FCC CFR47 PART 15 SUBPART C
INDUSTRY CANADA RSS-210 ISSUE 7

CERTIFICATION TEST REPORT

FOR

SYNCHRONOUS NETWORK SYSTEM LED CLOCK

MODEL NUMBER: SNS7B202C, SNS7B200, SNS7Y200-1, SNS7B212, SNS7Y212-1, SNS7B200G, SNS7Y200G-1, SNS7B212G, SNS7Y212G-1, SNS7B202, SNS7Y202-1, SNS7B419, SNS7Y419-1, SNS7B202E, SNS7Y202E-1, SNS7B419E, SNS7Y419E-1, SNS7Y202C-1, SNS7B419C, SNS7Y419C-1, SNS7Y202F-1, SNS7Y202EF-1, SNS7Y202CF-1, SNS7B201, SNS7Y201-1, SNS7B203, SNS7Y203-1

FCC ID: PZ3-SNSL
IC: 4256A-SNSL

REPORT NUMBER: 08U11863-1, Revision C

ISSUE DATE: AUGUST 08, 2008

Prepared for
PRIMEX WIRELESS, INC.
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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	08/25/08	Initial Issue	F. Ibrahim
A	07/29/08	Revised TX and RX data sheets.	F. Ibrahim
B	08/04/08	Revised AV power table, Peak Power data, and MPE section.	F. Ibrahim
C	08/08/08	Revised RF conducted and Radiated data.	F. Ibrahim

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: PRIMEX WIRELESS, INC
965 WELLS STREET
LAKE GENEVA, WI 53147, U.S.A

EUT DESCRIPTION: SYNCHROPNOUS NETWORK SYSTEM LED CLOCK

MODEL: SNS7B202C

SERIAL NUMBER: 02193

DATE TESTED: JULY 18-23, 2008

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 2	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, RSS-GEN Issue 2, and RSS-210 Issue 7.

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 a Synchronous Network System LED Clocks.

The radio module is manufactured by Universal Electronics.

5.2. MODIFICATION (S)

The following modifications were implemented in order to pass radiated emissions testing:

In order to reduce emissions below 1GHz from the 25MHz crystal the series resistors R99 and R108 going to the crystal were changed from 56ohms to 300ohms, the power line filter capacitor C66 was changed from 0.1uF to 470pF, and a clamp-on ferrite (Fair-Rite Model Number 0443806406) was added to the internal Ethernet cable going between the PCB and the RJ45 bulkhead connector located on the casing. The Ethernet cable passes through the clamp-on ferrite twice and is placed near the connector on the PCB.

The following modifications were implemented in order to pass conducted emissions testing:

In order to reduce conducted emissions below 30MHz the power supply was changed from Cincon model number CFM2002S to CUI model number VOF-25-12 and the ferrite bead (FB2) was removed from the PCB.

5.3. DESCRIPTION OF MODEL DIFFERENCES

Style	Sample	LED PCB	US Model #	European Model #	UK Model #	Cable Type	Mounting Option	Type
2.5" x 4 Digit Red Wall Mount		Q13035	SNS7B200	SNS7C200	SNS7G200	9 Foot Plugable cord	4 degree tilt bracket	LED Clock
			SNS7Y200-1	SNS7E200-1	SNS7K200-1	18 Inch Pig Tail	4 degree tilt bracket	LED Clock
			SNS7B212	SNS7C212	SNS7G212	9 Foot Plugable cord	18 degree tilt bracket	LED Clock
			SNS7Y212-1	SNS7E212-1	SNS7K212-1	18 Inch Pig Tail	18 degree tilt bracket	LED Clock
2.5" x 4 Digit Green Wall Mount		Q13035G	SNS7B200G	SNS7C200G	SNS7G200G	9 Foot Plugable cord	4 degree tilt bracket	LED Clock
			SNS7Y200G-1	SNS7E200G-1	SNS7K200G-1	18 Inch Pig Tail	4 degree tilt bracket	LED Clock
			SNS7B212G	SNS7C212G	SNS7G212G	9 Foot Plugable cord	18 degree tilt bracket	LED Clock
			SNS7Y212G-1	SNS7E212G-1	SNS7K212G-1	18 Inch Pig Tail	18 degree tilt bracket	LED Clock
2.5" x 6 Digit Red Wall Mount		Q13013	SNS7B202	SNS7C202	SNS7G202	9 Foot Plugable cord	4 degree tilt bracket	LED Clock
			SNS7Y202-1	SNS7E202-1	SNS7K202-1	18 Inch Pig Tail	4 degree tilt bracket	LED Clock
			SNS7B419	SNS7C419	SNS7G419	9 Foot Plugable cord	18 degree tilt bracket	LED Clock
			SNS7Y419-1	SNS7E419-1	SNS7K419-1	18 Inch Pig Tail	18 degree tilt bracket	LED Clock
			SNS7B202E	SNS7C202E	SNS7G202E	9 Foot Plugable cord	4 degree tilt bracket	Elapse Timer
			SNS7Y202E-1	SNS7E202E-1	SNS7K202E-1	18 Inch Pig Tail	4 degree tilt bracket	Elapse Timer
			SNS7B419E	SNS7C419E	SNS7G419E	9 Foot Plugable cord	18 degree tilt bracket	Elapse Timer
			SNS7Y419E-1	SNS7E419E-1	SNS7K419E-1	18 Inch Pig Tail	18 degree tilt bracket	Elapse Timer
			SNS7B202C	SNS7C202C	SNS7G202C	9 Foot Plugable cord	4 degree tilt bracket	Code Blue
			SNS7Y202C-1	SNS7E202C-1	SNS7K202C-1	18 Inch Pig Tail	4 degree tilt bracket	Code Blue
			SNS7B419C	SNS7C419C	SNS7G419C	9 Foot Plugable cord	18 degree tilt bracket	Code Blue
			SNS7Y419C-1	SNS7E419C-1	SNS7K419C-1	18 Inch Pig Tail	18 degree tilt bracket	Code Blue
2.5" x 6 Digit Red Flush Mount		Q13033	SNS7Y202F-1	SNS7E202F-1	SNS7K202F-1	18 Inch Pig Tail	Flush Mount	LED Clock
			SNS7Y202EF-1	SNS7E202EF-1	SNS7K202EF-1	18 Inch Pig Tail	Flush Mount	Elapse Timer
			SNS7Y202CF-1	SNS7E202CF-1	SNS7K202CF-1	18 Inch Pig Tail	Flush Mount	Code Blue
4" x 4 Digit Red Wall Mount		Q13034	SNS7B201	SNS7C201	SNS7G201	9 Foot Plugable cord	Standard Mounting Bracket	LED Clock
			SNS7Y201-1	SNS7E201-1	SNS7K201-1	18 Inch Pig Tail	Standard Mounting Bracket	LED Clock
4" x 6 Digit Red Flush Mount		Q13034 & Q12808	SNS7B203	SNS7C203	SNS7G203	9 Foot Plugable cord	Standard Mounting Bracket	LED Clock
			SNS7Y203-1	SNS7E203-1	SNS7K203-1	18 Inch Pig Tail	Standard Mounting Bracket	LED Clock

Notes
All LED models use the same radio module (part number Q13037) that is attached to the main LED PCBs using a header and screws.
All LED PCBs have virtually the same schematic designs. The only differences mainly are different size PCBs, different number of digits, different size LED displays, different color LED displays, and different value LED drive resistors. Power Cables, connectors, Power Supplies, and so on are the same for all of the styles.
All LED Models being sold to the US, UK, and the rest of Europe use the same same Universal 100 - 240VAC Switching Power Supply. The only different between US, UK, and European is a different power cable is used.
The 4" x 6 Digit LED Clocks use the same circuit baord for the hours and minutes (Q13034) as the 4" x 4 Digit LED Clocks. A 2nd PCB (Q12808) is added to show the seconds. These boards are connected together with a wire jumper.
The Red 2.5" x 4 Digit Clocks and the Green 2.5" x 4 Digit Clocks use the same bare PCB, the only different being that different LEDs and drive resistors for the LEDs are used.
Mounting Brackets for the Wall Mount Clocks are separate than the LED Clock Housing. For example, a 2.5 x 4" LED Clock could be attached to either a 4 degree title bracket or an 18 degree tilt bracket.
LED Clocks are basic clocks that only have a power cord coming out of the back of the unit. Elapse Timers are the same as LED Clock except an additional 15 foot telephone cable is also run out of the back of the unit that connects to a wall switch. The wall switch is low voltage and is used to control the elapse timer software functions.
The Code Blue Clock is the same as an Elapsed Timer accept an additonal 18 inch pair of shielded wires comes out of the back of the clock. These wires are meant to be connected to a customer's Code Blue System.

SNS7B202C was the representative model that was tested.

5.4. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
2412 - 2462	802.11b	18.12	64.86
2412 - 2462	802.11g	24.30	269.15

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PCB trace antenna, with a maximum gain of –1.2 dBi.

5.6. SOFTWARE AND FIRMWARE

The firmware installed in the EUT during testing was Atheros AR2315 single chip 2.4GHz Access Point Solution (radiofw-1.2.58).

The test utility software used during testing was ART, rev 5.2.

5.7. WORST-CASE CONFIGURATION AND MODE

For Radiated Emissions below 1 GHz and Power Line Conduced Emissions, the channel with highest output power was selected as worst-case, the channel with highest output power was found to be Mid Channel in 11g mode.

The worst-case data rate for each mode is determined to be as follows, based on input from the manufacturer of the radio:

All final tests in the 802.11b mode were made at 1 Mb/s.
All final tests in the 802.11g mode were made at 6 Mb/s.

5.8. DESCRIPTION OF TEST SETUP

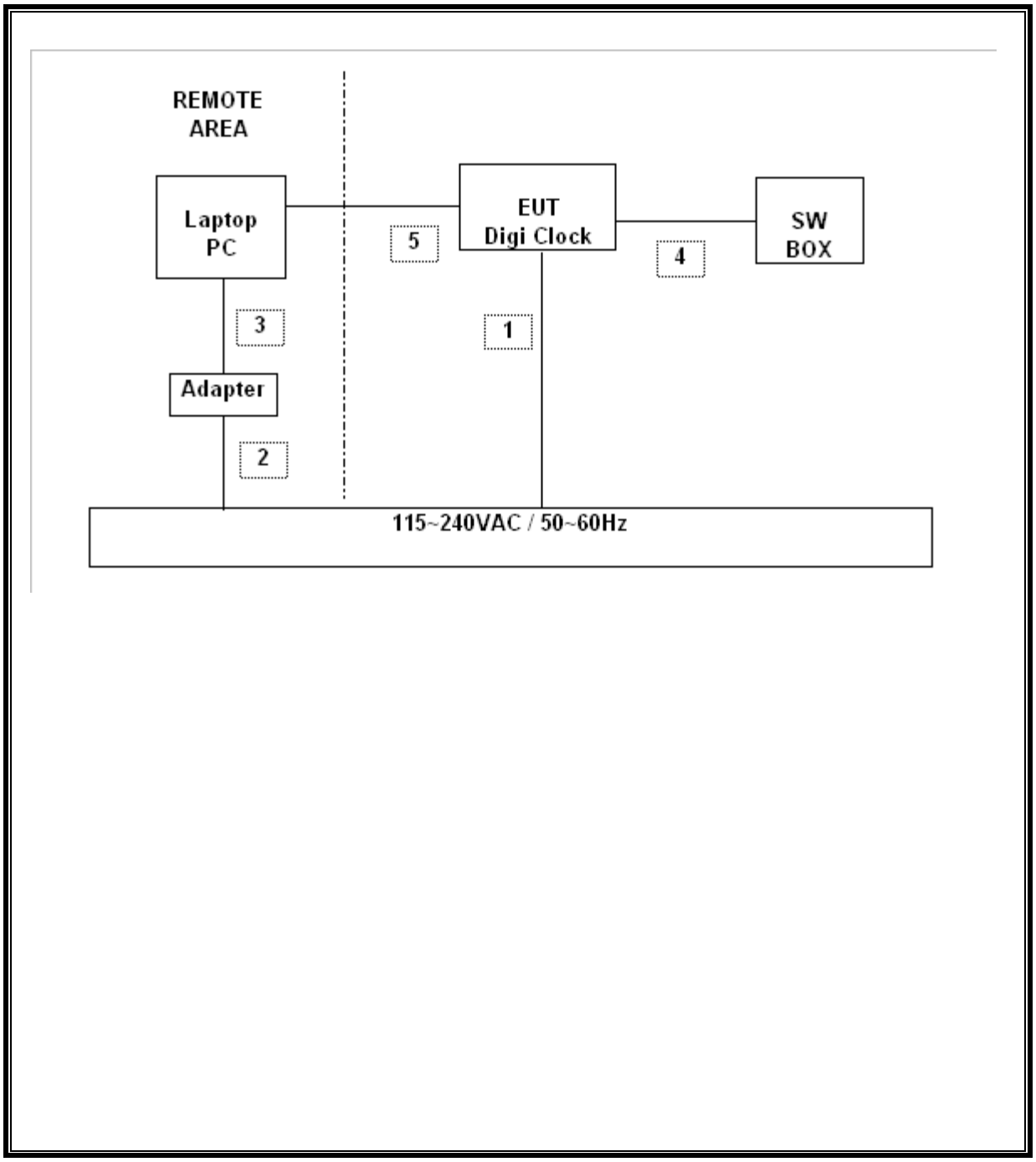
SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	**Manufacturer**	**Model**	**Serial Number**
Laptop PC	Dell	INSPIRON 6400	UT153A01
AC Adapter	Dell	LA65NS-00	CN-0DF2637161572M2925
SW Panel	Primex Wireless	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	2.5 m	N/A
2	AC	1	AC	Unshielded	0.8 m	N/A
3	DC	1	DC	Unshielded	1.5 m	N/A
4	RJ11	1	RJ11	Unshielded	4m	N/A
5	Ethernet	1	RJ45	Unshielded	1m	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**
Attenuators	Weinschel	56-10	N/A	N/A	N/A
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
Preamplifier, 1300 MHz	Agilent / HP	8447D	N/A	9/19/2007	09/19/08
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C00749	08/03/07	09/27/08
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
Pre-amplifier	Miteq	NSP4000-SP2	C00990	10/11/07	10/11/08
Horn Antenna	ARA	MWH-1826/B	C00980	09/29/07	09/29/08
Horn Antenna	ARA	MWH-2640/B	C00981	09/29/07	09/29/08

7. ANTENNA PORT TEST RESULTS

7.1. 802.11b MODE IN THE 2.4 GHz BAND

7.1.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

TEST PROCEDURE

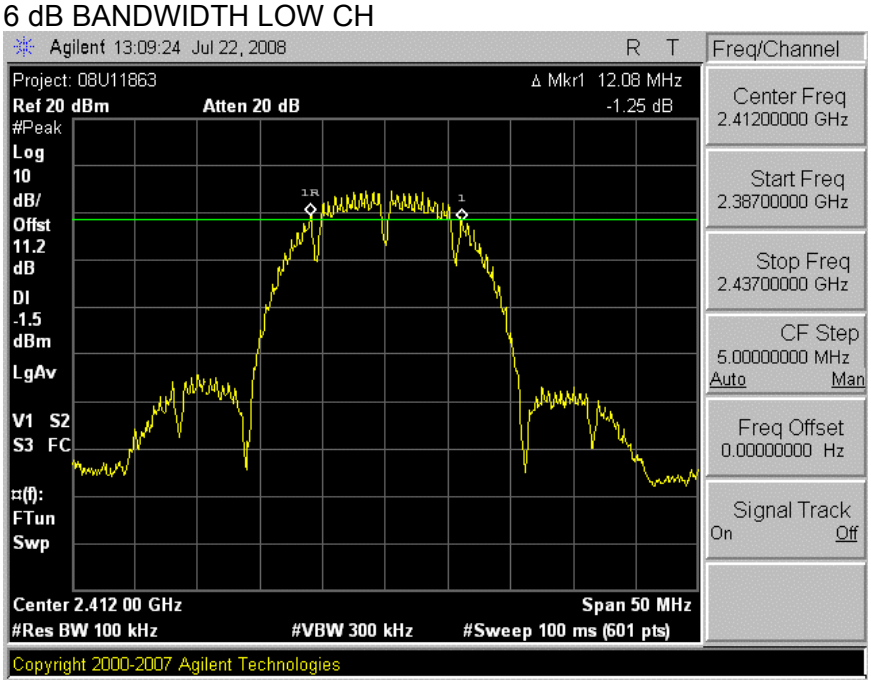
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

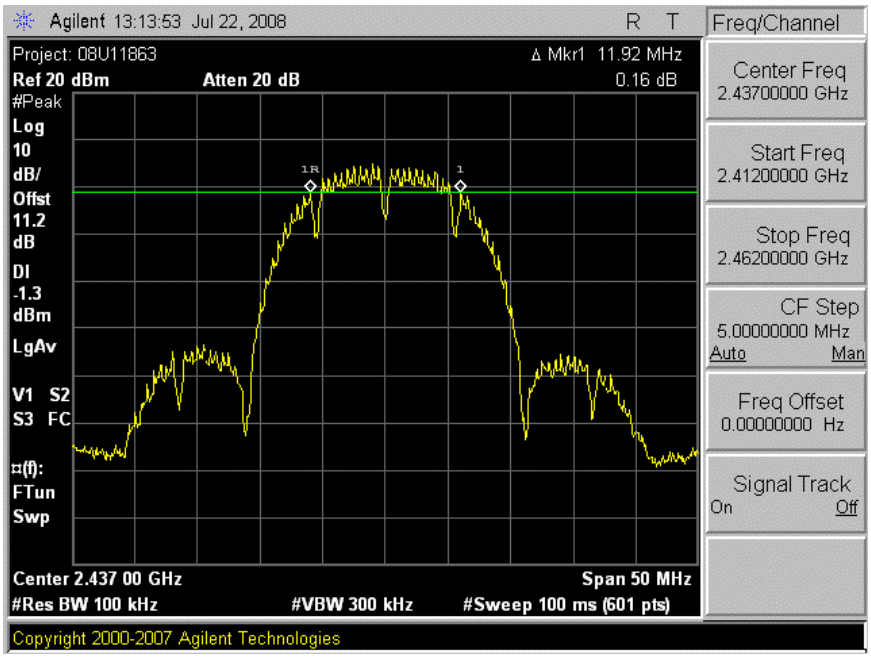
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	12.08	0.5
Middle	2437	11.92	0.5
High	2462	12.08	0.5

