FCC TEST REPORT

CATEGORY	:	Portable
PRODUCT NAME	:	PDA
FCC ID.	:	O8FLEO
FILING TYPE	:	Certification
BRAND NAME	:	palmOne
MODEL NAME	:	Tungsten E2
APPLICANT	:	**palmOne, Inc.** 400N. McCarthy Blvd. Milpitas, CA 95035
MANUFACTURER	:	**Inventec Appliances (Shanghai) Co., Ltd.** 7. Gui Qing Road, Shanghai 200233, China P.R.C.
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, NVLAP or any agency of U.S. government.

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

Dr. Alan Lane
Vice General Manager
Sporton International Inc.

1190
ILAC MRA

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HISTORY OF THIS TEST REPORT

Original Report Issue Date: Dec. 27, 2004
Report No.: FR4N2902

■ 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 (Section 15.247)

PRODUCT NAME	:	PDA
BRAND NAME	:	palmOne
MODEL NAME	:	Tungsten E2
APPLICANT	:	**palmOne, Inc.** 400N. McCarthy Blvd. Milpitas, CA 95035
MANUFACTURER	:	**Inventec Appliances (Shanghai) Co., Ltd.** 7. Gui Qing Road, Shanghai 200233, China P.R.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. Testing was carried out on Dec. 10, 2004 at SPORTON International Inc. LAB.

Dr. Alan Lane
Vice General Manager
Sporton International Inc.

1. General Description of Equipment under Test

1.1. Applicant

palmOne, Inc.
400N. McCarthy Blvd. Milpitas, CA 95035

1.2. Manufacturer

Inventec Appliances (Shanghai) Co., Ltd.
7. Gui Qing Road, Shanghai 200233, China P.R.C.

1.3. Basic Description of Equipment under Test

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

1.4. Features of Equipment under Test

Bluetooth Module

Items	Description
Type of Modulation	GFSK
Number of Channels	79
Frequency Band	2400MHz ~ 2483.5MHz
Carrier Frequency	See section 1.6 for details
Data Rate	1Mbps
Channel Bandwidth	1MHz
Max. Conducted Output Power	0.10dBm
Antenna Type	See section 1.5 for details
Testing Duty Cycle	46.40%
Power Rating (DC/AC, Voltage)	5.2 VDC from 100~240 VAC power adapter
Test Power Source	110.00V AC
Temperature Range (Operating)	-20 ~ 60 °C

PDA

Category	Parameter	Specification
LCD	LCD Type	Transflective AMLCD – Normally White
	Pixel configuration	RGB stripe
	Transmissive Aperture Ratio	47%
	Overall display format	324 x RGB x 324 pixels 2 pixel border)
	Active pixel format	320 x RGB x 320 pixels (1 Pixel = R + G + B)
	Color Depth / Data Transfer Dot Pitch	18-bit per pixel parallel data transfer 0.056(H) x 0.168(V) mm
	Viewing Direction	8:00
	Glass Thickness	0.50 mm for Color Filter and TFT glass
	Top Polarizer	Anti-glare 0.34mm max thickness
	Bottom Polarizer	Sumitomo SBP (0.50mm) or palmOne approved
		equivalent
	Rigid Spacer	1 per horizontal and vertical pixel
	Active 320x320 Frame Area	53.76 x 53.76 mm
	Total 324x324 Pixel Area	54.432 x 54.432 mm
	Viewing Area	58.0 x 57.3 mm
	Black Mask Area	60.1 x 59.5 mm minimum
Mechanical[1]	Overall Dimensions Board-to-board connector	66.0 x 86.8 x 4.45 mm Molex 55560-0407 or palmOne approved equivalent
	Weight	50 g maximum
	Bezel material	Tin Plated Cold Rolled Steel (SPTE), Nickel or Tin
		plated, or passivated stainless steel, or palmOne
		approved equivalent
Electrical	I/F circuit	Include gray scale circuit, DC/DC converters, VCOM
		circuit, Timing ASIC, LED driving circuit, and
		connections for LED backlight and touch panel.
	Touch Panel	Resistive membrane system, analog type; no anti
		glare, 0.50mm plastic substrate, anti-newton ring
	T/P Active Area	56.0 x 77.2 mm
	T/P Viewing Area	58.0 x 79.2 mm
Touch Panel	Overall Dimensions	65.8 x 86.6 x 1.00 mm typical (including icon sheet and
		adhesive)
	Surface Hardness	> 2H

Category	Parameter	Specification
	Mating Flex Connector	JST06FHJ-SM1-TB
Backlight	LED Backlight	4 White LED's approved by palmOne
	Brightness	Typical 110cd/m2 (surface of touch panel)
Environmental	Operating Temperature, Humidity	Temp Range: -10°C to +55°C Humid Profile (limits): 10 to 90% RH, +5 to +45°C, non-condensing
	Storage Temperature, Humidity	Temp Range: -20 to 60°C Humid Limit: 90% RH, +60°C, non-condensing

1.5. Antenna Description

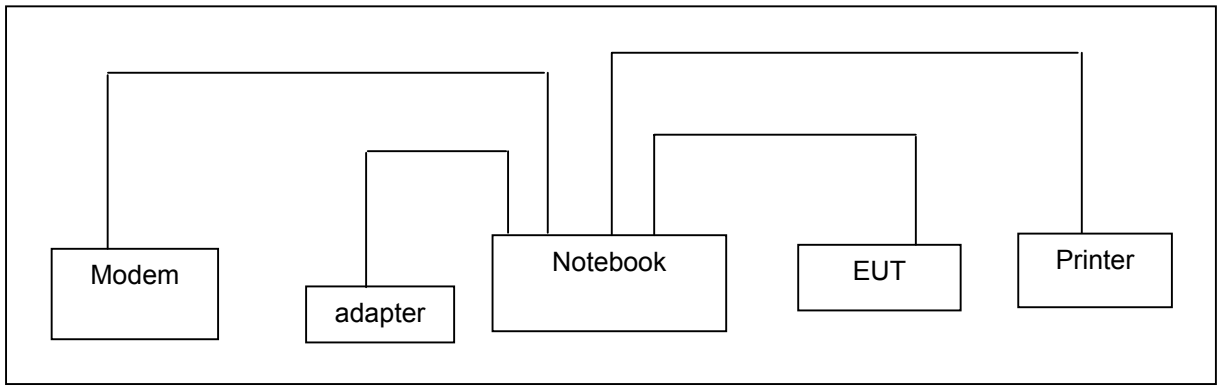
No.	Antenna Type	Gain (dBi)
1	Patch Antenna	-5.13

1.6. 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



2.2. The Test Mode Description

Spurious emission below 1GHz is independent of channel selection, so only channel 78 with GFSK modulation was tested.

AC conduction emission is independent of channel selection, so only channel 78 with GFSK modulation was tested. Because there are 3 adapters for the EUT, there are 3 modes for AC conduction emission test and spurious emission below 1GHz:

Mode 1: Adatper 1 (PHIHONG)

Mode 2: Adapter 2 (NetBit)

Mode3: Adatper 3 (palmOne)

2.3. Description of Test Supporting Units

Support unit	Brand	Model No.	Serial No.	FCC ID	Data cable (m)
Notebook	DELL	PP01L	SP0030	DoC	-
Printer	EPSON	STYLUS COLOR 680	SP0016	DoC	1.35
Modem	ACEEX	DM141	SP0019	IFAXDM141	1.15

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. Test Conditions

Normal Voltage : 110.00V (power adapter)
Normal Temperature : 20°C

3.3. Standards for Methods of Measurement

Here is the list of the standards followed in this test report.
ANSI C63.4-2003
47 CFR Part 15 Subpart C (Section 15.247)

3.4. DoC Statement

This EUT is also classified as a device of computer peripheral Class B which DoC has to be followed. It has been verified according to the rule of 47 CFR part 15 Subpart B, and found that all the requirements has been fulfilled.

3.5. Frequency Range Investigated

Radiated emission test: from 30 MHz to 10th carrier harmonic

3.6. Test Distance

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

3.7. Test Software

During testing, Channel & Power Controlling Software: This was provided by the manufacturer and is able to let the test engineer select the operating channel as well as the RF output power. The parameters for channel selection is trying to offer the test engineer the ability to fix the operating channel for testing, both normal data and continuously transmitting modes are allowed, and that for RF output power selection is for the setting of RF output power expected by the customer and is going to be fixed on the firmware of the final end product.

4. List of Measurements

4.1. Summary of the Test Results

Applied Standard: 47 CFR Part 15 and Part 2			
Paragraph	**FCC Rule**	**Description of Test**	**Result**
5.1	15.247	Hopping Channel Bandwidth	Pass
5.2	15.247	Hopping Channel Separation	Pass
5.3	15.247	Number of Hopping Frequency Used	Pass
5.4	15.247	Dwell Time of Each Frequency	Pass
5.5	15.247	Maximum Peak Output Power	Pass
5.6	15.247	Band Edges Emission	Pass
5.7	15.207	AC Power Line Conducted Emission	Pass
5.8	15.209/15.247	Spurious Radiated Emission	Pass
5.9	15.203/15.247	Antenna Requirement	Pass

5. Test Result

5.1. Test of Hopping Channel Bandwidth

5.1.1. Measuring Instruments

Item 18 of the table is on section 6.

5.1.2. Test Procedures

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
1. Set RBW of spectrum analyzer to 30KHz and VBW to 100KHz.
2. The spectrum width with level higher than 20dB below the peak level.
3. Repeat above 1~3 points for the middle and highest channel of the EUT.

