

ENGINEERING TEST REPORT

SS WIRELESS LAN CARD
Model No: UX-136 (EX-2006)

FCC ID: AFJEX-2006

FCC PART 15, SUBPART C, PARA. 15.247
DIRECT SEQUENCE SPREAD SPECTRUM (DSSS) TRANSMITTERS
OPERATING IN THE FREQUENCY BAND FROM 2412 - 2462 MHz

UltraTech's FILE NO.: **ICO-001FTX**

TESTED FOR:

ICOM INCORPORATED
1-6-19 Kamikurazukuri, Hirano-ku
Osaka, Japan 547

TESTED BY:

UltraTech Engineering Labs Inc.
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Mississauga, Ontario
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PREPARED BY: Tri M. Luu, P.Eng.

DATE: Apr. 10, 1998

UltraTech

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1. EXHIBIT 1 - SUMMARY OF TEST RESULTS & GENERAL STATEMENT OF CERTIFICATION

FCC PARAGRAPH.	TEST REQUIREMENTS	COMPLIANCE (YES/NO)
15.247(a)(2)	Spectrum Bandwidth of a Direct Sequence Spread Spectrum System	Yes
15.247(b)	Maximum Peak Power	Yes
15.247(e)	RF Conducted Spurious Emissions at the Transmitter Antenna Terminal	Yes
15.247(c), 15.209 & 15.205	Transmitter Radiated Emissions	Yes
15.247(d)	Transmitted Power Density of a Direct Sequence Spread Spectrum System	Yes
15.247(e)	Processing Gain of Direct Sequence Spread Spectrum System	Yes
15.107, 15.109	AC Power Conducted Emissions & Radiated Emissions Digital Circuit Portions	Yes (Note 1)

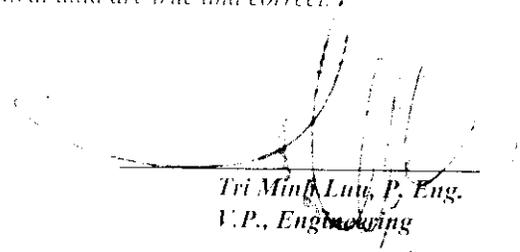
Note 1: The digital circuits and receiver portion of the EUT has been tested and verified to comply with FCC Part 15, Subpart B, Class B - Computing Devices (FCC DoC). The engineering test report can be provided upon FCC requests.

TESTIMONIAL AND STATEMENT OF CERTIFICATION

THIS IS TO CERTIFY:

- 1) *THAT the application was prepared either by, or under the direct supervision of the undersigned.*
- 2) *THAT the measurement data supplied with the application was taken under my direction and supervision.*
- 3) *THAT the data was obtained on representative production units, representative.*
- 4) *THAT, to the best of my knowledge and belief, the facts set forth in the application and accompanying technical data are true and correct.*

Certified by:



*Tri Minh Luu, P. Eng.
V.P., Engineering*

DATE: Apr. 10, 1998

2. EXHIBIT 2 - GENERAL INFORMATION

2.1 Applicant

ICOM INCORPORATED
1-6-19 Kamikurazukuri, Hirano-ku
Osaka, Japan 547

Applicant's Representative: Mr. T. Hoshio, Export Division Director

2.2 Manufacturer

ICOM INCORPORATED
1-6-19 Kamikurazukuri, Hirano-ku
Osaka, Japan 547

2.3 US Maintenance Facility

ICOM AMERICA
2380 116 Avenue North East
Bellevue, Washington
USA 98004

Mr. M. Takahashi
Tel. # 425-454-8155, Fax. # 425-454-1509

2.4 Description of Equipment under Test

PRODUCT NAME:	SS WIRELESS LAN CARD
SERIAL NUMBER:	Pre-production
TYPE OF EQUIPMENT:	DSSS Transmitters
MODULATION:	1 Mb/s DPSK or 2 Mb/s QPSK
CHIP RATE:	5.5 Mcchips/s (DPSK) or 11 Mcchips/s (QPSK)
OPERATING FREQ.:	2412 - 2462 MHz
NUMBER OF CHANNEL:	11
CHANNEL SPACING:	5 MHz
BANDWIDTH (6 dB OBW):	10 MHz minimum
POWER RATING:	81 miliWatts max. (direct) or 1.92micro-watts EIRP
ANTENNA GAIN:	Inverted F Antenna, Gain 5.2 dBi (permanently attached inside the case)

EMISSION DESIGNATION:	Direct Sequence Spread Spectrum
DUTY CYCLE:	Continuous
OSC. FREQUENCY(IES):	32.768 KHz, 22 MHz, 40MHz, 560 MHz (VCO), 2450 MHz (IF), 280 MHz (IF), Tx Local Osc.: Tx freq. - 1F freq. (280 MHz)
INPUT SUPPLY:	Using DC Power from a laptop computer
ASSOCIATED DEVICES:	Not applicable
FCC ID:	AFJEX-2006
INTERFACE PORTS:	Not applicable

2.5 *Related Submittal(s)/Grant*

Not applicable.

2.6 *Test Methodology*

These tests were conducted on a sample of the equipment for the purpose of certification compliance with Code of Federal Regulations (CFR47-1991), Part 15, Subpart C, Para. 15.247, Direct Sequence Spread Spectrum Transmitters operating in the Frequency Band 2412 - 2462 MHz.

Both conducted and radiated emissions measurements were conducted in accordance with American National Standards Institute ANSI C63.4-1992 - American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 KHz to 40 GHz.

2.7 *Test Facility*

AC Powerline Conducted Emissions were performed in UltraTech's shielded room, 16'(L) by 12'(W) by 12'(H).

Radiated Emissions were performed at the UltraTech's 3-to-10 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario.

The above sites have been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville Open Field Test Site has been filed with FCC office (FCC File No.: 31040/SFF 1300B3) and Industry Canada office (Industry Canada File No.: IC2049). Last Date of Site Calibration: July 16, 1997.

The above test site is also filed with Interference Technology International Ltd (ITI - An EC Directive on EMC).

2.8 *Units of Measurements*

Measurements of conducted emissions are reported in units of dB referenced to one microvolt [dB(uV)].

Measurements of radiated emissions are reported in units of dB referenced to one microvolt per meter [dB(uV)/m] at the distance specified in the report, wherever it is applicable.

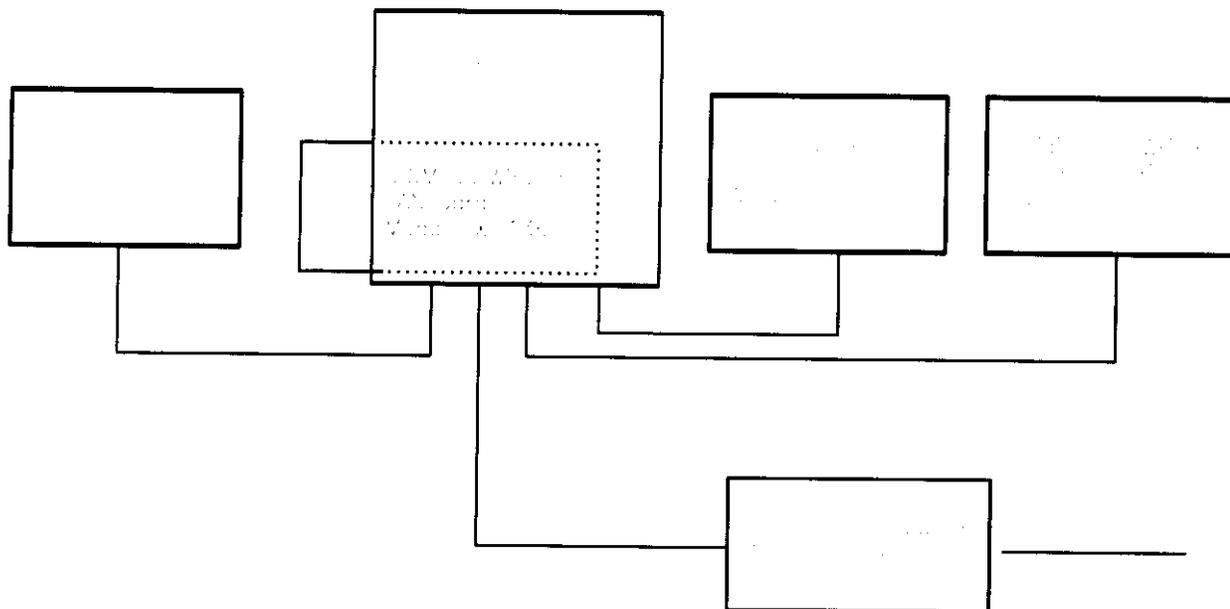
3. EXHIBIT 3 - SYSTEM TEST CONFIGURATION

3.1 Test System Details

The following peripherals, FCC identifiers and types interconnecting cables were used with the EUT for testing:

- (1) **EUT:** ICOM INCORPORATED, SS WIRELESS LAN CARD, Model : UX-136 (EX-2006), S/N: Pre-production
Power & I/O Cable: Not applicable.
- (2) **PERIPHERAL:** Toshiba Satellite Pro 440CDX ThinkPad, Model PA1241UVCD, S/N: 87208930-3, FCC DoC Class B Compliance.
I/O Cable: All I/O Cables were shielded
Power Supply Cable: Non-shielded
- (3) **PERIPHERAL:** Toshiba External Floppy Disk Drive, Model PA12611U, S/N:97259983, FCC DoC Class B Compliance.
I/O Cable: All I/O Cables were shielded
Power Supply Cable: Non-shielded
- (4) **PERIPHERAL:** Digital DEC Writer 100I Parallel Printer, Model LJ100-AZ, S/N: OV44352056, FCC ID: EP8JP150
I/O CABLE: Shielded
POWER CABLE: Unshielded
- (5) **PERIPHERAL:** GVC Fax Modem, Model FM-144VR1, FCC ID: DK4FM144VR1
I/O Cable: Shielded
Power Supply Cable: Non-shielded

3.2 Block Diagrams Radiated Emission Measurements



3.4 Justification

No deviation, in both configuration and operation manners, different from normal operation were required.

3.5 EUT Operating Condition

Software provided by ICOM INCORPORATED to set the EUT to transmit at lowest, middle and highest channel frequencies.

3.6 Special Accessories

No special accessories were required.

3.7 Equipment Modifications

To achieve compliance, the following change(s) were made by UltraTech's test house during compliance testing:

Not required.

4. EXHIBIT 4 - TEST DATA

4.1 6 dB Bandwidth @ FCC CFR 47, Para 15.247(a)(2)

PRODUCT NAME: SS WIRELESS LAN CARD, Model No.: UX-136 (EX-2006)

FCC REQUIREMENTS:

For a direct sequence spread spectrum system, the minimum 6 dB bandwidth shall be at least 500 KHz.

CLIMATE CONDITION:

Standard Temperature and Humidity: 23°C and 53%

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203

METHOD OF MEASUREMENTS:

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 100 KHz RBW, VBW = 100 KHz.. The 6 dB bandwidth was measured and recorded.

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TEST PERSONNEL: Tri M. Luu, P.Eng.

DATE: Apr. 06 & 08, 1998

MEASUREMENT DATA:

CHANNEL FREQUENCY (MHz)	DATA RATE / MODULATION	6 dB BANDWIDTH (MHz)	MINIMUM LIMIT (MHz)	PASS/FAIL
2412	2 Mb/s QPSK	10.1	0.5	PASS
2437	2 Mb/s QPSK	10.1	0.5	PASS
2462	2 Mb/s QPSK	10.1	0.5	PASS
2412	1 Mb/s BPSK	10.1	0.5	PASS
2437	1 Mb/s BPSK	10.1	0.5	PASS
2462	1 Mb/s BPSK	10.1	0.5	PASS

- Accredited by **ITI** (UK) Component Body & **NVLAP** (USA) Accreditation Body
- Recognized, Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (**NIST**)



ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Date: Apr 6 15:05:15
Hosted by: IUTL

REF 20.0 dBm
10dB/

Mon Apr 6 15:05:15 1998
ATT 30 dB
E-PLAN

X dB DOWN
6.0 dB

A MARKER
10.07 MHz
0.47 dB

* ▼

RBW 30 KHZ
VBW 100 KHZ
SWP 10 S

CENTER 2.41200 GHZ
SPAN 50.0 MHZ

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps/s, 2.0 Mb/s QPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

ATT 30 dB

Mon Apr 6 15:06:58 1998
E.F.LIFE

X dB DOWN
6.0 dB

▲ MARKER
10.14 MHz
-0.13 dB

* ▼

RBW 30 KHZ
VBW 100 KHZ
SWP 10 S

CENTER 2.43700 GHZ
SPAN 50.0 MHZ

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

ATT 30 dB

Mon Apr 6 15:14:03 1998
B.P. JPL

X dB DOWN
6.0 dB

▲ MARKER
10.14 MHz
-0.28 dB

* ▼

RBW 30 KHZ
VBW 100 KHZ
SWP 10 S

CENTER 2.46200 GHZ
SPAN 50.0 MHZ

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: 1 Tx Frequency: 2.412 MHz, RF Power: 0.1 W
Modulation: DSSS (11 Mchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

Wed Apr 8 15:07:26 1998
ATT 30 dB

X dB DOWN
6.0 dB

Δ MARKER
10.14 MHz
0.38 dB

* ▼

RBW 30 KHZ
VBW 30 KHZ
SWP 10 S

CENTER 2.41200 GHZ
SPAN 50.0 MHZ

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: 2 Tx Frequency: 5.137 MHz, RF Power: 24.2 mW
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

ATT 30 dB

Wed Apr 8 15:02:13 1998

X dB DOWN
6.0 dB

Δ MARKER
10.14 MHz
0.25 dB

* ▼

RBW 30 KHZ
VBW 30 KHZ
SWP 10 S

CENTER 2.4370 GHZ
SPAN 50.0 MHZ



UltraTech Engineering Labs Inc.
Tested by: [Signature]

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: [Blank] Tx Frequency: [Blank] MHz. RF Power: [Blank] mW
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Wed Apr 8 15:05:38 1998

ATT 30 dB

REF 20.0 dBm
10dB/

Δ MARKER
10.07 MHz
-0.22 dB

X dB DOWN
6.0 dB

* ▼

RBW 30 KHZ
VBW 30 KHZ
SWP 10 s

CENTER 2.46200 GHz

SPAN 50.0 MHz

4.2 **Maximum Peak Output Power @ FCC 15.247(b) and RF Exposure Limit FCC 1.1310**

PRODUCT NAME: SS WIRELESS LAN CARD, Model No.: UX-136 (EX-2006)

FCC REQUIREMENTS:

FCC 15.247(b):- Maximum peak output power of the transmitter shall not exceed 1 Watt. If the antenna of directional gain greater than 6 dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

FCC 1.1310:- The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in 1.1307(b).

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
(A) Limits for Occupational/Control Exposures				
300-1500	F/300	6
1500-100,000	5	6
(B) Limits for General Population/Uncontrolled Exposure				
300-1500	F/1500	6
1500-100,000	1.0	30

F = Frequency in MHz

* = Plane-wave equivalent power density

CLIMATE CONDITION:

- Standard Temperature and Humidity: 23°C and 53%

POWER INPUT:

Using DC Power from a laptop computer.

TEST EQUIPMENT:

- HP RF Peak Power Meter, Model 8900, S/N: 2131A00124, Measuring Freq. Range: 01 - 18 GHz, 50 Ohm IN.
- HP RF Peak Power Sensor, Model 8481A, S/N: 2551A01965, Measuring Freq. Range: 0.1 - 18 GHz, 50 Ohm IN/OUT
- Bird 20 dB Attenuator, 50 Ohm IN/OUT

METHOD OF MEASUREMENTS:

FCC 47 CFR 1.1310 & OST Bulletin No. 65-October 1985

$$S = PG/4\pi r^2 = EIRP/4\pi r^2$$

Where: P: power input to the antenna in mW
EIRP: Equivalent (effective) isotropic radiated power.
S: power density mW/cm²
G: numeric gain of antenna relative to isotropic radiator
r: distance to centre of radiation in cm

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

$$r = \sqrt{PG/4\pi S}$$

FCC radio frequency exposure limits may be exceeded at distances closer than r cm from the antenna of this device

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TEST PERSONNEL: Tri M. Lau, P.Eng.

DATE: Apr. 06, 1998

- Accredited by **ITI** (UK) Competent Body & **NVLAP** (USA) Accreditation Body
- Recognized/Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (**NIST**)

MEASUREMENT DATA:

PEAK POWER MEASUREMENT

ANTENNA GAIN: 5.2 dBi typical

**DIRECT POWER PEAK POWER MEASUREMENTS AT THE ANTENNA TERMINAL
 WITH THE ANTENNA REPLACED BY A SMA CONNECTOR**

TRANSMITTER CHANNEL OUTPUT	FUNDAMENTAL FREQUENCY (MHz)	DATA RATE / MODULATION	MEASURED PEAK TOTAL POWER (mW)	PEAK POWER LIMIT (mW)
1	2412	2 Mb/s QPSK	76.0	1000.0
6	2437	2 Mb/s QPSK	76.2	1000.0
11	2462	2 Mb/s QPSK	81.0	1000.0
1	2412	1 Mb/s BPSK	76.0	1000.0
6	2437	1 Mb/s BPSK	76.2	1000.0
11	2462	1 Mb/s BPSK	81.0	1000.0

**EFFECTIVE ISOTROPIC RADIATED POWER (EIRP) MEASURED AT 3 METER DISTANCE
 (Substitution Method)**

TX CHANNEL OUTPUT	FUNDAMENTAL FREQUENCY (MHz)	DATA RATE / MODULATION	Rx Antenna Gain (Numeric)	Max. Field Strength Level At 3 m (dBuV/m)	Max. EIRP POWER @ 1 MHz BW (uW)	PEAK POWER LIMIT (mW)
1	2412	2 Mb/s QPSK	4.3	72.4	0.36	1000.0
6	2437	2 Mb/s QPSK	4.3	78.9	1.74	1000.0
11	2462	2 Mb/s QPSK	4.3	73.3	0.47	1000.0
1	2412	1 Mb/s BPSK	4.3	71.3	0.30	1000.0
6	2437	1 Mb/s BPSK	4.3	78.7	1.70	1000.0
11	2462	1 Mb/s BPSK	4.3	79.3	1.92	1000.0

Remarks: The EIRP power was observed to be lower than the RF output power measured directly from the antenna terminal because of the characteristics of the packaging, antenna and antenna mounting position.

RF EXPOSURE DISTANCE LIMITS: $r = (PG/4\pi S)^{1/2}$
 $S=1mW/cm^2, G=5.2 dBi$ or 3.3

TRANSMITTER CHANNEL OUTPUT	FUNDAMENTAL FREQUENCY (MHz)	DATA RATE / MODULATION	MEASURED EIRP POWER (mWatts)	MINIMUM ALLOWABLE DISTANCE (r) FROM SKIN (Centi-Meter)
1	2412	2 Mb/s QPSK	0.00036	0.01
6	2437	2 Mb/s QPSK	0.00174	0.02
11	2462	2 Mb/s QPSK	0.00047	0.01
1	2412	1 Mb/s BPSK	0.00030	0.01
6	2437	1 Mb/s BPSK	0.00170	0.02
11	2462	1 Mb/s BPSK	0.00192	0.02

Since the distance r is too small and the rf output power is too low, no RF exposure limit warning is required.

