



FCC TEST REPORT

REPORT NO.: RF90040923

MODEL NO.: NWH610

NCP110

RECEIVED: April 9, 2001

TESTED: April 20, 2001

APPLICANT: NATIONAL DATACOMM CORPORATION

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Table of Contents

| | | |
|----------|---|----------|
| 1 | CERTIFICATION | 4 |
| 2 | SUMMARY OF TEST RESULTS..... | 5 |
| 3 | GENERAL INFORMATION | 6 |
| 3.1 | GENERAL DESCRIPTION OF EUT | 6 |
| 3.2 | DESCRIPTION OF TEST MODES | 6 |
| 3.3 | GENERAL DESCRIPTION OF APPLIED STANDARDS..... | 7 |
| 3.4 | DESCRIPTION OF SUPPORT UNITS | 7 |
| 4 | TEST PROCEDURES AND RESULTS | 8 |
| 4.1 | CONDUCTED EMISSION MEASUREMENT..... | 8 |
| 4.1.1 | LIMITS OF CONDUCTED EMISSION MEASUREMENT | 8 |
| 4.1.2 | TEST INSTRUMENTS | 8 |
| 4.1.3 | TEST PROCEDURES | 9 |
| 4.1.4 | TEST SETUP | 10 |
| 4.1.5 | TEST RESULTS | 11 |
| 4.2 | RADIATED EMISSION MEASUREMENT | 17 |
| 4.2.1 | LIMITS OF RADIATED EMISSION MEASUREMENT..... | 17 |
| 4.2.2 | TEST INSTRUMENTS | 18 |
| 4.2.3 | TEST PROCEDURES | 19 |
| 4.2.4 | TEST SETUP | 20 |
| 4.2.5 | TEST RESULTS | 21 |
| 4.3 | 6dB BANDWIDTH MEASUREMENT..... | 25 |
| 4.3.1 | LIMITS OF 6dB BANDWIDTH MEASUREMENT | 25 |
| 4.3.2 | TEST INSTRUMENTS | 25 |
| 4.3.3 | TEST PROCEDURE..... | 26 |
| 4.3.4 | TEST SETUP | 26 |
| 4.3.5 | EUT OPERATING CONDITION..... | 26 |
| 4.3.6 | TEST RESULTS | 27 |
| 4.4 | MAXIMUM PEAK OUTPUT POWER..... | 31 |
| 4.4.1 | LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT | 31 |
| 4.4.2 | INSTRUMENTS | 31 |
| 4.4.3 | TEST PROCEDURES | 32 |
| 4.4.4 | TEST SETUP | 32 |
| 4.4.5 | EUT OPERATING CONDITION..... | 32 |
| 4.4.6 | TEST RESULTS | 33 |
| 4.5 | POWER SPECTRAL DENSITY MEASUREMENT | 34 |
| 4.5.1 | LIMITS OF POWER SPECTRAL DENSITY MEASUREMENT | 34 |
| 4.5.2 | TEST INSTRUMENTS | 34 |



| | | |
|----------|---|-----------|
| 4.5.3 | TEST PROCEDURE..... | 35 |
| 4.5.4 | TEST SETUP | 35 |
| 4.5.5 | EUT OPERATING CONDITION | 35 |
| 4.5.6 | TEST RESULTS | 36 |
| 4.6 | BAND EDGES MEASUREMENT | 40 |
| 4.6.1 | LIMITS OF BAND EDGES MEASUREMENT | 40 |
| 4.6.2 | TEST INSTRUMENTS | 40 |
| 4.6.3 | TEST PROCEDURE..... | 40 |
| 4.6.4 | EUT OPERATING CONDITION..... | 41 |
| 4.6.5 | TEST RESULTS | 41 |
| 4.6.6 | NOTE ON BAND EDGE EMISSION..... | 42 |
| 4.7 | ANTENNA REQUIREMENT..... | 45 |
| 4.7.1 | STANDARD APPLICABLE | 45 |
| 4.7.2 | ANTENNA CONNECTED CONSTRUCTION..... | 45 |
| 5 | PHOTOGRAPHS OF THE TEST CONFIGURATION..... | 46 |
| 6 | INFORMATION ON THE TESTING LABORATORIES | 48 |
| ANNEX 1 | PROCESSING GAIN OF DIRECT SEQUENCE SPREAD SPECTRUM MEASUREMENT | |
| ANNEX 2 | PHOTOGRAPHS OF EUT | |



1 CERTIFICATION

PRODUCT : Wireless LAN PC Card
BRAND NAME : NDC
MODEL NO. : NWH610, NCP110
APPLICANT : NATIONAL DATACOMM CORPORATION
STANDARDS : 47 CFR Part 15, Subpart C (Section 15.247),
ANSI C63.4-1992
SITE REGISTRATION NO. : 90422 (FCC)
IC 3789-5 (Canada IC)

We, **Advance Data Technology Corporation**, hereby certify that one sample NWH610 of the designation has been tested in our facility on April 20, 2001.

The test record, data evaluation and Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions herein specified.

Tested by : Steven Lu, Date: April 23, 2001
Steven Lu

Prepared by : Demi Chen, Date: April 23, 2001
Demi Chen

Approved by : Alan Lane, Date: April 23, 2001
Dr. Alan Lane, Manager

2 SUMMARY OF TEST RESULTS

The EUT has been tested according to the following specifications:

| APPLIED STANDARD: 47 CFR Part 15, Subpart C | | | |
|---|---|--------|--|
| STANDARD PARAGRAPH | TEST REQUIREMENTS | RESULT | REMARK |
| 15.107 | AC Power Conducted Emissions Spec.: 48 dBuV | Yes | Minimum passing margin is -10.09dBuV At 0.45900 MHz |
| 15.247(a)(2) | Spectrum Bandwidth of a Direct Sequence Spread Spectrum System Spec.: min. 500 KHz | Yes | 9.96 MHz > 500 kHz |
| 15.247(b) | Maximum Peak Output Power Spec.: max. 30 dBm | Yes | 18.88dBm < 30 dBm |
| 15.247(c) | Transmitter Radiated Emissions Spec.: Table 15.209 | Yes | Minimum passing margin is -10.9dBuV At 528.08 MHz |
| 15.247(d) | Power Spectral Density Spec.: max. 8dBm | Yes | -10.29dBm < 8 dBm |
| 15.247(e) | Band Edge Measurement | Yes | N/A |
| 15.247(e) | Processing Gain of Direct Sequence Spread Spectrum System Spec.: min. 10 dB | Yes | N/A |

NOTE:

The receiver portion of the EUT has been tested in ADT. The test result has been verified to comply with FCC Part 15, Subpart B, Class B – Computing Devices (FCC DoC). The engineering test report can be provided upon FCC requests.

3 GENERAL INFORMATION

3.1 GENERAL DESCRIPTION OF EUT

| | |
|----------------------------------|--------------------------------|
| PRODUCT | Wireless LAN PC Card |
| MODEL NO. | NWH610, NCP110 |
| POWER SUPPLY | 5VDC from Notebook PCMCIA Slot |
| DATA CABLE | NA |
| BANDWIDTH OF EACH CHANNEL | 22MHz |
| MODULATION TYPE | CCK, BPSK, QPSK |
| RADIO TECHNOLOGY | DSSS |
| TRANSFER RATE | 1/2/5.5/11Mbps |
| FREQUENCY RANGE | 2412MHz ~ 2462MHz |
| NUMBER OF CHANNEL | 11 |
| OUTPUT POWER | 13dBm |
| ANTENNA TYPE | Patch Antenna |
| ASSOCIATED DEVICES | NA |

- Note:
1. NWH610, NCP110 are the same product for market requirement.
 2. This product is a PCMCIA LAN Card. It is plugged in the PCMCIA slot of notebook.

3.2 DESCRIPTION OF TEST MODES

Eleven channels are provided in this EUT.

| Channel | Frequency | Channel | Frequency |
|---------|-----------|---------|-----------|
| 1 | 2412 MHz | 7 | 2442 MHz |
| 2 | 2417 MHz | 8 | 2447 MHz |
| 3 | 2422 MHz | 9 | 2452 MHz |
| 4 | 2427 MHz | 10 | 2457 MHz |
| 5 | 2432 MHz | 11 | 2462 MHz |
| 6 | 2437 MHz | | |



3.3 GENERAL DESCRIPTION OF APPLIED STANDARDS

The EUT is a Wireless LAN PC Card, according to the specifications of the manufacturers, it must comply with the requirements of the following standards:

FCC CFR 47 Part 15, Subpart C. (15.247)

All tests have been performed and recorded as per the above standards.

