FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment	:	Patient Unit
Model No.	:	#2130
FCC ID	:	GX9616PU
Filing Type	:	Certification
Applicant	:	**CLIMAX TECHNOLOGY CO., LTD.** 4F., No. 3, Alley 2, Lane 342, Fu-Teh 1 Road, Hsi-Chin City, Taipei Hsien, Taiwan

SPORTON International Inc.

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

Table of Contents

History of this test report ..... **ii**

CERTIFICATE OF COMPLIANCE **1**

1. General Description of Equipment under Test **2**

1.1. Applicant 2
1.2. Manufacturer 2
1.3. Basic Description of Equipment under Test 2
1.4. Feature of Equipment under Test 3

2. Test Configuration of Equipment under Test **4**

2.1. Test Manner 4
2.2. Description of Test System 4
2.3. Connection Diagram of Test System 5
2.4. A plot shows the EUT meet the requirement of 15.231(c) 6

3. Test Software **7**

4. General Information of Test **8**

4.1. Test Facility 8
4.2. Test Voltage 8
4.3. Standard for Methods of Measurement 8
4.4. Test in Compliance with 8
4.5. Frequency Range Investigated 8
4.6. Test Distance 8

5. Test of Conducted Powerline **9**

5.1. Major Measuring Instruments 9
5.2. Test Procedures 10
5.3. Typical Test Setup Layout of Conducted Powerline 11
5.4. Test Result of AC Powerline Conducted Emission 12

6. Test of Radiated Emission **13**

6.1. Major Measuring Instruments 13
6.2. Test Procedures 14
6.3. Typical Test Setup Layout of Radiated Emission 15
6.4. Test Result of Radiated Emission 16

7. EMI Suppression Component List **18**

8. Antenna Factor & Cable Loss **19**

9. List of Measuring Equipments Used **20**

10. Uncertainty of Test Site **21**

History of this test report

Original Report Issue Date: Apr. 19, 2003

■ No additional attachment.

☐ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

Certificate No. : F340709

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment	:	Patient Unit
Model No.	:	#2130
FCC ID	:	GX9616PU
Filing Type	:	Certification
Applicant	:	**CLIMAX TECHNOLOGY CO., LTD.** 4F., No. 3, Alley 2, Lane 342, Fu-Teh 1 Road, Hsi-Chin City, Taipei Hsien, 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 Apr. 18, 2003 at **SPORTON International Inc.** LAB.

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

CLIMAX TECHNOLOGY CO., LTD.
4F., No. 3, Alley 2, Lane 342, Fu-Teh 1 Road,
Hsi-Chin City, Taipei Hsien, Taiwan

1.2. Manufacturer

Same as 1.1

1.3. Basic Description of Equipment under Test

Equipment	: Patient Unit
Model No.	: #2130
FCC ID	: GX9616PU
Trade Name	: CLIMAX
RJ11 Cable	: Non-Shielded, 0.8m
Power Supply Type	: Switching
AC Power Cord	: Wall-mount, 2pin
DC Power Cable	: Shielded, 1.8m

1.4. Feature of Equipment under Test

Type of Modulation	AM
Frequency Band	433.92Mhz
Carrier Frequency of each channel	433.92Mhz
Type of Antenna Connector (Ex: SMA,TNC, MCX, MMCX, UFC…….etc)	Built in PCB
Antenna Type / Class and **Gain**	Built in PCB
Function Type	Transmitter
Power Rating (DC/AC , Voltage)	DC 4.5V AC 115V
Basic function of product	Alarm signals transmit

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 5000MHz.
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 complete test system included STEREO Mic+EARPHONE, CLIMAX Sensor and EUT for EMI test.
f. There are four products in this report. The design of them are the same except for the button number. The most complex product which has four buttons was selected as the test sample.
g. 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 433.893MHz
433.931MHz * 0.25% = 1084.8275KHz
The test result is 259KHz (as shown in section 2.4 of this test report), which is less than 1084.8275KHz. The EUT meet the 20dB point bandwidth requirement.

