FCC CFR47 PART 15 SUBPART E
CLASS II PERMISSIVE CHANGE
TEST REPORT

FOR

802.11 ag /DRAFT 802.11n
WIRELESS LAN PCI-E MINI CARD

MODEL NUMBER: BCM94321MC

FCC ID: QDS-BRCM1024

REPORT NUMBER: 07U11031-1

ISSUE DATE: JULY 20, 2007

Prepared for
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Revision History

Rev.	Issue Date	Revisions	Revised By
--	7/20/2007	As Issued, based on CCS document 07U10893-2B	M. Heckrotte

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, USA
EUT DESCRIPTION:	802.11 AG /DRAFT 802.11n WIRELESS LAN PCI-E MINI CARD
MFR / MODEL TESTED:	Broadcom BCM94321MC
SERIAL NUMBER:	6F632058LWQXE & 6F634002HWQXE
DATE TESTED:	NOVEMBER 10 TO APRIL 15, 2007

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
FCC PART 15 SUBPART E	NO NON-COMPLIANCE NOTED

Compliance Certification Services, Inc. tested the above equipment in accordance with the requirements set forth in the above standards. 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 Compliance Certification Services and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by Compliance Certification Services 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:

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ENGINEERING MANAGER
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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 and FCC 06-96 APPENDIX "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVCIES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 561F Monterey Road, Morgan Hill, California, and 47173 Benicia Street, Fremont, California, USA. The sites are constructed in conformance with the requirements of ANSI C63.4, ANSI C63.7 and CISPR Publication 22. All receiving equipment conforms to CISPR Publication 16-1, "Radio Interference Measuring Apparatus and Measurement Methods."

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
Radiated Emission, 30 to 200 MHz	+/- 3.3 dB
Radiated Emission, 200 to 1000 MHz	+4.5 / -2.9 dB
Radiated Emission, 1000 to 2000 MHz	+4.5 / -2.9 dB
Power Line Conducted Emission	+/- 2.9 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11n MIMO transceiver chipset. The chipset is installed on a Mini PCI–E card, model number BCM94321MC.

The radio module is manufactured by Broadcom Corp.

5.2. DESCRIPTION OF CLASS II PERMISSIVE CHANGE

Adding 5470-5725MHz Band with DFS function.

5.3. TEST RESULT CONCLUSIONS

The worst-case data rate in each mode is based on investigations of PSD, peak power, average power, conducted emissions, plus bandedge and 2nd harmonic (5GHz only) radiated emissions across all the data rates, bandwidths, modulations and spatial stream modes.

Based upon pre-testing across all transmit modes, the worst case data rates are as follows:
For the Legacy Mode, the worst case is 1Mb/s @ 11b mode & 6Mb/s @ 11ag mode.
For MCS Index and MIMO operation modes covered under this evaluation it was determined that MCS Index 0 is worst case for all 20MHz bandwidth modes.
MCS Index 32 is worst case for 40MHz mode.
Both MCS 0 and MCS 32 were set to CDD mode.

Based on the preliminary test results, the following modes were tested:

5.2 GHz and 5.5 GHz UNII BANDS

1/ LEGACY MODE:
_802.11a Legacy Mode
_802.11n 20 MHz SISO is covered by the worst case 802.11a Legacy Mode testing)
_802.11n 40 MHz SISO

2/ MIMO MODE:
_802.11a Mode CDD is covered by the worst case 802.11n Mode 20 MHz CDD MCS0.
_802.11n 20 MHz CDD MCS 0
_802.11n 40 MHz CDD MCS 32
_802.11n 40 MHz SDM MCS 15

Comparative test results for Output Power and PPSD in the MIMO modes demonstrated close correlation (on the order of +/- 0.1 to 0.4 dB) between the mathematical addition of Chain 0 and Chain 1 (using linear units), as compared to measurements made using an RF combiner. Therefore all results presented in this report for the above parameters are Chain 0, Chain 1, and the mathematical sum of Chain 0 + Chain 1.

Comparative test results for Conducted Spurious in the MIMO modes demonstrated close correlation (on the order of +/- 1 dB) between individual chain and measurements made using an RF combiner. Therefore all results presented in this report for the above parameter is Chain 0 and Chain 1.

5.4. MAXIMUM OUTPUT POWER

The transmitter has a maximum conducted output power as follows:

5470 - 5725 MHz Authorized Band

Frequency Range (MHz)	Mode	Peak Power Chain 0 (dBm)	Peak Power Chain 1 (dBm)	Total Peak Power (dBm)	Output Power (mW)
5500 - 5700	802.11a Legacy	N/A	N/A	17.75	59.57
5500 - 5700	802.11n 20MHz SISO	covered by the worst case 802.11a Legacy testing			
5510 - 5670	802.11n 40MHz SISO	N/A	N/A	18.23	66.53
5500 - 5700	802.11a CDD Mode	covered by the worst case 802.11n 20 MHz CDD			

Power with Antenna Array Gain up to 6 dBi					
5500 - 5700	802.11n 20MHz CDD	17.21	17.24	20.24	105.57
5510 - 5670	802.11n 40MHz CDD	19.38	19.39	22.40	173.59

Power with Antenna Array Gain up to 8.75 dBi					
5500 - 5700	802.11n 20MHz CDD	14.63	14.65	17.65	58.21
5510 - 5670	802.11n 40MHz CDD	16.67	16.81	19.75	94.42

5.5. DESCRIPTION OF AVAILABLE ANTENNAS

The EUT has 2 Tx/Rx antennas that are automatically selected for use as per the MCS index and STF mode selections. The EUT was tested with the Acon PCB antenna described below:

Band	Ant Main	Ant Aux	10^(Ant Main /10)	10^(Ant Aux /10)	10^(Ant Main /10)+ 10^(Ant Aux /10)	10^log[10^(Ant Main /10)+ 10^(Ant Aux /10)](dBm)
5.4-5.725	6.02	5.44	3.999	3.499	7.499	8.750

On selected UNII channels and/or sub-bands, a higher output power is specified for antenna pairs of the same type with an array gain of 6 dBi or less. For these channels and/or sub-bands the maximum power was limited by Output Power and PPSD, rather than Spurious emissions performance. All Spurious testing was performed at the worst-case combination of the highest output power and the highest antenna array gain. This worst-case combination will not be marketed on those channels that would not comply with the Power or PPSD limits.

The conducted Output Power and PPSD measurements at the highest power level are applied to the maximum 6 dBi array gain for the Output Power and PPSD calculations. Additional conducted Output Power and PPSD measurements were made at the reduced power level, and these measurements are applied to the 7.077 / 8.677 / 8.750 dBi array gain for the respective Output Power and PPSD calculations.

5.6. SOFTWARE AND FIRMWARE

The EUT was tested in the following manner:
- “epi_ttcp.exe” was used to transmit UDP packets to a broadcast IP address (192.168.66.255) – i.e. no ACK required. This test mode sends a continuous packetized data stream with duty cycles that vary dependant upon data rate/MCS Index selected.
- “wl ampdu” and “frameburst” were enabled to ensure worst case data packet transfer and duty cycle.
- Worst case packet length have also been used to ensure max duty cycle

5.7. CONFIGURATION AND MODE

Operating modes were changed directly in software with no other changes to the set up. Power levels were verified across all the MCS Index at the start of test and as required throughout testing.

Prior to each test a power meter was used to tune the gated average power within a Tx packet. The channel gates on the meter were set to ensure that, at the time of recording, only packet power was captured without including duty cycle off time.

Power was tuned for different modes, channels and antennas based on the power tuning table contained in the Operational Description submitted under the same filing.

5.8. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	Dell	Inspiron 0000	CN-901014-70166-57K-01JT	DOC
AC Adapter	Dell	PA-1600-06D1	F9710	DOC

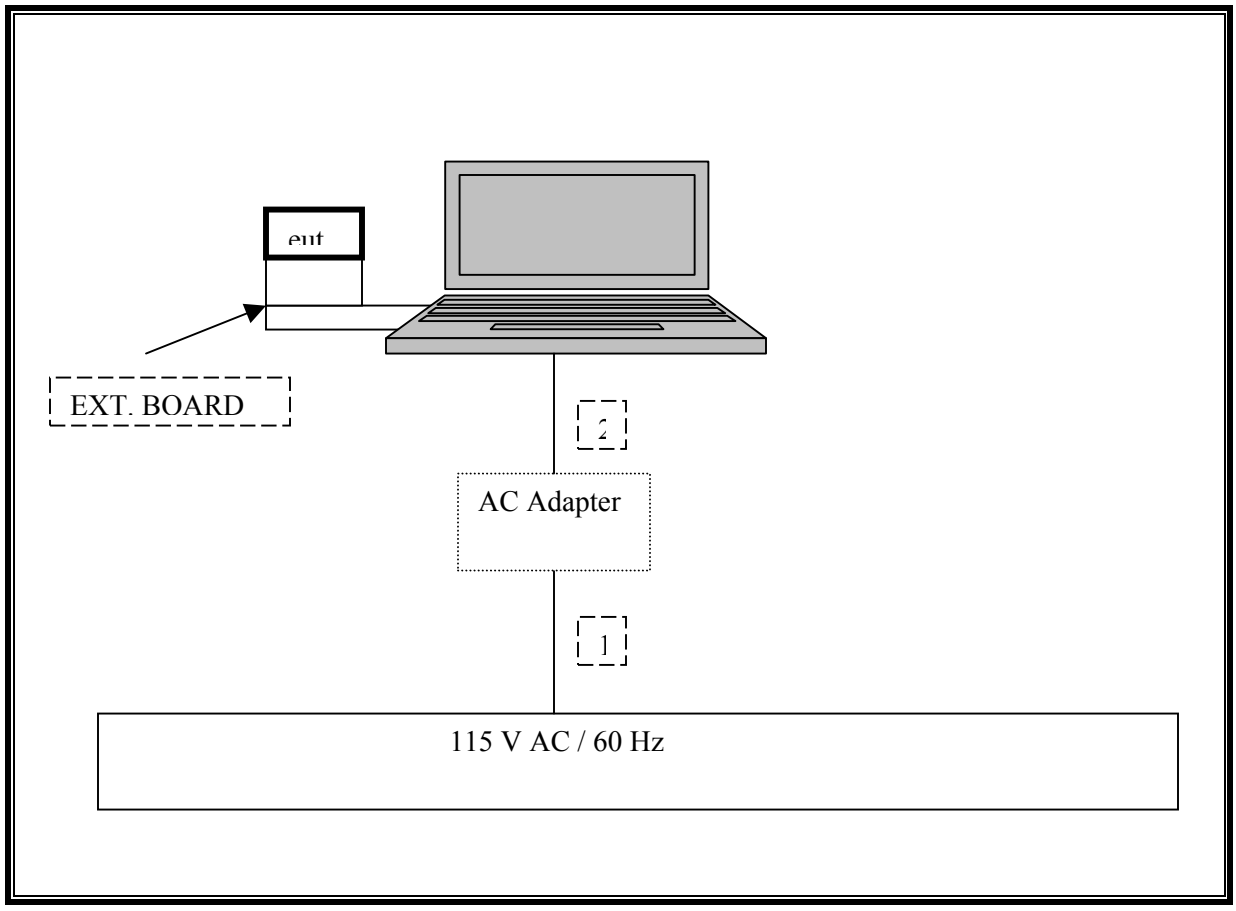
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identical Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	AC	Unshielded	1.2 m	N/A
2	DC	1	DC	Unshielded	1.2 m	N/A

TEST SETUP

The EUT is installed in a host laptop computer via Express card to MiniPCI-E adapter boards during the tests. Test software exercised the radio card.

SETUP DIAGRAM



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**	**Serial Number**	**Cal Due**
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42510266	10/19/2007
Antenna, Horn 1 ~ 18 GHz	EMCO	3115	2238	4/15/2008
Preamplifier, 1 ~ 26.5 GHz	Agilent / HP	8449B	3008A00561	10/3/2007
Preamplifier, 26 ~ 40 GHz	Miteq	NSP4000-SP2	924343	8/18/2007
LISN, 10 kHz ~ 30 MHz	FCC	LISN-50/250-25-2	2023	8/30/2007
LISN, 10 kHz ~ 30 MHz	Solar	8012-50-R-24-BNC	8379443	8/30/2007
EMI Test Receiver	R & S	ESHS 20	827129/006	11/3/2007
AC Power Source, 10 kVA	ACS	AFC-10K-AFC-2	J1568	CNR
Quasi-Peak Adaptor	Agilent / HP	85650A	2521A01038	01/11/08
SA Display Section 2	Agilent / HP	85662A	2816A16696	04/07/08
SA RF Section, 1.5 GHz	Agilent / HP	85680B	2814A04227	01/07/08
Preamp 30-1000MHz	Sonoma Instrument	310N	185623	01/20/08
Antenna, Bilog 30 MHz ~ 2 Ghz	Sunol Sciences	JB1	A121003	08/13/07
EMI Receiver, 9 kHz ~ 2.9 GHz	Agilent / HP	8542E	3942A00286	6/12/2008
RF Filter Section	Agilent / HP	85420E	3705A00256	6/12/2008
4.0 High Pass Filter	Micro Tronics	HPM13351	3	N/A
2.4 - 2.5 Band Reject Filter	Micro Tronics	N/A	1	N/A
2.0 - 4.2 GHz Combiner	Mini-Circuits	ZA4PD-4	SF380100518	N/A
4.6 - 5.8 GHz Combiner	Mini-Circuits	ZB4PD1-5.8	SN649900514	N/A
Peak Power Meter	Agilent / HP	E4416A	GB41291160	12/2/2007
Antenna, Horn, 18 ~ 26 GHz	ARA	MWH-1826/B	1013	8/6/2007
Antenna, Horn 26 ~ 40 GHz	ARA	MWH-2640/B	1029	4/11/2008
4.0 GHz High Pass Filter	Micro Tronics	HPM13351	3	N/A
2.4 - 2.5 Reject Filter	Micro Tronics	BRM50702	3	N/A
7.6 GHz High Pass Filter	Micro Tronics	HPM13350	1	N/A
5.75 - 5.8 Reject Filter	Micro Tronics	BRC13192	2	N/A

7. LIMITS AND RESULT

LEGACY MODE

7.1. CHANNEL TESTS FOR THE 5470 TO 5725 MHz BAND

7.1.1. EMISSION BANDWIDTH

LIMIT

§15.403 (i) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

No non-compliance noted:

802.11a LEGACY MODE

Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5500	29.64	14.72
Middle	5600	31.93	15.04
High	5700	32.49	15.12

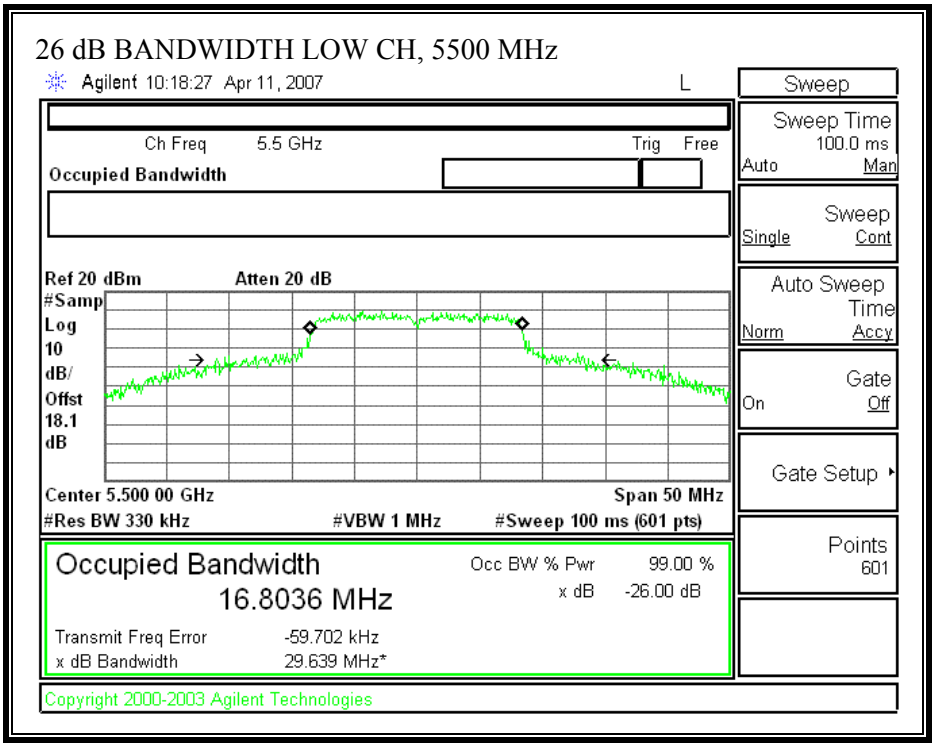
802.11n 20 MHz SISO MCS 0 MODE is covered by the worst case Legacy testing

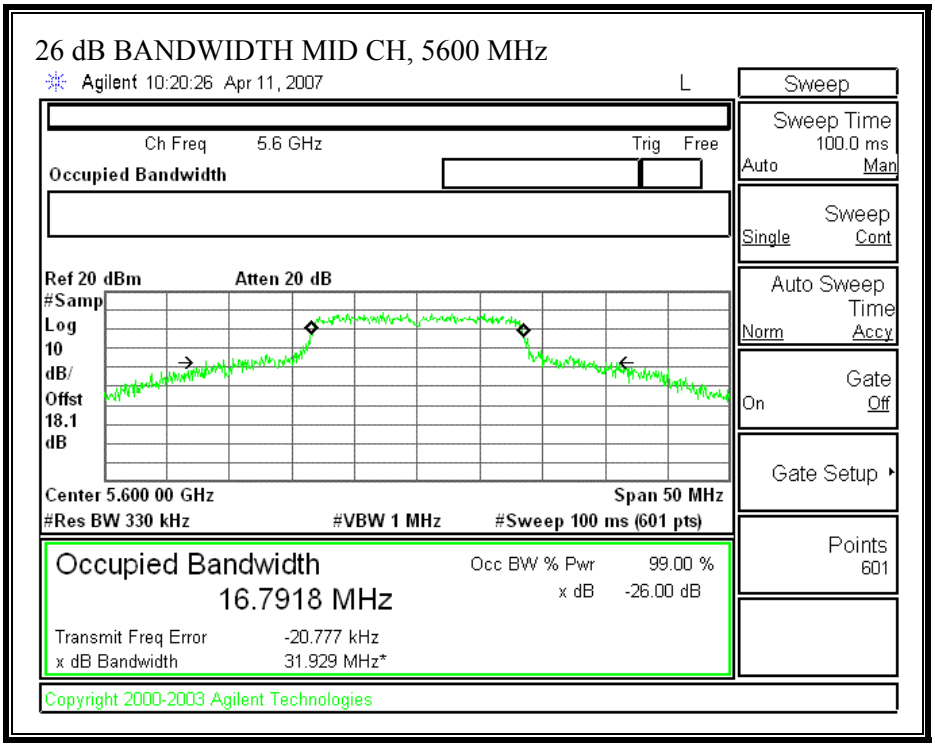
802.11n 40 MHz SISO MCS 32 MODE

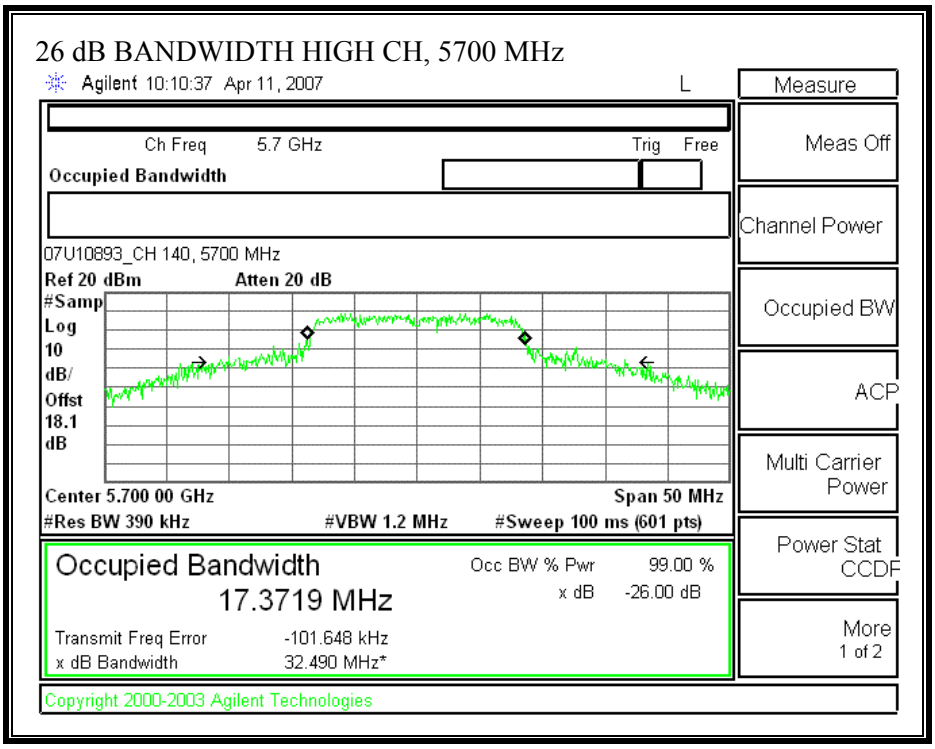
Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5510	48.77	16.88
Middle	5590	49.04	16.91
High	5670	43.37	16.37

802.11a MODE

26 dB EMISSION BANDWIDTH (802.11a MODE)

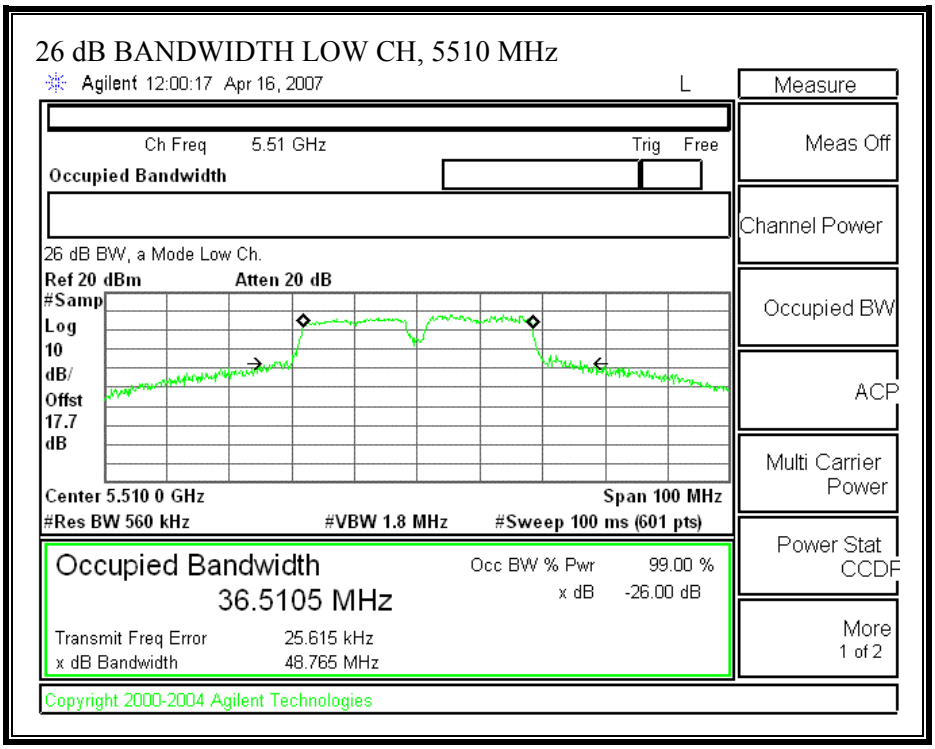


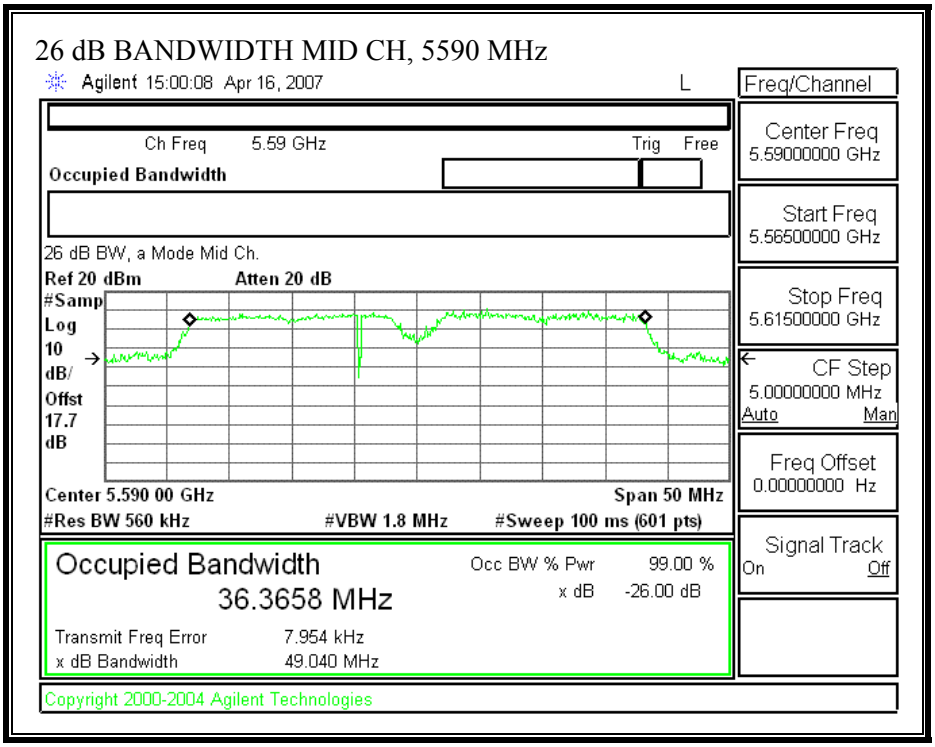


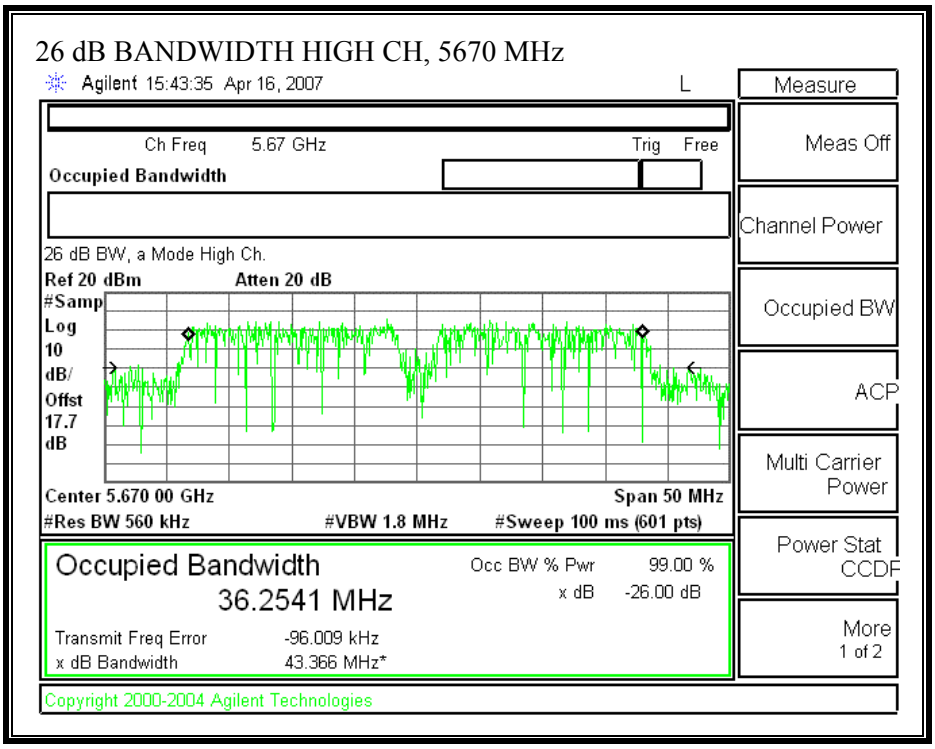


11n 40 MHz SISO MCS 32 MODE

26 dB EMISSION BANDWIDTH







7.1.2. PEAK POWER

LIMIT

§15.407 (a) (2) For the 5.47–5.725 GHz band, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 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 FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

LIMITS AND RESULTS

The cable assembly insertion loss of 11.4 dB (including 10 dB pad and 1.4 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

THE ANTENNA GAIN:

5.470 – 5.725 GHz: 6.02dB

LIMITS AND RESULTS

No non-compliance noted:

802.11a MODE

LIMITS AND RESULTS FOR TRANSMIT POWER:

Transmit Power Limit

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Limit (dBm)
Low	5500	24	16.80	23.25	23.25
Mid	5600	24	16.79	23.25	23.25
High	5700	24	17.37	23.40	23.40

Transmit Power Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	17.34	23.25	-5.91
Mid	5600	17.59	23.25	-5.66
High	5700	17.75	23.40	-5.65

LIMITS AND RESULTS FOR EIRP:

EIRP Limit

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	17 + 10 Log B Limit (dBm)	Limit (dBm)
Low	5500	30	16.80	29.25	29.25
Middle	5600	30	16.79	29.25	29.25
High	5700	30	17.37	29.40	29.40

EIRP Results

Channel	Frequency (MHz)	Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low	5500	17.34	6.02	23.36	29.25	-5.89
Middle	5600	17.59	6.02	23.61	29.25	-5.64
High	5700	17.75	6.02	23.77	29.40	-5.63

802.11n 20 MHz SISO MODE is covered by the worst case Legacy testing

802.11n 40 MHz SISO MCS 32 MODE

LIMITS AND RESULTS FOR TRANSMIT POWER:

Transmit Power Limit

Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	11 + 10 Log B Limit (dBm)	Limit (dBm)
Low	5510	24	36.51	26.62	24.00
Mid	5590	24	36.37	26.61	24.00
High	5670	24	36.25	26.59	24.00

Transmit Power Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	15.45	24.00	-8.55
Mid	5590	17.99	24.00	-6.01
High	5670	18.23	24.00	-5.77

LIMITS AND RESULTS FOR EIRP:

EIRP Limit

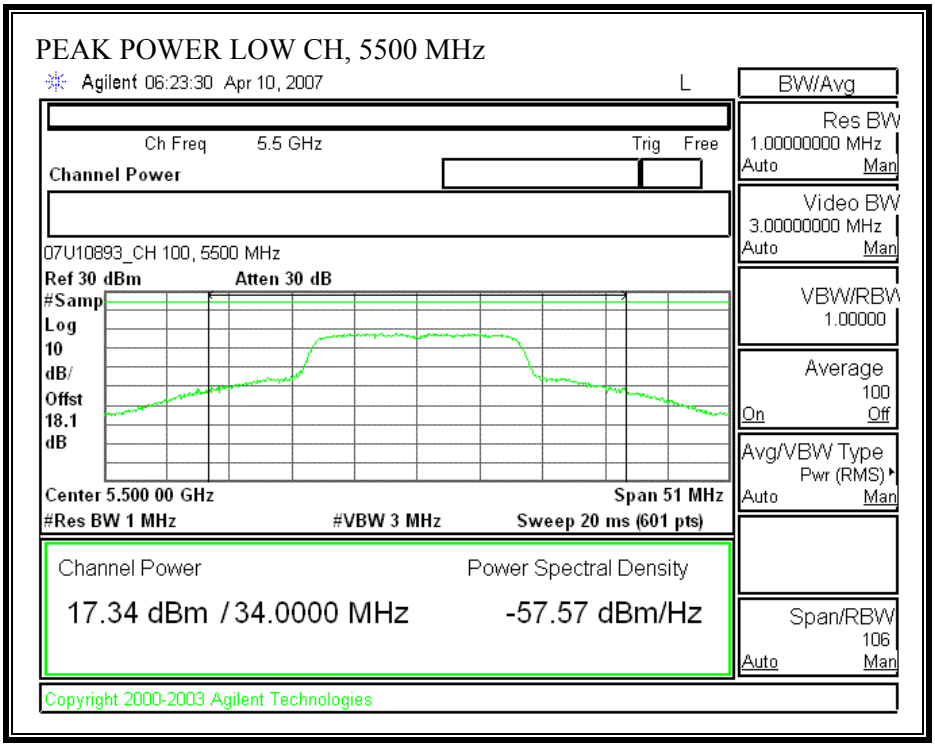
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	17 + 10 Log B Limit (dBm)	Limit (dBm)
Low	5510	30	16.80	29.25	29.25
Middle	5590	30	16.79	29.25	29.25
High	5670	30	17.37	29.40	29.40

EIRP Results

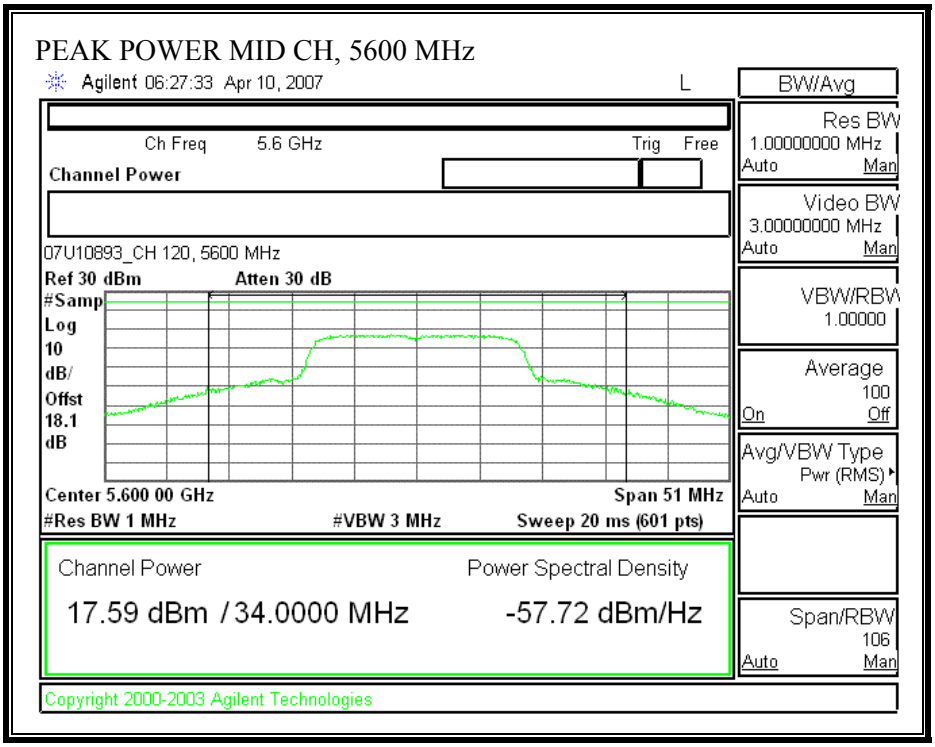
Channel	Frequency (MHz)	Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	Limit (dBm)	Margin (dB)
Low	5510	15.45	6.02	21.47	29.25	-7.78
Middle	5590	17.99	6.02	24.01	29.25	-5.24
High	5670	18.23	6.02	24.25	29.40	-5.15

802.11a MODE

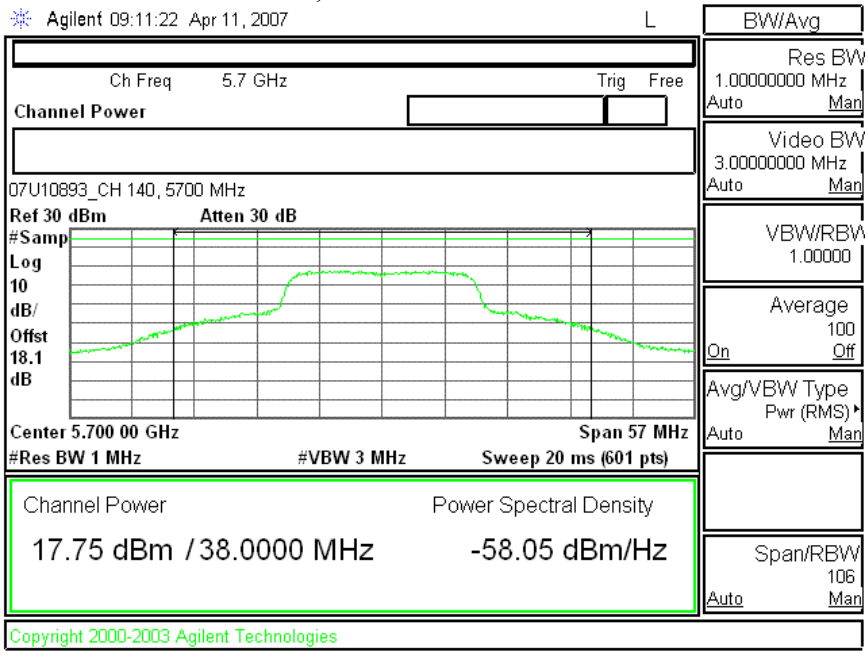
PEAK POWER



PEAK POWER MID CH, 5600 MHz

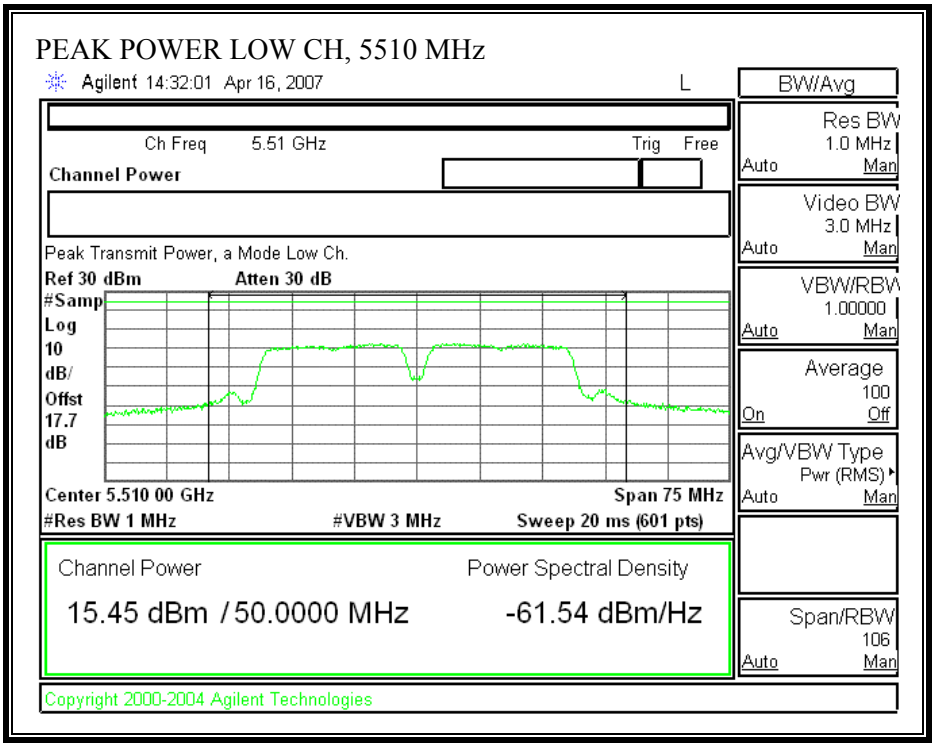


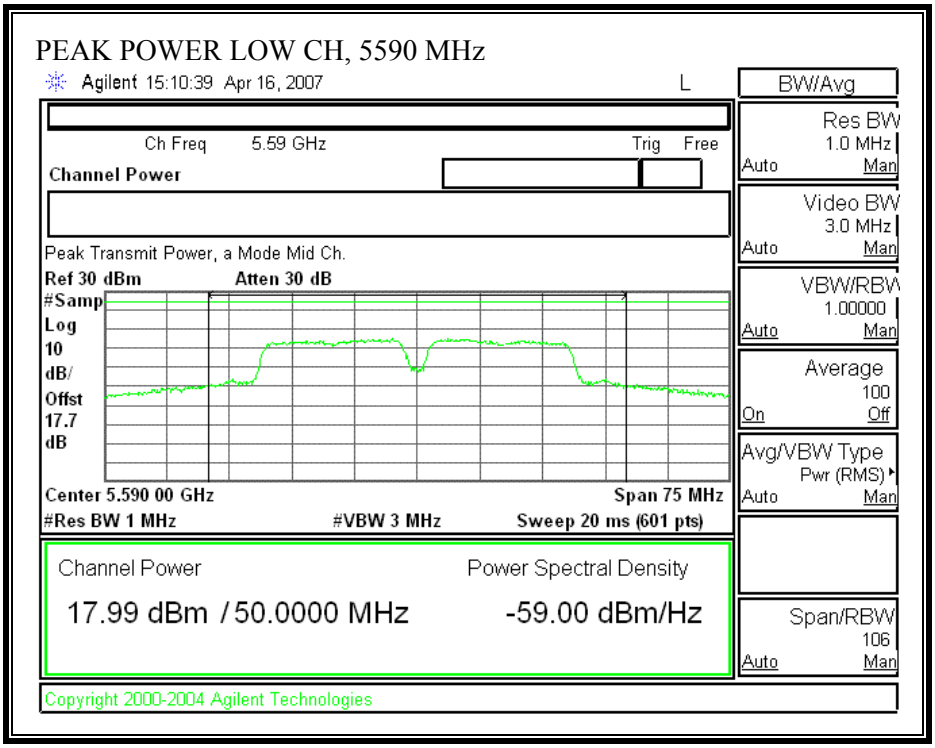
PEAK POWER HIGH CH, 5700 MHz



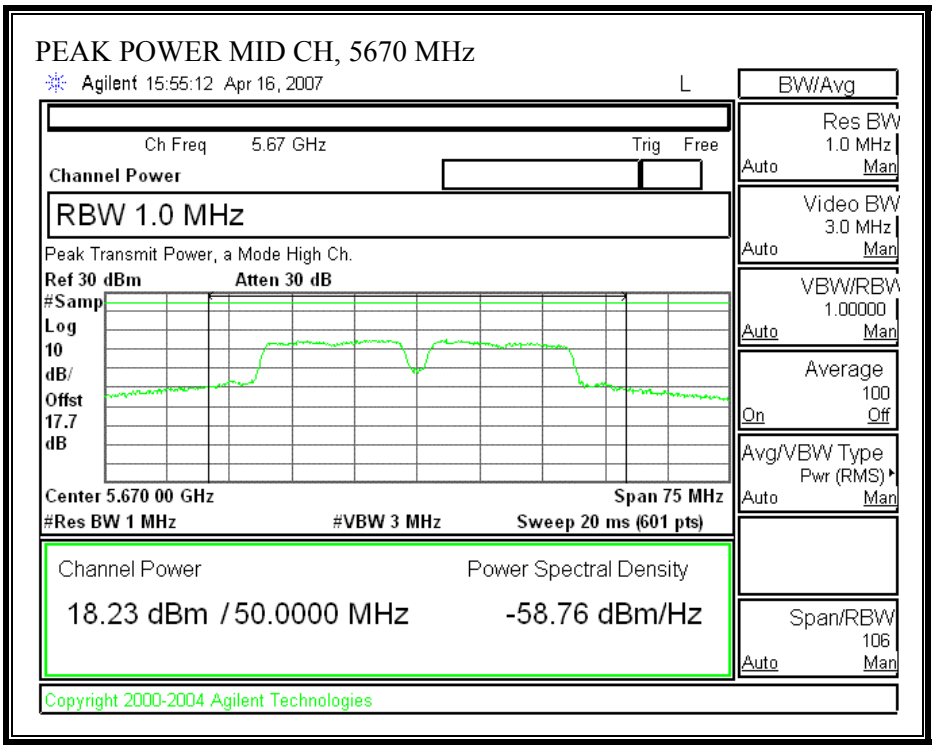
802.11n 40 MHz SISO MCS 32 MODE

PEAK POWER





PEAK POWER MID CH, 5670 MHz



7.1.3. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§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.

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 and rearranging the terms to express the distance as a function of the remaining variables yields:

$d = \sqrt{((30 * P * G) / (3770 * S))}$

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$
$d = 0.282 * \sqrt{(P * G / S)}$

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

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

where

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

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

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

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2 in the 5.6 GHz band.

RESULTS

No non-compliance noted

802.11a LEGACY MODE

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11a LEGACY	20.0	17.75	6.02	0.05

802.11n 20 MHz SISO MODE is covered by the worst case Legacy testing

802.11n 40 MHz SISO

Mode	MPE Distance (cm)	Output Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11n 40 MHz SISO	20.0	18.23	6.02	0.05

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.1.4. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.407 (a) (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.

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. PPSD method #2 was used.

RESULTS

No non-compliance noted:

THE ANTENNA GAIN:

5.470 – 5.725 GHz: 6.02dBi, limit = 10.98 dBm

RESULTS

No non-compliance noted:

802.11a MODE

802.11a Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5500	7.67	10.980	-3.31
Middle	5560	6.97	10.980	-4.01
High	5570	7.41	10.980	-3.57

802.11n 20 MHz SISO MODE is covered by the worst case Legacy testing

802.11n 40 MHz SISO MCS 32 MODE

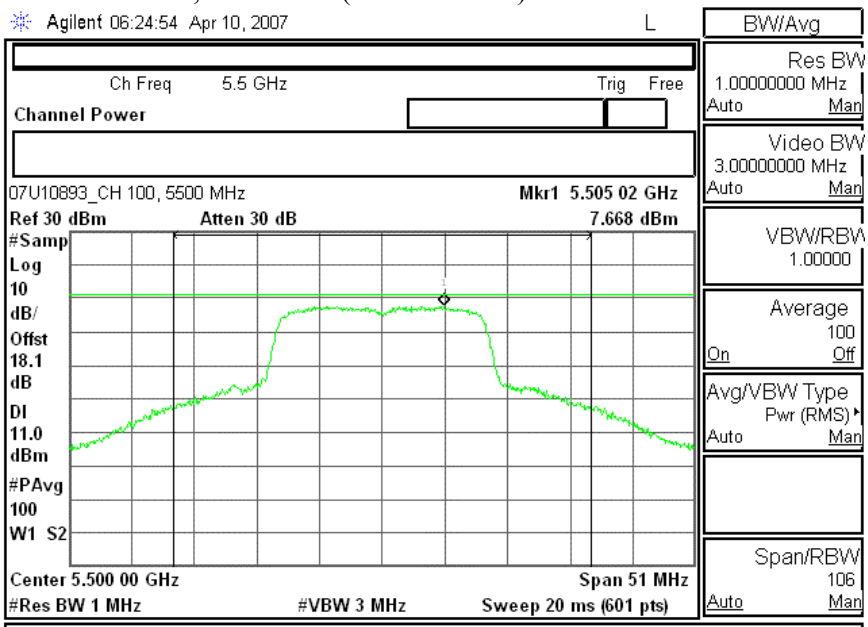
802.11a Mode

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5510	2.60	10.980	-8.38
Middle	5590	4.71	10.980	-6.27
High	5570	4.65	10.980	-6.33

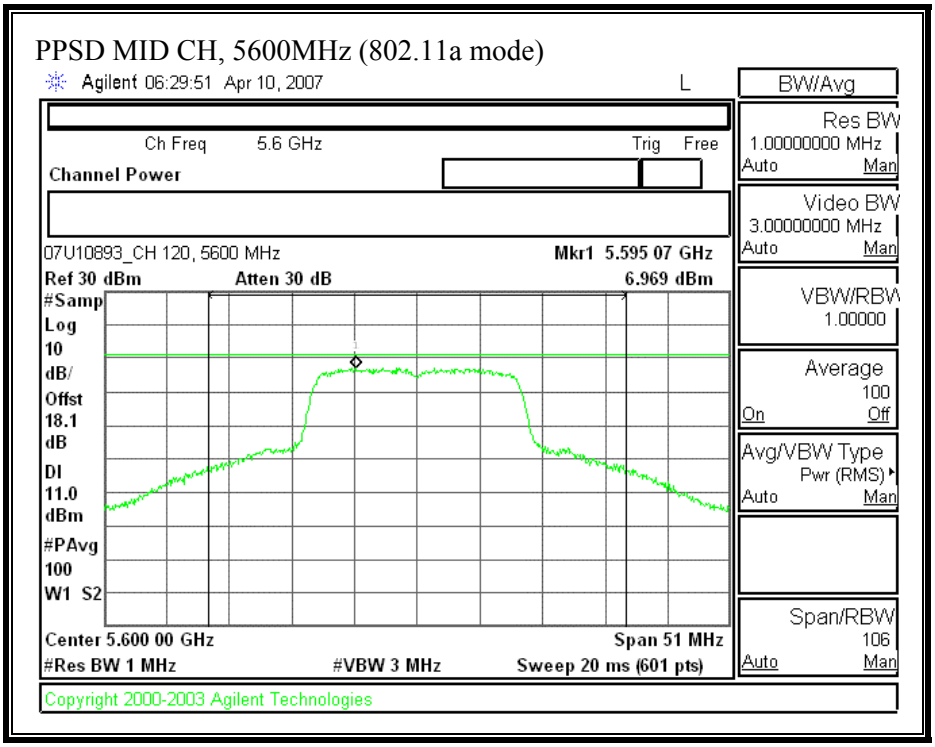
802.11a MODE

PEAK POWER SPECTRAL DENSITY (802.11a MODE)

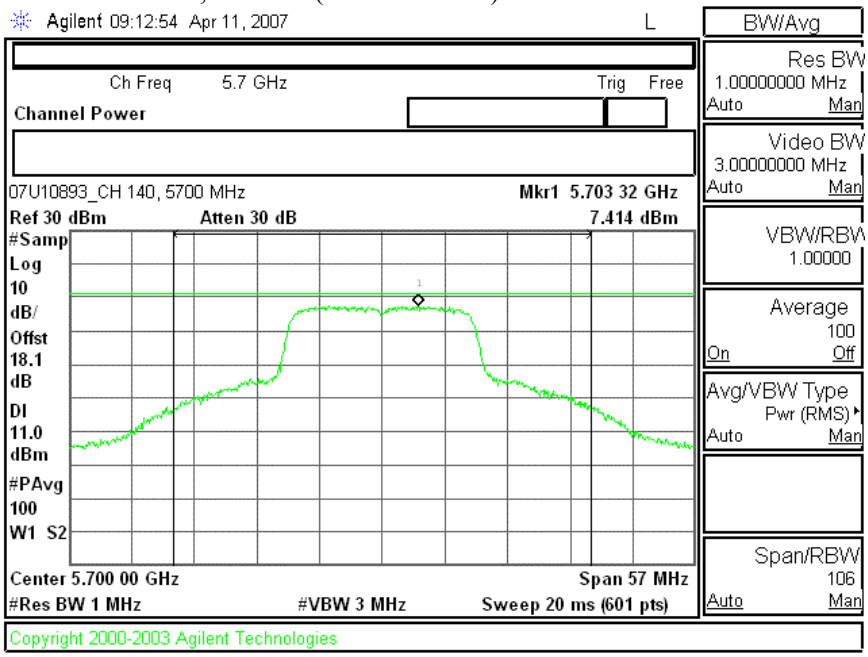
PPSD LOW CH, 5550 MHz (802.11a mode)



PPSD MID CH, 5600MHz (802.11a mode)

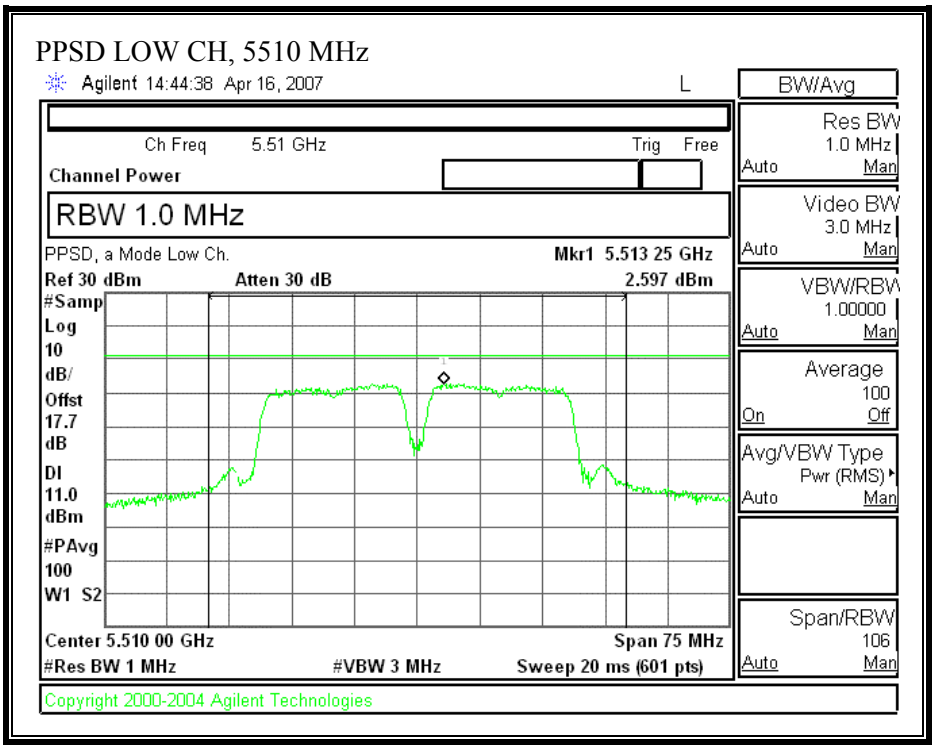


PPSD HIGH CH, 5700Hz (802.11a mode)

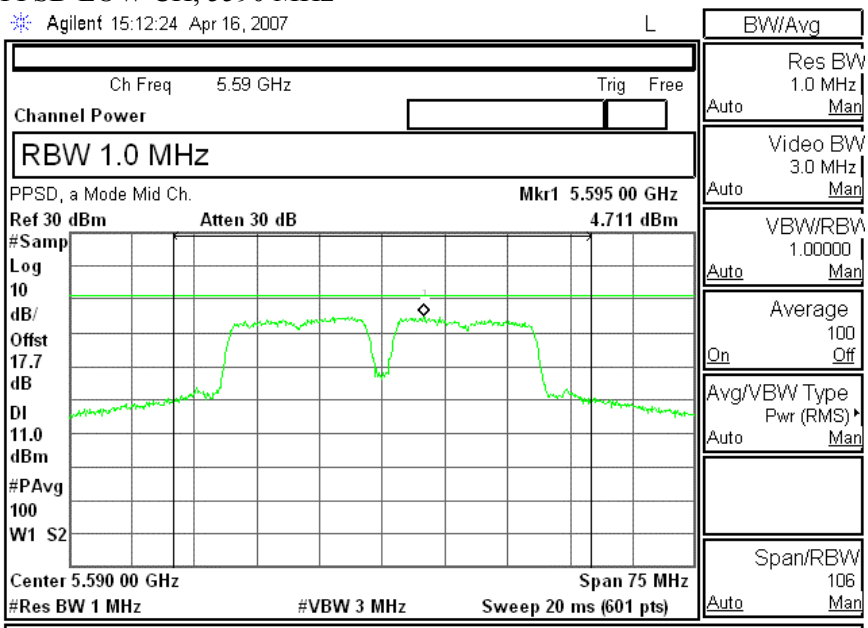


802.11n 40 MHz SISO MCS 32 MODE

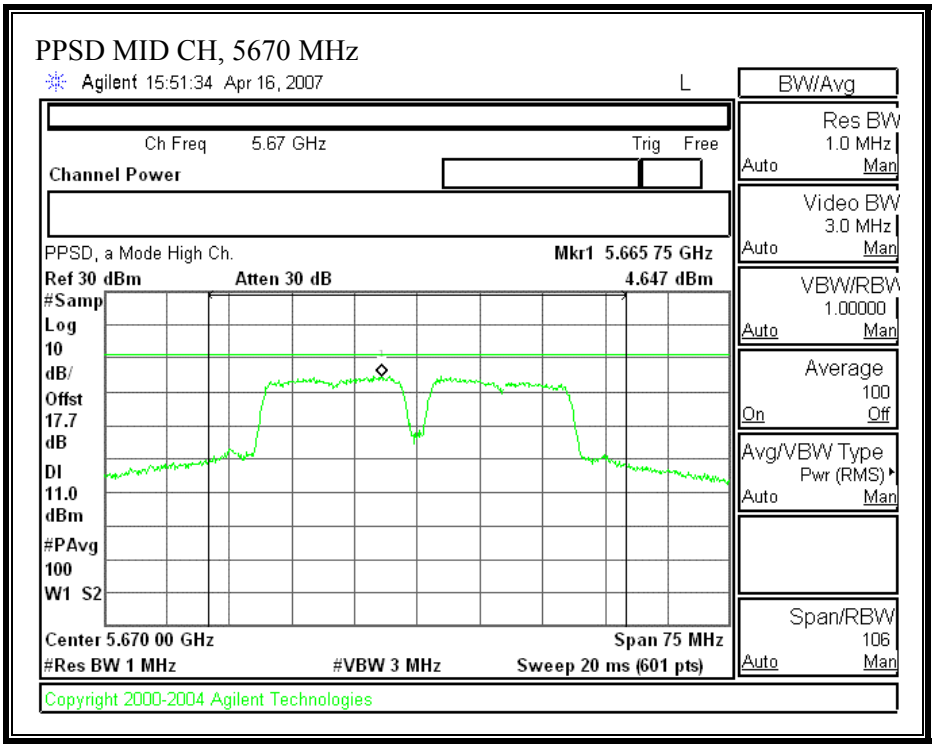
PEAK POWER SPECTRAL DENSITY



PPSD LOW CH, 5590 MHz



PPSD MID CH, 5670 MHz



7.1.5. PEAK EXCURSION

LIMIT

§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.

