

Part 2--Tested with Bluetooth Module
Test Report
for
FCC Part 15 Subpart B & C

of

Product Name

Notebook Personal Computer

Model

V100

(With WLAN & Bluetooth Module)

Applied by:

MITAC Technology Corporation
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Hsinchu Science-Bas
Taiwan,R. O. C.

Test Performed by:

International Standards Laboratory

Lung-Tan LAB

Site Registration No.

BSMI: SL2-IN-E-0013; TAF: 0997; NVLAP: 200234-0;
IC: IC4164-1; VCCI: R-1435, C-1440; NEMKO: ELA 113B

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ISL-T10-R2-3


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1. General

1.1 Certification of Accuracy of Test Data

| | |
|------------------------------|---|
| Standards: | CFR 47 Part 15 Subpart B Class B CFR 47 Part 15 Subpart C (Section 15.247) |
| Test Procedure: | ANSI C63.4:2003 |
| Equipment Tested: | Notebook Personal Computer |
| Model: | V100 |
| Applied by: | MITAC Technology Corporation |
| Sample received Date: | 2007/02/05 |
| Final test Date : | 2007/03/14-2007-03/16 |
| 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/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 48 pages, including 1 cover page, 2 contents page, and 45 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 Bluetooth 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(a) | AC Power Line Emissions | Pass | |
| 15.247(b) (1) | Max. Peak Output Power | Pass | |
| 15.209(a) | Radiated Emissions 30MHz – 25 GHz | Pass | |
| 15.247 (c) | Band Edge Measurement | Pass | |
| 15.247(a)(1)(iii) | Number of Hopping Frequency Used | Pass | |
| 15.247(a) (1)(ii) | Spectrum Bandwidth Of FHSS device | Pass | |
| 15.247(a)(1) | Hopping Channel Separation | Pass | |
| 15.247(a)(1)(iii) | Dwell Time | Pass | |

3. Description of Equipment Under Test (EUT)

| | |
|---------------------------------|---|
| Description: | Notebook Personal Computer |
| Condition: | Pre-Production |
| Model: | V100 |
| Brand: | MITAC |
| Wireless LAN Module: | Intel, Model: WM3945ABG |
| Bluetooth Module: | BILLIONTON(Model:GUBTCR42M) |
| Frequency Range of 802.11a: | 5150 - 5250 MHz 5250 - 5350 MHz 5725 - 5850 MHz |
| Frequency Range of 802.11b/g: | 2400 - 2483.5 MHz |
| Frequency Range of Bluetooth: | 2400 - 2483.5 MHz |
| Support channel: | |
| 802.11a Normal mode | 13 Channels |
| 802.11b/g | 11 Channels |
| Bluetooth | 79 Channels |
| Modulation Skill: | |
| 802.11a | OFDM (6 Mbps – 54 Mbps) |
| 802.11b | DBPSK(1Mbps), DQPSK(2Mbps), CCK(5.5/11Mbps) |
| 802.11g | OFDM (6M - 54Mbps) |
| Bluetooth | GFSK (1Mbps) |
| Antennas Type: | |
| WLAN Right antenna: | PIFA (P/N: IA-060076) White made by JOINSOON ELECTRONICS MFG. CO., LTD |
| WLAN Left antenna: | PIFA (P/N: IA-060239) Black made by JOINSOON ELECTRONICS MFG. CO., LTD |
| Bluetooth antenna: | PIFA Antenna(P/N: IA060093), made by JOINSOON ELECTRONICS MFG. CO.,LTD. |
| Antenna Connected: | Connected to RF connector on the PCB of the Bluetooth or WLAN module .The user is not possible to change the antenna without disassembling the notebook computer. |
| Antenna peak Gain: | |
| WLAN Right antenna | 1.61dBi(11b,11g), 2.45dBi(11a) |
| WLAN Left antenna | -0.55 dBi (11b,11g), 3.97 dBi (11a) |
| Bluetooth antenna | -0.8 dBi |
| Power Type of wireless module: | 3.3V DC from Notebook PC |
| Power Type of Bluetooth module: | 3.3V DC from Notebook PC |

The channel and the operation frequency of 802.11a listed below:

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 01 | 5180 | 02 | 5200 |
| 03 | 5220 | 04 | 5240 |
| 05 | 5260 | 06 | 5280 |
| 07 | 5300 | 08 | 5320 |
| 09 | 5745 | 10 | 5765 |
| 11 | 5785 | 12 | 5805 |
| 13 | 5825 | | |

The channel and the operation frequency of 802.11b and 802.11g 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 | | |

The channels and the operation frequency of Bluetooth listed below:

| Channel | Frequency(MHz) | Channel | Frequency(MHz) |
|---------|----------------|---------|----------------|
| 00 | 2402 | 01 | 2403 |
| 02 | 2404 | 03 | 2405 |
| 04 | 2406 | 05 | 2407 |
| | | | |
| 75 | 2477 | 76 | 2478 |
| 77 | 2479 | 78 | 2480 |

| | |
|--------------------|---|
| CPU: | Genuine intel U2500 1.2GHz |
| Adapter Type: | Auto Switching AC Adapter 100-240V,1.2A 50-60Hz EPS (Model: F10903-A) |
| Hard Disk Driver: | Toshiba (Model:MK8032GSX) 80G or Toshiba (Model:MK1234GSX) 120G |
| Modem Card: | Conexant (Model: RD-02-D330) |
| Wireless LAN Card: | Intel(Model:WM3945ABG) |
| Bluetooth module: | BILLIONTON(Model:GUBTCR42M) |
| USB Connector: | two 4 pin |
| RJ11 Connector: | one 2 pin |
| Serial Port: | two 9 pin |
| RJ45 Connector: | one 8 pin |
| Line out Port: | one |
| Line-in Port: | one |
| SD Card Port: | one |
| PCMCIA Slot: | two |
| DC IN Port: | one |
| Battery: | MITAC(Model: BP-LC2600/33-0151), 11.1Vdc, 7800mAh |
| LCD: | Toshiba(Model: LTD104KA1S) or Toshiba(Model: LTD121EXEV) |
| DDR: | Infineon(Model:PC2-4200S-444-11-A0) 512M Hnnix(Model:PC2-5300S555-12) 1G |
| Power Cord: | Non-shielded, Detachable |

Test configuration:

| configuration | LCD | CPU | Adapter Type | Hard Disk | Modem Card | Wireless LAN Card | Battery | DDR |
|---------------|------------------------------|----------------------------|-----------------------|---------------------------------|-------------------------------|--------------------------|-----------------------------------|---------------------------------|
| 1 | Toshiba(Model: LTD104K A1S) | Genuine intel U2500 1.2GHz | EPS (Model: F10903-A) | Toshiba (Model:MK 1234GSX) 120G | Conexant (Model: RD-02-D33 0) | Intel(Model: WM3945A BG) | MITAC(M odel:BP-LC 2600/33-015 1) | Hnnix(M odel:PC2- 5300S555 -12) |
| 2 | Toshiba(Model: LTD121E XEV) | Genuine intel U2500 1.2GHz | EPS (Model: F10903-A) | Toshiba (Model:MK 1234GSX) 120G | Conexant (Model: RD-02-D33 0) | Intel(Model: WM3945A BG) | MITAC(M odel:BP-LC 2600/33-015 1) | Hnnix(M odel:PC2- 5300S555 -12) |

