FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment	:	X'mas RF Remote Controller
Model No.	:	HXTC - 4001
FCC ID	:	QKUHXTC- 4001
Filing Type	:	Certification
Applicant	:	**Hugewin Electronic (Taiwan) Co., Ltd.** No. 293, Hwa-Hsin St., Chu-Pei Hsinchu, 302,Taiwan, R.O.C.

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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: Nov. 28, 2002

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

Certificate No. : F2N1106

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment	:	X'mas RF Remote Controller
Model No.	:	HXTC - 4001
FCC ID	:	QKUHXTC- 4001
Filing Type	:	Certification
Applicant	:	**Hugewin Electronic (Taiwan) Co., Ltd.** No. 293, Hwa-Hsin St., Chu-Pei Hsinchu, 302,Taiwan,

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 1992** and the energy emitted by this equipment was ***passed*** both radiated and conducted emission limits. Testing was carried out on Nov.15, 2002 at **SPORTON International Inc.** LAB.

K. J. Lin Jan. 22, 2003

K. J. Lin
Manager

SPORTON International Inc.

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

1. General Description of Equipment under Test

1.1. Applicant

Hugewin Electronic (Taiwan) Co., Ltd.
No.293, Hwa-Hsin St., Chu-Pei Hsinchu, 302, Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1.

1.3. Basic Description of Equipment under Test

Equipment	: X'mas RF Remote Controller
Model No.	: HXTC- 4001
FCC ID	: QKUHXTC- 4001
Trade Name	: HWIN
Power Supply Type	: From Battery
Power Cord	: N/A

1.4. Feature of Equipment under Test

1. Mode: HXTC- 4001
2. Tx Frequency: 434 MHz
3. 12 remote control keys for melody and volume control selection
4. Tx Power: 6.4uW
5. Input voltage: DC 12V
6. Working Current: 0.8mA
7. Color: different color selection.
8. Modulation: ASK
9. Temperature: 0℃ 50℃

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: conduction 150 KHz to 30 MHz, radiation 30 MHz to 4330 MHz.
c. The radiated emissions testing was made by rotating three orthogonal axes.
d. The EUT employs a switch that will automatically deactivate the transmitter within no more than 5 seconds of being released.
e. The EUT has no periodic transmission at regular predetermined interval.
f. Pursuant to 15.231(c) of Part 15. Subpart C, the bandwidth of the emission at the 20dB point shall be no wider than 0.25% of the center frequency for EUT.
The carrier frequency of EUT is 433.91MHz
433.91MHz * 0.25% = 1084.775KHz.

The test result is 580KHz (as shown in section 2.4 of this test report), which is less than 1084.775KHz. The EUT meet the 20dB point bandwidth requirement.