RESULTS

No non-compliance noted:

802.11a MODE

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5500	8.30	13	-4.70
Middle	5600	9.92	13	-3.08
High	5700	9.54	13	-3.46

802.11n 20 MHz SISO MODE is covered by the worst case Legacy testing

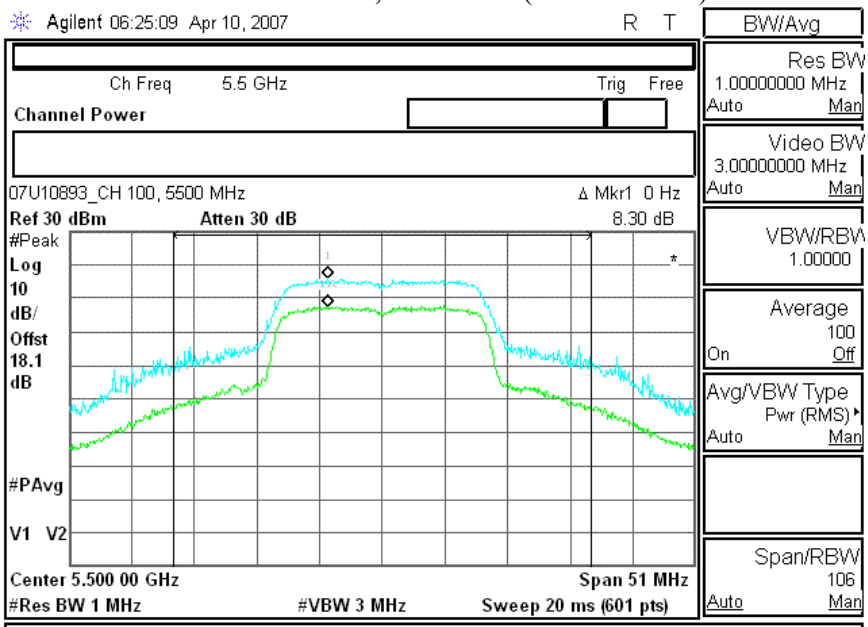
802.11n 40 MHz SISO MCS 32 MODE

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5510	9.36	13	-3.64
Middle	5590	12.34	13	-0.66
High	5670	10.20	13	-2.80

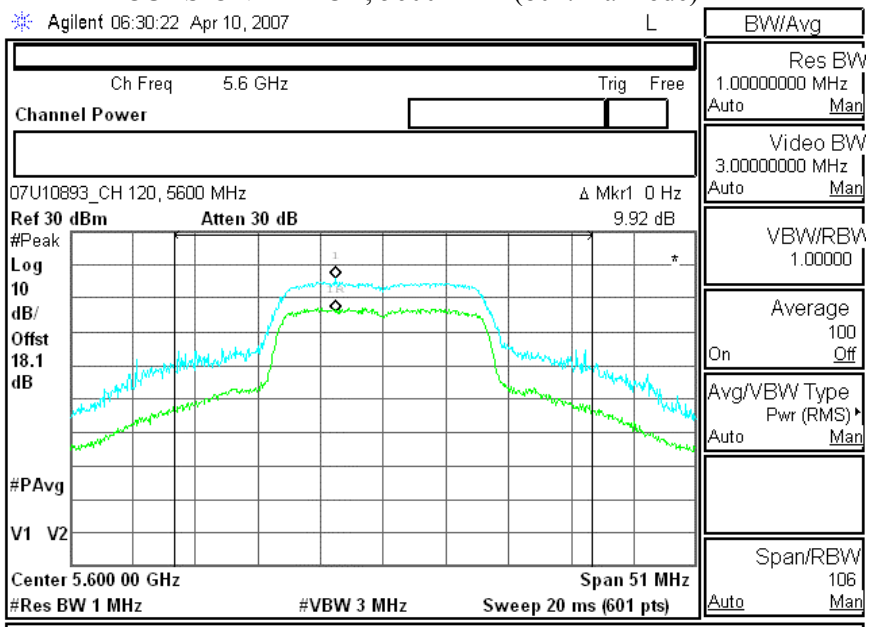
802.11a MODE

PEAK EXCURSION (802.11a MODE)

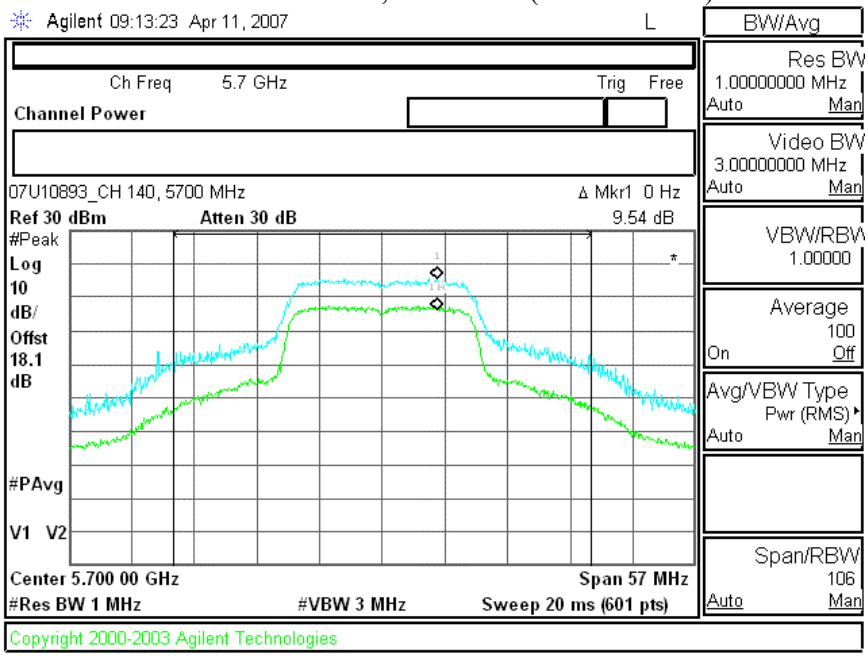
PEAK EXCURSION LOW CH, 5500 MHz (802.11a mode)



PEAK EXCURSION MID CH, 5600 MHz (802.11a mode)

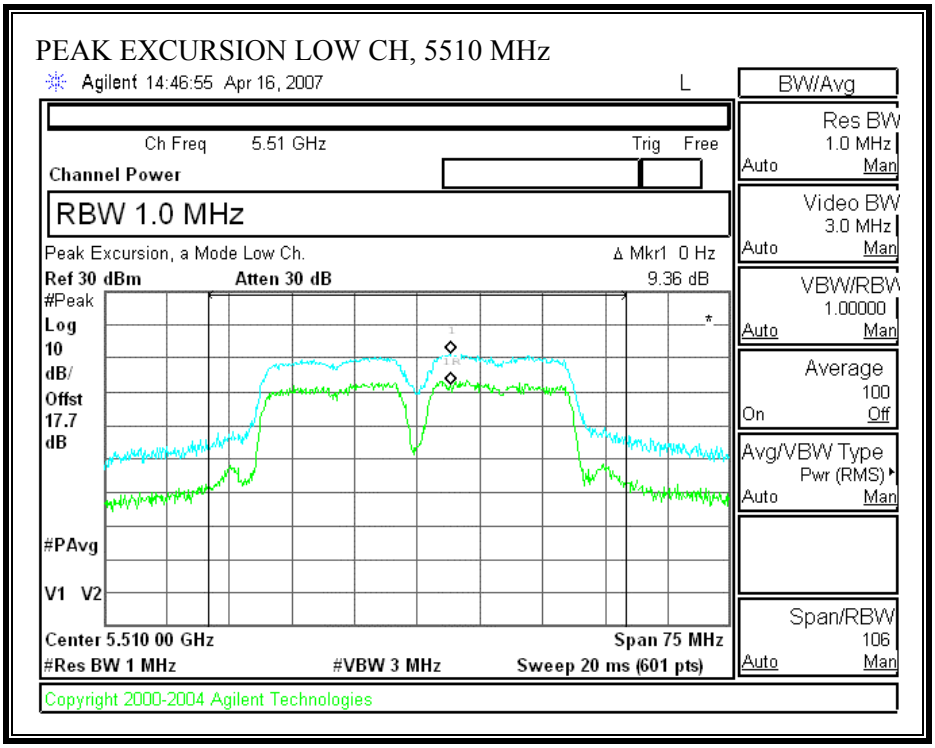


PEAK EXCURSION HIGH CH, 5700 MHz (802.11a mode)

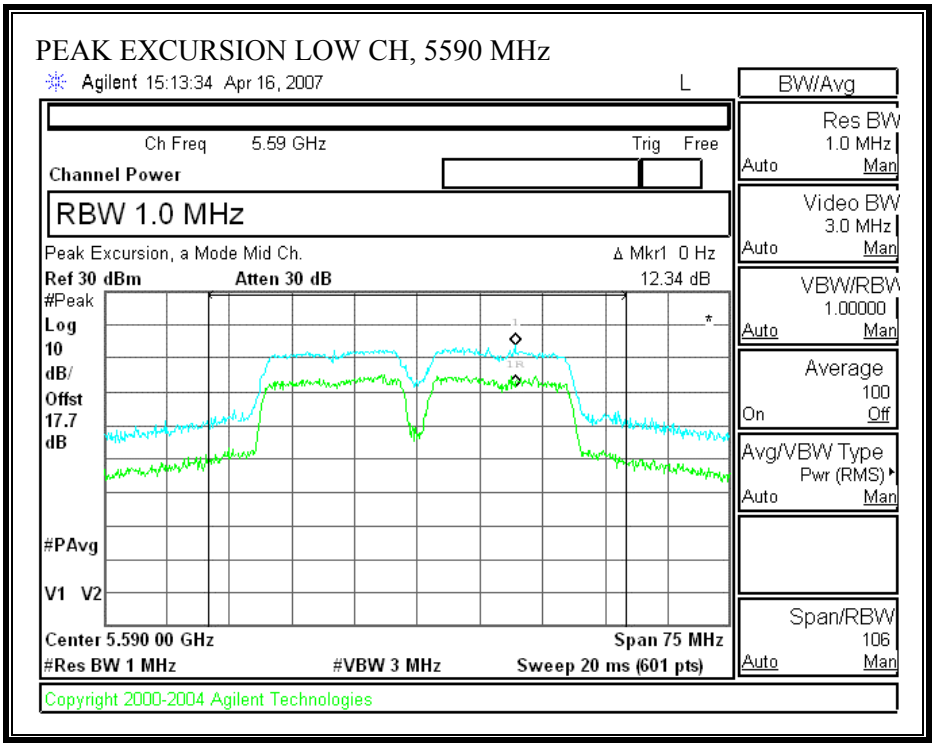


802.11n 40 MHz SISO MCS 32 MODE

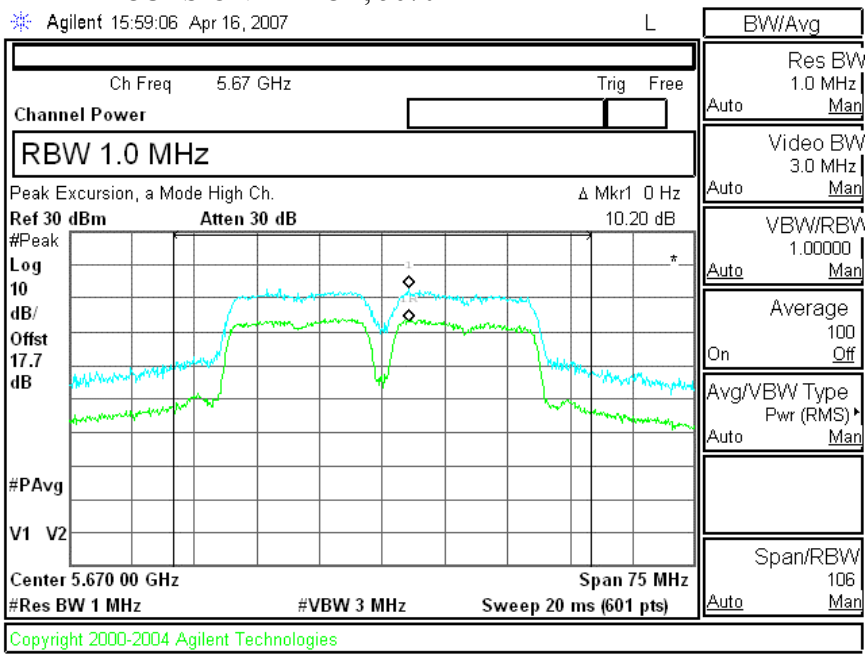
PEAK EXCURSION



PEAK EXCURSION LOW CH, 5590 MHz



PEAK EXCURSION MID CH, 5670 MHz



7.1.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.407 (b) (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.

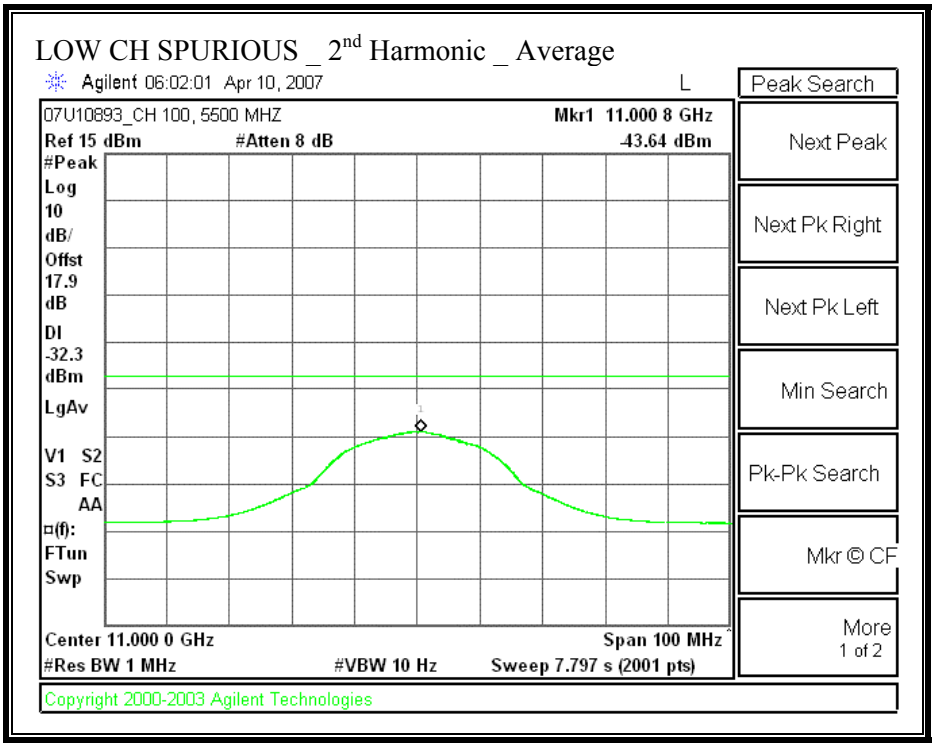
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

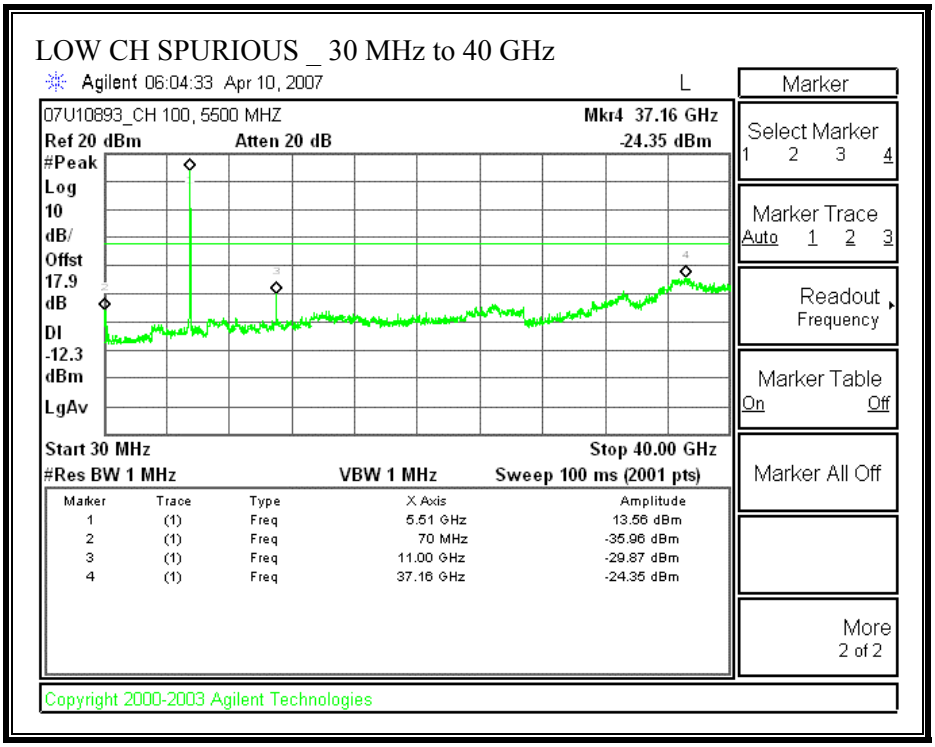
No non-compliance noted:

802.11a MODE

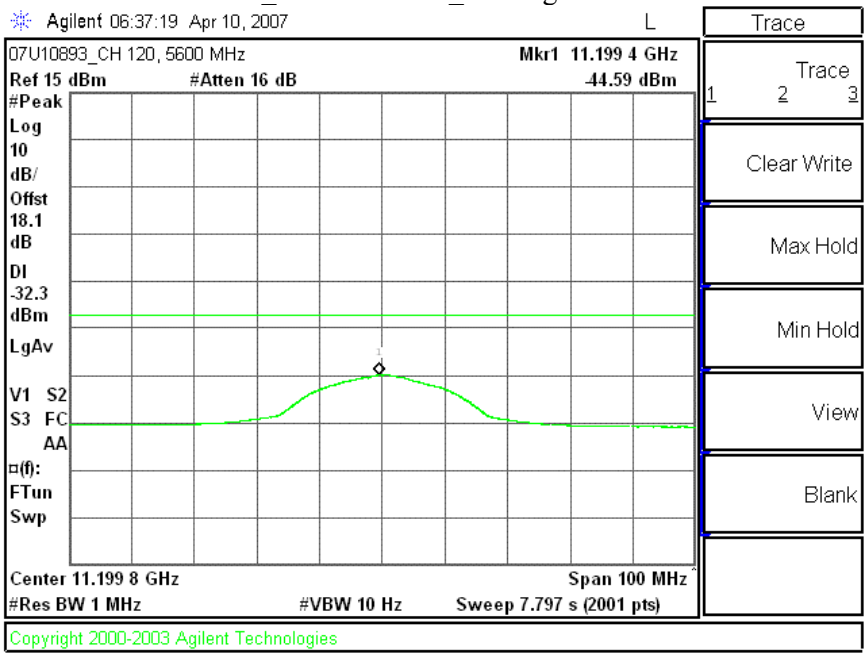
SPURIOUS EMISSIONS (802.11a MODE)



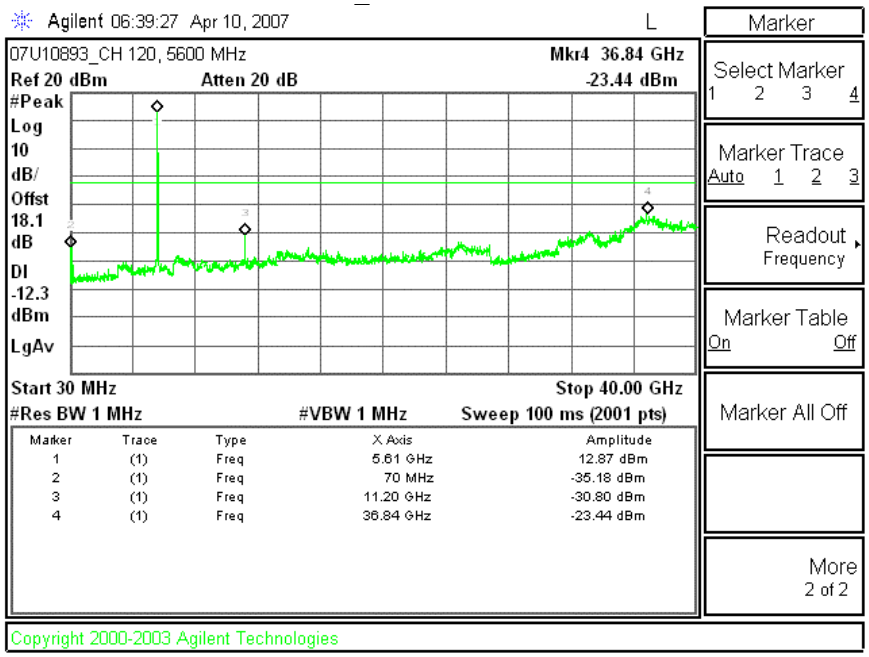
LOW CH SPURIOUS _ 30 MHz to 40 GHz



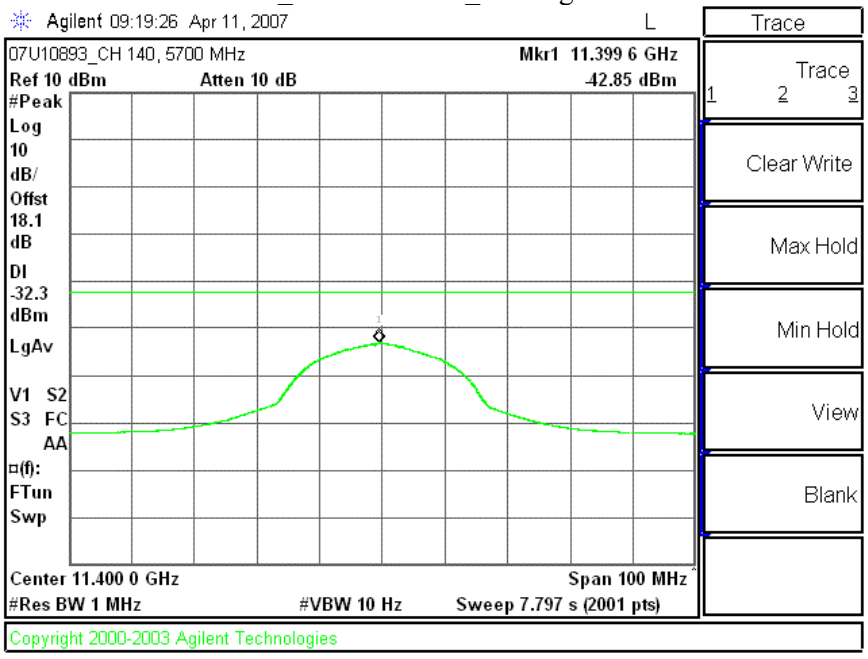
MID CH SPURIOUS _ 2nd Harmonic _ Average



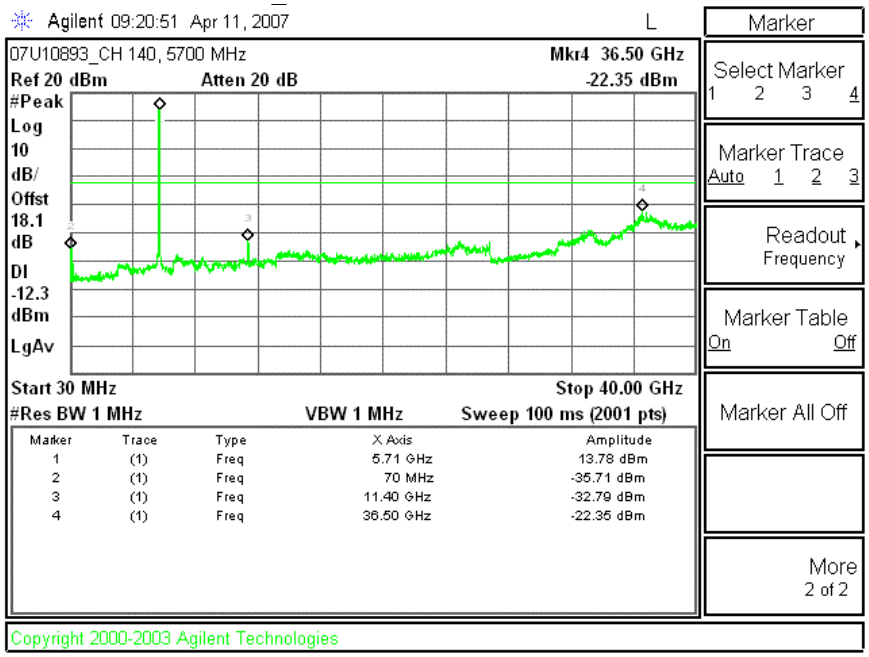
MID CHANNEL SPURIOUS_ 30 MHz to 40 GHz



HIGH CH SPURIOUS _ 2nd Harmonic _ Average



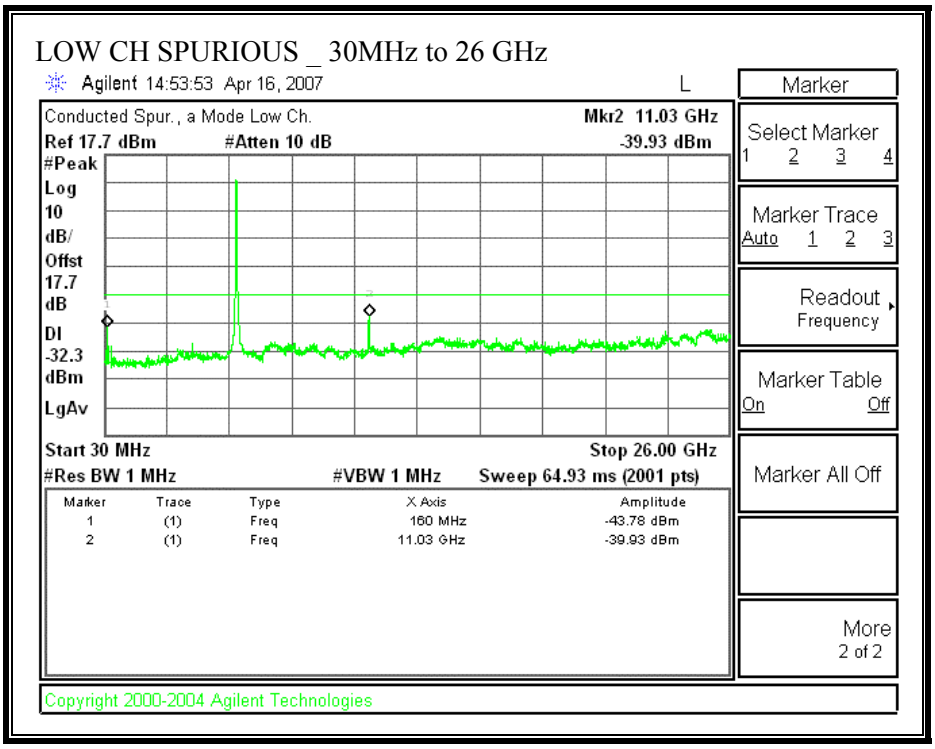
HIGH CH SPURIOUS_30 MHz to 40 GHz



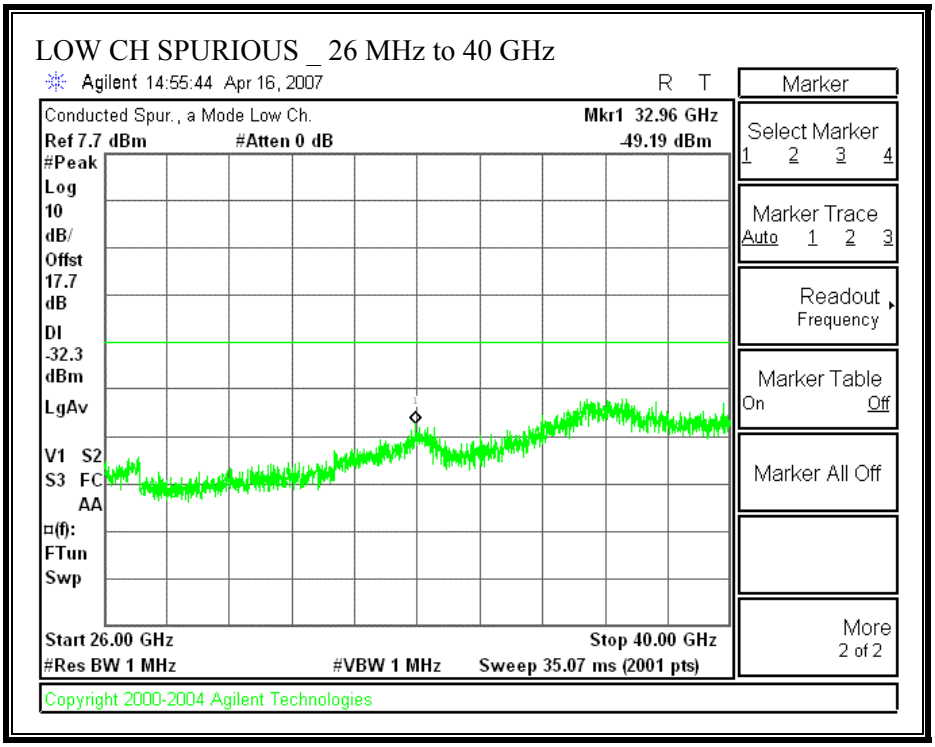
802.11n 20 MHz SISO MODE is covered by the worst case Legacy testing

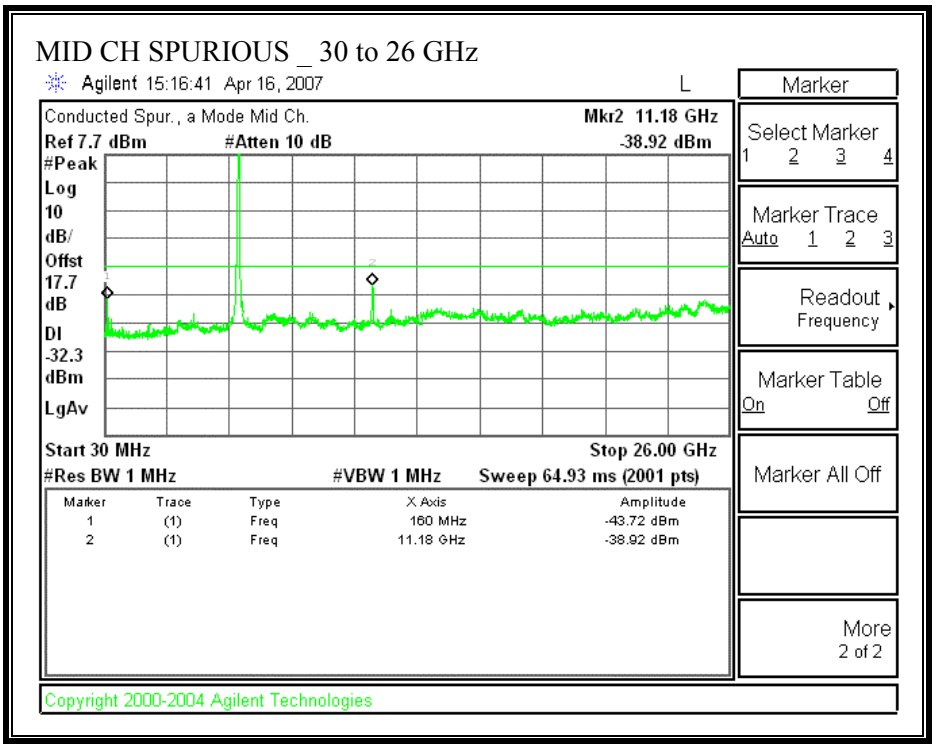
802.11n 40 MHz SISO MCS 32 MODE

SPURIOUS EMISSIONS

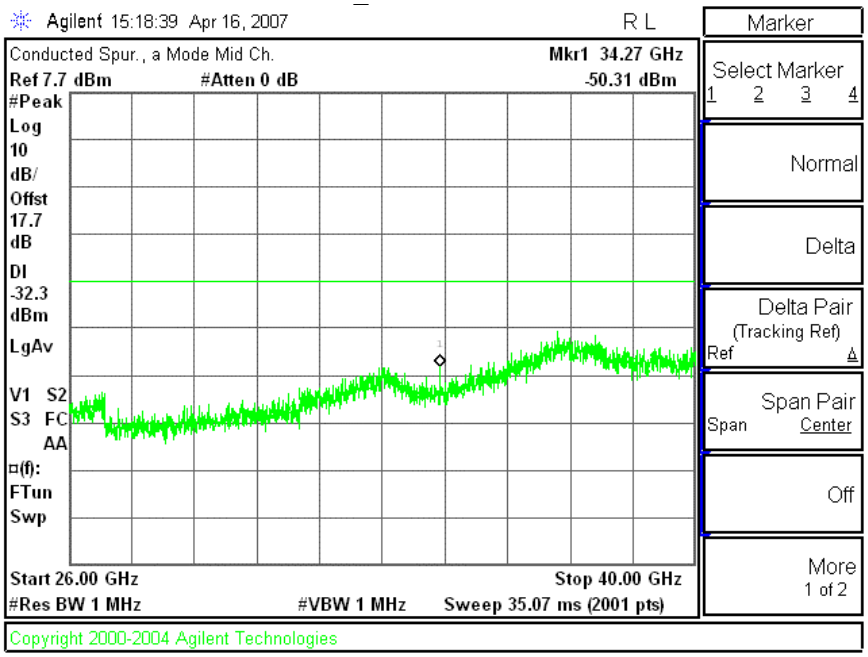


LOW CH SPURIOUS _ 26 MHz to 40 GHz

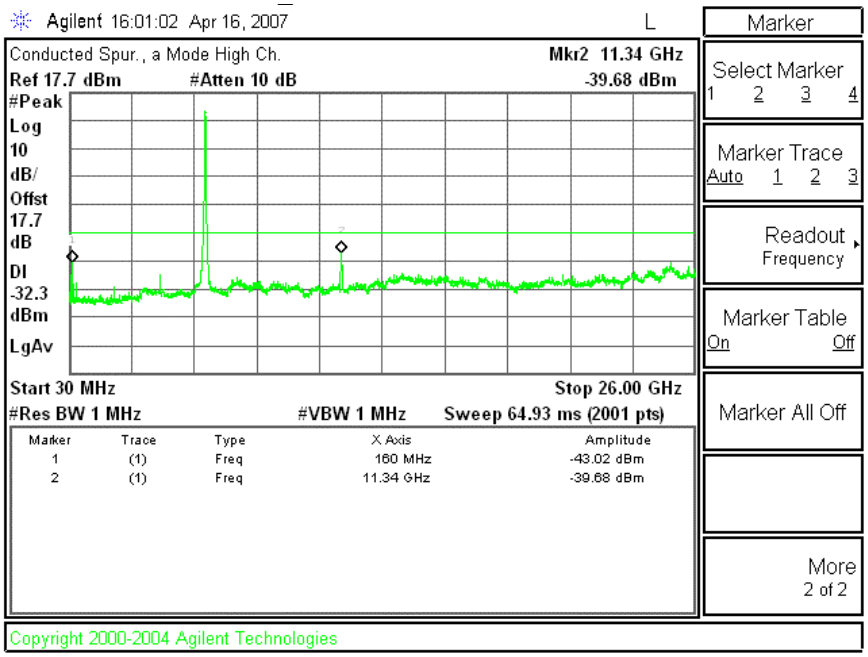




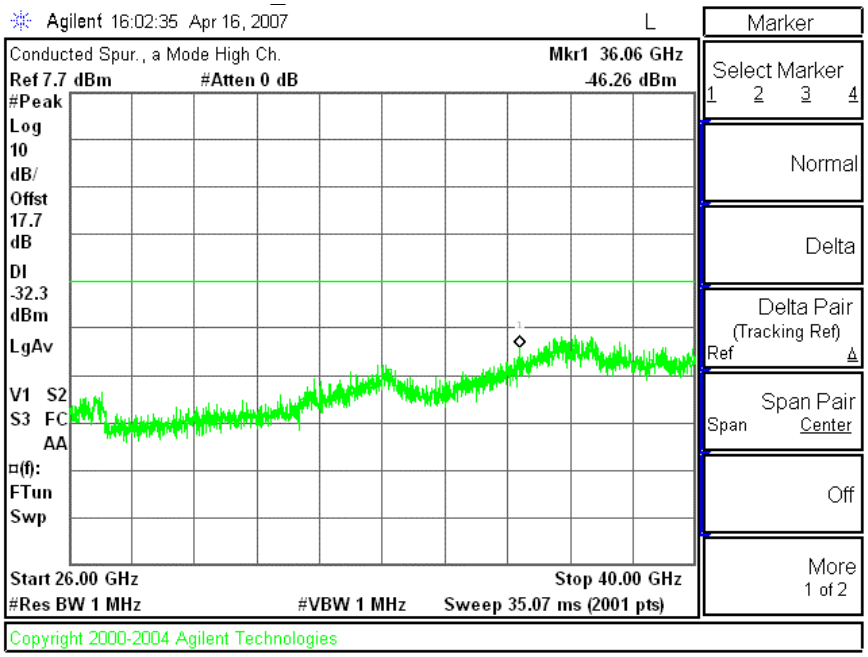
MID CHANNEL SPURIOUS_ 26 GHz to 40 GHz



HIGH CH SPURIOUS _ 30 MHz to 26 GHz



HIGH CH SPURIOUS_26 GHz to 40 GHz



MIMO MODE

7.2. CHANNEL TESTS FOR THE 5470 TO 5725 MHz BAND

7.2.1. EMISSION BANDWIDTH

LIMIT

§15.403 (i) Emission bandwidth. For purposes of this subpart the emission bandwidth shall be determined by measuring the width of the signal between two points, one below the carrier center frequency and one above the carrier center frequency, that are 26 dB down relative to the maximum level of the modulated carrier. Determination of the emissions bandwidth is based on the use of measurement instrumentation employing a peak detector function with an instrument resolutions bandwidth approximately equal to 1.0 percent of the emission bandwidth of the device under measurement.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 1% to 3% of the 26 dB bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled.

RESULTS

No non-compliance noted:

802.11a CDD MODE is covered by worst case 802.11n 20 MHz CDD MCS 0 MODE

802.11n 20 MHz CDD MCS 0 MODE

802.11 - 20 MHz Tx BANDWIDTH - CHAIN 0

Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5500	29.169	14.649
Middle	5560	35.640	15.519
High	5700	40.440	16.068

802.11 - 20 MHz Tx BANDWIDTH - CHAIN 1

Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5500	32.658	15.140
Middle	5560	33.139	15.203
High	5700	37.214	15.707

802.11n 40 MHz CDD MCS 32 MODE

802.11 - 40 MHz Tx BANDWIDTH - CHAIN 0

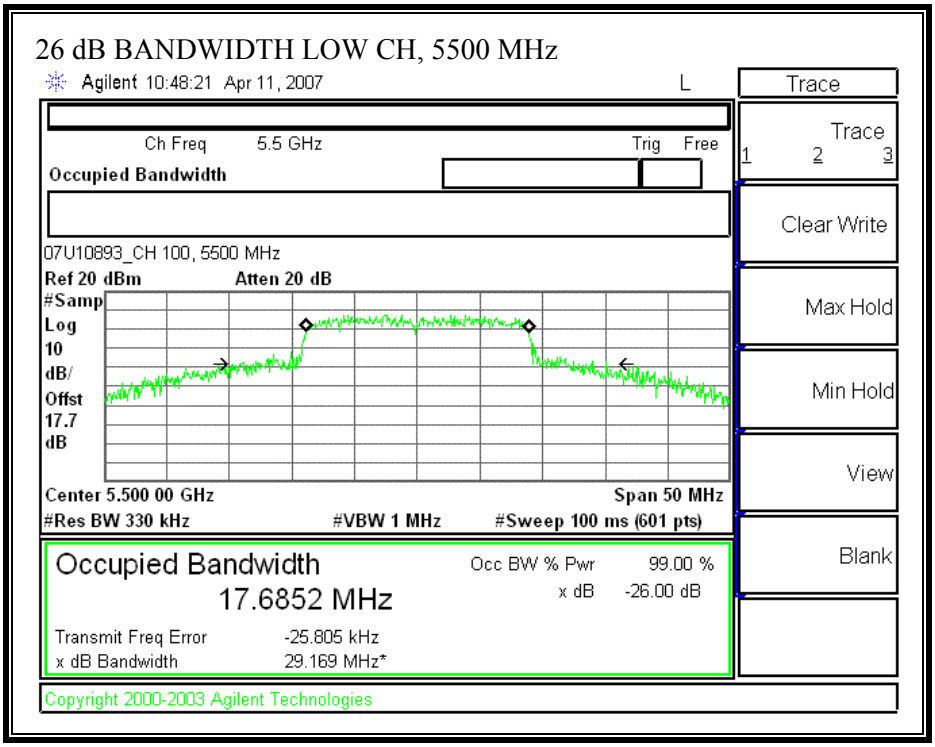
Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5510	51.364	17.107
Middle	5590	78.442	18.945
High	5670	67.147	18.270

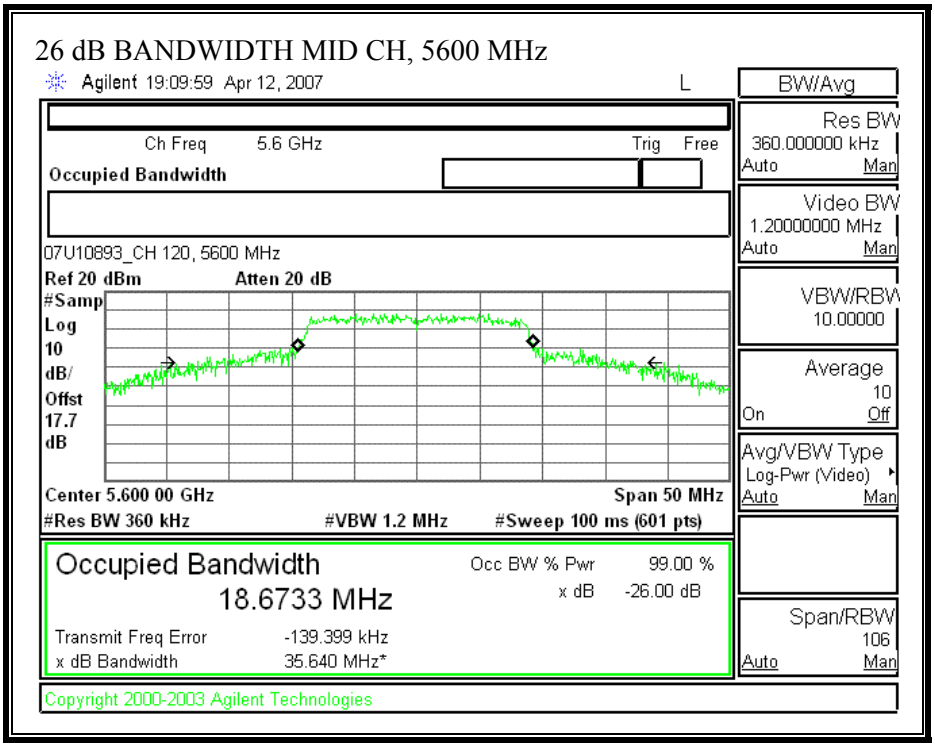
802.11 - 40 MHz Tx BANDWIDTH - CHAIN 1

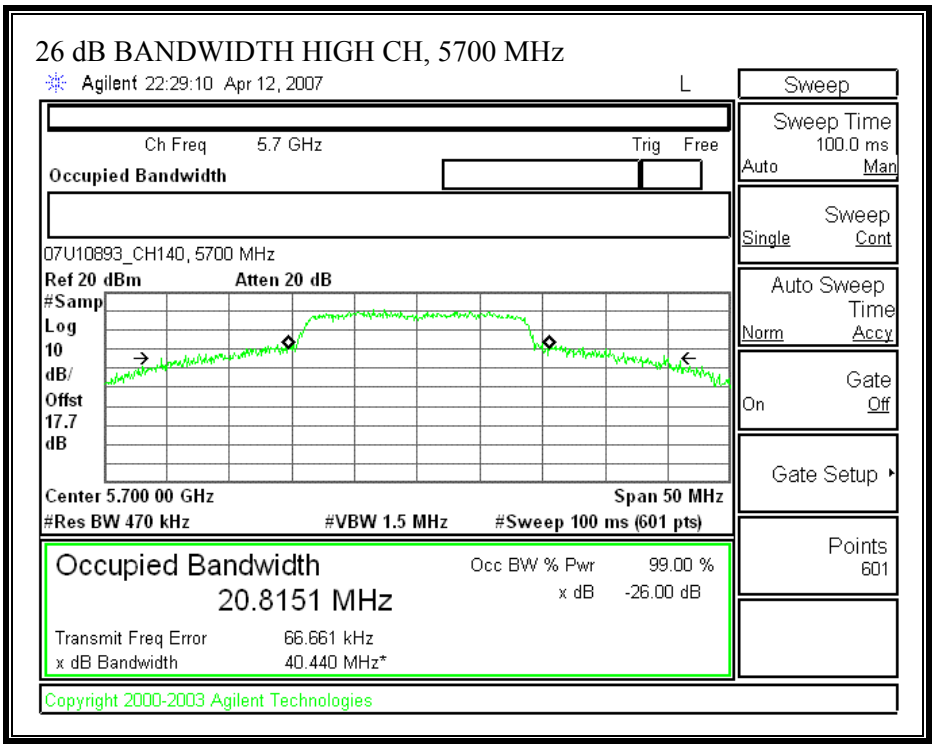
Channel	Frequency (MHz)	B (MHz)	10 Log B (dB)
Low	5510	49.658	16.960
Middle	5590	77.880	18.914
High	5670	64.891	18.122

802.11n 20 MHz CDD MCS 0

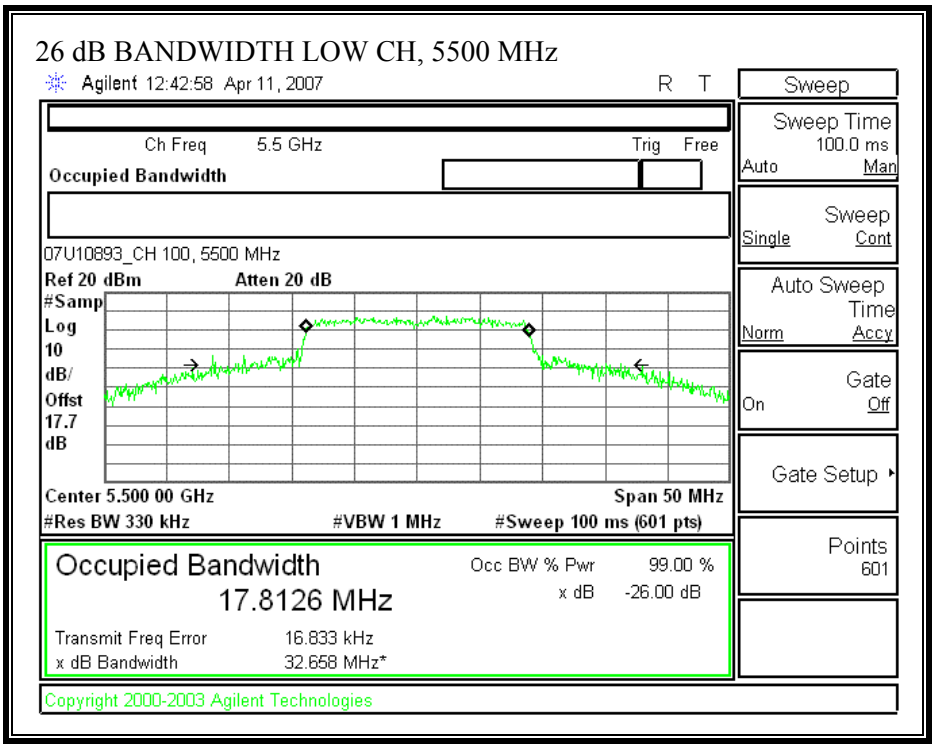
26 dB EMISSION BANDWIDTH (802.11 - 20 MHz TX BANDWIDTH- CHAIN 0)

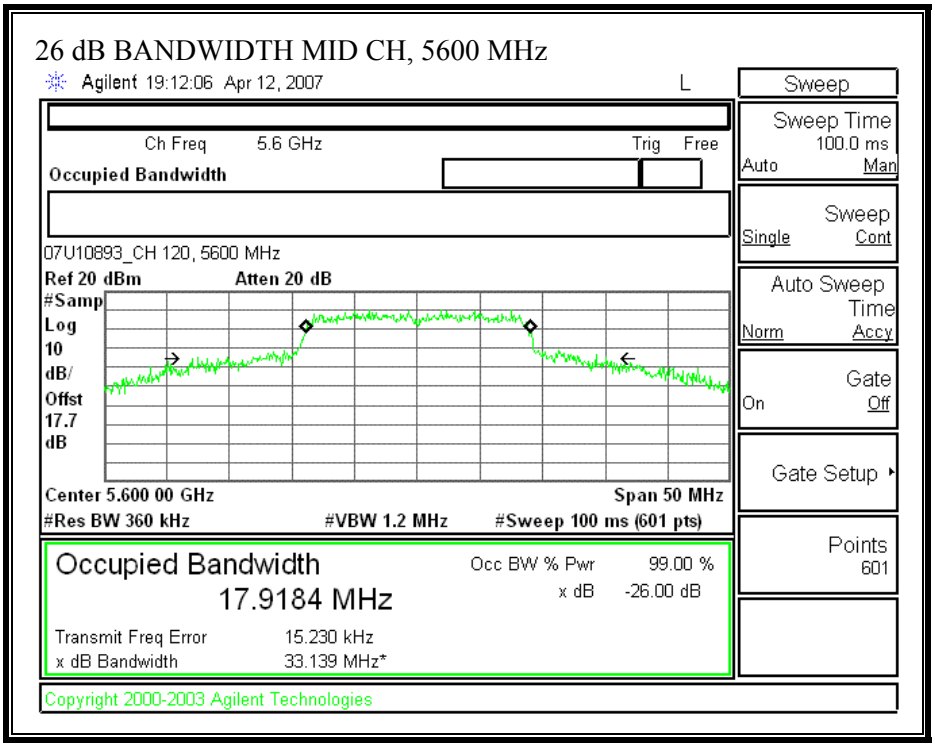


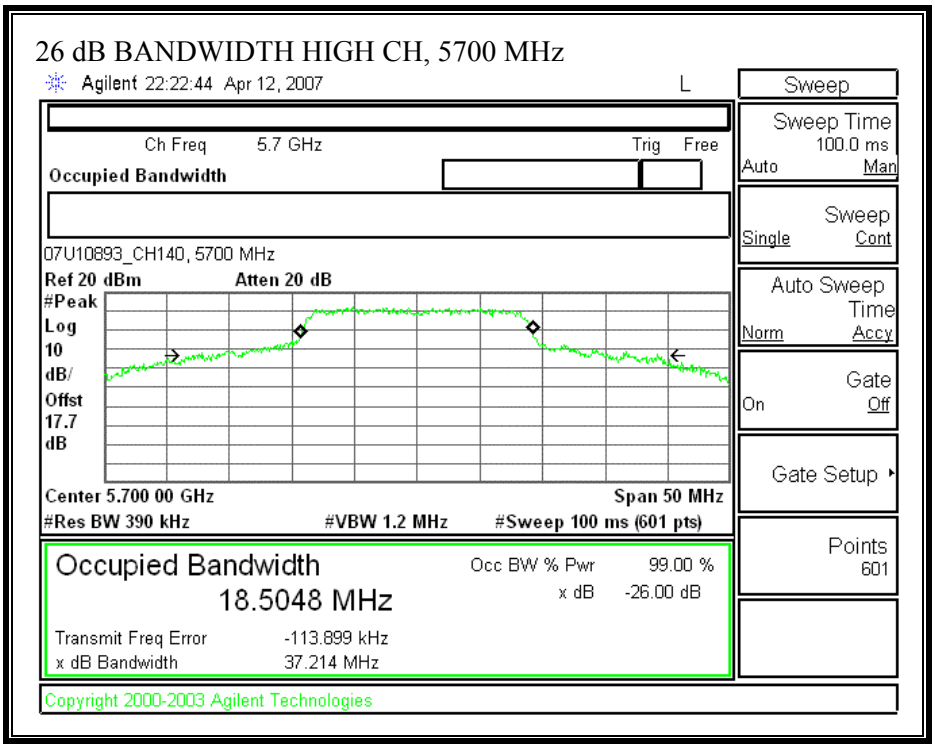




26 dB EMISSION BANDWIDTH (802.11 - 20 MHz TX BANDWIDTH- CHAIN 1)

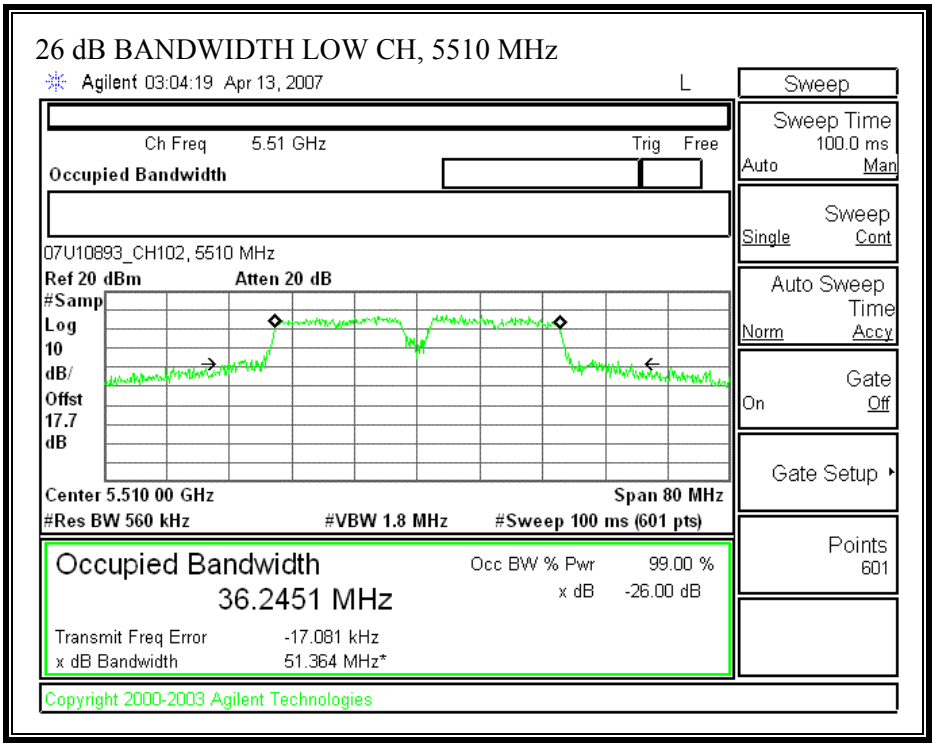


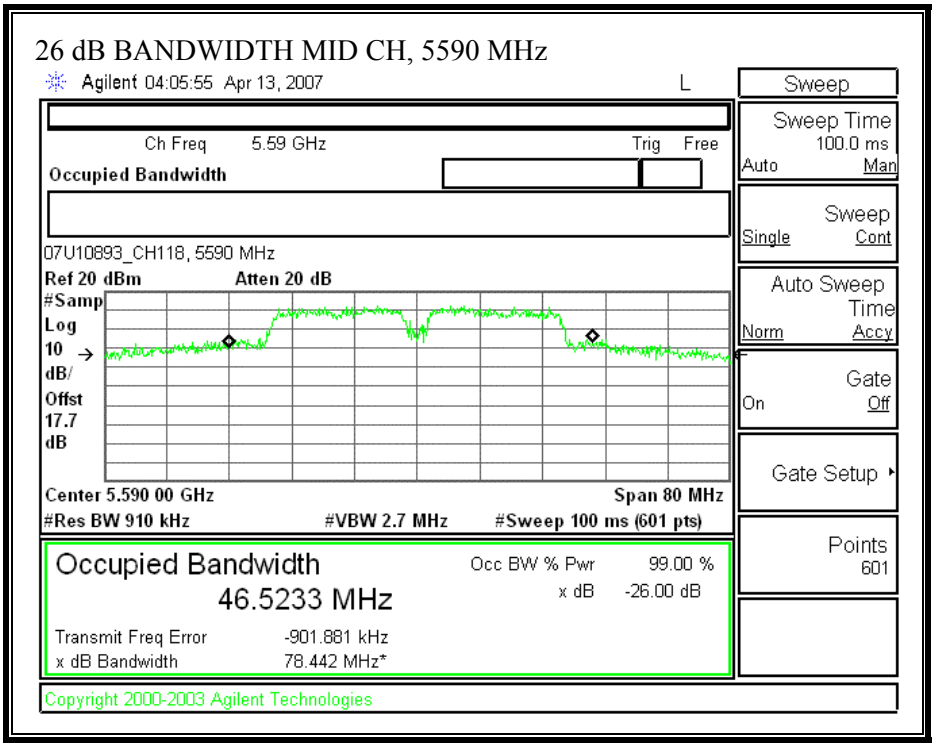


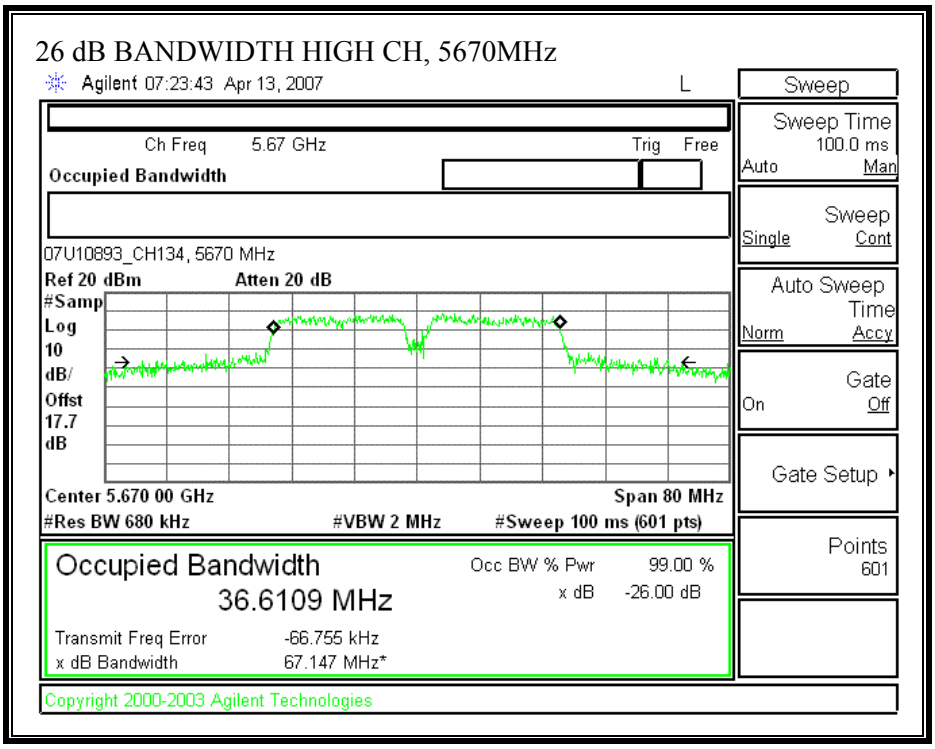


802.11n 40 MHz CDD MCS 32

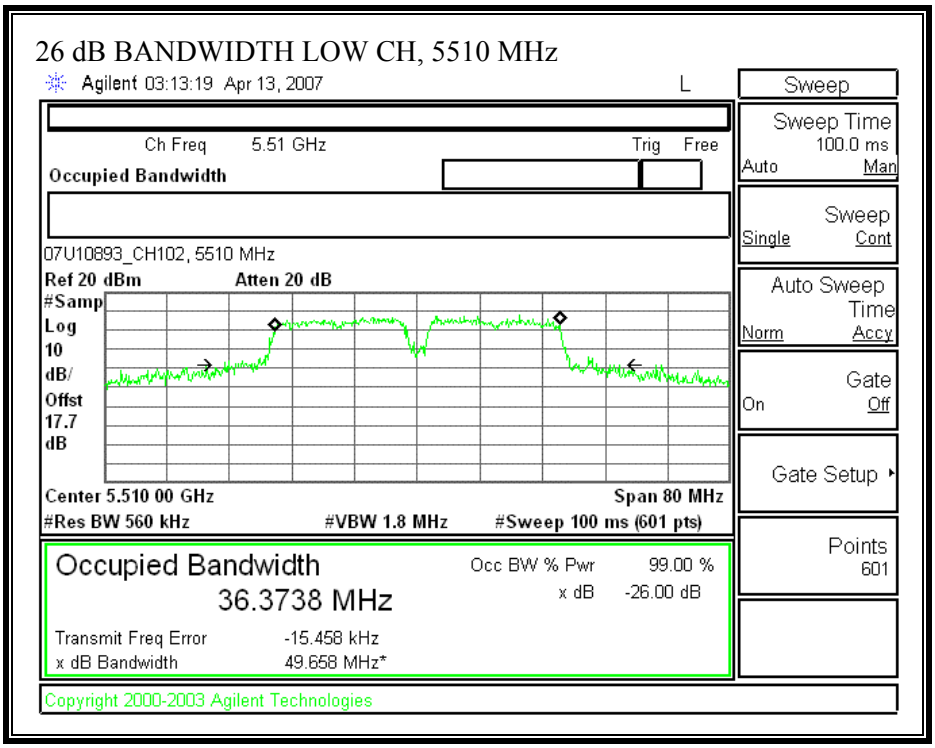
26 dB EMISSION BANDWIDTH (802.11 - 40 MHz TX BANDWIDTH- CHAIN 0)

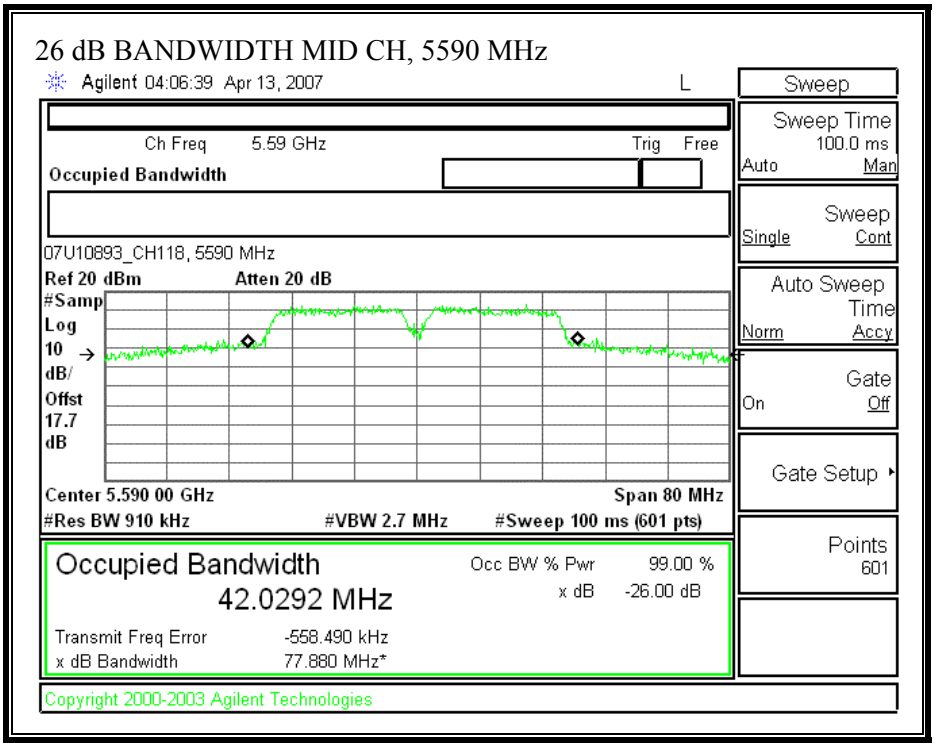




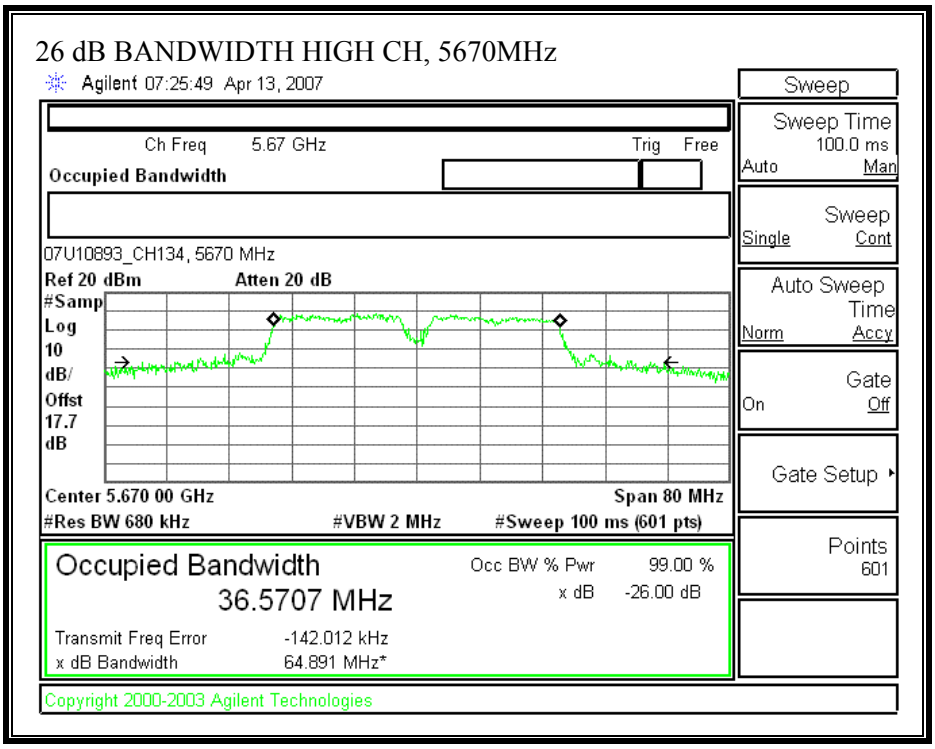


26 dB EMISSION BANDWIDTH (802.11 - 40 MHz TX BANDWIDTH- CHAIN 1)





26 dB BANDWIDTH HIGH CH, 5670MHz



7.2.2. PEAK POWER

LIMIT

§15.407 (a) (2) For the 5.47–5.725 GHz band, the peak transmit power over the frequency band of operation shall not exceed the lesser of 250 mW or 11 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 FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

The transmitter output operates continuously therefore Method # 1 is used.

