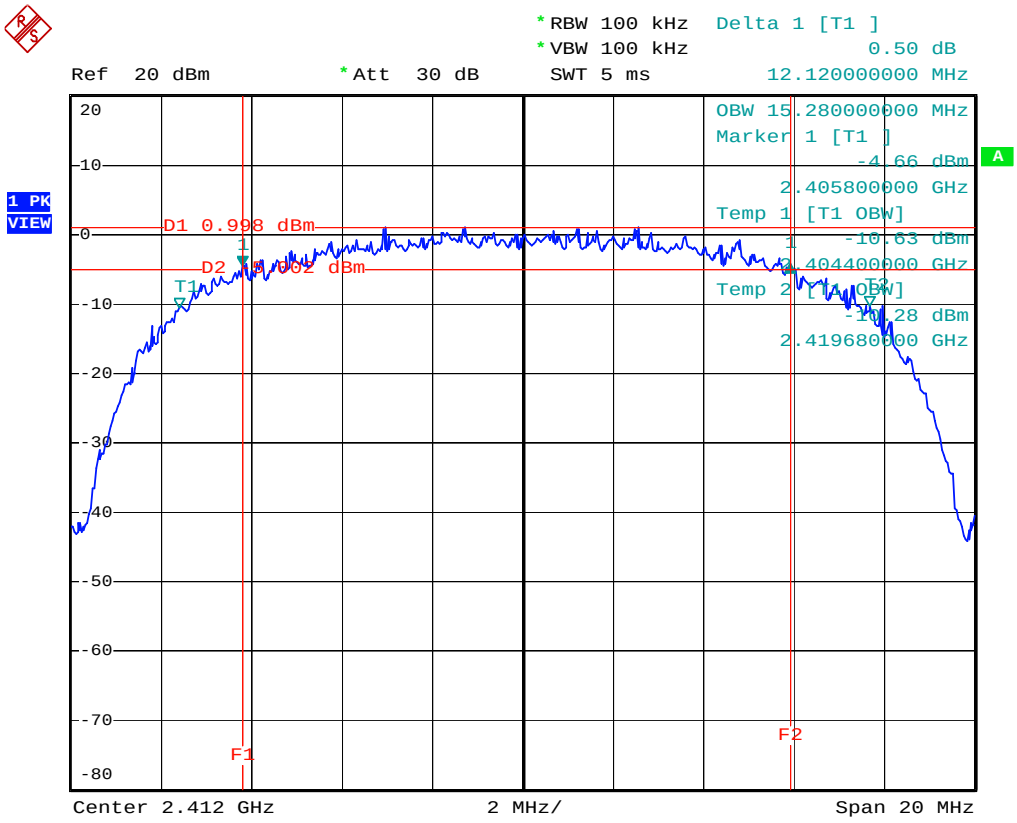
All test results complied with the requirements of Section 15.247(a)(2). Measurement Uncertainty is $1x10^{-5}$.

5.1.7. Test Result

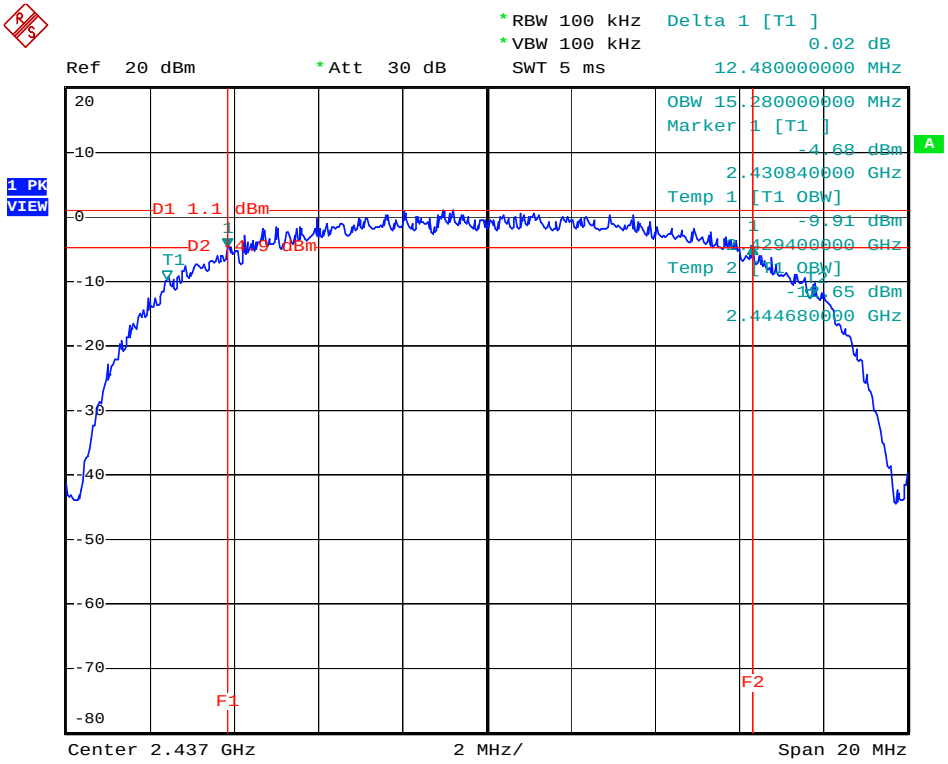
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	6dB Bandwidth (MHz)	99% Occupied BW (MHz)	Min. Limit (kHz)
DSSS	01	2412 MHz	12.12	15.28	0.5
DSSS	06	2437 MHz	12.48	15.28	0.5
DSSS	11	2462 MHz	12.36	15.20	0.5

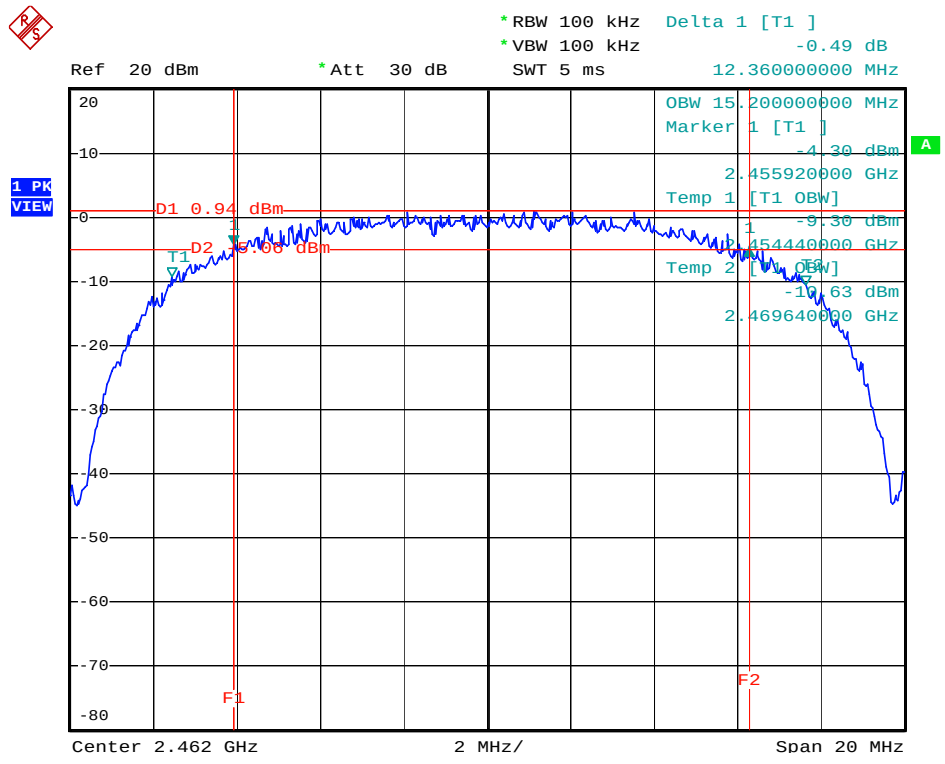
Modulation Type: DSSS (Channel 2412 MHz)：



Modulation Type: DSSS (Channel 2437 MHz)：



Modulation Type: DSSS (Channel 2462 MHz)：



5.2. Test of Maximum Conducted Output Power (WLAN)

5.2.1. Applicable Standard

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

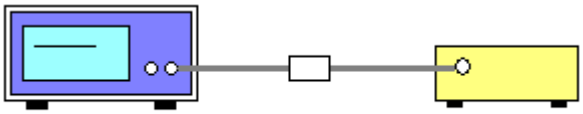
5.2.2. Measuring Instruments

Item 19, 21 of the table on section 6.

5.2.3. Test Procedures and Test Instruments Setting

1. The transmitter output was connected to the peak power meter through an attenuator.
2. Repeated point 1 for other tested channel of the EUT.

5.2.4. Test Setup Layout



5.2.5. Test Criteria

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

5.2.6. Test Result of Conducted Power

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
DSSS	01	2412 MHz	15.87	30
DSSS	06	2437 MHz	16.11	30
DSSS	11	2462 MHz	15.98	30

5.3. Test of Peak Power Spectral Density (WLAN)

5.3.1. Applicable Standard

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

5.3.2. Measuring Instruments

Item 18 of the table on section 6.

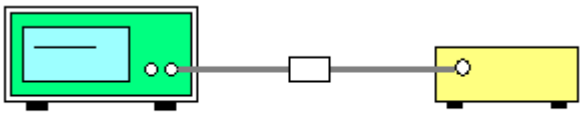
5.3.3. Description of Major Test Instruments Setting

- 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

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

5.3.5. Test Setup Layout



5.3.6. Test Criteria

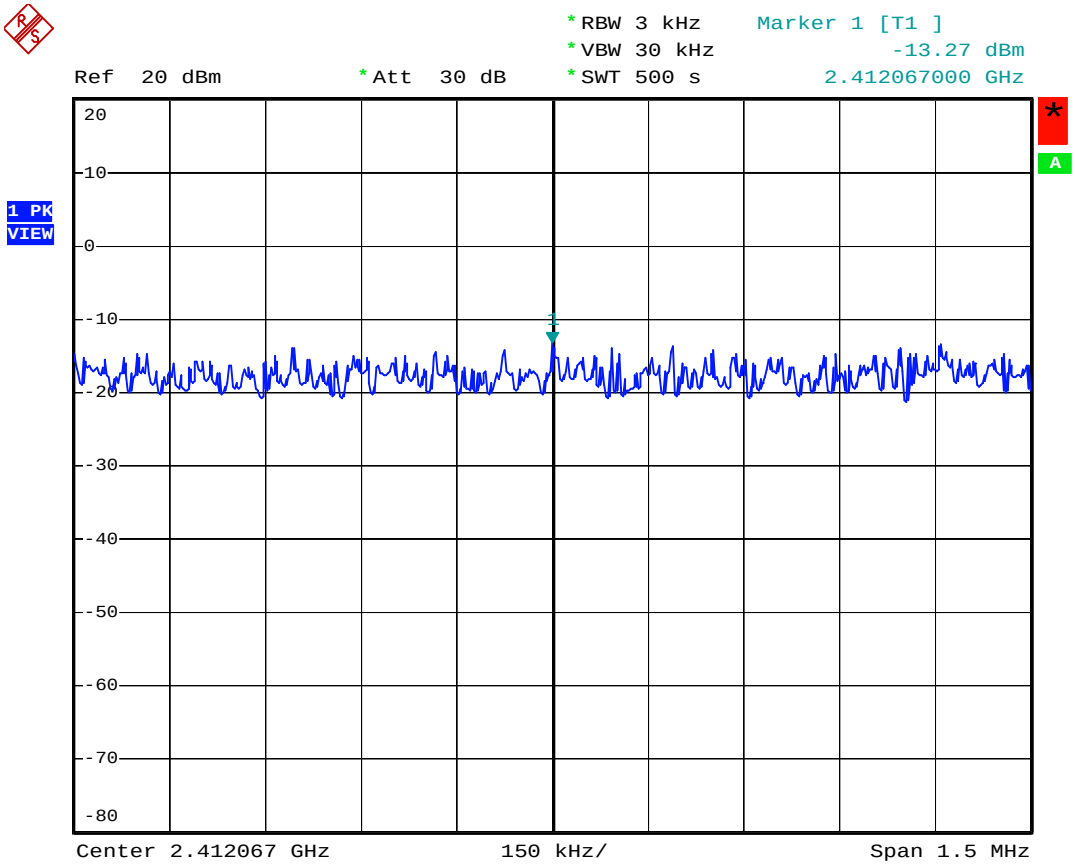
All test results complied with the requirements of 15.247(e). Measurement Uncertainty is 1.5dB.

5.3.7. Test Result: See spectrum analyzer plots below

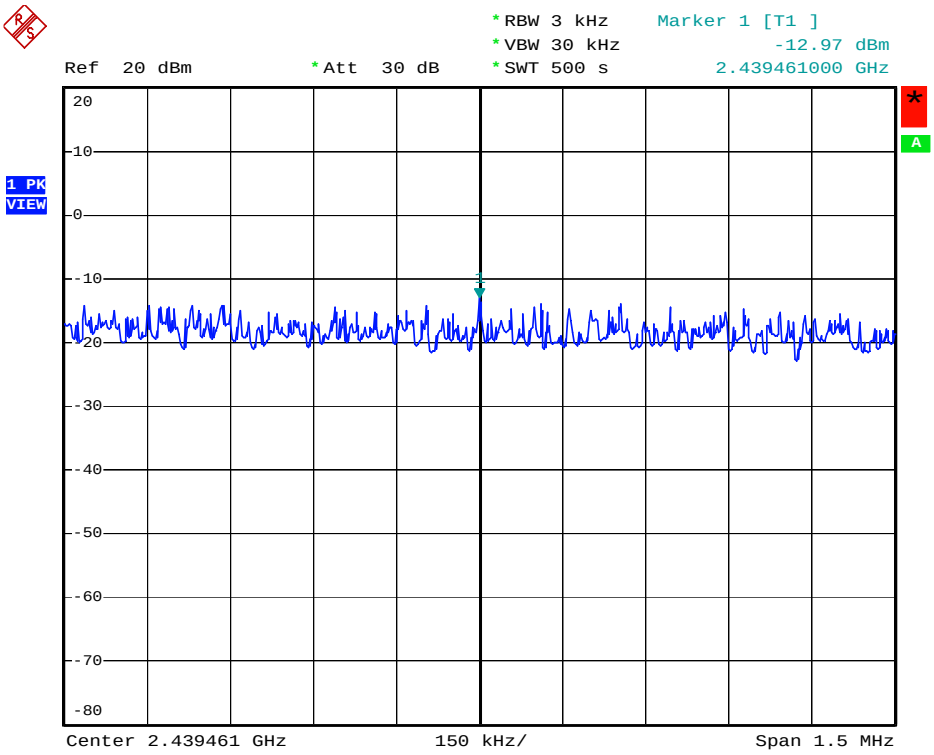
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	Power Density (dBm)	Limits (dBm)
DSSS	01	2412 MHz	-13.27	8
DSSS	06	2437 MHz	-12.97	8
DSSS	11	2462 MHz	-12.81	8

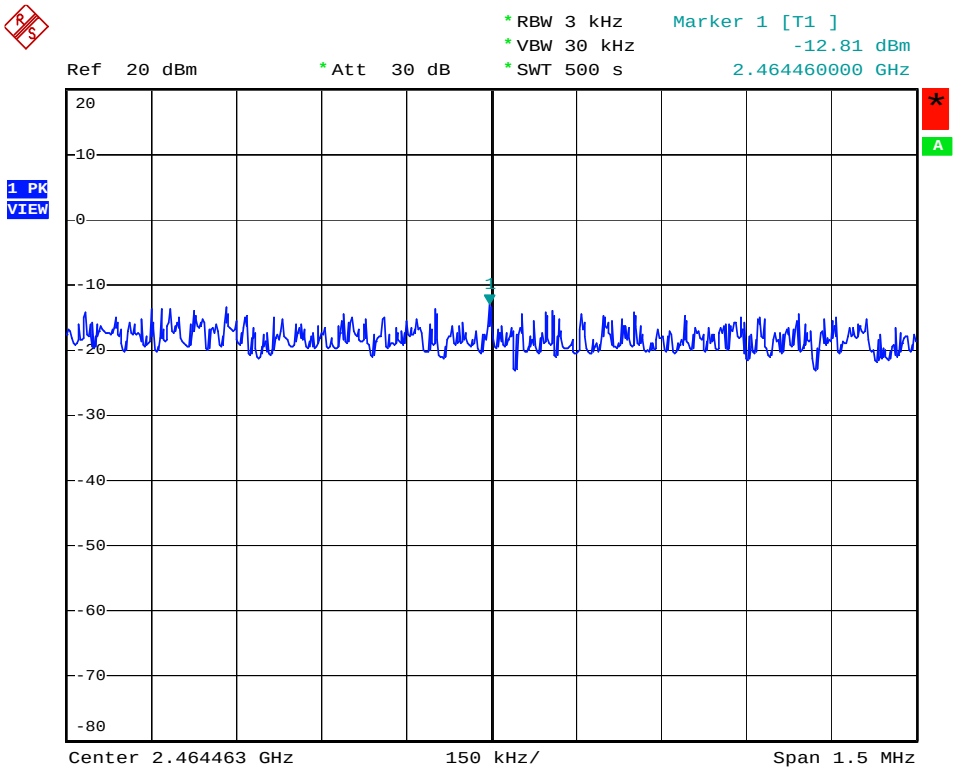
Modulation Type: DSSS (Channel 2412 MHz)：



Modulation Type: DSSS (Channel 2437 MHz)：



Modulation Type: DSSS (Channel 2462 MHz)：



5.4. Test of Band Edges Emission (WLAN)

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 6.3, must also comply with the radiated emission limits specified in Section 6.2.1.

5.4.2. Measuring Instruments

Item 6~17 of the table on section 6 for radiated measurement.
Item 18 of the table on section 6 for conducted measurement.

