

# FCC TEST REPORT

for

## 47 CFR, Part 15, Subpart C

Equipment : PowerPack for Earthmate GPS with Bluetooth/  
PowerPack for Earthmate GPS

Model No. : LR9822-X

FCC ID. : I2ILR9822

Filing Type : Certification

Applicant : **Leadtek Research Inc.**  
18F, No. 166, Chien-Yi Rd., Chung-Ho,  
Taipei Hsien, Taiwan, (235) R.O.C.

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**SPORION International Inc.**

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

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## History of this test report

Original Report Issue Date: Oct. 03, 2003

No additional attachment.

Additional attachment were issued as following record:

Certificate No. : F381902

# CERTIFICATE OF COMPLIANCE

for

## 47 CFR, Part 15, Subpart C

Equipment : PowerPack for Earthmate GPS with Bluetooth/  
PowerPack for Earthmate GPS

Model No. : LR9822-X

FCC ID. : I2ILR9822

Filing Type : Certification

Applicant : **Leadtek Research Inc.**  
18F, No. 166, Chien-Yi Rd., Chung-Ho,  
Taipei Hsien, Taiwan, (235) 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 - 2001** and the equipment under test was **passed** all test items required in FCC Part 15 subpart C, relative to the equipment under test. Testing was carried out on Sep. 17, 2003 at **SPORTON International Inc. LAB.**



Alex Chen  
Manager

**SPORTON International Inc.**

6F, No.106, Sec. 1, Hsin Tai Wu Rd., Hsi Chih, Taipei Hsien, Taiwan, R.O.C.

## **1. General Description of Equipment under Test**

### **1.1. Applicant**

Leadtek Research Inc.  
18F, No. 166, Chien-Yi Rd., Chung-Ho,  
Taipei Hsien, Taiwan, (235) R.O.C.

### **1.2. Manufacturer**

Leadtek Research Inc.  
5F, No. 4, Alley 11, Lane 327, Sec. 2, Chung Shan Rd.,  
Chung Ho, Taipei Hsien, Taiwan.

### **1.3. Basic Description of Equipment under Test**

Equipment	: PowerPack for Earthmate GPS with Bluetooth/ PowerPack for Earthmate GPS
FCC ID	: I2ILR9822
Model No.	: LR9822-X
Trade Name	: DELORME, Earthmate
USB Cable	: Shielded, 2 m
Power Supply Type	: Switching
AC Power Input	: Wall-mount, 2 pin
DC Power Cable	: Non-Shielded, 1 m, 2 pin

**1.4. Feature of Equipment under Test****General**

BT Module	Gemtek
Chipset	CSR
Frequency	2.40~2.48 GHz
Antenna Type	Built-in Ceramic Chip antenna

**Power**

Operational Power	3.3VDC±10% (from internal Lithium-Ion battery pack)
Charging Power	5VDC±10%
Battery Source	Rechargeable 1200mAh Lithium-Ion battery with 5V DC input charging circuit
Battery Charging	Full charge 2.5 hours by 650mA adapter
Backup Power	3.3V (internal onboard rechargeable backup battery)
Operational Current	70~80mA (with BT function but not include Earthmate GPS) 0~10 mA(without BT function but not include Earthmate GPS) 80~90mA(Max but not include Earthmate GPS)
Typical Operation	GPS and Bluetooth fully active 6-8 hours

**Main Interface**

Connection	Bluetooth Serial Port Profile (SPP) *
	UART *
	USB

**<Note> : UART and BT can't operate at the same time**

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

## 2. Test Configuration of Equipment under Test

### 2.1. Test Manner

- a. The EUT has been associated with notebook and peripherals pursuant to ANSI C63.4-2001 and configuration operated in a manner, which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included COMPAQ Notebook, VIEWSONIC Monitor, LOGITECH PS/2 Keyboard, LOGITECH USB Mouse, EPSON Printer and EUT for EMI test.
- c. This device is an integration of an SIG qualified BlueTooth module. The used codes for modulating IF carrier is of course pseudo-random. The hopping sequence is determined by the address of the piconet master. Here is the hopping sequence indicated by channel number:
- d. 02, 17, 68, 55, 4, 77, 56, 27, 70, 80, 22, 33, 57, 34, 29, 79, 44, 50, 3, 71, 66, 36, 78, 20, 67, 30, 24, 11, 37, 69, 23, 7, 41 38, 63, 14, 31, 59, 40, 13, 6, 25, 65, 15, 61, 73, 58, 47, 19, 28, 54, 76, 74, 48, 52, 75, 5, 42, 64, 72, 62, 51, 60, 18, 45, 53, 16, 39, 46, 32, 49, 43, 8, 21, 9, 12, 10, 26, 35
- e. For 15.247(g), during data transmission, the carrier frequency is repeatedly switched on 79 hopping frequencies, any 2 hopping frequencies will not be available on the spectrum simultaneously. So, this device can be taken as true frequency hopping device.
- f. For 15.247(h), the hopping sequence is determined by the address of piconet master. Each piconet master will have its unique address at any moment, so re-use of the hopping sequence is completely not possible. Within the piconet, one master can be communicated with many slaves via the same hopping sequence, but at any moment only one ( master or slave) can be "talk". It is determined by the master that who should be "listen" or "talk". Any slave who want to "talk" has to sent "inquiry" to master first. So, 2 slaves (or one slave one master) is not possible to be on "talk" mode simultaneously.
- g. The following test modes were pretested:
  - Mode 1: CH00 ( 2402MHz )
  - Mode 2: CH39 ( 2441MHz )
  - Mode 3: CH78 ( 2480MHz )

b. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 25000MHz.

### 2.2. Description of Test System

Support Unit 1. -- Notebook (COMPAQ)

FCC ID	: N/A
Model No.	: Presario 1500
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0036
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

**Support Unit 2. -- Monitor (VIEWSONIC)**

FCC ID	: N/A
Model No.	: VCDTS21553-3P
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0051
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity

**Support Unit 3. -- PS/2 Keyboard (LOGITECH)**

FCC ID	: N/A
Model No.	: Y-SJ17
Serial No.	: SP0054
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

