# Test Report
# for
# FCC Part 15 Subpart B & C

*of*

*Product Name*

## Wireless 802.11g MiniPCI Card

*Model*

## WM1260
## (Brand: CastleNet)

*Applied by:*

CastleNet Technology Inc.
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Chung-Ho City ,Taip
Taiwan R. O. C.

*Test Performed by:*

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**Report Number: ISL-04LR034FC** **Issue Date: 2004/12/08**
**HC LAB**:NVLAP:200234-0;VCCI: R-341,C-354;NEMKO:ELA 113a,113c;BSMI:SL2-IN-E-0037;SL2-R1-E-0037;CNLA:1178
**LT LAB**:NVLAP:200234-0;VCCI: R-1435,C-1440;NEMKO:ELA 113b,113d;BSMI:SL2-IN-E-0013;CNLA:0997
ISL-T10-R29-1

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# 1. General

## 1.1 Certification of Accuracy of Test Data

| | |
|---|---|
| **Standards:** | CFR 47 Part 15 Subpart B Class B<br>CFR 47 Part 15 Subpart C (Section 15.247) |
| **Test Procedure:** | ANSI C63.4:2003 |
| **Equipment Tested:** | Wireless 802.11g MiniPCI Card |
| **Model:** | WM1260 |
| **Applied by:** | CastleNet Technology Inc. |
| **Sample received Date:** | 2004/11/18 |
| **Final test Date :** | 2004/12/16 |
| **Test Result** | PASS |
| **Test Site:** | Chamber 02, Conduction 02 |
| **Temperature** | Refer to each site test data |
| **Humidity:** | Refer to each site test data |
| **Test Engineer:** | Jerry Chiou |

All the tests in this report have been performed and recorded in accordance with the standards described above and performed by an independent electromagnetic compatibility consultant, International Standards Laboratory.

The test results contained in this report accurately represent the measurements of the characteristics and the energy generated by sample equipment under test at the time of the test. The sample equipment tested as described in this report is in compliance with the limits of above standards.

Approve & Signature

Eddy Hsiung

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Eddy Hsiung/Director

Test results given in this report apply only to the specific sample(s) tested under stated test conditions. This report shall not be reproduced other than in full without the explicit written consent of ISL. This report totally contains 64 pages, including 1 cover page , 2 contents page, and 61 pages for the test description. This report must not be use to claim product endorsement by NVLAP or any agency of the U.S. Government.

This test data shown below is traceable to NIST or national or international standard. International Standards Laboratory certifies that no party to this application has been denied the FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 853(a).

## 2. Test Results Summary

The 802.11b functions of EUT has been tested according to the FCC regulations listed below:

| Tested Standards: 47 CFR Part 15 Subpart C | | | |
|---|---|---|---|
| Standard Section | Test Type | Result | Remarks |
| 15.207 | AC Power Line Emissions | Pass | |
| 15.247(a)(2) | Spectrum Bandwidth Of DSSS device | Pass | |
| 15.247(b) | Max. Peak Output Power | Pass | |
| 15.247( c ) | Radiated Emissions 30MHz – 25 GHz | Pass | |
| 15.247 ( c ) | Band Edge Measurement | Pass | |
| 15.247(b)(4) | Radiation Exposure | Pass | MPE report attached |
| 15.247 (d) | Power Spectral Density | Pass | |

The 802.11g functions of EUT has been tested according to the FCC regulations listed below:

| Tested Standards: 47 CFR Part 15 Subpart C | | | |
|---|---|---|---|
| Standard Section | Test Type | Result | Remarks |
| 15.207 | AC Power Line Emissions | Pass | |
| 15.247(a)(2) | Spectrum Bandwidth Of DSSS device | Pass | |
| 15.247(b) | Max. Peak Output Power | Pass | |
| 15.247( c ) | Radiated Emissions 30MHz – 25 GHz | Pass | |
| 15.247 ( c ) | Band Edge Measurement | Pass | |
| 15.247(b)(4) | Radiation Exposure | Pass | MPE report attached |
| 15.247 (d) | Power Spectral Density | Pass | |

## 3. Description of Equipment Under Test (EUT)

| | |
|---|---|
| Description: | Wireless 802.11g MiniPCI Card |
| Model No.: | WM1260 |
| FCC ID: | RK9-WM1260 |
| Brand: | CastleNet |
| Frequency Range 802.11b/g: | 2400~2483.5 MHz |
| Support channel: | |
| 802.11b/g | 11 Channels |
| Modulation Skill: | |
| 802.11b | DBPSK(1Mbps), DQPSK(2Mbps), CCK(5.5/11Mbps) |
| 802.11g | OFDM (6M - 54Mbps) |
| Antennas Type: | |
| Antenna 1: Dipole | made by ADVANCED-CONNECTEK INC. |
| Antenna 2: Dipole | made by WIESON TECHNOLOGIES CO.,LTD. |
| Antenna Connected: | The antenna is connected to the RF connector of the WLAN adapter. |
| Antenna peak Gain: | |
| Antenna 1: | Main (p/n:ADA3I-3K52203) 1 dBi |
| | Aux (p/n:ADA3I-3K52202) 1 dBi |
| Antenna 2: | Main (p/n:Y111Q139-002) 2.24 dBi |
| | Aux (p/n: Y111Q139-001) 2.24 dBi |
| WLAN Power Type : | 3.3V DC from the EUT |

The channel and the operation frequency of 802.11b and 802.11g is listed below:

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---|---|---|---|
| 01 | 2412 | 07 | 2442 |
| 02 | 2417 | 08 | 2447 |
| 03 | 2422 | 09 | 2452 |
| 04 | 2427 | 10 | 2457 |
| 05 | 2432 | 11 | 2462 |
| 06 | 2437 | | |

During the test, the EUT was tested as a modular device of a notebook PC using a PCMCIA extender board to extend the EUT outside the notebook PC enclosure.
There are two antennas in the EUT:
Antenna 1,2 are Dipole type in hirose connector.
All antennas have been tested, only the worst data of WM1260 using Antenna 2 was shown in this test report.

# 4. TEST RESULTS (802.11b)

## 4.1 Powerline Conducted Emissions [Section 15.207]

### 4.1.1 EUT Configuration

The conducted emission test setups are in accordance with Figs 9, 10(a) and 10(b) of ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996.

The EUT was set up on the non-conductive table that is 1.0 by 1.5 meter, 80cm above ground. The wall of the shielded room was located 40cm to the rear of the EUT.

Power to the EUT was provided through the LISN. The impedance vs. frequency characteristic of the LISN is complied with the limit shown on the figure 1 of ANSI C63.4-2001.

Both lines (neutral and hot) were connected to the LISN in series at testing. A coaxial-type connector which provides one 50 ohms terminating impedance was provided for connecting the test instrument. The excess length of the power cord was folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

If the EUT is a Personal Computer or a peripheral of personal computer, and the personal computer has an auxiliary AC outlet which can be used for providing power to an external monitor, then all measurements will be made with the monitor power from first the computer-mounted AC outlet and then a floor-mounted AC outlet.

### 4.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The main power line conducted EMI tests were run on the hot and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

At the frequencies where the peak values of the emissions were higher than 6dß below the applicable limits, the emissions were also measured with the quasi-peak detectors. At the frequencies where the quasi-peak values of the emissions were higher than 6dß below the applicable average limits, the emissions were also measured with the average detectors.

The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

### 4.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

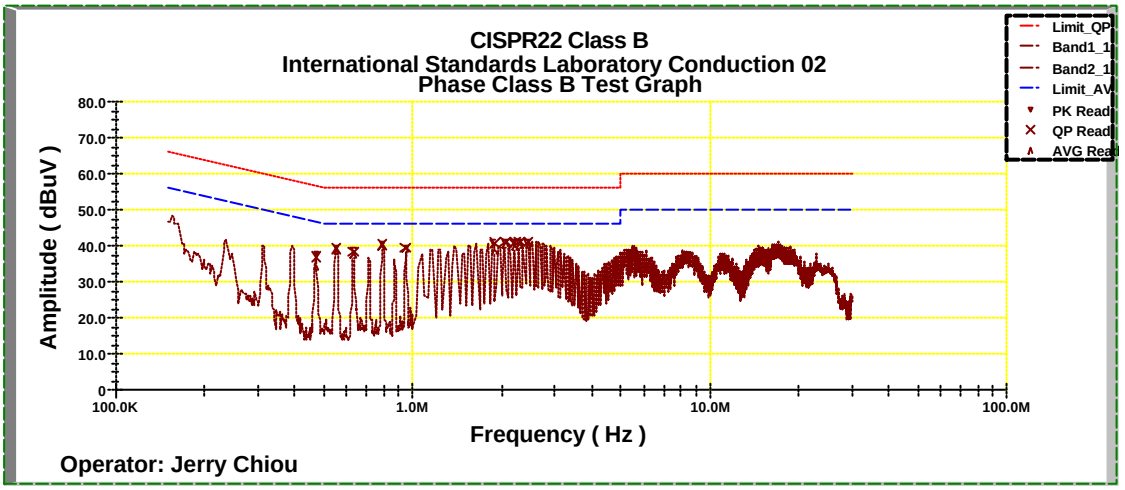
| | |
|---|---|
| Frequency Range | 150 KHz--30MHz |
| Detector Function | Quasi-Peak/Average |
| Bandwidth (RBW) | 9KHz |

### 4.1.4 Test Data:

## Power Line Conducted Emissions (Hot) Channel 1, 6, 11

Operator:JerryChiou
Temperature(C):24
10:27:16AM,Thursday,December02,2004 Humidity(%):50

