FCC TEST REPORT

CATEGORY	:	Portable
PRODUCT NAME	:	Bluetooth Car kit
FCC ID.	:	QW3-BTHCB01
FILING TYPE	:	Certification
BRAND NAME	:	Formosa Teletek
MODEL NAME	:	FB-HCBXX
APPLICANT	:	**Formosa Teletek Corporation** No. 358, Hwaya 2nd Gueishan Shiang, Taoyuan, Taiwan
MANUFACTURER	:	**Formosa Teletek Corporation** No. 358, Hwaya 2nd Gueishan Shiang, Taoyuan, Taiwan
ISSUED BY	:	**SPORTON INTERNATIONAL INC.** 6F, No. 106, Sec. 1, Hsin Tai Wu Rd., His 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 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.

1190
ILAC MRA

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APPENDIX A. PHOTOGRAPHS OF EUT ..... **A1 ~ A5**

HISTORY OF THIS TEST REPORT

Received Date: Mar. 10, 2005
Test Date: May 27, 2005
Original Report Issue Date: May 30, 2005
Report No.: FR531006

■ 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 Car kit

BRAND NAME : Formosa Teletek

MODEL NAME : FB-HCBXX

APPLICANT : **Formosa Teletek Corporation**
No. 358, Hwaya 2nd Gueishan Shiang, Taoyuan, Taiwan

MANUFACTURER : **Formosa Teletek Corporation**
No. 358, Hwaya 2nd Gueishan Shiang, Taoyuan, Taiwan

I **HEREBY** CERTIFY THAT:

The measurements shown in this test report were made in accordance with the procedures given in ANSI C63.4-2003 and all test are performed according to 47 CFR FCC Part 15 Subpart C. Testing was carried out on May 27, 2005 at SPORTON International Inc. LAB.

Wayne Hsu / Supervisor
Sporton International Inc.

1. General Description of Equipment under Test

1.1. Applicant

Formosa Teletek Corporation
No. 358, Hwaya 2nd Gueishan Shiang, Taoyuan, Taiwan

1.2. Manufacturer

Formosa Teletek Corporation
No. 358, Hwaya 2nd Gueishan Shiang, Taoyuan, Taiwan

1.3. Basic Description of Equipment under Test

This product is a Bluetooth Car kit. The technical data has been listed on section " Features of Equipment under Test ".

1.4. Features of Equipment under Test

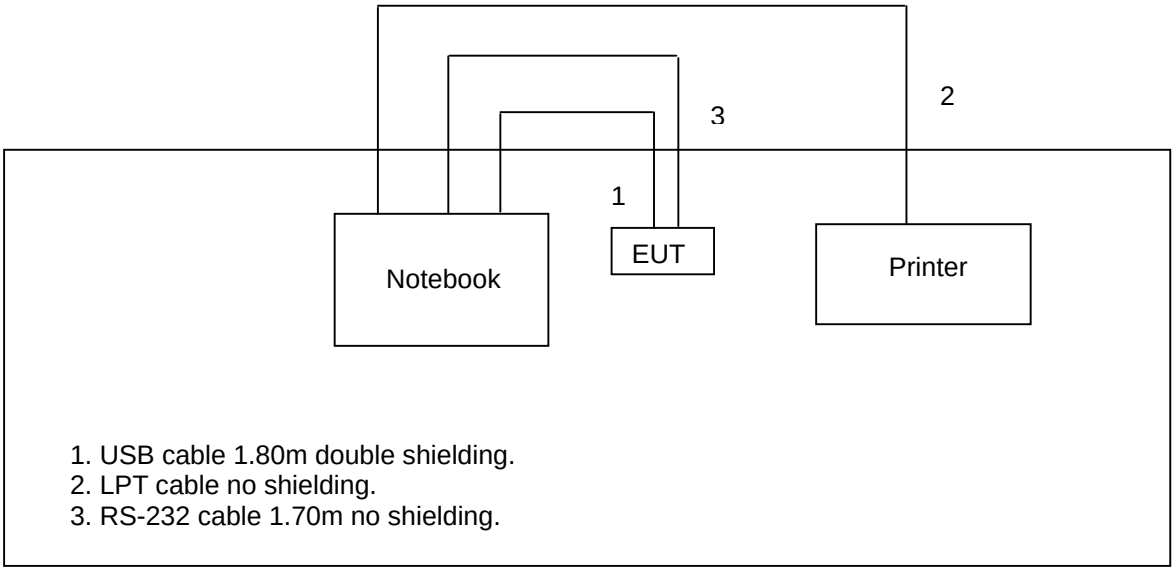
Items	Description
Type of Modulation	GFSK
Number of Channels	79
Frequency Band	2402 MHz ~ 2480 MHz
Carrier Frequency	See section 1.5 for details
Data Rate	1 Mbps
Channel Bandwidth	770 kHz
Max. EIRP Peak Power	4.90 dBm
Antenna Type / Gain	Chip Antenna / 2 dBi
Communication Type	Duplex
Test Power Source	DC 12 VDC Plug in the car cigarette lighter
Temperature Range (Operating)	-10 ~ 50 °C

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

2. Test Configuration of the Equipment under Test

2.1. Connection Diagram of Test System



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.

2.3. Description of Test Supporting Units

Support unit	Brand	Model No.	FCC ID	Data cable (m)
Notebook	DELL	PP01L (D505)	DoC	-
Printer	EPSON	LQ-680	DoC	1.35

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

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

During testing, Channel & Power Controlling Software was used. 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.

Software Version	:	Bluetest
Power Set CH00 / GFSK	:	63/ TX Power
Power Set CH39 / GFSK	:	63/ TX Power
Power Set CH78 / GFSK	:	63/ TX Power

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 18 of the table on section 6.

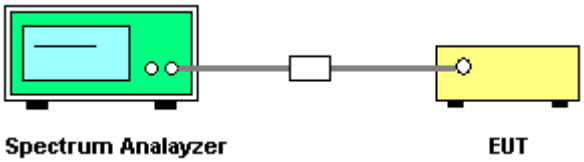
5.1.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP30
  Attenuation : Auto
  Center Frequency : 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 spectrum width with level higher than 20dB below the peak level.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.1.5. Test Setup Layout



5.1.6. Test Criteria

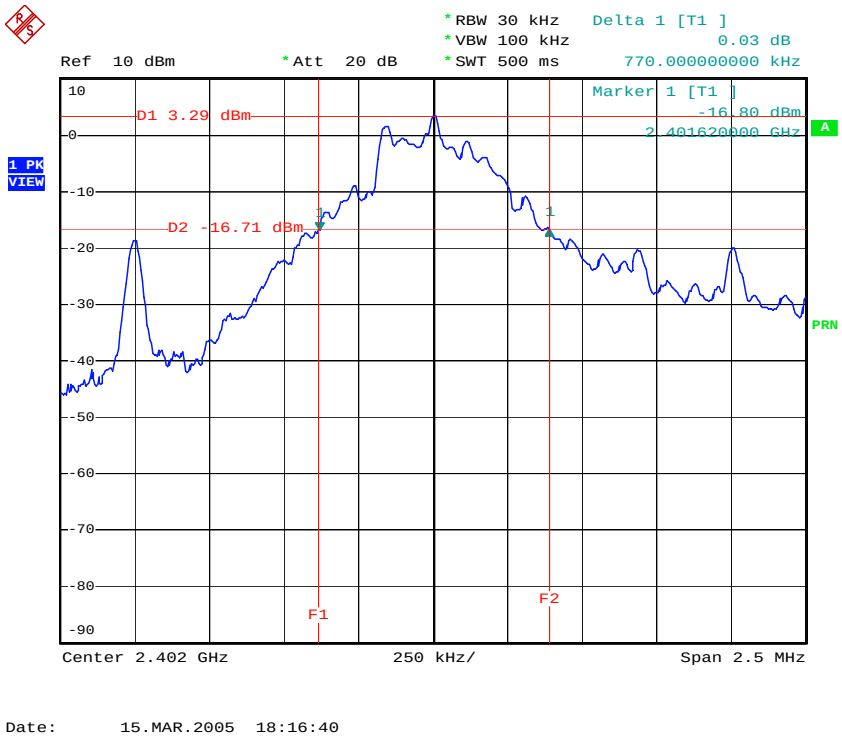
All test results complied with the requirements of Section 15.247(a)(1). Measurement Uncertainty is $1x10^{-5}$.

5.1.7. Test Result

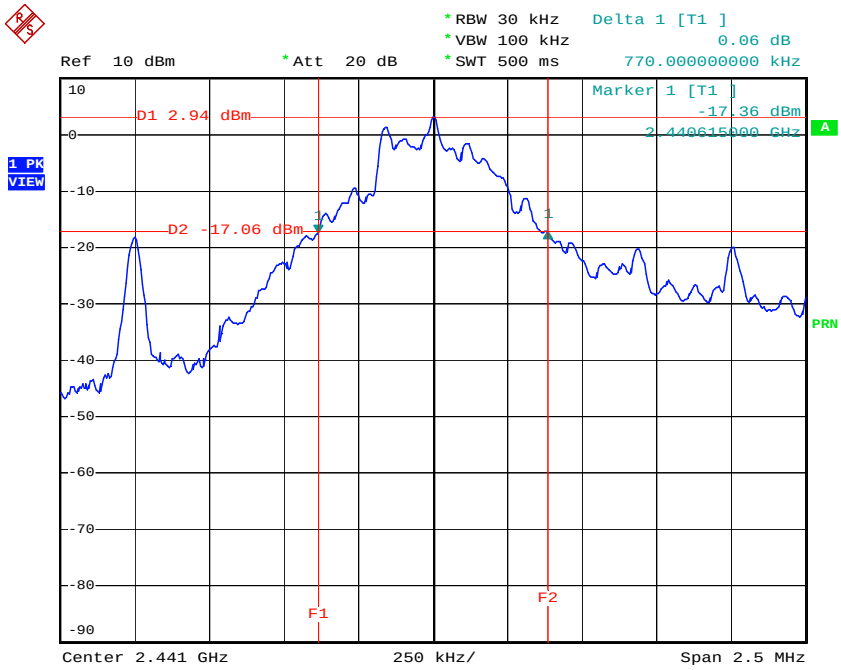
- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

Modulation Type	Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Min. Limit (kHz)
GFSK	00	2402 MHz	770.00	25
GFSK	39	2441 MHz	770.00	25
GFSK	78	2480 MHz	770.00	25