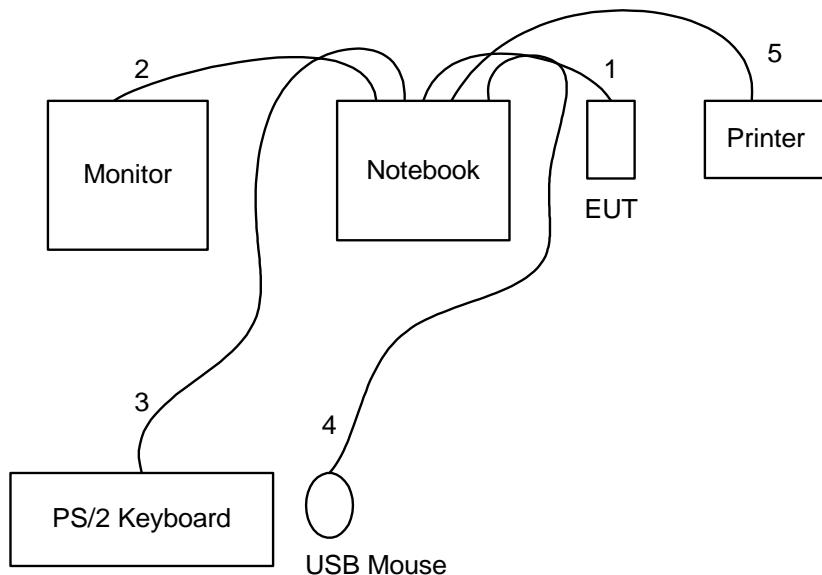
**Support Unit 4. – USB Mouse (LOGITECH)**

FCC ID	: N/A
Model No.	: M-BE58
Serial No.	: SP0041
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

**Support Unit 5. -- Printer (EPSON)**

FCC ID	: N/A
Model No.	: STYLUS COLOR S680
Power Supply Type	: Linear
Power Cord	: Non-Shielded
Serial No.	: SP0048
Data Cable	: Shielded, 1.35m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

### 2.3. Connection Diagram of Test System



1. The I/O cable is connected from EUT to the support unit 1.
2. The I/O cable is connected from Notebook to the support unit 2.
3. The I/O cable is connected from Notebook to the support unit 3.
4. The I/O cable is connected from Notebook to the support unit 4.
5. The I/O cable is connected from Notebook to the support unit 5.

### **3. Test Software**

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

The program was executed as follows:

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the hard disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H " messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- f. Repeat the steps from c to e.

At the same time, "Bluetest.exe" was executed to keep transmitting signals at fixed frequency.

## **4. General Information of Test**

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 : CO01-HY, 03CH03-HY

### **4.1. Test Voltage**

110V/60Hz

### **4.2. Standard for Methods of Measurement**

ANSI C63.4-2001 for conducted power line test and radiated emission test,  
DA 00-705 for test of hopping channel separation  
DA 00-705 for test of number of hopping frequency used  
DA 00-705 for test of hopping channel bandwidth  
DA 00-705 for test of dwell time of each frequency within a 30 second period  
DA 00-705 for test of output power  
DA 00-705 for test of 100khz bandwidth of frequency band edges

### **4.3. Test in Compliance with**

FCC Part 15, Subpart C 15.247

### **4.4. Frequency Range Investigated**

- a. Conduction: from 150 kHz to 30 MHz
- b. Radiation: from 30 MHz to 25,000MHz

### **4.5. Test Distance**

The test distance of radiated emission from antenna to EUT is 3 M.

## 5. Report of Measurements and Examinations

### 5.1. List of Measurements and Examinations

FCC Rule	Description of Test	Result
<u>15.107/15.207</u>	Conducted Emission	Pass
<u>15.247(a)(1)</u>	Hopping Channel Separation	Pass
<u>15.247(a)(1)(ii)</u>	Number of Hopping Frequency Used	Pass
15.247(a)(1)(ii)	Hopping Channel Bandwidth	Pass
<u>15.247(a)(1)(ii)</u>	Dwell Time of Each Frequency within a 30 Second Period	Pass
<u>15.247(b)</u>	Output Power	Pass
15.247(c)	100KHz Bandwidth of Frequency Band Edges	Pass
<u>15.203</u>	Antenna Requirement	Pass

## 5.2. Hopping Channel Separation

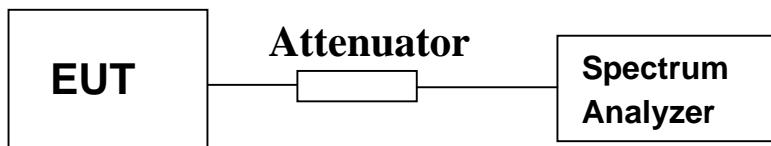
### 5.2.1. Measuring Instruments :

As described in chapter 9 of this test report.

### 5.2.2. Test Procedure :

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 channel is separated with the next channel.

### 5.2.3. Test Setup Layout :



### 5.2.4. Test Result : The spectrum analyzer plots are attached as below

- Temperature: 27°C
- Relative Humidity: 62 %
- Duty cycle of the equipment during the test X = 100%

Channel	Frequency ( MHz )	Hopping Channel Separation ( KHz )	Limits ( KHz )	Plot Ref. No.
00	2402	1000.0000	25	1
39	2441	1000.0000	25	2
78	2480	1000.0000	25	3

### 5.2.5. Test Configuration ( EUT Operating Condition ) :

The software provided by client to enable the EUT under transmission condition continuously at lowest, middle and highest channel frequencies respectively.

### **5.3. Number of Hopping Frequency**

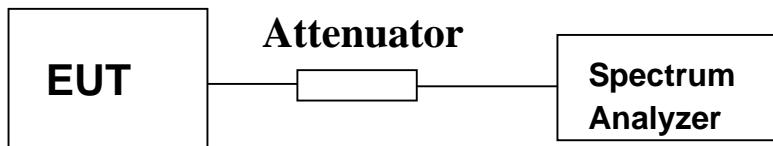
#### **5.3.1. Measuring Instruments :**

As described in chapter 9 of this test report.

#### **5.3.2. Test Procedure :**

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 number of hopping frequency used is defined as the device has the numbers of total channel.

#### **5.3.3. Test Setup Layout :**



#### **5.3.4. Test Result : See spectrum analyzer plots below**

- Temperature: 27°C
- Relative Humidity: 62 %
- Duty cycle of the equipment during the test X = 100%

Number of Hopping Frequency (Channel)	Limits (Channel)	Plot Ref. No.
79	75	1

## 5.4. Hopping Channel Bandwidth

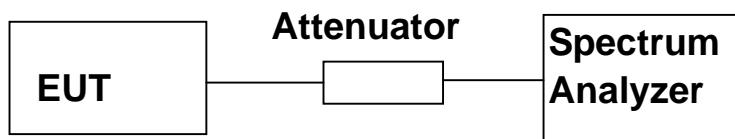
### 5.4.1. Measuring Instruments :

As described in chapter 9 of this test report.

### 5.4.2. Test Procedure :

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 1MHz and VBW to 1MHz.
3. Set the center frequency on any frequency would be measure and set the frequency span to zero span.
4. The calculate =  $30 * (1600/79) * t$  ( ie:  $t$  = the time duration of one single pulse )

### 5.4.3. Test Setup Layout :



### 5.4.4. Test Result : See spectrum analyzer plots below

- Temperature: 27°C
- Relative Humidity: 62 %
- Duty cycle of the equipment during the test X = 100%

Channel	Frequency (MHz)	Hopping Channel Bandwidth (MHz)	Limits (MHz)	Plot
				Ref. No.
00	2402	0.2710	1.0	1
39	2441	0.2690	1.0	2
78	2480	0.2700	1.0	3

### 5.4.5. Test Configuration ( EUT Operating Condition ) :

Same as Section 5.2.5.

