RADIATED EMISSION TEST

1 TEST INSTRUMENTS & FACILITIES

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

Item	Instruments /facilities	Specification	Manufacturer	Model # / S/N#	Location	Date of Cal.
1	SPECTRUM ANALYZER	9KHz ~ 1.8GHz	HP	HP8591 3710A06158	Open Site I	APR/98
2	EMI TEST RECEIVER	20MHz ~ 1GHz	ROHDE & SCHWARZ	ESVS10 845165/017	Open Site I	FEB/98
3	PRE-AMPLIFIER	0.1MHz ~ 1.3 GHz	HP	8447D 1937A02095	Open Site I	MAY/98
4	EMI TEST RECEIVER	20Hz ~ 26.5GHz	ROHDE & SCHWARZ	ESMI 845442/006	Open Site II	FEB/98
5	PRE-AMPLIFIER	20MHz ~ 7GHz	ROHDE & SCHWARZ	ESMI-Z7 846363/001	Open Site II	FEB/98
6	SIGNAL GENERATOR	9KHz ~ 2080MHz	ROHDE & SCHWARZ	SMY02 845096/018		FEB/98
7	ANTENNA (BI-LOG)	25MHz ~ 2GHz	ARA	LPB2520 S/N:1096	Open Site II	MAR/98
8	ANTENNA (BI-LOG)	25MHz ~ 2GHz	ARA	LPB2520 S/N:1095	Open Site I	MAR/98
9	CABLES			No. 2, No. 4 No. 1, No. 3	OATS 1 OATS 2	JUL/98 JUL/98
10	OPEN AREA TEST SITE	☐ OATS 1 ☑ OATS 2				
11	ANTENNA (DIPOLE)	30 ~ 300MHz	ROHDE & SCHWARZ	HZ-12 842899/08		JAN/98
12	ANTENNA (DIPOLE)	300 ~ 1000MHz	ROHDE & SCHWARZ	HZ-13 842007/0004		JAN/98

Note : 1. Items 1 ~ 10 upon which need to calibrated are with period of 1 year.
2. Items 11 ~ 12 upon which need to calibrated are with period of 3 year.

2 TEST PROCEDURE

2.1 The EUT was test according to **ANSI C63.4 - 1992**.

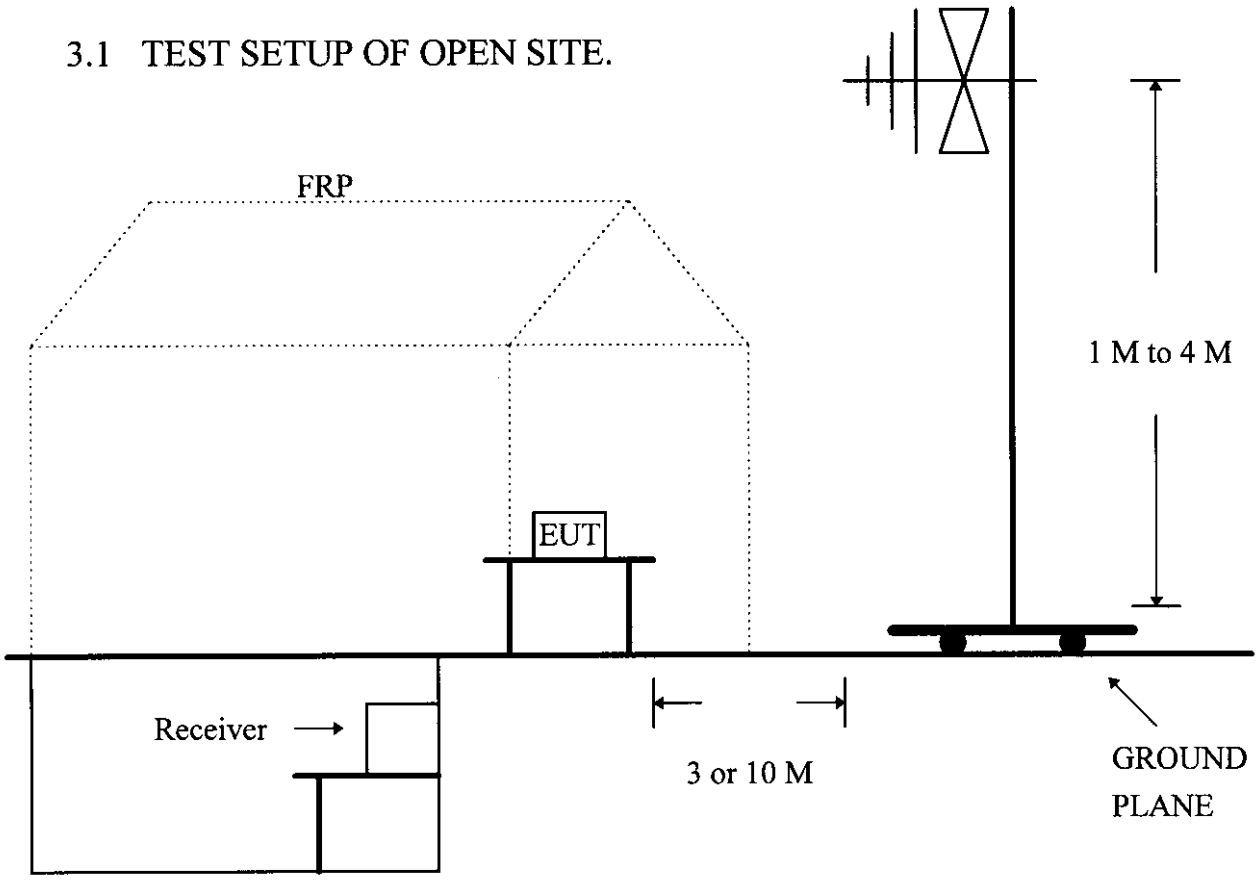
2.2 The radiated test was performed at HomeTek Lab's Open Site II.