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

Conducted Measurement

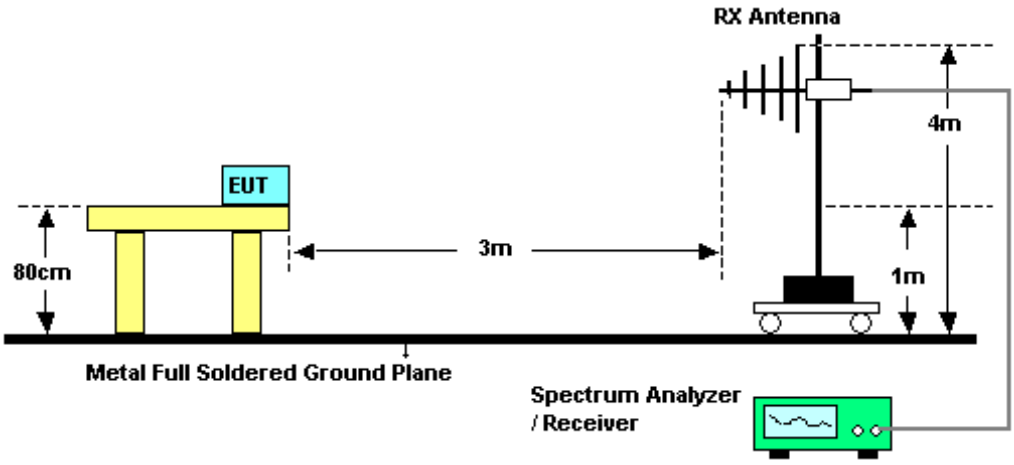
1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth 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

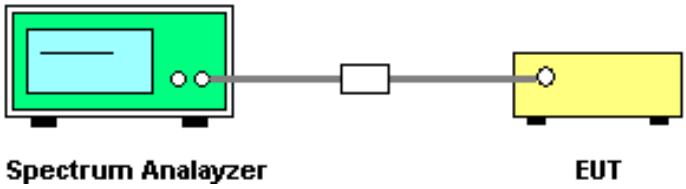
1. Configure the EUT according to ANSI C63.4-2003.
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of 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, use 10Hz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1 MHz RBW for reading under PK.

5.4.5. Test Setup

Radiated Method



Conducted Method

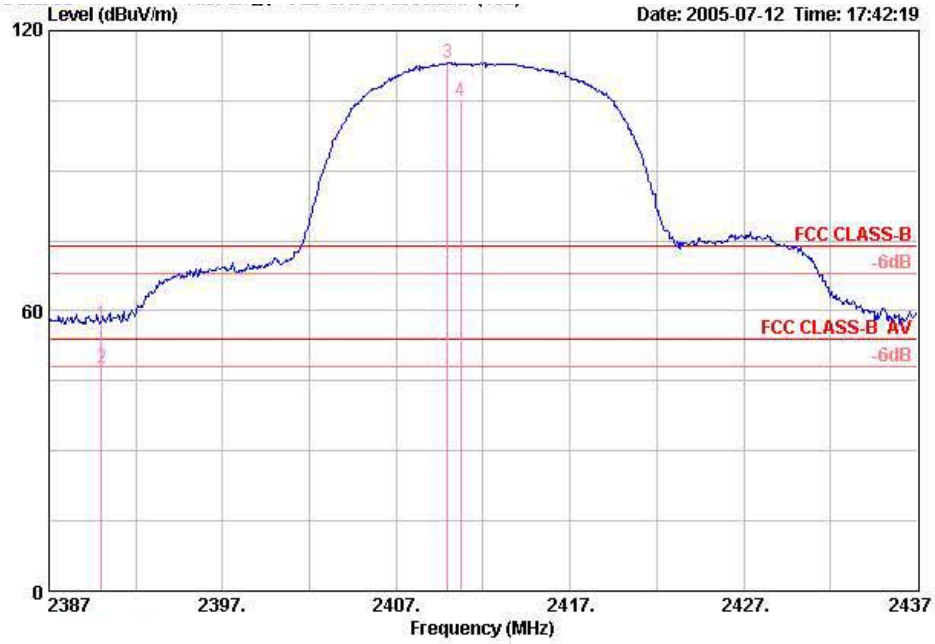


5.4.6. Test Criteria

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

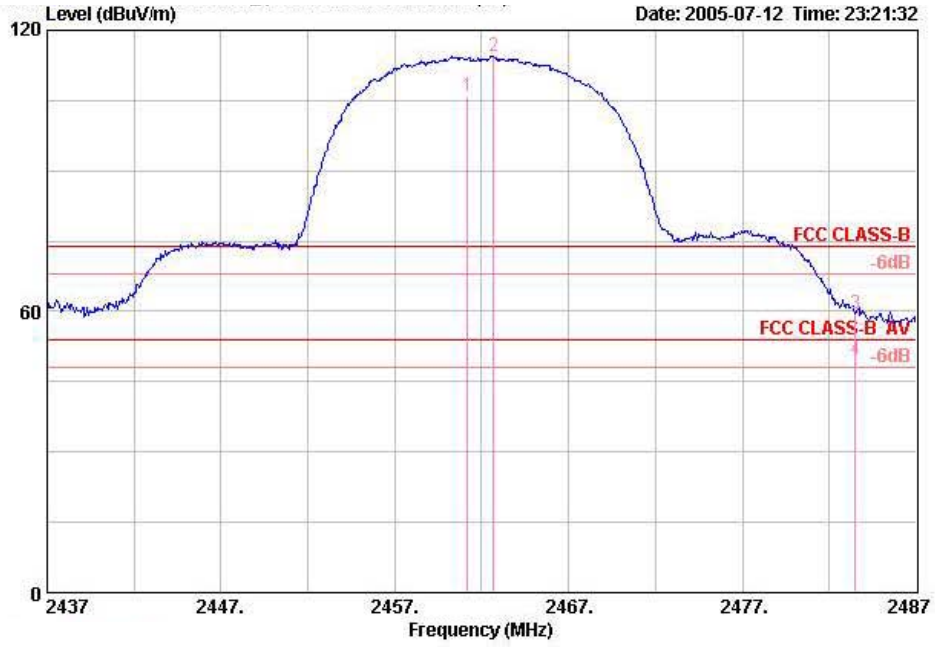
5.4.7. Test Result of Radiated Emission

Modulation Type: DSSS (Channel 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	2390.000	57.23	-16.77	74.00	28.13	2.00	0.00	27.10	HORIZONTAL	PEAK
2	2390.000	47.62	-6.38	54.00	28.13	2.00	0.00	17.49	HORIZONTAL	AVERAGE

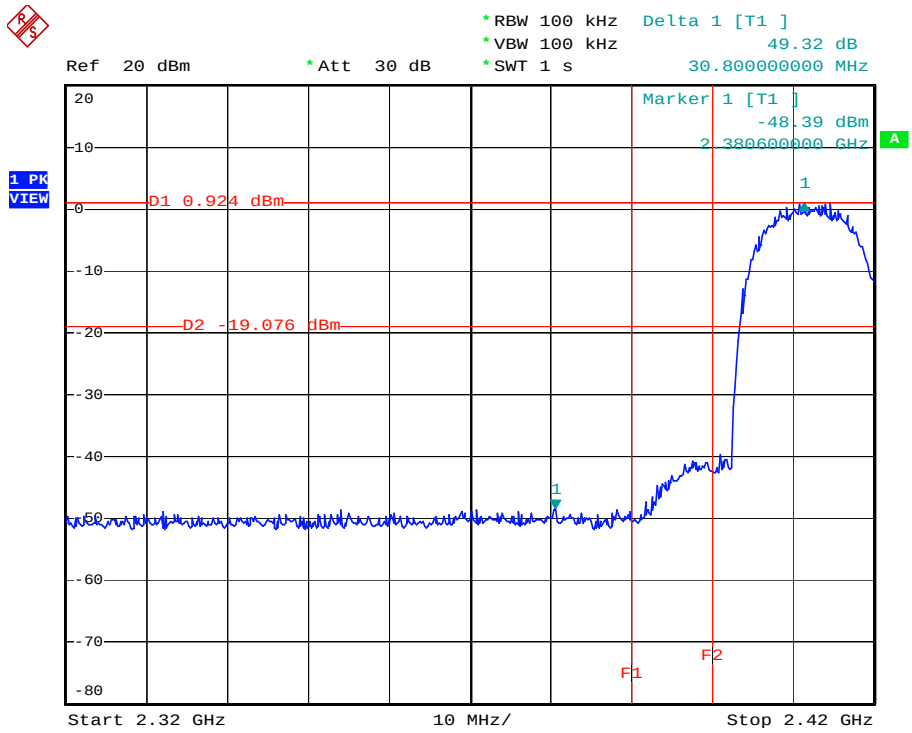
Modulation Type: DSSS (Channel 2462 MHz)：



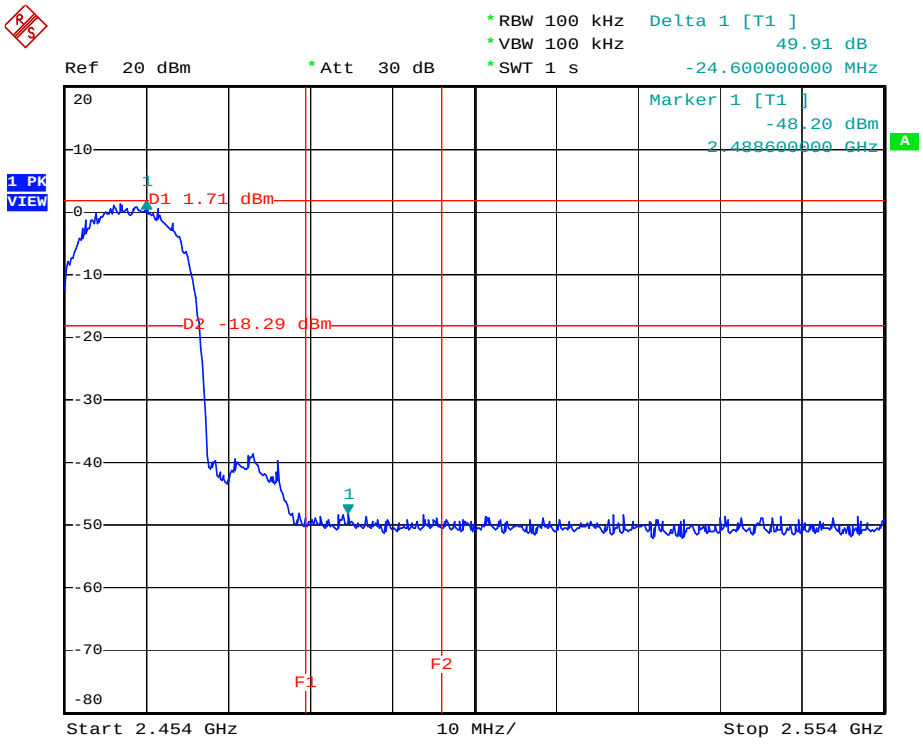
Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
2483.500	59.43	-14.57	74.00	28.36	2.04	0.00	29.04	HORIZONTAL	PEAK
2483.500	49.67	-4.33	54.00	28.36	2.04	0.00	19.27	HORIZONTAL	AVERAGE

5.4.8. Test Result of Conducted Emission

Modulation Type: DSSS (Channel 2412 MHz)：



Modulation Type: DSSS (Channel 2462 MHz)：



5.5. Test of Hopping Channel Bandwidth (BLUETOOTH)

5.5.1. Applicable Standard

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.5.2. Measuring Instruments

Item 18 of the table on section 6.

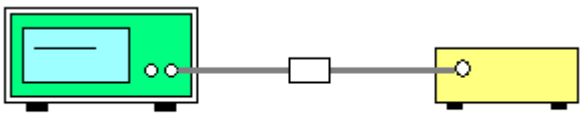
5.5.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP30
  Attenuation : Auto
  Center Frequency : 2402 MHz/ 2441 MHz / 2480 MHz
  Span Frequency : > 20dB Bandwidth
  RB : 30 kHz
  VB : 100 kHz
  Detector : Peak
  Trace : Max Hold
  Sweep Time : Auto

5.5.4. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 30KHz and VBW to 100KHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is Auto.
4. The hopping channel bandwidth is the spectrum with level higher than 20dB below the peak level.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.5.5. Test Setup Layout



5.5.6. Test Criteria

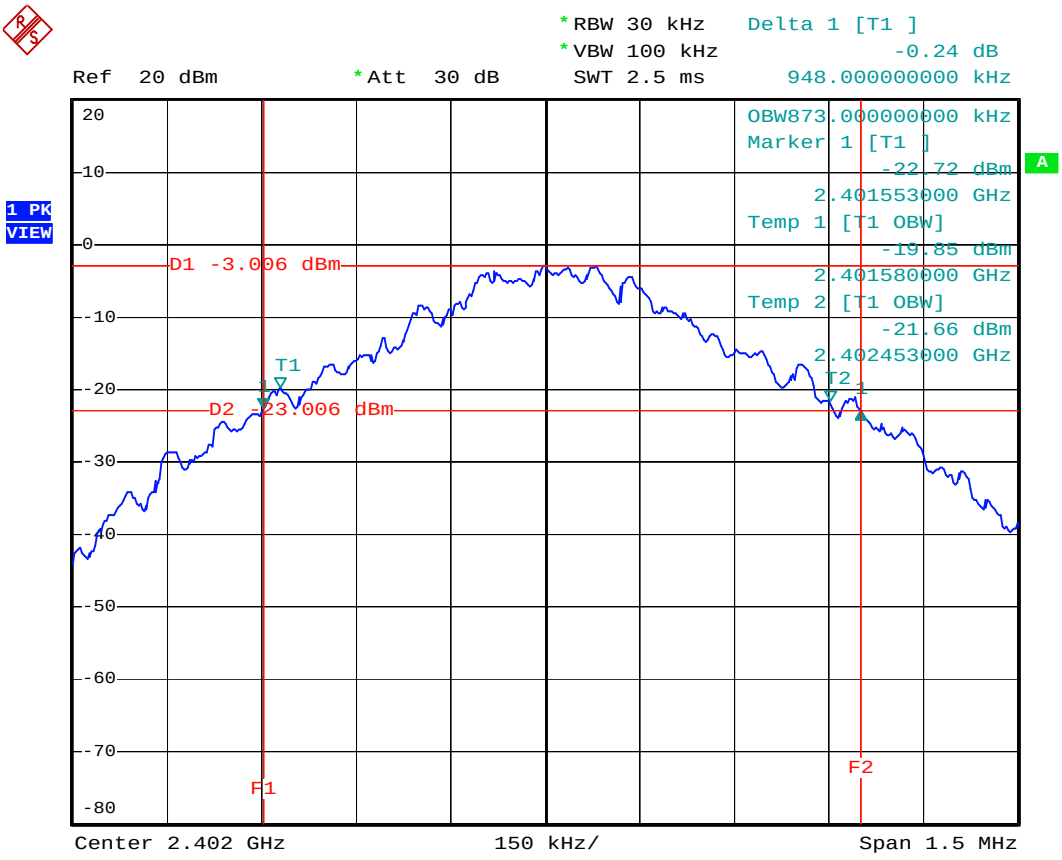
All test results complied with the requirements of Section 15.247(a)(1). Measurement Uncertainty is $1x10^{-5}$.

5.5.7. Test Result：See spectrum analyzer plots below

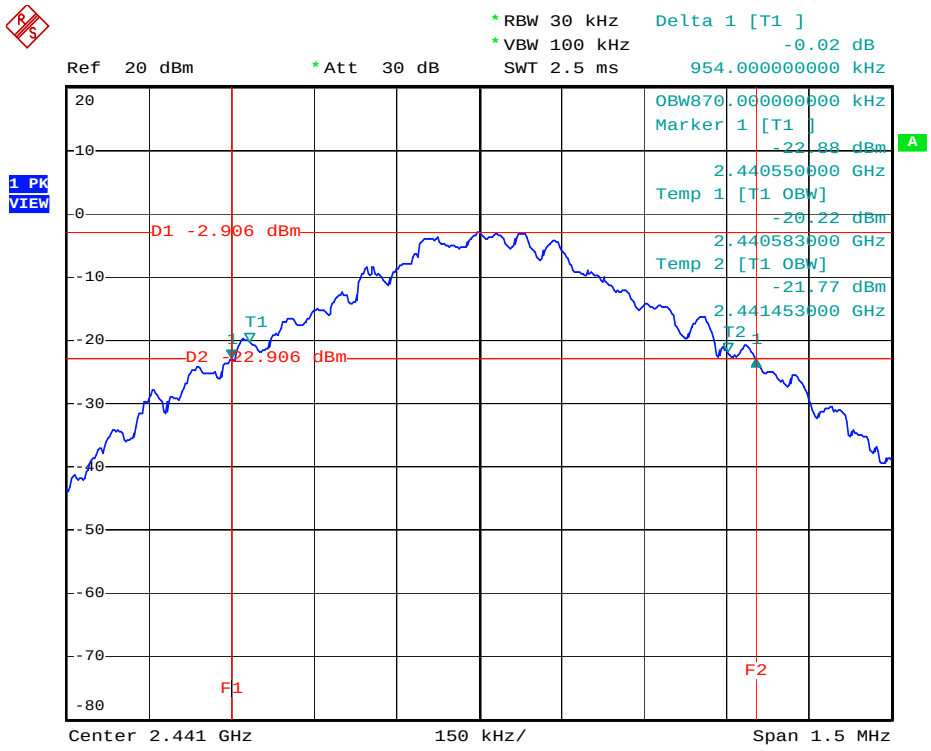
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 38.10%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Separation (MHz)
GFSK	00	2402 MHz	948.00	1.00
GFSK	39	2441 MHz	954.00	1.00
GFSK	78	2480 MHz	948.00	1.00

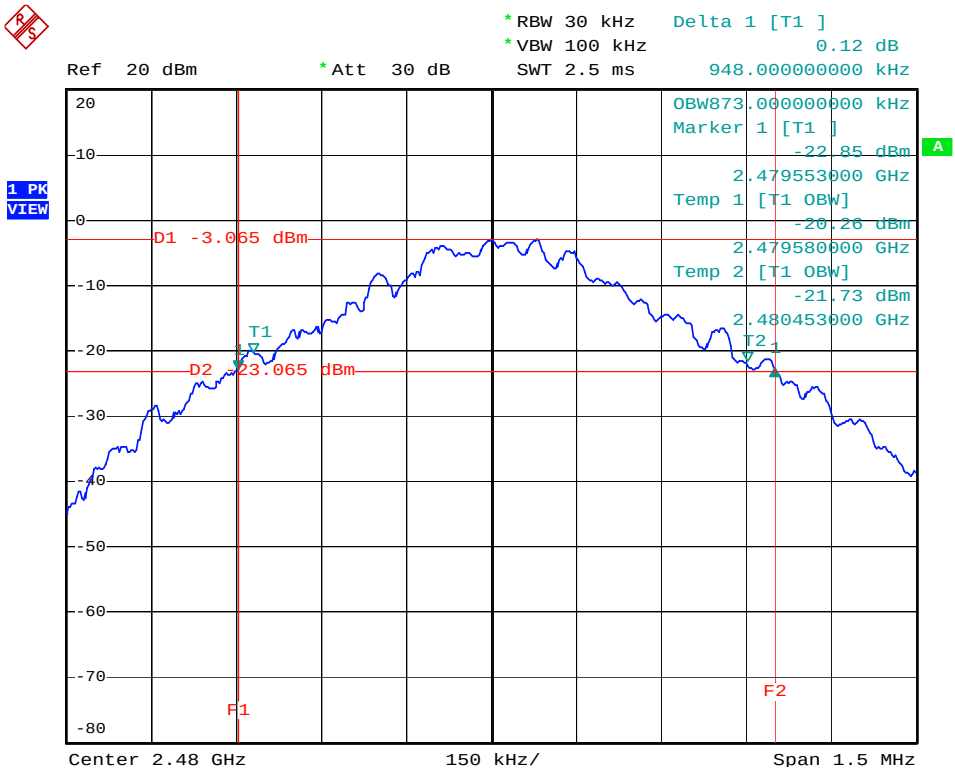
Modulation Type: GFSK (Channel 2402 MHz)：



Modulation Type: GFSK (Channel 2441 MHz)：



Modulation Type: GFSK (Channel 2480 MHz)：



5.6. Test of Number of Hopping Frequency (BLUETOOTH)

5.6.1. Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels.

