FCC CFR47 PART 15 SUBPART C

CERTIFICATION TEST REPORT

FOR

Digital I/O Wireless Controller

MODEL NUMBER: WC-21

FCC ID: TF7WX-21-1000

REPORT NUMBER: 08U11631-1, Revision A

ISSUE DATE: JULY 24, 2008

Prepared for
EVEREX COMMUNICATIONS, INC.
5020A BRANDIN CT.
FREMONT, CA 94538, U.S.A.

Prepared by
COMPLIANCE CERTIFICATION SERVICES
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	06/20/08	Initial Issue	F. Ibrahim
A	07/24/08	Revised test date. Revised LC data.	F. Ibrahim

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: EVEREX COMMUNICATIONS, INC.
5020A BRANDIN CT.
FREMONT, CA 94538, U.S.A.

EUT DESCRIPTION: Digital I/O Wireless Controller

MODEL: WC-21

SERIAL NUMBER: 02194

DATE TESTED: June 12-20, 2008

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	PASS

Compliance Certification Services, Inc. (CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by CCS based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by CCS will constitute fraud and shall nullify the document. No part of this report may be used to claim product certification, approval, or endorsement by NVLAP, NIST, or any government agency.

Approved & Released For CCS By:

FRANK IBRAHIM
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

Tested By:

TOM CHEN
EMC ENGINEER
COMPLIANCE CERTIFICATION SERVICES

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4-2003, FCC CFR 47 Part 2, FCC CFR 47 Part 15.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 47173 Benicia Street, Fremont, California, USA.

CCS is accredited by NVLAP, Laboratory Code 200065-0. The full scope of accreditation can be viewed at http://www.ccsemc.com.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Power Line Conducted Emission	+/- 2.3 dB
Radiated Emission	+/- 3.4 dB

Uncertainty figures are valid to a confidence level of 95%.

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.15.4 Digital I/O Wireless Controller.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2405-2475	802.15.4	11.25	13.34

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB Inverted F antenna, with a maximum gain of 3.5 dBi.

5.4. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was WC21_080513_FCC.HEX rev 1.0.

5.5. WORST-CASE CONFIGURATION AND MODE

The worst-case channel is determined as the channel with the highest output power.

5.6. DESCRIPTION OF TEST SETUP

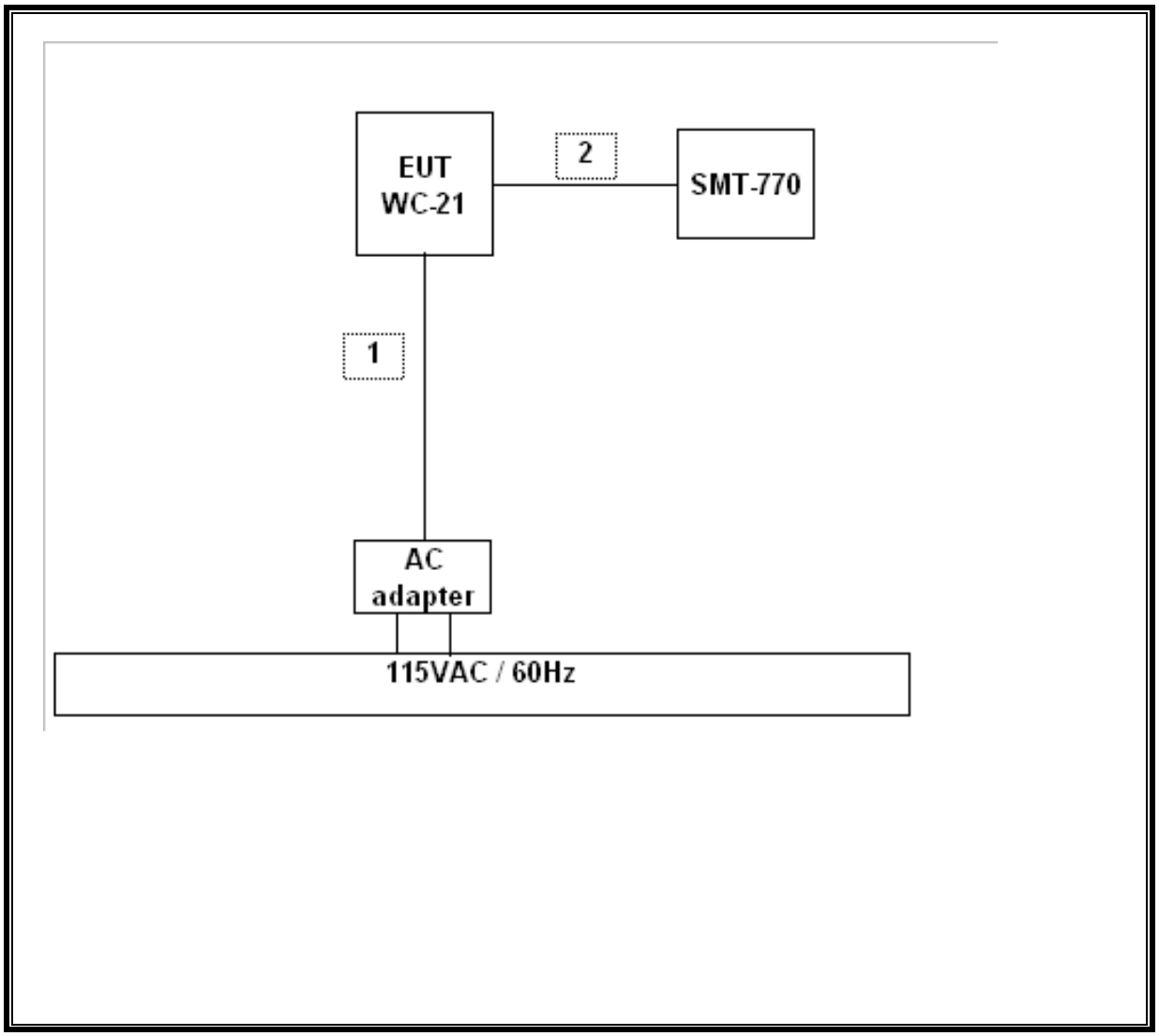
SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
AC adapter	MG Electronic	MGT2420	N/A	Doc
Controller	Smart Temp	SMT-770	N/A	N/A

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Unshielded	1.5m	N/A
2	I/O	1	Housing	Unshielded	0.3m	N/A

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

TEST EQUIPMENT LIST					
Description	**Manufacturer**	**Model**	**Asset**	**Cal Date**	**Cal Due**
Power Meter	Agilent / HP	438A	C01068	11/29/06	09/12/08
Antenna, Horn, 18 GHz	EMCO	3115	C00945	04/22/08	04/22/09
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00589	09/29/07	09/29/08
Preamplifier, 1300 MHz	Agilent / HP	8447D	N/A	09/19/07	09/19/08
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	08/03/07	08/03/08
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	09/28/07	09/28/08
Spectrum Analyzer, 40 GHz	Agilent / HP	8564E	C00951	09/05/07	12/05/08
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00996	09/11/07	09/11/08
Power Sensor, 18 GHz	Agilent / HP	8481A	N02784	01/12/07	10/22/08
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	09/15/06	09/15/08
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	02/06/08	08/06/09

7. ANTENNA PORT TEST RESULTS

7.1. 802.15 MODE IN THE 2.4 GHz BAND

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

The minimum 6 dB bandwidth shall be at least 500 kHz.

