Product Name:	BLUETOOTH USB DONGLE
Model No.:	BF-7221
Applicant:	TAIWAN FIRST LINE ELECTRONICS CORP. No. 40, Chung-Shan Road, Tu-Chen Industrial Area, Taipei Hsian, Taiwan, R.O.C.
Date of Receipt:	Apr. 24, 2003
Finished date of Test:	Jun. 13, 2003
Applicable Standards:	47 CFR Part 15, Subpart C ANSI C63.4:1992 DA 00-705

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.

Checked By : Sunyou Chen , Date: 8/26/2003
(Sunyou Chen)

Approved By : For , Date: 8/26/2003
(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.

2. DESCRIPTION OF EUT AND TEST MODE

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	BLUETOOTH USB DONGLE
MODEL NO.	BF-7221
POWER SUPPLY	5Vdc from USB port of PC system
CABLE	N/A
I/O PORT	USB interface
FREQUENCY BAND	2.402~2.4835GHz
CARRIER FREQUENCY	CH0: 2402MHz~CH78: 2480MHz
NUMBER OF CHANNEL	79
CHANNEL SPACING	1MHz
RATED RF OUTPUT POWER	1dBm
I.F. & L.O.	I.F.: 1.5MHz, L.O.=channel - 1.5MHz
MODULATION TYPE	GFSK
BIT RATE OF TRANSMISSION	1Mbps
ANTENNA TYPE	Monopole antenna printed on PCB
ANTENNA GAIN	0dBi

NOTE : For more detailed features, please refer to the manufacturer's specification or User's Manual of EUT.

2.2 DESCRIPTION OF SUPPORT UNIT

The transmitter part of EUT was tested with a PC system 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.	NOTEBOOK	DELL	PP01L	DOC	1.8m unshielded AC power cable 1.8m unshielded DC power cable
2	PRINTER	EPSON	STYLUS C20SX	DOC	1.5m unshielded power cord 1.2m shielded data cable
3	MODEM	ACEEX	DM-1414	DOC	1.5m unshielded DC power cable 1.2m shielded data cable

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

2.3 DESCRIPTION OF TEST MODE

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

Channel	Frequency(MHz)
0	2402
39	2441
78	2480

NOTE :

1. Below 1 GHz, the channel 0, 39, and 78 were pre-tested in chamber. The channel 78, worst case one, was chosen for conducted and radiated emission test.
2. Above 1 GHz, the channel 0, 39 and 78 were tested individually

3. DESCRIPTION OF APPLIED STANDARDS

The EUT is a kind of wireless product and to be connected with a PC 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
ANSI C63.4:1992
DA 00-705

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

4 TECHNICAL CHARACTERISTICS TEST

4.1 CONDUCTED EMISSION TEST

4.1.1 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
0.50 - 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.

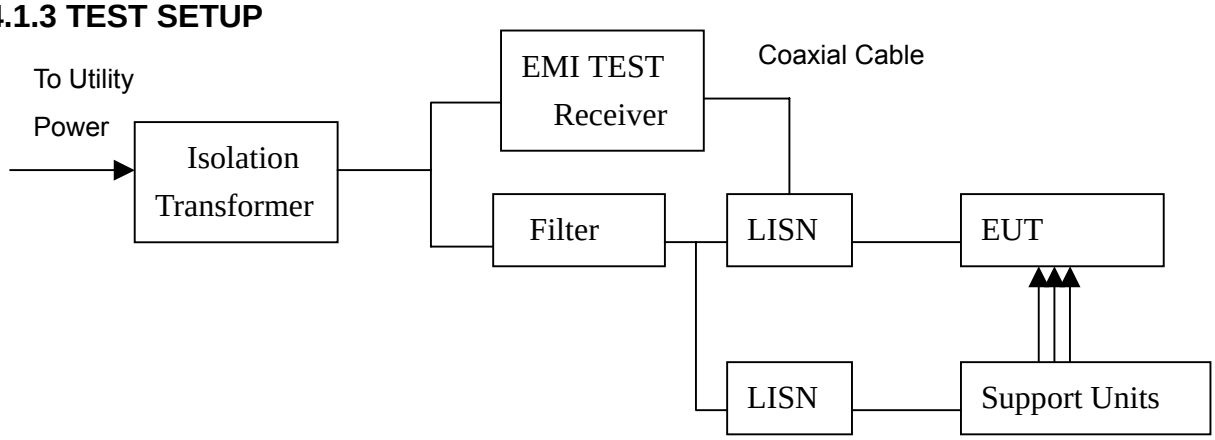
4.1.2 TEST EQUIPMENT

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 2750 MHz	ROHDE & SCHWARZ	ESCS30/ 830245/012	AUG. 2003 R&S
LISN (for EUT)	50 μH, 50 ohm	SOLAR ELECTRONICS	8012-50-R-24-BNC / 924839	JUN. 2004 ETC
LISN (for Peripheral)	50μH, 50 ohm	SOLAR ELECTRONICS	9252-50-R-24-BNC / 951318	JUN. 2004 ETC
50 ohm TERMINATOR	50 ohm	HP	11593A/ 2	JUN. 2004 ETC
COAXIAL CABLE	3m	SUNCITY	J400/ 3M	JUL. 2004 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. 2004 SRT
GROUND PLANE	2.4M (H) x 2.4M (W)	SRT	N/A	APR. 2004 SRT

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

4.1.3 TEST SETUP



NOTE:

1. The EUT was put on a wooden table with 0.8m height 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 951318.
4. The serial no. of the LISN connected to support units is 924839.

4.1.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4:1992 and CISRP22:1997. 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.

4.1.5 EUT OPERATING CONDITION

1. Set the EUT under transmission condition continuously at a specific channel frequency.
2. Under Windows XP ran “EMI TEST” and “Blue Test” programs, PC sent "H" pattern or accessed the following peripherals:
   - RS232 (modem)
   - Printer
   - FDD
   - HDD

4.1.6 TEST RESULT

Temperature:	25 °C	Humidity:	55 %RH
Ferquency Range:	0.15 – 30 MHz	Tested Mode:	N/A
Receiver Detector:	Q.P. and AV.	Tested By:	Ken Su
Tested Result:	Pass	Tested Date:	May 27, 2003

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.
0.170	0.20	49.0	38.0	49.2	38.2	65.0	55.0	-15.8	-16.8
0.310	0.20	30.9	26.8	31.1	27.0	59.9	49.9	-28.8	-22.9
0.576	0.20	23.2	20.1	23.4	20.3	56.0	46.0	-32.6	-25.7
1.838	0.20	20.0	17.9	20.2	18.1	56.0	46.0	-35.8	-27.9
3.791	0.27	27.7	18.7	28.0	19.0	56.0	46.0	-28.0	-27.0
4.541	0.31	23.9	15.5	24.2	15.8	56.0	46.0	-31.8	-30.2

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.
0.173	0.20	49.8	38.9	50.0	39.1	64.8	54.8	-14.8	-15.7
0.427	0.20	27.2	25.1	27.4	25.3	57.3	47.3	-29.9	-22.0
3.697	0.26	29.0	25.4	29.3	25.7	56.0	46.0	-26.7	-20.3
4.334	0.30	25.9	21.9	26.2	22.2	56.0	46.0	-29.8	-23.8
14.170	0.48	23.5	19.6	24.0	20.1	60.0	50.0	-36.0	-29.9
20.380	0.61	29.6	26.3	30.2	26.9	60.0	50.0	-29.8	-23.1

NOTE :

1. Measurement uncertainty is 2dB
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.

4.2 CHANNEL SEPARATION TEST

4.2.1 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

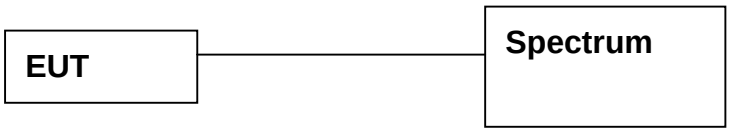
4.2.2 TEST EQUIPMENT

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	MAR. 2004 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

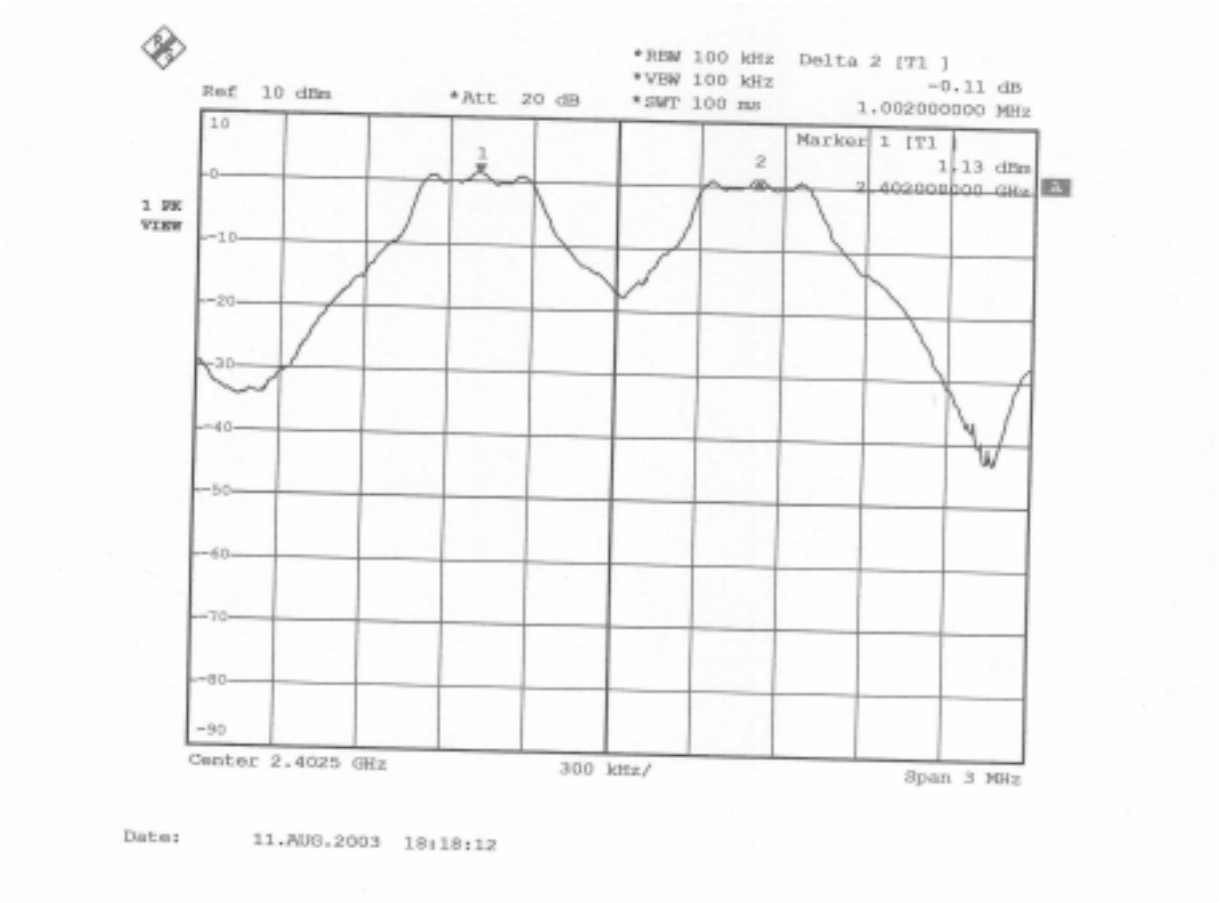
Same as section 4.1.5 of this report.