## 5.5. Dwell Time of Each Frequency within a 30 Seconds Period

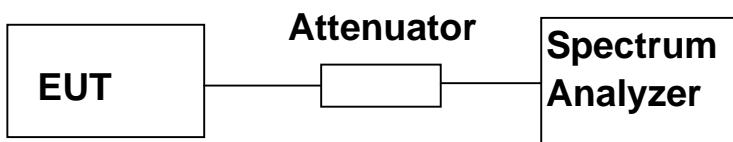
### 5.5.1. Measuring Instruments :

As described in chapter 9 of this test report.

### 5.5.2. Test Procedure :

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 the center frequency on any frequency would be measure and set the frequency span to zero span.

### 5.5.3. Test Setup Layout :



### 5.5.4. Test Result : See spectrum analyzer plots below

- Temperature: 27°C
- Relative Humidity: 62 %
- Duty cycle of the equipment during the test X = 100%

Channel	Frequency	Dwell Time	Limits	Plot
	(MHz)	(s)	(s)	Ref. No.
00	2402	0.323240506	0.4	1
39	2441	0.323240506	0.4	2
78	2480	0.323240506	0.4	3

### 5.5.5. Test Configuration ( EUT Operating Condition ) :

Same as Section 5.2.5.

## 5.6. Output Power

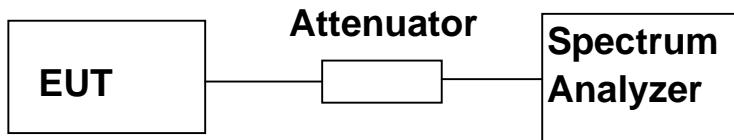
### 5.6.1. Measuring Instruments :

As described in chapter 9 of this test report.

### 5.6.2. Test Procedure :

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The center frequency of the spectrum analyzer was set to the fundamental frequency and set RBW to 1MHz and VBW to 1MHz.

### 5.6.3. Test Setup Layout :



### 5.6.4. Test Result : See spectrum analyzer plots below

- Temperature: 27°C
- Relative Humidity: 62 %
- Duty cycle of the equipment during the test X = 100%

Channel	Frequency	Measured Output Power (dBm)	Measured Output Power (mWatt)	Limits (Watt/dBm )
00	2402	-3.88	0.409260660	1W/30 dBm
39	2441	-4.20	0.380189396	1W/30 dBm
78	2480	-3.86	0.411149721	1W/30 dBm

### 5.6.5. Test Configuration ( EUT Operating Condition ) :

Same as Section 5.2.5.

## 5.7. 100KHz Bandwidth of Frequency Band Edges

### 5.7.1. Measuring Instruments :

As described in chapter 9 of this test report.

### 5.7.2. Test Procedure :

1. The transmitter output was connected to the spectrum analyzer via a low loss cable.
2. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100 KHz bandwidth from band edge.
3. The band edges was measured and recorded.

### 5.7.3. Test Result :

Test Result in lower band (Channel 00) :	PASS
Test Result in higher band(Channel 78) :	PASS

### 5.7.4. Note on Band edge Emission

The band edge emission plot on appendix B page B15. shows 64.09dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

Polarity	The emission of carrier power		The maximum field strength in restrict band		Margin	Detector	Result
	strength (dB $\mu$ V/m)	field strength in restrict band (dB $\mu$ V/m)	Limit (dB $\mu$ V/m)	(dB)			
H	72.76	16.79	74.00	-57.21	Peak	Pass	Pass
H	55.24	-0.73	54.00	-54.73	Average	Pass	Pass
V	72.77	16.80	74.00	-57.20	Peak	Pass	Pass
V	55.88	-0.09	54.00	-54.09	Average	Pass	Pass

\* The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.

### 5.7.5. Test Configuration ( EUT Operating Condition ) :

The software provided by client to enable the EUT under transmission condition continuously at lowest, and highest channel frequencies respectively.

## **5.8. Test of Conducted Emission**

Conducted Emissions were measured from 150 KHz to 30 MHz with a bandwidth of 9 KHz and return leads of the EUT according to the methods defined in ANSI C63.4-2001 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

### **5.8.1. Major Measuring Instruments :**

• Test Receiver	(R&S ESCS 30)
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

### **5.8.2. Test Procedures :**

- a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
- b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
- c. All the support units are connect to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 150 KHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

## 5.8.3. Test Result of Conducted Emission :

- Test Mode: Mode 1
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 24°C
- Relative Humidity: 53 %

**The test was passed at the minimum margin that marked by a frame in the following data**

Site : C001-HY  
 Condition : CNS/VCCI/CISPR-B 2003 2001/008 LINE  
 EUT : BlueTooth  
 Power : 110V/60Hz  
 Model :  
 Memo : TX CH00 2402MHz  
       : F381902

Freq	MHz	Over Limit		Read		Cable	Remark
		Level	Limit	Line	Level		
1	0.433	45.77	-11.43	57.20	45.56	0.10	0.11 QP
2	0.433	31.97	-15.23	47.20	31.76	0.10	0.11 Average
3	0.484	30.29	-15.98	46.27	30.08	0.10	0.11 Average
4	0.484	46.82	-9.45	56.27	46.61	0.10	0.11 QP
5	0.665	29.47	-16.53	46.00	29.28	0.10	0.09 Average
6	0.665	46.52	-9.48	56.00	46.33	0.10	0.09 QP
7	0.776	47.33	-8.67	56.00	47.15	0.10	0.08 QP
8	0.776	33.90	-12.10	46.00	33.72	0.10	0.08 Average
9	0.926	46.30	-9.70	56.00	46.14	0.10	0.06 QP
10	0.926	30.58	-15.42	46.00	30.42	0.10	0.06 Average
11	1.193	43.20	-12.80	56.00	43.03	0.10	0.07 QP
12	1.193	28.13	-17.87	46.00	27.96	0.10	0.07 Average

Site : C001-HY  
 Condition : CNS/VCCI/CISPR-B 2003 2001/008 NEUTRAL  
 EUT : BlueTooth  
 Power : 110V/60Hz  
 Model :  
 Memo : TX CH00 2402MHz  
       : F381902

