

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 then 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 = VBW = 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 5h.

The EUT was checked in both horizontal and vertical diversity. Only the worse case readings have been reported.

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
4.5280	-57.6	34.3	34.2	4.4	485.7	5000
5.1380	-59.5	34.2	35.3	4.4	442.6	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
4.5748	-57.8	34.3	34.3	4.4	477.2	5000
5.1842	-61.4	34.2	35.4	4.4	364.3	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
2.6340	-56.7	34.6	31.4	3.7	346.2	5000
3.6950	-59.8	34.4	33.3	4.5	337.2	5000
4.6174	-58.4	34.3	34.4	4.3	447.6	5000
5.1173	-59.3	34.2	35.2	4.3	448.1	5000

* = Data adjusted by + 1 dB for high pass filter

** = Instrumentation ground floor

SAMPLE CALCULATION:**RESULTS (uV/m @ 3m) = Antilog ((-57.6 – 34.3 + 34.2 + 4.4 + 107)/20) = 485.7****CONVERSION FROM dBm TO dBuV = 107 dB**

Test Results

Reviewed By:  Name: Tim R. Johnson

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

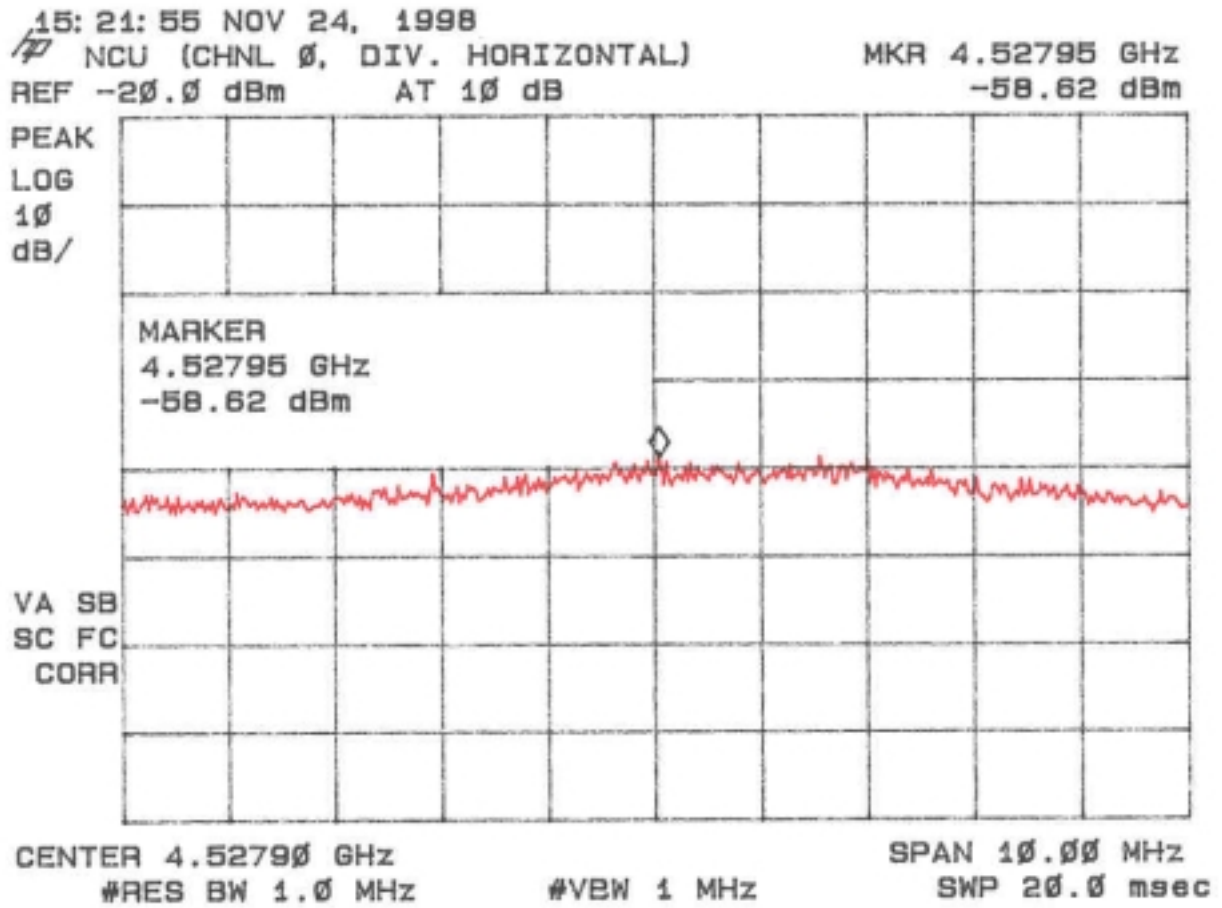


Figure 5b
Peak Radiated Spurious Emissions 15.247(c) Low

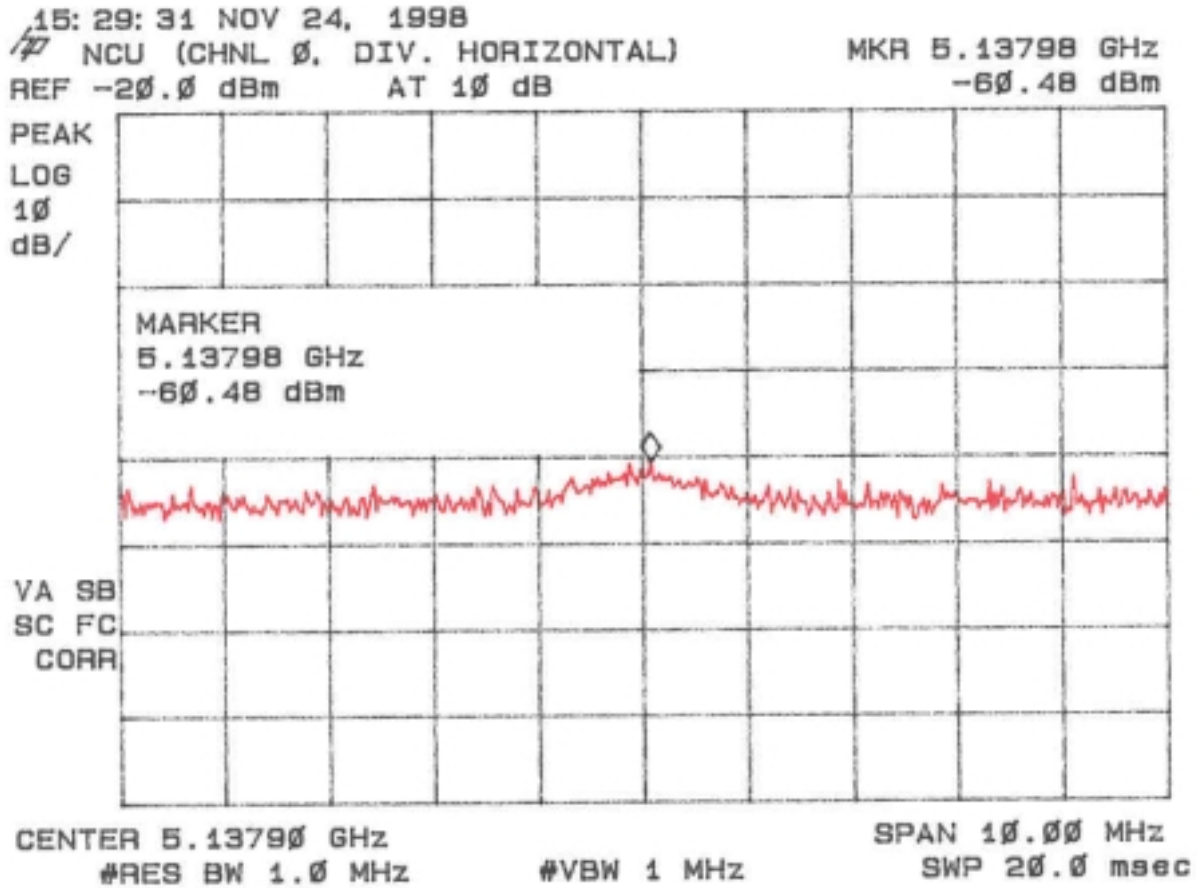


Figure 5c
Peak Radiated Spurious Emissions 15.247(c) Low

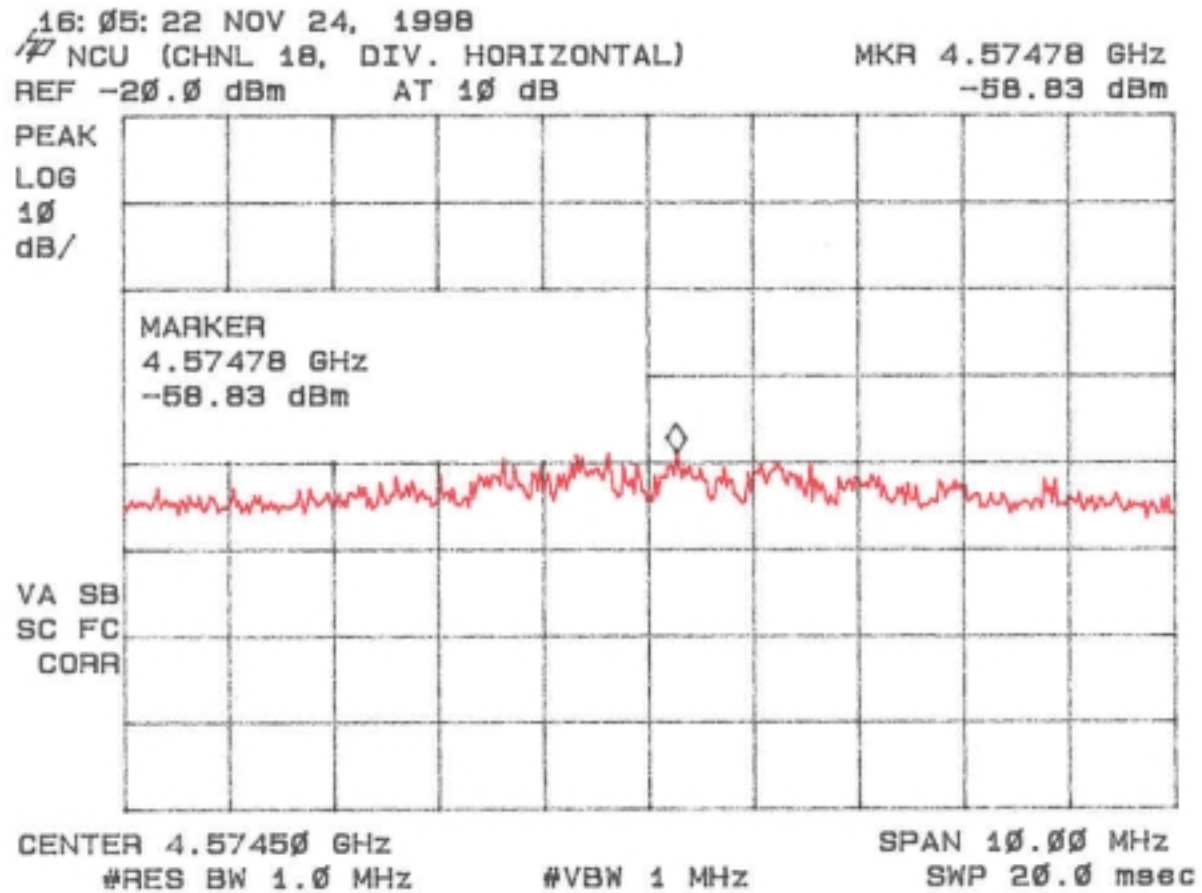


Figure 5d
Peak Radiated Spurious Emissions 15.247(c) Mid

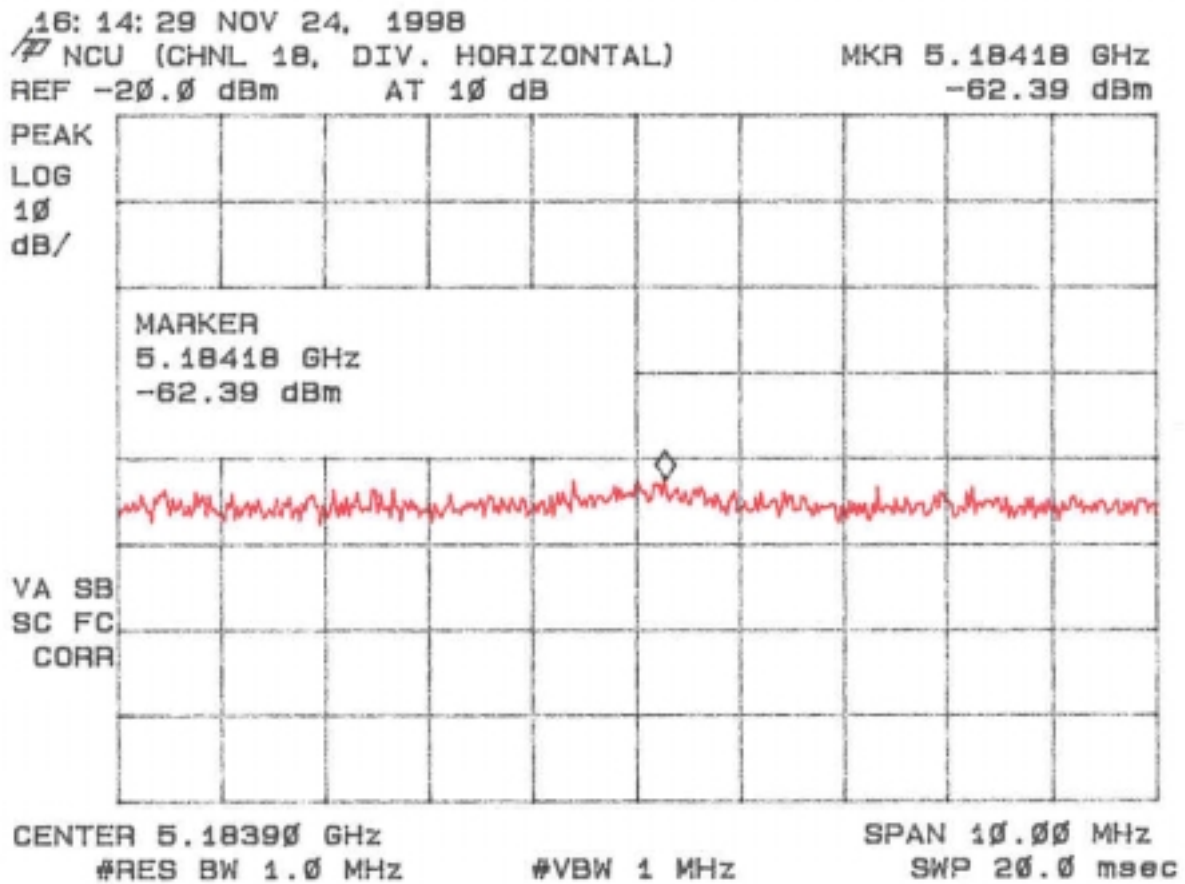


Figure 5e
Peak Radiated Spurious Emissions 15.247(c) Mid

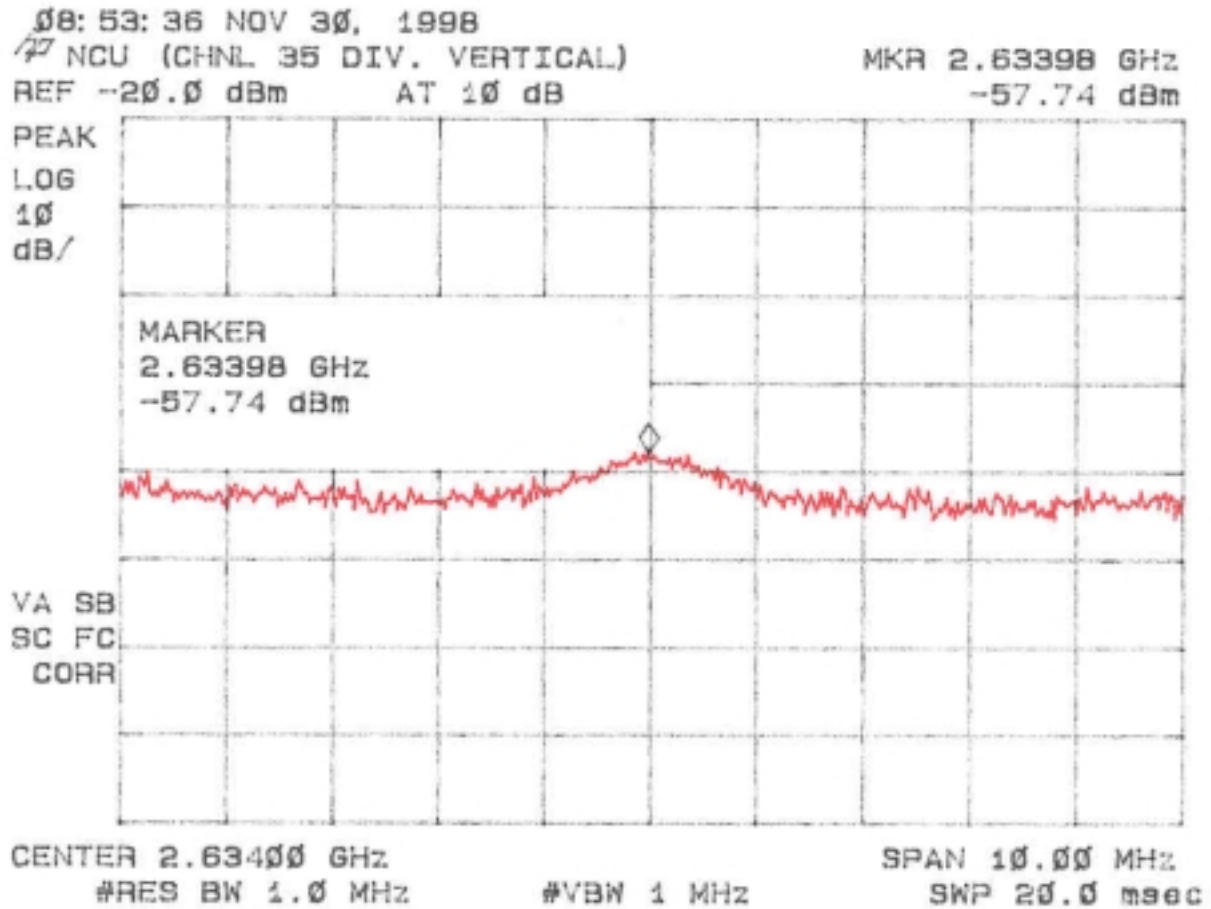


Figure 5f
Peak Radiated Spurious Emissions 15.247(c) Mid

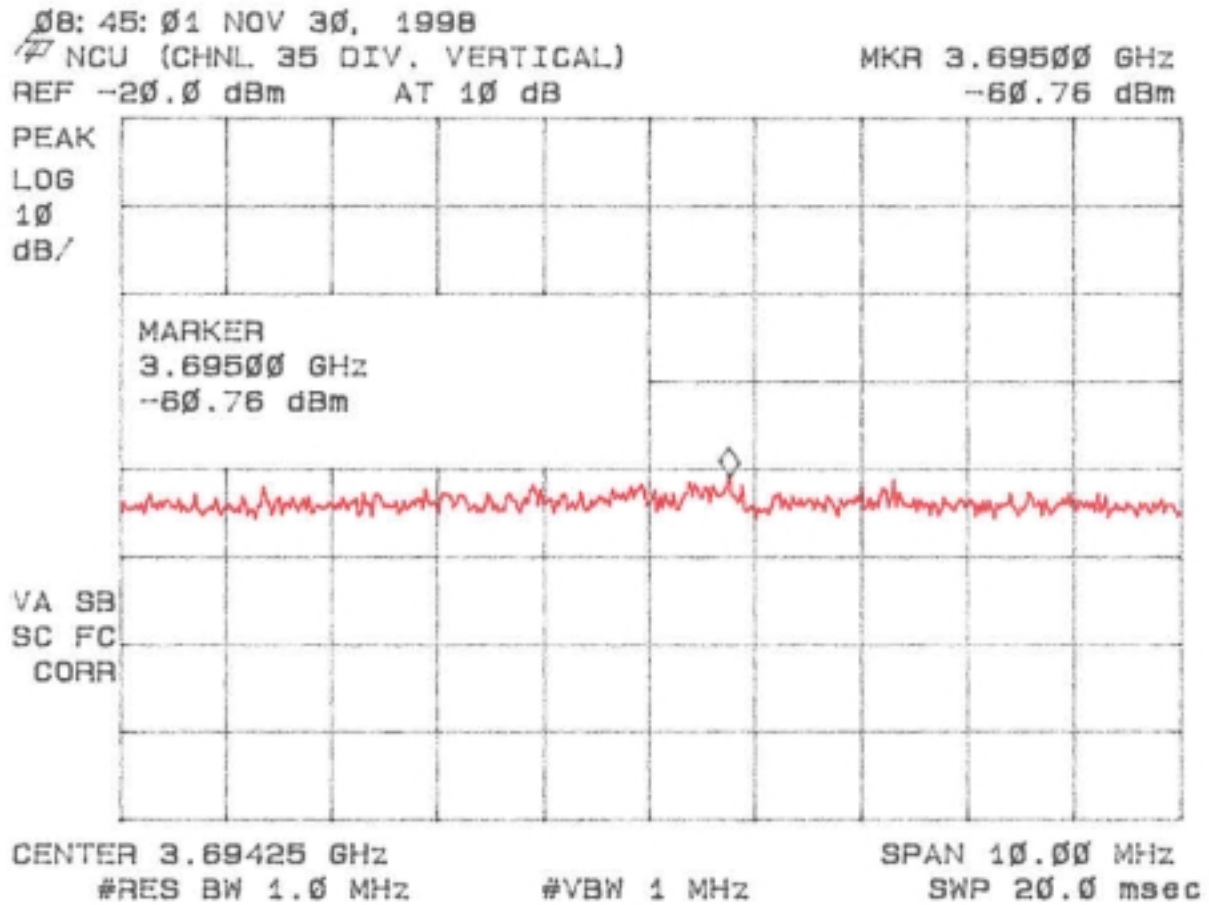


Figure 5g
Peak Radiated Spurious Emissions 15.247(c) High

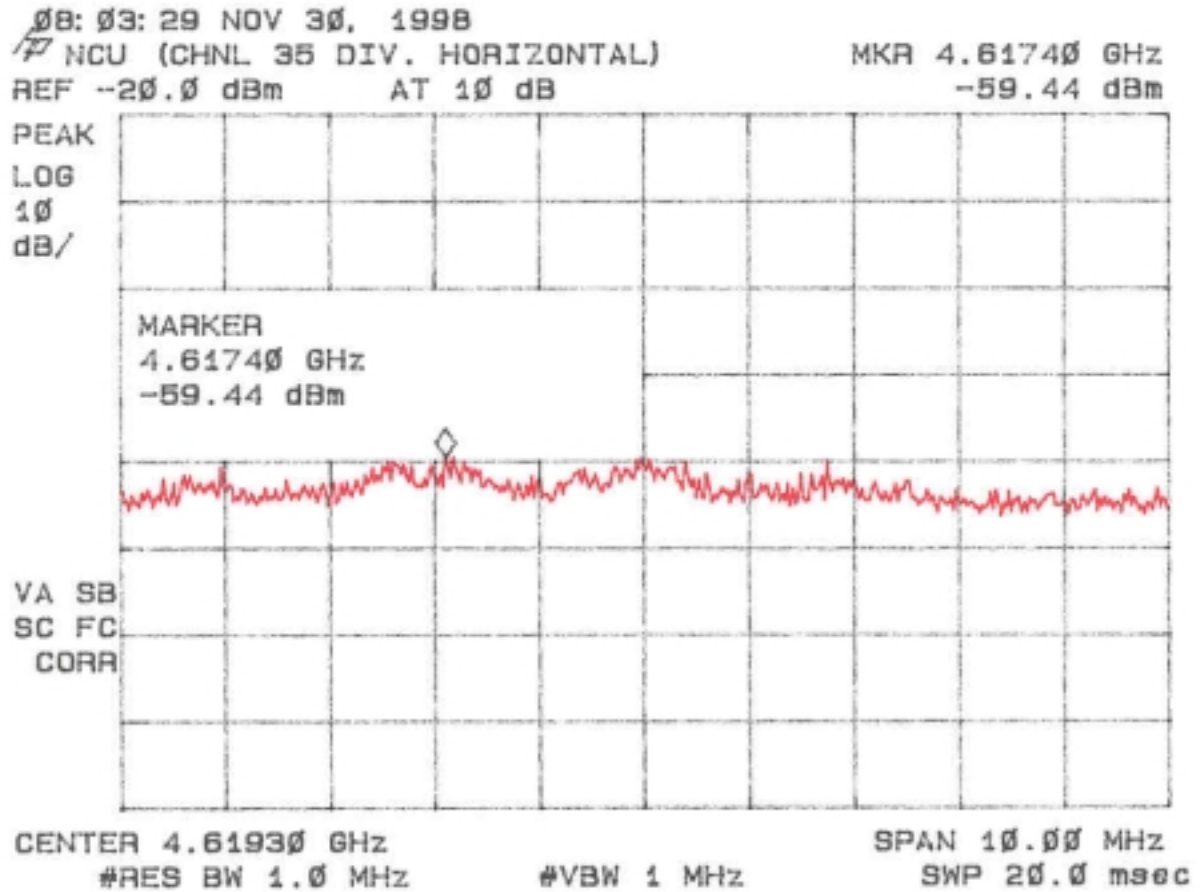
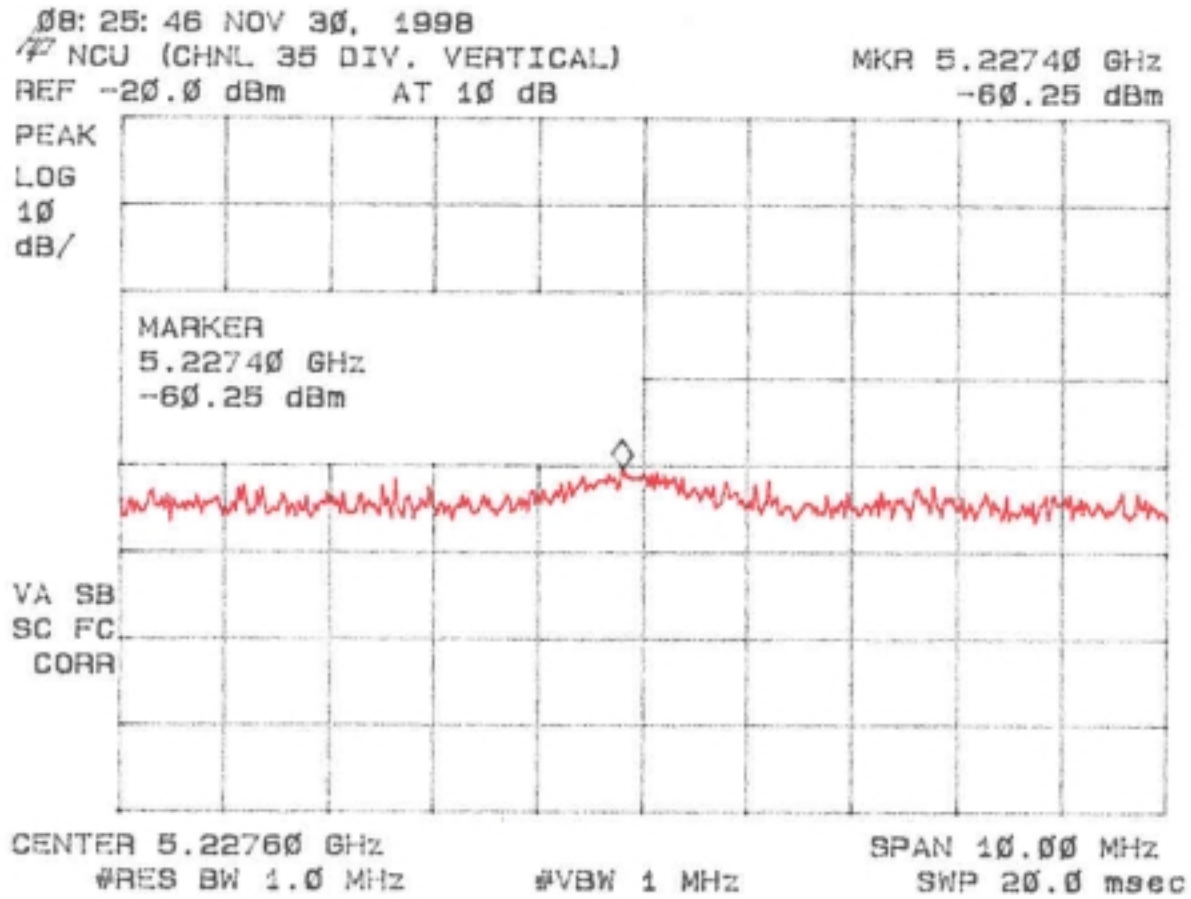


