FCC TEST REPORT

for

47 CFR Part 15 Subpart C

Equipment	:	USB Flash WLAN Card
Model No.	:	B241
FCC ID	:	QS3WBGZP1
Filing Type	:	Certification
Applicant	:	**TwinMOS Technologies Inc.** 303 No. 3, Tzu Chiang Rd., Hu Kou Xiang, Hsin Chu, Taiwan, R.O.C.

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. 11, 2004

■ No additional attachment.

□ Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

Certificate No. : F420905

CERTIFICATE OF COMPLIANCE

for

47 CFR Part 15 Subpart C

Equipment : USB Flash WLAN Card

Model No. : B241

FCC ID : QS3WBGZP1

Filing Type : Certification

Applicant : **TwinMOS Technologies Inc.**
303 No. 3, Tzu Chiang Rd.,
Hu Kou Xiang, Hsin Chu, Taiwan, R.O.C.

I **HEREBY** CERTIFY THAT :

The measurements shown in this test report were made in accordance with the procedures given in **ANSI C63.4 - 2001** and the equipment under test was ***passed*** all test items required in 47 CFR Part 15 Subpart C, relative to the equipment under test. Testing was carried out on Feb. 10, 2004 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

TwinMOS Technologies Inc.
303 No. 3, Tzu Chiang Rd.,
Hu Kou Xiang, Hsin Chu, Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1

1.3. Basic Description of Equipment under Test

Equipment	: USB Flash WLAN Card
Model No.	: B241
FCC ID.	: QS3WBGZP1
Trade Name	: TwinMOS
Power Supply Type	: From system
AC Power Input	: N/A

1.4. Feature of Equipment under Test

Host/Radio Interface	USB
Type of Modulation	DBPSK,DQPSK,CCK
Number of Channels	11
Frequency Band	2400MHz-2483.5MHz
Carrier Frequency of each channel	2412,2417,2422,2427,2432,2437,2442, 2447,2452,2457,2462 MHz
Bandwidth of each channel	22MHz
Output Power to Antenna	11.36dBm
Antenna Type / Class and Gain	Dipole Antenna / 2dBi
Function Type	Transceiver
Power Rating (DC/AC , Voltage)	5 VDC
Duty Cycle	45%~55%
Temperature Range (Operating)	0-55℃
Humidity	15%~95%

2. Test Configuration of Equipment under Test

2.1. Test Manner

a. This project is filed for Class II change for extra optional flash memories 256M and 512M. No complete re-test is required. Additional testing is on the emissions below 1GHz while the optional flash was used. The emission above 1GHz is not needed to be re-tested and the data is still kept in this test report. Please reference item C below for detail modes.

b. The EUT has been associated with notebook and peripherals pursuant to ANSI C63.4-2001 and configuration operated in a manner, which tended to maximize its emission characteristics in a typical application.

c. The complete test system included COMPAQ NOTEOOK, VIEWSONIC Monitor, LOGITECH PS/2 Keyboard, LOGITECH USB Mouse, EPSON Printer and EUT for EMI test.
The EUT can operate on eleven channels from 2412.0MHz to 2462.0MHz. (as listed in section 1.4).
For emission below 1GHz, channel 11 was selected for testing. Modes 1, 2 and 3 is only for emission below 1GHz. Modes 4, 5 and 6 is only for emission above 1GHz.
Mode 1: Flash 128M
Mode 2: Flash 256M
Mode 3: Flash 512M
Mode 4: CH 01 2412MHz
Mode 5: CH 06 2437MHz
Mode 6: CH 11 2462MHz

d. Frequency range investigated: conduction 150 KHz to 30 MHz, radiation 30 MHz to 25000MHz.

d. The flash memory is modified, only frequency below 1GHz is retested accordingly.

2.2. Description of Test System

Support Unit 1. – Notebook (COMPAQ)

FCC ID	: N/A
Model No.	: PRESARIO 1500
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0039
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

Support Unit 2. -- Monitor (VIEWSONIC)

FCC ID	: N/A
Model No.	: VCDTS21553-3P
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0050
Data Cable	: Shielded, 1.7m
Remark	: This support device was tested to compy with FCC standards and authorized under a declaration of conformity.

Support Unit 3. -- PS/2 Keyboard (LOGITECH)

FCC ID	: N/A
Model No.	: Y-SJ17
Serial No.	: SP0054
Data Cable	: Shielded, 360 degree via metal backshells, 1.7m
Remark	: This support device was tested to comply with FCC standards and authorized under a declaration of conformity.

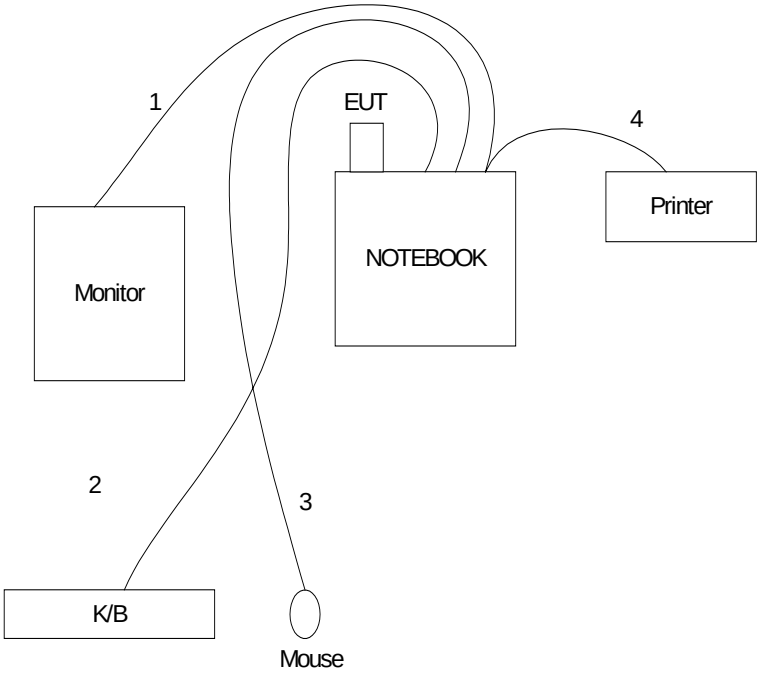
Support Unit 4. -- USB Mouse (LOGITECH)

FCC ID	: N/A
Model No.	: M-BE58
Serial No.	: SP0041
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 5. -- Printer (EPSON)

FCC ID	: N/A
Model No.	: STYLUS COLOR 680
Power Supply Type	: Linear
Power Cord	: Non-Shielded
Serial No.	: SP0048
Data Cable	: Shielded, 1.35m

2.3. Connection Diagram of Test System



1. The I/O cable is connected from the NOTEBOOK to the support unit 2.
2. The I/O cable is connected from the NOTEBOOK to the support unit 3.
3. The I/O cable is connected from the NOTEBOOK to the support unit 4.
4. The I/O cable is connected from the NOTEBOOK to the support unit 5.

