



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

CERTIFICATION TEST REPORT

FOR

WIRELESS ETHERNET BRIDGE

**MODEL NUMBER: PTP58500 and PTP58300
(WB2855, WB2856, WB3163, WB3164)**

**FCC ID: QWP58500
IC: 109AO-58500**

REPORT NUMBER: 08U11903-1, Revision B

ISSUE DATE: AUGUST 25, 2008

Prepared for
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NVLAP LAB CODE 200065-0

Revision History

<u>Rev.</u>	<u>Issue Date</u>	<u>Revisions</u>	<u>Revised By</u>
--	07/29/2008	Initial Issue	T. Chan
A	08/07/2008	Clarified Section 8.2 for maximum dish antenna diameters and corresponding output power levels	T. Chan
B	08/25/2008	Added model numbers	T.Chan

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: MOTOROLA
UNIT A1, LINHAY BUSINESS PARK, EASTERN RD
ASHBURTON, DEVON, TQ137UP, UNITED KINGDOM

EUT DESCRIPTION: WIRELESS ETHERNET BRIDGE

MODEL: PTP58500 and PTP58300

SERIAL NUMBER: 000456100381

DATE TESTED: JULY 8-18, 2008

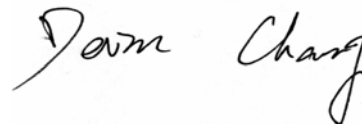
APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart C	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 8	Pass
INDUSTRY CANADA RSS-GEN Issue 2	Pass

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:

Tested By:



THU CHAN
EMC SUPERVISOR
COMPLIANCE CERTIFICATION SERVICES

DEVIN CHANG
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 5.8GHz band wireless Ethernet bridge.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

Frequency Band (MHz)	Mode	Output Power (dBm)	Output Power (mW)
Panel Antenna			
5730 - 5845	5MHz BW	27.19	523.6
5733 - 5842	10MHz BW	26.83	481.9
Dish Antenna			
5730 - 5845	5MHz BW	27.19	523.6
5733 - 5842	10MHz BW	26.83	481.9

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes Dish or Panel antennas, with an effective maximum gain of 33.9 dBi for Dish antenna and 23dBi gain for panel antenna.

5.4. SOFTWARE AND FIRMWARE

The operating software used during testing was 03-00.

5.5. WORST-CASE CONFIGURATION AND MODE

A baseline performance investigation was made by measuring the bandwidth, average power, peak power, power spectral density and band edge using all available modulation modes: Acquisition, BPSK, QPSK, 16QAM and 64QAM.

Baseline testing demonstrated that the BPSK mode is the worst case.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	Manufacturer	Model	Serial Number	FCC ID
PIDU PLUS	Motorola	PTP 500/600	819186578	NA
Point to Point Wireless Bridge	Motorola	PTP58500	000456100355	NA
Laptop	Acer	ZL8	LXA860518154004044EM00	DoC
AC Adapter	Delta	SADP65KBD	9JW0538080402	DoC
Directional Coupler	Krytar	1817	131	NA

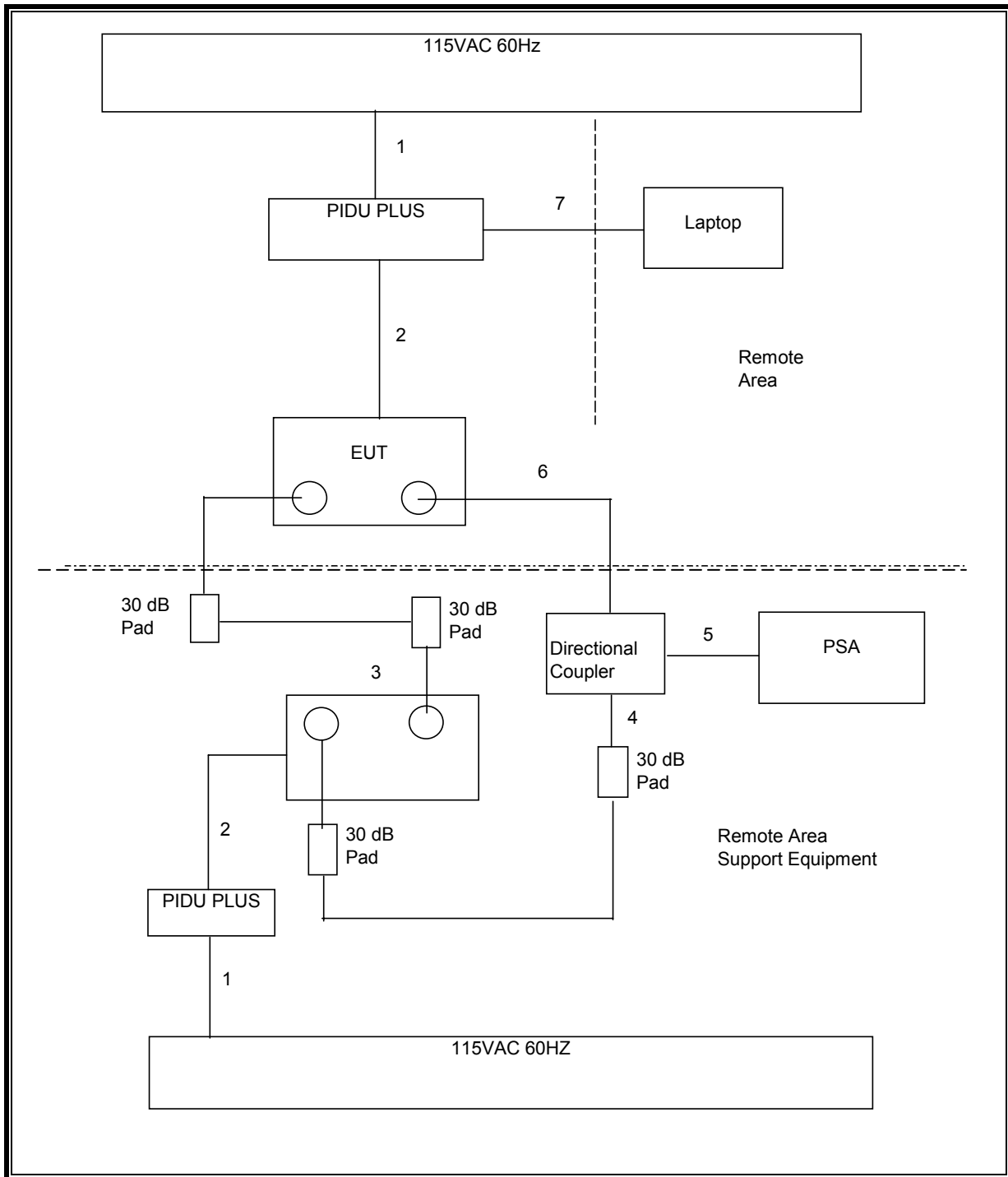
I/O CABLES

I/O CABLE LIST						
Cable No.	Port	# of Identical Ports	To Port	Cable Type	Cable Length	Remarks
1	AC Mains	2	Mains Input	Un-shielded	2m	NA
2	PIDU+	2	ODU	CAT 5 Un-shielded	2m	Data and 48 VDC
3	EUT Antenna H	1	Support Antenna H	Coaxial	1m	Incorporates two 30 dB Attenuators
4	Splitter	1	Support Antenna V	Coaxial	1m	Incorporates two 30 dB Attenuators
5	Splitter	1	PSA RF Input	Coaxial	1m	NA
6	EUT Antenna V	1	Splitter	Coaxial	0m	Direct Connection
7	LAN	1	Laptop LAN	CAT 5 Un-shielded	5m	NA

TEST SETUP

The EUT is connected to another wireless Ethernet bridge during test, a laptop is used to setup test condition requirement.

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
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	9/28/2007	9/28/2008
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	8/3/2007	8/3/2008
Antenna, Horn, 18 GHz	EMCO	3115	C00872	4/22/2008	4/22/2009
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	4/8/2008	10/8/2009
Power Meter	Agilent / HP	437B	N02778	4/18/2007	10/18/2008
Power Sensor	Agilent / HP	8481A	2783	11/2/2009	11/2/2009
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	3/31/2008	3/31/2009
Antenna, Horn, 26.5 GHz	ARA	MWH-1826/B	C00980	9/29/2007	9/29/2008
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	10/11/2007	10/11/2008
High Pass Filter 7.6GHz	Micro Tronics	HPM13195	N02681	CNR	CNR
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	2/6/2008	8/6/2009
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/2007	10/25/2008

7. ANTENNA PORT TEST RESULTS

7.1. 5.8 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 100 kHz. The sweep time is coupled.

RESULTS

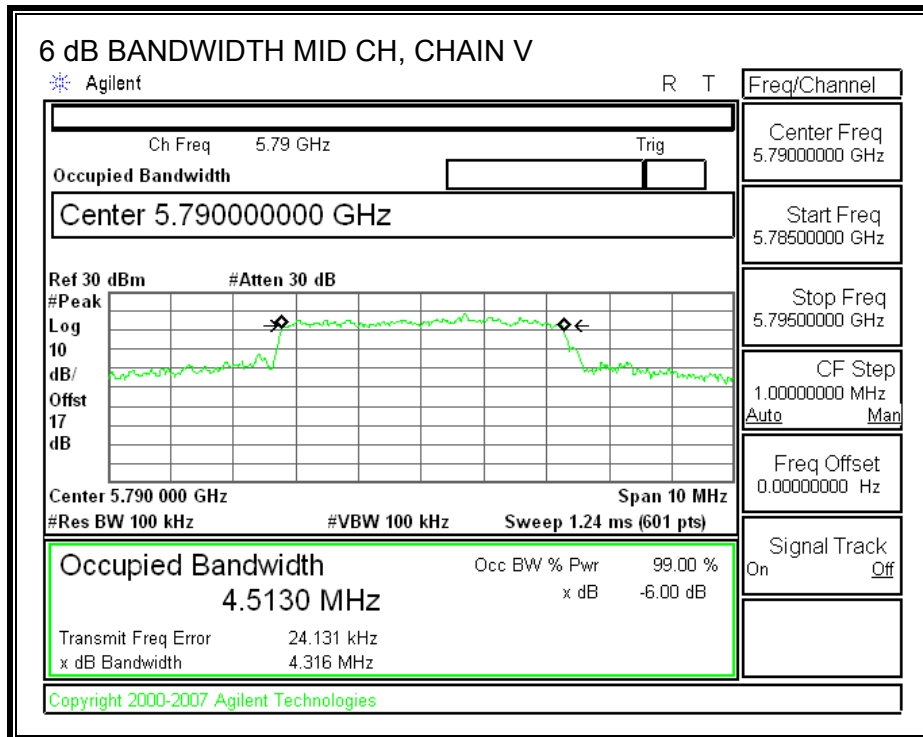
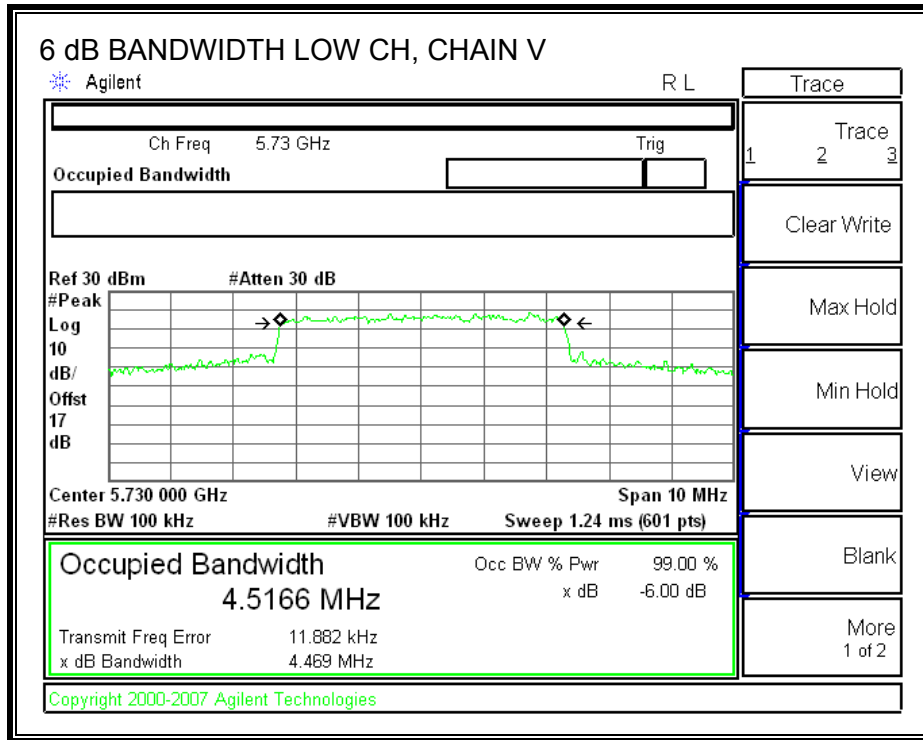
5MHz BANDWIDTH

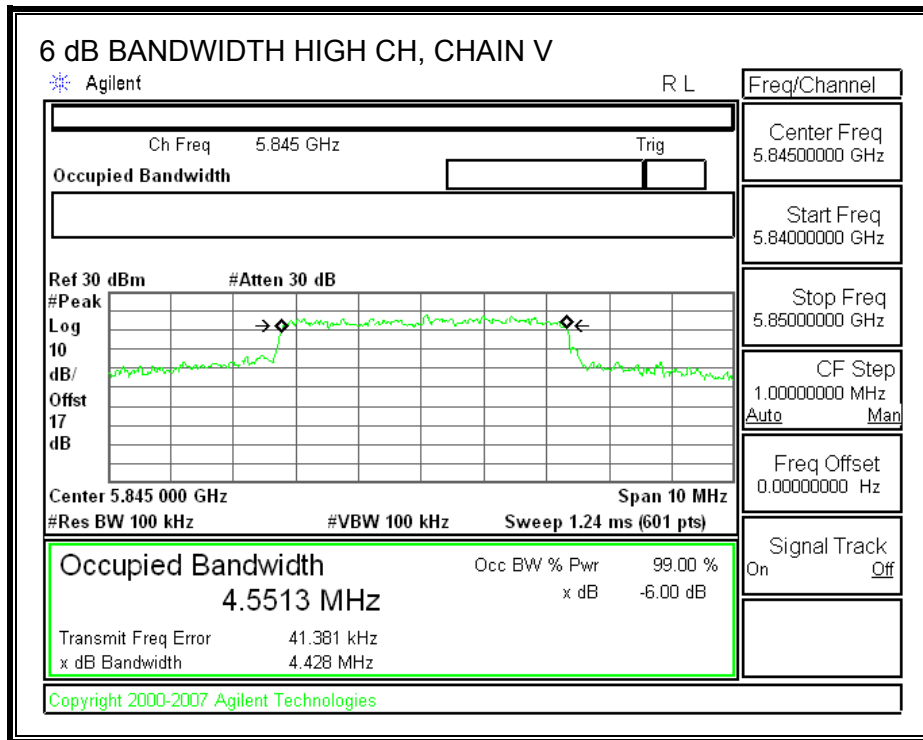
Channel	Frequency (MHz)	Chain V 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5730	4.469	0.5
Middle	5790	4.316	0.5
High	5845	4.428	0.5

10MHz BANDWIDTH

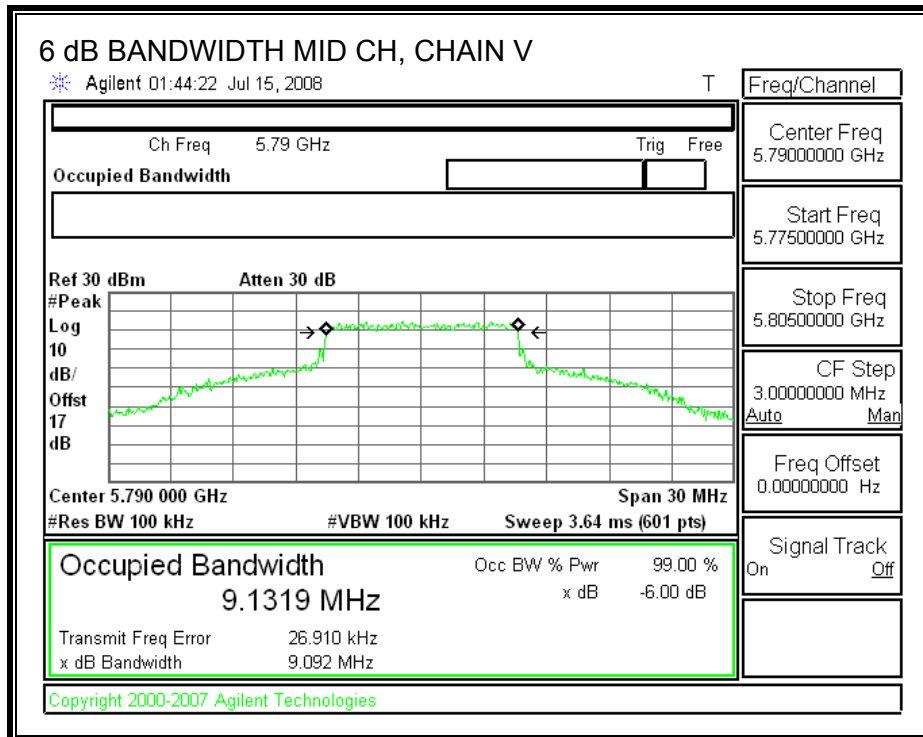
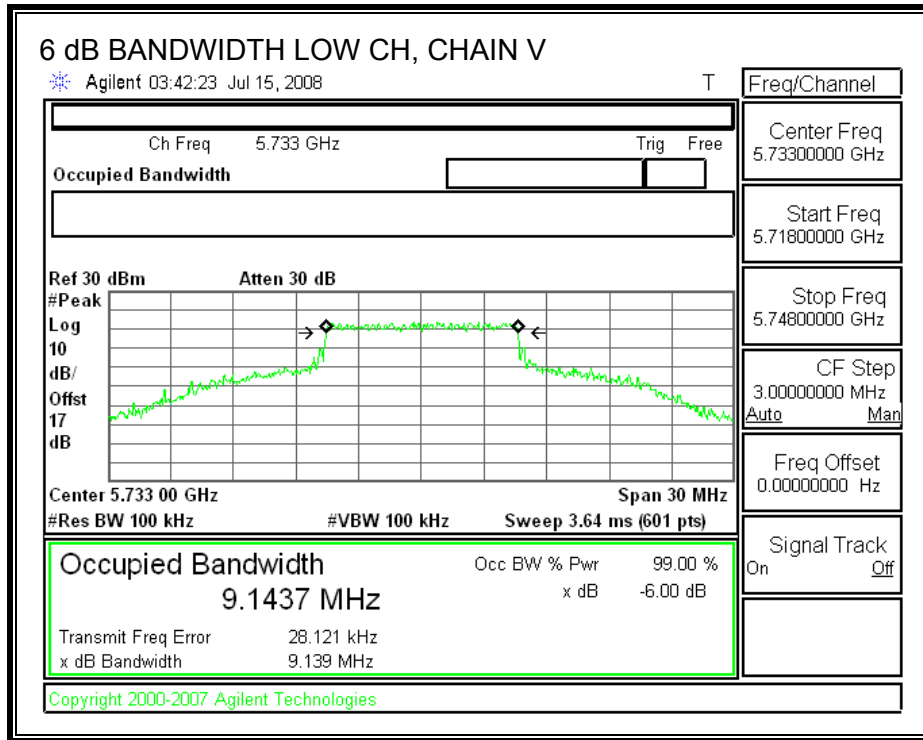
Channel	Frequency (MHz)	Chain V 6 dB BW (MHz)	Minimum Limit (MHz)
Low	5733	9.139	0.5
Middle	5790	9.092	0.5
High	5842	9.077	0.5