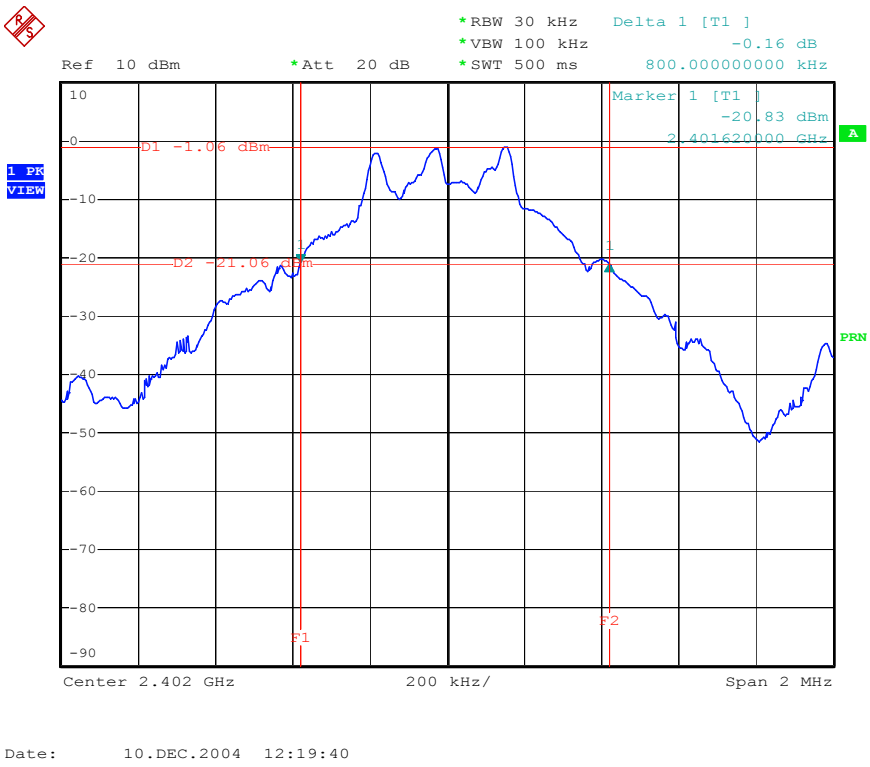
5.1.3. Test Setup Layout

5.1.4. Test Result: See spectrum analyzer plots below

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Sam Lee

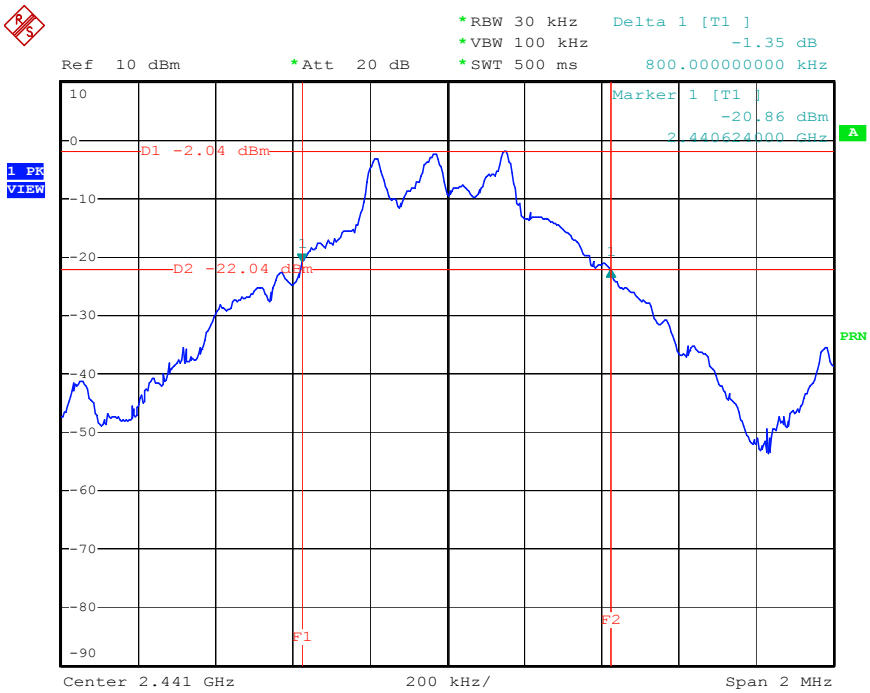
Modulation Type	Channel No.	Frequency (MHz)	20dB Bandwidth (kHz)	Min. Limit (kHz)
GFSK	00	2402 MHz	800.00	25
GFSK	39	2441 MHz	800.00	25
GFSK	78	2480 MHz	800.00	25

Modulation Type: GFSK (Channel 00) :



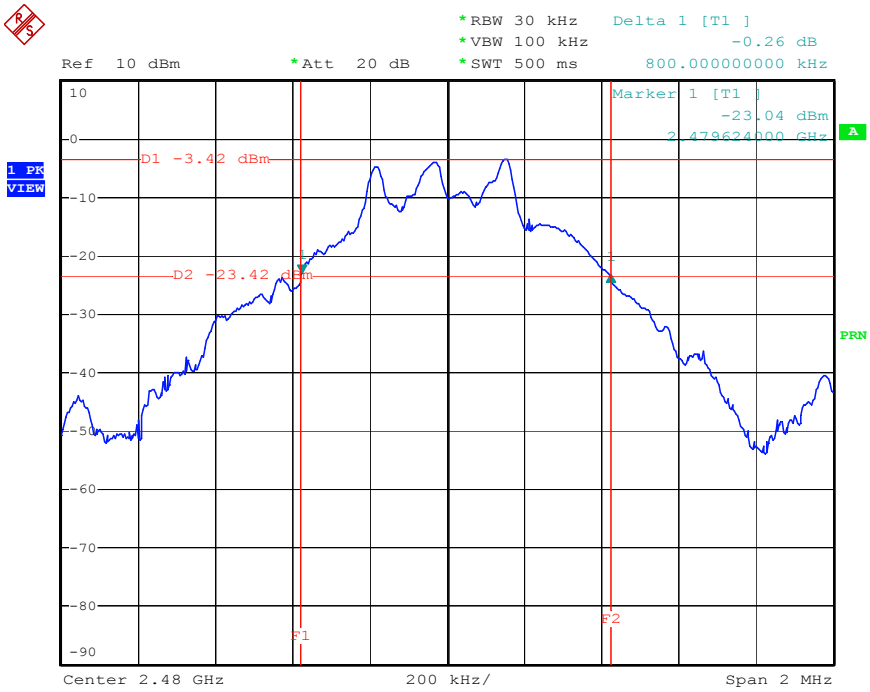
Date: 10.DEC.2004 12:19:40

Modulation Type: GFSK (Channel 39) :



Date: 10.DEC.2004 14:59:06

Modulation Type: GFSK (Channel 78) :



5.2. Test of Hopping Channel Separation

5.2.1. Measuring Instruments

Item 18 of the table is on section 6.