3. Operation of Equipment under Test

An executive programs, EMCTEST.EXE under WIN XP, which generate 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 internal Hard Disk, and the Hard Disk reads and writes the message.
f. Repeat the steps from c to e.

At the same time, "ZyDas.exe " was executed to keep transmitting signals at fixed frequency.

4. General Information of Test

Test Site Location	:	No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiag, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-318-0055
Test Site No	:	CO01-HY, 03CH03-HY

4.1. Test Voltage

110V/ 60Hz

4.2. Standard for Methods of Measurement

ANSI C63.4-2001 for conducted power line test and radiated emission test.

4.3. Test in Compliance with

47 CFR Part 15 Subpart C

4.4. Frequency Range Investigated

a. Conduction: from 150 kHz to 30 MHz
b. Radiation: from 30 MHz to 25000MHz

4.5. Test Distance

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

5. Report of Measurements and Examinations

5.1. List of Measurements and Examinations

FCC Rule	Description of Test	Result
15.207	Conducted Emission	Pass
15.247(a)(2)	6dB Bandwidth	Pass
15.247(b)	Maximum Peak Output Power	Pass
15.247(c)	Radiated Emission	Pass
15.247(c)	100kHz Bandwidth of Frequency Band Edges	Pass
15.247(d)	Power Spectral Density	Pass
15.203	Antenna Requirement	Pass
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	Pass

5.2. 6dB Bandwidth

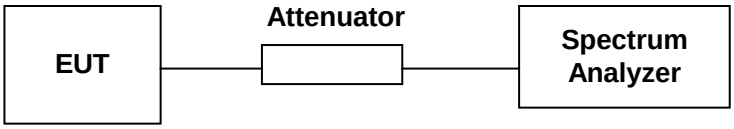
5.2.1. Measuring Instruments：

As described in chapter 7 of this test report.

5.2.2. Test Procedure：

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. Set RBW of spectrum analyzer to 100KHz and VBW to 100KHz.
3. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

5.2.3. Test Setup Layout：



5.2.4. Test Result：The spectrum analyzer plots are attached as below

- Temperature : 21.9 °C
- Relative Humidity : 60%

Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
01	2412	11.04	0.5	1
06	2437	11.04	0.5	2
11	2462	11.04	0.5	3

5.3. Peak Output Power

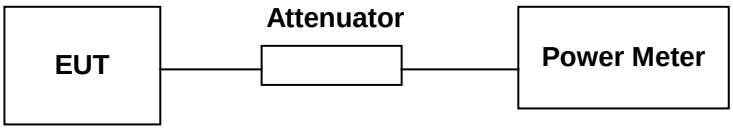
5.3.1. Measuring Instruments：

As described in chapter 7 of this test report.

5.3.2. Test Procedure：

The antenna port（RF output）of the EUT was connected to the input（RF input）of a power meter. Power was read directly from the meter and cable loss connection was added to the reading to obtain power at the EUT antenna terminal. The EUT Output Power was set to maximum to produce the worse case test result.

5.3.3. Test Setup Layout：



5.3.4. Test Result：See spectrum analyzer plots below

- Temperature : 21.9°C
- Relative Humidity : 60 %
- Antenna Gain: 2 dBi

Channel	Frequency (MHz)	Measured Output Power (mWatt)	Measured Output Power (dBm)	Limits (Watt/dBm)
01	2412	13.67728826	11.36	1W 30 dBm
06	2437	12.2179966	10.87	1W 30 dBm
11	2462	8.629785478	9.36	1W 30 dBm

- Comments：Maximum Peak Output Power < 30dBm (1Watt)

5.4. Power Spectral Density

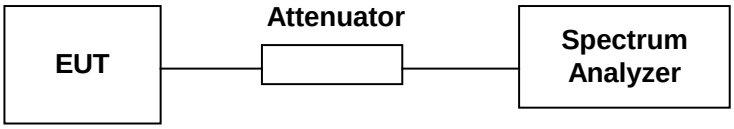
5.4.1. Measuring Instruments：

As described in chapter 7 of this test report.

5.4.2. Test Procedure：

1. The transmitter output was connected to spectrum analyzer through an attenuator.
2. The spectrum analyzer's resolution bandwidth were set at 3KHz RBW and 30KHz VBW as that of the fundamental frequency. Set the sweep time=span/3KHz.
3. The power spectral density was measured and recorded.
4. The Sweep time is allowed to be longer than span/3KHz for a full response of the mixer in the spectrum analyzer.

5.4.3. Test Setup Layout：



5.4.4. Test Result：See spectrum analyzer plots below

- Temperature : 21.9°C
- Relative Humidity : 60 %

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
01	2412	-11.94	8	1
06	2437	-12.40	8	2
11	2462	-12.49	8	3

5.5. Test of Conducted Emission

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 C63.4-2001 Section 3.1. The EUT was placed on a nonmetallic stand in a shielded room 0.8 meters above the ground plane. The interface cables and equipment positioning were varied within limits of reasonable applications to determine the position produced maximum conducted emissions.

5.5.1. 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

5.5.2. 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.