6 dB BANDWIDTH

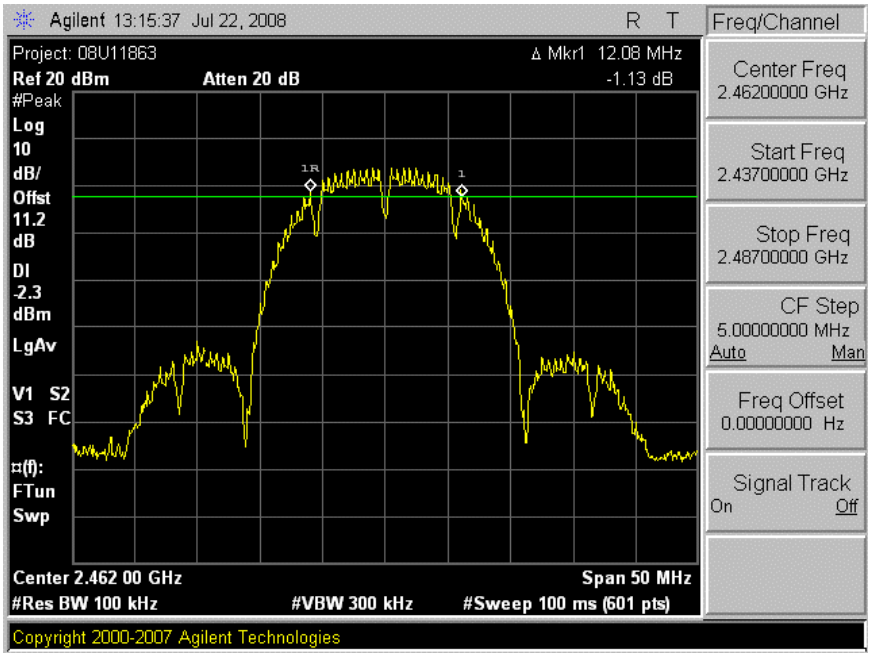
6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



6 dB BANDWIDTH HIGH CH



7.1.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

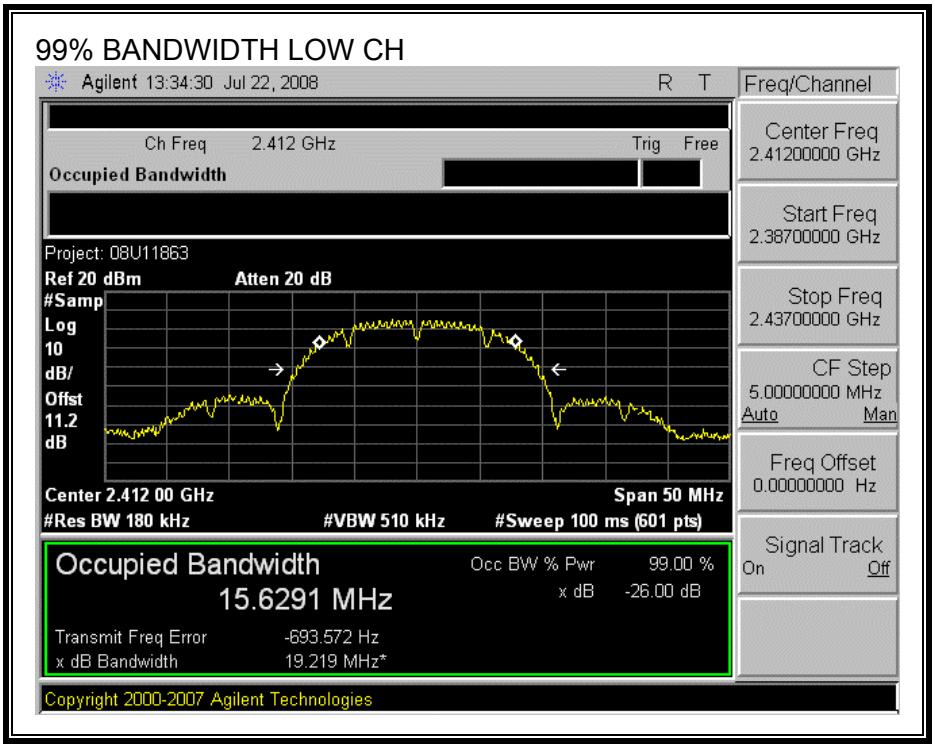
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

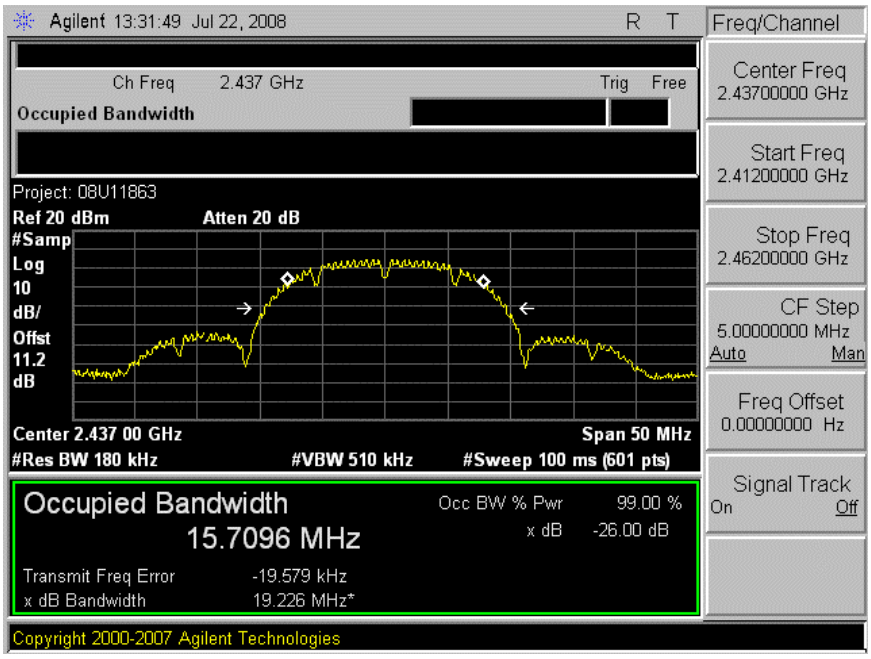
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	15.6291
Middle	2437	15.7096
High	2462	15.5410

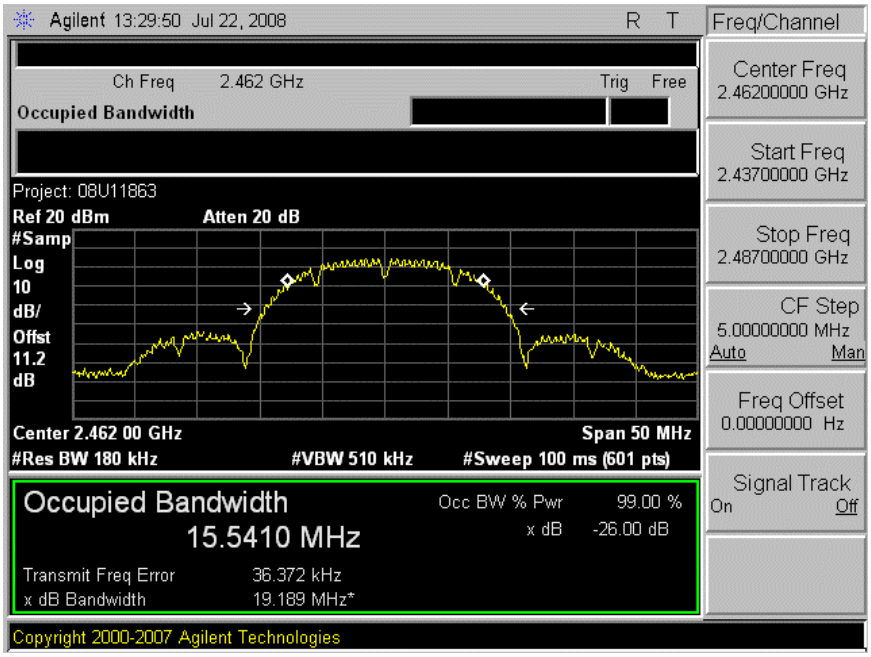
99% BANDWIDTH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH



7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

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

TEST PROCEDURE

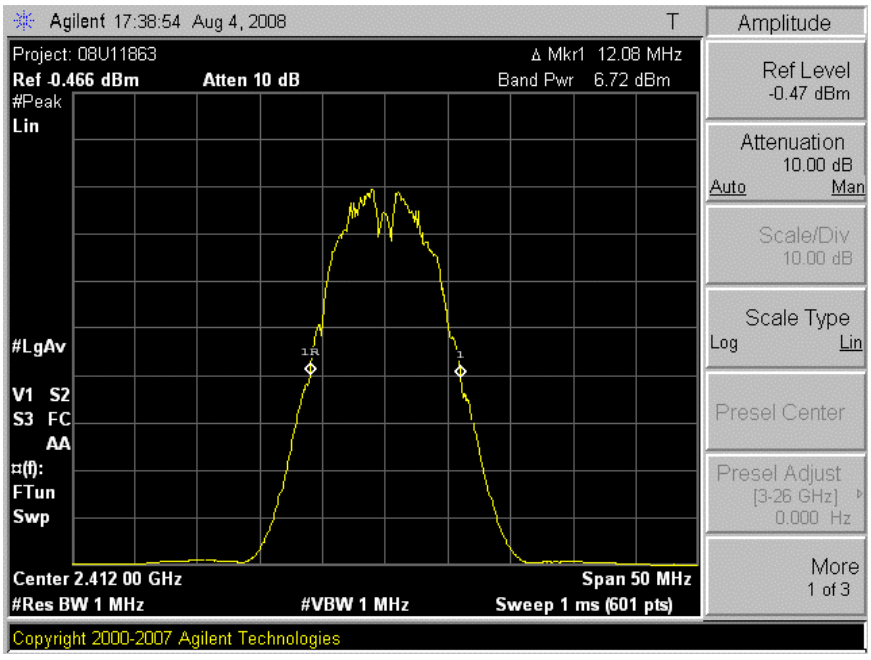
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

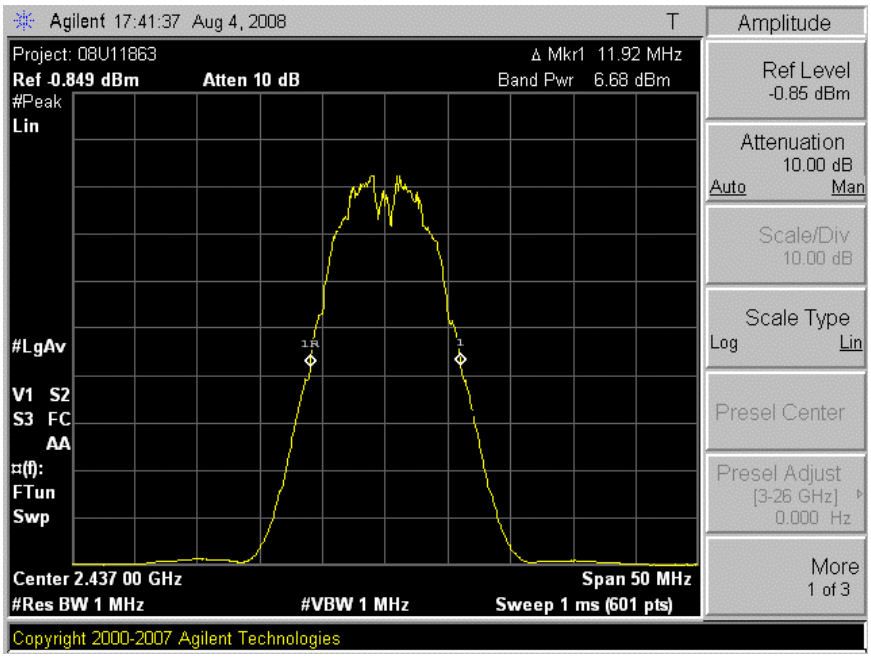
Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	6.72	11.4	18.12	30	-11.88
Middle	2437	6.68	11.4	18.08	30	-11.92
High	2462	6.28	11.4	17.68	30	-12.32

OUTPUT POWER

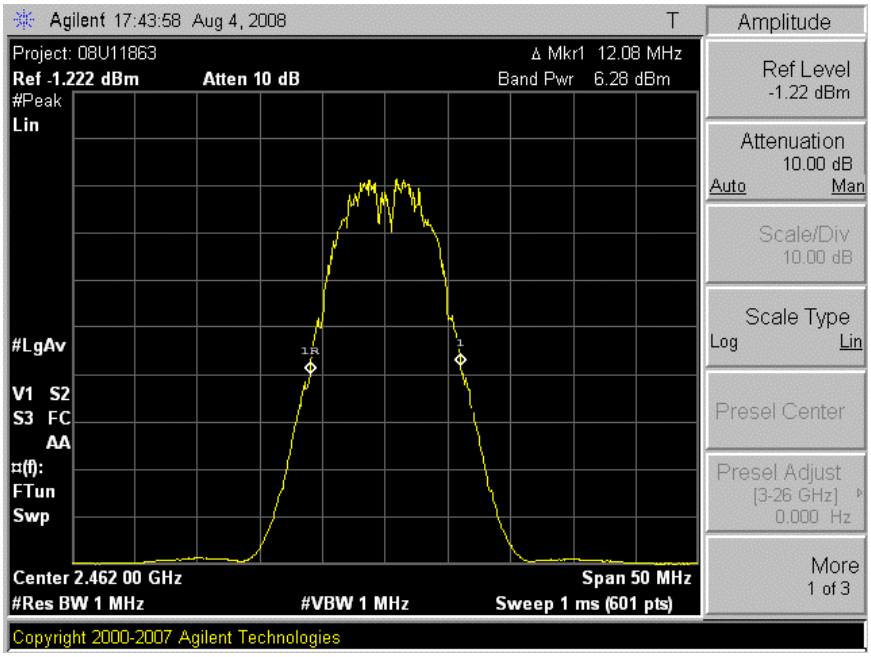
OUTPUT POWER LOW CH



OUTPUT POWER MID CH



OUTPUT POWER HIGH CH



7.1.4. 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 11.2 dB (including 10 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	15.30
Middle	2437	15.20
High	2462	15.10

7.1.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

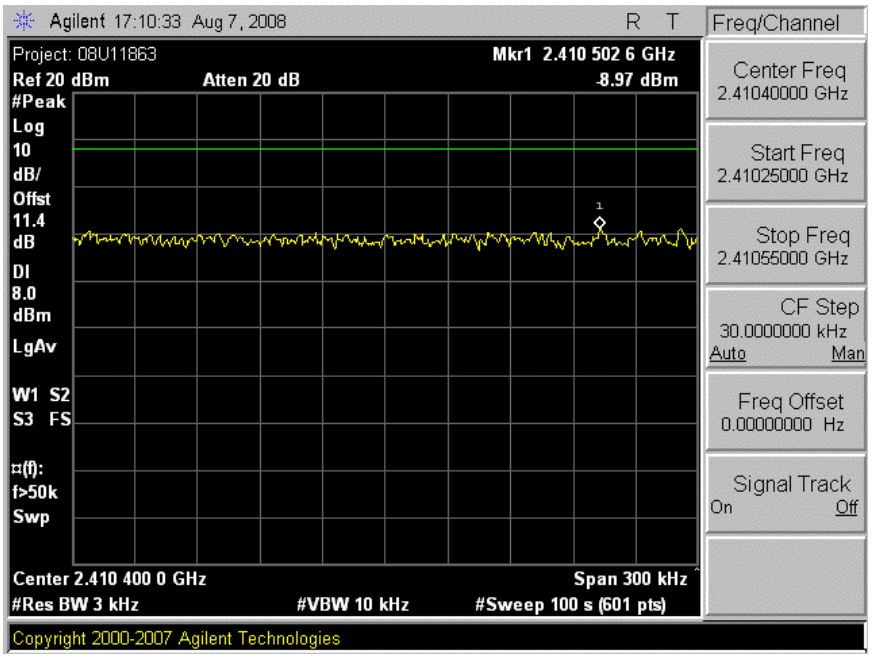
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

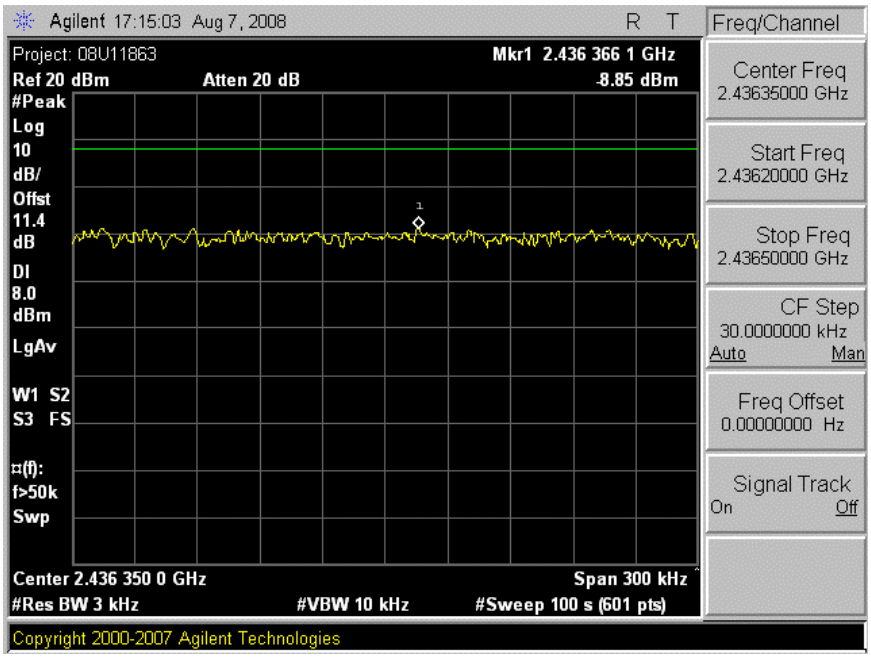
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-8.97	8	-16.97
Middle	2437	-8.85	8	-16.85
High	2462	-9.26	8	-17.26