All types of LCD, CPU, Adapter Type, Hard Disk, Modem Card, Wireless LAN Card, Battery, DDR with related components have been tested, only shown the worst data using the following configuration in this report.

| configuration | LCD | CPU | Adapter Type | Hard Disk | Modem Card | Wireless LAN Card | Battery | DDR |
|---------------|------------------------------|----------------------------|-----------------------|---------------------------------|-------------------------------|--------------------------|-----------------------------------|---------------------------------|
| 2 | Toshiba(Model: LTD121E XEV) | Genuine intel U2500 1.2GHz | EPS (Model: F10903-A) | Toshiba (Model:MK 1234GSX) 120G | Conexant (Model: RD-02-D33 0) | Intel(Model: WM3945A BG) | MITAC(M odel:BP-LC 2600/33-015 1) | Hnnix(M odel:PC2- 5300S555 -12) |

EMI Noise Source:

- GPS board Crystal: 12MHz(X1)
- Touch Panel board Crystal:7.372MHz(X1)
- SD card board Crystal:12MHz(X2)
- Main board Crystal:25MHz(X3),10MHz(X2),14.318MHz(X501)
- Clock Generator: U514

EMI Solution:

1. Adding shielded tape on LCD Signal cable
2. Adding Gasket on LCD Signal cable
3. Adding Gasket on LCD Panel around
4. Adding Gasket on Bluetooth Module
5. Adding aluminum foil on 3GCDMA antenna
6. Adding Copper on Main board
7. Adding Copper on Modem Card
8. Adding Gasket on Main board
9. Adding Gasket on Modem Card
10. Adding Core(A5 FS 16*5*12) on LAN Signal cable
11. Adding Core(A3 FS 15*3*11) on Modem Card Signal cable
12. Adding Core(K5B RH 6.35*15.8*3.3) on DC IN Jack
13. Adding aluminum foil on Case
14. Adding Core(FPC 40*2.7*12-K) on Keyboard Signal cable
15. Adding Core(RC 16*28*9 -M2) on Adapter Type Signal cable

4. TEST RESULTS (Bluetooth)

4.1 Powerline Conducted Emissions

4.1.1 EUT Configuration

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 used.

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 6dB 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 6dB below the applicable average limits, the emissions were also measured with the average detectors.

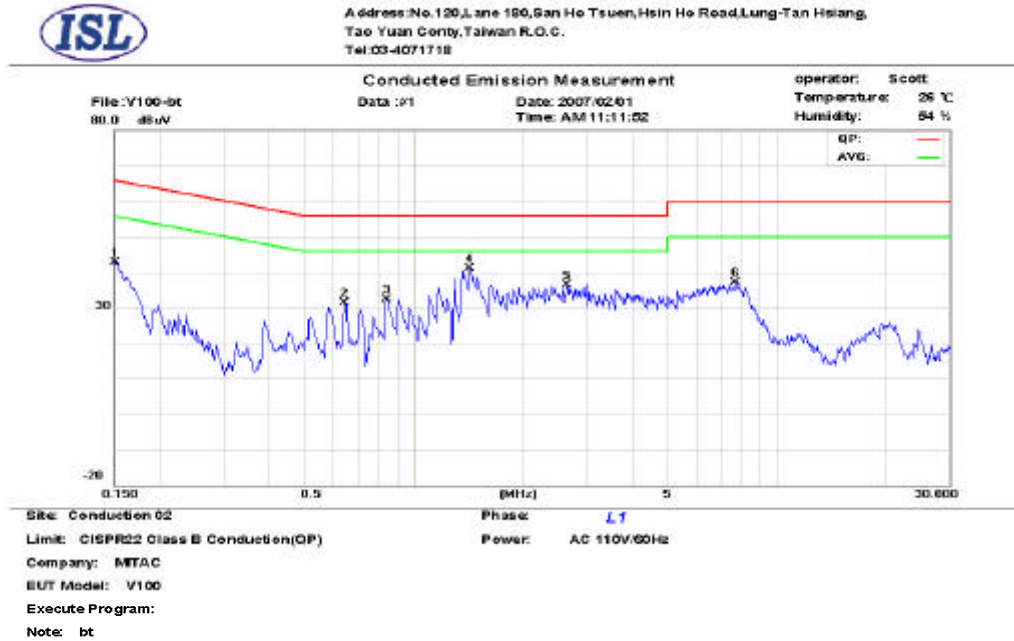
The highest emissions were analyzed in details by operating the spectrum analyzer in fixed tuned mode to determine the nature of the emissions and to provide information which could be useful in reducing their amplitude.

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 00, 39, 78



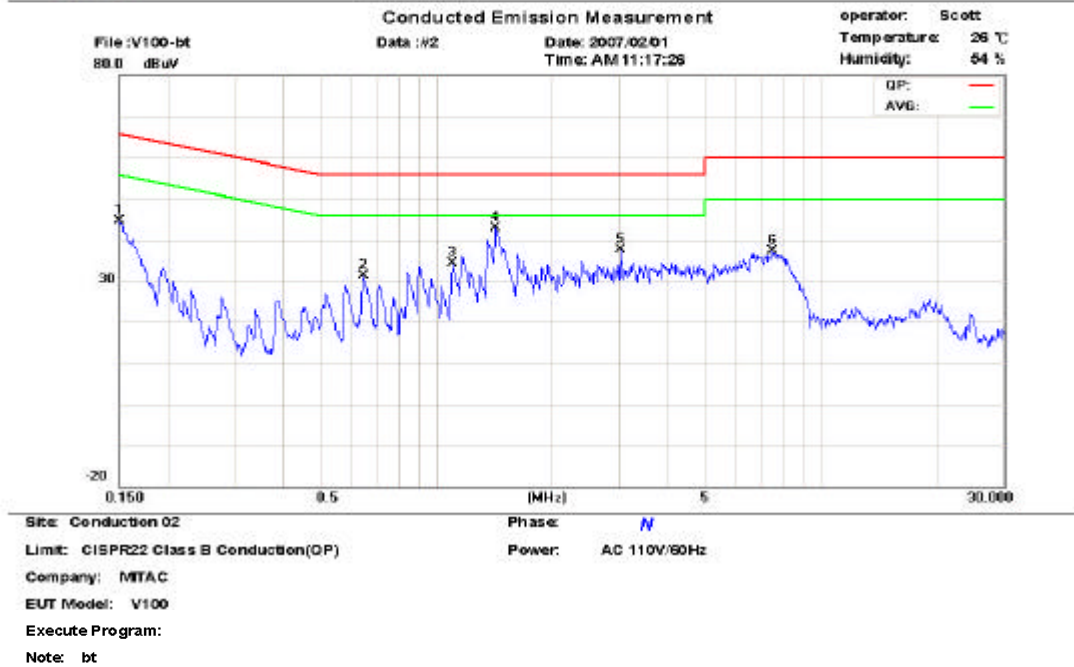
| Frequency MHz | LISN Loss dB | Cable Loss dB | QP Correct. dBuV | QP Limit dBuV | QP Margin dB | AVG Correct. dBuV | AVG Limit dBuV | AVG Margin dB | Note |
|---------------|--------------|---------------|------------------|---------------|--------------|-------------------|----------------|---------------|------|
| 0.1500 | 0.1 | 0.02 | 43.30 | 65.9 | -22.6 | 39.90 | 55.9 | -16.0 | |
| 0.6440 | 0.2 | 0.07 | 32.90 | 56.0 | -23.1 | 30.60 | 46.0 | -15.4 | |
| 0.8438 | 0.2 | 0.07 | 33.40 | 56.0 | -22.6 | 31.40 | 46.0 | -14.6 | |
| * 1.4256 | 0.2 | 0.08 | 41.40 | 56.0 | -14.6 | 36.10 | 46.0 | -9.90 | |
| 2.6500 | 0.26 | 0.11 | 36.20 | 56.0 | -19.8 | 34.60 | 46.0 | -11.4 | |
| 7.6870 | 0.46 | 0.18 | 40.00 | 60.0 | -20.0 | 35.80 | 50.0 | -14.2 | |

