FCC TEST REPORT

CATEGORY	:	Portable
PRODUCT NAME	:	Bluetooth USB Adapter
FCC ID.	:	KA2DBT1234A1
FILING TYPE	:	Certification
BRAND NAME	:	D-Link
MODEL NAME	:	DBT-123
APPLICANT	:	**D-Link Corporation** 2F, No. 233-2, Pao-Chiao Road, Hsin-Tien, Taipei, Taiwan, R.O.C.
MANUFACTURER	:	**D-Link Corporation** 2F, No. 233-2, Pao-Chiao Road, Hsin-Tien, Taipei, Taiwan, R.O.C.
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 CNLA, NVLAP or any agency of U.S. government.

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

Lab Code: 200079-0

Table of Contents

HISTORY OF THIS TEST REPORT II

CERTIFICATE OF COMPLIANCE III

1. GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST 1

1.1. Applicant 1
1.2. Manufacturer 1
1.3. Basic Description of Equipment under Test 1
1.4. Features of Equipment under Test 1
1.5. Table for Carrier Frequencies 2

2. TEST CONFIGURATION OF THE EQUIPMENT UNDER TEST 3

2.1. Connection Diagram of Test System 3
2.2. The Test Mode Description 5
2.3. Description of Test Supporting Units 5

3. GENERAL INFORMATION OF TEST 6

3.1. Test Facility 6
3.2. Standards for Methods of Measurement 6
3.3. Frequency Range Investigated 6
3.4. Test Distance 6
3.5. Test Software 6

4. LIST OF MEASUREMENTS 7

4.1. Summary of the Test Results 7

5. TEST RESULT 8

5.1. Test of Hopping Channel Bandwidth 8
5.2. Test of Hopping Channel Separation 11
5.3. Test of Number of Hopping Frequency 14
5.4. Test of Test of Dwell Time of Each Frequency 16
5.5. Maximum Peak Output Power 23
5.6. Test of Band Edges Emission 24
5.7. Test of AC Power Line Conducted Emission 28
5.8. Test of Spurious Radiated Emission 33
5.9. Antenna Requirements 48
5.10. RF Exposure 49

6. LIST OF MEASURING EQUIPMENTS USED 51

7. COMPANY PROFILE 53

7.1. Certificate of Accreditation 53
7.2. Test Location 53

8. UNCERTAINTY OF TEST SITE 54

9. CERTIFICATE OF NVLAP ACCREDITATION 55

APPENDIX A. PHOTOGRAPHS OF EUT ..... A1 ~ A4

HISTORY OF THIS TEST REPORT

Received Date: Aug. 01, 2005
Test Date: Sep. 22, 2005
Original Report Issue Date: Sep. 27, 2005
Report No.: FR580104

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

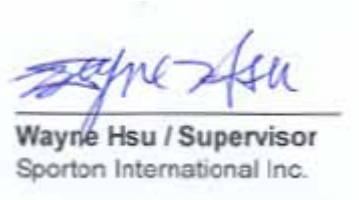
with

47 CFR FCC Part 15 Subpart C

PRODUCT NAME	:	Bluetooth USB Adapter
BRAND NAME	:	D-Link
MODEL NAME	:	DBT-123
APPLICANT	:	**D-Link Corporation** 2F, No. 233-2, Pao-Chiao Road, Hsin-Tien, Taipei, Taiwan, R.O.C.
MANUFACTURER	:	**D-Link Corporation** 2F, No. 233-2, Pao-Chiao Road, Hsin-Tien, Taipei, Taiwan, R.O.C.

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 Sep. 22, 2005 at SPORTON International Inc. LAB.



1. General Description of Equipment under Test

1.1. Applicant

D-Link Corporation
2F, No. 233-2, Pao-Chiao Road, Hsin-Tien, Taipei, Taiwan, R.O.C.

1.2. Manufacturer

D-Link Corporation
2F, No. 233-2, Pao-Chiao Road, Hsin-Tien, Taipei, Taiwan, R.O.C.

1.3. Basic Description of Equipment under Test

This product is a USB Adapter with Bluetooth function. The radio technical data has been listed on section " Features of Equipment under Test ".

1.4. Features of Equipment under Test

Items	Description
Type of Modulation	GFSK
Number of Channels	79
Frequency Band	2400 MHz ~ 2483.5 MHz
Carrier Frequency	See section 1.5 for details
Channel Bandwidth	1MHz
Data Rate	GFSK: 1Mbps
Max. Output Power	8.10 dBm
Antenna Type / Gain	Print Antenna / 2.95 dBi
Function Type	Transceiver
Power Rating (DC/AC, Voltage)	5V DC (from host)
Test Power Source	120V AC (for host)
Temperature Range (Operating)	-10 ~ 50 ℃

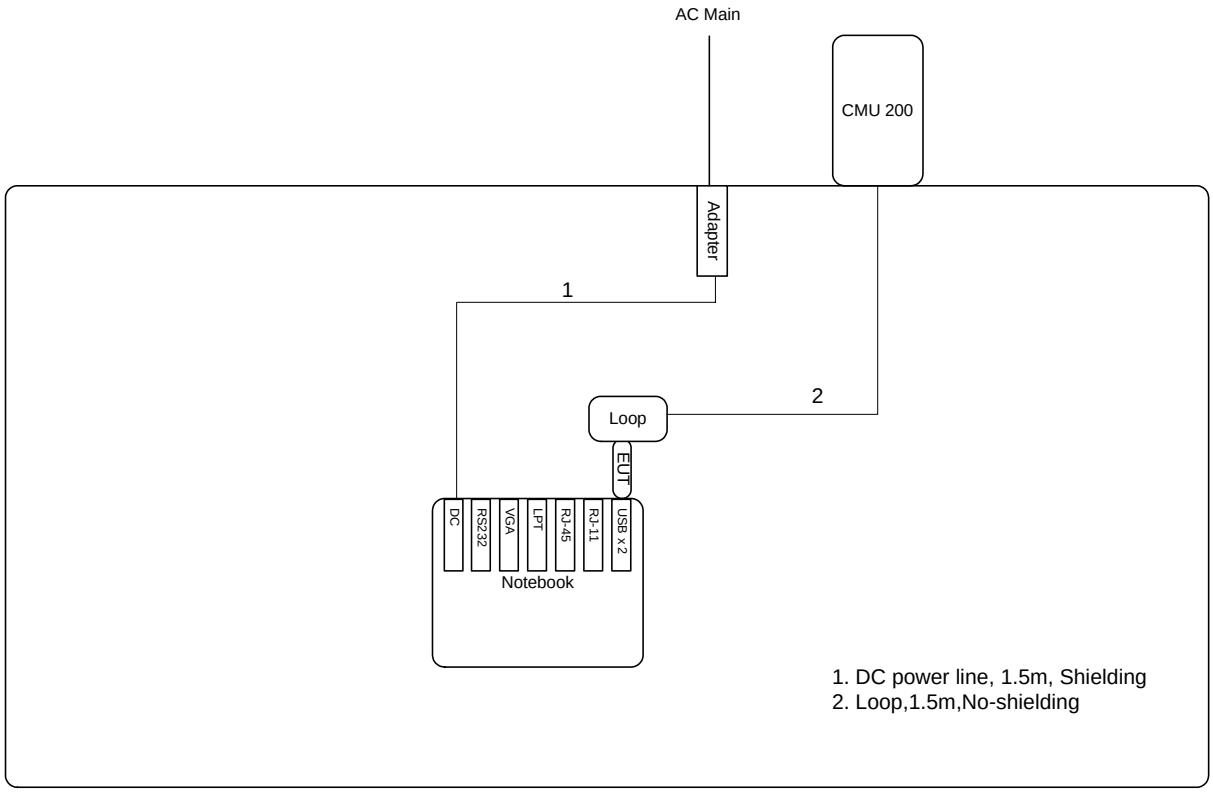
1.5. Table for Carrier Frequencies

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

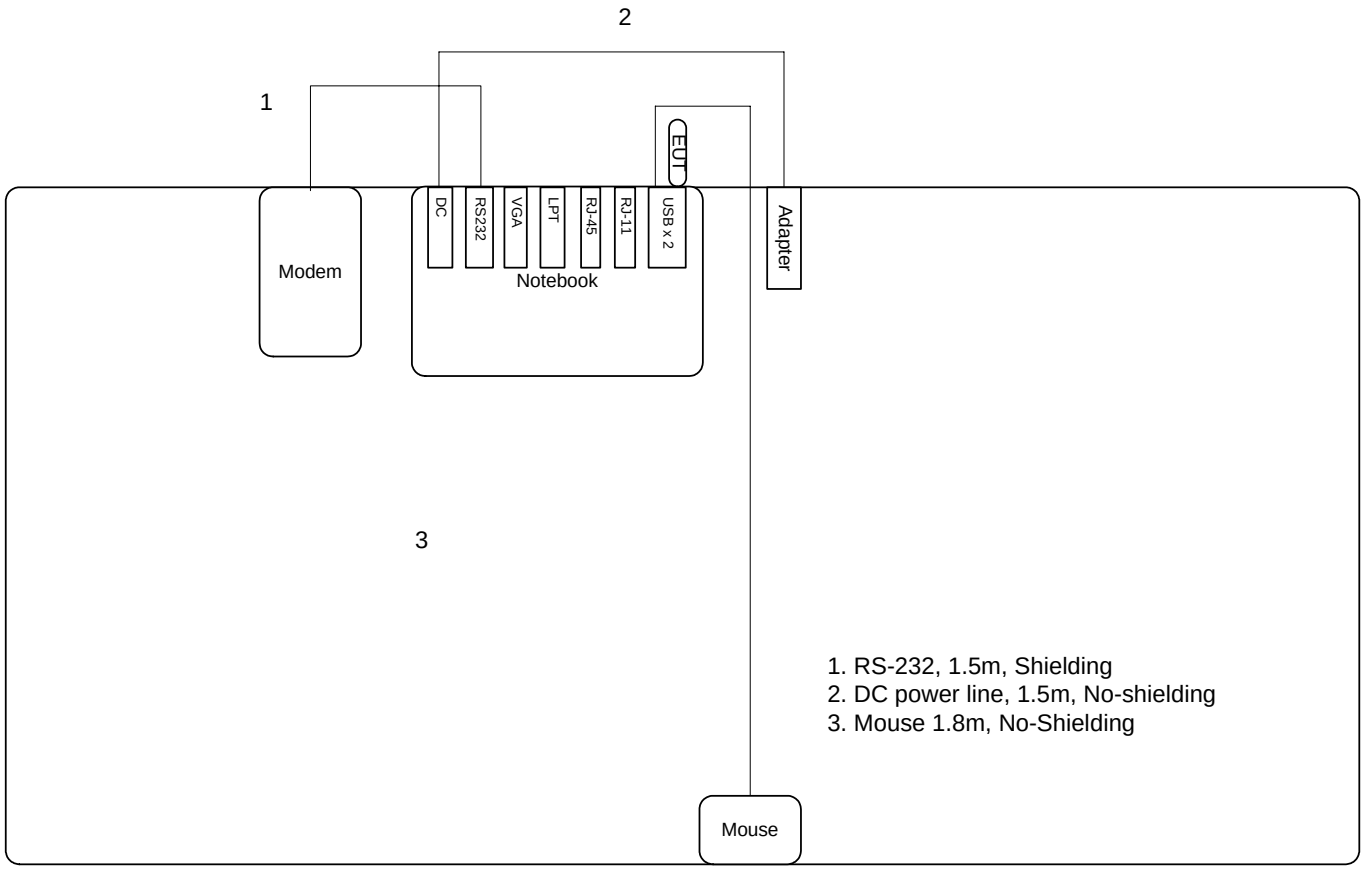
2. Test Configuration of the Equipment under Test

2.1. Connection Diagram of Test System

Radiation:



Conduction:


2
1
EUT
DC
RS232
VGA
LPT
RJ-45
RJ-11
USB x 2
Adapter
Modem
Notebook
3
1. RS-232, 1.5m, Shielding
2. DC power line, 1.5m, No-shielding
3. Mouse 1.8m, No-Shielding
Mouse

2.2. The Test Mode Description

1. For FHSS modulation, GFSK is the worst case on all test items.
2. According to ANSI C63.4-2003: Frequency range of EUT is more than 10 MHz, we have to test the lowest, middle and highest channels of EUT.
3. Spurious emission below 1GHz is independent of channel selection and there will be no effect on test results so only channel 39 with GFSK modulation was tested.
4. AC conduction emission, EUT link with the Bluetooth Headset wirelessly.

2.3. Description of Test Supporting Units

Support unit	Brand	Model No.	FCC ID	Remark
Notebook	DELL	PP01L (D505)	DoC	Rad. / Con.
CMU200	R&S	-	DoC	Rad.
Modem	ACEEX	DM-1414	IFAXDM1414	Con.
Mouse	Microsoft	1004	DoC	Con.
Bluetooth test system	-	CMU200	DoC	Con.
Bluetooth Headset	-	-	DoC	Con.

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 / CO04-HY / TH01-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 9kHz 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

Radiation:

An executive program, EMITEST.EXE under WIN XP, which generates a complete line of continuously repeating “H“ pattern was used as the test software.

At the same time, the following programs were executed:

The CMU 200 was linked with the EUT wirelessly and was used to set the RF parameters of the EUT. EUT was set to continuous TX or RX mode during test.

Conduction:

An executive program, EMCTEST.EXE under WIN XP, which generates a complete line of continuously repeating “H“ pattern was used as the test software.

At the same time, the following programs were executed:

- Bluetooth mode: Executed “BlueSoleil” to link with Bluetooth Device.

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

5. Test Result

5.1. Test of Hopping Channel Bandwidth

5.1.1. 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.

5.1.2. Measuring Instruments

Item 21 of the table on section 6.