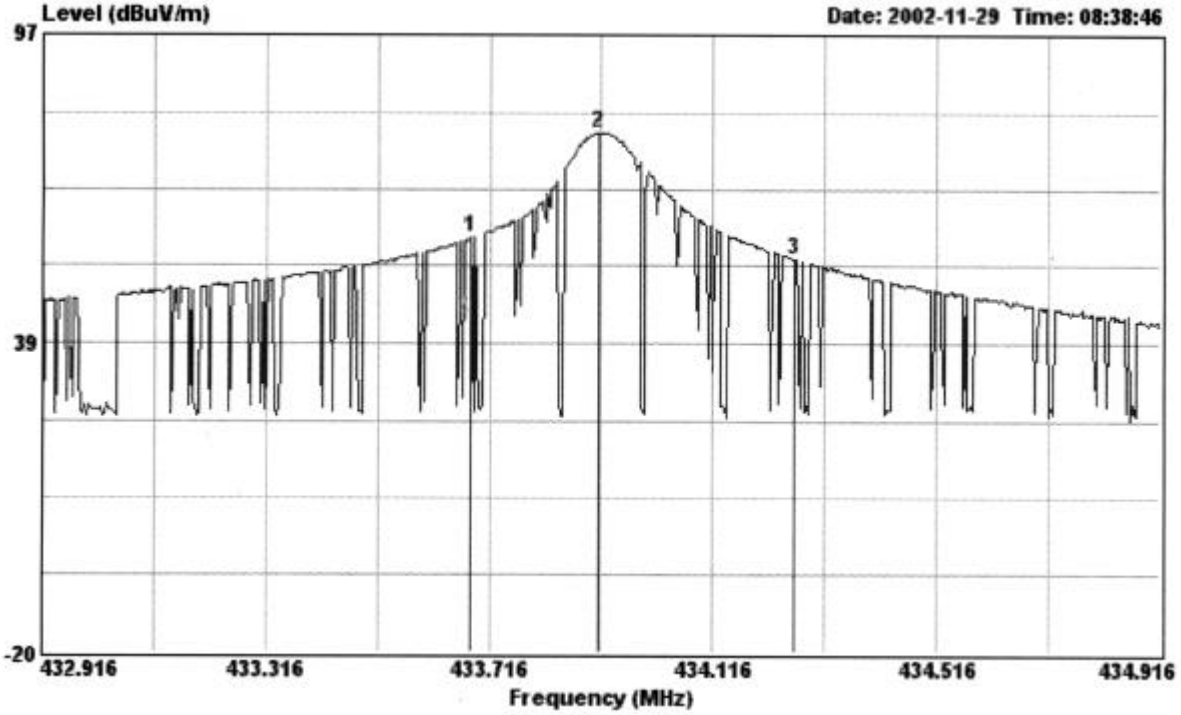
2.2. Description of Test System

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

2.3. Connection Diagram of Test System

EUT

2.4. A plot shows the EUT meet the requirement of 15.231(c)



Mark 1: 433.68MHz
Mark 3: 434.26MHz
20dB bandwidth=434.26-433.68=580KHz

3. Test Software

No test software was used during testing.

4. General Information of Test

4.1. Test Facility

This test was carried out by SPORTON International Inc.

Test Site Location	:	No. 52, Hwa Ya 1St Road, Hwa Ya Technology Park, Kwei-Shan Hsiang, TaoYuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973
Test Site No.	:	SH04

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. Conduction: from 150 KHz to 30 MHz
b. Radiation: from 30 MHz to 4330 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 test is not applicable for this EUT.

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 4330 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 in the open-field site, 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

6.1.1. from 30MHz to 1GHz

- Amplifier (HP 8477D)

RF Gain	30 dB
Signal Input	9 KHz to 3 GHz

- Spectrum Analyzer (ROHDE&SCHEARZ FSP7)

Attenuation	10 dB
Start Frequency	30 MHz
Stop Frequency	1000 MHz
Resolution Bandwidth	120 kHz
Signal Input	9KHz – 7GHz

6.1.2. from 1GHz to 4.3GHz

- Spectrum analyzer (R&S FSP40)

Attenuation	10 dB
Start Frequency	1 GHz
Stop Frequency	4.3 GHz
Resolution Bandwidth	1 MHz
Video Bandwidth	1 MHz
Signal Input	9 KHz to 40 GHz