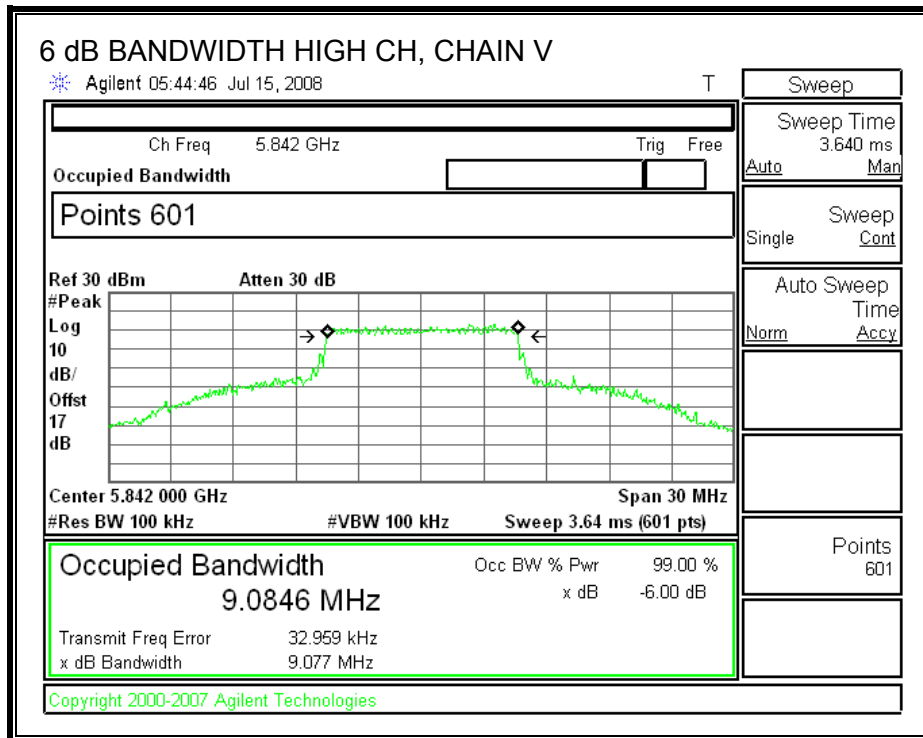
6 dB BANDWIDTH, CHAIN V
 5MHz BANDWIDTH





6 dB BANDWIDTH, CHAIN V
 10MHz BANDWIDTH





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

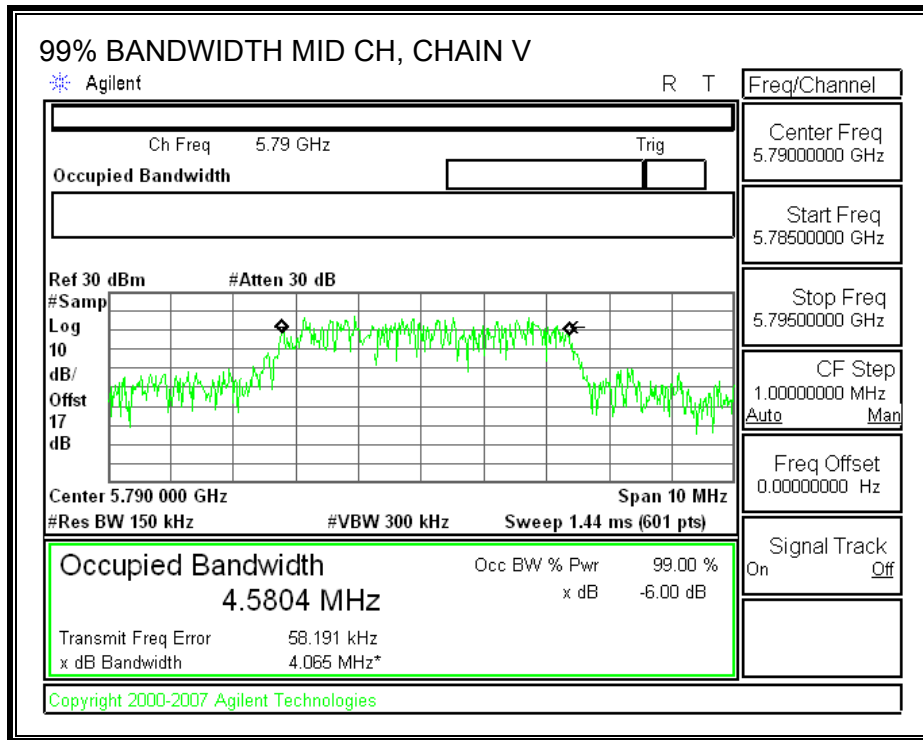
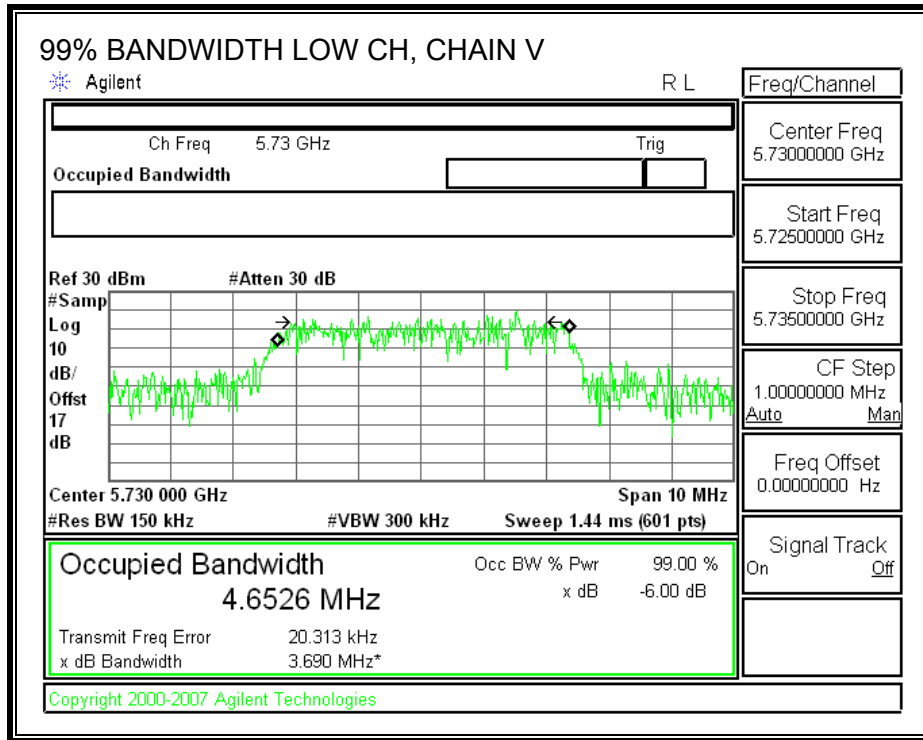
5MHz BANDWIDTH

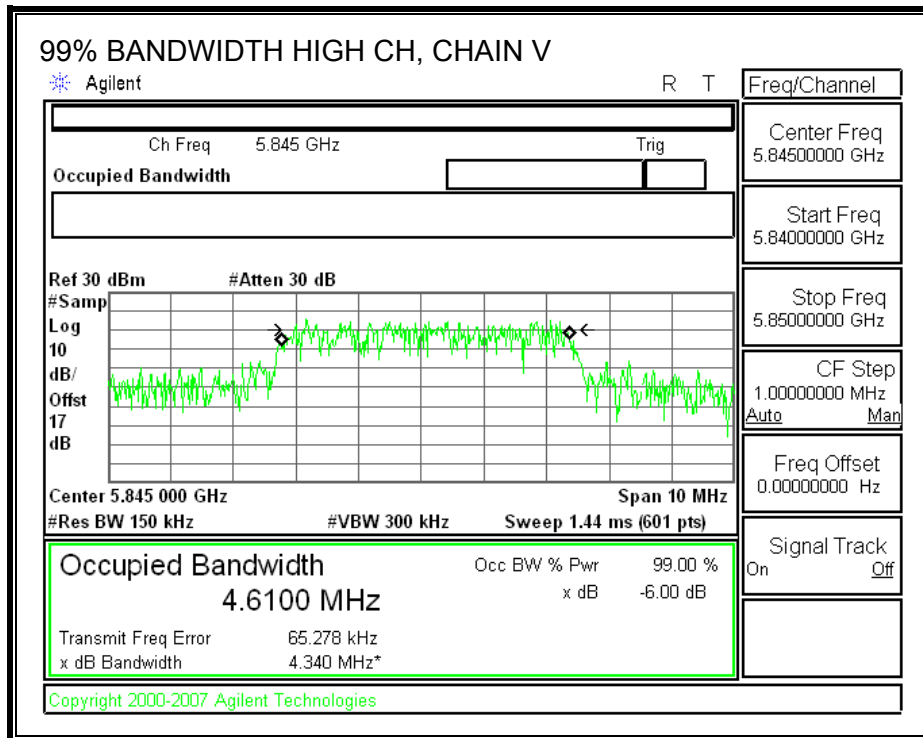
Channel	Frequency (MHz)	Chain V 99% Bandwidth (MHz)
Low	5730	4.6526
Middle	5790	4.5804
High	5845	4.6100

10MHz BANDWIDTH

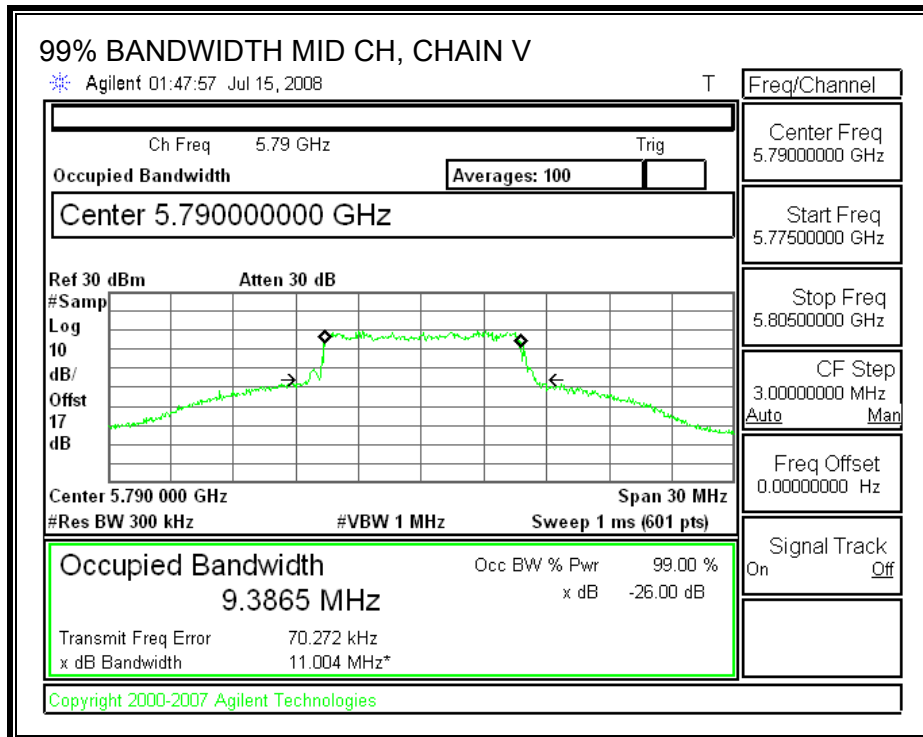
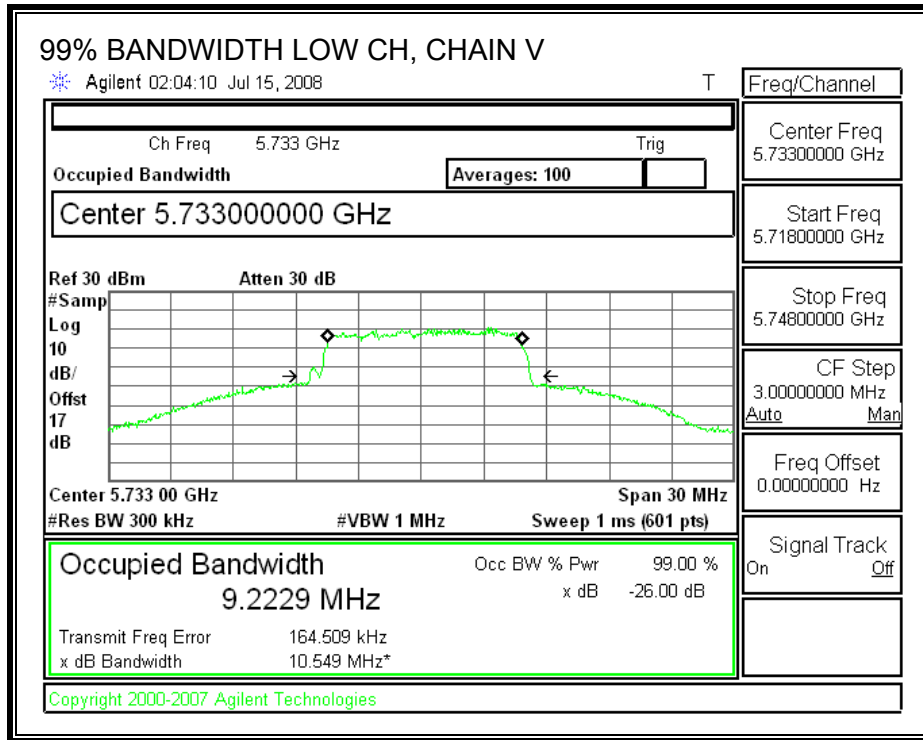
Channel	Frequency (MHz)	Chain V 99% Bandwidth (MHz)
Low	5733	9.2229
Middle	5790	9.3865
High	5842	9.2443

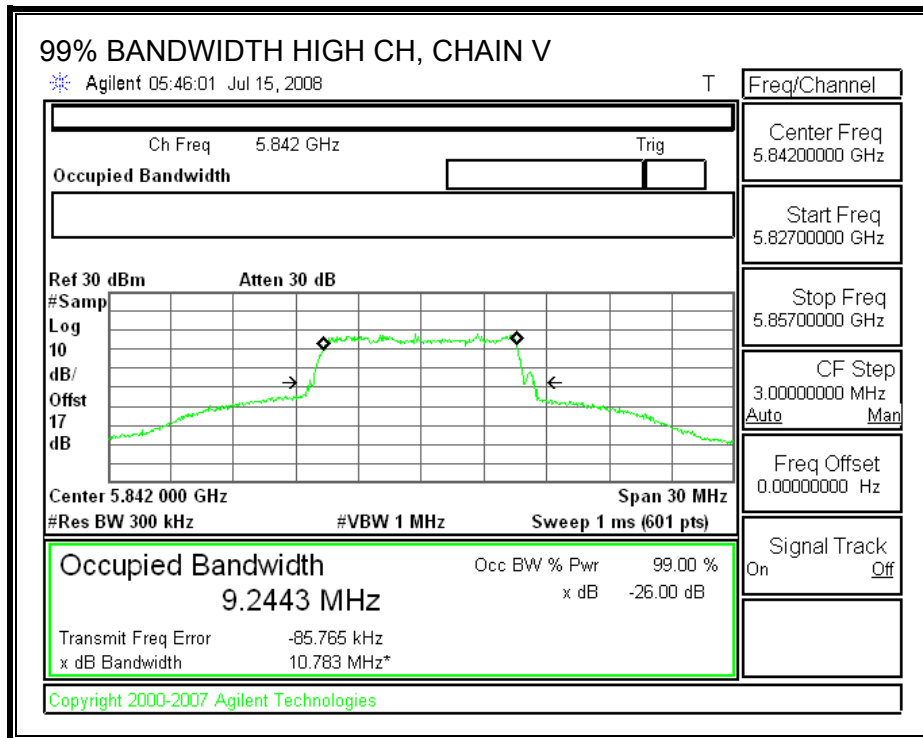
99% BANDWIDTH, CHAIN V
 5MHz BANDWIDTH





99% BANDWIDTH, CHAIN V
 10MHz BANDWIDTH





7.1.3. OUTPUT POWER

LIMITS

FCC §15.247 (b)

IC RSS-210 A8.4

The maximum antenna gain is greater than 6 dBi and all antennas are used exclusively for fixed, point-to-point operations, therefore the limit is 30 dBm.

