

FCC/MELLO

DEC 11 1998

FCC TEST REPORT

for

PART 15, SUBPART B CLASS B

EQUIPMENT : 3D graphics

MODEL NO. : Vulcan 2

F C C I D : ILL152

FILING TYPE : ORIGINAL, CERTIFICATION

APPLICANT : BRITEK ELECTRONICS CO., LTD.
8F-2, No. 146, Sung Chiang Road,
Taipei, Taiwan, R.O.C.

- The test result refers exclusively to the test presented test model / sample.
- Without the written authorization of the test lab., the Test Report may not be copied.

SPORTON INTERNATIONAL INC.

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

TABLE OF CONTENT

SECTION TITLE	PAGE
CERTIFICATE OF COMPLIANCE	3
1. GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST	4
1.1. APPLICANT	4
1.2. MANUFACTURER :	4
1.3. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST	4
1.4. FEATURE OF EQUIPMENT UNDER TEST	4
2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST	5
2.1. TEST MANNER	5
2.2. DESCRIPTION OF TEST SYSTEM	5
2.3. CONNECTION DIAGRAM OF TEST SYSTEM	7
3. TEST SOFTWARE	8
4. GENERAL INFORMATION OF TEST	9
4.1. TEST FACILITY	9
4.2. STANDARD FOR METHODS OF MEASUREMENT	9
4.3. TEST IN COMPLIANCE WITH	9
4.4. FREQUENCY RANGE INVESTIGATED	9
4.5. TEST DISTANCE	9
5. TEST OF CONDUCTED POWERLINE	10
5.1. MAJOR MEASURING INSTRUMENTS	10
5.2. TEST PROCEDURES	11
5.3. TYPICAL TEST SETUP LAYOUT OF CONDUCTED POWERLINE	12
5.4. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION	13
5.4.1. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION	14
5.5. PHOTOGRAPHS OF CONDUCTED POWERLINE TEST CONFIGURATION	15
5.5.1. PHOTOGRAPHS OF CONDUCTED POWERLINE TEST CONFIGURATION	17
6. TEST OF RADIATED EMISSION	19
6.1. MAJOR MEASURING INSTRUMENTS	19
6.2. TEST PROCEDURES	20
6.3. TYPICAL TEST SETUP LAYOUT OF RADIATED EMISSION	21
6.4. TEST RESULT OF RADIATED EMISSION	22
6.4.1. TEST RESULT OF RADIATED EMISSION	23
6.5. PHOTOGRAPHS OF RADIATED EMISSION TEST CONFIGURATION	24
6.5.1. PHOTOGRAPHS OF RADIATED EMISSION TEST CONFIGURATION	25
7. ANTENNA FACTOR AND CABLE LOSS	26
8. LIST OF MEASURING EQUIPMENT USED	27

CERTIFICATE OF COMPLIANCE

for

FCC PART 15, SUBPART B CLASS B

EQUIPMENT : 3D graphics

MODEL NO. : Vulcan 2

FCC ID : ILL152

APPLICANT : **BRITEK ELECTRONICS CO., LTD.**
8F-2, No. 146, Sung Chiang Road,
Taipei, Taiwan, R.O.C.

I HEREBY CERTIFY THAT :

The measurement shown in this 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 emissions **Class B** limits. Testing was carried out on **June 19, 1998** at **SPORTON International Inc.**


W. L. Huang
General Manager

SPORTON INTERNATIONAL INC.

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

1. GENERAL DESCRIPTION OF EQUIPMENT UNDER TEST

1.1. APPLICANT

BRITEK ELECTRONICS CO., LTD.
8F-2, No. 146, Sung Chiang Road,
Taipei, Taiwan, R.O.C.

1.2. MANUFACTURER :

Same as 1.1.