- Accredited by **ITI** (UK) Competent Body & **NVLAP** (USA) Accreditation Body
- Recognized/ Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test results contained in this compliance test report are traceable to National Institute of Standards and Technology (**NIST**)

4.3 RF Conducted Emissions at the Transmitter Antenna Terminal, FCC CFR 47, Para. 15.247(c)

PRODUCT NAME: SS WIRELESS LAN CARD, Model No.: UX-136 (EX-2006)

FCC REQUIREMENTS:

In any 100 KHz bandwidth outside the operating frequency band, the radio frequency power that is produced by modulation products of the spreading sequence, the information sequence and the carrier frequency shall be at least 20 dB below that in any 100 KHz bandwidth within the band that contains the highest level of the desired power.

CLIMATE CONDITION:

Standard Temperature and Humidity: 23°C and 53%

POWER INPUT:

Using DC Power from a laptop computer.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203

METHOD OF MEASUREMENT:

A scan was made by using a spectrum analyzer with the detector function set to PEAK mode.

Set RBW = 100 KHz, VBW = 100 KHz.

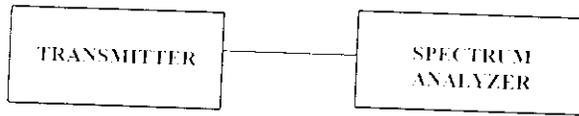
FCC CFR 47, Para. 2.997 - Frequency spectrum to be investigated

The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10th harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC CFR 47, Para. 2.991 - Spurious Emissions at Antenna Terminal

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of the harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in 2.989 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TEST PERSONNEL: Tri M. Luu, P.Eng.

DATE: Apr. 06 & 08, 1998

- Accredited by **ITI** (UK, Competent Body) & **NVLAP** (USA, Accreditation Body)
- Recognized/Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology, (**NIST**)

MEASUREMENT DATA

**SPURIOUS & HARMONIC EMISSIONS
AT THE TRANSMITTER ANTENNA TERMINAL**

TEST CONFIGURATION

- The transmitter was coupled to the Spectrum Analyzer.
- The channel frequencies were established on the extreme edges (both upper and lower) and middle of the 2412 - 2462 MHz band at its full rated output power. The emissions was investigated up to the tenth harmonic of the fundamental emissions in each case, the measured level of the carrier was recorded and compared to the level of the emissions as required in Part 15.247(c)

Channel #1, Channel Frequency: 2412 MHz Full Rated Power: 76.0 mW Modulation: DSSS, 2Mb/s Data Rate, QPSK			Power Level in 100 KHz BW: 5.3 dBm Limit = 5.3 dBm - 20 dB = -14.7 dBm	
FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2412.0	5.3	--	--	--
280.0	-54.7	-14.7	-40.0	PASS
2347.6	-52.3	-14.7	-37.6	PASS
2517.7	-51.9	-14.7	-37.2	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details				

Channel #6, Channel Frequency: 2437 MHz Full Rated Power: 76.2 mW Modulation: DSSS, 2Mb/s Data Rate, QPSK			Power Level in 100 KHz BW: 5.2 dBm Limit = 5.2 dBm - 20 dB = -14.8 dBm	
FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2437.0	5.2	--	--	--
280.0	-52.1	-14.8	-37.3	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details				

Channel #11, Channel Frequency: 2462 MHz Full Rated Power: 81.0 mW Modulation: DSSS, 2Mb/s Data Rate, QPSK			Power Level in 100 KHz BW: 4.5 dBm Limit = 4.5 dBm - 20 dB = -15.5 dBm	
FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2462.0	4.5	--	--	--
280.0	-57.2	-15.5	-41.7	PASS
2170.0	-49.0	-15.5	-33.5	PASS
2518.1	-51.8	-15.5	-36.3	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details				

Channel #1, Channel Frequency: 2412 MHz Full Rated Power: 76.0 mW Modulation: DSSS, 1Mb/s Data Rate, BPSK			Power Level in 100 KHz BW: 5.5 dBm Limit = 5.5 dBm - 20 dB = -14.5 dBm	
FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2412.0	5.5	--	--	--
280.0	-54.0	-14.5	-39.5	PASS
2348.9	-51.4	-14.5	-36.9	PASS
2477.0	-52.3	-14.5	-37.8	PASS
2519.0	-50.2	-14.5	-35.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details				

Channel #6, Channel Frequency: 2437 MHz Full Rated Power: 76.2 mW Modulation: DSSS, 1Mb/s Data Rate, bPSK			Power Level in 100 KHz BW: 6.2 dBm Limit = 6.2 dBm - 20 dB = -13.8 dBm	
FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2437.0	6.2	--	--	--
280.0	-51.7	-13.8	-37.9	PASS
2149.0	-53.8	-13.8	-40.0	PASS
2518.1	-51.9	-13.8	-38.1	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details				

Channel #11, Channel Frequency: 2462 MHz Full Rated Power: 81.0 mW Modulation: DSSS, 1Mb/s Data Rate, bPSK			Power Level in 100 KHz BW: 5.5 dBm Limit = 5.5 dBm - 20 dB = -14.5 dBm	
FREQUENCY (MHz)	RF LEVEL (dBm)	LIMIT (dBm)	MARGIN (dB)	PASS/ FAIL
2462.0	5.5	--	--	--
280.0	-53.4	-14.5	-38.9	PASS
2170.0	-49.0	-14.5	-34.5	PASS
2517.3	-50.6	-14.5	-36.1	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details				

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Mon Apr 6 13:50:23 1998

ATT 30 dB

REF 20.0 dBm
10dB/

MKR
2.4127 GHz

MARKER
2.4127 GHz
5.28 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

CENTER 2.4410 GHz

SPAN 300.0 MHZ

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: / Tx Frequency: MHz, RF Power: W
Modulation: DSSS (11 Mcbps/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Date: Apr 06
Tested by: Tim Lam

REF 20.0 dBm
10dB/

MON APR 6 13:55:39 1998
ATT 30 dB

MKS
295 MHz

MARKER
295 MHz
-54.69 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 1.0 s

START 10 MHz
STOP 5.000 GHz

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Date: Apr 5 1998
Tested by: JTL/om

REF 20.0 dBm
10dB/

Mon Apr 5 13:57:59 1998
EUTELOR

MKR
24.229 GHz

MARKER
24.229 GHz
-39.47 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 4.0 s

START 5.00000000 GHz STOP 25.000 GHz



UltraTech
Engineering Labs Inc.

Date: Apr 08
Tested by: Tim Lim

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps/s, 2.0 Mb/s QPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

ATT 30 dB

MON APR 6 14:05:55 1998

MKR
2.4354 GHz

MARKER
2.4354 GHz
5.22 dBm



RBW 100 KHZ
VBW 100 KHZ
SWP 10 s

CENTER 2.441 GHz

SPAN 300.0 MHZ

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____, Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Mon Apr 6 14:08:08 1998

REF 20.0 dBm
10dB/

ATT 30 dB

3.17 MHz

MKR
317 MHz

MARKER
317 MHz
-52.09 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

START 10 MHz

STOP 5.000 GHz

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps), 2.0 Mb/s GFSK, 2 bits/symbol

REF 20.0 dBm
10dB/

ATT 30 dB

MON APR 6 14:00:57 1998
E MARK

MKR
24.714 GHz
-39.03 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 4.0 S

START 5.00000000 GHz STOP 25.000 GHz



ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Date: Apr 98
Tested by: Jm Lim

REF 20.0 dBm
10dB/

MON APR 6 14:10:52 1998
ATT 30 dB

MKR
2.4620 GHZ

MARKER
2.4620 GHZ
4.53 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

CENTER 2.441 GHZ

SPAN 300.0 MHZ

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Mon Apr 6 14:13:29 1998
R FLUX

REF 20.0 dBm
10dB/

ATT 30 dB

MARKER
2.170 GHz
-49.00 dBm

MKA
2.170 GHz



RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

START 10 MHz

STOP 5.000 GHz

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

ATT 30 dB

MON APR 6 14:10:40 1998

MARKER

MKR
24.886 GHz

MARKER
24.886 GHz
-38.66 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 10 s

START 5.000 GHz

STOP 25.000 GHz



ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: 1, Tx Frequency: 2.4125 MHz, RF Power: 16 dBm
Modulation: DSSS (11 Mcips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Wed Apr 8 14:34:54 1998

ATT 30 dB

REF 20.0 dBm
10dB/

MARKER
2.4140 GHz
5.50 dBm

MKR
2.4140 GHz

RBW 100 KHZ
VBW 100 KHZ
SWP 60 ms

CENTER 2.4410 GHz

SPAN 300.0 MHZ

*2.4140 GHz
-5.50 dBm*

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

Wed Apr 8 14:39:31 1998
ATT 30 dB
2 bits/s

SWP 10 S

MARKER
295 MHz
-54.03 dBm

▼

RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

START 10 MHZ
STOP 5.000 GHZ

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____, Tx Frequency: _____ MHz, RF Power: _____ mW
Modulation: DSSS (11 Mcbps/s, 1.0 Mb/s BPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

ATT 30 dB

Wed Apr 8 14:44:51 1998

MKR
24.457 GHz

MARKER
24.457 GHz
-39.03 dBm

RBW 100 kHz
VBW 100 kHz
SWP 10 s

START 5.000 GHz STOP 25.000 GHz





UltraTech
Engineering Labs Inc.

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: 6 Tx Frequency: 2.4127 MHz, RF Power: 14.2 W
Modulation: DSSS (11 Mcbps/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Date: Apr 08 08
Tested by: [initials]

REF 20.0 dBm
10dB/

MKR
2.4389 GHz

Wed Apr 8 14:51:45 1998
ATT 30 dB

MARKER
2.4389 GHz
6.19 dBm

RBW 100 kHz
VBW 100 kHz
SWF 10 s

CENTER 2.4410 GHz SPAN 300.0 MHz

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: 46, Tx Frequency: 2437 MHz, RF Power: 76.2 mW
Modulation: DSSS (11 Mcbps/s, 1.0 Mbps BPSK, 2 bits/symbol)

Date: Apr 08 1998
Tested by: H11101

Wed Apr 8 14:58:29 1998

ATT 30 dB

REF 20.0 dBm
10dB/

MKR
2.149 GHz

MARKER
2.149 GHz
-53.81 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

*2437 MHz
-34.7 dBm*



START 10 MHz

STOP 5.000 GHz

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: 4 Tx Frequency: 4.37 MHz, RF Power: 12.5 mW
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Wed Apr 8 14:47:27 1998

REF 20.0 dBm
10dB/

ATT 30 dB
MARKER
24.914 GHz
-39.00 dBm

MKR
24.914 GHz

RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

START 5.000 GHZ
STOP 25.000 GHZ





UltraTech
Engineering Labs Inc.

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: 11, Tx Frequency: 2.467 MHz, RF Power: 51.2 W
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Print Applications
Tested by: J. J. Pitt

REF 20.0 dBm
10dB/

Wed Apr 8 14:54:02 1998
ATT 30 dB

MKR
2.4607 GHz

MARKER
2.4607 GHz
5.47 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

CENTER 2.4410 GHz

SPAN 300.0 MHZ

SS WIRELESS LAN
UX-136



UltraTech
Engineering Labs Inc.

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: *11* Tx Frequency: *2.4712* MHz, RF Power: *5.12* W

Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Date: *Apr 8 1998*
Posted by: *ELI*

REF 20.0 dBm
10dB/

ATT 30 dB

Wed Apr 8 14:56:12 1998

MKR
2.170 GHz

MARKER
2.170 GHz
-49.03 dBm

RBW 100 KHZ
VBW 100 KHZ
SWP 10 S

Agg 2.170 GHz
-55.4 dBm



START 10 MHz

STOP 5.000 GHz

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136
Channel #: 11 Tx Frequency: 24.771 MHz, RF Power: 5.00 W
Modulation: DSSS (11 Mcchips/s, 1.0 Mbits BPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

ATT 30 dB

Wed Apr 8 14: 49: 29 1998

MARKER
24.771 GHz
-38.91 dBm

MKR
24.771 GHz

RBW 100 kHz
VBW 100 kHz
SWP 10 s

START 5.000 GHz STOP 25.000 GHz

4.4 Transmitter Radiated Emissions @ 3 Meters, FCC CFR 47, Para. 15.247(c), 15.209 & 15.205

PRODUCT NAME: SS WIRELESS LAN CARD, Model No.: UX-136 (EX-2006)

FCC REQUIREMENTS:

In any 100 KHz bandwidth outside the operating frequency band, the radio frequency power that is produced by modulation products of the spreading sequence, the information sequence and the carrier frequency shall be either at least 20 dB below that in any 100 KHz bandwidth within the band that contains the highest level of the desired power or shall not exceed the general levels specified in (a) 15.209(a), which lesser attenuation.

All other emissions inside restricted bands specified in (a) 15.205(a) shall not exceed the general radiated emission limits specified in (a) 15.209(a)

Remarks:

- Applies to harmonics/spurious emissions that fall in the restricted bands listed in Section 15.205. The maximum permitted average field strength is listed in Section 15.209.
- (a) **FCC CFR 47, Para. 15.237(c)** - The emission limits as specified above are based on measurement instrument employing an average detector. The provisions in (a) **15.35** for limiting peak emissions apply.

FCC CFR 47, Part 15, Subpart C, Para. 15.205(a) - Restricted Frequency Bands

MHz	MHz	MHz	GHz
0.090 - 0.110	162.0125 - 167.17	2310 - 2390	9.3 - 9.5
0.49 - 0.51	167.72 - 173.2	2483.5 - 2500	10.6 - 12.7
2.1735 - 2.1905	240 - 285	2655 - 2900	13.25 - 13.4
8.362 - 8.366	322 - 335.4	3260 - 3267	14.47 - 14.5
13.36 - 13.41	399.9 - 410	3332 - 3339	14.35 - 16.2
25.5 - 25.67	608 - 614	3345.8 - 3358	17.7 - 21.4
37.5 - 38.25	960 - 1240	3600 - 4400	22.01 - 23.12
73 - 75.4	1300 - 1427	4500 - 5250	23.6 - 24.0
108 - 121.94	1435 - 1626.5	5350 - 5460	31.2 - 31.8
123 - 138	1660 - 1710	7250 - 7750	36.43 - 36.5
149.9 - 150.05	1718.8 - 1722.2	8025 - 8500	Above 38.6
156.7 - 156.9	2200 - 2300	9000 - 9200	

- Accredited by **ITI** (UK), Competent Body & **NVLAP** (USA) Accreditation Body
- Recognized/ Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (**NIST**)

FCC CFR 47, Part 15, Subpart C, Para. 15.209(a)
 -- Field Strength Limits within Restricted Frequency Bands --

FREQUENCY (MHz)	FIELD STRENGTH LIMITS (microvolts/m)	DISTANCE (Meters)
0.009 - 0.490	2,400 / F (KHz)	300
0.490 - 1.705	24,000 / F (KHz)	30
1.705 - 30.0	30	30
30 - 88	100	3
88 - 216	150	3
216 - 960	200	3
Above 960	500	3

CLIMATE CONDITION:

Standard Temperature and Humidity: 23°C and 53%

POWER INPUT:

Using DC Power from a laptop computer.

TEST EQUIPMENT:

- **Spectrum Analyzer**, Advantest, Model R3271, S/N: 15050203, 100 Hz to 32 GHz)
- **Spectrum Analyzer**, Advantest, Model 3261A, SN 91720151, Input +25dBm max., 9KHz-2.6GHz, 50 Ohms, built-in Quasi-Peak Detector.
- **RF Preselector**, Advantest Model R3551, SN 92970002, 9KHz-1GHz, 50 Ohms input/output, input +25 dBm max. 30 dB gain.
- **Microwave Amplifier**, HP, Model 83017A, Frequency Range 1 to 26.5 GHz, 34-38 dBdB gain nominal.
- **Active Loop Antenna**, Emco, Model 6507, SN 8906-1167, Frequency Range 1 KHz - 30 MHz, @ 50 Ohms
- **Log Periodic/Bow-Tie Antenna**, Emco, Model 3143, SN 1029, 20 - 1000 MHz, @ 50 ohms.
- **Log Periodic Antenna**, A.H. Systems, Model SAS-200/518, SN 343, Frequency Range: 1 - 18 GHz, @ 50 Ohms.
- **Horn Antenna**, Emco, Model 3160-09, 18-26.5GHz

METHOD OF MEASUREMENTS:

Refer to ANSI 63.4-1992, Para. 8 for detailed radiated emissions measurement procedures.

Applies to harmonics/spurious 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 highpass filter are used for this measurement.

For measurement below 1 GHz, set RBW = 100 KHz, VBW ≥ 100 KHz, SWEEP=AUTO.

For measurement above 1 GHz, set RBW = 1 MHz, VBW = 1 MHz (Peak) & VBW = 10 Hz (Average), SWEEP=AUTO.

If the emission is pulsed, modified the unit for continuous operation, then use the settings above for measurements, then correct the reading by subtracting the peak-average correction factor derived from the appropriate duty cycle calculation. See Section 15.35(b) and (c).

FCC CFR 47, Para. 2.997 - Frequency spectrum to be investigated

The spectrum was investigated from the lowest radio generated in the equipment up to at least the 10th harmonic of the carrier frequency or to the highest frequency practicable in the present state of the art of measuring techniques, whichever is lower. Particular attention should be paid to harmonics and subharmonics of the carrier frequency. Radiation at the frequencies of multiplier stages should be checked. The amplitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be reported.

FCC CFR 47, Para. 2.993 - Field Strength Spurious Emissions

- (a) Measurements was made to detect spurious emissions radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data were supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph 2.989(c) as appropriate. For equipment operating on frequencies below 1 GHz, an Open Field Test is normally required, with the measuring instrument antenna located in the far field at all test frequencies. In event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurement will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with the reference to the rated power output of the transmitter, assuming all emissions are radiated from half-wave dipole antennas.
- (b) Measurements specified in paragraph (a) of this section shall be made for the following equipment:
- (1) Those in which the spurious emission are required to be 60 dB or more below the mean power of the transmitter.
 - (2) All equipment operating on frequencies higher than 25 MHz
 - (3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
 - (4) Other types of equipment as required, when deemed necessary by the Commission.

TEST RESULTS: Conforms.

TEST PERSONNEL: Tri M. Luu, P.Eng.

