

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Super Mini Remote Control Submarine

Model No. : X-SUB

FCC ID : OZY-X-SUB

Filing Type : Certification

Applicant : **ADVOCATED ACCOMPANIMENT TECHNOLOGY CO., LTD.**
106, 8F-6, NO. 76, SEC. 1, FU-SHIN S. RD.,
TAIPEI, TAIWAN, R.O.C.

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- **Certificate or Test Report must not be used by the applicant to claim the product in this test report endorsement by NVLAP or any agency of U.S. government.**

SPORTON International Inc.

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

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History of this test report

Original Report Issue Date: Aug. 06, 2003

- ☒ No additional attachment.
☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : Super Mini Remote Control Submarine

Model No. : X-SUB

FCC ID : OZY-X-SUB

Applicant : **ADVOCATED ACCOMPANIMENT TECHNOLOGY CO., LTD.**
106, 8F-6, NO. 76, SEC. 1, FU-SHIN S. RD.,
TAIPEI, TAIWAN, R.O.C.

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 1992** and the energy emitted by this equipment was **passed** both radiated and conducted emission limits. Testing was carried out on Aug. 01, 2003 at **SPORTON International Inc. LAB.**



Alex Chen
Manager

SPORTON International Inc.

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

1. General Description of Equipment under Test

1.1. Applicant

ADVOCATED ACCOMPANIMENT TECHNOLOGY CO., LTD.
106, 8F-6, NO. 76, SEC. 1, FU-SHIN S. RD.,
TAIPEI, TAIWAN, R.O.C.

1.2. Manufacturer

Same as 1.1.

1.3. Basic Description of Equipment under Test

Equipment : Super Mini Remote Control Submarine
Model No. : X-SUB
FCC ID : OZY-X-SUB
Trade Name : ADVOCATED ACCOMPANIMENT TECHNOLOGY CO., LTD.
Power Supply Type : From Battery 3V
Power Cord : N/A

1.4. Feature of Equipment under Test

Transmitting Frequency	49MHz
Power Source	1.5V AAA Alkaline battery ×2
Feature	Forward, reverse, left / right turn, super dive key

2. Test Configuration of Equipment under Test

2.1. Test Manner

- a. The EUT has been associated with peripherals pursuant to ANSI C63.4-1992 and configuration operated in a manner which tended to maximize its emission characteristics in a typical application.
- b. Frequency range investigated: Radiation 30 MHz to 1000MHz.
- c. The radiated emissions testing was made by rotating three orthogonal axes.

2.2. Description of Test System

The EUT was tested alone. No support devices is needed for testing.

2.3. Connection Diagram of Test System



EUT

3. Test Software

No test software was used during testing.

4. General Information of Test

4.1. Test Facility

Test Site Location : No. 52, Hwa Ya 1St Road, Hwa Ya Technology Park,
Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C.
TEL : 886-3-3273456
FAX : 886-3-3180055
Test Site No. : 03CH03-HY

4.2. Standard for Methods of Measurement

ANSI C63.4-1992

4.3. Test in Compliance with

FCC Part 15, Subpart C

4.4. Frequency Range Investigated

a. Radiation: from 30 MHz to 1000 MHz

4.5. Test Distance

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

5. Test of Conducted Powerline

The power supply of EUT is from DC voltage.

Conduction Powerline tests is not applicable for this EUT.

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 1000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in ANSI C63.4-1992. The EUT was placed on a nonmetallic stand, 0.8 meter above the ground plane, as shown in section 6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions.

6.1. Major Measuring Instruments

- Amplifier (HP 8447D)
 - RF Gain 30 dB
 - Signal Input 100 KHz to 1.3 GHz

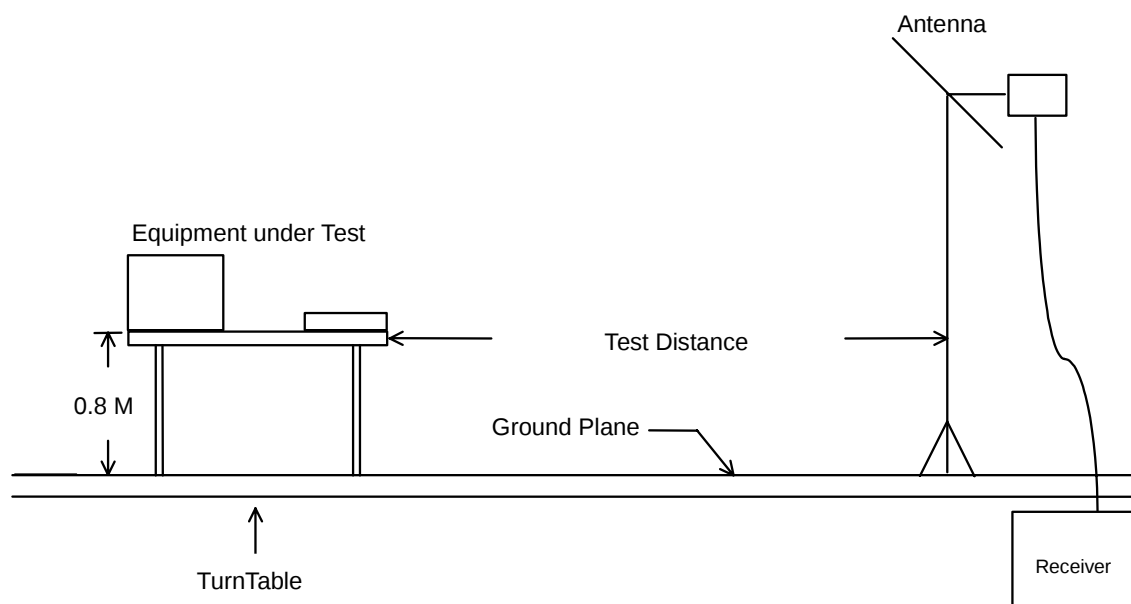
- Spectrum analyzer (R&S FSP40)
 - Attenuation 10 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1 GHz
 - Resolution Bandwidth 120 KHz
 - Signal Input 9 KHz to 40 GHz

- Test Receiver (SCHAFFNER SCR3501)
 - Resolution Bandwidth 120 KHz
 - Frequency Band 9 K – 1 GHz
 - Quasi-Peak Detector ON for Quasi-Peak Mode
OFF for Peak Mode

6.2. Test Procedures

- a. The EUT was placed on a rotatable table top 0.8 meter above ground.
- b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
- c. The table was rotated 360 degrees to determine the position of the highest radiation.
- d. The antenna is a half wave dipole and its height is varied between one meter and four meters above ground to find the maximum value of the field strength both horizontal polarization and vertical polarization of the antenna are set to make the measurement.
- e. For each suspected emission the EUT was arranged to its worst case and then tune the antenna tower (from 1 M to 4 M) and turn table (from 0 degree to 360 degrees) to find the maximum reading.
- f. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions which do not have 3 dB margin will be repeated one by one using the quasi-peak method and reported.

