FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Bluetooth Access Point with Broadband Router

Model No. : APBTC1G-X, APBTC1GA-X, APBTC1GB-X

FCC ID. : NLF-APBTC1G

Filing Type : Certification

Applicant : **Billionton Systems Inc.**
No. 21, Sui-Lih Rd., Hsin-Chu, Taiwan

SPORTON 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: Jun. 13, 2003

■ No additional attachment.

□ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

Certificate No. : F341704

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

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Filing Type : Certification

Applicant : **Billionton Systems Inc.**
No. 21, Sui-Lih Rd., Hsin-Chu, Taiwan

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 1992** 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 May 29, 2003 at **SPORTON International Inc.** LAB.

K. J. Lin
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

Billionton Systems Inc.
No. 21, Sui-Lih Rd., Hsin-Chu, Taiwan

1.2. Manufacturer

Same as 1.1

1.3. Basic Description of Equipment under Test

Equipment	: Bluetooth Access Point with Broadband Router
Model No.	: APBTC1G-X, APBTC1GA-X, APBTC1GB-X
FCC ID	: NLF-APBTC1G
Trade Name	: Billionton
TP Cable x 2	: Non-Shielded, 1m
Power Supply Type	: Switching
AC Power Input	: Wall-Mount, 2pin
DC Power Cable	: Non-Shielded, 1.5m

1.4. Feature of Equipment under Test

Product Feature & Specification	
1. Host/Radio Interface	IEEE802.3 / Bluetooth
2. Type of Modulation	FHSS
3. Number of Channels	79
4. Frequency Band	2402 ~2480 MHz
5. Carrier Frequency of each channel	F=2402+K MHz, K=0~78
6. Bandwidth of each channel	1 MHz
7. Maximum Output Power to Antenna	5 dBm(Max)
8. IF & L.O. frequency	Zreo IF, L.O=16MHz
9. Type of Antenna Connector (Ex: SMA,TNC, MCX, MMCX, UFC……etc)	NA
10. Antenna Type / Class and Gain	Type: RF Antenna Cable Assembly Gain: 1.7 dBi
11. Function Type	Transceiver
12. Power Rating (DC/AC, Voltage)	6~9V DC
13. Duty Cycle	36%
14. Basic function of product	Bluetooth Access Point (Router)
15. Adapter	SPECLIN ENTERPRISE CO., LTD, / SL05A106-U

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 C63.4-1992 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. For EMI test, vertical polarity of RF antenna generates the worse case, so the following test modes were tested with vertical:
   Mode 1: CH00（2402MHz）
   Mode 2: CH39（2441MHz）
   Mode 3: CH78（2480MHz）
d. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 24800MHz.

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 compy 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.

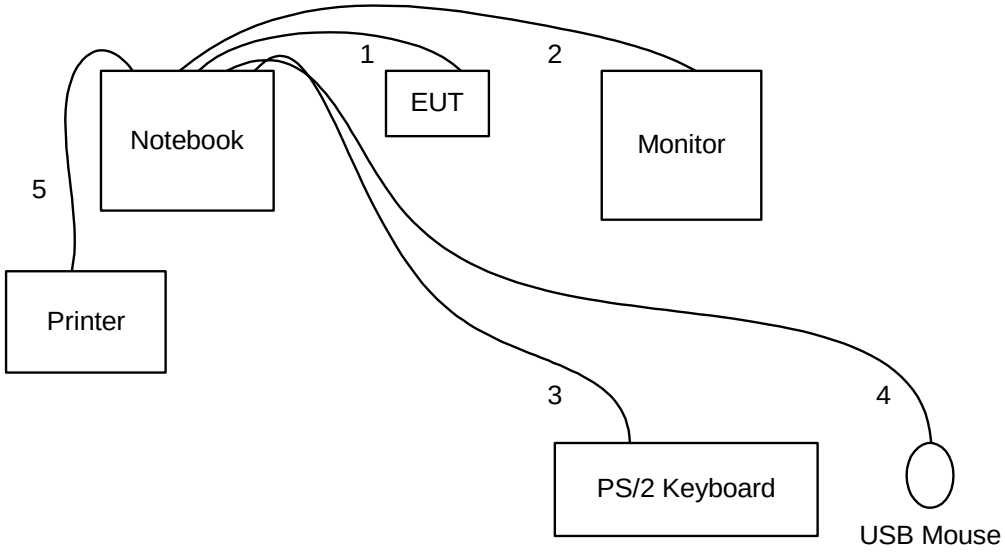
Support Unit 4. -- USB Mouse (LOGITECH)

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 COLRO 680
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 TP cable is connected from Notebook to the EUT.
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 2000, 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, the EUT 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, 03CH02-HY

4.1. Test Voltage

115V/60Hz

4.2. Standard for Methods of Measurement

ANSI C63.4-1992 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

4.4. Frequency Range Investigated

a. Conduction: from 150 KHz to 30 MHz
b. Radiation: from 30 MHz to 24800MHz

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

5.2. Hopping Channel Separation

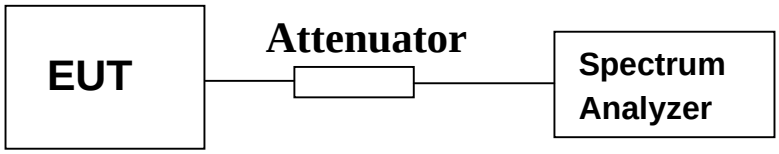
5.2.1. Measuring Instruments：

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: 63 %
- Duty cycle of the equipment during the test X ＝ 36%

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	1004.0000	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

