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INDUSTRY CANADA RSS-210 ISSUE 7**

CERTIFICATION TEST REPORT

FOR

POINT TO POINT WIRELESS BRIDGE

**TYPE NUMBER: PTP54600
MODEL NUMBERS: 5530BH, 5530BH15**

**FCC ID: QWP54100
IC: 109AO-54100**

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Prepared for

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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

TYPE NUMBER: PTP54600
MODELS: 5530BH, 5530BH15

SERIAL NUMBER, RF: 0004568050E0
S/N, DFS MASTER: 00045680503C
S/N, DFS SLAVE: 000456804C5D

DATE TESTED: SEPTEMBER 14-23, 2008

APPLICABLE STANDARDS	
STANDARD	TEST RESULTS
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 7 Annex 9	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:



MICHAEL HECKROTTE
DIRECTOR OF ENGINEERING
COMPLIANCE CERTIFICATION SERVICES

CHIN PANG
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, FCC 06-96, 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 PTP54600 is a 5.4 GHz band wireless Ethernet bridge.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
DISH Antenna 5MHz BW			
5474-5720	BPSK	-9.00	0.13
DISH Antenna 10MHz BW			
5476-5718	BPSK	-7.51	0.18
DISH Antenna 15MHz BW			
5480-5714	BPSK	-6.15	0.24
PANEL Antenna 5MHz BW			
5474-5720	BPSK	-0.95	0.80
PANEL Antenna 10MHz BW			
5476-5718	BPSK	3.10	2.04
PANEL Antenna 15MHz BW			
5480-5714	BPSK	3.99	2.51

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes Dish or Panel antennas, with a maximum assembly gain of 32.3 dBi for Dish antennas in the 5 MHz bandwidth, 33.9 dBi for Dish antennas in the 10 or 15 MHz bandwidths, and 23dBi gain for panel antenna in all bandwidths. The minimum gain of any antenna is 23 dBi.

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.

From the results of these measurements it was determined that BPSK modulation was the worst-case.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST			
Description	Manufacturer	Model	Serial Number
PIDU PLUS	Motorola	PTP 500/600	819186560
PIDU PLUS	Motorola	PTP 600	721131990
Wireless Ethernet Bridge	Motorola	PTP54600	000456804FDE
Laptop	Acer	ZL8	LXA860518154004044EM00
AC Adapter	Delta Electronic	SADP65KBD	9JW0538080402
Directional Coupler	Krytar	1817	131

I/O CABLES

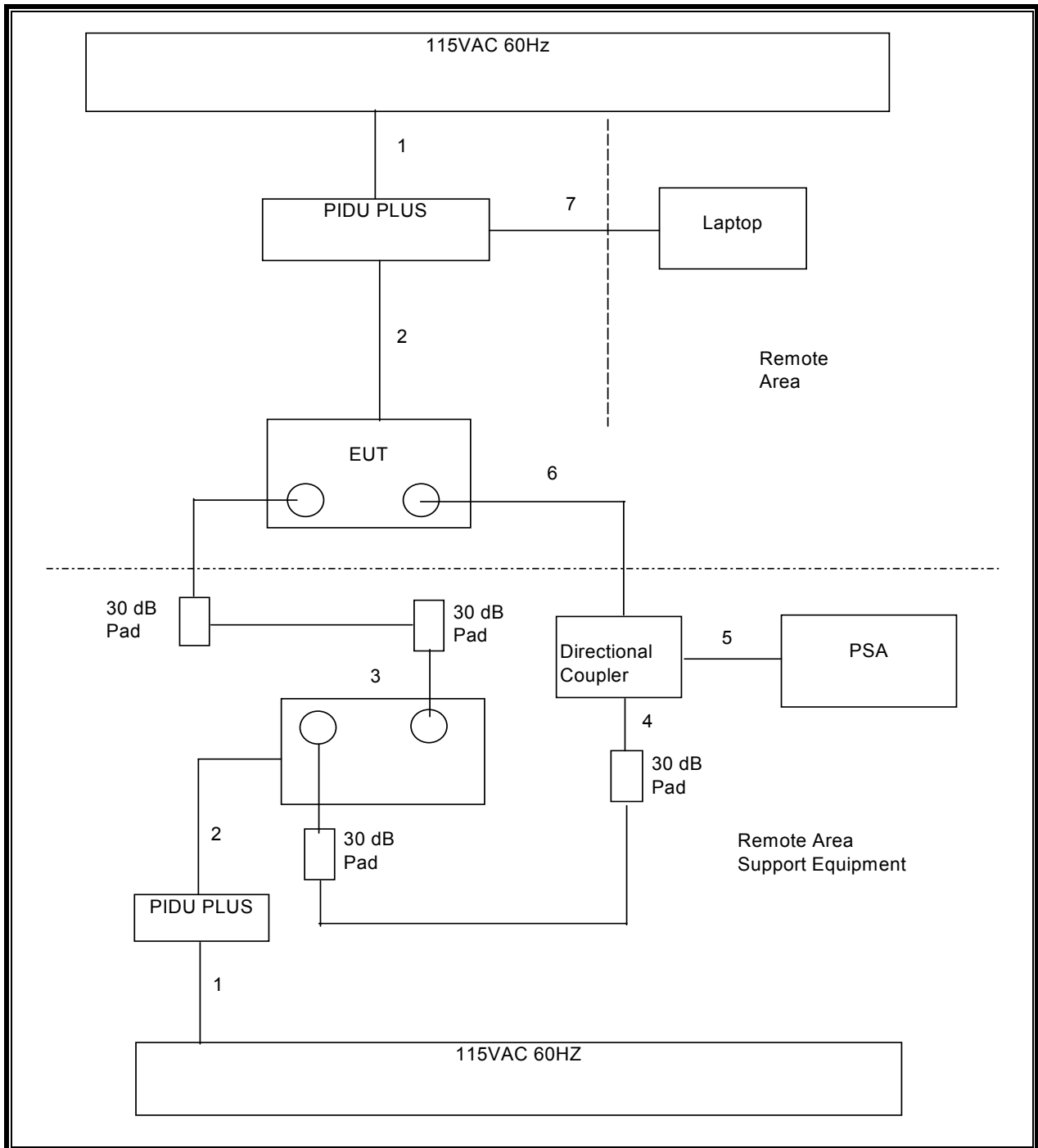
I/O CABLES

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 Due
Antenna, Bilog, 2 GHz	Sundt Sciences	JB1	C01011	9/28/2008
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	10/27/2008
Antenna, Horn, 18 GHz	EMCO	3115	C00872	4/22/2009
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C01069	10/8/2009
Power Meter	Agilent / HP	437B	N02778	10/18/2008
Power Sensor	Agilent / HP	8481A	2783	11/2/2009
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	3/31/2009
Antenna, Horn, 26.5 GHz	ARA	MMH-1826/B	C00980	9/29/2008
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	10/11/2008
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	8/6/2009
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	10/25/2008

7. ANTENNA PORT TEST RESULTS

7.1. 5MHz BANDWIDTH

7.1.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

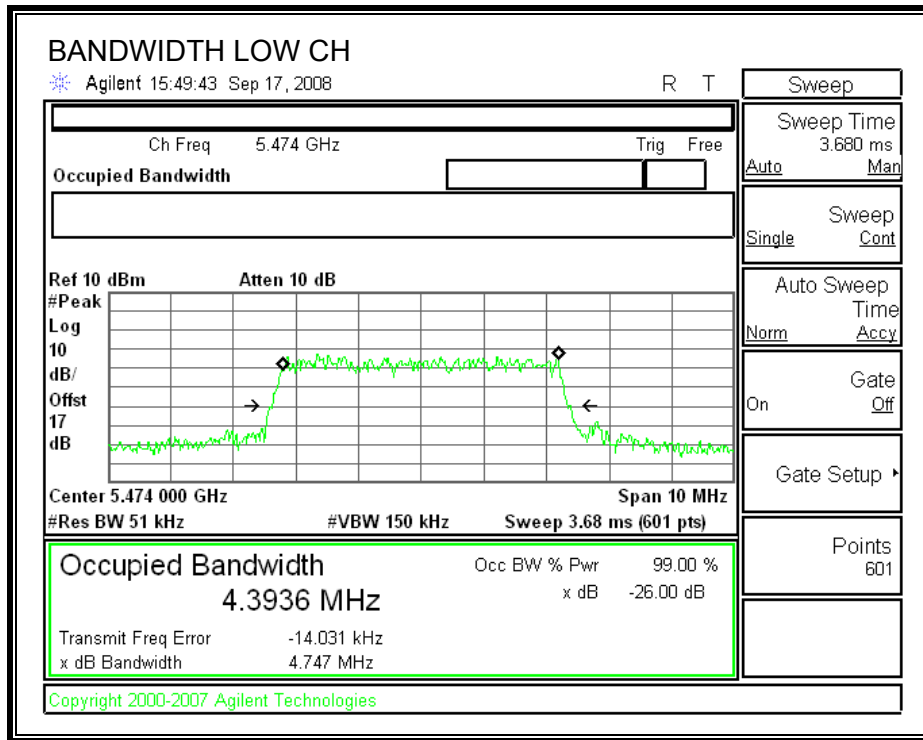
TEST PROCEDURE

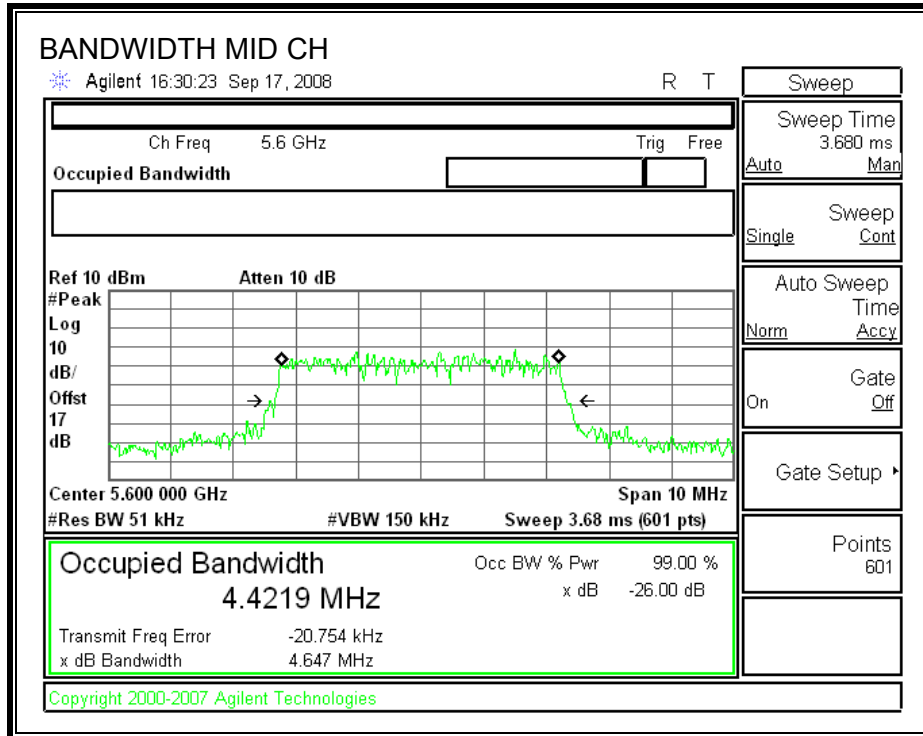
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

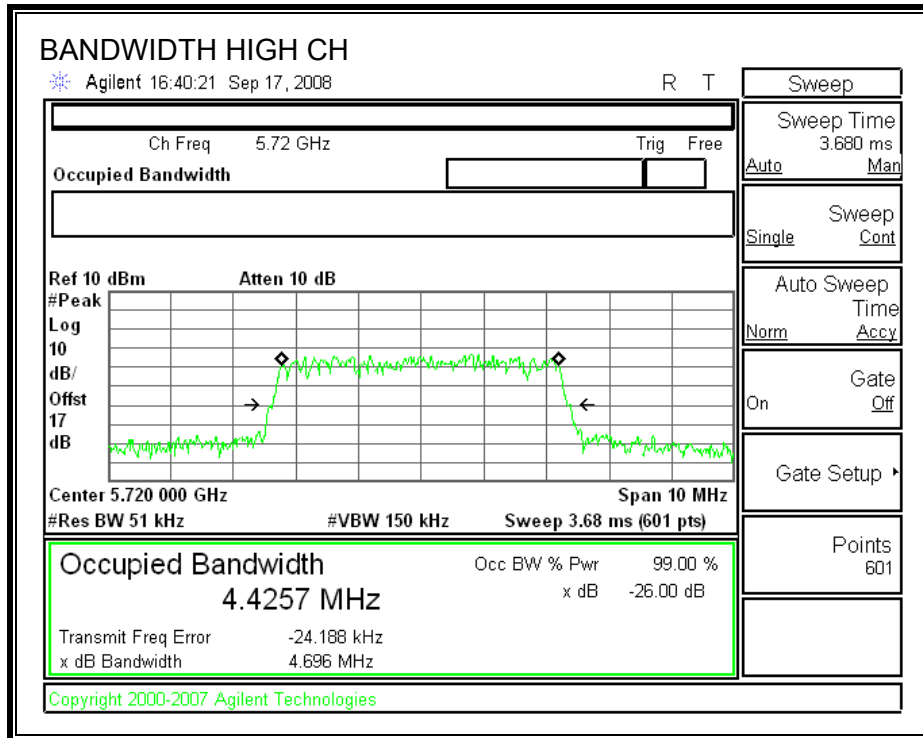
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5474	4.747	4.3936
Middle	5600	4.647	4.4219
High	5720	4.696	4.4257

26 dB and 99% BANDWIDTH







7.1.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with method 1 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

Dish Antenna, Port H and V

Limit

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5474	24	5	17.99	32.30	-8.31
Mid	5600	24	5	17.99	32.30	-8.31
High	5720	24	5	17.99	32.30	-8.31

Individual Chain Results

Channel	Frequency (MHz)	Port V Power (dBm)	Port H Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5474	-12.30	-12.40	-9.34	-8.31	-1.03
Mid	5600	-11.83	-12.19	-9.00	-8.31	-0.69
High	5720	-11.74	-12.39	-9.04	-8.31	-0.73

Panel Antenna, Port H and V

Limit

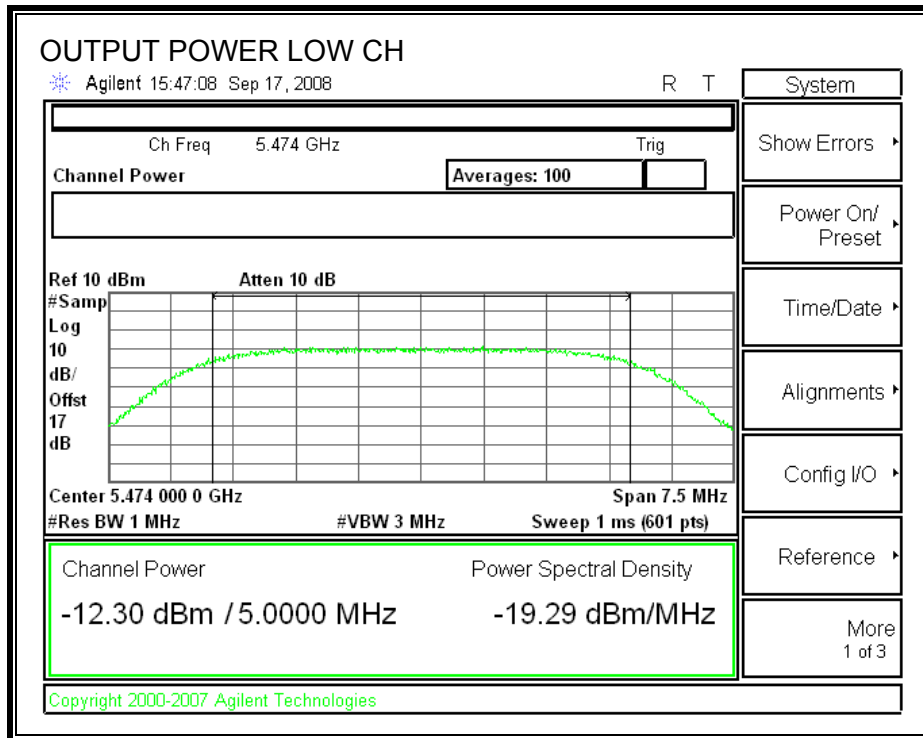
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5474	24	5	17.99	23.00	0.99
Mid	5600	24	5	17.99	23.00	0.99
High	5720	24	5	17.99	23.00	0.99

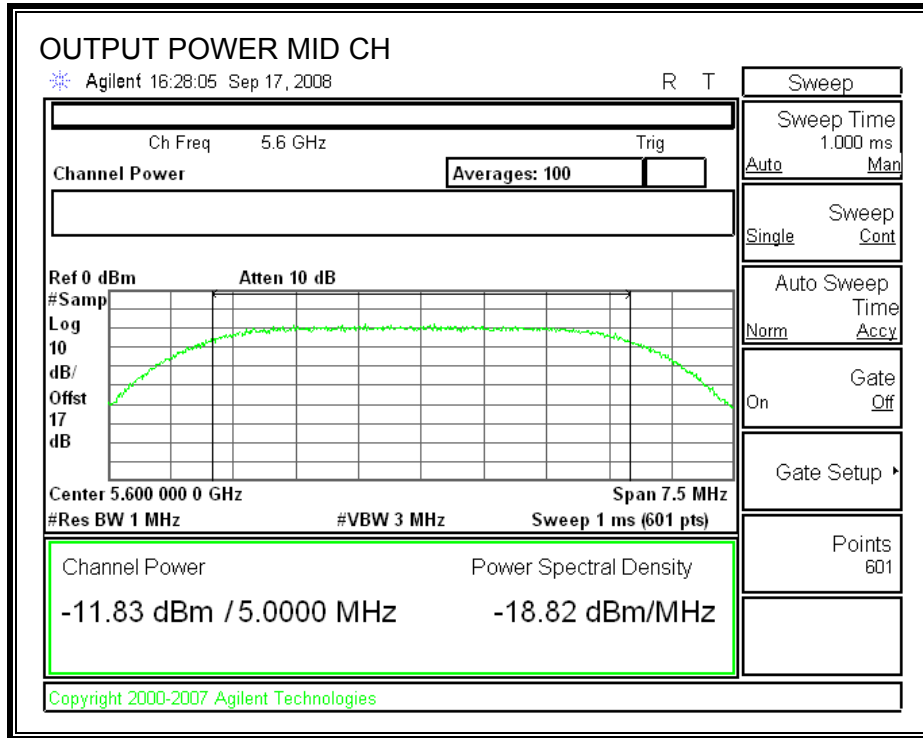
Individual Chain Results

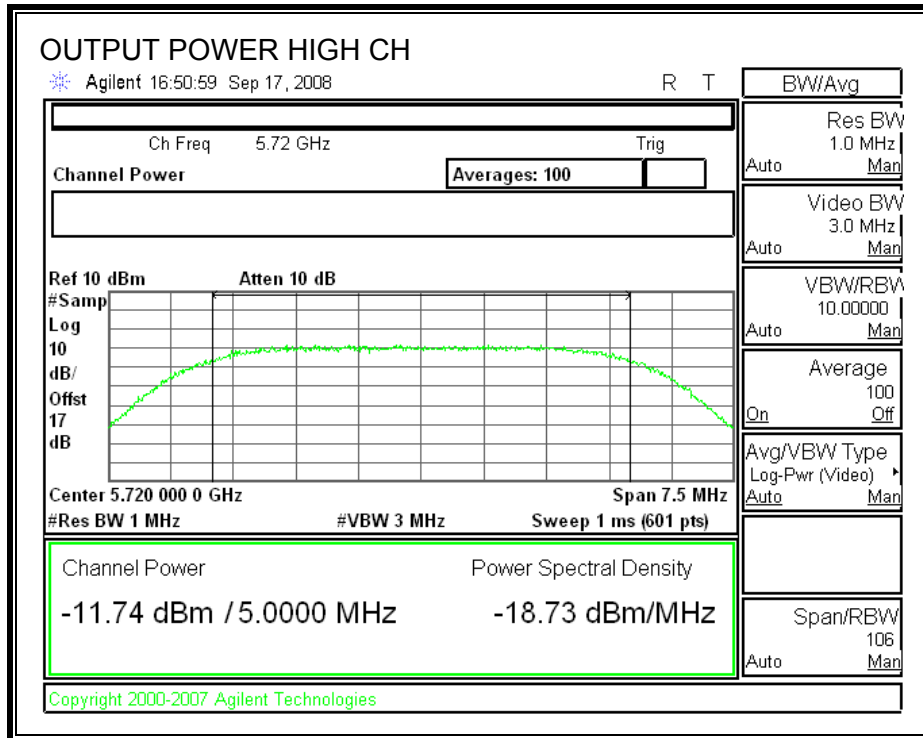
Channel	Frequency (MHz)	Port V Power (dBm)	Port H Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5474	-3.77	-4.28	-1.01	0.99	-2.00
Mid	5600	-4.03	-4.06	-1.03	0.99	-2.02
High	5720	-3.72	-4.22	-0.95	0.99	-1.94

DISH ANTENNA

Port V OUTPUT POWER

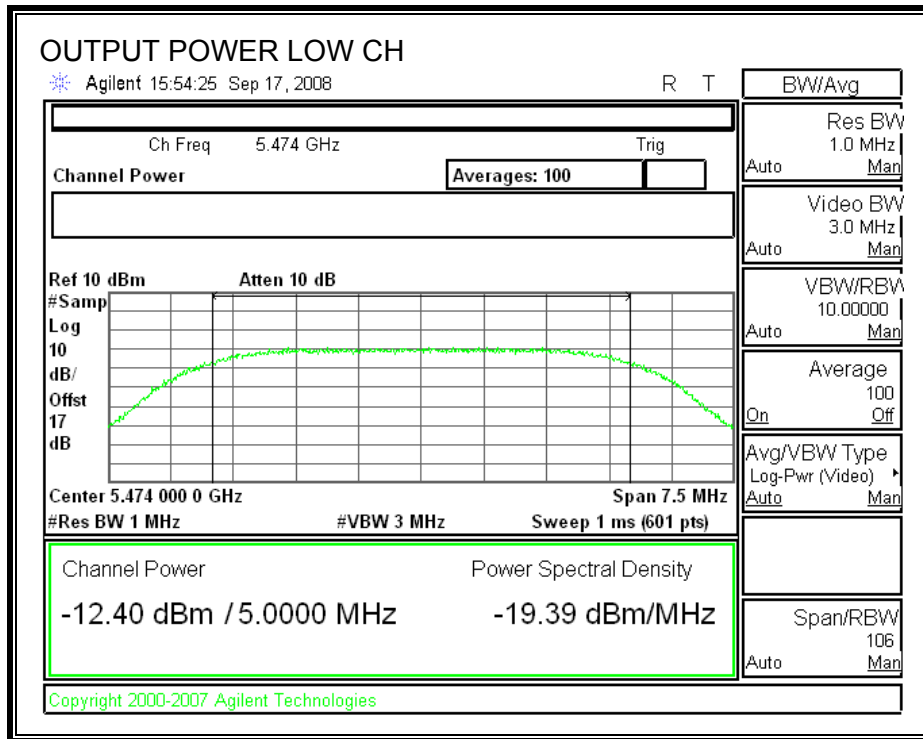


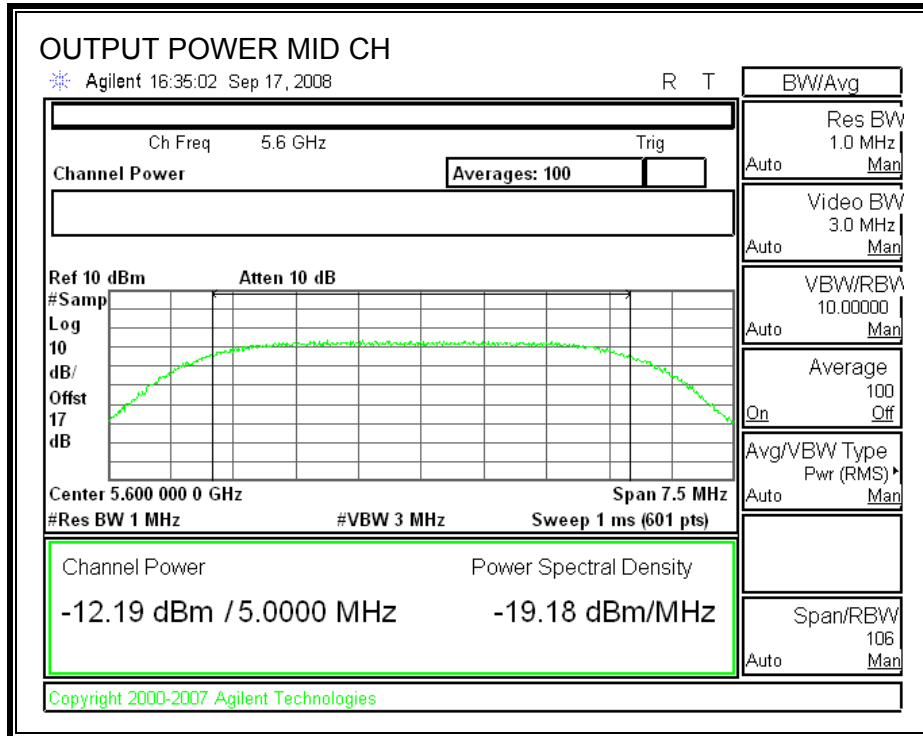


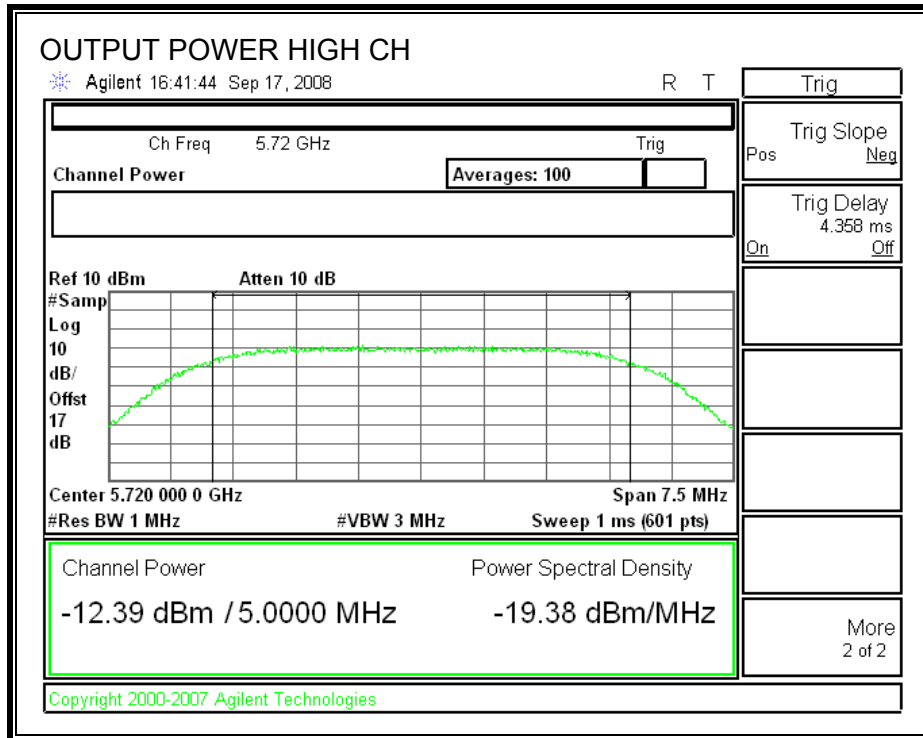


DISH ANTENNA

PORT H OUTPUT POWER

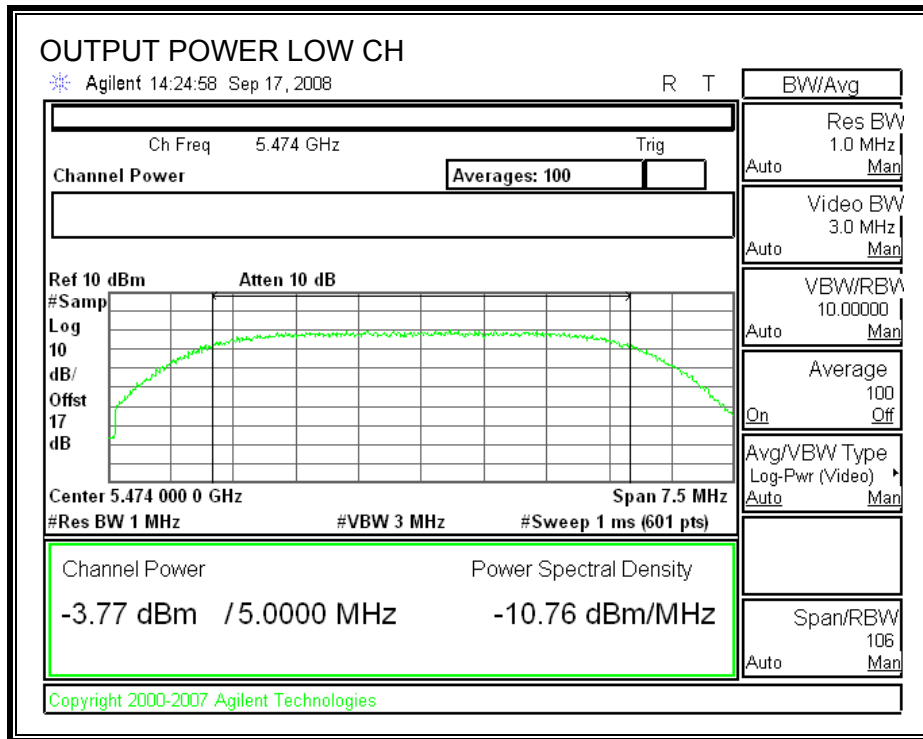


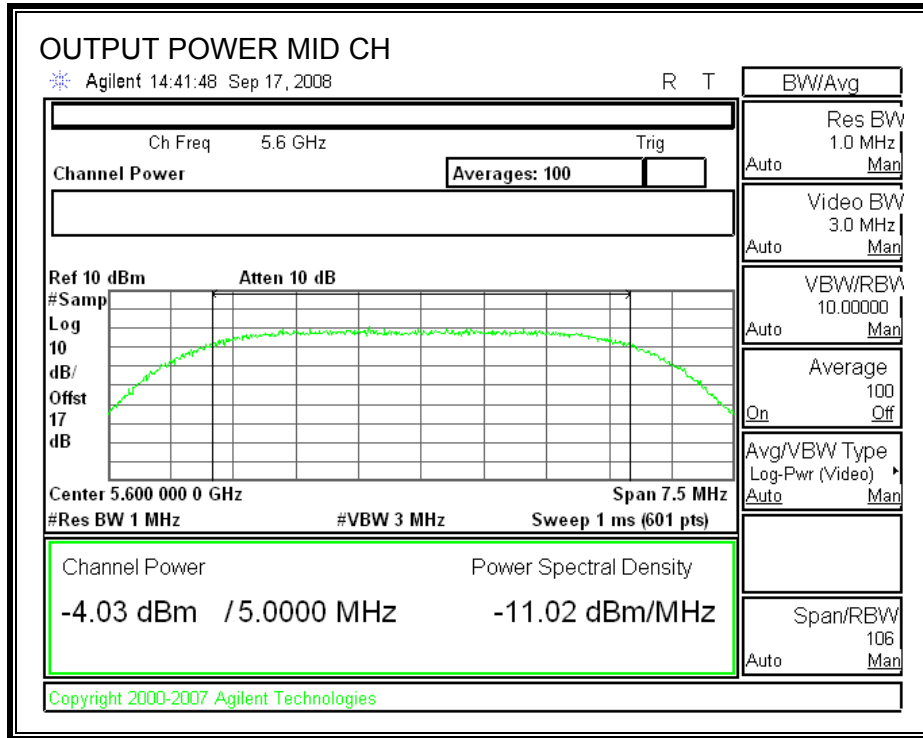


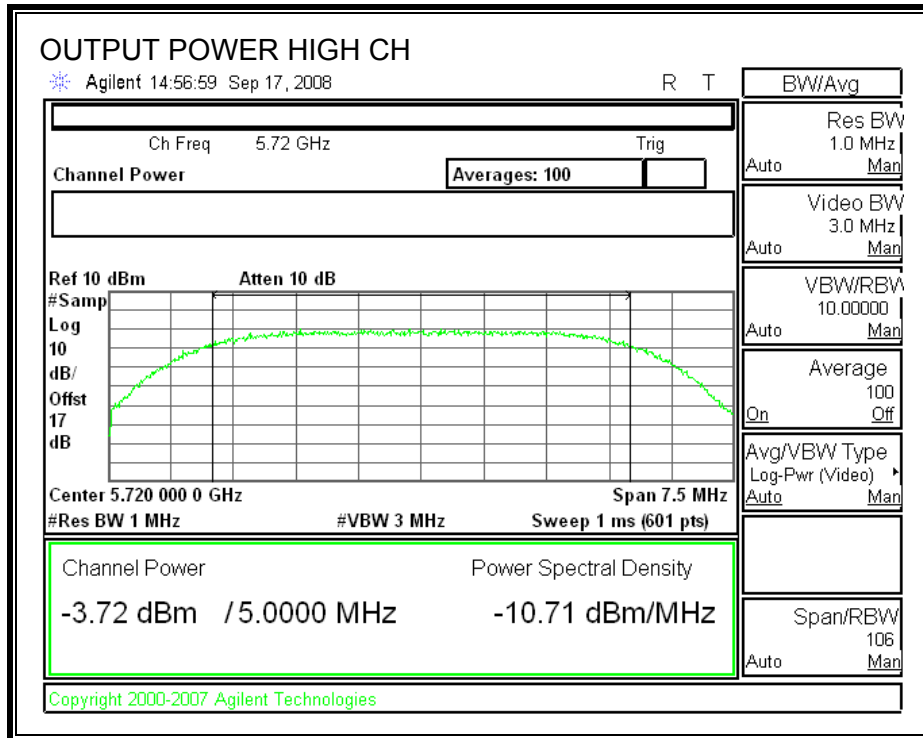


PANEL ANTENNA

Port V, OUTPUT POWER

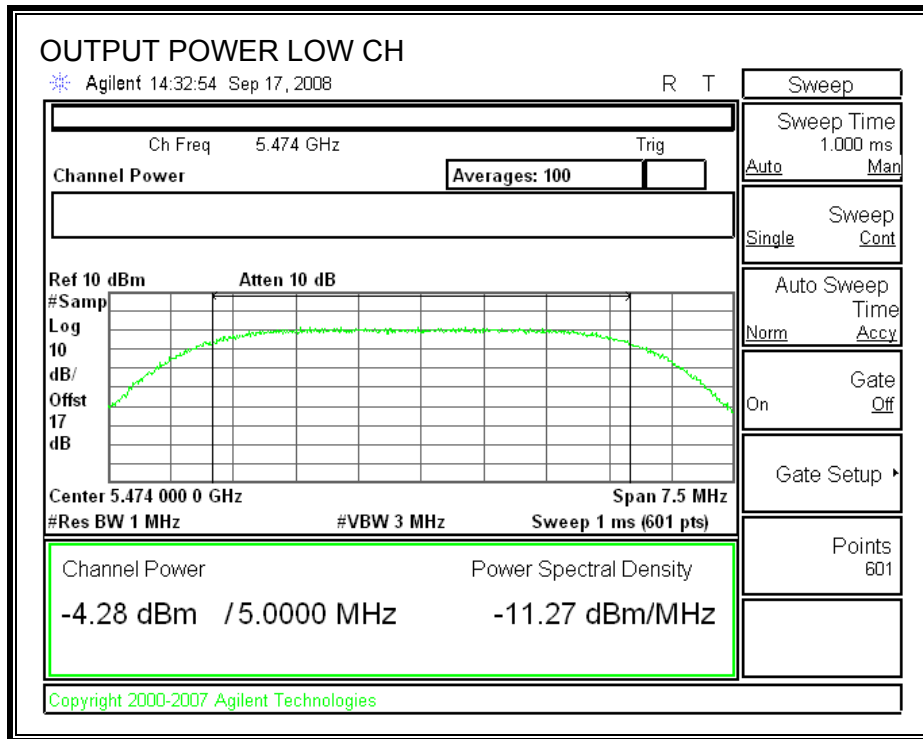


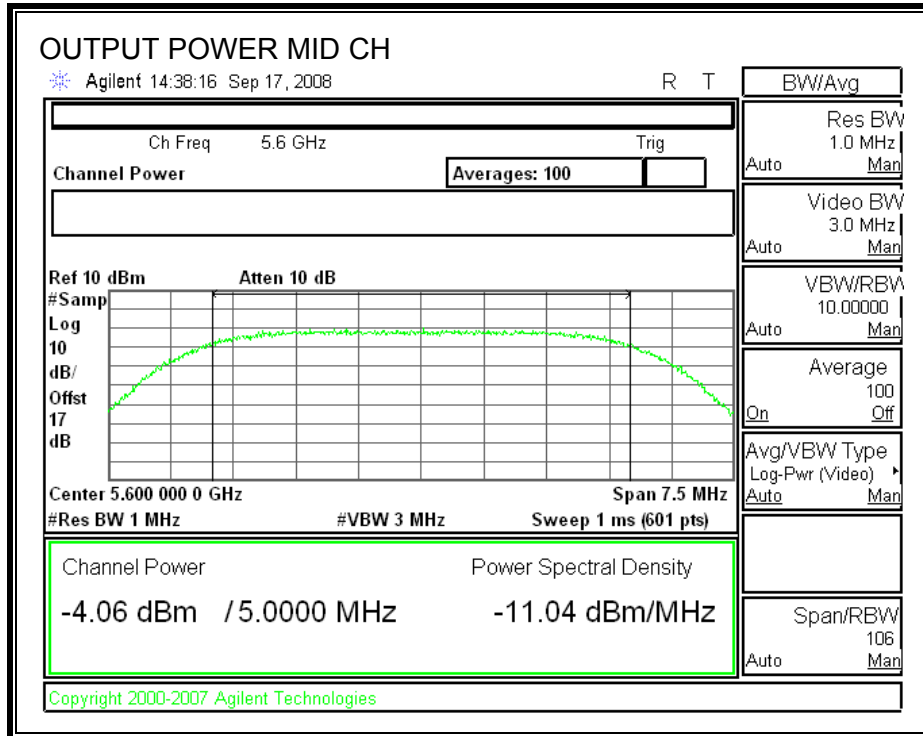


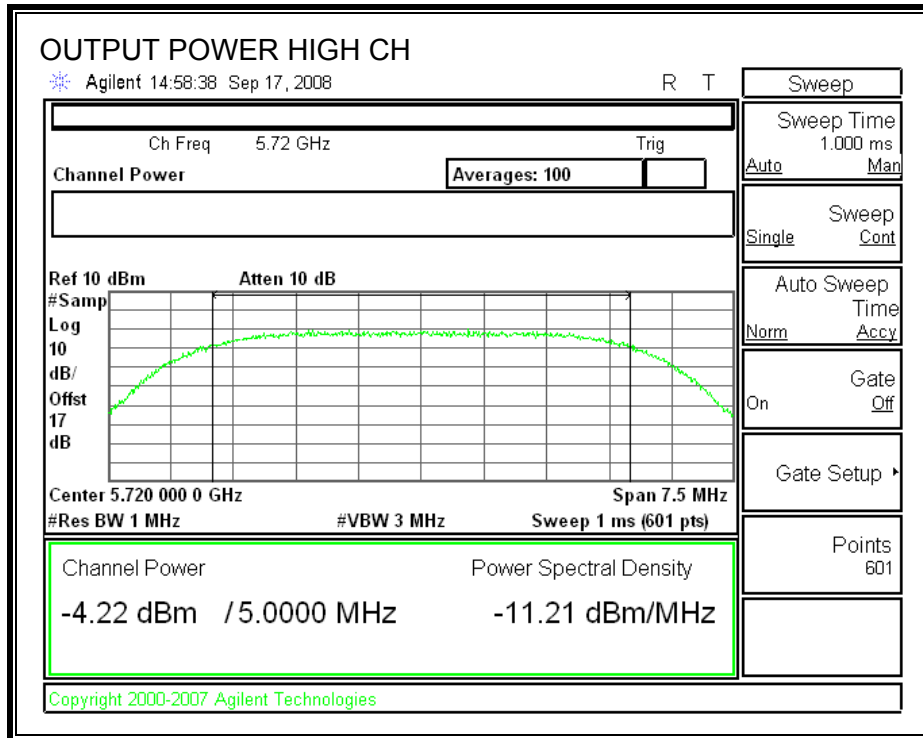


PANEL ANTENNA

PORT H OUTPUT POWER







7.1.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17dB (including 16 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

DISH ANTENNA

Channel	Frequency (MHz)	Power (dBm)
Low	5474	-13.10
Middle	5600	-12.80
High	5720	-13.00

PANEL ANTENNA

Channel	Frequency (MHz)	Power (dBm)
Low	5474	-4.70
Middle	5600	-4.27
High	5720	-4.68

7.1.4. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain for Dish Antenna is 32.3 dBi, therefore the limit is -15.3 dBm.

The maximum antenna gain for Panelk Antenna is 23 dBi, therefore the limit is -6 dBm.