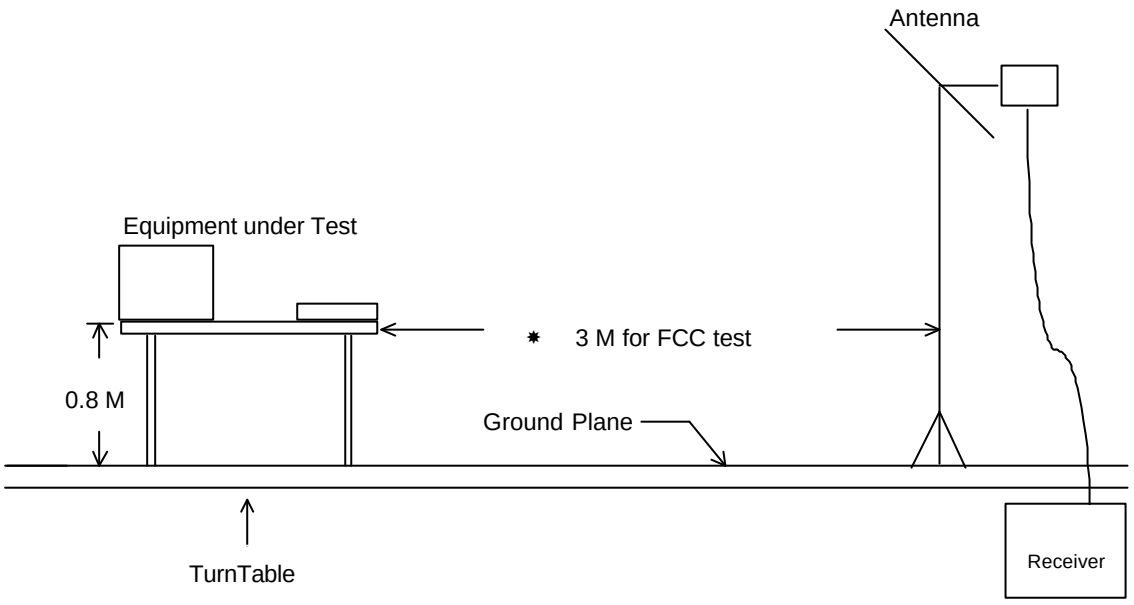
- Amplifier (MITEQ AFS44)

RF Gain	40 dB
Signal Input	100 MHz to 26.5GHz

6.2. Test Procedures

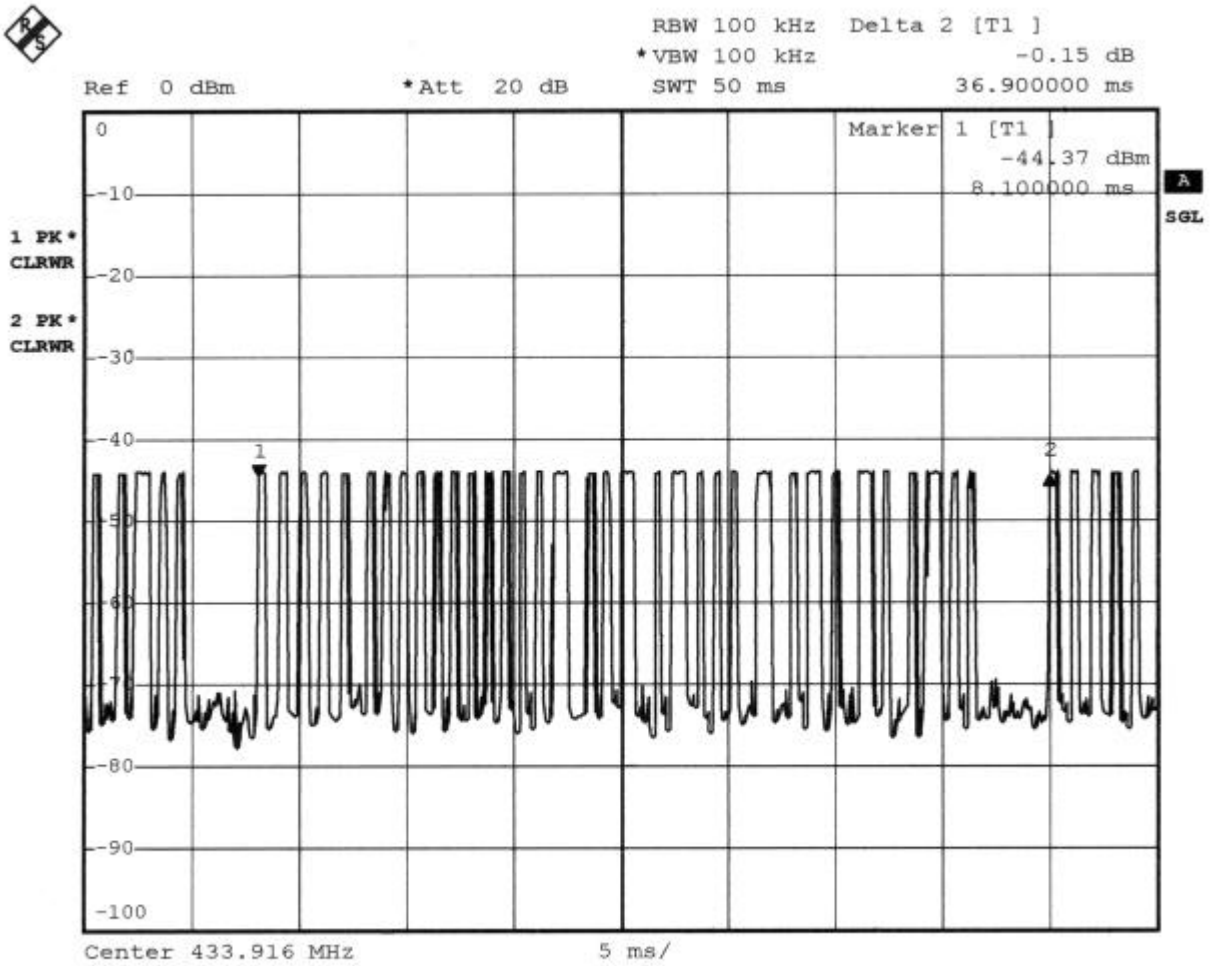
a. The EUT was placed on a rotatable table top 0.8 meter above ground.
b. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
c. The table was rotated 360 degrees to determine the position of the highest radiation.
d. The antenna 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.
h. For testing above 1GHz, the emission level of the EUT in peak mode was more 20dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

