FCC Certification Test Report

FCC Certification Test Report for ZCOMAX Technologies, Inc. FCC ID: RWQ-CPE2

April 5, 2004

Revision 1 issued April 19, 2004

Prepared for:

ZCOMAX Technologies, Inc.
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Prepared By:

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FCC Certification Test Program

FCC Certification Test Report
for the
ZCOMAX Technologies, Inc.
325H Wireless Router
FCC ID: RWQ-CPE2

April 5, 2004

Revision 1 issued April 19, 2004

WLL JOB# 7973

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Abstract

This report has been prepared on behalf of ZCOMAX Technologies, Inc. to support the attached Application for Equipment Authorization. The test report and application are submitted for a Direct Sequence Spread Spectrum Transmitter under Part 15.247 of the FCC Rules and Regulations. This Federal Communication Commission (FCC) Certification Test Report documents the test configuration and test results for a ZCOMAX Technologies, Inc. 325H Wireless Router.

ZCOMAX wishes to have this device approved as a module. Attestation letter and information are found in the related correspondence exhibits to this application.

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 ZCOMAX Technologies, Inc. 325H Wireless Router is an IEEE 802.11/802.11b compliant device and complies with the limits for a Direct Sequence Spread Spectrum Transmitter device under Part 15.247 of the FCC Rules and Regulations.

The radio transmitter in this device is based on a Certified module listed under FCC ID: M4Y-0325H.

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1 Introduction

1.1 Compliance Statement

The ZCOMAX Technologies, Inc. 325H Wireless Router complies with the limits for a Direct Sequence Spread Spectrum Transmitter device under Part 15.247 of the FCC Rules and Regulations.

The product is a mobile device designed for wireless access application and use.

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 00-705 and the 2001 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:	ZCOMAX Technologies, Inc. 400 Morris Avenue Suite 272 Denville, NJ 07834
Purchase Order Number:	WL020904MS01
Quotation Number:	61311-A

1.4 Test Dates

Testing was performed from February 17, 2004 to March 1, 2004.

1.5 Test and Support Personnel

Washington Laboratories: Steve Koster, James Ritter, Thuan Ta

1.6 Abbreviations

A	Ampere
Ac	alternating current
AM	Amplitude Modulation
Amps	Amperes
b/s	bits per second
BW	Bandwidth
CE	Conducted Emission
Cm	centimeter
CW	Continuous Wave
DB	decibel
Dc	direct current
EMI	Electromagnetic Interference
EUT	Equipment Under Test
FM	Frequency Modulation
G	giga - prefix for 10^9 multiplier
Hz	Hertz
IF	Intermediate Frequency
K	kilo - prefix for 10^3 multiplier
M	Mega - prefix for 10^6 multiplier
M	Meter
μ	micro - prefix for 10^{-6} multiplier
NB	Narrowband
LISN	Line Impedance Stabilization Network
RE	Radiated Emissions
RF	Radio Frequency
Rms	root-mean-square
SN	Serial Number
S/A	Spectrum Analyzer
V	Volt

2 Equipment Under Test

2.1 EUT Identification & Description

The Wireless Router is an IEEE 802.11b Wireless LAN adapter that is used to connect to networked resources such as Internet and Internal LAN resources. The ZCOMAX Technologies, Inc. 325H Wireless Router uses 11 channels in the 2.4GHz ISM band. The direct sequence spread spectrum signal is modulated using one of the following methods: DQPSK, DBPSK or CCK.

Table 1. Device Summary

ITEM	DESCRIPTION
Manufacturer:	ZCOMAX Technologies, Inc.
FCC ID Number	RWQ-CPE2
EUT Name:	Wireless Router
Model:	325H
FCC Rule Parts:	§15.247
Frequency Range:	2412MHz – 2462MHz
Maximum Output Power:	0.2W (23.8 dBm)
Modulation:	DQPSK, DBPSK or CCK
Occupied Bandwidth:	10.85 MHz
Keying:	Automatic
Type of Information:	Data
Number of Channels:	11
Power Output Level	Fixed
Antenna Connector	MMCX
Antenna Type	Plate – 18dBi or 16dBi
Interface:	PCMCIA Slot
Power Source & Voltage:	120VAC

2.2 Test Configuration

The 325H was configured with an extender card attached to a laptop PC and an 18dBi antenna.

2.3 Testing Algorithm

The 325H was programmed for continuous transmission at the highest power level. The unit was set to transmit on the lowest channel, highest channel, and a mid channel.

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 00-705, Filing and Measurement Guidelines for Direct Sequence Spread Spectrum Systems

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

Manufacturer	Model/Type	Function	Identification	Cal. Due
HP	8568B	Spectrum Analyzer	2634A02888	7/07/04
HP	85650A	Quasi-Peak Adapter	3303A01786	7/08/04
HP	Spectrum Analyzer	HP 8593A	3009A00739	6/25/04
HP	8449B	Microwave Preamp	3008A00385	9/29/05
Solar	8012-50-R-24BNC	LISN	8379493	6/30/04
ARA	LPB-2520	BiconiLog Antenna	1044	6/20/04
ARA	DRG118/A	Microwave Horn Antenna	1236	4/17/04
HP	85685A	RF Preselector	3221A01395	7/07/04
HP	8593A	Spectrum Analyzer	00074	6/25/04
Tektronix	TDS 220	Oscilloscope	00333	8/18/04
HP	8648C Signal	Generator	00075	4/30/04
Agilent	8474B	Diode Detector	00416	12/19/04
HP	438A	Power Meter	00394	3/10/04

4 Test Results

4.1 RF Power Output:

The output power was measured a low, high and middle channel.

The power measurement was made using the substitution method. The output of the EUT was connected to a diode detector, which was connected to the input of an oscilloscope. When the radio was turned on, the deflection of the oscilloscope was noted. Then, a signal generator, set to the same frequency as the radio, was connected to the input of the diode and the signal adjusted to get the same deflection as caused by the radio. The output of the signal generator was then connected to the input of a power meter and the resultant power measured. This represents the conducted output power from the radio, which is summarized in the following table.

Table 3. RF Power Output.

Frequency	Level	Limit	Pass/Fail
Low Channel 2412MHz	23.8 dBm	30 dBm	Pass
Mid Channel 2432MHz	22.5 dBm	30 dBm	Pass
High Channel 2462MHz	22.5 dBm	30 dBm	Pass

4.2 Power Spectral Density

For DSSS devices, the peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band.

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.

Table 4. Power Spectral Density

Frequency	Level	Limit	Pass/Fail
Low Channel 2412 MHz	-4.68 dBm	8 dBm	Pass
Mid Channel B 2432MHz	-4.55 dBm	8 dBm	Pass
High Channel 2462 MHz	-4.77 dBm	8 dBm	Pass