1.3. BASIC DESCRIPTION OF EQUIPMENT UNDER TEST

EQUIPMENT : 3D graphics
MODEL NO. : Vulcan 2
FCC ID : ILL152
TRADE NAME : **BRITEK**
VGA CABLE : Shielded
VOODOO TO VGA CARD CABLE : Shielded
POWER SUPPLY TYPE : N/A
POWER CORD : N/A

1.4. FEATURE OF EQUIPMENT UNDER TEST

- **Perspective correct texture mapping**
- **Bi-linear and tri-linear texture filtering**
- **Level-of-detail (LOD) MIP mapping**
- **Multiple texture formats including 8-bit compressed and 8-bit paletted formats**
- **Full bi-linear blending of paletted and compressed textures**
- **Support for PCI 2.0 and 2.1 spec slots (newer 2.0 slots)**

2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST

2.1. TEST MANNER

- a. The EUT has been associated with personal computer and 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. The HITACHI monitor, DELL keyboard, ACEEX modem, HP printer, PRIMAX mouse and EUT were connected to the F.I.C P.C. for EMI test.
- c. The following display resolution were investigated during the compliance test :
 1. Horizontal frequency (640×480 to 1600×1200, 31.5KHz to 94KHz)
 2. Vertical frequency (60Hz to 85Hz)
 3. 3D MODE.
- d. According to the above tests, we listed the flowing display modes as the worst cases :
 1. 3D MODE.
 2. 1600×1200, 75Hz / 94KHz.
- e. During the test, the monitor AC power cord was plugged into the P.C. computer-mounted AC outlet and a floor-mounted AC outlet to search the maximum emission.
- f. Frequency range investigated: Conduction 450 KHz to 30 MHz, Radiation 30 MHz to 2000 MHz.

2.2. DESCRIPTION OF TEST SYSTEM

Support Device 1. --- P.C. (FIC)

FCC ID : N/A
Model No. : P2L97
Serial No. : SP1005
Data Cable : Shielded
Power Cord : Non-hielded
Power Supply Type : Switching

(Remark : This support device was tested to comply with FCC standards and
authorized under a declaration of conformity.)

FCC TEST REPORT**REPORT NO. : F861507****Support Device 2. --- KEYBOARD (DELL)**

FCC ID : GYUM92SK
Model No. : AT101 (DE8M)
Serial No. : SP1009
Data Cable : Shielded, 360 degree via metal backshells, 1.9m

Support Device 3. -- PS/2 MOUSE (PRIMAX)

FCC ID : EMJMUJQ
Model No. : MUS9J
Serial No. : SP1012
Data Cable : Shielded, 1.7m

Support Device 4. -- MODEM (ACEEX)

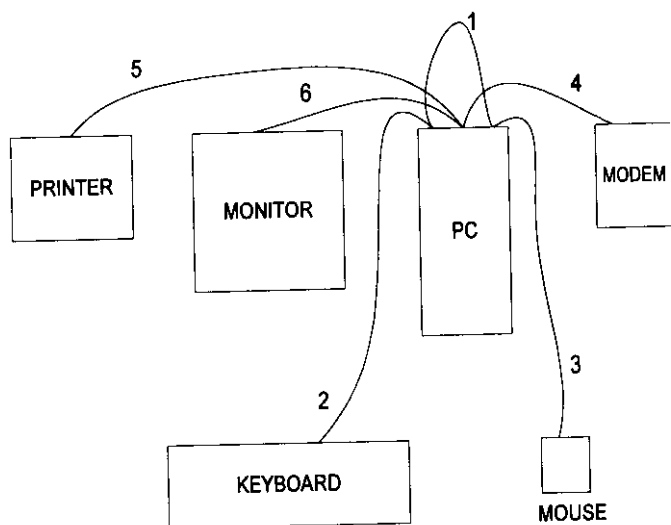
FCC ID : IFAXDM1414
Model No. : DM1414
Power Supply Type : Linear, AC Adapter
Power Cord : Non-shielded
Serial No. : SP1019
Data Cable : Shielded, 1.15m

