

FCC TEST REPORT

for

47 CFR, Part 15, Subpart B

Equipment : 4+1 port wired gateway router

Model No. : F5D5231-4

FCC ID : K7SF5D52314

Filing Type : Certification

Applicant : **Belkin Corporation**
501 West Walnut Street Compton CA, 90220-5221,USA

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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: Feb. 04, 2005

No additional attachment.

Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart B

Equipment : 4+1 port wired gateway router

Model No. : F5D5231-4

FCC ID : K7SF5D52314

Applicant : **Belkin Corporation**
501 West Walnut Street Compton CA, 90220-5221,USA

I **HEREBY** CERTIFY THAT:

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 2003** and the energy emitted by this equipment was **passed FCC Part 15** in both radiated and conducted emission class B limits. Testing was carried out on **Feb. 04, 2005** 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

Belkin Corporation
501 West Walnut Street Compton CA, 90220-5221, USA

1.2. Manufacturer

Mototech Inc.
9, Park Avenue II, Science-Based Industrial Park, Hsin-Chu, Taiwan, R.O.C.

1.3. Basic Description of Equipment under Test

Equipment : 4+1 port wired gateway router
Model No. : F5D5231-4
FCC ID. : K7SF5D52314
Trade Name : Mototech
TP Cable : Non-Shielded, 10m
TP Cable x 4 : Non-Shielded, 1m
Power Supply Type : Switching (LEI / MT12-2033150-A1)
AC Power Input : Wall-Mount, 2pin
DC Power Cable : Non-Shielded, 1.8m

1.4. Feature of Equipment under Test

- Please refer to user manual

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 C63.4-2003 and configuration operated in a manner which tended to maximize its emission characteristics in a typical application.
- b. The complete test system included remote workstation, COMPAQ PC, COMPAQ Monitor, COMPAQ PS/2 Keyboard, COMPAQ PS/2 Mouse, HP Printer, ACEEX Modem and EUT for EMI test. The remote workstation included COMPAQ PC, COMPAQ Monitor, COMPAQ PS/2 Mouse and COMPAQ PS/2 Keyboard.
- c. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 1,000 MHz.

2.2. Description of Test System

Support Unit 1. – Monitor (COMPAQ) – for local and remote workstation

FCC ID	: N/A
Model No.	: S510
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0067
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- PS/2 Keyboard (COMPAQ) – for local and remote workstation

FCC ID	: N/A
Model No.	: 6511-VA
Serial No.	: SP0054
Data Cable	: Shielded, 1.6m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- PS/2 Mouse (COMPAQ) – for local and remote workstation

FCC ID	: N/A
Model No.	: M-S69
Serial No.	: SP0108
Data Cable	: Shielded, 1.8m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 4. -- Printer (HP) – for local workstation

FCC ID : B94C2642X
Model No. : DJ 400
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0048
Data Cable : Shielded, 1.35m

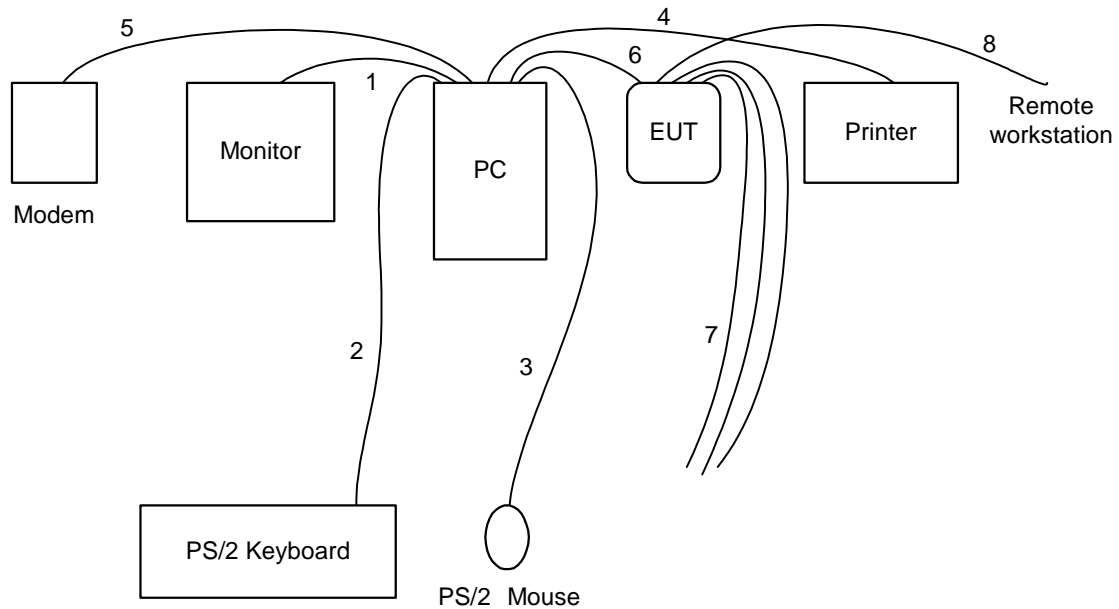
Support Unit 5. -- Modem (ACEEX) – for local workstation