6.3. Typical Test Setup Layout of Radiated Emission



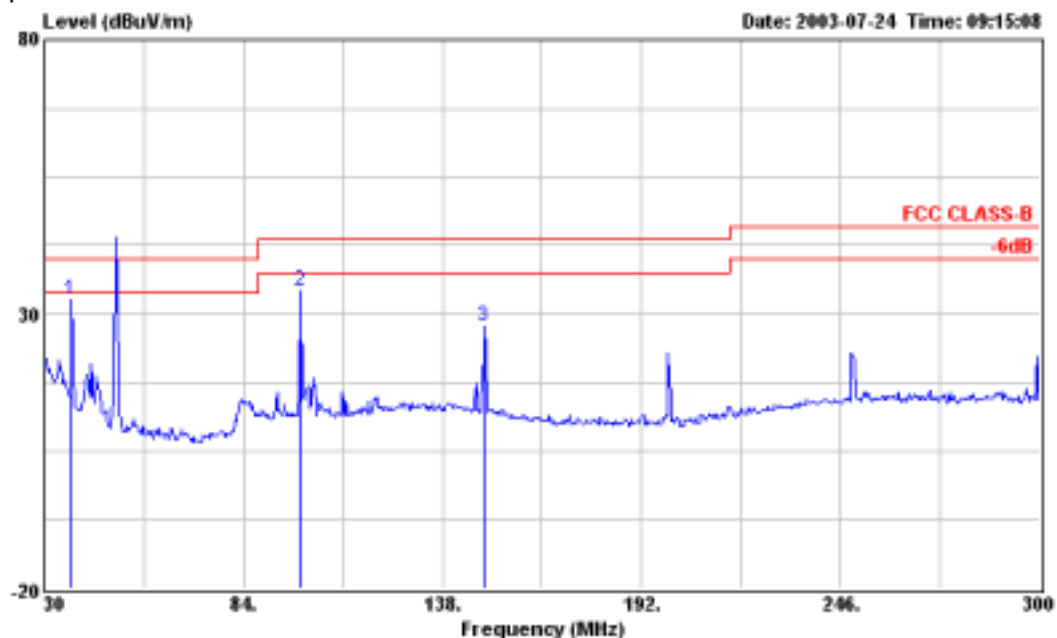
6.4. Test Result of Radiated Emission

6.4.1. Orthogonal axes: X

- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

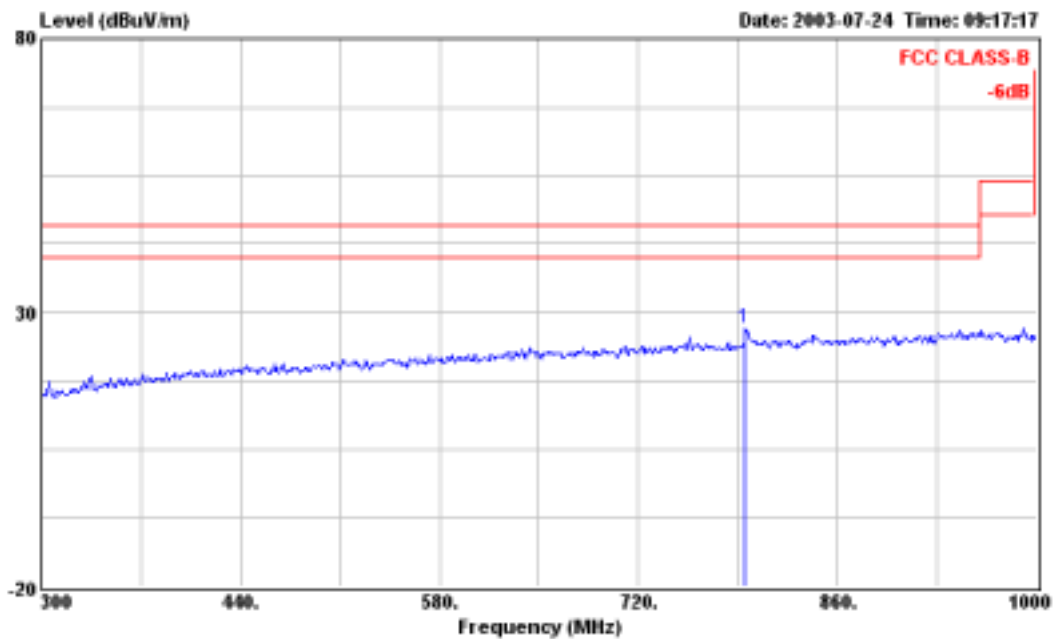
■ The test was passed at the minimum margin that marked by the frame in the following test record

