FCC CFR47 PART 15 SUBPART E
INDUSTRY CANADA RSS-210 ISSUE 8

CERTIFICATION TEST REPORT

FOR

WIFI 11A/N MODULE

MODEL NUMBER: MIC-A

FCC ID: MCLMICA
IC: 2878D-MICA

REPORT NUMBER: 10J13544-1, REVISION A

ISSUE DATE: DECEMBER 23, 2010

Prepared for
HON HAI PRECISION IND. CO., LTD.
5F-1, 5 HSIN-AN ROAD
HSINCHU SCIENCE-BASED INDUSTRIAL PARK
TAIWAN, R.O.C.

Prepared by
COMPLIANCE CERTIFICATION SERVICES (UL CCS)
47173 BENICIA STREET
FREMONT, CA 94538, U.S.A.
TEL: (510) 771-1000
FAX: (510) 661-0888

NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	12/18/10	Initial Issue	T. Chan
A	12/23/10	Removed Average Output Power Section	T. Chan

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: HON HAI PRECISION IND. CO., LTD.
5F-1, 5 HSIN-AN ROAD
HSINCHU SCIENCE-BASED INDUSTRIAL PARK
TAIWAN, R.O.C.

EUT DESCRIPTION: WIFI 11A/N MODULE

MODEL: MIC-A

SERIAL NUMBER: N/A

DATE TESTED: DECEMBER 9~15, 2010

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart E	Pass
INDUSTRY CANADA RSS-210 Issue 8 Annex 9	Pass
INDUSTRY CANADA RSS-GEN Issue 3	Pass

Compliance Certification Services (UL CCS) tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL CCS based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. 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 UL CCS and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL CCS will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For UL CCS By:

THU CHAN
ENGINEERING MANAGER
UL CCS

Tested By:

TOM CHEN
EMC ENGINEER
UL CCS

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2009, FCC CFR 47 Part 2, FCC CFR 47 Part 15, FCC 06-96, RSS-GEN Issue 3, and RSS-210 Issue 8.

3. FACILITIES AND ACCREDITATION

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

UL 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. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

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

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.52 dB
Radiated Disturbance, 30 to 1000 MHz	4.94 dB

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

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is WIFI Module with 802.11A/HT20/HT40.
The radio module is manufactured by Hon Hai Precision.

5.2. MAXIMUM OUTPUT POWER

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

Frequency Range (MHz)	Mode	Output Power (dBm)	Output Power (mW)
5180 - 5240	802.11a	10.80	12.02
5180 - 5240	802.11n HT20	10.82	12.08
5190 - 5230	802.11n HT40	11.37	13.71

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PiFA antenna for TX/RX diversity, with a maximum gain of 2.3dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT test utility software installed in the host computer during testing was Broadcom test program WLTEST, version: 4.219.93.0, and Driver version is 4.219.93.0.

5.5. WORST-CASE CONFIGURATION AND MODE

The output power was measured at ANT0 since this port output power was higher than ANT1.

The worst-case data rate for each mode is determined to be as follows, based on preliminary tests of the chipset utilized in this radio.

All final tests in the 802.11a mode were made at 6 Mb/s.
All final tests in the 802.11n HT20 SISO mode were made at MCS0.
All final tests in the 802.11n HT40 SISO mode were made at MCS0.

For radiated emissions below 1 GHz the worst-case configuration is determined to be the mode and channel with the highest output power.

To determine the worst-position of highest emissions, the EUT's antenna was investigated for X, Y, Z positions, and the worst position was turned out to be a Y-position with long ends at left side.

5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

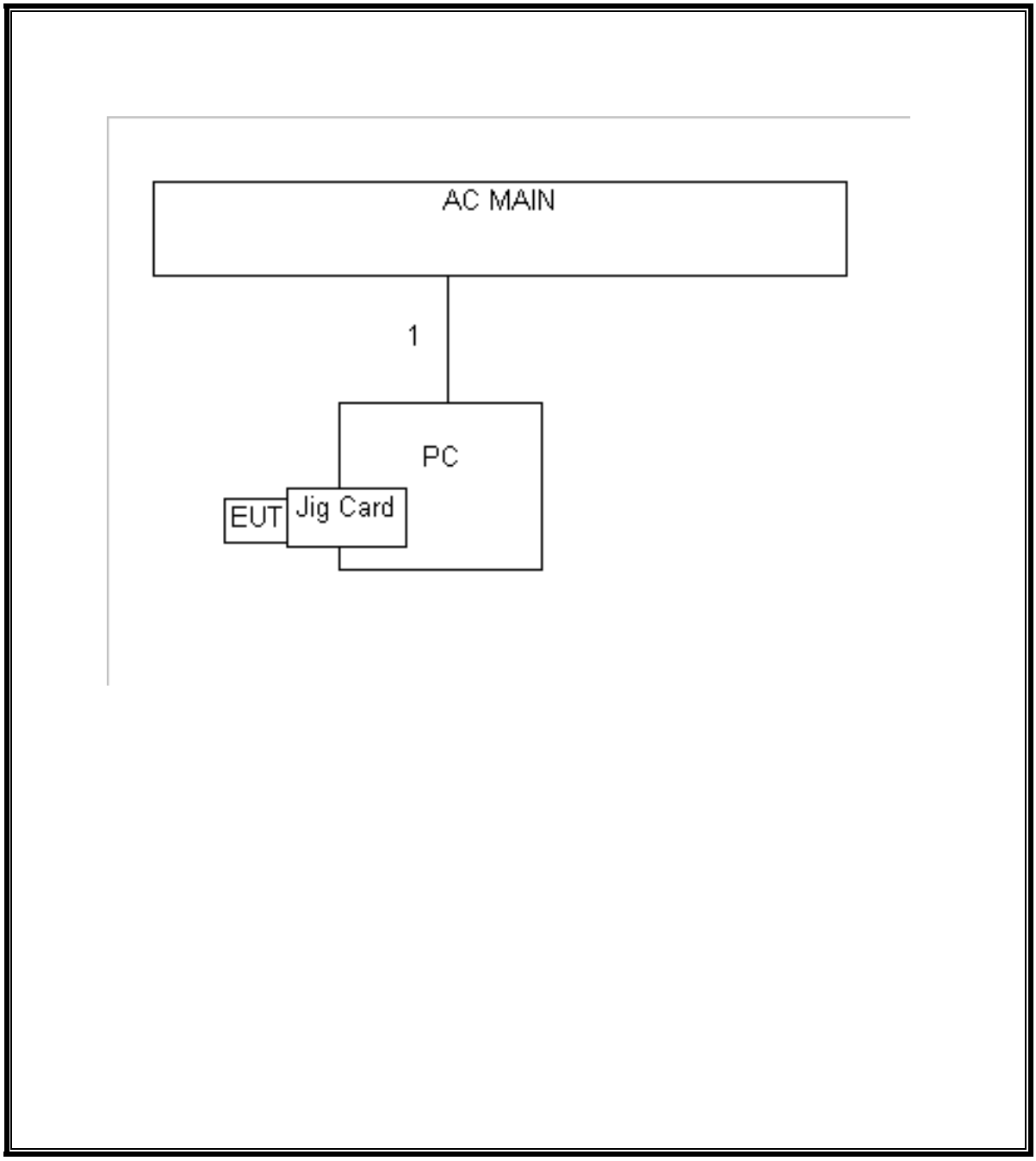
PERIPHERAL SUPPORT EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Laptop PC	DELL	PP09S	27920070721	DOC
AC Adapter	DELL	LA65NS0-00	CN0DF2637161577 5605A	DOC

I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Un-shielded	2m	

TEST SETUP

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01052	07/14/11
Antenna, Horn, 18 GHz	EMCO	3115	C00945	06/29/11
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/06/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01016	07/12/11
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/06/11
EMI Test Receiver, 30 MHz	R & S	ESHS 20	N02396	05/06/11
High Pass Filter, 7.6 GHz	Micro-Tronics	HPM13195	N02682	CNR
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/30/11
Peak Power Meter	Boonton	4541	C01186	03/01/11
Peak Power Sensor	Boonton	57318	C01202	02/23/11

7. ANTENNA PORT TEST RESULTS

7.1. 802.11a MODE IN THE 5.2 GHz BAND

7.1.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

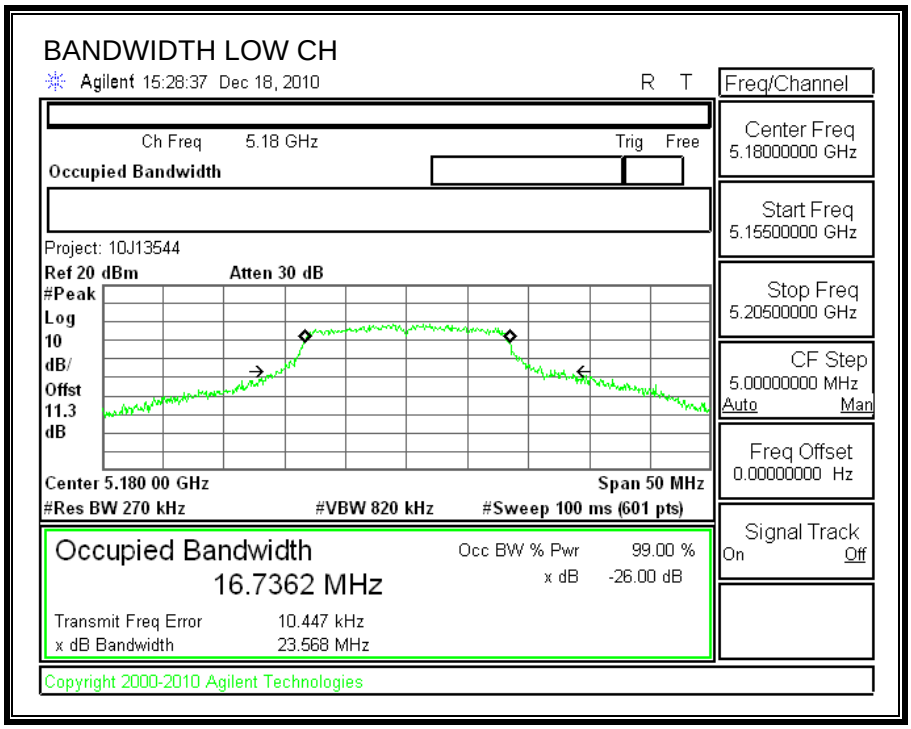
TEST PROCEDURE

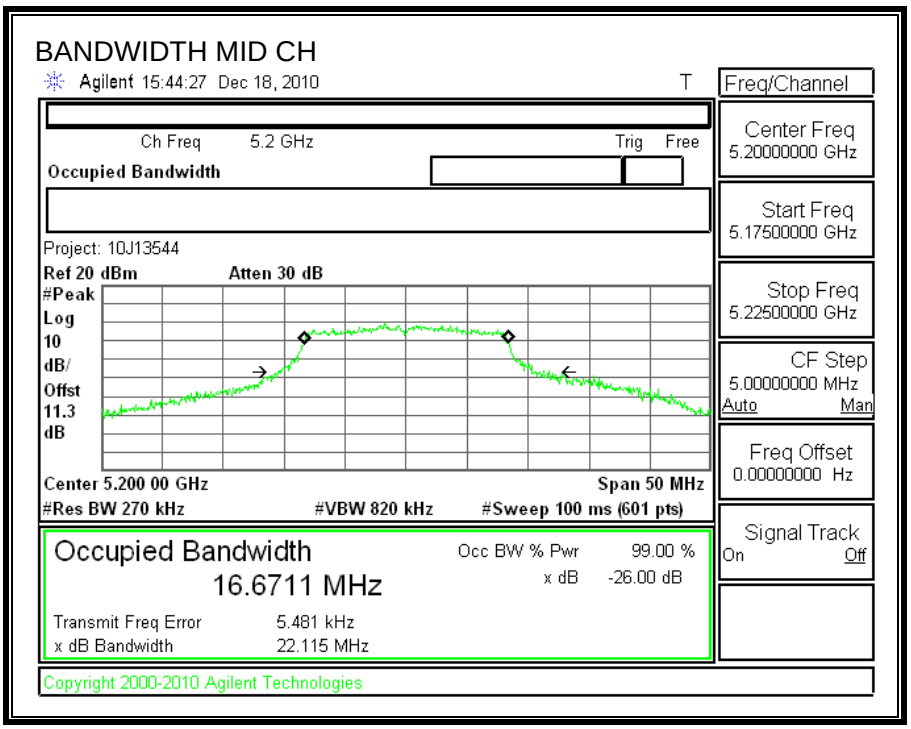
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

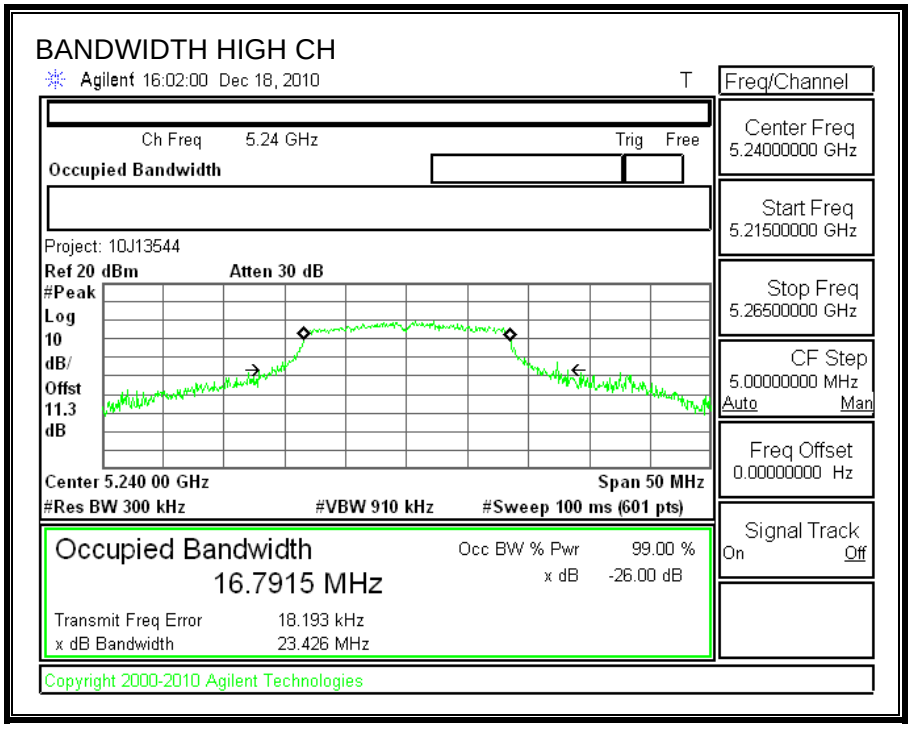
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	23.568	16.3937
Middle	5200	22.115	16.3852
High	5240	23.426	16.3744

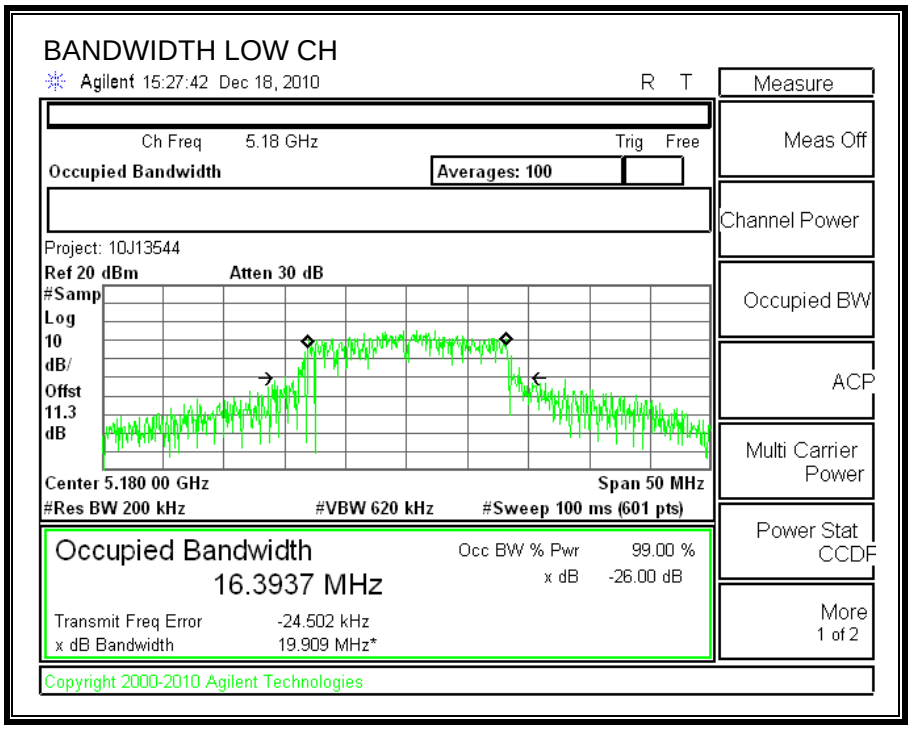
26 dB BANDWIDTH

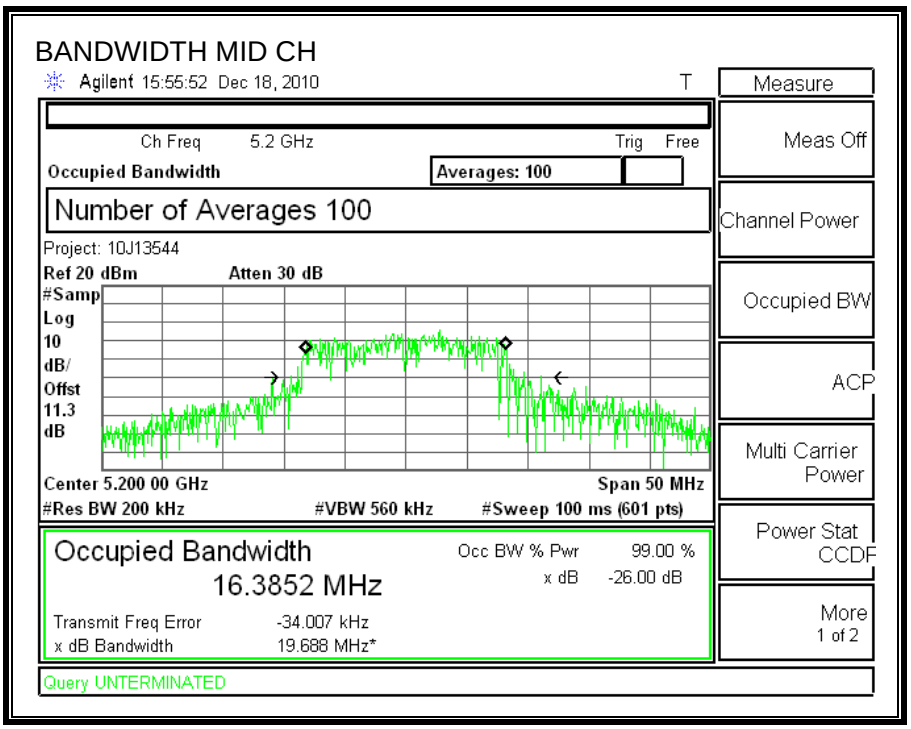


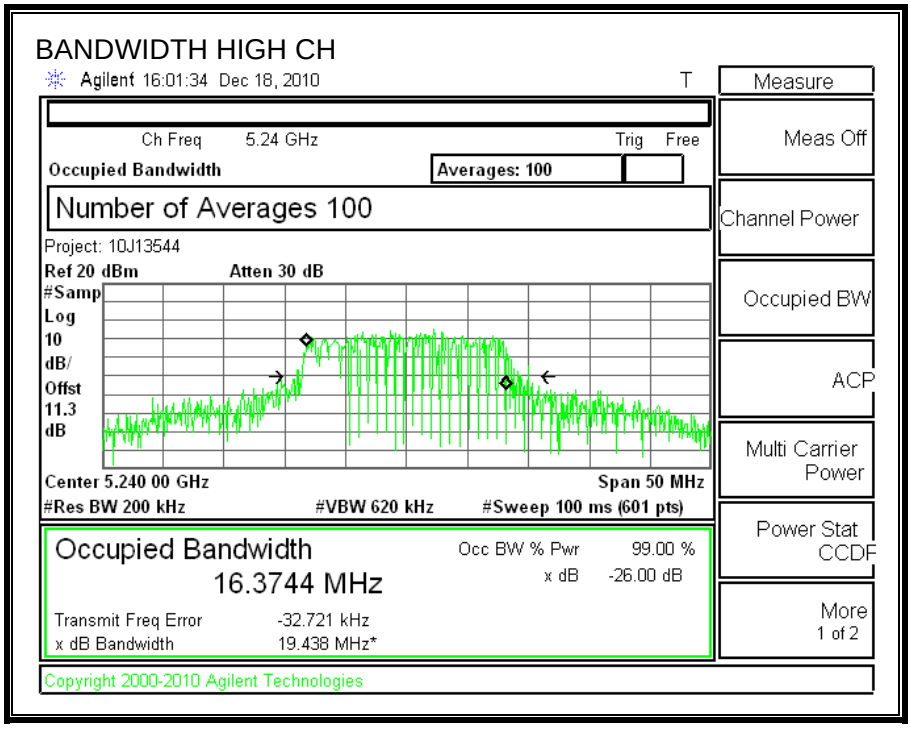




99% BANDWIDTH







7.1.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 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.