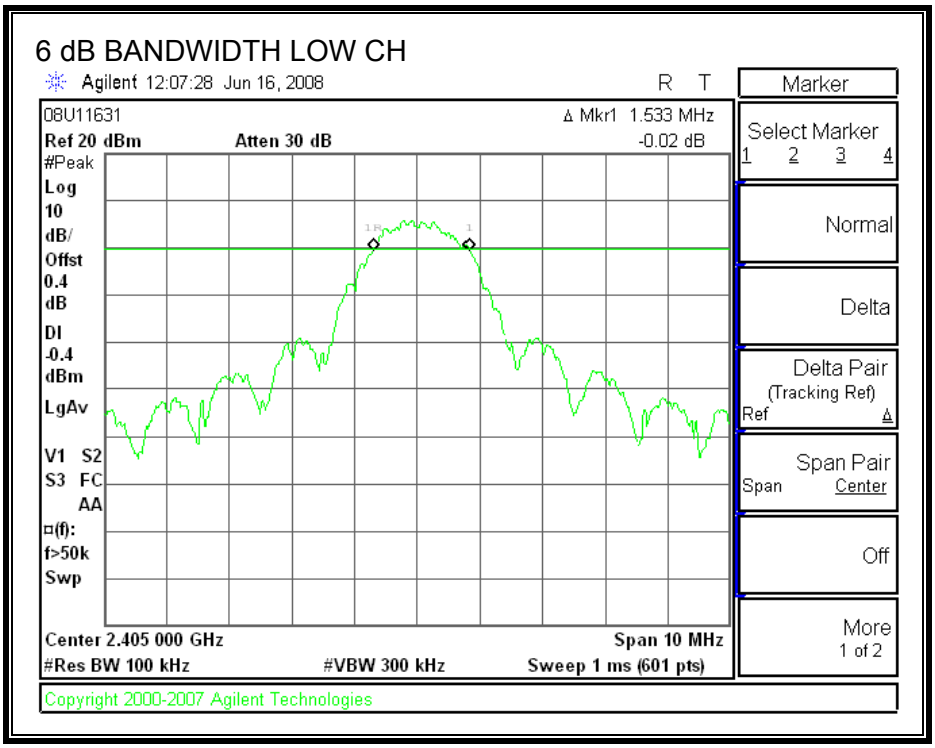
TEST PROCEDURE

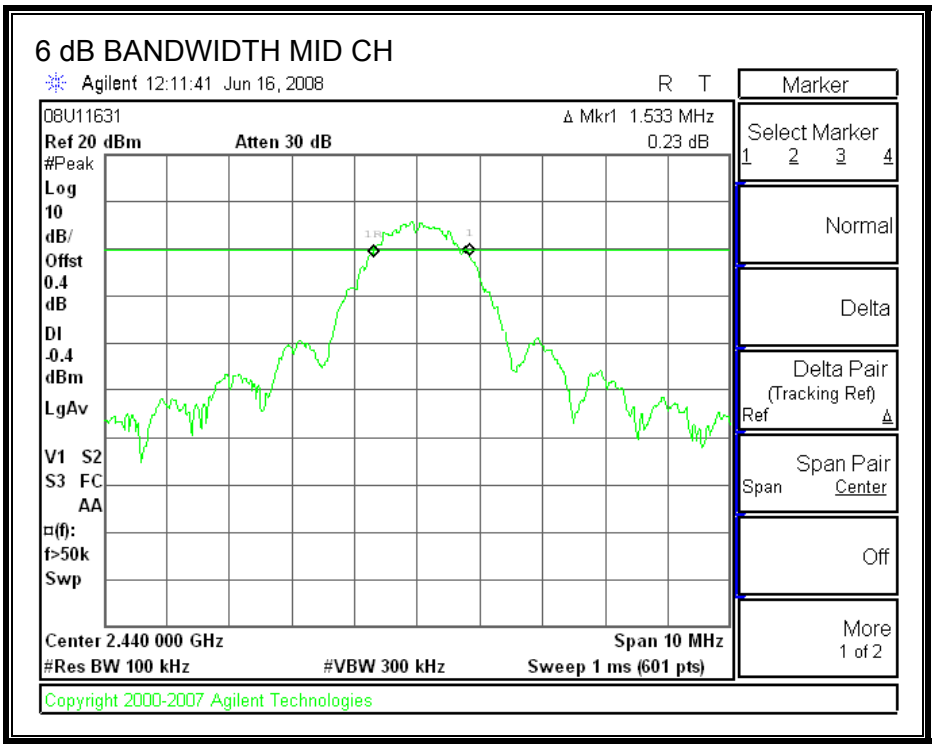
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

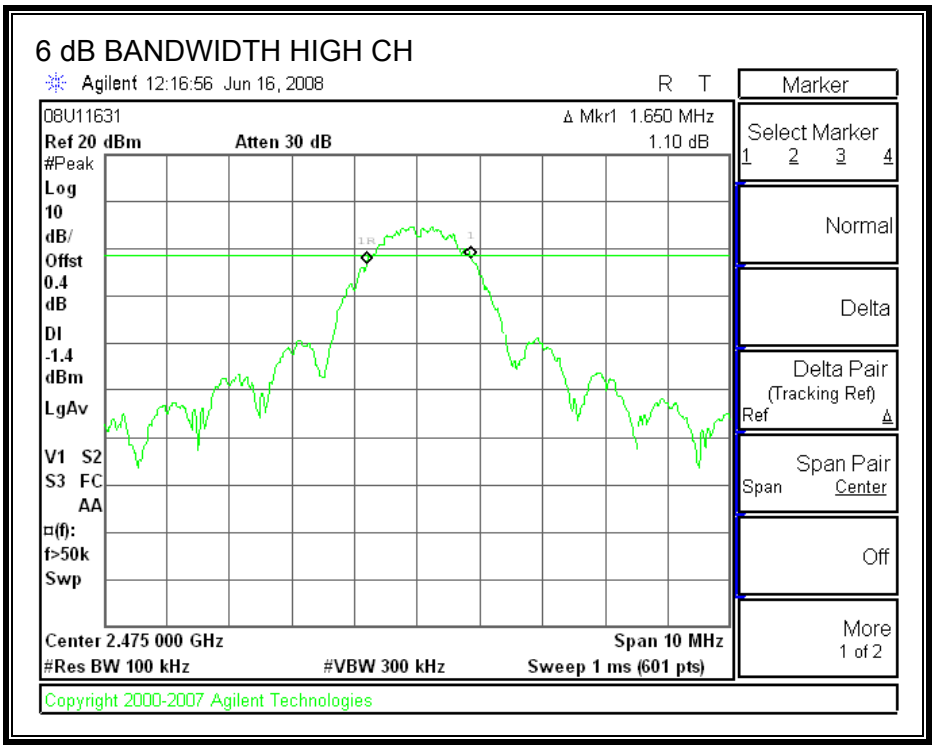
RESULTS

Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2405	1.533	0.5
Middle	2440	1.533	0.5
High	2475	1.650	0.5

6 dB BANDWIDTH







7.1.2. OUTPUT POWER

LIMITS

FCC §15.247 (b)

The maximum antenna gain is less than or equal to 6 dBi, therefore the limit is 30 dBm.

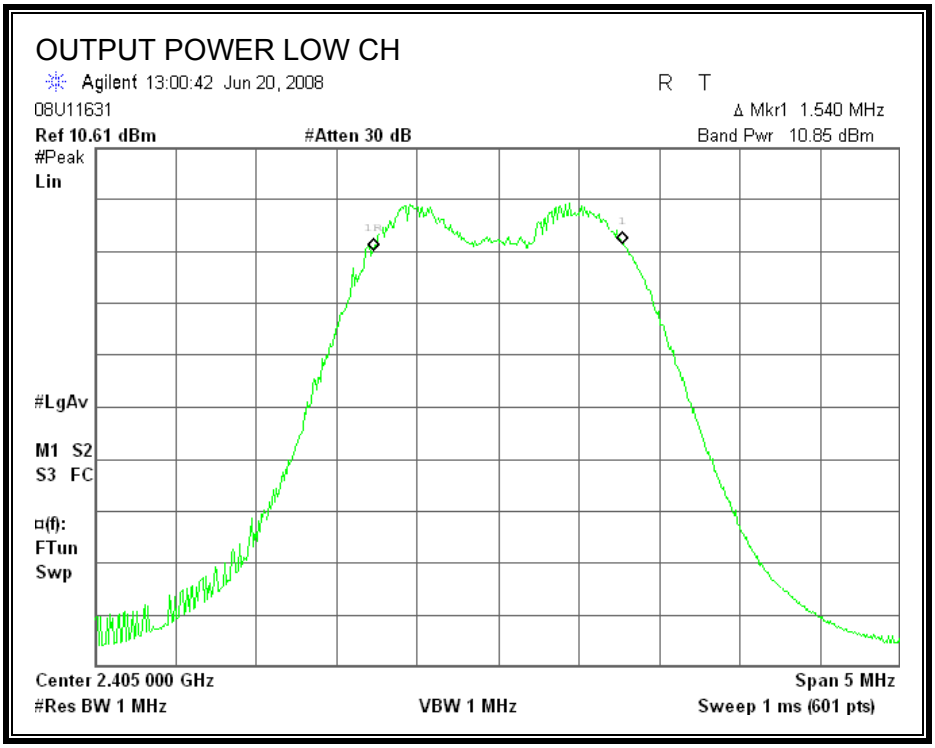
TEST PROCEDURE

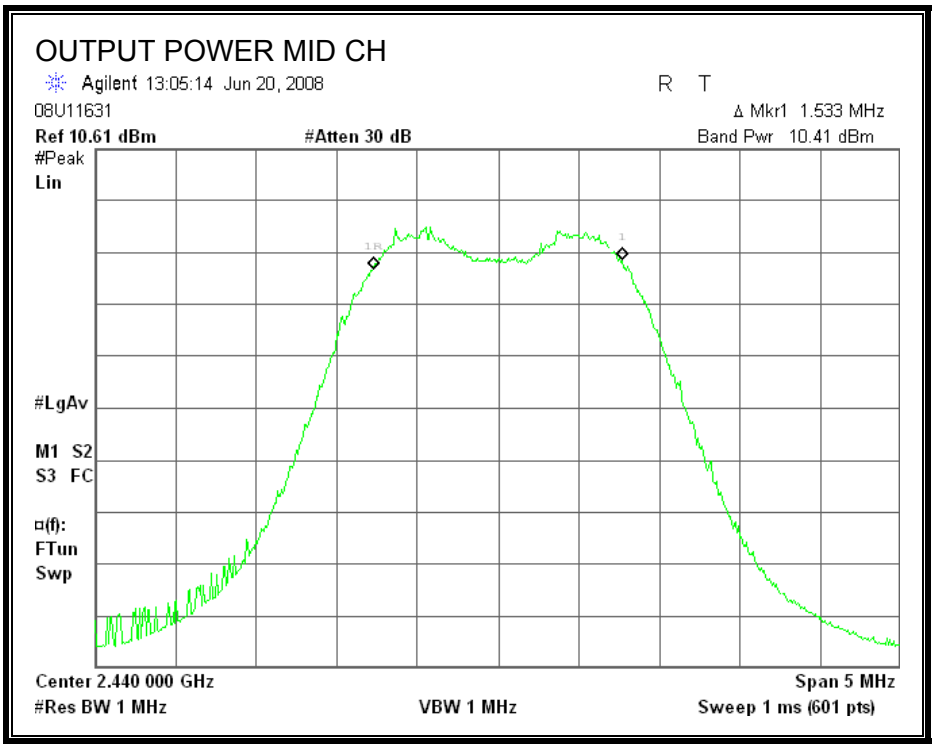
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