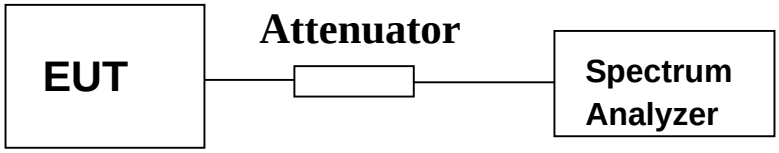
5.3.1. Measuring Instruments：

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: 63 %
- Duty cycle of the equipment during the test X ＝ 36%

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

5.4. Hopping Channel Bandwidth

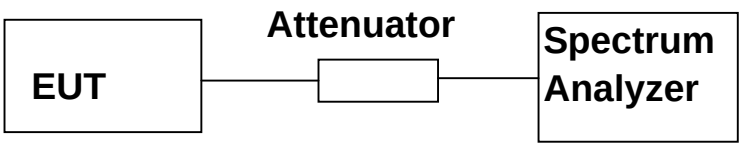
5.4.1. Measuring Instruments：

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 100KHz and VBW to 100KHz.
3. The Hopping Channel bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.

5.4.3. Test Setup Layout：



5.4.4. Test Result：See spectrum analyzer plots below

- Temperature: 27°C
- Relative Humidity: 63 %
- Duty cycle of the equipment during the test X ＝ 36%

Channel	Frequency (MHz)	Hopping Channel Bandwidth (KHz)	Limits (MHz)	Plot Ref. No.
00	2402	277.0000	1.0	1
39	2441	274.0000	1.0	2
78	2480	271.0000	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

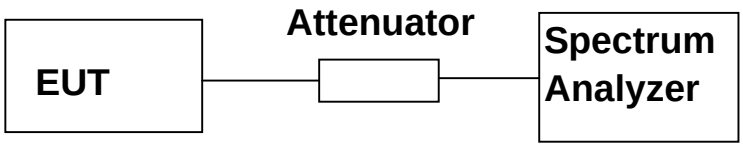
5.5.1. Measuring Instruments：

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: 63 %
- Duty cycle of the equipment during the test X ＝ 36%

Channel	Frequency (MHz)	Dwell Time (s)	Limits (s)	Plot Ref. No.
00	2402	0.136226643	0.4	1
39	2441	0.137432188	0.4	2
78	2480	0.138637734	0.4	3

5.5.5. Test Configuration（EUT Operating Condition）：

Same as Section 5.2.5.

5.6. Output Power

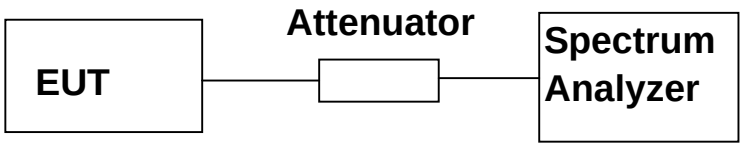
5.6.1. Measuring Instruments：

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: 63 %
- Duty cycle of the equipment during the test X ＝ 36%

Channel	Frequency (MHz)	Measured Output Power (mWatt)	Measured Output Power (dBm)	Limits (Watt/dBm)
00	2402	3.026913428	4.81	1W/30 dBm
39	2441	2.837919028	4.53	1W/30 dBm
78	2480	2.398832919	3.80	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 lose 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 page 31. shows 57.73dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

Polarity	The emission of carrier power strength (dB μV/m)	The maximum field strength in restrict band (dB μV/m)	Limit (dB μV/m)	Margin (dB)	Detector	Result
H	99.94	46.92	74.00	-27.08	Peak	Pass
H	92.30	39.28	54.00	-14.72	Average	Pass
V	111.31	58.29	74.00	-15.71	Peak	Pass
V	103.63	50.61	54.00	-3.39	Average	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 C63.4-1992 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: 26°C
- Relative Humidity: 68 %
- Test Date: 2003-5-29

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

Site : C001-HY
Condition : CISPR CLASS-B 2003 2001/008 LINE
EUT : BLUE TOOTH A.P.
Power : 110V/60Hz
Model : APBTCI
Memo : TX CH00 2402MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.191	43.65	-10.36	54.01	43.51	0.10	0.04	Average
2	0.192	50.96	-12.99	63.95	50.82	0.10	0.04	QP
3	0.259	32.44	-19.02	51.46	32.29	0.10	0.05	Average
4	0.259	39.61	-21.85	61.46	39.46	0.10	0.05	QP
5	0.387	19.42	-28.71	48.13	19.26	0.10	0.06	Average
6	0.387	25.94	-32.19	58.13	25.78	0.10	0.06	QP
7	0.513	25.75	-30.25	56.00	25.58	0.10	0.07	QP
8	0.513	19.19	-26.81	46.00	19.02	0.10	0.07	Average
9	2.490	6.57	-39.43	46.00	6.32	0.10	0.15	Average
10	2.490	12.06	-43.94	56.00	11.81	0.10	0.15	QP
11	8.240	28.85	-31.15	60.00	28.38	0.18	0.29	QP
12	8.240	22.15	-27.85	50.00	21.68	0.18	0.29	Average