■ Spurious Emission



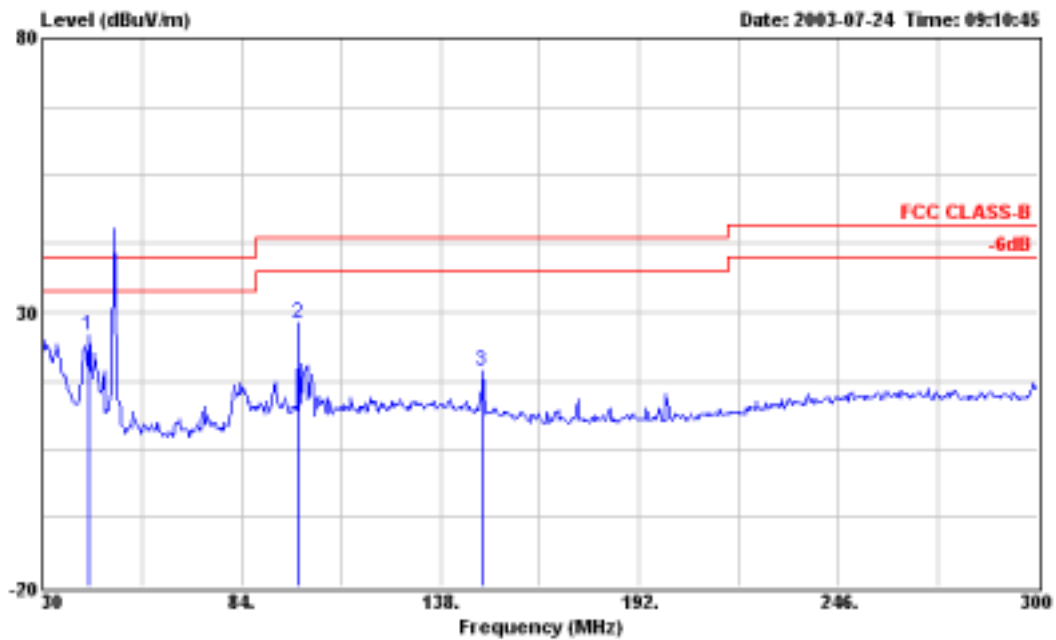
Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT :
Power : DC 3V
MODEL : X-SUB
MEMO : TX
MEMO : X

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	37.290	32.51	-7.49	40.00	46.58	11.96	1.07	27.10	Peak	---	---
2	99.660	34.32	-9.18	43.50	50.30	9.34	1.68	27.00	Peak	100	125
3	149.340	27.79	-15.71	43.50	43.03	9.47	2.09	26.80	Peak	---	---



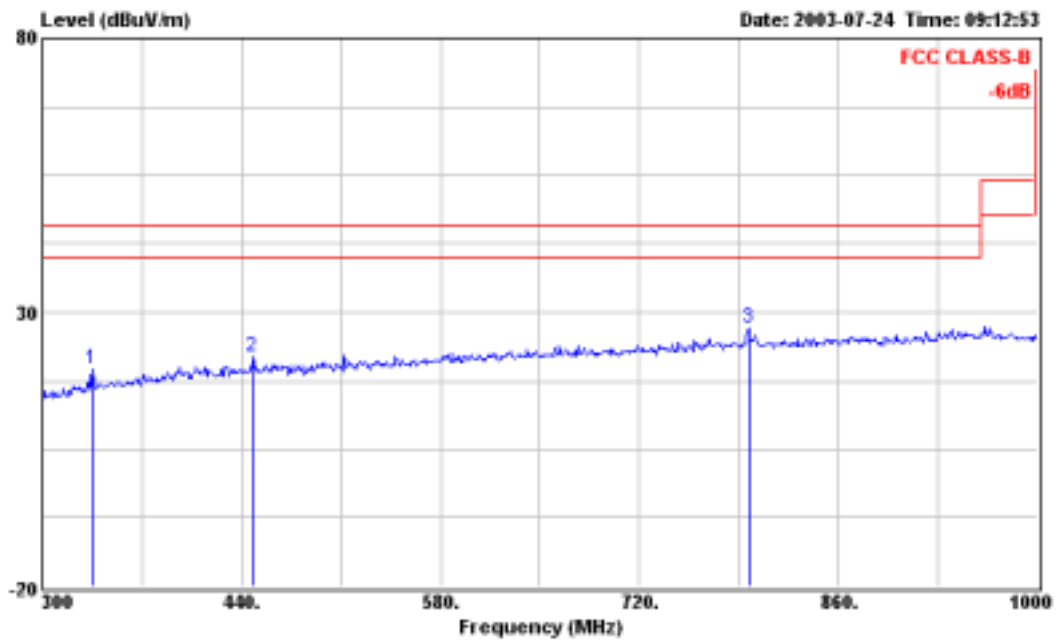
Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : X

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	794.900	26.99	-19.01	46.00	31.19	18.75	5.05	20.00	Peak	---	---



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : X

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	42.690	25.66	-14.34	40.00	41.93	9.63	1.20	27.10	Peak	---	---
2	99.660	27.95	-15.55	43.50	43.93	9.34	1.68	27.00	Peak	---	---
3	149.340	19.15	-24.35	43.50	34.39	9.47	2.09	26.00	Peak	---	---



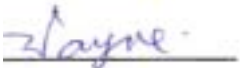
Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : X

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	335.000	19.69	-26.31	46.00	30.69	12.52	3.29	26.81	Peak	---	---
2	447.700	21.83	-24.17	46.00	30.42	15.90	3.55	27.44	Peak	---	---
3	797.000	27.03	-18.97	46.00	31.21	18.77	5.05	28.00	Peak	---	---

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	(uV/m)	Emission Level (dBuV/m)	(uV/m)	Margin (dB)	Detect Mode
49.860	H	6.49	1.43	40.20	80.00	10000.00	48.12	254.68	-31.88	Peak
49.860	V	6.49	1.43	37.01	80.00	10000.00	44.93	176.40	-35.07	Peak
99.720	H/V						-			Peak, A.V.
149.580	H/V						-			Peak, A.V.
199.440	H/V						-			Peak, A.V.
249.300	H/V						-			Peak, A.V.
299.160	H/V						-			Peak, A.V.
349.020	H/V						-			Peak, A.V.
398.880	H/V						-			Peak, A.V.
448.740	H/V						-			Peak, A.V.
498.600	H/V						-			Peak, A.V.
548.460	H/V						-			Peak, A.V.
598.320	H/V						-			Peak, A.V.
648.180	H/V						-			Peak, A.V.
698.040	H/V						-			Peak, A.V.
747.900	H/V						-			Peak, A.V.
797.760	H/V						-			Peak, A.V.
847.620	H/V						-			Peak, A.V.
897.480	H/V						-			Peak, A.V.
947.340	H/V						-			Peak, A.V.
997.200	H/V						-			Peak, A.V.

