



## ELECTROMAGNETIC COMPATIBILITY TEST REPORT

Company : TwinMOS Technologies Inc.  
Address : 303 No.3, Tzu Chiang Rd., Hu Kou Xiang, Hsin Chu,  
Taiwan, R.O.C .  
Product name : PCMCIA Wireless LAN Card  
Model name : 73-TMWBC-001  
Date Received : DEC. 23, 2002  
Date Tested : DEC. 24-25, 2002

### MEASUREMENT REQUIREMENT USED :

47 CFR Part 15, Subpart B and Subpart C (Section 15.247),  
ANSI C63.4-1992

WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.

|                   | Name                | Signature   | Date          |
|-------------------|---------------------|-------------|---------------|
| Testing Engineer  | M. C. Huang / NVLAP | M. C. Huang | Jan. 21, 2003 |
| Approving Manager | C. F. Wu / NVLAP    | C. F. Wu    | Jan. 21, 2003 |

### Notes :

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2. This report refers only to the specimen(s) submitted to test, and is invalid as separately used.
3. This report is invalid without examination stamp and signature of this institute.
4. The tested specimen(s) will be preserved for thirty days from the data issued.
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## TABLE OF CONTENTS

| TITLE                                         | PAGE NO. |
|-----------------------------------------------|----------|
| 1. GENERAL INFORMATION .....                  | 4        |
| 1.1 GENERAL STATEMENT .....                   | 4        |
| 1.2 GENERAL DESCRIPTION OF EUT & POWER .....  | 4        |
| 1.3 DESCRIPTION OF PERIPHERALS .....          | 5        |
| 1.4 EUT & PERIPHERALS SETUP DIAGRAM .....     | 6        |
| 1.5 EUT OPERATING CONDITION .....             | 6        |
| 1.6 DESCRIPTION OF TEST SITE .....            | 7        |
| 1.7 SUMMARY OF TEST RESULTS .....             | 7        |
| 2. CONDUCTED POWERLINE TEST .....             | 8        |
| 2.1 TEST EQUIPMENTS .....                     | 8        |
| 2.2 TEST SETUP .....                          | 8        |
| 2.3 CONDUCTED POWER LINE EMISSION LIMIT ..... | 9        |
| 2.4 TEST PROCEDURE .....                      | 9        |
| 2.5 UNCERTAINTY OF CONDUCTED EMISSION .....   | 9        |
| 2.6 CONDUCTED RF VOLTAGE MEASUREMENT .....    | 10       |
| 2.7 PHOTOS OF CONDUCTION TEST .....           | 11       |
| 3. RADIATED EMISSION TEST .....               | 12       |
| 3.1 TEST EQUIPMENTS .....                     | 12       |
| 3.2 TEST SETUP .....                          | 12       |
| 3.3 RADIATION LIMIT .....                     | 13       |
| 3.4 TEST PROCEDURES .....                     | 14       |
| 3.5 UNCERTAINTY OF RADIATED EMISSION .....    | 14       |
| 3.6 RADIATED RF NOISE MEASUREMENT .....       | 15-23    |
| 3.7 PHOTOS OF OPEN SITE .....                 | 24-25    |
| 4. 6dB BANDWIDTH MEASUREMENT .....            | 26       |
| 4.1 TEST EQUIPMENTS .....                     | 26       |
| 4.2 TEST SETUP .....                          | 26       |
| 4.3 LIMITS OF 6dB BANDWIDTH MEASUREMENT ..... | 26       |
| 4.4 TEST PROCEDURE .....                      | 26       |
| 4.5 UNCERTAINTY OF CONDUCTED EMISSION .....   | 26       |
| 4.6 TEST RESULTS .....                        | 27       |
| 4.7 PHOTO OF 6DB BANDWIDTH MEASUREMENT .....  | 28       |
| 5. MAXIMUM PEAK OUTPUT POWER .....            | 29       |
| 5.1 TEST EQUIPMENTS .....                     | 29       |
| 5.2 TEST SETUP .....                          | 29       |
| 5.3 LIMITS OF MAXIMUM PEAK OUTPUT POWER ..... | 29       |
| 5.4 TEST PROCEDURE .....                      | 30       |
| 5.5 UNCERTAINTY OF CONDUCTED EMISSION .....   | 30       |
| 5.6 TEST RESULTS .....                        | 30       |



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|                                                                   |    |
|-------------------------------------------------------------------|----|
| 6. POWER SPECTRAL DENSITY MEASUREMENT .....                       | 31 |
| 6.1 TEST EQUIPMENTS .....                                         | 31 |
| 6.2 TEST SETUP .....                                              | 31 |
| 6.3 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT .....            | 31 |
| 6.4 TEST PROCEDURE .....                                          | 32 |
| 6.5 UNCERTAINTY OF CONDUCTED EMISSION .....                       | 32 |
| 6.6 TEST RESULTS .....                                            | 32 |
| 6.7 PHOTO OF POWER SPECTRAL DENSITY MEASUREMENT .....             | 33 |
| 7. OUT OF BAND MEASUREMENT .....                                  | 34 |
| 7.1 TEST EQUIPMENTS .....                                         | 34 |
| 7.2 TEST SETUP .....                                              | 34 |
| 7.3 LIMITS OF OUT OF BAND EMISSIONS MEASUREMENT .....             | 34 |
| 7.4 TEST PROCEDURE .....                                          | 35 |
| 7.5 UNCERTAINTY OF CONDUCTED EMISSION .....                       | 35 |
| 7.6 TEST RESULTS .....                                            | 35 |
| 7.7 PHOTO OF OUT OF BAND MEASUREMENT .....                        | 36 |
| 8. ANTENNA REQUIREMENT .....                                      | 37 |
| 8.1 STANDARD APPLICABLE .....                                     | 37 |
| 8.2 ANTENNA CONNECTED CONSTRUCTION .....                          | 37 |
| 9. RF EXPOSURE EVALUATION .....                                   | 38 |
| 9.1 FRIIS FORMULA .....                                           | 38 |
| 9.2 EUT OPERATING CONDITION .....                                 | 38 |
| 9.3 TEST RESULT OF RF EXPOSURE EVALUATION .....                   | 39 |
| 9.3.1 ANTENNA GAIN .....                                          | 39 |
| 9.3.2 OUTPUT POWER INTO ANTENNA & RF EXPOSURE EVALUATION DISTANCE | 39 |



## 1. GENERAL INFORMATION

### 1.1 GENERAL STATEMENT

MEASUREMENT DEVIATION : Comply with standard in full

TRACEABILITY : This test result is traceable to national or international std.

### 1.2 GENERAL DESCRIPTION OF EUT & POWER

MANUFACTURER : TwinMOS Technologies Inc.

SAMPLE NAME : PCMCIA Wireless LAN Card

MODEL NAME : 73-TMWBC-001

FREQUENCY RANGE : 2412 MHz TO 2462MHz

CHANNEL NUMBER : 11

AIR DATA RATE : 11Mbps (Highest Mode)

TYPE OF MODULATION : DIRECT SEQUENCE SPREAD SPECTRUM

FREQUENCY SELECTION : BY SOFTWARE

EUT Description : 2.4GHz Direct Sequence Spread Spectrum Data Transceiver  
for 11Mbps Wireless Adapter

ANTENNA TYPE : PCB ANTENNA

POWER SOURCE : 5VDC(From PC)



## 1.3 DESCRIPTION OF PERIPHERALS

### (1) Notebook PC

MANUFACTURER : DELL CORP.  
MODEL NUMBER : PP01L  
SERIAL NUMBER : CN-09C748-48155-1AP-6081  
F.C.C. : DOC  
POWER CORD : Unshielded, Detachable, 1.8m

### (2) PRINT

MANUFACTURER : Hp Corp.  
MODEL NUMBER : C6431D  
SERIAL NUMBER : CN19T6S011  
F.C.C. ID : DOC  
POWER SOURCE : 100-240VAC,50/60Hz,0.7A  
SIGNAL CABLE : Shielded , Undetachable , 1.8m

### (3) MODEM

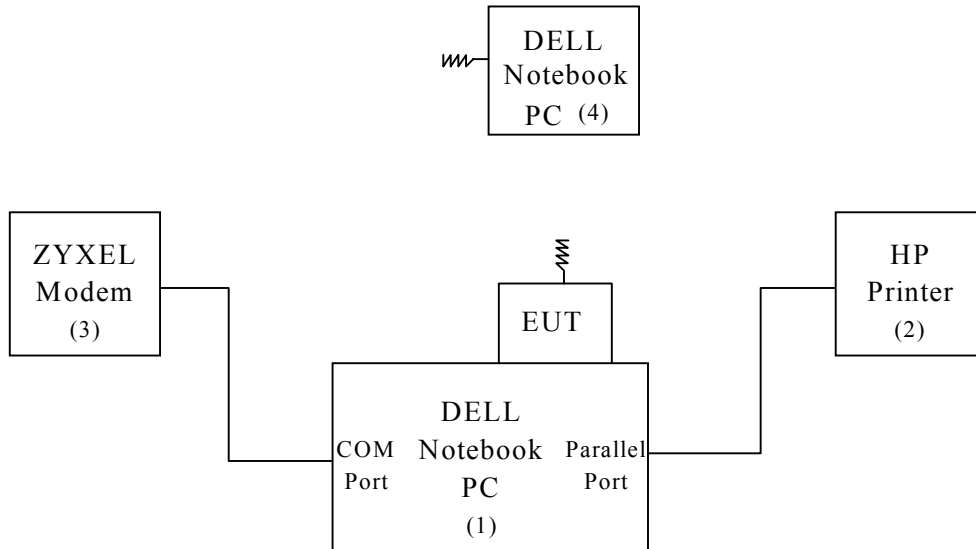
MANUFACTURER : ZYXEL communication Corp.  
MODEL NUMBER : Omni 56K  
SERIAL NUMBER : S1Z4107729  
F.C.C. ID : 1880MN156K  
POWER SOURCE : 9VAC(From Power Adapter)  
SIGNAL CABLE : Shielded , Undetachable , 1.8m