Freq	MHz	Over Limit		Read		Cable	Remark
		Level	Limit	Line	Level		
1	0.459	41.12	-15.89	56.71	40.91	0.10	0.11 QP
2	0.459	26.97	-19.74	46.71	26.76	0.10	0.11 Average
3	0.610	41.70	-14.30	56.00	41.51	0.10	0.09 QP
4	0.610	25.65	-20.35	46.00	25.46	0.10	0.09 Average
5	0.774	42.11	-13.89	56.00	41.93	0.10	0.08 QP
6	0.774	28.53	-17.47	46.00	28.35	0.10	0.08 Average
7	1.039	43.27	-12.73	56.00	43.11	0.10	0.06 QP
8	1.039	28.23	-17.77	46.00	28.07	0.10	0.06 Average
9	1.190	40.68	-15.32	56.00	40.51	0.10	0.07 QP
10	1.190	26.36	-19.64	46.00	26.19	0.10	0.07 Average
11	1.399	39.33	-16.67	56.00	39.15	0.10	0.08 QP
12	1.399	21.63	-24.37	46.00	21.45	0.10	0.08 Average



Test Engineer : \_\_\_\_\_  
 Brian Lin

- Test Mode: Mode 2
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 24°C
- Relative Humidity: 53 %

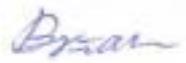
**The test was passed at the minimum margin that marked by a frame in the following data**

Site : COOL-HY  
 Condition : CNS/VCCI/CISPR-B 2003 2001/008 LINE  
 EUT : BlueTooth  
 Power : 110V/60Hz  
 Model :  
 Memo : TX CH39 2441MHz  
 : F381902

	Freq	Over Level	Limit	Read Line	Probe Level	Cable Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.392	46.50	-11.51	58.01	46.28	0.10	0.12	QP
2	0.392	32.76	-15.25	48.01	32.54	0.10	0.12	Average
3	0.538	46.71	-9.29	56.00	46.51	0.10	0.10	QP
4	0.538	31.25	-14.75	46.00	31.05	0.10	0.10	Average
5	0.686	47.27	-8.73	56.00	47.09	0.10	0.08	QP
6	0.686	33.72	-12.28	46.00	33.54	0.10	0.08	Average
7	0.793	46.90	-9.10	56.00	46.72	0.10	0.08	QP
8	0.793	30.13	-15.87	46.00	29.95	0.10	0.08	Average
9	0.943	46.30	-9.70	56.00	46.14	0.10	0.06	QP
10	0.943	29.01	-16.99	46.00	28.85	0.10	0.06	Average
11	1.056	27.62	-18.38	46.00	27.46	0.10	0.06	Average
12	1.056	45.24	-10.76	56.00	45.08	0.10	0.06	QP

Site : COOL-HY  
 Condition : CNS/VCCI/CISPR-B 2003 2001/008 NEUTRAL  
 EUT : BlueTooth  
 Power : 110V/60Hz  
 Model :  
 Memo : TX CH39 2441MHz  
 : F381902

	Freq	Over Level	Limit	Read Line	Probe Level	Cable Factor	Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.517	41.87	-14.13	56.00	41.67	0.10	0.10	QP
2	0.517	34.73	-11.27	46.00	34.53	0.10	0.10	Average
3	0.651	43.59	-12.41	56.00	43.40	0.10	0.09	QP
4	0.651	24.48	-21.52	46.00	24.29	0.10	0.09	Average
5	0.726	17.32	-28.68	46.00	17.14	0.10	0.08	Average
6	0.726	40.34	-15.66	56.00	40.16	0.10	0.08	QP
7	0.767	43.10	-12.90	56.00	42.92	0.10	0.08	QP
8	0.767	21.17	-24.83	46.00	20.99	0.10	0.08	Average
9	0.871	38.96	-17.04	56.00	38.79	0.10	0.07	QP
10	0.871	18.49	-27.51	46.00	18.32	0.10	0.07	Average
11	1.365	15.86	-30.14	46.00	15.68	0.10	0.08	Average
12	1.365	31.09	-24.91	56.00	30.91	0.10	0.08	QP



Test Engineer : \_\_\_\_\_  
 Brian Lin

- Test Mode: Mode 3
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 24°C
- Relative Humidity: 53 %

**The test was passed at the minimum margin that marked by a frame in the following data**

Site : CO01-HY  
 Condition : CMS/VCCI/CISPR-B 2003 2001/008 LINE  
 EUT : BlueTooth  
 Power : 110V/60Hz  
 Model :  
 Memo : TX CH78 2480MHz  
 : F381902

Freq	Level	Over Limit	Limit	Read		Cable	Remark
				Line	Level		
MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.424	46.10	-11.27	57.37	45.88	0.10	0.12 QP
2	0.424	34.23	-13.14	47.37	34.01	0.10	0.12 Average
3	0.542	34.34	-11.66	46.00	34.14	0.10	0.10 Average
4	0.542	47.38	-8.62	56.00	47.18	0.10	0.10 QP
5	0.615	28.81	-17.19	46.00	28.62	0.10	0.09 Average
6	0.615	46.35	-9.65	56.00	46.16	0.10	0.09 QP
7	0.718	33.53	-12.47	46.00	33.35	0.10	0.08 Average
8	0.718	47.96	-8.04	56.00	47.78	0.10	0.08 QP
9	0.822	47.26	-8.74	56.00	47.09	0.10	0.07 QP
10	0.822	31.99	-14.01	46.00	31.82	0.10	0.07 Average
11	1.024	38.10	-17.90	56.00	37.94	0.10	0.06 QP
12	1.024	17.36	-28.64	46.00	17.20	0.10	0.06 Average

Site : CO01-HY  
 Condition : CMS/VCCI/CISPR-B 2003 2001/008 NEUTRAL  
 EUT : BlueTooth  
 Power : 110V/60Hz  
 Model :  
 Memo : TX CH78 2480MHz  
 : F381902

Freq	Level	Over Limit	Limit	Read		Cable	Remark
				Line	Level		
MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.471	39.50	-17.00	56.50	39.29	0.10	0.11 QP
2	0.471	27.41	-19.09	46.50	27.20	0.10	0.11 Average
3	0.587	40.02	-18.98	56.00	39.83	0.10	0.09 QP
4	0.587	24.96	-21.04	46.00	24.77	0.10	0.09 Average
5	0.714	42.58	-13.42	56.00	42.40	0.10	0.08 QP
6	0.714	26.37	-19.63	46.00	26.19	0.10	0.08 Average
7	0.850	26.30	-19.70	46.00	26.13	0.10	0.07 Average
8	0.850	41.84	-14.16	56.00	41.67	0.10	0.07 QP
9	1.018	21.93	-24.07	46.00	21.77	0.10	0.06 Average
10	1.018	39.45	-16.55	56.00	39.29	0.10	0.06 QP
11	1.280	36.22	-19.78	56.00	36.04	0.10	0.08 QP
12	1.280	20.84	-25.16	46.00	20.66	0.10	0.08 Average

  
 Test Engineer : \_\_\_\_\_  
 Brian Lin

## 5.9. Test of Radiated Emission

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defines in ANSI C63.4-2001. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane, as shown in section 5.9.3 The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