Modulation Type: GFSK (Channel 00)：



Modulation Type: GFSK (Channel 39)：



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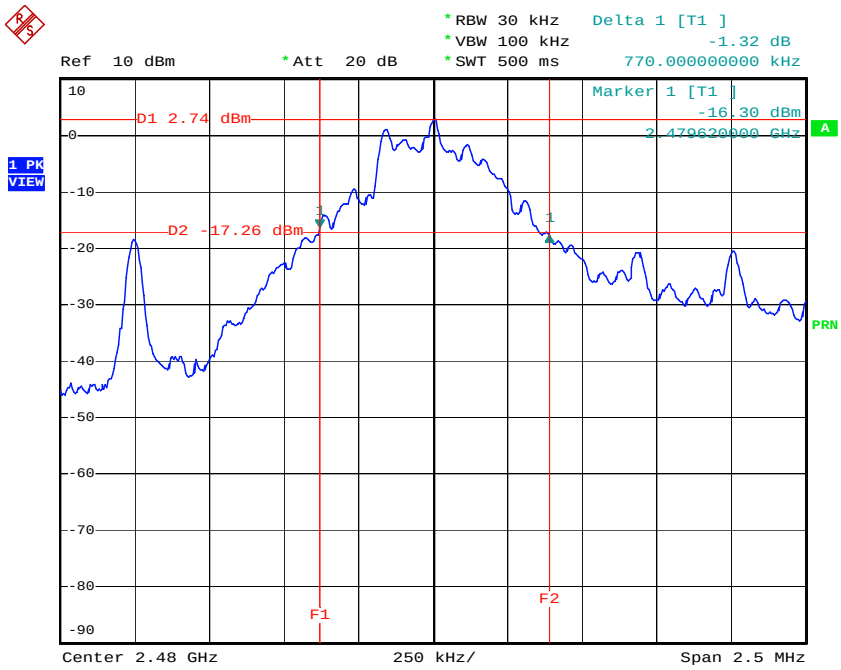
Modulation Type: GFSK (Channel 78)：



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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 18 of the table on section 6.

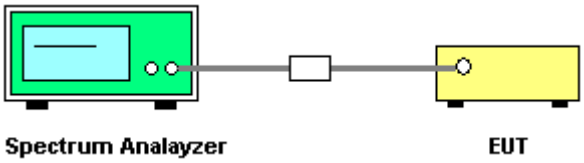
5.2.3. Description of Major Test Instruments Setting

- 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

5.2.4. 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 middle and highest channel of the EUT.

5.2.5. Test Setup Layout



5.2.6. Test Criteria

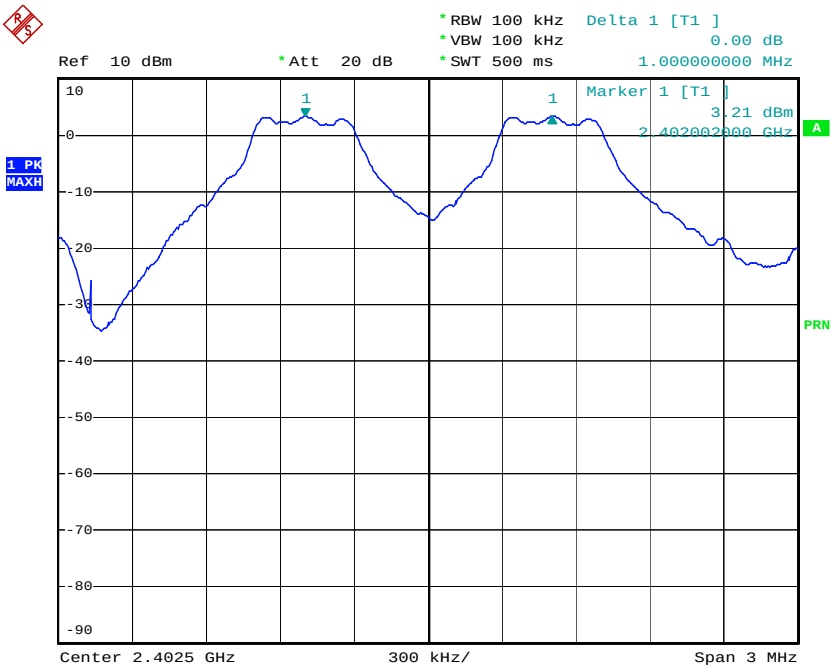
All test results complied with the requirements of Section 15.247(a)(1). Measurement Uncertainty is $1x10^{-5}$.

5.2.7. Test Result

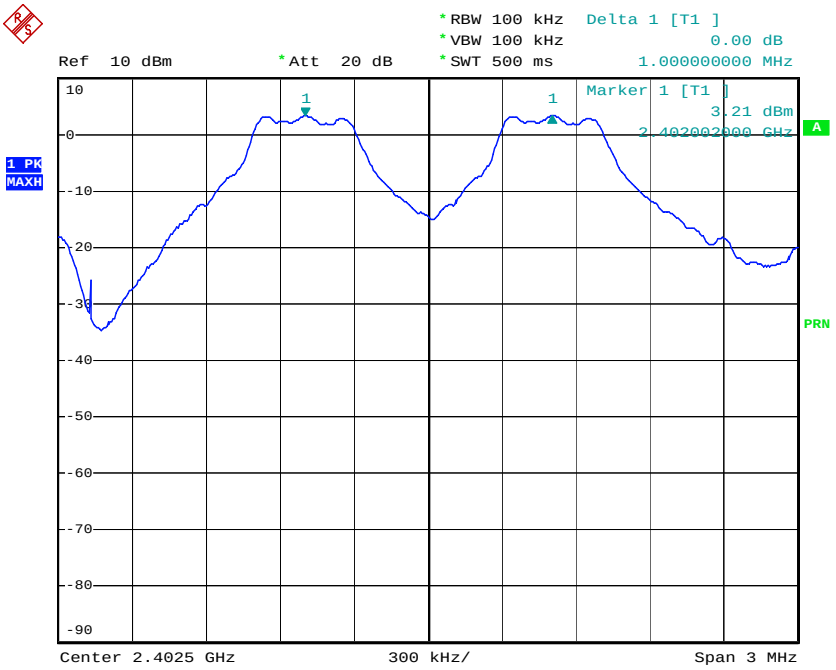
- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

Modulation Type	Channel No.	Frequency (MHz)	Hopping Channel Separation (kHz)	Min. Limit (kHz)
GFSK	00	2402 MHz	1000	770.00
GFSK	39	2441 MHz	1000	770.00
GFSK	78	2480 MHz	1000	770.00

Modulation Type: GFSK (Channel 00)：



Modulation Type: GFSK (Channel 39)：



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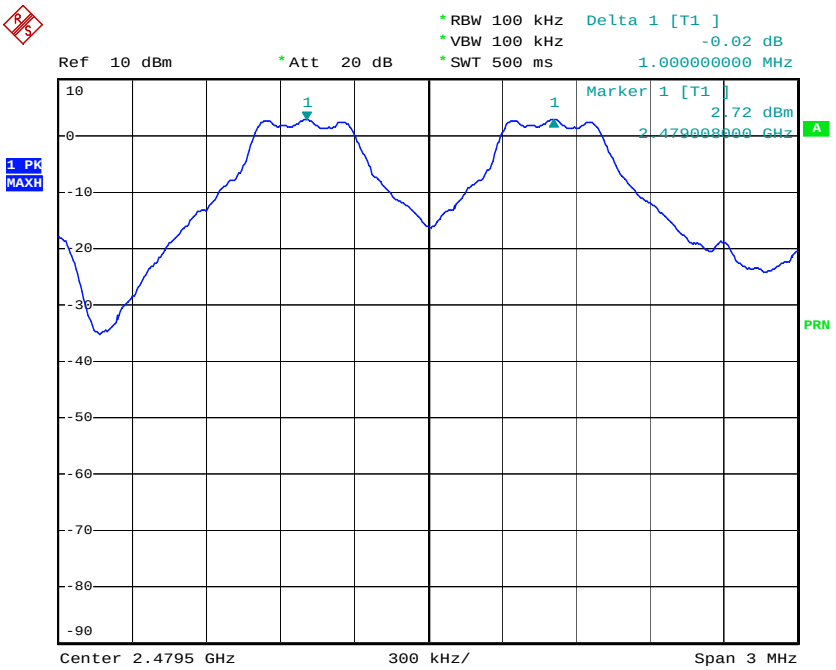
Modulation Type: GFSK (Channel 78)：



Date: 15.MAR.2005 18:29:28

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 18 of the table on section 6.

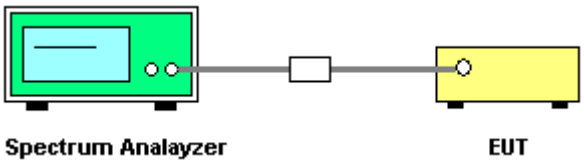
5.3.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP30
  Attenuation : Auto
  Center Frequency : 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 frequency hopping in 2400MHz~2483.5MHz, there are at least 75 non-overlapping channels.
5. Repeat above 1~3 points for the middle and highest channel of the EUT.

5.3.5. Test Setup Layout



5.3.6. Test Criteria

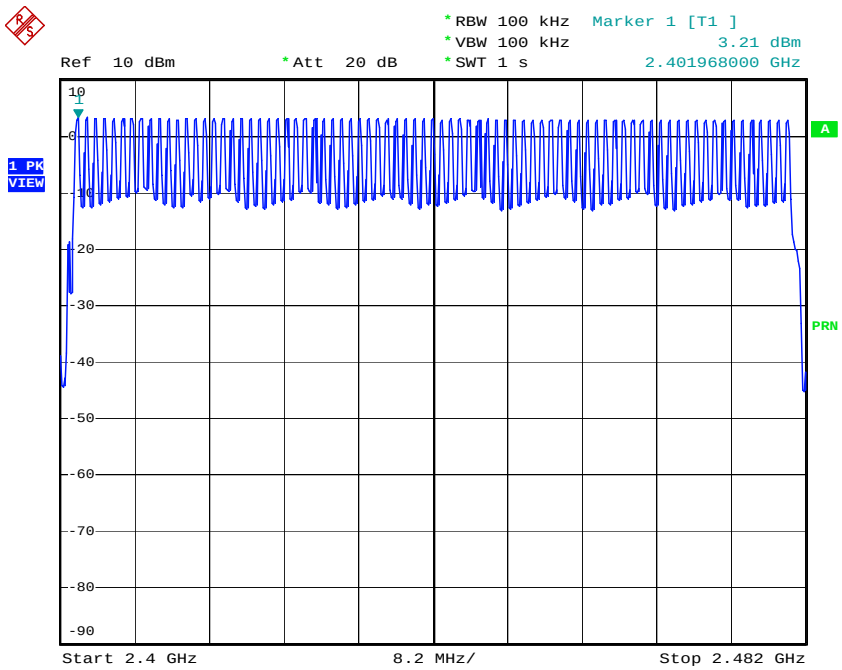
All test results complied with the requirements of Section 15.247(b)(1). Measurement Uncertainty is $1x10^{-5}$.