### (4) Notebook PC

MANUFACTURER : DELL CORP.  
MODEL NUMBER : PP01L  
SERIAL NUMBER : CN-09C748-48155-1AP-6630  
F.C.C. : DOC  
POWER CORD : Unshielded, Detachable, 1.8m



## 1.4 EUT & PERIPHERALS SETUP DIAGRAM



## 1.5 EUT OPERATING CONDITION

1. Set up all computers like the setup diagram.
2. Notebook (4) ping 192.168.1.90 -t to EUT
3. Notebook PC(1) contained EUT ping 192.168.1.80 -t to NB(4)
4. All of the function are under run.
5. Start test.



## 1.6 DESCRIPTION OF TEST SITE

SITE DESCRIPTION : FCC certificate NO. : 31040/SIT  
 TUV certificate NO. : I9664582-9911  
 BSMI certificate NO. : SL2-IN-E-0002  
 NVLAP Lab code : 200118-0  
 CNLA certificate NO. : CNLA-ZL97018  
 VCCI certificate NO. : R-1189, C-1250

NAME OF SITE : Electronics Research & Service Organization  
 Industrial Technology Research Institute

SITE LOCATION : R1500, 195-4 , sec. 4, Chung Hsing Rd., Chu-Tung Chen.  
 Hsin-Chu, Taiwan 310 R.O.C.

## 1.7 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications :

| APPLIED STANDARD : 47 CFR Part 15, Subpart B and Subpart C |                                                                                                                                                      |        |                               |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|--------|-------------------------------|
| Standard Section                                           | Test Type and Limit                                                                                                                                  | Result | REMARK                        |
| 15.107<br>15.207                                           | AC Power Conducted Emission<br>Limit : 48dBuV                                                                                                        | PASS   | Meet the requirement of limit |
| 15.247(a)(2)                                               | Spectrum Bandwidth of a Direct Sequence Spread Spectrum System<br>Limit : 6dB bandwidth > 500KHz                                                     | PASS   | Meet the requirement of limit |
| 15.247(b)                                                  | Maximum Peak Output Power<br>Limit : max. 30dBm                                                                                                      | PASS   | Meet the requirement of limit |
| 15.109<br>15.205<br>15.209                                 | Transmitter Radiated Emissions<br>Limit : Table 15.209                                                                                               | PASS   | Meet the requirement of limit |
| 15.247(d)                                                  | Power Spectral Density<br>Limit : max. 8dBm                                                                                                          | PASS   | Meet the requirement of limit |
| 15.247(c)                                                  | Out of Band Emission and Restricted Band Radiation<br>Limit:20dB less than peak value of fundamental frequency<br>Restricted band Limit:Table 15.209 | PASS   | Meet the requirement of limit |



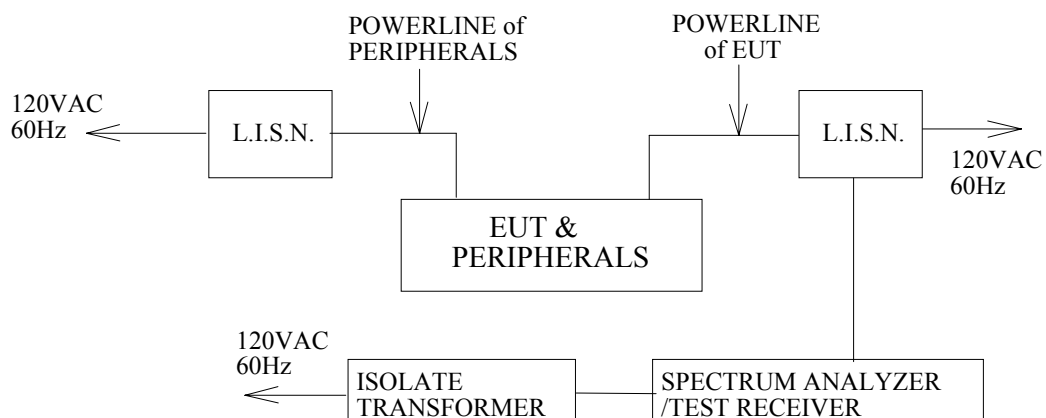
## 2. CONDUCTED POWERLINE TEST

### 2.1 TEST EQUIPMENTS

The following test equipments are used during the conducted powerline tests :

| MANUFACTURER OR TYPE        | MODEL No     | SERIAL NO.             | DATE OF CALIBRATION                                                                 | CALIBRATION PERIOD | REMARK  |
|-----------------------------|--------------|------------------------|-------------------------------------------------------------------------------------|--------------------|---------|
| SPECTRUM ANALYZER & DISPLAY | HP 8568A     | 2235A02320             | APR. 01, 2002                                                                       | 1 Year             | PRETEST |
| QUASI-PEAK ADAPTER          | HP 85650 A   | 2341A00672             | APR. 01, 2002                                                                       | 1 Year             | PRETEST |
| ISOLATION TRANSFORMER       | SOLAR 7032-1 | N/A                    | N/A                                                                                 | N/A                | FINAL   |
| L.I.S.N.                    | EMCO 3850/2  | 9311-1025<br>9401-1028 | JAN. 08, 2002<br>For Characteristic impedance<br>MAY 18, 2002<br>For Insertion loss | 1 Year             | FINAL   |
| TEST RECEIVER               | R/S ESHS30   | 838550/003             | JUN. 07, 2002                                                                       | 1 Year             | FINAL   |
| SHIELDED ROOM               | KEENE 5983   | NO.1                   | N/A                                                                                 | N/A                | FINAL   |
| PULSE LIMIT                 | R/S EHS3Z2   | 357.8810.52            | JUL. 10, 2002                                                                       | 1 Year             | FINAL   |
| N TYPE COAXIAL CABLE        | -----        | -----                  | JUL. 10, 2002                                                                       | 1 Year             | FINAL   |
| 50Ω TERMINATOR              | -----        | -----                  | JUL. 10, 2002                                                                       | 1 Year             | FINAL   |

### 2.2 TEST SETUP







## 2.3 CONDUCTED POWER LINE EMISSION LIMIT

For unintentional device, according to § 15.107(a) Line Conducted Emission Limits is as following :

| FREQUENCY<br>(MHz) | MAXIMUM RF LINE VOLTAGE (dB $\mu$ V) |      |         |       |
|--------------------|--------------------------------------|------|---------|-------|
|                    | CLASS A                              |      | CLASS B |       |
|                    | Q.P.                                 | Ave. | Q.P.    | Ave.  |
| 0.15 - 0.50        | 79                                   | 66   | 66-56   | 56-46 |
| 0.50 - 5.00        | 73                                   | 60   | 56      | 46    |
| 5.00 - 30.0        | 73                                   | 60   | 60      | 50    |

For intentional device, according to § 15.207(a) Line Conducted Emission Limit is same as above table.

## 2.4 TEST PROCEDURE

The test procedure is performed in a 12ft $\times$  12ft $\times$  8ft(L $\times$  W $\times$  H) shielded room. the EUT along with its peripherals were placed on a 1.0m(W) $\times$  1.5m(L) and 0.8m in height wooden table and the EUT was adjusted to maintain a 0.4 meter space from a vertical reference plane. The EUT was connected to power mains through a line impedance stabilization network (LISN) which provides 50 ohm coupling impedance for measuring instrument and the chasis ground was bounded to the horizontal ground plane of shielded room. All peripherals were connected to the second LISN and the chasis ground also bounded to the horizontal ground plane of shielded room. The excess power cable between the EUT and the LISN was bundled. The power cables of peripherals were unbundled. All connecting cables of EUT and peripherals were moved to find the maximum emission.

## 2.5 UNCERTAINTY OF CONDUCTED EMISSION

The uncertainty of conducted emission is  $\pm$  1.36dB.



## 2.6 CONDUCTED RF VOLTAGE MEASUREMENT

The frequency spectrum from 0.15 MHz to 30 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.