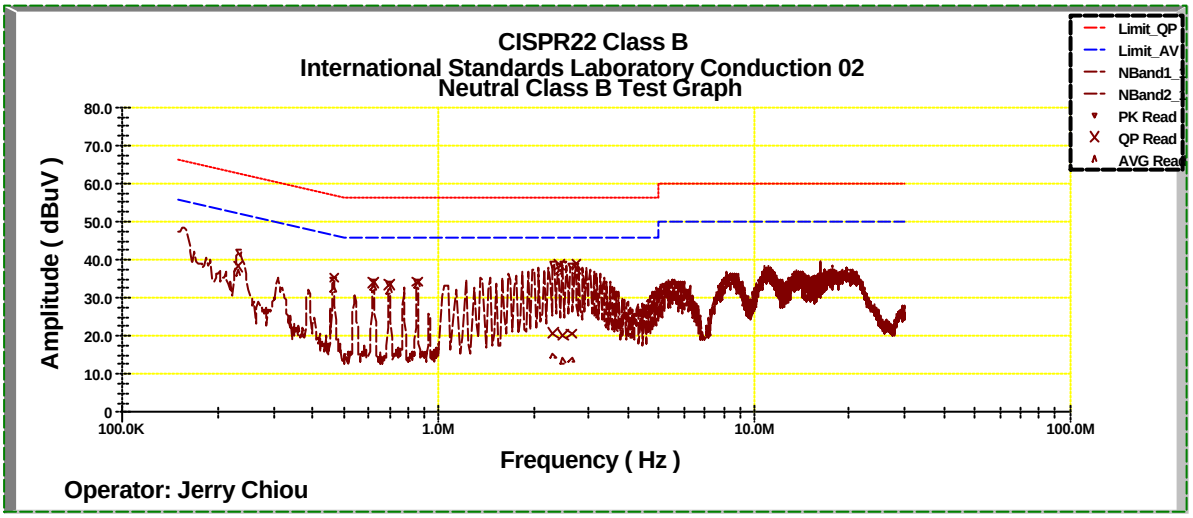
| Frequency | LISNLoss | CableLoss | QPCorrct. | QPLimit | QPMargin | AVECorrct. | AVELimit | AVEMargin |
|---|---|---|---|---|---|---|---|---|
| MHz | (dB) | (dB) | Amp.(dBuV) | (dBuV) | (dB) | Amp.(dBuV) | (dBuV) | (dB) |
| 0.47278 | 0.11 | 0.07 | 36.87 | 56.78 | -19.91 | 33.65 | 46.78 | -13.13 |
| 0.55171 | 0.13 | 0.07 | 39.24 | 56.00 | -16.76 | 38.18 | 46.00 | -7.82 |
| 0.63058 | 0.14 | 0.07 | 38.35 | 56.00 | -17.65 | 37.06 | 46.00 | -8.94 |
| 0.78663 | 0.16 | 0.07 | 40.37 | 56.00 | -15.63 | 39.54 | 46.00 | -6.46 |
| 0.94563 | 0.19 | 0.07 | 39.58 | 56.00 | -16.42 | 38.88 | 46.00 | -7.12 |
| 1.88973 | 0.21 | 0.09 | 40.72 | 56.00 | -15.28 | 38.34 | 46.00 | -7.66 |
| 2.04892 | 0.20 | 0.09 | 41.22 | 56.00 | -14.78 | 40.22 | 46.00 | -5.78 |
| 2.20735 | 0.20 | 0.10 | 40.97 | 56.00 | -15.03 | 39.24 | 46.00 | -6.76 |
| 2.28586 | 0.20 | 0.10 | 41.23 | 56.00 | -14.77 | 39.86 | 46.00 | -6.14 |
| 2.44391 | 0.20 | 0.10 | 41.03 | 56.00 | -14.97 | 39.88 | 46.00 | -6.12 |



## Power Line Conducted Emissions (Neutral) Channel 1, 6, 11

Operator:JerryChiou
Temperature(C):24
10:16:37AM,Thursday,December02,2004 Humidity(%):50

| Frequency | LISNLoss | CableLoss | QPCorrct. | QPLimit | QPMargin | AVECorrct. | AVELimit | AVEMargin |
|---|---|---|---|---|---|---|---|---|
| MHz | (dB) | (dB) | Amp.(dBuV) | (dBuV) | (dB) | Amp.(dBuV) | (dBuV) | (dB) |
| 0.23261 | 0.10 | 0.06 | 38.31 | 63.64 | -25.33 | 36.49 | 53.64 | -17.15 |
| 0.46693 | 0.11 | 0.07 | 35.25 | 56.94 | -21.70 | 31.89 | 46.94 | -15.06 |
| 0.62408 | 0.14 | 0.07 | 34.04 | 56.00 | -21.96 | 32.66 | 46.00 | -13.34 |
| 0.70110 | 0.15 | 0.07 | 33.60 | 56.00 | -22.40 | 31.68 | 46.00 | -14.32 |
| 0.85798 | 0.18 | 0.07 | 34.23 | 56.00 | -21.77 | 33.27 | 46.00 | -12.73 |
| 2.30771 | 0.20 | 0.10 | 20.82 | 56.00 | -35.18 | 14.75 | 46.00 | -31.25 |
| 2.42207 | 0.20 | 0.10 | 38.62 | 56.00 | -17.38 | 36.72 | 46.00 | -9.28 |
| 2.48265 | 0.20 | 0.10 | 20.16 | 56.00 | -35.84 | 13.42 | 46.00 | -32.58 |
| 2.64294 | 0.20 | 0.11 | 20.59 | 56.00 | -35.41 | 13.63 | 46.00 | -32.37 |
| 2.73781 | 0.20 | 0.11 | 38.87 | 56.00 | -17.13 | 36.77 | 46.00 | -9.23 |




* NOTE: During the test, the EMI receiver was set to Max. Hold then switch the EUT Channel between 1 , 6, 11 to get the maximum reading of all these channels .
Margin = Amplitude + Insertion Loss- Limit
A margin of -8dB means that the emission is 8dB below the limit

## 4.2 Bandwidth for DSSS [Section 15.247 (a)(2)]

### 4.2.1 Test Procedure

The Transmitter output of EUT was connected to the spectrum analyzer. The 6 dB bandwidth of the fundamental frequency was measured. The setting of spectrum analyzer is as follows

| | |
|---|---|
| Equipment mode | Spectrum analyzer |
| Detector function | Peak mode |
| RBW | 100KHz |
| VBW | 100KHz |