5.3.7. Test Result

- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

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)：



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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 18 of the table on section 6.

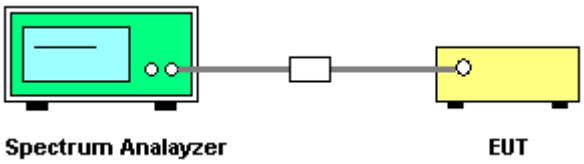
5.4.3. Description of Major Test Instruments Setting

- 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

5.4.4. 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.
6. 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.
7. 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.
8. 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

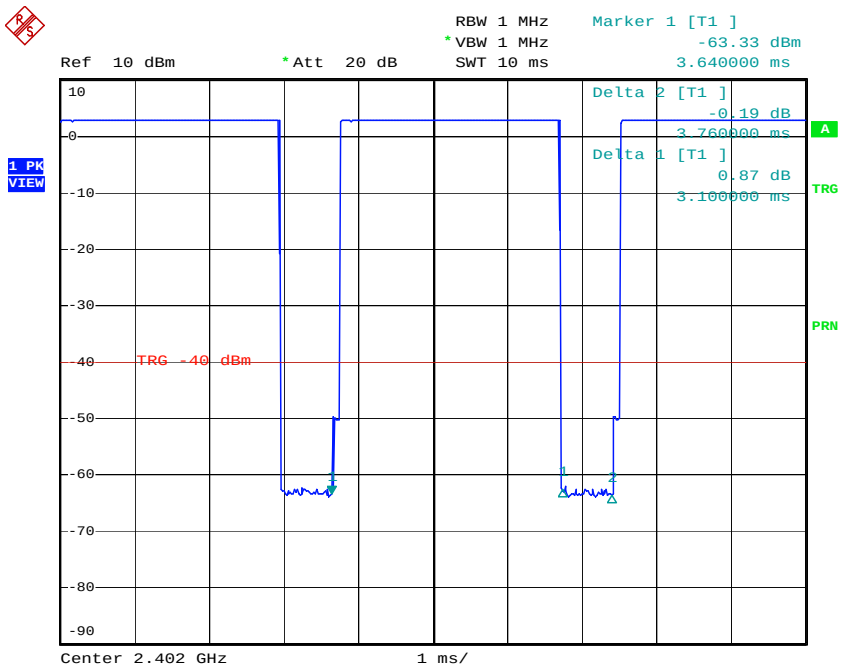
All test results complied with the requirements of Section 15.247(a)(1)(iii). Measurement Uncertainty is $1x10^{-5}$.

5.4.7. Test Result

- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

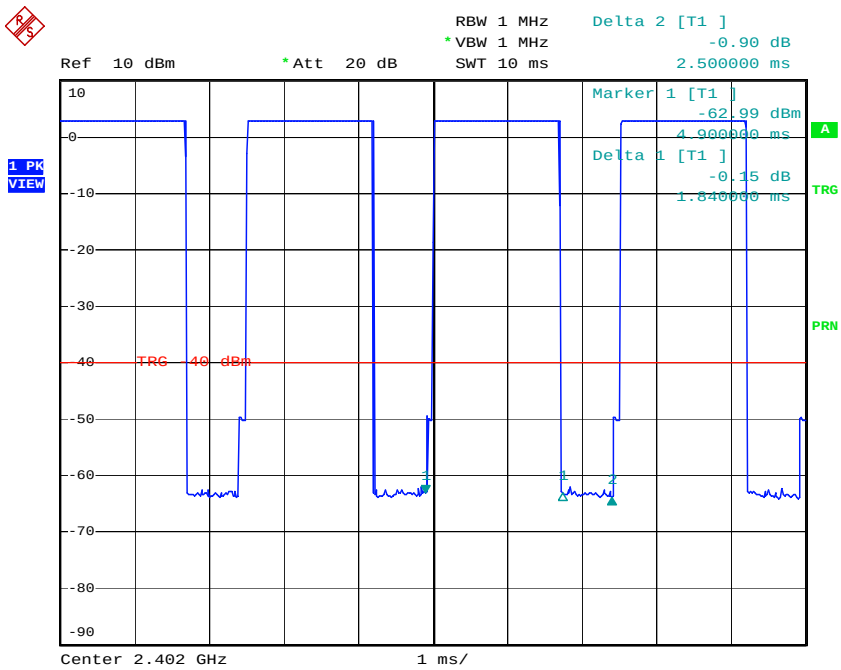
Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH5	2402 MHz	3.1000	0.3307	0.4
DH3	2441 MHz	1.8400	0.2944	0.4
DH1	2480 MHz	0.5800	0.1856	0.4