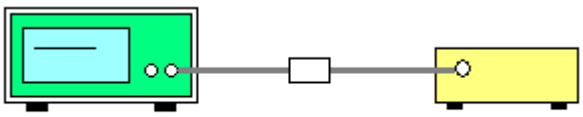
5.1.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
  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

5.1.4. 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 is Auto.
4. The 20dB spectrum width is the spectrum with level higher than 20dB below the peak level.
5. 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

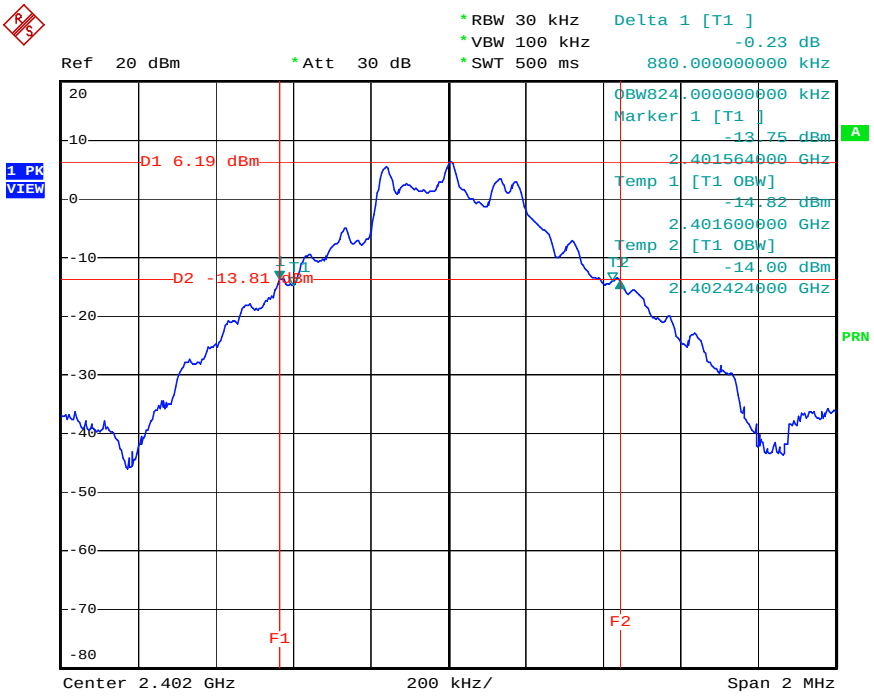
All test results complied with the requirements of Section 15.247(a)(1). Measurement Uncertainty is $1x10^{-5}$.

5.1.7. Test Result

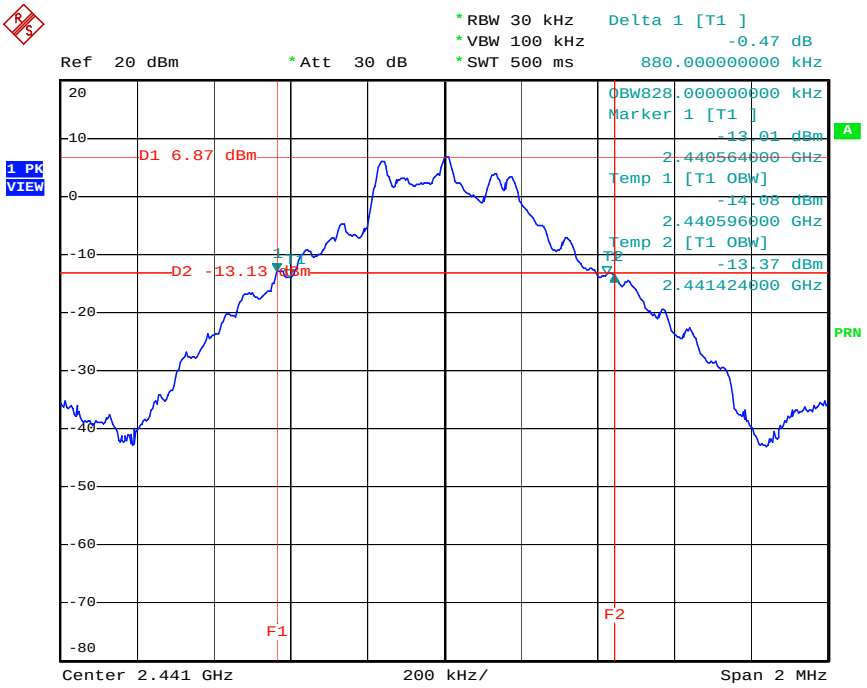
- Temperature: 27°C
- Relative Humidity: 55%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Eason Lu

Modulation Type	Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	99% Bandwidth (kHz)	Min. Limit (kHz)
GFSK	00	2402 MHz	880.00	824.00	25
GFSK	39	2441 MHz	880.00	828.00	25
GFSK	78	2480 MHz	876.00	820.00	25

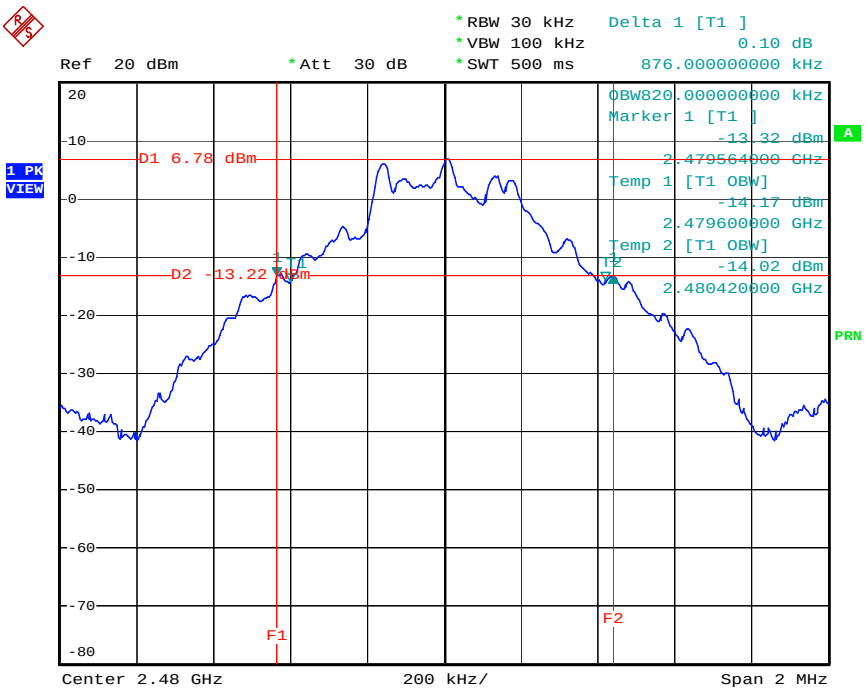
Modulation Type: GFSK (Channel 00)：



Modulation Type: GFSK (Channel 39)：



Modulation Type: GFSK (Channel 78)：



5.2. Test of Hopping Channel Separation

5.2.1. 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.

5.2.2. Measuring Instruments

Item 21 of the table on section 6.

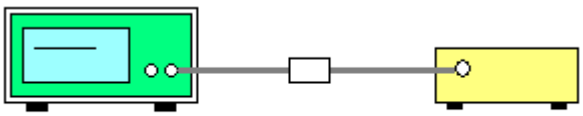
5.2.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
  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

5.2.4. 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 is Auto.
4. The Hopping Channel Separation is defined as the separation between 2 neighboring hopping frequencies.
5. Repeat above 1~3 points for the Lowest, middle, and highest channel of the EUT.

5.2.5. Test Setup Layout



5.2.6. Test Criteria

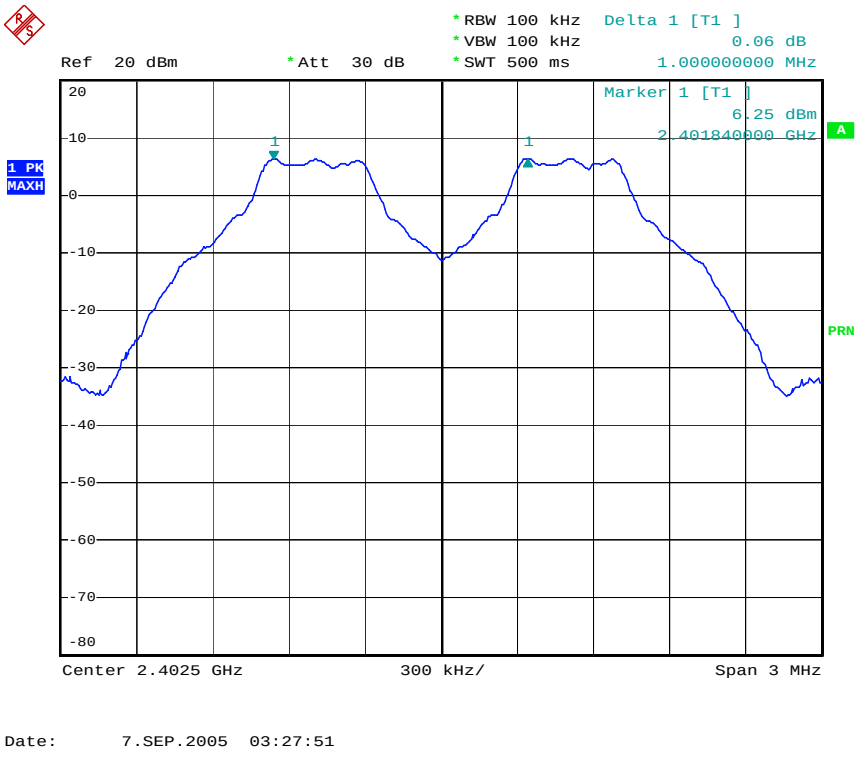
All test results complied with the requirements of Section 15.247(a)(1). Measurement Uncertainty is $1x10^{-5}$.

5.2.7. Test Result

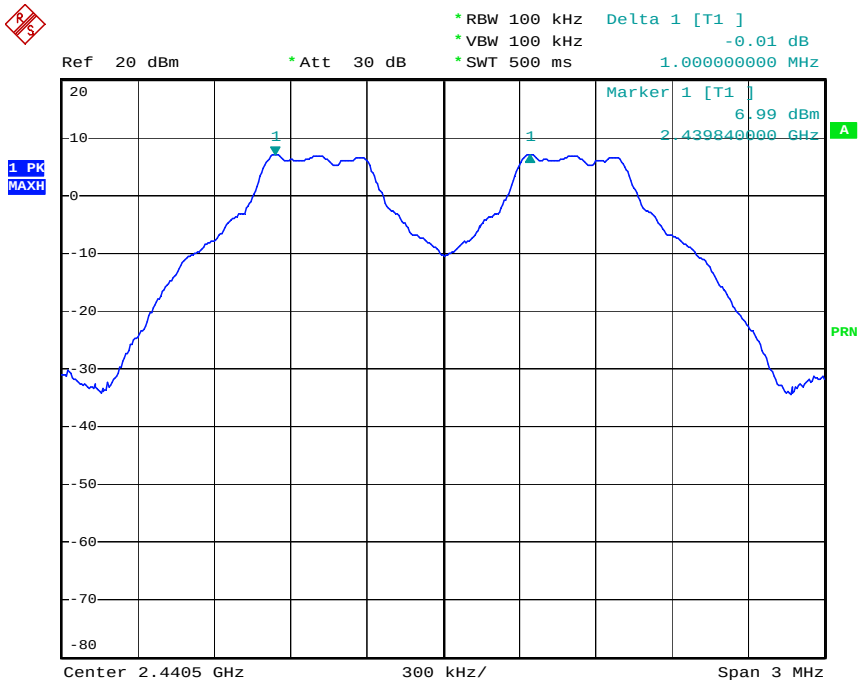
- Temperature: 27°C
- Relative Humidity: 55%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Eason Lu

Modulation Type	Channel No.	Frequency (MHz)	Hopping Channel Separation (kHz)	Min. Limit (kHz)
GFSK	00	2402 MHz	1000	880.00
GFSK	39	2441 MHz	1000	880.00
GFSK	78	2480 MHz	1000	876.00

Modulation Type: GFSK (Channel 00)：

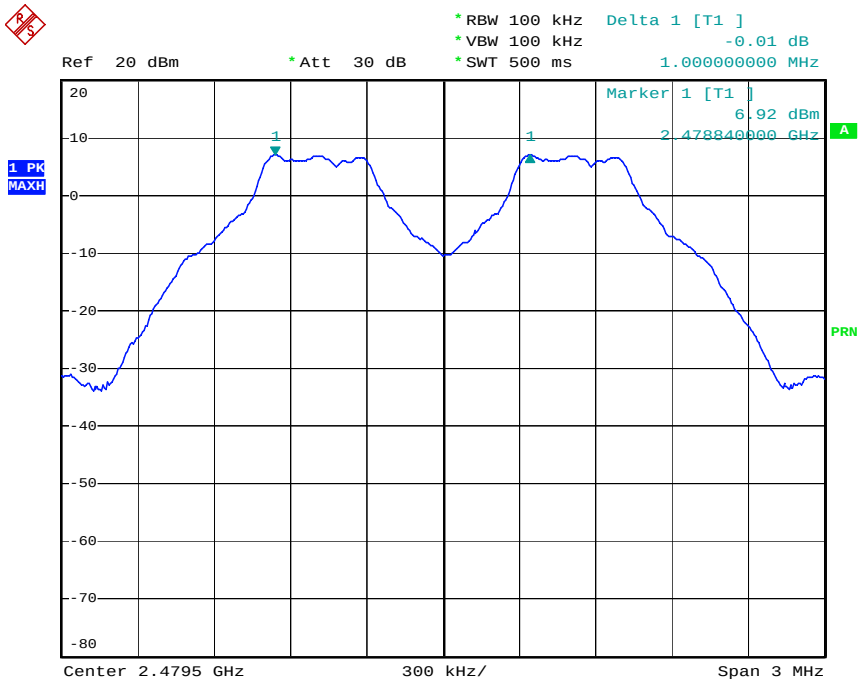


Modulation Type: GFSK (Channel 39)：



Date: 7.SEP.2005 03:28:27

Modulation Type: GFSK (Channel 78)：



Date: 7.SEP.2005 03:30:34

5.3. Test of Number of Hopping Frequency

5.3.1. 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.

5.3.2. Measuring Instruments

Item 21 of the table on section 6.