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

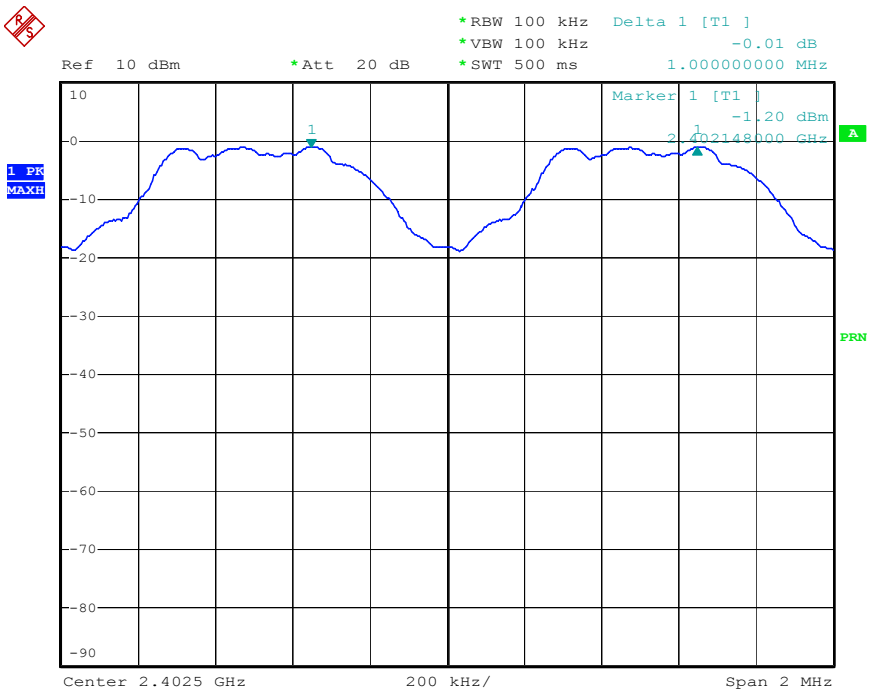
5.2.3. Test Setup Layout

5.2.4. Test Result: See spectrum analyzer plots below

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Sam Lee

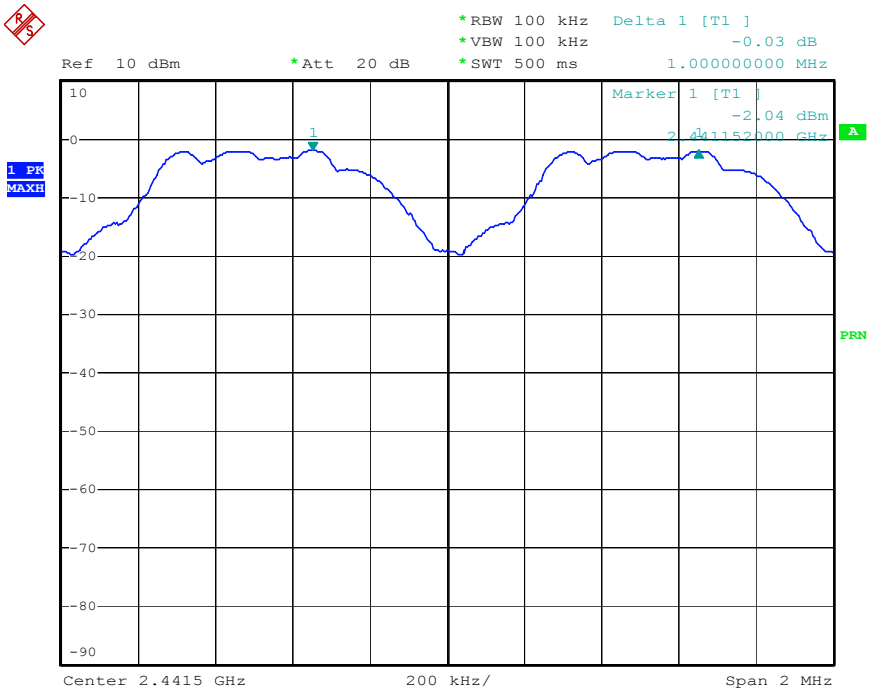
Modulation Type	Channel No.	Frequency (MHz)	Hopping Channel Separation (kHz)	Min. Limit (kHz)
GFSK	00	2402 MHz	1000	800.00
GFSK	39	2441 MHz	1000	800.00
GFSK	78	2480 MHz	1000	800.00

Modulation Type: GFSK (Channel 00) :



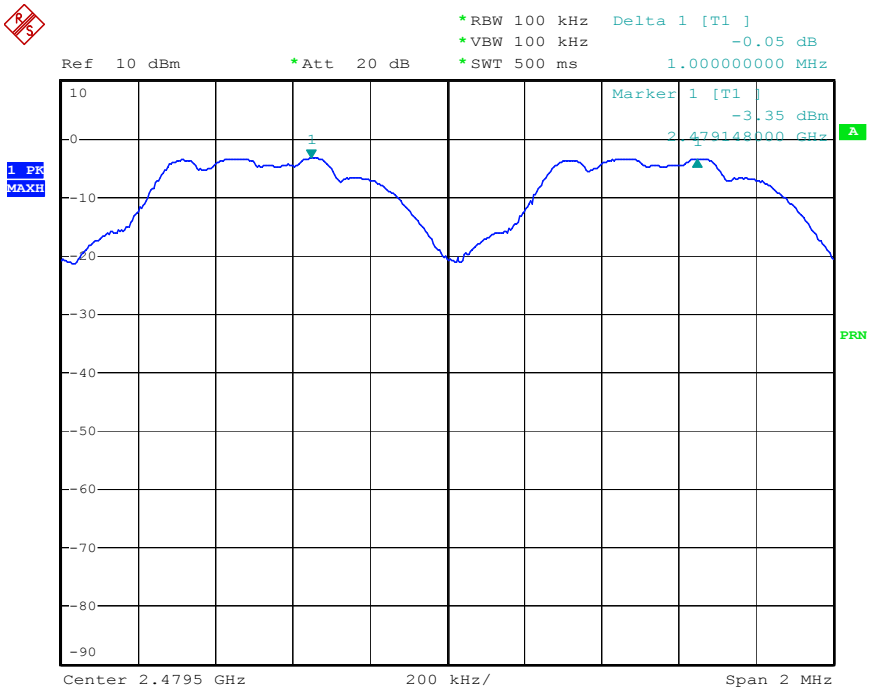
Date: 10.DEC.2004 15:03:50

Modulation Type: GFSK (Channel 39) :



Date: 10.DEC.2004 15:04:25

Modulation Type: GFSK (Channel 78)：



5.3. Test of Number of Hopping Frequency

5.3.1. Measuring Instruments

Item 18 of the table is on section 6.

5.3.2. 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.

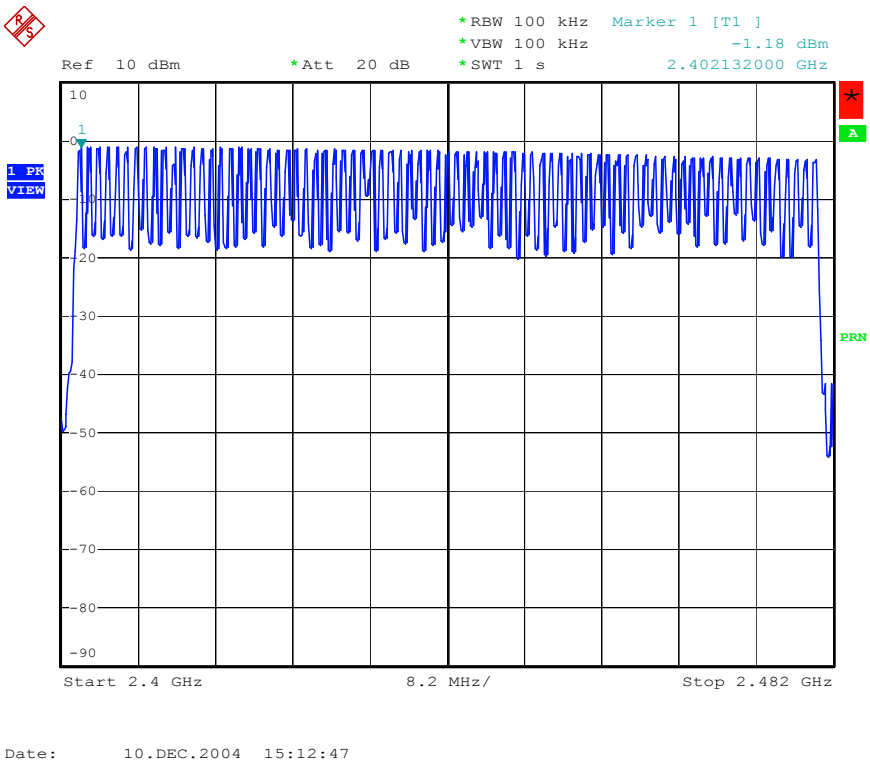
5.3.3. Test Setup Layout

5.3.4. Test Result: See spectrum analyzer plots below

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Sam Lee

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

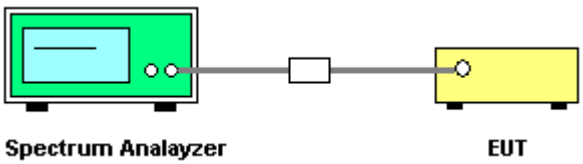
5.4.1. Measuring Instruments

Item 18 of the table is on section 6.

5.4.2. Test Procedures

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 the center frequency on any frequency would be measure and set the frequency span to zero span.
4. Set the EUT for DH5, DH3 and DH1 packet transmitting.
5. Measure the maximum time duration, t , 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.