5.5.3. Test Result of Conducted Emission：

Frequency Range of Test : from 150KHz to 30 MHz

6dB Bandwidth : 9KHz

- Test Mode : Mode 4
- Temperature : 21.9°C
- Relative Humidity : 60 %

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

Line

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.169	43.99	-21.02	65.01	43.85	0.10	0.04	QP
2	0.169	27.67	-27.34	55.01	27.53	0.10	0.04	Average
3	0.227	42.28	-20.28	62.56	42.14	0.10	0.04	QP
4	0.227	25.82	-26.74	52.56	25.68	0.10	0.04	Average
5	0.297	31.96	-28.36	60.32	31.81	0.10	0.05	QP
6	0.297	22.47	-27.85	50.32	22.32	0.10	0.05	Average
7	2.840	30.94	-25.06	56.00	30.73	0.10	0.11	QP
8	2.840	24.39	-21.61	46.00	24.18	0.10	0.11	Average
9	4.720	32.23	-23.77	56.00	31.95	0.12	0.16	QP
10	4.720	27.00	-19.00	46.00	26.72	0.12	0.16	Average
11	15.470	34.70	-25.30	60.00	34.12	0.21	0.37	QP
12	15.470	30.22	-19.78	50.00	29.64	0.21	0.37	Average

Neutral

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.152	46.41	-19.48	65.89	46.26	0.10	0.05	QP
2	0.152	35.20	-20.69	55.89	35.05	0.10	0.05	Average
3	0.160	27.40	-28.06	55.46	27.26	0.10	0.04	Average
4	0.160	45.19	-20.27	65.46	45.05	0.10	0.04	QP
5	0.197	36.56	-17.18	53.74	36.43	0.10	0.03	Average
6	0.197	40.66	-23.08	63.74	40.53	0.10	0.03	QP
7	0.222	43.20	-19.54	62.74	43.07	0.10	0.03	QP
8	0.222	27.26	-25.48	52.74	27.13	0.10	0.03	Average
9	2.900	32.14	-23.86	56.00	31.88	0.15	0.11	QP
10	2.900	23.95	-22.05	46.00	23.69	0.15	0.11	Average
11	4.750	32.33	-23.67	56.00	31.96	0.20	0.17	QP
12	4.750	27.20	-18.80	46.00	26.83	0.20	0.17	Average

Test Engineer : John Huang 

- Test Mode : Mode 5
- Temperature : 21.9 °C
- Relative Humidity : 60 %

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

Line

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.169	43.25	-21.76	65.01	43.11	0.10	0.04	QP
2	0.169	27.53	-27.48	55.01	27.39	0.10	0.04	Average
3	0.244	38.66	-23.32	61.98	38.52	0.10	0.04	QP
4	0.244	31.06	-20.92	51.98	30.92	0.10	0.04	Average
5	0.289	31.47	-29.08	60.55	31.32	0.10	0.05	QP
6	0.289	19.03	-31.52	50.55	18.88	0.10	0.05	Average
7	0.346	27.48	-31.58	59.06	27.33	0.10	0.05	QP
8	0.346	18.21	-30.85	49.06	18.06	0.10	0.05	Average
9	3.010	30.97	-25.03	56.00	30.75	0.10	0.12	QP
10	3.010	24.53	-21.47	46.00	24.31	0.10	0.12	Average
11	4.720	32.32	-23.68	56.00	32.04	0.12	0.16	QP
12	4.720	27.00	-19.00	46.00	26.72	0.12	0.16	Average

Neutral

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.152	45.78	-20.11	65.89	45.63	0.10	0.05	QP
2	0.152	35.20	-20.69	55.89	35.05	0.10	0.05	Average
3	0.195	42.85	-20.99	63.84	42.72	0.10	0.03	QP
4	0.195	39.39	-14.45	53.84	39.26	0.10	0.03	Average
5	0.241	33.67	-18.40	52.07	33.53	0.10	0.04	Average
6	0.241	39.69	-22.38	62.07	39.55	0.10	0.04	QP
7	0.294	31.89	-28.52	60.41	31.74	0.10	0.05	QP
8	0.294	23.68	-26.73	50.41	23.53	0.10	0.05	Average
9	2.953	32.33	-23.67	56.00	32.06	0.16	0.11	QP
10	2.953	24.36	-21.64	46.00	24.09	0.16	0.11	Average
11	4.500	32.45	-23.55	56.00	32.09	0.20	0.16	QP
12	4.500	27.57	-18.43	46.00	27.21	0.20	0.16	Average

Test Engineer : John

John Huang

- Test Mode : Mode 6
- Temperature : 21.9 °C
- Relative Humidity : 60 %

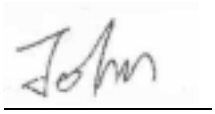
■ **The test was passed at the minimum margin that marked by the frame in the following table**

Line

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.150	47.06	-18.92	65.98	46.91	0.10	0.05	QP
2	0.150	37.28	-18.70	55.98	37.13	0.10	0.05	Average
3	0.194	39.90	-13.96	53.86	39.77	0.10	0.03	Average
4	0.194	42.81	-21.05	63.86	42.68	0.10	0.03	QP
5	0.221	26.65	-26.13	52.78	26.52	0.10	0.03	Average
6	0.221	43.00	-19.78	62.78	42.87	0.10	0.03	QP
7	2.660	30.87	-25.13	56.00	30.66	0.10	0.11	QP
8	2.660	23.60	-22.40	46.00	23.39	0.10	0.11	Average
9	4.600	32.30	-23.70	56.00	32.02	0.12	0.16	QP
10	4.600	27.21	-18.79	46.00	26.93	0.12	0.16	Average
11	15.150	34.55	-25.45	60.00	33.99	0.20	0.36	QP
12	15.150	30.26	-19.74	50.00	29.70	0.20	0.36	Average