6.3. Typical Test Setup Layout of Radiated Emission



6.4. Figure of Duty Cycle

6.4.1 Total Cycle



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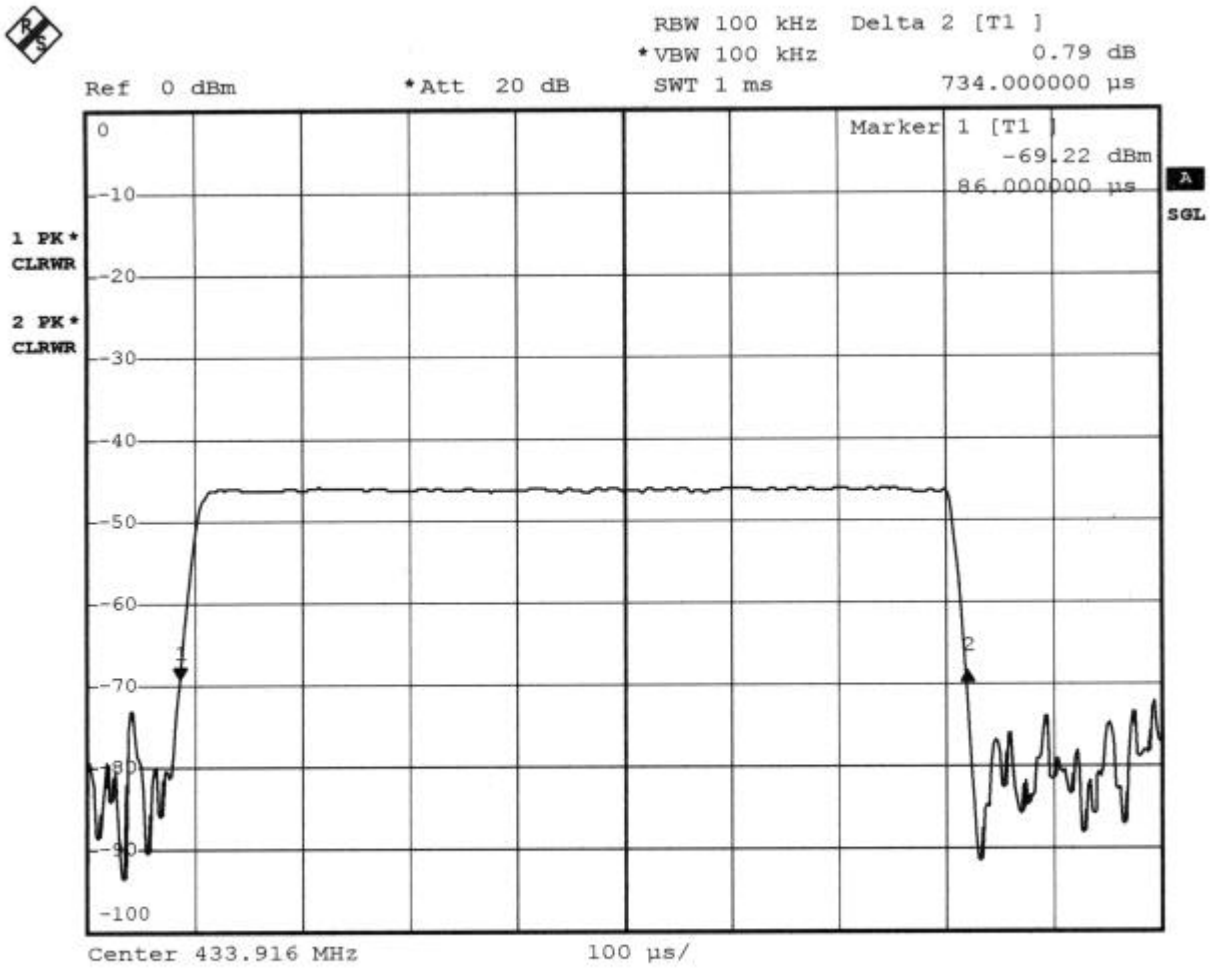
6.4.2 Long Duty



