Product Name:	Wireless 2 Control Pad
Model Number:	GGE 633
Applicant:	Front Electronics (H.K.) Limited Unit 903,Level 9,Landmark North,39 Lung Sum Avenue, Sheung Shui,N.T .Hong Kong
Date of Receipt:	Jul. 18, 2006
Finished date of Test:	Aug. 09, 2006
Applicable Standards:	47 CFR Part 15, Subpart C 47 CFR Part 15, Subpart B ANSI C63.4: 2003

We, **Spectrum Research & Testing Laboratory Inc.**, hereby certify that one sample of the above was tested in our laboratory with positive results according to the above-mentioned standards. The records in the report are an accurate account of the results. Details of the results are given in the subsequent pages of this report.

Tested By : Mao Feng Hsu. , Date: Aug. 09, 2006
(Mao Feng Hsu)

Approved By : , Date: Aug. 09, 2006
(Johnson Ho, Director)

NVLAP®
Lab Code: 200099-0

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1. DOCUMENT POLICY AND TEST STATEMENT

1.1 DOCUMENT POLICY

- The report shall not be reproduced except in full, without the written approval of SRT Lab, Inc.

1.2 TEST STATEMENT

- The test results in the report apply only to the unit tested by SRT Lab.
- There was no deviation from the requirements of test standards during the test.
- AC power source, 120 VAC/60 Hz, was used during the test.

1.3 EUT MODIFICATION

- No modification in SRT Lab.

2. DESCRIPTION OF EUT AND TEST MODE

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless 2 Control Pad
MODEL NO.	GGE 633
POWER SUPPLY	DC 4.5 V, 0.1A
FREQUENCY BAND	2.410~2.470GHz
CARRIER FREQUENCY	2.410GHz
NUMBER OF CHANNEL	74
CHANNEL SPACING	810.9KHz
RATED RF OUTPUT POWER	0dBm (1mW)
I.F. & L.O.	I.F.:374MHz,L.O.:2410-2470 MHz
MODULATION TYPE	MSK
BIT RATE OF TRANSMISSION	250Kbps
DUTY CYCLE	Max 1600 hops/sec
ANTENNA TYPE	PCB Antenna
ANTENNA GAIN	Max 2 dBi
OPERATING TEMPERATURE	-40~85℃
CHANNEL BANDWIDTH	1MHz

NOTE：
The EUT has two model numbers as below on market. They are identical in all aspects except for the color of case.

2.2 DESCRIPTION OF SUPPORT UNIT

The transmitter part of EUT was tested with a Game system(Play station 2) and configured by the requirement of ANSI C63.4. All interface ports were connected to the appropriate support units via specific cables. The support units and cables are listed below.

NO	DEVICE	BRAND	MODEL #	FCC ID/DOC	CABLE
1	PLAY STATION 2	SONY	SCPH-15000	N/A	1.5m unshielded power cord 1.5m unshielded power cord
2	TV	PANASONIC	TC14S10RZ	DOC	1.5m shielded data cable

NOTE：

For the actual test configuration, please refer to the photos of testing.

2.3 DESCRIPTION OF TEST MODE

74 channels are provided by EUT. The 3 channels of lower, medium and higher were chosen for test..

Channel	Frequency(MHz)
0	2410
37	2440
73	2470

NOTE ：

1. Below 1 GHz, the channel 0, 37 and 73 were pre-tested in chamber. The channel 73, worst case one, was chosen for radiated emission test.
2. Above 1 GHz, the channel 0, 37 and 73 were tested individually.

3. DESCRIPTION OF APPLIED STANDARDS

The EUT is a kind of wireless product and to be connected with a Game system for normal use. According to the specifications provided by the applicant, it must comply with the requirements of the following standards:

47 CFR Part 15, Subpart C

47 CFR Part 15, Subpart B

ANSI C63.4: 2003

Public DA00-705 (March 2000)

All tests have been performed and recorded as the above standards.

4. TECHNICAL CHARACTERISTICS TEST

4.1 CHANNEL SEPARATION TEST

4.1.1 LIMIT

FCC Part15, Subpart C Section 15.247(a)(1). Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

FREQUENCY RANGE (MHz)	Limit(kHz)
902-928	>25kHz
2400-2483.5	>25kHz
5725-5850	>25kHz

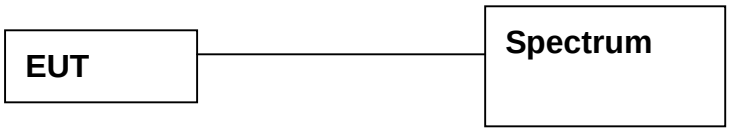
4.1.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test：

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE & SCHWARZ	FSP7/ 839511/010	APR. 2007 R&S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.1.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.1.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel.
Printed out the test result from the spectrum by hard copy function.

4.1.5 EUT OPERATING CONDITION

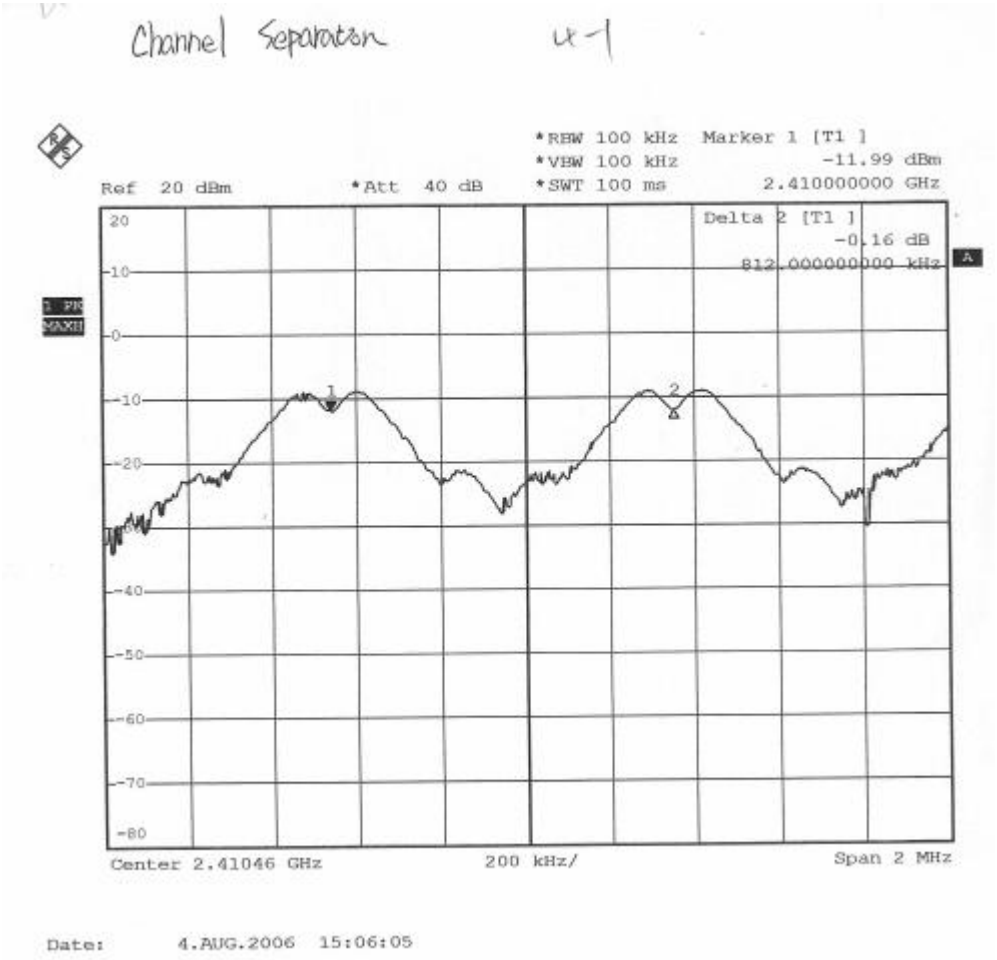
The transmitter part of EUT was tested with a Game system(Play Station 2). The control pad which has been set on particular frequency channel sent control signal to receiver on Play Station 2.

4.1.6 TEST RESULT

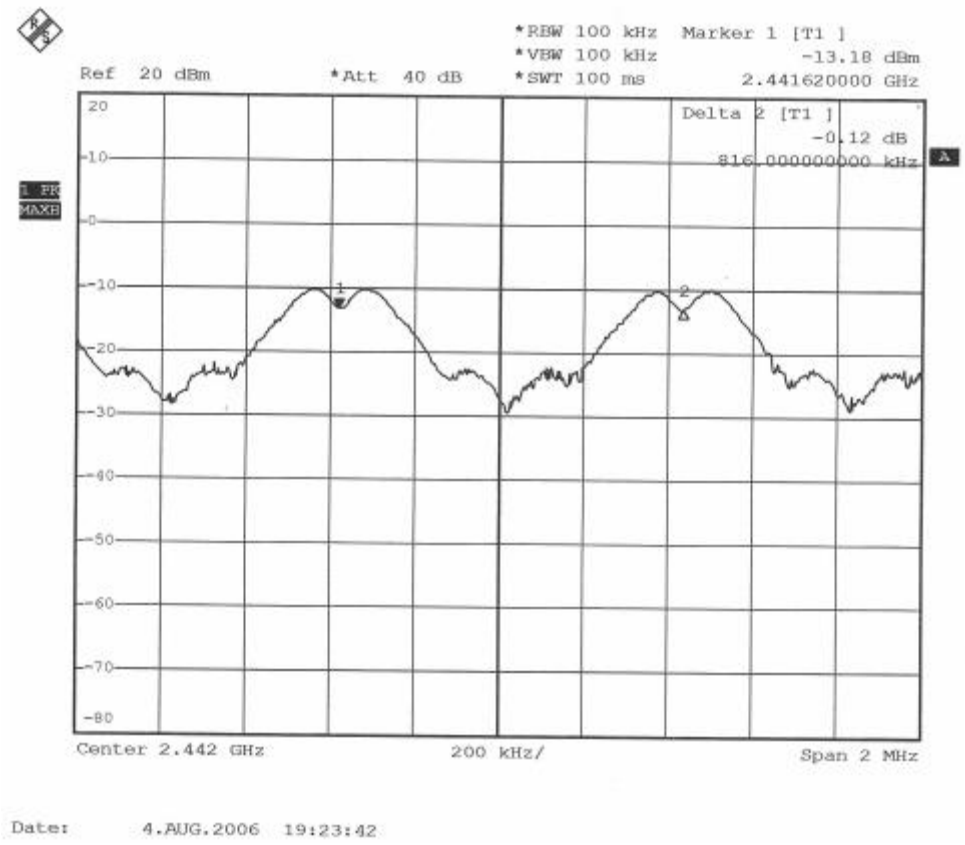
Temperature:	24°C	Humidity:	55%RH
Spectrum Detector:	PK	Tested by:	Mao Feng Hsu
Test Result:	PASS	Tested Date:	Aug. 04, 2006

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	SEPARATION READ VALUE (kHz)	SEPARATION LIMIT (kHz)
0	2410	812.000	>25kHz
37	2441	816.000	>25kHz
73	2470	816.000	>25kHz