DATE: Apr. 07 & 09, 1998

MEASUREMENT DATA

RADIATED EMISSIONS MEASUREMENTS (at 3 METERS)

TEST CONFIGURATION

- This lowest, middle and highest channels were established at its full rated output power. The emissions were investigated from the lowest frequency generated by the transmitter up to the 10th harmonic of the fundamental emissions in each case, the measured level of the carrier was recorded and compared to the level of the emissions as required in Parts 15.247(e) or 15.209(a) whichever was applicable.
- For measuring radiated emissions at frequencies below 1 GHz, the Spectrum Analyzer was set as 100 KHz RBW, VBW ≥ RBW, SWEEP TIME: AUTO, PEAK DETECTOR.
- For measuring radiated emissions at frequencies above 1 GHz, the Spectrum Analyzer was set as 1 MHz RBW, 1 MHz VBW, SWEEP TIME: AUTO for PEAK measurements and 1 MHz RBW, 10 Hz VBW, SWEEP TIME: AUTO for AVERAGE measurements.
- The following measurements were the worst cases when the radiating antenna was placed in both horizontal and vertical polarization.
- The following **AVERAGE** if levels were obtained from either Peak or Average readings added by the duty cycle correction factor. **DUTY CYCLE FACTOR = N/A (continuous)**

Channel #1, Channel Frequency: 2412 MHz Full Rated Power: 76.0 mW Modulation: DSSS, 2Mb/s Data Rate, QPSK				Power Level in 1 MHz BW: 72.4 dBuV/m Limit = 72.4 dBuV/m - 20 dB = 52.4 dBuV/m or 54 dBuV/m whichever is higher			
FREQUENCY (MHz)	PEAK LEVEL (dBuV/m)	AVG LEVEL (dBuV/m)	PLANE (H/V)	15.209 (dBuV/m)	15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
280.00	24.5	12.5	V	46.0	52.4	-33.5	PASS
280.00	27.9	15.9	H	46.0	52.4	-30.1	PASS
560.00	20.3	8.3	V	46.0	52.4	-6.4	PASS
560.00	23.7	11.7	H	46.0	52.4	-6.4	PASS
2132.00	49.0	46.6	V	54.0	54.0	-7.4	PASS
2132.00	46.3	41.6	H	54.0	54.0	-12.4	PASS
2412.00	72.4	--	V	--	--	--	Note (1)
2412.00	64.9	--	H	--	--	--	Note (1)
4264.00	47.3	38.3	V	54.0	54.0	-15.7	PASS
4264.00	42.4	33.1	H	54.0	54.0	-20.9	PASS
4824.00	52.9	48.4	V	54.0	54.0	-5.6	PASS
4824.00	49.7	42.3	H	54.0	54.0	-11.7	PASS
6396.00	52.9	52.0	V	54.0	54.0	-2.0	PASS
6396.00	47.3	45.0	H	54.0	54.0	-9.0	PASS
7236.00	54.0	43.7	V	54.0	54.0	-10.3	PASS
7236.00	51.5	43.0	H	54.0	54.0	-11.0	PASS

No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details

Emission within the restricted band specified in (a 15.205(a))

Note (1): The field strength level of the carrier was observed to be lower than that expected by calculation because of the effect of the packaging and type of antenna used.

Note (2): The Laptop PC was placed in two possible positions: seated in a normal position as it is intended to be used and seated on it's left side of its case for maximizing the emissions from the transmitter. In addition tests were repeated with the peripheral devices such as parallel printer and serial modem on the table and off the table. The maximum signal level is recorded as shown in the above table.

Channel #6, Channel Frequency: 2437 MHz Full Rated Power: 76.2 mW Modulation: DSSS, 2Mb/s Data Rate, QPSK				Power Level in 1 MHz BW: 78.9 dBuV/m Limit = 78.9 dBuV/m - 20 dB = 58.9 dBuV/m			
FREQUENCY (MHz)	RF PEAK LEVEL (dBuV/m)	RF AVG LEVEL (dBuV/m)	ANTENNA PLANE (H/V)	LIMIT 15.209 (dBuV/m)	LIMIT 15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL.
280.00	24.5	12.5	V	46.0	58.9	-33.5	PASS
280.00	27.9	15.9	H	46.0	58.9	-30.1	PASS
560.00	20.3	8.3	V	46.0	58.9	-50.6	PASS
560.00	23.7	11.7	H	46.0	58.9	-47.2	PASS
2157.00	48.3	44.7	H	54.0	58.9	-14.2	PASS
2157.00	46.1	42.4	H	54.0	58.9	-16.5	PASS
2437.00	78.9	--	V	--	--	--	Note (1)
2437.00	70.3	--	H	--	--	--	Note (1)
4314.00	46.6	36.5	V	54.0	58.9	-17.5	PASS
4314.00	46.1	35.6	H	54.0	58.9	-18.4	PASS
4874.0	57.3	53.2	V	54.0	58.9	-0.8	PASS
4874.0	54.0	51.4	H	54.0	58.9	-2.6	PASS
6471.00	54.4	53.7	V	54.0	58.9	-5.2	PASS
6471.00	48.3	46.3	H	54.0	58.9	-12.6	PASS
7312.00	58.8	53.4	V	54.0	58.9	-0.6	PASS
7312.00	56.9	51.3	H	54.0	58.9	-2.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							
<i>Emission within the restricted band specified in (a) 15.205(a)</i>							

Note (1): The field strength level of the carrier was observed to be lower than that expected by calculation because of the effect of the packaging and type of antenna used.

Note (2): The Laptop PC was placed in two possible positions; seated in a normal position as it is intended to be used and seated on it's left side of its case for maximizing the emissions from the transmitter. In addition tests were repeated with the peripheral devices such as parallel printer and serial modem on the table and off the table. The maximum signal level is recorded as shown in the above table.

Channel #11, Channel Frequency: 2462 MHz Full Rated Power: 81.0 Mw Modulation: DSSS, 2Mb/s Data Rate, QPSK				Power Level in 1 MHz BW: 79.3 dBuV/m Limit = 79.3 dBuV/m - 20 dB = 59.3 dBuV/m			
FREQUENCY (MHz)	PEAK LEVEL (dBuV/m)	AVG LEVEL (dBuV/m)	PLANE (H/V)	15.209 (dBuV/m)	15.247 (dBuV/m)	MARGIN (dB)	PASS/ FAIL
280.00	24.5	12.5	V	46.0	59.3	-33.5	PASS
280.00	27.9	15.9	H	46.0	59.3	-30.1	PASS
560.00	20.3	8.3	V	46.0	59.3	-51.0	PASS
560.00	23.7	11.7	H	46.0	59.3	-47.6	PASS
2182.00	46.4	42.9	V	54.0	59.3	-16.4	PASS
2182.00	46.6	43.0	H	54.0	59.3	-16.3	PASS
2462.00	72.5	--	H	--	--	--	Note (1)
2462.00	79.3	--	V	--	--	--	Note (1)
4364.00	46.7	35.5	V	54.0	59.3	-18.5	PASS
4364.00	45.7	34.8	H	54.0	59.3	-19.2	PASS
4924.00	55.1	52.5	V	54.0	59.3	-1.5	PASS
4924.00	53.2	46.9	H	54.0	59.3	-7.1	PASS
6546.00	53.8	52.9	V	54.0	59.3	-6.4	PASS
6546.00	52.7	51.9	H	54.0	59.3	-7.4	PASS
7386.00	53.3	44.7	V	54.0	59.3	-9.3	PASS
7386.00	52.7	43.3	H	54.0	59.3	-10.7	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							
<i>Emission within the restricted band specified in (a) 15.205(a)</i>							

Note (1): The field strength level of the carrier was observed to be lower than that expected by calculation because of the effect of the packaging and type of antenna used.

Note (2): The Laptop PC was placed in two possible positions; seated in a normal position as it is intended to be used and seated on it's left side of its case for maximizing the emissions from the transmitter. In addition tests were repeated with the peripheral devices such as parallel printer and serial modem on the table and off the table. The maximum signal level is recorded as shown in the above table.

- Accredited by **ITI** (UK) Competent Body & **NVLAP** (USA) Accreditation Body
- Recognized/Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test results contained in this compliance test report are traceable to National Institute of Standards and Technology (**NIST**)

Channel #1, Channel Frequency: 2412 MHz Full Rated Power: 76.0 mW Modulation: DSSS, 1Mb/s Data Rate, BPSK				Power Level in 1 MHz BW: 71.3 dBuV/m Limit = 71.3 dBm - 20 dB = 51.3 dBuV/m or 54 dBuV/m whichever is higher.			
FREQUENCY (MHz)	PEAK LEVEL (dBuV/m)	AVG LEVEL (dBuV/m)	PLANE (H/V)	15.209 (dBuV/m)	15.247 (dBuV/m)	MARGIN (dB)	PASS/FAIL
280.00	24.5	12.5	V	46.0	51.3	-33.5	PASS
280.00	27.9	15.9	H	46.0	51.3	-30.1	PASS
560.00	20.3	8.3	V	46.0	51.3	-5.3	PASS
560.00	23.7	11.7	H	46.0	51.3	-5.3	PASS
2132.00	48.8	45.8	V	54.0	54.0	-8.2	PASS
2132.00	45.3	40.5	H	54.0	54.0	-13.5	PASS
2412.00	67.4	--	H	--	--	Note (1)	PASS
2412.00	71.3	--	V	--	--	Note (1)	PASS
4264.00	46.8	37.8	V	54.0	54.0	-16.2	PASS
4264.00	42.1	32.7	H	54.0	54.0	-21.3	PASS
4824.00	52.8	48.5	V	54.0	54.0	-5.5	PASS
4824.00	49.5	42.1	H	54.0	54.0	-11.9	PASS
6396.00	53.0	52.1	V	54.0	54.0	-1.9	PASS
6396.00	47.0	44.7	H	54.0	54.0	-9.3	PASS
7236.00	54.1	43.9	V	54.0	54.0	-10.1	PASS
7236.00	52.0	43.4	H	54.0	54.0	-10.6	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							
<i>Emission within the restricted band specified in (a) 15.205(a)</i>							

Note (1): The field strength level of the carrier was observed to be lower than that expected by calculation because of the effect of the packaging and type of antenna used.

Note (2): The Laptop PC was placed in two possible positions; seated in a normal position as it is intended to be used and seated on it's left side of its case for maximizing the emissions from the transmitter. In addition tests were repeated with the peripheral devices such as parallel printer and serial modem on the table and off the table. The maximum signal level is recorded as shown in the above table.

- Accredited by **ITI** (UK) Competent Body & **NVLAP** (USA) Accreditation Body
- Recognized/Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (**NIST**)

Channel #6, Channel Frequency: 2437 MHz Full Rated Power: 76.2 Mw Modulation: DSSS, 1Mb/s Data Rate, BPSK				Power Level in 1 MHz BW: 78.7 dBuV/m Limit = 78.7 dBuV/m - 20 dB = 58.7 dBuV/m			
FREQUENCY (MHz)	PEAK LEVEL (dBuV/m)	AVG LEVEL (dBuV/m)	PLANE (H/V)	15.209 (dBuV/m)	15.247 (dBuV/m)	MARGIN (dB)	PASS/FAIL
280.00	24.5	12.5	V	46.0	58.7	-33.5	PASS
280.00	27.9	15.9	H	46.0	58.7	-30.1	PASS
560.00	20.3	8.3	V	46.0	58.7	-50.4	PASS
560.00	23.7	11.7	H	46.0	58.7	-47.0	PASS
2157.00	48.2	44.5	H	54.0	58.7	-14.2	PASS
2157.00	46.0	42.3	H	54.0	58.7	-16.4	PASS
2437.00	78.7	--	V	--	--	--	Note (1)
2437.00	76.3	--	H	--	--	--	Note (1)
4314.00	46.5	36.4	V	54.0	58.7	-17.6	PASS
4314.00	46.2	35.7	H	54.0	58.7	-18.3	PASS
4874.0	56.3	53.6	V	54.0	58.7	-0.4	PASS
4874.0	53.8	51.1	H	54.0	58.7	-2.9	PASS
6471.00	54.3	52.9	V	54.0	58.7	-5.8	PASS
6471.00	48.0	46.2	H	54.0	58.7	-12.5	PASS
7312.00	58.6	53.2	V	54.0	58.7	-0.8	PASS
7312.00	56.7	51.0	H	54.0	58.7	-3.0	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							
<i>Emission within the restricted band specified in (a 15.205(a))</i>							

Note (1): The field strength level of the carrier was observed to be lower than that expected by calculation because of the effect of the packaging and type of antenna used.

Note (2): The Laptop PC was placed in two possible positions; seated in a normal position as it is intended to be used and seated on it's left side of its case for maximizing the emissions from the transmitter. In addition tests were repeated with the peripheral devices such as parallel printer and serial modem on the table and off the table. The maximum signal level is recorded as shown in the above table.

- Accredited by **ITI** (UK) Competent Body & **NVLAP** (USA) Accreditation Body
- Recognized / Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (**NIST**)

Channel #11, Channel Frequency: 2462 MHz Full Rated Power: 81.0 Mw Modulation: DSSS, 1Mb/s Data Rate, BPSK				Power Level in 1 MHz BW: 73.3 dBuV/m Limit = dBuV/m - 20 dB = 53.3 dBuV/m or 54 dBuV/m whichever is higher			
FREQUENCY (MHz)	PEAK LEVEL (dBuV/m)	AVG LEVEL (dBuV/m)	PLANE (H/V)	15.209 (dBuV/m)	15.247 (dBuV/m)	MARGIN (dB)	PASS/FAIL
280.00	24.5	12.5	V	46.0	53.3	-33.5	PASS
280.00	27.9	15.9	H	46.0	53.3	-30.1	PASS
560.00	20.3	8.3	V	46.0	53.3	-45.0	PASS
560.00	23.7	11.7	H	46.0	53.3	-41.6	PASS
2182.00	45.5	41.7	V	54.0	54.0	-12.3	PASS
2182.00	46.1	41.5	H	54.0	54.0	-12.5	PASS
2462.00	73.3	--	V	--	--	--	Note (1)
2462.00	67.9	--	H	--	--	--	Note (1)
4364.00	46.0	34.7	V	54.0	54.0	-19.3	PASS
4364.00	44.8	34.1	H	54.0	54.0	-19.9	PASS
4924.00	53.0	50.2	V	54.0	54.0	-3.8	PASS
4924.00	52.1	45.9	H	54.0	54.0	-8.1	PASS
6546.00	52.4	51.2	V	54.0	54.0	-2.8	PASS
6546.00	51.6	50.1	H	54.0	54.0	-3.9	PASS
7386.00	52.9	44.6	V	54.0	54.0	-9.4	PASS
7386.00	52.0	43.0	H	54.0	54.0	-11.0	PASS
No other significant emissions were found in the frequency range from 10 MHz to 25 GHz. Refer to attached plots for details							
<i>Emission within the restricted band specified in @ 15.205(a)</i>							

Note (1): The field strength level of the carrier was observed to be lower than that expected by calculation because of the effect of the packaging and type of antenna used.

Note (2): The Laptop PC was placed in two possible positions: seated in a normal position as it is intended to be used and seated on it's left side of its case for maximizing the emissions from the transmitter. In addition tests were repeated with the peripheral devices such as parallel printer and serial modem on the table and off the table. The maximum signal level is recorded as shown in the above table.



UltraTech
Engineering Labs Inc.

Date: Apr 7 1998
Tested by: JML

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: _____, Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps/s, 2.0 Mb/s QPSK, 2 bits/symbol)

E3115+HP89017+SMA7

REF 97.0 dB μ V/m
10dB/

Tue Apr 7 12:53:20 1998

ATT 0 dB

MARKER

MARKER

2.4153 GHz

64.94 dB μ V/m

MKR

2.4153 GHz

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz

SPAN 250.0 MHz

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

E3115+HP83017+SMA7
REF 97.0 dB μ V/m
10dB/

Tue Apr 7 13:27:34 1998
F. D. 0.0

ATT 0 dB

MKR
2.4139 GHz

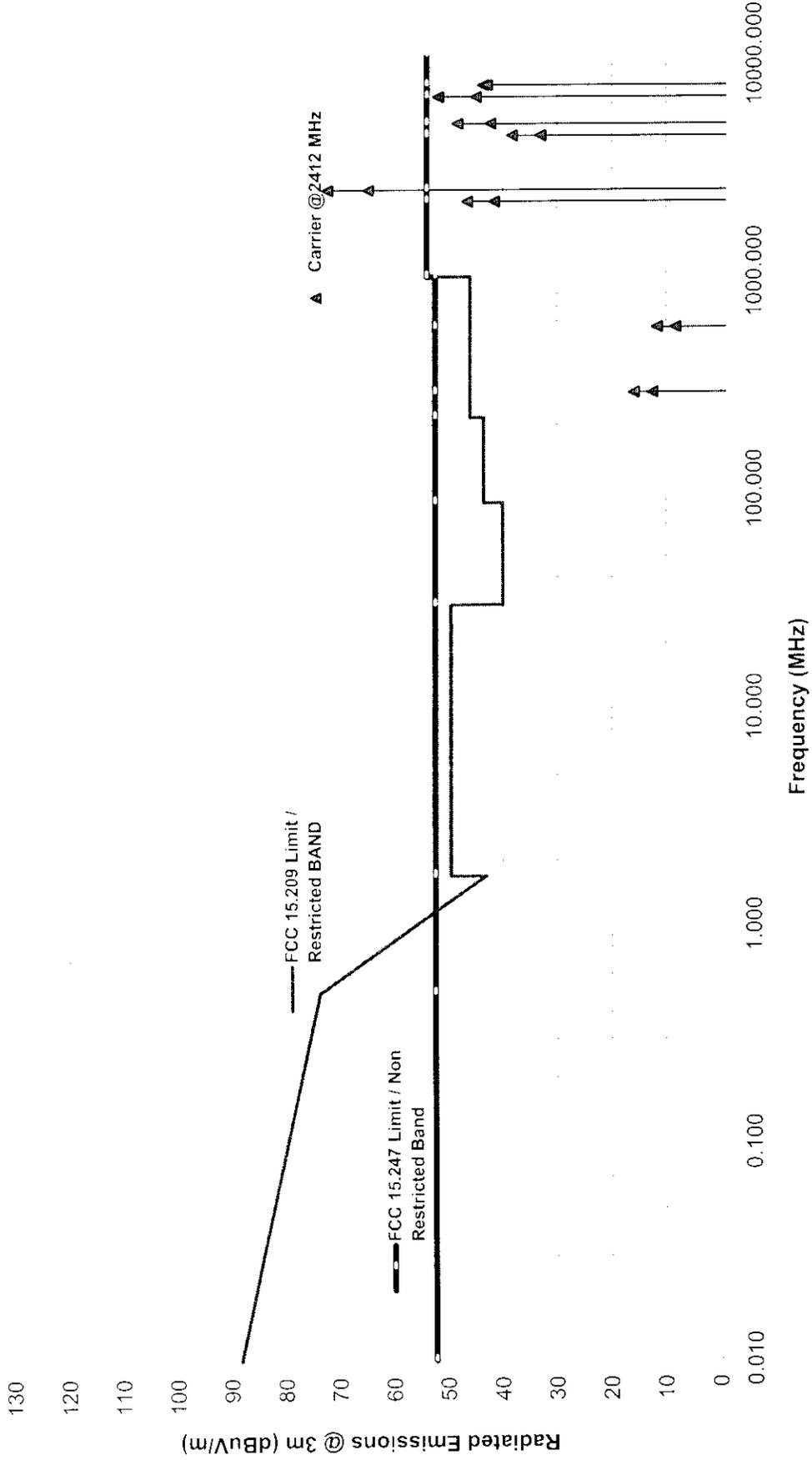
MARKER
2.4139 GHz
72.38 dB μ V/m

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz

SPAN 250.0 MHz

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
 ICOM INCORPORATED
 SS WIRELESS LAN CARD, MODEL UX-136 (EX-2006)
 Tx Freq.: 2412 MHz @ 2 Mb/s QPSK