POWER SPECTRAL DENSITY

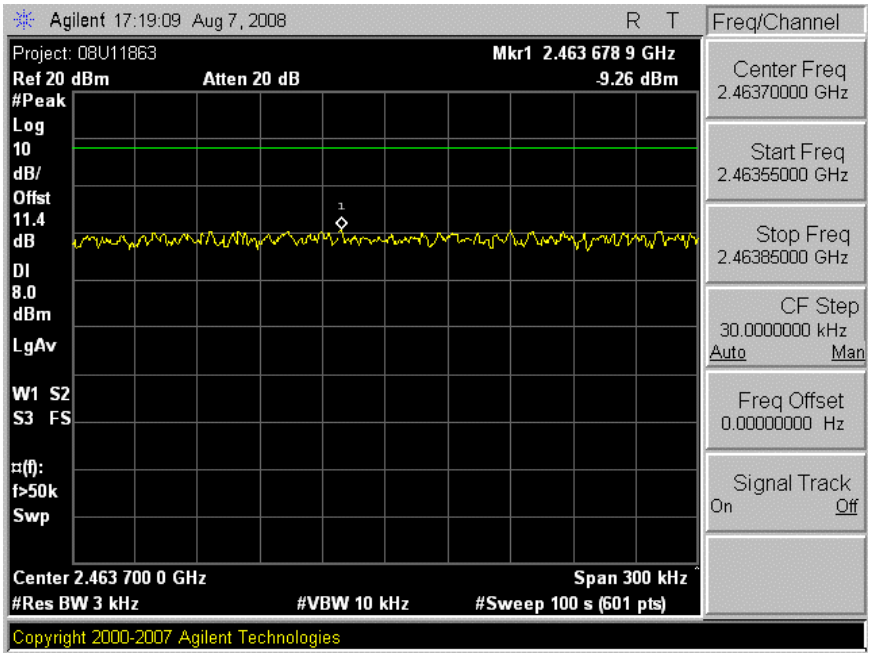
PSD LOW CH



PSD MID CH



PSD HIGH CH



7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

TEST PROCEDURE

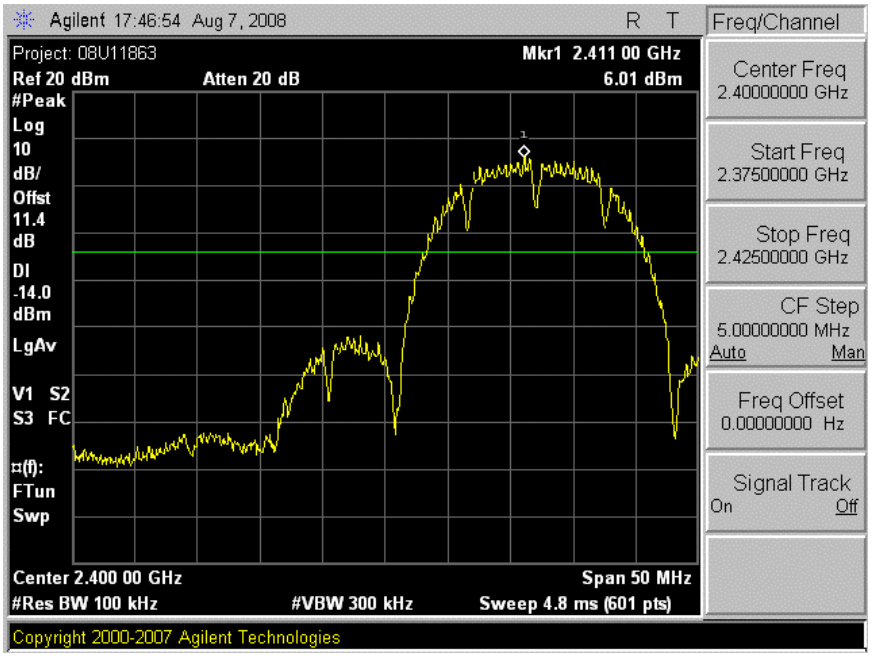
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

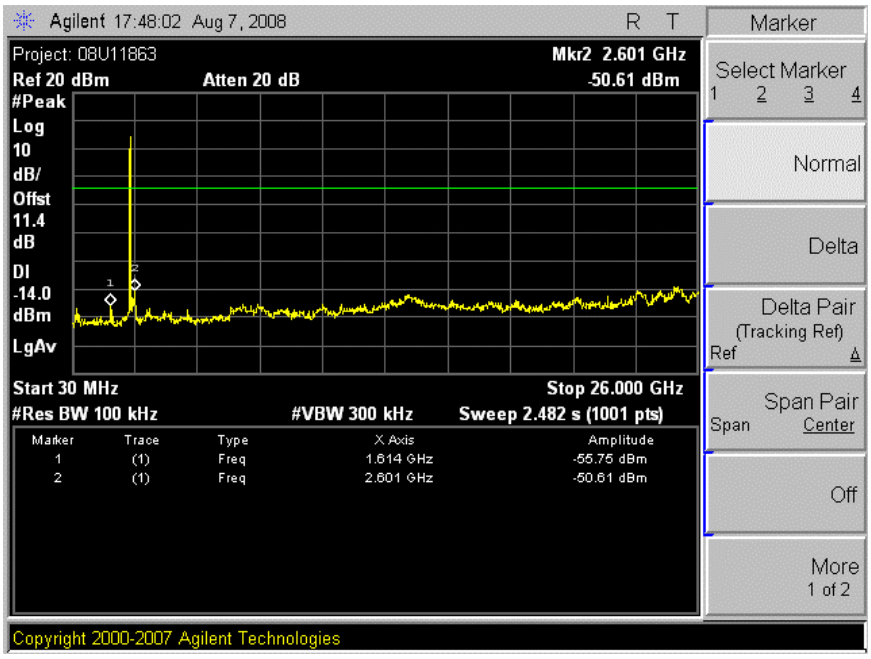
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

LOW CH BANDEDGE

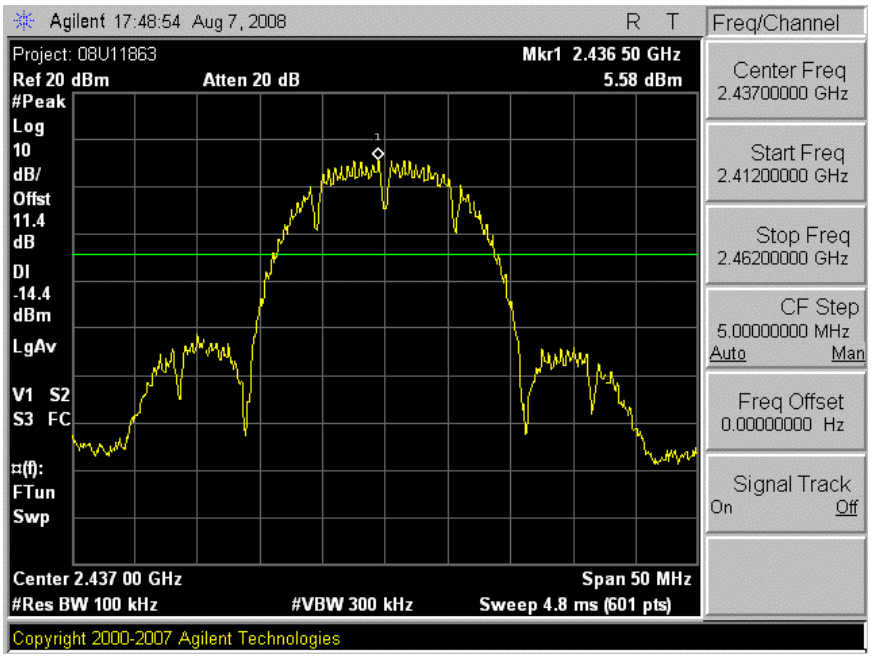


LOW CH SPURIOUS

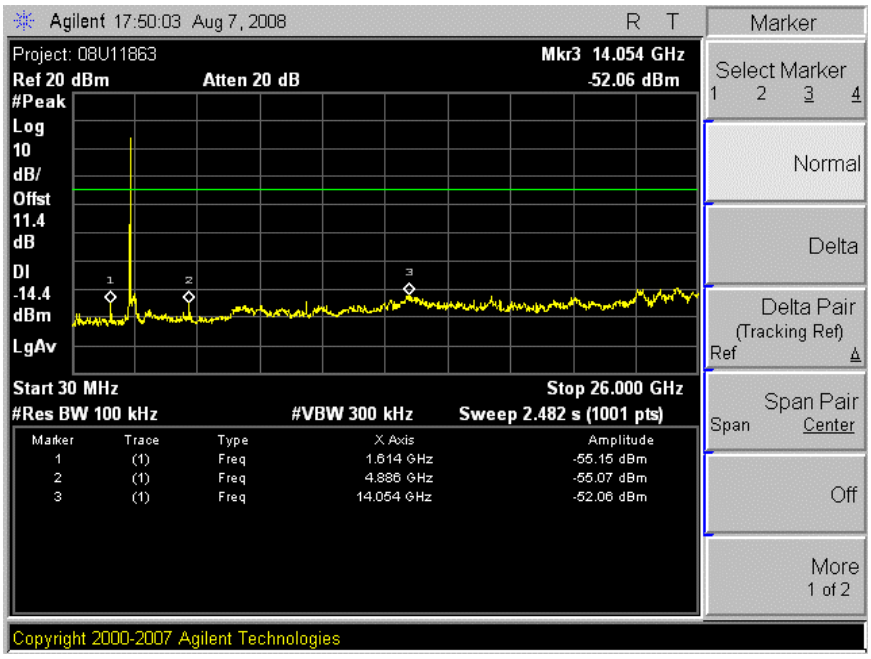


SPURIOUS EMISSIONS, MID CHANNEL

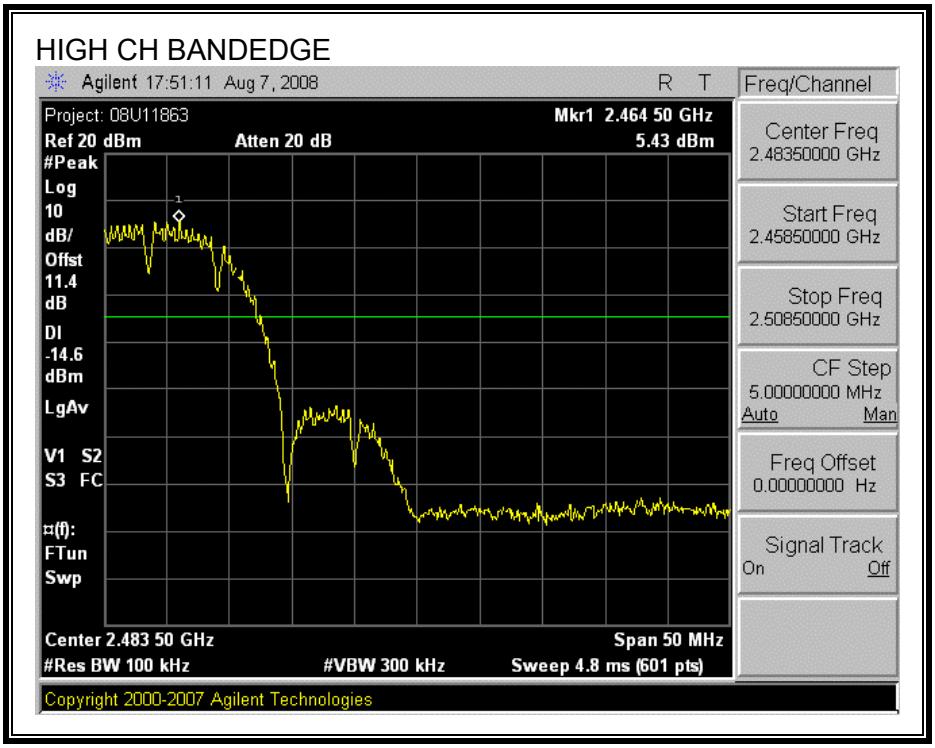
MID CH REFERENCE



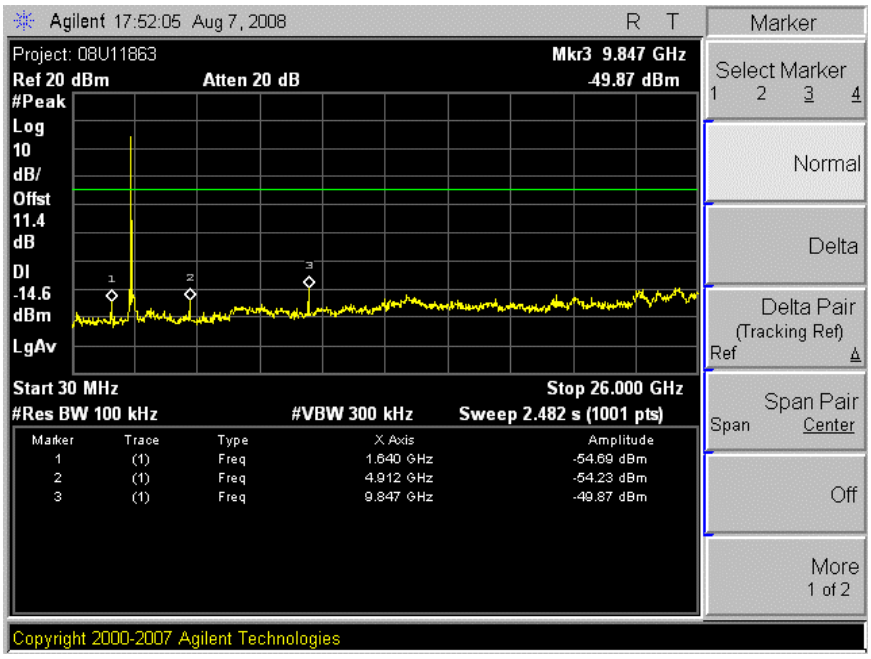
MID CH SPURIOUS



SPURIOUS EMISSIONS, HIGH CHANNEL



HIGH CH SPURIOUS



7.2. 802.11g MODE IN THE 2.4 GHz BAND

7.2.1. 6 dB BANDWIDTH

LIMITS

FCC §15.247 (a) (2)

IC RSS-210 A8.2 (a)

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

TEST PROCEDURE

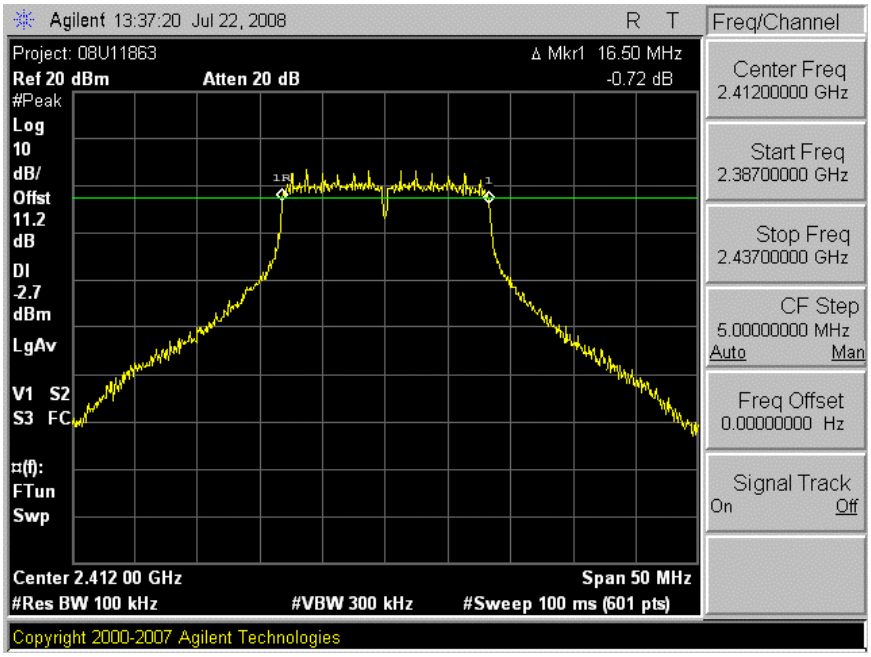
The transmitter output is connected to a spectrum analyzer. The RBW is set to 100 kHz and the VBW is set to 300 kHz. The sweep time is coupled.