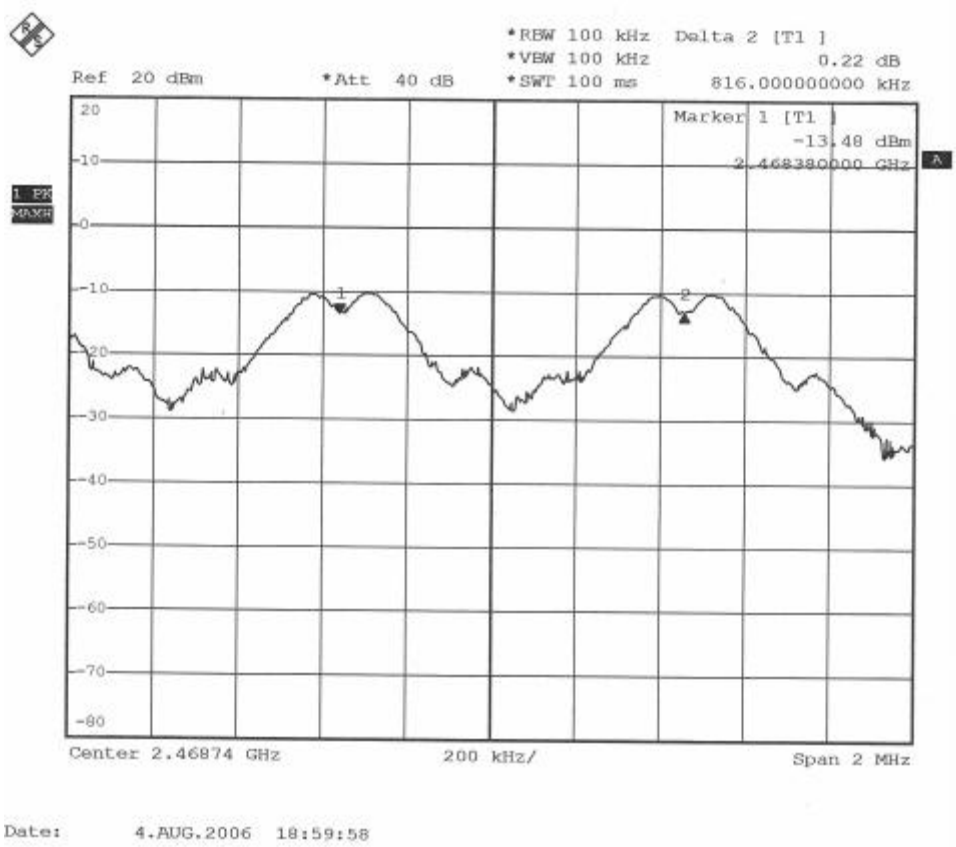
CH0:


Channel Separation
*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-11.99 dBm
2.410000000 GHz
Ref 20 dBm
*Att 40 dB
Delta 2 [T1]
-0.16 dB
812.000000000 kHz
20
10
0
-10
-20
-40
-50
-60
-70
-80
Center 2.41046 GHz
200 kHz/
Span 2 MHz
Date: 4.AUG.2006 15:06:05

CH37:


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-13.18 dBm
2.441620000 GHz
Ref 20 dBm
*Att 40 dB
Delta 2 [T1]
-0.12 dB
816.000000000 kHz
1 PK
MAXH
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.442 GHz
200 kHz/
Span 2 MHz
Date: 4.AUG.2006 19:23:42

CH73:


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Delta 2 [T1]
0.22 dB
816.000000000 kHz
Ref 20 dBm
*Att 40 dB
Marker 1 [T1]
-13.48 dBm
2.468380000 GHz
1 PK
MAXH
A
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.46874 GHz
200 kHz/
Span 2 MHz
Date: 4.AUG.2006 18:59:58

4.2 20dB Bandwidth

4.2.1 LIMIT

Frequency Range (MHz)	Limit(kHz)				
	Quantity of Hopping Channel	50	25	15	75
902-928		<250	>250	NA	NA
2400-2483.5		NA	NA	>1000	<1000

4.2.2 TEST EQUIPMENT

The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE & SCHWARZ	FSP7/ 839511/010	APR. 2007 R&S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.2.3 TEST SET-UP

The EUT was connected to a spectrum through a 50Ω RF cable.

4.2.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel.
Printed out the test result from the spectrum by hard copy function.

4.2.5 EUT OPERATING CONDITION

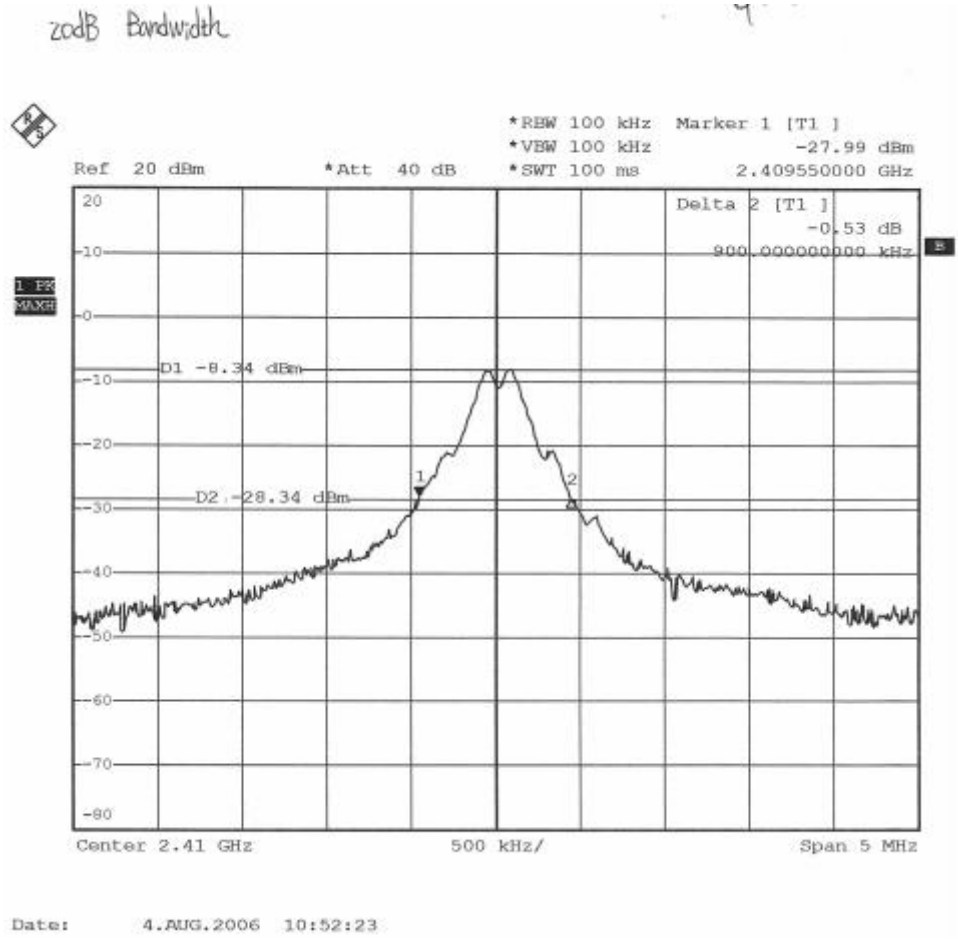
Same as section 4.1.5 of this report.

4.2.6 TEST RESULT

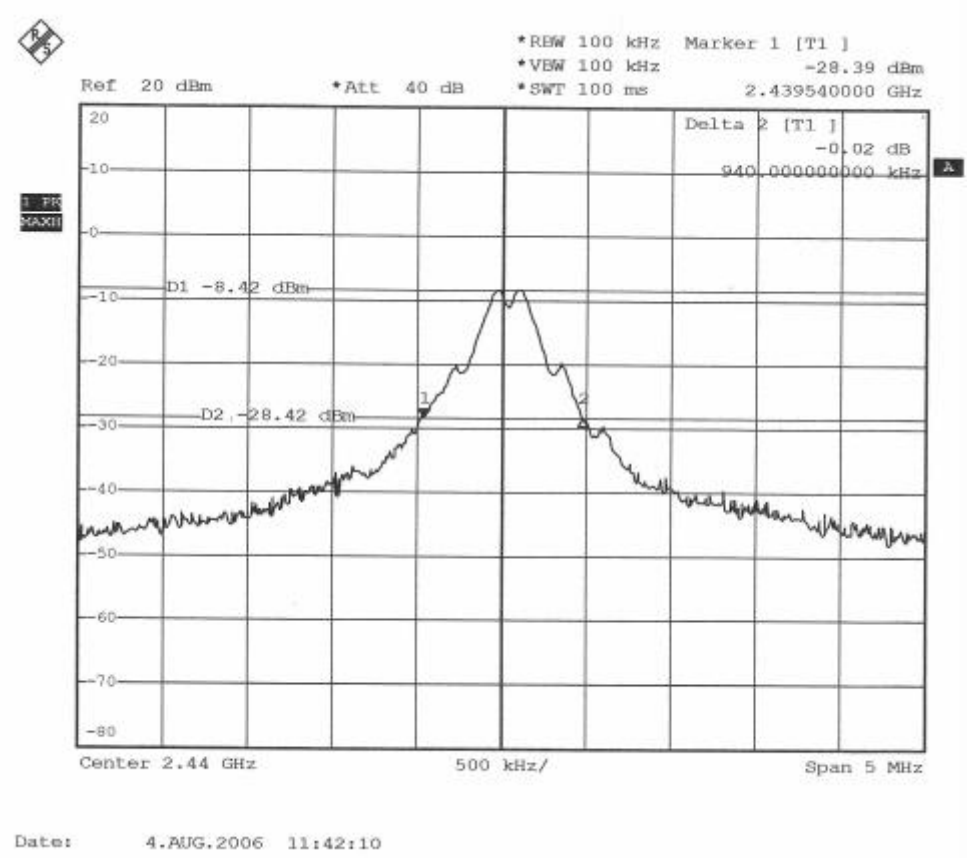
Temperature:	24°C	Humidity:	55%RH
Spectrum Detector:	PK	Tested by:	Mao Feng Hsu
Test Result:	PASS	Tested Date:	Aug. 04, 2006

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	20dB DOWN BW (kHz)
0	2410	900
37	2440	940
73	2470	970

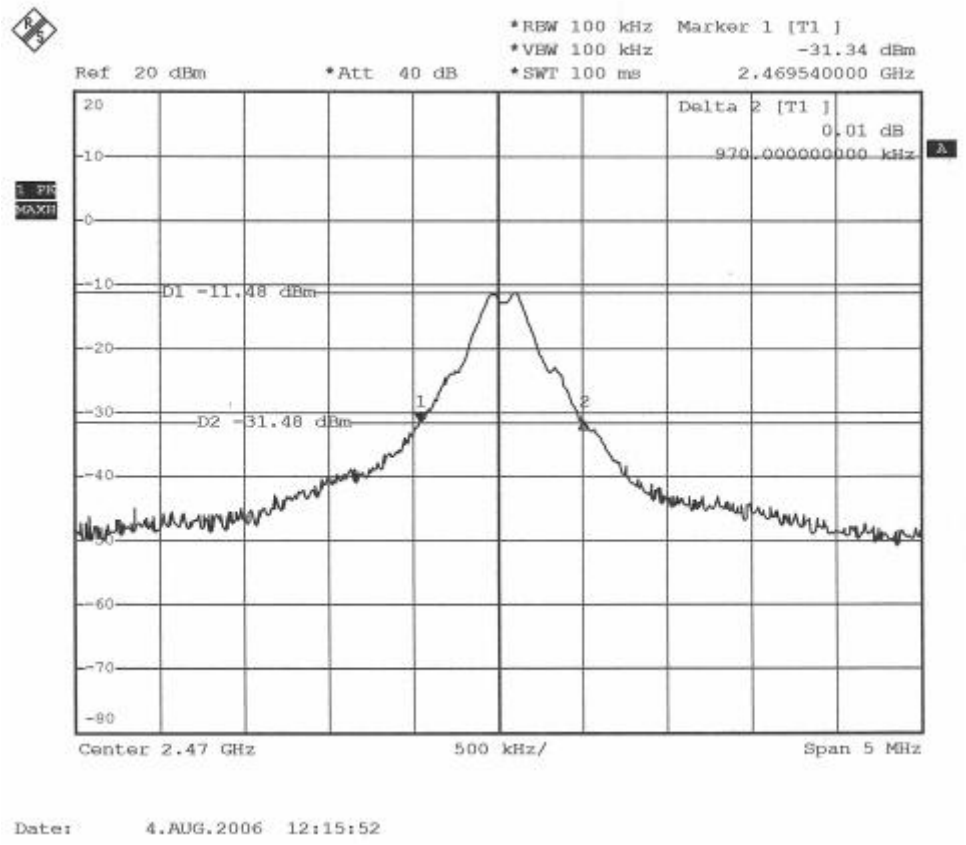
CH0:



Ch37:


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-28.39 dBm
2.439540000 GHz
Ref 20 dBm
*Att 40 dB
Delta 2 [T1]
-0.02 dB
940.000000000 kHz
1 PK
MAXH
A
D1 -8.42 dBm
D2 -28.42 dBm
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.44 GHz
500 kHz/
Span 5 MHz
Date: 4.AUG.2006 11:42:10

CH73:


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-31.34 dBm
2.469540000 GHz
Ref 20 dBm
*Att 40 dB
Delta 2 [T1]
0.01 dB
970.000000000 kHz
D1 -11.48 dBm
D2 -31.48 dBm
Center 2.47 GHz
500 kHz/
Span 5 MHz
Date: 4.AUG.2006 12:15:52

4.3 QUANTITY OF HOPPING CHANNEL TEST

4.3.1 LIMIT

FCC Part15, Subpart C Section 15.247.