RESULTS

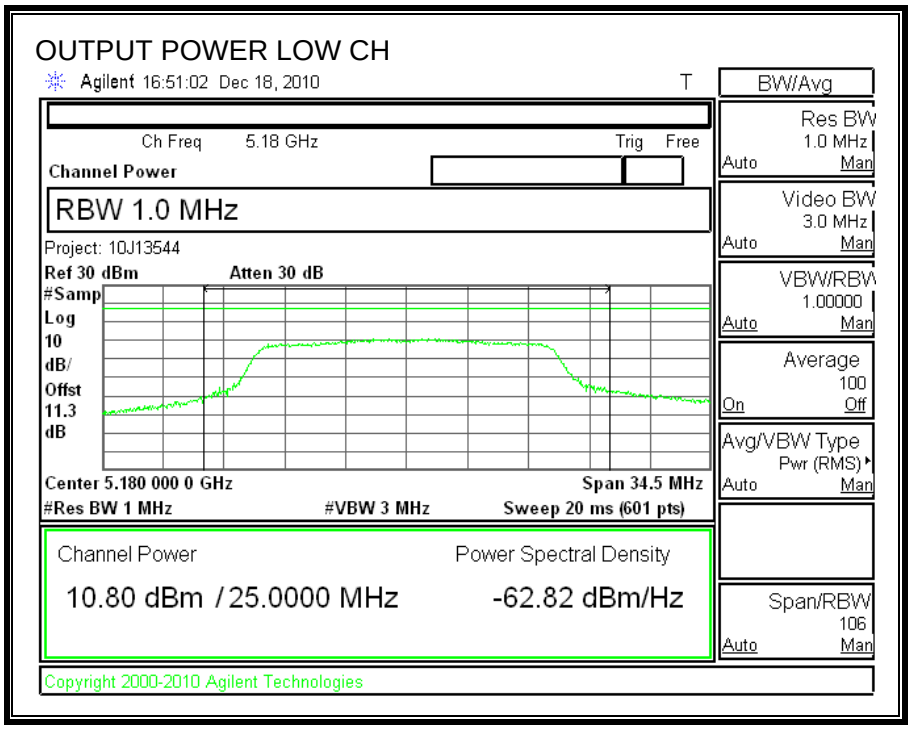
Limit

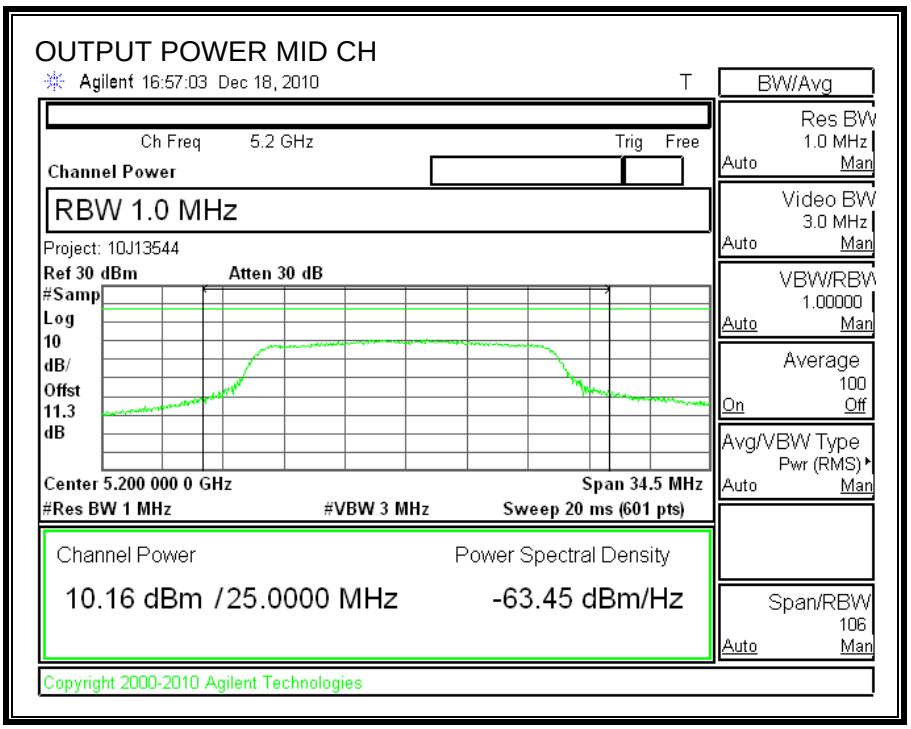
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	23.60	17.73	2.30	17.00
Mid	5200	17	22.10	17.44	2.30	17.00
High	5240	17	23.43	17.70	2.30	17.00

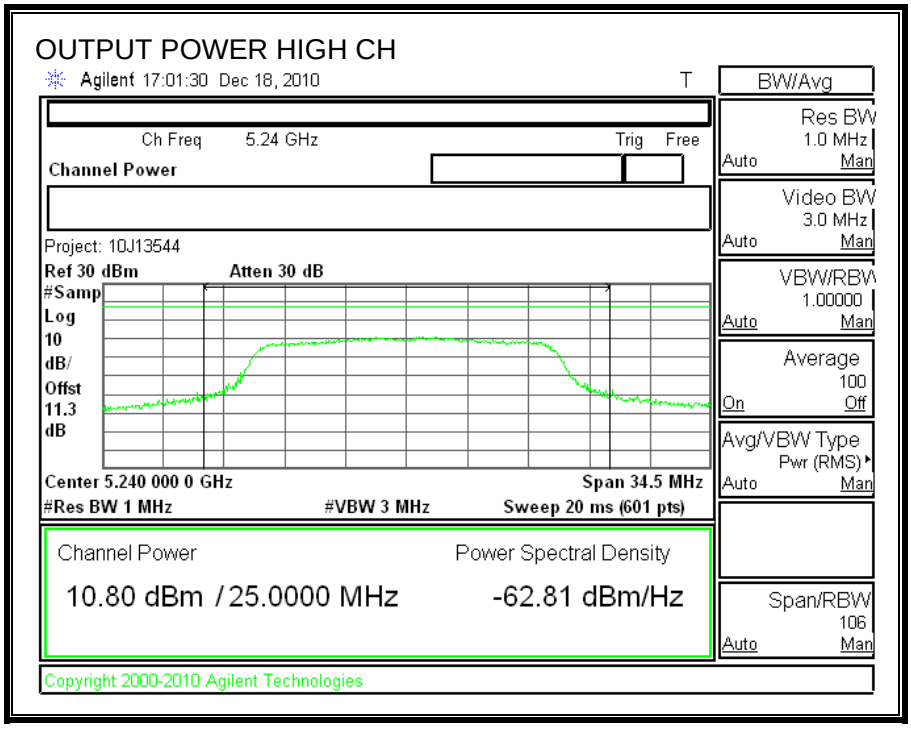
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	10.80	17.00	-6.20
Mid	5200	10.16	17.00	-6.84
High	5240	10.80	17.00	-6.20

OUTPUT POWER







7.1.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 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 is less than or equal to 6 dBi, therefore the limit is 4 dBm.

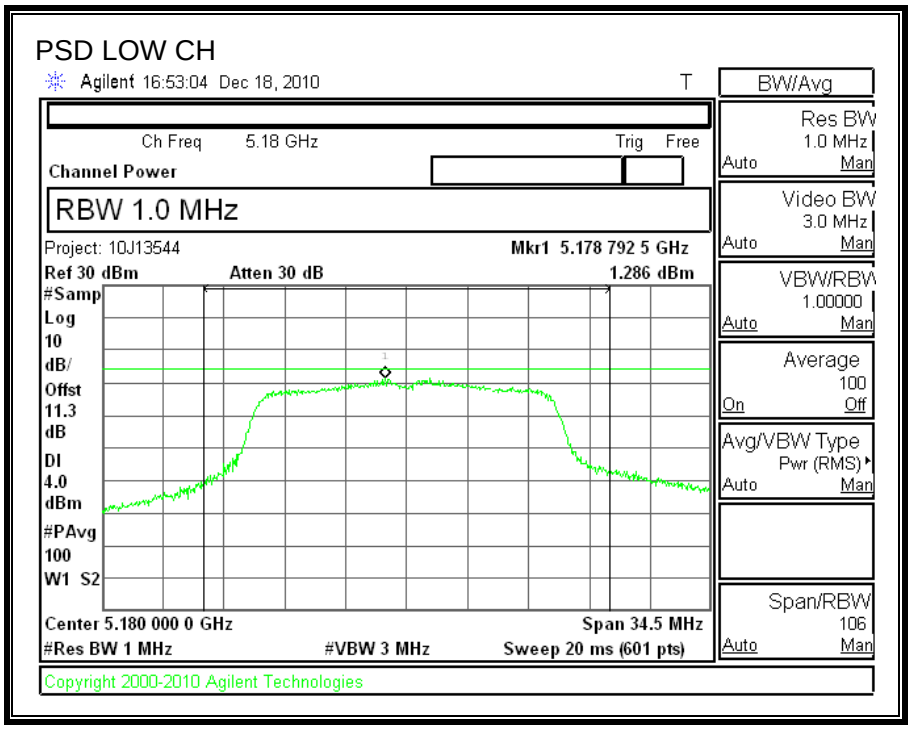
TEST PROCEDURE

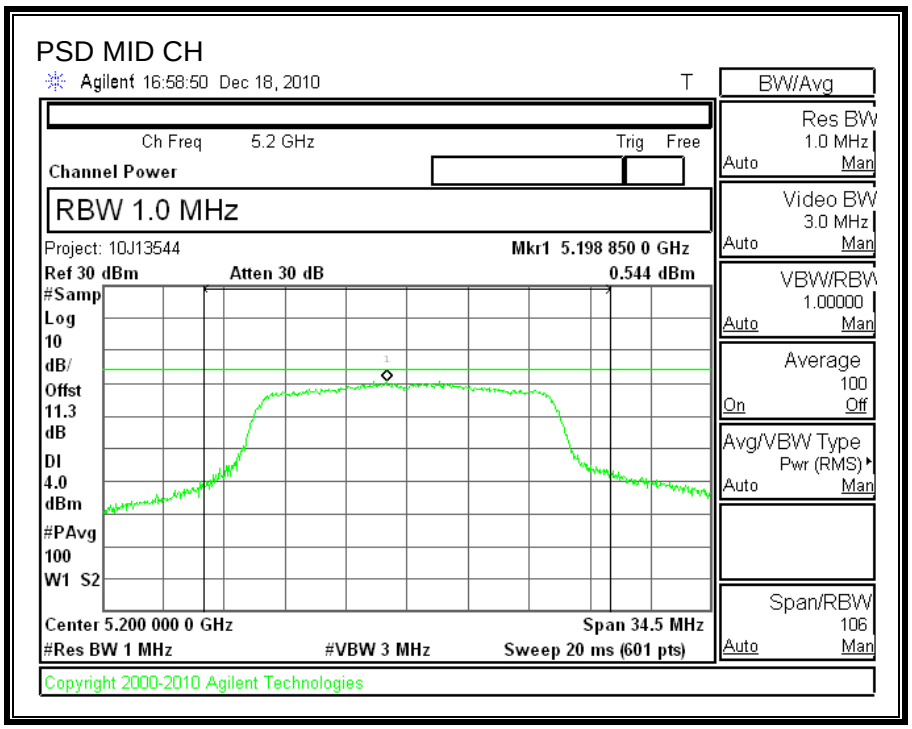
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

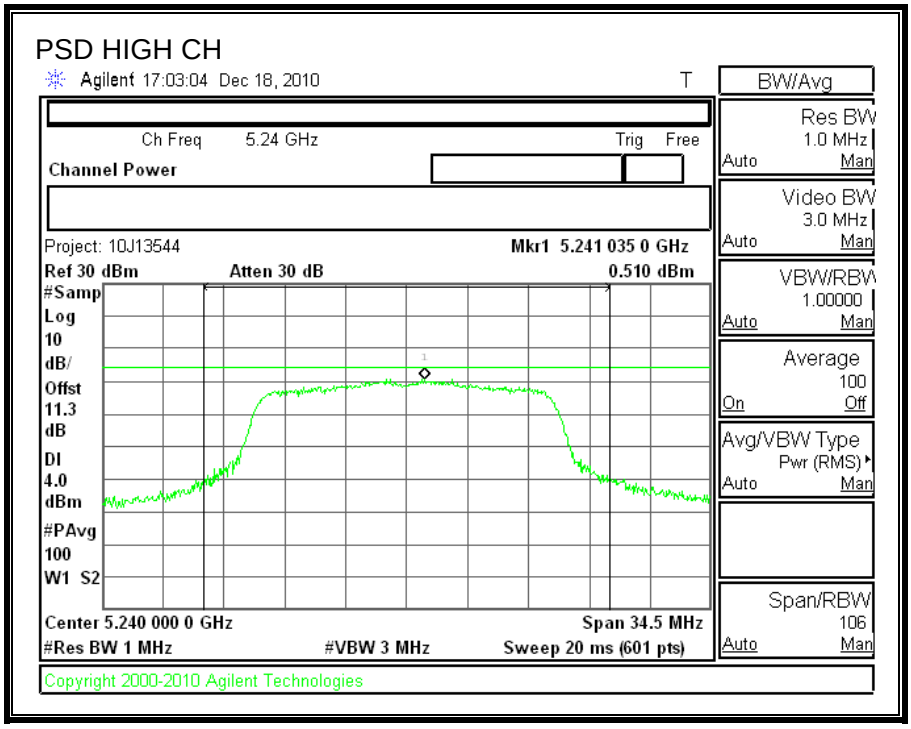
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	1.29	4	-2.71
Middle	5200	0.54	4	-3.46
High	5240	0.51	4	-3.49

POWER SPECTRAL DENSITY







7.1.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

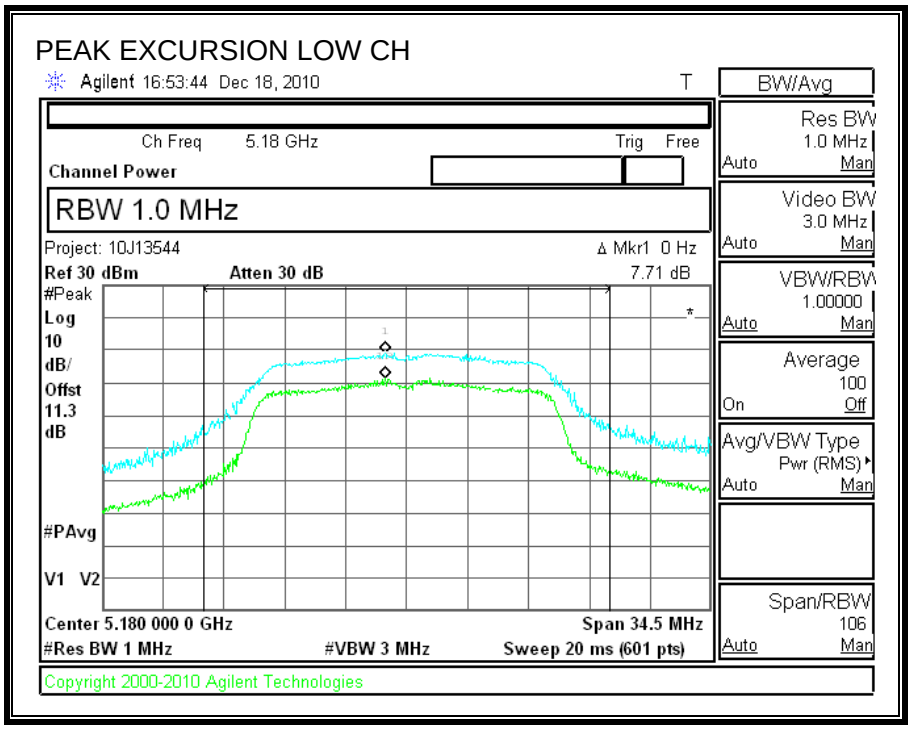
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

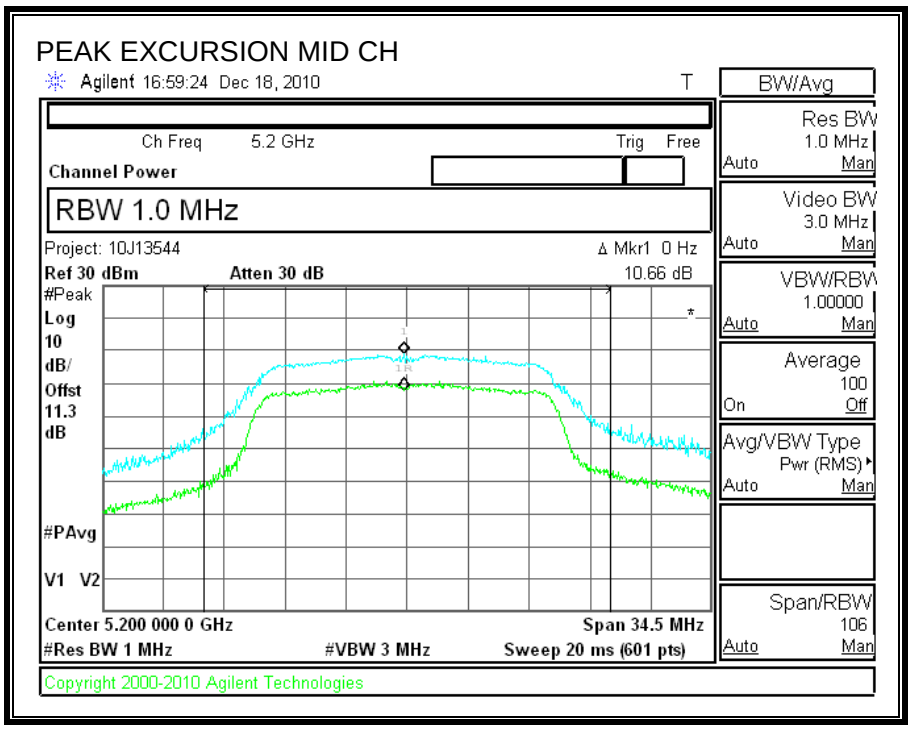
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

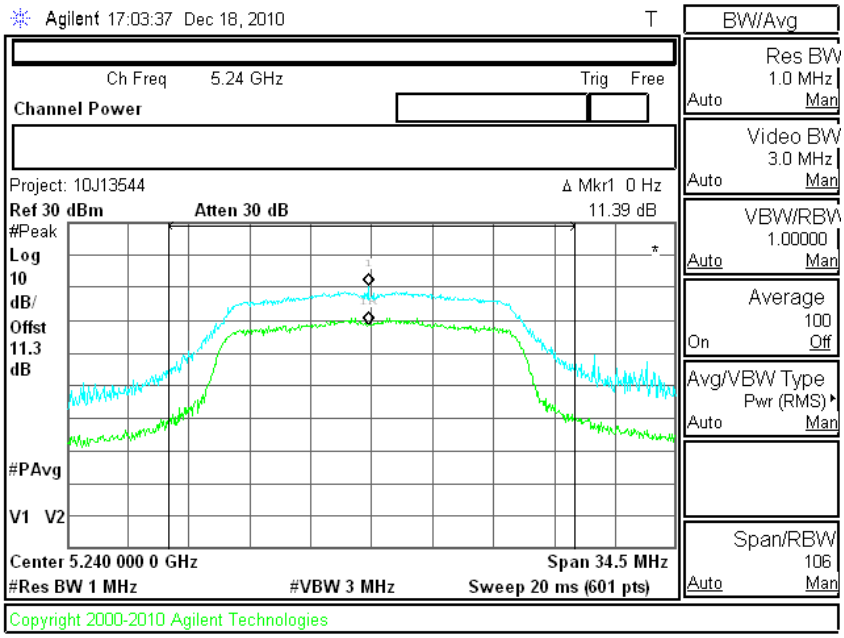
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	7.71	13	-5.29
Middle	5200	10.66	13	-2.34
High	5240	11.39	13	-1.61

PEAK EXCURSION





PEAK EXCURSION HIGH CH



7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 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.