3.4 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

| NO. | PRODUCT | BRAND | MODEL NO. | SERIAL NO. | FCC ID |
|-----|-------------|-------|-----------|------------|----------------|
| 1 | NOTEBOOK PC | DELL | PPX | 99125 | DoC APPROVELED |
| 2 | PRINTER | HP | 2225C+ | 3123S97230 | DSI6XU2225 |
| 3 | MODEM | ACEEX | 1414 | 980020510 | IFAXDM1414 |

| NO. | SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS |
|-----|---|
| 1 | NA |
| 2 | 1.2m braid shielded wire, terminated with DB25 and Centronics connector via metallic frame, w/o core. |
| 3 | 1.2 m braid shielded wire, terminated with DB25 and DB9 connector via metallic frame, w/o core. |

NOTE: All power cords of the above support units are non shielded (1.8m).



4 TEST PROCEDURES AND RESULTS

4.1 CONDUCTED EMISSION MEASUREMENT

4.1.1 LIMITS OF CONDUCTED EMISSION MEASUREMENT

| FREQUENCY (MHz) | Class A (dBuV) | | Class B (dBuV) | |
|-----------------|----------------|---------|----------------|---------|
| | Quasi-peak | Average | Quasi-peak | Average |
| 0.45 – 30 | 48 | - | 48 | - |
| | | | | |
| | | | | |

Notes:

1. The lower limit shall apply at the transition frequencies.
2. All emanations from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.1.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED UNTIL |
|--|-----------|--------------|------------------|
| ROHDE & SCHWARZ Test Receiver | ESHS30 | 828109/007 | July 6, 2001 |
| ROHDE & SCHWARZ Artificial Mains Network (for EUT) | ESH3-Z5 | 839135/006 | July 9, 2001 |
| ROHDE & SCHWARZ 4-wire ISN | ENY41 | 837032/016 | Nov. 28, 2001 |
| ROHDE & SCHWARZ 2-wire ISN | ENY22 | 837497/016 | Dec. 3, 2001 |
| EMCO-L.I.S.N. (for peripheral) | 3825/2 | 9204-1964 | July 9, 2001 |
| Software | Cond-V2e | NA | NA |
| RF cable (JYEBAO) | RG-58A/U | Cable-C02.01 | July 9, 2001 |
| HP Terminator (For EMCO LISN) | 11593A | E1-01-298 | Feb. 20, 2002 |
| HP Terminator (For EMCO LISN) | 11593A | E1-01-299 | Feb. 20, 2002 |
| Shielded Room | Site 2 | ADT-C02 | NA |
| VCCI Site Registration No. | Site 2 | C-240 | NA |

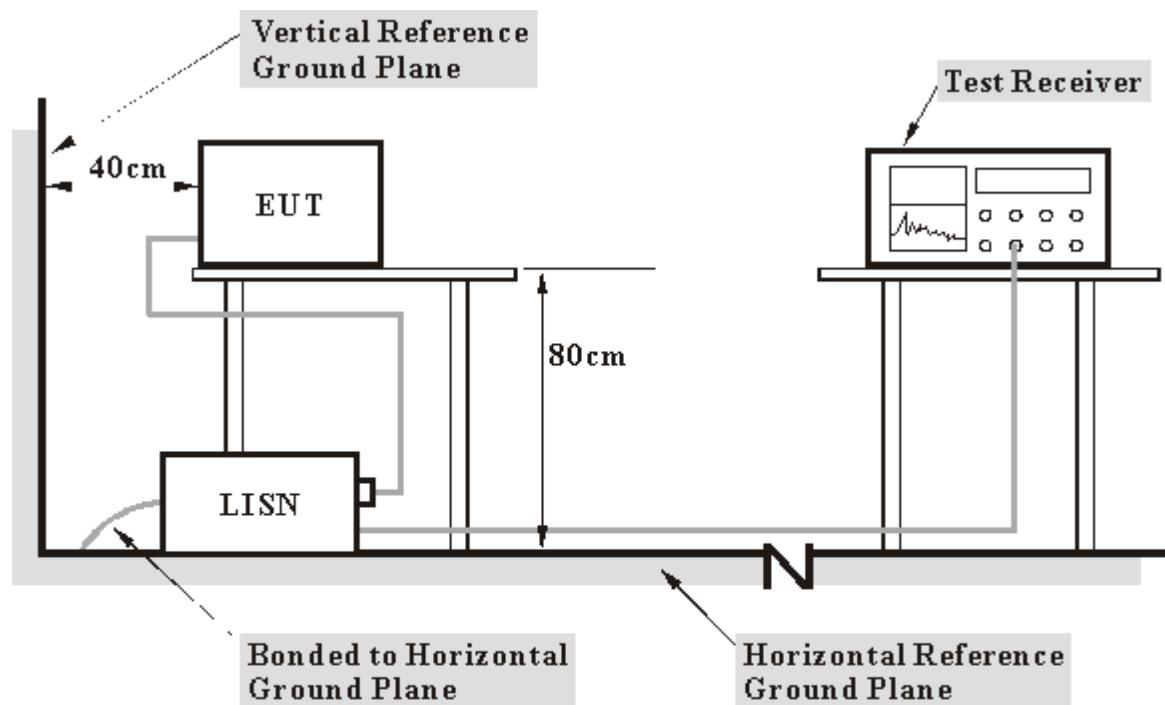
Notes:

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.

4.1.3 TEST PROCEDURES

1. Place the EUT at 0.4 meter away from the conduction wall of the shielded room.
2. Connect the EUT to the power mains through a Line Impedance Stabilization Network (LISN).
3. Connect the other support units to the other LISN too.
4. Make sure the 50Ω / $50\mu\text{H}$ coupling impedance is provided to the measurement instrument by the LISNs.
5. Measure the maximum conducted interference on both lines of the power mains connects to the EUT, within frequency range 450KHz ~ 30MHz.
6. The emission level under limit by 10dB is not needed to be reported.

4.1.4 TEST SETUP



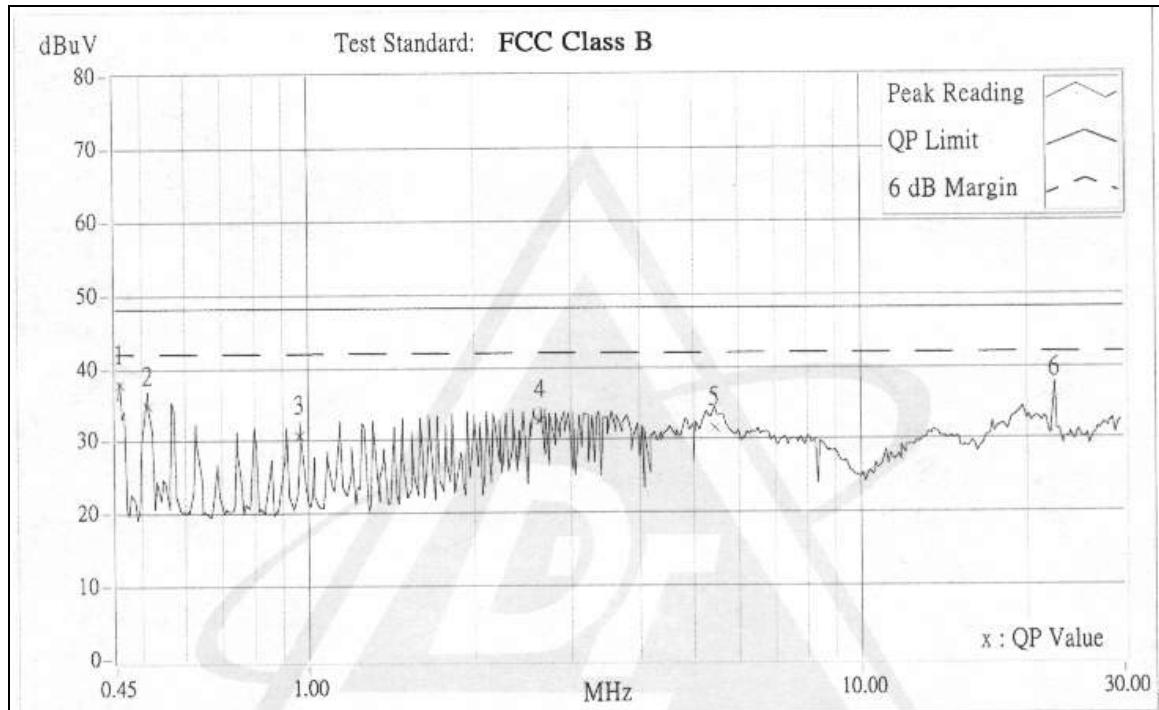
- Note:**
1. Support units were connected to second LISN.
 2. Both of LISNs (AMIN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

For the actual test configuration, please refer to the related Item in this test report
(**Photographs of the Test Configuration**).