FREQUENCY RANGE (MHz)	Limit (Quantity of Hopping Channel)			
	20dB bandwidth <250kHZ	20dB bandwidth >250kHZ	20dB bandwidth <1MHz	20dB bandwidth >1MHz
902-928	50	25	N/A	N/A
2400-2483.5	N/A	N/A	75	15
5725-5850	N/A	N/A	75	N/A

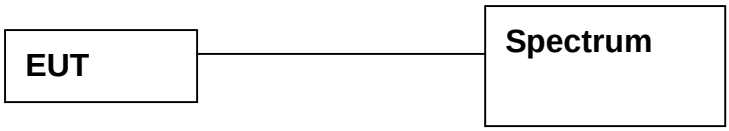
4.3.2 TEST EQUIPMENT

The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE & SCHWARZ	FSP7/ 839511/010	APR. 2007 R&S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.3.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.3.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel.
Printed out the test result from the spectrum by hard copy function.

4.3.5 EUT OPERATING CONDITION

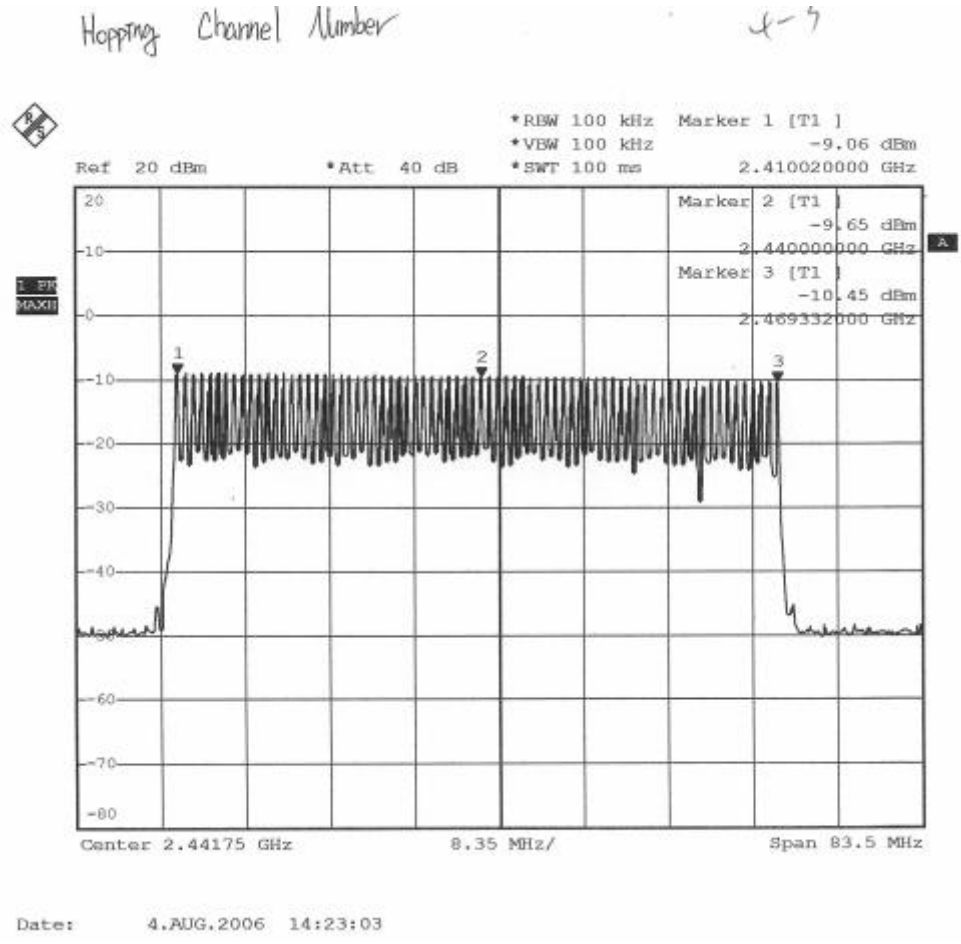
Same as section 4.1.5 of this report.

4.3.6 TEST RESULT

Temperature:	24°C	Humidity:	55%RH
Spectrum Detector:	PK	Tested by:	Mao Feng Hsu
Test Result:	PASS	Tested Date:	Aug. 04, 2006

HOPPING CHANNEL FREQUENCY RANGE	QUANTITY OF HOPPING CHANNEL READ VALUE	QUANTITY OF HOPPING CHANNEL LIMIT
2410~2470	74	15

CH0-CH73



4.4 Time of occupancy (Dwell Time)

4.4.1 LIMIT

FCC Part15, Subpart C Section 15.247.

FREQUENCY RANGE (MHz)	LIMIT (ms)		
	20dB bandwidth <250kHZ(50Channel)	20dB bandwidth >250kHZ(25Channel)	20dB bandwidth <1MHz(75Channel)
902-928	400(20s)	400(10s)	NA
2400-2483.5	NA	NA	400(30s)
5725-5850	NA	NA	400(30s)

NOTE: The "()" is all channel's average time of occupancy.

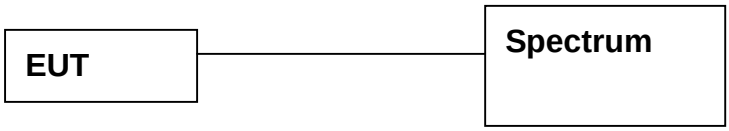
4.4.2 TEST EQUIPMENT

The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE & SCHWARZ	FSP7/ 839511/010	APR. 2007 R&S

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.4.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.4.4 TEST PROCEDURE

The EUT was operating in hopping mode or could be controlled its channel.
Printed out the test result from the spectrum by hard copy function.

4.4.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

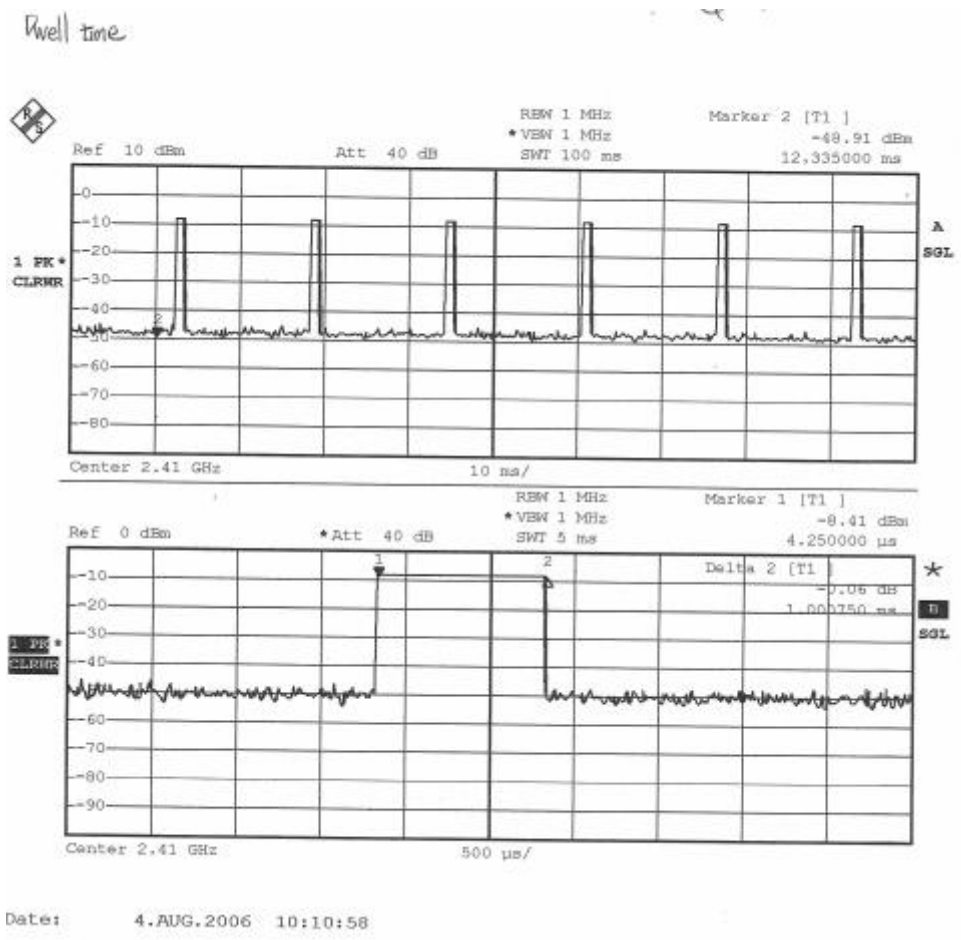
4.4.6 TEST RESULT

Temperature:	24°C	Humidity:	55%RH
Spectrum Detector:	PK	Tested by:	Mao Fneg Hsu
Test Result:	PASS	Tested Date:	Aug. 04, 2006