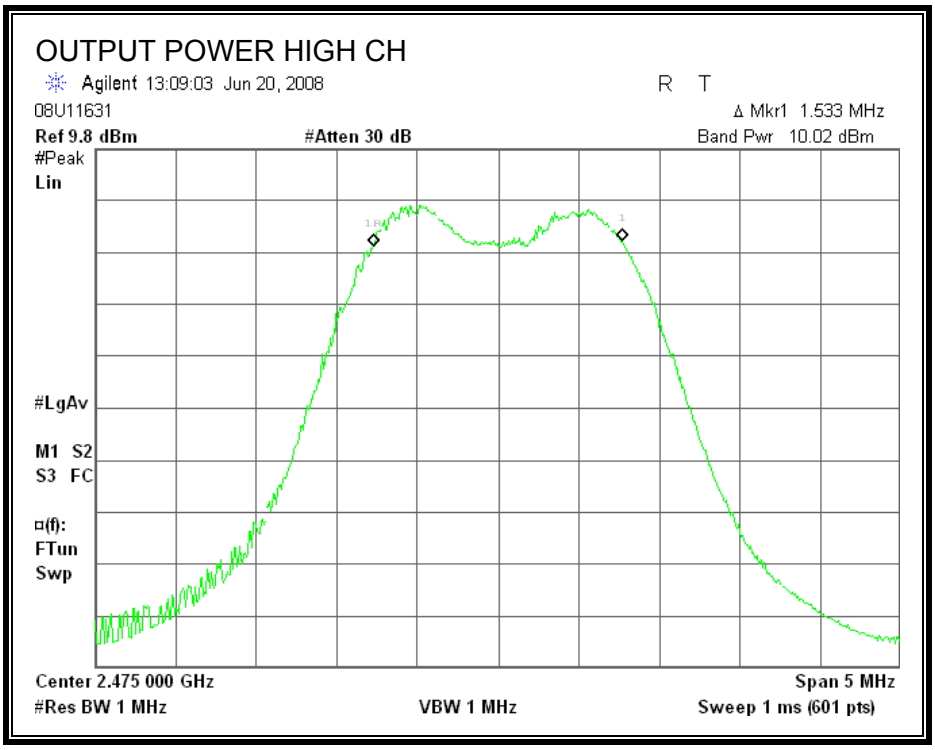
RESULTS

Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2405	10.85	0.4	11.25	30	-18.75
Middle	2440	10.41	0.4	10.81	30	-19.19
High	2475	10.02	0.4	10.42	30	-19.58

OUTPUT POWER







7.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 0.4 dB (including 0.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2405	5.60
Middle	2440	5.30
High	2475	4.11

7.1.4. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

The power spectral density conducted from the transmitter to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

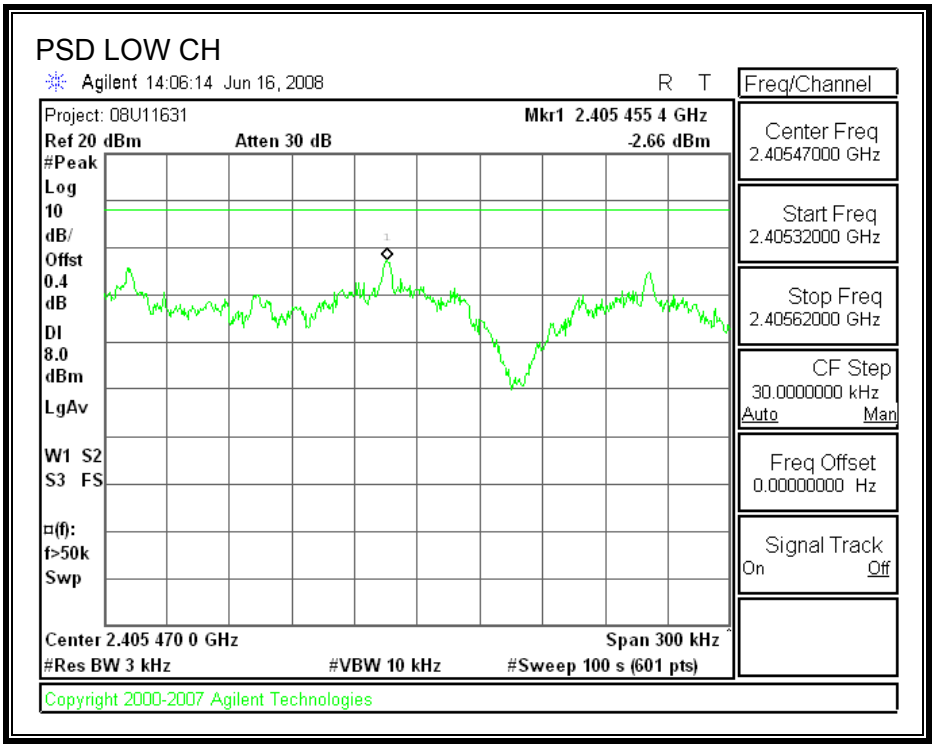
TEST PROCEDURE

Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

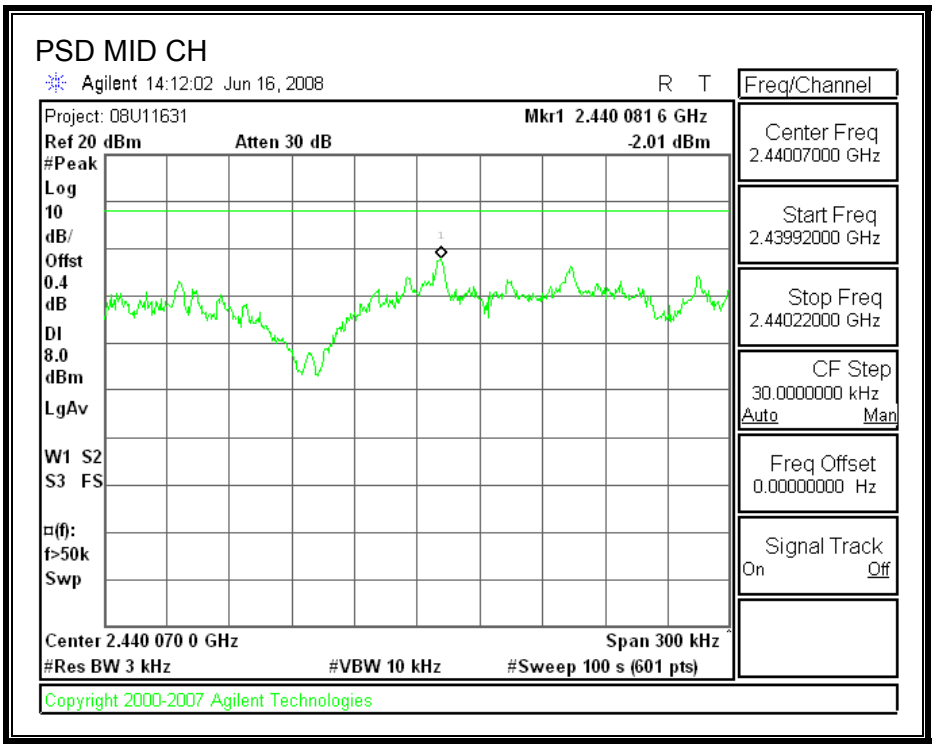
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2405	-2.66	8	-10.66
Middle	2440	-2.01	8	-10.01
High	2475	-5.26	8	-13.26

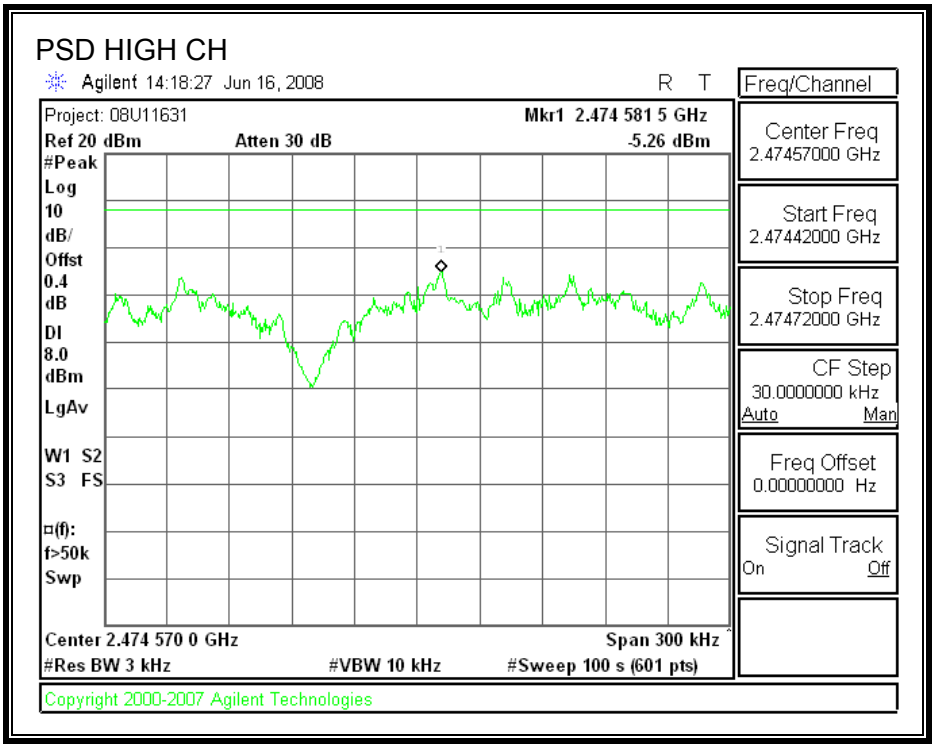
POWER SPECTRAL DENSITY



PSD MID CH



PSD HIGH CH



7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Output power was measured based on the use of a peak measurement, therefore the required attenuation is 20 dB.

