



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

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4.6.2 TEST EQUIPMENT

The following test equipment was used during the test :

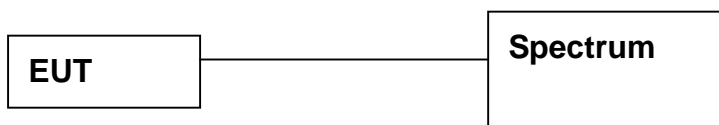
EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
SPECTRUM	9kHz-7GHz	ROHDE & SCHWARZ	FSP7/ 839511/010	APR. 2006 R&S
EMI TEST RECEIVER	9 kHz TO 2750 MHz	ROHDE & SCHWARZ	ESCS30/ 830245/012	AUG. 2006 R&S
SPECTRUM	9KHz-26.5GHz	HP	8593E/ 3710A03220	MAY 2006 ETC
PRE-AMPLIFIER	1GHz-26.5GHz Gain:30dB	HP	8449B/ 3008A01019	NOV. 2005 ETC
BI-LOG ANTENNA	25 MHz TO 2 GHz	EMCO	3142/ 9701-1124	FEB. 2006 SRT
HORN ANTENNA	1GHz to 18GHz	EMCO	3115/ 9602-4681	DEC. 2005 ETC
OATS	3 - 10 M measurement	SRT	SRT-1	APR. 2006 SRT