5.4.3. Test Setup Layout

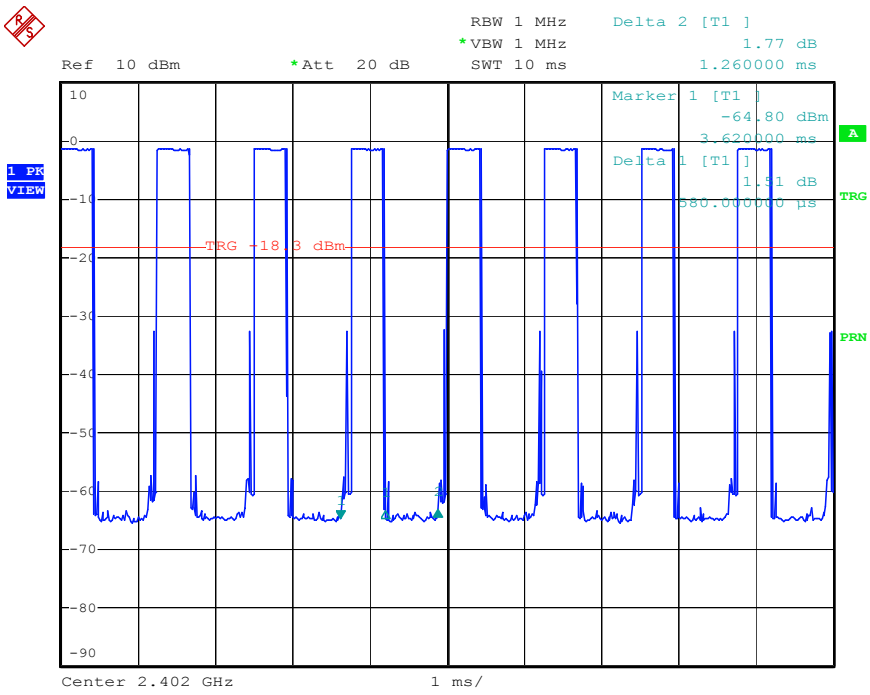


5.4.4. Test Result: See spectrum analyzer plots below

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Sam Lee

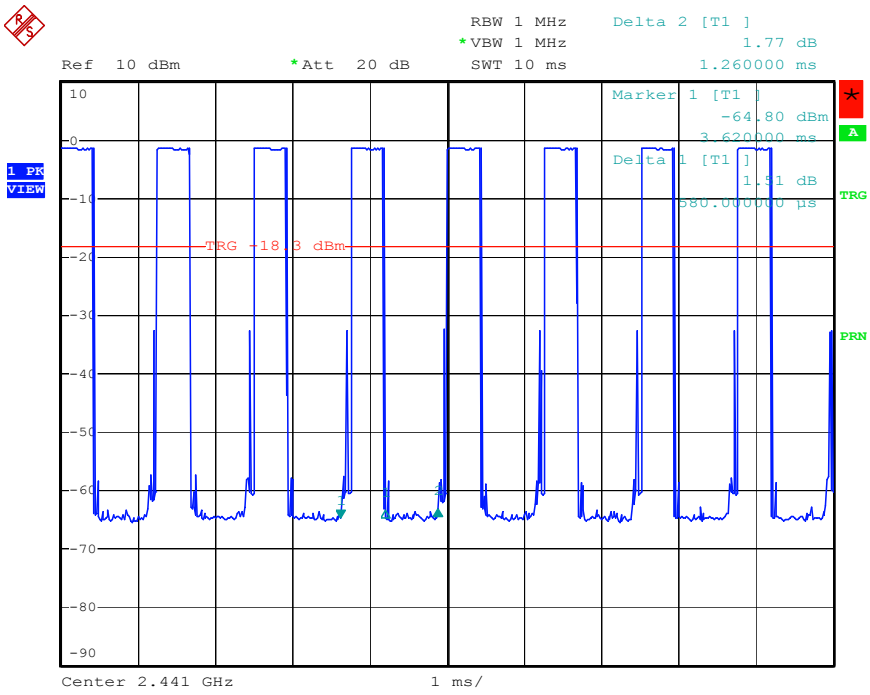
Data Packet	Frequency (MHz)	Pulse Duration (ms)	Dwell Time (s)	Limits (s)
DH1	2402 MHz	0.5800	0.1855	0.4
DH3	2441 MHz	1.8400	0.2943	0.4
DH5	2480 MHz	3.1000	0.3306	0.4

DH 1 Modulation Type: GFSK (Channel 00) :



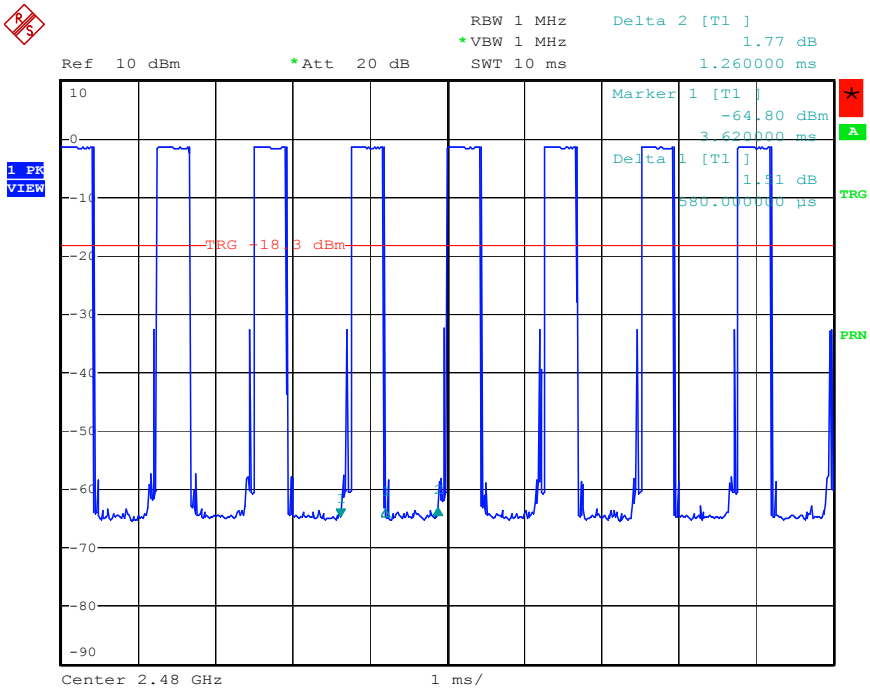
Date: 10.DEC.2004 14:33:26

DH1 Modulation Type: GFSK (Channel 39) :