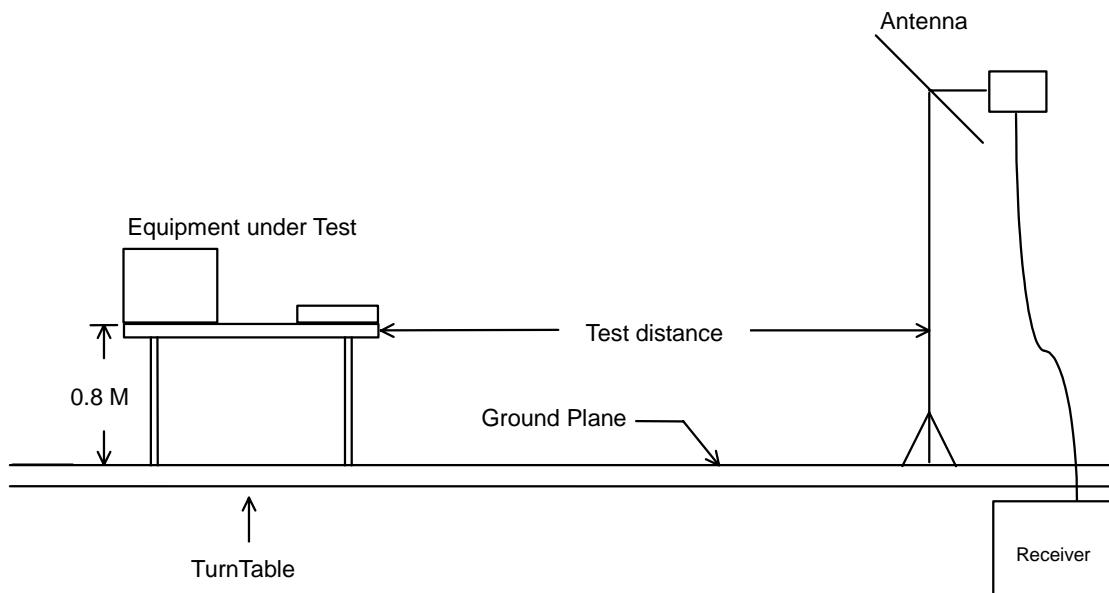
### 5.9.1. Major Measuring Instruments

- Amplifier (HP 8447D )
  - RF Gain 30 dB
  - Signal Input 100 KHz to 1.3 GHz
- Amplifier (MITEQ AFS44 )
  - RF Gain 40 dB
  - Signal Input 100 MHz to 26.5 GHz
- Spectrum analyzer ( R&S FSP40 )
  - Attenuation 10 dB
  - Start Frequency 1 GHz
  - Stop Frequency 25 GHz
  - Resolution Bandwidth 1 MHz
  - Video Bandwidth 1 MHz
  - Signal Input 9 KHz to 40 GHz
- Test Receiver ( SCHAFFNER SCR3501 )
  - Resolution Bandwidth 120 KHz
  - Frequency Band 9 K – 1 GHz
  - Quasi-Peak Detector ON for Quasi-Peak Mode  
OFF for Peak Mode

## 5.9.2. Test Procedures

1. The EUT was placed on a rotatable table top 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a broadband antenna and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
5. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. If the emission level of the EUT in peak mode was 3 dB lower than the 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 and reported.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 20dB lower 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.

## 5.9.3. Typical Test Setup Layout of Radiated Emission



## 5.9.4. Test Result of Radiated Emission

- Test Mode: Mode 1
- Test Distance: 3 M
- Temperature: 27°C
- Relative Humidity: 62 %
- Emission level (dB<sub>uV/m</sub>) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

**The test was passed at the minimum margin that marked by the frame in the following test record**

■ Spurious Emission

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH00 2402MHz  
 : F381902

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Preamp			Ant Pos	Table Pos
						dB	dB <sub>uV/m</sub>	dB <sub>uV</sub>		
1	91.020	36.18	-7.32	43.50	52.05	8.04	1.51	27.02	Peak	---
2	132.330	29.54	-13.96	43.50	44.00	10.45	1.96	26.87	Peak	---
3	240.330	30.86	-15.14	46.00	43.98	10.93	2.55	26.60	Peak	---
1	343.400	35.58	-10.42	46.00	46.25	12.79	3.40	26.06	Peak	---
2	397.300	36.50	-9.50	46.00	45.63	14.54	3.51	27.18	Peak	---
3	931.400	38.12	-7.88	46.00	40.58	19.52	5.73	27.71	Peak	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH00 2402MHz  
 : F381902

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Preamp			Ant Pos	Table Pos
						dB	dB <sub>uV/m</sub>	dB <sub>uV</sub>		
1	89.940	36.61	-6.89	43.50	53.42	8.78	1.43	27.02	Peak	---
2	191.730	33.84	-9.66	43.50	50.86	7.39	2.22	26.63	Peak	---
3	198.210	34.06	-9.44	43.50	51.09	7.29	2.20	26.60	Peak	---
1	455.400	34.74	-11.26	46.00	43.24	15.40	3.58	27.48	Peak	---
2	786.500	36.70	-9.30	46.00	40.99	18.68	5.03	28.00	Peak	---
3	932.100	35.91	-10.09	46.00	38.35	19.53	5.73	27.70	Peak	---

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-6741 HORIZONTAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL : GPS9822  
 MEMO : TX CH00 2402MHz  
 : F381902

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Preamp			Ant Pos	Table Pos
						Loss	Factor	Remark		
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB	cm	deg	
1	1198.000	42.27	-31.73	74.00	53.74	24.60	4.24	40.31	Peak	---
2	1198.000	22.74	-31.26	54.00	34.21	24.60	4.24	40.31	Average	---
3	1324.000	40.79	-33.21	74.00	51.89	24.91	4.43	40.44	Peak	---
4	1324.000	22.86	-31.14	54.00	33.96	24.91	4.43	40.44	Average	---
5	1454.000	41.46	-32.54	74.00	52.18	25.22	4.63	40.57	Peak	---
6	1454.000	25.03	-28.97	54.00	35.75	25.22	4.63	40.57	Average	---
7	1590.000	45.61	-28.39	74.00	55.66	25.73	4.88	40.66	Peak	---
8	1590.000	26.23	-27.77	54.00	36.28	25.73	4.88	40.66	Average	---
9	2126.000	46.99	-27.01	74.00	54.46	27.66	5.85	40.98	Peak	---
10	2126.000	31.10	-22.90	54.00	38.57	27.66	5.85	40.98	Average	---
1	3950.000	51.35	-22.65	74.00	51.09	32.50	9.24	41.48	Peak	---
2	3950.000	50.45	-3.55	54.00	50.19	32.50	9.24	41.48	Average	---