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



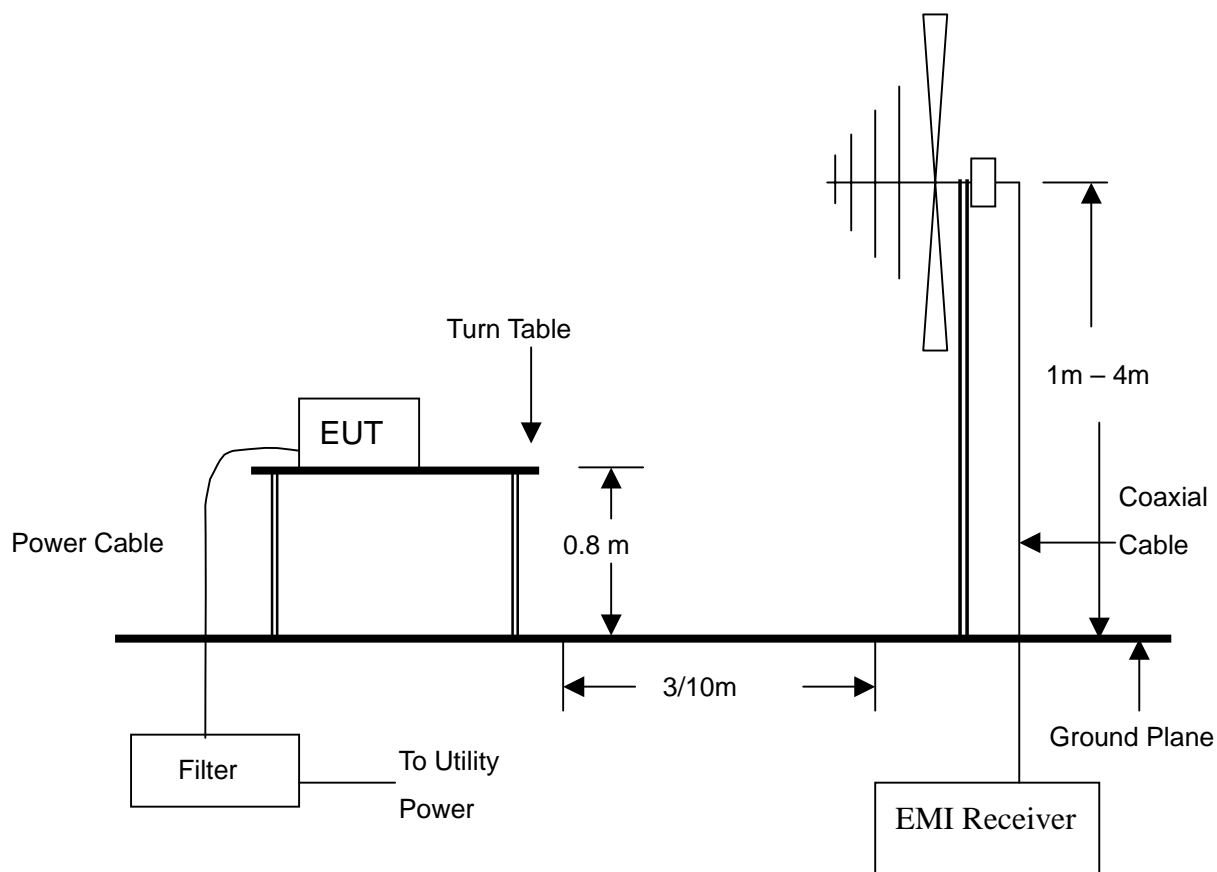
4.6.3 TEST SET-UP

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:	20°C	Humidity:	55%RH
Spectrum Detector:	PK & AV	Tested by:	Julian Chiang
Test Result:	PASS	Tested Date:	Aug. 26, 2005

1. Conducted test

Frequency (MHz)	PEAK POWER OUTPUT (dBm)	Emission read Value(dBm)	Result of Band edge (dBc)	Band edge LIMIT (dBc)
<2400	-4.81	-46.19	41.38	>20dBc
>2483.5	-3.52	-48.18	44.66	>20dBc

2. Radiated emission test

Frequency (MHz)	Antenna polarization (H/V)	Reading (dBuV)		Emission (dBuV/m)		Band edge Limit (dBuV/m)	
		PK	AV	PK	AV	PK	AV
<2400	V	49.6	*	45.4	*	74.0	54.0
>2483.5	V	48.9	*	45.1	*	74.0	54.0

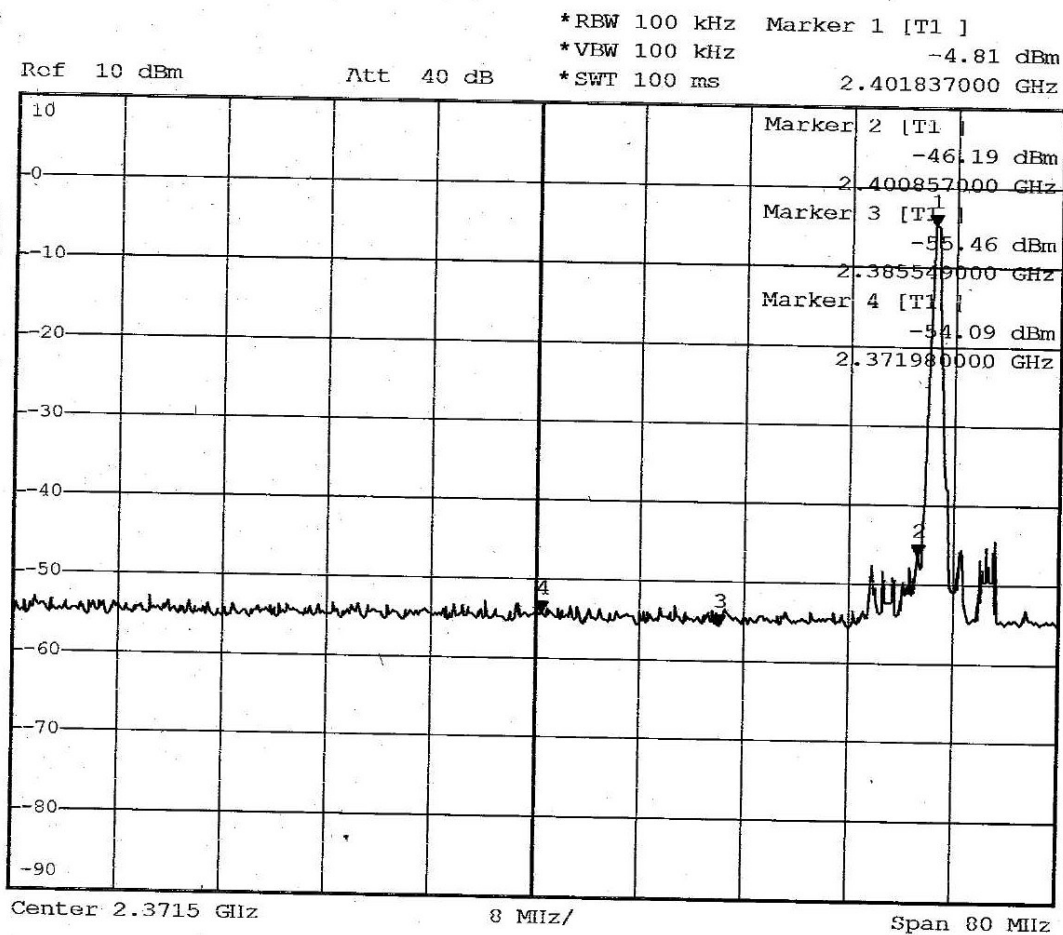


TEST REPORT

<2400MHz:



1 PK
MAXH



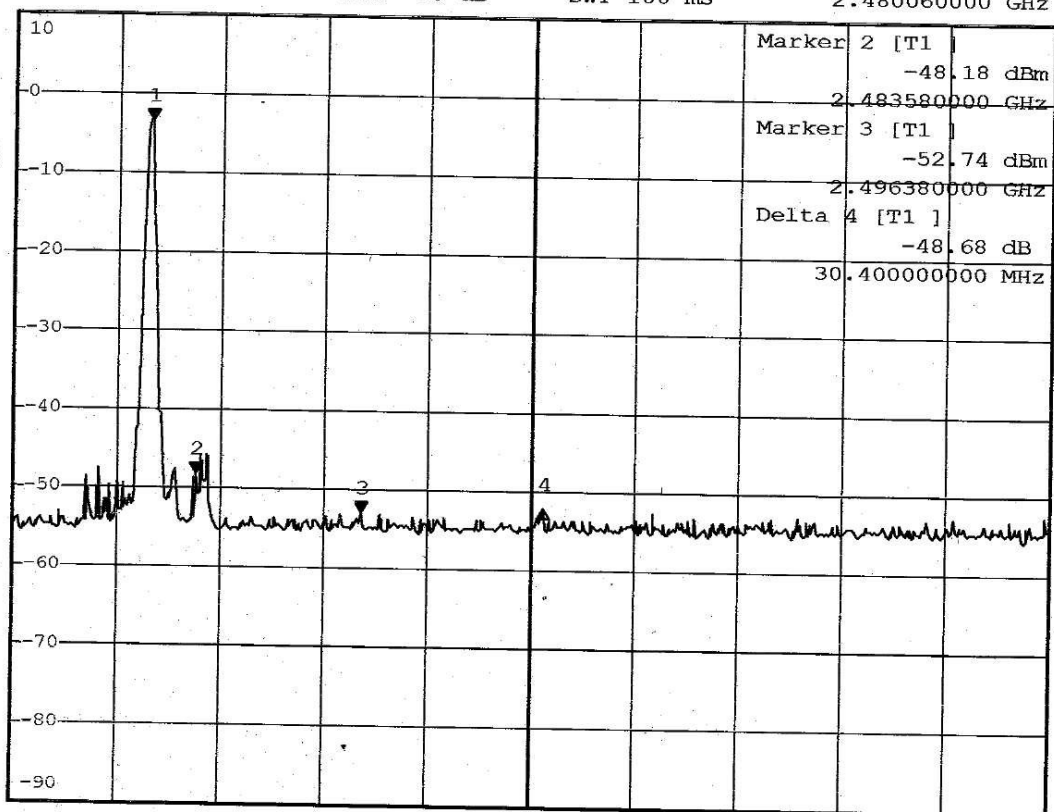


TEST REPORT

>2483.5MHz



Ref 10 dBm Att 40 dB *RBW 100 kHz Marker 1 [T1]
*VBW 100 kHz -3.52 dBm
*SWT 100 ms 2.480060000 GHz



Center 2.5095 GHz

8 MHz/

Span 80 MHz



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 (dB μ V/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)	FIELD 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