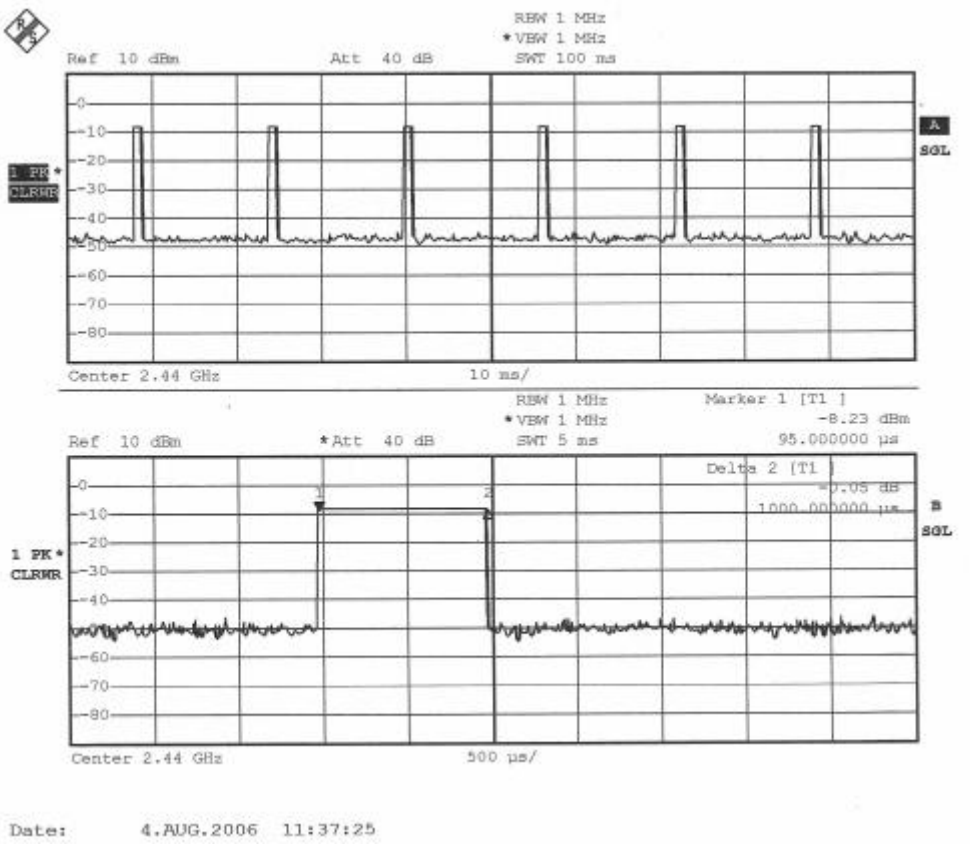
CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	Pulse Time (µs)	Burts (in 1 sec.)	Time of occupancy (Dwell Time) (ms)	Average time of occupancy LIMIT (ms)
0	2410.00	1000	6	24	400
37	2440.00	1000	6	24	400
73	2470.00	990	6	23.8	400

NOTE: Dwell Time: Pulse Time*Burts*0.4*74

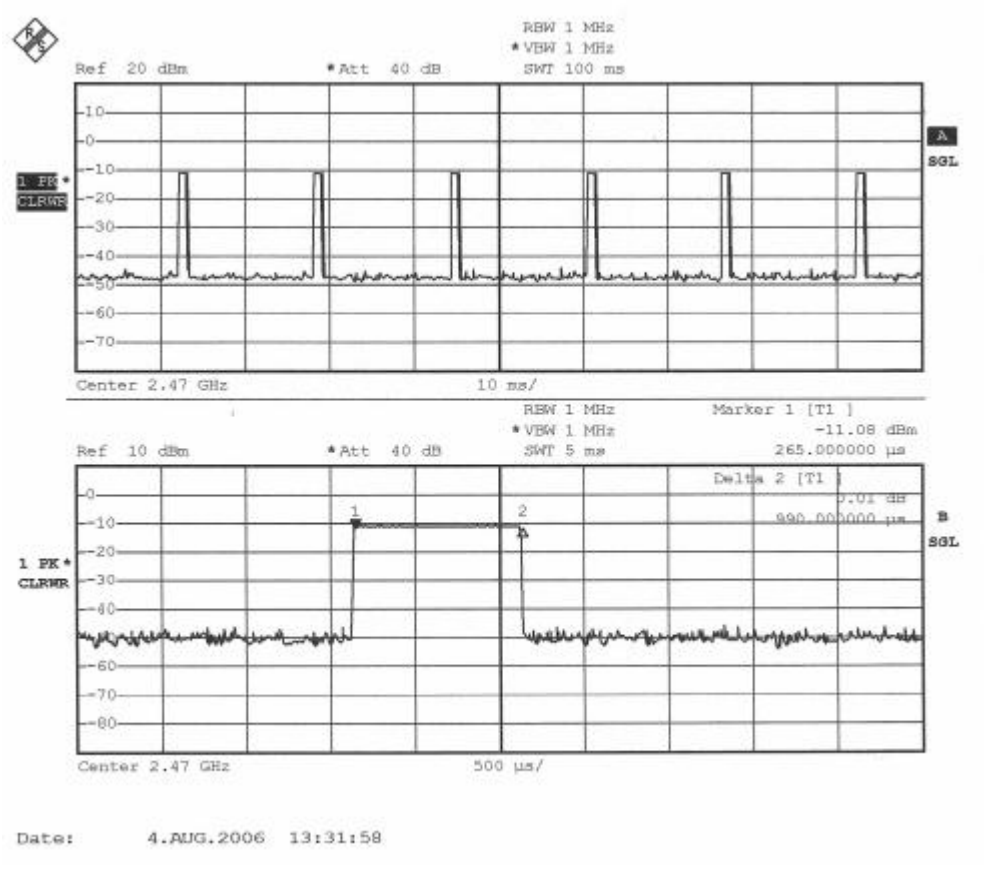
CH0:



Ch37:


RBW 1 MHz
*VBW 1 MHz
SWT 100 ms
Ref 10 dBm
Att 40 dB
1 PK*
CLRWR
A
SGL
Center 2.44 GHz
10 ms/
RBW 1 MHz
*VBW 1 MHz
SWT 5 ms
Marker 1 [T1]
-8.23 dBm
95.000000 µs
Ref 10 dBm
*Att 40 dB
Delta 2 [T1]
1000.000000 µs
B
SGL
1 PK*
CLRWR
Center 2.44 GHz
500 µs/
Date: 4.AUG.2006 11:37:25

CH73:


RBW 1 MHz
*VBW 1 MHz
SWT 100 ms
Ref 20 dBm
*Att 40 dB
1 PK*
CLRWR
A
SGL
Center 2.47 GHz
10 ms/
RBW 1 MHz
*VBW 1 MHz
SWT 5 ms
Marker 1 [T1]
-11.08 dBm
265.000000 µs
Ref 10 dBm
*Att 40 dB
Delta 2 [T1]
990.000000 µs
B
SGL
1 PK*
CLRWR
Center 2.47 GHz
500 µs/
Date: 4.AUG.2006 13:31:58

4.5 PEAK POWER TEST

4.5.1 LIMIT

FCC Part15, Subpart C Section 15.247.

FREQUENCY RANGE (MHz)	LIMIT (W)				
	Quantity of Hopping Channel	50	25	15	75
902-928		1(30dBm)	0.125(21dBm)	NA	NA
2400-2483.5		NA	NA	0.125(21dBm)	1(30dBm)
5725-5850		NA	NA	NA	1(30dBm)

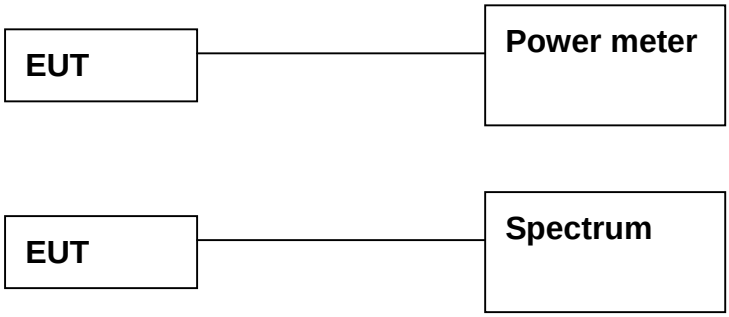
4.5.2 TEST EQUIPMENT

The following test equipment was used during the test：

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE & SCHWARZ	FSP7/ 839511/010	APR. 2007 R&S
POWER METER	N/A	BOONTON	4232A/ 29001	MAY 2007 ETC
POWER SENSOR	DC-18GHz 0.3μW-100mW 50Ω	BOONTON	51011-EMC/ 31184	JUN. 2007 ETC

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.5.3 TEST SET-UP



The EUT was connected to a spectrum through a 50Ω RF cable.

4.5.4 TEST PROCEDURE

The EUT was operating in hopping mode or could control its channel.
Printed out the test result from the spectrum by hard copy function.
Recorded the read value of the power meter.

4.5.5 EUT OPERATING CONDITION

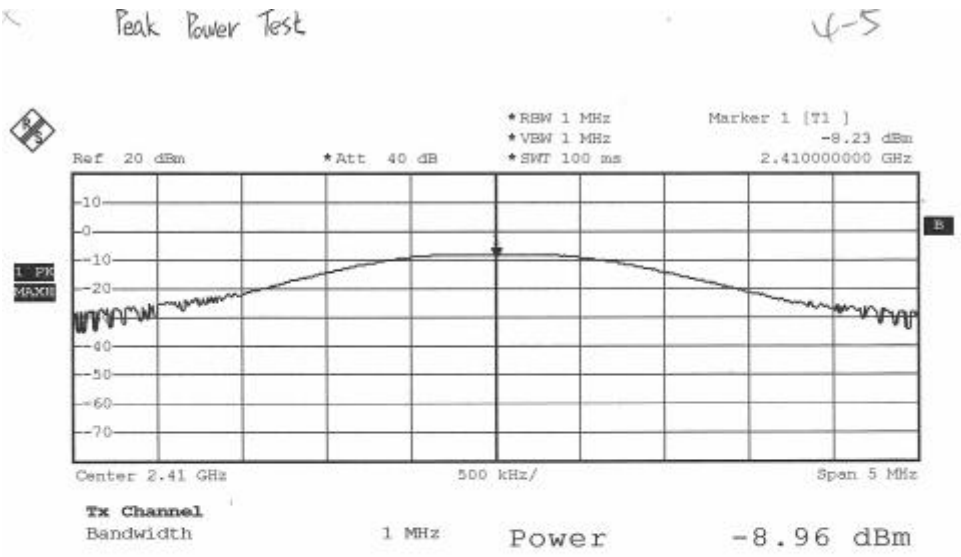
Same as section 4.1.5 of this report.

4.5.6 TEST RESULT

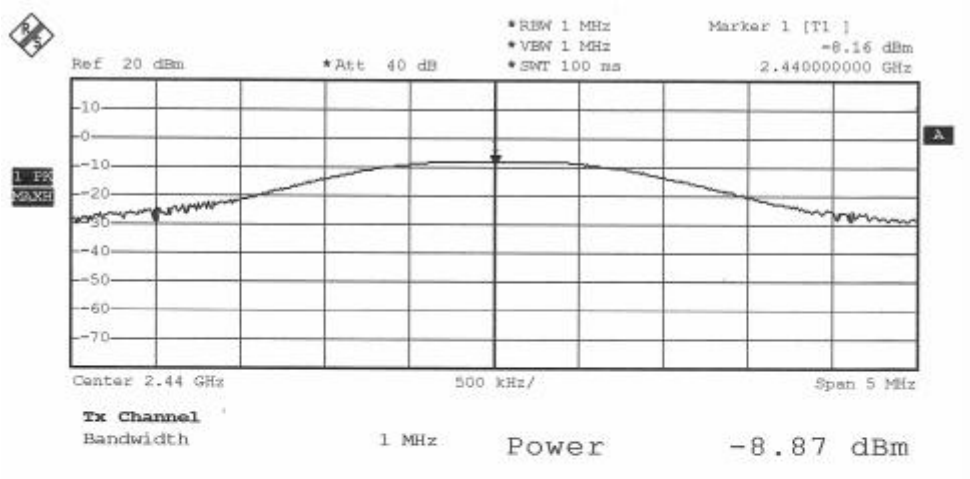
Temperature:	24°C	Humidity:	55%RH
Spectrum Detector:	PK	Tested by:	Mao Feng Hsu
Test Result:	PASS	Tested Date:	Aug. 04, 2006

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)
0	2410.0000	-8.96	21
37	2440.0000	-8.87	21
73	2470.0000	-11.93	21