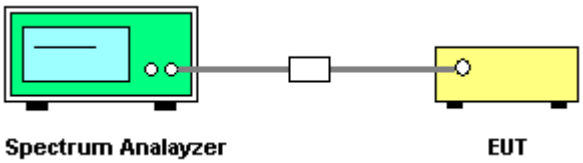
5.3.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
  Attenuation : Auto
  Center Frequency : 2402 MHz ~ 2480 MHz
  Span Frequency : > Operation frequency range
  RB : 100 kHz
  VB : 100 kHz

5.3.4. 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 is Auto.
4. Observe hopping frequency in 2400MHz~2483.5MHz, there are at least 75 non-overlapping channels.

5.3.5. Test Setup Layout



5.3.6. Test Criteria

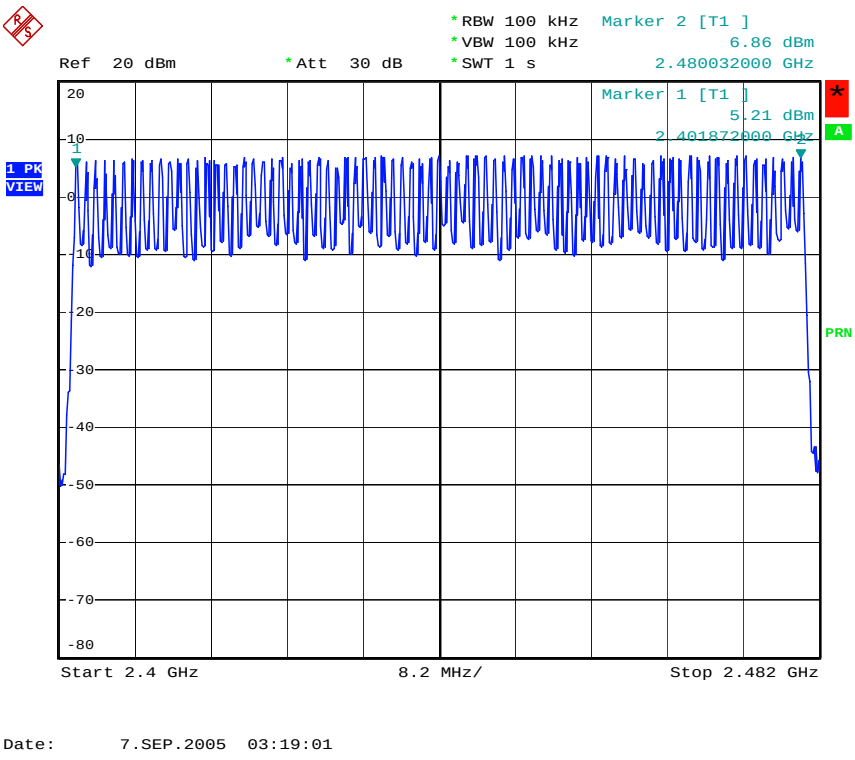
All test results complied with the requirements of Section 15.247(b)(1). Measurement Uncertainty is $1x10^{-5}$.

5.3.7. Test Result

- Temperature: 27°C
- Relative Humidity: 55%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Eason Lu

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

Modulation Type: GFSK (Channel 00 ~ Channel 78)：



5.4. Test of Test of Dwell Time of Each Frequency

5.4.1. 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.

5.4.2. Measuring Instruments

Item 21 of the table on section 6.

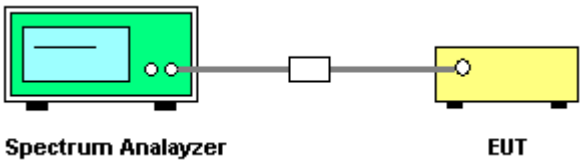
5.4.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
  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

5.4.4. 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.

5.4.5. Test Setup Layout



5.4.6. Test Criteria

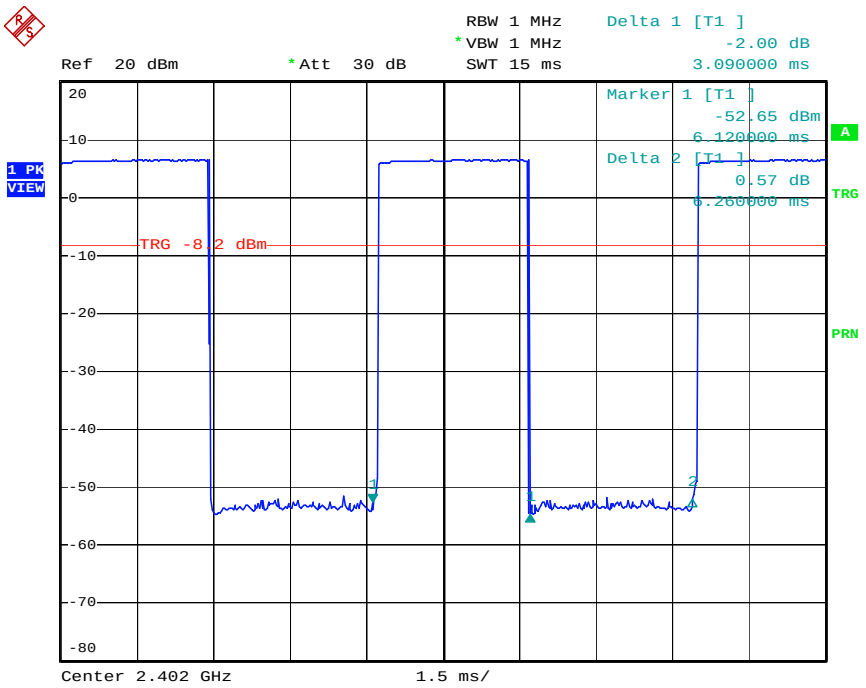
All test results complied with the requirements of Section 15.247(a)(1)(iii). Measurement Uncertainty is $1x10^{-5}$.

5.4.7. Test Result

- Temperature: 27°C
- Relative Humidity: 55%
- Test Engineer: Eason Lu

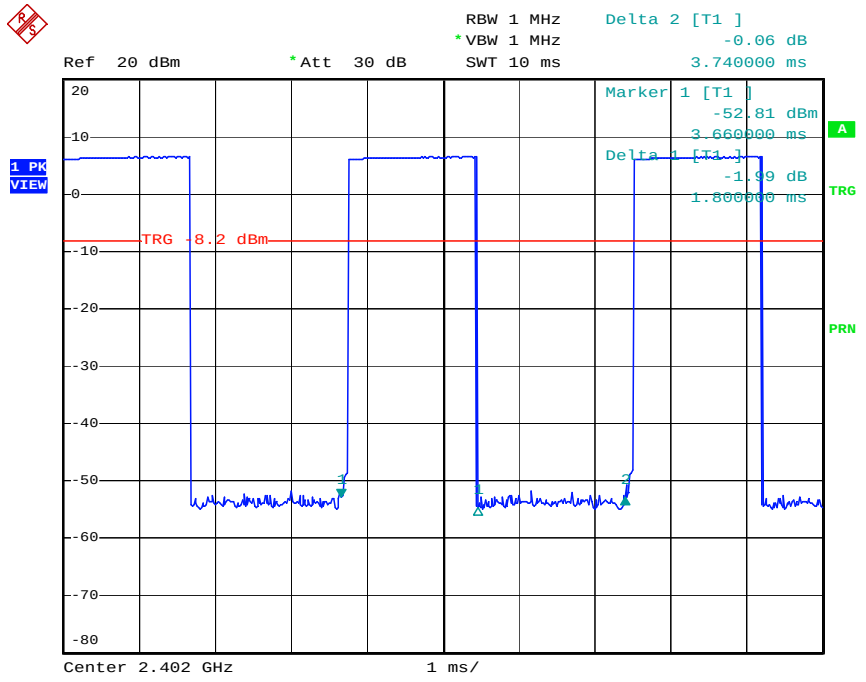
Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH5	2402 MHz	3.0900	0.3296	0.4000
DH3	2402 MHz	1.8000	0.2880	0.4000
DH1	2402 MHz	0.5200	0.1664	0.4000
DH5	2441 MHz	3.0900	0.3296	0.4000
DH3	2441 MHz	1.8000	0.2880	0.4000
DH1	2441 MHz	0.5200	0.1664	0.4000
DH5	2480 MHz	3.0900	0.3296	0.4000
DH3	2480 MHz	1.8000	0.2880	0.4000
DH1	2480 MHz	0.5200	0.1664	0.4000