TEST PROCEDURE

Maximum Conducted Output Power based on RMS averaging over a time interval is measured in accordance with Power Output Option 2, Method #1 as specified by FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005. External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

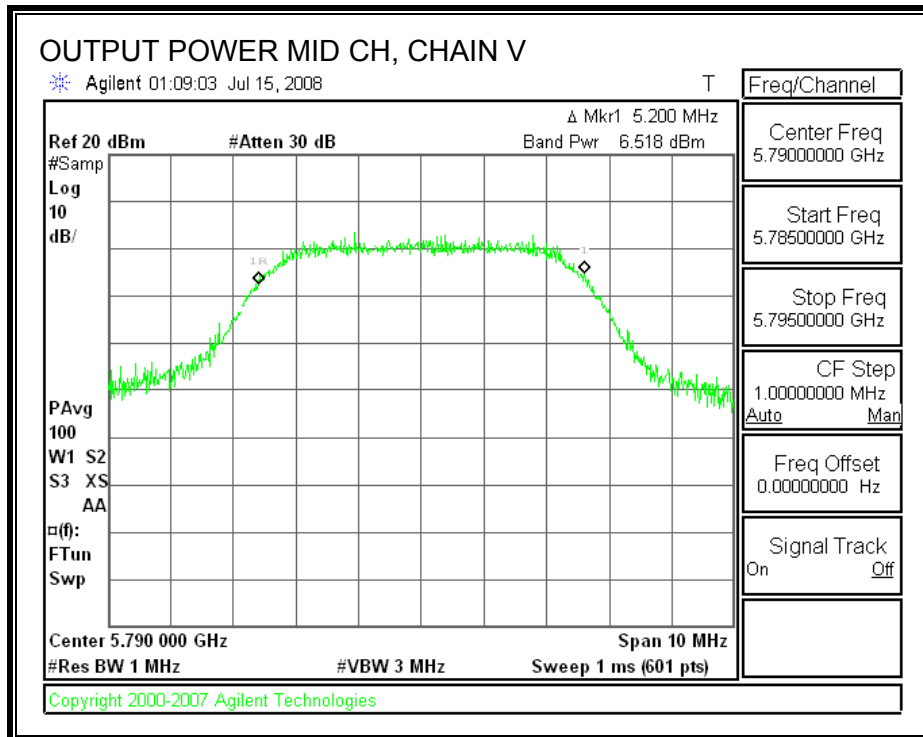
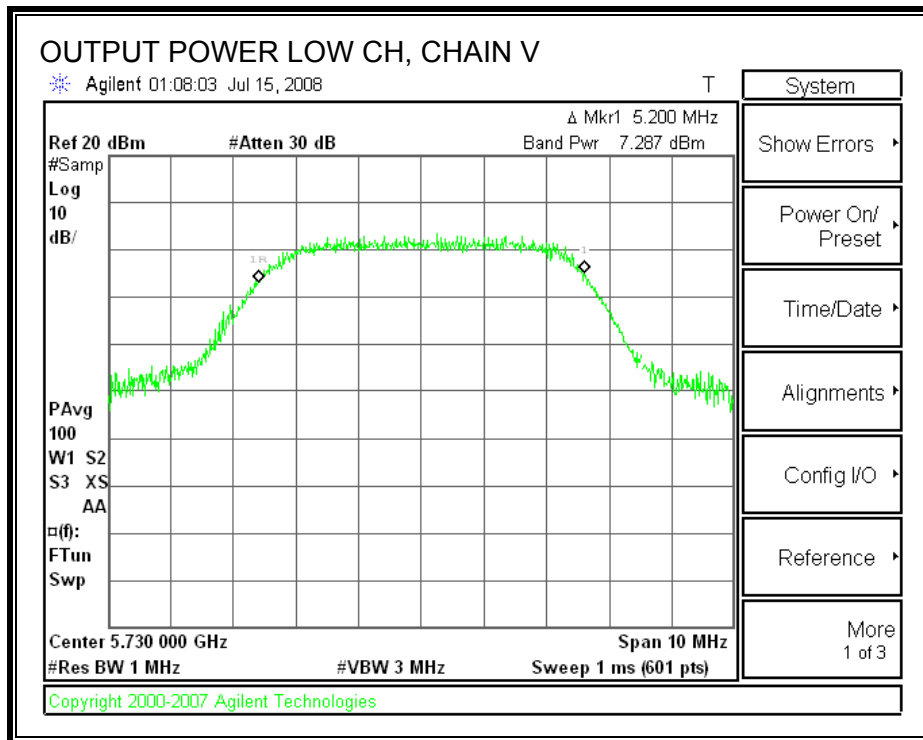
5MHz BANDWIDTH

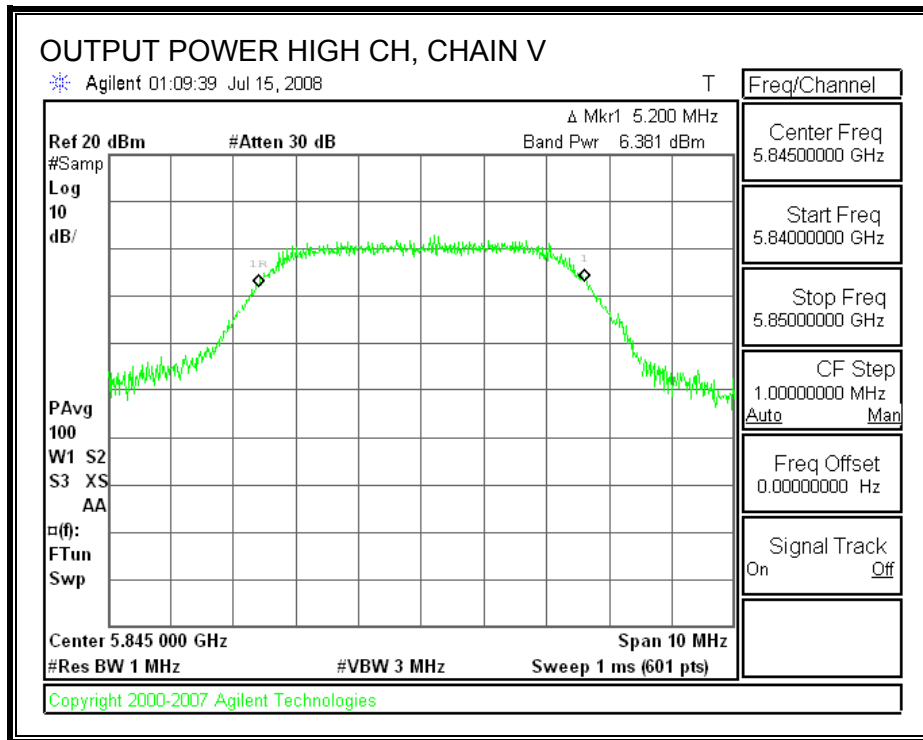
Channel	Frequency (MHz)	Limit (dBm)	Chain V Power (dBm)	Chain H Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Margin (dB)
Low	5730	30.00	7.29	7.08	17.00	27.19	-2.81
Mid	5790	30.00	6.52	6.68	17.00	26.61	-3.39
High	5845	30.00	6.38	6.33	17.00	26.36	-3.64

10MHz BANDWIDTH

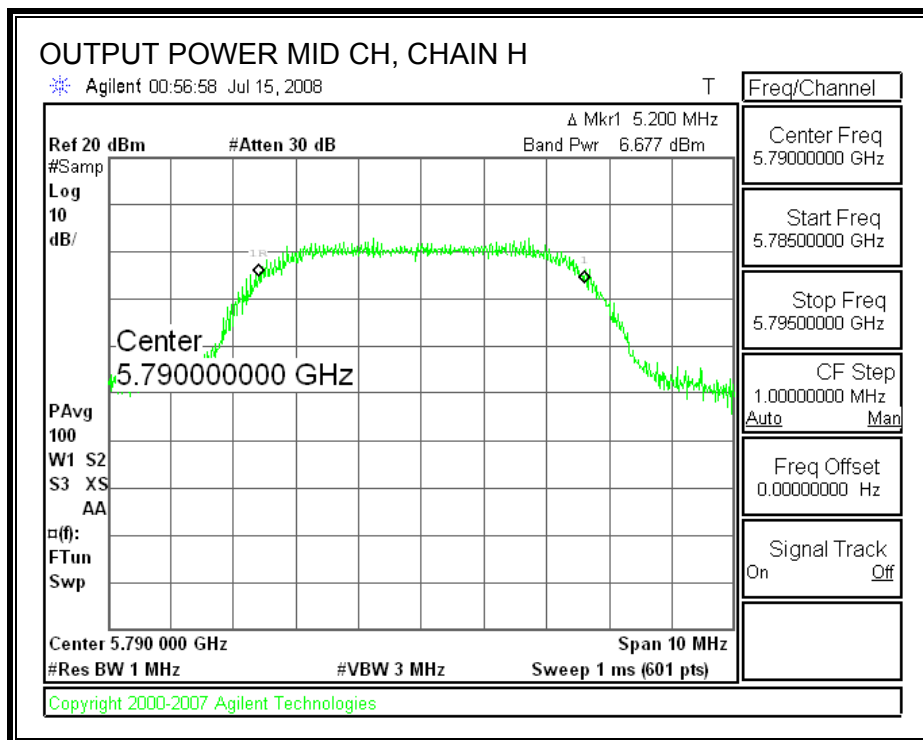
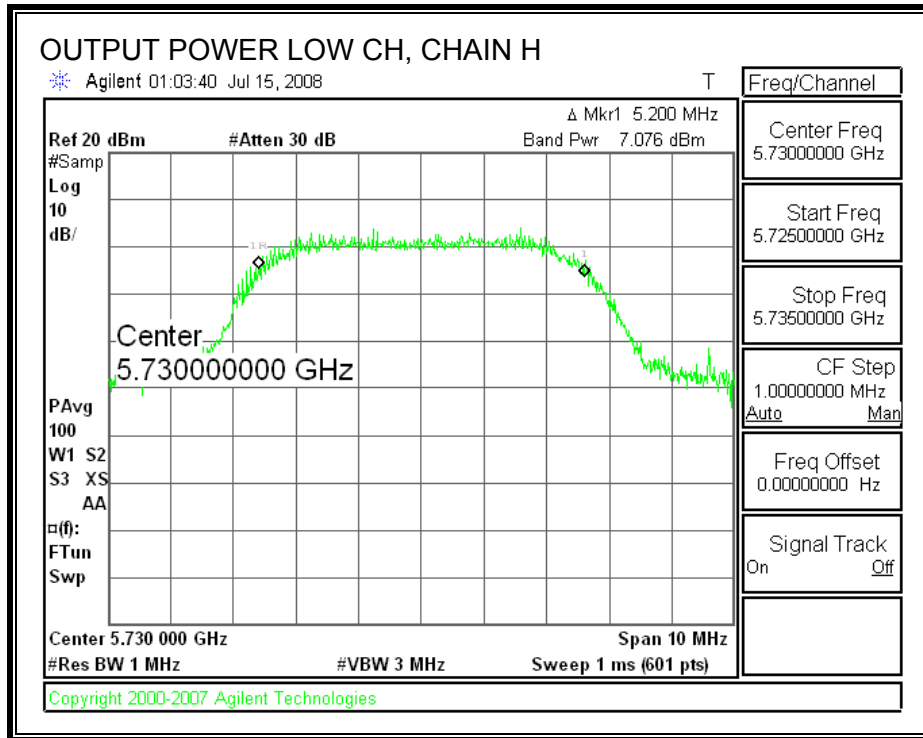
Channel	Frequency (MHz)	Limit (dBm)	Chain V Power (dBm)	Chain H Power (dBm)	Attenuator + Cable Offset (dB)	Total Power (dBm)	Margin (dB)
Low	5733	30.00	5.72	6.07	17.00	25.91	-4.09
Mid	5790	30.00	6.74	6.90	17.00	26.83	-3.17
High	5842	30.00	5.24	5.34	17.00	25.30	-4.70

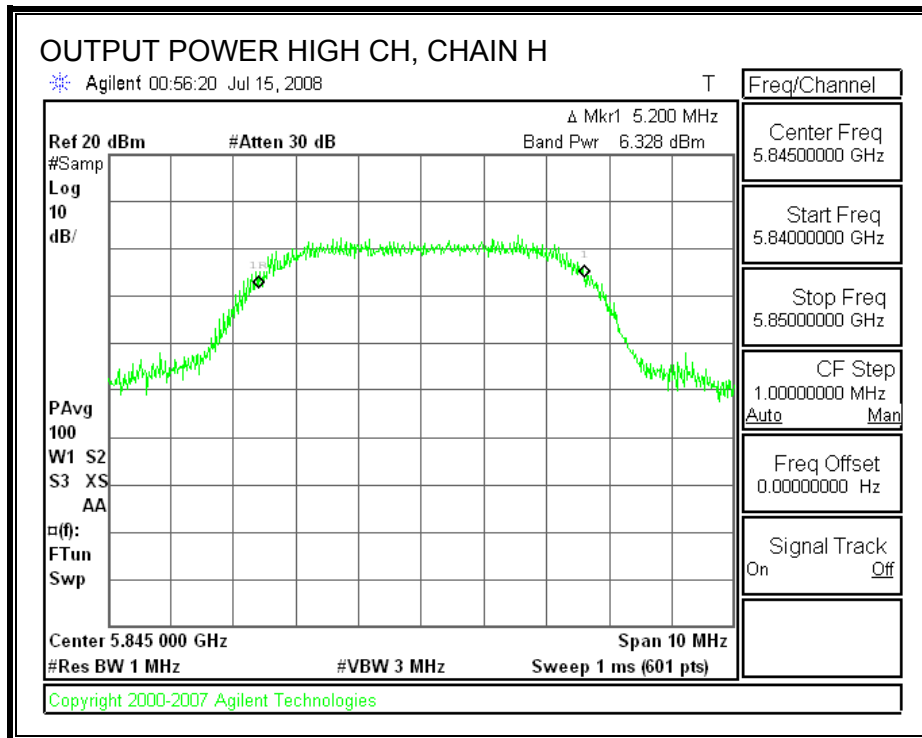
CHAIN V OUTPUT POWER
 5MHz BANDWIDTH



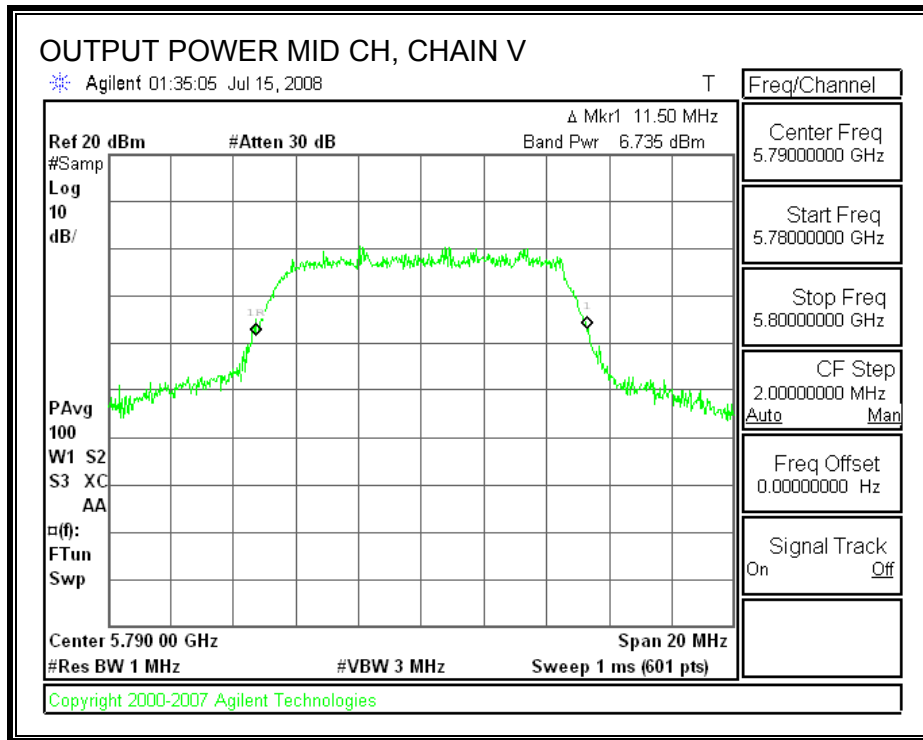
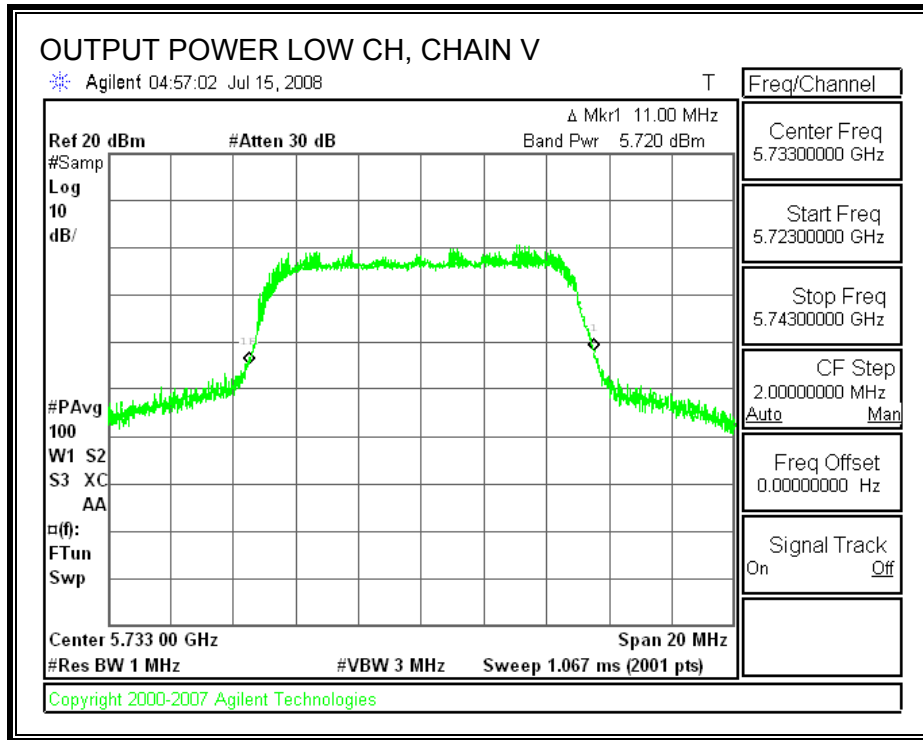