DH5 Modulation Type: GFSK (Channel 00)：



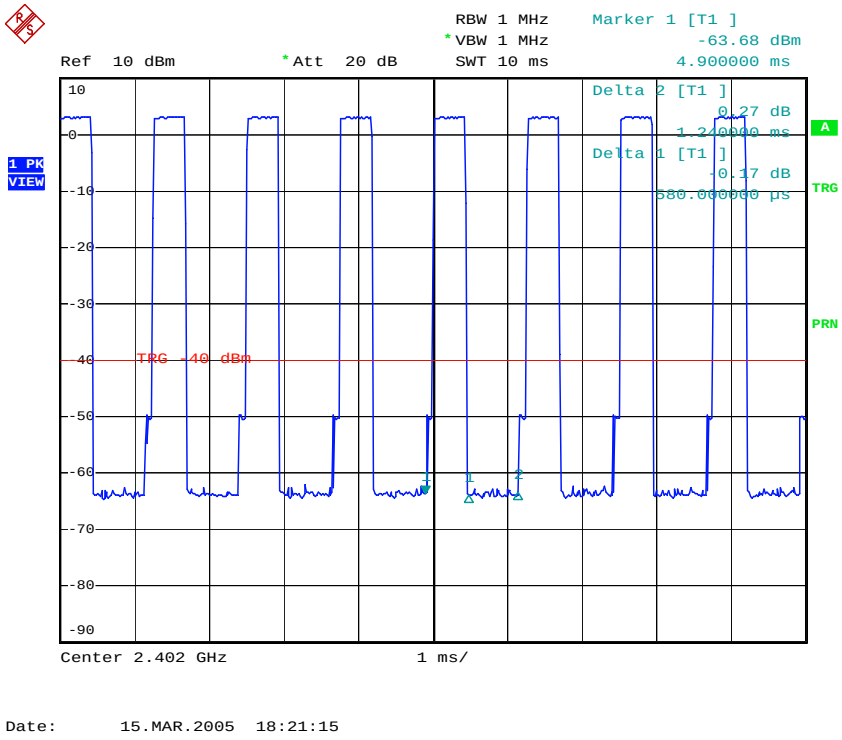
Date: 15.MAR.2005 18:24:55

DH3 Modulation Type: GFSK (Channel 00)：

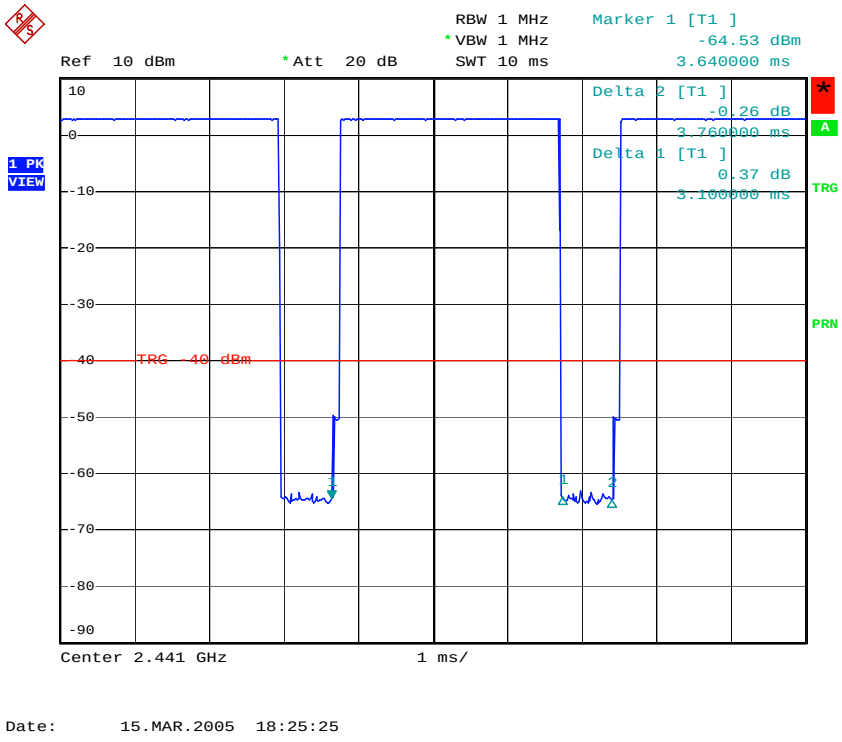


Date: 15.MAR.2005 18:23:27

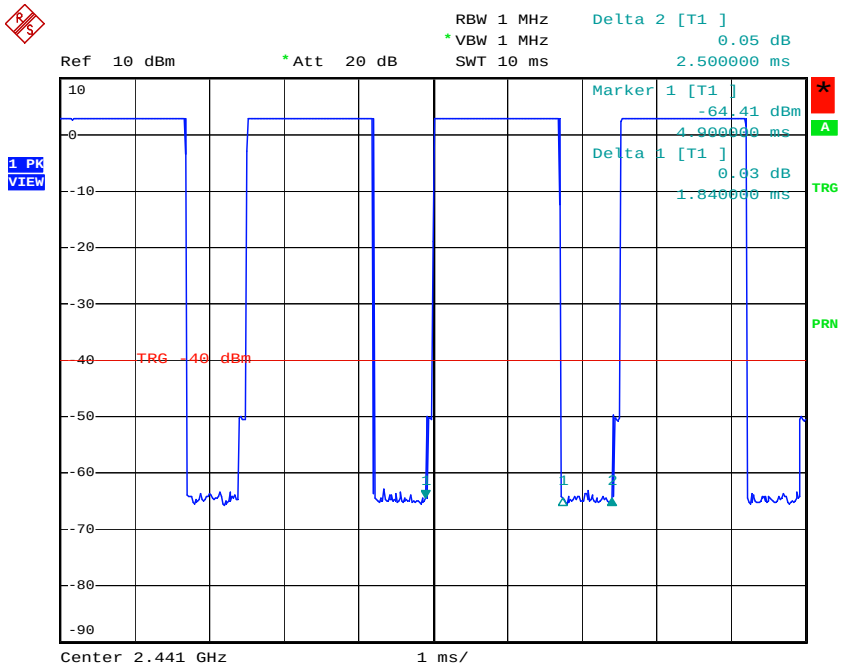
DH1 Modulation Type: GFSK (Channel 00)：



DH5 Modulation Type: GFSK (Channel 39)：

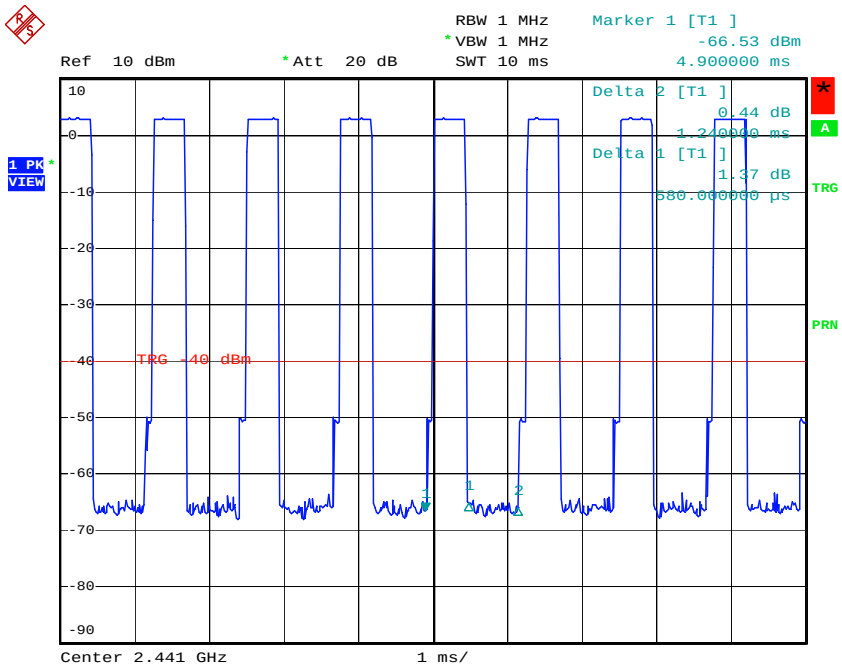


DH3 Modulation Type: GFSK (Channel 39)：



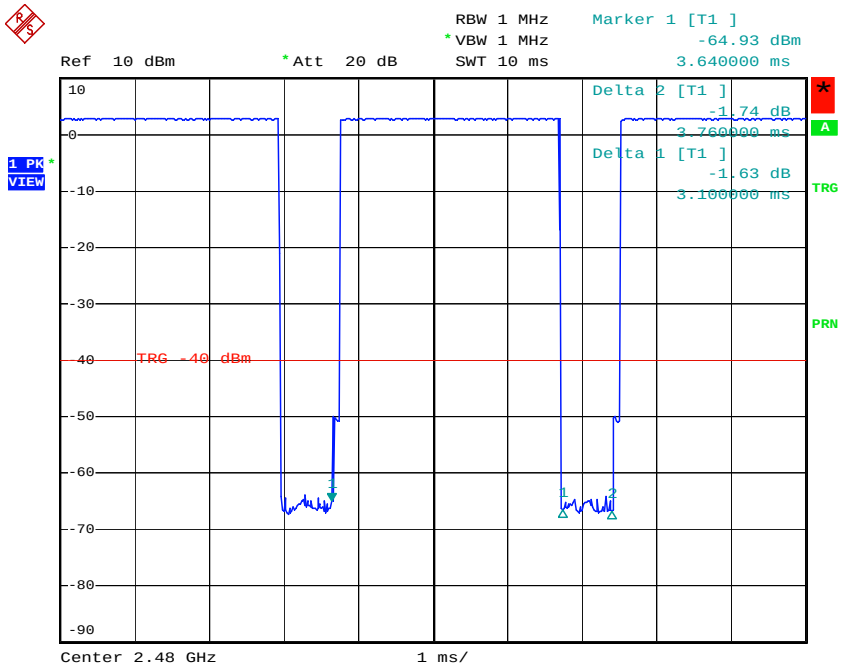
Date: 15.MAR.2005 18:23:49

DH1 Modulation Type: GFSK (Channel 39)：



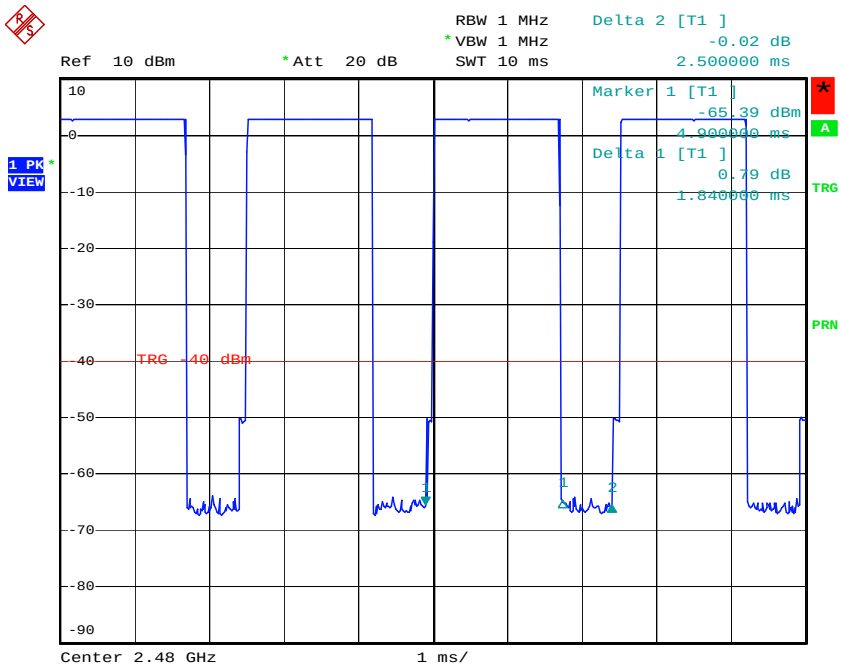
Date: 15.MAR.2005 18:21:42

DH5 Modulation Type: GFSK (Channel 78)：



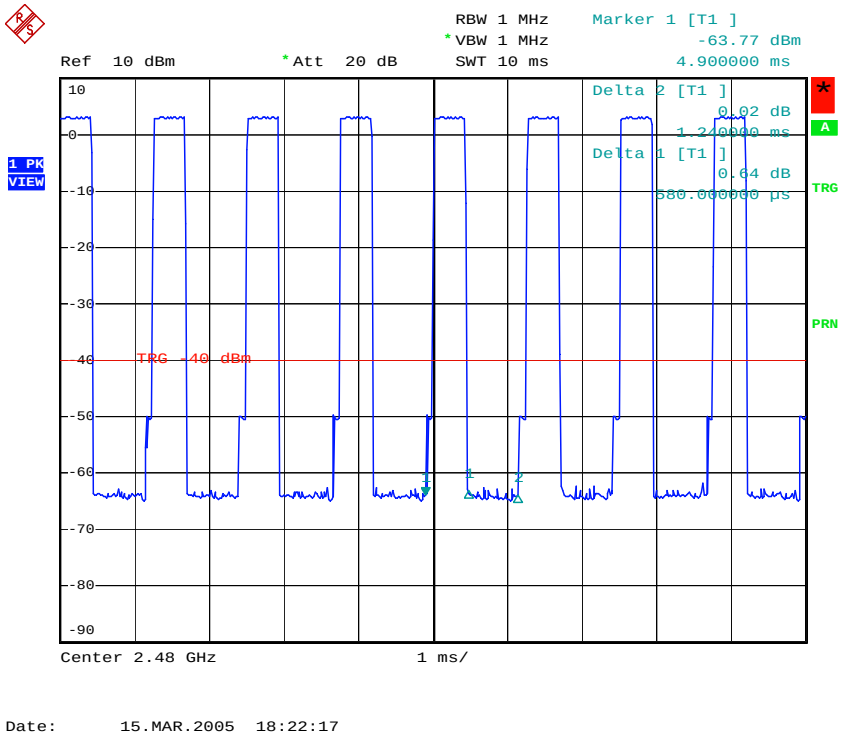
Date: 15.MAR.2005 18:25:53

DH3 Modulation Type: GFSK (Channel 78)：



Date: 15.MAR.2005 18:24:11

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.

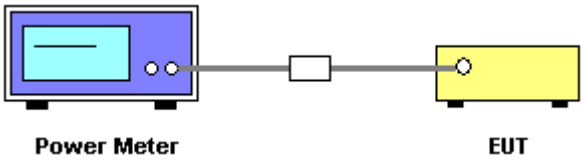
5.5.2. Measuring Instruments

Item 19, 21 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. Peak power meter parameter set to auto attenuator and filter is the same as.
3. Repeated the 1 for the 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: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
GFSK	00	2402 MHz	4.90	30
GFSK	39	2441 MHz	4.62	30
GFSK	78	2480 MHz	4.50	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 6~17 of the table on section 6 for radiated measurement.
Item 18 of the table on section 6 for conducted measurement.

5.6.3. 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

5.6.4. 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.