2.2. Description of Test System

Support Unit 1. – Mic+EARPHONE (STEREO)

FCC ID	: N/A
Model No.	: MSB-206
Serial No.	: SP0054
Data Cable	: Non-Shielded, 360 degree via metal backshells, 2.3m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

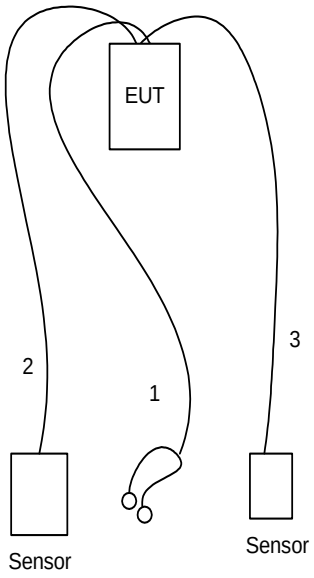
Support Unit 2. –Sensor (CLIMAX)

Model No.	: B1
Serial No.	: SP0050

Support Unit 3. –Sensor (CLIMAX)

Model No.	: S1
Serial No.	: SP0051

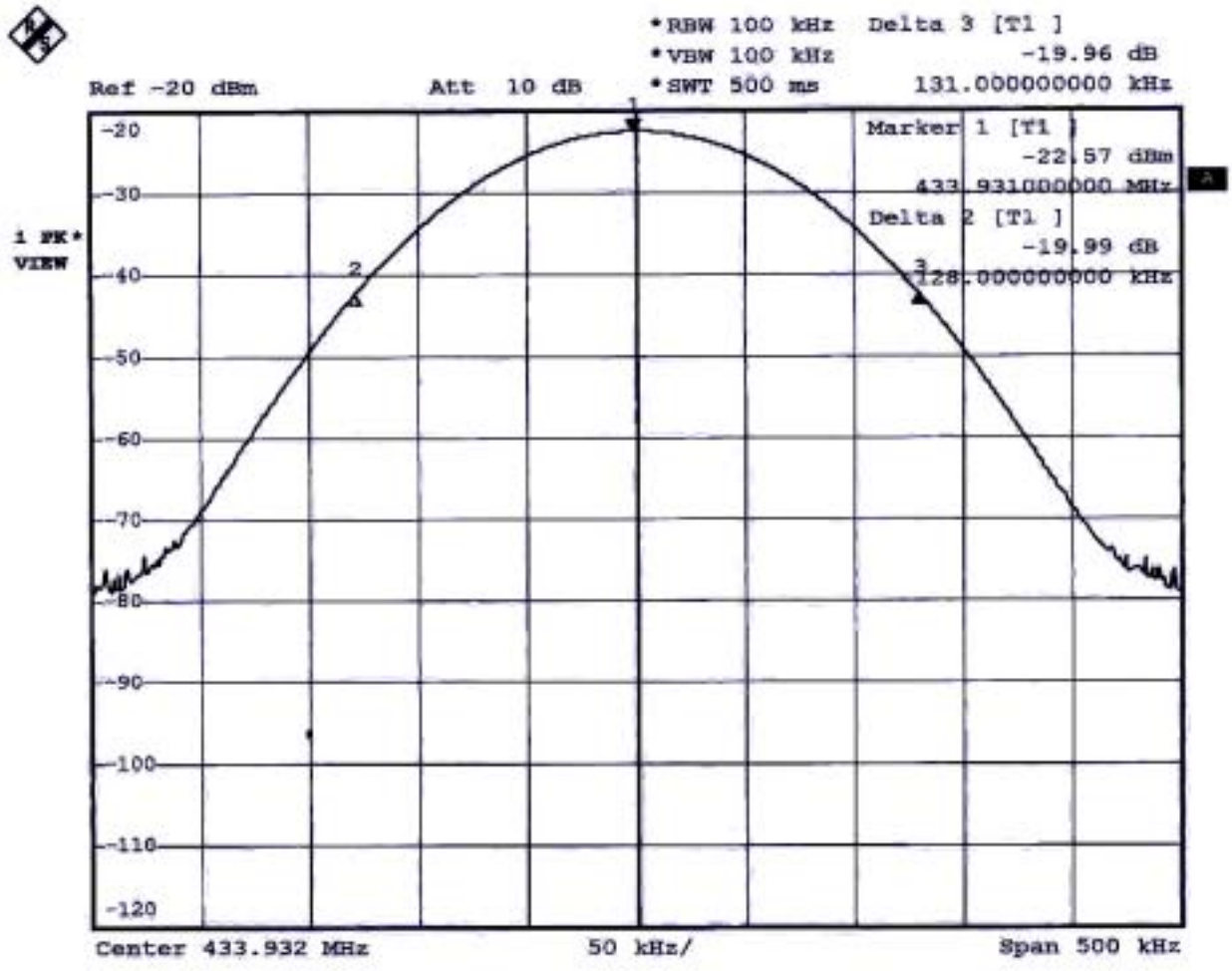
2.3. Connection Diagram of Test System



1. The audio cable is connected from EUT to the support unit 1
2. The RJ11 cable is connected from EUT to the support unit 2
3. The RJ11 cable is connected from EUT to the support unit 3.

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

2.4.1 Test Procedures and Result



a. User the Radiated method
b. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
c. The 20 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 20 dB.
d. 20dB bandwidth= (Delta 3)－(Delta 2)= 259KHz

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. : CO01-HY, 03CH03-HY

4.2. Test Voltage

115V / 60Hz

4.3. Standard for Methods of Measurement

ANSI C63.4-1992

4.4. Test in Compliance with

FCC Part 15, Subpart C

4.5. Frequency Range Investigated

a. Conduction: from 150 KHz to 30 MHz
b. Radiation: from 30 MHz to 5000 MHz

4.6. Test Distance

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

5. Test of Conducted Powerline

Conducted Emissions were measured from 150 kHz to 30 MHz with a bandwidth of 9 KHz and return leads of the EUT according to the methods defined in ANSI C63.4-1992 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane as shown in section 5.3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