TEST PROCEDURE

The test is performed in accordance with PPSD method#2 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

DISH Antenna

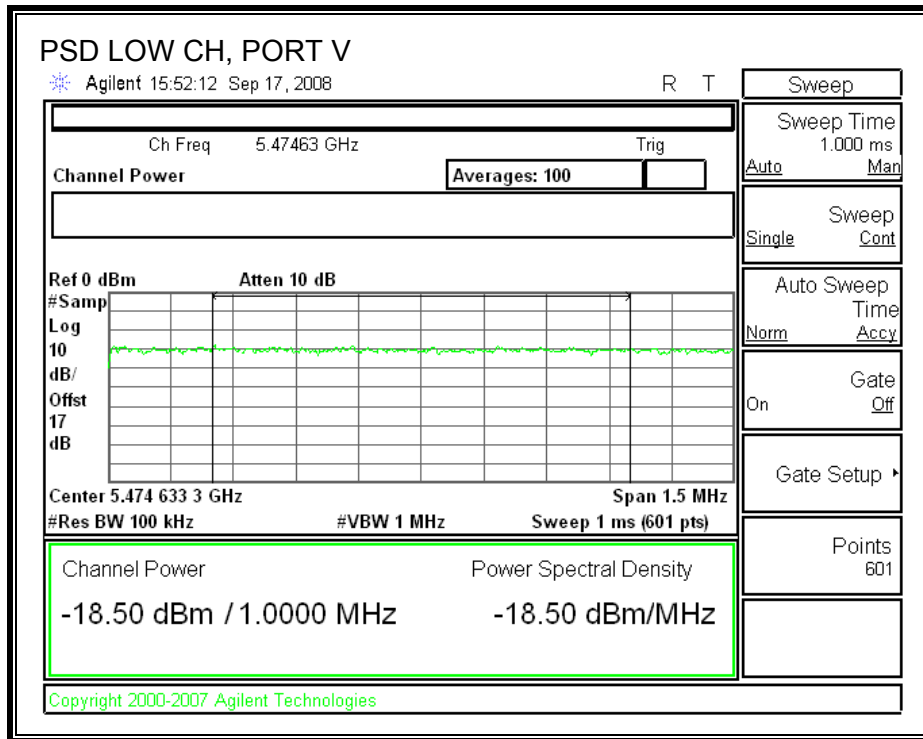
Channel	Frequency (MHz)	Port V PPSD (dBm)	Port H PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5474	-18.50	-18.67	-15.57	-15.3	-0.27
Middle	5600	-18.35	-18.55	-15.44	-15.3	-0.14
High	5720	-18.02	-18.69	-15.33	-15.3	-0.03

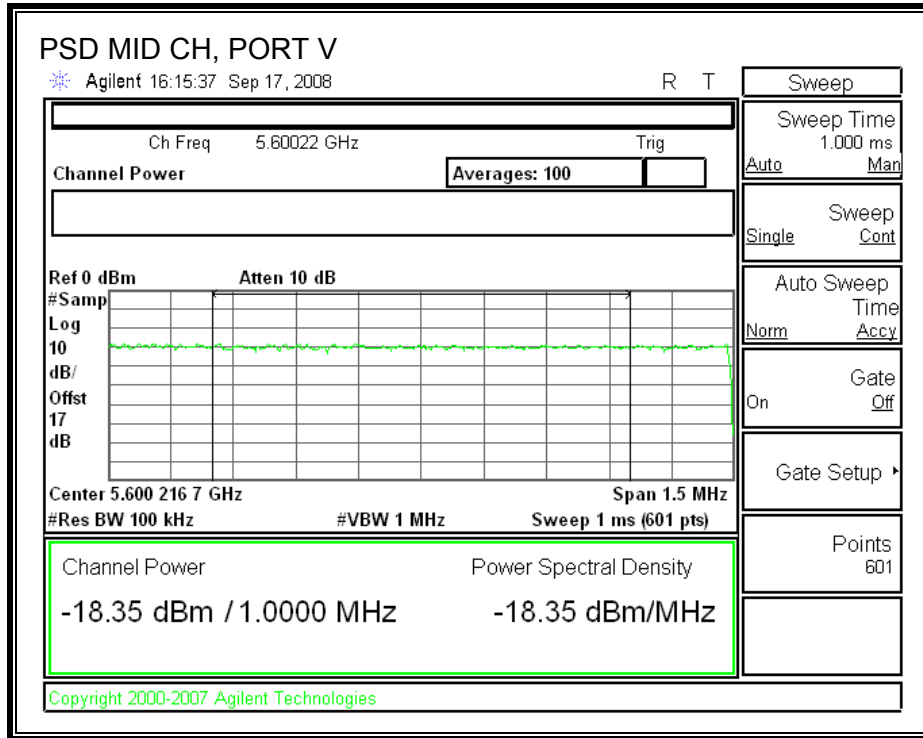
Panel Antenna

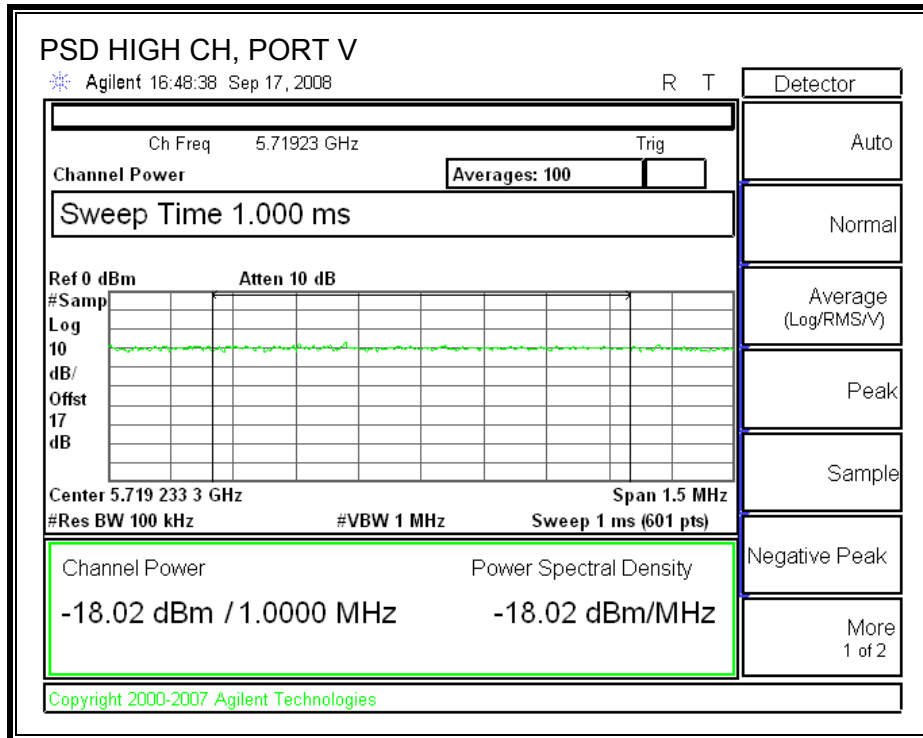
Channel	Frequency (MHz)	Port V PPSD (dBm)	Port H PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5474	-9.95	-10.5	-7.21	-6	-1.21
Middle	5600	-10.28	-10.31	-7.28	-6	-1.28
High	5720	-10.12	-10.42	-7.26	-6	-1.26

DISH ANTENNA

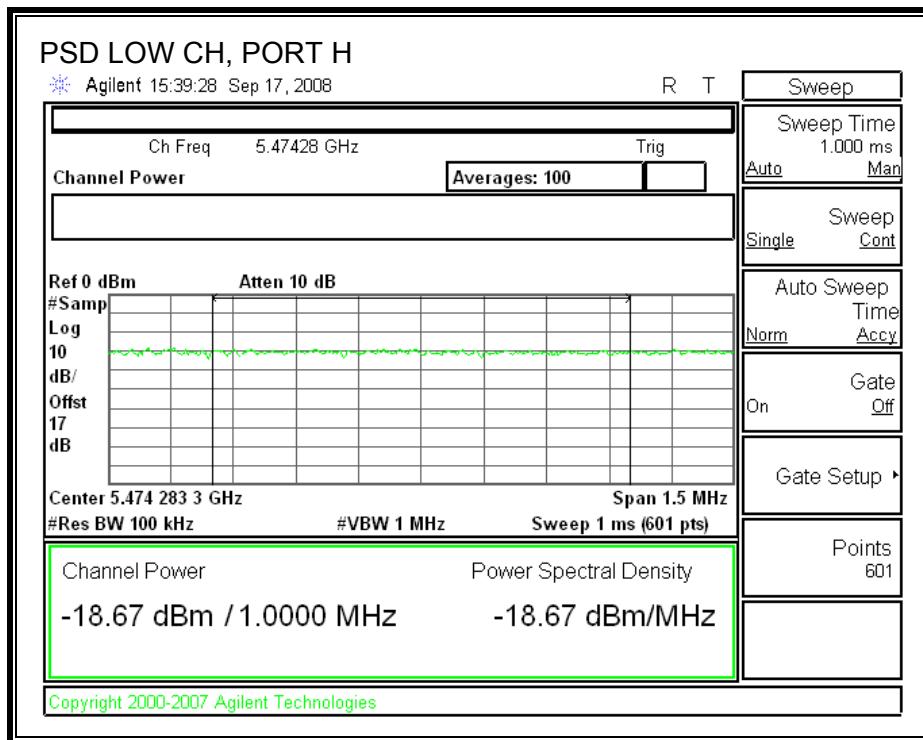
PORT V POWER SPECTRAL DENSITY

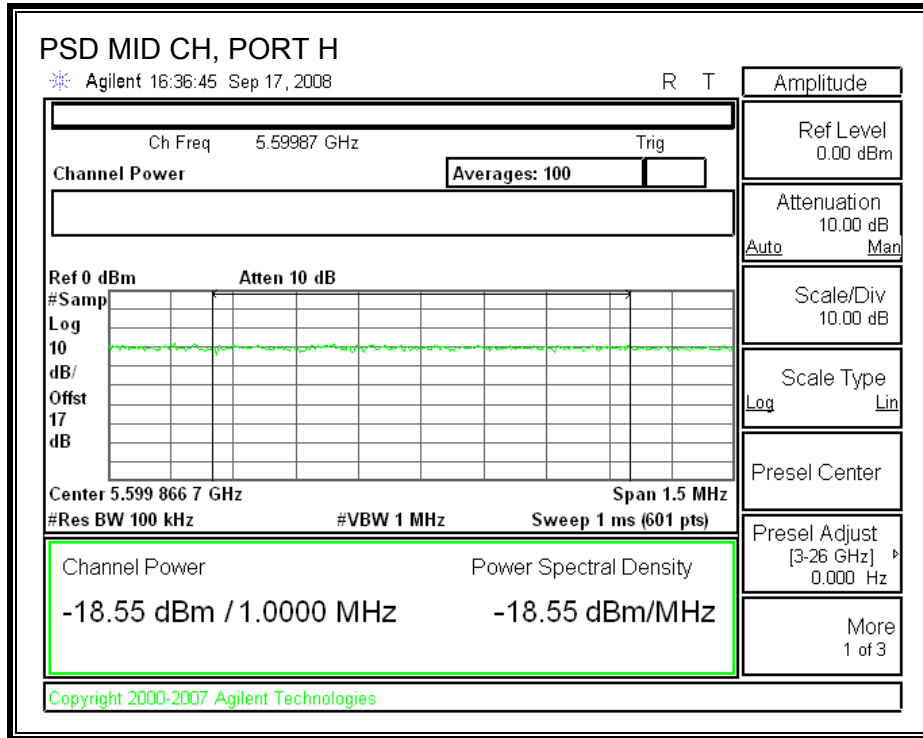


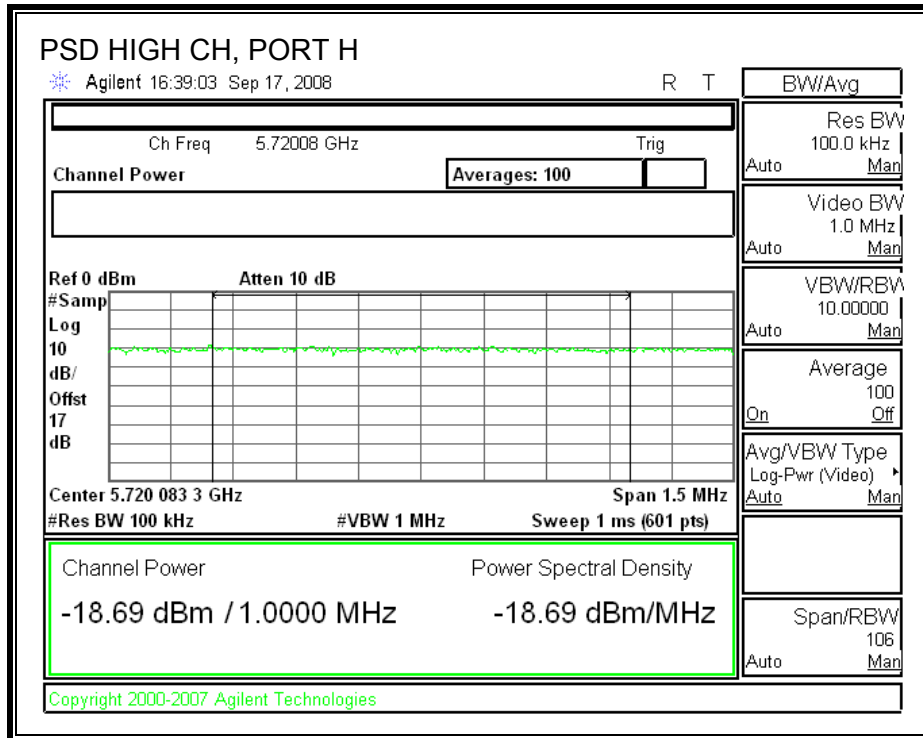




PORT H POWER SPECTRAL DENSITY

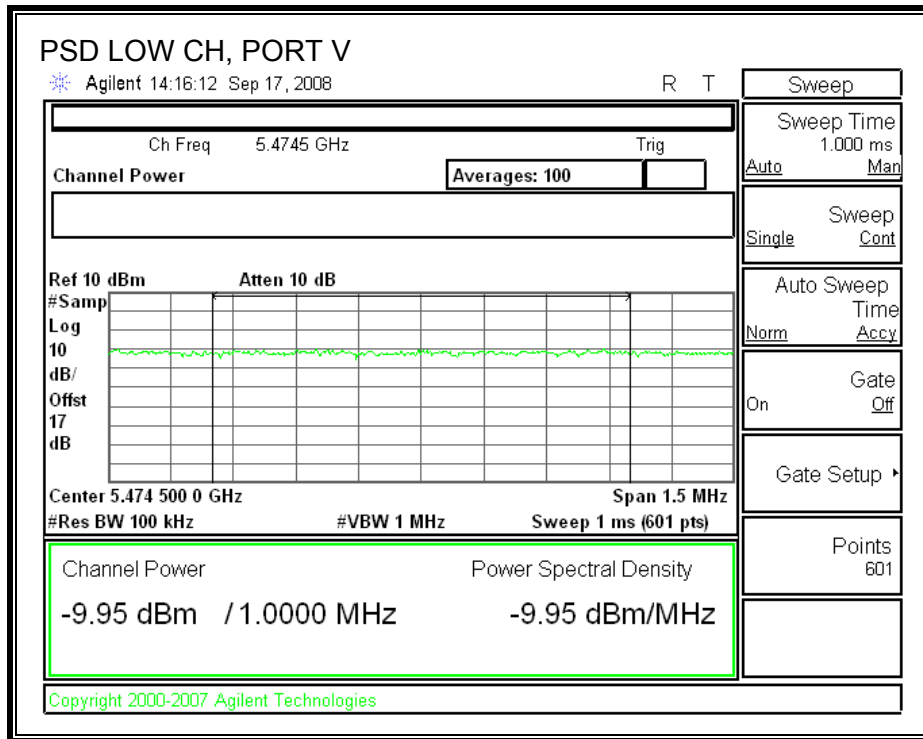


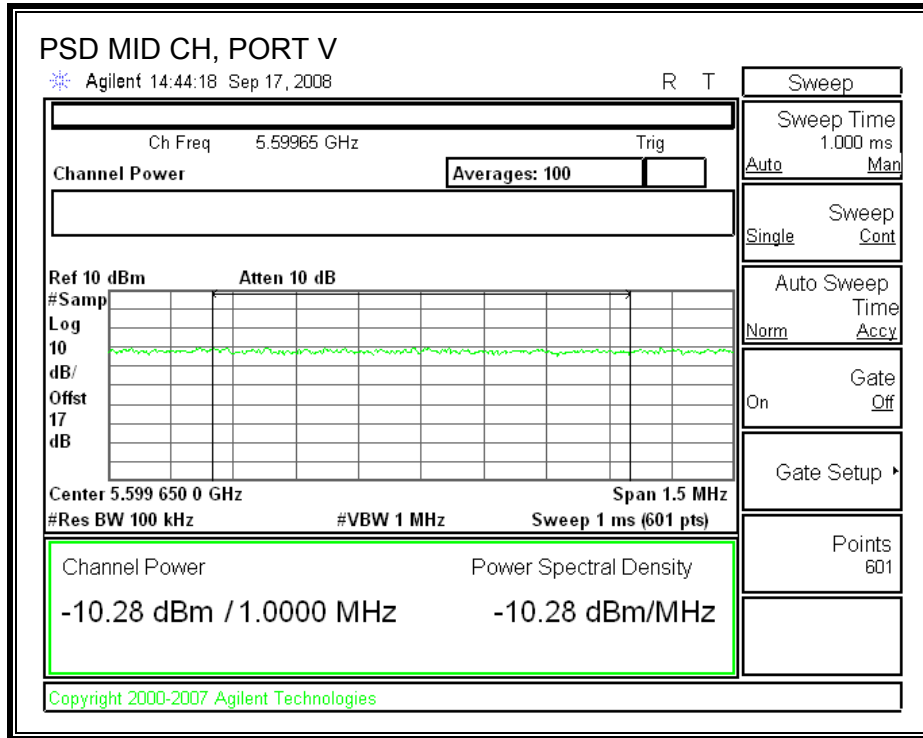


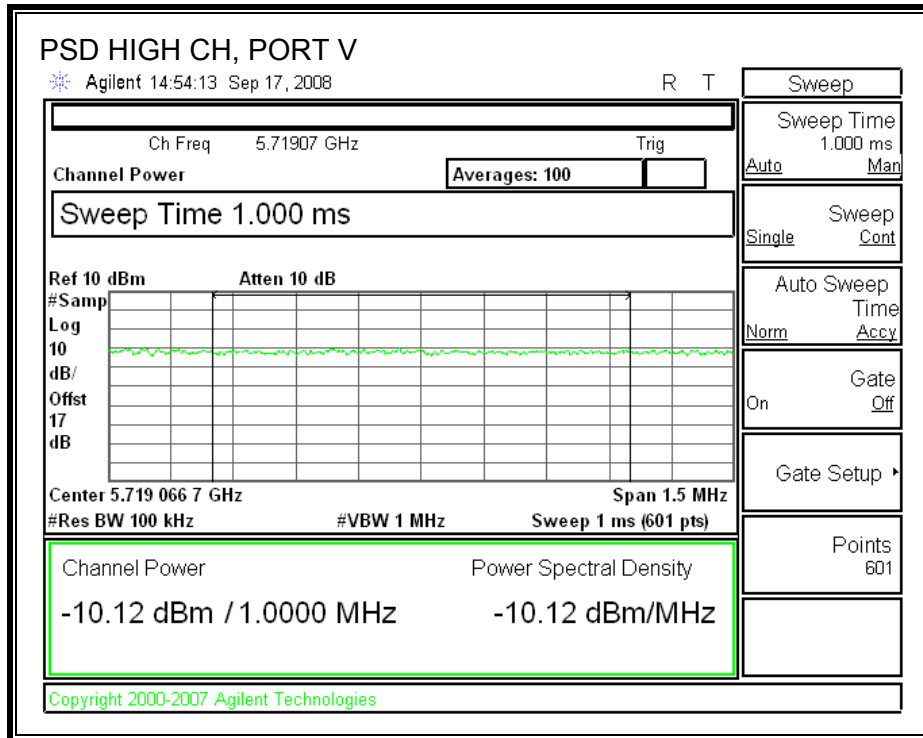


PANEL ANTENNA

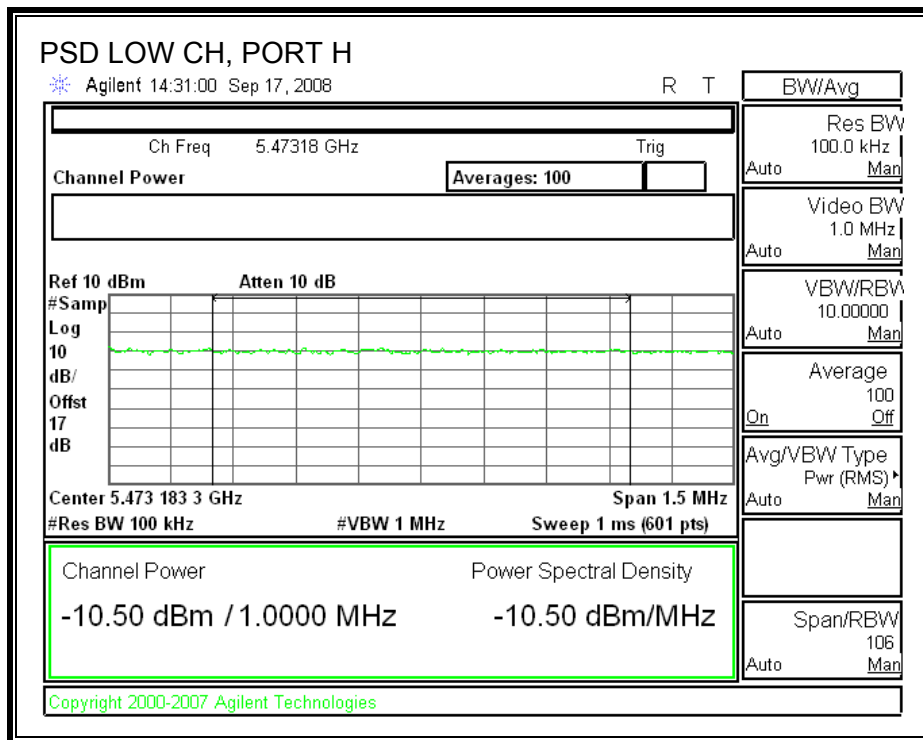
PORT V POWER SPECTRAL DENSITY

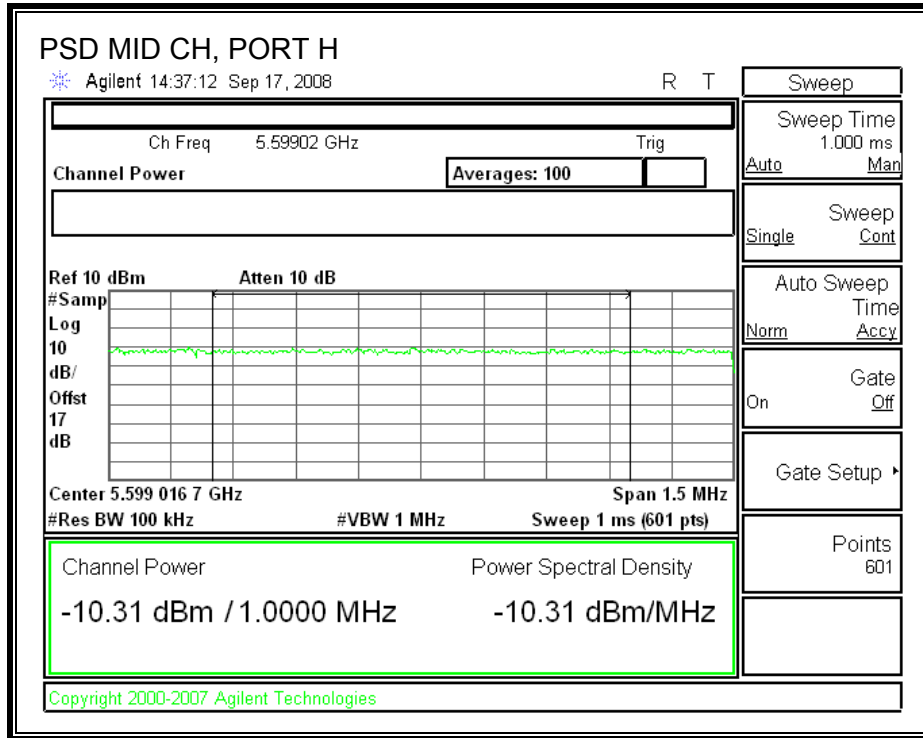


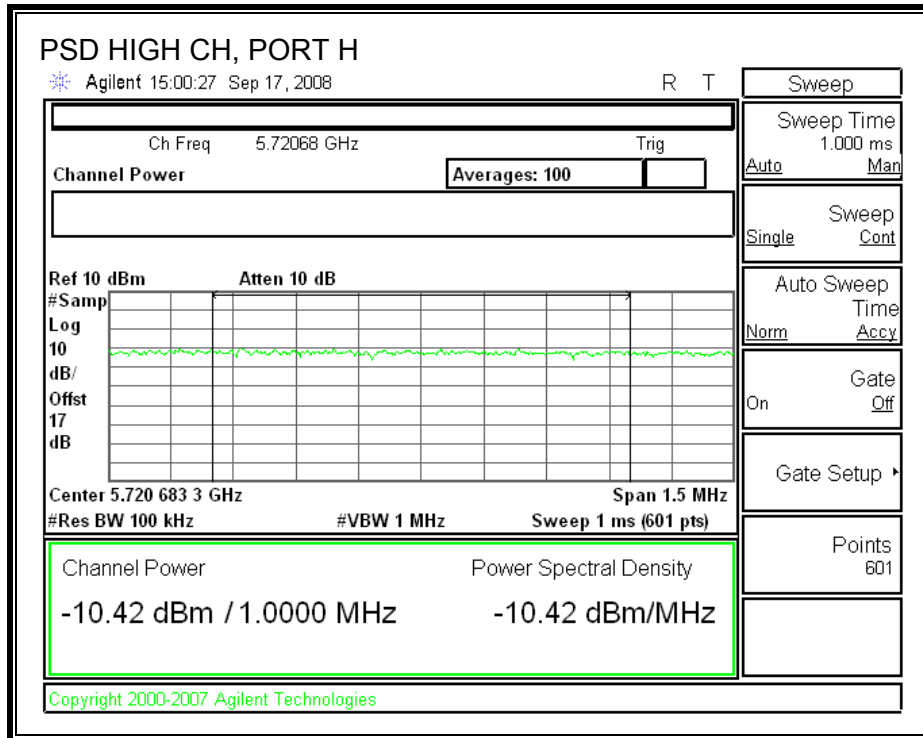




PORT H POWER SPECTRAL DENSITY







7.1.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

DISH ANTENNA

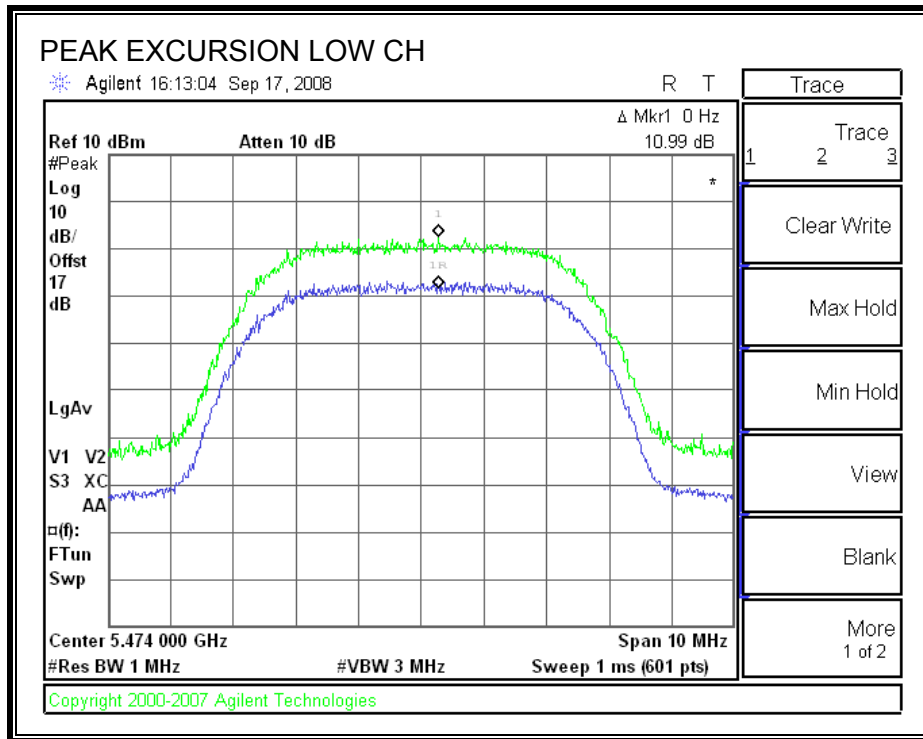
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5474	10.99	13	-2.01
Middle	5600	11.69	13	-1.31
High	5720	12.24	13	-0.76

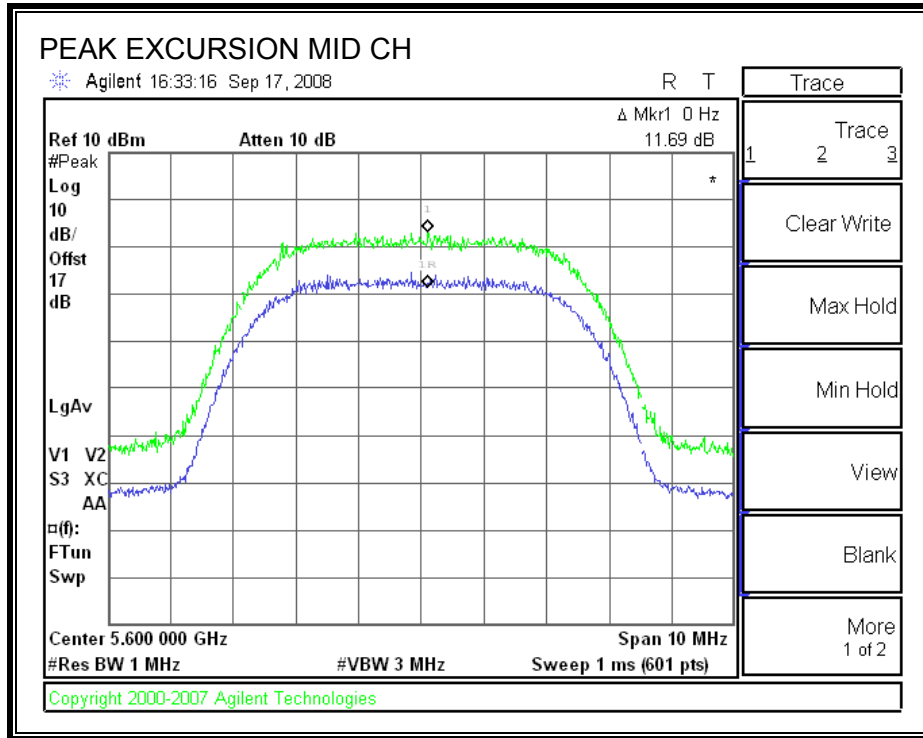
PANEL ANTENNA

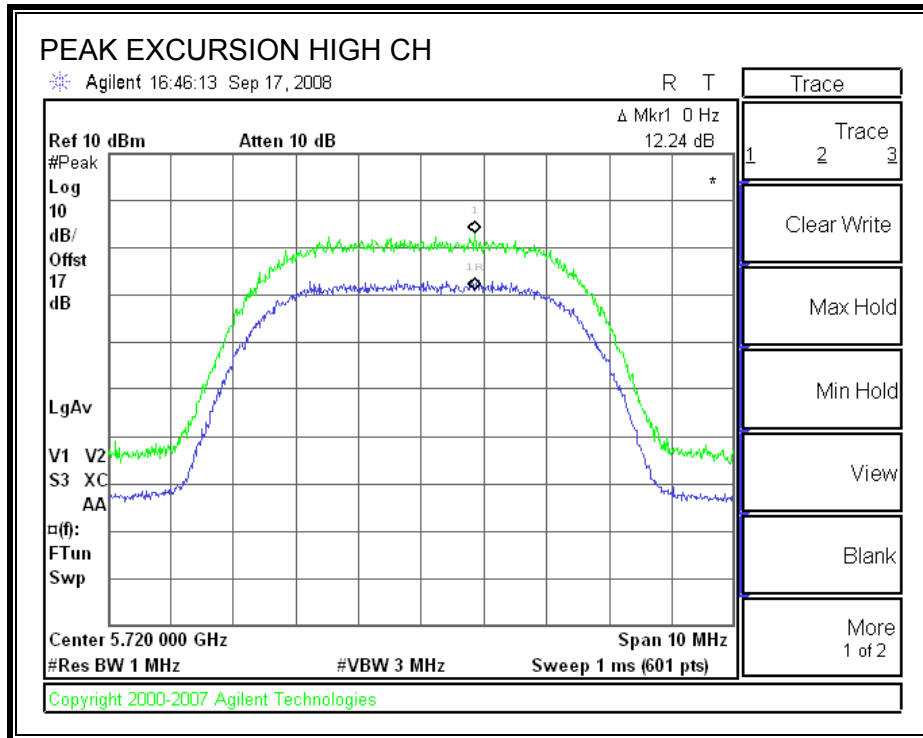
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5474	9.83	13	-3.17
Middle	5600	10.46	13	-2.54
High	5720	9.85	13	-3.15

DISH ANTENNA

PEAK EXCURSION

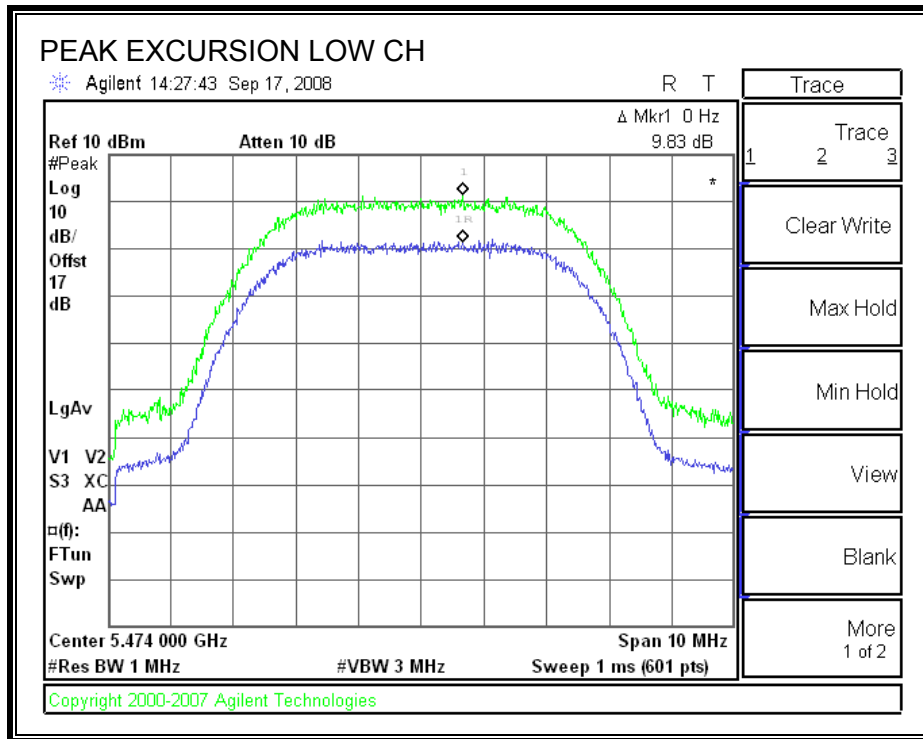


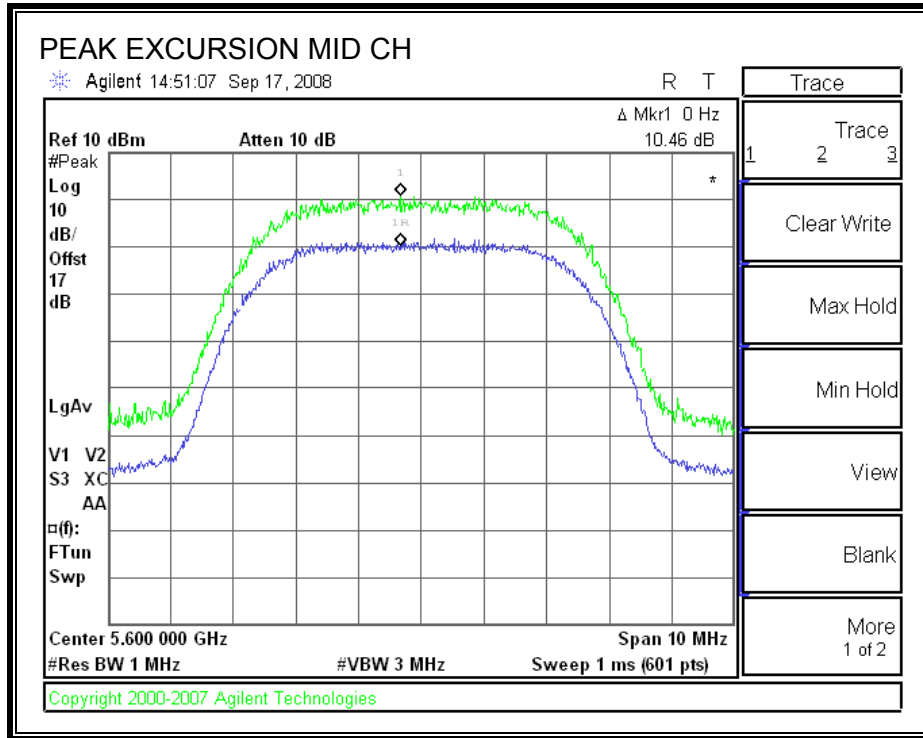




PANEL ANTENNA

PEAK EXCURSION





7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

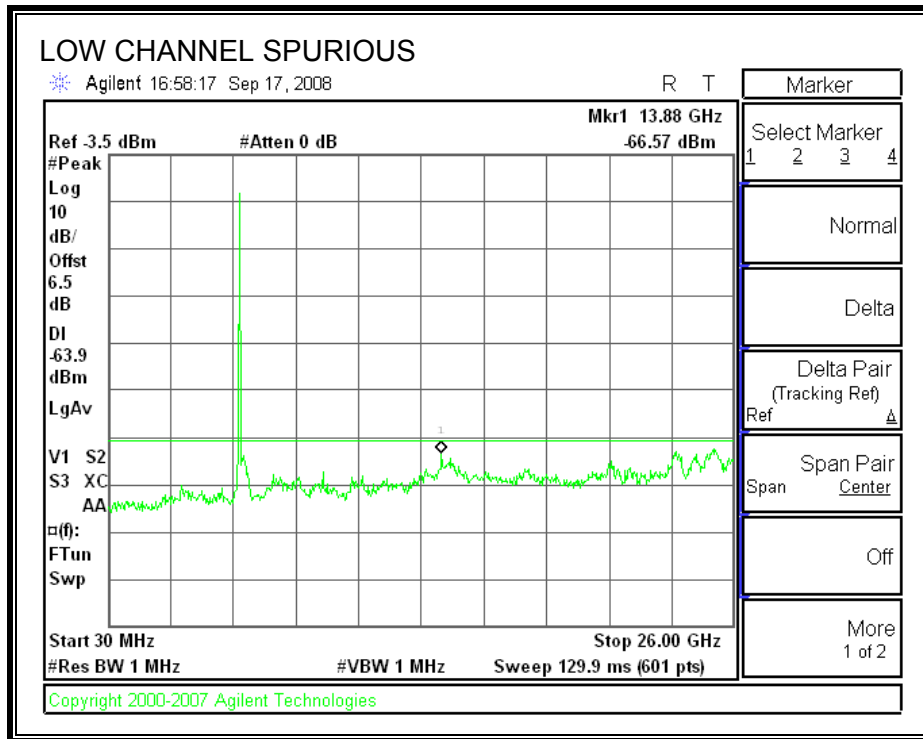
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

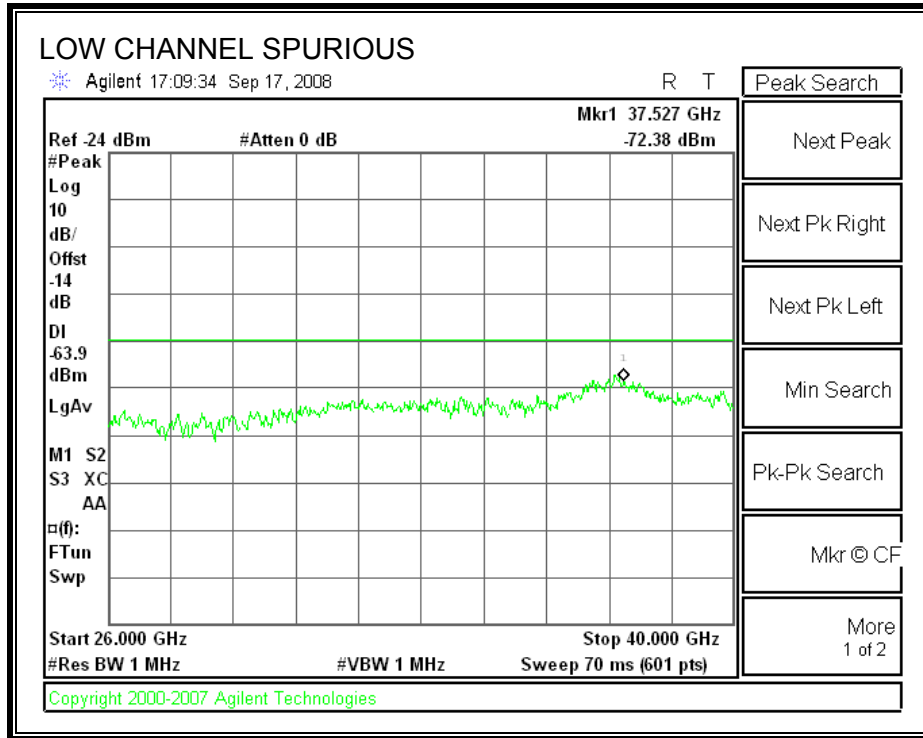
RESULTS

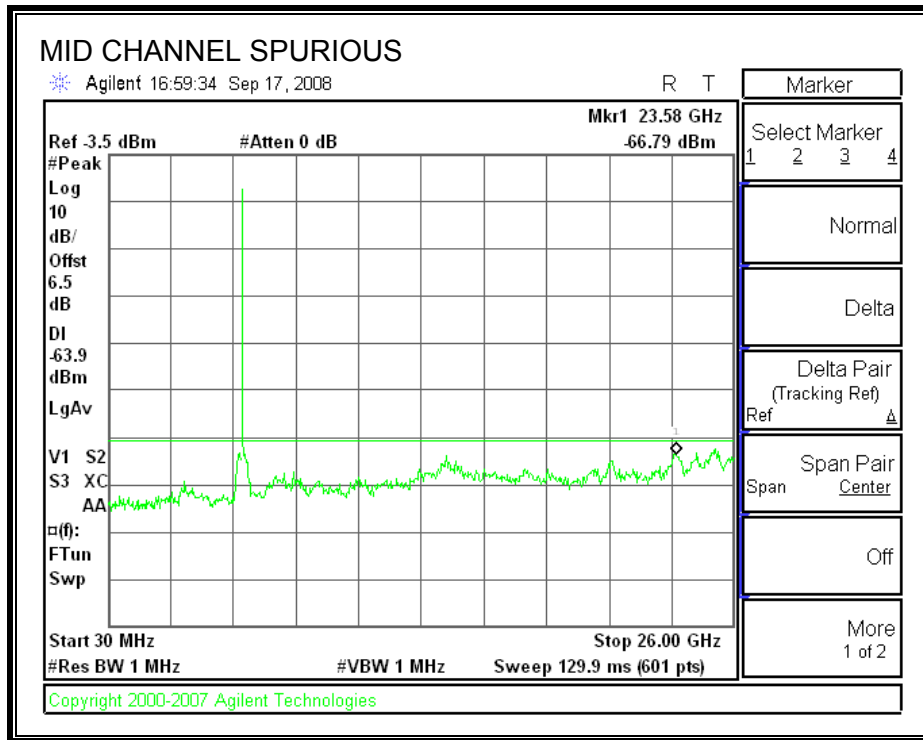
Note: For Dish antenna, an 26-40GHz pre-Amp

