

FCC TEST REPORT

for

47 CFR, Part 15, Subpart C

Equipment : Easy Presentation Station

Model No. : EPS11

FCC ID : MXF-PS910815

Filing Type : Certification

Applicant : **GemTek Technology Co., Ltd.**
No. 1, Jan Ai Road, Hsinchu Industrial Park, Hukou,
Hsinchu, Taiwan, R.O.C.

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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: Sep. 10, 2002

| No additional attachment.

? Additional attachment were issued as following record:

Attachment No.	Issue Date	Description

CERTIFICATE OF COMPLIANCE

for

47 CFR, Part 15, Subpart C

Equipment : Easy Presentation Station

Model No. : EPS11

FCC ID : MXF-PS910815

Applicant : **GemTek Technology Co., Ltd.**
No. 1, Jan Ai Road, Hsinchu Industrial Park, Hukou, Hsinchu,
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 - 1992** and the equipment under test was **passed** all test items required in FCC Part 15 subpart C, relative to the equipment under test. Testing was carried out on Aug. 28, 2002 at **SPORTON International Inc.** LAB.

K. J. Lin Mar. 08, 2003

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

GemTek Technology Co., Ltd.

No. 1, Jan Ai Road, Hsinchu Industrial Park, Hukou, Hsinchu, Taiwan, R.O.C.

1.2. Manufacturer

Same as 1.1.

1.3. Basic Description of Equipment under Test

Equipment	: Easy Presentation Station
Model No.	: EPS11
FCC ID	: MXF-PS910815
Trade Name	: Gem Tek
Power Supply Type	: Switching
AC Power Cord	: Wall-mount, 2 pin
DC Power Cable	: Non-Shielded, 2m, 2 pin

1.4. Feature of Equipment under Test

Items	Contents
1. Modulation type	DSSS
2. How to move out the modulation	Software Control
3. Number of channels	Default: 11,
4. Carrier frequency of each channel	2412, 2417, 2422, 2427, 2432, 2437, 2442, 2447, 2452, 2457, 2462,
5. Bandwidth of each channel	5 MHz
6. IF & L.O. frequency	IF=374 MHz, L.O.=2038.2098 MHz
7. Transmitter or Transceiver	Transceiver
8. Power Rating (DC or AC, Volt)	5V/1000mA
9. Maximum output power to Antenna	15 dBm
10. Duty Cycle	100%
11. Basic function of product	802.11b Wireless LAN
12. Operation Temperature	0.55.
13. Antenna Type	Dipole Antenna
14. Antenna Gain	2dBi
15. Adapter	LINKSYS / MS15-050250 -A10

2. Test Configuration of Equipment under Test

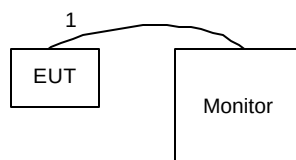
2.1. Test Manner

- 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. The complete test system included HITACHI Monitor and EUT for EMI test.
- c. The EUT can operate on eleven channels from 2412.0MHz to 2462.0MHz. (as listed in section 1.4). According to 15.31(m), three channels (one near top, one near middle and one near bottom) were performed as following :
Mode 1: 2412MHz (Channel 1)
Mode 2: 2437MHz (Channel 6)
Mode 3: 2462MHz (Channel 11)
- d. Frequency range investigated: conduction 450 KHz to 30 MHz, radiation 30 MHz to 24.83GHz.

2.2. Description of Test System

Support Unit 1. -- Monitor (HITACHI)

FCC ID	: N/A
Model No.	: CM823F
Power Supply Type	: Switching
Power Cord	: Non-Shielded
Serial No.	: SP0180
Data Cable	: Shielded, 1.15m
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 EUT to the support unit 1.

3. Operation of Equipment under Test

During testing, the software provided by the applicant enable the EUT under transmission condition continuously.

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, Tao Yuan Hsien, Taiwan, R.O.C.
TEL : 886-3-3273456
FAX : 886-3-3180055
Test Site No. : CH01, SH04

4.2. Standard for Methods of Measurement

ANSI C63.4-1992

4.3. Test in Compliance with

FCC Part 15, Subpart C

4.4. Frequency Range Investigated

- a. Conduction: from 450 kHz to 30 MHz
- b. Radiation : from 30 MHz to 24.83GHz

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
<u>15.247(a)(2)</u>	6dB Bandwidth	Pass
<u>15.247(b)</u>	Maximum Peak Output Power	Pass
15.209	Radiated Emission	Pass
15.247(c)	100kHz Bandwidth of Frequency B and Edges	Pass
<u>15.247(d)</u>	Power Spectral Density	Pass
<u>15.203</u>	Antenna Requirement	Pass
1.1307 1.1310 2.1091 2.1093	RF Exposure Compliance	Pass

5.2. 6dB Bandwidth

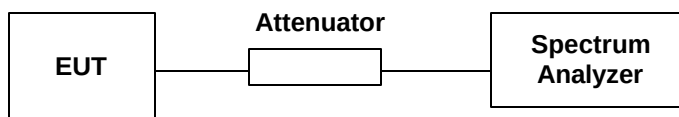
5.2.1. Measuring Instruments.

As described in chapter 6 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.