RESULTS

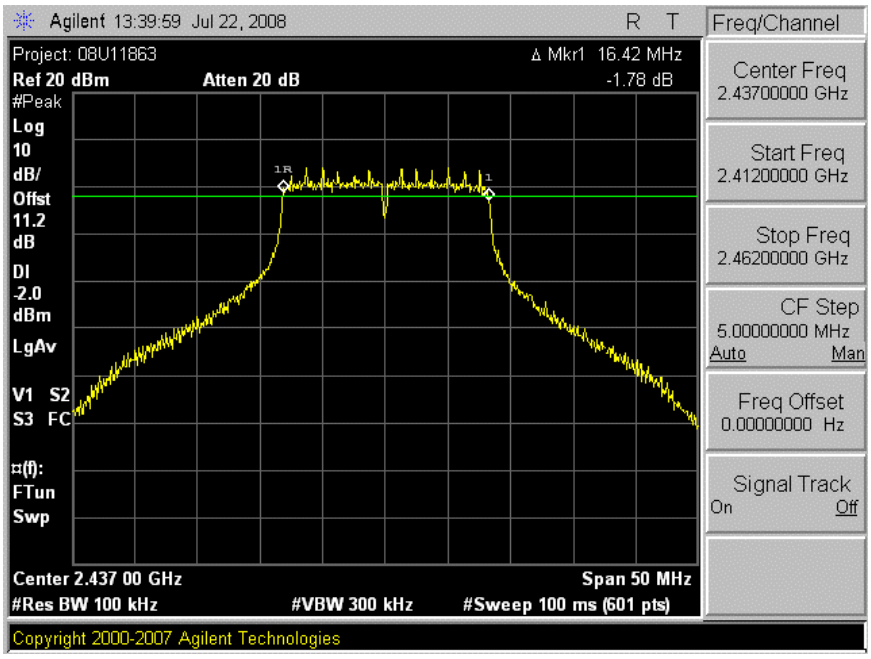
Channel	Frequency (MHz)	6 dB Bandwidth (MHz)	Minimum Limit (MHz)
Low	2412	16.50	0.5
Middle	2437	16.42	0.5
High	2462	16.33	0.5

6 dB BANDWIDTH

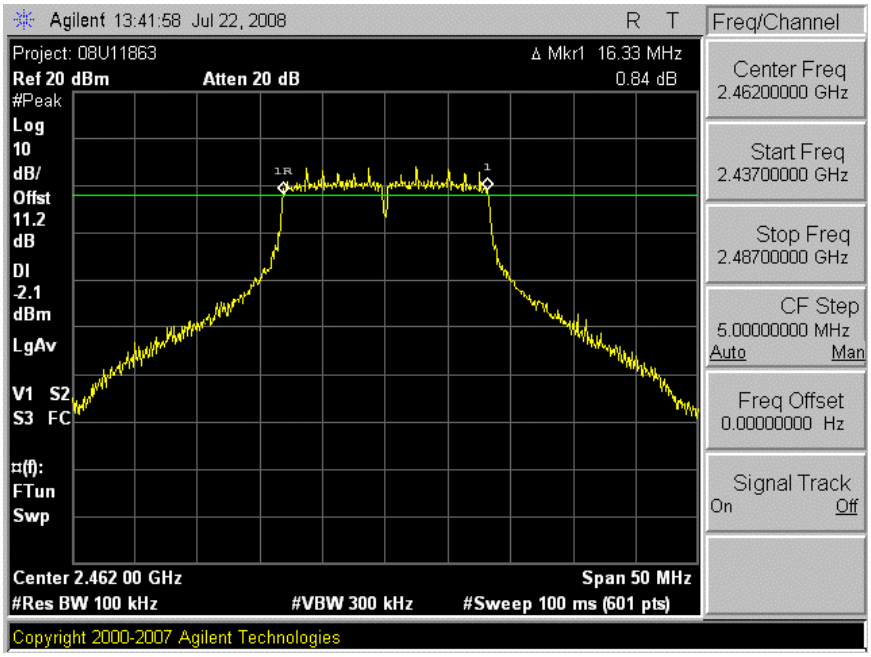
6 dB BANDWIDTH LOW CH



6 dB BANDWIDTH MID CH



6 dB BANDWIDTH HIGH CH



7.2.2. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

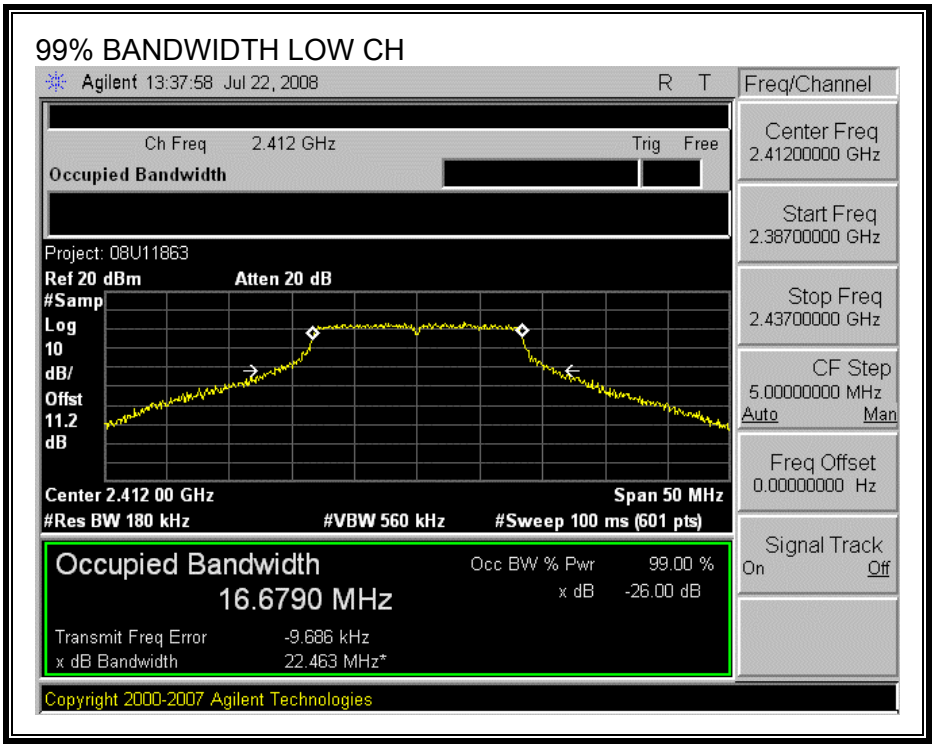
TEST PROCEDURE

The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal 99% bandwidth function is utilized.

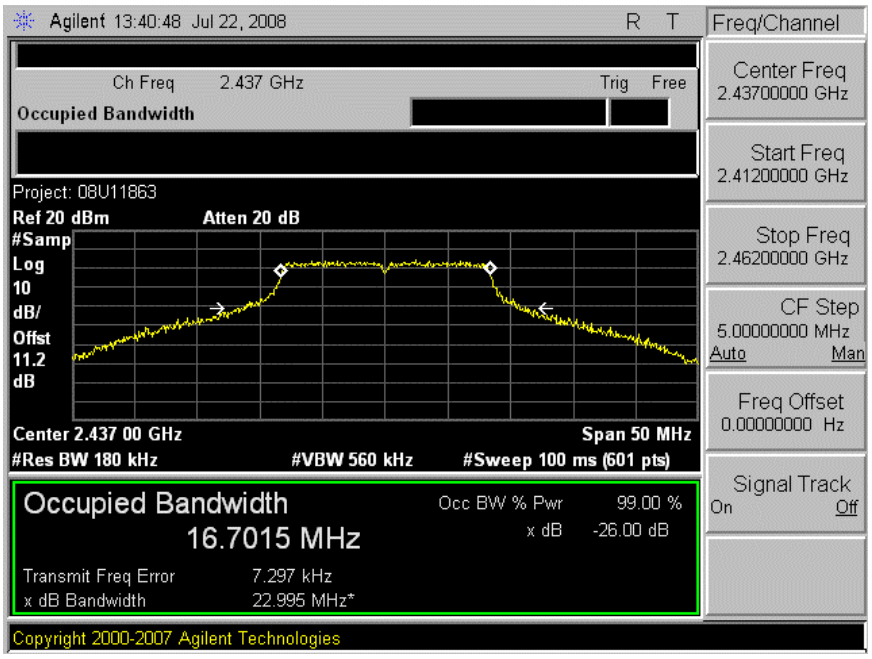
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	2412	16.6790
Middle	2437	16.7015
High	2462	16.7670

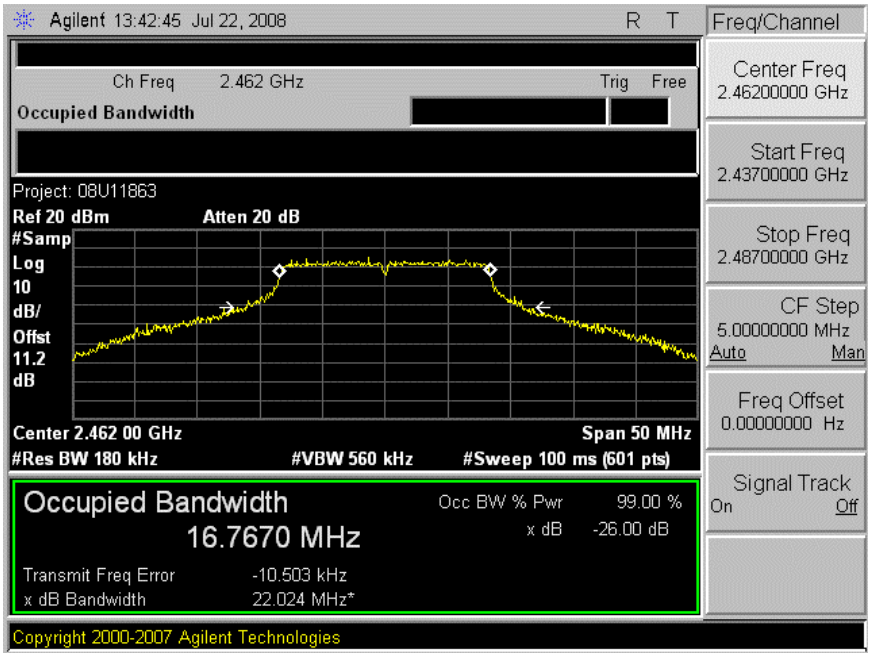
99% BANDWIDTH



99% BANDWIDTH MID CH



99% BANDWIDTH HIGH CH



7.2.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

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

TEST PROCEDURE

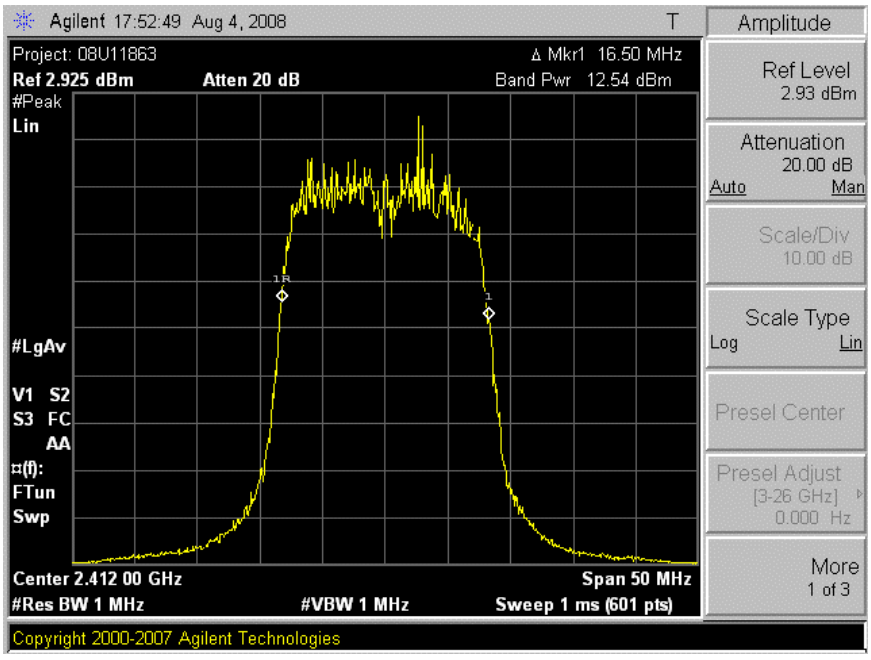
Peak power is measured using the Channel bandwidth Alternative peak output power procedure specified in "TCB Training for Devices covered under Scopes A1 - A4" by Joe Dichoso, May 2003.

RESULTS

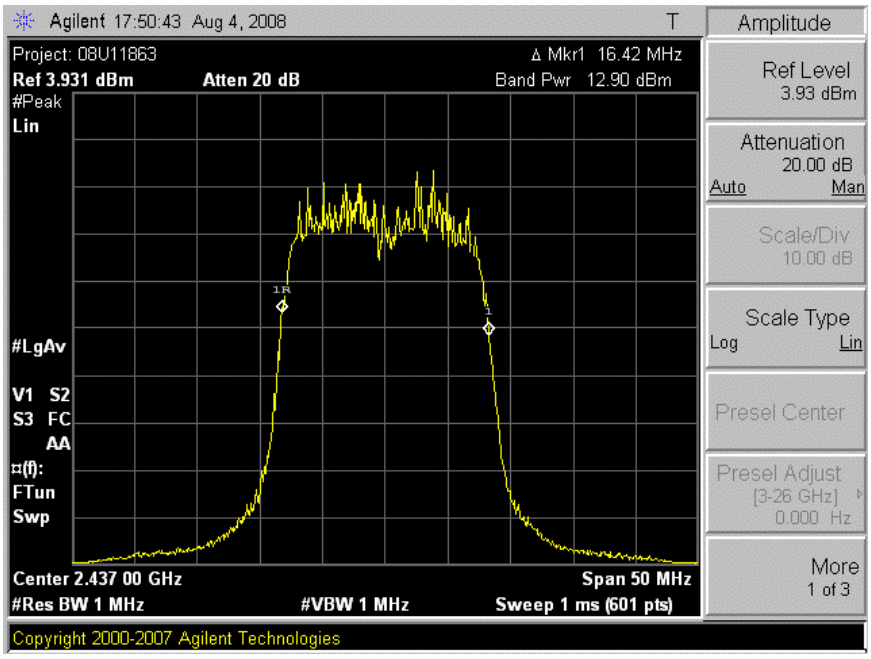
Channel	Frequency (MHz)	Spectrum Analyzer Reading (dBm)	Attenuator and Cable Offset (dB)	Output Power (dBm)	Limit (dBm)	Margin (dB)
Low	2412	12.54	11.4	23.94	30	-6.06
Middle	2437	12.90	11.4	24.30	30	-5.70
High	2462	12.67	11.4	24.07	30	-5.93

OUTPUT POWER

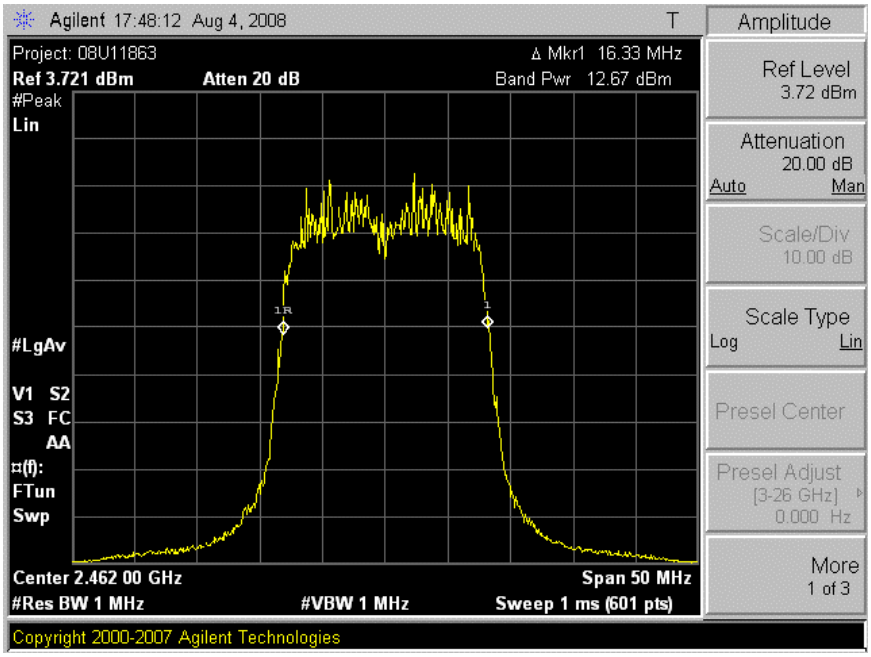
OUTPUT POWER LOW CH



OUTPUT POWER MID CH



OUTPUT POWER HIGH CH



7.2.4. 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 11.2 dB (including 10 dB pad and 1.2 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	2412	16.10
Middle	2437	16.20
High	2462	16.20

7.2.5. POWER SPECTRAL DENSITY

LIMITS

FCC §15.247 (e)

IC RSS-210 A8.2 (b)

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

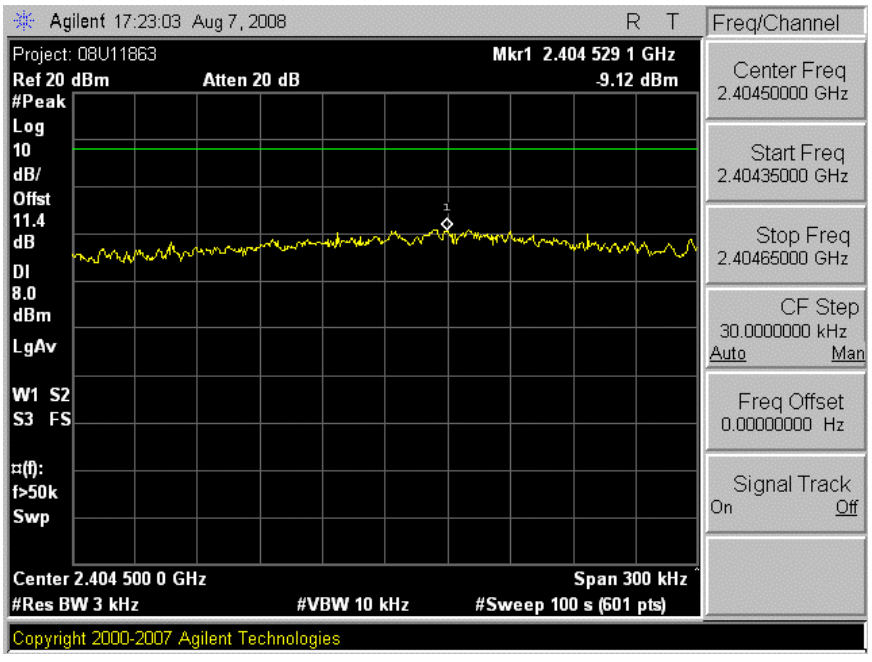
Output power was measured based on the use of a peak measurement, therefore the power spectral density was measured using PSD Option 1 in accordance with FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005.