4.2.6 TEST RESULT

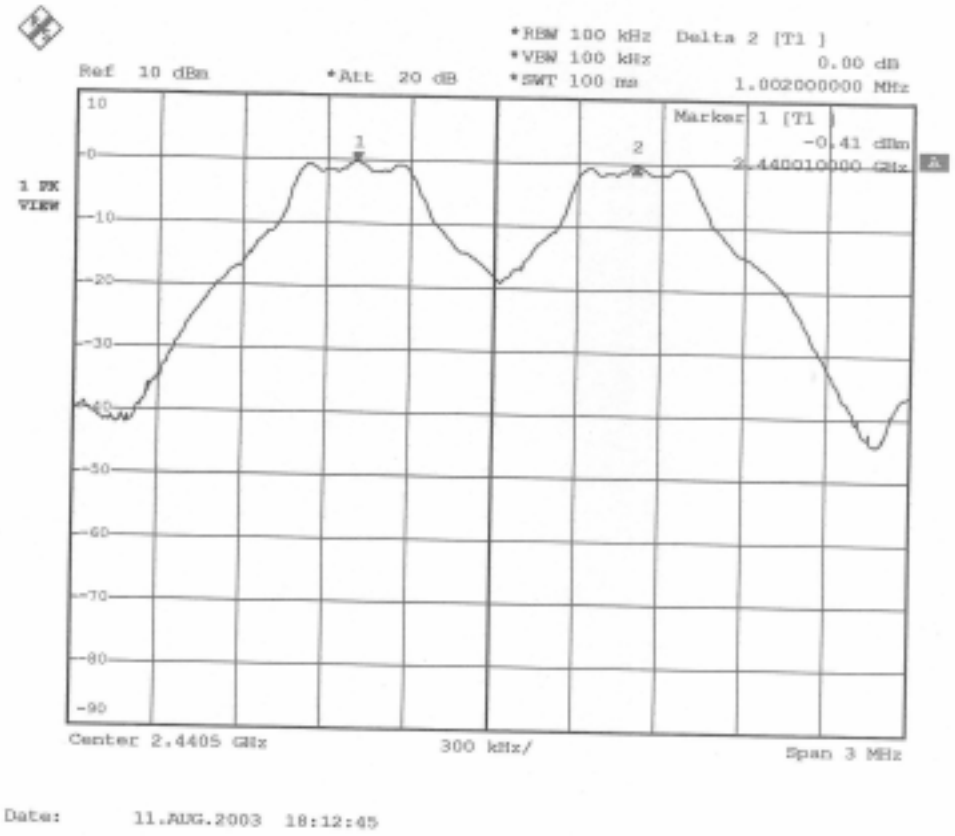
Temperature:	25°C	Humidity:	50%RH
Spectrum Detector:	PK.	Tested Mode:	N/A
Tested Result:	Pass	Tested By:	Ken Su

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	SEPARATION READ VALUE (kHz)	SEPARATION LIMIT (kHz)
0	2402	1002	>25kHz
39	2441	1002	>25kHz
78	2480	1000	>25kHz

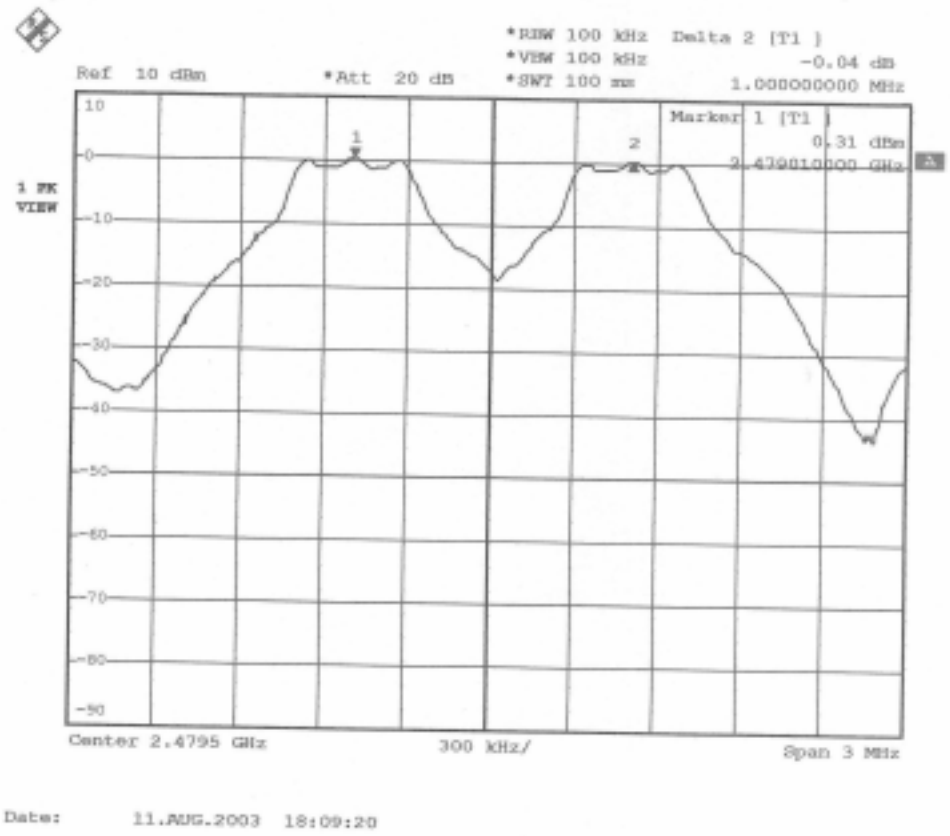
CH0:



CH39:


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Delta 2 [T1]
0.00 dB
1.002000000 MHz
Ref 10 dBm
*Att 20 dB
Marker 1 [T1]
-0.41 dBm
2.440010000 GHz
1 PK
VIEW
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.4405 GHz
300 kHz/
Span 3 MHz
Date: 11.AUG.2003 18:12:45

CH78:


*RBW 100 kHz
*VBW 100 kHz
*SWT 100 ms
Delta 2 [T1]
-0.04 dB
1.000000000 MHz
Ref 10 dBm
*Att 20 dB
Marker 1 [T1]
0.31 dBm
2.479010000 GHz
1 PK
VIEW
10
0
-10
-20
-30
-40
-50
-60
-70
-80
-90
Center 2.4795 GHz
300 kHz/
Span 3 MHz
Date: 11.AUG.2003 18:09:20

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	NA	NA
2400-2483.5	NA	NA	75	15
5725-5850	NA	NA	75	NA

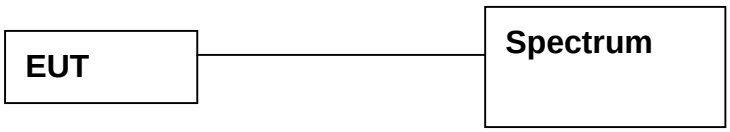
4.3.2 TEST EQUIPMENT

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	MAR. 2004 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

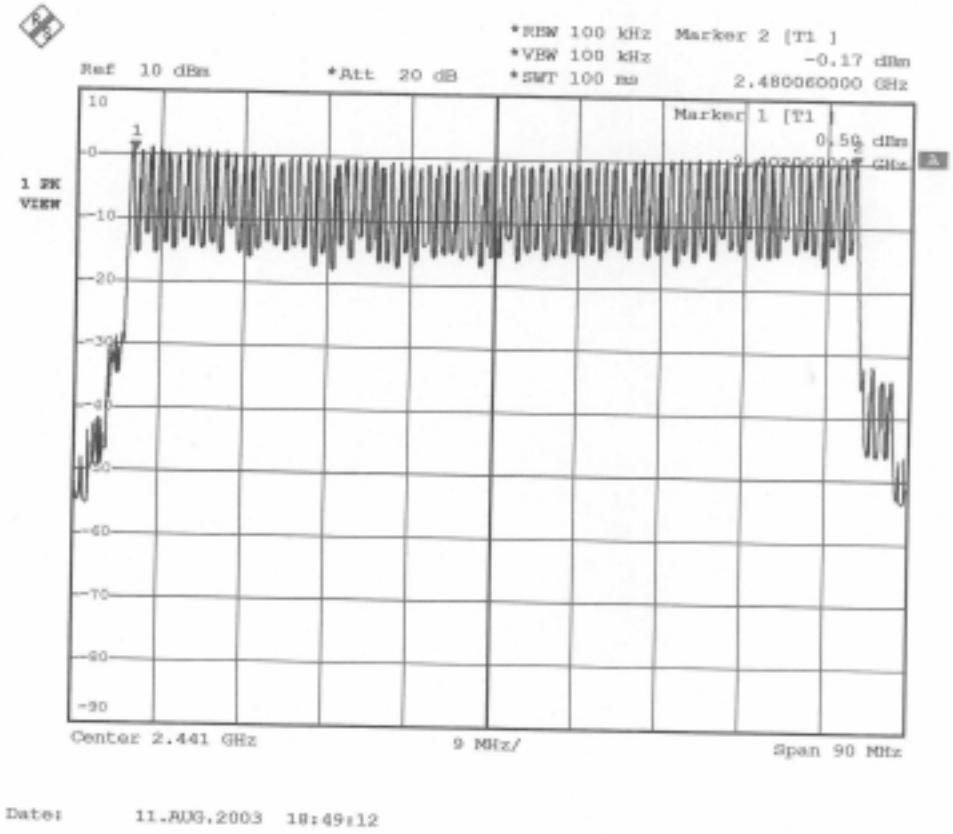
Same as section 4.1.5 of this report.