### 4.2.2 Test Setup

### 4.2.3 Test Data:

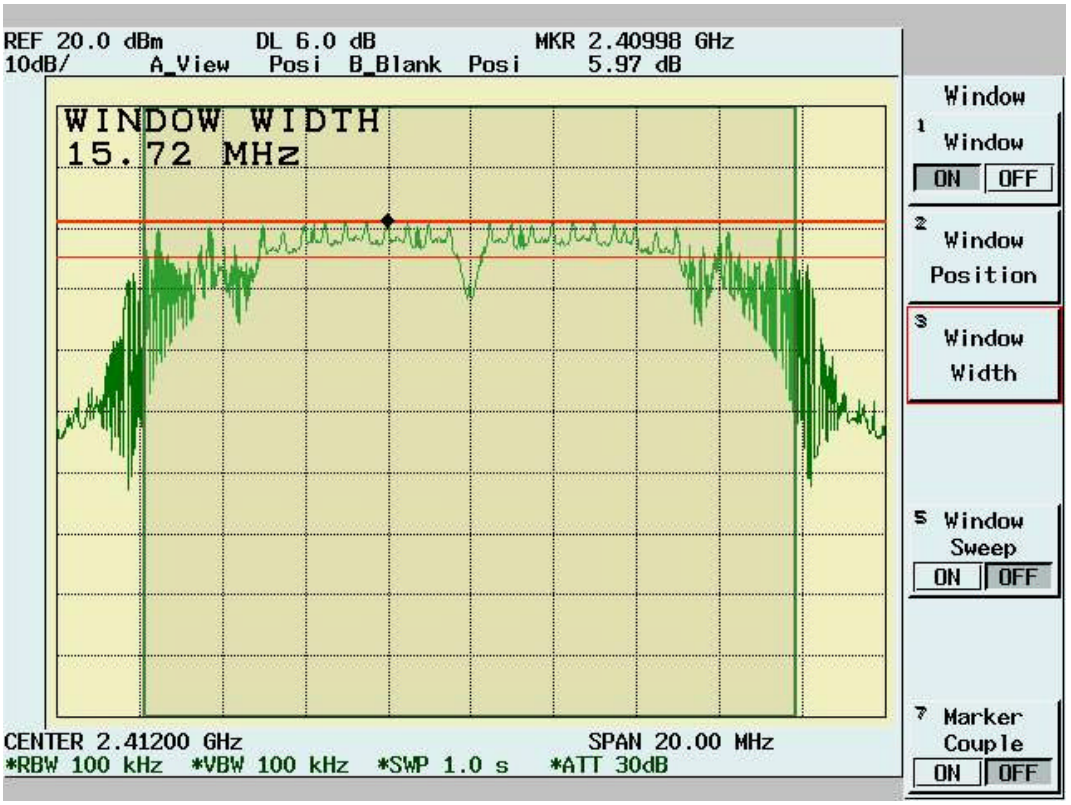
**6dB Bandwidth**

Temp. (deg. C): 25

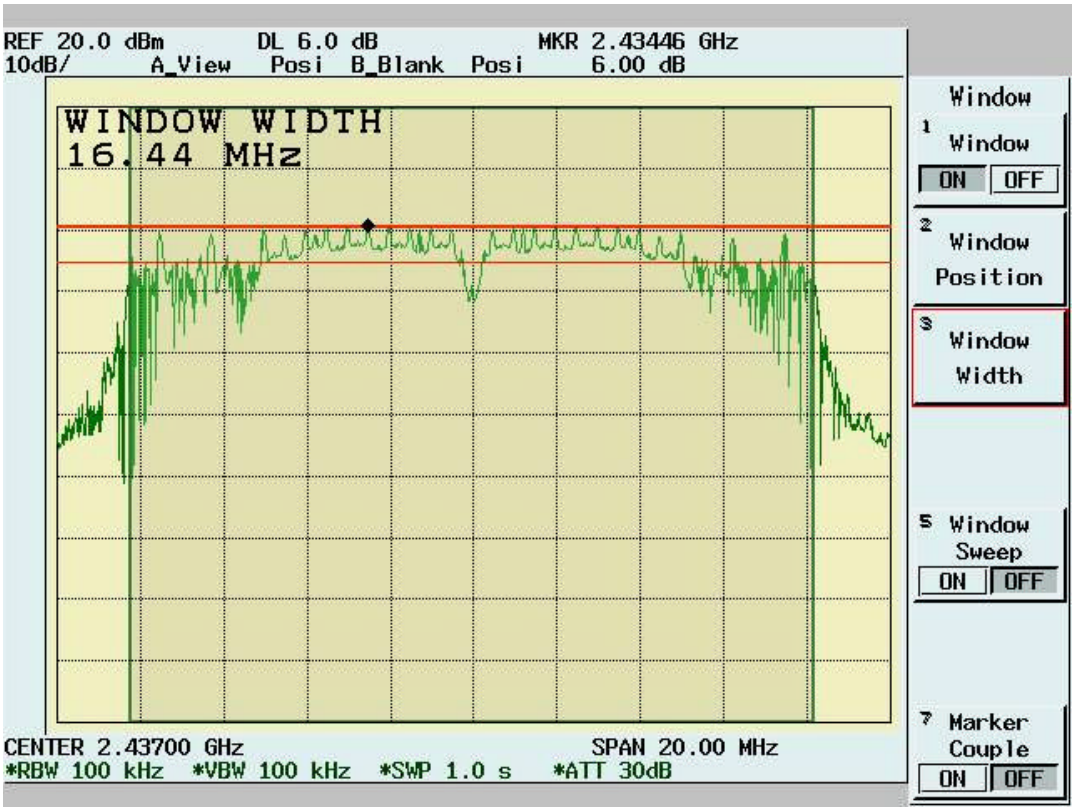
Test Engr: Jerry Chiou Humidity (%): 50

| Chennel | Frequency (MHz) | 6dB Bandwidth (MHz) | Limit (MHz) | Pass/Fail |
|---|---|---|---|---|
| 1 | 2412 | 15.72 | 0.5 | Pass |
| 6 | 2437 | 16.44 | 0.5 | Pass |
| 11 | 2462 | 16.52 | 0.5 | Pass |

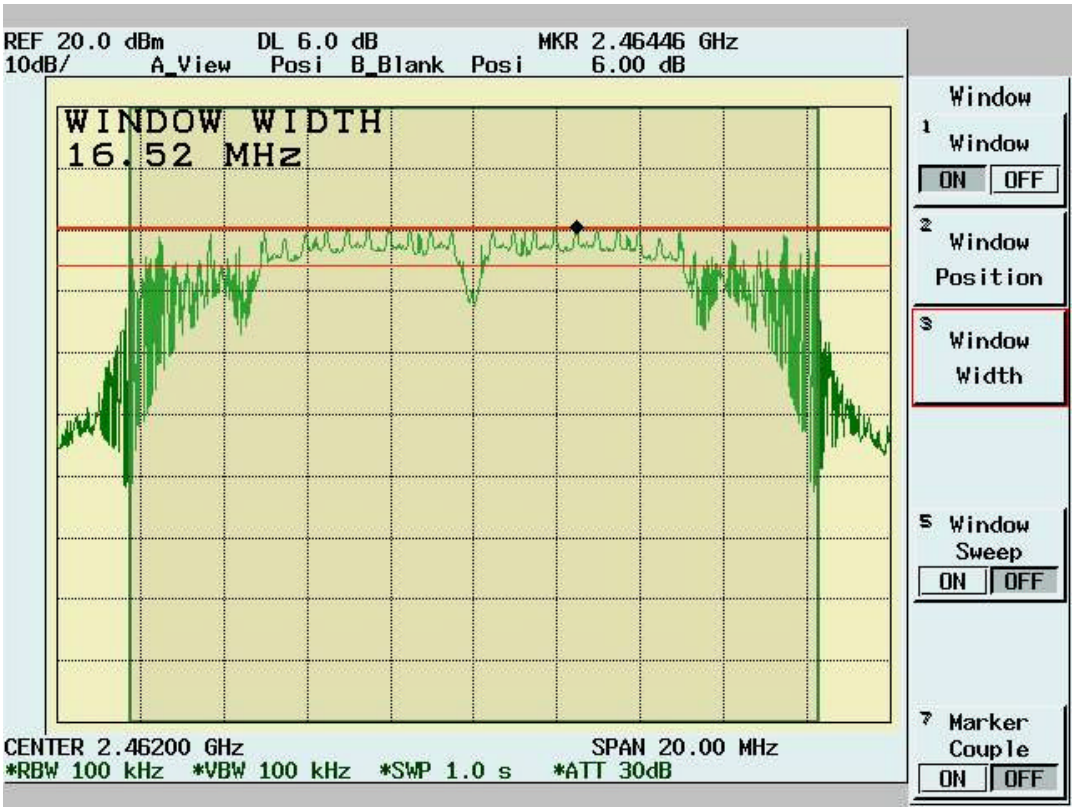
Channel 1:




Channel 6:



Channel 11:

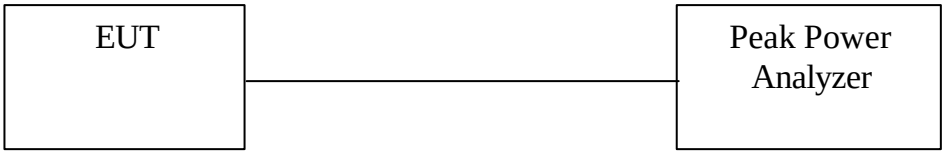

REF 20.0 dBm
10dB/
DL 6.0 dB
A_View
Posi
B_Blank
Posi
MKR 2.46446 GHz
6.00 dB
WINDOW WIDTH
16.52 MHz
CENTER 2.46200 GHz
SPAN 20.00 MHz
*RBW 100 kHz
*VBW 100 kHz
*SWP 1.0 s
*ATT 30dB
Window
1 Window
ON OFF
2 Window Position
3 Window Width
5 Window Sweep
ON OFF
7 Marker Couple
ON OFF

## 4.3 DSSS Maximum Peak Output Power [Section 15.247 (b)(1)]

### 4.3.1 Test Procedure

The Transmitter output of EUT was connected to the peak power analyzer.

### 4.3.2 Test Setup




### 4.3.3 Test Data

**Maximum Peak Output Power**

Temp. (deg. C): 25

Test Engr: Jerry Chiou Humidity (%): 50

| Channel | Frequency (Mhz) | Analyzer Reading (dBm) | Cable Loss (dB) | Peak Power Output (mW) | Peak Power Output (dBm) | Limit (dBm) | Pass/Fail |
|---|---|---|---|---|---|---|---|
| 1 | 2412 | 15.843 | 1.1 | 49.47 | 16.943 | 30 | Pass |
| 6 | 2437 | 15.093 | 1.1 | 41.62 | 16.193 | 30 | Pass |
| 11 | 2462 | 14.406 | 1.1 | 35.53 | 15.506 | 30 | Pass |

Note: Two RF output( MAIN & AUX) have been test,the worse data shown above.

## 4.4 Radiated Emission Measurement [Section [15.247(c)(4)]

### 4.4.1 EUT Configuration

The equipment under test was set up on the 10 meter chamber with measurement distance of 3 meters. The EUT was placed on a non-conductive table 80cm above ground.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

### 4.4.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. We found the maximum readings by varying the height of antenna and then rotating the turntable. Both polarization of antenna, horizontal and vertical, are measured.

30M to 1GHz: The highest emissions between 30 MHz to 1000 MHz were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in quasi-peak mode to determine the precise amplitude of the emissions. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission.

1GHz – 25GHz: The highest emissions were also analyzed in details by operating the spectrum analyzer and/or EMI receiver in peak mode to determine the precise amplitude of the emission. While doing so, the interconnecting cables and major parts of the system were moved around, the antenna height was varied between one and four meters, its polarization was varied between vertical and horizontal, and the turntable was slowly rotated, to maximize the emission. During test the EMI receiver and spectrum was setup ac*cording to EMI Receiver/Spectrum Analyzer Configuration.*

For the test of $2^{nd}$ to $10^{th}$ harmonics frequencies , the equipment setup was also refer to *EMI Receiver/Spectrum Analyzer Configuration*. The frequencies were tested using Peak mode first, if the test data is higher than the emissions limit, an additional measurement using Average mode will be performed and the average reading will be compared to the limit and record in test report.