4.1.5 TEST RESULTS

| | | | |
|---------------------------------|----------------------|------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Channel | Channel 1 | Phase | L |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value | | Emission Level | | Limit | | Margin | |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-----|--------|-----|
| | | | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.45900 | 0.20 | 37.91 | --- | 37.91 | --- | 48.00 | --- | -10.09 | --- |
| 2 | 0.51300 | 0.20 | 34.93 | --- | 34.93 | --- | 48.00 | --- | -13.07 | --- |
| 3 | 0.96900 | 0.20 | 31.00 | --- | 31.00 | --- | 48.00 | --- | -17.00 | --- |
| 4 | 2.62800 | 0.26 | 33.01 | --- | 33.01 | --- | 48.00 | --- | -14.99 | --- |
| 5 | 5.42900 | 0.47 | 32.03 | --- | 32.03 | --- | 48.00 | --- | -15.97 | --- |
| 6 | 22.56800 | 1.25 | 36.58 | --- | 36.58 | --- | 48.00 | --- | -11.42 | --- |



Remarks: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

2. "-": NA

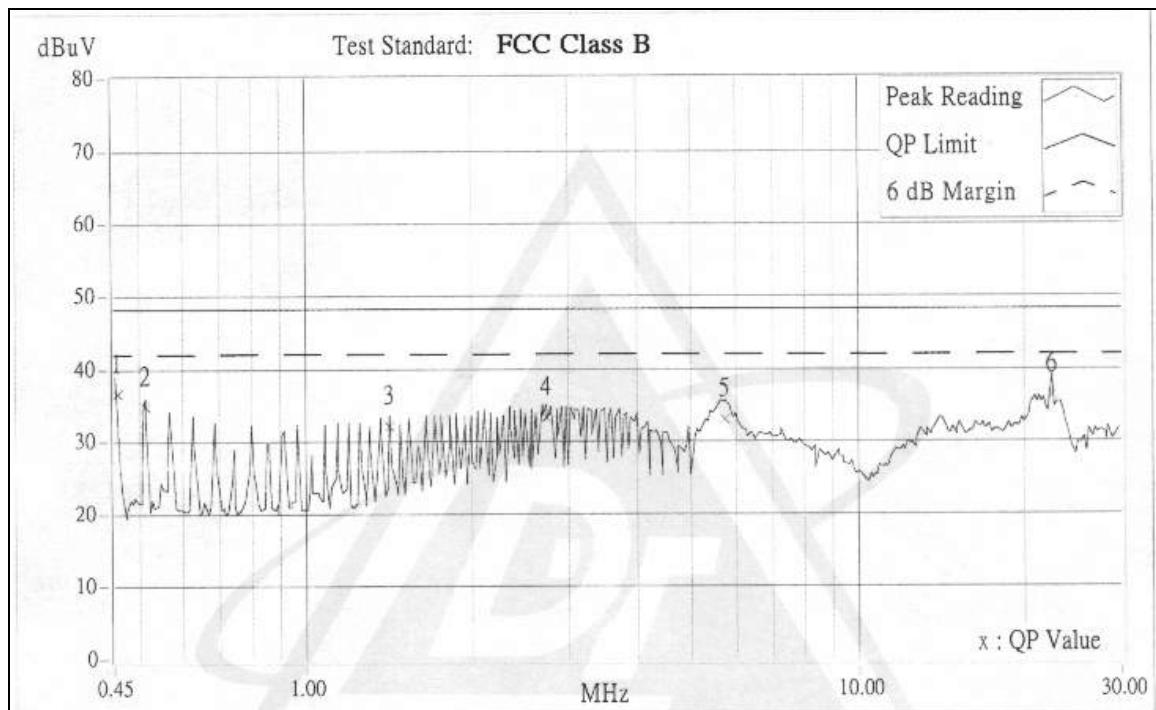
3. The emission levels of other frequencies were very low against the limit.

4. Margin value = Emission level - Limit value

5. Emission Level = Correction Factor + Reading Value.

| | | | |
|---------------------------------|----------------------|------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Channel | Channel 6 | Phase | L |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value | | Emission Level | | Limit | | Margin | |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-----|--------|-----|
| | | | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.45628 | 0.20 | 36.73 | --- | 36.73 | --- | 48.00 | --- | -11.27 | --- |
| 2 | 0.51300 | 0.20 | 35.13 | --- | 35.13 | --- | 48.00 | --- | -12.87 | --- |
| 3 | 1.42500 | 0.20 | 32.24 | --- | 32.24 | --- | 48.00 | --- | -15.76 | --- |
| 4 | 2.73600 | 0.27 | 33.51 | --- | 33.51 | --- | 48.00 | --- | -14.49 | --- |
| 5 | 5.76363 | 0.49 | 33.57 | --- | 33.57 | --- | 48.00 | --- | -14.43 | --- |
| 6 | 22.57100 | 1.25 | 37.42 | --- | 37.42 | --- | 48.00 | --- | -10.58 | --- |



Remarks: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

2. "-"; NA

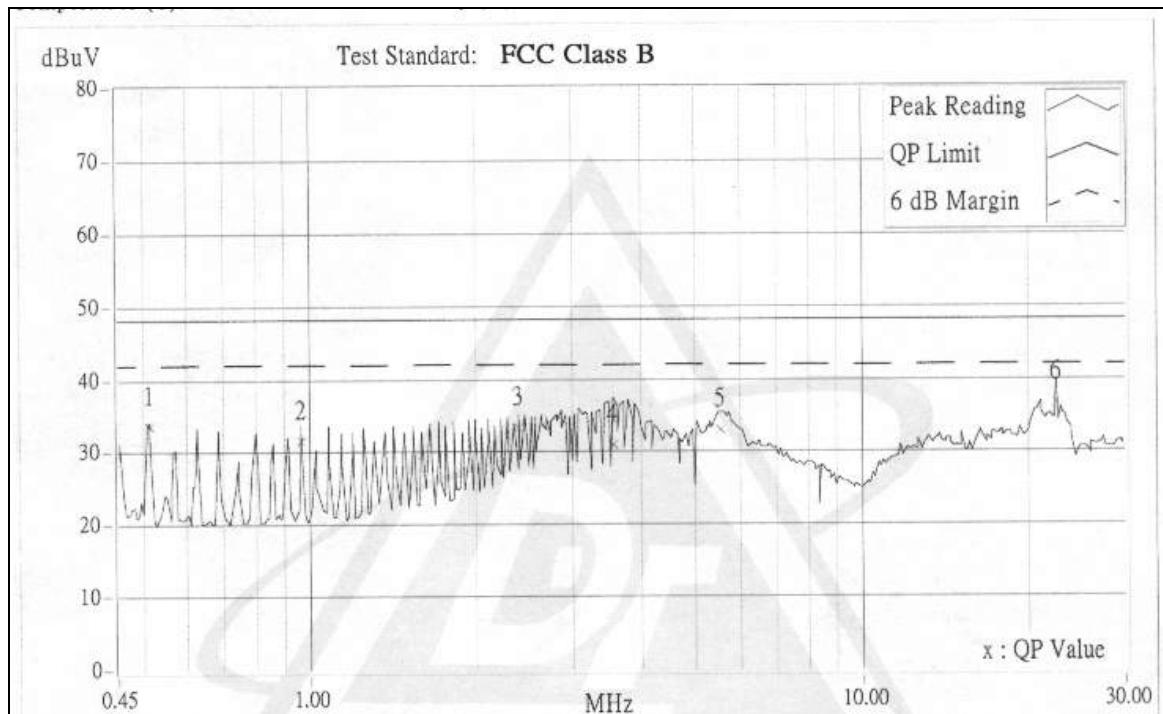
3. The emission levels of other frequencies were very low against the limit.