The cable assembly insertion loss of 11.4 dB (including 10 dB pad and 1.4dB cable) was entered as an offset in the power meter to allow for direct reading of power.

LIMITS AND RESULTS

No non-compliance noted:

Total peak power calculation formula: 10 log (10^ (Pchain0 / 10) + 10^ (Pchain1 / 10))

Note: Pchain 0 and Pchain1 are in dBm

For combiner: Following formula to calculate the array gain:

Array gain = 10*log (10^ (main gain/10) + 10^ (aux gain/10))

5.470 – 5.725GHz band: 8.75dBi

802.11a CDD MODE is covered by worst case 802.11n 20 MHz CDD MCS 0 MODE

802.11n 20 MHz CDD MCS 0 MODE

8.75dBi Antenna

Channel	Frequency (MHz)	Fixed Limit (dBm)	B Chain 0 (MHz)	B Chain 1 (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	29.169	32.658	25.649	8.75	21.25
Mid	5600	24	35.640	33.139	26.203	8.75	21.25
High	5700	24	40.440	37.214	26.707	8.75	21.25

Results

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	14.63	14.65	17.65	21.25	-3.60
Mid	5600	14.08	14.13	17.12	21.25	-4.13
High	5700	14.32	14.04	17.19	21.25	-4.06

6dBi Antenna

Channel	Frequency (MHz)	Fixed Limit (dBm)	B Chain 0 (MHz)	B Chain 1 (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5500	24	29.169	32.658	25.649	6.00	24.00
Mid	5600	24	35.640	33.139	26.203	6.00	24.00
High	5700	24	40.440	37.214	26.707	6.00	24.00

Results

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5500	17.21	17.24	20.24	24.00	-3.76
Mid	5600	16.81	16.70	19.77	24.00	-4.23
High	5700	16.58	16.69	19.65	24.00	-4.35

802.11n 40 MHz CDD MCS 32 MODE

8.75dBi antenna

Channel	Frequency (MHz)	Fixed Limit (dBm)	B Chain 0 (MHz)	B Chain 1 (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5510	24	44.836	39.829	27.002	8.75	21.25
Mid	5590	24	76.184	74.998	29.750	8.75	21.25
High	5670	24	65.430	61.061	28.858	8.75	21.25

Results

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5510	15.79	15.68	18.75	21.25	-2.50
Mid	5590	16.64	16.70	19.68	21.25	-1.57
High	5670	16.67	16.81	19.75	21.25	-1.50

6dBi antenna

Note: The low channel utilizes the same power level for all antennas, low channel power data in table below is from 8.75 dBi data.

Channel	Frequency (MHz)	Fixed Limit (dBm)	B Chain 0 (MHz)	B Chain 1 (MHz)	11 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Mid	5590	24	44.836	39.829	27.002	6.00	24.00
Mid	5590	24	76.184	74.998	29.750	6.00	24.00
High	5670	24	65.430	61.061	28.858	6.00	24.00

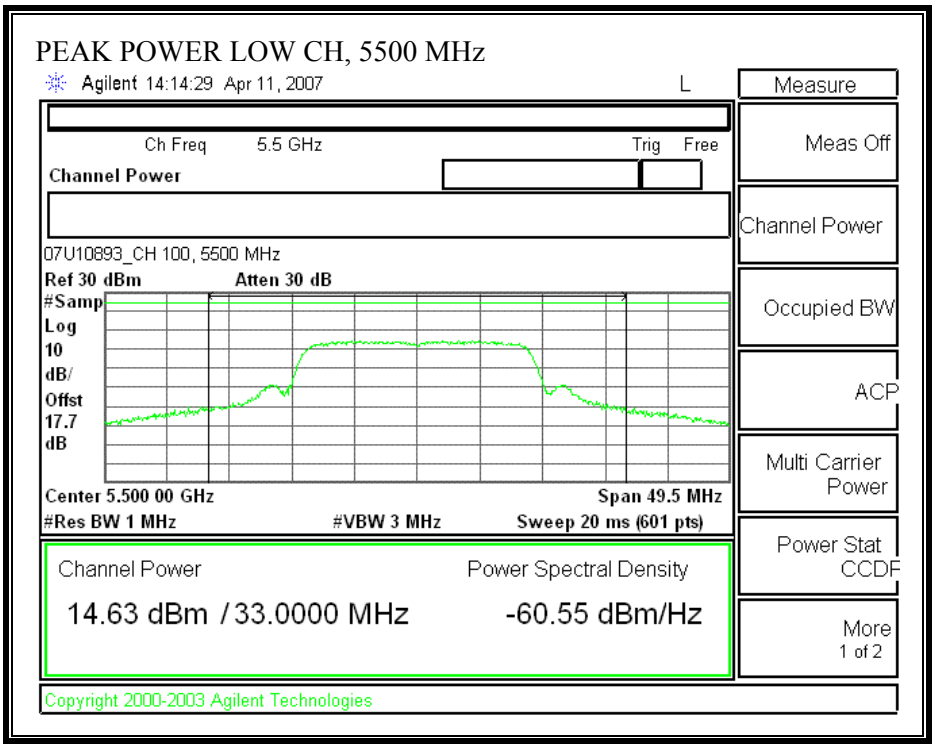
Results

Channel	Frequency (MHz)	Power Chain 0 (dBm)	Power Chain 1 (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Mid	5590	15.79	15.68	18.75	24.00	-5.25
Mid	5590	19.38	19.39	22.40	24.00	-1.60
High	5670	19.31	19.34	22.34	24.00	-1.66

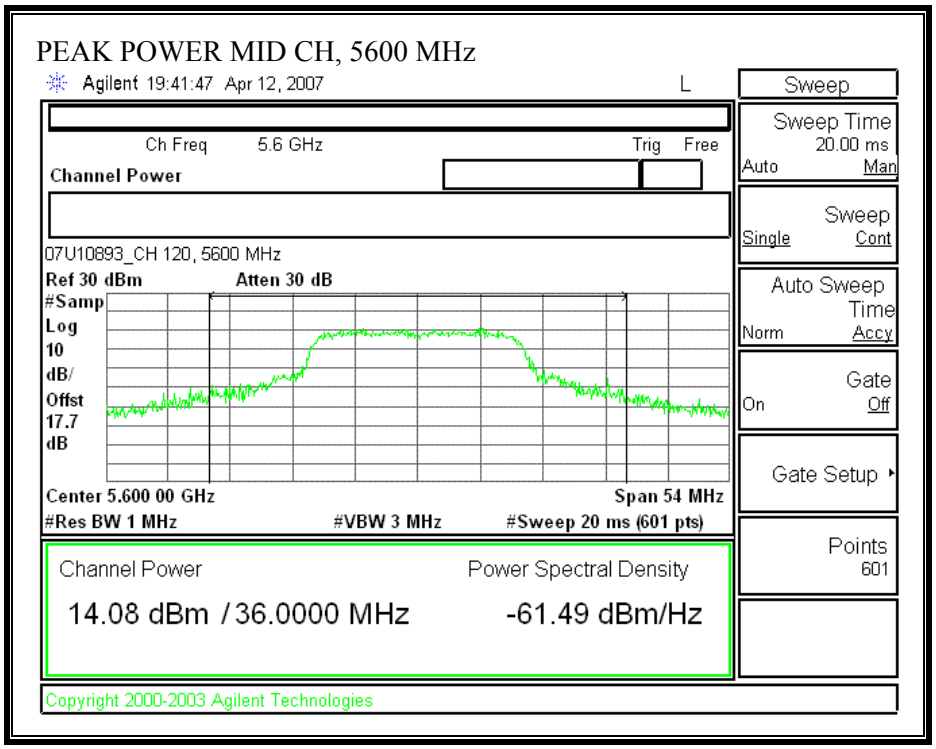
802.11n 20 MHz CDD MCS 0 MODE

8.75dBi Antenna

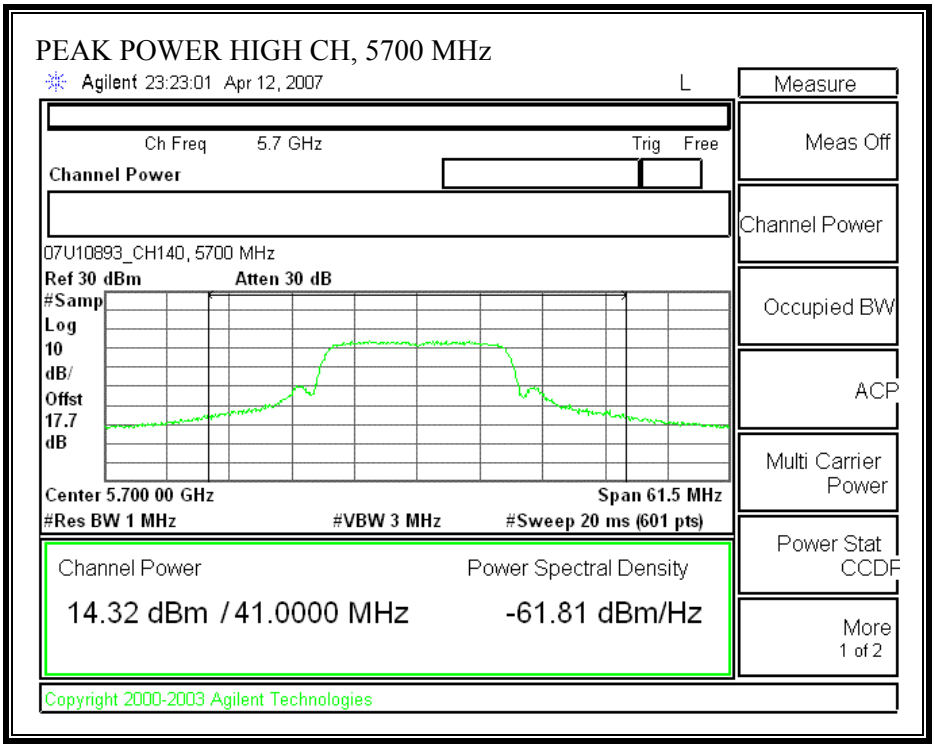
PEAK POW7ER (802.11 – 20MHz TX BANDWIDTH – CHAIN 0)



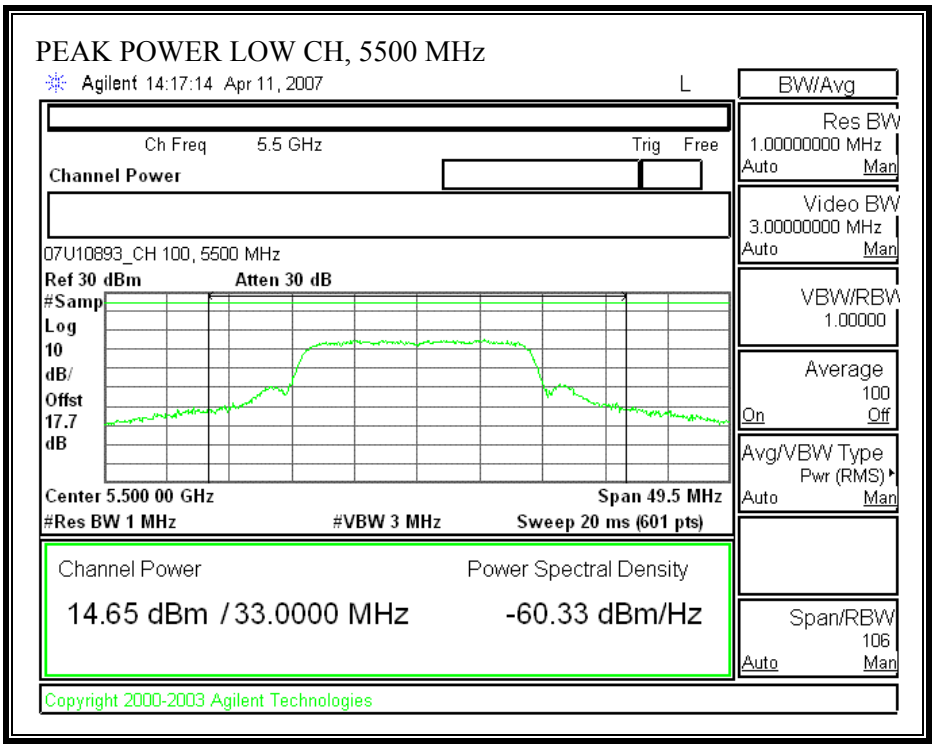
PEAK POWER MID CH, 5600 MHz



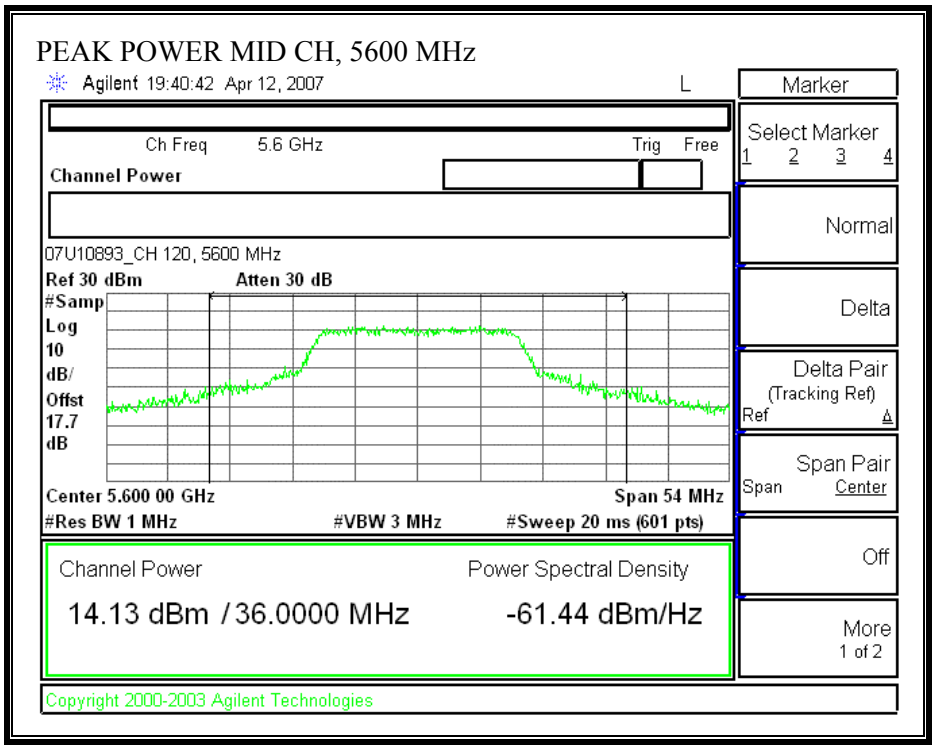
PEAK POWER HIGH CH, 5700 MHz

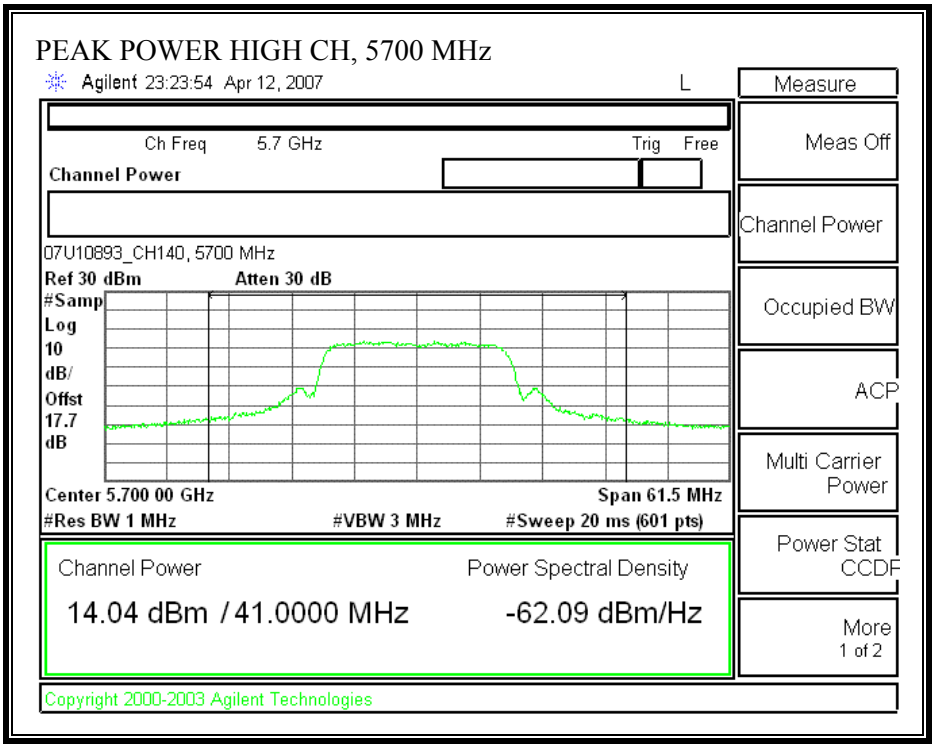


PEAK POWER (802.11 – 20MHz TX BANDWIDTH – CHAIN 1)



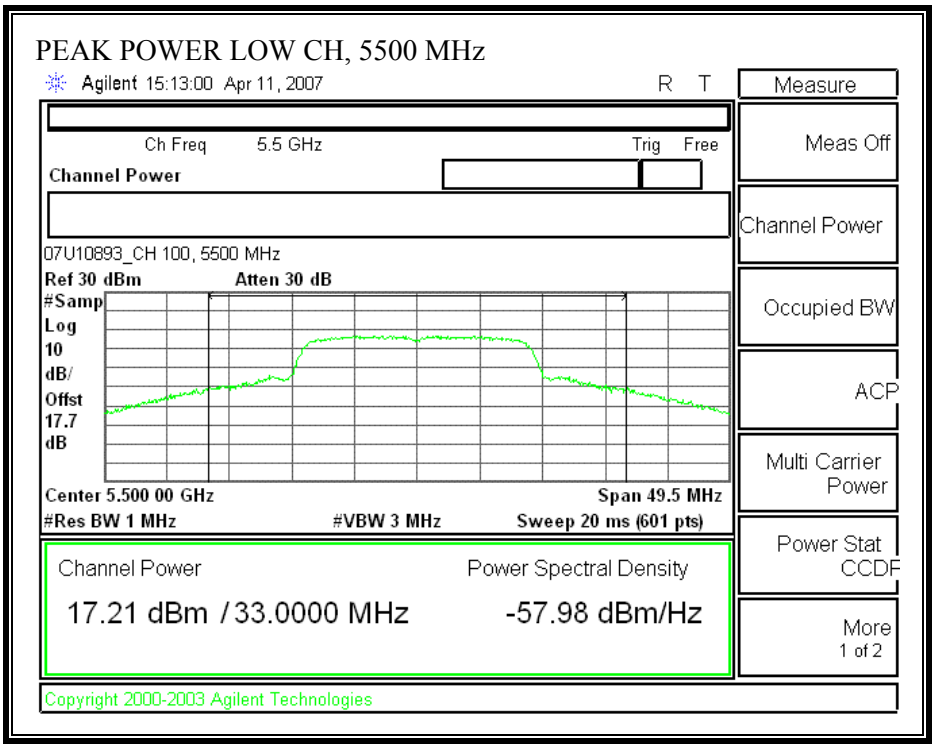
PEAK POWER MID CH, 5600 MHz

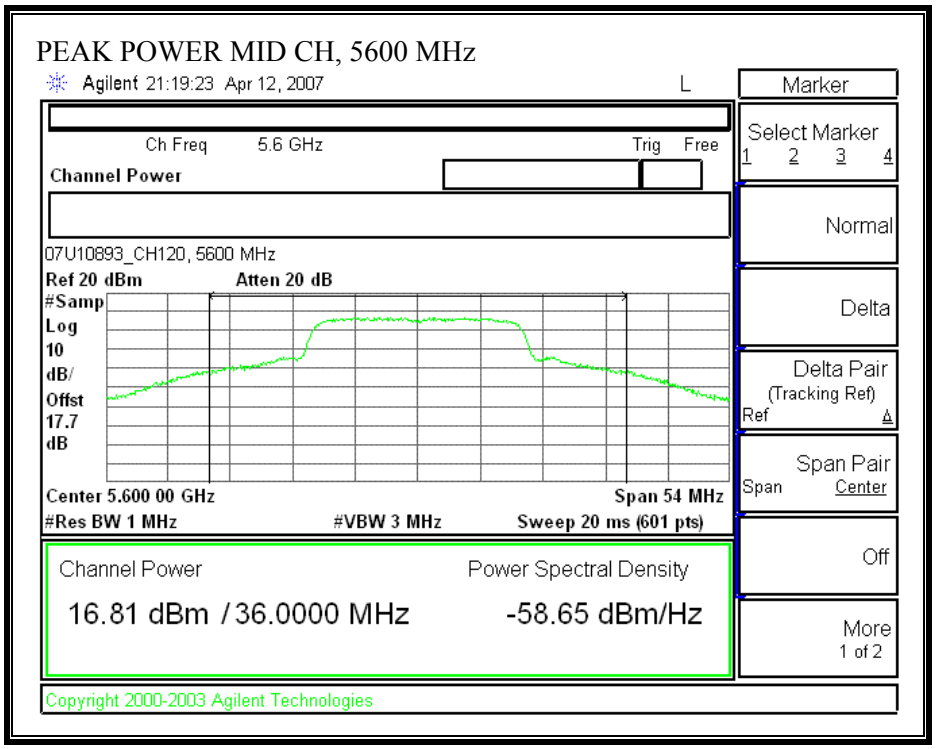




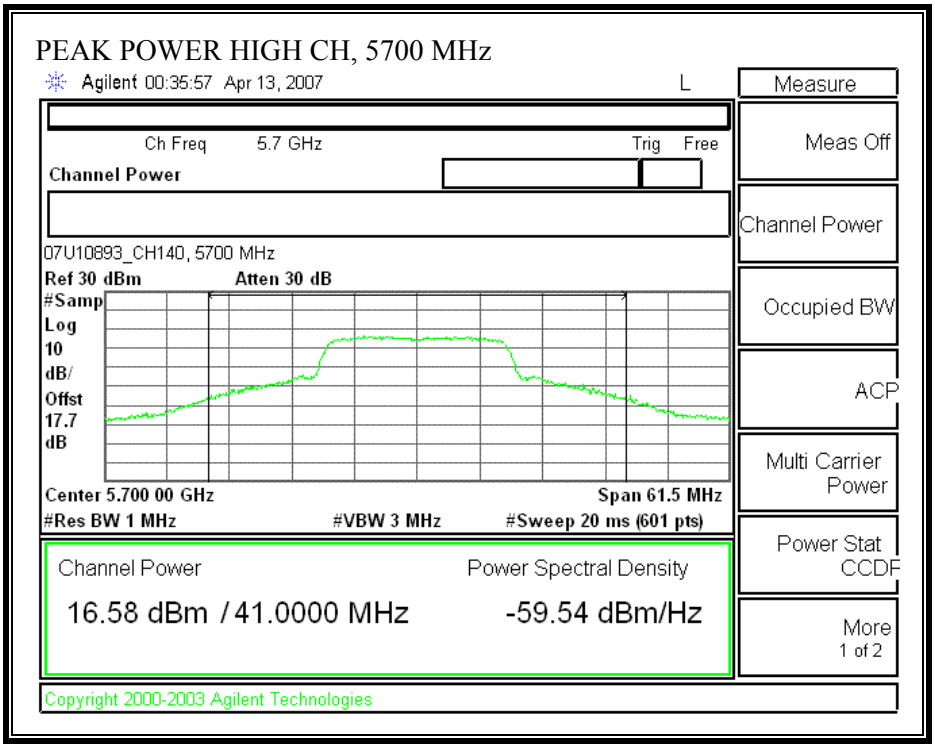
6dBi Antenna

PEAK POWER (802.11 – 20MHz TX BANDWIDTH – CHAIN 0)

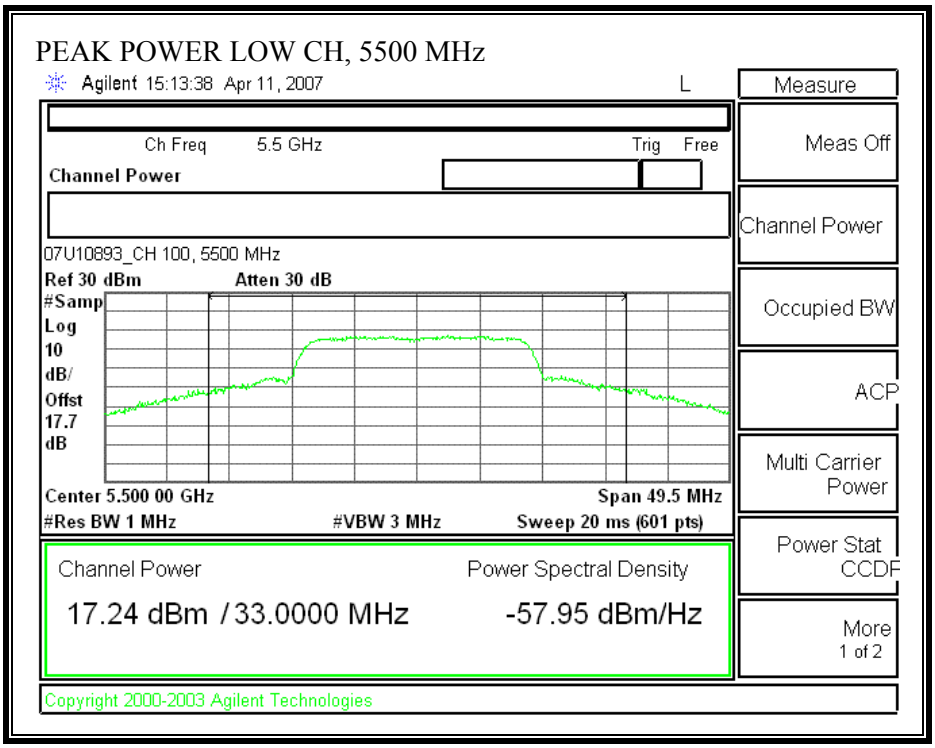




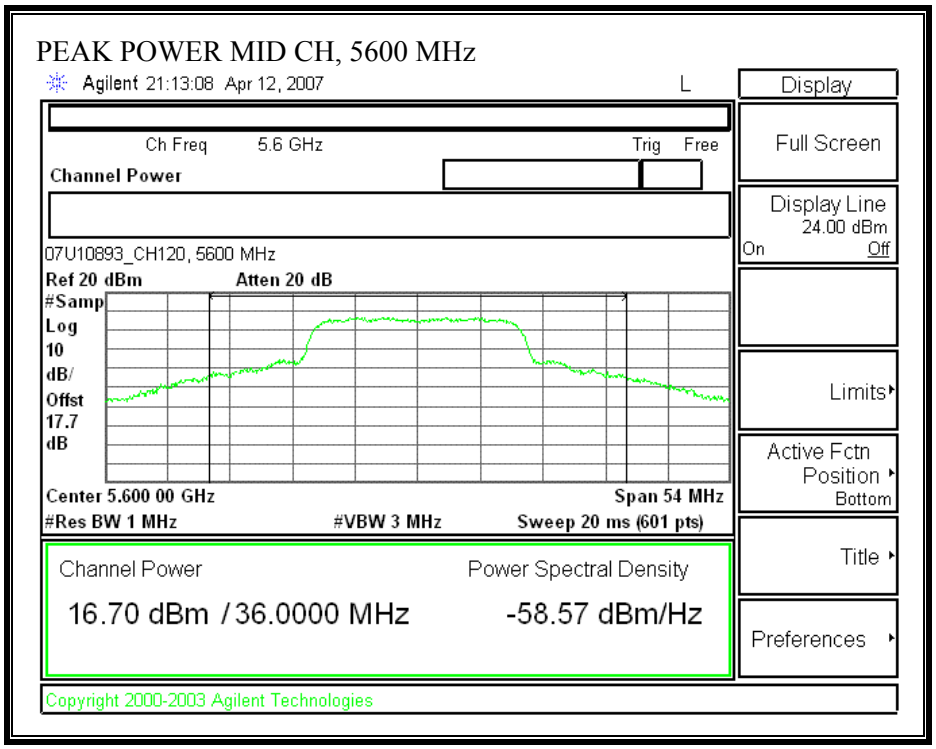
PEAK POWER HIGH CH, 5700 MHz



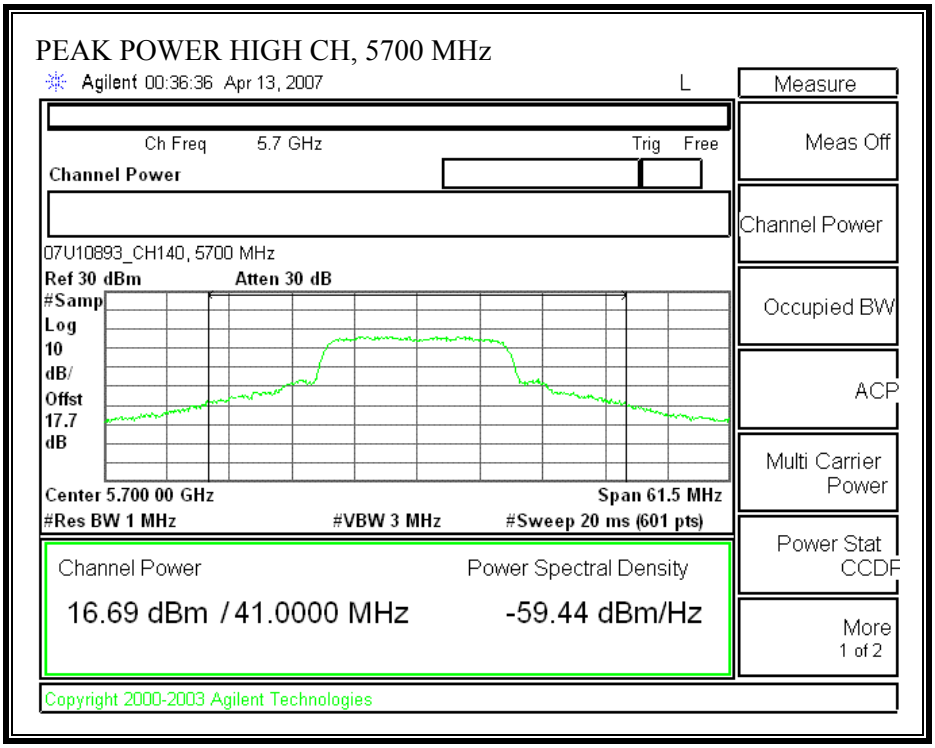
PEAK POWER (802.11 – 20MHz TX BANDWIDTH – CHAIN 1)



PEAK POWER MID CH, 5600 MHz



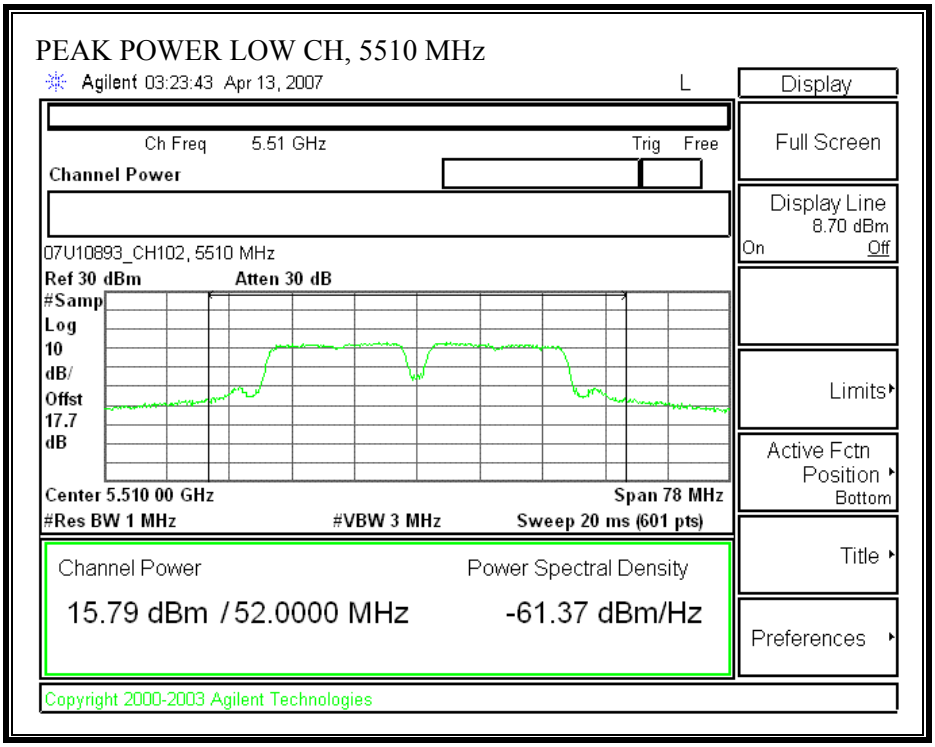
PEAK POWER HIGH CH, 5700 MHz



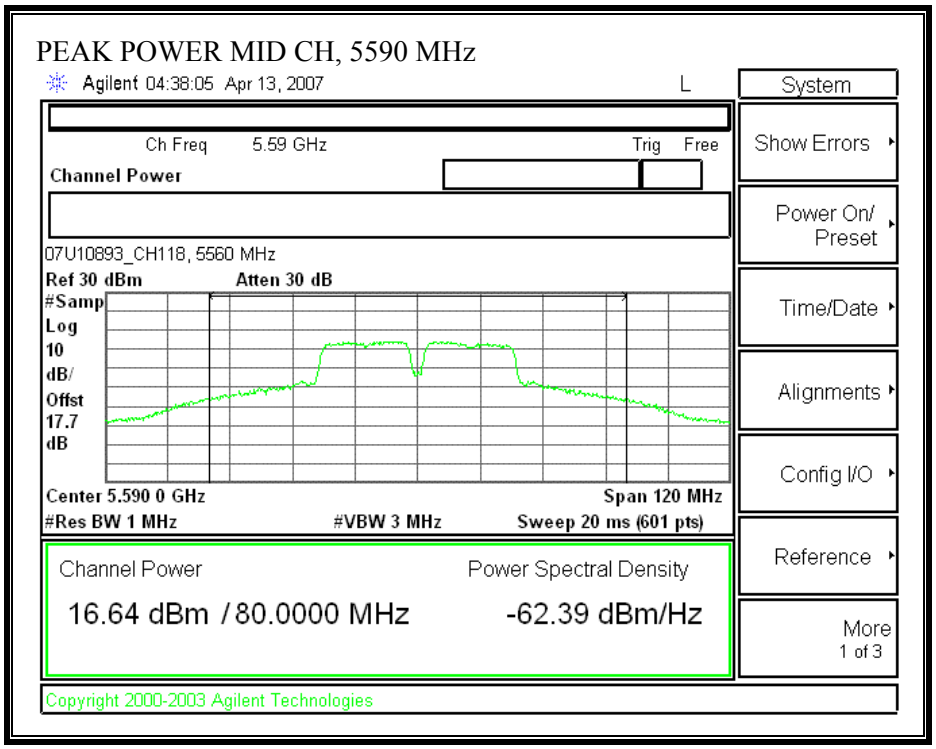
802.11n 40 MHz CDD MCS 32 MODE

8.75dBi antenna

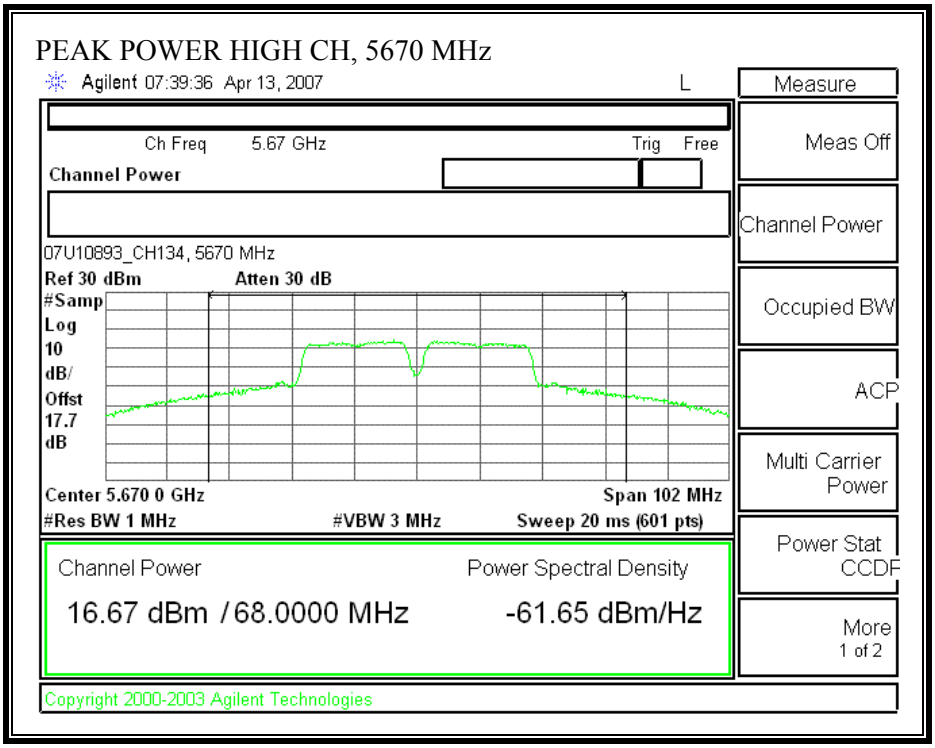
PEAK POWER (802.11 – 40MHz TX BANDWIDTH – CHAIN 0)



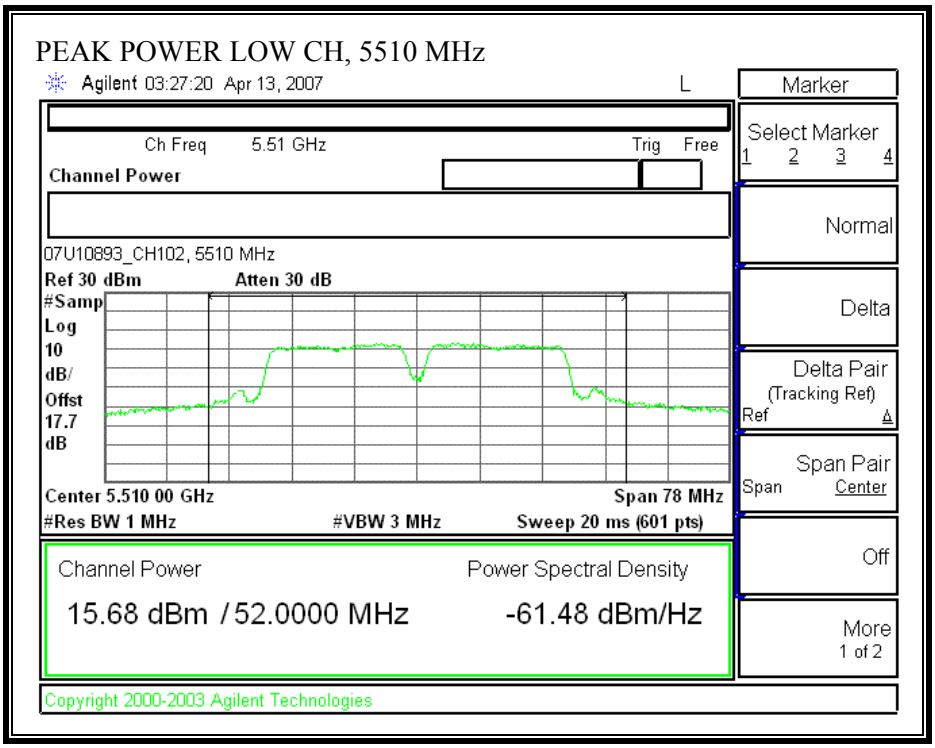
PEAK POWER MID CH, 5590 MHz

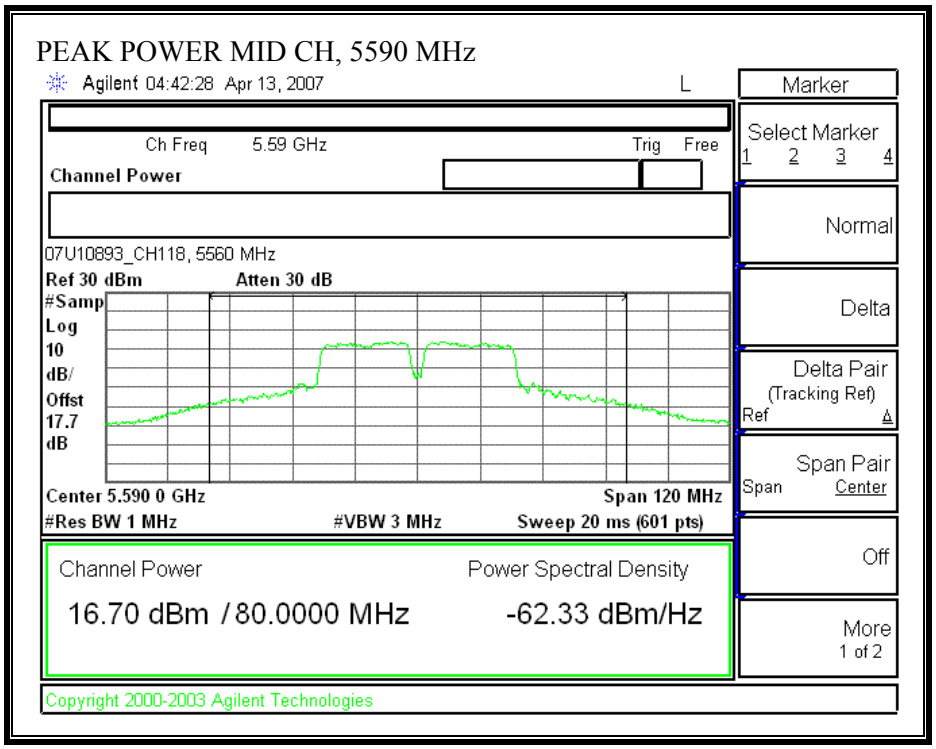


PEAK POWER HIGH CH, 5670 MHz

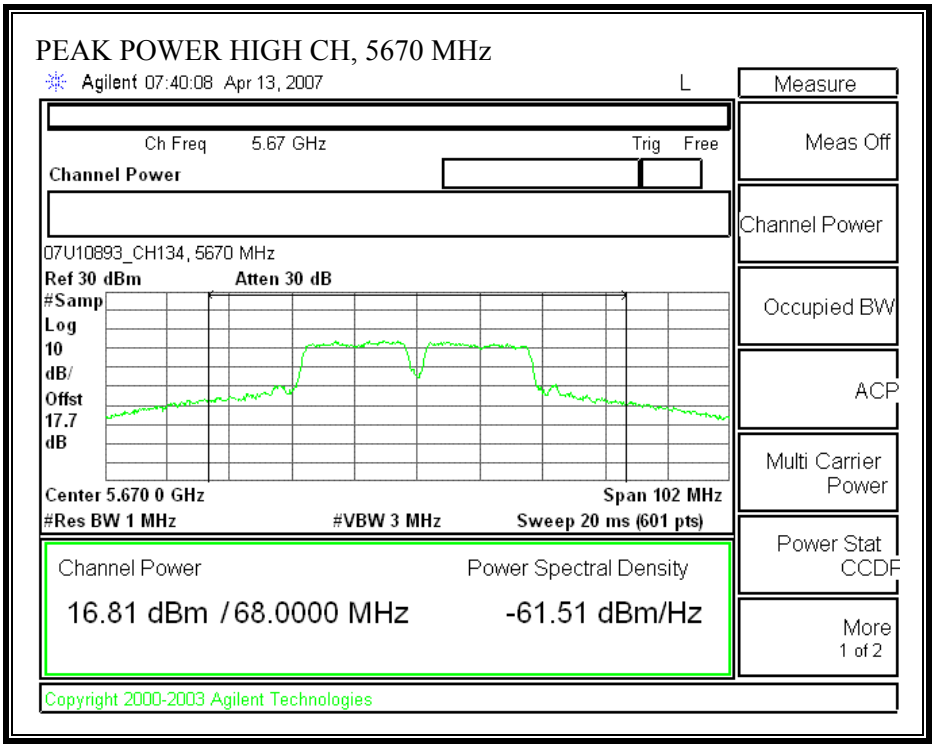


PEAK POWER (802.11 – 40MHz TX BANDWIDTH – CHAIN 1)



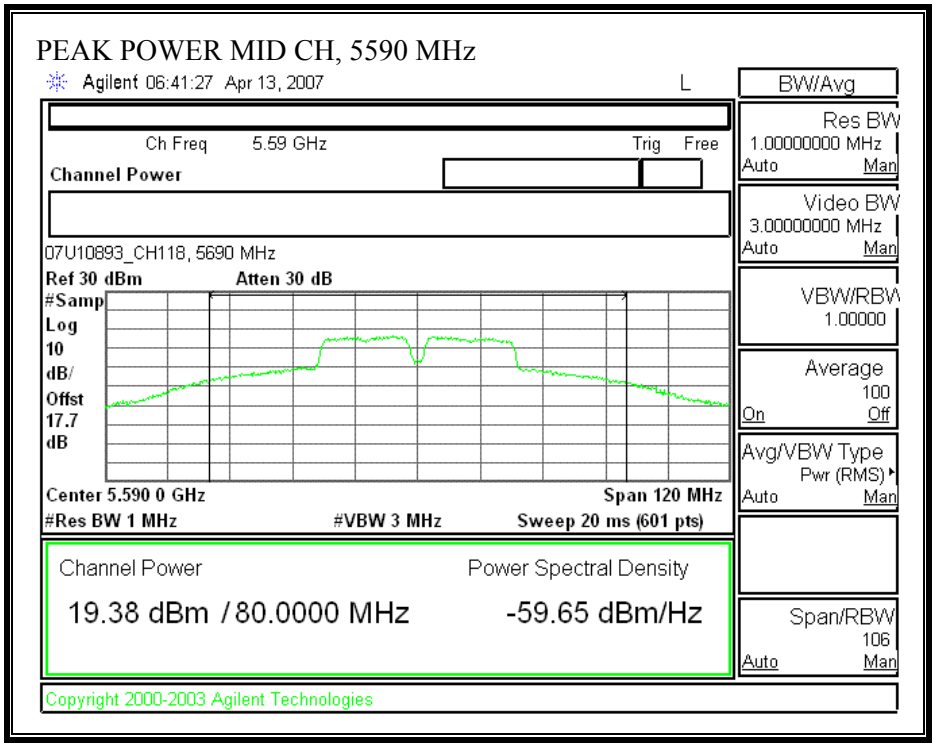


PEAK POWER HIGH CH, 5670 MHz

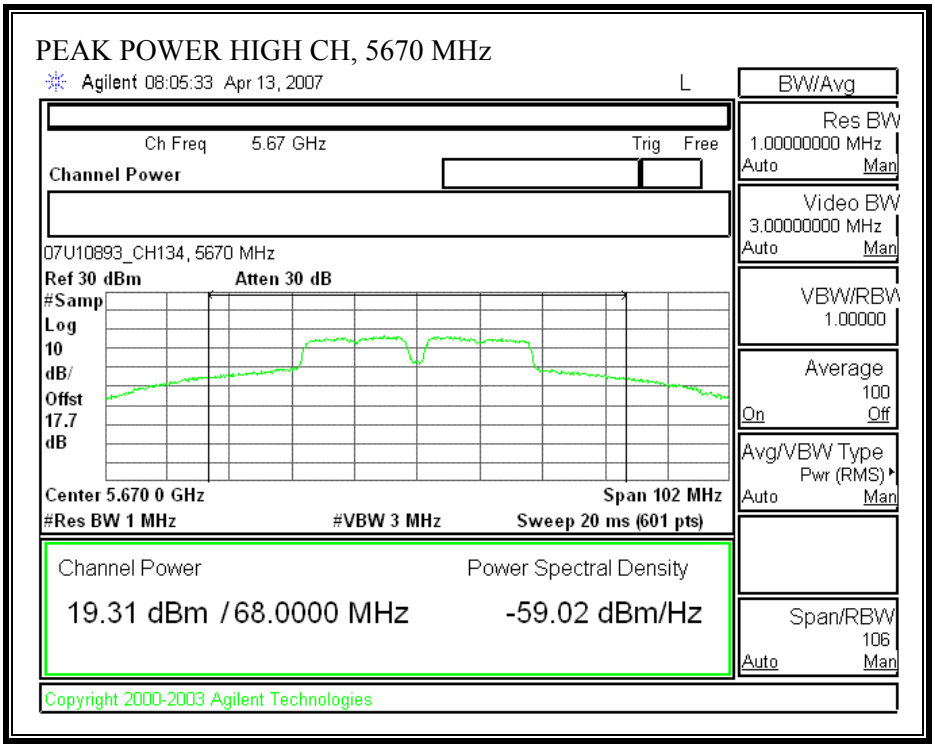


6dBi Antenna

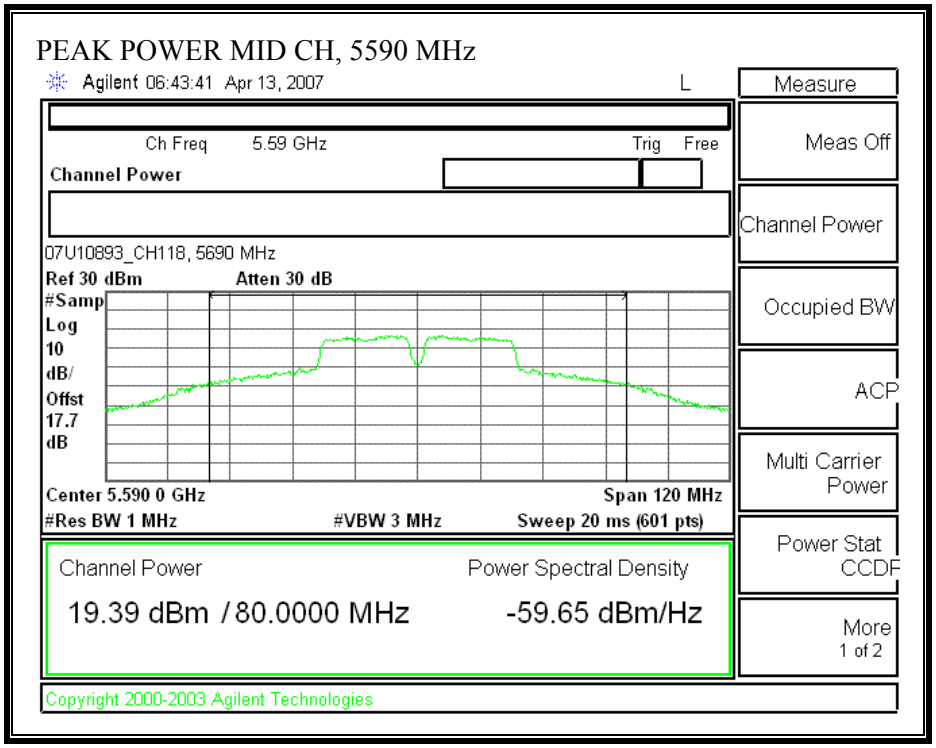
PEAK POWER (802.11 – 40MHz TX BANDWIDTH – CHAIN 0)



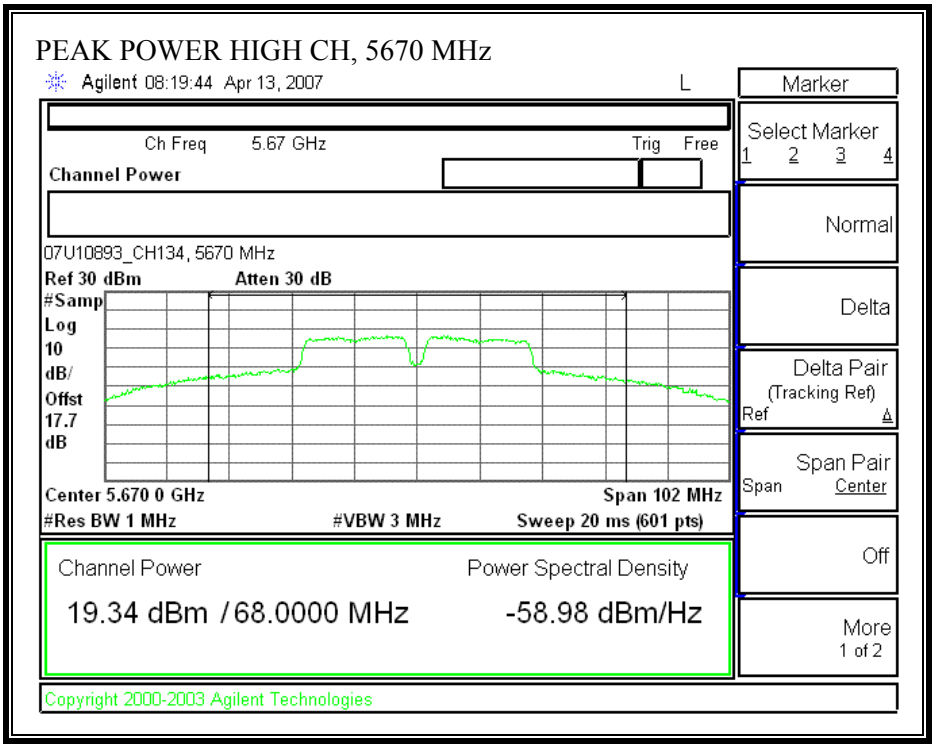
PEAK POWER HIGH CH, 5670 MHz



PEAK POWER (802.11 – 40MHz TX BANDWIDTH – CHAIN 1)



PEAK POWER HIGH CH, 5670 MHz



7.2.3. MAXIMUM PERMISSIBLE EXPOSURE

LIMITS

§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.