4.3.6 TEST RESULT

Temperature:	25°C	Humidity:	50%RH
Spectrum Detector:	PK.	Tested Mode:	N/A
Test Result:	Pass	Tested By:	Ken Su

HOPPING CHANNEL FREQUENCY RANGE	QUANTITY OF HOPPING CHANNEL READ VALUE	QUANTITY OF HOPPING CHANNEL LIMIT
2402~2480	79	75

CH0-CH78



4.4 20dB BANDWIDTH

4.4.1 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

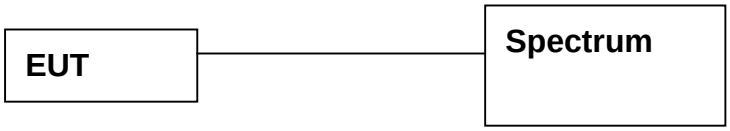
4.4.2 TEST EQUIPMENT

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	MAR.2004 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

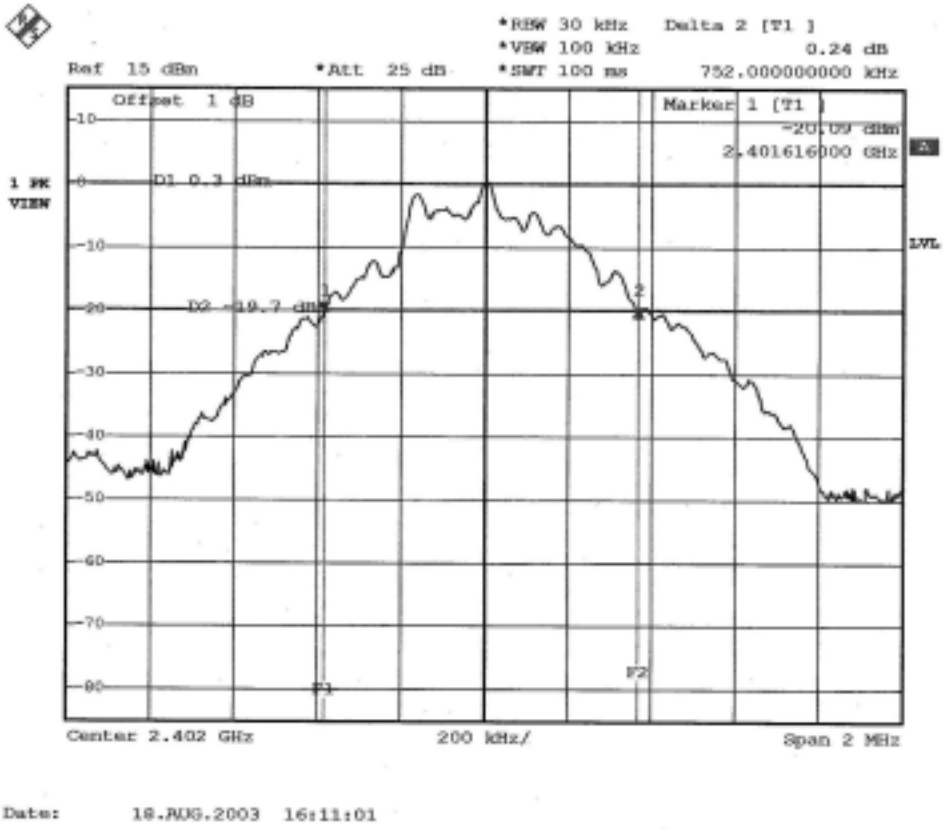
Same as section 4.1.5 of this report.

4.4.6 TEST RESULT

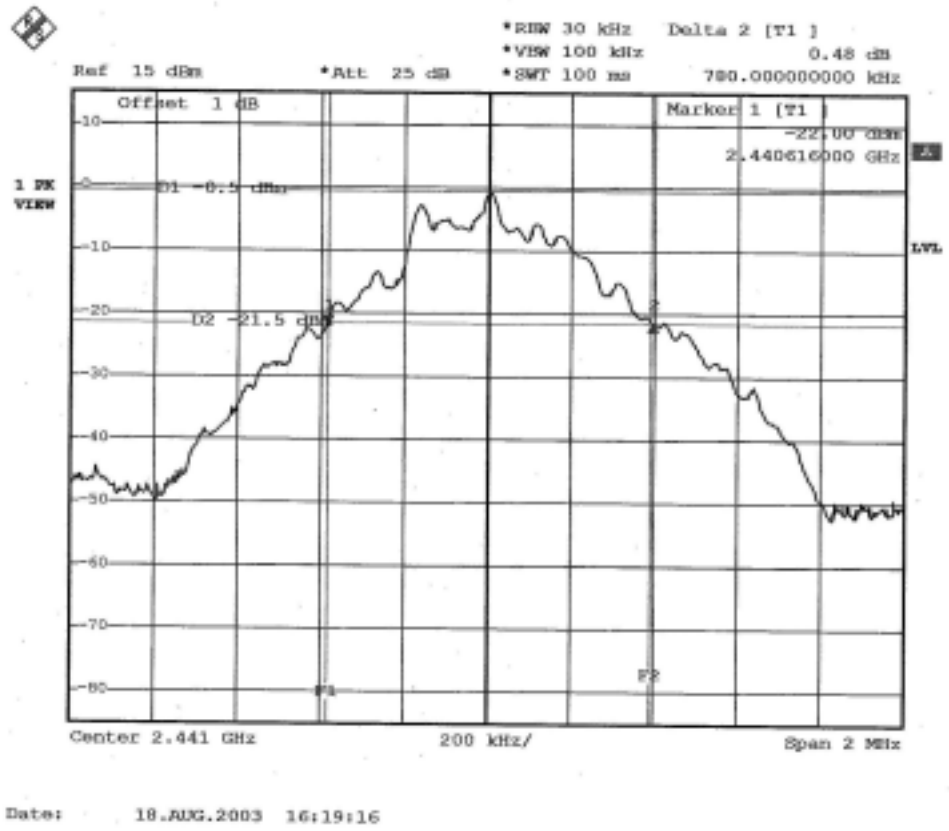
Temperature:	26°C	Humidity:	55%RH
Spectrum Detector:	PK.	Tested By:	Ken Su
Test Result:	Pass	Tested Date:	Aug. 18, 2003

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	20dB DOWN BW (MHz)	MINIMUM LIMIT (MHz)
0	2402	0.752	1
39	2441	0.780	1
78	2480	0.780	1

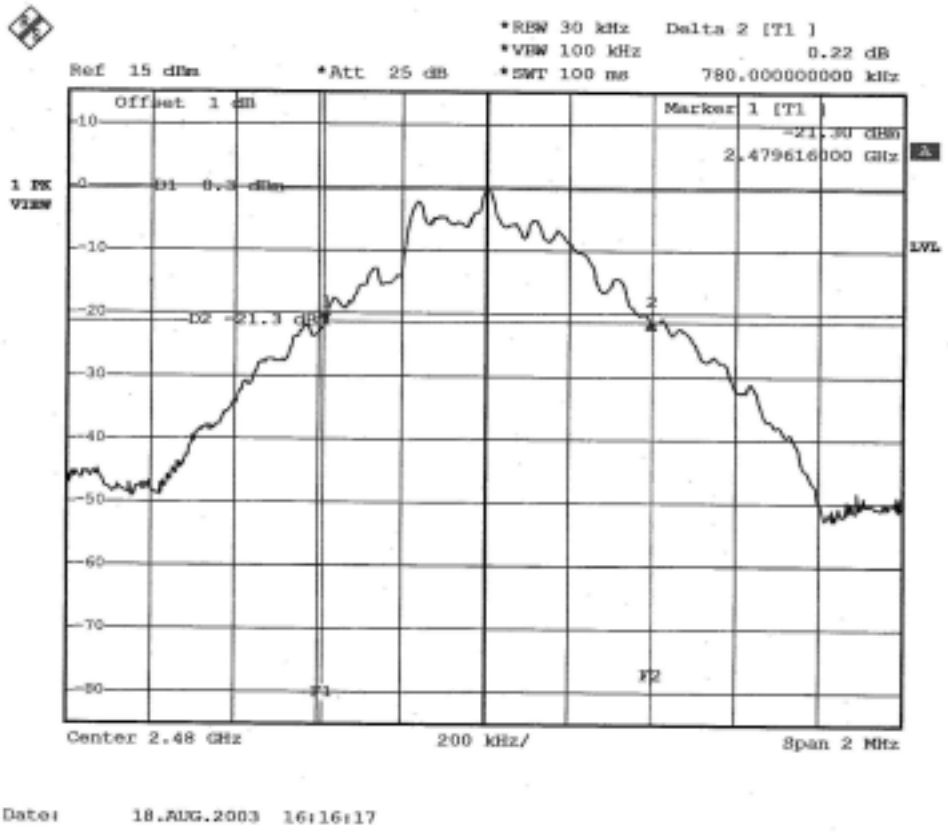
CH0:



CH39:


*RBW 30 kHz
*VBW 100 kHz
*SWT 100 ms
Delta 2 [T1]
0.48 dB
780.000000000 kHz
Ref 15 dBm
*Att 25 dB
Offset 1 dB
Marker 1 [T1]
-22.00 dBm
2.440616000 GHz
1 PK
VIEW
D1 -8.5 dBm
D2 -21.5 dBm
LVL
Center 2.441 GHz
200 kHz/
Span 2 MHz
Date: 18.AUG.2003 16:19:16

CH78:


*RBW 30 kHz
*VBW 100 kHz
*SWT 100 ms
Delta 2 [T1]
0.22 dB
780.000000000 kHz
Ref 15 dBm
*Att 25 dB
Offset 1 dB
Marker 1 [T1]
2.479616000 GHz
1 PK
VIEW
LVL
D1 0.3 dBm
D2 -21.3 dBm
Center 2.48 GHz
200 kHz/
Span 2 MHz
Date: 18.AUG.2003 16:16:17

4.5 TIME OF OCCUPANCY (DWELL TIME)

4.5.1 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.

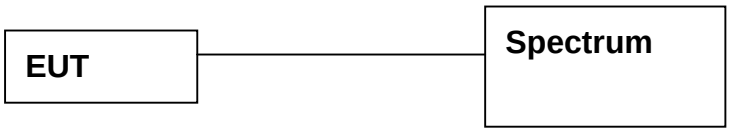
4.5.2 TEST EQUIPMENT

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	MAR. 2004 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.

4.5.3 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 be controlled its channel.
Printed out the test result from the spectrum by hard copy function.