Figure 5h
Peak Radiated Spurious Emissions 15.247(c) High



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 6h.

The EUT was checked in both horizontal and vertical diversity. Only the worse case readings have been reported.

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
4.5284	-74.1	34.3	34.2	4.4	72.7	500
5.1379	-69.5	34.2	35.3	4.4	140.0	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
4.5739	-74.8	34.3	34.3	4.4	67.4	500
5.1840	-72.7	34.2	35.4	4.4	99.2	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
2.6340	-65.9	34.6	31.4	3.7	120.1	500
3.6946	-73.3	34.4	33.3	4.5	71.3	500
4.6174	-74.0	34.3	34.4	4.3	74.3	500
5.2275	-67.9	34.2	35.5	4.5	176.3	500

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

** = Instrumentation ground floor.

SAMPLE CALCULATION:

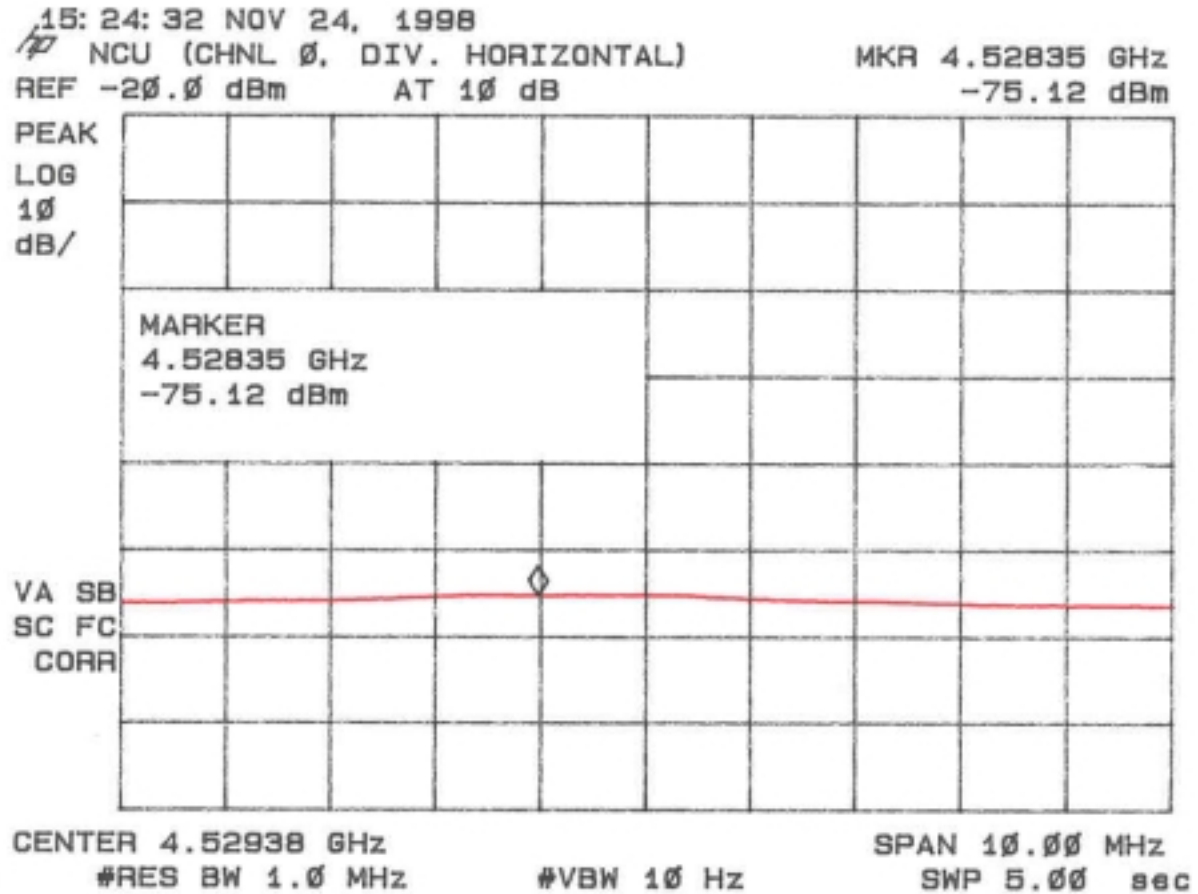
RESULTS (uV/m @ 3m) = Antilog ((-74.1 - 34.3 + 34.2 + 4.4 + 107)/20) = 72.7