RESULTS

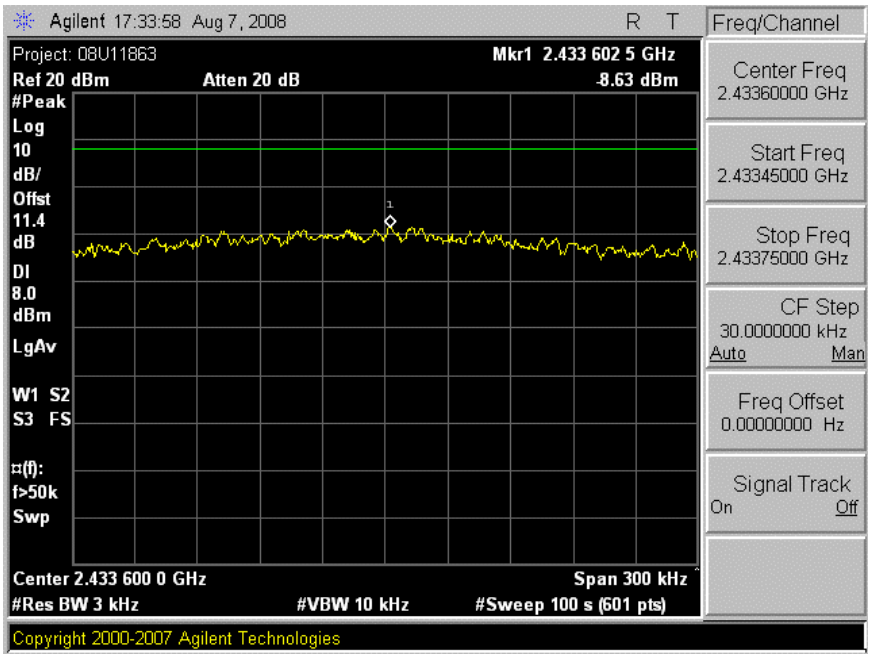
Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	2412	-9.12	8	-17.12
Middle	2437	-8.63	8	-16.63
High	2462	-9.14	8	-17.14

POWER SPECTRAL DENSITY

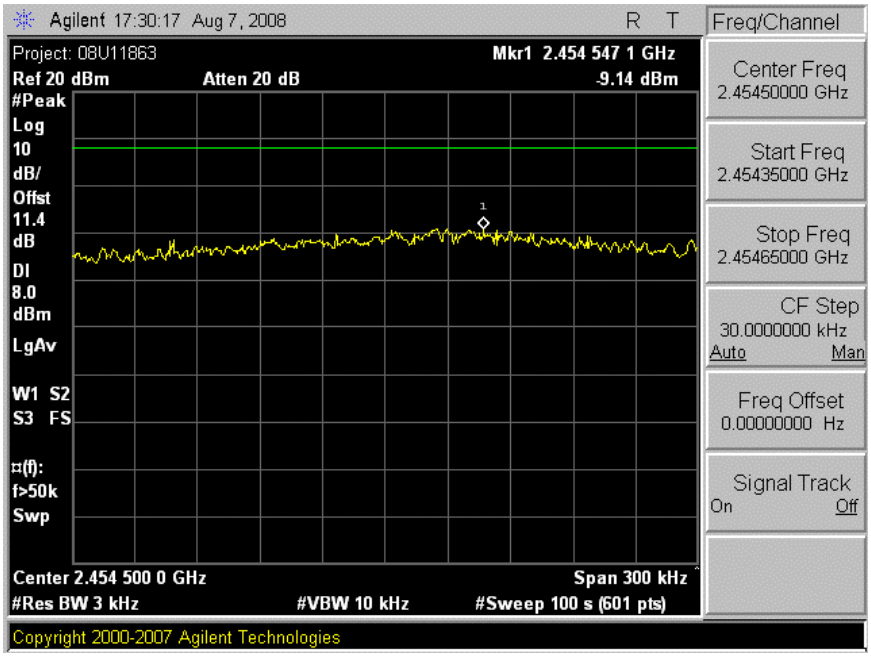
PSD LOW CH



PSD MID CH



PSD HIGH CH



7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

IC RSS-210 A8.5

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

TEST PROCEDURE

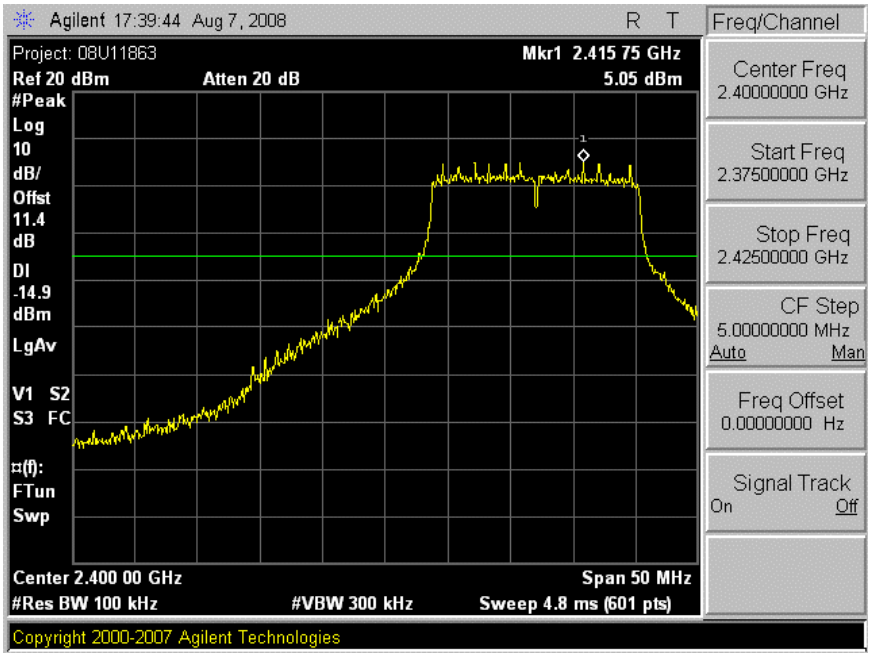
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

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

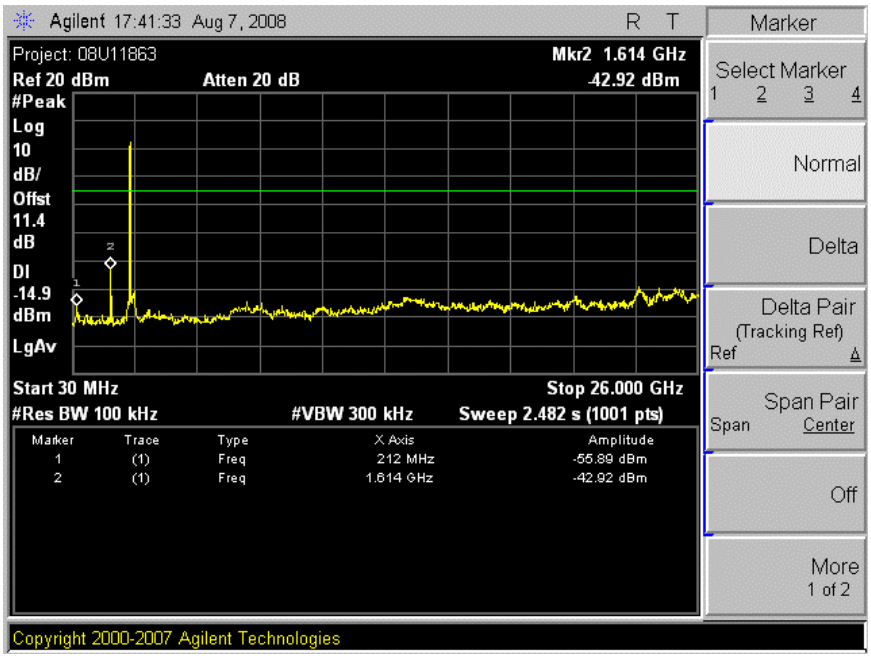
RESULTS

SPURIOUS EMISSIONS, LOW CHANNEL

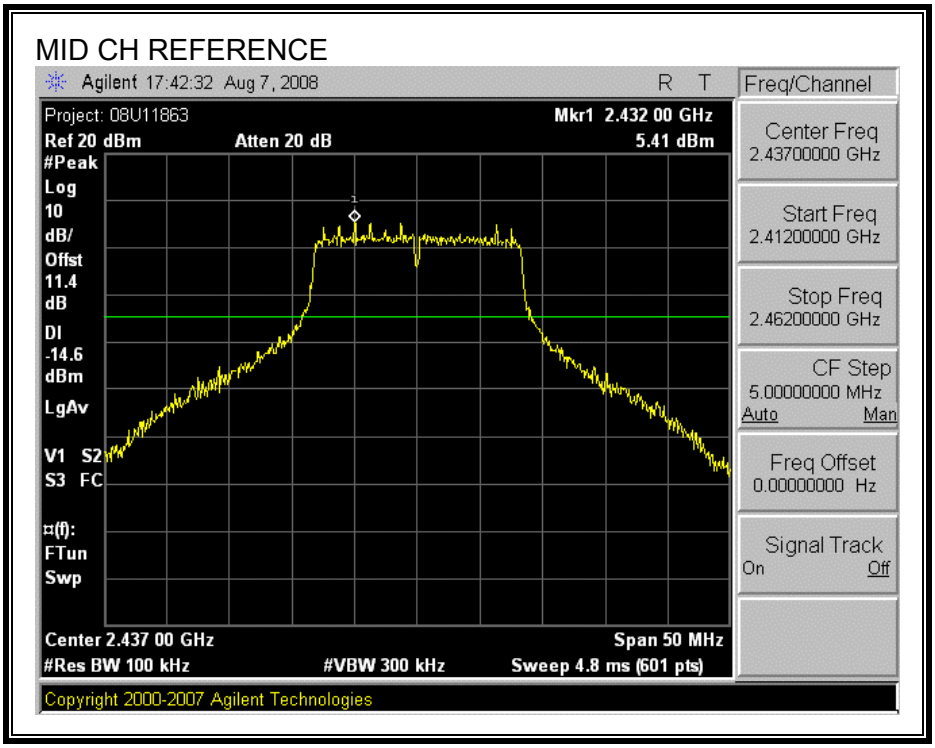
LOW CH BANDEDGE



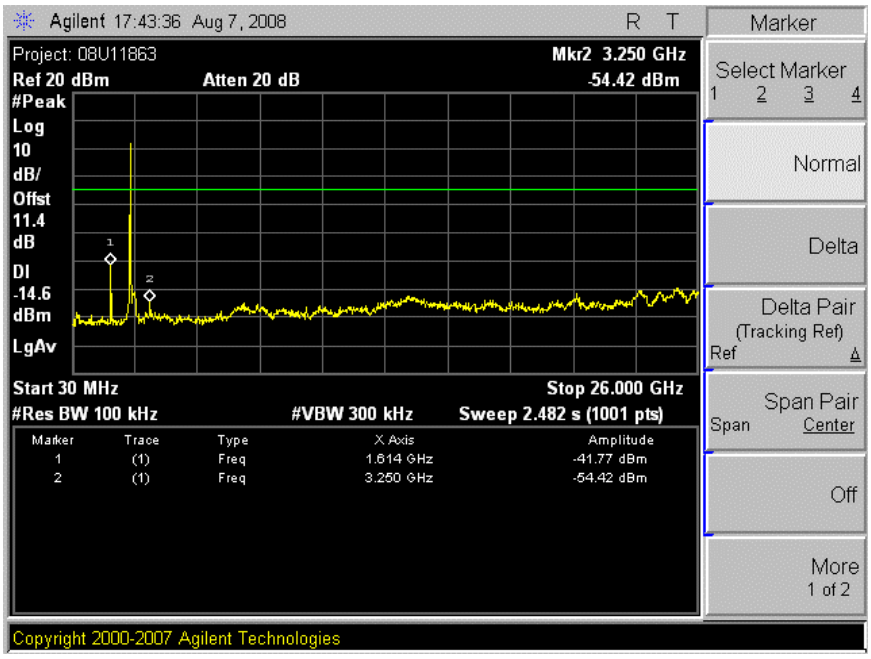
LOW CH SPURIOUS



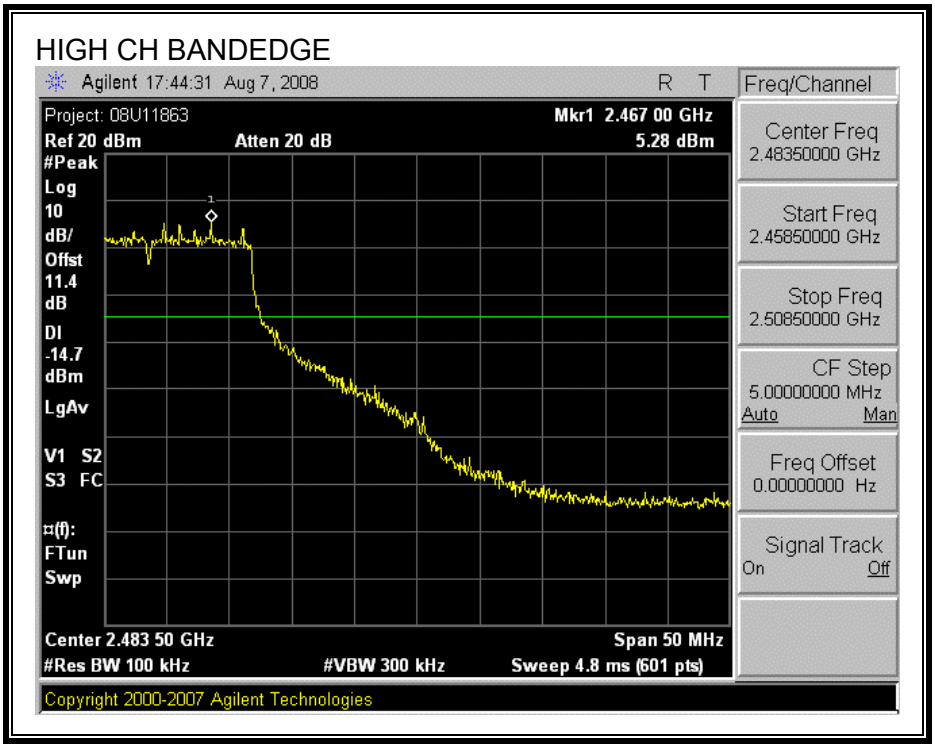
SPURIOUS EMISSIONS, MID CHANNEL



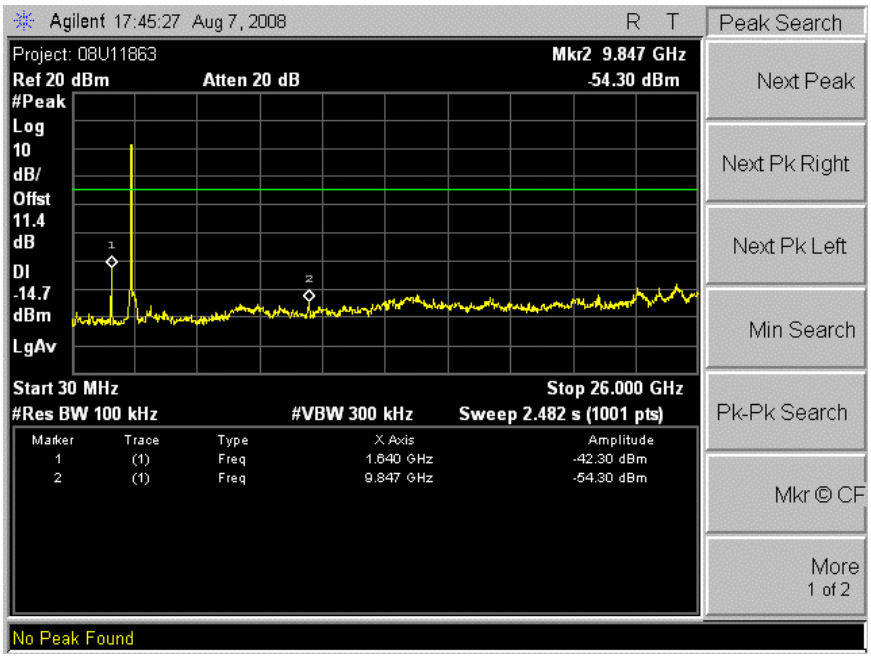
MID CH SPURIOUS



SPURIOUS EMISSIONS, HIGH CHANNEL



HIGH CH SPURIOUS



8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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.