Support Device 5. --- PRINTER (HP)

FCC ID : B94C2642X
Model No. : DESK JET 400
Serial No. : SP0037
Data Cable : Shielded, 360 degree via metal backshells, 1.35m
Power Supply Type : Linear

Support Device 6. --- MONITOR (HITACHI)

FCC ID : M9U9705C97BMD
Model No. : CM-803ET
Serial No. : SP1043
Data Cable : Shielded, 360 degree via metal backshells, 1.7m
Power Supply Type : Switching
Power Cord : Non-shielded

2.3. CONNECTION DIAGRAM OF TEST SYSTEM

1. The Voodoo cable is connected from the VGA-in port of EUT to the VGA Card.
2. The I/O cable is connected to the support device 2.
3. The I/O cable is connected to the support device 3.
4. The I/O cable is connected to the support device 4.
5. The I/O cable is connected to the support device 5.
6. The I/O cable is connected from the EUT to the support device 6.

3. TEST SOFTWARE

An executive program, WINFCC.EXE, 3DMAZE under WIN98, which generates a complete line of continuously repeating " H " pattern was used as the test software.

The program was executed as follows :

- a. Turn on the power of all equipment.
- b. The PC reads the test program from the floppy disk drive and runs it.
- c. The PC sends " H " messages to the monitor, and the monitor displays " H " patterns on the screen.
- d. The PC sends " VIDEO MOTION " messages to the monitor, and the monitor displays "VIDEO MOTION " patterns on the screen.
- e. The PC sends " H " messages to the printer, then the printer prints them on the paper.
- f. The PC sends " H " messages to the modem.
- g. The PC sends " H " messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- h. Repeat the steps from b to g.

4. GENERAL INFORMATION OF TEST

4.1. TEST FACILITY

This test was carried out by SPORTON INTERNATIONAL INC. in an openarea test site.

Openarea Test Site Location : No. 30-1, Lin 6, Diing-Fwu Tsuen, Lin-Kou-Hsiang,
Taipei Hsien, Taiwan, R.O.C.

TEL : 886-2-2601-1640,

FAX : 886-2-2601-1695

4.2. STANDARD FOR METHODS OF MEASUREMENT

ANSI C63.4-1992

4.3 .TEST IN COMPLIANCE WITH

FCC PART 15, SUBPART B CLASS B

4.4. FREQUENCY RANGE INVESTIGATED

- a. Conduction : from 450 KHz to 30 MHz
- b. Radiation : from 30 MHz to 2000 MHz.

4.5. TEST DISTANCE

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

5. TEST OF CONDUCTED POWERLINE

Conducted Emissions were measured from 450 KHz to 30 MHz with a bandwidth of 9 KHz on the 115 VAC power 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 Figure 5-3. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