CONVERSION FROM dBm TO dBuV = 107 dB

Test Results

Reviewed By:  Name: Tim R. Johnson

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



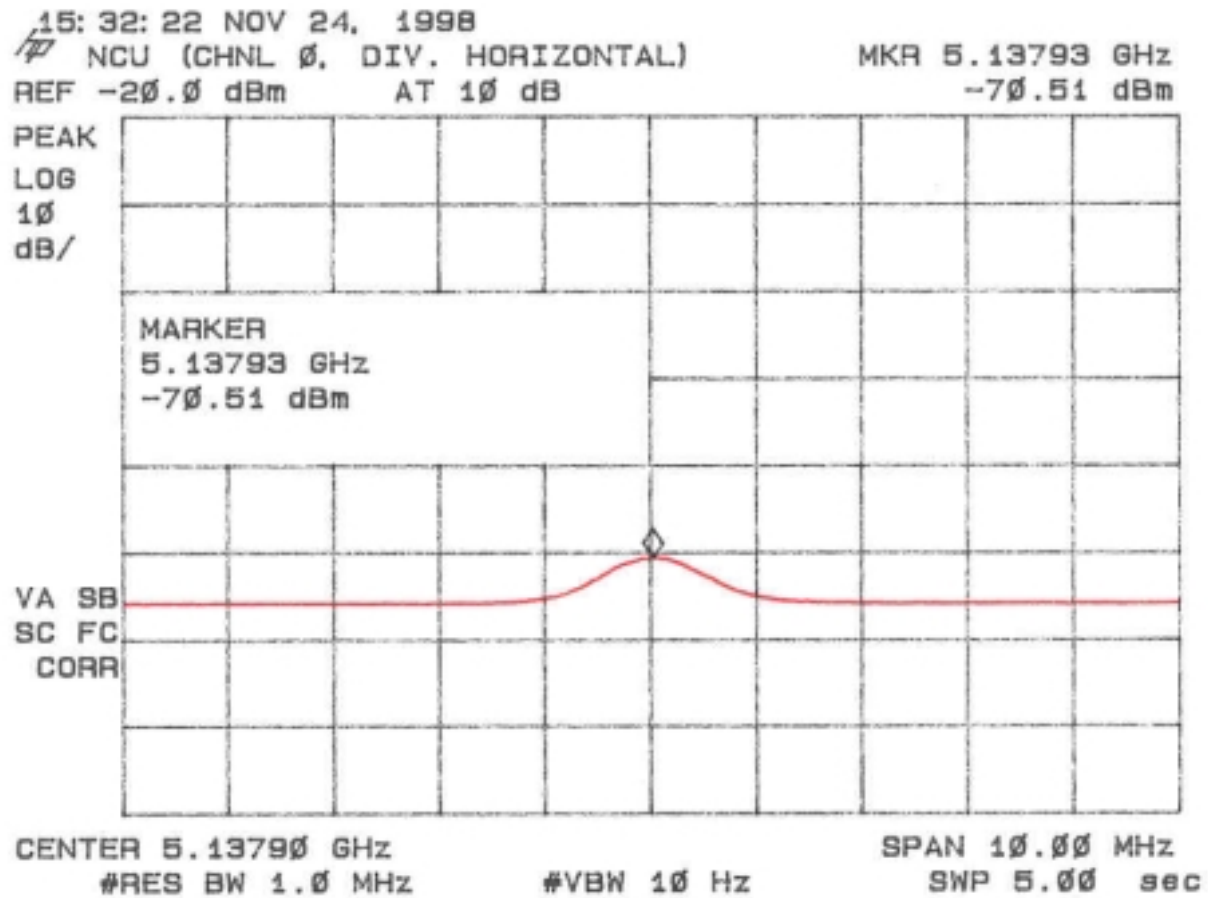


Figure 6c
Average Radiated Spurious Emissions 15.247(c) Mid

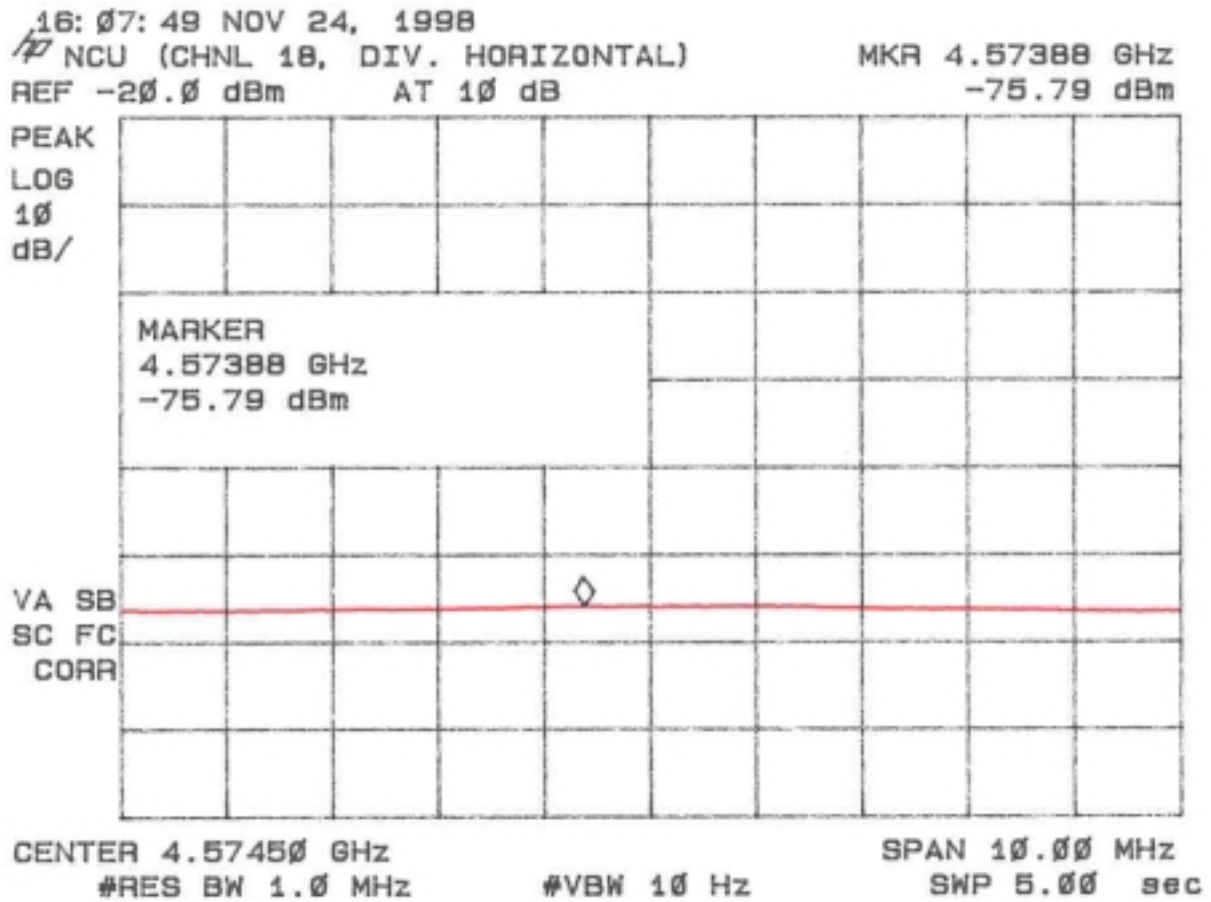


Figure 6d
Average Radiated Spurious Emissions 15.247(c) Mid

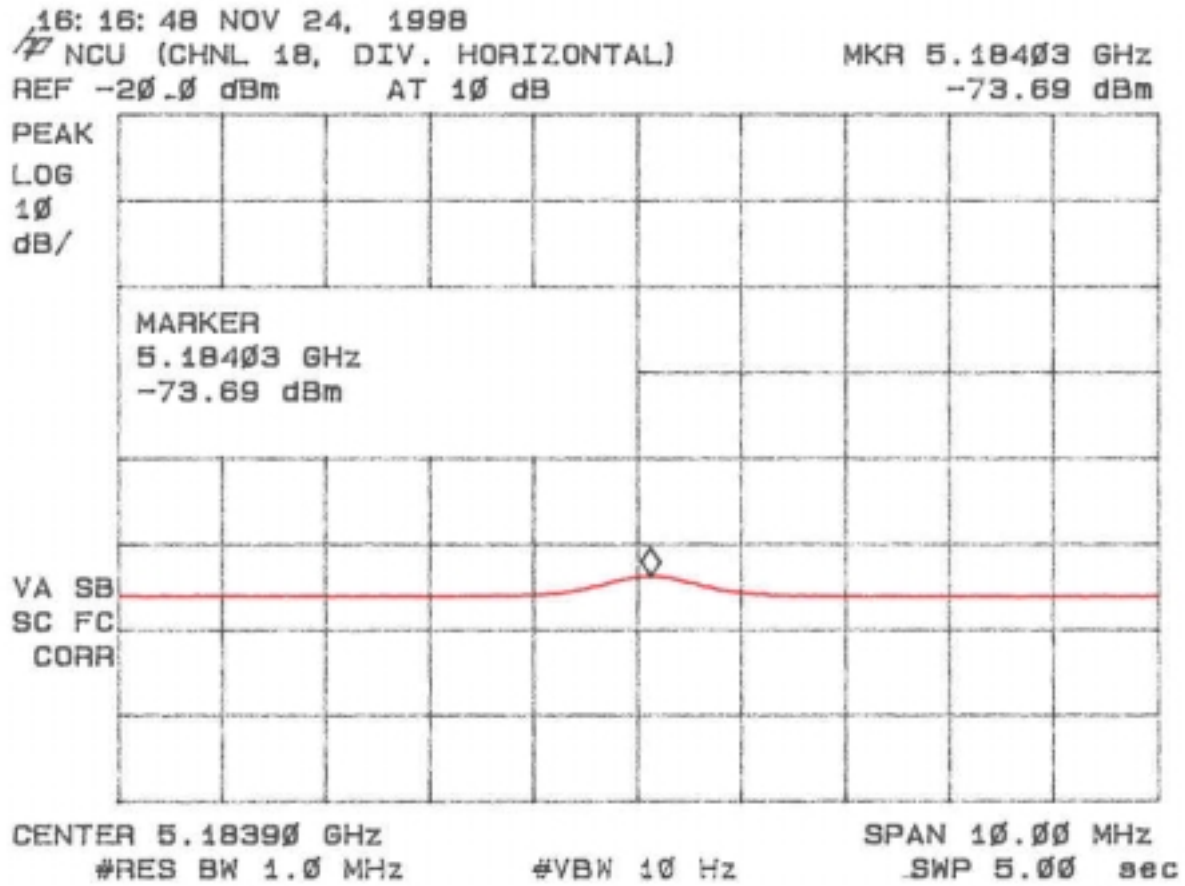


Figure 6e
Average Radiated Spurious Emissions 15.247(c) High

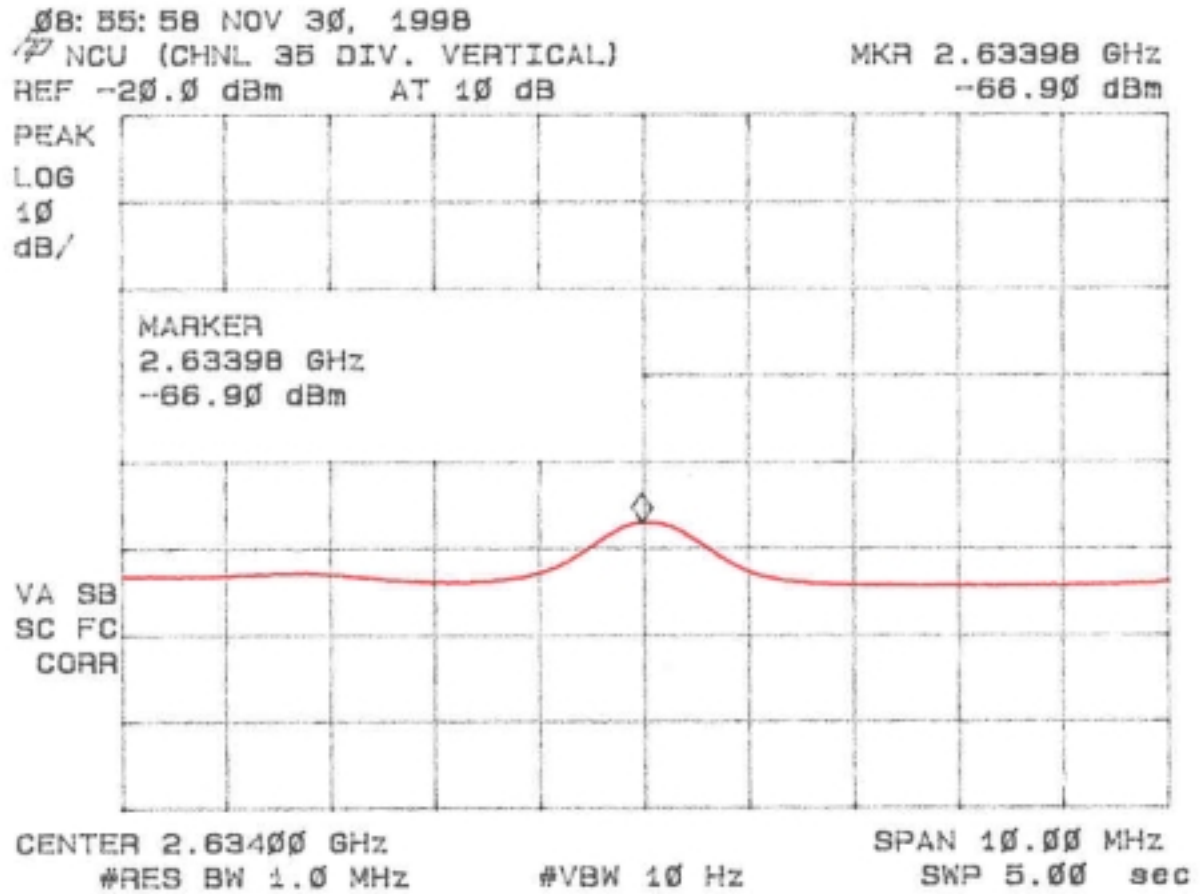


Figure 6f
Average Radiated Spurious Emissions 15.247(c) High

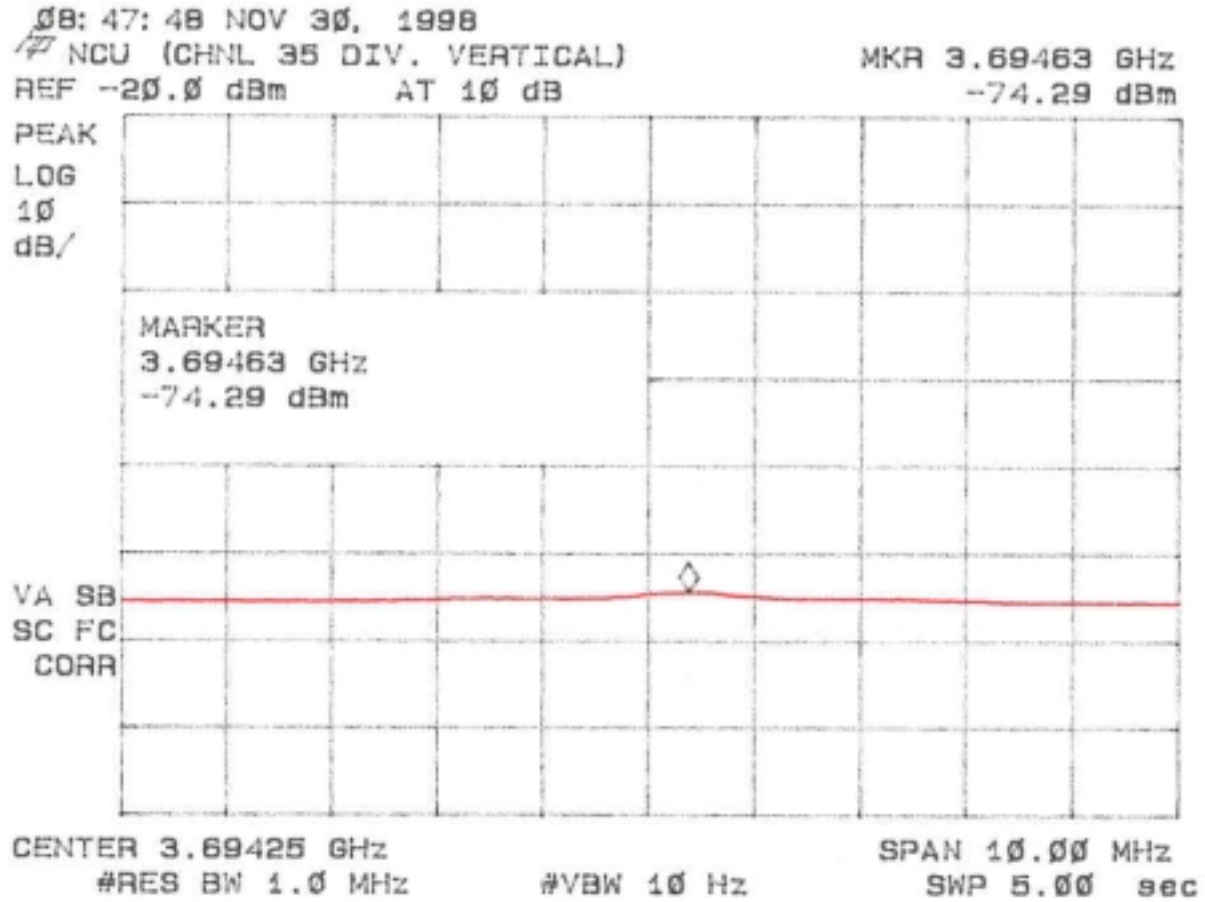


Figure 6g
Average Radiated Spurious Emissions 15.247(c) High