CALCULATIONS

Given

E = √ (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 and rearranging the terms to express the distance as a function of the remaining variables yields:

d = √ ((30 * P * G) / (3770 * S))

Changing to units of Power to mW and Distance to cm, using:

P (mW) = P (W) / 1000 and
d (cm) =100 * d (m)

yields

d = 100 * √ ((30 * (P / 1000) * G) / (3770 * S))
d = 0.282 * √ (P * G / S)

where

d = distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power Density in mW/cm^2

Substituting the logarithmic form of power and gain using:

P (mW) = 10 ^ (P (dBm) / 10) and
G (numeric) = 10 ^ (G (dBi) / 10)

yields

d = 0.282 * 10 ^ ((P + G) / 20) / √ S

where

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

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

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

LIMITS

From §1.1310 Table 1 (B), S = 1.0 mW/cm^2 in the 5.6 GHz band.

RESULTS

No non-compliance noted

802.11a CDD MODE is covered by worst case 802.11n 20 MHz CDD MODE

802.11n 20 MHz CDD MODE

8.75dBi Antenna

Mode	MPE Distance (cm)	Total Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11n 20 MHz CDD	20.0	17.65	8.75	0.09

6dBi Antenna

Mode	MPE Distance (cm)	Total Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11n 20 MHz CDD	20.0	20.24	6.00	0.08

802.11n 40 MHz CDD MODE

8.75dBi Antenna

Mode	MPE Distance (cm)	Total Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11n 40 MHz CDD	20.0	19.75	8.75	0.14

6dBi Antenna

Mode	MPE Distance (cm)	Total Power (dBm)	Antenna Gain (dBi)	Power Density (mW/cm^2)
802.11n 40 MHz CDD	20.0	22.40	6.00	0.14

NOTE: For mobile or fixed location transmitters, the minimum separation distance is 20 cm, even if calculations indicate that the MPE distance would be less.

7.2.4. PEAK POWER SPECTRAL DENSITY

LIMIT

§15.407 (a) (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 > 6dBi, therefore there is a reduction due to antenna gain.

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. PPSD method #2 was used.

For combiner: Following formula to calculate the array gain:

Array gain = 10*log (10^ (main gain/10) + 10^ (aux gain/10))

5.470 – 5.725GHz band: 8.75dBi, limit = 8.25 dBm

802.11a CDD is covered by worst case 802.11n 20 MHz CDD MCS 0 MODE

802.11n 20 MHz CDD MCS 0 MODE

8.75dBi Antenna

Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
Low	5500	4.30	4.71	7.52	8.25	-0.73
Middle	5600	4.16	4.07	7.13	8.25	-1.12
High	5700	3.26	3.39	6.34	8.25	-1.91

6dBi Antenna

Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
Low	5500	6.69	6.98	9.85	11.00	-1.15
Middle	5600	6.88	6.69	9.80	11.00	-1.20
High	5700	6.43	6.53	9.49	11.00	-1.51

802.11n 40 MHz CDD MCS 32 MODE

8.75dBi Antenna

Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
Low	5510	2.99	2.99	6.00	8.25	-2.25
Middle	5590	3.87	3.91	6.90	8.25	-1.35
High	5670	4.07	3.67	6.89	8.25	-1.36

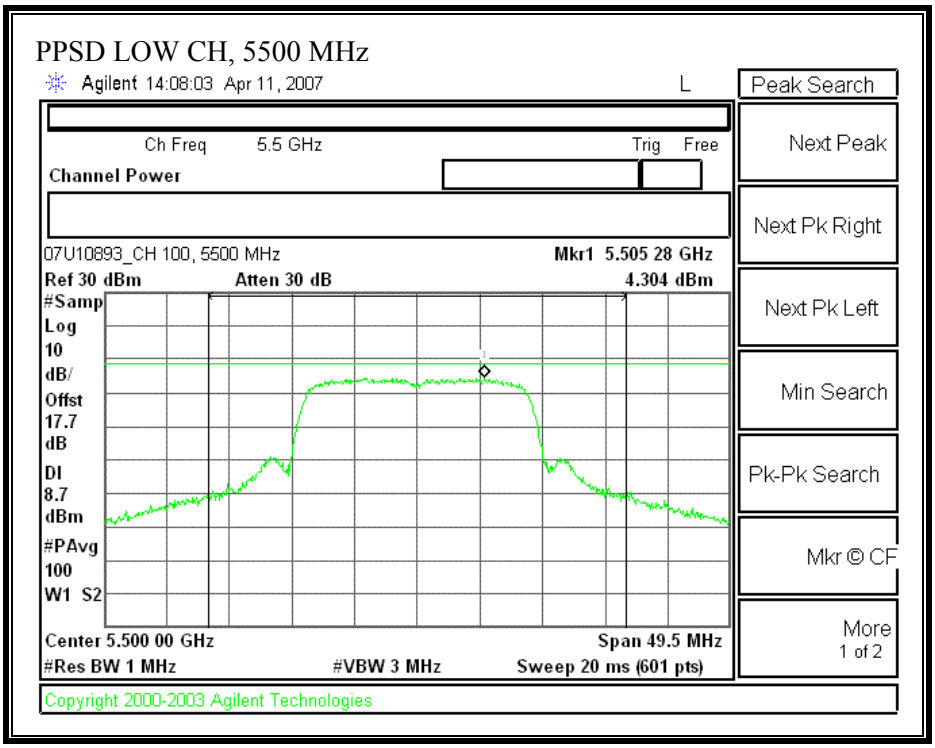
6dBi Antenna

Channel	Frequency (MHz)	PPSD Chain 0 (dBm)	PPSD Chain 1 (dBm)	PPSD Total (dBm)	Limit (dBm)	Margin (dB)
Middle	5590	6.28	6.48	9.39	11.00	-1.61
High	5670	6.22	6.15	9.19	11.00	-1.81

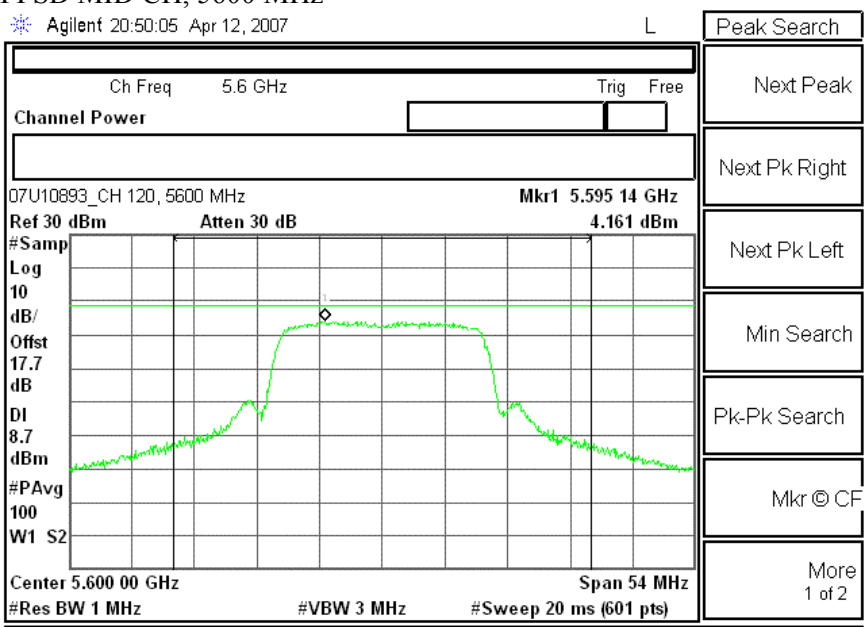
802.11n 20 MHz CDD MCS 0 MODE

8.75dBi Antenna

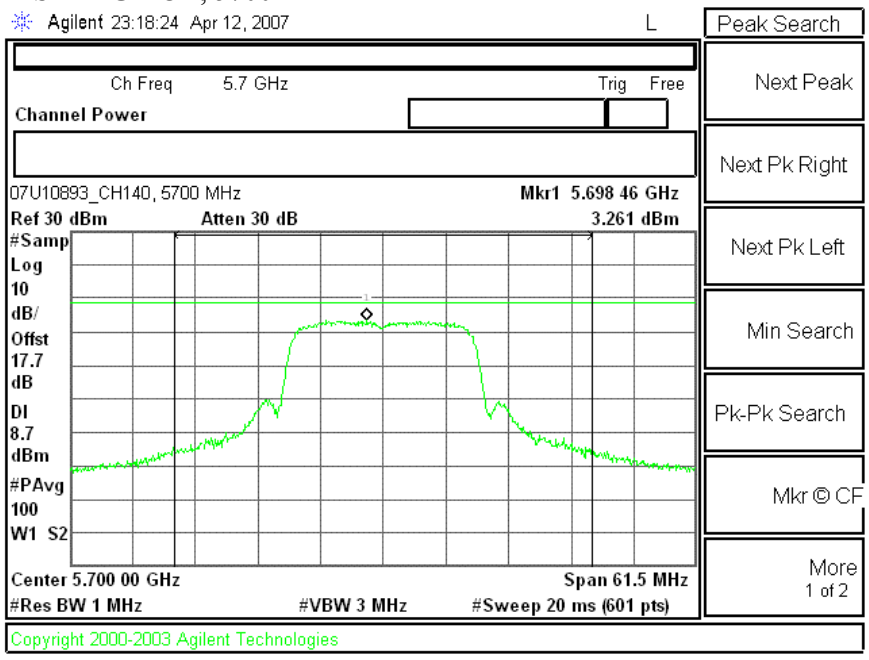
PEAK POWER SPECTRAL DENSITY (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)



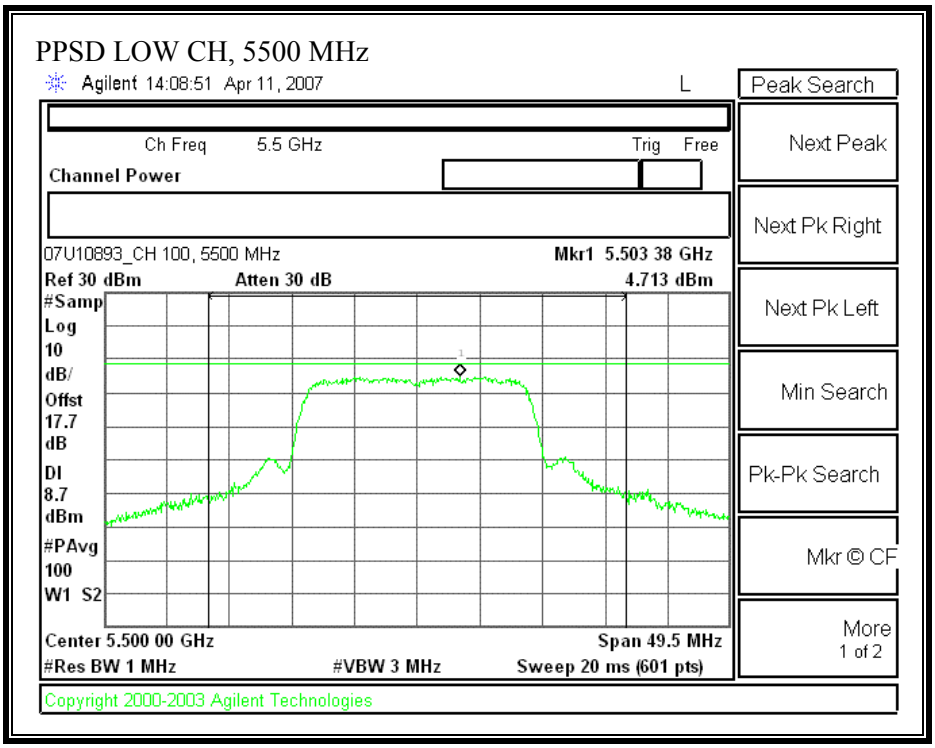
PPSD MID CH, 5600 MHz



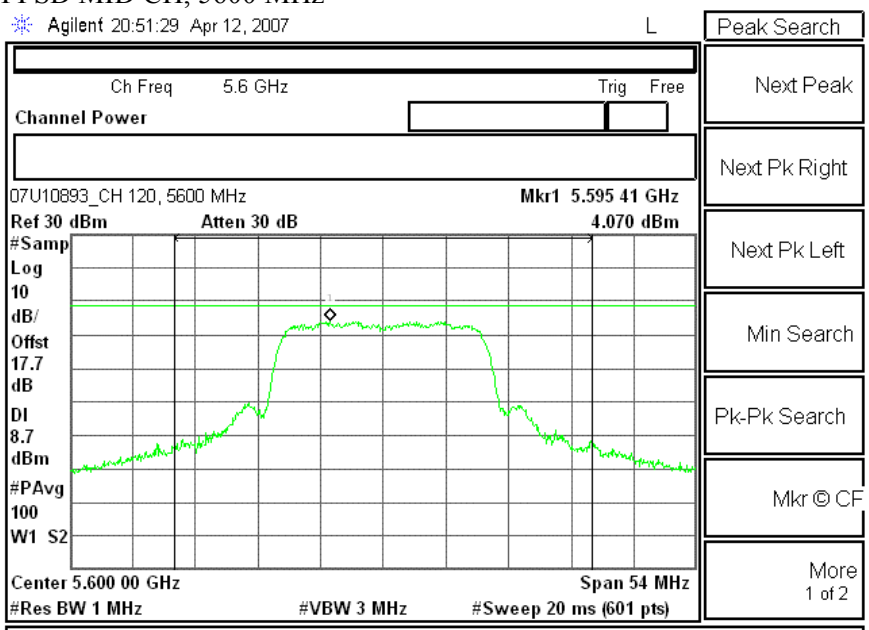
PPSD HIGH CH, 5700 MHz



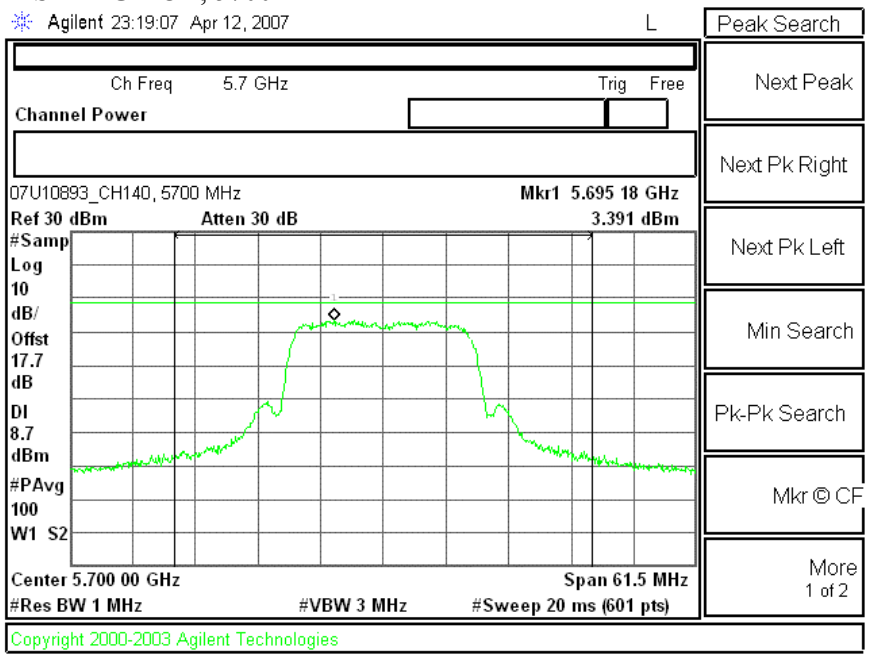
PEAK POWER SPECTRAL DENSITY (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)



PPSD MID CH, 5600 MHz

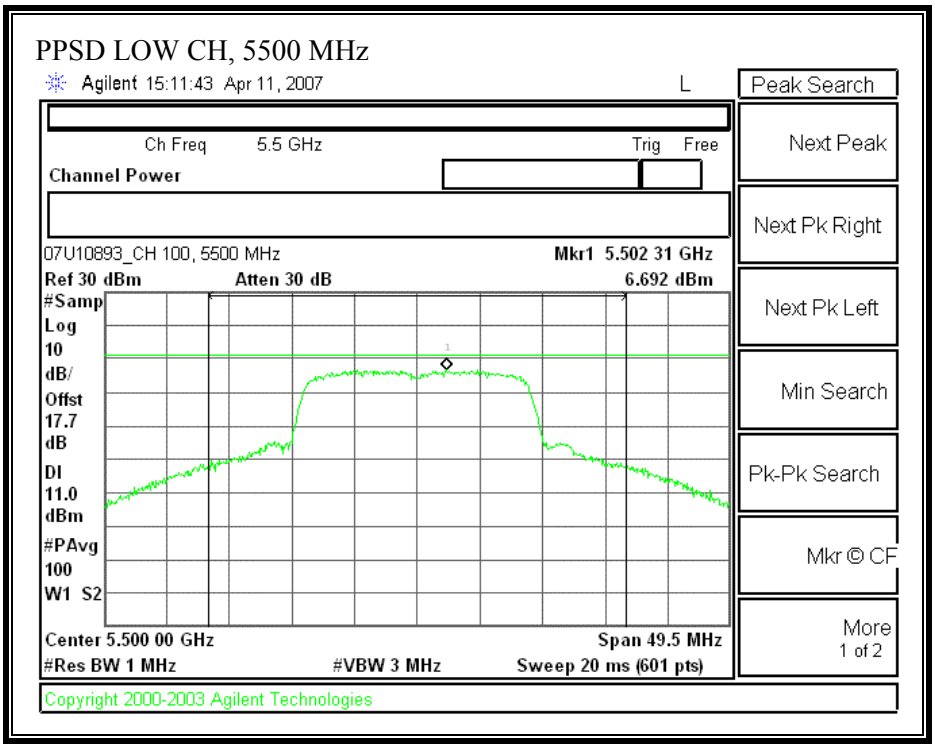


PPSD HIGH CH, 5700 MHz

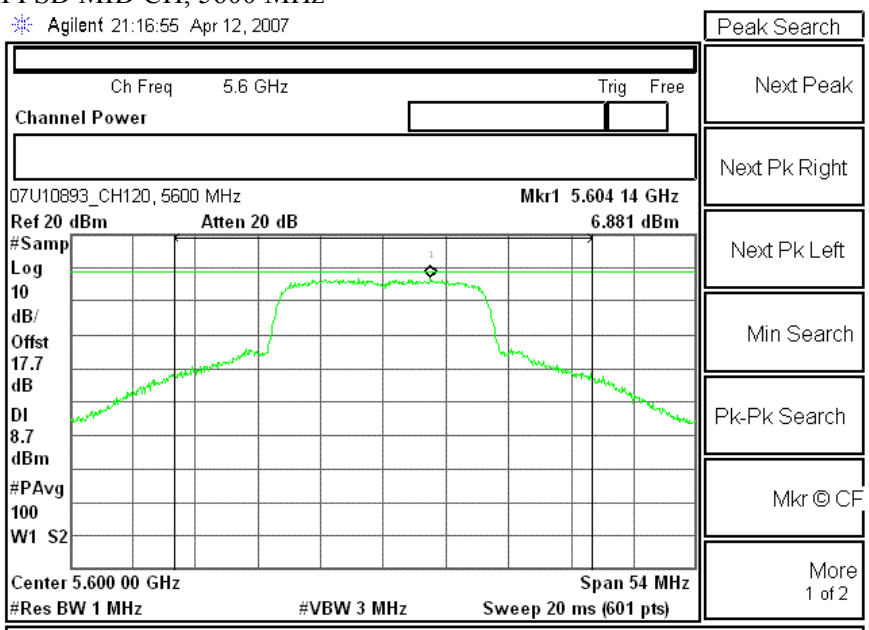


6dBi Antenna

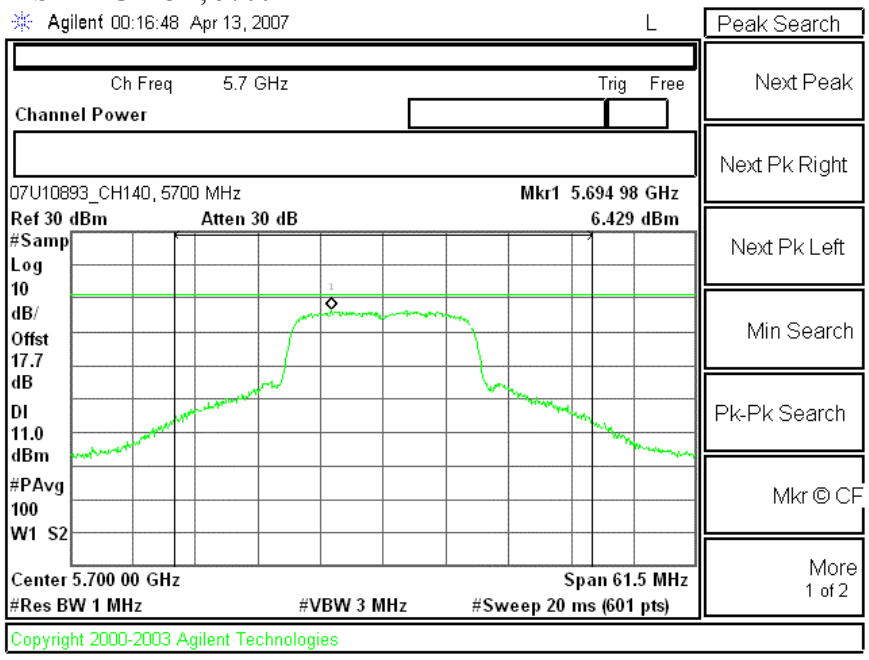
PEAK POWER SPECTRAL DENSITY (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)



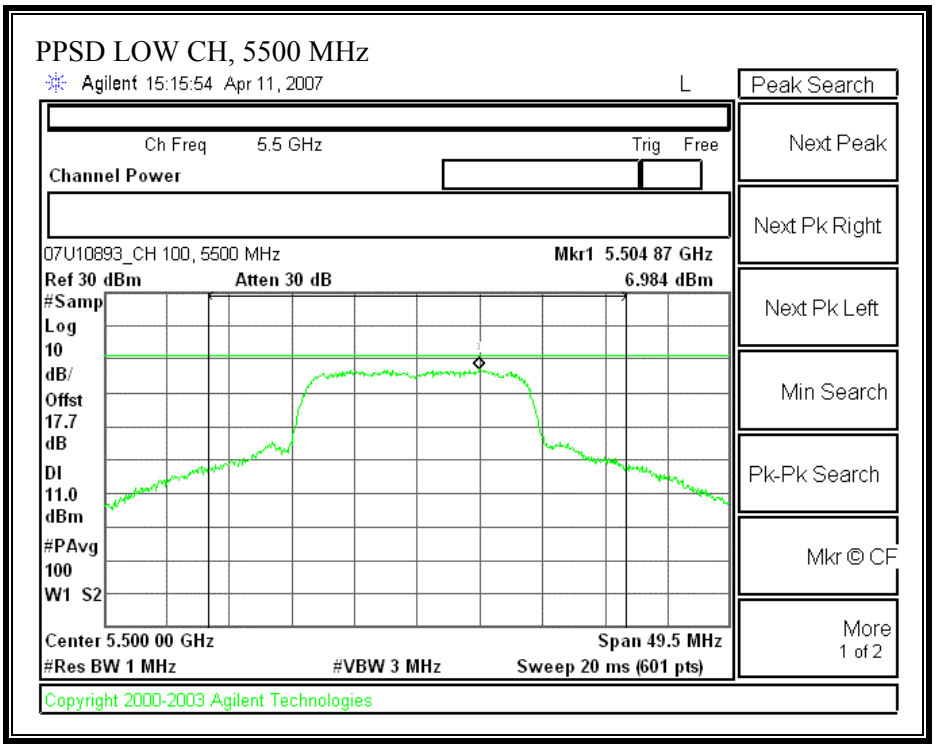
PPSD MID CH, 5600 MHz



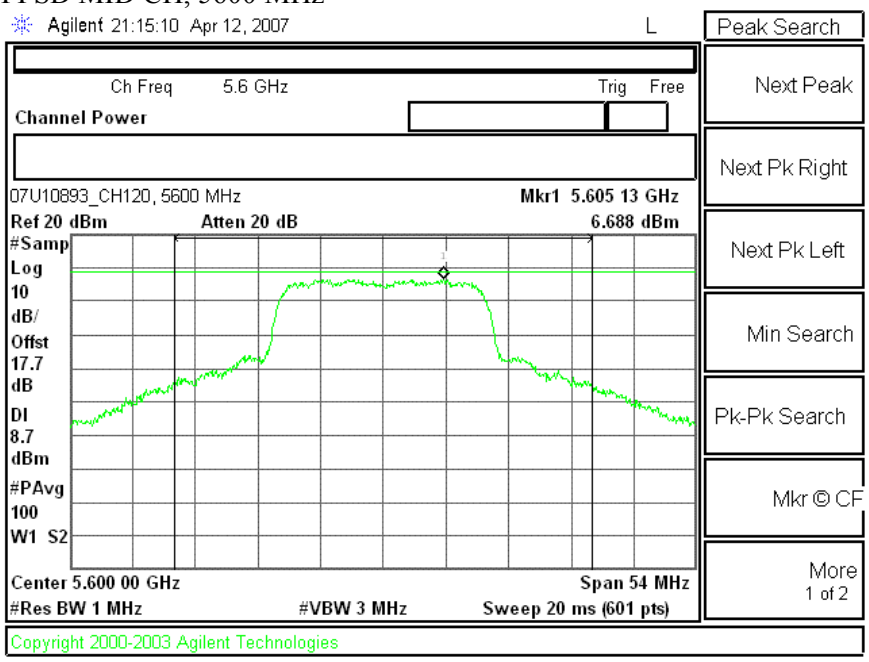
PPSD HIGH CH, 5700 MHz



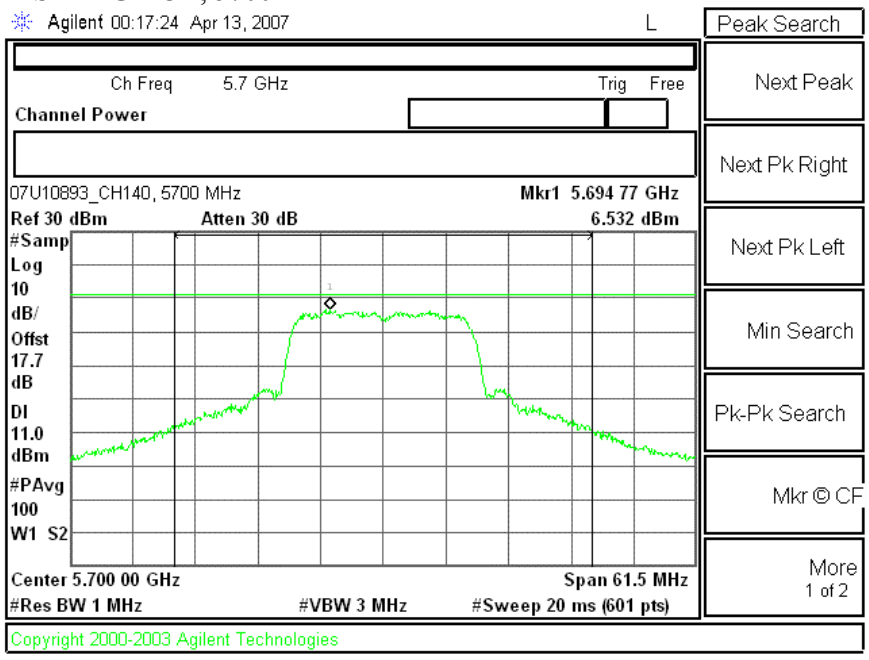
PEAK POWER SPECTRAL DENSITY (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)



PPSD MID CH, 5600 MHz



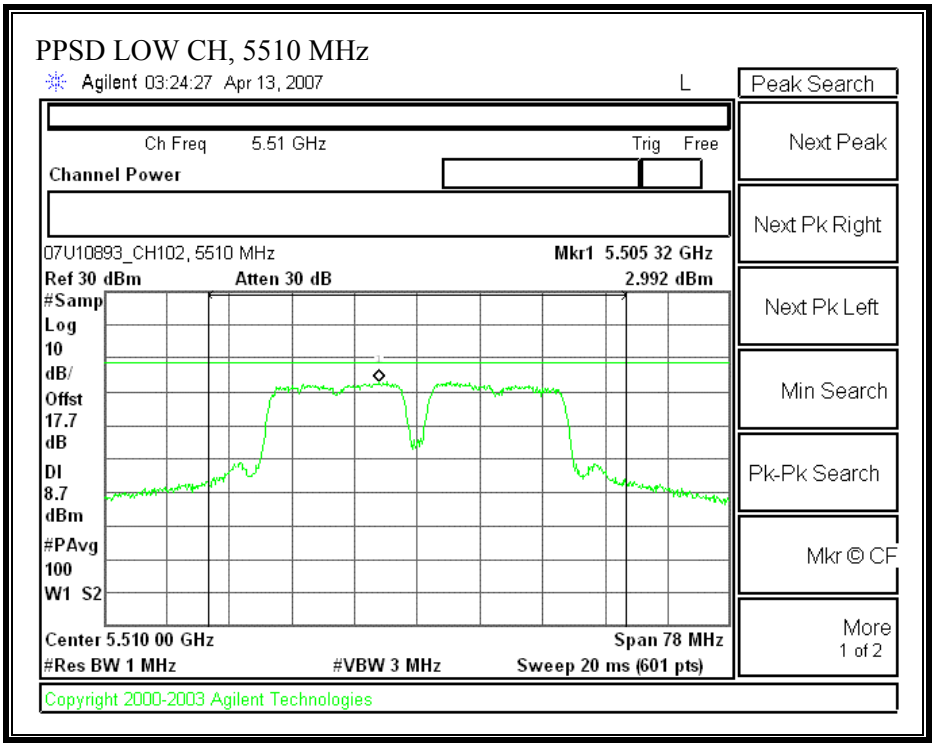
PPSD HIGH CH, 5700 MHz



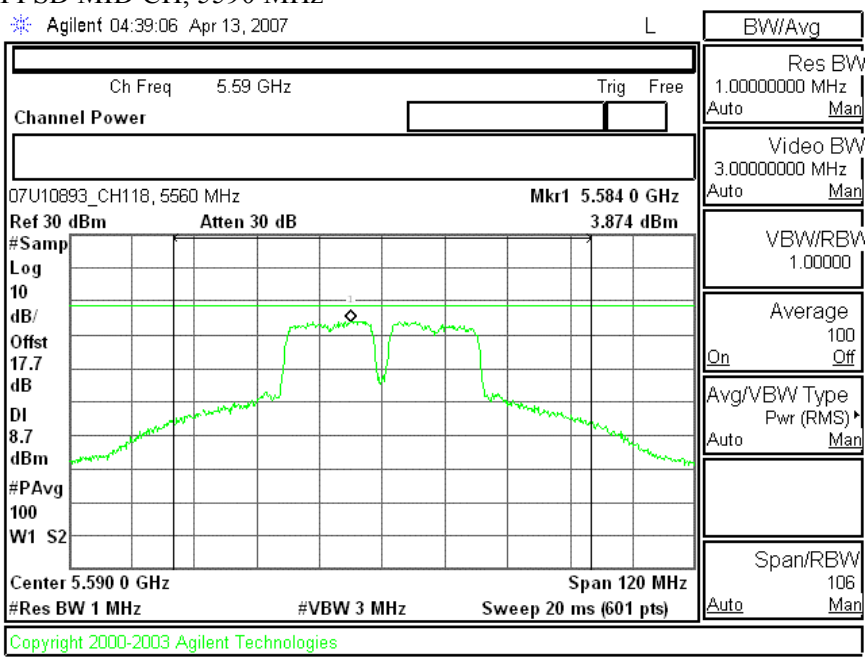
802.11n 40 MHz CDD MCS 32 MODE

8.75dBi Antenna

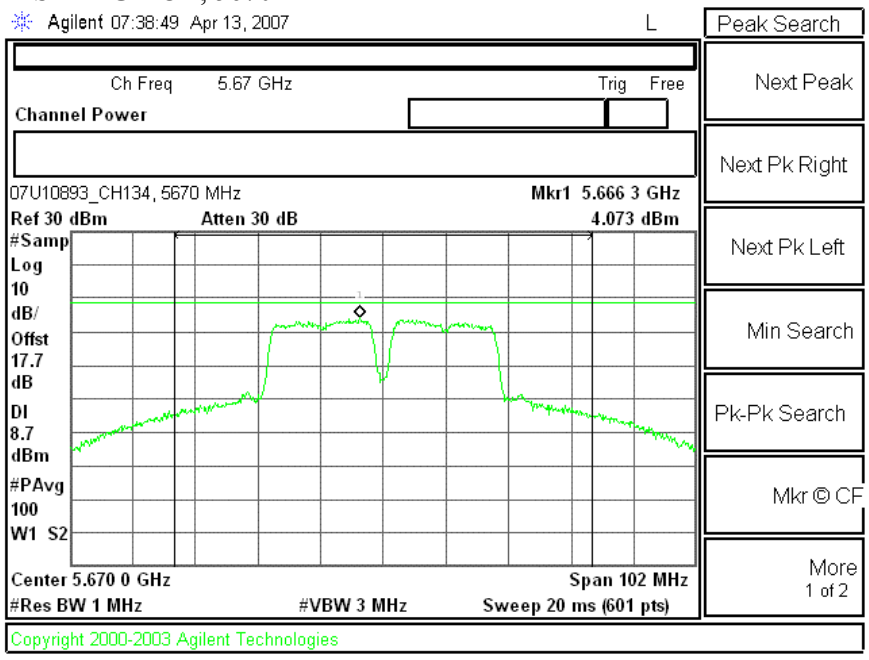
PEAK POWER SPECTRAL DENSITY (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)



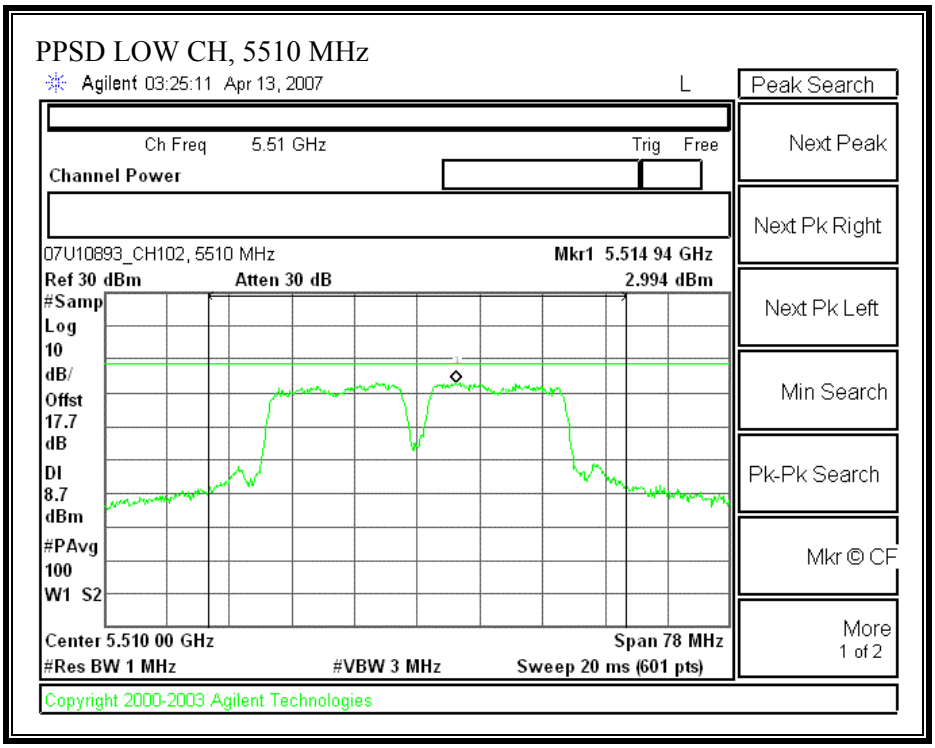
PPSD MID CH, 5590 MHz



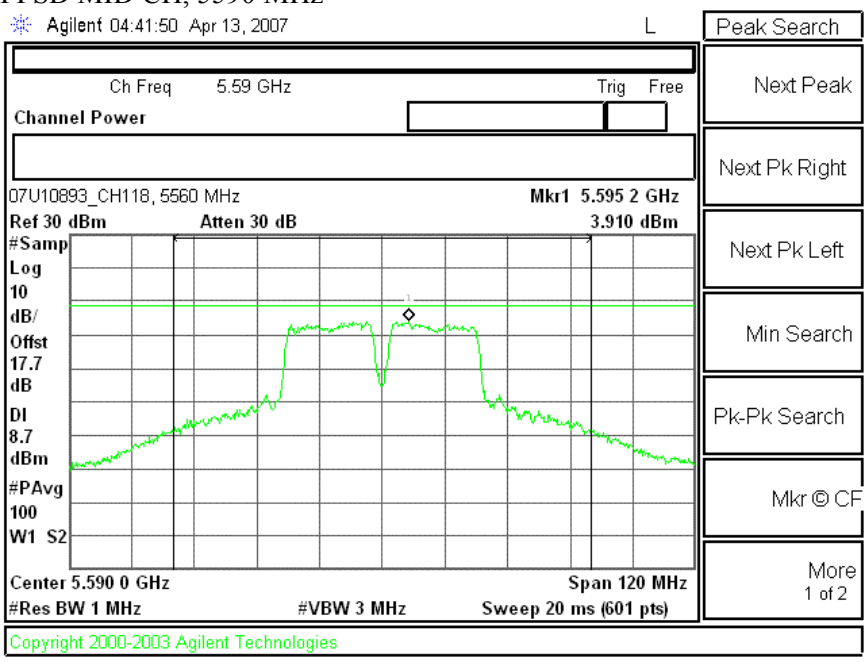
PPSD HIGH CH, 5670 MHz



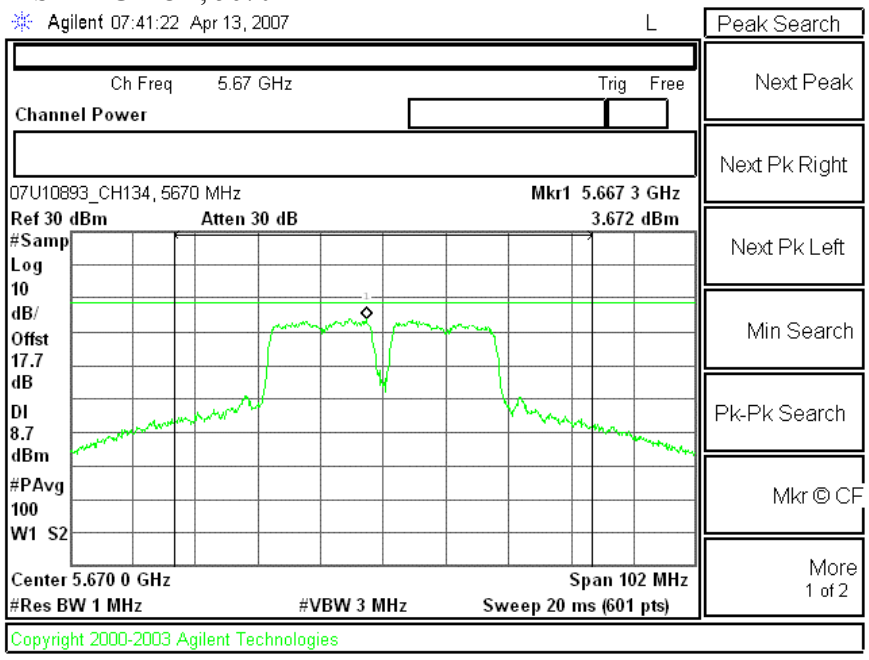
PEAK POWER SPECTRAL DENSITY (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)



PPSD MID CH, 5590 MHz

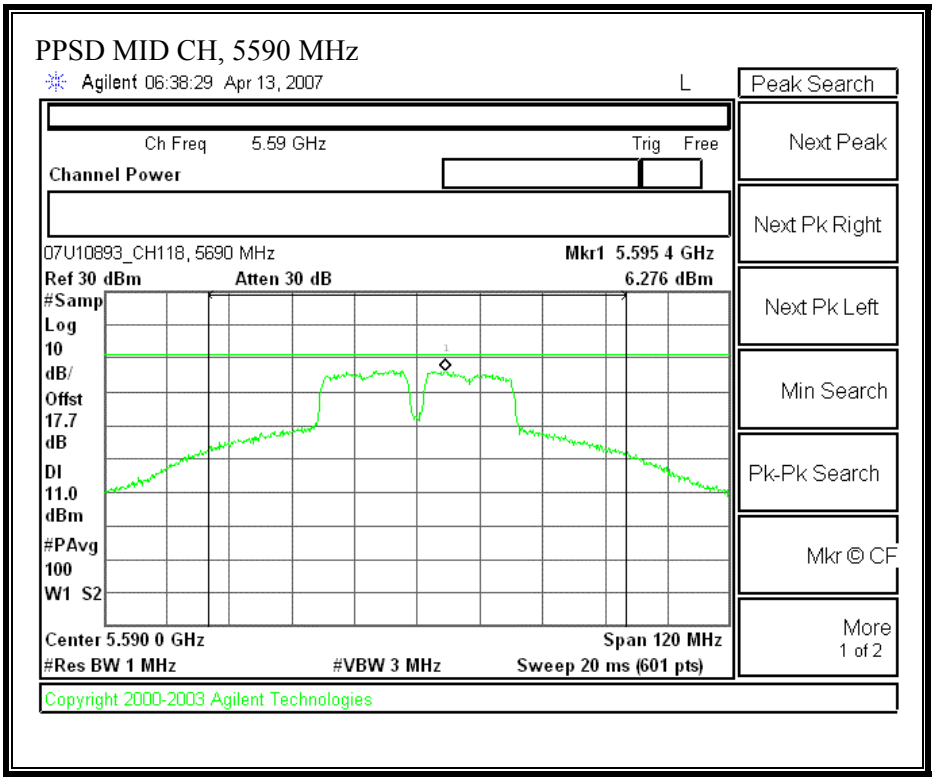


PPSD HIGH CH, 5670 MHz

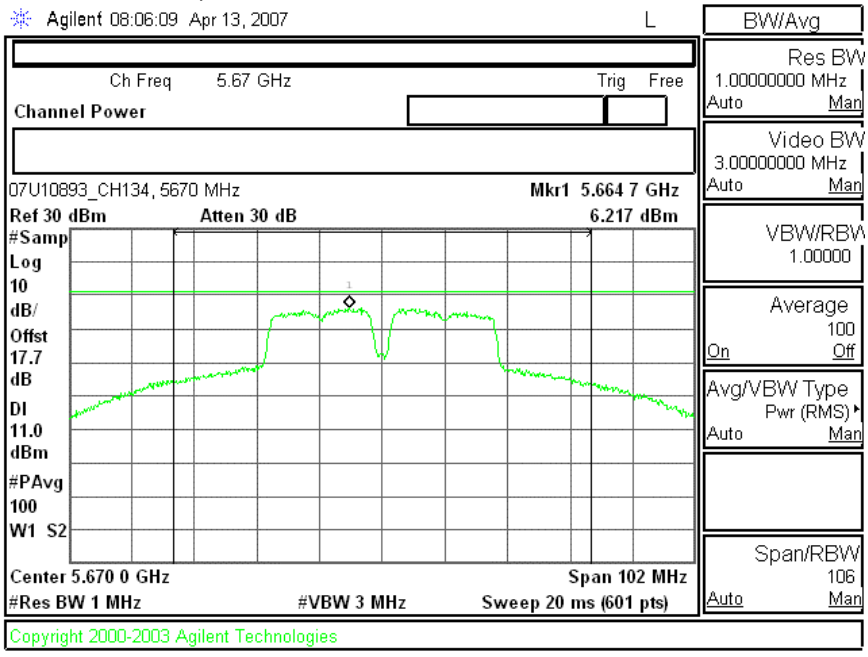


6dBi Antenna

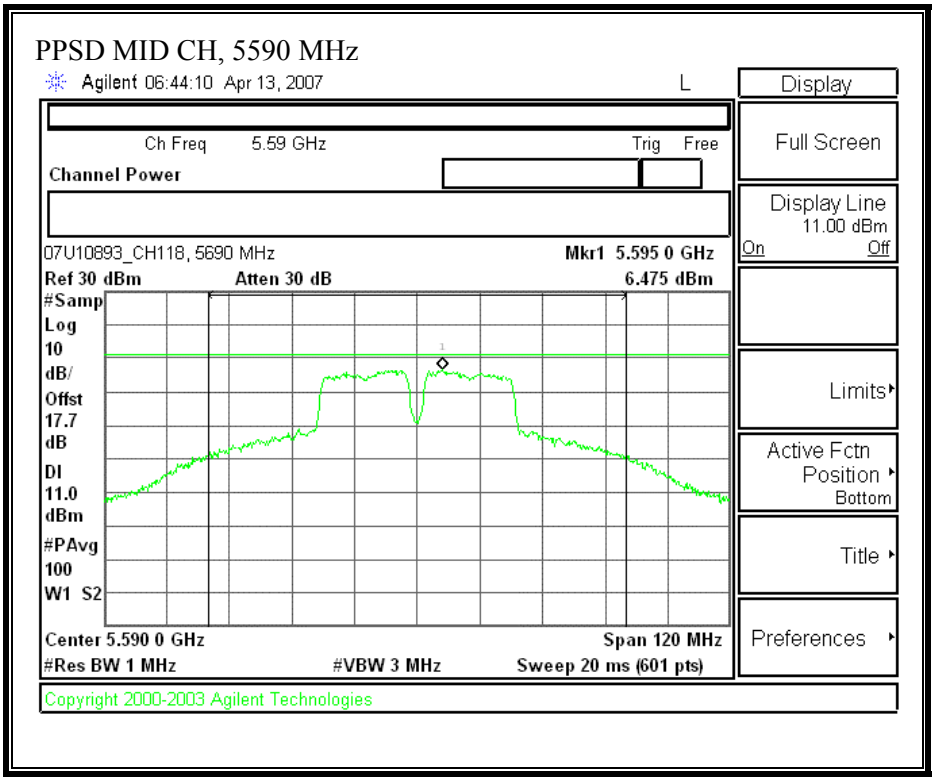
PEAK POWER SPECTRAL DENSITY (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)



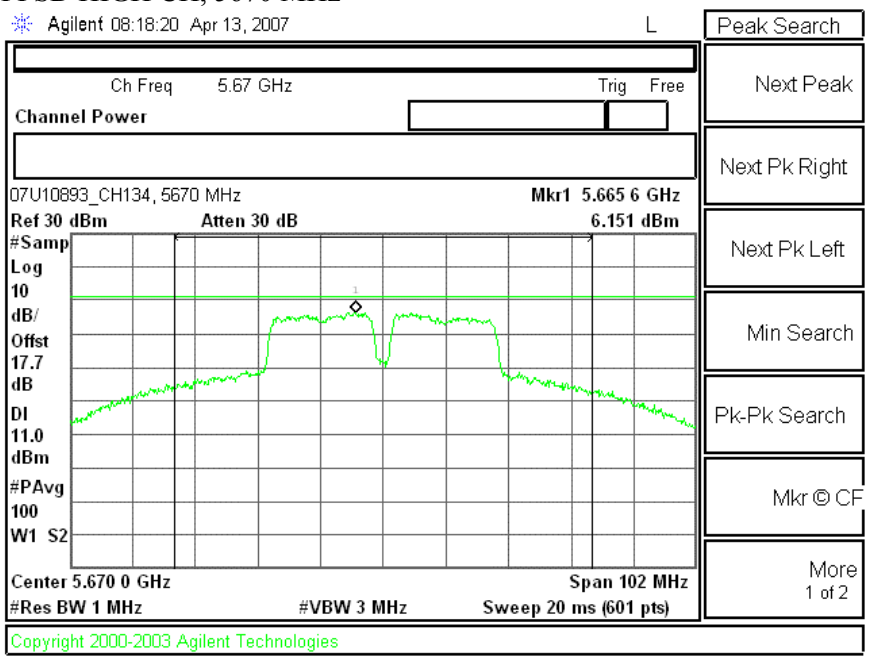
PPSD HIGH CH, 5670 MHz



PEAK POWER SPECTRAL DENSITY (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)



PPSD HIGH CH, 5670 MHz



7.2.5. PEAK EXCURSION

LIMIT

§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.