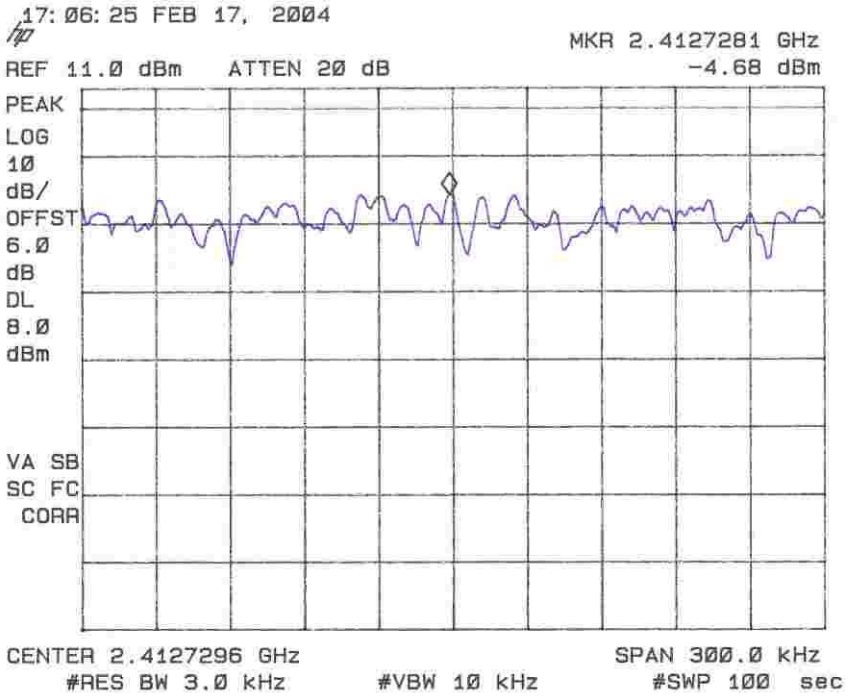

Figure 4-1: Power Spectral Density Plot, Channel 1

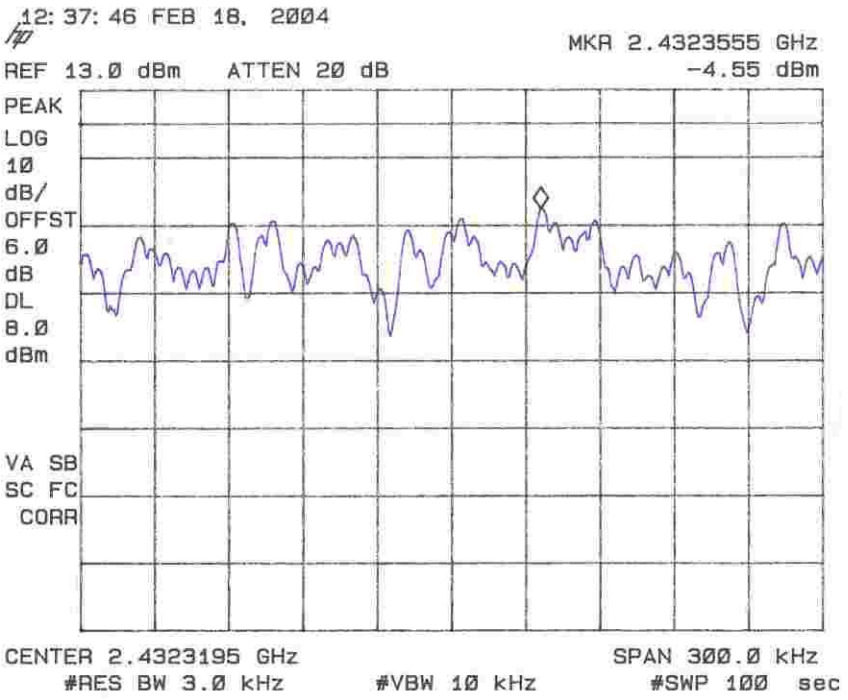

Figure 4-2: Power Spectral Density Plot, Channel 5

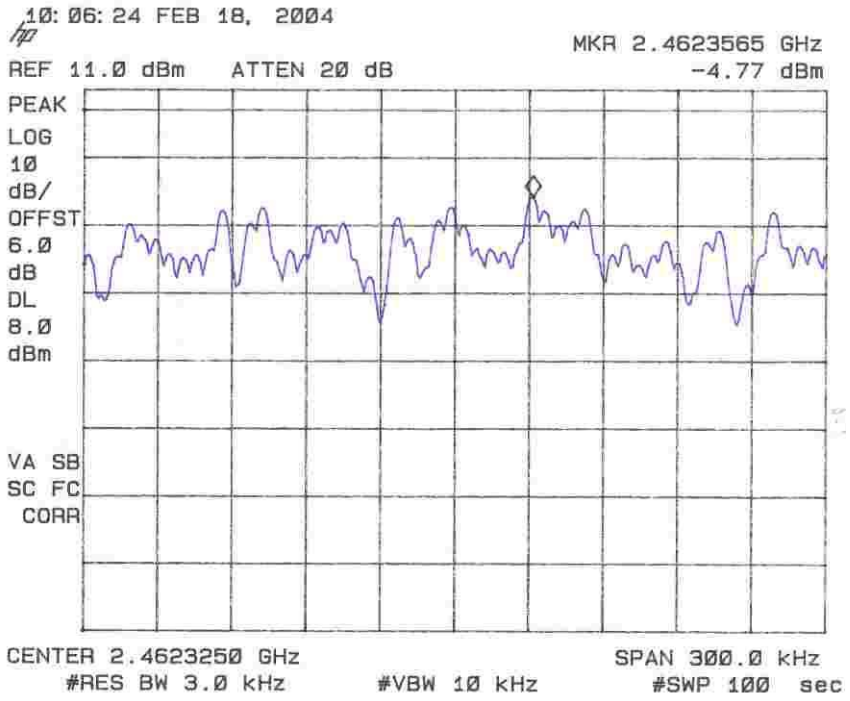

Figure 4-3: Power Spectral Density Plot, Channel 11

4.3 Occupied Bandwidth: (FCC Part §2.1049)

The occupied bandwidth was measured by coupling the output of the EUT to the input of a spectrum analyzer.

For Direct Sequence Spread Spectrum Systems, FCC Part 15.247 requires that the minimum 6 dB bandwidth be at least 500 kHz. Three channels were measured with the data shown in Figure 4-4 through Figure 4-6.

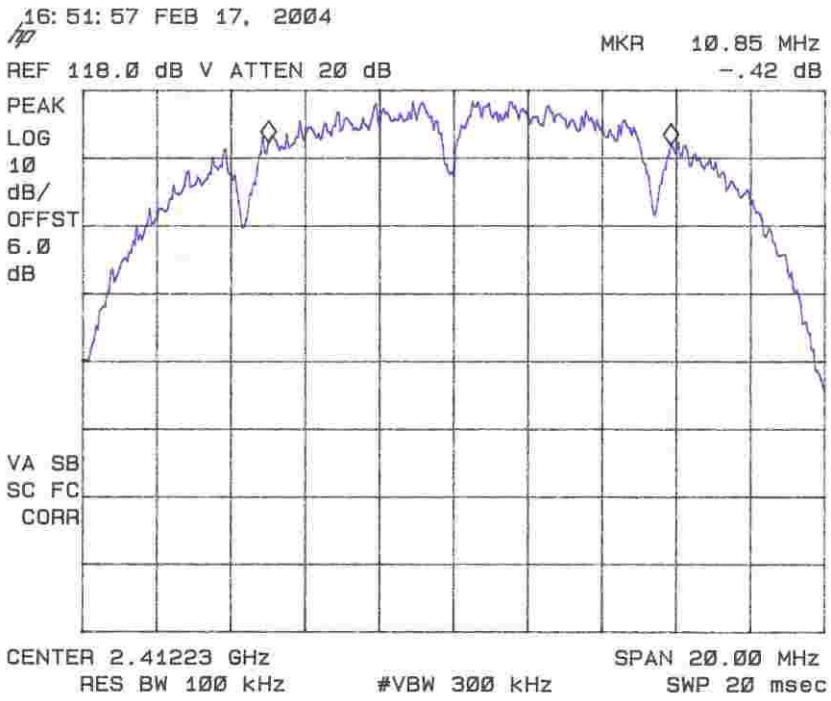

Figure 4-4. Occupied Bandwidth, Low Channel

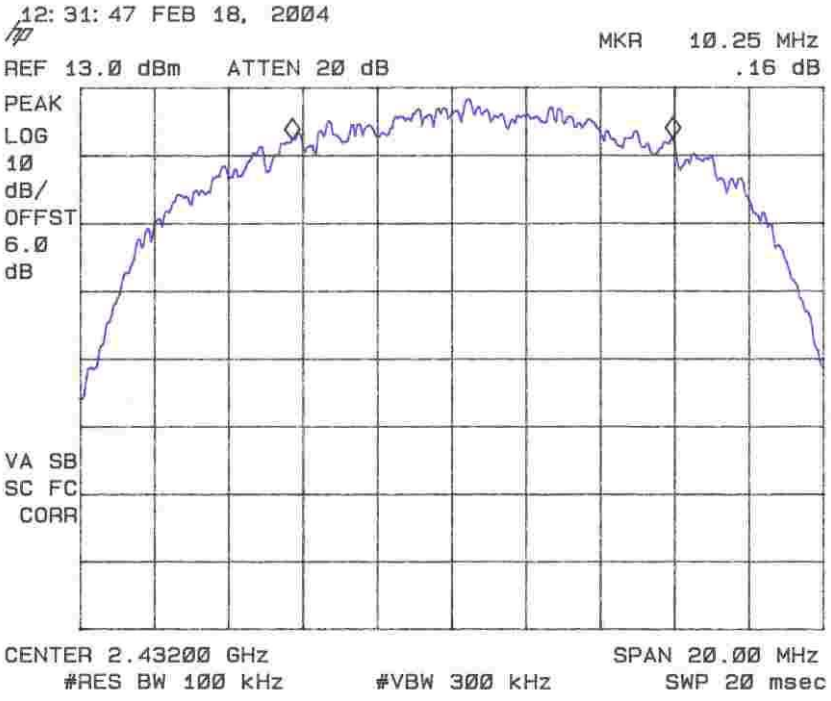

Figure 4-5. Occupied Bandwidth, Mid Channel

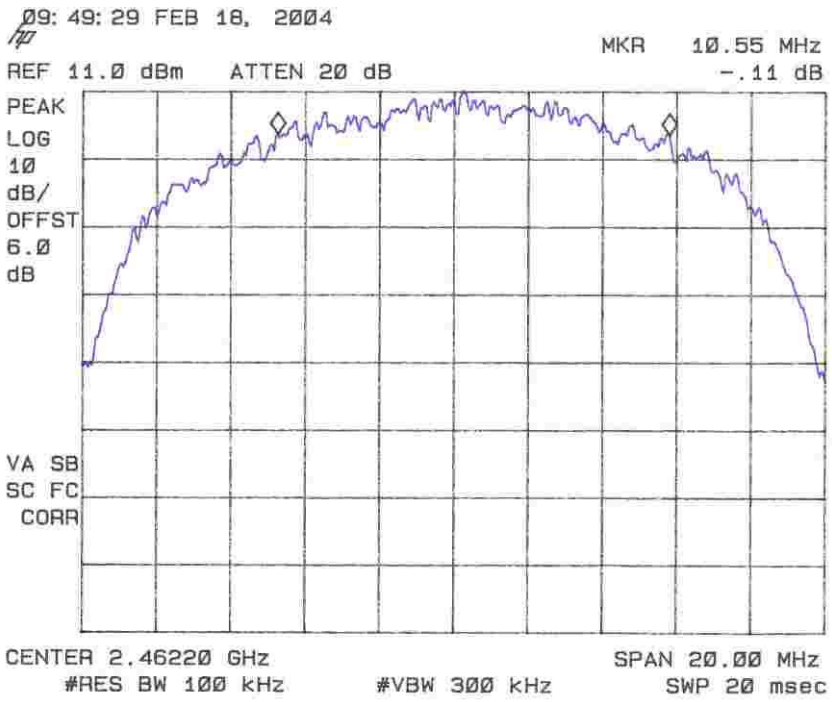

Figure 4-6. Occupied Bandwidth, High Channel

Table 5 provides a summary of the Occupied Bandwidth Results.