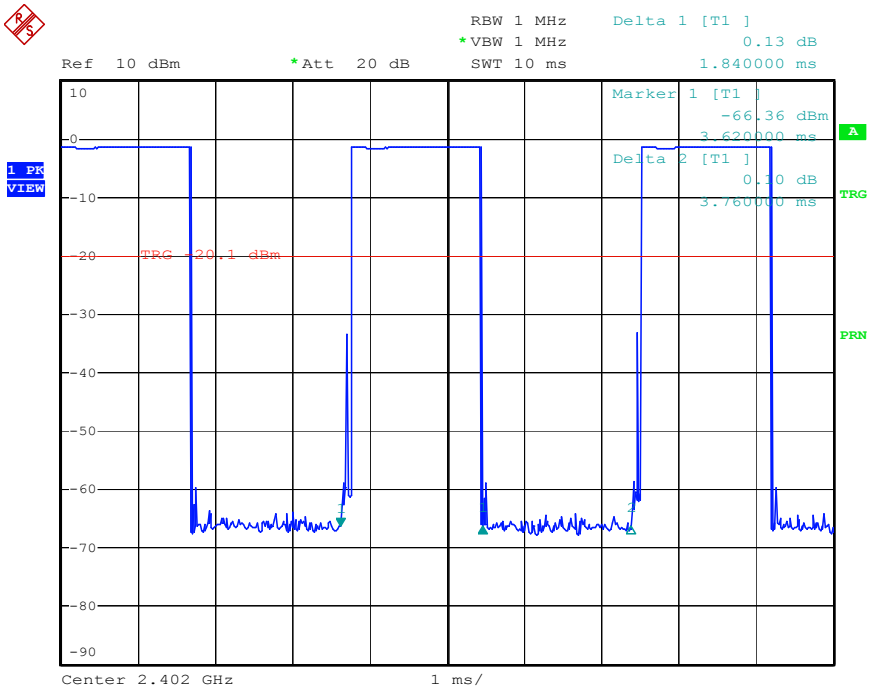


Date: 10.DEC.2004 14:34:12

DH1 Modulation Type: GFSK (Channel 78)：

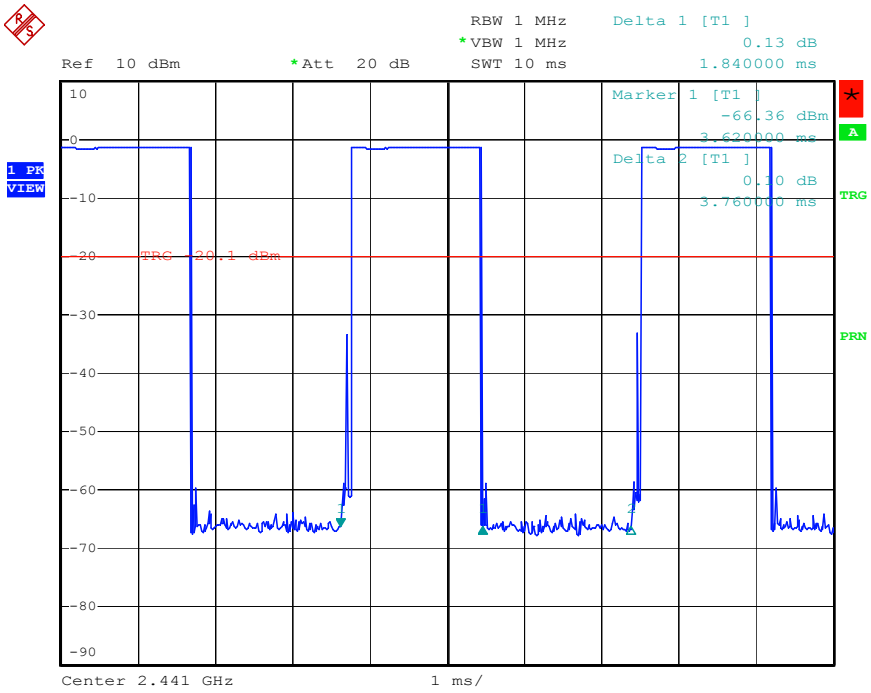


DH 3 Modulation Type: GFSK (Channel 00)：



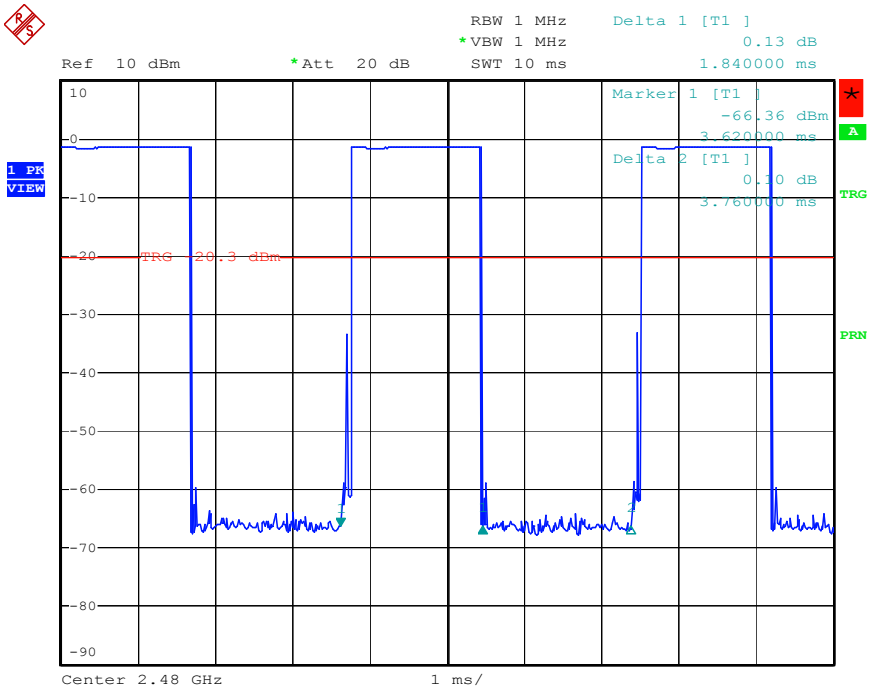
Date: 10.DEC.2004 14:36:05

DH3 Modulation Type: GFSK (Channel 39)：

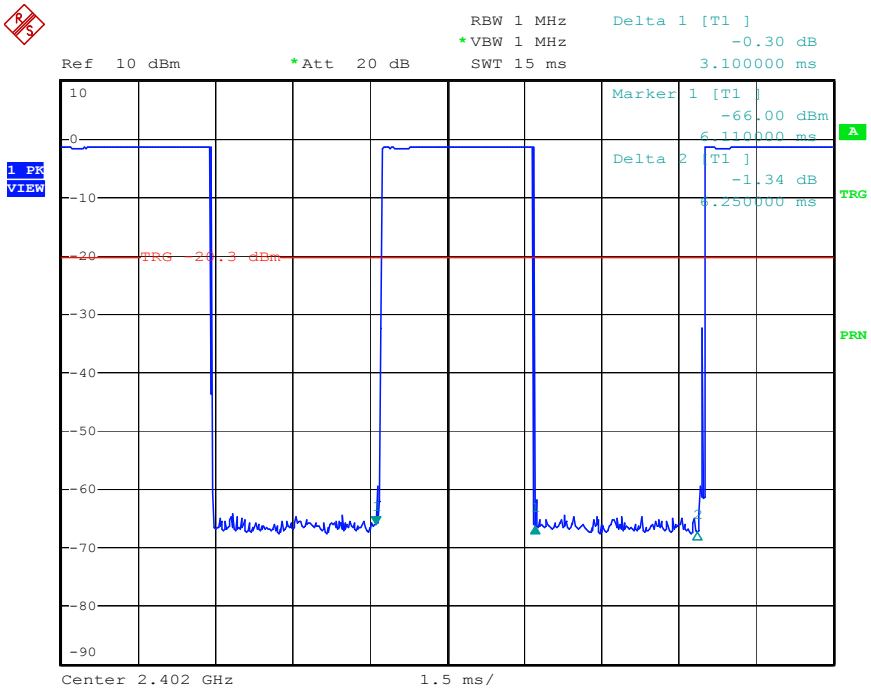


Date: 10.DEC.2004 14:36:26

DH3 Modulation Type: GFSK (Channel 78)：

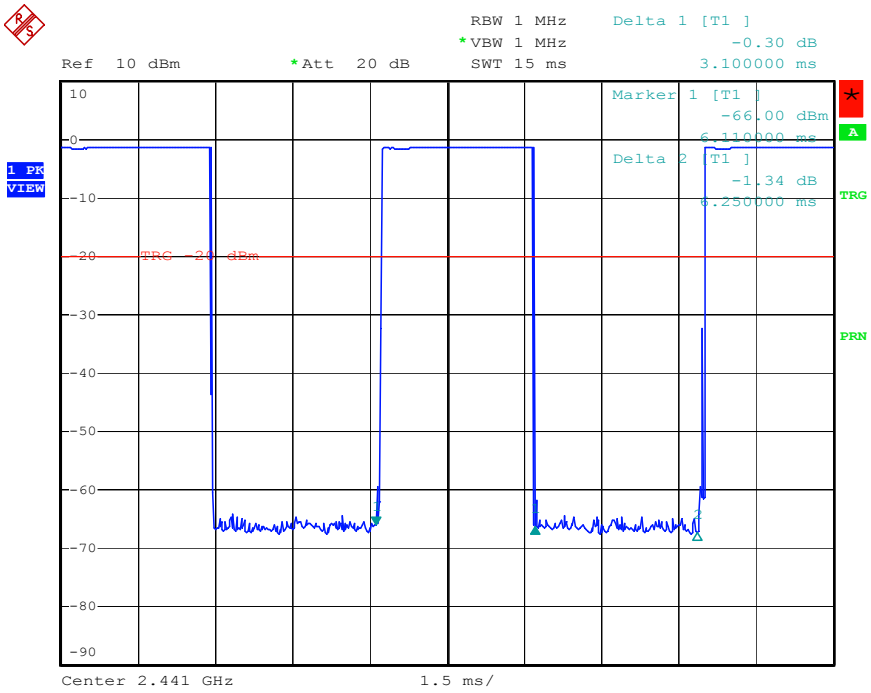


DH 5 Modulation Type: GFSK (Channel 00)：



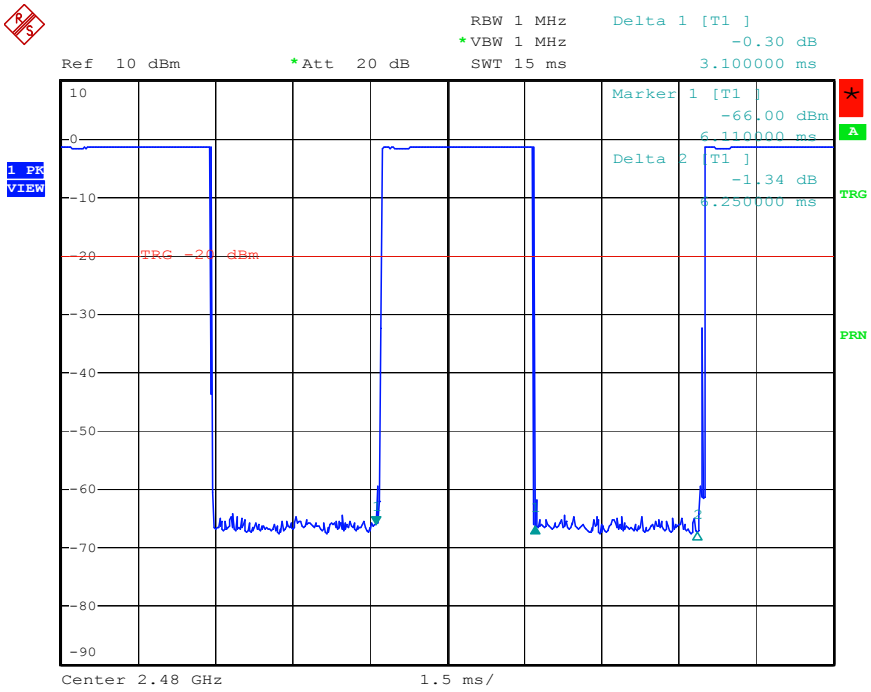
Date: 10.DEC.2004 14:43:43

DH5 Modulation Type: GFSK (Channel 39)：



Date: 10.DEC.2004 14:44:12

D5 Modulation Type: GFSK (Channel 78) :



5.5. Maximum Peak Output Power

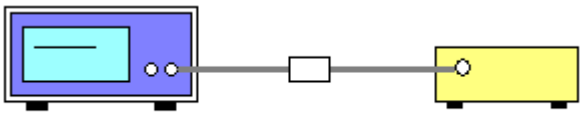
5.5.1. Measuring Instruments

Item 19, 21 of the table is on section 6.

5.5.2. Test Procedures

1. The transmitter output was connected to the peak power meter and recorded the peak value.
2. Repeated the 1~4 for the middle and highest channel of the EUT.

5.5.3. Test Setup Layout



5.5.4. Test Result of Conducted Peak Power

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Sam Lee

Modulation Type	Channel No.	Frequency (MHz)	Output Power (dBm)	Limits (dBm)
GFSK	00	2402 MHz	0.80	30
GFSK	39	2441 MHz	0.10	30
GFSK	78	2480 MHz	-1.37	30

The max output power : GFSK modulation is 0.10 dBm.

5.5.5. Test Result of EIRP Power

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Sam Lee

Antenna No.	Gain (dBi)	Modulation Type	Channel No.	Frequency (MHz)	Power (dBm)	Limits (dBm)
1	-5.13	GFSK	00	2402 MHz	-4.33	36
1	-5.13	GFSK	39	2441 MHz	-5.03	36
1	-5.13	GFSK	78	2480 MHz	-6.5	36

5.6. Test of Band Edges Emission

5.6.1. Measuring Instruments

Item 6~18 of the table is on section 6.