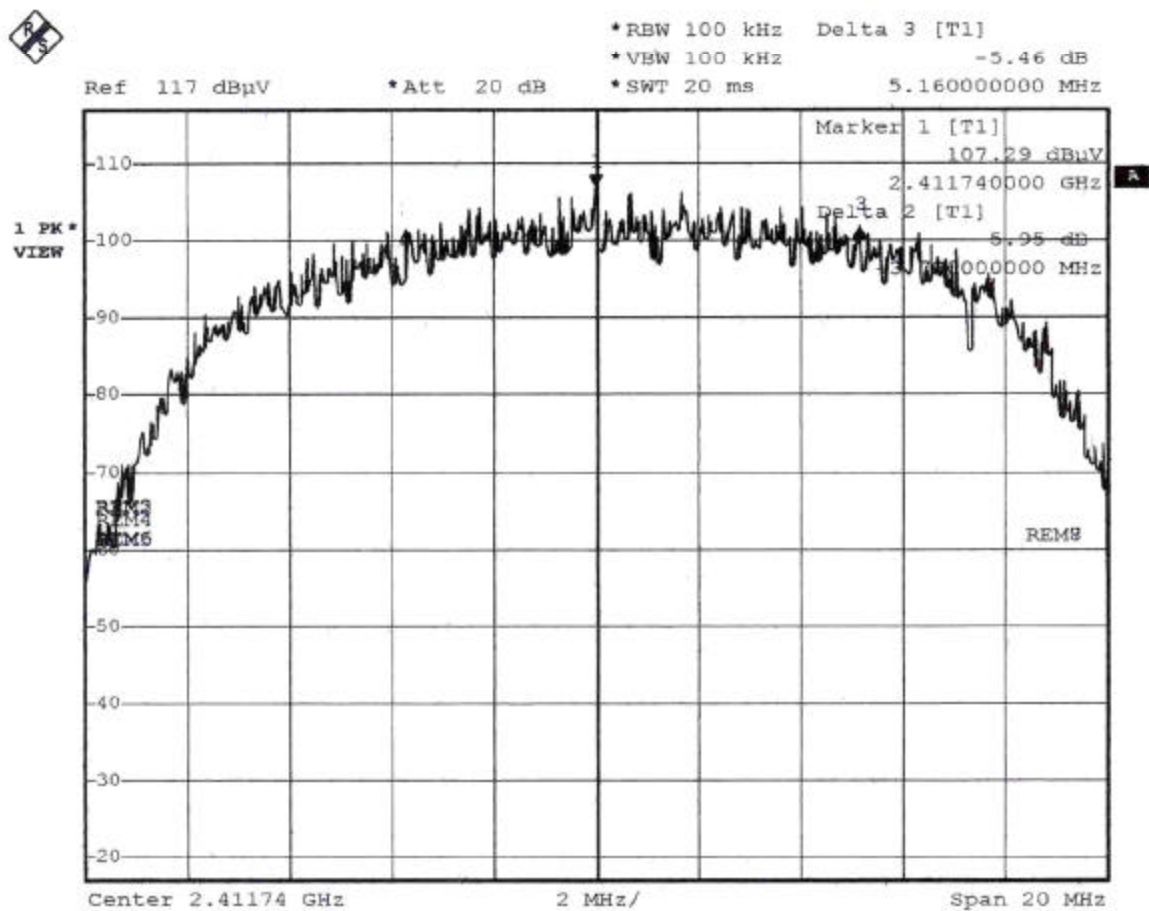


5.2.4. Test Result. The spectrum analyzer plots are attached as below

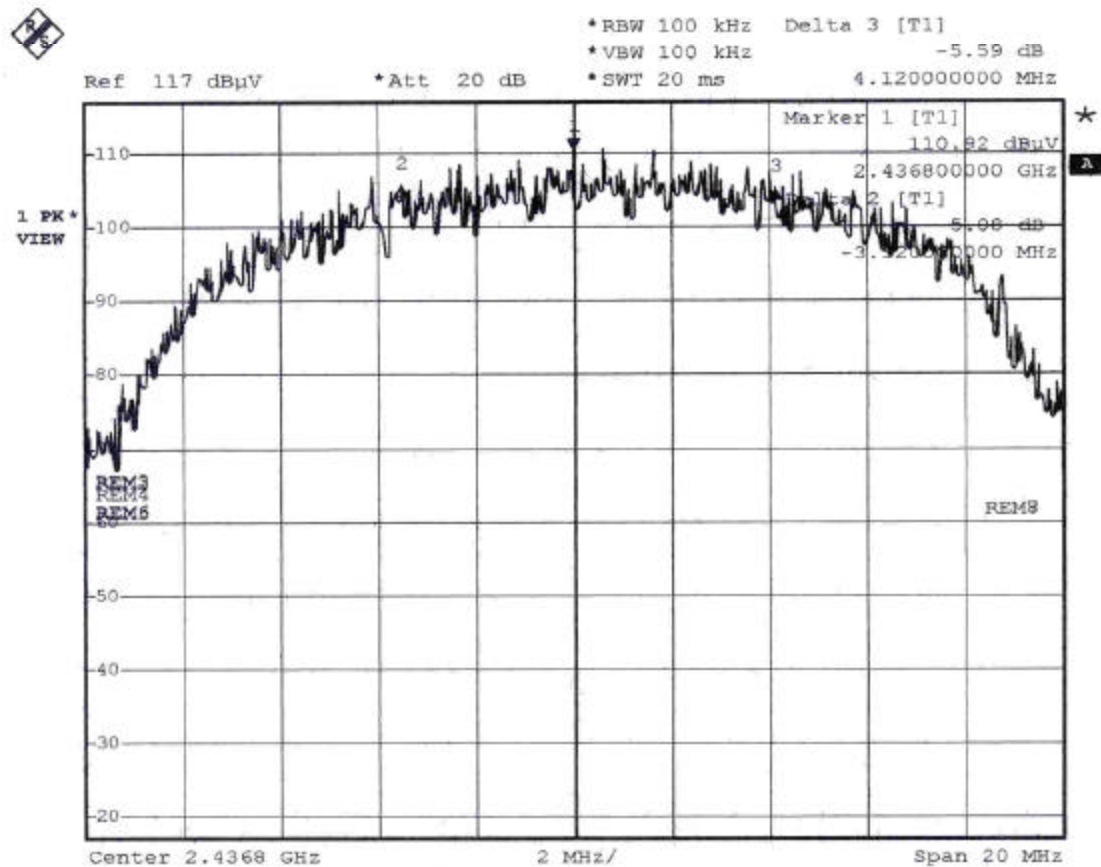
- Temperature : 25°C
- Relative Humidity : 54 %

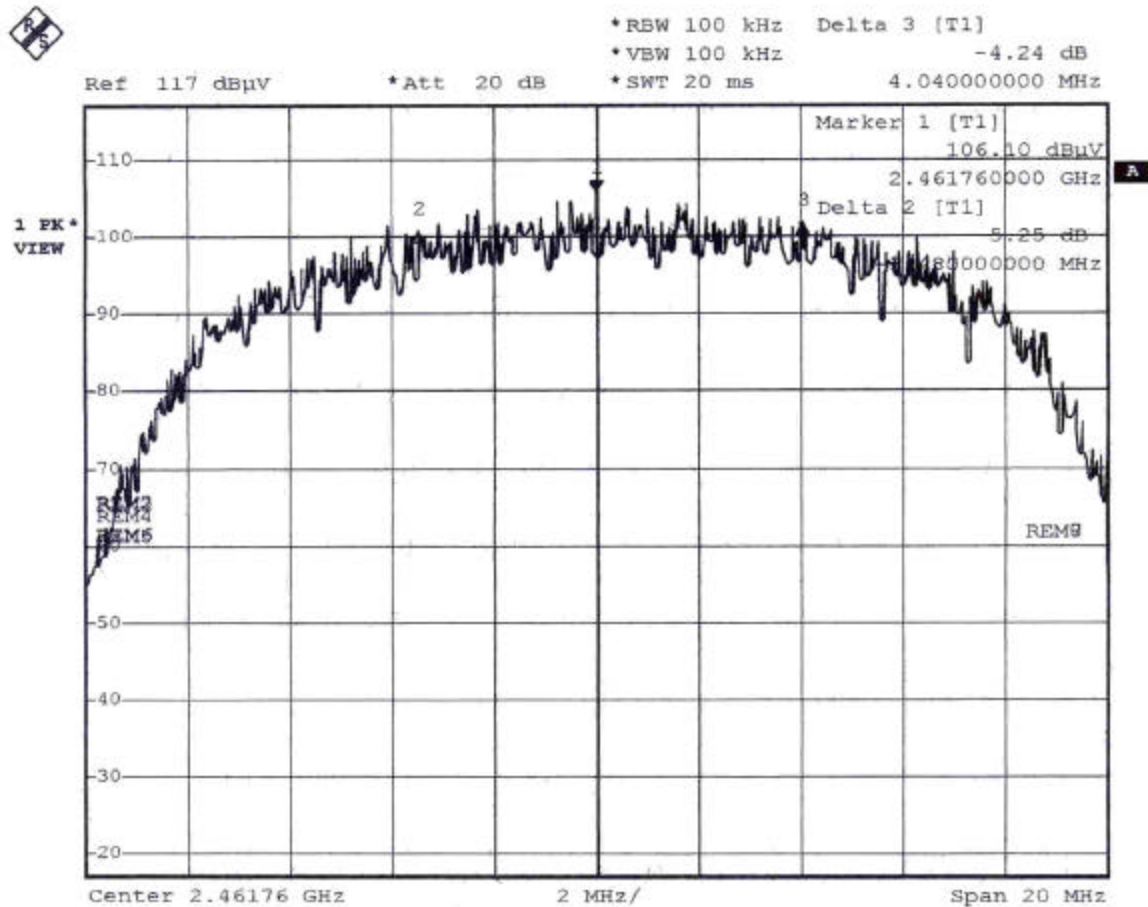
Channel	Frequency (MHz)	6dB Emission bandwidth (MHz)	Limits (MHz)	Plot Ref. No.
1	2412	8.950	0.5	1
6	2437	7.440	0.5	2
11	2462	7.520	0.5	3