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4.7.2 TEST EQUIPMENT

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

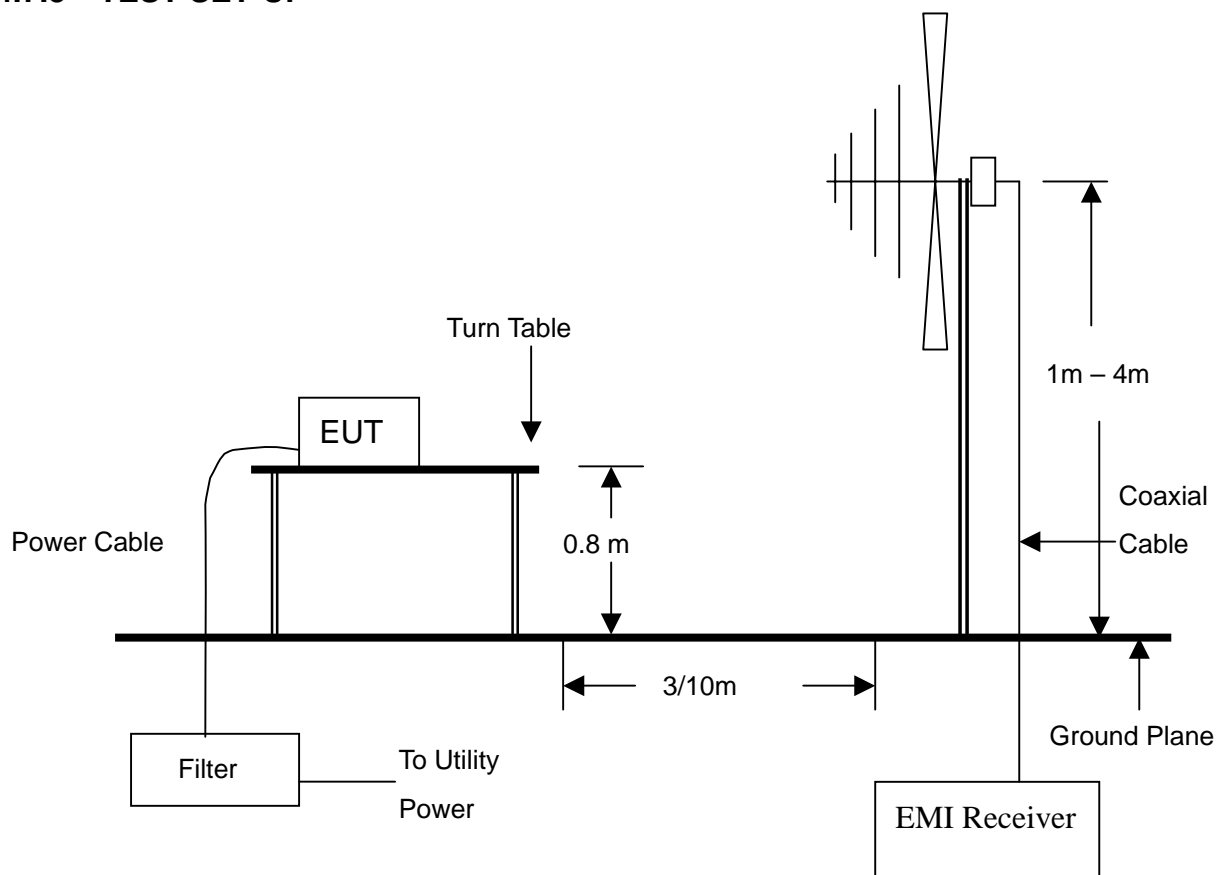
EQUIPMENT/ FACILITIES	SPECIFICATIONS	MANUFACTURER	MODEL#/ SERIAL#	DUE DATE OF CAL. & CAL. CENTER
EMI TEST RECEIVER	20 kHz TO 1 GHz	ROHDE & SCHWARZ	ESCS30/ 830245/012	OCT. 2006 ETC
SPECTRUM ANALYZER	9KHz TO 26.5GHz	HP	8593E/ 3710A03220	MAY 10,2006 ETC
HORN ANTENNA	18GHz TO 40GHz	ETS	3116/00028513	OCT 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. 2006 SRT
FILTER	2 LINE, 30A	FIL.COIL	FC-943/ 869	N/A
FREQUENCY CONVERTER	N/A	APC	AFC-2KBB/ F100030031	AUG. 2006 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