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

Test Engineer : 

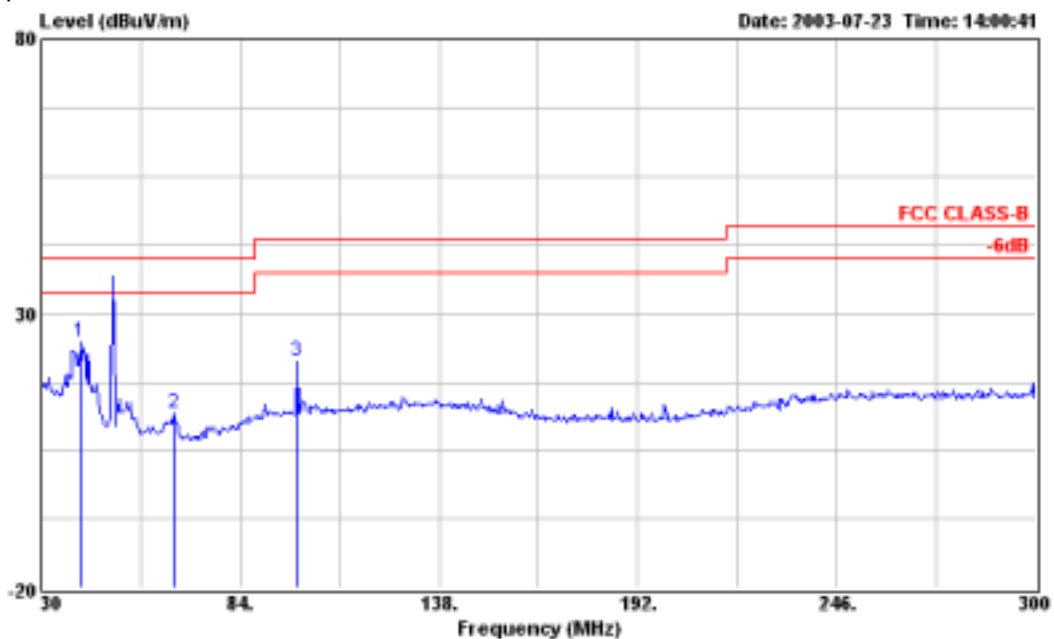
Wayue Hsu

6.4.2. Orthogonal axes: Y

- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

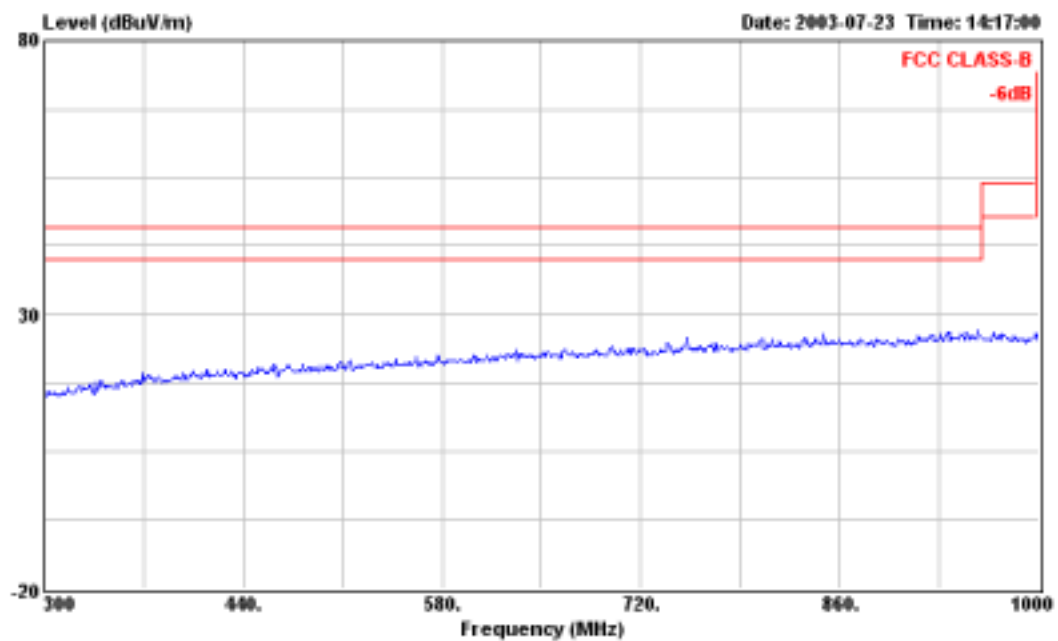
■ The test was passed at the minimum margin that marked by the frame in the following test record