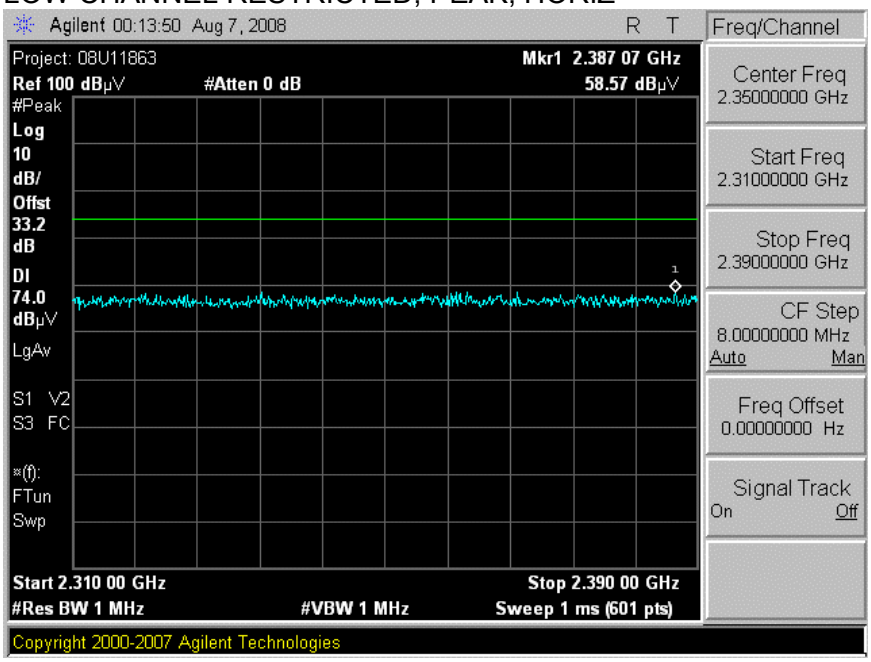
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

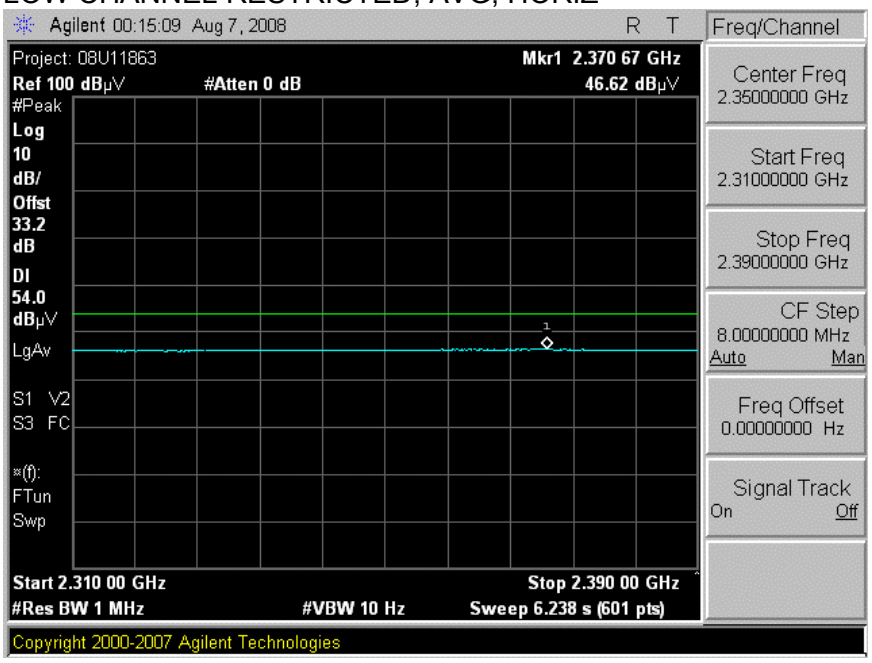
8.2.1. TX ABOVE 1 GHz FOR 802.11b MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

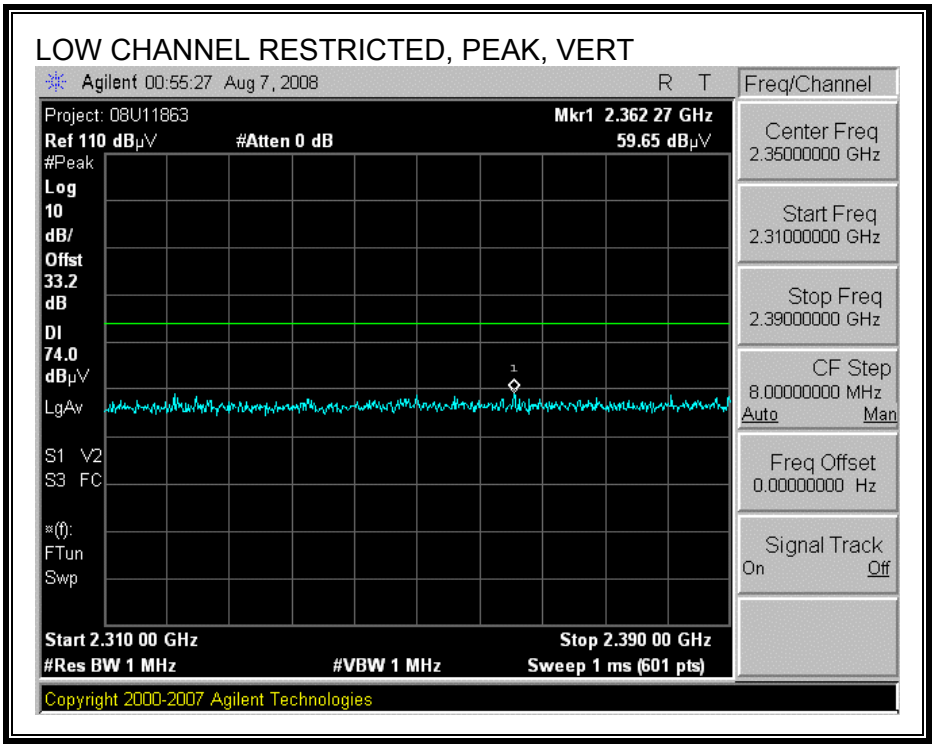
LOW CHANNEL RESTRICTED, PEAK, HORIZ



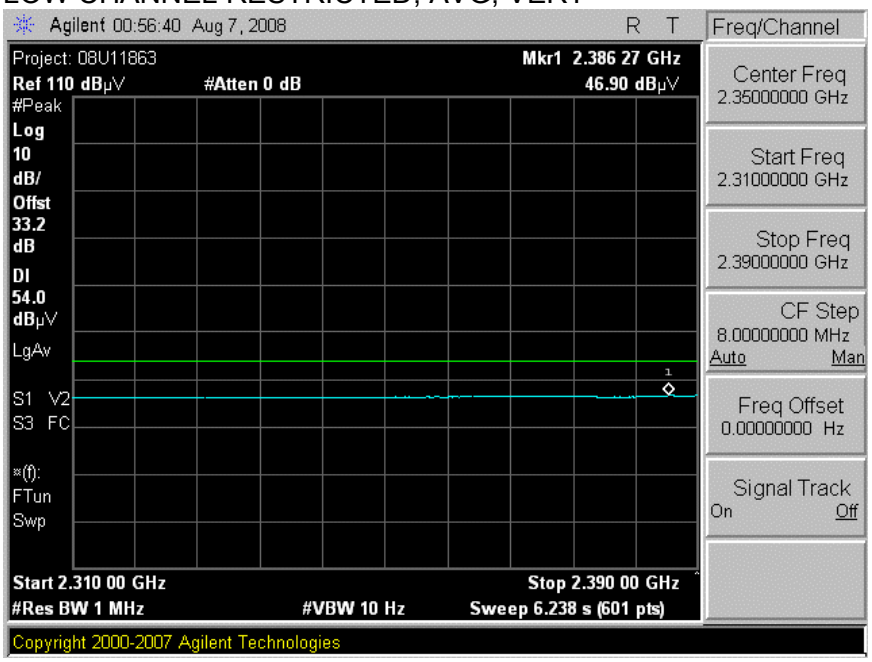
LOW CHANNEL RESTRICTED, AVG, HORIZ



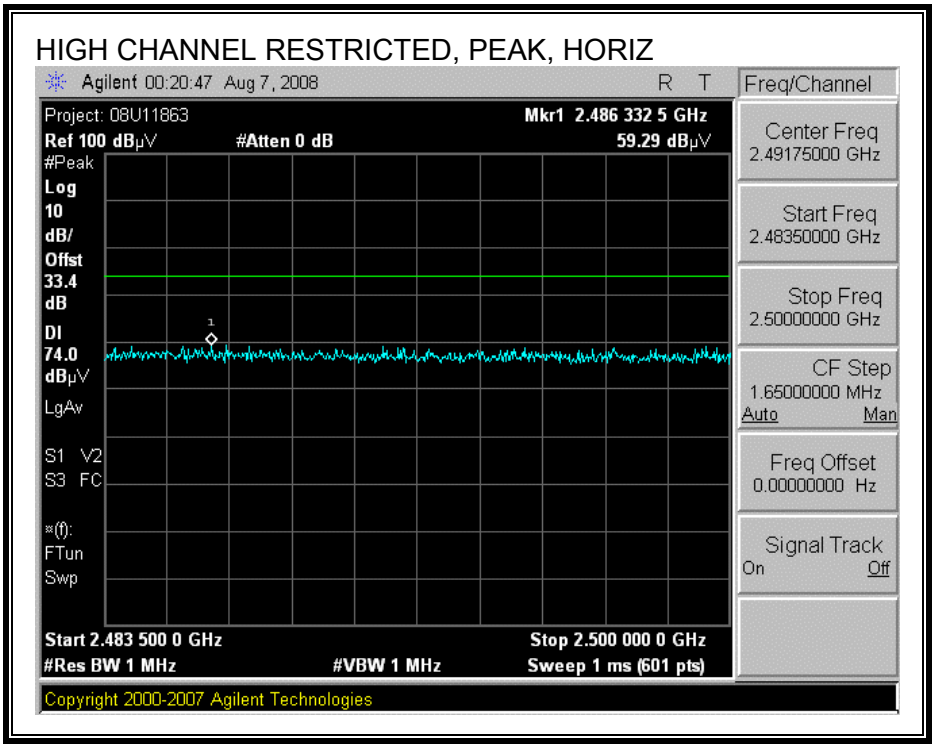
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



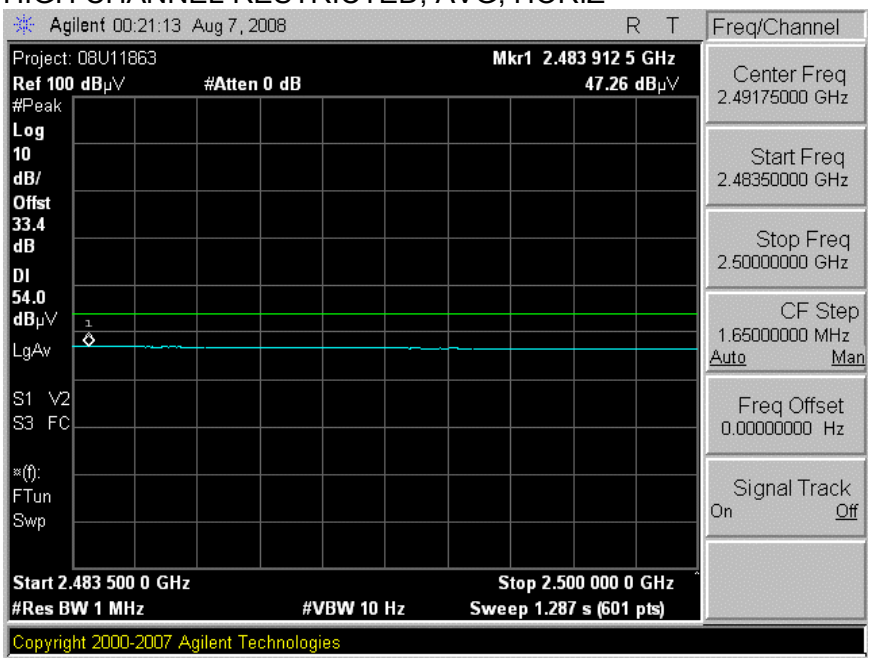
LOW CHANNEL RESTRICTED, AVG, VERT



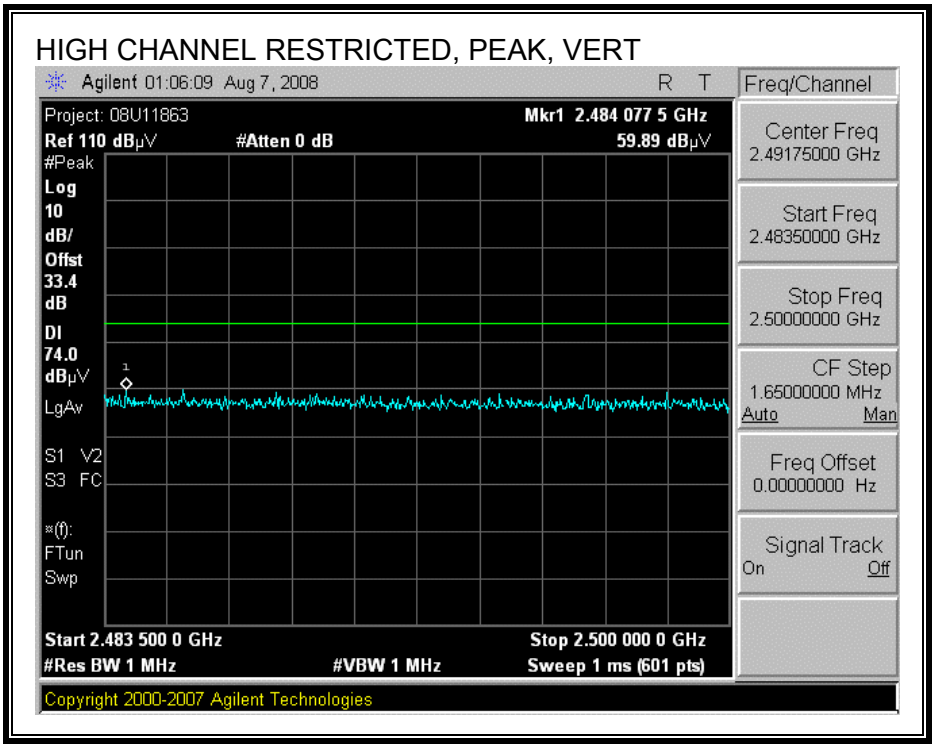
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



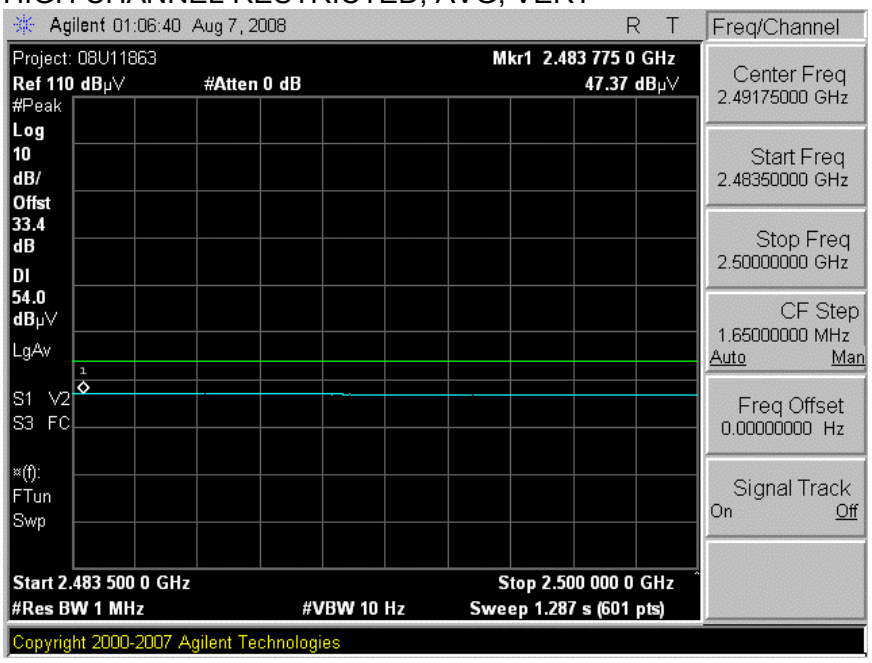
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company:	Primex Wireless
Project #:	08U11863
Date:	08/07/08
Test Engineer:	Tom Chen
Configuration:	EUT with minimun configuration
Mode:	TX 802.11b, Low, Mid, High CH

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931		T39 ARA 18-26GHz & Mixer > 26GHz	FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		A-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)
LOW CHANNEL, 2412MHz															ART set 16
4.824	3.0	49.9	48.5	33.3	6.9	-36.5	0.0	0.0	53.6	52.2	74	54	-20.4	-1.8	V
7.236	3.0	38.5	30.0	34.9	8.4	-36.2	0.0	0.0	45.6	37.1	74	54	-28.4	-16.9	V
9.648	3.0	36.9	30.0	36.7	9.7	-37.0	0.0	0.0	46.4	39.5	74	54	-27.6	-14.5	V
4.824	3.0	50.1	49.1	33.3	6.9	-36.5	0.0	0.0	53.8	52.8	74	54	-20.2	-1.2	H
7.236	3.0	37.3	30.0	34.9	8.4	-36.2	0.0	0.0	44.4	37.1	74	54	-29.6	-16.9	H
9.648	3.0	36.4	30.0	36.7	9.7	-37.0	0.0	0.0	45.9	39.5	74	54	-28.1	-14.5	H
MID CHANNEL, 2437MHz															ART set 16
4.874	3.0	45.2	42.3	33.4	6.9	-36.5	0.0	0.0	49.0	46.1	74	54	-25.0	-7.9	V
9.748	3.0	39.9	30.0	36.8	9.8	-37.0	0.0	0.0	49.5	39.6	74	54	-24.5	-14.4	V
4.874	3.0	43.1	37.6	33.4	6.9	-36.5	0.0	0.0	46.9	41.4	74	54	-27.1	-12.6	H
7.311	3.0	36.2	30.0	35.0	8.4	-36.2	0.0	0.0	43.4	37.2	74	54	-30.6	-16.8	H
9.748	3.0	37.9	30.2	36.8	9.8	-37.0	0.0	0.0	47.5	39.8	74	54	-26.5	-14.2	H
HIGH CHANNEL, 2462MHz															ART set 16
4.924	3.0	46.0	44.5	33.4	7.0	-36.5	0.0	0.0	49.9	48.4	74	54	-24.1	-5.6	V
7.386	3.0	37.5	30.0	35.0	8.4	-36.2	0.0	0.0	44.8	37.3	74	54	-29.2	-16.7	V
9.848	3.0	38.3	33.0	36.8	9.9	-37.0	0.0	0.0	48.0	42.7	74	54	-26.0	-11.3	V
4.924	3.0	44.7	35.3	33.4	7.0	-36.5	0.0	0.0	48.6	39.2	74	54	-25.4	-14.8	H
7.386	3.0	38.3	30.0	35.0	8.4	-36.2	0.0	0.0	45.6	37.3	74	54	-28.4	-16.7	H
9.848	3.0	38.5	29.5	36.8	9.9	-37.0	0.0	0.0	48.2	39.2	74	54	-25.8	-14.8	H