2.3 This site is on file with the FCC laboratory division, reference 31040/site 1300F2, Date : August 22, 1997.

2.4 The frequency range from 30 MHz to 1 GHz, the measurement were made at 3 meters, with a BI-log antenna.

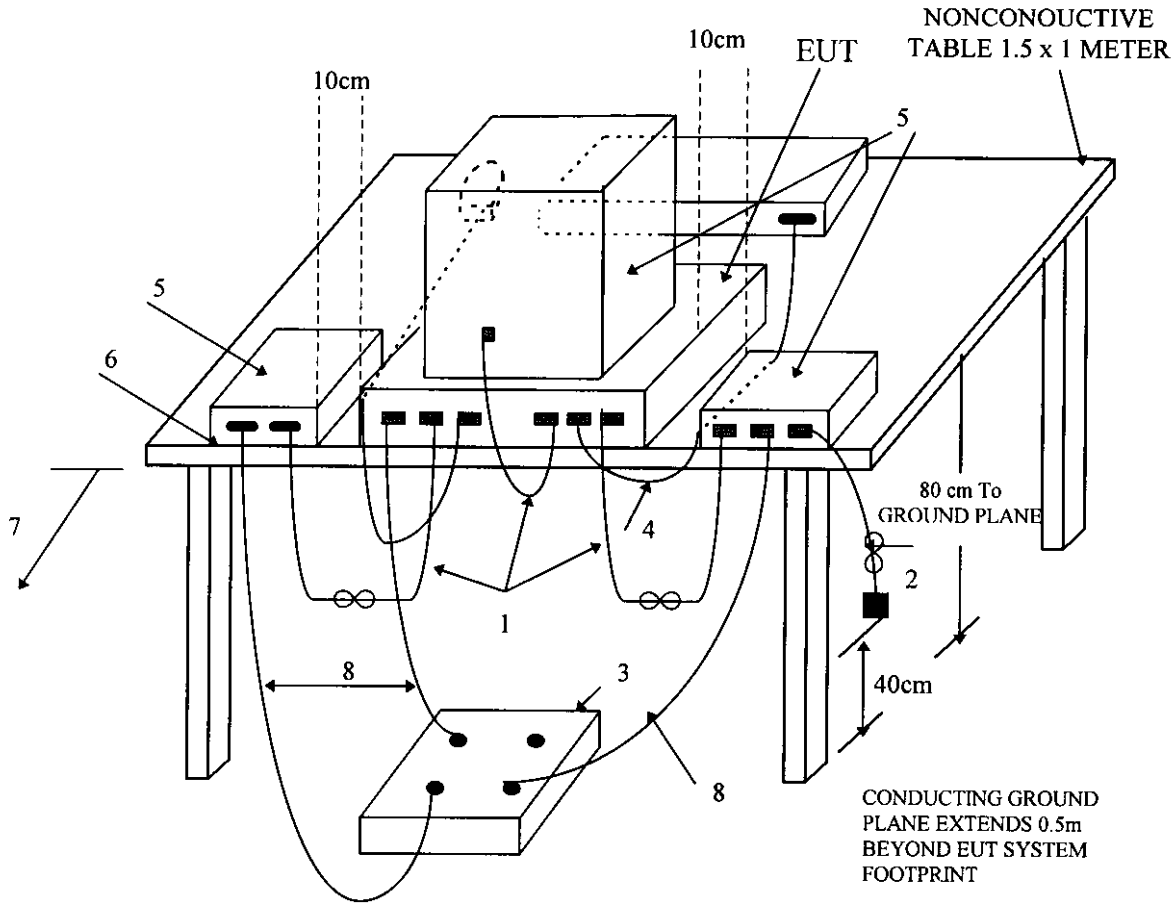
3 TEST SETUP

3.1 TEST SETUP OF OPEN SITE.



3.2 TEST SET OF EUT

ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9kHz TO 40 GHz ANSI C63.4-1992



LEGEND:

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
2. I/O cables that are connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1m.
3. If LISNs are kept in the test setup for radiated emissions, it is preferred that they be installed under the ground plane with the receptacle flush with the ground plane.
4. Cables of hand-operated devices, such as keyboards, mouses, etc., have to be placed as close as possible to the controller.
5. Non-EUT components of EUT system being tested.
6. The rear of all components of the system under test shall be located flush with the rear of the table.
7. No vertical conducting wall used.
8. Power cords drape to the floor and are routed over to receptacle.

Test Configuration

Tabletop Equipment Radiated Emission

4 CONFIGURATION OF THE EUT

Same as "Conducted Power Line test", section 4

5 EUT OPERATING CONDITION

5.1 Same as "Conducted Power Line test", section 5

5.2 The radiated emission in the frequency range from 30 MHz - 1000 MHz was test in a horizontal and vertical polarization at HomeTek Lab's open site II.

6 LIMIT OF RADIATED EMISSION CLASS B:

Frequency (MHz)	Measurement Distance	dBuV	uV/m
30 - 88	3 (M)	40	100
88 - 216	3 (M)	43.5	150
216 - 960	3 (M)	46	200
Above 960	3 (M)	54	500

6.1 The tighter limit shall apply at the edge between two frequency bands.

