Washington Laboratories, Ltd.

FCC Class II Permissive Change Report

For the

HydroSoft Internet, Inc.

XV-5850

FCC ID: M4Y-0005850

WLL JOB# **9760**
July 31, 2007

Prepared for:

HydroSoft Internet, Inc.
6 East Main Street
Leola, PA, 17540

Prepared By:

Washington Laboratories, Ltd.
7560 Lindbergh Drive
Gaithersburg, Maryland 20879

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Prepared by: Steve Dovell
EMC Test Engineer

Reviewed by: Steven D. Koster
EMC Operations Manager

Abstract

This report has been prepared on behalf of HydroSoft Internet, Inc. to support the attached Class II Permissive Change Application for Equipment Authorization. The test report and application are submitted for a Transmitter under Part 15 Subpart E of the FCC Rules and Regulations. This Certification Test Report documents the test configuration and test results for a Z-COM, Inc. XV-5850.

HydroSoft Internet, Inc. wishes to include additional antennas to be used with the device. The test data contained supports the Class II change.

Testing was performed on an Open Area Test Site (OATS) of Washington Laboratories, Ltd, 7560 Lindbergh Drive, Gaithersburg, MD 20879. Site description and site attenuation data have been placed on file with the FCC's Sampling and Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

The Z-COM, Inc. XV-5850 complies with the limits for a Transmitter device under FCC Part 15 Subpart E.

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1 Introduction

1.1 Compliance Statement

The Z-COM, Inc. XV-5850 complies with the limits for a Transmitter device under FCC Part 15 Subpart E.

NOTE: To comply with the Radiated emission limits, the inside of Radio case was coated with Sanpro "Silver Lining Part #CON-A9-5M0A-QQ1 and gasketing material was added along the edges between two halves of case. Tech Etch 2210-1181-0008".

1.2 Test Scope

Tests for radiated and conducted (at antenna terminal) emissions were performed. All measurements were performed in accordance with FCC Public Notice DA 02-2138 and the 2003 version of ANSI C63.4. The measurement equipment conforms to ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation.

1.3 Contract Information

Customer:	HydroSoft Internet, Inc. 6 East Main Street Leola, PA, 17540
Quotation Number:	63581A

1.4 Test Dates

Testing was performed on the following date(s):	May 25, 2007 - June 29, 2007

1.5 Test and Support Personnel

Washington Laboratories, LTD	Steve Dovell, James Ritter

2 Equipment Under Test

2.1 EUT Identification & Description

The Z-COM, Inc. XV-5850 employs a 5.7GHz OFDM Transceiver and a COFDM PTMC modem daughter card. The EUT is a UNII device, which operates in the frequency range 5724-5825MHz. The unit can operate in the following modes, QPSK, QAM-16, and QAM-64. The EUT is an Access Point.

The system is designed to bridge or backhaul Voice-TDM, Wireless-CDMA, or Data traffic for a large variety of carrier class service providers. In its most fundamental configuration a bi-directional wireless link is facilitated between two nodes in a point-to-point architecture.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	Z-COM, Inc.
FCC ID:	M4Y-0005850
Model:	XV-5850
FCC Rule Parts:	§15 Subpart E
Frequency Range:	5725MHz ~ 5825MHz
Maximum Output Power:	21.76dBm
Modulation:	OFDM
Occupied Bandwidth:	21.47 MHz
Keying:	Automatic
Type of Information:	Data
Power Output Level	Fixed
Antenna Connector	N-Type
Antenna Type	22.5dBi parabolic
Power Source & Voltage:	12Vdc from Power Over Ethernet source

2.2 Test Configuration

The XV-5850 was configured internally in Plastic chassis for all emissions measurements. The antenna used for radiated spurious emissions testing was a Radio Waves Model: SP1-5.8, 22.5dBi parabolic antenna.

2.3 Testing Algorithm

The XV-5850 was programmed for maximum power at the low, middle and high channels of operation. For the conducted emissions testing at the antenna terminal the unit was set to all three modes of modulation. A support PC was connected to the EUT via an LAN connection and a control program "ART" was used to control the radio. Worst-case emission levels are provided in the test results data.

2.4 Test Location

All measurements herein were performed at Washington Laboratories, Ltd. test center in Gaithersburg, MD. Site description and site attenuation data have been placed on file with the FCC's Sampling and

Measurements Branch at the FCC laboratory in Columbia, MD. Washington Laboratories, Ltd. has been accepted by the FCC and approved by NIST NVLAP (NVLAP Lab Code: 200066-0) as an independent FCC test laboratory.

2.5 Measurements

2.5.1 References

FCC Public Notice DA 02-2138, Measurement Procedure Updated for Peak Transmit Power in the Unlicensed National Information Infrastructure (U-NII) Bands

ANSI C63.2 Specifications for Electromagnetic Noise and Field Strength Instrumentation

ANSI C63.4 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

2.6 Measurement Uncertainty

All results reported herein relate only to the equipment tested. For the purposes of the measurements performed by Washington Laboratories, the measurement uncertainty is ±2.3 dB. This has been calculated for a *worst-case situation* (radiated emissions measurements performed on an open area test site).

The following measurement uncertainty calculation is provided:

$$\text{Total Uncertainty} = (A^2 + B^2 + C^2)^{1/2}/(n-1)$$

where:

A = Antenna calibration uncertainty, in dB = 2 dB

B = Spectrum Analyzer uncertainty, in dB = 1 dB

C = Site uncertainty, in dB = 4 dB

n = number of factors in uncertainty calculation = 3

Thus, Total Uncertainty = $0.5\ (2^2 + 1^2 + 4^2)^{1/2} = \pm 2.3$ dB.

3 Test Equipment

Table 2 shows a list of the test equipment used for measurements along with the calibration information.