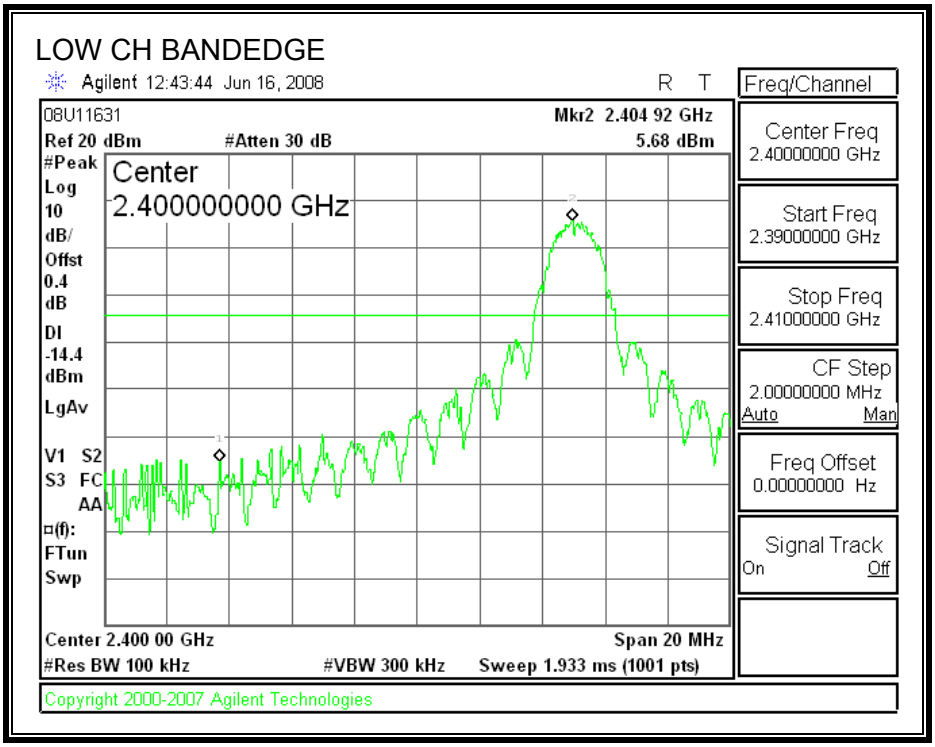
TEST PROCEDURE

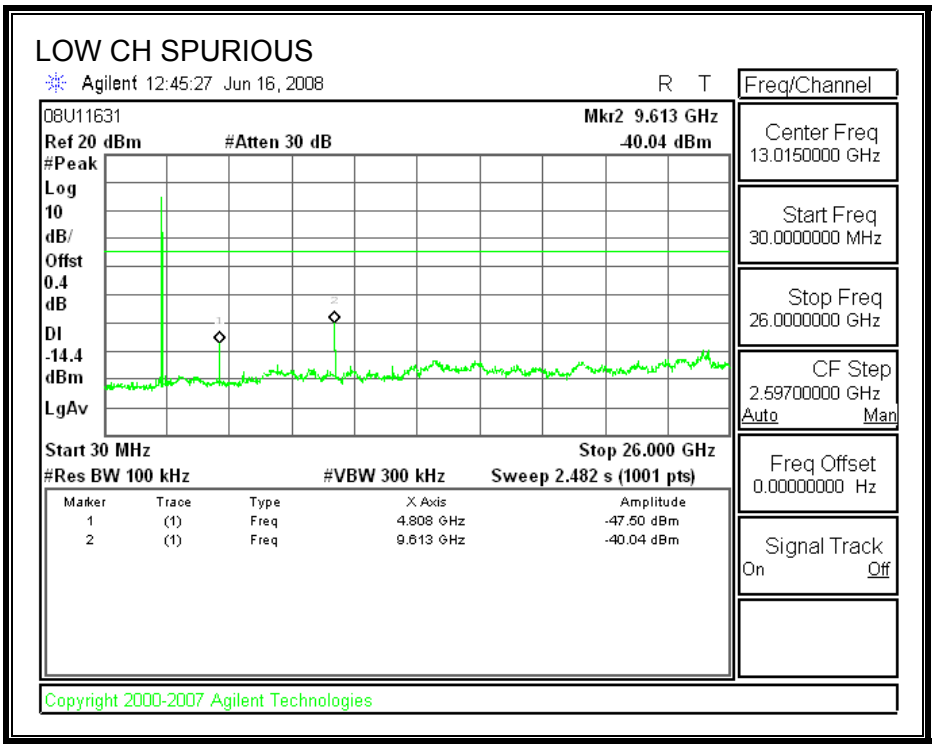
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