Neutral

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	dB	
1	0.192	43.26	-20.68	63.94	43.13	0.10	0.03	QP
2	0.192	39.71	-14.23	53.94	39.58	0.10	0.03	Average
3	0.242	33.95	-18.09	52.04	33.81	0.10	0.04	Average
4	0.242	39.74	-22.30	62.04	39.60	0.10	0.04	QP
5	2.050	31.00	-25.00	56.00	30.82	0.10	0.08	QP
6	2.050	24.16	-21.84	46.00	23.98	0.10	0.08	Average
7	2.500	24.46	-21.54	46.00	24.23	0.13	0.10	Average
8	2.500	30.99	-25.01	56.00	30.76	0.13	0.10	QP
9	2.950	32.41	-23.59	56.00	32.14	0.16	0.11	QP
10	2.950	24.36	-21.64	46.00	24.09	0.16	0.11	Average
11	4.720	32.29	-23.71	56.00	31.93	0.20	0.16	QP
12	4.720	27.13	-18.87	46.00	26.77	0.20	0.16	Average

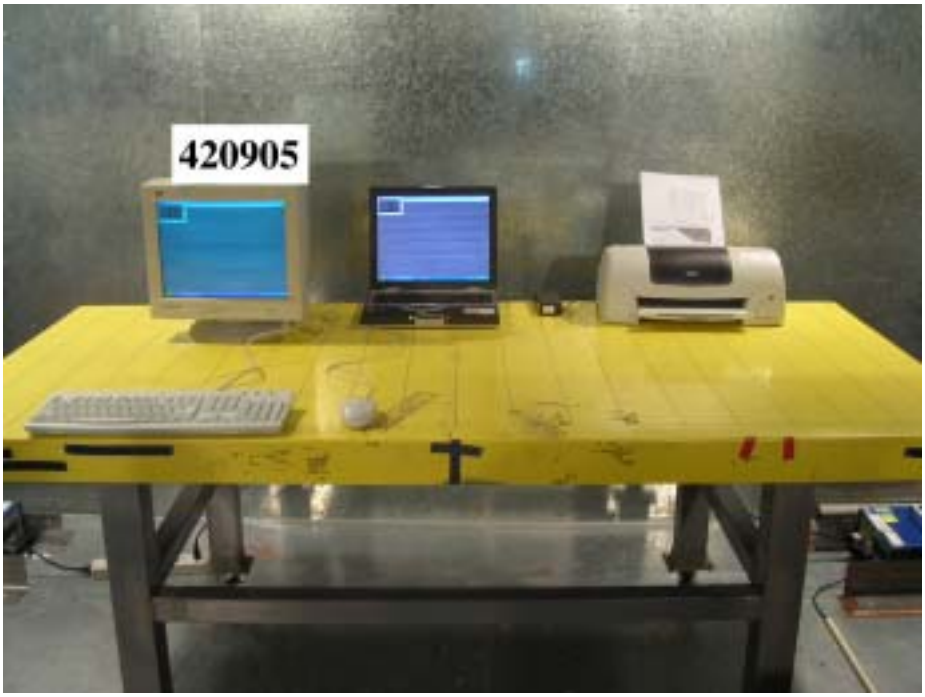
Test Engineer : 

John Huang

5.5.4. Photographs of Conducted Emission Test Configuration

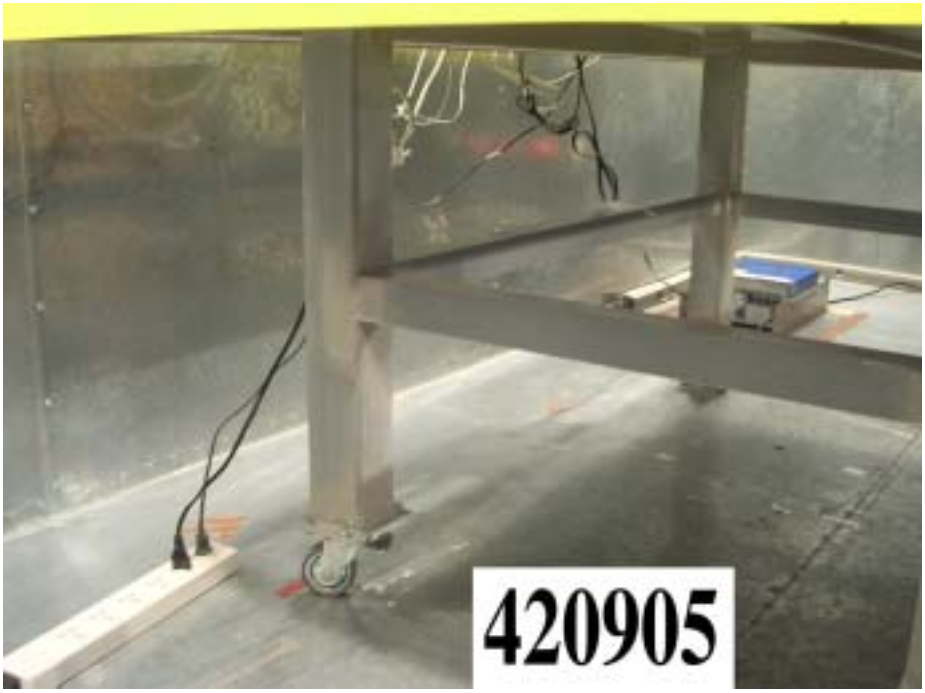
- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



REAR VIEW

SIDE VIEW



5.6. Test of Radiated Emission

Radiated emissions from 30 MHz to 25 GHz were measured according to the methods defines in ANSI C63.4-2001. The EUT was placed, 0.8 meter above the ground plane, as shown in section 5.6.3. The interface cables and equipment positions were varied within limits of reasonable applications to determine the positions producing maximum radiated emissions