Table 2: Test Equipment List

Site 2 List:

WLL Asset #	Manufacturer Model/Type	Function	Cal. Due
00007	ARA, LPB-2520	ANTENNA, BICONILOG ANTENNA	6/7/2008
00004	ARA, DRG-118/A	ANTENNA, DRG, 1-18GHZ	2/2/2009
00066	HP, 8449B	PRE-AMPLIFIER, RF. 1-26.5GHZ	8/1/2007
00210	NARDA, V638	HORN, STANDARD, GAIN	12/25/2008
00209	NARDA	HORN, STANDARD, GAIN	12/25/2008
00453	A.H., SYSTEMS, PAM1840	PRE-AMPLIFIER, 18GHZ-40 GHZ	3/28/2008
00528	AGILENT, E4446A	ANALYZER, SPECTRUM	2/15/2008
00558	HP, 8447D	AMPLIFIER	2/2/2008
00001	A.H., SYSTEMS, SAS-200/518	ANTENNA, LP, 1-18GHZ	4/5/2008
00605	Agilent	N1911A P-series Power Meter	4/11/08
00605	Agilent	Wideband Power Sensor N1921A	4/11/08

4 Test Results

4.1 Emission Bandwidth: (FCC Part §15.401(i))

The emissions bandwidth measurement was performed by connecting the output of the EUT to the input of a spectrum analyzer.

The method described in FCC Public Notice DA 02-2138 was used to measure the emission bandwidth (26dBc) at full modulation. The emission bandwidth was recorded for OFDM mode of operation.