Date: Apr 7 1998
Tested by: [illegible]

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: [illegible] Tx Frequency: [illegible] MHz, RF Power: [illegible] W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

E3115+HP83017+SMA7
REF 97.0 dB μ V/m
100B7
Tue Apr 7 13:32:54 1998
ATT 0 dB

MKR
2.4406 GHz
MARKER
2.4406 GHz
78.91 dB μ V/m

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz
SPAN 250.0 MHz

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: _____, Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

E3115+HP83017+SMA7
REF 97.0 dB μ V/m
10dB

Tue Apr 7 13:36:26 1998
ATT 0 dB
E-UTRA

MKR
2.4392 GHz

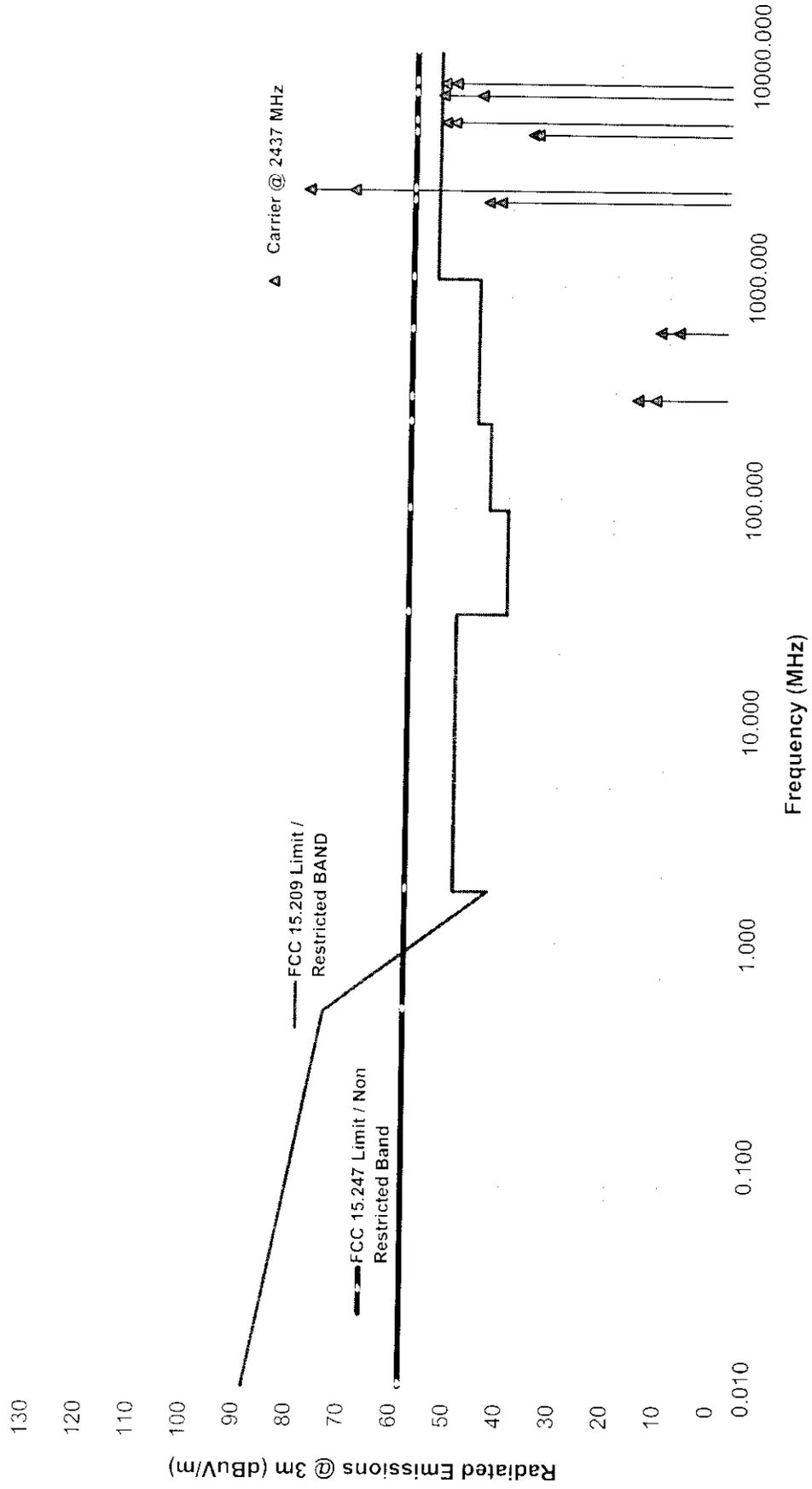
MARKER
2.4392 GHz
70.28 dB μ V/m

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz

SPAN 250.0 MHz

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
 ICOM INCORPORATED
 SS WIRELESS LAN CARD, MODEL UX-136 (EX-2006)
 Tx Freq.: 2437 MHz @ 2 Mb/s QPSK



ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____, Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

E3115+HP83017+3MA7 Tue Apr 7 13:40:48 1998
REF 97.0 dB μ /m ATT 0 dB
10dB/

MKR
2.4621 GHz

MARKER
2.4621 GHz
67.98 dB μ /m



RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz SPAN 250.0 MHz

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps/s, 2.0 Mb/s QPSK, 2 bits/symbol)

E3115+HP83017+SMA7
REF 97.0 dB μ V/m
20dB/

Tue Apr 7 13:45:49 1998
ATT 0 dB
5.00ms

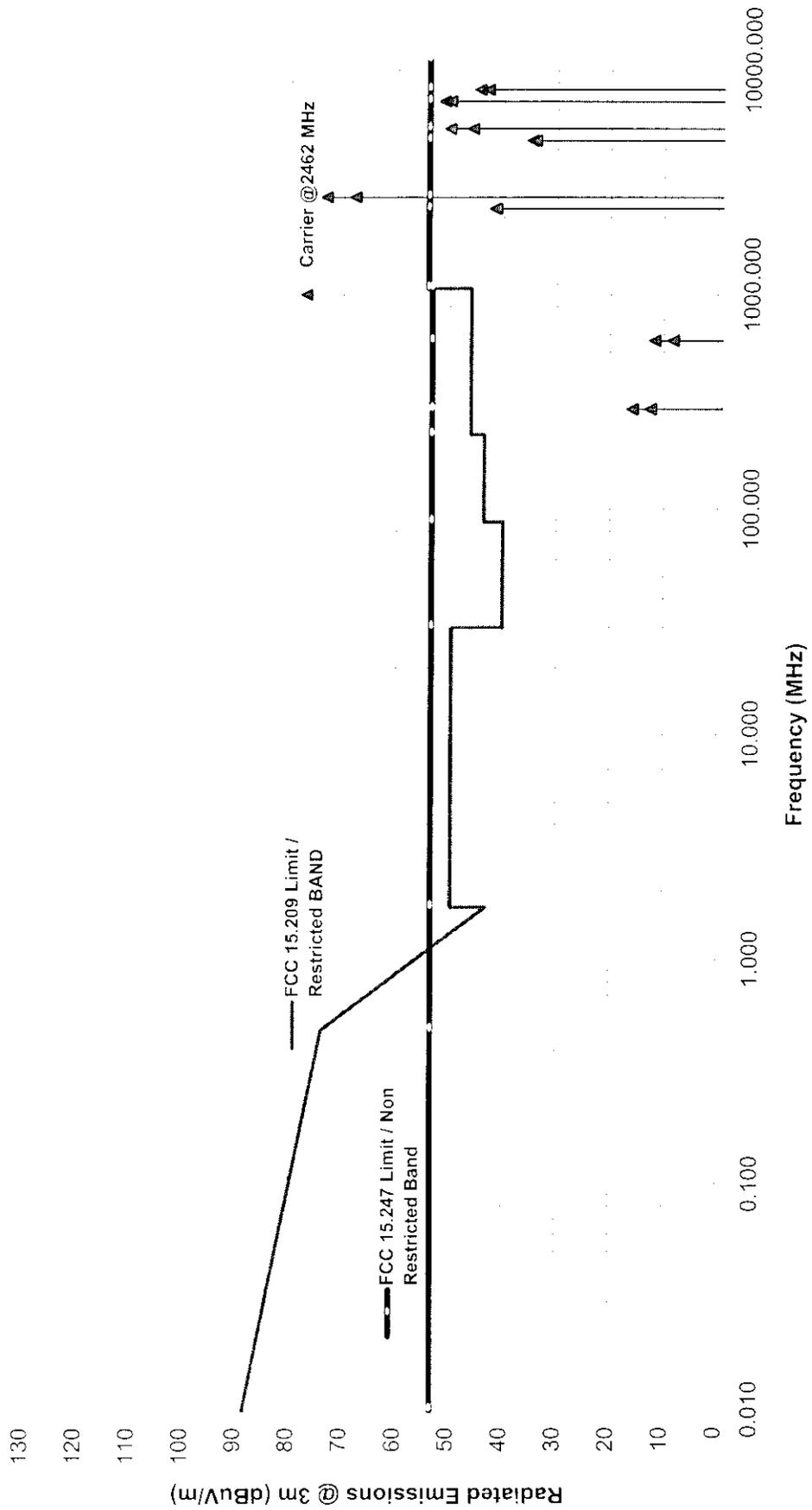
MKR
2.4621 GHz
73.28 dB μ V/m

MARKER
2.4621 GHz
73.28 dB μ V/m

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz
SPAN 250.0 MHz

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
 ICOM INCORPORATED
 SS WIRELESS LAN CARD, MODEL UX-136 (EX-2006)
 Tx Freq.: 2462 MHz @ 2 Mb/s QPSK



ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136
Channel #: 1 Tx Frequency: 2.412 MHz, RF Power: 2 mW
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Radiated Emission at 3 Meters, RX Antenna: vertical [], horizontal []

E3145+HP83017+SMA7
REF 97.0 dB μ V/m
10dB/

Thu Apr 9 13:57:33 1998
ATT 0 dB

MARKER
2.4153 GHz
67.44 dB μ V/m



RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz
SPAN 200.0 MHz



UltraTech
Engineering Labs Inc.

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: / Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Date: Apr. 09 '98
Tested by: T.L.Liu

Radiated Emission at 3 Meters, RX Antenna: vertical [✓], horizontal []

E3145+HP83017+SMA7
REF 97.0 dB μ V/m
10dB/

Thu Apr 9 11:26:38 1998
ATT 0 dB

MKR
2.4136 GHZ

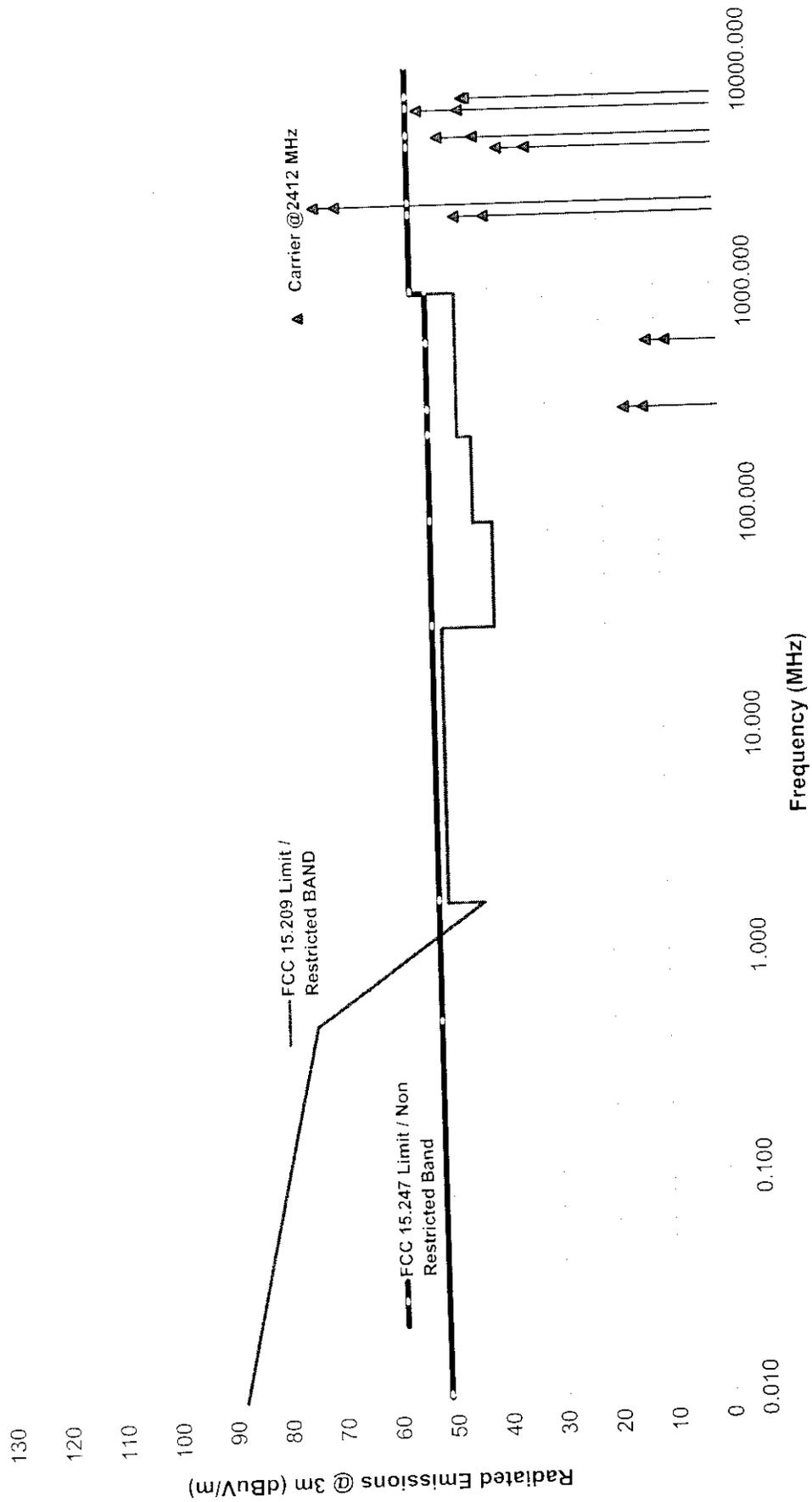
MARKER
2.4136 GHZ
71.34 dB μ V/m

RBW 1 MHZ
VBW 1 MHZ
SWP 50 ms

CENTER 2.4410 GHZ

SPAN 200.0 MHZ

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
 ICOM INCORPORATED
 SS WIRELESS LAN CARD, MODEL UX-136 (EX-2006)
 Tx Freq.: 2412 MHz @ 1 Mb/s BPSK



ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: 1, Tx Frequency: 2.47 MHz, RF Power: 1 mW
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Radiated Emission at 3 Meters, RX Antenna: vertical [], horizontal [M]

E3115+HP83017+SMA7 Thu Apr 9 13:50:40 1998
REF 97.0 dB μ V/m ATT 0 dB
10dB/

MKR 2.4401 GHz \blacktriangledown
MARKER
2.4401 GHz
76.31 dB μ V/m

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz SPAN 200.0 MHz



Date: Apr. 09 98
Tested by: [redacted]

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: 6
Tx Frequency: 2.47 MHz, RF Power: 2.46 W
Modulation: DSSS (11 Mcbps/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Radiated Emission at 3 Meters, RX Antenna: vertical [X], horizontal []

E3115+HP83017+SMA7
REF 97.0 dB μ V/m
10dB/

Thu Apr 9 11:54:05 1998
ATT 0 dB

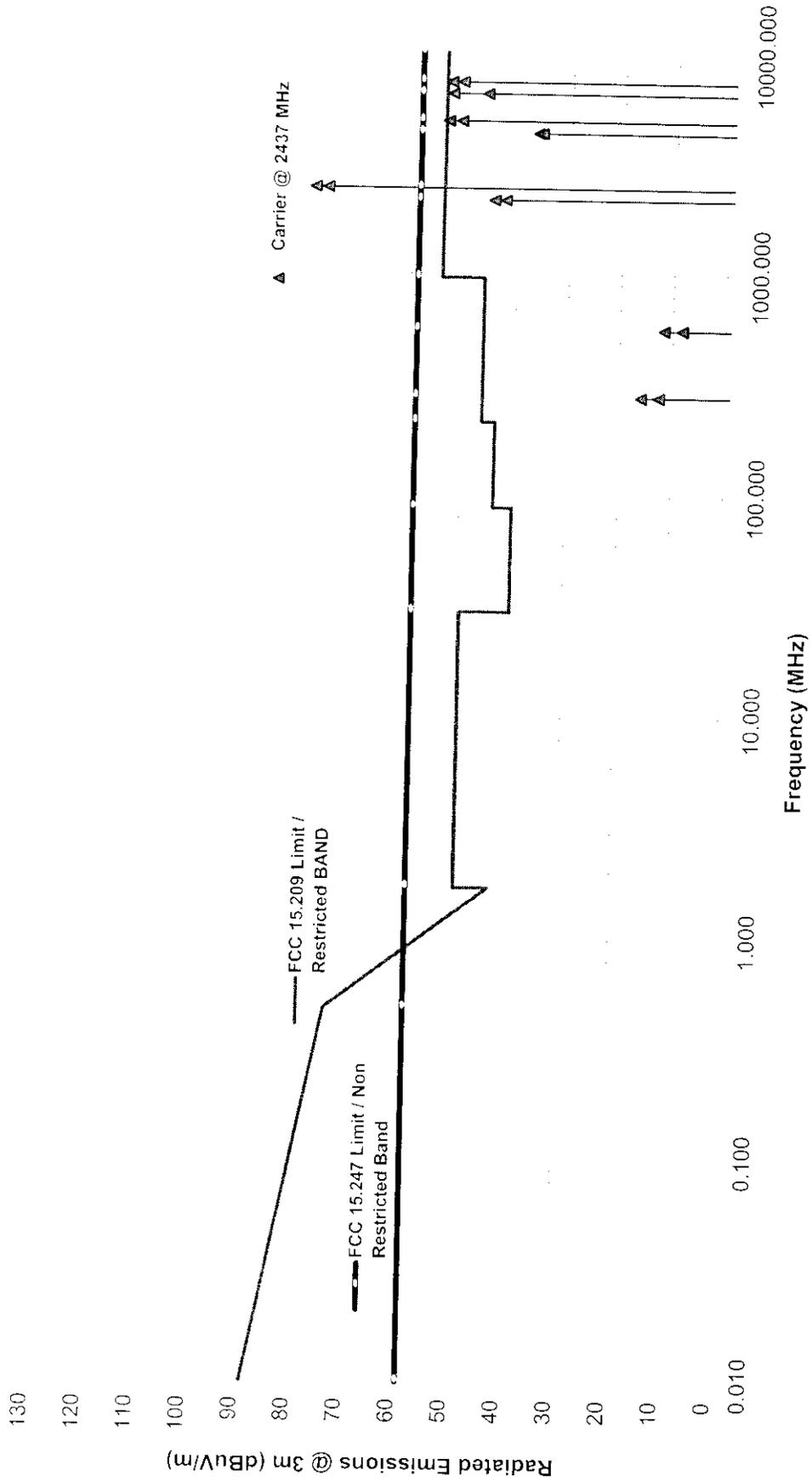
MKR
2.4387 GHz

MARKER
2.4387 GHz
78.69 dB μ V/m

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz
SPAN 200.0 MHz

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
 ICOM INCORPORATED
 SS WIRELESS LAN CARD, MODEL UX-136 (EX-2006)
 Tx Freq.: 2437 MHz @ 1 Mb/s BPSK



ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Radiated Emission at 3 Meters, RX Antenna: vertical [], horizontal [M]

E3115+HP83017+SMA7 Thu Apr 9 13:36:23 1998
REF 97.0 dB μ V/m ATT 0 dB
10dB/

MARKER
2.4604 GHz
72.53 dB μ V/m

MKR
2.4604 GHz

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHz
SPAN 200.0 MHz

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: // Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Radiated Emission at 3 Meters, RX Antenna: vertical [], horizontal []

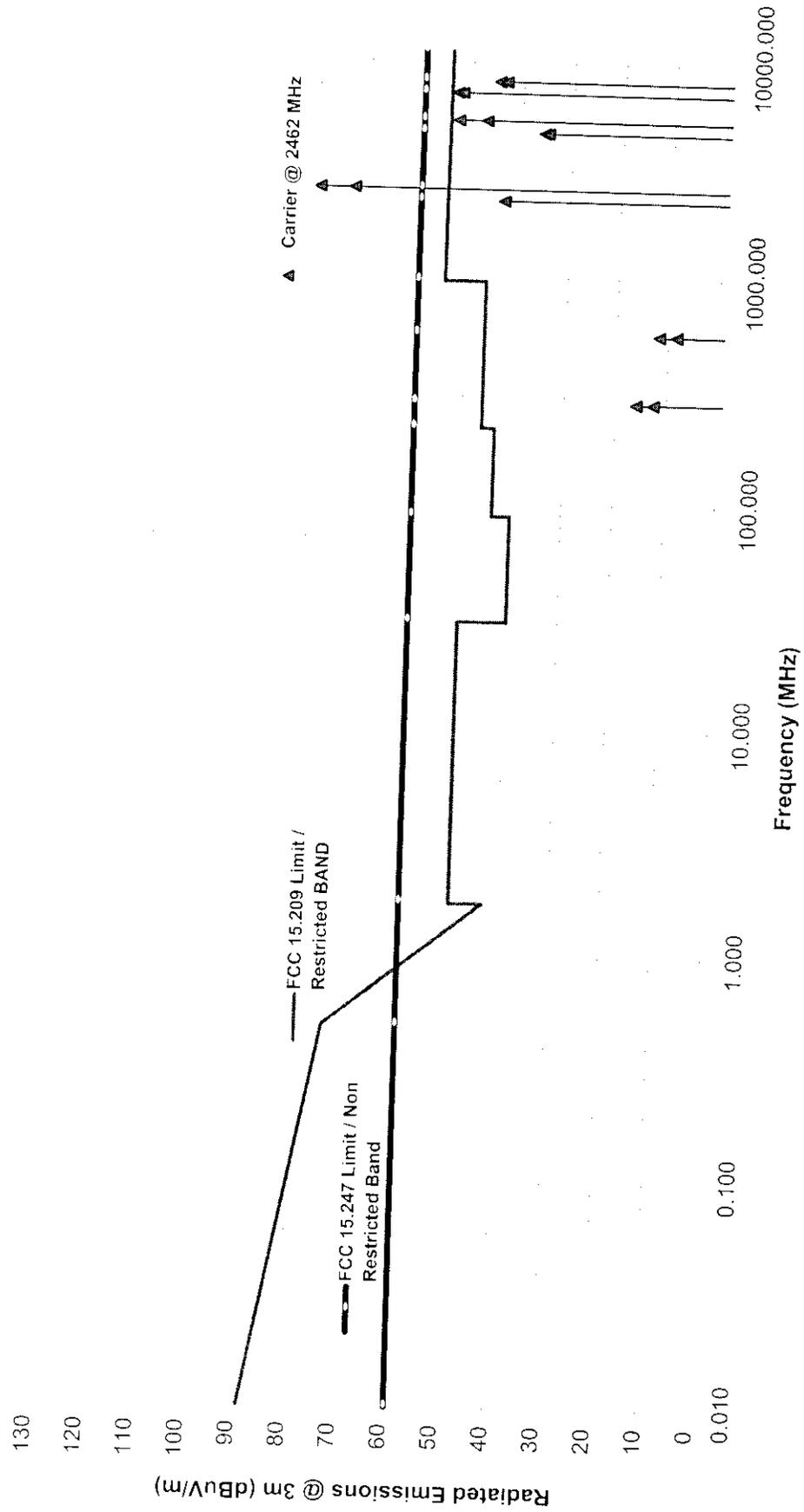
E3115+HP83017+SMA7 Thu Apr 9 13: 15: 59 1998
REF 97.0 dB μ V/m ATT 0 dB

MKR 2.4604 GHZ
MARKER
2.4604 GHZ
79.34 dB μ V/m

RBW 1 MHz
VBW 1 MHz
SWP 50 ms

CENTER 2.4410 GHZ SPAN 200.0 MHZ

Transmitter Radiated Emissions Measurements at 3 Meter OFTS
 ICOM INCORPORATED
 SS WIRELESS LAN CARD, MODEL UX-136 (EX-2006)
 Tx Freq.: 2462 MHz @ 1 Mb/s BPSK



4.5 Transmitted Power Density of a Direct Sequence Spread Spectrum System, FCC CFR 47, Para. 15.247(d)

PRODUCT NAME: SS WIRELESS LAN CARD, Model No.: UX-136 (EX-2006)

FCC REQUIREMENTS:

For a direct sequence system, the transmitted power density average over any 1 second interval shall not be greater than 8 dBm in any 3 KHz bandwidth within this band.

CLIMATE CONDITION:

Standard Temperature and Humidity: 23°C and 53%

POWER INPUT:

Using DC Power from a laptop computer.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- Bird 20 dB Attenuator, 50 Ohm IN:OUT

METHOD OF MEASUREMENT:

A scan was made by using a spectrum analyzer with the detector function set to NORMAL mode.

Locate and zoom in on emission peak(s) within the passband. Set RBW = 3 KHz, VBW ≥ RBW, Sweep = SPAN/3 KHz. For example, a span of 1.5 MHz, the sweep should be $1.6 \times 10^6 / 3.0 \times 10^3 = 500$ seconds. The measured peak level must be no greater than -8 dBm.

- For devices with spectrum line spacing greater than 3 KHz no change is required.
- For devices with spectrum line spacing equal to or less than 3 KHz, the resolution bandwidth must be reduced below 3 KHz until the individual lines in the spectrum are resolved. The measurement data must then be normalized to 3 KHz by summing the power of all the individual spectral lines within 3 KHz band (in linear power units) to determine compliance.
- If the spectrum line spacing cannot be resolved on the available spectrum analyzer, the noise density function on most modern conventional spectrum analyzer will directly measure the noise power density normalized to 1 Hz noise power bandwidth. Add 30 dB for correction to 3 KHz.
- Should all the above fail or any controversy develop regarding accuracy of measurement, the Laboratory will use HP 89440A Vector Signal Analyzer for final measurement unless a clear showing can be made for a further alternate.

TEST ARRANGEMENT



TEST RESULTS: Conforms.

TEST PERSONNEL: Tri M. Luu, P.Eng.

DATE: Apr. 06 & 08, 1998

MEASUREMENT DATA:

TEST CONFIGURATION

- The transmitter was coupled to the Spectrum Analyzer.
- The channel frequencies were established on the extreme edges (both upper and lower) and middle of the 2412 - 2462 MHz band at its full rated output power. The emissions was investigated up to the tenth harmonic of the fundamental emissions in each case, the measured level of the carrier was recorded and compared to the level of the emissions as required in Part 15.247(d)

CHANNEL NUMBER	CHANNEL FREQUENCY (MHz)	DATA RATE / MODULATION	RF POWER LEVEL IN 3 KHz BW (dBm)	LIMIT (dBm)	MARGIN (dB)	COMMENTS (PASS/FAIL)
1	2412	2 Mb/s QPSK	-8.1	8.0	-16.1	PASS
6	2437	2 Mb/s QPSK	-7.5	8.0	-15.5	PASS
11	2462	2 Mb/s QPSK	-8.0	8.0	-16.0	PASS
1	2412	2 Mb/s QPSK	-8.4	8.0	-16.4	PASS
6	2437	2 Mb/s QPSK	-6.5	8.0	-14.5	PASS
11	2462	2 Mb/s QPSK	-7.6	8.0	-15.6	PASS



Date: 4/22/98
Tested by: TTT

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps/s, 2.0 Mb/s QPSK, 2 bits/symbol)

REF 30.0 dBm
100dB
MON APR 6 14:59:22 1998
ATT 40 dB
EQUINE

MKR
2.4283 GHz
MARKER
2.4283 GHz
-8.13 dBm



RBW 3 kHz
VBW 30 kHz
SWP 1000 S

CENTER 2.4120 GHz
SPAN 20.00 MHz

ICOM INCORPORATED
SS WIRELESS LAN CARD. MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Date: Apr 27 1998
Tested by: [Signature]

REF 30.0 dBm
10dB/

MON APR 6 15:02:17 1998
ATT 40 dB

MKR
2.4126850 GHz

MARKER
2.4126850 GHz
-11.50 dBm



RBW 3 KHZ
VBW 30 KHZ
SWP 1000 S

CENTER 2.412684 GHz

SPAN 500 KHZ



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Channel #: W
 Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)
 SS WIRELESS LAN CARD, MODEL UX-136
 Tx Frequency: MHz, RF Power: W

Date: Apr 22 1998
 Tested by: PLT

REF 30.0 dBm
 10dB/

ATT 40 dB

MON APR 6 14:41:33 1998
 3.0000

MKR
 2.43754 GHz

MARKER
 2.43754 GHz
 -7.47 dBm



RBW 3 kHz
 VBW 30 kHz
 SWP 200 s

CENTER 2.43700 GHz

SPAN 20.00 MHz



ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: 44 Tx Frequency: 2.437710 MHz, RF Power: 1.0 W
Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

REF 30.0 dBm
10dB/

ATT 40 dB

MON APR 6 14:50:35 1998
E.P.A.S

MKR
2.4376379 GHz

MARKER
2.4376379 GHz
-11.53 dBm



RBW 3 KHZ
VBW 30 KHZ
SWP 1000 S

CENTER 2.4377100 GHz
SPAN 500 KHZ



UltraTech
Engineering Labs Inc.

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W

Modulation: DSSS (11 Mcchips/s, 2.0 Mb/s QPSK, 2 bits/symbol)

Date: Apr 1998
Tested by: [unreadable]

MON APR 6 14:21:17 1998

ATT 40 dB

REF 30.0 dBm
10dB/

MARKER
2.46143 GHz
-8.00 dBm

MKR
2.46143 GHz



RBW 3 KHZ
VBW 30 KHZ
SWP 1000 S

CENTER 2.46200 GHz

SPAN 20.00 MHz



ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: _____ Tx Frequency: _____ MHz, RF Power: _____ W
Modulation: DSSS (11 Mcbps/s, 2.0 Mbps QPSK, 2 bits/symbol)

Date: _____
Tested by: _____

REF 30.0 dBm
10dB/

MON APR 5 14:35:03 1998
ATT 40 dB
FLANK

MARKER
2.4613079 GHz

MARKER
2.4613079 GHz
-12.16 dBm



RBW 3 kHz
VBW 30 kHz
SWP 1000 s

CENTER 2.4612629 GHz

SPAN 500 kHz



UltraTech
Engineering Labs Inc.

Date: Apr 08 08
Tested by: Jm Tim

ICOM INCORPORATED
SS WIRELESS LAN CARD, MODEL UX-136
Channel #: 1 Tx Frequency: 2.41269 MHz, RF Power: 100 mW
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

REF 20.0 dBm
10dB/

ATT 30 dB

Wed Apr 8 15:09:22 1998

MKR 2.41269 GHz
-8.38 dBm



RBW 3 kHz
VBW 30 kHz
SWP 1000 s

CENTER 2.41200 GHz

SPAN 20.00 MHz



ICOM INCORPORATED

Channel #: / SS WIRELESS LAN CARD, MODEL UX-136
Tx Frequency: 2.4126786 MHz, RF Power: 20.0 dBm
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

DATE: APR 8 1998
TIME: 15:12:09

Wed Apr 8 15:12:09 1998

REF 20.0 dBm
10dB/

ATT 30 dB

2.4126786

MARKER
2.4126786 GHz
-10.97 dBm

MKR
2.4126786 GHz



RBW 3 kHz
VBW 30 kHz
SWP 1000 s

CENTER 2.412684 GHz

SPAN 500 KHZ

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: 6 Tx Frequency: 2.437 MHz, RF Power: 2 W
Modulation: DSSS (11 Mcbps/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Wed Apr 8 15:14:28 1998

REF 20.0 dBm
10dB/

ATT 30 dB

0.0000

MARKER

2.43623 GHz

-6.50 dBm

MKR

2.43623 GHz



RBW 3 kHz
VBW 30 kHz
SWP 100 s

CENTER 2.43700 GHz

SPAN 20.00 MHz



Date: Apr 08 08:05
Tested by: Eric Lim

ICOM INCORPORATED

Channel #: SS WIRELESS LAN CARD, MODEL UX-136
Tx Frequency: MHz, RF Power: W
Modulation: DSSS (11 Mcbps/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Wed Apr 8 15:29:57 1998
MARKER

REF 20.0 dBm
10dB/

ATT 30 dB

MARKER
2.4362807 GHz
-10.56 dBm

MKR
2.4362807 GHz



RBW 3 KHZ
VBW 30 KHZ
SWP 1000 S

CENTER 2.4362443 GHz SPAN 500 KHZ



UltraTech
Engineering Labs Inc.

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: (1) Tx Frequency: 2.462 MHz, RF Power: 100 mW
Modulation: DSSS (11 Mcbps/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Date: Apr 08 1998
Tested by: Jim Hunt

Wed Apr 8 15:35:03 1998

ATT 30 dB

REF 20.0 dBm
10dB/

MARKER
2.46271 GHz
-7.56 dBm

MKR
2.46271 GHz



RBW 3 kHz
VBW 30 kHz
SWP 1000 s

CENTER 2.462000 GHz

SPAN 20.00 MHz



UltraTech
Engineering Labs Inc.

ICOM INCORPORATED

SS WIRELESS LAN CARD, MODEL UX-136

Channel #: 11, Tx Frequency: 2.4626829 MHz, RF Power: 21.300 W
Modulation: DSSS (11 Mcchips/s, 1.0 Mb/s BPSK, 2 bits/symbol)

Date: Apr 08 98
Tested by: Jm1mg

REF 20.0 dBm
10dB/

Wed Apr 8 15:44:48 1998
ATT 30 dB

MARKER
2.4626829 GHz
-10.97 dBm



RBW 3 kHz
VBW 30 kHz
SWP 1000 s

CENTER 2.4626771 GHz
SPAN 500 kHz

4.6 **Processing Gain of A Direct Sequence Spread Spectrum, FCC CFR 47, Para. 15.247(e)****PRODUCT NAME:** SS WIRELESS LAN CARD, Model No.: UX-136 (EX-2006)**FCC REQUIREMENTS:**

The processing gain of a direct sequence system shall be at least 10 dB. The processing gain shall be determined from the ratio in dB of the signal-to-noise ratio with the system spreading code turned off to the signal-to-noise ratio with the system spreading code turned on, as measured at the demodulated output of the receiver.

CLIMATE CONDITION:

Standard Temperature and Humidity: 23°C and 53%

POWER INPUT:

Using DC Power from a laptop computer.

TEST EQUIPMENT:

- Advantest Spectrum Analyzer, Model R3271, S/N: 15050203
- 3dB & 40 dB Attenuators, 50 Ohm IN/OUT
- Fluke RF Signal Generator, Model 6061A, Freq. range: 10 KHz - 1050 MHz.
- HP 8900 RF Peak Power Meter, Measuring Frequency Range: 100 MHz - 18 GHz.
- Bert Fireberd 4000 Communication Analyzer

METHOD OF MEASUREMENT:- Jamming Margin Method

The processing gain may be measured using the CW jamming margin method. Figure 1 shows the test configuration. The test consists of stepping a signal generator in 50 KHz increments across the passband of the system. At each point, the generator level required to produce the recommended Bit Error Rate (BER) is recorded. This level is jammer level. The output power of the transmitting unit is measured at the same point. The Jammer to Signal (J/S) ratio is then calculated. Discard the worst 20% of the J/S data points. The lowest remaining J/S ratio is used when calculating the Process Gain.

The signal to noise ratio for an ideal differentially coherent detection of a differentially encoded DPSK receiver can be derived from the Bit Error Probability (Pb) versus Signal-to-Noise ratio. See attached plot for detailed information.

For measurement of the $(S/N)_c$, we use the Pb of 1.0×10^{-5} minimum.

Ref.: Viterbi, A.J. Principles of Coherent Communications (New York: McGraw-Hill, 1966), Pg. 207

Using equation (1) shown above, calculate the signal to noise ratio required for your chosen BER. This value and the measured J/S ratio are used in the following equation to calculate the Process Gain (Gp) of the system.

$$G_p = (S/N)_c + M_j + L_{sys}$$

Where:

(S/N)₀: Theoretical signal to noise ratio required to maintain the normal operation just before the BER appears. In real measurements the maximum error of 0.001 is allowed in an ideal system using their modulation scheme with all codes turned off (i.e. no spreading or processing gain).

M_j: Maximum jammer to Signal Ratio that recorded at the detected BER.

L_{sys}: System losses such as non-ideal synchronization, tracking circuitry, non-optimal baseband receiver filtering and etc... These losses can be in excess of 3 dB for each transmitter and receiver pair. For the purpose of this processing gain calculation we assume a L_{sys} at its minimum value of 3 dB.

Ref.: Dixon, R. Spread Spectrum Systems. (New York: Wiley, 1984), Chapter 1.

TEST RESULTS: Conforms.

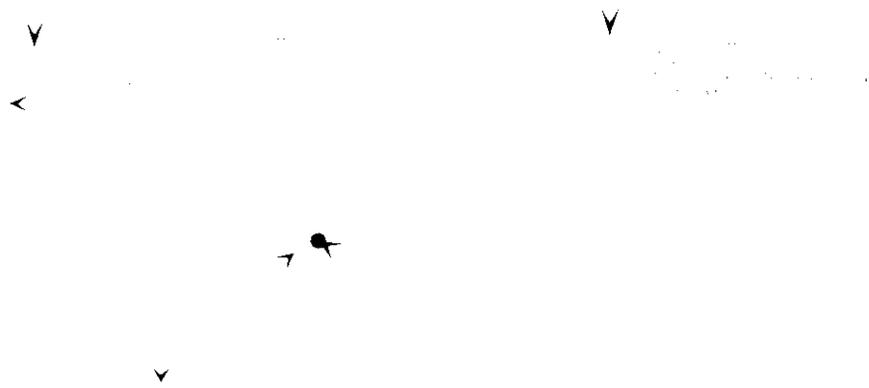
TEST PERSONNEL: Tri M. Luu, P.Eng.