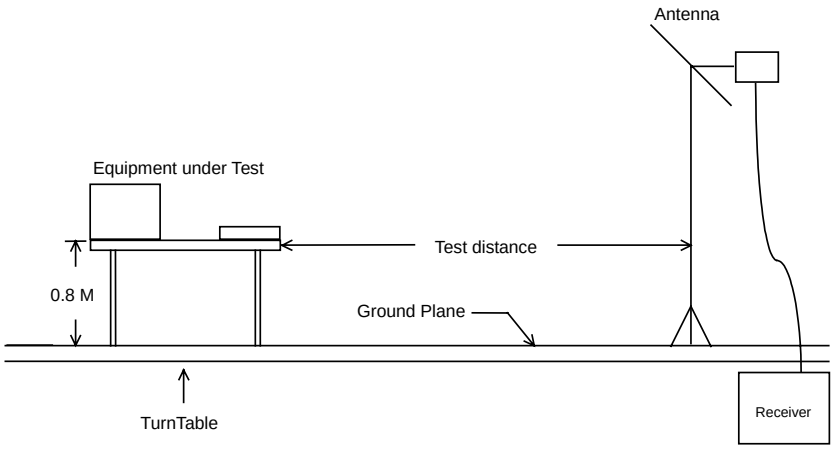
5.6.1. Major Measuring Instruments

• Amplifier	(HP 8447D)
RF Gain	30 dB
Signal Input	100 KHz to 1.3 GHz
• Amplifier	(MITEQ AFS44)
RF Gain	40 dB
Signal Input	100 MHz to 26.5 GHz
• Spectrum analyzer	(R&S FSP40)
Attenuation	10 dB
Start Frequency	1 GHz
Stop Frequency	25GHz
Resolution Bandwidth	1 MHz
Video Bandwidth	1 MHz
Signal Input	9 KHz to 40 GHz
• Test Receiver	(SCHAFFNER SCR3501)
• Resolution Bandwidth	120 KHz
Frequency Band	9 K – 1 GHz
Frequency Band	ON for Quasi-Peak Mode
	OFF for Peak Mode

5.6.2. Test Procedures

1. The EUT was placed on a rotatable table top 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a broadband antenna 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.
5. 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.
6. Set the test-receiver system to Peak or CISPR quasi-peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. 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.
8. For testing above 1GHz, the emission level of the EUT in peak mode was 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.

5.6.3. Typical Test Setup Layout of Radiated Emission



5.6.4. Test Result of Radiated Emission

- Test Mode: Mode 1
- Test Distance : 3 M
- Temperature : 25 °C
- Relative Humidity : 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

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

■ Spurious Emission

Horizontal

		Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1		132.510	29.73	-13.77	43.50	44.32	11.46	1.78	27.83	Peak	---	---
2		166.340	36.16	-7.34	43.50	48.84	13.05	2.04	27.77	Peak	---	---
3		184.190	30.24	-13.26	43.50	41.59	13.99	2.39	27.73	Peak	---	---
1		343.200	35.88	-10.12	46.00	44.86	15.30	3.23	27.51	Peak	---	---
2	!	397.600	42.49	-3.51	46.00	50.74	15.74	3.80	27.79	Peak	100	125
3		432.000	33.73	-12.27	46.00	41.98	16.24	3.60	28.09	Peak	---	---

Vertical

		Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
		MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	!	77.260	34.46	-5.54	40.00	51.64	9.25	1.51	27.94	Peak	---	---
2	!	115.510	39.85	-3.65	43.50	55.34	10.52	1.86	27.87	Peak	---	---
3	!	119.420	38.64	-4.86	43.50	54.03	10.57	1.90	27.86	Peak	---	---
1		343.200	34.07	-11.93	46.00	43.05	15.30	3.23	27.51	Peak	---	---
2		396.800	34.10	-11.90	46.00	42.35	15.73	3.80	27.78	Peak	---	---

Test Engineer : Steve

Steve Chen

- Test Mode: Mode 2
- Test Distance : 3 M
- Temperature : 27 °C
- Relative Humidity : 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

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

■ Spurious Emission

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	133.020	34.95	-8.55	43.50	49.05	11.48	2.25	27.83	Peak	---	---
2	184.190	30.43	-13.07	43.50	41.59	13.99	2.58	27.73	Peak	---	---
3	195.580	35.23	-8.27	43.50	45.50	14.70	2.74	27.71	Peak	---	---
1	343.200	36.49	-9.51	46.00	44.95	15.30	3.75	27.51	Peak	---	---
2	396.800	41.15	-4.85	46.00	49.19	15.73	4.01	27.78	Peak	---	---
3	432.000	34.92	-11.08	46.00	42.61	16.24	4.16	28.09	Peak	---	---

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	127.580	32.60	-10.90	43.50	47.09	11.18	2.17	27.84	Peak	---	---
2	132.340	35.90	-7.60	43.50	50.07	11.45	2.21	27.83	Peak	---	---
3	165.830	30.64	-12.86	43.50	42.95	13.02	2.44	27.77	Peak	---	---
1	343.200	34.86	-11.14	46.00	43.32	15.30	3.75	27.51	Peak	---	---
2	397.600	36.75	-9.25	46.00	44.79	15.74	4.01	27.79	Peak	---	---
3	787.200	36.99	-9.01	46.00	39.69	20.28	5.81	28.79	Peak	---	---

Test Engineer : Steve

Steve Chen

- Test Mode: Mode 3
- Test Distance : 3 M
- Temperature : 27 °C
- Relative Humidity : 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

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

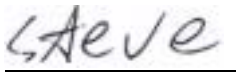
■ Spurious Emission

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	133.020	29.72	-13.78	43.50	44.06	11.48	2.01	27.83	Peak	---	---
2	175.860	28.67	-14.83	43.50	41.24	13.43	1.75	27.75	Peak	---	---
3	181.470	28.68	-14.82	43.50	40.38	13.70	2.34	27.74	Peak	---	---
1	343.200	34.55	-11.45	46.00	43.55	15.30	3.21	27.51	Peak	---	---
2 !	396.800	42.52	-3.48	46.00	51.13	15.73	3.44	27.78	Peak	---	---
3	727.200	32.54	-13.46	46.00	36.60	19.91	4.76	28.73	Peak	---	---

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	51.590	28.64	-11.36	40.00	45.25	10.13	1.25	27.99	Peak	---	---
2 !	133.020	38.01	-5.49	43.50	52.35	11.48	2.01	27.83	Peak	---	---
3	190.140	29.75	-13.75	43.50	40.52	14.57	2.38	27.72	Peak	---	---
1	396.800	36.67	-9.33	46.00	45.28	15.73	3.44	27.78	Peak	---	---
2	662.400	33.68	-12.32	46.00	38.59	19.04	4.79	28.74	Peak	---	---
3	697.600	31.29	-14.71	46.00	35.90	19.75	4.34	28.70	Peak	---	---