Plot1(Channel 1).



Plot2(Channel 6).





5.3. Peak Output Power

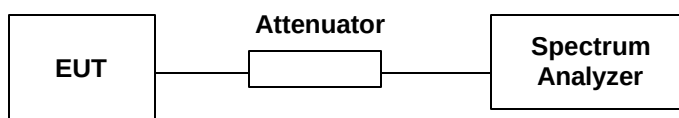
5.3.1. Measuring Instruments.

As described in chapter 6 of this test report.

5.3.2. Test Procedure.

1. The transmitter output was connected to the spectrum analyzer through an attenuator.
2. The center of the spectrum analyzer is set to the fundamental frequency and using 3 MHz RBW and 3MHz VBW.
3. The span of the spectrum analyzer should be larger than 6dB bandwidth plug 10MHz.
4. Use Peak Search after Maximum Hold function is activated.
5. Shift the marker to +/- 3MHz and +/- 6MHz, and record the reading.
6. The Maximum Peak Output Power is the linear summation of the 5 reading in (4) and (5).

5.3.3. Test Setup Layout.



5.3.4. Test Result. See spectrum analyzer plots below

- Temperature : 25°C
- Relative Humidity : 54 %
- Antenna Gain: 2 dBi

Channel	Frequency (MHz)	Measured Output Power (mWatt)	Measured Output Power (dBm)	Limits (Watt/dBm)
1	2412	34.91	15.43	1W/30 dBm
6	2437	29.65	14.72	1W/30 dBm
11	2462	29.44	14.69	1W/30 dBm

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

5.4. Power Spectral Density

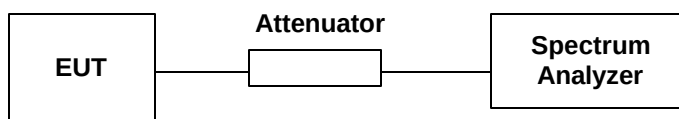
5.4.1. Measuring Instruments.

As described in chapter 6 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.