4.5.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

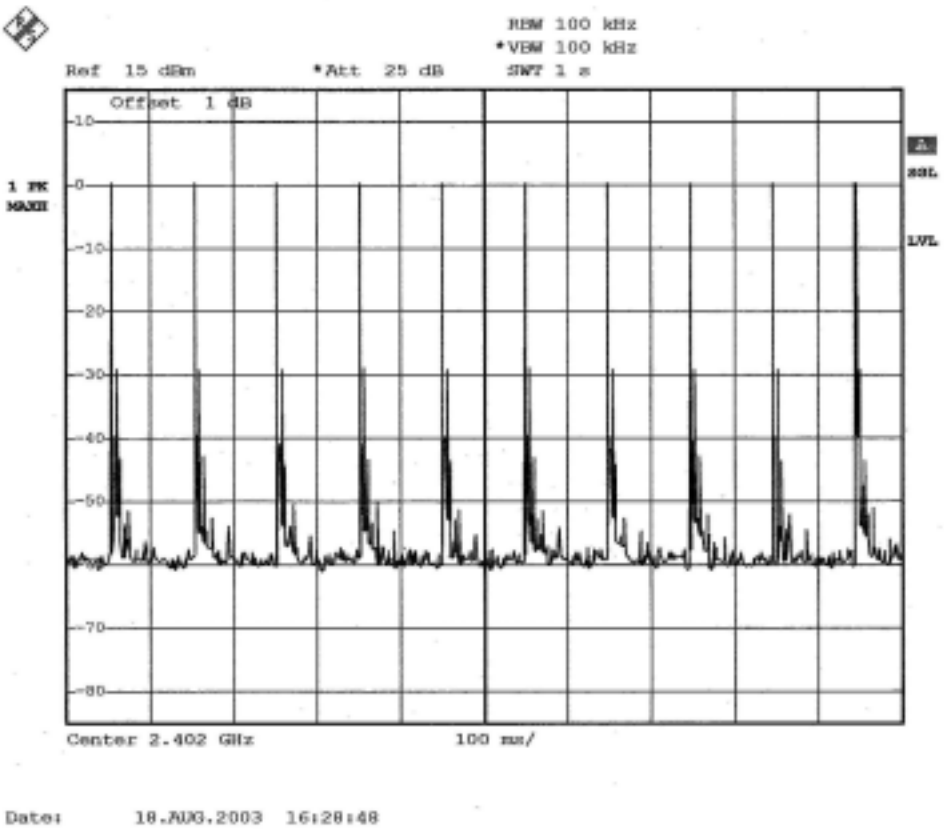
4.5.6 TEST RESULT

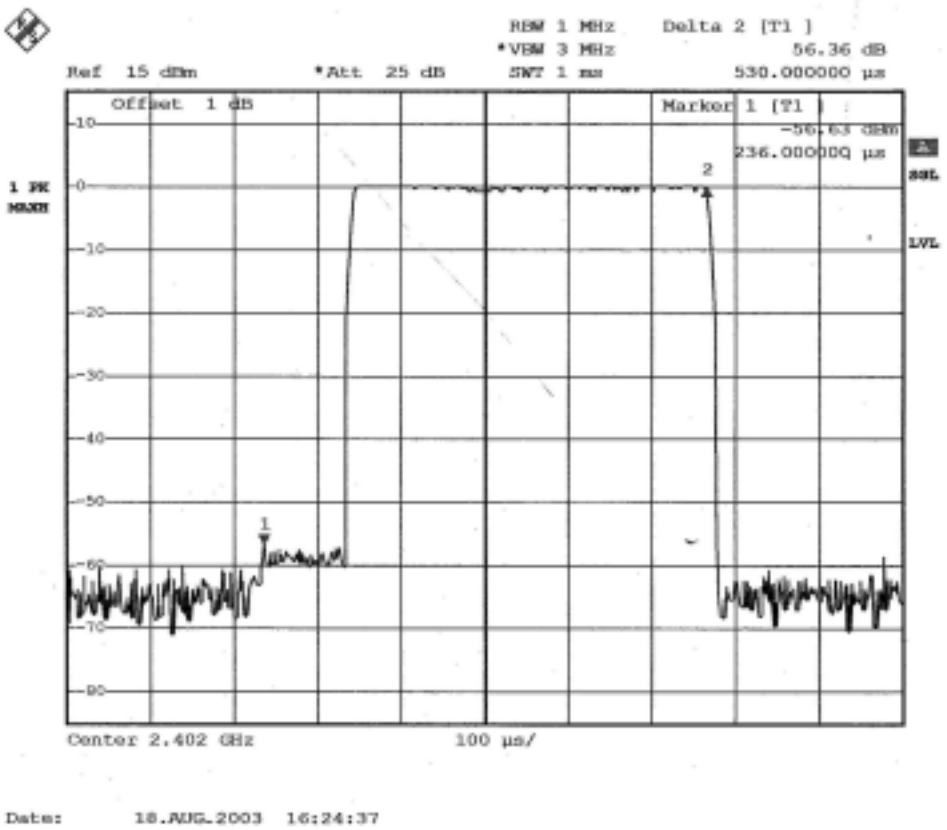
Temperature:	25°C	Humidity:	50%RH
Spectrum Detector:	PK.	Tested Mode:	N/A
Tested Result:	Pass	Tested By:	Ken Su

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	2402.00	530	10	159.0	400
39	2441.00	530	10	159.0	400
78	2480.00	532	10	159.6	400

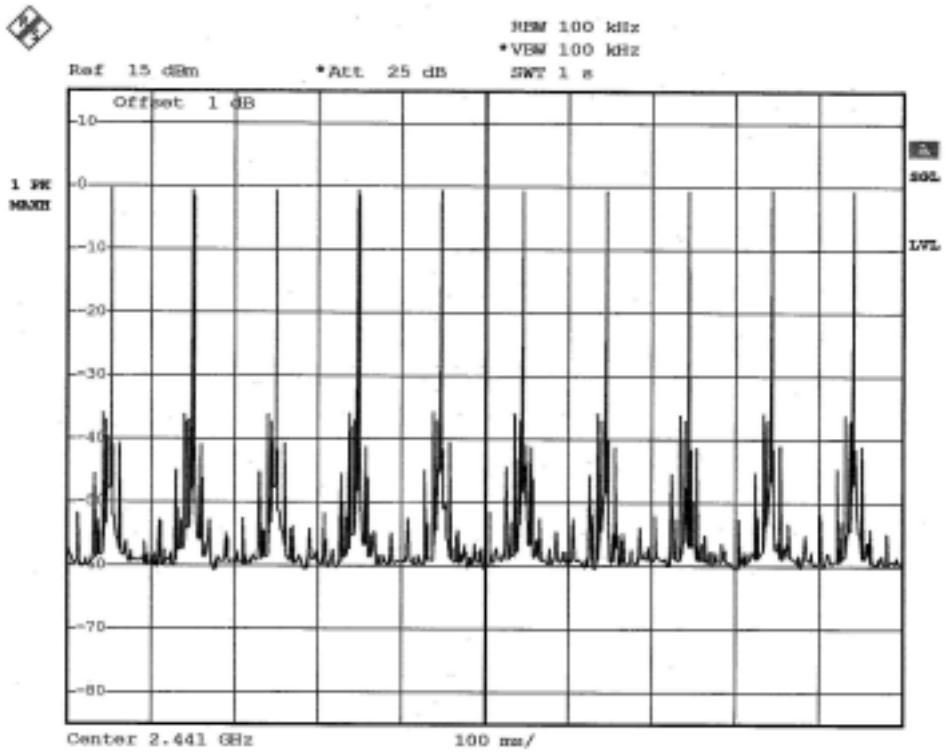
Note:
Dwell Time:
CH0: 530×10×30=159000(μs)=159ms
CH39: 530×10×30=159000(μs)=159ms
CH78: 532×10×30=159600(μs)=159.6ms

CH0:

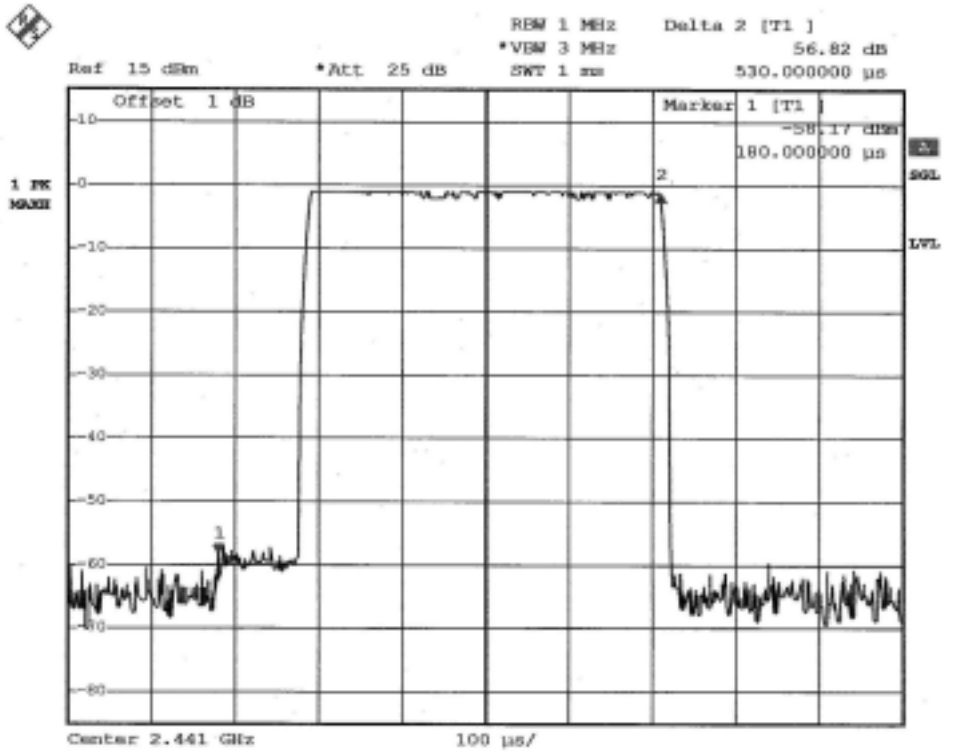

RBW 100 kHz
*VBW 100 kHz
Ref 15 dBm
*Att 25 dB
SWT 1 s
Offset 1 dB
1 PK
MAXH
A
AUTO
LVL
Center 2.402 GHz
100 ms/
Date: 18.AUG.2003 16:28:48


RBW 1 MHz
*VBW 3 MHz
SWT 1 ms
Delta 2 [T1]
56.36 dB
530.000000 µs
Ref 15 dBm
*Att 25 dB
Offset 1 dB
Marker 1 [T1]
-56.63 dBm
236.000000 µs
1 PK
MAXH
A
AUTO
LVL
Center 2.402 GHz
100 µs/
Date: 18.AUG.2003 16:24:37

Ch39:

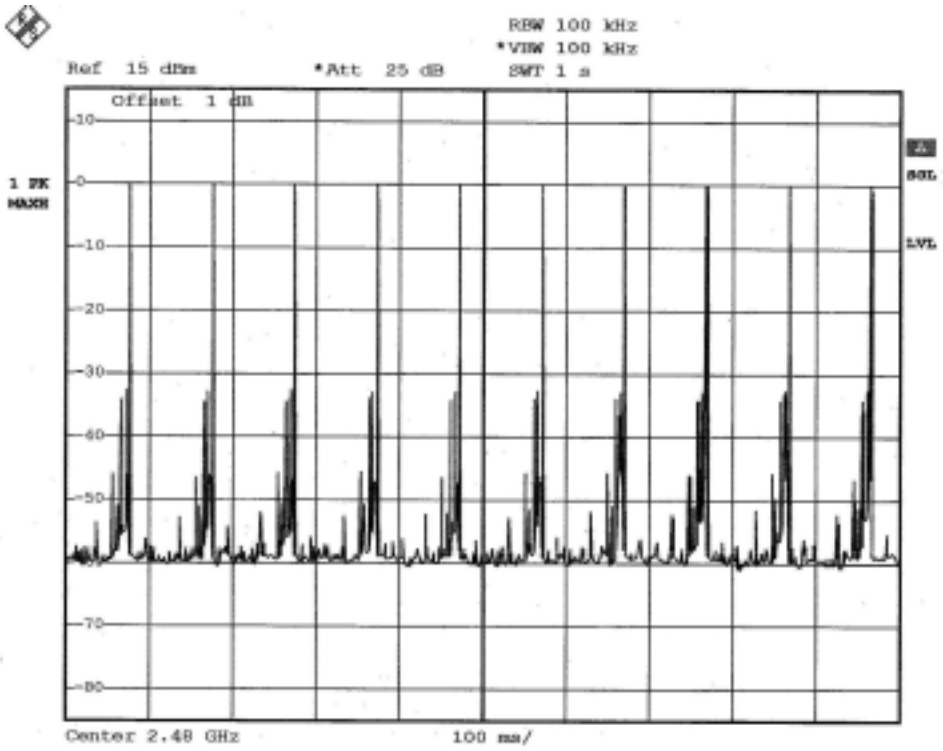


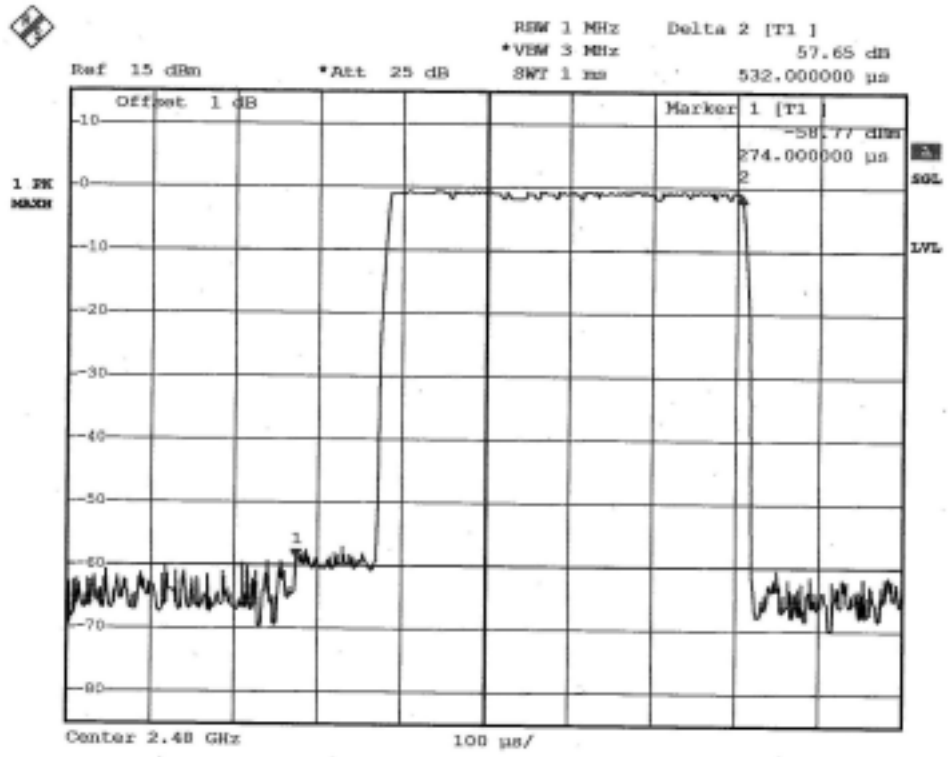
Date: 18.AUG.2003 16:28:25



Date: 18.AUG.2003 16:25:21

CH78:


RBW 100 kHz
*VBW 100 kHz
Ref 15 dBm
*Att 25 dB
SWT 1 s
Offset 1 dB
1 PK
MAXH
A
SGL
LVL
Center 2.48 GHz
100 ms/
Date: 18.AUG.2003 16:27:35


RBW 1 MHz
*VBW 3 MHz
SWT 1 ms
Delta 2 [T1]
57.65 dB
532.000000 µs
Ref 15 dBm
*Att 25 dB
Offset 1 dB
Marker 1 [T1]
274.000000 µs
1 PK
MAXH
A
SGL
LVL
Center 2.48 GHz
100 µs/
Date: 18.AUG.2003 16:26:16

4.6 PEAK POWER TEST

4.6.1 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)

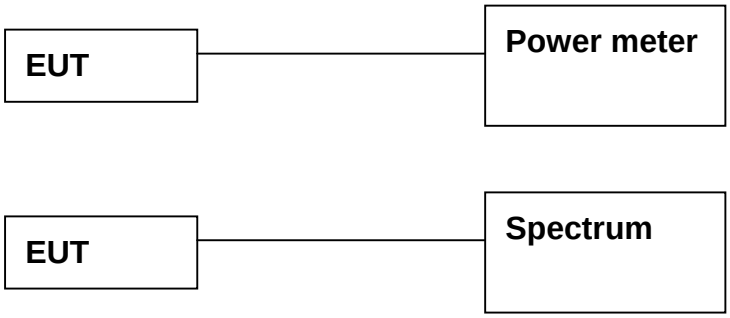
4.6.2 TEST EQUIPMENT

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	MAR. 2004 R & S
POWER METER	N/A	BOONTON	4232A/ 29001	MAY 2004 ETC

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

4.6.3 TEST SET-UP



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

4.6.4 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.

4.6.5 EUT OPERATING CONDITION

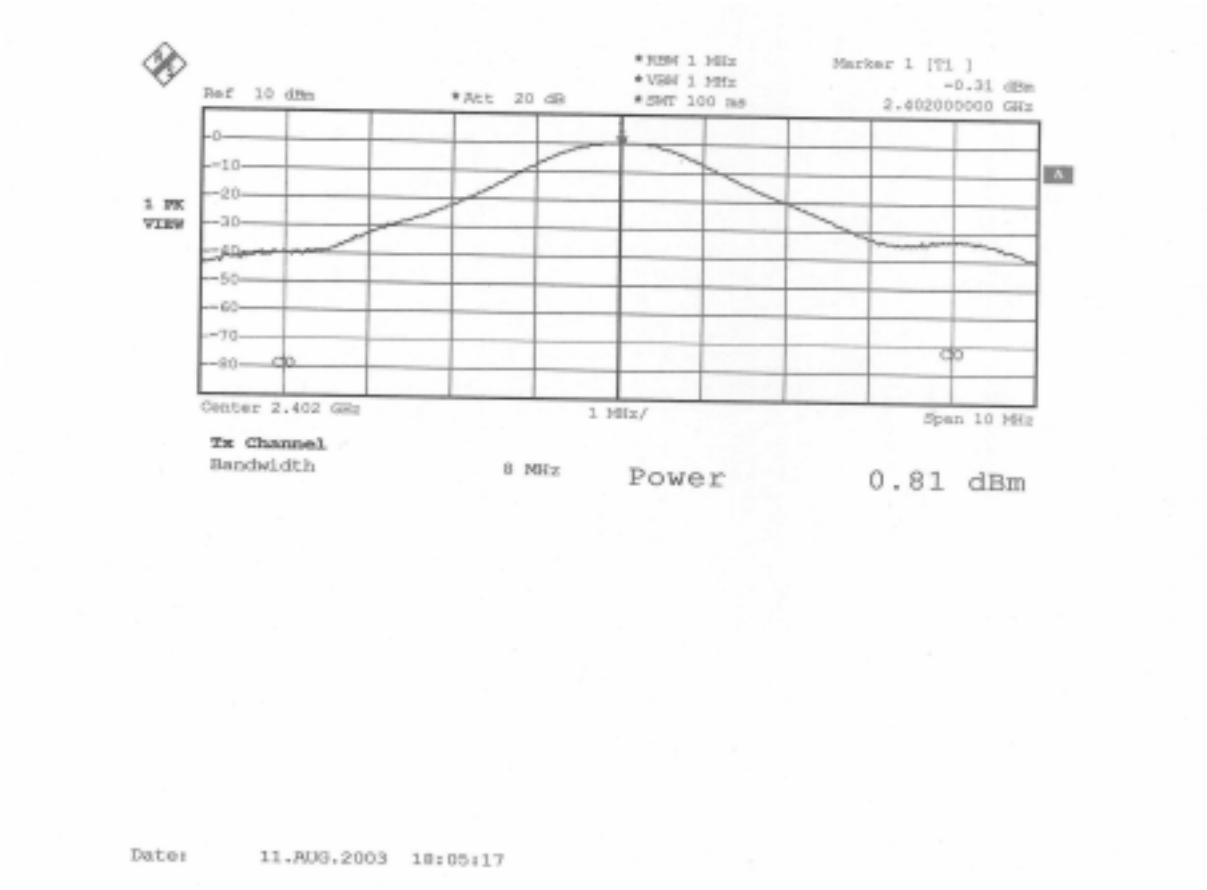
Same as section 4.1.5 of this report.