Site : C001-HY
Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
EUT : BLUE TOOTH A.P.
Power : 110V/60Hz
Model : APBTCI
Memo : TX CH00 2402MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.190	46.56	-17.48	64.04	46.42	0.10	0.04	QP
2	0.190	36.94	-17.10	54.04	36.80	0.10	0.04	Average
3	0.251	35.48	-16.24	51.72	35.33	0.10	0.05	Average
4	0.251	42.16	-19.56	61.72	42.01	0.10	0.05	QP
5	0.313	37.36	-22.53	59.89	37.21	0.10	0.05	QP
6	0.313	32.64	-17.25	49.89	32.49	0.10	0.05	Average
7	1.760	15.93	-30.07	46.00	15.70	0.10	0.13	Average
8	1.760	24.96	-31.04	56.00	24.73	0.10	0.13	QP
9	3.960	24.52	-31.48	56.00	24.14	0.20	0.18	QP
10	3.960	13.13	-32.87	46.00	12.75	0.20	0.18	Average
11	8.150	22.02	-27.98	50.00	21.53	0.20	0.29	Average
12	8.150	29.72	-30.28	60.00	29.23	0.20	0.29	QP

Test Engineer: John

John Huang

- Test Mode: Mode 2
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 26°C
- Relative Humidity: 68 %
- Test Date: 2003-5-29
- ■ The test was passed at the minimum margin that marked by a frame in the following data

Site : C001-HY
Condition : CISPR CLASS-B 2003 2001/008 LINE
EUT : BLUE TOOTH A.P.
Power : 110V/60Hz
Model : APBTCI
Memo : TX CH39 2441MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.188	48.35	-15.77	64.12	48.21	0.10	0.04	QP
2	0.188	41.01	-13.11	54.12	40.87	0.10	0.04	Average
3	0.377	35.56	-12.78	48.34	35.40	0.10	0.06	Average
4	0.379	37.05	-21.25	58.30	36.89	0.10	0.06	QP
5	0.564	32.63	-13.37	46.00	32.45	0.10	0.08	Average
6	0.564	35.58	-20.42	56.00	35.40	0.10	0.08	QP
7	1.570	24.50	-31.50	56.00	24.27	0.10	0.13	QP
8	1.570	16.94	-29.06	46.00	16.71	0.10	0.13	Average
9	8.020	29.14	-30.86	60.00	28.67	0.18	0.29	QP
10	8.023	22.41	-27.59	50.00	21.94	0.18	0.29	Average
11	25.050	17.22	-42.78	60.00	16.23	0.50	0.49	QP
12	25.050	8.97	-41.03	50.00	7.98	0.50	0.49	Average

Site : C001-HY
Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
EUT : BLUE TOOTH A.P.
Power : 110V/60Hz
Model : APBTCI
Memo : TX CH39 2441MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.187	35.21	-18.98	54.19	35.07	0.10	0.04	Average
2	0.190	46.17	-17.87	64.04	46.03	0.10	0.04	QP
3	0.257	31.45	-20.08	51.53	31.30	0.10	0.05	Average
4	0.257	38.66	-22.87	61.53	38.51	0.10	0.05	QP
5	0.376	30.21	-18.15	48.36	30.05	0.10	0.06	Average
6	0.376	33.33	-25.03	58.36	33.17	0.10	0.06	QP
7	1.758	13.27	-32.73	46.00	13.04	0.10	0.13	Average
8	1.760	25.10	-30.90	56.00	24.87	0.10	0.13	QP
9	3.960	13.19	-32.81	46.00	12.81	0.20	0.18	Average
10	3.960	24.60	-31.40	56.00	24.22	0.20	0.18	QP
11	8.869	24.76	-25.24	50.00	24.26	0.20	0.30	Average
12	8.870	30.32	-29.68	60.00	29.82	0.20	0.30	QP

Test Engineer: 

John Huang

- Test Mode: Mode 3
- Frequency Range of Test: from 150KHz to 30 MHz
- 6dB Bandwidth: 9KHz
- Temperature: 26°C
- Relative Humidity: 68 %
- Test Date: 2003-5-29
- ■ The test was passed at the minimum margin that marked by a frame in the following data

Site : C001-HY
Condition : CISPR CLASS-B 2003 2001/008 LINE
EUT : BLUE TOOTH A.P.
Power : 110V/60Hz
Model : APBTCI
Memo : TX CH78 2480MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.188	48.42	-15.70	64.12	48.28	0.10	0.04	QP
2	0.192	39.99	-13.96	53.95	39.85	0.10	0.04	Average
3	0.252	41.76	-9.93	51.69	41.61	0.10	0.05	Average
4	0.252	45.83	-15.86	61.69	45.68	0.10	0.05	QP
5	0.310	32.81	-17.15	49.96	32.66	0.10	0.05	Average
6	0.313	40.89	-19.00	59.89	40.74	0.10	0.05	QP
7	0.379	35.64	-12.66	48.30	35.48	0.10	0.06	Average
8	0.379	37.07	-21.23	58.30	36.91	0.10	0.06	QP
9	1.570	18.22	-27.78	46.00	17.99	0.10	0.13	Average
10	1.570	26.18	-29.82	56.00	25.95	0.10	0.13	QP
11	8.020	22.65	-27.35	50.00	22.18	0.18	0.29	Average
12	8.020	29.52	-30.48	60.00	29.05	0.18	0.29	QP

Site : C001-HY
Condition : CISPR CLASS-B 2003 2001/008 NEUTRAL
EUT : BLUE TOOTH A.P.
Power : 110V/60Hz
Model : APBTCI
Memo : TX CH78 2480MHz