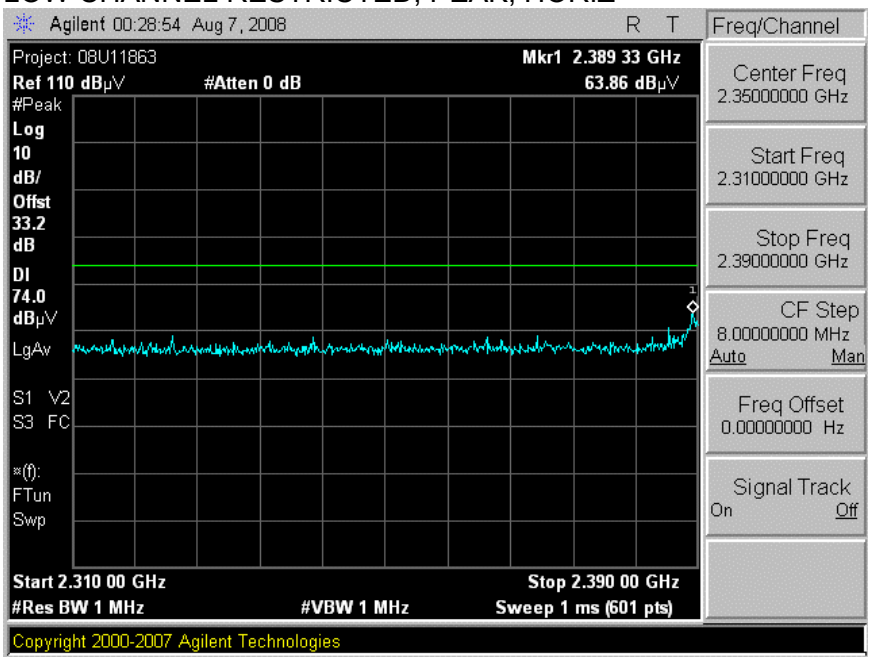
Note: **No more emissions from EUT were detected above the noise floor.**

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		

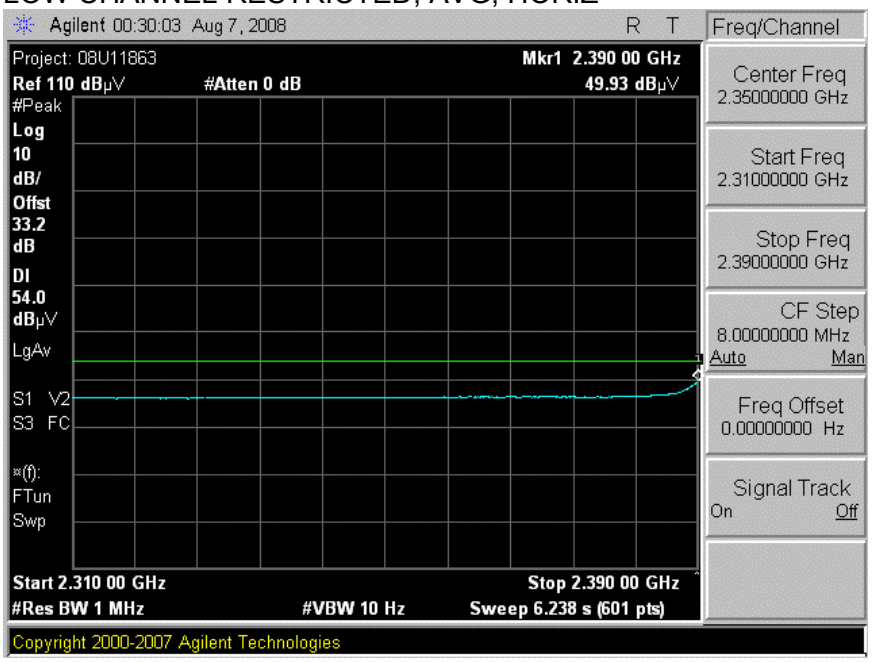
8.2.2. TX ABOVE 1 GHz FOR 802.11g MODE IN THE 2.4 GHz BAND

RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

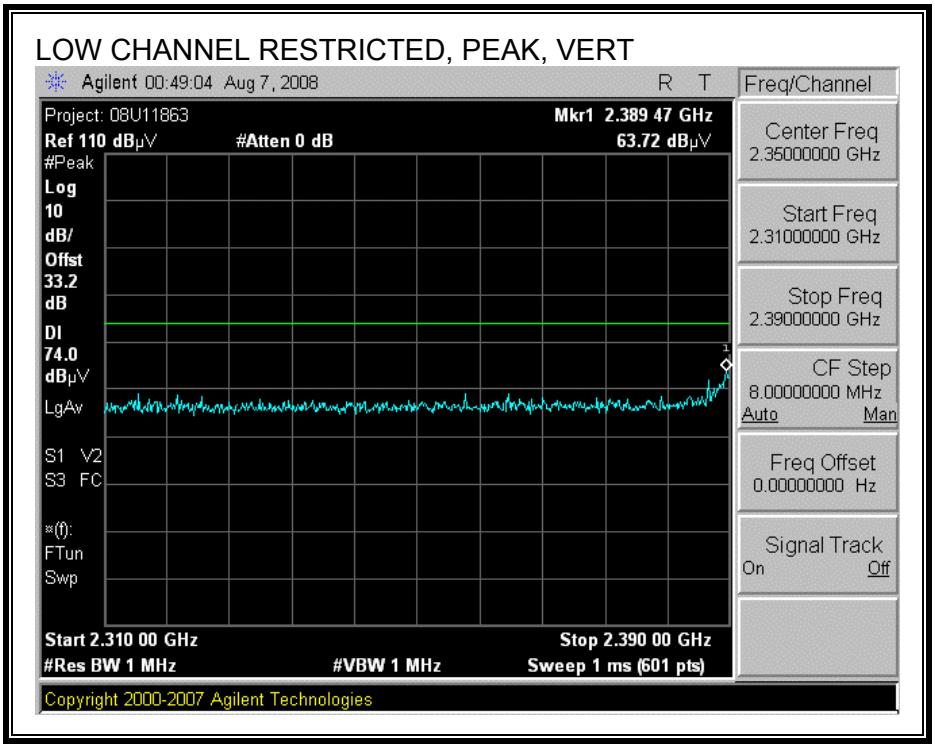
LOW CHANNEL RESTRICTED, PEAK, HORIZ



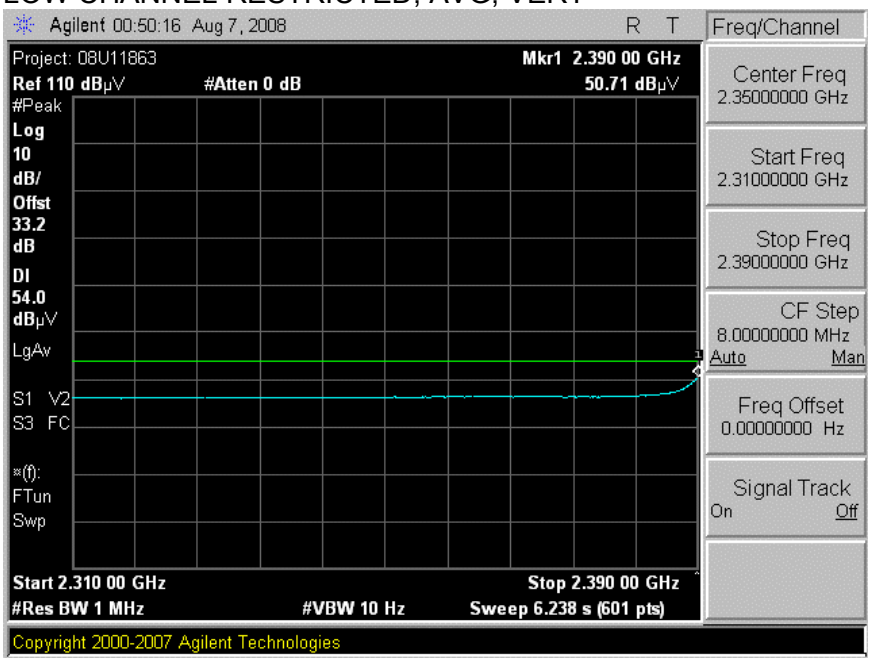
LOW CHANNEL RESTRICTED, AVG, HORIZ



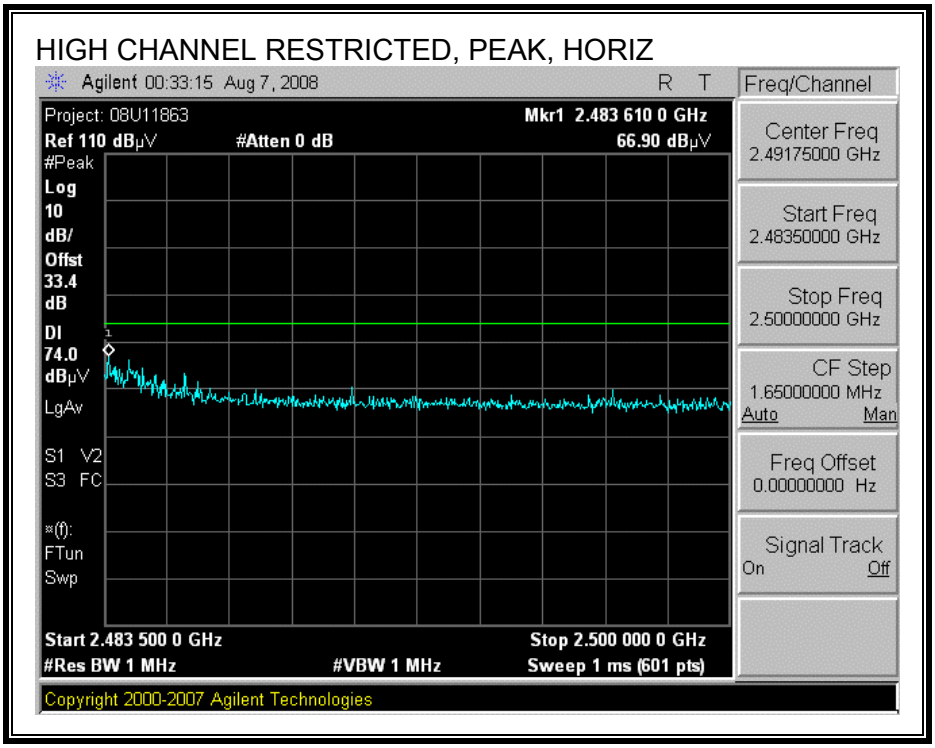
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



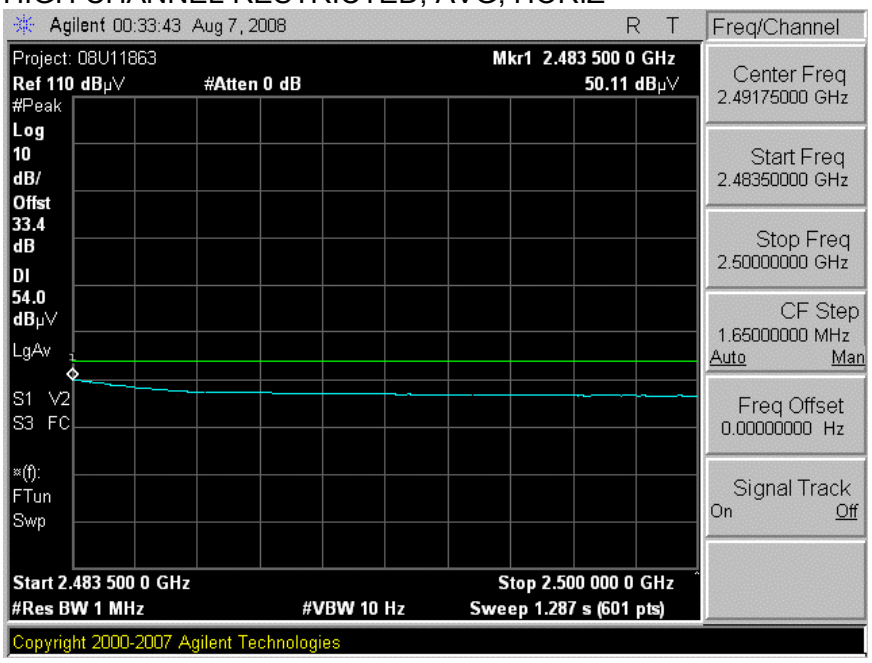
LOW CHANNEL RESTRICTED, AVG, VERT



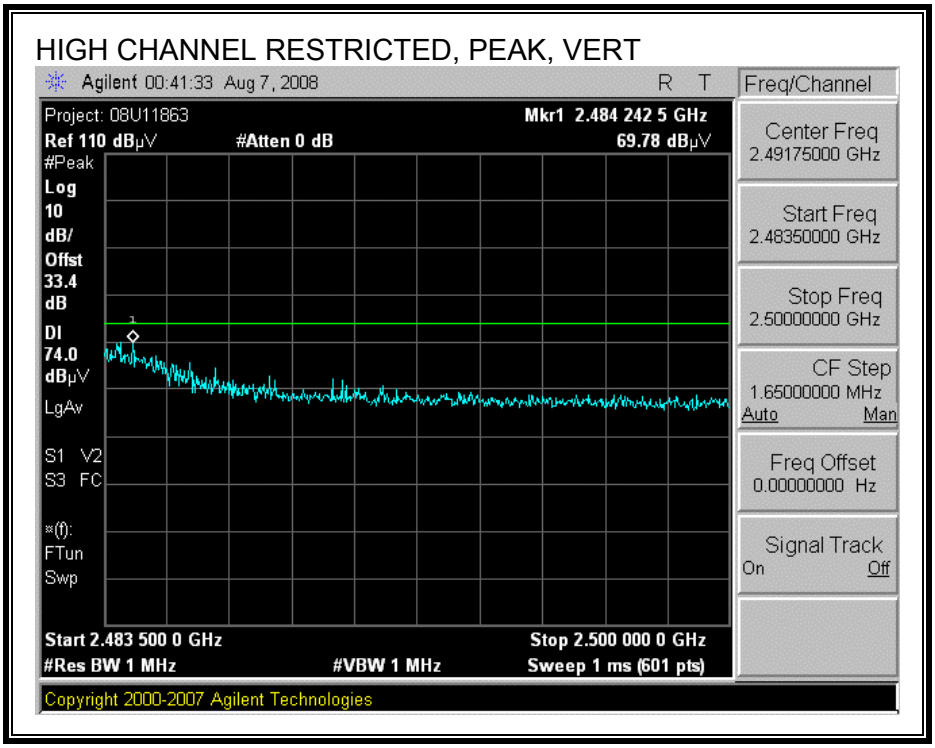
RESTRICTED BANDEDGE (HIGH CHANNEL, HORIZONTAL)



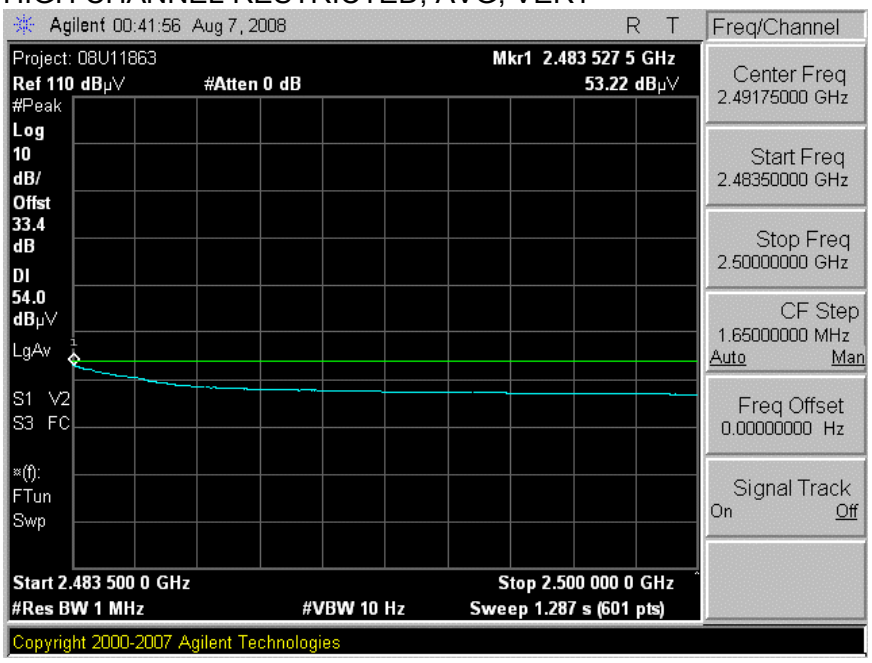
HIGH CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDG (HIGH CHANNEL, VERTICAL)



