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

CERTIFICATION TEST REPORT

FOR

WIFI 11A/N MODULE

MODEL NUMBER: MIC-B2

FCC ID: MCLMICB2
IC: 2878D-MICB2

REPORT NUMBER: 11J13872-1, Revision B

ISSUE DATE: SEPTEMBER 23, 2011

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

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NVLAP LAB CODE 200065-0

Revision History

Rev.	Issue Date	Revisions	Revised By
--	8/22/2011	Initial Issue	T. Chan
A	9/20/2011	Page 10, revised Test and Measurement equipment, correction of typo	T. Chan
B	9/23/2011	Re-measured 99% BW & add MPE co-location	T. Chan

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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-B2

SERIAL NUMBER: E00C7F2DB7AB

DATE TESTED: JULY 15 - AUGUST 19 & SEPTEMBER 21, 2011

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:

Tadaomi Yamano
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 Legacy	Covered by the worst case 802.11n SISO HT20	
5180 - 5240	802.11n SISO HT20 (MCS0 – MCS7)	13.25	21.13
5180 - 5240	802.11n MIMO HT20 (MCS8 – MCS15)	13.74	23.66
5180 - 5240	802.11n SISO HT40 (MCS0 – MCS7)	12.21	16.63
5190 - 5230	802.11n MIMO HT40 (MCS8 – MCS15)	15.14	32.66

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna, and the antenna gain for SISO mode is 1.23dBi, and the antenna gain for MIMO mode is 4.23dBi.

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.91.100.31.
The test utility software used during testing was BCM Internal, rev. 5.91.RC100.31.

5.5. WORST-CASE CONFIGURATION AND MODE

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 802.11n SISO 20MHz & 40MHz mode were made at MCS0.
All final tests in the 802.11n MIMO 20MHz & 40MHz mode were made at MCS8.

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

For SISO highest port conducted power was recorded.

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 Z-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	2610486685	DOC
AC-DC Adapter (for PC)	DELL	LA65NS0-00	CN0DF2637161571U4CB8	DOC
Extended Card	Broadcom	BCM9SDIO2 CONAD	1431666	N/A
Evaluation Board	Broadcom	BCM9SANAD	1382537	N/A
AC-SC Adapter (for EUT)	V-INFINITY	EPS050250U PS-P5P-KH	N/A	DOC

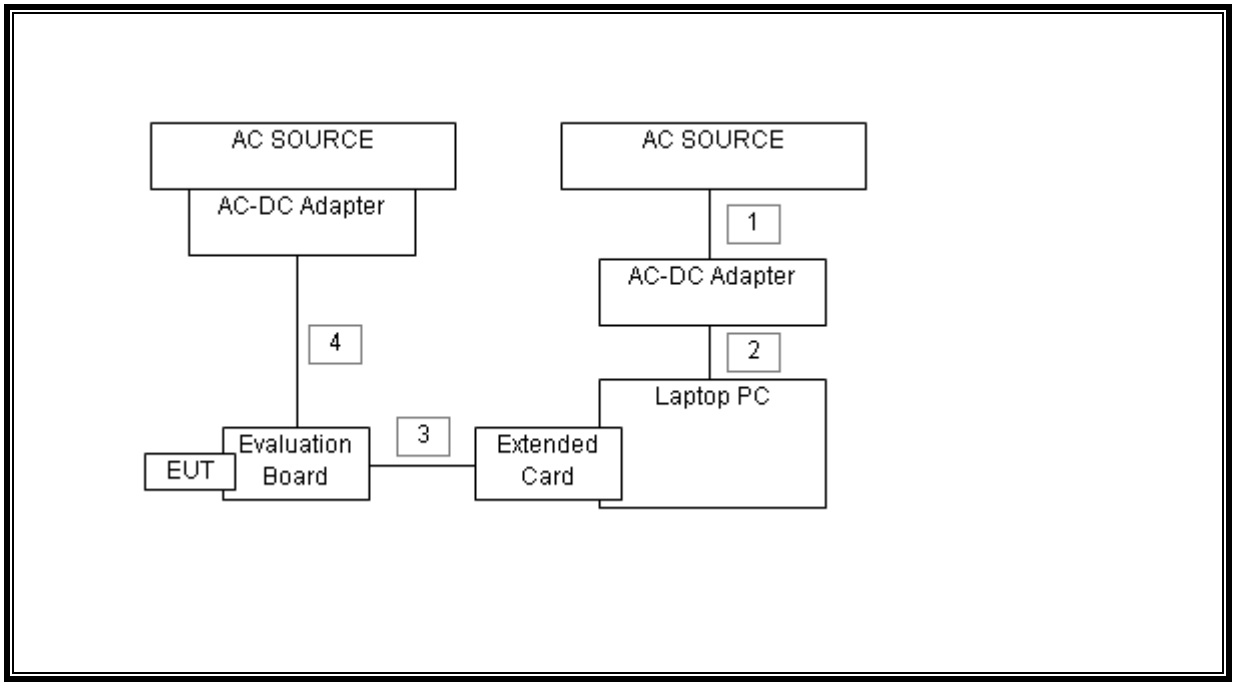
I/O CABLES

I/O CABLE LIST						
Cable No.	**Port**	**# of Identica Ports**	**Connector Type**	**Cable Type**	**Cable Length**	**Remarks**
1	AC	1	US 115V	Un-shielded	0.9m	-
2	DC	2	DC	Un-shielded	1.8m	-
3	I/O	3	Ribon	Un-shielded	0.5m	-
4	DC	4	DC	Un-shielded	1.85m	-

TEST SETUP

The EUT is attached to a jig board with a ribbon cable which is installed in the SDIO slot of a host laptop computer during the tests. Test software exercised the radio card.

SETUP DIAGRAM FOR TESTS



6. TEST AND MEASUREMENT EQUIPMENT

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

TEST EQUIPMENT LIST				
Description	**Manufacturer**	**Model**	**Asset**	**Cal Due**
Antenna, Horn, 18 GHz	EMCO	3115	C00783	06/29/12
Preamplifier, 26.5 GHz	Agilent / HP	8449B	C01063	01/27/12
Spectrum Analyzer, 26.5 GHz	Agilent / HP	E4440A	C01178	08/30/11
Antenna, Bilog, 2 GHz	Sunol Sciences	JB1	C01011	07/16/12
Preamplifier, 1300 MHz	Agilent / HP	8447D	C00885	01/27/12
LISN, 30 MHz	FCC	LISN-50/250-25-2	N02625	11/10/11
Reject Filter, 5.15-5.35 GHz	Micro-Tronics	BRC13190	N02680	CNR
Spectrum Analyzer, 44 GHz	Agilent / HP	E4446A	C00986	12/17/11
Power Meter	Agilent / HP	437B	N02778	08/11/12
Power Sensor, 18 GHz	Agilent / HP	8481A	N02784	07/29/13
Antenna, Horn, 40 GHz	ARA	MWH-2640/B	C00981	6/14/2012
Preamplifier, 40 GHz	Miteq	NSP4000-SP2	C00990	8/2/2012

7. ANTENNA PORT TEST RESULTS

7.1. 802.11n HT20 SISO MODE IN THE 5.2 GHz BAND

7.1.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.0 dB (including 10 dB Attenuator and 1.0 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5180	13.22
Middle	5200	13.10
High	5240	12.41

7.1.2. 6 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

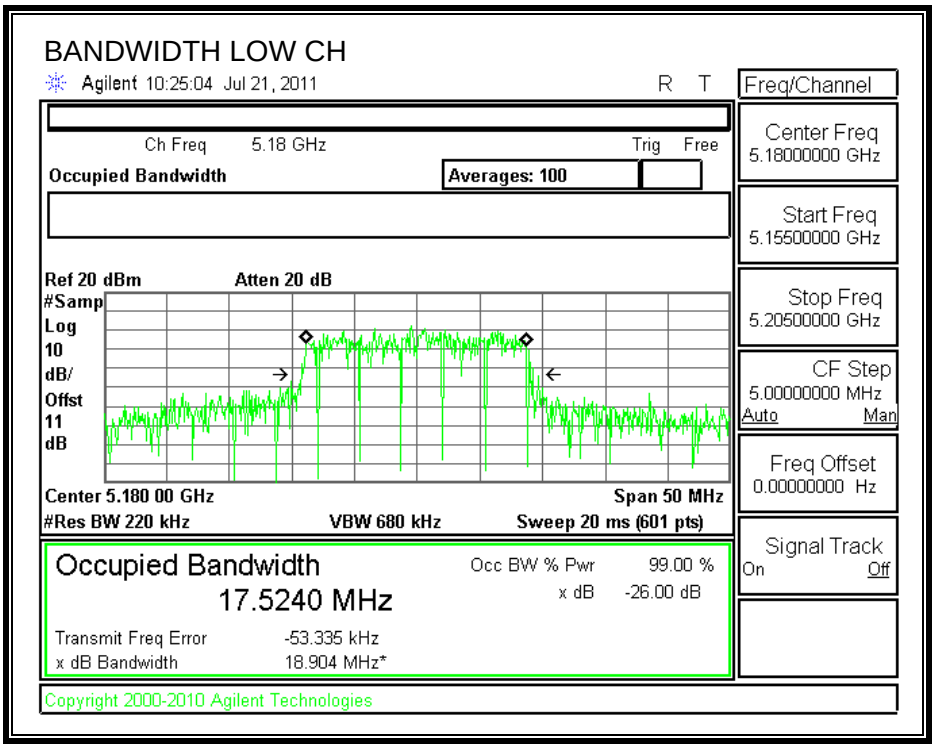
TEST PROCEDURE

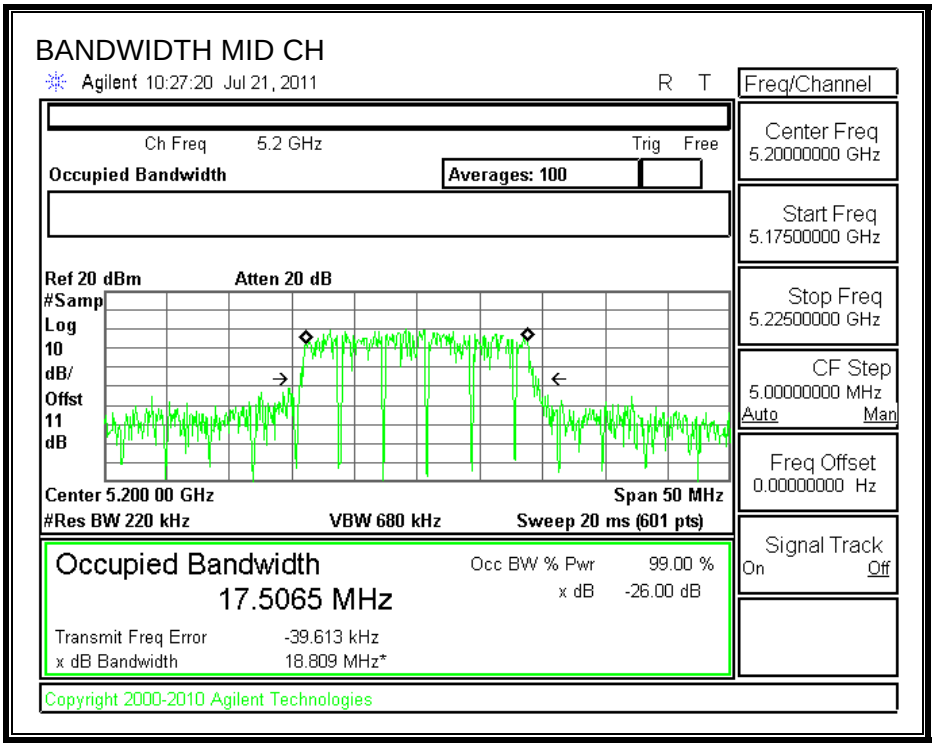
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

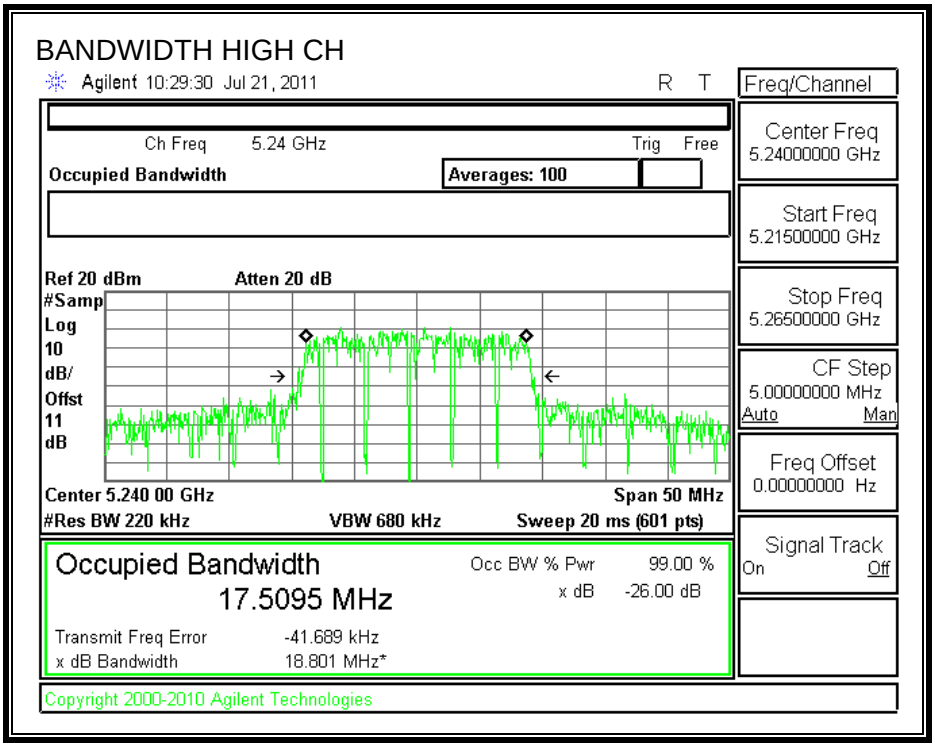
RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	18.904
Middle	5200	18.809
High	5240	18.801

26 dB BANDWIDTH







7.1.3. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

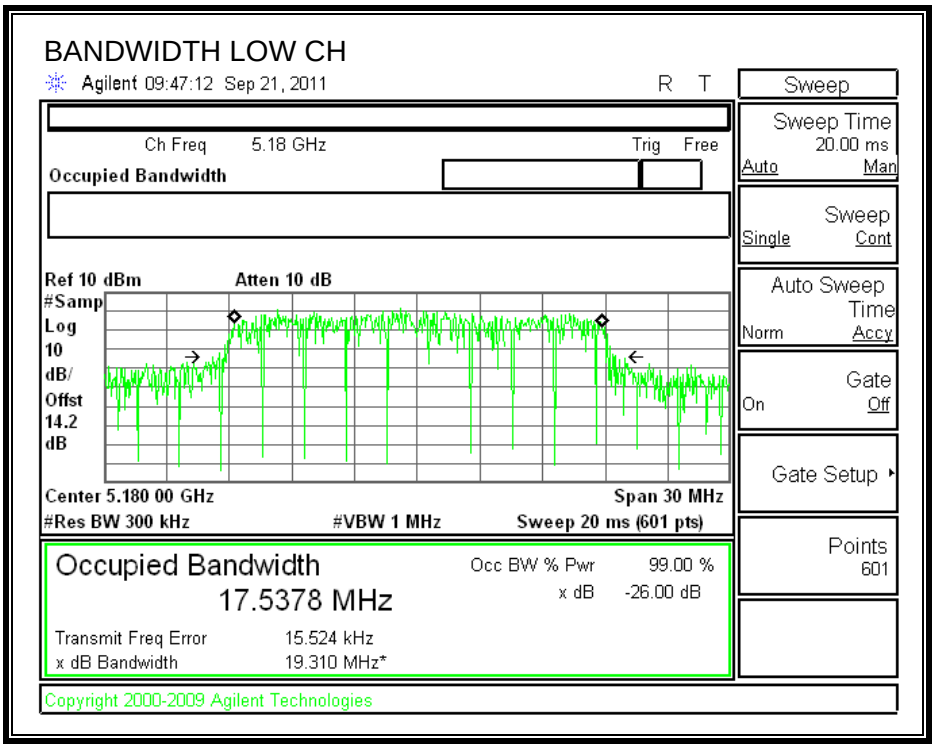
TEST PROCEDURE

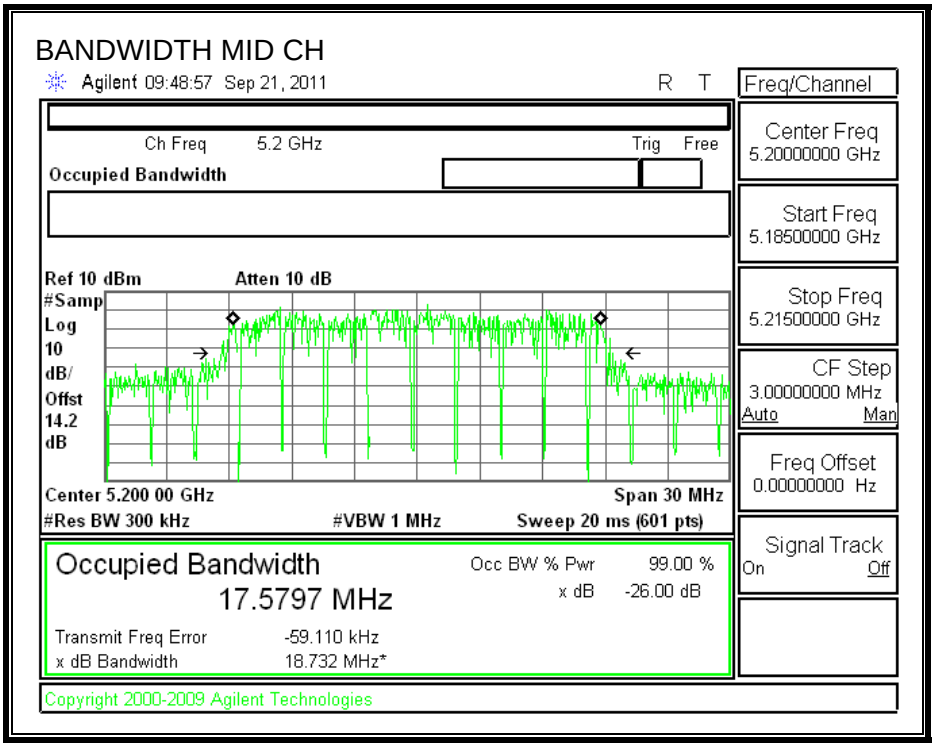
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

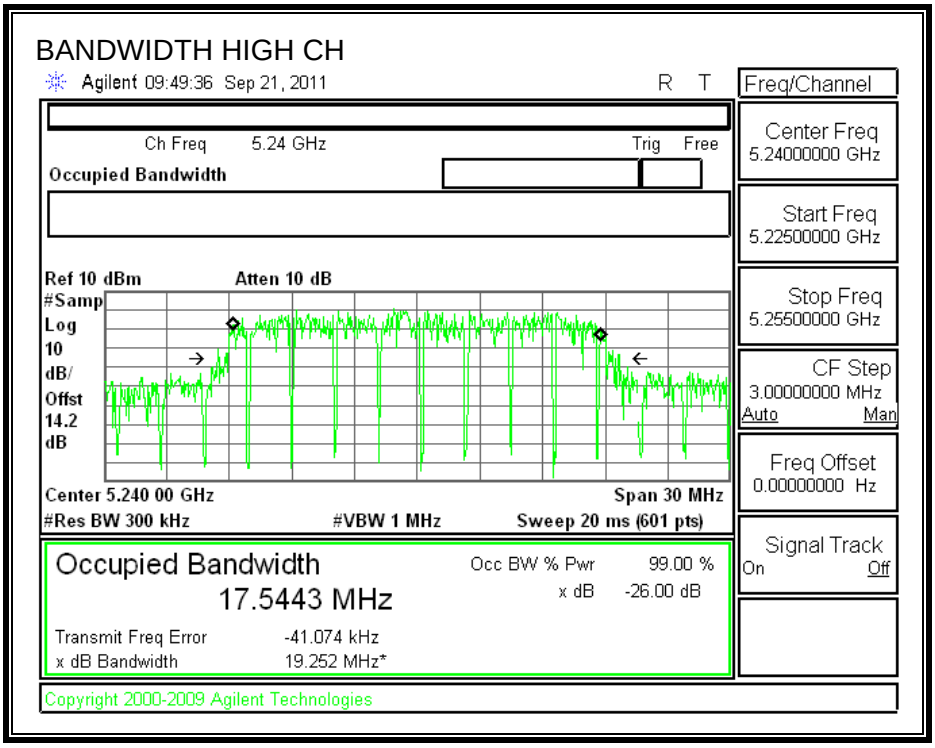
RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5180	17.5378
Middle	5200	17.5797
High	5240	17.5443

99% BANDWIDTH







7.1.4. 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

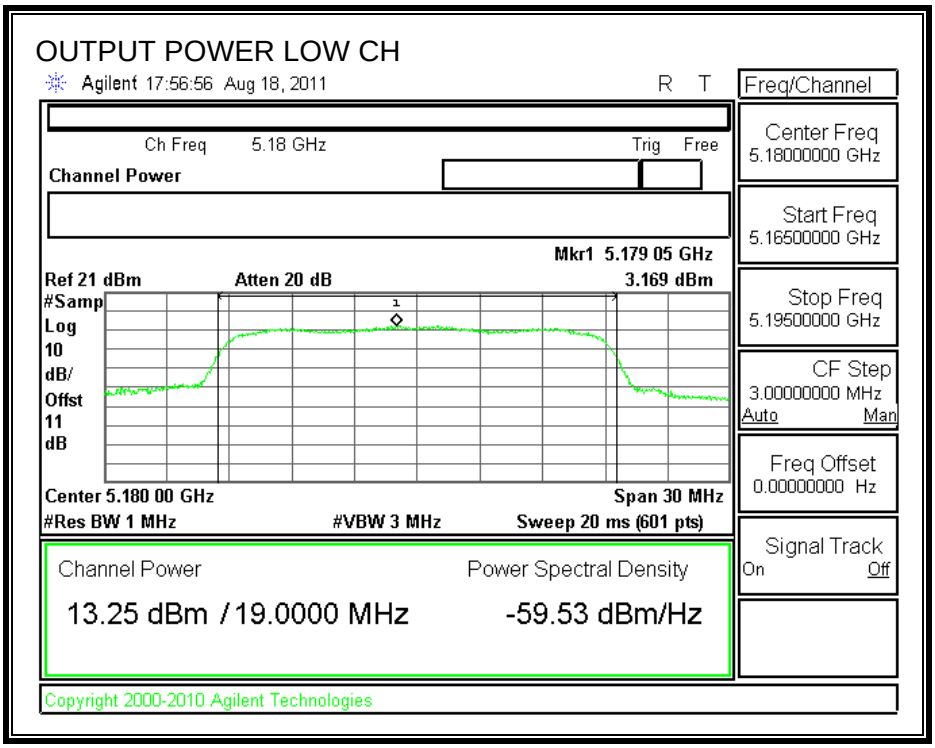
Limit

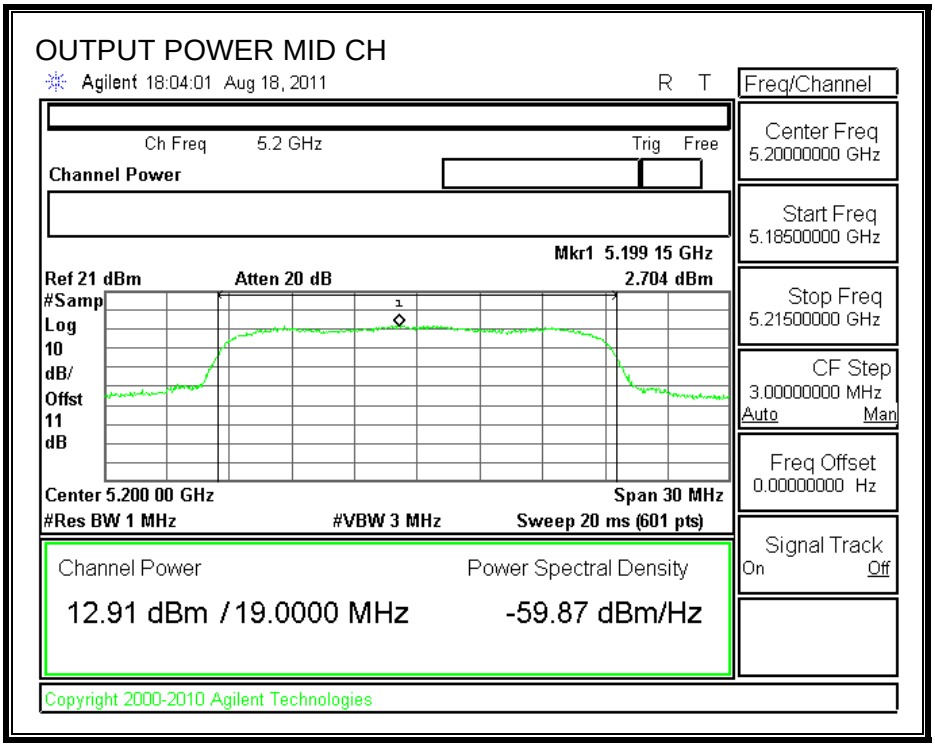
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	18.904	16.77	1.23	16.77
Mid	5200	17	18.809	16.74	1.23	16.74
High	5240	17	18.801	16.74	1.23	16.74

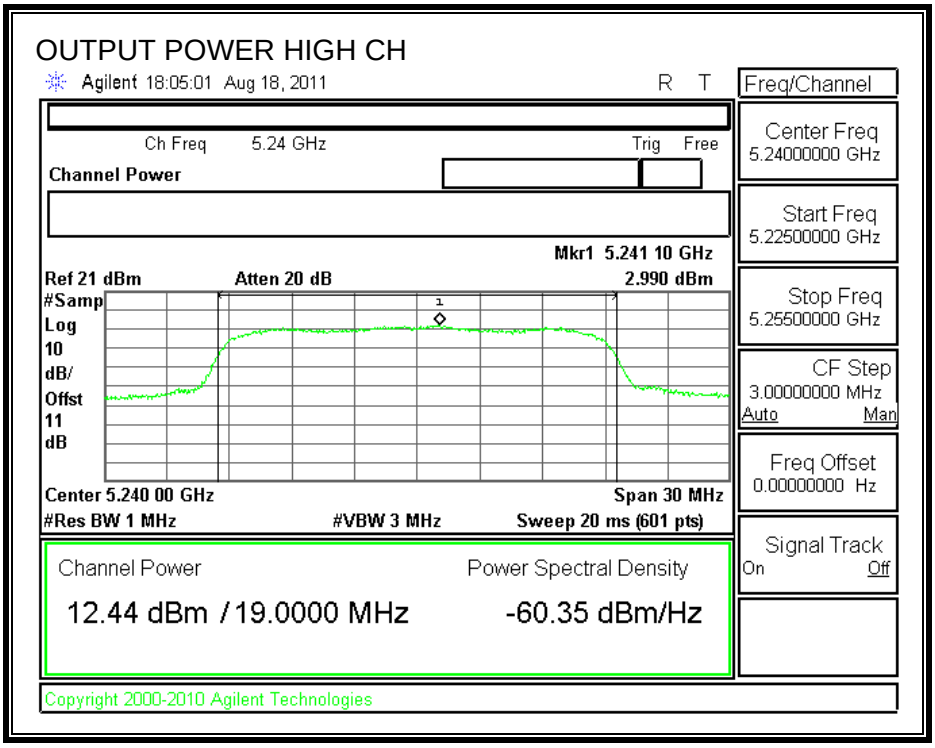
Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	13.25	16.77	-3.52
Mid	5200	12.91	16.74	-3.83
High	5240	12.44	16.74	-4.30

OUTPUT POWER







7.1.5. 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.

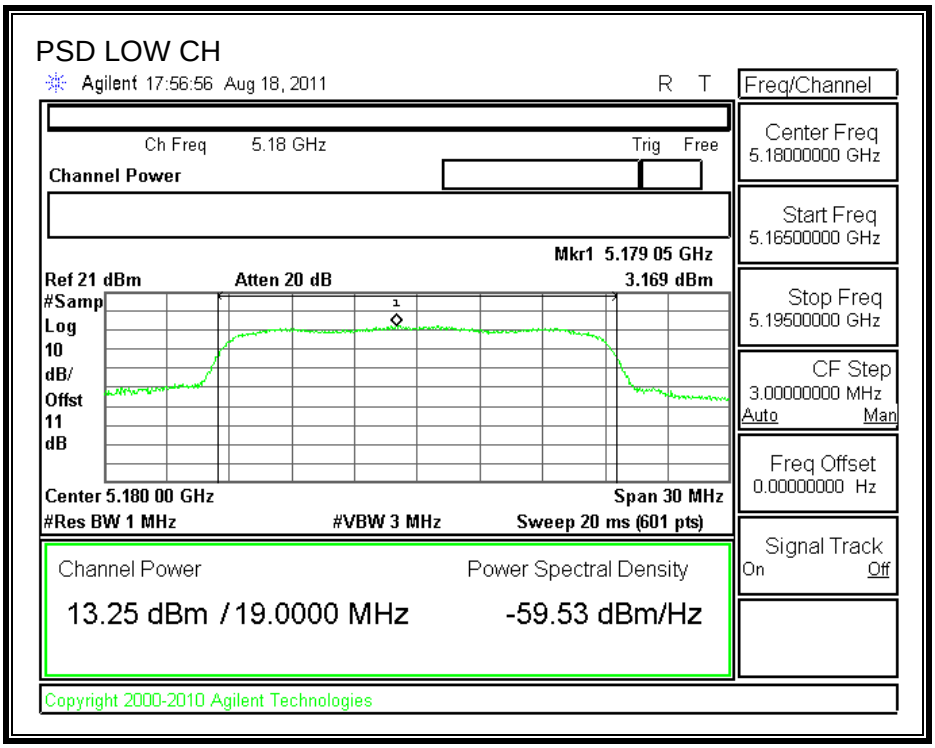
TEST PROCEDURE

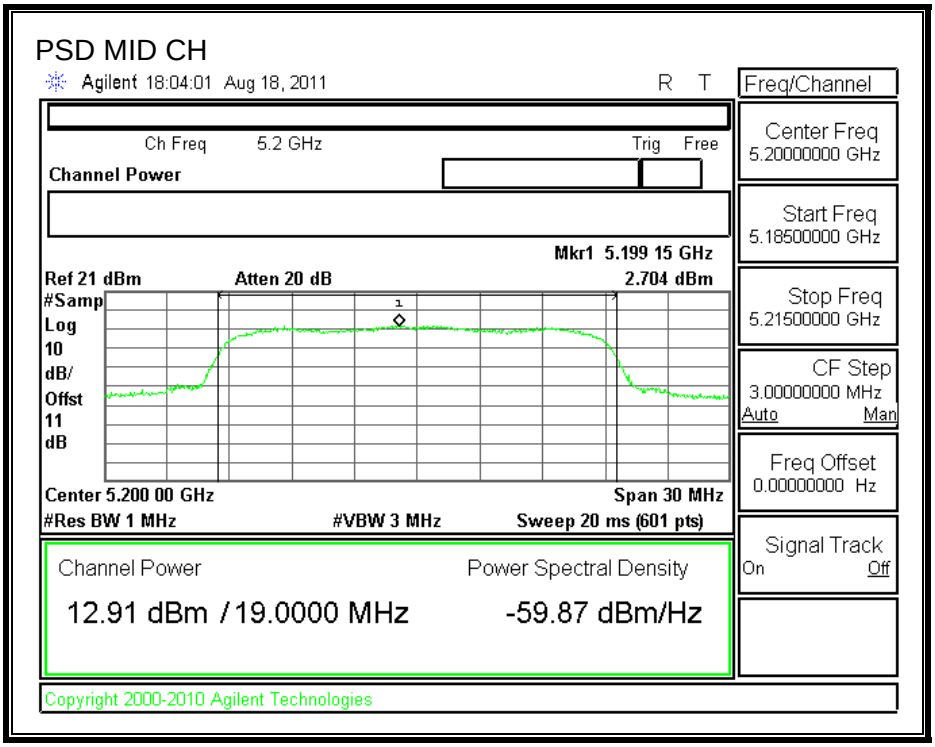
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