Table 5. Occupied Bandwidth Results

Frequency	Bandwidth	Limit	Pass/Fail
Low Channel 2412MHz	10.85MHz	> 500 kHz	Pass
Mid Channel 2432MHz	10.25MHz	> 500 kHz	Pass
High Channel 2462MHz	10.55MHz	> 500 kHz	Pass

4.4 Conducted Spurious Emissions at Antenna Terminals (FCC Part §2.1051)

The EUT must comply with requirements for spurious emissions at antenna terminals. Per §15.247(c) all spurious emissions in any 100 kHz bandwidth outside the frequency band in which the spread spectrum device is operating shall be attenuated 20 dB below the highest power level in a 100 kHz bandwidth within the band containing the highest level of the desired power.

The EUT antenna was removed and the cable was connected directly into a spectrum analyzer through a 10 dB attenuator. An offset was programmed into the spectrum

analyzer to compensate for the loss of the external attenuator. The spectrum analyzer resolution bandwidth was set to 100 kHz and the video bandwidth was set to 100 kHz. The amplitude of the EUT carrier frequency was measured to determine the emissions limit (20 dB below the carrier frequency amplitude). The emissions outside of the allocated frequency band were then scanned from 30 MHz up to the tenth harmonic of the carrier.

The following are plots of the conducted spurious emissions data.