4. Margin value = Emission level - Limit value

5. Emission Level = Correction Factor + Reading Value.

| | | | |
|---------------------------------|----------------------|------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Channel | Channel 6 | Phase | N |
| Environmental Conditions | 20, 60%RH | Tested By | Steven Lu |

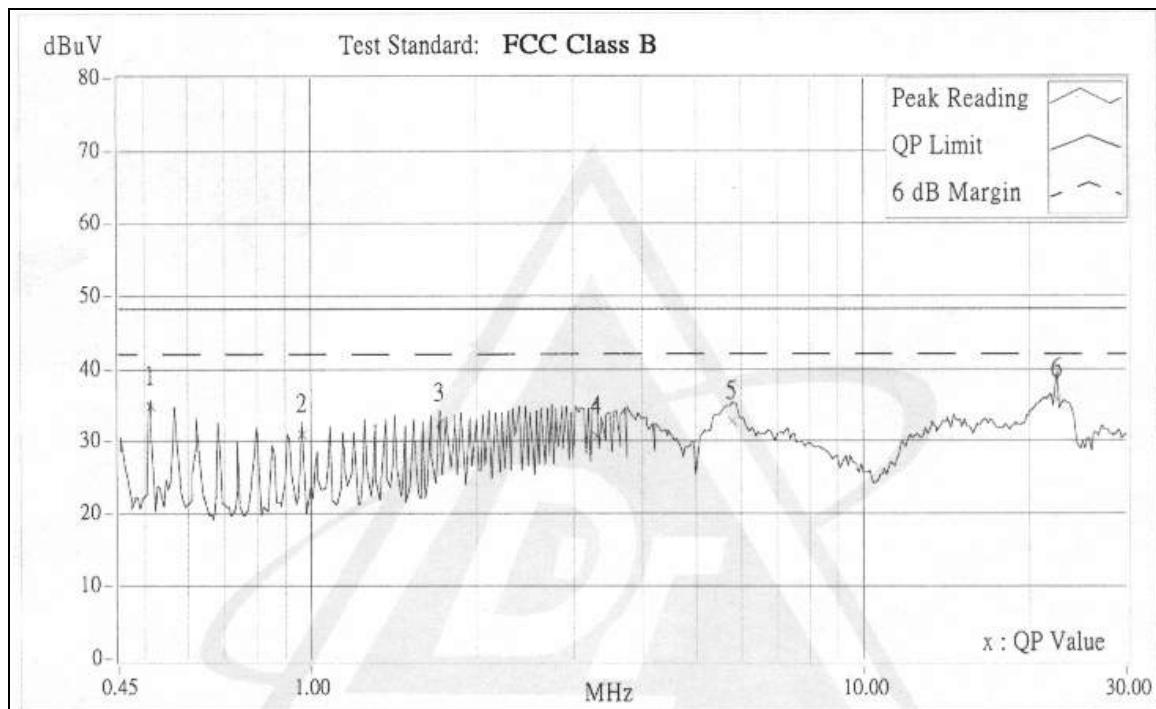
| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value | | Emission Level | | Limit | | Margin | |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-----|--------|-----|
| | | | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.51300 | 0.20 | 33.99 | --- | 33.99 | --- | 48.00 | --- | -14.01 | --- |
| 2 | 0.96900 | 0.20 | 31.78 | --- | 31.78 | --- | 48.00 | --- | -16.22 | --- |
| 3 | 2.39700 | 0.24 | 33.64 | --- | 33.64 | --- | 48.00 | --- | -14.36 | --- |
| 4 | 3.53700 | 0.35 | 31.25 | --- | 31.25 | --- | 48.00 | --- | -16.75 | --- |
| 5 | 5.54290 | 0.45 | 33.49 | --- | 33.49 | --- | 48.00 | --- | -14.51 | --- |
| 6 | 22.56800 | 1.15 | 37.80 | --- | 37.80 | --- | 48.00 | --- | -10.20 | --- |



- Remarks:
1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
 2. "-": NA
 3. The emission levels of other frequencies were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. Emission Level = Correction Factor + Reading Value.

| | | | |
|---------------------------------|----------------------|------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Channel | Channel 11 | Phase | L |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| No | Freq. [MHz] | Corr. Factor (dB) | Reading Value | | Emission Level | | Limit | | Margin | |
|----|----------------|-------------------------|---------------|-----|----------------|-----|-----------|-----|--------|-----|
| | | | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.51300 | 0.20 | 34.91 | --- | 34.91 | --- | 48.00 | --- | -13.09 | --- |
| 2 | 0.96900 | 0.20 | 31.34 | --- | 31.34 | --- | 48.00 | --- | -16.66 | --- |
| 3 | 1.70700 | 0.20 | 32.54 | --- | 32.54 | --- | 48.00 | --- | -15.46 | --- |
| 4 | 3.30000 | 0.33 | 31.08 | --- | 31.08 | --- | 48.00 | --- | -16.92 | --- |
| 5 | 5.80908 | 0.49 | 33.32 | --- | 33.32 | --- | 48.00 | --- | -14.68 | --- |
| 6 | 22.57171 | 1.25 | 36.84 | --- | 36.84 | --- | 48.00 | --- | -11.16 | --- |



Remarks: 1. Q.P. and AV. are abbreviations of quasi-peak and average individually.

2. "-": NA

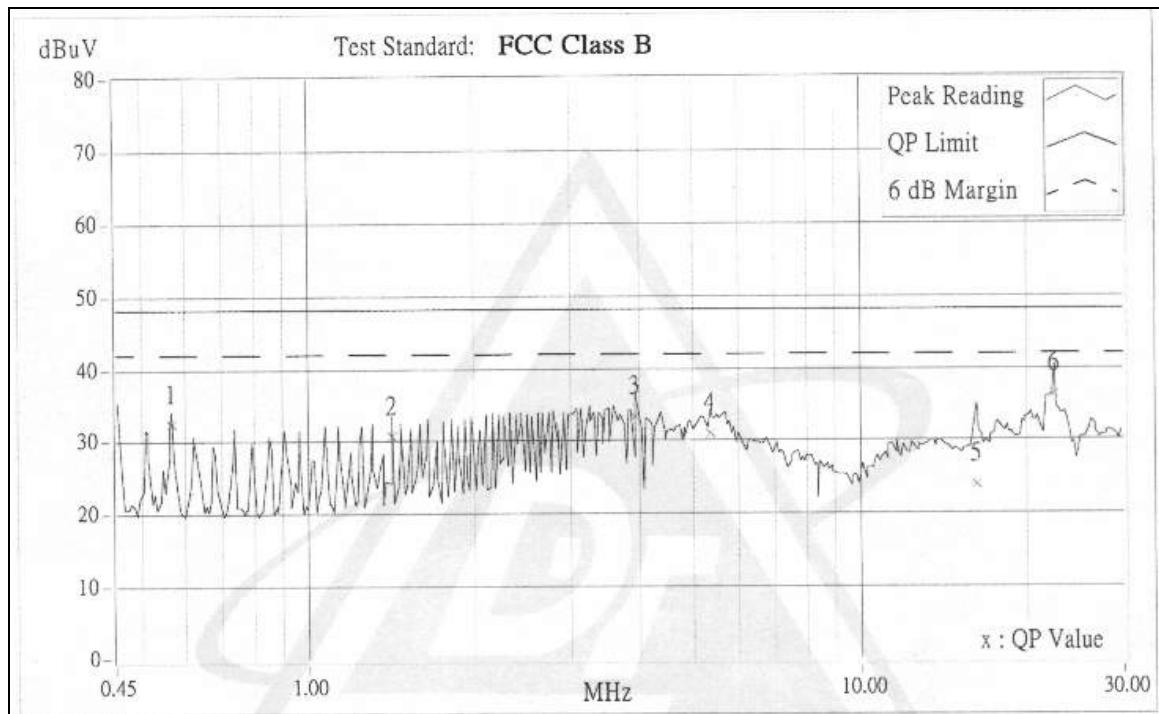
3. The emission levels of other frequencies were very low against the limit.

4. Margin value = Emission level - Limit value

5. Emission Level = Correction Factor + Reading Value.

| | | | |
|---------------------------------|----------------------|------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Channel | Channel 11 | Phase | N |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| No | Freq. [MHz] | Corr. Factor (dB) | Reading | Value | Emission | Level | Limit | | Margin | |
|----|----------------|-------------------------|-----------|-------|-----------|-------|-----------|-----|--------|-----|
| | | | [dB (uV)] | | [dB (uV)] | | [dB (uV)] | | (dB) | |
| | | | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. | Q.P. | AV. |
| 1 | 0.56700 | 0.20 | 32.69 | --- | 32.69 | --- | 48.00 | --- | -15.31 | --- |
| 2 | 1.41900 | 0.20 | 30.88 | --- | 30.88 | --- | 48.00 | --- | -17.12 | --- |
| 3 | 3.92435 | 0.39 | 33.75 | --- | 33.75 | --- | 48.00 | --- | -14.25 | --- |
| 4 | 5.34408 | 0.44 | 31.56 | --- | 31.56 | --- | 48.00 | --- | -16.44 | --- |
| 5 | 16.25763 | 0.93 | 24.92 | --- | 24.92 | --- | 48.00 | --- | -23.08 | --- |
| 6 | 22.56843 | 1.15 | 37.48 | --- | 37.48 | --- | 48.00 | --- | -10.52 | --- |



Remarks:

1. Q.P. and AV. are abbreviations of quasi-peak and average individually.
2. "-": NA
3. The emission levels of other frequencies were very low against the limit.
4. Margin value = Emission level - Limit value
5. Emission Level = Correction Factor + Reading Value.