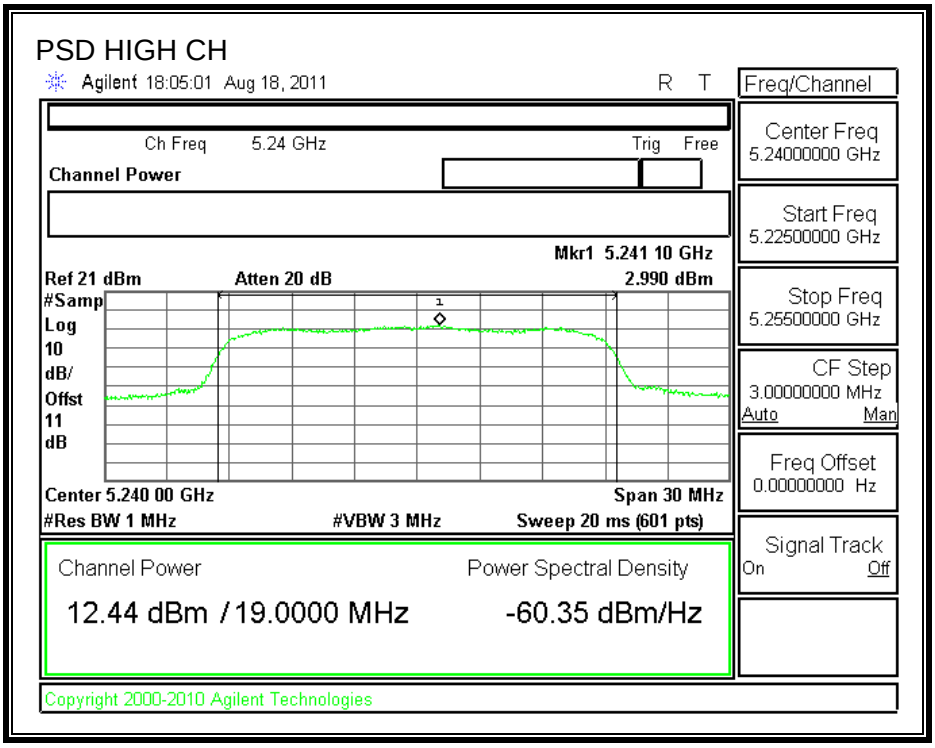
RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	3.17	4	-0.83
Middle	5200	2.70	4	-1.30
High	5240	2.99	4	-1.01

POWER SPECTRAL DENSITY







7.1.6. 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

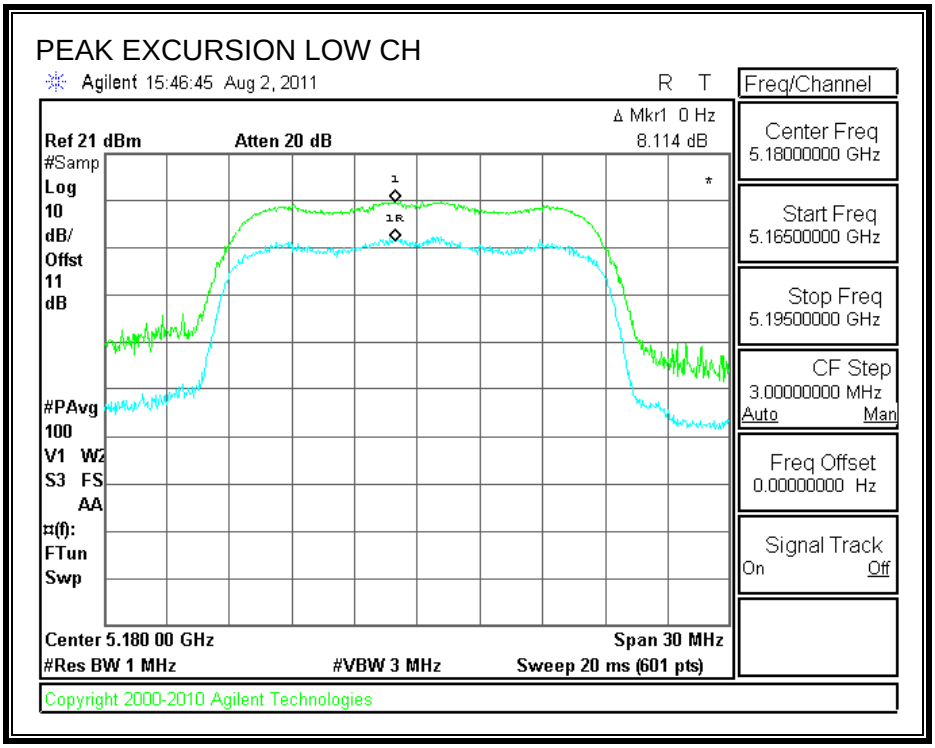
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

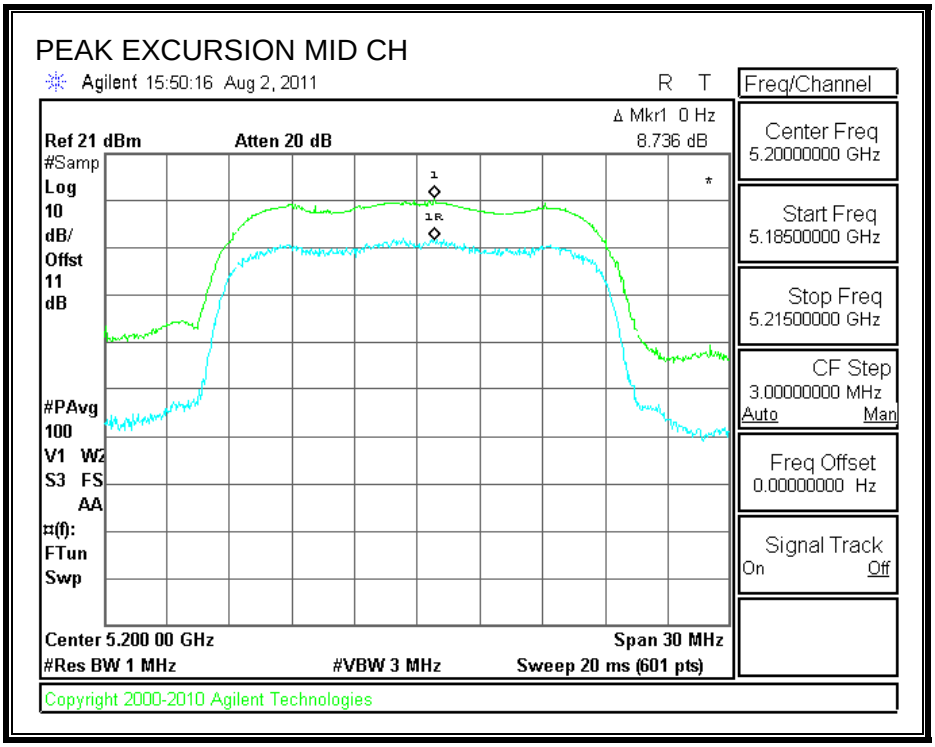
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

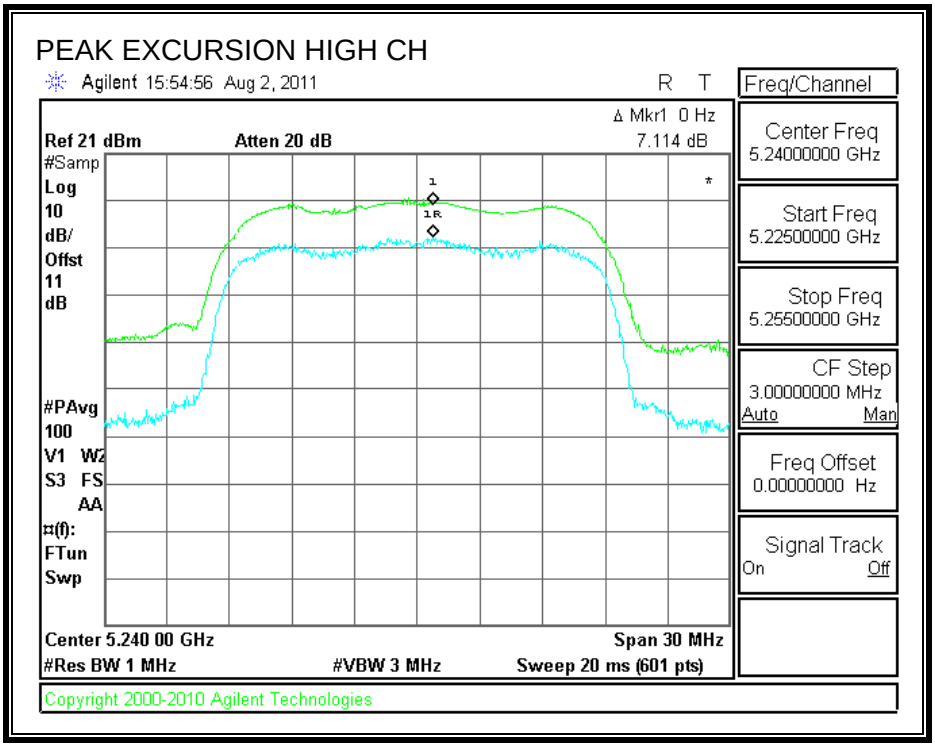
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.11	13	-4.89
Middle	5200	8.74	13	-4.26
High	5240	7.11	13	-5.89

PEAK EXCURSION







7.1.7. 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

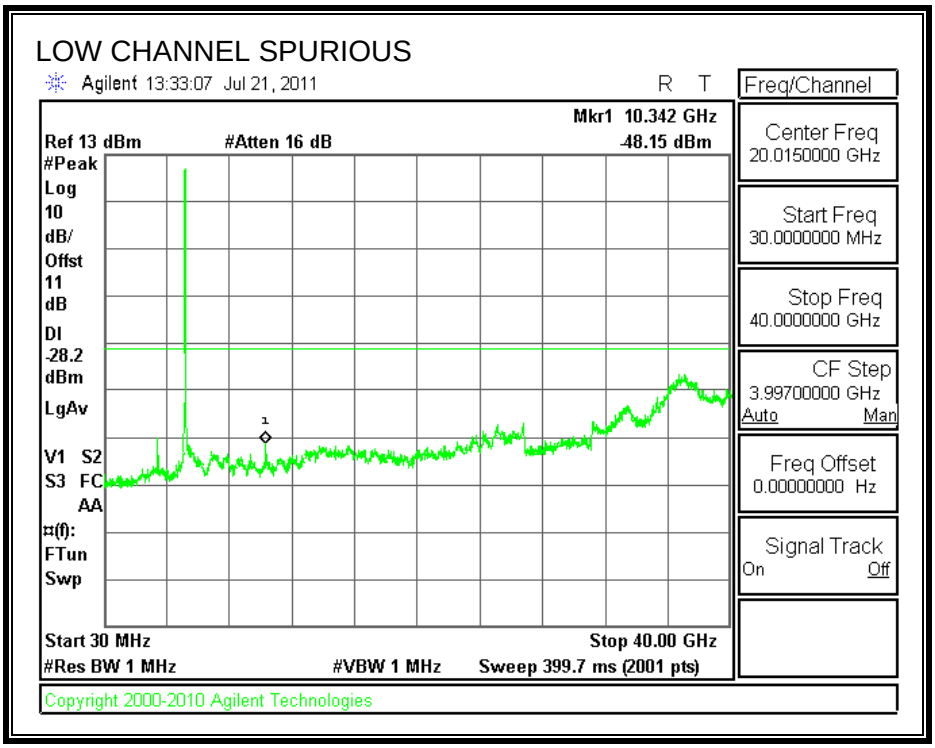
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

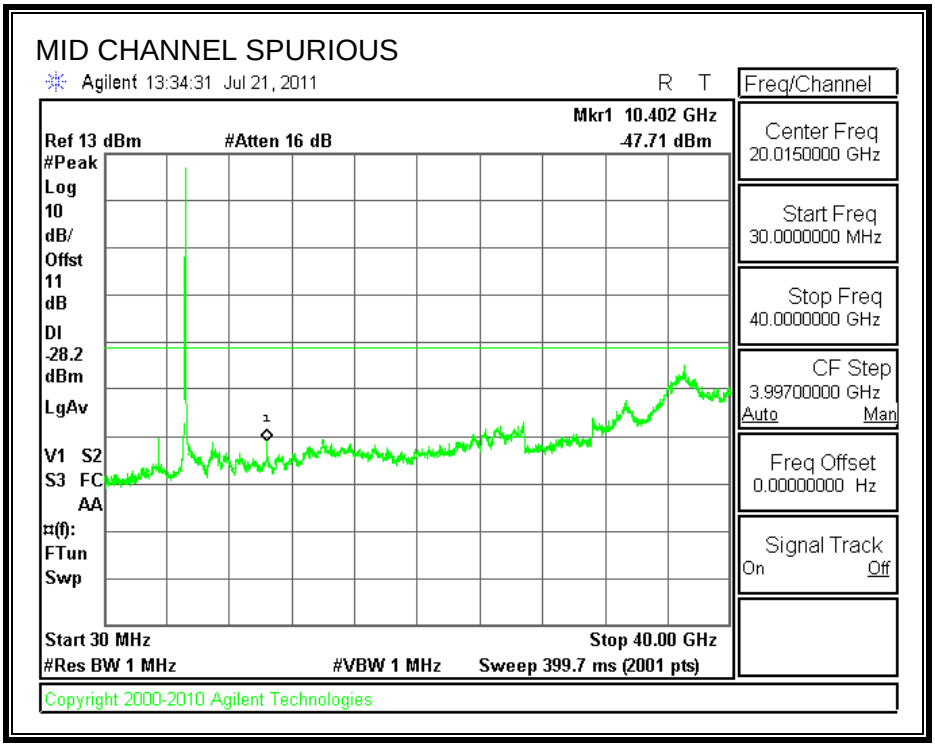
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

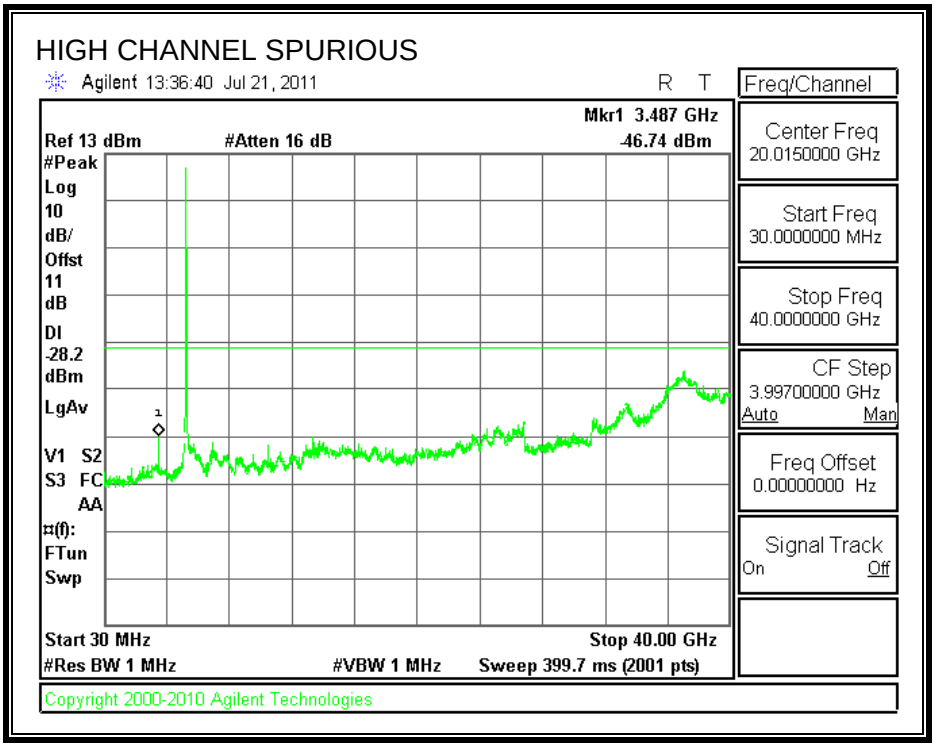
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

RESULTS

SPURIOUS EMISSIONS







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

7.2.1. AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB Attenuator and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	5180	10.52	10.78	13.66
Middle	5200	10.43	10.33	13.39
High	5240	10.65	10.27	13.47

7.2.2. 26 dB 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

CHAIN 1

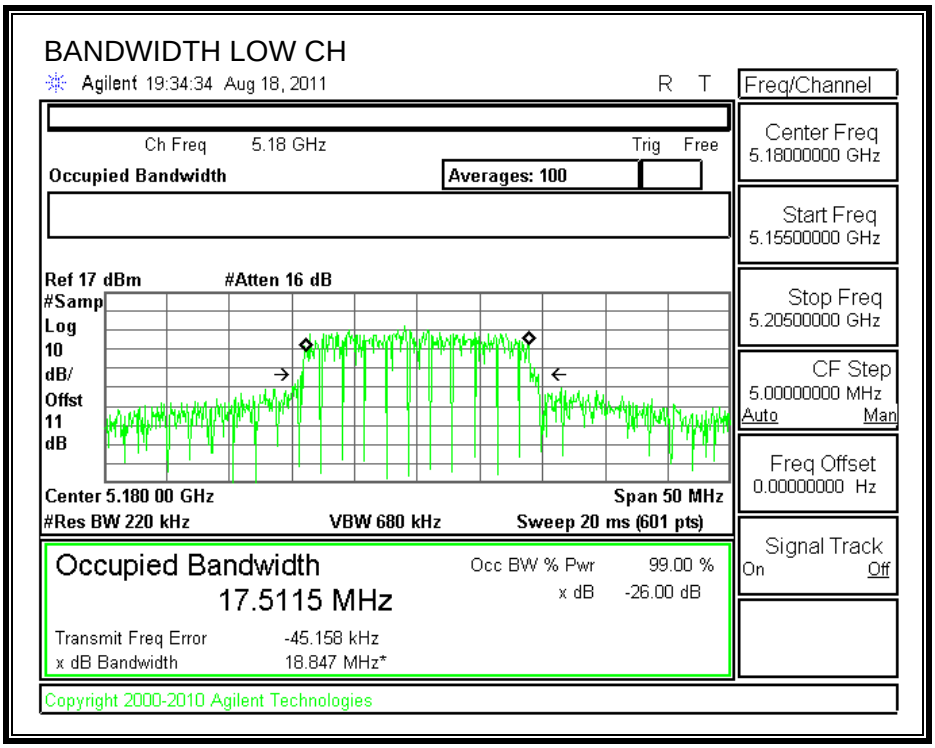
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	18.847
Middle	5200	18.804
High	5240	18.739

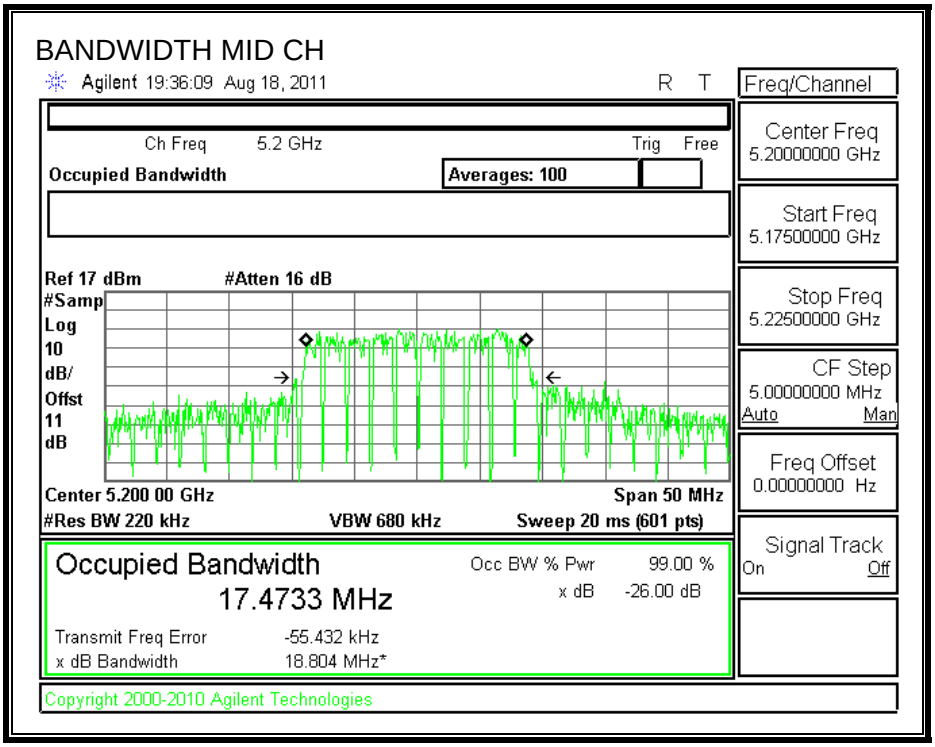
CHAIN 2

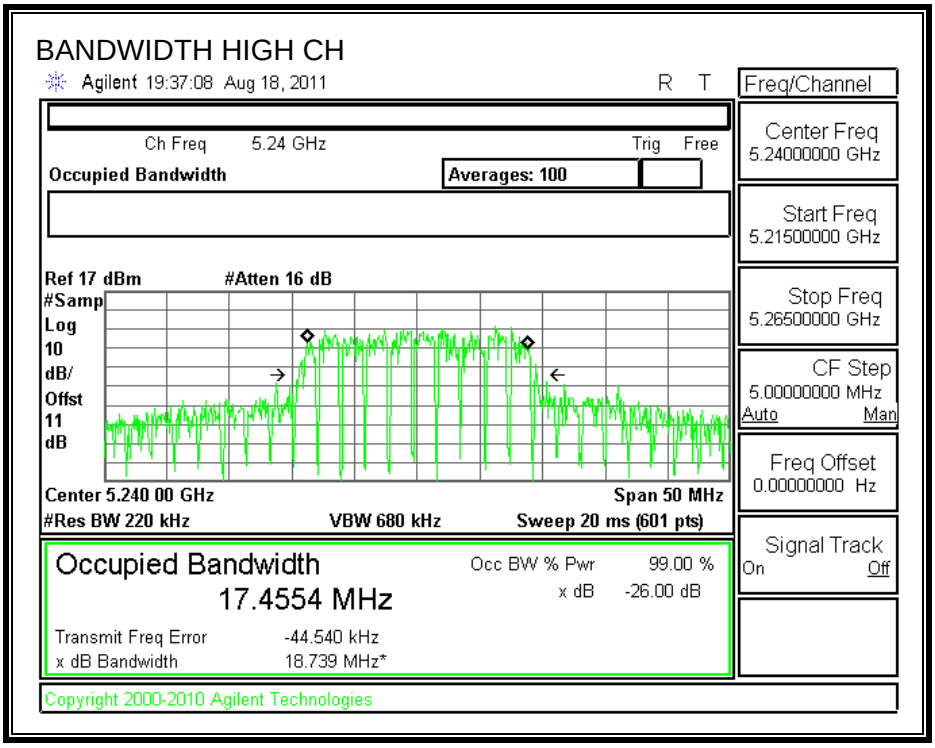
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5180	19.665
Middle	5200	19.492
High	5240	19.355

CHAIN 1

26 dB BANDWIDTH

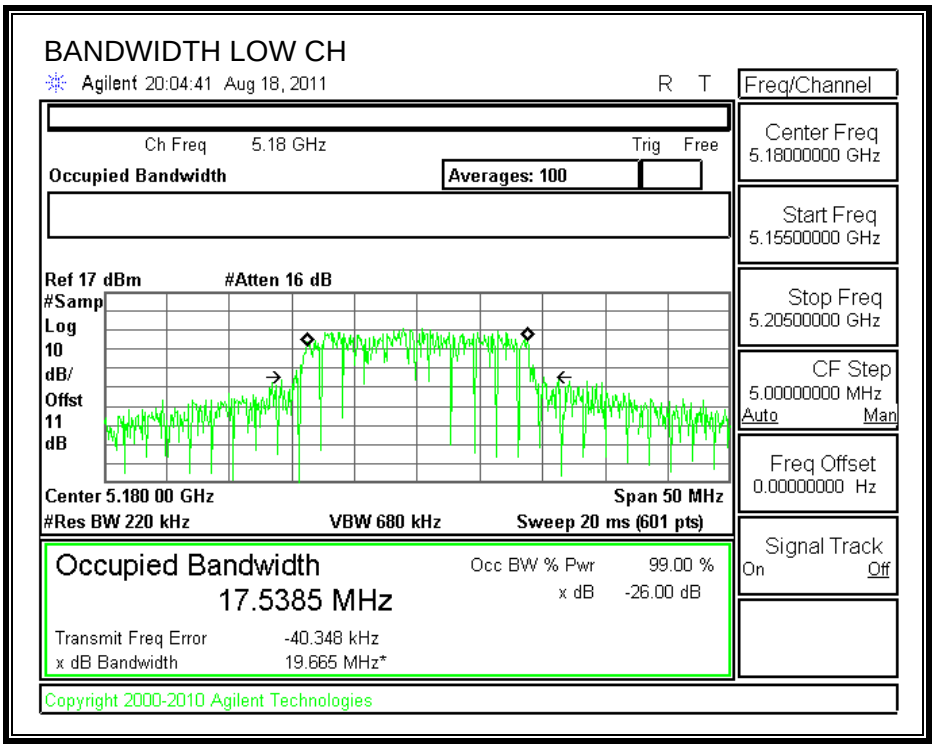


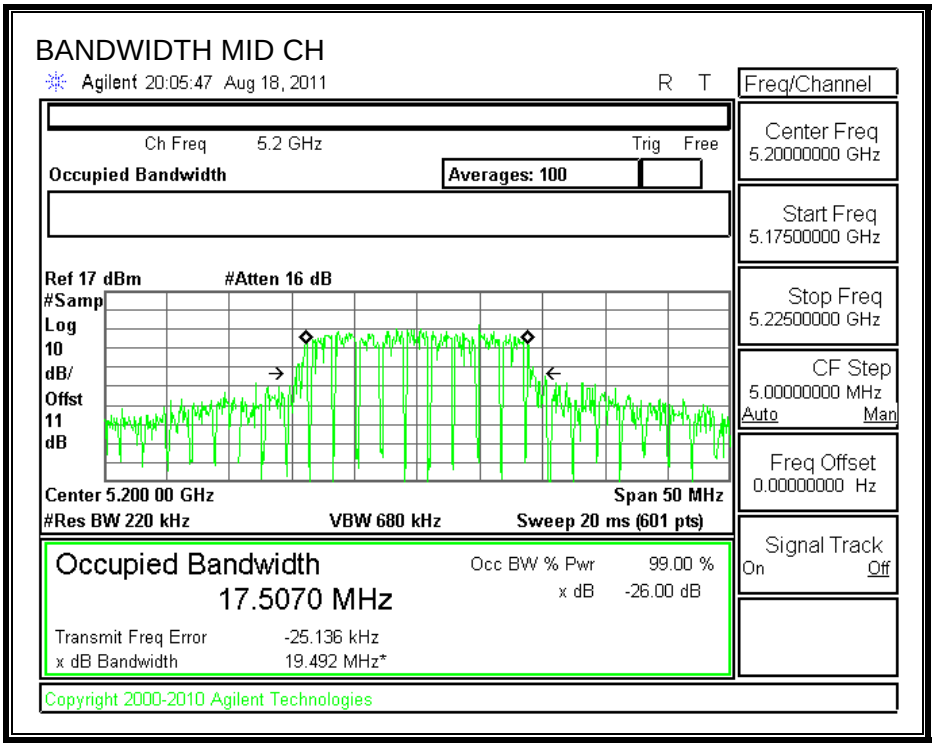


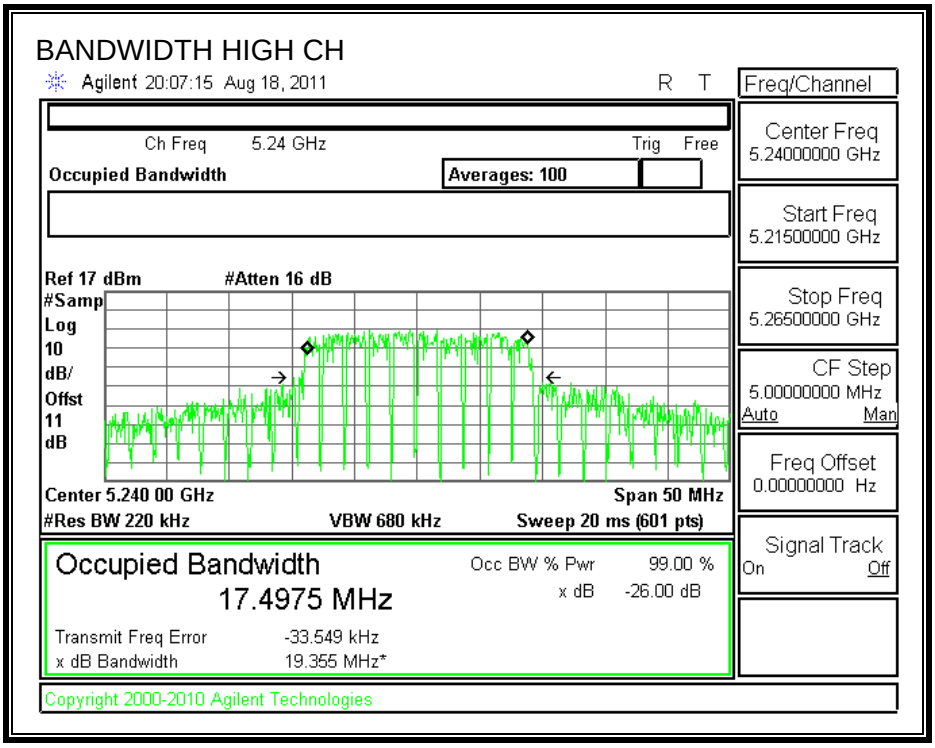


CHAIN 2

26 dB BANDWIDTH







7.2.3. 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 span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

CHAIN 1

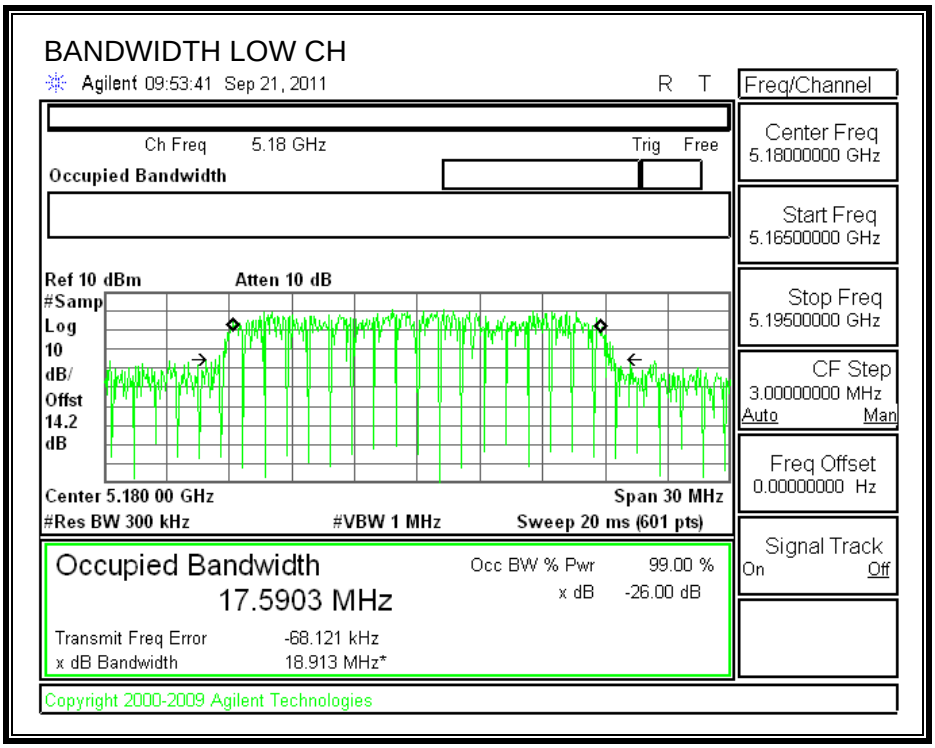
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5180	17.5903
Middle	5200	17.6373
High	5240	17.5263