RESULTS

No non-compliance noted:

802.11a CDD is covered by worst case 802.11n 20 MHz CDD MCS 0 MODE

802.11n 20 MHz CDD MCS 0

20 MHz TX BANDWIDTH - CHAIN 0

Channel	Frequency (MHz)	Peak Excursion Chain 0 (dB)	Limit (dB)	Margin (dB)
Low	5180	8.21	13	-4.79
Middle	5260	8.79	13	-4.21
High	5320	9.51	13	-3.49

20 MHz TX BANDWIDTH - CHAIN 1

Channel	Frequency (MHz)	Peak Excursion Chain 1 (dB)	Limit (dB)	Margin (dB)
Low	5180	9.59	13	-3.41
Middle	5260	8.99	13	-4.01
High	5320	9.22	13	-3.78

802.11n 40 MHz CDD MCS 32

40 MHz TX BANDWIDTH - CHAIN 0

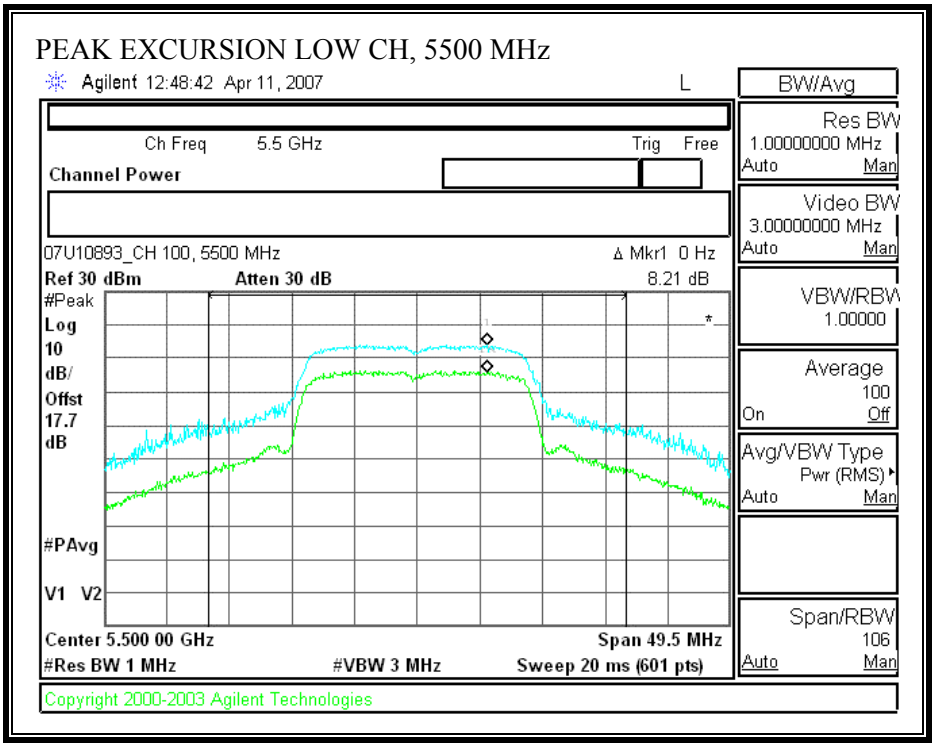
Channel	Frequency (MHz)	Peak Excursion Chain 0 (dB)	Limit (dB)	Margin (dB)
Low	5510	9.99	13	-3.01
Middle	5590	9.51	13	-3.49
High	5670	9.86	13	-3.14

40 MHz TX BANDWIDTH - CHAIN 1

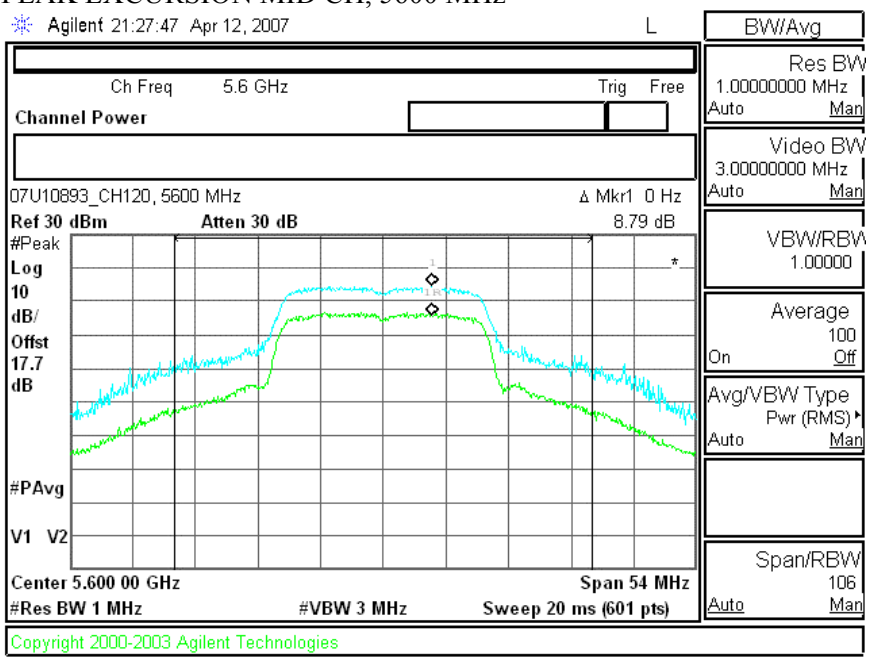
Channel	Frequency (MHz)	Peak Excursion Chain 1 (dB)	Limit (dB)	Margin (dB)
Low	5510	9.11	13	-3.89
Middle	5590	9.77	13	-3.23
High	5670	9.41	13	-3.59

802.11n 20 MHz CDD MCS 0

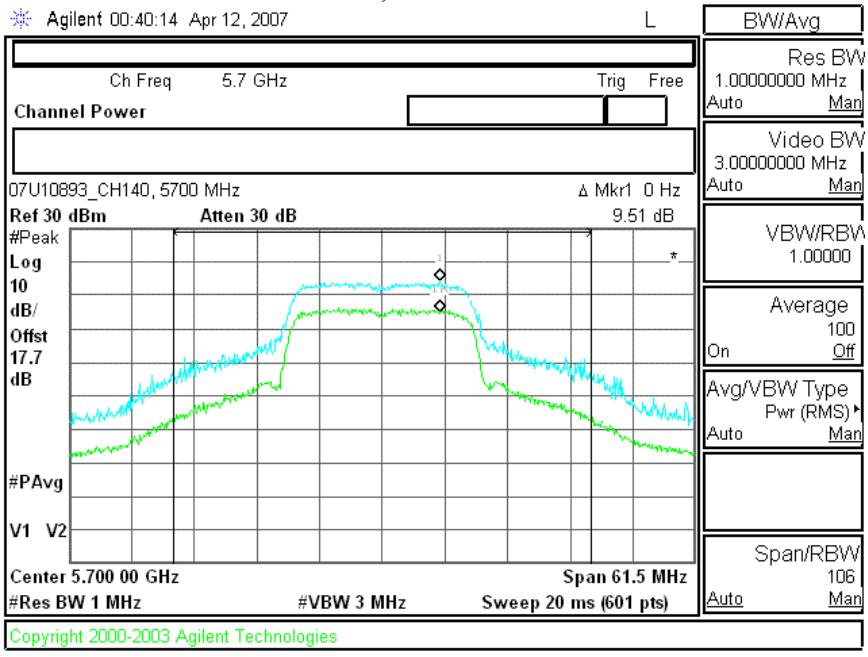
PEAK EXCURSION (802.11 - 20 MHz TX BANDWIDTH – CHAIN 0)



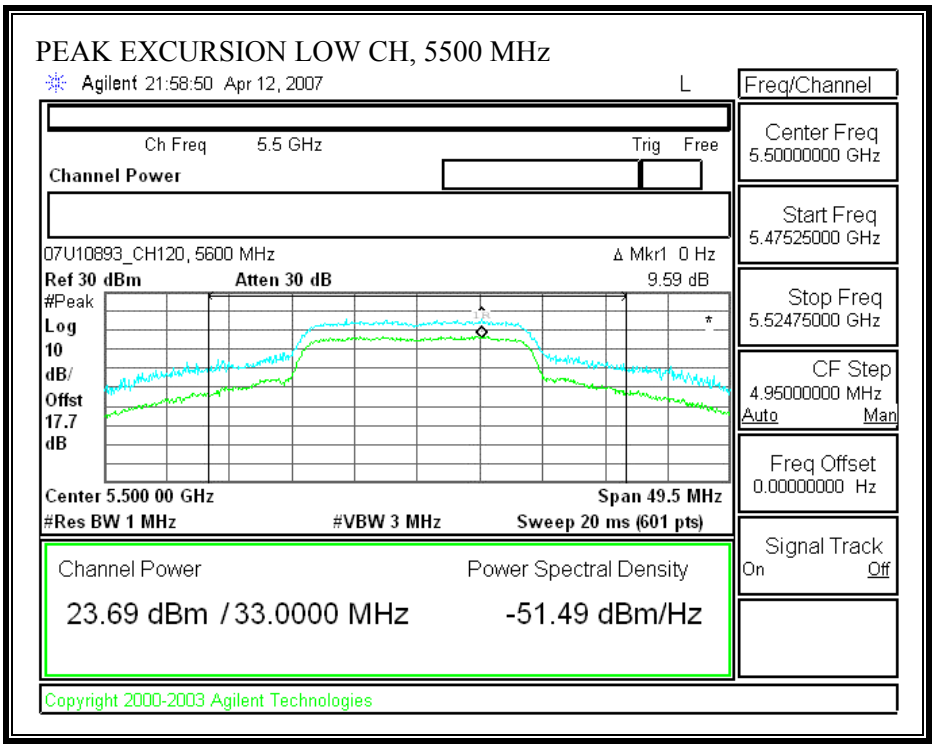
PEAK EXCURSION MID CH, 5600 MHz



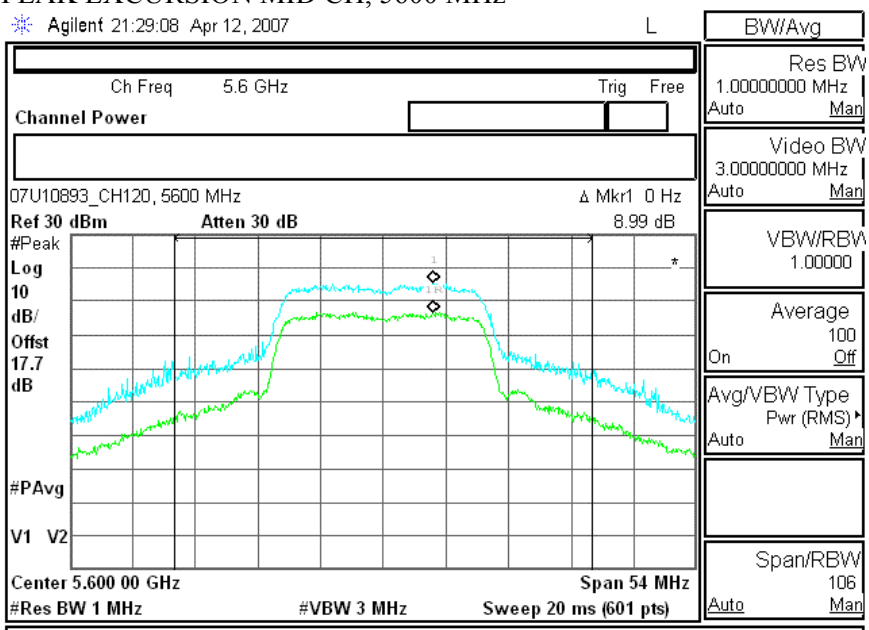
PEAK EXCURSION HIGH CH, 5700 MHz



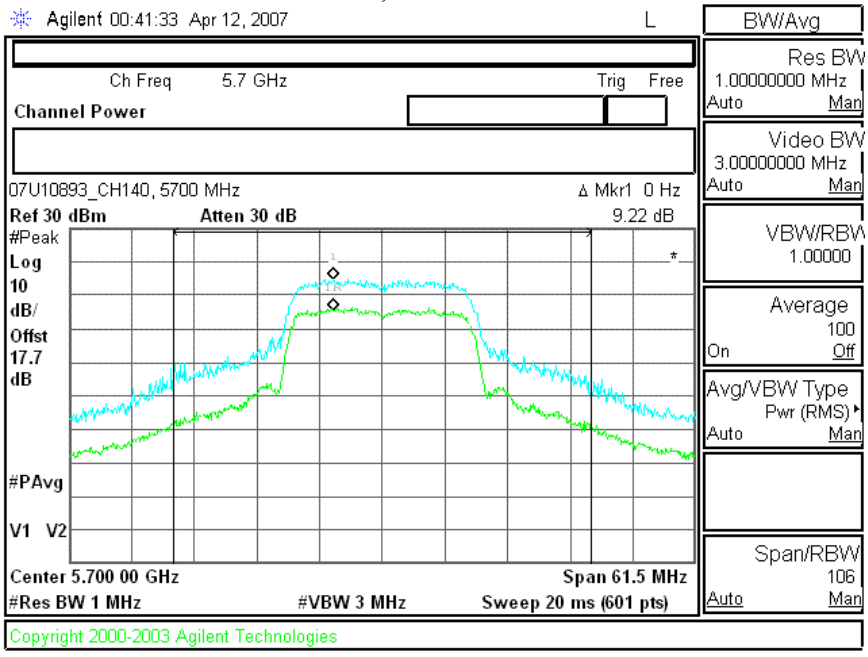
PEAK EXCURSION (802.11 - 20 MHz TX BANDWIDTH – CHAIN 1)



PEAK EXCURSION MID CH, 5600 MHz

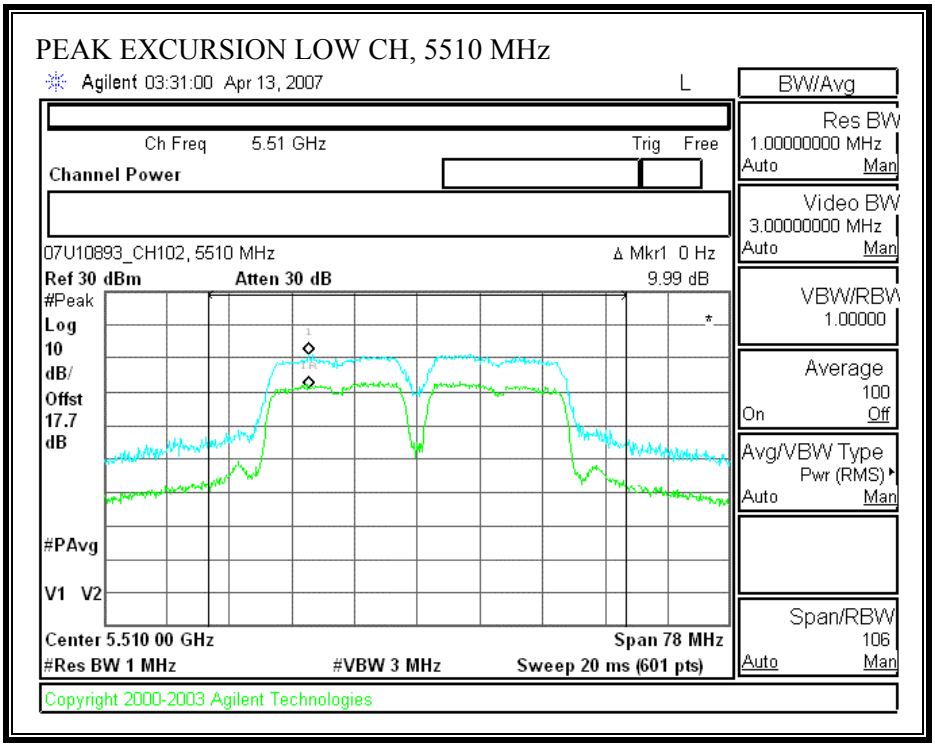


PEAK EXCURSION HIGH CH, 5700 MHz

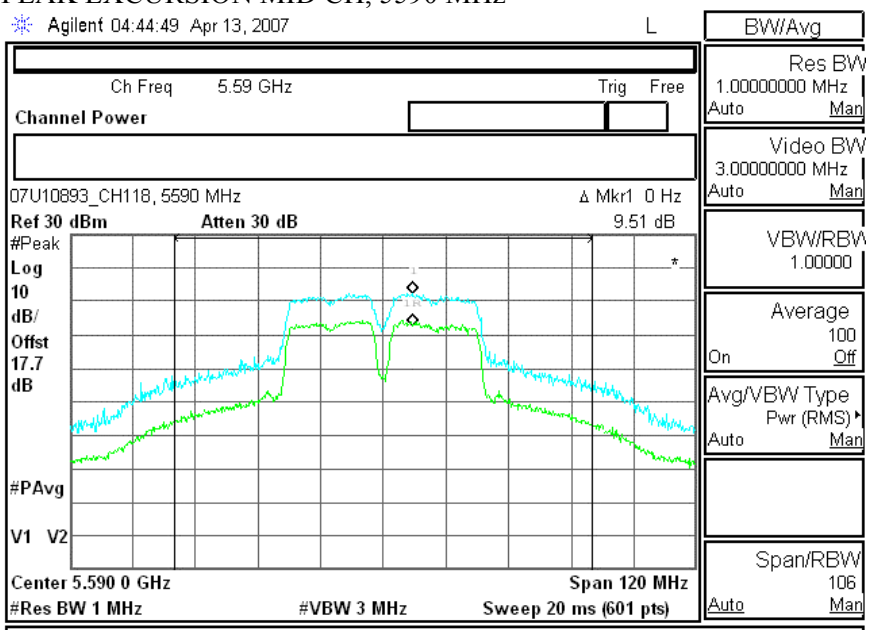


802.11n 40 MHz CDD MCS 32

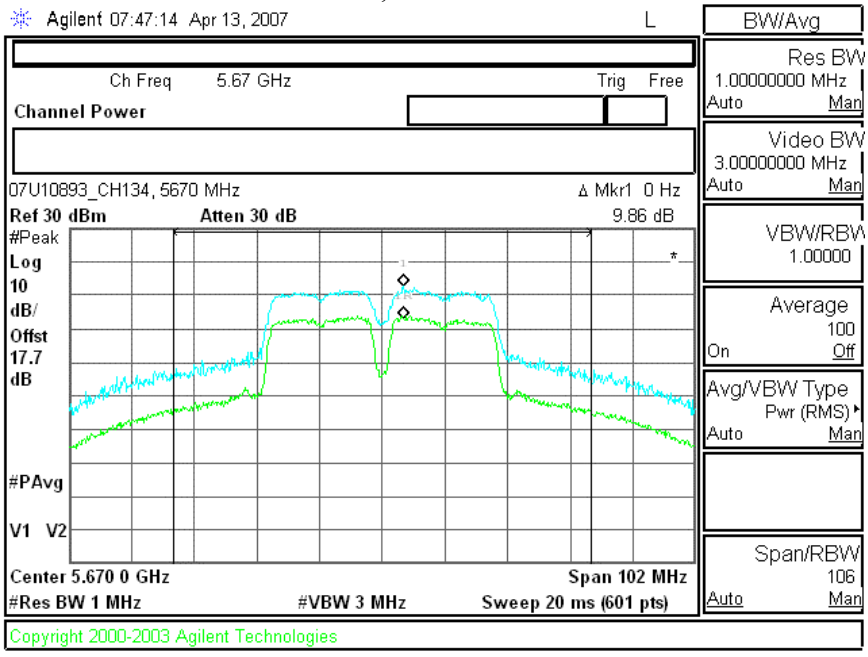
PEAK EXCURSION (802.11 - 40 MHz TX BANDWIDTH – CHAIN 0)



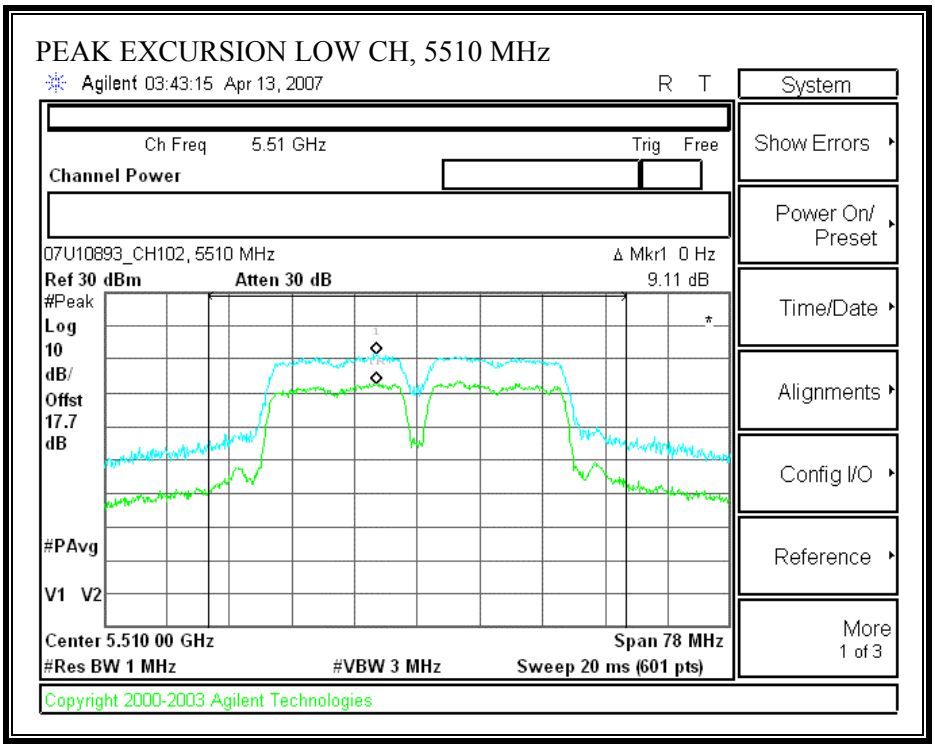
PEAK EXCURSION MID CH, 5590 MHz



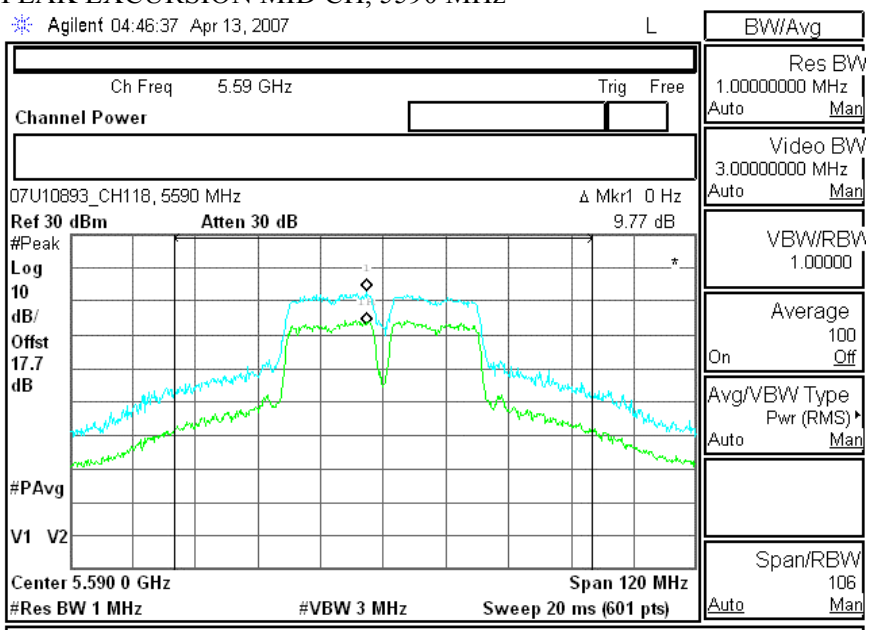
PEAK EXCURSION HIGH CH, 5670 MHz



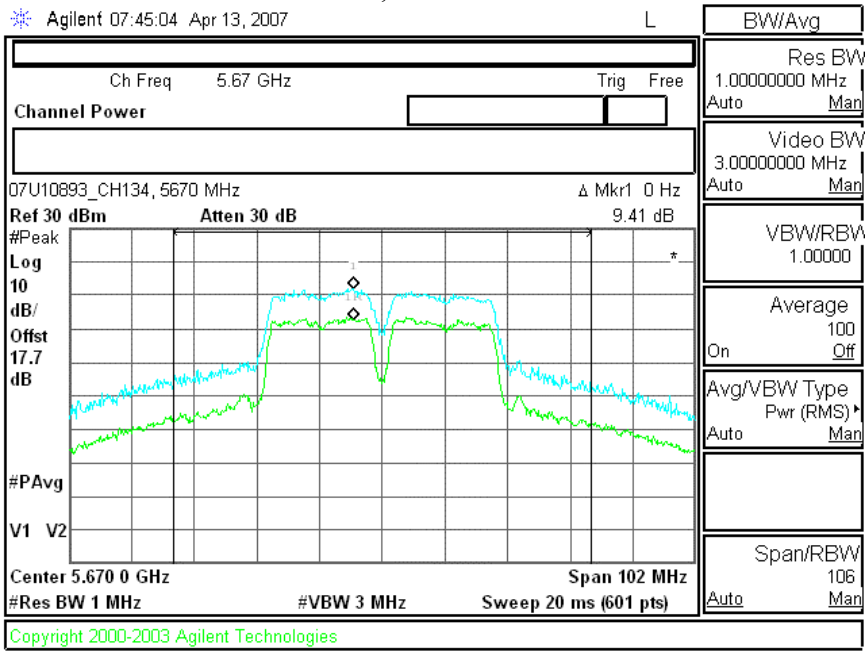
PEAK EXCURSION (802.11 - 40 MHz TX BANDWIDTH – CHAIN 1)



PEAK EXCURSION MID CH, 5590 MHz



PEAK EXCURSION HIGH CH, 5670 MHz



7.2.6. CONDUCTED SPURIOUS EMISSIONS

LIMITS

§15.407 (b) (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.

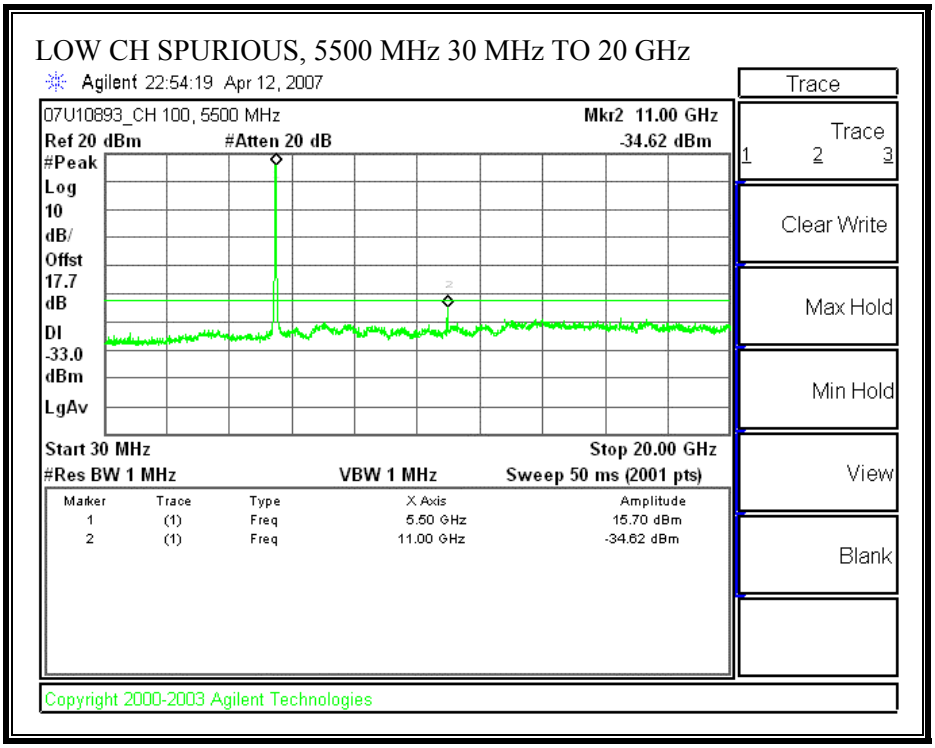
RESULTS

No non-compliance noted:

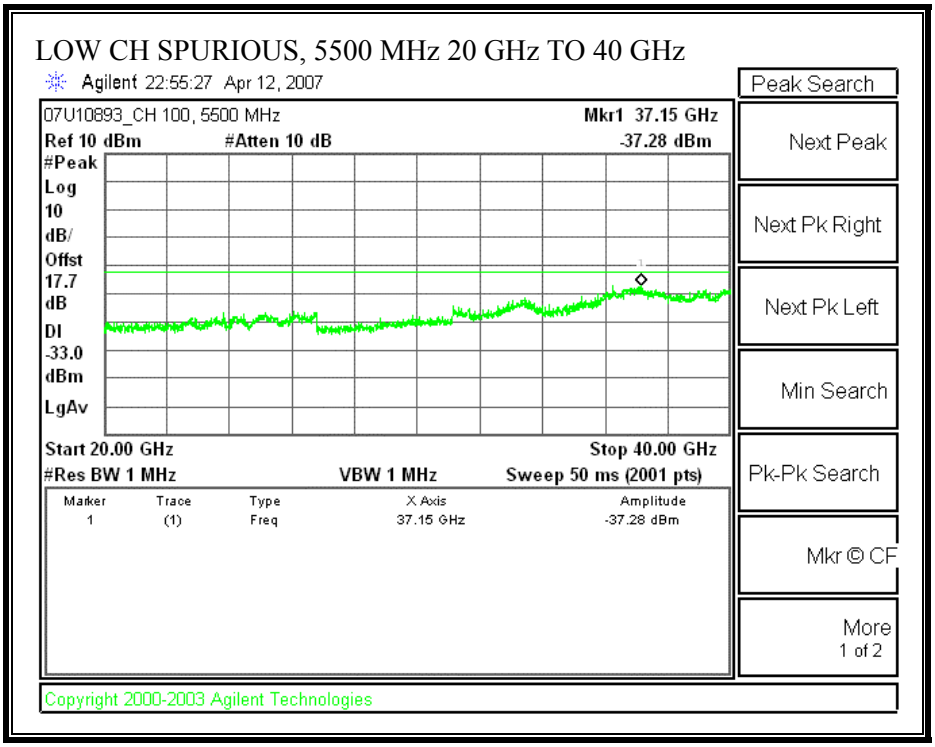
802.11a CDD is covered by worst case 802.11n 20 MHz CDD MCS 0

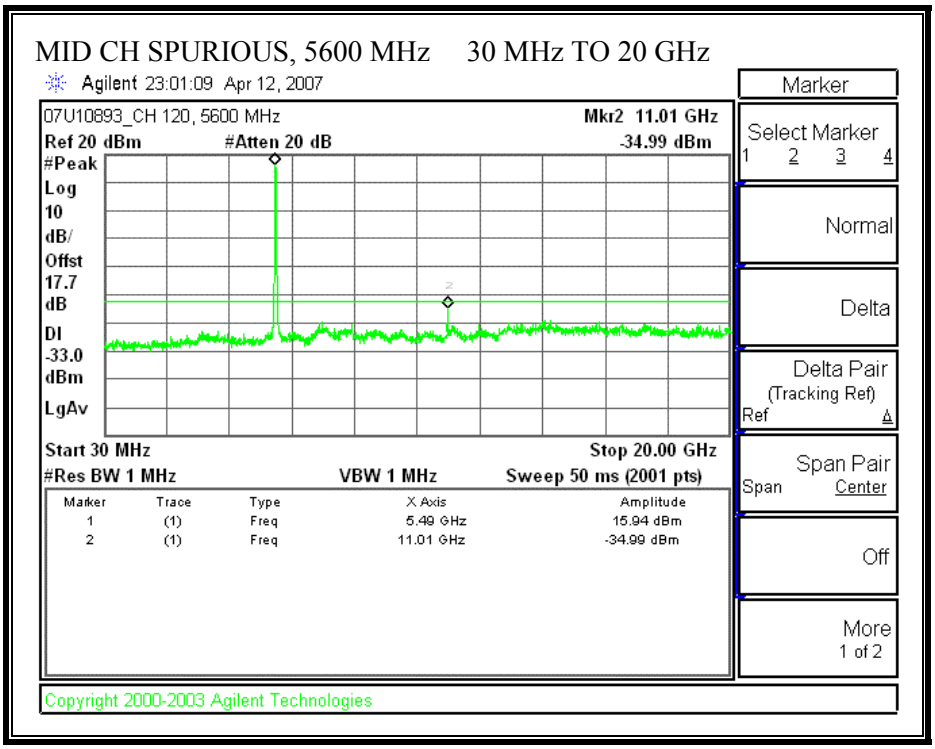
802.11n 20 MHz CDD MCS 0

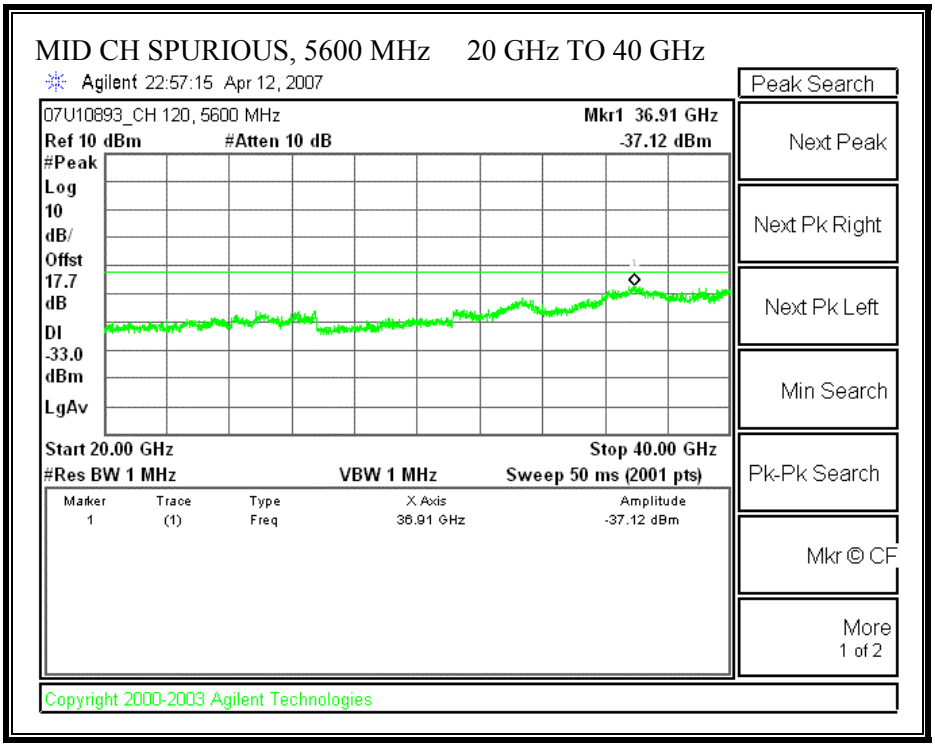
SPURIOUS EMISSIONS - 802.11a -20 MHz TX BANDWIDTH – CHAIN 0

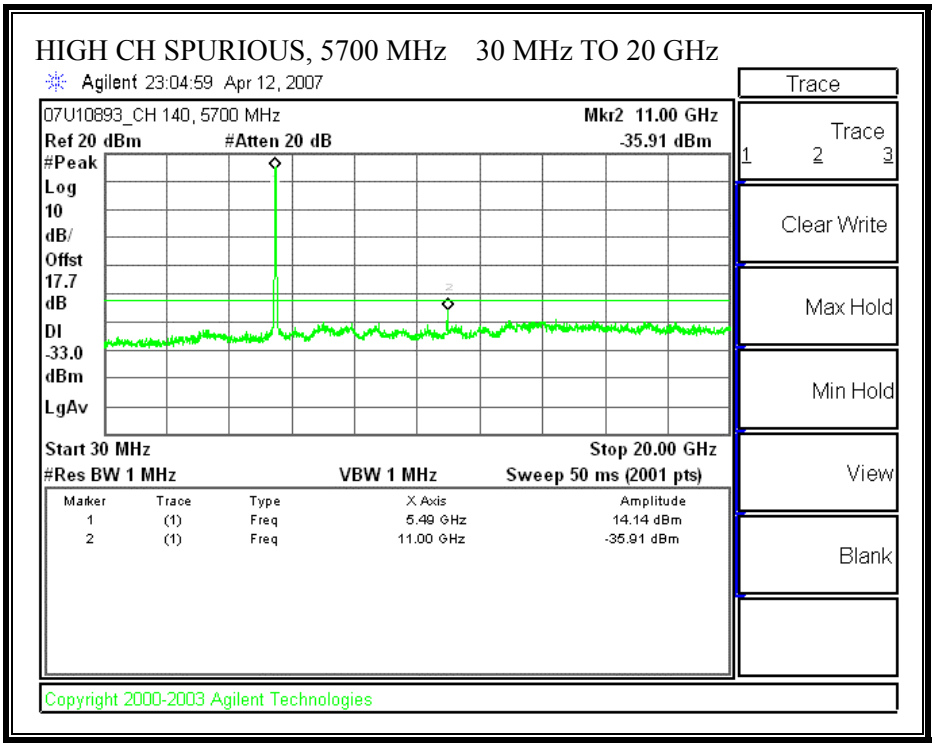


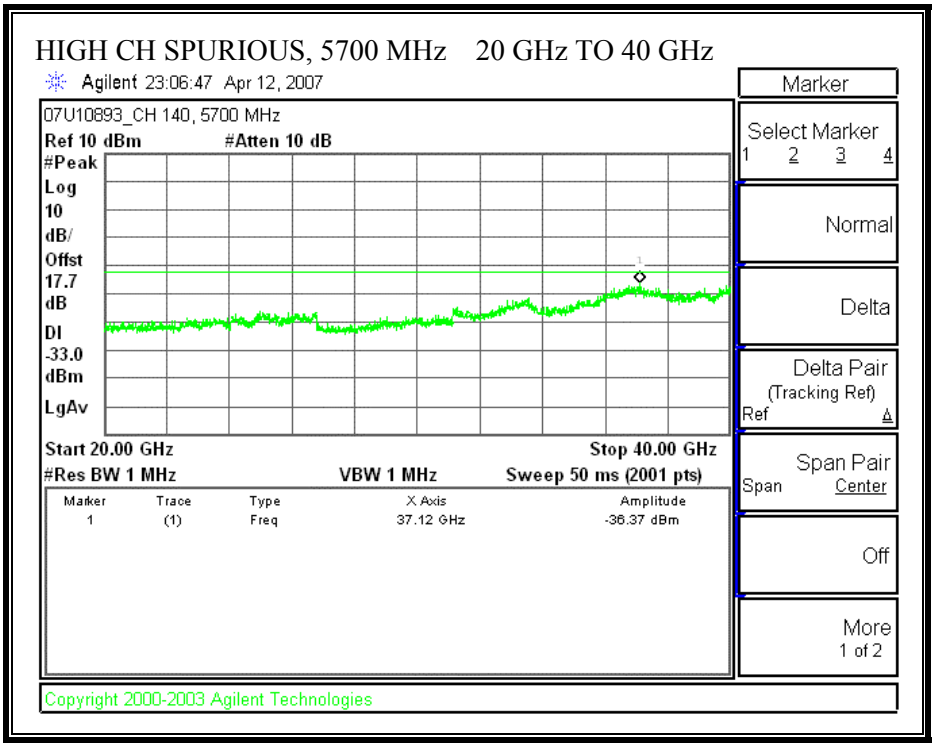
LOW CH SPURIOUS, 5500 MHz 20 GHz TO 40 GHz



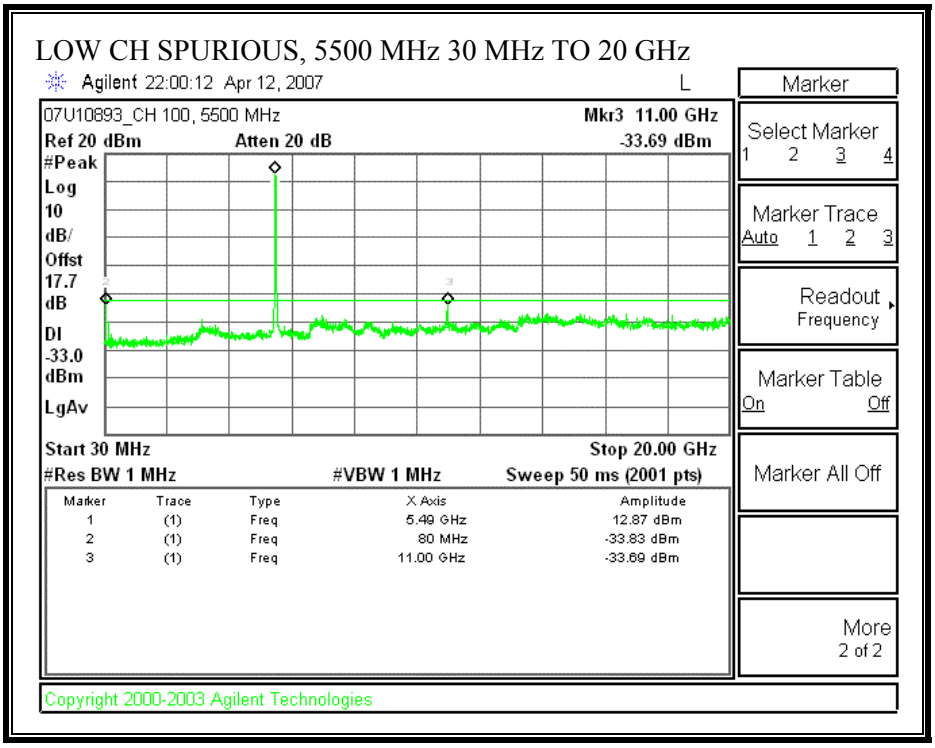


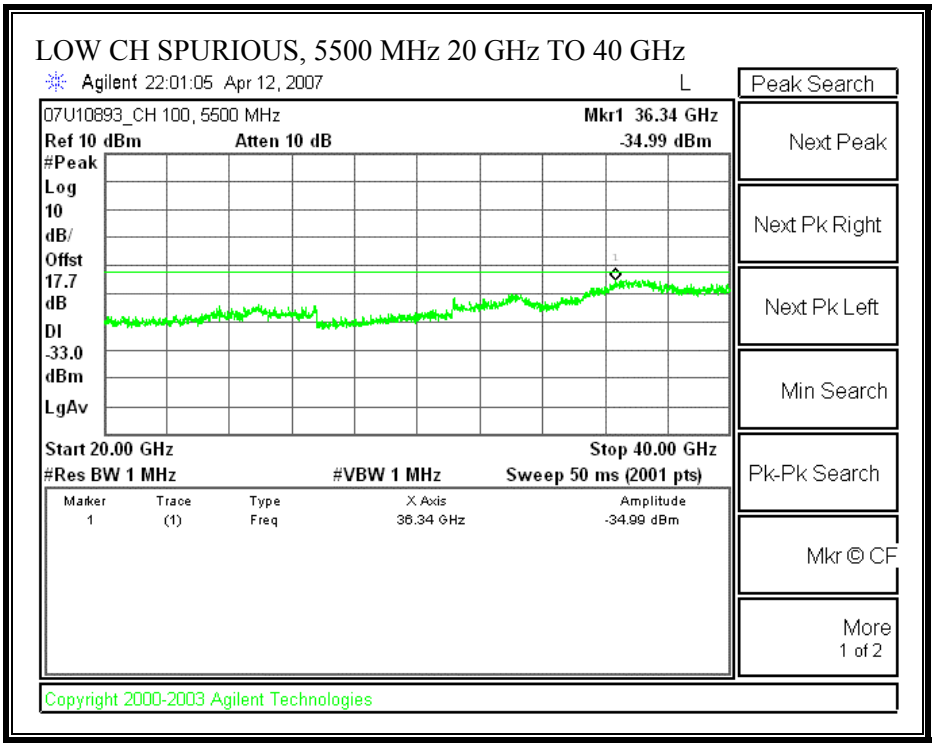


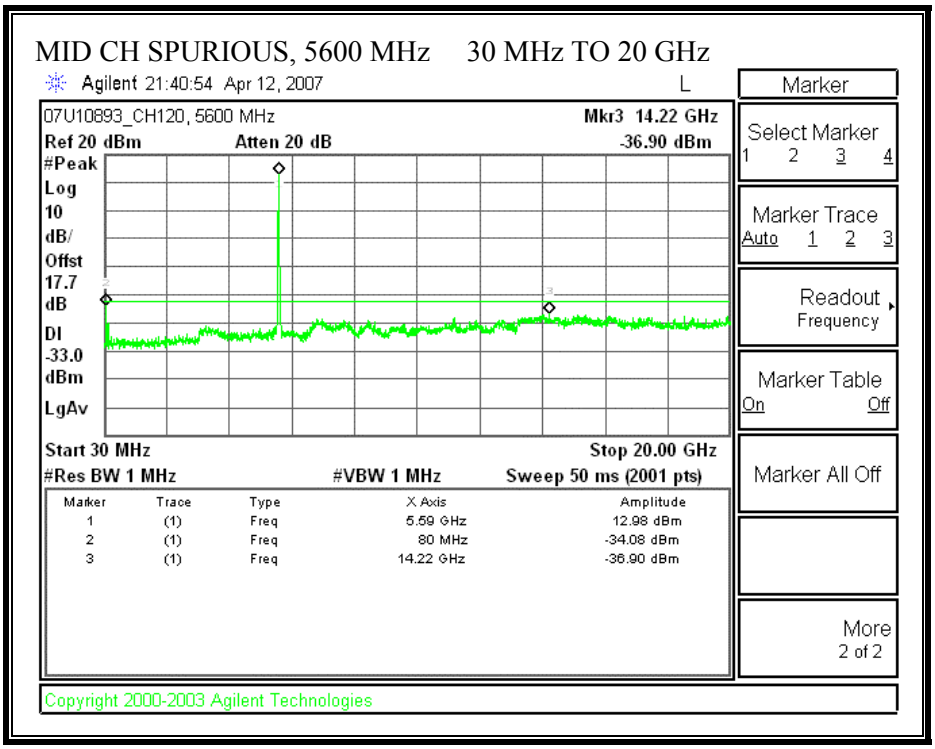


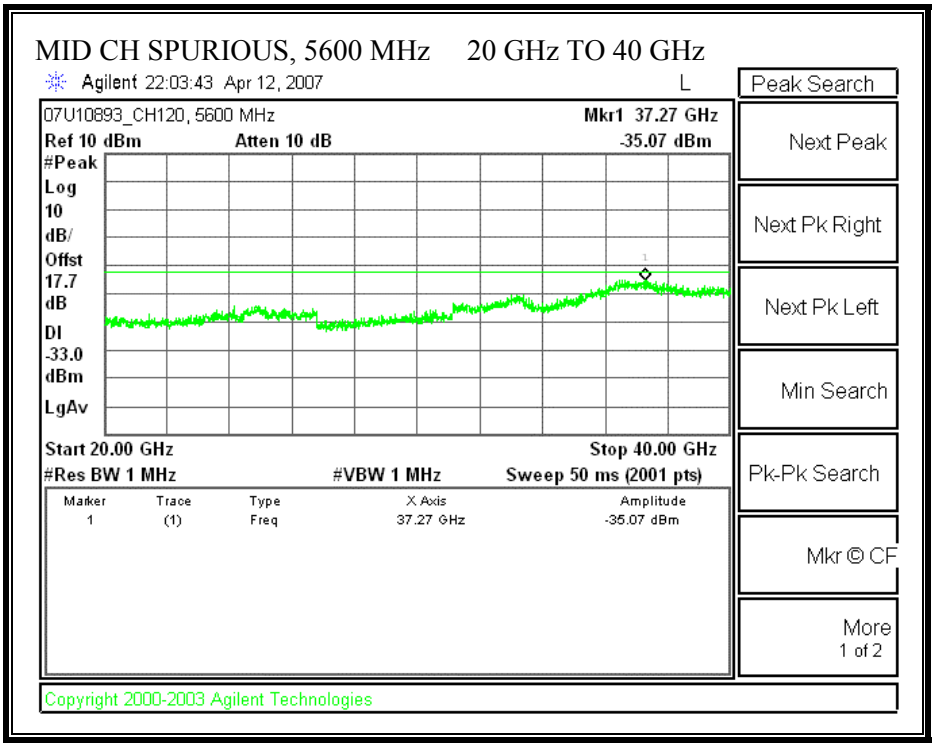


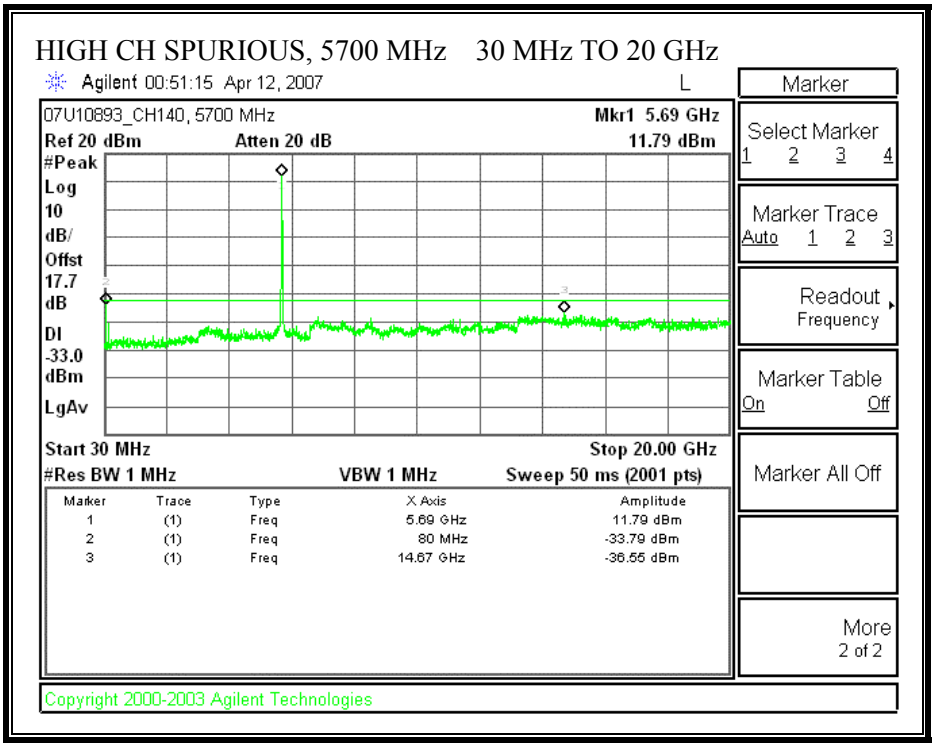
SPURIOUS EMISSIONS - 802.11a -20 MHz TX BANDWIDTH – CHAIN 1



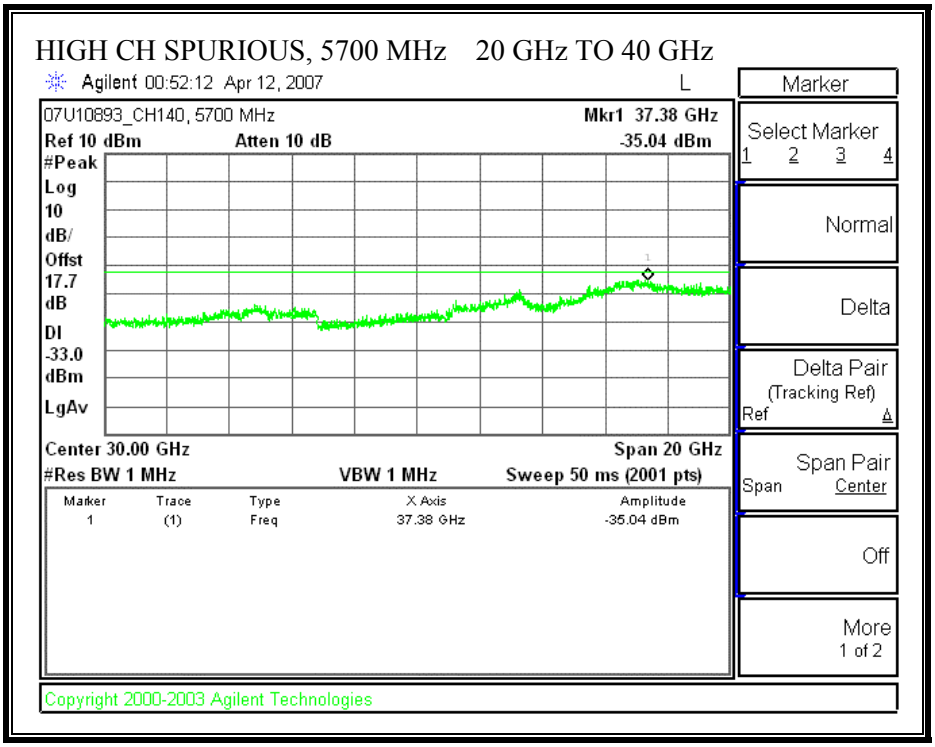






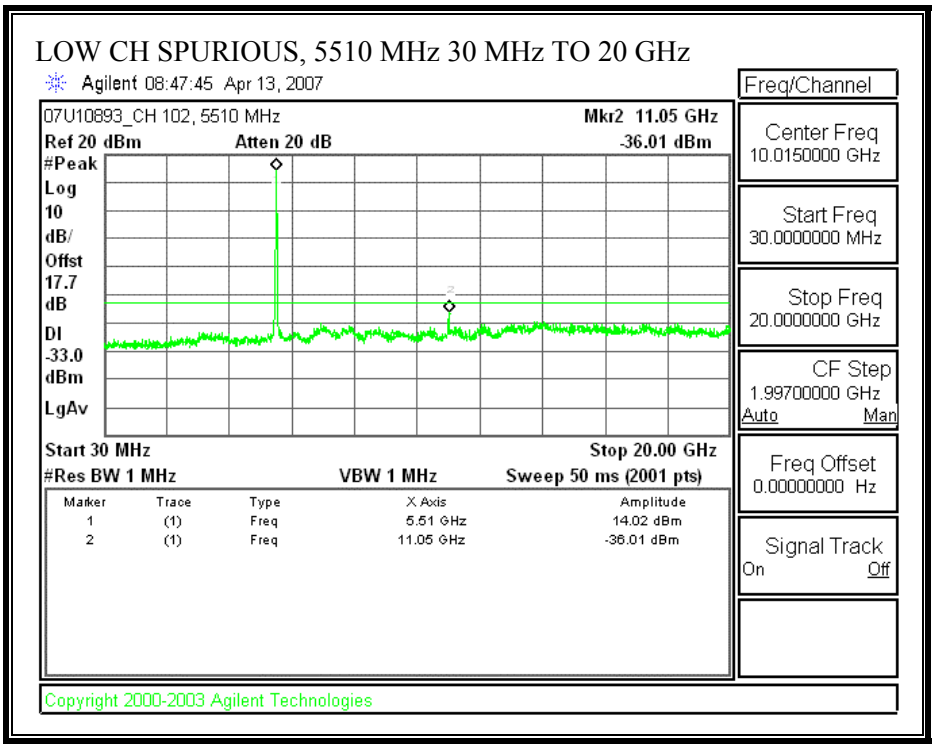


HIGH CH SPURIOUS, 5700 MHz 20 GHz TO 40 GHz

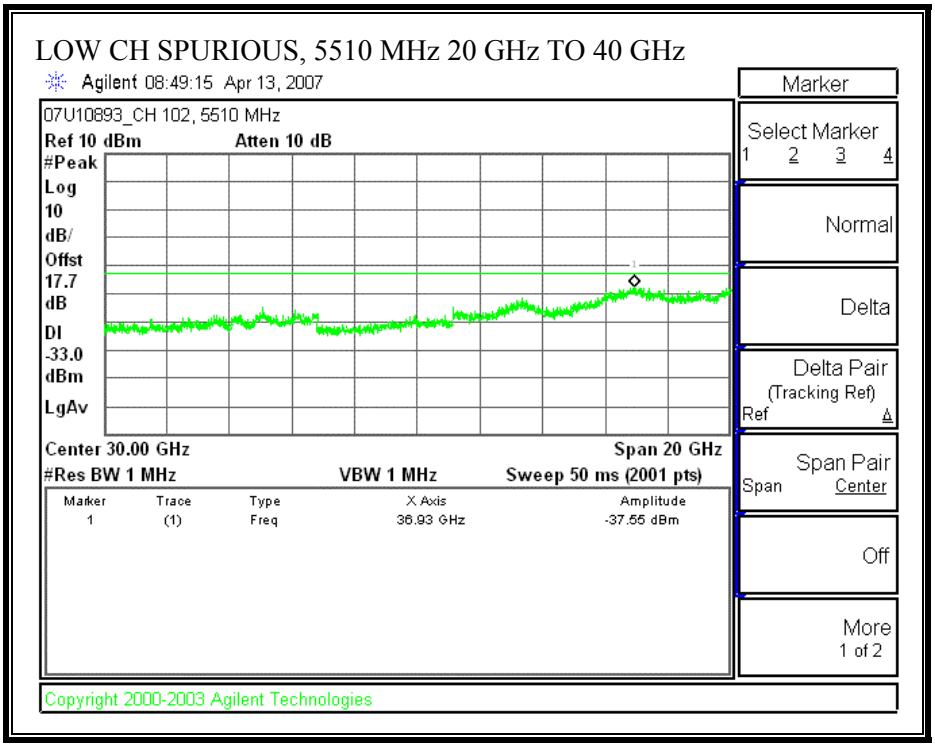


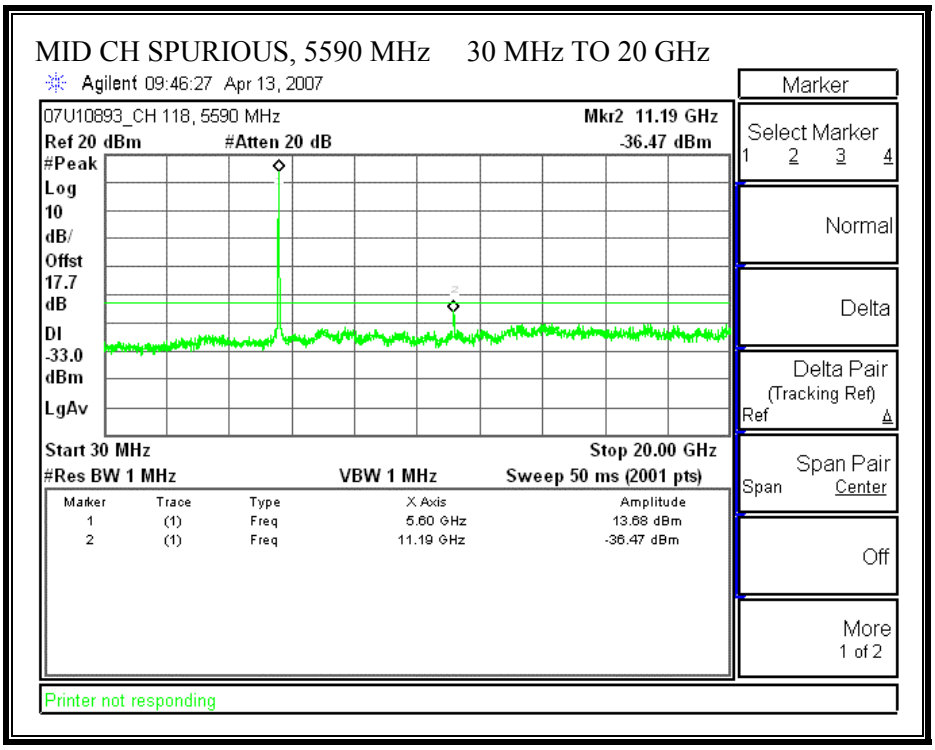
802.11n 40 MHz CDD MCS 32

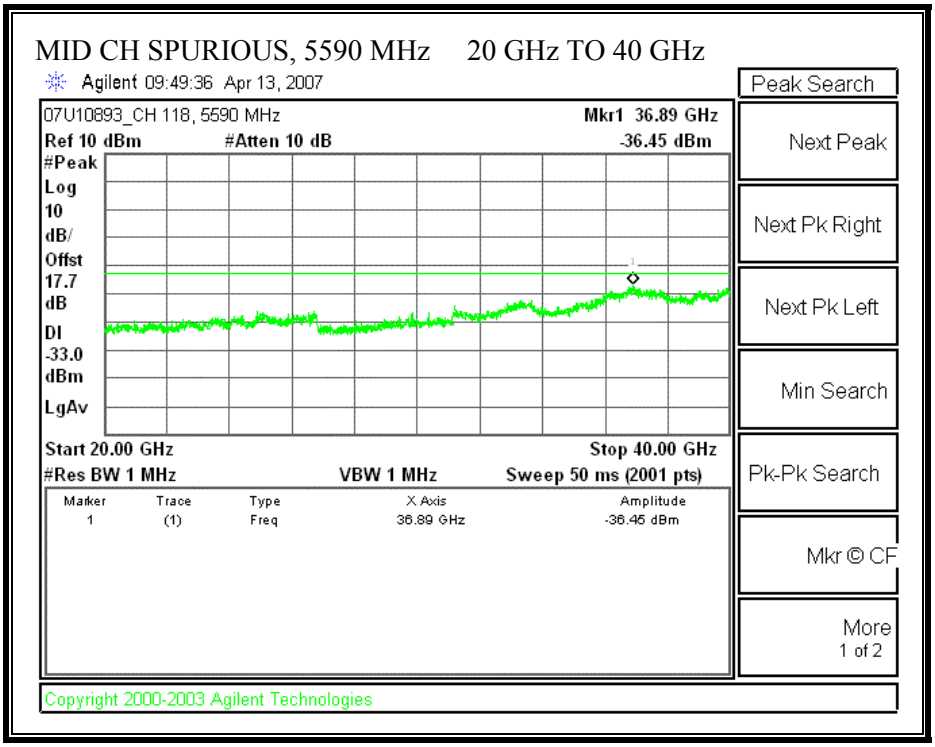
SPURIOUS EMISSIONS - 802.11a -40 MHz TX BANDWIDTH – CHAIN 0



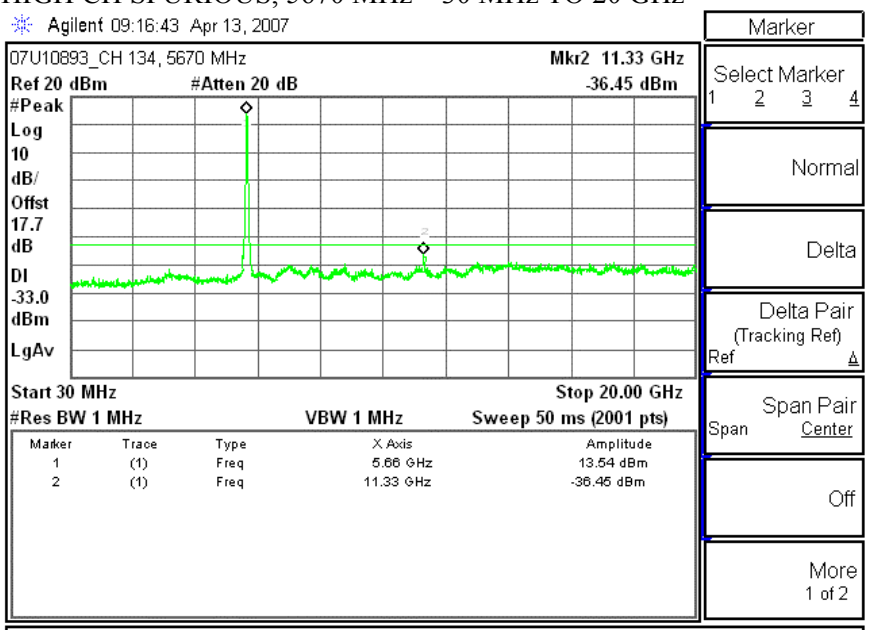
LOW CH SPURIOUS, 5510 MHz 20 GHz TO 40 GHz