FCC ID : IFAXDM1414
Model No. : DM1414
Power Supply Type : Linear
Power Cord : Non-Shielded
Serial No. : SP0015
Data Cable : Shielded, 1.15m

Support Unit 6. – Personal Computer (COMPAQ) – for local and remote workstation

FCC ID : N/A
Model No. : Evo D380mx
Power Supply Type : Switching
Power Cord : Non-Shielded
Serial No. : SP0051
Remark : This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

2.3. Connection Diagram of Test System



1. The I/O cable is connected from PC to the support unit 1.
2. The I/O cable is connected from PC to the support unit 2.
3. The I/O cable is connected from PC to the support unit 3.
4. The I/O cable is connected from PC to the support unit 4.
5. The I/O cable is connected from PC to the support unit 5.
6. The TP cable is connected from PC to the EUT.
7. These TP cables(x3) are floating.
8. The TP cable is connected from EUT to the remote workstation.

3. Test Software

An executive program, "EMITEST.EXE " under Win XP, 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 hard 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 " H" messages to the printer, then the printer prints them on the paper.
- e. The PC sends " H" messages to the modem.
- f. The PC sends " H" messages to the internal Hard Disk, and the Hard Disk reads and writes the message.
- g. Repeat the steps from c to e.

At the same time, "Ping.exe" was executed to link with the remote workstation to receive and transmit data by TP cable:

4. General Information of Test

4.1. Test Facility

Test Site Location : No. 30-2, Lin 6, Diing-Fwu Tsuen, Lin-Kou-Hsiang,
Taipei Hsien, Taiwan, R.O.C.
TEL: 886-2-2601-1640
FAX: 886-2-2601-1695

Test Site No. : CO01-LK, OS01-LK

4.2. Test Voltage

110V/60Hz

4.3. Standard for Methods of Measurement

ANSI C63.4-2003

4.4. Test in Compliance with

FCC Part 15, Subpart B

4.5. Frequency Range Investigated

- a. Conduction: from 150 kHz to 30 MHz
- b. Radiation: from 30 MHz to 1,000 MHz

4.6. Test Distance

The test distance of radiated emission from antenna to EUT is 10 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 C63.4-2003 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.