6.2 Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.

7 RESULT OF RADIATED EMISSION TEST

7.1 The frequency range from 30 MHz to 1 GHz was investigated. All readings are quasi-peak values with resolution bandwidth of 120 kHz.

7.2 The measurements above 1 GHz with a resolution bandwidth of 1 MHz are peak reading at 3 meters.

7.3 The measurements were made at 3 meters of HomeTek Lab's open site II.

7.4 Temperature : 21 ℃, Humidity : 72 % RH.

7.5 Radiated Emission data : **Horizontal**

Frequency (MHz)	Reading Level (dBuV)	ANT factor (dBuV)	Cable Loss (dBuV)	Emission Level (dBuV)	Emission Level (uV/m)	Limit (dBuV)	Limit (uV/m)
31.00	11.47	15.58	0.41	27.46	23.60	40.0	100
40.06	10.55	15.12	0.41	26.08	20.14	40.0	100
74.93	20.83	6.95	0.53	28.31	26.03	40.0	100
133.65	16.26	11.48	0.74	28.48	26.55	43.5	150
145.60	18.22	9.90	0.71	28.83	27.64	43.5	150
233.20	20.35	13.60	0.94	34.89	55.53	46.0	200
301.04	16.97	15.11	1.07	33.15	45.45	46.0	200
934.86	12.29	23.06	1.93	37.28	73.11	46.0	200

- Emission Level = Reading Level + ANT Factor + Cable Loss.
- Sample Calculation for 934.86 MHz .
- Corrected Reading : (12.29) + (23.06) + (1.93) = 37.28 . (Emission Level)

7.6 Radiated Emission data : **Vertical**

Frequency (MHz)	Reading Level (dBuV)	ANT factor (dBuV)	Cable Loss (dBuV)	Emission Level (dBuV)	Emission Level (uV/m)	Limit (dBuV)	Limit (uV/m)
32.40	11.22	13.16	0.41	24.79	17.36	40.0	100
46.76	18.12	12.60	0.48	31.20	36.31	40.0	100
58.97	22.39	7.99	0.43	30.81	34.71	40.0	100
74.89	22.87	9.59	0.53	32.99	44.62	40.0	100
133.61	19.11	14.24	0.74	34.09	50.64	43.5	150
154.85	20.61	11.49	0.74	32.84	43.85	43.5	150
300.77	18.88	17.08	1.07	37.03	71.04	46.0	200
934.87	8.14	26.44	1.93	36.51	66.91	46.0	200

