Home Wireless Networks Inc.
FCC Part 15, Certification Application
95-0003-XXX

December 3, 1998

MEASUREMENT/TECHNICAL REPORT

COMPANY NAME: **Home Wireless Networks Inc.**

MODEL: **95-0003-XXX**

FCC ID: **NSK0003A**

DATE: **December 3, 1998**

This report concerns (check one): Original grant X
Class II change_____

Equipment type: **Spread Spectrum Transmitter**

Deferred grant requested per 47 CFR 0.457(d)(1)(ii)? yes_____ No X

If yes, defer until:_____
date

N.A. agrees to notify the Commission by N.A.
Date
of the intended date of announcement of the product so that the grant can be issued on that date.

Report prepared by:

United States Technologies, Inc.
3505 Francis Circle
Alpharetta, GA 30004

Phone Number: (770) 740-0717
Fax Number: (770) 740-1508

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GENERAL INFORMATION

GENERAL INFORMATION

1.1 Product Description

The Equipment Under Test (EUT) is a Home Wireless Networks, Inc., Model 95-0003-XXX, FCC ID: NSK0003A. The Home Wireless Networks, Inc. Model 95-0003-XXX is a wireless access unit (WAU) with a DB9 interface which is designed to allow you to connect a PC to your Home Wireless Network.

The following is a list of the channels designed into the EUT:

Channel	Channel Frequency (MHz)
0	905.728
1	906.240
2	906.752
3	907.264
4	907.776
5	908.288
6	908.800
7	909.312
8	909.824
9	910.336
10	910.848
11	911.360
12	911.872
13	912.384
14	912.896
15	913.408
16	913.920
17	914.432
18	914.944
19	915.456
20	915.968
21	916.480
22	916.992
23	917.504
24	918.016
25	918.528
26	919.040
27	919.552
28	920.064
29	920.576
30	921.088
31	921.600
32	922.112
33	922.624
34	923.136
35	923.648

1.2 Related Submittal(s)/Grant(s)

The EUT will be used with part of a system to send and receive voice and/or data. The transceiver presented in this report will be used with another transceiver which has been submitted under FCC ID: NSK0005A.

The EUT is subject to the following authorizations:

a) Certification as a transmitter
b) Verification as a receiver
c) DoC or Certification as a PC peripheral

The information contained in this report is presented for the certification authorization of the EUT (covers the transmitter). A separate report has been issued for a DoC authorization of the EUT (covers the PC peripheral and receiver portion).

SECTION 2

TESTS AND MEASUREMENTS

TEST AND MEASUREMENTS

2.1 Configuration of Tested System and Test Procedure

The sample was tested per ANSI C63.4, Methods of Measurement from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz (1992). Conducted and radiated emissions data were taken with the test receiver or spectrum analyzer's resolution bandwidth adjusted to 9 kHz and 120 kHz, respectively. All measurements are peak unless stated otherwise. The video filter associated with the spectrum analyzer was off throughout the evaluation process. Interconnecting cables were manipulated as necessary to maximize emissions. A block diagram of the tested system is shown in Figure 1. Test configuration photographs for spurious and fundamental emissions are shown in Figure 2.

The sample used for testing was received by U.S. Technologies on October 27, 1998 in good condition.

2.2 Test Facility

Testing was performed at US Tech's measurement facility at 3505 Francis Circle, Alpharetta, GA. This site has been fully described and submitted to the FCC, and accepted in their letter marked 31040/SIT. Additionally this site has also been fully described and submitted to Industry Canada (IC), and has been approved under file number IC2982.

2.3 Test Equipment

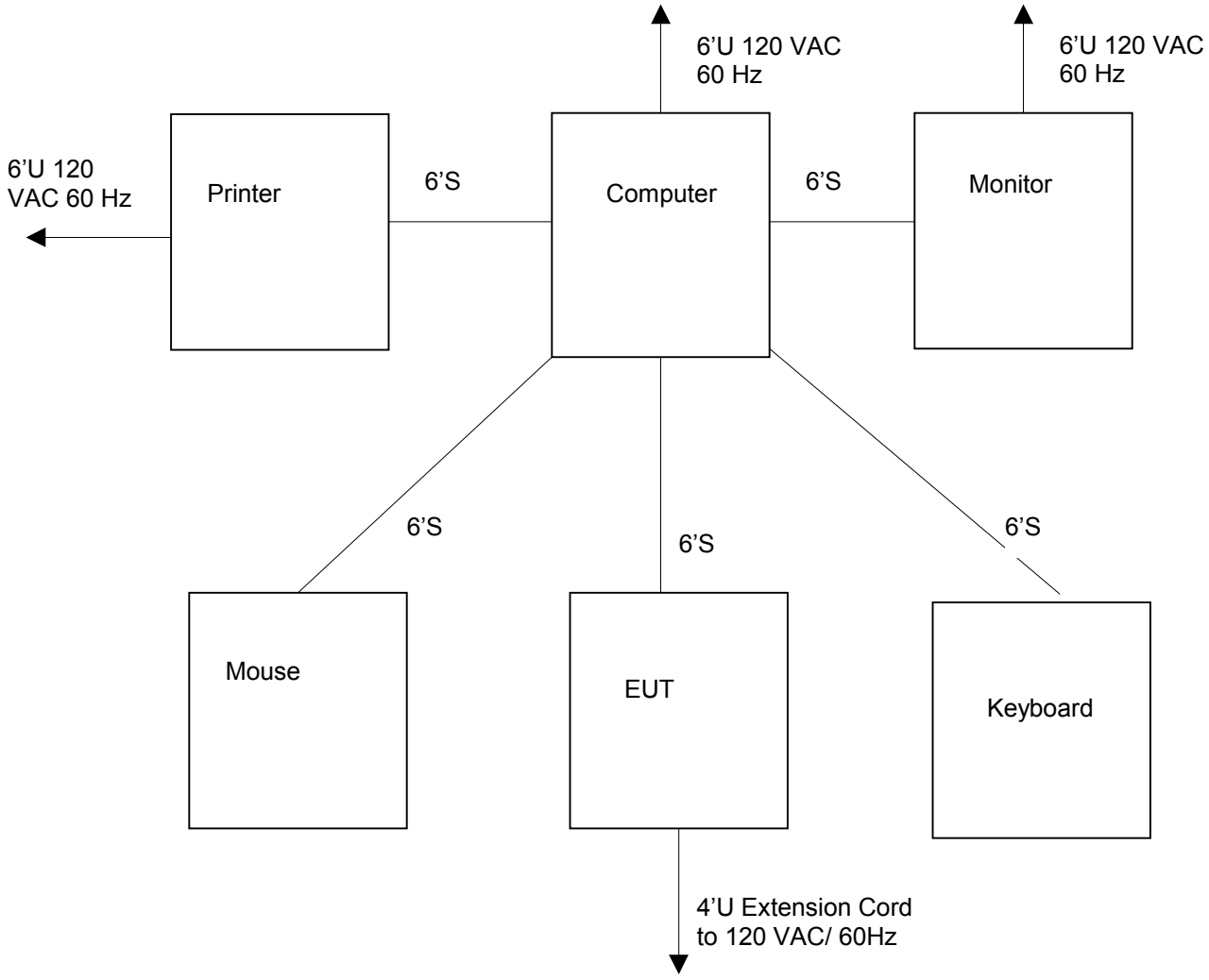
Table 2 describes test equipment used to evaluate this product.

2.4 Modifications

No modifications were made by US Tech to bring the EUT into compliance with FCC Part 15, Class B limits for the transmitter portion of the EUT.

FIGURE 1

TEST CONFIGURATION



Test Date: October 20 & 21, 1998
UST Project: 98-589
Customer: Home Wireless Networks, Inc.
Model: 95-0003-XXX

FIGURE 2a

Photograph(s) for Spurious and Fundamental Emissions (Front)

Test Date: November 9 & 10, 1998
UST Project: 98-589
Customer: Home Wireless Networks, Inc.
Model: 95-0003-XXX

FIGURE 2b

Photograph(s) for Spurious and Fundamental Emissions (Back)

Test Date: November 27, 1998
UST Project: 98-589
Customer: Home Wireless Networks, Inc.
Model: 95-0003-XXX

FIGURE 2c

Photograph(s) for Conducted Emissions

TABLE 1

EUT and Peripherals

PERIPHERAL MANUFACTURER	MODEL NUMBER	SERIAL NUMBER	FCC ID:	CABLES P/D
Transceiver (EUT) Home Wireless Networks, Inc.	95-0003-XXX	None	NSK0003A (Pending)	4' U Extension Cord to 120 VAC 60 Hz
Printer Panasonic	KX-P1180	1CKARQ99923	AJC5Z6KX-P1180	6'S 6'U 120 VAC 60 Hz
Computer Hewlett Packard	D331060101 D3310A	SG51042069	B94HPL5105	6' S 6' U 120 VAC 60 Hz
Monitor IBM	6543-301	23DR948	ANO6543	6' S 6' U 120 VAC 60 Hz
Mouse Hewlett Packard	M-S34	LZA74405157	DZL211029	6' S
Keyboard Hewlett Packard	E03633MLUS-C	D4950B ABA	CIGE03633	6' S

TABLE 2
TEST INSTRUMENTS

TYPE	MANUFACTURER	MODEL	SN.
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3710A03009
SPECTRUM ANALYZER	HEWLETT-PACKARD	8593E	3205A00124
SPECTRUM ANALYZER	HEWLETT-PACKARD	8558B	2332A09900
S A DISPLAY	HEWLETT-PACKARD	853A	2404A02387
COMB GENERATOR	HEWLETT-PACKARD	8406A	1632A01519
RF PREAMP	HEWLETT-PACKARD	8447D	1937A03355
RF PREAMP	HEWLETT-PACKARD	8449B	3008A00480
HORN ANTENNA	EMCO	3115	3723
BICONICAL ANTENNA	EMCO	3110	9307-1431
LOG PERIODIC ANTENNA	EMCO	3146	9110-3600
BILOG	CHASE	CBL6112A	2238
LISN	SOLAR ELE.	8012	865577
LISN	SOLAR ELE.	8028	910494
LISN	SOLAR ELE.	8028	910495
THERMOMETER	FLUKE	52	5215250
MULTIMETER	FLUKE	85	53710469
FUNCTION GENERATOR	TEKTRONIX	CFG250	CFG250TW15059
PLOTTER	HEWLETT-PACKARD	7475A	2325A65394

2.5 Antenna Description (Paragraph 15.203)

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The Model Home Wireless Networks, Inc. 95-0003-XXX incorporates an internal antenna only.