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.186	34.29	-19.92	54.21	34.15	0.10	0.04	Average
2	0.190	46.07	-17.97	64.04	45.93	0.10	0.04	QP
3	0.252	42.14	-19.54	61.68	41.99	0.10	0.05	QP
4	0.252	35.71	-15.97	51.68	35.56	0.10	0.05	Average
5	0.310	32.27	-27.70	59.97	32.12	0.10	0.05	QP
6	0.310	26.28	-23.69	49.97	26.13	0.10	0.05	Average
7	0.633	35.18	-20.82	56.00	35.00	0.10	0.08	QP
8	0.634	31.47	-14.53	46.00	31.29	0.10	0.08	Average
9	1.257	20.69	-25.31	46.00	20.48	0.10	0.11	Average
10	1.260	26.42	-29.58	56.00	26.21	0.10	0.11	QP
11	8.145	22.62	-27.38	50.00	22.13	0.20	0.29	Average
12	8.150	29.86	-30.14	60.00	29.37	0.20	0.29	QP

Test Engineer: John

John Huang

5.9. Test of Radiated Emission

Radiated emissions from 30 MHz to 24.8 GHz were measured according to the methods defines in ANSI C63.4-1992. The EUT was placed on a nonmetallic stand in the open-field site, 0.8 meter above the ground plane, as shown in section 4.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

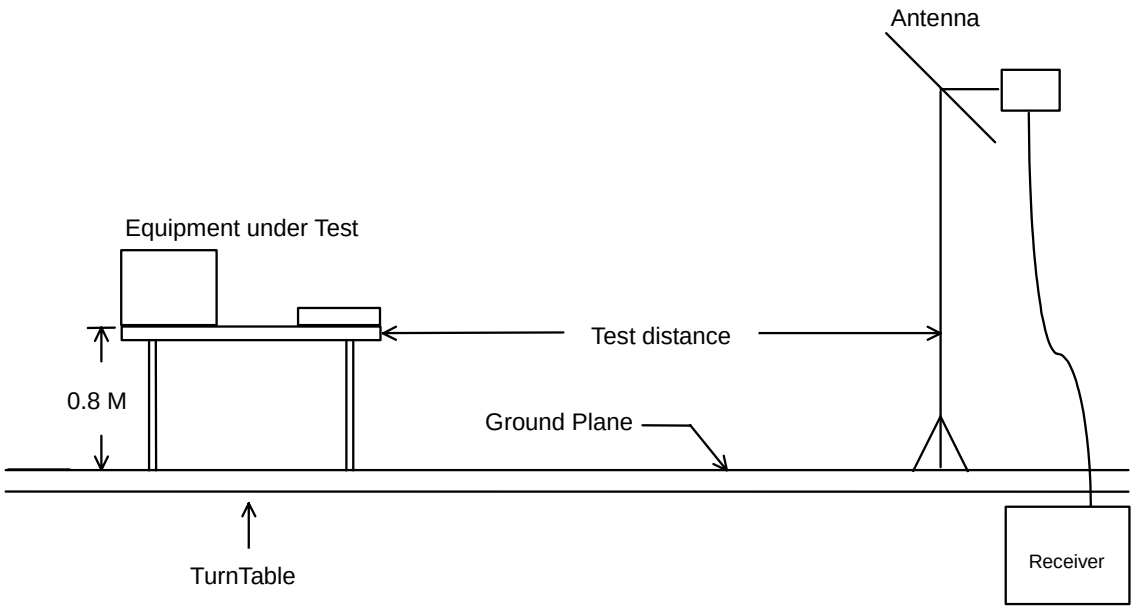
5.9.1. Major Measuring Instruments

● Amplifier	(ADVANTEST BB525C)
RF Gain	30 dB
Signal Input	9 KHz to 3 GHz
● Spectrum analyzer	(R&S FSP40)
Attenuation	10 dB
Start Frequency	1 GHz
Stop Frequency	18 GHz
Resolution Bandwidth	1 MHz
Video Bandwidth	1 MHz
Signal Input	9 KHz to 40 GHz
● Amplifier	(MITEQ AFS44)
RF Gain	40 dB
Signal Input	100 MHz to 26.5GHz
● 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: 63 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-5-9

■ **The test was passed at the minimum margin that marked under gray area in the following table, and its antenna height is 2 m, turn table degree is 70°**

■ Spurious Emission

```
Site      : 03CH02-HY
Condition : 3m CH3-3MAT HORIZONTAL
EUT       : BLUETOOTH A.P.
Power     : AC 120/60Hz
MODEL     : APBTCI
MEMO      : F341704
          : TX CH00 2402MHz
```

	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	80.220	25.93	-14.07	40.00	47.37	8.11	1.45	31.00	Peak	---	---
2	139.890	26.27	-17.23	43.50	43.34	11.65	2.16	30.88	Peak	---	---

```
Site      : 03CH02-HY
Condition : 3m CH3-3MAT HORIZONTAL
EUT       : BLUETOOTH A.P.
Power     : AC 120/60Hz
MODEL     : APBTCI
MEMO      : F341704
          : TX CH00 2402MHz
```

	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 !	318.900	41.88	-4.12	46.00	54.87	13.92	3.57	30.48	QP	---	---
2 !	358.100	41.96	-4.04	46.00	53.78	14.66	3.96	30.44	QP	---	---
3	383.300	39.53	-6.47	46.00	50.90	15.13	3.92	30.42	Peak	---	---
4 !	439.300	42.84	-3.16	46.00	53.01	15.94	4.13	30.24	Peak	---	---

```
Site       : 03CH02-HY
Condition  : 3m CH3-3MAT VERTICAL
EUT        : BLUETOOTH A.P.
Power      : AC 120/60Hz
MODEL      : APBTCI
MEMO       : F341704
           : TX CH00 2402MHz
```