- Emission Level = Reading Level + ANT Factor + Cable Loss.
- Sample Calculation for 934.87 MHz .
- Corrected Reading : (8.14) + (26.44) + (1.93) = 36.51 . (Emission Level)

REMARK :

1. Model : G9900H
2. Measuring mode :
3. Uncertainty in radiated emission measured : < ± 4.0dB.

Test Engineer : Jonny

CONDUCTED POWER LINE TEST

1 TEST INSTRUMENTS & FACILITIES

The following test Instruments was used during the conducted test :

Item	Instruments/ Facilities	Specification	Manufacturer	Model # / S/N#	Date Of Cal.
1	EMI Receiver	9KHz ~ 30MHz	ROHDE & SCHWARZ	ESHS 30 844827/007	FEB/98
2	LISN	50 Ω/50uH/100A 9KHz ~ 30MHz	SCHWARZ BECK	NNLK 8121 8121370	FEB/98
3	LISN	9KHz ~ 30MHz	ROHDE & SCHWARZ	ESH3-Z5 846128/007	FEB/98
4	Pulse Limiter	9KHz ~ 30MHz	ROHDE & SCHWARZ	ESH3Z2 357.8810.52	JUL/98

Note : All equipment upon which need to calibrated are with period of 1 year.

2 TEST PROCEDURE

2.1 The EUT was tested according to **ANSI C63.4 - 1992.**

2.2 The EUT was placed 0.4 meter from the conducting wall of shielding room and kept at least 0.8 meter from any other grounded conducting surface.

2.3 The frequency range form 0.45 MHz to 30 MHz was investigated.

2.4 The LISN used was 50 Ohm / 50 uHenry as specified by Section 5.1 of **ANSI C63.4 - 1992.**

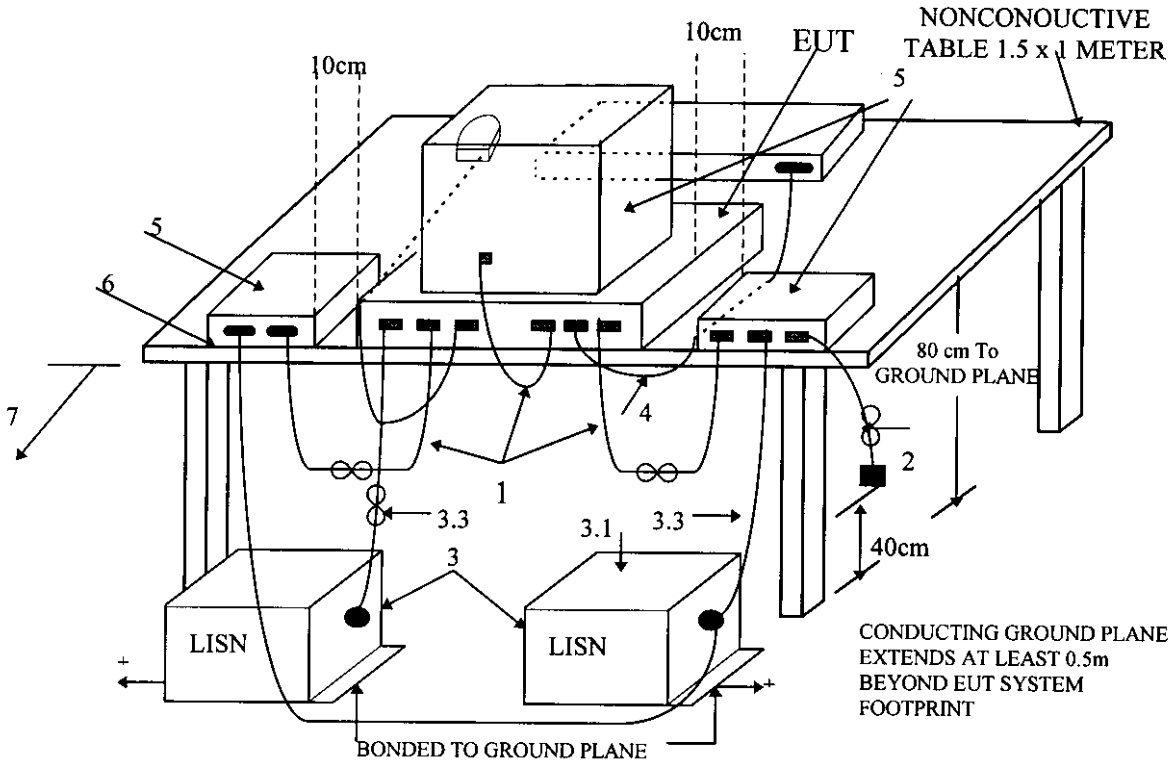
2.5 All the support peripherals are connect to the other LISN.