Manufacturer:	Home Wireless Networks, Inc. 3145 Avalon Ridge Place Norcross, GA 30071
Type:	Metal Patch Antenna
Model Number:	None
Gain:	-1 dBi
Connector:	Metal Contacts on PCB (Internal Antenna Only)

2.6 Peak power within the band 902 - 928 MHz per FCC Section 15.247(b)

Peak power within the band 902 - 928 MHz has been measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer. The spectrum analyzer was set for a 50 Ω impedance with the VBW ≥ RBW 6 dB bandwidth. The results of the measurements are given in Table 3 and Figure 3a through Figure 3c. If the spectrum analyzer did not have a RBW greater than the 6 dB bandwidth for the largest fundamental bandwidth, then the data was taken using the channel power function of the spectrum analyzer.

The EUT did not incorporate any antennas of directional gain greater than 6 dBi, therefore the output power has not been reduced as required by 15.247(b)(3).

TABLE 3
PEAK POWER OUTPUT

Test Date: **October 27, 1998**
UST Project: **98-589**
Customer: **Home Wireless Networks, Inc.**
Model: **95-0003-XXX**

Frequency of Fundamental (MHz)	Measurement (dBm)*	Measurement (Watt)*	FCC Limit (Watt)
905.73	16.61	0.046	1.0
914.94	15.94	0.039	1.0
923.65	15.14	0.033	1.0

*** Measurement includes 0.1 cable loss**

Tester Signature: _____ **Name:** **Tim R. Johnson**

Figure 3a.
Peak Power per FCC Section 15.247(b) (Low)

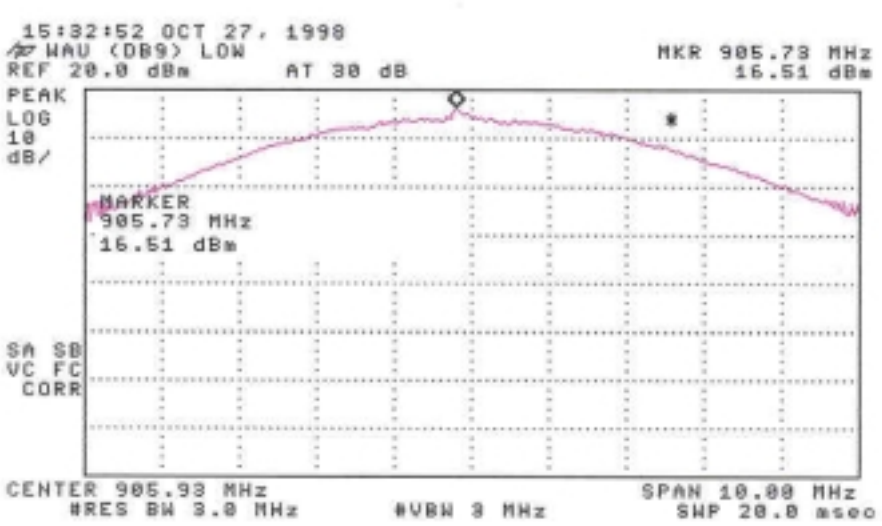


Figure 3b.
Peak Power per FCC Section 15.247(b) (Mid)

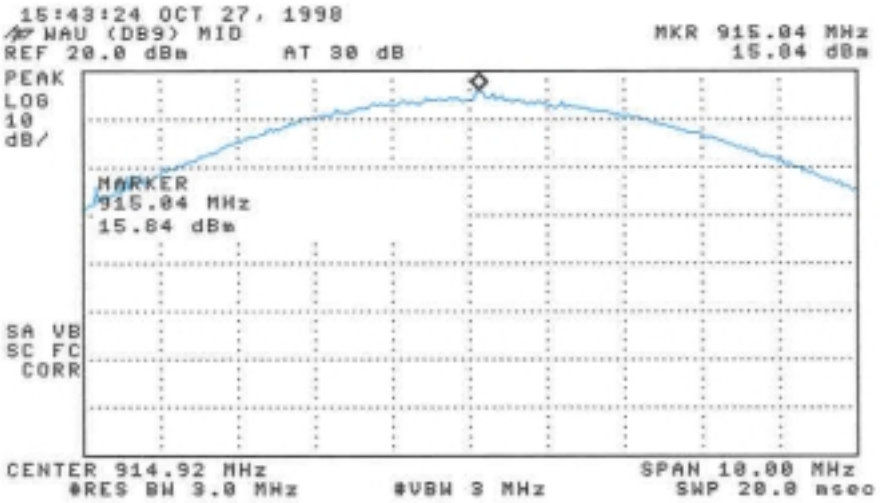
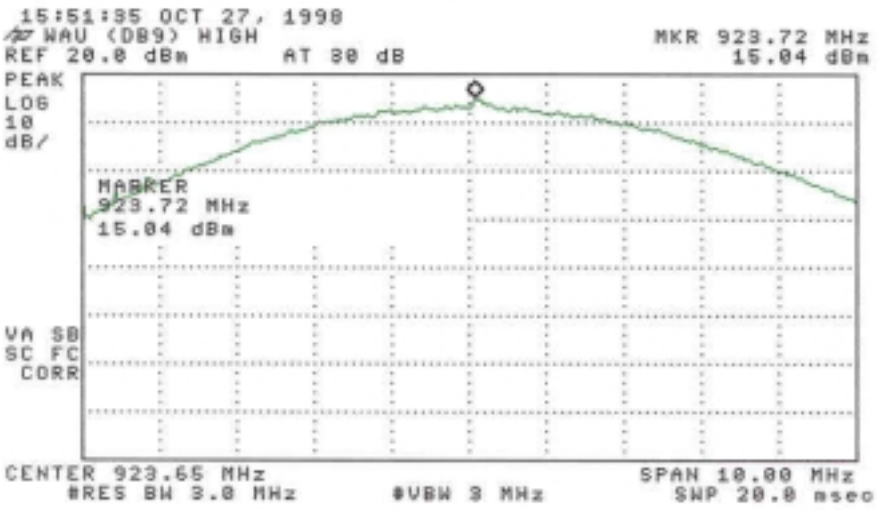


Figure 3c.
Peak Power per FCC Section 15.247(b) (High)



2.7 Antenna Conducted Spurious Emissions in the Frequency Range 30 - 10000 MHz (FCC Section 15.247(c))

Spurious emissions in the frequency range 30 – 10000 MHz have been measured with a spectrum analyzer by connecting the spectrum analyzer directly via a short cable to the antenna output terminals or across the antenna leads on the PCB as specified by the manufacturer. The spectrum analyzer was set for a 50 Ω impedance with the RBW = 100 kHz & VBW > RBW. All spurious emissions measured were greater than 20 dB down from the fundamental. The results of conducted spurious emissions are given in Figure 4a through Figure 4l.