*:Maximum data x:Over limit

Power Line Conducted Emissions (Neutral) Channel 00, 39, 78



Address: No.120, Lane 180, San Ho Tsuen, Hsin Ho Road, Lung-Tan Hsiang,
Tao Yuan Conity, Taiwan R.O.C.
Tel:03-4071718



| Frequency MHz | LISN Loss dB | Cable Loss dB | QP Correct dBuV | QP Limit dBuV | QP Margin dB | AVG Correct dBuV | AVG Limit dBuV | AVG Margin dB | Note |
|---------------|--------------|---------------|-----------------|---------------|--------------|------------------|----------------|---------------|------|
| 0.1500 | 0.1 | 0.02 | 42.30 | 65.9 | -23.6 | 39.40 | 55.9 | -16.5 | |
| 0.6474 | 0.2 | 0.07 | 33.60 | 56.0 | -22.4 | 31.00 | 46.0 | -15.0 | |
| 1.0997 | 0.2 | 0.07 | 36.70 | 56.0 | -19.3 | 33.40 | 46.0 | -12.6 | |
| * 1.4226 | 0.2 | 0.08 | 41.90 | 56.0 | -14.1 | 40.70 | 46.0 | -5.30 | |
| 3.0253 | 0.2 | 0.12 | 26.70 | 56.0 | -29.3 | 22.30 | 46.0 | -23.7 | |
| 7.4860 | 0.32 | 0.18 | 36.20 | 60.0 | -23.8 | 30.20 | 50.0 | -19.8 | |

*.Maximum data x:Over limit

* NOTE: During the test, the EMI receiver was set to Max. Hold then switch the EUT Channel between 00, 39, 78 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 FHSS Maximum Peak Output Power