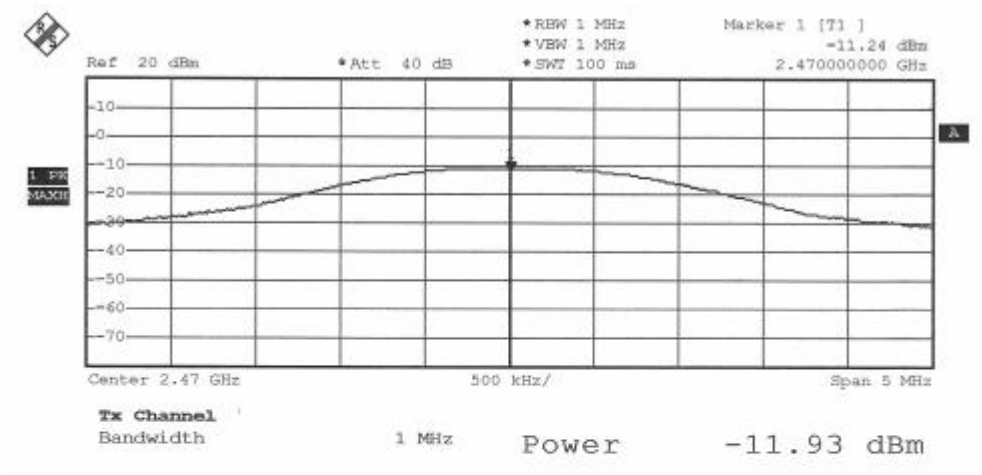
CH0:


Peak Power Test
4-5
*RBW 1 MHz
*VBW 1 MHz
*SWT 100 ms
Marker 1 [T1]
-8.23 dBm
2.410000000 GHz
Ref 20 dBm
*Att 40 dB
1 PK
MAXH
B
Center 2.41 GHz
500 kHz/
Span 5 MHz
Tx Channel
Bandwidth
1 MHz
Power
-8.96 dBm

CH37:


*RBW 1 MHz
*VBW 1 MHz
*SWT 100 ms
Marker 1 [T1]
-8.16 dBm
2.440000000 GHz
Ref 20 dBm
*Att 40 dB
10
0
-10
-20
-30
-40
-50
-60
-70
A
1 PK
MAXH
Center 2.44 GHz
500 kHz/
Span 5 MHz
Tx Channel
Bandwidth
1 MHz
Power
-8.87 dBm

CH73:


RBW 1 MHz
VBW 1 MHz
SWT 100 ms
Marker 1 [T1]
-11.24 dBm
2.470000000 GHz
Ref 20 dBm
Att 40 dB
1 PK
MAXH
A
10
0
-10
-20
-30
-40
-50
-60
-70
Center 2.47 GHz
500 kHz/
Span 5 MHz
Tx Channel
Bandwidth
1 MHz
Power
-11.93 dBm

4.6 BAND EDGE TEST

4.6.1 LIMIT

FCC Part15, Subpart C Section 15.247. In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (see Section 15.205(c)).

OPERATING FREQUENCY RANGE (MHz)	SPURIOUS EMISSION FREQUENCY (MHz)	LIMIT	
		Peak power ration to emission(dBc)	Emission level(dBuV/m)
902-928	<902	>20	NA
	>928	>20	NA
	960-1240	NA	54
2400-2483.5	<2400	>20	NA
	>2483.5-2500	NA	54
5725-5850	<5350-5460	NA	54
	<5725	>20	NA
	>5850	>20	NA

4.6.2 TEST EQUIPMENT

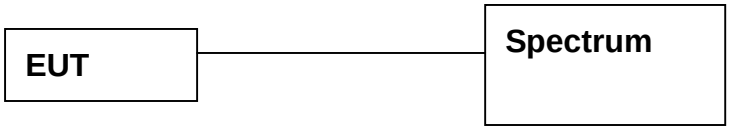
The following test equipment was used during the test：

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE & SCHWARZ	FSP7/ 839511/010	APR. 2007 R&S
EMI TEST RECEIVER	9 kHz TO 2750 MHz	ROHDE & SCHWARZ	ESCS30/ 830245/012	AUG. 2007 R&S
SPECTRUM	9KHz-26.5GHz	HP	8593E/ 3710A03220	MAY 2007 ETC
PRE-AMPLIFIER	1GHz-26.5GHz Gain:30dB	HP	8449B/ 3008A01019	NOV. 2006 ETC
BI-LOG ANTENNA	25 MHz TO 2 GHz	EMCO	3142/ 9701-1124	FEB. 2007 SRT
HORN ANTENNA	1GHz to 18GHz	EMCO	3115/ 9602-4681	DEC. 2006 ETC
OATS	3 - 10 M measurement	SRT	SRT-1	APR. 2007 SRT

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

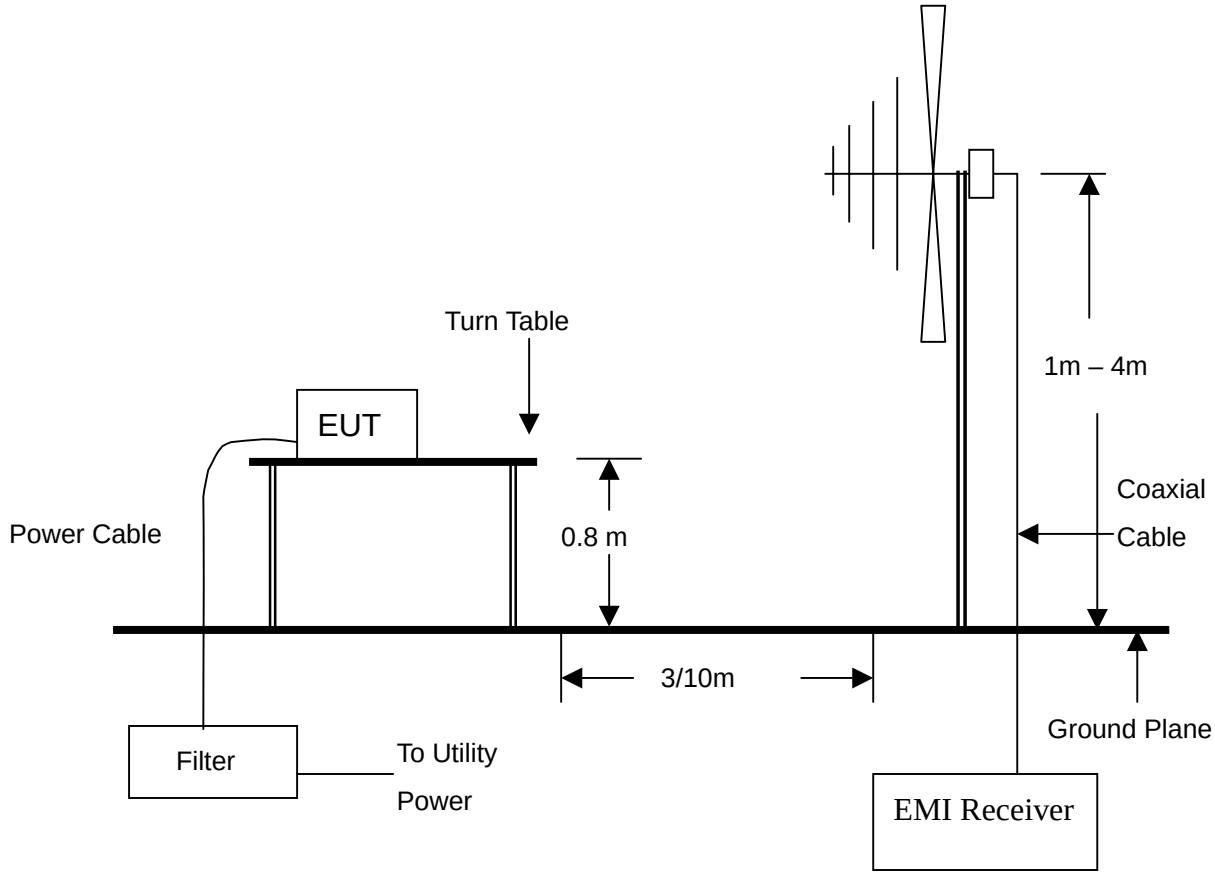
4.6.3 TEST SET-UP

FOR RF CONDUCTED TEST (dBc)



The EUT was connected to the spectrum through a 50Ω RF cable.

FOR RADIATED EMISSION TEST



NOTE :

1. The EUT system was put on a wooden table with 0.8m heights above a ground plane.
2. For the actual test configuration, please refer to the photos of testing.

4.6.4 TEST PROCEDURE

1. The EUT was operating in hopping mode or could be controlled its channel. Printed out the test result from the spectrum by hard copy function.
2. The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22. The measurements were made at an open area test site with 10 meter measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz. All readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak and average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

4.6.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

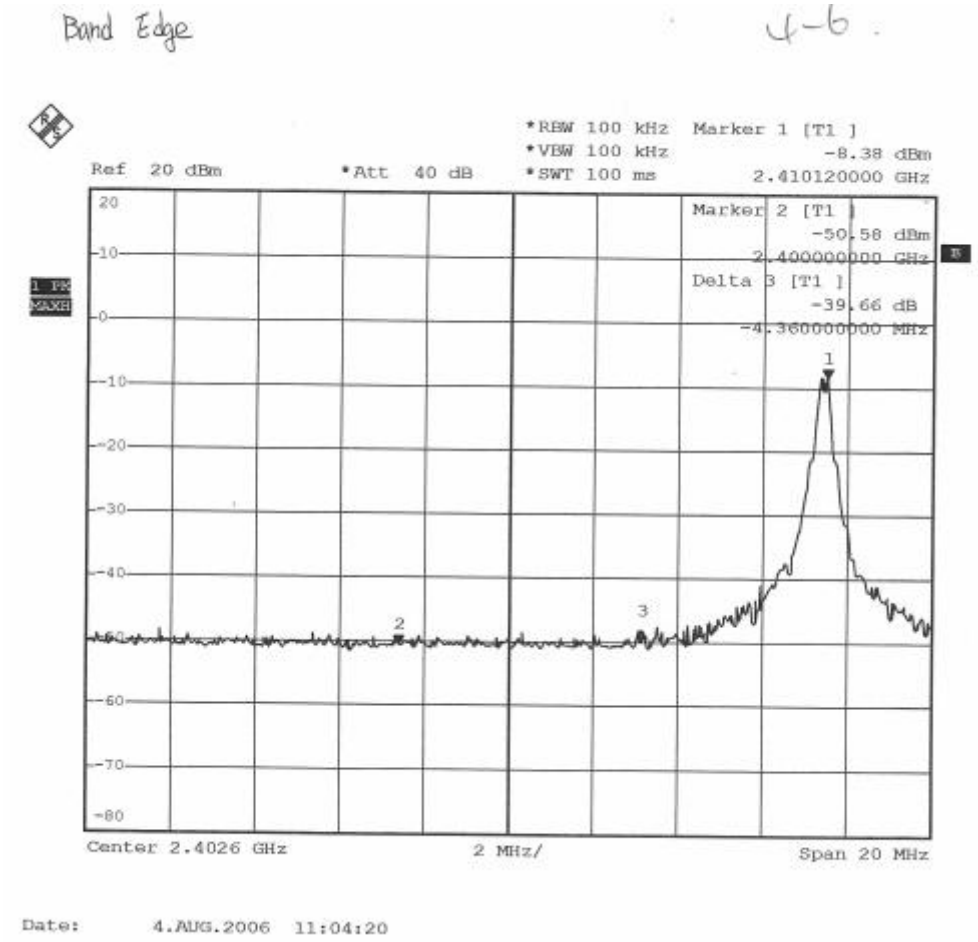
4.6.6 TEST RESULT

Temperature:	24°C	Humidity:	55%RH
Spectrum Detector:	PK & AV	Tested by:	Mao Feng Hsu
Test Result:	PASS	Tested Date:	Aug. 04, 2006