DH5 Modulation Type: GFSK (Channel 00)：



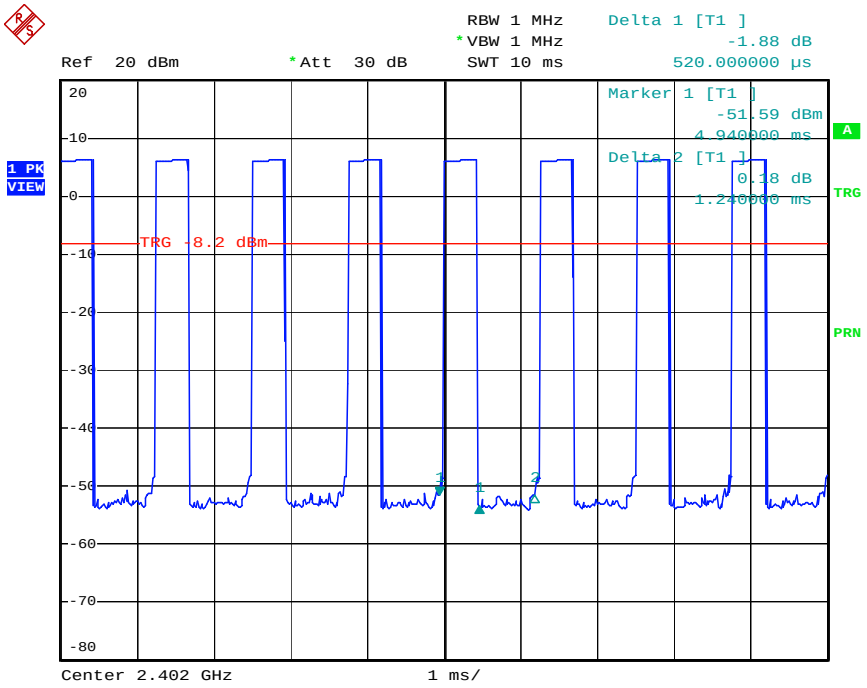
Date: 7.SEP.2005 03:25:23

DH3 Modulation Type: GFSK (Channel 00)：



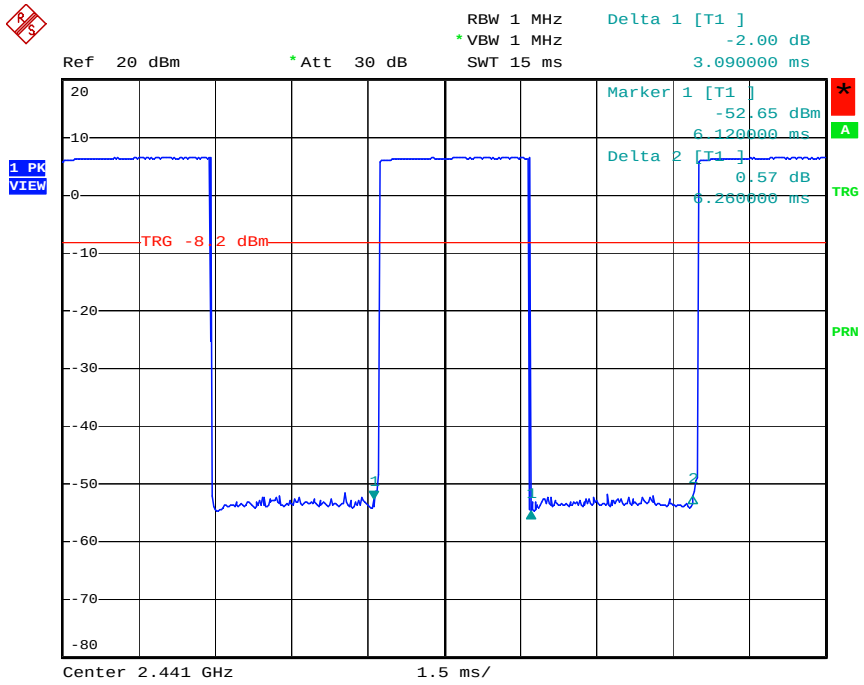
Date: 7.SEP.2005 03:23:53

DH1 Modulation Type: GFSK (Channel 00)：



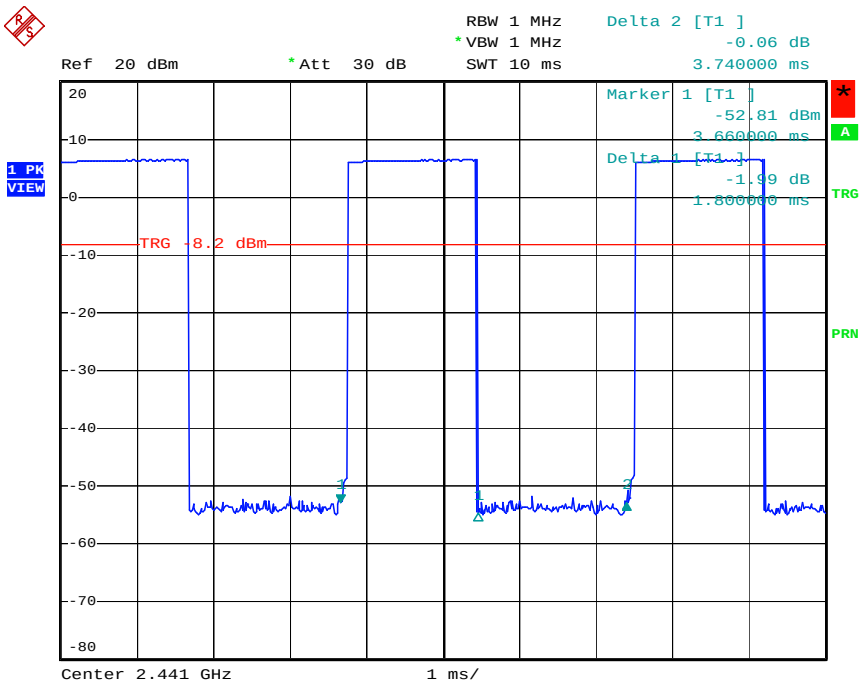
Date: 7.SEP.2005 03:22:20

DH5 Modulation Type: GFSK (Channel 39)：



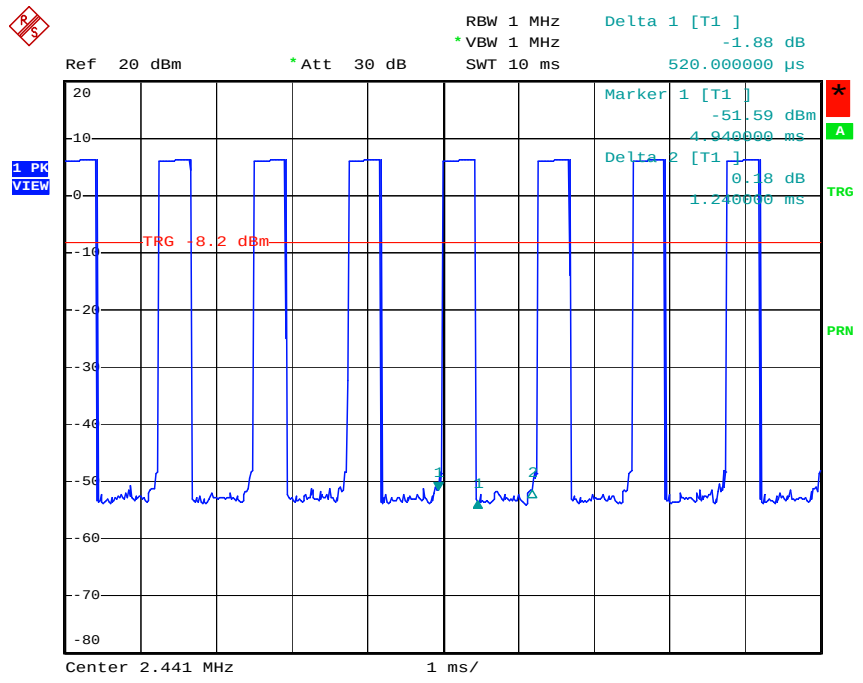
Date: 7.SEP.2005 03:25:42

DH3 Modulation Type: GFSK (Channel 39)：



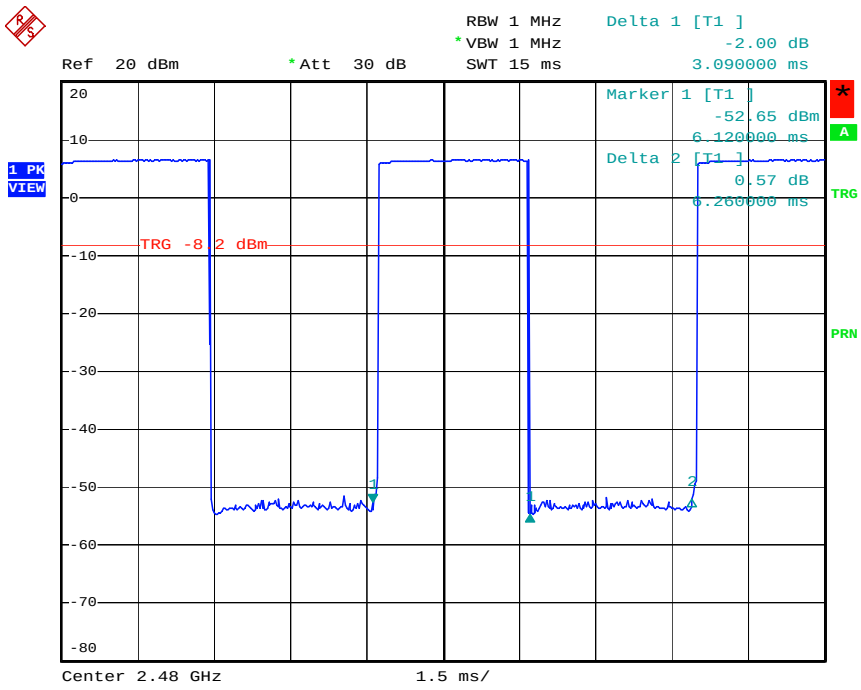
Date: 7.SEP.2005 03:24:09

DH1 Modulation Type: GFSK (Channel 39)：



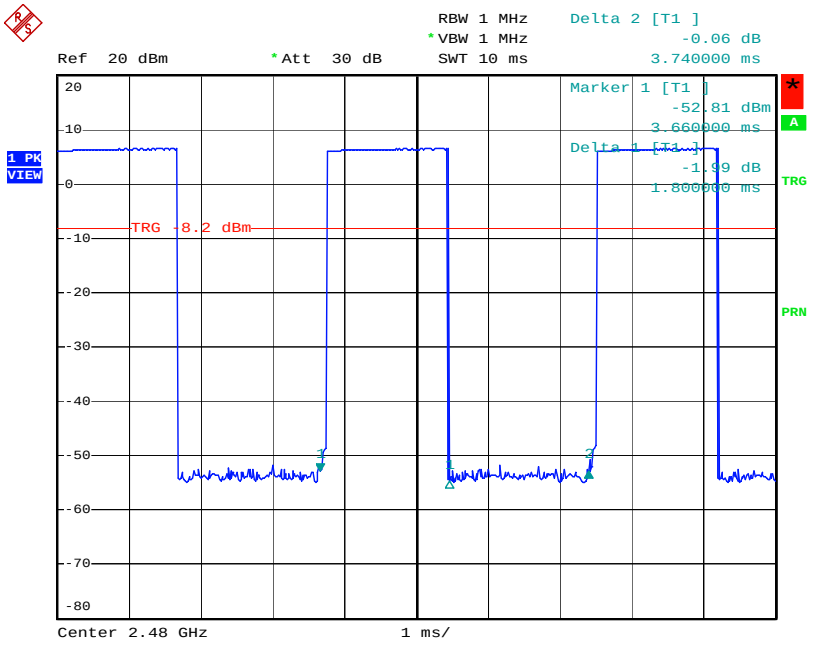
Date: 7.SEP.2005 03:22:44

DH5 Modulation Type: GFSK (Channel 78)：



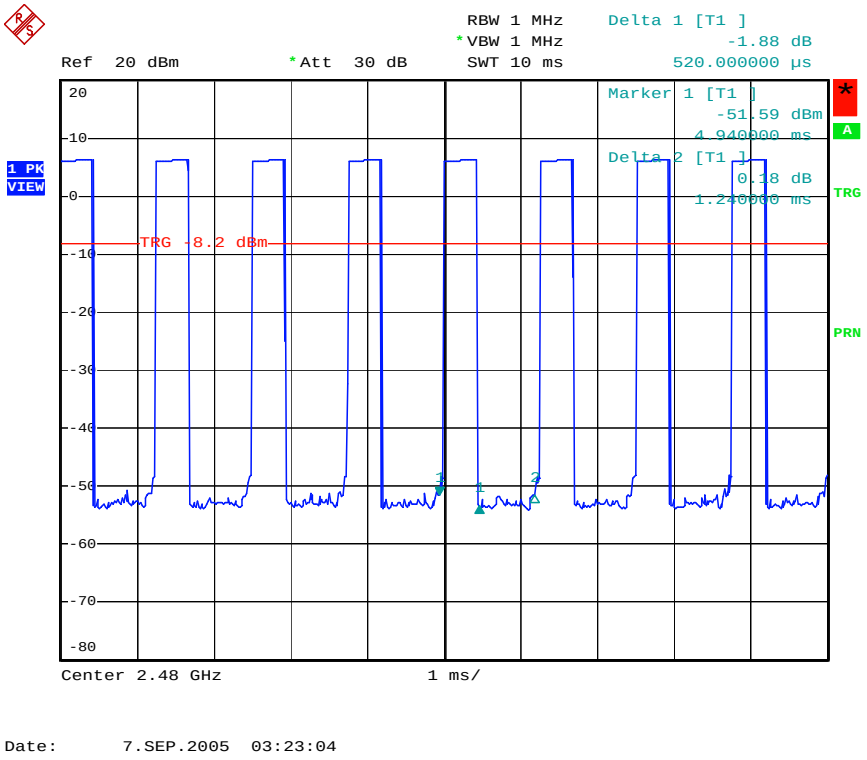
Date: 7.SEP.2005 03:26:01

DH3 Modulation Type: GFSK (Channel 78)：



Date: 7.SEP.2005 03:24:27

DH1 Modulation Type: GFSK (Channel 78)：



5.5. Maximum Peak Output Power

5.5.1. 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.

5.5.2. Measuring Instruments

Item 22, 24 of the table on section 6.

5.5.3. 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 Lowest, middle, and highest channel of the EUT.

5.5.4. Test Setup Layout

5.5.5. Test Criteria

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

5.5.6. Test Result of Conducted Peak Power

- Temperature: 27°C
- Relative Humidity: 55%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Eason Lu

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
GFSK	00	2402 MHz	8.10	30
GFSK	39	2441 MHz	7.95	30
GFSK	78	2480 MHz	8.05	30

5.6. Test of Band Edges 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

Item 6~20 of the table on section 6 for radiated measurement.
Item 21 of the table on section 6 for conducted measurement.

5.6.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40 (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

5.6.4. 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.

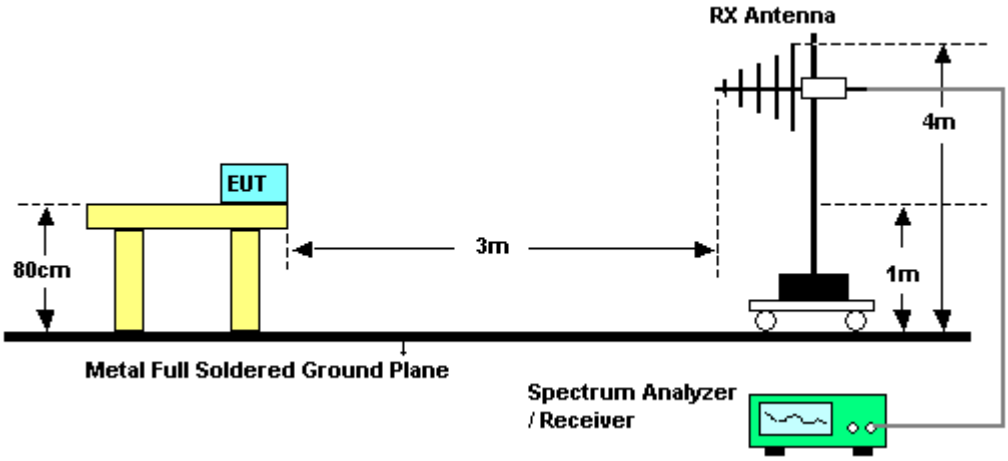
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement

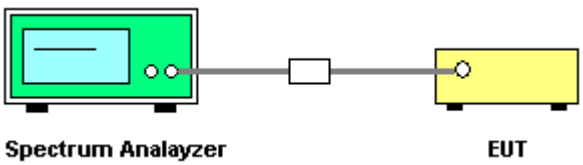
1. Configure the EUT according to ANSI C63.4-2003.
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of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

5.6.5. Test Setup

Radiated Method



Conducted Method



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 00 / 2402 MHz

- Modulation Type: GFSK
- Temperature: 27°C
- Relative Humidity: 55%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Ted Chiu

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	2390.000	54.98	-19.02	24.49	74.00	2.28	28.21	0.00	Peak	---	---
1	2390.000	46.37	-7.63	15.88	54.00	2.28	28.21	0.00	Average	---	---

5.6.8. Test Results for CH 78 / 2480 MHz

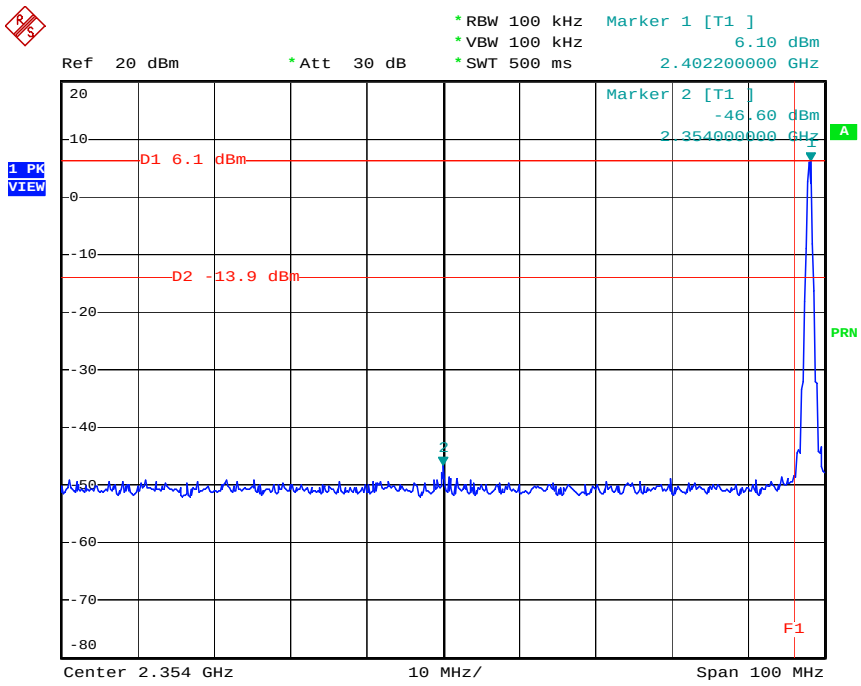
- Modulation Type: GFSK
- Temperature: 27°C
- Relative Humidity: 55%
- Duty Cycle of the Equipment During the Test: 46.8%
- Test Engineer: Ted Chiu

	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
2	2483.500	52.05	-21.95	21.34	74.00	2.34	28.37	0.00	Peak	---	---
2	2483.500	43.67	-10.33	12.96	54.00	2.34	28.37	0.00	Average	---	---

Level* : The max field strength in the restricted bands.