4.2 RADIATED EMISSION MEASUREMENT

4.2.1 LIMITS OF RADIATED EMISSION MEASUREMENT

Field strength limits are at the distance of 3 meters, emissions radiated outside of the specified bands, shall be according to the general radiated limits in 15.209 as following:

| Frequencies (MHz) | Field Strength of Fundamental | |
|----------------------|-------------------------------|------------|
| | µV/meter | dBµV/meter |
| 30-88 | 100 | 40.0 |
| 88-216 | 150 | 43.5 |
| 216-960 | 200 | 46.0 |
| Above 960 | 500 | 54.0 |

As shown in 15.35(b), for frequencies above 1000MHz, the field strength limits are based on average detector, however, the peak field strength of any emission shall not exceed the maximum permitted average limits, specified above by more than 20dB under any condition of modulation.

LIMIT OF RADIATED EMISSION OF FCC PART 15, SUBPART B FOR FREQUENCY ABOVE 1000 MHz

| FREQUENCY (MHz) | Class A (at 10m) | | Class B (at 3m) | |
|--------------------|------------------|--------|-----------------|--------|
| | uV/m | dBuV/m | uV/m | dBuV/m |
| Above 1000 | 300 | 49.5 | 500 | 54.0 |

- Note:
1. The lower limit shall apply at the transition frequencies.
 2. Emission level (dBuV/m) = 20 log Emission level (uV/m).
 3. All emanation from a class A/B digital device or system, including any network of conductors and apparatus connected thereto, shall not exceed the level of field strengths specified above.

4.2.2 TEST INSTRUMENTS

| DESCRIPTION & MANUFACTURER | MODEL NO. | SERIAL NO. | CALIBRATED UNTIL |
|------------------------------------|----------------------|--------------------------|------------------|
| *HP Spectrum Analyzer | 8590L | 3544A01176 | May 7, 2001 |
| *HP Preamplifier | 8447D | 2944A08485 | Nov. 4, 2001 |
| * HP Preamplifier | 8449B | 3008A01201 | Dec. 13, 2001 |
| * ROHDE & SCHWARZ TEST RECEIVER | ESMI | 839013/007 839379/002 | Jan. 25, 2002 |
| SCHWARZBECK Tunable Dipole Antenna | VHA 9103 UHA 9105 | E101051 E101055 | Nov. 23, 2001 |
| * CHASE BILOG Antenna | CBL6112A | 2221 | Aug. 4, 2001 |
| * EMCO Turn Table | 1060 | 1115 | NA |
| * SHOSHIN Tower | AP-4701 | A6Y005 | NA |
| * Software | AS61D | NA | NA |
| * ANRITSU RF Switches | MP59B | M35046 | Aug. 4, 2001 |
| * TIMES RF cable | LMR-600 | CABLE-ST5-01 | Aug. 4, 2001 |
| Horn Antenna | BBHA9120-D | D130 | July 10, 2001 |
| Open Field Test Site | Site 5 | ADT-R05 | July 28, 2001 |
| VCCI Site Registration No. | Site 5 | R-1039 | NA |

NOTE: 1. The measurement uncertainty is less than +/- 3.0dB, 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.

3. “*” = These equipments are used for the final measurement.

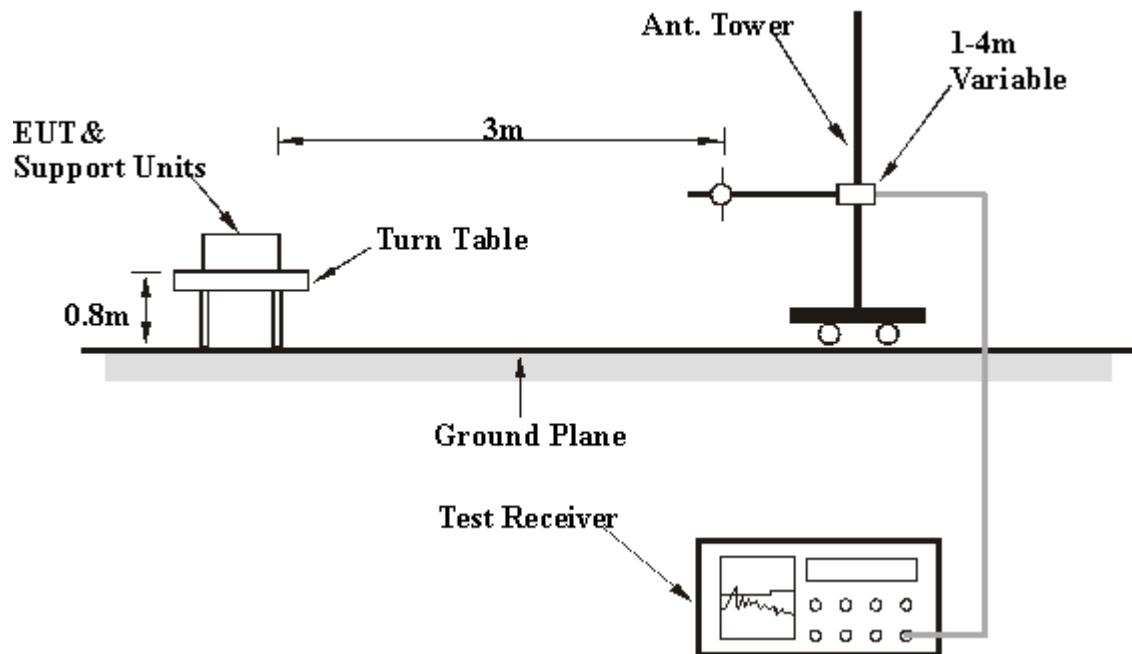
4.2.3 TEST PROCEDURES

1. The EUT was placed on the turn table 0.8 meter above ground in 3 meter open area test site.
2. Set the resolution bandwidth to 120KHz in the test receiver and select Peak function to scan the frequency below 1 GHz.
3. Shift the interference-receiving antenna located in antenna tower upwards and downwards between 1 and 4 meters above ground and find out the local peak emission on frequency domain.
4. Locate the interference-receiving antenna at the position where the local peak reach the maximum emission.
5. Rotate the turn table and stop at the angle where the measurement device has maximum reading
6. Shift the interference-receiving antenna again to detect the maximum emission of the local peak
7. If the reading of the local peak under Peak function is lower than limit by 6dB, then Quasi Peak detection is not needed and this reading should be recorded. And if it is higher than Peak limit, then the test is fail. Others, switch the receiver to Quasi Peak function, set the resolution bandwidth to 100kHz and repeat the procedures C ~ F. If the reading is lower than limit, this reading should be recorded, otherwise, the test is fail.
8. Set the resolution and video bandwidth of the spectrum analyzer to 1MHz and repeat procedures C ~ F for frequency band from 1 GHz to 10 times carrier frequency.
9. If the reading for the local peak is lower than the Average limit, no further testing is needed in this local peak and this reading should be recorded. If it is higher than Average limit but lower than Peak limit, then set the resolution bandwidth to 1MHz and video bandwidth to 300Hz. Repeat procedures C ~ F. If the maximum reading is lower than Average limit, then this reading should be recorded. If it is higher, then the test is fail.

Note:1. The frequency range of verification is either from 30 MHz to 1GHz or from 30 MHz up to 10 times carrier frequency of EUT (whichever is the highest frequency range).

2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120kHz for frequency below 1GHz.
3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 300 Hz for frequency above 1GHz.

4.2.4 TEST SETUP



For the actual test configuration, please refer to the related Item in this test report
(Photographs of the Test Configuration).