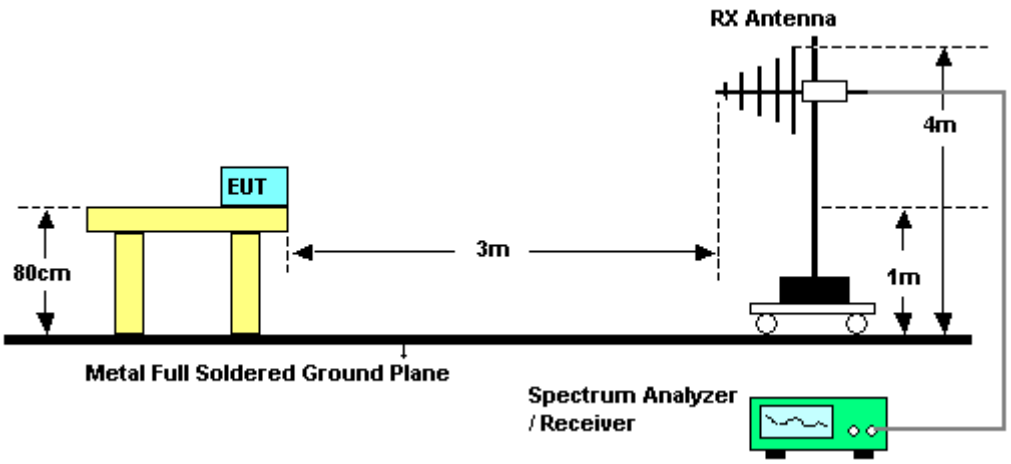
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement

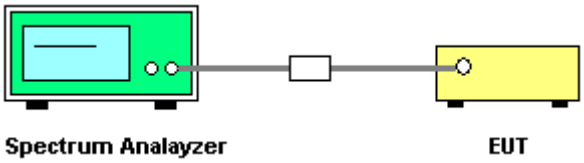
1. Configure the EUT according to ANSI C63.4.
2. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both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

5.6.5. 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 Result of Radiated

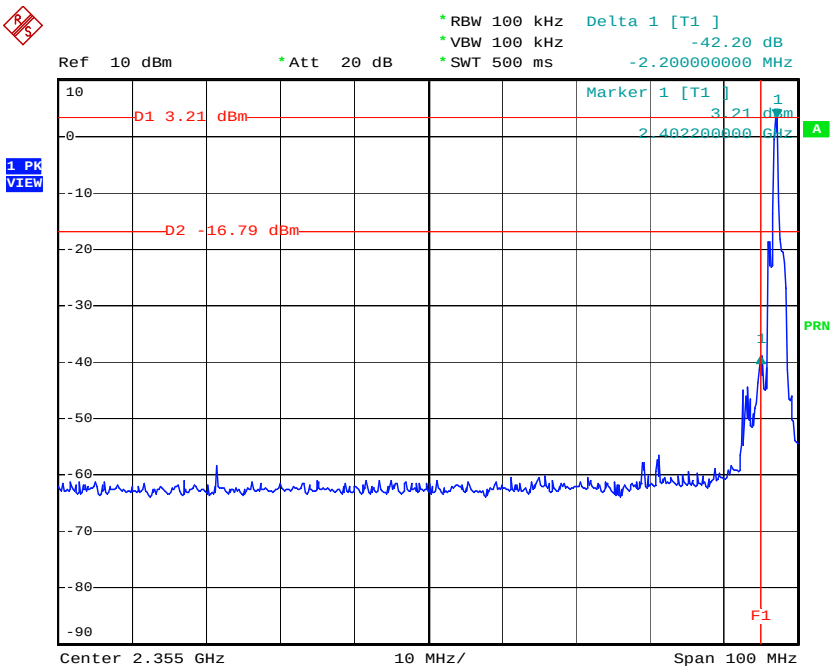
- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

Modulation Type	Test Channel	Freq. (MHz)	Level* (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Trace (PK/AV)
GFSK	00	2389.99	56.16	-17.84	74	PK
GFSK	00	2389.99	43.15	-10.85	54	AV
GFSK	78	2483.66	64.97	-9.03	74	PK
GFSK	78	2483.66	51.45	-2.55	54	AV

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

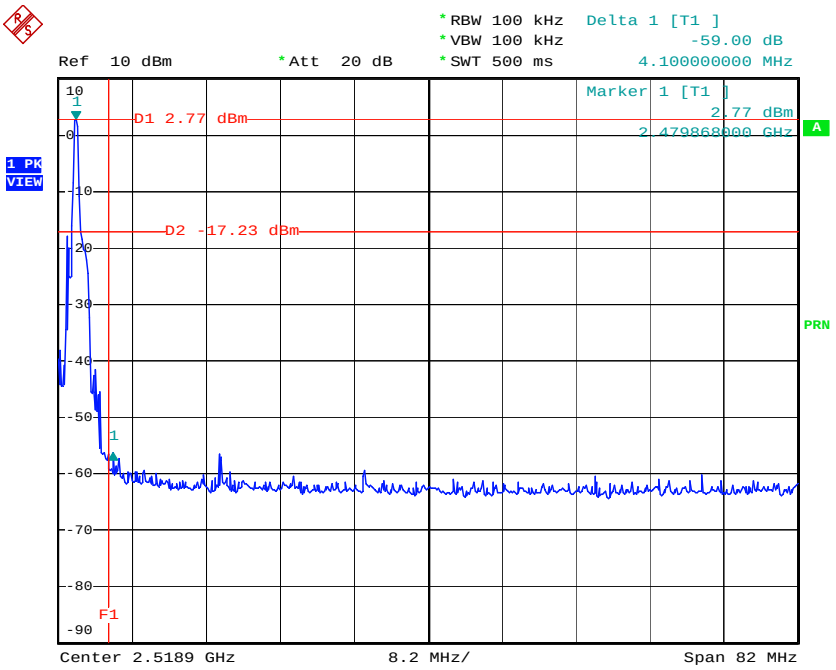
Test Result of Conducted

Modulation Type: GFSK (Channel 00)：



Date: 15.MAR.2005 18:18:10

Modulation Type: GFSK (Channel 78)：



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5.7. Test of AC Power Line Conducted Emission

EUT is DC source, So EUT shall not complied with AC conduction emission.

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 1~17 in chapter 6 for the instruments used for testing.

5.8.3. Description of Major Test Instruments Setting

- Spectrum Analyzer : R&S FSP40
  Attenuation : Auto
  Start Frequency : 1000 MHz
  Stop Frequency : 10th carrier harmonic
  RB / VB : 1 MHz / 1MHz for Peak
  RB / VB : 1 MHz / 10Hz for Average

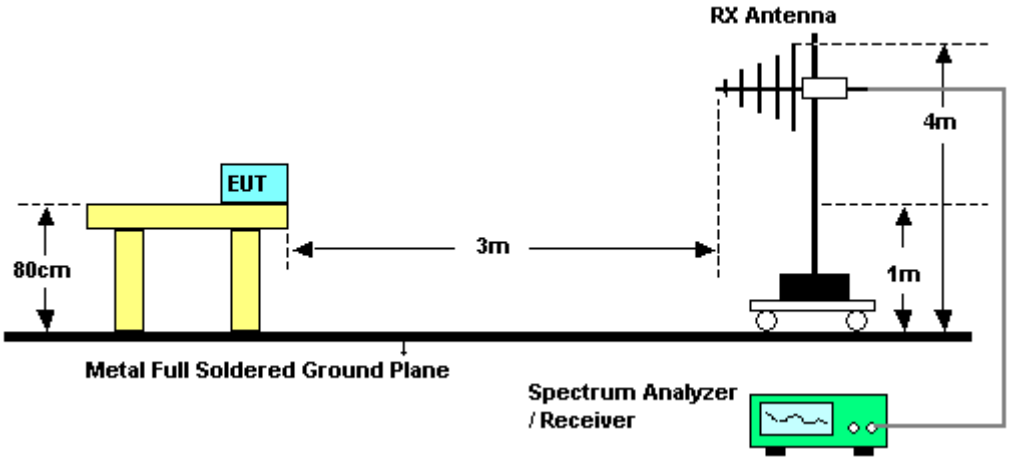
- Test Receiver : R&S ESCS 30
  Attenuation : Auto
  Start Frequency : 9 kHz
  Stop Frequency : 1000 MHz
  RB : 120 KHz for QP or PK

5.8.4. Test Procedures

1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on the top of the turntable 0.8 meter above ground.
3. The phase center of the receiving antenna mounted on the top of a height-variable antenna tower was placed 3 meters far away from the turntable.
4. Power on the EUT and all the supporting units.
5. The turntable was rotated by 360 degrees to determine the position of the highest radiation.
6. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both horizontal and vertical polarization.
7. For each suspected emission, the antenna tower was scan (from 1 M to 4 M) and then the turntable was rotated (from 0 degree to 360 degrees) to find the maximum reading.
8. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function with specified bandwidth under Maximum Hold Mode.
9. For emission above 1GHz, use 1MHz VBW and RBW for peak reading. Then 1MHz RBW and 10Hz VBW for average reading in spectrum analyzer.

10. If the emission level of the EUT in peak mode was 3 dB lower than the average limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method for below 1GHz and average method for above the 1GHz. the reported.
11. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB higher than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