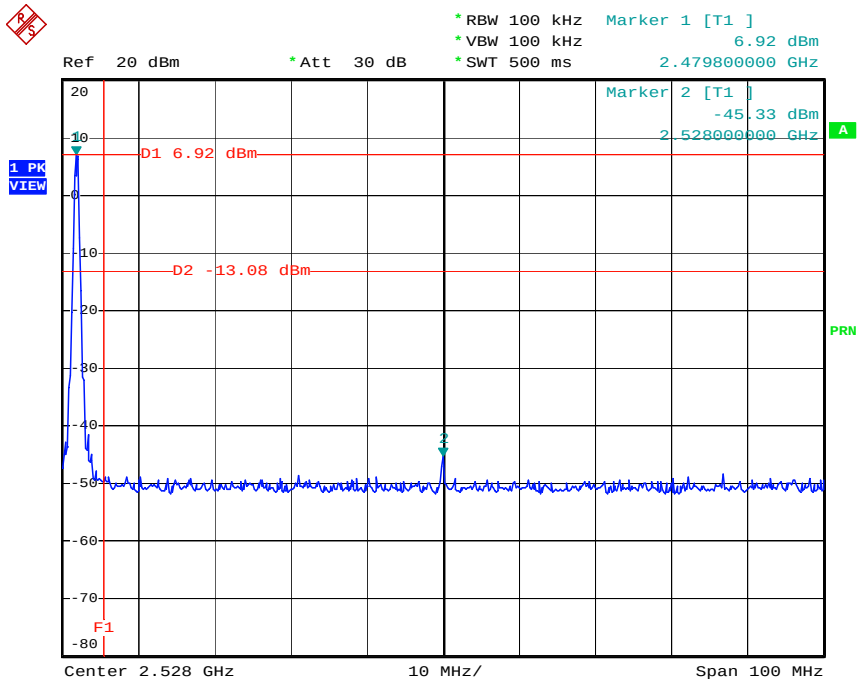
Test Result of Conducted Emission

Modulation Type: GFSK (Channel 00)：



Date: 7.SEP.2005 03:16:21

Modulation Type: GFSK (Channel 78)：



Date: 7.SEP.2005 03:15:04

5.7. Test of AC Power Line Conducted Emission

5.7.1. 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

5.7.2. Measuring Instruments

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

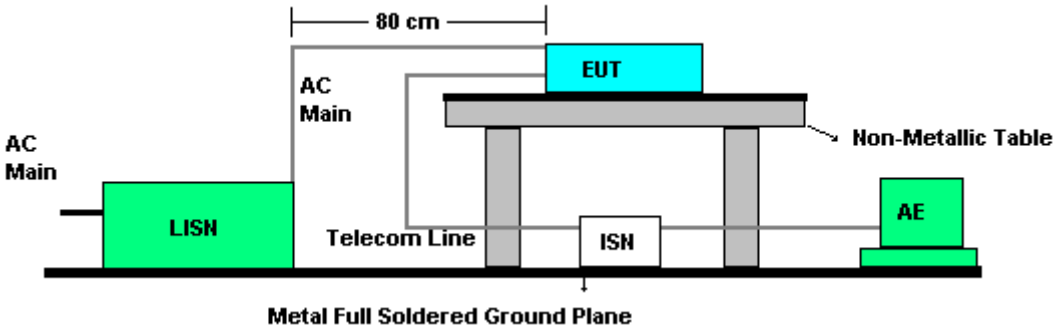
5.7.3. Description of Major Test Instruments Setting

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

5.7.4. Test Procedures

1. Configure the EUT according to ANSI C63.4.
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.

5.7.5. Test Setup Layout



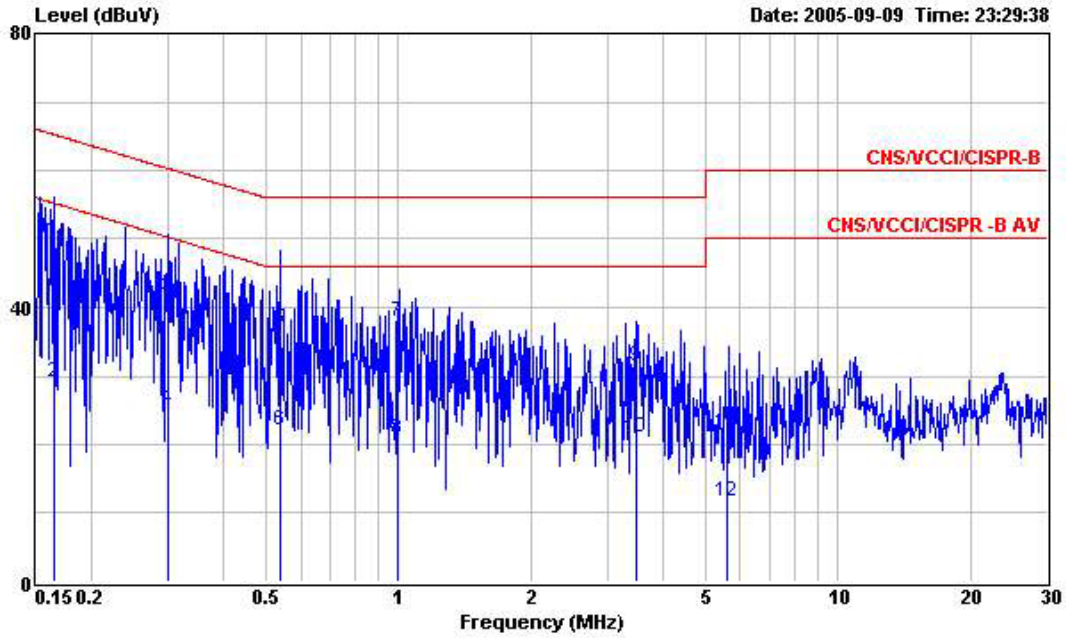
5.7.6. Test Criteria

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

5.7.7. Test Result of Conducted Emission

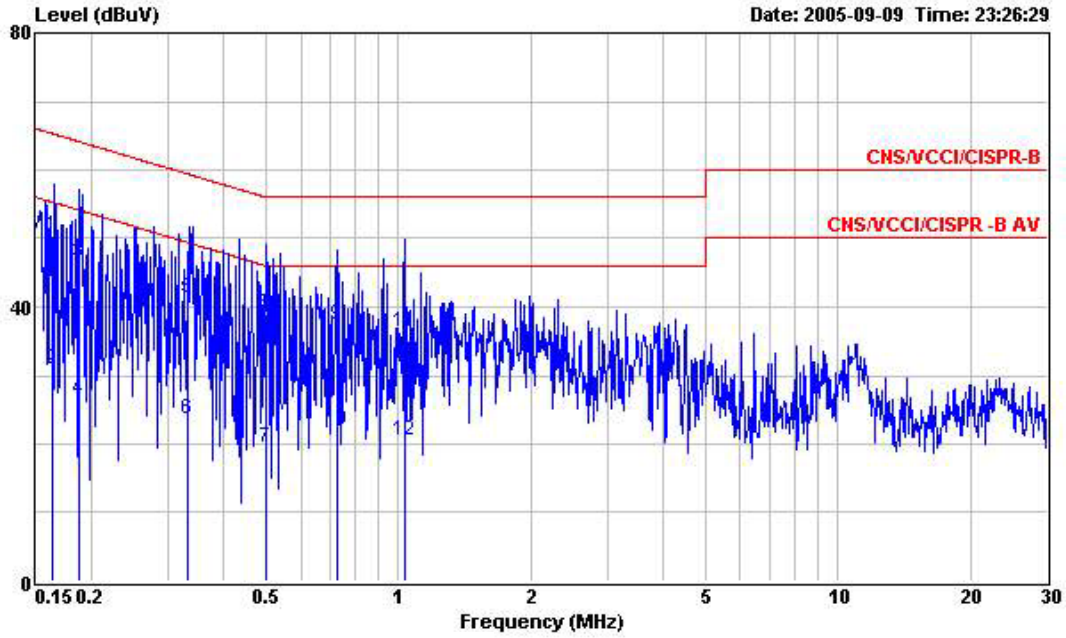
- Test Mode: Normal Link
- Temperature: 27°C
- Relative Humidity: 45%
- Test Engineer: Sky Wu

Line to Ground



	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	49.82	-15.44	65.26	49.72	0.06	0.04	QP
2	0.164	29.17	-26.09	55.26	29.07	0.06	0.04	Average
3	0.300	41.65	-18.59	60.24	41.54	0.06	0.05	QP
4	0.300	25.18	-25.06	50.24	25.07	0.06	0.05	Average
5	0.537	36.92	-19.08	56.00	36.77	0.08	0.07	QP
6	0.537	22.12	-23.88	46.00	21.97	0.08	0.07	Average
7	0.999	37.82	-18.18	56.00	37.63	0.11	0.08	QP
8	0.999	20.90	-25.10	46.00	20.71	0.11	0.08	Average
9	3.490	31.36	-24.64	56.00	31.05	0.19	0.12	QP
10	3.490	21.09	-24.91	46.00	20.78	0.19	0.12	Average
11	5.620	21.90	-38.10	60.00	21.54	0.21	0.15	QP
12	5.620	11.59	-38.41	50.00	11.23	0.21	0.15	Average

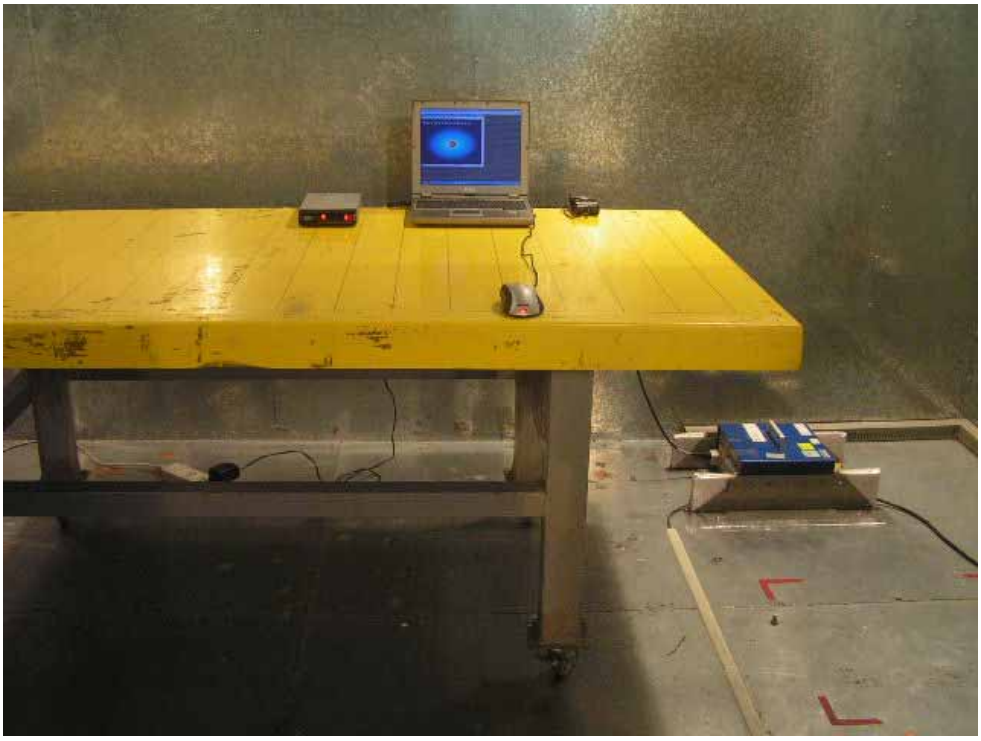
Neutral to Ground



	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.164	50.27	-15.00	65.27	50.12	0.11	0.04	QP
2	0.164	31.03	-24.24	55.27	30.88	0.11	0.04	Average
3	0.188	46.57	-17.54	64.11	46.43	0.11	0.03	QP
4	0.188	26.50	-27.61	54.11	26.36	0.11	0.03	Average
5	0.333	41.17	-18.21	59.38	41.01	0.11	0.05	QP
6	0.333	23.64	-25.74	49.38	23.48	0.11	0.05	Average
7	0.500	19.49	-26.51	46.00	19.29	0.14	0.06	Average
8	0.500	39.02	-16.98	56.00	38.82	0.14	0.06	QP
9	0.726	37.46	-18.54	56.00	37.20	0.19	0.07	QP
10	0.726	21.97	-24.03	46.00	21.71	0.19	0.07	Average
11	1.031	36.47	-19.53	56.00	36.16	0.23	0.08	QP
12	1.031	20.49	-25.51	46.00	20.18	0.23	0.08	Average

5.7.8. Photographs of Conducted Emission Test Configuration

FRONT VIEW



REAR VIEW

5.8. Test of Spurious Radiated Emission

5.8.1. 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.

5.8.2. Measuring Instruments

Please reference item 6~20 in chapter 6 for the instruments used for testing.

5.8.3. Description of Major Test Instruments Setting

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

- 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

5.8.4. Test Procedures

For radiated emissions below 30MHz

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 loop receiving antenna mounted 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 receiving antenna was fixed at one meter above ground to find the maximum emissions field strength.
4. Set the test-receiver system to QP Detect Function with specified bandwidth under Maximum Hold Mode.

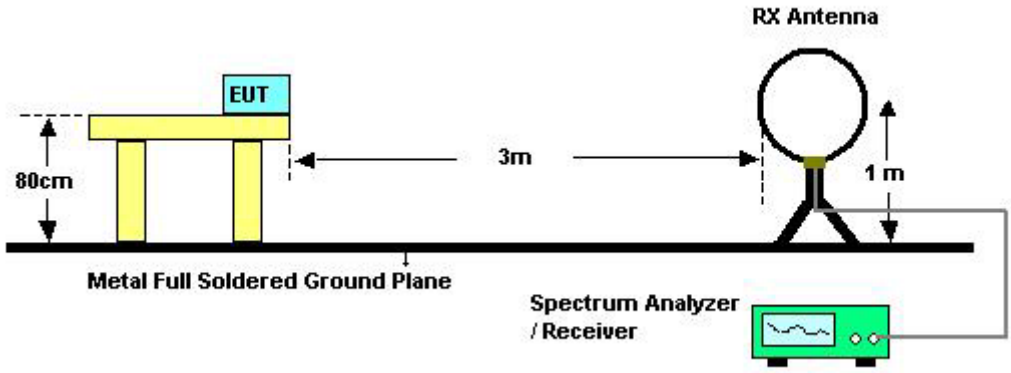
For radiated emissions above 30MHz

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.