### 4.4.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range Tested: | 30MHz~1000MHz |
| Detector Function: | Quasi-Peak Mode |
| Resolution Bandwidth (RBW): | 120KHz |
| Video Bandwidth (VBW) | 1MHz |
| | |
| Frequency Range Tested: | 1GHz – 25 GHz |
| Detector Function: | Peak Mode |
| Resolution Bandwidth (RBW): | 1MHz |
| Video Bandwidth (VBW) | 3MHz |
| | |
| Frequency Range Tested: | 1GHz – 25 GHz |
| Detector Function: | Average Mode |
| Resolution Bandwidth (RBW): | 1MHz |
| Video Bandwidth (VBW) | 10 Hz |

### 4.4.4 Test Data (30MHz – 1GHz):

## 30M – 1GHz Open Field Radiated Emissions (Horizontal) Channel 1, 6, 11

Operator:JerryChiou
Temperature(C):22
03:44:15PM,Monday,November29,2004 Humidity(%):55

| Frequency | RxAmp. | AntFact | CableLoss | PreAmpGain | Corrct.Emi. | Limit | Margin | Ant.Pos. | TablePos. |
|---|---|---|---|---|---|---|---|---|---|
| MHz | (dBuV) | (dB/m) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg) |
| 433.52 | 22.31 | 16.17 | 4.84 | 0.00 | 43.32 | 46.00 | -2.68 | 197.00 | 9.00 |
| 631.4 | 15.53 | 18.96 | 6.15 | 0.00 | 40.64 | 46.00 | -5.36 | 145.00 | 155.00 |
| 697.36 | 13.22 | 19.00 | 6.52 | 0.00 | 38.74 | 46.00 | -7.26 | 100.00 | 23.00 |
| 719.67 | 9.51 | 19.43 | 6.75 | 0.00 | 35.69 | 46.00 | -10.31 | 100.00 | 23.00 |
| 764.29 | 11.29 | 20.10 | 6.95 | 0.00 | 38.34 | 46.00 | -7.66 | 100.00 | 23.00 |
| 791.45 | 12.81 | 20.10 | 7.14 | 0.00 | 40.05 | 46.00 | -5.95 | 100.00 | 23.00 |

## 30M – 1GHz Open Field Radiated Emissions (Vertical) Channel 1, 6, 11

Operator:JerryChiou
Temperature(C):22
03:46:15PM,Monday,November29,2004 Humidity(%):55

| Frequency | RxAmp. | AntFact | CableLoss | PreAmpGain | Corrct.Emi. | Limit | Margin | Ant.Pos. | TablePos. |
|---|---|---|---|---|---|---|---|---|---|
| MHz | (dBuV) | (dB/m) | (dB) | (dB) | (dBuV/m) | (dBuV/m) | (dB) | (cm) | (deg) |
| 35.82 | 13.50 | 14.64 | 1.02 | 0.00 | 29.16 | 40.00 | -10.84 | 152.00 | 304.00 |
| 299.66 | 24.05 | 13.59 | 3.72 | 0.00 | 41.36 | 46.00 | -4.64 | 197.00 | 22.00 |
| 366.59 | 19.73 | 14.83 | 4.33 | 0.00 | 38.90 | 46.00 | -7.10 | 197.00 | 88.00 |
| 433.52 | 21.76 | 16.17 | 4.84 | 0.00 | 42.76 | 46.00 | -3.24 | 197.00 | 22.00 |
| 498.51 | 18.70 | 17.46 | 5.29 | 0.00 | 41.45 | 46.00 | -4.55 | 197.00 | 6.00 |
| 564.47 | 13.20 | 18.83 | 5.69 | 0.00 | 37.72 | 46.00 | -8.28 | 152.00 | 41.00 |
| 632.37 | 9.57 | 18.96 | 6.15 | 0.00 | 34.68 | 46.00 | -11.32 | 103.00 | 88.00 |
| 749.74 | 7.73 | 20.09 | 6.93 | 0.00 | 34.76 | 46.00 | -11.24 | 152.00 | 57.00 |
| 764.29 | 6.48 | 20.10 | 6.95 | 0.00 | 33.54 | 46.00 | -12.46 | 197.00 | 22.00 |
| 791.45 | 5.63 | 20.10 | 7.14 | 0.00 | 32.87 | 46.00 | -13.13 | 197.00 | 22.00 |

NOTE:

✍✍ During the Pre-test, the EUT has been tested for Channel 1 , 6, 11 transmit from Main and Aux antenna respectively to get all the critical emission frequencies. In the final test all the critical emission frequencies has been tested and the test data are listed above.

✍✍ Margin = Corrected Amplitude – Limit

Corrected Amplitude = Radiated Amplitude + Antenna Correction Factor + Cable Loss - Pre-Amplifier Gain

A margin of -8dB means that the emission is 8dB below the limit

**All frequencies from 30MHz to 1GHz have been tested**

### 4.4.5 Test Data ( 1GHz – 25 GHz) .

### 1GHz~ 25 GHz (Horizontal), Channel 1: 2412 MHz

Operator:JerryChiou RBW:1MHz
Humidity(%):37
Temperature(C):21

| Frequency | Rx_R. | Ant_F. | Cab_L. | PreAmpl | Emission | Limit | Margin | A.Tower | T.Table |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | cm | deg |
| 1971.53 | 45.50pk | 30.76 | 2.58 | 35.30 | 43.54pk | 54.00av | -10.46 | 100 | 45 |
| 2281.22 | 45.86pk | 30.94 | 1.74 | 35.43 | 43.12pk | 54.00av | -10.88 | 101 | 131 |
| 2338.66 | 45.41pk | 30.93 | 1.57 | 35.45 | 42.46pk | 54.00av | -11.54 | 101 | 149 |
| 6730.77 | 30.28pk | 37.65 | 3.26 | 38.14 | 33.05pk | 54.00av | -20.95 | 101 | 157 |

### 1GHz~ 25 GHz (Vertical), Channel 1: 2412 MHz

Operator:JerryChiou RBW:1MHz
Humidity(%):37
Temperature(C):21

| Frequency | Rx_R. | Ant_F. | Cab_L. | PreAmpl | Emission | Limit | Margin | A.Tower | T.Table |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | cm | deg |
| 1986.51 | 46.09pk | 30.89 | 2.59 | 35.31 | 44.26pk | 54.00av | -9.74 | 100 | 44 |
| 2048.95 | 45.42pk | 30.99 | 2.45 | 35.33 | 43.53pk | 54.00av | -10.47 | 100 | 58 |
| 2278.72 | 45.47pk | 30.94 | 1.75 | 35.43 | 42.74pk | 54.00av | -11.26 | 101 | 131 |
| 6573.43 | 31.04pk | 36.80 | 3.36 | 38.74 | 32.45pk | 54.00av | -21.55 | 101 | 185 |
| 12604.4 | 31.62pk | 41.68 | 3.67 | 36.34 | 40.62pk | 54.00av | -13.38 | 101 | 244 |

Note:

✍✍ According to ANSI C63.4-2001 8.3.1.2 Notes(1):Where limits are specified by agencies for both average and peak (or quasi-peak) detection , if the peak (or quasi-peak) measured value complies with the average limit , it is unnecessary to perform an average measurement.

✍✍ " * ": Fundamental Frequency

✍✍ "**": Not in the restricted band, Limit level=Fundamental Emission-20dB

✍✍ " pk": peak mode

✍✍ "av": average mode

✍✍ "---": No meter reading data due to the emission level is smaller than spectrum noise level.

✍✍ The Spectrum noise level+Correction Factor < Limit - 6 dB

✍✍ Margin=Corrected Amplitude – Limit

✍✍ Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain

✍✍ A margin of -8dB means that the emission is 8dB below the limit.

**All frequencies from 1GHz to 25 GHz have been tested.**

## 1GHz~ 25 GHz (Horizontal) , Channel 6 : 2437 MHz

Operator:JerryChiou

RBW:1MHz
Humidity(%):37
Temperature(C):21

| Frequency | Rx_R. | Ant_F. | Cab_L. | PreAmpl | Emission | Limit | Margin | A.Tower | T.Table |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | cm | deg |
| 1996.5 | 44.79pk | 30.97 | 2.60 | 35.31 | 43.05pk | 54.00av | -10.95 | 100 | 43 |
| 2066.43 | 44.91pk | 30.99 | 2.40 | 35.34 | 42.95pk | 54.00av | -11.05 | 100 | 64 |
| 2371.13 | 45.77pk | 30.93 | 1.47 | 35.47 | 42.69pk | 54.00av | -11.31 | 101 | 160 |
| 12322.7 | 31.54pk | 41.91 | 3.68 | 36.95 | 40.18pk | 54.00av | -13.82 | 100 | 170 |

## 1GHz~ 25 GHz (Vertical), Channel 6 : 2437 MHz

Operator:JerryChiou

RBW:1MHz
Humidity(%):37
Temperature(C):21

| Frequency | Rx_R. | Ant_F. | Cab_L. | PreAmpl | Emission | Limit | Margin | A.Tower | T.Table |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | cm | deg |
| 2008.99 | 46.18pk | 31.00 | 2.57 | 35.31 | 44.44pk | 54.00av | -9.56 | 100 | 46 |
| 2068.93 | 45.40pk | 30.99 | 2.39 | 35.34 | 43.44pk | 54.00av | -10.56 | 100 | 65 |
| 2308.69 | 45.86pk | 30.94 | 1.66 | 35.44 | 43.02pk | 54.00av | -10.98 | 101 | 140 |
| 2595.9 | 45.34pk | 30.94 | 1.38 | 35.49 | 42.17pk | 54.00av | -11.83 | 102 | 230 |
| 12178.8 | 32.53pk | 42.09 | 3.66 | 37.38 | 40.90pk | 54.00av | -13.10 | 100 | 132 |

Note:

- ✍✍ According to ANSI C63.4-2001 8.3.1.2 Notes(1):Where limits are specified by agencies for both average and peak (or quasi-peak) detection , if the peak (or quasi-peak) measured value complies with the average limit , it is unnecessary to perform an average measurement.
- ✍✍ " * ": Fundamental Frequency
- ✍✍ "**": Not in the restricted band, Limit level=Fundamental Emission-20dB
- ✍✍ " pk": peak mode
- ✍✍ "av": average mode
- ✍✍ "---": No meter reading data due to the emission level is smaller than spectrum noise level.
- ✍✍ The Spectrum noise level+Correction Factor < Limit - 6 dB
- ✍✍ Margin=Corrected Amplitude – Limit
- ✍✍ Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain
- ✍✍ A margin of -8dB means that the emission is 8dB below the limit.