Temperature : 26 °C

Humidity : 65 % RH

| FREQUENCY<br>(MHz) | READING(dB $\mu$ V) |      |                       |      | LIMITS<br>(dB $\mu$ V) |       |
|--------------------|---------------------|------|-----------------------|------|------------------------|-------|
|                    | ONE END & GRD'D     |      | THE OTHER END & GRD'D |      | Q.P.                   | Ave.  |
|                    | Q.P.                | Ave. | Q.P.                  | Ave. |                        |       |
| 0.150              | *                   | *    | *                     | *    | 66.00                  | 56.00 |
| 0.198              | *                   | *    | 48.2                  | *    | 64.80                  | 54.80 |
| 0.201              | 49.5                | *    | *                     | *    | 60.20                  | 50.20 |
| 0.402              | 42.9                | *    | *                     | *    | 56.00                  | 46.00 |
| 0.498              | *                   | *    | 41.7                  | *    | 56.00                  | 46.00 |
| 0.900              | *                   | *    | 42.2                  | *    | 56.00                  | 46.00 |
| 1.002              | 41.5                | *    | *                     | *    | 56.00                  | 46.00 |
| 1.902              |                     | *    | 36.7                  | *    | 56.00                  | 46.00 |
| 1.905              | 39.5                | *    | *                     | *    | 56.00                  | 46.00 |
| 2.202              | *                   | *    | 34.8                  | *    | 56.00                  | 46.00 |
| 3.507              | 36.0                | *    | *                     | *    | 56.00                  | 46.00 |
| 4.503              | *                   | *    | 33.0                  | *    | 56.00                  | 46.00 |
| 4.512              | 36.0                | *    | *                     | *    | 56.00                  | 46.00 |
| 9.324              | 36.3                | *    | *                     | *    | 60.00                  | 50.00 |
| 15.213             | *                   | *    | 35.1                  | *    | 60.00                  | 50.00 |
| 16.185             | 33.9                | *    | *                     | *    | 60.00                  | 50.00 |
| 16.815             | *                   | *    | 32.1                  | *    | 60.00                  | 50.00 |

REMARKS : 1. \* Undetectable or the Q.P. value is lower than the limits of Ave.



## 2.7 PHOTOS OF CONDUCTION TEST





### 3. RADIATED EMISSION TEST

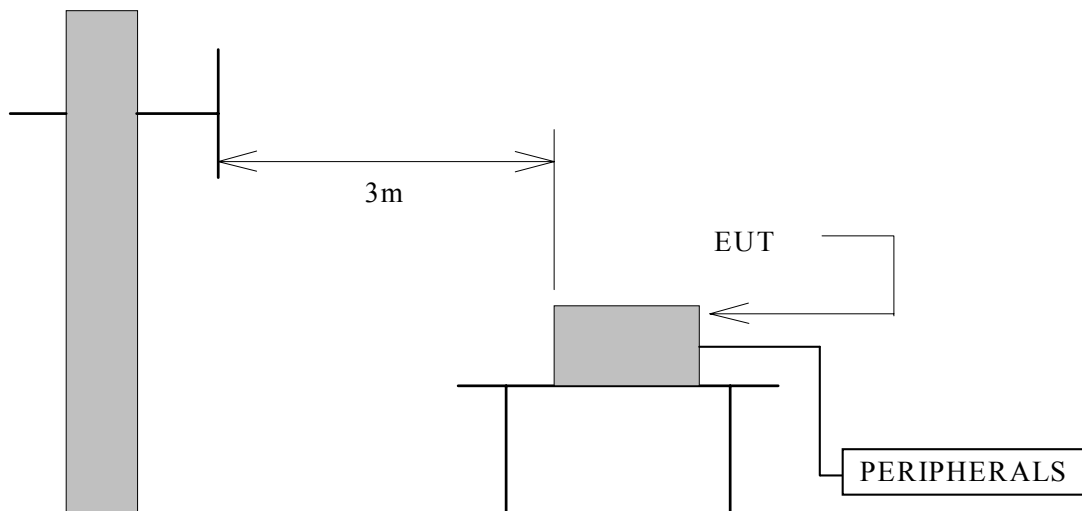
#### 3.1 TEST EQUIPMENTS

The following test equipments are utilized in making the measurements contained in this report.

| MANUFACTURER OR TYPE | MODEL NO    | SERIAL NO                | DATE OF CALIBRATION | CALIBRATION PERIOD | REMARK |
|----------------------|-------------|--------------------------|---------------------|--------------------|--------|
| CHASE BI-LOG ANTENNA | CBL6112B    | 2421                     | MAY 07, 2002        | 1 Year             | FINAL  |
| R/S TEST RECEIVER    | ESMI        | 842088/005<br>841978/008 | SEPT. 3, 2002       | 1 Year             | FINAL  |
| OPEN SITE            | -----       | No.1                     | JUL. 10~12, 2002    | 1 Year             | FINAL  |
| N TYPE COAXIAL CABLE | CHA9525     | 4                        | JUL. 13, 2002       | 1 Year             | FINAL  |
| Horn Antenna         | AH-118      | 10089                    | FEB. 25, 2002       | 1 Year             | FINAL  |
| HP Pre-amplifier     | 8449B       | 3008A01471               | OCT. 11, 2002       | 1 Year             | FINAL  |
| HP High pass filter  | 84300/80038 | 011                      | cal. on use         | 1 Year             | FINAL  |
| Horn Antenna         | AH-840      | 03077                    | FEB. 25, 2002       | 1 Year             | FINAL  |

#### 3.2 TEST SETUP

The diagram below shows the test setup which is utilized to make these measurements.



Antenna Elevation Variable



### 3.3 RADIATION LIMIT

For unintentional device, according to § 15.109(a), except for Class A digital devices, the field strength of radiated emissions from unintentional radiators at a distance of 3 meters shall not exceed the following values :

| FREQUENCY<br>(MHz) | DISTANCE<br>(METERS) | Radiated<br>(dB $\mu$ V/M) | Radiated<br>( $\mu$ V/M) |
|--------------------|----------------------|----------------------------|--------------------------|
| 30-88              | 3                    | 40.0                       | 100                      |
| 88-216             | 3                    | 43.5                       | 150                      |
| 216-960            | 3                    | 46.0                       | 200                      |
| Above 960          | 3                    | 54.0                       | 500                      |

For intentional device, according to § 15.209(a), the general requirement of field strength of radiated emissions from intentional radiators at a distance of 3 meters shall not exceed the above table.



### 3.4 TEST PROCEDURES

- a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.
- b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
- c. The antenna is a broadband antenna, and its height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarization of the antenna are set to make the measurement.
- d. For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
- e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
- f. If the emission level of the EUT in peak mode was 10 dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE :

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.
2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

### 3.5 UNCERTAINTY OF RADIATED EMISSION

The uncertainty of radiated emission is  $\pm 2.72\text{dB}$ .



### 3.6 RADIATED RF NOISE MEASUREMENT

Test Requirement: 15.109, 15.209

The frequency spectrum from 30 MHz to 1000 MHz was investigated. All emissions not reported below are more than 20 dB below the prescribed limits.

All readings are quasi-peak values.

Temperature : 25 °C

Humidity : 65 % RH

| FREQ-<br>UENCY<br><br>(MHz) | ANTENNA<br>FACTOR<br><br>(dB) | CABLE<br>LOSS<br><br>(dB) | METER READING<br>AT3m(dB μV/M) |          | LIMITS<br><br>(dB μV/M) | EMISSION LEVEL<br>AT3m(dB μV/M) |          |
|-----------------------------|-------------------------------|---------------------------|--------------------------------|----------|-------------------------|---------------------------------|----------|
|                             |                               |                           | HORIZON-<br>TAL                | VERTICAL |                         | HORIZON-<br>TAL                 | VERTICAL |
| 30.00                       | 21.39                         | 0.90                      | *                              | *        | 40.00                   | *                               | *        |
| 85.68                       | 10.24                         | 1.71                      | 15.10                          | 14.80    | 40.00                   | 27.05                           | 26.75    |
| 146.76                      | 12.42                         | 2.27                      | 14.00                          | 13.70    | 43.50                   | 28.69                           | 28.39    |
| 196.49                      | 10.35                         | 2.76                      | 22.30                          | 16.20    | 43.50                   | 35.42                           | 29.32    |
| 221.35                      | 11.54                         | 2.97                      | 22.30                          | 20.90    | 46.00                   | 36.81                           | 35.41    |
| 299.73                      | 13.50                         | 3.60                      | 18.16                          | 21.30    | 46.00                   | 35.26                           | 38.40    |
| 441.54                      | 17.69                         | 4.49                      | 18.31                          | 15.41    | 46.00                   | 40.49                           | 37.59    |
| 476.58                      | 18.07                         | 4.74                      | 18.69                          | 14.21    | 46.00                   | 41.49                           | 37.01    |
| 577.48                      | 19.27                         | 5.29                      | 18.38                          | 16.58    | 46.00                   | 42.93                           | 41.13    |
| 1000.00                     | 24.69                         | 5.70                      | *                              | *        | 46.00                   | *                               | *        |

REMARKS : 1. \* Undetectable

2. Emission level (dB μV/M) = Antenna Factor (dB/m) + Cable loss (dB)  
 + Meter Reading (dB μV).

3. According to technical experiences, all spurious emission at channel 1,6,11 are almost the same below 1GHz, so that the channel 1 was chosen as representation for the test.