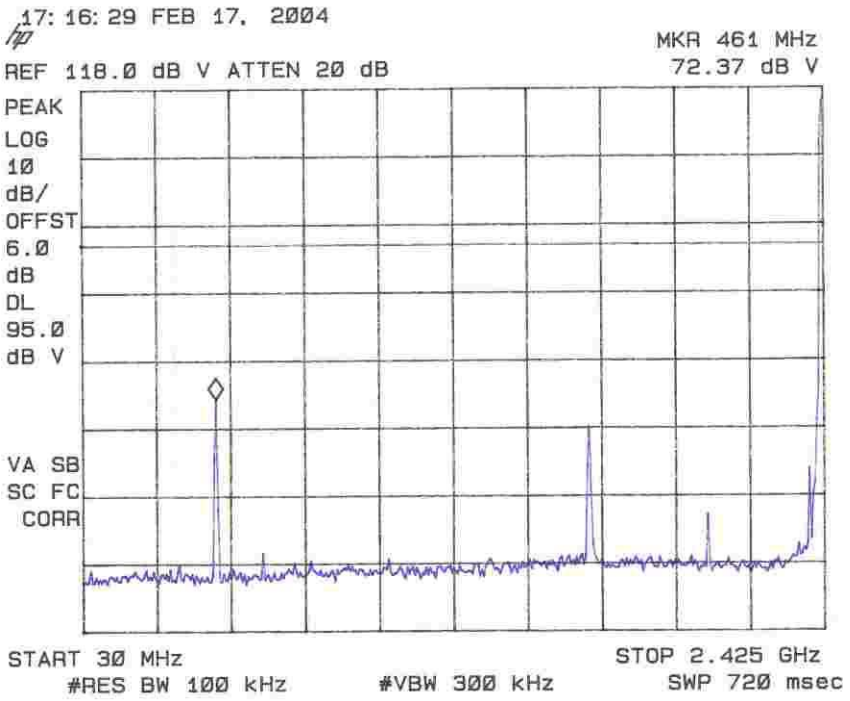

Figure 4-7. Conducted Spurious Emissions, Low Channel 30 – 2.425GHz

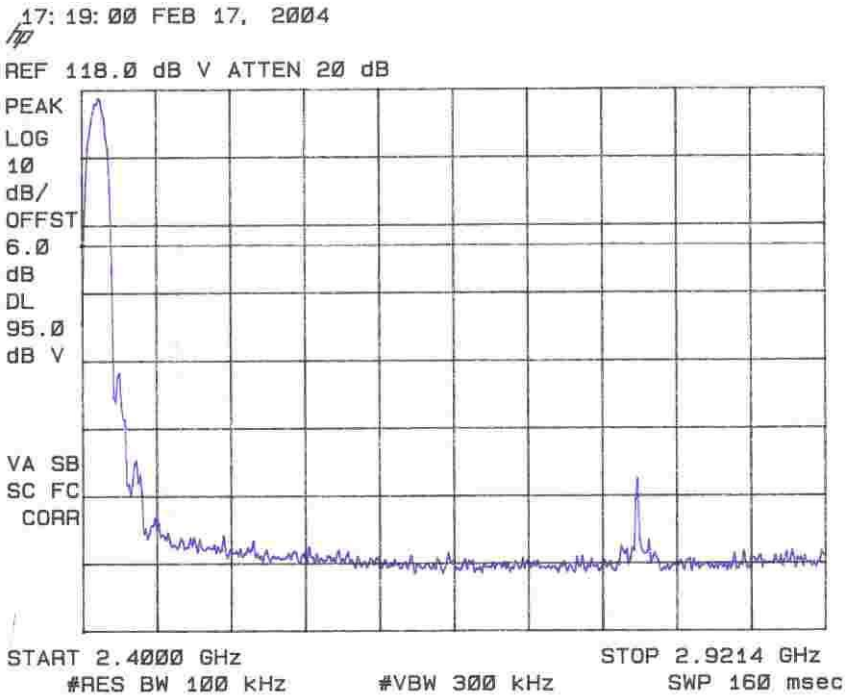

Figure 4-8. Conducted Spurious Emissions, Low Channel 2.4GHz – 2.9214GHz

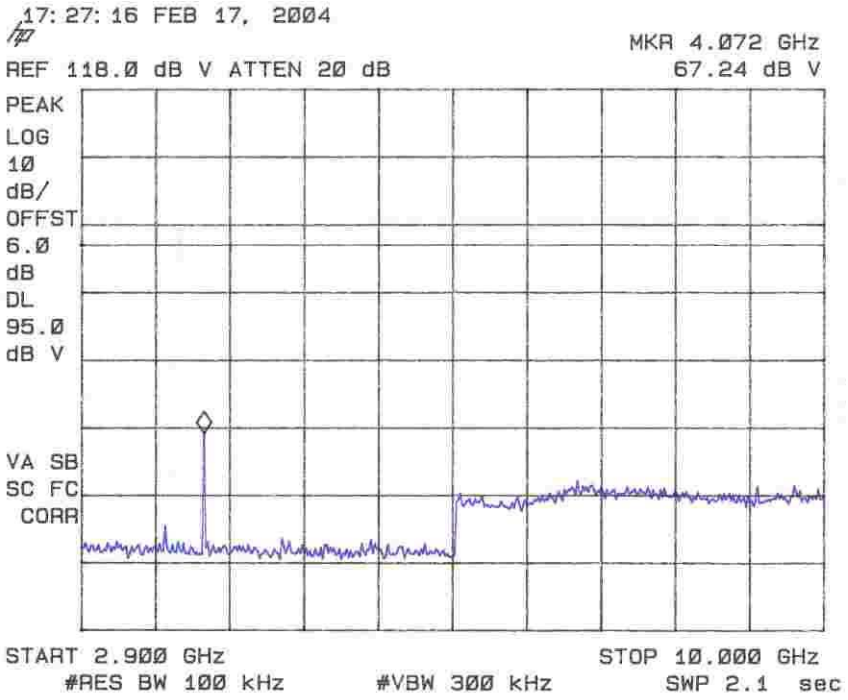

Figure 4-9. Conducted Spurious Emissions, Low Channel 2.9 – 10GHz

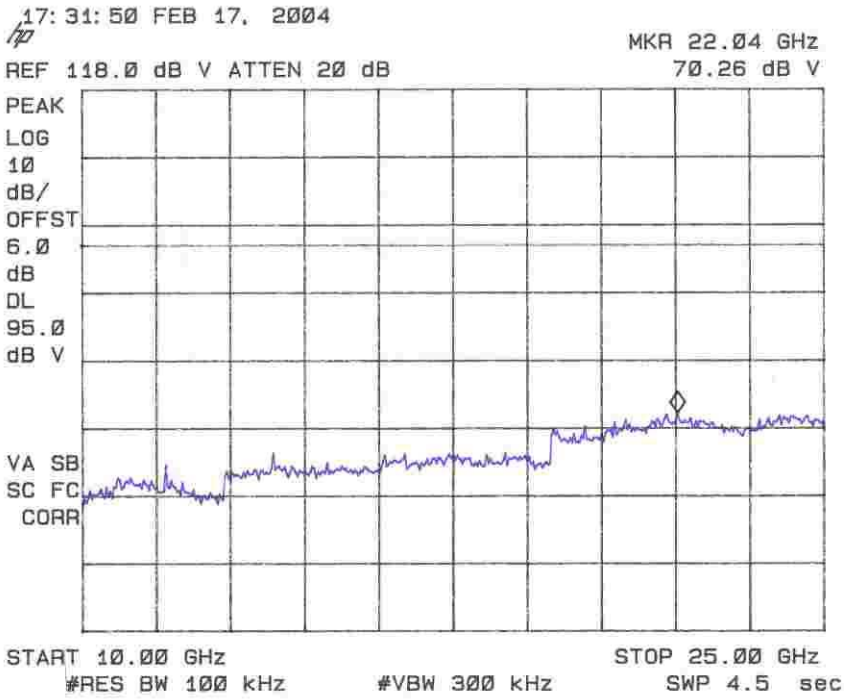

Figure 4-10. Conducted Spurious Emissions, Low Channel 10GHz - 25GHz

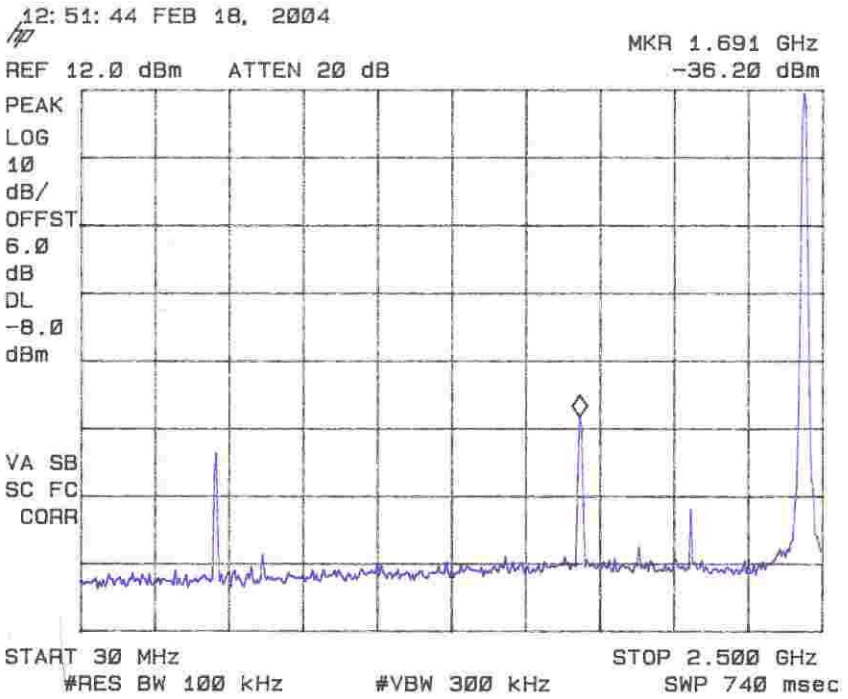

Figure 4-11. Conducted Spurious Emissions, Mid Channel 30MHz – 2.5GHz

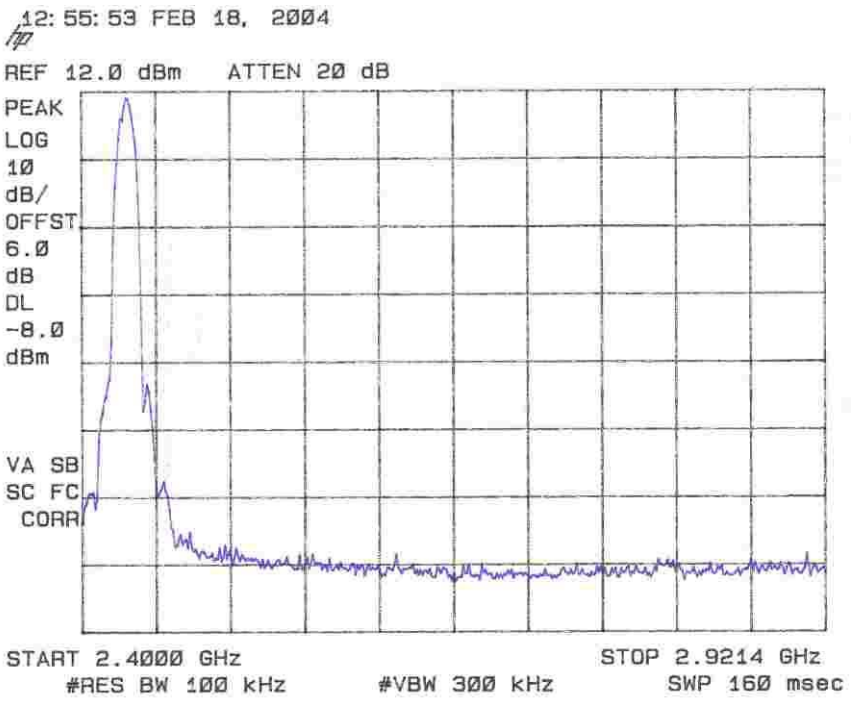

Figure 4-12. Conducted Spurious Emissions, Mid Channel 2.4GHz - 2.914 GHz

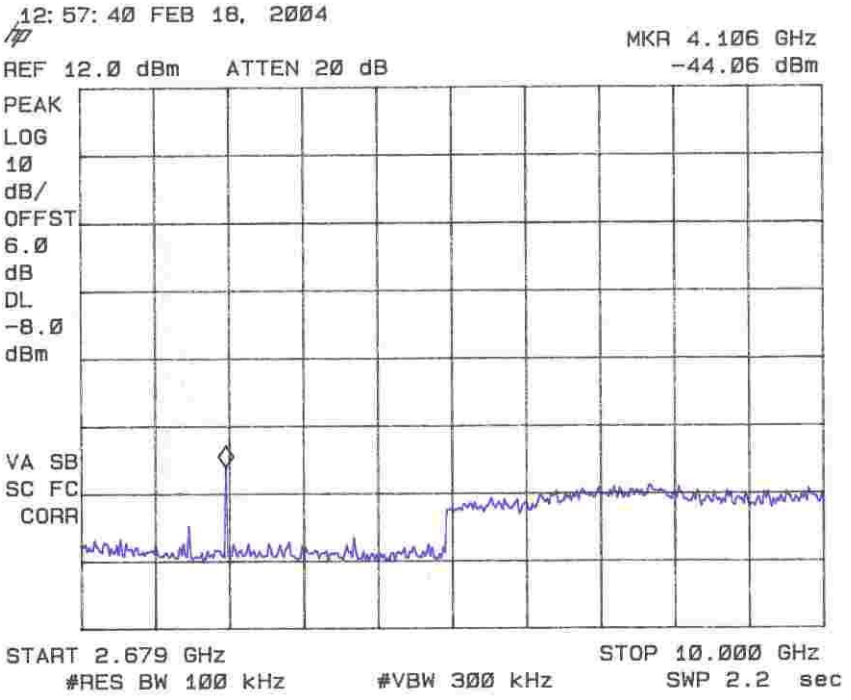

Figure 4-13. Conducted Spurious Emissions, Mid Channel 2.679GHz - 10GHz

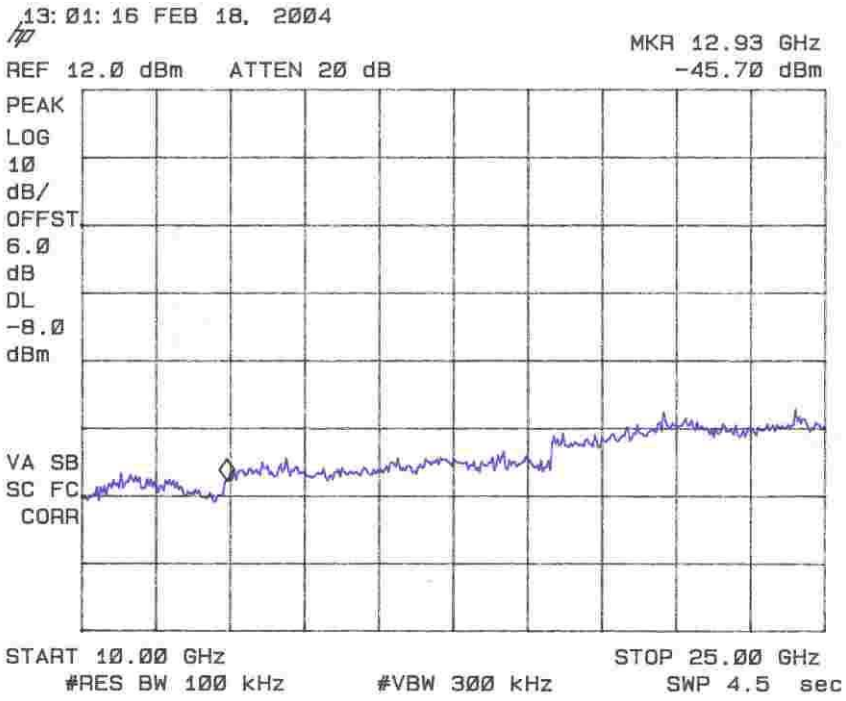

Figure 4-14. Conducted Spurious Emissions, Mid Channel 10GHz – 25GHz

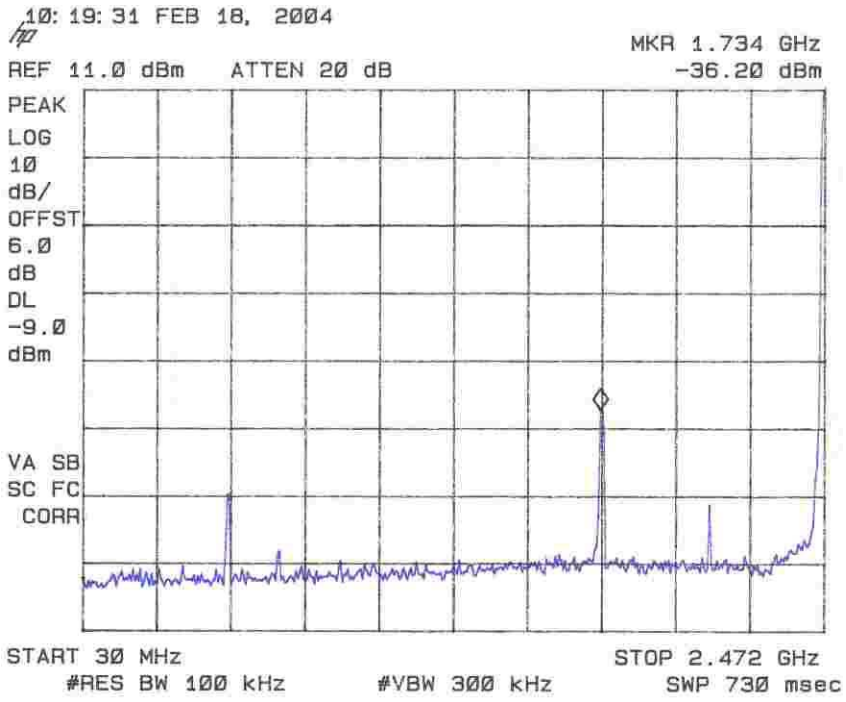

Figure 4-15. Conducted Spurious Emissions, High Channel 30MHz – 2.472GHz

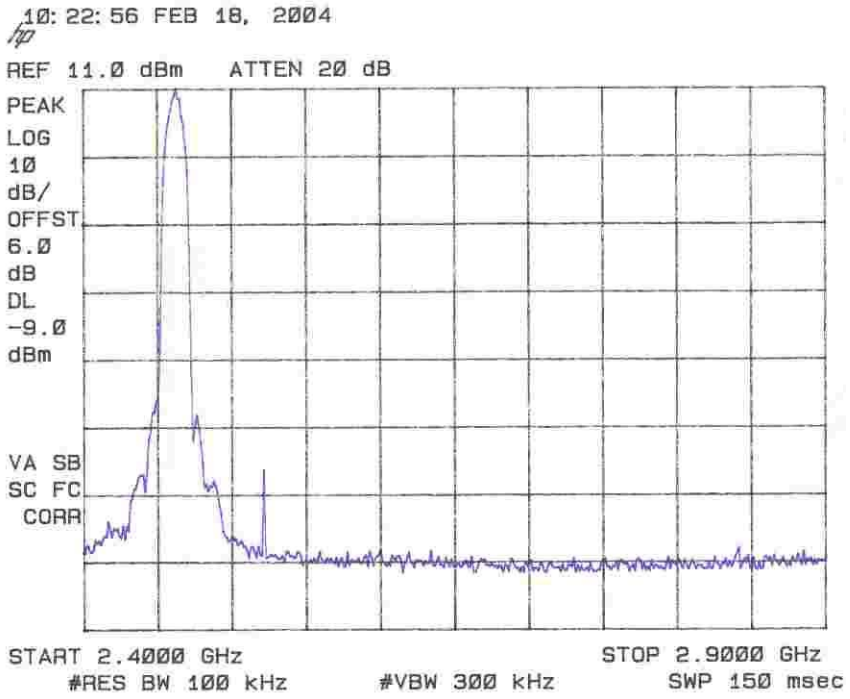

Figure 4-16. Conducted Spurious Emissions, High Channel 2.4GHz – 2.9GHz

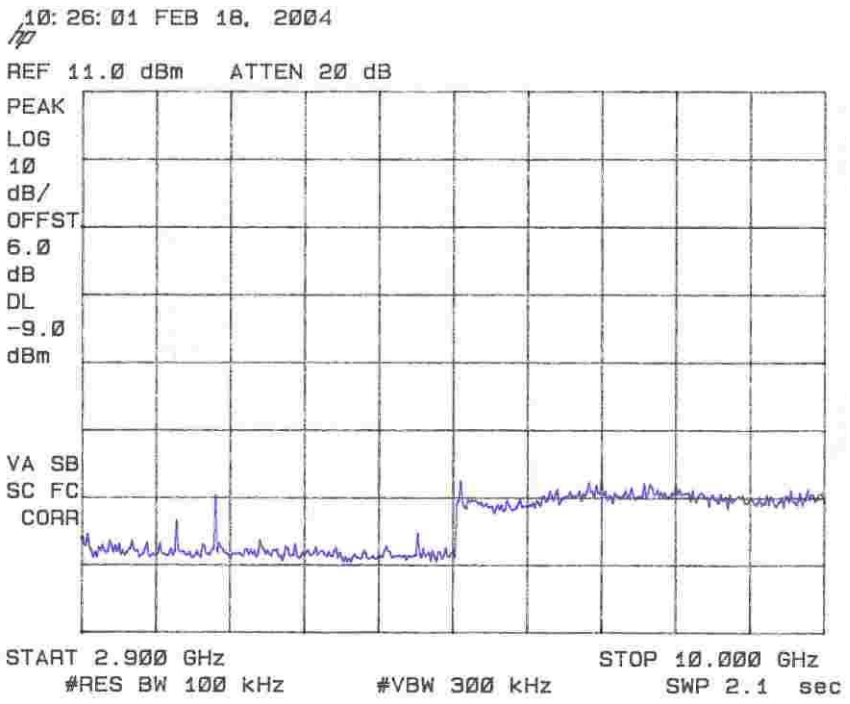

Figure 4-17. Conducted Spurious Emissions, High Channel 2.9GHz – 10GHz