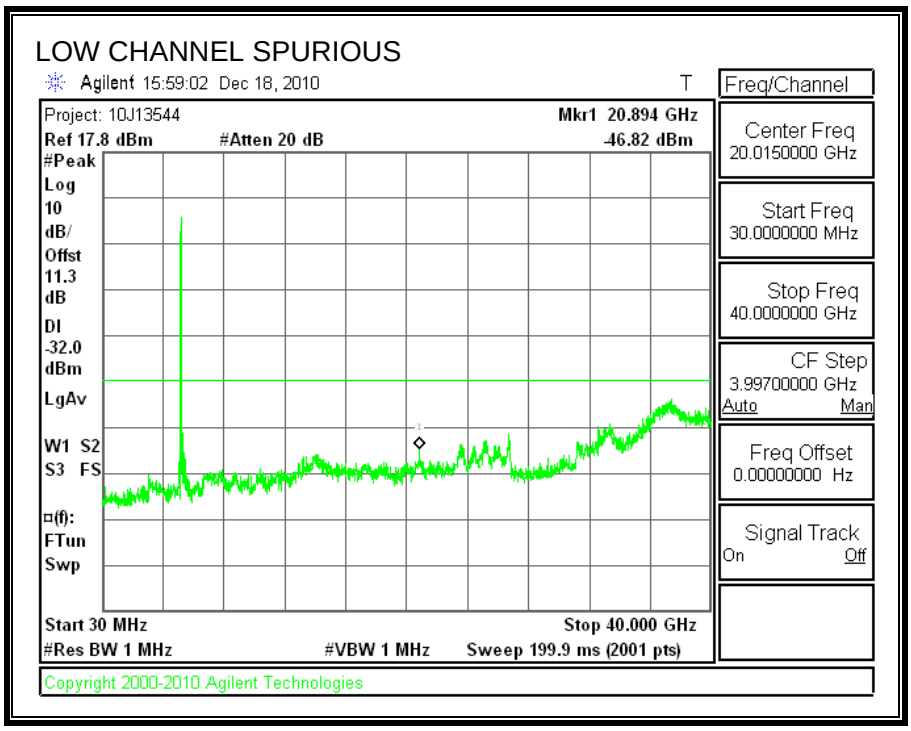
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

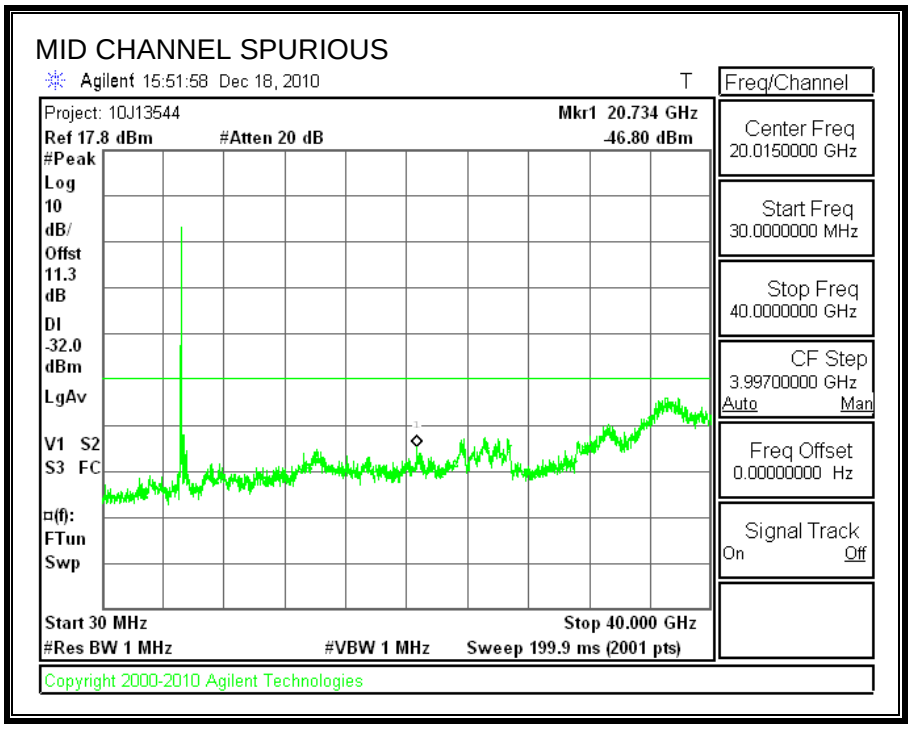
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

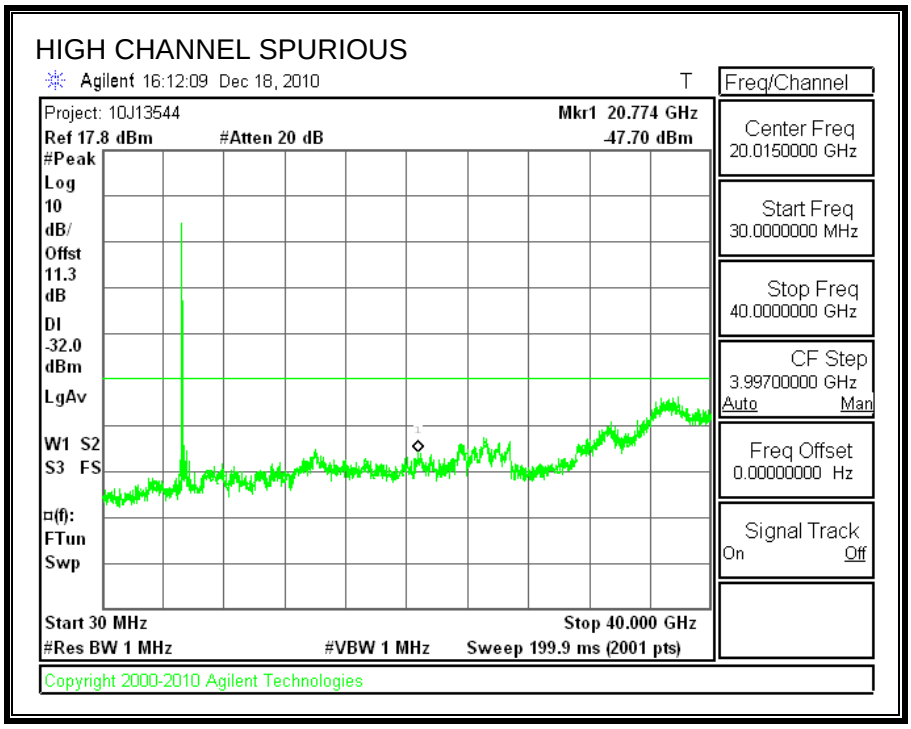
RESULTS

Since all limits still passed with the worse case of 4.99dBi antenna gain, so no necessary to re-test with 2.3dBi lower antenna gain.

SPURIOUS EMISSIONS







7.2. 802.11n HT20 SISO MODE IN THE 5.2 GHz BAND

7.2.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

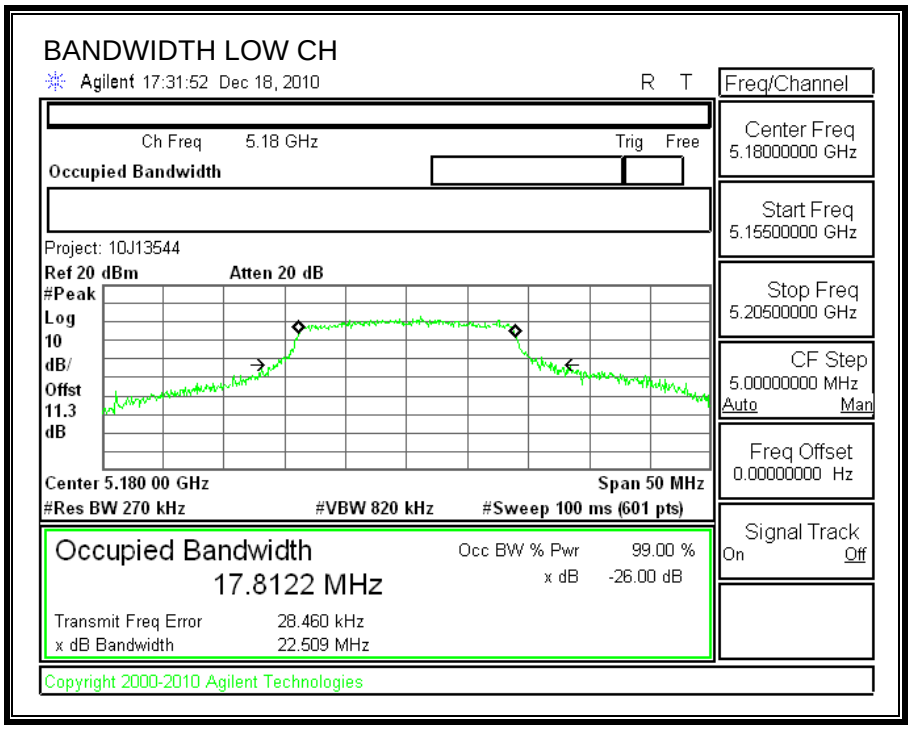
TEST PROCEDURE

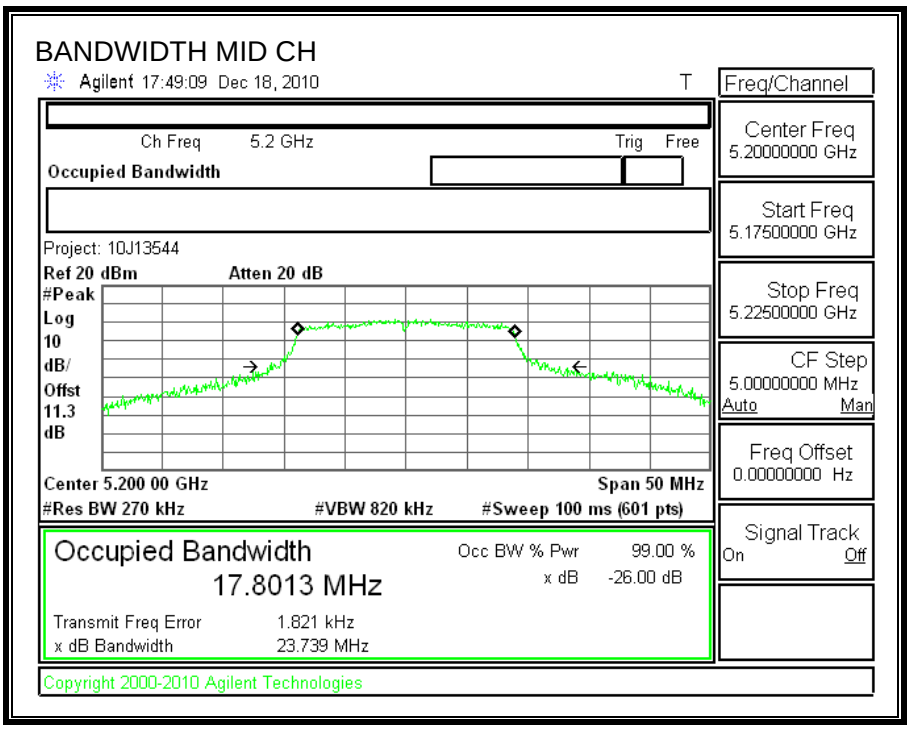
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

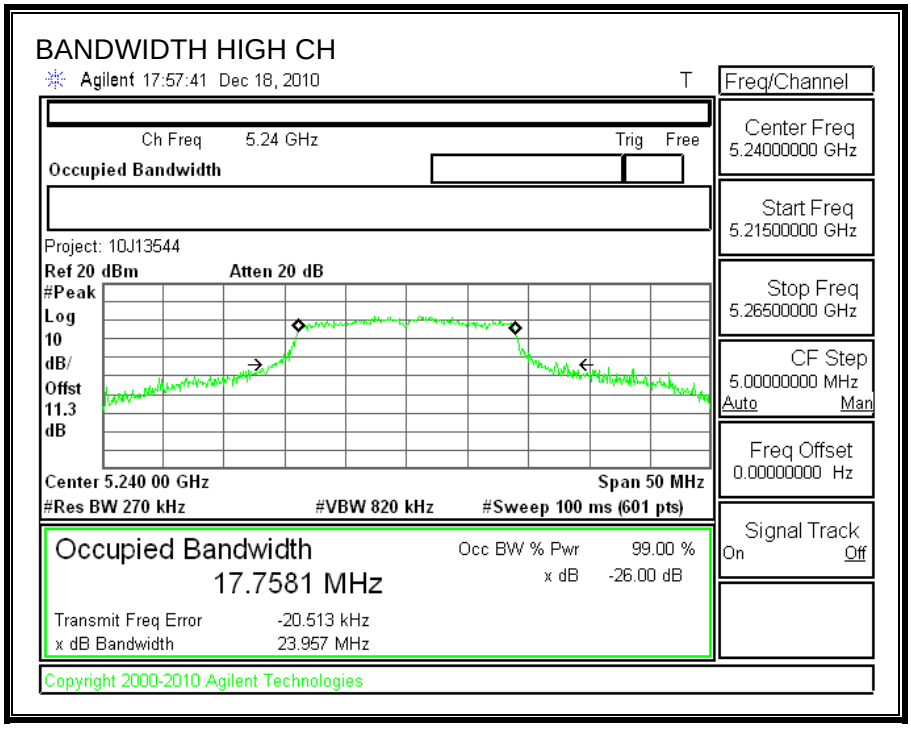
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5180	22.509	17.5843
Middle	5200	23.739	17.5767
High	5240	23.957	17.5596

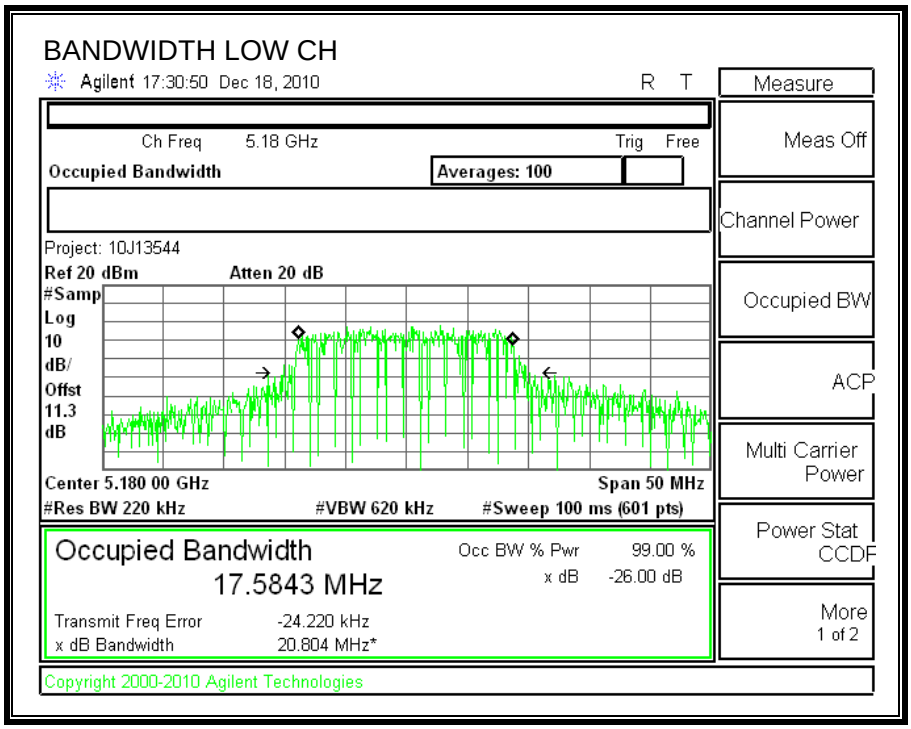
26 dB BANDWIDTH

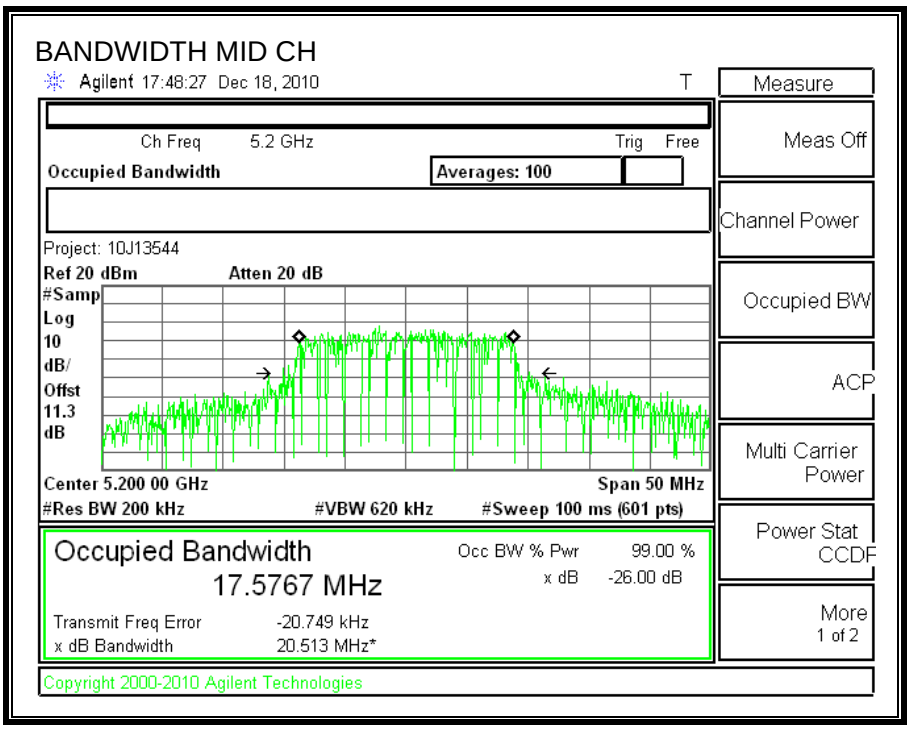


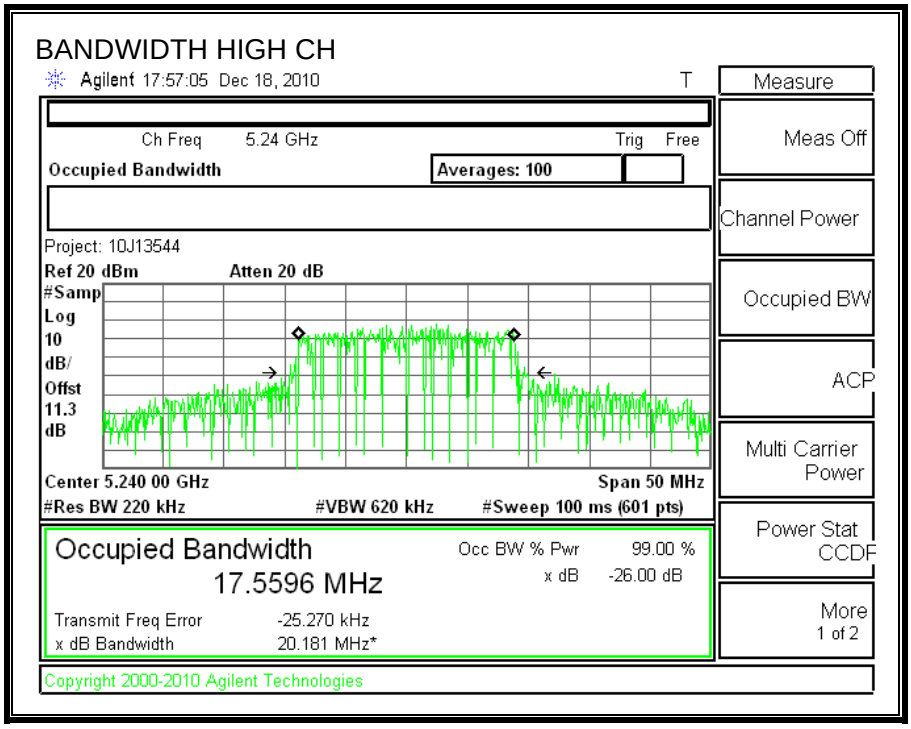




99% BANDWIDTH







7.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 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.