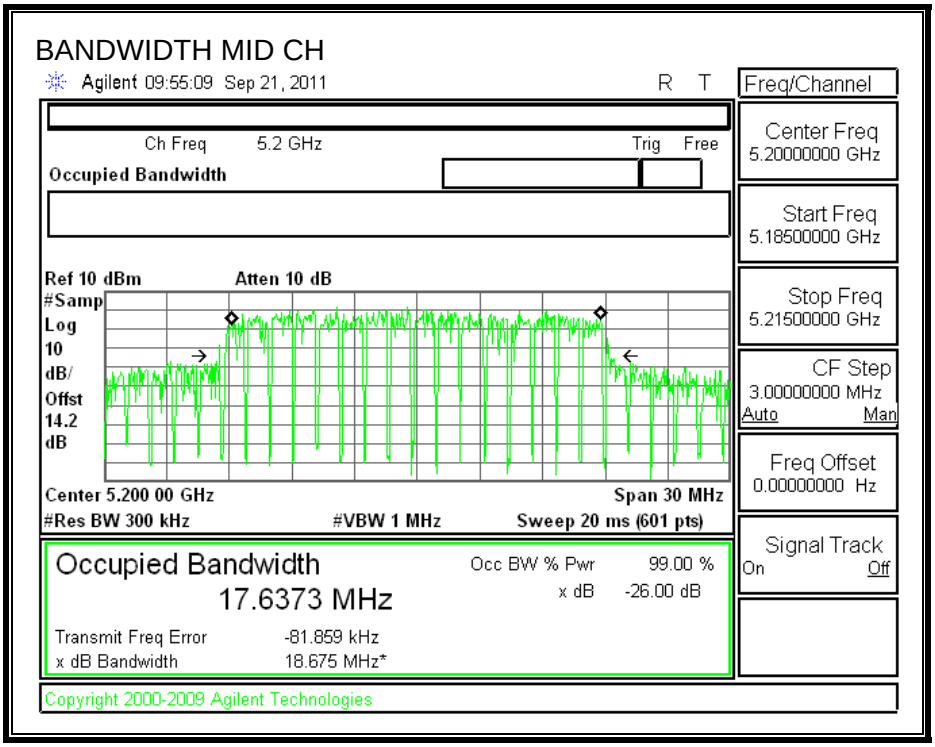
CHAIN 2

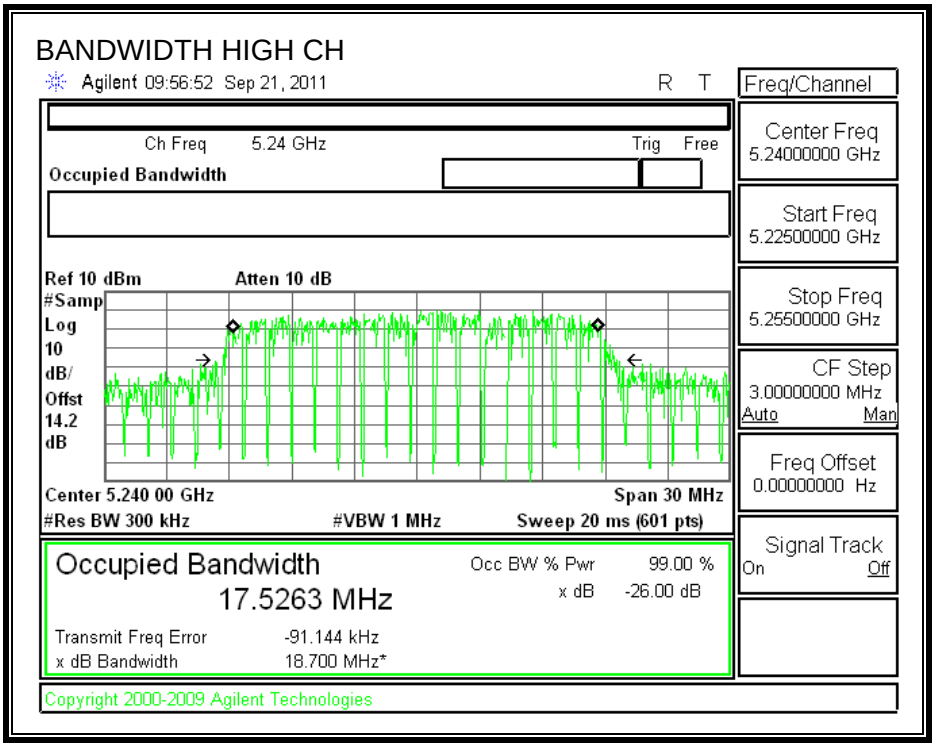
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5180	17.4896
Middle	5200	17.5957
High	5240	17.4635

CHAIN 1

99% BANDWIDTH

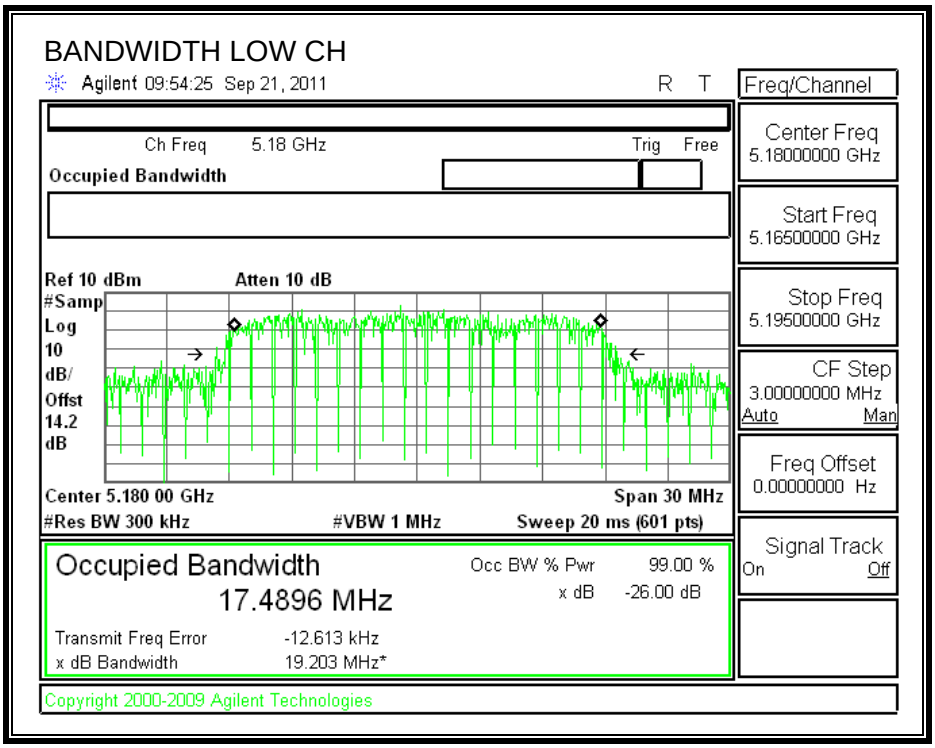


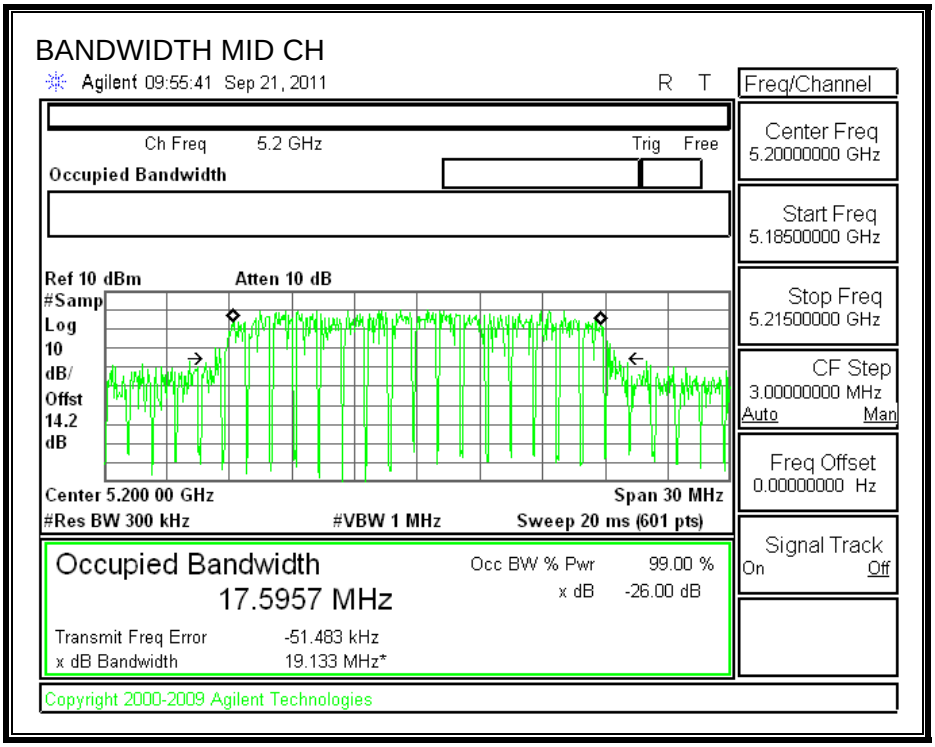


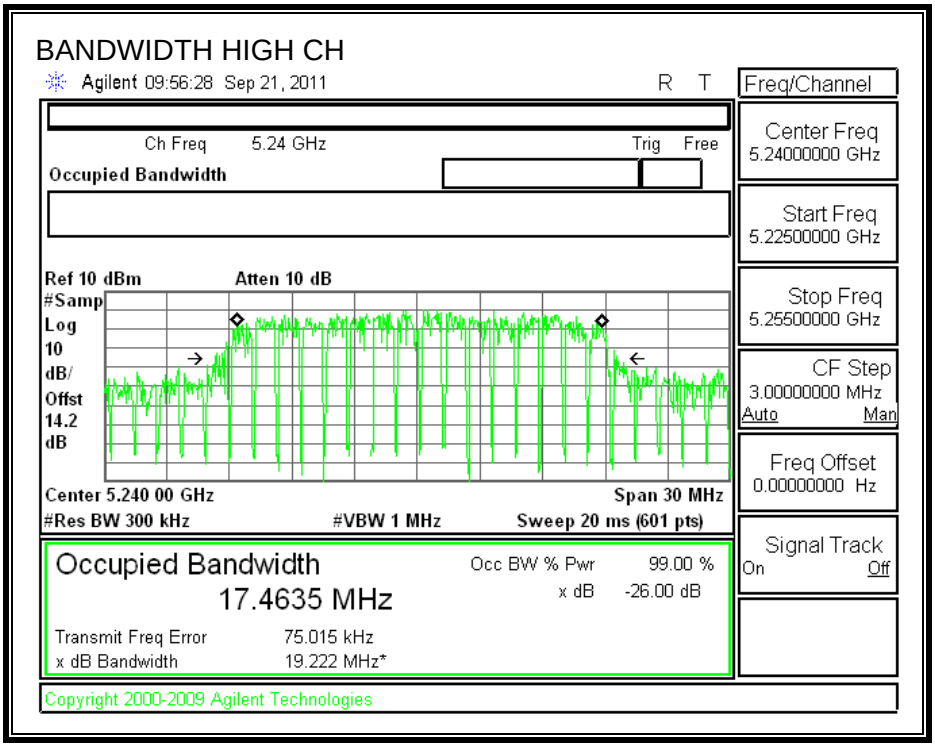


CHAIN 2

99% BANDWIDTH







7.2.4. 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

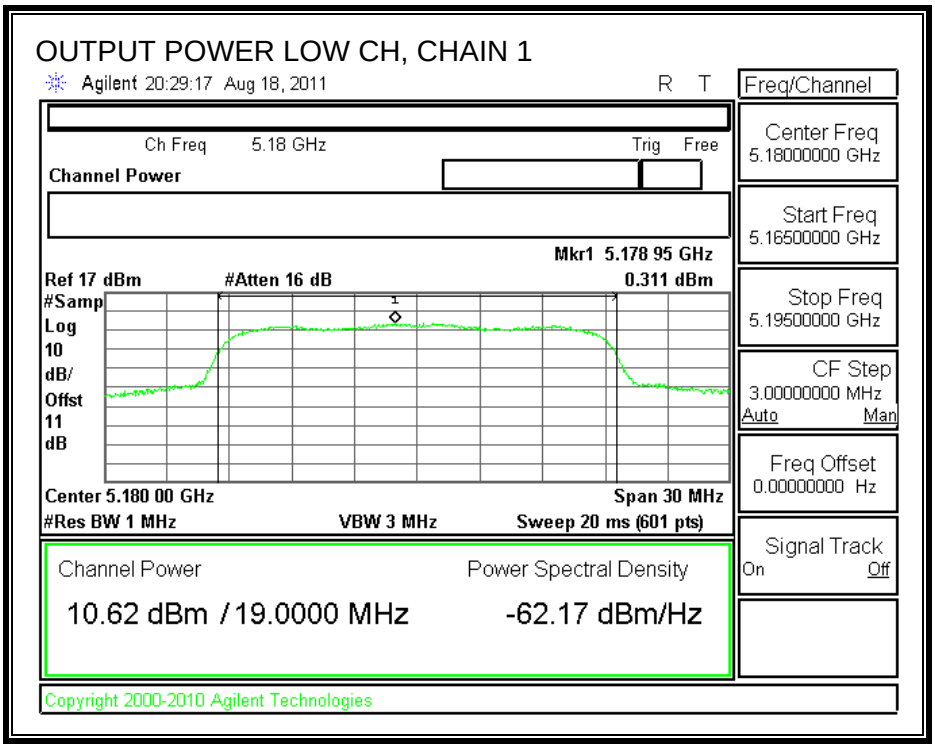
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5180	17	18.847	16.75	1.23	16.75
Mid	5200	17	18.804	16.74	1.23	16.74
High	5240	17	18.739	16.73	1.23	16.73

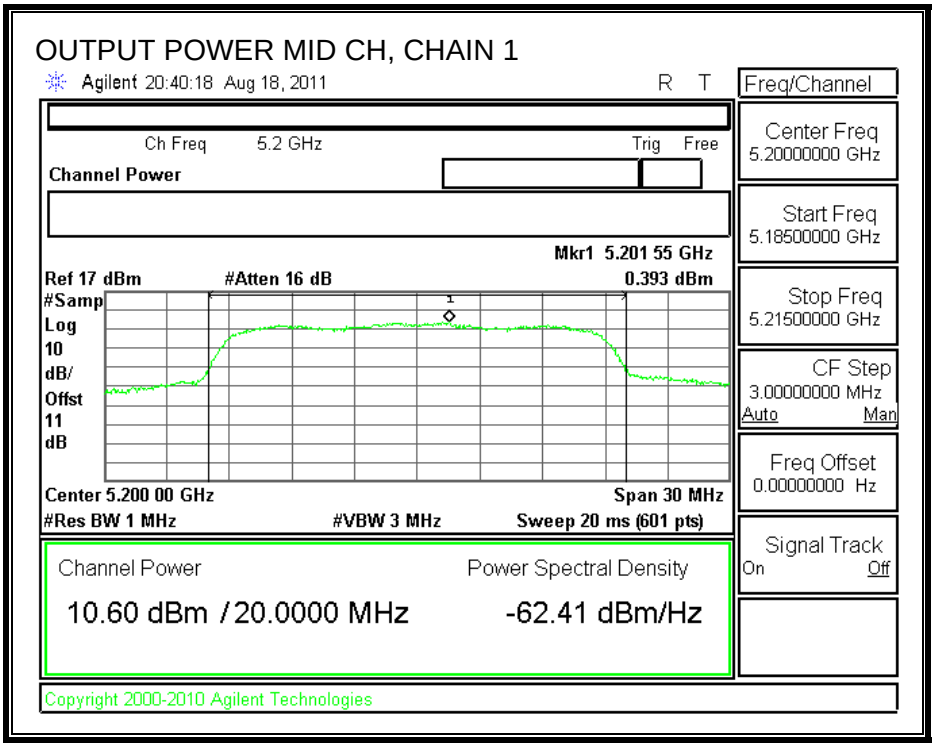
Individual Chain Results

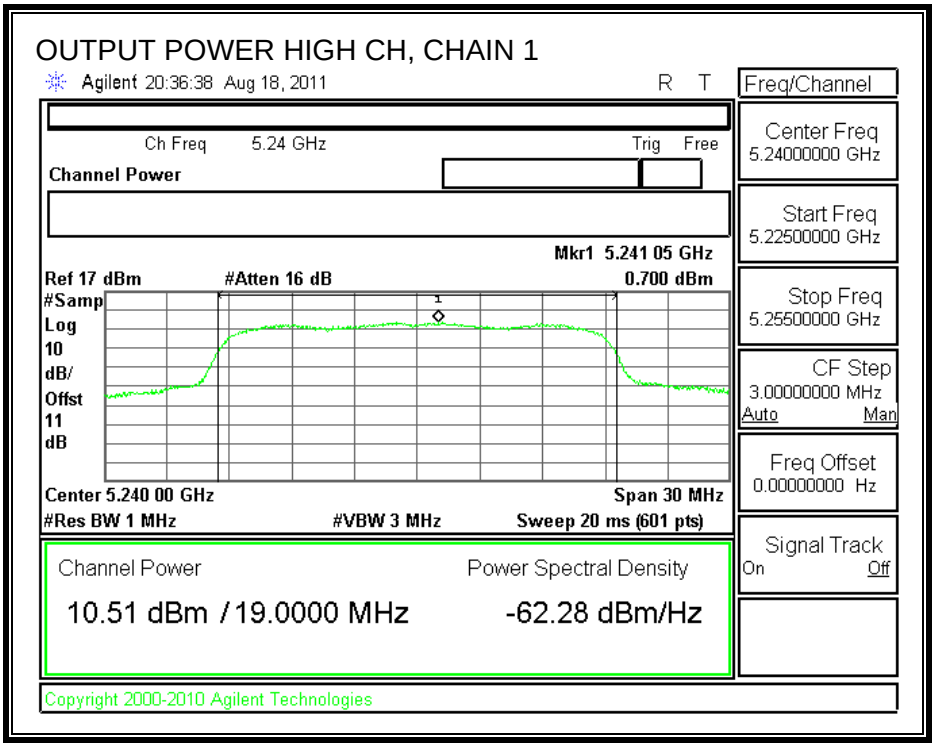
Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5180	10.62	10.76	13.70	16.75	-3.05
Mid	5200	10.60	10.60	13.61	16.74	-3.13
High	5240	10.51	10.93	13.74	16.73	-2.99

STBC is used for MIMO mode, and STBC is categorized as Uncorrelated signal, hence, single antenna gain is used as directional antenna gain per KDB 66291 D01.

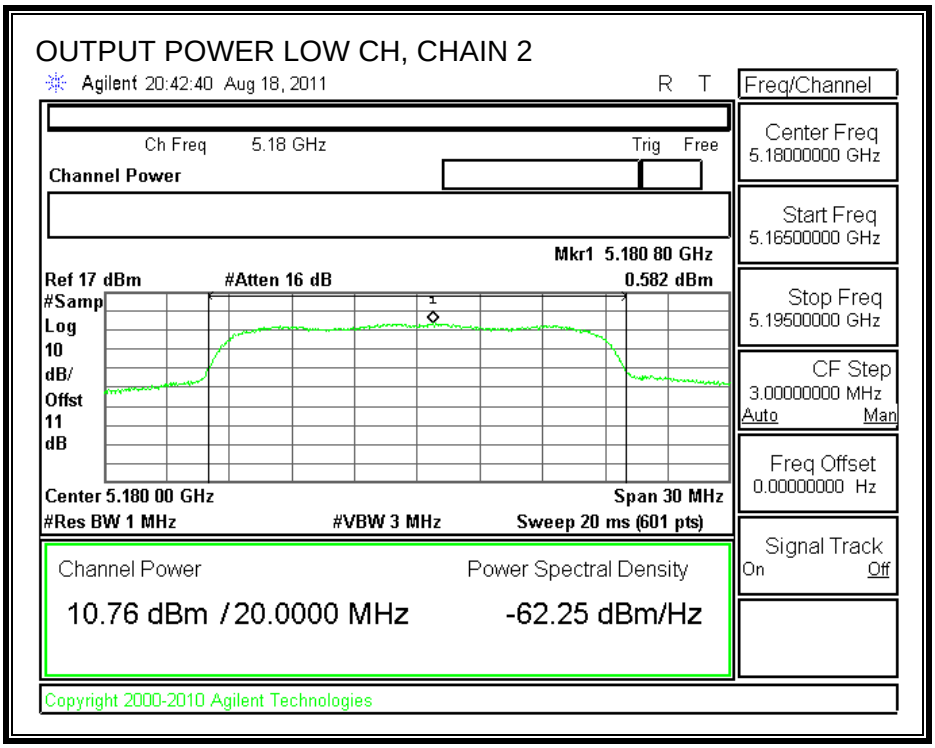
CHAIN 1 OUTPUT POWER



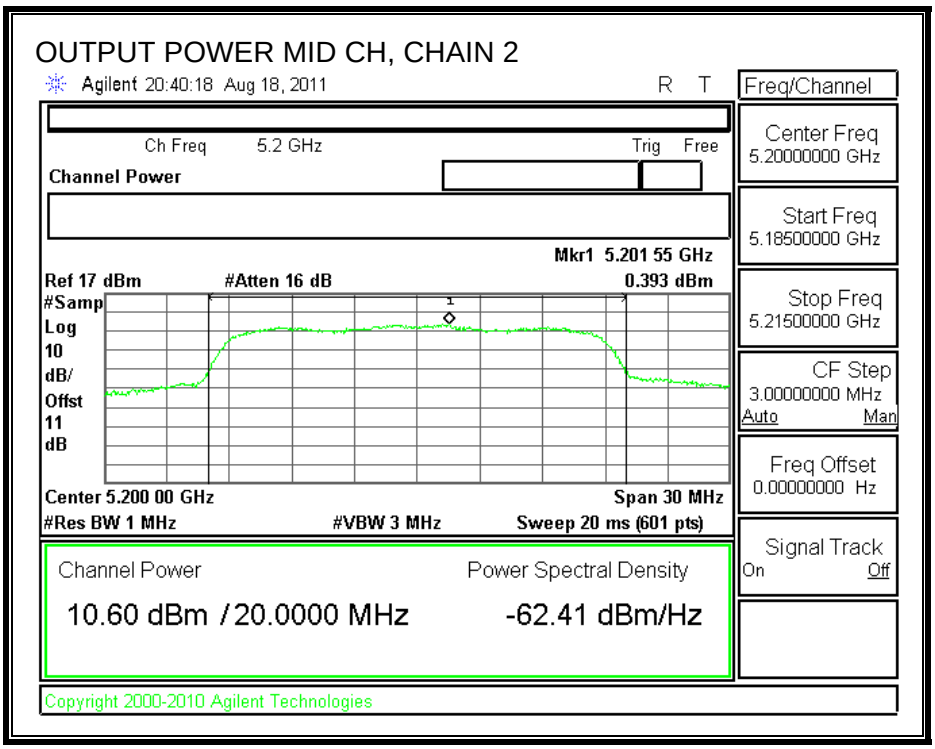


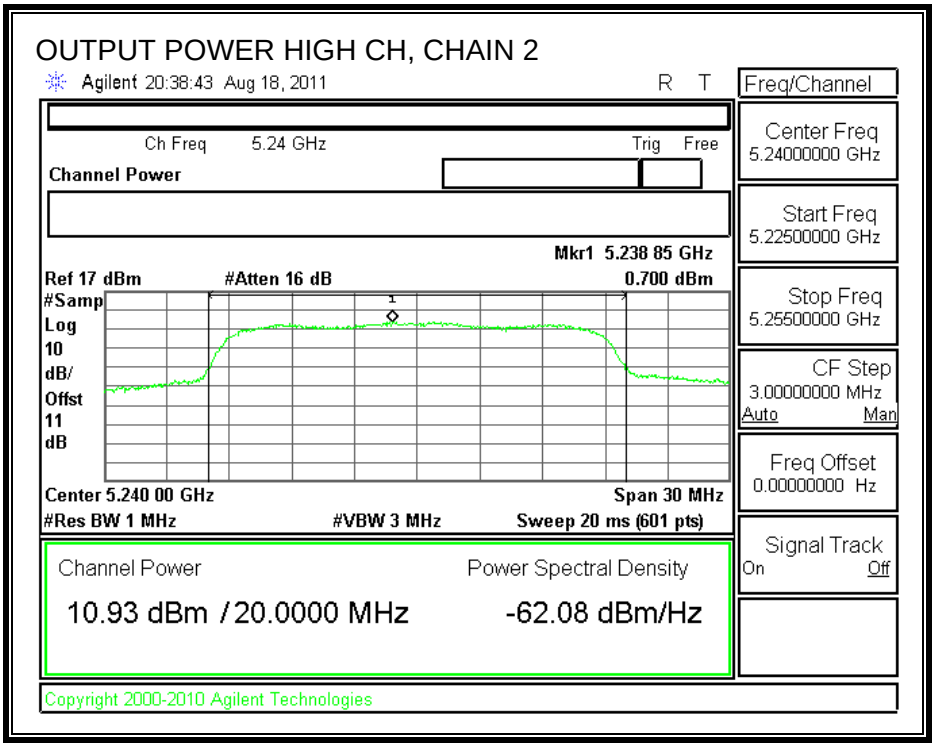


CHAIN 2 OUTPUT POWER



OUTPUT POWER MID CH, CHAIN 2





7.2.5. 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.

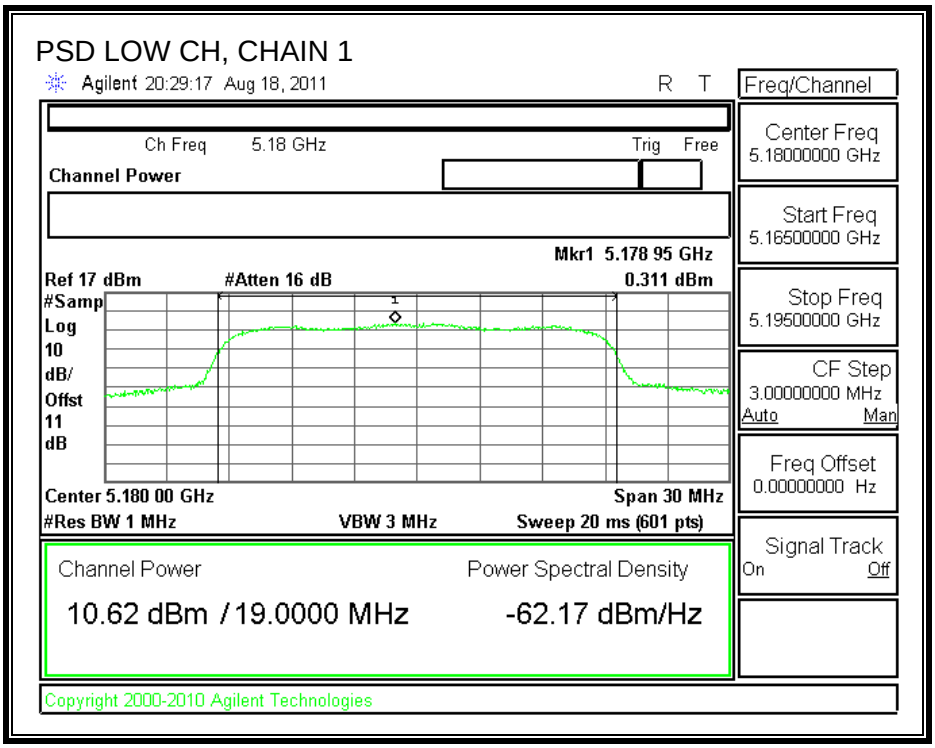
TEST PROCEDURE

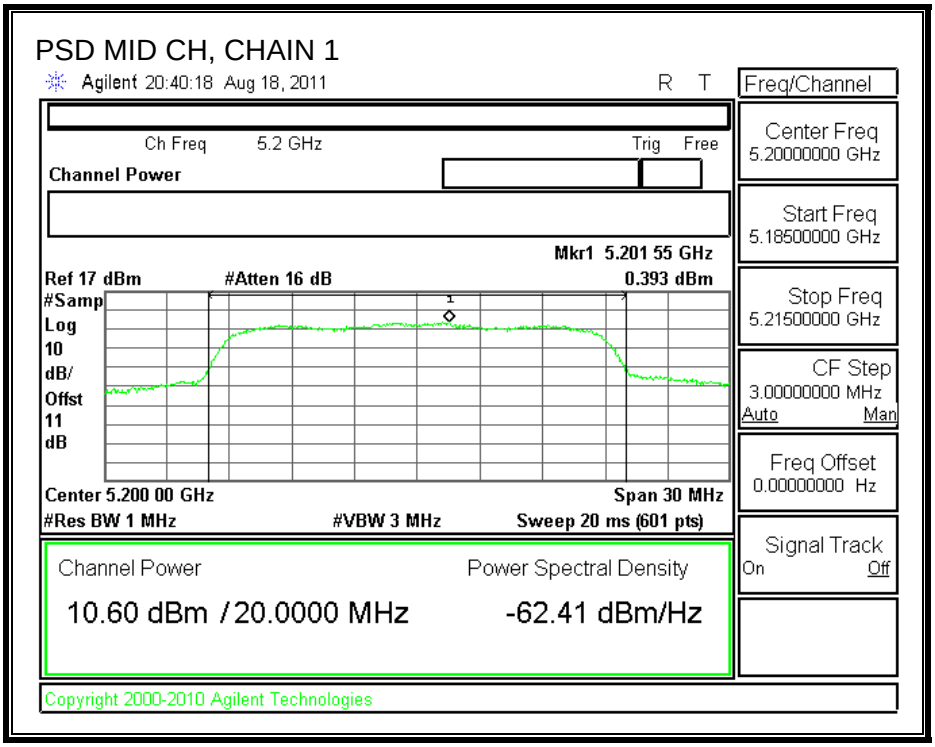
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

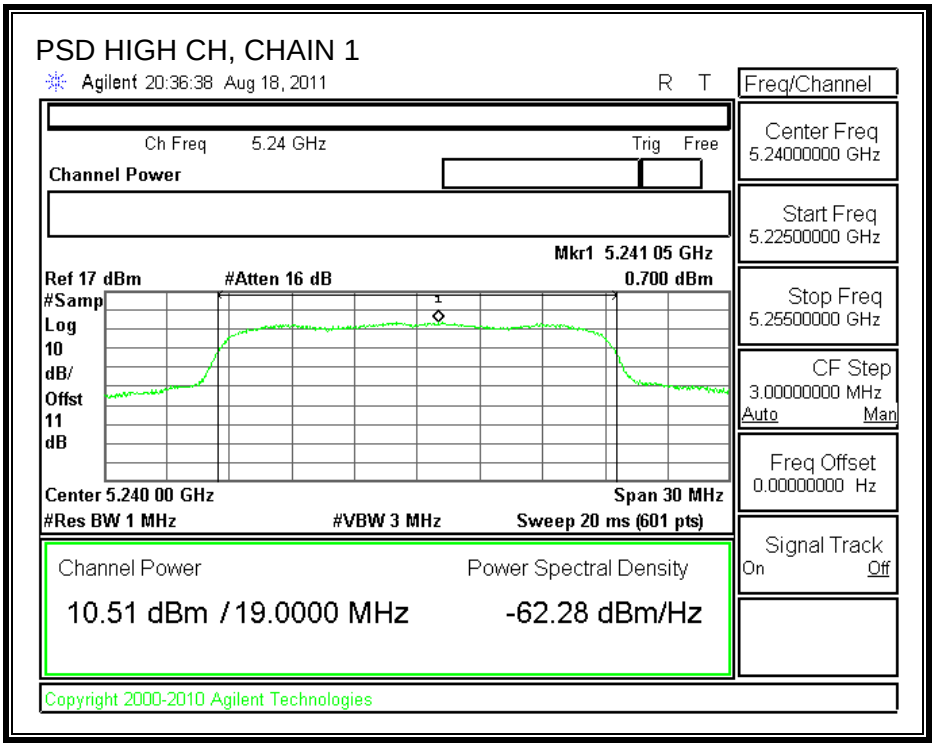
RESULTS

Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5180	0.311	0.582	3.46	4	-0.54
Middle	5200	0.393	0.393	3.40	4	-0.60
High	5240	0.700	0.700	3.71	4	-0.29