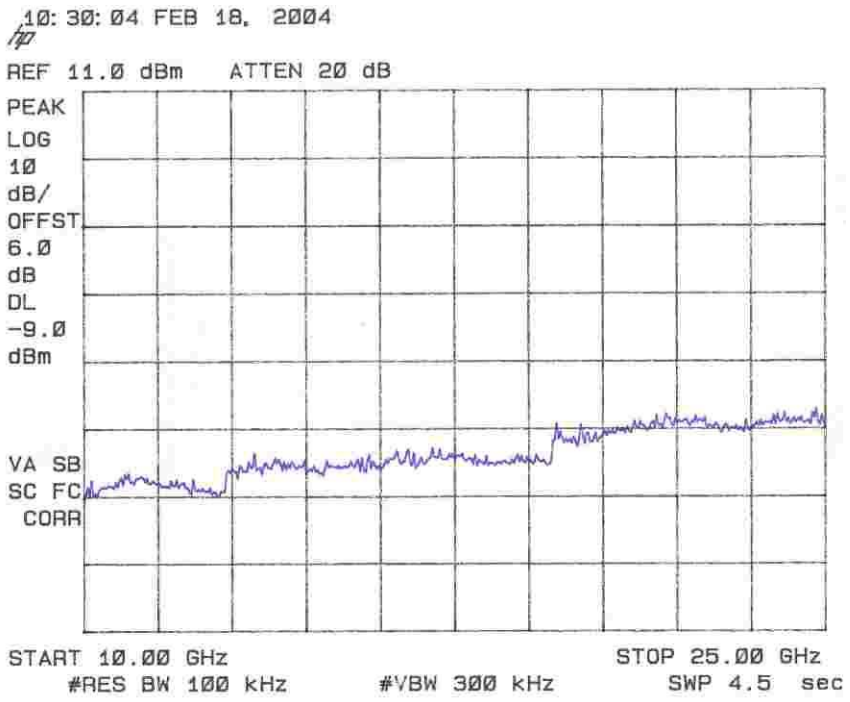

Figure 4-18. Conducted Spurious Emissions, High Channel 10GHz – 25GHz

4.5 Radiated Spurious Emissions: (FCC Part §2.1053)

The EUT must comply with the requirements for radiated spurious emissions that fall within the restricted bands. These emissions must meet the limits specified in §15.209 and §15.35(b) for peak measurements.

4.5.1 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 C63.4-2001. 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)

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 C63.4-2001. Cables were varied in position to produce maximum emissions. Both the horizontal and vertical field components were measured.

Emissions were scanned up to the 10^{th} harmonic of the fundamental frequency. Worst case emissions are reported in the data table. Band Edge data are included in Table 9 followed by plots of the band edge emissions. The band edge plots in Figures 4-19 and Figure 4-20 indicate a peak emission occurring at approximately 2.34GHz. This emission was evaluated and found to be an ambient signal.

The following is a sample calculation used in the data tables for calculating the final field strength of spurious emissions and comparing these levels to the specified limits.