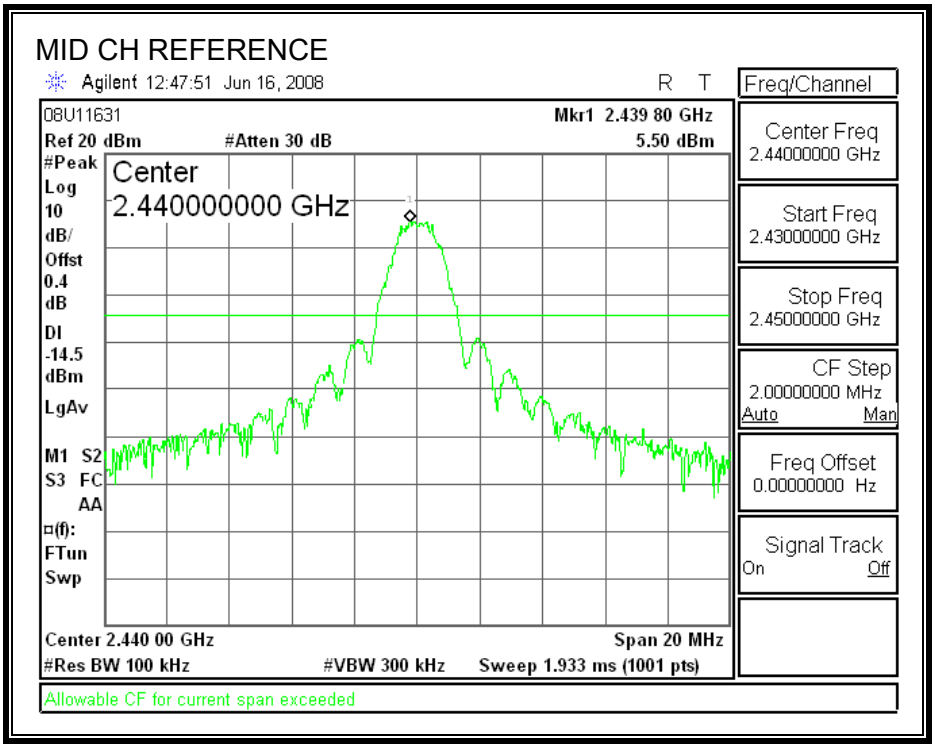
RESULTS

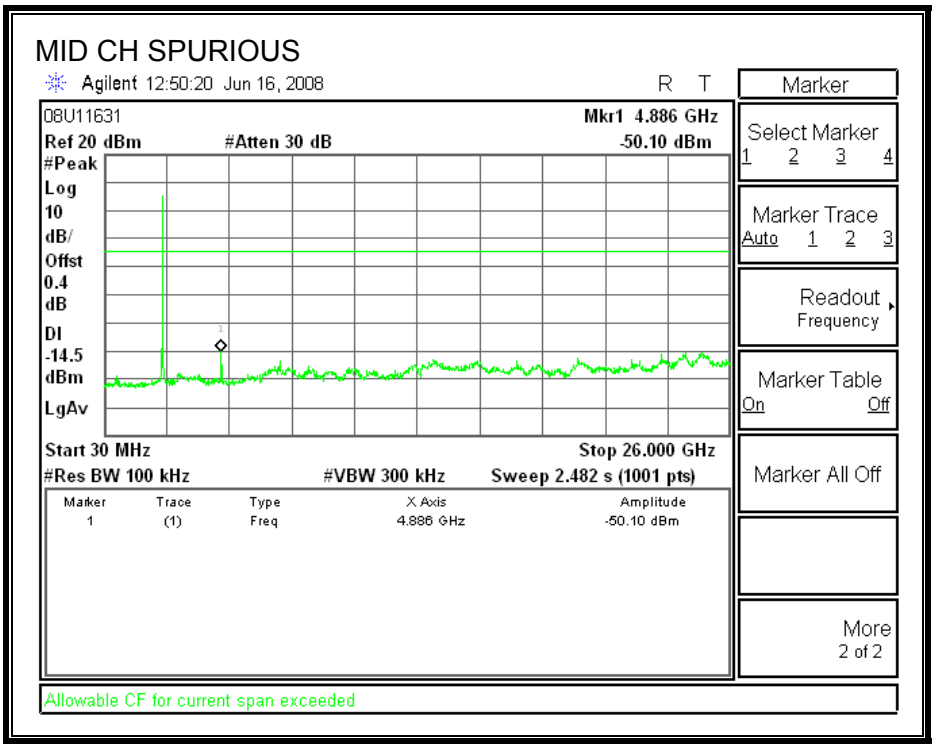
SPURIOUS EMISSIONS, LOW CHANNEL



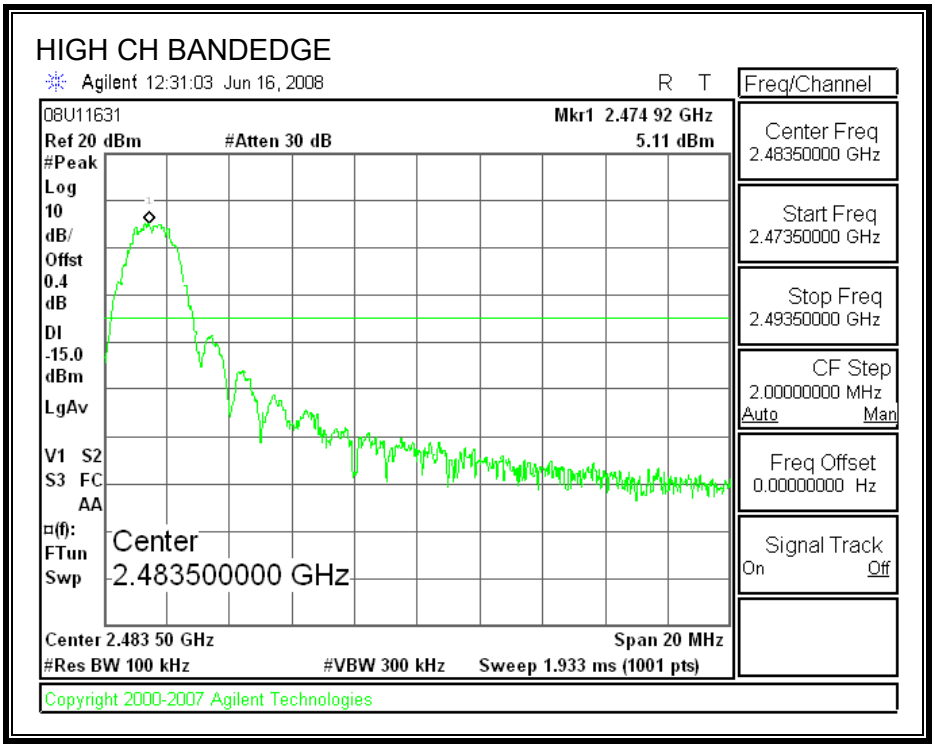


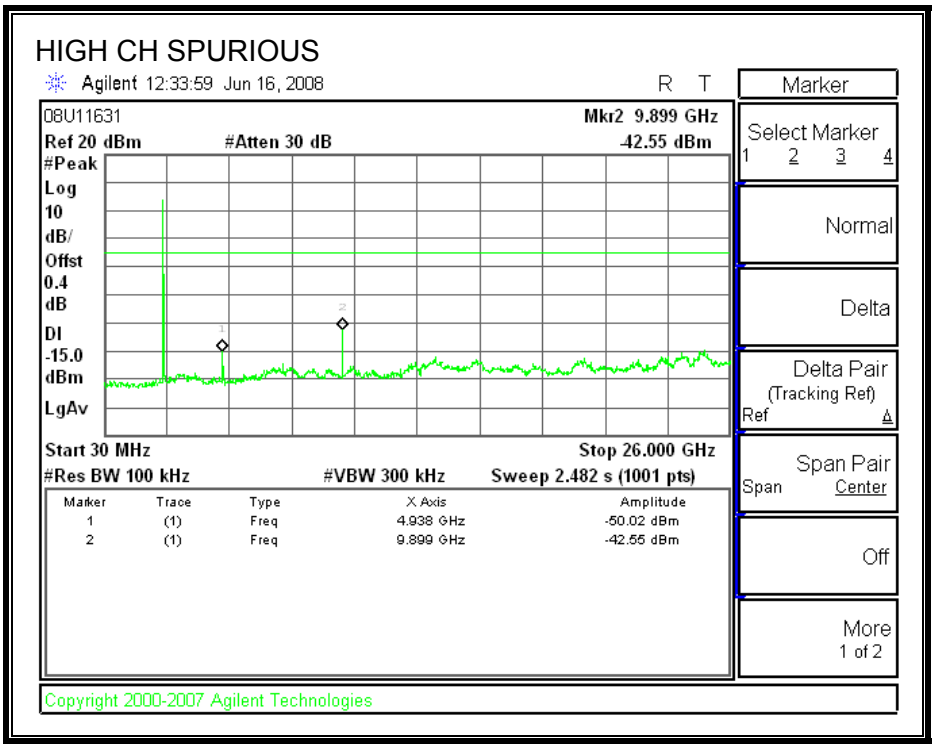
SPURIOUS EMISSIONS, MID CHANNEL





SPURIOUS EMISSIONS, HIGH CHANNEL





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

Frequency Range (MHz)	Field Strength Limit (uV/m) at 3 m	Field Strength Limit (dBuV/m) at 3 m
30 - 88	100	40
88 - 216	150	43.5
216 - 960	200	46
Above 960	500	54

TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane. The antenna to EUT distance is 3 meters. The EUT is configured in accordance with ANSI C63.4. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 1 MHz for peak measurements and 10 Hz for average measurements.

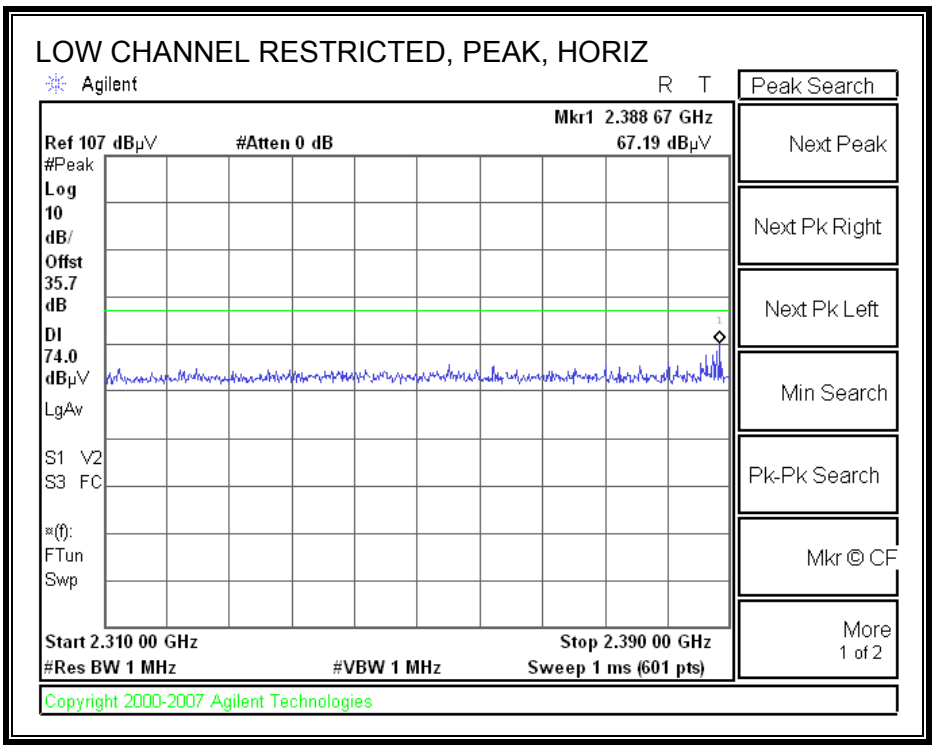
The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

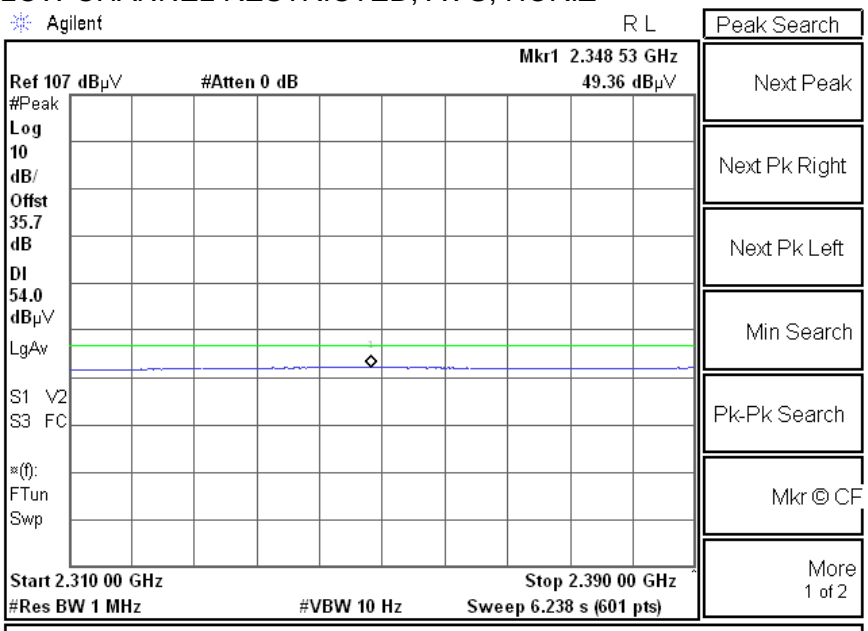
8.2. TRANSMITTER ABOVE 1 GHz

8.2.1. TX ABOVE 1 GHz FOR 802.11 MODE IN THE 2.4 GHz BAND

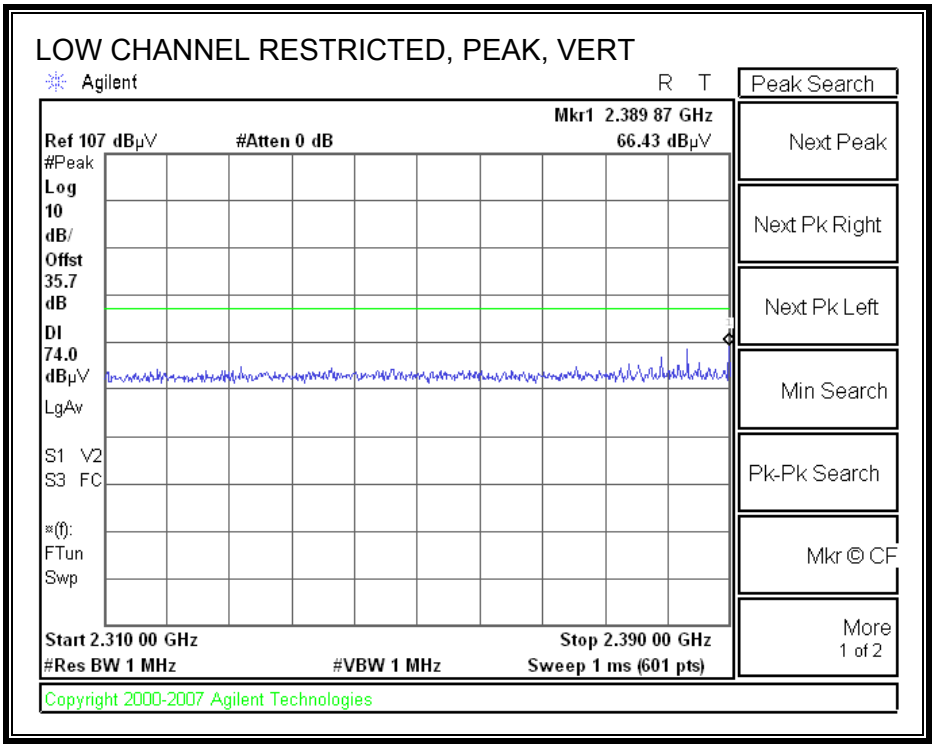
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