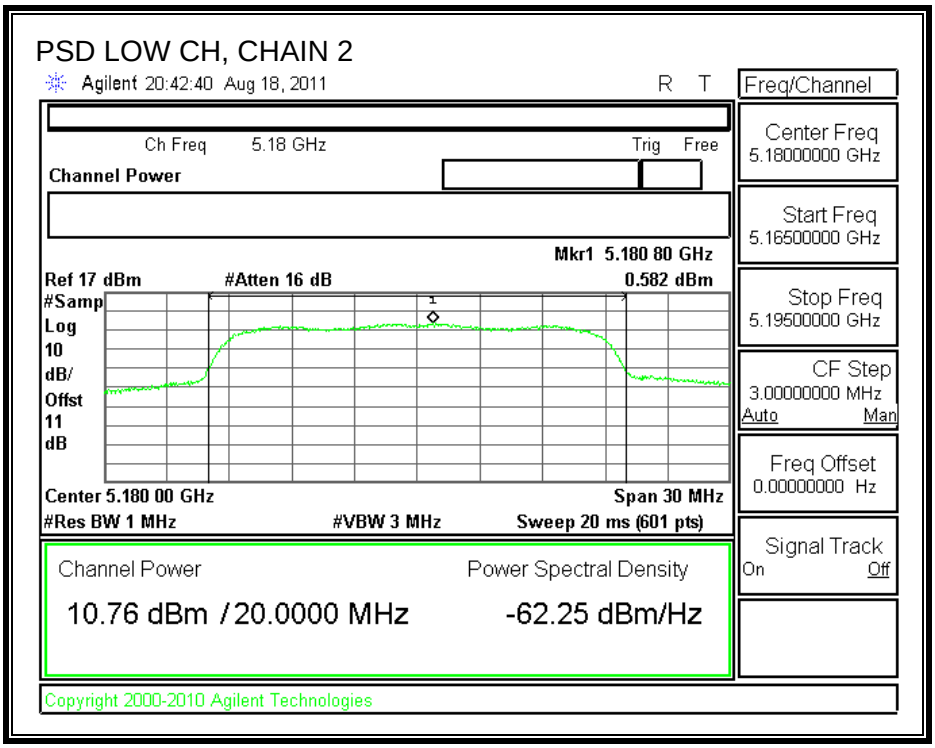
CHAIN 1 POWER SPECTRAL DENSITY

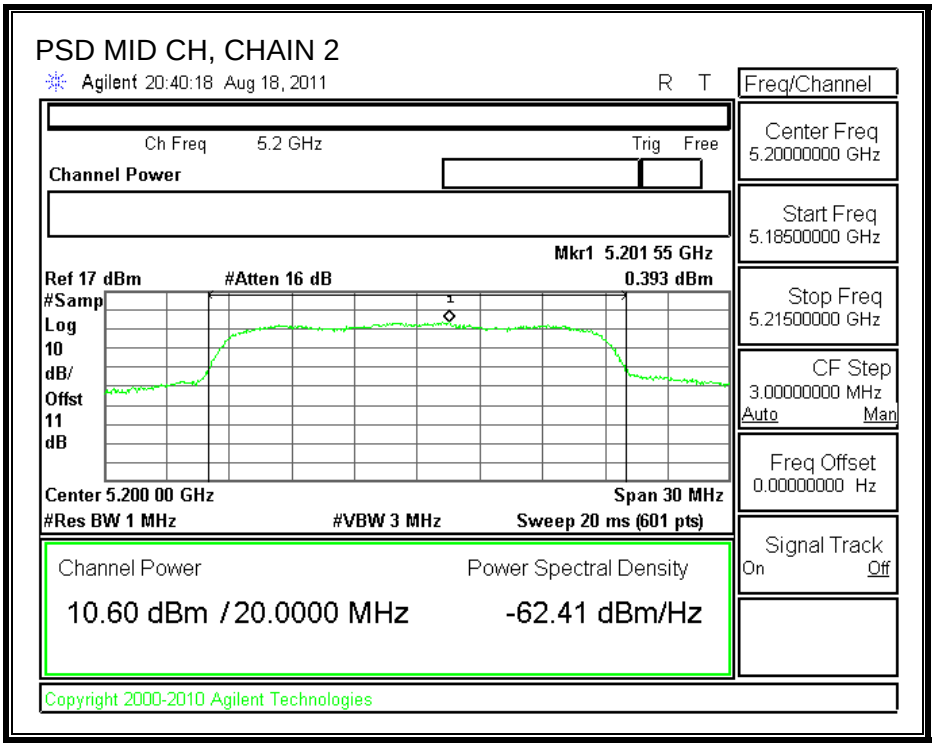


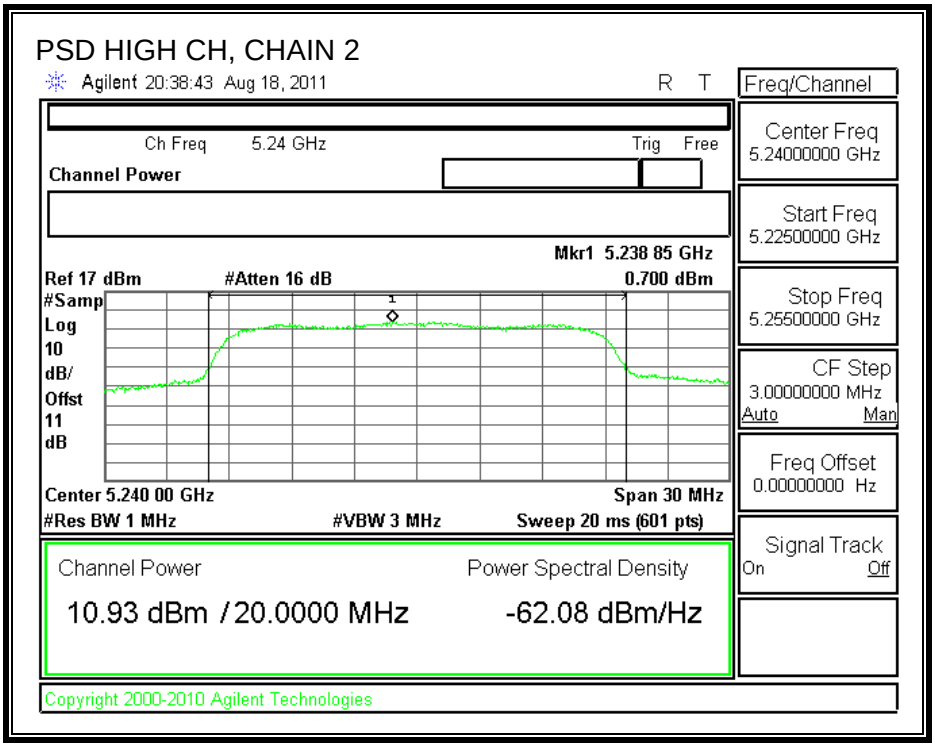




CHAIN 2 POWER SPECTRAL DENSITY







7.2.6. 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

CHAIN 1

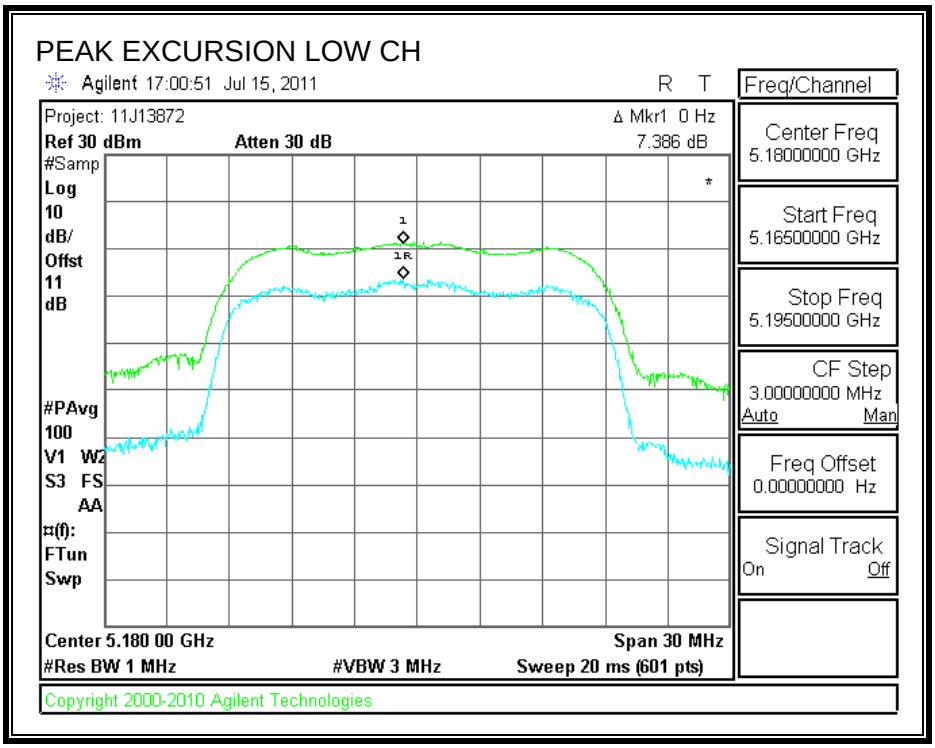
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	7.39	13	-5.61
Middle	5200	7.47	13	-5.53
High	5240	7.31	13	-5.69

CHAIN 2

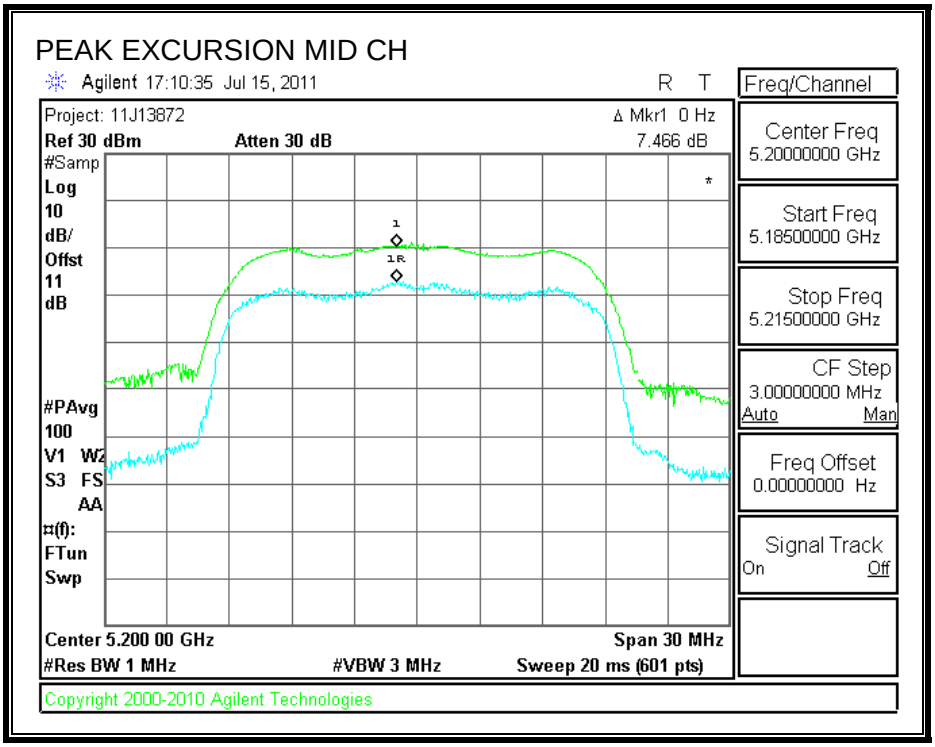
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5180	8.73	13	-4.28
Middle	5200	8.28	13	-4.72
High	5240	8.24	13	-4.76

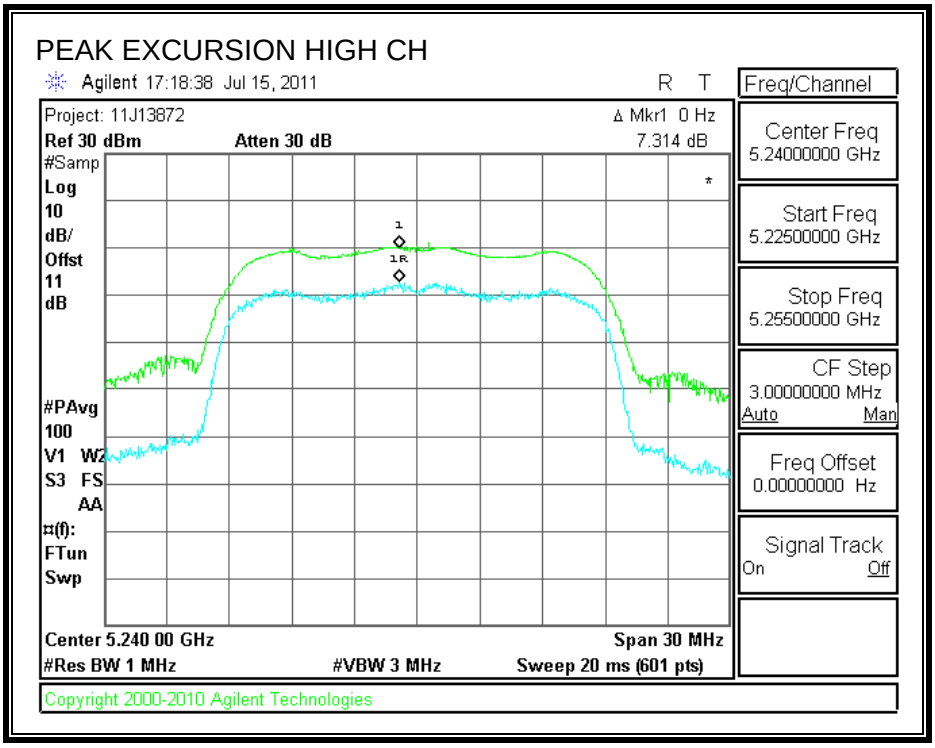
CHAIN 1

PEAK EXCURSION



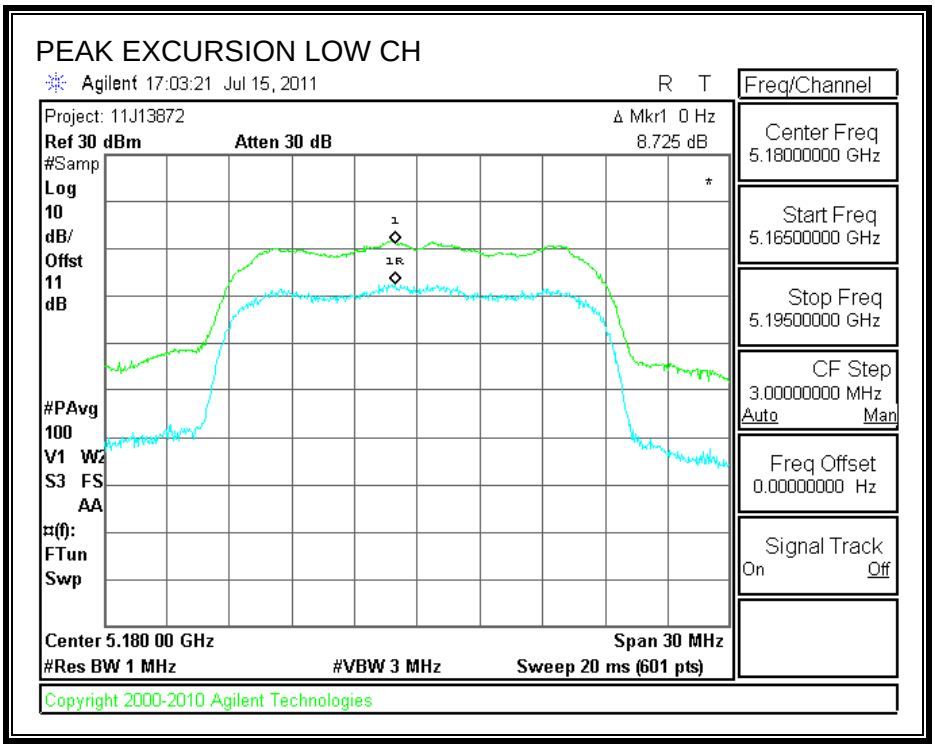
PEAK EXCURSION MID CH



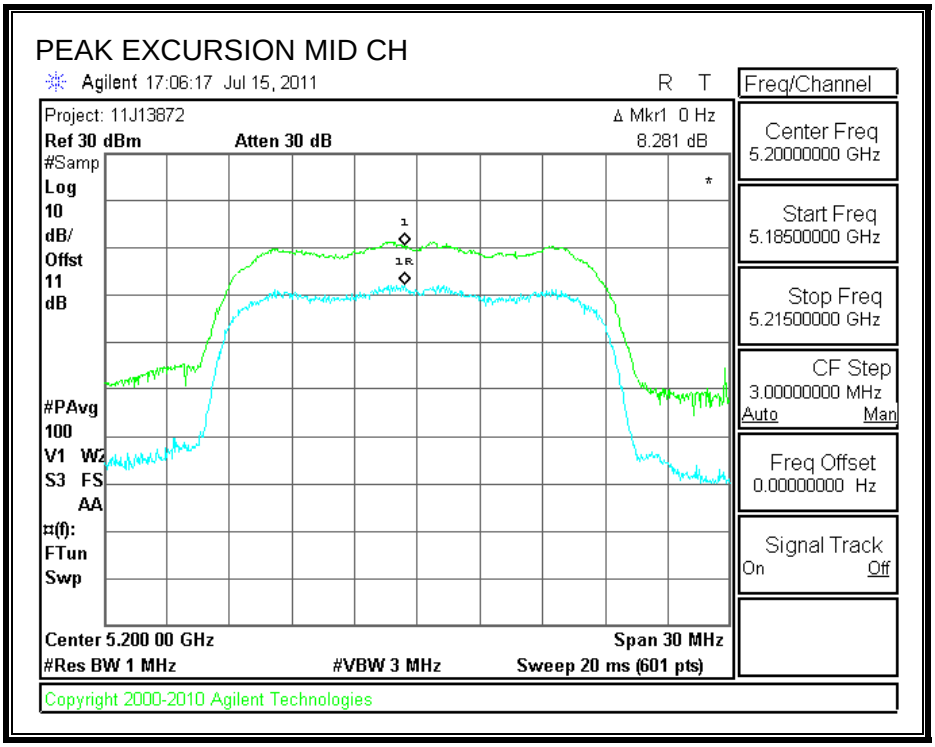


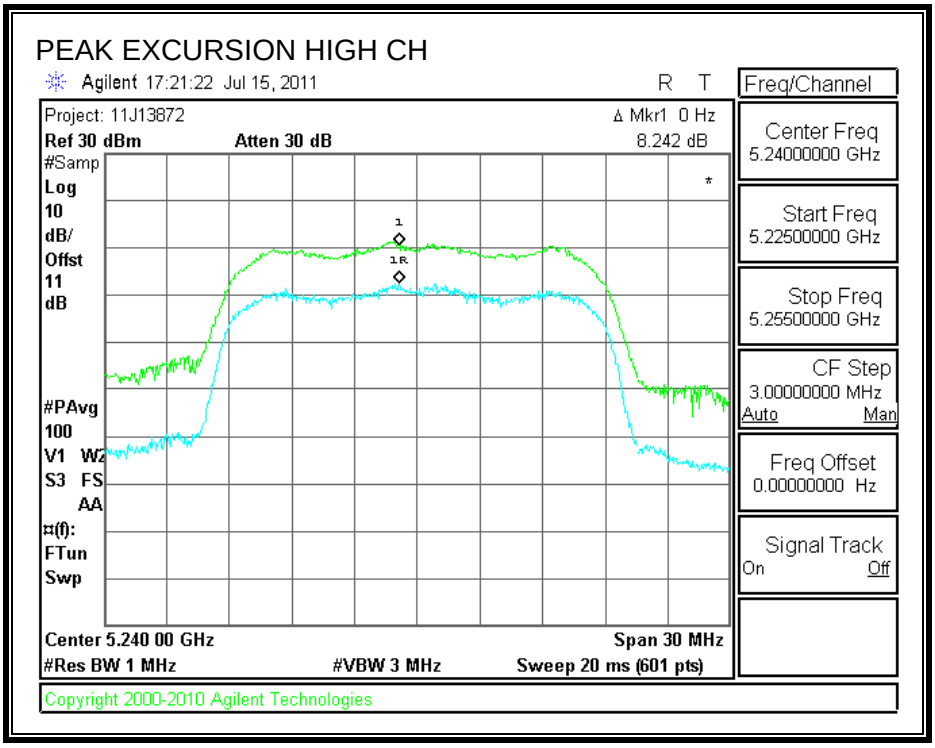
CHAIN 2

PEAK EXCURSION



PEAK EXCURSION MID CH





7.2.7. 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.

Since the combination antenna gain is 1.23dBi, so the EIRP limit is -28.23dBm.

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.

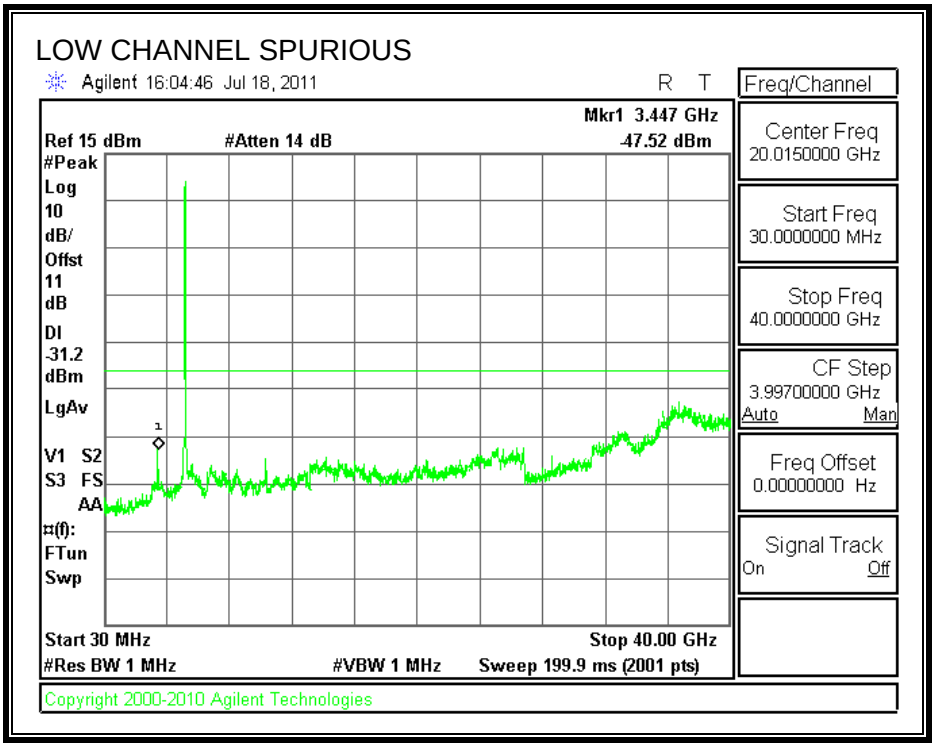
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

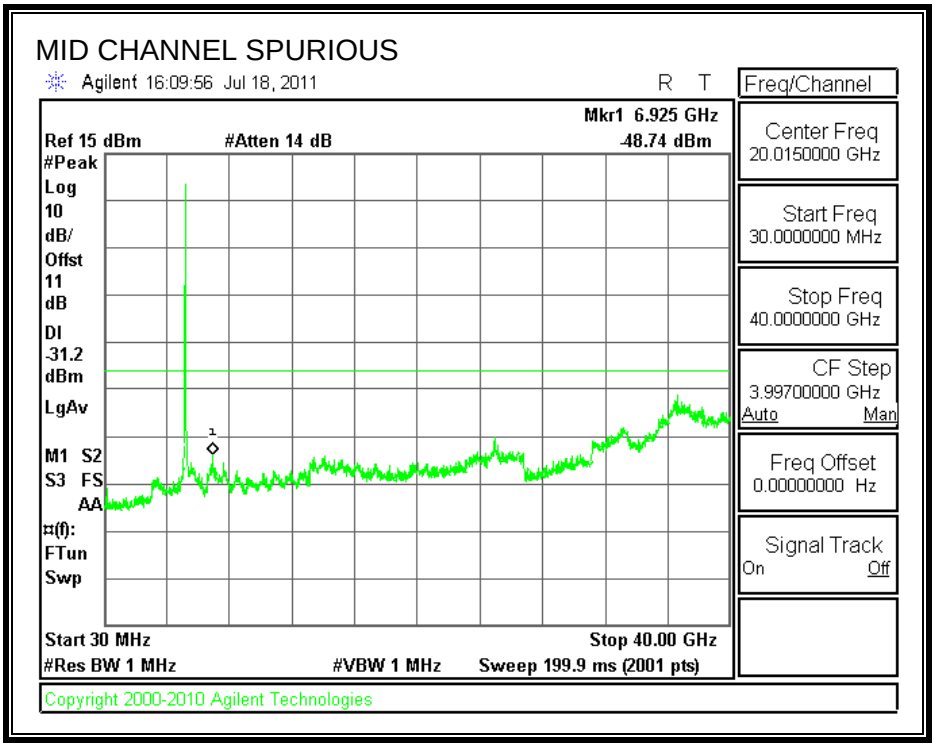
RESULTS

CONDUCTED SPURIOUS EMISSIONS

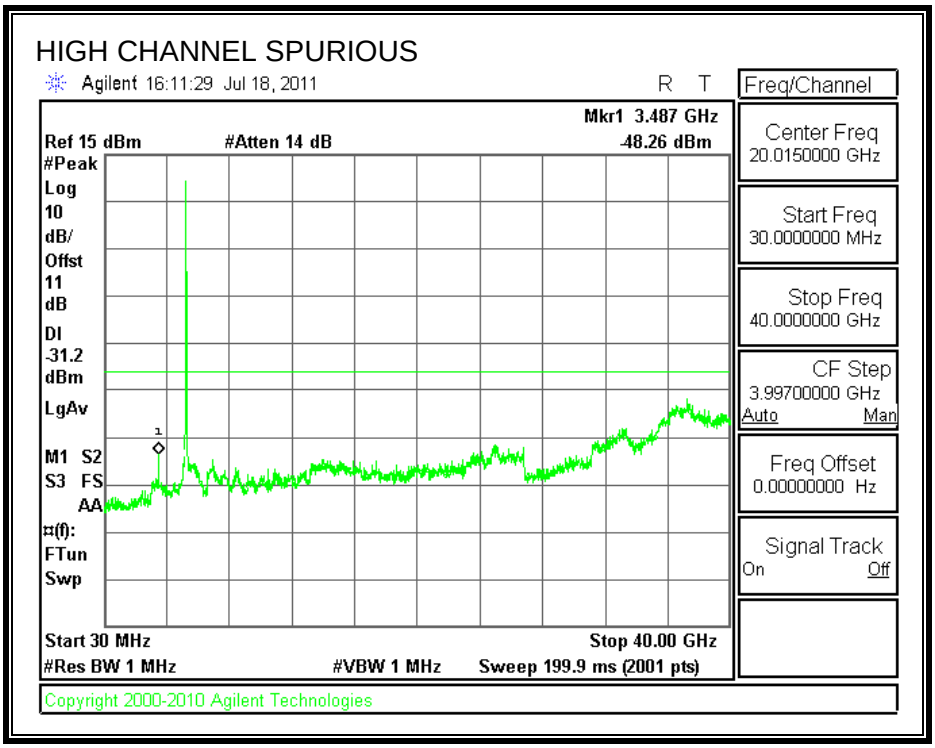
CHAIN 1



The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.

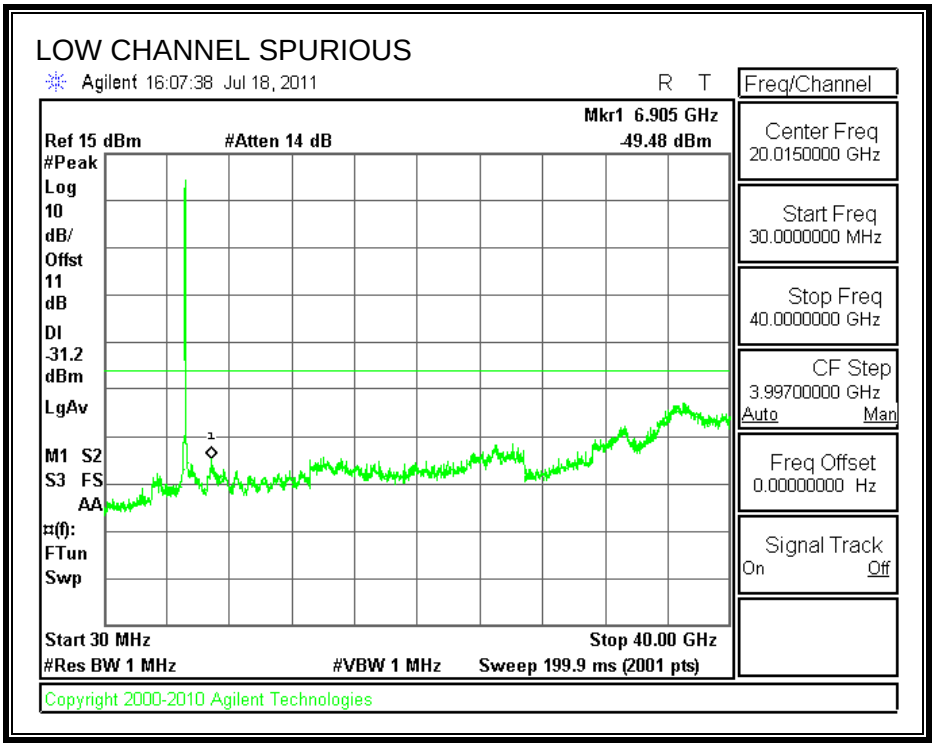


The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.

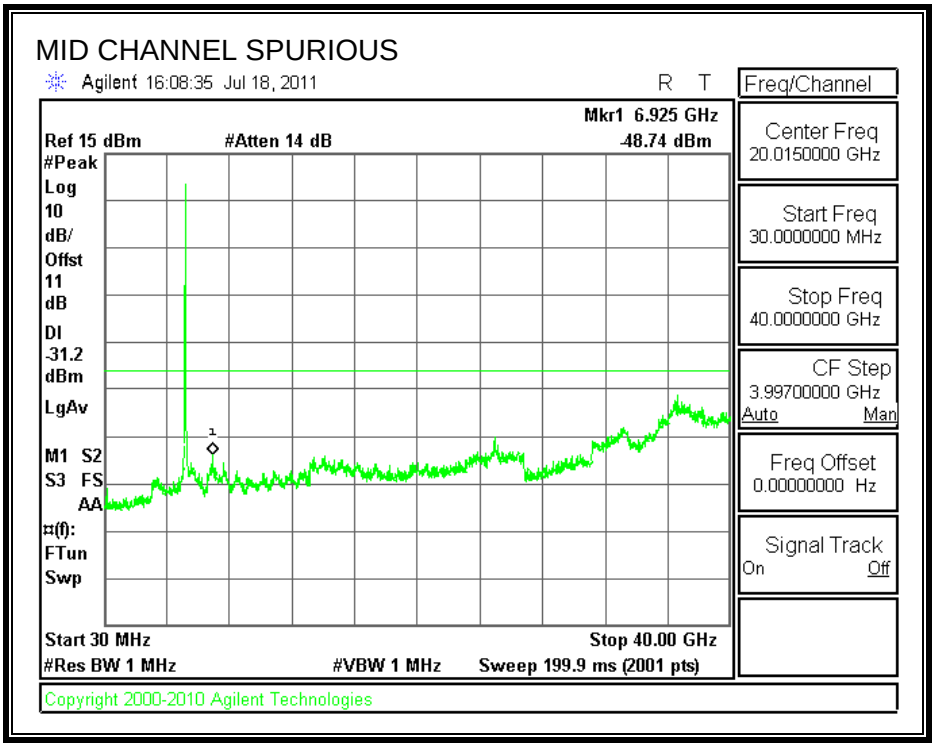


The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.

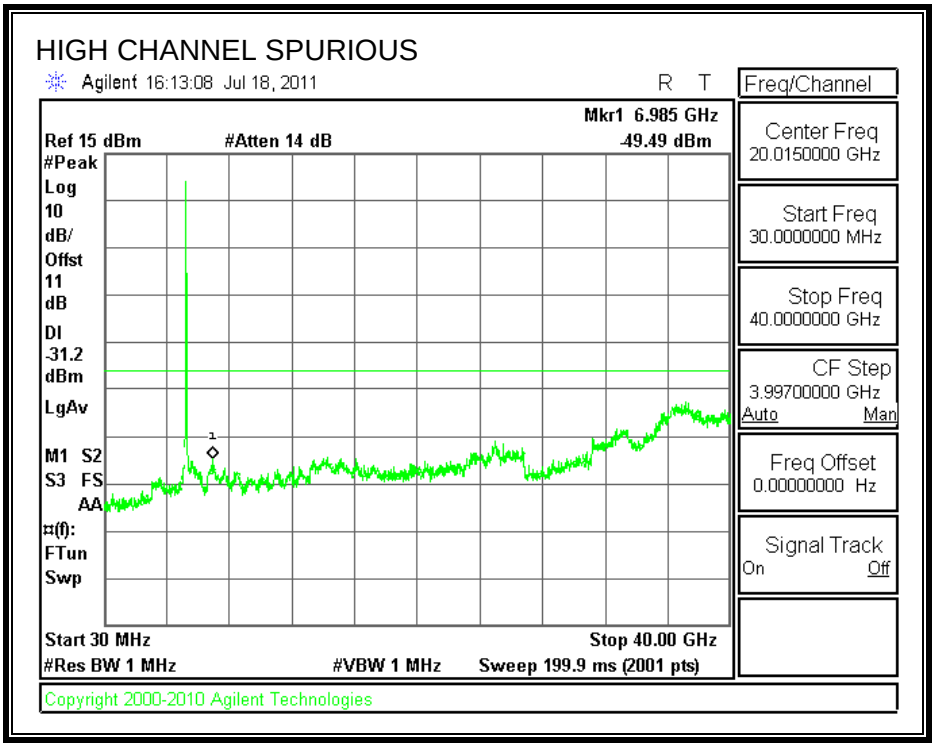
CHAIN 2



The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.



The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.



The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.