Figure 4a
Conducted Spurious Emissions 15.247(c) Low

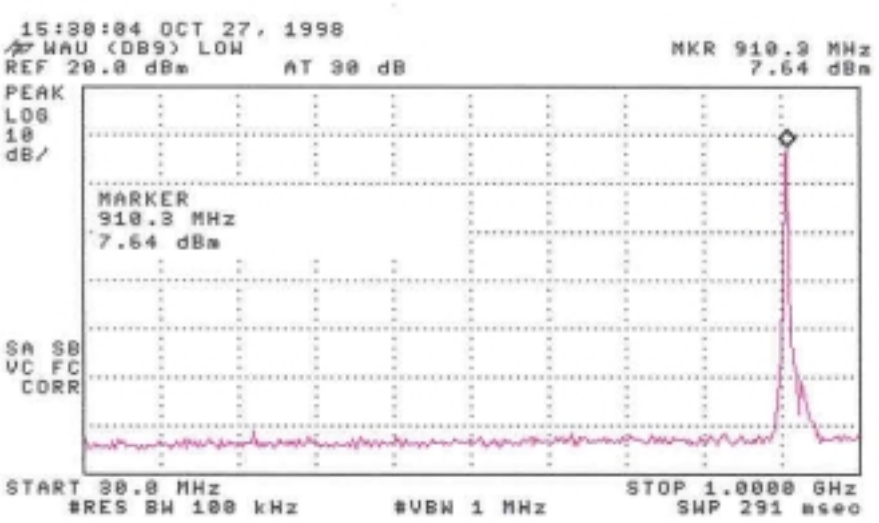


Figure 4b
Conducted Spurious Emissions 15.247(c) Low

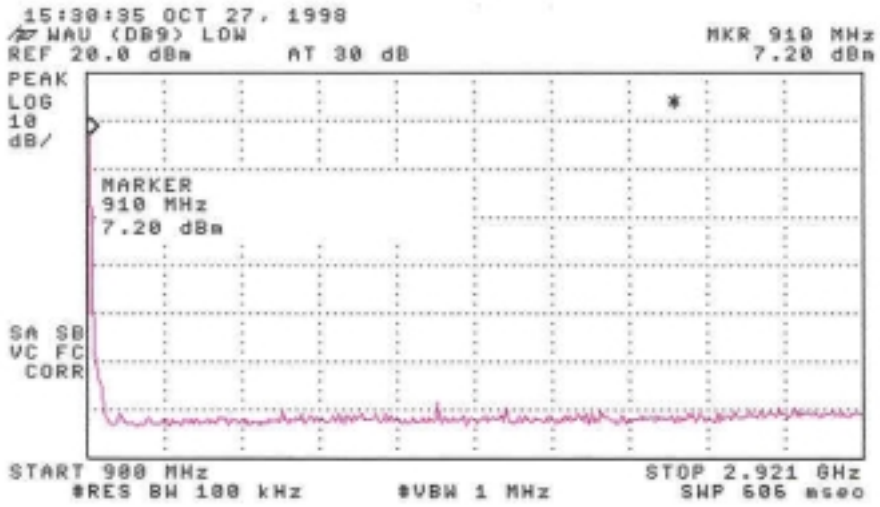


Figure 4c
Conducted Spurious Emissions 15.247(c) Low

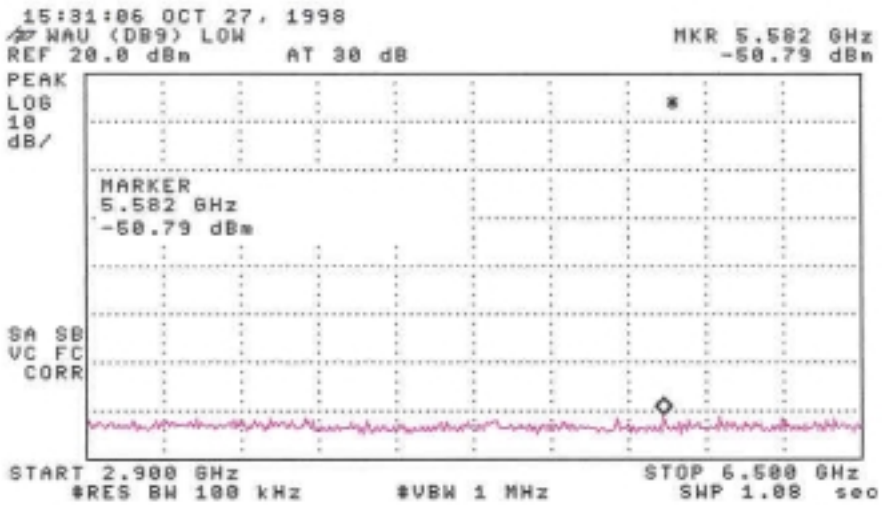


Figure 4d
Conducted Spurious Emissions 15.247(c) Low

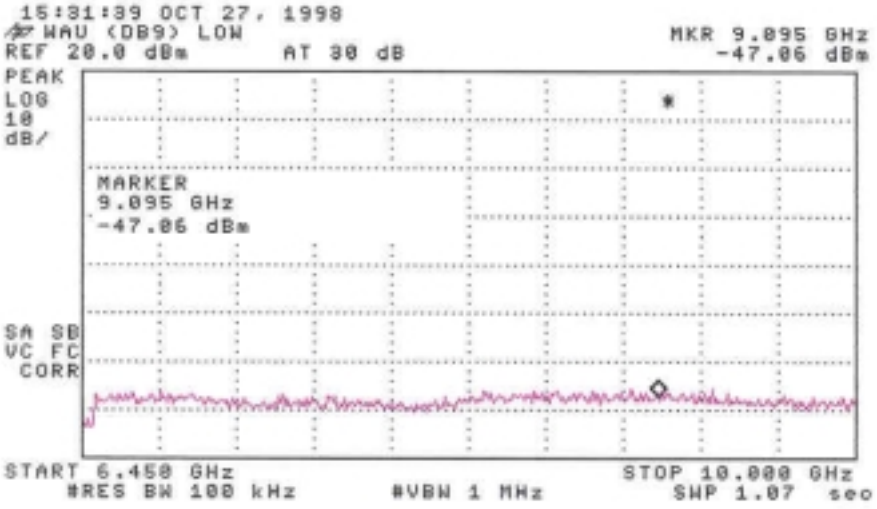


Figure 4e
Conducted Spurious Emissions 15.247(c) Mid

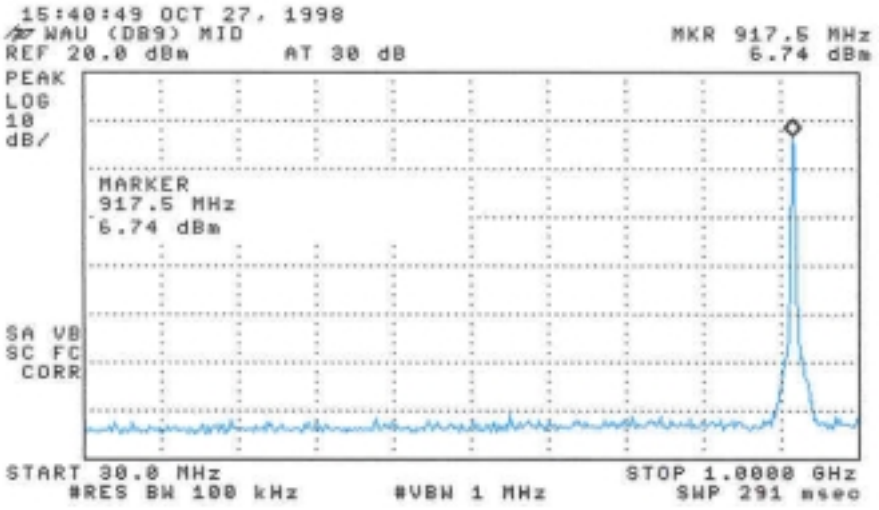


Figure 4f
Conducted Spurious Emissions 15.247(c) Mid

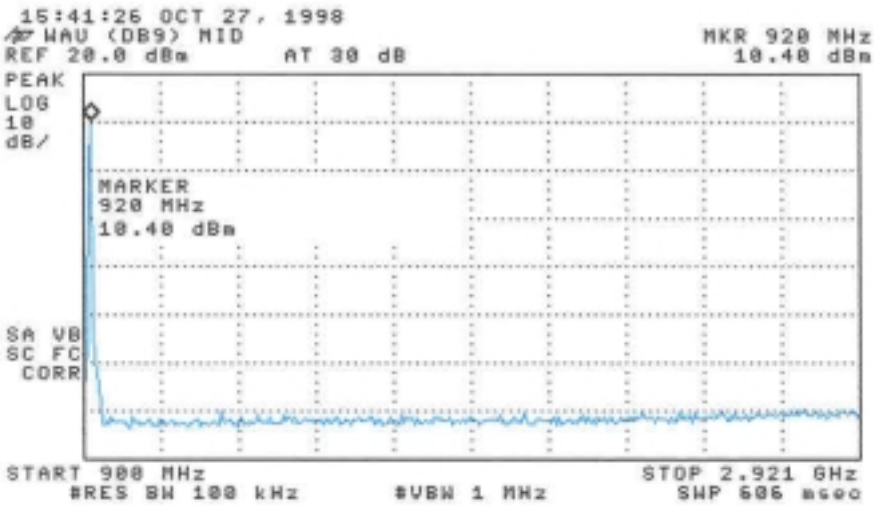


Figure 4g
Conducted Spurious Emissions 15.247(c) Mid

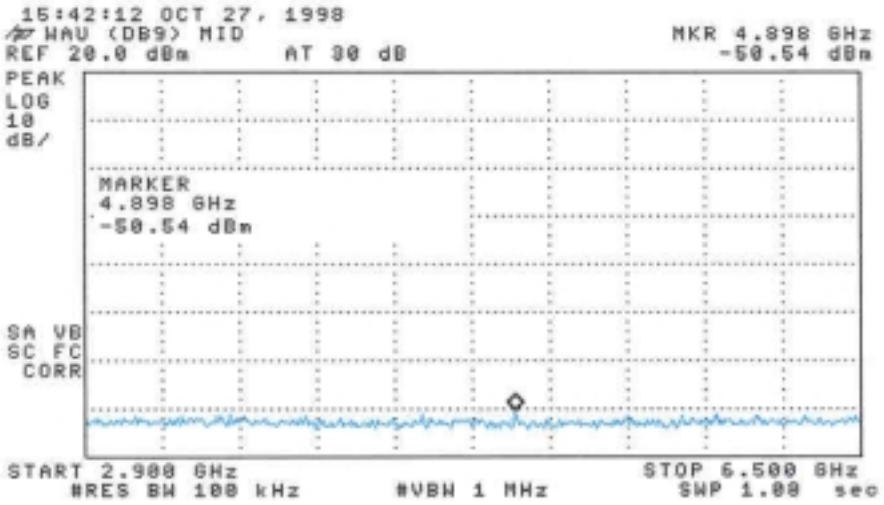


Figure 4h
Conducted Spurious Emissions 15.247(c) Mid

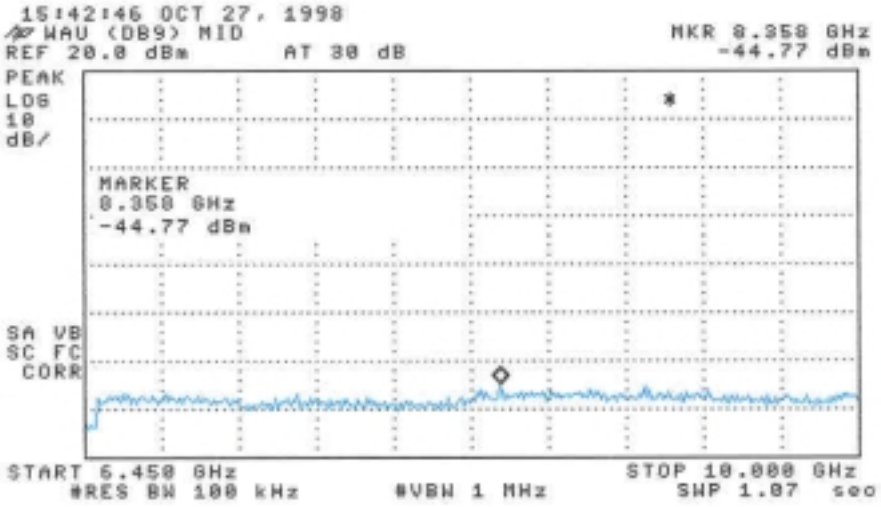


Figure 4i
Conducted Spurious Emissions 15.247(c) High

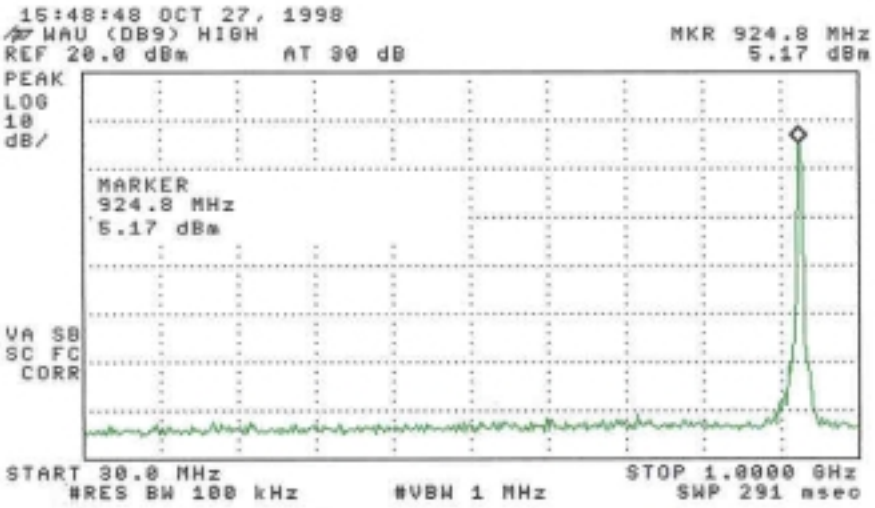


Figure 4j