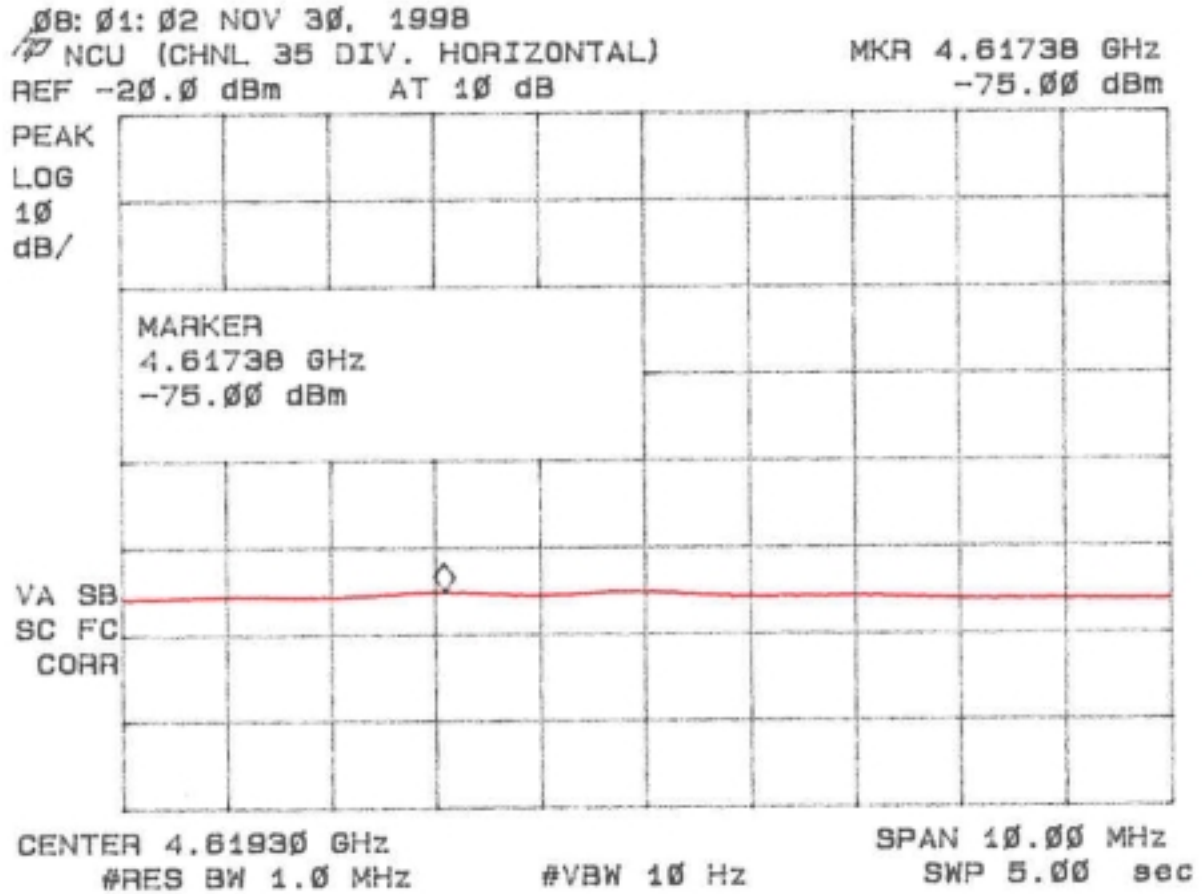
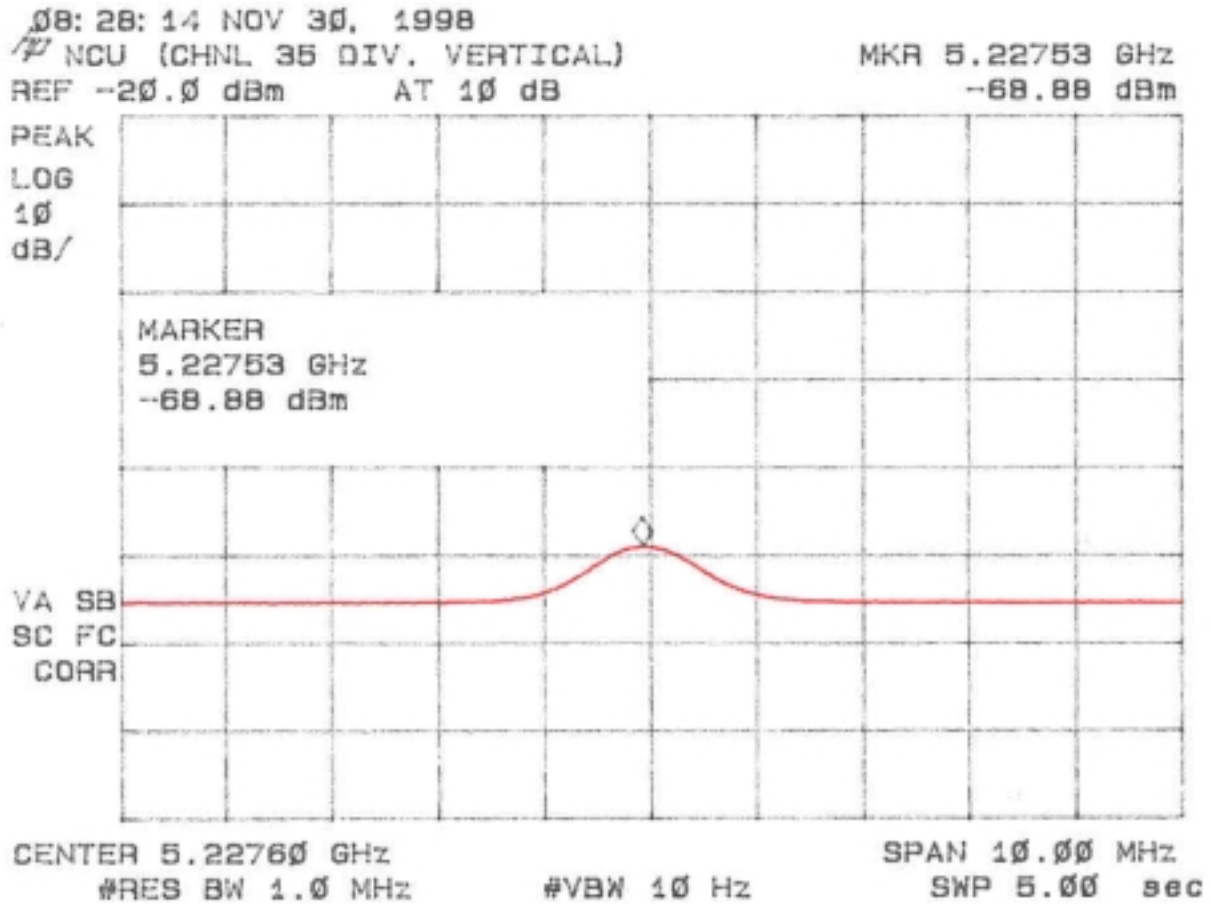


Figure 6h
Average Radiated Spurious Emissions 15.247(c) High



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 \geq RBW. If the EUT incorporates different spreading codes or data rates these were each investigated, 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 7f.

Figure 7a.
6 dB Bandwidth per FCC Section 15.247(a)(2) (Low – Horizontal div.)

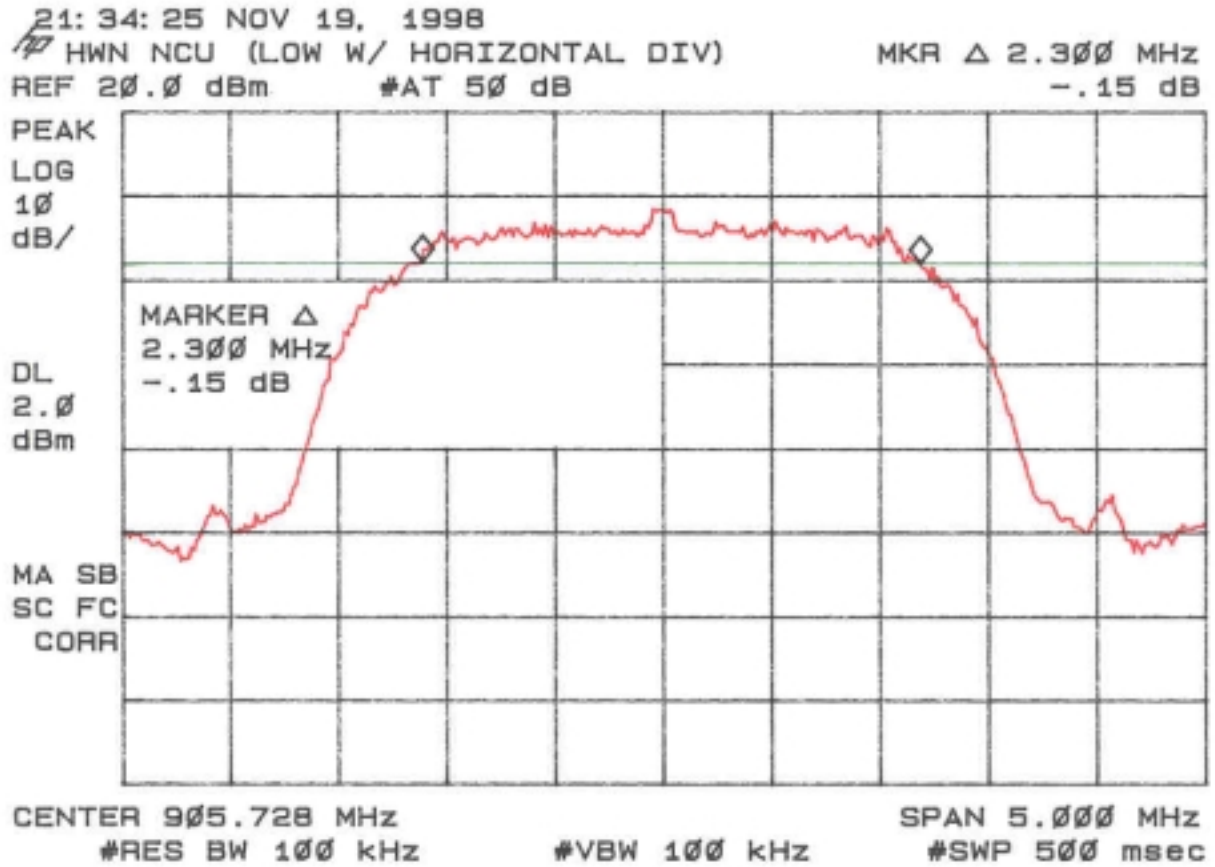


Figure 7b.
6 dB Bandwidth per FCC Section 15.247(a)(2) (Mid-Horizontal Div.)

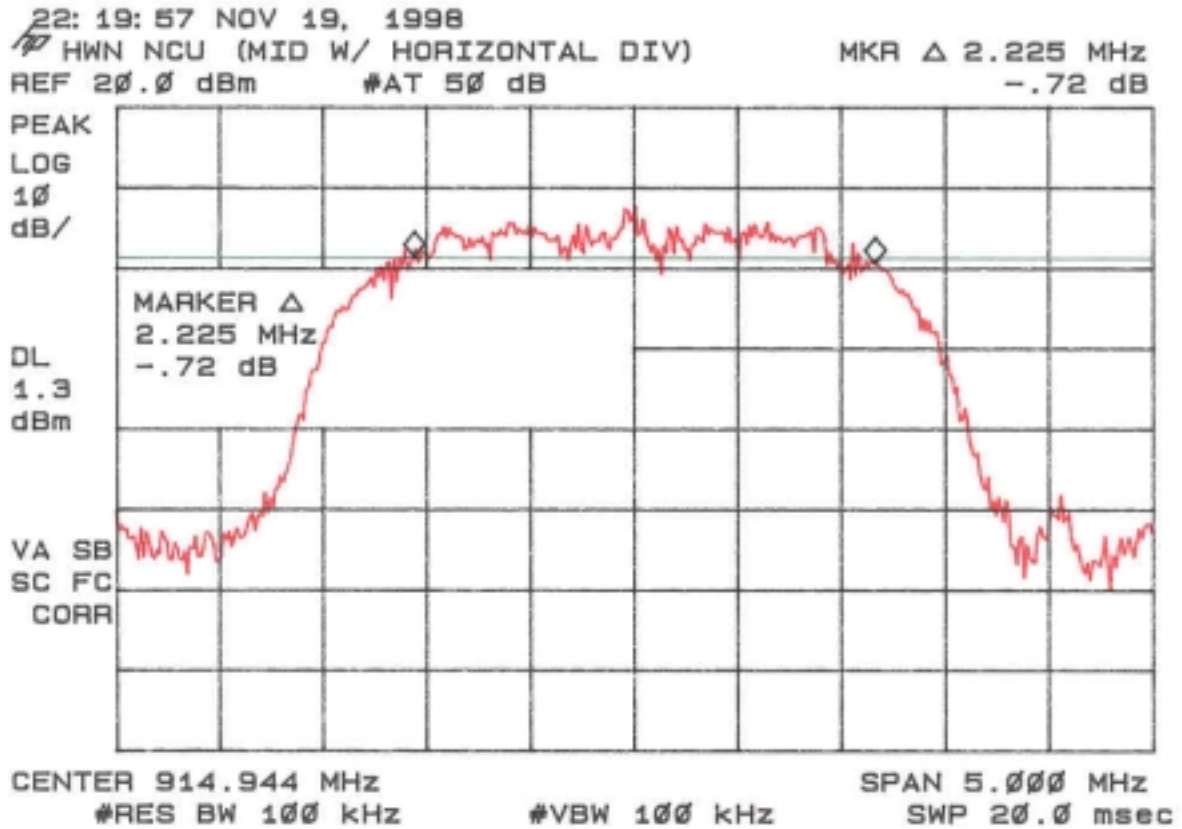


Figure 7c.
6 dB Bandwidth per FCC Section 15.247(a)(2) (High-Horizontal Div.)