5.6.2. Measuring Instruments

Item 18 of the table on section 6.

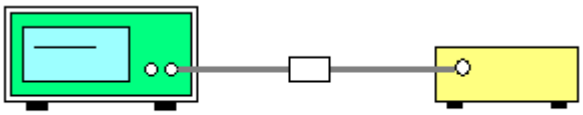
5.6.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP30
  Attenuation : Auto
  Center Frequency : 2402 MHz ~ 2480 MHz
  Span Frequency : > Operation frequency range
  RB : 100 kHz
  VB : 100 kHz

5.6.4. 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.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time to Auto.
4. Observe hopping frequency in 2400MHz~2483.5MHz band.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.6.5. Test Setup Layout



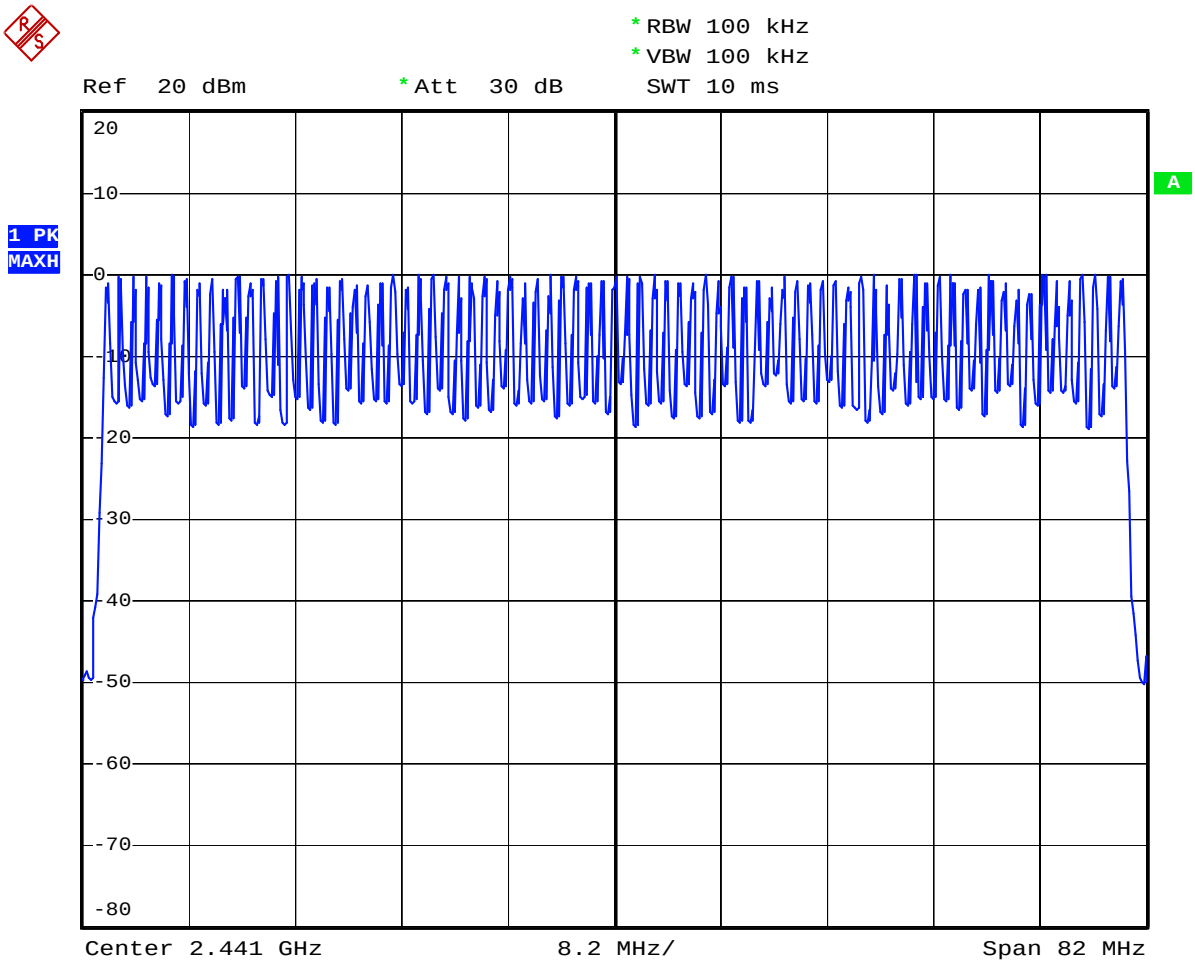
5.6.6. Test Criteria

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

5.6.7. Test Result：See spectrum analyzer plots below

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 38.10%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	Number of Hopping Ch. (Channels)	Min. Limit (Channels)
GFSK	00 ~ 78	2402MHz ~ 2480MHz	79	75



Date: 11.JUL.2005 13:57:52

5.7. Test of Hopping Channel Separation (BLUETOOTH)

5.7.1. Applicable Standard

Section 15.247(a)(1): Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

5.7.2. Measuring Instruments

Item 18 of the table on section 6.

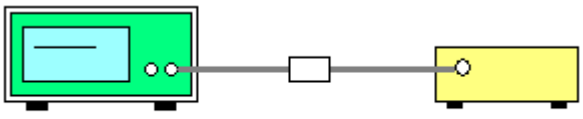
5.7.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP30
  Attenuation : Auto
  Center Frequency : 2402 MHz/ 2441 MHz / 2480 MHz
  Span Frequency : > One time channel separation
  RB : 100 kHz
  VB : 100 kHz
  Detector : Peak
  Trace : Max Hold
  Sweep Time : Auto

5.7.4. 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.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time to Auto.
4. The Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.7.5. Test Setup Layout



5.7.6. Test Criteria

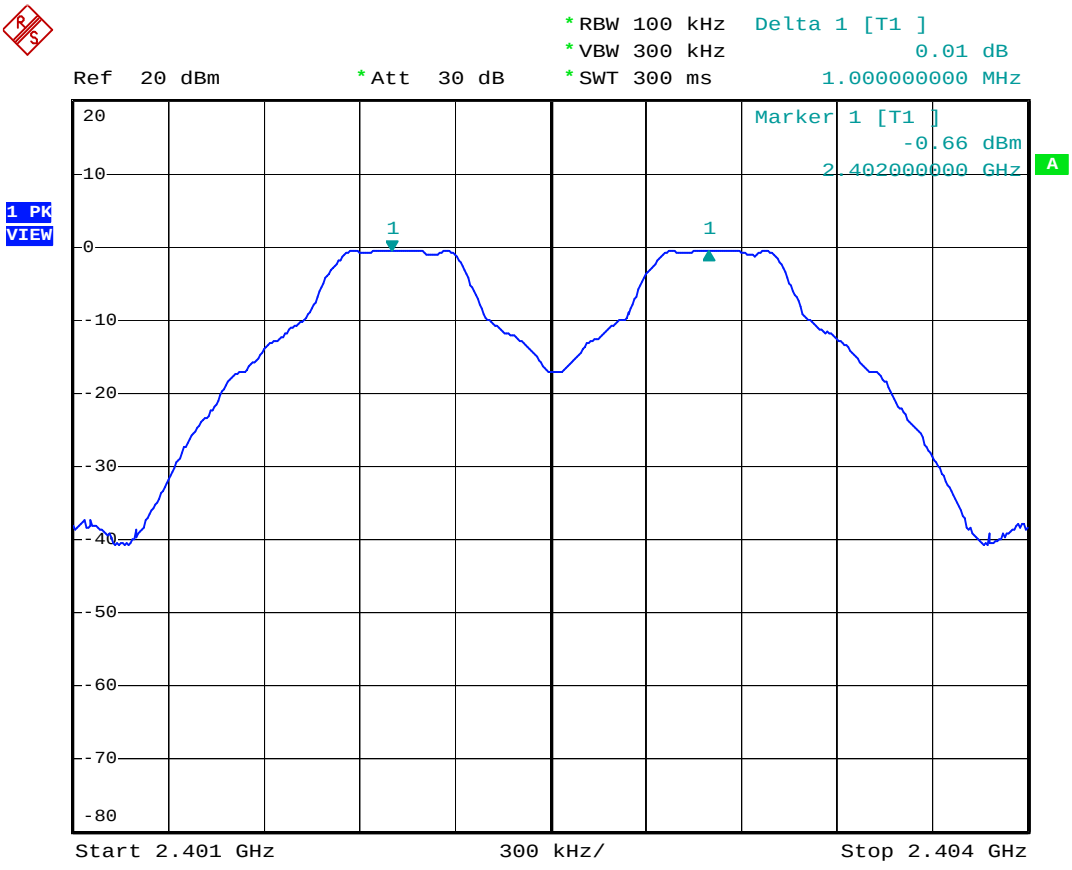
All test results complied with the requirements of Section 15.247(a)(1). Measurement Uncertainty is $1x10^{-5}$.

5.7.7. Test Result

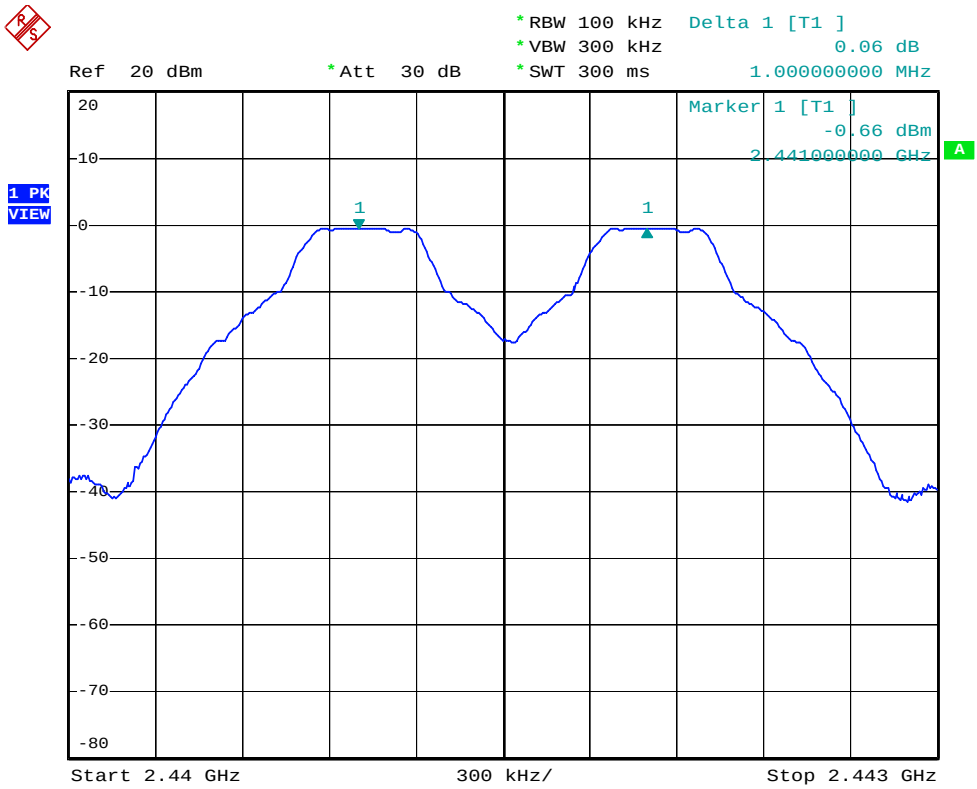
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 38.10%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	Hopping Channel Separation (KHz)	Limits (KHz)
GFSK	00	2402 MHz	1000.0000	836.00
GFSK	39	2441 MHz	1000.0000	876.00
GFSK	78	2480 MHz	1000.0000	880.00

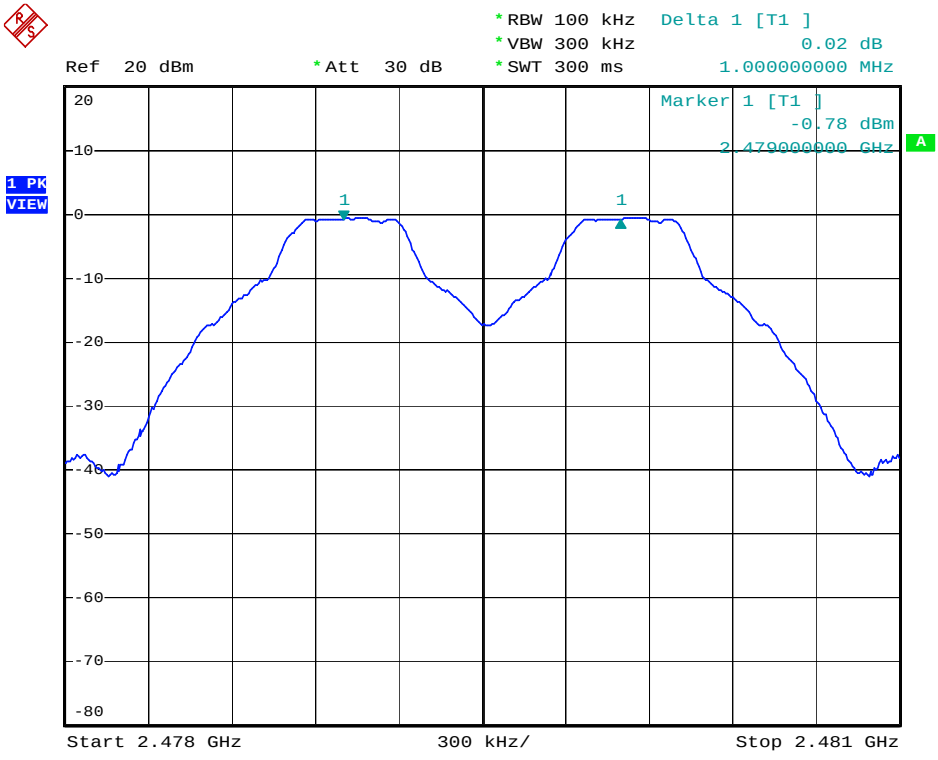
Modulation Type: GFSK (Channel 2402 MHz)：



Modulation Type: GFSK (Channel 2441 MHz)：



Modulation Type: GFSK (Channel 2480 MHz)：



5.8. Test of Dwell Time of Each Frequency (BLUETOOTH)

5.8.1. Applicable Standard

Section 15.247(a)(1)(iii): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels.

5.8.2. Measuring Instruments

Item 18 of the table on section 6.

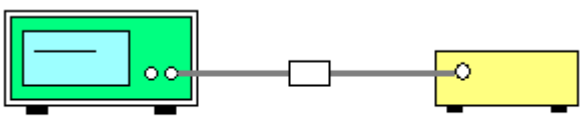
5.8.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP30
  Attenuation : Auto
  Center Frequency : 2402 MHz/ 2441 MHz / 2480 MHz
  Span Frequency : 0MHz
  RB : 1 MHz
  VB : 1 MHz
  Detector : Peak
  Trigger : Video
  Sweep Time : > One pulse time

5.8.4. T Test Procedures and Test Instruments Setting

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 1000kHz and VBW to 1000kHz.
3. Set Detector to Peak, Trace to Max Hold and Sweep Time is more than once pulse time.
4. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
5. Set the EUT for DH5, DH3 and DH1 packet transmitting.
6. Measure the maximum time duration of one single pulse.
7. DH5 Packet permit maximum 3.37 hops per second in each channel. So, the dwell time is the time duration of the pulse times 106.6 within 31.6 seconds.
8. DH3 Packet permit maximum 5.06 hops per second in each channel. So, the dwell time is the time duration of the pulse times 160 within 31.6 seconds.
9. DH1 Packet permit maximum 10.12 hops per second in each channel. So, the dwell time is the time duration of the pulse times 320 within 31.6 seconds.

5.8.5. Test Setup Layout



5.8.6. Test Criteria

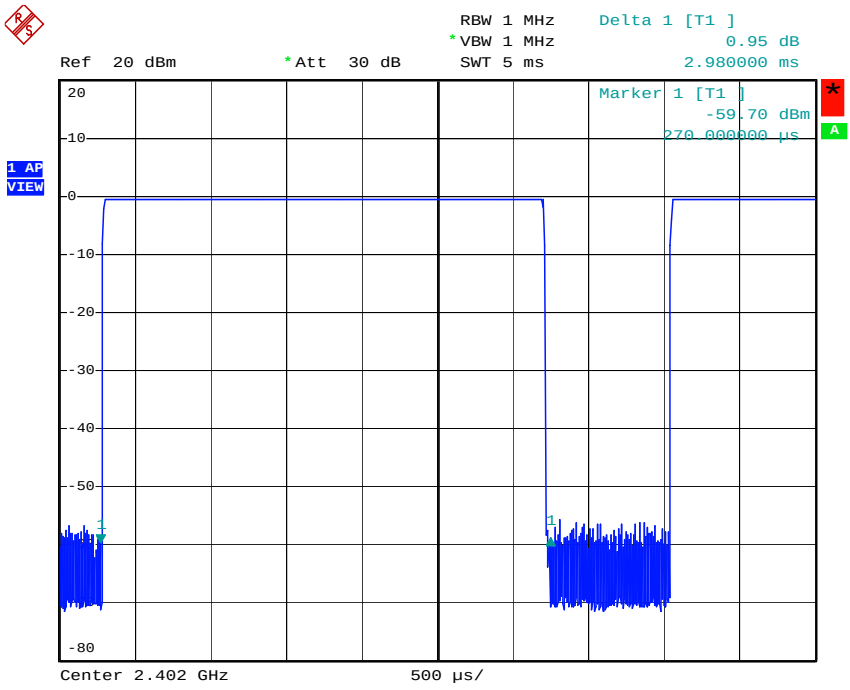
All test results complied with the requirements of Section 15.247(a)(1)(iii). Measurement Uncertainty is $1x10^{-5}$.