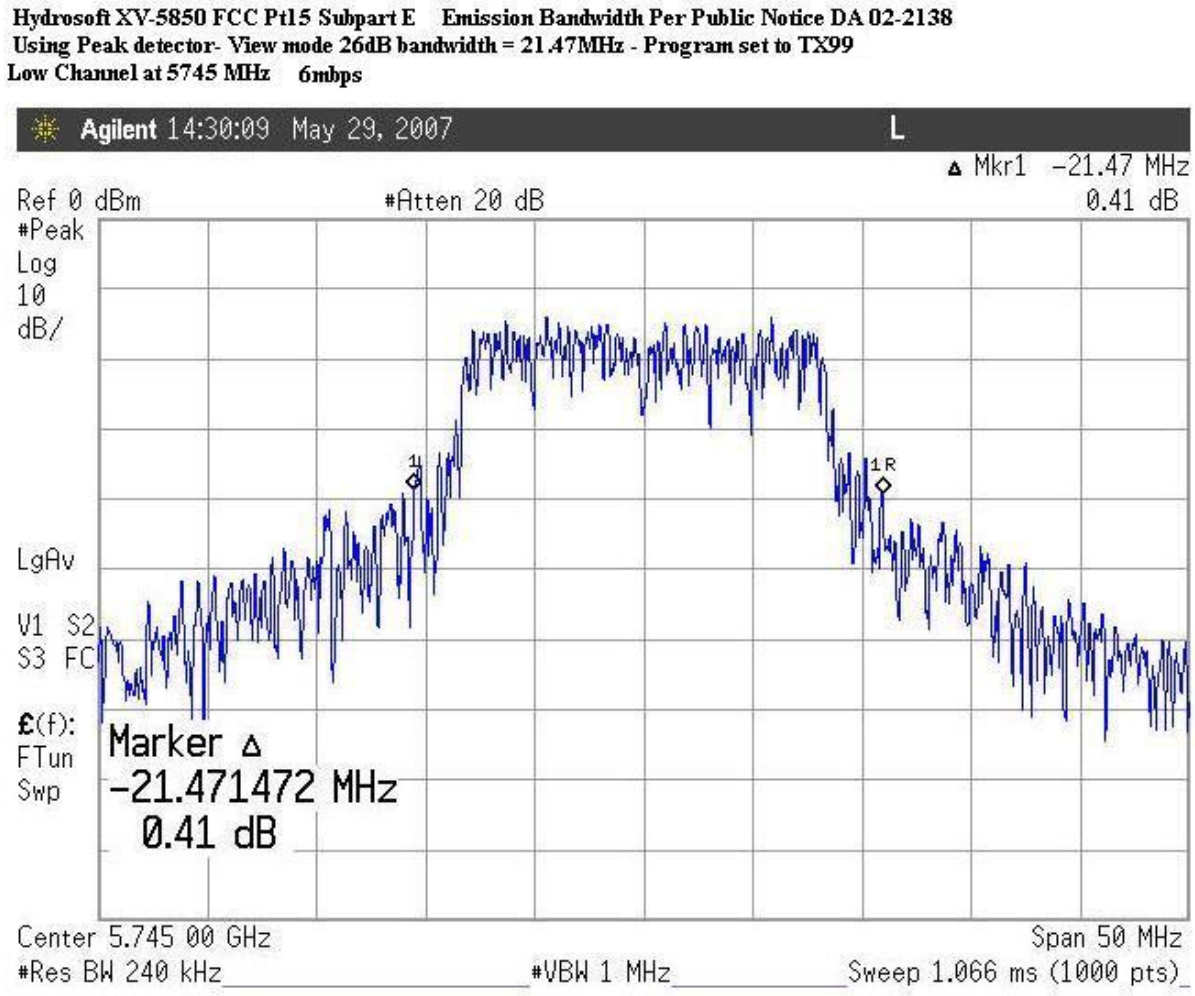

Figure 4-1. Occupied Bandwidth, Low Channel

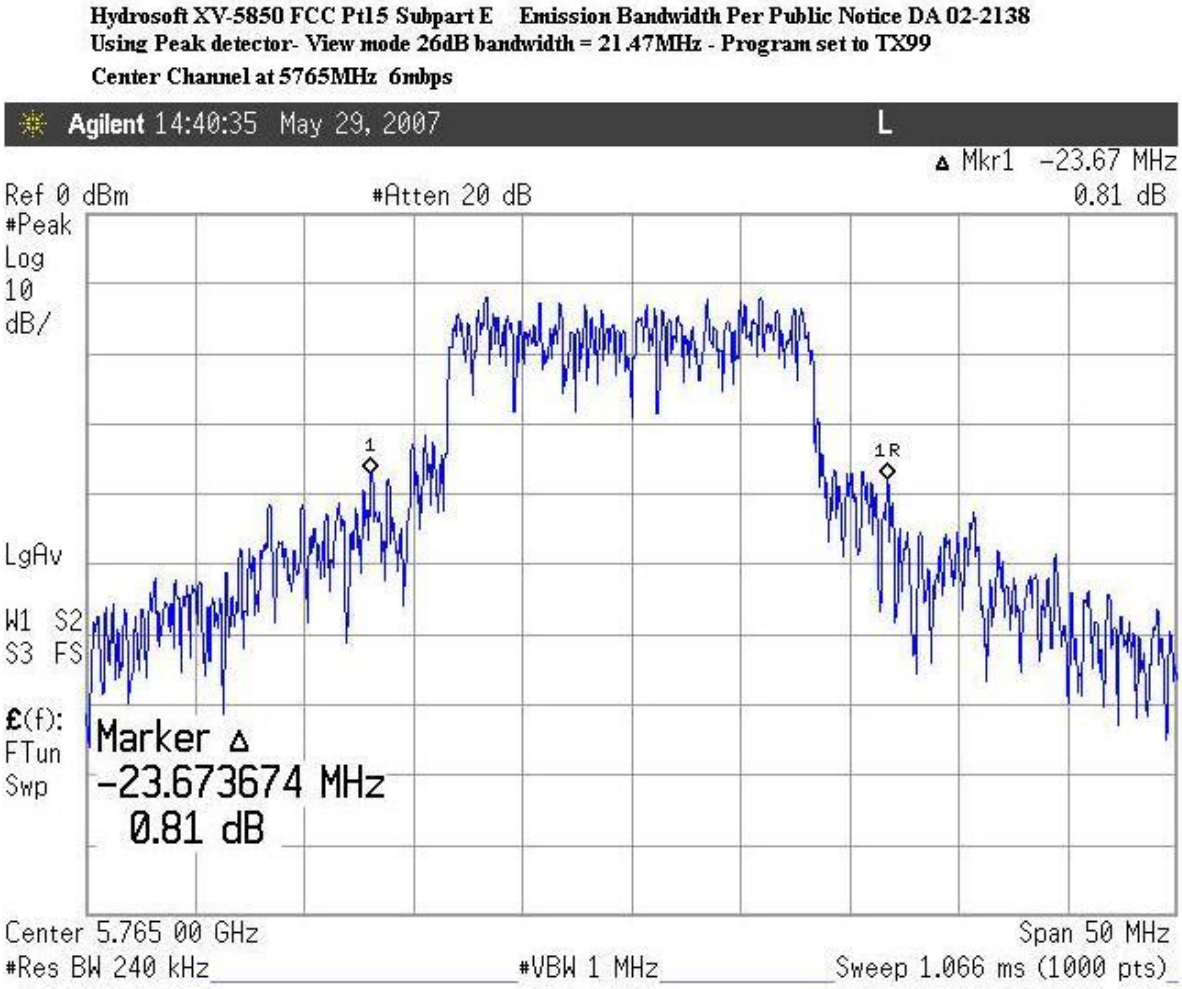

Figure 4-2. Occupied Bandwidth, Mid Channel

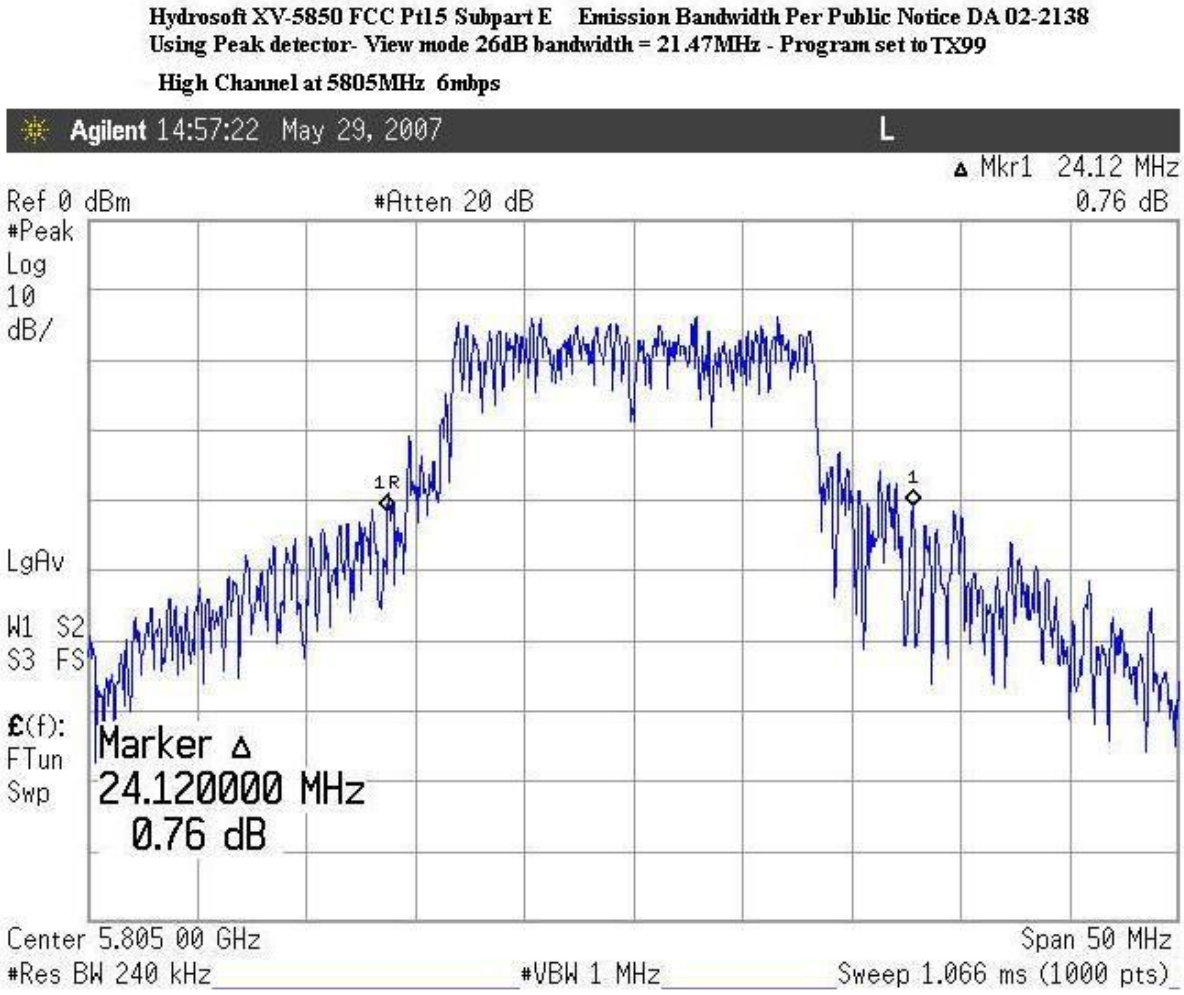

Figure 4-3. Occupied Bandwidth, High Channel

The following tables provide a summary of the Emission Bandwidth Results.