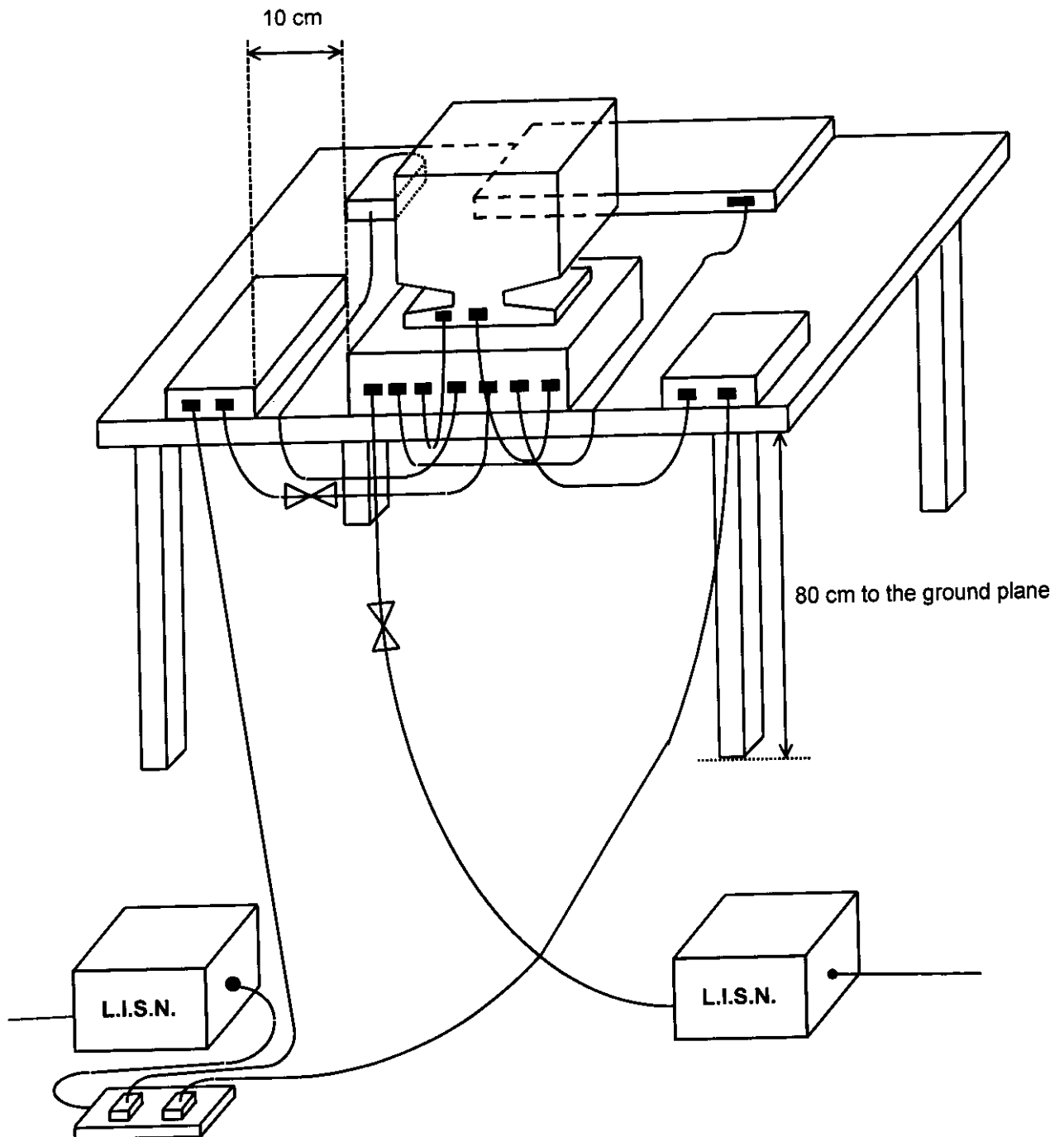
5.1. MAJOR MEASURING INSTRUMENTS

• Test Receiver	(HP 85462A)
Attenuation	0 dB
Start Frequency	0.45 MHz
Stop Frequency	30 MHz
Step MHz	0.007 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 and 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).
- c. All the support units are connect to the other LISN.
- d. The LISN provides 50 ohm coupling impedance for the measuring instrument.
- e. The FCC states that a 50 ohm , 50 microhenry LISN should be used.
- f. Both sides of AC line were checked for maximum conducted interference.
- g. The frequency range from 450 KHz to 30 MHz was searched.
- h. Set the test-receiver system (HP receiver 85462A) to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- i. If the emission level of the EUT in peak mode was 6 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 6 dB margin will be retested on by one using the quasi-peak method and reported.

5.3. TYPICAL TEST SETUP LAYOUT OF CONDUCTED POWERLINE



5.4. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION

- Frequency Range of Test : from 0.45 MHz to 30 Mhz
- All emissions not reported here are more than 10 dB below the prescribed limit.
- Temperature : 25°C
- Relative Humidity : 65 % RH
- Test Mode : 1600 × 1200 / 75Hz / 90K
- Test Date : June 19, 1998

The Conducted Emission test was passed at Line 9.78 MHz/ 33.30 dBuV.