5.8.7. Test Result

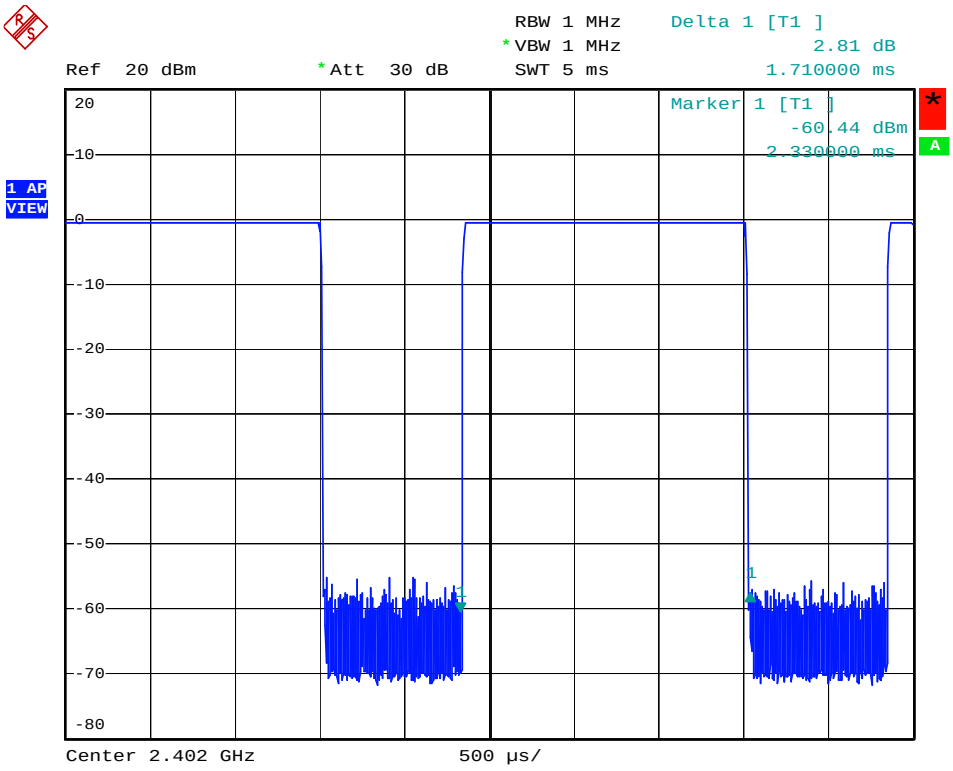
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 38.10%
- Test Engineer: Steven Lu

Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH5	2402 MHz	2.9800	0.3179	0.4
DH3	2402 MHz	1.7100	0.2736	0.4
DH1	2402 MHz	0.4500	0.1440	0.4
DH5	2441 MHz	2.9600	0.3157	0.4
DH3	2441 MHz	1.7200	0.2752	0.4
DH1	2441 MHz	0.4500	0.1440	0.4
DH5	2480 MHz	2.9800	0.3179	0.4
DH3	2480 MHz	1.7100	0.2736	0.4
DH1	2480 MHz	0.4500	0.1440	0.4

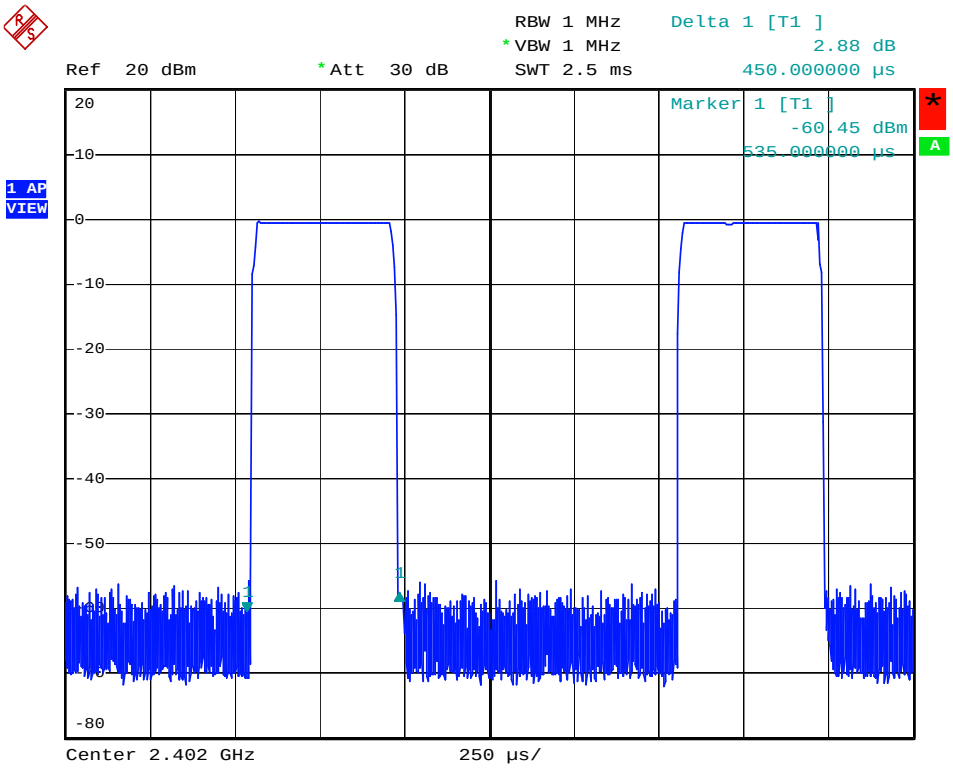
DH5 Modulation Type: GFSK (Channel 2402 MHz)：



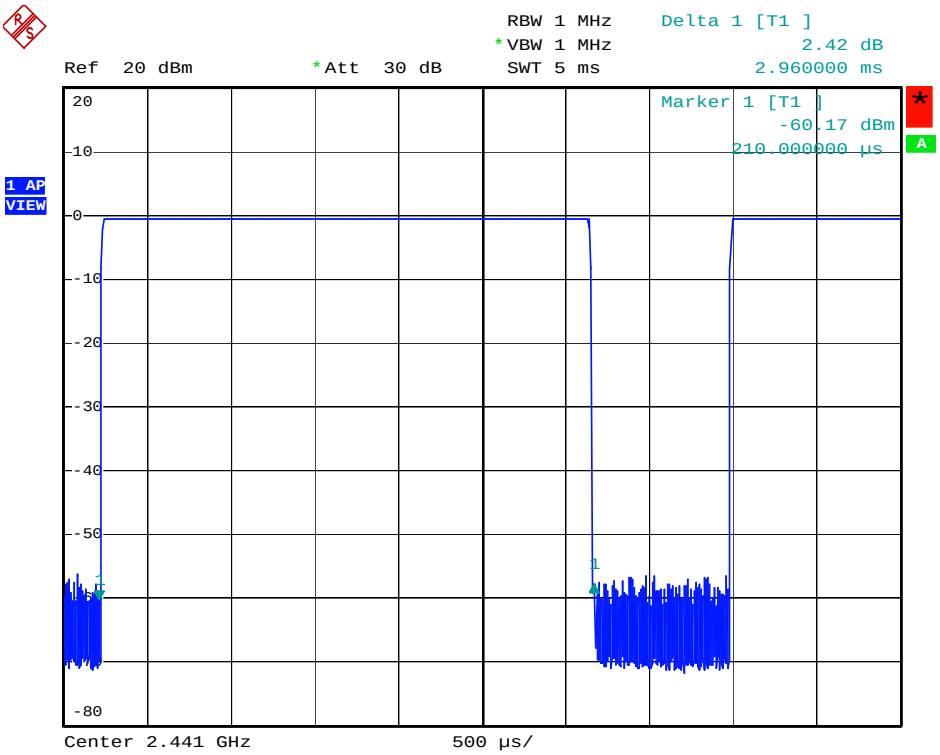
DH3 Modulation Type: GFSK (Channel 2402MHz)：



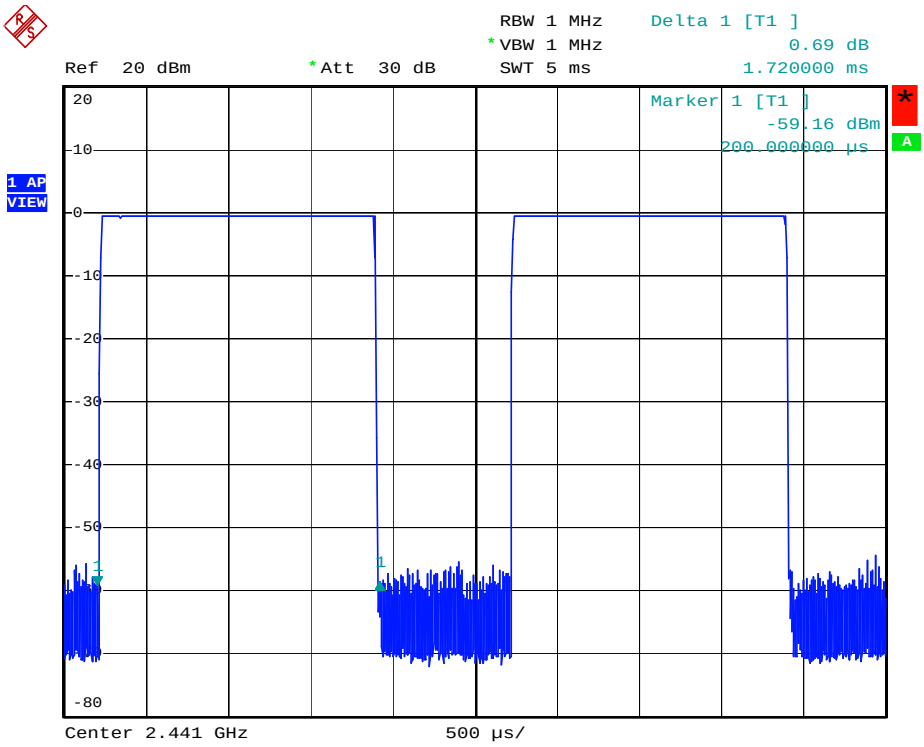
DH1 Modulation Type: GFSK (Channel 2402 MHz)：



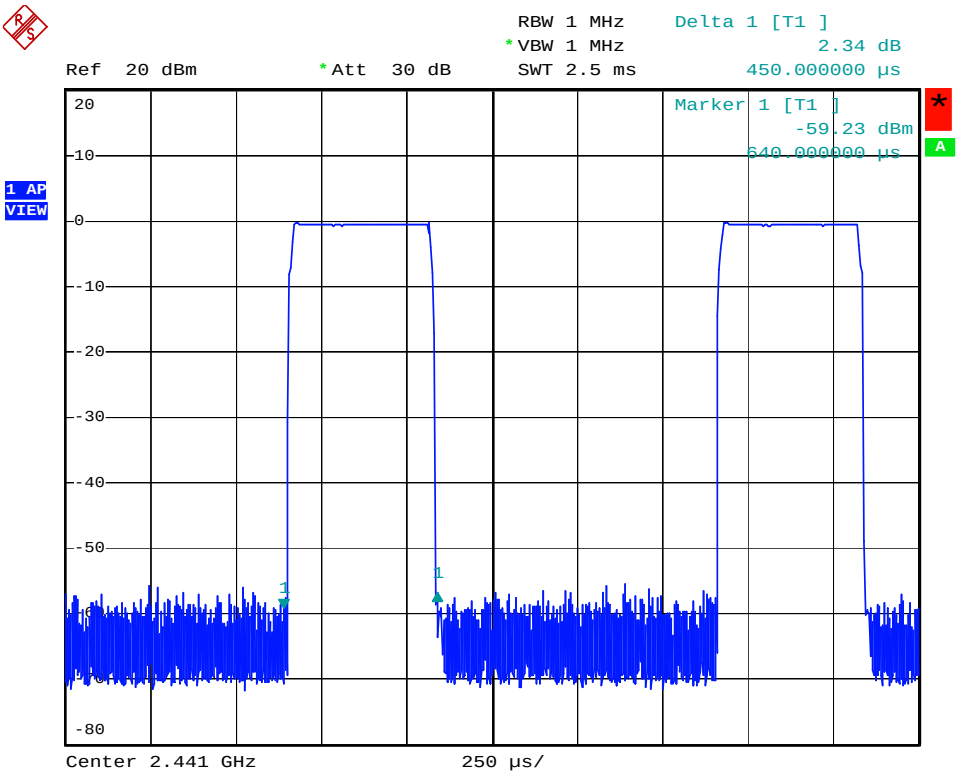
DH5 Modulation Type: GFSK (Channel 2441 MHz)：



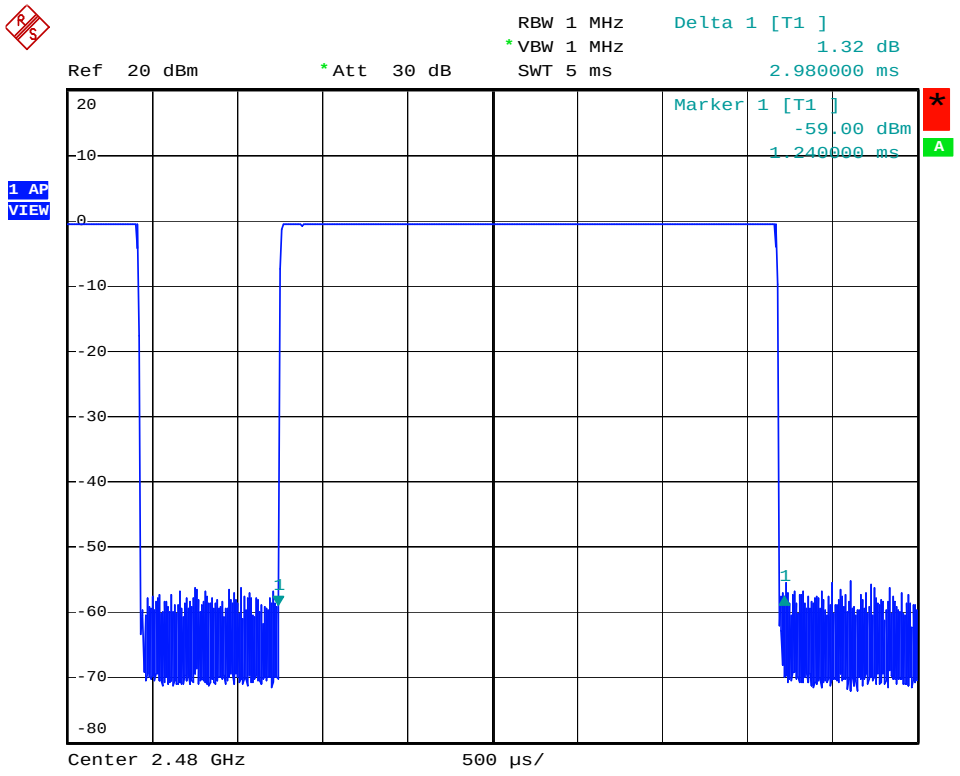
DH3 Modulation Type: GFSK (Channel 2441 MHz)：



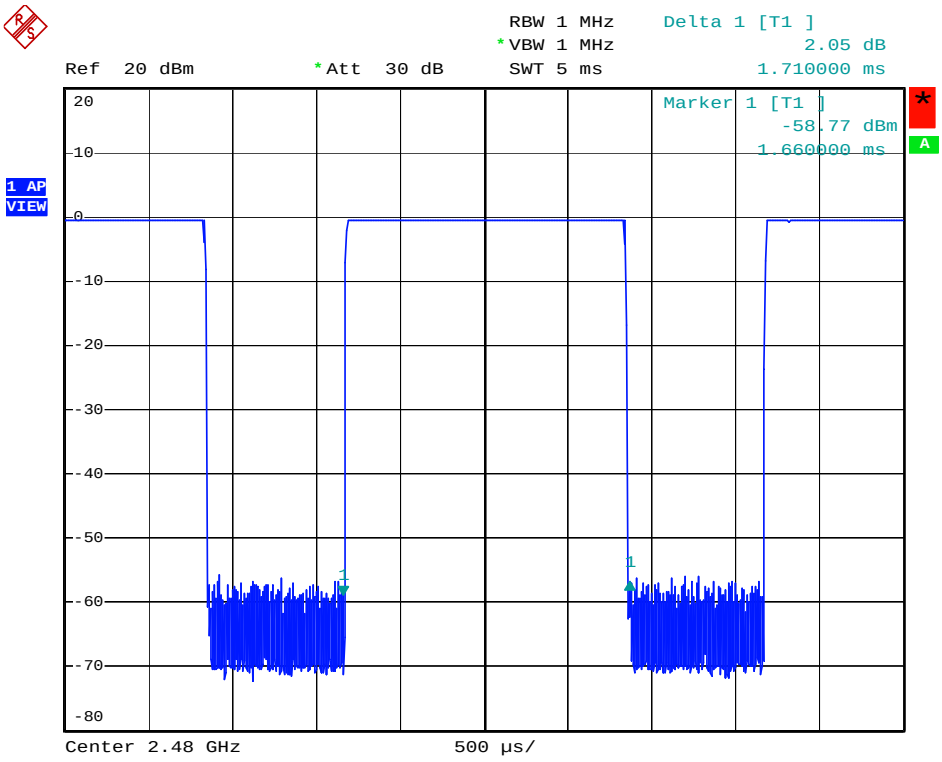
DH1 Modulation Type: GFSK (Channel 2441 MHz)：