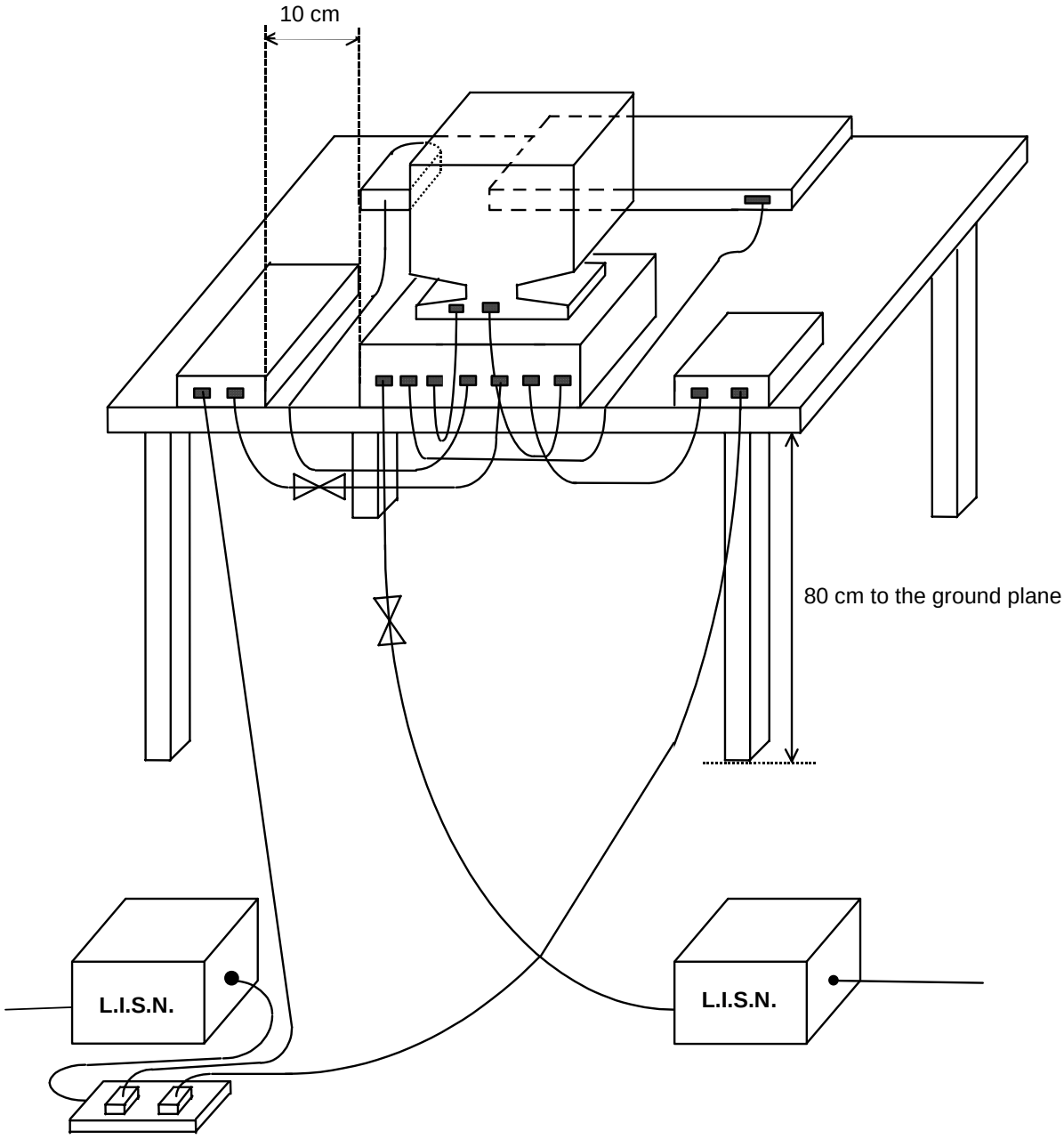
5.1. Major Measuring Instruments

• Test Receiver	(R&S ESCS 30)
Attenuation	10 dB
Start Frequency	0.15 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz

5.2. Test Procedures

a. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
b. Connect EUT to the power mains through a line impedance stabilization network (LISN).
a. All the support units are connect to the other LISN.
b. The LISN provides 50 ohm coupling impedance for the measuring instrument.
c. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
d. Both sides of AC line were checked for maximum conducted interference.
e. The frequency range from 150 kHz to 30 MHz was searched.
f. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

5.3. Typical Test Setup Layout of Conducted Powerline



5.4. Test Result of AC Powerline Conducted Emission

- Frequency Range of Test : from 0.15 MHz to 30 MHz
- Temperature : 23°C
- Relative Humidity : 66 %
- Test Date : Apr. 15, 2003