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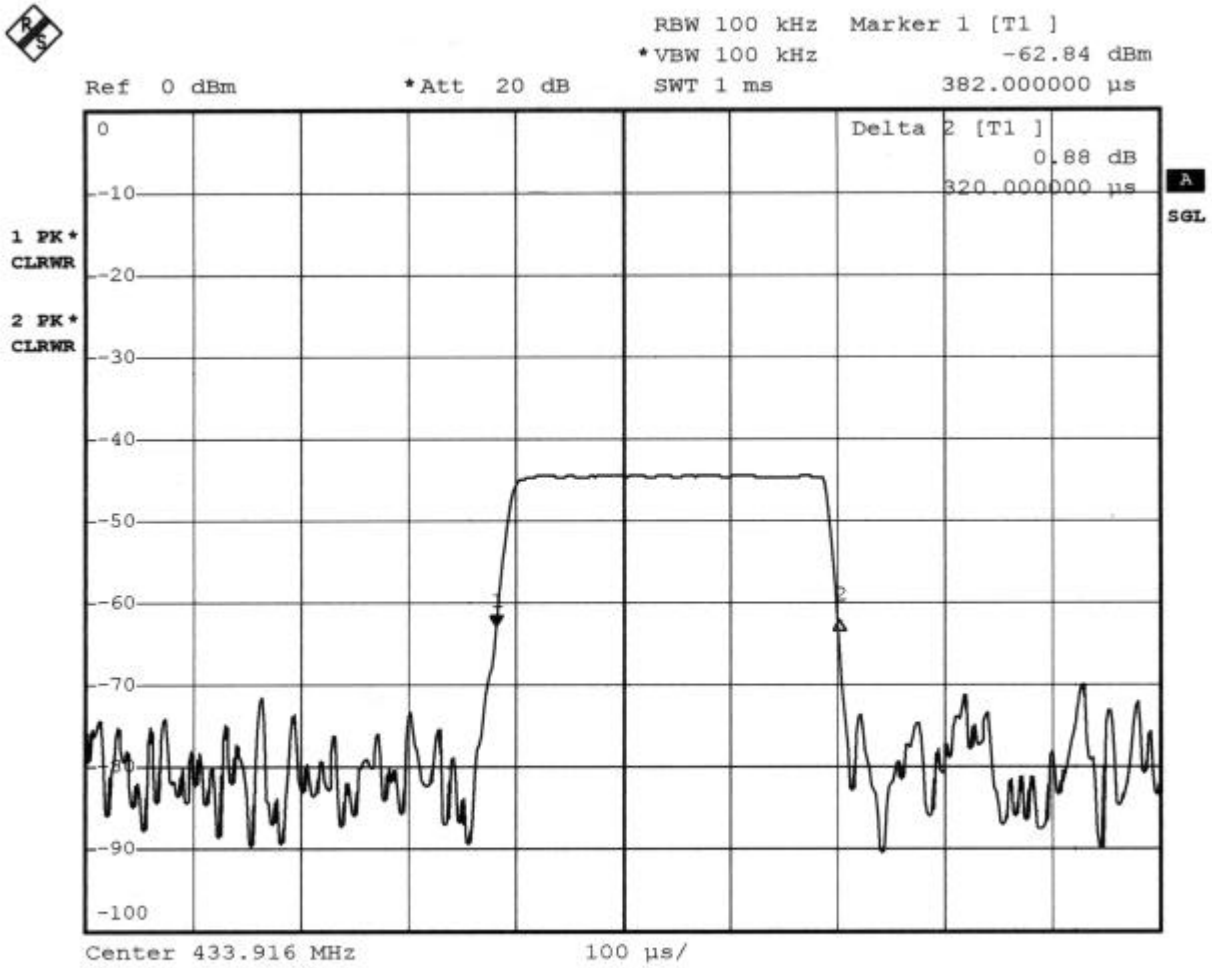
6.4.3 Short Duty