4.2.5 TEST RESULTS

Digital Portion

| | | | |
|---------------------------------|----------------------|--------------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Mode | Channel 11 | Detector Function | Quasi-Peak |
| Frequency Range | 30-1000 MHz | Test Distance | 3M |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| ANTENNA POLARITY: VERTICAL | | | | | | | |
|----------------------------|------------------------|----------------------|-------------------------|----------------|-------------|---------------------|----------------------|
| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) |
| 220.00 | 14.59 | 40.98 | 26.4 | 46.0 | -19.6 | 130 | 272 |
| 352.00 | 9.75 | 34.25 | 24.5 | 46.0 | -21.5 | 116 | 248 |
| 396.00 | 8.32 | 38.22 | 29.9 | 46.0 | -16.1 | 135 | 28 |
| 440.00 | 7.80 | 42.00 | 34.2 | 46.0 | -11.8 | 106 | 136 |
| 484.04 | 6.80 | 39.67 | 32.9 | 46.0 | -13.1 | 114 | 233 |
| 528.08 | 6.29 | 41.42 | 35.1 | 46.0 | -10.9 | 200 | 355 |
| 572.01 | 6.01 | 39.62 | 33.6 | 46.0 | -12.4 | 205 | 10 |
| 792.04 | 3.79 | 34.63 | 30.8 | 46.0 | -15.2 | 134 | 206 |
| 880.12 | 2.83 | 30.08 | 27.2 | 46.0 | -18.8 | 126 | 33 |

| ANTENNA POLARITY: HORIZONTAL | | | | | | | |
|------------------------------|------------------------|----------------------|-------------------------|----------------|-------------|---------------------|----------------------|
| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | Emission Level (dBuV/m) | Limit (dBuV/m) | Margin (dB) | Antenna Height (cm) | Table Angle (Degree) |
| 220.01 | 14.59 | 43.88 | 29.3 | 46.0 | -16.7 | 163 | 163 |
| 352.01 | 9.75 | 37.19 | 27.4 | 46.0 | -18.6 | 101 | 101 |
| 396.01 | 8.32 | 35.47 | 27.1 | 46.0 | -18.9 | 134 | 134 |
| 440.04 | 7.80 | 35.28 | 27.5 | 46.0 | -18.5 | 179 | 179 |
| 484.04 | 6.80 | 32.18 | 25.4 | 46.0 | -20.6 | 199 | 199 |
| 528.06 | 6.29 | 36.34 | 30.0 | 46.0 | -16.0 | 205 | 205 |
| 572.00 | 6.01 | 34.94 | 28.9 | 46.0 | -17.1 | 140 | 140 |
| 792.00 | 3.79 | 31.75 | 28.0 | 46.0 | -18.0 | 101 | 101 |
| 880.23 | 2.83 | 30.52 | 27.7 | 46.0 | -18.3 | 197 | 197 |

NOTES: 1 Emission level (dBuV/m) = Reading value (dBuV)-Correction Factor (dB).

2 Correction Factor (dB) = Ant. Factor (dB)+Cable loss (dB)

3 The other emission levels were very low against the limit.

4 Margin value = Emission level - Limit value

**RF Portion**

| | | | |
|---------------------------------|----------------------|--------------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Mode | Channel 1 | Detector Function | Peak,Average |
| Frequency Range | Above 1000 MHz | Test Distance | 3M |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| ANTENNA POLARITY: Vertical | | Detector Function : | | | | 6dB Bandwidth : 1MHz | | | | Frequency Range : Above 1GHz | |
|---|------------------------|----------------------------|-------|-------------------------|------|-----------------------------|------|-------------|------|-------------------------------------|----------------------|
| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | | Antenna Height (cm) | Table Angle (Degree) |
| | | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | | |
| 2039.2 | -29.61 | 13.20 | - | 42.8 | - | 74.0 | 54.0 | -31.2 | - | 102 | 348 |
| *2412.4 | -31.04 | 71.30 | 64.50 | 102.3 | 95.5 | - | - | - | - | 100 | 80 |
| 4076.5 | -34.79 | 10.59 | - | 45.4 | - | 74.0 | 54.0 | -28.6 | - | 110 | 179 |
| 4824.3 | -36.55 | 10.00 | - | 46.5 | - | 74.0 | 54.0 | -27.5 | - | 102 | 268 |

| ANTENNA POLARITY: Horizontal | | Detector Function : | | | | 6dB Bandwidth:1MHz | | | | Frequency Range: Above 1GHz | |
|---|------------------------|----------------------------|-------|-------------------------|------|---------------------------|------|-------------|------|------------------------------------|----------------------|
| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | | Antenna Height (cm) | Table Angle (Degree) |
| | | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | | |
| 2036.9 | -29.61 | 12.25 | - | 41.9 | - | 74.0 | 54.0 | -32.1 | - | 100 | 89 |
| *2412.3 | -31.04 | 70.60 | 64.30 | 101.6 | 95.3 | - | - | - | - | 105 | 283 |
| 4076.5 | -34.79 | 11.20 | - | 46.0 | - | 74.0 | 54.0 | -28.0 | - | 101 | 96 |
| 4824.2 | -36.55 | 9.60 | - | 46.1 | - | 74.0 | 54.0 | -27.9 | - | 101 | 188 |

- NOTES: 1. Emission level (dBuV/m) = Reading value (dBuV) - Correction Factor (dB).
 2. Correction Factor (dB) = Ant. Factor (dB)+Cable loss (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. The limit value is defined as per 15.247
 6. “*”: Fundamental frequency

| | | | |
|---------------------------------|----------------------|--------------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Mode | Channel 6 | Detector Function | Peak, Average |
| Frequency Range | Above 1000 MHz | Test Distance | 3M |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| ANTENNA POLARITY: Vertical | | Detector Function : | | | | 6dB Bandwidth:1MHz | | | | Frequency Range: Above 1GHz | |
|--------------------------------------|------------------------|----------------------------|-------|-------------------------|------|---------------------------|------|-------------|------|---------------------------------------|----------------------|
| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | | Antenna Height (cm) | Table Angle (Degree) |
| | | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | | |
| 2062.6 | -29.69 | 10.28 | - | 40.0 | - | 74.0 | 54.0 | -34.0 | - | 101 | 29 |
| *2437.8 | -31.16 | 69.60 | 62.90 | 100.8 | 94.1 | - | - | - | - | 107 | 338 |
| 4126.2 | -34.90 | 10.23 | - | 45.1 | - | 74.0 | 54.0 | -28.9 | - | 102 | 177 |
| 4874.2 | -36.69 | 9.20 | - | 45.9 | - | 74.0 | 54.0 | -28.1 | - | 103 | 262 |

| ANTENNA POLARITY: Horizontal | | Detector Function : | | | | 6dB Bandwidth:1MHz. | | | | Frequency Range: Above 1GHz. | |
|--|------------------------|----------------------------|-------|-------------------------|------|----------------------------|------|-------------|------|--|----------------------|
| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | | Antenna Height (cm) | Table Angle (Degree) |
| | | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | | |
| 2063.2 | -29.69 | 11.28 | - | 41.0 | - | 74.0 | 54.0 | -33.0 | - | 100 | 166 |
| *2438.2 | -31.16 | 71.20 | 64.50 | 102.4 | 95.7 | - | - | - | - | 100 | 291 |
| 4126.2 | -34.90 | 9.69 | - | 44.6 | - | 74.0 | 54.0 | -29.4 | - | 106 | 60 |
| 4874.5 | -36.69 | 10.00 | - | 46.7 | - | 74.0 | 54.0 | -27.3 | - | 101 | 180 |

- NOTES: 1. Emission level (dBuV/m) = Reading value (dBuV) - Correction Factor (dB).
 2. Correction Factor (dB) = Ant. Factor (dB)+Cable loss (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. The limit value is defined as per 15.247
 6. “*”: Fundamental frequency

| | | | |
|---------------------------------|----------------------|--------------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Mode | Channel 11 | Detector Function | Peak, Average |
| Frequency Range | Above 1000MHz | Test Distance | 3M |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| ANTENNA POLARITY: Vertical | | Detector Function : | | | | 6dB Bandwidth:1MHz. | | | | Frequency Range: Above 1GHz | |
|--------------------------------------|------------------------|----------------------------|-------|-------------------------|------|----------------------------|------|-------------|------|---------------------------------------|----------------------|
| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | | Antenna Height (cm) | Table Angle (Degree) |
| | | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | | |
| 2089.8 | -29.81 | 10.80 | - | 40.6 | - | 74.0 | 54.0 | -33.4 | - | 109 | 362 |
| *2463.0 | -31.24 | 70.00 | 63.40 | 101.2 | 94.6 | - | - | - | - | 100 | 102 |
| 2490.5 | -31.35 | 10.60 | - | 42.0 | - | 74.0 | 54.0 | -32.0 | - | 109 | 72 |
| 4175.4 | -35.00 | 8.92 | - | 43.9 | - | 74.0 | 54.0 | -30.1 | - | 103 | 78 |
| 4923.4 | -36.83 | 7.59 | - | 44.4 | - | 74.0 | 54.0 | -29.6 | - | 105 | 125 |

| ANTENNA POLARITY: Horizontal | | Detector Function : | | | | 6dB Bandwidth:1MHz. | | | | Frequency Range: Above 1GHz | |
|--|------------------------|----------------------------|-------|-------------------------|------|----------------------------|------|-------------|------|---------------------------------------|----------------------|
| Frequency (MHz) | Correction Factor (dB) | Reading Value (dBuV) | | Emission Level (dBuV/m) | | Limit (dBuV/m) | | Margin (dB) | | Antenna Height (cm) | Table Angle (Degree) |
| | | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | P.K. | A.V. | | |
| 2089.0 | -29.81 | 11.22 | - | 41.0 | - | 74.0 | 54.0 | -33.0 | - | 100 | 312 |
| *2463.0 | -31.24 | 70.50 | 64.90 | 101.7 | 96.1 | - | - | - | - | 100 | 141 |
| 2491.3 | -31.35 | 10.58 | - | 41.9 | - | 74.0 | 54.0 | -32.1 | - | 100 | 81 |
| 4175.4 | -35.00 | 9.63 | - | 44.6 | - | 74.0 | 54.0 | -29.4 | - | 100 | 81 |
| 4923.7 | -36.83 | 8.96 | - | 45.8 | - | 74.0 | 54.0 | -28.2 | - | 101 | 76 |