DATE: Apr. 16, 1998

MEASUREMENT DATA:

Theoretical Process Gain = $\frac{11 \text{ Mchips/symbol}}{(2\text{Mb/s})/(2\text{bits/symbol})}$ = 11 numeric or 10.4 dB

- (S/N)₀: Refer to attached curves, BER versus (S/N)₀ for Differential Coherent Detection of Differentially Encoded DPSK
- Processing gain $G_p = (S/N)_0 + L_{sys} + M_j = (S/N)_0 + 2 + M_j$



- Accredited by: **ITI** (UK), Competent Body & **NVLAP** (USA), Accreditation Body
- Recognized/ Listed by: **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
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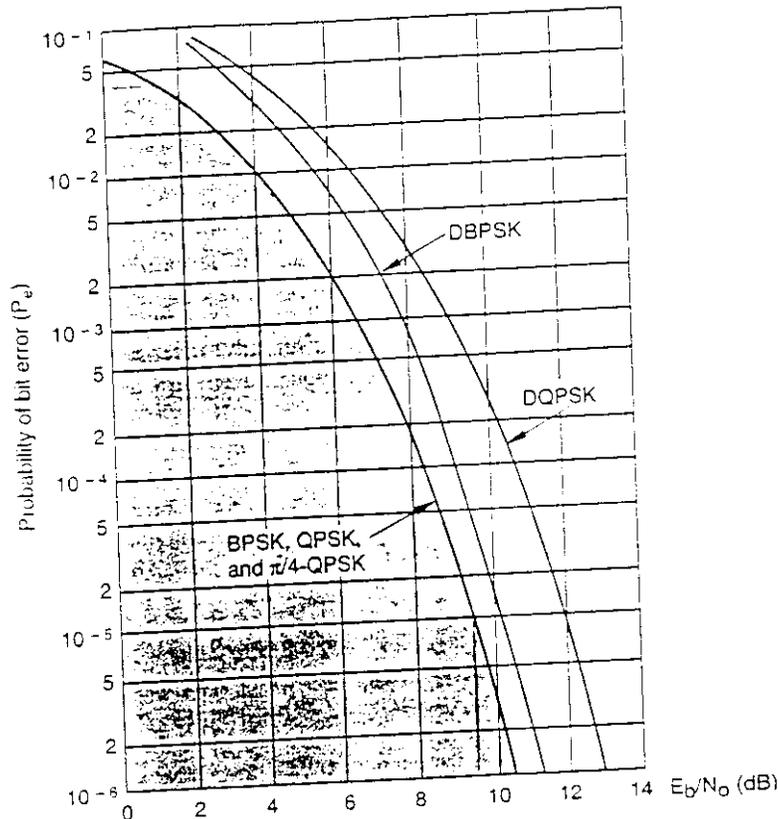


Figure 4.5.1 Theoretical $P_e = f(E_b/N_0)$ performance in a stationary additive white Gaussian noise (AWGN) environment. Ideal, linearly amplified coherent BPSK, QPSK, and differentially demodulated DBPSK systems are illustrated. The performance of non-linearly amplified FQPSK and GMSK is compared to ideal linearly amplified QPSK in Figures 4.3.33 and 4.3.34. (From Proakis, 1989.) See Appendix A.3.

tically equivalent term bit-error rate (BER) is used in applied references and specifications.

Power efficiency of modulated systems is defined as being inversely proportional to the

$$\text{BER} = f(C/N)$$

and/or

$$\text{BER} = f(E_b/N_0)$$

equations and performance curves, where E_b is the average energy of a modulated bit and N_0 is the noise power spectral density (the noise power in a normalized 1-Hz bandwidth) at the demodulator input. The higher the probability of error, the lower the power efficiency, since transmitted power is "wasted" on more bad data.

e relations

(4.5.3)

(4.5.4)

(4.5.5)

(4.5.6)

noise band-
widthing instru-

onary AWGN
Hz. What is the
ratio is 8.4 dB?
corresponding C/N

From the curve
e-sideband RF
bit rate (that is,

ratio in a sta-
tion in this section.
areas the prac-

Test Method Employed: Jamming Margin
Test Configuration Mode: QPSK MODULATION, 2 Mb/s Data Rate

$$\text{Theoretical Process Gain} = \frac{11 \text{ MHz}}{(2\text{Mb/s})/(2\text{bits/symbol})} = 11 \text{ numeric or } 10.4 \text{ dB}$$

Measured The Transmitter's Peak RF Power (@ Receiver Input Terminal:: -37.4 dBm

THEORETICAL PROCESS GAIN : 10.4dB				MIN. MEASURED PROCESSING GAIN: 12.3dB after discarding 19.4% of the worst readings			
Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to Signal Ratio M _j (dB)	Measured Processing Gain (dB)	Number of Discard Reading
1	-5.00	1.7	9.4	2.0	1.9	13.3	
2	-4.95	5.8	8.9	2.0	3.3	14.2	
3	-4.90	1.7	9.4	2.0	3.1	14.5	
4	-4.85	2.6	9.3	2.0	3.0	14.3	
5	-4.80	1.2	9.5	2.0	2.9	14.4	
6	-4.75	2.6	9.3	2.0	2.9	14.2	
7	-4.70	0.9	9.5	2.0	3.2	14.7	
8	-4.65	2.8	9.3	2.0	3.2	14.5	
9	-4.60	3.7	9.2	2.0	3.5	14.7	
10	-4.55	1.8	9.4	2.0	4.0	15.4	
11	-4.50	2.8	9.3	2.0	2.5	13.8	
12	-4.45	1.6	9.4	2.0	3.9	15.3	
13	-4.40	1.7	9.4	2.0	3.4	14.8	
14	-4.35	2.5	9.3	2.0	3.2	14.5	
15	-4.30	1.4	9.4	2.0	3.1	14.5	
16	-4.25	1.5	9.4	2.0	2.6	14.0	
17	-4.20	3.2	9.2	2.0	2.7	13.9	
18	-4.15	1.0	9.5	2.0	2.5	14.0	
19	-4.10	1.5	9.4	2.0	2.5	13.9	
20	-4.05	6.3	8.9	2.0	2.7	13.6	
21	-4.00	2.6	9.3	2.0	1.3	12.6	
22	-3.95	3.6	9.2	2.0	2.3	13.5	
23	-3.90	1.0	9.5	2.0	2.1	13.6	
24	-3.85	2.4	9.3	2.0	1.6	12.9	
25	-3.80	2.6	9.3	2.0	1.1	12.4	
26	-3.75	2.0	9.4	2.0	0.6	12.0	1
27	-3.70	3.0	9.3	2.0	0.6	11.9	2
28	-3.65	1.0	9.5	2.0	0.5	12.0	3
29	-3.60	5.6	8.9	2.0	0.5	11.4	4
30	-3.55	2.1	9.4	2.0	0.6	12.0	5
31	-3.50	1.1	9.5	2.0	-1.3	10.2	6

Continued ...

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- Recognized Listed by **FCC** (USA), **Industry Canada** (Canada), **Austel** (Australia)
- All test reports contained in this engineering test report are traceable to National Institute of Standards and Technology (**NIST**)

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to Signal Ratio M _j (dB)	Measured Processing Gain (dB)	Number of Discard Reading
32	-3.45	0.9	9.5	2.0	0.3	11.8	7
33	-3.40	1.7	9.4	2.0	0.1	11.5	8
34	-3.35	2.9	9.3	2.0	-0.1	11.2	9
35	-3.30	2.5	9.3	2.0	-0.2	11.1	10
36	-3.25	1.3	9.5	2.0	-0.5	11.0	11
37	-3.20	1.7	9.4	2.0	0.0	11.4	12
38	-3.15	2.0	9.4	2.0	0.2	11.6	13
39	-3.10	2.2	9.4	2.0	0.4	11.8	14
40	-3.05	0.9	9.5	2.0	0.8	12.3	
41	-3.00	4.7	9.0	2.0	-0.6	10.4	15
42	-2.95	1.2	9.5	2.0	0.9	12.4	
43	-2.90	5.1	9.0	2.0	0.9	11.9	16
44	-2.85	1.0	9.5	2.0	0.8	12.3	
45	-2.80	2.0	9.4	2.0	0.6	12.0	17
46	-2.75	2.2	9.4	2.0	0.7	12.1	18
47	-2.70	1.0	9.5	2.0	0.9	12.4	
48	-2.65	3.4	9.2	2.0	1.3	12.5	
49	-2.60	1.5	9.4	2.0	1.7	13.1	
50	-2.55	2.2	9.4	2.0	2.3	13.7	
51	-2.50	4.0	9.1	2.0	1.3	12.4	
52	-2.45	1.9	9.4	2.0	2.8	14.2	
53	-2.40	1.4	9.4	2.0	2.8	14.2	
54	-2.35	4.2	9.1	2.0	2.8	13.9	
55	-2.30	1.6	9.4	2.0	2.9	14.3	
56	-2.25	3.7	9.2	2.0	2.8	14.0	
57	-2.20	1.0	9.5	2.0	3.2	14.7	
58	-2.15	3.1	9.2	2.0	3.4	14.6	
59	-2.10	1.6	9.4	2.0	3.8	15.2	
60	-2.05	2.7	9.3	2.0	4.0	15.3	
61	-2.00	2.1	9.4	2.0	2.3	13.7	
62	-1.95	1.9	9.4	2.0	3.9	15.3	
63	-1.90	3.0	9.3	2.0	3.5	14.8	
64	-1.85	1.7	9.4	2.0	3.3	14.7	
65	-1.80	5.0	9.0	2.0	3.1	14.1	
66	-1.75	1.8	9.4	2.0	2.7	14.1	
67	-1.70	1.7	9.4	2.0	3.1	14.5	
68	-1.65	2.7	9.3	2.0	3.0	14.3	
69	-1.60	4.9	9.0	2.0	3.1	14.1	
70	-1.55	0.9	9.5	2.0	3.3	14.8	
71	-1.50	2.4	9.3	2.0	1.8	13.1	
72	-1.45	2.9	9.3	2.0	3.5	14.8	

Continued ...

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- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (**NIST**)

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N) _o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Number of Discard Reading
73	-1.40	1.0	9.5	2.0	3.1	14.6	
74	-1.35	3.3	9.2	2.0	2.7	13.9	
75	-1.30	3.9	9.1	2.0	2.4	13.5	
76	-1.25	2.7	9.3	2.0	1.7	13.0	
77	-1.20	1.7	9.4	2.0	1.9	13.3	
78	-1.15	2.8	9.3	2.0	2.1	13.4	
79	-1.10	2.7	9.3	2.0	2.1	13.4	
80	-1.05	1.9	9.4	2.0	2.1	13.5	
81	-1.00	3.7	9.2	2.0	0.2	11.4	19
82	-0.95	5.9	8.9	2.0	1.8	12.7	
83	-0.90	2.9	9.3	2.0	1.2	12.5	
84	-0.85	4.1	9.1	2.0	0.7	11.8	20
85	-0.80	3.2	9.2	2.0	0.2	11.4	21
86	-0.75	6.3	8.9	2.0	-0.6	10.3	22
87	-0.70	2.7	9.3	2.0	-0.5	10.8	23
88	-0.65	0.9	9.5	2.0	-0.8	10.7	24
89	-0.60	3.8	9.2	2.0	-0.4	10.8	25
90	-0.55	2.0	9.4	2.0	0.1	11.5	26
91	-0.50	1.8	9.4	2.0	-1.3	10.1	27
92	-0.45	1.4	9.4	2.0	0.6	12.0	28
93	-0.40	3.7	9.2	2.0	0.5	11.7	29
94	-0.35	3.7	9.2	2.0	0.3	11.5	30
95	-0.30	4.9	9.0	2.0	-0.1	10.9	31
96	-0.25	2.2	9.4	2.0	-1.2	10.2	32
97	-0.20	1.7	9.4	2.0	-0.7	10.7	33
98	-0.15	4.9	9.0	2.0	-0.7	10.3	34
99	-0.10	1.7	9.4	2.0	-0.5	10.9	35
100	-0.05	1.1	9.5	2.0	-0.1	11.4	36
101	0.00	2.6	9.3	2.0	1.6	12.9	
102	0.05	2.6	9.3	2.0	0.9	12.2	37
103	0.10	5.4	9.0	2.0	1.2	12.2	38
104	0.15	2.0	9.4	2.0	1.6	13.0	
105	0.20	1.8	9.4	2.0	2.3	13.7	
106	0.25	2.8	9.3	2.0	2.2	13.5	
107	0.30	4.3	9.1	2.0	3.7	14.8	
108	0.35	1.0	9.5	2.0	4.4	15.9	
109	0.40	1.0	9.5	2.0	4.8	16.3	
110	0.45	5.3	9.0	2.0	5.1	16.1	
111	0.50	1.5	9.4	2.0	3.9	15.3	
112	0.55	1.9	9.4	2.0	5.0	16.4	
113	0.60	1.6	9.4	2.0	4.5	15.9	

Continued ...

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- All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (**NIST**)

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to Signal Ratio M _j (dB)	Measured Processing Gain (dB)	Number of Discard Reading
114	0.65	1.9	9.4	2.0	4.4	15.8	
115	0.70	1.0	9.5	2.0	4.2	15.7	
116	0.75	3.5	9.2	2.0	4.0	15.2	
117	0.80	1.2	9.5	2.0	4.1	15.6	
118	0.85	1.8	9.4	2.0	4.3	15.7	
119	0.90	3.4	9.2	2.0	7.3	18.5	
120	0.95	1.0	9.5	2.0	7.9	19.4	
121	1.00	1.0	9.5	2.0	7.1	18.6	
122	1.05	1.8	9.4	2.0	7.9	19.3	
123	1.10	3.1	9.2	2.0	7.8	19.0	
124	1.15	1.3	9.5	2.0	7.4	18.9	
125	1.20	1.0	9.5	2.0	7.3	18.8	
126	1.25	2.0	9.4	2.0	6.9	18.3	
127	1.30	4.6	9.1	2.0	6.8	17.9	
128	1.35	0.7	9.5	2.0	6.7	18.2	
129	1.40	1.1	9.5	2.0	6.5	18.0	
130	1.45	1.8	9.4	2.0	6.4	17.8	
131	1.50	1.5	9.4	2.0	4.6	16.0	
132	1.55	3.5	9.2	2.0	5.7	16.9	
133	1.60	3.1	9.2	2.0	5.1	16.3	
134	1.65	2.0	9.4	2.0	4.5	15.9	
135	1.70	1.1	9.5	2.0	4.1	15.6	
136	1.75	1.0	9.5	2.0	3.5	15.0	
137	1.80	1.6	9.4	2.0	3.5	14.9	
138	1.85	5.4	9.0	2.0	3.4	14.4	
139	1.90	2.1	9.4	2.0	3.1	14.5	
140	1.95	1.0	9.5	2.0	3.1	14.6	
141	2.00	1.8	9.4	2.0	1.9	13.3	
142	2.05	1.1	9.5	2.0	2.6	14.1	
143	2.10	1.9	9.4	2.0	2.0	13.4	
144	2.15	1.4	9.4	2.0	1.7	13.1	
145	2.20	1.7	9.4	2.0	1.4	12.8	
146	2.25	2.7	9.3	2.0	1.1	12.4	
147	2.30	3.7	9.2	2.0	1.4	12.6	
148	2.35	3.1	9.2	2.0	1.3	12.5	
149	2.40	2.0	9.4	2.0	1.5	12.9	
150	2.45	2.0	9.4	2.0	1.9	13.3	
151	2.50	2.4	9.3	2.0	1.0	12.3	
152	2.55	2.3	9.3	2.0	2.2	13.5	
153	2.60	3.4	9.2	2.0	2.3	13.5	
154	2.65	1.0	9.5	2.0	1.8	13.3	

Continued ...

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Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to Signal Ratio M _j (dB)	Measured Processing Gain (dB)	Number of Discard Reading
155	2.70	2.9	9.3	2.0	1.9	13.2	
156	2.75	3.1	9.2	2.0	2.0	13.2	
157	2.80	2.2	9.4	2.0	2.2	13.6	
158	2.85	3.7	9.2	2.0	2.4	13.6	
159	2.90	2.6	9.3	2.0	2.8	14.1	
160	2.95	1.0	9.5	2.0	3.1	14.6	
161	3.00	1.9	9.4	2.0	1.9	13.3	
162	3.05	1.0	9.5	2.0	3.5	15.0	
163	3.10	1.1	9.5	2.0	3.4	14.9	
164	3.15	3.2	9.2	2.0	3.5	14.7	
165	3.20	2.2	9.4	2.0	3.5	14.9	
166	3.25	1.5	9.4	2.0	3.5	14.9	
167	3.30	1.6	9.4	2.0	3.6	15.0	
168	3.35	2.4	9.3	2.0	3.8	15.1	
169	3.40	1.0	9.5	2.0	3.9	15.4	
170	3.45	1.0	9.5	2.0	4.0	15.5	
171	3.50	3.5	9.2	2.0	3.0	14.2	
172	3.55	2.7	9.3	2.0	4.2	15.5	
173	3.60	1.0	9.5	2.0	3.9	15.4	
174	3.65	1.0	9.5	2.0	3.5	15.0	
175	3.70	3.9	9.1	2.0	3.4	14.5	
176	3.75	0.9	9.5	2.0	3.1	14.6	
177	3.80	1.0	9.5	2.0	3.1	14.6	
178	3.85	5.0	9.0	2.0	3.0	14.0	
179	3.90	0.8	9.5	2.0	3.3	14.8	
180	3.95	0.7	9.5	2.0	3.4	14.9	
181	4.00	1.9	9.4	2.0	2.3	13.7	
182	4.05	1.3	9.5	2.0	3.5	15.0	
183	4.10	1.0	9.5	2.0	3.2	14.7	
184	4.15	3.8	9.2	2.0	2.9	14.1	
185	4.20	1.0	9.5	2.0	2.7	14.2	
186	4.25	1.5	9.4	2.0	2.7	14.1	
187	4.30	1.0	9.5	2.0	2.6	14.1	
188	4.35	3.1	9.2	2.0	2.4	13.6	
189	4.40	3.6	9.2	2.0	2.4	13.6	
190	4.45	1.3	9.5	2.0	2.3	13.8	
191	4.50	1.9	9.4	2.0	1.1	12.5	
192	4.55	2.8	9.3	2.0	1.9	13.2	
193	4.60	3.1	9.2	2.0	1.6	12.8	
194	4.65	1.8	9.4	2.0	1.4	12.8	
195	4.70	1.0	9.5	2.0	1.3	12.8	

Continued ...