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-6741 VERTICAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL : GPS9822  
 MEMO : TX CH00 2402MHz  
 : F381902

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Preamp			Ant Pos	Table Pos
						Loss	Factor	Remark		
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB	cm	deg	
1	1454.000	42.40	-31.60	74.00	53.12	25.22	4.63	40.57	Peak	---
2	1454.000	27.95	-26.05	54.00	38.67	25.22	4.63	40.57	Average	---
3	1588.000	50.45	-23.55	74.00	60.51	25.72	4.88	40.66	Peak	---
4	1588.000	30.50	-23.50	54.00	40.56	25.72	4.88	40.66	Average	---
5	1726.000	44.89	-29.11	74.00	54.19	26.29	5.15	40.74	Peak	---
6	1726.000	27.23	-26.77	54.00	36.53	26.29	5.15	40.74	Average	---
7	1748.000	47.40	-26.60	74.00	56.59	26.38	5.19	40.76	Peak	---
8	1748.000	30.46	-23.54	54.00	39.65	26.38	5.19	40.76	Average	---
9	1844.000	49.23	-24.77	74.00	57.00	26.78	5.38	40.81	Peak	---
10	1844.000	31.17	-22.83	54.00	39.82	26.78	5.38	40.81	Average	---
1	4988.000	52.03	-21.97	74.00	52.07	33.40	9.16	42.60	Peak	---
2	4988.000	50.85	-3.15	54.00	50.89	33.40	9.16	42.60	Average	100 120

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

## ■ Field strength of fundamental and harmonics

Frequency ( MHz )	Antenna Polarity	Cable Factor	Reading Loss	Limits	Emission ( dBuV/m )	Level ( uV/m )	Margin ( dB )	Detect Mode	
2404.000	H	28.23	6.21	19.42	-	-	53.86	493.17	Peak
2404.000	H	28.23	6.21	37.06	-	-	71.50	3758.37	A.V.
2404.000	V	28.23	6.21	37.48	-	-	71.92	3944.57	Peak
2404.000	V	28.23	6.21	20.13	-	-	54.57	535.18	A.V.
4804.000	V/H					-			A.V.
7206.000	V/H					-			Peak, A.V.
9608.000	V/H					-			Peak, A.V.
12010.000	V/H					-			Peak, A.V.
14412.000	V/H					-			Peak, A.V.
16814.000	V/H					-			Peak, A.V.
19216.000	V/H					-			Peak, A.V.
21618.000	V/H					-			Peak, A.V.
24020.000	V/H					-			Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer : Steve  
Steve Chen

- Test Mode: Mode 2
- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

**The test was passed at the minimum margin that marked by the frame in the following test record**

■ Spurious Emission

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH39 2441MHz  
 : F381902

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Preamp		Ant Pos	Table Pos
						dB	dB		
1	97.770	34.73	-8.77	43.50	50.77	9.23	1.73	27.00 Peak	---
2	179.040	29.79	-13.71	43.50	46.76	7.59	2.12	26.68 Peak	---
3	240.330	31.14	-14.86	46.00	44.26	10.93	2.55	26.60 Peak	---
1	397.300	37.41	-8.59	46.00	46.54	14.54	3.51	27.18 Peak	---
2	430.900	35.99	-10.01	46.00	44.73	15.07	3.54	27.35 Peak	---
3	929.300	37.11	-8.89	46.00	39.60	19.52	5.70	27.71 Peak	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH39 2441MHz  
 : F381902

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Preamp		Ant Pos	Table Pos
						dB	dB		
1	94.260	36.92	-6.58	43.50	53.11	9.04	1.78	27.01 Peak	---
2	198.210	34.08	-9.42	43.50	51.11	7.29	2.28	26.60 Peak	---
3	204.420	32.90	-10.60	43.50	49.50	7.68	2.32	26.60 Peak	---
1	396.600	34.09	-11.91	46.00	43.24	14.52	3.51	27.18 Peak	---
2	786.500	35.98	-10.02	46.00	40.27	18.68	5.03	28.00 Peak	---
3	931.400	36.95	-9.05	46.00	39.41	19.52	5.73	27.71 Peak	---

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-6741 HORIZONTAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH39 2441MHz  
 : F381902

Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Ant	Table
		Limit	Line	Level	Factor	Loss	Factor		Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB	cm	deg
1	1220.000	44.04	-29.96	74.00	55.45	24.65	4.27	40.33	Peak
2	1220.000	22.85	-31.15	54.00	34.26	24.65	4.27	40.33	Average
3	1452.000	40.46	-33.54	74.00	51.17	25.22	4.63	40.56	Peak
4	1452.000	22.86	-31.14	54.00	33.57	25.22	4.63	40.56	Average
5	1518.000	41.00	-33.00	74.00	51.45	25.43	4.74	40.62	Peak
6	1518.000	26.40	-27.60	54.00	36.85	25.43	4.74	40.62	Average
7	1590.000	44.30	-29.70	74.00	54.35	25.73	4.88	40.66	Peak
8	1590.000	26.87	-27.13	54.00	36.92	25.73	4.88	40.66	Average
9	1724.000	41.62	-32.38	74.00	50.93	26.28	5.15	40.74	Peak
10	1724.000	20.95	-33.05	54.00	30.26	26.28	5.15	40.74	Average
1	3950.000	51.78	-22.22	74.00	51.52	32.50	9.24	41.48	Peak
2	3950.000	50.77	-3.23	54.00	50.51	32.50	9.24	41.48	Average
								100	115

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-6741 VERTICAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH39 2441MHz  
 : F381902

Freq	Level	Over	Limit	Read	Probe	Cable	Preamp	Ant	Table
		Limit	Line	Level	Factor	Loss	Factor		Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB	cm	deg
1	1196.000	41.24	-32.76	74.00	52.71	24.60	4.24	40.31	Peak
2	1196.000	19.66	-34.34	54.00	31.13	24.60	4.24	40.31	Average
3	1326.000	42.94	-31.06	74.00	54.03	24.91	4.44	40.44	Peak
4	1326.000	20.06	-33.94	54.00	31.15	24.91	4.44	40.44	Average
5	1454.000	44.08	-29.92	74.00	54.80	25.22	4.63	40.57	Peak
6	1454.000	22.94	-31.06	54.00	33.66	25.22	4.63	40.57	Average
7	1590.000	51.04	-22.96	74.00	61.09	25.73	4.88	40.66	Peak
8	1590.000	28.69	-25.31	54.00	38.74	25.73	4.88	40.66	Average
9	1718.000	43.34	-30.66	74.00	52.68	26.26	5.14	40.74	Peak
10	1718.000	24.77	-29.23	54.00	34.11	26.26	5.14	40.74	Average
1	4884.000	52.38	-21.62	74.00	52.54	33.19	9.10	42.45	Peak
2	4884.000	43.02	-10.98	54.00	43.18	33.19	9.10	42.45	Average