RESULTS

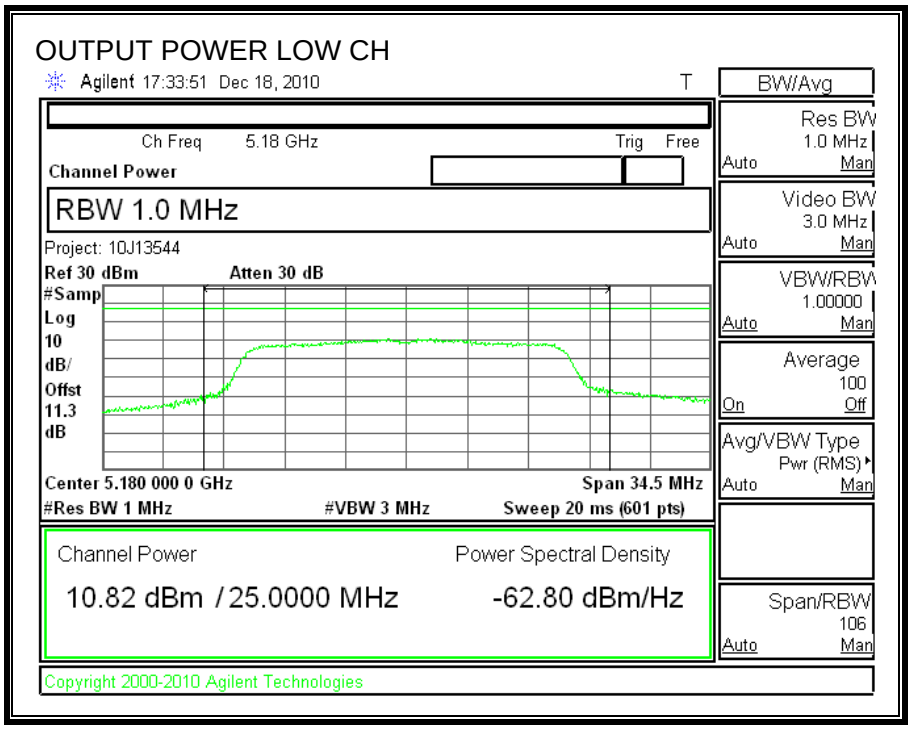
Limit

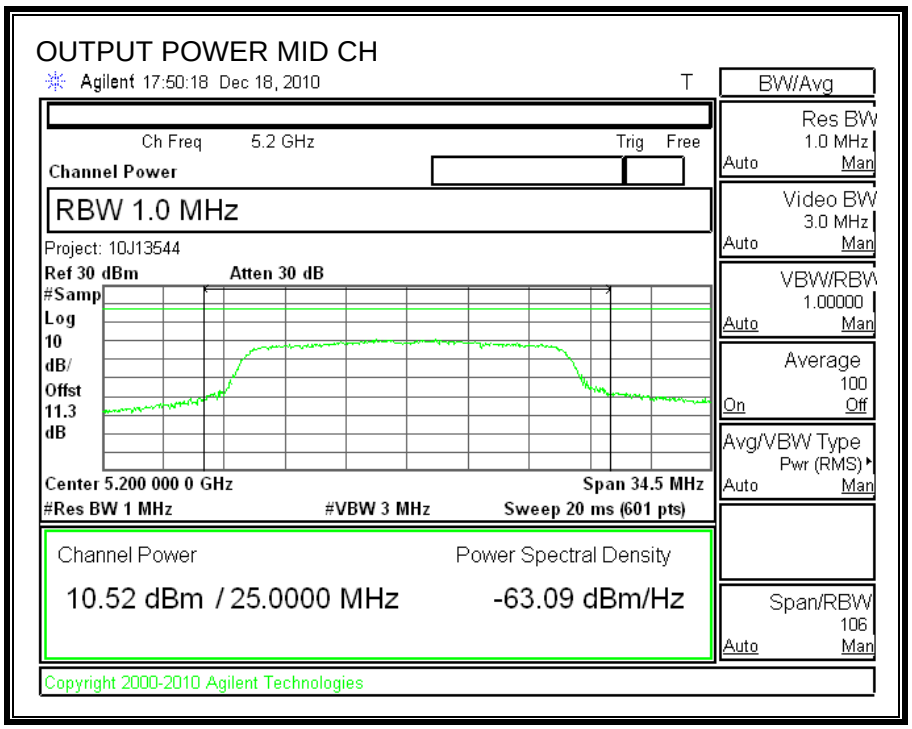
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	22.51	17.52	2.30	17.00
Mid	5200	17	23.74	17.75	2.30	17.00
High	5240	17	23.96	17.79	2.30	17.00

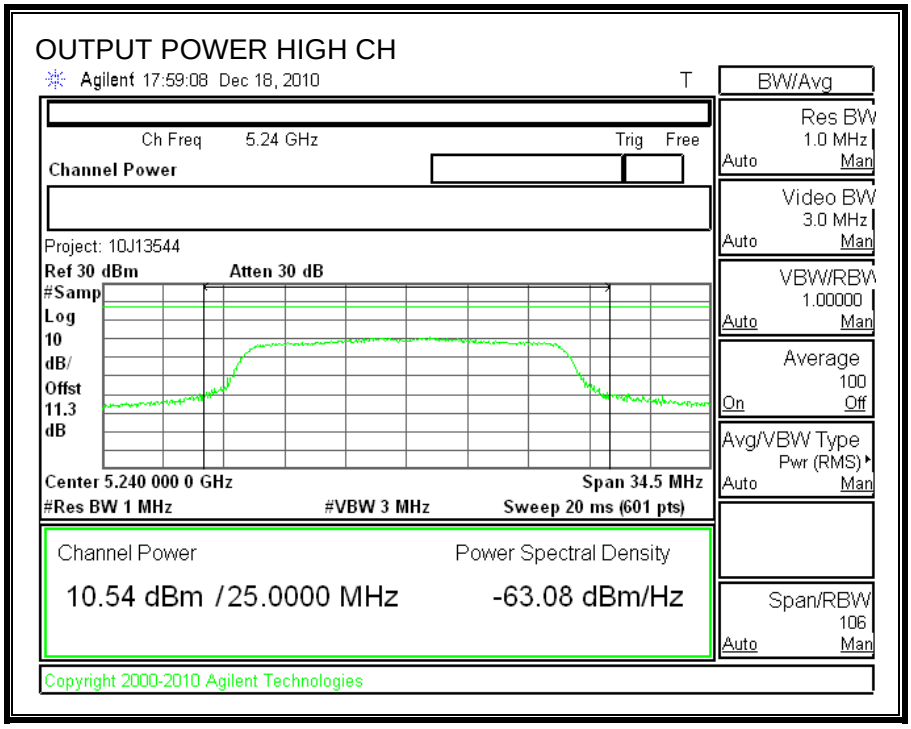
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	10.82	17.00	-6.18
Mid	5200	10.52	17.00	-6.48
High	5240	10.54	17.00	-6.46

OUTPUT POWER







7.2.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 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 is less than or equal to 6 dBi, therefore the limit is 4 dBm.

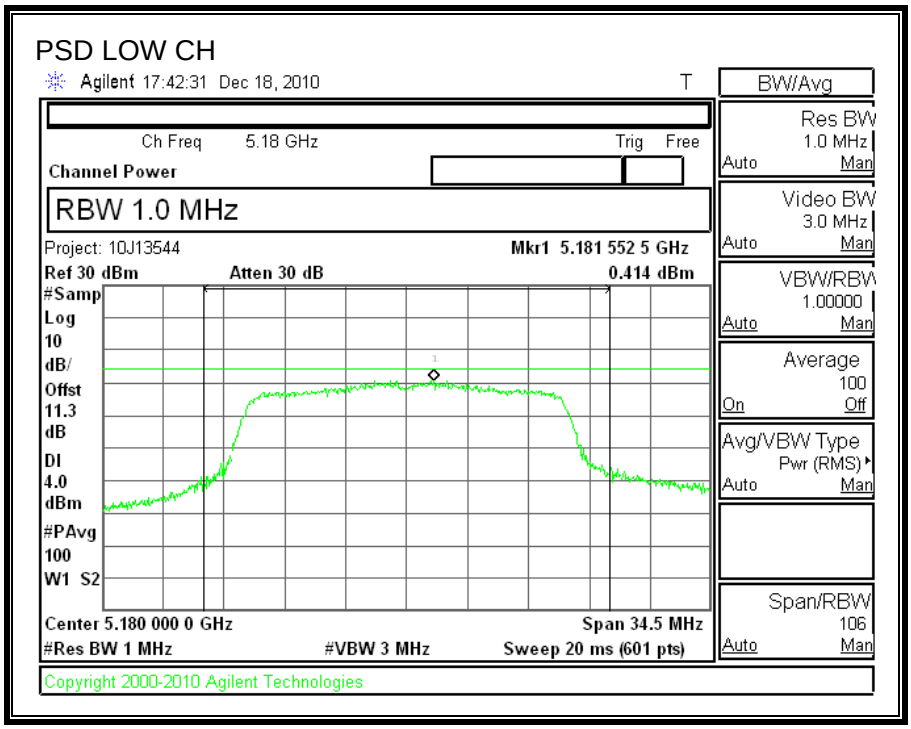
TEST PROCEDURE

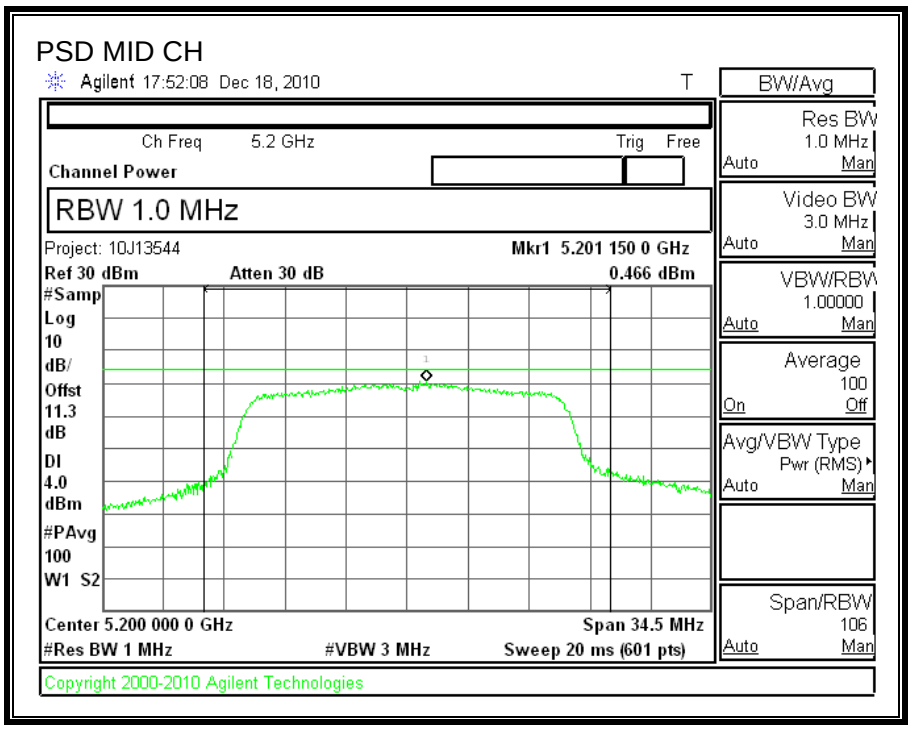
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

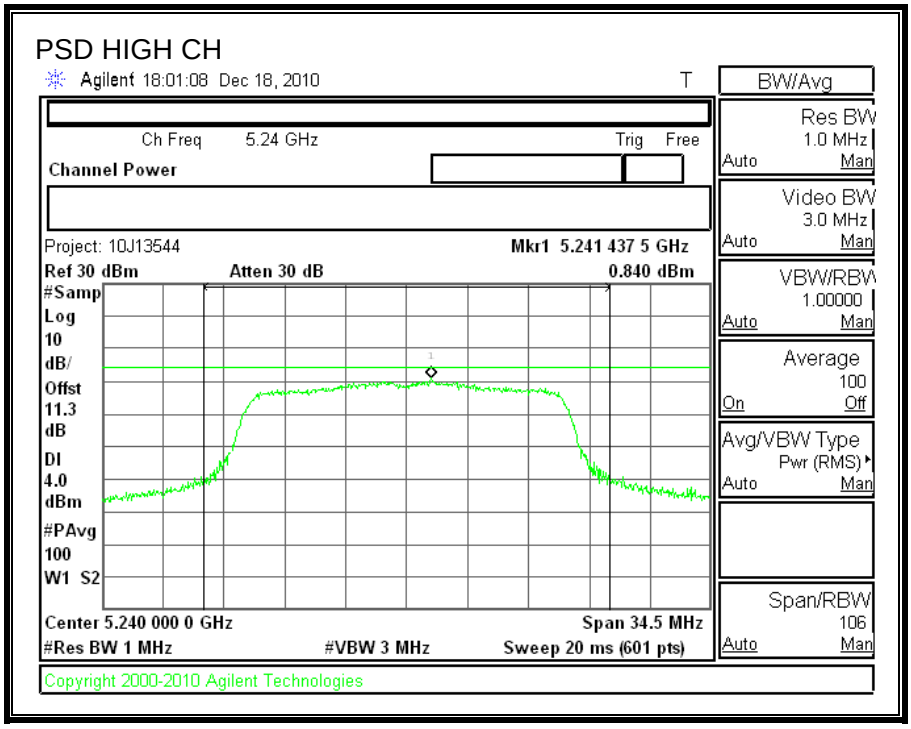
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	0.41	4	-3.59
Middle	5200	0.47	4	-3.53
High	5240	0.84	4	-3.16

POWER SPECTRAL DENSITY







7.2.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

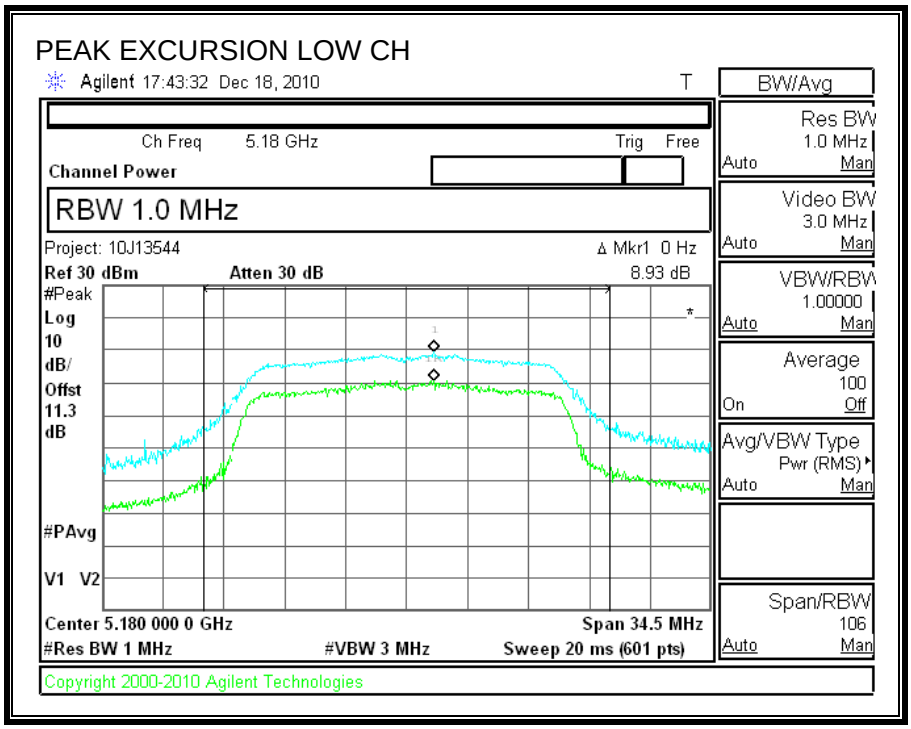
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

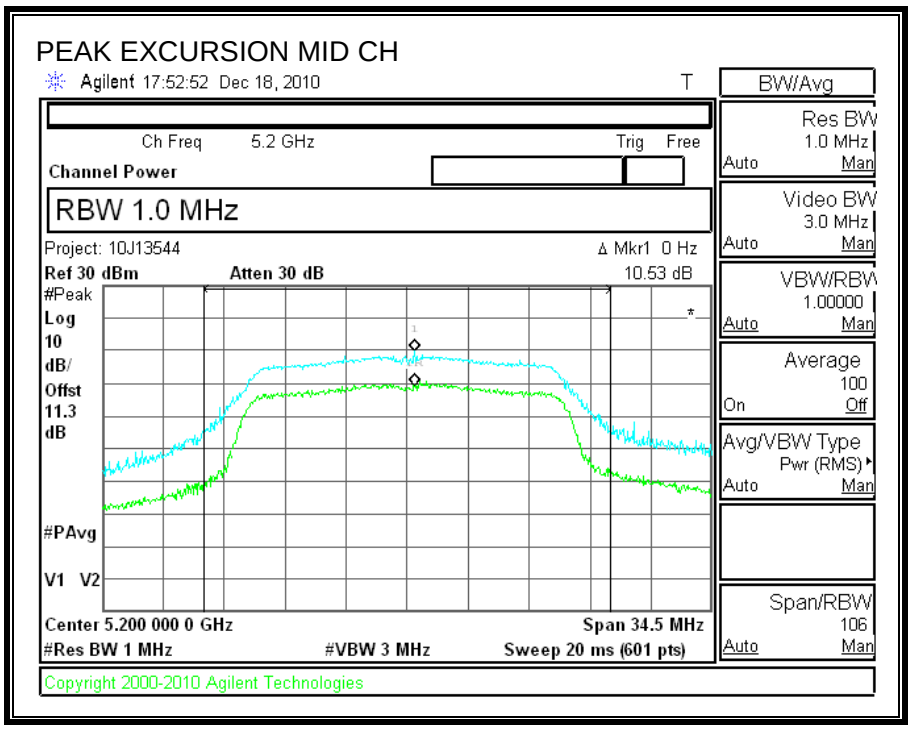
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

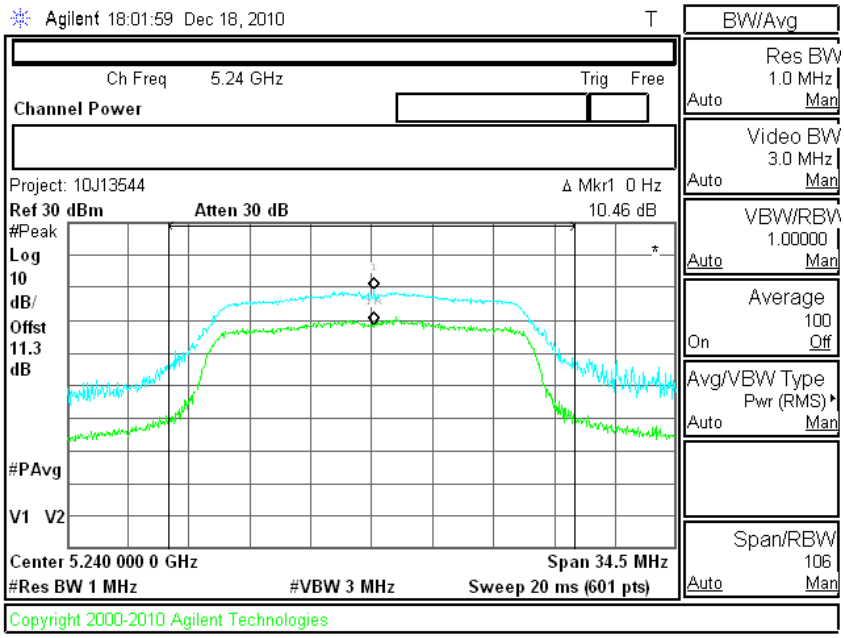
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.93	13	-4.07
Middle	5200	10.53	13	-2.47
High	5240	10.46	13	-2.54

PEAK EXCURSION





PEAK EXCURSION HIGH CH



7.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 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.