■ Spurious Emission

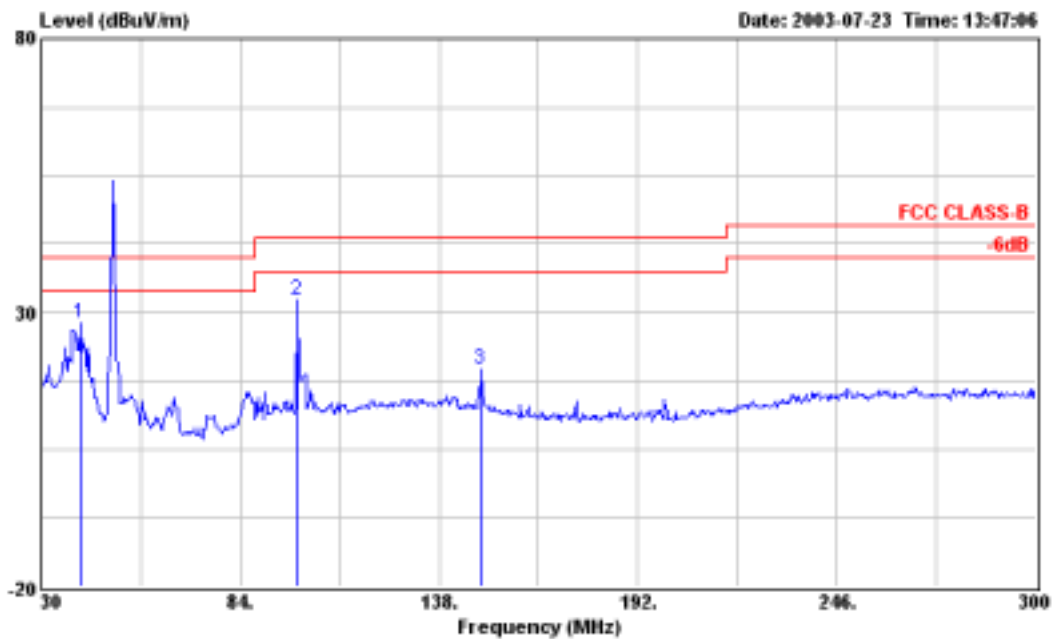


Site : 03CH03-MY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : Y

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	40.530	24.77	-15.23	40.00	40.19	10.55	1.13	27.10	Peak	---	---
2	66.180	11.04	-28.16	40.00	32.00	4.69	1.42	27.07	Peak	---	---
3	99.660	21.28	-22.22	43.50	37.26	9.34	1.68	27.00	Peak	---	---

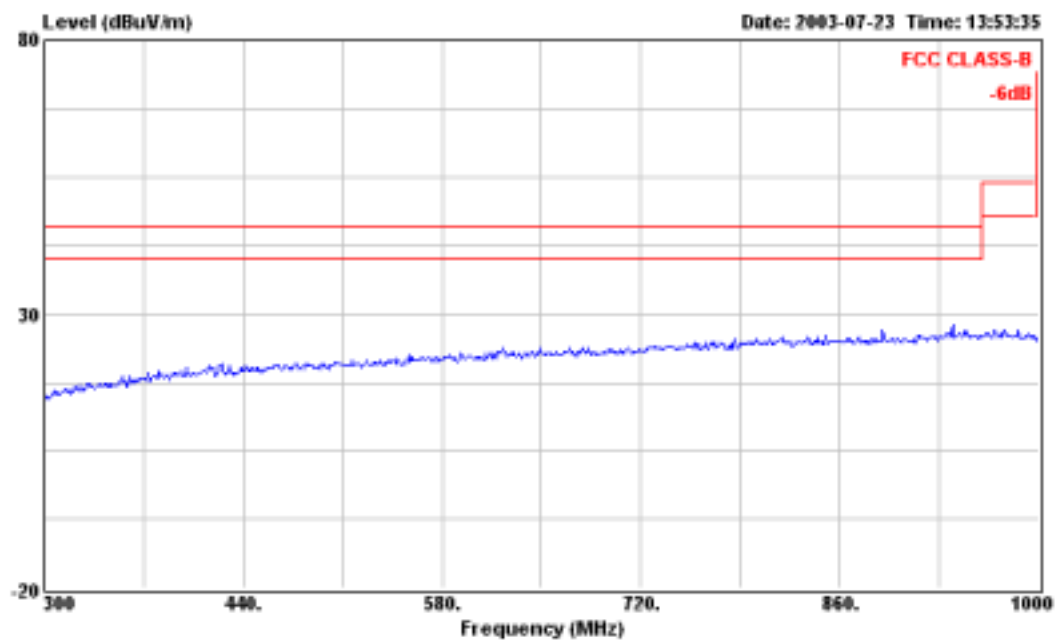


Site : 03CH03-HY
Condition : 3m 03CH03-MAT HORIZONTAL
EUT :
Power : DC 3V
MODEL : X-SUB
MEMO : TX
MEMO : Y



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : Y

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamplifier	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	40.530	27.97	-12.03	40.00	43.39	10.55	1.13	27.10	Peak	---	---
2	99.660	32.34	-11.16	43.50	46.32	9.34	1.68	27.00	Peak	100	125
3	149.340	19.70	-23.80	43.50	34.94	9.47	2.09	26.80	Peak	---	---



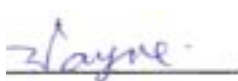
Site : 03CH03-MY
Condition : 3m 03CH03-MAT VERTICAL
EUT :
Power : DC 3V
MODEL : X-SUB
MEMO : TX
MEMO : Y

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	(uV/m)	Emission Level (dBuV/m)	(uV/m)	Margin (dB)	Detect Mode
49.860	H	6.49	1.43	31.94	80.00	10000.00	39.86	98.40	-40.14	Peak
49.860	V	6.49	1.43	49.72	80.00	10000.00	57.64	762.08	-22.36	Peak
99.720	H/V						-			Peak, A.V.
149.580	H/V						-			Peak, A.V.
199.440	H/V						-			Peak, A.V.
249.300	H/V						-			Peak, A.V.
299.160	H/V						-			Peak, A.V.
349.020	H/V						-			Peak, A.V.
398.880	H/V						-			Peak, A.V.
448.740	H/V						-			Peak, A.V.
498.600	H/V						-			Peak, A.V.
548.460	H/V						-			Peak, A.V.
598.320	H/V						-			Peak, A.V.
648.180	H/V						-			Peak, A.V.
698.040	H/V						-			Peak, A.V.
747.900	H/V						-			Peak, A.V.
797.760	H/V						-			Peak, A.V.
847.620	H/V						-			Peak, A.V.
897.480	H/V						-			Peak, A.V.
947.340	H/V						-			Peak, A.V.
997.200	H/V						-			Peak, A.V.