- NOTES: 1. Emission level (dBuV/m) = Correction Factor (dB) + Reading value (dBuV).
 2. Correction Factor (dB) = Ant. Factor (dB)+Cable loss (dB)
 3. The other emission levels were very low against the limit.
 4. Margin value = Emission level - Limit value
 5. The limit value is defined as per 15.247
 6. “*”: Fundamental frequency



4.3 6dB BANDWIDTH MEASUREMENT

4.3.1 LIMITS OF 6dB BANDWIDTH MEASUREMENT

The Limit of 6dB Bandwidth Measurement is 0.5 MHz.

4.3.2 TEST INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|-------------------------------|-----------|------------|------------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESMI | 839379/002 | Aug. 04, 2001 |
| HP ATTENUATOR | 8496B | 3247A18505 | Cal. on use |
| HP PLOTTER | 7475A | 2641V27755 | N/A |

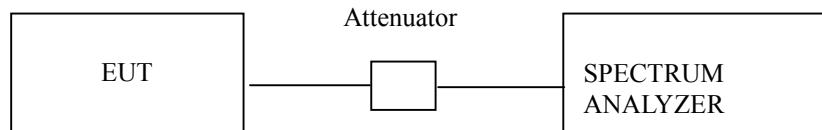
Notes:

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.

4.3.3 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 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

4.3.4 TEST SETUP



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

4.3.5 EUT OPERATING CONDITION

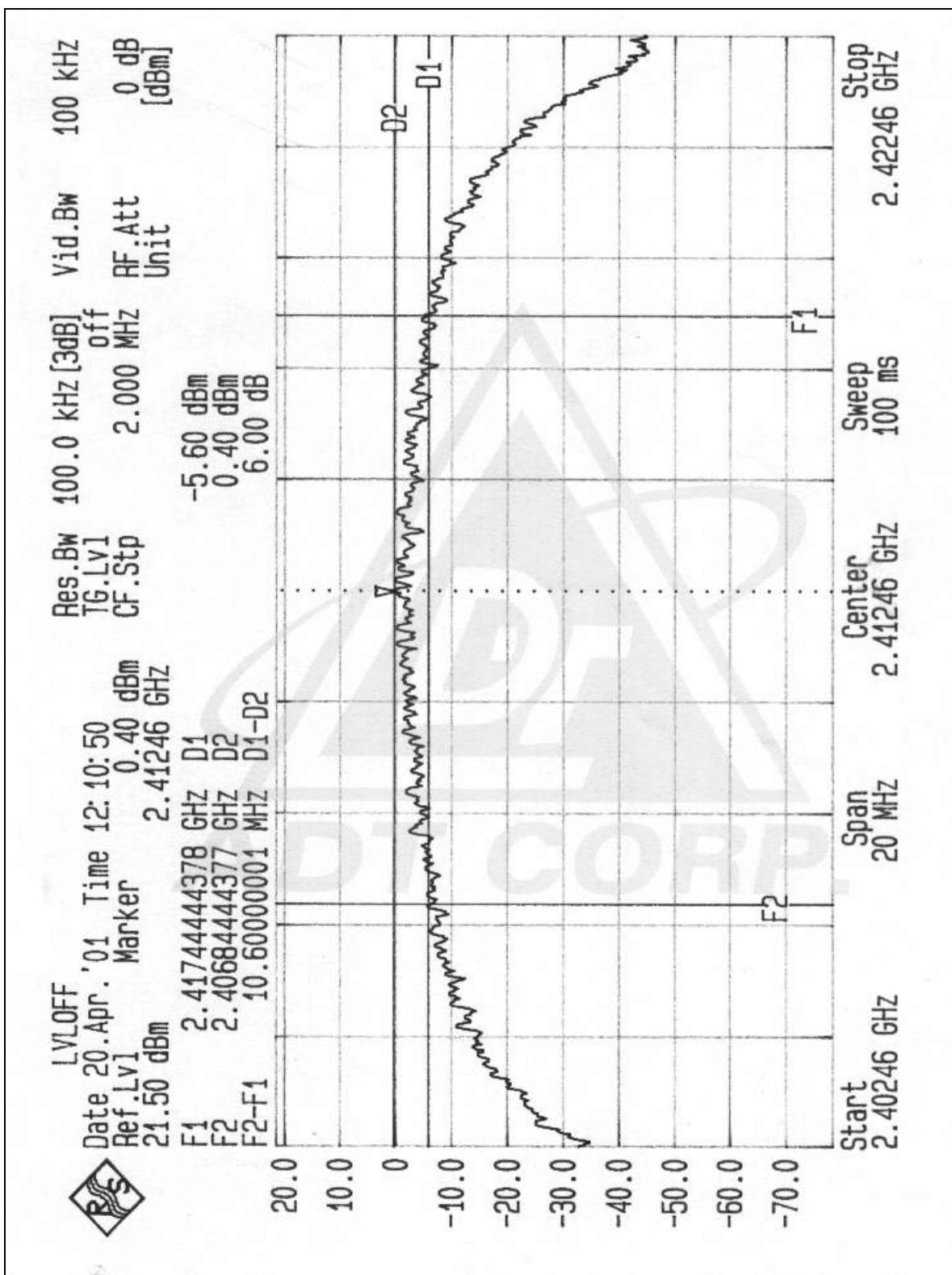
The software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel frequencies individually.