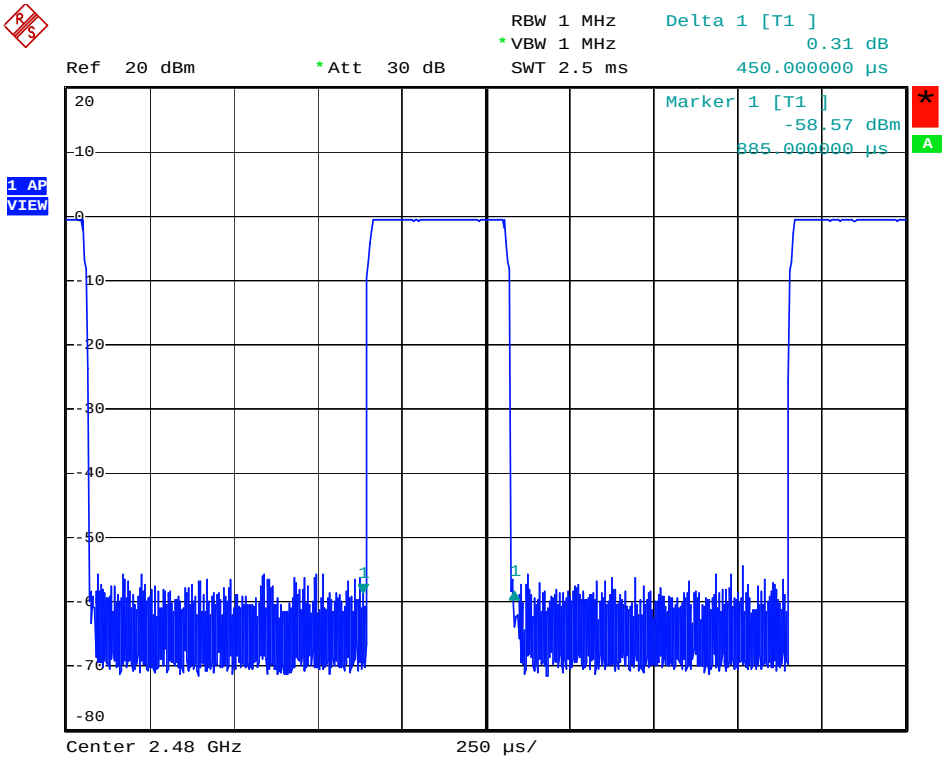
DH5 Modulation Type: GFSK (Channel 2480 MHz)：



DH3 Modulation Type: GFSK (Channel 2480 MHz)：



DH1 Modulation Type: GFSK (Channel2480 MHz)：



5.9. Maximum Peak Output Power (BLUETOOTH)

5.9.1. Applicable Standard

Section 15.247(b)(1): For frequency hopping systems operating in the 2400-2483.5 MHz band employing at least 75 non-overlapping hopping channels and the maximum peak output power shall not exceed 1 watt.

5.9.2. Measuring Instruments

Item 19, 21 of the table on section 6.

5.9.3. Test Procedures and Test Instruments Setting

1. The transmitter output was connected to the peak power meter and recorded the peak value.
2. Repeated point 1 for the middle and highest channel of the EUT.

5.9.4. Test Setup Layout

5.9.5. Test Criteria

All test results complied with the requirements of 15.247(b)(1). Measurement Uncertainty is 1.5dB.

5.9.6. Test Result of Conducted Peak Power

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 38.10%
- Test Engineer: Steven Lu

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
GFSK	00	2402 MHz	-0.28	30
GFSK	39	2441 MHz	-0.30	30
GFSK	78	2480 MHz	-0.45	30

5.10. Test of Band Edges Emission

5.10.1. 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.

5.10.2. Measuring Instruments

Item 6~17 of the table on section 6 for radiated measurement.
Item 18 of the table on section 6 for conducted measurement.

5.10.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP30 (Conducted Measurement)
  Attenuation : Auto
  Center Frequency : 2402 MHz / 2480 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 : 2402 MHz/ 2480 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

5.10.4. Test Procedures

Conducted Measurement

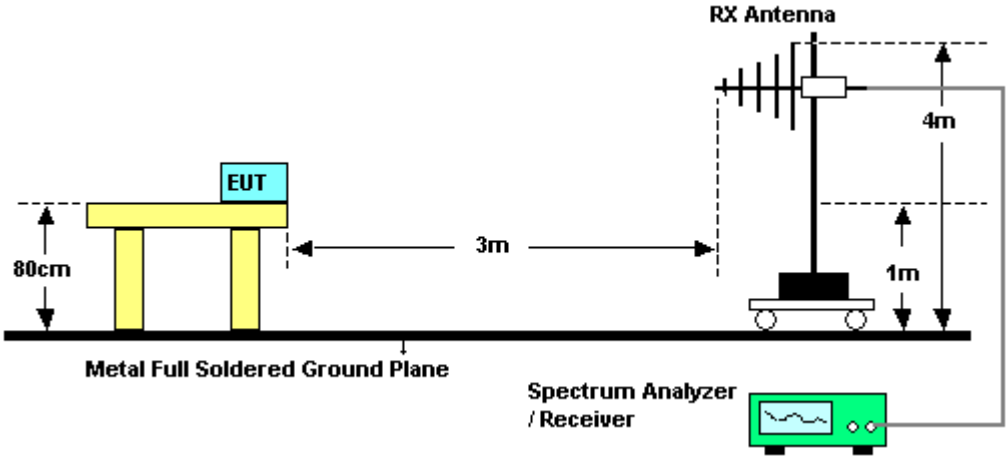
1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth 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

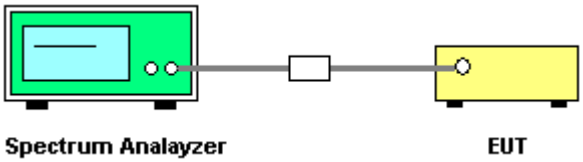
1. Configure the EUT according to ANSI C63.4-2003.
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of 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, use 10Hz VBW and 1MHz RBW for reading under AV and use 1MHz VBW and 1 MHz RBW for reading under PK.

5.10.5. Test Setup

Radiated Method



Conducted Method

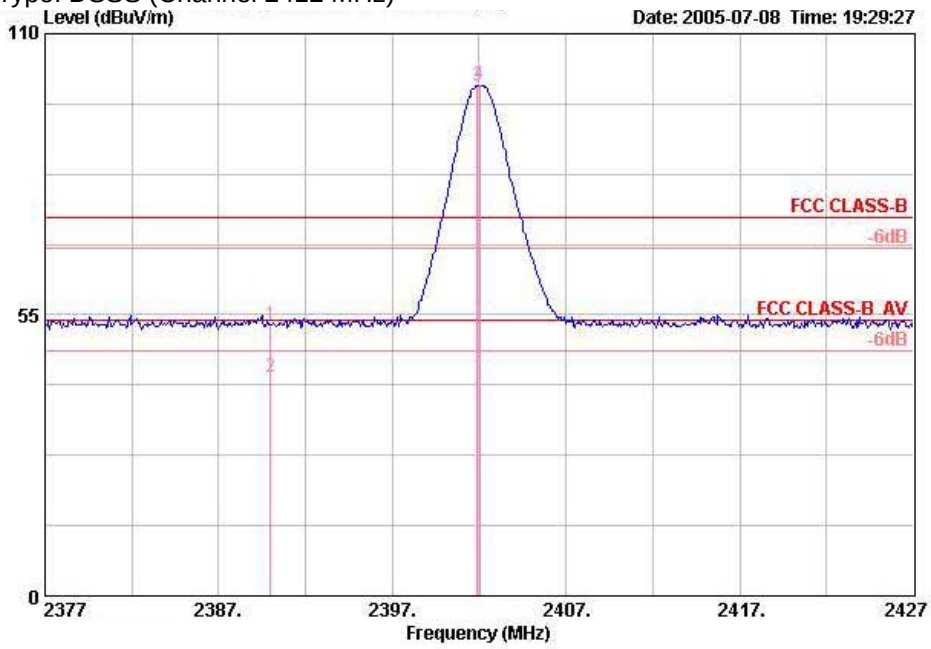


5.10.6. Test Criteria

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

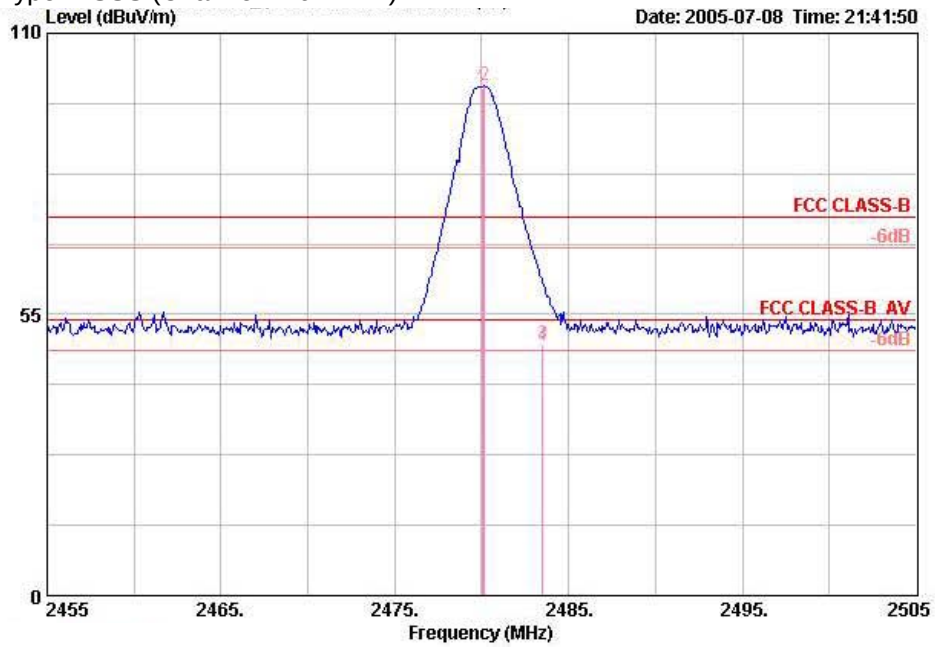
5.10.7. Test Result of Radiated Emission

Modulation Type: DSSS (Channel 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		
2390.000	52.96	-21.04	74.00	28.13	2.00	0.00	22.82	HORIZONTAL	PEAK
2390.000	42.99	-11.01	54.00	28.13	2.00	0.00	12.86	HORIZONTAL	AVERAGE

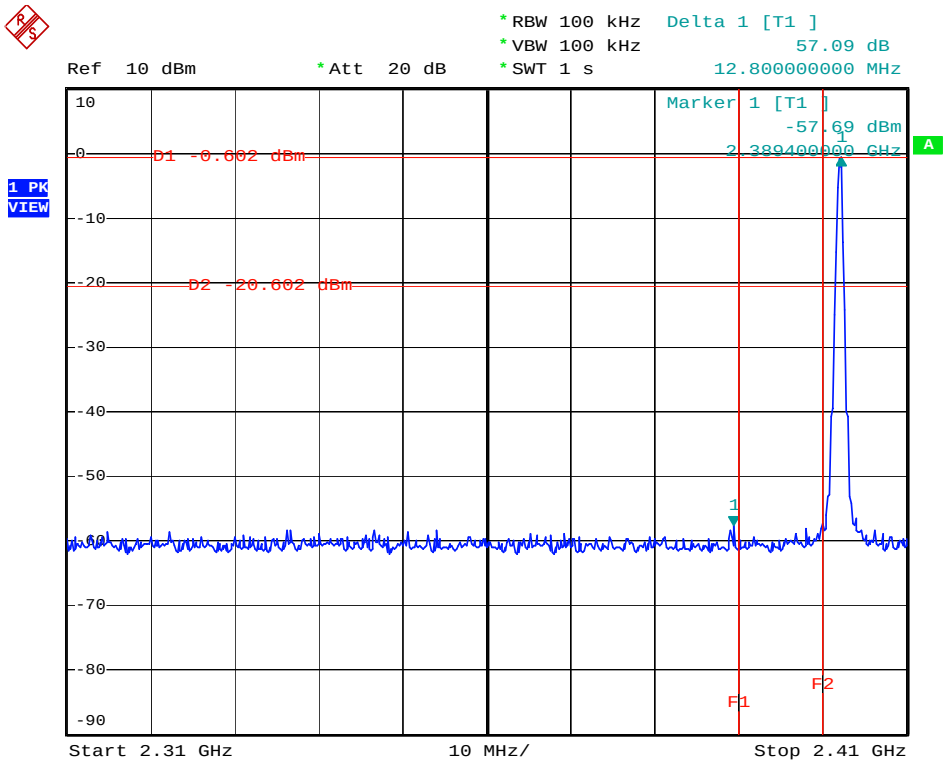
Modulation Type: DSSS (Channel 2462 MHz)：



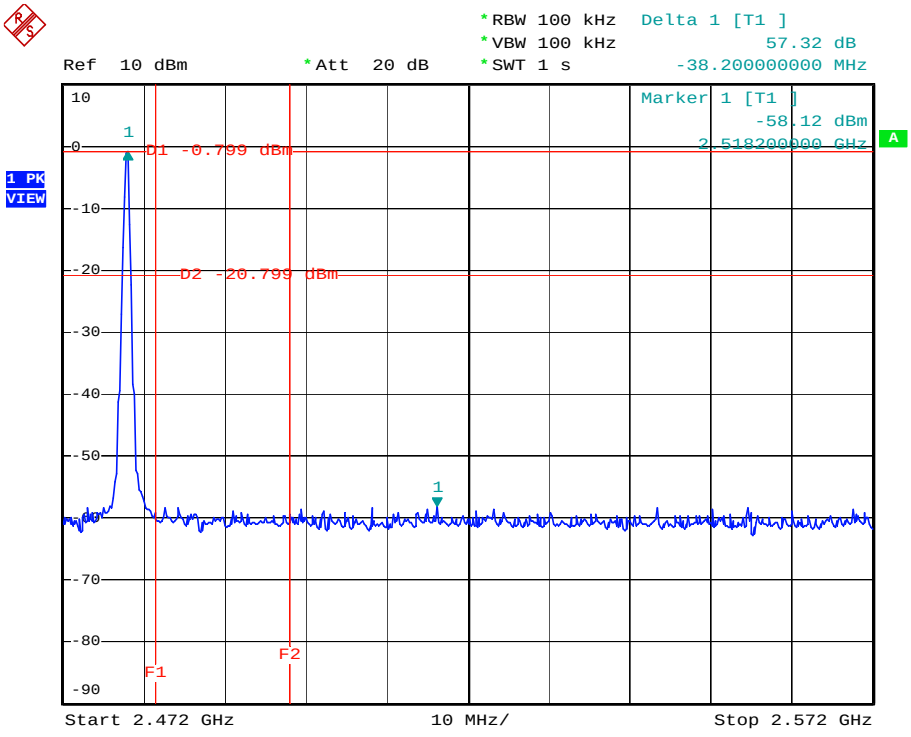
Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
2483.500	49.19	-24.81	74.00	28.36	2.04	0.00	18.79	HORIZONTAL	Peak
2483.500	48.81	-5.19	54.00	28.36	2.04	0.00	18.41	HORIZONTAL	Average

5.10.8. Test Result of Conducted Emission

Modulation Type: GFSK (Channel 00)：



Modulation Type: GFSK (Channel 78)：



5.11. Test of AC Power Line Conducted Emission

5.11.1. 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

5.11.2. Measuring Instruments

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

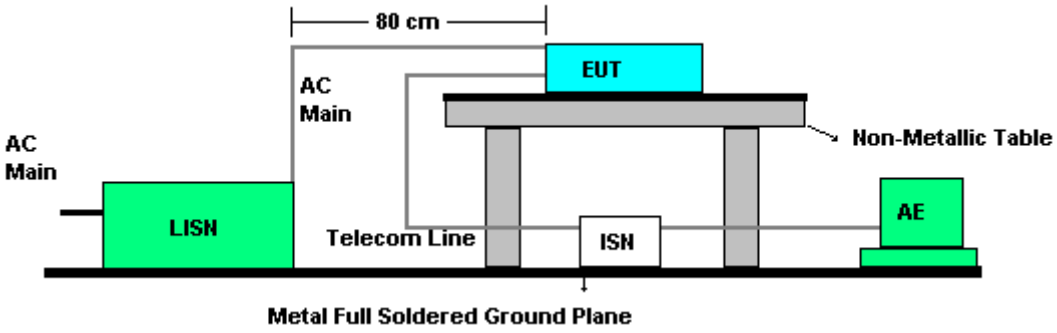
5.11.3. Description of Major Test Instruments Setting

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

5.11.4. 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 provides 50uH/50ohms coupling impedance.
5. The frequency range from 150 KHz to 30 MHz was searched.
6. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
7. The measurement has to be done between each power line and ground at the power terminal for each RF channel. Only one RF channel has to be investigated since this test is independent with the RF channel selection.