7.3 802.11n HT40 SISO MODE IN THE 5.2 GHz BAND

7.3.1 AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11.0 dB (including 10 dB Attenuator and 1.0 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Power (dBm)
Low	5190	12.54
High	5230	12.55

7.3.2 26 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

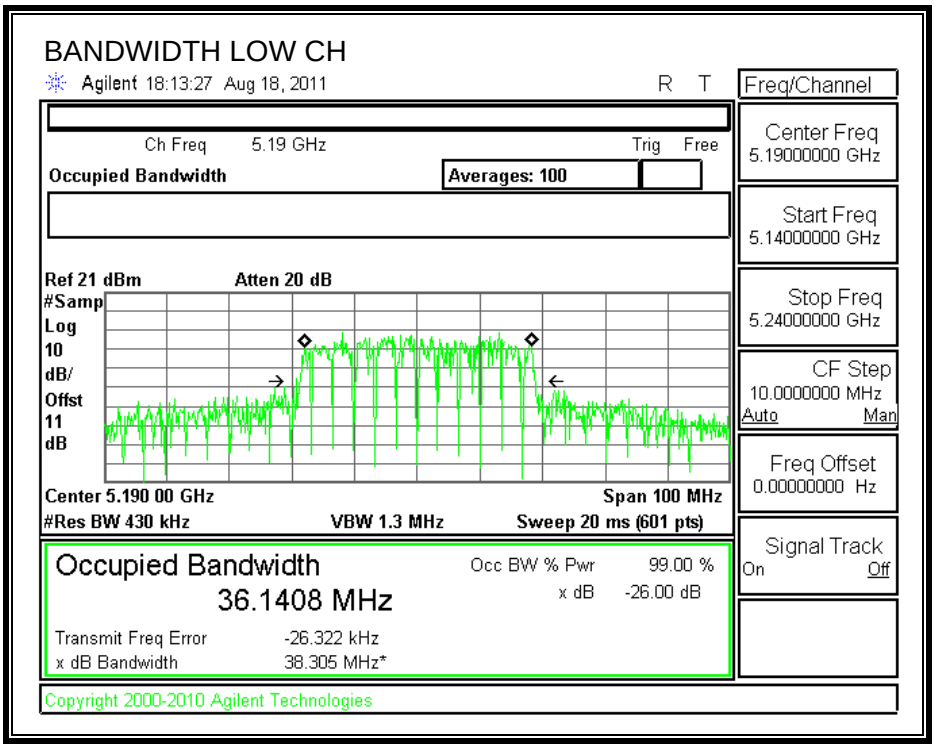
TEST PROCEDURE

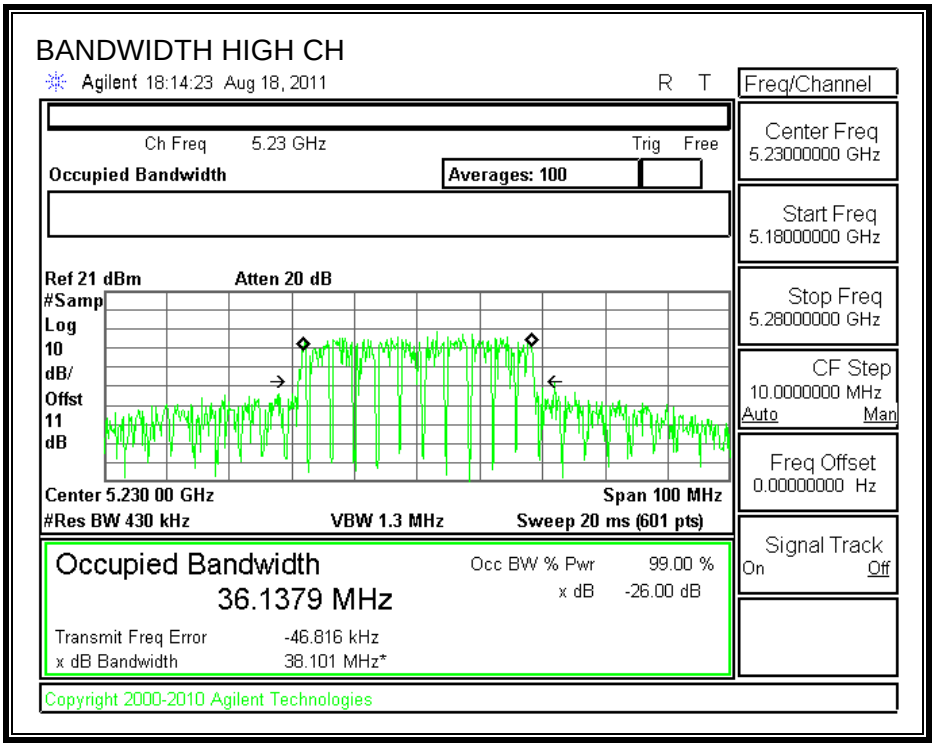
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5190	38.305
High	5230	38.101

26 dB BANDWIDTH





7.3.3 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

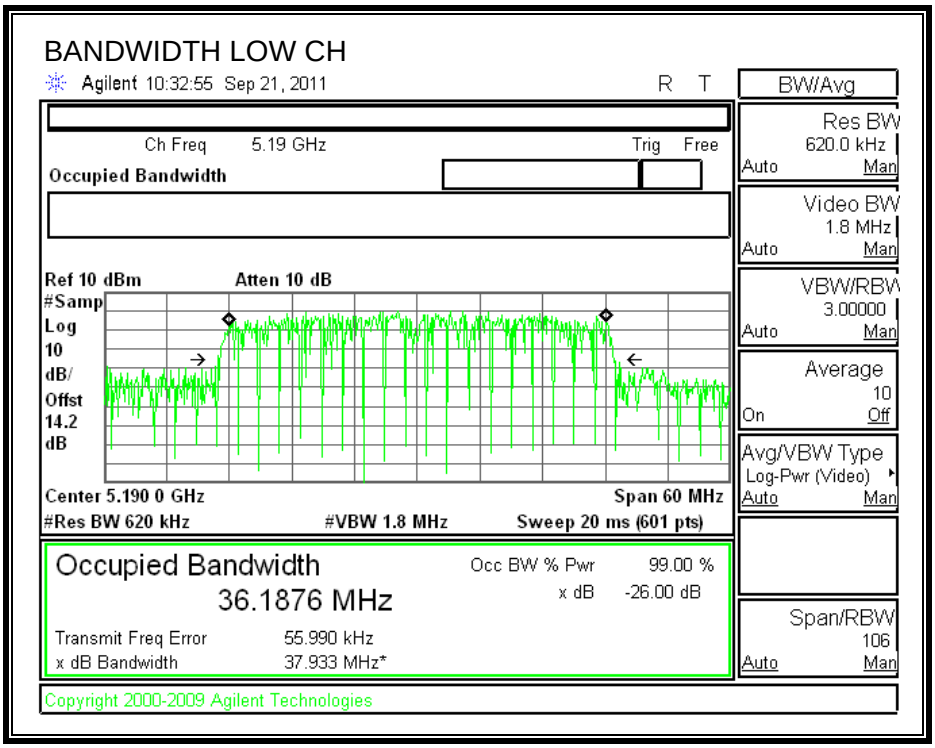
TEST PROCEDURE

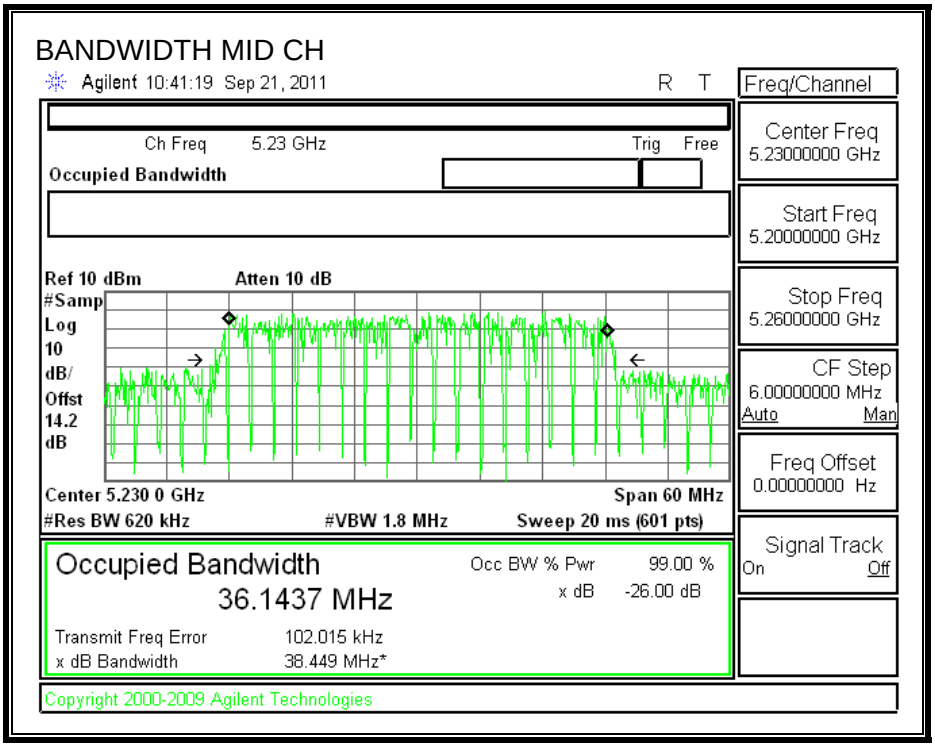
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5190	36.1876
High	5230	36.1437

99% BANDWIDTH





7.3.4 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

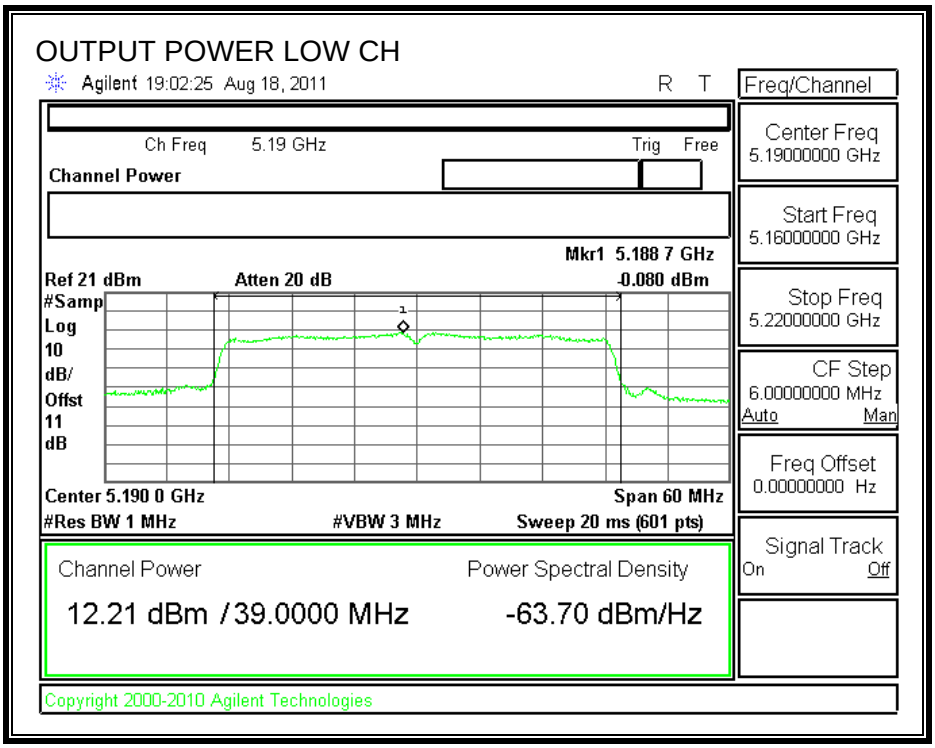
Limit

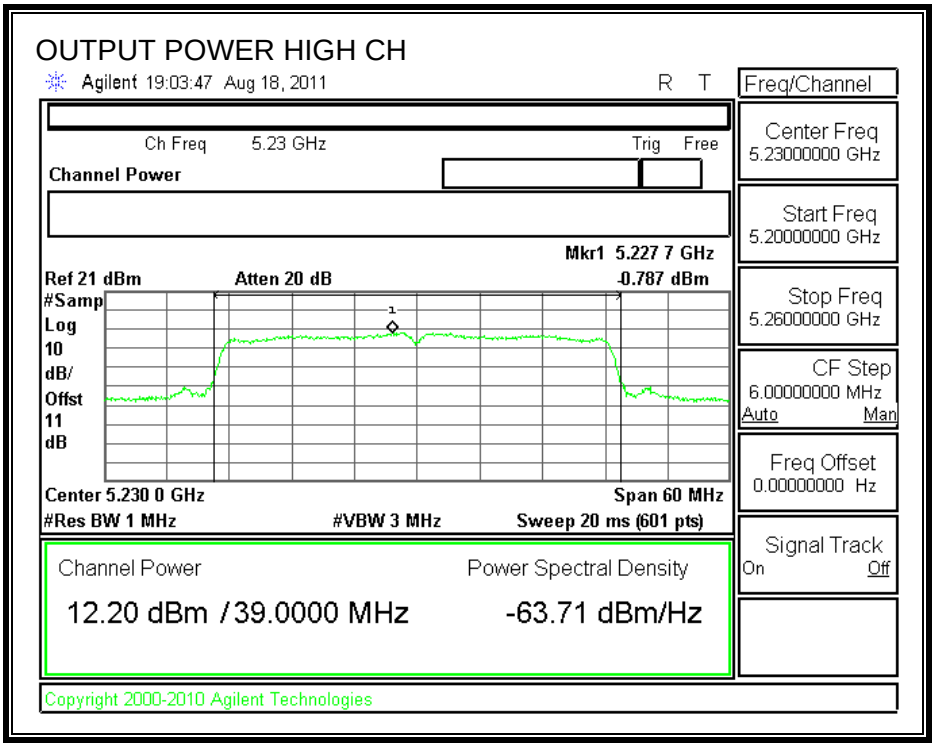
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	38.305	19.83	1.23	17.00
High	5230	17	38.101	19.81	1.23	17.00

Results

Channel	Frequency (MHz)	Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	12.21	17.00	-4.79
High	5230	12.20	17.00	-4.80

OUTPUT POWER





7.3.5 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.

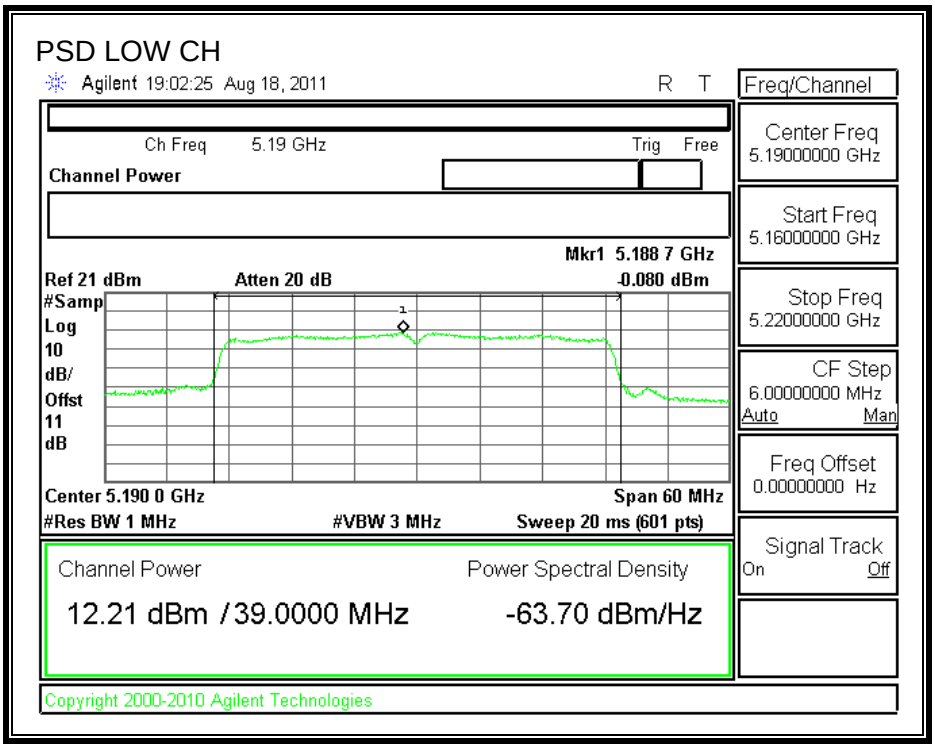
TEST PROCEDURE

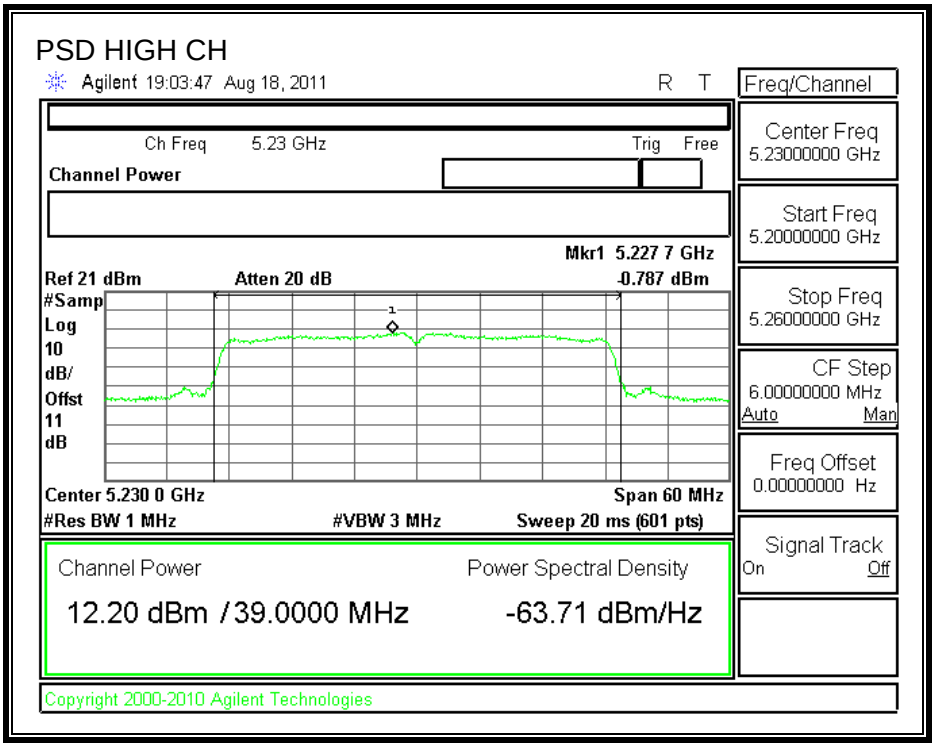
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

Channel	Frequency (MHz)	PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-0.08	4	-4.08
High	5230	-0.79	4	-4.79

POWER SPECTRAL DENSITY





7.3.6 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.

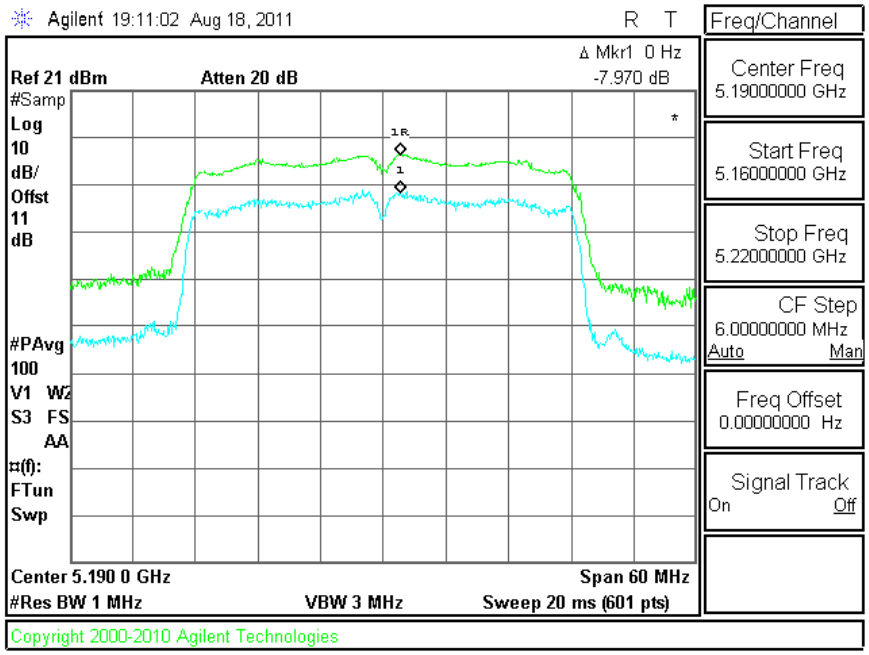
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

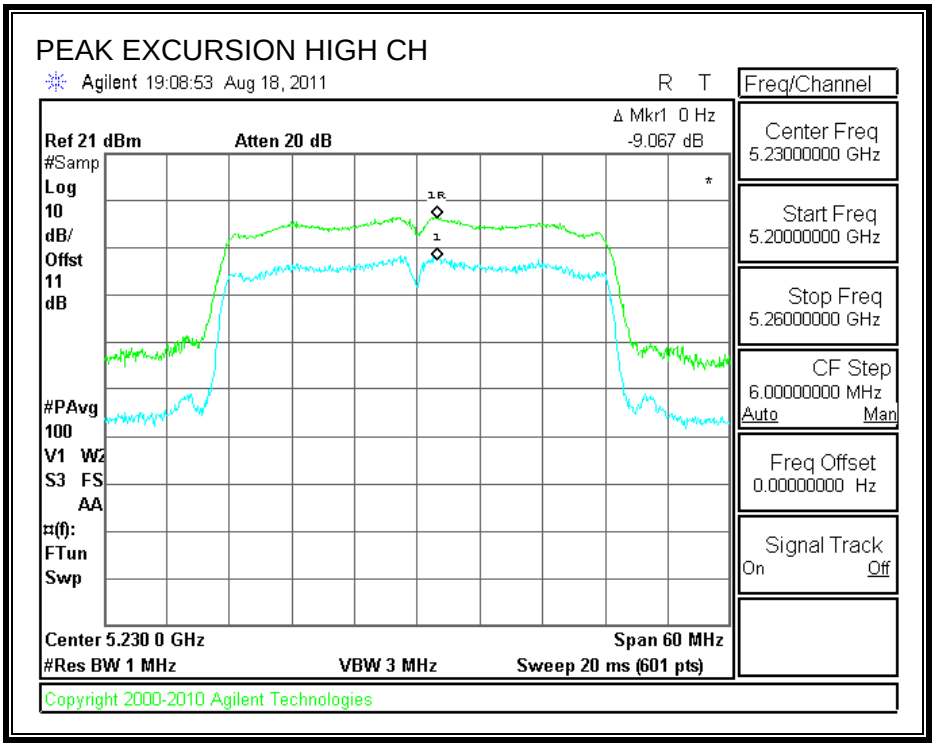
RESULTS

Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	7.97	13	-5.03
High	5230	9.07	13	-3.93

PEAK EXCURSION

PEAK EXCURSION LOW CH





7.3.7 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

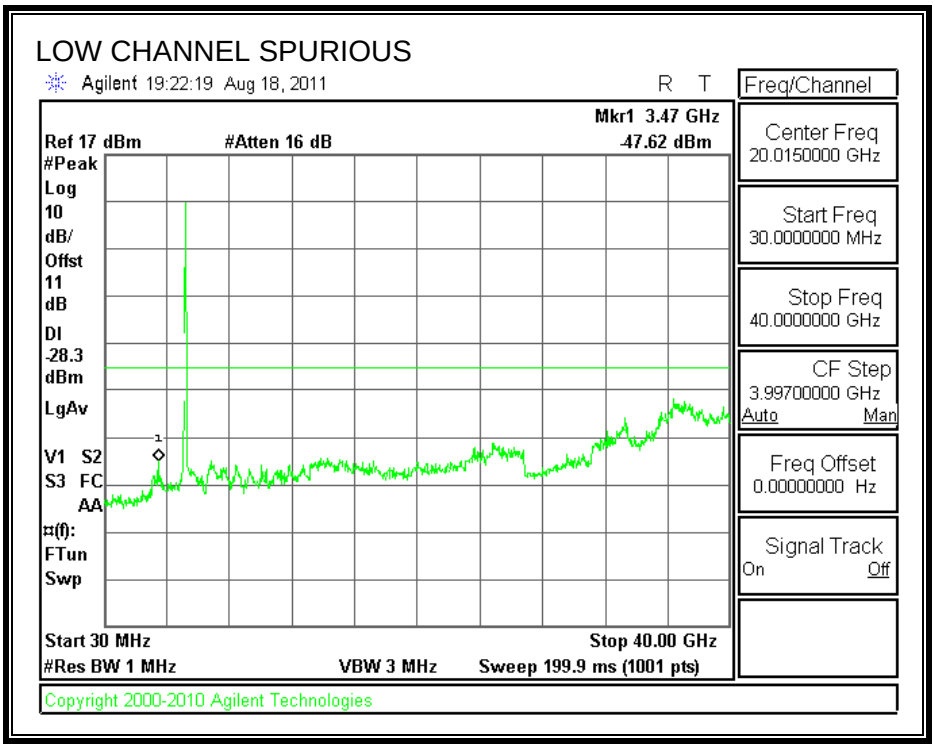
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

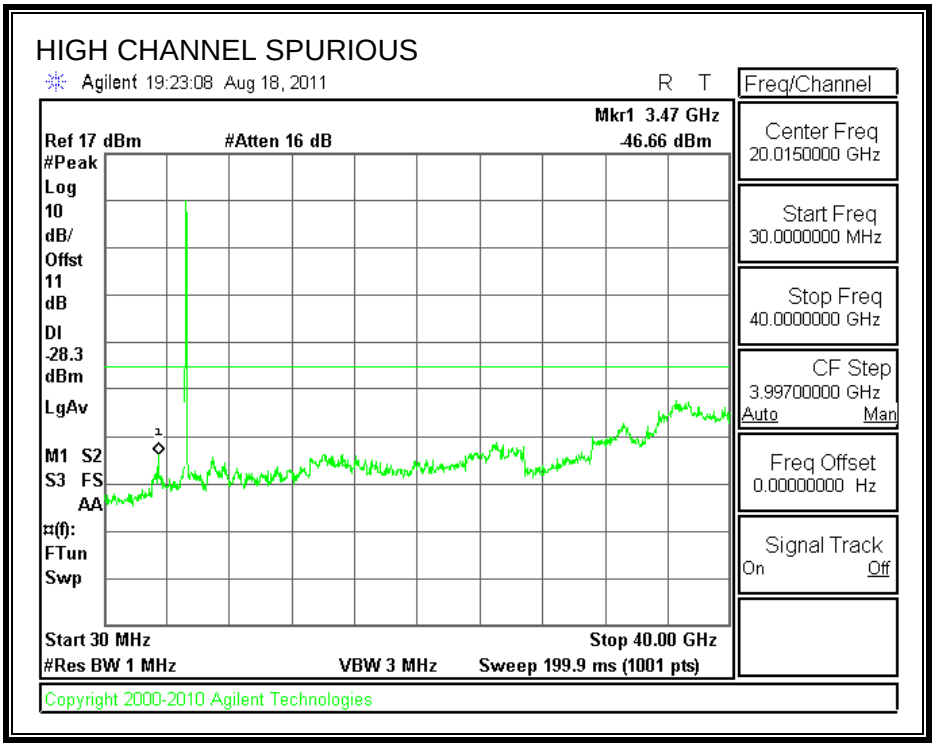
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

RESULTS

SPURIOUS EMISSIONS





7.4 802.11n HT40 MIMO MODE IN THE 5.2 GHz BAND

7.4.1 AVERAGE POWER

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a power meter.

RESULTS

The cable assembly insertion loss of 11 dB (including 10 dB Attenuator and 1 dB cable) was entered as an offset in the power meter to allow for direct reading of power.

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)
Low	5190	11.79	11.66	14.74
High	5230	12.34	12.19	15.28

7.4.2 26 dB 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

CHAIN 1

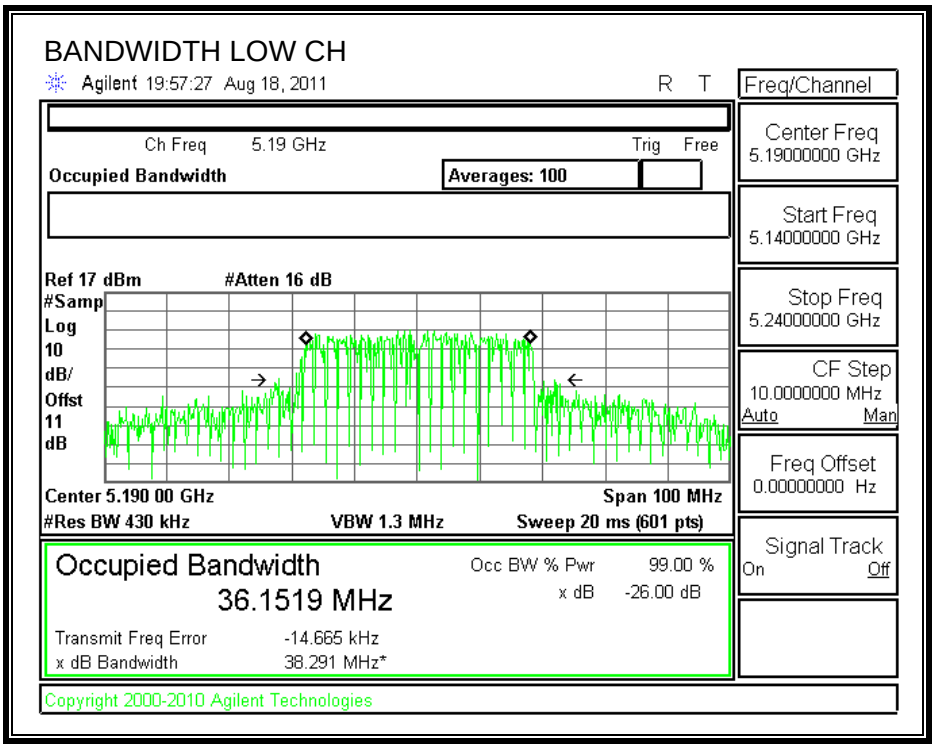
Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5190	38.291
High	5230	38.133

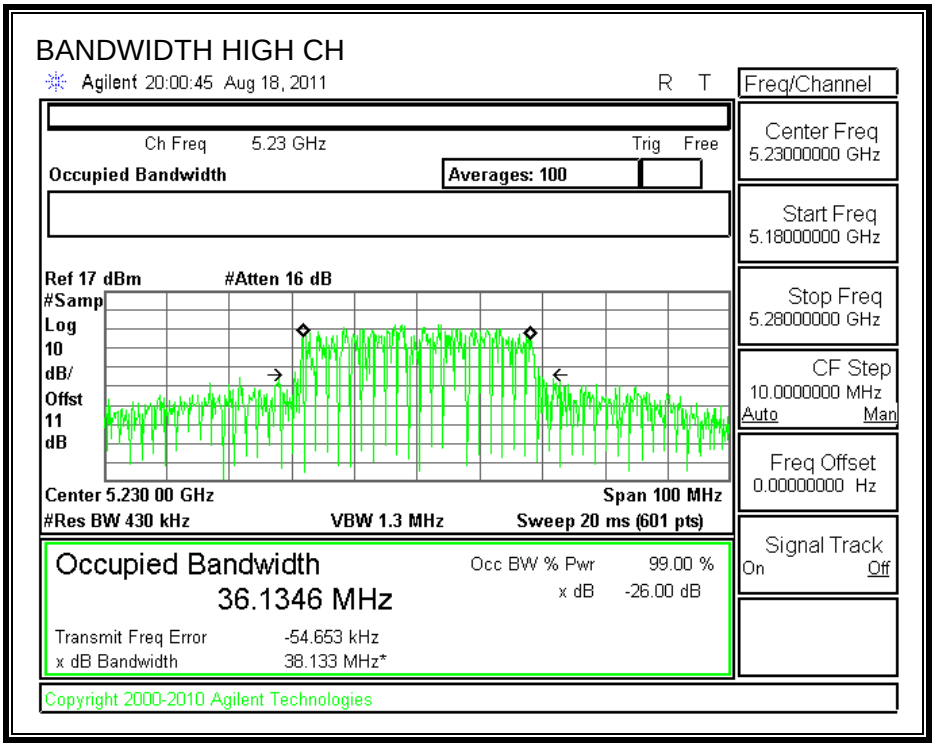
CHAIN 2

Channel	Frequency (MHz)	26 dB Bandwidth (MHz)
Low	5190	39.451
High	5230	41.405

CHAIN 1

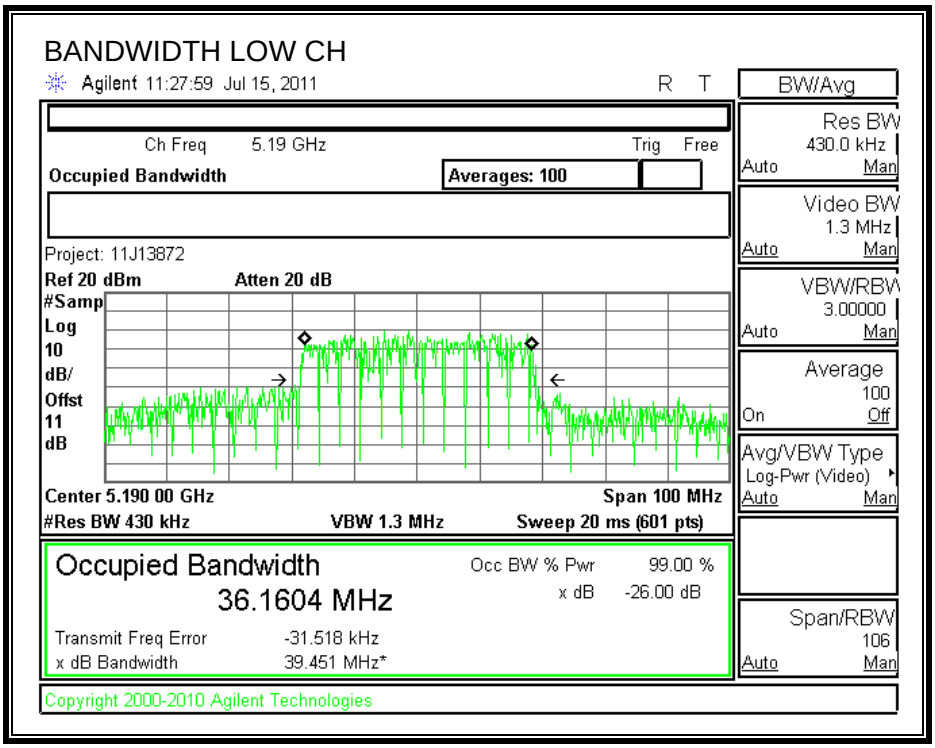
26 dB BANDWIDTH

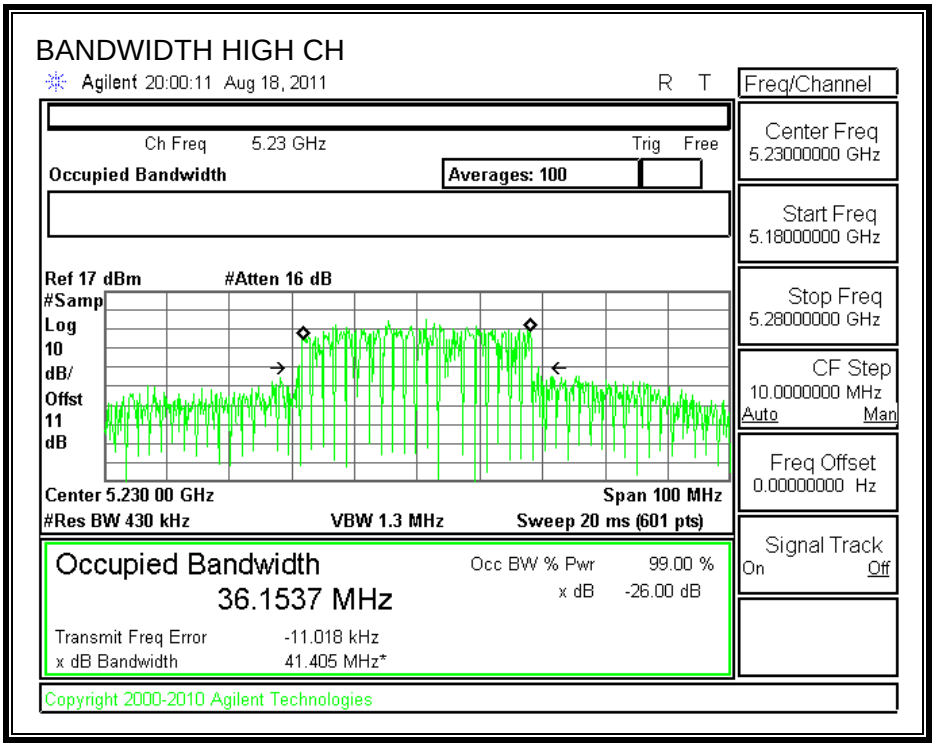




CHAIN 2

26 dB BANDWIDTH





7.4.3 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 span. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