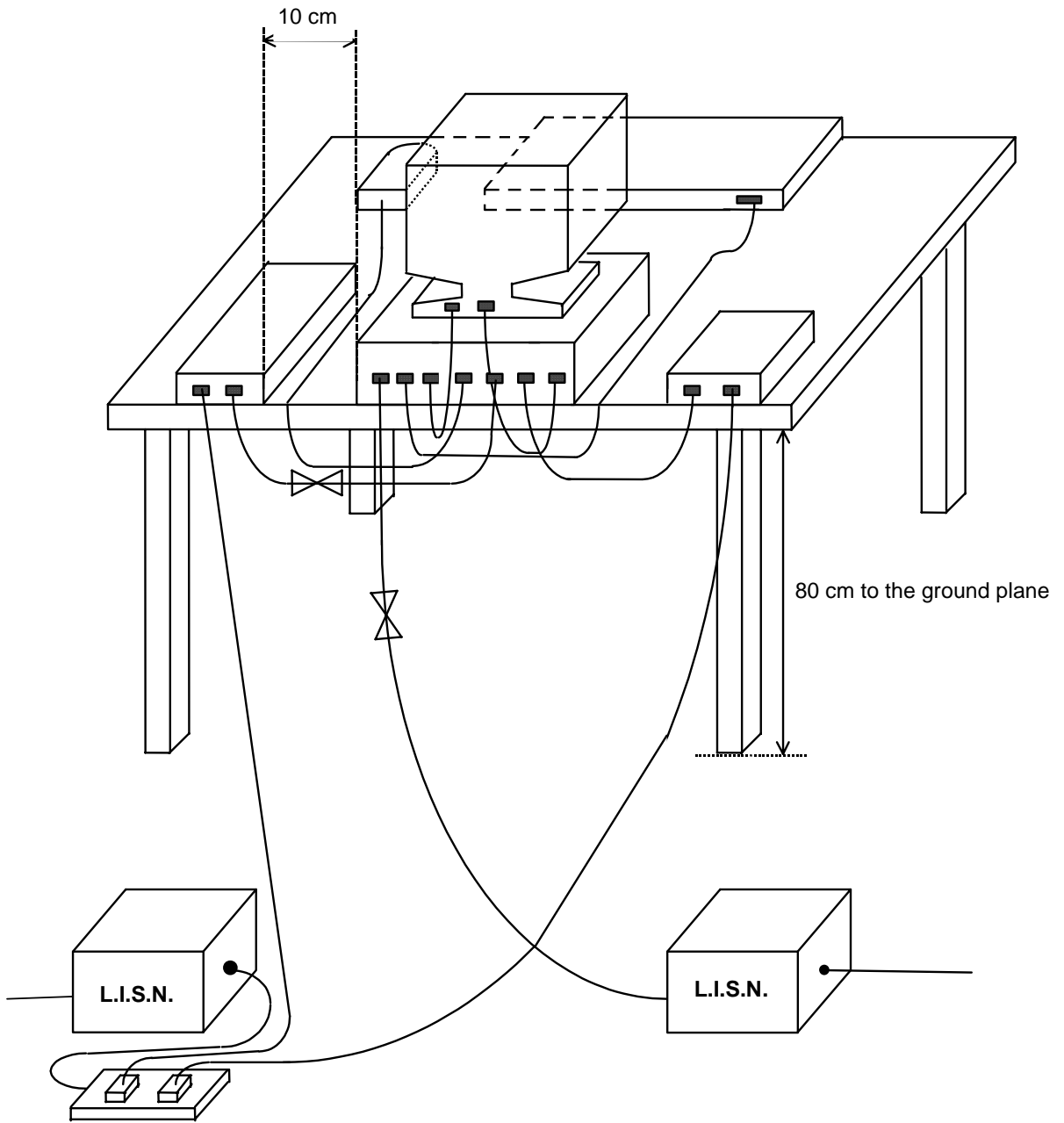
5.1. Major Measuring Instruments

● 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).
- 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 150 kHz to 30 MHz was searched.
- h. Set the test-receiver system to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

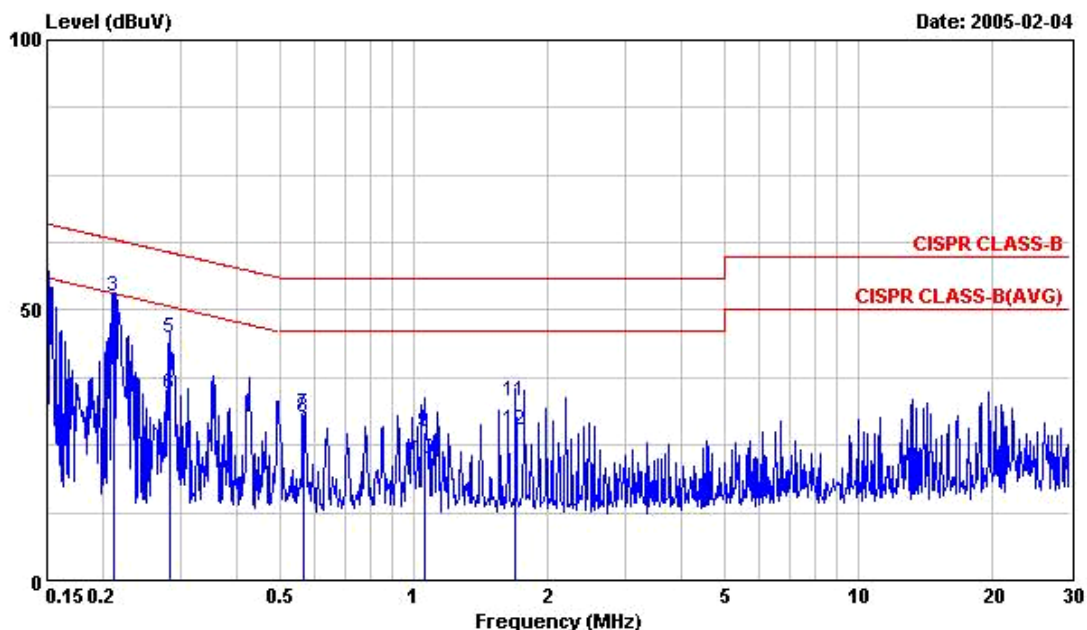
5.3. Typical Test Setup Layout of Conducted Powerline



5.4. Test Result of AC Powerline Conducted Emission

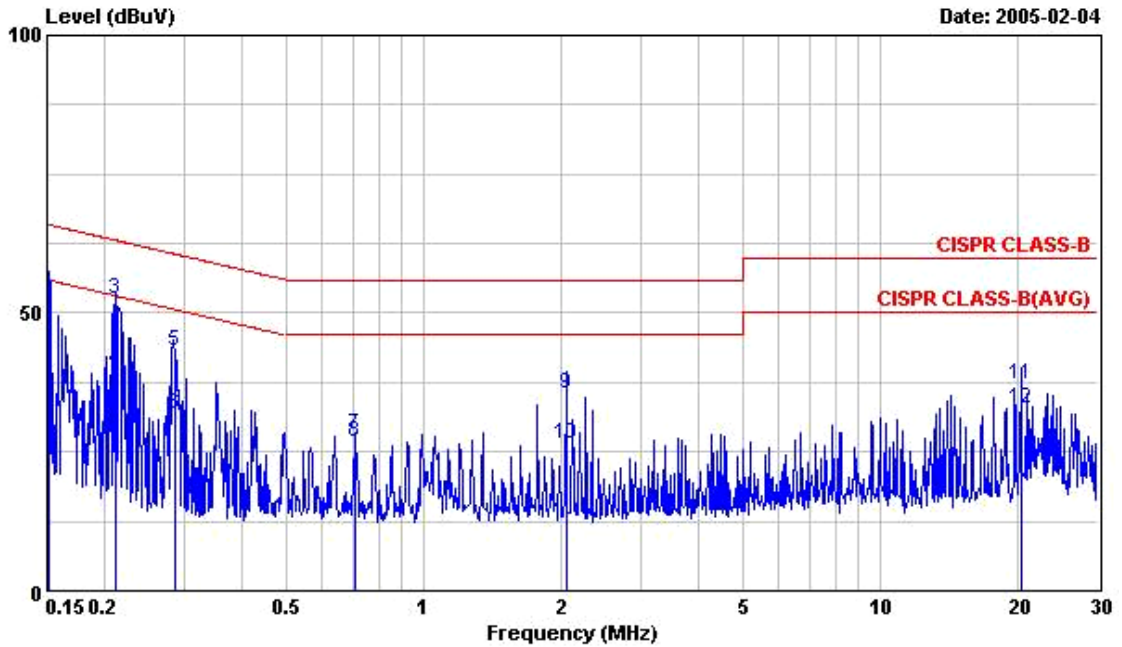
- Frequency Range of Test: from 0.15 MHz to 30 MHz
- Temperature: 22 °C
- Relative Humidity: 51 %
- All emissions not reported here are more than 10 dB below the prescribed limit.
- Corrected Reading (dBuV) = LISN Factor + Cable Loss + Read Level = Level