**All frequencies from 1GHz to 25 GHz have been tested.**

## 1GHz~ 25 GHz (Horizontal), Channel 11: 2462 MHz

Operator:JerryChiou RBW:1MHz
Humidity(%):37
Temperature(C):21

| Frequency | Rx_R. | Ant_F. | Cab_L. | PreAmpl | Emission | Limit | Margin | A.Tower | T.Table |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | cm | deg |
| 2226.27 | 45.91pk | 30.95 | 1.91 | 35.41 | 43.37pk | 54.00av | -10.63 | 101 | 114 |
| 2608.39 | 45.59pk | 30.94 | 1.38 | 35.49 | 42.43pk | 54.00av | -11.57 | 102 | 234 |
| 2665.83 | 45.60pk | 30.97 | 1.39 | 35.47 | 42.49pk | 54.00av | -11.51 | 102 | 252 |
| 4947.55 | 29.06pk | 35.40 | 2.16 | 39.22 | 27.40pk | 54.00av | -26.60 | 100 | 5 |
| 12526.5 | 31.17pk | 41.69 | 3.68 | 36.40 | 40.15pk | 54.00av | -13.85 | 101 | 223 |

## 1GHz~ 25 GHz (Vertical), Channel 11 : 2462 MHz

Operator:JerryChiou RBW:1MHz
Humidity(%):37
Temperature(C):21

| Frequency | Rx_R. | Ant_F. | Cab_L. | PreAmpl | Emission | Limit | Margin | A.Tower | T.Table |
|---|---|---|---|---|---|---|---|---|---|
| MHz | dBuV | dB/m | dB | dB | dBuV/m | dBuV/m | dB | cm | deg |
| 2011.49 | 45.29pk | 31.00 | 2.56 | 35.31 | 43.54pk | 54.00av | -10.46 | 100 | 47 |
| 2096.4 | 45.36pk | 30.98 | 2.31 | 35.35 | 43.30pk | 54.00av | -10.70 | 100 | 73 |
| 2408.59 | 45.05pk | 30.92 | 1.53 | 35.48 | 42.01pk | 54.00av | -11.99 | 101 | 171 |
| 12538.5 | 31.16pk | 41.69 | 3.68 | 36.39 | 40.15pk | 54.00av | -13.85 | 101 | 227 |

Note:

- ✍✍ According to ANSI C63.4-2001 8.3.1.2 Notes(1):Where limits are specified by agencies for both average and peak (or quasi-peak) detection , if the peak (or quasi-peak) measured value complies with the average limit , it is unnecessary to perform an average measurement.
- ✍✍ " * ": Fundamental Frequency
- ✍✍ "**": Not in the restricted band, Limit level=Fundamental Emission-20dB
- ✍✍ " pk": peak mode
- ✍✍ "av": average mode
- ✍✍ "---": No meter reading data due to the emission level is smaller than spectrum noise level.
- ✍✍ The Spectrum noise level+Correction Factor < Limit - 6 dB
- ✍✍ Margin=Corrected Amplitude – Limit
- ✍✍ Corrected Amplitude=Radiated Amplitude+Antenna Correction Factor+Cable Loss-Pre-Amplifier Gain
- ✍✍ A margin of -8dB means that the emission is 8dB below the limit.

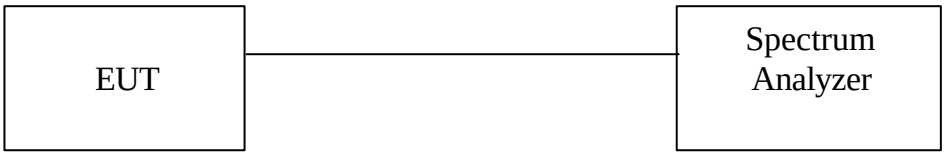
**All frequencies from 1GHz to 25 GHz have been tested.**

## 4.5 Band Edge Measurement

### 4.5.1 Test Procedure (Conducted)

1. The transmitter output of EUT was connected to the spectrum analyzer.
   Equipment mode: Spectrum analyzer
   Detector function: Peak mode
   SPAN: 100MHz
   RBW: 100KHz
   VBW: 100KHz
   Center frequency: 2.4GHz, 2.4835GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed
3. Find the next peak frequency outside the operation frequency band

### 4.5.2 Test Setup (Conducted)




### 4.5.3 Test Data:

**Table: Band Edge measurement (Conducted)**

Temp. (deg. C): 25

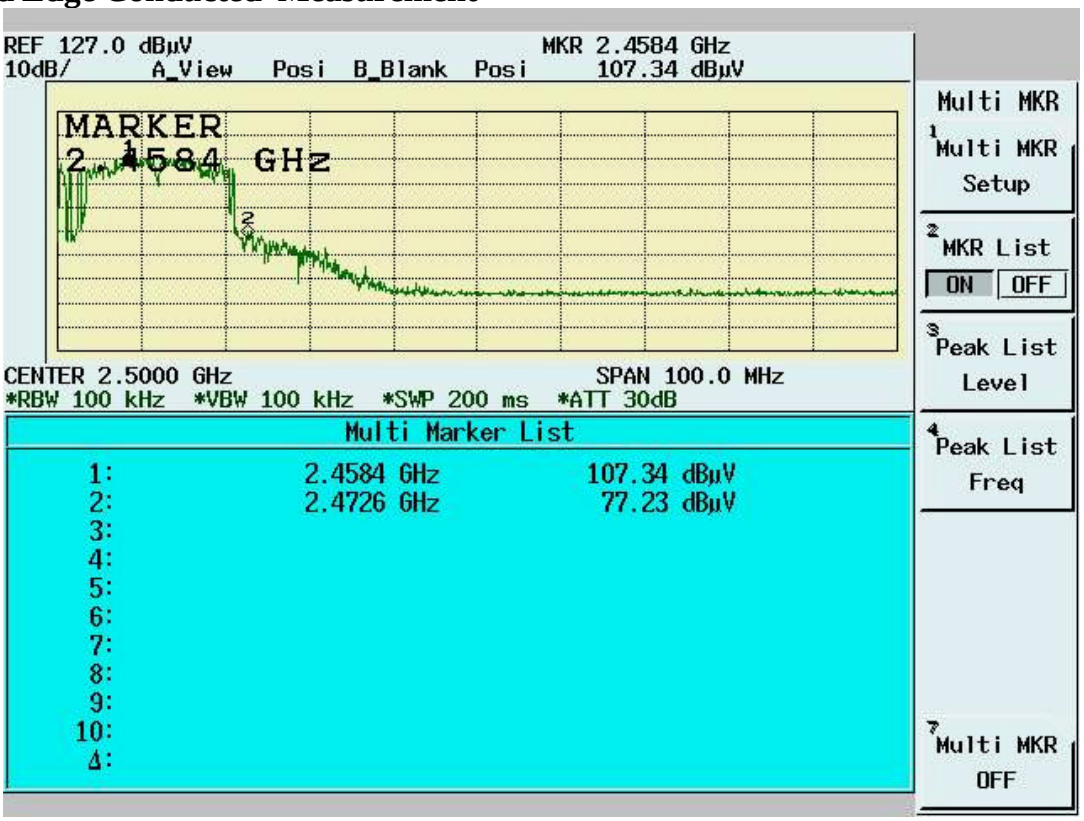
Test Engr: Jerry Chiou Humidity (%): 50

| Channel | Frequency (MHz) | Spectrum Reading (dBuV) | Carrier - Outsideband Limit: >20dB (dB) | Pass/Fail |
|---|---|---|---|---|
| 1 | 2408.9 | 108.6 | --- | --- |
| Outside band | 2398.8 | 76.59 | 32.01 | Pass |
| 11 | 2458.4 | 107.34 | --- | --- |
| Outside band | 2472.6 | 77.23 | 30.11 | Pass |

Note: Two RF output( MAIN & AUX) have been test,the worse data shown above.

## Band Edge Conducted measurement

## Band Edge Conducted Measurement



### 4.5.4 Test Procedure (Radiated)

1. Antenna and Turntable test procedure same as Radiated Emission Measurement.
   Equipment mode: Spectrum analyzer
   Detector function: Peak mode
   SPAN: 100MHz
   RBW: 1MHz
   VBW: 1MHz
   Center frequency: 2.395GHz, 2.48GHz.
2. Using Peak Search to read the peak power of Carrier frequencies after Maximum Hold function is completed.
3. Find the next peak frequency outside the operation frequency band
4. For peak frequency emission level measurement in Restricted Band ,
   Change RBW: 1MHz
   VBW: 10Hz
   Span: 100MHz.
5. Get the spectrum reading after Maximum Hold function is completed.