Sample Calculation:

Spectrum Analyzer Voltage (SA Level): VdBµV
Antenna Factor (Ant Corr): AFdB/m
Cable Loss Correction (Cable Corr): CCdB
Amplifier Gain: GdB
Electric Field (Corr Level): EdBµV/m = VdBµV + AFdB/m + CCdB - GdB
To convert to linear units: EµV/m = antilog (EdBµV/m/20)

Table 6: Radiated Emission Test Data, Restricted Bands <1GHz

CLIENT:	Zcomax	DATE:	2/18/2004
TESTER:	James Ritter	JOB #:	7973
EUT Information:		**Test Requirements:**	
EUT:	XI-325H module	TEST STANDARD:	FCC Part 15
CONFIGURATION:	EUT on extender card with plate antenna connected	DISTANCE:	3m
		CLASS:	B
Test Equipment/Limit:			
ANTENNA:	A_00007	CABLE:	CSITE2_3m
LIMIT:	LFCC_3m_Class_B	AMPLIFIER (dB)	None

Worst Case:

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (QP) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
37.88	H	270.0	3.7	11.1	18.0	1.2	30.3	32.7	100.0	-9.7
133.70	H	0.0	3.2	25.2	10.2	1.9	37.3	73.3	150.0	-6.2 **b**
166.92	H	90.0	3.0	21.6	9.9	2.0	33.5	47.4	150.0	-10.0
169.43	H	270.0	3.5	21.0	9.5	2.1	32.6	42.4	150.0	-11.0
333.94	H	270.0	2.6	14.5	14.2	2.7	31.4	37.4	200.0	-14.6 **b**
329.98	H	0.0	3.0	16.1	14.0	2.7	32.8	43.8	200.0	-13.2
37.88	V	0.0	1.0	9.9	18.0	1.2	29.1	28.5	100.0	-10.9
133.70	V	180.0	1.0	25.8	10.2	1.9	37.9	78.5	150.0	-5.6 **b**
166.92	V	0.0	1.4	12.7	9.9	2.0	24.6	17.0	150.0	-18.9
169.43	V	270.0	1.4	19.6	9.5	2.1	31.2	36.1	150.0	-12.4
333.94	V	180.0	2.3	14.9	14.2	2.7	31.8	39.1	200.0	-14.2
329.98	V	180.0	2.0	14.8	14.0	2.7	31.5	37.7	200.0	-14.5

b = broadband emission

Table 7: Radiated Emission Test Data, Restricted Bands >1GHz

CLIENT:	ZCOMAX	DATE:	2/23/2004
TESTER:	James Ritter	JOB #:	7973
EUT Information:		**Test Requirements:**	
EUT:	XI-325H module	TEST STANDARD:	FCC Part 15
CONFIGURATION:	EUT on extender card with plate antenna connected	DISTANCE:	3m
		CLASS:	B
Test Equipment/Limit:			
ANTENNA:	A_00425	CABLE:	CSITE2_HF
LIMIT:	LFCC_3m_Class_B	AMPLIFIER (dB)	A_00066

Average Emissions Data

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Avg.) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Chan 1											
1103.38	H	0.0	1.0	44.9	25.7	1.4	36.3	35.7	60.8	500.0	-18.3
1103.38	V	180.0	1.0	42.1	25.7	1.4	36.3	32.9	44.1	500.0	-21.1
1404.80	H	180.0	1.0	49.2	27.1	2.2	36.0	42.6	134.8	500.0	-11.4
1603.40	H	180.0	1.0	39.2	27.9	2.7	35.8	34.0	50.1	500.0	-20.0
1603.40	V	90.0	1.0	38.2	27.9	2.7	35.8	33.0	44.6	500.0	-21.0
4175.80	H	180.0	1.0	36.7	31.7	3.1	35.5	36.0	62.9	500.0	-18.0
4175.80	V	180.0	1.0	44.4	31.7	3.1	35.5	43.7	153.2	500.0	-10.3
4824.00	H	25.0	1.0	34.8	33.3	4.2	35.9	36.4	66.1	500.0	-17.6
4824.00	V	0.0	1.0	32.1	33.3	4.2	35.9	33.7	48.3	500.0	-20.3
7236.00	H	0.0	1.0	27.2	37.6	4.5	35.9	33.4	47.0	500.0	-20.5 a
7236.00	V	0.0	1.0	27.0	37.6	4.5	35.9	33.3	46.1	500.0	-20.7 a
12060.00	H	0.0	1.0	27.6	41.4	5.2	35.8	38.4	83.3	500.0	-15.6 a
12060.00	V	0.0	1.0	27.1	41.4	5.2	35.8	37.9	79.0	500.0	-16.0 a
14472.00	H	0.0	1.0	30.5	40.8	7.6	34.8	44.2	161.8	500.0	-9.8 a
14472.00	V	0.0	1.0	30.4	40.8	7.6	34.8	44.1	159.6	500.0	-9.9 a
19296.00	H	0.0	1.0	37.0	39.7	7.8	35.4	49.1	285.8	500.0	-4.9 a
19296.00	V	0.0	1.0	35.3	39.7	7.8	35.4	47.4	234.1	500.0	-6.6 a
Chan 5											
1104.40	H	0.0	1.0	45.1	25.7	1.4	36.3	35.8	62.0	500.0	-18.1
1104.40	V	180.0	1.0	41.6	25.7	1.4	36.3	32.4	41.6	500.0	-21.6
1202.00	H	90.0	1.0	38.9	26.2	1.7	36.2	30.6	33.9	500.0	-23.4
1202.00	V	0.0	1.0	37.9	26.2	1.7	36.2	29.6	30.1	500.0	-24.4
1577.67	H	0.0	1.0	42.7	27.8	2.6	35.8	37.3	73.4	500.0	-16.7
1577.67	V	0.0	1.0	39.8	27.8	2.6	35.8	34.4	52.6	500.0	-19.6
4115.50	H	90.0	1.0	44.3	31.5	3.0	35.5	43.3	146.3	500.0	-10.7
4115.50	V	90.0	1.0	49.5	31.5	3.0	35.5	48.5	267.4	500.0	-5.4
4864.00	H	0.0	1.0	33.2	33.4	4.3	36.0	34.9	55.7	500.0	-19.1
4864.00	V	20.0	1.0	29.8	33.4	4.3	36.0	31.5	37.6	500.0	-22.5
7296.00	H	0.0	1.0	26.2	37.7	4.6	35.9	32.5	42.1	500.0	-21.5 a
7296.00	V	0.0	1.0	26.4	37.7	4.6	35.9	32.7	43.1	500.0	-21.3 a

12160.00	H	0.0	1.0	26.7	41.3	5.4	35.7	37.7	76.4	500.0	-16.3 a
12160.00	V	0.0	1.0	27.4	41.3	5.4	35.7	38.4	83.2	500.0	-15.6 a
19456.00	H	0.0	1.0	37.3	39.7	7.8	35.3	49.5	298.2	500.0	-4.5 a
19456.00	V	0.0	1.0	37.5	39.7	7.8	35.3	49.7	304.1	500.0	-4.3 a
Chan 11											
1102.00	H	180.0	1.0	52.5	25.7	1.4	36.3	43.2	145.1	500.0	-10.7
1102.00	V	180.0	1.0	51.0	25.7	1.4	36.3	41.8	122.5	500.0	-12.2
1603.55	H	190.0	1.0	40.2	27.9	2.7	35.8	35.0	56.2	500.0	-19.0
1603.55	V	90.0	1.0	39.1	27.9	2.7	35.8	33.9	49.5	500.0	-20.1
2338.50	H	270.0	1.0	52.6	29.8	3.2	35.6	50.0	315.8	500.0	-4.0 **a**
2338.50	V	90.0	1.0	52.1	29.8	3.2	35.6	49.5	298.1	500.0	-4.5 **a**
4924.00	V	350.0	1.0	25.6	33.5	4.4	36.0	27.5	23.7	500.0	-26.5
4924.00	H	350.0	1.0	30.6	33.5	4.4	36.0	32.5	42.2	500.0	-21.5
7386.00	V	0.0	1.0	26.5	37.8	4.6	35.9	32.9	44.4	500.0	-21.0 **a**
7386.00	H	0.0	1.0	27.3	37.8	4.6	35.9	33.7	48.7	500.0	-20.2 **a**
12310.00	V	0.0	1.0	27.1	41.1	5.6	35.5	38.4	82.8	500.0	-15.6 **a**
12310.00	H	0.0	1.0	27.9	41.1	5.6	35.5	39.2	90.8	500.0	-14.8 **a**
19696.00	V	0.0	1.0	35.4	39.7	7.8	35.3	47.6	240.1	500.0	-6.4 **a**
19696.00	H	0.0	1.0	35.7	39.7	7.8	35.3	47.9	248.5	500.0	-6.1 **a**
22158.00	V	0.0	1.0	36.0	40.5	8.4	35.0	49.9	313.2	500.0	-4.1 **a**
22158.00	H	0.0	1.0	36.2	40.5	8.4	35.0	50.1	320.5	500.0	-3.9 **a**

a = ambient reading

Table 8: Radiated Emission Test Data, Restricted Bands >1GHz

CLIENT:	ZCOMAX	DATE:	2/18/2004
TESTER:	James Ritter	JOB #:	7973
EUT Information:		**Test Requirements:**	
EUT:	XI-325H module	TEST STANDARD:	FCC Part 15
CONFIGURATION:	EUT on extender card with plate antenna connected	DISTANCE:	3m
		CLASS:	B
Test Equipment/Limit:			
ANTENNA:	A_00425	CABLE:	CSITE2_HF
LIMIT:	LFCC_3m_Class_B	AMPLIFIER (dB)	A_00066