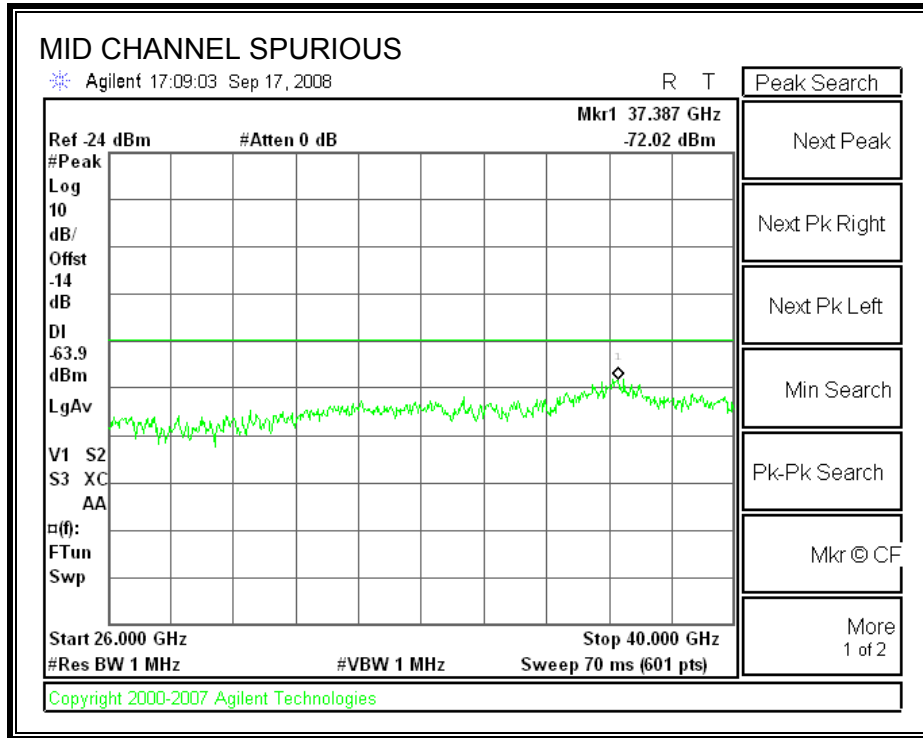
DISH ANTENNA

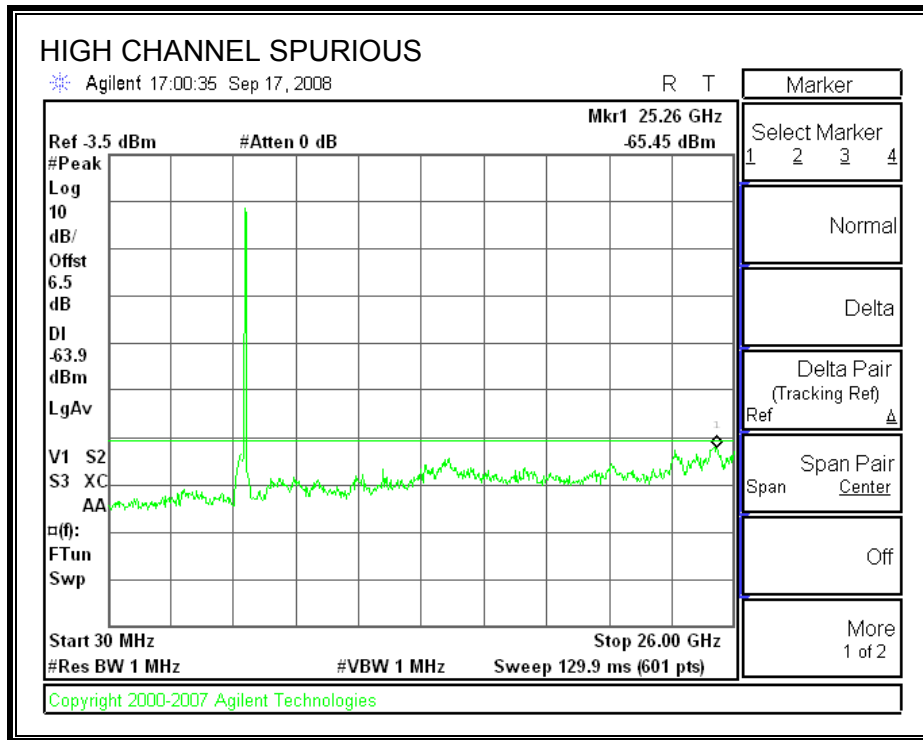
SPURIOUS EMISSIONS

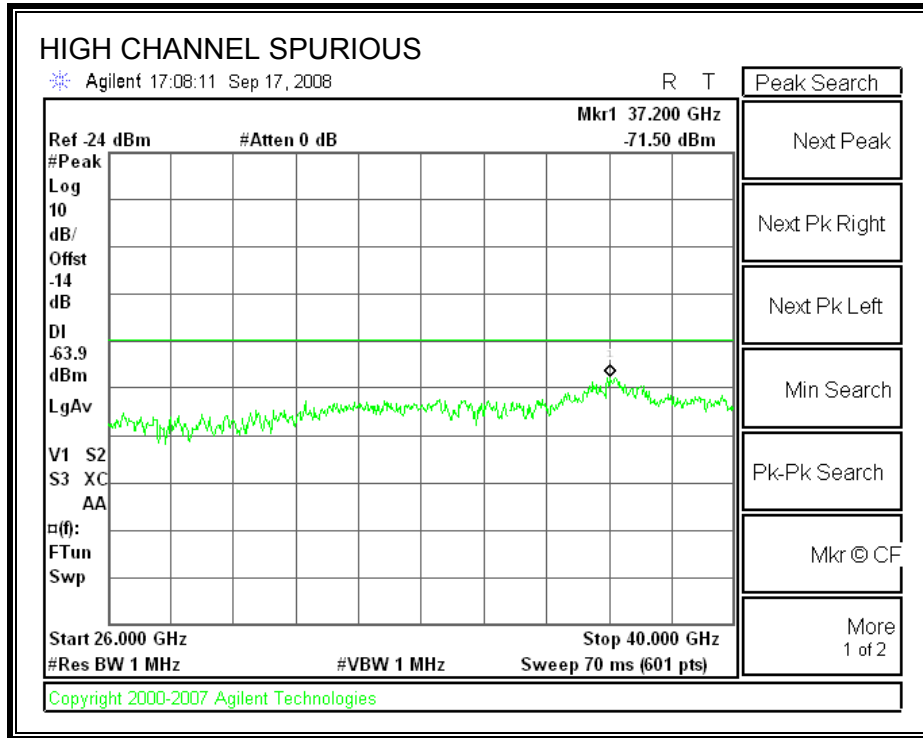






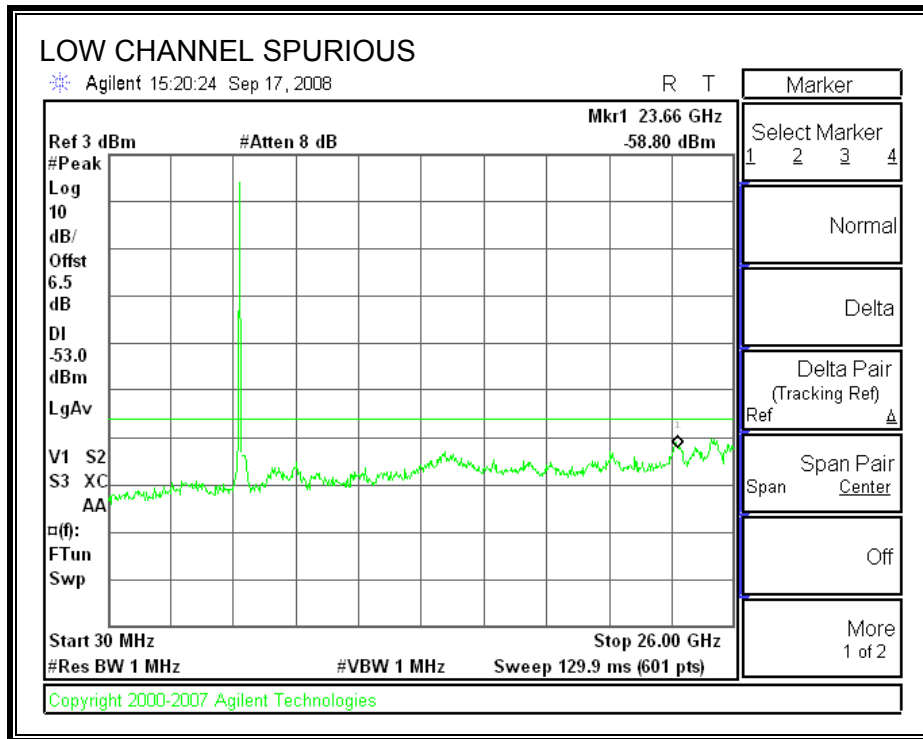


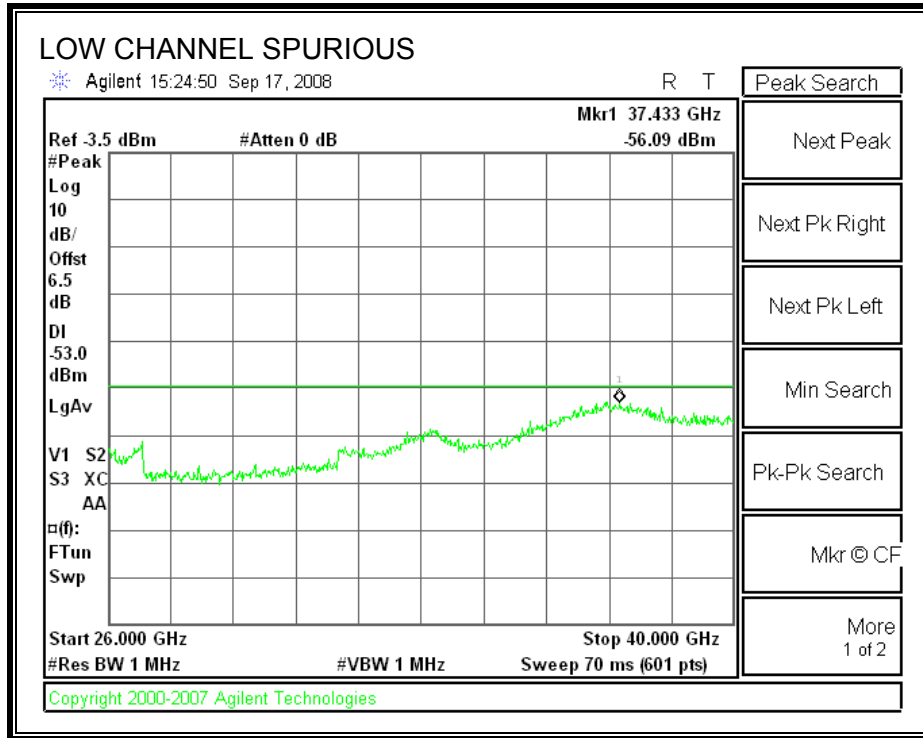


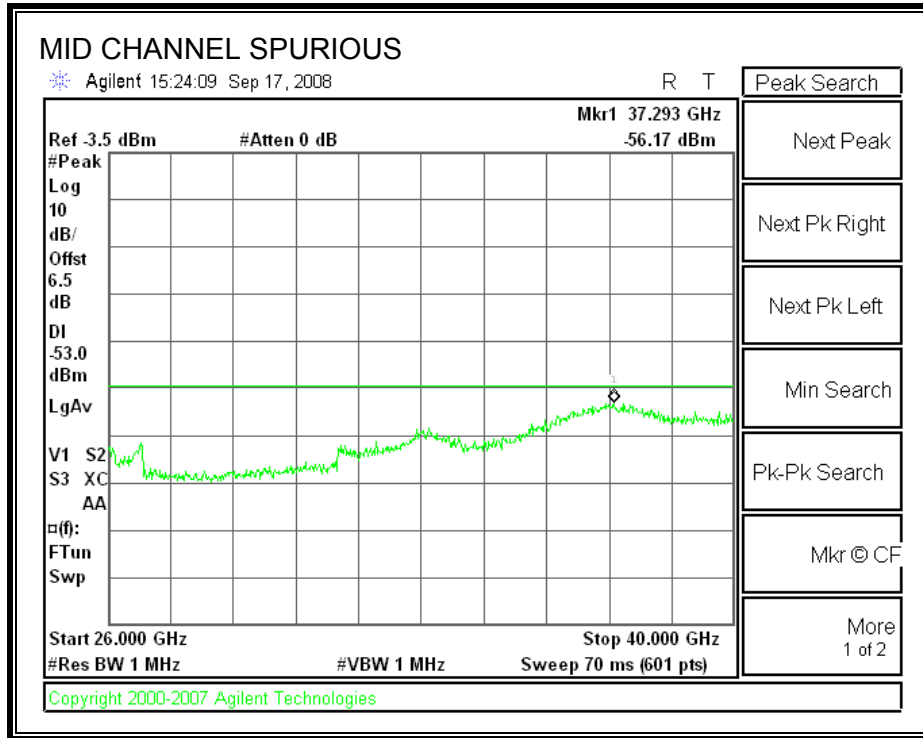


PANEL ANTENNA

SPURIOUS EMISSIONS







7.1.7. TPC

LIMITS

FCC §15.407 (h) (1)

IC RSS-210 A9.4 (a)

Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

TEST PROCEDURE

The test is performed in accordance with method 1 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

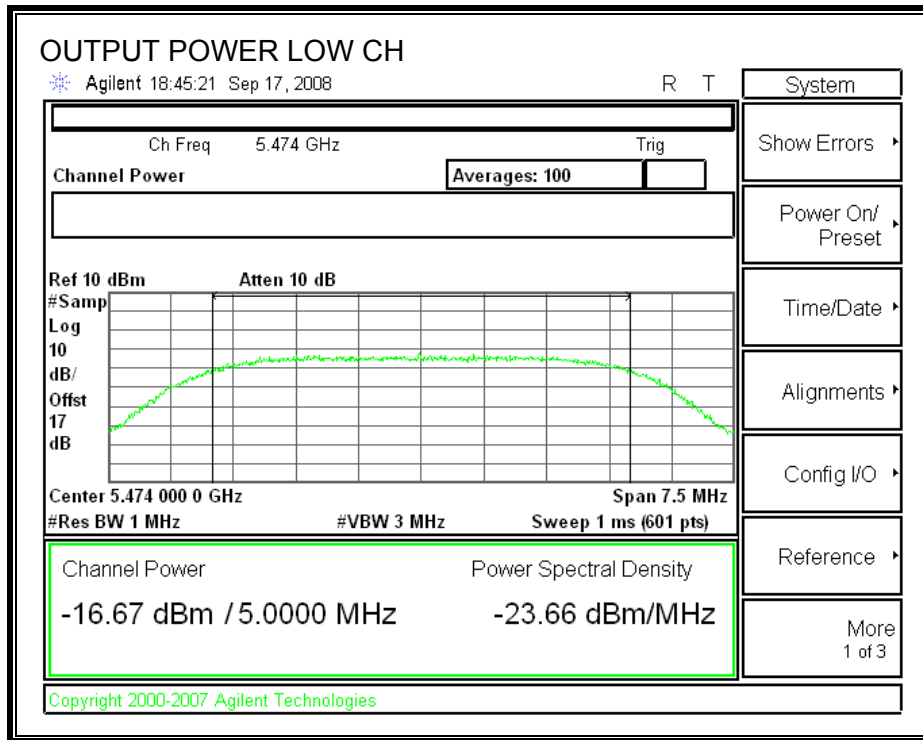
The Panel antenna has a lower gain than the Dish antenna, therefore the EIRP at the lowest power with the Panel antenna will be lower than indicated below for the Dish antenna.

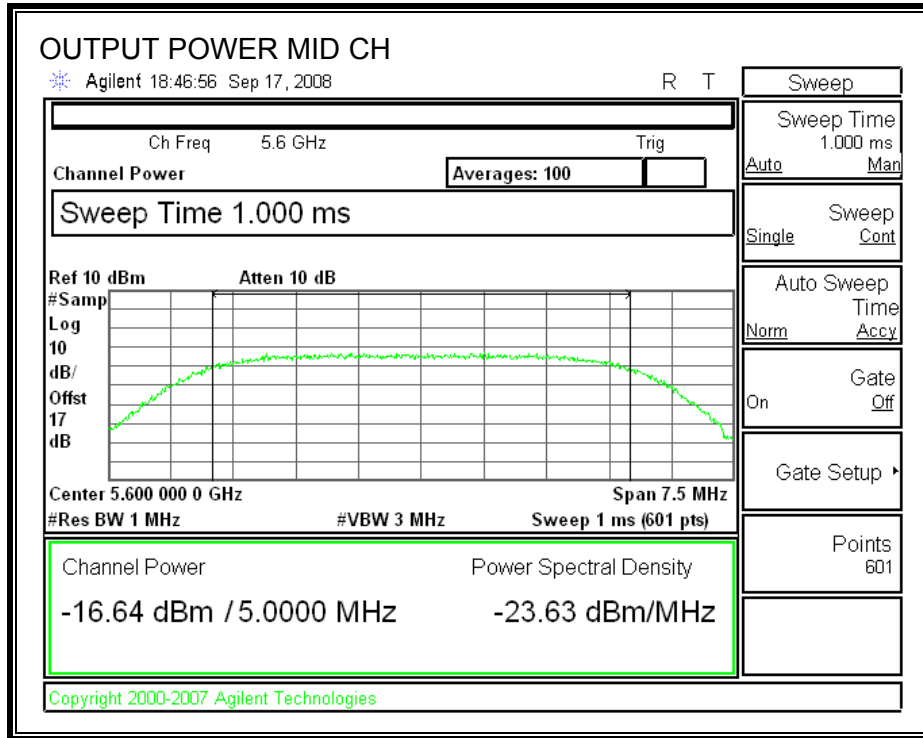
Limit

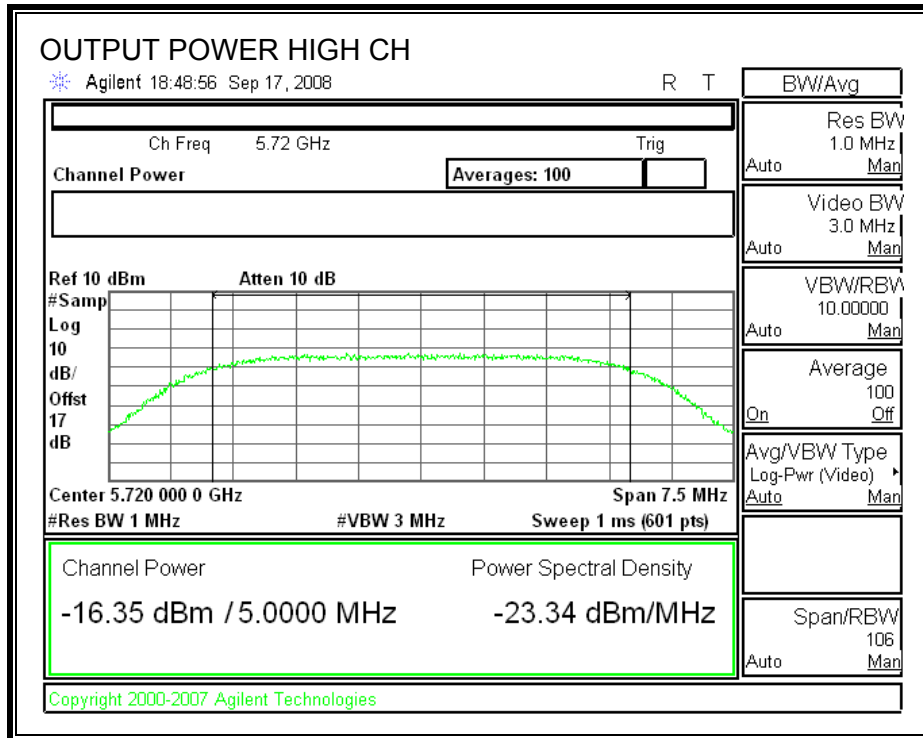
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	5 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5474	24	5	11.99	32.30	-14.31
Mid	5600	24	5	11.99	32.30	-14.31
High	5720	24	5	11.99	32.30	-14.31

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5474	-16.67	-14.31	-2.36
Mid	5600	-16.64	-14.31	-2.33
High	5720	-16.35	-14.31	-2.04







7.2. 10MHz BANDWIDTH

7.2.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

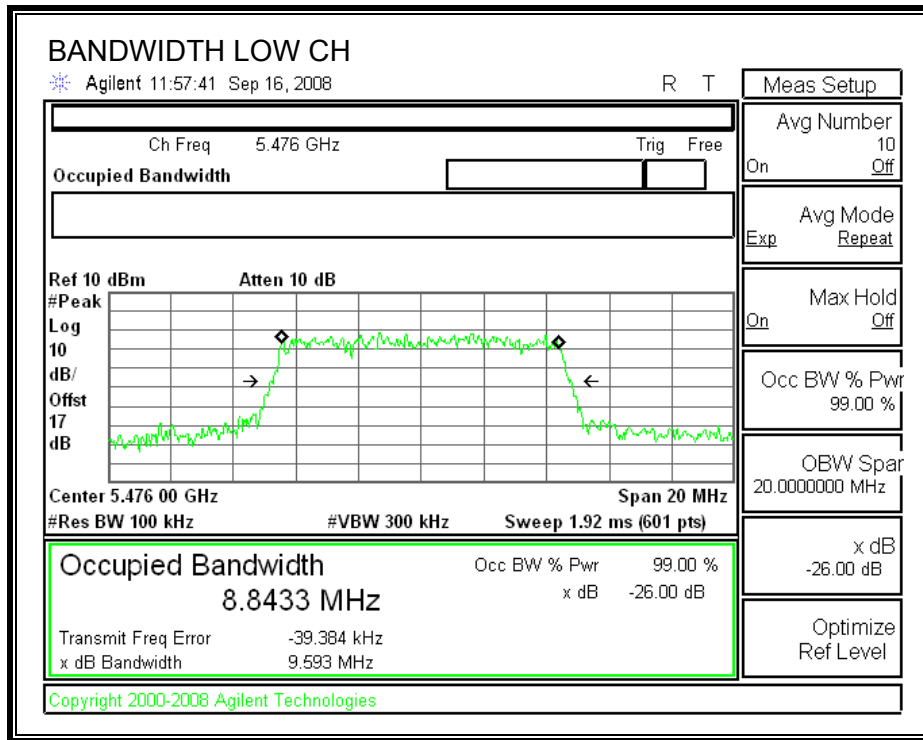
TEST PROCEDURE

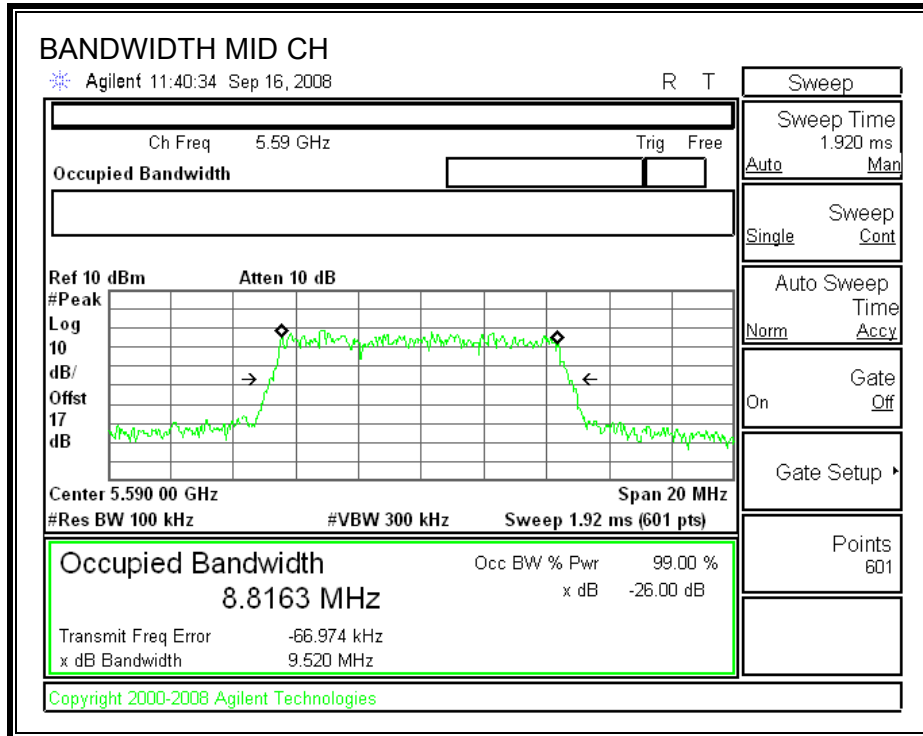
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

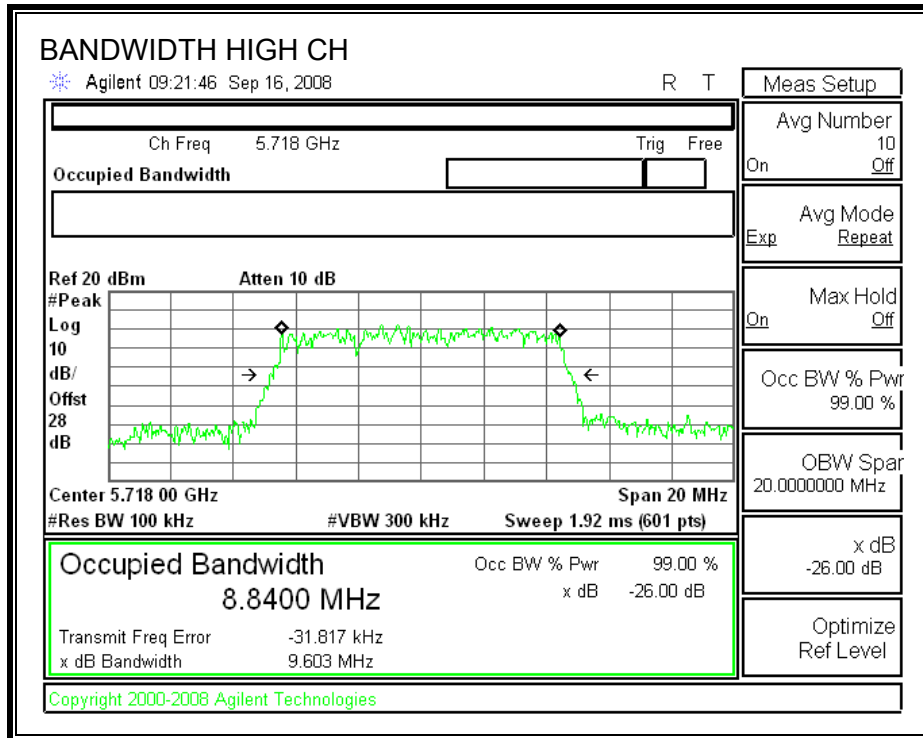
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5476	9.593	8.8433
Middle	5590	9.520	8.8163
High	5718	9.603	8.8400

26 dB and 99% BANDWIDTH







7.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with method 1 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

DISH Antenna

Limit

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5476	24	9.6	20.82	33.90	-7.08
Mid	5590	24	9.6	20.82	33.90	-7.08
High	5718	24	9.6	20.82	33.90	-7.08

Individual Chain Results

Channel	Frequency (MHz)	Port V Power (dBm)	Port H Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5476	-9.99	-11.13	-7.51	-7.08	-0.44
Mid	5590	-10.72	-11.04	-7.87	-7.08	-0.79
High	5718	-10.51	-11.41	-7.93	-7.08	-0.85

PANEL Antenna

Limit

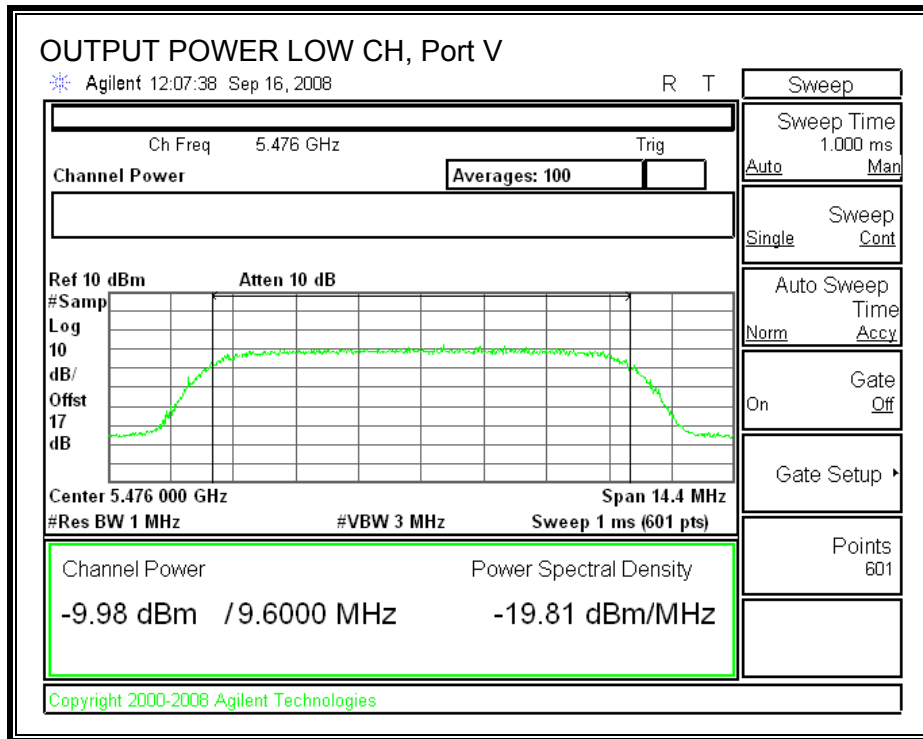
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5476	24	9.6	20.82	23.00	3.82
Mid	5590	24	9.6	20.82	23.00	3.82
High	5718	24	9.6	20.82	23.00	3.82

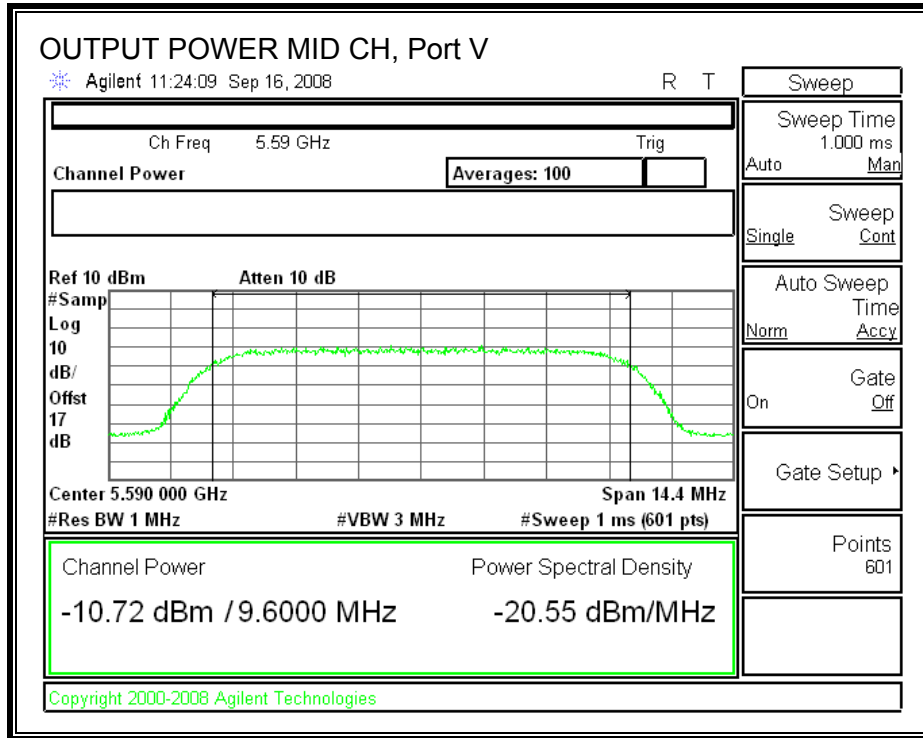
Individual Chain Results

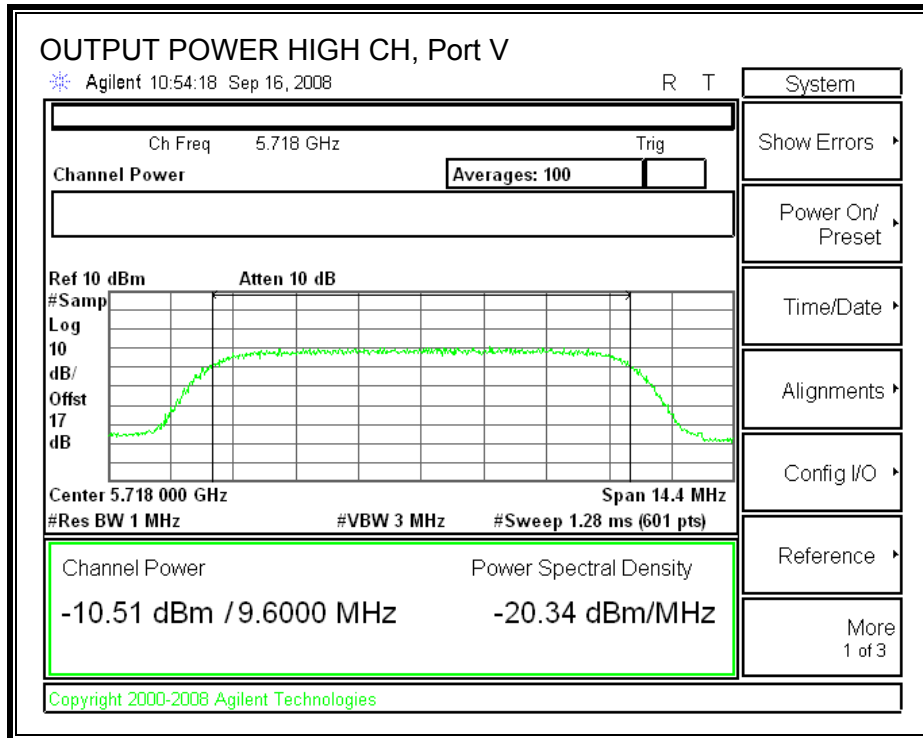
Channel	Frequency (MHz)	Port V Power (dBm)	Port H Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5476	-0.86	-1.12	2.02	3.82	-1.80
Mid	5590	-0.82	-1.01	2.10	3.82	-1.73
High	5718	0.23	-0.06	3.10	3.82	-0.72