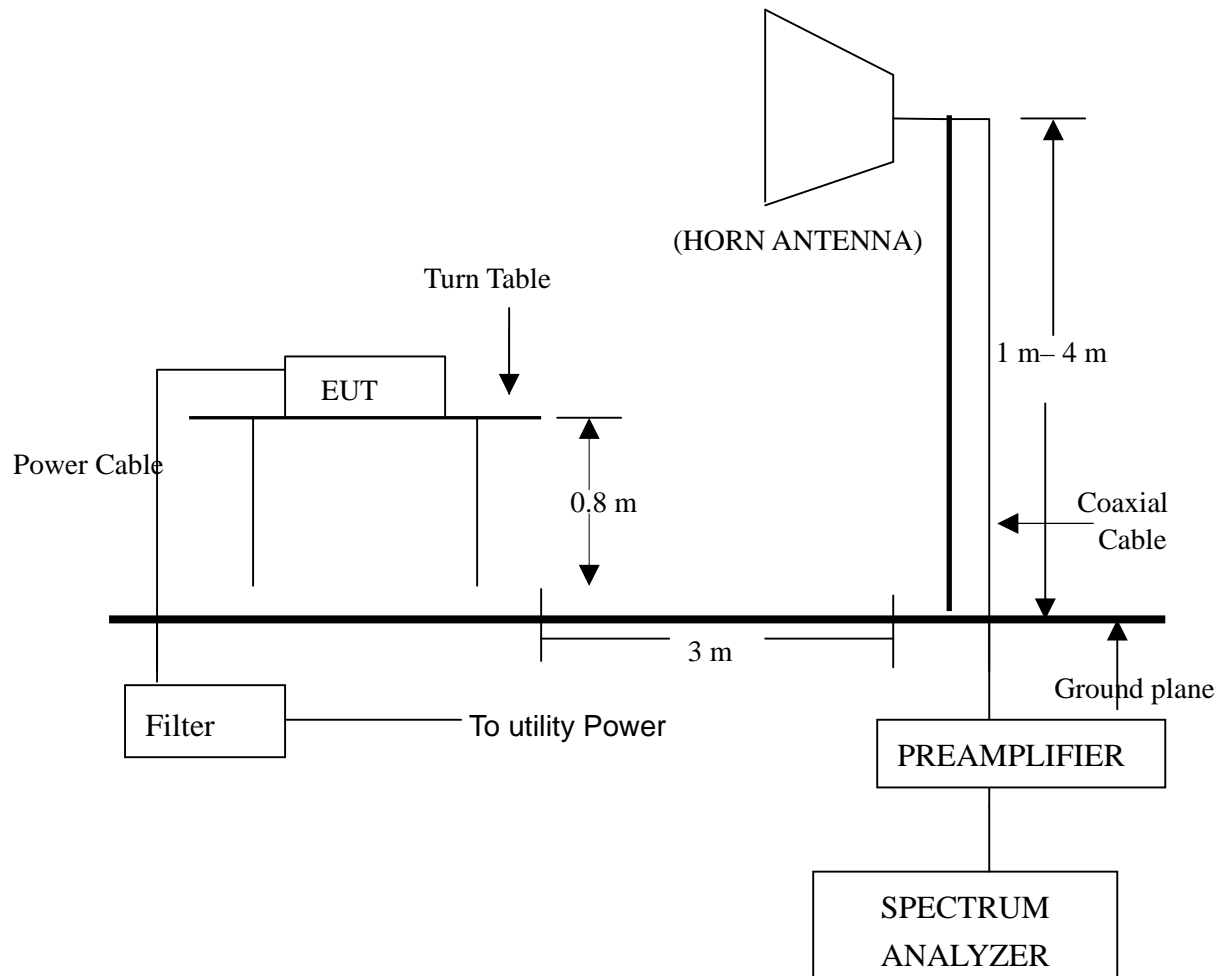
NOTE :

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.



TEST REPORT

(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.

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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 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.



TEST REPORT

4.7.6 TEST RESULT

Temperature:	20 °C	Humidity:	55%RH
Frequency Range:	30 – 1000 MHz	Measured Distance:	3m
Receiver Detector:	Q.P.	Tested Mode:	Link
Tested By:	Julian Chiang	Tested Date:	Aug. 26, 2005

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)
132.4820	1.55	10.26	13.6	25.4	43.5	-18.1	15.4	2.3
187.6210	1.85	9.33	12.8	24.0	43.5	-19.5	64.8	2.6
236.8710	2.09	10.91	11.6	24.6	46.0	-21.4	153.6	2.1
359.1640	3.26	15.34	10.7	29.3	46.0	-16.7	147.8	2.0
398.3140	3.13	16.16	12.4	31.7	46.0	-14.3	54.9	2.3
659.1850	4.64	20.38	14.9	39.9	46.0	-6.1	63.2	1.8

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)
75.4900	1.21	6.80	13.7	21.7	40.0	-18.3	124.7	1.3
126.8970	1.42	8.73	15.7	25.9	43.5	-17.7	136.8	1.3
202.6840	2.10	9.48	12.8	24.4	43.5	-19.1	133.7	1.0
534.9770	3.62	18.08	10.9	32.6	46.0	-13.4	359.4	1.0
695.7310	4.08	21.10	14.1	39.3	46.0	-6.7	12.2	1.2
832.1490	4.79	22.30	11.9	39.0	46.0	-7.0	94.6	1.0