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

Test Engineer :



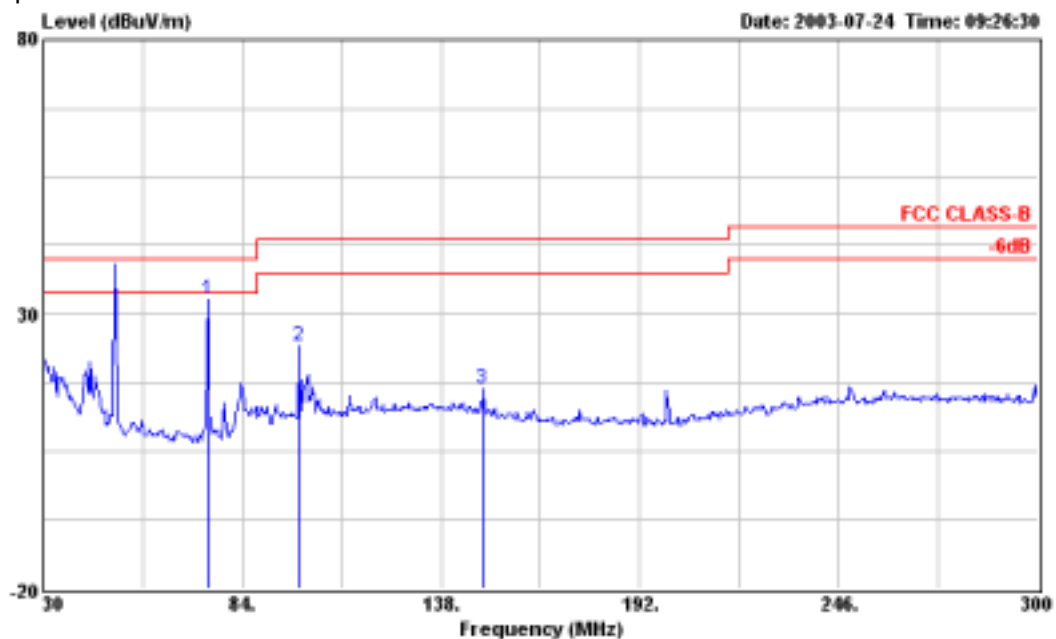
Wayue Hsu

6.4.3. Orthogonal axes: Z

- Test Distance: 3 M
- Temperature: 27 °C
- Relative Humidity: 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

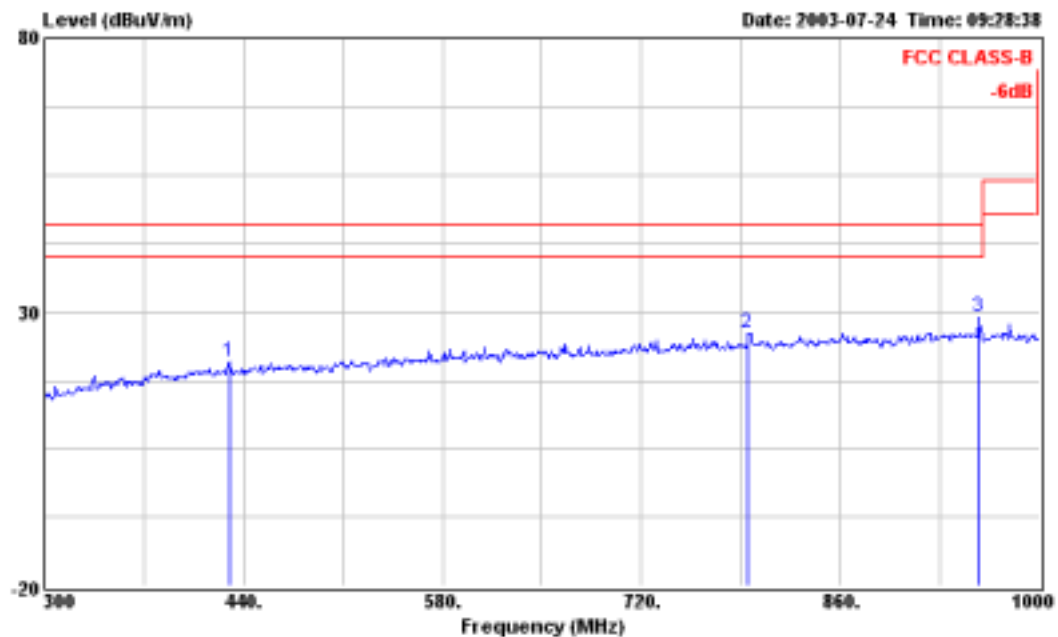
■ The test was passed at the minimum margin that marked by the frame in the following test record

■ Spurious Emission



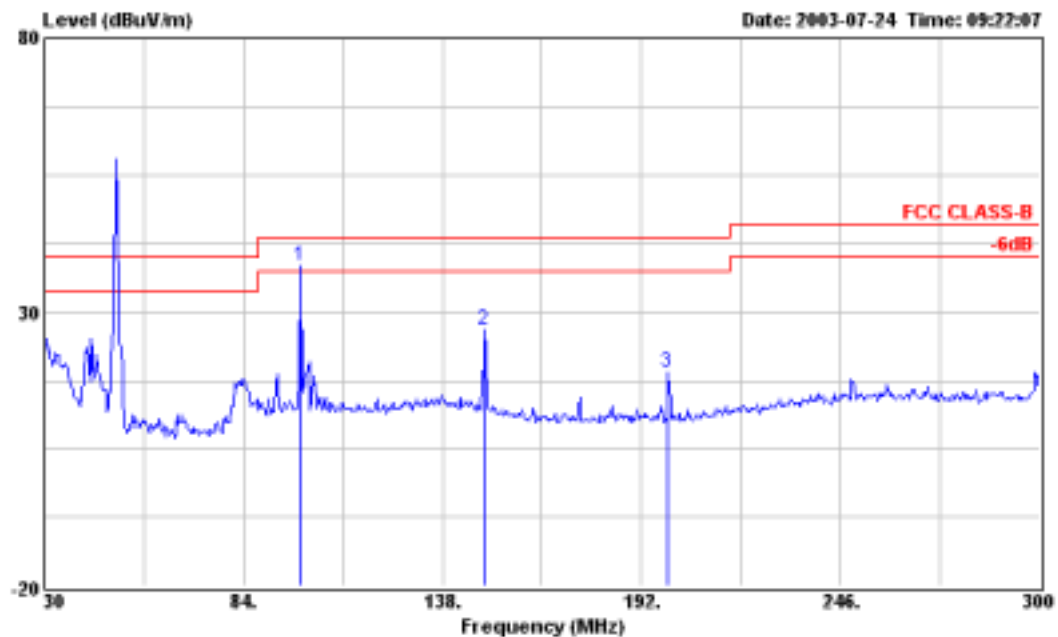
Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : Z