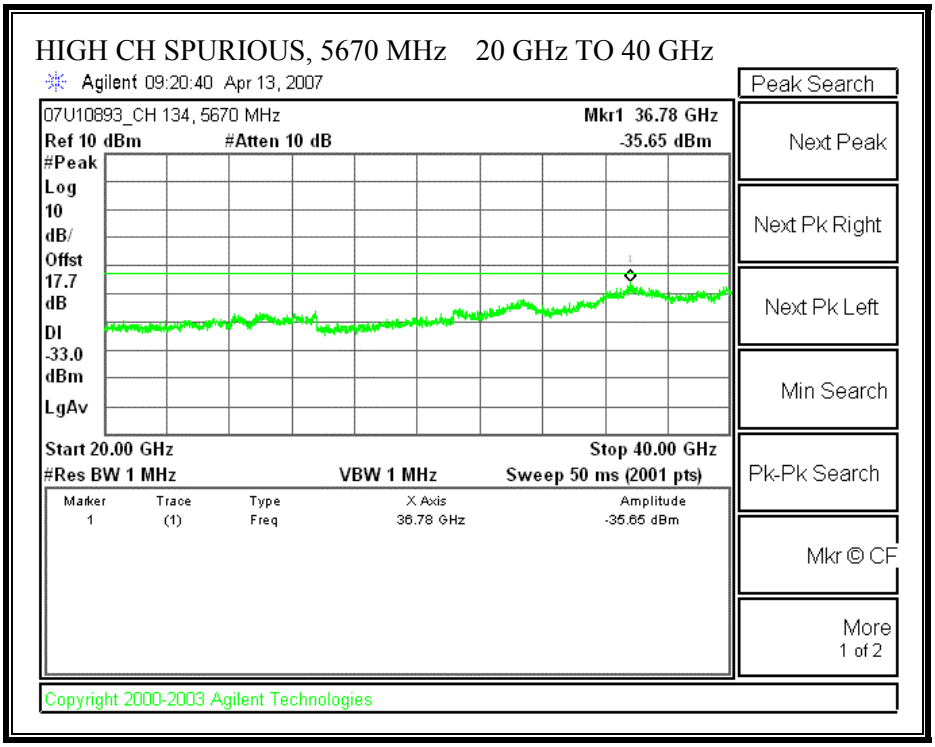




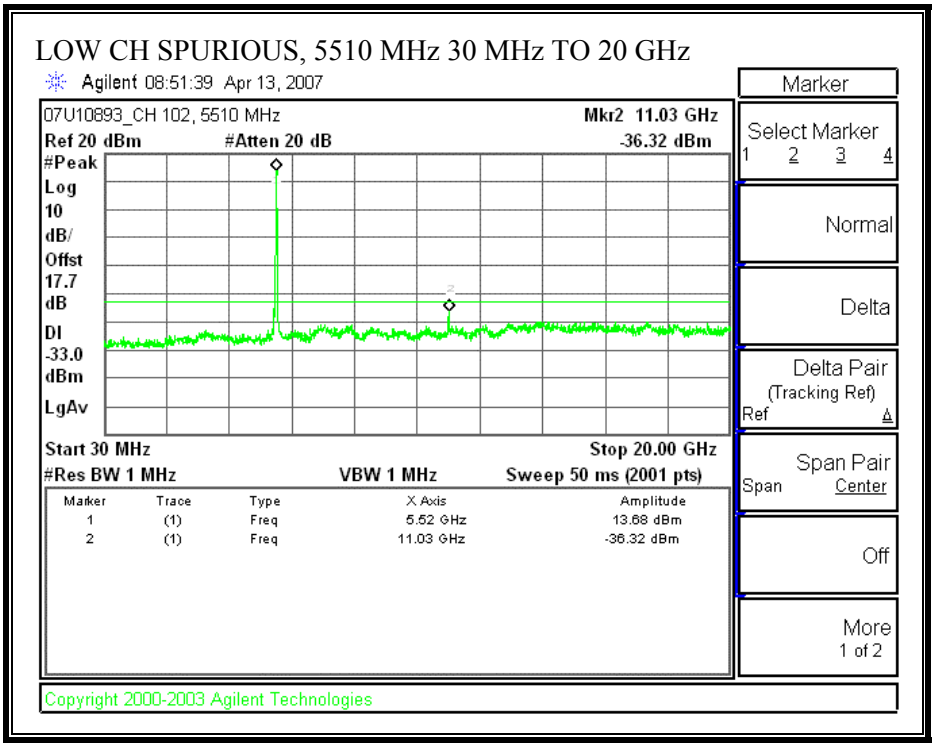


HIGH CH SPURIOUS, 5670 MHz 30 MHz TO 20 GHz

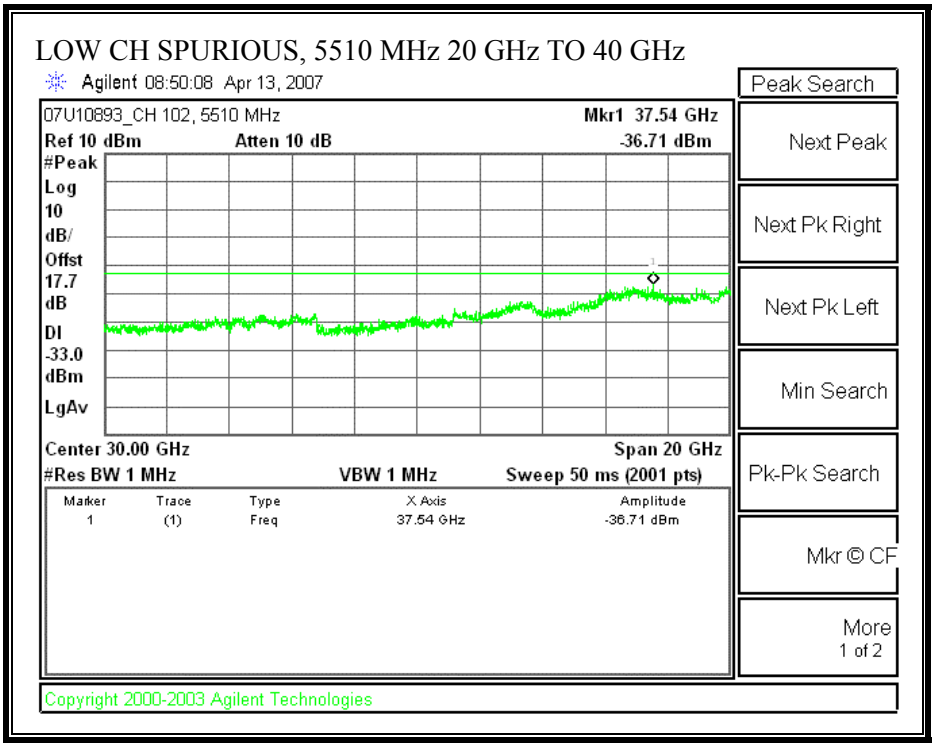


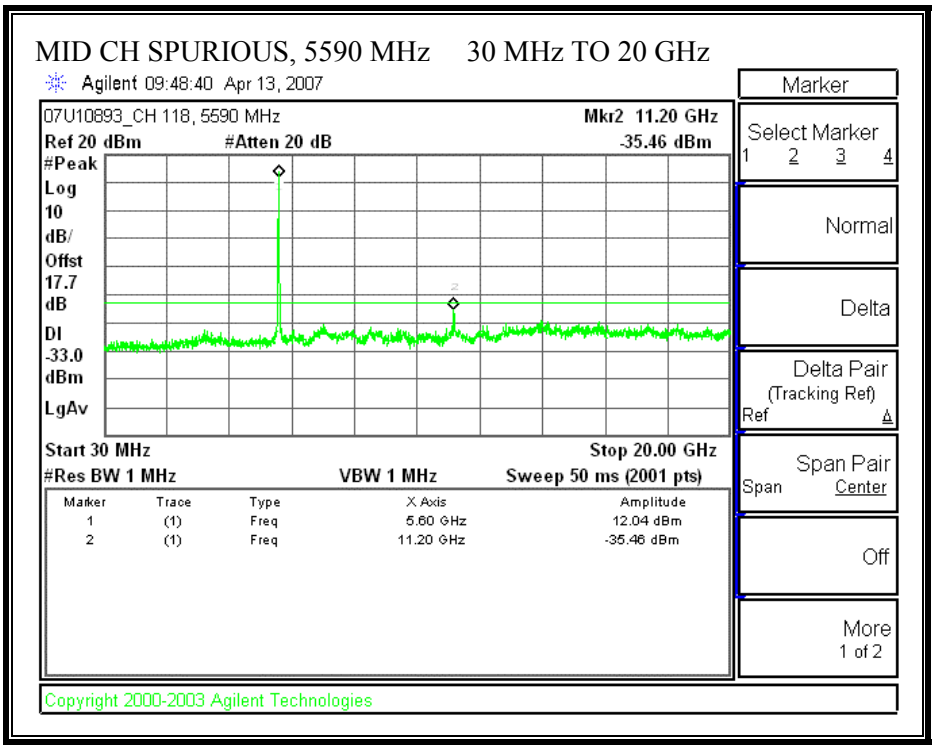


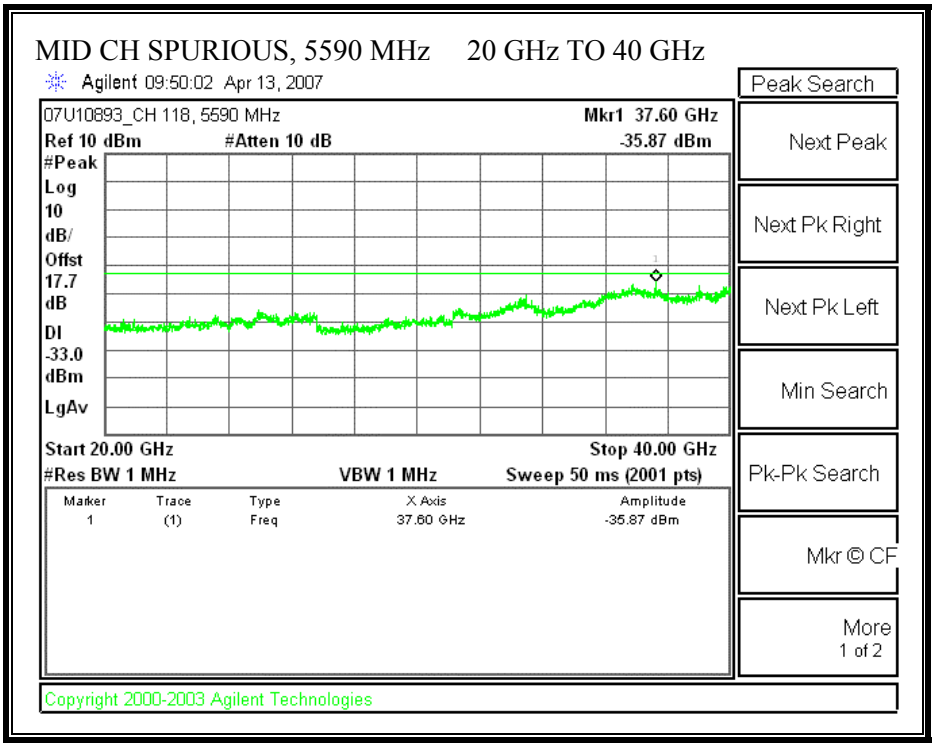
SPURIOUS EMISSIONS - 802.11a -40 MHz TX BANDWIDTH – CHAIN 1

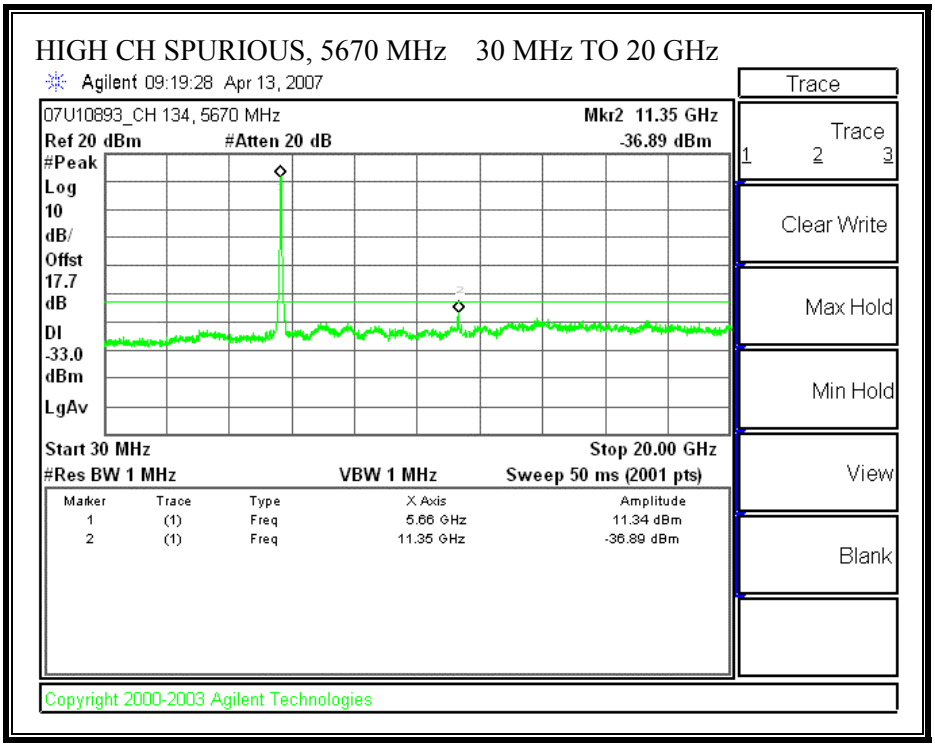


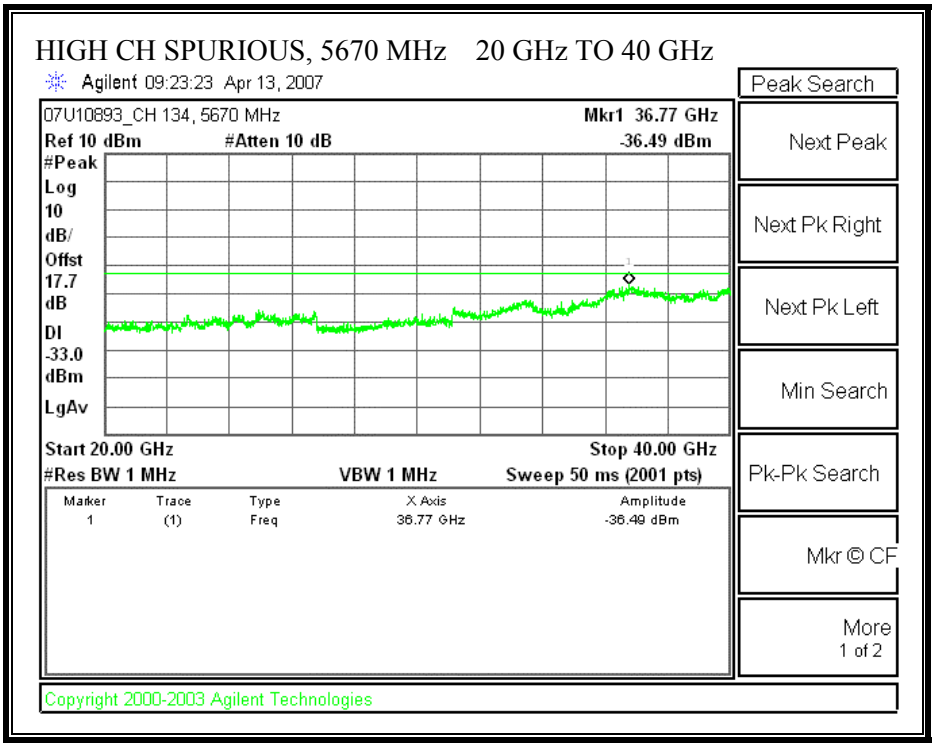
LOW CH SPURIOUS, 5510 MHz 20 GHz TO 40 GHz











7.3. RADIATED EMISSIONS

7.3.1. TRANSMITTER RADIATED SPURIOUS EMISSIONS

LIMITS

§15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 - 1710	10.6 - 12.7
6.26775 - 6.26825	108 - 121.94	1718.8 - 1722.2	13.25 - 13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 - 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 - 16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3358	36.43 - 36.5
12.57675 - 12.57725	322 - 335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.
[2] Above 38.6

§15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown in Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

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 5 GHz band.

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

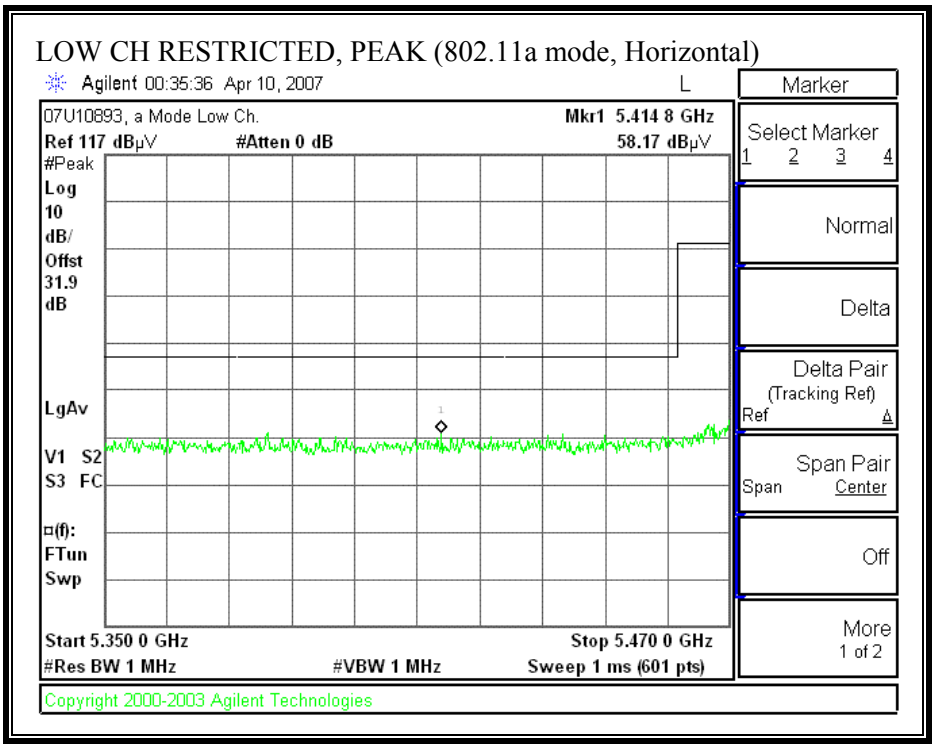
LEGACY MODE

7.3.2. TRANSMITTER ABOVE 1 GHz FOR 5470 TO 5725 MHz BAND

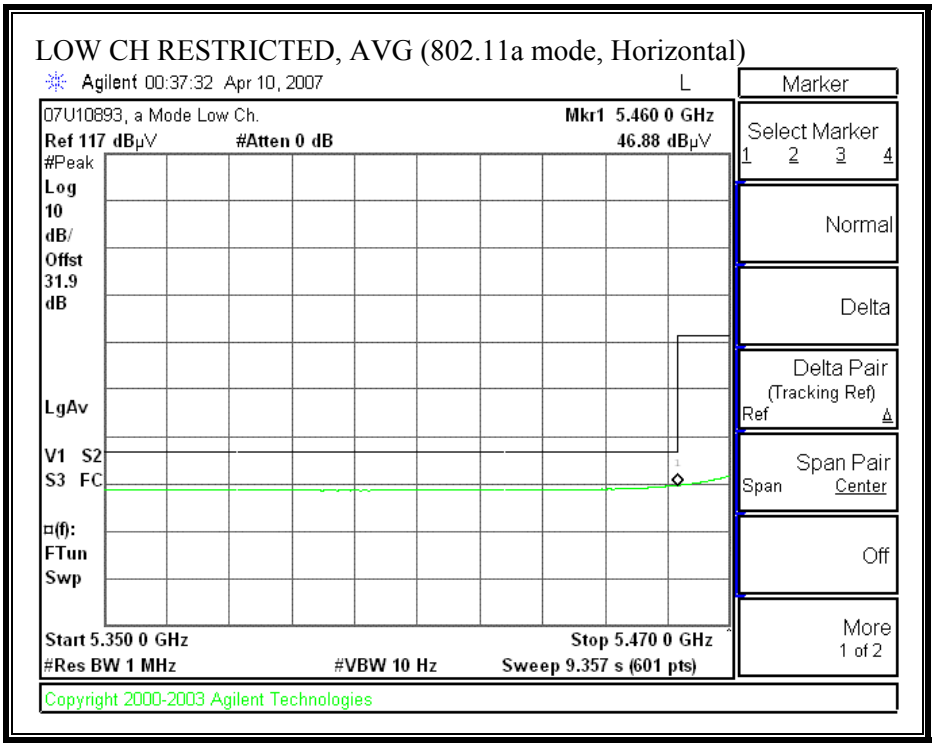
802.11a MODE

RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, 5500 MHz - HORIZONTAL)

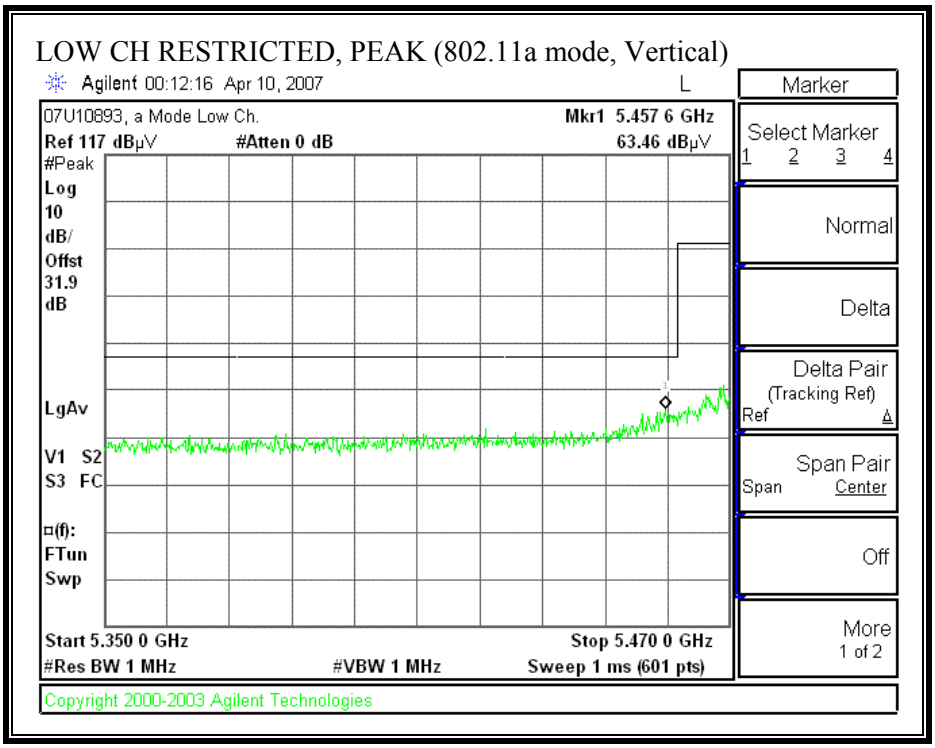
LOW CH RESTRICTED, PEAK (802.11a mode, Horizontal)



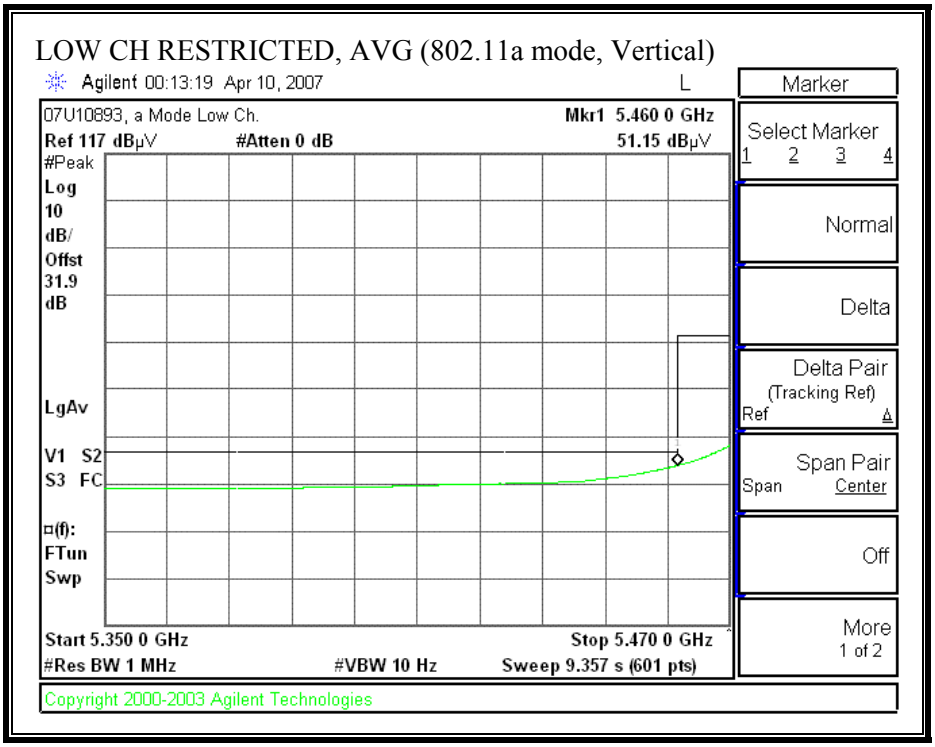
LOW CH RESTRICTED, AVG (802.11a mode, Horizontal)



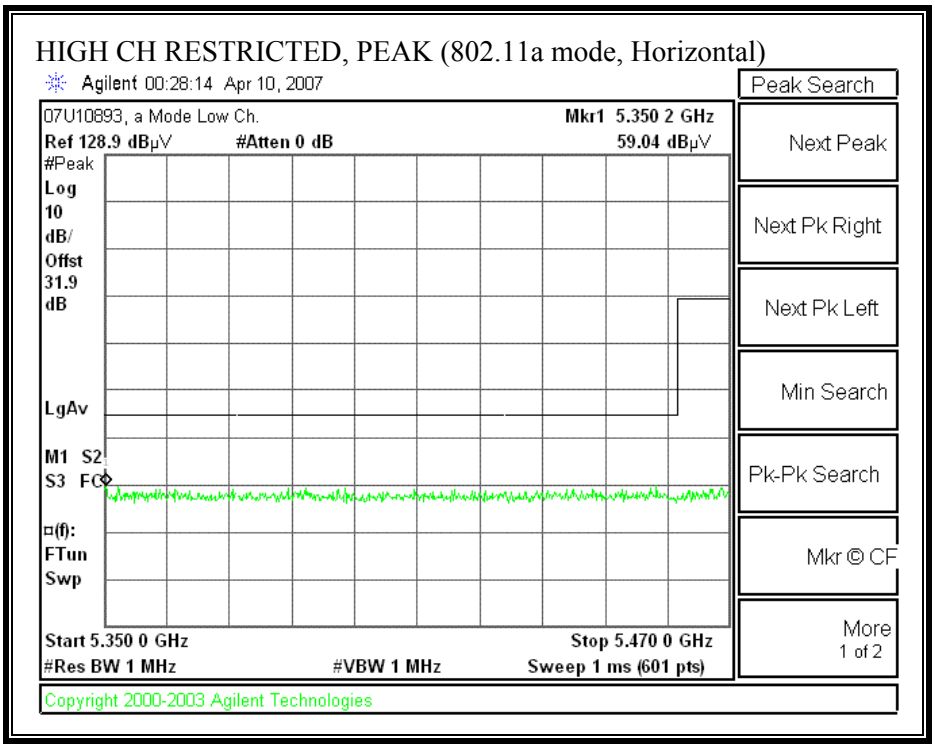
RESTRICTED BANDEDGE (802.11a MODE, LOW CHANNEL, 5500 MHz - VERTICAL)



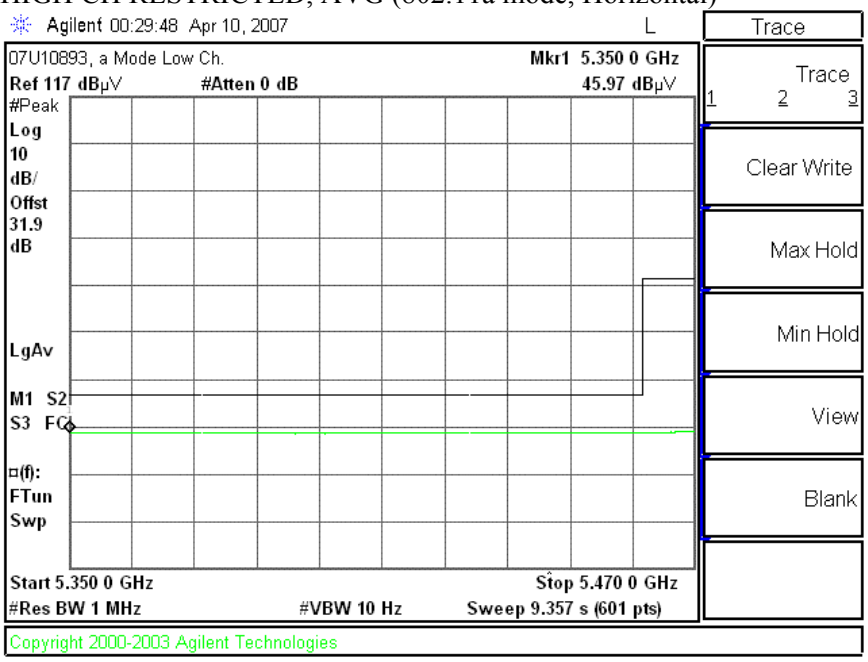
LOW CH RESTRICTED, AVG (802.11a mode, Vertical)



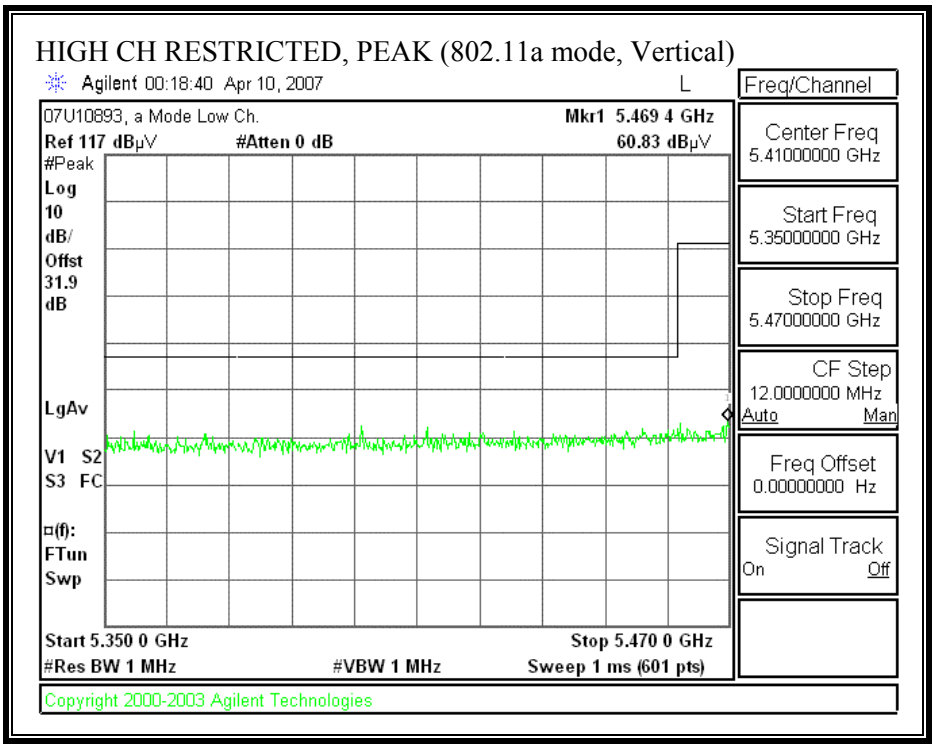
RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, 5520 MHz - HORIZONTAL)



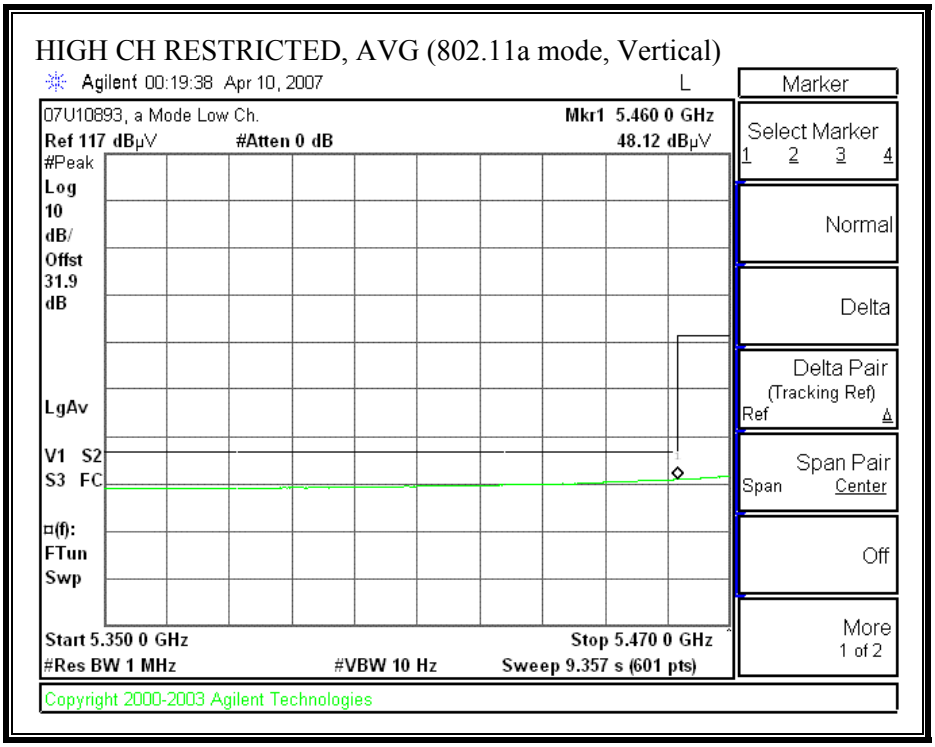
HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)



RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, 5520 MHz - VERTICAL)

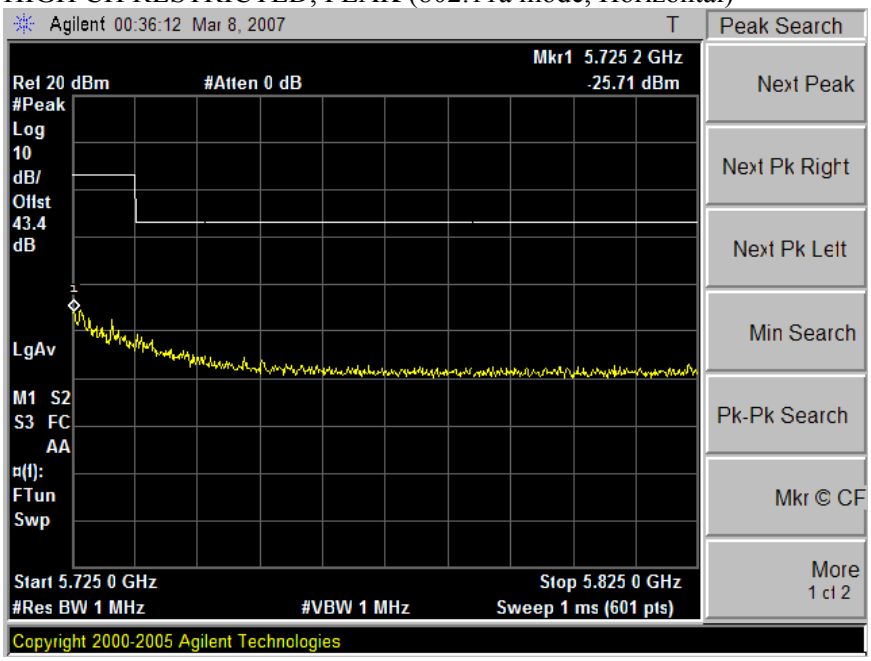


HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)

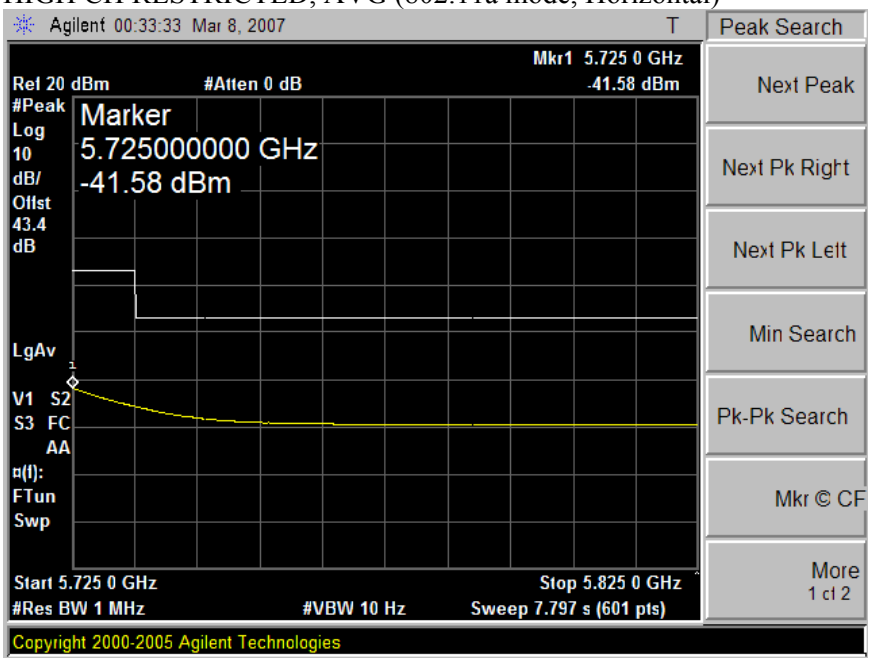


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, 5700 MHz - HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Horizontal)

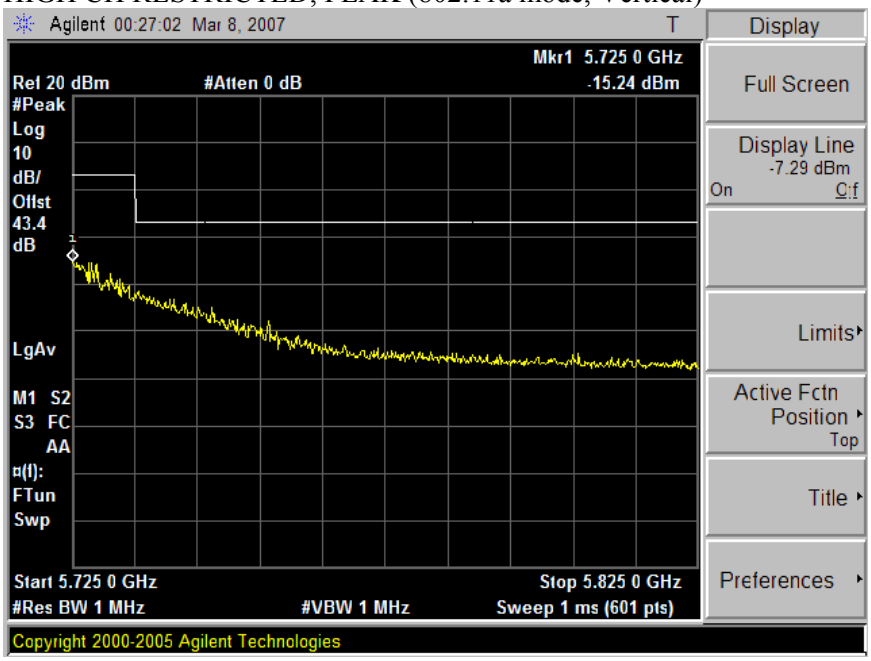


HIGH CH RESTRICTED, AVG (802.11a mode, Horizontal)

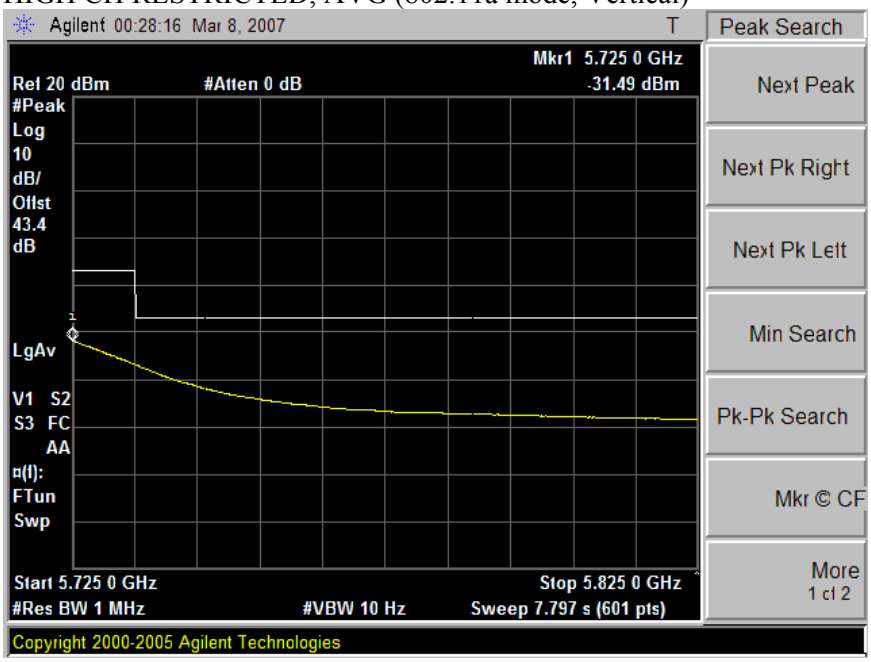


RESTRICTED BANDEDGE (802.11a MODE, HIGH CHANNEL, 5700 MHz - VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11a mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11a mode, Vertical)



802.11a MODE

HARMONICS AND SPURIOUS EMISSIONS (802.11a MODE)

High Frequency Measurement
Compliance Certification Services, Fremont, A-5m Chamber

Company: Broadcom Corporation
Project #: 07U10893
Date: 04/09/2007
Test Engineer: Vien Tran
Configuration: EUT (With 5.35dBi Main Antenna, 5.2dBi Aux dBi)
Mode: Transmit, 5.5GHz_11a Legacy

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		Gordon 203134001	HPF_7.6GHz	

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

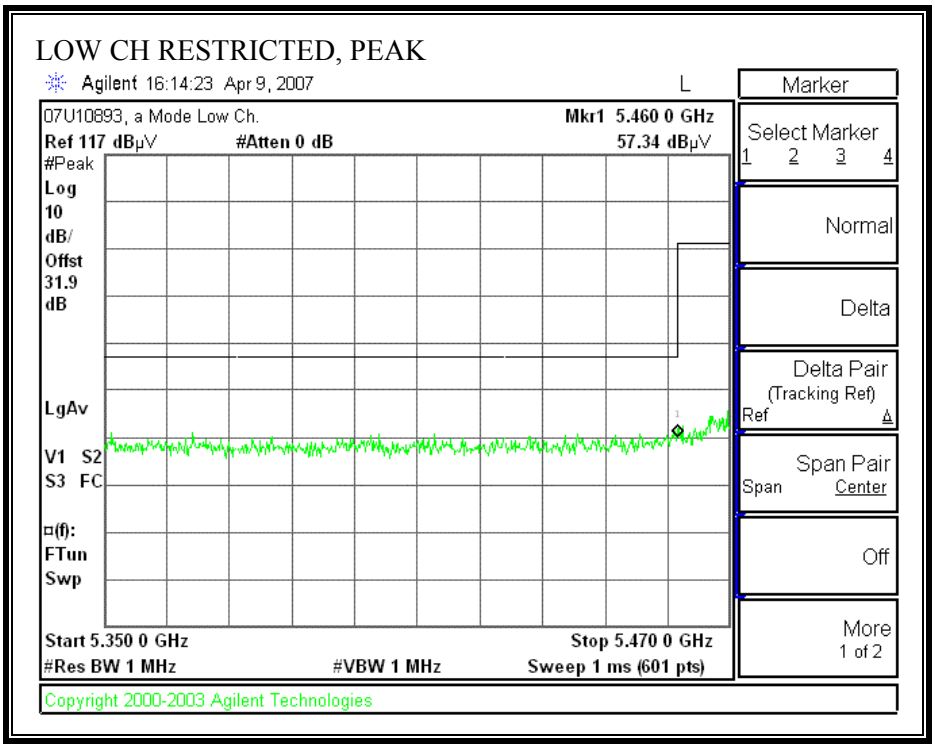
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
CH 100, 5500 MHz															
11.000	3.0	56.0	40.8	37.3	11.1	-36.3	0.0	0.7	68.9	53.7	74	54	-5.1	-0.3	H
11.000	3.0	51.6	39.9	37.3	11.1	-36.3	0.0	0.7	64.5	52.8	74	54	-9.5	-1.2	V
CH 120, 5600 MHz															
11.200	3.0	52.6	40.6	37.3	11.3	-36.1	0.0	0.7	65.9	53.9	74	54	-8.1	-0.1	H
11.200	3.0	51.8	40.0	37.3	11.3	-36.1	0.0	0.7	65.1	53.3	74	54	-8.9	-0.7	V
CH140, 5700 MHz															
11.400	3.0	52.2	40.1	37.4	11.5	-35.9	0.0	0.7	65.9	53.8	74	54	-8.1	-0.2	H
11.400	3.0	51.5	39.4	37.4	11.5	-35.9	0.0	0.7	65.2	53.1	74	54	-8.8	-0.9	V

No other emissions were detected above system noise floor

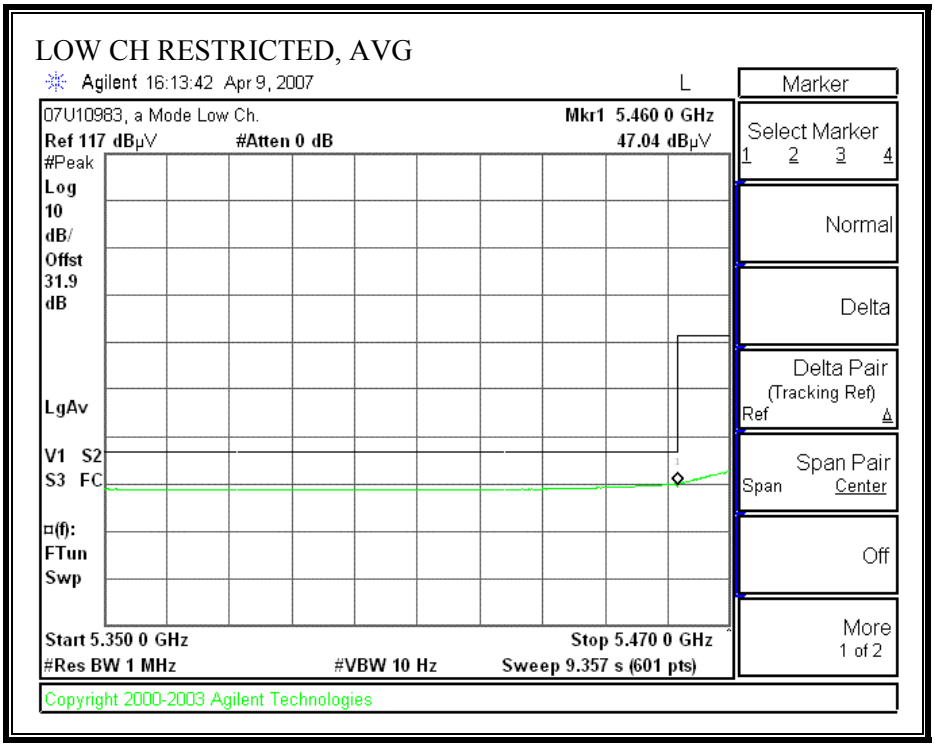
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

802.11n 40 MHz SISO MCS 32 MODE

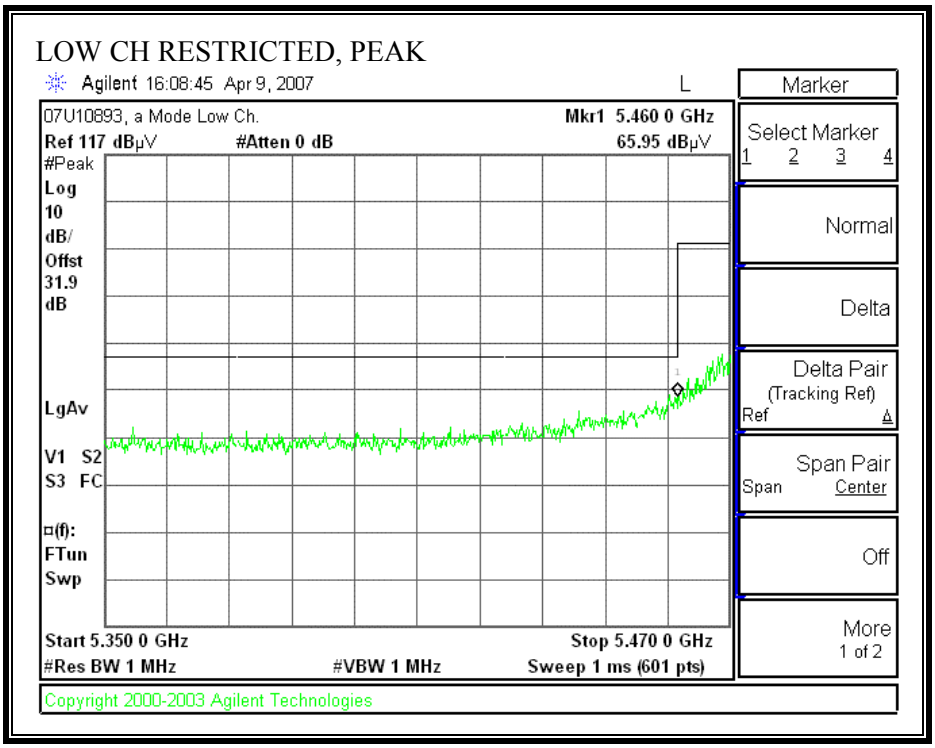
RESTRICTED BANDEDGE, LOW CHANNEL, 5510 MHz - HORIZONTAL



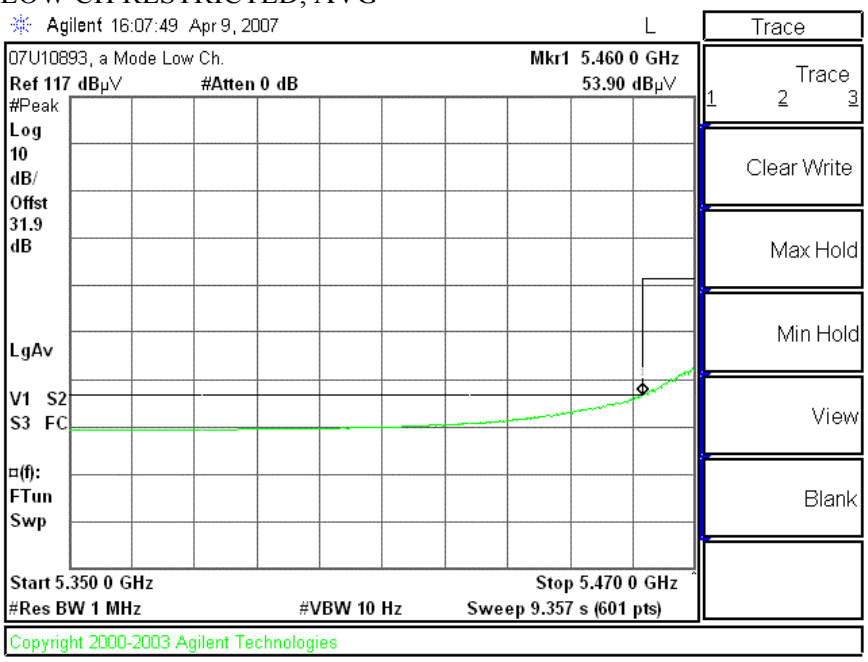
LOW CH RESTRICTED, AVG



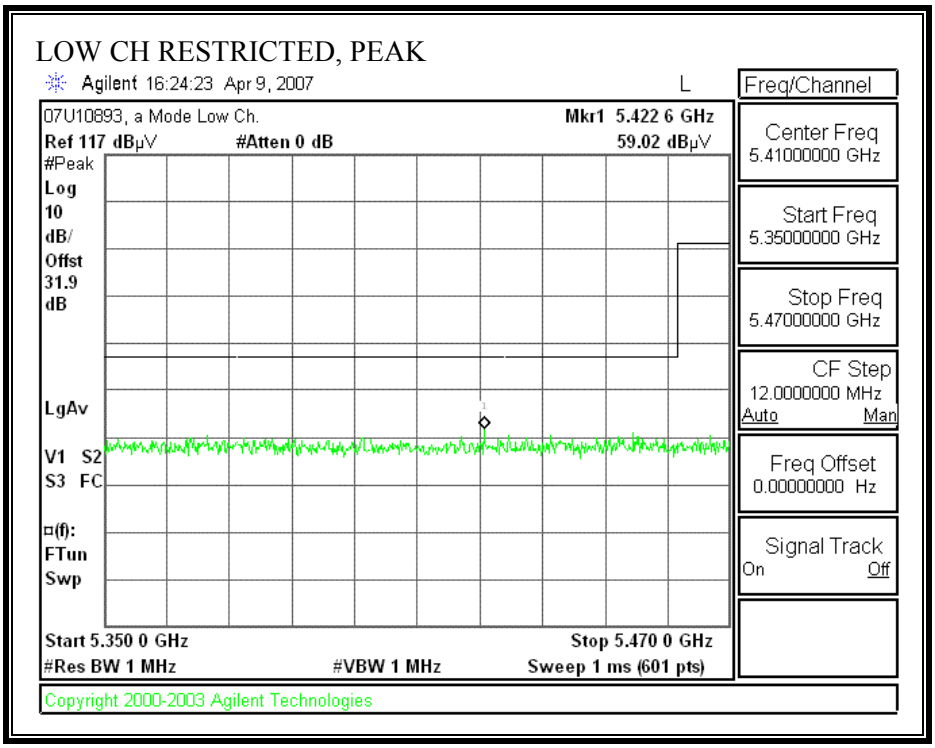
RESTRICTED BANDEDGE, LOW CHANNEL, 5510 MHz - VERTICAL



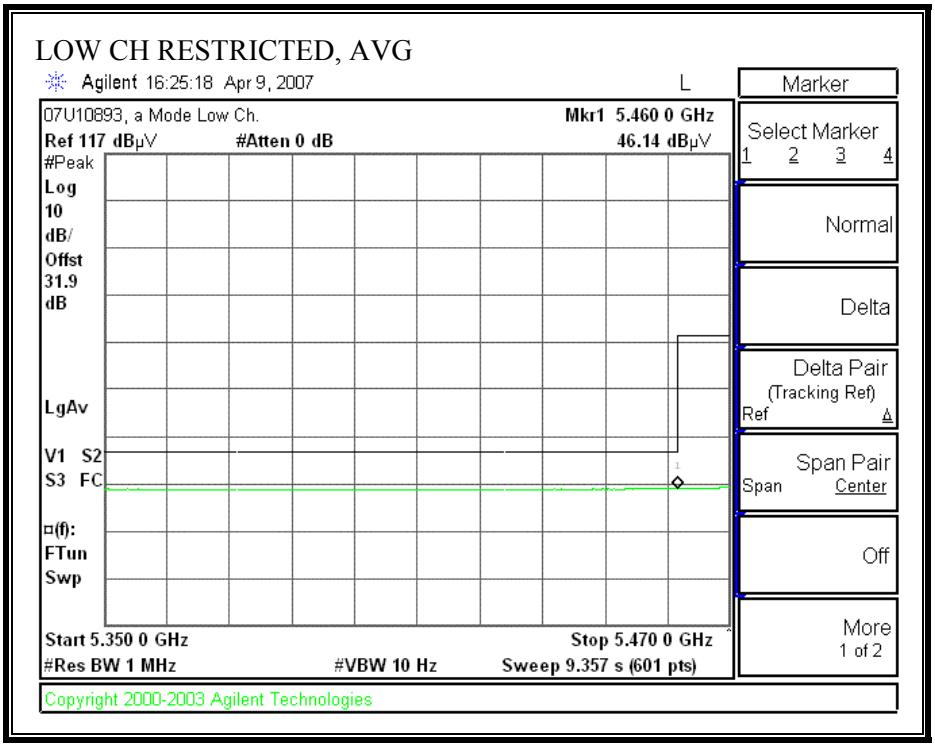
LOW CH RESTRICTED, AVG



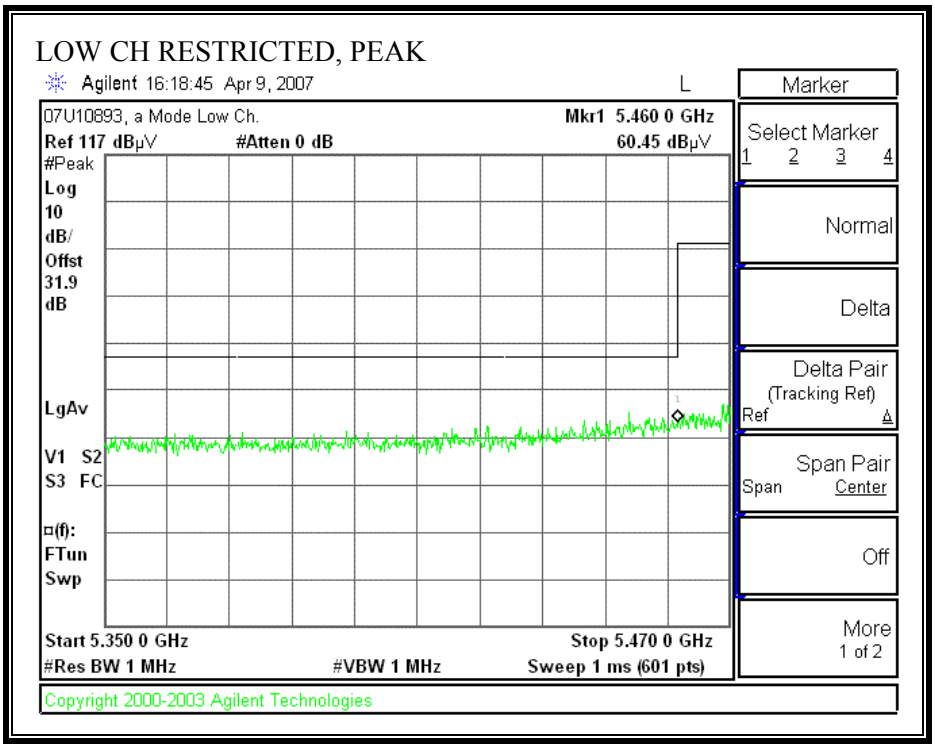
RESTRICTED BANDEDGE, LOW CHANNEL, 5550 MHz - HORIZONTAL