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6.5. Test Result of Radiated Emission

6.5.1. Orthogonal axes: **X**

- Frequency range: 30 ~ 5000 MHz
- Test Distance: 3 M
- Temperature: 26°C
- Relative Humidity: 55 %
- Test Date: Nov. 15, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Reading = Emission

433.000 MHz / 78.72 dBuV (HORIZONTAL) Antenna Height 1 Meter, Turntable Degree 220 ^{o}.

- Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect
433.91	H	3.55	16.25	58.89	100.83	110027	78.69	8600.03	-22.14	Peak
433.91	H	3.55	16.25	51.33	80.83	11003	71.13	3601.64	-9.70	A.V.
867.700	H	20.30	5.04	20.68	80.83	11003	46.02	199.99	-34.81	Peak
867.700	H	20.30	5.04	13.12	60.83	1100	38.46	83.75	-22.37	A.V.
433.91	V	3.55	16.25	51.41	100.83	110027	71.21	3634.96	-29.62	Peak
433.91	V	3.55	16.25	43.85	80.83	11003	63.65	1522.30	-17.18	A.V.
867.700	V	20.30	5.04	11.45	80.83	11003	36.79	69.10	-44.04	Peak
867.700	V	20.30	5.04	3.89	60.83	1100	29.23	28.94	-31.60	A.V.
1326.000	V	26.60	3.77	11.00	74.00	5012	41.37	117.08	-32.63	Peak
1326.000	V	26.60	3.77	3.44	54.00	501	33.81	49.03	-20.19	A.V.
1732.000	H/V						-			Peak, A.V.
2165.000	H/V						-			Peak, A.V.
2598.000	H/V						-			Peak, A.V.
3031.000	H/V						-			Peak, A.V.
3464.000	H/V						-			Peak, A.V.
3897.000	H/V						-			Peak, A.V.
4330.000	H/V						-			Peak, A.V.