Table 3. Occupied Bandwidth Results

Frequency	Bandwidth
Low Channel	21.47MHz
Mid Channel	21.47MHz
High Channel	21.47MHz

4.2 RF Power Output: (FCC Part §15.407(a)3)

For the band 5.725-5.825 GHz, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 1 W or 17 dBm + 10log B, where B is the 26-dB emission bandwidth in MHz.

The largest emission bandwidth measured is 7.296MHz thus the maximum power shall not exceed 25.6dBm (0.365W).

The output from the transmitter was connected to an attenuator and then to the input of the RF Spectrum Analyzer. The analyzer offset was adjusted to compensate for the attenuator and other losses in the system. To measure the output power the channel power function of the spectrum analyzer was used per Method 1 described in FCC DA 02-2138. The RBW was set to 1MHz and the VBW was set to 3MHz. Power was measured across the appropriate channel bandwidth for each mode.

Following are tables and spectrum analyzer plots of the RF Power data.

Table 4. RF Power Output

Frequency	Level	Limit	Pass/Fail
Low Channel 5745MHz	21.76 dBm	25.6 dBm	Pass
Mid Channel 5765MHz	21.35 dBm	25.6 dBm	Pass
High Channel 5805MHz	21.04 dBm	25.6 dBm	Pass

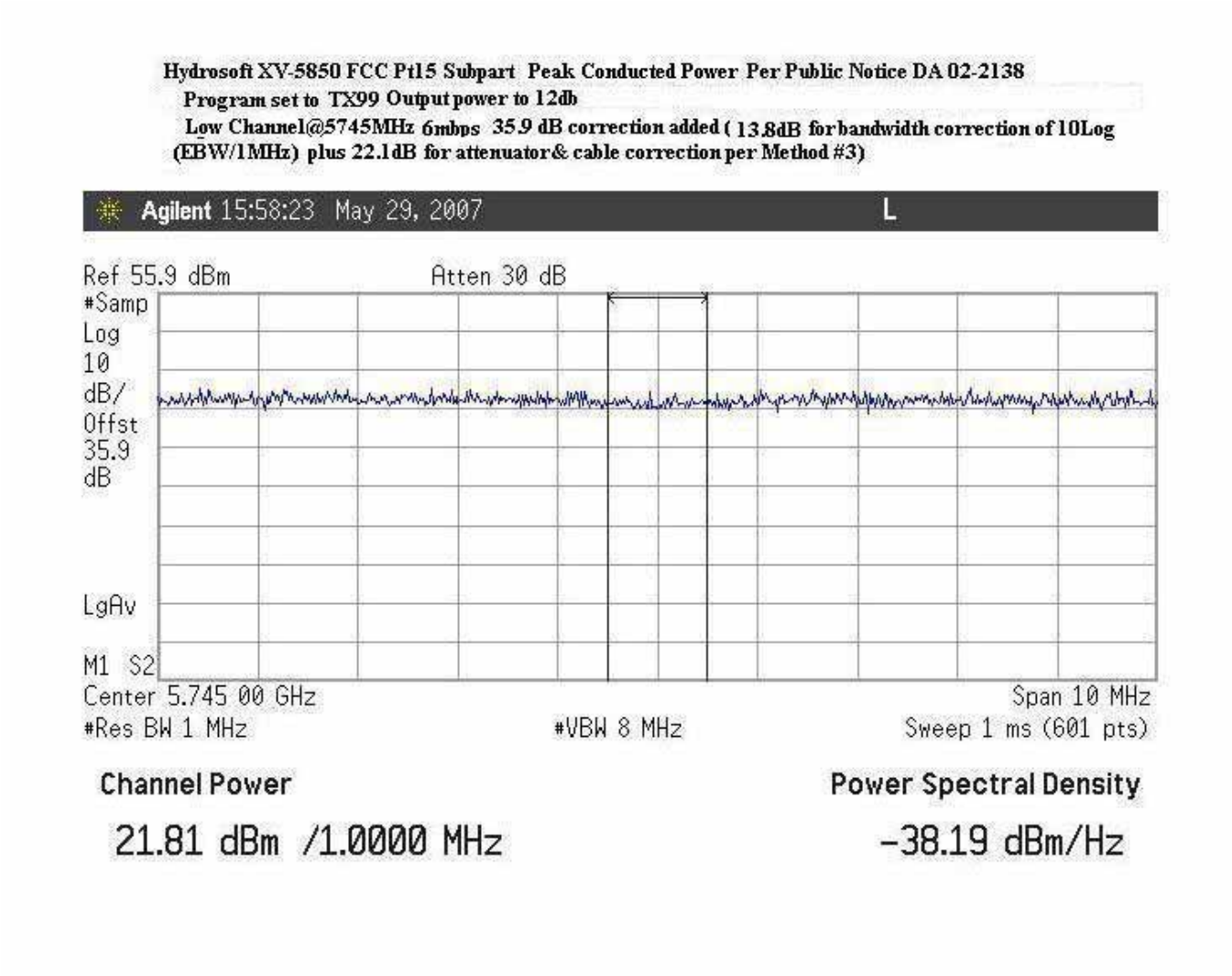

Figure 4-4. RF Peak Power, Low Channel

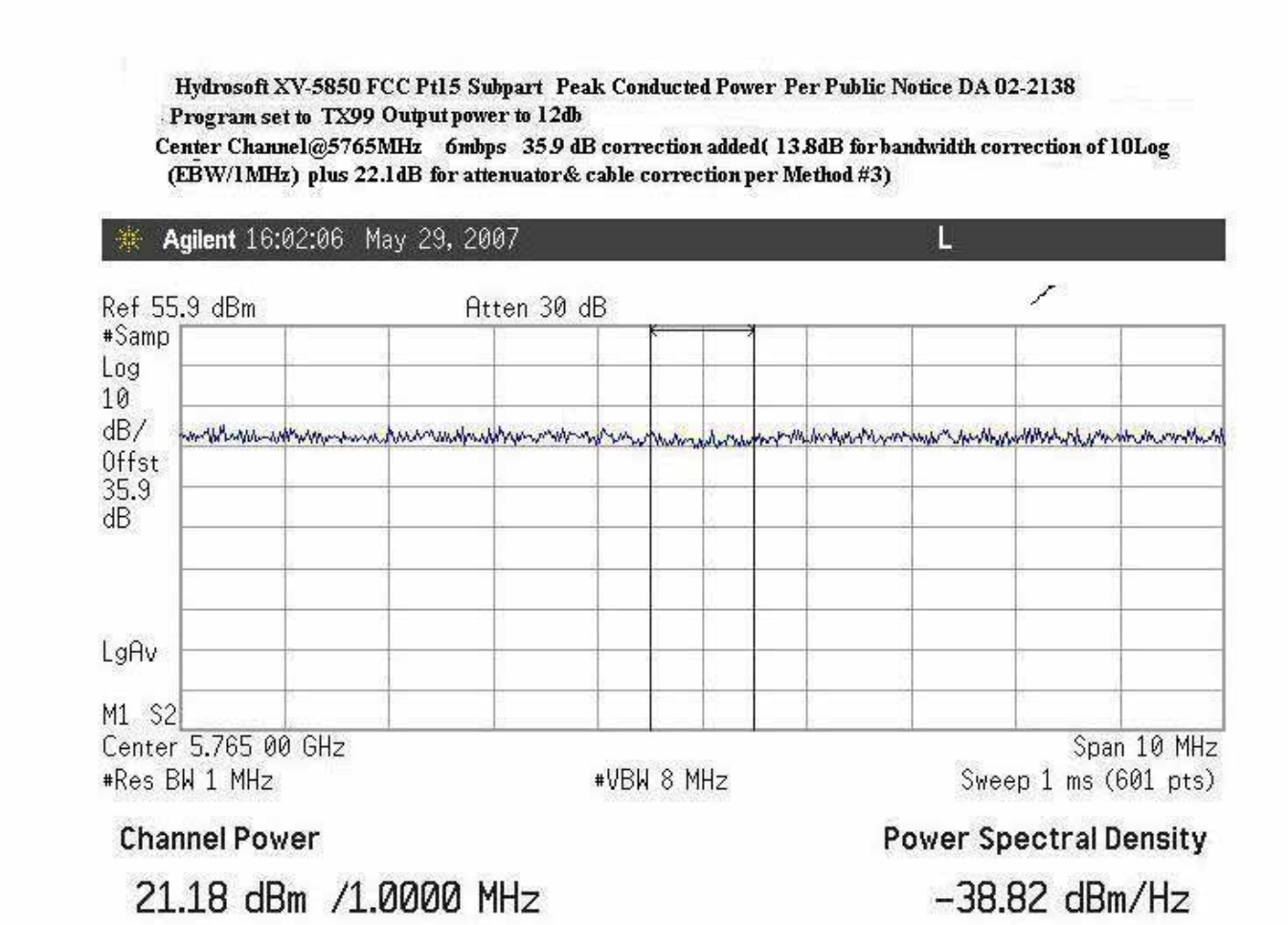

Figure 4-5. RF Peak Power, Mid Channel

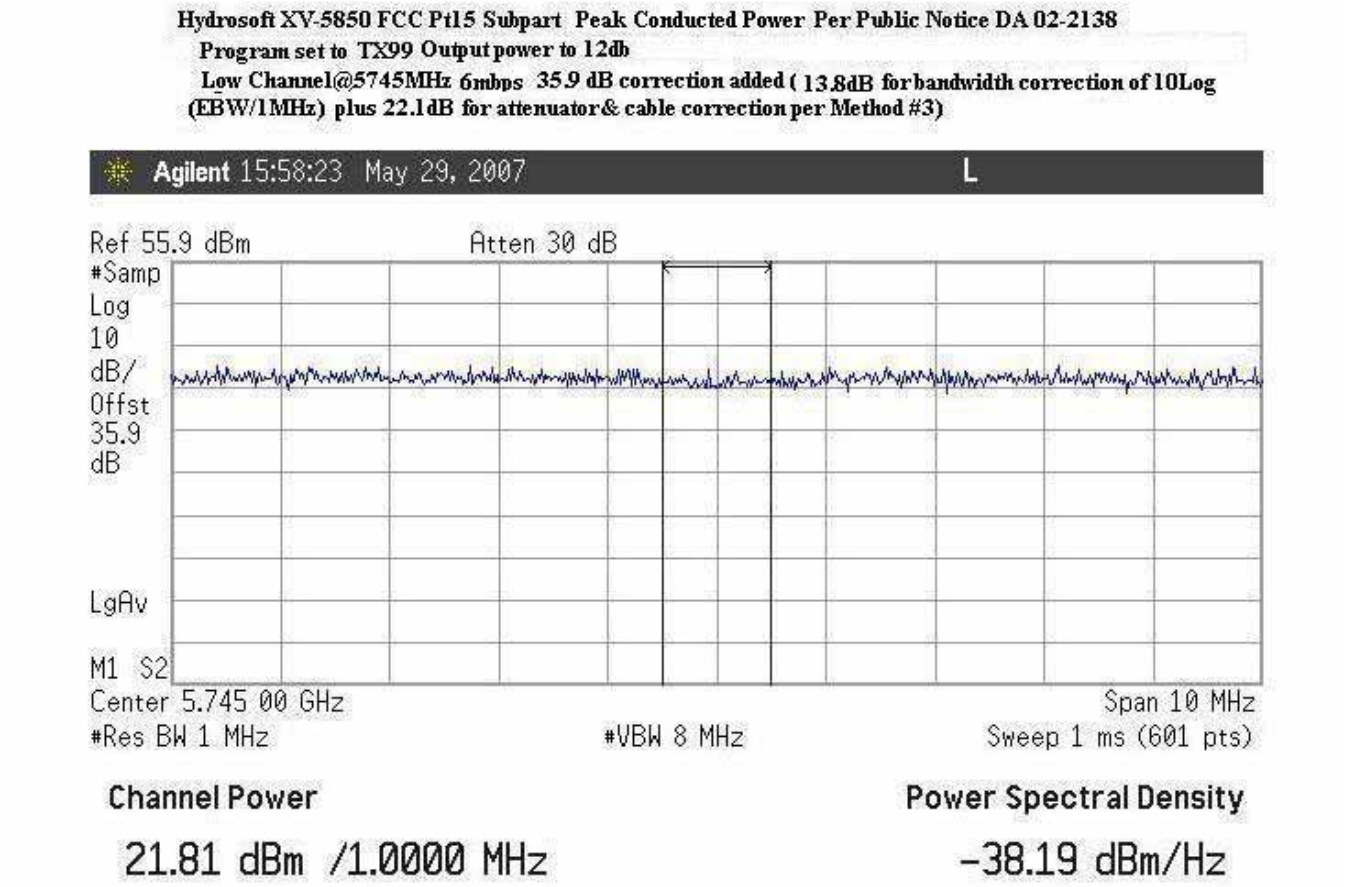

Figure 4-6. RF Peak Power, High Channel

4.3 Peak Power Spectral Density: (FCC Part §15.407(a)3)

Measurements for peak power spectral density were taken in accordance with 15.407(a)(3). The measurements were performed using Method 1 of FCC Public Notice DA 02-2138.