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	74.820	32.58	-7.42	40.00	52.07	5.21	1.55	27.05	Peak	---	---
2	99.660	24.30	-19.20	43.50	40.28	9.34	1.68	27.00	Peak	---	---
3	149.340	16.28	-27.22	43.50	31.52	9.47	2.09	26.80	Peak	---	---



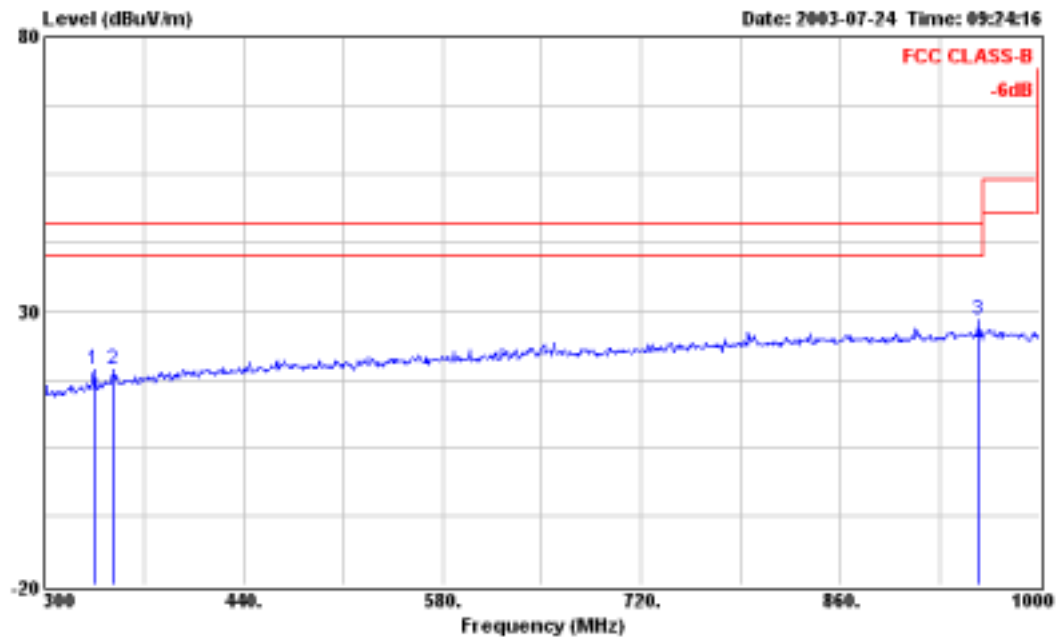
Site : 03CH03-HY
 Condition : 3m 03CH03-MAT HORIZONTAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : Z

	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	430.200	20.88	-25.12	46.00	29.63	15.06	3.54	27.35	Peak	---	---
2	794.900	26.22	-19.78	46.00	30.42	18.75	5.05	28.00	Peak	---	---
3	957.300	28.96	-17.04	46.00	31.12	19.61	5.86	27.63	Peak	---	---



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : 2

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamplifier Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	99.660	38.32	-5.18	43.50	54.30	9.94	1.68	27.00	Peak	100	190
2	149.340	26.69	-16.81	43.50	41.93	9.47	2.09	26.80	Peak	---	---
3	199.290	19.07	-24.43	43.50	36.11	7.27	2.29	26.60	Peak	---	---



Site : 03CH03-HY
 Condition : 3m 03CH03-MAT VERTICAL
 EUT :
 Power : DC 3V
 MODEL : X-SUB
 MEMO : TX
 MEMO : Z

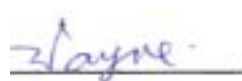
	Freq	Level	Over	Limit	Read	Probe	Cable	Preamp		Ant	Table
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Remark	Pos	Pos
			dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	335.000	19.24	-26.76	46.00	30.24	12.52	3.29	26.81	Peak	---	---
2	349.000	19.23	-26.77	46.00	29.67	12.98	3.47	26.89	Peak	---	---
3	957.300	28.37	-17.63	46.00	30.53	19.61	5.86	27.63	Peak	---	---

■ Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	(uV/m)	Emission Level (dBuV/m)	(uV/m)	Margin (dB)	Detect Mode
49.860	H	6.49	1.43	33.38	80.00	10000.00	41.30	116.14	-38.70	Peak
49.860	V	6.49	1.43	41.60	80.00	10000.00	49.52	299.23	-30.48	Peak
99.720	H/V						-			Peak, A.V.
149.580	H/V						-			Peak, A.V.
199.440	H/V						-			Peak, A.V.
249.300	H/V						-			Peak, A.V.
299.160	H/V						-			Peak, A.V.
349.020	H/V						-			Peak, A.V.
398.880	H/V						-			Peak, A.V.
448.740	H/V						-			Peak, A.V.
498.600	H/V						-			Peak, A.V.
548.460	H/V						-			Peak, A.V.
598.320	H/V						-			Peak, A.V.
648.180	H/V						-			Peak, A.V.
698.040	H/V						-			Peak, A.V.
747.900	H/V						-			Peak, A.V.
797.760	H/V						-			Peak, A.V.
847.620	H/V						-			Peak, A.V.
897.480	H/V						-			Peak, A.V.
947.340	H/V						-			Peak, A.V.
997.200	H/V						-			Peak, A.V.

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

Test Engineer :