- **Spurious Emission**

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect
57.810	H	5.62	1.30	31.37	40.00	100.00	11.21	3.63	-28.79	Peak
186.060	H	8.70	2.30	34.96	43.50	150.00	19.31	9.24	-24.19	Peak
1844.000	H	28.61	4.50	38.34	74.00	5011.90	44.37	165.40	-29.63	Peak
60.780	V	5.17	1.32	31.91	40.00	100.00	11.32	3.70	-28.68	Peak
69.420	V	5.19	1.40	32.79	40.00	100.00	12.32	4.13	-27.68	Peak
73.740	V	5.96	1.48	42.38	40.00	100.00	22.77	13.76	-17.23	Peak
228.180	V	9.47	2.59	29.64	46.00	200.00	15.10	5.70	-30.90	Peak
1844.000	V	28.61	4.50	40.13	74.00	5011.90	46.16	203.24	-27.84	Peak

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

Test Engineer: Wayne

Wayne Hsu

6.5.2. Orthogonal axes: **Y**

- Frequency range: 30 ~ 5000 MHz
- Test Distance: 3 M
- Temperature: 26°C
- Relative Humidity: 55 %
- Test Date: Nov. 15, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

433.00 MHz / 72.55 dBuV (HORIZONTAL) Antenna Height 2 Meter, Turntable Degree 150 ^{o}.

- Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect
433.91	H	3.55	16.25	60.28	100.83	110027	80.08	10093	-20.75	Peak
433.91	H	3.55	16.25	52.72	80.83	11003	72.52	4226.69	-8.31	A.V.
867.700	H	20.30	5.04	19.23	80.83	11003	44.57	169.24	-36.26	Peak
867.700	H	20.30	5.04	11.67	60.83	1100	37.01	70.88	-23.82	A.V.
433.91	V	3.55	16.25	50.55	100.83	110027	70.35	3292.30	-30.48	Peak
433.91	V	3.55	16.25	42.99	80.83	11003	62.79	1378.80	-18.04	A.V.
867.700	V	20.30	5.04	12.74	80.83	11003	38.08	80.17	-42.75	Peak
867.700	V	20.30	5.04	5.18	60.83	1100	30.52	33.57	-30.31	A.V.
1299.000	H/V						-			Peak, A.V.
1732.000	H/V						-			Peak, A.V.
2165.000	H/V						-			Peak, A.V.
2598.000	H/V						-			Peak, A.V.
3031.000	H/V						-			Peak, A.V.
3464.000	H/V						-			Peak, A.V.
3897.000	H/V						-			Peak, A.V.
4330.000	H/V						-			Peak, A.V.

- **Spurious Emission**

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect
78.330	H	6.62	1.50	31.44	40.00	100.00	12.52	4.23	-27.48	Peak
1844.000	H	28.61	4.50	38.77	74.00	5011.90	44.80	173.78	-29.20	Peak
61.860	V	5.11	1.35	33.49	40.00	100.00	12.87	4.40	-27.13	Peak
1844.000	V	28.61	4.50	38.08	74.00	5011.90	44.11	160.51	-29.89	Peak

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

Test Engineer: Wayne

Wayne Hsu

6.5.3. Orthogonal axes: **Z**

- Frequency range: 30 ~ 5000 MHz
- Test Distance: 3 M
- Temperature: 26°C
- Relative Humidity: 55 %
- Test Date: Nov. 15, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

36.210 MHz / 31.93 dBuV (Vertical) Antenna Height 1 Meter, Turntable Degree 80 °.

- Field strength of fundamental and harmonics

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect
433.91	H	3.55	16.25	46.70	100.83	110027	66.50	2113.5	-34.33	Peak
433.91	H	3.55	16.25	39.11	80.83	11003	58.91	882.06	-21.92	A.V.
867.700	H	20.30	5.04	9.84	80.83	11003	35.18	57.41	-45.65	Peak
867.700	H	20.30	5.04	2.28	60.83	1100	27.62	24.04	-33.21	A.V.
433.91	V	3.55	16.25	56.44	100.83	110027	76.24	6486.34	-24.59	Peak
433.91	V	3.55	16.25	48.88	80.83	11003	68.68	2716.44	-12.15	A.V.
867.700	V	20.30	5.04	12.19	80.83	11003	37.53	75.25	-43.30	Peak
867.700	V	20.30	5.04	4.63	60.83	1100	29.97	31.51	-30.86	A.V.
1299.000	H/V						-			Peak, A.V.
1732.000	H/V						-			Peak, A.V.
2165.000	H/V						-			Peak, A.V.
2598.000	H/V						-			Peak, A.V.
3031.000	H/V						-			Peak, A.V.
3464.000	H/V						-			Peak, A.V.
3897.000	H/V						-			Peak, A.V.
4330.000	H/V						-			Peak, A.V.