5.11.5. Test Setup Layout



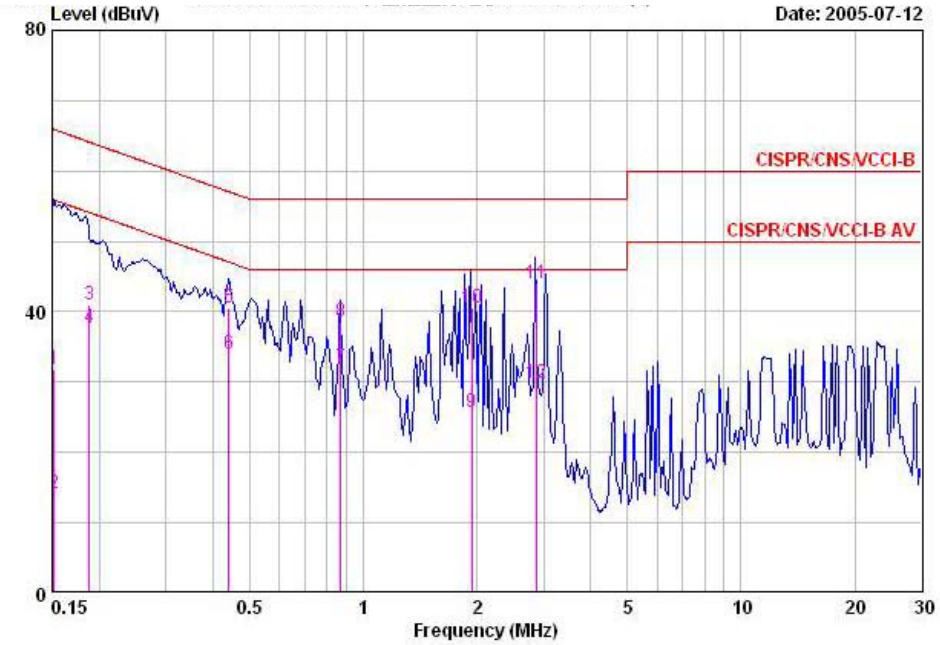
5.11.6. Test Criteria

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

5.11.7. Test Result of Conducted Emission

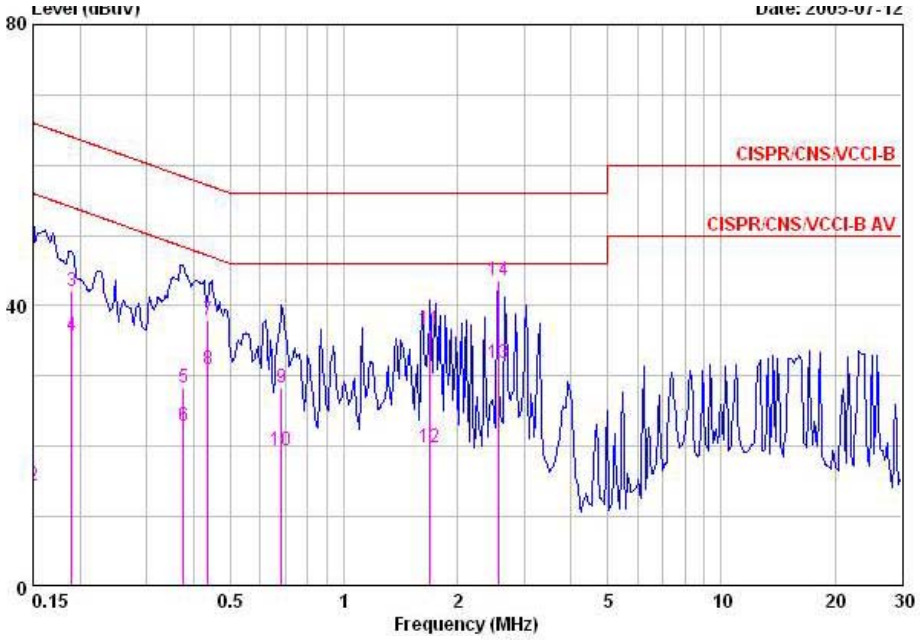
- Test Mode: Adapter Charging Function
- Temperature: 263°C
- Relative Humidity: 645%
- Test Engineer: Steven Lu

Line to Ground



	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.15160	31.80	-34.12	65.91	29.58	2.02	0.20	QP
2	0.15160	14.22	-41.70	55.91	12.00	2.02	0.20	AVERAGE
3	0.18810	41.03	-23.09	64.12	39.62	1.21	0.20	QP
4	0.18810	37.75	-16.37	54.12	36.34	1.21	0.20	AVERAGE
5	0.43974	40.64	-16.43	57.07	39.94	0.50	0.20	QP
6	0.43974	33.95	-13.12	47.07	33.25	0.50	0.20	AVERAGE
7	0.87293	32.05	-13.95	46.00	31.55	0.30	0.20	AVERAGE
8	0.87293	38.52	-17.48	56.00	38.02	0.30	0.20	QP
9	1.934	25.82	-20.18	46.00	25.33	0.30	0.19	AVERAGE
10	1.934	40.44	-15.56	56.00	39.95	0.30	0.19	QP
11 @	2.868	43.96	-12.04	56.00	43.46	0.30	0.20	QP
12	2.868	29.81	-16.19	46.00	29.31	0.30	0.20	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	29.72	-36.28	66.00	27.62	1.90	0.20	QP
2	0.15000	14.29	-41.71	56.00	12.19	1.90	0.20	AVERAGE
3	0.18950	42.00	-22.06	64.06	40.75	1.05	0.20	QP
4	0.18950	35.68	-18.38	54.06	34.43	1.05	0.20	AVERAGE
5	0.37512	28.27	-30.12	58.39	27.57	0.50	0.20	QP
6	0.37512	22.80	-25.59	48.39	22.10	0.50	0.20	AVERAGE
7	0.43712	37.88	-19.24	57.12	37.28	0.40	0.20	QP
8	0.43712	30.85	-16.27	47.12	30.25	0.40	0.20	AVERAGE
9	0.68263	28.30	-27.70	56.00	27.80	0.30	0.20	QP
10	0.68263	19.33	-26.67	46.00	18.83	0.30	0.20	AVERAGE
11	1.689	36.54	-19.46	56.00	36.14	0.26	0.14	QP
12	1.689	19.74	-26.26	46.00	19.34	0.26	0.14	AVERAGE
13	2.563	31.87	-14.13	46.00	31.37	0.30	0.20	AVERAGE
14 @	2.563	43.57	-12.43	56.00	43.07	0.30	0.20	QP

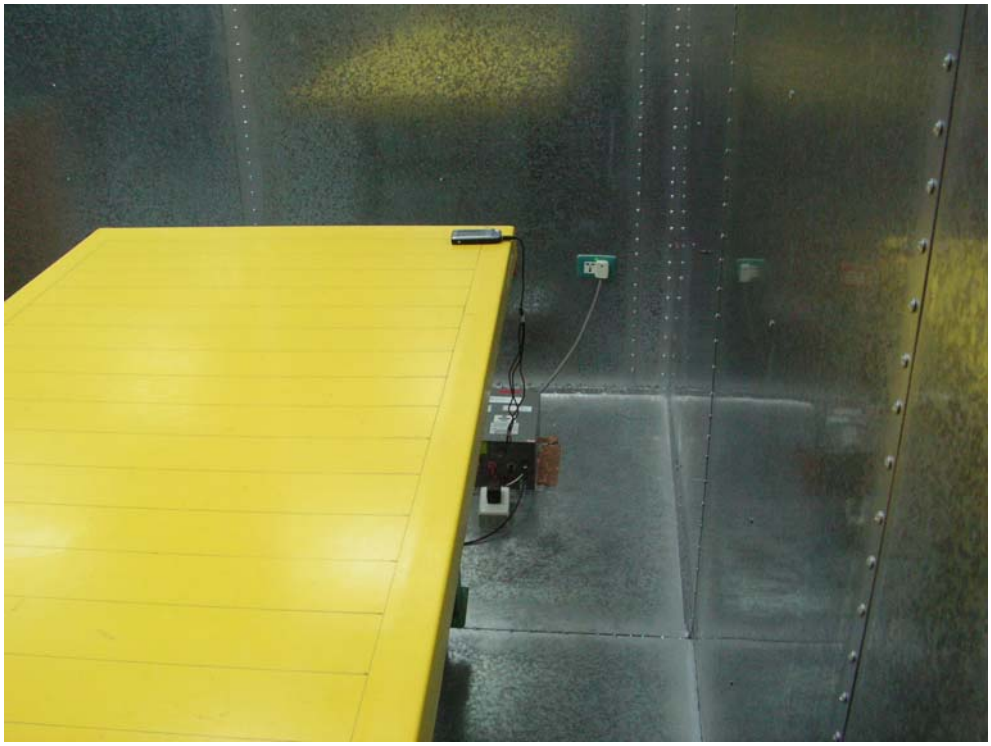
Note:
Corrected Reading: LISN Factor + Cable Loss + Read Level = Level.

5.11.8. Photographs of Conducted Emission Test Configuration

Adapter Charging Mode

FRONT VIEW

REAR VIEW



5.12. Test of Spurious Radiated Emission

5.12.1. 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.

5.12.2. Measuring Instruments

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

5.12.3. 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

5.12.4. Test Procedures

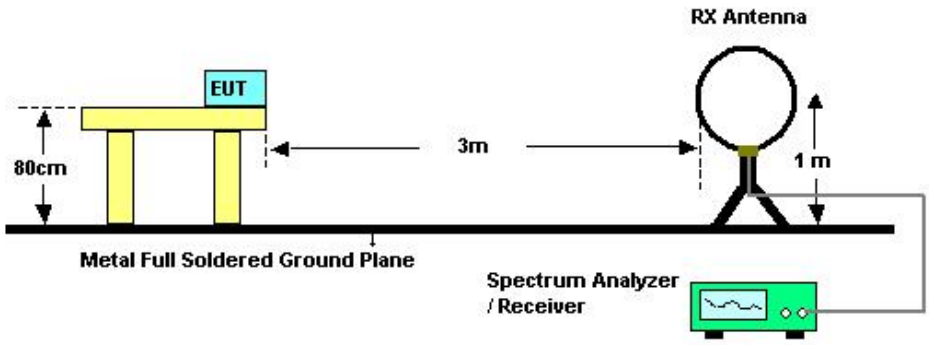
1. Configure the EUT according to ANSI C63.4. The EUT was placed on the top of the turntable 0.8 meter above ground. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
2. Power on the EUT and all the supporting units. 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 emissions field strength of both horizontal and vertical polarization.
4. For each suspected emissions, 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.
5. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
6. For emissions above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.
7. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over

one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.

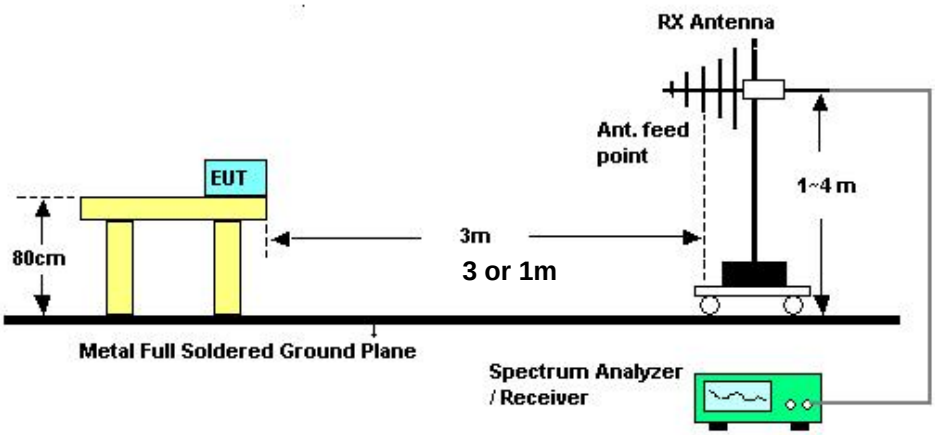
8. If the emissions level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz.
9. For testing above 1GHz, the emissions level of the EUT in peak mode was lower than average limit (that means the emissions 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.
10. In case the emission is lower than 30MHz, loop antenna has to be used for measurement and the recorded data should be QP measured by receiver. High – Low scan is not required in this case.

5.12.5. Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



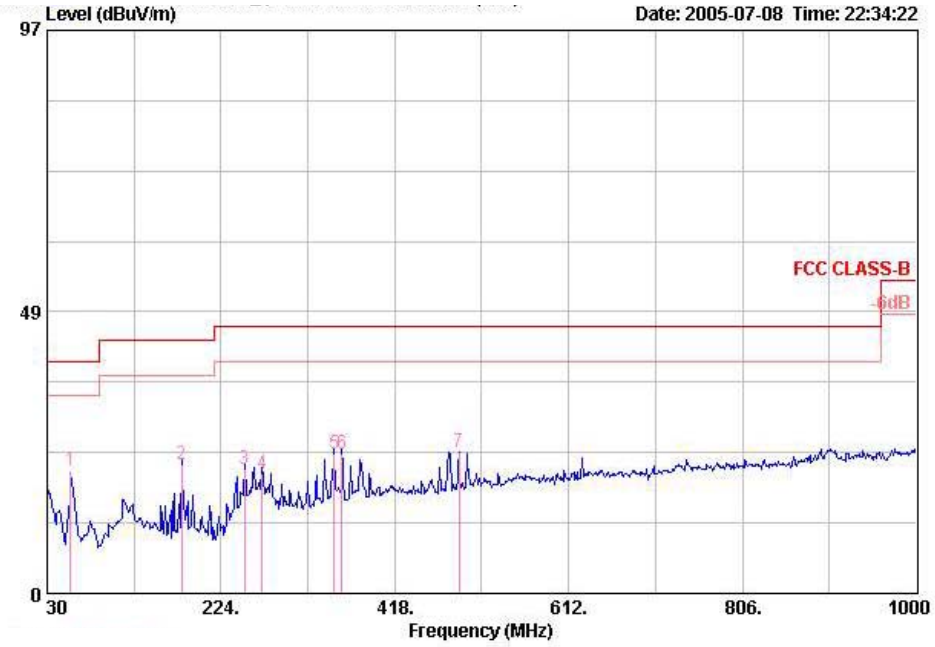
5.12.6. Test Criteria

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

5.12.7. Test Results

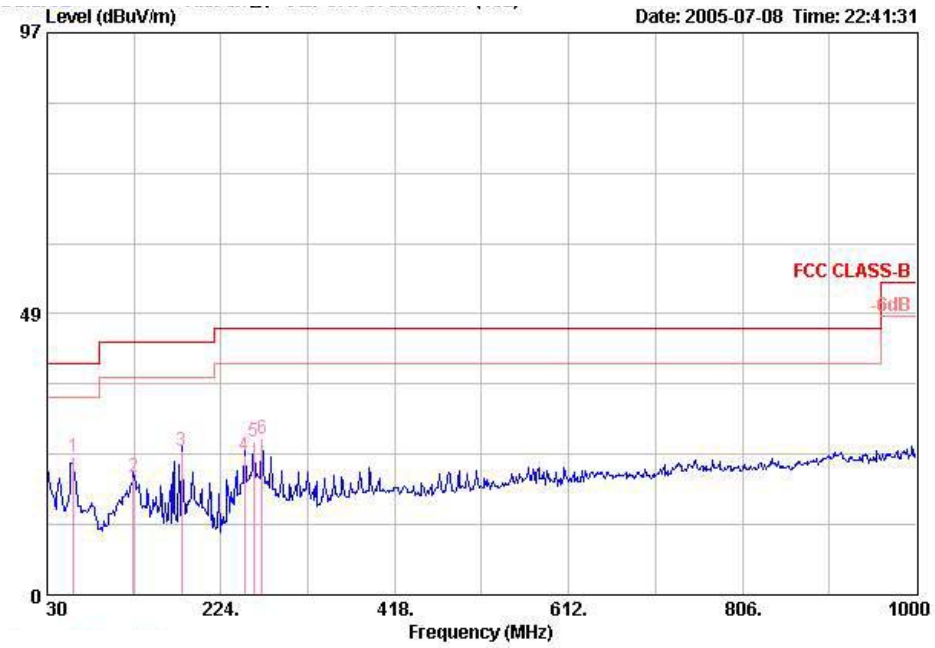
- Test Mode: WLAN Function for CH 06 / 2437 MHz (for emission below 1GHz)
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Steven Lu

(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 @	56.190	21.28	-18.72	40.00	6.00	0.63	29.82	44.46	HORIZONTAL	Peak
2 @	180.350	22.20	-21.30	43.50	8.30	1.06	30.05	42.89	HORIZONTAL	Peak
3	250.190	21.42	-24.58	46.00	12.10	1.24	30.13	38.21	HORIZONTAL	Peak
4	269.590	20.72	-25.28	46.00	12.50	1.30	30.04	36.96	HORIZONTAL	Peak
5	350.100	23.93	-22.07	46.00	14.40	1.48	30.59	38.64	HORIZONTAL	Peak
6	358.830	23.94	-22.06	46.00	14.76	1.50	30.57	38.26	HORIZONTAL	Peak
7 @	489.780	24.24	-21.76	46.00	17.19	1.75	30.58	35.88	HORIZONTAL	Peak

(B) Polarization: Vertical

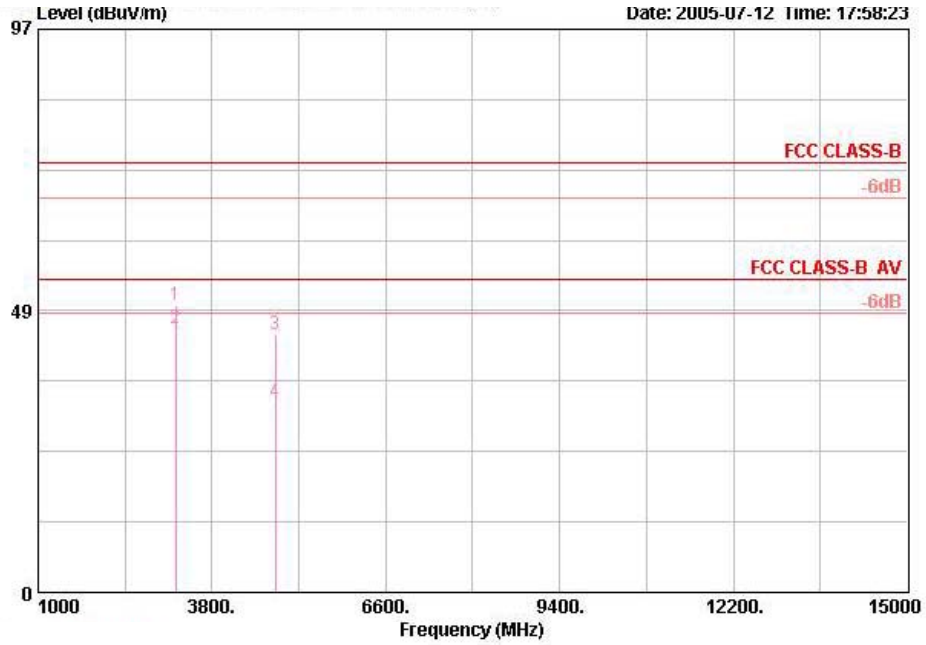


	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	59.100	23.84	-16.16	40.00	5.45	0.65	29.86	47.60	VERTICAL	Peak
2	126.030	20.25	-23.25	43.50	11.84	0.90	30.03	37.55	VERTICAL	Peak
3 @	180.350	24.97	-18.53	43.50	8.30	1.06	30.05	45.66	VERTICAL	Peak
4 @	250.190	24.17	-21.83	46.00	12.10	1.24	30.13	40.96	VERTICAL	Peak
5 @	260.860	26.43	-19.57	46.00	12.92	1.27	30.08	42.31	VERTICAL	Peak
6 @	269.590	27.03	-18.97	46.00	12.50	1.30	30.04	43.27	VERTICAL	Peak

Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m)
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
The amplitude of spurious emissions which are attenuated by more than 20 dB below the permissible value has no need to be reported.
Distance extrapolation factor = 40 log (specific distance / test distance) (dB);
Limit line = specific limits (dBuV) + distance extrapolation factor.