Conducted Spurious Emissions 15.247(c) High

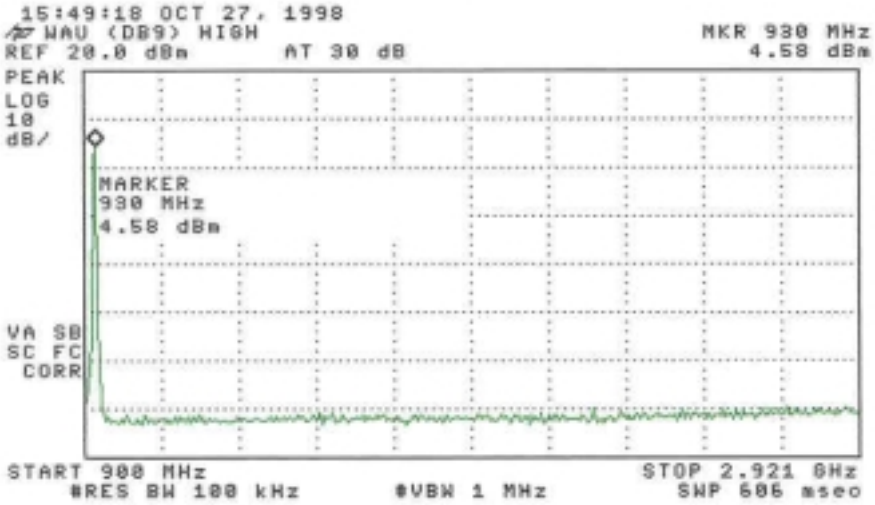


Figure 4k
Conducted Spurious Emissions 15.247(c) High

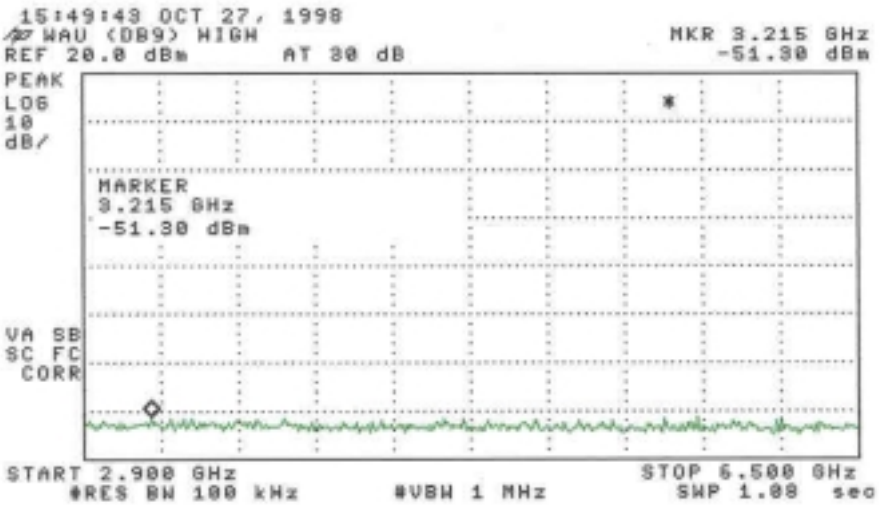
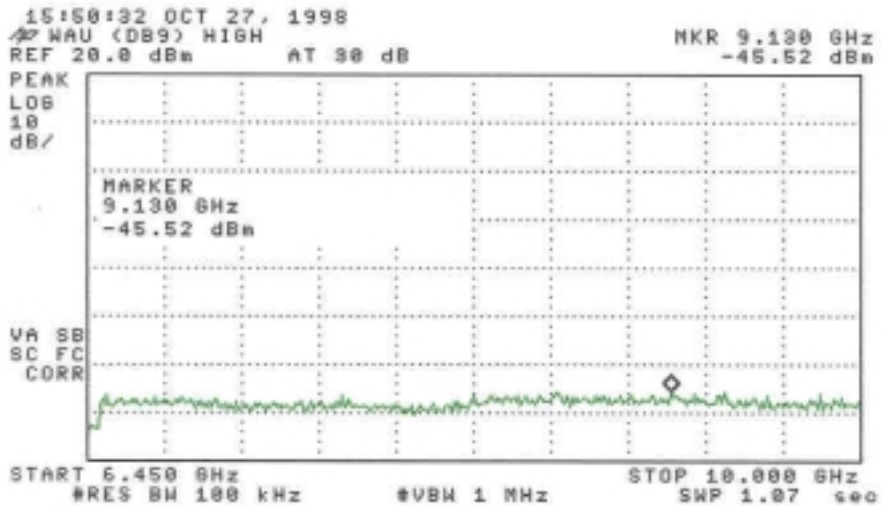


Figure 4l
Conducted Spurious Emissions 15.247(c) High



2.8 Peak Radiated Spurious Emissions in the Frequency Range 30 -10000 MHz (FCC Section 15.247(c))

A preliminary scan was performed on the EUT to determine frequencies that were caused by the transmitter portion of the product. Significant emissions that fell within restricted bands were measured on an OAT's site. Radiated measurements below 1 GHz were tested with a RBW = 120 kHz. Radiated measurements above 1 GHz were measured using a RBW = 1 MHz. The results of peak radiated spurious emissions falling within restricted bands are given in Table 4a (low), Table 4b, (mid), Table 4c (high) and Figure 5a through 5c.