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



Site : CO01-LK
 Condition : CISPR CLASS-B CO01 LISN 93-08-30 LINE
 EUT : 4/1 port Router
 MODEL : F5D5231-4
 POWER : 110VAC
 MEMO : LAN:100M/10M

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.150	49.12	-16.88	66.00	49.02	0.10	0.00	QP
2	0.150	33.48	-22.52	56.00	33.38	0.10	0.00	Average
3	0.212	52.47	-10.66	63.13	52.36	0.10	0.01	QP
4	0.212	40.80	-12.33	53.13	40.69	0.10	0.01	Average
5	0.283	44.70	-16.03	60.73	44.55	0.10	0.05	QP
6	0.283	34.52	-16.21	50.73	34.37	0.10	0.05	Average
7	0.567	30.86	-25.14	56.00	30.66	0.10	0.10	QP
8	0.567	30.24	-15.76	46.00	30.04	0.10	0.10	Average
9	1.065	27.48	-28.52	56.00	27.26	0.11	0.11	QP
10	1.065	22.45	-23.55	46.00	22.23	0.11	0.11	Average
11	1.700	33.00	-23.00	56.00	32.64	0.18	0.18	QP
12	1.700	27.64	-18.36	46.00	27.28	0.18	0.18	Average



Site : CO01-LK
 Condition : CISPR CLASS-B CO01 LISN 93-08-30 NEUTRAL
 EUT : 4/1 port Router
 MODEL : F5D5231-4
 POWER : 110VAC
 MEMO : LAN:100M/10M

	Freq	Level	Over Limit	Limit Line	Read Level	LISN Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.151	49.02	-16.92	65.94	48.92	0.10	0.00	QP
2	0.151	29.41	-26.53	55.94	29.31	0.10	0.00	Average
3	0.213	52.47	-10.62	63.09	52.36	0.10	0.01	QP
4	0.213	39.86	-13.23	53.09	39.75	0.10	0.01	Average
5	0.285	43.26	-17.41	60.67	43.11	0.10	0.05	QP
6	0.285	31.80	-18.87	50.67	31.65	0.10	0.05	Average
7	0.709	28.06	-27.94	56.00	27.86	0.10	0.10	QP
8	0.709	26.89	-19.11	46.00	26.69	0.10	0.10	Average
9	2.058	35.57	-20.43	56.00	35.17	0.20	0.20	QP
10	2.058	26.55	-19.45	46.00	26.15	0.20	0.20	Average
11	20.491	37.08	-22.92	60.00	35.75	0.82	0.51	QP
12	20.491	32.83	-17.17	50.00	31.50	0.82	0.51	Average

Test Engineer: Neil
 Neil Huang

6. Test of Radiated Emission

Radiated emissions from 30 MHz to 1,000 MHz were measured with a bandwidth of 120 kHz according to the methods defines in ANSI C63.4-2003. 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 25 dB
 - Signal Input 0.1 MHz -1.3 GHz