4.2.1 Test Procedure

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

4.2.2 Test Setup



4.2.3 Test Data

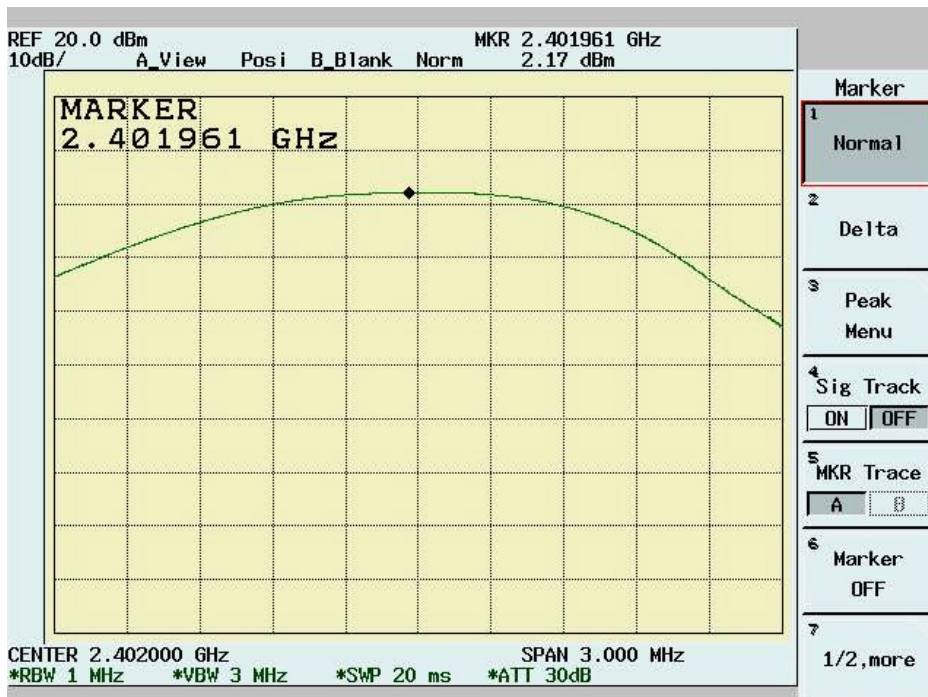
Maximum Peak Output Power

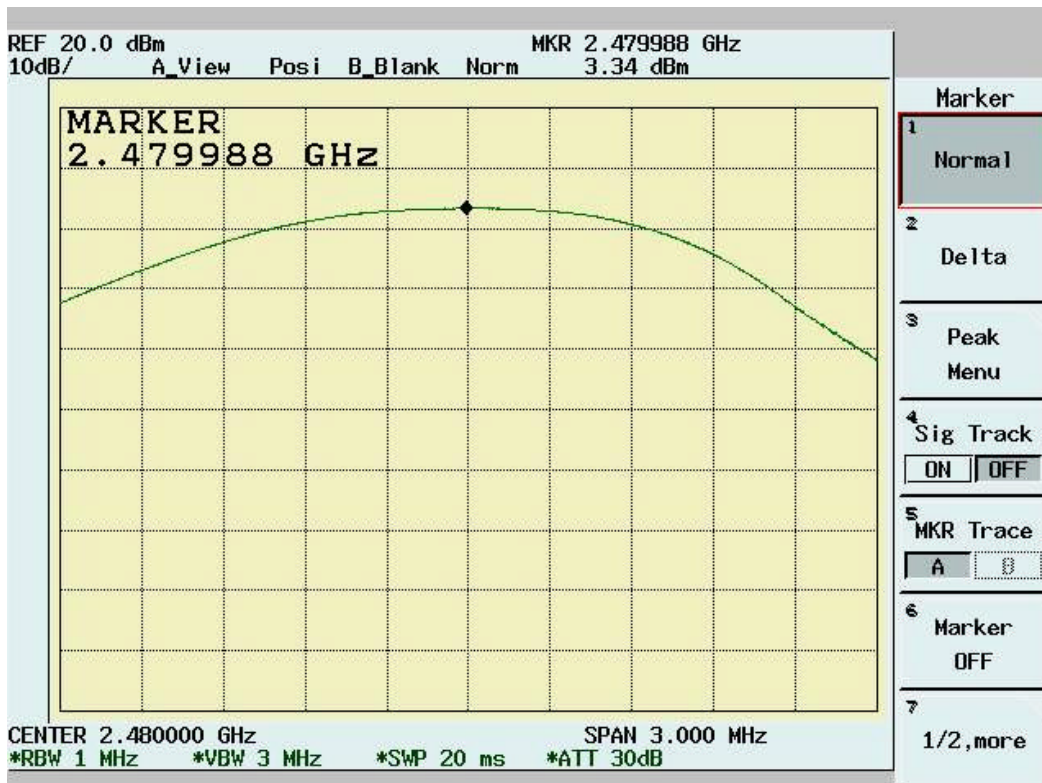
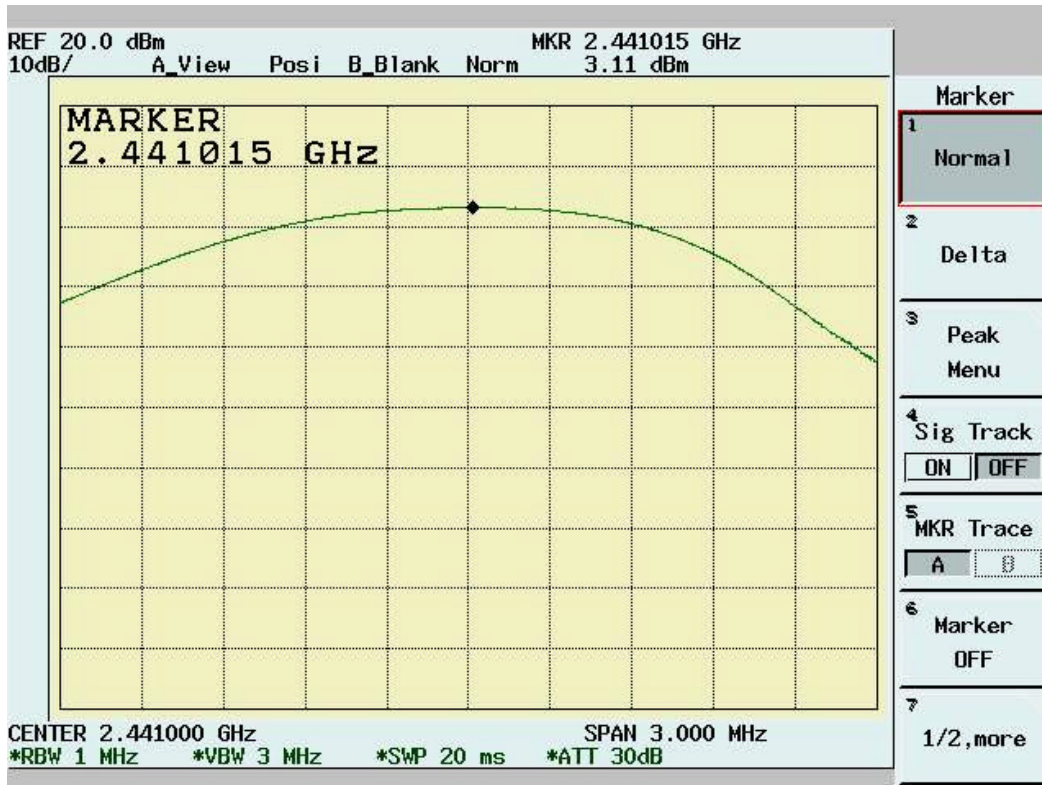
Temperature ():25

Humidity (%):55

Test Engineer:Jerry Chiou

| Channel | Frequency (Mhz) | Analyzer Reading (dBm) | Cable Loss (dB) | Peak Power Output (mW) | Peak Power Output (dBm) | Limit (dBm) | Pass/Fail |
|---------|--------------------|------------------------------|-----------------------|------------------------------|-------------------------------|----------------|-----------|
| 00 | 2402 | 2.17 | 1.10 | 2.12 | 3.27 | 30 | Pass |
| 39 | 2441 | 3.11 | 1.10 | 2.64 | 4.21 | 30 | Pass |
| 78 | 2480 | 3.34 | 1.10 | 2.78 | 4.44 | 30 | Pass |





4.3 Radiated Emission Measurement

4.3.1 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.

4.3.2 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 according to *EMI Receiver/Spectrum Analyzer Configuration*.

For the test of 2nd to 10th 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.

4.3.3 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 |

4.3.4 Test Data (30MHz – 1GHz):

30M – 1GHz Open Field Radiated Emissions (Horizontal) Channel 00, 39, 78

Operator: Jerry Chiou

Temperature(C):22

Humidity(%):63

| 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) |
| 59.1 | 19.51 | 6.72 | 1.33 | 0.00 | 27.56 | 40.00 | -12.44 | 96.00 | 33.00 |
| 68.8 | 20.84 | 6.16 | 1.51 | 0.00 | 28.52 | 40.00 | -11.48 | 96.00 | 243.00 |
| 84.32 | 20.21 | 7.76 | 1.67 | 0.00 | 29.65 | 40.00 | -10.35 | 96.00 | 191.00 |
| 88.2 | 20.36 | 8.54 | 1.67 | 0.00 | 30.57 | 43.50 | -12.93 | 96.00 | 217.00 |
| 102.75 | 14.50 | 11.10 | 1.93 | 0.00 | 27.52 | 43.50 | -15.98 | 96.00 | 33.00 |
| 105.66 | 14.23 | 11.62 | 1.93 | 0.00 | 27.78 | 43.50 | -15.72 | 96.00 | 33.00 |
| 108.57 | 15.76 | 12.14 | 1.94 | 0.00 | 29.84 | 43.50 | -13.66 | 96.00 | 33.00 |
| 111.48 | 17.76 | 12.43 | 1.90 | 0.00 | 32.09 | 43.50 | -11.41 | 96.00 | 59.00 |
| 162.89 | 17.47 | 9.93 | 2.39 | 0.00 | 29.78 | 43.50 | -13.72 | 96.00 | 217.00 |
| 919.49 | 5.15 | 20.66 | 5.32 | 0.00 | 31.12 | 46.00 | -14.88 | 96.00 | 349.00 |