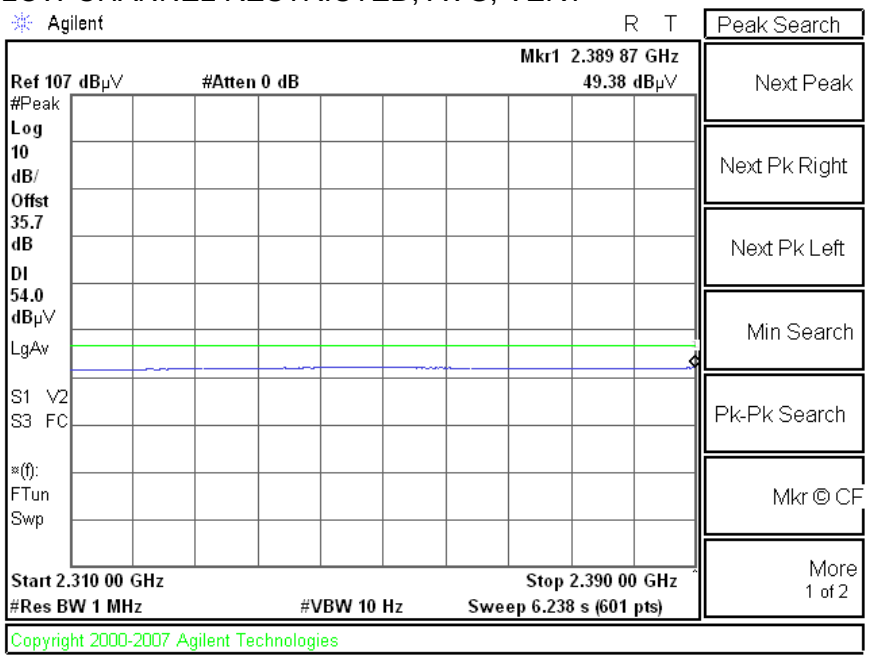
LOW CHANNEL RESTRICTED, AVG, HORIZ



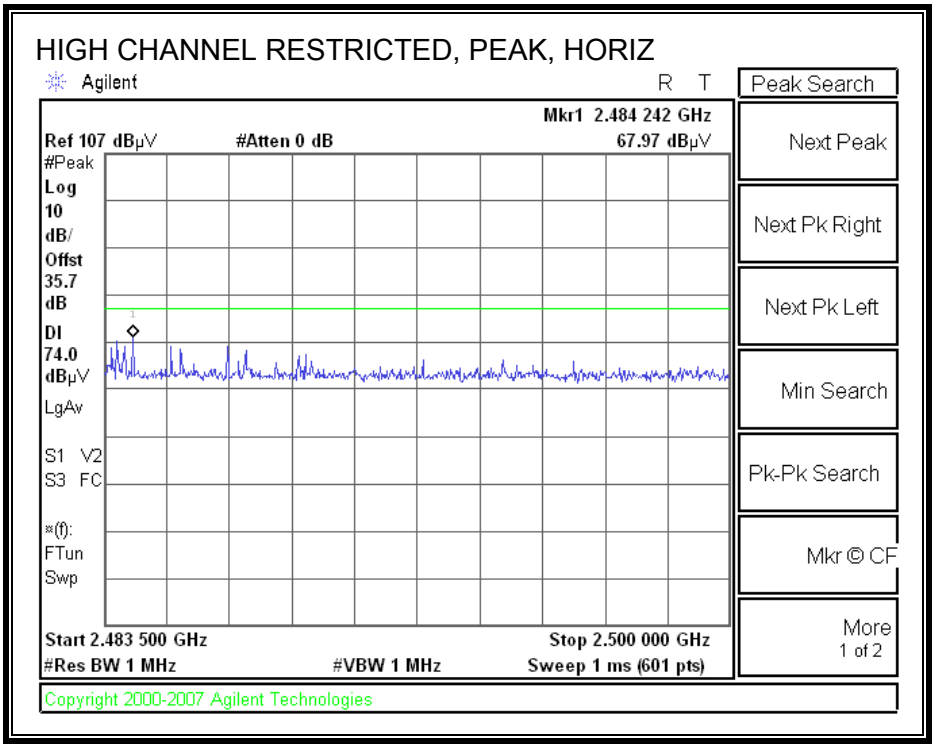
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



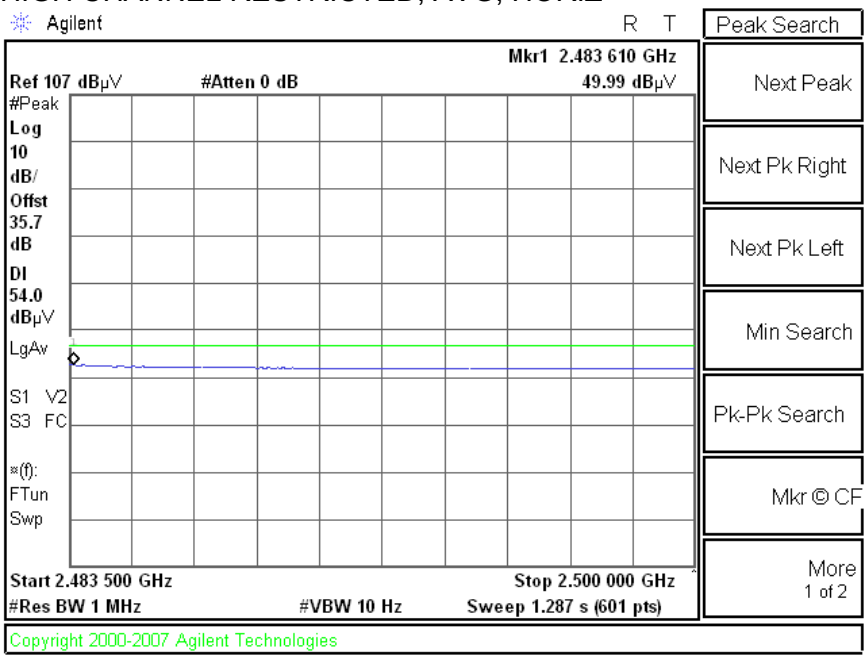
LOW CHANNEL RESTRICTED, AVG, VERT



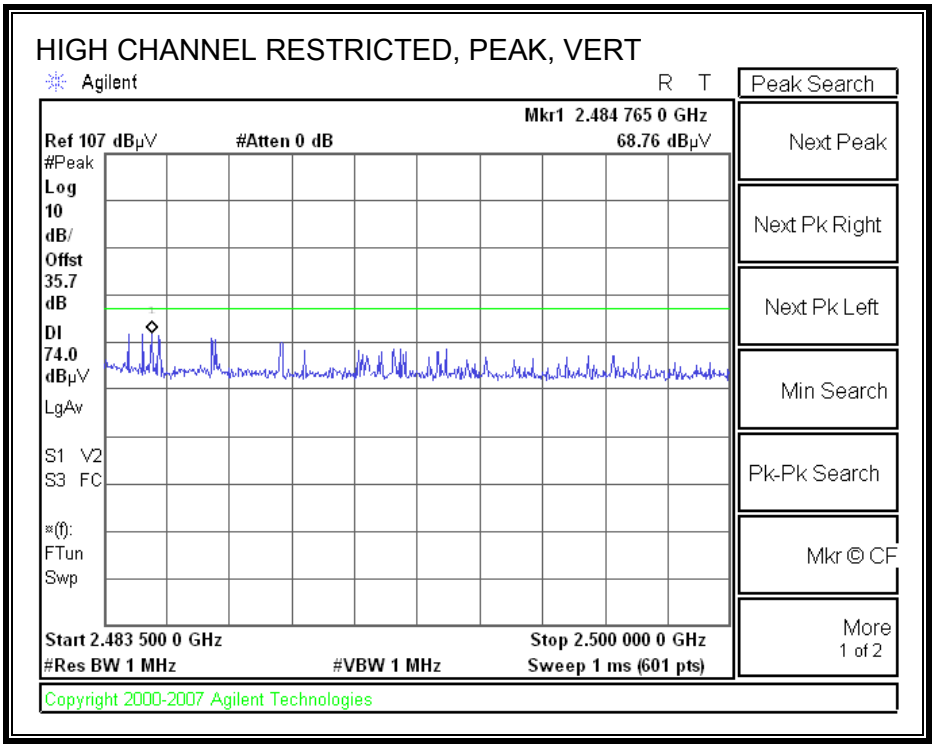
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