Peak Emissions Data

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Hght (m)	SA Level (Peak) (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amp Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB
Channel 1											
4824.00	H	25.0	1.0	44.6	33.3	4.2	35.9	46.2	203.7	5000.0	-27.8
7236.00	H	0.0	1.0	35.6	37.6	4.5	35.9	41.9	124.0	5000.0	-32.1 a
12060.00	H	0.0	1.0	35.5	41.4	5.2	35.8	46.3	207.0	5000.0	-27.7 a
14472.00	H	0.0	1.0	40.3	40.8	7.6	34.8	54.0	498.8	5000.0	-20.0 a
19296.00	H	0.0	1.0	48.3	39.7	7.8	35.4	60.4	1049.5	5000.0	-13.6 a
4824.00	V	0.0	1.0	42.1	33.3	4.2	35.9	43.7	152.7	5000.0	-30.3
7236.00	V	0.0	1.0	35.0	37.6	4.5	35.9	41.3	115.8	5000.0	-32.7 a
12060.00	V	0.0	1.0	34.3	41.4	5.2	35.8	45.1	180.9	5000.0	-28.8 a
14472.00	V	0.0	1.0	40.5	40.8	7.6	34.8	54.2	510.5	5000.0	-19.8 a
19296.00	V	0.0	1.0	46.2	39.7	7.8	35.4	58.3	824.1	5000.0	-15.7 a
Channel 5											
4864.00	H	0.0	1.0	36.5	33.4	4.3	36.0	38.2	81.4	5000.0	-35.8
7296.00	H	0.0	1.0	31.1	37.7	4.6	35.9	37.4	74.4	5000.0	-36.5 a
12160.00	H	0.0	1.0	35.5	41.3	5.4	35.7	46.5	211.2	5000.0	-27.5 a
19456.00	H	0.0	1.0	46.7	39.7	7.8	35.3	58.9	877.1	5000.0	-15.1 a
4864.00	V	20.0	1.0	39.9	33.4	4.3	36.0	41.6	120.4	5000.0	-32.4
7296.00	V	0.0	1.0	35.4	37.7	4.6	35.9	41.7	122.1	5000.0	-32.2 a
12160.00	V	0.0	1.0	39.2	41.3	5.4	35.7	50.2	324.1	5000.0	-23.8 a
19456.00	V	0.0	1.0	46.8	39.7	7.8	35.3	59.0	890.3	5000.0	-15.0 a
Channel 11											
4924.00	V	350.0	1.0	33.8	33.5	4.4	36.0	35.7	61.0	5000.0	-38.3
7386.00	V	0.0	1.0	37.5	37.8	4.6	35.9	43.9	157.1	5000.0	-30.1 a
12310.00	V	0.0	1.0	34.4	41.1	5.6	35.5	45.6	191.6	5000.0	-28.3 a
19696.00	V	0.0	1.0	49.7	39.7	7.8	35.3	61.9	1245.6	5000.0	-12.1 a
22158.00	V	0.0	1.0	49.3	40.5	8.4	35.0	63.2	1453.0	5000.0	-10.7 a
4924.00	H	350.0	1.0	39.8	33.5	4.4	36.0	41.7	121.7	5000.0	-32.3
7386.00	H	0.0	1.0	38.5	37.8	4.6	35.9	44.9	176.3	5000.0	-29.1 a
12310.00	H	0.0	1.0	34.5	41.1	5.6	35.5	45.8	194.1	5000.0	-28.2 a
19696.00	H	0.0	1.0	50.3	39.7	7.8	35.3	62.5	1339.3	5000.0	-11.4 a
22158.00	H	0.0	1.0	49.7	40.5	8.4	35.0	63.6	1511.0	5000.0	-10.4 a

Table 9. FCC Part 15.247 Band Edge Radiated Emissions Test Data Sheet

CLIENT:	Hand Held Products	DATE:	4/5/2004
TESTER:	Greg Snyder	JOB #:	7973
EUT Information:		**Test Requirements:**	
EUT:	XI-325H Module	TEST STANDARD:	FCC Part 15
CONFIGURATION:	Transmitting	DISTANCE:	3m
CLOCKS:	2.412GHz (Channel 1) and 2.462 GHz (Channel 11)		
Test Equipment/Limit:			
ANTENNA:	A_00425		
LIMIT:	LFCC_3m_Class_B		
CABLE:	CSITE1_HF		
AMPLIFIER (dB)	A_00066		

Frequency (MHz)	Polarity H/V	Azimuth Degree	Ant. Height (m)	SA Level (dBµV)	Ant. Corr. (dB/m)	Cable Corr. (dB)	Amplifier Gain (dB)	Corr. Level (dBµV/m)	Corr. Level (µV/m)	Limit (µV/m)	Margin dB	Comments
2386.50	V	270.0	1.0	45.8	29.9	2.9	35.6	43.0	141.8	5000.0	-30.9	Peak
2386.50	V	270.0	1.0	33.8	29.9	2.9	35.6	31.0	35.6	500.0	-22.9	Average
2498.50	V	225.0	1.0	50.0	30.0	3.0	35.6	47.4	234.3	5000.0	-26.6	Peak
2485.00	V	225.0	1.0	33.2	30.0	3.0	35.6	30.6	33.9	500.0	-23.4	Average