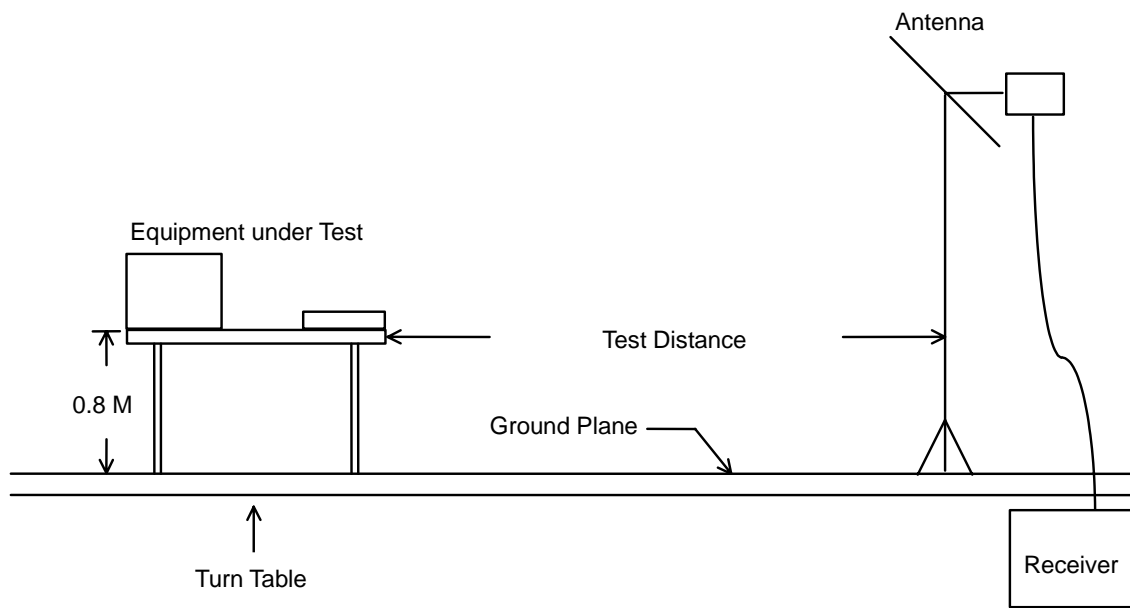
- Spectrum Analyzer (ADVANTEST R3261C)
 - Attenuation 10 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 120 KHz
 - Signal Input 30MHz – 2.6GHz

- Test Receiver (R&S ESCS 30)
 - Resolution Bandwidth 120 KHz
 - Frequency Band 9 K – 2.75 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 10 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.

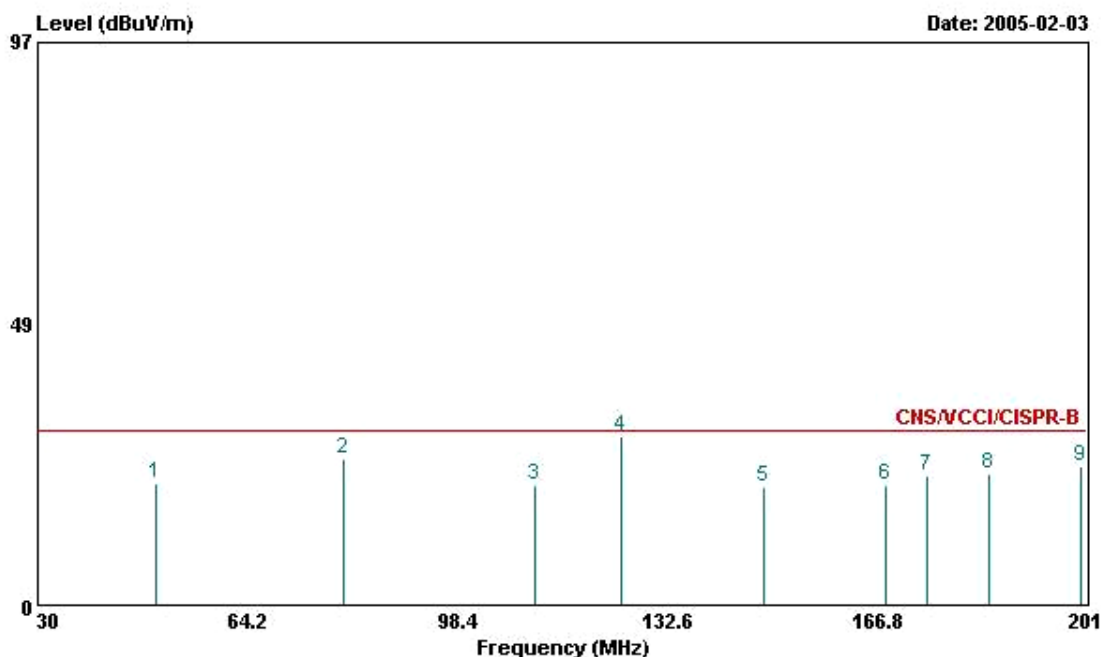
6.3. Typical Test Setup Layout of Radiated Emission