### 4.5.5 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

### 4.5.6 Test Data

## Table Band Edge measurement (Radiated)

Temp. (deg. C): 25

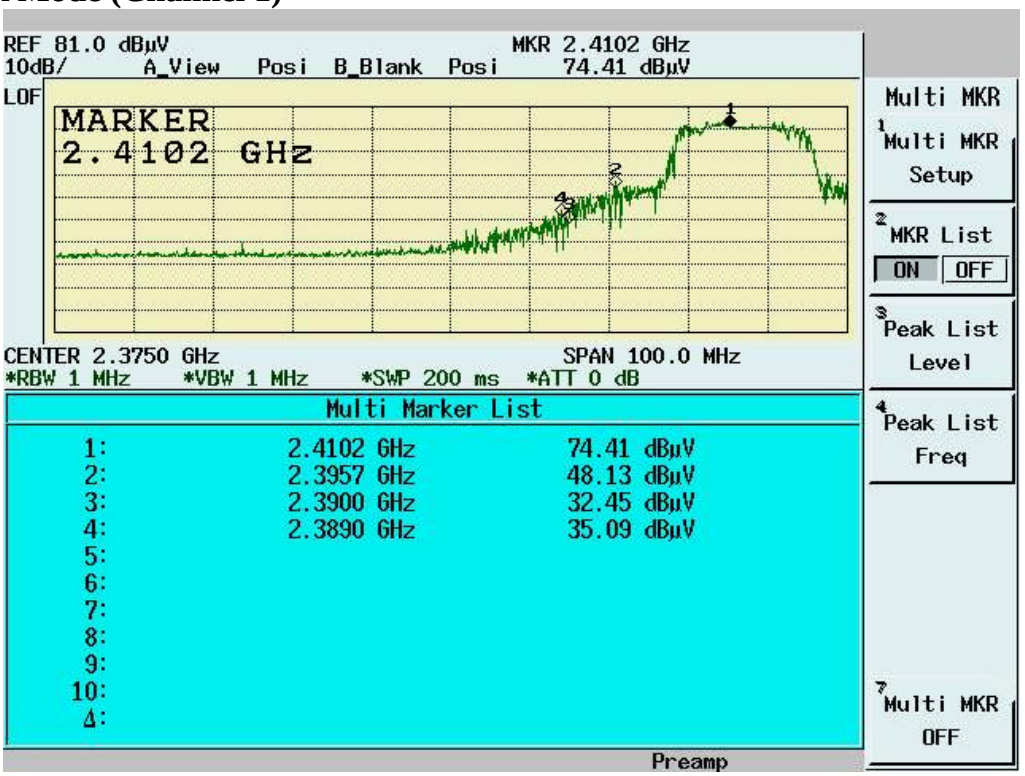
Test Engr: Jerry Chiou Humidity (%): 50

| Description | Frequency (MHz) | Spectrum Reading (dBuV) | Correction Factor (dB/m) | Emission Level (dBuV/m) | dBc ( Limit: > 20dBc) | Limit (dBuV/m) | Equip. Setup VBW | Pass or Fail |
|---|---|---|---|---|---|---|---|---|
| Channel_1 (average mode) | 2409.3 | 66.07 | 35.48 | 101.55 | --- | --- | 10Hz | --- |
| Channel_1 (peak mode) | 2410.2 | 74.41 | 35.48 | 109.89 | --- | --- | 1MHz | --- |
| Outside band (peak mode) | 2395.7 | 48.13 | 35.48 | 83.61 | 26.28 | --- | 1MHz | Pass |
| | | | | | | | | |
| Channel_11 (average mode) | 2464.2 | 65.15 | 35.5 | 100.65 | --- | --- | 10Hz | --- |
| Channel_11 (peak mode) | 2467.2 | 74.34 | 35.5 | 109.84 | --- | --- | 1MHz | --- |
| Outside band (peak mode) | 2472.9 | 48.63 | 35.51 | 84.14 | 25.7 | --- | 1MHz | Pass |
| | | | | | | | | |
| Channel_1 Restricted band (peak mode) | 2389 | 35.09 | 35.47 | 70.56 | --- | 74 | 1MHz | Pass |
| Restricted band (average mode) | 2375.9 | 8.84 | 35.47 | 44.31 | --- | 54 | 10Hz | Pass |
| | | | | | | | | |
| Channel_11 Restricted band (peak mode) | 2483.9 | 37.24 | 35.51 | 72.75 | --- | 74 | 1MHz | Pass |
| Restricted band (average mode) | 2483.5 | 8.94 | 35.51 | 44.45 | --- | 54 | 10Hz | Pass |

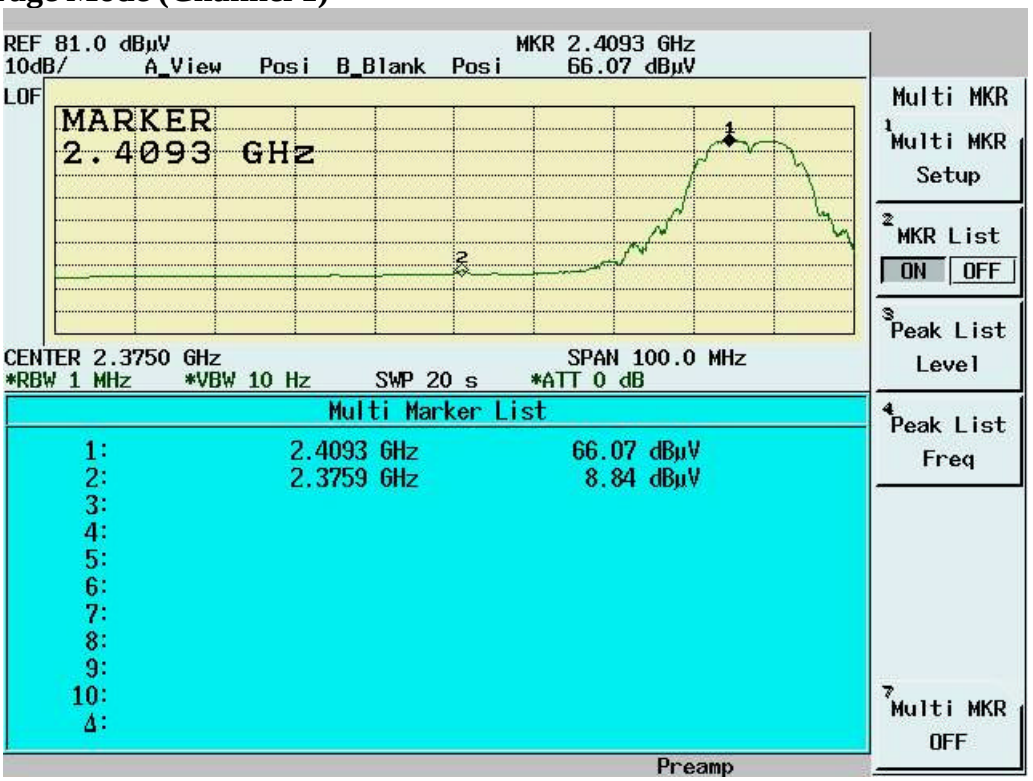
Note:

- ✍✍ The Spectrum plot of emission level measurement in Restricted band is attached.
- ✍✍ Emission Level=Spectrum Reading+Correction Factor
- ✍✍ Correction Factor=Antenna Factor+cable loss–amplifier gain
- ✍✍ Both Horizontal and Vertical polarizaion have been tested and the worst data is listed above.

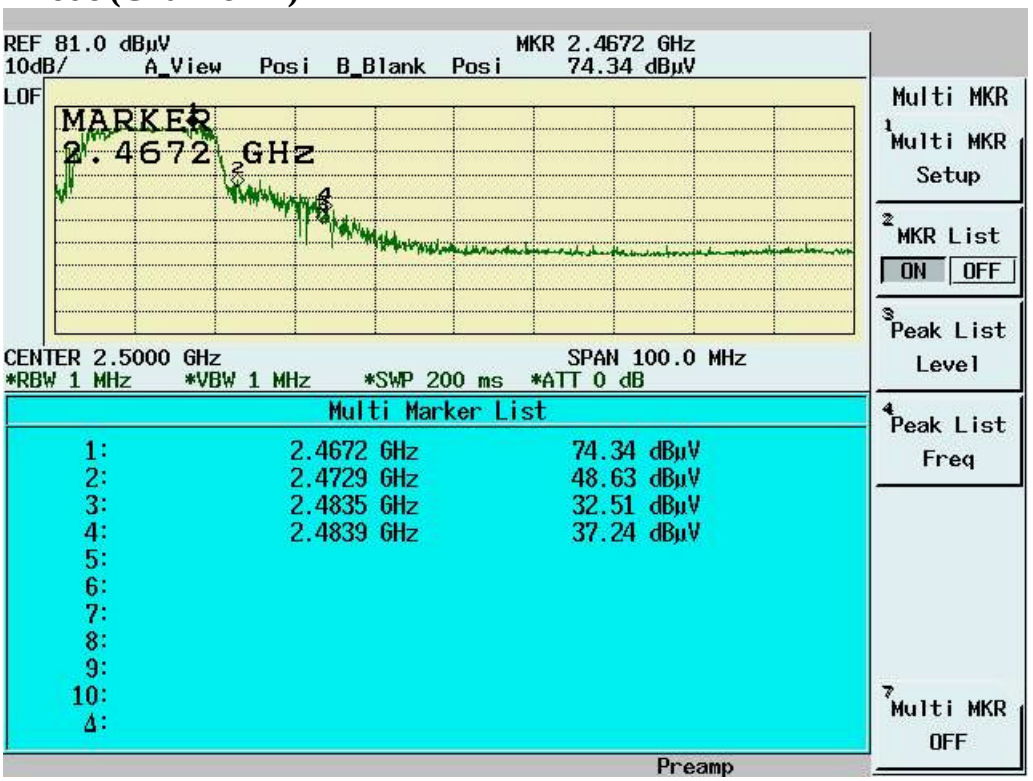
**Band Edge measurement for radiated emission in Restricted Band(Radiated) Peak Mode (Channel 1)**