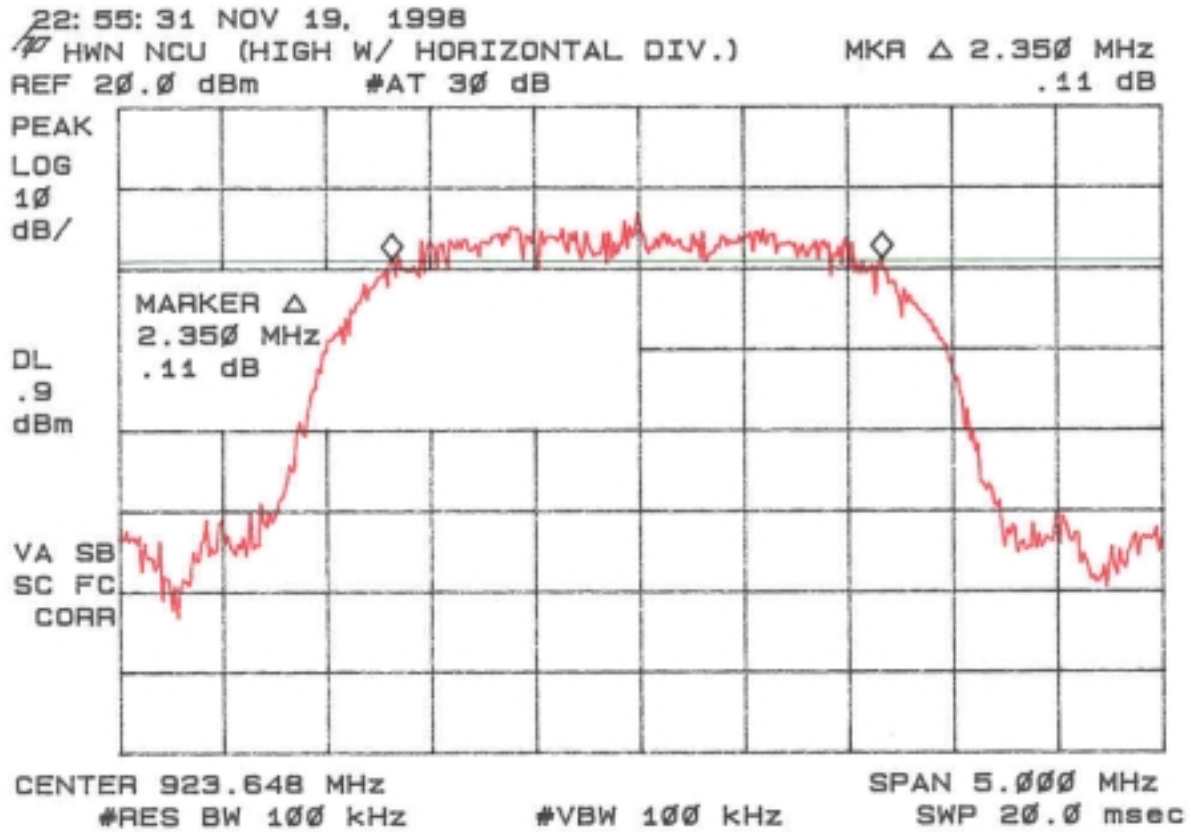


Figure 7d.
6 dB Bandwidth per FCC Section 15.247(a)(2) (Low-Vertical Div.)

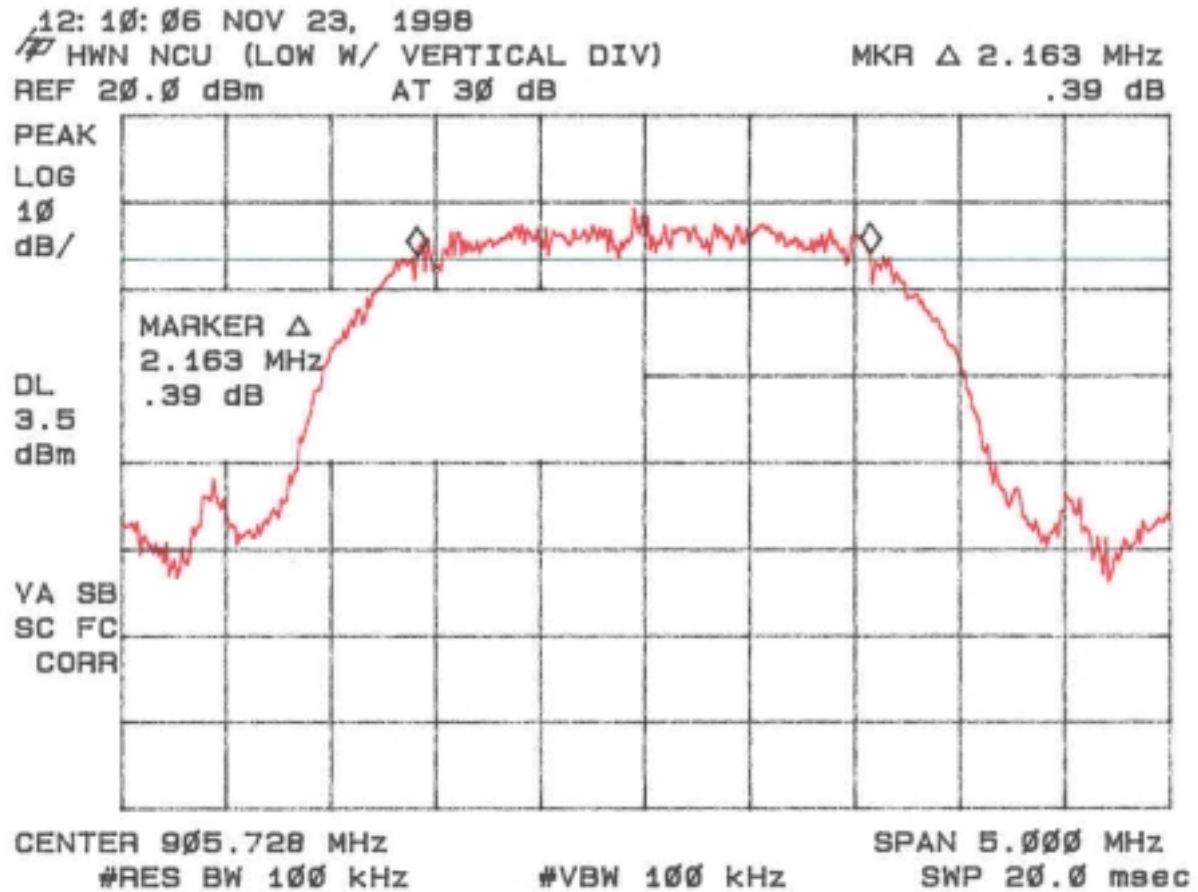


Figure 7e.
6 dB Bandwidth per FCC Section 15.247(a)(2) (Mid-Vertical Div.)

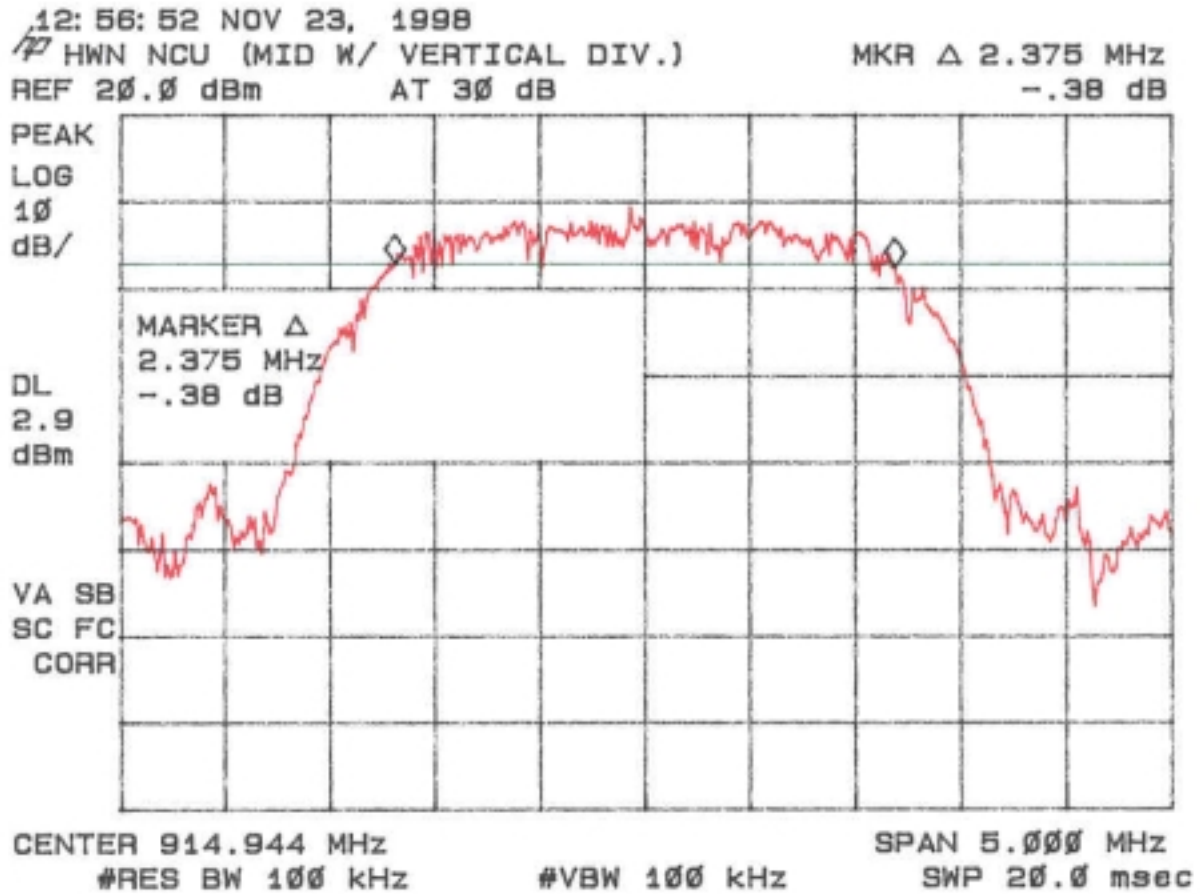
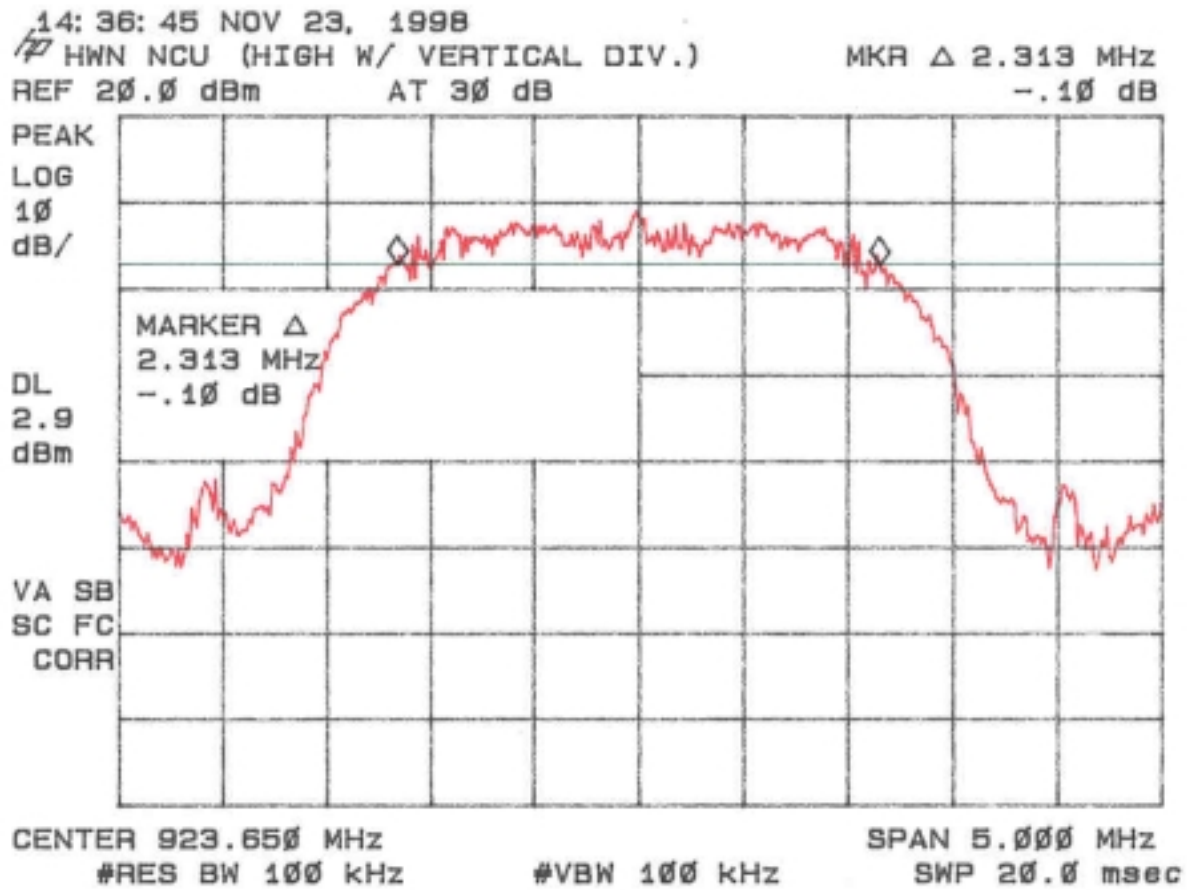


Figure 7f.
6 dB Bandwidth per FCC Section 15.247(a)(2) (High-Vertical Div.)