30M – 1GHz Open Field Radiated Emissions (Vertical) Channel 00, 39, 78

Operator: Jerry Chiou
Temperature(C): 22
Humidity(%): 63

| Frequency MHz | RxAmp. (dBuV) | AntFact (dB/m) | CableLoss (dB) | PreAmpGain (dB) | Corrct.Emi. (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Ant.Pos. (cm) | TablePos. (deg) |
|------------------|------------------|-------------------|-------------------|--------------------|-------------------------|-------------------|----------------|------------------|--------------------|
| 58.13 | 19.06 | 6.84 | 1.33 | 0.00 | 27.23 | 40.00 | -12.77 | 96.00 | 217.00 |
| 68.8 | 21.68 | 6.16 | 1.51 | 0.00 | 29.35 | 40.00 | -10.65 | 96.00 | 243.00 |
| 88.2 | 21.01 | 8.54 | 1.67 | 0.00 | 31.21 | 43.50 | -12.29 | 96.00 | 217.00 |
| 102.75 | 15.16 | 11.10 | 1.93 | 0.00 | 28.18 | 43.50 | -15.32 | 96.00 | 33.00 |
| 105.66 | 14.78 | 11.62 | 1.93 | 0.00 | 28.33 | 43.50 | -15.17 | 96.00 | 33.00 |
| 108.57 | 14.50 | 12.14 | 1.94 | 0.00 | 28.58 | 43.50 | -14.92 | 96.00 | 33.00 |
| 111.48 | 15.84 | 12.43 | 1.90 | 0.00 | 30.18 | 43.50 | -13.32 | 96.00 | 59.00 |
| 155.13 | 16.47 | 10.15 | 2.31 | 0.00 | 28.93 | 43.50 | -14.57 | 96.00 | 217.00 |
| 164.83 | 18.48 | 9.81 | 2.39 | 0.00 | 30.68 | 43.50 | -12.82 | 96.00 | 217.00 |
| 197.81 | 16.39 | 9.16 | 2.60 | 0.00 | 28.14 | 43.50 | -15.36 | 96.00 | 243.00 |

NOTE:

- During the Pre-test, the EUT has been tested for Channel 00, 39, 78 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

4.3.5 Test Data (1GHz – 25 GHz)

1GHz~ 25 GHz (Horizontal), Channel 00: 2402 MHz

Operator: JerryChiou

RBW: 1MHz
Humidity(%): 59
Temperature(C): 22

| 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 |
| 1497 | 40.97pk | 26.79 | 2.23 | 23.75 | 46.23pk | 54.00av | -7.77 | 101 | 78 |
| 5064.44 | 30.23pk | 34.88 | 5.07 | 27.28 | 42.90pk | 54.00av | -11.10 | 100 | 18 |
| 9482.52 | 30.21pk | 39.16 | 3.83 | 24.97 | 48.23pk | 54.00av | -5.77 | 102 | 10 |

1GHz~ 25 GHz (Vertical), Channel 00: 2402 MHz

Operator: Jerry Chiou

RBW: 1MHz
Humidity(%): 59
Temperature(C): 22

| 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 |
| 1596.9 | 40.42pk | 27.61 | 2.30 | 23.75 | 46.59pk | 54.00av | -7.41 | 101 | 71 |
| 1861.64 | 39.05pk | 29.84 | 2.50 | 23.75 | 47.63pk | 54.00av | -6.37 | 100 | 53 |
| 6817.18 | 31.57pk | 37.82 | 3.89 | 26.89 | 46.39pk | 54.00av | -7.61 | 101 | 142 |
| 9554.95 | 29.83pk | 39.00 | 3.88 | 24.90 | 47.81pk | 54.00av | -6.19 | 102 | 9 |

Note:

- According to the standards used, 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 39 : 2441 MHz

Operator:JerryChiou

RBW:1MHz
Humidity(%):59
Temperature(C):22

| Frequency MHz | Rx_R. dBuV | Ant_F. dB/m | Cab_L. dB | PreAmpl dB | Emission dBuV/m | Limit dBuV/m | Margin dB | A.Tower cm | T.Table deg |
|------------------|---------------|----------------|--------------|---------------|--------------------|-----------------|--------------|---------------|----------------|
| 1497 | 41.54pk | 26.79 | 2.23 | 23.75 | 46.80pk | 54.00av | -7.20 | 101 | 78 |
| 4629.87 | 30.47pk | 33.39 | 5.16 | 27.75 | 41.27pk | 54.00av | -12.73 | 101 | 37 |
| 8526.47 | 29.77pk | 41.08 | 3.80 | 26.37 | 48.29pk | 54.00av | -5.71 | 102 | 131 |
| 9714.29 | 29.59pk | 38.71 | 3.99 | 24.79 | 47.50pk | 54.00av | -6.50 | 102 | 6 |

1GHz~ 25 GHz (Vertical), Channel 39 : 2441 MHz

Operator: Jerry Chiou

RBW: 1MHz
Humidity(%): 59
Temperature(C): 22

| Frequency MHz | Rx_R. dBuV | Ant_F. dB/m | Cab_L. dB | PreAmpl dB | Emission dBuV/m | Limit dBuV/m | Margin dB | A.Tower cm | T.Table deg |
|------------------|---------------|----------------|--------------|---------------|--------------------|-----------------|--------------|---------------|----------------|
| 1996.5 | 35.27pk | 30.97 | 2.60 | 23.75 | 45.08pk | 54.00av | -8.92 | 100 | 43 |
| 5035.46 | 30.28pk | 34.84 | 5.09 | 27.26 | 42.96pk | 54.00av | -11.04 | 100 | 10 |
| 7280.72 | 30.96pk | 38.32 | 3.88 | 26.57 | 46.59pk | 54.00av | -7.41 | 101 | 150 |
| 9757.74 | 30.16pk | 38.64 | 4.02 | 24.76 | 48.05pk | 54.00av | -5.95 | 101 | 5 |

Note:

- According to the standards used: 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 78: 2480 MHz

Operator: JerryChiou

RBW: 1MHz
Humidity(%): 59
Temperature(C): 22

| Frequency MHz | Rx_R. dBuV | Ant_F. dB/m | Cab_L. dB | PreAmpl dB | Emission dBuV/m | Limit dBuV/m | Margin dB | A.Tower cm | T.Table deg |
|------------------|---------------|----------------|--------------|---------------|--------------------|-----------------|--------------|---------------|----------------|
| 1497 | 42.03pk | 26.79 | 2.23 | 23.75 | 47.29pk | 54.00av | -6.71 | 101 | 78 |
| 4687.81 | 30.60pk | 33.61 | 5.15 | 27.67 | 41.70pk | 54.00av | -12.30 | 101 | 31 |
| 8511.99 | 29.65pk | 41.09 | 3.80 | 26.38 | 48.16pk | 54.00av | -5.84 | 102 | 135 |
| 10308.2 | 32.11pk | 38.45 | 4.23 | 25.29 | 49.49pk | 54.00av | -4.51 | 101 | 72 |

1GHz~ 25 GHz (Vertical), Channel 78 : 2480 MHz

Operator: Jerry Chiou

RBW: 1MHz
Humidity(%): 59
Temperature(C): 22

| 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 |
| 1856.64 | 39.77pk | 29.80 | 2.49 | 23.75 | 48.31pk | 54.00av | -5.69 | 100 | 53 |
| 2006.49 | 35.38pk | 31.00 | 2.58 | 23.76 | 45.19pk | 54.00av | -8.81 | 100 | 45 |
| 6541.96 | 30.84pk | 38.76 | 4.12 | 27.21 | 46.51pk | 54.00av | -7.49 | 101 | 191 |
| 9250.75 | 29.40pk | 39.90 | 3.72 | 25.35 | 47.67pk | 54.00av | -6.33 | 102 | 15 |

Note:

- According to the standards used, 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.