DISH ANTENNA

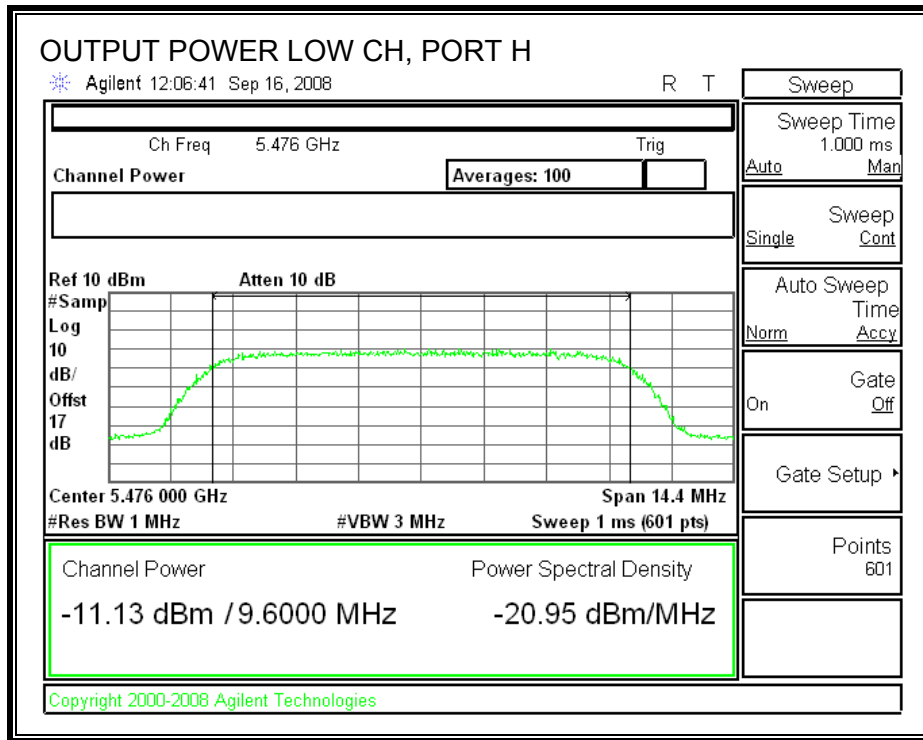
PORT V OUTPUT POWER

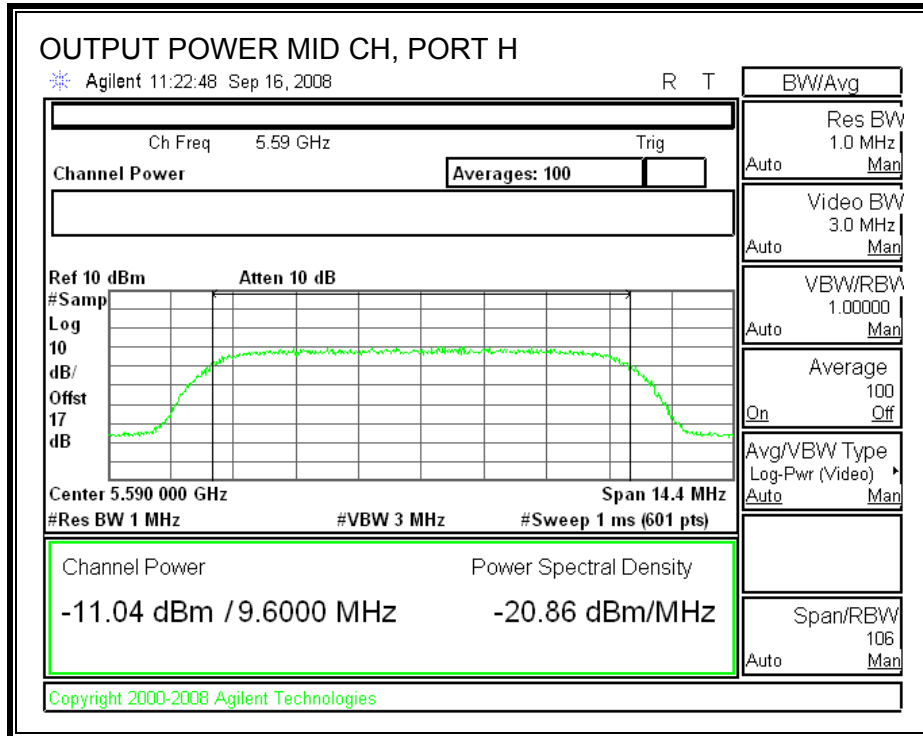


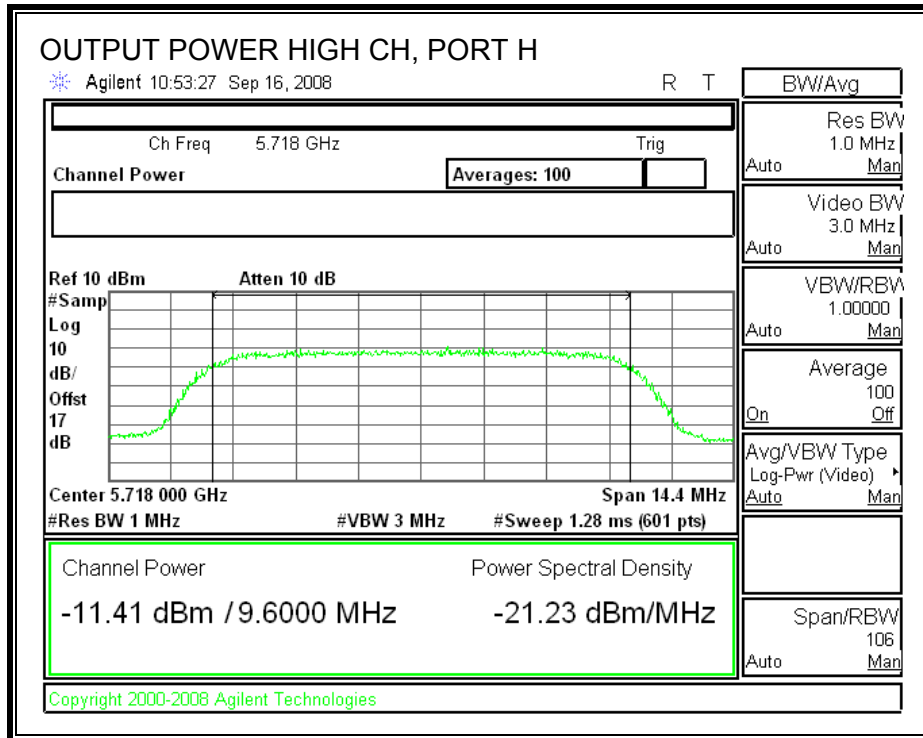




PORT H OUTPUT POWER

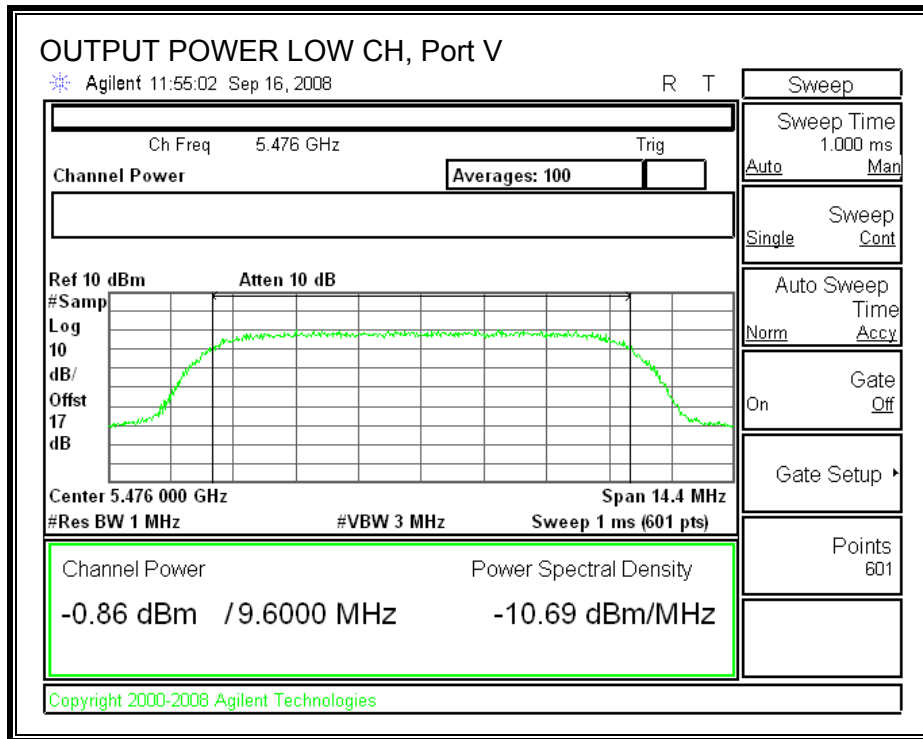


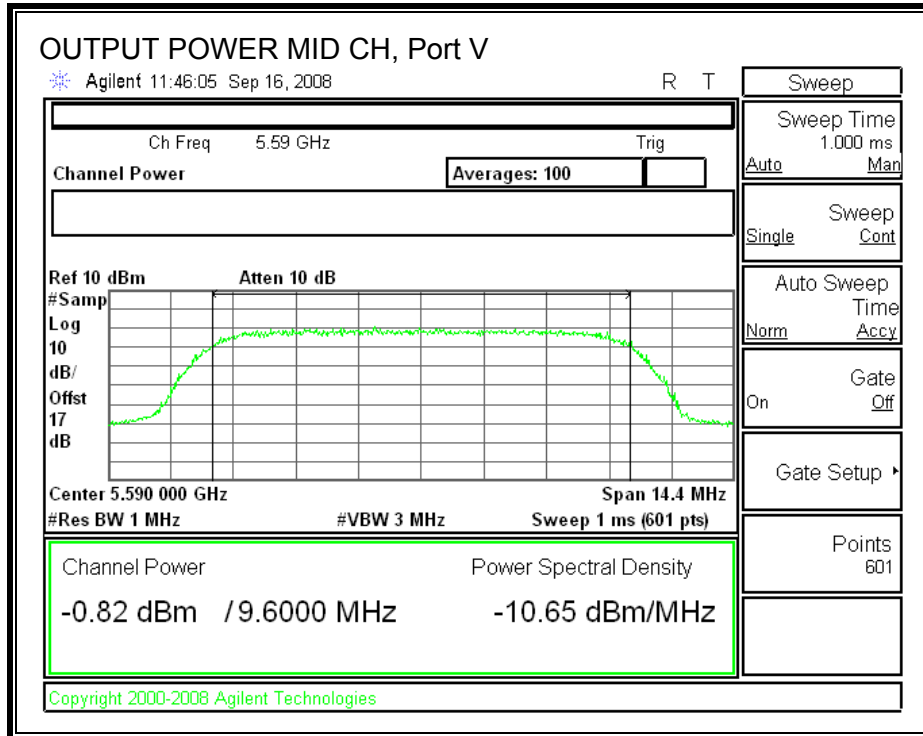


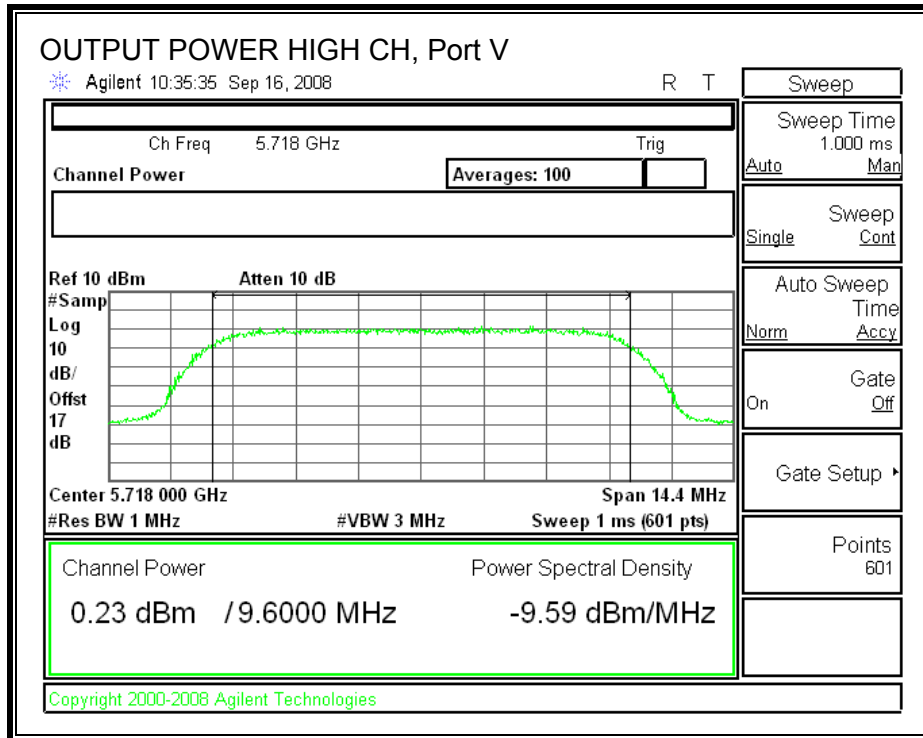


PANEL ANTENNA

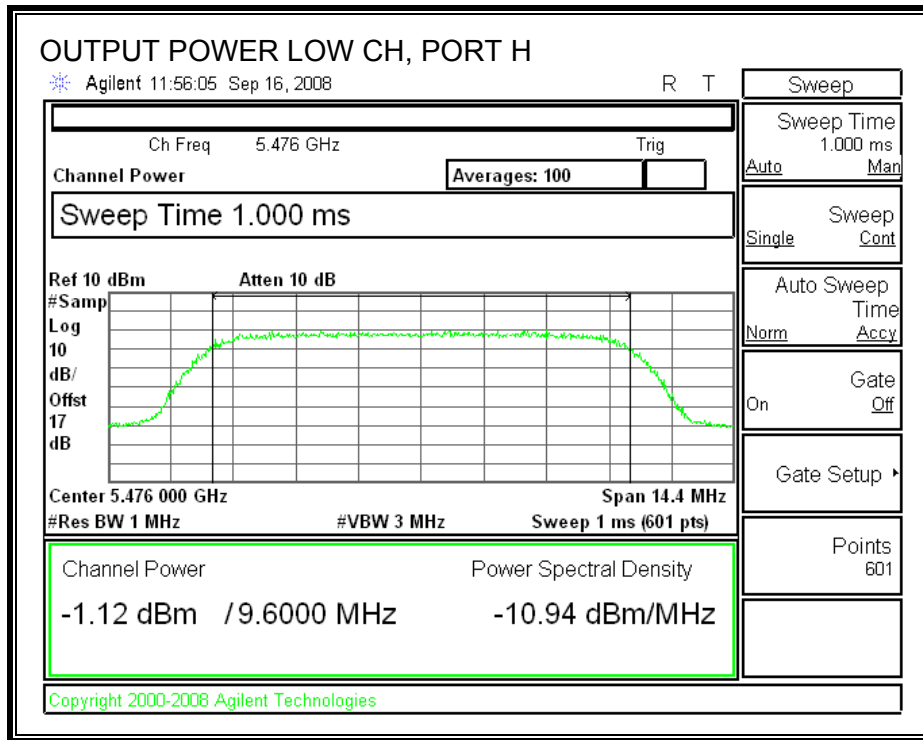
PORT V OUTPUT POWER

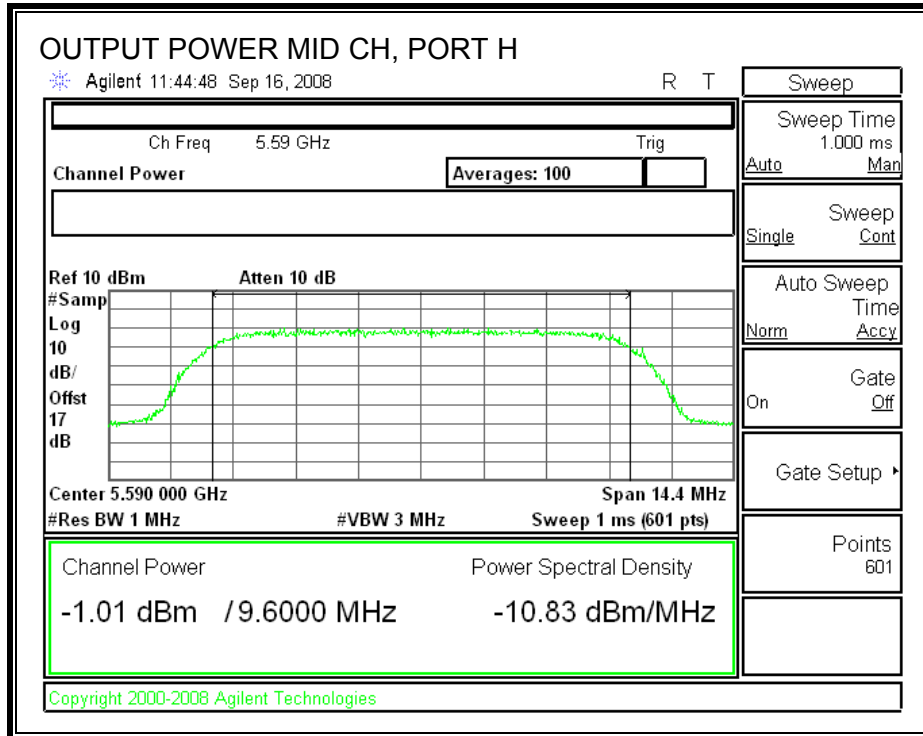


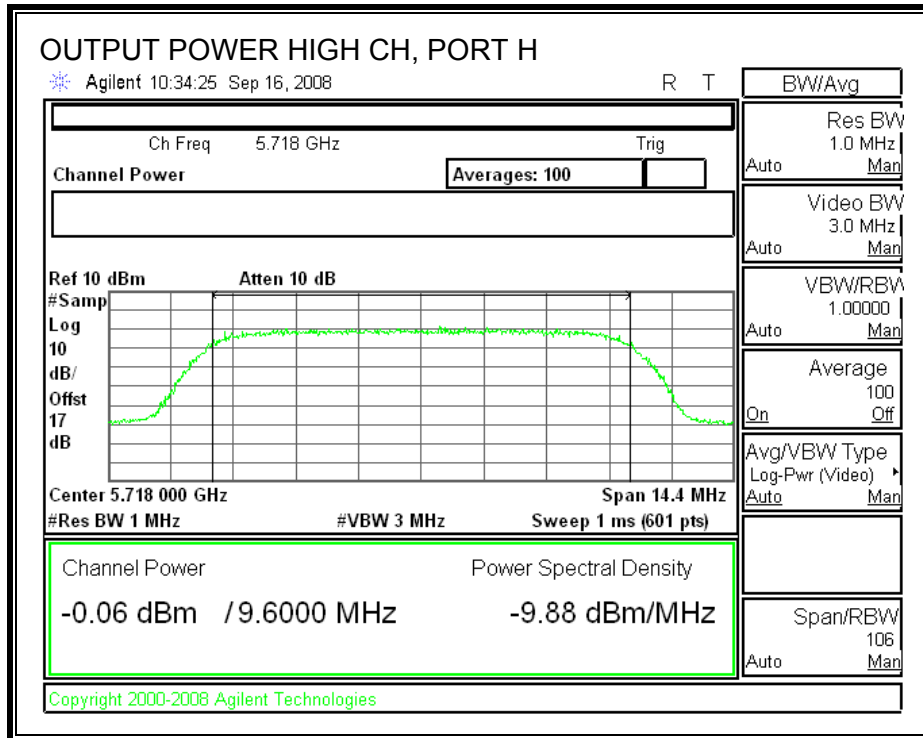




PORT H OUTPUT POWER







7.2.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17 dB (including 16 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

DISH ANTENNA

Channel	Frequency (MHz)	Power (dBm)
Low	5476	-13.05
Middle	5590	-13.10
High	5718	-13.15

Panel ANTENNA

Channel	Frequency (MHz)	Power (dBm)
Low	5476	0.50
Middle	5590	-0.50
High	5718	-0.80

7.2.4. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum Dish antenna gain is 33.9 dBi, therefore the limit is -16.9 dBm.

The maximum Panel antenna gain is 23 dBi, therefore the limit is -6 dBm.

TEST PROCEDURE

The test is performed in accordance with PPSD method#2 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

DISH ANTENNA

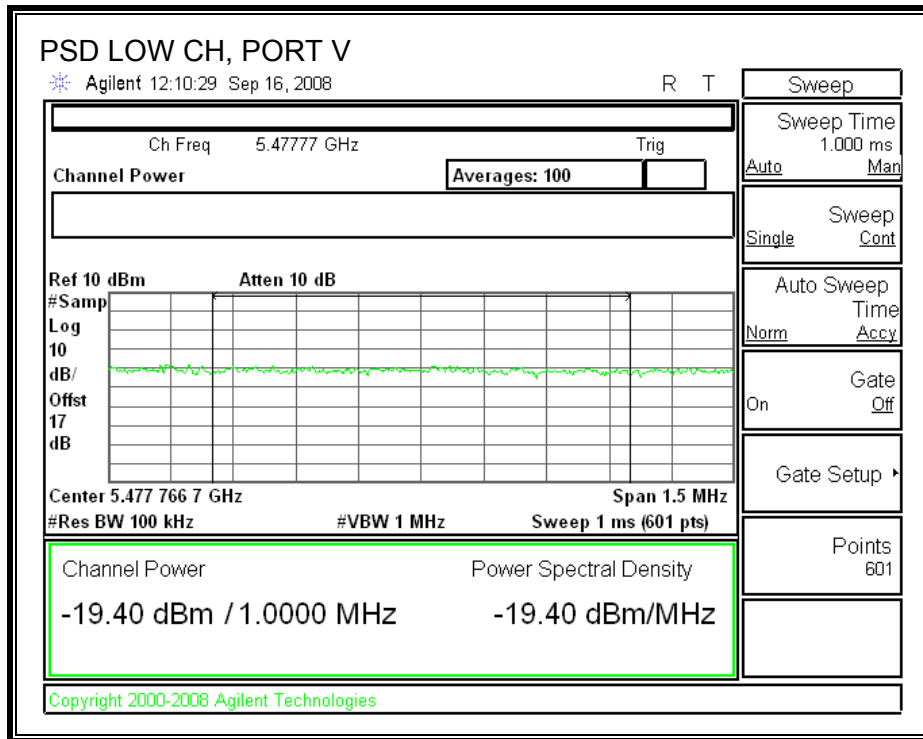
Channel	Frequency (MHz)	Port V PPSD (dBm)	Port H PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5476	-19.44	-20.97	-17.13	-16.9	-0.23
Middle	5590	-19.57	-20.75	-17.11	-16.9	-0.21
High	5718	-20	-20.4	-17.19	-16.9	-0.29

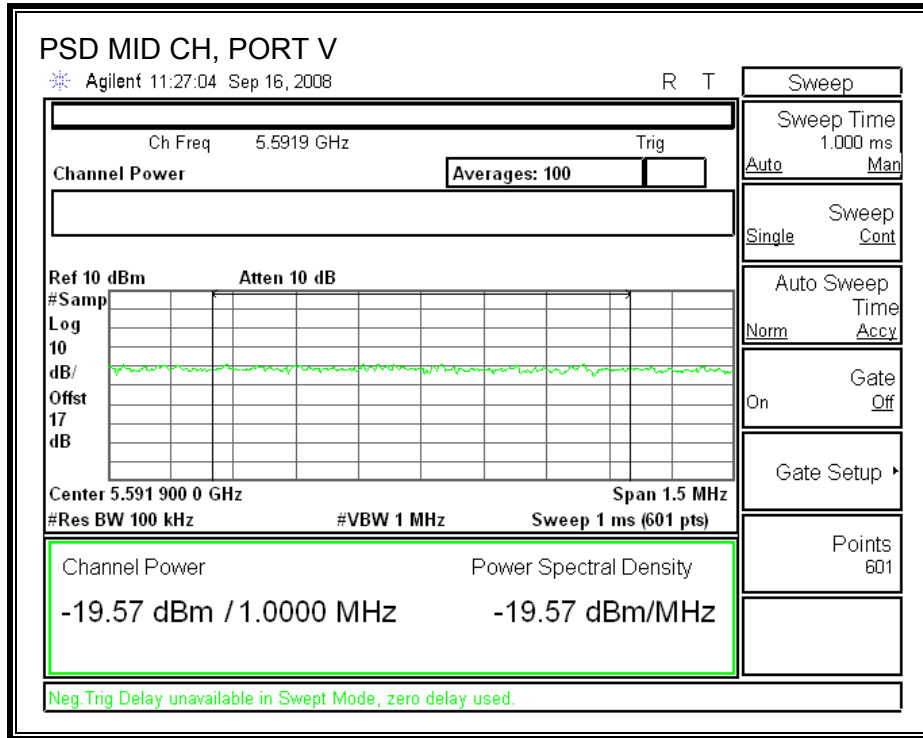
PANEL ANTENNA

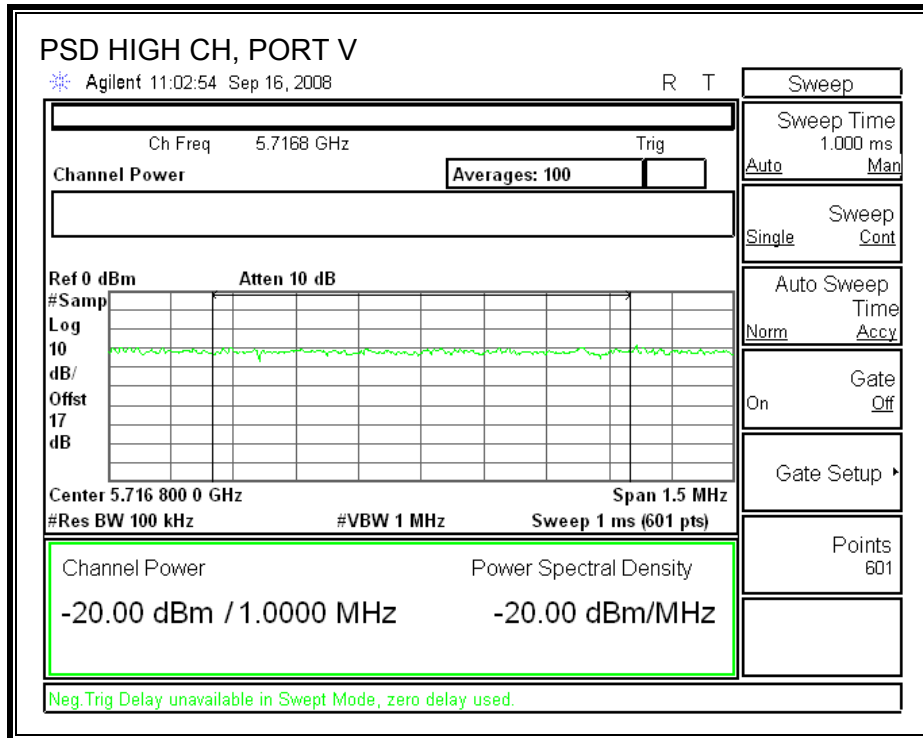
Channel	Frequency (MHz)	Port V PPSD (dBm)	Port H PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5476	-10.49	-10.89	-7.68	-6	-1.68
Middle	5590	-10.21	-10.32	-7.25	-6	-1.25
High	5718	-8.82	-9.25	-6.02	-6	-0.02

DISH ANTENNA

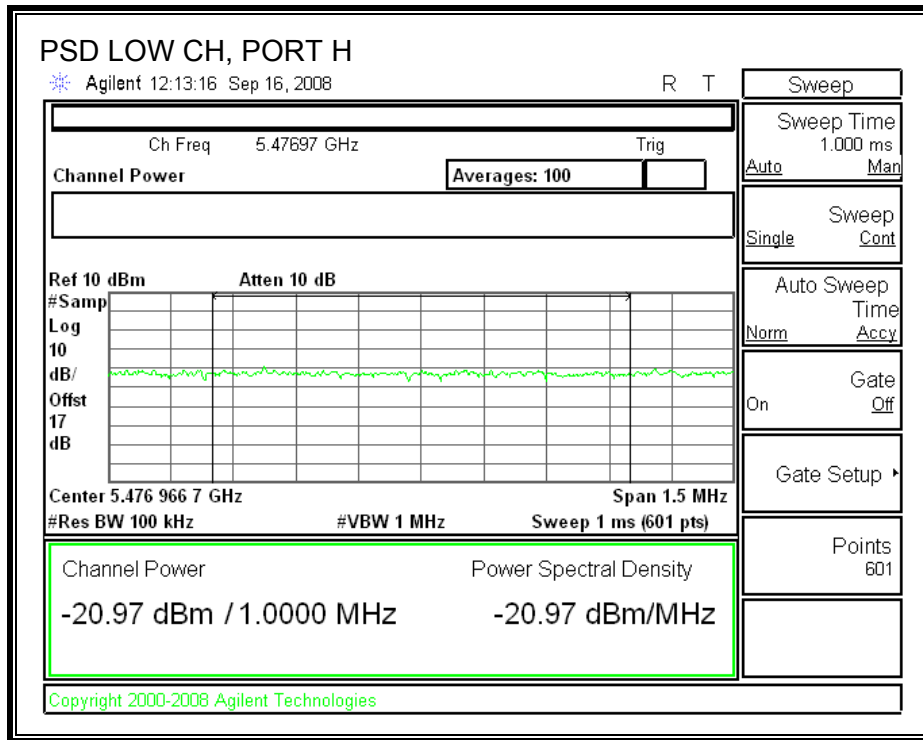
PORT V POWER SPECTRAL DENSITY

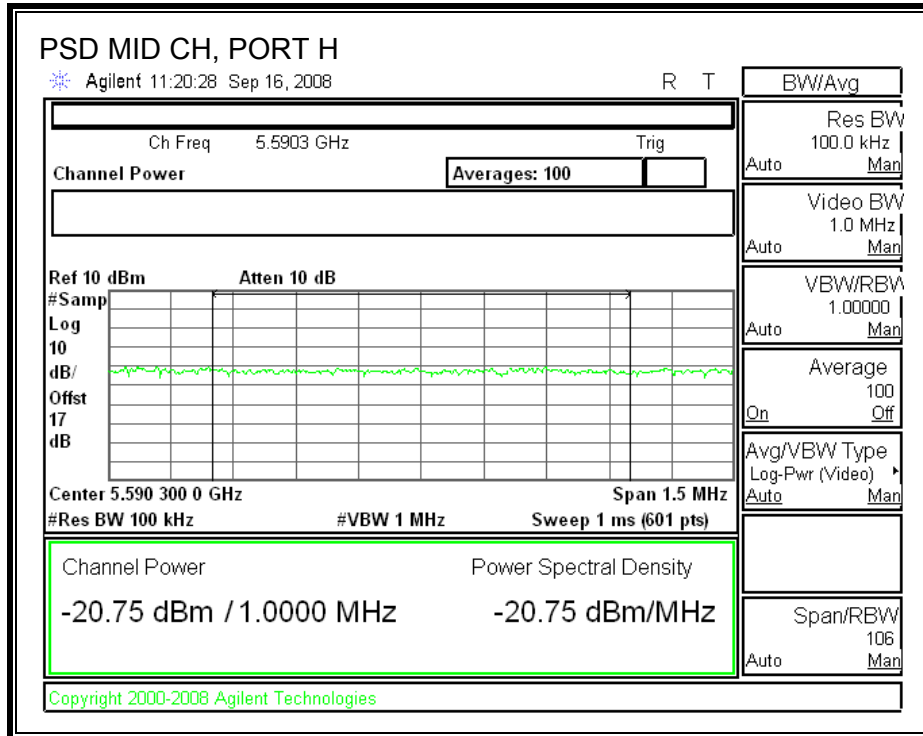


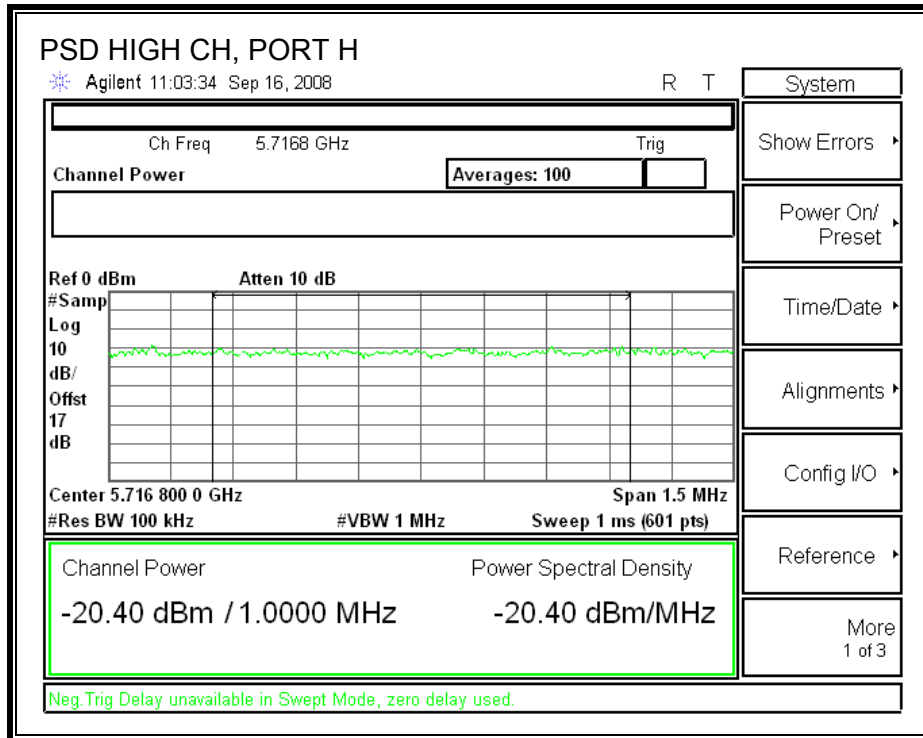




PORT H POWER SPECTRAL DENSITY

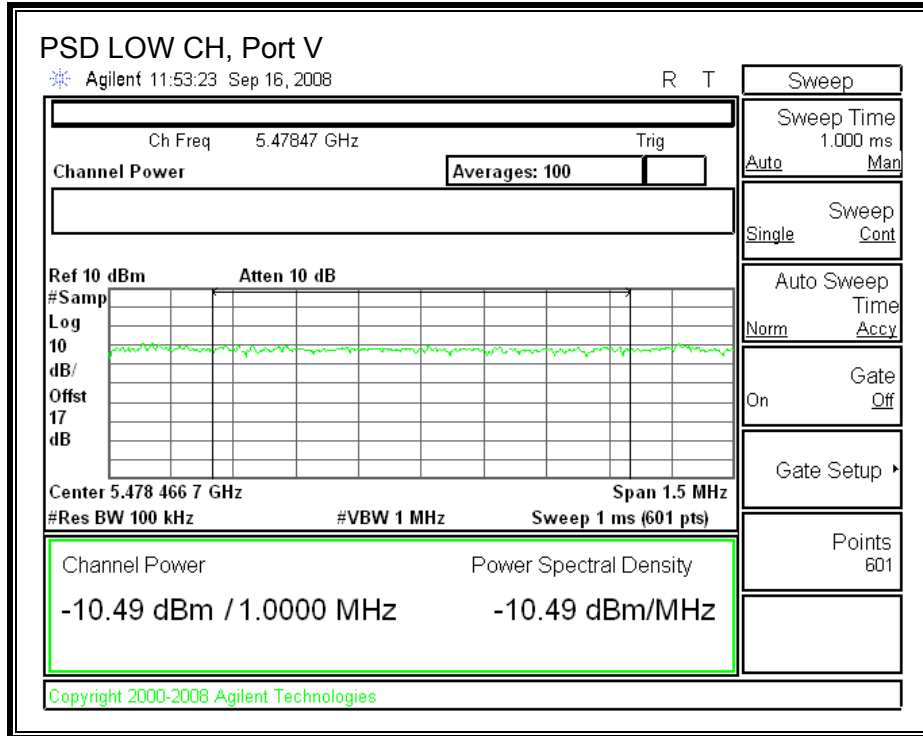


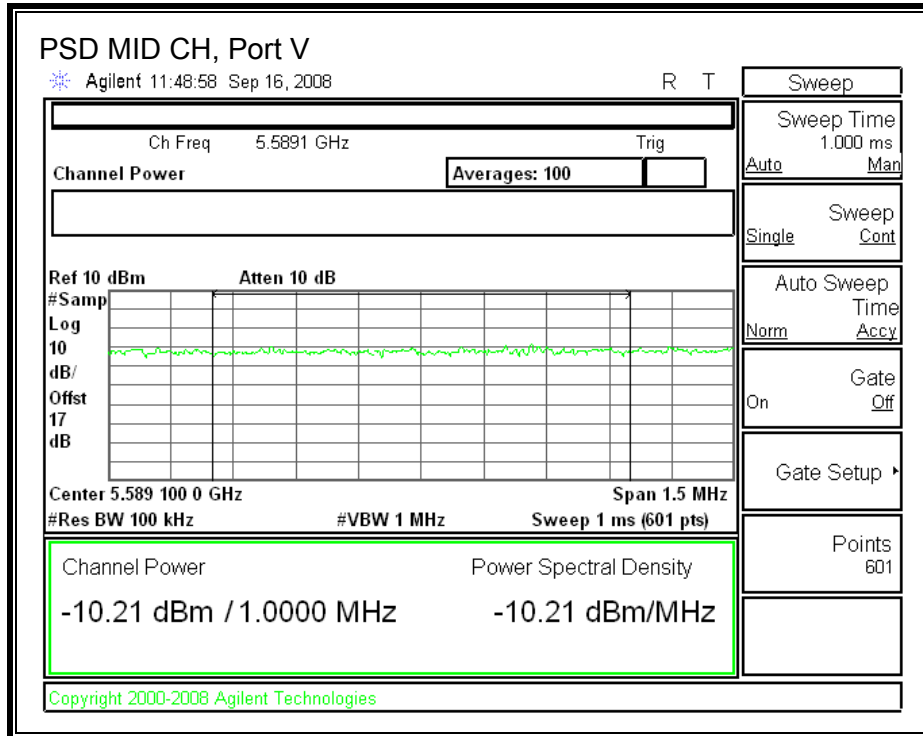


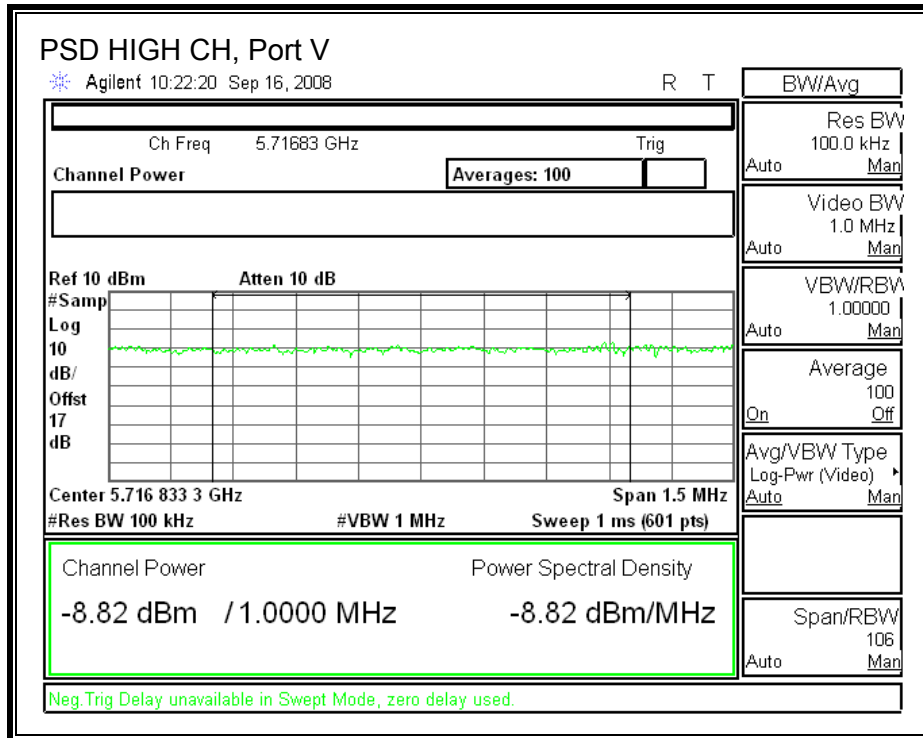


PANEL ANTENNA

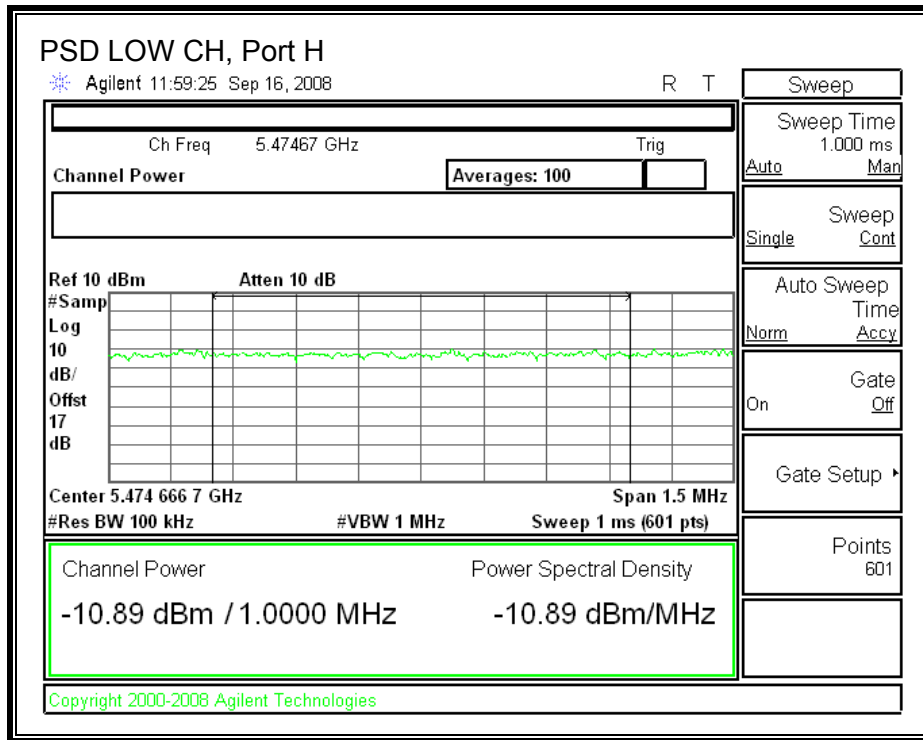
Port V POWER SPECTRAL DENSITY

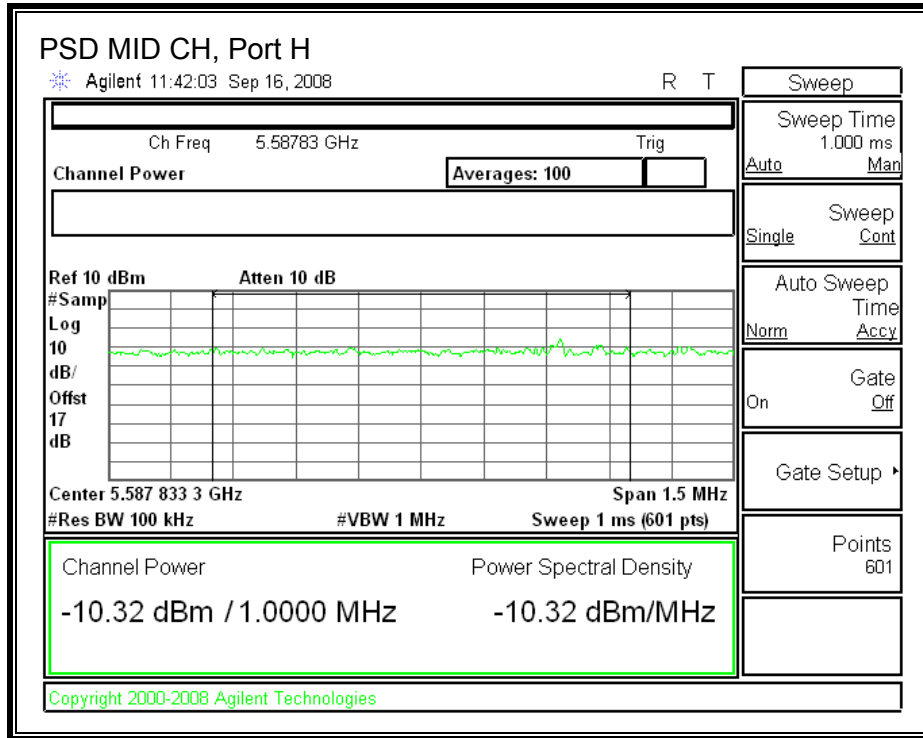


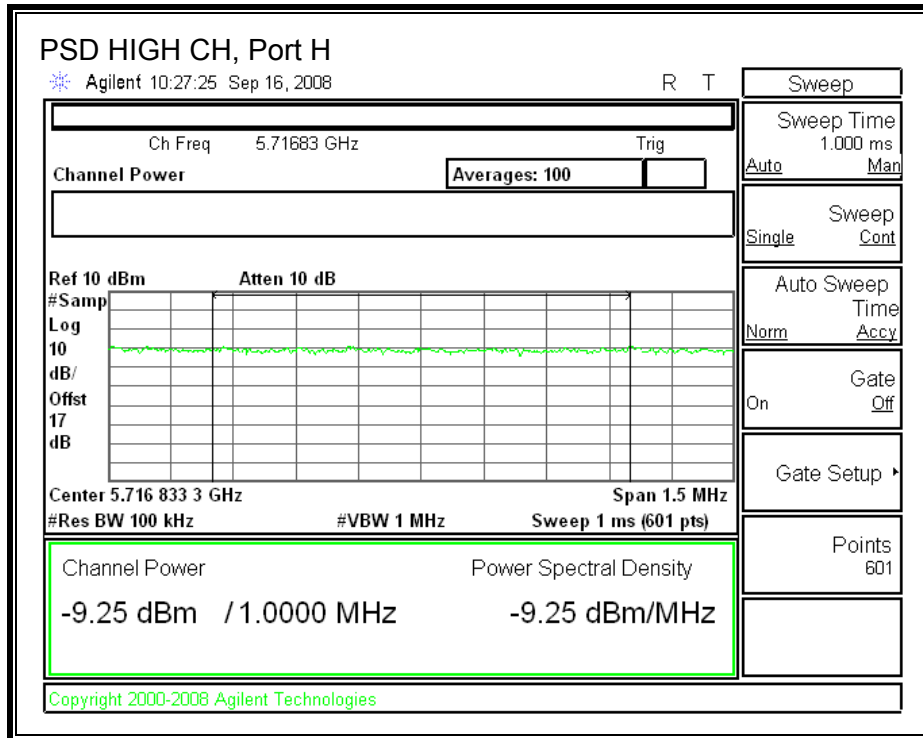




Port H POWER SPECTRAL DENSITY







7.2.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep

RESULTS

DISH ANTENNA

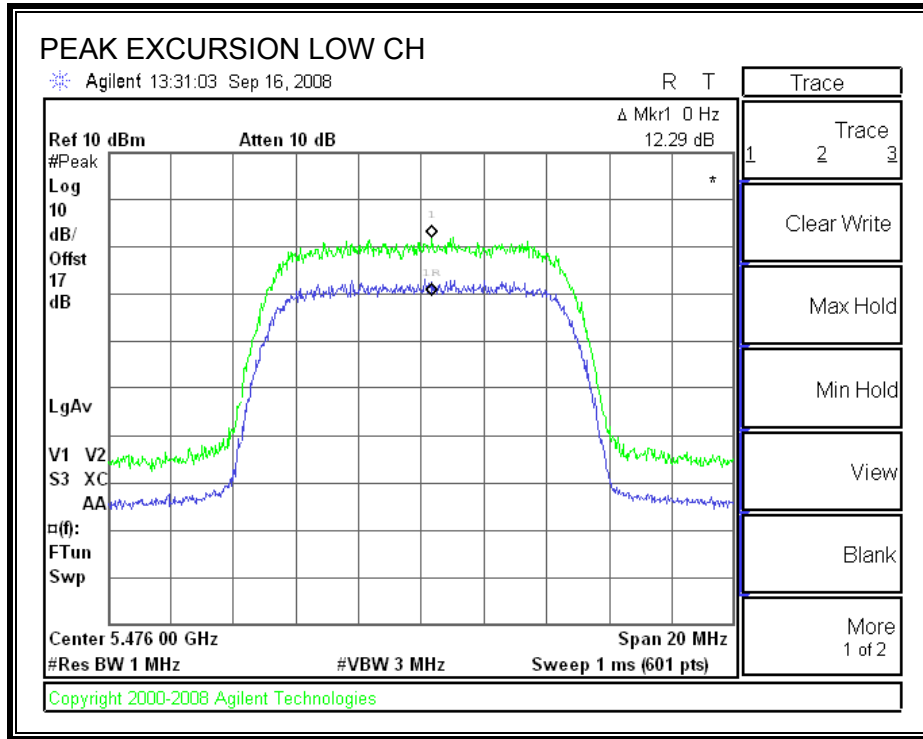
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5476	12.29	13	-0.71
Middle	5590	10.75	13	-2.25
High	5718	12.79	13	-0.21