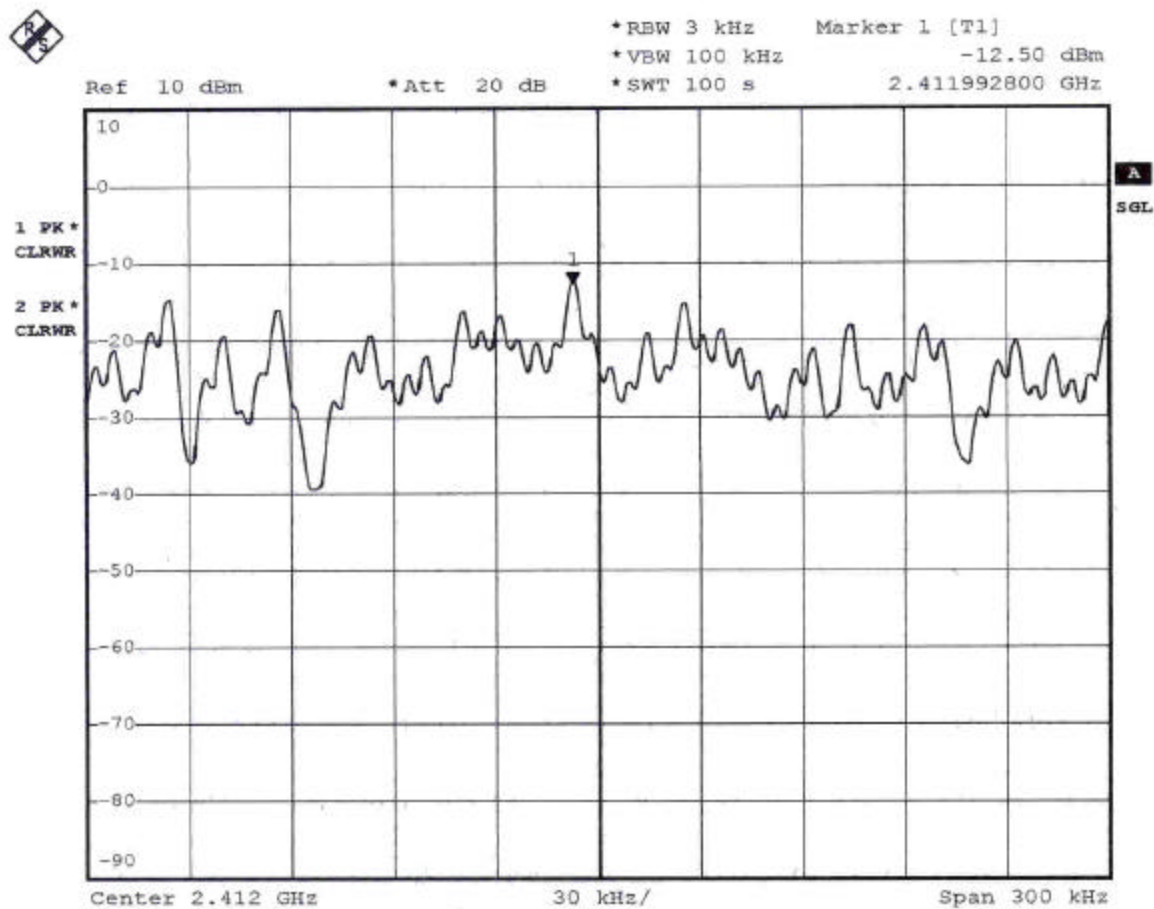


5.4.4. Test Result. See spectrum analyzer plots below

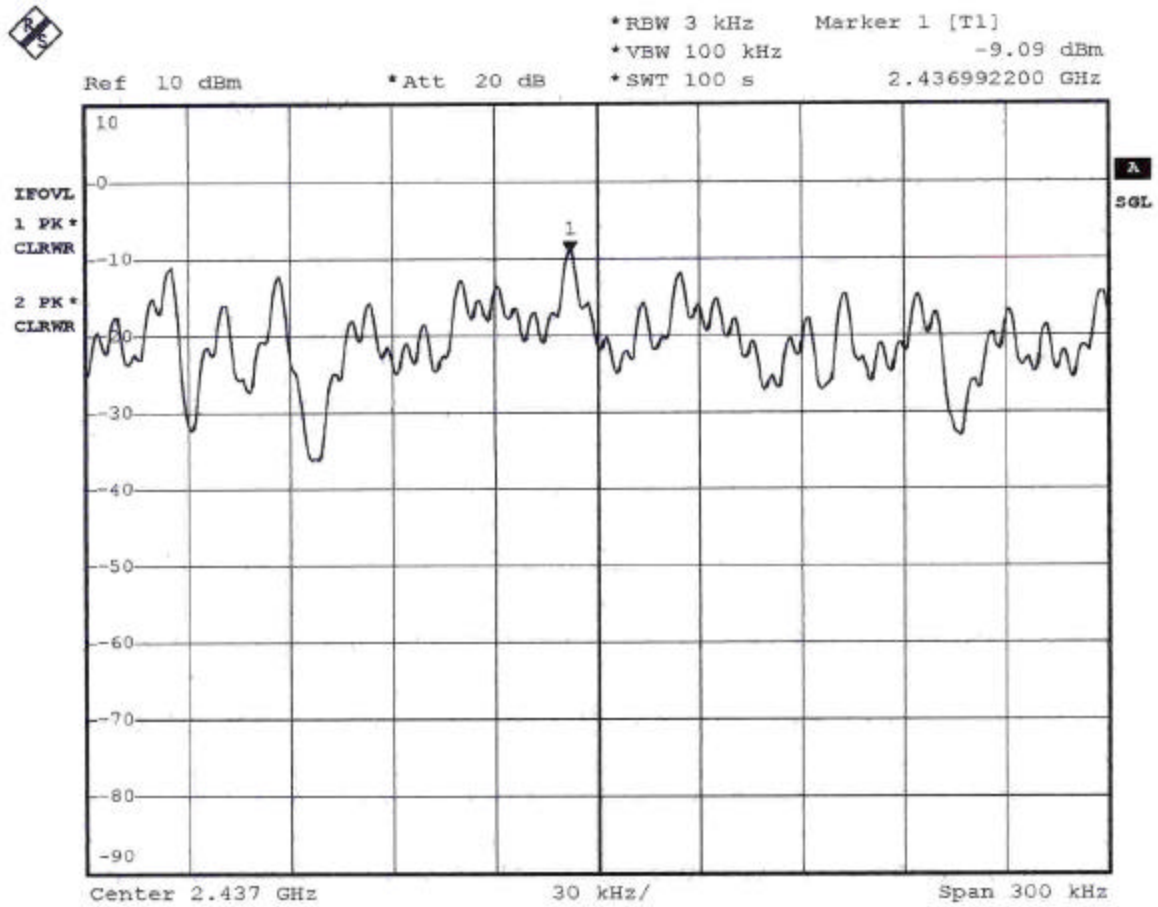
- Temperature : 25°C
- Relative Humidity : 54 %

Channel	Frequency (MHz)	Power Spectral Density (dBm)	Limits (dBm)	Plot Ref. No.
1	2412	-12.50	8	1
6	2437	-9.09	8	2
11	2462	-14.37	8	3

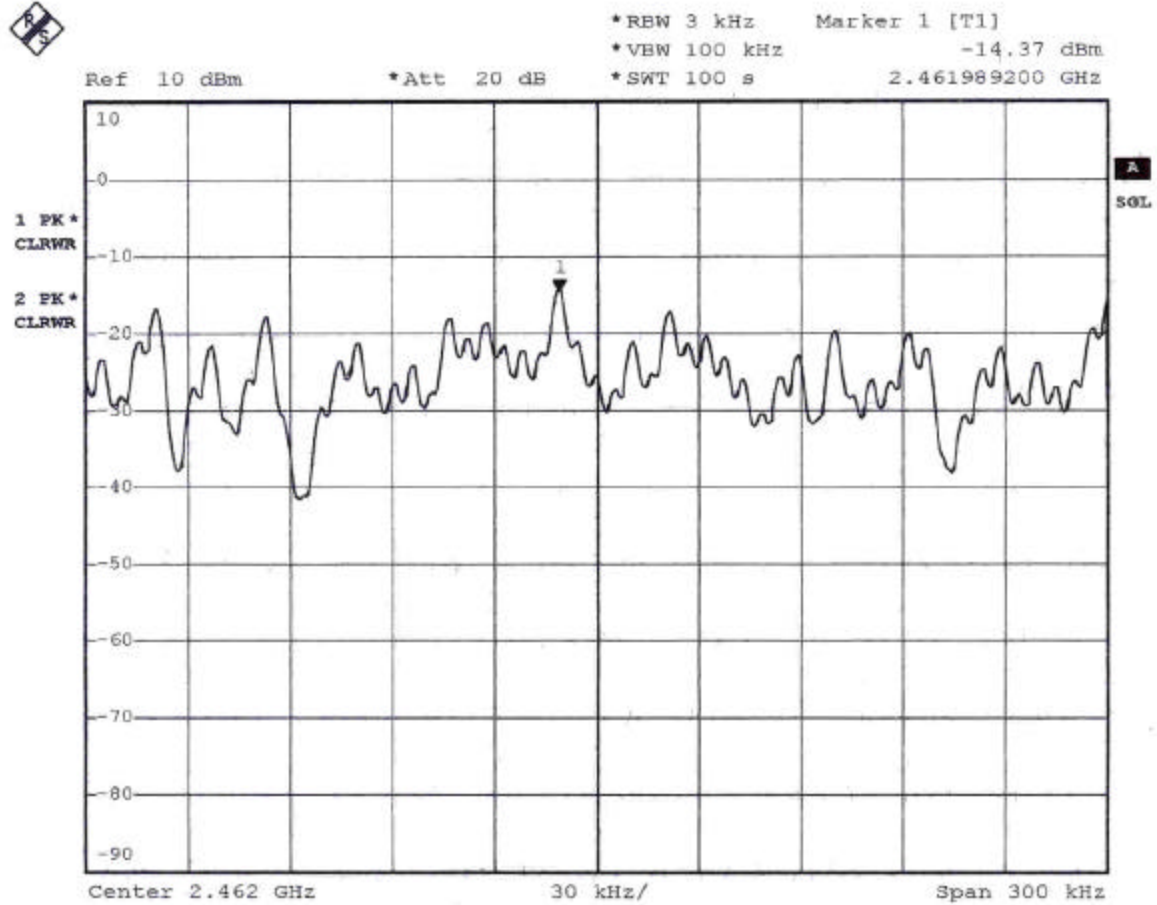
Plot1(Channel 1):



Plot2(Channel 6):



Plot3(Channel 11):



Comments : Maximum Power Spectral Density < 8dBm

5.5. Test of Conducted Emission

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. 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	(RAHDE&SCHEARZESCS 30)
Attenuation	10 dB
Start Frequency	0.45 MHz
Stop Frequency	30 MHz
IF Bandwidth	9 KHz – 2750 MHz

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 450 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 0.45 MHz to 30 MHz

6dB Bandwidth : 10KHz

- Test Mode : Mode 1
- Temperature : 30°C
- Relative Humidity : 53 %
- Test Date: Aug. 23, 2002

The Conducted Emission test was passed at minimum margin LINE 2.286 MHz / 38.62 dBuV .