2.6 Cables and peripherals were moved to find the maximum emission levels for each frequency.

3 TEST SETUP

3.1 Typical : Setup Of Conducted Test

ELECTRICAL AND ELECTRONIC EQUIPMENT IN THE RANGE OF 9kHz TO 40 GHz ANSI C63.4-1992



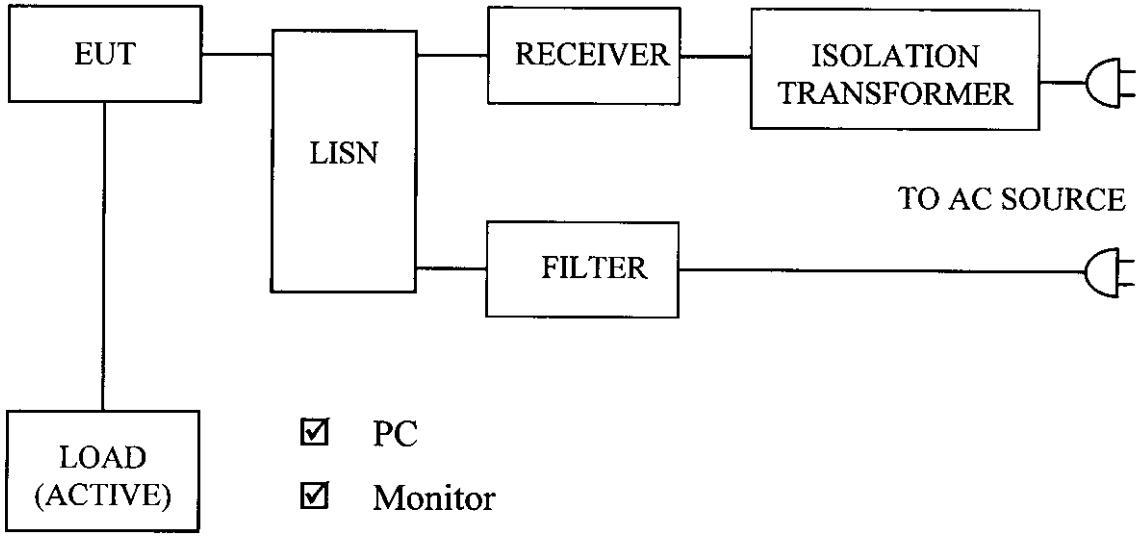
+LISNs may have to be moved to the side to meet 3.3 below.

LEGEND:

1. Interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth forming a bundle 30 to 40 cm long, hanging approximately in the middle between ground plane and table.
2. I/O cables that are connected to a peripheral shall be bundled in center. The end of the cable may be terminated if required using correct terminating impedance. The total length shall not exceed 1m.
3. EUT connected to one LISN. Unused LISN connectors shall be terminated in 50 Ω. LISN can be placed on top of, or immediately beneath, ground plane.
   - 3.1 All other equipment powered from second LISN.
   - 3.2 Multiple outlet strip can be used for multiple power cords of non-EUT equipment.
   - 3.3 LISN at least 80 cm from nearest part of EUT chassis.
4. Cables of hand-operated devices, such as keyboards, mouses, etc., have to be placed as close as possible to the host.
5. Non-EUT components being tested.
6. Rear of EUT, including peripherals, shall be all aligned and flush with rear of tabletop.
7. Rear of tabletop shall be 40 cm removed from a vertical conducting plane that is bonded to the floor ground plane (see 5.2).