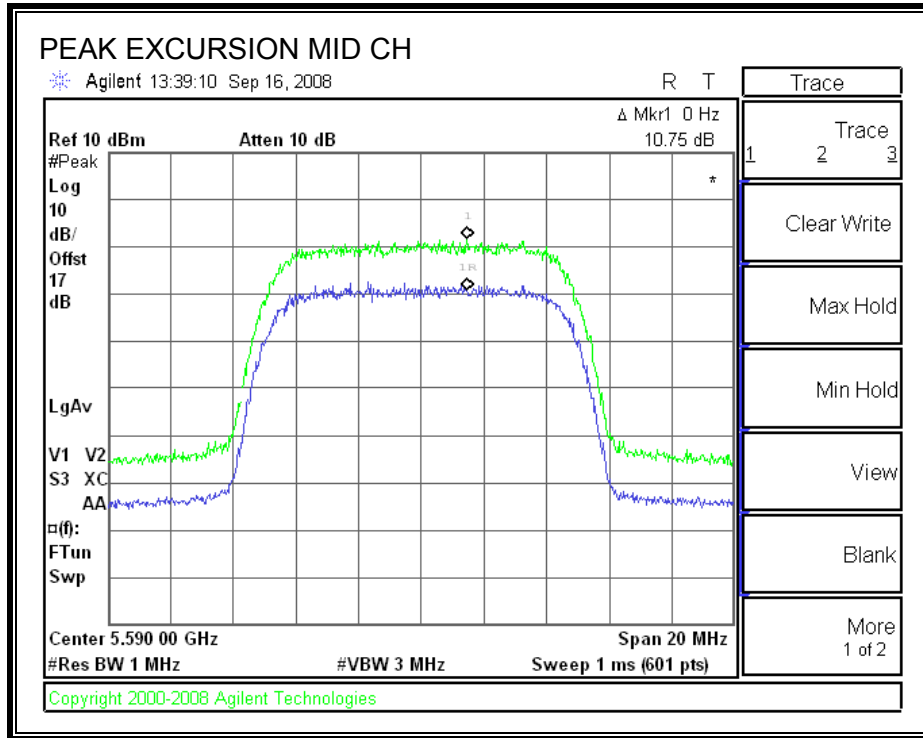
PANEL ANTENNA

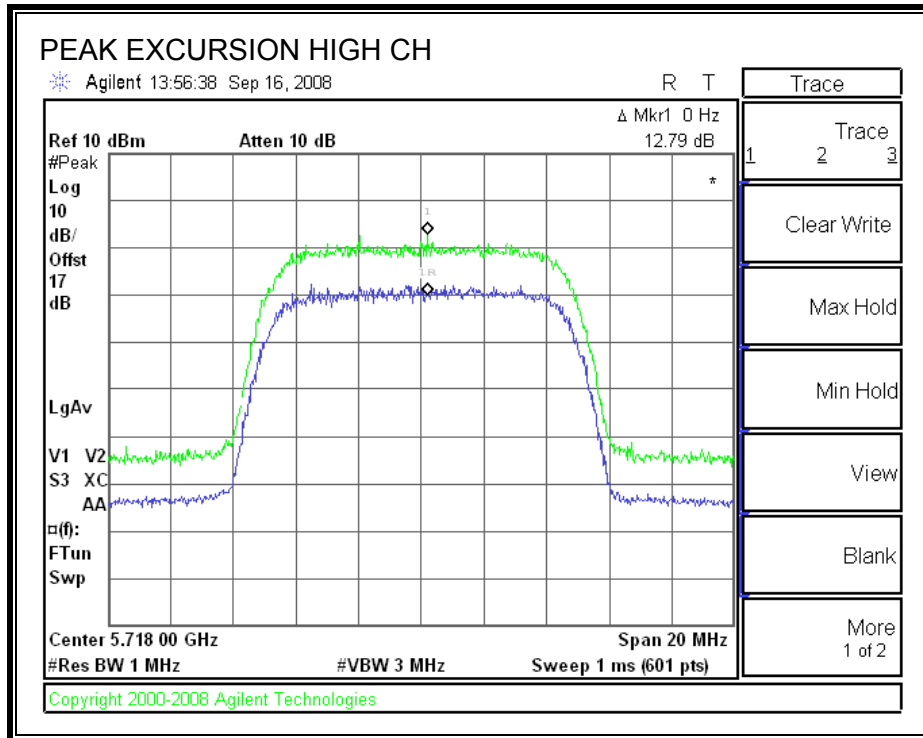
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5476	11.28	13	-1.72
Middle	5590	11.36	13	-1.64
High	5718	11.78	13	-1.22

DISH ANTENNA

PEAK EXCURSION

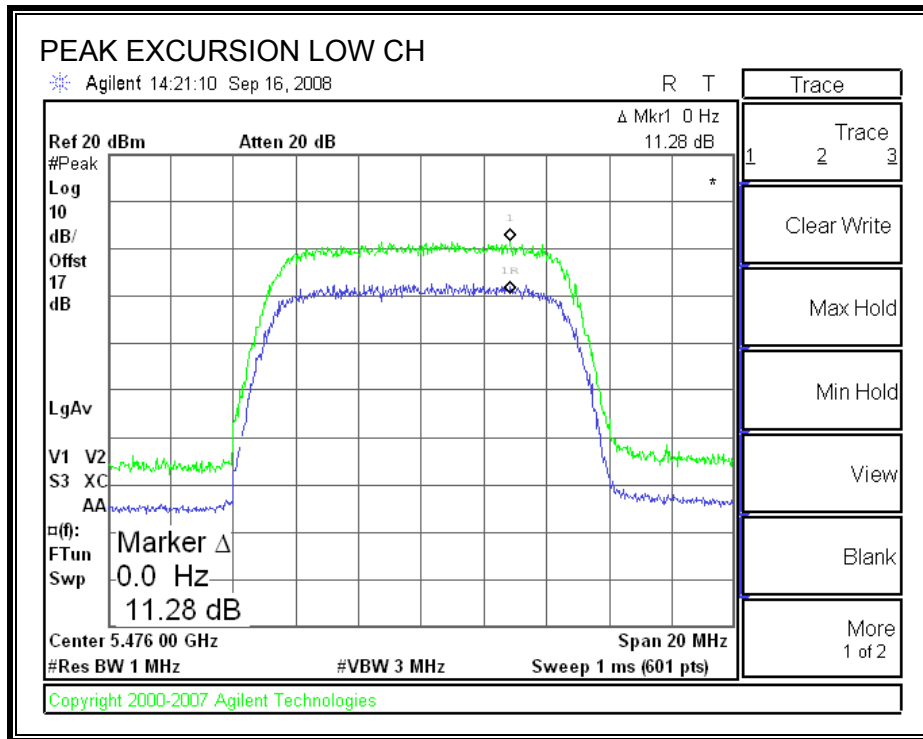


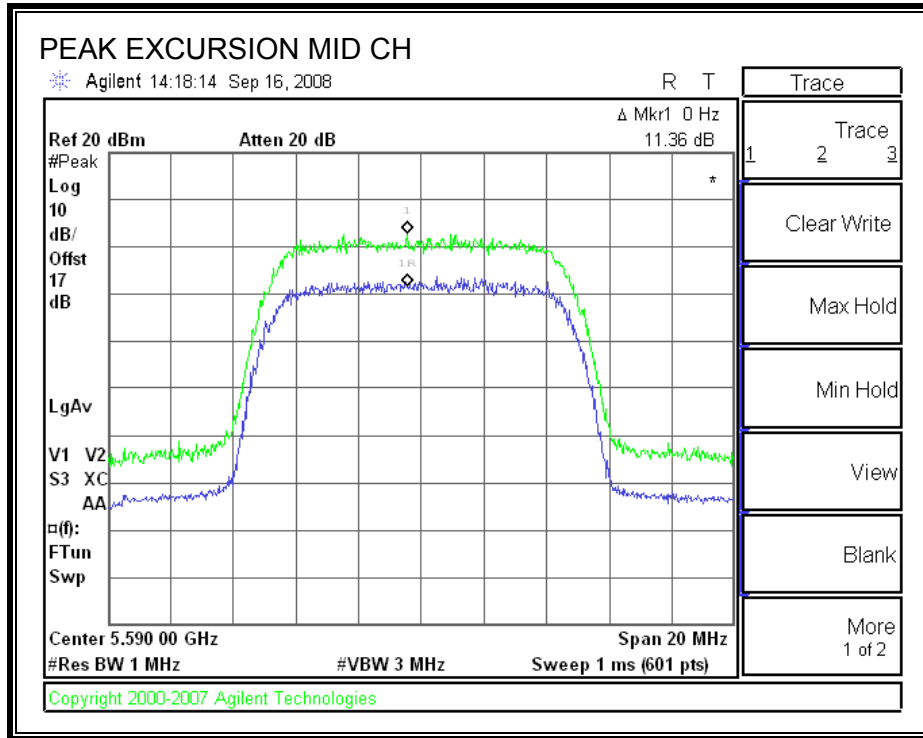


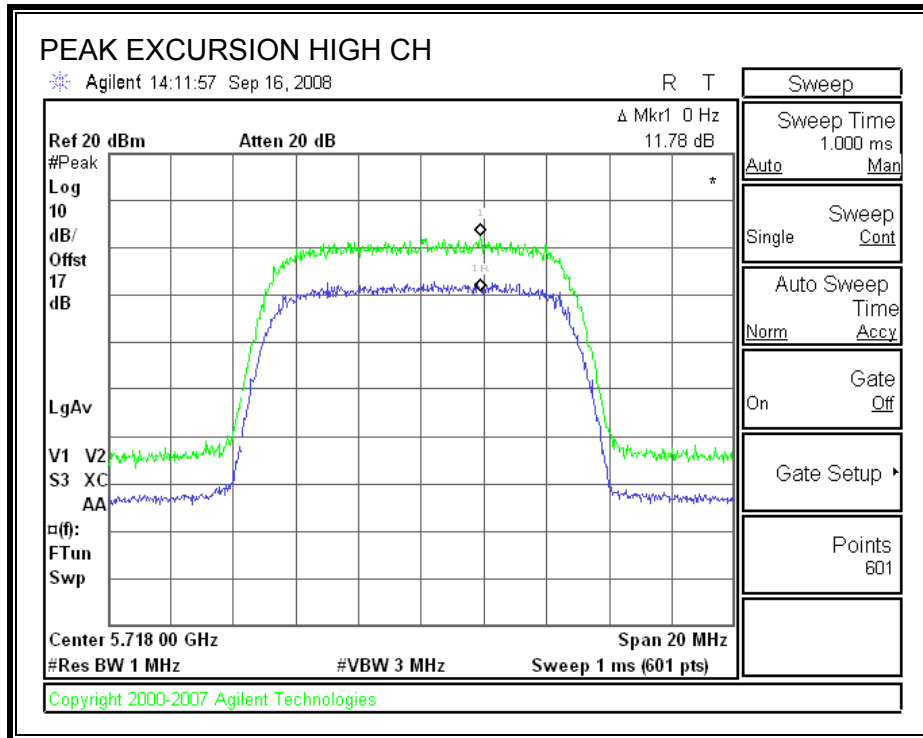


PANEL ANTENNA

PEAK EXCURSION







7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

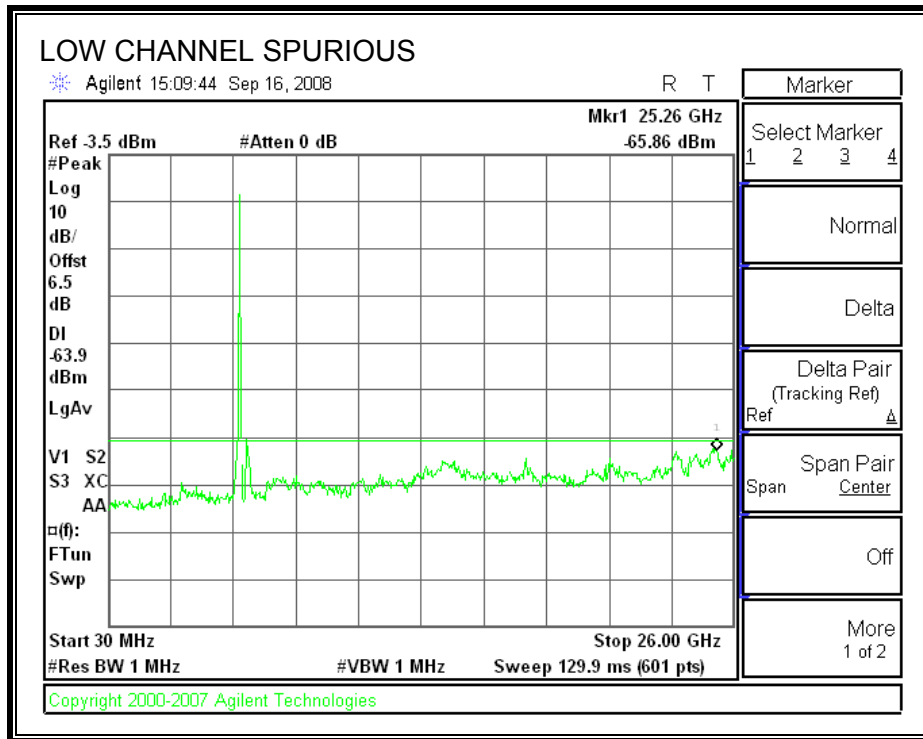
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

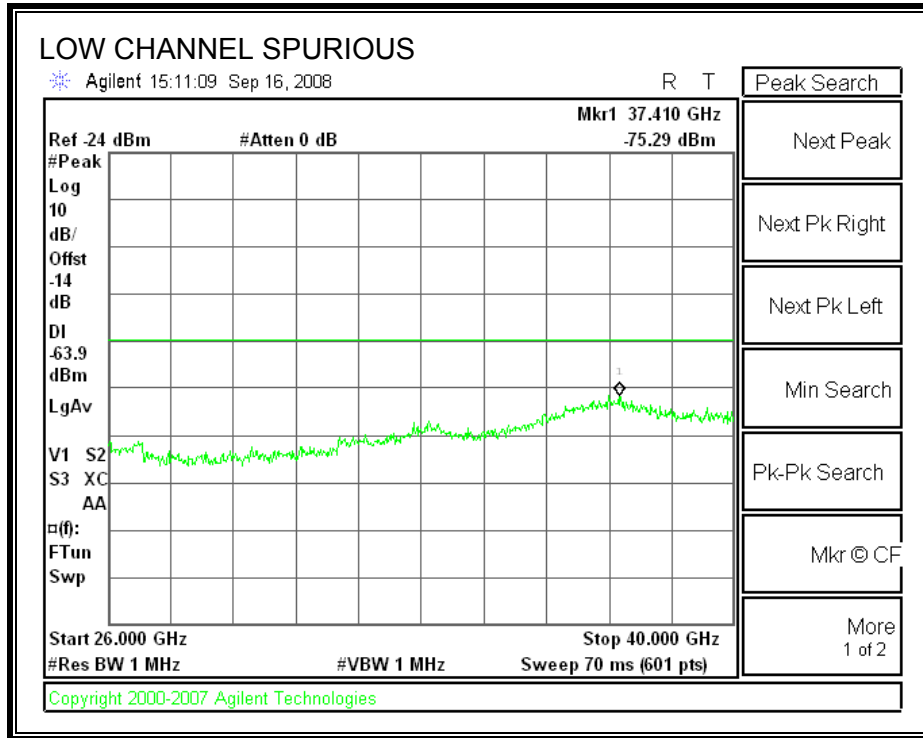
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

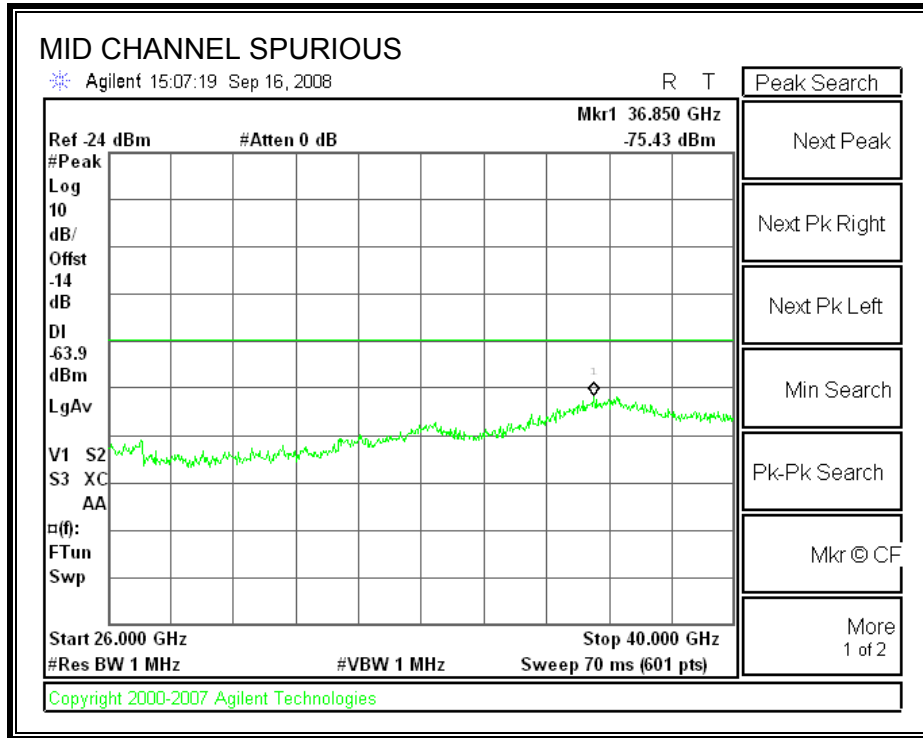
RESULTS

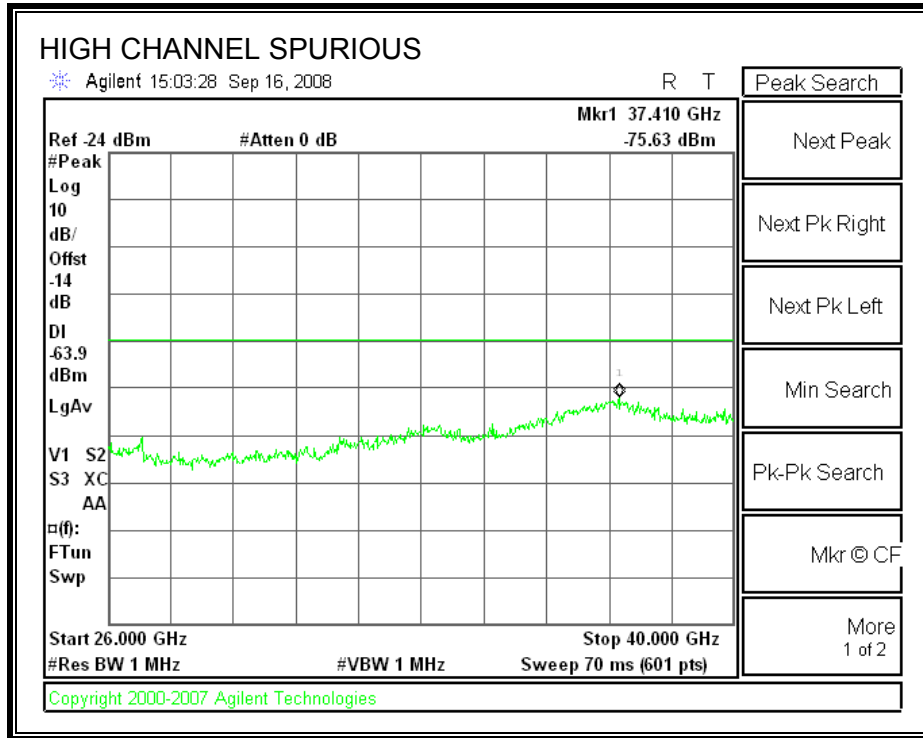
DISH ANTENNA

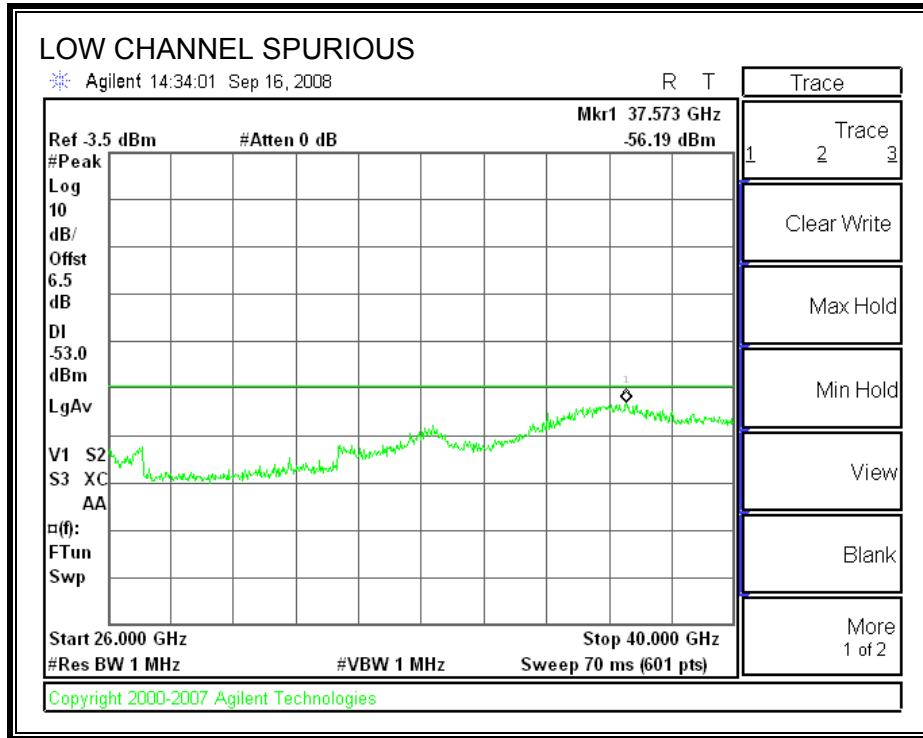
SPURIOUS EMISSIONS

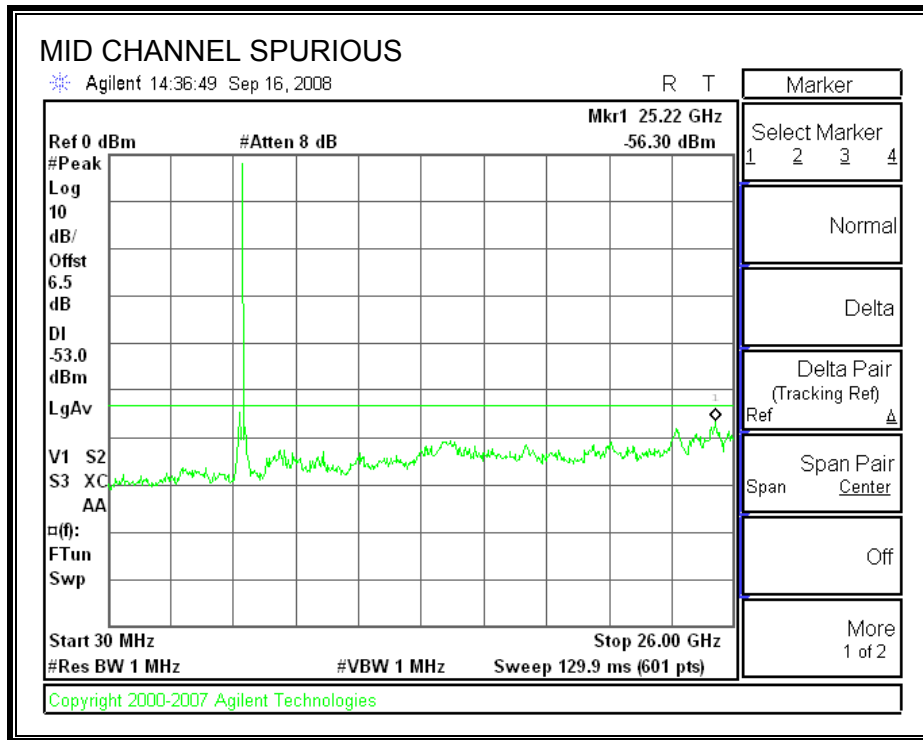


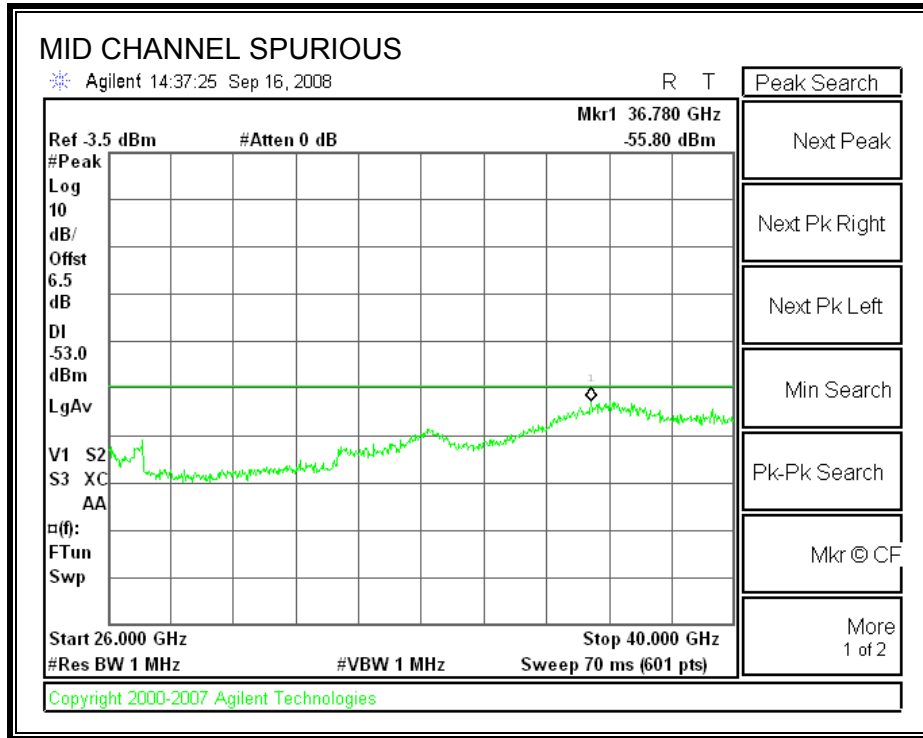


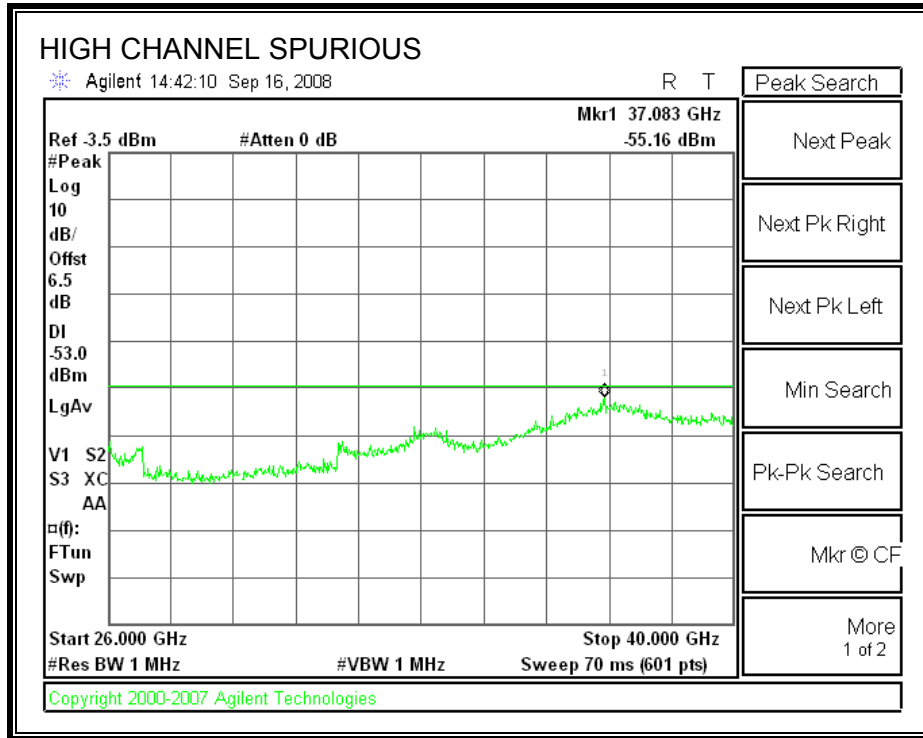












7.2.7. TPC

LIMITS

FCC §15.407 (h) (1)

IC RSS-210 A9.4 (a)

Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

TEST PROCEDURE

The test is performed in accordance with method 1 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

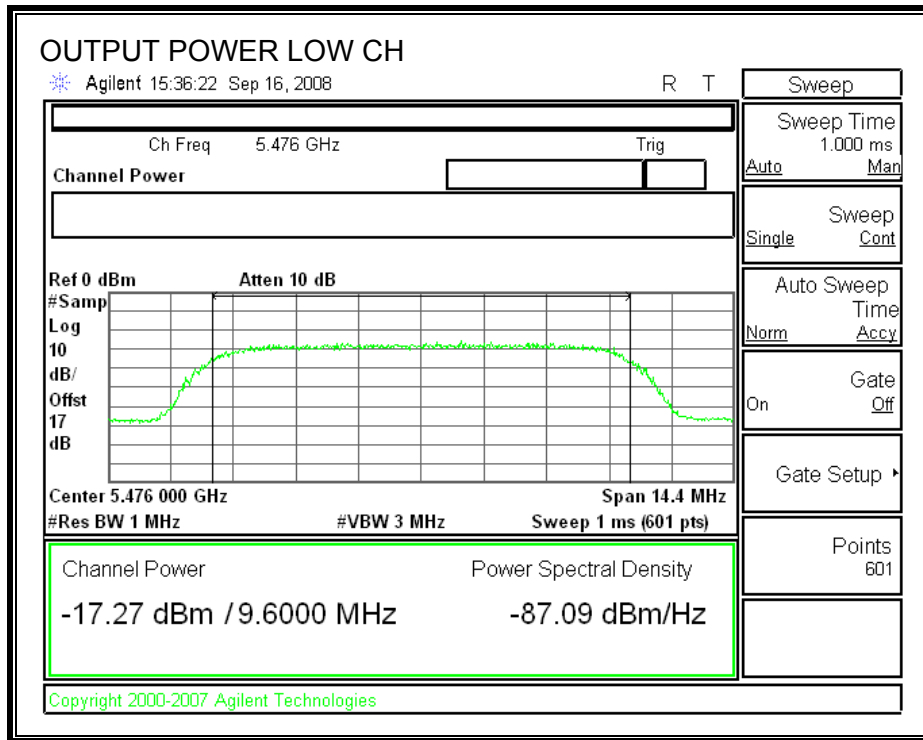
The Panel antenna has a lower gain than the Dish antenna, therefore the EIRP at the lowest power with the Panel antenna will be lower than indicated below for the Dish antenna.

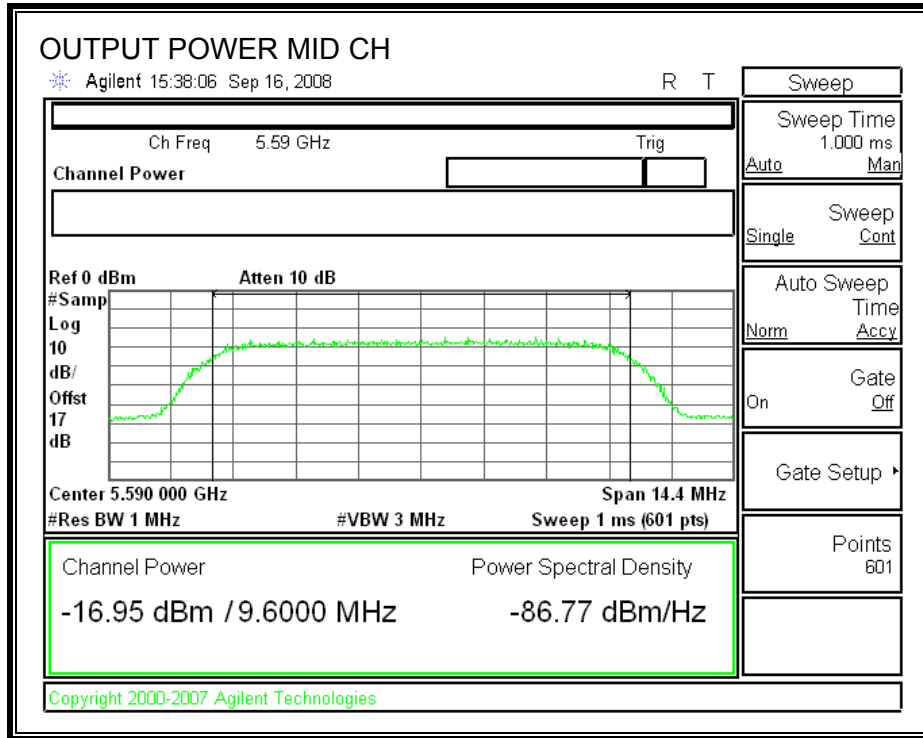
Limit

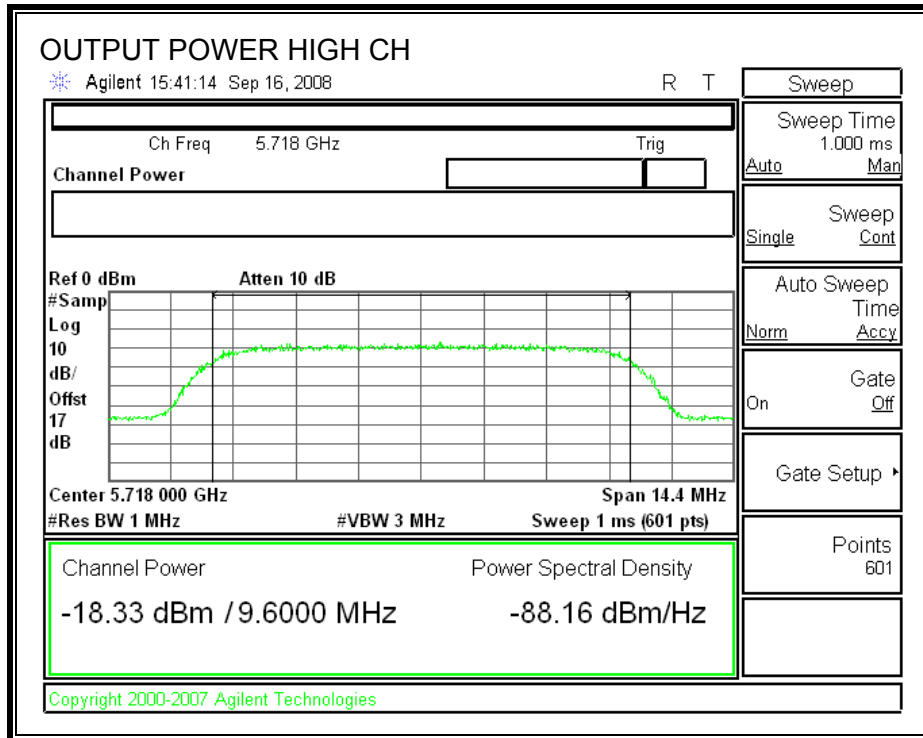
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	5 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5476	24	9.6	14.82	32.30	-11.48
Mid	5590	24	9.6	14.82	32.30	-11.48
High	5718	24	9.6	14.82	32.30	-11.48

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5476	-17.27	-11.48	-5.79
Mid	5590	-16.95	-11.48	-5.47
High	5718	-18.33	-11.48	-6.85







7.3. 15MHz BANDWIDTH

7.3.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

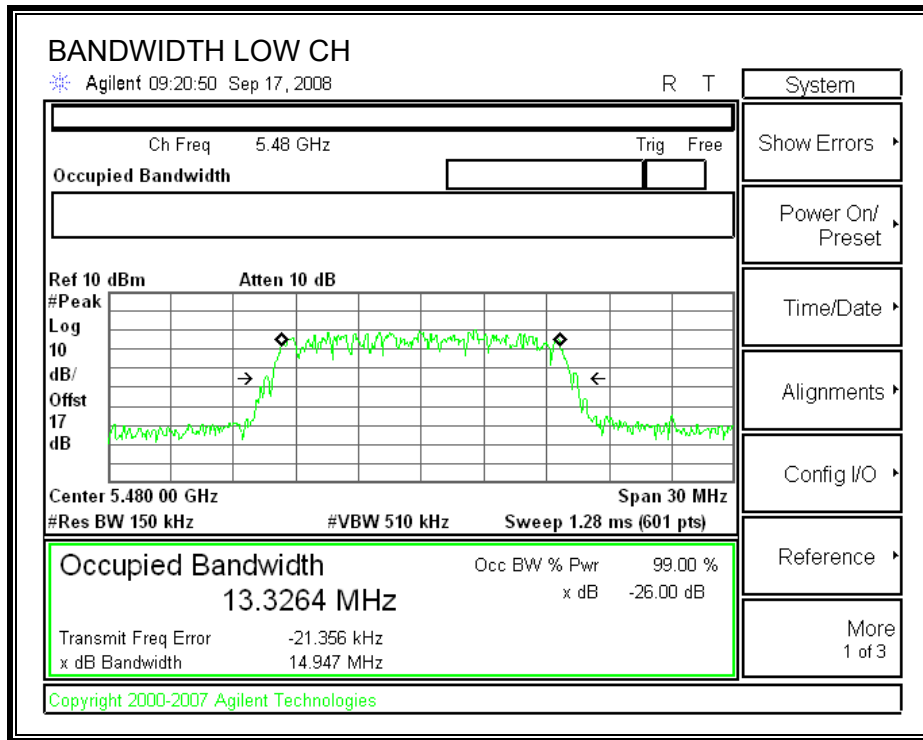
TEST PROCEDURE

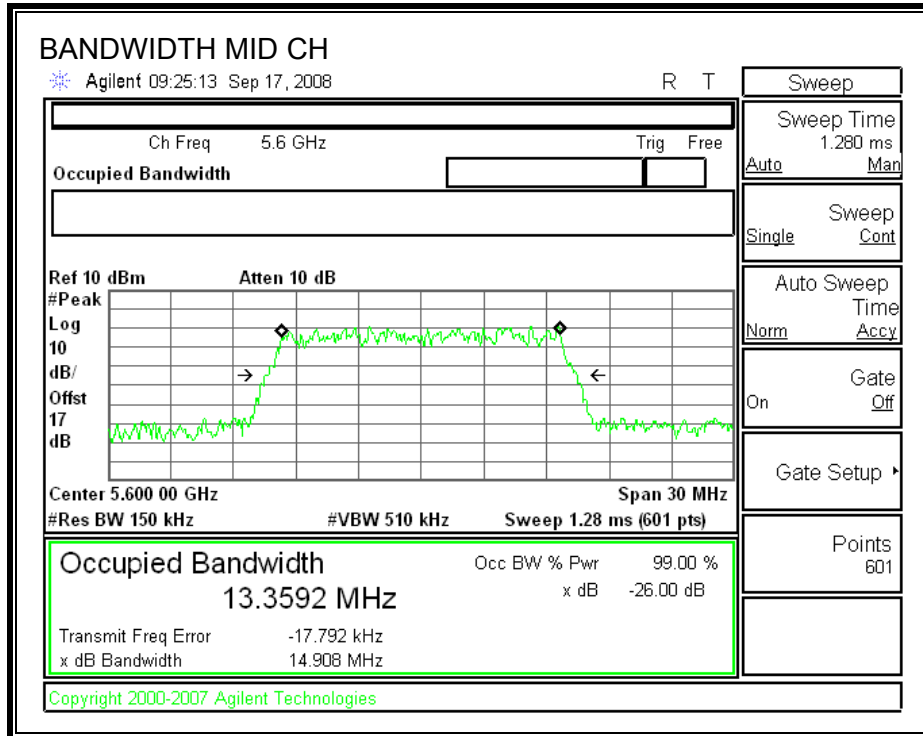
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

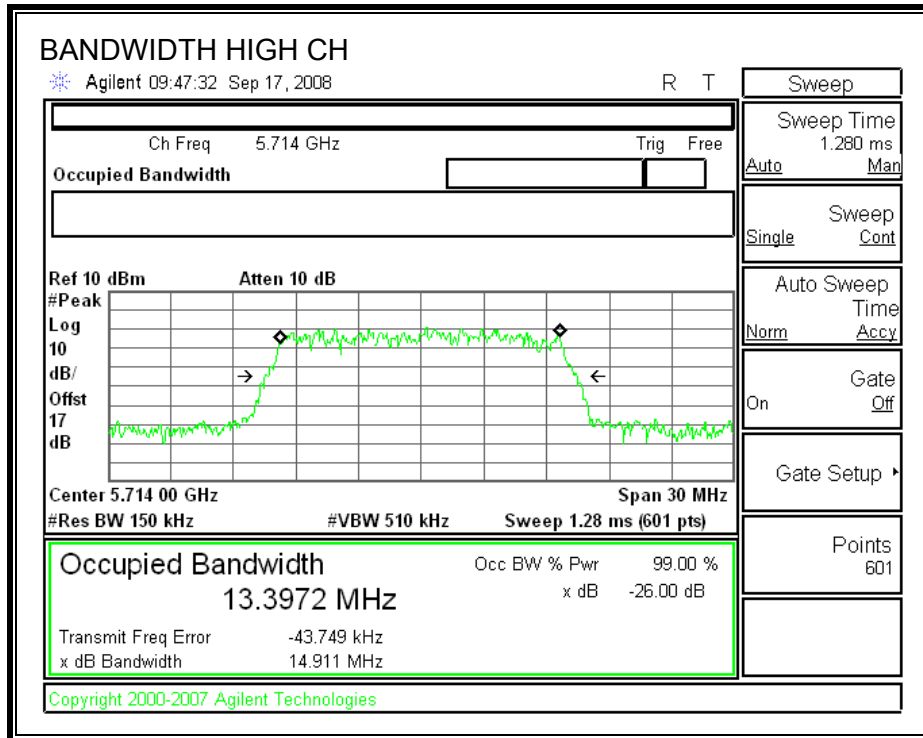
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5480	14.947	13.3264
Middle	5600	14.908	13.3592
High	5714	14.911	13.3972