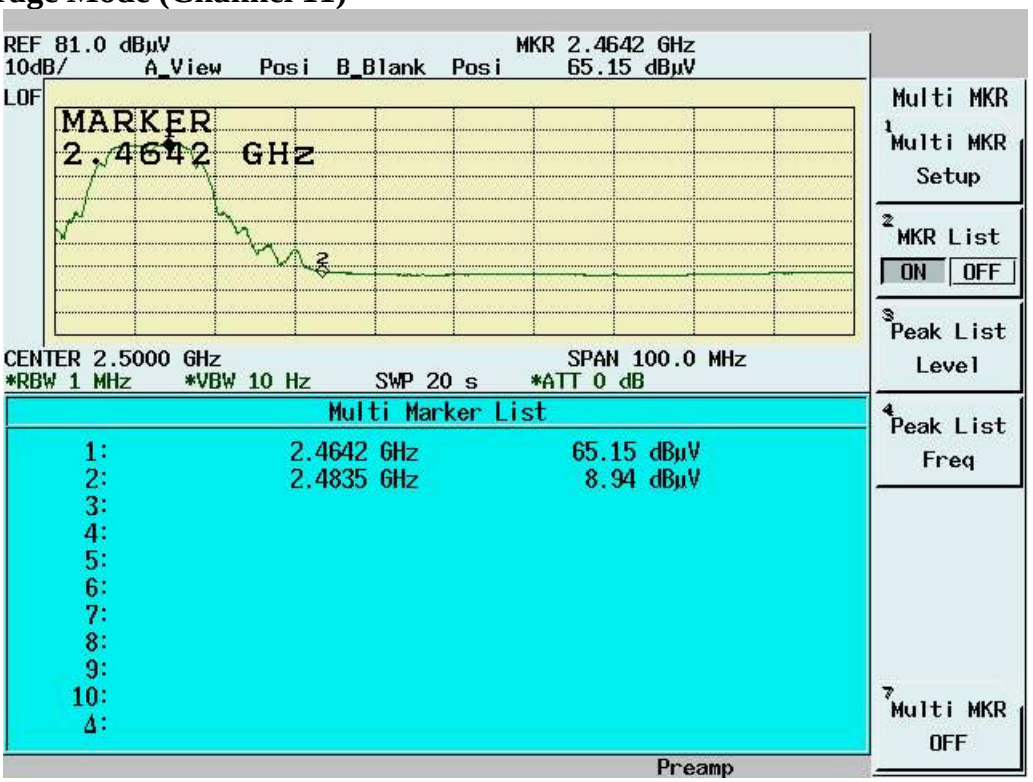

**Band Edge measurement for radiated emission in Restricted Band(Radiated) Average Mode (Channel 1)**



**Band Edge measurement for radiated emission in Restricted Band(Radiated) Peak Mode (Channel 11)**




**Band Edge measurement for radiated emission in Ristricted Band(Radiated) Average Mode (Channel 11)**



## 4.6 RF Exposure Measurement [Section 15.247(b)(4) & 1.1307(b)]

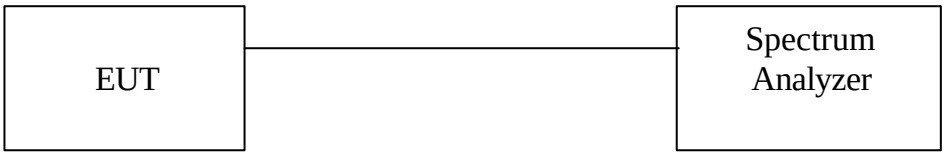
**See MPE report**

## 4.7 DSSS Peak Power Spectral Density [Section 15.247(d) ]

### 4.7.1 Test Procedure

1. The Transmitter output of EUT was connected to the spectrum analyzer.
   Equipment mode: Spectrum analyzer
   Detector function: Peak mode
   SPAN:1.5MHz
   RBW: 3KHz
   VBW: 30KHz
   Center frequency: fundamental frequency tested.
   Sweep time= 500 sec.
2. Using Peak Search to read the peak power after Maximum Hold function is completed.

### 4.7.2 Test Setup




### 4.7.3 Test Data

**Maximum Peak Output Power Density**

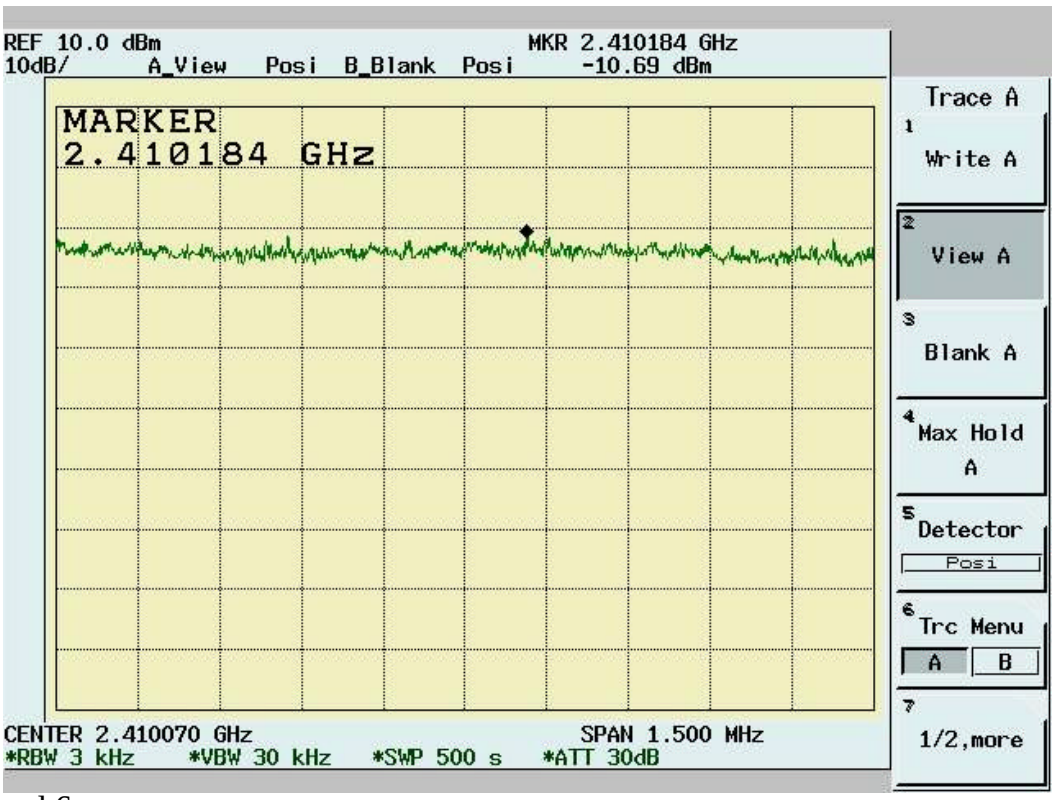
Temp. (deg. C): 25

Test Engr: Jerry Chiou Humidity (%): 50

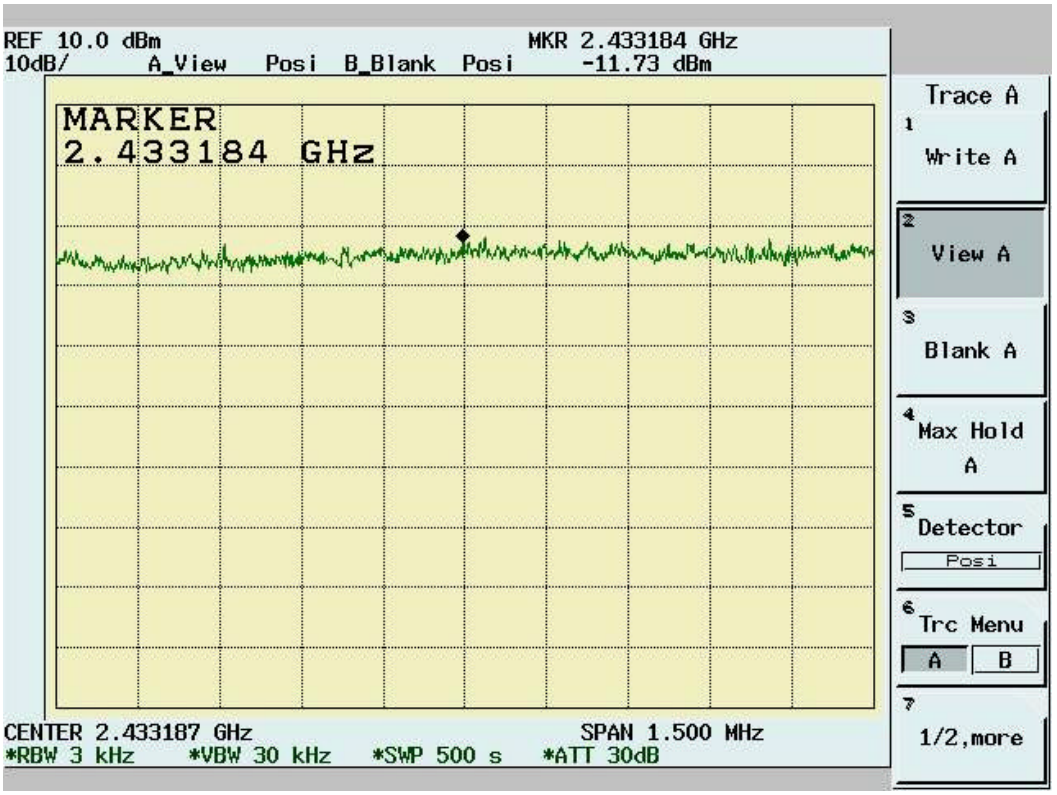
| Chennel | Frequency (MHz) | Spectrum Reading (dBm/3KHz) | Cable Loss (dB) | Peak Power Output (dBm/3KHz) | Limit (dBm/3KHz) | Pass/Fail |
|---|---|---|---|---|---|---|
| 1 | 2412 | -10.69 | 1.1 | -9.59 | 8 | Pass |
| 6 | 2437 | -11.73 | 1.1 | -10.63 | 8 | Pass |
| 11 | 2462 | -11.58 | 1.1 | -10.48 | 8 | Pass |

Note: Two RF output( MAIN & AUX) have been test,the worse data shown above.