2.11 Power Spectral Density FCC Section 15.247 (d)

The transmitter power spectral density averaged over any 1 second interval is given in Table 7a through 7f and Figure 8a through Figure 8f. 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 – HORIZONTAL DIVERSITY

Test Date: November 19, 1998
UST Project: 98-559
Customer: Home Wireless Networks, Inc.
Model: 95-0005-XXX

TABLE 7a POWER SPECTRAL DENSITY (Low)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-47.04	-12.24	+8.0

TABLE 7b POWER SPECTRAL DENSITY (Mid)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-47.81	-13.01	+8.0

TABLE 7c POWER SPECTRAL DENSITY (High)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-47.99	-13.19	+8.0

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

Tester

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

POWER SPECTRAL DENSITY – VERTICAL DIVERSITY

Test Date: November 23, 1998
UST Project: 98-559
Customer: Home Wireless Networks, Inc.
Model: 95-0005-XXX

TABLE 7d POWER SPECTRAL DENSITY (Low)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-45.41	-10.61	+8.0

TABLE 7e POWER SPECTRAL DENSITY (Mid)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-44.14	-9.34	+8.0

TABLE 7f POWER SPECTRAL DENSITY (High)

Test Data (dBm) Normalized to 1 Hz	Results (dBm)	FCC Limit (dBm)
-44.69	-9.89	+8.0

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

Test Results
Reviewed By:



Name: Tim R. Johnson

Figure 8a
Power Spectral Density 15.247(d) Low-Horizontal Div.

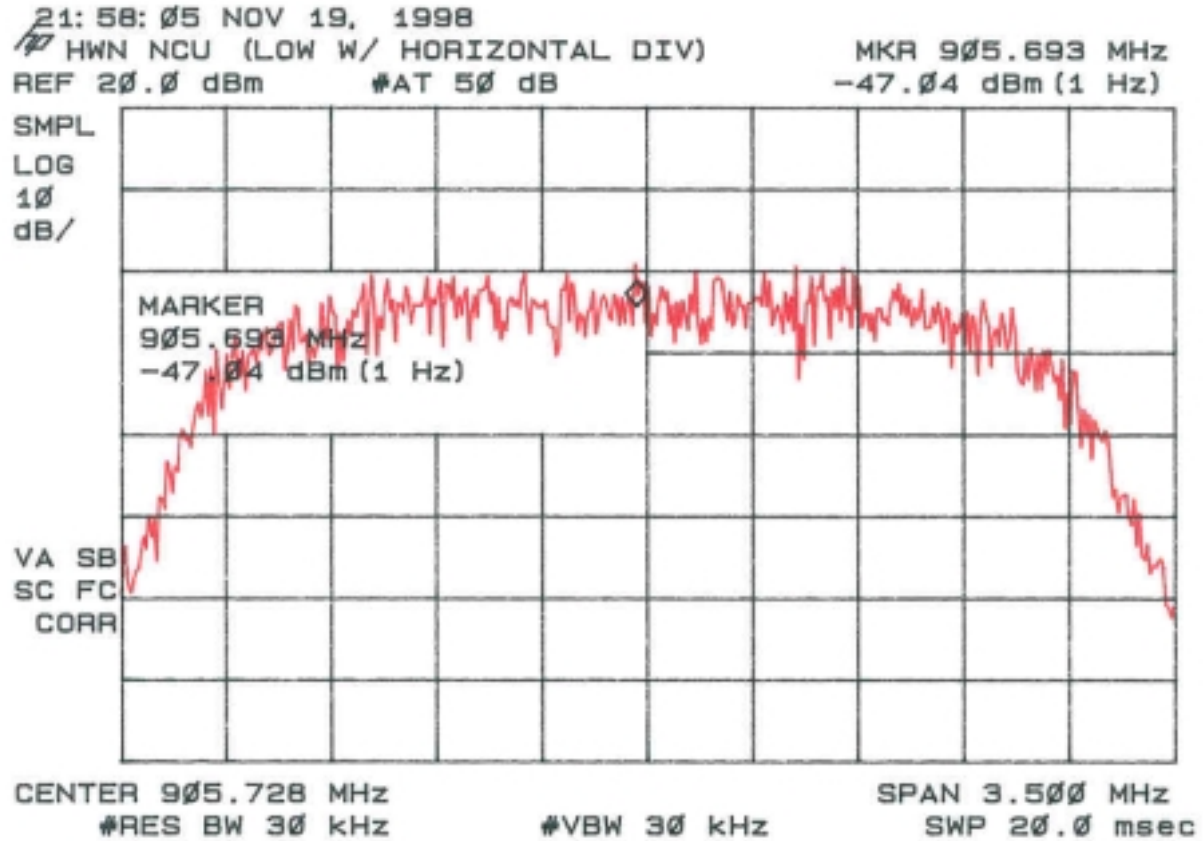


Figure 8b
Power Spectral Density 15.247(d) Mid-Horizontal Div.

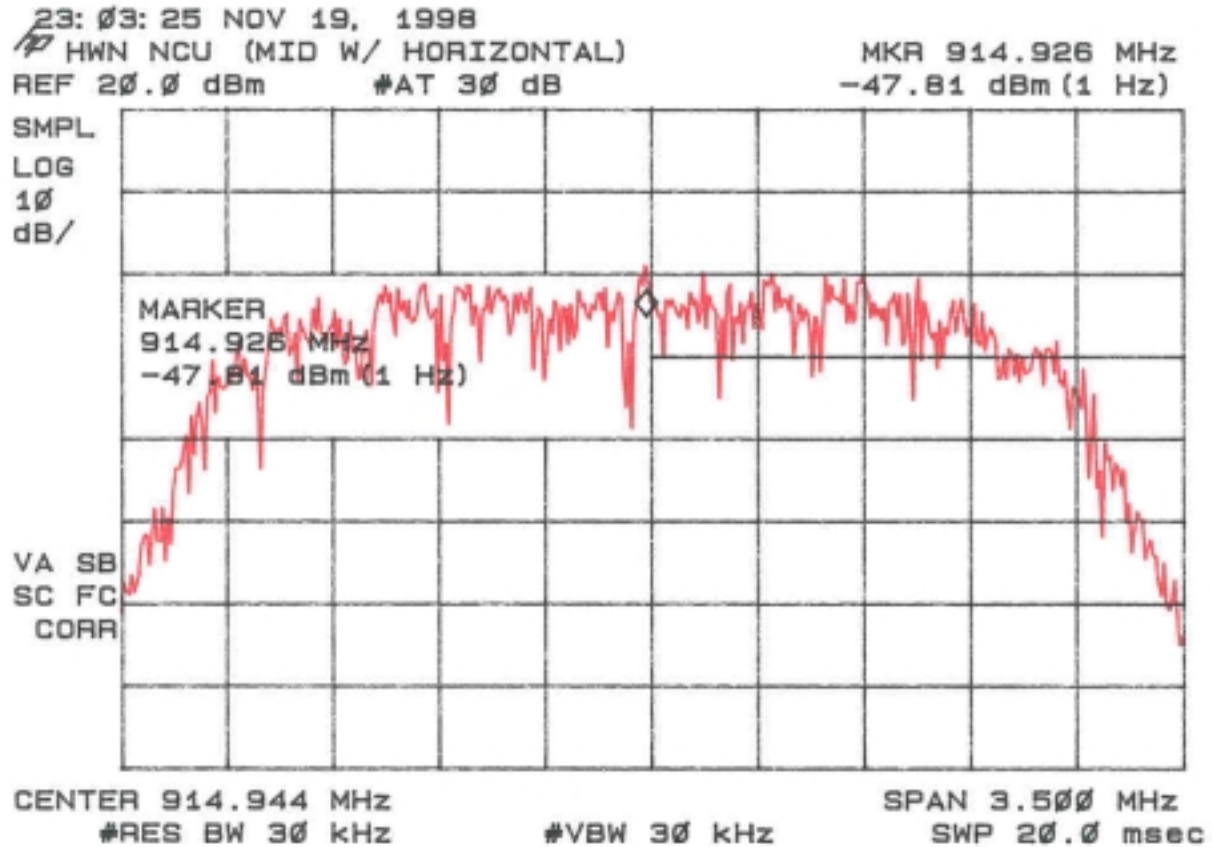


Figure 8c
Power Spectral Density 15.247(d) High-Horizontal Div.

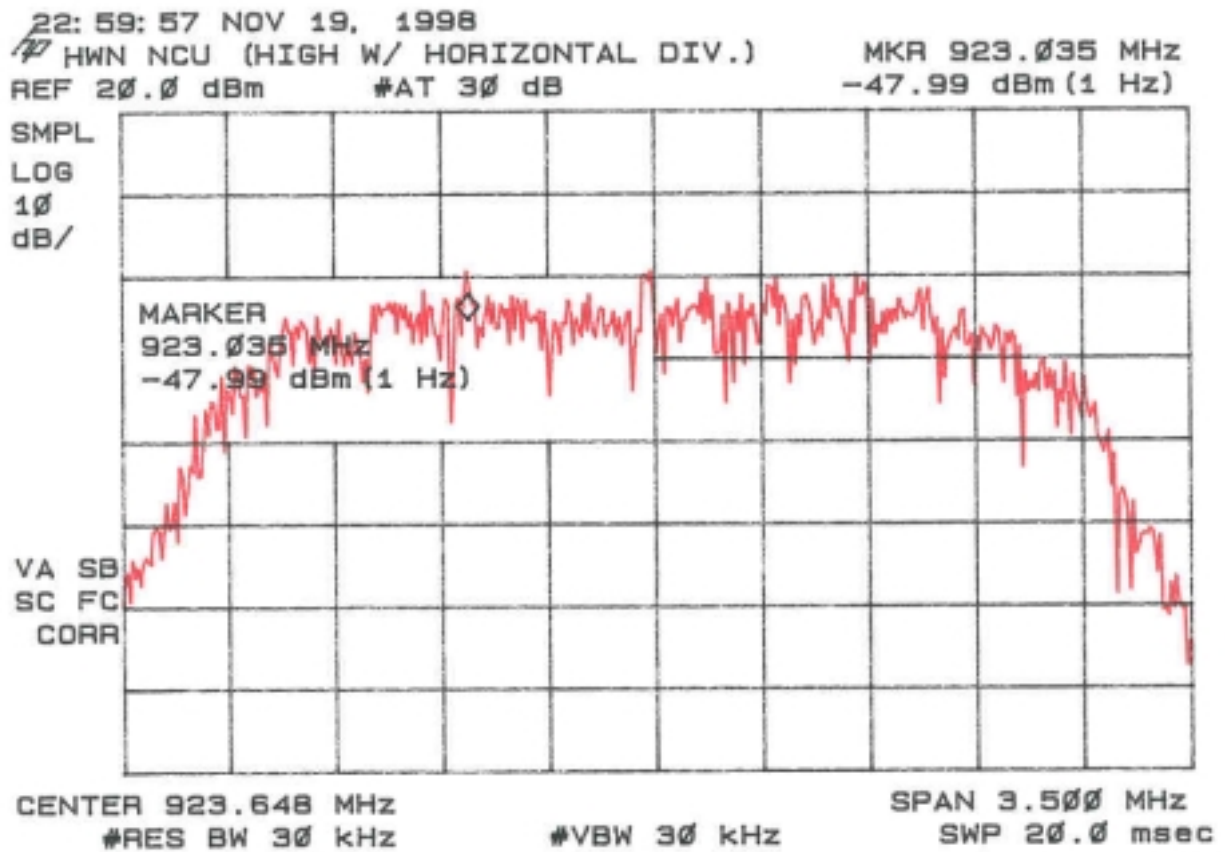


Figure 8d
Power Spectral Density 15.247(d) Low-Vertical Div.

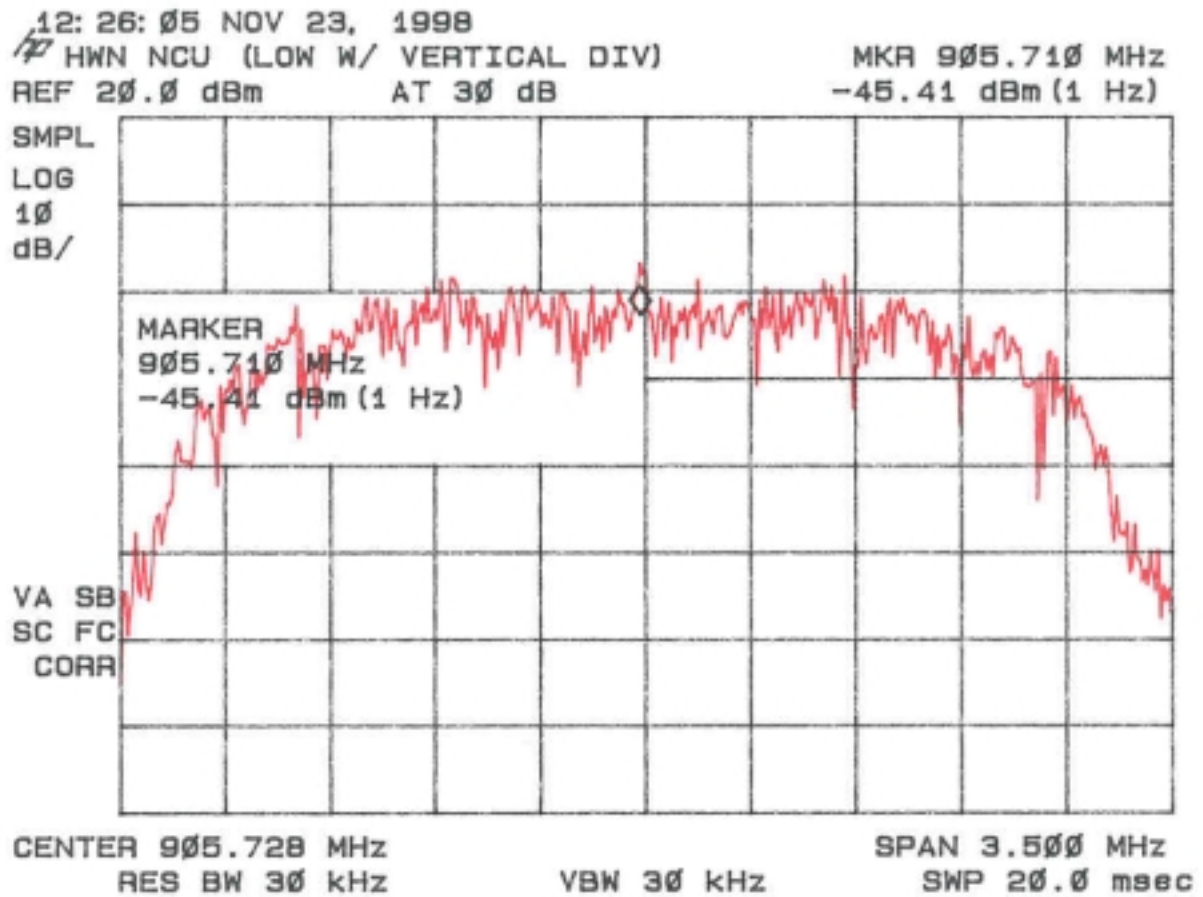


Figure 8e
Power Spectral Density 15.247(d) Mid-Vertical Div.