26 dB and 99% BANDWIDTH







7.3.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 250 mW or $11 \text{ dBm} + 10 \log B$, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

The test is performed in accordance with method 1 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

DISH Antenna

Limit

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5480	24	15	22.76	33.90	-5.14
Mid	5600	24	15	22.76	33.90	-5.14
High	5714	24	15	22.76	33.90	-5.14

Individual Chain Results

Channel	Frequency (MHz)	Port V Power (dBm)	Port H Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5480	-8.91	-10.40	-6.58	-5.14	-1.44
Mid	5600	-8.37	-10.13	-6.15	-5.14	-1.01
High	5714	-8.54	-10.31	-6.33	-5.14	-1.19

PANEL Antenna

Limit

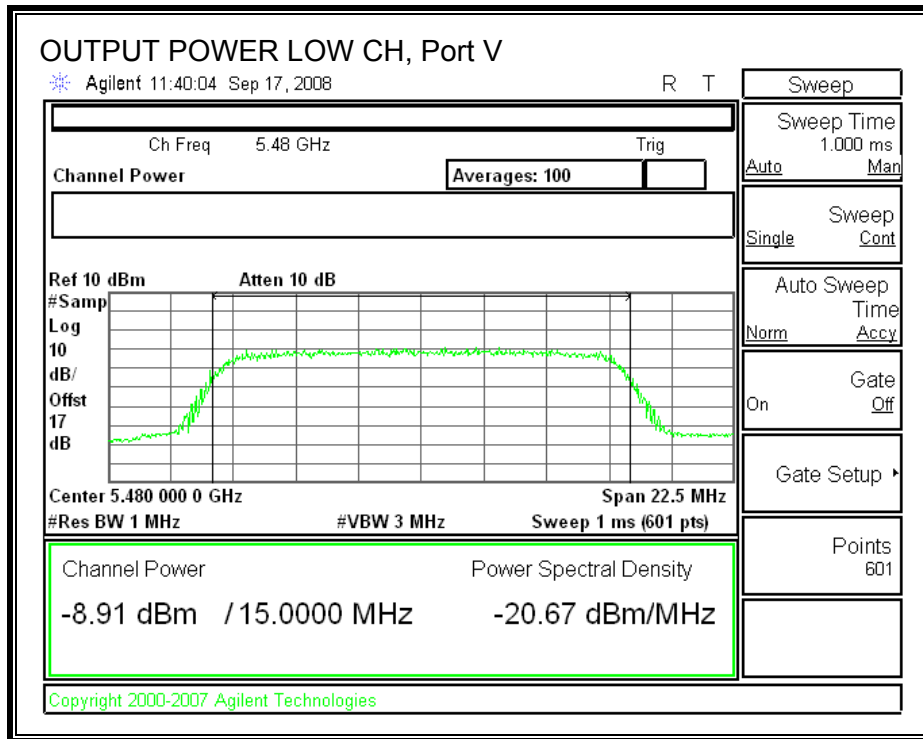
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5480	24	15	22.76	23.00	5.76
Mid	5600	24	15	22.76	23.00	5.76
High	5714	24	15	22.76	23.00	5.76

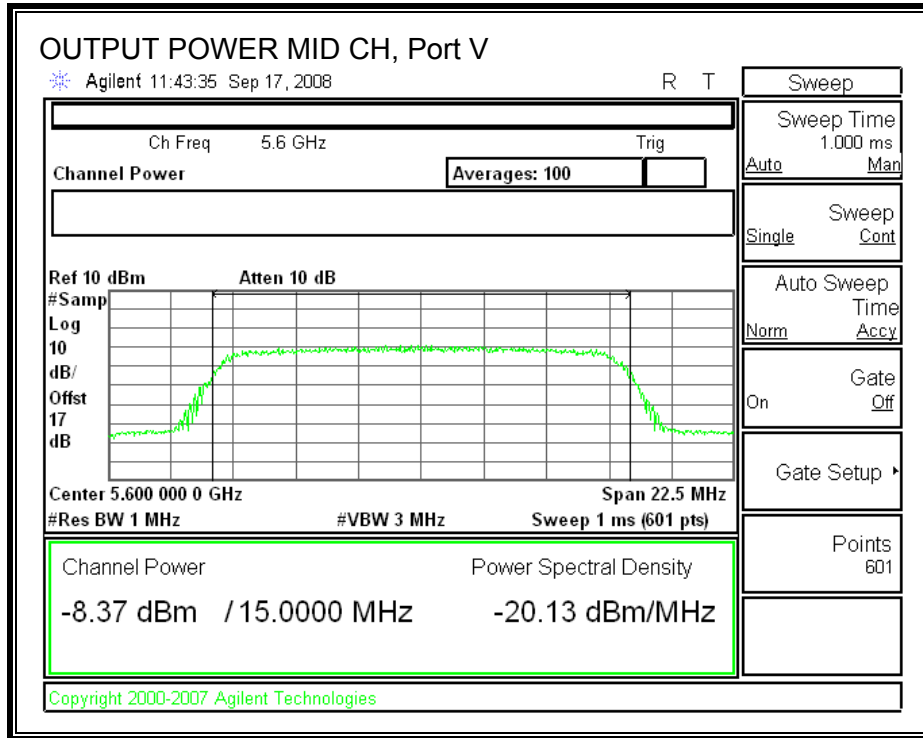
Individual Chain Results

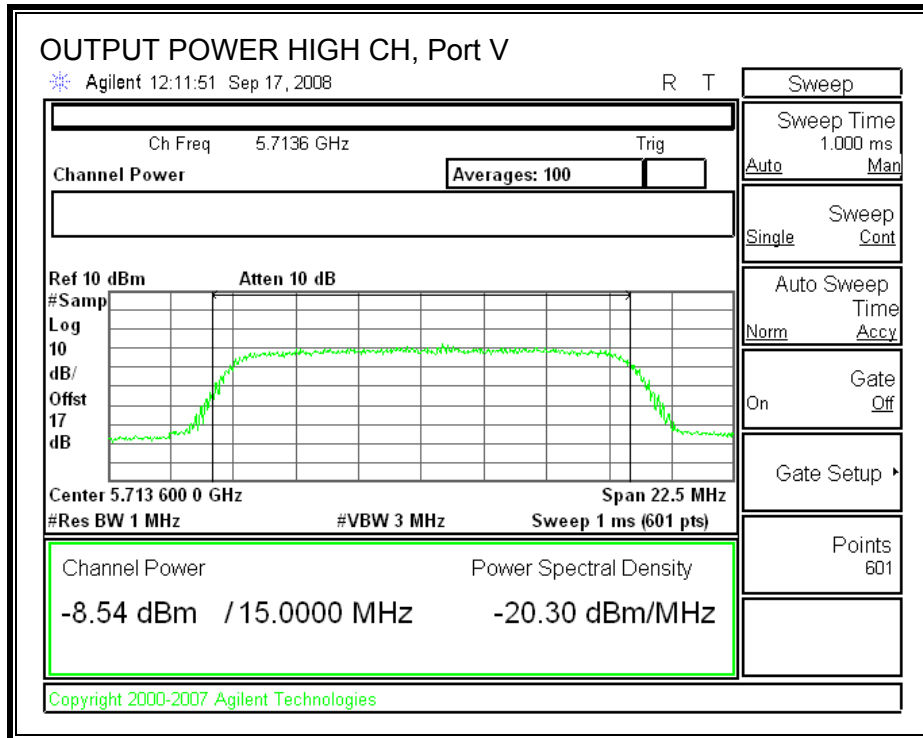
Channel	Frequency (MHz)	Port V Power (dBm)	Port H Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5480	0.95	0.77	3.87	5.76	-1.89
Mid	5600	1.15	0.80	3.99	5.76	-1.77
High	5714	1.04	0.82	3.94	5.76	-1.82

DISH ANTENNA

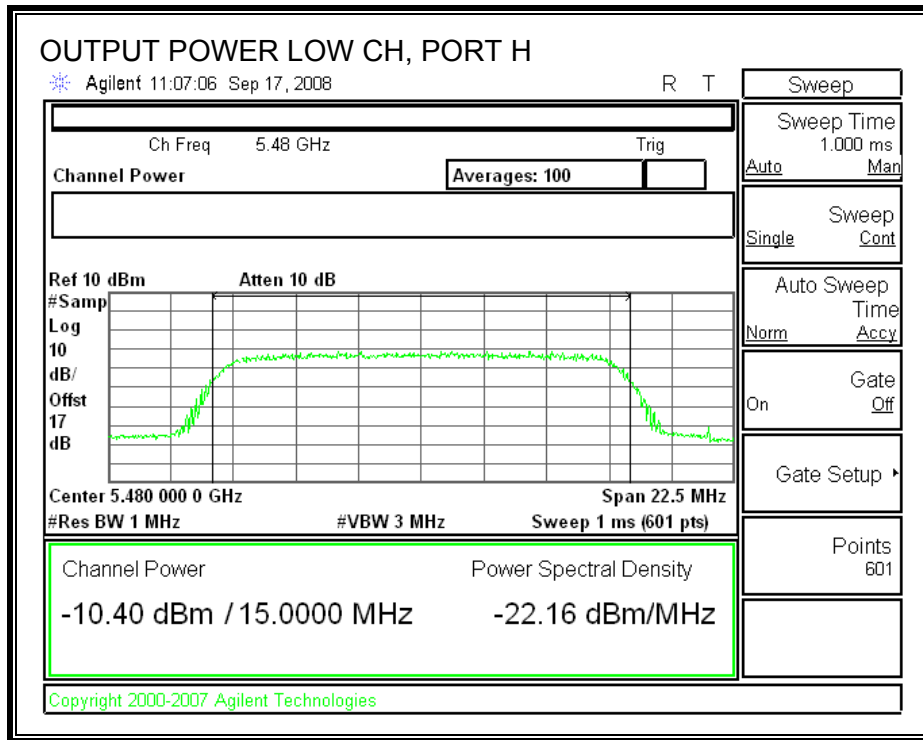
PORT V OUTPUT POWER

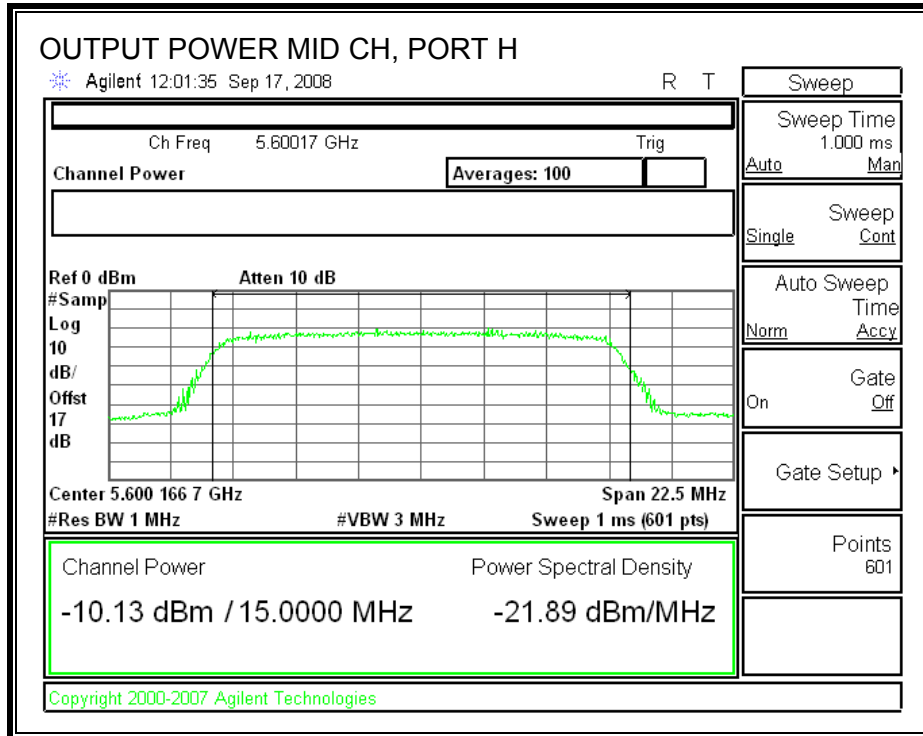


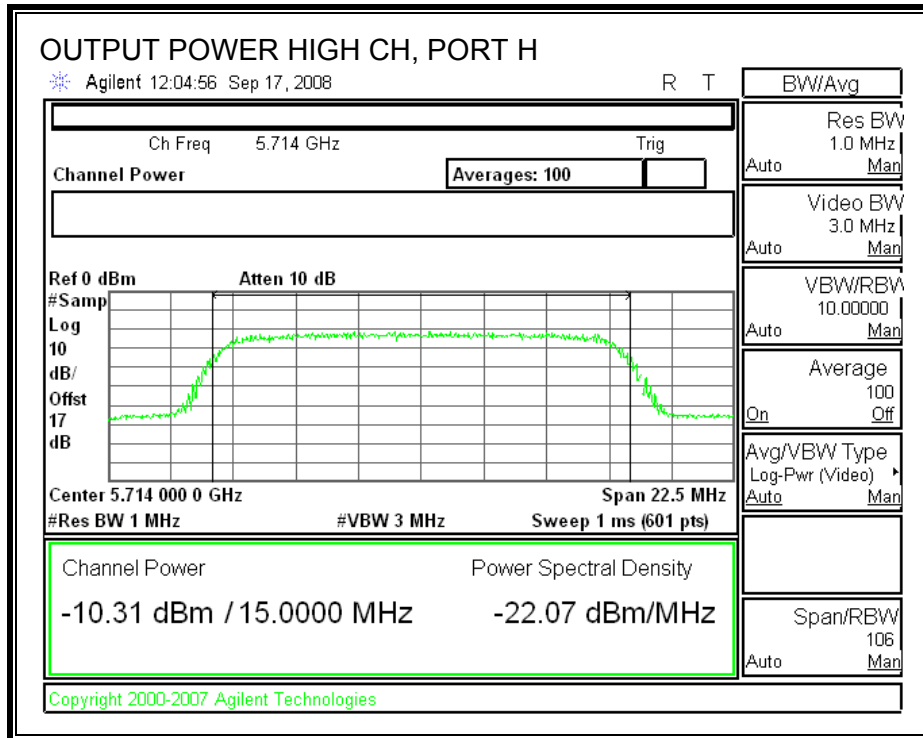




PORT H OUTPUT POWER

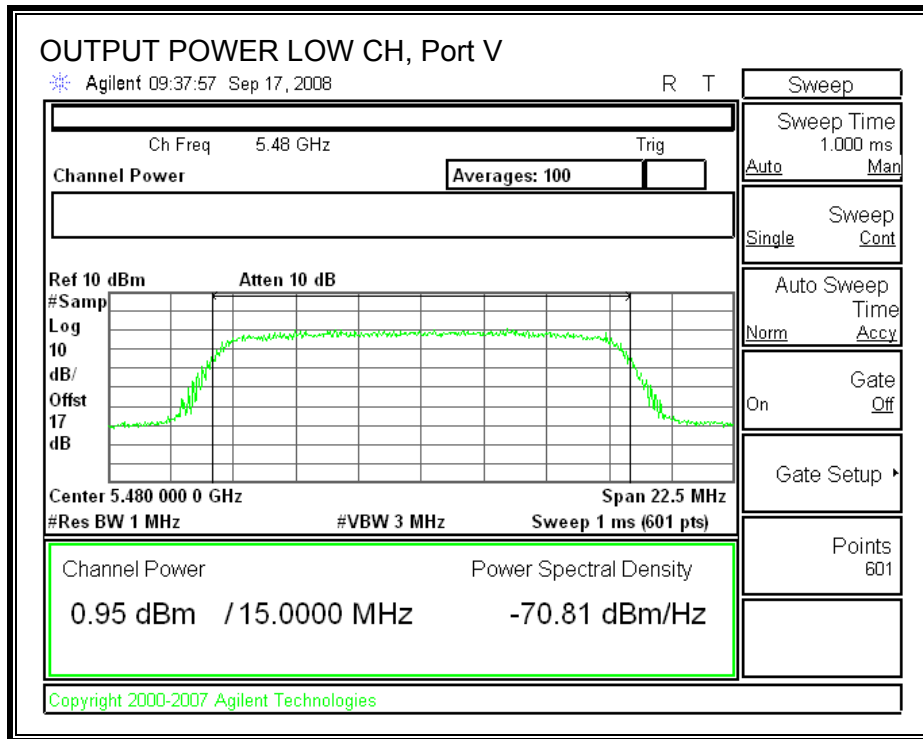


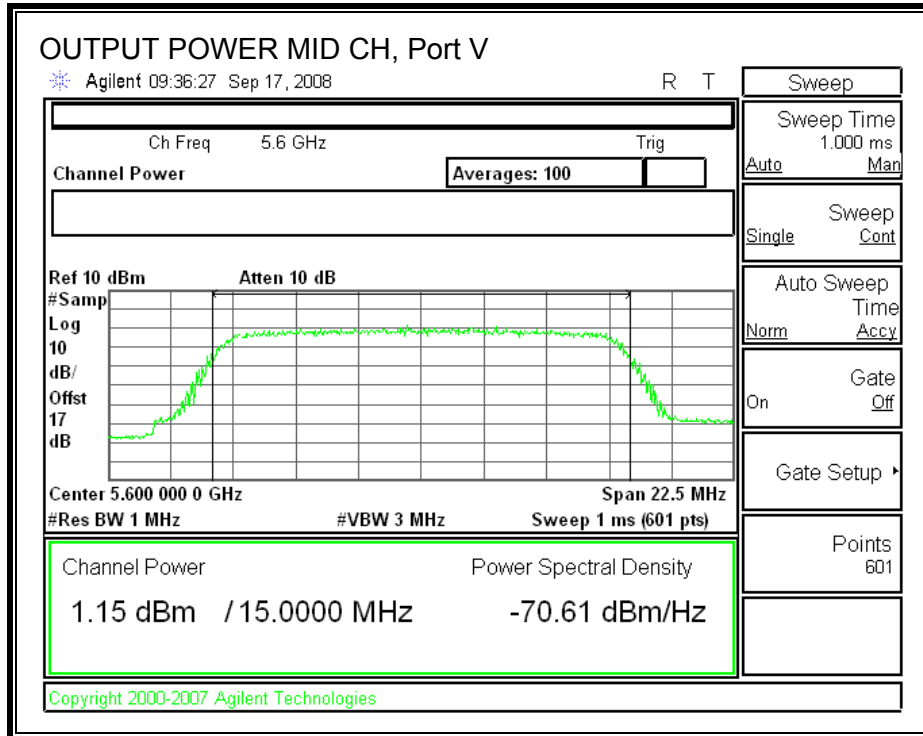


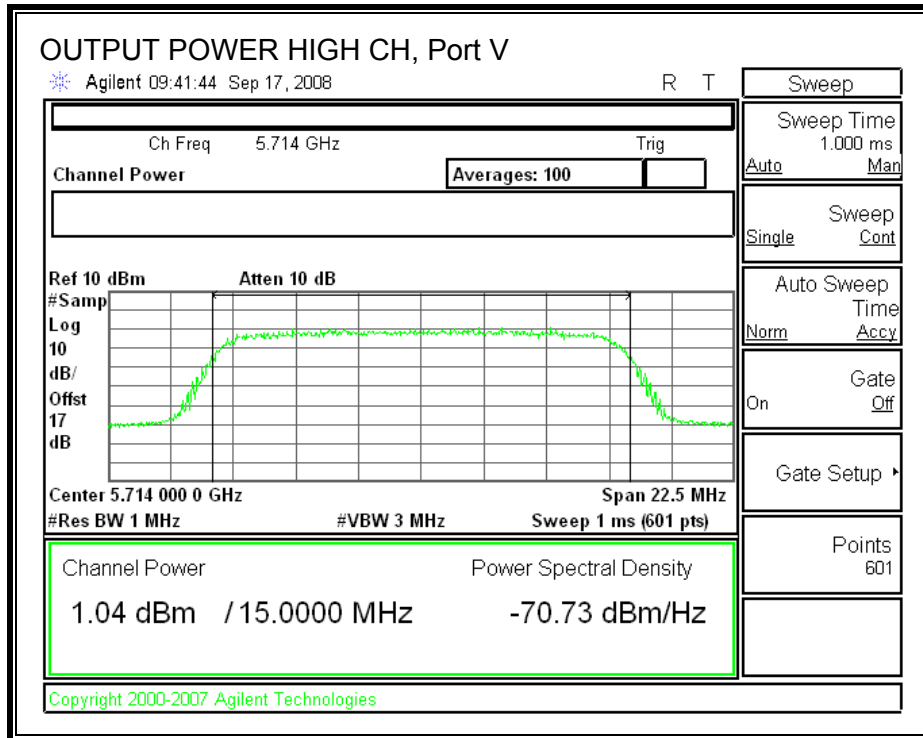


PANEL ANTENNA

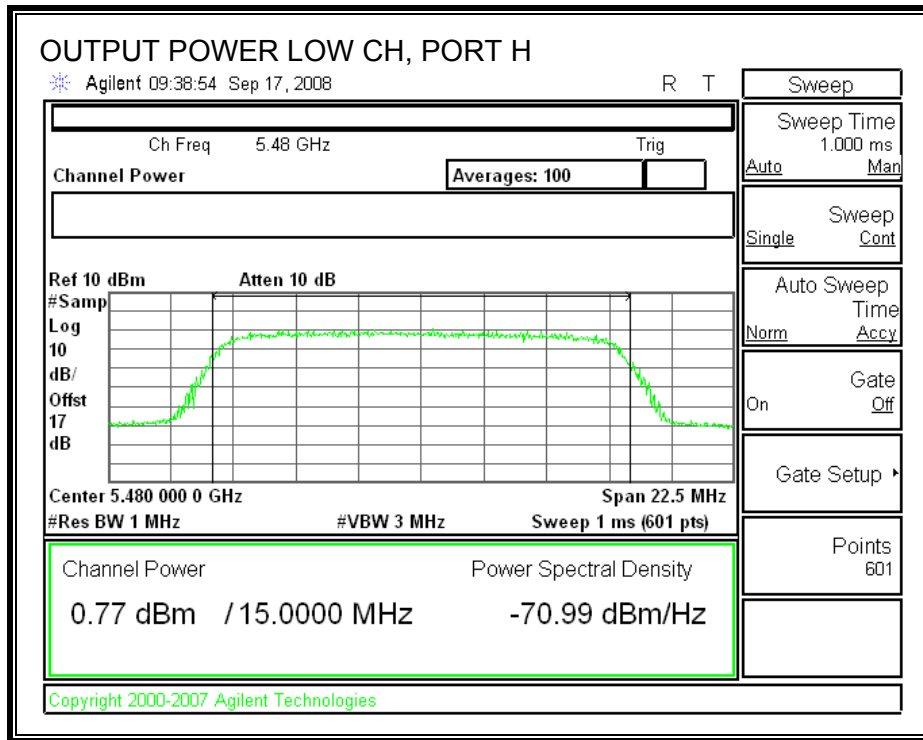
PORT V OUTPUT POWER

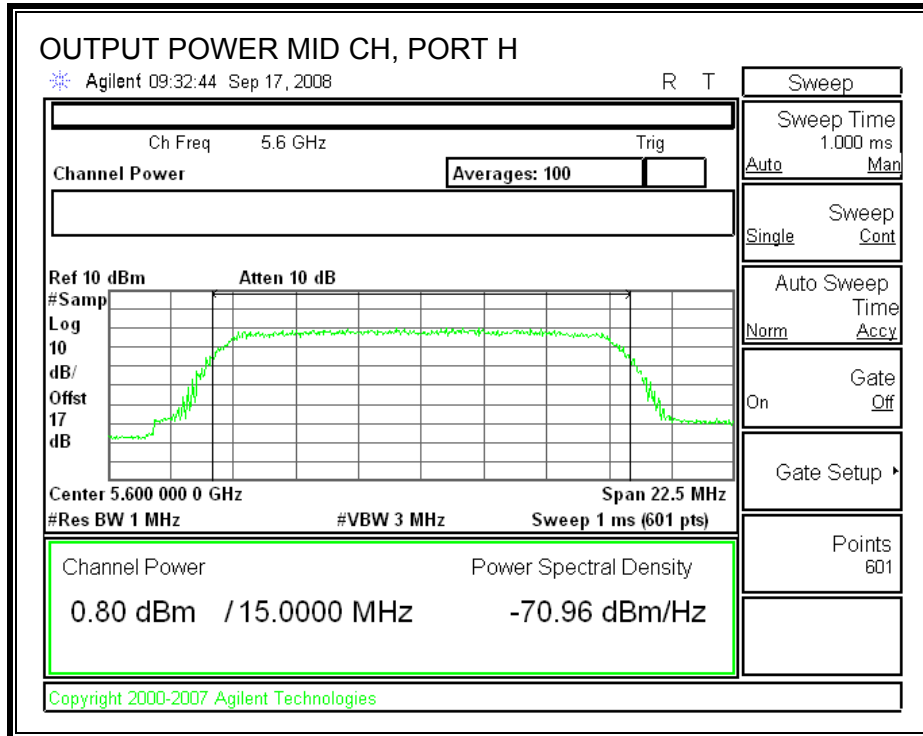


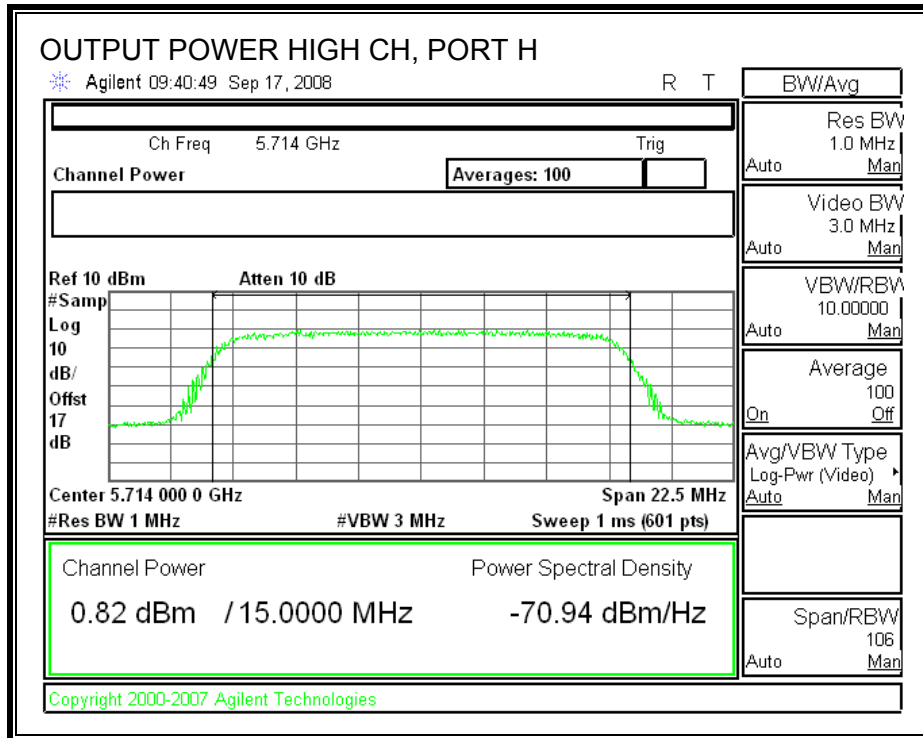




PORT H OUTPUT POWER







7.3.3. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 17 dB (including 16 dB pad and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

DISH ANTENNA

Channel	Frequency (MHz)	Power (dBm)
Low	5480	-10.15
Middle	5600	-9.55
High	5714	-9.63

Pannel ANTENNA

Channel	Frequency (MHz)	Power (dBm)
Low	5480	0.37
Middle	5600	0.44
High	5714	0.33

7.3.4. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (2)

IC RSS-210 A9.2 (2)

For the 5.47-5.725 GHz band, the peak power spectral density shall not exceed 11 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum Dish antenna gain is 33.9 dBi, therefore the limit is -16.9 dBm.

The maximum Panel antenna gain is 23 dBi, therefore the limit is -6 dBm.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

TEST PROCEDURE

The test is performed in accordance with PPSD method#2 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

DISH ANTENNA

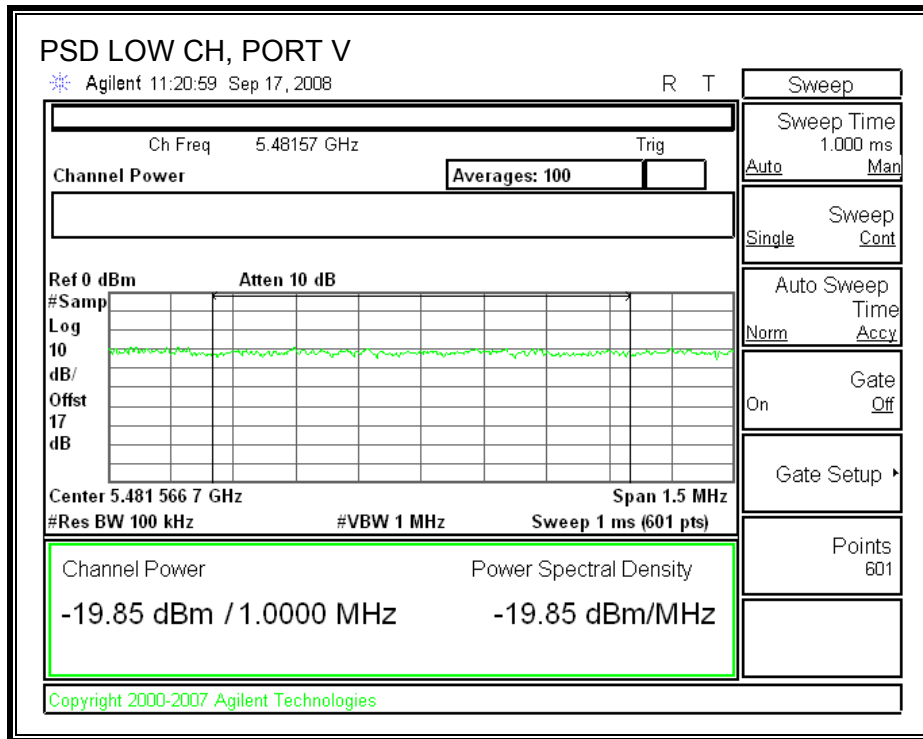
Channel	Frequency (MHz)	Port V PPSD (dBm)	Port H PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5480	-19.85	-21.47	-17.57	-16.9	-0.67
Middle	5600	-19.22	-21.26	-17.11	-16.9	-0.21
High	5714	-19.6	-21.3	-17.36	-16.9	-0.46

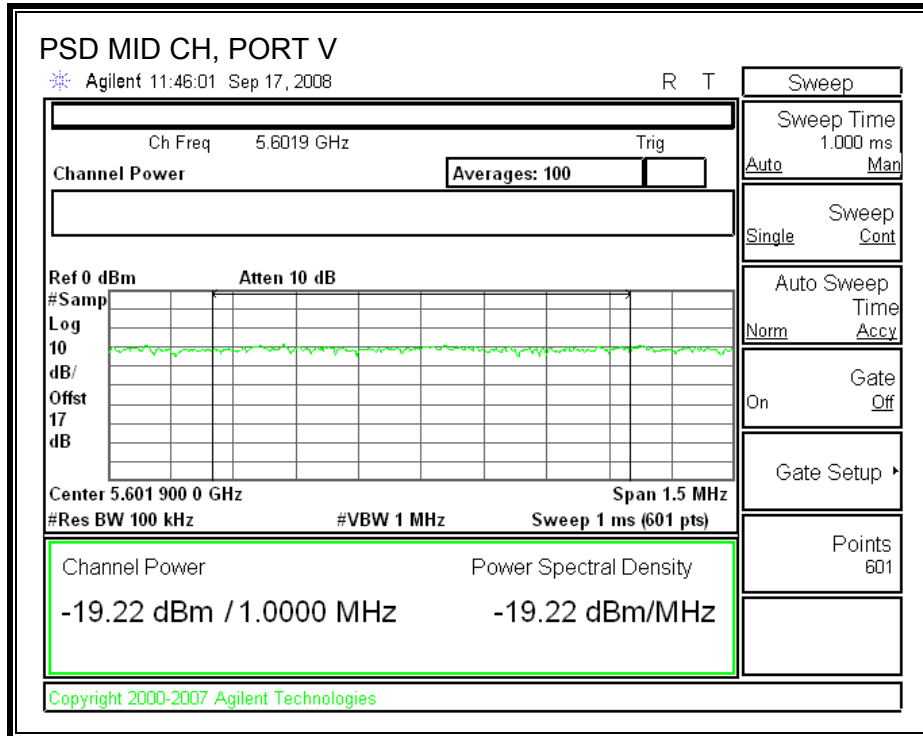
PANEL ANTENNA

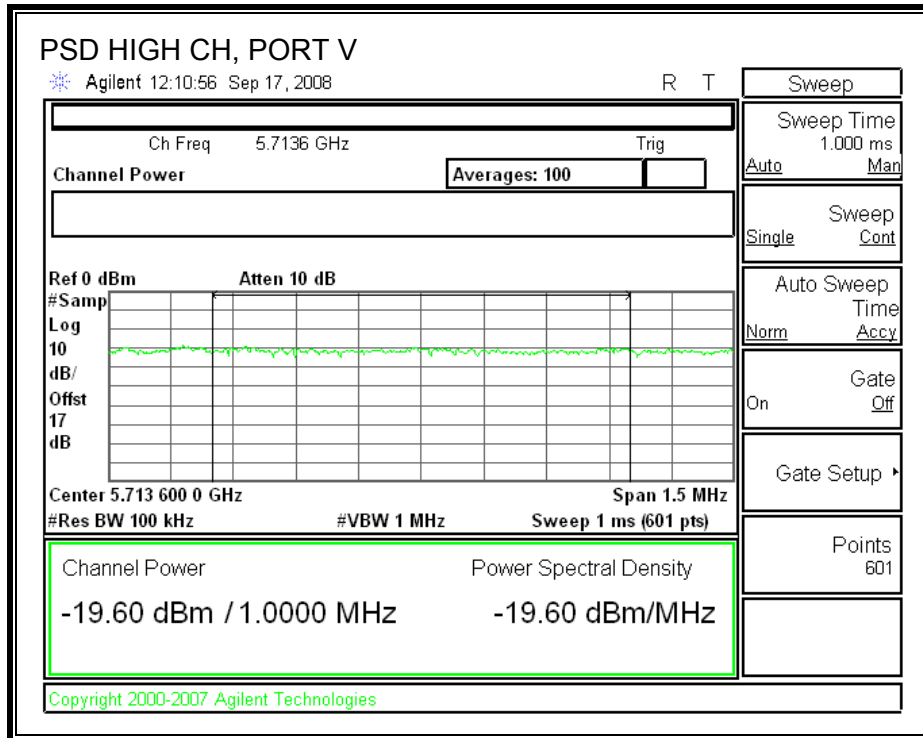
Channel	Frequency (MHz)	Port V PPSD (dBm)	Port H PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5480	-9.79	-10.18	-6.97	-6	-0.97
Middle	5600	-9.67	-10.65	-7.12	-6	-1.12
High	5714	-9.8	-9.83	-6.80	-6	-0.80