Test Requirement: 15.109 ,15.209

The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

|               |       |             |            |
|---------------|-------|-------------|------------|
| RX            |       | Test Date : | 2002/12/25 |
|               |       | Test By:    | M.C. Huang |
| Temperature : | 26 °C | Humidity :  | 65%        |

|          |         | CH      | 1     | RX      |      |        |          |       |        |       |       |         |
|----------|---------|---------|-------|---------|------|--------|----------|-------|--------|-------|-------|---------|
| Freq.    | Reading | AF      | Closs | Pre-amp | Dist | Filter | Level    | Limit | Margin | Mark  | Pol   | Height  |
| (MHz)    | (dBuV)  | (dBuV)  | (dB)  | (dB)    | dB   | dB     | (dBuV/m) | FCC_B | (dB)   | P/Q/A | (H/V) | (Meter) |
| 4824.29  | 47.00   | 34.4403 | 2.78  | 35.38   | 9.5  | 1      | 40.33    | 74    | -33.67 | P     | V     | 1.0     |
| 4824.29  | 38.34   | 34.4403 | 2.78  | 35.38   | 9.5  | 1      | 31.67    | 54    | -22.33 | A     | V     | 1.0     |
| 9647.887 | 47.50   | 38.5352 | 4.10  | 35.67   | 9.5  | 1      | 45.96    | 74    | -28.04 | P     | V     | 1.0     |
| 9648.887 | 43.20   | 38.5351 | 4.10  | 35.67   | 9.5  | 1      | 41.66    | 54    | -12.34 | A     | V     | 1.0     |
| 4824.29  | 48.80   | 34.4403 | 2.78  | 35.38   | 9.5  | 1      | 42.13    | 74    | -31.87 | P     | H     | 1.0     |
| 4824.29  | 42.30   | 34.4403 | 2.78  | 35.38   | 9.5  | 1      | 35.63    | 54    | -18.37 | A     | H     | 1.0     |
| 9647.887 | 48.50   | 38.5352 | 4.10  | 35.67   | 9.5  | 1      | 46.96    | 74    | -27.04 | P     | H     | 1.0     |
| 9648.887 | 40.20   | 38.5351 | 4.10  | 35.67   | 9.5  | 1      | 38.66    | 54    | -15.34 | A     | H     | 1.0     |
|          |         |         |       |         |      |        |          |       |        |       |       |         |
|          |         | CH      | 6     | RX      |      |        |          |       |        |       |       |         |
| 4874.25  | 47.62   | 34.7701 | 2.80  | 35.40   | 9.5  | 1      | 41.29    | 74    | -32.71 | P     | V     | 1.0     |
| 4874.25  | 41.28   | 34.7701 | 2.80  | 35.40   | 9.5  | 1      | 34.95    | 54    | -19.05 | A     | V     | 1.0     |
| 9748.08  | 47.15   | 38.5252 | 4.02  | 35.72   | 9.5  | 1      | 45.47    | 74    | -28.53 | P     | V     | 1.0     |
| 9748.08  | 43.62   | 38.5252 | 4.02  | 35.72   | 9.5  | 1      | 40.94    | 54    | -13.06 | A     | V     | 1.0     |
| 4874.25  | 48.85   | 34.7701 | 2.80  | 35.40   | 9.5  | 1      | 42.52    | 74    | -31.48 | P     | H     | 1.0     |
| 4874.25  | 41.65   | 34.7701 | 2.80  | 35.40   | 9.5  | 1      | 35.32    | 54    | -18.68 | A     | H     | 1.0     |
| 9748.08  | 44.68   | 38.5252 | 4.02  | 35.72   | 9.5  | 1      | 43.00    | 74    | -31.00 | P     | H     | 1.0     |
| 9748.08  | 42.89   | 38.5252 | 4.02  | 35.72   | 9.5  | 1      | 40.21    | 54    | -13.79 | A     | H     | 1.0     |

Note :

1. Measurement was up to 6GHz harmonic,“---” means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss,
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz,VBW=10Hz
- 4.The result basic equation calculation is as follow:

$$\text{Level}=\text{Reading}+\text{AF}+\text{Closs}-\text{Preamp}+\text{Filter}-\text{Dist},\text{Margin}=\text{Level}-\text{Limit}$$





Test Requirement: 15.109 ,15.209

The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

|               |       |             |            |
|---------------|-------|-------------|------------|
| RX            |       | Test Date : | 2002/12/25 |
|               |       | Test By:    | M.C. Huang |
| Temperature : | 26 °C | Humidity :  | 65%        |

|         |         | CH      | 11    | RX      |      |        |          |       |        |       |       |         |
|---------|---------|---------|-------|---------|------|--------|----------|-------|--------|-------|-------|---------|
| Freq.   | Reading | AF      | Closs | Pre-amp | Dist | Filter | Level    | Limit | Margin | Mark  | Pol   | Height  |
| (MHz)   | (dBuV)  | (dBuV)  | (dB)  | (dB)    | dB   | dB     | (dBuV/m) | FCC_B | (dB)   | P/Q/A | (H/V) | (Meter) |
| 4924.05 | 47.80   | 35.0987 | 2.83  | 35.41   | 9.5  | 1      | 41.82    | 74    | -32.18 | P     | V     | 1.0     |
| 4924.05 | 40.70   | 35.0987 | 2.83  | 35.41   | 9.5  | 1      | 34.72    | 54    | -19.28 | A     | V     | 1.0     |
| 9848.02 | 50.70   | 38.5152 | 3.93  | 35.77   | 9.5  | 1      | 48.88    | 74    | -25.12 | P     | V     | 1.0     |
| 9849.02 | 43.50   | 38.5151 | 3.93  | 35.77   | 9.5  | 1      | 40.67    | 54    | -13.33 | A     | V     | 1.0     |
| 4924.05 | 48.56   | 35.0987 | 2.83  | 35.41   | 9.5  | 1      | 42.58    | 74    | -31.42 | P     | H     | 1.0     |
| 4924.05 | 41.25   | 35.0987 | 2.83  | 35.41   | 9.5  | 1      | 35.27    | 54    | -18.73 | A     | H     | 1.0     |
| 9848.02 | 49.15   | 38.5152 | 3.93  | 35.77   | 9.5  | 1      | 47.33    | 74    | -26.67 | P     | H     | 1.0     |
| 9849.02 | 40.25   | 38.5151 | 3.93  | 35.77   | 9.5  | 1      | 37.42    | 54    | -16.58 | A     | H     | 1.0     |

Note :

1. Measurement was up to 6GHz harmonic,“---” means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss,
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz,VBW=10Hz
- 4.The result basic equation calculation is as follow:  
 $Level=Reading+AF+Closs-Preamp+Filter-Dist,Margin=Level-Limit$



**Test Requirement: 15.205**

The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

|                        |                |             |            |
|------------------------|----------------|-------------|------------|
| Operation Mode:        | Transmitting   | Test Date : | 2002/12/25 |
| Fundamental Frequency: | 2412MHz (CH 1) | Test By:    | M.C. Huang |
| Temperature :          | 30 °C          | Humidity :  | 65%        |

| Freq.<br>(MHz) | Reading<br>(dBuV) | AF<br>(dBuV) | Closs<br>(dB) | Pre-amp<br>(dB) | Dist<br>(dB) | Filter<br>(dB) | Level<br>(dBuV/m) | Limit<br>FCC_B | Margin<br>(dB) | Mark<br>(P/Q/A) | Pol<br>(H/V) | Height<br>(Meter) |
|----------------|-------------------|--------------|---------------|-----------------|--------------|----------------|-------------------|----------------|----------------|-----------------|--------------|-------------------|
| 4824.29        | 56.76             | 34.44        | 2.78          | 35.38           | 9.5          | 1              | 50.09             | 74             | -23.91         | P               | H            | 1.0               |
| 4824.29        | 41.90             | 34.44        | 2.78          | 35.38           | 9.5          | 1              | 35.23             | 54             | -18.77         | A               | H            | 1.0               |
| 7234.66        | 46.58             | 39.81        | 3.94          | 35.56           | 9.5          | 1              | 46.27             | 74             | -27.73         | P               | H            | 1.0               |
| 7234.66        | 38.25             | 39.81        | 3.94          | 35.56           | 9.5          | 1              | 37.94             | 54             | -16.06         | A               | H            | 1.0               |
| 9647.89        | 50.23             | 38.54        | 4.10          | 35.67           | 9.5          | 1              | 48.69             | 74             | -25.31         | P               | H            | 1.0               |
| 9648.89        | 43.73             | 38.54        | 4.10          | 35.67           | 9.5          | 1              | 42.19             | 54             | -11.81         | A               | H            | 1.0               |
| 12059.93*      | ---               | 42.60        | 15.20         | 35.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | H            | 1.0               |
| 14471.97*      | ---               | 43.40        | 16.80         | 34.00           | 9.5          | 1              | ---               | ---            | ---            | ---             | H            | 1.0               |
| 16884.01       | ---               | 45.20        | 17.60         | 34.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | H            | 1.0               |
| 19296.05*      | ---               | 36.30        | 18.50         | 34.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | H            | 1.0               |
| 21708.09       | ---               | 36.20        | 19.20         | 34.60           | 9.5          | 1              | ---               | ---            | ---            | ---             | H            | 1.0               |
| 24120.13       | ---               | 36.80        | 21.00         | 34.20           | 9.5          | 1              | ---               | ---            | ---            | ---             | H            | 1.0               |

Note :

1. The measurement was searched to 10th harmonic, Remark “---” means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Remark “\*” means that Restricted band.
5. The result basic equation calculation is as follow:  
 $Level = Reading + AF + Closs - Preamp + Filter - Dist, Margin = Level - Limit$