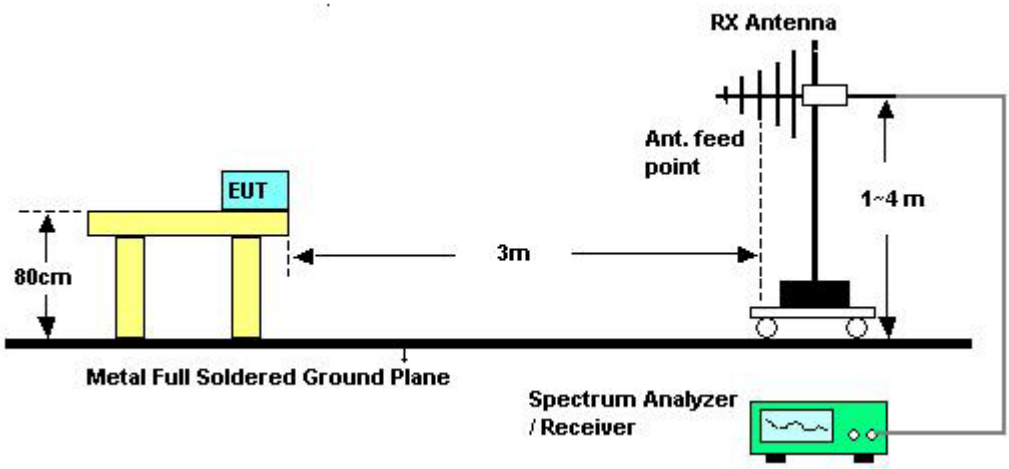
2. Power on the EUT and all the supporting units. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emissions field strength of both 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.

5.8.5. Test Setup Layout

For radiated emissions below 30MHz



For radiated emissions above 30MHz



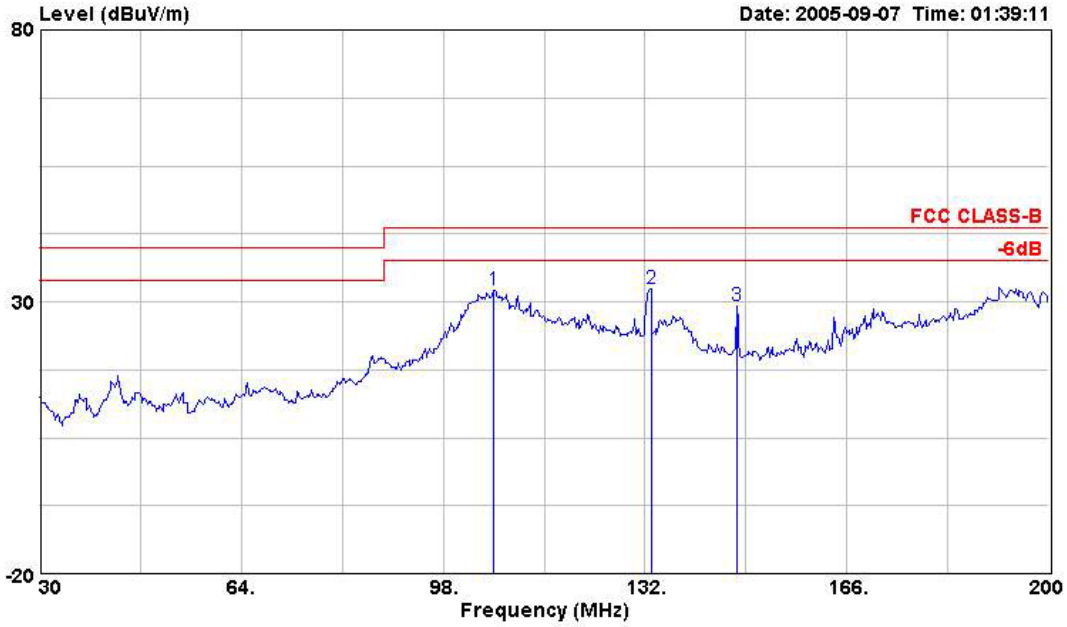
5.8.6. Test Criteria

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

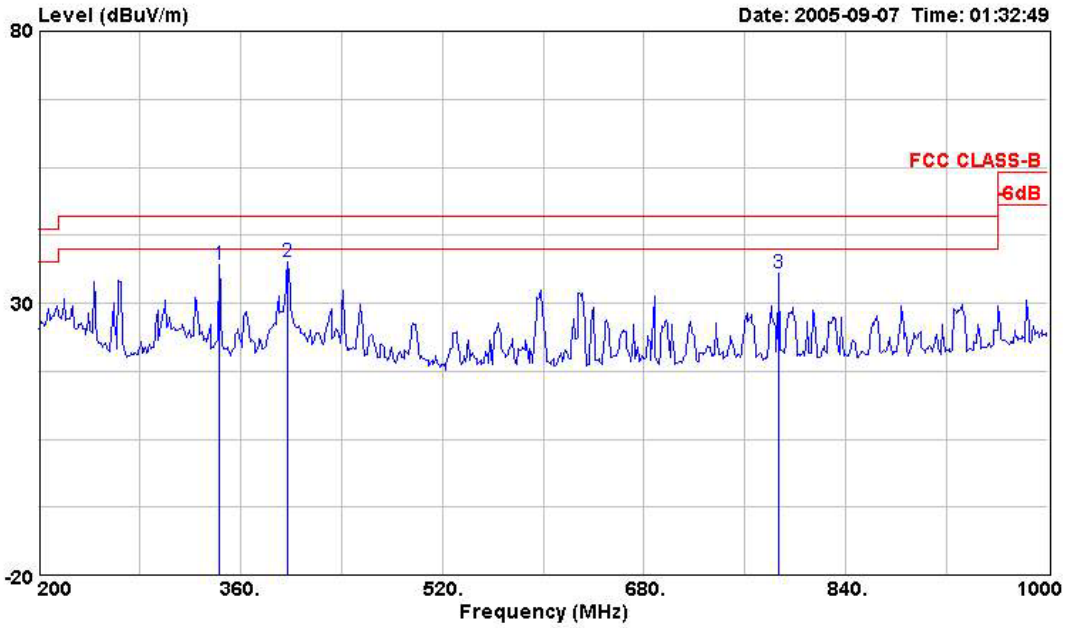
5.8.7. Test Results for CH 39 / 2441 MHz (for emission below 1GHz)

- Modulation Type: GFSK
- Temperature: 28°C
- Relative Humidity: 59%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Ted Chiu

(A) Polarization: Horizontal

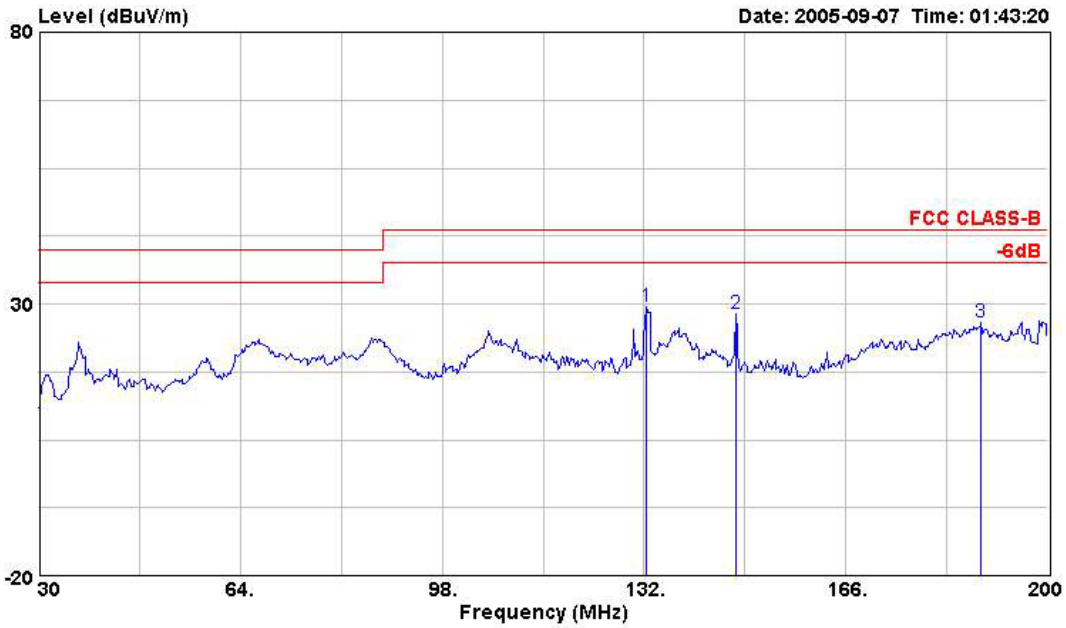


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	106.500	32.14	-11.36	51.59	43.50	1.01	9.94	30.40	Peak	---	---
2	133.020	32.48	-11.02	49.63	43.50	1.15	12.41	30.72	Peak	---	---
3	147.470	29.13	-14.37	46.37	43.50	1.19	12.07	30.50	Peak	---	---

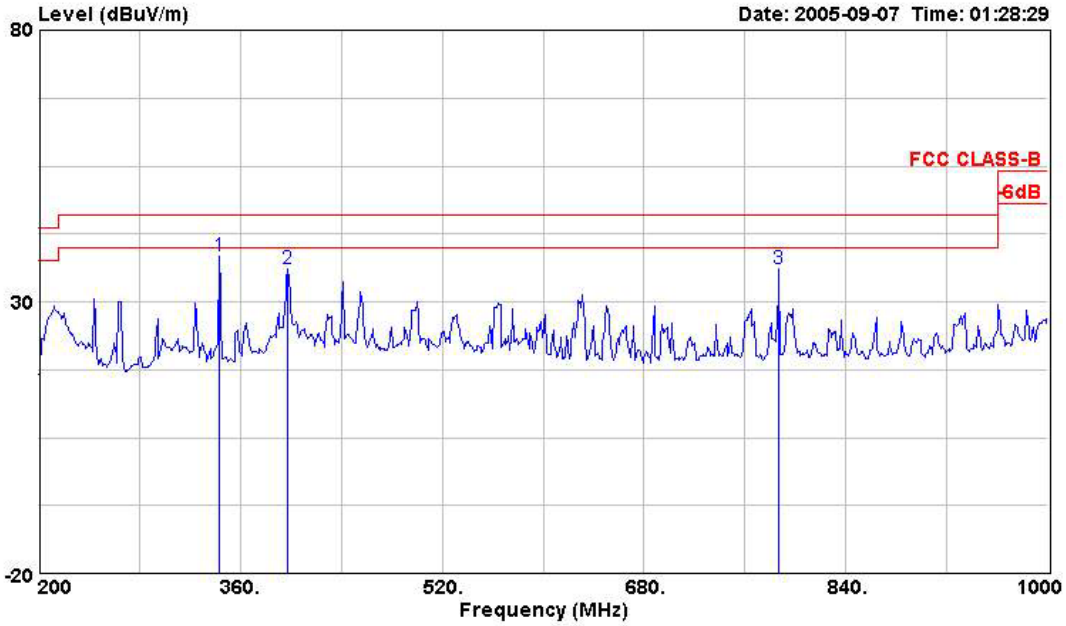


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	343.200	37.01	-8.99	51.06	46.00	1.78	15.10	30.94	Peak	---	---
2	397.600	37.51	-8.49	49.99	46.00	1.97	16.73	31.17	Peak	---	---
3	787.200	35.60	-10.40	41.70	46.00	2.79	21.74	30.63	Peak	---	---

(B) Polarization: Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	132.340	29.38	-14.12	46.55	43.50	1.15	12.39	30.71	Peak	---	---
2	147.470	28.22	-15.28	45.46	43.50	1.19	12.07	30.50	Peak	---	---
3	188.780	26.60	-16.90	40.52	43.50	1.27	14.90	30.09	Peak	---	---



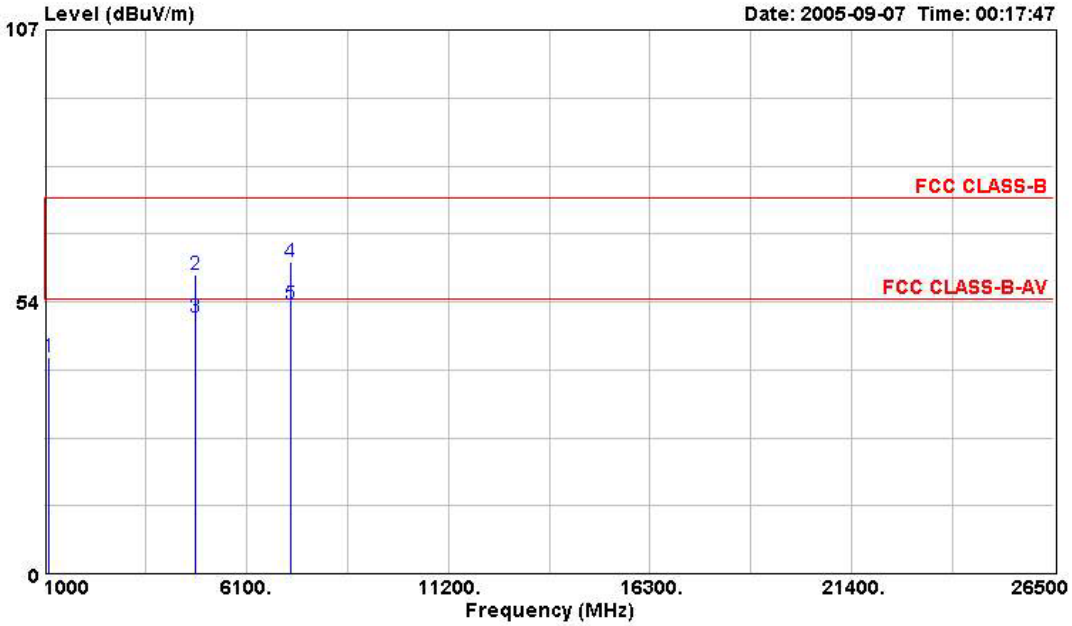
	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	343.200	38.46	-7.54	52.51	46.00	1.78	15.10	30.94	Peak	---	---
2	397.600	36.06	-9.94	48.54	46.00	1.97	16.73	31.17	Peak	---	---
3	787.200	36.04	-9.96	42.14	46.00	2.79	21.74	30.63	Peak	---	---

Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m)
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
Results for the radiated measurement below 30MHz, no emissions found and caused by the EUT.
The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

5.8.8. Test Results for CH 00 / 2402 MHz (for emission above 1GHz)

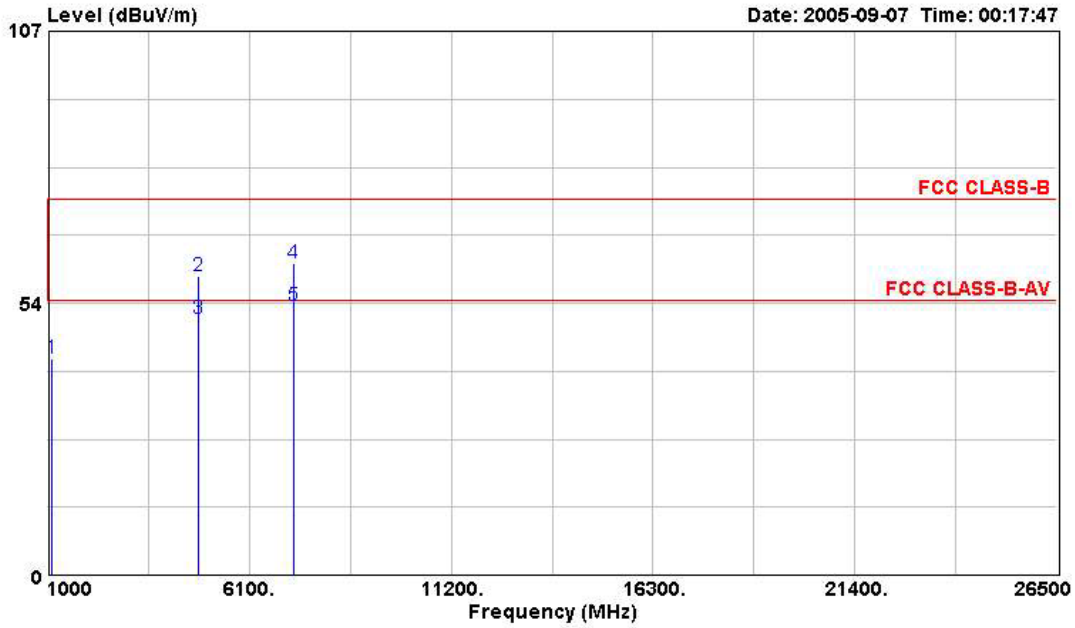
- Modulation Type: GFSK
- Temperature: 28°C
- Relative Humidity: 59%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Ted Chiu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1118.000	42.57	-31.43	50.76	74.00	1.12	24.54	33.85	Peak	---	---
2	4808.000	58.91	-15.09	55.26	74.00	3.10	33.10	32.54	PEAK	---	---
3	4808.000	50.30	-3.70	46.65	54.00	3.10	33.10	32.54	Average	---	---
4	7204.000	61.49	-12.51	53.85	74.00	4.10	35.90	32.35	PEAK	---	---
5	7204.000	52.88	-1.12	45.23	54.00	4.10	35.90	32.35	Average	---	---

(B) Polarization: Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1118.000	42.57	-31.43	50.76	74.00	1.12	24.54	33.85	Peak	---	---
2	4808.000	58.91	-15.09	55.26	74.00	3.10	33.10	32.54	PEAK	---	---
3	4808.000	50.30	-3.70	46.65	54.00	3.10	33.10	32.54	Average	---	---
4	7204.000	61.49	-12.51	53.85	74.00	4.10	35.90	32.35	PEAK	---	---
5	7204.000	52.88	-1.12	45.23	54.00	4.10	35.90	32.35	Average	---	---

Note:

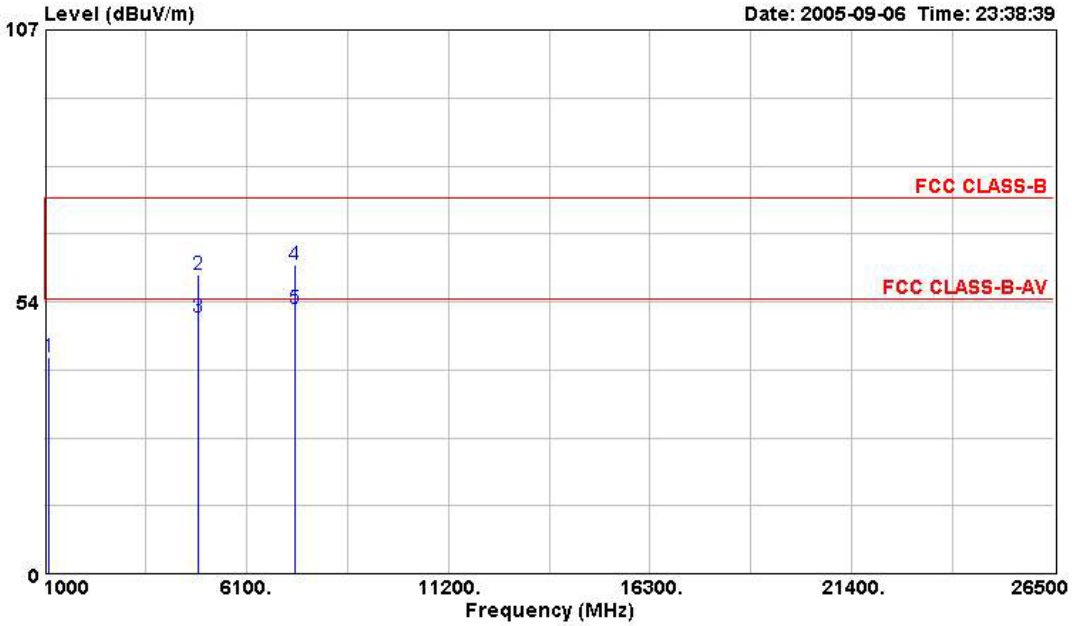
Emission level (dBuV/m) = 20 log Emission level (uV/m)

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

5.8.9. Test Results for CH 39 / 2441 MHz (for emission above 1GHz)

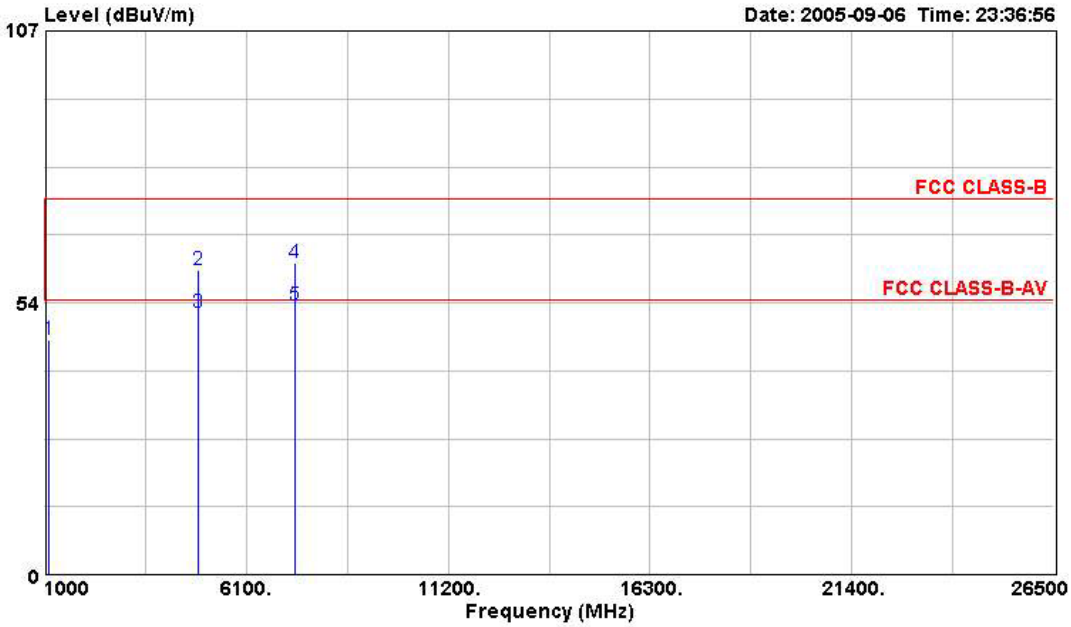
- Modulation Type: GFSK
- Temperature: 28°C
- Relative Humidity: 59%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Ted Chiu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1120.000	42.66	-31.34	50.85	74.00	1.12	24.54	33.85	PEAK	---	---
2	4884.000	58.97	-15.03	55.19	74.00	3.11	33.21	32.55	PEAK	---	---
3	4884.000	50.36	-3.64	46.59	54.00	3.11	33.21	32.55	Average	---	---
4	7320.000	60.66	-13.34	53.02	74.00	4.06	36.19	32.61	PEAK	---	---
5	7320.000	52.05	-1.95	44.41	54.00	4.06	36.19	32.61	Average	---	---

(B) Polarization: Vertical



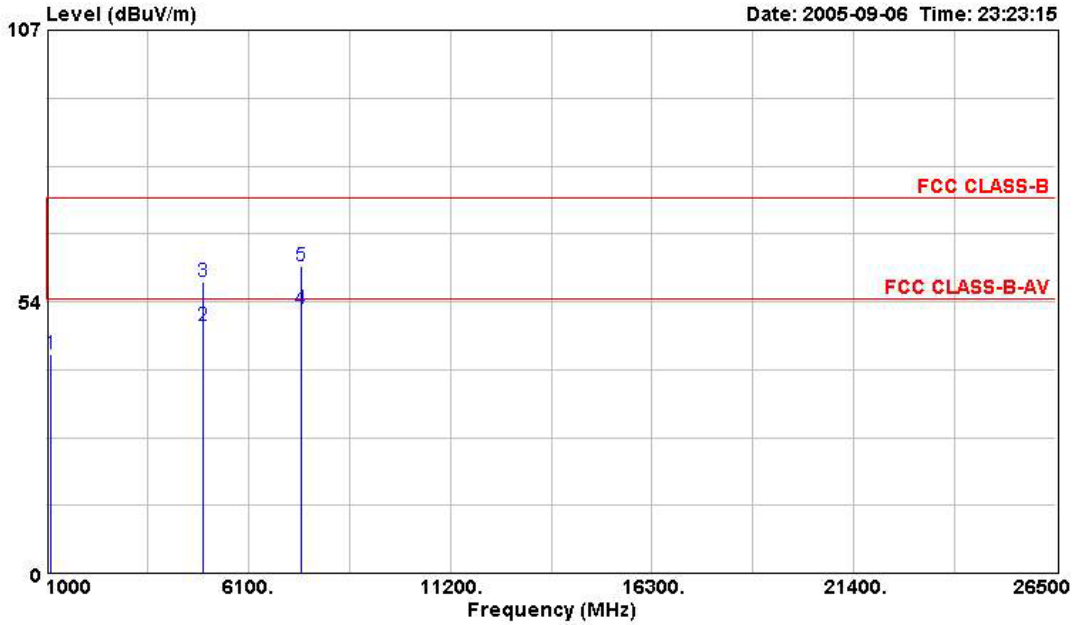
	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1124.000	46.28	-27.72	54.47	74.00	1.12	24.54	33.85	PEAK	---	---
2	4884.000	60.05	-13.95	56.28	74.00	3.11	33.21	32.55	PEAK	---	---
3	4884.000	51.44	-2.56	47.67	54.00	3.11	33.21	32.55	Average	---	---
4	7320.000	61.47	-12.53	53.83	74.00	4.06	36.19	32.61	PEAK	---	---
5	7320.000	52.86	-1.14	45.22	54.00	4.06	36.19	32.61	Average	---	---

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

5.8.10. Test Results for CH 78 / 2480 MHz (for emission above 1GHz)

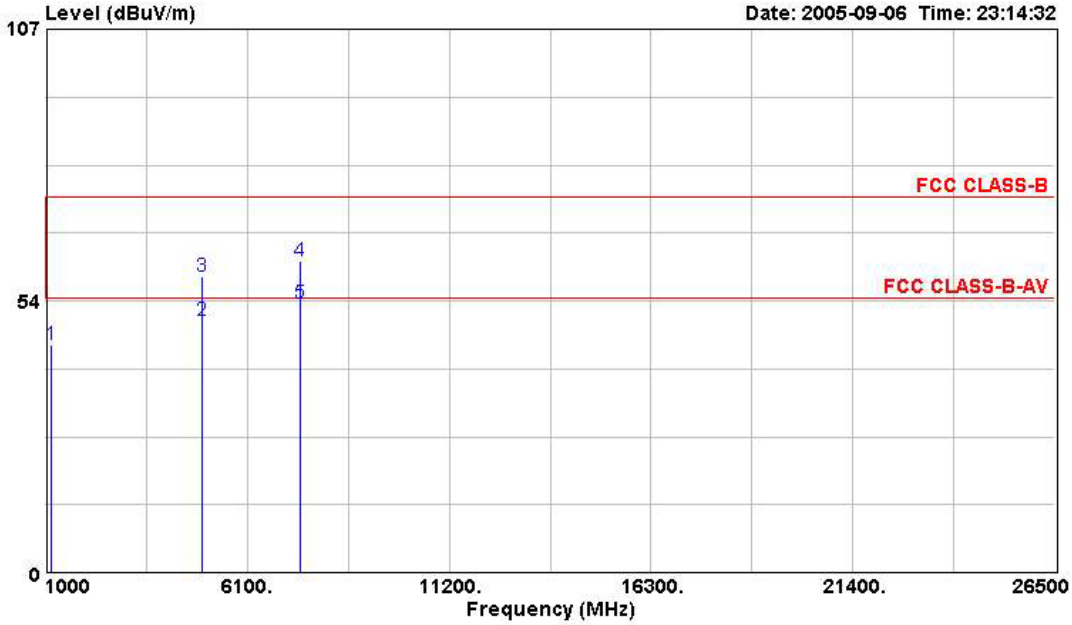
- Modulation Type: GFSK
- Temperature: 28°C
- Relative Humidity: 59%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Ted Chiu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1120.000	43.14	-30.86	51.33	74.00	1.12	24.54	33.85	PEAK	---	---
2	4964.000	48.83	-5.17	44.91	54.00	3.13	33.34	32.56	Average	---	---
3	4964.000	57.44	-16.56	53.52	74.00	3.13	33.34	32.56	Peak	---	---
4	7440.000	51.98	-2.02	44.35	54.00	4.02	36.48	32.87	Average	---	---
5	7440.000	60.59	-13.41	52.96	74.00	4.02	36.48	32.87	PEAK	---	---