4.6.6 TEST RESULT

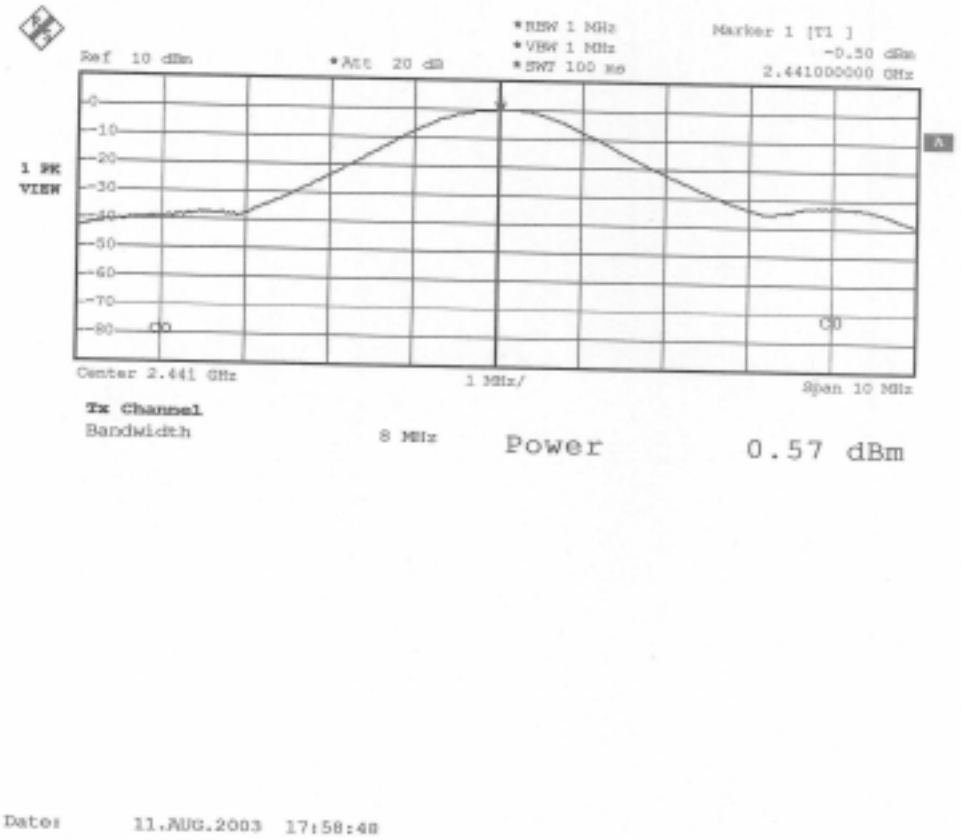
Temperature:	25°C	Humidity:	50%RH
Spectrum Detector:	PK.	Tested Mode:	N/A
Tested Result:	Pass	Tested By:	Ken Su

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	PEAK POWER OUTPUT (dBm)	PEAK POWER LIMIT (dBm)
0	2402	0.81	30
39	2441	0.57	30
78	2480	0.90	30

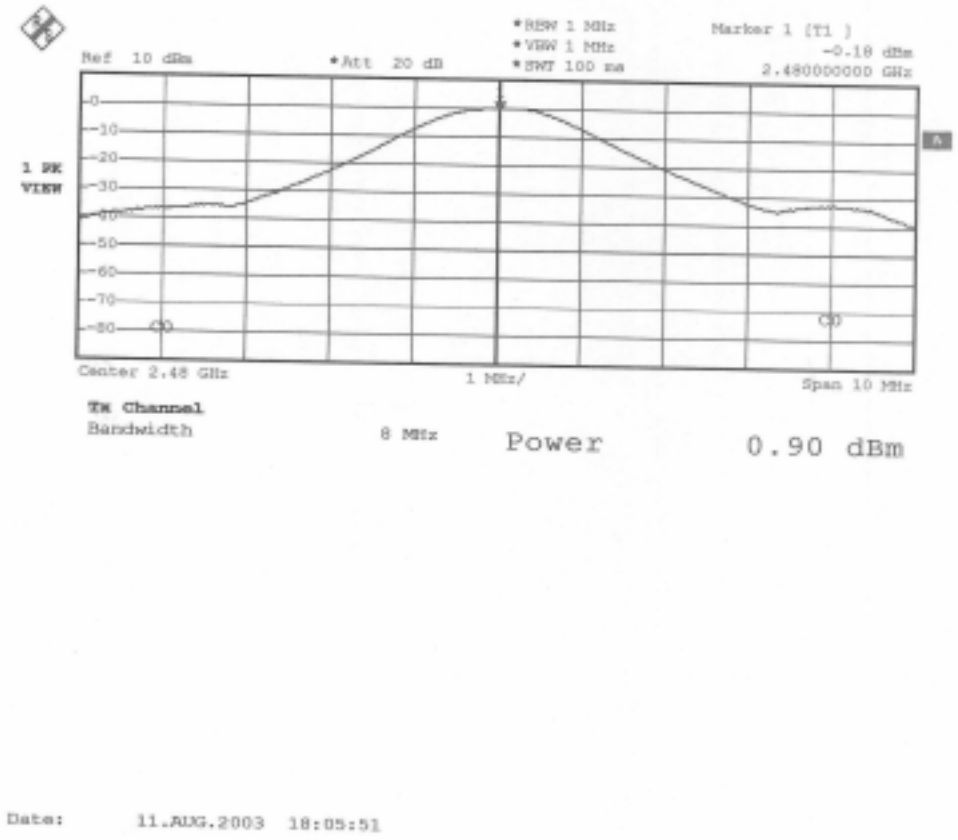
CH0:



CH39:


Ref 10 dBm
*Att 20 dB
*RBW 1 MHz
*VBW 1 MHz
*SWT 100 ms
Marker 1 [T1]
-0.50 dBm
2.441000000 GHz
1 PK
VIEW
Center 2.441 GHz
1 MHz/
Span 10 MHz
Tx Channel
Bandwidth
8 MHz
Power
0.57 dBm
Date: 11.AUG.2003 17:58:48

CH78:


Ref 10 dBm
*Att 20 dB
*RBW 1 MHz
*VBW 1 MHz
*SWT 100 ms
Marker 1 [T1]
-0.18 dBm
2.480000000 GHz
1 PK
VIEW
0
-10
-20
-30
-40
-50
-60
-70
-80
Center 2.48 GHz
1 MHz/
Span 10 MHz
TX Channel
Bandwidth
8 MHz
Power
0.90 dBm
Date: 11.AUG.2003 18:05:51

4.7 BAND EDGE TEST

4.7.1 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

4.7.2 TEST EQUIPMENT

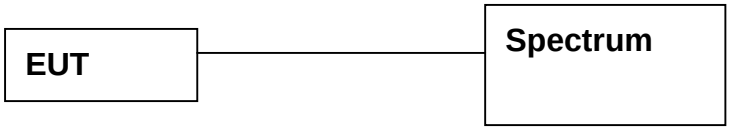
The following test equipment was used during the test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE & SCHWARZ	FSP7/ 839511/010	MAR. 2004 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.

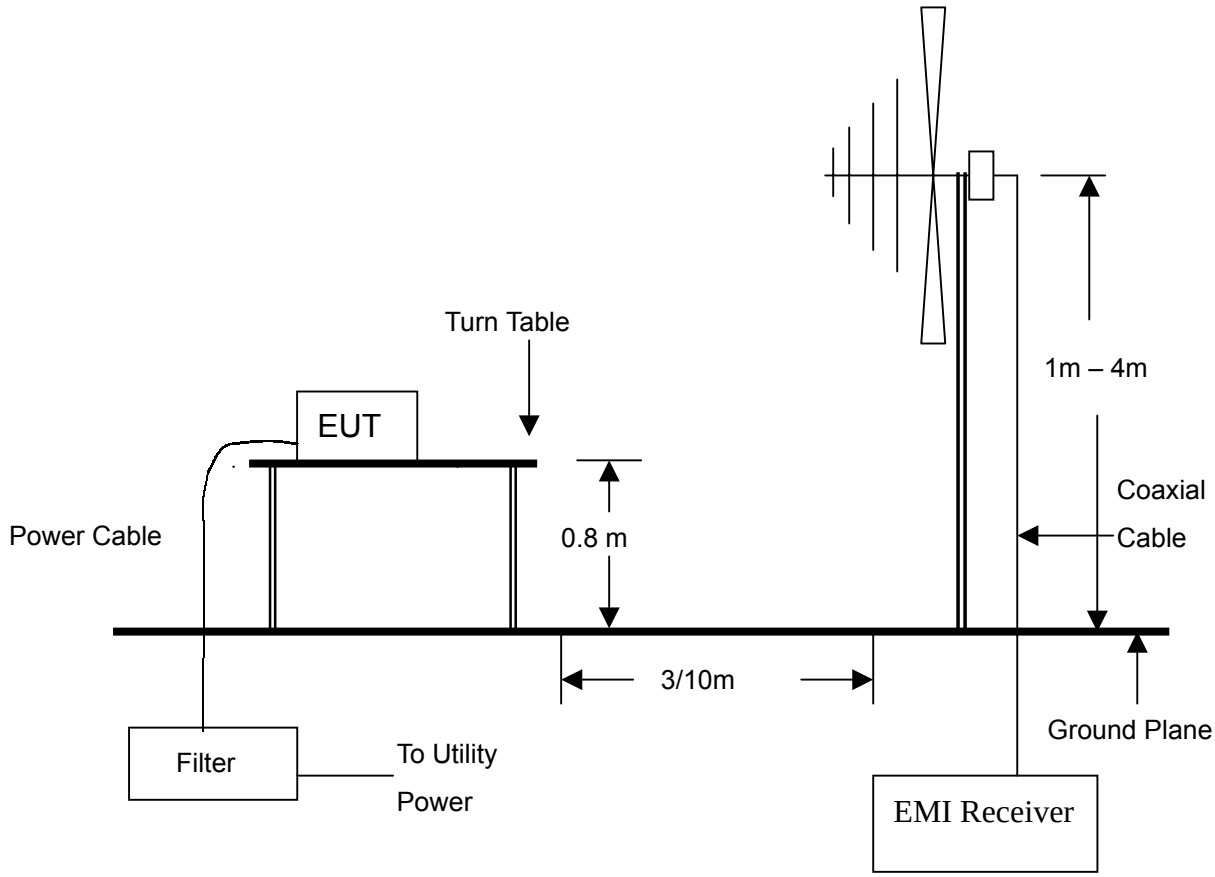
4.7.3 TEST SET-UP

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.

4.7.4 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.