**Test Requirement: 15.205**

The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

|                        |                |             |            |
|------------------------|----------------|-------------|------------|
| Operation Mode:        | Transmitting   | Test Date : | 2002/12/25 |
| Fundamental Frequency: | 2412MHz (CH 1) | Test By:    | M.C. Huang |
| Temperature :          | 30 °C          | Humidity :  | 65%        |

| Freq.<br>(MHz) | Reading<br>(dBuV) | AF<br>(dBuV) | Closs<br>(dB) | Pre-amp<br>(dB) | Dist<br>(dB) | Filter<br>(dB) | Level<br>(dBuV/m) | Limit<br>FCC_B | Margin<br>(dB) | Mark<br>(P/Q/A) | Pol<br>(H/V) | Height<br>(Meter) |
|----------------|-------------------|--------------|---------------|-----------------|--------------|----------------|-------------------|----------------|----------------|-----------------|--------------|-------------------|
| 4824.29        | 63.30             | 34.44        | 2.78          | 35.38           | 9.5          | 1              | 56.63             | 74             | -17.37         | P               | V            | 1.0               |
| 4824.29        | 48.30             | 34.44        | 2.78          | 35.38           | 9.5          | 1              | 41.63             | 54             | -12.37         | A               | V            | 1.0               |
| 7234.66        | 46.34             | 39.81        | 3.94          | 35.56           | 9.5          | 1              | 46.03             | 74             | -27.97         | P               | V            | 1.0               |
| 7234.66        | 38.25             | 39.81        | 3.94          | 35.56           | 9.5          | 1              | 37.94             | 54             | -16.06         | A               | V            | 1.0               |
| 9647.887       | 47.56             | 38.54        | 4.10          | 35.67           | 9.5          | 1              | 46.02             | 74             | -27.98         | P               | V            | 1.0               |
| 9648.887       | 39.85             | 38.54        | 4.10          | 35.67           | 9.5          | 1              | 38.31             | 54             | -15.69         | A               | V            | 1.0               |
| 12059.93*      | ---               | 42.60        | 15.20         | 35.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 14471.97*      | ---               | 43.40        | 16.80         | 34.00           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 16884.01       | ---               | 45.20        | 17.60         | 34.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 19296.05*      | ---               | 36.30        | 18.50         | 34.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 21708.09       | ---               | 36.20        | 19.20         | 34.60           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 24120.13       | ---               | 36.80        | 21.00         | 34.20           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |

Note :

1. The measurement was searched to 10th harmonic, Remark “---” means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Remark “\*” means that Restricted band.
5. The result basic equation calculation is as follow:  
 Level=Reading+AF+Closs-Preamp+Filter-Dist, Margin=Level-Limit



**Test Requirement: 15.205**

The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

|                        |                 |             |            |
|------------------------|-----------------|-------------|------------|
| Operation Mode:        | Transmitting    | Test Date : | 2002/12/25 |
| Fundamental Frequency: | 2437MHz (CH 6 ) | Test By:    | M.C. Huang |
| Temperature :          | 30 °C           | Humidity :  | 65%        |

| Freq.<br>(MHz) | Reading<br>(dBuV) | AF<br>(dBuV) | Closs<br>(dB) | Pre-amp<br>(dB) | Dist<br>dB | Filter<br>dB | Level<br>(dBuV/m) | Limit<br>FCC_B | Margin<br>(dB) | Mark<br>(P/Q/A) | Pol<br>(H/V) | Height<br>(Meter) |
|----------------|-------------------|--------------|---------------|-----------------|------------|--------------|-------------------|----------------|----------------|-----------------|--------------|-------------------|
| 4874.25        | 58.31             | 34.77        | 2.80          | 35.40           | 9.5        | 1            | 51.98             | 74             | -22.02         | P               | H            | 1.0               |
| 4874.25        | 41.35             | 34.77        | 2.80          | 35.40           | 9.5        | 1            | 35.02             | 54             | -18.98         | A               | H            | 1.0               |
| 7309.85        | 49.21             | 39.78        | 4.00          | 35.57           | 9.5        | 1            | 48.92             | 74             | -25.08         | P               | H            | 1.0               |
| 7309.85        | 38.26             | 39.78        | 4.00          | 35.57           | 9.5        | 1            | 37.97             | 54             | -16.03         | A               | H            | 1.0               |
| 9749.08        | 58.36             | 38.53        | 4.02          | 35.72           | 9.5        | 1            | 56.68             | 74             | -17.32         | P               | H            | 1.0               |
| 9749.08        | 48.31             | 38.53        | 4.02          | 35.72           | 9.5        | 1            | 46.63             | 54             | -7.37          | A               | H            | 1.0               |
| 12185.10*      | ---               | 32.14        | 4.53          | 35.24           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 14622.12       | ---               | 43.40        | 16.80         | 34.00           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 17059.14       | ---               | 45.20        | 17.60         | 34.30           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 19496.16*      | ---               | 36.30        | 18.50         | 34.30           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 21933.18       | ---               | 36.20        | 19.20         | 34.60           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 24370.2        | ---               | 36.80        | 21.00         | 34.20           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |

Note :

1. The measurement was searched to 10th harmonic, Remark “---” means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Remark “\*” means that Restricted band.
5. The result basic equation calculation is as follow:

$$\text{Level} = \text{Reading} + \text{AF} + \text{Closs} - \text{Preamp} + \text{Filter} - \text{Dist}, \text{Margin} = \text{Level} - \text{Limit}$$



**Test Requirement: 15.205**

The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

|                        |                 |             |            |
|------------------------|-----------------|-------------|------------|
| Operation Mode:        | Transmitting    | Test Date : | 2002/12/25 |
| Fundamental Frequency: | 2437MHz (CH 6 ) | Test By:    | M.C. Huang |
| Temperature :          | 30 °C           | Humidity :  | 65%        |

| Freq.<br>(MHz) | Reading<br>(dBuV) | AF<br>(dBuV) | Closs<br>(dB) | Pre-amp<br>(dB) | Dist<br>(dB) | Filter<br>(dB) | Level<br>(dBuV/m) | Limit<br>FCC_B | Margin<br>(dB) | Mark<br>(P/Q/A) | Pol<br>(H/V) | Height<br>(Meter) |
|----------------|-------------------|--------------|---------------|-----------------|--------------|----------------|-------------------|----------------|----------------|-----------------|--------------|-------------------|
| 4874.25        | 62.29             | 34.77        | 2.80          | 35.40           | 9.5          | 1              | 55.96             | 74             | -18.04         | P               | V            | 1.0               |
| 4874.25        | 49.31             | 34.77        | 2.80          | 35.40           | 9.5          | 1              | 42.98             | 54             | -11.02         | A               | V            | 1.0               |
| 7309.85        | 56.37             | 39.78        | 4.00          | 35.57           | 9.5          | 1              | 56.08             | 74             | -17.92         | P               | V            | 1.0               |
| 7309.85        | 45.24             | 39.78        | 4.00          | 35.57           | 9.5          | 1              | 44.95             | 54             | -9.05          | A               | V            | 1.0               |
| 9749.08        | 52.31             | 38.53        | 4.02          | 35.72           | 9.5          | 1              | 50.63             | 74             | -23.37         | P               | V            | 1.0               |
| 9749.08        | 49.21             | 38.53        | 4.02          | 35.72           | 9.5          | 1              | 47.53             | 54             | -6.47          | A               | V            | 1.0               |
| 12185.10*      | ---               | 32.14        | 4.53          | 35.24           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 14622.12       | ---               | 43.40        | 16.80         | 34.00           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 17059.14       | ---               | 45.20        | 17.60         | 34.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 19496.16*      | ---               | 36.30        | 18.50         | 34.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 21933.18       | ---               | 36.20        | 19.20         | 34.60           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 24370.20       | ---               | 36.80        | 21.00         | 34.20           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |

**Note :**

1. The measurement was searched to 10th harmonic, Remark “---” means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Remark “\*” means that Restricted band.
5. The result basic equation calculation is as follow:  
 Level=Reading+AF+Closs-Preamp+Filter-Dist, Margin=Level-Limit



**Test Requirement: 15.205**

The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

|                        |                  |             |            |
|------------------------|------------------|-------------|------------|
| Operation Mode:        | Transmitting     | Test Date : | 2002/12/25 |
| Fundamental Frequency: | 2462MHz (CH 11 ) | Test By:    | M.C. Huang |
| Temperature :          | 30 °C            | Humidity :  | 65%        |

| Freq.<br>(MHz) | Reading<br>(dBuV) | AF<br>(dBuV) | Closs<br>(dB) | Pre-amp<br>(dB) | Dist<br>dB | Filter<br>dB | Level<br>(dBuV/m) | Limit<br>FCC_B | Margin<br>(dB) | Mark<br>(P/Q/A) | Pol<br>(H/V) | Height<br>(Meter) |
|----------------|-------------------|--------------|---------------|-----------------|------------|--------------|-------------------|----------------|----------------|-----------------|--------------|-------------------|
| 4924.05        | 54.33             | 35.10        | 2.83          | 35.41           | 9.5        | 1            | 48.35             | 74             | -25.65         | P               | H            | 1.0               |
| 4924.05        | 40.81             | 35.10        | 2.83          | 35.41           | 9.5        | 1            | 34.83             | 54             | -19.17         | A               | H            | 1.0               |
| 7387.05        | 45.3              | 39.75        | 4.06          | 35.57           | 9.5        | 1            | 45.03             | 74             | -28.97         | P               | H            | 1.0               |
| 7387.05        | 33.3              | 39.75        | 4.06          | 35.57           | 9.5        | 1            | 32.03             | 54             | -21.97         | A               | H            | 1.0               |
| 9848.02        | 51.7              | 38.52        | 3.93          | 35.77           | 9.5        | 1            | 49.88             | 74             | -24.12         | P               | H            | 1.0               |
| 9849.02        | 45.66             | 38.52        | 3.93          | 35.77           | 5          | 1            | 42.83             | 54             | -11.17         | A               | H            | 1.0               |
| 12310.04*      | ---               | 32.14        | 4.53          | 35.24           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 14772.06       | ---               | 43.40        | 16.80         | 34.00           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 17234.08       | ---               | 45.20        | 17.60         | 34.30           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 19696.1*       | ---               | 36.30        | 18.50         | 34.30           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 22158.12*      | ---               | 36.20        | 19.20         | 34.60           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |
| 24620.14       | ---               | 36.80        | 21.00         | 34.20           | 9.5        | 1            | ---               | ---            | ---            | ---             | H            | 1.0               |