Test Engineer : 

Steve Chen

- Test Mode: Mode 4
- Test Distance : 3 M
- Temperature : 27 °C
- Relative Humidity : 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)

Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

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

■ Spurious Emission

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	4822.000	50.00	-24.00	74.00	50.25	33.06	9.06	42.37	Peak	---	---
2	4822.000	41.62	-12.38	54.00	41.87	33.06	9.06	42.37	Average	---	---

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1588.000	51.17	-22.83	74.00	61.23	25.72	4.88	40.66	Peak	---	---
2	1588.000	35.60	-18.40	54.00	45.66	25.72	4.88	40.66	Average	---	---
5	2508.000	53.80	-20.20	74.00	60.18	28.46	6.36	41.20	Peak	---	---
6	2508.000	43.74	-10.26	54.00	50.12	28.46	6.36	41.20	Average	---	---

➢ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

■ 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
2414.000	H	28.25	6.23	67.57	-	-	102.05	126619.33		Peak
2414.000	H	28.25	6.23	59.47	-	-	93.95	49831.05		AV
2414.000	V	28.25	6.23	63.61	-	-	98.09	80260.16		AV
2414.000	V	28.25	6.23	72.22	-	-	106.70	216271.85		Peak
4828.000	V/H									AV/Peak
4828.000	V/H									AV/Peak
4822.000	V/H									AV/Peak
4822.000	V/H									AV/Peak
9648.000	V/H						-			AV/Peak
12060.000	V/H						-			AV/Peak
14472.000	V/H						-			AV/Peak
16884.000	V/H						-			AV/Peak
19296.000	V/H						-			AV/Peak
21708.000	V/H						-			AV/Peak
24120.000	V/H						-			AV/Peak

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

Test Engineer : Steve

Steve Chen

- Test Mode: Mode 5
- Test Distance : 3 M
- Temperature : 25 °C
- Relative Humidity : 65 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

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

■ Spurious Emission

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1070.000	47.93	-26.07	74.00	59.77	24.29	4.05	40.18	Peak	---	---
2	1070.000	32.28	-21.72	54.00	44.12	24.29	4.05	40.18	Average	---	---
1	4876.000	49.86	-24.14	74.00	50.04	33.17	9.09	42.44	Peak	---	---
2	4876.000	41.57	-12.43	54.00	41.75	33.17	9.09	42.44	Average	---	---

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1588.000	50.77	-23.23	74.00	60.83	25.72	4.88	40.66	Peak	---	---
2	1588.000	35.19	-18.81	54.00	45.25	25.72	4.88	40.66	Average	---	---

➢ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

■ 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
2436.000	H	28.29	6.26	66.67	-	-	101.22	115080.04		Peak
2436.000	H	28.29	6.26	58.71	-	-	93.26	46025.66		AV
2438.000	V	28.30	6.26	70.59	-	-	105.15	180925.59		Peak
2438.000	V	28.30	6.26	61.15	-	-	95.71	61023.91		AV
4874.000	V/H						-			AV/Peak
4876.000	V/H									AV/Peak
4876.000	V/H									AV/Peak
7311.000	V/H						-			AV/Peak
9748.000	V/H						-			AV/Peak
12185.000	V/H						-			AV/Peak
14622.000	V/H						-			AV/Peak
17059.000	V/H						-			AV/Peak
19496.000	V/H						-			AV/Peak
21933.000	V/H						-			AV/Peak
24370.000	V/H						-			AV/Peak

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

Test Engineer : Steve

Steve Chen

- Test Mode: Mode 6
- Test Distance : 3 M
- Temperature : 27 °C
- Relative Humidity : 62 %
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Probe Factor + Cable Loss + Read Level - Preamp Factor = Level

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

■ Spurious Emission

Horizontal

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1590.000	51.71	-22.29	74.00	61.76	25.73	4.88	40.66	Peak	---	---
2	1590.000	36.52	-17.48	54.00	46.57	25.73	4.88	40.66	Average	---	---
1	4924.000	53.00	-21.00	74.00	53.12	33.27	9.12	42.51	Peak	---	---
2	4924.000	46.99	-7.01	54.00	47.11	33.27	9.12	42.51	Average	---	---

Vertical

	Freq	Level	Over Limit	Limit Line	Read Level	Probe Factor	Cable Loss	Preamp Factor	Remark	Ant Pos	Table Pos
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB	dB	dB		cm	deg
1	1590.000	52.15	-21.85	74.00	62.20	25.73	4.88	40.66	Peak	---	---
2	1590.000	42.43	-11.57	54.00	52.48	25.73	4.88	40.66	Average	---	---

➢ For 5GHz ~ 25GHz

Remark: Frequency from 5000MHz to 25000MHz, the emission emitted by the EUT is too low to be measured

■ 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
2462.000	H	28.35	6.29	68.89	-	-	103.53	150141.24		Peak
2462.000	H	28.35	6.29	60.07	-	-	94.71	54387.61		AV
2458.000	V	28.34	6.28	70.17	-	-	104.79	173580.13		Peak
2458.000	V	28.34	6.28	61.41	-	-	96.03	63314.04		AV
4924.000	V/H						-			AV/ Peak
4924.000	V/H									AV/ Peak
4924.000	V/H									AV/ Peak
7386.000	V/H						-			AV/ Peak
9848.000	V/H						-			AV/ Peak
12310.000	V/H						-			AV/ Peak
14772.000	V/H						-			AV/ Peak
17234.000	V/H						-			AV/ Peak
19696.000	V/H						-			AV/ Peak
22158.000	V/H						-			AV/ Peak
24620.000	V/H						-			AV/ Peak