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

## ■ Field strength of fundamental and harmonics

Frequency ( MHz )	Antenna Polarity	Cable Factor	Reading Loss	Limits	Emission ( dBuV/m )	Level ( uV/m )	Margin ( dB )	Detect Mode
2444.000	H	28.31	6.27	22.49	-	57.07	713.67	Peak
2444.000	H	28.31	6.27	41.13	-	75.71	6102.39	A.V.
2444.000	V	28.31	6.27	40.82	-	75.40	5888.44	Peak
2444.000	V	28.31	6.27	21.69	-	56.27	650.88	A.V.
7323.000	V/H					-		Peak, A.V.
7323.000	V/H					-		Peak, A.V.
9764.000	V/H					-		Peak, A.V.
12205.000	V/H					-		Peak, A.V.
14646.000	V/H					-		Peak, A.V.
17087.000	V/H					-		Peak, A.V.
19528.000	V/H					-		Peak, A.V.
21969.000	V/H					-		Peak, A.V.
24410.000	V/H					-		Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer : Steve

Steve Chen

- Test Mode: Mode 3
- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

**The test was passed at the minimum margin that marked by the frame in the following test record**

■ Spurious Emission

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT HORIZONTAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH78 2480MHz  
 : F381902

Freq	Level	Over Limit		Read Line	Probe Factor	Cable Preamp		Remark	Ant Pos	Table Pos
		MHz	dBuV/m	dB	dBuV/m	dB	dB			
1	89.130	36.52	-6.98	43.50	53.36	8.74	1.44	27.02 Peak	---	---
2	178.500	29.66	-13.84	43.50	46.64	7.58	2.12	26.60 Peak	---	---
3	275.970	30.41	-15.59	46.00	42.68	11.59	2.74	26.60 Peak	---	---
1	397.300	39.08	-6.92	46.00	48.21	14.54	3.51	27.18 Peak	---	---
2	430.900	35.09	-10.11	46.00	44.63	15.07	3.54	27.35 Peak	---	---
3	932.100	37.10	-8.90	46.00	39.54	19.53	5.73	27.70 Peak	---	---

Site : 03CH03-HY  
 Condition : 3m 03CH03-MAT VERTICAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH78 2441MHz  
 : F381902

Fr	Level	Over Limit		Read Line	Probe Factor	Cable Preamp		Remark	Ant Pos	Table Pos
		MHz	dBuV/m	dB	dBuV/m	dB	dB			
1	94.260	36.92	-6.58	43.50	53.11	9.04	1.78	27.01 Peak	---	---
2	198.210	34.08	-9.42	43.50	51.11	7.29	2.28	26.60 Peak	---	---
3	204.420	32.90	-10.60	43.50	49.50	7.68	2.32	26.60 Peak	---	---
1	324.500	34.41	-11.59	46.00	45.80	12.19	3.17	26.75 Peak	---	---
2	397.300	34.24	-11.76	46.00	43.37	14.54	3.51	27.18 Peak	---	---
3	786.500	36.06	-9.94	46.00	40.35	18.68	5.03	28.00 Peak	---	---

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-6741 HORIZONTAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL :  
 MEMO : TX CH78 2480MHz  
 : F381902

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Preamp		Ant Pos	Table Pos
						dB	dB		
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB	cm	deg
1	1238.000	45.34	-28.66	74.00	56.69	24.70	4.30	40.35	Peak
2	1238.000	19.76	-34.24	54.00	31.11	24.70	4.30	40.35	Average
3	1460.000	40.44	-33.56	74.00	51.13	25.24	4.64	40.57	Peak
4	1460.000	19.05	-34.95	54.00	29.74	25.24	4.64	40.57	Average
5	1524.000	41.11	-32.89	74.00	51.52	25.46	4.75	40.62	Peak
6	1524.000	19.36	-34.64	54.00	29.77	25.46	4.75	40.62	Average
7	1596.000	42.30	-31.70	74.00	52.32	25.75	4.89	40.66	Peak
8	1596.000	21.56	-32.44	54.00	31.58	25.75	4.89	40.66	Average
9	1806.000	43.22	-30.78	74.00	52.08	26.62	5.31	40.79	Peak
10	1806.000	25.85	-28.15	54.00	34.71	26.62	5.31	40.79	Average
1	4030.000	51.71	-22.29	74.00	51.33	32.58	9.33	41.53	Peak
2	4030.000	50.85	-3.15	54.00	50.47	32.58	9.33	41.53	Average
								100	115

Site : 03CH03-HY  
 Condition : 3m HORN-ANT-6741 VERTICAL  
 EUT : Bluetooth  
 Power : 110V/60Hz  
 MODEL : GPS9822  
 MEMO : TX CH78 2480MHz  
 : F381902

Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Preamp		Ant Pos	Table Pos
						dB	dB		
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB	cm	deg
1	1190.000	40.90	-33.10	74.00	52.39	24.58	4.23	40.30	Peak
2	1190.000	22.03	-31.97	54.00	33.52	24.58	4.23	40.30	Average
3	1324.000	42.61	-31.39	74.00	53.71	24.91	4.43	40.44	Peak
4	1324.000	23.18	-30.82	54.00	34.28	24.91	4.43	40.44	Average
5	1454.000	42.92	-31.08	74.00	53.64	25.22	4.63	40.57	Peak
6	1454.000	23.52	-30.48	54.00	34.24	25.22	4.63	40.57	Average
7	1590.000	50.92	-23.08	74.00	60.97	25.73	4.88	40.66	Peak
8	1590.000	28.69	-25.31	54.00	38.74	25.73	4.88	40.66	Average
9	1718.000	42.47	-31.53	74.00	51.01	26.26	5.14	40.74	Peak
10	1718.000	24.17	-29.83	54.00	33.51	26.26	5.14	40.74	Average
1	4964.000	51.53	-22.47	74.00	51.60	33.35	9.14	42.56	Peak
2	4964.000	41.56	-12.44	54.00	41.63	33.35	9.14	42.56	Average

➤ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

## ■ Field strength of fundamental and harmonics

Frequency ( MHz )	Antenna Polarity	Cable Factor	Reading ( dB )	Loss ( dBuV )	Limits ( dBuV/m )	Emission ( dBuV/m )	Level ( uV/m )	Margin ( dB )	Detect Mode
2478.000	H	28.38	6.31	20.55	-	55.24	578.10		A.V.
2478.000	H	28.38	6.31	38.07	-	72.76	4345.10		Peak
2478.000	V	28.38	6.31	21.19	-	55.88	622.30		Peak
2478.000	V	28.38	6.31	38.08	-	72.77	4350.11		A.V.
4960.000	V/H						-		Peak, A.V.
7440.000	V/H						-		Peak, A.V.
9920.000	V/H						-		Peak, A.V.
12400.000	V/H						-		Peak, A.V.
14880.000	V/H						-		Peak, A.V.
17360.000	V/H						-		Peak, A.V.
19840.000	V/H						-		Peak, A.V.
22320.000	V/H						-		Peak, A.V.
24800.000	V/H						-		Peak, A.V.