Frequency (MHz)	Line / Neutral	Meter Reading		Limits		Margin
		(dBuV)	(uV)	(dBuV)	(uV)	(dB)
9.78	L	33.30	46.24	48.00	251.19	-14.70
22.57	L	28.70	27.23	48.00	251.19	-19.30
0.48	N	31.50	37.58	48.00	251.19	-16.50
0.57	N	28.30	26.00	48.00	251.19	-19.70
9.79	N	29.60	30.20	48.00	251.19	-18.40
22.57	N	28.20	25.70	48.00	251.19	-19.80

Test Engineer :

Alex Wu

ALEX WU

5.4.1. TEST RESULT OF AC POWERLINE CONDUCTED EMISSION

- Frequency Range of Test : from 0.45 MHz to 30 Mhz
- All emissions not reported here are more than 10 dB below the prescribed limit.
- Temperature : 25°C
- Relative Humidity : 65 % RH
- Test Mode : 3D MODE
- Test Date : June 18, 1998

The Conducted Emission test was passed at Neutral 0.47 MHz/ 29.40 dBuV.

Frequency (MHz)	Line / Neutral	Meter Reading		Limits		Margin
		(dBuV)	(uV)	(dBuV)	(uV)	(dB)
11.01	L	26.80	21.88	48.00	251.19	-21.20
18.70	L	26.50	21.13	48.00	251.19	-21.50
23.71	L	25.70	19.28	48.00	251.19	-22.30
0.47	N	29.40	29.51	48.00	251.19	-18.60
11.01	N	25.50	18.84	48.00	251.19	-22.50
18.66	N	26.70	21.63	48.00	251.19	-21.30

Test Engineer :

Alex WU

ALEX WU

6. TEST OF RADIATED EMISSION

Radiated emissions from 30 MHz to 2000 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 Figure 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

- RF Preselector
 - Attenuation 0 dB
 - RF Gain 20 dB
 - Signal Input Input 2 (for 20 MHz to 2 GHz)

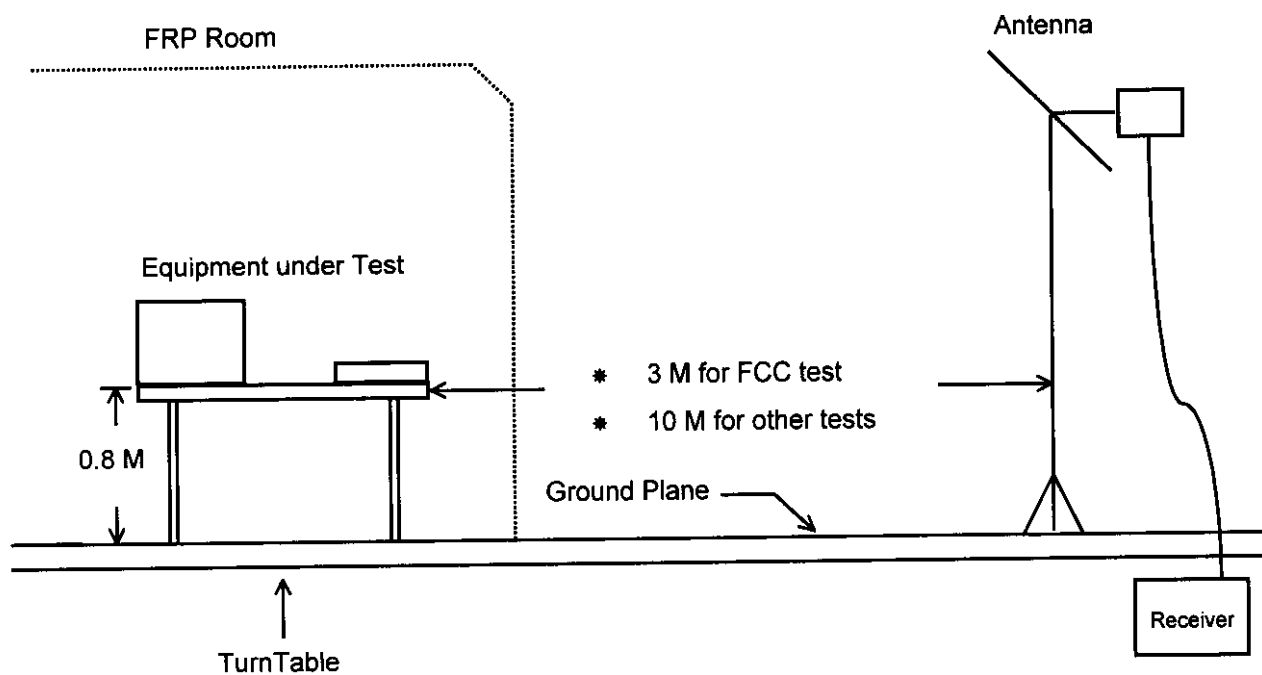
- Spectrum Analyzer 8568B/ 8594A
 - Attenuation 0 dB
 - Start Frequency 30 MHz
 - Stop Frequency 2000 MHz
 - Resolution Bandwidth 1 MHz
 - Video Bandwidth 1 MHz
 - Signal Input Input 1 (for 9 KHz to 2.9 GHz)