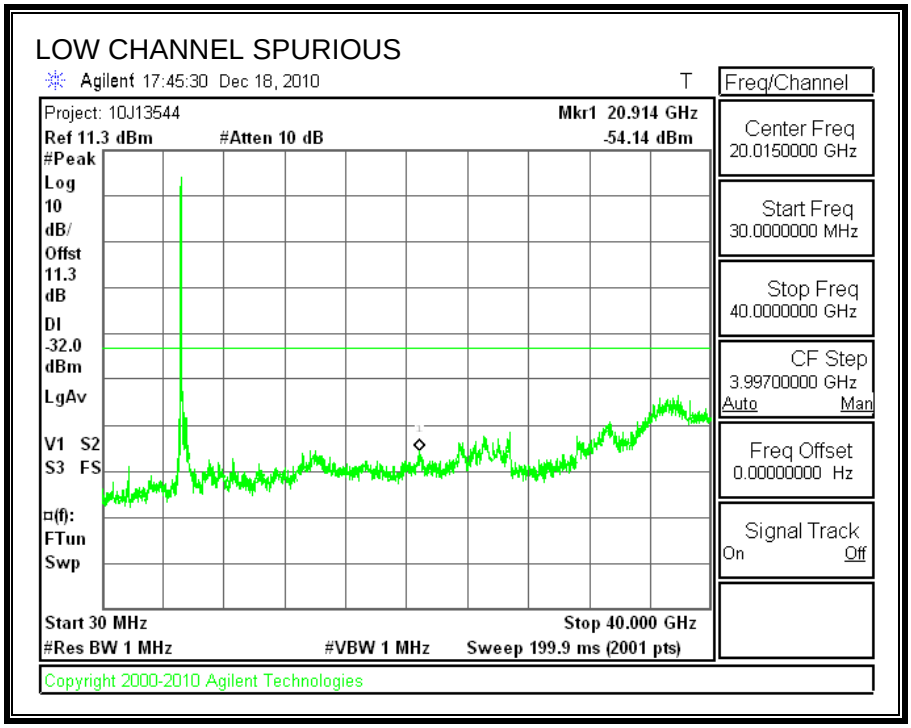
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

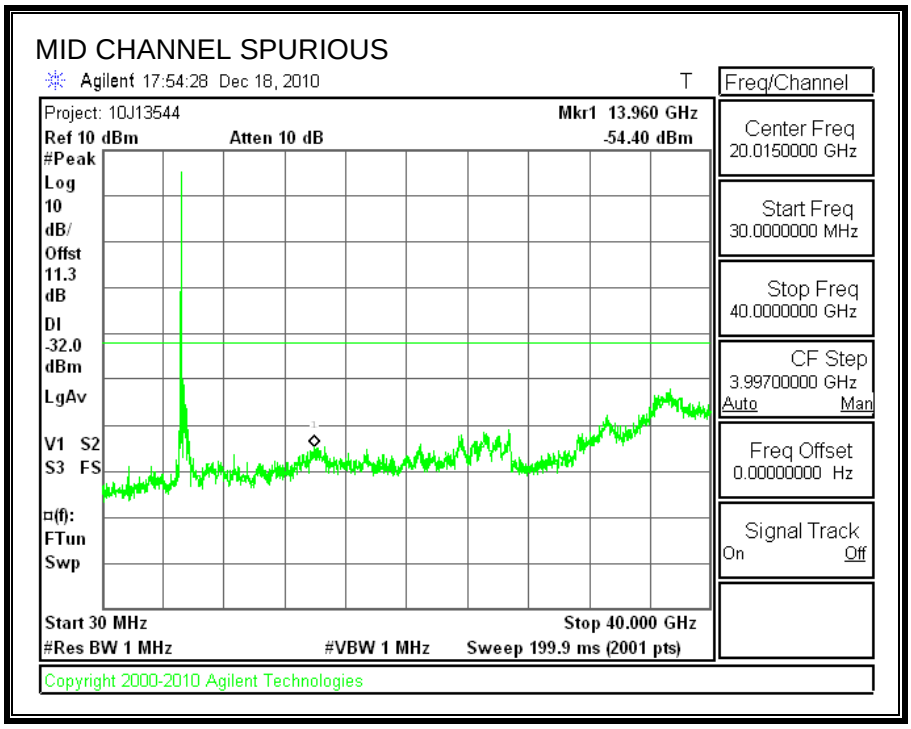
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

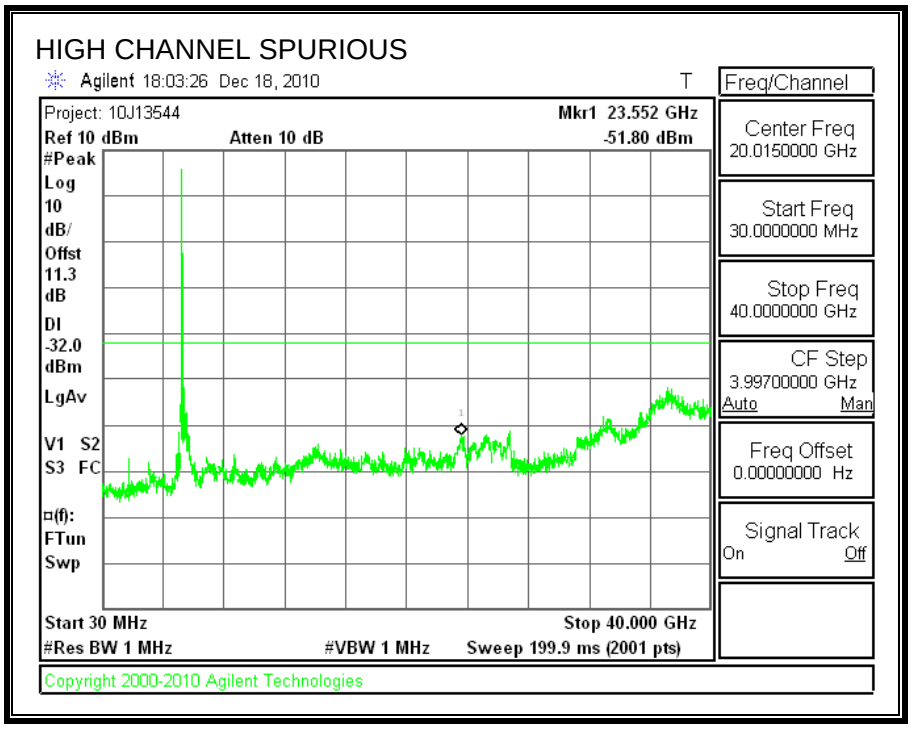
RESULTS

Since all limits still passed with the worse case of 4.99dBi antenna gain, so no necessary to re-test with 2.3dBi lower antenna gain.

SPURIOUS EMISSIONS







7.3. 802.11n HT40 SISO MODE IN THE 5.2 GHz BAND

7.3.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

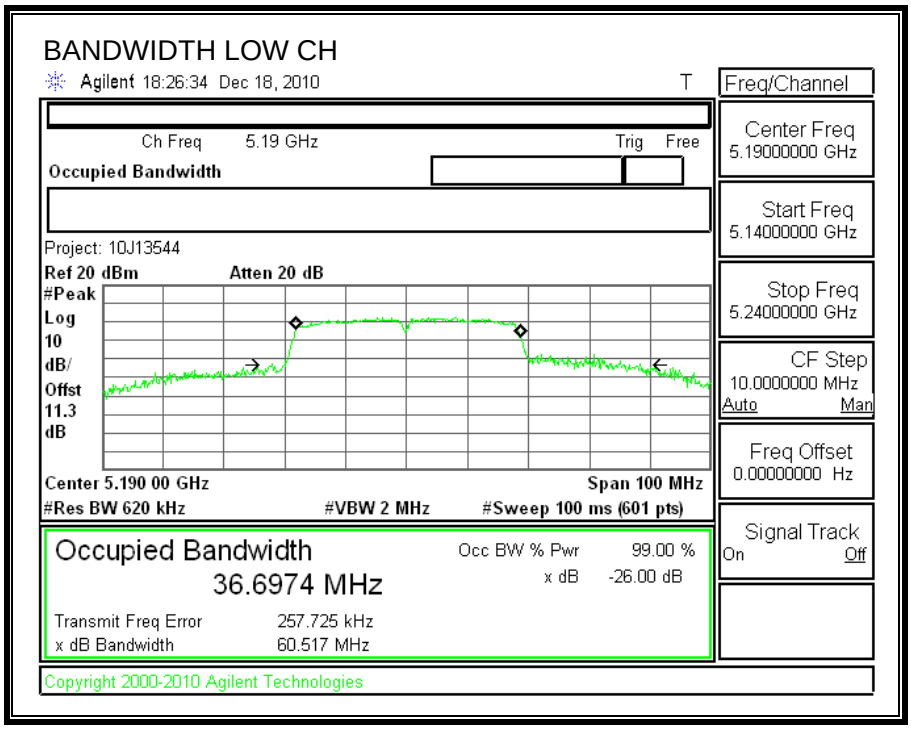
TEST PROCEDURE

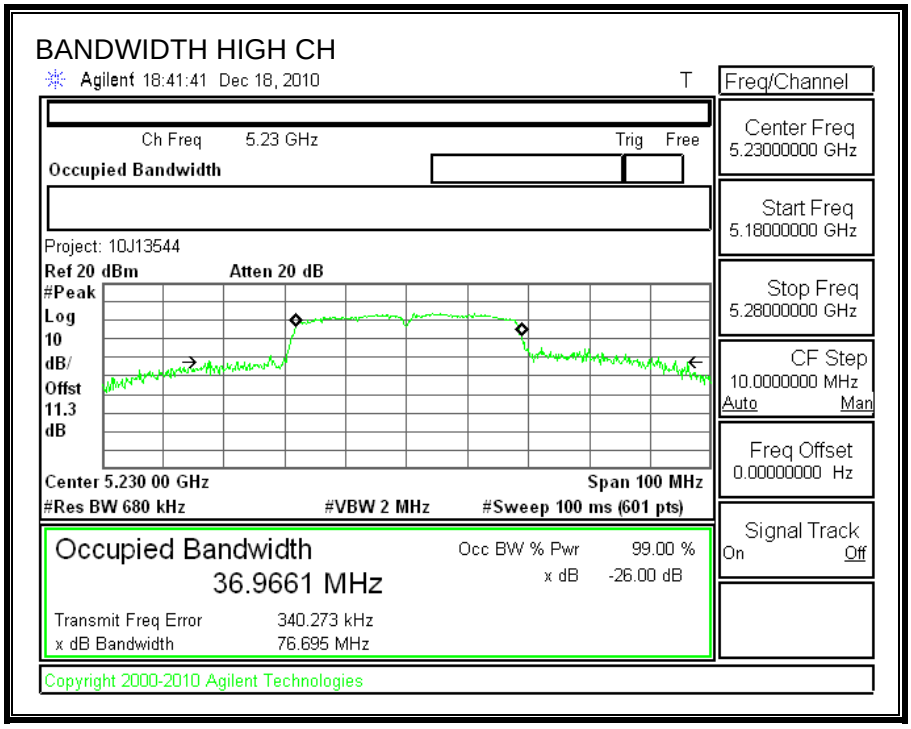
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

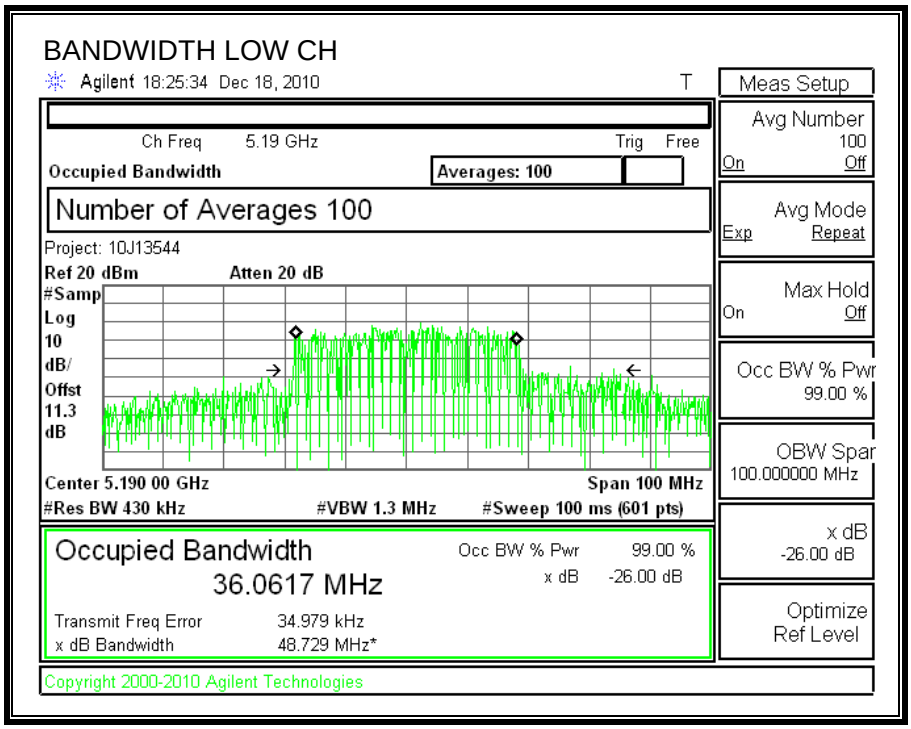
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)	99% Bandwidth (MHz)
Low	5190	60.517	36.062
High	5230	76.695	36.069

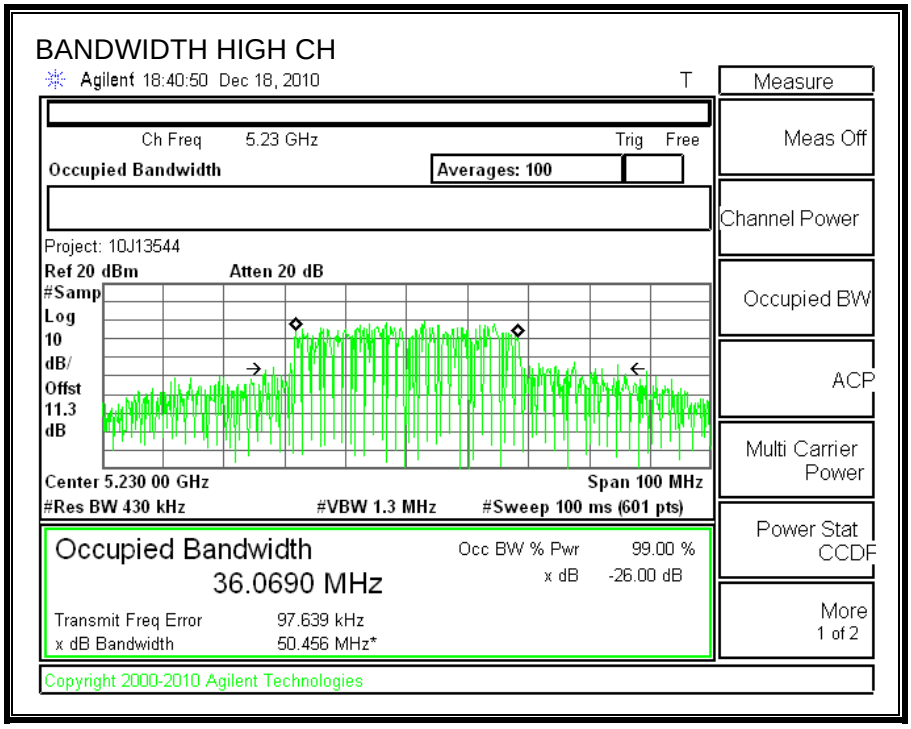
26 dB BANDWIDTH





99% BANDWIDTH





7.3.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 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.

RESULTS

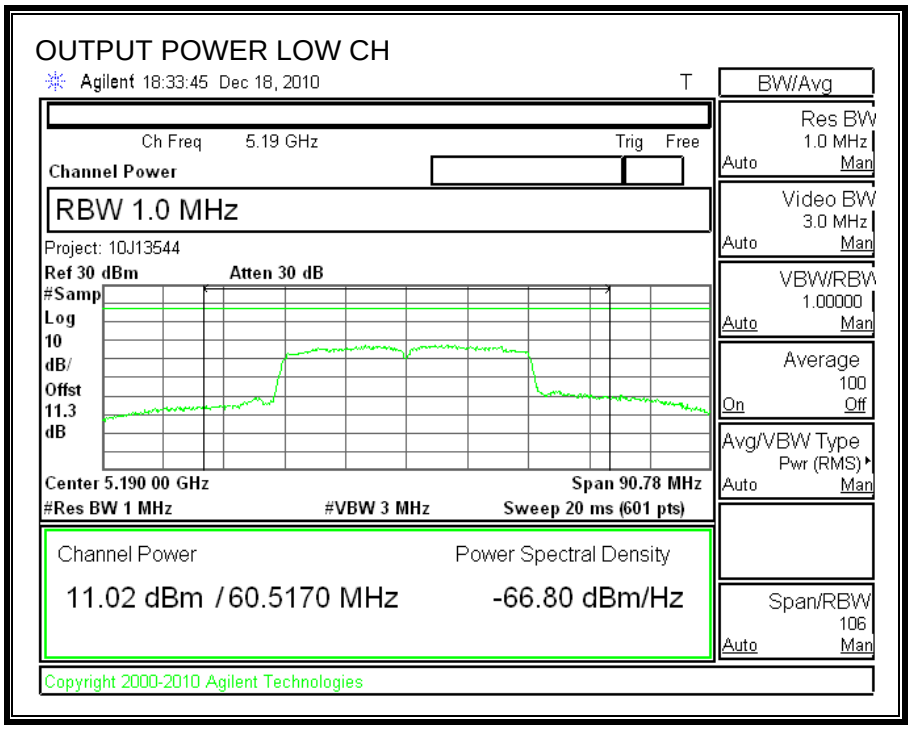
Limit

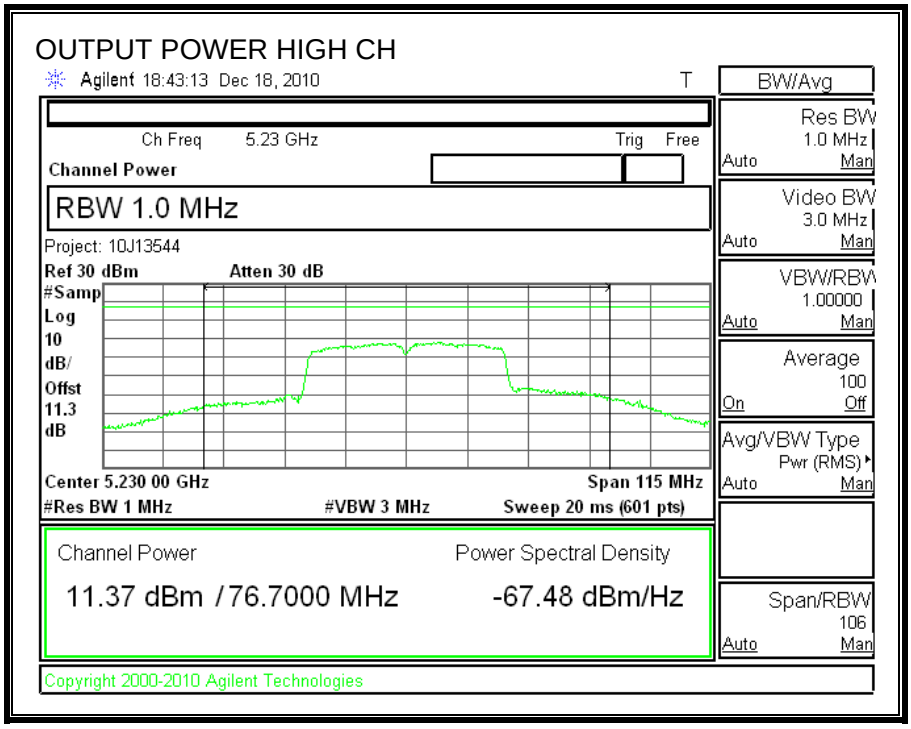
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	60.52	21.82	2.30	17.00
High	5240	17	76.70	22.85	2.30	17.00

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	11.02	17.00	-5.98
High	5240	11.37	17.00	-5.63

OUTPUT POWER





7.3.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 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 is less than or equal to 6 dBi, therefore the limit is 4 dBm.