TABLE 4a PEAK RADIATED SPURIOUS EMISSIONS (Low)

Freq. (GHz)	Test Data (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
0.1198	-84.5**	-	11.6	2.3	65.9	150.0
2.7169	-63.6*	34.6	31.4	3.8	158.6	5000

TABLE 4b PEAK RADIATED SPURIOUS EMISSIONS (Mid)

Freq. (GHz)	Test Data (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
2.7450	-63.4*	34.6	31.4	3.8	163.0	5000

TABLE 4c PEAK RADIATED SPURIOUS EMISSIONS (High)

Freq. (GHz)	Test Data (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
0.2780	-86.0	-	11.6	2.3	83.9	200.0
1.0450	-71.7	36.0	26.9	2.2	26.6	5000

*** = Data adjusted by + 1 dB for high pass filter**
**** = Quasi-Peak Measurement**

SAMPLE CALCULATION:
RESULTS (uV/m @ 3m) = Antilog ((-63.6 - 34.6 + 31.4 + 3.8 + 107)/20) = 158.6
CONVERSION FROM dBm TO dBuV = 107 dB

Results
Reviewed by: _____ Name: Tim R. Johnson

Figure 5a
Peak Radiated Spurious Emissions 15.247(c) Low

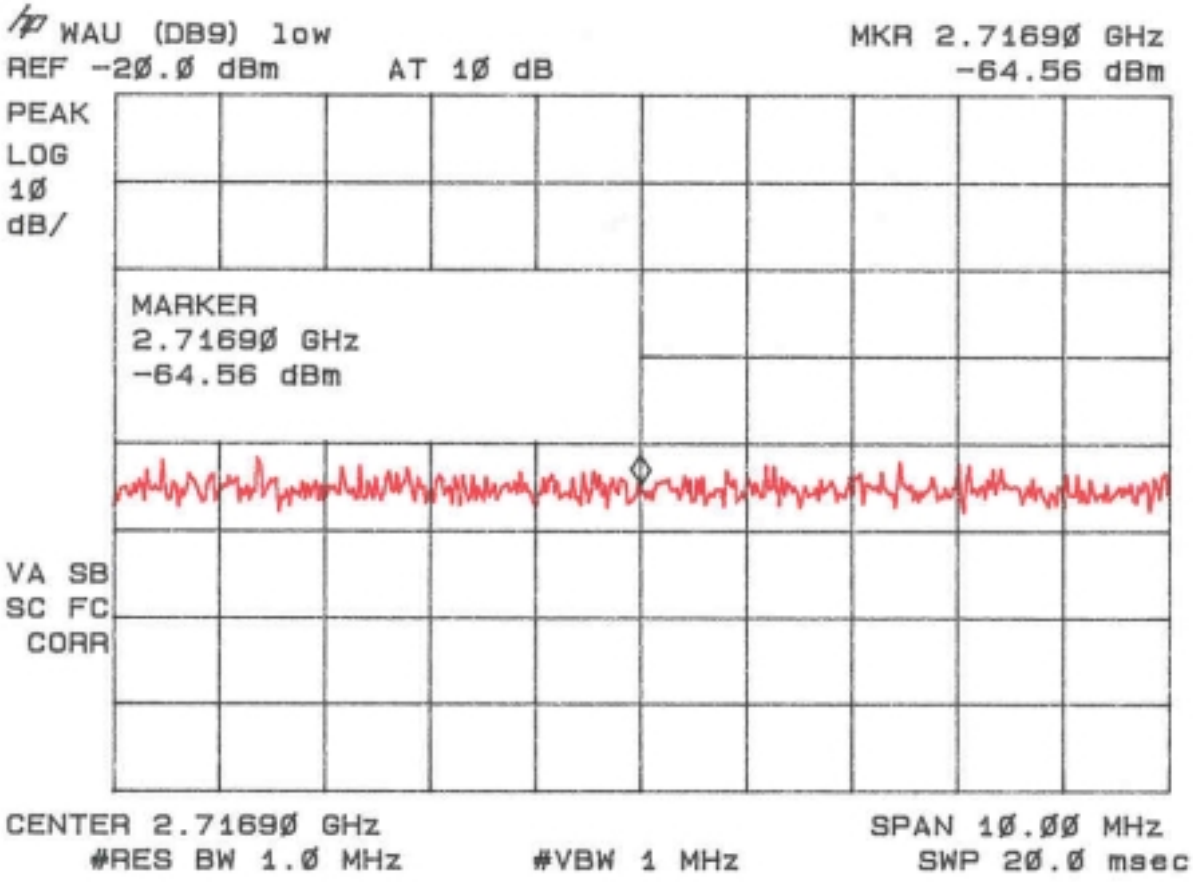


Figure 5b
Peak Radiated Spurious Emissions 15.247(c) Low

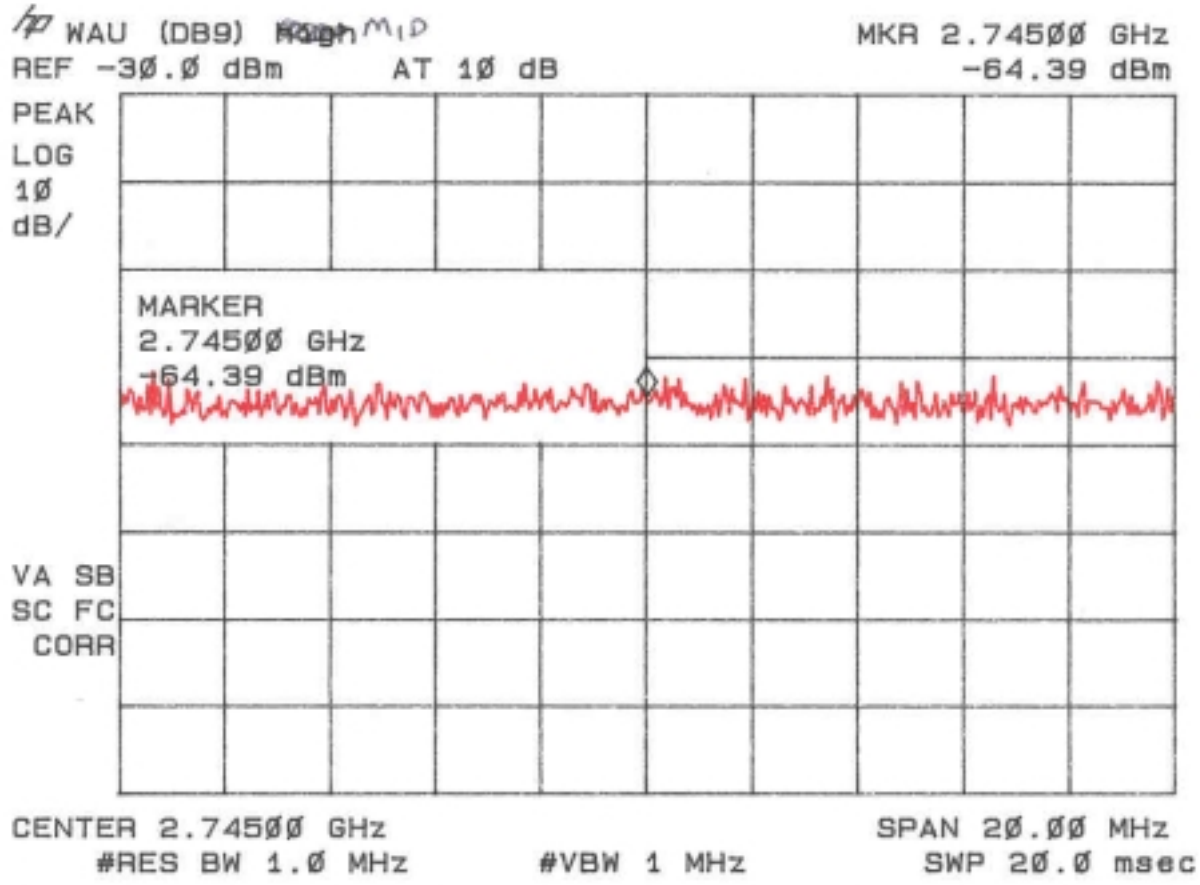
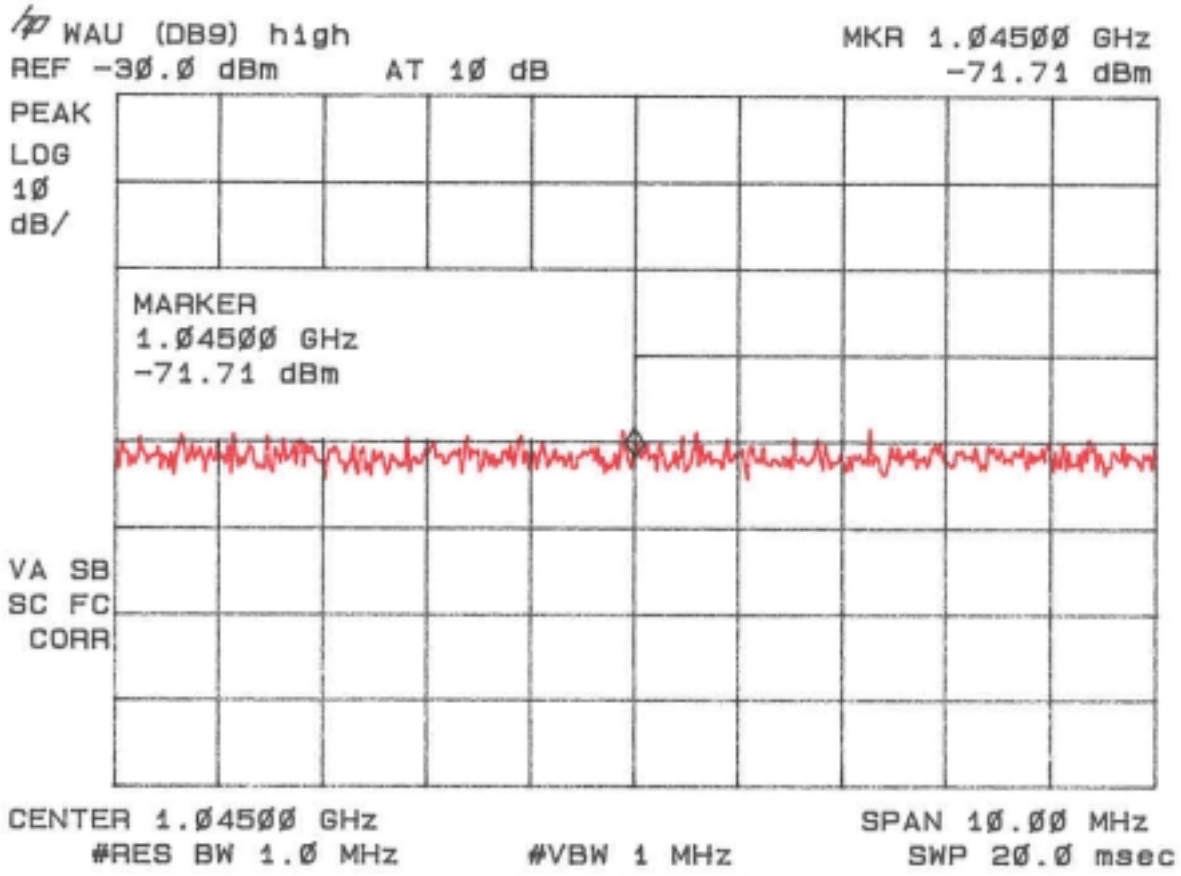


Figure 5c
Peak Radiated Spurious Emissions 15.247(c) Mid



2.9 Average Radiated Spurious Emissions in the Frequency Range 30 - 10000 MHz (FCC Section 15.247(c))

The results of average radiated spurious emissions falling within restricted bands are given in Table 5a (low), Table 5b (mid), Table 5c (high) and Figure 6a through 6c.