RESULTS

CHAIN 1

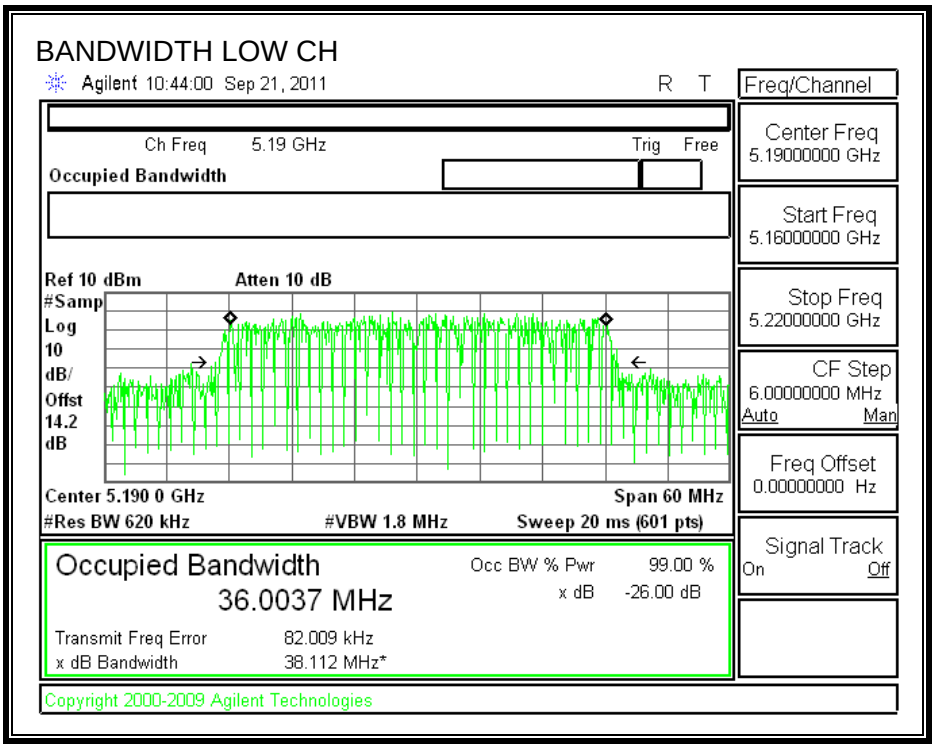
Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5190	36.1923
High	5230	36.1434

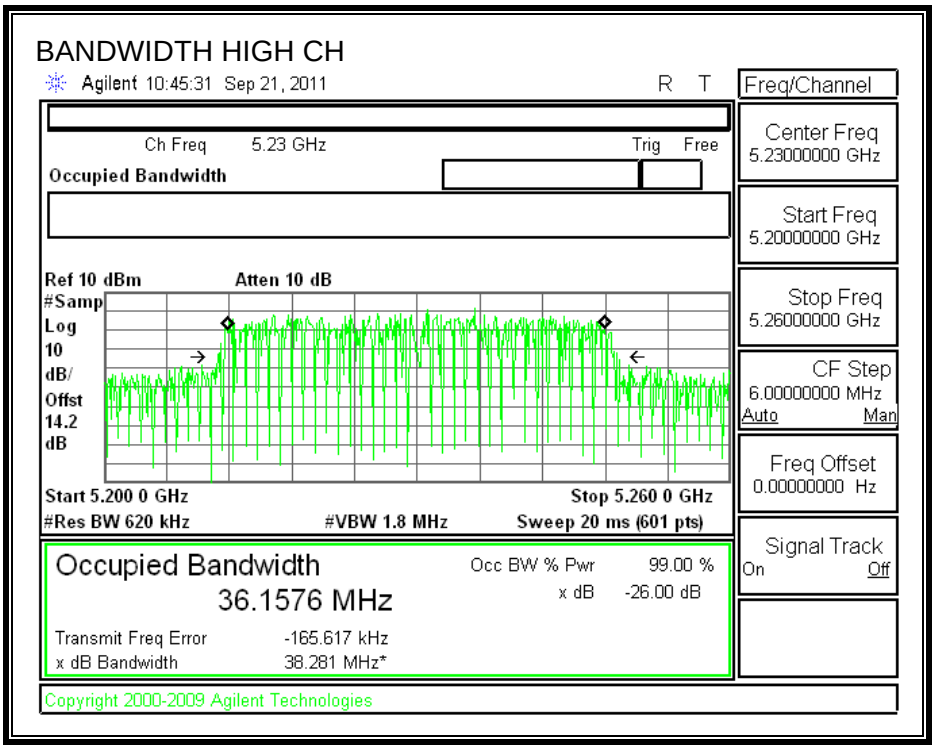
CHAIN 2

Channel	Frequency (MHz)	99% Bandwidth (MHz)
Low	5190	36.1923
High	5230	36.1434

CHAIN 1

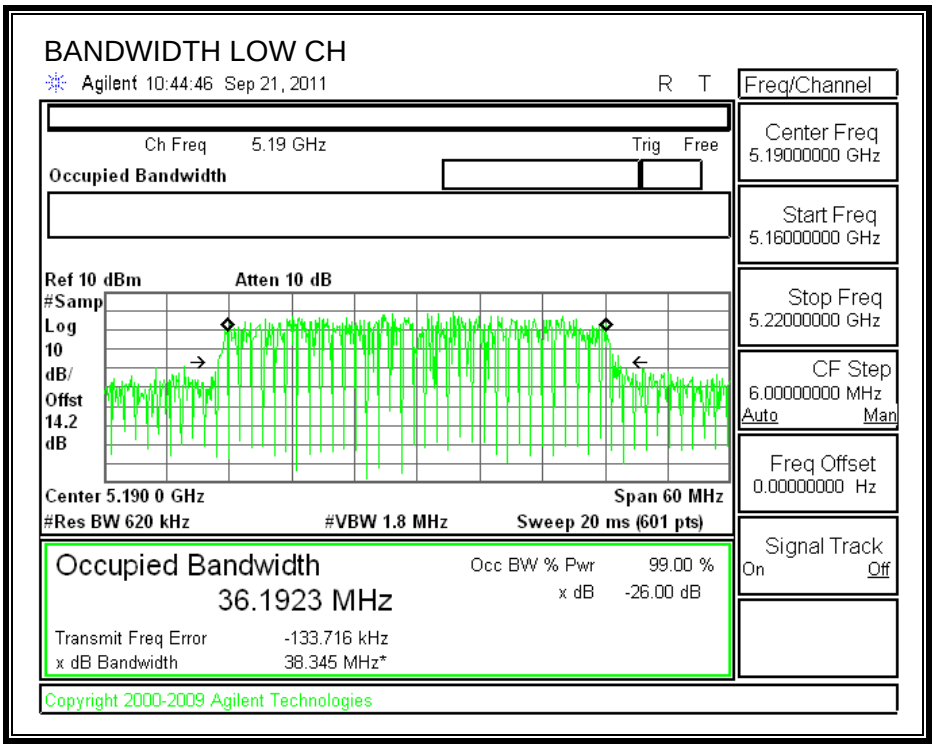
99% BANDWIDTH

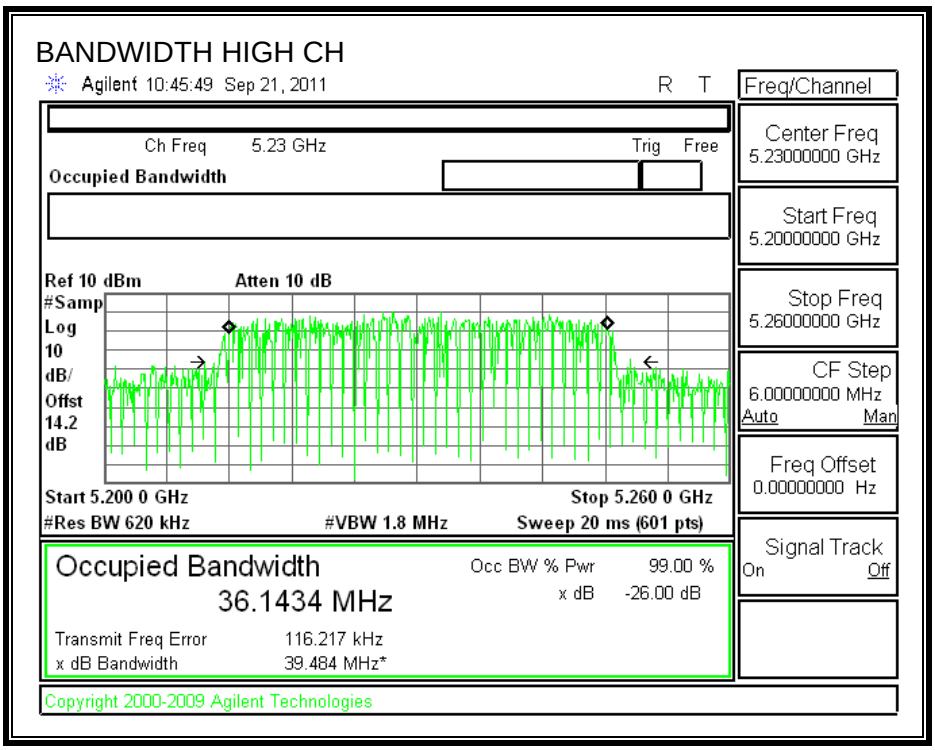




CHAIN 2

99% BANDWIDTH





7.4.4 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

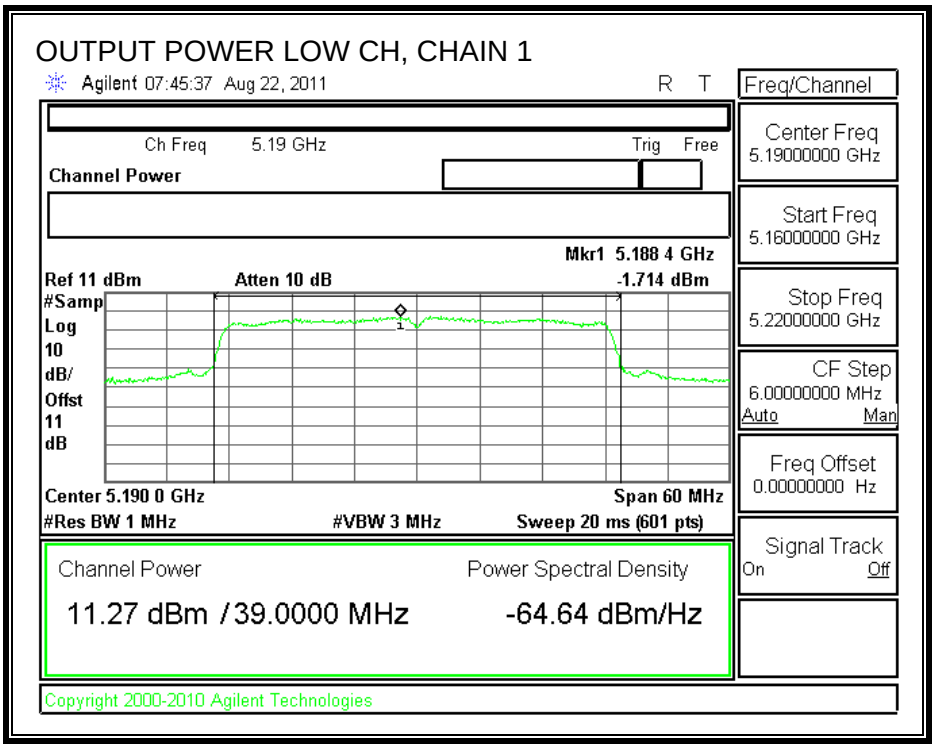
Channel	Frequency (MHz)	Fixed Limit (dBm)	B (MHz)	4 + 10 Log B Limit (dBm)	Antenna Gain (dBi)	Limit (dBm)
Low	5190	17	38.291	19.83	1.23	17.00
High	5230	17	38.133	19.81	1.23	17.00

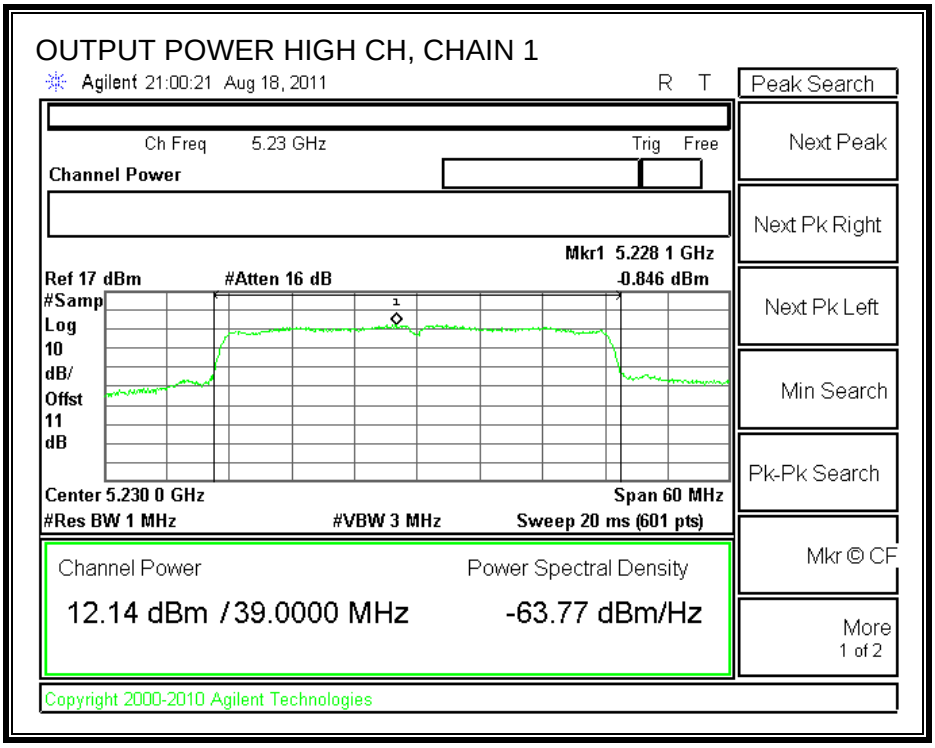
Individual Chain Results

Channel	Frequency (MHz)	Chain 1 Power (dBm)	Chain 2 Power (dBm)	Total Power (dBm)	Limit (dBm)	Margin (dB)
Low	5190	11.27	11.65	14.47	17.00	-2.53
High	5230	12.14	12.12	15.14	17.00	-1.86

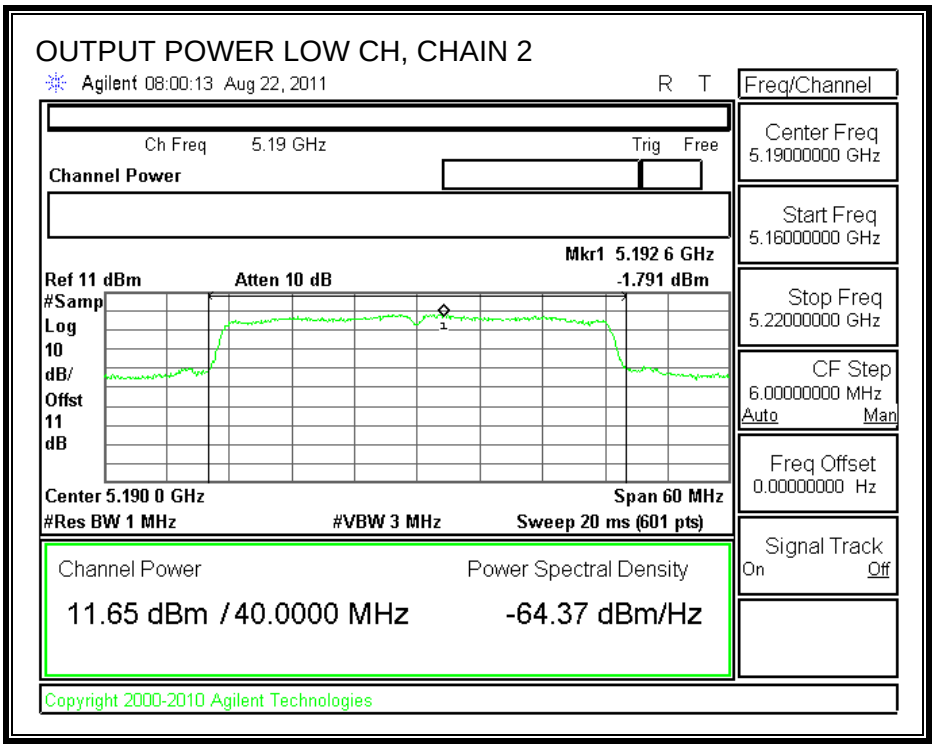
STBC is used for MIMO mode, and STBC is categorized as Uncorrelated signal, hence, single antenna gain is used as directional antenna gain per KDB 66291 D01.

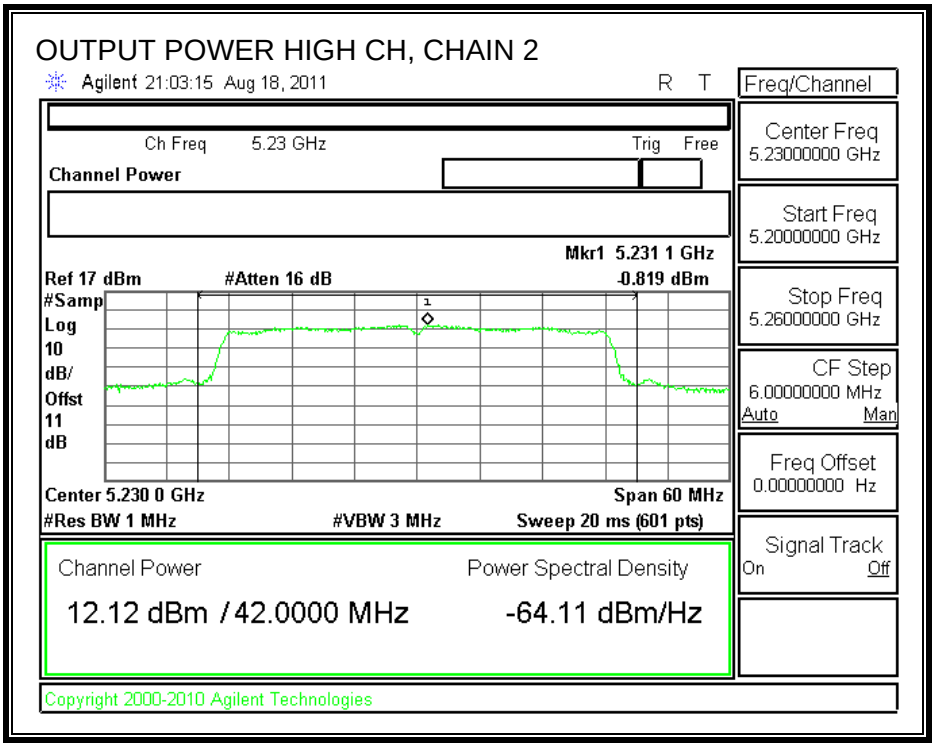
CHAIN 1 OUTPUT POWER





CHAIN 2 OUTPUT POWER





7.4.5 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.

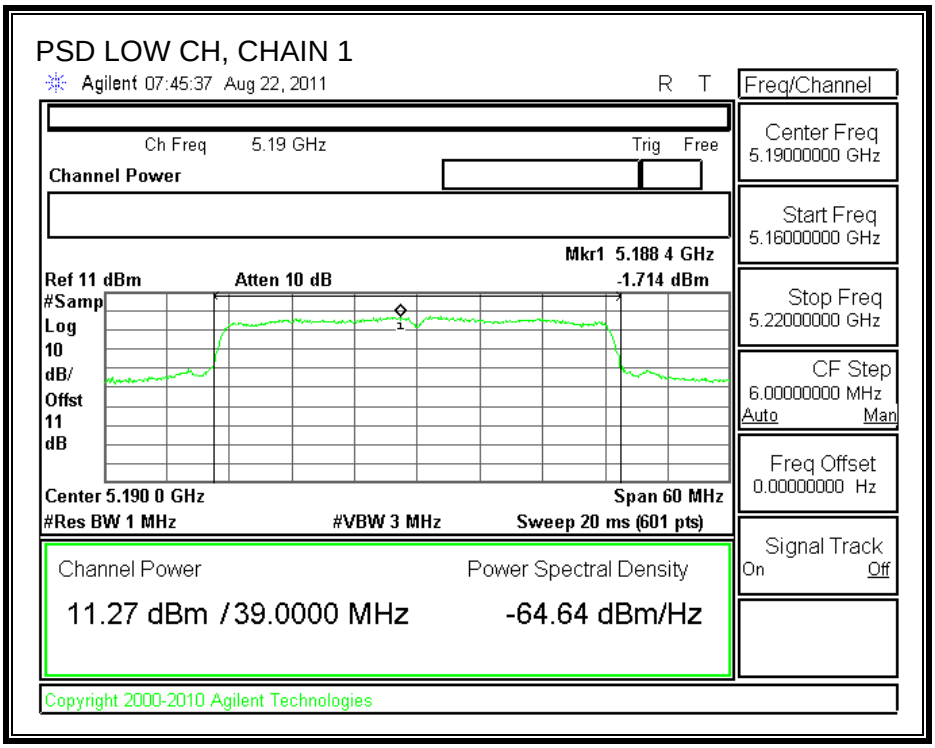
TEST PROCEDURE

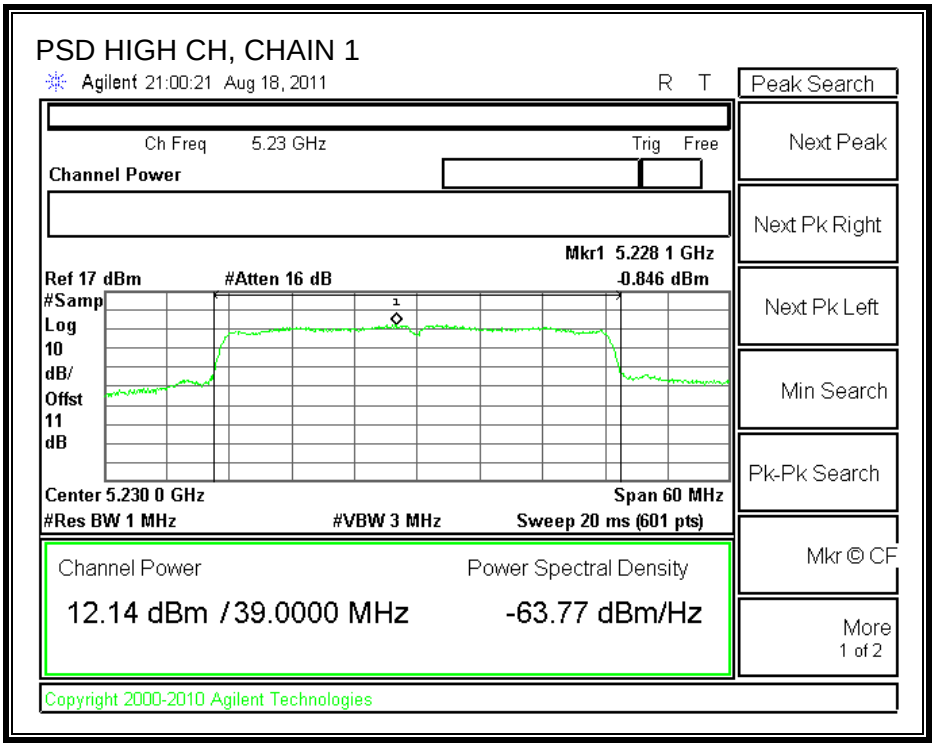
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

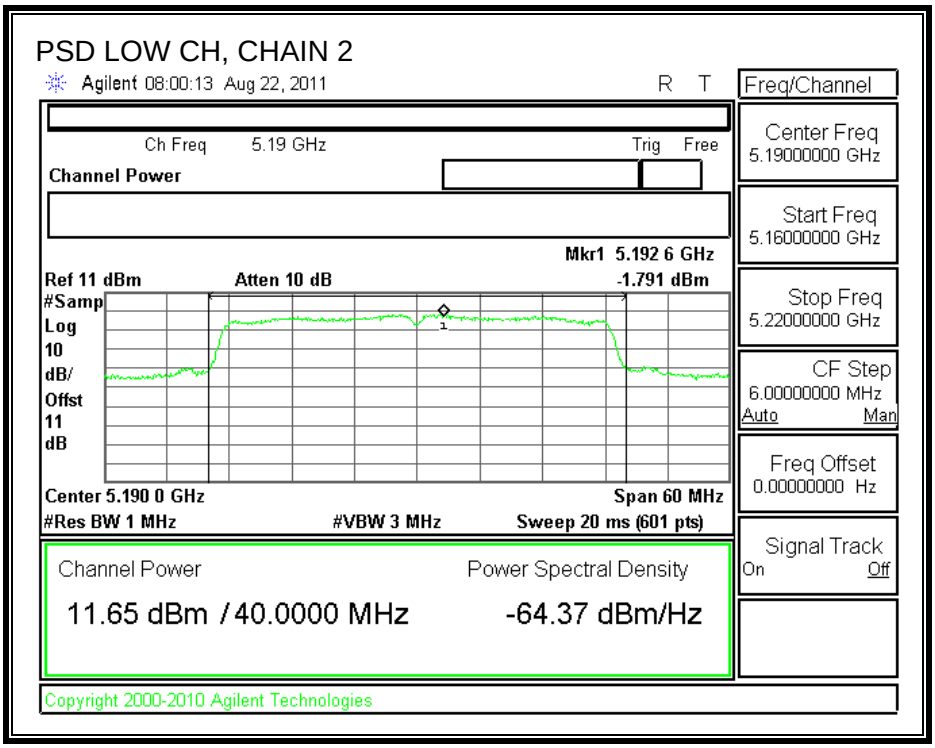
Channel	Frequency (MHz)	Chain 1 PPSD (dBm)	Chain 2 PPSD (dBm)	Total PPSD (dBm)	Limit (dBm)	Margin (dB)
Low	5190	-1.714	-1.791	1.26	4	-2.74
High	5230	-0.846	-0.819	2.18	4	-1.82

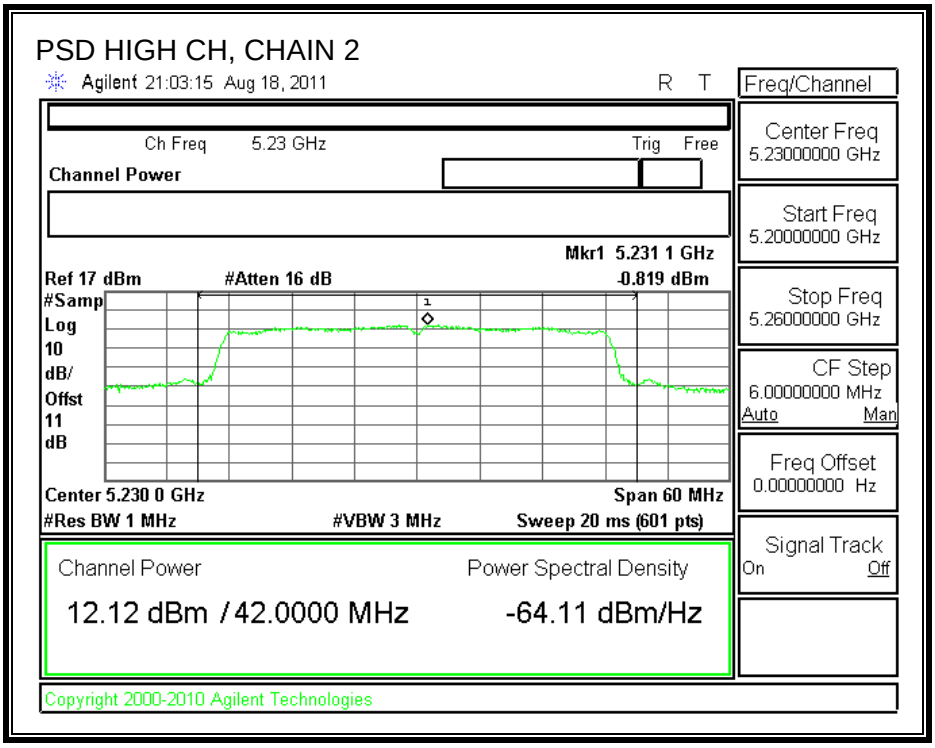
CHAIN 1 POWER SPECTRAL DENSITY





CHAIN 2 POWER SPECTRAL DENSITY





7.4.6 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

CHAIN 1

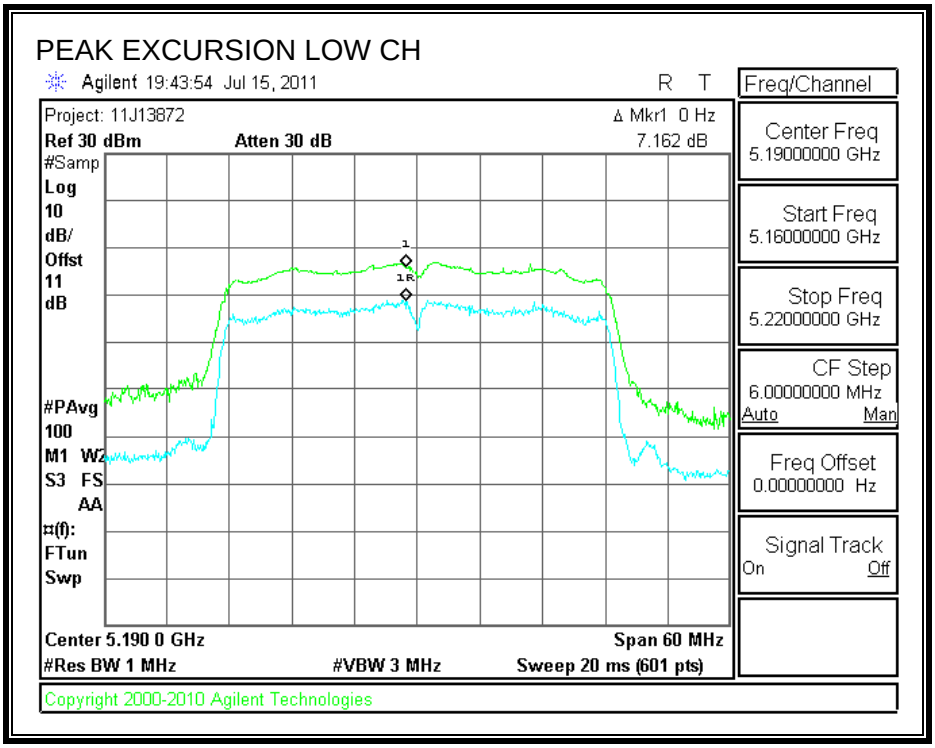
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	7.16	13	-5.84
High	5230	7.48	13	-5.52