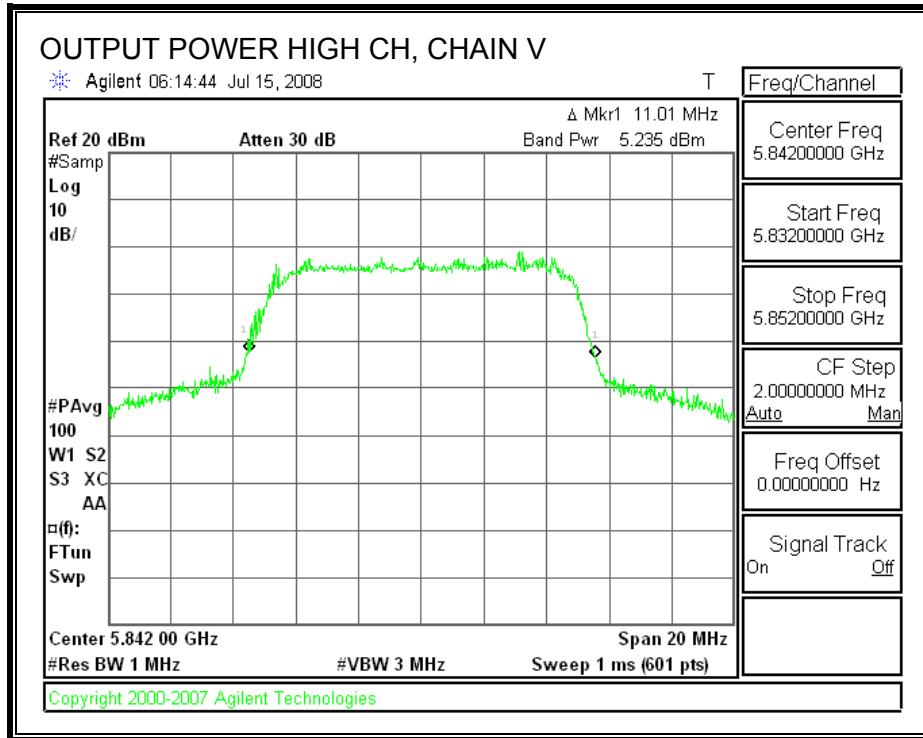
CHAIN H OUTPUT POWER



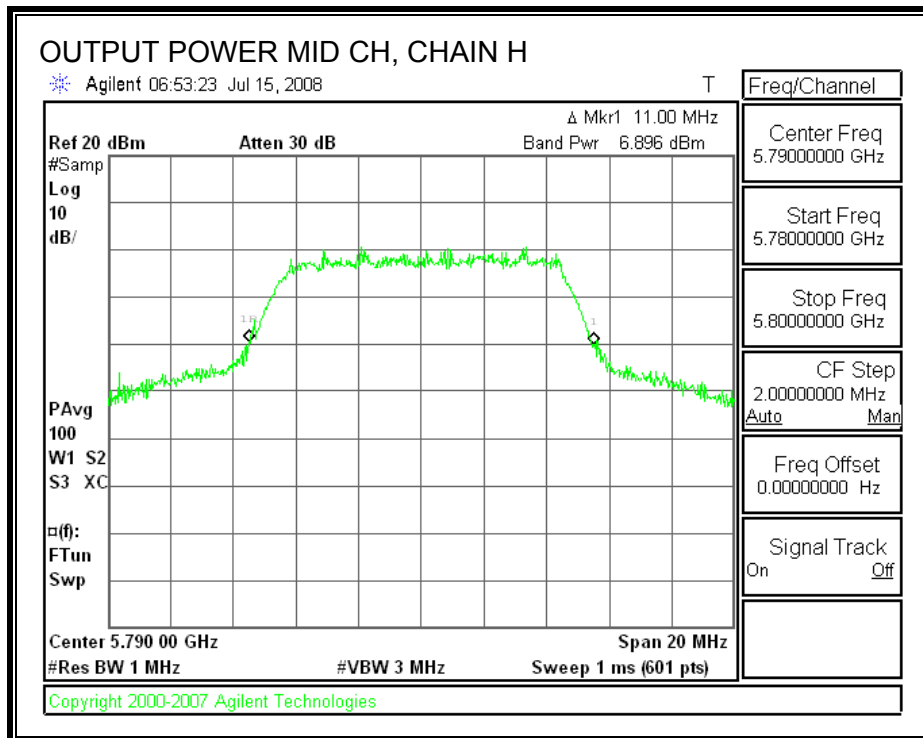
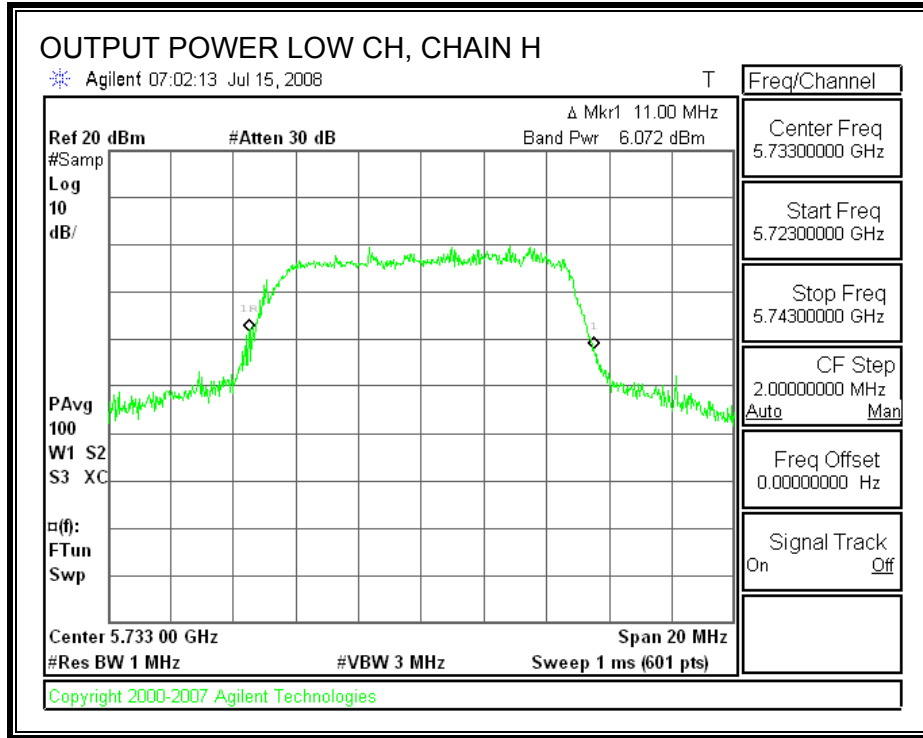


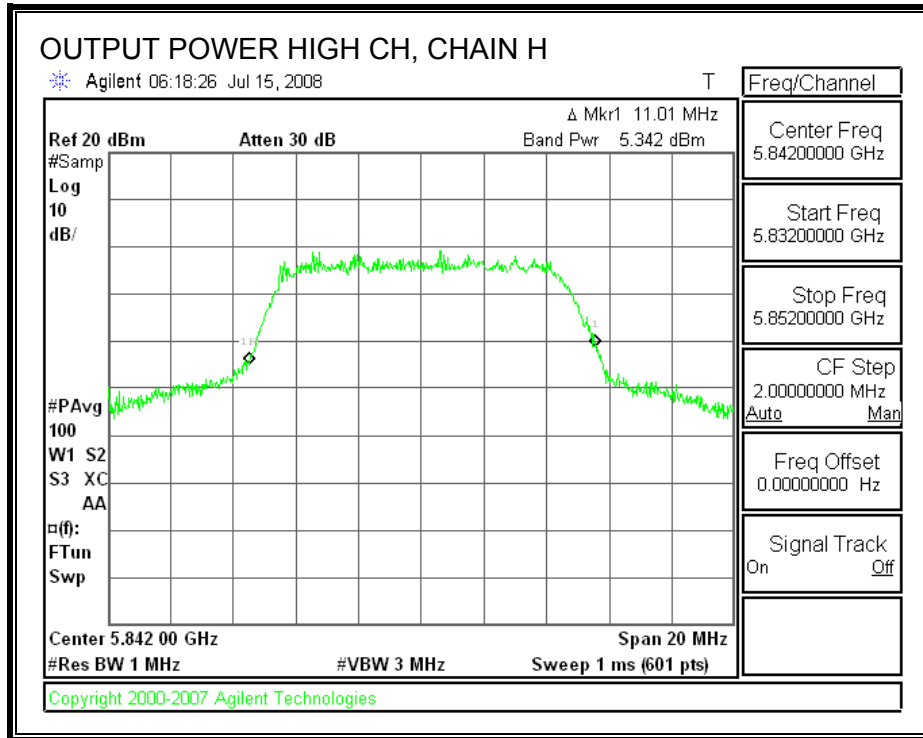
CHAIN V OUTPUT POWER
 10MHz BANDWIDTH





CHAIN H OUTPUT POWER





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 17 dB (including 10 dB pad and 7 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

5 MHz BANDWIDTH

Channel	Frequency (MHz)	Chain V Power (dBm)	Chain H Power (dBm)	Total Power (dBm)
Low	5730	24.38	23.79	27.11
Middle	5790	23.68	23.51	26.61
High	5845	23.55	23.14	26.36

10 MHz BANDWIDTH

Channel	Frequency (MHz)	Chain V Power (dBm)	Chain H Power (dBm)	Total Power (dBm)
Low	5733	23.25	23.09	26.18
Middle	5790	23.70	23.76	26.74
High	5842	22.76	22.26	25.53

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

The test is performed in accordance with PPSD Option #2 as specified by FCC document "Measurement of Digital Transmission Systems Operating under Section 15.247", March 23, 2005. External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS:

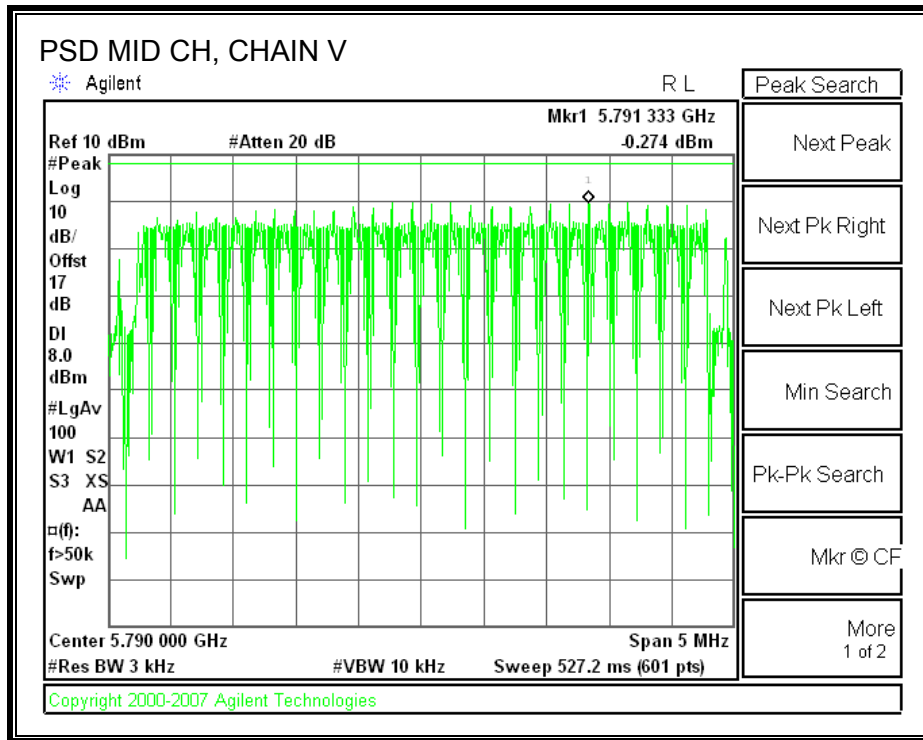
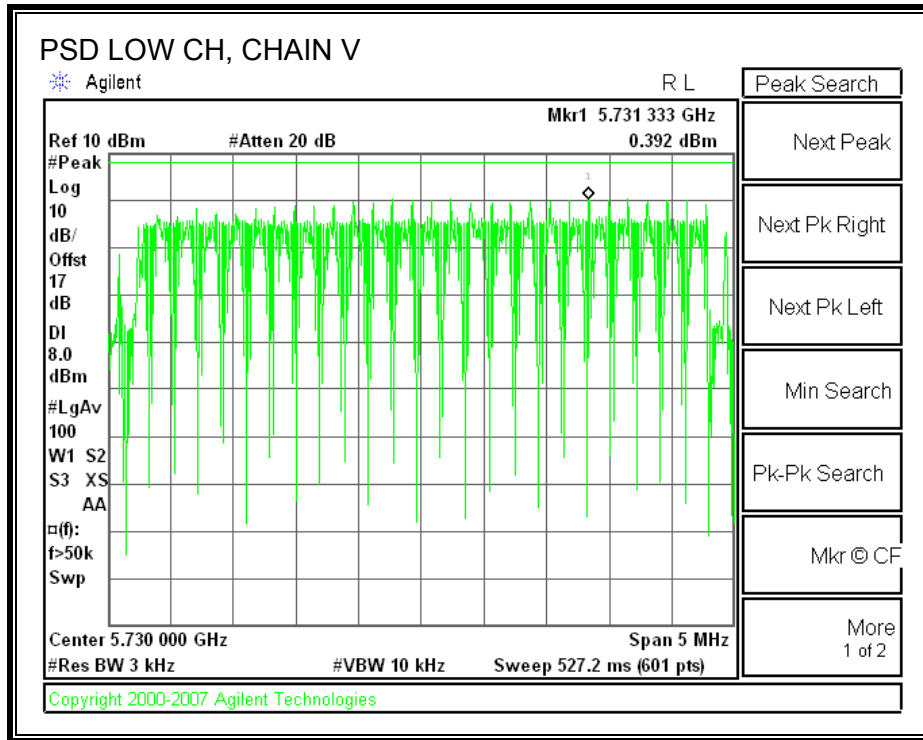
5MHz BANDWIDTH

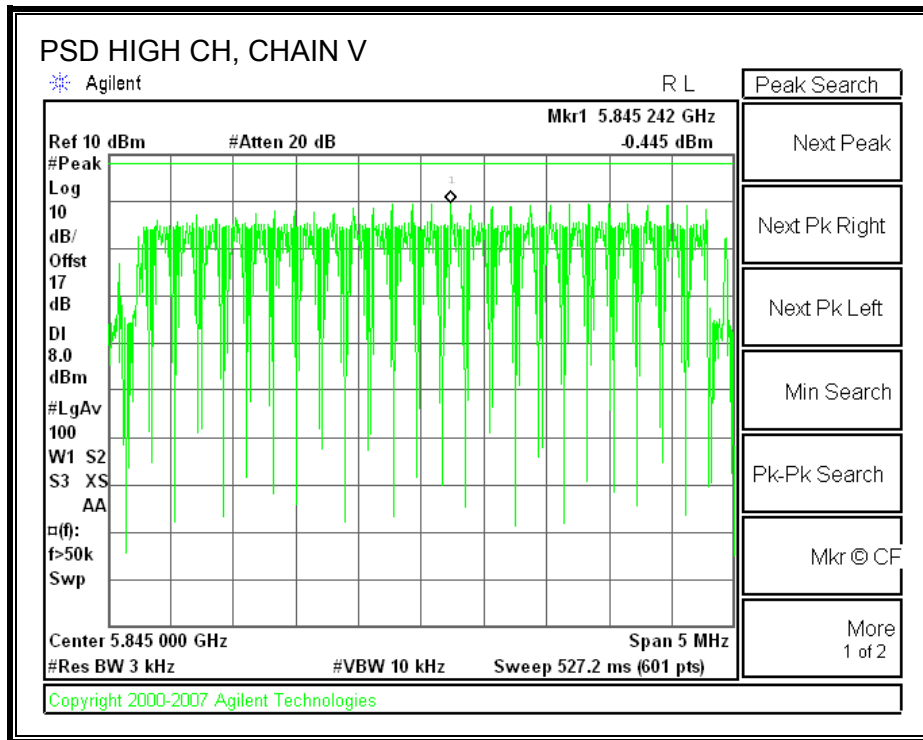
Channel	Frequency (MHz)	Chain V PSD (dBm)	Chain H PSD (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	5730	0.392	-0.103	3.16	8	-4.84
Middle	5790	-0.274	-0.351	2.70	8	-5.30
High	5845	-0.445	-0.624	2.48	8	-5.52

10MHz BANDWIDTH

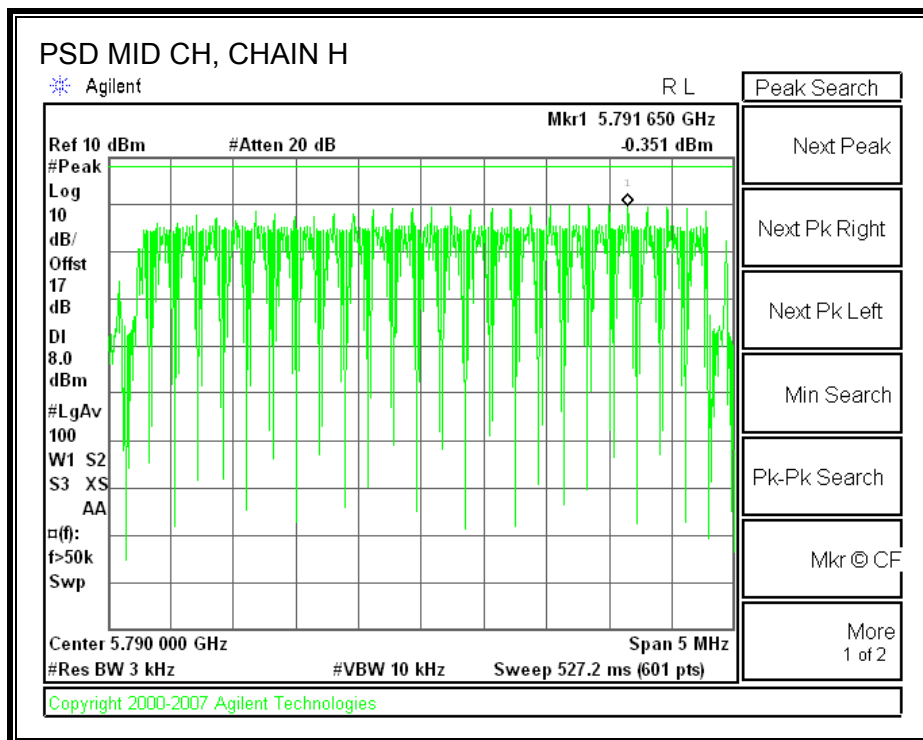
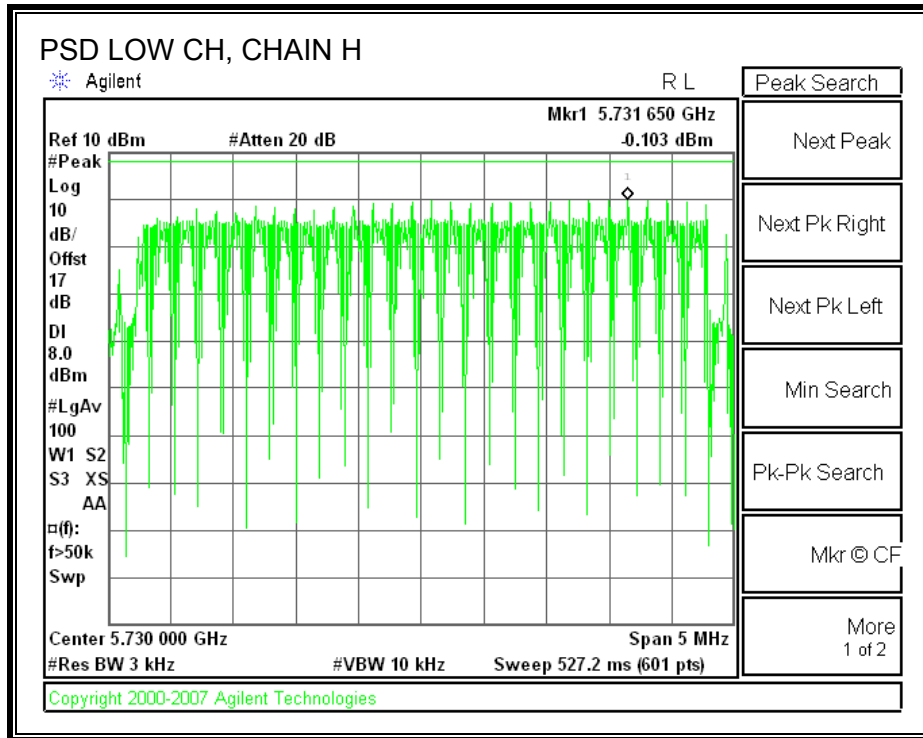
Channel	Frequency (MHz)	Chain V PSD (dBm)	Chain H PSD (dBm)	Total PSD (dBm)	Limit (dBm)	Margin (dB)
Low	5733	-0.008	-0.532	2.75	8	-5.25
Middle	5790	-0.813	-0.888	2.16	8	-5.84
High	5842	-0.599	-0.445	2.49	8	-5.51