	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	39.450	24.90	-15.10	40.00	42.87	12.41	0.65	31.03	Peak	---	---
2	59.970	27.36	-12.64	40.00	51.59	5.58	1.19	31.00	Peak	---	---
3	79.410	28.71	-11.29	40.00	50.32	7.93	1.46	31.00	Peak	---	---
4	99.660	24.99	-18.51	43.50	43.04	11.36	1.59	31.00	Peak	---	---

```
Site       : 03CH02-HY
Condition  : 3m CH3-3MAT VERTICAL
EUT        : BLUETOOTH A.P.
Power      : AC 120/60Hz
MODEL      : APBTCI
MEMO       : F341704
           : TX CH00 2402MHz
```

	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	318.900	30.84	-15.16	46.00	43.83	13.92	3.57	30.48	Peak	---	---
2	399.400	27.14	-18.86	46.00	38.20	15.43	3.91	30.40	Peak	---	---

```
Site       : 03CH02-HY
Condition  : 3m HORN-ANT-10094-0417 HORIZONTAL
EUT        : Bluetooth AP
Power      : 110V/60Hz
MODEL      : APBTCI
MEMO       : TX CH00 2402MHz
           : F341704
           : 對校線
```

	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	1054.000	48.24	-25.76	74.00	57.14	25.05	3.99	37.94	Peak	---	---
2	1054.000	24.56	-29.44	54.00	33.46	25.05	3.99	37.94	Average	---	---
3	1150.000	46.93	-27.07	74.00	55.32	25.44	4.13	37.96	Peak	---	---
4	1150.000	25.99	-28.01	54.00	34.38	25.44	4.13	37.96	Average	---	---
5	1198.000	48.01	-25.99	74.00	56.13	25.64	4.21	37.97	Peak	---	---
6	1198.000	29.39	-24.61	54.00	37.51	25.64	4.21	37.97	Average	---	---
7	1246.000	47.35	-26.65	74.00	55.22	25.83	4.28	37.98	Peak	---	---
8	1246.000	29.75	-24.25	54.00	37.62	25.83	4.28	37.98	Average	---	---
9	1502.000	51.24	-22.76	74.00	57.68	26.93	4.66	38.03	Peak	---	---
10	1502.000	34.95	-19.05	54.00	41.39	26.93	4.66	38.03	Average	---	---

```
Site       : 03CH02-HY
Condition  : 3m HORN-ANT-10094-0417 HORIZONTAL
EUT        : Bluetooth AP
Power      : 110V/60Hz
MODEL      : APBTCI
MEMO       : TX CH00 2402MHz
           : F341704
```

```
Site       : 03CH02-HY
Condition  : 3m HORN-ANT-10094-0417 VERTICAL
EUT        : Bluetooth AP
Power      : 110V/60Hz
MODEL      : APBTCI
MEMO       : TX CH00 2402MHz
           : F341704
           : 對較線
```

	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	1508.000	50.58	-23.42	74.00	56.97	26.97	4.67	38.03	Peak	---	---
2	1508.000	35.13	-18.87	54.00	41.52	26.97	4.67	38.03	Average	---	---
5	2596.000	53.92	-20.08	74.00	55.78	30.08	6.26	38.20	Peak	---	---
6 !	2596.000	52.73	-1.27	54.00	54.59	30.08	6.26	38.20	Average	---	---
7 !	2644.000	52.37	-1.63	54.00	54.16	30.07	6.34	38.20	Average	---	---
8	2644.000	54.16	-19.84	74.00	55.95	30.07	6.34	38.20	Peak	---	---
9 !	2660.000	52.90	-1.10	54.00	54.66	30.07	6.37	38.20	Average	---	---
10	2660.000	54.80	-19.20	74.00	56.56	30.07	6.37	38.20	Peak	---	---

```
Site       : 03CH02-HY
Condition  : 3m HORN-ANT-10094-0417 VERTICAL
EUT        : Bluetooth AP
Power      : 110V/60Hz
MODEL      : APBTCI
MEMO       : TX CH00 2402MHz
           : F341704
           : 對較線
```

	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	3294.000	55.19	-18.81	74.00	55.85	30.18	7.44	38.28	Peak	---	---
2 !	3294.000	52.11	-1.89	54.00	52.77	30.18	7.44	38.28	Average	---	---

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect Mode
2404.000	H	30.19	5.97	68.30	-	-	104.46	167109.06		Peak
2404.000	H	30.19	5.97	62.28	-	-	98.44	83560.30		A.V.
2404.000	V	30.19	5.97	75.03	-	-	111.19	362660.29		Peak
2404.000	V	30.19	5.97	69.38	-	-	105.54	189234.36		A.V.
4804.000	H						-			Peak, A.V.
4804.000	V	33.21	9.15	16.19	74.00	5011.87	58.55	846.25	-15.45	Peak
4804.000	V	33.21	9.15	10.94	54.00	501.19	53.30	462.38	-0.70	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: Murray

Murray Lu

- Test Mode: Mode 2
- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 63 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-5-9

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

■ Spurious Emission

```
Site      : 03CH02-HY
Condition : 3m CH3-3MAT HORIZONTAL
EUT       : BLUETOOTH A.P.
Power     : AC 120/60Hz
MODEL     : APBTCI
MEMO      : F341704
          : TX CH39 2441MHz
```

	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	59.970	26.13	-13.87	40.00	50.36	5.58	1.19	31.00	Peak	---	---
2	80.220	27.47	-12.53	40.00	48.91	8.11	1.45	31.00	Peak	---	---
3	240.060	29.70	-16.30	46.00	46.17	11.26	2.89	30.62	Peak	---	---

```
Site      : 03CH02-HY
Condition : 3m CH3-3MAT HORIZONTAL
EUT       : BLUETOOTH A.P.
Power     : AC 120/60Hz
MODEL     : APBTCI
MEMO      : F341704
          : TX CH39 2441MHz
```