CHAIN 2

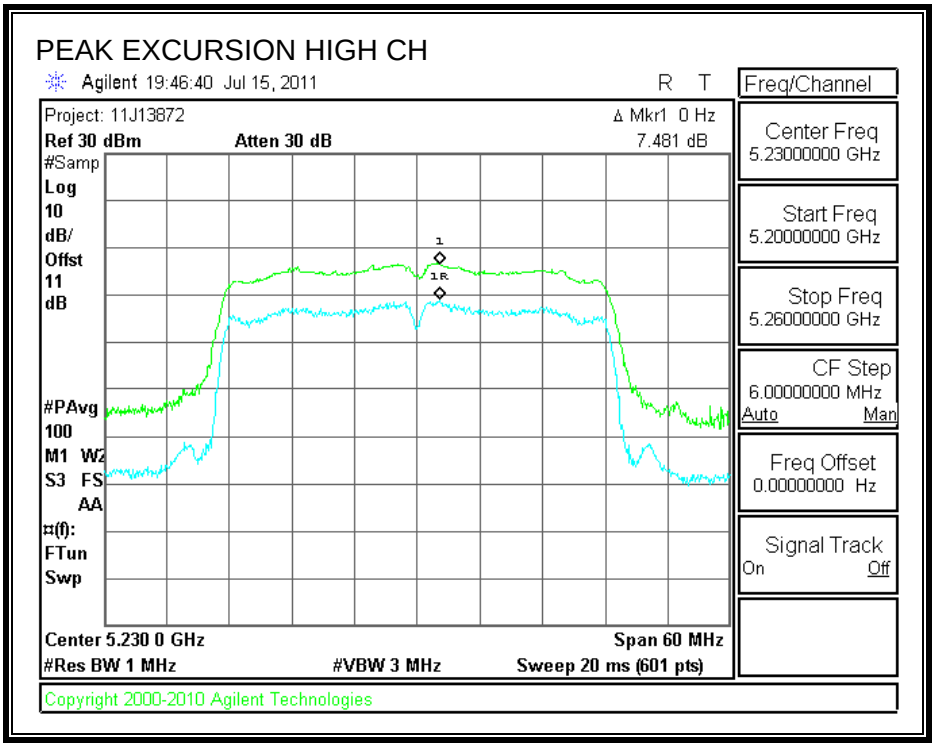
Channel	Frequency (MHz)	Peak Excursion (dB)	Limit (dB)	Margin (dB)
Low	5190	7.44	13	-5.56
High	5230	7.66	13	-5.34

CHAIN 1

PEAK EXCURSION

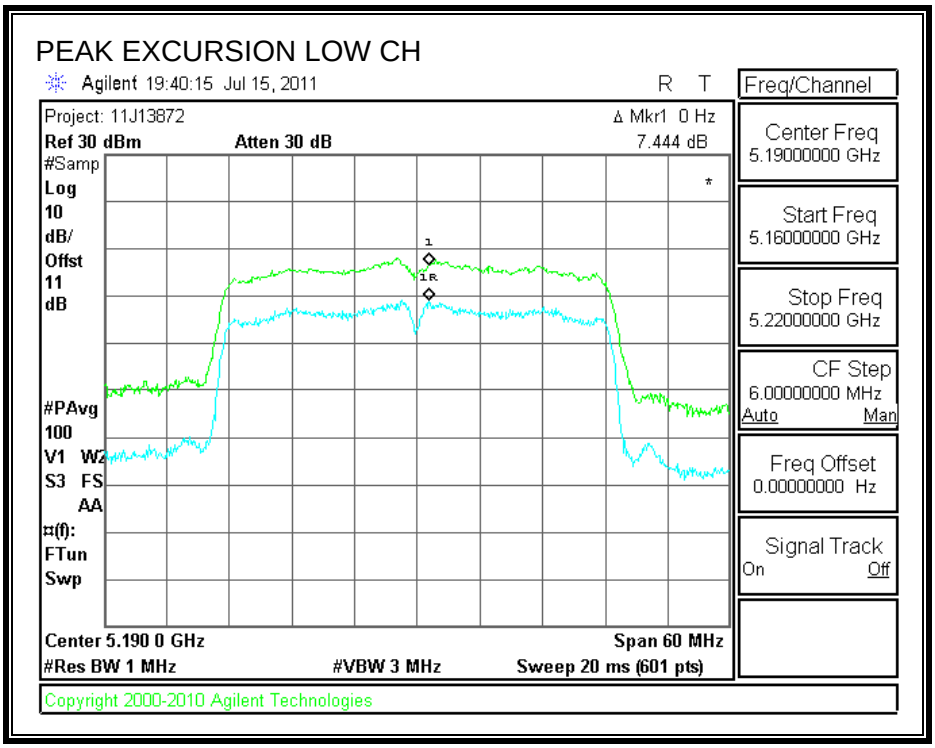


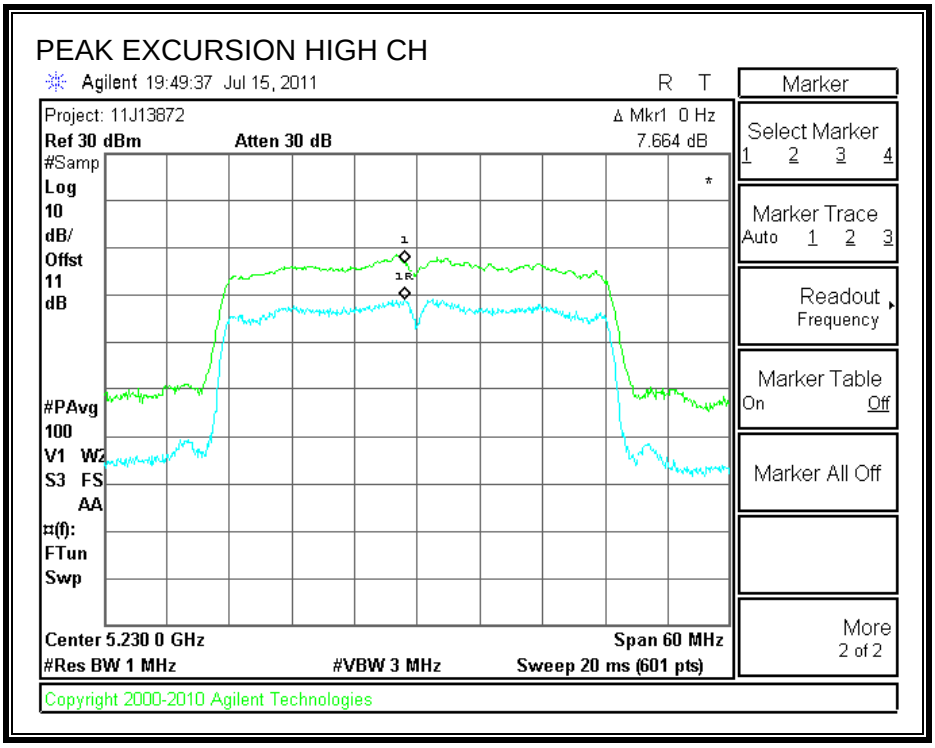
PEAK EXCURSION HIGH CH



CHAIN 2

PEAK EXCURSION





7.4.7 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.

Since the combination antenna gain is 1.23dBi, so the EIRP limit is -28.23dBm.

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.

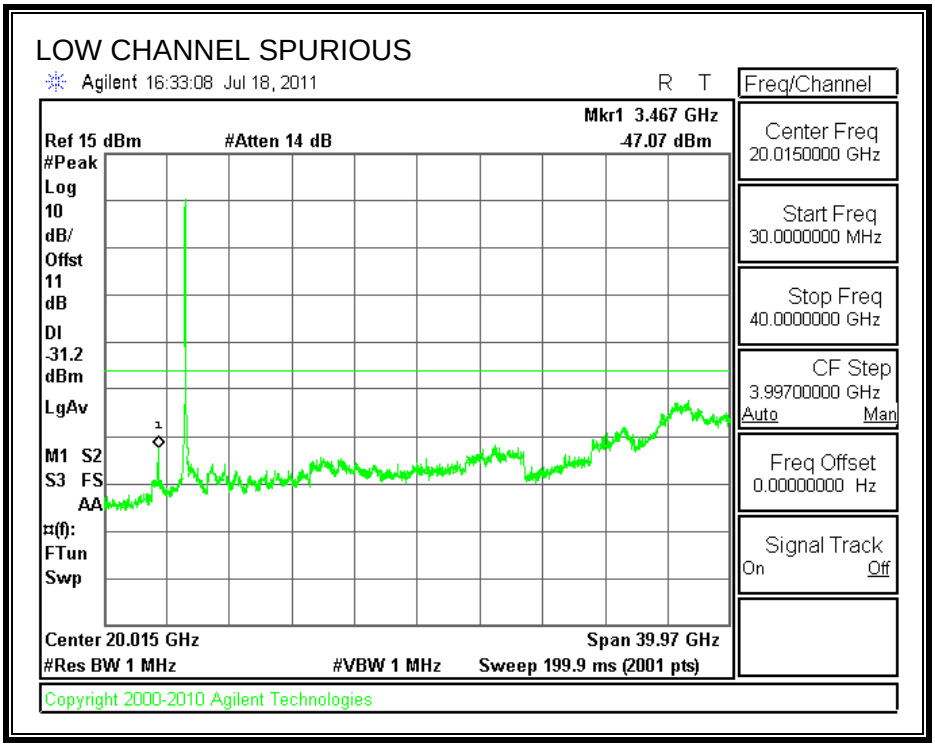
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

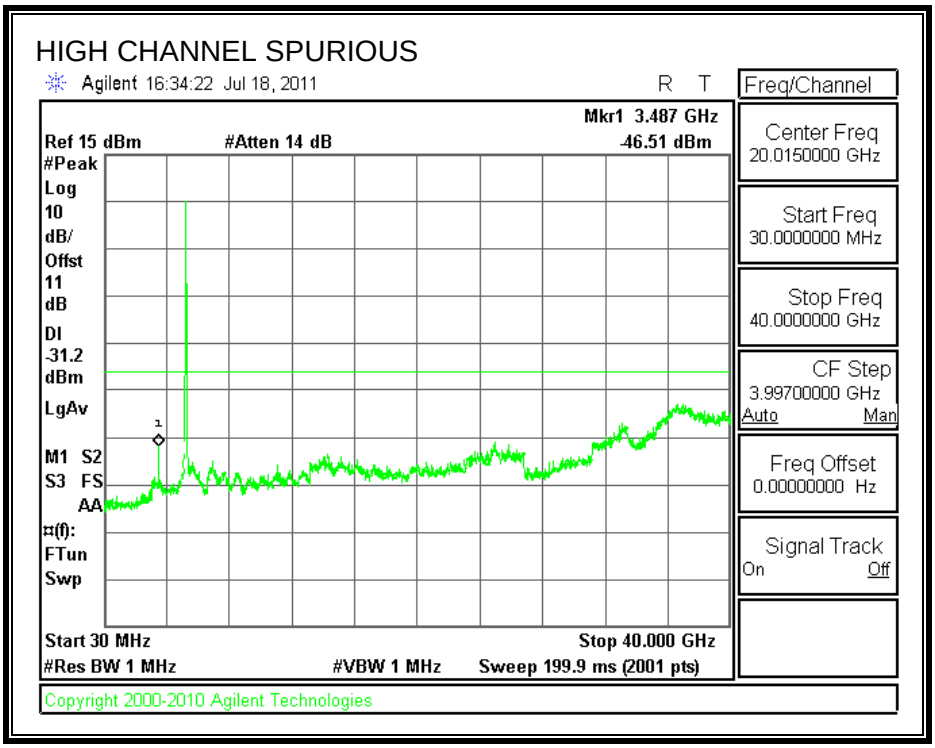
RESULTS

CONDUCTED SPURIOUS EMISSIONS

CHAIN 1

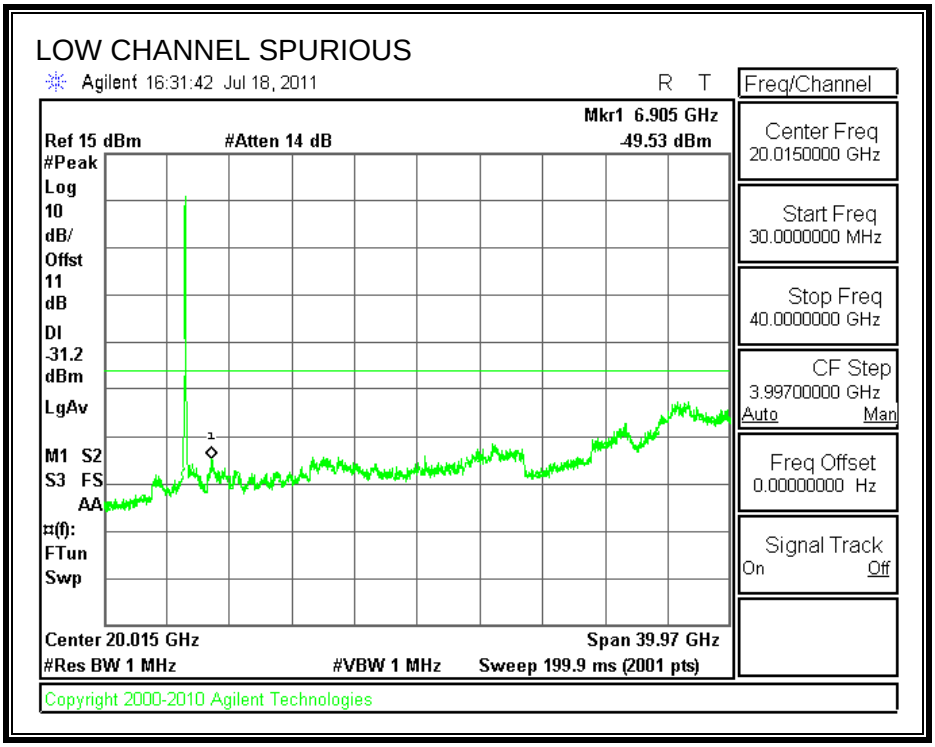


The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.

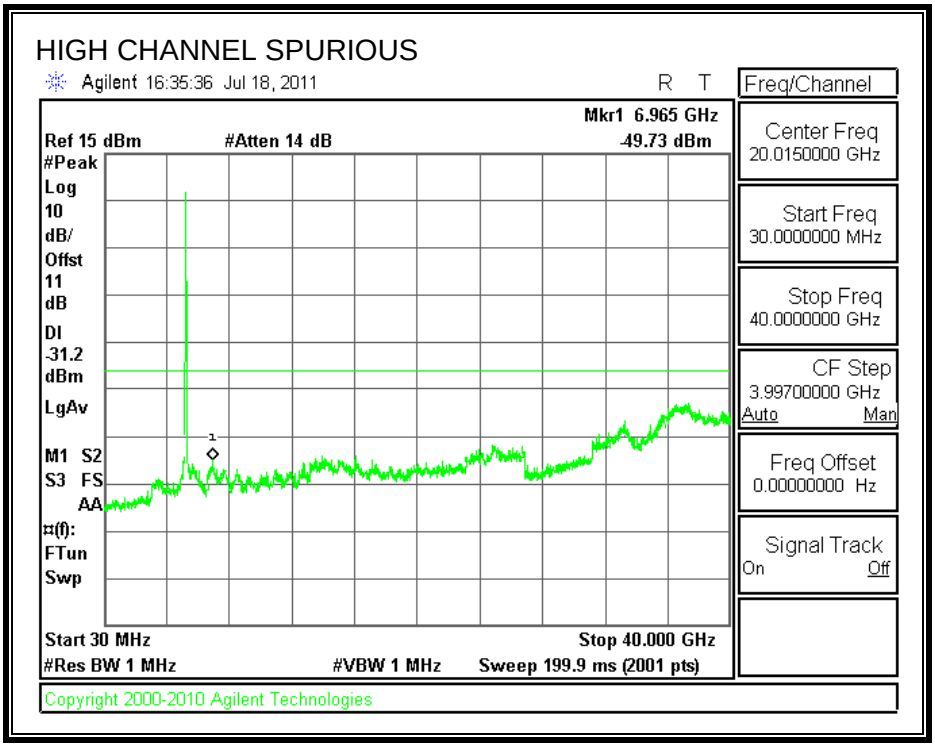


The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.

CHAIN 2



The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.



The limit line in this plot -31.2 dBm is 3dB lower than the limit -28.23 dBm.

8 RADIATED TEST RESULTS

8.4 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.

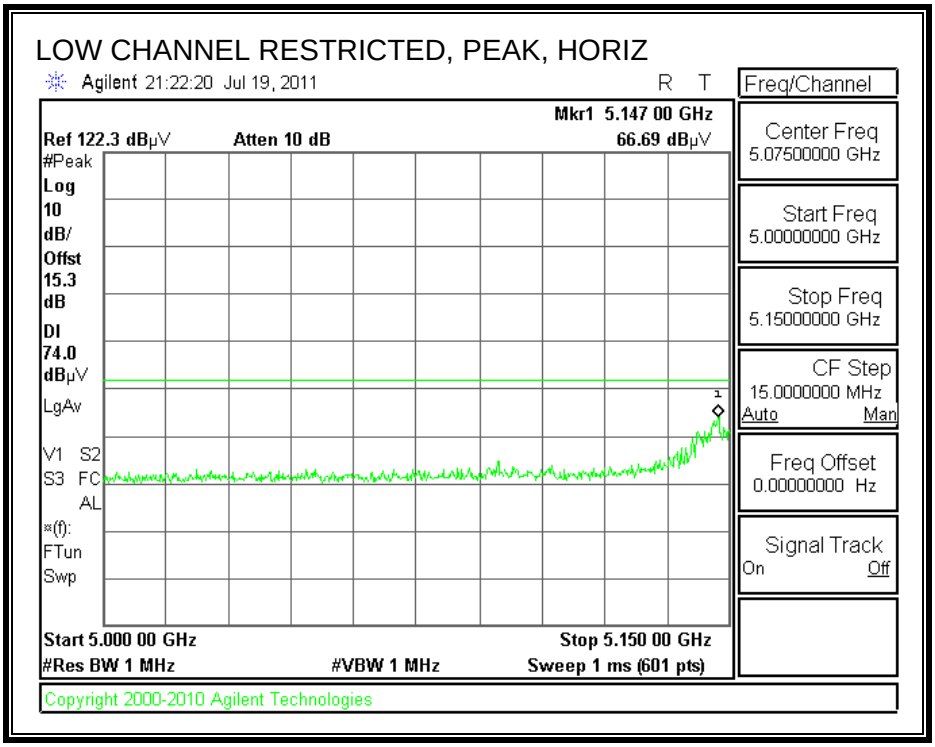
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

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.

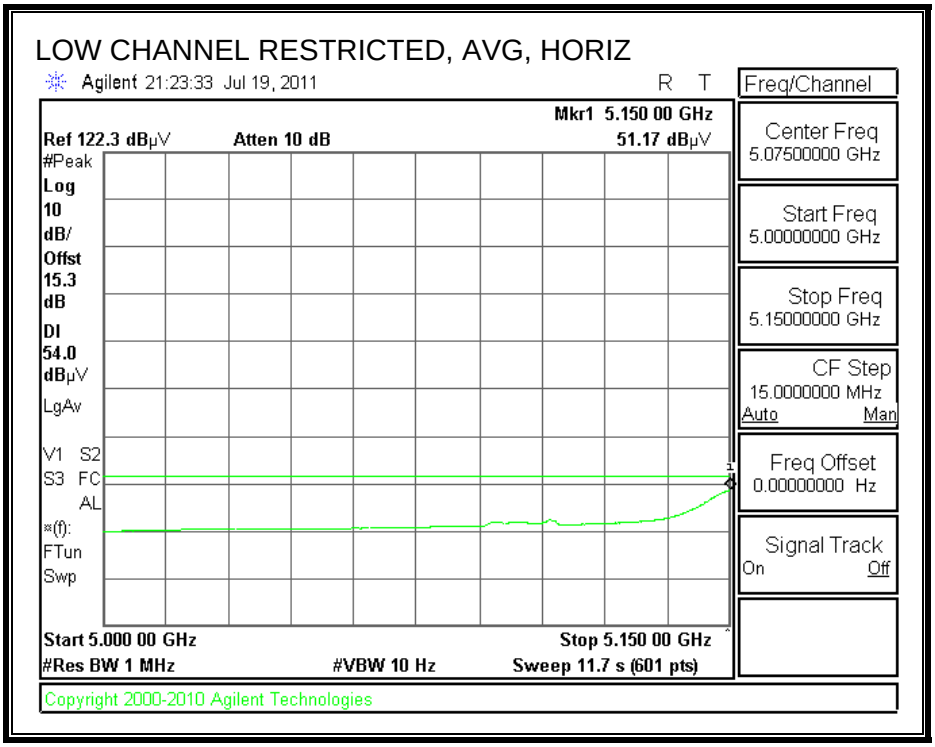
8.5 TRANSMITTER ABOVE 1 GHz

7.2.1. 802.11n HT20 SISO MODE IN THE LOWER 5.2 GHz BAND

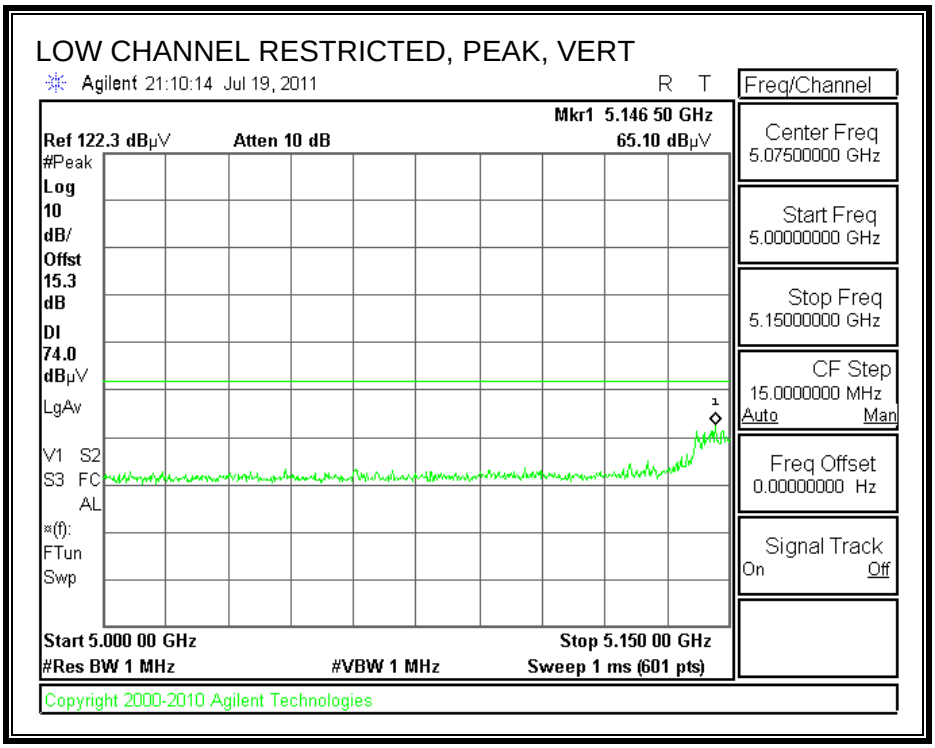
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



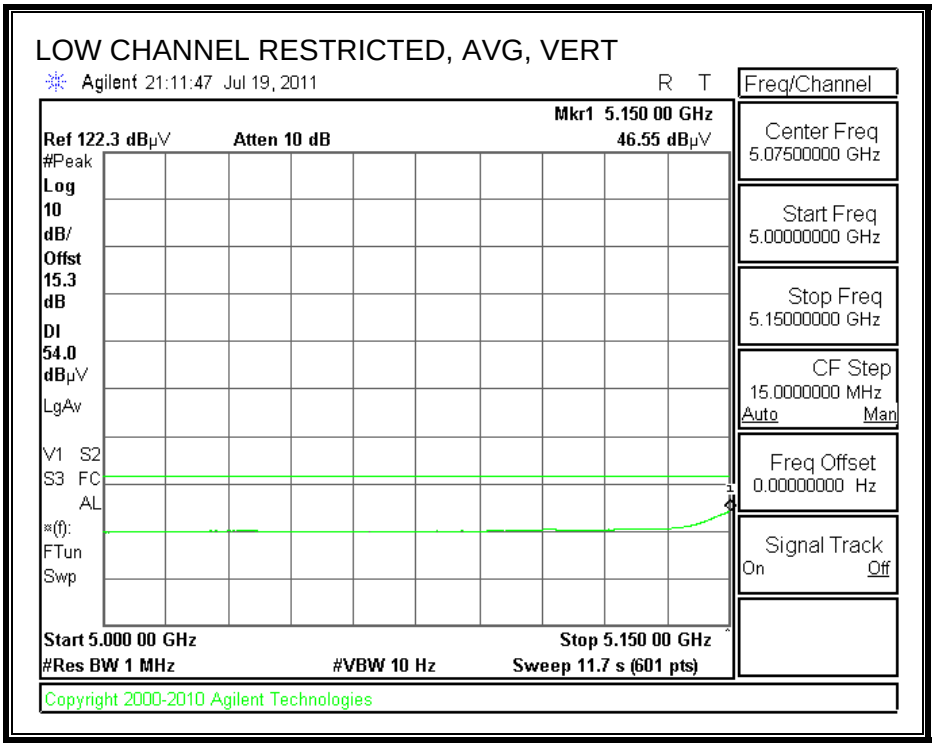
LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



LOW CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

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

Company: Hon Hai
Project #: 11J13782
Date: 2011/7/23
Test Engineer: Tadaomi Yamano
Configuration: Antenna-Z Axis
Mode: Tx 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			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

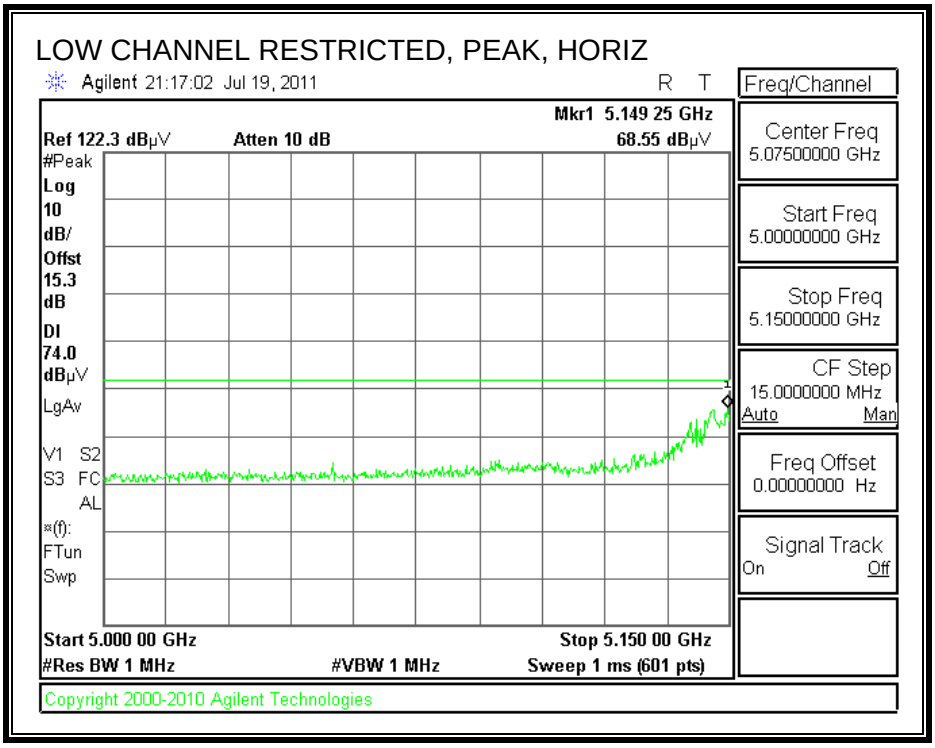
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
11n HT20 SISO L-ch															
15.540	3.0	40.1	27.3	38.7	12.2	-34.8	0.0	0.7	56.9	44.0	74	54	-17.1	-10.0	H
15.540	3.0	40.3	27.2	38.7	12.2	-34.8	0.0	0.7	57.0	43.9	74	54	-17.0	-10.1	V
11n HT20 SISO M-ch															
15.600	3.0	40.7	27.4	38.5	12.2	-34.8	0.0	0.7	57.4	44.1	74	54	-16.6	-9.9	H
15.600	3.0	40.6	27.3	38.5	12.2	-34.8	0.0	0.7	57.3	44.0	74	54	-16.7	-10.0	V
11n HT20 SISO H-ch															
15.720	3.0	40.6	27.2	38.2	12.3	-34.7	0.0	0.7	57.1	43.7	74	54	-16.9	-10.3	H
15.720	3.0	39.7	27.4	38.2	12.3	-34.7	0.0	0.7	56.2	43.9	74	54	-17.8	-10.1	V

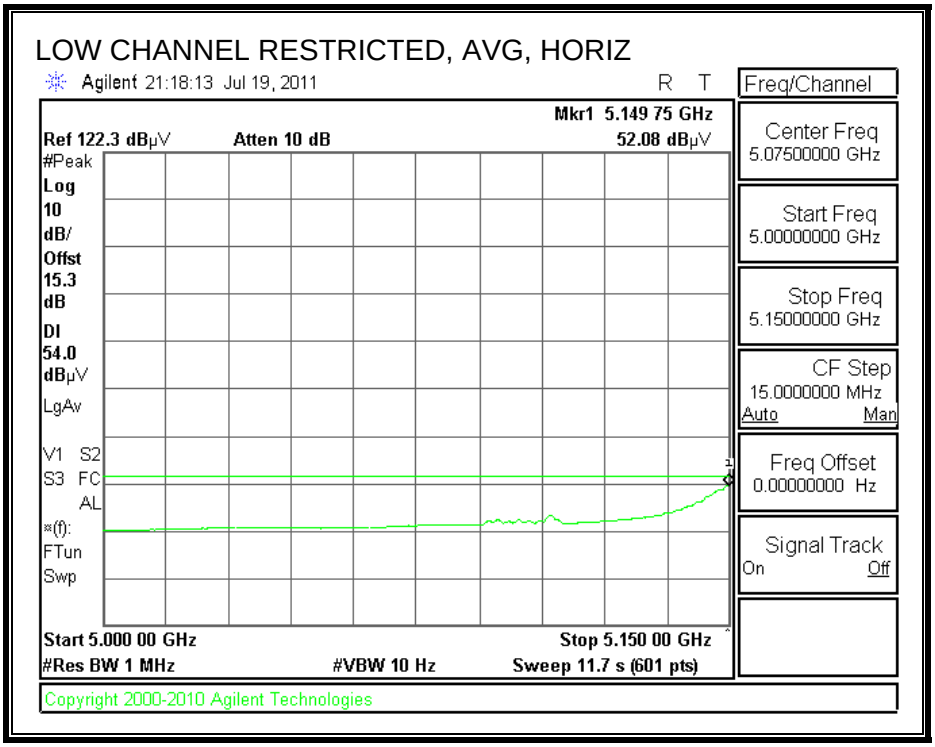
Rev. 07.08.11

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		

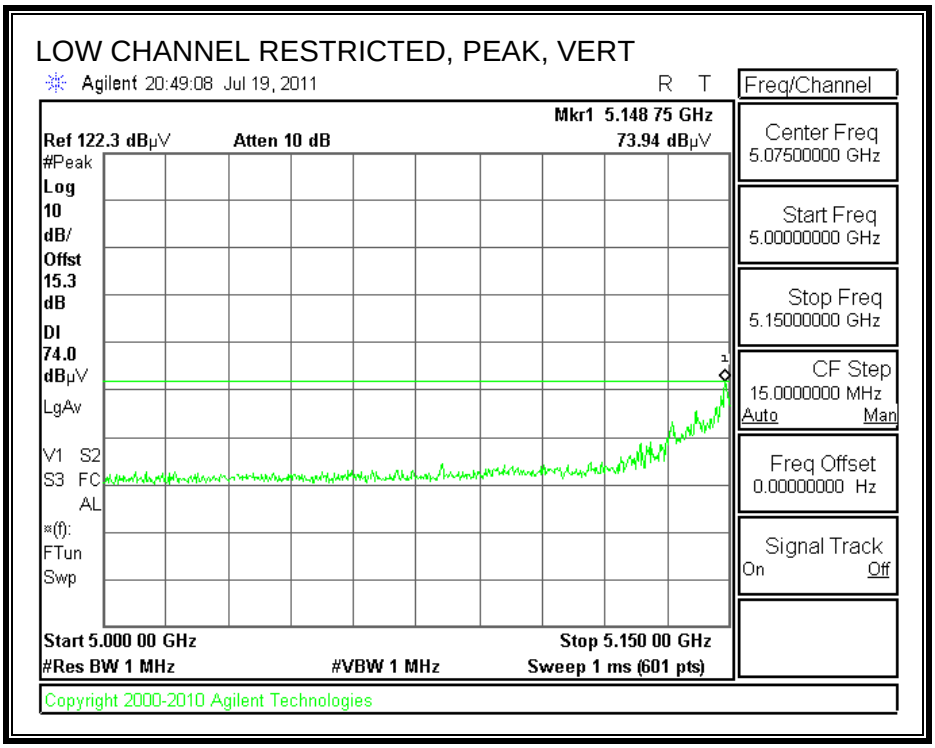
8.5.2 802.11n HT20 MIMO MODE IN THE LOWER 5.2 GHz BAND