**Note :**

1. The measurement was searched to 10th harmonic, Remark “---” means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Remark “\*” means that Restricted band.
5. The result basic equation calculation is as follow:

$$\text{Level} = \text{Reading} + \text{AF} + \text{Closs} - \text{Preamp} + \text{Filter} - \text{Dist}, \text{Margin} = \text{Level} - \text{Limit}$$



**Test Requirement: 15.205**

The frequency spectrum above 1 GHz was investigated. All emissions not reported below are more than 40 dB below the prescribed limits. Readings are both peak and average values.

|                        |                  |             |            |
|------------------------|------------------|-------------|------------|
| Operation Mode:        | Transmitting     | Test Date : | 2002/12/25 |
| Fundamental Frequency: | 2462MHz (CH 11 ) | Test By:    | M.C. Huang |
| Temperature :          | 30 °C            | Humidity :  | 65%        |

| Freq.<br>(MHz) | Reading<br>(dBuV) | AF<br>(dBuV) | Closs<br>(dB) | Pre-amp<br>(dB) | Dist<br>(dB) | Filter<br>(dB) | Level<br>(dBuV/m) | Limit<br>FCC B | Margin<br>(dB) | Mark<br>(P/Q/A) | Pol<br>(H/V) | Height<br>(Meter) |
|----------------|-------------------|--------------|---------------|-----------------|--------------|----------------|-------------------|----------------|----------------|-----------------|--------------|-------------------|
| 4924.05        | 61.83             | 35.10        | 2.83          | 35.41           | 9.5          | 1              | 55.85             | 74             | -18.15         | P               | V            | 1.0               |
| 4924.05        | 47.64             | 35.10        | 2.83          | 35.41           | 9.5          | 1              | 41.66             | 54             | -12.34         | A               | V            | 1.0               |
| 7386.00        | 55.05             | 39.75        | 4.06          | 35.57           | 9.5          | 1              | 54.78             | 74             | -19.22         | P               | V            | 1.0               |
| 7387.00        | 40.20             | 39.75        | 4.06          | 35.57           | 9.5          | 1              | 38.93             | 54             | -15.07         | A               | V            | 1.0               |
| 9848.02        | 51.50             | 38.52        | 3.93          | 35.77           | 9.5          | 1              | 49.68             | 74             | -24.32         | P               | V            | 1.0               |
| 9849.02        | 45.05             | 38.52        | 3.93          | 35.77           | 9.5          | 1              | 42.22             | 54             | -11.78         | A               | V            | 1.0               |
| 12310.04*      | ---               | 32.14        | 4.53          | 35.24           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 14772.06       | ---               | 43.40        | 16.80         | 34.00           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 17234.08       | ---               | 45.20        | 17.60         | 34.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 19696.1*       | ---               | 36.30        | 18.50         | 34.30           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 22158.12*      | ---               | 36.20        | 19.20         | 34.60           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |
| 24620.14       | ---               | 36.80        | 21.00         | 34.20           | 9.5          | 1              | ---               | ---            | ---            | ---             | V            | 1.0               |

**Note :**

1. The measurement was searched to 10th harmonic, Remark “---” means that the emissions level is too low to be measured.
2. AF: Antenna Factor, Closs: Cable Loss, Pre-Amp: Preamp gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Remark “\*” means that Restricted band.
5. The result basic equation calculation is as follow:  
 $Level = Reading + AF + Closs - Preamp + Filter - Dist$ ,  $Margin = Level - Limit$



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FCC ID : QS3WBCII1

Report No. : 510-9112-027F

Page 24 of 39

### 3.7 PHOTOS OF OPEN SITE







### 3.7 PHOTOS OF OPEN SITE





## 4. 6dB BANDWIDTH MEASUREMENT

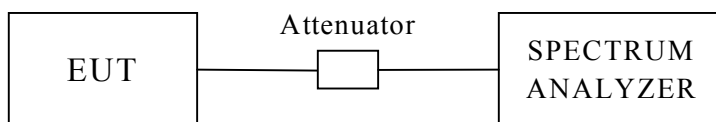
### 4.1 TEST EQUIPMENTS

| Description & Manufacturer    | Model No. | Serial No.               | DATE OF CALIBRATION |
|-------------------------------|-----------|--------------------------|---------------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESMI      | 842088/005<br>841978/008 | SEPT. 3, 2002       |
| HP ATTENUATOR                 | 8496B     | 3247A18505               | Cal. on use         |
| HP PLOTTER                    | 7750A     | 725A 852141              | N/A                 |

NOTE :

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 4.2 TEST SETUP



### 4.3 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The minimum of 6dB Bandwidth Measurement is >500KHz

### 4.4 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 100 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

### 4.5 UNCERTAINTY OF CONDUCTED EMISSION

The uncertainty of conducted emission is  $\pm 200$ KHz.



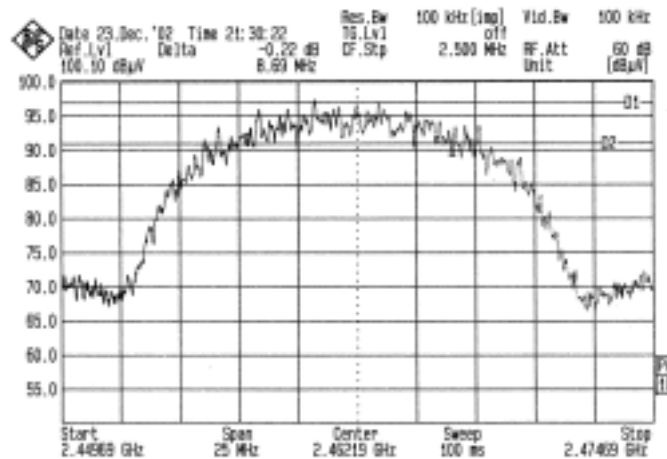
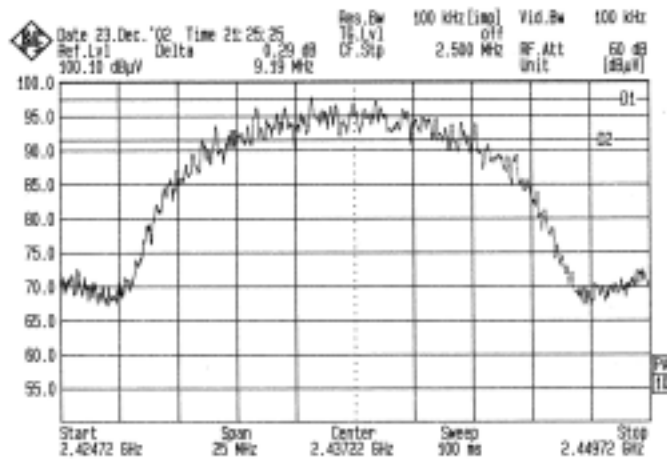
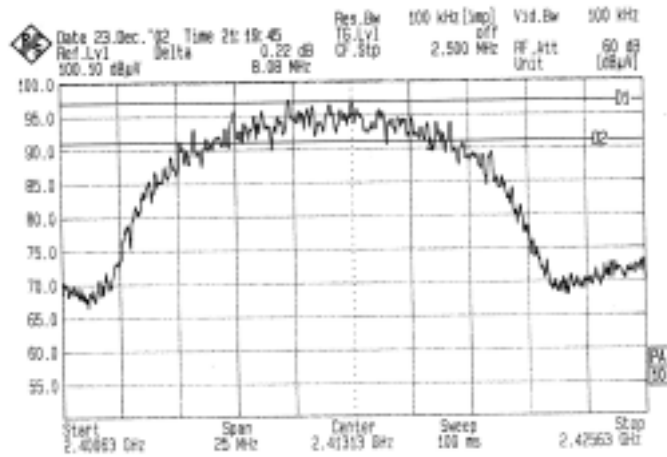
#### 4.6 TEST RESULTS

|                                |                          |                                 |              |
|--------------------------------|--------------------------|---------------------------------|--------------|
| <b>EUT</b>                     | PCMCIA Wireless LAN Card | <b>MODEL</b>                    | 73-TMWBC-001 |
| <b>INPUT POWER (SYSTEM)</b>    | 5VDC(From PC)            | <b>ENVIRONMENTAL CONDITIONS</b> | 27°C, 70%RH, |
| <b>TESTED BY : M. C. Huang</b> |                          |                                 |              |

| <b>CHANNEL</b> | <b>CHANNEL FREQUENCY (MHz)</b> | <b>6dB BANDWIDTH (MHz)</b> | <b>MINIMUM LIMIT (MHz)</b> | <b>PASS / FAIL</b> |
|----------------|--------------------------------|----------------------------|----------------------------|--------------------|
| 1              | 2412                           | 8.08                       | 0.5                        | PASS               |
| 6              | 2437                           | 9.19                       | 0.5                        | PASS               |
| 11             | 2462                           | 8.69                       | 0.5                        | PASS               |