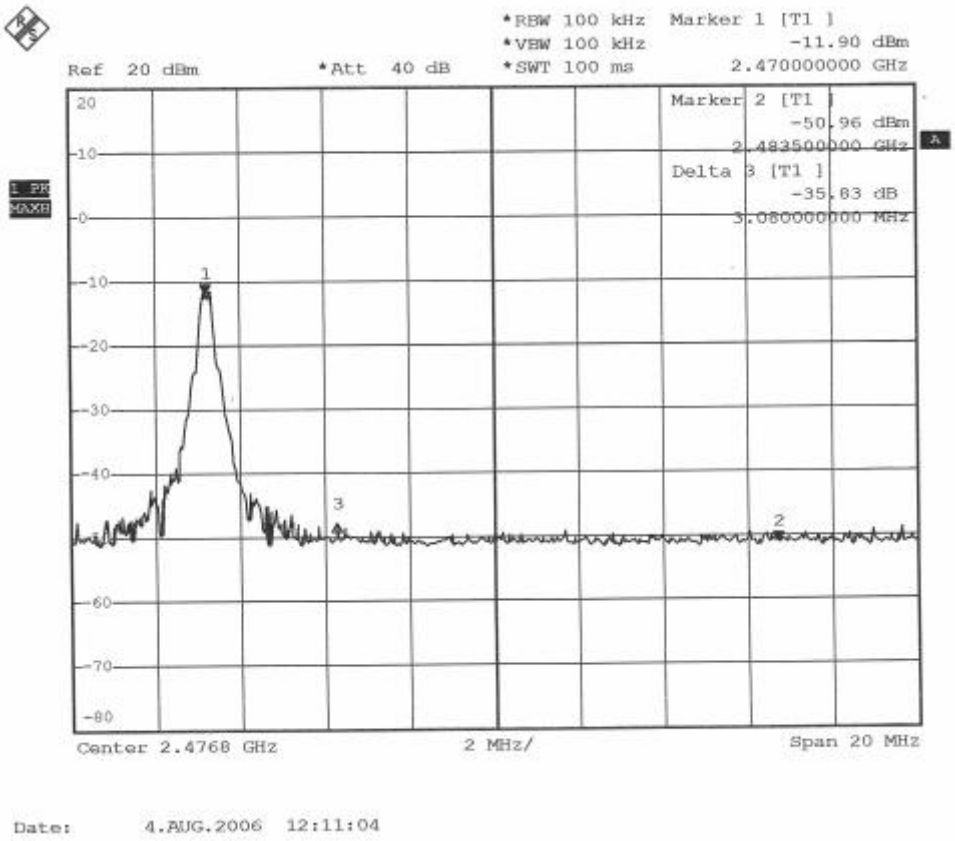
1.Conducted test

Frequency (MHz)	PEAK POWER OUTPUT (dBm)	Emission read Value(dBm)	Result of Band edge (dBc)	Band edge LIMIT (dBc)
<2400	-8.38	-48.04	39.66	>20dBc
>2483.5	-11.9	-47.73	35.83	>20dBc

<2400MHz:


Band Edge
4-6
*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-8.38 dBm
2.410120000 GHz
Ref 20 dBm
*Att 40 dB
Marker 2 [T1]
-50.58 dBm
2.400000000 GHz
Delta 3 [T1]
-39.66 dB
-4.360000000 MHz
1 PK
MAXH
20
10
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.4026 GHz
2 MHz/
Span 20 MHz
Date: 4.AUG.2006 11:04:20

>2470MHz


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Marker 1 [T1]
-11.90 dBm
2.470000000 GHz
Ref 20 dBm
*Att 40 dB
Marker 2 [T1]
-50.96 dBm
2.483500000 GHz
Delta 3 [T1]
-35.83 dB
3.080000000 MHz
1 PK
MAXH
A
20
10
0
-10
-20
-30
-40
-60
-70
-80
Center 2.4768 GHz
2 MHz/
Span 20 MHz
Date: 4.AUG.2006 12:11:04

4.7 SPURIOUS RADIATED EMISSION TEST

4.7.1 LIMIT

FCC Part15, Subpart C Section 15.209 limit of radiated emission for frequency below1000MHz. The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

FREQUENCY (MHz)	DISTANCE (m)	FIELD STRENGTH (dBμV/m)
30 - 88	3	40.0
88 - 216	3	43.5
216 - 960	3	46.0
ABOVE 960	3	54.0

NOTE : 1. In the emission tables above , the tighter limit applies at the band edges.
2. Distance refers to the distance between measuring instrument , antenna , and the closest point of any part of the device or system.

FCC Part 15, Section15.35(b) limit of radiated emission for frequency above 1000 MHz

FREQUENCY (MHz)	Class A (dBuV/m) (at 3m)		Class B (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
Above 1000	80.0	60.0	74.0	54.0

FCC Part 15, Subpart C Section 15.249. The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

FUNDAMENTAL FREQUENCY (MHz)	FILED STRENGTH OF FUNDAMENTAL (dBuV/m) (at 3m)		FIELD STRENGTH OF HARMONICS (dBuV/m) (at 3m)	
	PEAK	AVERAGE	PEAK	AVERAGE
902-928	114	94	74.0	54.0
2400-2483.5	114	94	74.0	54.0
5725-5875	114	94	74.0	54.0
24000-24250	128	108	88.0	68.0

4.7.2 TEST EQUIPMENT

The following test equipment was used during the radiated emission test：

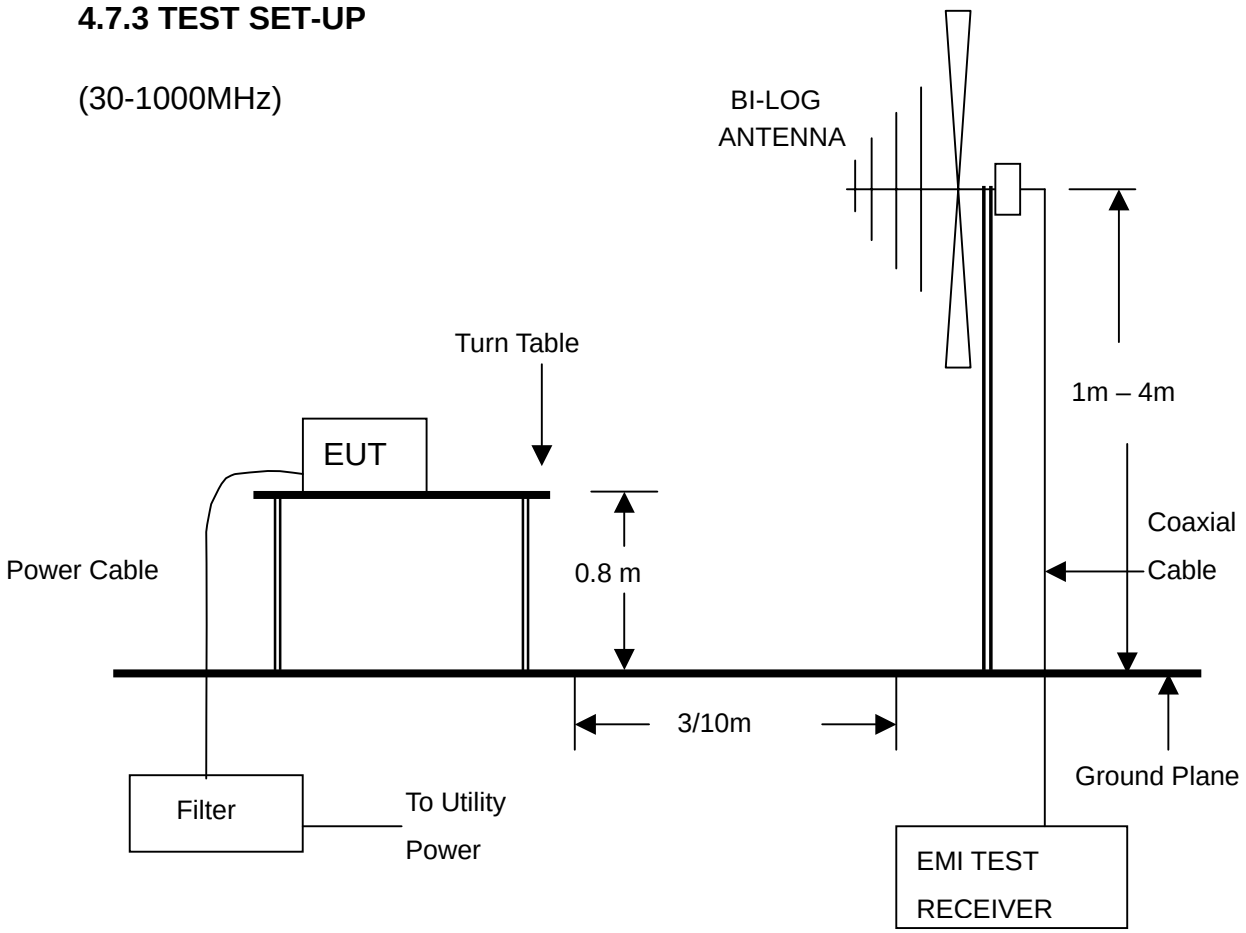
EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	20 kHz TO 1 GHz	ROHDE & SCHWARZ	ESCS30/ 830245/012	OCT. 2006 ETC
SPECTRUM ANALYZER	9KHz TO 26.5GHz	HP	8593E/ 3710A03220	MAY 10,2007 ETC
HORN ANTENNA	18GHz TO 40GHz	ETS	3116/00028513	OCT 05,2006 DBN
HORN ANTENNA	1GHz TO 18GHz	EMCO	3115/9012-3619	JAN. 09,2007 ETC
PREAMPLIFIER	1GHz TO 26.5GHz	HP	8449B/ 3008A01019	NOV. 15,2006 ETC
BI-LOG ANTENNA	25 MHz TO 2 GHz	EMCO	3143/ 9509-1141	SEP. 2006 SRT
OATS	3 – 10 M MEASUREMENT	SRT	SRT-1	DEC. 2006 SRT
COAXIAL CABLE	25M	SUNCITY	J400/ 25M	AUG. 2007 SRT
FILTER	2 LINE, 30A	FIL.COIL	FC-943/ 869	N/A
FREQUENCY CONVERTER	N/A	APC	AFC-2KBB/ F100030031	AUG. 2007 SRT

NOTE:

1. The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.
2. The Open Area Test Site (SRT-1) is registered by FCC with No. 90957 and VCCI with No. R-1081.
3. The Open Area Test Site (SRT-2) is registered by FCC with No. 98458 and VCCI with No. R-1168.