Frequency (MHz)	Line / Neutral	Meter Reading		Limits		Margin (dB)
		(dBuV)	(uV)	(dBuV)	(uV)	
0.476	L	35.19	57.48	48.00	251.19	-12.81
0.594	L	37.70	76.74	48.00	251.19	-10.30
1.290	L	37.71	76.82	48.00	251.19	-10.29
1.441	L	38.57	84.82	48.00	251.19	-9.43
2.286	L	38.62	85.31	48.00	251.19	-9.38
2.781	L	37.78	77.45	48.00	251.19	-10.22
0.478	N	36.39	65.99	48.00	251.19	-11.61
0.597	N	38.06	79.98	48.00	251.19	-9.94
0.764	N	37.27	73.03	48.00	251.19	-10.73
0.993	N	36.07	63.61	48.00	251.19	-11.93
1.491	N	35.75	61.31	48.00	251.19	-12.25
2.290	N	37.38	73.96	48.00	251.19	-10.62

Test Engineer : 

Joke Yang

- Test Mode : Mode 2
- Temperature : 30°C
- Relative Humidity : 53 %
- Test Date: Aug. 23, 2002

The Conducted Emission test was passed at minimum margin NEUTRAL 0.561 MHz / 40.6 dBuV.

Frequency (MHz)	Line / Neutral	Meter Reading		Limits		Margin (dB)
		(dBuV)	(uV)	(dBuV)	(uV)	
0.554	L	38.69	86.00	48.00	251.19	-9.31
0.738	L	38.86	87.70	48.00	251.19	-9.14
0.893	L	39.10	90.16	48.00	251.19	-8.90
1.218	L	37.75	77.18	48.00	251.19	-10.25
2.497	L	39.35	92.79	48.00	251.19	-8.65
4.476	L	33.65	48.14	48.00	251.19	-14.35
0.561	N	40.60	107.15	48.00	251.19	-7.40
0.764	N	37.29	73.20	48.00	251.19	-10.71
0.937	N	39.11	90.26	48.00	251.19	-8.89
1.345	N	39.20	91.20	48.00	251.19	-8.80
2.236	N	33.76	48.75	48.00	251.19	-14.24
4.568	N	34.76	54.70	48.00	251.19	-13.24

Test Engineer : 

Joke Yang

- Test Mode : Mode 3
- Temperature : 30°C
- Relative Humidity : 53 %
- Test Date: Aug. 23, 2002

The Conducted Emission test was passed at minimum margin NEUTRAL 2.271 MHz / 40.05 dBuV .

Frequency (MHz)	Line / Neutral	Meter Reading		Limits		Margin (dB)
		(dBuV)	(uV)	(dBuV)	(uV)	
0.470	L	36.33	65.54	48.00	251.19	-11.67
0.562	L	36.54	67.14	48.00	251.19	-11.46
1.505	L	34.14	50.93	48.00	251.19	-13.86
1.767	L	37.54	75.34	48.00	251.19	-10.46
2.427	L	39.00	89.13	48.00	251.19	-9.00
4.553	L	33.08	45.08	48.00	251.19	-14.92
0.469	N	38.99	89.02	48.00	251.19	-9.01
0.784	N	40.00	100.00	48.00	251.19	-8.00
1.080	N	39.12	90.36	48.00	251.19	-8.88
2.271	N	40.05	100.58	48.00	251.19	-7.95
2.747	N	37.29	73.20	48.00	251.19	-10.71
4.423	N	32.58	42.56	48.00	251.19	-15.42

Test Engineer : 

Joke Yang

5.6. Test of Radiated Emission

Radiated emissions from 30 MHz to 24.83 GHz were measured 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 4.6 .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

■ from 30MHz to 1GHz

- Amplifier (HP 8447D)
 - Attenuation 10 dB
 - RF Gain 30 dB
 - Signal Input 100 KHz to 1.3 GHz

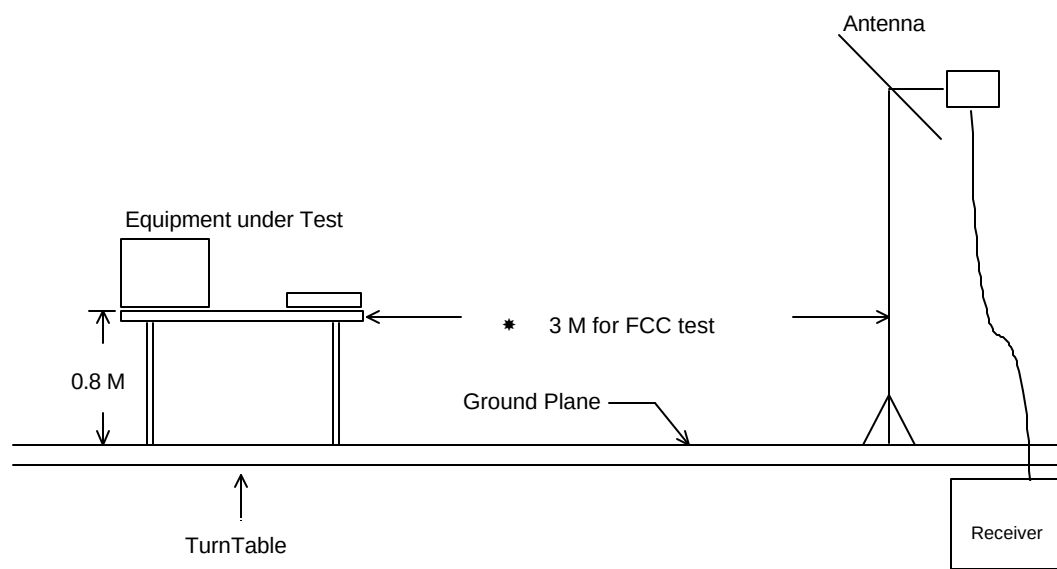
- Spectrum Analyzer (RAHDE&SCHEARZ& FSP)
 - Attenuation 10 dB
 - Start Frequency 30 MHz
 - Stop Frequency 1000 MHz
 - Resolution Bandwidth 120 KHz
 - Signal Input 9 KHz to 7 GHz

■ above 1GHz

● Spectrum Analyzer	(RAHDE&SCHEARZ & FSP)
Attenuation	10 dB
Start Frequency	1000 MHz
Stop Frequency	7000 MHz
Resolution Bandwidth	1 MHz
Signal Input	9 KHz to 7 GHz

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.