TABLE 5a AVERAGE RADIATED SPURIOUS EMISSIONS (Low)

Freq. (GHz)	Test Data (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
2.7169	-73.4*	34.6	31.4	3.8	51.3	500

TABLE 5b AVERAGE RADIATED SPURIOUS EMISSIONS (Mid)

Freq. (GHz)	Test Data (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
2.7450	-73.3*	34.6	31.4	3.8	57.1	500

TABLE 5c AVERAGE RADIATED SPURIOUS EMISSIONS (High)

Freq. (GHz)	Test Data (dBm) @3m	Amp. Gain (dB)	Antenna Factor (dB)	Cable Loss (dB)	Results (uV/m) @3m	FCC Limits (uV/m) @3m
1.0450	-81.2	36.0	26.9	2.2	8.9	500

*** = Data adjusted by + 1dB for high pass filter.**
**** = Instrumentation ground floor.**

SAMPLE CALCULATION:

RESULTS (uV/m @ 3m) = Antilog ((-73.4 - 34.6 + 31.4 + 3.8 + 107)/20) = 51.3
CONVERSION FROM dBm TO dBuV = 107 dB

Results
Reviewed by: _____ Name: Tim R. Johnson

Figure 6a
Average Radiated Spurious Emissions 15.247(c) Low

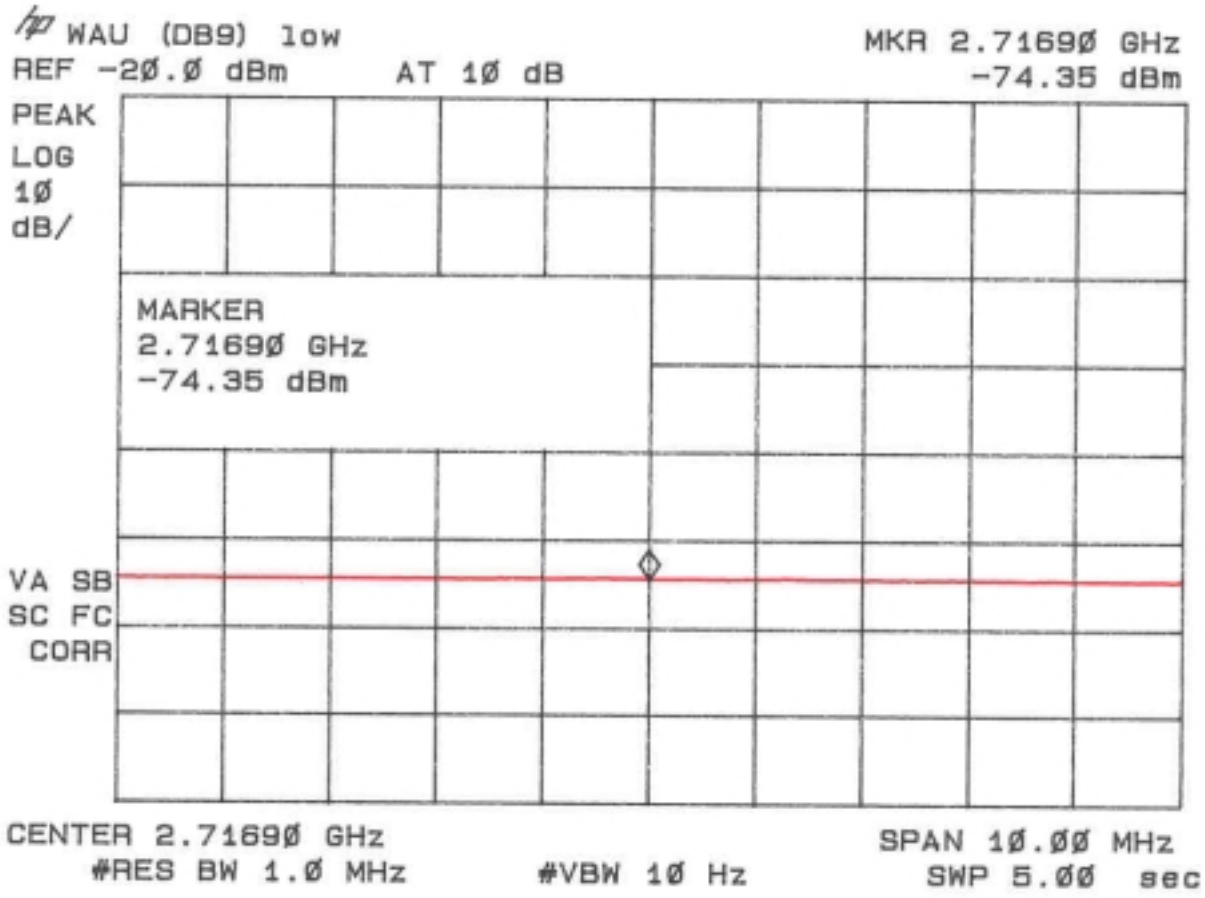


Figure 6b
Average Radiated Spurious Emissions 15.247(c) Low

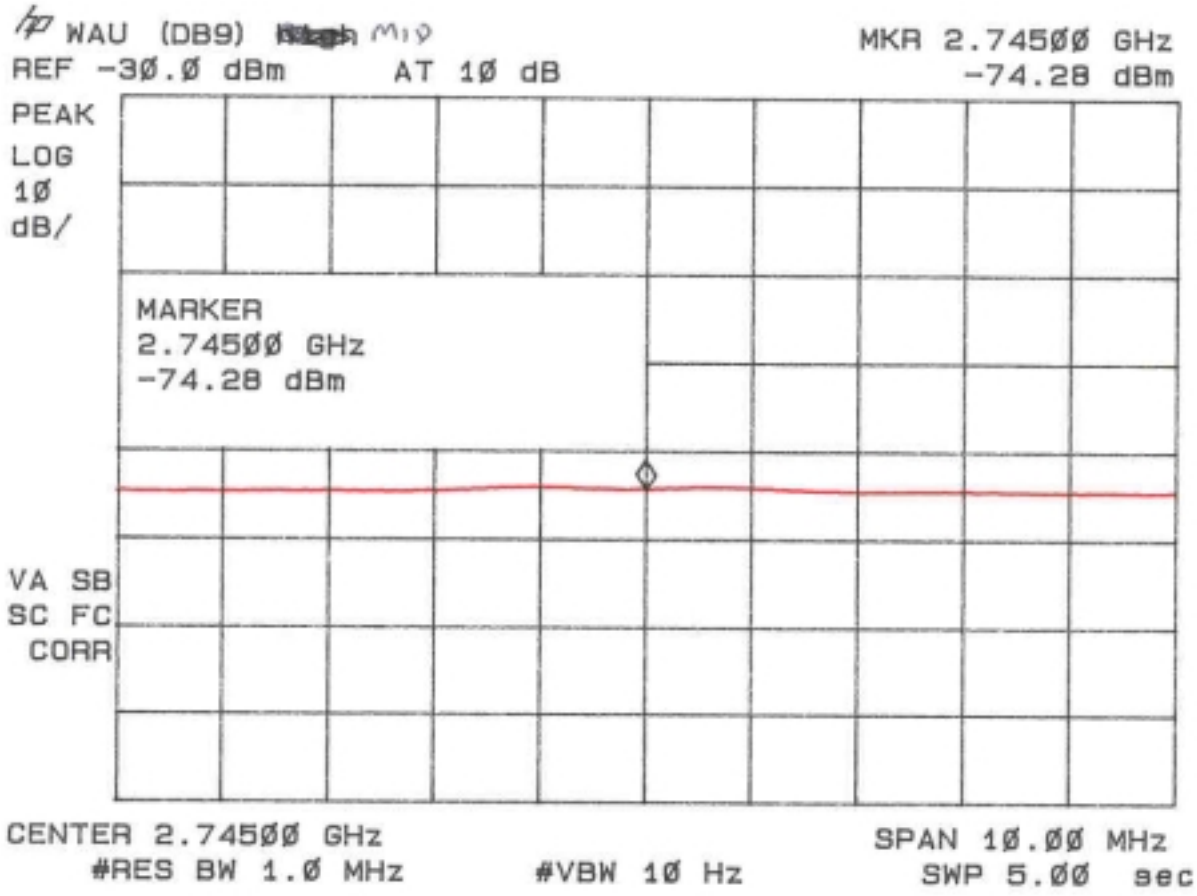
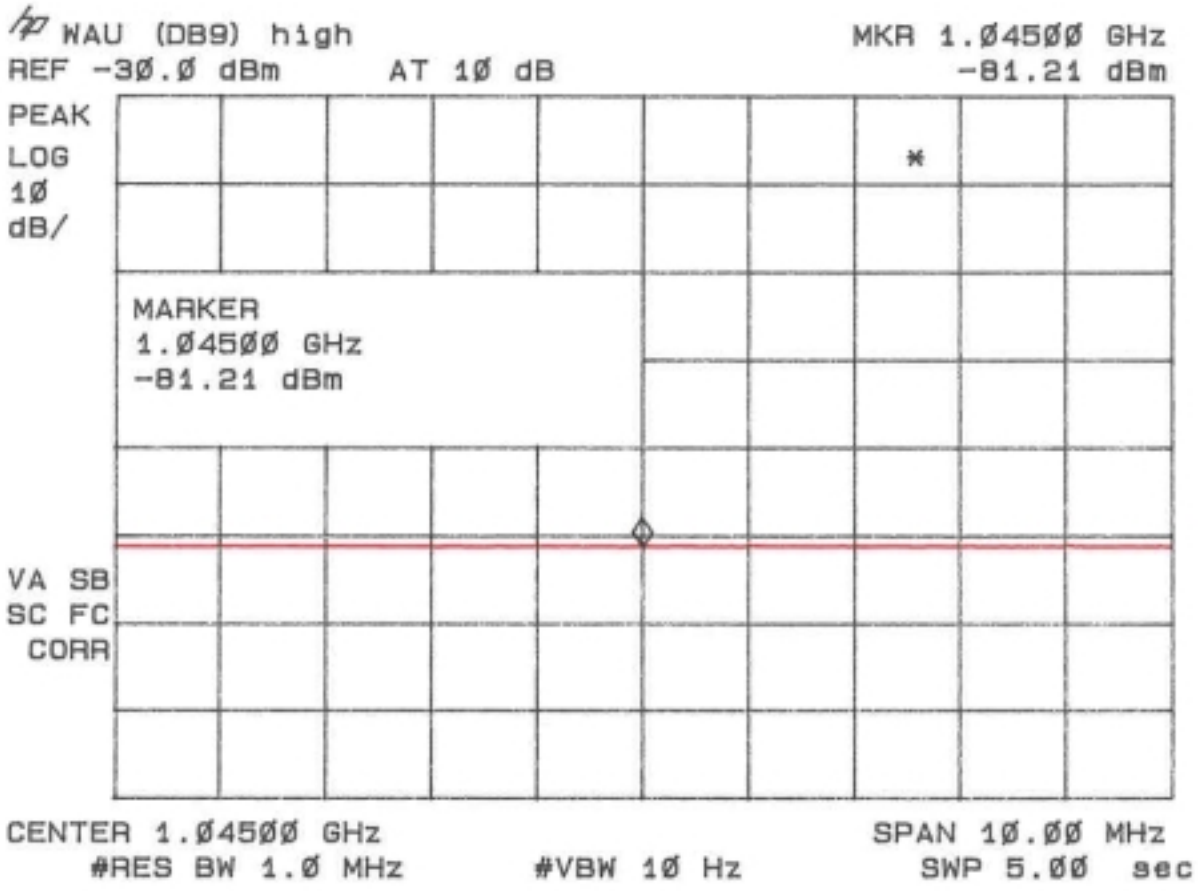


Figure 6c
Average Radiated Spurious Emissions 15.247(c) Mid



2.10 Minimum 6 dB Bandwidth per FCC Section 15.247(a)(2)