4.7.5 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

4.7.6 TEST RESULT

Temperature:	25°C	Humidity:	60%RH
Spectrum Detector:	PK. & AV.	Tested Mode:	N/A
Tested Result:	Pass	Tested By:	Ken Su

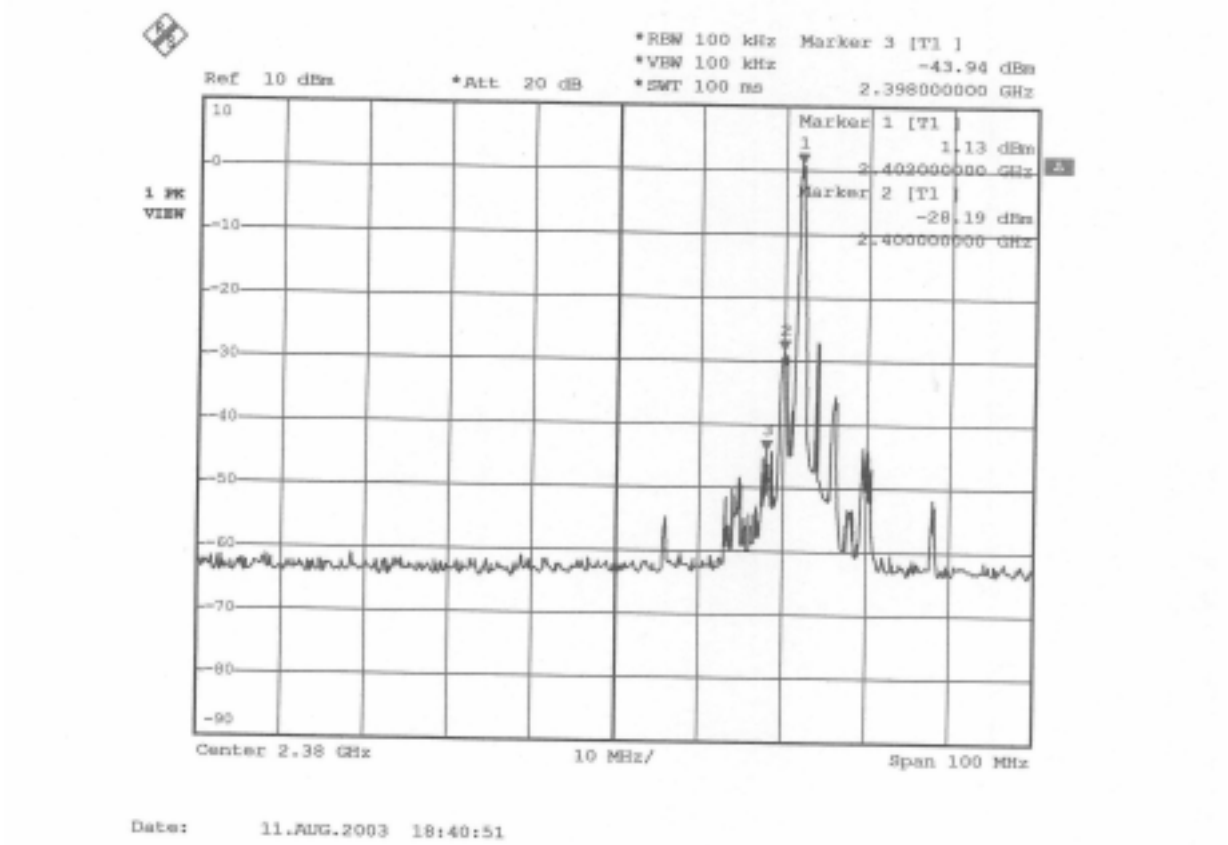
1.Conducted test

Frequency (MHz)	PEAK POWER OUTPUT (dBm)	Emission read Value(dBm)	Result of Band edge (dBc)	Band edge LIMIT (dBc)
<2400	1.13	-28.19	29.32	>20dBc
>2483.5	-0.20	-35.19	34.99	>20dBc

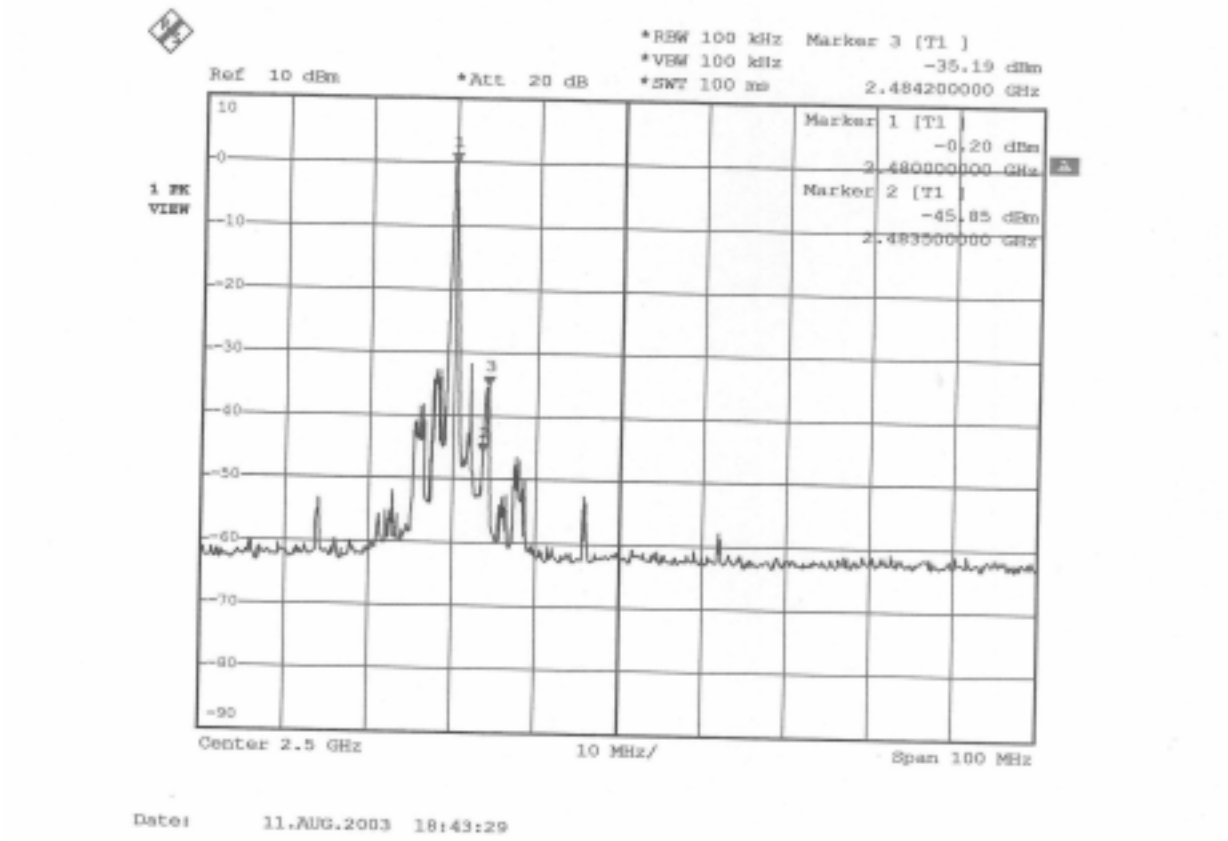
2.Radiated emision test

Frequency (MHz)	Antenna polarization (H/V)	PEAK POWER OUTPUT (dBuV/m)	Emission read Value(dBuV/m)	Band edge LIMIT (dBuV/m)
<2400	H	92.0	43.3	54
>2483.5	H	94.5	55.8	54

<2400MHz:



>2483.5MHz



4.8 SPURIOUS RADIATED EMISSION TEST

4.8.1 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, antemma, 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	68

4.8.2 TEST EQUIPMENT

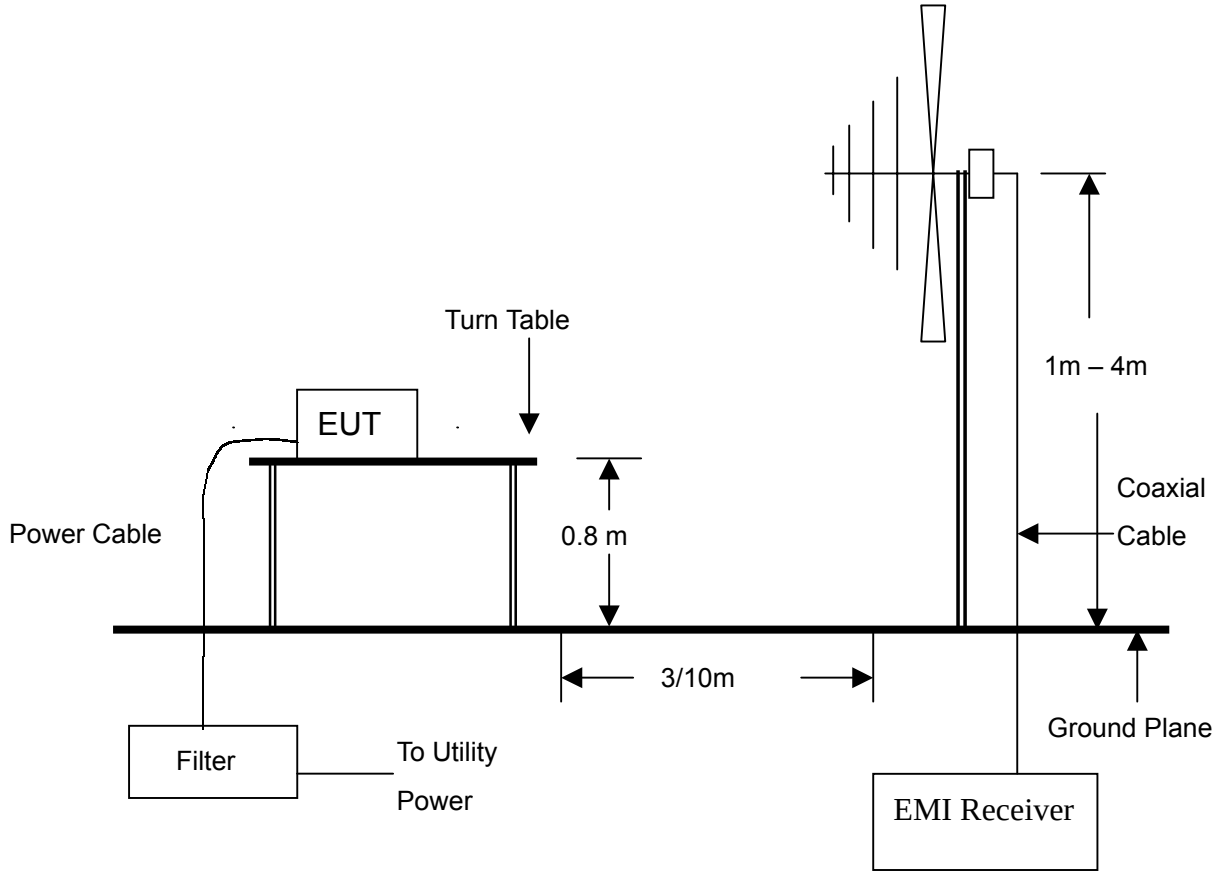
The following test equipment was used during the radiated emission test:

EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	9 kHz TO 2750 MHz	ROHDE & SCHWARZ	ESCS30/ 830245/012	AUG. 2003 R&S
BI-LOG ANTENNA	25 MHz TO 2 GHz	EMCO	3142/ 9701-1124	APR. 2004 SRT
SPECTRUM ANALYZER	9 KHz TO 26.5 GHz	HP	8593E/ 3710A03220	MAY 2004 ETC
PRE-AMPLIFIER	1 GHz TO 26.5 GHz	HP	8449B/ 3008A01019	DEC. 2003 ETC
HORN ANTENNA	1 GHz TO 18 GHz	EMCO	3115/ 9602-4681	DEC. 2003 ETC
HORN ANTENNA	15GHz TO 40GHz	EMCO	3116/ 2567	JUL. 2004 ETC
OATS	3 – 10 M MEASUREMENT	SRT	SRT-1	APR. 2004 SRT
COAXIAL CABLE	25M	SUNCITY	J400/ 25M	AUG. 2004 SRT
FILTER	2 LINE, 30A	FIL.COIL	FC-943/ 869	N/A
FREQUENCY CONVERTER	N/A	APC	AFC-1KW/ 860612	AUG. 2004 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.