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 : 28°C
- Relative Humidity : 57 %
- Test Date : Aug. 28, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin:

VERTICAL 32.700 MHz / 36.59 dBuV/m Antenna Height 1 Meter , Turntable Degree 74 °.

• **Spurious Emission**

Frequency	Antenna	Cable	Reading	Limits	Emission	Level	Margin
Polarity	Factor	Loss					
(MHz)	(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m) (dB)
264.090	H	12.74	2.75	24.68	46.00	199.53	40.17 101.98 -5.83
414.100	H	16.48	3.44	21.56	46.00	199.53	41.48 118.58 -4.52
444.200	H	16.22	3.60	22.51	46.00	199.53	42.33 130.77 -3.67
472.200	H	16.96	3.70	21.25	46.00	199.53	41.91 124.59 -4.09
32.700	V	16.87	0.90	18.82	40.00	100.00	36.59 67.53 -3.41
559.000	V	18.70	3.96	17.87	46.00	199.53	40.53 106.29 -5.47
2036.000	V	31.01	4.76	15.20	74.00	5011.87	50.97 353.59 -23.03
2036.000	V	31.01	4.76	13.95	54.00	501.19	49.72 306.20 -4.28

• Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits	Emission Level		Margin	Detect
	Polarity	Factor	Loss					
(MHz)		(dB/m)	(dB)	(dBuV) (dBuV/m) (uV/m)	(dBuV/m)	(mV/m)	(dB)	Mode
2414.000	H	30.17	5.20	55.35	90.72	34355.79	-	Peak
2414.000	H	30.17	5.20	52.86	88.23	25792.89	-	A.V.
2414.000	V	30.17	5.20	62.64	98.01	79524.33	-	A.V.
2414.000	V	30.17	5.20	66.32	101.69	121478.6	-	Peak
4824.00	H/V				-			Peak, A.V.
7236.00	H/V				-			Peak, A.V.
9648.00	H/V				-			Peak, A.V.
12060.00	H/V				-			Peak, A.V.
14472.00	H/V				-			Peak, A.V.
16884.00	H/V				-			Peak, A.V.
19296.00	H/V				-			Peak, A.V.
21708.00	H/V				-			Peak, A.V.
24120.00	H/V				-			Peak, A.V.

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

Test Engineer :



Wayue Hsu

- Test Mode: Mode 2
- Test Distance : 3 M
- Temperature : 28°C
- Relative Humidity : 57 %
- Test Date : Aug. 28, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin:

VERTICAL 615.700 MHz / 42.74 dBuV/m Antenna Height 3 Meter , Turntable Degree 55 °.

▪ **Spurious Emission**

Frequency	Antenna	Cable	Reading	Limits	Emission	Level	Margin
Polarity	Factor	Loss					
(MHz)	(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m) (dB)
394.500	H	15.55	3.40	21.14	46.00	199.53	40.09 101.04 -5.91
615.700	H	18.90	4.27	18.26	46.00	199.53	41.43 117.90 -4.57
858.600	H	20.30	5.02	15.31	46.00	199.53	40.63 107.52 -5.37
444.200	V	16.22	3.60	21.36	46.00	199.53	41.18 114.55 -4.82
615.700	V	18.90	4.27	19.57	46.00	199.53	42.74 137.09 -3.26
747.300	V	19.86	4.69	16.40	46.00	199.53	40.95 111.56 -5.05
2062.000	V	30.95	4.79	15.27	74.00	5011.87	51.01 355.22 -22.99
2062.000	V	30.95	4.79	14.19	54.00	501.19	49.93 313.69 -4.07

• Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits	Emission Level		Margin	Detect
	Polarity	Factor	Loss					
(MHz)		(dB/m)	(dB)	(dBuV) (dBuV/m) (uV/m)	(dBuV/m)	(mV/m)	(dB)	Mode
2438.000	H	30.11	5.23	59.85	95.19	57477.78	-	Peak
2438.000	H	30.11	5.23	55.79	91.13	36016.38	-	A.V.
2438.000	V	30.11	5.23	68.36	103.70	153108.7	-	A.V.
2438.000	V	30.11	5.23	70.54	105.88	196788.6	-	Peak
4874.00	H/V				-			Peak, A.V.
7311.00	H/V				-			Peak, A.V.
9748.00	H/V				-			Peak, A.V.
12185.00	H/V				-			Peak, A.V.
14622.00	H/V				-			Peak, A.V.
17059.00	H/V				-			Peak, A.V.
19496.00	H/V				-			Peak, A.V.
21933.00	H/V				-			Peak, A.V.
24370.00	H/V				-			Peak, A.V.

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

Test Engineer :



Wayue Hsu

- Test Mode: Mode 3
- Test Distance : 3 M
- Temperature : 28°C
- Relative Humidity : 57 %
- Test Date : Aug. 28, 2002
- Emission level (dBuV/m) = 20 log Emission level (uV/m)
- Corrected Reading : Antenna Factor + Cable Loss + Reading = Emission

The Radiated Emission test was passed at minimum margin:

HORIZONTAL 444.200 MHz / 41.27 dBuV/m Antenna Height 2 Meter , Turntable Degree 65 °.

▪ **Spurious Emission**

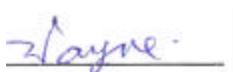
Frequency	Antenna	Cable	Reading	Limits	Emission	Level	Margin
Polarity	Factor	Loss					
(MHz)	(dB/m)	(dB)	(dBuV)	(dBuV/m)	(uV/m)	(dBuV/m)	(uV/m) (dB)
444.200	H	16.22	3.60	21.45	46.00	199.53	41.27 115.74 -4.73
556.900	H	18.67	3.94	17.65	46.00	199.53	40.26 103.04 -5.74
32.700	V	16.87	0.90	16.78	40.00	100.00	34.55 53.39 -5.45
444.200	V	16.22	3.60	21.43	46.00	199.53	41.25 115.48 -4.75
559.000	V	18.70	3.96	17.57	46.00	199.53	40.23 102.68 -5.77
615.700	V	18.90	4.27	17.07	46.00	199.53	40.24 102.80 -5.76
2086.000	V	30.90	4.82	15.59	74.00	5011.87	51.31 367.71 -22.69
2086.000	V	30.90	4.82	9.63	54.00	501.19	45.35 185.14 -8.65

• Field strength of fundamental and harmonics

Frequency	Antenna	Cable	Reading	Limits	Emission Level		Margin	Detect
	Polarity	Factor	Loss					
(MHz)		(dB/m)	(dB)	(dBuV) (dBuV/m) (uV/m)	(dBuV/m)	(mV/m)	(dB)	Mode
2462.000	H	30.06	5.25	43.47	78.78	8689.60	-	A.V.
2462.000	H	30.06	5.25	63.17	98.48	83946.00	-	Peak
2462.000	V	30.06	5.25	65.41	100.72	108642.5	-	Peak
2462.000	V	30.06	5.25	56.45	91.76	38725.76	-	A.V.
4924.00	H/V				-			Peak, A.V.
7386.00	H/V				-			Peak, A.V.
9848.00	H/V				-			Peak, A.V.
12310.00	H/V				-			Peak, A.V.
14772.00	H/V				-			Peak, A.V.
17234.00	H/V				-			Peak, A.V.
19696.00	H/V				-			Peak, A.V.
22158.00	H/V				-			Peak, A.V.
24620.00	H/V				-			Peak, A.V.