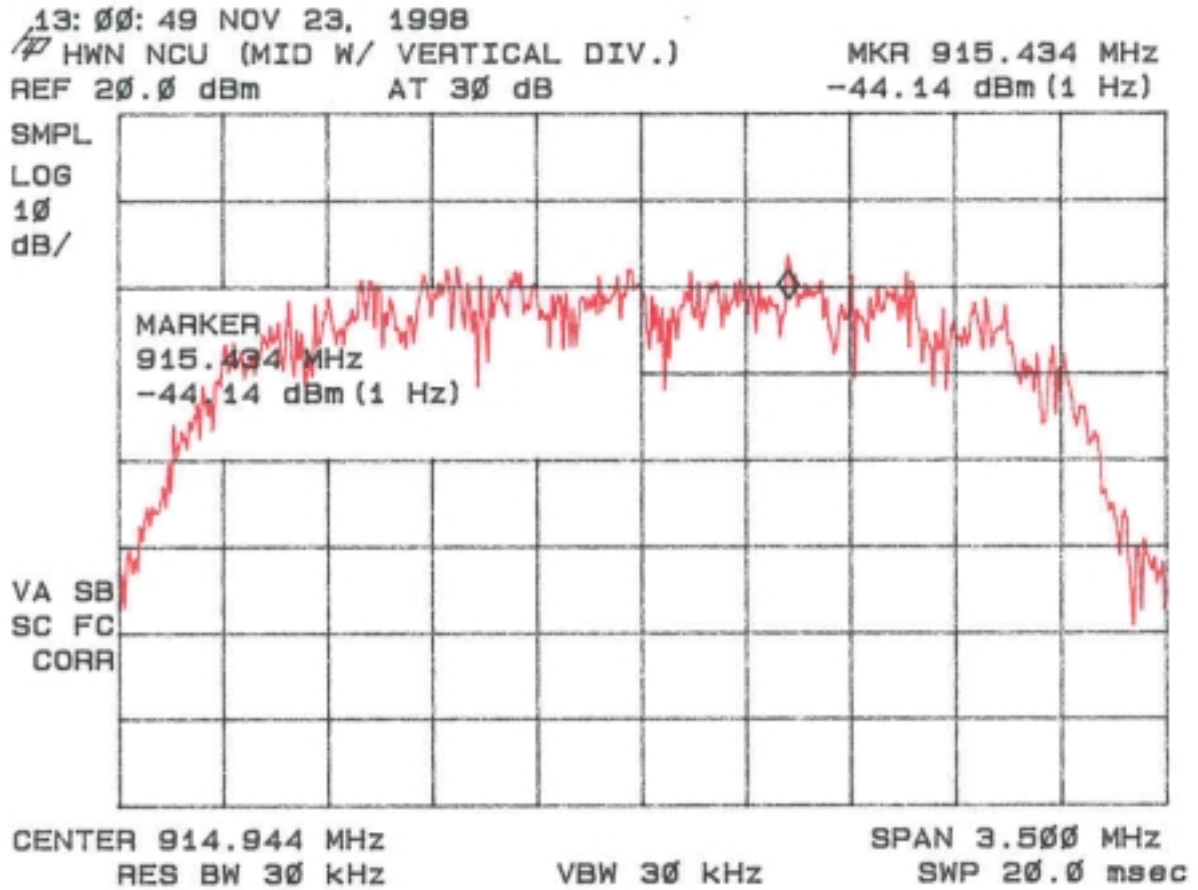
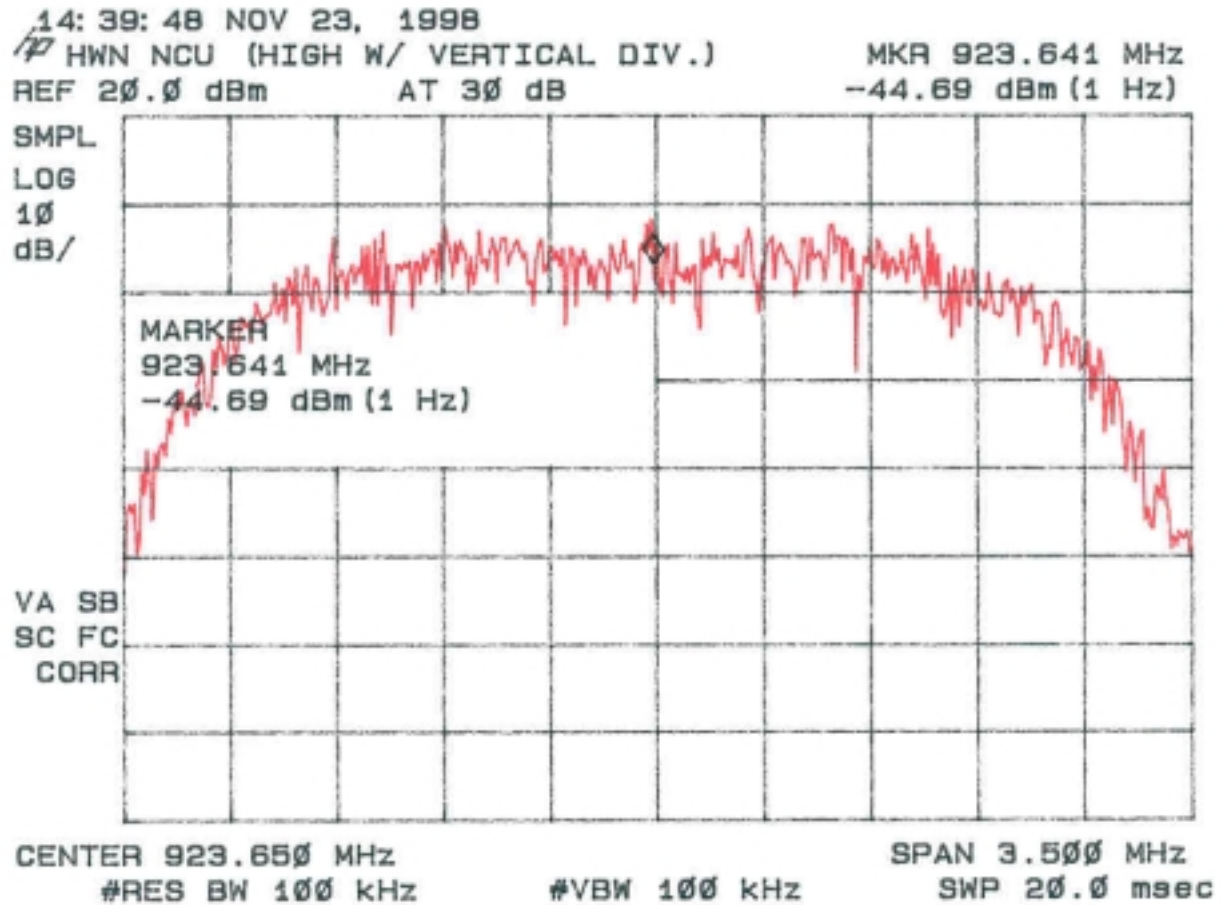


Figure 8f
Power Spectral Density 15.247(d) High-Vertical Div.



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 files.

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: November 30, 1998
UST Project: 98-559
Customer: Home Wireless Networks, Inc.
Product: 95-0005-XXX

FREQUENCY (MHz)	TEST DATA (dBm)		LISN LOSS (dBm)		CABLE FACTOR (dB)	RESULTS (uV)		FCC LIMITS (uV)	MARGIN BELOW LIMIT (dB)	
	PHASE	NEUTRAL	PHASE	NEUTRAL		PHASE	NEUTRAL		PHASE	NEUTRAL
0.45	-67.0	-69.0	0.1	0.1	0.1	102.0	81.3	250.0	7.8	9.8
0.79	-73.0	-73.0	0.0	0.0	0.1	50.7	50.7	250.0	13.9	13.9
13.80	-90.0	-81.0	0.1	0.0	0.6	7.6	21.3	250.0	30.3	21.4
16.40	-78.0	-79.0	0.1	0.1	0.6	30.5	27.2	250.0	18.3	19.3
21.70	-91.0	-85.0	0.1	0.1	0.7	6.9	13.8	250.0	31.2	25.2
29.50	-74.0	-76.0	0.2	0.2	0.9	50.7	40.3	250.0	13.9	15.9

Test 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 than or equal to 1 GHz. Data reported is for the worse case mode of operation on the middle channel.

**TABLE 9a. RADIATED EMISSIONS DATA
(DIGITAL DEVICE & RECEIVER)**

CLASS B

Test Date: October 20, 1998
 UST Project: 98-588
 Customer: Home Wireless Networks, Inc.
 Product: 95-0005-XXX

Frequency (MHz)	Test Data (dBm) @3m	Ant. Factor + Cable Atten. - Amp Gain	Results (uV/m)	FCC Limits (uV/m) @3m	Margin Below FCC Limit (dB)
49.2	-88.0	12.1	35.9	100.0	8.9
114.7	-89.0	13.5	37.5	150.0	12.0
131.1	-85.0	14.6	68.0	150.0	6.9
213.0	-90.0	14.8	39.1	150.0	11.7
262.1	-90.0	16.6	48.0	200.0	12.4

***= Quasi Peak Measurement**

SAMPLE CALCULATIONS:

RESULTS uV/m @ 3m = Antilog $((-88.0 + 12.1 + 107)/20)$ = 35.9

CONVERSION FROM dBm TO dBuV = 107 dB

Test Results
 Reviewed By: _____



Name: Tim R. Johnson

TABLE 9b RADIATED EMISSIONS DATA (DIGITAL DEVICE & RECEIVER)**CLASS B**

Test Date: October 20, 1998
UST Project: 98-588
Customer: Home Wireless Networks, Inc.
Model: 95-0005-XXX

Peak Measurements >1GHz

FREQ. (GHz)	TEST DATA (dBm) @ 3m	AMP GAIN (dB)	ANT. FACTOR (dB)	CABLE LOSS (dB)	RESULTS (uV/m) @ 3m	FCC LIMITS (uV/m) @ 3m
No Emissions Within 10 dB of the FCC Limit						

Test Results
Reviewed By: _____



Name: Tim R. Johnson

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.

**TABLE 10. POWER LINE CONDUCTED EMISSIONS DATA (RECIVER & DIGITAL DEVICE)
CLASS B**

Test Date: November 30, 1998
UST Project: 98-559
Customer: Home Wireless Networks, Inc.
Product: 95-0005-XXX

FREQUENCY (MHz)	TEST DATA (dBm)		LISN LOSS (dBm)		CABLE FACTOR (dB)	RESULTS (uV)		FCC LIMITS (uV)	MARGIN BELOW LIMIT (dB)	
	PHASE	NEUTRAL	PHASE	NEUTRAL		PHASE	NEUTRAL		PHASE	NEUTRAL
0.45	-67.0	-69.0	0.1	0.1	0.1	102.0	81.3	250.0	7.8	9.8
0.79	-73.0	-73.0	0.0	0.0	0.1	50.7	50.7	250.0	13.9	13.9
13.80	-90.0	-81.0	0.1	0.0	0.6	7.6	21.3	250.0	30.3	21.4
16.40	-78.0	-79.0	0.1	0.1	0.6	30.5	27.2	250.0	18.3	19.3
21.70	-91.0	-85.0	0.1	0.1	0.7	6.9	13.8	250.0	31.2	25.2
29.50	-74.0	-76.0	0.2	0.2	0.9	50.7	40.3	250.0	13.9	15.9

Test Results
Reviewed By:  **Name:** Tim R. Johnson

SECTION 3

LABELING INFORMATION

These have been provided in a separate file

SECTION 4

BLOCK DIAGRAM(S) / SCHEMATIC(S)

These have been provided in separate files

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, Side View

Photo 4. Internal View Showing Battery and Expansion Ports (Top Cover Opened)

Photo 5. EUT, Top View of Main Board (Shields Installed)

Photo 6. EUT, Top View of Main Board (Shields Removed)

Photo 7. EUT, Bottom View of Main Board

These have been provided in separate files

SECTION 6

USER'S MANUAL

These have been provided in separate files