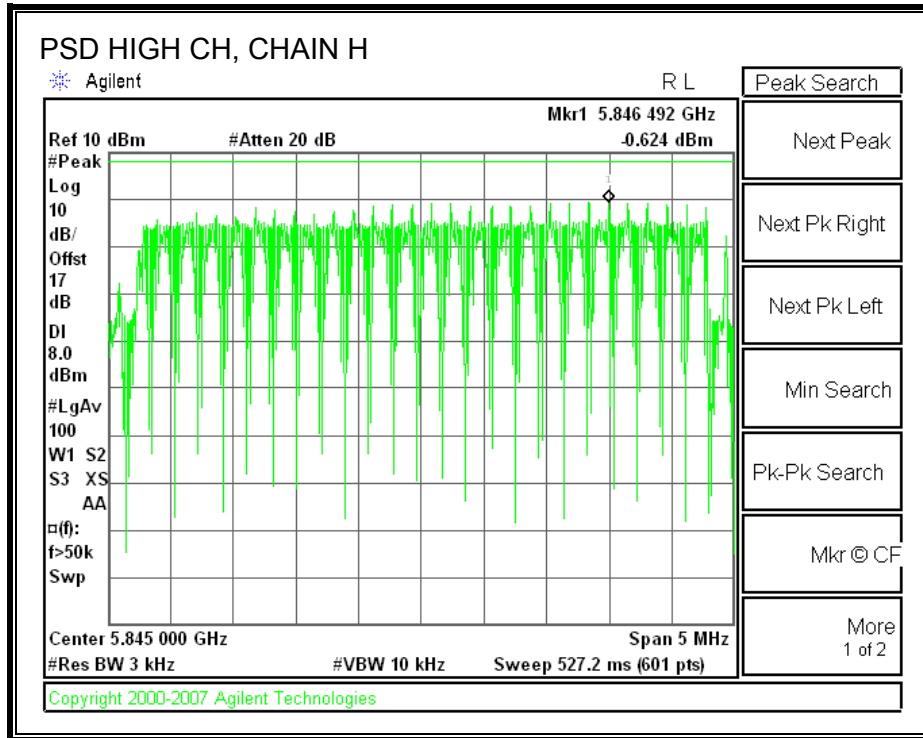
POWER SPECTRAL DENSITY, CHAIN V
5MHz BANDWIDTH



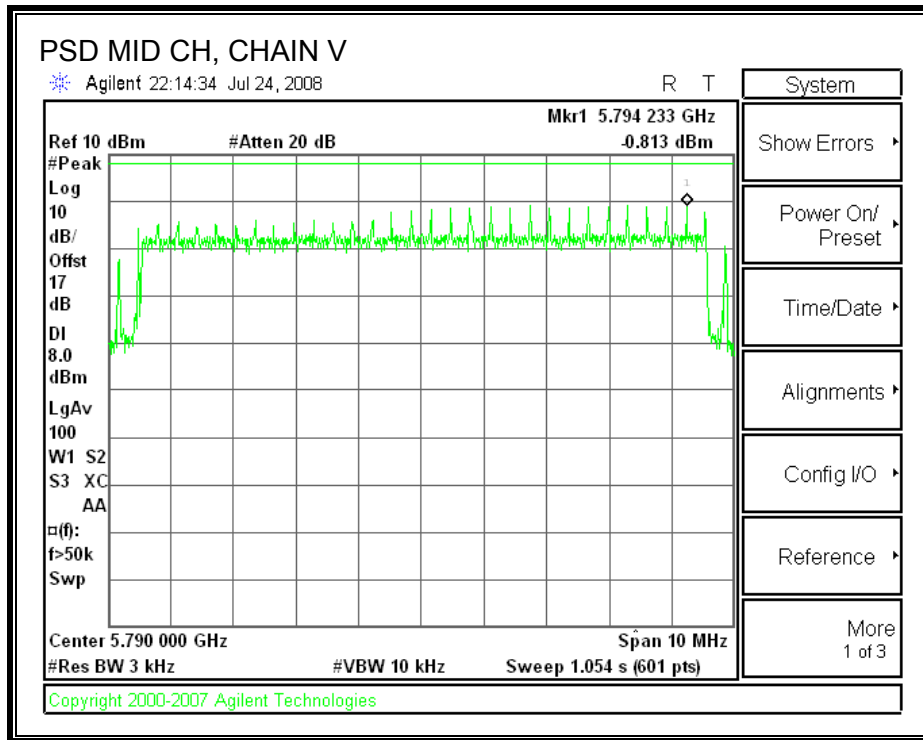
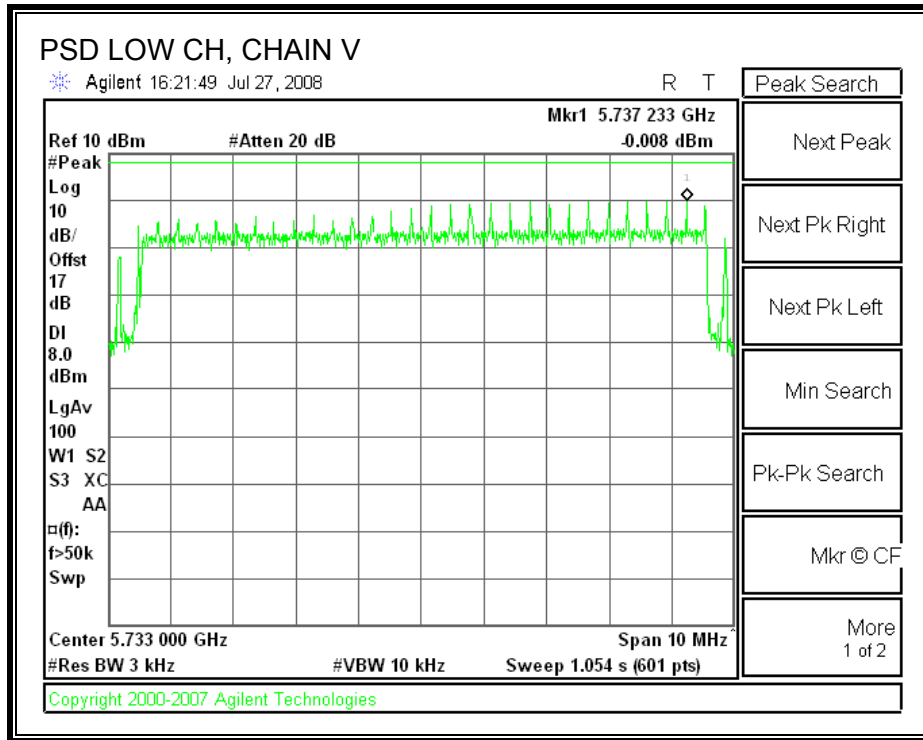


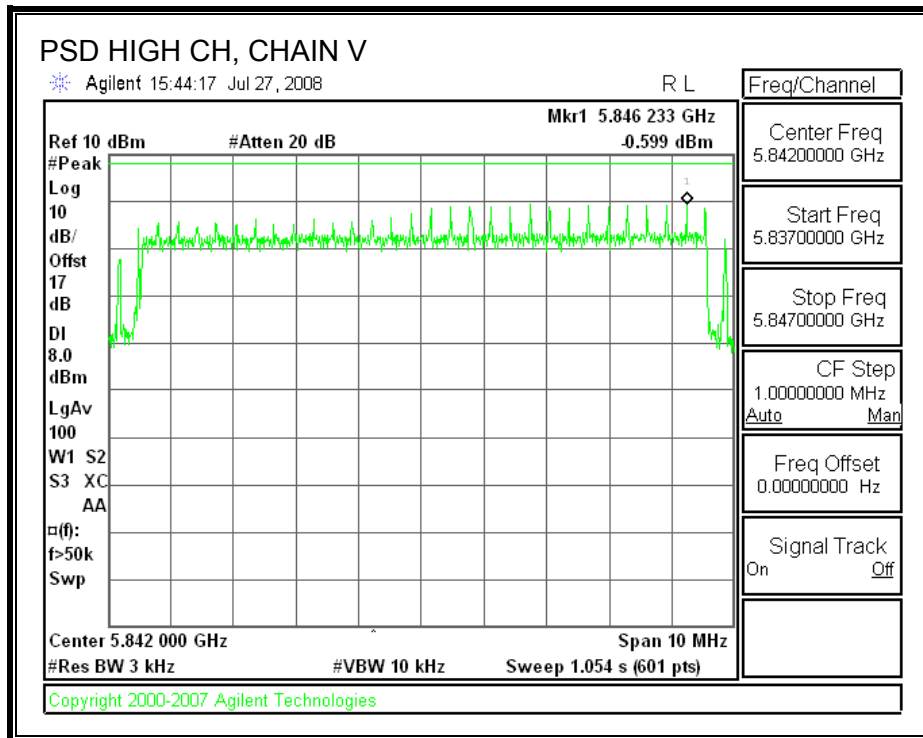
POWER SPECTRAL DENSITY, CHAIN H



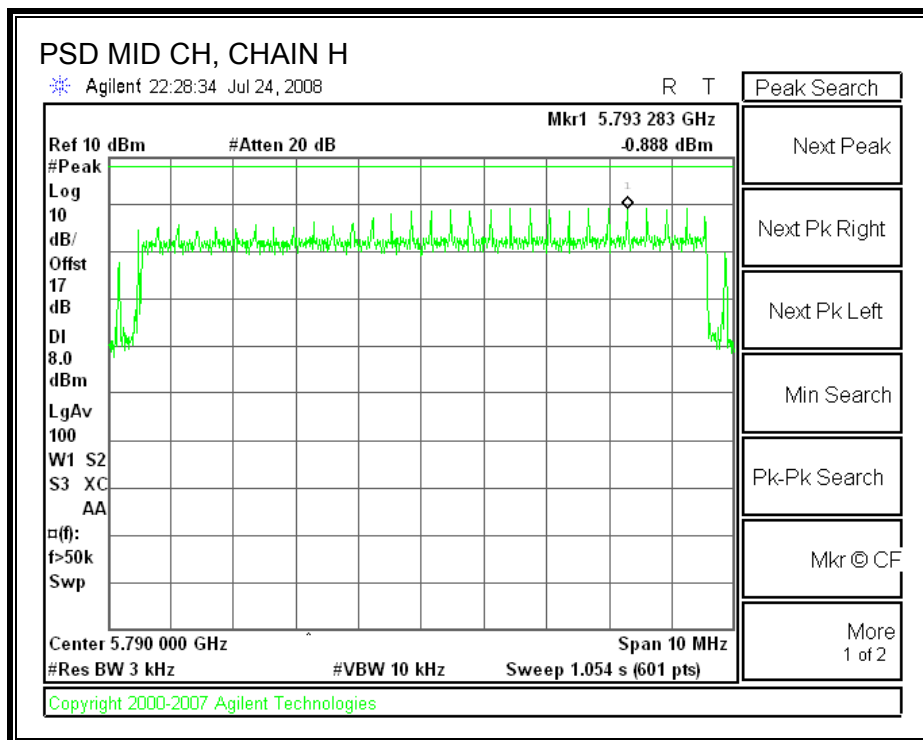
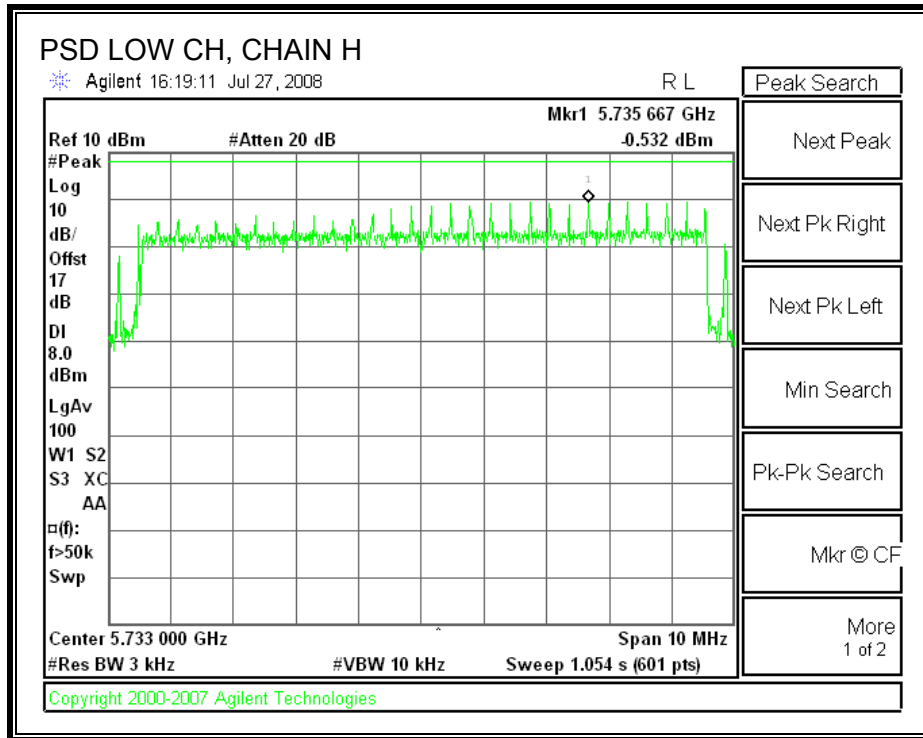


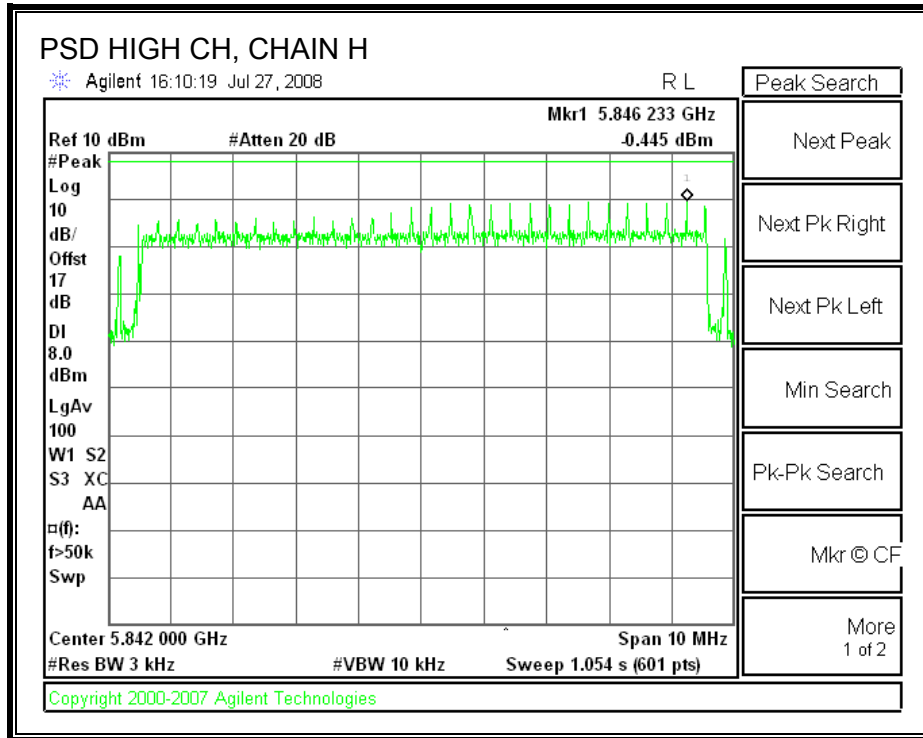
POWER SPECTRAL DENSITY, CHAIN V
 10MHz BANDWIDTH





POWER SPECTRAL DENSITY, CHAIN H





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 RMS averaging over a time interval, therefore the required attenuation is 30 dB.