Test Point	Jammer Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Number of Discard Reading
196	4.75	1.1	9.5	2.0	1.1	12.6	
197	4.80	1.1	9.5	2.0	1.3	12.8	
198	4.85	2.0	9.4	2.0	1.5	12.9	
199	4.90	2.0	9.4	2.0	1.9	13.3	
200	4.95	1.0	9.5	2.0	2.1	13.6	
201	5.00	5.9	8.9	2.0	1.2	12.1	39

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Test Method Employed: Jamming Margin
Test Configuration Mode: BPSK MODULATION, 1 Mb/s Data Rate

Theoretical Process Gain = $\frac{5.5 \text{ Mcchips/symbol}}{(1 \text{ Mb/s})/(2 \text{ bits/symbol})}$ = 11 numeric or 10.4 dB

Measured The Transmitter's Peak RF Power (at Receiver Input Terminal): -37.4 dBm

THEORETICAL PROCESS GAIN : 10.4dB				MIN. MEASURED PROCESSING GAIN: 11.9 dB after discarding 19.4% of the worst readings			
Test Point	Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N)o (dB)	System Loss Lsys (dB)	Jammer to Signal Ratio Mj (dB)	Measured Processing Gain (dB)	Discarded Readings
1	-5.00	2.4	9.3	2.0	1.9	13.2	
2	-4.95	0.9	9.5	2.0	3.5	15.0	
3	-4.90	1.7	9.4	2.0	3.2	14.6	
4	-4.85	3.3	9.2	2.0	3.2	14.4	
5	-4.80	0.9	9.5	2.0	3.0	14.5	
6	-4.75	2.1	9.4	2.0	2.9	14.3	
7	-4.70	1.9	9.4	2.0	3.3	14.7	
8	-4.65	5.2	9.0	2.0	3.6	14.6	
9	-4.60	2.6	9.3	2.0	3.7	15.0	
10	-4.55	1.0	9.5	2.0	4.0	15.5	
11	-4.50	2.0	9.4	2.0	2.7	14.1	
12	-4.45	1.8	9.4	2.0	4.0	15.4	
13	-4.40	1.0	9.5	2.0	3.7	15.2	
14	-4.35	5.0	9.0	2.0	3.4	14.4	
15	-4.30	1.0	9.5	2.0	3.3	14.8	
16	-4.25	1.7	9.4	2.0	2.9	14.3	
17	-4.20	1.0	9.5	2.0	2.9	14.4	
18	-4.15	1.7	9.4	2.0	2.8	14.2	
19	-4.10	2.7	9.3	2.0	3.0	14.3	
20	-4.05	1.0	9.5	2.0	3.0	14.5	
21	-4.00	1.7	9.4	2.0	1.4	12.8	
22	-3.95	3.3	9.2	2.0	2.6	13.8	
23	-3.90	0.8	9.5	2.0	2.2	13.7	
24	-3.85	2.6	9.3	2.0	1.7	13.0	
25	-3.80	1.0	9.5	2.0	1.1	12.6	
26	-3.75	3.3	9.2	2.0	0.9	12.1	
27	-3.70	1.0	9.5	2.0	0.7	12.2	
28	-3.65	4.2	9.1	2.0	0.6	11.7	1
29	-3.60	3.9	9.1	2.0	0.6	11.7	2
30	-3.55	1.0	9.5	2.0	0.7	12.2	
31	-3.50	0.9	9.5	2.0	0.6	12.1	
32	-3.45	2.3	9.3	2.0	-0.8	10.5	3
33	-3.40	1.7	9.4	2.0	0.5	11.9	

Continued ...

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Test Point	Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10 ⁻⁵	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to Signal Ratio M _j (dB)	Measured Processing Gain (dB)	Discarded Readings
34	-3.35	1.5	9.4	2.0	0.2	11.6	4
35	-3.30	1.3	9.5	2.0	0.0	11.5	5
36	-3.25	2.7	9.3	2.0	0.0	11.3	6
37	-3.20	2.4	9.3	2.0	-0.4	10.9	7
38	-3.15	1.9	9.4	2.0	0.1	11.5	8
39	-3.10	4.8	9.0	2.0	0.3	11.3	9
40	-3.05	1.0	9.5	2.0	0.6	12.1	
41	-3.00	4.3	9.1	2.0	1.0	12.1	
42	-2.95	1.9	9.4	2.0	-0.3	11.1	10
43	-2.90	0.9	9.5	2.0	1.1	12.6	
44	-2.85	2.4	9.3	2.0	0.8	12.1	
45	-2.80	3.9	9.1	2.0	0.7	15.0	11
46	-2.75	3.5	9.2	2.0	0.9	12.1	
47	-2.70	4.2	9.1	2.0	1.0	12.1	
48	-2.65	0.9	9.5	2.0	1.3	12.8	
49	-2.60	1.0	9.5	2.0	1.9	13.4	
50	-2.55	1.0	9.5	2.0	2.4	13.9	
51	-2.50	2.7	9.3	2.0	1.5	12.8	
52	-2.45	4.2	9.1	2.0	2.7	13.8	
53	-2.40	1.0	9.5	2.0	2.6	14.1	
54	-2.35	2.1	9.4	2.0	2.8	14.2	
55	-2.30	1.0	9.5	2.0	2.9	14.4	
56	-2.25	2.1	9.4	2.0	2.9	14.3	
57	-2.20	3.4	9.2	2.0	3.2	14.4	
58	-2.15	2.0	9.4	2.0	3.4	14.8	
59	-2.10	1.6	9.4	2.0	3.7	15.1	
60	-2.05	1.8	9.4	2.0	4.0	15.4	
61	-2.00	0.9	9.5	2.0	3.5	15.0	
62	-1.95	1.2	9.5	2.0	3.8	15.3	
63	-1.90	3.0	9.3	2.0	3.5	14.8	
64	-1.85	4.2	9.1	2.0	3.1	14.2	
65	-1.80	3.2	9.2	2.0	3.1	14.3	
66	-1.75	0.8	9.5	2.0	2.5	14.0	
67	-1.70	4.2	9.1	2.0	2.9	14.0	
68	-1.65	1.9	9.4	2.0	3.0	14.4	
69	-1.60	2.6	9.3	2.0	3.1	14.4	
70	-1.55	1.0	9.5	2.0	3.4	14.9	
71	-1.50	1.0	9.5	2.0	1.3	12.8	
72	-1.45	1.0	9.5	2.0	3.3	14.8	

Continued ...

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Test Point	Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to Signal Ratio M _j (dB)	Measured Processing Gain (dB)	Discarded Readings
73	-1.40	0.8	9.5	2.0	3.1	14.6	
74	-1.35	4.2	9.1	2.0	2.8	13.9	
75	-1.30	1.6	9.4	2.0	2.7	14.1	
76	-1.25	4.8	9.0	2.0	2.4	13.4	
77	-1.20	3.0	9.3	2.0	2.1	13.4	
78	-1.15	1.6	9.4	2.0	2.2	13.6	
79	-1.10	1.0	9.5	2.0	2.4	13.9	
80	-1.05	1.6	9.4	2.0	0.3	11.7	12
81	-1.00	4.9	9.0	2.0	2.0	13.0	
82	-0.95	1.0	9.5	2.0	1.4	12.9	
83	-0.90	4.4	9.1	2.0	0.6	11.7	13
84	-0.85	1.5	9.4	2.0	0.2	11.6	14
85	-0.80	1.0	9.5	2.0	0.8	12.3	
86	-0.75	3.7	9.2	2.0	-0.4	10.8	15
87	-0.70	1.0	9.5	2.0	-0.7	10.8	16
88	-0.65	1.0	9.5	2.0	-0.5	11.0	17
89	-0.60	1.0	9.5	2.0	0.0	11.5	18
90	-0.55	2.1	9.4	2.0	-1.6	9.8	19
91	-0.50	0.8	9.5	2.0	0.4	11.9	
92	-0.45	3.6	9.2	2.0	0.2	11.4	20
93	-0.40	1.2	9.5	2.0	0.1	11.6	21
94	-0.35	1.9	9.4	2.0	-0.2	11.2	22
95	-0.30	1.0	9.5	2.0	-0.3	11.2	23
96	-0.25	1.1	9.5	2.0	-1.5	10.0	24
97	-0.20	2.9	9.3	2.0	-0.8	10.5	25
98	-0.15	1.5	9.4	2.0	-0.9	10.5	26
99	-0.10	0.7	9.5	2.0	-0.9	10.6	27
100	-0.05	2.9	9.3	2.0	-0.3	11.0	28
101	0.00	1.1	9.5	2.0	1.4	12.9	
102	0.05	2.1	9.4	2.0	0.4	11.8	29
103	0.10	2.1	9.4	2.0	0.7	12.1	
104	0.15	0.9	9.5	2.0	1.3	12.8	
105	0.20	4.6	9.1	2.0	2.0	13.1	
106	0.25	4.2	9.1	2.0	2.0	13.1	
107	0.30	4.0	9.1	2.0	3.6	14.7	
108	0.35	1.5	9.4	2.0	4.2	15.6	
109	0.40	2.4	9.3	2.0	4.7	16.0	
110	0.45	2.4	9.3	2.0	5.0	16.3	
111	0.50	3.5	9.2	2.0	3.9	15.1	

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Test Point	Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10 ⁻⁵	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to	Measured	Discarded Readings
					Signal Ratio M _j (dB)	Processing Gain (dB)	
112	0.55	1.0	9.5	2.0	4.7	16.2	
113	0.60	1.0	9.5	2.0	4.4	15.9	
114	0.65	1.8	9.4	2.0	4.2	15.6	
115	0.70	2.6	9.3	2.0	4.2	15.5	
116	0.75	3.9	9.1	2.0	4.0	15.1	
117	0.80	0.8	9.5	2.0	4.1	15.6	
118	0.85	0.9	9.5	2.0	4.2	15.7	
119	0.90	1.8	9.4	2.0	4.8	16.2	
120	0.95	4.6	9.1	2.0	5.3	16.4	
121	1.00	3.3	9.2	2.0	4.4	15.6	
122	1.05	0.8	9.5	2.0	5.6	17.1	
123	1.10	0.8	9.5	2.0	5.3	16.8	
124	1.15	3.8	9.2	2.0	5.2	16.4	
125	1.20	1.6	9.4	2.0	5.0	16.4	
126	1.25	1.0	9.5	2.0	4.6	16.1	
127	1.30	0.6	9.5	2.0	4.7	16.2	
128	1.35	1.0	9.5	2.0	4.5	16.0	
129	1.40	1.0	9.5	2.0	4.7	16.2	
130	1.45	1.0	9.5	2.0	4.5	16.0	
131	1.50	1.9	9.4	2.0	2.7	14.1	
132	1.55	4.0	9.1	2.0	4.2	15.3	
133	1.60	3.7	9.2	2.0	3.7	14.9	
134	1.65	2.1	9.4	2.0	3.2	14.6	
135	1.70	1.4	9.4	2.0	2.9	14.3	
136	1.75	2.7	9.3	2.0	2.2	13.5	
137	1.80	1.5	9.4	2.0	2.1	13.5	
138	1.85	1.0	9.5	2.0	1.9	13.4	
139	1.90	1.0	9.5	2.0	2.1	13.6	
140	1.95	1.5	9.4	2.0	2.0	13.4	
141	2.00	1.0	9.5	2.0	0.3	11.8	
142	2.05	2.4	9.3	2.0	1.5	12.8	
143	2.10	1.3	9.5	2.0	0.9	12.4	
144	2.15	1.0	9.5	2.0	0.6	12.1	
145	2.20	6.0	8.9	2.0	0.2	11.8	30
146	2.25	1.4	9.4	2.0	-0.1	12.1	31
147	2.30	2.8	9.3	2.0	-0.1	12.1	32
148	2.35	3.7	9.2	2.0	-0.1	12.8	33
149	2.40	1.8	9.4	2.0	0.2	13.4	34
150	2.45	1.0	9.5	2.0	0.5	12.0	
151	2.50	1.2	9.5	2.0	-0.7	12.8	35

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Test Point	Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10-5	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to Signal Ratio M _j (dB)	Measured Processing Gain (dB)	Discarded Readings
152	2.55	1.0	9.5	2.0	1.0	12.5	
153	2.60	4.5	9.1	2.0	0.7	14.1	36
154	2.65	0.8	9.5	2.0	0.6	12.1	
155	2.70	2.3	9.3	2.0	0.5	14.4	37
156	2.75	3.4	9.2	2.0	1.0	12.2	
157	2.80	3.1	9.2	2.0	1.2	12.4	
158	2.85	6.2	8.9	2.0	1.5	12.4	
159	2.90	1.0	9.5	2.0	2.1	13.6	
160	2.95	1.0	9.5	2.0	2.7	14.2	
161	3.00	1.0	9.5	2.0	1.3	12.8	
162	3.05	4.6	9.1	2.0	3.4	14.5	
163	3.10	1.3	9.5	2.0	3.4	14.9	
164	3.15	4.7	9.0	2.0	3.6	14.6	
165	3.20	2.0	9.4	2.0	3.7	15.1	
166	3.25	1.0	9.5	2.0	3.8	15.3	
167	3.30	1.6	9.4	2.0	4.2	15.6	
168	3.35	1.0	9.5	2.0	4.5	16.0	
169	3.40	0.8	9.5	2.0	4.5	16.0	
170	3.45	4.6	9.1	2.0	5.0	16.1	
171	3.50	1.6	9.4	2.0	3.7	15.1	
172	3.55	0.7	9.5	2.0	4.9	16.4	
173	3.60	2.1	9.4	2.0	4.6	16.0	
174	3.65	4.8	9.0	2.0	4.3	15.3	
175	3.70	3.6	9.2	2.0	4.1	15.3	
176	3.75	0.9	9.5	2.0	4.1	15.6	
177	3.80	1.1	9.5	2.0	4.1	15.6	
178	3.85	1.7	9.4	2.0	4.0	15.4	
179	3.90	4.9	9.0	2.0	4.3	15.3	
180	3.95	2.5	9.3	2.0	4.4	15.7	
181	4.00	3.3	9.2	2.0	3.0	14.2	
182	4.05	3.1	9.2	2.0	4.5	15.7	
183	4.10	1.1	9.5	2.0	4.3	15.8	
184	4.15	1.0	9.5	2.0	4.1	15.6	
185	4.20	1.0	9.5	2.0	4.0	15.5	
186	4.25	1.0	9.5	2.0	3.6	15.1	
187	4.30	3.0	9.3	2.0	3.2	14.5	
188	4.35	4.0	9.1	2.0	3.2	14.3	
189	4.40	5.0	9.0	2.0	3.4	14.4	
190	4.45	3.8	9.2	2.0	0.5	9.8	38
191	4.50	3.5	9.2	2.0	-0.7	11.9	

Continued ...

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Test Point	Signal Freq. +/- Fc (MHz)	(BER) (DQPSK) x10 ⁻⁵	(S/N) _o (dB)	System Loss L _{sys} (dB)	Jammer to Signal Ratio M _j (dB)	Measured Processing Gain (dB)	Discarded Readings
192	4.55	1.0	9.5	2.0	0.7	12.2	
193	4.60	0.8	9.5	2.0	0.6	12.1	
194	4.65	3.1	9.2	2.0	0.5	11.2	39
195	4.70	0.7	9.5	2.0	0.7	12.2	
196	4.75	4.3	9.1	2.0	0.9	12.0	
197	4.80	5.2	9.0	2.0	1.1	12.1	
198	4.85	1.0	9.5	2.0	1.7	13.2	
199	4.90	1.0	9.5	2.0	2.0	13.5	
200	4.95	1.0	9.5	2.0	1.6	13.1	
201	5.00	0.7	9.5	2.0	0.4	11.9	

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4.7 AC Powerline Conducted Emissions, FCC CFR 47, Para. 15.107(a)

PRODUCT NAME: SS WIRELESS LAN CARD, Model No.: UX-136 (EX-2006)

NAME OF TEST: AC Powerline Conducted Emissions.

FCC LIMIT:

The RF voltage conducted back onto the public utility lines shall not exceed 250 uV or 48.0 dBuV measured from 450 KHz to 30 MHz.

CLIMATE CONDITION:

Standard Temperature and Humidity: 23°C and 53%

POWER INPUT:

Using DC Power from a laptop computer.

TEST EQUIPMENT:

- Advantest R3271 Spectrum Analyzer, Frequency Range: 100Hz-26.5GHz, with built-in Peak, Quasi-Peak and Average Detectors.
- HP 11947A Transient Limiter, HP, Model 11947A, Frequency Range: 9KHz-200MHz, Attenuation: 10dB.
- HP 7475 Plotter
- EMCO 3825 2 LISN, Frequency Range: 9KHz-200MHz
- RF Shielded Enclosure (12x16x12 feet)

METHOD OF MEASUREMENTS:

Refer to ANSI C63.4-1992.

TEST RESULTS: Conforms.

TEST PERSONNEL: Tri M. Luu, P.Eng.

DATE: Apr. 17, 1998

MEASUREMENT DATA

AC POWER-LINE CONDUCTED EMISSIONS

REMARKS

- All rf emissions from 450 KHz to 30 MHz were scanned, and eight highest emission levels were recorded. See attached plots.
- P: Peak Detector, 10 KHz RBW, VBW ≥ RBW
- Q: CISPR QUASI-PEAK, 9 KHz RBW, VBW ≥ RBW
- QP/BB: for broadband emission (QP level - AVG level > 6 dB); the recorded level was QP level less 13 dB.

FREQUENCY (MHz)	RF LEVEL (dBuV)	RECEIVER DETECTOR (P/QP/AVG)	QP/NB LIMIT (dBuV)	QP/BB LIMIT (dBuV)	MARGIN (dB)	PASS/FAIL	LINE TESTED (L1/L2)
2.970	38.7	QP	48.0	61.0	-9.3	PASS	L1
4.450	39.3	QP	48.0	61.0	-8.7	PASS	L1
4.950	39.9	QP	48.0	61.0	-21.1	PASS	L1
5.440	38.5	QP	48.0	61.0	-9.5	PASS	L1
5.690	36.4	QP	48.0	61.0	-24.6	PASS	L1
2.970	39.2	QP	48.0	61.0	-21.8	PASS	L2
4.450	39.7	QP	48.0	61.0	-8.3	PASS	L2
4.950	38.9	QP	48.0	61.0	-22.1	PASS	L2
5.440	39.1	QP	48.0	61.0	-8.9	PASS	L2
5.940	37.4	QP	48.0	61.0	-23.6	PASS	L2



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Engineering Labs Inc.