6.4. Test Result of Radiated Emission

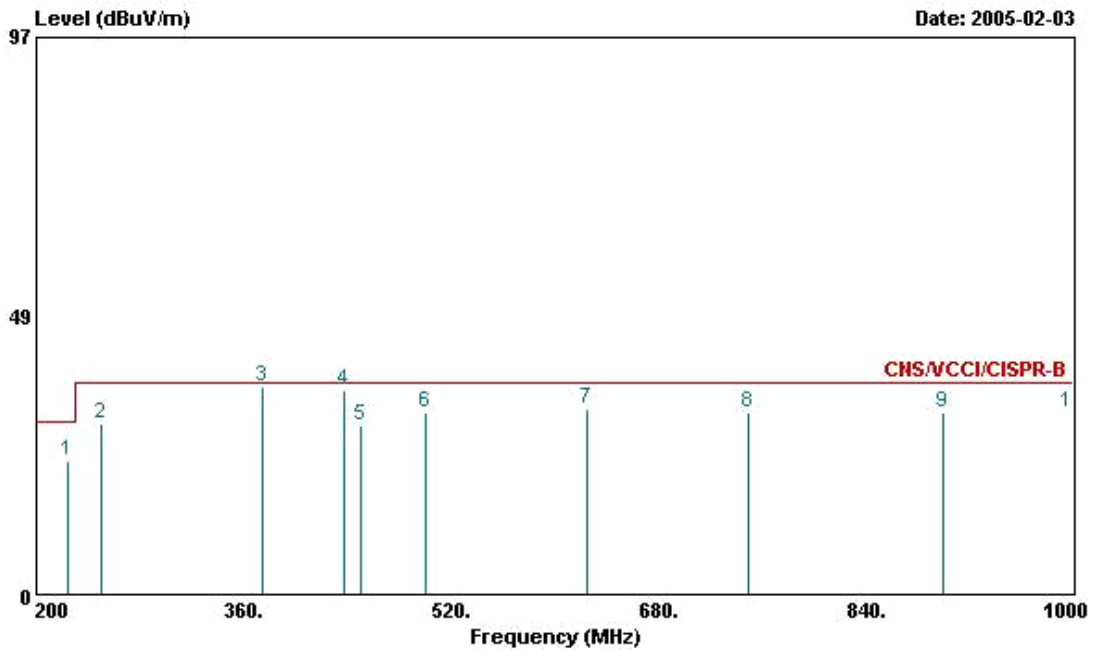
- Temperature: 23 °C
- Relative Humidity: 56 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

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



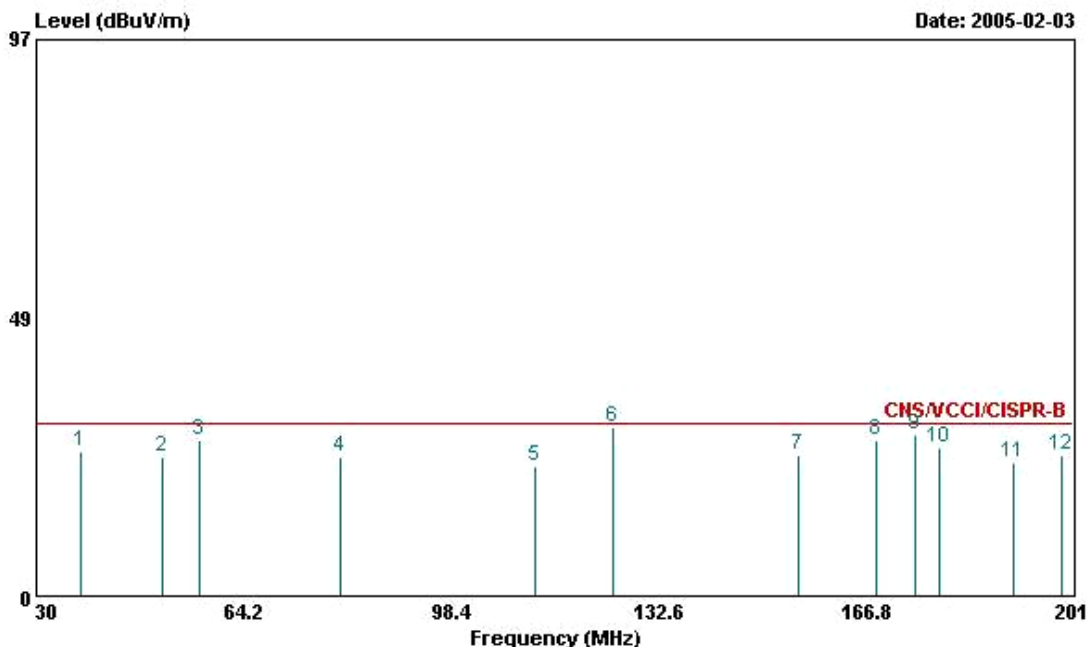
Site : OS01-LK
 Condition : CNS/VCCI/CISPR-B 10m 2672-JUNE-05-2004 HORIZONTAL
 EUT : ROUTER
 Power : 110VAC
 Memo : LAN:100M/10M

	Over	Limit	Read	Cable	Preamp	Antenna			Ant	Table
Freq	Level	Limit	Line	Level	Loss	Factor	Factor	Remark	Pos	Pos
MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB/m		cm	deg
1	49.320	21.13	-8.87	30.00	38.25	0.86	27.30	9.32 Peak	---	---
2	79.760	25.24	-4.76	30.00	43.54	1.24	27.30	7.76 Peak	---	---
3	111.050	20.62	-9.38	30.00	35.00	1.45	27.30	11.47 Peak	---	---
4	125.000	29.00	-1.00	30.00	42.80	1.58	27.30	11.92 QP	400	250
5	148.500	20.33	-9.67	30.00	35.14	1.76	27.30	10.73 Peak	---	---
6	168.340	20.65	-9.35	30.00	36.20	1.93	27.30	9.82 Peak	---	---
7	175.000	22.36	-7.64	30.00	38.17	1.89	27.30	9.60 Peak	---	---
8	185.100	22.52	-7.48	30.00	38.60	1.79	27.30	9.43 Peak	---	---
9	200.000	24.08	-5.92	30.00	40.20	1.87	27.30	9.31 Peak	---	---