Wayue Hsu

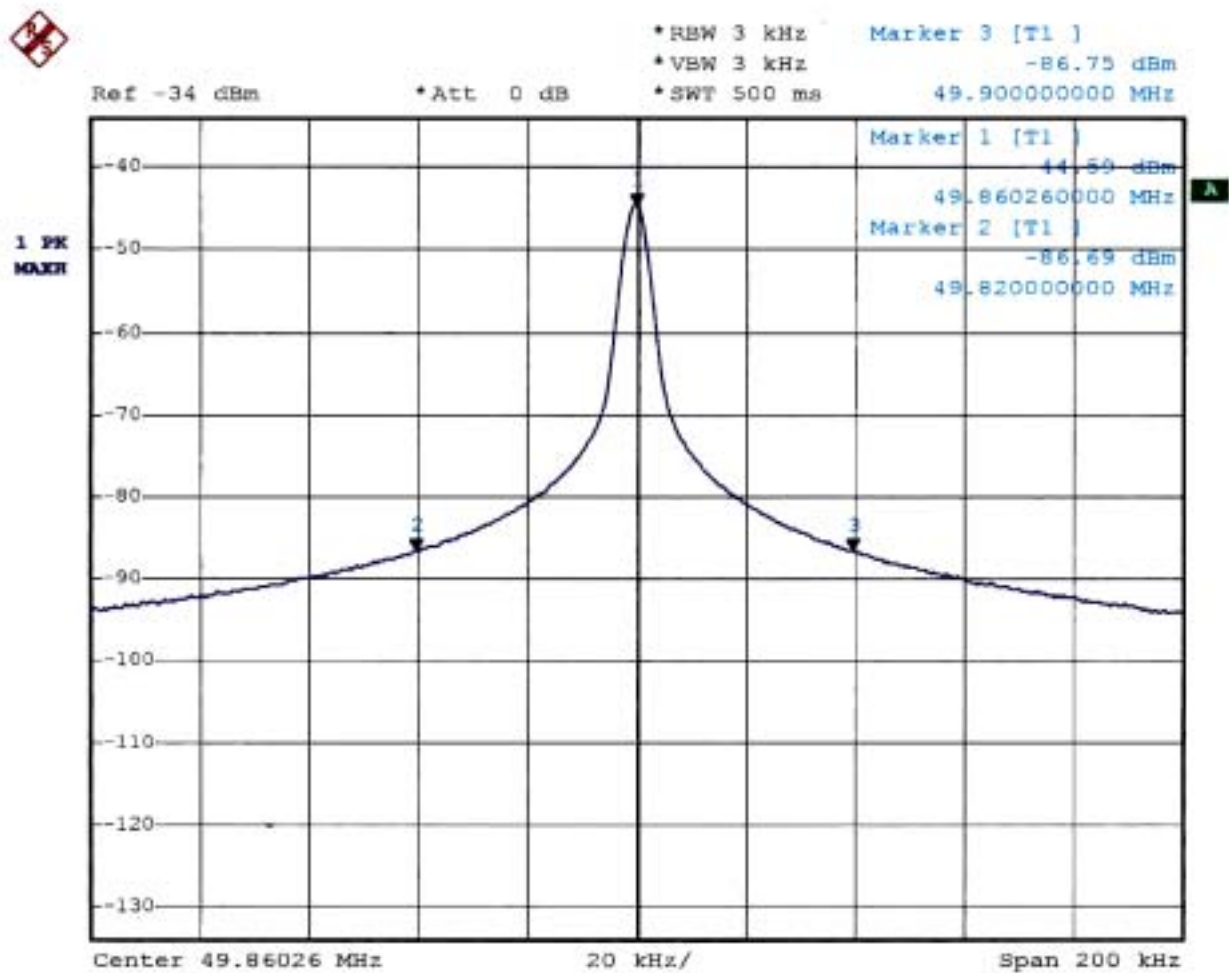
6.5. Band Edges Measurement

6.5.1. Test Result :

- Test Result in lowest : PASS
- Test Result in highest : PASS

The spectrum analyzer plots are attached as below :

Plot1 (Channel 1) :



Date: 1.AUG.2003 20:27:10

7. EMI Suppression Component List

1. Antenna circled by core (K5B 6.35*15.8*3.3).
(As the Internal photo No.3)

8. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.01
35	13.63	1.04
40	11.11	1.09
45	10.59	1.24
50	6.47	1.43
55	5.83	1.39
60	5.18	1.59
65	4.81	1.41
70	4.43	1.43
75	5.10	1.55
80	5.91	1.56
85	7.33	1.62
90	8.74	1.41
95	9.05	1.81
100	9.36	1.68
110	9.65	1.73
120	9.97	1.79
130	10.51	1.93
140	10.32	2.06
150	9.42	2.09
160	8.09	2.12
170	7.43	2.12
180	7.60	2.12
190	7.43	2.21
200	7.26	2.29
220	9.11	2.42
240	10.88	2.54
260	11.75	2.66
280	11.55	2.76
300	11.36	2.85
320	12.03	3.10
340	12.69	3.36
360	13.33	3.49
380	14.00	3.50
400	14.63	3.51
450	15.33	3.55
500	16.03	3.81
550	16.65	4.05
600	17.29	4.23
650	17.64	4.63
700	18.00	4.74
750	18.39	4.95
800	18.79	5.06
850	19.10	5.18
900	19.42	5.40
950	19.58	5.91
1000	19.75	5.58

9. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2003	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP40	100004/040	9KHZ~40GHz	Aug. 07, 2002	Radiation (03CH03-HY)
Receiver	SCHAFFNER	SCR 3501	417	9 KHz ~1GHz	Feb. 20, 2003	Radiation (03CH03-HY)
Amplifier	HP	8447D	2944A09072	100KHz ~ 1.3GHz	Oct. 21, 2002	Radiation (03CH03-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2687	30MHz ~2GHz	Dec. 21, 2002	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Jan. 02, 2003	Radiation (03CH03-HY)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (03CH03-HY)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (03CH03-HY)

* Calibration Interval of instruments listed above is one year.

10. Uncertainty of Test Site

Uncertainty of Radiated Emission Measurement

Contribution	Probability Distribution	3m
Antenna factor calibration	normal(k=2)	±1
cable loss calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
Antenna Directivity	rectangular	±3
Antenna Factor V.S. Height	rectangular	±2
Antenna Factor Interpolation for Frequency	rectangular	±0.25
site imperfection	rectangular	±2
Mismatch Receiver VSWR $\Gamma_1=0.09$ Antenna VSWR $\Gamma_2=0.67$ Uncertainty= $20\log(1-\Gamma_1\Gamma_2)$	U-shaped	±0.54
combined standard uncertainty Ue(y)	normal	±2.7
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±5.4

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

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

Uncertainty of Conducted Emission Measurement

Contribution	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR $\Gamma_1=0.09$ LISN VSWR $\Gamma_2=0.33$ Uncertainty= $20\log(1-\Gamma_1\Gamma_2)$	U-shaped	0.2
combined standard uncertainty Ue(y)	normal	±1.66
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±3.32

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