4.7.3 TEST SET-UP

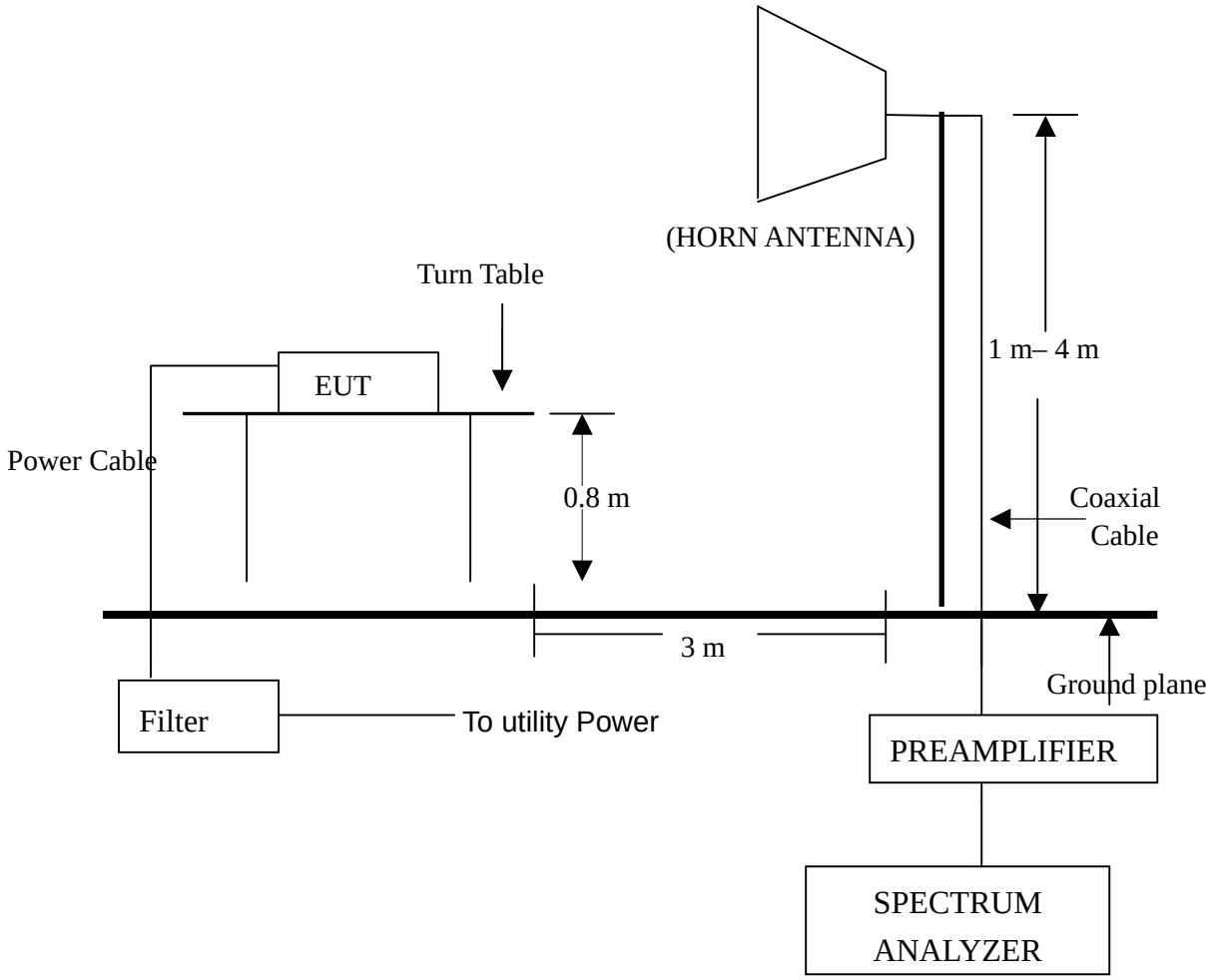
(30-1000MHz)



NOTE :

1. The EUT system was put on a wooden table with 0.8m heights above a ground plane.
2. For the actual test configuration, please refer to the photos of testing.

(1-25GHz)



NOTE :

1. The EUT system was put on a wooden table with 0.8m heights above a ground plane.
2. For the actual test configuration, please refer to the photos of testing.

4.7.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4 and CISPR 22. The measurements were made at an open area test site with 10 meters measurement distance under 1 GHz and with 3m distance above 1GHz. The frequency spectrum measured started from 30 MHz. Under 1 GHz. All readings were quasi-peak values with 120 kHz resolution bandwidth of the test receiver. Above 1 GHz, the measurements were made at an open area test site with 3 meter measurement distance and all readings were peak and average values with 1 MHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. The cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.

4.7.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

4.7.6 TEST RESULT

Temperature:	30°C	Humidity:	68 %RH
Frequency Range:	30 – 1000 MHz	Measured Distance:	3m
Receiver Detector:	Q.P.	Tested Mode:	Link
Tested By:	Mao Feng Hsu	Tested Date:	Aug. 08, 2006

Antenna Polarization: Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
239.6000	2.10	11.04	15.0	28.1	46.0	-17.9	270	4.0
350.2000	3.29	15.15	19.2	37.6	46.0	-8.4	90	1.0
649.7500	4.76	20.18	8.2	33.1	46.0	-12.9	350	3.3
791.0000	5.04	21.38	8.0	34.4	46.0	-11.6	10	1.5
885.4800	4.66	23.78	7.9	36.3	46.0	-9.7	110	3.2
932.0000	4.84	23.34	8.1	36.3	46.0	-9.7	345	2.2

Antenna Polarization: Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Margin (dB)	AZ(°)	EL(m)
178.8300	1.59	9.19	8.1	18.9	43.5	-24.6	350	2.8
313.2400	2.59	14.37	5.6	22.6	46.0	-23.4	350	1.4
350.1000	3.29	15.15	8.4	26.8	46.0	-19.2	10	1.4
393.2050	3.14	16.05	19.6	38.8	46.0	-7.2	20	1.0
589.8000	3.71	19.01	10.9	33.6	46.0	-12.4	180	1.8
786.6000	4.94	21.37	2.4	28.7	46.0	-17.3	0	1.6

NOTE :

1. Measurement uncertainty is +/-2dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. The field strength of other emission frequencies were very low against the limit.

Temperature:	30 °C	Humidity:	70 %RH
Frequency Range:	1 – 25 GHz	Test mode:	TX:CH0
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Mao Feng Hsu	Tested Date:	Aug. 08, 2006

Antenna Polarization: Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m		Limit (dBμV/m)		Margin (dB)		AZ(°)	EL(m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2410.00	-32.18	28.56	78.0	76.8	74.4	73.1	N/A	N/A	N/A	N/A	146	1.2
4820.00	-30.42	33.66	50.2	*	53.4	*	74.0	54.0	-20.6	*	137	1.1
7320.00	-29.05	36.36	49.6	*	56.9	*	74.0	54.0	-17.1	*	66.5	1.2
9640.00	-28.63	37.86	N/A	*	N/A	*	74.0	54.0	N/A	*	N/A	N/A
2400.00	-32.16	28.00	46.9	*	42.7	*	74.0	54.0	-31.3	*	48	1.1
2417.00	-32.19	28.03	47.6	*	43.5	*	74.0	54.0	-30.5	*	131	1.2
12050.00	*	*	*	*	*	*	*	*	*	*	*	*
14460.00	*	*	*	*	*	*	*	*	*	*	*	*
16870.00	*	*	*	*	*	*	*	*	*	*	*	*
19280.00	*	*	*	*	*	*	*	*	*	*	*	*
21690.00	*	*	*	*	*	*	*	*	*	*	*	*
24100.00	*	*	*	*	*	*	*	*	*	*	*	*

NOTE :

1. Measurement uncertainty is +/-2dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. Margin=Emission-Limit
5. The field strength of other emission frequencies (Above 8GHz)were very low against the limit.

Temperature:	30 °C	Humidity:	70 %RH
Frequency Range:	1 – 25 GHz	Test mode:	TX:CH0
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Mao Feng Hsu	Tested Date:	Aug. 08, 2006

Antenna Polarization: Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m		Limit (dBμV/m)		Margin (dB)		AZ(°)	EL(m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2410.00	-32.18	28.02	84.1	82.6	79.9	78.4	N/A	N/A	N/A	N/A	67	1.3
4820.00	-30.42	33.66	50.3	*	53.6	*	74.0	54.0	-20.4	*	165	1.2
7230.00	-28.96	36.28	49.8	*	57.1	*	74.0	54.0	-16.9	*	189	1.1
9640.00	-28.63	37.86	N/A	*	N/A	*	74.0	54.0	N/A	*	N/A	N/A
2400.00	-32.16	28.00	47.7	*	43.5	*	74.0	54.0	-30.5	*	66	1.2
2415.30	-32.18	28.03	48.0	*	43.8	*	74.0	54.0	-30.2	*	38.5	1.3
12050.00	*	*	*	*	*	*	*	*	*	*	*	*
14460.00	*	*	*	*	*	*	*	*	*	*	*	*
16870.00	*	*	*	*	*	*	*	*	*	*	*	*
19280.00	*	*	*	*	*	*	*	*	*	*	*	*
21690.00	*	*	*	*	*	*	*	*	*	*	*	*
24100.00	*	*	*	*	*	*	*	*	*	*	*	*

NOTE :

1. Measurement uncertainty is +/-2dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. Margin=Emission-Limit
5. The field strength of other emission frequencies (Above 8GHz)were very low against the limit.

Temperature:	30°C	Humidity:	70 %RH
Frequency Range:	1 – 25 GHz	Test mode:	TX:CH37
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Mao Feng Hsu	Tested Date:	Aug. 08, 2006

Antenna Polarization: Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m		Limit (dBμV/m)		Margin (dB)		AZ(°)	EL(m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2440.00	-32.22	28.62	69.0	67.9	65.4	64.3	N/A	N/A	N/A	N/A	115	1.2
4880.00	-30.27	33.70	49.0	*	52.4	*	74.0	54.0	-21.6	*	165	1.2
7320.00	-29.05	36.36	49.9	*	57.2	*	74.0	54.0	-16.8	*	163	1.1
9760.00	-28.48	37.90	N/A	*	N/A	*	74.0	54.0	N/A	*	N/A	N/A
2420.00	-32.19	28.04	48.7	*	44.6	*	74.0	54.0	-29.4	*	188	1.2
2449.30	-32.24	28.10	49.0	*	44.9	*	74.0	54.0	-29.1	*	333	1.3
12200.00	*	*	*	*	*	*	*	*	*	*	*	*
14640.00	*	*	*	*	*	*	*	*	*	*	*	*
17080.00	*	*	*	*	*	*	*	*	*	*	*	*
19520.00	*	*	*	*	*	*	*	*	*	*	*	*
21960.00	*	*	*	*	*	*	*	*	*	*	*	*
24400.00	*	*	*	*	*	*	*	*	*	*	*	*

NOTE :

1. Measurement uncertainty is +/-2dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. Margin=Emission-Limit
5. The field strength of other emission frequencies (Above 8GHz)were very low against the limit.

Temperature:	30°C	Humidity:	70 %RH
Frequency Range:	1 – 25 GHz	Test mode:	TX:CH37
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Mao Feng Hsu	Tested Date:	Aug. 08, 2006

Antenna Polarization: Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m		Limit (dBμV/m)		Margin (dB)		AZ(°)	EL(m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2440.00	-32.22	28.08	83.3	83.0	79.1	78.8	N/A	N/A	N/A	N/A	168	1.2
4880.00	-30.27	33.70	48.6	*	52.1	*	74.0	54.0	-21.9	*	150	1.2
7320.00	-29.05	36.36	49.5	*	56.8	*	74.0	54.0	-17.2	*	160	1.1
9760.00	-28.48	37.90	N/A	*	N/A	*	74.0	54.0	N/A	*	N/A	N/A
2420.00	-32.19	28.04	49.2	*	45.1	*	74.0	54.0	-28.9	*	93.5	1.3
2473.90	-32.20	28.15	49.0	*	44.9	*	74.0	54.0	-29.1	*	46.5	1.2
12200.00	*	*	*	*	*	*	*	*	*	*	*	*
14640.00	*	*	*	*	*	*	*	*	*	*	*	*
17080.00	*	*	*	*	*	*	*	*	*	*	*	*
19520.00	*	*	*	*	*	*	*	*	*	*	*	*
21960.00	*	*	*	*	*	*	*	*	*	*	*	*
24400.00	*	*	*	*	*	*	*	*	*	*	*	*

NOTE :

1. Measurement uncertainty is +/-2dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. Margin=Emission-Limit
5. The field strength of other emission frequencies (Above 8GHz)were very low against the limit.