(B) Polarization: Vertical

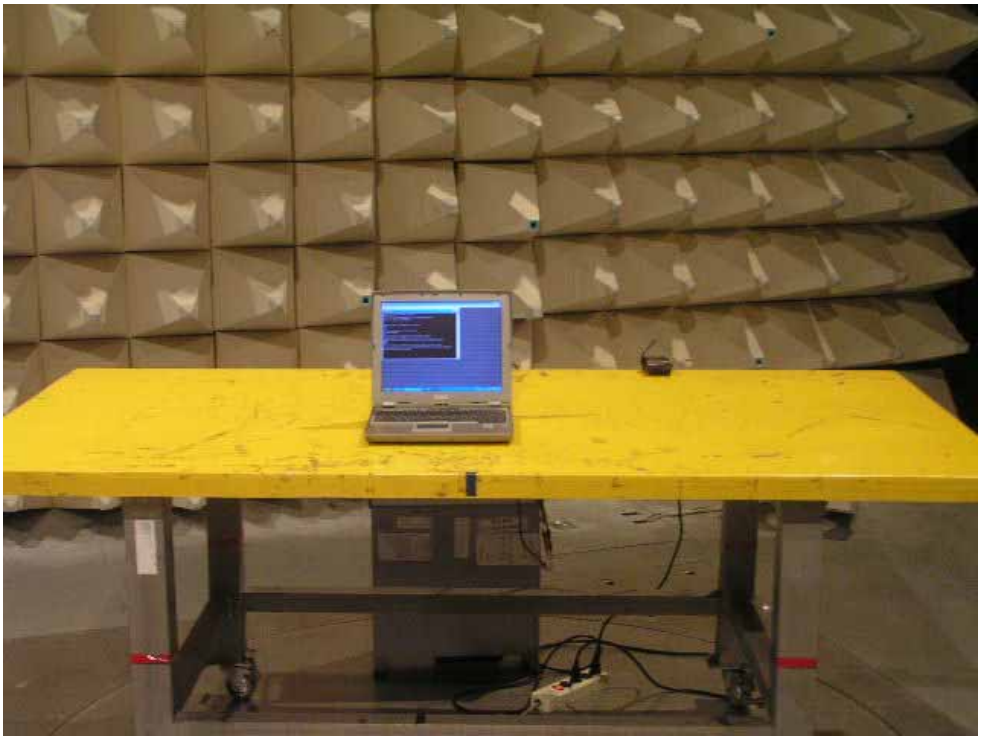


	Freq	Level	Over Limit	Read Level	Limit Line	Cable Loss	Antenna Factor	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB/m	dB		cm	deg
1	1160.000	44.73	-29.27	52.76	74.00	1.16	24.61	33.80	PEAK	---	---
2	4960.000	49.66	-4.34	45.74	54.00	3.13	33.34	32.56	Average	---	---
3	4960.000	58.27	-15.73	54.35	74.00	3.13	33.34	32.56	Peak	---	---
4	7440.000	61.48	-12.52	53.85	74.00	4.02	36.48	32.87	Peak	---	---
5	7440.000	52.87	-1.13	45.24	54.00	4.02	36.48	32.87	Average	---	---

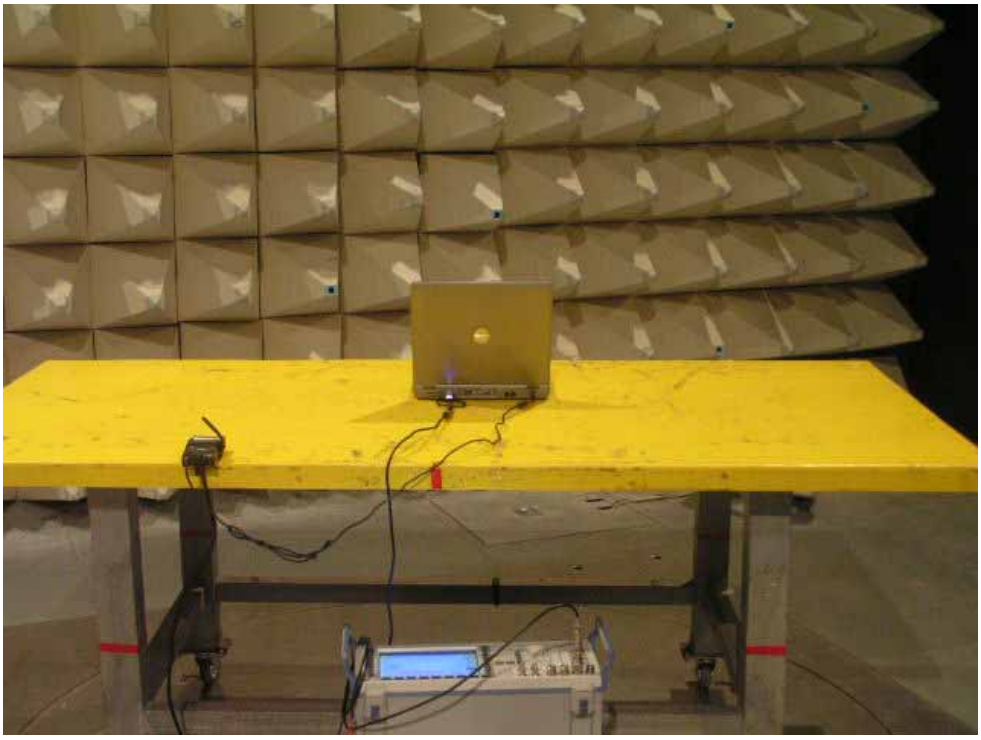
Note:
Emission level (dBuV/m) = 20 log Emission level (uV/m)
Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

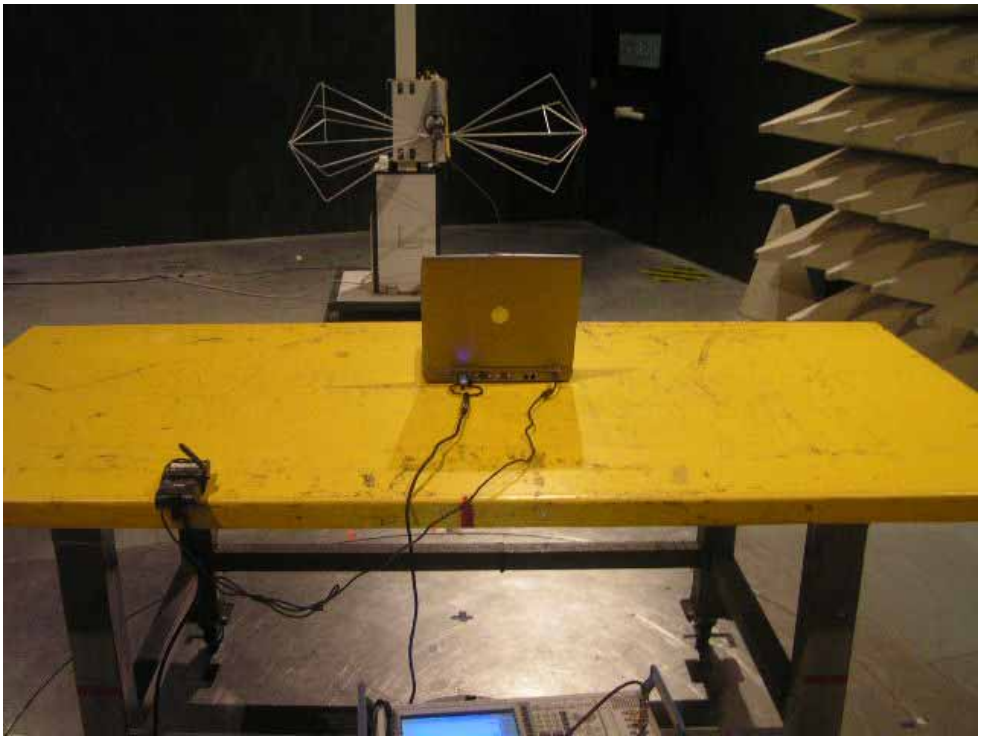
5.8.11. Photographs of Radiated Emission Test Configuration

FRONT VIEW



REAR VIEW





5.9. Antenna Requirements

5.9.1. 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.

5.9.2. Antenna Connected Construction

There is no antenna connector for integral printed antenna.

5.9.3. Antenna Gain

Antenna gain of EUT is less than 6dBi. Therefore peak conducted power limit shall not be degraded any more. Antenna report of manufacturer will have more detail antenna gain or antenna pattern.

5.9.4. Test Criteria

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

5.10. RF Exposure

5.10.1. 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

5.10.2. MPE Calculation Method

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

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.

5.10.3. Calculated Result and Limit

- Modulation Type: GFSK
- Temperature: 27°C
- Relative Humidity: 55%
- Duty Cycle of the Equipment During the Test: 41.9%
- Test Engineer: Eason Lu

Channel No.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)
00	2.95	1.9724	8.1000	6.4565	0.002535	1

6. List of Measuring Equipments Used

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
1	EMC Receiver	R&S	ESCS 30	100174	9kHz – 2.75GHz	Feb. 16, 2005	Conduction (CO04-HY)
2	LISN	MessTec	NNB-2/16Z	2001/004	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
3	LISN (Support Unit)	MessTec	NNB-2/16Z	99041	9kHz – 30MHz	May. 05, 2005	Conduction (CO04-HY)
4	RF Cable-CON	UTIFLEX	3102-26886-4	CB049	9kHz – 30MHz	Apr. 20, 2005	Conduction (CO04-HY)
5	EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
6	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30 MHz - 1 GHz 3m	Jun. 16, 2005	Radiation (03CH03-HY)
7	Amplifier	SCHAFFNER	CPA9231A	18667	9 kHz - 2 GHz	Jan. 10, 2005	Radiation (03CH03-HY)
9	Amplifier	Agilent	8449B	3008A02120	1 GHz - 26.5 GHz	May 31, 2005	Radiation (03CH03-HY)
10	Spectrum Analyzer	R&S	FSP40	100019	9 kHz - 40 GHz	Jul. 21, 2005	Radiation (03CH03-HY)
11	Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30 MHz - 200 MHz	Jul. 22, 2005	Radiation (03CH03-HY)
12	Log Antenna	SCHWARZBECK	VUSLP 9111	221	200 MHz - 1 GHz	Jul. 22, 2005	Radiation (03CH03-HY)
13	Horn Antenna	EMCO	3115	6741	1 GHz - 18 GHz	Apr. 22, 2005	Radiation (03CH03-HY)
14	RF Cable-R03m	Jye Bao	RG142	CB021	30 MHz - 1 GHz	Feb. 22, 2005	Radiation (03CH03-HY)
15	RF Cable-HIGH	SUHNER	SUCOFLEX 106	03CH03-HY	1 GHz - 40 GHz	Dec.01, 2004	Radiation (03CH03-HY)
16	Turn Table	HD	DS 420	420/650/00	0 - 360 degree	N/A	Radiation (03CH03-HY)
17	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.

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

※ Calibration Interval of instruments listed above is two year.

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
21	Spectrum analyzer	R&S	FSP40	100116	9kHz ~ 40GHx	Jan. 28, 2005	Conducted (TH01-HY)
22	Power meter	R&S	NRVS	100444	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
23	Power sensor	R&S	NRV-Z55	100049	DC ~ 40GHz	Jul. 06, 2005	Conducted (TH01-HY)
24	Power Sensor	R&S	NRV-Z32	100057	30MHz ~ 6GHz	Apr. 28, 2005	Conducted (TH01-HY)
25	AC power source	HPC	HPA-500W	HPA-9100024	AC 0 ~ 300V	Apr. 21, 2005	Conducted (TH01-HY)
26	DC power source	G.W.	GPC-6030D	C671845	DC 1V ~ 60V	Nov. 28, 2004	Conducted (TH01-HY)
27	Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2004	Conducted (TH01-HY)
28	RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz ~ 7GHz	Jan. 01, 2005	Conducted (TH01-HY)
29	RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz ~ 1GHz	Jan. 01, 2005	Conducted (TH01-HY)
30	Oscilloscope	Tektronix	TDS1012	CO38515	100MHz / 1GS/s	Apr. 15, 2005	Conducted (TH01-HY)
31	Signal Generator	R&S	SMR40	100116	10MHz ~ 40GHz	Dec. 31, 2004	Conducted (TH01-HY)
32	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. Uncertainty of Test Site

Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.41	Normal(k=2)	0.21
Antenna factor calibration	0.83	Normal(k=2)	0.42
Cable loss calibration	0.25	Normal(k=2)	0.13
Pre Amplifier Gain calibration	0.27	Normal(k=2)	0.14
RCV/SPA specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site imperfection	1.43	Rectangular	0.83
Mismatch	+0.39/-0.41	U-shaped	0.28
combined standard uncertainty Uc(y)	**1.27**		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	**2.54**		

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.10	Normal(k=2)	0.05
Cable loss	0.10	Normal(k=2)	0.05
AMN insertion loss	2.50	Rectangular	0.63
Receiver Spec	1.50	Rectangular	0.43
Site imperfection	1.39	Rectangular	0.80
Mismatch	+0.34/-0.35	U-shape	0.24
combined standard uncertainty Uc(y)	**1.13**		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	**2.26**		

9. 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

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)