■ The test was passed at the minimum margin that marked under gray area in the following table

Frequency	Line	Meter Reading		Limits		Margin	
	or	Q.P.	A.V.	Q.P.	A.V.	Q.P.	A.V.
(MHz)	Neutral	(dBuV)	(dBuV)	(dBuV)	(dBuV)	(dB)	(dB)
0.162	L	36.37	17.80	65.36	55.36	-28.99	-37.56
0.220	L	34.47	9.82	62.82	52.82	-28.35	-43.00
0.270	L	32.69	9.59	61.12	51.12	-28.43	-41.53
0.397	L	30.44	10.53	57.92	47.92	-27.48	-37.39
0.479	L	30.10	7.90	56.36	46.36	-26.26	-38.46
0.621	L	28.13	6.64	56.00	46.00	-27.87	-39.36
0.161	N	36.41	18.46	65.41	55.41	-29.00	-36.95
0.199	N	35.81	10.25	63.65	53.65	-27.84	-43.40
0.330	N	32.11	9.27	59.45	49.45	-27.34	-40.18
0.402	N	31.49	9.49	57.81	47.81	-26.32	-38.32
0.621	N	29.53	6.83	56.00	46.00	-26.47	-39.17
1.740	N	13.83	6.33	56.00	46.00	-42.17	-39.67

Test Engineer : 

John Huang

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 5000 MHz were measured with a bandwidth of 120 kHz for 30MHz to 1 GHz and 1MHz for above 1GHz 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 8447D)
  - RF Gain 30 dB
  - Signal Input 100 KHz to 1.3 GHz