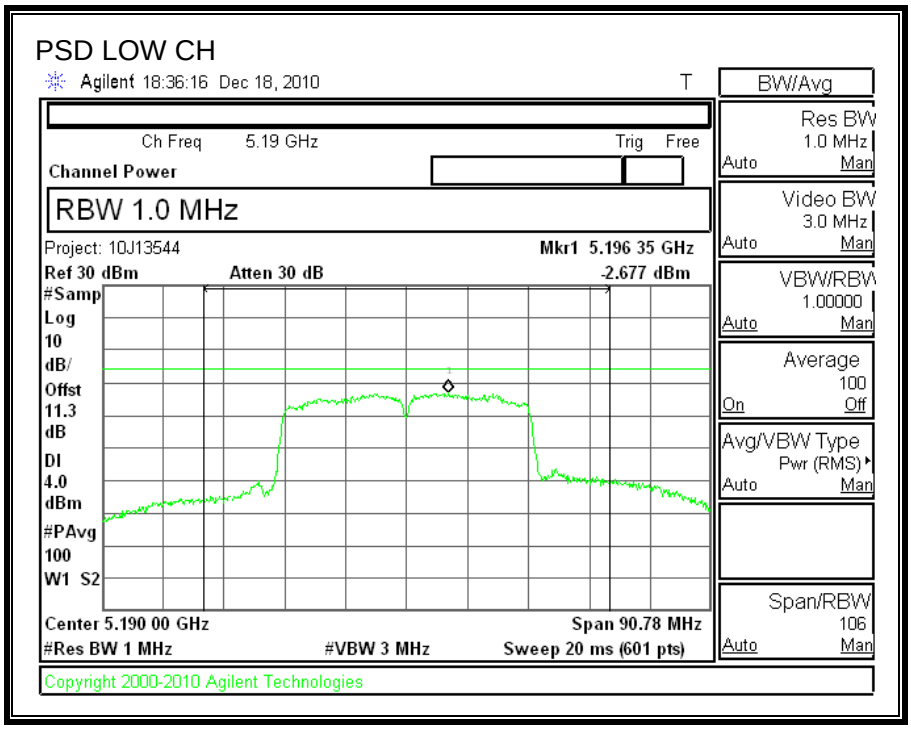
TEST PROCEDURE

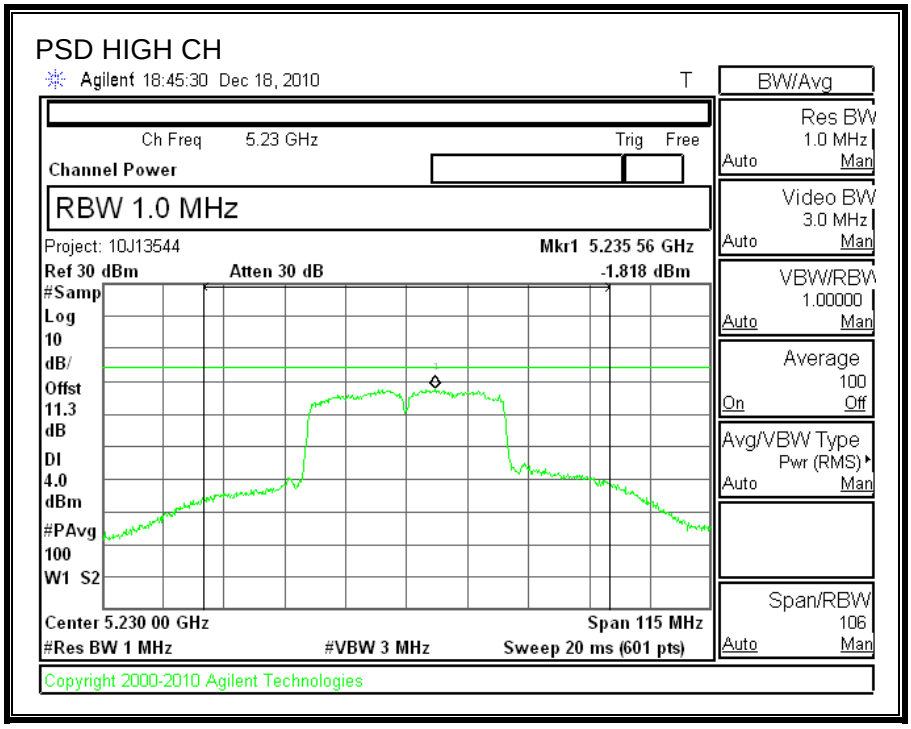
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-2.68	4	-6.68
High	5230	-1.82	4	-5.82

POWER SPECTRAL DENSITY





7.3.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

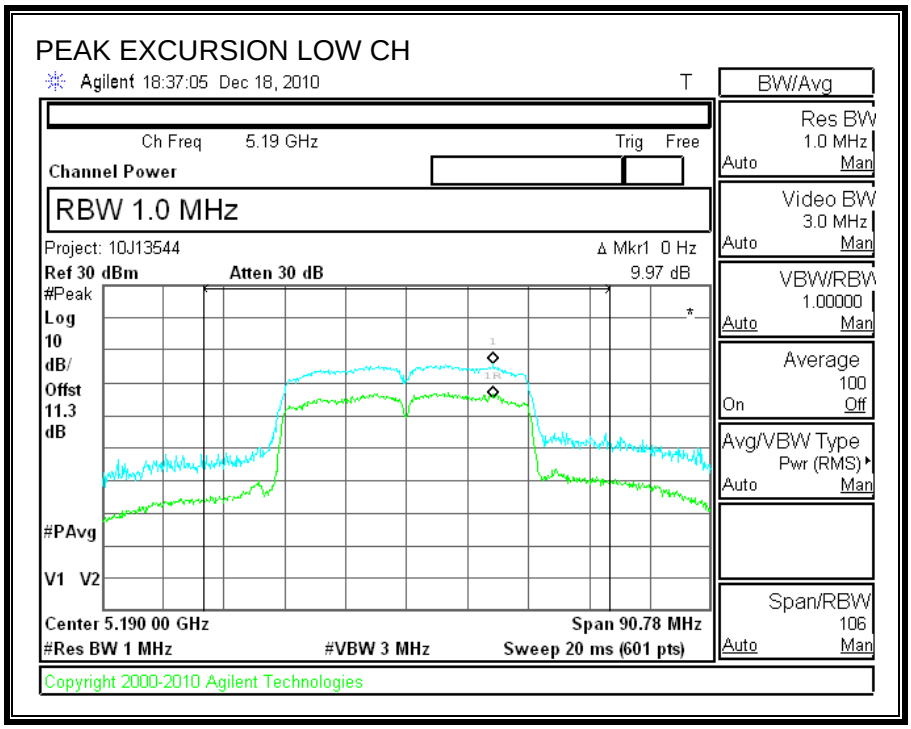
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

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

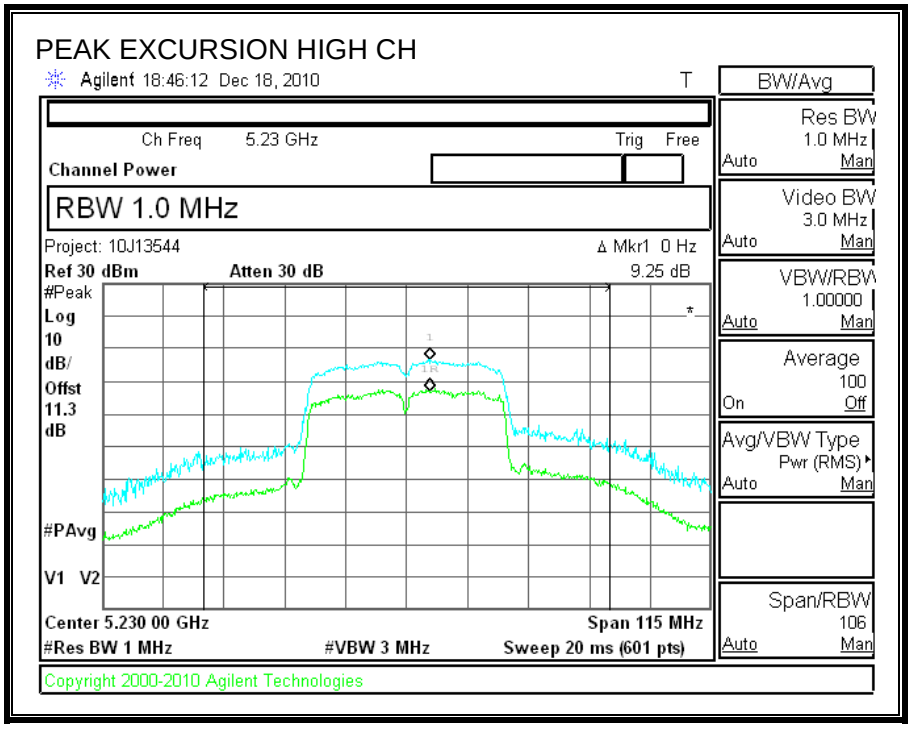
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	9.97	13	-3.03
High	5230	9.25	13	-3.75

PEAK EXCURSION



PEAK EXCURSION HIGH CH



7.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 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.

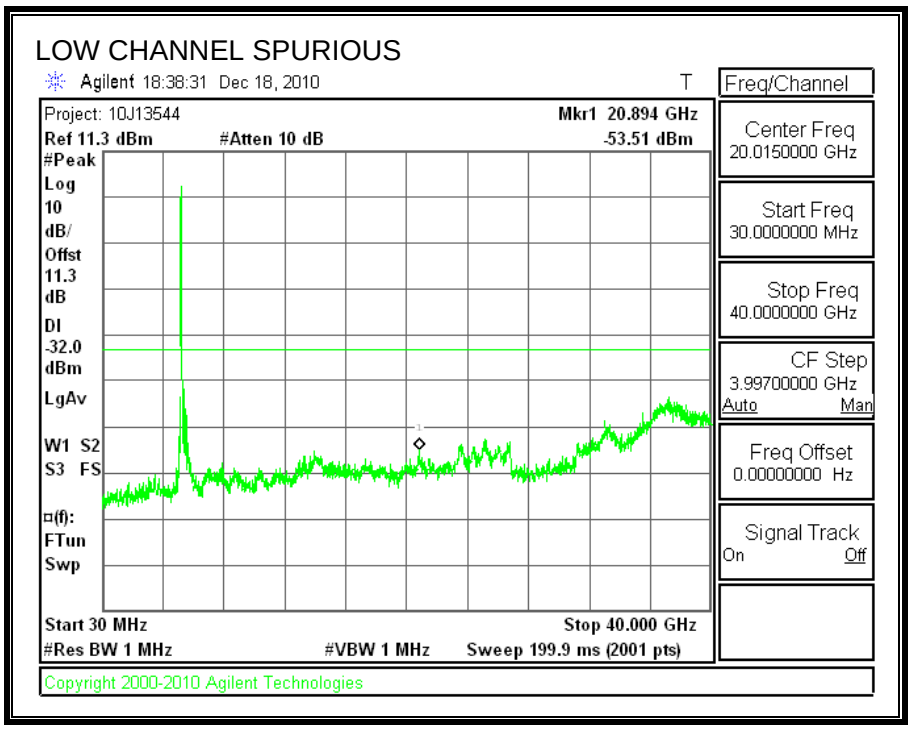
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

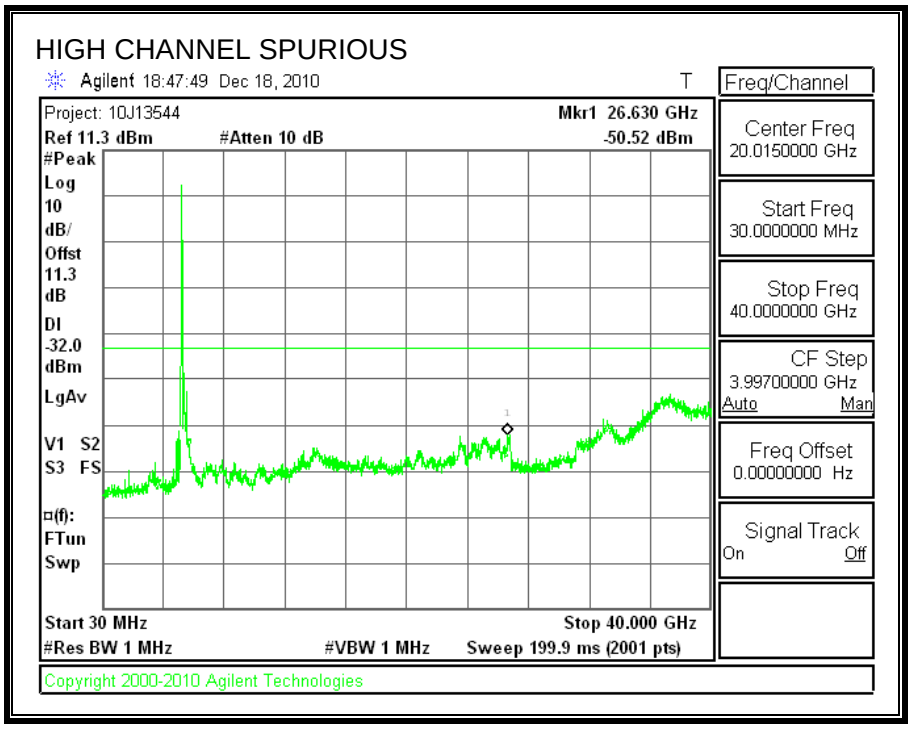
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

Since all limits still passed with the worse case of 4.99dBi antenna gain, so no necessary to re-test with 2.3dBi lower antenna gain.

SPURIOUS EMISSIONS





8. RADIATED TEST RESULTS

8.1. LIMITS AND PROCEDURE

LIMITS

FCC §15.205 and §15.209

IC RSS-210 Clause 2.6 (Transmitter)

IC RSS-GEN Clause 6 (Receiver)

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

TEST PROCEDURE

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

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

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

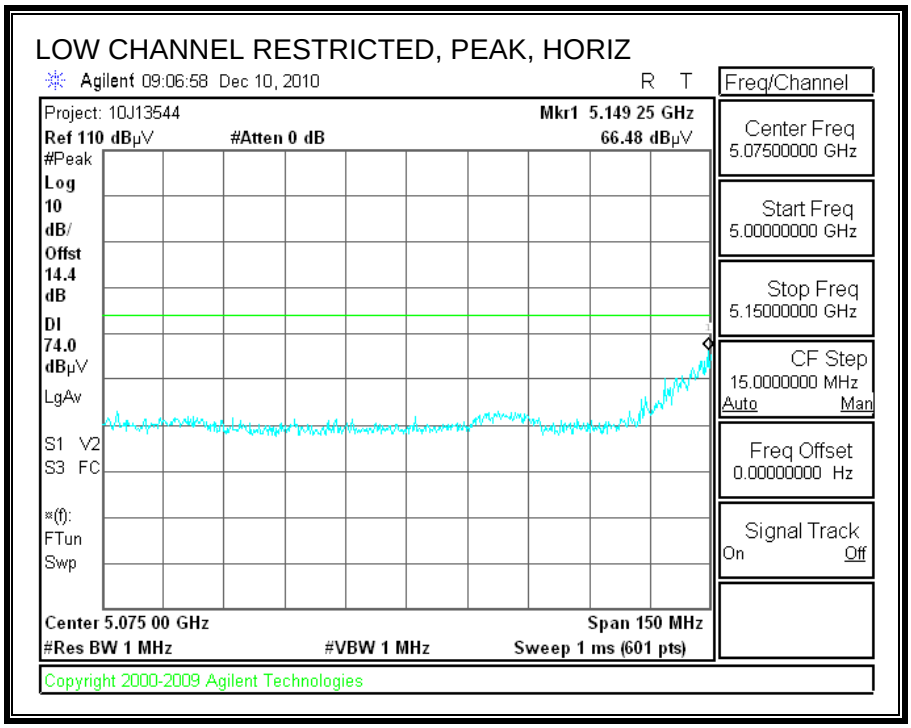
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

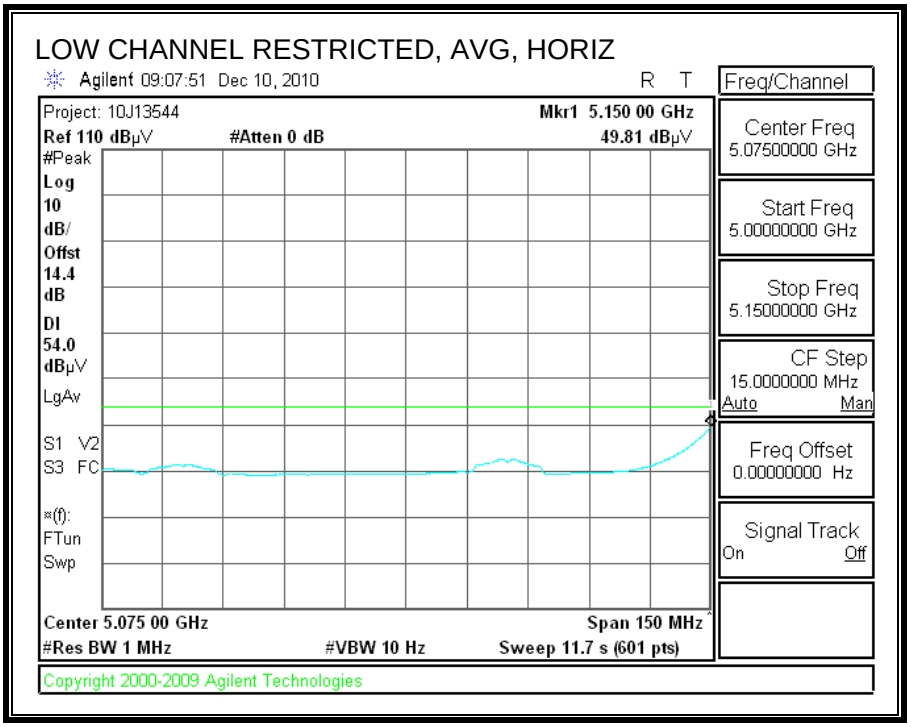
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

8.2. TRANSMITTER ABOVE 1 GHz

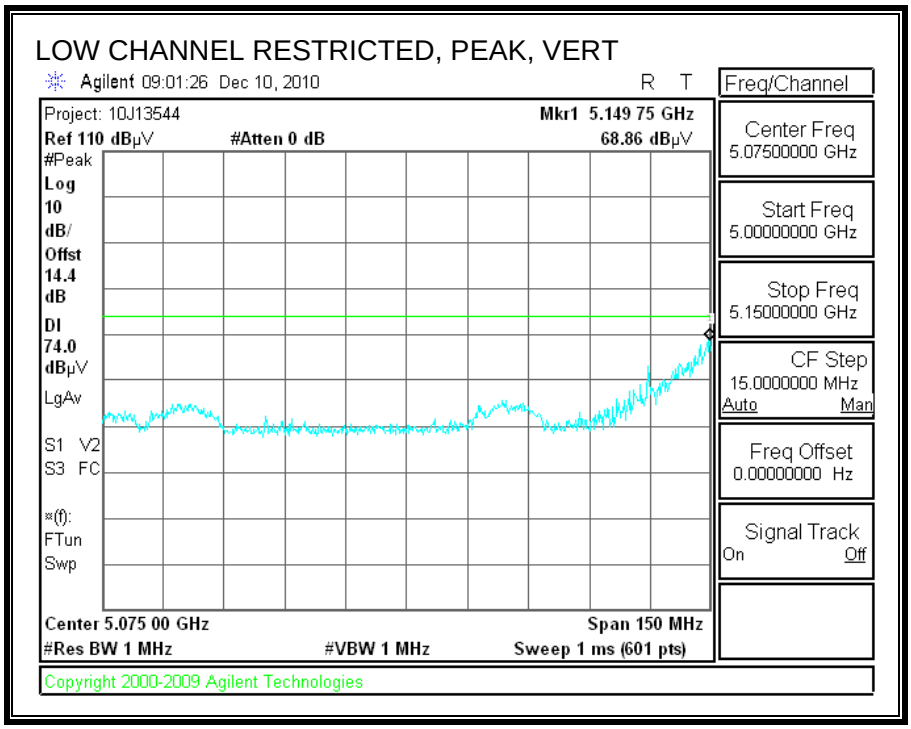
8.2.1. TX ABOVE 1 GHz FOR 802.11a MODE IN THE LOWER 5.2 GHz BAND