The spectrum analyzer was set to peak detect mode with a RBW of 1MHz and a VBW of 3MHz. The highest level detected across any 1MHz band was then recorded and compared to the limit 17dBm.

The following table and plots give the results for power spectral density testing.

Table 5. Peak Power Spectral Density

Frequency	Level	Limit	Pass/Fail
Low Channel 5745MHz	9.87 dBm	17 dBm	Pass
Mid Channel 5765MHz	9.56 dBm	17 dBm	Pass
High Channel 5805MHz	9.66 dBm	17 dBm	Pass

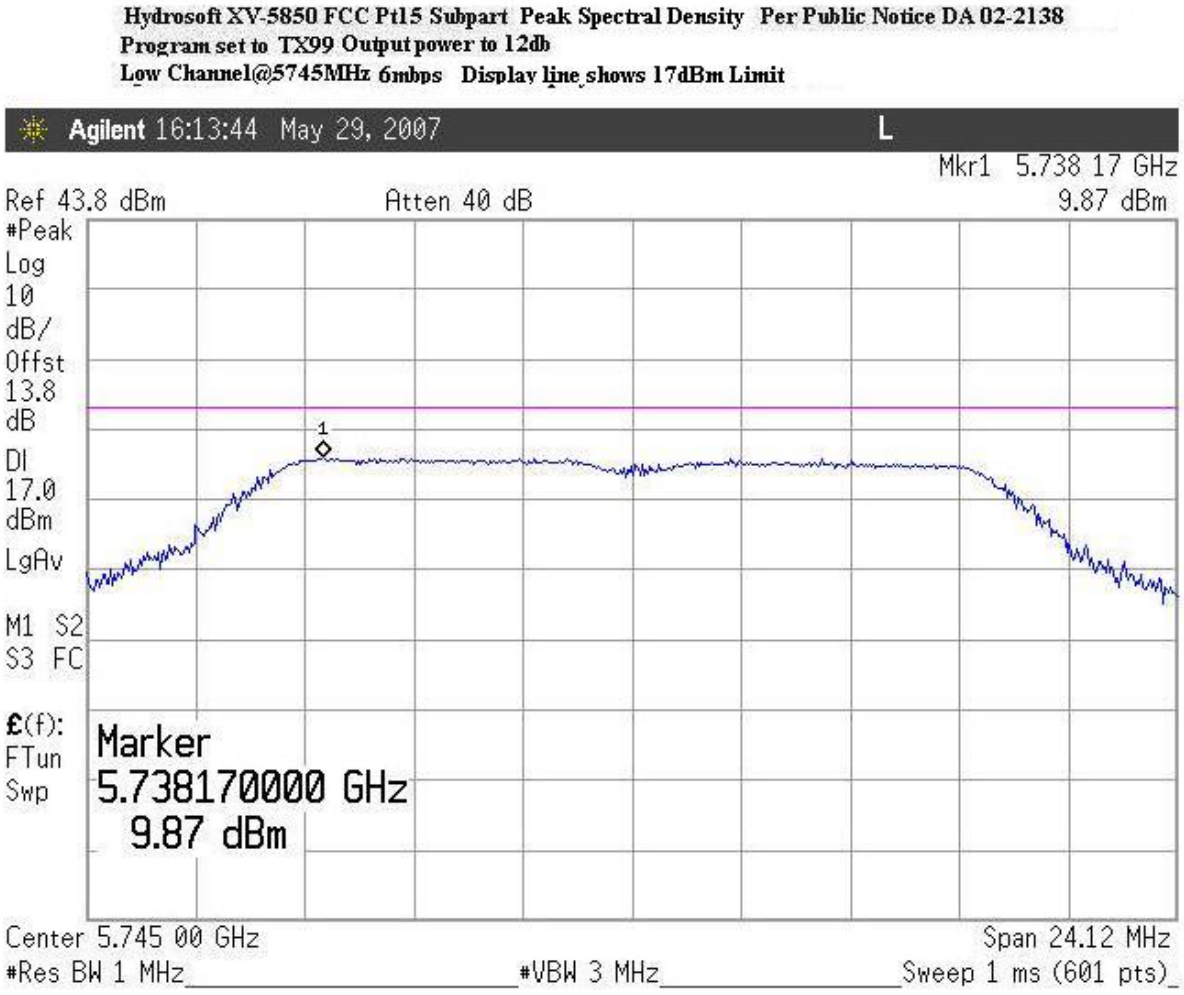