5.8.5. Test Setup Layout



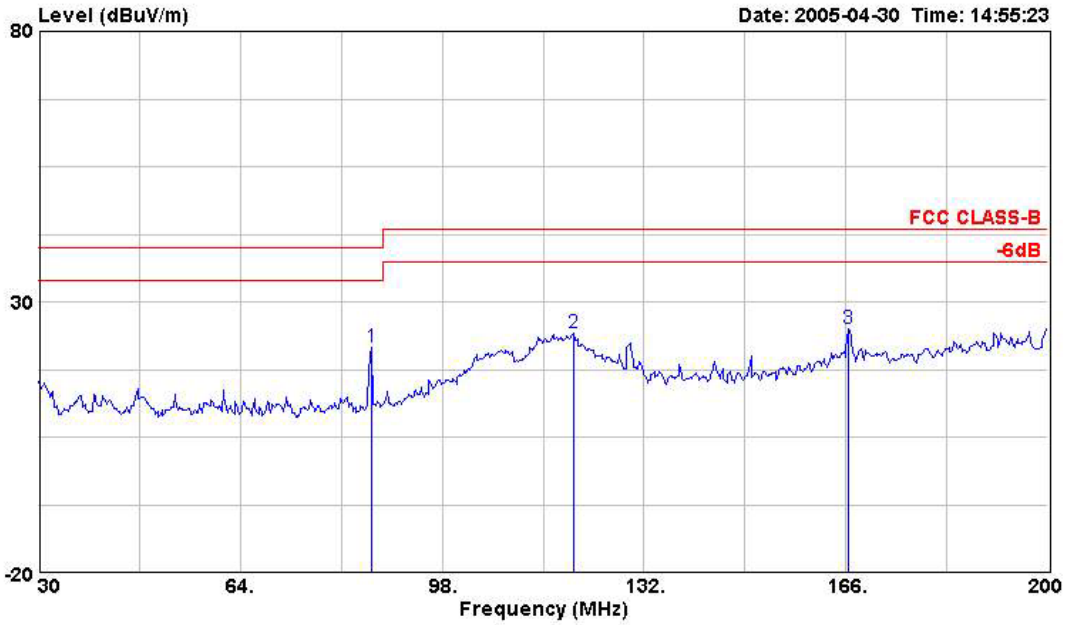
5.8.6. Test Criteria

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

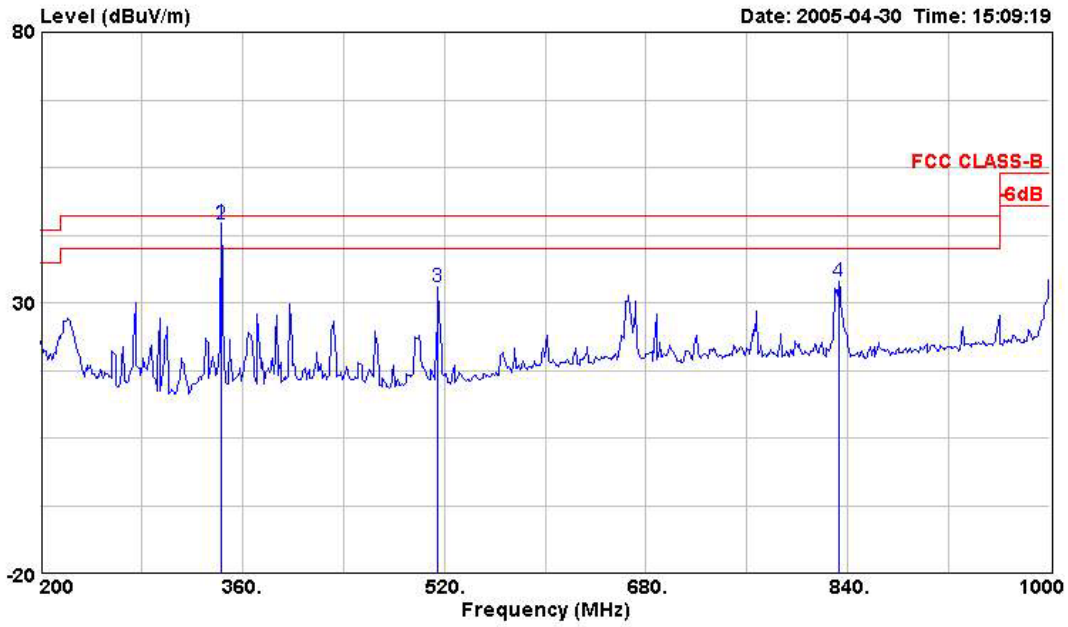
5.8.7. Test Results for CH 39 / 2441 MHz (for emission below 1GHz)

- Modulation Type: GFSK
- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

(A) Polarization: Horizontal

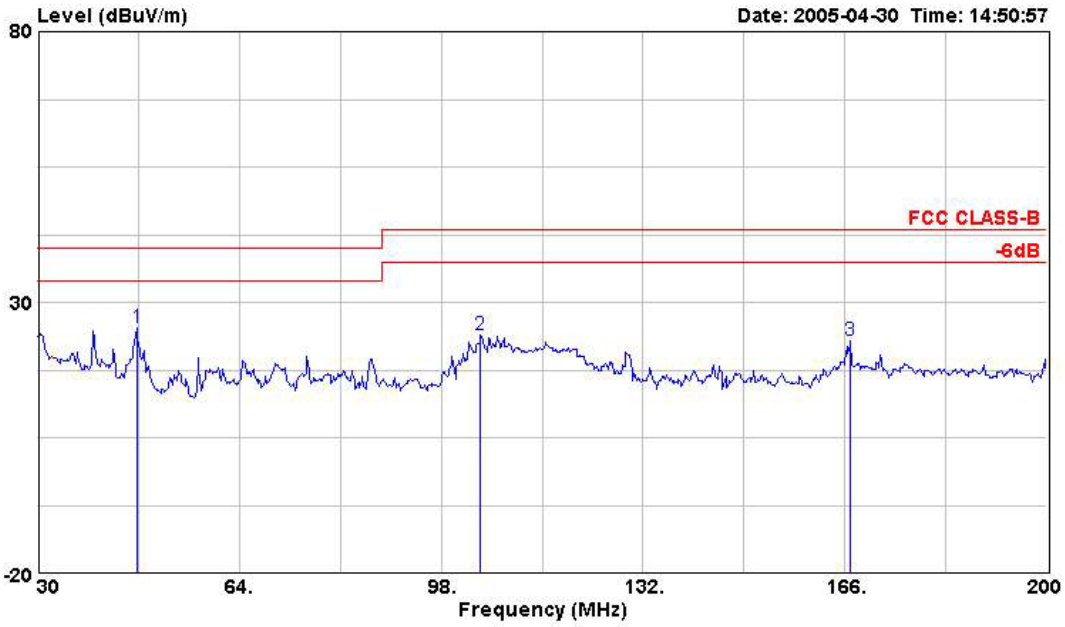


	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1	86.100	21.62	-18.38	41.90	40.00	-20.28	0.93	30.09	Peak
2	120.100	24.10	-19.40	41.43	43.50	-17.33	1.09	30.32	Peak
3	166.510	25.12	-18.38	40.64	43.50	-15.52	1.28	30.11	Peak

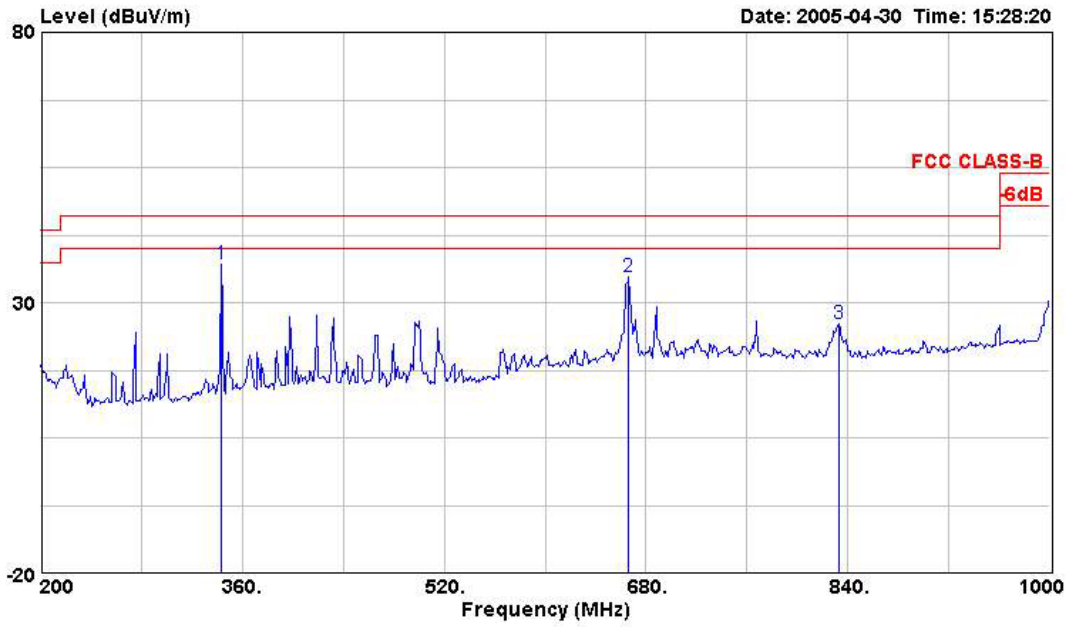


	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1 @	343.200	44.72	-1.28	58.77	46.00	-14.05	1.78	30.94	Peak
2 !	343.200	44.53	-1.47	58.58	46.00	-14.05	1.78	30.94	QP
3	515.200	32.86	-13.14	44.81	46.00	-11.95	2.20	30.83	Peak
4	832.800	33.84	-12.16	39.54	46.00	-5.70	2.88	30.41	Peak

(B) Polarization: Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1	46.660	25.22	-14.78	42.73	40.00	-17.51	0.66	30.23	Peak
2	104.630	23.85	-19.65	43.67	43.50	-19.82	0.99	30.47	Peak
3	167.020	22.86	-20.64	38.27	43.50	-15.41	1.28	30.06	Peak



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1	343.200	37.13	-8.87	51.18	46.00	-14.05	1.78	30.94	Peak
2	666.400	34.65	-11.35	42.08	46.00	-7.43	2.52	30.54	Peak
3	832.800	26.02	-19.98	31.72	46.00	-5.70	2.88	30.41	Peak

Note:

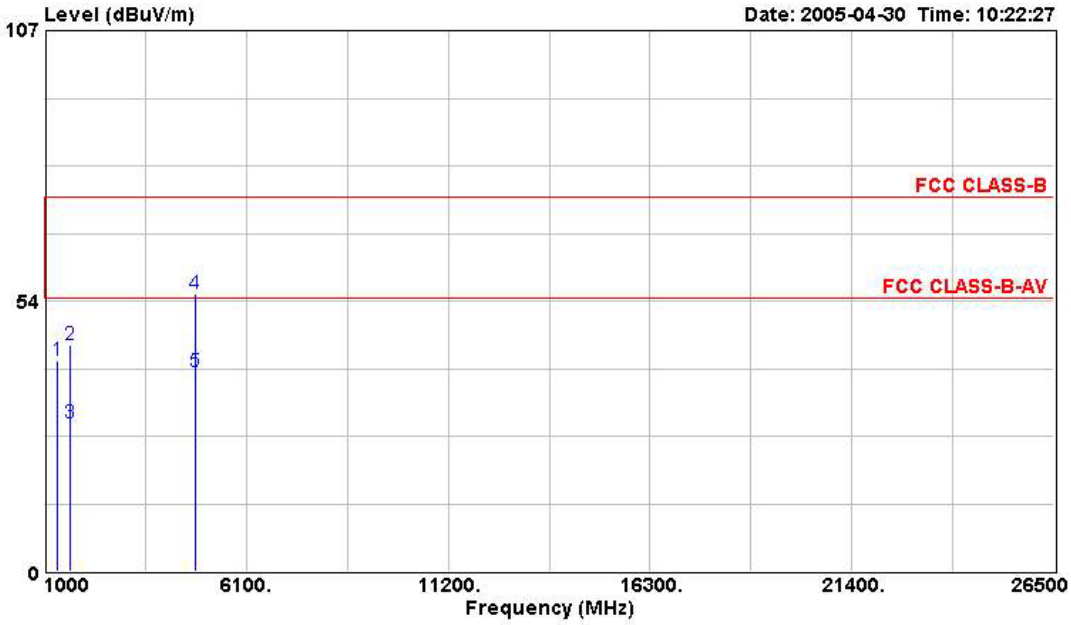
Emission level (dBuV/m) = 20 log Emission level (uV/m)