5.6.2. Test Procedures

Conducted Measurement

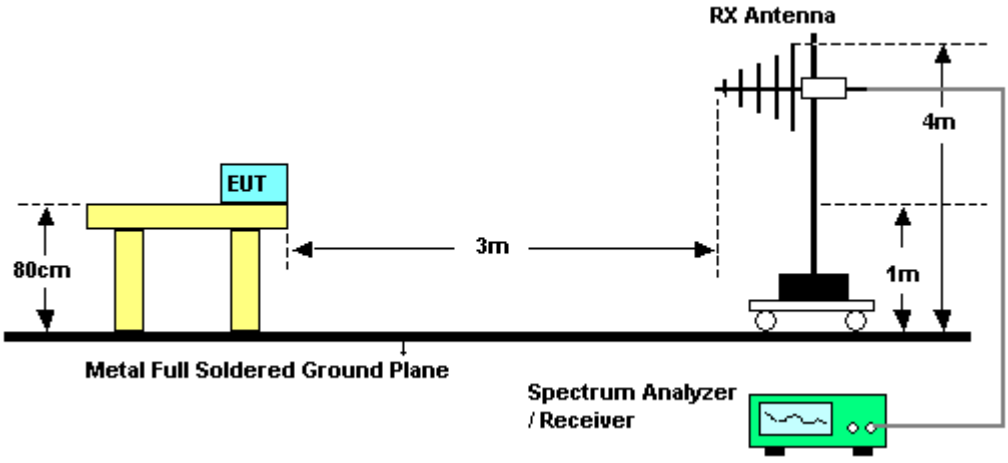
1. The transmitter is set to the lowest channel.
2. The transmitter output was connected to the spectrum analyzer via a cable and cable loss is used as the offset of the spectrum analyzer.
3. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100MHz bandwidth from lower band edge.
4. The lowest band edges emission was measured and recorded.
5. The transmitter set to the highest channel and repeated 2~4.

Radiated Measurement

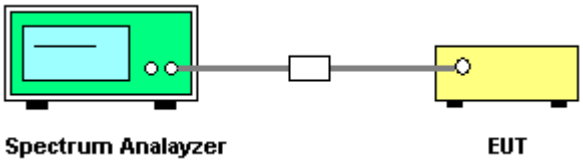
1. Configure the EUT according to ANSI C63.4.
2. The turn table was rotated by 360 degrees to determine the position of the highest radiation.
3. The height of the broadband receiving antenna was varied between one meter and four meters above ground to find the maximum emission field strength of both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

5.6.3. Test Setup

Radiated Method



Conducted Method



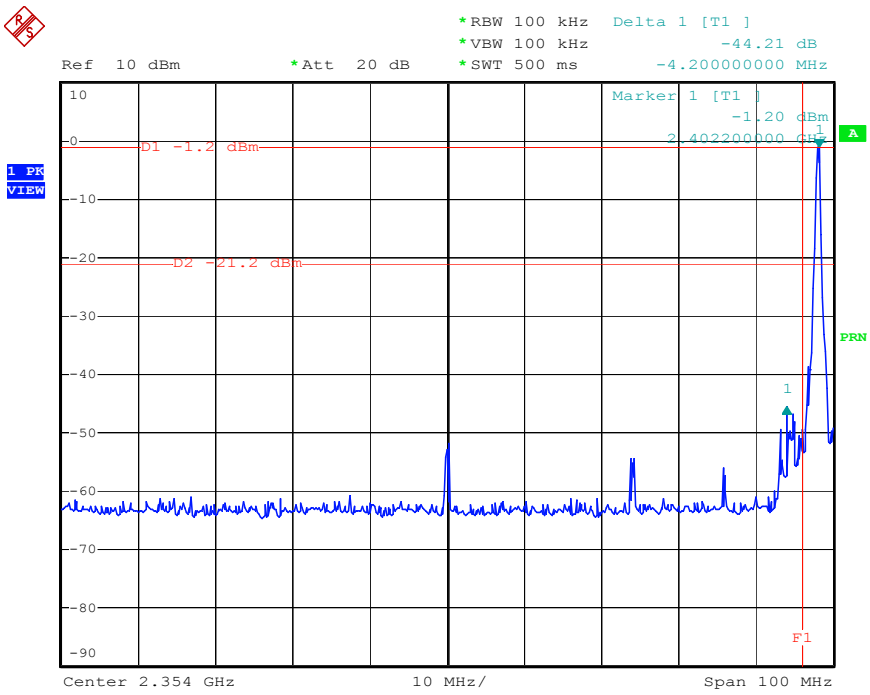
5.6.4. Test Result of Radiated Emission

- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Sam Lee

Modulation Type	Test Channel	Freq. (MHz)	Level* (dBuV/m)	Margin (dB)	Limit (dBuV/m)	Trace (PK/AV)
GFSK	00	2389.23	54.23	-19.77	74	PK
GFSK	00	2389.23	41.18	-12.82	54	AV
GFSK	78	2483.85	54.65	-19.35	74	PK
GFSK	78	2483.85	47.34	-6.66	54	AV

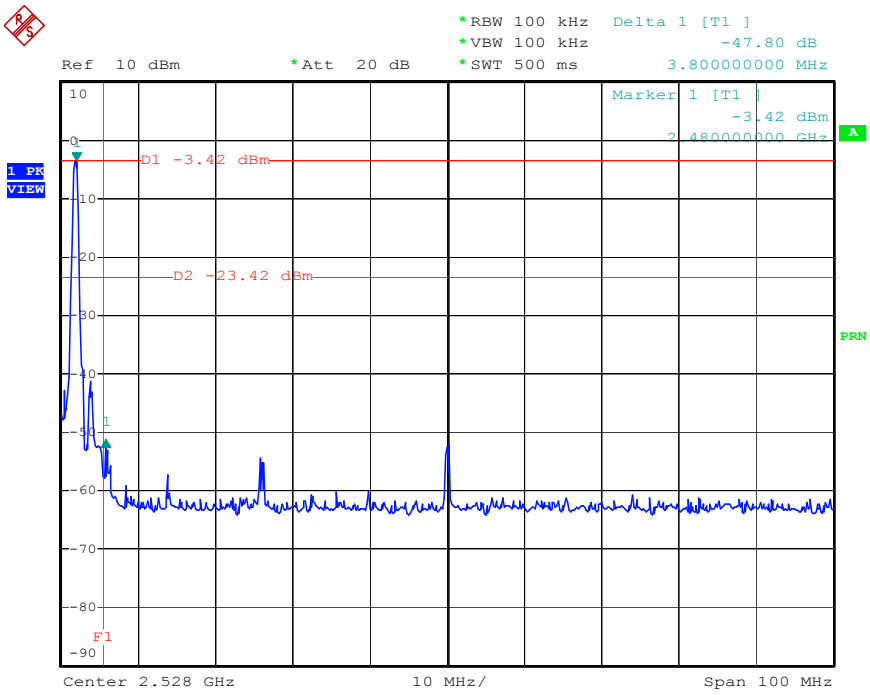
Level*: The max field strength in the restricted bands.

Modulation Type: GFSK (Channel 00) :



Date: 10.DEC.2004 15:02:34

Modulation Type: GFSK (Channel 78) :



Date: 10.DEC.2004 15:01:37

5.7. Test of AC Power Line Conducted Emission

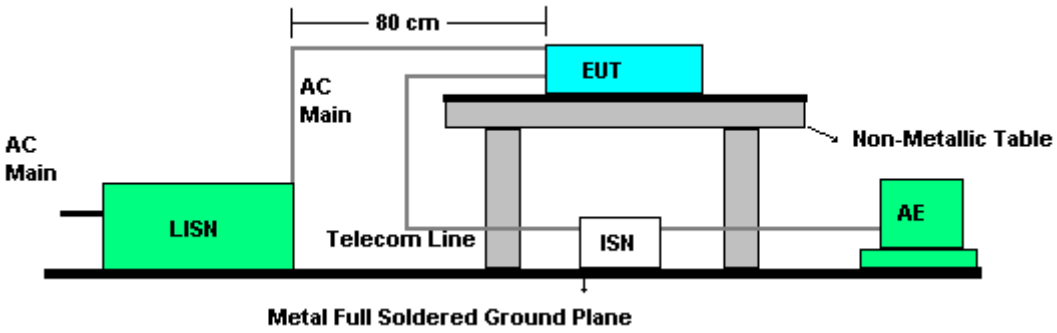
5.7.1. Measuring Instruments

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

5.7.2. 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 provides 50uH/50ohms coupling impedance.
5. The frequency range from 150 KHz to 30 MHz was searched.
6. Use the Channel & Power Controlling software to make the EUT working on selected channel and expected output power, then use the “H” Patter Generator software to make the supporting equipments stay on working condition.
7. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
8. 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.