HIGH CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

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Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931		T39 ARA 18-26GHz & Mixer > 26GHz	FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		A-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)
LOW CHANNEL, 2412MHz															ART set 17
4.824	3.0	46.6	34.9	33.3	6.9	-36.5	0.0	0.0	50.3	38.6	74	54	-23.7	-15.4	V
7.236	3.0	38.5	30.0	34.9	8.4	-36.2	0.0	0.0	45.6	37.1	74	54	-28.4	-16.9	V
9.648	3.0	36.9	30.0	36.7	9.7	-37.0	0.0	0.0	46.4	39.5	74	54	-27.6	-14.5	V
4.824	3.0	48.1	36.0	33.3	6.9	-36.5	0.0	0.0	51.8	39.7	74	54	-22.2	-14.3	H
7.236	3.0	38.5	30.0	34.9	8.4	-36.2	0.0	0.0	45.6	37.1	74	54	-28.4	-16.9	H
9.648	3.0	38.0	30.0	36.7	9.7	-37.0	0.0	0.0	47.5	39.5	74	54	-26.5	-14.5	H
MID CHANNEL, 2437MHz															ART set 17
4.874	3.0	43.1	33.6	33.4	6.9	-36.5	0.0	0.0	46.9	37.4	74	54	-27.1	-16.6	V
7.311	3.0	38.3	30.0	35.0	8.4	-36.2	0.0	0.0	45.5	37.2	74	54	-28.5	-16.8	V
9.748	3.0	36.6	30.0	36.8	9.8	-37.0	0.0	0.0	46.2	39.6	74	54	-27.8	-14.4	V
4.874	3.0	41.0	31.0	33.4	6.9	-36.5	0.0	0.0	44.8	34.8	74	54	-29.2	-19.2	H
7.311	3.0	38.1	30.5	35.0	8.4	-36.2	0.0	0.0	45.3	37.7	74	54	-28.7	-16.3	H
9.748	3.0	39.0	31.5	36.8	9.8	-37.0	0.0	0.0	48.6	41.1	74	54	-25.4	-12.9	H
HIGH CHANNEL, 2462MHz															ART set 17
4.924	3.0	48.9	37.7	33.4	7.0	-36.5	0.0	0.0	52.8	41.6	74	54	-21.2	-12.4	V
7.386	3.0	37.5	30.0	35.0	8.4	-36.2	0.0	0.0	44.8	37.3	74	54	-29.2	-16.7	V
9.848	3.0	42.3	31.3	36.8	9.9	-37.0	0.0	0.0	52.0	41.0	74	54	-22.0	-13.0	V
4.924	3.0	44.1	31.5	33.4	7.0	-36.5	0.0	0.0	48.0	35.4	74	54	-26.0	-18.6	H
7.386	3.0	39.0	31.0	35.0	8.4	-36.2	0.0	0.0	46.3	38.3	74	54	-27.7	-15.7	H
9.848	3.0	40.0	31.1	36.8	9.9	-37.0	0.0	0.0	49.7	40.8	74	54	-24.3	-13.2	H

Note: **No more emissions from EUT were detected above the noise floor.**

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. RECEIVER ABOVE 1 GHz

8.3.1. RX ABOVE 1 GHz FOR 20 MHz BANDWIDTH IN THE 2.4 GHz BAND

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Company:	Primex Wireless
Project #:	08U11863
Date:	07/19/08
Test Engineer:	Tom Chen
Configuration:	EUT with minimun configuration
Mode:	RX 802.11b, Mid CH

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T145 Agilent 3008A005(		T39 ARA 18-26GHz & Mixer > 26GHz	RX RSS 210

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)
1.000	3.0	57.8	39.7	23.8	3.2	-36.2	0.0	0.0	48.7	30.6	74	54	-25.3	-23.4	V
1.105	3.0	47.4	32.4	24.2	3.4	-36.1	0.0	0.0	38.9	23.9	74	54	-35.1	-30.1	V
1.245	3.0	48.3	34.0	24.7	3.5	-36.0	0.0	0.0	40.6	26.3	74	54	-33.4	-27.7	V
1.502	3.0	48.9	34.2	25.6	3.9	-35.8	0.0	0.0	42.6	27.9	74	54	-31.4	-26.1	V
1.000	3.0	54.7	39.4	23.8	3.2	-36.2	0.0	0.0	45.6	30.3	74	54	-28.4	-23.7	H
1.250	3.0	52.4	36.9	24.7	3.6	-36.0	0.0	0.0	44.7	29.2	74	54	-29.3	-24.8	H
1.500	3.0	48.7	31.3	25.6	3.9	-35.8	0.0	0.0	42.4	25.0	74	54	-31.6	-29.0	H

Note: No more emissions from EUT were detected above the noise floor.

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		

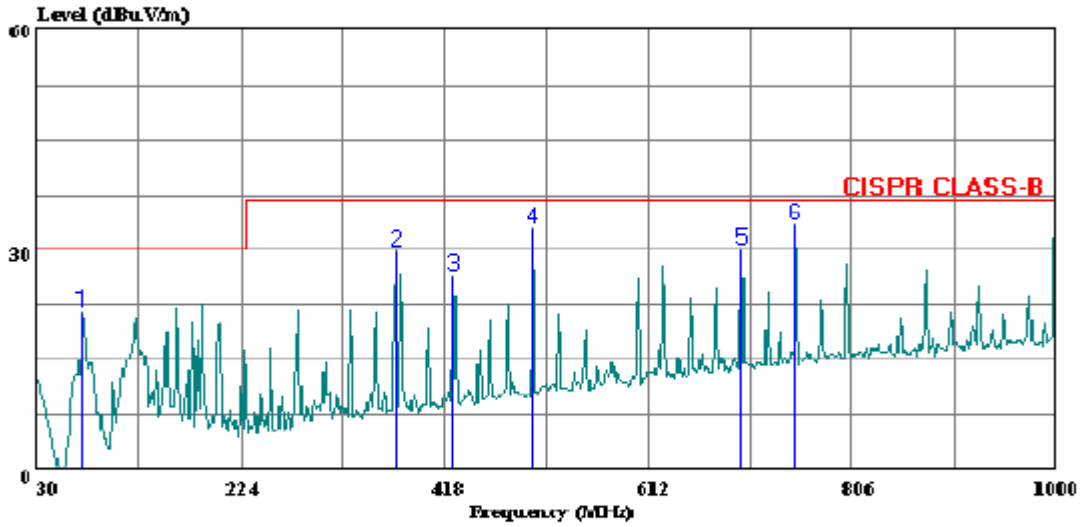
8.4. WORST-CASE BELOW 1 GHz

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#: 49 File#: 08u11863-1.EMI Date: 08-07-2008 Time: 22:30:25



Trace: 48 Ref Trace:

Condition: CISPR CLASS-B HORIZONTAL
Test Operator:: Tom Chen
Project #: : 08U11863
Company: : Primex Wireless
Configuration:: EUT only
Mode : : Normal Operation
Target: : CISPR Class B

HORIZONTAL DATA

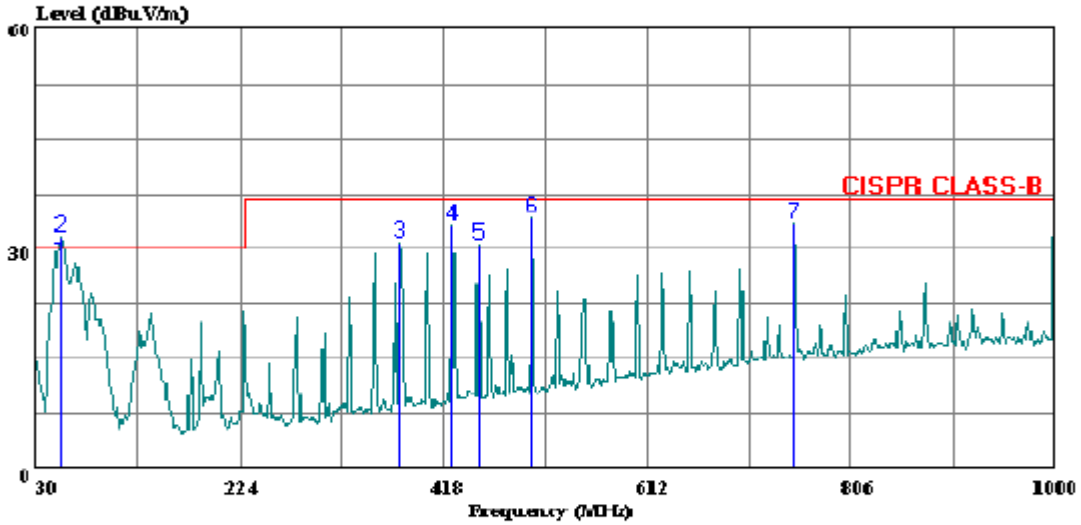
	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	72.680	40.62	-19.17	21.45	30.00	-8.55	Peak
2	371.440	40.50	-10.53	29.97	37.00	-7.03	Peak
3	426.730	35.61	-9.18	26.43	37.00	-10.57	Peak
4	502.390	40.33	-7.34	32.99	37.00	-4.01	Peak
5	701.240	33.58	-3.50	30.08	37.00	-6.92	Peak
6	751.680	36.36	-2.74	33.62	37.00	-3.38	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#: 47 File#: 08u11863-1.EMI Date: 08-07-2008 Time: 22:15:39



Trace: 44 Ref Trace:

Condition: CISPR CLASS-B VERTICAL
Test Operator:: Tom Chen
Project #: : 08U11863
Company: : Primex Wireless
Configuration:: EUT only
Mode : : Normal Operation
Target: : CISPR Class B

VERTICAL DATA

		Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
		MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1		53.280	47.50	-19.26	28.24	30.00	-1.76	QP
2	*	53.280	50.79	-19.19	31.60	30.00	1.60	Peak
3		376.290	41.33	-10.42	30.91	37.00	-6.09	Peak
4		426.730	42.40	-9.18	33.22	37.00	-3.78	Peak
5		450.980	39.20	-8.51	30.69	37.00	-6.31	Peak
6		502.390	41.56	-7.34	34.22	37.00	-2.78	Peak
7		751.680	36.33	-2.74	33.59	37.00	-3.41	Peak

8.5. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.4

LIMIT

§15.107 (a) Except for Class A digital devices, for equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the band edges.

Frequency range (MHz)	Limits (dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56	56 to 46
0.50 to 5	56	46
5 to 30	60	50
Notes: 1. The lower limit shall apply at the transition frequencies 2. The limit decreases linearly with the logarithm of the frequency in the range 0.15 MHz to 0.50 MHz.		

RESULTS

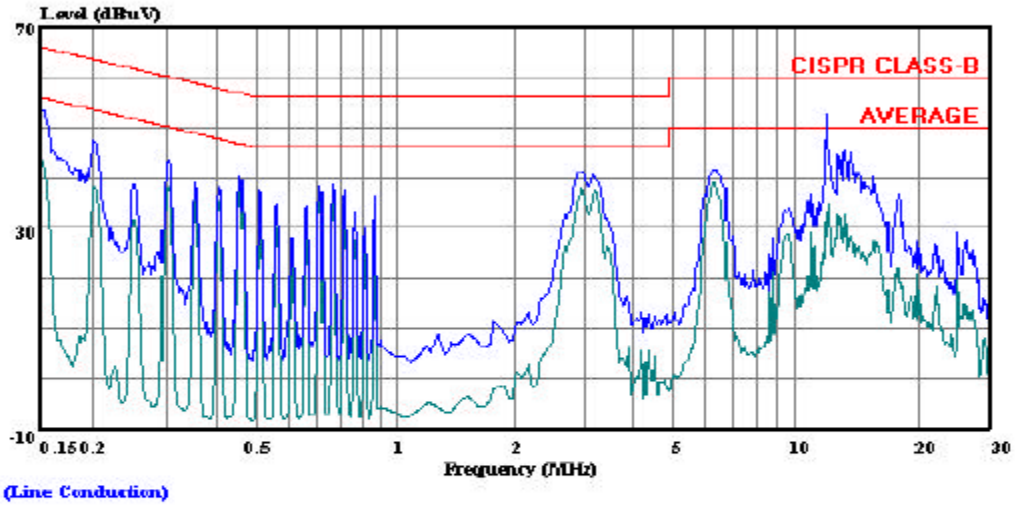
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.15	53.21	--	42.12	0.00	65.84	55.84	-12.63	-13.72	L1
3.09	41.09	--	37.42	0.00	56.00	46.00	-14.91	-8.58	L1
12.00	52.83	--	33.23	0.00	60.00	50.00	-7.17	-16.77	L1
0.15	54.09	--	43.52	0.00	66.00	56.00	-11.91	-12.48	L2
0.30	44.41	--	39.66	0.00	60.16	50.16	-15.75	-10.50	L2
12.00	53.07	--	33.39	0.00	60.00	50.00	-6.93	-16.61	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#: 28 File#: 08U11863 LC-2.EMIDate: 07-15-2008 Time: 18:13:15



(Line Conduction)

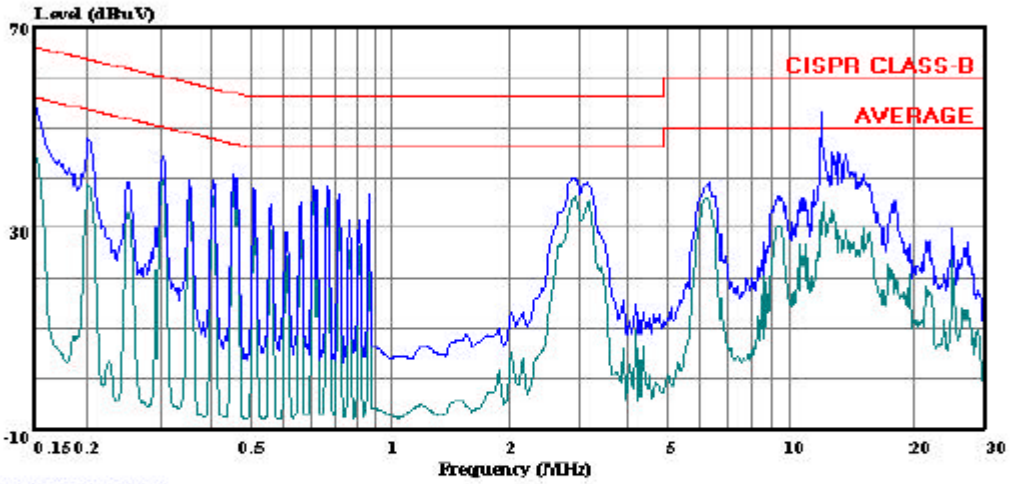
Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Tom Chen
Project #: : 08U11863
Company: : Primex Wireless
Configuration:: EUT stand alone
Mode: : TX Worst case
Target: : FCC Class B
Voltage: : 115VAC / 60Hz
: L1: Peak (Blue); Average (Green)
: with new power supply
: TX on

LINE 2 RESULTS

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

Data#: 35 File#: 08U11863 LC-2.EMIDate: 07-15-2008 Time: 18:33:54



(Line Conduction)

Trace: 33 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Tom Chen
Project #: : 08U11863
Company: : Primex Wireless
Configuration:: EUT stand alone
Mode: : TX Worst case
Target: : FCC Class B
Voltage: : 115VAC / 60Hz
: L2: Peak (Blue); Average (Green)
: with new power supply
: TX on

9. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

§1.1310 The criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*($900/f^2$)	6
30–300	61.4	0.163	1.0	6
300–1500	.....	.....	f/300	6
1500–100,000	.....	.....	5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*($180/f^2$)	30

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)—Continued

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

IC RULES

IC Safety Code 6, Section 2.2.1 (a) A person other than an RF and microwave exposed worker shall not be exposed to electromagnetic radiation in a frequency band listed in Column 1 of Table 5, if the field strength exceeds the value given in Column 2 or 3 of Table 5, when averaged spatially and over time, or if the power density exceeds the value given in Column 4 of Table 5, when averaged spatially and over time.

Table 5
Exposure Limits for Persons Not Classed As RF and Microwave Exposed Workers (Including the General Public)

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		6
10–30	28	$2.19/f$		6
30–300	28	0.073	2*	6
300–1 500	$1.585f^{0.5}$	$0.0042f^{0.5}$	$f/150$	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	$616\,000/f^{1.2}$
150 000–300 000	$0.158f^{0.5}$	$4.21 \times 10^{-4}f^{0.5}$	$6.67 \times 10^{-5}f$	$616\,000/f^{1.2}$

* Power density limit is applicable at frequencies greater than 100 MHz.

Notes: 1. Frequency, f, is in MHz.
2. A power density of 10 W/m^2 is equivalent to 1 mW/cm^2.
3. A magnetic field strength of 1 A/m corresponds to 1.257 microtesla (μT) or 12.57 milligauss (mG).

CALCULATIONS

Given

$E = \sqrt{(30 * P * G)} / d$

and

$S = E ^ 2 / 3770$

where

E = Field Strength in Volts/meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power Density in milliwatts/square centimeter

Combining equations, rearranging the terms to express the distance as a function of the remaining variables, changing to units of Power to mW and Distance to cm, and substituting the logarithmic form of power and gain yields:

$d = 0.282 * 10 ^ ((P + G) / 20) / \sqrt{S}$

where

d = MPE distance in cm
P = Power in dBm
G = Antenna Gain in dBi
S = Power Density Limit in mW/cm^2

Rearranging terms to calculate the power density at a specific distance yields

$S = 0.0795 * 10 ^ ((P + G) / 10) / (d^2)$

The power density in units of mW/cm^2 is converted to units of W/m^2 by multiplying by a factor of 10.

LIMITS

From FCC §1.1310 Table 1 (B), the maximum value of S = 1.0 mW/cm^2

From IC Safety Code 6, Section 2.2 Table 5 Column 4, S = 10 W/m^2

RESULTS

(MPE distance equals 20 cm)

Mode	Band	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	FCC Power Density (mW/cm^2)	IC Power Density (W/m^2)
WLAN	2.4 GHz	20.0	24.30	-1.20	0.04	0.41