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

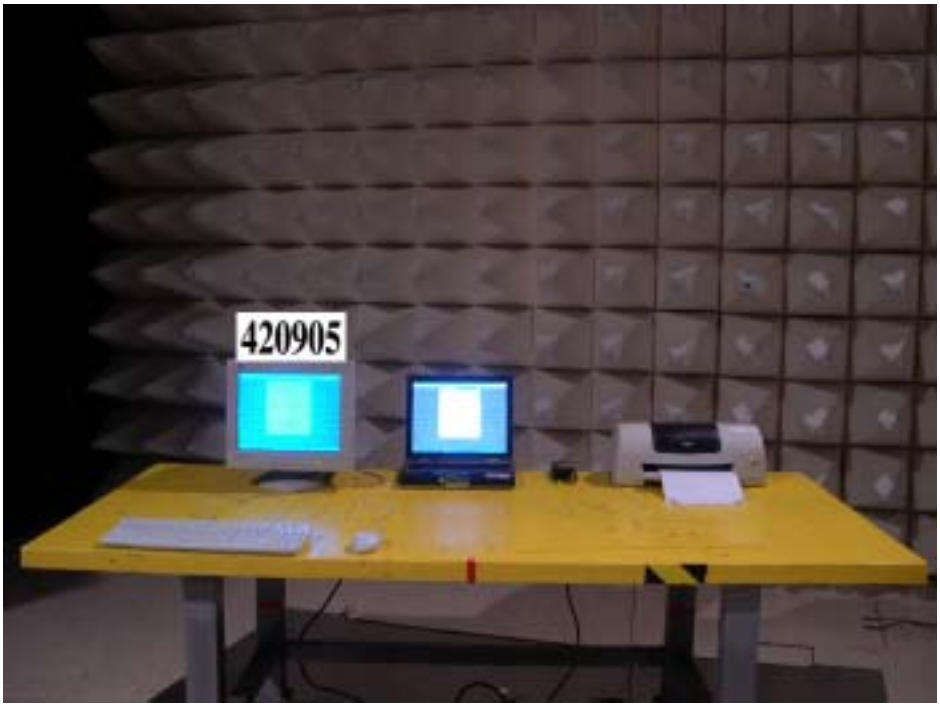
Test Engineer : Steve

Steve Chen

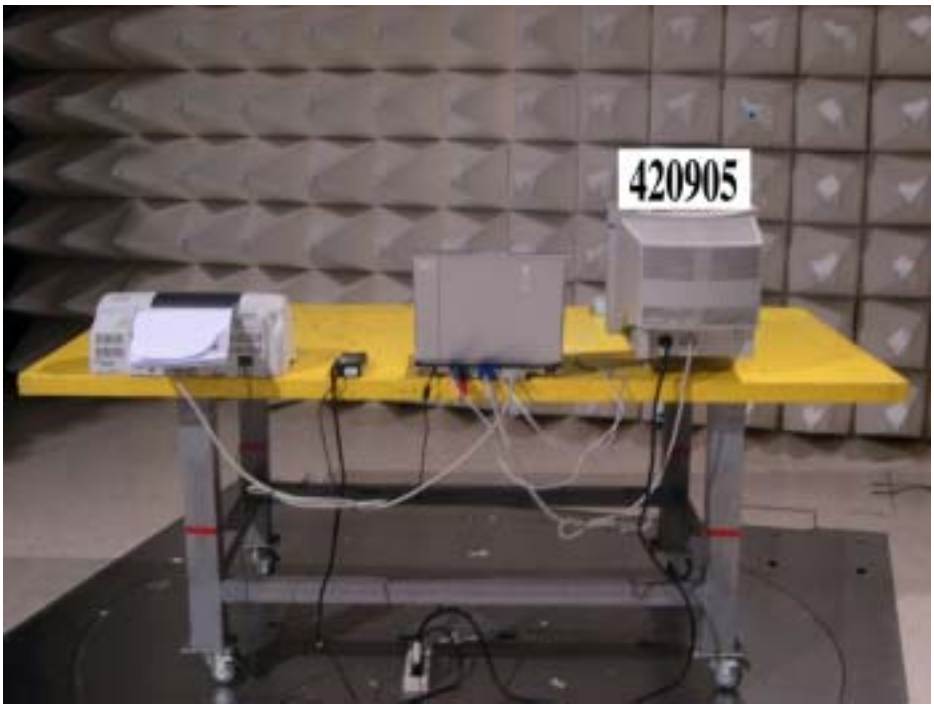
5.6.5. Photographs of Radiated Emission Test Configuration

- The photographs show the configuration that generates the maximum emission.

FRONT VIEW



REAR VIEW



5.7. Band Edges Measurement

5.7.1. Measuring Instruments：

As described in chapter 7 of this test report.

5.7.2. Test Procedure：

1. The transmitter output was connected to the spectrum analyzer via a low lose cable.
2. Set both RBW and VBW of spectrum analyzer to 100KHz with convenient frequency span including 100 KHz bandwidth from band edge.
3. The band edges was measured and recorded.

5.7.3. Test Result：

- Test Result in lower band (Channel 1) ： PASS
- Test Result in higher band(Channel 11)： PASS

5.7.4. Note on Band edge Emission

The band edge emission plot on appendix B page B7. shows 55.12dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

CH	The emission of carrier power strength (dB μ V/m)	The maximum field strength in restrict band (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
01	98.09	42.97	54.00	-11.03	Average

The band edge emission plot on appendix B page B8. shows 52.74dB delta between carrier maximum power and local maximum emission in the restricted band (2.4835GHz).

CH	The emission of carrier power strength (dB μ V/m)	The maximum field strength in restrict band (dB μ V/m)	Limit (dB μ V/m)	Margin (dB)	Result
11	96.03	43.29	54.00	-10.71	Average

＊The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.

5.8. Antenna Requirements

The EUT use a undetachable Chip antenna on PCB board external connector. It is considered meet antenna requirement of FCC.

5.8.1. Standard Applicable

For intentional device, according to FCC 47 CFR Section 15.203, an intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

5.8.2. Antenna Connected Construction

The maximum Gain antenna used in this product is Dipole antenna. On PCB board, with UFL antenna connector.