The minimum 6 dB bandwidth of the EUT was measured. The spectrum analyzer was set for a 50 Ω impedance with the RBW=100 kHz and VBW ≥ RBW. If the EUT incorporates different spreading codes or data rates these were each investigated, and the one which produced the smallest 6 dB bandwidth was selected for test. All bandwidths measured are greater than 500 kHz minimum requirement specified by the FCC. The results of this test are given in Figure 7a through Figure 7c.

Figure 7a.
6 dB Bandwidth per FCC Section 15.247(a)(2) (low)

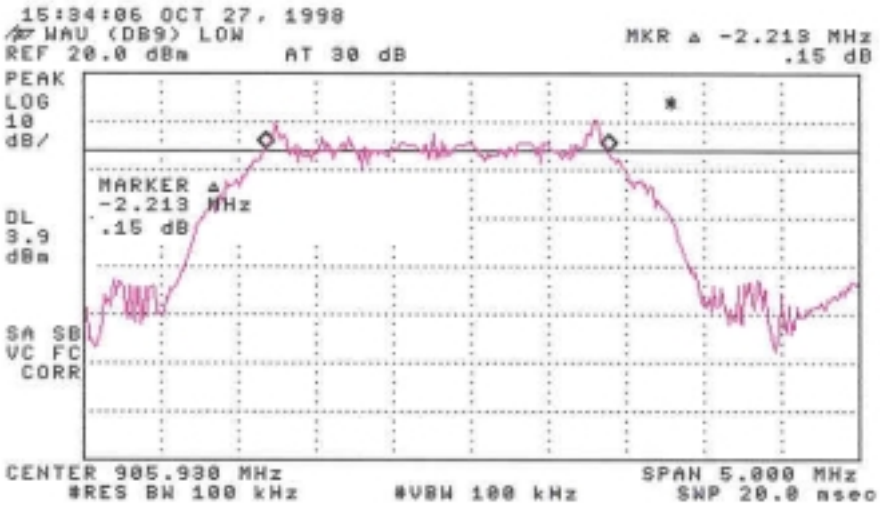


Figure 7b.
6 dB Bandwidth per FCC Section 15.247(a)(2) (Mid)

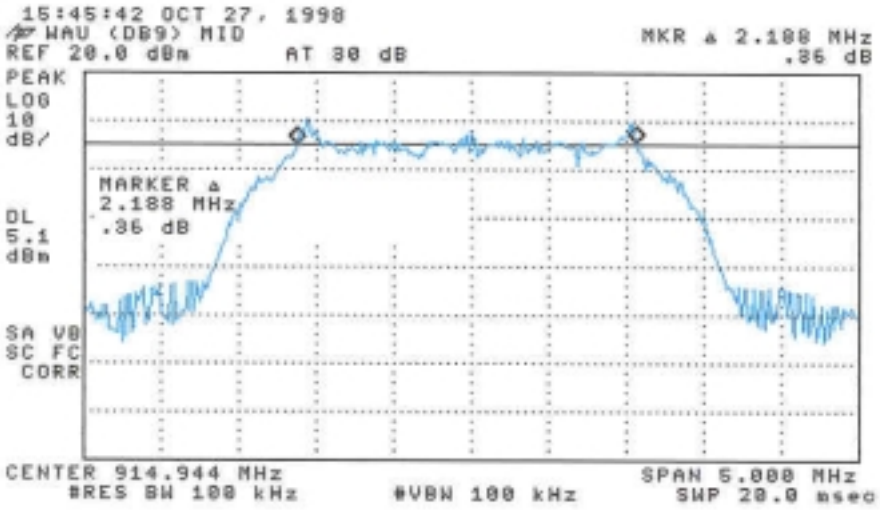
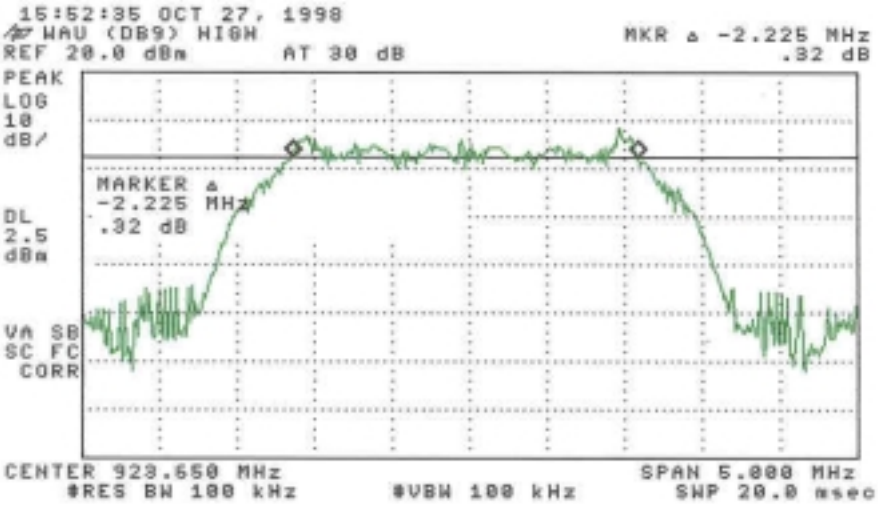


Figure 7c.
6 dB Bandwidth per FCC Section 15.247(a)(2) (High)



2.11 Power Spectral Density FCC Section 15.247(b) and 15.247(d)

The transmitter power spectral density averaged over any 1 second interval is given in Table 7a (low), Table 7b (mid), Table 7c (high) and Figure 8a through Figure 8c. If the EUT incorporates different spreading codes or data rates these were each investigated and the one which produced the highest spectral density was selected for test. The measurement was made using a spectrum analyzer utilizing noise marker mode. A 34.8 dBm adjustment has been added to the measurement to correct from 1 Hz to 3 kHz measurement.