Dish Antenna

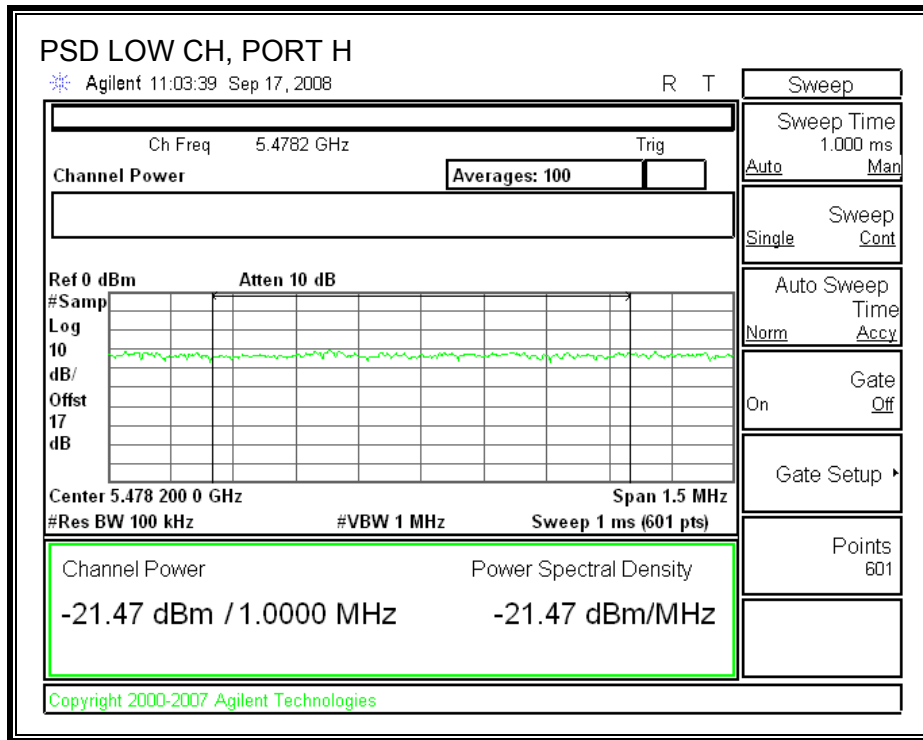
PORT V POWER SPECTRAL DENSITY

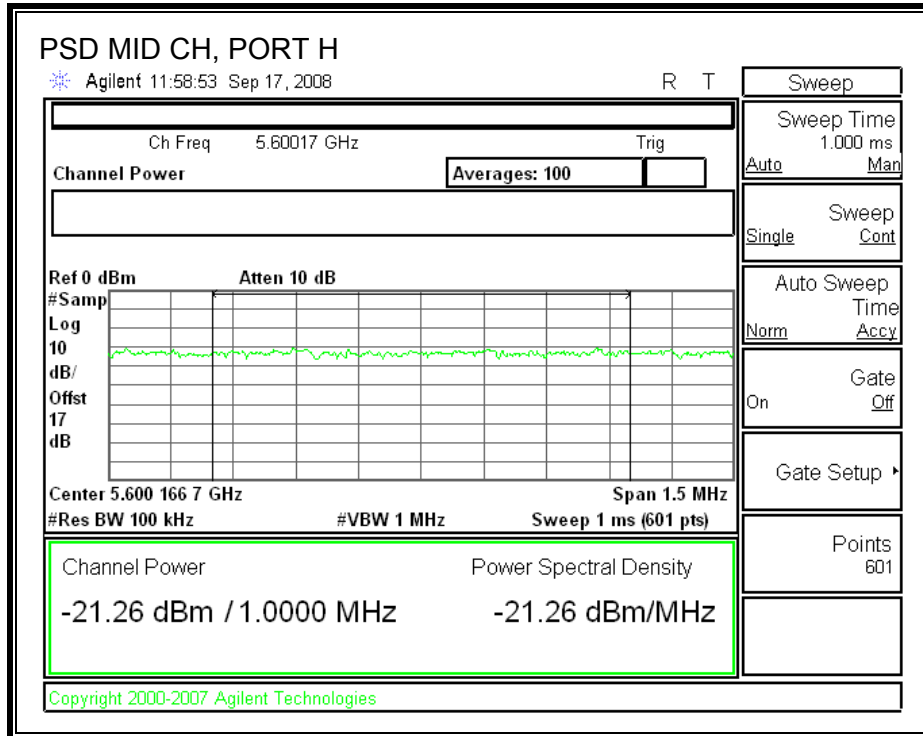


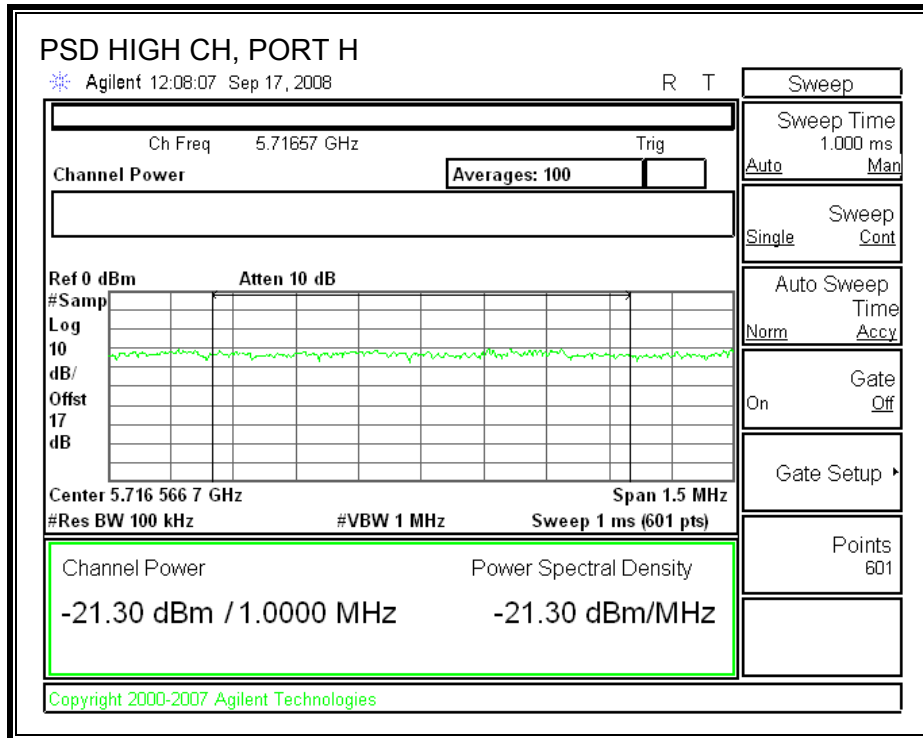




PORT H POWER SPECTRAL DENSITY

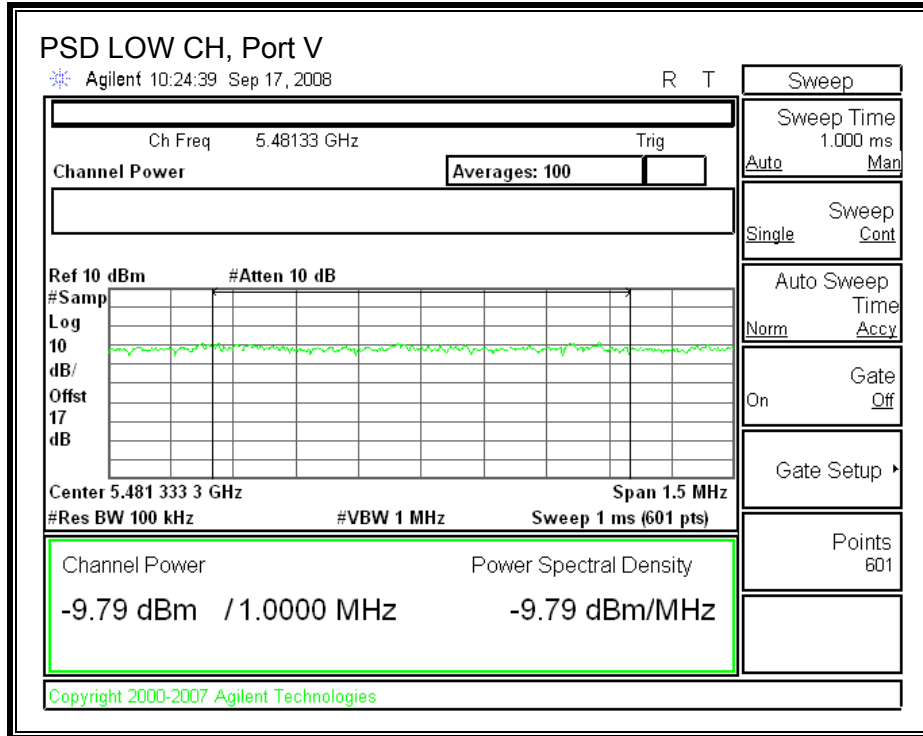


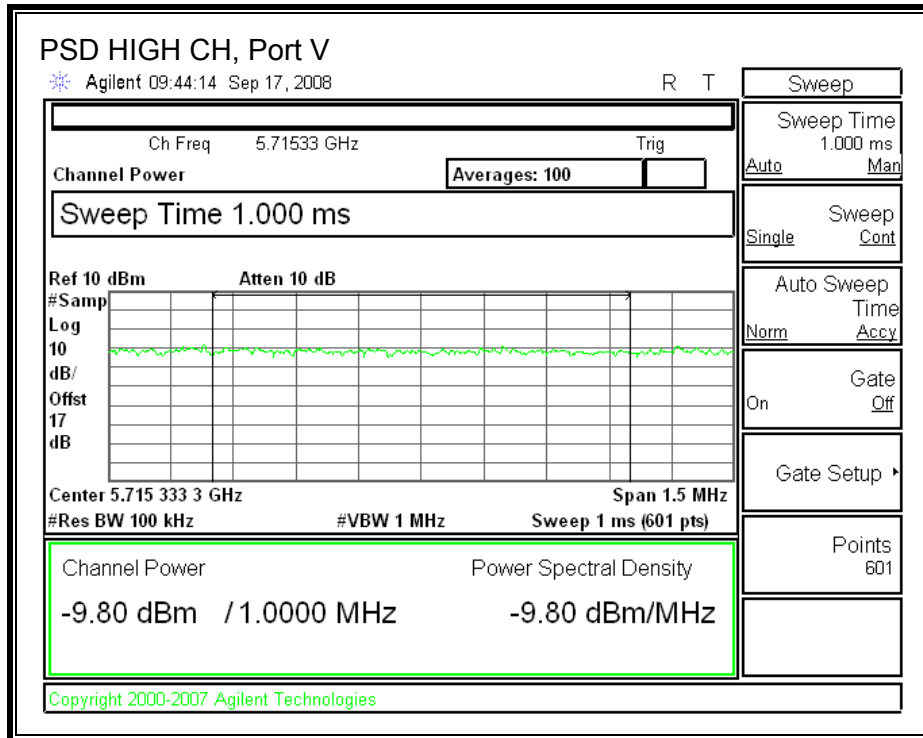




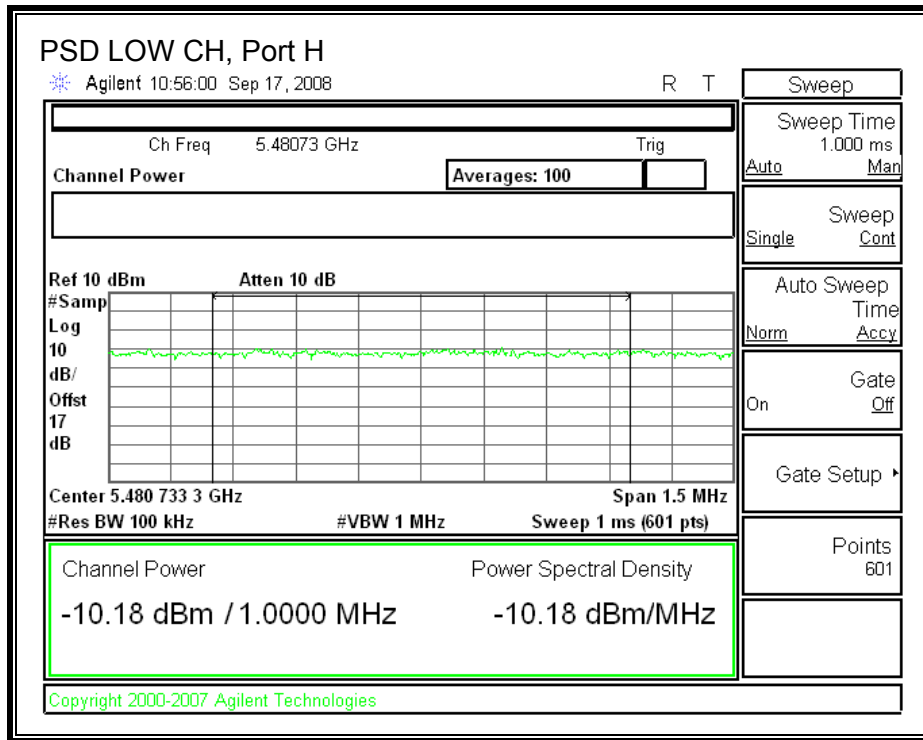
Panel Antenna

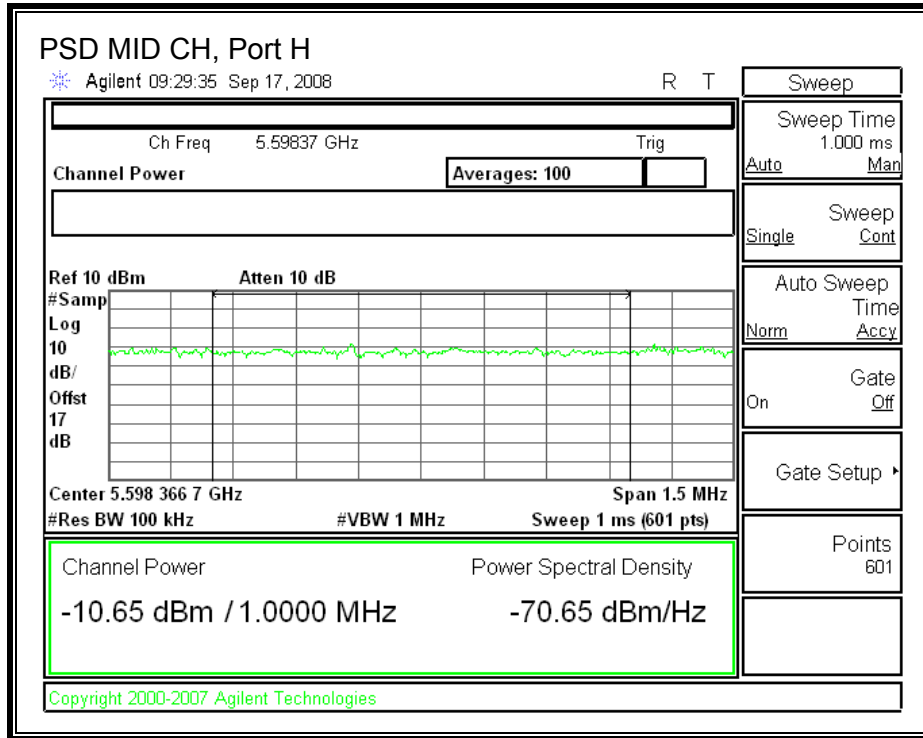
Port V POWER SPECTRAL DENSITY

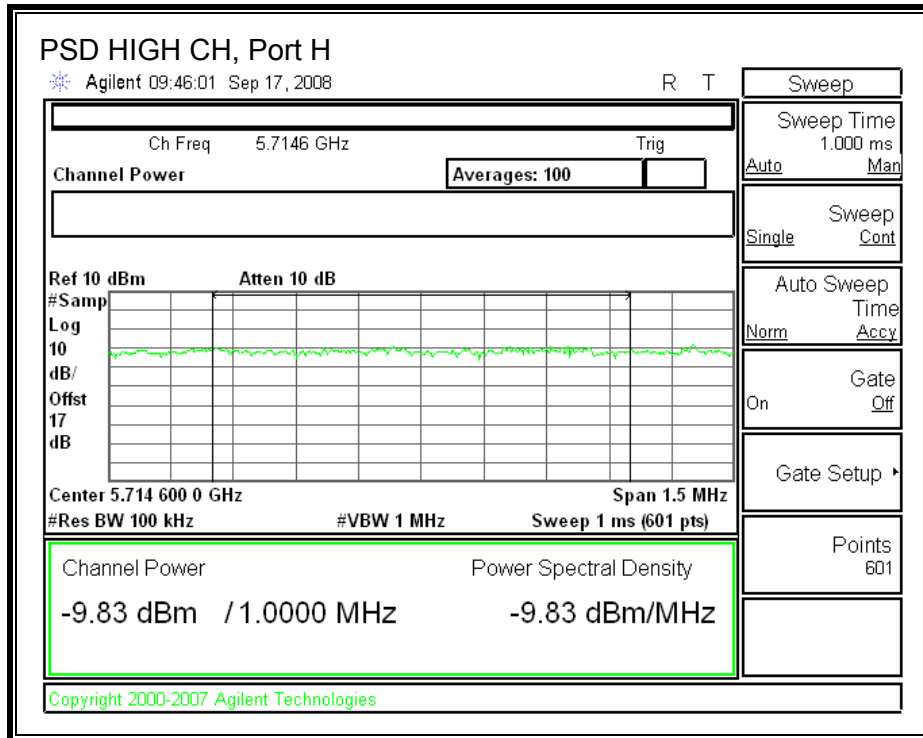




Port H POWER SPECTRAL DENSITY







7.3.5. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

The ratio of the peak excursion of the modulation envelope (measured using a peak hold function) to the peak transmit power (measured as specified above) shall not exceed 13 dB across any 1 MHz bandwidth or the emission bandwidth whichever is less.

TEST PROCEDURE

The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

DISH ANTENNA

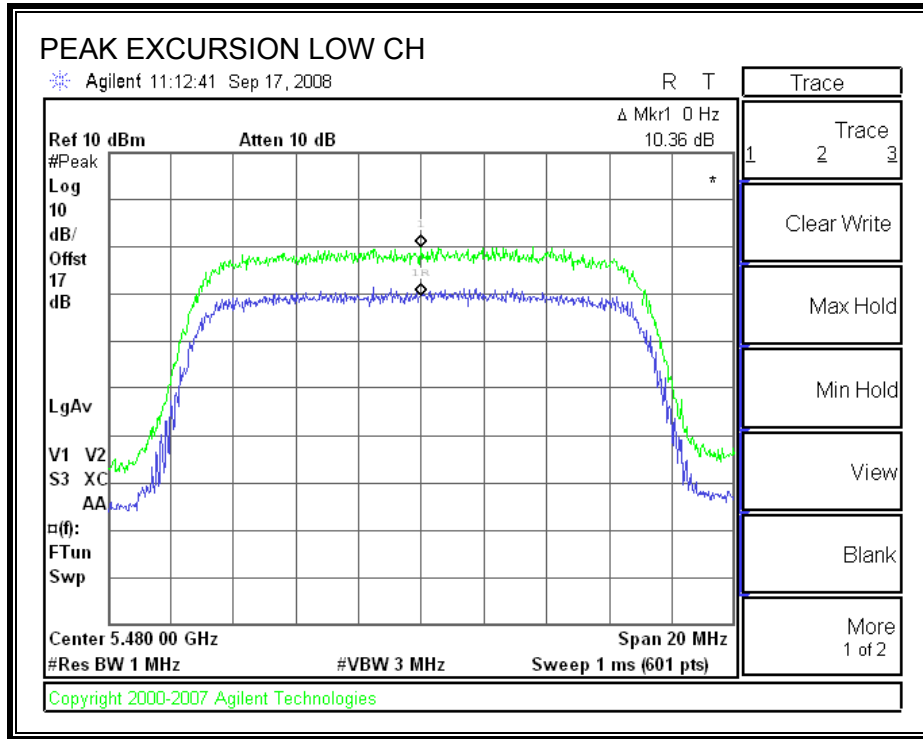
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5480	10.36	13	-2.64
Middle	5600	9.69	13	-3.31
High	5714	11.14	13	-1.86

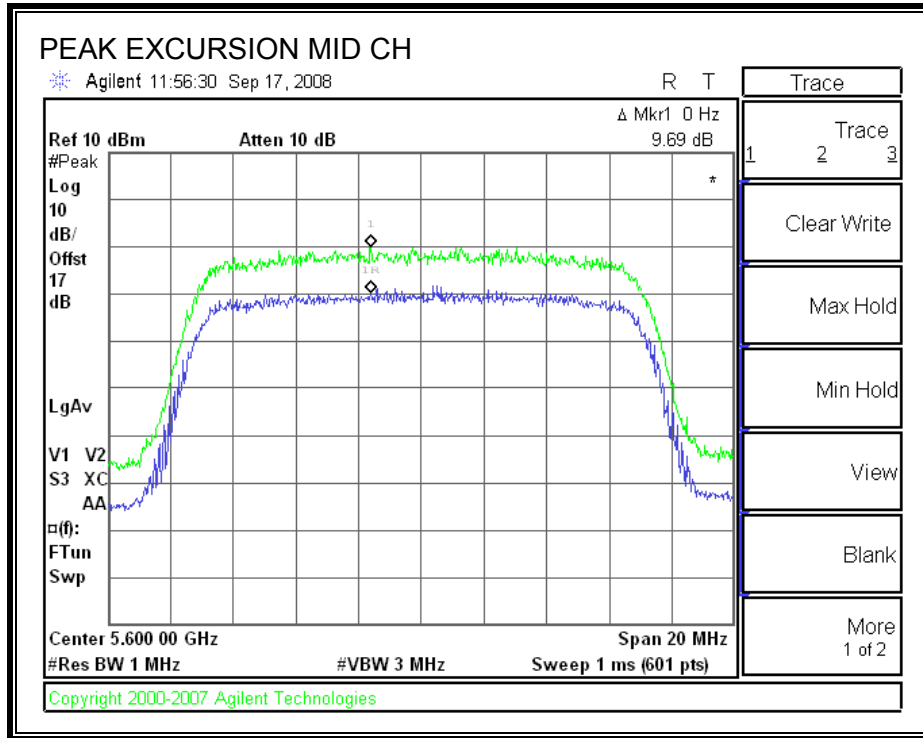
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5480	10.68	13	-2.32
Middle	5600	11.06	13	-1.94
High	5714	10.67	13	-2.33

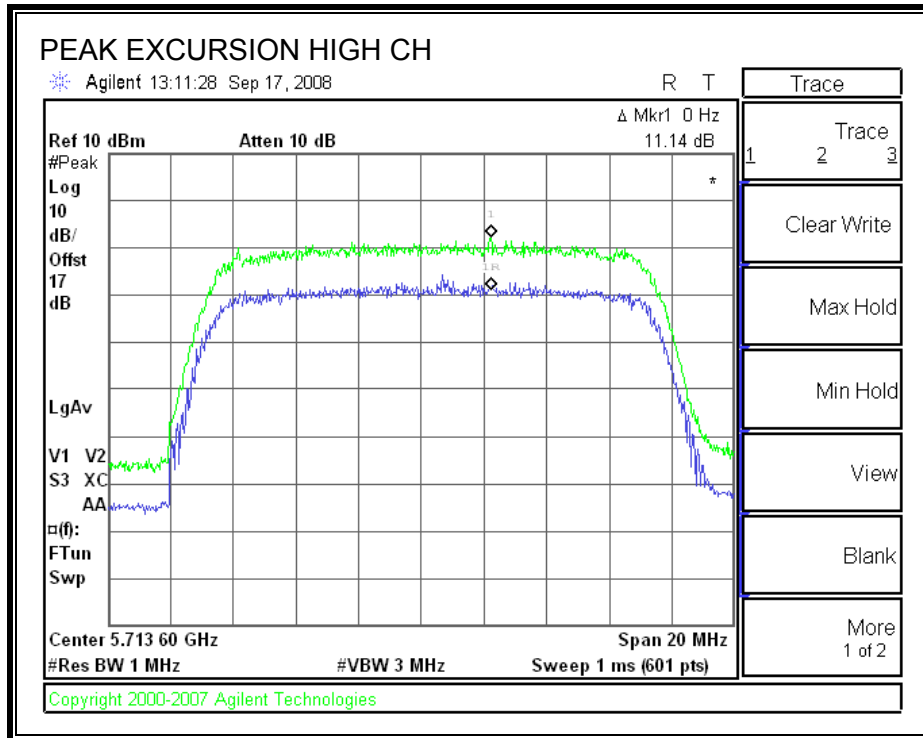
PANEL ANTENNA

DISH ANTENNA

PEAK EXCURSION

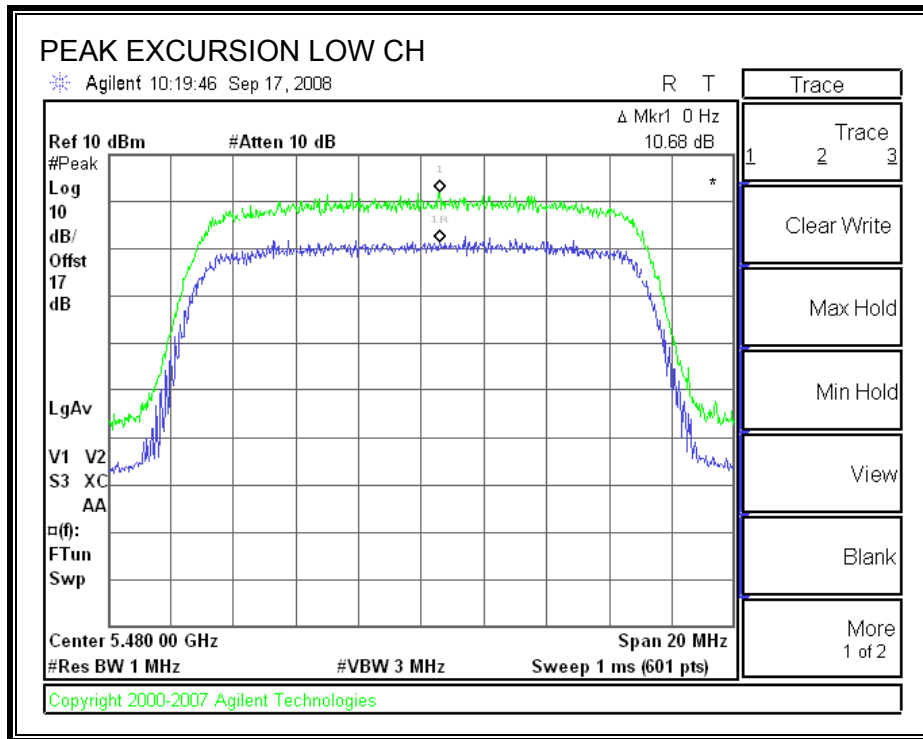


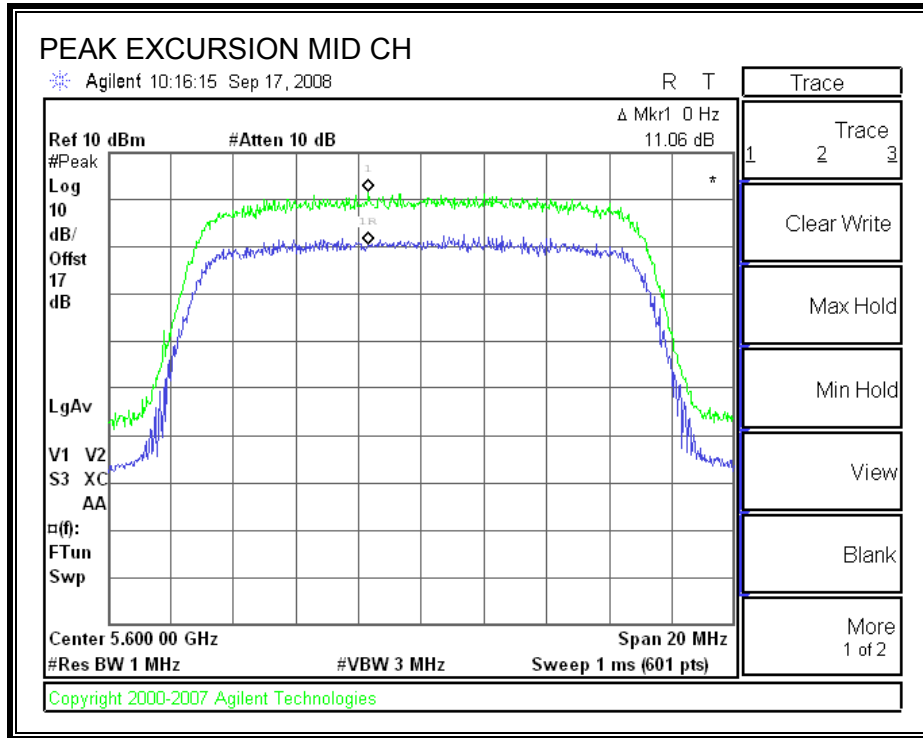


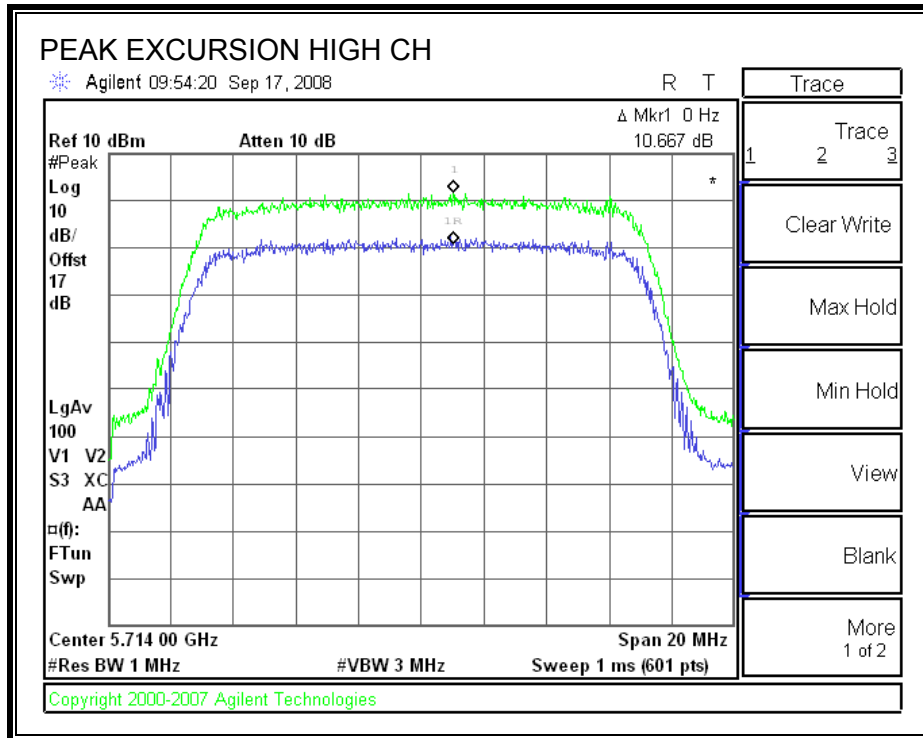


PANEL ANTENNA

PEAK EXCURSION







7.3.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (3)

IC RSS-210 A9.3 (3)

For transmitters operating in the 5.47-5.725 GHz band: all emissions outside of the 5.47-5.725 GHz band shall not exceed an EIRP of -27dBm / MHz.

TEST PROCEDURE

Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

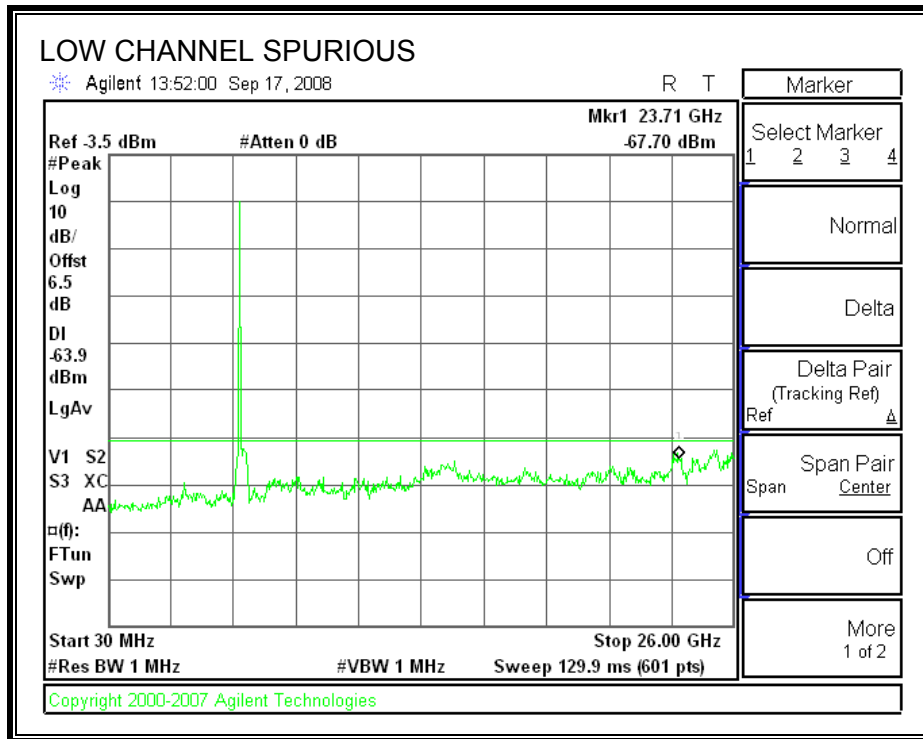
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1MHz Peak detection measurements are compared to the average EIRP limit, adjusted for the maximum antenna gain. If necessary, additional average detection measurements are made.

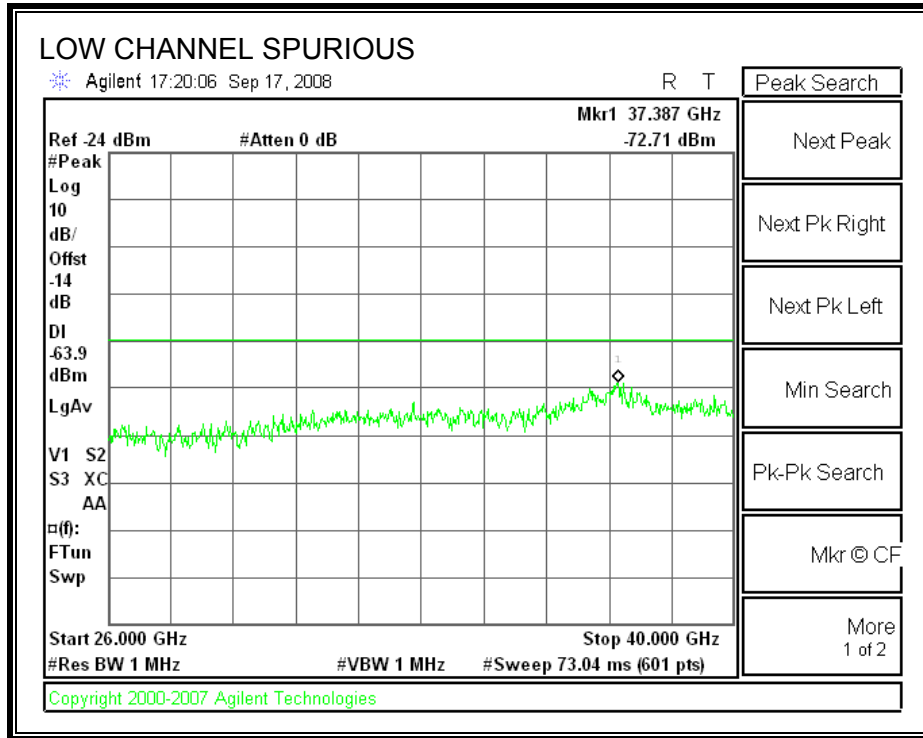
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

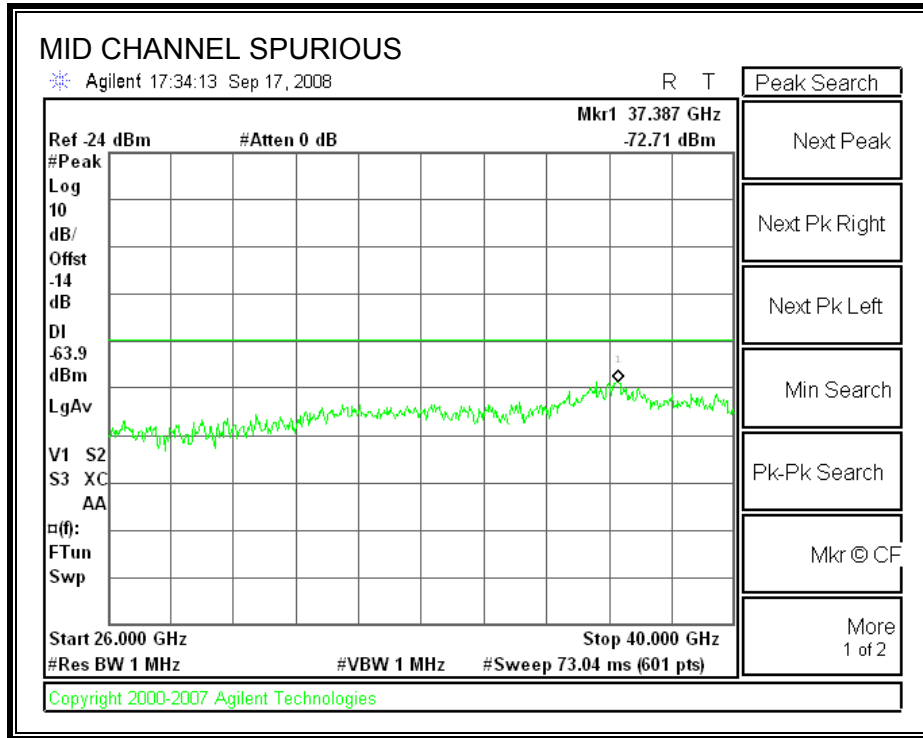
RESULTS

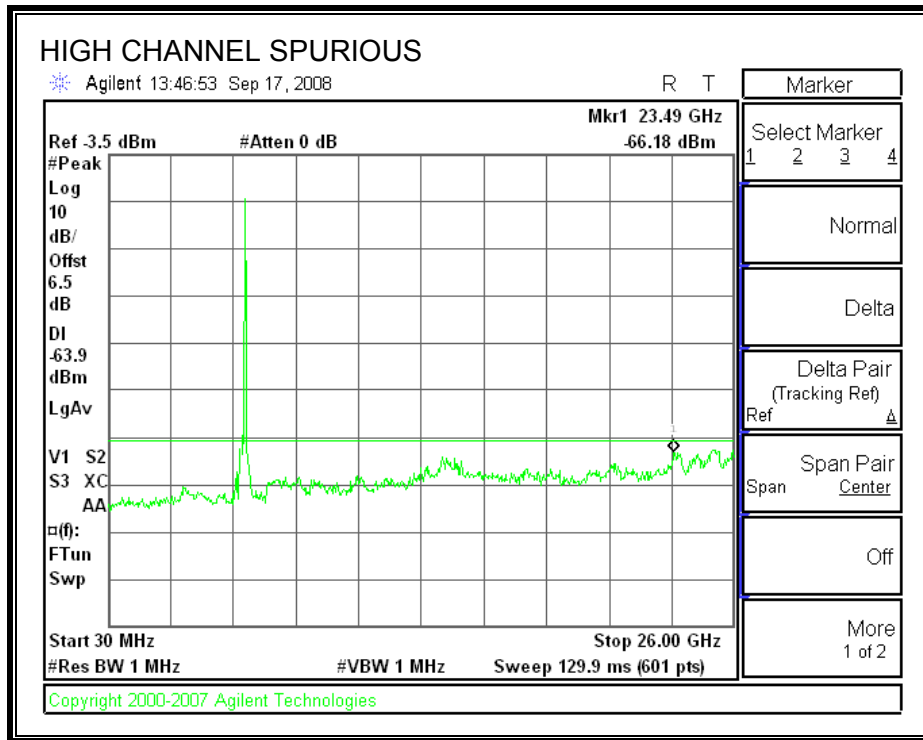
DISH ANTENNA

SPURIOUS EMISSIONS



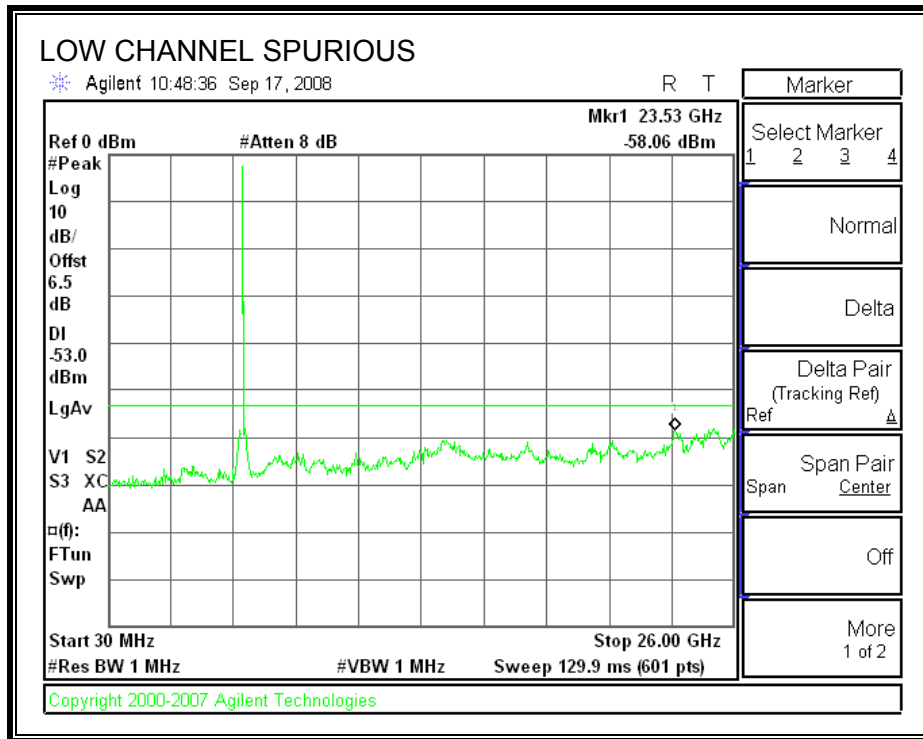


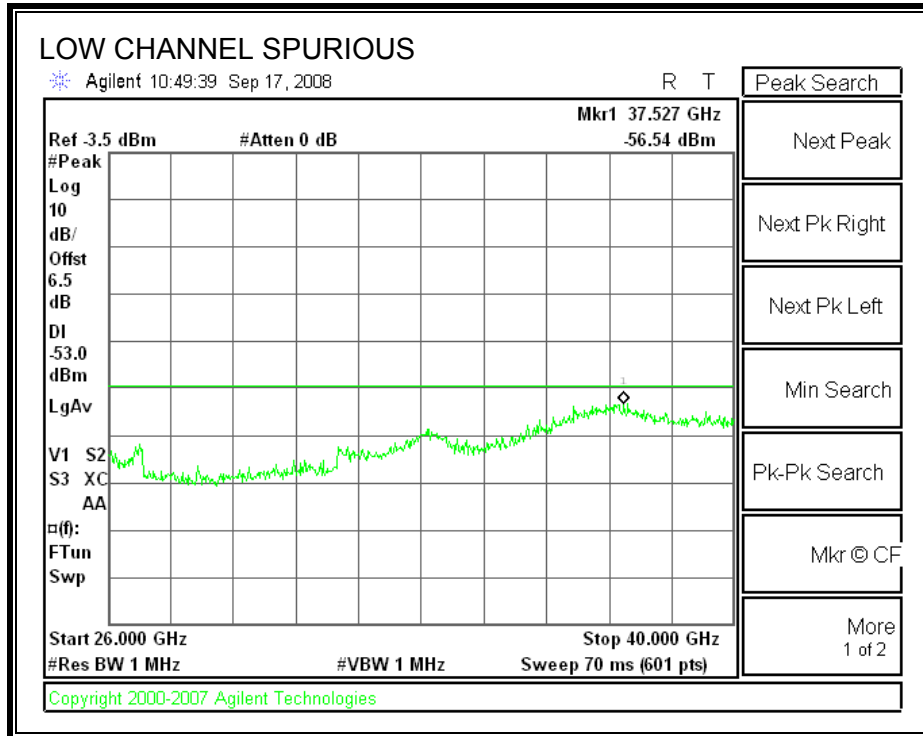


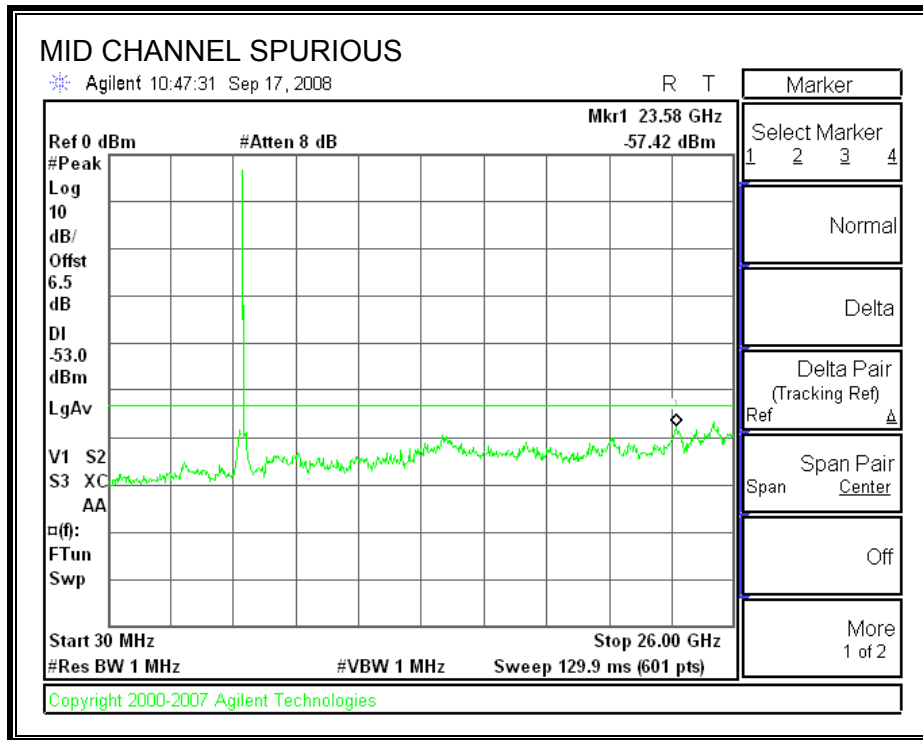


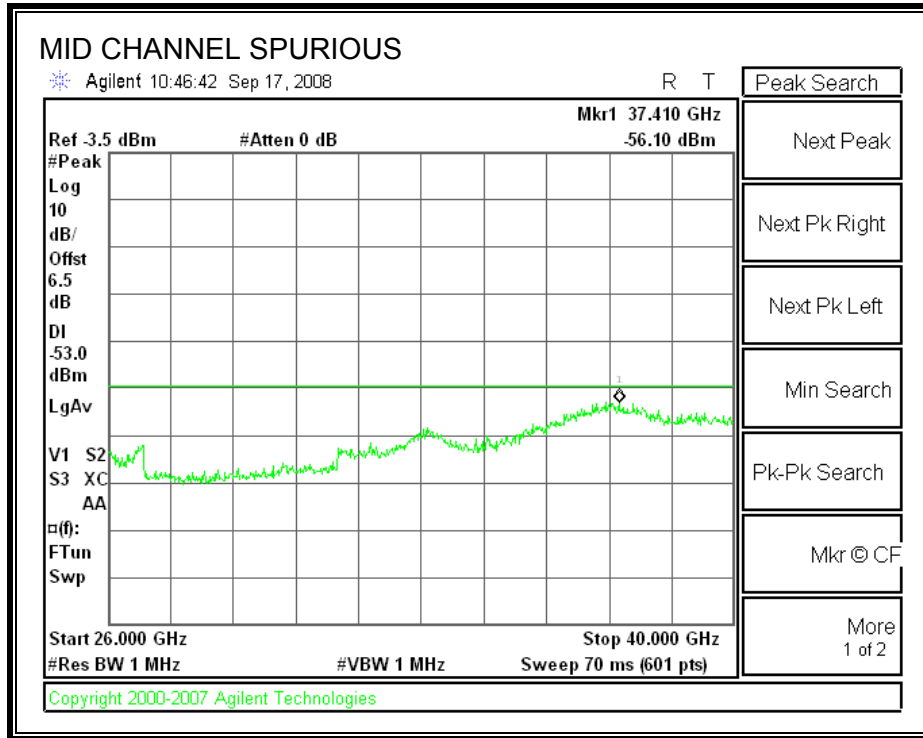
PANEL ANTENNA

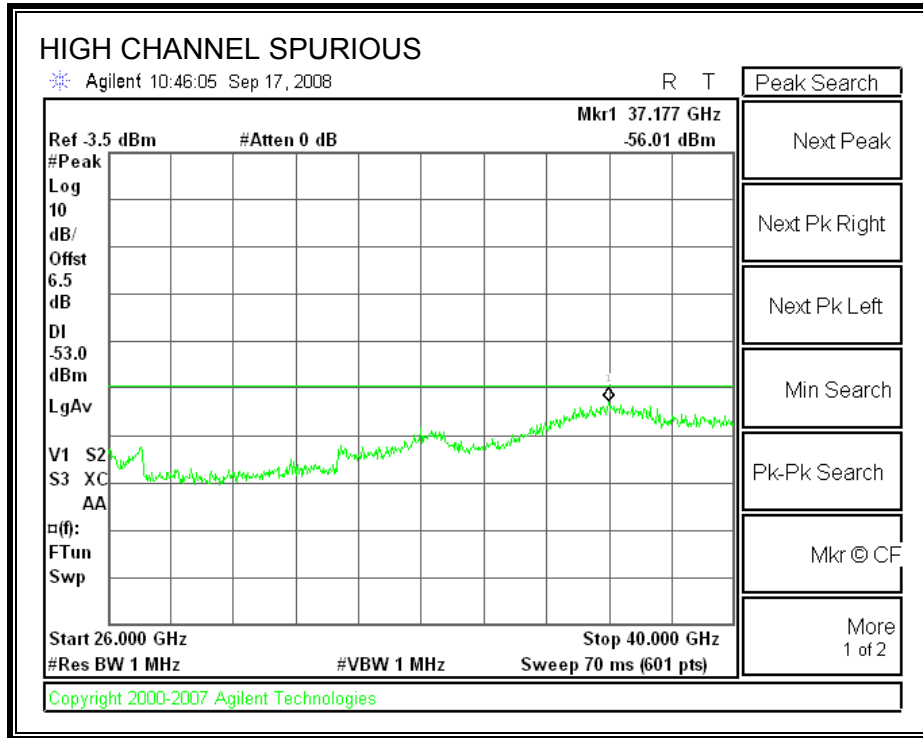
SPURIOUS EMISSIONS











7.3.7. TPC

LIMITS

FCC §15.407 (h) (1)

IC RSS-210 A9.4 (a)

Transmit power control (TPC). U-NII devices operating in the 5.25–5.35 GHz band and the 5.47–5.725 GHz band shall employ a TPC mechanism. The U-NII device is required to have the capability to operate at least 6 dB below the mean EIRP value of 30 dBm. A TPC mechanism is not required for systems with an e.i.r.p. of less than 500 mW.