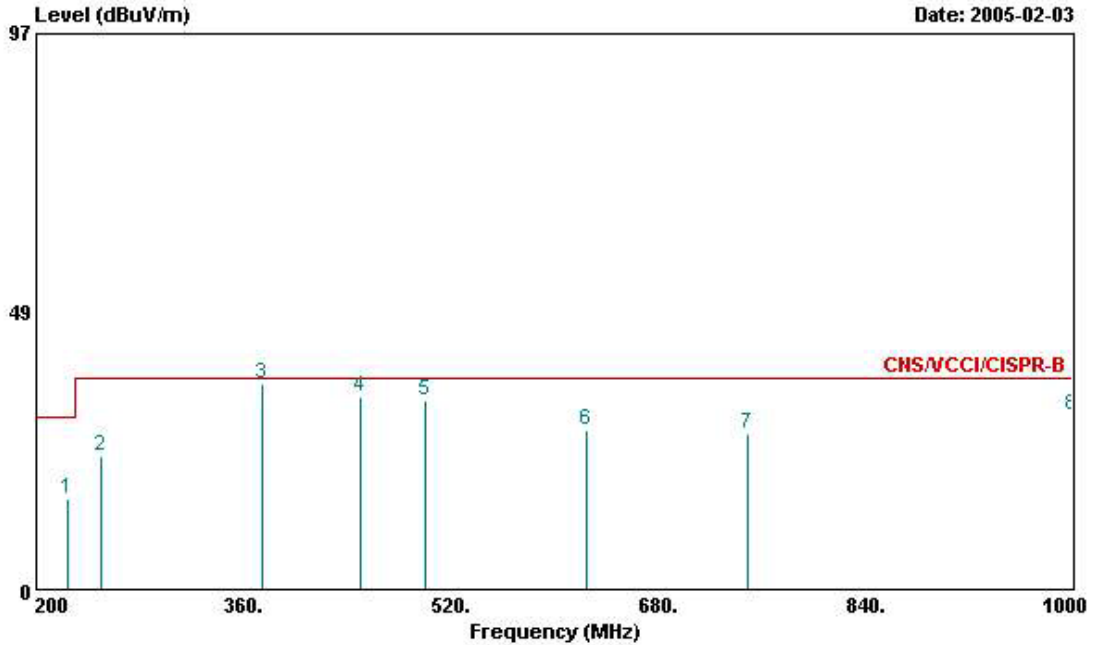
Site : OS01-LK
 Condition : CNS/VCCI/CISPR-B 10m 2672-JUNE-05-2004 HORIZONTAL
 EUT : ROUTER
 Power : 110VAC
 Memo : LAN:100M/10M

	Freq	Level	Over Limit	Limit Line	Read Level	Cable Loss	Preamp Factor	Antenna Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB/m		cm	deg
1	225.000	23.31	-6.69	30.00	37.80	2.17	27.33	10.67	Peak	---	---
2	250.000	29.82	-7.18	37.00	42.63	2.51	27.35	12.03	Peak	---	---
3 @	375.000	36.23	-0.77	37.00	45.52	3.11	27.78	15.38	QP	224	121
4	437.540	35.56	-1.44	37.00	43.50	3.48	28.05	16.63	QP	250	224
5	450.000	29.32	-7.68	37.00	37.00	3.56	28.10	16.86	Peak	---	---
6	500.000	31.75	-5.25	37.00	38.20	4.08	28.30	17.77	Peak	---	---
7	625.000	32.44	-4.56	37.00	37.20	4.31	28.22	19.15	Peak	---	---
8	750.000	31.59	-5.41	37.00	36.60	4.98	27.85	17.86	Peak	---	---
9	900.000	31.65	-5.35	37.00	34.21	5.50	27.50	19.44	Peak	---	---
10	1000.000	31.81	-5.19	37.00	30.60	5.87	27.50	22.84	Peak	---	---



Site : OS01-IK
 Condition : CNS/VCCI/CISPR-B 10m 2672-JUNE-05-2004 VERTICAL
 EUT : ROUTER
 Power : 110VAC
 Memo : LAN:100M/10M

	Freq	Level	Over	Limit	Read	Cable	Preamp	Antenna	Remark	Ant	Table
	MHz	dBuV/m	dB	dBuV/m	dBuV	Loss	Factor	Factor		Pos	Pos
						dB	dB	dB/m		cm	deg
1	37.350	25.29	-4.71	30.00	36.80	0.79	27.30	15.00	Peak	---	---
2	50.860	24.28	-5.72	30.00	42.20	0.88	27.30	8.50	Peak	---	---
3	57.020	27.00	-3.00	30.00	46.89	0.96	27.30	6.45	Peak	---	---
4	80.270	24.33	-5.67	30.00	42.42	1.25	27.30	7.96	Peak	---	---
5	112.250	22.74	-7.26	30.00	37.02	1.47	27.30	11.55	Peak	---	---
6	125.000	29.50	-0.50	30.00	43.30	1.58	27.30	11.92	QP	100	220
7	155.860	24.43	-5.57	30.00	39.60	1.81	27.30	10.32	Peak	---	---
8	168.680	27.24	-2.76	30.00	42.79	1.93	27.30	9.82	Peak	---	---
9	175.000	28.19	-1.81	30.00	44.00	1.89	27.30	9.60	QP	100	224
10	178.940	26.02	-3.98	30.00	42.00	1.83	27.30	9.49	Peak	---	---
11	191.250	23.26	-6.74	30.00	39.40	1.78	27.30	9.38	Peak	---	---
12	199.290	24.48	-5.52	30.00	40.60	1.87	27.30	9.31	Peak	---	---