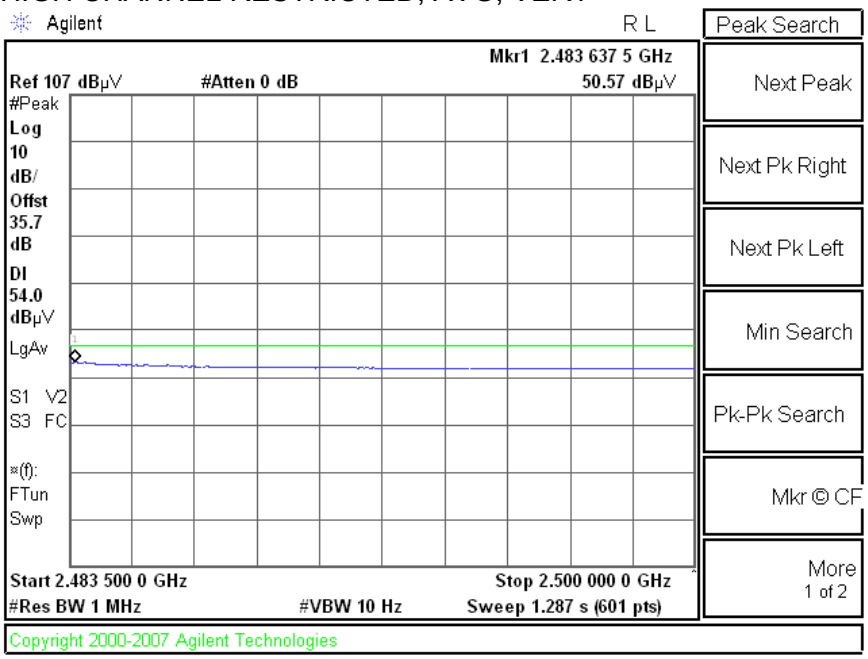
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company: EVEREX COMMUNICATIONS, INC.
Project #: 08U11631
Date: 05/23/08
Test Engineer: Tom Chen
Configuration: EUT only (WC-21)
Mode: Tx

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T34 HP 8449B		T39; ARA 18-26GHz; S/N:1013	FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		B-5m Chamber		R_001

Peak Measurements
RBW=VBW=1MHz
Average Measurements
RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
CHANNEL 11, 2405 MHz															
4.810	3.0	60.3	40.9	33.7	7.1	-34.8	0.0	0.0	66.3	46.9	74	54	-7.7	-7.1	V
12.025	3.0	41.0	29.5	40.4	12.4	-32.5	0.0	0.0	61.3	49.8	74	54	-12.7	-4.2	V
4.810	3.0	58.2	40.0	33.7	7.1	-34.8	0.0	0.0	64.2	46.0	74	54	-9.8	-8.0	H
12.025	3.0	41.5	29.1	40.4	12.4	-32.5	0.0	0.0	61.8	49.4	74	54	-12.2	-4.6	H
CHANNEL 18, 2440 MHz															
4.880	3.0	60.1	41.3	33.8	7.2	-34.8	0.0	0.0	66.3	47.5	74	54	-7.7	-6.5	V
7.320	3.0	46.5	33.5	36.2	8.7	-34.1	0.0	0.0	57.3	44.3	74	54	-16.7	-9.7	V
12.200	3.0	41.0	29.7	41.2	12.4	-32.5	0.0	0.0	62.1	50.8	74	54	-11.9	-3.2	V
4.880	3.0	59.6	42.3	33.8	7.2	-34.8	0.0	0.0	65.8	48.5	74	54	-8.2	-5.5	H
7.320	3.0	44.7	33.3	36.2	8.7	-34.1	0.0	0.0	55.5	44.1	74	54	-18.5	-9.9	H
12.200	3.0	41.5	29.3	41.2	12.4	-32.5	0.0	0.0	62.6	50.4	74	54	-11.4	-3.6	H
CHANNEL 25, 2475 MHz															
4.950	3.0	60.8	39.5	33.9	7.2	-34.8	0.0	0.0	67.1	45.8	74	54	-6.9	-8.2	V
7.425	3.0	46.2	34.1	36.3	8.7	-34.1	0.0	0.0	57.1	45.0	74	54	-16.9	-9.0	V
12.375	3.0	40.1	28.7	41.4	12.4	-32.5	0.0	0.0	61.4	50.0	74	54	-12.6	-4.0	V
4.950	3.0	58.3	41.4	33.9	7.2	-34.8	0.0	0.0	64.6	47.7	74	54	-9.4	-6.3	H
7.425	3.0	45.3	32.3	36.3	8.7	-34.1	0.0	0.0	56.2	43.2	74	54	-17.8	-10.8	H
12.375	3.0	40.5	28.5	41.4	12.4	-32.5	0.0	0.0	61.8	49.8	74	54	-12.2	-4.2	H

f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength	Pk Mar	Margin vs. Peak Limit
CL	Cable Loss	HPF	High Pass Filter		

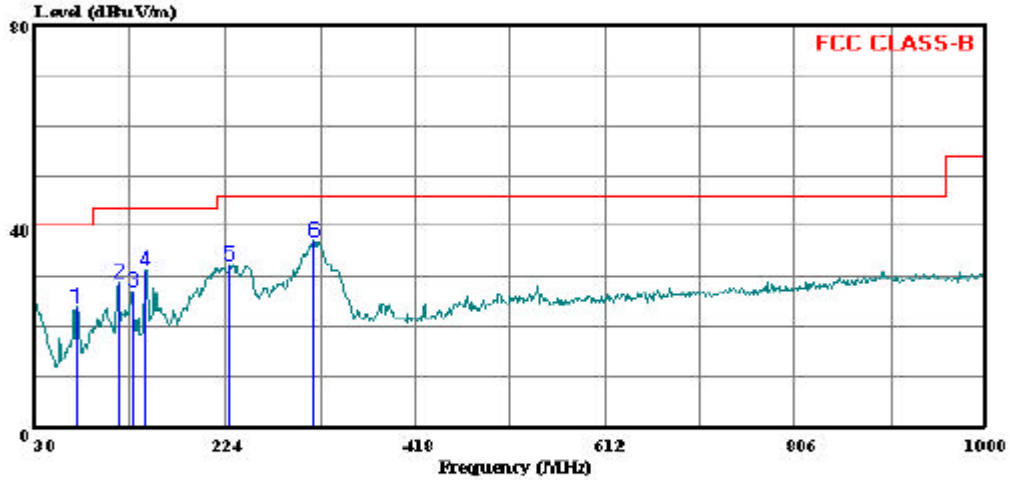
8.3. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 17 File#: 08u11631.emi Date: 06-12-2008 Time: 14:37:20



Trace: 16 Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Chin Pang
Project #: : 08U11631
Company: : EVEREX COMMUNICATIONS, INC
Model: : WC-21
Configuration:: EUT with smart temp
Mode : : TX
Target: : FCC Class B

HORIZONTAL DATA

Page: 1

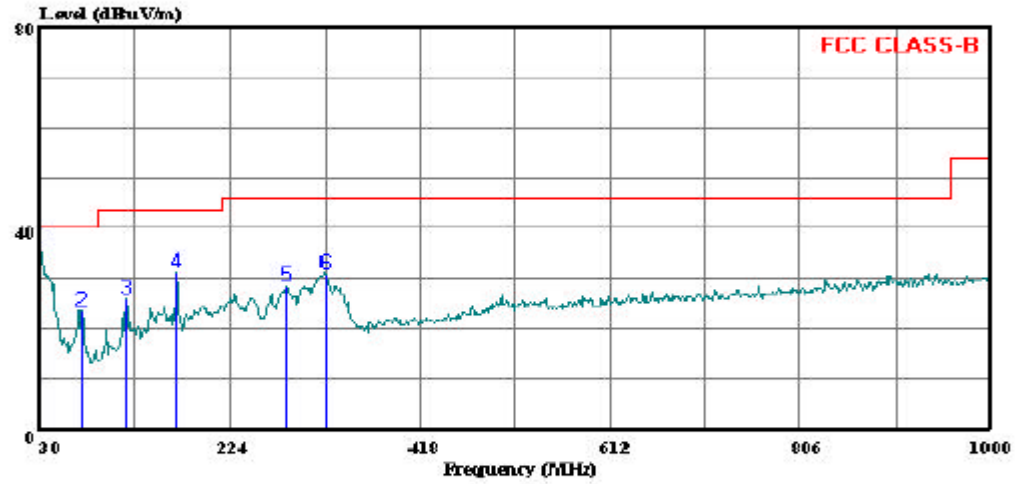
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	71.710	43.17	-19.18	23.98	40.00	-16.02	Peak
2	115.360	43.00	-14.12	28.88	43.50	-14.62	Peak
3	129.910	40.00	-13.07	26.93	43.50	-16.57	Peak
4	143.490	44.67	-13.49	31.18	43.50	-12.32	Peak
5	229.820	47.00	-14.84	32.16	46.00	-13.84	Peak
6	314.210	49.00	-12.04	36.96	46.00	-9.04	Peak

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 15 File#: 08u11631.emi Date: 06-12-2008 Time: 14:29:36



Trace: 14 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Chin Pang
Project #: : 08U11631
Company: : EVEREX COMMUNICATIONS, INC
Model: : WC-21
Configuration:: EUT with smart temp
Mode : : TX
Target: : FCC Class B

VERTICAL DATA

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	30.970	41.92	-5.75	36.17	40.00	-3.83	Peak
2	71.710	42.83	-19.18	23.65	40.00	-16.35	Peak
3	118.270	39.67	-13.55	26.11	43.50	-17.39	Peak
4	168.710	45.67	-14.56	31.11	43.50	-12.39	Peak
5	282.200	41.33	-13.05	28.28	46.00	-17.72	Peak
6	321.000	42.67	-11.82	30.84	46.00	-15.16	Peak