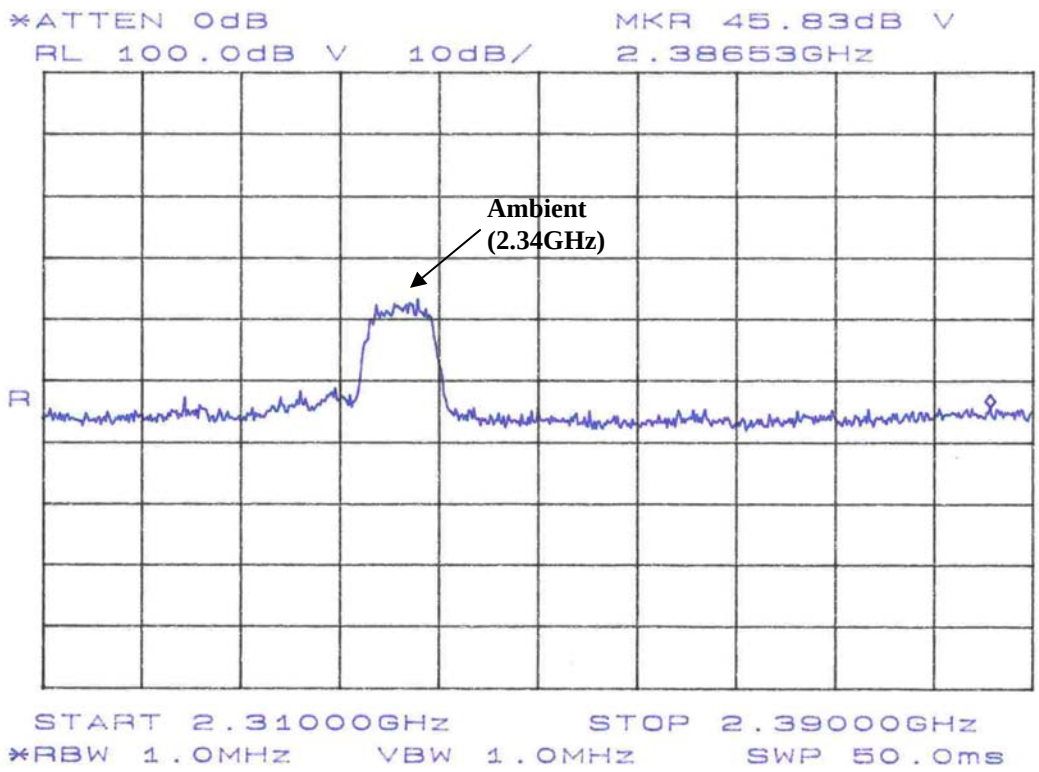

Figure 4-19. Channel 1 Band Edge, Peak

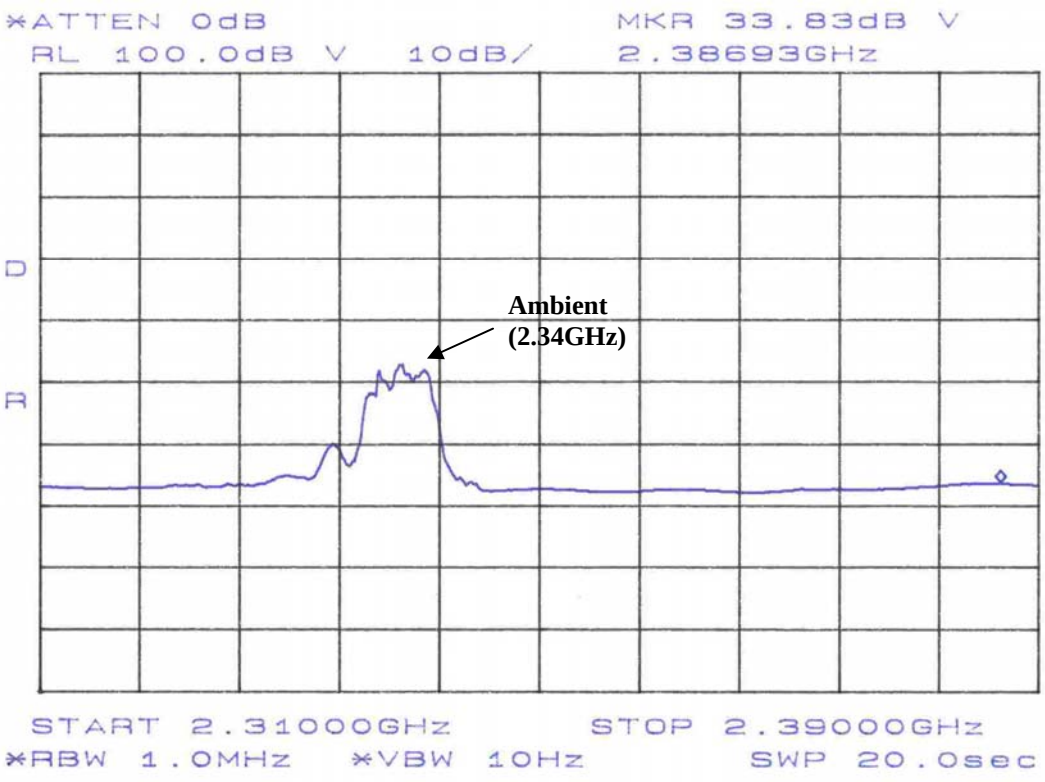

Figure 4-20. Channel 1 Band Edge, Average

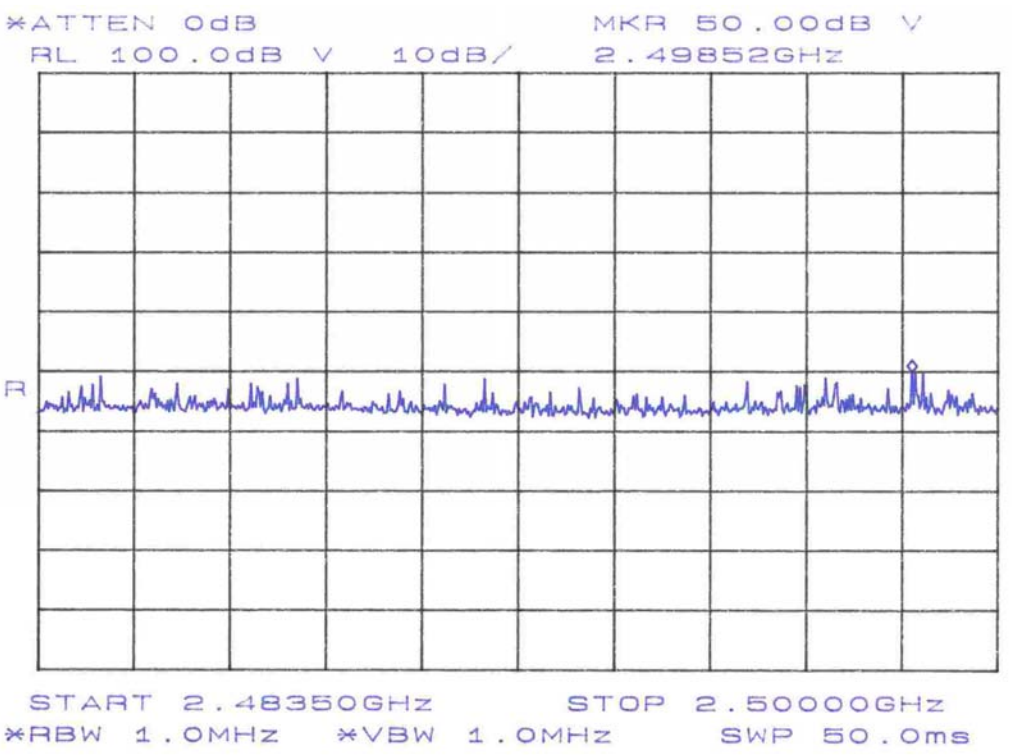

Figure 4-21. Channel 11 Band Edge, Peak

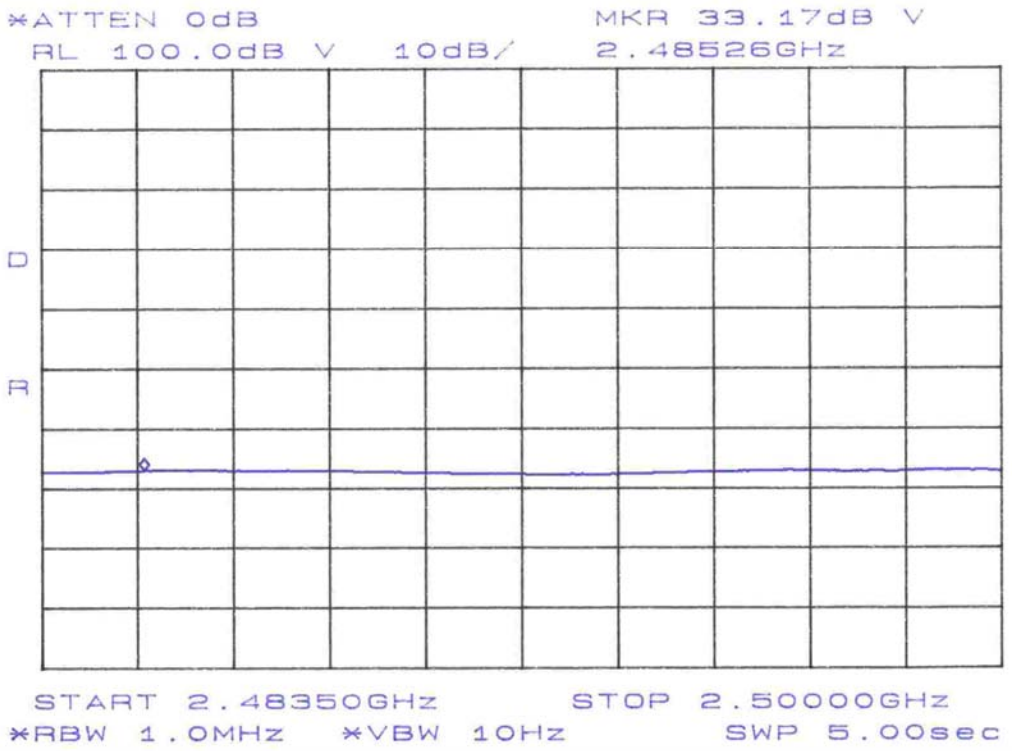

Figure 4-22. Channel 11 Band Edge, Average

4.6 AC Powerline Conducted Emissions: (FCC Part §15.207)

The EUT was placed on an 80 cm high 1 x 1.5 m non-conductive table above a ground plane. Power to the EUT was provided through a Solar Corporation 50 Ω/50 μH Line Impedance Stabilization Network bonded to a 3 x 2 meter ground plane. The LISN has its AC input supplied from a filtered AC power source. Power and data cables were moved about to obtain maximum emissions.

The 50 Ω output of the LISN was connected to the input of the spectrum analyzer and the emissions in the frequency range of 450 kHz to 30 MHz were measured. The detector function was set to quasi-peak or peak, as appropriate, and the resolution bandwidth during testing was at least 9 kHz, with all post-detector filtering no less than 10 times the resolution bandwidth.

Data is recorded in Table 10.

Table 10: Conducted Emissions Test Data; 15.207

CLIENT:	Zcomax	DATE:	2/24/2004
MODEL:	XI-325H with 18 dbi antenna	JOB #:	7973
TESTER:	James Ritter		
TEST STANDARD:	FCC Part 15	CLASS:	FCC_B
TEST SITE:	CSITE2_CE	TEST VOLTAGE:	120 VAC

LINE 1 – NEUTRAL

Frequency MHz	Level QP dBuV	Cable Loss dB	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Cable Loss dB	Limit AVG dBuV	Margin AVG dB
20.250	35.2	12.6	60.0	-12.2	35.2	12.6	50.0	-2.2
16.228	35.4	12.3	60.0	-12.3	35.4	12.3	50.0	-2.3
23.129	33.9	12.8	60.0	-13.3	33.9	12.8	50.0	-3.3
0.151	41.8	10.7	65.9	-13.5	32.1	10.7	55.9	-13.2
4.680	27.5	11.5	56.0	-17.0	27.5	11.5	46.0	-7.0
27.159	28.8	13.0	60.0	-18.2	28.8	13.0	50.0	-8.2

LINE 2 – PHASE

Frequency MHz	Level QP dBuV	Cable Loss dB	Limit QP dBuV	Margin QP dB	Level AVG dBuV	Cable Loss dB	Limit AVG dBuV	Margin AVG dB
0.151	49.8	10.7	65.9	-5.5	40.9	10.7	55.9	-4.4
4.680	28.1	11.5	56.0	-16.4	28.1	11.5	46.0	-6.4
16.228	30.5	12.3	60.0	-17.2	30.5	12.3	50.0	-7.2
20.259	31.7	12.6	60.0	-15.7	31.7	12.6	50.0	-5.7
23.129	34.5	12.8	60.0	-12.7	34.5	12.8	50.0	-2.7
27.159	29.9	13.0	60.0	-17.1	29.9	13.0	50.0	-7.1