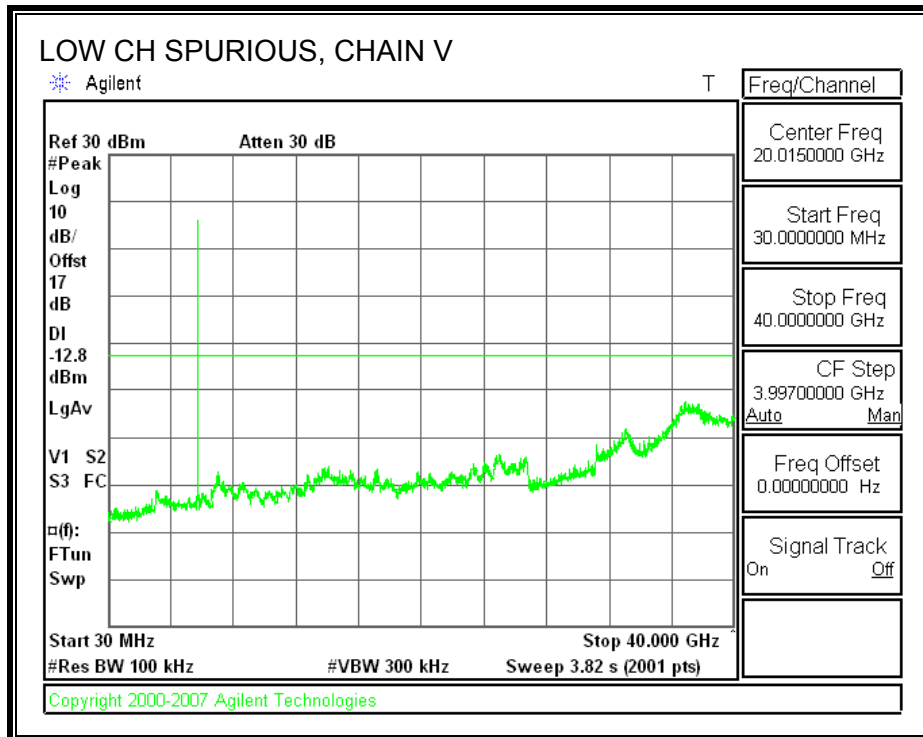
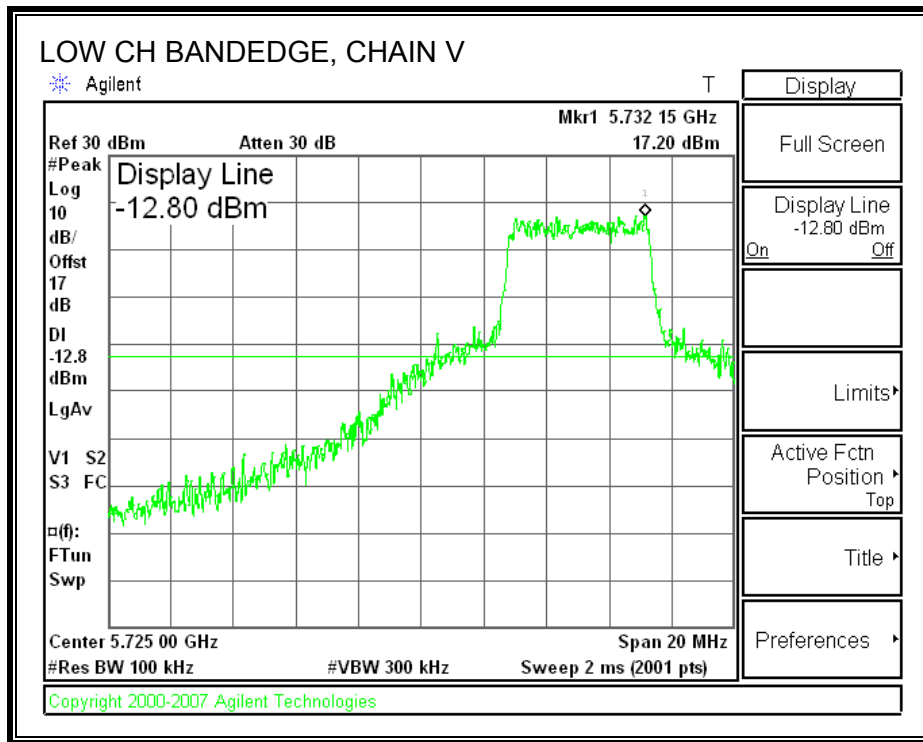
TEST PROCEDURE

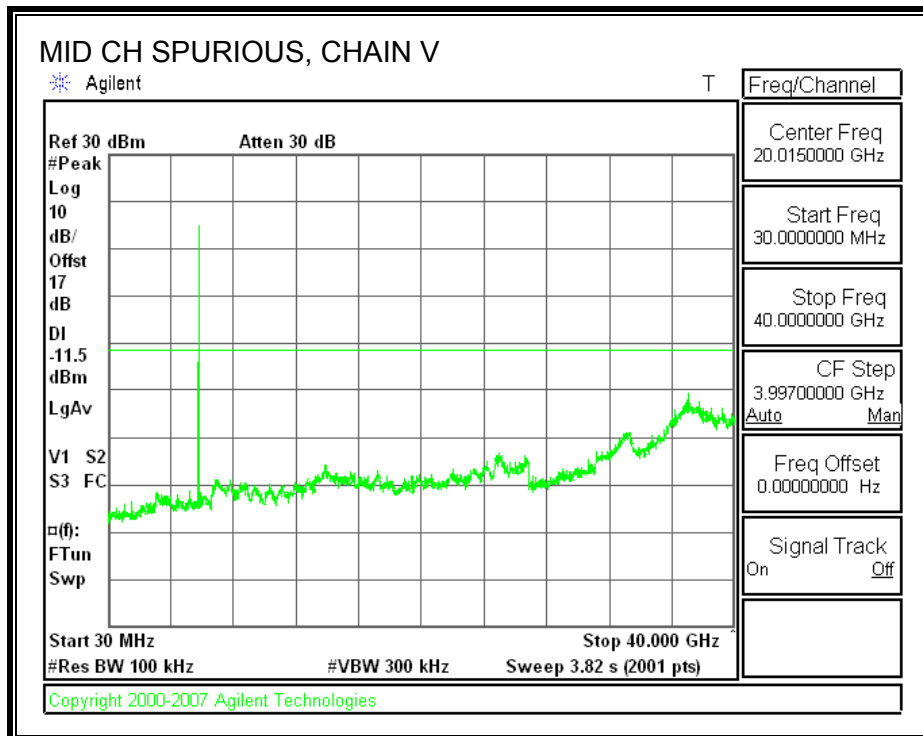
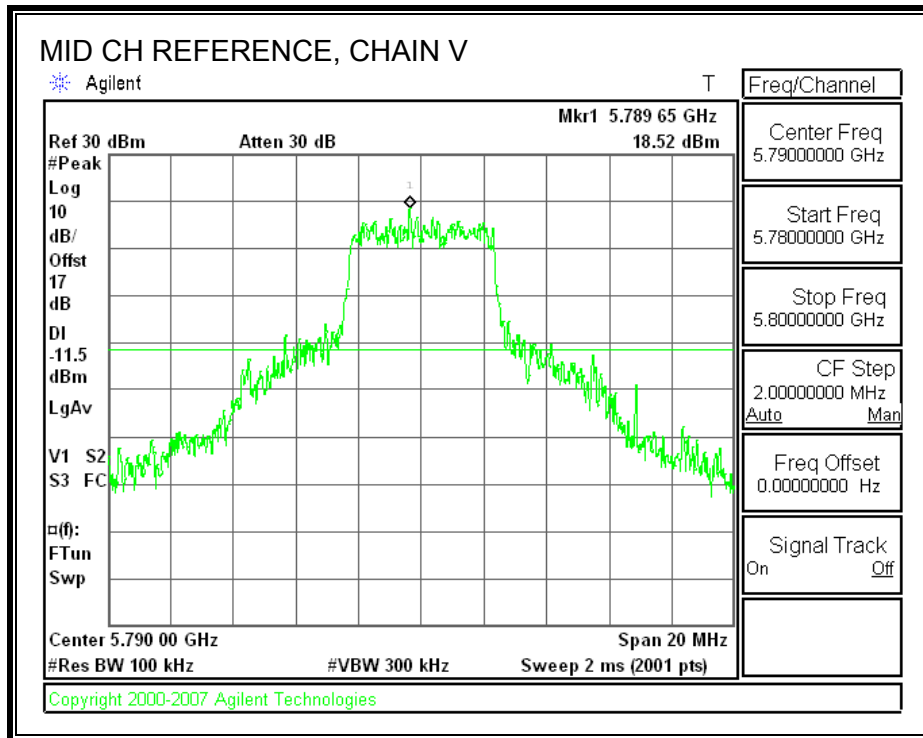
The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

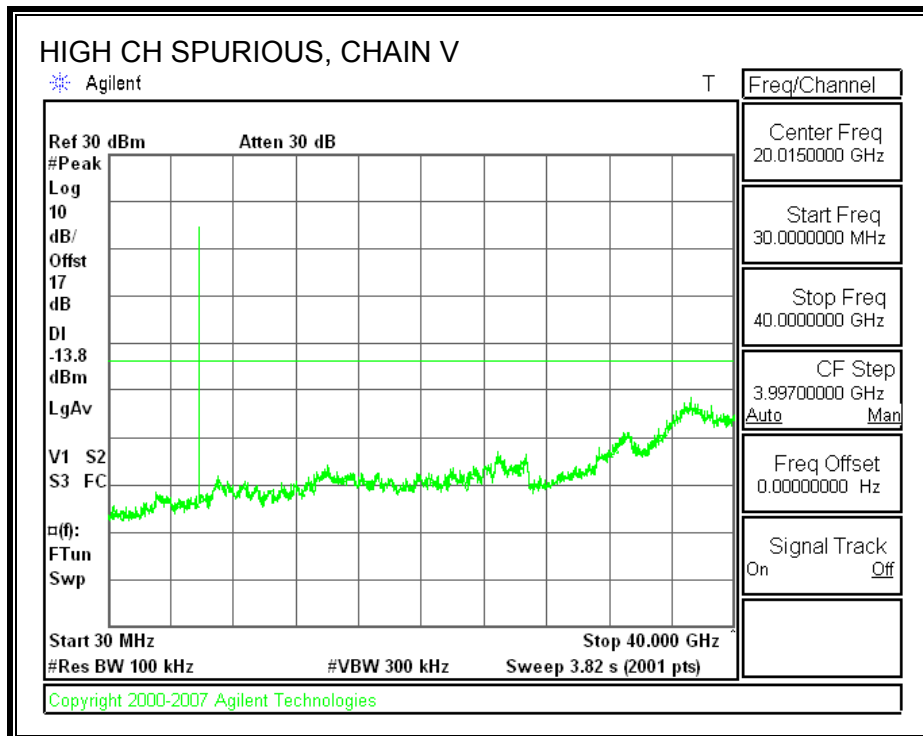
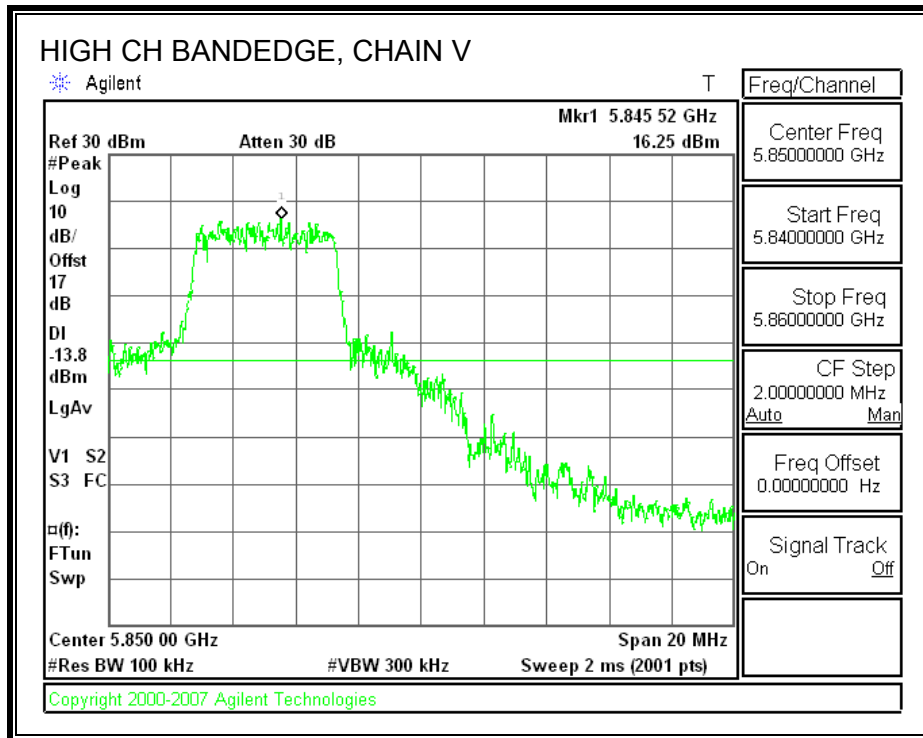
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

RESULTS

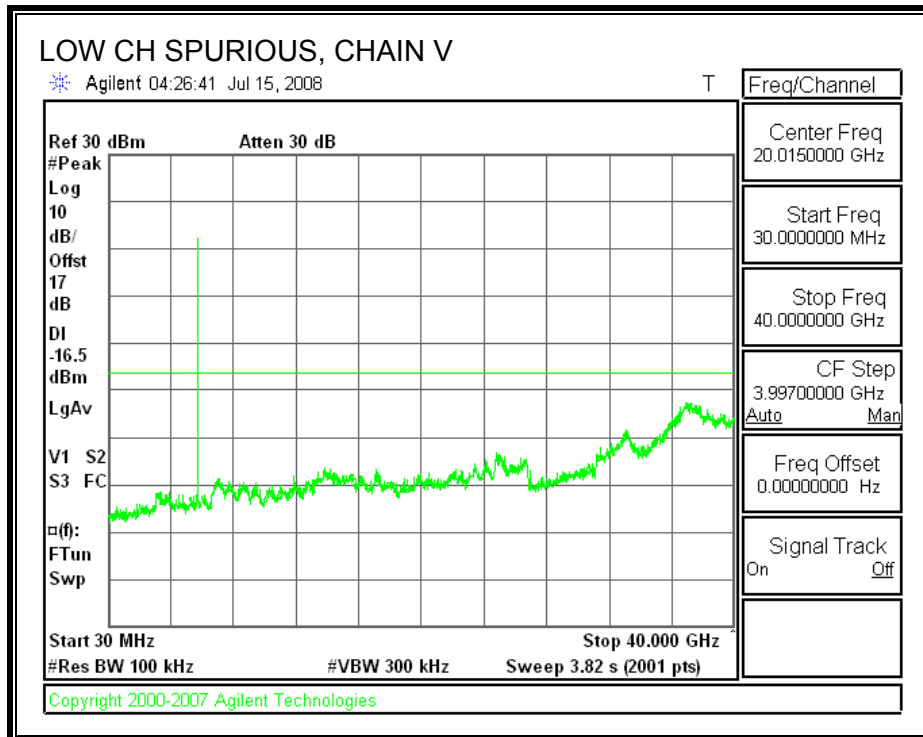
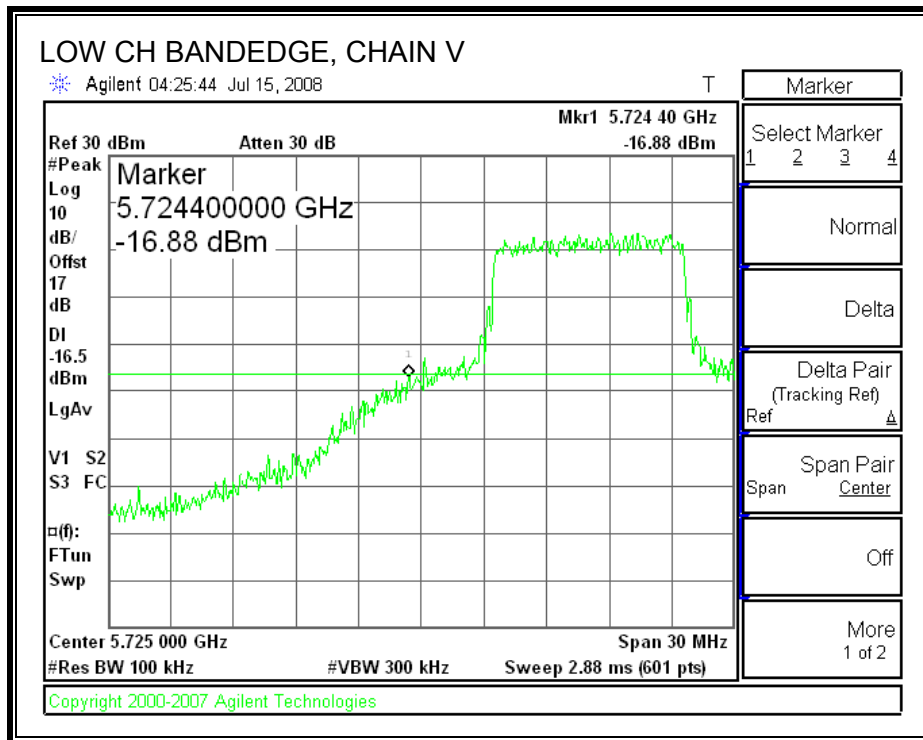
CHAIN V SPURIOUS EMISSIONS
 5MHz BANDWIDTH