Figure 4-7. Peak Power Spectral Density, Low Channel

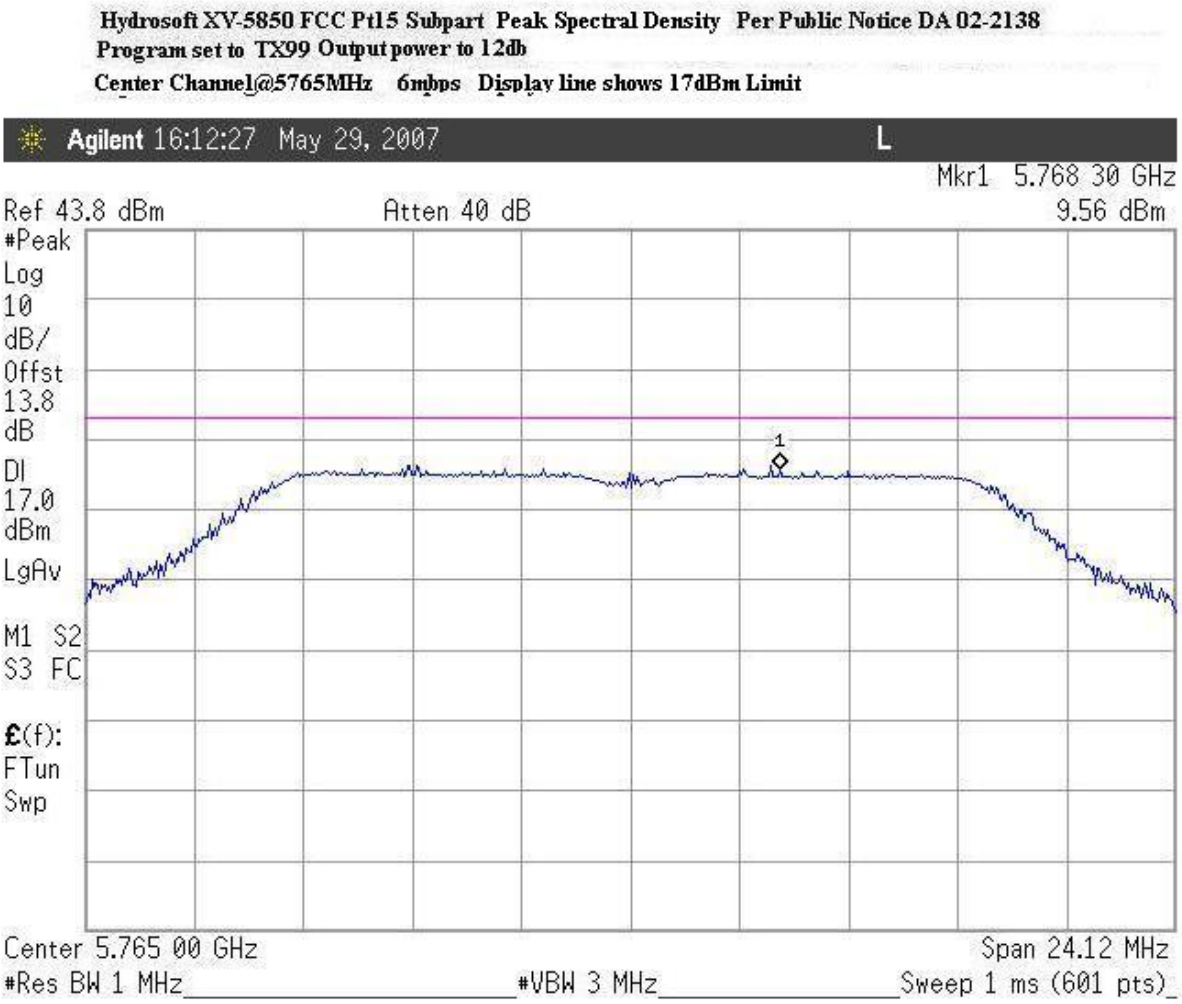

Figure 4-8. Peak Power Spectral Density, Mid Channel

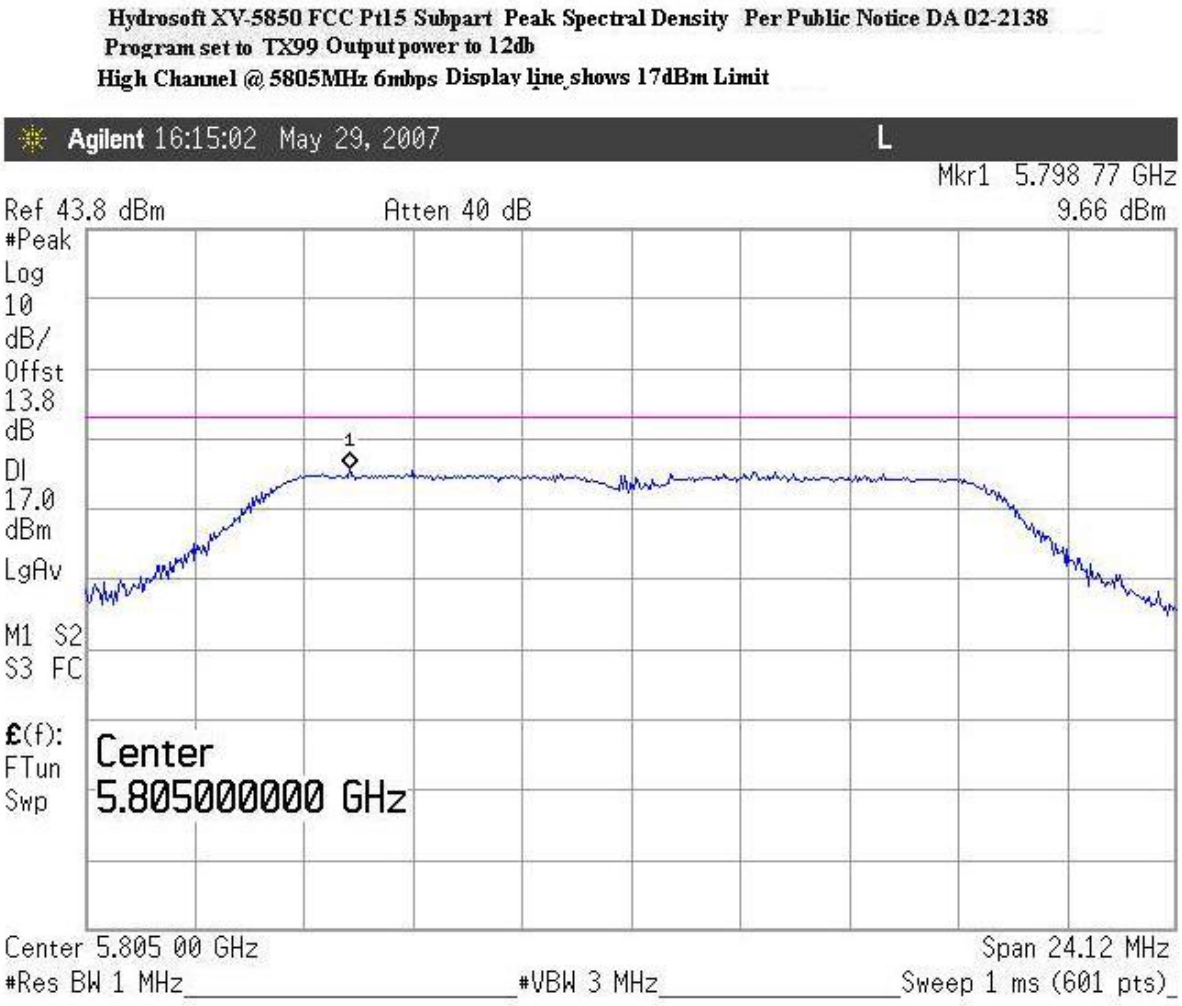

Figure 4-9. Peak Power Spectral Density, High Channel

4.4 Radiated Spurious Emissions: (FCC Part §15.209 and 15.407(b)(4))

The EUT must comply with the requirements for radiated spurious emissions per 15.407(b)(4). These emissions must meet the limits specified for peak measurements.