- Quasi-Peak Adapter
 - Resolution Bandwidth 120 KHz
 - Frequency Band 30 MHz to 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 (HP 8568B) to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
- g. If the emission level of the EUT in peak mode was 6 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 6 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

- Equipment meets the technical specifications of 15.109
- Frequency Range of Test : from 30 MHz to 2000 MHz
- Test Distance : 3 M
- Temperature : 31°C
- Relative Humidity : 71 % RH
- Test Mode : 1600 × 1200 / 75Hz / 94K
- Test Date : June 15, 1998
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Sample Calculation at 312.00 MHz
Corrected Reading = 18.06 + 3.10 + 21.67 = 42.83 (dBuV/m)

The Radiated Emission test was passed at

Vertical 312.00 MHz / 42.83 dBuV

Antenna Height 1.0 Meter , Turntable Degree 82 °.

Frequency	Antenna	Cable	Reading	Limits	Emission	Level	Margin
Polarity	Factor	Loss					
(MHz)	(dB)	(dB)	(dBuV)	(dBuV)	(uV)	(dBuV)	(uV) (dB)
312.00	V	18.06	3.10	21.67	46.00	200	42.83 138.52 -3.17
72.80	V	5.88	1.26	27.10	40.00	100	34.24 51.52 -5.76
39.40	V	0.36	0.93	31.58	40.00	100	32.87 44.00 -7.13
112.80	H	10.19	1.63	21.08	43.50	150	32.90 44.16 -10.60
36.00	H	-0.46	0.84	33.62	40.00	100	34.01 50.18 -5.99
146.60	H	11.74	1.98	17.13	43.50	150	30.85 34.87 -12.65

Test Engineer : *William Lee*

WILLIAM LEE

6.4.1. TEST RESULT OF RADIATED EMISSION

- Equipment meets the technical specifications of 15.109
- Frequency Range of Test : from 30 MHz to 2000 MHz
- Test Distance : 3 M
- Temperature : 31°C
- Relative Humidity : 71 % RH
- Test Mode : 3D MODE
- Test Date : June 15, 1998
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Sample Calculation at 35.80 MHz
Corrected Reading = $(-0.51) + 0.84 + 34.38 = 34.71$ (dBuV/m)

The Radiated Emission test was passed at

Horizontal 35.80 MHz / 34.71 dBuV

Antenna Height 3.0 Meter , Turntable Degree 276 °.