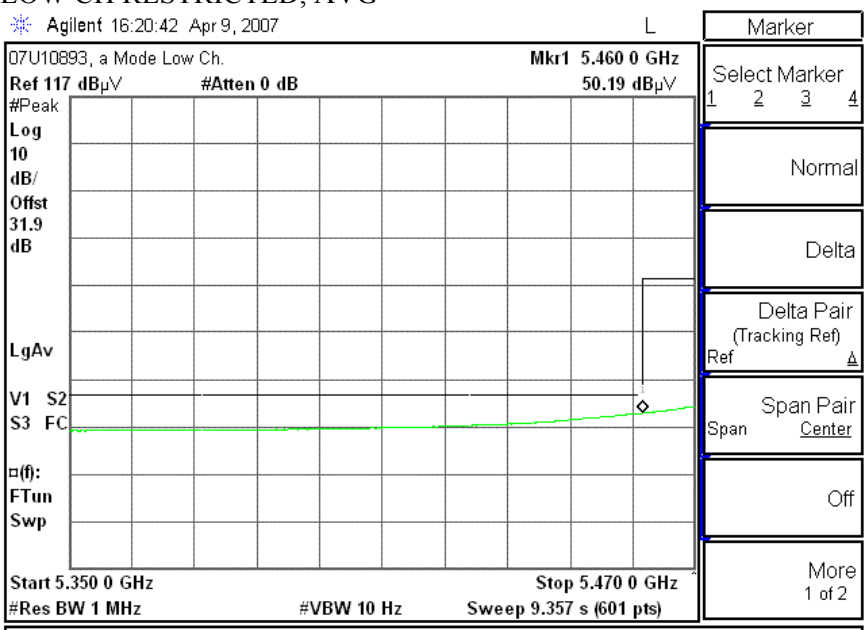
LOW CH RESTRICTED, AVG



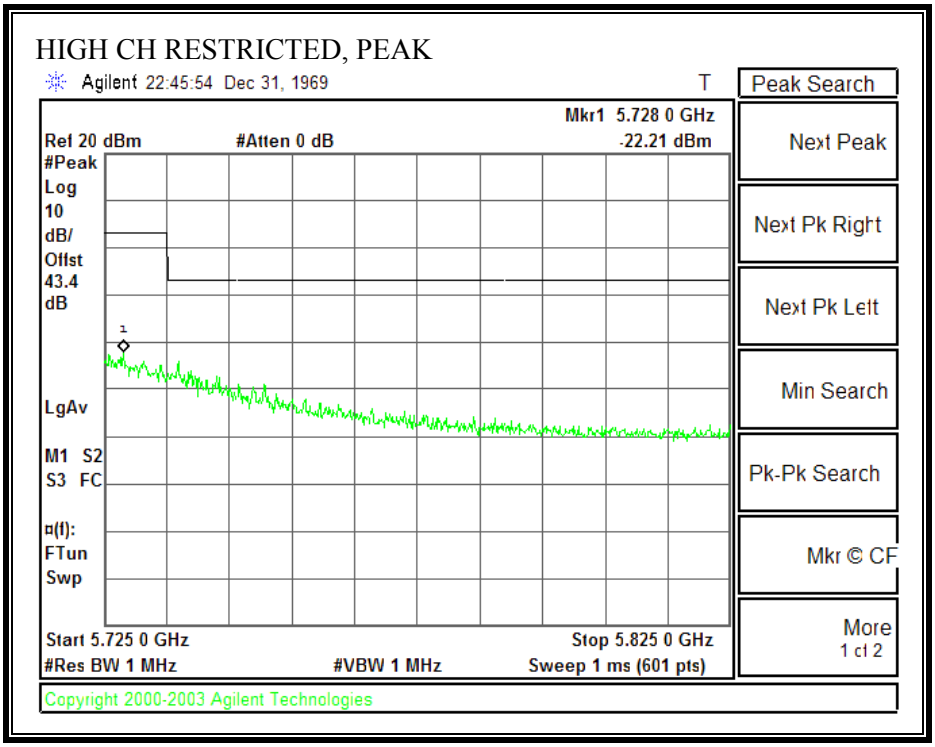
RESTRICTED BANDEDGE, LOW CHANNEL, 5550 MHz - VERTICAL



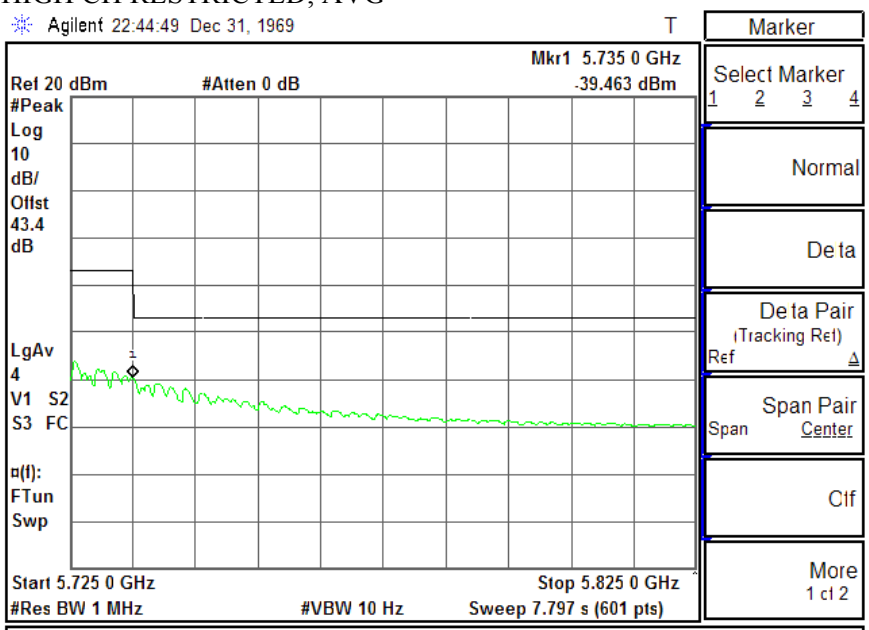
LOW CH RESTRICTED, AVG



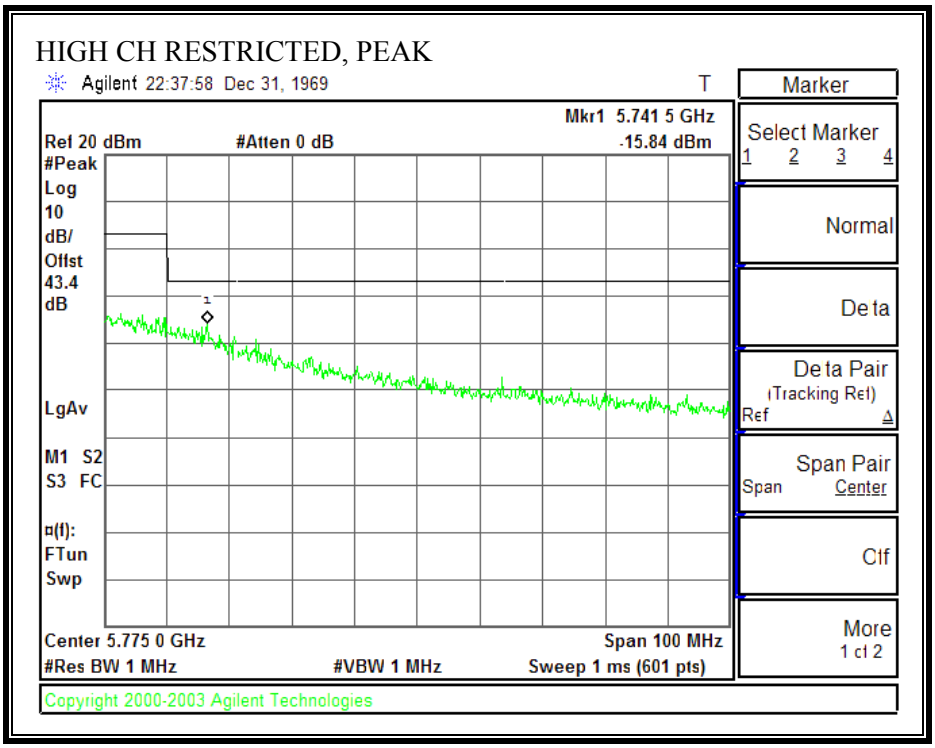
RESTRICTED BANDEDGE, HIGH CHANNEL, 5670 MHz - HORIZONTAL



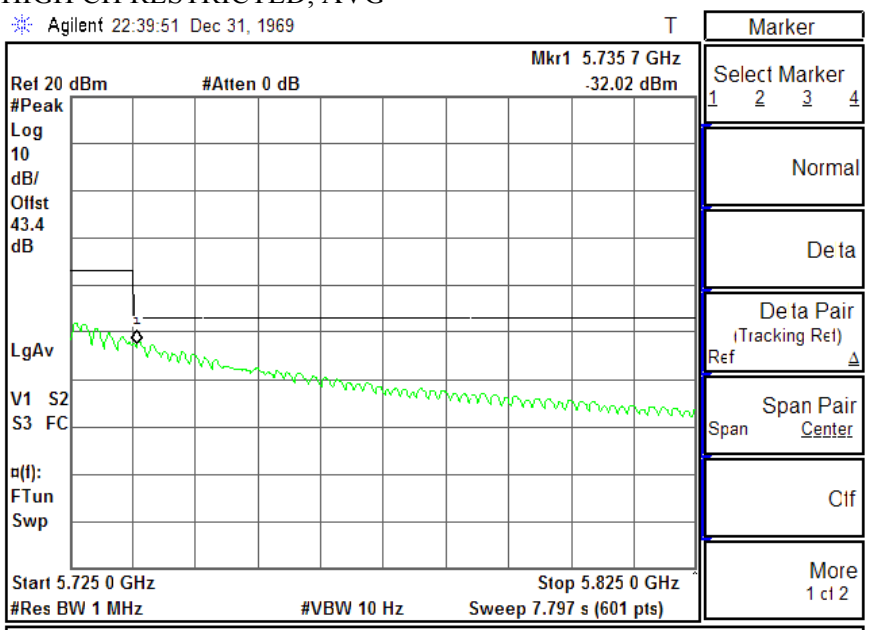
HIGH CH RESTRICTED, AVG



RESTRICTED BANDEDGE, HIGH CHANNEL, 5670 MHz - VERTICAL



HIGH CH RESTRICTED, AVG



802.11n 40 MHz SISO MODE

HARMONICS AND SPURIOUS EMISSIONS (802.11n 40 MHz SISO MODE)

High Frequency Measurement
Compliance Certification Services, Fremont, A-5m Chamber

Company: Broadcom Corporation
Project #: 07U10893
Date: 4/9/2007
Test Engineer: Vien Tran
Configuration: EUT (With 5.35dBi Main Antenna, 5.2dBi Aux dBi)
Mode: Transmit, 5.5GHz_11n 40 MHz SISO MCS 32

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		Gordon 203134001	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	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
CH 102, 5510 MHz															
11.020	3.0	52.5	40.8	37.3	11.1	-36.3	0.0	0.7	65.4	53.7	74	54	-8.6	-0.3	H
11.020	3.0	51.5	39.5	37.3	11.1	-36.3	0.0	0.7	64.4	52.4	74	54	-9.6	-1.6	V
CH 118, 5590 MHz															
11.180	3.0	50.5	40.5	37.3	11.3	-36.1	0.0	0.7	63.7	53.7	74	54	-10.3	-0.3	H
11.180	3.0	49.8	39.1	37.3	11.3	-36.1	0.0	0.7	63.0	52.3	74	54	-11.0	-1.7	V
CH134, 5670 MHz															
11.340	3.0	50.5	39.7	37.4	11.5	-36.0	0.0	0.7	64.1	53.3	74	54	-9.9	-0.7	H
11.340	3.0	49.3	38.9	37.4	11.5	-36.0	0.0	0.7	62.9	52.5	74	54	-11.1	-1.5	V

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		

MIMO MODE

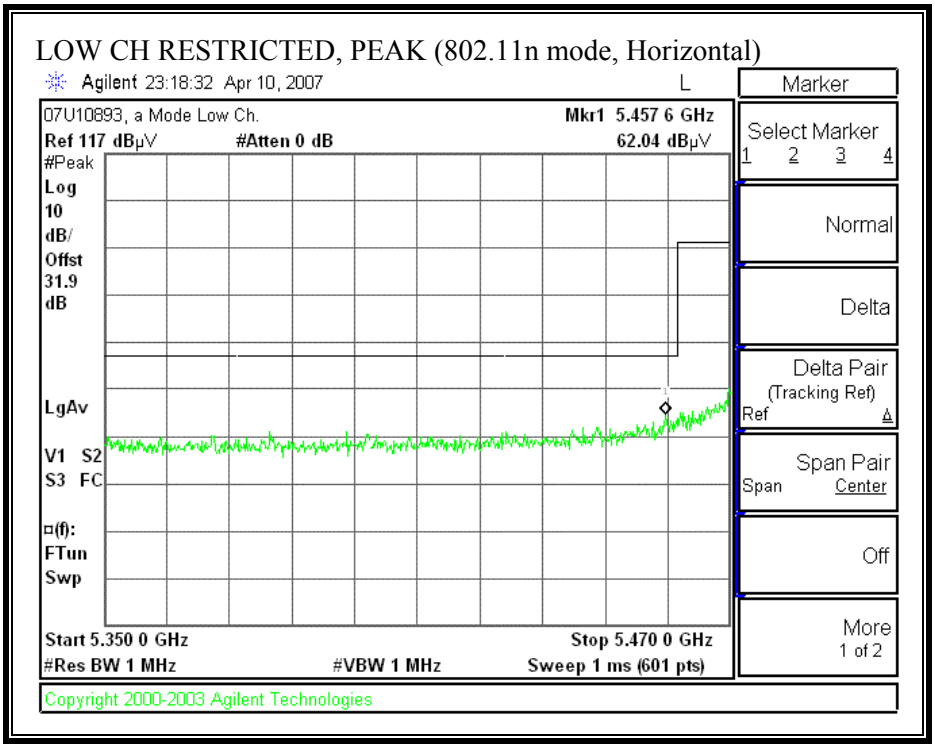
7.3.3. TRANSMITTER ABOVE 1 GHz FOR 5470 TO 5725 MHz BAND

802.11a CDD is covered by worst case 802.11n 20 MHz CDD MCS 0

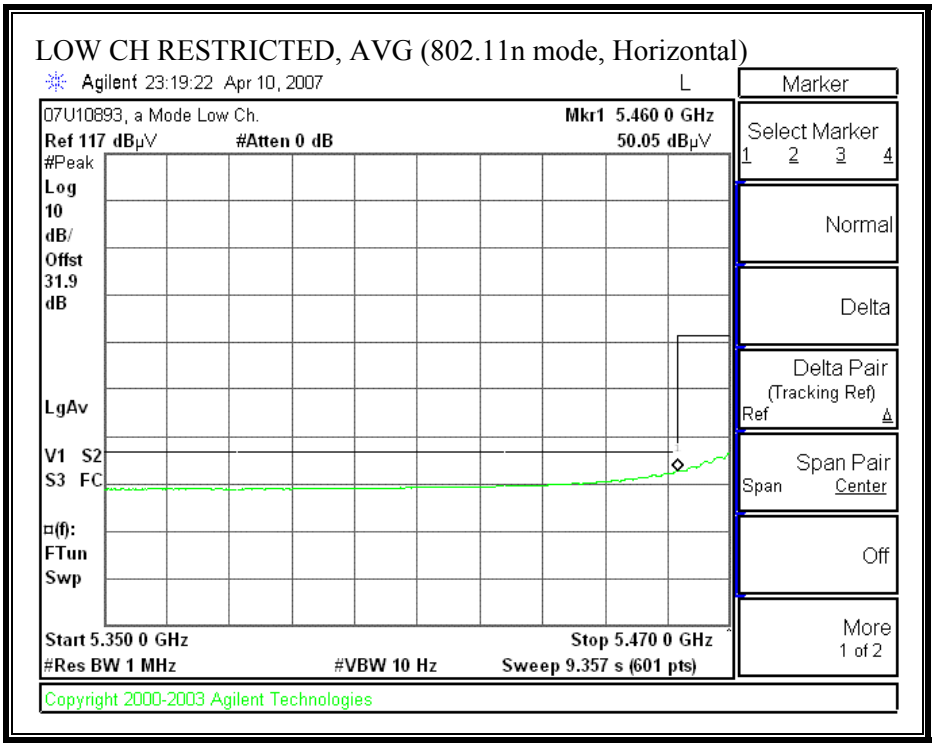
802.11n 20 MHz CDD MCS 0

RESTRICTED BANDEDGE (LOW CHANNEL, 5500 MHz - HORIZONTAL)

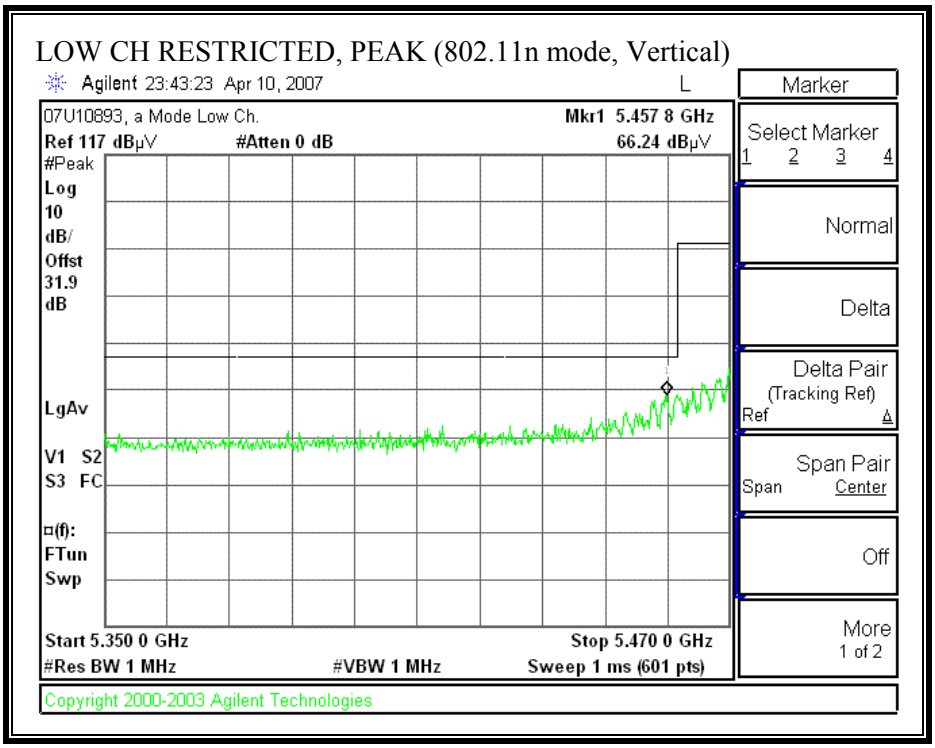
LOW CH RESTRICTED, PEAK (802.11n mode, Horizontal)



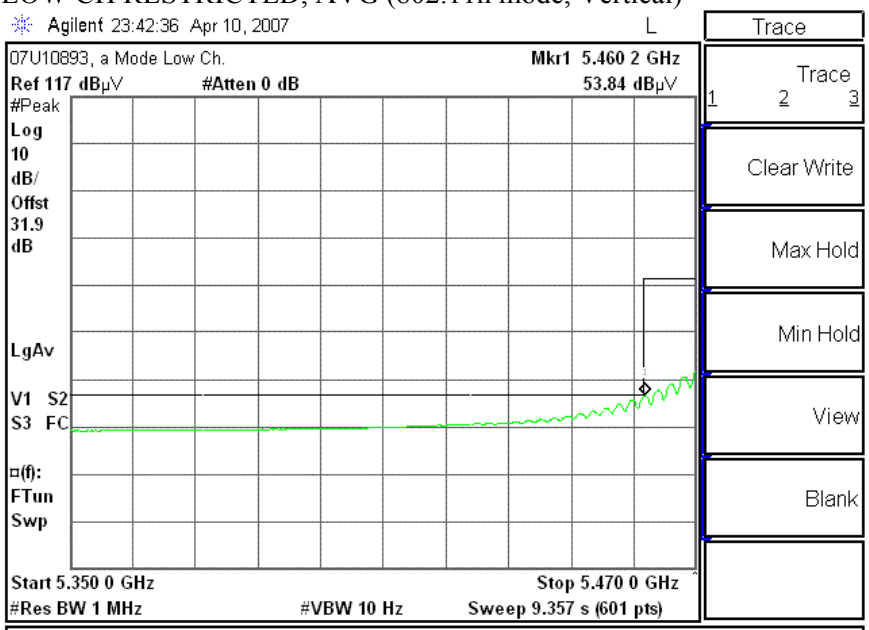
LOW CH RESTRICTED, AVG (802.11n mode, Horizontal)



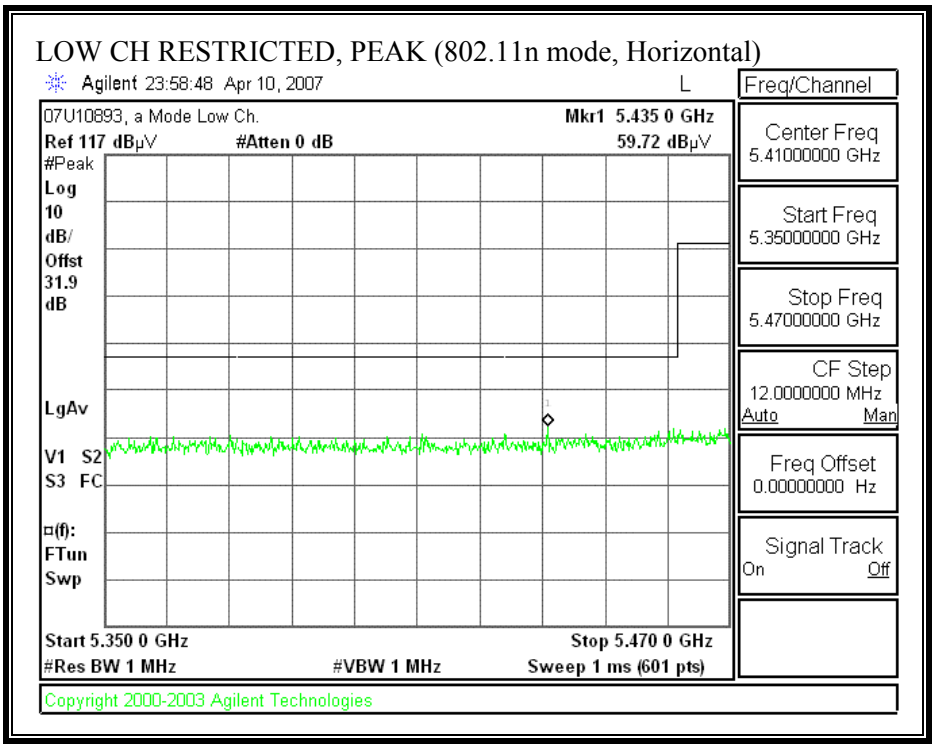
RESTRICTED BANDEDGE (802.11n MODE, LOW CHANNEL, 5500 MHz - VERTICAL)



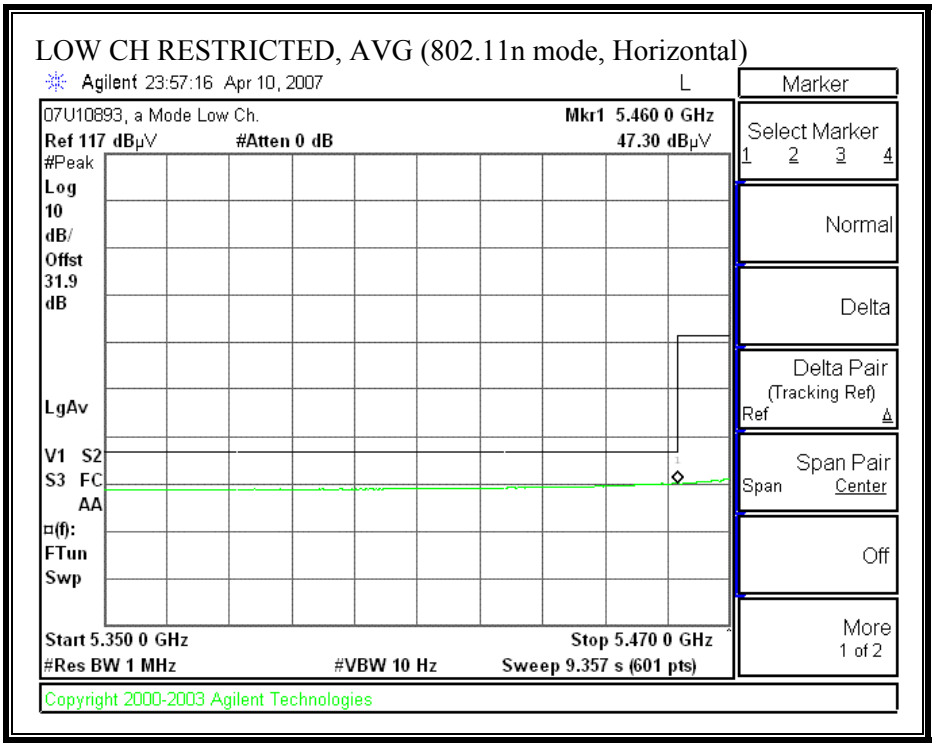
LOW CH RESTRICTED, AVG (802.11n mode, Vertical)



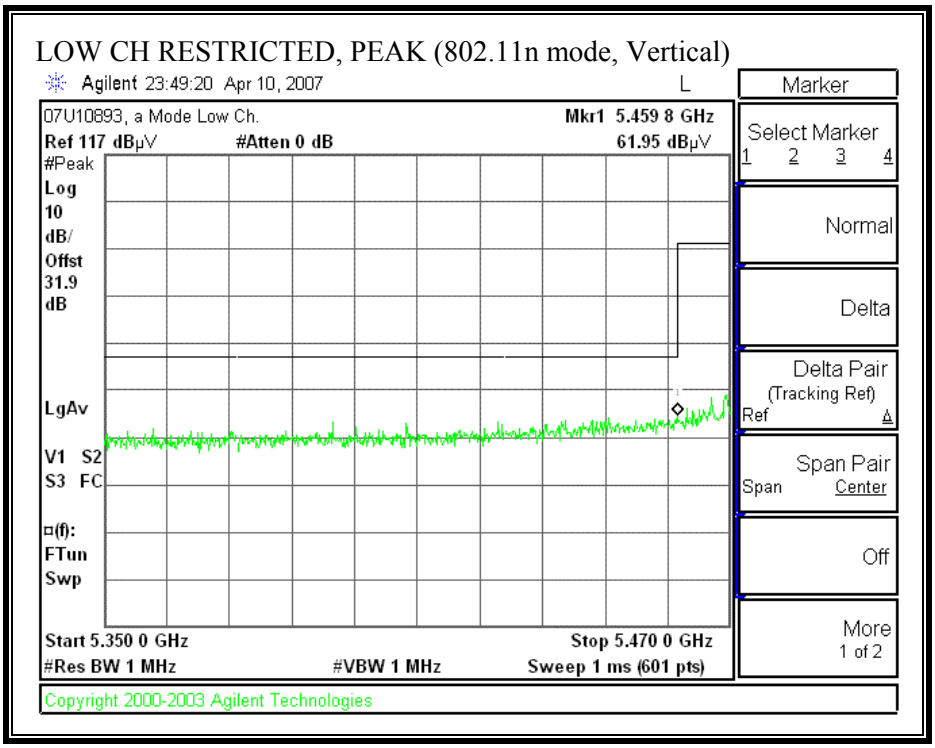
RESTRICTED BANDEDGE (LOW CHANNEL, 5520 MHz - HORIZONTAL)



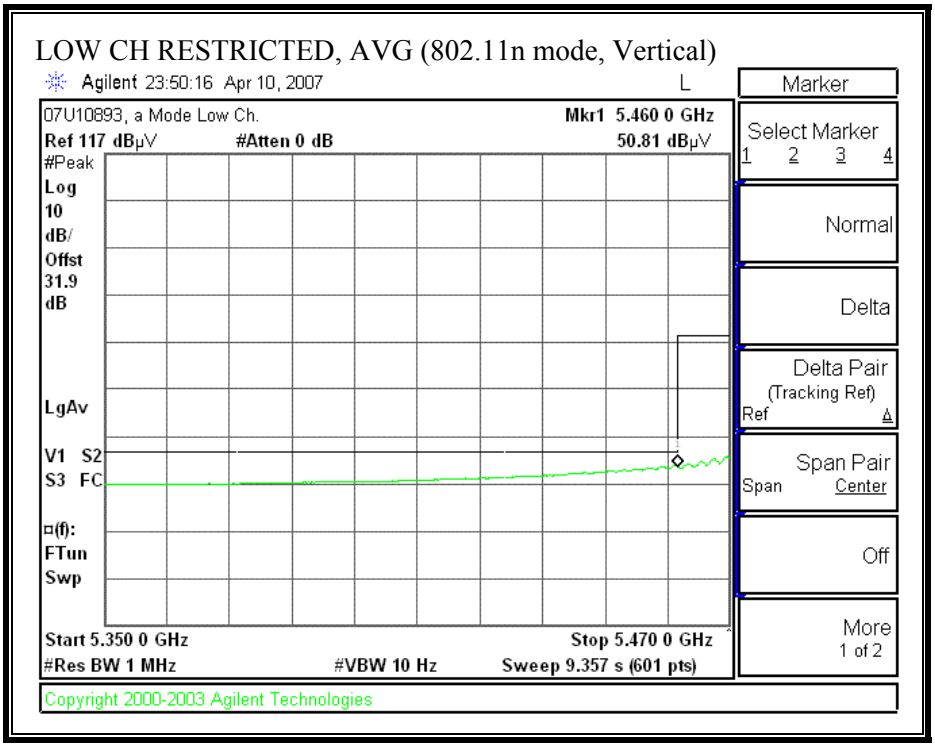
LOW CH RESTRICTED, AVG (802.11n mode, Horizontal)



RESTRICTED BANDEDGE (802.11n MODE, LOW CHANNEL, 5520 MHz - VERTICAL)

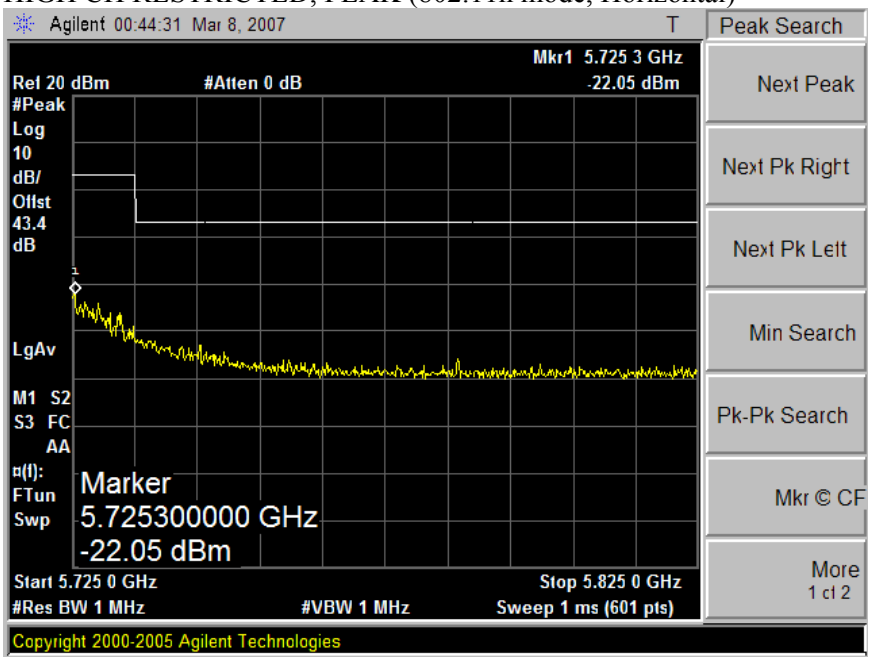


LOW CH RESTRICTED, AVG (802.11n mode, Vertical)

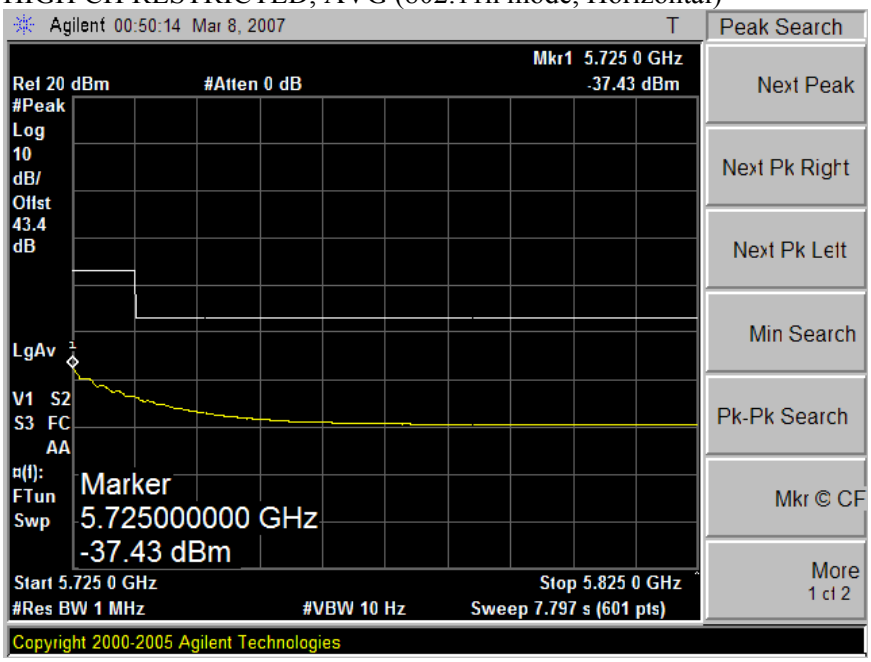


RESTRICTED BANDEDGE (802.11n MODE, HIGH CHANNEL, 5700 MHz - HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11n mode, Horizontal)

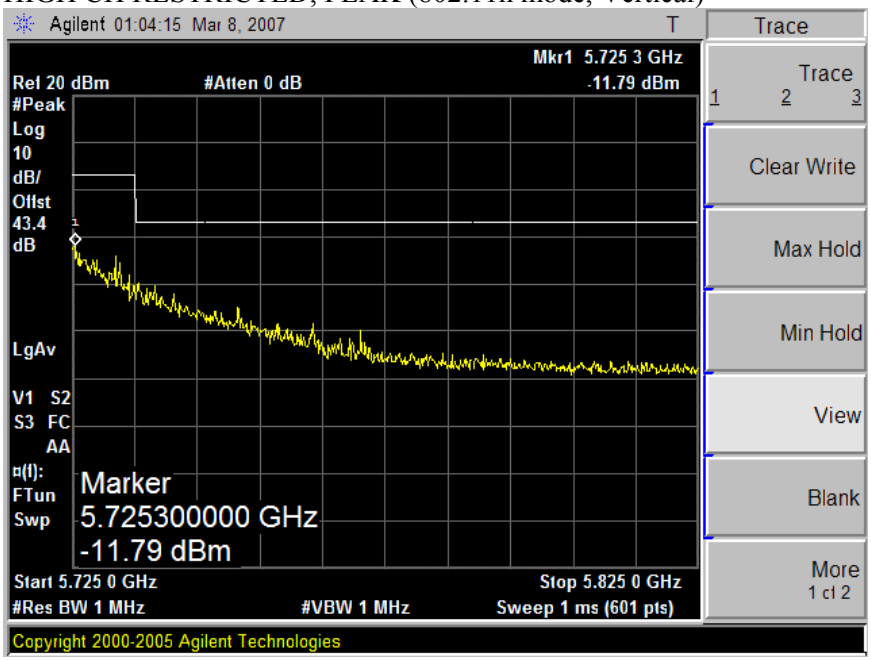


HIGH CH RESTRICTED, AVG (802.11n mode, Horizontal)

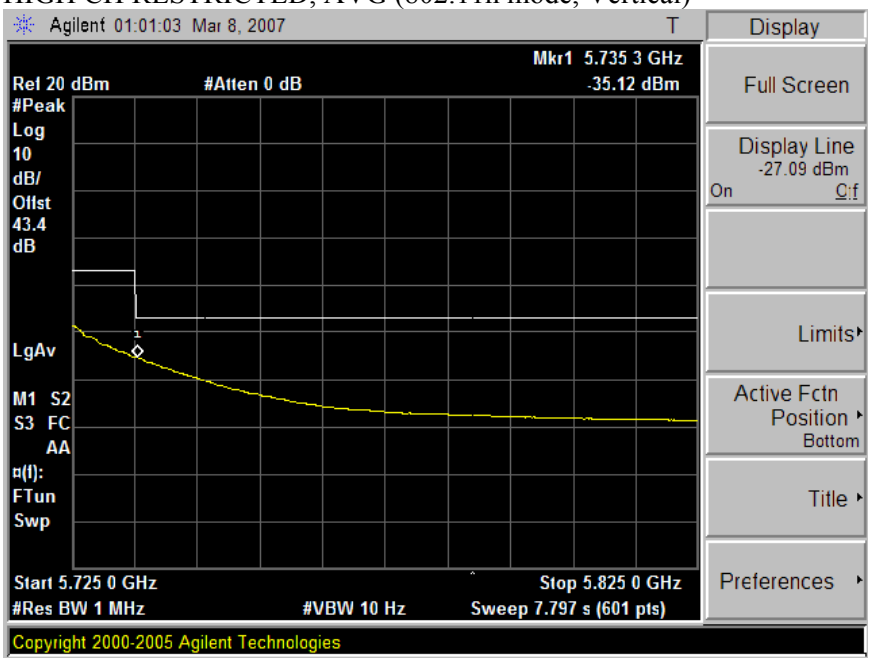


RESTRICTED BANDEDGE (802.11n MODE, HIGH CHANNEL, 5700 MHz - VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11n mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11n mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11n – 20 MHz TX BANDWIDTH)

High Frequency Measurement
Compliance Certification Services, Fremont, A-5m Chamber

Company: Broadcom Corporation
Project #: 07U10893
Date: 04/09/2007
Test Engineer: Vien Tran
Configuration: EUT
Mode: Transmit, 5.6GHz_11n 20 MHz CDD MCS 0

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T60; S/N: 2238 @3m	T144 Miteq 3008A00931			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		Gordon 203134001	HPF_7.6GHz	

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

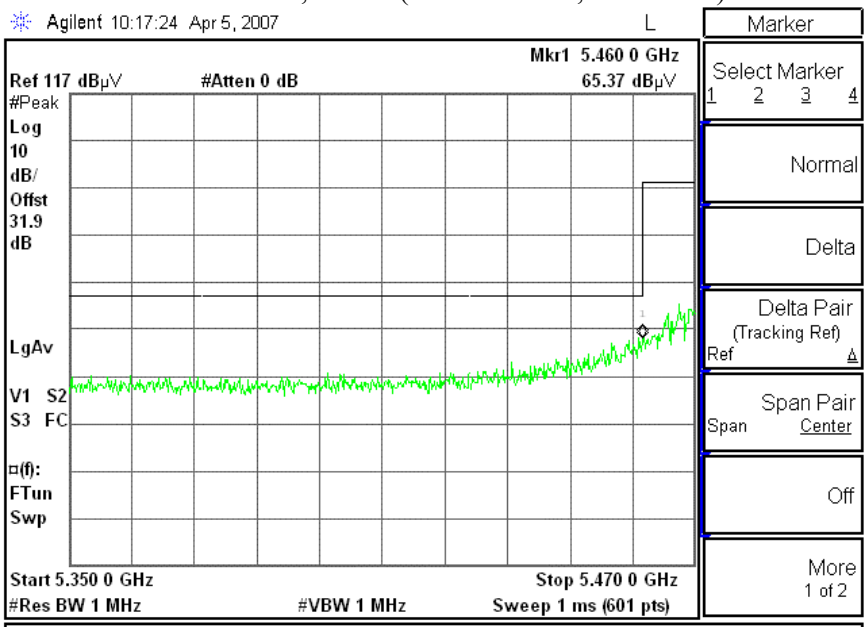
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
CH 100, 5500 MHz															
11.000	3.0	53.8	40.7	37.3	11.1	-36.3	0.0	0.7	66.7	53.6	74	54	-7.3	-0.4	H
11.000	3.0	51.6	39.3	37.3	11.1	-36.3	0.0	0.7	64.5	52.2	74	54	-9.5	-1.8	V
CH 120, 5600 MHz															
11.200	3.0	53.2	40.4	37.3	11.3	-36.1	0.0	0.7	66.5	53.6	74	54	-7.5	-0.4	H
11.200	3.0	51.1	38.9	37.3	11.3	-36.1	0.0	0.7	64.4	52.2	74	54	-9.6	-1.8	V
CH140, 5700 MHz															
11.400	3.0	52.8	40.2	37.4	11.5	-35.9	0.0	0.7	66.5	53.9	74	54	-7.5	-0.1	H
11.400	3.0	51.0	39.0	37.4	11.5	-35.9	0.0	0.7	64.7	52.7	74	54	-9.3	-1.3	V

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		

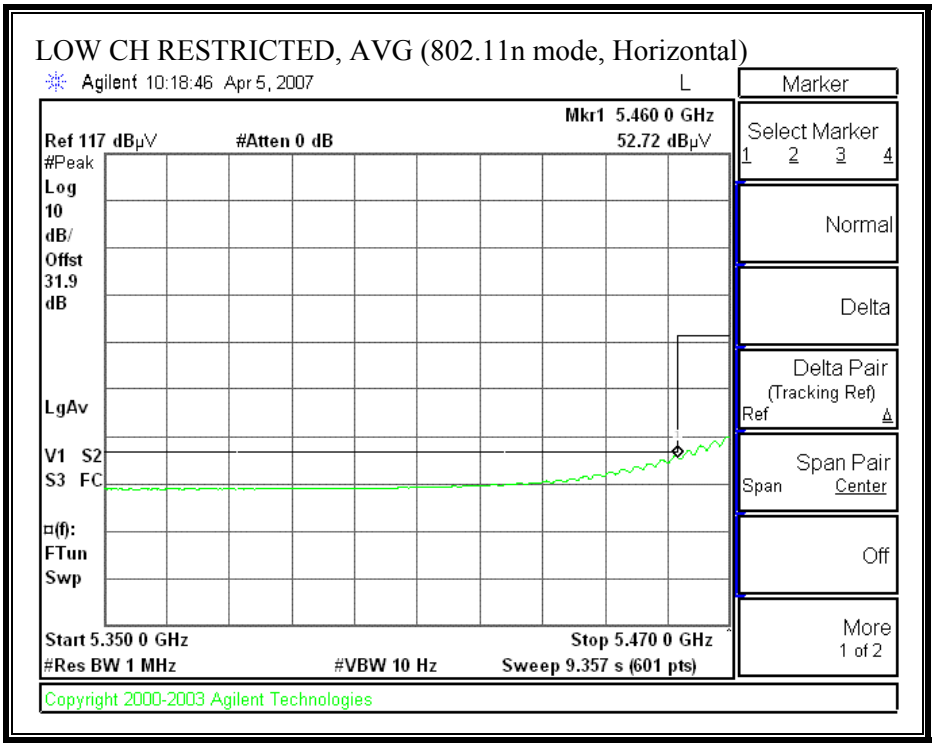
802.11n 40 MHz CDD MCS 32 MODE

RESTRICTED BANDEDGE (LOW CHANNEL, 5510 MHz - HORIZONTAL)

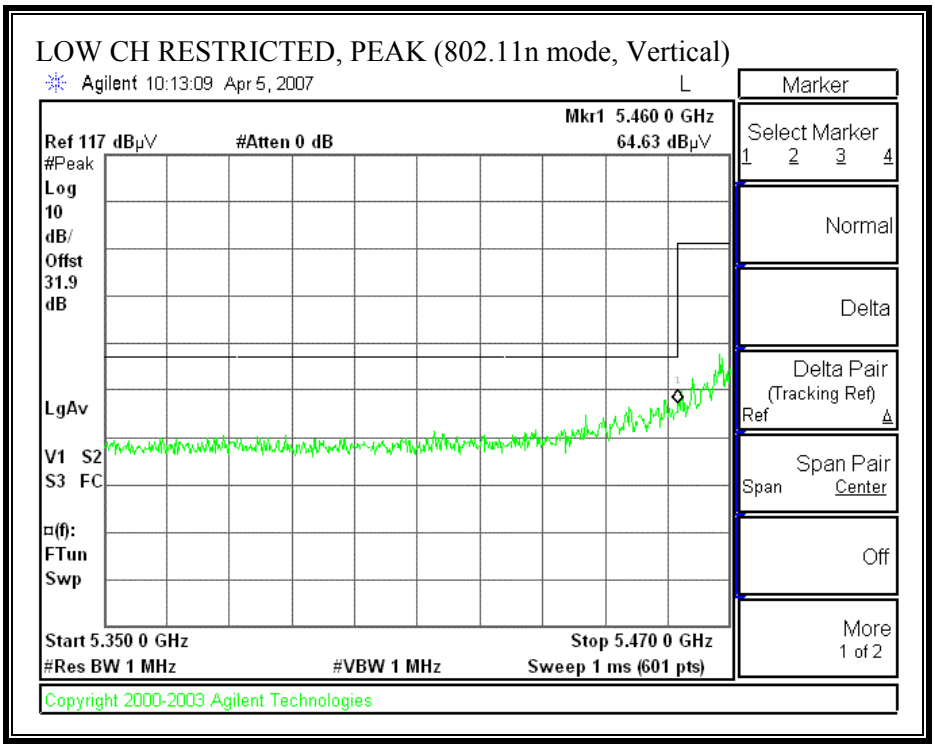
LOW CH RESTRICTED, PEAK (802.11n mode, Horizontal)



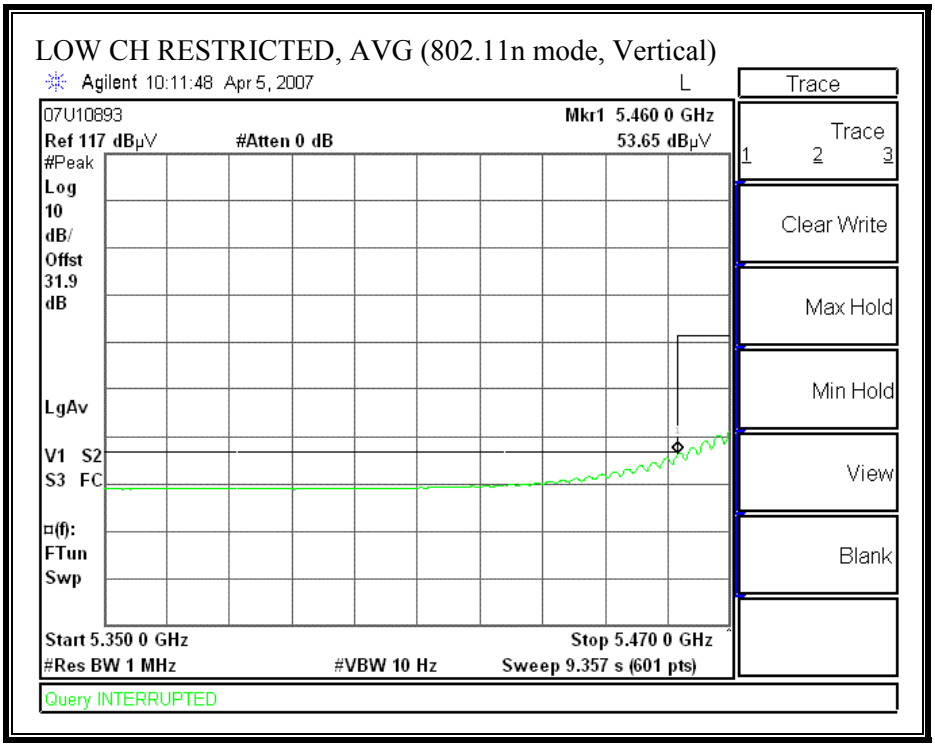
LOW CH RESTRICTED, AVG (802.11n mode, Horizontal)



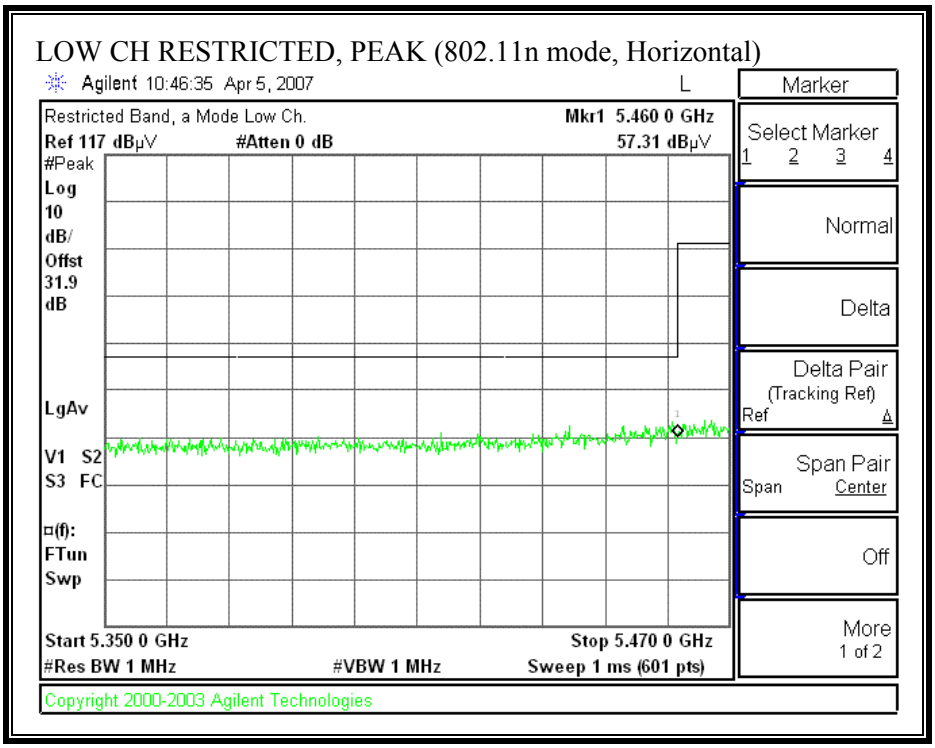
RESTRICTED BANDEDGE (802.11n MODE, LOW CHANNEL, 5510 MHz - VERTICAL)



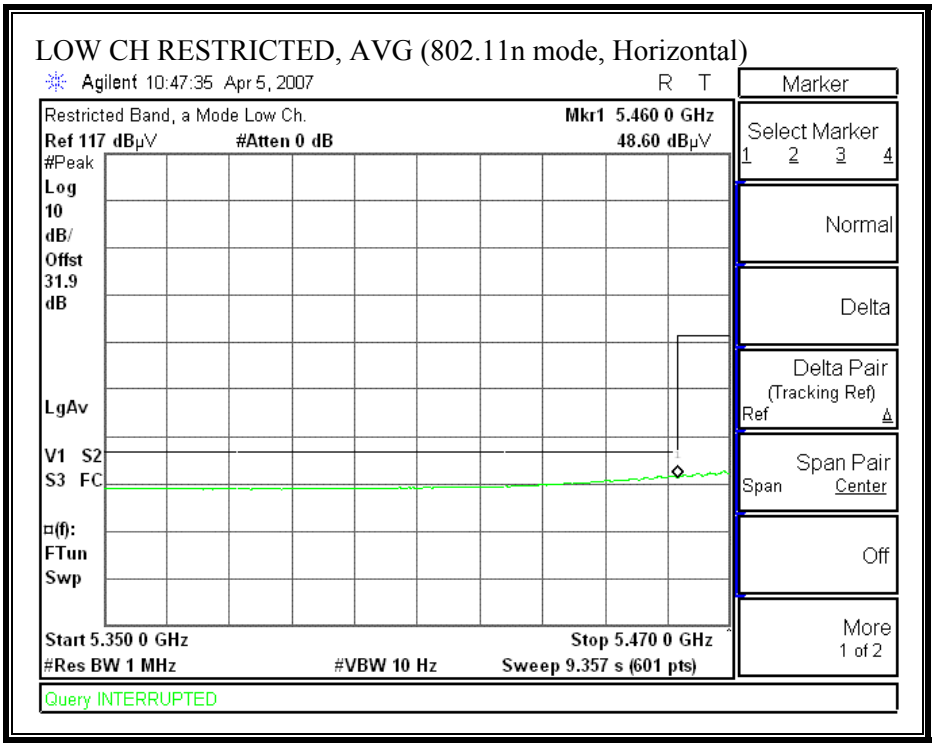
LOW CH RESTRICTED, AVG (802.11n mode, Vertical)



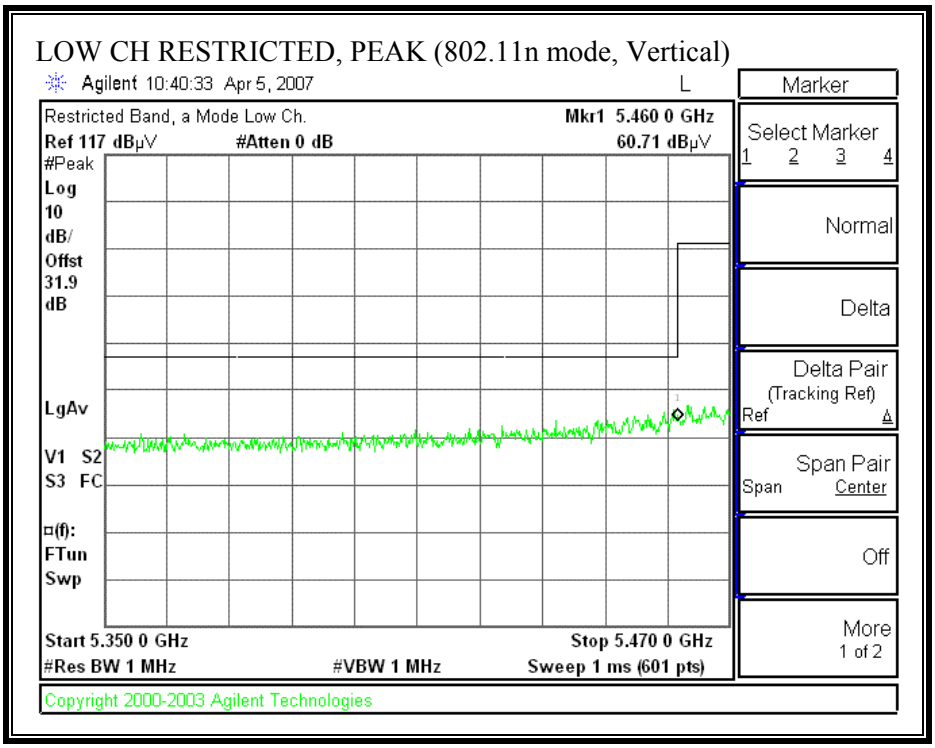
RESTRICTED BANDEDGE (LOW CHANNEL, 5550 MHz - HORIZONTAL)



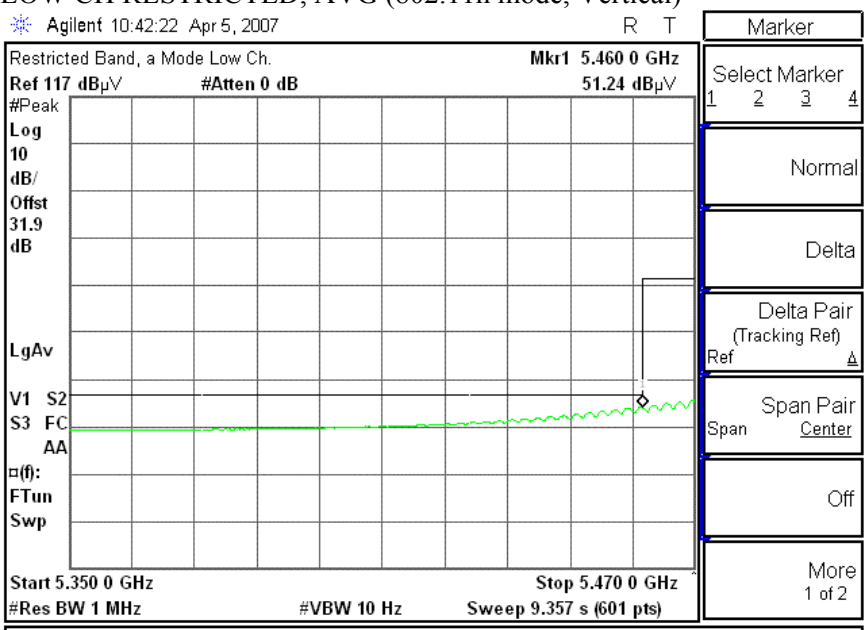
LOW CH RESTRICTED, AVG (802.11n mode, Horizontal)