4.3.6 TEST RESULTS

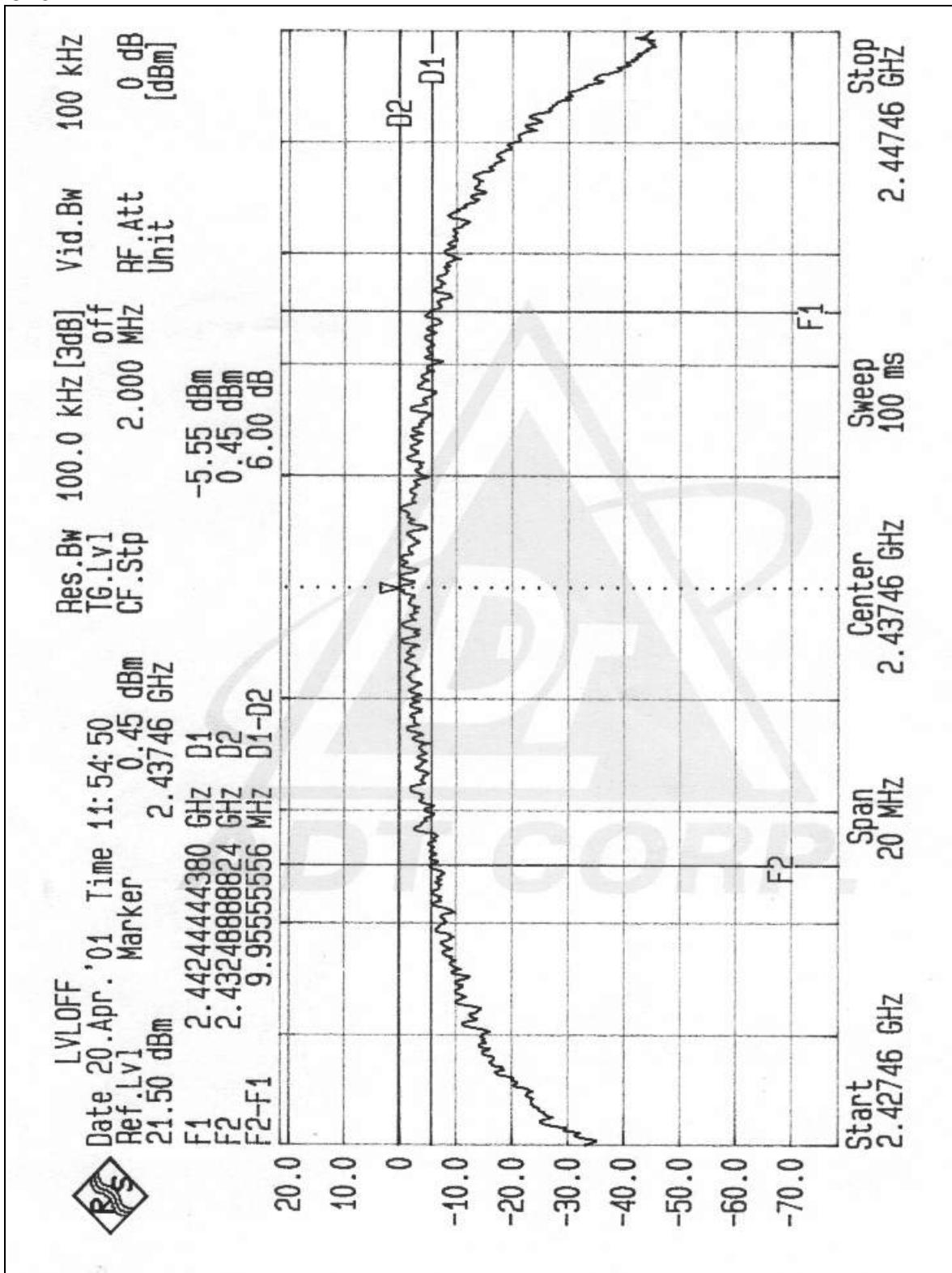
| | | | |
|---------------------------------|----------------------|------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| CHANNEL | CHANNEL FREQUENCY (MHz) | 6 dB BANDWIDTH (MHz) | MINIMUM LIMIT (MHz) | PASS/FAIL |
|---------|-------------------------|----------------------|---------------------|-----------|
| 1 | 2412 | 10.60 | 0.5 | PASS |
| 6 | 2437 | 9.96 | 0.5 | PASS |
| 11 | 2462 | 10.42 | 0.5 | PASS |

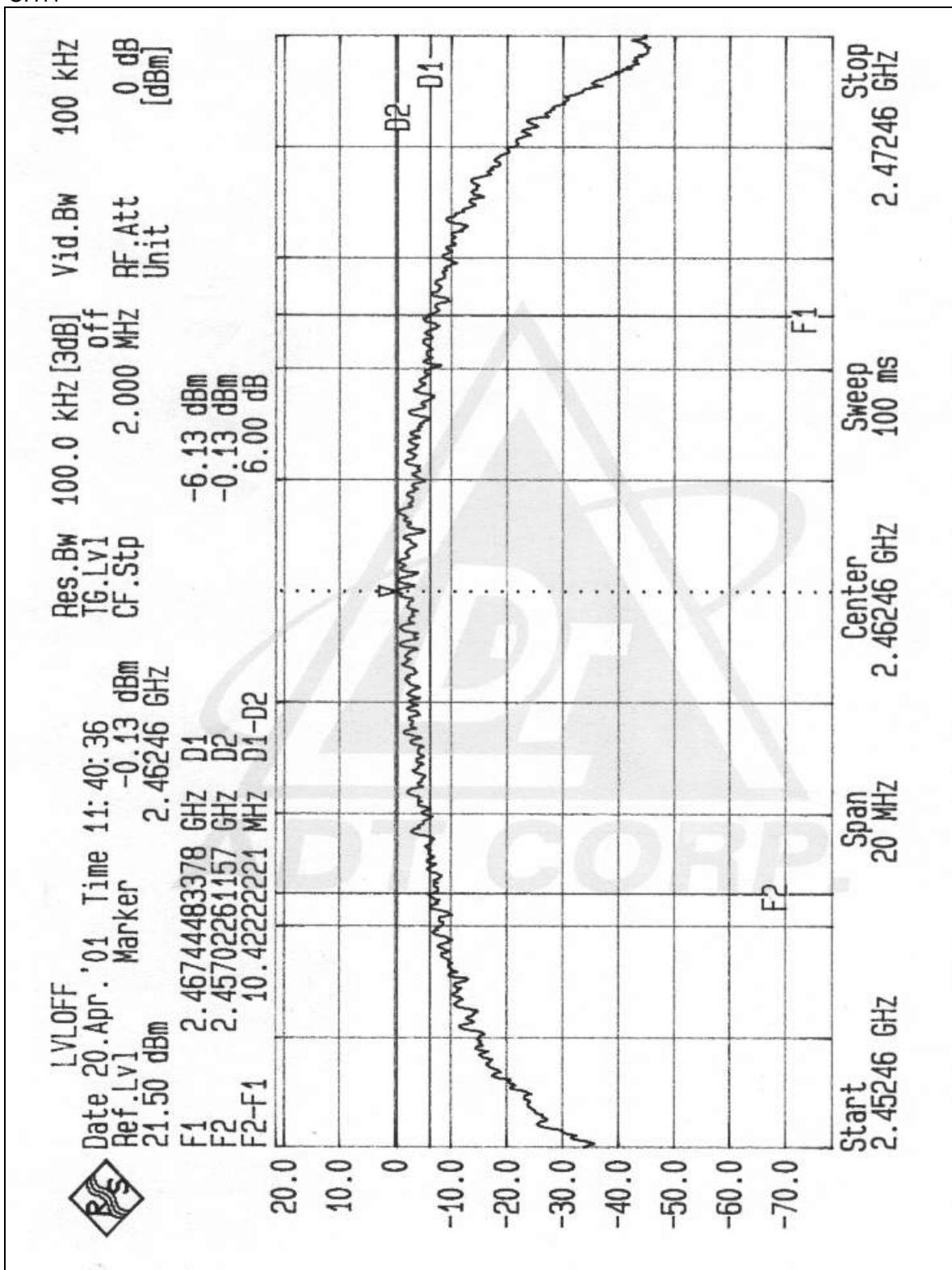
CH1



CH6



CH11





4.4 MAXIMUM PEAK OUTPUT POWER

4.4.1 LIMITS OF MAXIMUM PEAK OUTPUT POWER MEASUREMENT

The Limit of Maximum Peak Output Power Measurement is 30dBm.

4.4.2 INSTRUMENTS

| Description & Manufacturer | Model No. | Serial No. | Calibrated Until |
|-------------------------------|-----------|------------|------------------|
| ROHDE & SCHWARZ TEST RECEIVER | ESMI | 839379/002 | Aug. 04, 2001 |
| HP ATTENUATOR | 8496B | 3247A18505 | Cal. on use |
| HP PLOTTER | 7475A | 2641V27755 | N/A |

Notes:

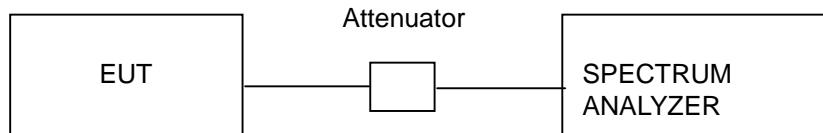
1. The measurement uncertainty is less than +/- 2.6dB, which is calculated as per the NAMAS document NIS81.
2. The calibration interval of the above test instruments is 12 months. And the calibrations are traceable to NML/ROC and NIST/USA.

4.4.3 TEST PROCEDURES

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

Note: This measurement is the total power of 15MHz bandwidth which is far more wider than 6dB bandwidth.

4.4.4 TEST SETUP



For the actual test configuration, please refer to the related Item – Photographs of the Test Configuration.

4.4.5 EUT OPERATING CONDITION

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



4.4.6 TEST RESULTS

Output Power Into Antenna:

| | | | |
|---------------------------------|----------------------|------------------|------------------|
| EUT | Wireless LAN PC Card | Model | NWH610 NCP110 |
| Environmental Conditions | 20°C, 60%RH | Tested By | Steven Lu |

| CHANNEL | CHANNEL FREQUENCY (MHz) | PEAK POWER OUTPUT (dBm) | PEAK POWER LIMIT (dBm) | PASS/FAIL |
|---------|-------------------------|-------------------------|------------------------|-----------|
| 1 | 2412 | 18.88 | 30 | PASS |
| 6 | 2437 | 18.82 | 30 | PASS |
| 11 | 2462 | 17.71 | 30 | PASS |