APPLICANT:
PRODUCT:
MODEL:

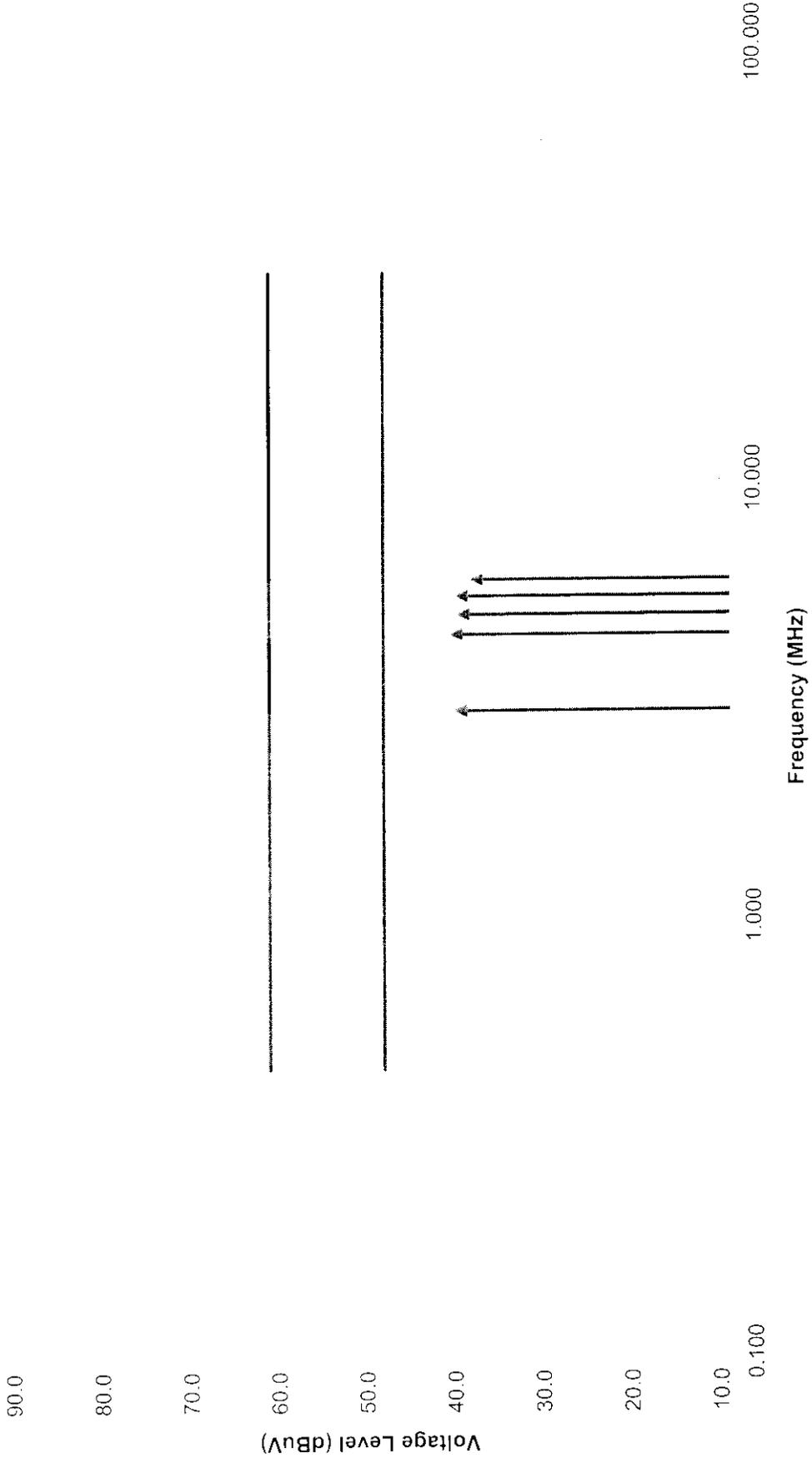
[Handwritten signature]
[Handwritten text]

POWER-LINE CONDUCTED EMISSIONS MEASUREMENTS

EMI Detector: Peak Quasi Peak Average Temp.: *22* °C, Humidity: *24* %
 Line Tested: *1111*, Input Voltage: *111.1*, Tested by: *1111*, Test Date: *11/11/11*
 Comments: *1111*

[Faint, illegible handwritten notes and signatures]

AC Conducted Emissions - Line #2 (Neutral)
ICOM CORPORATION
SS WIRELESS LAN CARD, MODEL UX-136 (EX-2006)

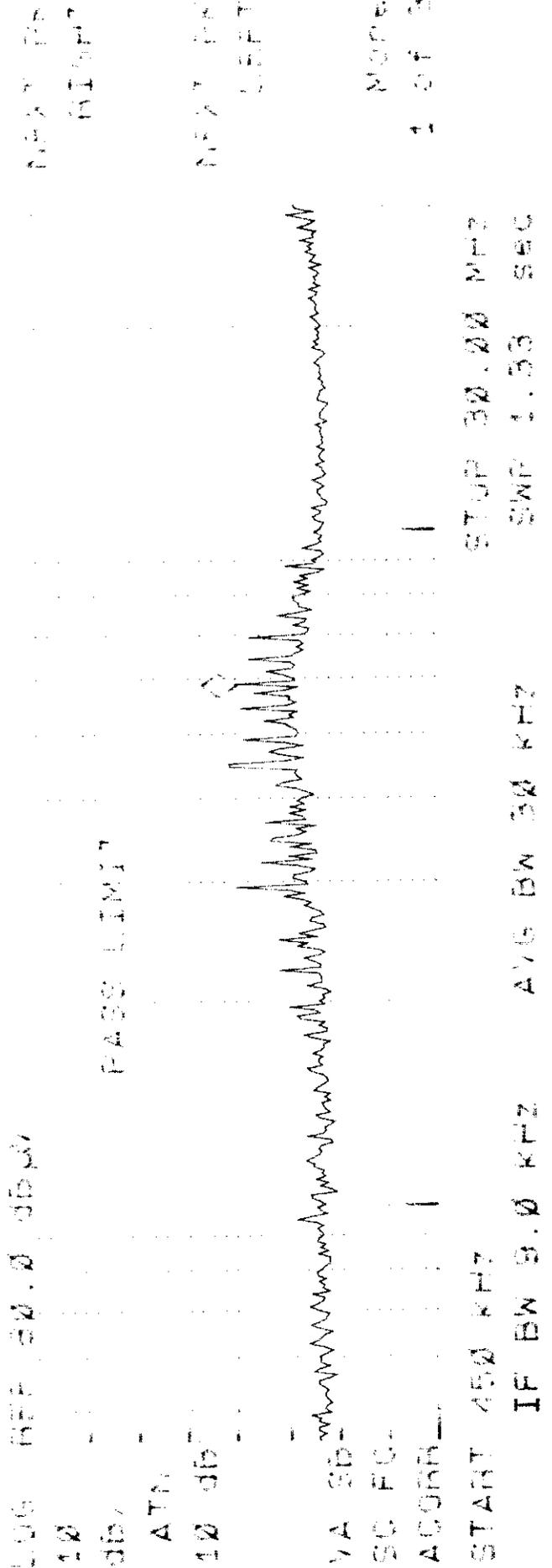


APPLICANT: _____
PRODUCT: _____
MODEL: _____

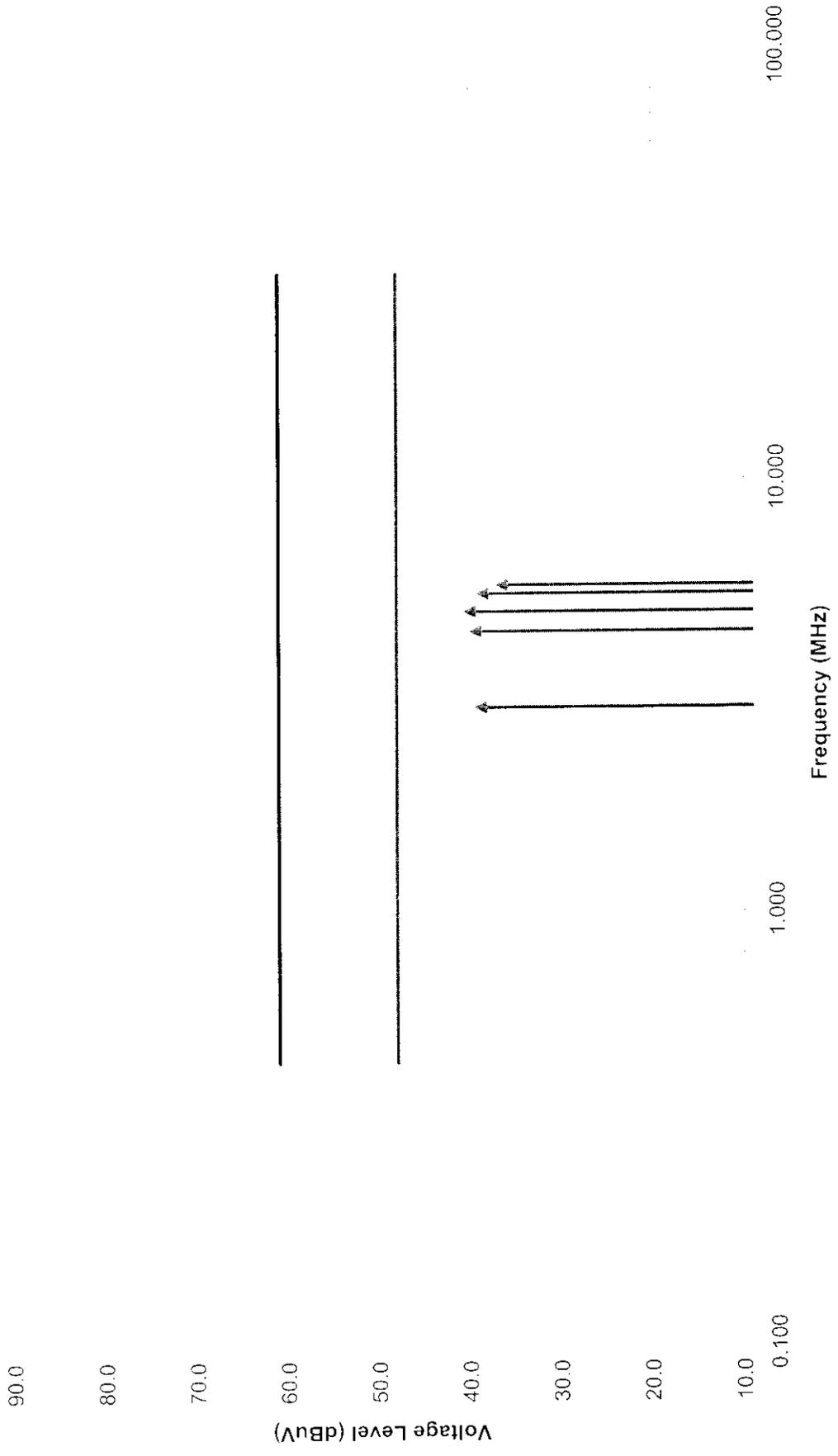
EMI Detector: [Y] Peak [M] Quasi Peak [Y] Average Temp.: 25 °C, Humidity: 50%
Line Tested: 2 Input Voltage: 230 V, Tested by: J. S. Test Date: 12/15/00
Comments: _____

Signal	Freq (MHz)	RF Amp	GF Amp	AV Amp	MARKER
1	2.967915	42.2	39.2	38.8	→ HIGH
2	4.452760	41.1	39.7	39.2	
3	4.947926	42.5	38.9	38.2	
4	5.441508	42.3	39.1	38.5	
5	5.937985	40.1	37.4	34.6	→ LF

START 450 KHZ
STOP 450 KHZ
AVERAGE: PEAK
MEASUREMENT: PEAK
MATH: 5.01 MHz
39.45 dBu



AC Conducted Emissions - Line #1 (Hot)
ICOM CORPORATION
SS WIRELESS LAN CARD, MODEL UX-136 (EX-2006)



5. EXHIBIT 5 - GENERAL TEST PROCEDURES

5.1 AC Powerline Conducted Emissions Measurements - General Test Method

- AC Powerline Conducted Emissions were performed in the shielded room, 16'(L) by 12'(W) by 12'(H).
- Conducted power-line measurements were made over the frequency range from 450 KHz to 30 MHz to determine the line-to-ground radio noise voltage which was conducted from the EUT power-input terminals that were directly connected to a public power network.
- The EUT normally received power from another device that connects to the public utility ac power lines, measurements would be made on that device with the EUT in operation to ensure that the device continues to comply with the appropriate limits while providing the EUT with power.
- If the EUT was operates only from internal or dedicated batteries, with no provisions for connection to the public utility ac power lines, ac power-line conducted measurements are not required.
- Table-top devices were placed on a platform of nominal size 1 m by 1.5m raised 80 cm above the conducting ground plane.
- The EUT current-carrying power lead, except the ground (safety) lead, was individually connected through a LISN to the power source. All unused 50-Ohm connectors of the LISN was terminated in 50-ohm when not connected to the measuring instruments.
- The line cord of the EUT connected to one LISN which was connected to the measuring instrument. Those power cords for the units of devices not under measurement were connected to a separate multiple ac outlets. Drawings and photographs of typically conducted emission test setups were shown in the Test Report. Each current-carrying conductor of the EUT shall be individually tested.
- The EUT was normally operated with a ground (safety) connection, the EUT was connected to the ground at the LISN through a conductor provided in the lead from the ac power mains to the LISN.
- The excess length of the power cord was folded back and forth in an 8-shape on a wooden strip with a vertical prong located on the top of the LISN case.
- The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.
- A preliminary scan was made by using spectrum analyzer system with the detector function set to PEAK mode (10 KHz RBW, VBW \geq RBW), frequency span 450KHz-30MHz.
- The maximum conducted emission for a given mode of operation was found by using the following step-by-step procedure:

- Step1. Monitor the frequency range of interest at a fixed EUT azimuth.
- Step2. Manipulate the system cables and peripheral devices to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.
- Step3. The effects of various modes of operation is examined. This is done by varying equipment operation modes as step 2 is being performed.
- Step4. After completing step 1 through 3, record EUT and peripheral device configuration, mode of operation, cable configuration, signal levels and frequencies for final test.

- Each highest signal level at the maximized test configuration was zoomed in a small frequency span on the spectrum analyzer's display (the manipulation of cables and peripheral devices and EUT operation modes might have to be repeated to obtain the highest signal level with the spectrum analyzer set to PEAK detector mode 10 KHz RBW and VBW \geq RBW). The spectrum analyzer was then set to CISPR QUASI-PEAK detector mode (9 KHz RBW, 1 MHz VBW) and the final highest RF signal level and frequency was record.
- **Broad-band ac Powerline conducted emissions:-** If the EUT exhibits ac Powerline conducted emissions that exceed the limit with the instrument set to the quasi-peak mode, then measurements should be made in the average mode. If the amplitude measured in the quasi-peak mode is at least 6 dB higher than the amplitude measured in the average mode, the level measured in quasi peak mode may be reduced by 13 dB before comparing it to the limit.

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5.2 Electrical Field Radiated Emissions Measurements - General Test Method

- The radiated emission measurements were performed at the UltraTech's 3 Meter Open Field Test Site (OFTS) situated in the Town of Oakville, province of Ontario. The Attenuation Characteristics of OFTS have been filed to FCC.
- Radiated emissions measurements were made using the following test instruments:
 - 1) Calibrated EMCO active loop antenna in the frequency range from 10 KHz to 1 MHz
 - 2) Calibrated EMCO biconilog antenna in the frequency range from 30 MHz to 2000 MHz.
 - 3) Calibrated A.H. Systems log periodic antenna in the frequency range above 1000 MHz (1GHz - 18 GHz).
 - 4) Horn Antennas:
 - a) Horn Antenna, Emco, Model 3160-09, 18-26.5GHz
 - b) Horn Antenna, Emco, Model 3160-10, 26.5-40GHz
 - c) Mixer, Tektronix, P/N 118-0098-00, 18-26.5GHz
 - d) Mixer, Tektronix, P/N 119-0098-00, 26.5-40GHz
 - e) Mixer, HP, P/N R3434A, 12.4-18GHz
 - f) Mixer, HP, P/N R3434B, 18-26.5GHz
 - g) Mixer, HP, P/N R3434C, 26.5-40GHz
 - 5) Calibrated Advantest spectrum analyzer and pre-selector/pre-amplifier. In general, the spectrum analyzer would be used as follows:
 - The rf electric field levels were measured with the spectrum analyzer set to PEAK detector (1 KHz RBW and 1 KHz VBW for frequency below 30 MHz, 100 KHz RBW and VBW \geq RBW for Frequency below 1 GHz and 1 MHz RBW and 1 MHz VBW for frequency greater than 1 GHz).
 - If any rf emission was observed to be a broadband noise, the spectrum analyzer's CISPR QUASI-PEAK detector (120 KHz RBW and 1MHz VBW) was then set to measure the signal level.
 - If the signal being measured was narrowband and the ambient field was broadband, the bandwidth of the spectrum analyzer was reduced.
- The EUT was set-up in its typical configuration and operated in its various modes as described in 3.2 of the test report.
- The frequencies of emissions was first detected. Then the amplitude of the emissions was measured at the specified measurement distance using required antenna height, polarization, and detector characteristics.
- During this process, cables and peripheral devices were manipulated within the range of likely configuration.
- For each mode of operation required to be tested, the frequency spectrum was monitored. Variations in antenna heights (from 1 meter to 4 meters above the ground plane), antenna polarization (horizontal plane and vertical plane), cable placement and peripheral placement (each variable within bounds specified elsewhere) were explored to produce the highest amplitude signal relative to the limit.

The maximum radiated emission for a given mode of operation was found by using the following step-by-step procedure:

Step1: Monitor the frequency range of interest at a fixed antenna height and EUT azimuth.

Step2: Manipulate the system cables to produce highest amplitude signal relative to the limit. Note the amplitude and frequency of the suspect signal.

- Step3: Rotate the EUT 360 degrees to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, go back to the azimuth and repeat Step 2. Otherwise, orient the EUT azimuth to repeat the highest amplitude observation and proceed.
- Step4: Move the antenna over its full allowed range of travel (1 to 4 meters) to maximize the suspected highest amplitude signal. If the signal or another at a different frequency is observed to exceed the previously noted highest amplitude signal by 1 dB or more, return to Step 2 with the highest amplitude observation and proceed.
- Step5: Change the polarization of the antenna and repeat Step 2 through 4. Compare the resulting suspected highest amplitude signal with that found for the other polarization. Select and note the higher of the two signals. This signal is termed the highest observed signal with respect to the limit for this EUT operational mode.
- Step6: The effects of various modes of operation is examined. This is done by varying the equipment modes as steps 2 through 5 are being performed.
- Step7: After completing steps 1 through 6, record the final highest emission level, frequency, antenna polarization and detector mode of the measuring instrument.

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Calculation of Field Strength:

The field strength is calculated by adding the calibrated antenna factor and cable factor, and subtracting the Amplifier gain (if any) from the measured reading. The basic equation with a sample calculation is as follows:

$$FS = RA + AF + CF - AG$$

Where FS -- Field Strength
 RA -- Receiver/Analyzer Reading
 AF -- Antenna Factor
 CF -- Cable Attenuation Factor
 AG -- Amplifier Gain

Example: If a receiver reading of 60.0 dBuV is obtained, the antenna factor of 7.0 dB/m and cable factor of 1.0 dB are added, and the amplifier gain of 30 dB is subtracted. The actual field strength will be:

Field Level in dBuV/m = 60 + 7.0 + 1.0 - 30 = 38.0 dBuV/m.

Field Level in uV/m = $10^{(38/20)}$ = 79.43 uV/m.

Notes: The frequency and amplitude of at least six highest conducted emissions relative to the limit are recorded unless such emissions are more than 20 dB below the limit. If less than six emissions are within 20dB of the limit, the background or receiver noise level shall be reported at representative frequencies.

6. EXHIBIT 6 - INFORMATION RELATED TO EQUIPMENT UNDER TESTS**6.1 FCC ID Labeling and Sketch of FCC Label Location**

Refer to the attached sheets

6.2 Photographs of Equipment under Test

Refer to the attached photographs

6.3 System Block Diagram(s)

Refer to the attached sheets

6.4 Schematic Diagrams

Refer to the attached sheets

6.5 User's Manual with "FCC Information to User Statements"

Refer to the attached Users' manual