## 4.7 PHOTO OF 6DB BANDWIDTH MEASUREMENT





## 5. MAXIMUM PEAK OUTPUT POWER

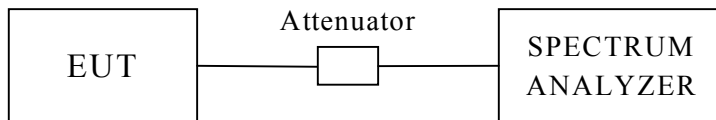
### 5.1 TEST EQUIPMENTS

| Description & Manufacturer    | Model No. | Serial No.               | DATE OF CALIBRATION |
|-------------------------------|-----------|--------------------------|---------------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESMI      | 842088/005<br>841978/008 | SEPT. 3, 2002       |
| HP ATTENUATOR                 | 8496B     | 3247A18505               | Cal. on use         |
| HP PLOTTER                    | 7750A     | 725A 852141              | N/A                 |

NOTE :

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 5.2 TEST SETUP



### 5.3 LIMITS OF MAXIMUM PEAK OUTPUT POWER

The Maximum Peak Output Power Measurement is 30dBm.



## 5.4 TEST PROCEDURE

The RF power output was measured with a Power meter connected to the RF Antenna connector ( conducted measurement ) while EUT was operating in transmit mode at the appropriate center frequency.

## 5.5 UNCERTAINTY OF CONDUCTED EMISSION

The uncertainty of conducted emission is  $\pm 1.82\text{dB}$ .

## 5.6 TEST RESULTS

|                                |                          |                                 |              |
|--------------------------------|--------------------------|---------------------------------|--------------|
| <b>EUT</b>                     | PCMCIA Wireless LAN Card | <b>MODEL</b>                    | 73-TMWBC-001 |
| <b>INPUT POWER (SYSTEM)</b>    | 5VDC(From PC)            | <b>ENVIRONMENTAL CONDITIONS</b> | 27°C, 70%RH, |
| <b>TESTED BY : M. C. Huang</b> |                          |                                 |              |

| <b>CHANNEL</b> | <b>CHANNEL FREQUENCY (MHz)</b> | <b>PEAK POWER OUTPUT (dBm)</b> | <b>PEAK POWER LIMIT (dBm)</b> | <b>PASS / FAIL</b> |
|----------------|--------------------------------|--------------------------------|-------------------------------|--------------------|
| 1              | 2412                           | 10.88                          | 30                            | PASS               |
| 6              | 2437                           | 10.8                           | 30                            | PASS               |
| 11             | 2462                           | 11.2                           | 30                            | PASS               |



## 6. POWER SPECTRAL DENSITY MEASUREMENT

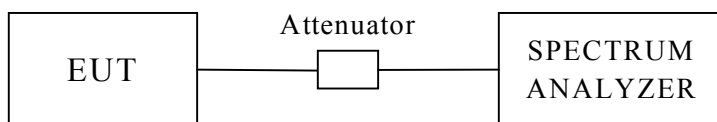
### 6.1 TEST EQUIPMENTS

| Description & Manufacturer    | Model No. | Serial No.               | DATE OF CALIBRATION |
|-------------------------------|-----------|--------------------------|---------------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESMI      | 842088/005<br>841978/008 | SEPT. 3, 2002       |
| HP ATTENUATOR                 | 8496B     | 3247A18505               | Cal. on use         |
| HP PLOTTER                    | 7750A     | 725A 852141              | N/A                 |

NOTE :

1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 6.2 TEST SETUP



### 6.3 LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT

The Maximum Power Spectral Density Measurement is 8dBm.



## 6.4 TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3KHz RBW and 30KHz VBW, set sweep time=span / 3KHz.

The power spectral density was measured and recorded.

The sweep time is allowed to be longer than span / 3KHz for a full response of the mixer in the spectrum analyzer.

## 6.5 UNCERTAINTY OF CONDUCTED EMISSION

The uncertainty of conducted emission is  $\pm 1.82$ dB.

## 6.6 TEST RESULTS

|                                |                          |                                 |              |
|--------------------------------|--------------------------|---------------------------------|--------------|
| <b>EUT</b>                     | PCMCIA Wireless LAN Card | <b>MODEL</b>                    | 73-TMWBC-001 |
| <b>INPUT POWER (SYSTEM)</b>    | 5VDC(From PC)            | <b>ENVIRONMENTAL CONDITIONS</b> | 27°C, 70%RH, |
| <b>TESTED BY : M. C. Huang</b> |                          |                                 |              |

| <b>CHANNEL</b> | <b>CHANNEL FREQUENCY (MHz)</b> | <b>Final RF Power Level IN 3KHz BW (dBm)</b> | <b>MAXIMUM LIMIT (dBm)</b> | <b>PASS / FAIL</b> |
|----------------|--------------------------------|----------------------------------------------|----------------------------|--------------------|
| 1              | 2412                           | -13.98                                       | 8                          | PASS               |
| 6              | 2437                           | -14.59                                       | 8                          | PASS               |
| 11             | 2462                           | -15.71                                       | 8                          | PASS               |

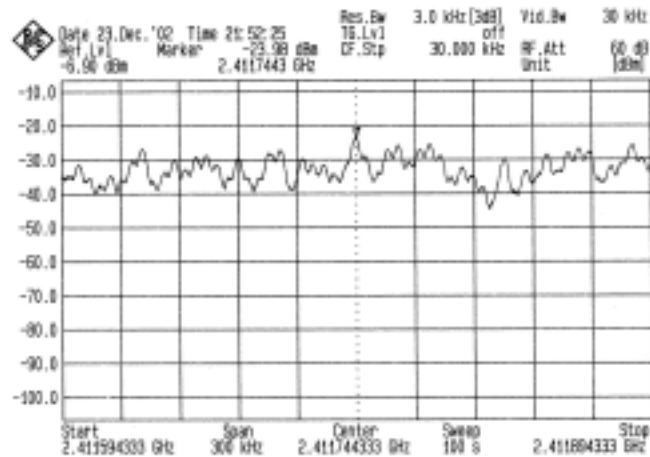
Note:

- 1.The measurement value of RF Power Level + 10dB attenuator=Final RF Power Level

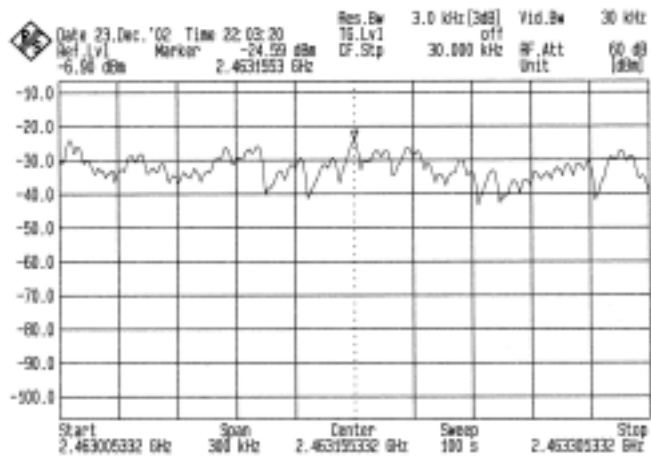




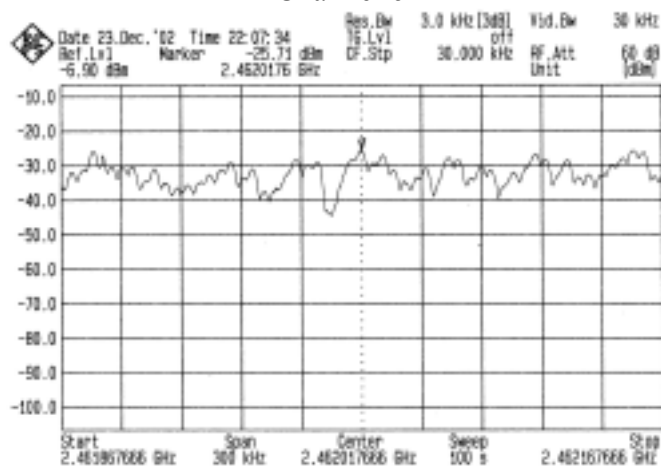
## 6.7 PHOTO OF POWER SPECTRAL DENSITY MEASUREMENT



Channel 1



Channel 6



Channel 11



## 7. OUT OF BAND MEASUREMENT

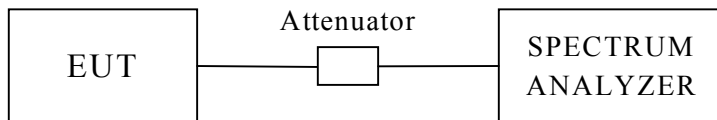
### 7.1 TEST EQUIPMENTS

| Description & Manufacturer    | Model No. | Serial No.               | DATE OF CALIBRATION |
|-------------------------------|-----------|--------------------------|---------------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESMI      | 842088/005<br>841978/008 | SEPT. 3, 2002       |
| HP ATTENUATOR                 | 8496B     | 3247A18505               | Cal. on use         |
| HP PLOTTER                    | 7750A     | 725A 852141              | N/A                 |

NOTE :

3. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
4. The calibration interval of the above test instruments is 12 months and the calibrations are traceable to NML/ROC and NIST/USA.