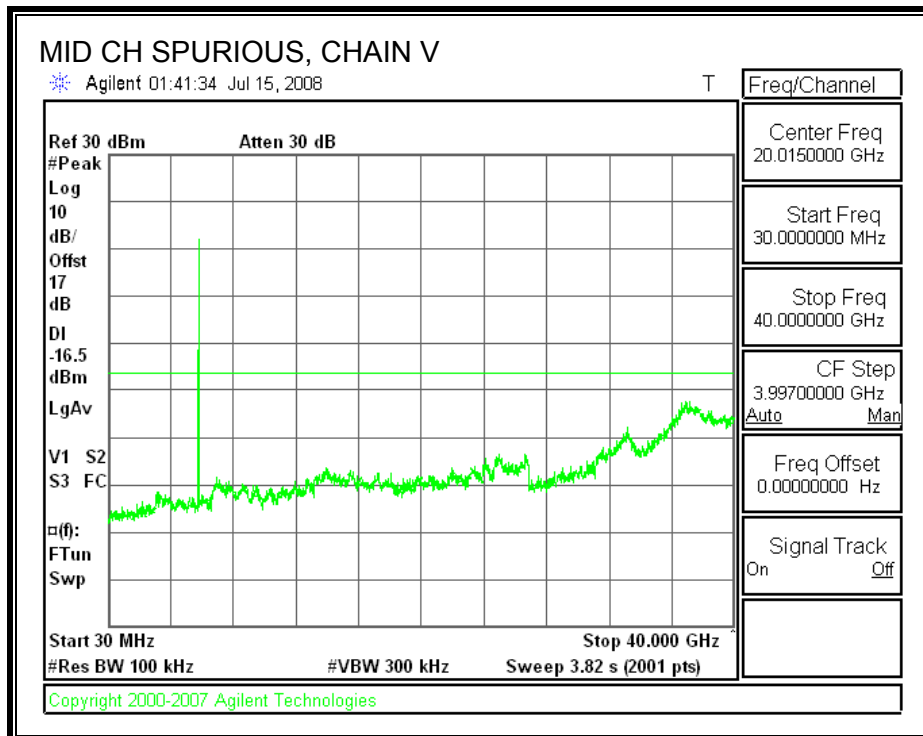
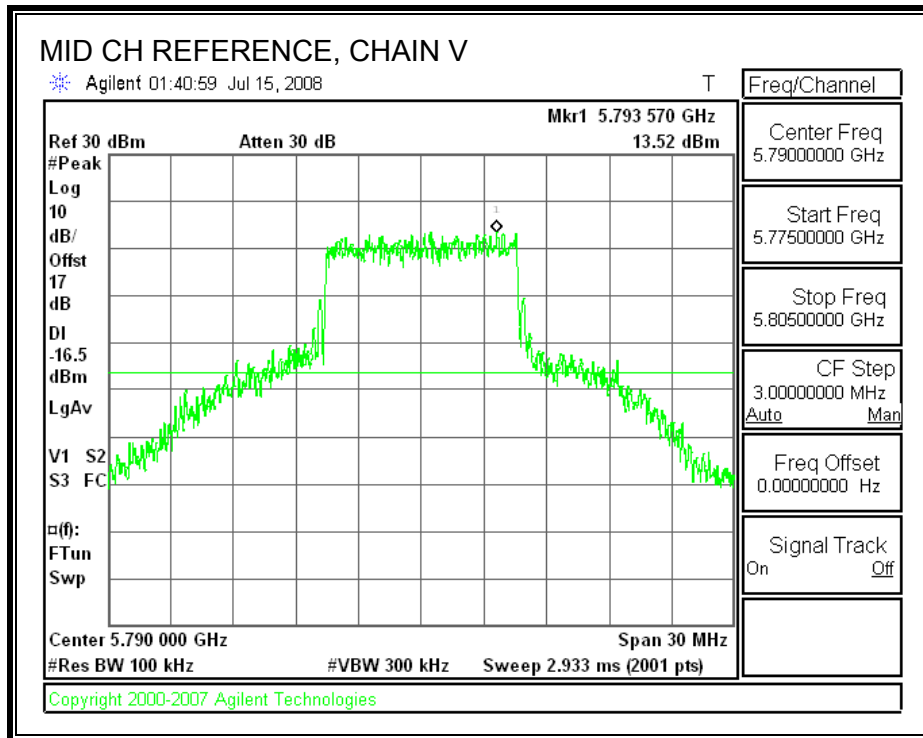


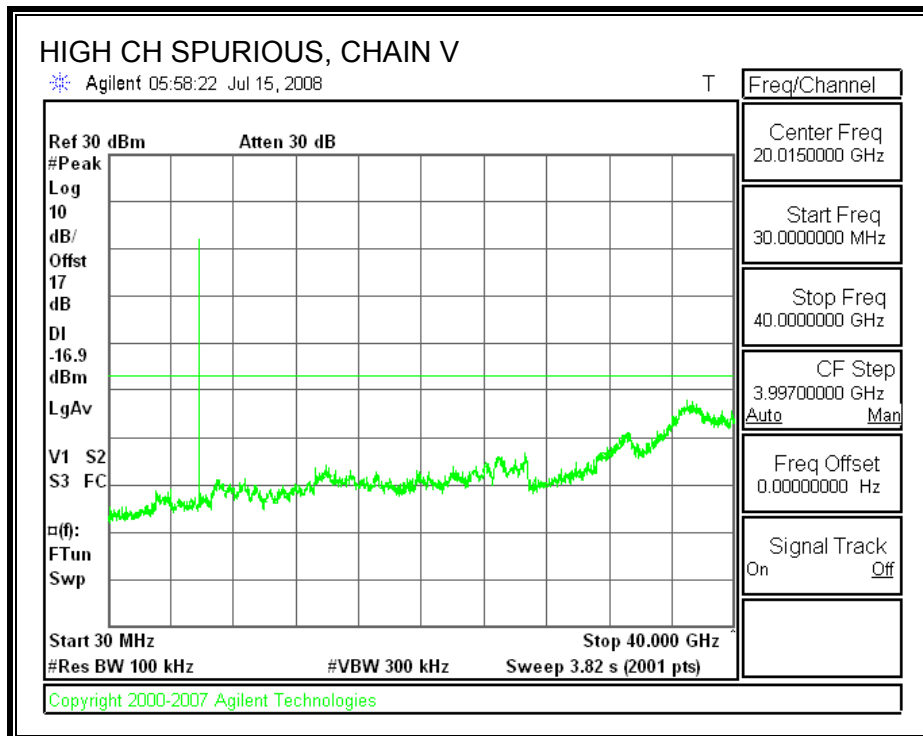
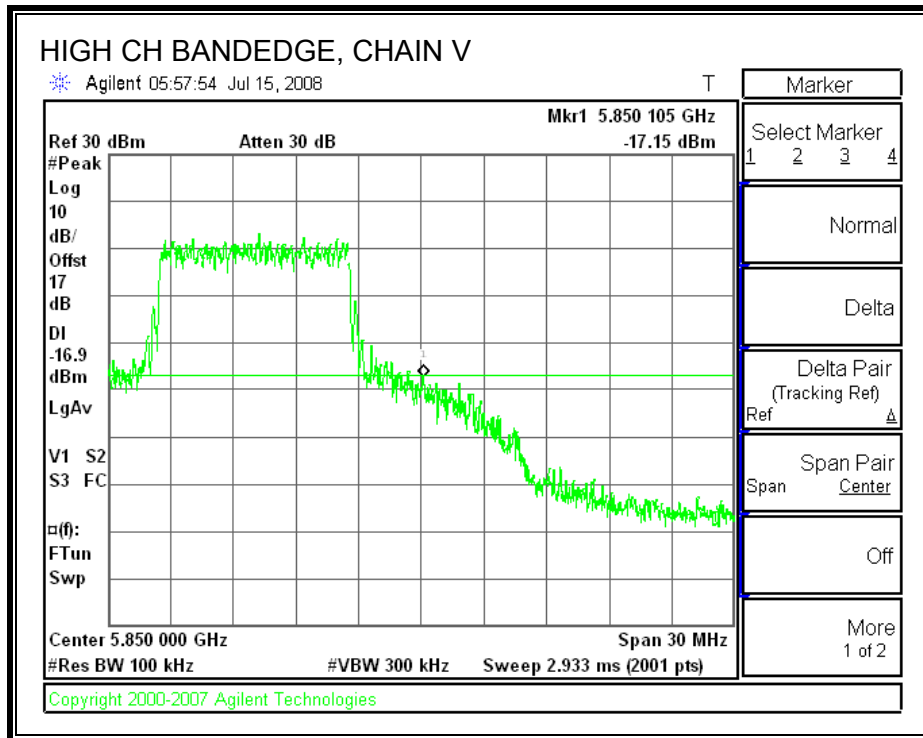




CHAIN V SPURIOUS EMISSIONS
 10MHz BANDWIDTH







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 spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable 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. TRANSMITTER ABOVE 1 GHz FOR 5MHz BW IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

4-Foot Maximum Diameter Dish Antenna

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company:		Motorola															
Project #:		08U11902															
Date:		7/10/2008															
Test Engineer:		Devin Chang															
Configuration:		EUT only															
Mode:		Tx Mode, 5MHz BW															
		6 foot Diameter Dish with 3 dB pad yields equivalent gain of 4 foot Diameter Dish															
		Rated Power (27 dBm total power)															
Duty Cycle Factor:		3.18															
Test Equipment:																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T120; S/N: 29310 @3m			T145 Agilent 3008A005						T89; ARA 18-26GHz; S/N:1049			FCC 15.205					
Hi Frequency Cables																	
2 foot cable			3 foot cable			12 foot cable			HPF			Reject Filter			Peak Measurements		
						A-5m Chamber			HPF_7.6GHz						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	Fldr 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 Ch. 5730MHz																	
11.460	3.0	43.0	25.8	37.6	11.6	-33.1	0.0	0.7	59.8	45.7	74	54	-14.2	-8.3	V		
11.460	3.0	41.7	27.3	37.6	11.6	-33.1	0.0	0.7	58.5	47.2	74	54	-15.5	-6.8	H		
Mid Ch. 5790MHz																	
11.580	3.0	42.4	26.1	37.6	11.7	-33.0	0.0	0.7	59.5	46.3	74	54	-14.5	-7.7	V		
11.580	3.0	42.4	25.8	37.6	11.7	-33.0	0.0	0.7	59.5	46.0	74	54	-14.5	-8.0	H		
High Ch. 5845MHz																	
11.690	3.0	50.0	27.3	37.7	11.8	-32.8	0.0	0.7	67.3	47.8	74	54	-6.7	-6.2	V		
11.690	3.0	48.9	27.1	37.7	11.8	-32.8	0.0	0.7	66.2	47.6	74	54	-7.8	-6.4	H		
Rev. 4.12.7																	
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										

6-Foot Maximum Diameter Dish Antenna

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company:		Motorola															
Project #:		08U11902															
Date:		7/10/2008															
Test Engineer:		Devin Chang															
Configuration:		EUT only															
Mode:		Tx Mode, 5MHz BW 6 foot Diameter Dish Rated Power reduced by 3 dB (24 dBm total power)															
Duty Cycle Factor:		3.18															
Test Equipment:																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T120; S/N: 29310 @3m			T145 Agilent 3008A005t						T89; ARA 18-26GHz; S/N:1049			FCC 15.205					
Hi Frequency Cables																	
2 foot cable			3 foot cable			12 foot cable			HPF		Reject Filter						
						A-5m Chamber			HPF_7.6GHz				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	Filtr 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 Ch. 5730MHz																	
11.460	3.0	53.0	28.3	37.6	11.6	-33.1	0.0	0.7	69.8	48.2	74	54	-4.2	-5.8	V		
11.460	3.0	53.7	28.9	37.6	11.6	-33.1	0.0	0.7	70.5	48.8	74	54	-3.5	-5.2	H		
Mid Ch. 5790MHz																	
11.580	3.0	54.3	28.1	37.6	11.7	-33.0	0.0	0.7	71.4	48.3	74	54	-2.6	-5.7	V		
11.580	3.0	53.1	27.8	37.6	11.7	-33.0	0.0	0.7	70.2	48.0	74	54	-3.8	-6.0	H		
High Ch. 5845MHz																	
11.690	3.0	56.3	29.1	37.7	11.8	-32.8	0.0	0.7	73.6	49.7	74	54	-0.4	-4.3	V		
11.690	3.0	54.9	28.9	37.7	11.8	-32.8	0.0	0.7	72.2	49.4	74	54	-1.8	-4.6	H		
Rev. 4.12.7																	
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													

HARMONICS AND SPURIOUS EMISSIONS

Panel Antenna

High Frequency Measurement																
Compliance Certification Services, Fremont 5m Chamber																
Company:		Motorola														
Project #:		08U11902														
Date:		7/10/2008														
Test Engineer:		Devin Chang														
Configuration:		EUT only														
Mode:		Tx Mode, 5MHz BW														
Duty Cycle Factor:		3.18														
Test Equipment:																
Horn 1-18GHz			Pre-amplifer 1-26GHz			Pre-amplifer 26-40GHz			Horn > 18GHz			Limit				
T60; S/N: 2238 @3m			T34 HP 8449B						T89; ARA 18-26GHz; S/N:1049			FCC 15.205				
Hi Frequency Cables																
2 foot cable			3 foot cable			12 foot cable			HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz			
						C-5m Chamber			HPF_7.6GHz				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	Filtr 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 Ch. 5730MHz																
11.460	3.0	43.4	27.7	37.4	0.0	-32.5	0.0	0.7	48.9	36.4	74	54	-25.1	-17.6	V	
11.460	3.0	44.0	28.0	37.4	0.0	-32.5	0.0	0.7	49.6	36.8	74	54	-24.4	-17.2	H	
Mid Ch. 5790MHz																
11.580	3.0	53.4	32.2	37.4	0.0	-32.5	0.0	0.7	58.9	40.9	74	54	-15.1	-13.1	V	
11.580	3.0	58.7	33.8	37.4	0.0	-32.5	0.0	0.7	64.3	42.6	74	54	-9.7	-11.4	H	
High Ch. 5845MHz																
11.690	3.0	57.4	33.5	37.4	0.0	-32.5	0.0	0.7	63.0	42.3	74	54	-11.0	-11.7	V	
11.690	3.0	67.0	35.9	37.4	0.0	-32.5	0.0	0.7	72.6	44.7	74	54	-1.4	-9.3	H	
Rev. 4.12.7																
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. TRANSMITTER ABOVE 1 GHz FOR 10MHz BW IN THE 5.8 GHz BAND

HARMONICS AND SPURIOUS EMISSIONS

6-Foot Maximum Diameter Dish Antenna

High Frequency Measurement
 Compliance Certification Services, Fremont 5m Chamber

Company: Motorola
 Project #: 08U11902
 Date: 7/10/2008
 Test Engineer: Devin Chang
 Configuration: EUT only
 Mode: Tx Mode, 10MHz BW
 6 foot Diameter Dish
 Rated Power (26 / 27 / 26 dBm total power for Low / Mid / High)
 Duty Cycle Factor: 3.18

Test Equipment:

Horn 1-18GHz	Pre-amplifier 1-26GHz	Pre-amplifier 26-40GHz	Horn > 18GHz	Limit
T120; S/N: 29310 @3m	T145 Agilent 3008A005		T89; ARA 18-26GHz; S/N:1049	FCC 15.205

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter	
		A-5m Chamber	HPF_7.6GHz		<u>Peak Measurements</u> RBW=VBW=1MHz <u>Average Measurements</u> RBW=1MHz ; VBW=10Hz

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr 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 Ch. 5733MHz															
11.466	3.0	51.0	27.6	37.6	11.6	-33.1	0.0	0.7	67.8	47.6	74	54	-6.2	-6.4	V
11.466	3.0	49.8	27.4	37.6	11.6	-33.1	0.0	0.7	66.6	47.4	74	54	-7.4	-6.6	H
Mid Ch. 5790MHz															
11.580	3.0	56.0	31.4	37.6	11.7	-33.0	0.0	0.7	73.1	51.6	74	54	-0.9	-2.4	V
11.580	3.0	52.2	28.9	37.6	11.7	-33.0	0.0	0.7	69.3	49.1	74	54	-4.7	-4.9	H
High Ch. 5842MHz															
11.684	3.0	51.7	28.5	37.7	11.8	-32.8	0.0	0.7	69.0	49.0	74	54	-5.0	-5.0	V
11.684	3.0	51.2	28.3	37.7	11.8	-32.8	0.0	0.7	68.5	48.8	74	54	-5.5	-5.2	H

Rev. 4.12.7

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		

HARMONICS AND SPURIOUS EMISSIONS

Panel Antenna

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company:		Motorola															
Project #:		08U11902															
Date:		7/10/2008															
Test Engineer:		Devin Chang															
Configuration:		EUT only															
Mode:		Tx Mode, 10MHz BW															
Duty Cycle Factor:		3.18															
Test Equipment:																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T60; S/N: 2238 @3m			T34 HP 8449B						T89; ARA 18-26GHz; S/N:1049			FCC 15.205					
Hi Frequency Cables																	
2 foot cable			3 foot cable			12 foot cable			HPF		Reject Filter		Peak Measurements RBW=VBW=1MHz Average Measurements RBW=1MHz ; VBW=10Hz				
						C-5m Chamber			HPF_7.6GHz								
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Filtr 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 Ch. 5733MHz																	
11.466	3.0	42.0	27.9	37.4	0.0	-32.5	0.0	0.7	47.5	36.6	74	54	-26.5	-17.4	V		
11.466	3.0	44.3	28.5	37.4	0.0	-32.5	0.0	0.7	49.8	37.2	74	54	-24.2	-16.8	H		
Mid Ch. 5790MHz																	
11.580	3.0	50.3	30.5	37.4	0.0	-32.5	0.0	0.7	55.9	39.2	74	54	-18.1	-14.8	V		
11.580	3.0	54.2	31.5	37.4	0.0	-32.5	0.0	0.7	59.7	40.2	74	54	-14.3	-13.8	H		
High Ch. 5842MHz																	
11.684	3.0	52.0	32.2	37.4	0.0	-32.5	0.0	0.7	57.5	40.9	74	54	-16.5	-13.1	V		
11.684	3.0	60.2	33.4	37.4	0.0	-32.5	0.0	0.7	65.8	42.1	74	54	-8.2	-11.9	H		
Rev. 4.12.7																	
f	Measurement Frequency		Amp	Preamp Gain		Avg Lim	Average Field Strength Limit		Pk Lim	Peak Field Strength Limit		Avg Mar	Margin vs. Average Limit		Pk Mar	Margin vs. Peak Limit	
Dist	Distance to Antenna		D Corr	Distance Correct to 3 meters													
Read	Analyzer Reading		Avg	Average Field Strength @ 3 m													
AF	Antenna Factor		Peak	Calculated Peak Field Strength													
CL	Cable Loss		HPF	High Pass Filter													

8.3. RECEIVER ABOVE 1 GHz

8.3.1. RECEIVER ABOVE 1 GHz FOR 5.8 GHz BAND

Note: No receive-only mode, test is not applicable

8.4. WORST-CASE BELOW 1 GHz

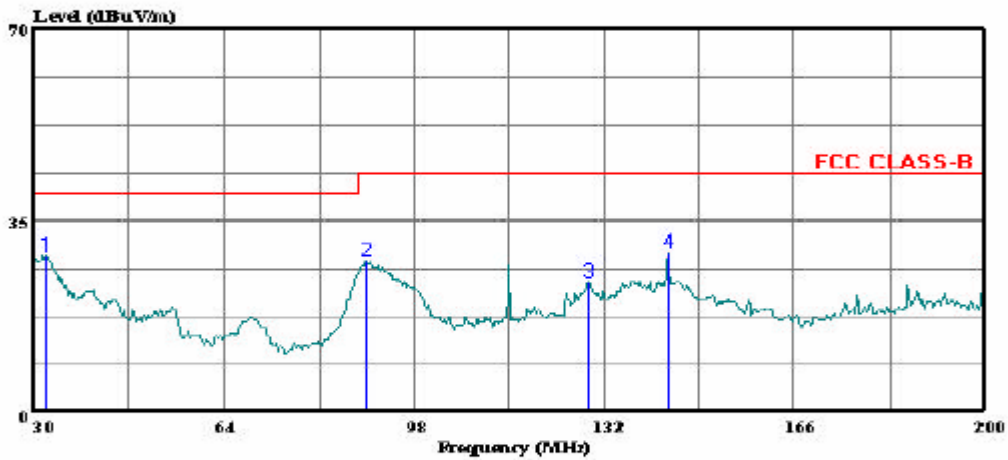
SPURIOUS EMISSIONS 30 TO 230 MHz (WORST-CASE CONFIGURATION, HORIZONTAL)