POWER SPECTRAL DENSITY

Test Date: October 27, 1998
UST Project: 98-589
Customer: Home Wireless Networks, Inc.
Model: 95-0003-XXX

TABLE 7a POWER SPECTRAL DENSITY (Low)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-46.72	-11.92	+8.0

TABLE 7a POWER SPECTRAL DENSITY (Mid)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-45.63	-10.83	+8.0

TABLE 7a POWER SPECTRAL DENSITY (High)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-45.90	-11.10	+8.0

Note: 34.8 dBm has been added to correct from 1 Hz to 3 kHz

Tester Signature:  **Name: Tim R. Johnson**

Figure 8a
Power Spectral Density 15.247(b) and 15.247(d) Low

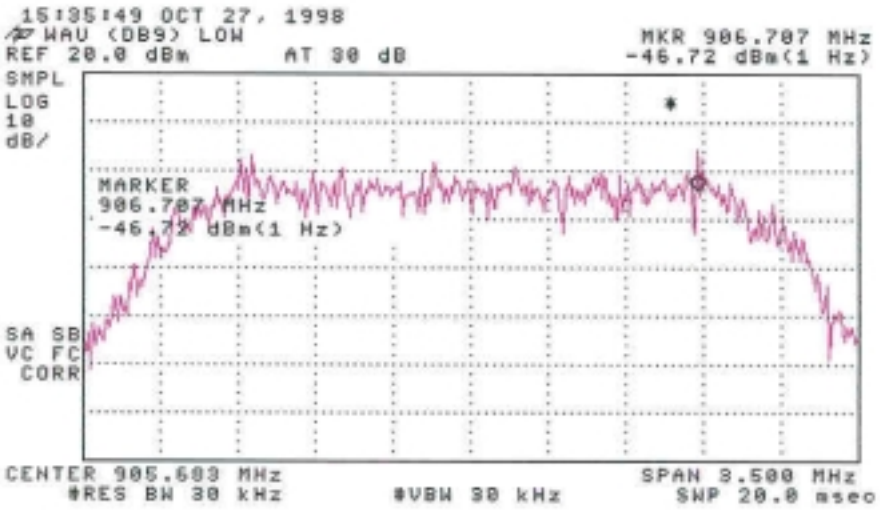


Figure 8b
Power Spectral Density 15.247(b) and 15.247(d) Mid

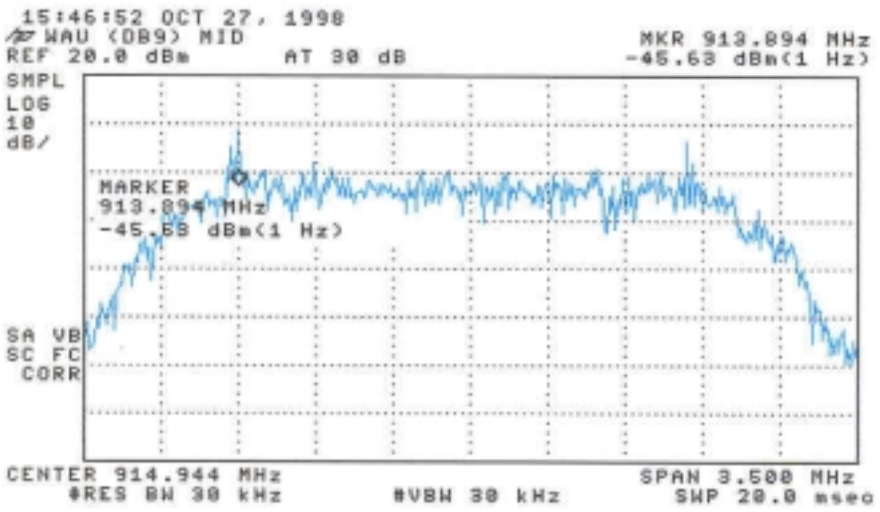
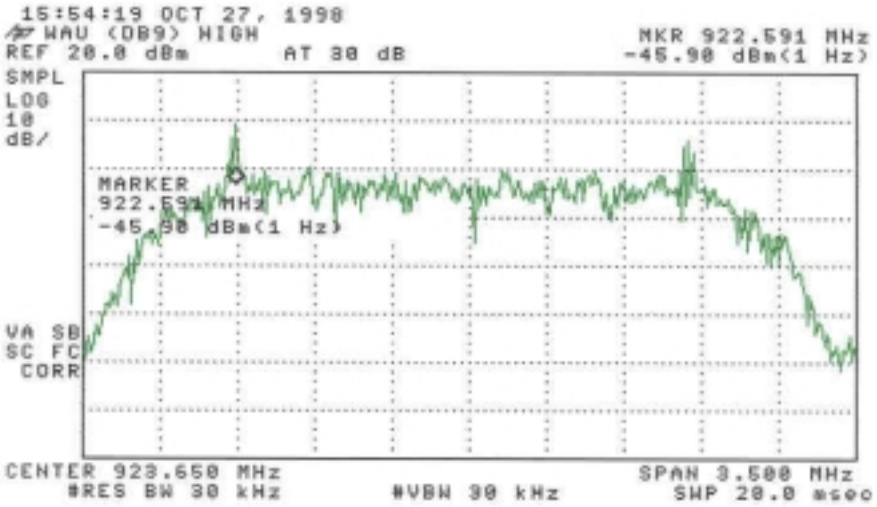


Figure 8c
Power Spectral Density 15.247(b) and 15.247(d) High



2.12 Processing Gain

Data regarding processing gain has been provided on the following page(s) from Home Wireless Networks, Inc.

This information has been provided in a separate file

2.13 Power Line Conducted Emissions for Transmitter FCC Section 15.207

The conducted voltage measurements have been carried out in accordance with FCC Section 15.207, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmit. A preliminary scan was performed for a typical low, middle, and high channel. Final data was taken only for the worse case mode of operation determined from the preliminary scan. The results are given in Table 8.

TABLE 8. POWER LINE CONDUCTED EMISSIONS DATA (TRANSMITTER)
CLASS B

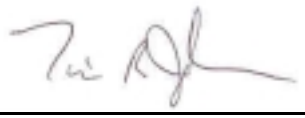
Test Date: October 27, 1998
UST Project: 98-589
Customer: Home Wireless Networks, Inc.
Product: 95-0003-XXX

Worse Case Mode = Channel 35

FREQUENCY (MHz)	TEST DATA (dBm) PHASE	TEST DATA (dBm) NEUTRAL	LISN LOSS (dBm) PHASE	LISN LOSS (dBm) NEUTRAL	CABLE FACTOR (dB)	RESULTS (uV) PHASE	RESULTS (uV) NEUTRAL	FCC LIMITS (uV)	MARGIN BELOW LIMIT (dB) PHASE	MARGIN BELOW LIMIT (dB) NEUTRAL
0.46	-77.0	-74.0	0.1	0.1	0.1	32.2	45.7	250.0	17.8	14.8
5.00	-79.0	-81.0	0.0	0.0	0.3	26.0	20.7	250.0	19.7	21.7
11.80	-71.0	-85.0	0.0	0.0	0.4	66.4	13.2	250.0	11.5	25.5
13.60	-72.0	-84.0	0.1	0.1	0.5	60.4	15.2	250.0	12.3	24.3
15.10	-66.0	-76.0	0.1	0.1	0.5	120.4	38.1	250.0	6.3	16.3
17.60	-83.0	-84.0	0.1	0.1	0.6	17.2	15.3	250.0	23.3	24.3
21.50	-83.0	-81.0	0.1	0.1	0.7	17.4	21.9	250.0	23.2	21.2

SAMPLE CALCULATIONS:

RESULTS uV =
Antilog ((-77.0 + 0.1 + 0.1 + 107)/20) = 32.2
CONVERSION FROM dBm TO dBuV = 107 dB

Results
Reviewed by:  **Name: Tim R. Johnson**

2.14 Radiated Emissions for Digital Device & Receiver (47 CFR 15.109a)

Radiated emissions were evaluated from 30 to 5000 MHz while the EUT was placed into a Receive mode of operation. Measurements were made with the analyzer's bandwidth set to 120 kHz for measurements made less than 1 GHz and 1 MHz for measurements made greater then or equal to 1 GHz.

Since the EUT is subject to a DoC authorization as a PC peripheral, this data has been provided in a separate report. This data may be provided to the FCC upon request.

2.15 Power Line Conducted Emissions for Digital Device and Receiver FCC Section 15.107

The conducted voltage measurements have been carried out in accordance with FCC Section 15.107, with a spectrum analyzer connected to a LISN and the EUT placed into a continuous mode of transmit.

Since the EUT is subject to a DoC authorization as a PC peripheral, this data has been provided in a separate report. This data may be provided to the FCC upon request.

SECTION 3

LABELING INFORMATION

This information has been provided in a separate file

SECTION 4

BLOCK DIAGRAM(S) / SCHEMATIC(S)

This information has been provided in a separate file

SECTION 5

PHOTOGRAPHS

PHOTOS OF THE TESTED EUT

The following photos are attached:

Photo 1. EUT, Front View
Photo 2. EUT, Rear View
Photo 3. EUT, Internal View Showing Antenna (Cover Opened)
Photo 4. EUT, Top View of Transceiver Board (Shield Installed)
Photo 5. EUT, Top View of Transceiver Board (Shield Removed)
Photo 6. EUT, Bottom View of Transceiver Board
Photo 7. EUT, Top View of Main Board (Shield Installed)
Photo 8. EUT, Top View of Main Board (Shield Removed)
Photo 9. EUT, Bottom View of Main Board

These have been provided in separate files

SECTION 6

USER'S MANUAL

This information has been provided in a separate file