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

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

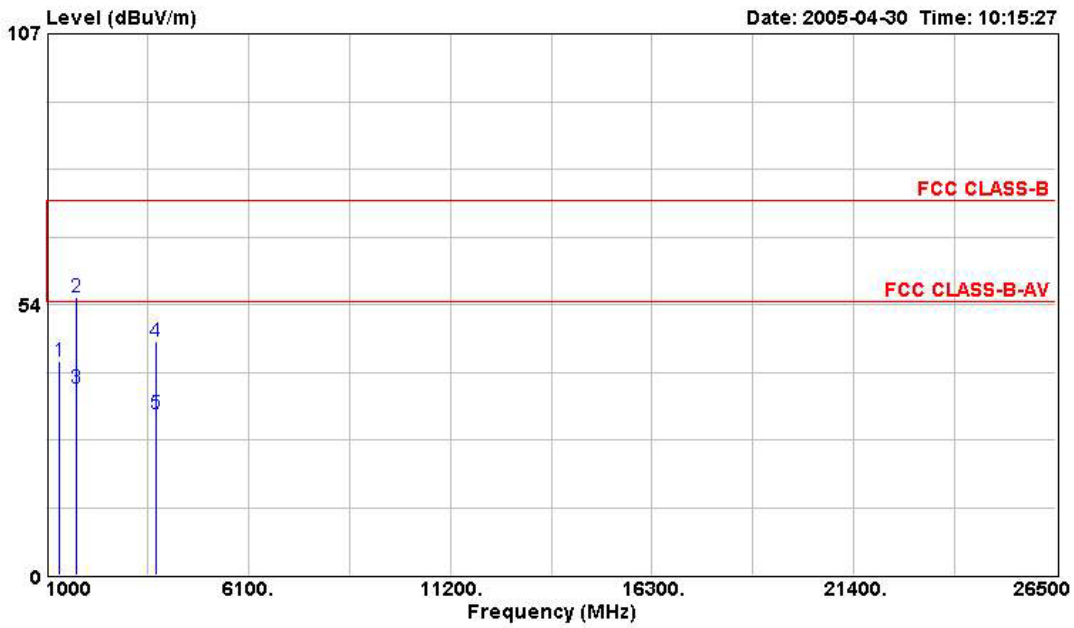
- Modulation Type: GFSK
- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1	1326.000	41.55	-32.45	53.64	74.00	-12.09	1.37	40.13	Peak
2	1662.000	44.73	-29.27	55.00	74.00	-10.27	1.54	40.38	Peak
3	1662.000	29.41	-24.59	39.68	54.00	-10.27	1.54	40.38	Average
4	4804.000	54.98	-19.02	60.91	74.00	-5.93	2.84	41.80	Peak
5	4804.000	39.36	-34.64	45.29	74.00	-5.93	2.84	41.80	Peak

(B) Polarization: Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1	1326.000	42.27	-31.73	54.36	74.00	-12.09	1.37	40.13	Peak
2	1748.000	54.91	-19.09	64.70	74.00	-9.79	1.58	40.47	Peak
3	1748.000	36.90	-17.10	46.69	54.00	-9.79	1.58	40.47	Average
4	3784.000	46.27	-27.73	54.42	74.00	-8.15	2.42	41.30	Peak
5	3784.000	31.92	-22.08	40.07	54.00	-8.15	2.42	41.30	Average

Note:

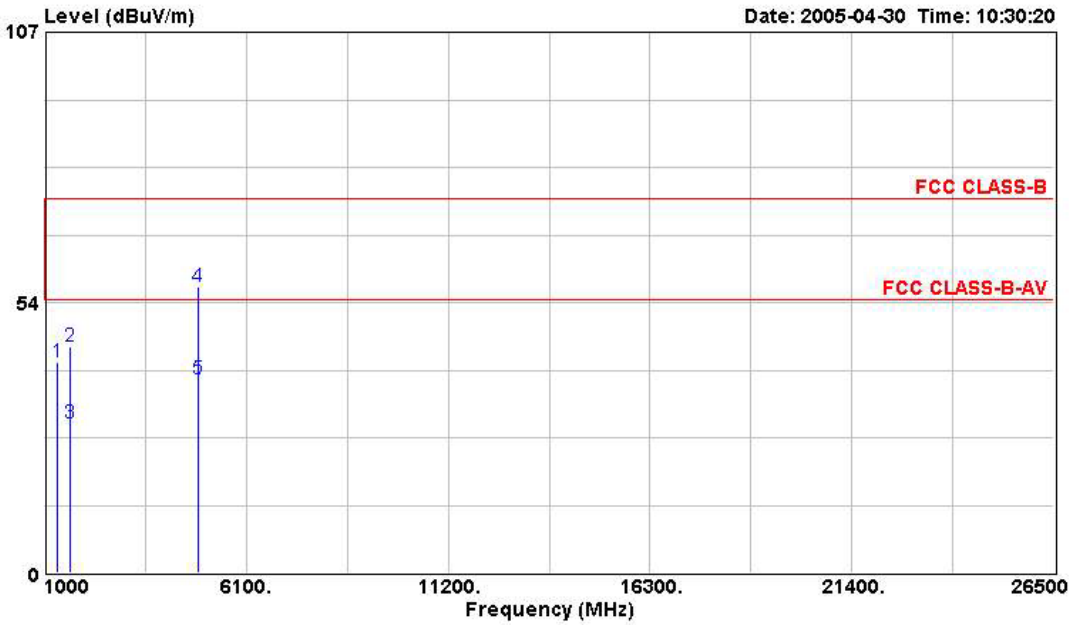
Emission level (dBuV/m) = 20 log Emission level (uV/m)

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)

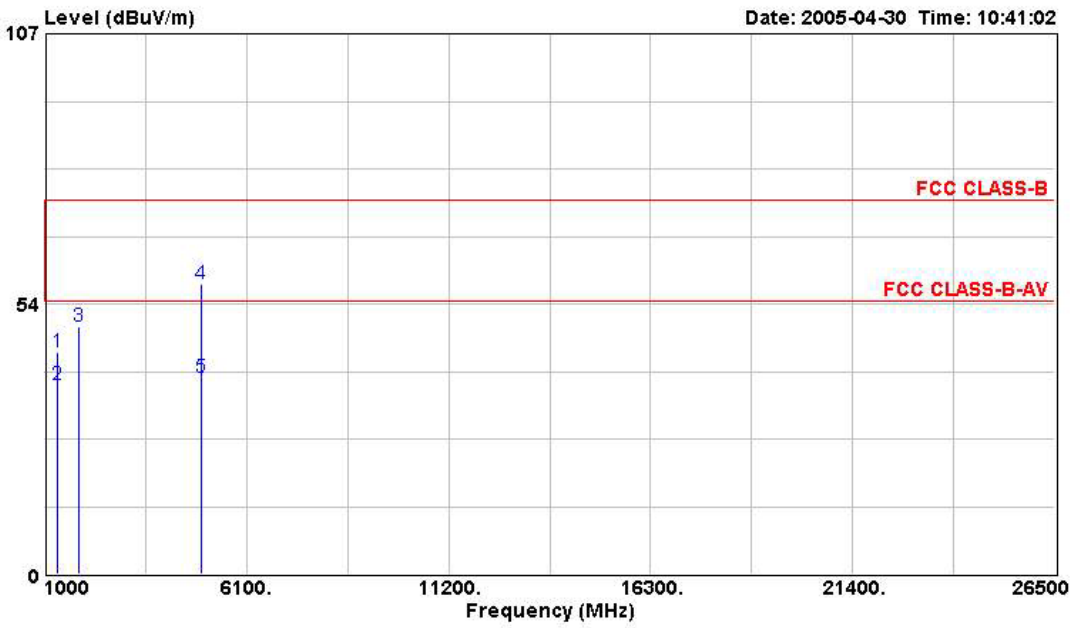
- Modulation Type: GFSK
- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

(A) Polarization: Horizontal



	Freq MHz	Level dBuV/m	Over Limit dB	Read Level dBuV	Limit Line dBuV/m	Factor dB	Cable Loss dB	Preamp Factor dB	Remark
1	1332.000	41.80	-32.20	53.78	74.00	-11.98	1.39	40.13	Peak
2	1662.000	44.75	-29.25	55.02	74.00	-10.27	1.54	40.38	Peak
3	1662.000	29.52	-24.48	39.79	54.00	-10.27	1.54	40.38	Average
4	4884.000	56.49	-17.51	62.18	74.00	-5.69	2.87	41.80	Peak
5	4884.000	38.28	-15.72	43.97	54.00	-5.69	2.87	41.80	Average

(B) Polarization: Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1	1332.000	43.81	-30.19	55.79	74.00	-11.98	1.39	40.13	Peak
2	1332.000	37.44	-16.56	49.42	54.00	-11.98	1.39	40.13	Average
3	1844.000	49.05	-24.95	58.27	74.00	-9.22	1.64	40.60	Peak
4	4960.000	57.33	-16.67	62.73	74.00	-5.40	2.91	41.80	Peak
5	4960.000	38.84	-15.16	44.24	54.00	-5.40	2.91	41.80	Average

Note:

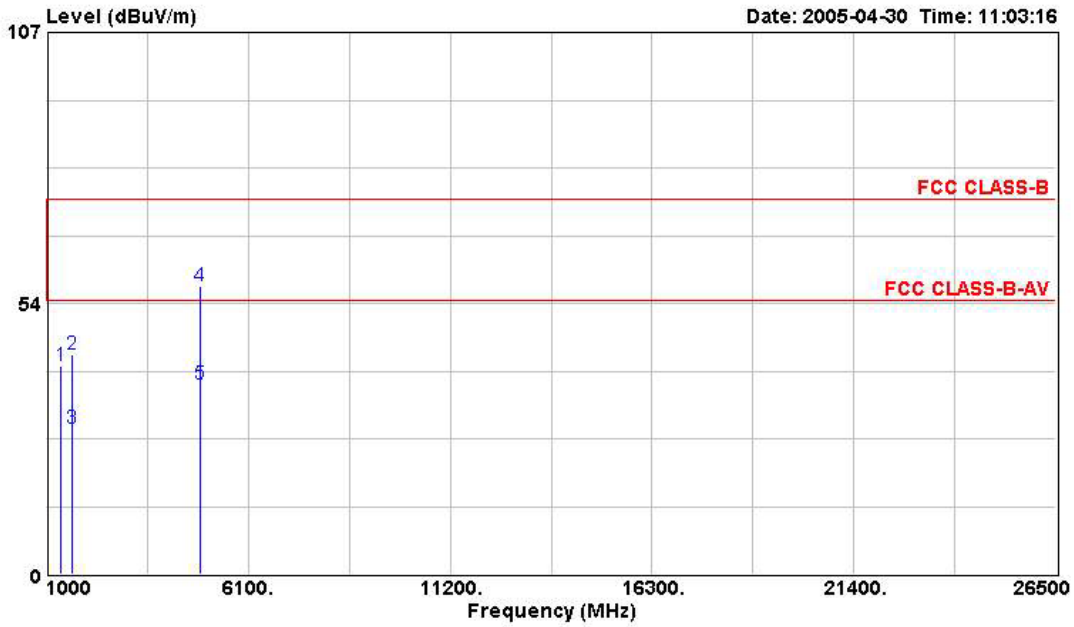
Emission level (dBuV/m) = 20 log Emission level (uV/m)

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)