### 7.2 TEST SETUP



### 7.3 LIMITS OF OUT OF BAND EMISSIONS MEASUREMENT

1. Below -20dB of the highest emission level of operating band (in 100KHz Resolution Bandwidth).
2. Fall in the restricted bands listed in section 15.205. The maximum permitted average field strength is listed in section 15.209.



## 7.4 TEST PROCEDURE

1. The transmitter output was connected to the spectrum analyzer via a low lose cable. Set both RBW and VBW of spectrum analyzer to 100KHz with suitable frequency span including 100KHz bandwidth from band edge. The band edges was measured and recorded.
2. Radiated emission test: Applies to harmonics/spurs that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209. A pre-amp (and possibly a high-pass filter) is necessary for this measurement. For measurements above 1 GHz, set RBW= 1MHz, VBW= 10Hz, Sweep: Auto. If the emission is pulsed, modify the unit for continuous operation, use the setting shown above, then correct the reading by subtracting the peak-average correction factor, derived from the appropriate duty cycle calculation.

## 7.5 UNCERTAINTY OF CONDUCTED EMISSION

The uncertainty of conducted emission is  $\pm 1.82$ dB.

## 7.6 TEST RESULTS

### A. Conducted

Refer to 7.7 photo of out band Emission measurement

### B. Radiated

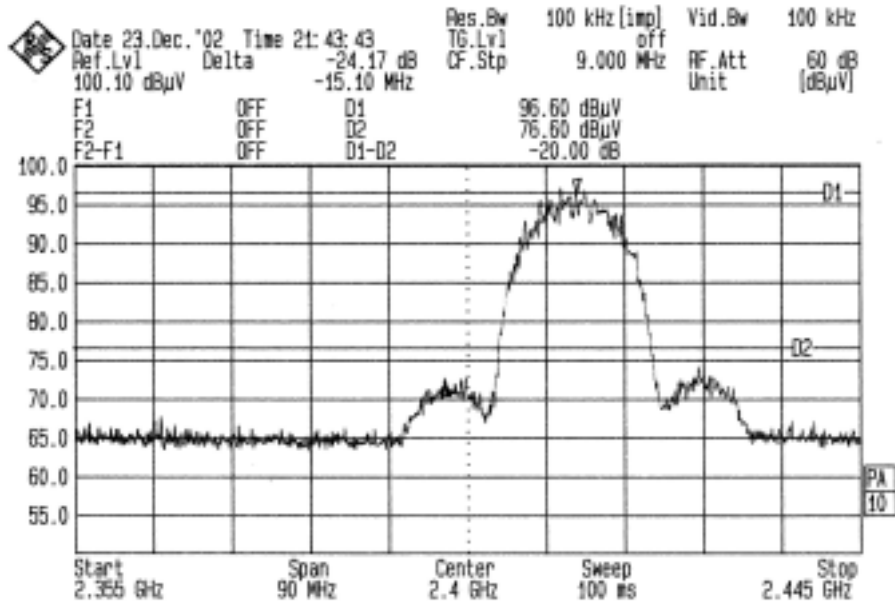
Refer to the section of Radiation Emission ; Test requirement 15.205 from P19 to P24 of the measurement data.

|                                |                          |                                 |              |
|--------------------------------|--------------------------|---------------------------------|--------------|
| <b>EUT</b>                     | PCMCIA Wireless LAN Card | <b>MODEL</b>                    | 73-TMWBC-001 |
| <b>INPUT POWER (SYSTEM)</b>    | 5VDC(From PC)            | <b>ENVIRONMENTAL CONDITIONS</b> | 27°C, 70%RH, |
| <b>TESTED BY : M. C. Huang</b> |                          |                                 |              |

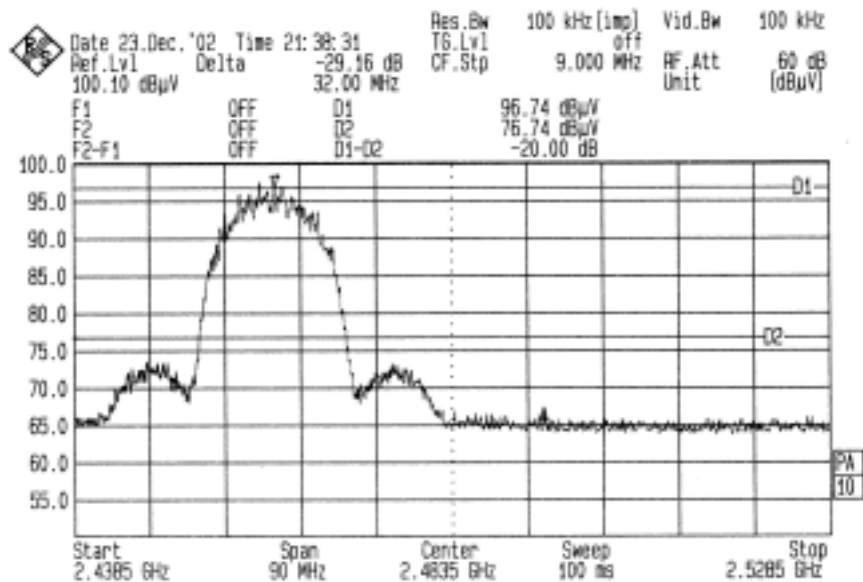
| <b>CHANNEL FREQUENCY (MHz)</b> | <b>Required Limit (dBc)</b> | <b>PASS / FAIL</b> |
|--------------------------------|-----------------------------|--------------------|
| <2400                          | >20                         | PASS               |
| >2483.5                        | >20                         | PASS               |
| <2400                          | >20                         | PASS               |
| >2483.5                        | >20                         | PASS               |



## 7.7 PHOTO OF OUT OF BAND MEASUREMENT



FRONT



BACK



## **8. ANTENNA REQUIREMENT**

### **8.1 STANDARD APPLICABLE**

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

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

### **8.2 ANTENNA CONNECTED CONSTRUCTION**

The antenna used in this product is PCB antenna. The PCB antenna connector is MM8430-260 And the maximum Gain of these antennas are only 2dBi.



## 9. RF EXPOSURE EVALUATION

According to FCC 1.1310 : The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)  
 LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

| Frequency Range<br>(MHz)                                | Electric Field<br>Strength (V/m) | Magnetic Field<br>Strength (A/m) | Power Density<br>(mW/cm <sup>2</sup> ) | Average Time |
|---------------------------------------------------------|----------------------------------|----------------------------------|----------------------------------------|--------------|
| (A) Limits for Occupational / Control Exposures         |                                  |                                  |                                        |              |
| 300-1,500                                               | --                               | --                               | F/300                                  | 6            |
| 1,500-100,000                                           | --                               | --                               | 5                                      | 6            |
| (B) Limits for General Population / Uncontrol Exposures |                                  |                                  |                                        |              |
| 300-1,500                                               | --                               | --                               | F/1500                                 | 6            |
| 1,500-100,000                                           | --                               | --                               | 1                                      | 30           |

### 9.1 FRIIS FORMULA

Friis transmission formula :  $P_d = (P_{out} * G) / (4 * \pi * r^2)$

Where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = output power to antenna in mW

$G$  = gain of antenna in linear scale

$\pi$  = 3.1416

$R$  = distance between observation point and center of the radiator in cm

$P_d$  is the limit of MPE, 1 mW/cm<sup>2</sup>. If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance  $r$  where the MPE limit is reached.

### 9.2 EUT OPERATING CONDITION

A software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.



## 9.3 TEST RESULT OF RF EXPOSURE EVALUATION

Test Item : RF Exposure Evaluation Data

Test Mode : Normal Operation

### 9.3.1 ANTENNA GAIN

Antenna Gain : The maximum Gain measured in fully anechoic chamber is 2dBi linear scale.

### 9.3.2 OUTPUT POWER INTO ANTENNA & RF EXPOSURE EVALUATION DISTANCE

| Channel | Channel Frequency (MHz) | Output Power to Antenna (dBm) | EIRP at Friis formula when r=20cm | Limit |
|---------|-------------------------|-------------------------------|-----------------------------------|-------|
| CH1     | 2412.00                 | 10.88                         | 0.003861                          | 1     |
| CH6     | 2437.00                 | 10.8                          | 0.003791                          | 1     |
| CH11    | 2462.00                 | 11.2                          | 0.004157                          | 1     |

The distance r (4<sup>th</sup> column) calculated from the Friis transmission formula is far lower than the limit 1 mW/cm<sup>2</sup>. So, RF exposure limit warning or SAR test are not required.