- Spectrum Analyzer (R&S FSP)
  - Attenuation 10 dB
  - Start Frequency 30 MHz
  - Stop Frequency 1000 MHz
  - Resolution Bandwidth 120 KHz
  - Signal Input 9 KHz to 7 GHz

6.1.2. From 1GHz to 5GHz

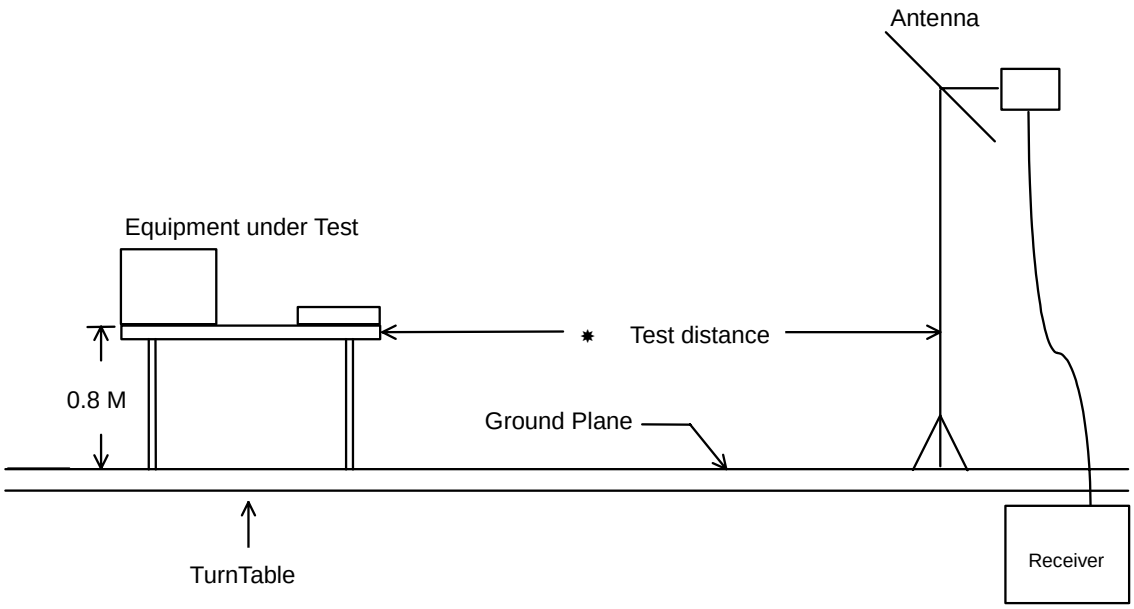
- Spectrum analyzer (R&S FSP40)
  - Attenuation 10 dB
  - Start Frequency 1 GHz
  - Stop Frequency 5 GHz
  - Resolution Bandwidth 1 MHz
  - Video Bandwidth 1 MHz
  - Signal Input 9 KHz to 40 GHz

- 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. Test Result of Radiated Emission

- Frequency range: 30 ~ 5000 MHz
- Test Distance: 3 M
- Temperature: 26
- Relative Humidity: 65
- Test Date: Apr. 16, 2003
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Reading = Emission

■ **The test was passed at the minimum margin that marked under gray area in the following table, and its antenna height is 4 m, turn table degree is 176°.**

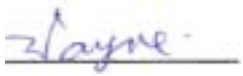
- Spurious Emissions

Frequency	Polarity	Antenna Factor	Cable Loss	Reading	Limits		Emission Level		Margin	Detect
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)	Mode
30.000	V	15.35	1.00	8.42	40.00	100	24.77	17.32	-15.23	Peak
38.100	V	11.64	1.16	10.98	40.00	100	23.78	15.45	-16.22	Peak
61.050	V	5.09	1.46	12.51	40.00	100	19.06	8.97	-20.94	Peak
86.700	V	8.03	1.79	9.77	40.00	100	19.59	9.54	-20.41	Peak
35.940	H	12.52	1.11	4.61	40.00	100	18.24	8.17	-21.76	Peak
943.300	H	19.56	7.09	5.96	46.00	200	32.61	42.71	-13.39	Peak