	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 !	318.900	42.96	-3.04	46.00	55.95	13.92	3.57	30.48	QP	---	---
2	358.100	36.26	-9.74	46.00	48.08	14.66	3.96	30.44	Peak	---	---
3	399.400	36.97	-9.03	46.00	48.03	15.43	3.91	30.40	Peak	---	---

Site : 03CH02-HY
Condition : 3m CH3-3MAT VERTICAL
EUT : BLUETOOTH A.P.
Power : AC 120/60Hz
MODEL : APBTCI
MEMO : F341704
: TX CH39 2441MHz

	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	59.700	29.12	-10.88	40.00	53.35	5.58	1.19	31.00	Peak	---	---
2	71.580	25.12	-14.88	40.00	48.62	5.98	1.52	31.00	Peak	---	---
3	80.220	27.67	-12.33	40.00	49.11	8.11	1.45	31.00	Peak	---	---

Site : 03CH02-HY
Condition : 3m CH3-3MAT VERTICAL
EUT : BLUETOOTH A.P.
Power : AC 120/60Hz
MODEL : APBTCI
MEMO : F341704
: TX CH39 2441MHz

	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	318.900	32.97	-13.03	46.00	45.96	13.92	3.57	30.48	Peak	---	---
2	399.400	30.07	-15.93	46.00	41.13	15.43	3.91	30.40	Peak	---	---
3	702.500	32.58	-13.42	46.00	37.66	19.33	5.20	29.69	Peak	---	---

Site : 03CH02-HY
Condition : 3m HORN-ANT-10094-0417 HORIZONTAL
EUT : Bluetooth AP
Power : 110V/60Hz
MODEL : APBTCI
MEMO : TX CH39 2441MHz
: F341704
: 對校線

	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	1054.000	45.94	-28.06	74.00	54.84	25.05	3.99	37.94	Peak	---	---
2	1054.000	22.45	-31.55	54.00	31.35	25.05	3.99	37.94	Average	---	---
3	1246.000	46.55	-27.45	74.00	54.42	25.83	4.28	37.98	Peak	---	---
4	1246.000	25.53	-28.47	54.00	33.40	25.83	4.28	37.98	Average	---	---
5	1342.000	46.25	-27.75	74.00	53.61	26.22	4.42	38.00	Peak	---	---
6	1342.000	27.20	-26.80	54.00	34.56	26.22	4.42	38.00	Average	---	---
7	1726.000	53.12	-20.88	74.00	57.59	28.59	5.01	38.07	Peak	---	---
8	1726.000	37.06	-16.94	54.00	41.53	28.59	5.01	38.07	Average	---	---
11	2926.000	49.67	-24.33	74.00	51.07	30.01	6.83	38.24	Peak	---	---
12	2926.000	36.40	-37.60	74.00	37.80	30.01	6.83	38.24	Peak	---	---

```
Site       : 03CH02-HY
Condition  : 3m HORN-ANT-10094-0417 HORIZONTAL
EUT        : Bluetooth AP
Power      : 110V/60Hz
MODEL      : APBTCI
MEMO       : TX CH39 2441MHz
           : F341704
```

```
Site       : 03CH02-HY
Condition  : 3m HORN-ANT-10094-0417 VERTICAL
EUT        : Bluetooth AP
Power      : 110V/60Hz
MODEL      : APBTCI
MEMO       : TX CH39 2441MHz
           : F341704
           : 對經緯
```

		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		1716.000	55.45	-18.55	74.00	60.01	28.52	4.99	38.07	Peak	---	---
2	!	1716.000	52.14	-1.86	54.00	56.70	28.52	4.99	38.07	Average	200	170
3		2246.000	55.02	-18.98	74.00	57.06	30.35	5.76	38.15	Peak	---	---
4	!	2246.000	51.47	-2.53	54.00	53.51	30.35	5.76	38.15	Average	---	---
7		2636.000	53.62	-20.38	74.00	55.42	30.07	6.33	38.20	Peak	---	---
8		2636.000	42.57	-11.43	54.00	44.37	30.07	6.33	38.20	Average	---	---
9		2684.000	53.42	-20.58	74.00	55.16	30.06	6.41	38.21	Peak	---	---
10		2684.000	42.60	-11.40	54.00	44.34	30.06	6.41	38.21	Average	---	---

```
Site       : 03CH02-HY
Condition  : 3m HORN-ANT-10094-0417 VERTICAL
EUT        : Bluetooth AP
Power      : 110V/60Hz
MODEL      : APBTCI
MEMO       : TX CH39 2441MHz
```

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect Mode
2444.000	H	30.15	6.02	64.05	-	-	100.22	102565.19		Peak
2444.000	H	30.15	6.02	57.28	-	-	93.45	47043.54		A.V.
2444.000	V	30.15	6.02	75.06	-	-	111.23	364334.25		Peak
2444.000	V	30.15	6.02	58.60	-	-	94.77	54764.61		A.V.
4882.000	H						-			Peak, A.V.
4884.000	V	33.46	9.18	16.33	74.00	5011.87	58.97	888.18	-15.03	Peak
4884.000	V	33.46	9.18	9.08	54.00	501.19	51.72	385.48	-2.28	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: Murray

Murray Lu

- Test Mode: Mode 3
- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 63 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level
- Test Date: 2003-5-9