4.8.3 TEST SET-UP



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.

4.8.4 TEST PROCEDURE

The EUT was tested according to the requirement of ANSI C63.4:1992 and CISPR 22:1997. 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 or 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.
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 EUT OPERATING CONDITION

Same as section 4.1.5 of this report.

4.8.6 TEST RESULT

Temperature:	26 °C	Humidity:	55 %RH
Ferquency Range:	30 – 1000 MHz	Measured Distance:	3m
Receiver Detector:	Q.P.	Tested Mode:	RX
Tested By:	Ken Su		

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)
185.6632	1.60	10.00	19.2	30.8	43.5	-12.7	224.0	4.00
218.5460	1.74	11.22	22.4	35.4	46.0	-10.6	186.0	1.60
234.5520	1.91	12.00	27.1	41.0	46.0	-5.0	15.4	3.85
243.0622	1.98	12.41	26.9	41.3	46.0	-4.7	184.0	4.00
361.8550	2.19	15.62	25.1	42.9	46.0	-3.1	180.0	4.00
391.0048	2.42	16.17	22.2	40.8	46.0	-5.2	185.0	3.58

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)
129.5563	1.37	8.21	22.8	32.4	43.5	-11.1	188.0	1.20
195.8422	1.61	10.35	24.8	36.8	43.5	-6.7	193.0	1.30
228.1174	1.84	11.70	22.3	35.8	46.0	-10.2	9.5	1.28
260.8540	1.94	13.00	20.4	35.3	46.0	-10.7	187.0	1.00
391.4710	2.42	16.17	23.1	41.7	46.0	-4.3	185.0	1.20
400.1995	2.70	16.30	20.4	39.4	46.0	-6.6	1.0	1.20

NOTE :

1. Measurement uncertainty is 4dB.
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:	25 °C	Humidity:	50 %RH
Ferquency Range:	1 – 25 GHz	Measured Distance:	3m
Receiver Detector:	PK. or AV.	Tested Mode:	CH 0 : 2402MHz
Tested By:	Ken Su		

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. 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.		
2402.0000(F)	-32.16	28.00	96.1	62.4	92.0	58.2	N/A	N/A	N/A	N/A	117.0	1.00
2304.6800	-32.35	27.81	47.8	*	43.3	*	74.0	54.0	-30.7	*	61.0	1.00
2482.1900	-32.19	28.16	47.2	*	43.2	*	74.0	54.0	-30.8	*	268.0	1.00
2386.4500	-32.21	27.97	46.6	*	42.4	*	74.0	54.0	-31.6	*	241.0	1.00
4804.0000	-30.47	33.64	45.9	*	49.0	*	74.0	54.0	-25.0	*	34.0	1.00
7206.0000	-28.90	36.26	44.2	*	51.6	*	74.0	54.0	-22.4	*	178.0	1.00

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. 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.		
2402.0000(F)	-32.16	28.00	92.0	53.4	87.8	49.2	N/A	N/A	N/A	N/A	53.0	1.60
2385.9000	-32.22	27.97	46.5	*	42.3	*	74.0	54.0	-31.7	*	50.0	1.30
2356.5000	-32.33	27.91	47.7	*	43.3	*	74.0	54.0	-30.7	*	300.0	1.00
4804.0000	-30.47	33.64	47.9	*	51.0	*	74.0	54.0	-23.0	*	3.0	2.00
7206.0000	-28.90	36.26	43.1	*	50.5	*	74.0	54.0	-23.5	*	35.0	1.00

NOTE :

1. Measurement uncertainty is 4dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	25 °C	Humidity:	50 %RH
Ferquency Range:	1 – 25 GHz	Measured Distance:	3m
Receiver Detector:	PK. or AV.	Tested Mode:	CH 39 : 2441MHz
Tested By:	Ken Su		

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. 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.		
2441.0000(F)	-32.23	28.08	92.5	55.0	88.4	50.9	N/A	N/A	N/A	N/A	55.0	2.00
2424.9000	-32.20	28.05	45.8	*	41.6	*	74.0	54.0	-32.4	*	89.0	1.00
2493.5000	-32.17	28.19	45.8	*	41.8	*	74.0	54.0	-32.2	*	300.0	1.00
2392.0000	-32.19	27.98	47.3	*	43.1	*	74.0	54.0	-30.9	*	30.0	1.00
4882.0000	-30.26	33.71	48.4	*	51.9	*	74.0	54.0	-22.1	*	0	2.30
7323.0000	-29.04	36.36	46.8	*	54.1	*	74.0	54.0	-19.9	*	0	1.00

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. 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.		
2441.0000(F)	-32.23	28.08	94.0	55.8	89.9	51.7	N/A	N/A	N/A	N/A	112.0	1.30
2462.7000	-32.22	28.12	45.9	*	41.8	*	74.0	54.0	-32.2	*	12.0	1.00
2454.5000	-32.23	28.11	46.2	*	42.1	*	74.0	54.0	-31.9	*	124.0	1.72
4882.0000	-30.26	33.71	48.3	31.0	51.7	34.4	74.0	54.0	-22.3	-19.6	315.0	1.50
7323.0000	-29.04	36.36	44.0	*	51.3	*	74.0	54.0	-22.7	*	177.0	1.00

NOTE :

1. Measurement uncertainty is 4dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

Temperature:	25 °C	Humidity:	50 %RH
Ferquency Range:	1 – 25 GHz	Measured Distance:	3m
Receiver Detector:	PK. or AV.	Tested Mode:	CH 78 : 2480MHz
Tested By:	Ken Su		

Antenna Polarization : Horizontal

Frequency (MHz)	Correct Factor (dB)	Ant. 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.		
2480.0000(F)	-32.19	28.16	98.5	60.5	94.5	56.5	N/A	N/A	N/A	N/A	118.0	1.00
2483.5000	-32.19	28.17	59.8	43.4	55.8	39.4	74.0	54.0	-18.2	-14.6	118.0	1.00
2464.5000	-32.22	28.13	49.9	*	45.8	*	74.0	54.0	-28.2	*	0	1.00
2448.2500	-32.24	28.10	49.0	*	44.9	*	74.0	54.0	-29.1	*	110.0	1.00
4960.0000	-30.26	33.77	49.3	*	52.8	*	74.0	54.0	-21.2	*	324.0	1.30
7440.0000	-28.95	36.45	43.7	*	51.2	*	74.0	54.0	-22.8	*	250.0	1.00

Antenna Polarization : Vertical

Frequency (MHz)	Correct Factor (dB)	Ant. 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.		
2480.0000(F)	-32.19	28.16	90.3	50.1	86.3	46.1	N/A	N/A	N/A	N/A	88.0	1.00
2484.0000	-32.19	28.17	44.4	*	40.4	*	74.0	54.0	-33.6	*	311.0	1.30
2495.5000	-32.17	28.19	45.2	*	41.2	*	74.0	54.0	-32.8	*	268.0	1.00
2464.0000	-32.22	28.13	47.5	*	43.4	*	74.0	54.0	-30.6	*	56.0	1.00
4960.0000	-30.26	33.77	49.8	*	53.3	*	74.0	54.0	-20.7	*	328.0	1.00
7440.0000	-28.95	36.45	44.7	*	52.2	*	74.0	54.0	-21.8	*	300.0	1.00

NOTE :

1. Measurement uncertainty is 4dB.
2. "*": The Peak reading value also meets average limit and measurement with the average detector is unnecessary.
3. Emissiom Level = Reading Value + Ant. Factor + Correct Factor (incl.:Cable Loss and Pre-Amplifier Gain)
4. The field strength of other emission frequencies were very low against the limit.
5. (F):The field stregth of fundamental frequency.

5. Antenna application

5.1 Antenna requirement

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

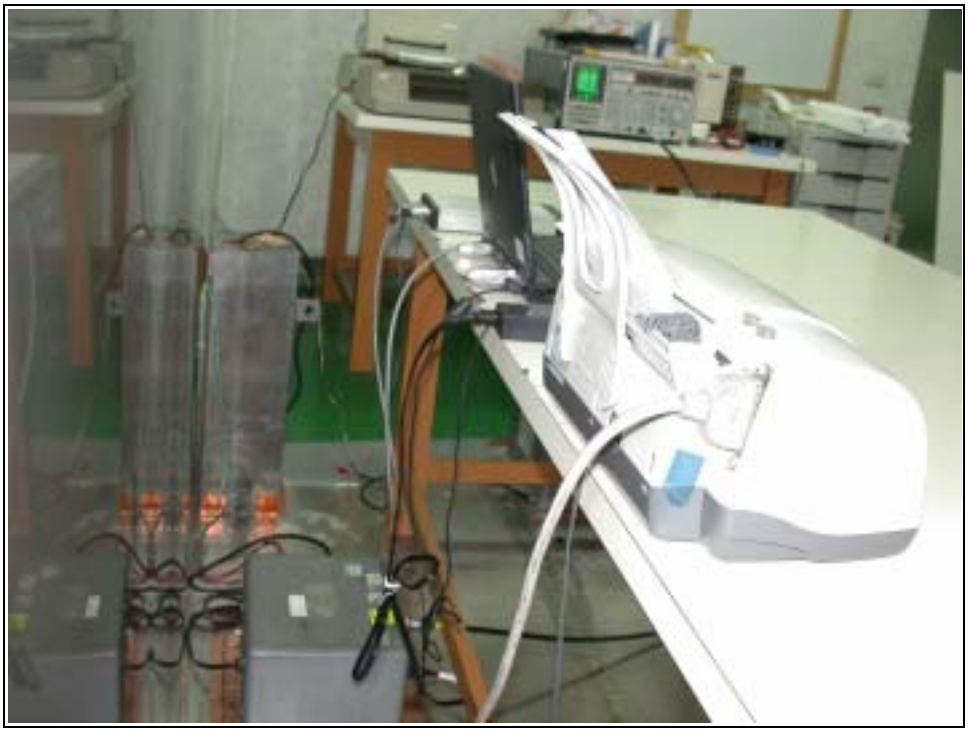
FCC part15C section15.247 requirement:
Systems operating in the 2400-2483.5 MHz band that are used exclusively for fixed, point-to-point operations may employ transmitting antennas with directional gain greater than 6 dBi provided the maximum peak output power of the intentional radiator is reduced by 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 Monopole antenna printed on PCB. The antenna's gain is 0dBi and meets the requirement. The location of the antenna on the EUT as show in the attached EUT PHOTOS.

6. PHOTOS OF TESTING

- Conducted test



- Radiated test

7. TERMS OF ABRIVATION

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