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

ANSI C63.4

RESULTS

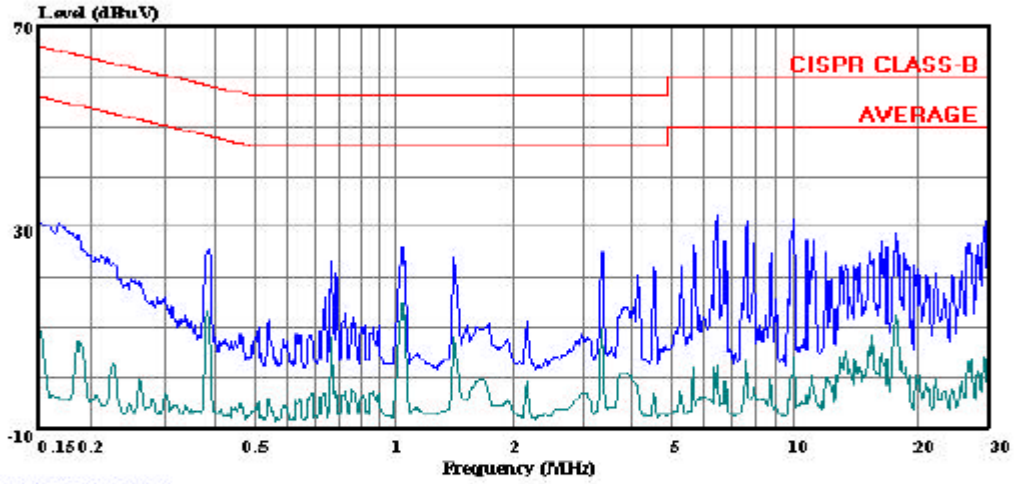
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.17	30.41	--	--	0.00	65.01	55.01	-34.60	-24.60	L1
1.14	25.91	--	--	0.00	56.00	46.00	-30.09	-20.09	L1
3.45	24.83	--	--	0.00	56.00	46.00	-31.17	-21.17	L1
0.16	31.33	--	--	0.00	65.62	55.62	-34.29	-24.29	L2
10.73	32.30	--	--	0.00	60.00	50.00	-27.70	-17.70	L2
12.85	34.87	--	--	0.00	60.00	50.00	-25.13	-15.13	L2
6 Worst Data									

LINE 1 RESULTS

Compliance Certification Services
47173 Benicia Street
Fremont, CA 94538
Tel: (510) 771-1000
Fax: (510) 661-0888

Data#: 7 File#: 08U11631 LC.EMI Date: 06-16-2008 Time: 09:13:14

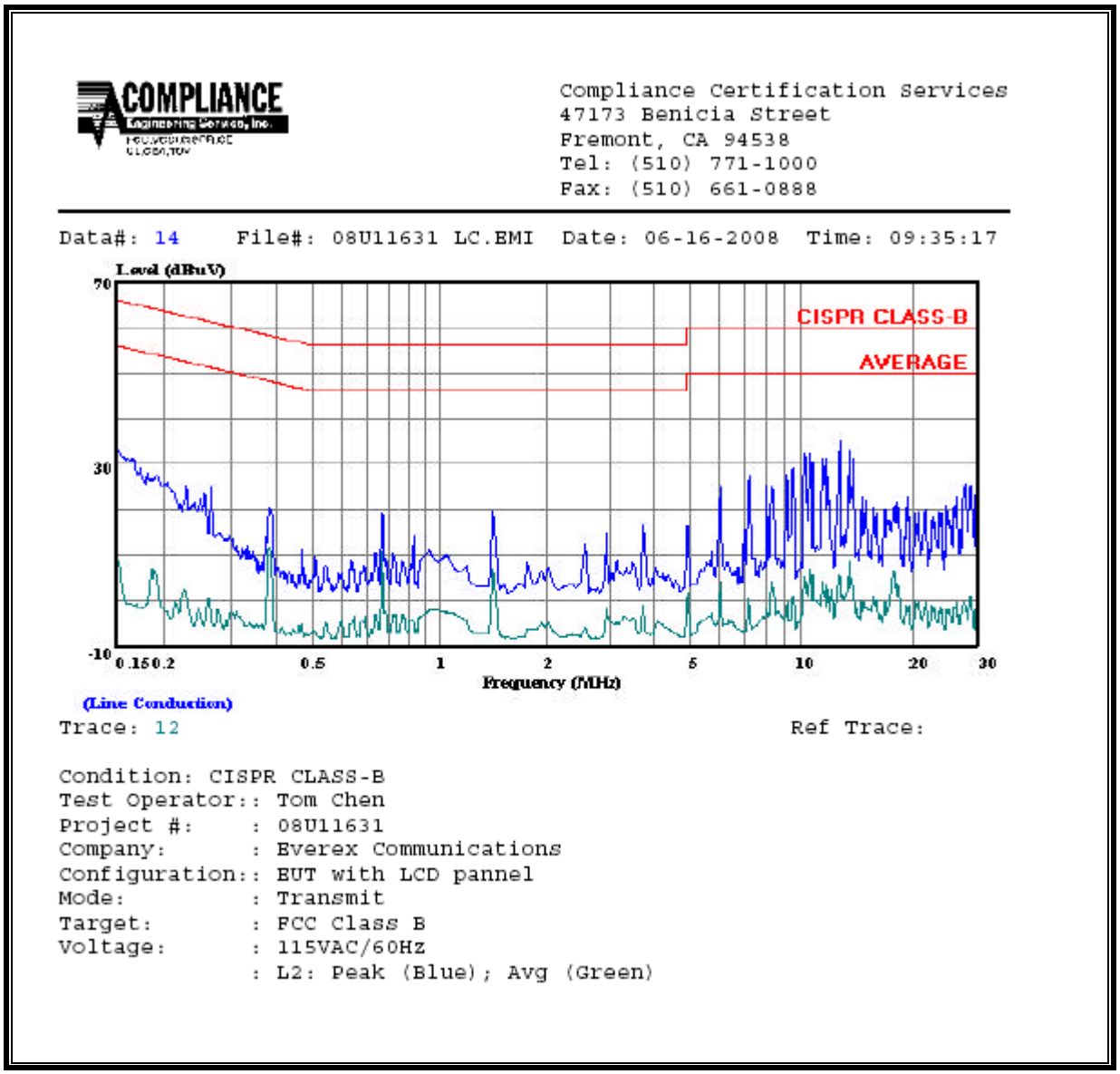


(Line Conduction)

Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Tom Chen
Project #: : 08U11631
Company: : Everex Communications
Configuration:: EUT with LCD pannel
Mode: : Transmit
Target: : FCC Class B
Voltage: : 115VAC/60Hz
: L1: Peak (Blue); Avg (Green)

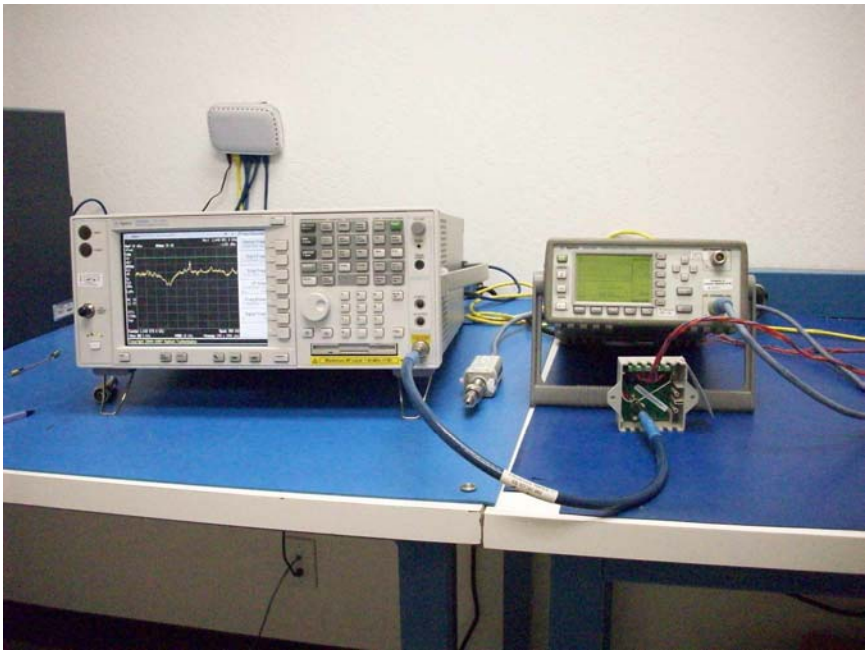
LINE 2 RESULTS



10. SETUP PHOTOS

ANTENNA PORT CONDUCTED RF MEASUREMENT SETUP

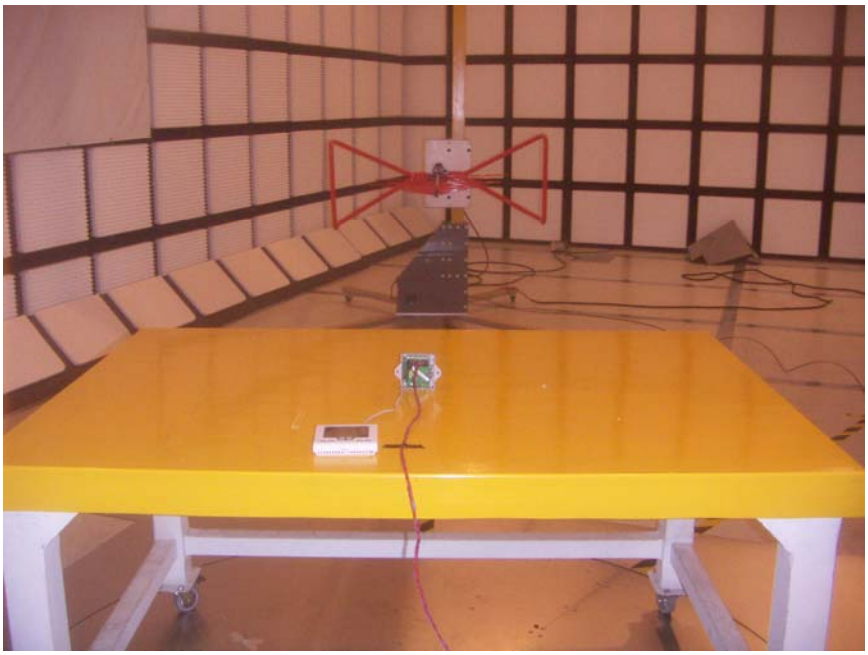
ANTENNA PORT CONDUCTED PHOTO



RADIATED RF MEASUREMENT SETUP

RADIATED FRONT PHOTO

RADIATED BACK PHOTO



POWERLINE CONDUCTED EMISSIONS MEASUREMENT SETUP

LINE CONDUCTED FRONT PHOTO

LINE CONDUCTED BACK PHOTO

END OF REPORT