NOTE :

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

Temperature:	26 °C	Humidity:	60 %RH
Frequency Range:	1 – 25 GHz	Test mode:	Ch 0
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Julian Chiang		

Antenna Polarization : Horizontal

[illegible]



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Temperature:	26 °C	Humidity:	60 %RH
Frequency Range:	1 – 25 GHz	Test mode:	Ch 0
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Julian Chiang		

Antenna Polarization : Vertical

Freq/MHz	Cable Loss (dB)	Ant. Fact. (dB)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)		AZ (o)	EL (m)
			PK	AV	PK	AV	PK	AV	PK	AV		
2402.00(F)	-32.16	28.00	68.4	61.2	64.2	57.0	N/A	N/A	N/A	N/A	323.8	1.0
4804.00	-30.47	33.64	51.6	42.8	54.8	46.0	74.0	54.0	-19.2	-8.0	37.1	1.2
7206.00	-28.90	36.26	51.7	42.8	59.1	50.2	74.0	54.0	-14.9	-3.8	298.8	1.2
2374.87	-32.26	27.95	47.9	*	43.6	*	74.0	54.0	-30.4	*	226.0	1.1
2390.02	-32.20	27.98	49.6	*	45.4	*	74.0	54.0	-28.6	*	69.4	1.0
2427.34	-32.20	28.05	47.9	*	43.8	*	74.0	54.0	-30.2	*	165.9	1.1
9764.00	*	*	*	*	*	*	*	*	*	*	*	*
12205.00	*	*	*	*	*	*	*	*	*	*	*	*
14646.00	*	*	*	*	*	*	*	*	*	*	*	*
17087.00	*	*	*	*	*	*	*	*	*	*	*	*
19528.00	*	*	*	*	*	*	*	*	*	*	*	*
21969.00	*	*	*	*	*	*	*	*	*	*	*	*
24410.00	*	*	*	*	*	*	*	*	*	*	*	*

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

Temperature:	26°C	Humidity:	60 %RH
Frequency Range:	1 – 25 GHz	Test mode:	Ch39
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Julian Chiang		

Antenna Polarization : Horizontal

[illegible]



TEST REPORT

Temperature:	26°C	Humidity:	60 %RH
Frequency Range:	1 – 25 GHz	Test mode:	Ch39
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Julian Chiang		

Antenna Polarization : Vertical

Freq./MHz	Cable Loss (dB)	Ant. Fact. (dB)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)		AZ (o)	EL (m)
			PK	AV	PK	AV	PK	AV	PK	AV		
2441.00(F)	-32.23	28.08	64.9	58.2	60.8	54.1	N/A	N/A	N/A	N/A	142.6	1.0
4882.00	-30.26	33.71	52.6	43.5	56.0	46.9	74.0	54.0	-18.0	-7.1	90.3	1.0
7323.00	-29.04	36.36	53.7	44.1	61.0	51.4	74.0	54.0	-13.0	-2.6	13.7	1.2
2403.69	-32.16	28.01	48.6	*	44.4	*	74.0	54.0	-29.6	*	54.8	1.1
2426.87	-32.20	28.05	47.0	*	42.9	*	74.0	54.0	-31.1	*	340.4	1.2
2894.13	-31.72	30.41	47.9	*	46.6	*	74.0	54.0	-27.4	*	74.6	1.2
9764.00	*	*	*	*	*	*	*	*	*	*	*	*
12205.00	*	*	*	*	*	*	*	*	*	*	*	*
14646.00	*	*	*	*	*	*	*	*	*	*	*	*
17087.00	*	*	*	*	*	*	*	*	*	*	*	*
19528.00	*	*	*	*	*	*	*	*	*	*	*	*
21969.00	*	*	*	*	*	*	*	*	*	*	*	*
24410.00	*	*	*	*	*	*	*	*	*	*	*	*

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

Temperature:	26°C	Humidity:	60%RH
Frequency Range:	1 – 25GHz	Test mode:	Ch78
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Julian Chiang		

Antenna Polarization : Horizontal

[illegible]



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Temperature:	26°C	Humidity:	60%RH
Frequency Range:	1 – 25GHz	Test mode:	Ch78
Receiver Detector:	PK. or AV.	Measured Distance:	3m
Tested by:	Julian Chiang		