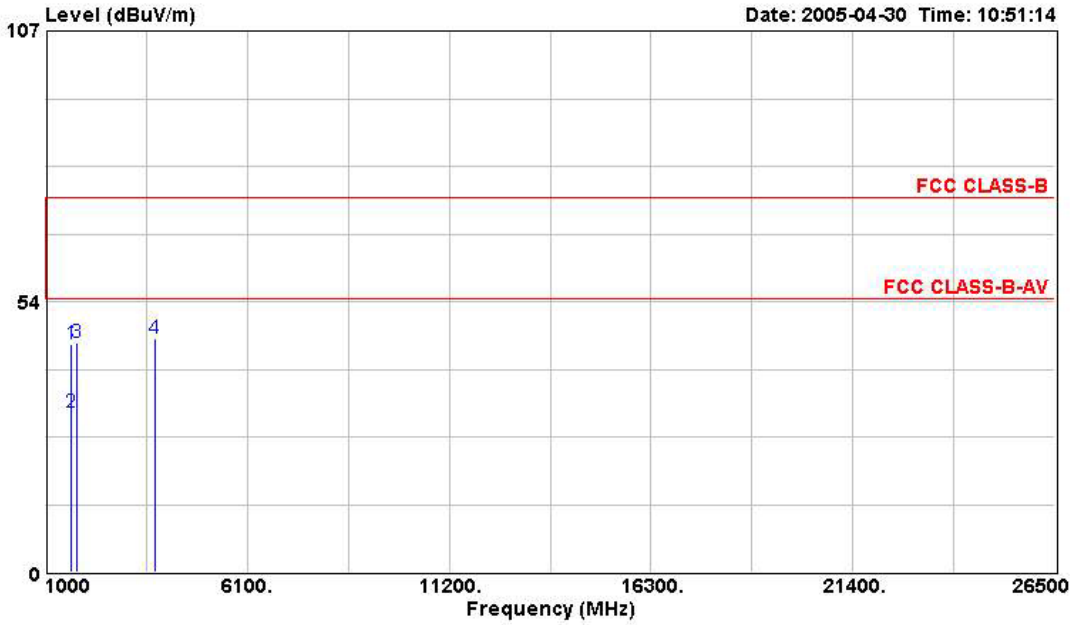
- Modulation Type: GFSK
- Temperature: 25°C
- Relative Humidity: 60%
- Duty Cycle of the Equipment During the Test: 100%
- Test Engineer: Wayne Hsu

(A) Polarization: Horizontal



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1	1356.000	41.21	-32.79	53.12	74.00	-11.91	1.39	40.14	Peak
2	1662.000	43.40	-30.60	53.67	74.00	-10.27	1.54	40.38	Peak
3	1662.000	28.78	-25.22	39.05	54.00	-10.27	1.54	40.38	Average
4	4884.000	56.80	-17.20	62.49	74.00	-5.69	2.87	41.80	Peak
5	4884.000	37.58	-16.42	43.27	54.00	-5.69	2.87	41.80	Average

(B) Polarization: Vertical



	Freq	Level	Over Limit	Read Level	Limit Line	Factor	Cable Loss	Preamp Factor	Remark
	MHz	dBuV/m	dB	dBuV	dBuV/m	dB	dB	dB	
1	1660.000	45.00	-29.00	55.27	74.00	-10.27	1.54	40.38	Peak
2	1660.000	31.56	-22.44	41.83	54.00	-10.27	1.54	40.38	Average
3	1806.000	45.25	-28.75	54.78	74.00	-9.53	1.62	40.57	Peak
4	3784.000	46.27	-27.73	54.42	74.00	-8.15	2.42	41.30	

Note:

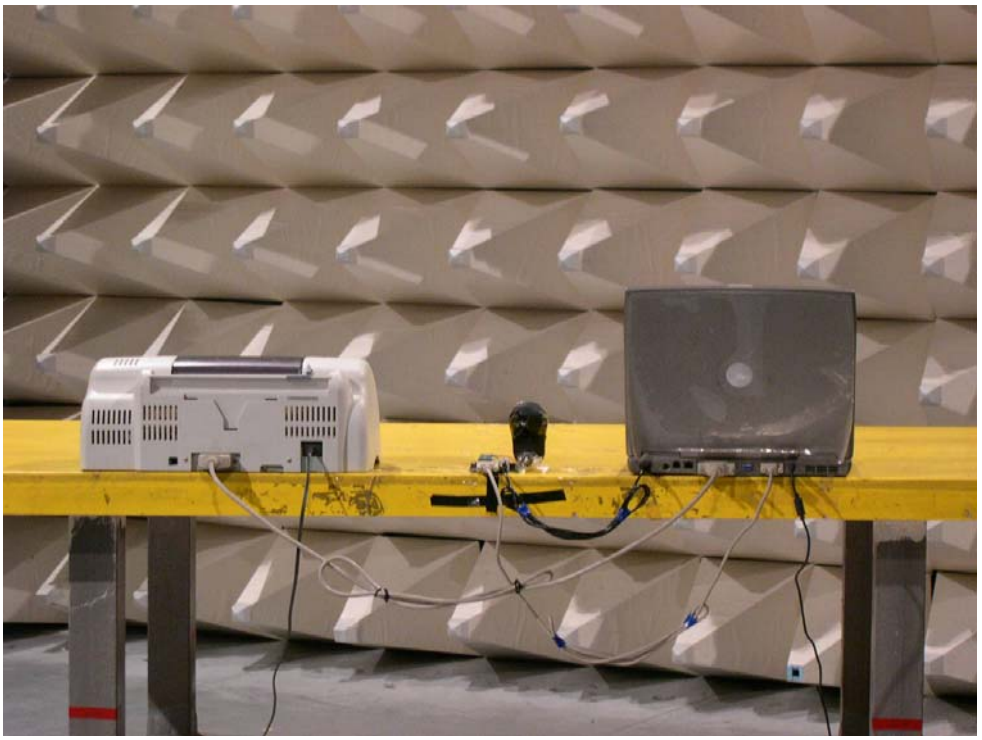
Emission level (dBuV/m) = 20 log Emission level (uV/m)

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 chip antenna. So there is need to fulfill the unique antenna connector requirement.

5.9.3. Antenna Gain

All antennas gain of EUT are 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).

6. List of Measuring Equipments Used

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
1	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2004	Radiation (03CH03-HY)
2	Spectrum Analyzer	R&S	FSP40	100004	9KHZ~4GHz	Aug. 31, 2004	Radiation (03CH03-HY)
3	Amplifier	Schaffner	CPA9231A	18667	9KHz – 2GHz	Jan. 04, 2005	Radiation (03CH03-HY)
4	Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz –200MHz	Jul. 23, 2004	Radiation (03CH03-HY)
5	Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz -1GHz	Jul. 23, 2004	Radiation (03CH03-HY)
6	RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Dec. 02, 2004	Radiation (03CH03-HY)
7	Amplifier	MITEQ	AFS44	879984	1GHz~26.5GHz	Mar. 25, 2005	Radiation (03CH03-HY)
8	Horn Antenna	COMPOWER	AH-118	10092	1GHz – 18GHz	Feb. 18, 2005	Radiation (03CH03-HY)
9	Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
10	Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
11	Horn Antenna	Schwarzbeck	BBHA9170	154	15GHz~40GHz	Jun. 09, 2004	Radiation (03CH03-HY)
12	RF Cable-HIGH	SUHNER	SUCOFLES 106	SN30094/6	1GHz~26.5GHz	Mar. 05, 2005	Radiation (03CH03-HY)
13	Spectrum Analyzer	R&S	FSP30	100023	9kHz – 30GHz	Aug. 02, 2004	Conducted (TH01-HY)
14	Power Meter	R&S	NRVS	100444	DC – 40GHz	Jun. 15, 2004	Conducted (TH01-HY)
15	Power Sensor	R&S	NRV-Z55	100049	DC – 40GHz	Jun. 15, 2004	Conducted (TH01-HY)
16	Power Sensor	R&S	NRV-Z32	100057	30MHz – 6GHz	Jun. 15, 2004	Conducted (TH01-HY)
17	AC Power Source	HPC	HPA-500W	HPA-9100024	AC 0 – 300V	Jun. 16, 2004	Conducted (TH01-HY)
18	DC Power Source	G.W.	GPC-6030D	C671845	DC 1V – 60V	Dec. 28, 2004	Conducted (TH01-HY)
19	Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Oct. 01, 2004	Conducted (TH01-HY)
20	RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz – 7GHz	Jan. 01, 2005	Conducted (TH01-HY)
21	RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz – 1GHz	Jan. 01, 2005	Conducted (TH01-HY)
22	Data Generator	Tektronix	J310345	J310345	400Mbps	Dec. 21, 2004	Conducted (TH01-HY)
23	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： TEL： FAX：	6Fl., No. 106, Sec. 1, Shintai 5th Rd., Shijr City, Taipei, Taiwan 221, R.O.C. 02-2696-2468 02-2696-2255
HWA YA	ADD： TEL： FAX：	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. 03-327-3456 03-318-0055
LINKOU	ADD： TEL： FAX：	No. 30-2, Dingfu Tsuen, Linkou Shiang, Taipei, Taiwan 244, R.O.C 02-2601-1640 02-2601-1695
DUNGHU	ADD： TEL： FAX：	No. 3, Lane 238, Kangle St., Neihu Chiu, Taipei, Taiwan 114, R.O.C. 02-2631-4739 02-2631-9740
JUNGHE	ADD： TEL： FAX：	7Fl., No. 758, Jungjeng Rd., Junghe City, Taipei, Taiwan 235, R.O.C. 02-8227-2020 02-8227-2626
NEIHU	ADD： TEL： FAX：	4Fl., No. 339, Hsin Hu 2nd Rd., Taipei 114, Taiwan, R.O.C. 02-2794-8886 02-2794-9777

8. CNLA Certificate of Accreditation

Test Lab.	:	Sporton International Inc.
Accreditation Number	:	1190
Originally Accredited	:	2003/12/15
Effective Period	:	2003/12/15~2006/12/14
Accredited Scope	:	47 CFR FCC Part 15 Subpart C (9kHz~40GHz)

Taiwan Accreditation Foundation
Chinese National Laboratory Accreditation
Certificate of Accreditation

Accreditation Criteria:	ISO 17025
Accreditation Number:	1190
Organization/Laboratory:	EMC & Wireless Communications Laboratory,Sporton International Inc.
Originally Accredited:	December 15, 2003
Effective Period:	December 15, 2003 To December 14, 2006
Accredited Scope:	Electrical Testing Field, 7 items, details shown in the following pages.
Specific Accreditation Program:	Recognition and Approval of Designated Laboratory for Commodities Inspection

President, Taiwan Accreditation Foundation
Date:July 19, 2004

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