Temperature:	30°C	Humidity:	70 %RH
Frequency Range:	1 – 25 GHz	Test mode:	TX:CH73
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Mao Feng Hsu	Tested Date:	Aug. 08, 2006

Antenna Polarization: Horizontal

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m		Limit (dBμV/m)		Margin (dB)		AZ(°)	EL(m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2470.00	-32.21	28.71	72.8	70.6	69.3	67.1	N/A	N/A	N/A	N/A	75.5	1.2
4940.00	-30.24	33.75	50.7	*	54.2	*	74.0	54.0	-19.8	*	42.5	1.2
7410.00	-28.93	36.43	50.2	*	57.7	*	74.0	54.0	-16.3	*	132	1.1
9880.00	-28.76	37.95	N/A	*	N/A	*	74.0	54.0	N/A	*	N/A	N/A
2445.10	-32.23	28.09	48.9	*	44.7	*	74.0	54.0	-29.3	*	91.5	1.2
2502.20	-32.15	28.21	49.1	*	45.2	*	74.0	54.0	-28.8	*	144	1.3
12350.00	*	*	*	*	*	*	*	*	*	*	*	*
14820.00	*	*	*	*	*	*	*	*	*	*	*	*
17290.00	*	*	*	*	*	*	*	*	*	*	*	*
19760.00	*	*	*	*	*	*	*	*	*	*	*	*
22230.00	*	*	*	*	*	*	*	*	*	*	*	*
24700.00	*	*	*	*	*	*	*	*	*	*	*	*

NOTE :

1. Measurement uncertainty is +/-2dB.
2. "*": Measurement does not apply for this frequency.
3. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
4. Margin=Emission-Limit
5. The field strength of other emission frequencies (Above 8GHz)were very low against the limit.

Temperature:	30°C	Humidity:	70 %RH
Frequency Range:	1 – 25 GHz	Test mode:	TX:CH73
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Mao Feng Hsu	Tested Date:	Aug. 08, 2006

Antenna Polarization: Vertical

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Reading Data (dBμV)		Emission Level (dBμV/m		Limit (dBμV/m)		Margin (dB)		AZ(°)	EL(m)
			PK.	AV.	PK.	AV.	PK.	AV.	PK.	AV.		
2470.00	-32.21	28.14	80.7	79.5	76.6	75.5	N/A	N/A	N/A	N/A	93.5	1.1
4940.00	-30.24	33.75	49.4	*	52.9	*	74.0	54.0	-21.1	*	73	1.2
7410.00	-28.93	36.43	50.2	*	57.7	*	74.0	54.0	-16.3	*	25.5	1.2
9880.00	-28.76	37.95	N/A	*	N/A	*	74.0	54.0	N/A	*	N/A	N/A
2436.70	-32.22	28.07	48.9	*	44.7	*	74.0	54.0	-29.3	*	337	1.2
2505.40	-32.13	28.23	49.7	*	45.8	*	74.0	54.0	-28.2	*	91	1.3
12350.00	*	*	*	*	*	*	*	*	*	*	*	*
14820.00	*	*	*	*	*	*	*	*	*	*	*	*
17290.00	*	*	*	*	*	*	*	*	*	*	*	*
19760.00	*	*	*	*	*	*	*	*	*	*	*	*
22230.00	*	*	*	*	*	*	*	*	*	*	*	*
24700.00	*	*	*	*	*	*	*	*	*	*	*	*

NOTE :

1. Measurement uncertainty is +/-2dB.
2. "*": Measurement does not apply for this frequency.
5. Emissiom Level = Reading Value + Ant. Factor + Cable Loss.
6. Margin=Emission-Limit
5. The field strength of other emission frequencies (Above 8GHz)were very low against the limit.

4.8 CONDUCTED EMISSION TEST FOR POWER PORT

4.8.1 CONDUCTED EMISSION LIMIT

FREQUENCY (MHz)	Class A (dBμV)		Class B (dBμV)	
	Quasi-peak	Average	Quasi-peak	Average
0.15 - 0.5	79	66	66 - 56	56 - 46
0.5 - 5.0	73	60	56	46
5.0 - 30.0	73	60	60	50

NOTE:

1. The lower limit shall apply at the transition frequencies.
2. The limit decreases in line with the logarithm of the frequency in the range of 0.15 to 0.50 MHz.

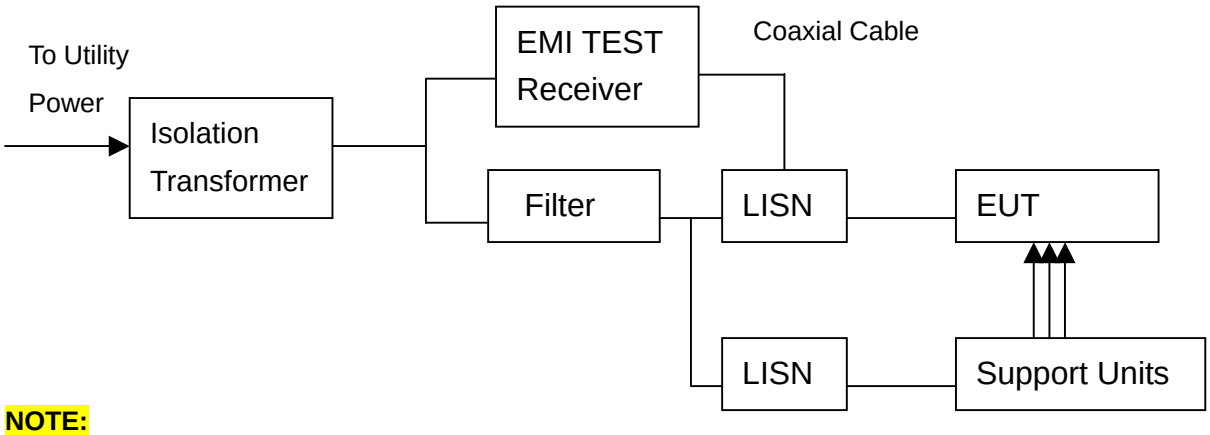
4.8.2 TEST EQUIPMENT

The following test equipment was used for the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	9 kHz TO 30 MHz	ROHDE & SCHWARZ	ESHS30/ 826003/008	AUG. 2007 ETC
LISN (for EUT)	50 μH, 50 ohm	SOLAR ELECTRONICS	8012-50-R-24-BNC / 924839	JUN. 2007 ETC
LISN (for Peripheral)	50μH, 50 ohm	SOLAR ELECTRONICS	9252-50-R-24-BNC / 951318	JUN. 2007 ETC
50 ohm TERMINATOR	50 ohm	HP	11593A/ 2	JUN. 2007 ETC
COAXIAL CABLE	3m	SUNCITY	J400/ 3M	JUL. 2007 SRT
ISOLATION TRANSFORMER	N/A	APC	AFC-11015/ F102040016	N/A
FILTER	2 LINE, 30A	FIL.COIL	FC-943/ 771	N/A
GROUND PLANE	2.3M (H) x 2.4M (W)	SRT	N/A	APR. 2007 SRT
GROUND PLANE	2.4M (H) x 2.4M (W)	SRT	N/A	APR. 2007 SRT

NOTE: The calibration interval of the above test equipment is one year and the calibrations are traceable to NML/ROC and NIST/USA.

4.8.3 TEST SETUP



NOTE:

1. The EUT was put on a wooden table with 0.8m heights above ground plane, and 0.4m away from reference ground plane (> 2mx2m).
2. For the actual test configuration, please refer to the photos of testing.
3. The serial no. of the LISN connected to EUT is 01017.
4. The serial no. of the LISN connected to support units is 01018.

4.8.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4:2003 and CISPR22:2003. The frequency spectrum from 0.15 MHz to 30 MHz was investigated. The LISN used was 50 ohm/50µH as specified. All readings were quasi-peak and average values with 10 kHz resolution bandwidth of the test receiver. The EUT system was operated in all typical methods by users. Both lines of the power mains of EUT were measured and the cables connected to EUT and support units were moved to find the maximum emission levels for each frequency.
First, find the margin or higher points at least 6 points by software, then use manual to find the maximum data. The procedure is referred on the test procedure of SRT LAB.

4.8.5 TEST RESULT

Temperature:	24 °C	Humidity:	68 %RH
Frequency Range:	0.15 – 30 MHz	Tested Mode:	Link
Receiver Detector:	Q.P. and AV.	Tested By:	Mao Feng Hsu
Tested Result:	Pass	Tested Date:	Aug. 05, 2006

Power Line Measured : Line

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.192	0.30	50.56	42.22	50.86	42.52	63.93	53.93	-13.07	-11.41
0.195	0.30	49.48	39.93	49.78	40.23	63.80	53.80	-14.02	-13.57
0.802	0.19	35.72	34.01	35.91	34.20	56.00	46.00	-20.09	-11.80
1.349	0.15	39.76	31.55	39.91	31.70	56.00	46.00	-16.09	-14.30
3.576	0.19	42.02	36.90	42.21	37.09	56.00	46.00	-13.79	-8.91
5.467	0.22	26.86	21.67	27.08	21.89	60.00	50.00	-32.92	-28.11

Power Line Measured : Neutral

Freq. (MHz)	Correct. Factor (dB)	Reading Value (dBμV)		Emission Level (dBμV)		Limit (dBμV)		Margin (dB)	
		Q.P.	AV.	Q.P.	AV.	Q.P.	AV.	Q.P.	AV.
0.192	0.30	50.76	42.54	51.06	42.84	63.93	53.93	-12.87	-11.09
0.195	0.30	49.76	40.60	50.06	40.90	63.80	53.80	-13.74	-12.90
1.090	0.14	36.30	28.71	36.44	28.85	56.00	46.00	-19.56	-17.15
1.289	0.14	36.02	28.57	36.16	28.71	56.00	46.00	-19.84	-17.29
3.576	0.19	41.46	36.36	41.65	36.55	56.00	46.00	-14.35	-9.45
10.278	0.23	26.92	22.05	27.15	22.28	60.00	50.00	-32.85	-27.72

NOTE :

1. Measurement uncertainty is +/-1.32dB
2. Emission level = Reading valus + Correction factor
3. Correction Factor = Cable loss + Insertion loss of LISN
4. Margin value = Emission level - Limit
5. The emission of other frequencies were very low against the limit.
6. "-": The Quasi-peak reading value also meets average limit and measurement with the average detector is unnecessary.

5. Antenna application

5.1 Antenna requirement

The EUT's antenna is met the requirement of FCC part15C section15.203 and 15.204.

FCC part15C section15.247 requirement:
Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6 dBi.

5.2 Result

The EUT's antenna used a dipole antenna and integrated on PCB. The antenna's gain is 1dBi and meets the requirement.

6. PHOTOS OF TESTING

- Radiated test (TX)

- Radiated test (LINK)

- Conducted test (TX)

7. TERMS OF ABBREVIATION

AV.	Average detection
AZ(°)	Turn table azimuth
Correct.	Correction
EL(m)	Antenna height (meter)
EUT	Equipment Under Test
Horiz.	Horizontal direction
LISN	Line Impedance Stabilization Network
NSA	Normalized Site Attenuation
Q.P.	Quasi-peak detection
SRT Lab	Spectrum Research & Testing Laboratory, Inc.
Vert.	Vertical direction