RESTRICTED BANDEDGE (802.11n MODE, LOW CHANNEL, 5550 MHz - VERTICAL)

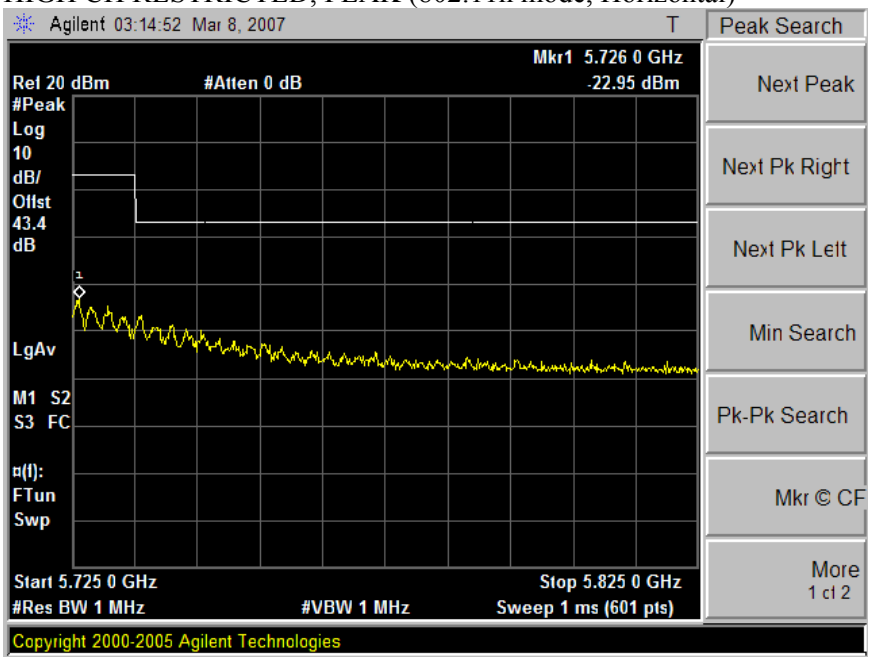


LOW CH RESTRICTED, AVG (802.11n mode, Vertical)

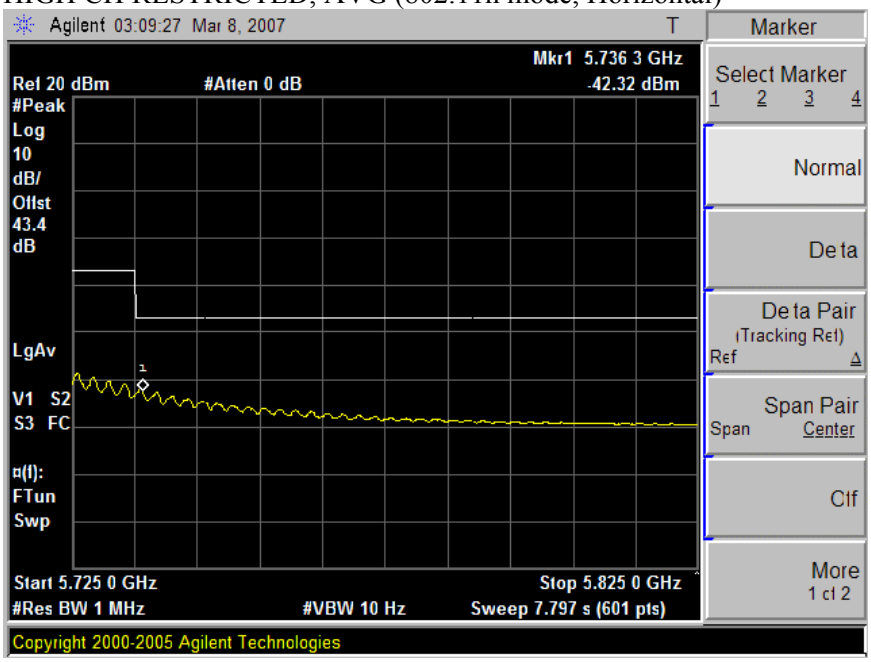


RESTRICTED BANDEDGE (802.11n MODE, HIGH CHANNEL, 5670 MHz - HORIZONTAL)

HIGH CH RESTRICTED, PEAK (802.11n mode, Horizontal)

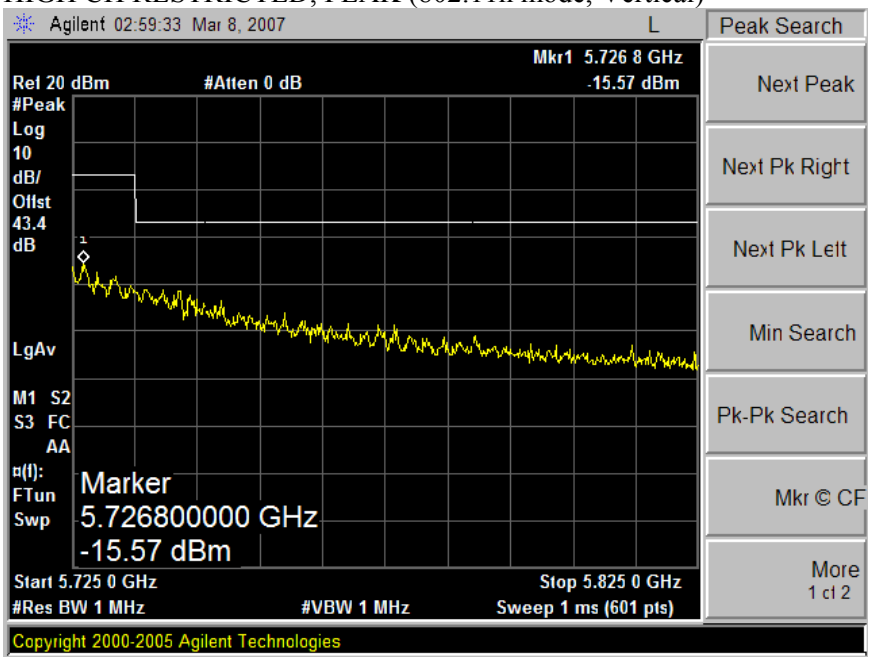


HIGH CH RESTRICTED, AVG (802.11n mode, Horizontal)

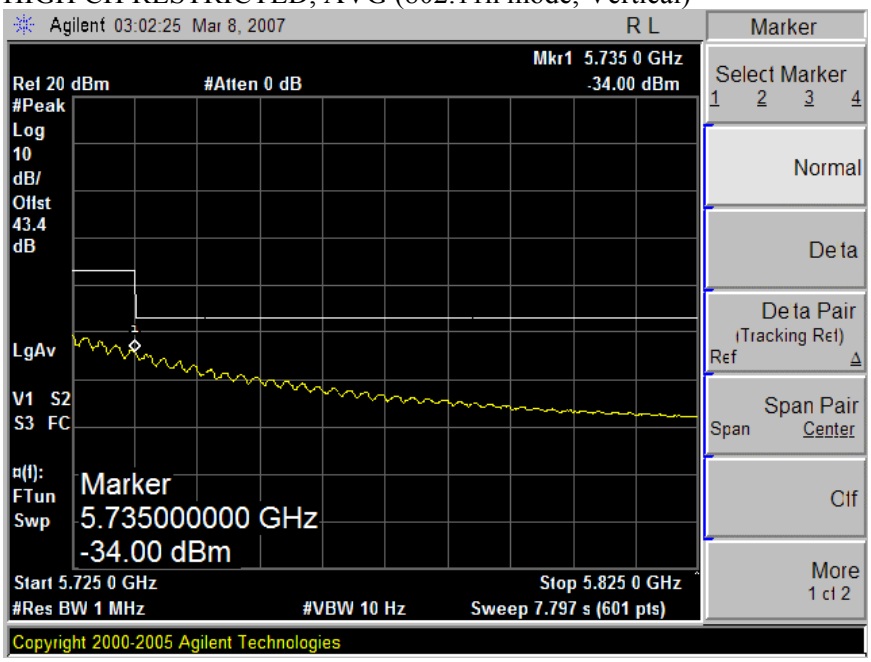


RESTRICTED BANDEDGE (802.11n MODE, HIGH CHANNEL, 5670 MHz - VERTICAL)

HIGH CH RESTRICTED, PEAK (802.11n mode, Vertical)



HIGH CH RESTRICTED, AVG (802.11n mode, Vertical)



HARMONICS AND SPURIOUS EMISSIONS (802.11n – 40 MHz TX BANDWIDTH)

High Frequency Measurement
Compliance Certification Services, Fremont, A-5m Chamber

Company: Broadcom Corporation
Project #: 07U10893
Date: 3/23/2007
Test Engineer: Vien Tran
Configuration: EUT
Mode: Transmit, 5.5GHz_11n 40 MHz SDM MCS 32

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T119; S/N: 29301 @3m	T34 HP 8449B			FCC 15.209

Hi Frequency Cables

2 foot cable	3 foot cable	12 foot cable	HPF	Reject Filter
		Gordon 203134001	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	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
CH 102, 5510 MHz															
11.020	3.0	49.9	37.6	37.0	11.1	-32.6	0.0	0.7	66.2	53.9	74	54	-7.8	-0.1	H
11.020	3.0	44.1	34.3	37.0	11.1	-32.6	0.0	0.7	60.4	50.6	74	54	-13.6	-3.4	V
CH 118, 5590 MHz															
11.180	3.0	46.7	35.3	37.1	11.3	-32.6	0.0	0.7	63.2	51.8	74	54	-10.8	-2.2	H
11.180	3.0	42.5	32.6	37.1	11.3	-32.6	0.0	0.7	59.0	49.1	74	54	-15.0	-4.9	V
CH134, 5670 MHz															
11.340	3.0	46.4	34.9	37.1	11.5	-32.6	0.0	0.7	63.1	51.6	74	54	-10.9	-2.4	H
11.340	3.0	42.3	32.2	37.1	11.5	-32.6	0.0	0.7	59.0	48.9	74	54	-15.0	-5.1	V

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		

7.3.4. WORST-CASE RADIATED EMISSIONS BELOW 1 GHz

HORIZONTAL DATA

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 13 File#: 06u10708.emi Date: 12-08-2006 Time: 15:47:39
Audix ATC

Condition: FCC CLASS-B HORIZONTAL
Test Operator:: Vien Tran
Company: : Broadcom
Project #: : 06U10708
Configuration:: EUT / Laptop
Mode of Oper.:: Tx Worst Case 5.2 GHz Band
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	201.690	23.54	14.32	37.86	43.50	-5.64	Peak
2	337.490	20.55	16.56	37.11	46.00	-8.89	Peak
3	434.490	18.23	18.84	37.07	46.00	-8.93	Peak
4	516.940	16.85	20.48	37.32	46.00	-8.68	Peak
5	633.340	17.26	22.05	39.31	46.00	-6.69	Peak
6	897.180	17.10	25.85	42.95	46.00	-3.05	Peak

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

VERTICAL DATA

561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0888
Fax: (408) 463-0885

Data#: 11 File#: 06u10708.emi Date: 12-08-2006 Time: 15:30:42
Audix ATC

Condition: FCC CLASS-B VERTICAL
Test Operator:: Vien Tran
Company: : Broadcom
Project #: : 06U10708
Configuration:: EUT / Laptop
Mode of Oper.:: Tx Worst Case 5.2 GHz Band
Target: : FCC Class B

Page: 1

	Freq	Read Level	Factor	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dBuV/m	dBuV/m	dB	
1	279.290	18.64	14.93	33.57	46.00	-12.43	Peak
2	402.480	18.35	18.11	36.46	46.00	-9.54	Peak
3	482.990	20.39	19.89	40.28	46.00	-5.72	Peak
4	516.940	18.58	20.48	39.05	46.00	-6.95	Peak
5	565.440	17.65	21.05	38.70	46.00	-7.30	Peak
6	997.090	14.38	26.91	41.29	54.00	-12.71	Peak

7.4. POWERLINE CONDUCTED EMISSIONS

LIMIT

§15.207 (a) Except as shown in paragraphs (b) and (c) of this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

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 resolution bandwidth is set to 9 kHz for both peak detection and quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

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

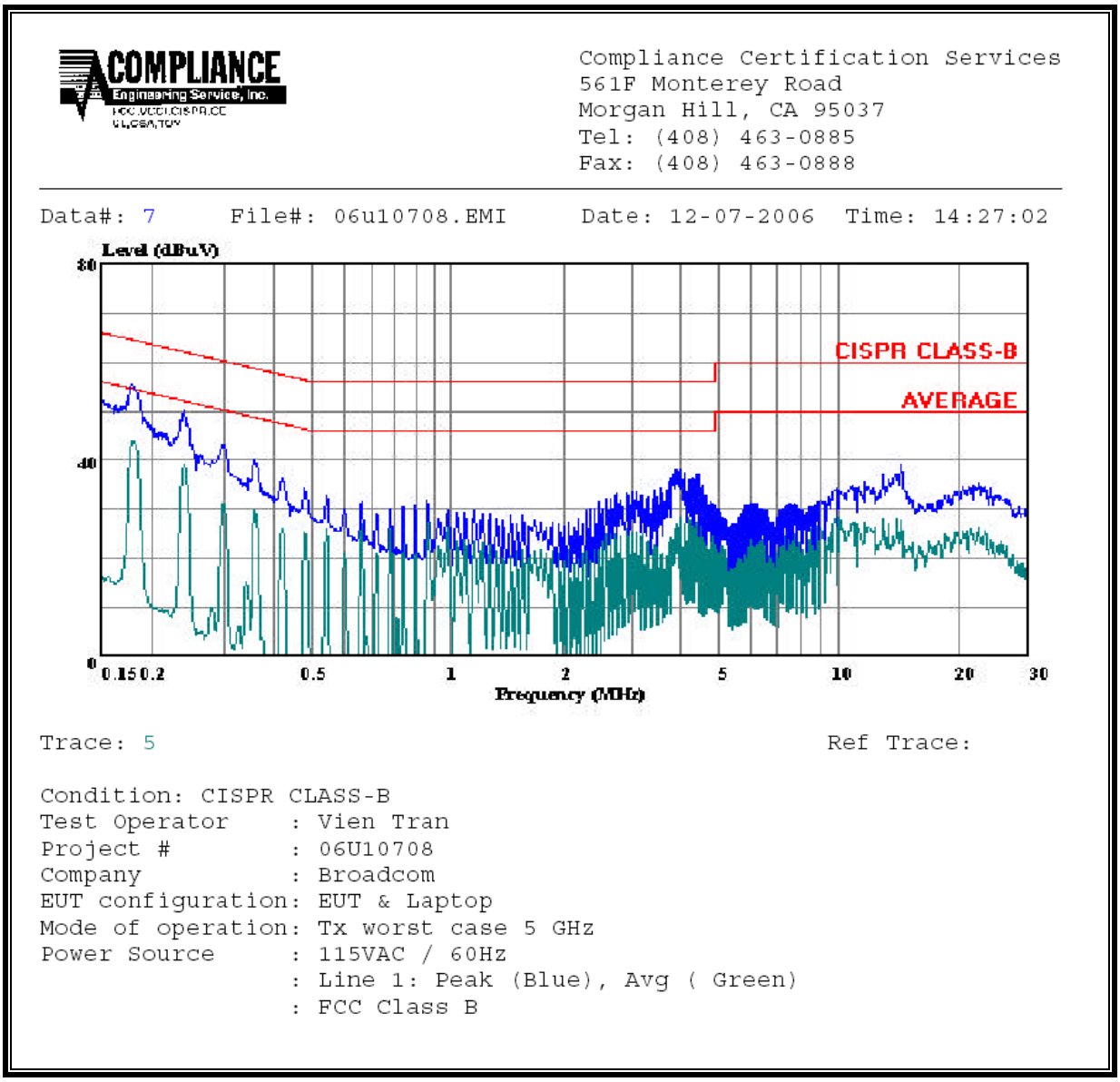
RESULTS

No non-compliance noted:

6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	FCC_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.18	55.32	--	44.00	0.00	64.49	54.49	-9.17	-10.49	L1
0.24	50.36	--	38.98	0.00	62.10	52.10	-11.74	-13.12	L1
4.05	37.97	--	28.50	0.00	56.00	46.00	-18.03	-17.50	L1
0.18	51.51	--	39.12	0.00	64.49	54.49	-12.98	-15.37	L2
0.24	42.85	--	20.62	0.00	62.10	52.10	-19.25	-31.48	L2
4.05	35.63	--	18.90	0.00	56.00	46.00	-20.37	-27.10	L2
6 Worst Data									

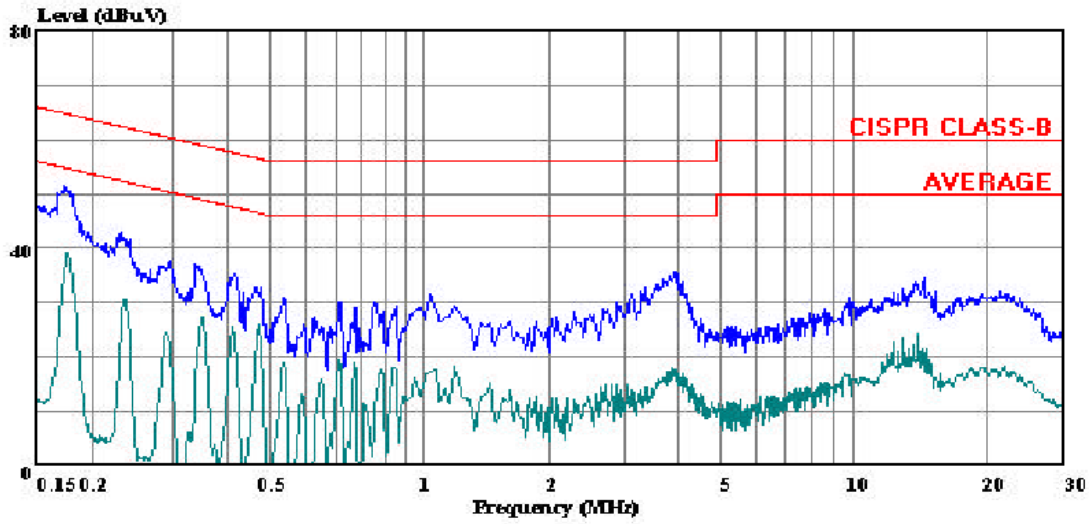
LINE 1 RESULTS



LINE 2 RESULTS

Compliance Certification Services
561F Monterey Road
Morgan Hill, CA 95037
Tel: (408) 463-0885
Fax: (408) 463-0888

Data#: 28 File#: 06u10708.EMI Date: 12-07-2006 Time: 15:30:52



Trace: 26 Ref Trace:

Condition: CISPR CLASS-B
Test Operator : Vien Tran
Project # : 06U10708
Company : Broadcom
EUT configuration: EUT & Laptop
Mode of operation: Tx worst case 5 GHz
Power Source : 115VAC / 60Hz
: Line 2: Peak (Blue), Avg (Green)
: FCC Class B

8. DYNAMIC FREQUENCY SELECTION

8.1. OVERVIEW

8.1.1. LIMITS

§15.407 (h) and FCC 06-96 APPENDIX "COMPLIANCE MEASUREMENT PROCEDURES FOR UNLICENSED-NATIONAL INFORMATION INFRASTRUCTURE DEVCIES OPERATING IN THE 5250-5350 MHz AND 5470-5725 MHz BANDS INCORPORATING DYNAMIC FREQUENCY SELECTION".

Table 1: Applicability of DFS requirements prior to use of a channel

Requirement	**Operational Mode**		
	Master	**Client (without radar detection)**	**Client (with radar detection)**
Non-Occupancy Period	Yes	Not required	Yes
DFS Detection Threshold	Yes	Not required	Yes
Channel Availability Check Time	Yes	Not required	Not required
Uniform Spreading	Yes	Not required	Not required

Table 2: Applicability of DFS requirements during normal operation

Requirement	**Operational Mode**		
	Master	**Client** (without DFS)	**Client** (with DFS)
DFS Detection Threshold	Yes	Not required	Yes
Channel Closing Transmission Time	Yes	Yes	Yes
Channel Move Time	Yes	Yes	Yes

Table 3: Interference Threshold values, Master or Client incorporating In-Service Monitoring

Maximum Transmit Power	**Value (see note)**
≥ 200 milliwatt	-64 dBm
< 200 milliwatt	-62 dBm
Note 1: This is the level at the input of the receiver assuming a 0 dBi receive antenna Note 2: Throughout these test procedures an additional 1 dB has been added to the amplitude of the test transmission waveforms to account for variations in measurement equipment. This will ensure that the test signal is at or above the detection threshold level to trigger a DFS response.	

Table 4: DFS Response requirement values

Parameter	**Value**
Non-occupancy period	30 minutes
Channel Availability Check Time	60 seconds
Channel Move Time	10 seconds
Channel Closing Transmission Time	200 milliseconds + approx. 60 milliseconds over remaining 10 second period
The instant that the *Channel Move Time* and the *Channel Closing Transmission Time* begins is as follows: • For the Short pulse radar Test Signals this instant is the end of the *Burst*. • For the Frequency Hopping radar Test Signal, this instant is the end of the last radar burst generated. • For the Long Pulse radar Test Signal this instant is the end of the 12 second period defining the radar transmission. The Channel Closing Transmission Time is comprised of 200 milliseconds starting at the beginning of the Channel Move Time plus any additional intermittent control signals required to facilitate channel changes (an aggregate of approximately 60 milliseconds) during the remainder of the 10 second period. The aggregate duration of control signals will not count quiet periods in between transmissions.	

Table 5 – Short Pulse Radar Test Waveforms

Radar Type	Pulse Width (Microseconds)	PRI (Microseconds)	Pulses	Minimum Percentage of Successful Detection	Minimum Trials
1	1	1428	18	60%	30
2	1-5	150-230	23-29	60%	30
3	6-10	200-500	16-18	60%	30
4	11-20	200-500	12-16	60%	30
Aggregate (Radar Types 1-4)				80%	120

Table 6 – Long Pulse Radar Test Signal

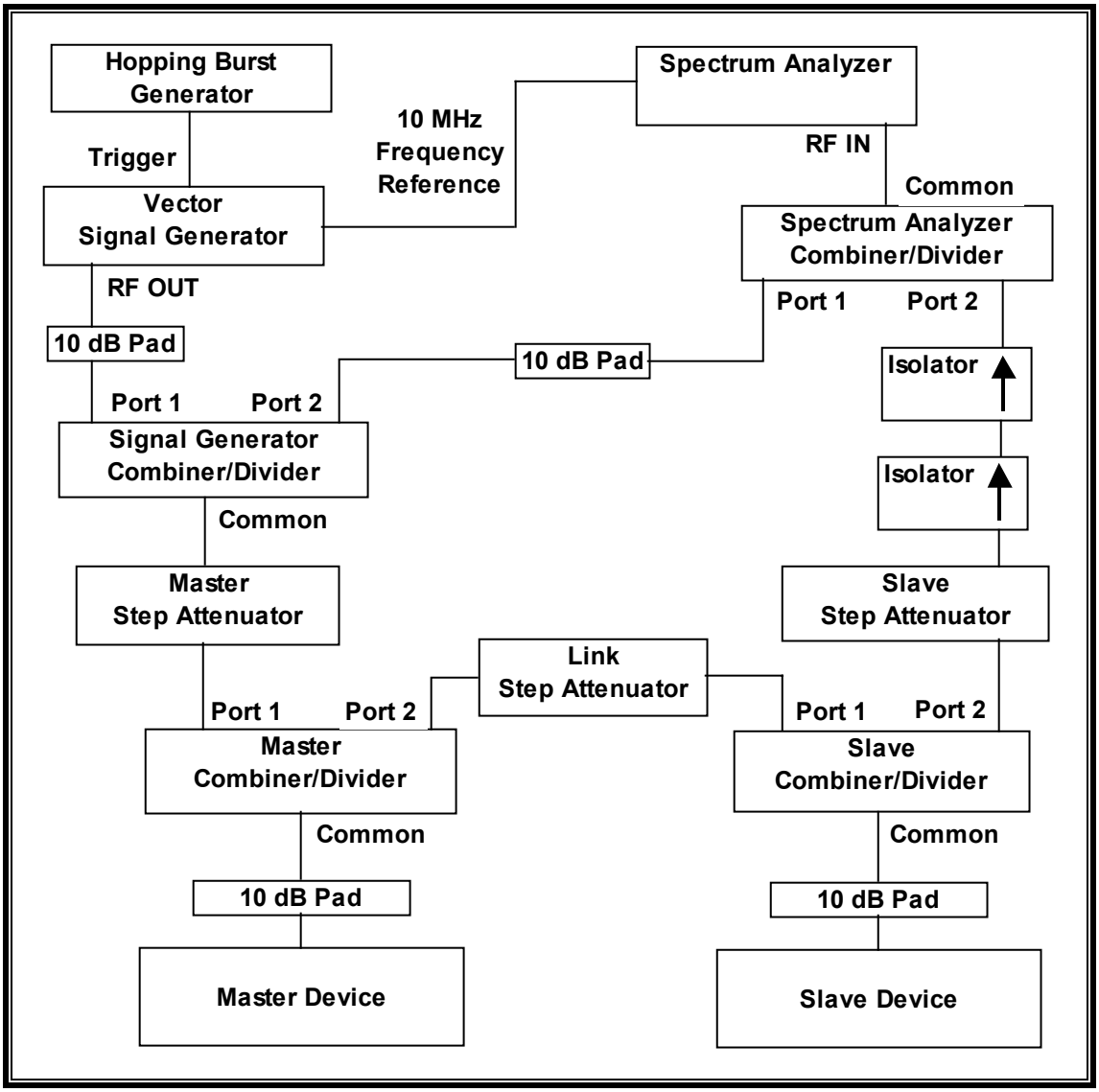
Radar Waveform	Bursts	Pulses per Burst	Pulse Width (µsec)	Chirp Width (MHz)	PRI (µsec)	Minimum Percentage of Successful Detection	Minimum Trials
5	8-20	1-3	50-100	5-20	1000-2000	80%	30

Table 7 – Frequency Hopping Radar Test Signal

Radar Waveform	Pulse Width (µsec)	PRI (µsec)	Burst Length (ms)	Pulses per Hop	Hopping Rate (kHz)	Minimum Percentage of Successful Detection	Minimum Trials
6	1	333	300	9	.333	70%	30

8.1.2. TEST AND MEASUREMENT SYSTEM

CONDUCTED METHOD SYSTEM BLOCK DIAGRAM



SYSTEM OVERVIEW

The short pulse and long pulse signal generating system utilizes the NTIA software. The Vector Signal Generator has been validated by the NTIA. The hopping signal generating system utilizes the CCS simulated hopping method and system, which has been validated by the DoD, FCC and NTIA. The software selects waveform parameters from within the bounds of the signal type on a random basis using uniform distribution.

The short pulse types 2, 3 and 4, and the long pulse type 5 parameters are randomized at run-time.

The hopping type 6 pulse parameters are fixed while the hopping sequence is based on the August 2005 NTIA Hopping Frequency List. The initial starting point randomized at run-time and each subsequent starting point is incremented by 475. Each frequency in the 100-length segment is compared to the boundaries of the EUT Detection Bandwidth and the software creates a hopping burst pattern in accordance with Section 7.4.1.3 Method #2 Simulated Freqeuncy Hopping Radar Waveform Generating Subsystem of FCC 06-96 APPENDIX. The frequency of the signal generator is incremented in 1 MHz steps from F_L to F_H for each successive trial. This incremental sequence is repeated as required to generate a minimum of 30 total trials and to maintain a uniform frequency distribution over the entire Detection Bandwidth.

The signal monitoring equipment consists of a spectrum analyzer set to display 8001 bins on the horizontal axis. The time-domain resolution is 2 msec / bin with a 16 second sweep time, meeting the 10 second short pulse reporting criteria. The aggregate ON time is calculated by multiplying the number of bins above a threshold during a particular observation period by the dwell time per bin, with the analyzer set to peak detection and max hold.

Should multiple RF ports be utilized for the Master and/or Slave devices (for example, for diversity or MIMO implementations), additional combiner/dividers are inserted between the Master Combiner/Divider and the pad connected to the Master Device (and/or between the Slave Combiner/Divider and the pad connected to the Slave Device). Additional pads are utilized such that there is one pad at each RF port on each EUT.

SYSTEM CALIBRATION

A 50 ohm load is connected in place of the spectrum analyzer, and the spectrum analyzer is connected in place of the master device and the signal generator is set to CW mode. The amplitude of the signal generator is adjusted to yield a level of –64 dBm as measured on the spectrum analyzer.

Without changing any of the instrument settings, the spectrum analyer is reconnected to the Common port of the Spectrum Analyzer Combiner/Divider. Measure the amplitude and calculate the difference from –64 dBm. Adjust the Reference Level Offset of the spectrum analyzer to this difference.

The spectrum analyzer displays the level of the signal generator as received at the antenna ports of the Master Device. The interference detection threshold may be varied from the calibrated value of –64 dBm and the spectrum analyzer will still indicate the level as received by the Master Device.

Set the signal generator to produce a radar waveform, trigger a burst manually and measure the level on the spectrum analyzer. Readjust the amplitude of the signal generator as required so that the peak level of the waveform is at a displayed level equal to the required or desired interference detection threshold. Separate signal generator amplitude settings are determined as required for each radar type.

ADJUSTMENT OF DISPLAYED TRAFFIC LEVEL

Establish a link between the Master and Slave, adjusting the Link Step Attenuator as needed to provide a suitable received level at the Master and Slave devices. Stream the video test file to generate WLAN traffic. Confirm that the WLAN traffic level, as displayed on the spectrum analyzer, is at lower amplitude than the radar detection threshold. For Master Device testing confirm that the displayed traffic does not include Slave Device traffic. For Slave Device testing confirm that the displayed traffic does not include Master Device traffic.

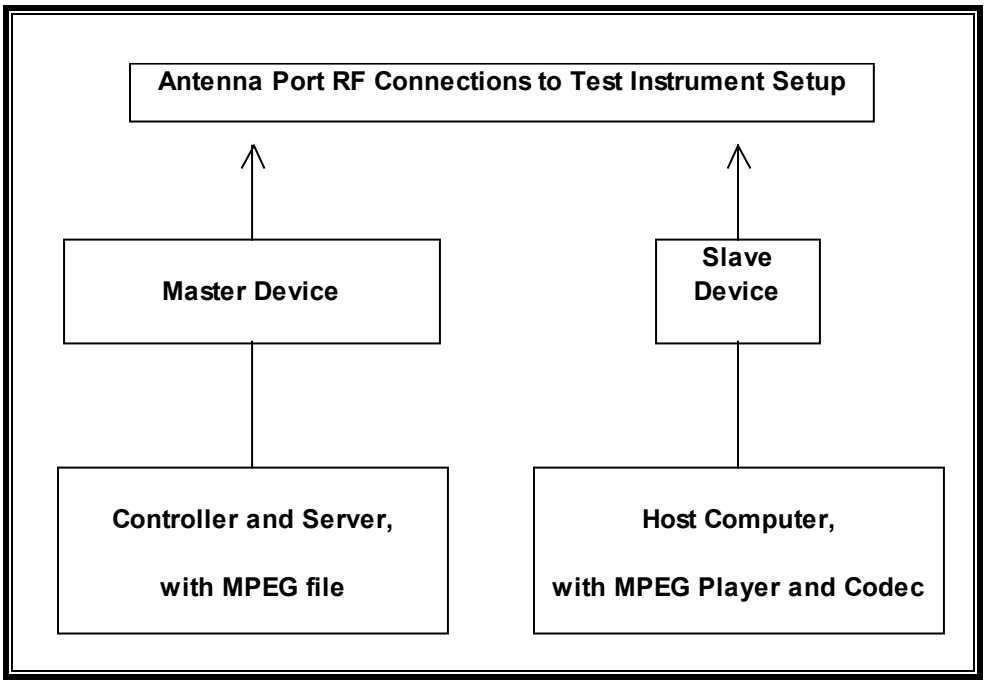
If a different setting of the Master Step Attenuator is required to meet the above conditions, perform a new System Calibration for the new Master Step Attenuator setting.

TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**Cal Due**
Spectrum Analyzer 3 Hz ~ 44 GHz	Agilent / HP	E4446A	US42070220	7/29/2007
Vector Signal Generator 250kHz-20GHz	Agilent / HP	E8267C	US43320336	11/2/2007
High Speed Digital I/O Card	National Instruments	PCI-6534	HA1612845	1/16/2008

CONDUCTED METHOD EUT TEST SETUP



SUPPORT EQUIPMENT

The sample test was serial number 1112186.

SUPPORT EQUIPMENT

The following test and measurement equipment was utilized for the 20 MHz bandwidth DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	DELL	Dell Inspiron 4150	CN-04P449-48643-2CH-2011	DoC
AC Adapter	DELL	ADP-70EB	TH-09364U-17971-248-8PDP	DoC
Laptop	Compaq	Presario 3000	CNU327025L	DoC
AC Adapter	Compaq	PA-1900-05H	3300371601	DoC
Access Point	CISCO	AIR-AP1242AG-A-K9	FTX1042B5E0	LDK102056
AC Adapter	Delta	ADP-18PB	PZT0628359656	DoC

The following test and measurement equipment was utilized for the 40 MHz bandwidth DFS tests documented in this report:

PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop	HP	PA-1121-12HD	PPP017L	DoC
AC Adapter	HP	HP Pavilion zv6000	CND52904s1	DoC
Laptop	DELL	ADP-70EB	TH-09364U-17971-248-8PDP	DoC
AC Adapter	DELL	Dell Inspiron 4150	CN-04P449-48643-2CH-2011	DoC
Access Point	Broadcom	BCM94705LMP	Prototype	QDS-BRCM1025
AC Adapter	Bothhand	M1-10S05	R00031106975B	DoC

8.1.3. DESCRIPTION OF EUT WITH RESPECT TO FCC 06-96 REQUIREMENTS

The EUT operates over the 5250-5350 MHz and 5470-5725 MHz ranges.

The EUT is a Slave Device without radar detection.

The highest power level within these bands is 27.37 dBm EIRP in the 5250-5350 MHz band and 28.5 dBm EIRP in the 5470-5725 MHz band.

The main antenna assembly utilized with the EUT has a gain of 6.23 dBi for the 5250-5350 MHz band and 6.02 dBi in the 5470-5725 MHz band. The aux antenna assembly utilized with the EUT has a gain of 5.02 dBi for the 5250-5350 MHz band and 5.44 dBi in the 5470-5725 MHz band.

All antennas are integral.

Two non-identical antennas are utilized to meet the MIMO transmit diversity operational requirements.

The EUT uses two transmitters, each connected to a 50-ohm coaxial antenna port. Both antenna ports are connected to the test system via a power divider to perform conducted tests.

WLAN traffic is generated by streaming the video file TestFile.mp2 “6 ½ Magic Hours” from the Master to the Slave in full motion video mode using the media player with the V2.61 Codec package.

TPC is required since the maximum EIRP is greater than 500 mW (27 dBm).

The EUT utilizes the 802.11a / 802.11Draft n architecture. Two nominal channel bandwidths, 20 MHz and 40 MHz, are implemented.

DESCRIPTION OF TPC FUNCTION

The power level can be reduced to a conducted level of 15 dBm, which yields a maximum EIRP of 23.7 dBm, which is less than the 24 dBm EIRP limit for TPC level.

OVERVIEW OF MASTER DEVICE UTILIZED FOR 20 MHz BANDWIDTH TESTS WITH RESPECT TO §15.407 (h) REQUIREMENTS

The Master Device is a Cisco Access Point, FCC ID: LDK102056. The DFS software installed in the Master Device is revision 6.00.1. The minimum antenna gain for the Master Device is 3.5 dBi.

The rated output power of the Master unit is > 23dBm (EIRP). Therefore the required interference threshold level is –64 dBm. After correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is –64 + 2 + 1 = -61 dBm.

The calibrated conducted DFS Detection Threshold level is set to –64 dBm. The tested level is lower than the required level hence it provides margin to the limit.

OVERVIEW OF MASTER DEVICE UTILIZED FOR 40 MHz BANDWIDTH TESTS WITH RESPECT TO §15.407 (h) REQUIREMENTS

The Master Device is a Broadcom Access Point, FCC ID: QDS-BRCM1025. The DFS software installed in the Master Device is revision PO_4_100_22_2. The minimum antenna gain for the Master Device is 3 dBi.

The rated output power of the Master unit is < 23 dBm (EIRP). Therefore the required interference threshold level is –62 dBm. After correction for antenna gain and procedural adjustments, the required conducted threshold at the antenna port is –62 + 3 + 1 = -58dBm.

The calibrated conducted DFS Detection Threshold level is set to –64 dBm. The tested level is lower than the required level hence it provides margin to the limit.

8.2. RESULTS FOR 20 MHz BANDWIDTH CONFIGURATION

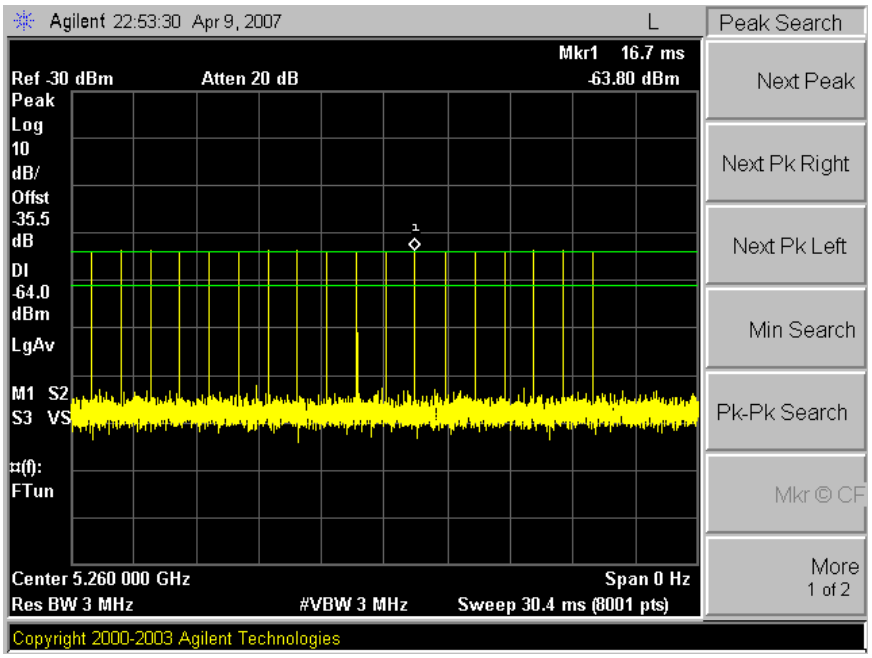
8.2.1. TEST CHANNEL AND METHOD

All tests were performed at a channel center frequency of 5260 MHz. Measurements were performed using conducted test methods.

8.2.2. PLOTS OF RADAR WAVEFORM, AND WLAN TRAFFIC

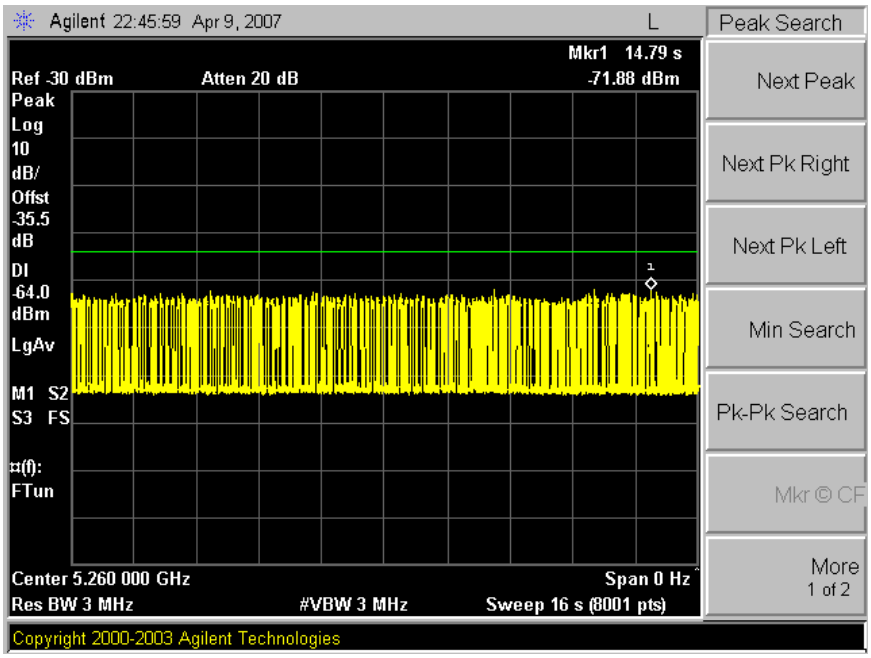
PLOTS OF RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 1



PLOT OF WLAN TRAFFIC FROM SLAVE

WLAN TRAFFIC



8.2.3. CHANNEL MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =
(Number of analyzer bins showing transmission) * (dwell time per bin)

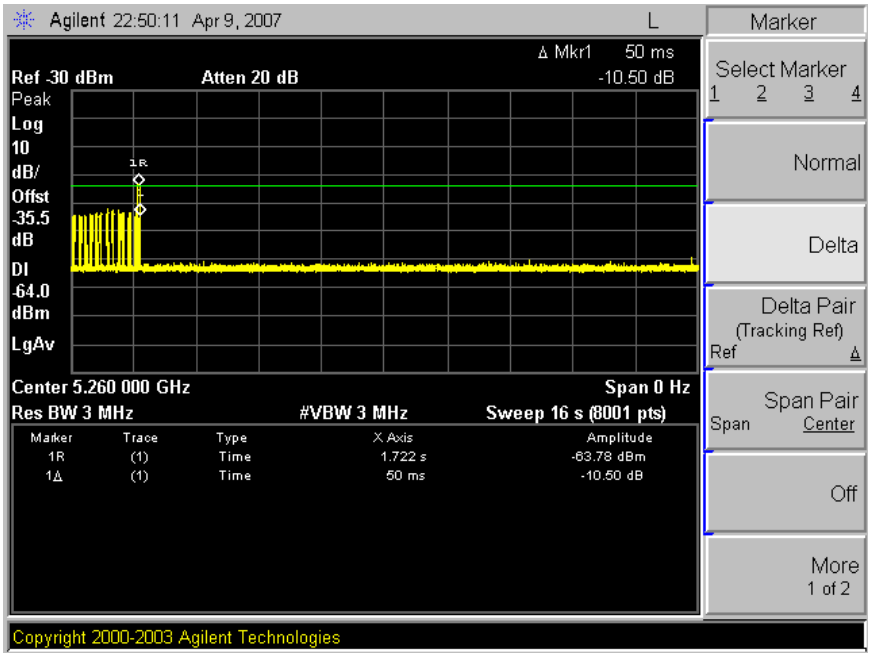
The observation period over which the aggregate time is calculated
Begins at (Reference Marker + 200 msec)
and
Ends no earlier than (Reference Marker + 10 sec).

CHANNEL MOVE TIME RESULTS

No non-compliance noted:

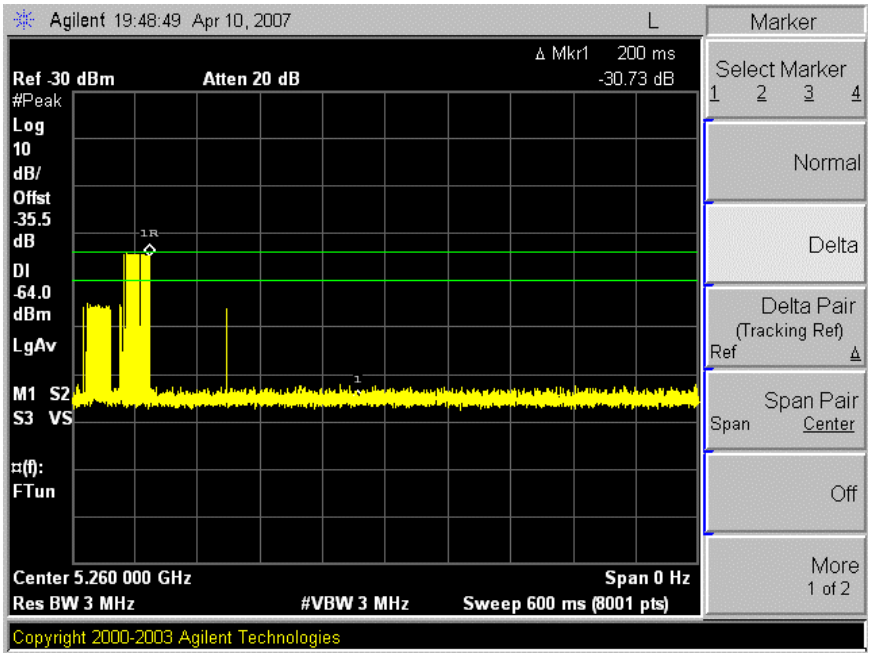
Channel Move Time (s)	Limit (s)
0.000	10

MOVE TIME PLOT



CHANNEL CLOSING TIME RESULTS

CLOSING TIME PLOT



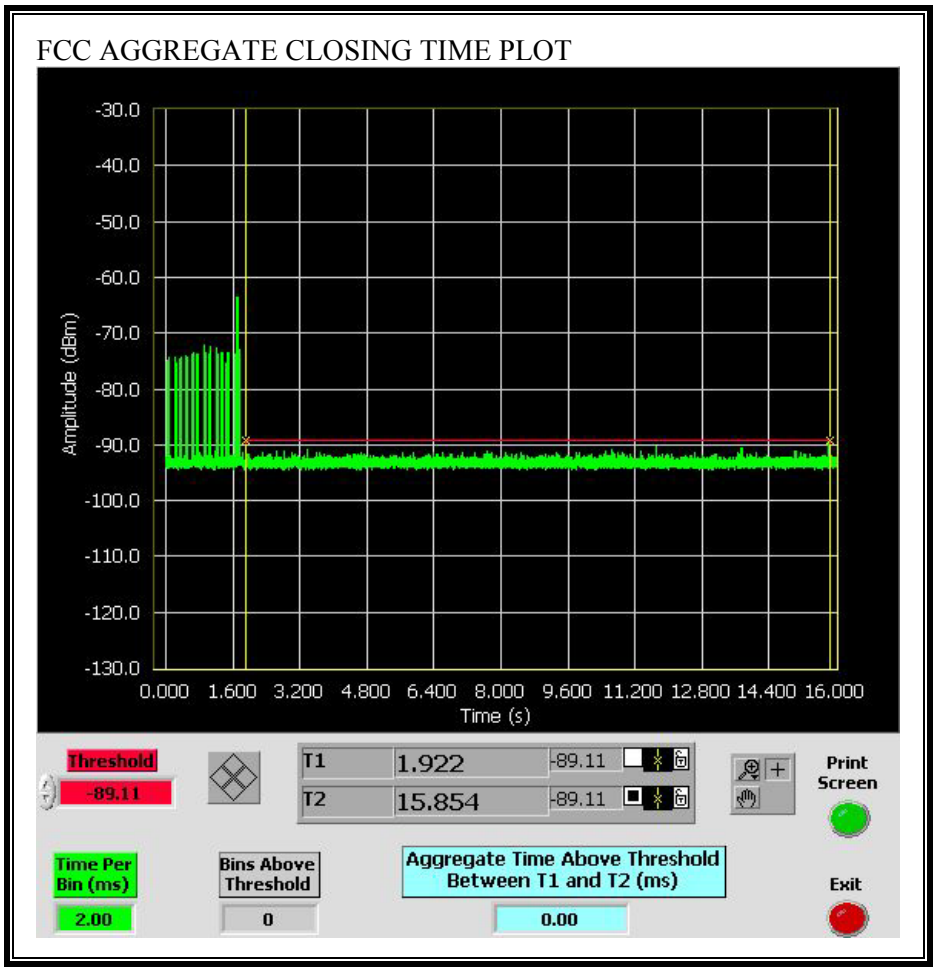
FCC AGGREGATE CHANNEL CLOSING TRANSMISSION TIME RESULTS

No non-compliance noted:

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
0.00	60	60.00

No transmissions are observed during the aggregate monitoring period.

FCC AGGREGATE CLOSING TIME PLOT



8.3. RESULTS FOR 40 MHz BANDWIDTH CONFIGURATION

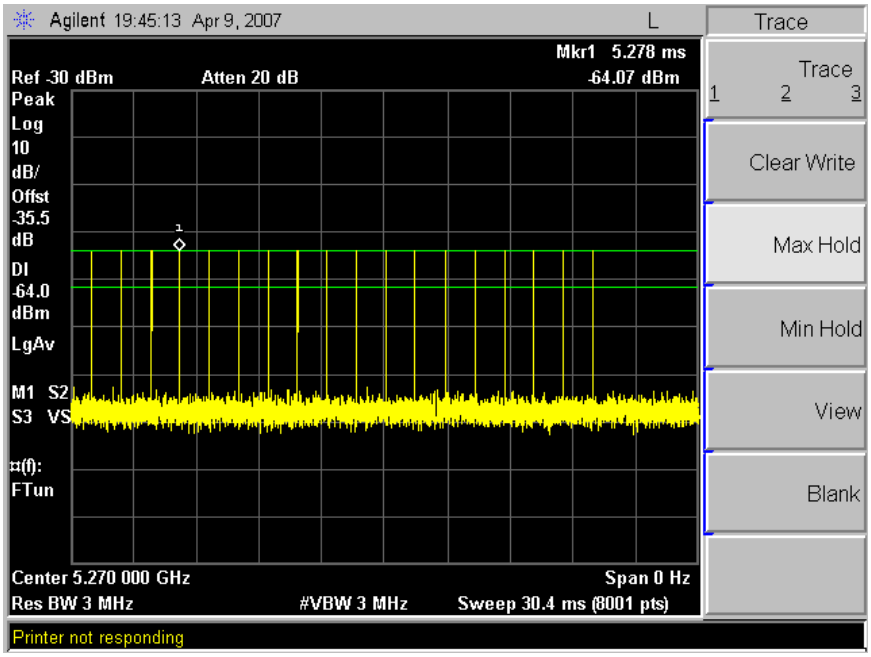
8.3.1. TEST CHANNEL AND METHOD

All tests were performed at a channel center frequency of 5270 MHz. Measurements were performed using conducted test methods.

8.3.2. PLOTS OF RADAR WAVEFORM, AND WLAN TRAFFIC

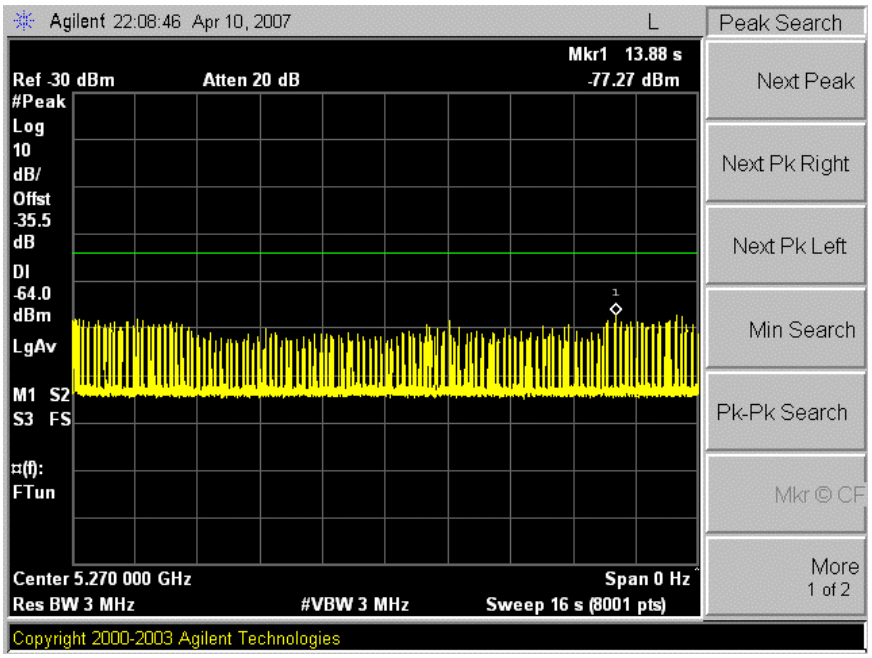
PLOTS OF RADAR WAVEFORMS

SHORT PULSE RADAR TYPE 1



PLOT OF WLAN TRAFFIC FROM SLAVE

WLAN TRAFFIC



8.3.3. MOVE TIME AND CHANNEL CLOSING TRANSMISSION TIME

REPORTING NOTES

The reference marker is set at the end of last radar pulse.

The delta marker is set at the end of the last WLAN transmission following the radar pulse. This delta is the channel move time.

The aggregate channel closing transmission time is calculated as follows:

Aggregate Transmission Time =
(Number of analyzer bins showing transmission) * (dwell time per bin)

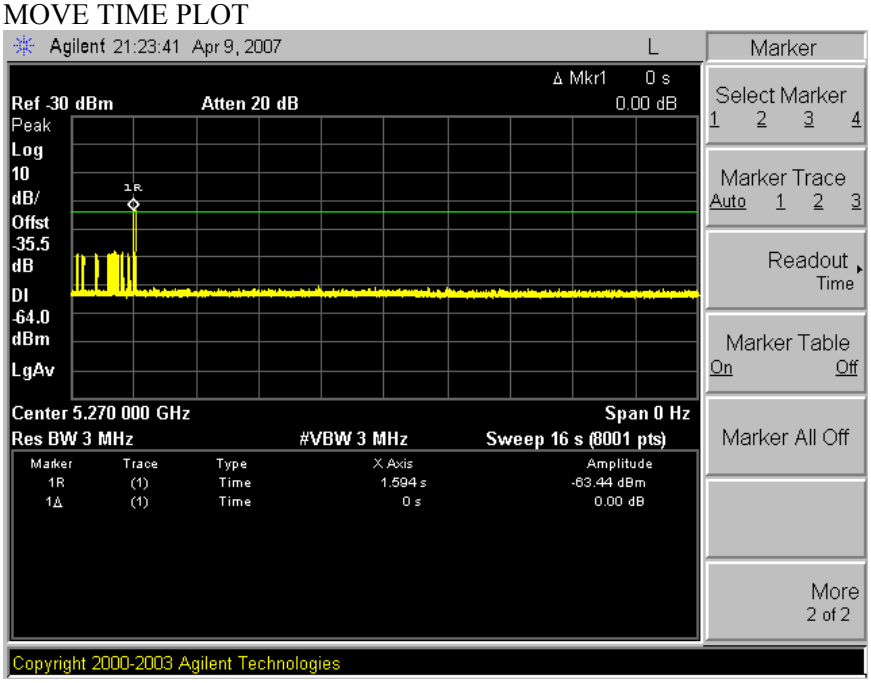
The observation period over which the aggregate time is calculated
Begins at (Reference Marker + 200 msec)
and
Ends no earlier than (Reference Marker + 10 sec).

CHANNEL MOVE TIME RESULTS

No non-compliance noted:

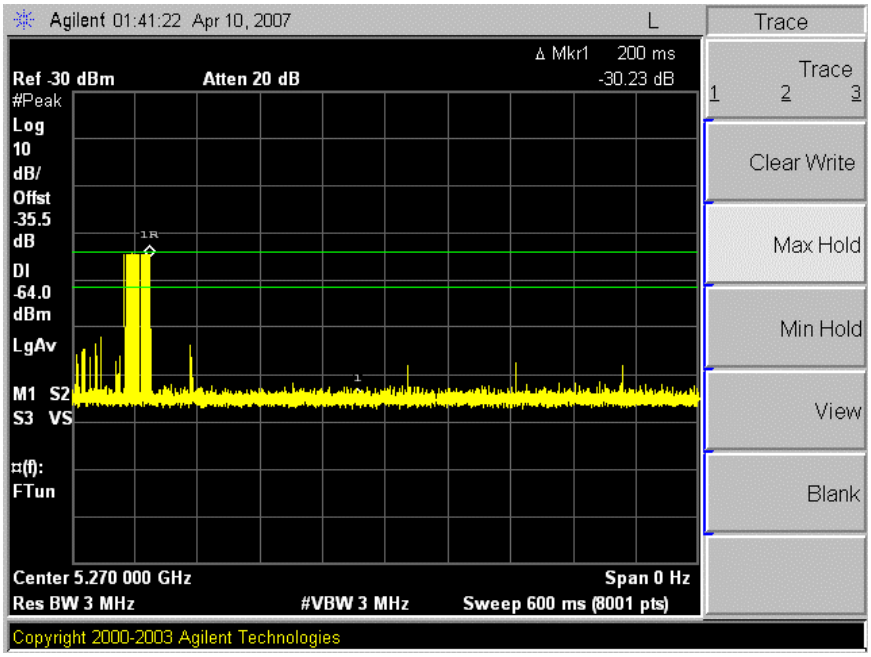
Channel Move Time (s)	Limit (s)
0.000	10

MOVE TIME PLOT



CHANNEL CLOSING TIME RESULTS

CLOSING TIME PLOT



FCC AGGREGATE CHANNEL CLOSING TRANSMISSION TIME RESULTS

No non-compliance noted:

Aggregate Transmission Time (ms)	Limit (ms)	Margin (ms)
0.00	60	60.00

No transmissions are observed during the aggregate monitoring period.

FCC AGGREGATE CLOSING TIME PLOT