5.7.3. Test Setup Layout



5.7.4. Test Result of Conducted Emission

- Test Mode: Mode 1
- Temperature: 26°C
- Relative Humidity: 64%
- Test Engineer: Sky Wu

Line to Ground

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1974250	31.93	-31.79	63.72	31.82	0.10	0.01	QP
2	0.1974250	18.18	-35.54	53.72	18.07	0.10	0.01	Average
3	0.3589320	29.86	-28.89	58.75	29.67	0.10	0.09	QP
4	0.3589320	20.65	-28.10	48.75	20.46	0.10	0.09	Average
5	0.9135710	24.63	-31.37	56.00	24.06	0.10	0.47	QP
6	0.9135710	18.97	-27.03	46.00	18.40	0.10	0.47	Average
7	2.110	19.18	-36.82	56.00	19.04	0.11	0.03	QP
8	2.110	13.81	-32.19	46.00	13.67	0.11	0.03	Average
9	14.520	12.52	-47.48	60.00	11.48	0.20	0.84	QP
10	14.520	7.32	-42.68	50.00	6.28	0.20	0.84	Average
11	22.660	12.75	-47.25	60.00	12.25	0.30	0.20	QP
12	22.660	7.74	-42.26	50.00	7.24	0.30	0.20	Average

Neutral to Ground

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1646160	37.30	-27.93	65.23	36.97	0.10	0.23	QP
2	0.1646160	19.99	-35.24	55.23	19.66	0.10	0.23	Average
3	0.1646160	36.86	-28.37	65.23	36.53	0.10	0.23	QP
4	0.1646160	20.22	-35.01	55.23	19.89	0.10	0.23	Average
5	0.2630270	25.57	-35.77	61.34	25.39	0.10	0.08	QP
6	0.2630270	14.00	-37.34	51.34	13.82	0.10	0.08	Average
7	0.3464610	24.22	-34.83	59.05	24.02	0.10	0.10	QP
8	0.3464610	13.70	-35.35	49.05	13.50	0.10	0.10	Average
9	1.900	16.09	-39.91	56.00	15.94	0.10	0.05	QP
10	1.900	8.56	-37.44	46.00	8.41	0.10	0.05	Average
11	22.569	32.82	-27.18	60.00	32.27	0.35	0.20	QP
12 @	22.569	30.60	-19.40	50.00	30.05	0.35	0.20	Average

- Test Mode: Mode 2
- Temperature: 26°C
- Relative Humidity: 64%
- Test Engineer: Sky Wu

Line to Ground

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1913990	36.64	-27.34	63.98	36.49	0.10	0.05	
2	0.1913990	10.99	-42.99	53.98	10.84	0.10	0.05	Average
3	@0.3356200	33.83	-25.48	59.31	33.63	0.10	0.10	QP
4	0.3356200	8.97	-40.34	49.31	8.77	0.10	0.10	Average
5	@0.6172570	30.45	-25.55	56.00	30.02	0.10	0.33	QP
6	0.6172570	6.76	-39.24	46.00	6.33	0.10	0.33	Average
7	0.9184250	25.61	-30.39	56.00	25.05	0.10	0.46	QP
8	0.9184250	5.23	-40.77	46.00	4.67	0.10	0.46	Average
9	1.340	19.56	-36.44	56.00	19.20	0.10	0.26	QP
10	1.340	3.72	-42.28	46.00	3.36	0.10	0.26	Average
11	20.380	15.94	-44.06	60.00	15.42	0.30	0.22	QP
12	20.380	8.13	-41.87	50.00	7.61	0.30	0.22	Average

Neutral to Ground

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1805620	35.31	-29.15	64.46	35.09	0.10	0.12	QP
2	0.1805620	10.18	-44.28	54.46	9.96	0.10	0.12	Average
3	0.2291780	33.18	-29.30	62.48	33.04	0.10	0.04	QP
4	0.2291780	8.22	-44.26	52.48	8.08	0.10	0.04	Average
5	0.3285820	25.95	-33.54	59.49	25.74	0.10	0.11	QP
6	0.3285820	6.66	-42.83	49.49	6.45	0.10	0.11	Average
7	0.4761190	26.25	-30.16	56.41	26.13	0.10	0.02	QP
8	0.4761190	5.37	-41.04	46.41	5.25	0.10	0.02	Average
9	0.8572950	26.19	-29.81	56.00	25.61	0.10	0.48	QP
10	0.8572950	5.32	-40.68	46.00	4.74	0.10	0.48	Average
11	20.920	19.36	-40.64	60.00	18.83	0.32	0.21	QP
12	20.920	10.21	-39.79	50.00	9.68	0.32	0.21	Average

- Test Mode: Mode 3
- Temperature: 26°C
- Relative Humidity: 64%
- Test Engineer: Sky Wu

Line to Ground

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1598470	12.96	-52.51	65.47	12.60	0.10	0.26	QP
2	0.1598470	8.65	-46.82	55.47	8.29	0.10	0.26	Average
3	0.3851900	10.75	-47.42	58.17	10.56	0.10	0.09	QP
4	0.3851900	5.07	-43.10	48.17	4.88	0.10	0.09	Average
5	1.830	7.21	-48.79	56.00	7.04	0.10	0.07	QP
6	1.830	2.83	-43.17	46.00	2.66	0.10	0.07	Average
7	10.290	11.95	-48.05	60.00	11.34	0.20	0.41	QP
8	10.290	6.84	-43.16	50.00	6.23	0.20	0.41	Average
9	14.520	14.70	-45.30	60.00	13.66	0.20	0.84	QP
10	14.520	9.60	-40.40	50.00	8.56	0.20	0.84	Average
11	21.260	14.77	-45.23	60.00	14.26	0.30	0.21	QP
12	21.260	8.63	-41.37	50.00	8.12	0.30	0.21	Average

Neutral to Ground

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.1615500	12.69	-52.69	65.38	12.34	0.10	0.25	QP
2	0.1615500	8.16	-47.22	55.38	7.81	0.10	0.25	Average
3	0.4104750	11.06	-46.58	57.64	10.89	0.10	0.07	QP
4	0.4104750	5.87	-41.77	47.64	5.70	0.10	0.07	Average
5	0.5581450	7.97	-48.03	56.00	7.70	0.10	0.17	QP
6	0.5581450	3.58	-42.42	46.00	3.31	0.10	0.17	Average
7	8.550	9.88	-50.12	60.00	9.55	0.18	0.15	QP
8	8.550	5.22	-44.78	50.00	4.89	0.18	0.15	Average
9	15.150	15.35	-44.65	60.00	14.49	0.21	0.65	QP
10	15.150	9.50	-40.50	50.00	8.64	0.21	0.65	Average
11	22.660	13.74	-46.26	60.00	13.18	0.36	0.20	QP
12	22.660	8.37	-41.63	50.00	7.81	0.36	0.20	Average

5.8. Test of Spurious Radiated Emission

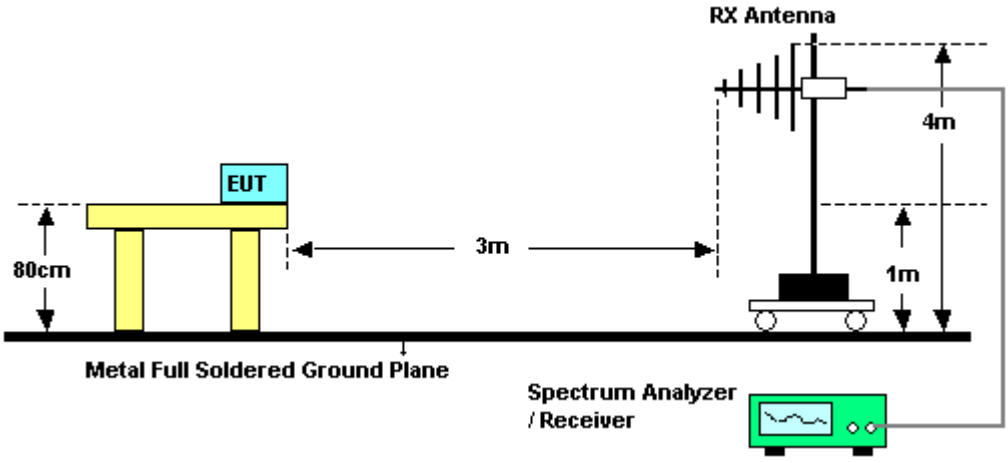
5.8.1. Measuring Instruments

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

5.8.2. Test Procedures

1. Configure the EUT according to ANSI C63.4.
2. The EUT was placed on the top of the turn table 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 turn table.
4. Power on the EUT and all the supporting units.
5. The turn table 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 turn table 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.

5.8.3. Test Setup Layout



5.8.4. Test Results for CH 78 / 2480 MHz (for emission below 1GHz)

- Test Mode: Mode 1
- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Ted Chou

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	64.340	25.59	-14.41	40.00	41.53	10.19	1.35	27.48	Peak	---	---
2	119.420	30.87	-12.63	43.50	44.26	11.82	1.95	27.16	Peak	---	---
3	178.070	25.61	-17.89	43.50	36.04	14.20	2.41	27.04	Peak	---	---
1	396.800	33.08	-12.92	46.00	40.58	16.70	3.46	27.66	Peak	---	---
2	496.800	25.90	-20.10	46.00	34.09	16.03	3.87	28.09	Peak	---	---
3	596.000	30.11	-15.89	46.00	33.93	20.22	4.35	28.39	Peak	---	---

(B) Polarization: Vertical

		Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	!	52.100	34.81	-5.19	40.00	49.97	11.21	1.21	27.58	Peak	105	45
2		118.740	28.61	-14.89	43.50	42.10	11.72	1.95	27.16	Peak	---	---
3		171.950	27.29	-16.21	43.50	38.09	13.88	2.37	27.05	Peak	---	---
1		390.400	24.00	-22.00	46.00	31.62	16.53	3.43	27.58	Peak	---	---
2		697.600	26.85	-19.15	46.00	29.62	20.69	4.65	28.11	Peak	---	---
3		957.600	29.76	-16.24	46.00	28.47	22.96	5.65	27.32	Peak	---	---

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

5.8.5. Test Results for CH 78 / 2480 MHz (for emission below 1GHz)

- Test Mode: Mode 2
- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Ted Chou