4.4 Band Edge Measurement

4.4.1 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

4.4.2 Test Setup (Conducted)



4.4.3 Test Data

Table: Band Edge measurement (Conducted)

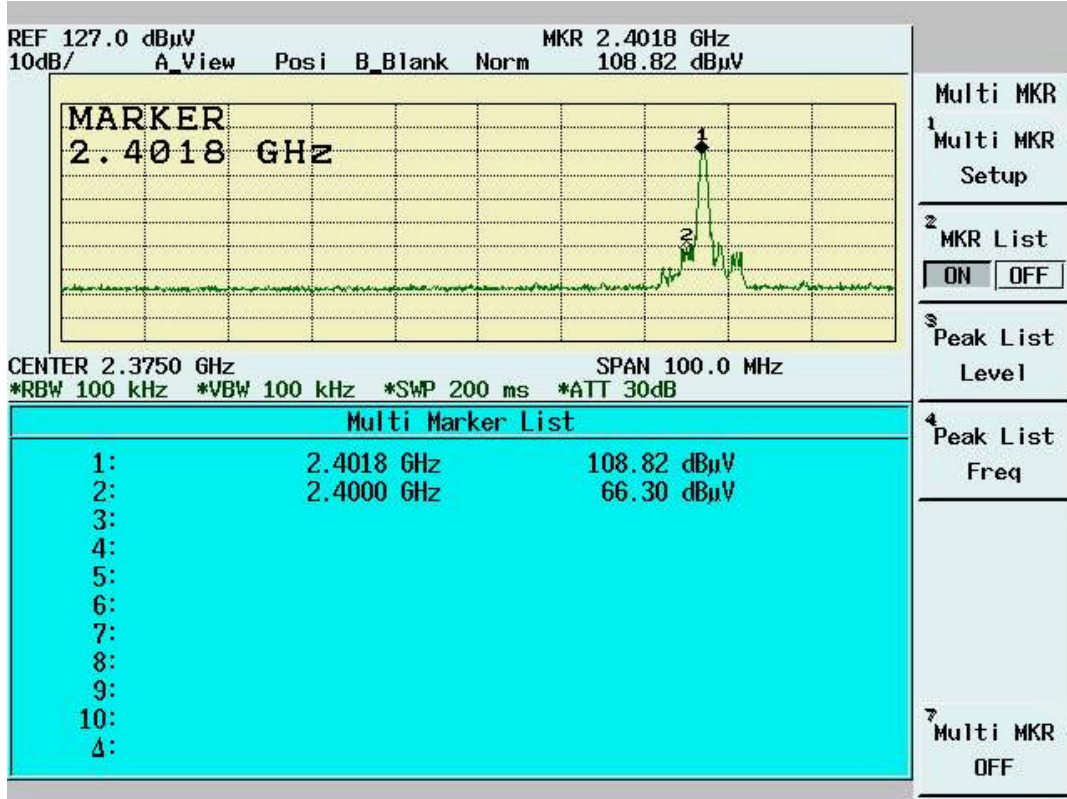
Temperature ():25

Test Engineer:Jerry Chiou

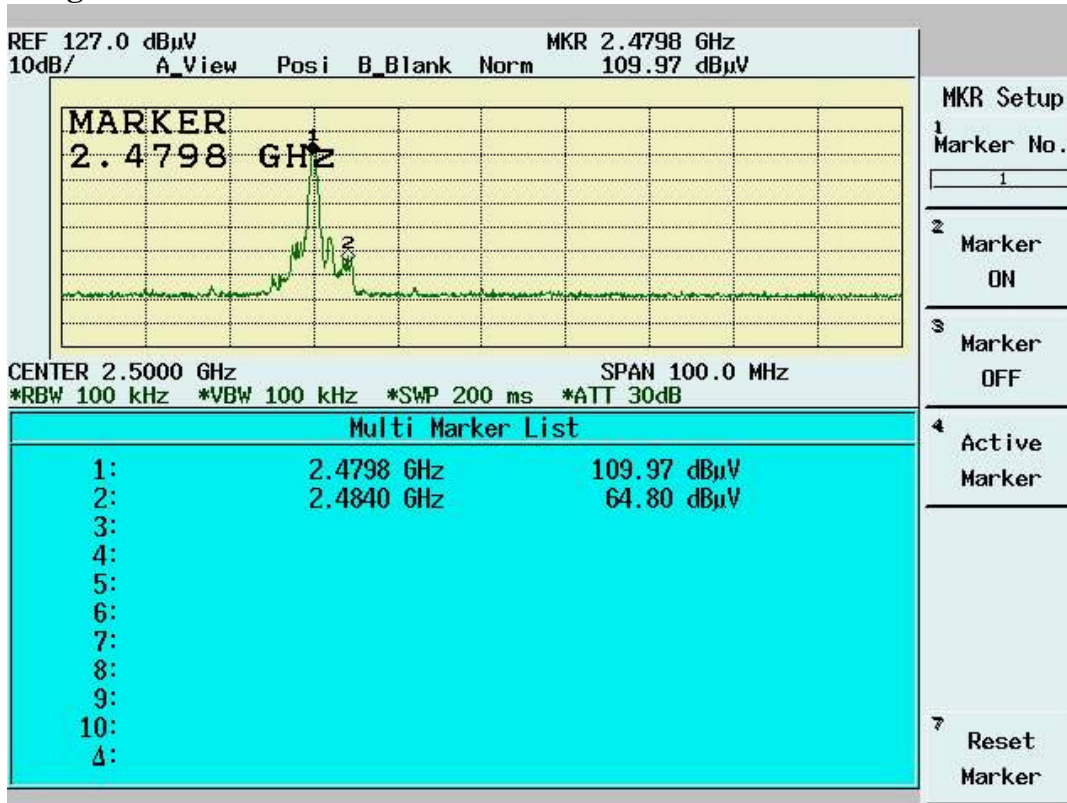
Humidity (%):55

| Channel | Frequency | Spectrum Reading | Carrier - Outsideband Limit: >20dB | Pass/Fail |
|---------------------|-----------|------------------|------------------------------------|-----------|
| | (MHz) | (dBuV) | (dB) | |
| 00 | 2401.8 | 108.8 | --- | --- |
| Outside band | 2400.0 | 66.3 | 42.5 | Pass |
| 78 | 2479.8 | 110.0 | --- | --- |
| Outside band | 2484.0 | 64.8 | 45.2 | Pass |

Band Edge Conducted Measurement



Band Edge Conducted Measurement



4.4.4 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: 3MHz
Center frequency: 2.375GHz, 2.500GHz.
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.