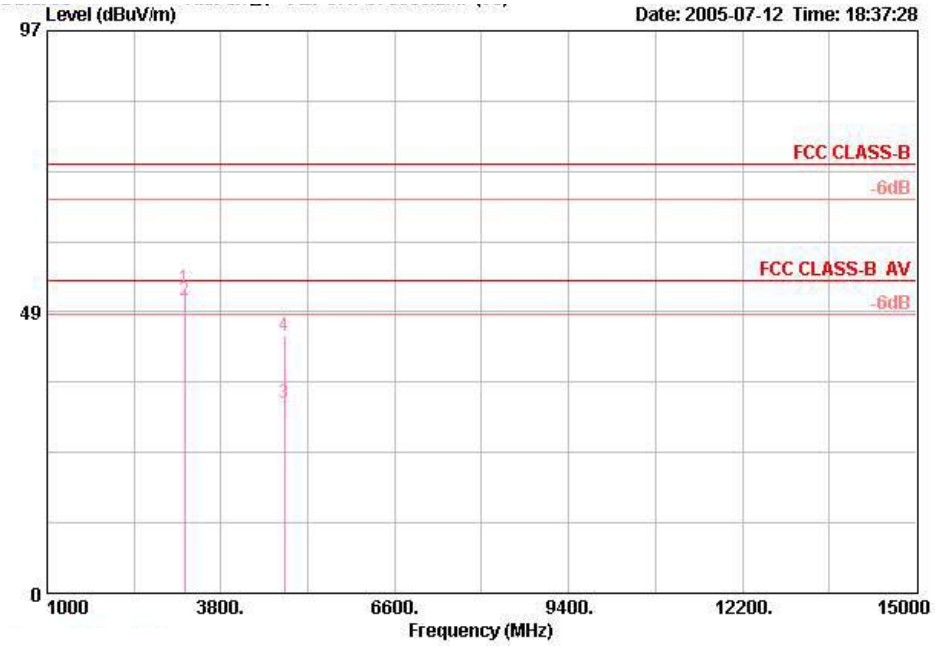
- Test Mode: WLAN Function for CH 01 / 2412 MHz (for emission above 1GHz)
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Steven Lu

(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	3216.000	49.32	-24.68	74.00	30.66	1.97	35.20	51.90	HORIZONTAL	PEAK
2	3216.000	45.34	-8.66	54.00	30.66	1.97	35.20	47.92	HORIZONTAL	AVERAGE
3	4824.040	44.51	-29.49	74.00	33.22	3.20	35.10	43.19	HORIZONTAL	PEAK
4	4824.040	32.90	-21.10	54.00	33.22	3.20	35.10	31.58	HORIZONTAL	AVERAGE

(B) Polarization: Vertical

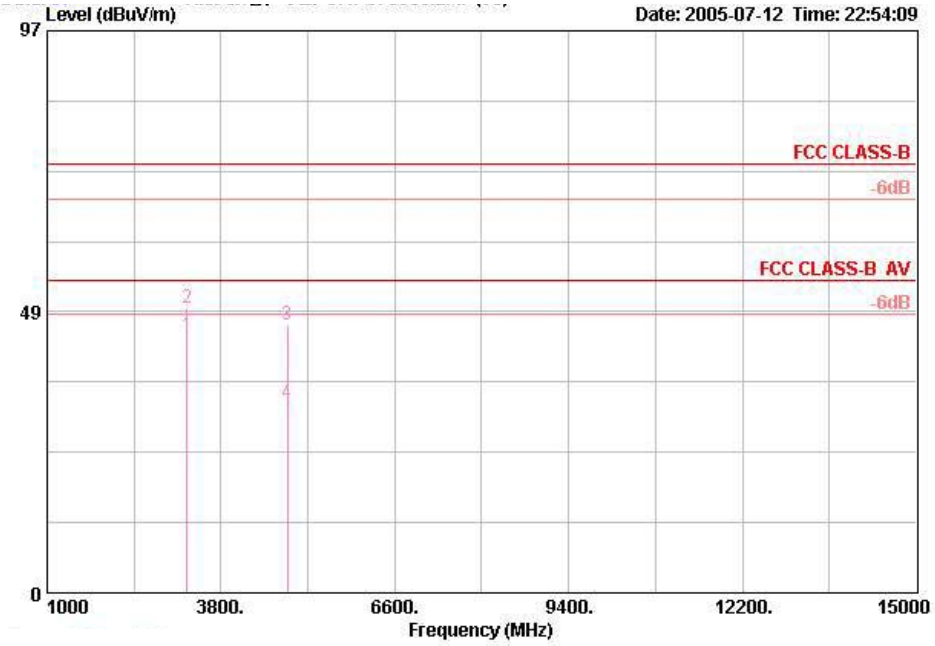


	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	3216.000	52.57	-21.43	74.00	30.66	1.97	35.20	55.15	VERTICAL	PEAK
2 !	3216.000	50.50	-3.50	54.00	30.66	1.97	35.20	53.08	VERTICAL	AVERAGE
3	4824.060	32.87	-21.13	54.00	33.22	3.20	35.10	31.54	VERTICAL	AVERAGE
4	4824.060	44.32	-29.68	74.00	33.22	3.20	35.10	43.00	VERTICAL	PEAK

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

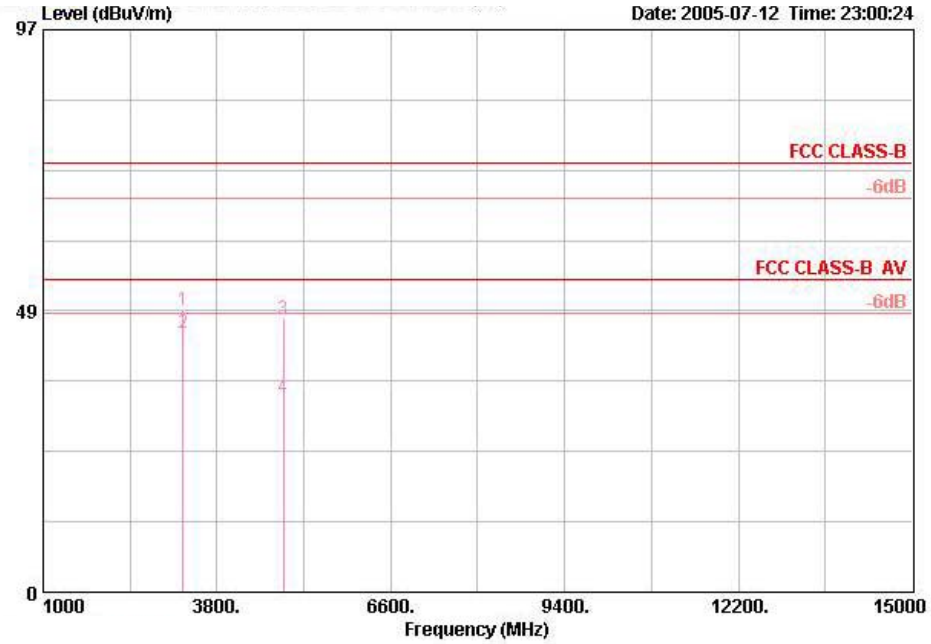
- Test Mode: WLAN Function for CH 06 / 2437 MHz (for emission above 1GHz)
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Steven Lu

(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	3249.320	44.44	-9.56	54.00	30.73	2.03	35.20	46.87	HORIZONTAL	AVERAGE
2	3249.320	49.23	-24.77	74.00	30.73	2.03	35.20	51.67	HORIZONTAL	PEAK
3	4874.180	46.16	-27.84	74.00	33.33	3.22	35.10	44.71	HORIZONTAL	PEAK
4	4874.180	32.80	-21.20	54.00	33.33	3.22	35.10	31.35	HORIZONTAL	AVERAGE

(B) Polarization: Vertical

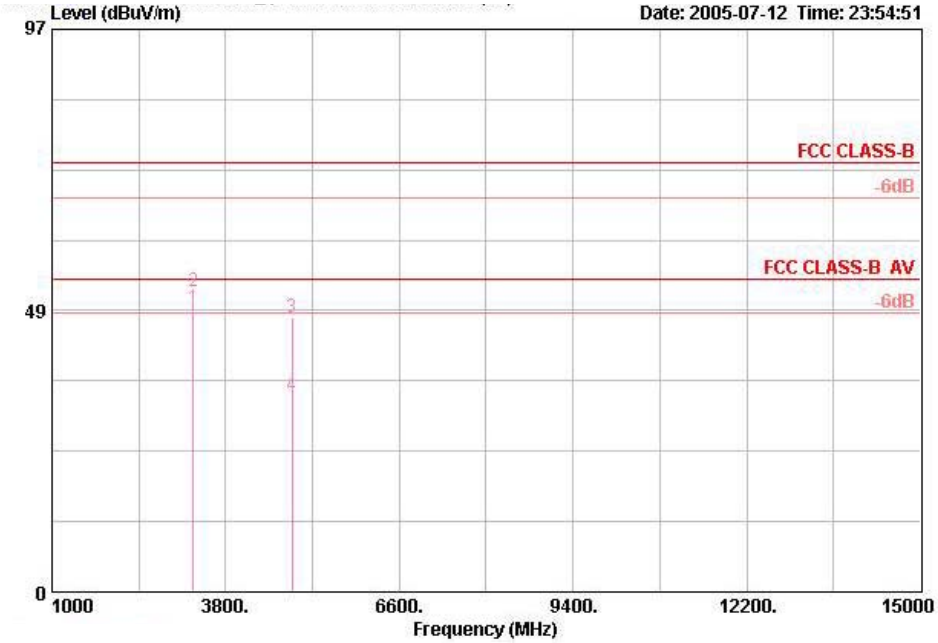


	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	3249.340	48.61	-25.39	74.00	30.73	2.03	35.20	51.05	VERTICAL	PEAK
2	3249.340	44.61	-9.39	54.00	30.73	2.03	35.20	47.05	VERTICAL	AVERAGE
3	4874.020	47.14	-26.86	74.00	33.33	3.22	35.10	45.69	VERTICAL	PEAK
4	4874.240	33.57	-20.43	54.00	33.33	3.22	35.10	32.12	VERTICAL	AVERAGE

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

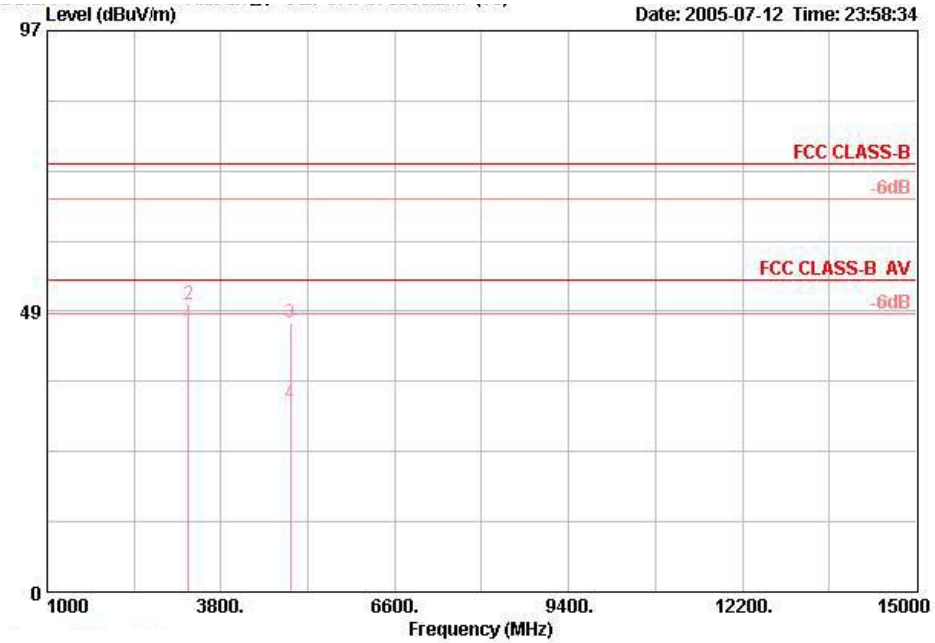
- Test Mode: WLAN Function for CH 11 / 2462 MHz (for emission above 1GHz)
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Steven Lu

(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 !	3282.680	48.99	-5.01	54.00	30.81	2.10	35.20	51.28	VERTICAL	AVERAGE
2	3282.680	51.70	-22.30	74.00	30.81	2.10	35.20	53.99	VERTICAL	PEAK
3	4875.300	47.30	-26.70	74.00	33.33	3.22	35.10	45.85	VERTICAL	Peak
4	4875.300	33.80	-20.20	54.00	33.33	3.22	35.10	32.35	VERTICAL	Average

(B) Polarization: Vertical



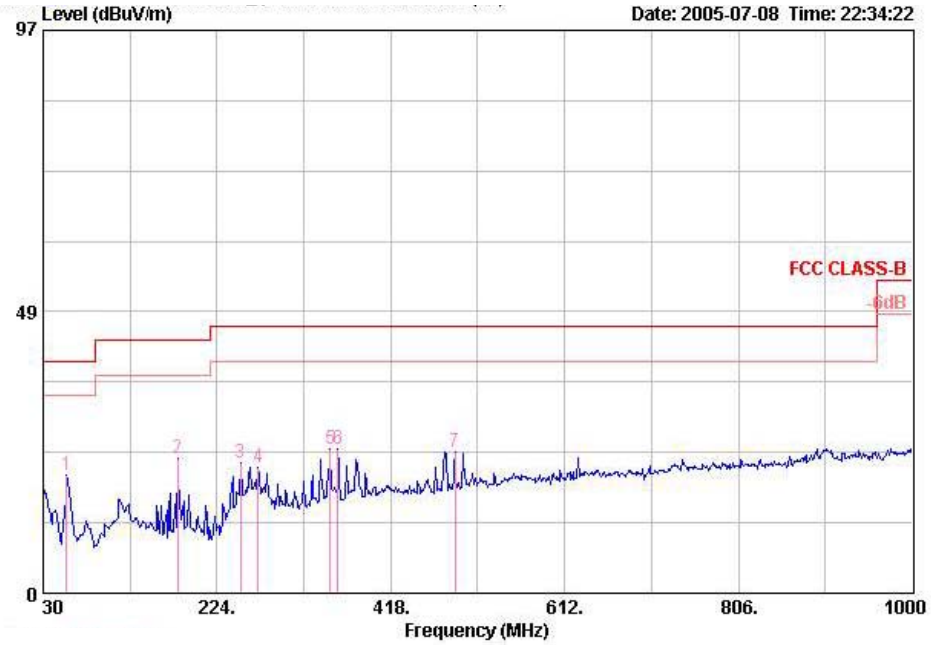
	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1	3282.640	45.27	-8.73	54.00	30.81	2.10	35.20	47.56	HORIZONTAL	AVERAGE
2	3282.640	49.62	-24.38	74.00	30.81	2.10	35.20	51.92	HORIZONTAL	PEAK
3	4925.100	46.40	-27.60	74.00	33.45	3.25	35.10	44.80	HORIZONTAL	PEAK
4	4925.100	32.57	-21.43	54.00	33.45	3.25	35.10	30.97	HORIZONTAL	Average

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

5.12.8. Test Results

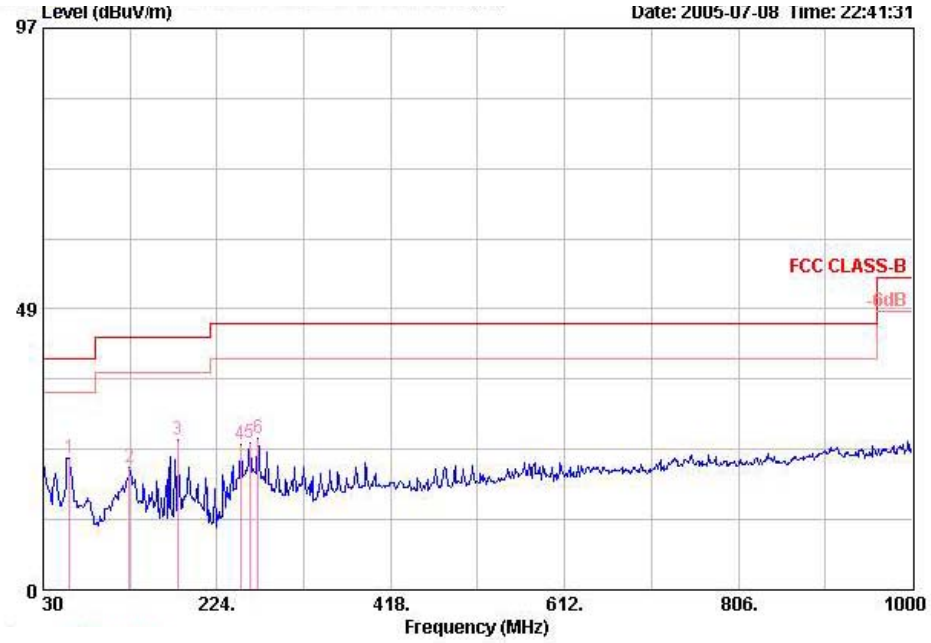
- Test Mode: Bluetooth Function for CH 39 / 2441 MHz (for emission below 1GHz)
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46%
- Test Engineer: Ted Chiu

(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 @	56.190	20.28	-19.72	40.00	6.00	0.63	29.82	43.46	HORIZONTAL	Peak
2 @	180.350	23.20	-20.30	43.50	8.30	1.06	30.05	43.89	HORIZONTAL	Peak
3 @	250.190	22.42	-23.58	46.00	12.10	1.24	30.13	39.21	HORIZONTAL	Peak
4 @	269.590	21.72	-24.28	46.00	12.50	1.30	30.04	37.96	HORIZONTAL	Peak
5 @	350.100	24.93	-21.07	46.00	14.40	1.48	30.59	39.64	HORIZONTAL	Peak
6 @	358.830	24.94	-21.06	46.00	14.76	1.50	30.57	39.26	HORIZONTAL	Peak
7 @	489.780	24.24	-21.76	46.00	17.19	1.75	30.58	35.88	HORIZONTAL	Peak