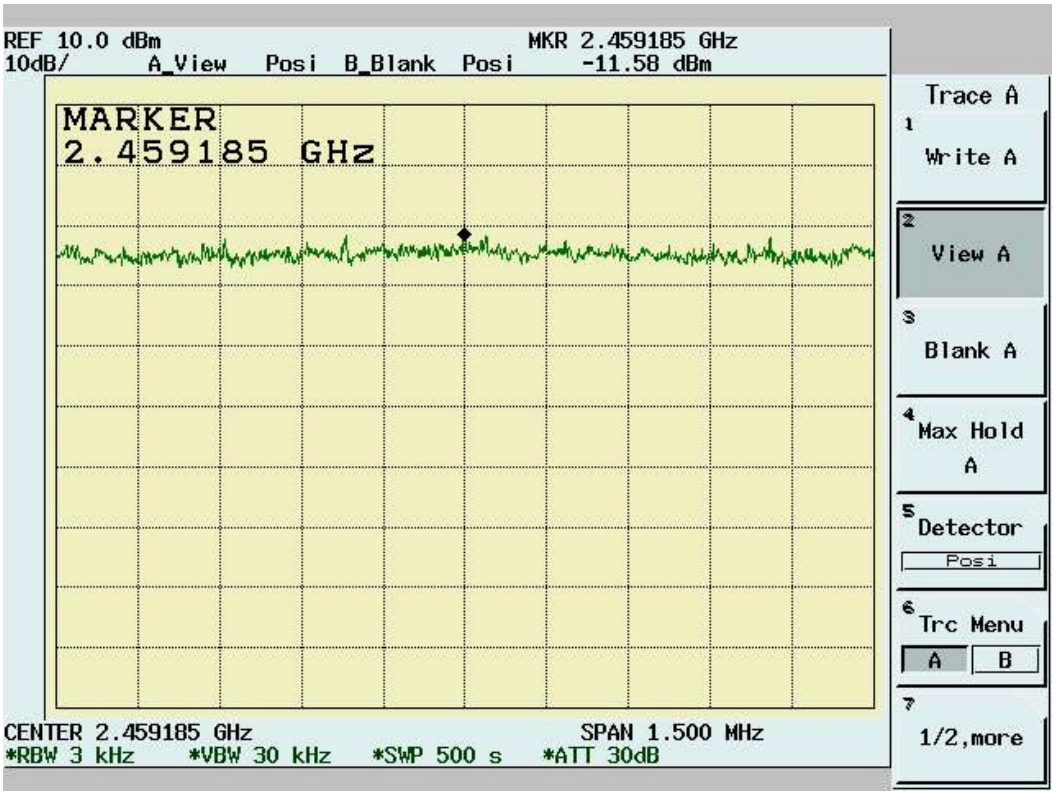
Channel 1




Channel 6



Channel 11


REF 10.0 dBm
10dB/
A_View Posi B_Blank Posi
MKR 2.459185 GHz
-11.58 dBm
MARKER
2.459185 GHz
CENTER 2.459185 GHz
SPAN 1.500 MHz
*RBW 3 kHz *VBW 30 kHz *SWP 500 s *ATT 30dB
Trace A
1 Write A
2 View A
3 Blank A
4 Max Hold A
5 Detector
Posi
6 Trc Menu
A B
7 1/2,more

# 5. TEST RESULTS (802.11g)

## 5.1 Powerline Conducted Emissions [Section 15.207]

### 5.1.1 EUT Configuration

The conducted emission test setups are in accordance with Figs 9, 10(a) and 10(b) of ANSI C63.4-2001, CFR 47 Part 15 Subpart B; or EN55022:1994/ A1:1995/A2:1997; CISPR 22:1993/A1:1995/A2:1996.

The EUT was set up on the non-conductive table that is 1.0 by 1.5 meter, 80cm above ground. The wall of the shielded room was located 40cm to the rear of the EUT.

Power to the EUT was provided through the LISN. The impedance vs. frequency characteristic of the LISN is complied with the limit shown on the figure 1 of ANSI C63.4-2001.

Both lines (neutral and hot) were connected to the LISN in series at testing. A coaxial-type connector which provides one 50 ohms terminating impedance was provided for connecting the test instrument. The excess length of the power cord was folded back and forth at the center of the lead so as to form a bundle not exceeding 40cm in length.

Any changes made to the configuration, or modifications made to the EUT, during testing are noted in the following test record.

If the EUT is a Personal Computer or a peripheral of personal computer, and the personal computer has an auxiliary AC outlet which can be used for providing power to an external monitor, then all measurements will be made with the monitor power from first the computer-mounted AC outlet and then a floor-mounted AC outlet.

### 5.1.2 Test Procedure

The system was set up as described above, with the EMI diagnostic software running. The main power line conducted EMI tests were run on the hot and neutral conductors of the power cord and the results were recorded. The effect of varying the position of the interface cables has been investigated to find the configuration that produces maximum emission.

At the frequencies where the peak values of the emissions were higher than 6dß below the applicable limits, the emissions were also measured with the quasi-peak detectors. At the frequencies where the quasi-peak values of the emissions were higher than 6dß below the applicable average limits, the emissions were also measured with the average detectors.

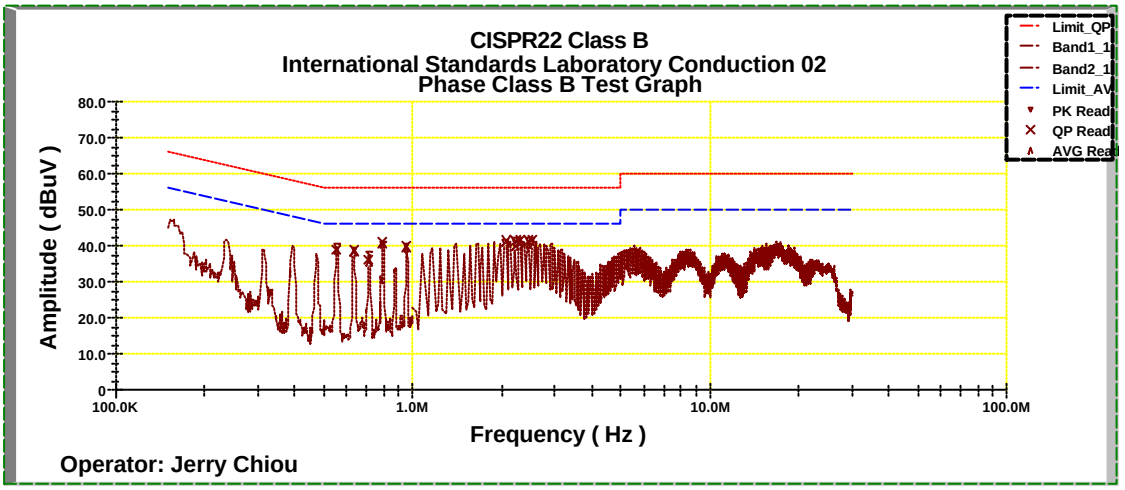
The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

### 5.1.3 EMI Receiver/Spectrum Analyzer Configuration (for the frequencies tested)

| | |
|---|---|
| Frequency Range | 150 KHz--30MHz |
| Detector Function | Quasi-Peak/Average |
| Bandwidth (RBW) | 9KHz |

### 5.1.4 Test Data:

## Power Line Conducted Emissions (Hot) Channel 1, 6, 11

Operator:JerryChiou
Temperature(C):24
10:39:47AM,Thursday,December02,2004 Humidity(%):50

| Frequency | LISNLoss | CableLoss | QPCorrct. | QPLimit | QPMargin | AVECorrct. | AVELimit | AVEMargin |
|---|---|---|---|---|---|---|---|---|
| MHz | (dB) | (dB) | Amp.(dBuV) | (dBuV) | (dB) | Amp.(dBuV) | (dBuV) | (dB) |
| 0.55258 | 0.13 | 0.07 | 38.89 | 56.00 | -17.11 | 38.18 | 46.00 | -7.82 |
| 0.63296 | 0.14 | 0.07 | 38.69 | 56.00 | -17.31 | 37.54 | 46.00 | -8.46 |
| 0.71098 | 0.15 | 0.07 | 36.06 | 56.00 | -19.94 | 34.80 | 46.00 | -11.20 |
| 0.79110 | 0.17 | 0.07 | 40.85 | 56.00 | -15.15 | 40.08 | 46.00 | -5.92 |
| 0.94890 | 0.19 | 0.07 | 39.81 | 56.00 | -16.19 | 38.90 | 46.00 | -7.10 |
| 2.05649 | 0.20 | 0.09 | 41.35 | 56.00 | -14.65 | 40.42 | 46.00 | -5.58 |
| 2.21478 | 0.20 | 0.10 | 41.29 | 56.00 | -14.71 | 39.25 | 46.00 | -6.75 |
| 2.29223 | 0.20 | 0.10 | 41.40 | 56.00 | -14.60 | 40.08 | 46.00 | -5.92 |
| 2.45233 | 0.20 | 0.10 | 41.33 | 56.00 | -14.67 | 39.91 | 46.00 | -6.09 |
| 2.53188 | 0.20 | 0.10 | 41.56 | 56.00 | -14.44 | 39.83 | 46.00 | -6.17 |