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

■ Spurious Emission

```
Site      : 03CH02-HY
Condition : 3m CH3-3MAT HORIZONTAL
EUT       : BLUETOOTH A.P.
Power     : AC 120/60Hz
MODEL     : APBTCI
MEMO      : F341704
          : TX CH78 2480MHz
```

	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	59.700	25.89	-14.11	40.00	50.12	5.58	1.19	31.00	Peak	---	---
2	79.410	28.26	-11.74	40.00	49.87	7.93	1.46	31.00	Peak	---	---
3	240.060	39.27	-6.73	46.00	55.74	11.26	2.89	30.62	Peak	---	---

```
Site      : 03CH02-HY
Condition : 3m CH3-3MAT HORIZONTAL
EUT       : BLUETOOTH A.P.
Power     : AC 120/60Hz
MODEL     : APBTCI
MEMO      : F341704
          : TX CH78 2480MHz
```

	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 !	318.900	40.34	-5.66	46.00	53.33	13.92	3.57	30.48	Peak	---	---
2	358.100	35.89	-10.11	46.00	47.71	14.66	3.96	30.44	Peak	---	---
3	439.300	37.23	-8.77	46.00	47.40	15.94	4.13	30.24	Peak	---	---

Site : 03CH02-HY
Condition : 3m CH3-3MAT VERTICAL
EUT : BLUETOOTH A.P.
Power : AC 120/60Hz
MODEL : APBTCI
MEMO : F341704
: TX CH78 2480MHz

	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	59.700	30.23	-9.77	40.00	54.46	5.58	1.19	31.00	Peak	---	---
2	71.580	25.81	-14.19	40.00	49.31	5.98	1.52	31.00	Peak	---	---
3	79.410	28.99	-11.01	40.00	50.60	7.93	1.46	31.00	Peak	---	---
4	240.060	31.55	-14.45	46.00	48.02	11.26	2.89	30.62	Peak	---	---

Site : 03CH02-HY
Condition : 3m CH3-3MAT VERTICAL
EUT : BLUETOOTH A.P.
Power : AC 120/60Hz
MODEL : APBTCI
MEMO : F341704
: TX CH78 2480MHz

	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	318.900	38.32	-7.68	46.00	51.31	13.92	3.57	30.48	Peak	---	---
2	741.700	32.56	-13.44	46.00	37.05	19.76	5.24	29.49	Peak	---	---

Site : 03CH02-HY
Condition : 3m MORN-ANT-10094-0417 HORIZONTAL
EUT : Bluetooth AP
Power : 110V/60Hz
MODEL : APBTCI
MEMO : TX CH78 2480MHz
: F341704
: 對校線

	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	1054.000	45.43	-28.57	74.00	54.33	25.05	3.99	37.94	Peak	---	---
2	1054.000	28.64	-25.36	54.00	37.54	25.05	3.99	37.94	Average	---	---
3	1150.000	44.25	-29.75	74.00	52.64	25.44	4.13	37.96	Peak	---	---
4	1150.000	24.86	-29.14	54.00	33.25	25.44	4.13	37.96	Average	---	---
5	1246.000	46.86	-27.14	74.00	54.73	25.83	4.28	37.98	Peak	---	---
6	1246.000	26.70	-27.30	54.00	34.57	25.83	4.28	37.98	Average	---	---
7	1342.000	46.76	-27.24	74.00	54.12	26.22	4.42	38.00	Peak	---	---
8	1342.000	33.88	-20.12	54.00	41.24	26.22	4.42	38.00	Average	---	---
9	1964.000	49.75	-24.25	74.00	52.13	30.36	5.38	38.12	Peak	---	---
10	1964.000	35.20	-18.80	54.00	37.58	30.36	5.38	38.12	Average	---	---
11	2286.000	50.38	-23.62	74.00	52.43	30.30	5.81	38.16	Peak	---	---
12	2286.000	32.63	-21.37	54.00	34.68	30.30	5.81	38.16	Average	---	---

Site : 03CH02-HY
Condition : 3m HORN-ANT-10094-0417 HORIZONTAL
EUT : Bluetooth AP
Power : 110V/60Hz
MODEL : APBTCI
MEMO : TX CH78 2480MHz
: F341704

Site : 03CH02-HY
Condition : 3m HORN-ANT-10094-0417 VERTICAL
EUT : Bluetooth AP
Power : 110V/60Hz
MODEL : APBTCI
MEMO : TX CH78 2480MHz
: F341704
: 對紀錄

	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	1238.000	45.33	-28.67	74.00	53.24	25.80	4.27	37.98	Peak	---	---
2	1238.000	26.21	-27.79	54.00	34.12	25.80	4.27	37.98	Average	---	---
3	1958.000	52.10	-21.90	74.00	54.53	30.32	5.37	38.12	Peak	---	---
4	1958.000	38.81	-15.19	54.00	41.24	30.32	5.37	38.12	Average	---	---
5 !	2286.000	53.83	-0.17	54.00	55.88	30.30	5.81	38.16	Average	100	175
6	2286.000	57.20	-16.80	74.00	59.25	30.30	5.81	38.16	Peak	---	---
7	2324.000	53.79	-20.21	74.00	55.82	30.27	5.86	38.16	Peak	---	---
8	2324.000	42.53	-11.47	54.00	44.56	30.27	5.86	38.16	Average	---	---
11	2710.000	53.52	-20.48	74.00	55.22	30.06	6.45	38.21	Peak	---	---
12	2710.000	42.47	-11.53	54.00	44.17	30.06	6.45	38.21	Average	---	---