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

Test Engineer :



Wayue Hsu

5.7. Band Edges Measurement

5.7.1. Measuring Instruments.

As described in chapter 6 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

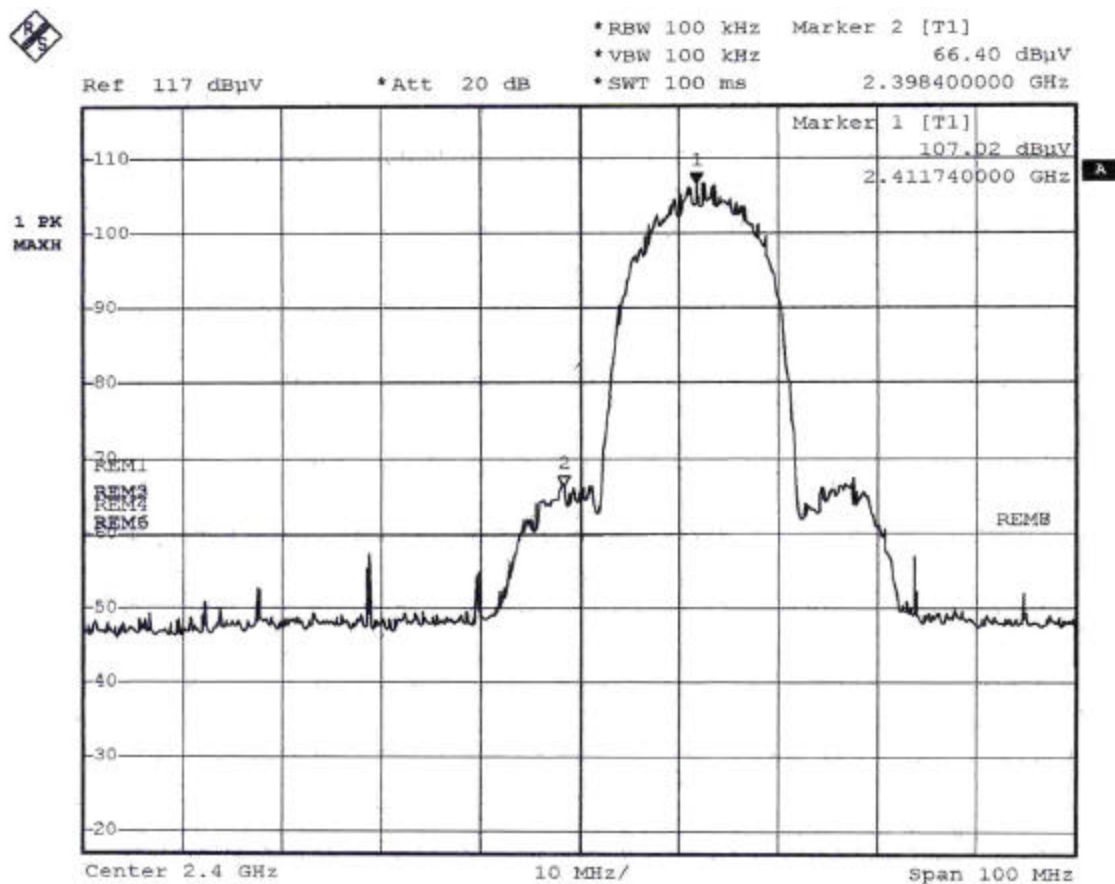
The band edge emission plot on page 36. shows 54.56dB dela between carrier maximum power and local maximum emission in the restricted band (2.4837GHz).

Polarity	The emission of carrier power strength (dBμV/m)	The maximum field strength in restrict band (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Result
V	91.76	41.30	54	-12.70	Pass
H	78.78	28.32	54	-25.68	Pass

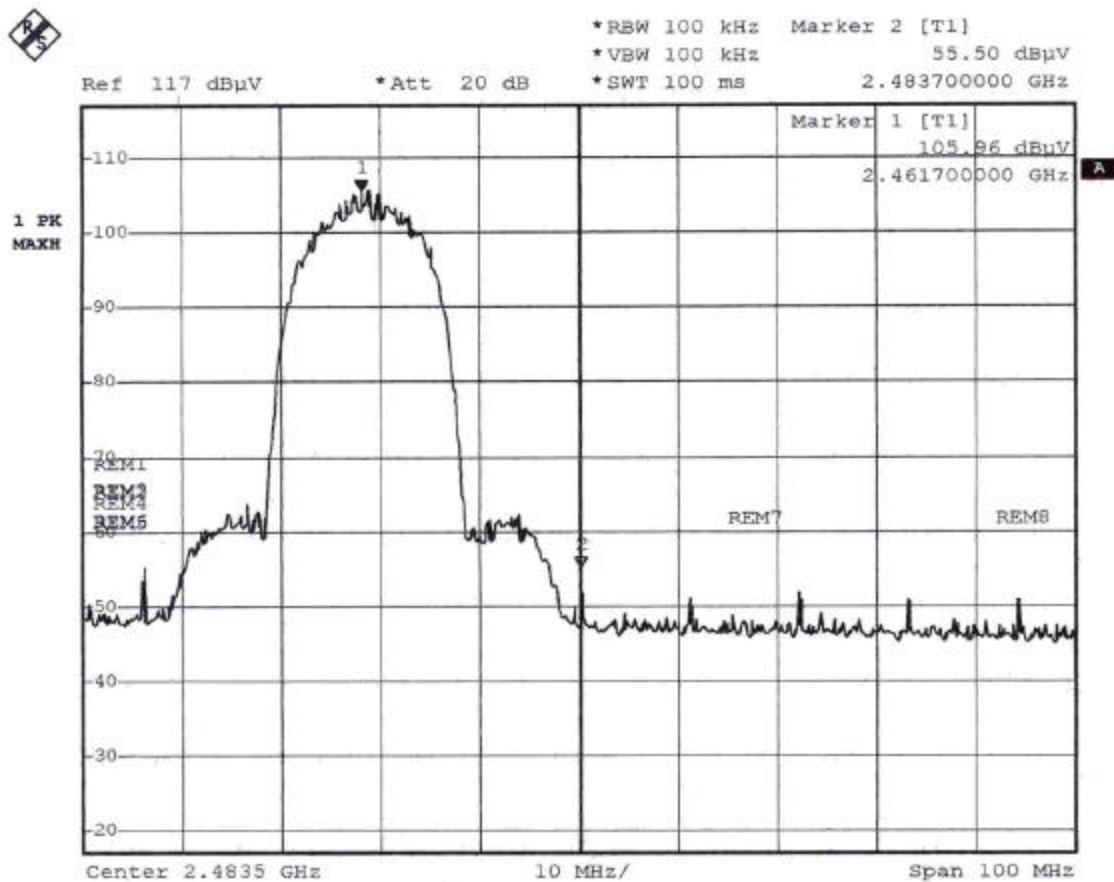
* The maximum field strength in restricted band is the emission of carrier power strength subtract to the delta between carrier maximum power and local maximum emission in the restricted band.