Frequency	Antenna	Cable	Reading	Limits	Emission	Level	Margin
Polarity	Factor	Loss					
(MHz)	(dB)	(dB)	(dBuV)	(dBuV)	(uV)	(dBuV)	(uV) (dB)
35.80	H	-0.51	0.84	34.38	40.00	100	34.71 54.39 -5.29
34.30	V	-0.91	0.82	34.69	40.00	100	34.60 53.70 -5.40
401.60	V	22.29	3.61	15.34	46.00	200	41.24 115.35 -4.76
50.00	V	2.39	1.00	20.34	40.00	100	23.73 15.36 -16.27
312.00	V	18.06	3.10	18.86	46.00	200	40.02 100.23 -5.98
221.60	V	14.37	2.41	15.99	46.00	200	32.77 43.50 -13.23

Test Engineer : *William Lee*

WILLIAM LEE

7. ANTENNA FACTOR AND CABLE LOSS

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	-1.91	0.90
35	-0.50	0.92
40	0.61	1.04
45	1.40	1.28
50	2.39	1.10
55	3.54	1.11
60	4.40	1.30
65	4.84	1.40
70	5.59	1.37
75	6.21	1.24
80	7.60	1.51
85	7.73	1.60
90	8.22	1.60
95	8.90	1.70
100	9.36	1.70
110	10.01	1.70
120	10.41	1.90
130	10.84	1.90
140	11.42	1.91
150	11.91	2.01
160	12.25	2.11
170	12.72	2.21
180	13.02	2.30
190	13.50	2.30
200	14.05	2.40
220	15.11	2.50
240	16.81	2.60
260	17.51	2.71
280	17.70	2.90
300	17.89	2.91
320	18.00	3.10
340	18.33	3.20
360	19.44	3.30
380	20.31	3.40
400	21.19	3.50
450	21.10	3.70
500	22.21	4.10
550	23.42	4.30
600	24.01	4.50
650	25.11	4.70
700	26.00	4.90
750	26.41	5.11
800	27.10	5.50
850	27.51	5.60
900	27.90	5.80
950	28.01	5.90

8. LIST OF MEASURING EQUIPMENT USED

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Receiver RF section (site 1)	HP	85462A	3325A00108	9 KHz - 6.5 GHz	Oct. 22, 1997	Conduction
RF Filter section (site 1)	HP	85460A	3308A00104	9 KHz - 6.5 GHz	Oct. 22, 1997	Conduction
LISN (EUT) (site 1)	EMCO	3850/2	1035	50 ohm / 50 uH	Oct. 27, 1997	Conduction
LISN (Support Unit) (site 1)	KYORITSU	KNW-407	8-693-10	50 ohm / 50 uH	Oct. 04, 1997	Conduction
EMI Filter (site 1)	CORCOM	MRI-2030	N/A	480 VAC / 30 A	N/A	Conduction
Amplifier (Site 1)	HP	8447D	2944A08291	0.1MHz -1.3GHz	Nov. 12, 1997	Radiation
Quasi-Peak Adapter (site 1)	HP	85650A	2811A01116	9KHz - 1000KHz	Jun. 17, 1998	Radiation
Spectrum Analyzer (site 1)	HP	8568B	2732A04100	100Hz - 1500KHz	Jun. 17, 1998	Radiation
Bilog Antenna (Site 1)	CHASE	CBL6111	1378	30MHz -1 GHz	Aug. 11, 1997	Radiation
Half-wave dipole antenna (site 1)	EMCO	3121C	9705-1285	28 M - 1GHz	May 19, 1998	Radiation
Turn Table (site 1)	EMCO	1060-1.211	9507-1805	0 ~ 360 degree	N/A	Radiation
Antenna Mast (site 1)	EMCO	1051-1.2	9502-1868	1 m - 4 m	N/A	Radiation