Site : 03CH02-HY
Condition : 3m HORN-ANT-10094-0417 VERTICAL
EUT : Bluetooth AP
Power : 110V/60Hz
MODEL : [illegible]
MEMO : [illegible] 2480MHz
: F341704

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect Mode
2478.000	H	30.11	6.06	63.77	-	-	99.94	99311.60		Peak
2478.000	H	30.11	6.06	56.13	-	-	92.30	41209.75		A.V.
2478.000	V	30.11	6.06	75.14	-	-	111.31	367705.39		Peak
2478.000	V	30.11	6.06	67.46	-	-	103.63	151879.79		A.V.
4960.000	H						-			Peak, A.V.
4964.000	V	33.72	9.21	16.01	74.00	5011.87	58.94	885.12	-15.06	Peak
4964.000	V	33.72	9.21	10.25	54.00	501.19	53.18	456.04	-0.82	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: Murray

Murray Lu

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 dipole antenna.

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^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm^2)	Averaging Time $\|E\|^2$,$\|H\|^2$ or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

F=frequency in MHz *Plane-wave equivalent power density

7.1.2. MPE Calculations

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

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/m2. 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 1	1.70	1.48	4.81	3.03	0.01	20
Channel 6	1.70	1.48	4.53	2.84	0.01	20
Channel 11	1.70	1.48	3.80	2.40	0.01	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

1. Add a GND to connect with panel GND.
   (As the Internal photo No.2)

9. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	0.63	1000	24.30	3.89
35	13.83	0.76	2000	31.10	5.41
40	12.41	0.65	3000	29.60	6.92
45	11.69	1.22	4000	30.80	8.24
50	7.77	0.92	5000	34.20	9.22
55	6.68	1.11	6000	33.30	10.25
60	5.58	1.19	7000	37.80	11.61
65	5.51	1.48	8000	39.40	11.78
70	5.43	1.46	9000	38.40	12.59
75	6.65	1.62	10000	38.90	13.84
80	8.11	1.46	11000	41.10	14.64
85	9.23	1.40	12000	42.70	14.12
90	10.34	1.98	13000	43.90	16.01
95	10.85	1.61	14000	43.70	13.76
100	11.36	1.59	15000	43.40	14.30
110	11.27	1.97	16000	40.90	15.16
120	11.17	1.87	17000	44.40	15.88
130	11.17	2.04	18000	47.10	16.09
140	11.72	2.16	19000	37.60	16.98
150	10.52	2.28	20000	37.30	16.21
160	9.39	2.40	21000	37.00	20.13
170	8.93	2.56	22000	38.00	19.24
180	9.20	2.53	23000	38.70	19.64
190	8.98	2.55	24000	38.60	20.54
200	8.76	2.52	25000	38.90	20.14
220	10.01	2.74	14000	43.70	13.76
240	11.20	2.89	15000	43.40	14.30
260	12.19	2.93	16000	40.90	15.16
280	12.89	3.40	17000	44.40	15.88
300	13.56	3.21	18000	47.10	16.09
320	13.94	3.59	19000	37.60	16.98
340	14.32	3.38	20000	37.30	16.21
360	14.69	4.00	21000	37.00	20.13
380	15.07	3.98	22000	38.00	19.24
400	15.43	3.92	23000	38.70	19.64
450	16.08	4.32	24000	38.60	20.54
500	16.73	4.52	25000	38.90	20.14
550	17.70	4.59			
600	18.69	5.45			
650	18.99	5.15			
700	19.30	5.26			
750	19.84	5.24			
800	20.39	5.20			
850	20.60	5.59			
900	20.82	5.39			
950	20.98	6.28			
1000	21.15	6.53			

10. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9 KHz – 2.75 GHz	Jun. 03, 2002	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001-009	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9KHz~30MHz	Jan. 07, 2003	Conduction (CO01-HY)
50 ohm BNC type Terminal	NOBLE	50ohm	TM009	50 ohm	Apr. 24, 2003	Conduction (CO01-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH02-HY	30MHz~1GHz 3m	Jun. 15, 2002	Radiation (03CH02-HY)
Spectrum Analyzer	R&S	FSP7	838858/039	9KHz – 7GHz	Jan. 20, 2003	Radiation (03CH02-HY)
Receiver	SCHAFFNER	SCR 3501	416	9 KHz –1GHz	Feb. 19, 2003	Radiation (03CH02-HY)
Amplifier	ADVANTEST	BB525C	CH300001	9KHz – 3GHz	Nov. 18, 2002	Radiation (03CH02-HY)
Bilog Antenna	SCHAFFNER	CBL61128	2681	30MHz –2GHz	Dec. 21, 2002	Radiation (03CH02-HY)
Turn Table	HD	DS 420	420/649/00	0 ~ 360 degree	N/A	Radiation (03CH02-HY)
Antenna Mast	HD	MA 240	240/559/00	1 m - 4 m	N/A	Radiation (03CH02-HY)
RF Cable-R03m	Jye Bao	RG142	CB020	30MHz~1GHz	Jan. 02, 2003	Radiation (03CH02-HY)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 10, 2003	Radiation
Spectrum analyzer	R&S	FSP40	100004/040	9KHZ~40GHZ	Aug. 07, 2002	Radiation
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Aug. 12, 2002	Radiation
RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Mar. 14, 2003	Radiation
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 Chamber	KSON	THS-C3L	612	N/A	Oct. 02, 2002	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

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

$U=\sqrt{\{(1/2)^2+(0.3/2)^2+(2^2+3^2+2^2+0.25^2+2^2)/3+(0.54)^2/2\}}=2.7$ 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

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