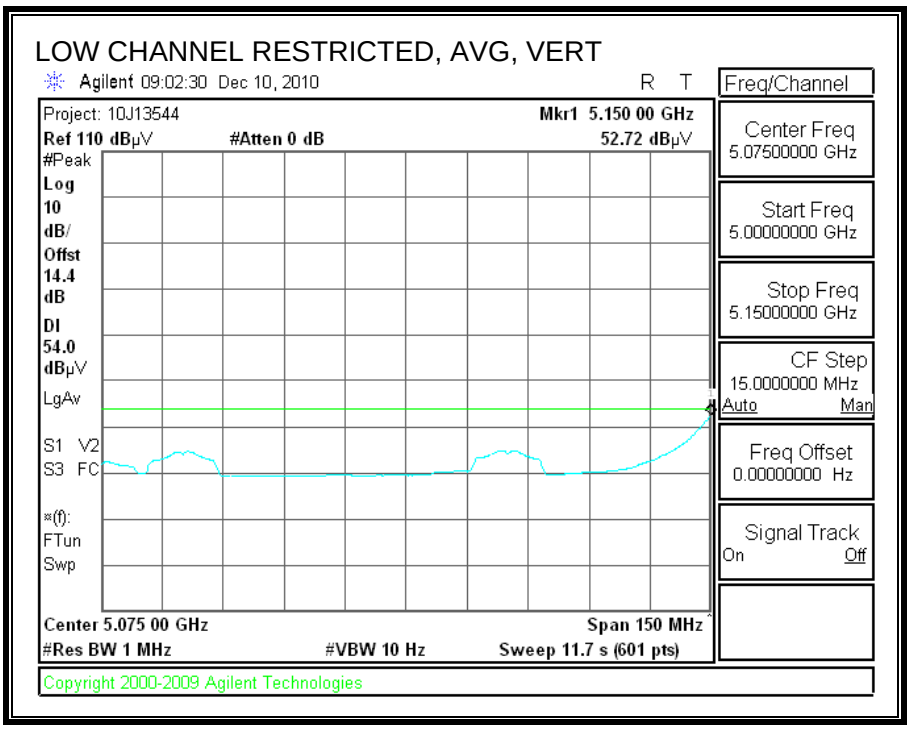
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 12/10/10
Project #: 10J13544
Company: Hon Hai
Test Target: FCC Class B
Mode Oper: TX mode

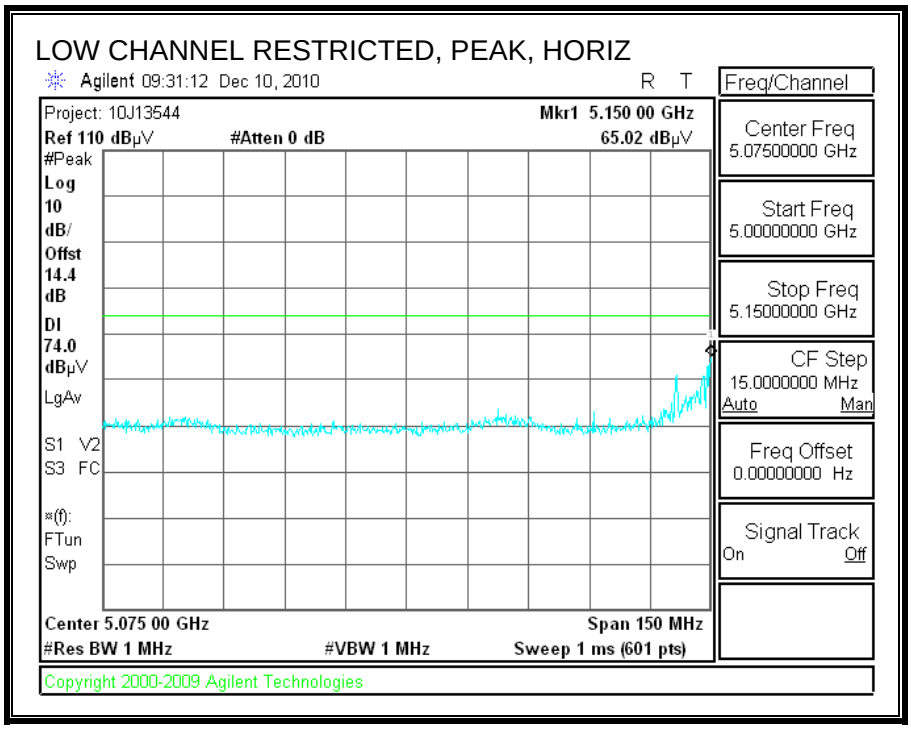
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

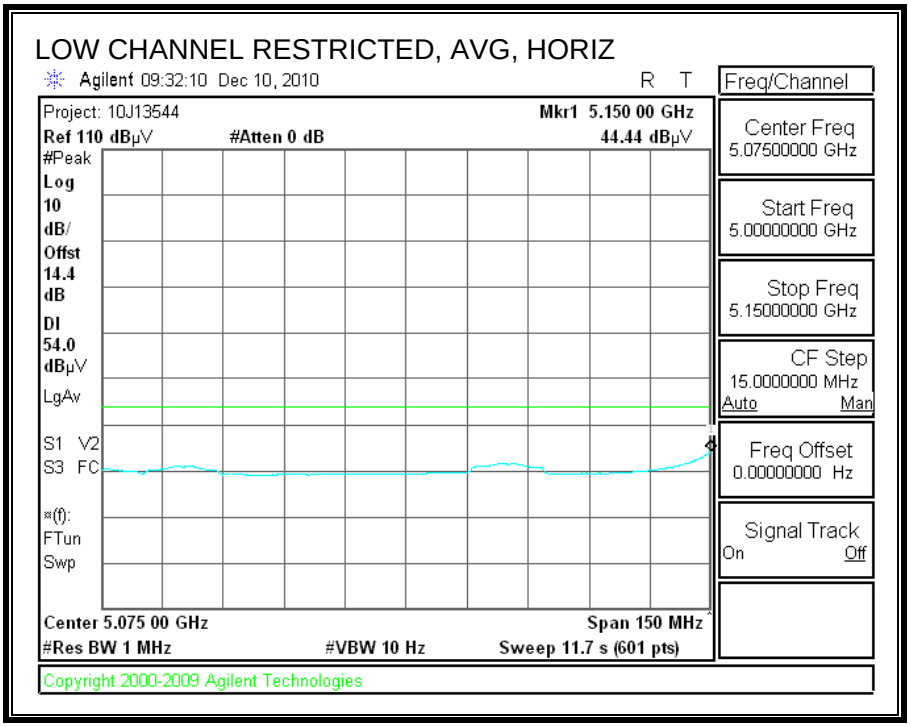
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
5180MHz Low CH													
10.360	3.0	41.1	37.4	8.9	-34.6	0.0	0.8	53.6	74.0	-20.4	V	P	
10.360	3.0	28.1	37.4	8.9	-34.6	0.0	0.8	40.6	54.0	-13.4	V	A	
15.540	3.0	34.4	38.9	11.3	-32.3	0.0	0.7	53.0	74.0	-21.0	V	P	
15.540	3.0	22.5	38.9	11.3	-32.3	0.0	0.7	41.2	54.0	-12.8	V	A	
5180MHz Low CH													
10.360	3.0	41.8	37.4	8.9	-34.6	0.0	0.8	54.3	74.0	-19.7	H	P	
10.360	3.0	28.5	37.4	8.9	-34.6	0.0	0.8	41.0	54.0	-13.0	H	A	
15.540	3.0	34.9	38.9	11.3	-32.3	0.0	0.7	53.6	74.0	-20.4	H	P	
15.540	3.0	22.3	38.9	11.3	-32.3	0.0	0.7	41.0	54.0	-13.0	H	A	
5200MHz Mid CH													
10.400	3.0	36.7	37.5	8.9	-34.6	0.0	0.8	49.3	74.0	-24.7	H	P	
10.400	3.0	24.3	37.5	8.9	-34.6	0.0	0.8	36.9	54.0	-17.1	H	A	
15.600	3.0	34.7	38.7	11.4	-32.3	0.0	0.7	53.3	74.0	-20.7	H	P	
15.600	3.0	22.2	38.7	11.4	-32.3	0.0	0.7	40.7	54.0	-13.3	H	A	
5200MHz Mid CH													
10.400	3.0	37.5	37.5	8.9	-34.6	0.0	0.8	50.2	74.0	-23.8	V	P	
10.400	3.0	25.3	37.5	8.9	-34.6	0.0	0.8	37.9	54.0	-16.1	V	A	
15.600	3.0	34.2	38.7	11.4	-32.3	0.0	0.7	52.8	74.0	-21.2	V	P	
15.600	3.0	22.2	38.7	11.4	-32.3	0.0	0.7	40.7	54.0	-13.3	V	A	
5240MHz High CH													
10.480	3.0	42.0	37.5	9.0	-34.5	0.0	0.8	54.8	74.0	-19.2	V	P	
10.480	3.0	27.8	37.5	9.0	-34.5	0.0	0.8	40.6	54.0	-13.4	V	A	
15.720	3.0	34.2	38.4	11.4	-32.3	0.0	0.7	52.5	74.0	-21.5	V	P	
15.720	3.0	22.2	38.4	11.4	-32.3	0.0	0.7	40.5	54.0	-13.5	V	A	
5240MHz High CH													
10.480	3.0	35.3	37.5	9.0	-34.5	0.0	0.8	48.1	74.0	-25.9	H	P	
10.480	3.0	23.0	37.5	9.0	-34.5	0.0	0.8	35.8	54.0	-18.2	H	A	
15.720	3.0	34.0	38.4	11.4	-32.3	0.0	0.7	52.3	74.0	-21.7	H	P	
15.720	3.0	22.1	38.4	11.4	-32.3	0.0	0.7	40.4	54.0	-13.6	H	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

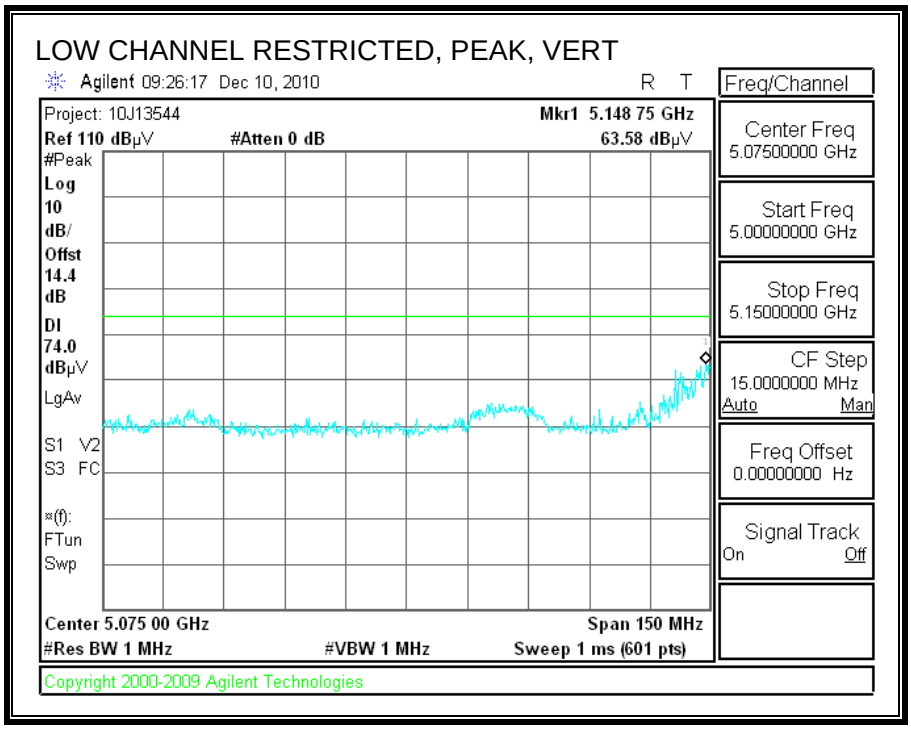
8.2.2. TX ABOVE 1 GHz FOR 802.11n HT20 SISO MODE IN THE LOWER 5.2 GHz BAND

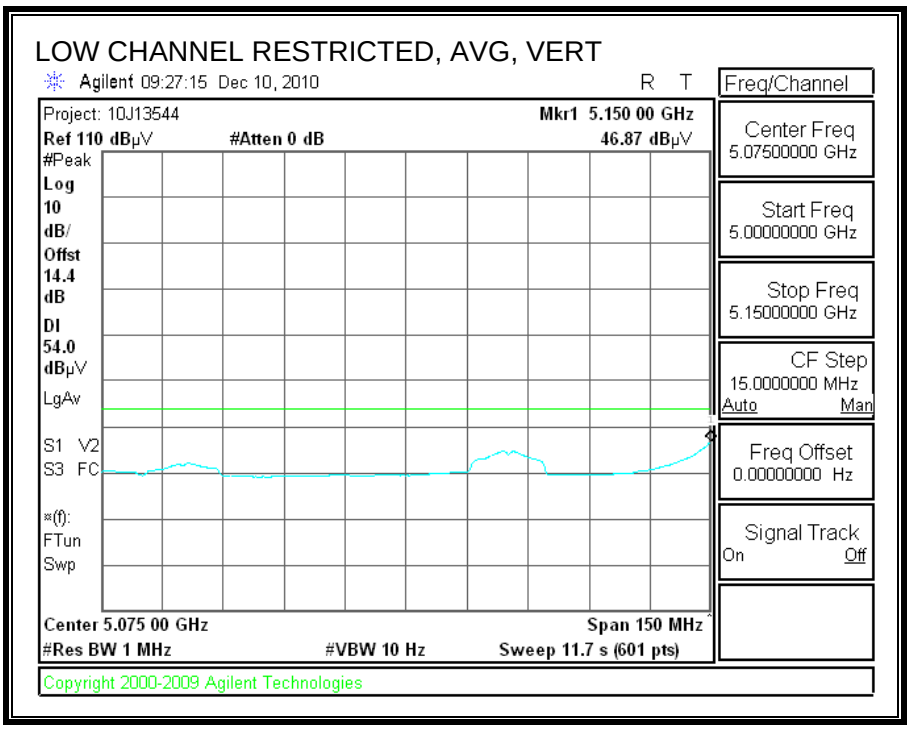
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 12/10/10
Project #: 10J13544
Company: Hon Hai
Test Target: FCC Class B
Mode Oper: TX mode

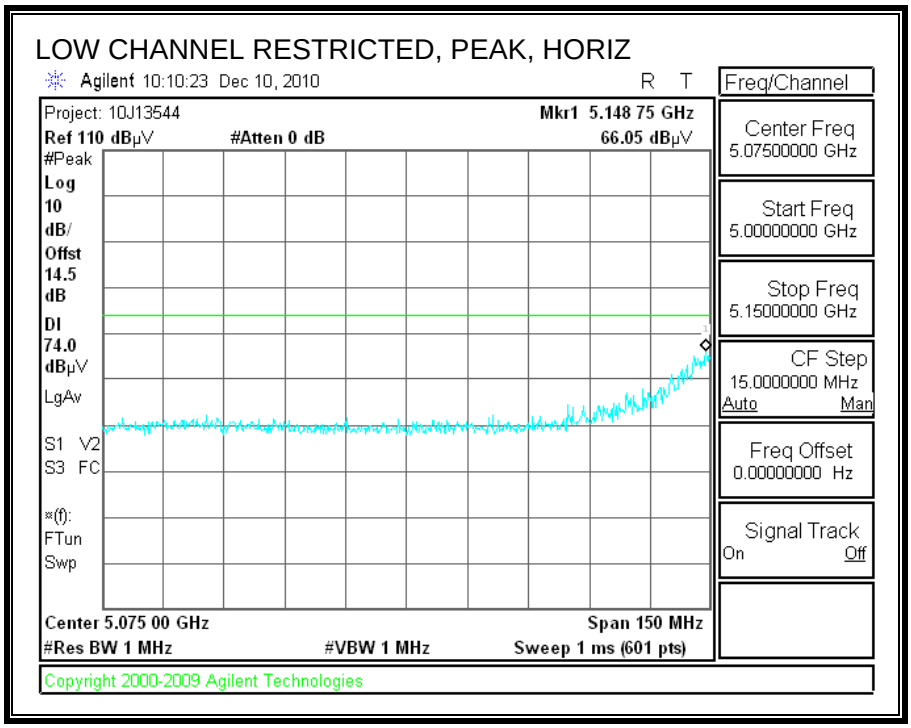
f	Measurement Frequency	Amp	Preamp Gain		Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters		Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m		Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field Strength		Margin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

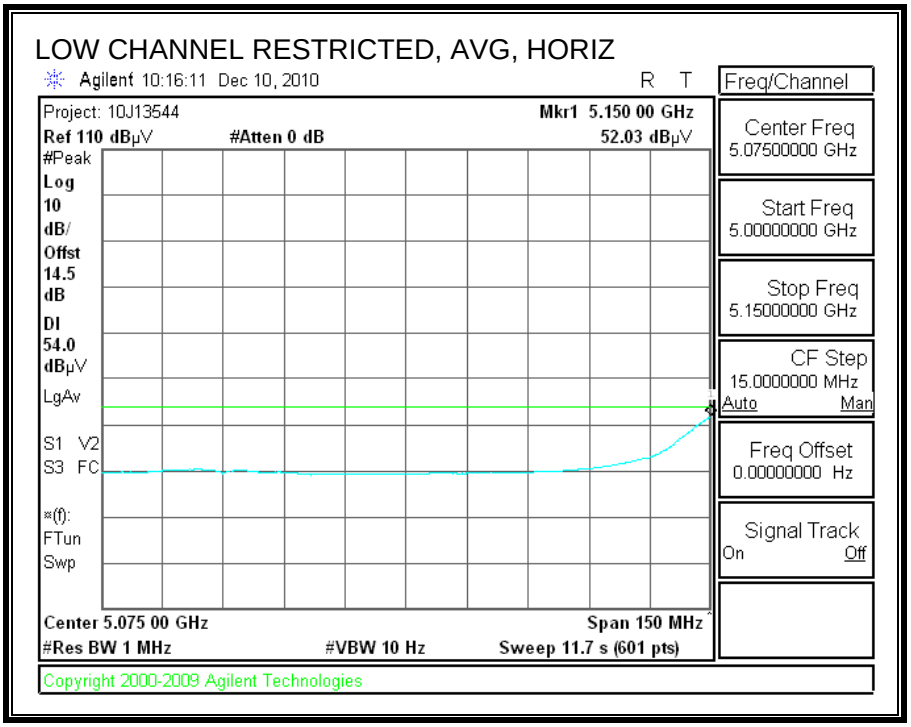
f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
5180MHz Low CH													
10.360	3.0	35.9	37.4	8.9	-34.6	0.0	0.8	48.5	74.0	-25.5	V	P	
10.360	3.0	23.4	37.4	8.9	-34.6	0.0	0.8	35.9	54.0	-18.1	V	A	
15.540	3.0	35.2	38.9	11.3	-32.3	0.0	0.7	53.9	74.0	-20.1	V	P	
15.540	3.0	22.3	38.9	11.3	-32.3	0.0	0.7	41.0	54.0	-13.0	V	A	
5180MHz Low CH													
10.360	3.0	36.5	37.4	8.9	-34.6	0.0	0.8	49.1	74.0	-24.9	H	P	
10.360	3.0	23.4	37.4	8.9	-34.6	0.0	0.8	36.0	54.0	-18.0	H	A	
15.540	3.0	35.0	38.9	11.3	-32.3	0.0	0.7	53.6	74.0	-20.4	H	P	
15.540	3.0	22.3	38.9	11.3	-32.3	0.0	0.7	41.0	54.0	-13.0	H	A	
5200MHz Mid CH													
10.400	3.0	35.5	37.5	8.9	-34.6	0.0	0.8	48.1	74.0	-25.9	H	P	
10.400	3.0	23.5	37.5	8.9	-34.6	0.0	0.8	36.1	54.0	-17.9	H	A	
15.600	3.0	34.4	38.7	11.4	-32.3	0.0	0.7	53.0	74.0	-21.0	H	P	
15.600	3.0	22.2	38.7	11.4	-32.3	0.0	0.7	40.8	54.0	-13.2	H	A	
5200MHz Mid CH													
10.400	3.0	39.8	37.5	8.9	-34.6	0.0	0.8	52.5	74.0	-21.5	V	P	
10.400	3.0	27.3	37.5	8.9	-34.6	0.0	0.8	39.9	54.0	-14.1	V	A	
15.600	3.0	34.7	38.7	11.4	-32.3	0.0	0.7	53.2	74.0	-20.8	V	P	
15.600	3.0	22.2	38.7	11.4	-32.3	0.0	0.7	40.7	54.0	-13.3	V	A	
5240MHz High CH													
10.480	3.0	35.2	37.5	9.0	-34.5	0.0	0.8	48.0	74.0	-26.0	H	P	
10.480	3.0	23.0	37.5	9.0	-34.5	0.0	0.8	35.8	54.0	-18.2	H	A	
15.720	3.0	33.9	38.4	11.4	-32.3	0.0	0.7	52.2	74.0	-21.8	H	P	
15.720	3.0	22.2	38.4	11.4	-32.3	0.0	0.7	40.5	54.0	-13.5	H	A	
5240MHz High CH													
10.480	3.0	34.9	37.5	9.0	-34.5	0.0	0.8	47.7	74.0	-26.3	V	P	
10.480	3.0	23.0	37.5	9.0	-34.5	0.0	0.8	35.7	54.0	-18.3	V	A	
15.720	3.0	34.7	38.4	11.4	-32.3	0.0	0.7	53.0	74.0	-21.0	V	P	
15.720	3.0	22.1	38.4	11.4	-32.3	0.0	0.7	40.4	54.0	-13.6	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