(B) Polarization: Vertical

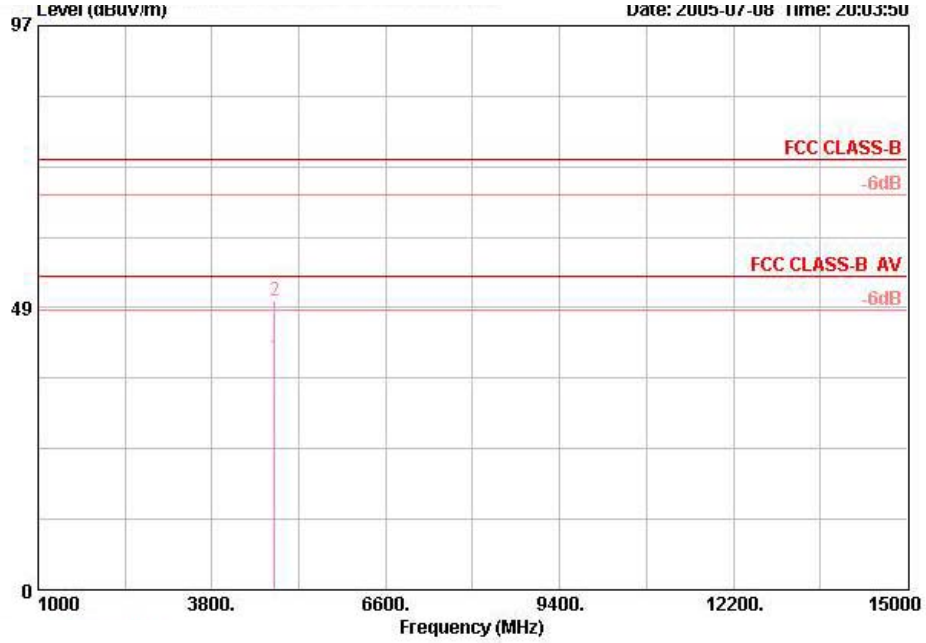


	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	59.100	22.84	-17.16	40.00	5.45	0.65	29.86	46.60	VERTICAL	Peak
2 @	126.030	21.25	-22.25	43.50	11.84	0.90	30.03	38.55	VERTICAL	Peak
3 @	180.350	25.97	-17.53	43.50	8.30	1.06	30.05	46.66	VERTICAL	Peak
4 @	250.190	25.17	-20.83	46.00	12.10	1.24	30.13	41.96	VERTICAL	Peak
5 @	260.860	25.43	-20.57	46.00	12.92	1.27	30.08	41.31	VERTICAL	Peak
6 @	269.590	26.03	-19.97	46.00	12.50	1.30	30.04	42.27	VERTICAL	Peak

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

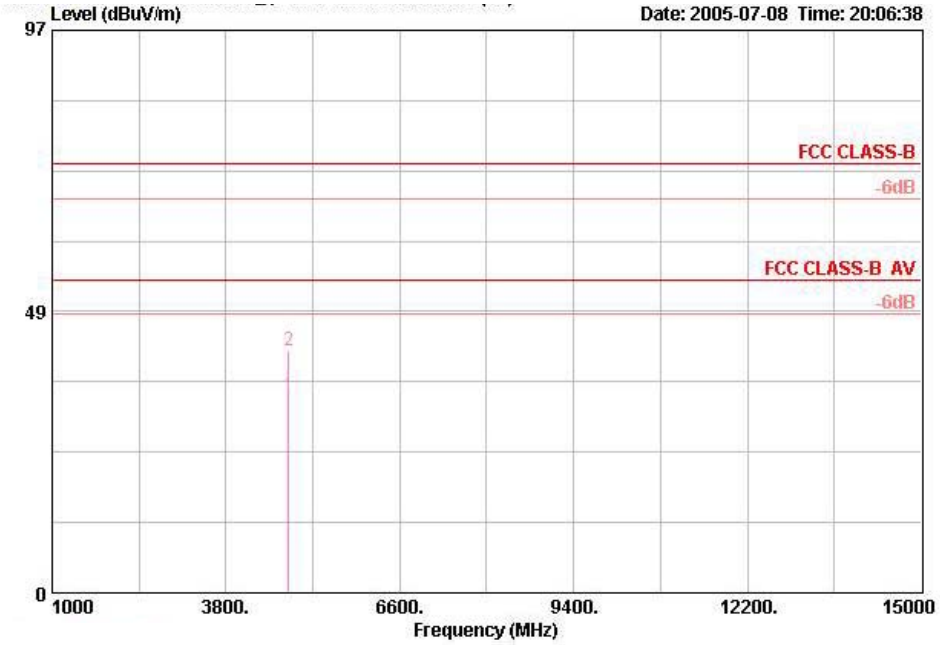
- Test Mode: Bluetooth Function for CH 00 / 2402 MHz (for emission above 1GHz)
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46%
- Test Engineer: Steven Lu

(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 @	4803.960	39.89	-14.11	54.00	33.18	3.20	35.10	38.61	HORIZONTAL	AVERAGE
2 @	4803.960	49.62	-24.38	74.00	33.18	3.20	35.10	48.34	HORIZONTAL	PEAK

(B) Polarization: Vertical

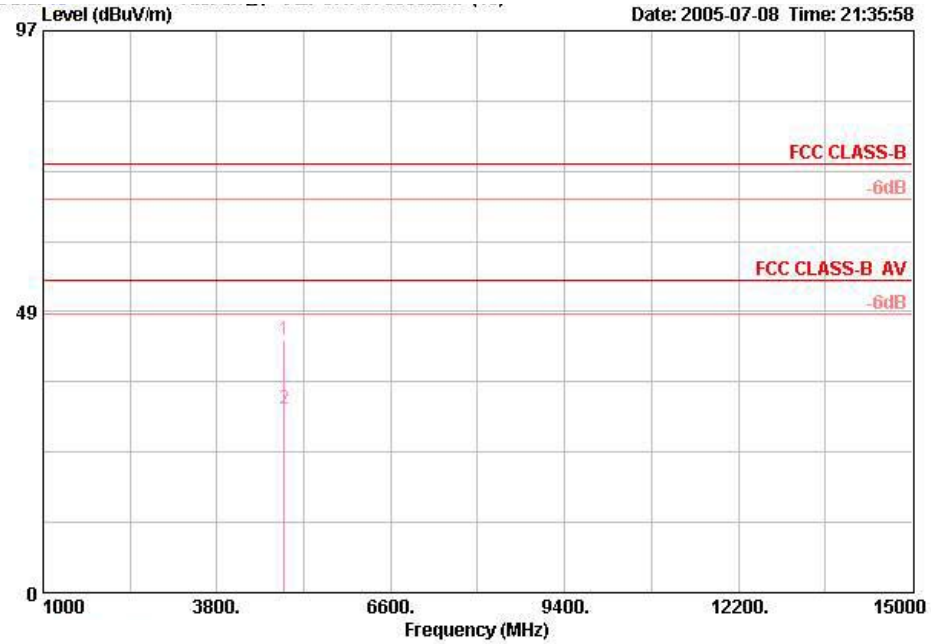


	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	4804.010	33.84	-20.16	54.00	33.18	3.20	35.10	32.55	VERTICAL	AVERAGE
2 @	4804.010	41.71	-32.29	74.00	33.18	3.20	35.10	40.43	VERTICAL	PEAK

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

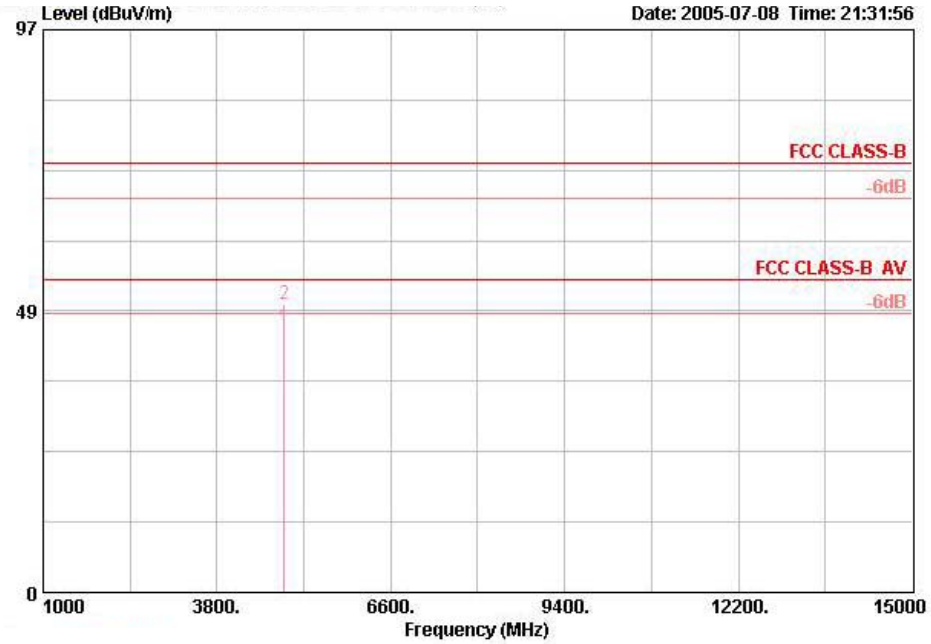
- Test Mode: Bluetooth Function for CH 39 / 2441 MHz (for emission above 1GHz)
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46%
- Test Engineer: Steven Lu

(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 @	4881.880	43.65	-30.35	74.00	33.33	3.23	35.10	42.18	HORIZONTAL	PEAK
2 @	4881.880	31.74	-22.26	54.00	33.33	3.23	35.10	30.27	HORIZONTAL	AVERAGE

(B) Polarization: Vertical

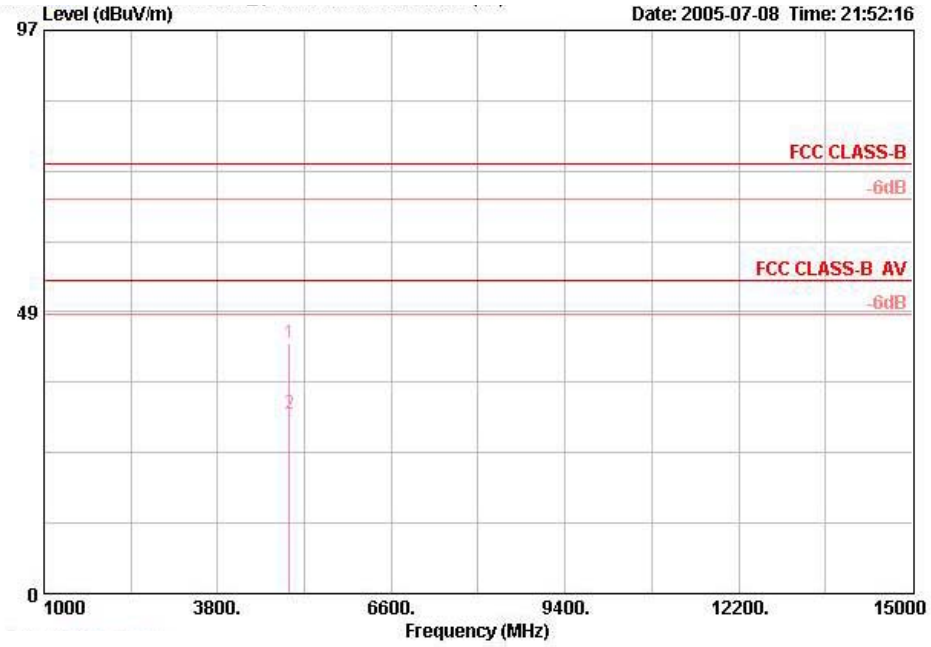


	Freq	Level	Over Limit	Limit Line	Antenna Factor	Cable Loss	Preamp Factor	Read Level	Pol/Phase	Remark
	MHz	dBuV/m	dB	dBuV/m	dB/m	dB	dB	dBuV		
1 @	4882.000	45.84	-8.16	54.00	33.33	3.23	35.10	44.37	VERTICAL	AVERAGE
2 @	4882.000	49.71	-24.29	74.00	33.33	3.23	35.10	48.25	VERTICAL	PEAK

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

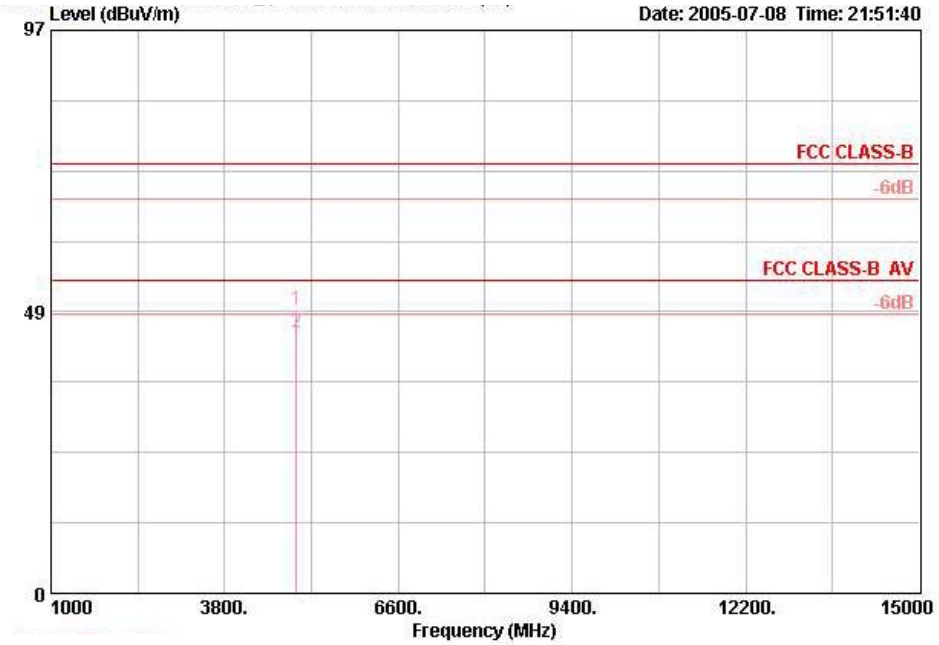
- Test Mode: Bluetooth Function for CH 78 / 2480 MHz (for emission above 1GHz)
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46%
- Test Engineer: Steven Lu

(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 @	4960.000	43.00	-31.00	74.00	33.52	3.26	35.10	41.31	HORIZONTAL	Peak
2 @	4960.000	31.00	-23.00	54.00	33.52	3.26	35.10	29.31	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 @	4960.000	49.00	-25.00	74.00	33.52	3.26	35.10	47.31	VERTICAL	Peak
2 @	4960.000	45.00	-9.00	54.00	33.52	3.26	35.10	43.31	VERTICAL	Average

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

5.12.9. Photographs of Radiated Emission Test Configuration

FRONT VIEW

REAR VIEW

5.13. Antenna Requirements

5.13.1. 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.

5.13.2. Antenna Connected Construction

There is no antenna connector for integral PIFA antenna (WLAN and Bluetooth)

5.13.3. Antenna Gain

The maximum Gain of the PIFA antenna used in this product is 0dBi.

5.13.4. Test Criteria

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

6. List of Measuring Equipments Used

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
1	EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Feb. 19, 2005	Conduction (CO04-HY)
2	LISN	EMCO	3810/2NM	9703-1839	9kHz – 30MHz	Mar. 15, 2005	Conduction (CO04-HY)
3	LISN (Support Unit)	MessTec	NNB-2/16Z	99041	9kHz – 30MHz	Apr. 08, 2005	Conduction (CO04-HY)
4	EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
5	RF Cable-CON	UTIFLEX	3102-26886-4	CB044	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
6	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 16, 2005	Radiation (03CH03-HY)
7	Spectrum Analyzer	R&S	FSP40	100004	9KHZ~4GHz	Aug. 31, 2004	Radiation (03CH03-HY)
8	Amplifier	Schaffner	CPA9231A	18667	9KHz – 2GHz	Jan. 04, 2005	Radiation (03CH03-HY)
9	Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz –200MHz	Jul. 23, 2004	Radiation (03CH03-HY)
10	Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz -1GHz	Jul. 23, 2004	Radiation (03CH03-HY)
11	RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Dec. 02, 2004	Radiation (03CH03-HY)
12	Amplifier	MITEQ	AFS44	879984	1GHz~26.5GHz	Mar. 25, 2005	Radiation (03CH03-HY)
13	Horn Antenna	COMPOWER	AH-118	10092	1GHz – 18GHz	Feb. 18, 2005	Radiation (03CH03-HY)
14	Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
15	Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
16	Horn Antenna	Schwarzbeck	BBHA9170	154	15GHz~40GHz	Jun. 09, 2004*	Radiation (03CH03-HY)
17	RF Cable-HIGH	SUHNER	SUCOFLES 106	SN30094/6	1GHz~26.5GHz	Mar. 04, 2005	Radiation (03CH03-HY)

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

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
18	Spectrum Analyzer	R&S	FSP30	100023	9kHz – 30GHz	Aug. 02, 2004	Conducted (TH01-HY)
19	Power Meter	R&S	NRVS	100444	DC – 40GHz	Jun. 14, 2005	Conducted (TH01-HY)
20	Power Sensor	R&S	NRV-Z55	100049	DC – 40GHz	Jun. 14, 2005	Conducted (TH01-HY)
21	Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Apr. 28, 2005	Conducted (TH01-HY)
22	AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 – 300V	Apr. 21, 2005	Conducted (TH01-HY)
23	DC Power Source	G.W.	GPC-6030D	C671845	DC 1V – 60V	Dec. 28, 2004	Conducted (TH01-HY)
24	Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2004	Conducted (TH01-HY)
25	RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz – 7GHz	Jan. 01, 2005	Conducted (TH01-HY)
26	RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz – 1GHz	Jan. 01, 2005	Conducted (TH01-HY)
27	Data Generator	Tektronix	J310345	J310345	400Mbps	Dec. 21, 2004	Conducted (TH01-HY)
28	OscilloScope	Tektronix	TDS1012	C038520	100MHz-1Gs/s	Jan. 02, 2005	Conducted (TH01-HY)

※ Calibration Interval of instruments listed above is one year.

7. Company Profile

SPORTON Lab. was established in 1986 with one shielded room: the first private EMI test facility, offering local manufacturers an alternative EMI test 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)