Site : OS01-IK
 Condition : CNS/VCCI/CISPR-B 10m 2672-JUNE-05-2004 VERTICAL
 EUT : ROUTER
 Power : 110VAC
 Memo : LAN:100M/10M

	Freq	Level	Over	Limit	Read	Cable	Preamp	Antenna	Remark	Ant	Table
	MHz	dBuV/m	dB	dBuV/m	dBuV	Loss	Factor	Factor		Pos	Pos
						dB	dB	dB/m		cm	deg
1	225.000	15.91	-14.09	30.00	30.40	2.17	27.33	10.67	Peak	---	---
2	250.000	23.39	-13.61	37.00	36.20	2.51	27.35	12.03	Peak	---	---
3	375.000	36.02	-0.98	37.00	45.31	3.11	27.78	15.38	QP	257	200
4	450.000	33.72	-3.28	37.00	41.40	3.56	28.10	16.86	Peak	---	---
5	500.000	32.94	-4.06	37.00	39.39	4.08	28.30	17.77	Peak	---	---
6	625.000	27.84	-9.16	37.00	32.60	4.31	28.22	19.15	Peak	---	---
7	750.000	27.19	-9.81	37.00	32.20	4.98	27.85	17.86	Peak	---	---
8	1000.000	30.41	-6.59	37.00	29.20	5.87	27.50	22.84	Peak	---	---

Test Engineer: *William*
 William Lee

7. List of Measuring Equipment Used

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Remark
Receiver	R&S	ESCS 30	836858/024	9 KHz - 2.75 GHz	Jul. 09, 2004	Conduction (CO01-LK)
LISN	Rolf Hoine	NNB-2/16Z	98087	9KHz ~ 30MHz	Aug. 30, 2004	Conduction (CO01-LK)
LISN	Rolf Hoine	NNB-2/16Z	98009	9KHz ~ 30MHz	Aug. 30, 2004	Conduction (CO01-LK)
RF Cable-CON	Suhner Switzerland	RG223/U	CB017	9KHz~30MHz	Dec. 17, 2004	Conduction (CO01-LK)
Open Area Test Site	SPORTON	OATS-10	OS01-LK	30MHz~1GHz 10m, 3m	Nov. 20, 2004	Radiation (OS01-LK)
Spectrum Analyzer	Advantest	R3261C	81720145	9KHz-2.6GHz	May 21, 2004	Radiation (OS01-LK)
Amplifier	HP	8447D	2944A09068	100KHz -1.3GHz	Oct. 28, 2004	Radiation (OS01-LK)
Bilog Antenna	CHASE	CBL6112A	2672	30MHz -2GHz	Jun. 05, 2004	Radiation (OS01-LK)
Turn Table	EMCO	2080	9711-2022	0 ~ 360 degree	N/A	Radiation (OS01-LK)
Antenna Mast	EMCO	2075	9710-2101	1 m- 4 m	N/A	Radiation (OS01-LK)
RF Cable-R10m	BELDEN	RG8/U	CB005	30MHz~1GHz	Jan. 19, 2005	Radiation (OS01-LK)
RF Cable-R03m	BELDEN	RG8/U	CB006	30MHz~1GHz	Jan. 19, 2005	Radiation (OS01-LK)
Receiver	R&S	ESCS 30	838251/003	9KHz~2.75GHz	Jan. 25, 2005	Radiation (OS01-LK)

Calibration Interval of instruments listed above is one year.

8. Uncertainty of Test Site

Uncertainty of Conducted Emission Measurement (150kHz ~ 30MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.15	Normal(k=2)	0.08
Cable loss	0.21	Normal(k=2)	0.11
AMN insertion loss	2.50	Rectangular	0.63
Receiver Spec	1.50	Rectangular	0.43
Site imperfection	1.56	Rectangular	0.90
Mismatch	+0.34/-0.35	U-shape	0.24
combined standard uncertainty Uc(y)	1.21		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	2.42		

Uncertainty of Radiated Emission Measurement (30MHz ~ 1000MHz)

Contribution	Uncertainty of x_i		$u(x_i)$
	dB	Probability Distribution	
Receiver reading	0.15	Normal(k=2)	0.08
Antenna factor calibration	1.12	Normal(k=2)	0.56
Cable loss calibration	0.12	Normal(k=2)	0.06
Pre Amplifier Gain calibration	0.13	Normal(k=2)	0.07
RCV/SPA specification	2.5	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1	Rectangular	0.29
Site imperfection	2.1	Rectangular	1.21
Mismatch	+0.39/-0.41	U-shaped	0.28
combined standard uncertainty Uc(y)	1.58		
Measuring uncertainty for a level of confidence of 95% U=2Uc(y)	3.16		