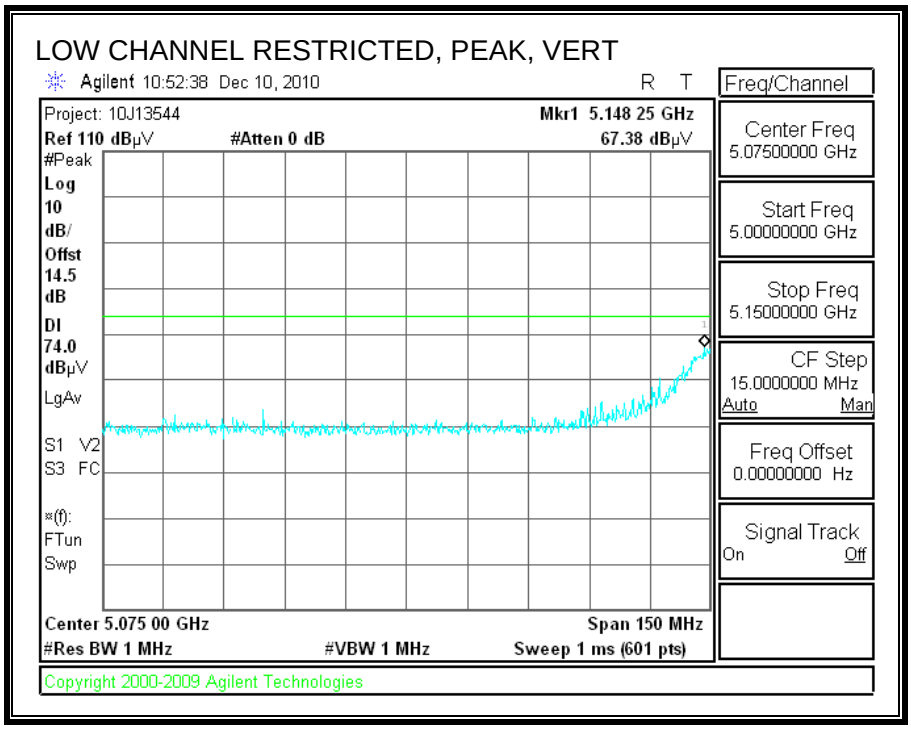
8.2.3. TX ABOVE 1 GHz FOR 802.11n HT40 SISO MODE IN THE LOWER 5.2 GHz BAND

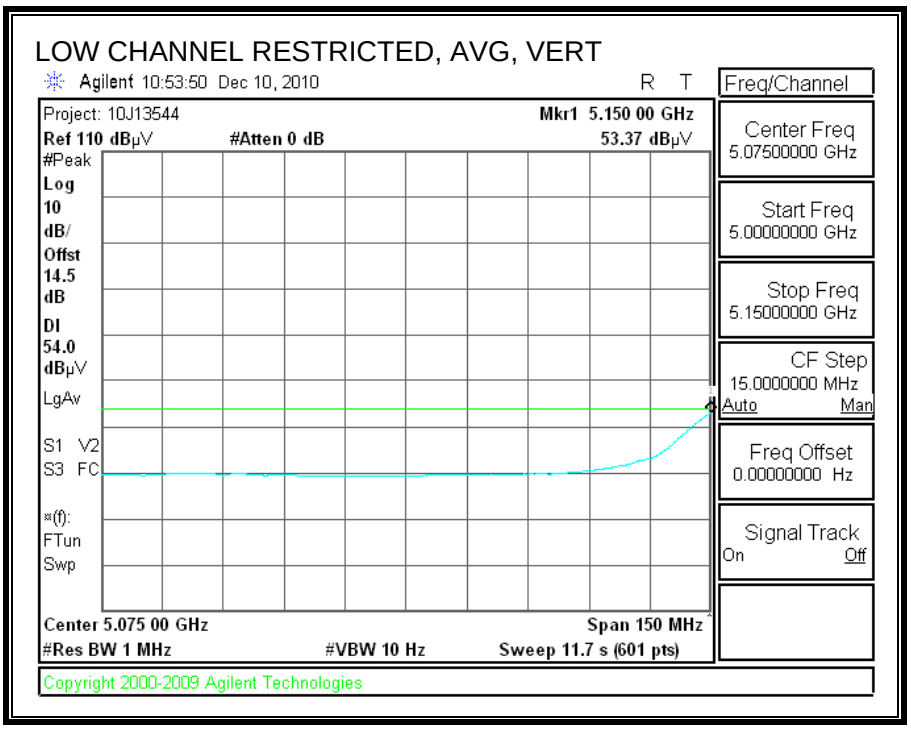
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Tom Chen
Date: 12/10/10
Project #: 10J13544
Company: Hon Hai
Test Target: FCC Class B
Mode Oper: TX mode

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

f GHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
5190MHz Low CH													
10.380	3.0	35.7	37.4	8.9	-34.6	0.0	0.8	48.3	74.0	-25.7	V	P	
10.380	3.0	23.2	37.4	8.9	-34.6	0.0	0.8	35.8	54.0	-18.2	V	A	
15.570	3.0	34.6	38.8	11.4	-32.3	0.0	0.7	53.2	74.0	-20.8	V	P	
15.570	3.0	22.3	38.8	11.4	-32.3	0.0	0.7	40.9	54.0	-13.1	V	A	
5190MHz Low CH													
10.380	3.0	35.8	37.4	8.9	-34.6	0.0	0.8	48.4	74.0	-25.6	H	P	
10.380	3.0	23.3	37.4	8.9	-34.6	0.0	0.8	35.9	54.0	-18.1	H	A	
15.570	3.0	35.5	38.8	11.4	-32.3	0.0	0.7	54.1	74.0	-19.9	H	P	
15.570	3.0	22.3	38.8	11.4	-32.3	0.0	0.7	40.9	54.0	-13.1	H	A	
5230MHz High CH													
10.460	3.0	35.6	37.5	9.0	-34.5	0.0	0.8	48.3	74.0	-25.7	H	P	
10.460	3.0	23.8	37.5	9.0	-34.5	0.0	0.8	36.6	54.0	-17.4	H	A	
15.690	3.0	34.4	38.5	11.4	-32.3	0.0	0.7	52.7	74.0	-21.3	H	P	
15.690	3.0	22.3	38.5	11.4	-32.3	0.0	0.7	40.6	54.0	-13.4	H	A	
5230MHz High CH													
10.460	3.0	37.6	37.5	9.0	-34.5	0.0	0.8	50.3	74.0	-23.7	V	P	
10.460	3.0	24.6	37.5	9.0	-34.5	0.0	0.8	37.3	54.0	-16.7	V	A	
15.690	3.0	34.7	38.5	11.4	-32.3	0.0	0.7	53.1	74.0	-20.9	V	P	
15.690	3.0	22.5	38.5	11.4	-32.3	0.0	0.7	40.8	54.0	-13.2	V	A	

Rev. 4.1.2.7
Note: No other emissions were detected above the system noise floor.

8.3. RECEIVER ABOVE 1 GHz

8.3.1. RECEIVER ABOVE 1 GHz (20MHz Bandwidth)

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Project #: 10J13544
Date: 12/13/2010
Test Engineer: Tom Chen
Configuration: Hon Hai
Mode: RX mode

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.247	3.0	50.9	35.2	24.7	2.7	-39.1	0.0	0.0	39.1	23.4	74	54	-34.9	-30.6	V
1.600	3.0	53.3	37.6	25.9	3.0	-38.6	0.0	0.0	43.6	27.9	74	54	-30.4	-26.1	V
1.980	3.0	49.9	34.2	27.1	3.4	-38.1	0.0	0.0	42.4	26.7	74	54	-31.6	-27.3	V
2.467	3.0	51.5	35.8	28.4	3.9	-37.5	0.0	0.0	46.3	30.6	74	54	-27.7	-23.4	V
2.920	3.0	52.8	37.1	29.8	4.3	-37.4	0.0	0.0	49.5	33.8	74	54	-24.5	-20.2	V
3.187	3.0	53.4	37.7	30.4	4.5	-37.2	0.0	0.0	51.1	35.4	74	54	-22.9	-18.6	V
2.127	3.0	49.2	33.5	27.5	3.6	-37.9	0.0	0.0	42.5	26.7	74	54	-31.5	-27.3	H
2.393	3.0	48.2	32.5	28.2	3.8	-37.5	0.0	0.0	42.7	27.0	74	54	-31.3	-27.0	H
2.667	3.0	47.3	31.5	29.0	4.1	-37.4	0.0	0.0	42.9	27.2	74	54	-31.1	-26.8	H
3.187	3.0	47.7	31.9	30.4	4.5	-37.2	0.0	0.0	45.4	29.6	74	54	-28.6	-24.4	H

Rev. 07.22.09

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

8.3.2. RECEIVER ABOVE 1 GHz (40MHz Bandwidth)

Compliance Certification Services, Fremont 5m Chamber

Project #: 10J13544
Date: 12/13/2010
Test Engineer: Tom Chen
Configuration: Hon Hai
Mode: RX mode, 40MHz BW

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T73; S/N: 6717 @3m	T144 Miteq 3008A00931			RX RSS 210

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500		

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

f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
1.600	3.0	53.0	37.3	25.9	3.0	-38.6	0.0	0.0	43.3	27.5	74	54	-30.7	-26.5	V
1.980	3.0	49.6	34.5	27.1	3.4	-38.1	0.0	0.0	42.1	27.0	74	54	-31.9	-27.0	V
2.467	3.0	51.2	35.4	28.4	3.9	-37.5	0.0	0.0	46.0	30.3	74	54	-28.0	-23.7	V
2.920	3.0	52.5	36.8	29.8	4.3	-37.4	0.0	0.0	49.2	33.4	74	54	-24.8	-20.6	V
3.187	3.0	53.1	37.4	30.4	4.5	-37.2	0.0	0.0	50.8	35.1	74	54	-23.2	-18.9	V
2.127	3.0	49.6	33.8	27.5	3.6	-37.9	0.0	0.0	42.8	27.1	74	54	-31.2	-26.9	H
2.393	3.0	48.5	32.8	28.2	3.8	-37.5	0.0	0.0	43.1	27.3	74	54	-30.9	-26.7	H
2.667	3.0	47.6	31.9	29.0	4.1	-37.4	0.0	0.0	43.2	27.5	74	54	-30.8	-26.5	H
3.187	3.0	48.0	32.3	30.4	4.5	-37.2	0.0	0.0	45.7	30.0	74	54	-28.3	-24.0	H

Rev. 07.22.09

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

8.4. WORST-CASE BELOW 1 GHz

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION

HROZONTAL AND VERTICAL DATA

30-1000MHz Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

Test Engr: Oliver Su
Date: 12/13/2010
Project #: 10J13544
Company: Hon Hai
Test Target: FCC15 Class B
Mode Oper: TX continuously

f	Measurement Frequency	Amp	Preamp Gain
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters
Read	Analyzer Reading	Filter	Filter Insert Loss
AF	Antenna Factor	Corr.	Calculated Field Strength
CL	Cable Loss	Limit	Field Strength Limit

Margin Margin vs. Limit

f MHz	Dist (m)	Read dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Pad dB	Corr. dBuV/m	Limit dBuV/m	Margin dB	Ant. Pol. V/H	Det. P/A/QP	Notes
Horizontal													
166.566	3.0	43.2	10.4	1.2	29.3	0.0	0.0	15.1	43.5	-28.4	H	P	
816.032	3.0	44.9	21.1	2.8	29.1	0.0	0.0	18.7	46.0	-27.3	H	P	
912.036	3.0	41.4	21.6	3.0	28.5	0.0	0.0	15.9	46.0	-30.1	H	P	
Vertical													
144.005	3.0	46.7	13.0	1.1	29.3	0.0	0.0	18.5	43.5	-25.0	V	P	
154.325	3.0	39.7	11.8	1.1	29.3	0.0	0.0	11.6	43.5	-31.9	V	P	
192.007	3.0	38.4	11.4	1.2	29.0	0.0	0.0	10.6	43.5	-32.9	V	P	

Rev. 1.27.09
Note: No other emissions were detected above the system noise floor.

9. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 7.2.2

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

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

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

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

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

RESULTS

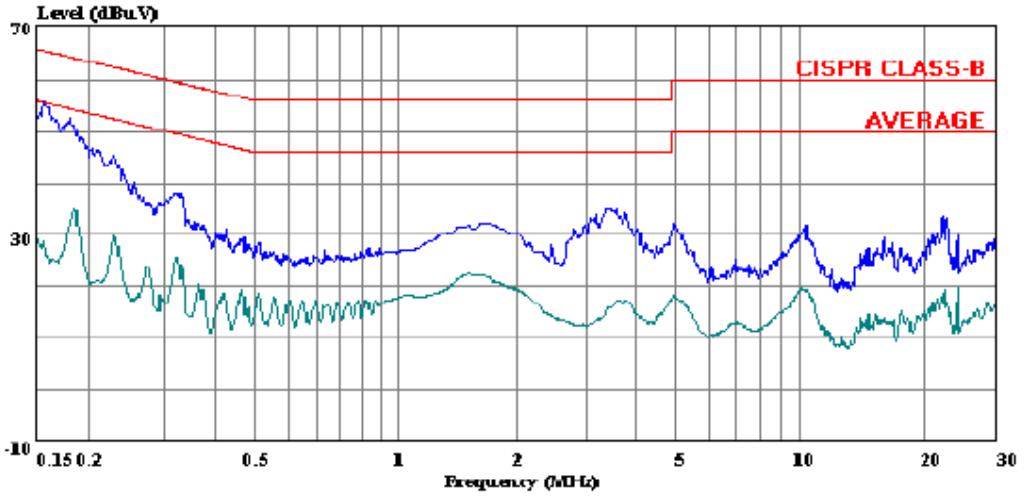
6 WORST EMISSIONS

CONDUCTED EMISSIONS DATA (115VAC 60Hz)									
Freq.	Reading			Closs	Limit	EN_B	Margin		Remark
(MHz)	PK (dBuV)	QP (dBuV)	AV (dBuV)	(dB)	QP	AV	QP (dB)	AV (dB)	L1 / L2
0.16	55.69	--	28.83	0.00	65.73	55.73	-10.04	-26.90	L1
0.18	52.58	--	32.32	0.00	64.49	54.49	-11.91	-22.17	L1
0.23	45.43	--	29.43	0.00	62.52	52.52	-17.09	-23.09	L1
0.16	53.91	--	24.70	0.00	65.52	55.52	-11.61	-30.82	L2
0.18	50.45	--	25.99	0.00	64.67	54.67	-14.22	-28.68	L2
0.20	46.01	--	18.67	0.00	63.45	53.45	-17.44	-34.78	L2
6 Worst Data									

LINE 1 RESULTS

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

Data#: 7 File#: 10J13544-LC.EMI Date: 12-14-2010 Time: 20:08:09



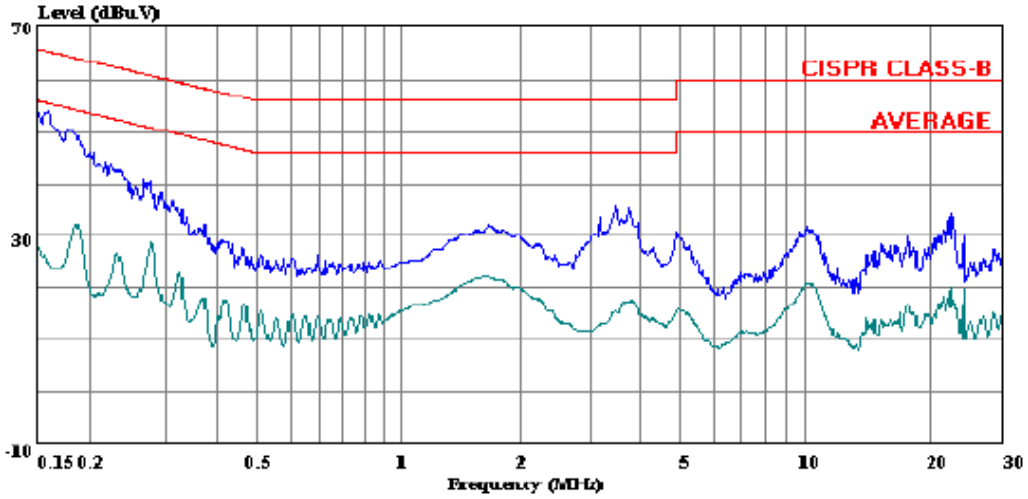
Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Tom Chen
Project #: : 10U13544
Company: : Hon Hai
Configuration:: EUT hosted support laptop PC
Mode : : TX worst case
Target: : FCC Class B
Voltage: : 115VAC / 60Hz
: L1: Peak (Blue) ; Average (Green)

LINE 2 RESULTS

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

Data#: 14 File#: 10J13544-LC.EMI Date: 12-14-2010 Time: 20:18:49



Trace: 12 Ref Trace:

Condition: CISPR CLASS-B
Test Operator:: Tom Chen
Project #: : 10U13544
Company: : Hon Hai
Configuration:: EUT hosted support laptop PC
Mode : : TX worst case
Target: : FCC Class B
Voltage: : 115VAC / 60Hz
: L2: Peak (Blue) ; Average (Green)

10. MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm²)	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/f²)	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/f²)	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/cm²)	Averaging time (minutes)
30–300	27.5	0.073	0.2	30
300–1500	.....	.....	f/1500	30
1500–100,000	.....	.....	1.0	30

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

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

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

IC RULES

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

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

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

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

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

EQUATIONS

Power density is given by:

S = EIRP / (4 * Pi * D^2)

where

S = Power density in W/m^2
EIRP = Equivalent Isotropic Radiated Power in W
D = Separation distance in m

Power density in units of W/m^2 is converted to units of mWc/m^2 by dividing by 10.

In the table(s) below, Power and Gain are entered in units of dBm and dBi respectively and conversions to linear forms are used for the calculations.

LIMITS

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

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

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
5 GHz	WLAN	0.20	11.37	2.30	0.05	0.005