4.4.1 Test Procedure

The EUT was placed on motorized turntable for radiated testing on a 3-meter open field test site. The emissions from the EUT were measured continuously at every azimuth by rotating the turntable. Receiving antennas were mounted on an antenna mast to determine the height of maximum emissions. The height of the antenna was varied between 1 and 4 meters. The peripherals were placed on the table in accordance with ANSI C63.4-2003. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

The emissions were measured using the following resolution bandwidths:

Frequency Range	Resolution Bandwidth	Video Bandwidth
30MHz-1000 MHz	120kHz	>100 kHz
>1000 MHz	1 MHz	<30 Hz (Avg.) 1MHz (Peak)

Emissions detected from the band edge to 10MHz above or below the band edge are to meet the specification EIRP limit of -17dBm/MHz while emissions removed from the band edge by more than 10MHz are to comply with an EIRP of -27dBm/MHz. Emissions detected below 1GHz are to comply with the limits specified in 15.209.

EIRP levels were obtained using the signal substitution method.

Table 6: Radiated Emission Test Data, Low Frequency Data (<1GHz)

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin (dB)
212.350	V	300.0	1.5	42.1	11.6	2.1	27.2	28.6	27.0	150.0	-14.9
212.950	V	300.0	1.5	44.8	11.6	2.1	27.2	31.3	36.8	150.0	-12.2
232.200	V	45.0	4.0	43.4	12.7	2.6	27.2	31.5	37.7	200.0	-14.5
266.990	V	90.0	1.0	46.2	14.5	3.0	27.1	36.5	67.0	200.0	-9.5
537.233	V	180.0	2.5	43.7	17.9	4.1	27.0	38.7	86.5	200.0	-7.3
40.390	H	180.0	2.5	43.5	17.7	0.8	27.0	34.9	55.7	100.0	-5.1
80.000	H	340.0	3.0	51.1	7.1	1.5	27.0	32.7	43.0	100.0	-7.3
212.350	H	270.0	2.0	43.8	11.6	2.1	27.2	30.3	32.6	150.0	-13.2
212.950	H	270.0	2.0	40.0	11.6	2.1	27.2	26.5	21.2	150.0	-17.0
232.100	H	120.0	1.0	41.0	12.7	2.6	27.2	29.2	28.7	200.0	-16.9
267.000	H	270.0	2.3	40.9	14.5	3.0	27.1	31.2	36.4	200.0	-14.8
537.233	H	90.0	1.8	39.1	17.9	4.1	27.0	34.1	50.6	200.0	-11.9

Table 7: Radiated Emission Test Data, High Frequency Data (>1GHz): Low Channel

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	Spurious Level dBµV	Sub. Sig. Gen. Level dBm	Sub. Power Level dBm	Sub. Ant. Factor dB/m	Sub. Ant. Gain dBi	EIRP Level dBm	Limit dBm	Margin dB
Band edge											
5725.00	H	0.0	1.0	38.4	-20.8	-26.4	40.2	5.2	-21.2	-17.0	-4.2
5830.00	H	0.0	1.0	39.1	-18.0	-23.7	40.4	5.1	-18.6	-17.0	-1.6
5725.00	V	0.0	1.0	37.8	-23.0	-28.6	40.2	5.2	-23.4	-17.0	-6.4
5830.00	V	0.0	1.0	39.6	-19.5	-24.1	40.4	5.1	-19.0	-17.0	-2.0
Non-edge											
11490.000	H	110.0	1.0	46.9	-47.8	-47.2	48.8	2.6	-44.6	-27.0	-17.6
11490.000	V	45.0	1.0	48.9	-44.4	-43.8	48.8	2.6	-41.2	-27.0	-14.2

Table 8: Radiated Emission Test Data, High Frequency Data (>1GHz): Mid Channel

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	Spurious Level dBµV	Sub. Sig. Gen. Level dBm	Sub. Power Level dBm	Sub. Ant. Factor dB/m	Sub. Ant. Gain dBi	EIRP Level dBm	Limit dBm	Margin dB
Band edge											
5725.00	H	0.0	1.0	38.4	-20.8	-26.4	40.2	5.2	-21.2	-17.0	-4.2
5830.00	H	0.0	1.0	39.1	-18.0	-23.7	40.4	5.1	-18.6	-17.0	-1.6
5725.00	V	0.0	1.0	37.8	-23.0	-28.6	40.2	5.2	-23.4	-17.0	-6.4
5830.00	V	0.0	1.0	39.6	-19.5	-24.1	40.4	5.1	-19.0	-17.0	-2.0
Non-edge											
11530.000	H	100.0	1.0	45.8	-47.0	-46.7	48.8	2.6	-44.1	-27.0	-17.1
11530.000	V	180.0	1.0	46.1	-47.7	-47.5	48.8	2.6	-44.9	-27.0	-17.9

Table 9: Radiated Emission Test Data, High Frequency Data (>1GHz): High Channel

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	Spurious Level dBµV	Sub. Sig. Gen. Level dBm	Sub. Power Level dBm	Sub. Ant. Factor dB/m	Sub. Ant. Gain dBi	EIRP Level dBm	Limit dBm	Margin dB
Band edge											
5725.00	H	0.0	1.0	38.4	-20.8	-26.4	40.2	5.2	-21.2	-17.0	-4.2
5830.00	H	0.0	1.0	39.1	-18.0	-23.7	40.4	5.1	-18.6	-17.0	-1.6
5725.00	V	0.0	1.0	37.8	-23.0	-28.6	40.2	5.2	-23.4	-17.0	-6.4
5830.00	V	0.0	1.0	39.6	-19.5	-24.1	40.4	5.1	-19.0	-17.0	-2.0
Non-edge											
11610.000	H	90.0	1.0	46.9	-47.0	-46.2	49.0	2.5	-43.7	-27.0	-16.7
11610.000	V	0.0	1.0	44.9	-52.0	-50.9	49.0	2.5	-48.4	-27.0	-21.4

4.5 AC Power line Conducted Emissions: (FCC Part §15.207)

The EUT is powered via a Power Over Ethernet (POE). A separate injector, properly equipped server or router can provide this power source. All are considered support equipment and conducted emissions on the AC power line were not performed.