The spectrum analyzer plots are attached as below:

Plot1 (Channel 1):



Plot2 (Channel 11):



Comments: All emissions in any 100kHz bandwidth outside the band edge are attenuated more than 20dB from the carrier.

5.8. Antenna Requirements

5.8.1. Antenna Connected Construction

The EUT use a permanently undetachable antenna. It is considered meet antenna requirement of FCC.

The antenna used in this product is a dipole antenna.

5.8.2. 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.

5.9. 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/cm ²)	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/cm ²)	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

$$E \text{ (V/m)} = \frac{\sqrt{30 \cdot P \cdot G}}{d} \quad \text{Power Density: } P_d \text{ (mW/cm}^2\text{)} = \frac{E^2}{3770}$$

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/cm². We can change the formula to:

$$d = \sqrt{\frac{30 \cdot P \cdot G}{3770}}$$

Channel No.	Gain (dBi)	Gain Numeric	Peak Output Power (mW)	Calculated RF Exposure Separation Distance (cm)	Minimum RF Exposure Separation Distance (cm)
Channel 1	2	1.58	10.07	0.36	20
Channel 6	2	1.58	9.84	0.35	20
Channel 11	2	1.58	8.83	0.33	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. EMI Suppression Component List

1. A core is added on DC power cable.
(As the Internal photo No.10)

7. Antenna Factor & Cable Loss

Frequency (MHz)	Antenna Factor (dB)	Cable Loss (dB)
30	18.10	0.90
35	16.00	0.90
40	13.19	1.09
45	10.57	1.10
50	8.00	1.21
55	6.30	1.30
60	5.30	1.30
65	4.95	1.40
70	5.19	1.40
75	6.05	1.49
80	6.86	1.50
85	7.94	1.60
90	8.60	1.60
95	9.70	1.60
100	10.26	1.69
110	11.19	1.70
120	11.60	1.81
130	11.42	1.90
140	10.92	1.99
150	10.20	2.00
160	9.20	2.11
170	9.00	2.20
180	8.60	2.29
190	8.70	2.30
200	8.10	2.40
220	8.86	2.51
240	10.70	2.60
260	13.10	2.71
280	12.50	2.80
300	13.00	2.90
320	13.51	3.00
340	13.90	3.10
360	14.43	3.30
380	14.79	3.30
400	15.80	3.40
450	16.37	3.59
500	17.40	3.80
550	18.57	3.90
600	18.50	4.20
650	18.93	4.40
700	19.03	4.40
750	19.84	4.71
800	19.82	4.90
850	20.30	5.00
900	20.32	5.11
950	20.82	5.60
1000	21.20	5.50

8. List of Measuring Equipments Used

Reference Number	Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date
1	Bi-Log periodic Antenna	Schaffner	CBL6112B	2445	30MHz~1GHz	2002/2/8
2	Horn Antenna	Com-Power	AH-118	10091	1GHz~18GHz	2002/2/7
3	Preamplifier	MITEQ	Nsp2650-NF	805858	0.1~26.5GHz	2001/7/9
4	Test Receiver	R&S	esvp	893610/003	20~1300MHz	2001/5/4
5	Spectrum Analyzer	R&S	FSP30	100023	9KHz~30GHz	2002/4/2
6	Spectrum Analyzer	HP	8560E	3728A03185	30Hz~2.9GHz	2001/9/3
7	Multi-Device Controller	EMCO	2090	-	-	N/A
8	Turn Table	HD	DS630	-	-	N/A
9	Antenna Mast(site 4)	HD	MA240	-	-	N/A
10	RF Cable	Jyebao	L142 Cable	-	-	N/A
11	Attenuator	Jyebao	3A-3dB	-	3dB	N/A
12	L.I.S.N.	Mess Tec	Nnb-2/16Z	98087	-	2001/12/17
13	L.I.S.N.	Mess Tec	Nnb-2/16Z	98009	-	2001/12/17
14	EMC Receiver	RAHDE & SCHEARZ	ESCS 30	836858/024	9 KHz	Dec. 11, 2001
15	LISN	MessTec	NNB-2/16Z	2001-008	9 KHz – 30 MHz	Apr. 30, 2002
16	LISN (Support Unit)	MessTec	NNB-2/16Z	2001-009	9 KHz – 30 MHz	Apr. 30, 2002
17	EMI Filter	LINDGREN	LRE-2060	1004	< 450 Hz	N/A
18	EMI Filter	LINDGREN	N6006	201052	0 ~ 60 Hz	N/A
19	Spectrum Analyzer	RAHDE & SCHEARZ	FSP	838858/037	9KHz – 7GHz	Jan. 08, 2002
20	Amplifier	HP	8447D	2944A09072	100KHz – 1.3GHz	Sep. 26, 2001
21	Bilog Antenna	SCHAFFNER	CBL6112B	2687	30MHz – 2GHz	Dec. 23, 2001
22	Turn Table	HD	DS 420	420/650/00	0 ~ 360 degree	N/A
23	Antenna Mast	HD	MA 240	240/560/00	1 m - 4 m	N/A
24	Spectrum analyzer	R&S	FSP30	100024	9KHZ~30GHZ	Apr. 02, 2002
25	Horn Antenna	COM-POWER	AH-118	10094	1GHz – 18GHz	Apr. 09, 2002

? Calibration Interval of instruments listed above is one year.

9. 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 $\Gamma_1=0.09$ Antenna VSWR $\Gamma_2=0.67$ Uncertainty= $20\log(1-\Gamma_1*\Gamma_2)$	U-shaped	±0.54
combined standard uncertainty $U_e(y)$	normal	±2.7
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	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 $\Gamma_1=0.09$ LISN VSWR $\Gamma_2=0.33$ Uncertainty= $20\log(1-\Gamma_1*\Gamma_2)$	U-shaped	0.2
combined standard uncertainty $U_e(y)$	normal	±1.66
Measuring uncertainty for a level of confidence of 95% $U=2U_e(y)$	normal (k=2)	±3.32

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