Remark: The emission emitted by the EUT is too low to be measured except the emission listed above

Test Engineer : Steve

Steve Chen

## **6. Antenna Requirements**

The EUT use a undetachable antenna. It is considered meet antenna requirement of FCC.

### **6.1.1. Standard Applicable**

For intentional device, according to FCC 47 CFR 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

### **6.1.2. Antenna Connected Construction**

The maximum Gain antenna used in this product is Ceramic Chip antenna, No antenna Connector.

## 7. RF Exposure

FCC Rules and Regulations Part 1.1307,1.1310,2.1091,2.1093:

RF Exposure Compliance

### 7.1.1. Limit For Maximum Permissible Exposure (MPE)

#### (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/ cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> 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/cm <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> 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

## 7.1.2. MPE Calculations

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } P_d \text{ (mW/cm}^2\text{)} = \frac{E^2}{3770}$$

E = Electric field (V/m)

P = Peak output power (mW)

G = Antenna numeric gain (numeric)

d = Separation distance (m)

Because the EUT is belong to General Population/ Uncontrolled Exposure. So the Limit of Power Density is 10 W/m<sup>2</sup>. We can change the formula to:

$$d = \sqrt{\frac{30 \times P \times G}{3770}}$$

Channel No.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated RF Exposure Separation Distance (cm)	Minimum RF Exposure Separation Distance (cm)
Channel 00	0.00	1.00	-3.88	0.40	0.18	20
Channel 39	0.00	1.00	-4.20	0.40	0.17	20
Channel 78	0.00	1.00	-3.86	0.40	0.18	20

## 7.1.3. FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation. Proposed RF exposure safety information to include in User's Manual.

## **8. EMI Suppression Component List**

No EMI suppression components.

## 9. Antenna Factor &amp; Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.01	1000	24.10	3.92
35	13.63	1.04	2000	27.40	5.66
40	11.11	1.09	3000	30.00	7.20
45	10.59	1.24	4000	32.60	9.36
50	6.47	1.43	5000	33.40	9.16
55	5.83	1.39	6000	34.20	10.70
60	5.18	1.59	7000	35.30	12.16
65	4.81	1.41	8000	36.90	13.12
70	4.43	1.43	9000	38.10	13.81
75	5.10	1.55	10000	39.00	14.83
80	5.91	1.56	11000	38.60	15.83
85	7.33	1.62	12000	39.50	17.11
90	8.74	1.41	13000	39.30	17.62
95	9.05	1.81	14000	41.60	18.37
100	9.36	1.68	15000	40.60	19.10
110	9.65	1.73	16000	37.20	19.72
120	9.97	1.79	17000	40.20	21.98
130	10.51	1.93	18000	48.90	21.22
140	10.32	2.06	19000	37.60	23.90
150	9.42	2.09	20000	37.30	24.07
160	8.09	2.12	21000	37.00	25.49
170	7.43	2.12	22000	38.00	24.92
180	7.60	2.12	23000	38.70	25.60
190	7.43	2.21	24000	38.60	25.70
200	7.26	2.29	25000	24.10	3.92
220	9.11	2.42	14000	27.40	5.66
240	10.88	2.54	15000	30.00	7.20
260	11.75	2.66	16000	32.60	9.36
280	11.55	2.76	17000	33.40	9.16
300	11.36	2.85	18000	34.20	10.70
320	12.03	3.10	19000	35.30	12.16
340	12.69	3.36	20000	36.90	13.12
360	13.33	3.49	21000	38.10	13.81
380	14.00	3.50	22000	39.00	14.83
400	14.63	3.51	23000	38.60	15.83
450	15.33	3.55	24000	39.50	17.11
500	16.03	3.81	25000	39.30	17.62
550	16.65	4.05			
600	17.29	4.23			
650	17.64	4.63			
700	18.00	4.74			
750	18.39	4.95			
800	18.79	5.06			
850	19.10	5.18			
900	19.42	5.40			
950	19.58	5.91			
1000	19.75	5.58			

## 10. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2003	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP40	100004	9KHZ~40GHz	Aug. 07, 2003	Radiation (03CH03-HY)
Receiver	SCHAFFNER	SCR 3501	417	9 KHz –1GHz	Feb. 20, 2003	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Oct. 21, 2002	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2687	30MHz –2GHz	Dec. 21, 2002	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Jan. 02, 2003	Radiation (03CH03-HY)
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Jul. 23, 2003	Radiation (03CH03-HY)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 10, 2003	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170154	15GHz~40GHz	Jun. 02, 2003	Radiation (03CH03-HY)
RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Mar. 14, 2003	Radiation (03CH03-HY)
Power meter	R&S	NRVS	100444	DC~40GHz	May 28, 2003	Conducted
Power sensor	R&S	NRV-Z55	100049	DC~40GHz	May 28, 2003	Conducted
Power Sensor	R&S	NRV-Z32	100057	30MHz-6GHz	May 28, 2003	Conducted
AC power source	HPC	HPA-500W	HPA-9100024	AC 0~300V	May 27, 2003	Conducted
Temp. and Humidity	KSON	THS-C3L	612	N/A	Oct. 02, 2002	Conducted
Power meter	R&S	NRVS	100444	DC~40GHz	May 28, 2003	Conducted

Calibration Interval of instruments listed above is one year.

## 11. Uncertainty of Test Site

### Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m
Antenna factor calibration	normal(k=2)	±1
cable loss calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
Antenna Directivity	rectangular	±3
Antenna Factor V.S. Height	rectangular	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25
site imperfection	rectangular	±2
Mismatch Receiver VSWR Γ1=0.09 Antenna VSWR Γ2=0.67 Uncertainty=20log(1-Γ1*Γ2)	U-shaped	±0.54
combined standard uncertainty Ue(y)	normal	±2.7
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±5.4

U=  $\{(1/2)^2+(0.3/2)^2+(2^2+0.5^2+2^2+0.25^2+2^2)/3+(0.54)^2/2\}=2.2$  for 10m test distance

U=  $\{(1/2)^2+(0.3/2)^2+(2^2+3^2+2^2+0.25^2+2^2)/3+(0.54)^2/2\}=2.7$  for 3m test distance

### Uncertainty of Conducted Emission Measurement

Contribution	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR Γ1=0.09 LISN VSWR Γ2=0.33 Uncertainty=20log(1-Γ1*Γ2)	U-shaped	0.2
combined standard uncertainty Ue(y)	normal	±1.66
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±3.32

U=  $\{(0.3/2)^2+(2^2+1.5^2+0.2^2)/3+(0.2)^2/2\}=1.66$