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	66.380	24.05	-15.95	40.00	40.09	10.06	1.37	27.47	Peak	---	---
2	112.110	22.83	-20.67	43.50	37.36	10.75	1.89	27.17	Peak	---	---
3	175.860	29.99	-13.51	43.50	40.45	14.20	2.39	27.05	Peak	---	---
1	297.600	27.70	-18.30	46.00	37.41	13.73	3.07	26.51	Peak	---	---
2	397.600	29.77	-16.23	46.00	37.25	16.73	3.46	27.67	Peak	---	---
3	596.000	32.32	-13.68	46.00	36.14	20.22	4.35	28.39	Peak	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	48.190	32.57	-7.43	40.00	47.24	11.74	1.17	27.58	Peak	128	152
2	114.830	31.19	-12.31	43.50	45.32	11.13	1.91	27.17	Peak	---	---
3	169.230	32.46	-11.04	43.50	43.57	13.59	2.36	27.06	Peak	---	---
1	297.600	34.64	-11.36	46.00	44.35	13.73	3.07	26.51	Peak	---	---
2	396.800	24.88	-21.12	46.00	32.38	16.70	3.46	27.66	Peak	---	---
3	596.000	28.66	-17.34	46.00	32.48	20.22	4.35	28.39	Peak	---	---

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

5.8.6. Test Results for CH 78 / 2480 MHz (for emission below 1GHz)

- Test Mode: Mode 3
- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Ted Chou

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	64.340	24.65	-15.35	40.00	40.59	10.19	1.35	27.48	Peak	---	---
2	114.830	26.23	-17.27	43.50	40.36	11.13	1.91	27.17	Peak	---	---
3	180.790	31.18	-12.32	43.50	41.53	14.26	2.43	27.04	Peak	101	184
1	294.400	26.30	-19.70	46.00	36.12	13.65	3.06	26.53	Peak	---	---
2	397.600	28.90	-17.10	46.00	36.38	16.73	3.46	27.67	Peak	---	---
3	596.000	31.05	-14.95	46.00	34.87	20.22	4.35	28.39	Peak	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	54.990	27.49	-12.51	40.00	42.83	10.96	1.26	27.56	Peak	---	---
2	99.020	25.36	-18.14	43.50	41.86	8.95	1.76	27.21	Peak	---	---
3	115.340	25.69	-17.81	43.50	39.73	11.21	1.92	27.17	Peak	---	---
1	297.600	27.80	-18.20	46.00	37.51	13.73	3.07	26.51	Peak	---	---
2	397.600	26.61	-19.39	46.00	34.09	16.73	3.46	27.67	Peak	---	---
3	596.000	29.93	-16.07	46.00	33.75	20.22	4.35	28.39	Peak	---	---

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

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

- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Ted Chou

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1228.000	38.38	-35.62	74.00	51.66	24.63	1.30	39.21	Peak	---	---
2	4808.000	45.32	-28.68	74.00	50.10	32.96	2.40	40.14	Peak	---	---
3	7204.000	49.89	-24.11	74.00	51.10	35.67	2.61	39.49	Peak	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1260.000	40.46	-33.54	74.00	53.59	24.70	1.38	39.21	Peak	---	---
2	4804.000	51.15	-22.85	74.00	55.94	32.93	2.42	40.14	Peak	---	---
3	4804.000	48.27	-5.73	54.00	53.06	32.93	2.42	40.14	Average	---	---
4	7204.000	53.08	-20.92	74.00	54.29	35.67	2.61	39.49	Peak	---	---
5	7204.000	48.36	-5.64	54.00	49.57	35.67	2.61	39.49	Average	---	---
6	9608.000	57.72	-16.28	74.00	54.48	38.22	3.78	38.76	Peak	---	---
7	9608.000	52.39	-1.61	54.00	49.15	38.22	3.78	38.76	Average	---	---

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

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

- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Ted Chou

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1548.000	40.73	-33.27	74.00	53.15	25.33	1.47	39.22	Peak	---	---
2	4884.000	45.11	-28.89	74.00	49.63	33.11	2.51	40.14	Peak	---	---
3	7324.000	50.02	-23.98	74.00	50.37	36.13	2.97	39.45	Peak	---	---
4	9764.000	51.05	-22.95	74.00	47.61	38.47	3.68	38.71	Peak	---	---
5	9764.000	43.91	-10.09	54.00	40.47	38.47	3.68	38.71	Average	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1452.000	38.37	-35.63	74.00	51.06	25.04	1.46	39.19	Peak	---	---
2	4884.000	50.46	-23.54	74.00	54.98	33.11	2.51	40.14	Peak	---	---
3	7324.000	54.43	-19.57	74.00	54.78	36.13	2.97	39.45	Peak	---	---
4	7324.000	49.29	-4.71	54.00	49.64	36.13	2.97	39.45	Average	---	---
5	9764.000	58.10	-15.90	74.00	54.66	38.47	3.68	38.71	Peak	---	---
6	9764.000	53.68	-0.32	54.00	50.24	38.47	3.68	38.71	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 78 / 2480 MHz (for emission above 1GHz)

- Modulation Type: GFSK
- Temperature: 26°C
- Relative Humidity: 64%
- Duty Cycle of the Equipment During the Test: 46.40%
- Test Engineer: Ted Chou

(A) Polarization: Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1132.000	42.80	-31.20	74.00	56.34	24.45	1.23	39.22	Peak	---	---
2	3968.000	42.89	-31.11	74.00	48.56	32.46	1.28	39.41	Peak	---	---
3	7440.000	48.75	-25.25	74.00	48.88	36.39	2.90	39.42	Peak	---	---
4	9920.000	53.14	-20.86	74.00	49.13	38.78	3.89	38.66	Peak	---	---
5	9920.000	45.53	-8.47	54.00	41.52	38.78	3.89	38.66	Average	---	---

(B) Polarization: Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1128.000	40.91	-33.09	74.00	54.49	24.42	1.23	39.23	Peak	---	---
2	4964.000	48.07	-25.93	74.00	52.54	33.24	2.44	40.15	Peak	---	---
3	7440.000	50.51	-23.49	74.00	50.64	36.39	2.90	39.42	Peak	---	---
4	9920.000	57.88	-16.12	74.00	53.87	38.78	3.89	38.66	Peak	---	---
5	9920.000	52.66	-1.34	54.00	48.65	38.78	3.89	38.66	Average	---	---

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

5.9. Antenna Requirements

5.9.1. Standard Applicable

47 CFR Part15 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.
47 CFR Part15 Section 15.247 (b):
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 Patch antenna.

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	9 KHz – 2.75 GHz	Feb. 16, 2004	Conduction (CO04-HY)
2	LISN	MessTec	NNB-2/16Z	2001/004	9 KHz – 30 MHz	Jun. 09, 2004	Conduction (CO04-HY)
3	LISN (Support Unit)	MessTec	NNB-2/16Z	99041	9 KHz – 30 MHz	Apr. 27, 2004	Conduction (CO04-HY)
4	EMI Filter	LINDGREN	LRE-2030	2651	< 450 Hz	N/A	Conduction (CO04-HY)
5	RF Cable-CON	UTIFLEX	3102-26886-4	CB044	9KHz~30MHz	Apr. 21, 2004	Conduction (CO04-HY)
6	3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2004	Radiation (03CH03-HY)
7	Spectrum analyzer	R&S	FSP40	100004	9KHZ~40GHz	Aug. 31, 2004	Radiation (03CH03-HY)
8	Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Nov. 04, 2004	Radiation (03CH03-HY)
9	Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz –200MHz	Jul. 28, 2004	Radiation (03CH03-HY)
10	Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz -1GHz	Jul. 28, 2004	Radiation (03CH03-HY)
11	RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Dec. 02, 2004	Radiation (03CH03-HY)
12	Amplifier	MITEQ	AFS44	849984	100MHz~26.5GHz	Mar. 26, 2004	Radiation (03CH03-HY)
13	Horn Antenna	EMCO	3115	6741	1GHz – 18GHz	Apr. 07, 2004	Radiation (03CH03-HY)
14	Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
15	Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
16	Horn Antenna	Schwarzbeck	BBHA9170	154	18GHz~40GHz	Jun. 09, 2004	Radiation (03CH03-HY)
17	RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Dec. 04, 2004	Radiation (03CH03-HY)

※ Calibration Interval of instruments listed above is one year.

Items	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
18	Spectrum analyzer	R&S	FSP7	838858/014	9KHZ~7GHZ	Sep. 02, 2004	Conducted (TH01-HY)
19	Power meter	R&S	NRVS	100444	DC~40GHz	Jun. 15, 2004	Conducted (TH01-HY)
20	Power sensor	R&S	NRV-Z55	100049	DC~40GHz	Jun. 15, 2004	Conducted (TH01-HY)
21	Power Sensor	R&S	NRV-Z32	100057	30MHz-6GHz	Jun. 15, 2004	Conducted (TH01-HY)
22	AC power source	HPC	HPA-500W	HPA-9100024	AC 0~300V	Jun. 16, 2004	Conducted (TH01-HY)
23	AC power source	G.W.	GPC-6030D	C671845	DC 1V~60V	Nov. 05, 2004	Conducted (TH01-HY)
24	Temp. and Humidity Chamber	KSON	THS-C3L	612	N/A	Sep. 30, 2004	Conducted (TH01-HY)
25	RF CABLE-1m	Jye Bao	RG142	CB034-1m	20MHz~7GHz	Jan. 01, 2004	Conducted (TH01-HY)
26	RF CABLE-2m	Jye Bao	RG142	CB035-2m	20MHz~1GHz	Jan. 01, 2004	Conducted (TH01-HY)

※ Calibration Interval of instruments listed above is one year.