- Field strength of fundamental and harmonics

Frequency	Polarity	Antenna Factor	Cable Loss	Reading	Limits		Emission Level		Margin	Detect
(MHz)		(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m)	(dB)	Mode
433.940	V	15.11	4.25	49.04	80.79	10952	68.40	2630.27	-12.39	Peak
433.940	H	15.11	4.25	56.14	80.79	10952	75.50	5956.62	-5.29	Peak
867.870	V	19.22	6.69	24.60	60.79	1095	50.51	335.35	-10.28	Peak
867.880	H	19.22	6.69	26.63	60.79	1095	52.54	423.64	-8.25	Peak
1300.000	V	24.85	4.36	15.87	60.79	1095	45.08	179.47	-15.71	Peak
1300.000	H	24.85	4.36	15.12	60.79	1095	44.33	164.63	-16.46	Peak
1734.000	V	26.32	5.02	14.30	60.79	1095	45.64	191.43	-15.15	Peak
1734.000	H	26.32	5.02	12.48	60.79	1095	43.82	155.24	-16.97	Peak
2169.465	H/V						-			Peak
2603.358	H/V						-			Peak
3037.251	H/V						-			Peak
3471.144	H/V						-			Peak
3905.037	H/V						-			Peak
4338.930	H/V						-			Peak

Remark " - ": Except for the above listed emission, the emission of the EUT is too low to be measured. "

Test Engineer: 

Wayue Hsu

7. EMI Suppression Component List

No EMI suppression components.

8. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	15.35	1.00
35	13.63	1.08
40	11.11	1.18
45	10.59	1.24
50	6.47	1.30
55	5.83	1.38
60	5.18	1.44
65	4.81	1.52
70	4.43	1.59
75	5.10	1.68
80	5.91	1.75
85	7.33	1.77
90	8.74	1.83
95	9.05	1.85
100	9.36	1.90
110	9.65	2.01
120	9.97	2.06
130	10.51	2.16
140	10.32	2.24
150	9.42	2.34
160	8.09	2.42
170	7.43	2.56
180	7.60	2.62
190	7.43	2.67
200	7.26	2.76
220	9.11	2.92
240	10.88	3.09
260	11.75	3.23
280	11.55	3.38
300	11.36	3.51
320	12.03	3.63
340	12.69	3.73
360	13.33	4.03
380	14.00	4.00
400	14.63	4.09
450	15.33	4.31
500	16.03	4.64
550	16.65	5.09
600	17.29	5.49
650	17.64	5.82
700	18.00	5.94
750	18.39	6.16
800	18.79	6.58
850	19.10	6.72
900	19.42	6.81
950	19.58	7.10
1000	19.75	7.41
1000	24.30	3.89
2000	31.10	5.41
3000	29.60	6.92
4000	30.80	8.24
5000	34.20	9.22

9. List of Measuring Equipments Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
EMC Receiver	R&S	ESCS 30	100132	9 KHz – 2.75 GHz	Jun. 03, 2002	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 30, 2002	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001-009	9 KHz – 30 MHz	Apr. 30, 2002	Conduction (CO01-HY)
EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A	Conduction (CO01-HY)
EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A	Conduction (CO01-HY)
RF Cable-CON	Suhner Switzerland	RG223/U	CB029	9KHz~30MHz	Jan. 07, 2003	Conduction (CO01-HY)
50 ohm BNC type Terminal	NOBLE	50ohm	TM009	50 ohm	May 16, 2002	Conduction (CO01-HY)
Spectrum analyzer	R&S	FSP40	100004/040	9KHZ~40GHz	Aug. 07, 2002	Radiation (03CH03-HY)
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Aug. 12, 2002	Radiation (03CH03-HY)
Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 09, 2002	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)
Horn Antenna	Schwarzbeck	BBHA9170	BBHA9170154	15GHz~40GHz	May. 09, 2001	Radiation (03CH03-HY)
RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~29.5GHz	Mar. 14, 2003	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

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 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

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