Antenna Polarization : Vertical

Freq./MHz	Cable Loss (dB)	Ant. Fact. (dB)	Reading (dBuV)		Emission (dBuV/m)		Limit Line (dBuV/m)		Margin (dBuV/m)		AZ (o)	EL (m)
			PK	AV	PK	AV	PK	AV	PK	AV		
2480.00(F)	-32.19	28.16	65.8	59.2	61.8	55.2	N/A	N/A	N/A	N/A	52.7	1.0
4960.00	-30.26	33.77	52.1	43.6	55.6	47.1	74.0	54.0	-18.4	-6.9	94.6	1.0
7440.00	-28.95	36.45	51.9	42.7	59.4	50.2	74.0	54.0	-14.6	-3.8	105.6	1.2
2448.69	-32.24	28.10	49.7	*	45.6	*	74.0	54.0	-28.4	*	38.0	1.1
2470.64	-32.21	28.14	48.0	*	43.9	*	74.0	54.0	-30.1	*	49.2	1.1
2510.37	-32.09	28.26	48.9	*	45.1	*	74.0	54.0	-28.9	*	347.4	1.2
9920.00	*	*	*	*	*	*	*	*	*	*	*	*
12400.00	*	*	*	*	*	*	*	*	*	*	*	*
14880.00	*	*	*	*	*	*	*	*	*	*	*	*
17360.00	*	*	*	*	*	*	*	*	*	*	*	*
19840.00	*	*	*	*	*	*	*	*	*	*	*	*
22320.00	*	*	*	*	*	*	*	*	*	*	*	*
24800.00	*	*	*	*	*	*	*	*	*	*	*	*

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

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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 2dBi and meets the requirement.



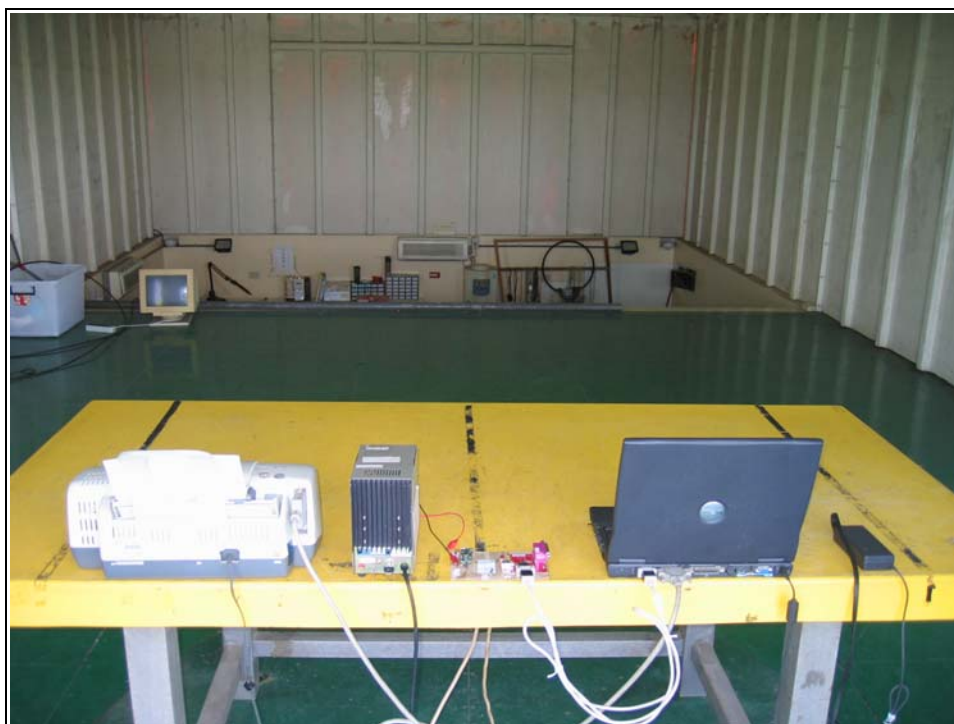
6. PHOTOS OF TESTING

- Radiated test(RX)





- Radiated test(TX)