HORIZONTAL PLOT



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

Data#: 36 File#: 08U11902_10MHz.EMI Date: 07-12-2008 Time: 14:35:42



Trace: 35

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Chin Pang
Project #: : 08U11902
Company: : Motorola
Configuration:: EUT with Antenna (6 FT DISH)
Mode : : Data TX/RX mode
Target: : FCC Class B
: 5MHz BW

HORIZONTAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	32.380	38.46	-9.68	28.78	40.00	-11.22	Peak
2	89.330	46.77	-18.88	27.89	43.50	-15.61	Peak
3	129.280	37.24	-13.16	24.08	43.50	-19.42	Peak
4	143.390	42.90	-13.60	29.30	43.50	-14.20	Peak

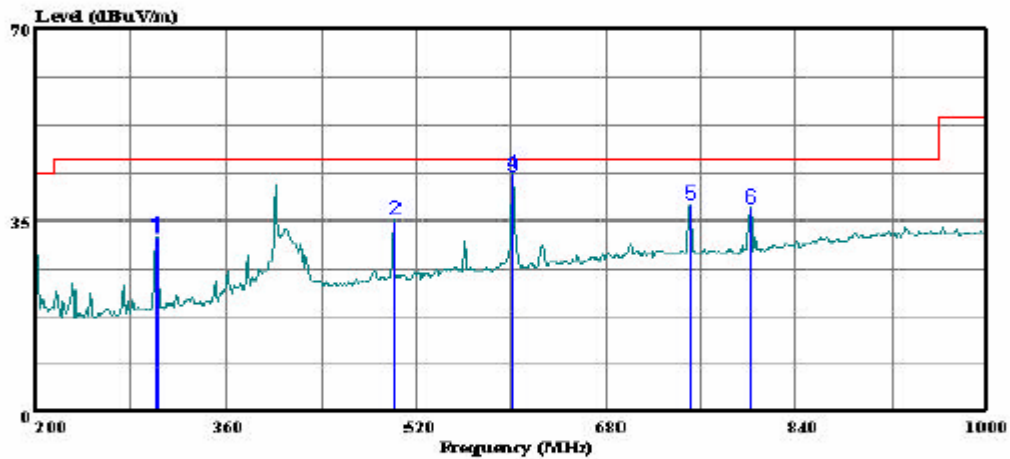
SPURIOUS EMISSIONS 230 TO 1000 MHz (WORST-CASE CONFIGURATION HORIZONTAL)

VERTICAL PLOT



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

Data#: 34 File#: 08U11902_10MHZ.EMI Date: 07-12-2008 Time: 14:28:50



Trace: 31

Ref Trace:

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Chin Pang
Project #: : 08U11902
Company: : Motorola
Configuration: BUT with Antenna (6 FT DISH)
Mode : : Data TX/RX mode
Target: : FCC Class B
: 5MHZ BW

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	301.600	43.11	-11.03	32.08	46.00	-13.92	Peak
2	501.600	39.81	-4.71	35.10	46.00	-10.90	Peak
3	601.600	45.69	-2.79	42.90	46.00	-3.10	QP
4	601.600	46.53	-2.81	43.72	46.00	-2.28	Peak
5	751.200	37.79	0.17	37.96	46.00	-8.04	Peak
6	801.600	36.52	0.74	37.26	46.00	-8.74	Peak

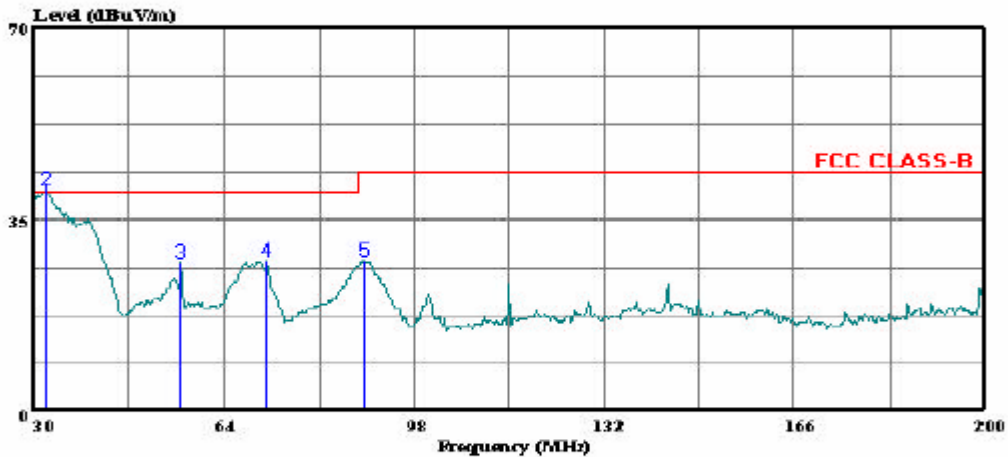
SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



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

Data#: 26 File#: 08U11902_10MHZ.EMI Date: 07-12-2008 Time: 12:44:50



Trace: 23 Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Chin Pang
Project #: : 08U11902
Company: : Motorola
Configuration: BUT with Antenna (6 FT DISH)
Mode : : Data TX/RX mode
Target: : FCC Class B
: 5MHz BW

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	32.380	47.99	-9.68	38.31	40.00	-1.69	QP
2 *	32.380	49.97	-9.68	40.29	40.00	0.29	Peak
3	56.180	47.03	-19.63	27.40	40.00	-12.60	Peak
4	71.480	46.64	-18.95	27.70	40.00	-12.30	Peak
5	88.990	46.60	-18.89	27.71	43.50	-15.79	Peak

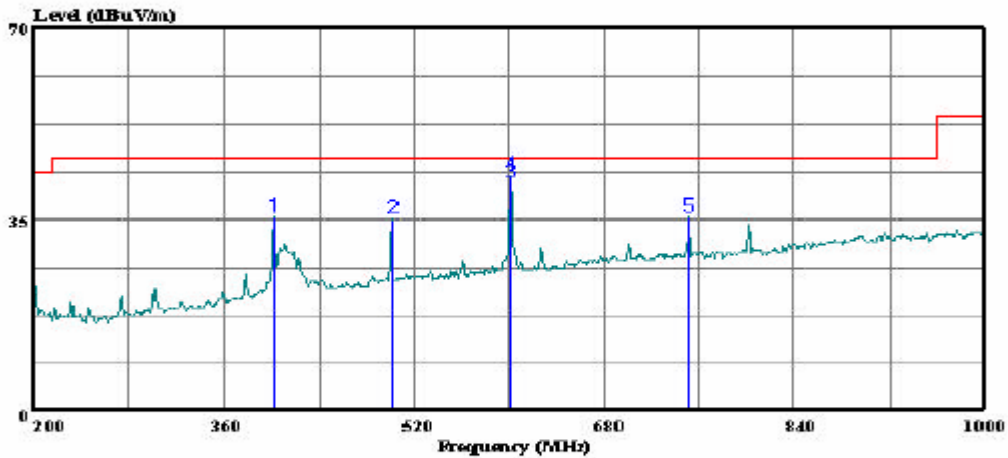
SPURIOUS EMISSIONS 230 TO 1000 MHz (WORST-CASE CONFIGURATION, VERTICAL)

VERTICAL PLOT



Compliance Certification Services
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Data#: 30 File#: 08U11902_10MHz.EMI Date: 07-12-2008 Time: 12:57:44



Trace: 27

Ref Trace:

Condition: FCC CLASS-B VERTICAL
Test Operator:: Chin Pang
Project #: : 08U11902
Company: : Motorola
Configuration: : EUT with Antenna (6 FT DISH)
Mode : : Data TX/RX mode
Target: : FCC Class B
: 5MHZ BW

VERTICAL DATA

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHZ	dBuV	dB	dBuV/m	dBuV/m	dB	
1	401.600	43.54	-8.20	35.34	46.00	-10.66	Peak
2	501.600	39.77	-4.71	35.06	46.00	-10.94	Peak
3	601.600	44.55	-2.79	41.76	46.00	-4.24	QP
4	601.600	45.91	-2.81	43.10	46.00	-2.90	Peak
5	751.200	35.16	0.17	35.33	46.00	-10.67	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

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.4.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

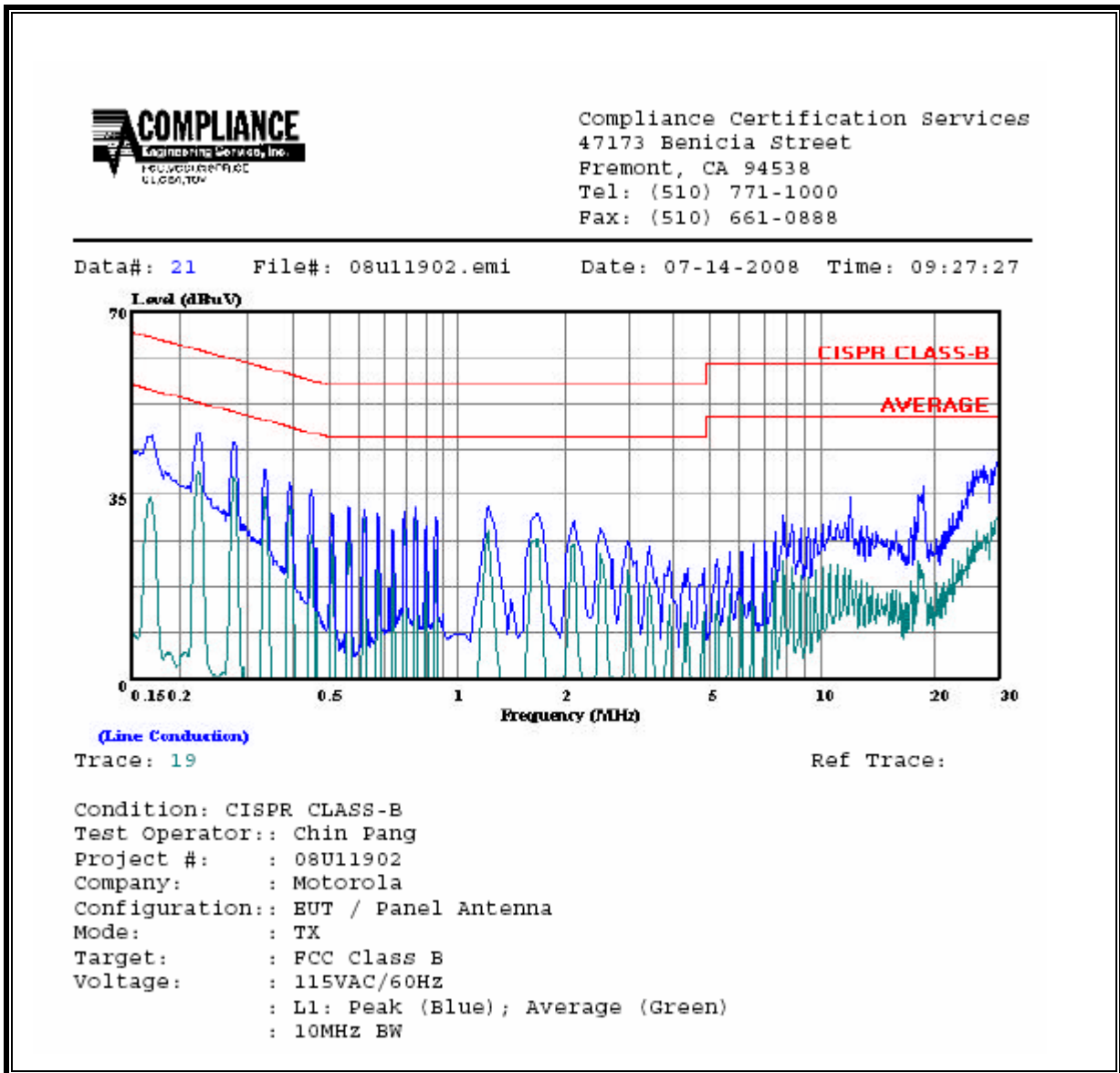
Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

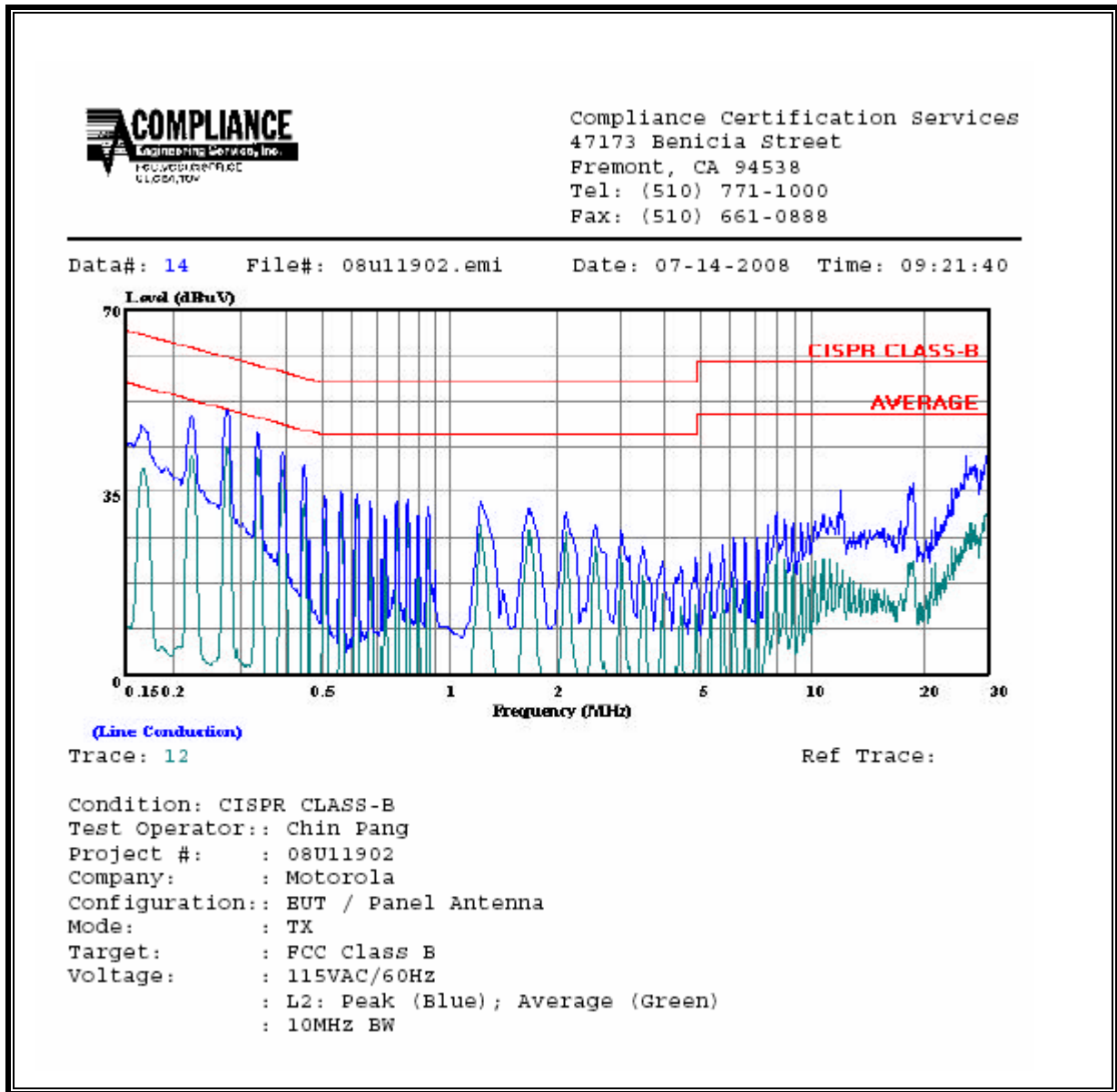
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq. (MHz)	Reading			Class (dB)	Limit QP	EN B AV	Margin		Remark L1 / L2
	PK (dBuV)	QP (dBuV)	AV (dBuV)				QP (dB)	AV (dB)	
0.23	47.12	--	39.21	0.00	62.60	52.60	-15.48	-13.39	L1
0.28	45.25	--	38.34	0.00	60.85	50.85	-15.60	-12.51	L1
29.68	42.85	--	32.43	0.00	60.00	50.00	-17.15	-17.57	L1
0.22	49.83	--	41.45	0.00	62.71	52.71	-12.88	-11.26	L2
0.28	50.64	--	43.10	0.00	60.85	50.85	-10.21	-7.75	L2
29.68	44.15	--	32.99	0.00	60.00	50.00	-15.85	-17.01	L2
6 Worst Data									

LINE 1 RESULTS



LINE 2 RESULTS



10. 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/ <i>f</i>	2.19/ <i>f</i>		6
10–30	28	2.19/ <i>f</i>		6
30–300	28	0.073	2*	6
300–1 500	1.585 <i>f</i> ^{0.5}	0.0042 <i>f</i> ^{0.5}	<i>f</i> /150	6
1 500–15 000	61.4	0.163	10	6
15 000–150 000	61.4	0.163	10	616 000 / <i>f</i> ^{1.2}
150 000–300 000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616 000 / <i>f</i> ^{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/m² is equivalent to 1 mW/cm².
 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/cm²

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/cm² is converted to units of W/m² by multiplying by a factor of 10.

LIMITS

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

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

RESULTS

Mode	Band	FCC Limit (mW/cm ²)	IC Limit (W/m ²)	Output Power (dBm)	Antenna Gain (dBi)	MPE Distance (cm)
5MHz BW	5.8 GHz	1.0	10.0	27.19	33.90	319.7
10MHz BW	5.8 GHz	1.0	10.0	26.83	33.90	306.7
5MHz BW	5.8 GHz	1.0	10.0	27.19	23.00	91.1
10MHz BW	5.8 GHz	1.0	10.0	26.83	23.00	87.4