4.4.5 Test Setup (Radiated)

Same as *Radiated Emission Measurement*

4.4.6 Test Data

Table Band Edge measurement (Radiated)

Test Engineer: Jerry Chiou

Temperature (): 25

Data Rate

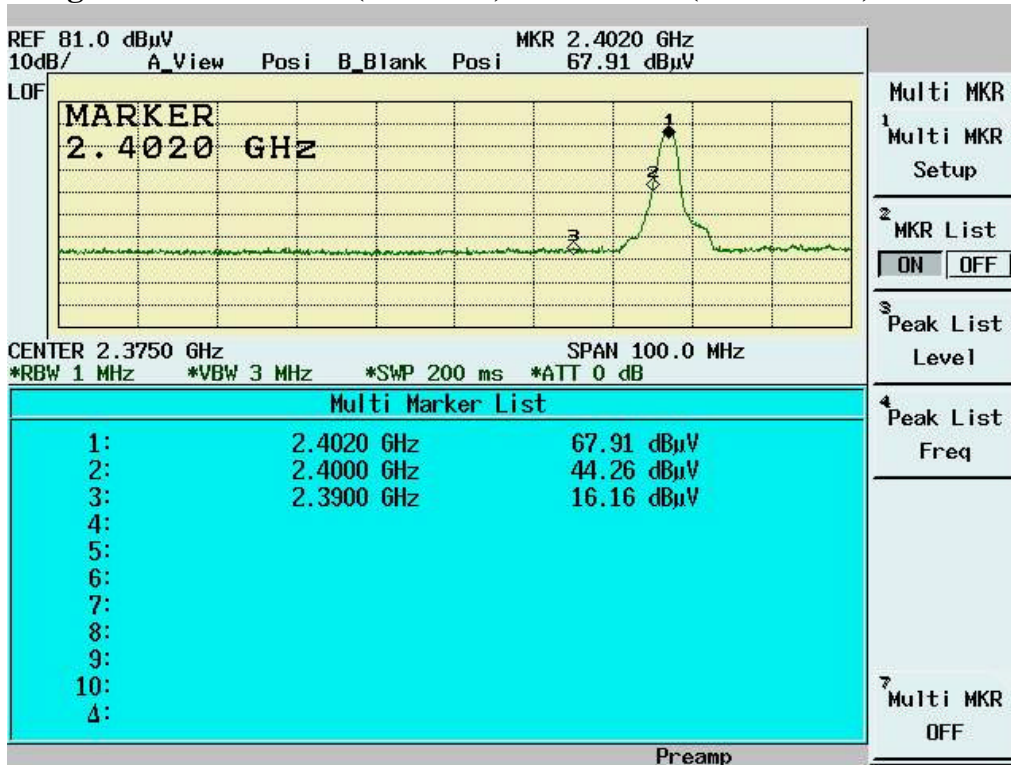
Humidity (%): 60

| Description | Frequency | Spectrum Reading | Correction Factor | Emission Level | dBc (Limit: > 20dBc) | Limit (dBuV/m) | Equip. Setup | Pass or Fail |
|--|-----------|------------------|-------------------|----------------|----------------------|----------------|--------------|--------------|
| | (MHz) | (dBuV) | (dB/m) | (dBuV/m) | | | VBW | |
| Channel_00 (average mode) | 2402.40 | 29.13 | 35.48 | 64.61 | --- | --- | 10Hz | --- |
| Channel_00 (peak mode) | 2402.00 | 67.91 | 35.48 | 103.39 | --- | --- | 3MHz | --- |
| Outside band (peak mode) | 2400.00 | 44.26 | 35.48 | 79.74 | 23.65 | --- | 3MHz | Pass |
| Channel_78 (average mode) | 2480.40 | 30.07 | 35.51 | 65.58 | --- | --- | 10Hz | --- |
| Channel_78 (peak mode) | 2480.00 | 69.11 | 35.51 | 104.62 | --- | --- | 3MHz | --- |
| Outside band (peak mode) | 2483.80 | 27.70 | 35.51 | 63.21 | 41.41 | --- | 3MHz | Pass |
| Channel_00 Restricted band (peak mode) | 2390.00 | 16.16 | 35.47 | 51.63 | --- | 74 | 3MHz | Pass |
| Restricted band (average mode) | 2390.00 | 5.52 | 35.47 | 40.99 | --- | 54 | 10Hz | Pass |
| Channel_78 Restricted band (peak mode) | 2483.80 | 27.70 | 35.51 | 63.21 | --- | 74 | 3MHz | Pass |
| Restricted band (average mode) | 2484.10 | 11.33 | 35.51 | 46.84 | --- | 54 | 10Hz | Pass |

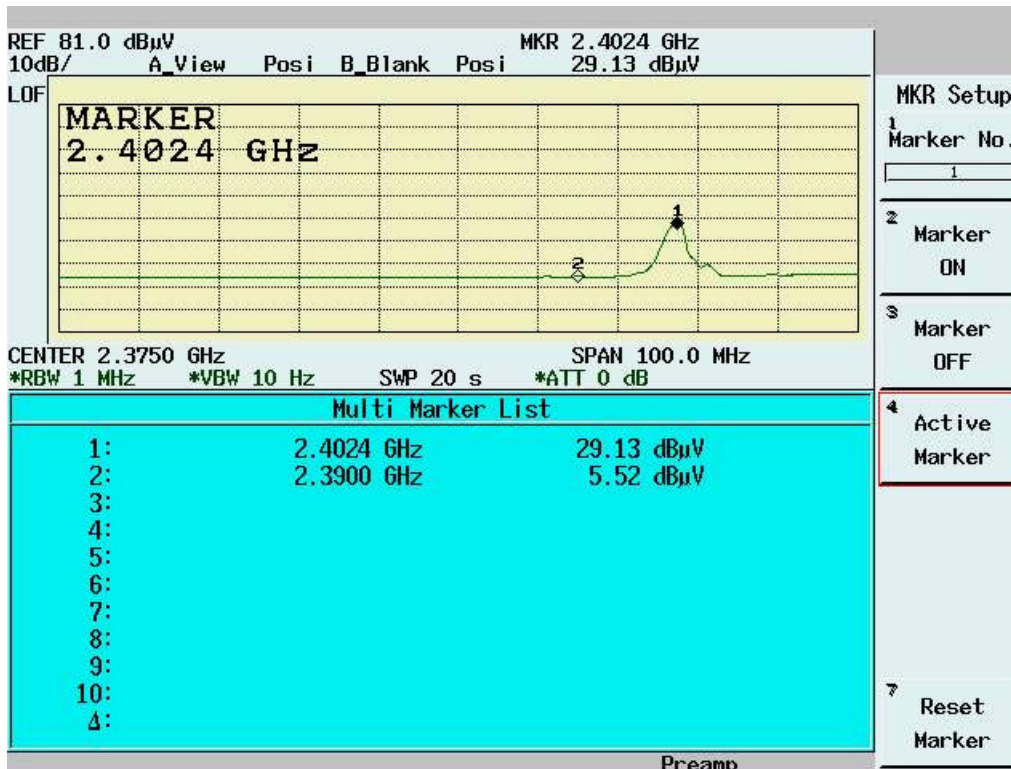
Note:

- 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 polarization have been tested and the worst data is listed above.