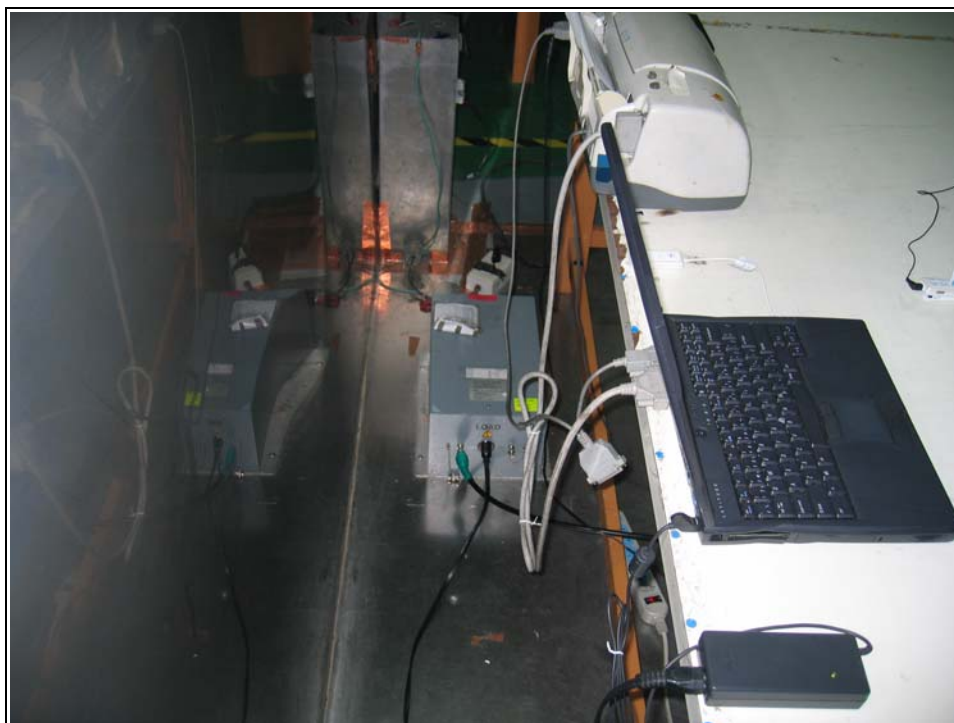


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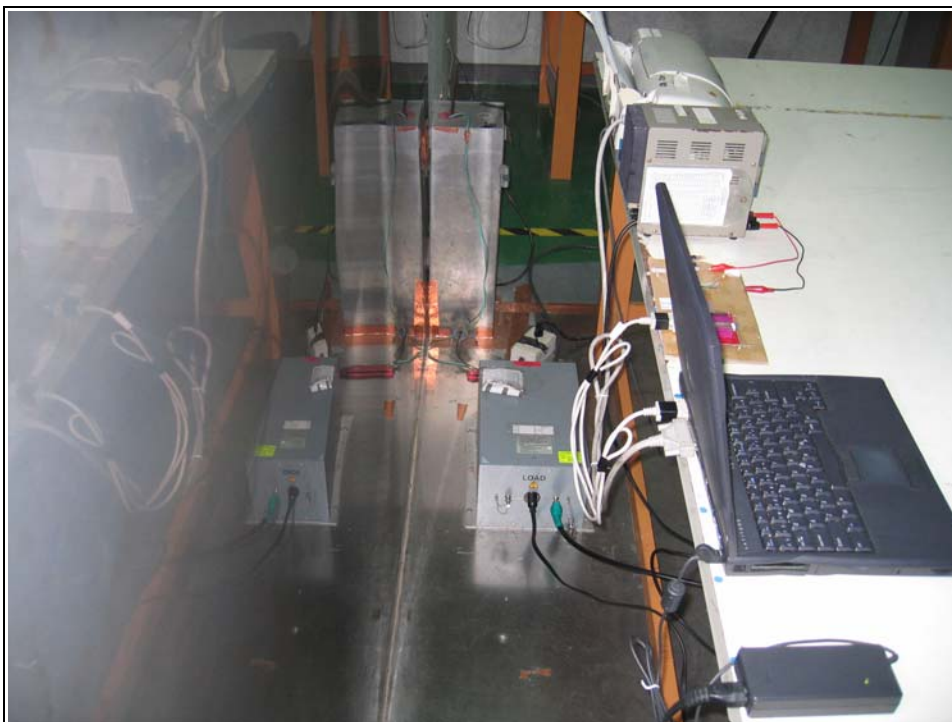
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- Conducted test (RX)





- Conducted test (TX)





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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