- **Spurious Emission**

Frequency (MHz)	Polarity	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Limits (dBuV/m)	Limits (uV/m)	Emission (dBuV/m)	Level (uV/m)	Margin (dB)	Detect
1844.000	H	28.61	4.50	39.42	74.00	5011.90	45.45	187.28	-28.55	Peak
36.210	V	15.01	0.96	43.06	40.00	100.00	31.93	39.50	-8.07	Peak
82.650	V	7.45	1.56	29.76	40.00	100.00	11.74	3.86	-28.26	Peak
1846.000	V	28.64	4.51	38.21	74.00	5011.90	44.28	163.68	-29.72	Peak

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

Test Engineer: Wayne

Wayne Hsu

7. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	18.10	0.90
35	16.00	0.90
40	13.19	1.09
45	10.57	1.10
50	8.00	1.21
55	6.30	1.30
60	5.30	1.30
65	4.95	1.40
70	5.19	1.40
75	6.05	1.49
80	6.86	1.50
85	7.94	1.60
90	8.60	1.60
95	9.70	1.60
100	10.26	1.69
110	11.19	1.70
120	11.60	1.81
130	11.42	1.90
140	10.92	1.99
150	10.20	2.00
160	9.20	2.11
170	9.00	2.20
180	8.60	2.29
190	8.70	2.30
200	8.10	2.40
220	8.86	2.51
240	10.70	2.60
260	13.10	2.71
280	12.50	2.80
300	13.00	2.90
320	13.51	3.00
340	13.90	3.10
360	14.43	3.30
380	14.79	3.30
400	15.80	3.40
450	16.37	3.59
500	17.40	3.80
550	18.57	3.90
600	18.50	4.20
650	18.93	4.40
700	19.03	4.40
750	19.84	4.71
800	19.82	4.90
850	20.30	5.00
900	20.32	5.11
950	20.82	5.60
1000	21.20	5.50

8. EMI Suppression Component List

No EMI suppression components.

9. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Spectrum Analyzer	ROHDE & SCHEARZ	FSP	838858/037	9KHz – 7GHz	Jan. 08, 2002	Radiation (SH04)
Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Oct. 21, 2002	Radiation (SH04)
Bilog Antenna	SCHAFFNER	CBL6112B	2687	30MHz –2GHz	Dec. 23, 2001	Radiation (SH04)
Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A	Radiation (SH04)
Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A	Radiation (SH04)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 09, 2002	Radiation (SH04)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 09, 2002	Radiation
Spectrum analyzer	R&S	FSP40	100004/040	9KHZ~40GHZ	Aug. 07, 2002	Radiation (SH04)
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Aug. 12, 2002	Radiation

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 Γ1=0.09 Antenna VSWR Γ2=0.67 Uncertainty=20log(1-Γ1*Γ2)	U-shaped	±0.54
combined standard uncertainty Ue(y)	normal	±2.7
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±5.4

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

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

Uncertainty of Conducted Emission Measurement

	Probability Distribution	150KHz – 30MHz
Cable and I/P attenuator calibration	normal(k=2)	±0.3
RCV/SPA specification	rectangular	±2
LISN coupling specification	rectangular	±1.5
Transducer factor frequency interpolation	rectangular	±0.2
Mismatch Receiver VSWR Γ1=0.09 LISN VSWR Γ2=0.33 Uncertainty=20log(1-Γ1*Γ2)	U-shaped	0.2
combined standard uncertainty Ue(y)	normal	±1.66
Measuring uncertainty for a level of confidence of 95% U=2Ue(y)	normal (k=2)	±3.32

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