5.9. RF Exposure

FCC Rules and Regulations Part 1.1307,1.1310,2.1091,2.1093:

RF Exposure Compliance

5.9.1. Limit For Maximum Permissible Exposure (MPE)

(A) Limits for Occupational / Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/ cm2)	Averaging Time |E|2,|H|2 or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842/f	4.89/f	(900/f)*	6
30-300	61.4	0.163	1.0	6
300-1500			F/300	6
1500-100,000			5	6

(B) Limits for General Population / Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm2)	Averaging Time |E|2,|H|2 or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	30
30-300	27.5	0.073	0.2	30
300-1500			F/1500	30
1500-100,000			1.0	30

F=frequency in MHz *Plane-wave equivalent power density

5.9.2. MPE Calculations

$$\text{E (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: Pd (mW/cm}^2\text{)} = \frac{E^2}{377}$$

E＝Electric field (V/m)

P＝Peak output power (mW)

G＝Antenna numeric gain (numeric)

d＝Separation distance (m)

Because the EUT is belong to General Population/ Uncontrolled Exposure. So the Limit of Power Density is 1.0 mW/m^2. We can change the formula to:

$$d = \sqrt{\frac{30 \times P \times G}{377}}$$

Channel No.	Antenna Gain (dBi)	Antenna Gain (numeric)	Peak Output Power (dBm)	Peak Output Power (mW)	Calculated RF Exposure Separation Distance (cm)	Minimum RF Exposure Separation Distance (cm)
Channel 01	2.00	1.58	11.36	13.68	1.53	20
Channel 06	2.00	1.58	10.87	12.22	1.47	20
Channel 11	2.00	1.58	09.36	08.63	1.43	20

5.9.3. FCC Radiation Exposure Statement

This equipment complies with FCC radiation exposure limits set forth for an uncontrolled environment. In order to avoid the possibility of exceeding the FCC radio frequency exposure limits, human proximity to the antenna shall not be less than 20cm (8 inches) during normal operation. Proposed RF exposure safety information to include in User's Manual.

6. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)	Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	14.47	0.92	1000	22.23	3.92
35	13.08	1.05	2000	27.40	5.66
40	11.70	1.08	3000	30.00	7.20
45	10.64	1.15	4000	32.60	9.36
50	10.14	1.29	5000	33.40	9.16
55	10.21	1.63	6000	34.20	10.70
60	10.21	1.30	7000	35.30	12.16
65	9.35	1.36	8000	36.90	13.12
70	8.91	1.43	9000	38.10	13.81
75	9.12	1.48	10000	39.00	14.83
80	9.50	1.53	11000	38.60	15.83
85	9.71	1.61	12000	39.50	17.11
90	9.30	1.69	13000	39.30	17.62
95	9.36	1.67	14000	41.60	18.37
100	9.80	1.76	15000	40.60	19.10
110	10.44	1.80	16000	37.20	19.72
120	10.58	1.90	17000	40.20	21.98
130	11.37	1.61	18000	48.90	21.22
140	11.74	2.14	19000	37.60	23.90
150	12.38	2.16	20000	37.30	24.07
160	12.68	2.16	21000	37.00	25.49
170	13.26	1.99	22000	38.00	24.92
180	13.56	2.39	23000	38.70	25.60
190	14.57	2.38	24000	38.60	25.70
200	14.80	2.46	25000	38.90	26.54
200	15.39	2.46			
220	14.08	2.59			
240	12.85	2.68			
260	12.46	2.91			
280	12.91	2.92			
300	13.21	2.99			
320	14.37	3.03			
340	15.31	3.22			
360	15.23	3.28			
380	15.39	3.80			
400	15.79	3.80			
450	16.52	3.69			
500	17.35	3.93			
550	17.77	3.56			
600	19.00	4.15			
650	18.78	4.58			
700	19.80	4.73			
750	20.01	4.71			
800	20.38	4.99			
850	20.86	5.24			
900	21.08	5.38			
950	21.83	5.57			

7. 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. 12, 2003	Conduction (CO01-HY)
LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 29, 2003	Conduction (CO01-HY)
LISN (Support Unit)	MessTec	NNB-2/16Z	2001-009	9 KHz – 30 MHz	Apr. 29, 2003	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	Dec. 24, 2003	Conduction (CO01-HY)
50 ohm BNC type Terminal	NOBLE	50ohm	TM009	50 ohm	Apr. 24, 2003	Conduction (CO01-HY)
3m Semi Anechoic Chamber	SIDT FRANKONIA	SAC-3M	03CH03-HY	30MHz~1GHz 3m	Jun. 21, 2003	Radiation (03CH03-HY)
Spectrum analyzer	R&S	FSP40	100004	9KHZ~40GHz	Aug. 23, 2003	Radiation (03CH03-HY)
Amplifier	MITEQ	AFS44	879981	100MHz~26.5GHz	Jul. 23, 2003	Radiation (03CH03-HY)
Biconical Antenna	SCHWARZBECK	VHBB 9124	301	30MHz –200MHz	Jul. 24, 2003	Radiation (03CH03-HY)
Log Antenna	SCHWARZBECK	VUSLP 9111	221	200MHz -1GHz	Jul. 24, 2003	Radiation (03CH03-HY)
RF Cable-R03m	Jye Bao	RG142	CB021	30MHz~1GHz	Dec. 03, 2003	Radiation (03CH03-HY)
RF Cable-HIGH	Jye Bao	RG142	CB030-HIGH	1GHz~26.5GHz	Dec. 05, 2003	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)
Power meter	R&S	NRVS	100444	DC~40GHz	May 28, 2003	Conducted
Power sensor	R&S	NRV-Z55	100049	DC~40GHz	May 28, 2003	Conducted
Power Sensor	R&S	NRV-Z32	100057	30MHz-6GHz	May 28, 2003	Conducted
AC power source	HPC	HPA-500W	HPA-9100024	AC 0~300V	May 27, 2003	Conducted
Temp. and Humidity	KSON	THS-C3L	612	N/A	Oct. 01, 2003	Conducted
Power meter	R&S	NRVS	100444	DC~40GHz	May 28, 2003	Conducted

※ Calibration Interval of instruments listed above is one year.

8. 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

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