TEST PROCEDURE

The test is performed in accordance with method 1 as documented in FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

External triggering is used to ensure that the transmitter operates at full control power during the entire sweep of every sweep.

RESULTS

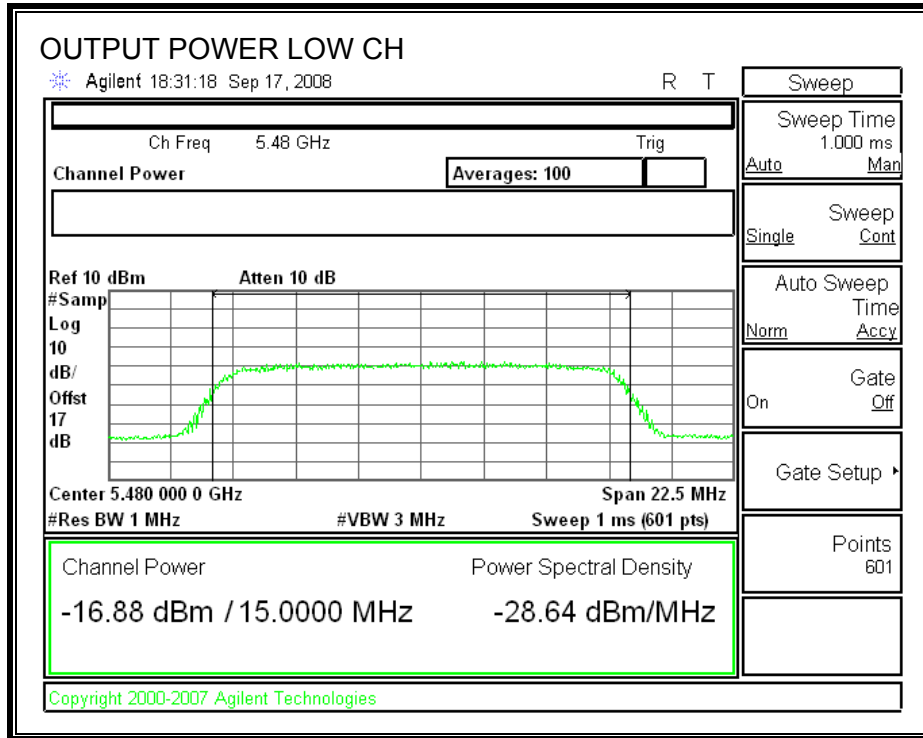
The Panel antenna has a lower gain than the Dish antenna, therefore the EIRP at the lowest power with the Panel antenna will be lower than indicated below for the Dish antenna.

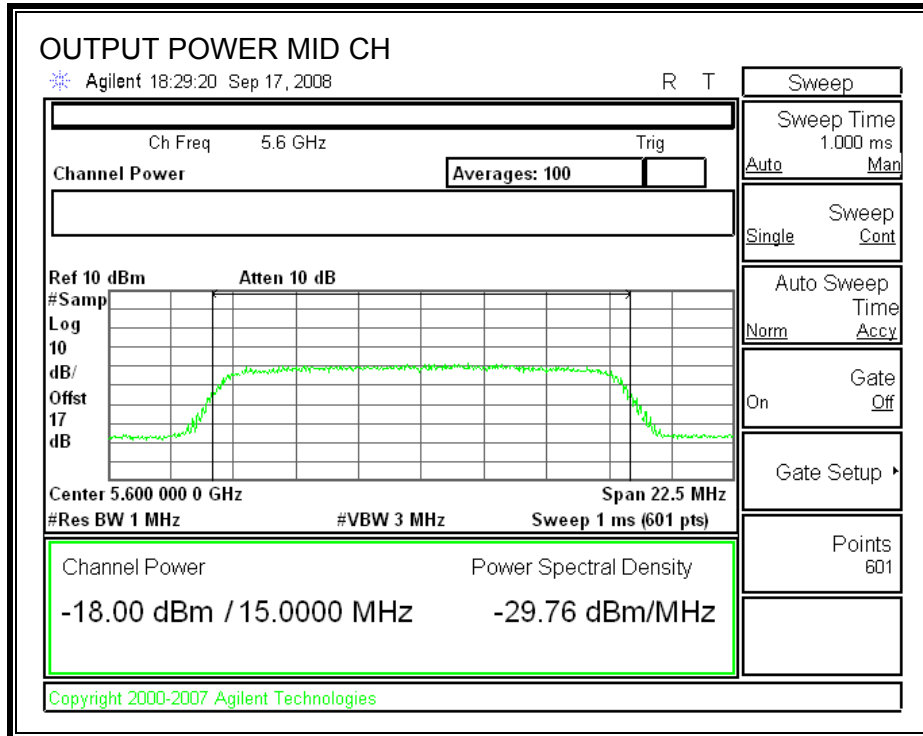
Limit

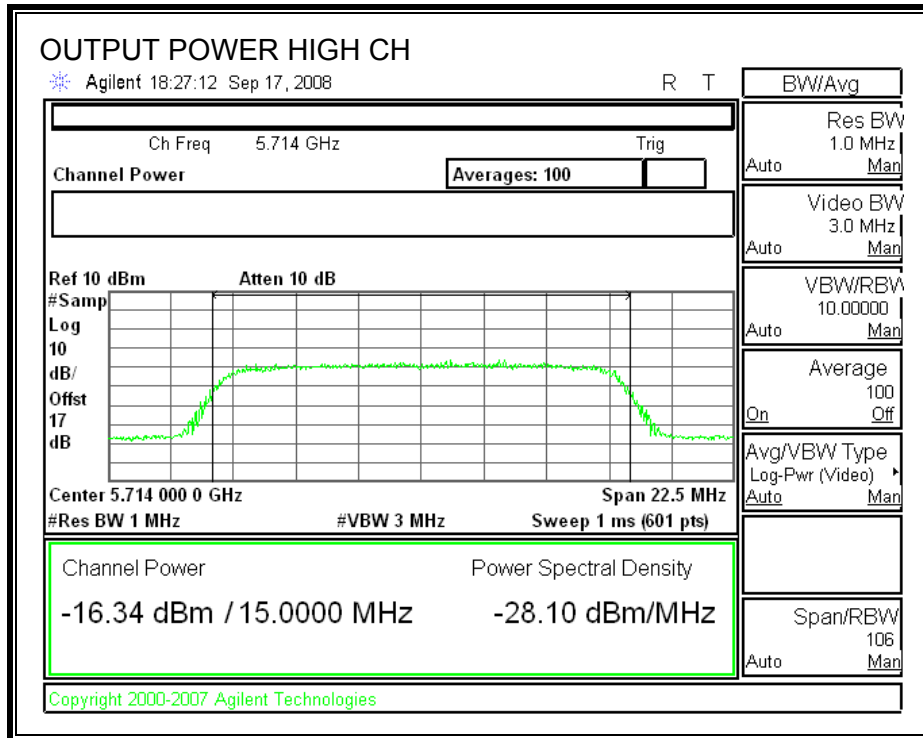
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	5 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5480	24	15	16.76	32.30	-9.54
Mid	5600	24	15	16.76	32.30	-9.54
High	5714	24	15	16.76	32.30	-9.54

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5480	-16.88	-9.54	-7.34
Mid	5600	-18.00	-9.54	-8.46
High	5714	-16.34	-9.54	-6.80







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.

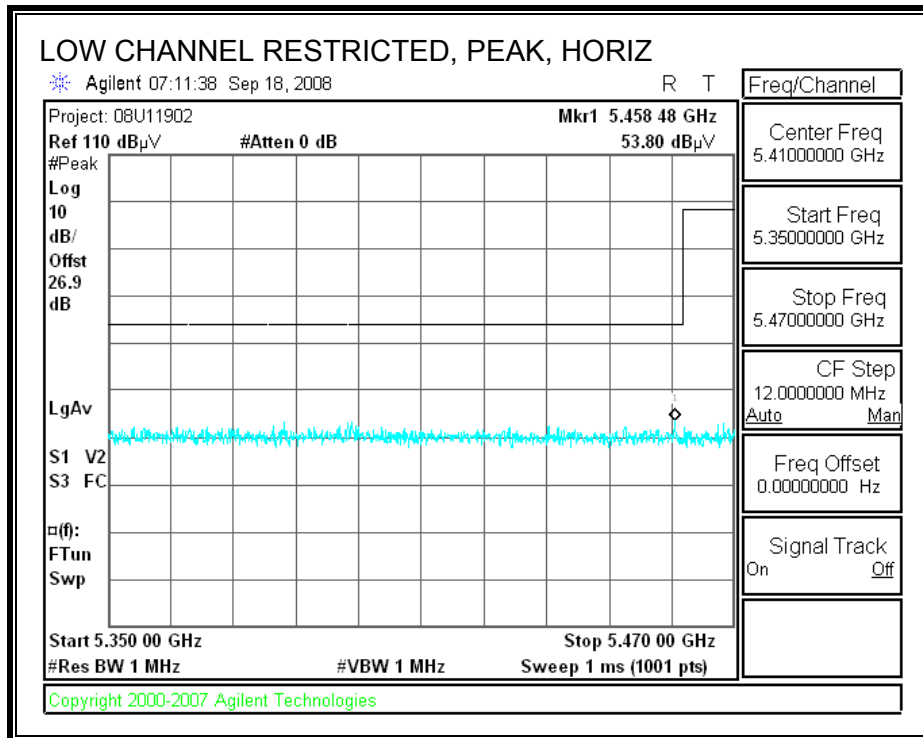
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

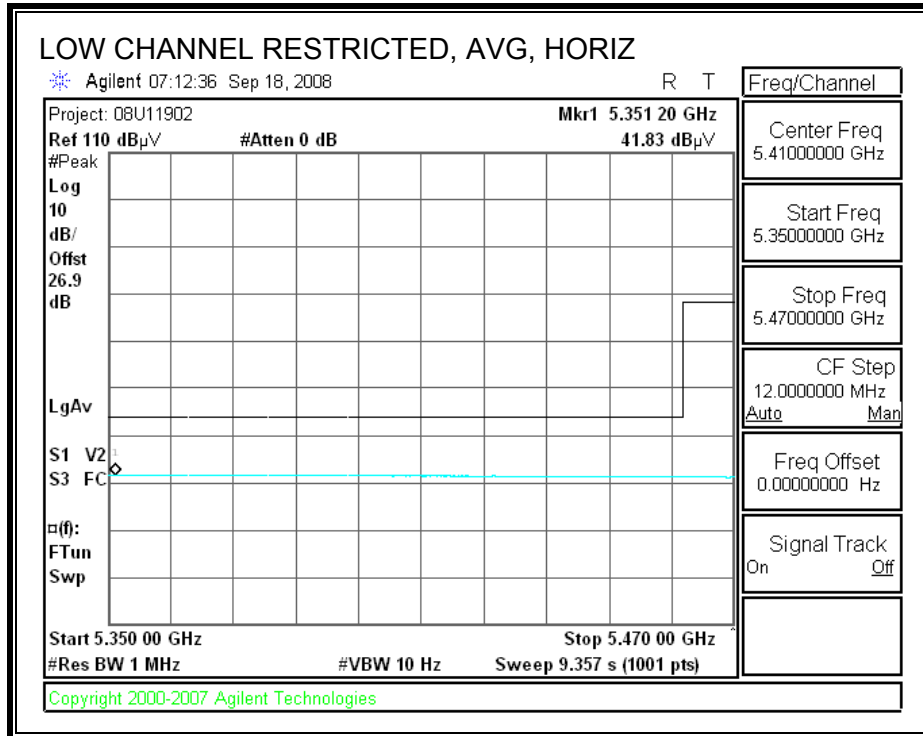
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

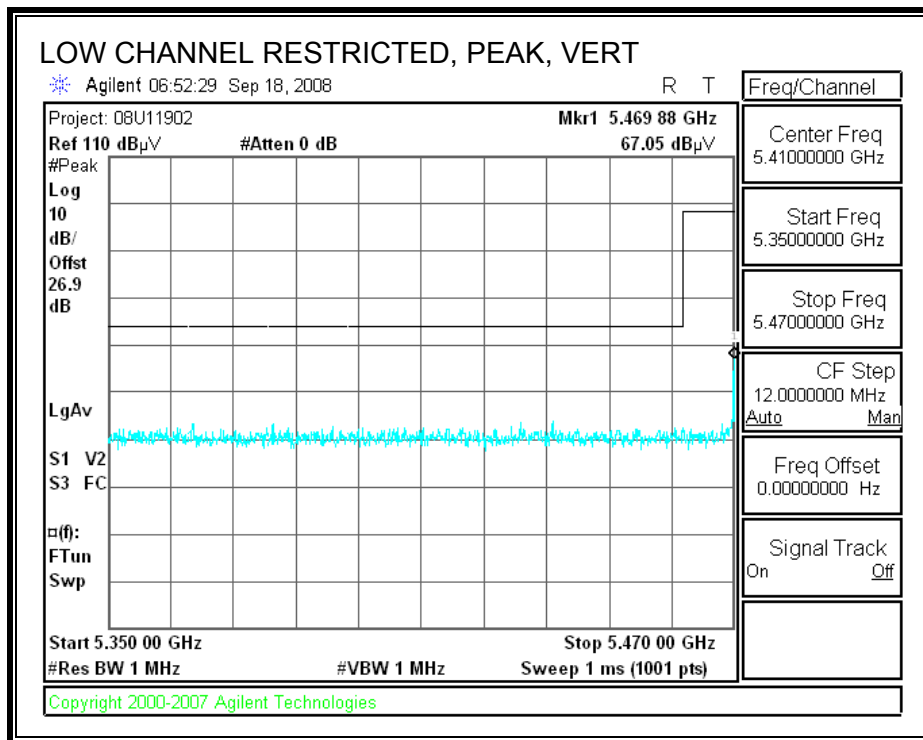
8.2.1. TRANSMITTER ABOVE 1 GHz FOR 5MHz BANDWIDTH, DISH ANTENNA

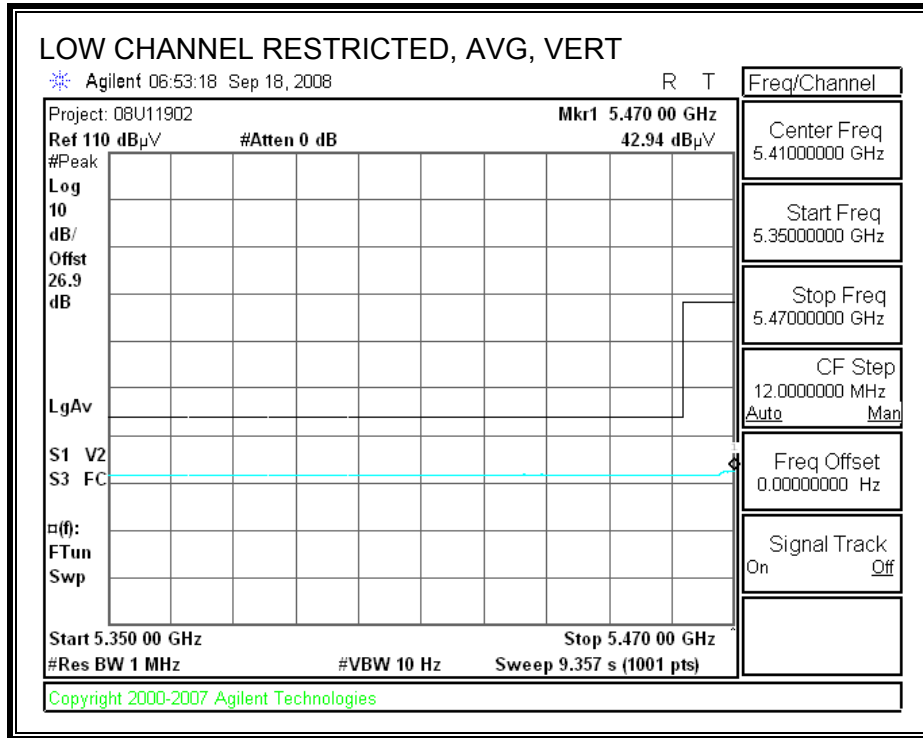
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



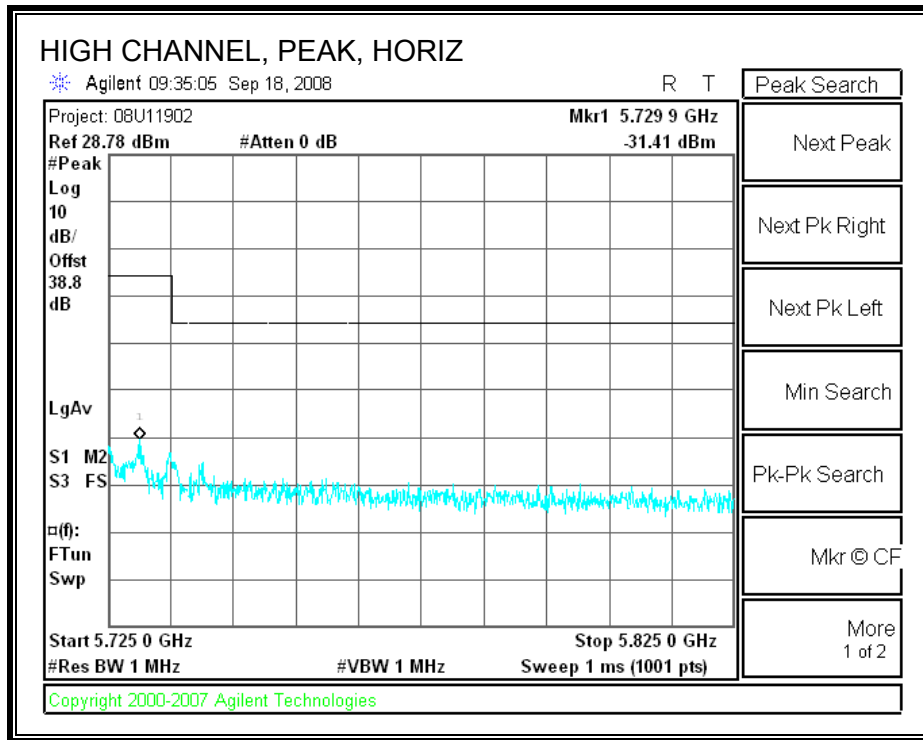


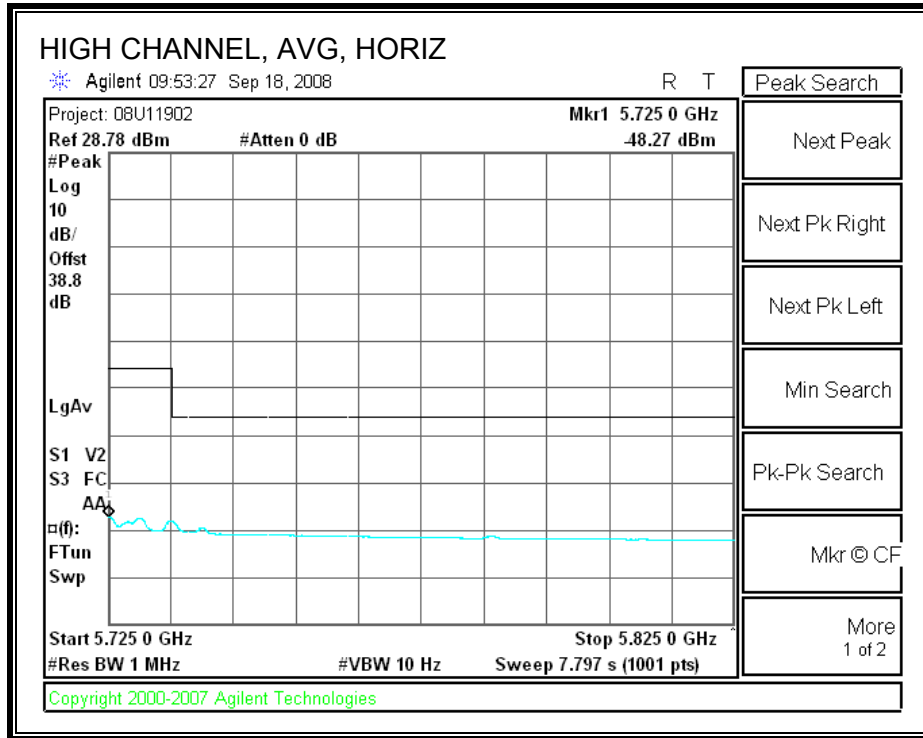
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



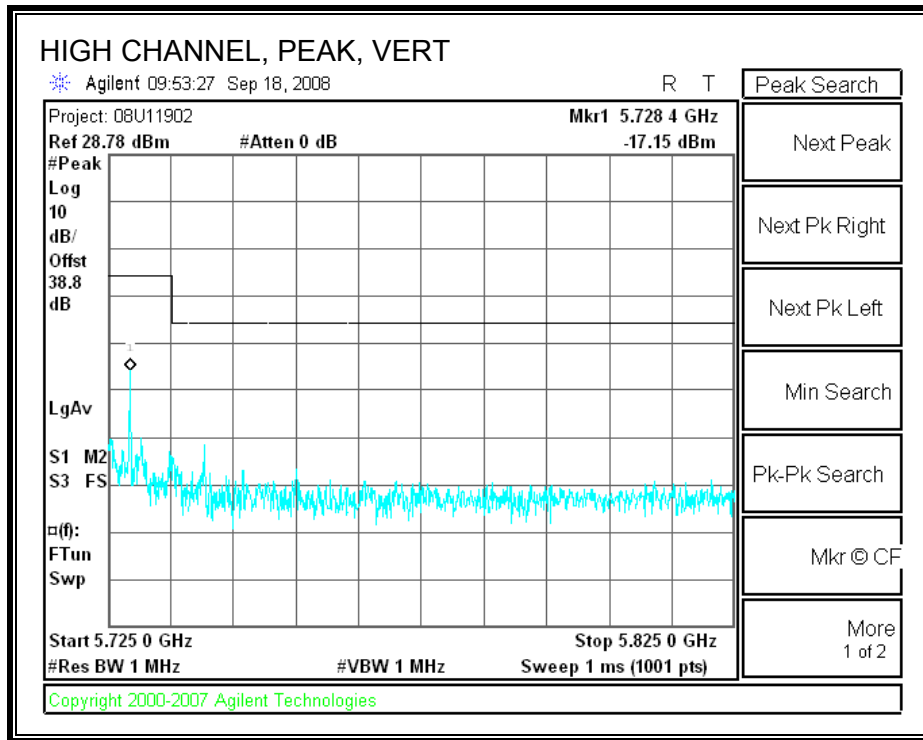


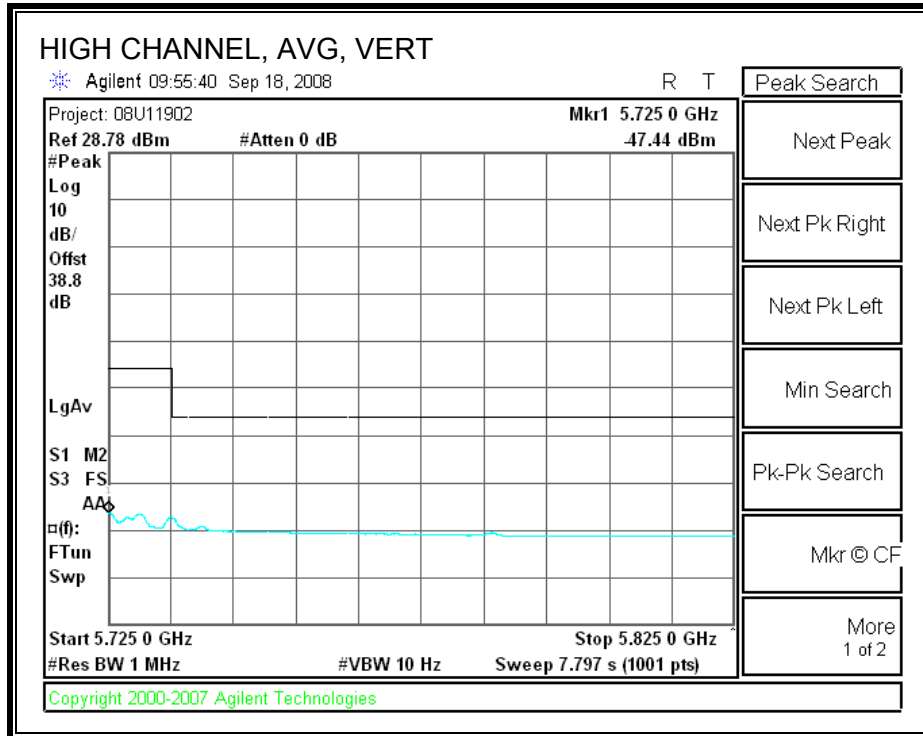
AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)



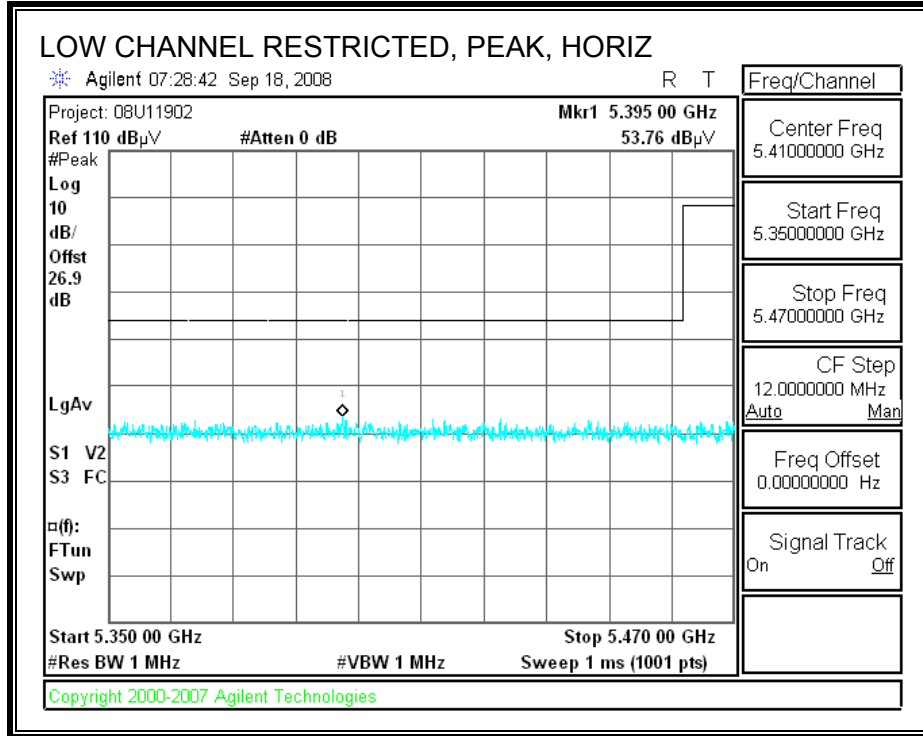


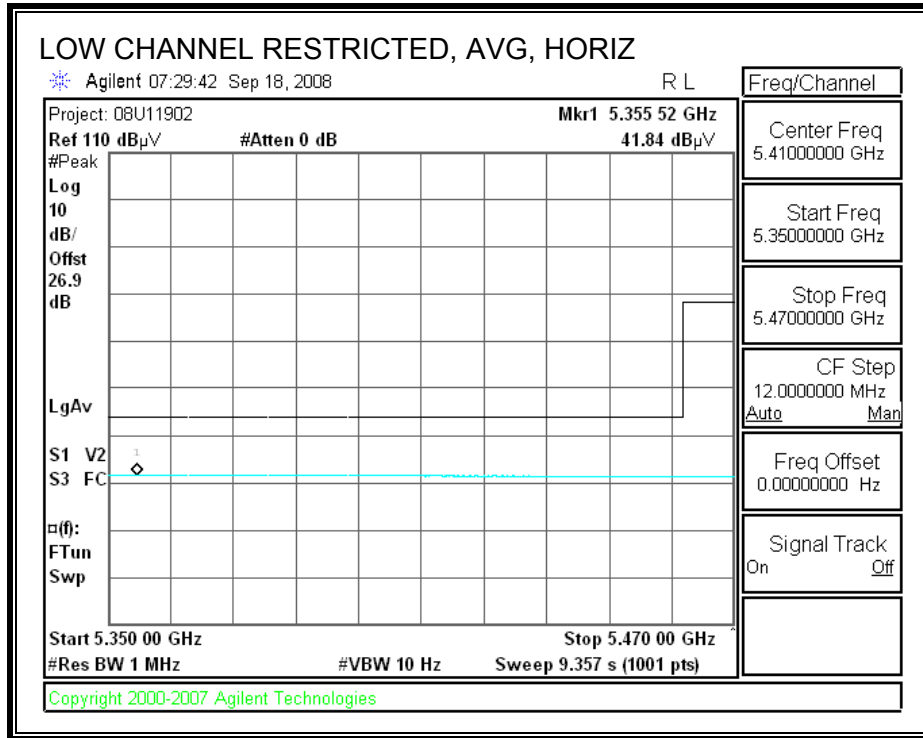
HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement																	
Compliance Certification Services, Fremont 5m Chamber																	
Company: Motorola																	
Project #: 08U11902																	
Date: 9-19-2008																	
Test Engineer: Tom Chen																	
Configuration: EUT with Dish Antenna (33.9dBi Gain)																	
Mode: Tx, 5MHz BW																	
Test Equipment:																	
Horn 1-18GHz			Pre-amplifier 1-26GHz			Pre-amplifier 26-40GHz			Horn > 18GHz			Limit					
T60; S/N: 2238 @3m			T34 HP 8449B			T88 Miteq 26-40GHz			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					
						C-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	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, 5474MHz																	
10.948	3.0	42.7	30.1	38.6	0.0	-32.6	0.0	0.0	48.7	36.1	74	54	-25.3	-17.9	V		
10.948	3.0	41.4	29.0	38.6	0.0	-32.6	0.0	0.0	47.4	35.0	74	54	-26.6	-19.0	H		
Mid Ch, 5600MHz																	
11.200	3.0	43.2	31.2	38.7	0.0	-32.6	0.0	0.0	49.3	37.3	74	54	-24.7	-16.7	V		
11.200	3.0	42.6	29.8	38.7	0.0	-32.6	0.0	0.0	48.7	35.9	74	54	-25.3	-18.1	H		
High Ch, 5720MHz																	
11.440	3.0	42.1	30.1	38.8	0.0	-32.5	0.0	0.0	48.3	36.3	74	54	-25.7	-17.7	V		
11.440	3.0	41.3	29.5	38.8	0.0	-32.5	0.0	0.0	47.5	35.7	74	54	-26.5	-18.3	H		
Rev. 4.12.7																	
Note: No other emissions were detected above the system 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										

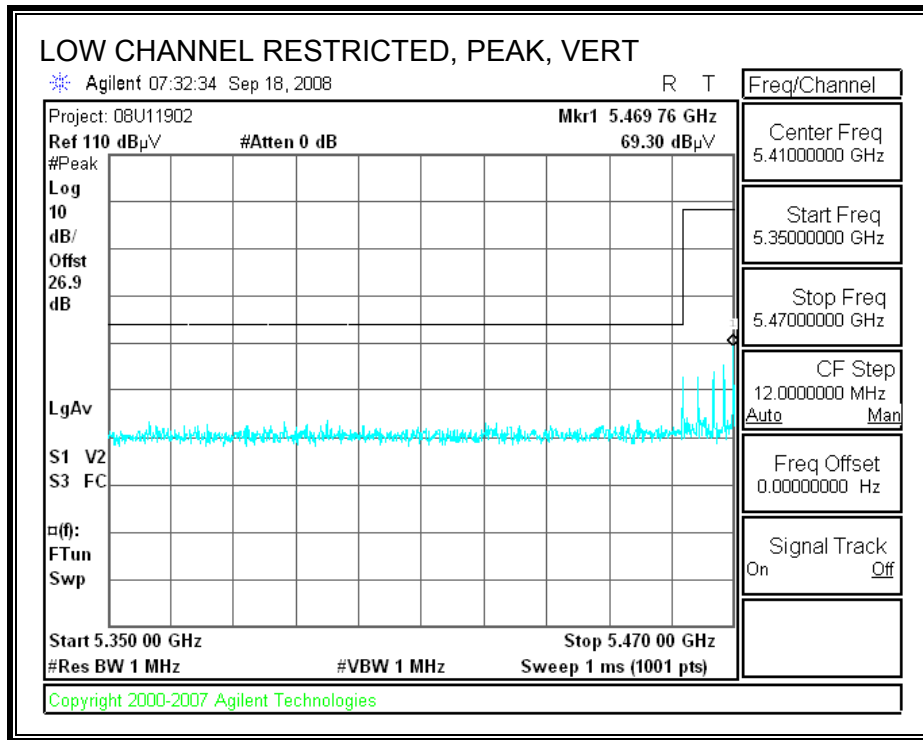
8.2.2. TRANSMITTER ABOVE 1 GHz FOR 10MHz, DISH ANTENNA

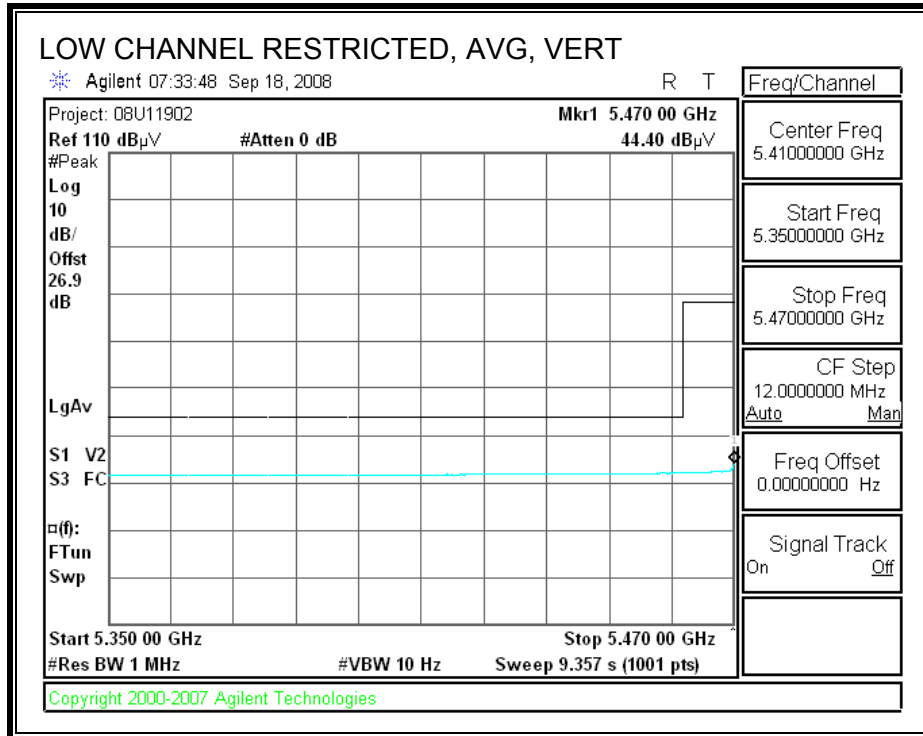
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



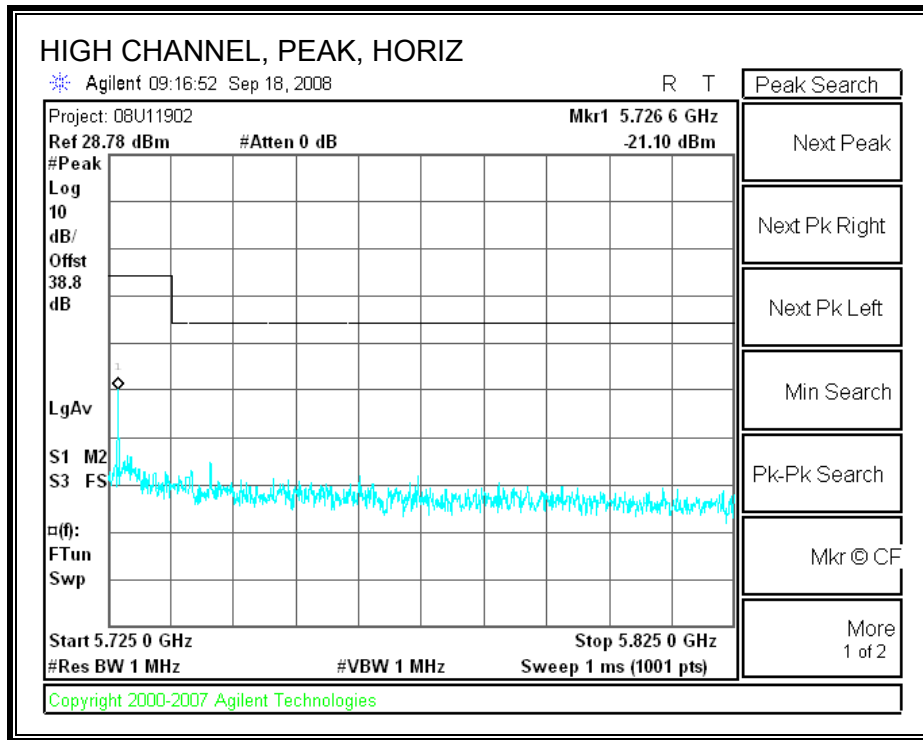


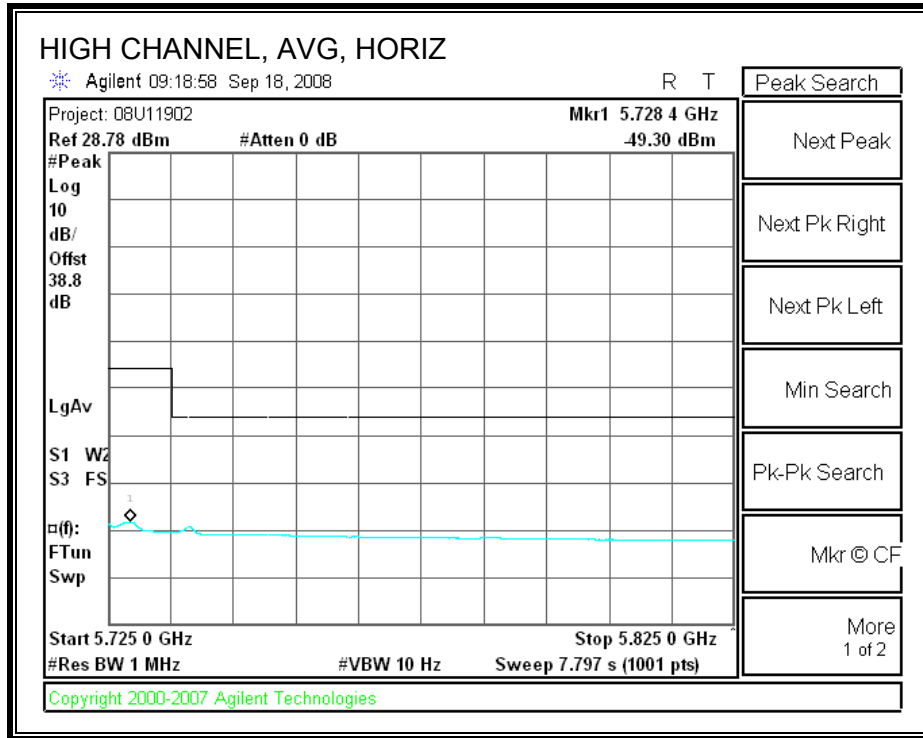
RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





AUTHORIZED BANDEDGE (HIGH CHANNEL, HORIZONTAL)





AUTHORIZED BANDEDGE (HIGH CHANNEL, VERTICAL)