Test Configuration
Tabletop Equipment Conducted Emission

3.2 Block Diagram Of Conducted Test



- ☑ PC
- ☑ Monitor
- ☑ Printer
- ☑ Modem
- ☑ Mouse
- ☑ Key Board

4 CONFIGURATION OF THE EUT

The EUT was configured according to **ANSI C63.4 - 1992**. All I/O ports were connected to the appropriate peripherals. All peripherals and cables are listed below (including internal device) :

4.1 EUT

EUT Type	:	☐Proto Type ☑Engineer Type ☐Mass Production
Condition when received	:	☑Good ☐Damage : _____
Connector Type	:	☑Metal Type ☐Plastic Type
Device	:	Keyboard
Manufacturer	:	SILITEK
Model Number	:	G9900H
Serial Number	:	N/A
FCC ID	:	GYUR67SK
Data Cable	:	Shielded, 1.8 m
Power Cord	:	N/A

4.2 PERIPHERALS

☑ Host Personal Computer

Manufacturer	:	CHAINTECH
Model Number	:	6LTM
Serial Number	:	N/A
FCC ID	:	DoC By PEP LAB
Data Cable	:	Shielded
Power Cord	:	Shielded, 1.8 m

☑ Monitor

Manufacturer	:	ATEC
Model Number	:	G450DU
Serial Number	:	714PD000Q0002
FCC ID	:	GKR450
Data Cable	:	Shielded, 1.5 m, Connected to the VGA port
Power Cord	:	Un-Shielded, 1.8 m

☑ Printer

Manufacturer	:	HP
Model Number	:	DJ400
Serial Number	:	MY77V1C0DD
FCC ID	:	B94C2642X
Data Cable	:	Shielded, 1.5m, Connected to the Printer port
Power Cord & Adaptor	:	Un-Shielded, 1.8 m

☑ Modem

Manufacturer	:	DATATRONIC
Model Number	:	1200CK
Serial Number	:	N/A
FCC ID	:	E2050V1200CK
Data Cable	:	Shielded, 1.5m, Connected to the COM port
Power Cord & Adaptor	:	Un-Shielded, 1.8 m

☑ Mouse (PSII)

Manufacturer	:	LOGITECH
Model Number	:	M-S34
Serial Number	:	LZA73037418
FCC ID	:	DZL211029
Data Cable	:	Shielded, 1.8m, Connected to the PSII port
Power Cord	:	N/A

☑ KeyBoard (USB)

Manufacturer	:	SILITEK
Model Number	:	SK-2000U
Serial Number	:	N/A
FCC ID	:	GYUR50SK
Data Cable	:	Shielded, 1.5m, Connected to the USB port
Power Cord	:	N/A

4.3 Internal Devices

☑ VGA Card

Manufacturer	:	LEADTEK
Model Number	:	LR 2634
Serial Number	:	N/A
FCC ID	:	FCC DoC
Data Cable	:	Shielded

4.4 REMARK :

5 EUT OPERATING CONDITION

5.1 Operating condition is according to **ANSI C63.4 - 1992.**

5.2 The oscillator frequency of the EUT were 4 MHz.

5.3 Turn on the power of all equipments.

5.4 Test program sent "H" pattern to peripherals as following :

5.4.1 Printer

5.4.2 Monitor

5.4.3 Modem

5.4.4 Keyboard

6 LIMIT OF CONDUCTED POWER LINE EMISSION CLASS B:

Frequency Range	dBuV	uV
0.45 ~ 1.705 MHz	48	250 uV
1.705 ~ 30 MHz	48	250 uV

6.1 In the above table, the tighter limit applies at the band edges.

7 RESULT OF CONDUCTED POWER LINE TEST

7.1 The frequency range from 0.45 MHz to 30 MHz was investigated. All readings are quasi-peak values.

7.2 IF bandwidth : 9 kHz, Meas Time : 1 sec.

7.3 Temperature : 21 ℃, Humidity : 72 % RH.

7.4 Deviations from the specifications : None

7.5 Quasi-Peak :

Frequency (MHz)	Line 1		Line 2		Limit	
	dBuV	uV	dBuV	uV	dBuV	uV
0.507	36.31	65.39	34.62	53.83	48	250
0.887	26.95	22.26	25.19	18.18	48	250
1.645	11.35	3.69	10.48	3.34	48	250
3.445	14.06	5.05	11.96	3.96	48	250
6.080	10.64	3.40	16.43	6.63	48	250
10.130	27.80	24.55	27.86	24.72	48	250
16.045	31.91	39.40	30.50	33.50	48	250
25.600	20.87	11.05	23.48	14.93	48	250

REMARK :

1. Model : G9900H
2. Measuring mode :
3. Uncertainty in conduction emission measured : $< \pm 2.0$dB.

Test Engineer : Tony