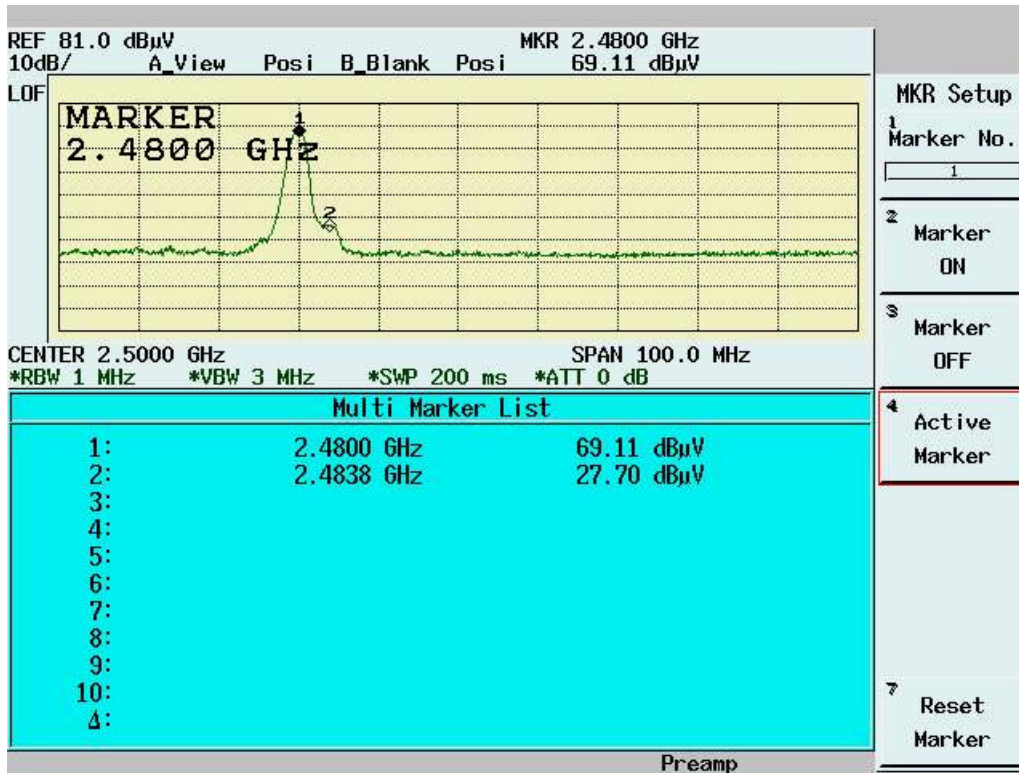
Band Edge Restricted Band (Radiated)-Peak Mode (Channel 00)



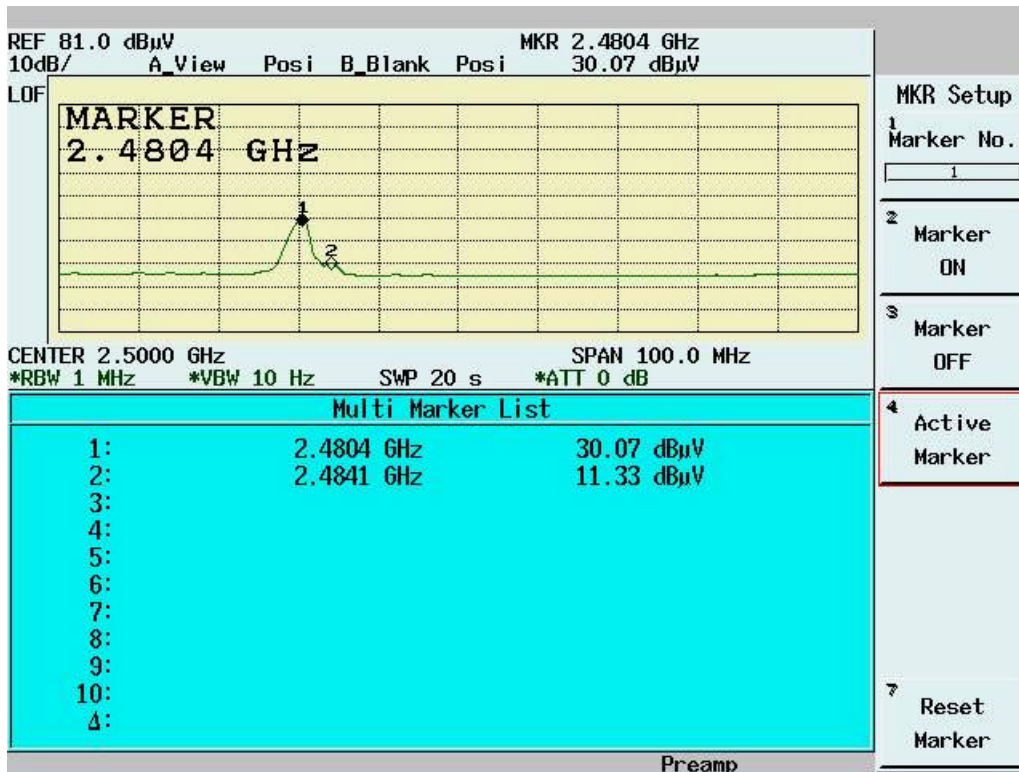
Band Edge Restricted Band (Radiated)-Average Mode (Channel 00)



Band Edge Restricted Band (Radiated)-Peak Mode (Channel 78)



Band Edge Restricted Band (Radiated)-Average Mode (Channel 78)



4.5 Bandwidth & Hopping Channel Separation

4.5.1 Standard Applicable

According to §15.247(a) (1), frequency hopping system shall have, hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies.

4.5.2 Test Procedure

■ Bandwidth Test Procedure

The Transmitter output of EUT was connected to the spectrum analyzer. The 20 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 | 30KHz |
| VBW | 100KHz |

■ Hopping Channel Separation Test Procedure

1. Connect EUT antenna terminal to the spectrum analyzer with a low loss cable.

Equipment mode: Spectrum analyzer

RBW: 100KHz

VBW: 300KHz

SPAN:3MHz

2. By using the Max-Hold function record the separation of two adjacent channels.
3. Measure the frequency difference of these two adjacent channels by spectrum analyzer Marker function.
4. Repeat above procedures until all frequencies measured were complete.

4.5.3 Test Setup