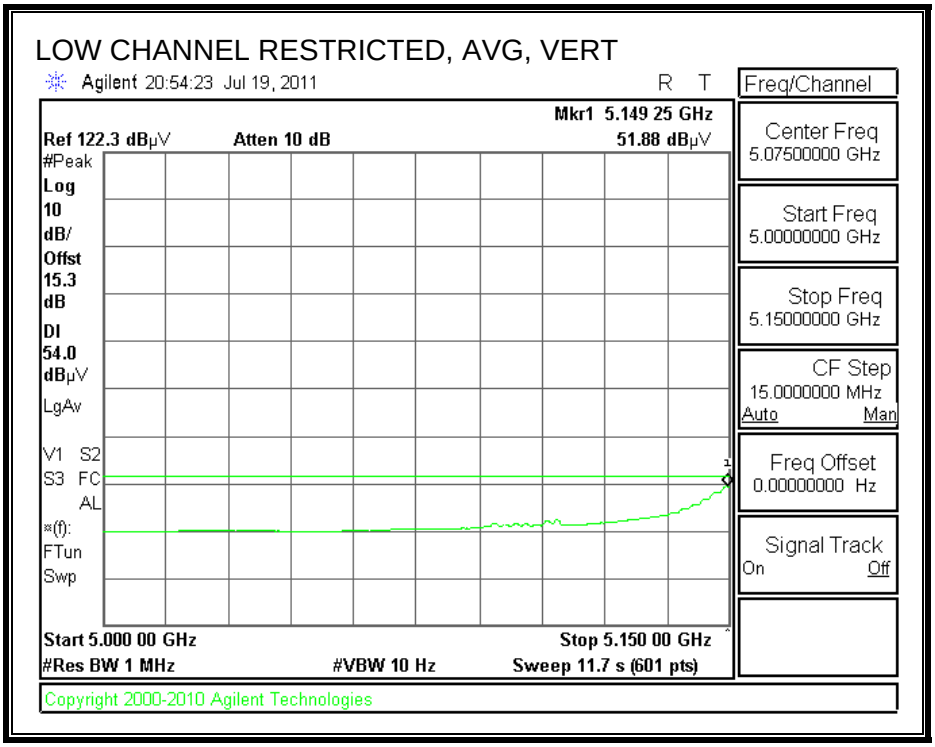
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)





RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

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

Company: Hon Hai
Project #: 11J13782
Date: 2011/7/23
Test Engineer: Tadaomi Yamano
Configuration: Antenna-Z Axis
Mode: Tx 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			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

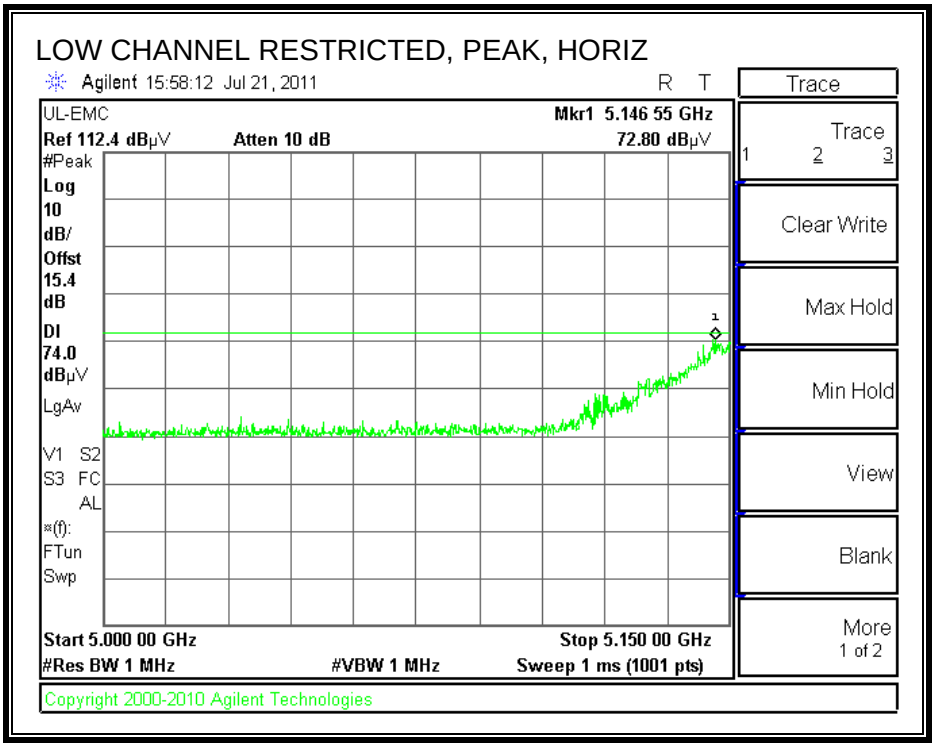
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
11n HT20 MIMO L-ch															
15.540	3.0	40.5	27.6	38.7	12.2	-34.8	0.0	0.7	57.3	44.3	74	54	-16.7	-9.7	H
15.540	3.0	40.3	27.3	38.7	12.2	-34.8	0.0	0.7	57.1	44.1	74	54	-16.9	-9.9	V
11n HT20 MIMO M-ch															
15.600	3.0	40.0	27.0	38.5	12.2	-34.8	0.0	0.7	56.7	43.7	74	54	-17.3	-10.3	H
15.600	3.0	40.2	27.9	38.5	12.2	-34.8	0.0	0.7	56.9	44.6	74	54	-17.1	-9.4	V
11n HT20 MIMO H-ch															
15.720	3.0	40.2	26.6	38.2	12.3	-34.7	0.0	0.7	56.7	43.1	74	54	-17.3	-10.9	H
15.720	3.0	39.5	27.6	38.2	12.3	-34.7	0.0	0.7	56.0	44.2	74	54	-18.0	-9.8	V

Rev. 07.08.11

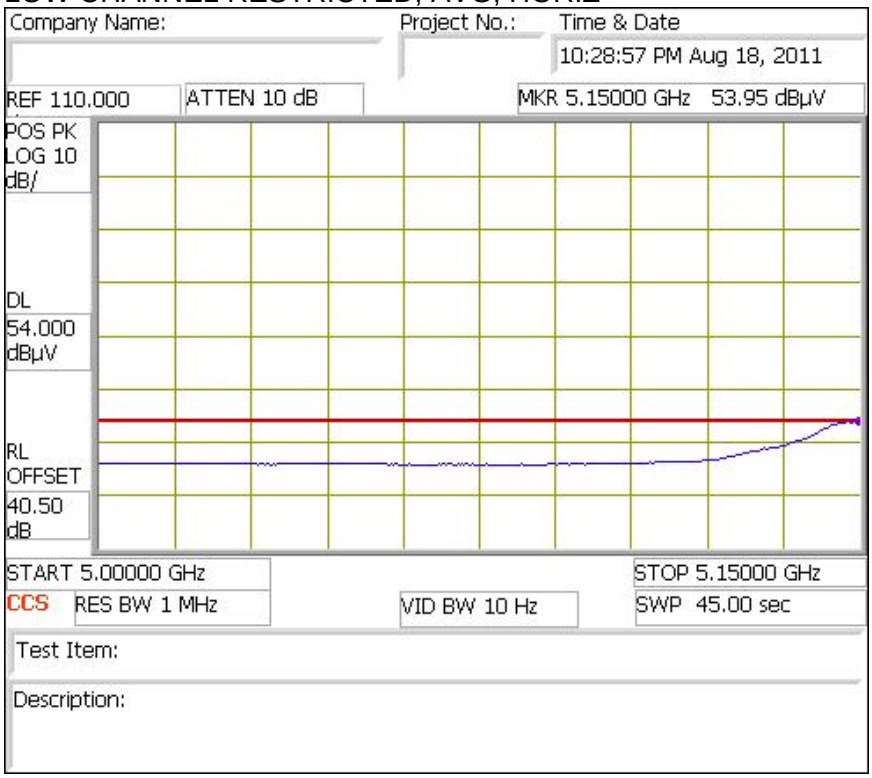
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

8.5.3 802.11n HT40 SISO MODE IN THE LOWER 5.2 GHz BAND

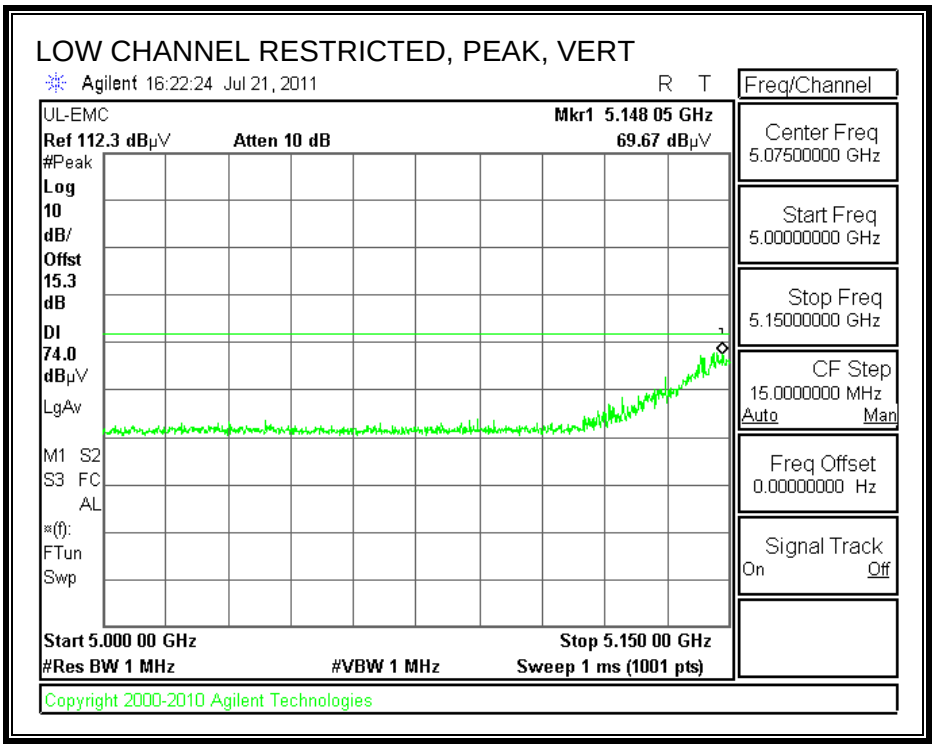
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)

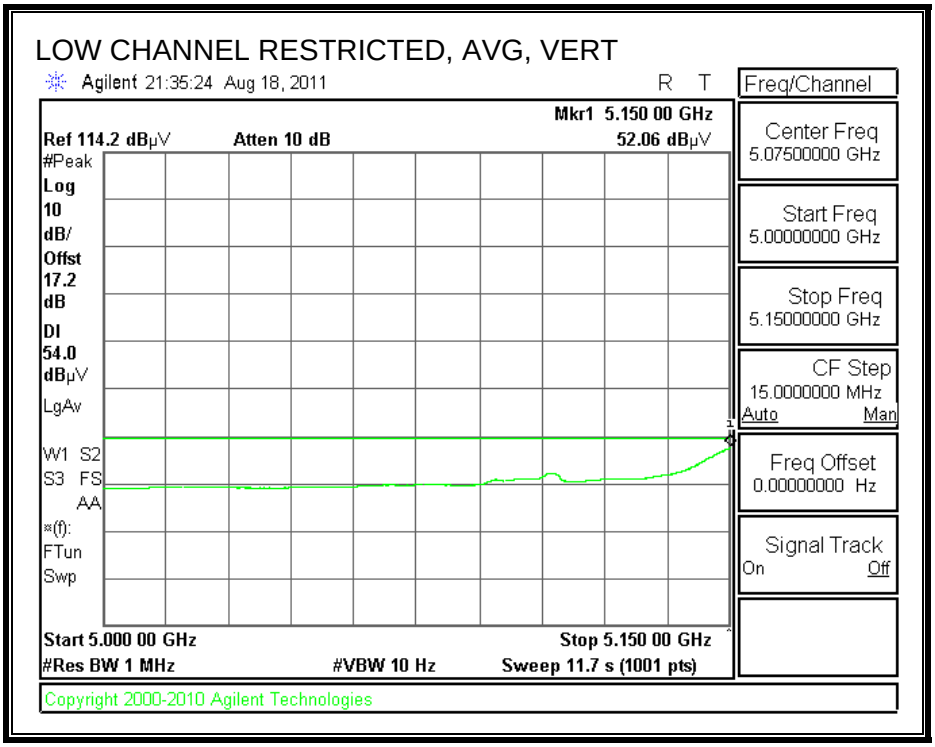


LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)





HARMONICS AND SPURIOUS EMISSIONS

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

Company: Hon Hai
Project #: 11J13782
Date: 7/23/2011
Test Engineer: Tadaomi Yamano
Configuration: Antenna-Z Axis
Mode: Tx 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			FCC 15.205

Hi Frequency Cables

3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF	Reject Filter
3' cable 22807700	12' cable 22807600	20' cable 22807500	HPF_7.6GHz	

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

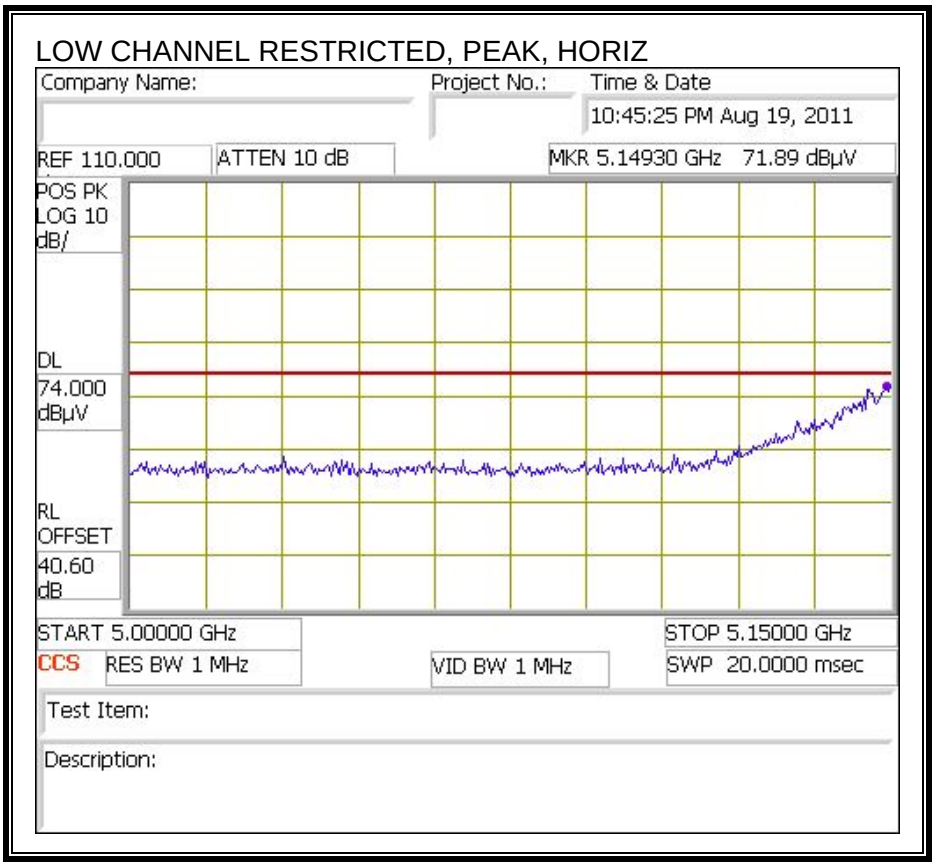
f GHz	Dist (m)	Read Pk dBuV	Read Avg. dBuV	AF dB/m	CL dB	Amp dB	D Corr dB	Fltr dB	Peak dBuV/m	Avg dBuV/m	Pk Lim dBuV/m	Avg Lim dBuV/m	Pk Mar dB	Avg Mar dB	Notes (V/H)
11n HT40 SISO L-ch															
15.570	3.0	40.0	28.0	38.6	12.2	-34.8	0.0	0.7	56.7	44.7	74	54	-17.3	-9.3	H
15.570	3.0	41.2	27.3	38.6	12.2	-34.8	0.0	0.7	57.9	44.0	74	54	-16.1	-10.0	V
11n HT40 SISO H-ch															
15.690	3.0	40.3	26.9	38.3	12.3	-34.7	0.0	0.7	56.9	43.5	74	54	-17.1	-10.5	H
15.690	3.0	41.5	27.0	38.3	12.3	-34.7	0.0	0.7	58.1	43.6	74	54	-15.9	-10.4	V

Rev. 07.08.11

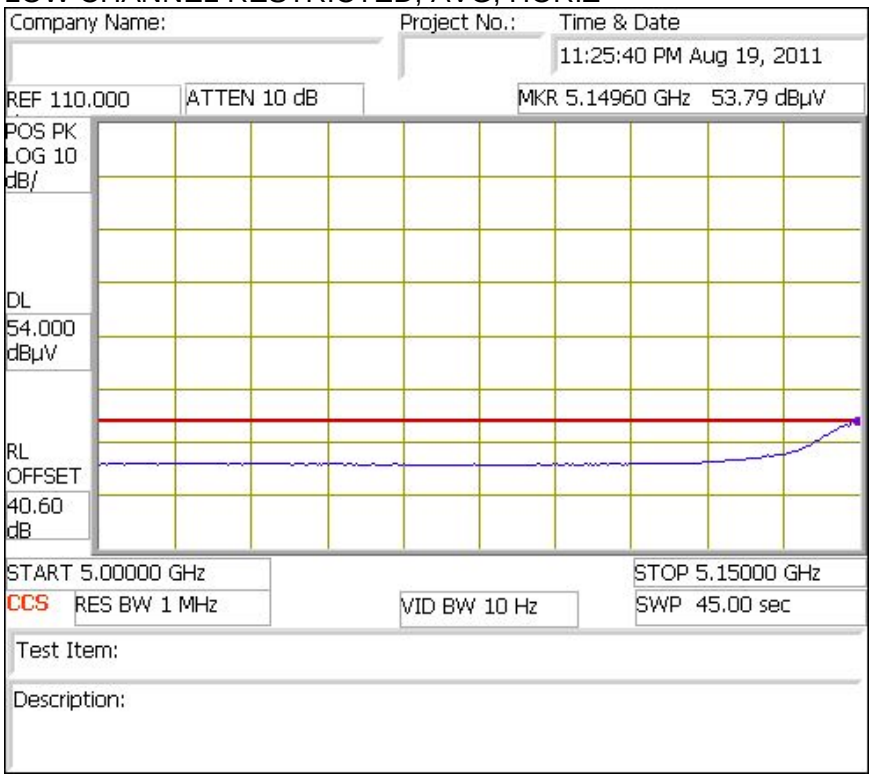
f	Measurement Frequency	Amp	Preamp Gain	Avg Lim	Average Field Strength Limit
Dist	Distance to Antenna	D Corr	Distance Correct to 3 meters	Pk Lim	Peak Field Strength Limit
Read	Analyzer Reading	Avg	Average Field Strength @ 3 m	Avg Mar	Margin vs. Average Limit
AF	Antenna Factor	Peak	Calculated Peak Field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

8.5.4 802.11n HT40 MIMO MODE IN THE LOWER 5.2 GHz BAND

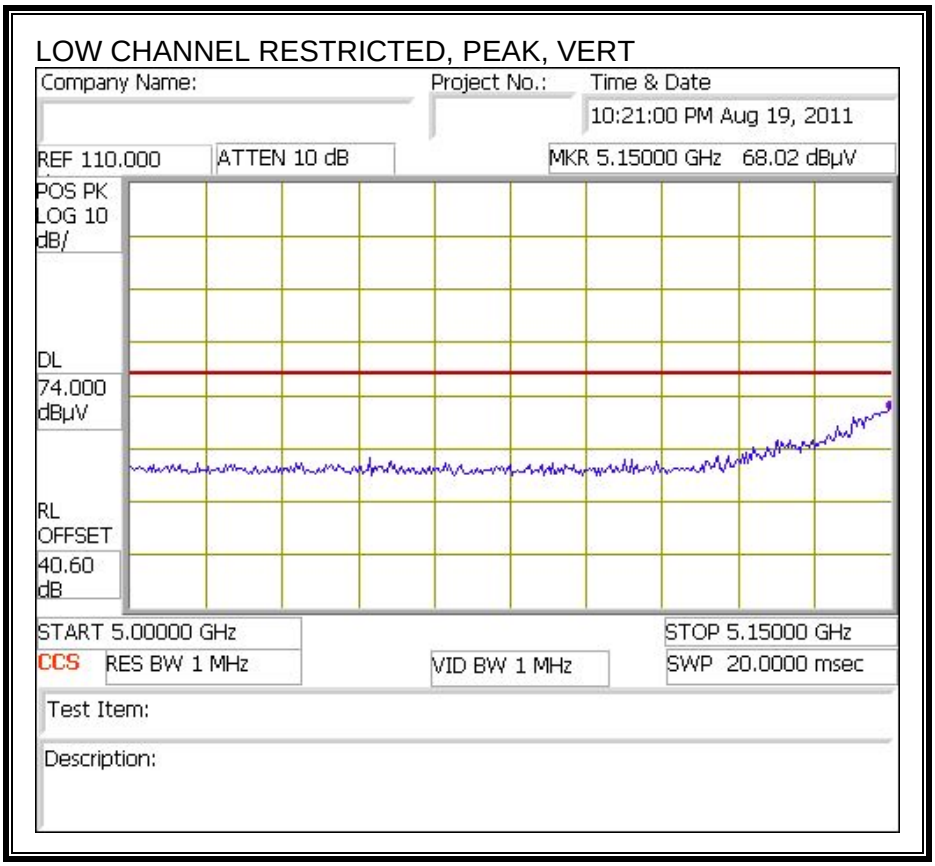
RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)



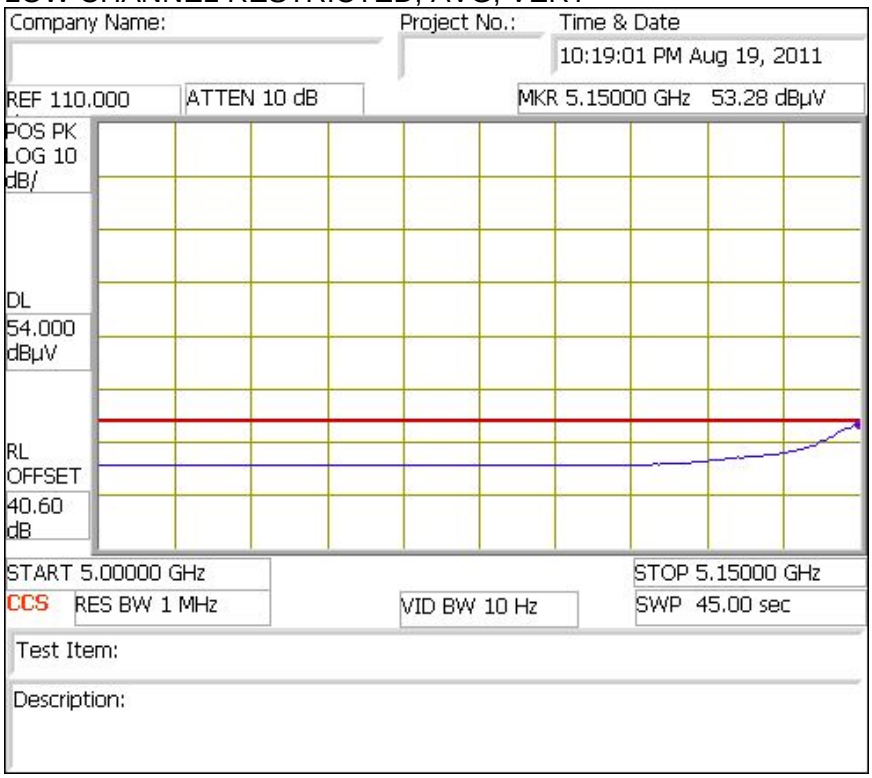
LOW CHANNEL RESTRICTED, AVG, HORIZ



RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)



LOW CHANNEL RESTRICTED, AVG, VERT



HARMONICS AND SPURIOUS EMISSIONS

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

Company: Hon Hai
Project #: 11J13782
Date: 7/23/2011
Test Engineer: Tadaomi Yamano
Configuration: Antenna-Z Axis
Mode: Tx mode

Test Equipment:

Horn 1-18GHz: T73; S/N: 6717 @3m
Pre-amplifer 1-26GHz: T144 Miteq 3008A00931
Pre-amplifer 26-40GHz:
Horn > 18GHz:
Limit: FCC 15.205

Hi Frequency Cables
3' cable 22807700: 3' cable 22807700
12' cable 22807600: 12' cable 22807600
20' cable 22807500: 20' cable 22807500
HPF: HPF_7.6GHz
Reject Filter:

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)
11n HT40 MIMO L-ch															
15.570	3.0	39.8	27.9	38.6	12.2	-34.8	0.0	0.7	56.6	44.7	74	54	-17.4	-9.3	H
15.570	3.0	40.2	27.0	38.6	12.2	-34.8	0.0	0.7	56.9	43.7	74	54	-17.1	-10.3	V
11n HT40 MIMO H-ch															
15.690	3.0	40.4	26.6	38.3	12.3	-34.7	0.0	0.7	56.9	43.2	74	54	-17.1	-10.8	H
15.690	3.0	40.7	27.4	38.3	12.3	-34.7	0.0	0.7	57.2	44.0	74	54	-16.8	-10.0	V

Rev. 07.08.11

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		

8.6 RECEIVER ABOVE 1 GHz

8.6.2 20MHZ BANDWIDTH

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

Company: Hon Hai
Project #: 11J13872
Date: 7/21/11
Test Engineer: Tadaomi Yamano
Configuration: Antenna-Z Axis
Mode: Rx

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A005			FCC 15.209

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)
HT20 5200MHz															
1.329	3.0	52.2	29.5	25.1	3.2	-35.9	0.0	0.0	44.6	21.9	74	54	-29.4	-32.1	H
3.051	3.0	39.8	27.8	30.1	5.2	-35.2	0.0	0.0	39.9	27.9	74	54	-34.1	-26.1	H
5.200	3.0	38.4	26.0	33.2	7.0	-34.8	0.0	0.0	43.8	31.4	74	54	-30.2	-22.6	H
1.392	3.0	65.5	33.2	25.4	3.3	-35.9	0.0	0.0	58.3	26.0	74	54	-15.7	-28.0	V
3.051	3.0	41.2	27.6	30.1	5.2	-35.2	0.0	0.0	41.3	27.7	74	54	-32.7	-26.3	V
5.200	3.0	37.5	25.8	33.2	7.0	-34.8	0.0	0.0	42.9	31.2	74	54	-31.1	-22.8	V

Rev. 07.08.11

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		

8.6.3 40MHZ BANDWIDTH

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

Company: Hon Hai
Project #: 11J13872
Date: 7/21/11
Test Engineer: Tadaomi Yamano
Configuration: Antenna-Z Axis
Mode: Rx

Test Equipment:

Horn 1-18GHz	Pre-amplifer 1-26GHz	Pre-amplifer 26-40GHz	Horn > 18GHz	Limit
T59; S/N: 3245 @3m	T145 Agilent 3008A0056			FCC 15.209

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)
HT40 5190MHz															
1.329	3.0	52.7	31.9	25.1	3.2	-35.9	0.0	0.0	45.1	24.3	74	54	-28.9	-29.7	H
3.051	3.0	40.5	27.7	30.1	5.2	-35.2	0.0	0.0	40.6	27.8	74	54	-33.4	-26.2	H
5.190	3.0	35.9	27.1	33.2	7.0	-34.8	0.0	0.0	41.3	32.5	74	54	-32.7	-21.5	H
1.392	3.0	60.1	34.4	25.4	3.3	-35.9	0.0	0.0	52.9	27.2	74	54	-21.1	-26.8	V
3.051	3.0	40.6	27.5	30.1	5.2	-35.2	0.0	0.0	40.7	27.6	74	54	-33.3	-26.4	V
5.190	3.0	37.4	26.0	33.2	7.0	-34.8	0.0	0.0	42.8	31.3	74	54	-31.2	-22.7	V

Rev. 07.08.11

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		

8.7 WORST-CASE BELOW 1 GHz

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

HROZONTAL AND VERTICAL DATA

30 - 1000MHz HORIZONTAL

Test Frequency	Meter Reading	Detector	5m B Cable[dB]	5m B T10 PreAmp [dB]	5m B T130 Bilog [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin [dB]	Height [cm]	Polarity
165.4976	41.49	PK	1.8	-29.1	10.5	24.69	43.5	-18.81	200	Horz
266.297	43.39	PK	2.3	-28.7	12.3	29.29	46	-16.71	100	Horz
466.5388	35.93	PK	3	-29.3	16.2	25.83	46	-20.17	200	Horz

30 - 1000MHz VERTICAL

Test Frequency	Meter Reading	Detector	5m B Cable[dB]	5m B T10 PreAmp [dB]	5m B T130 Bilog [dB]	dBuV/m	CFR 47 Part 15 Class B 3m	Margin [dB]	Height [cm]	Polarity
165.4976	39.49	PK	1.8	-29.1	10.5	22.69	43.5	-20.81	100	Vert
265.5216	39.26	PK	2.3	-28.7	12.3	25.16	46	-20.84	200	Vert
466.3449	36.4	PK	3	-29.3	16.2	26.3	46	-19.7	100	Vert

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

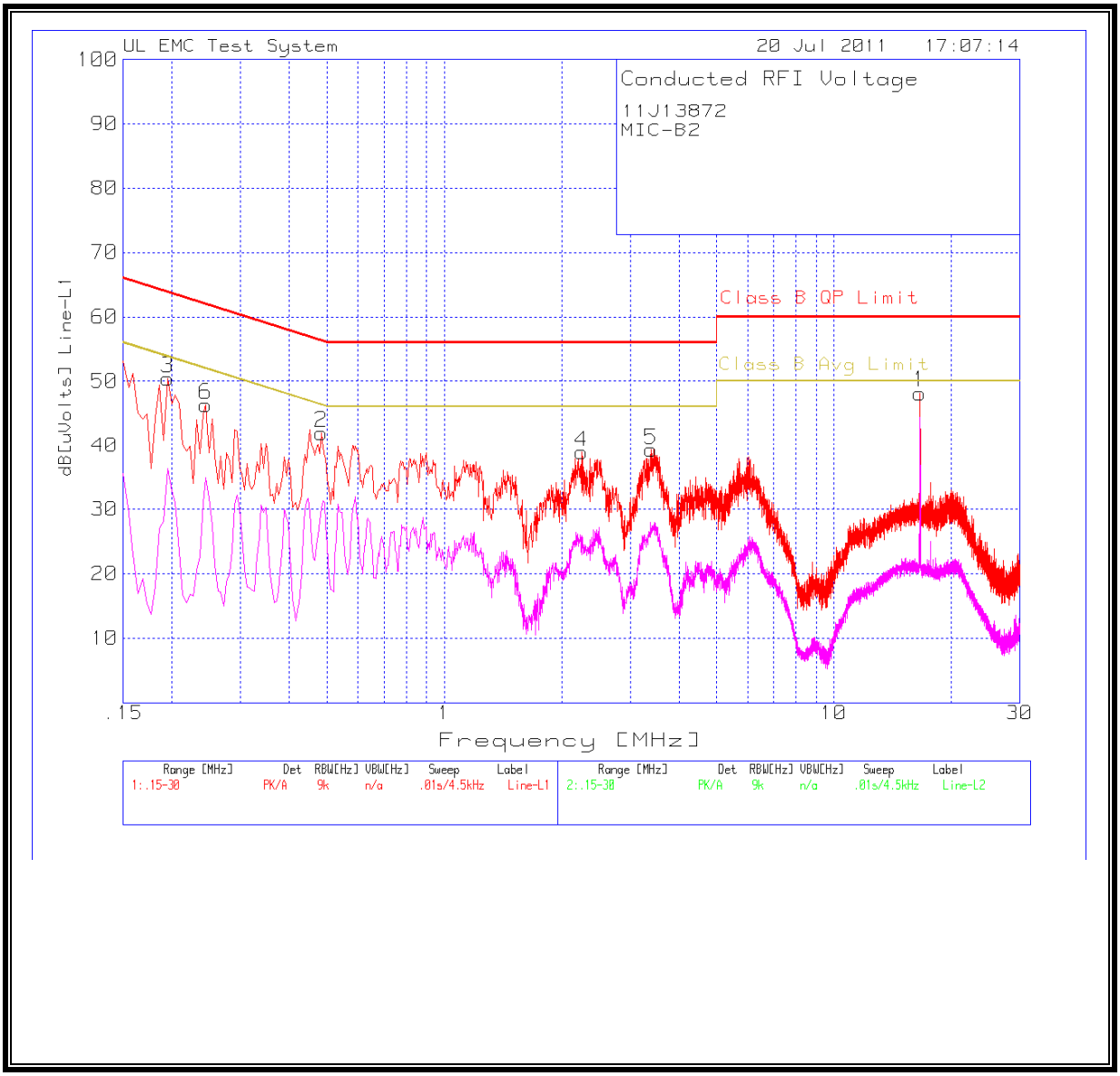
Line-L1 0.15 - 30MHz

Test Frequency	Reading	Detector	dB[uVolts]	Class B QP Limit	Margin [dB]	Class B Avg Limit	Margin [dB]
16.6245	48.18	PK	48.18	60	-11.82	50	-1.82
0.483	41.96	PK	41.96	56.3	-14.34	46.3	-4.34
0.195	50.42	PK	50.42	63.8	-13.38	53.8	-3.38
2.256	38.89	PK	38.89	56	-17.11	46	-7.11
3.4035	39.22	PK	39.22	56	-16.78	46	-6.78
0.2445	46.31	PK	46.31	61.9	-15.59	51.9	-5.59

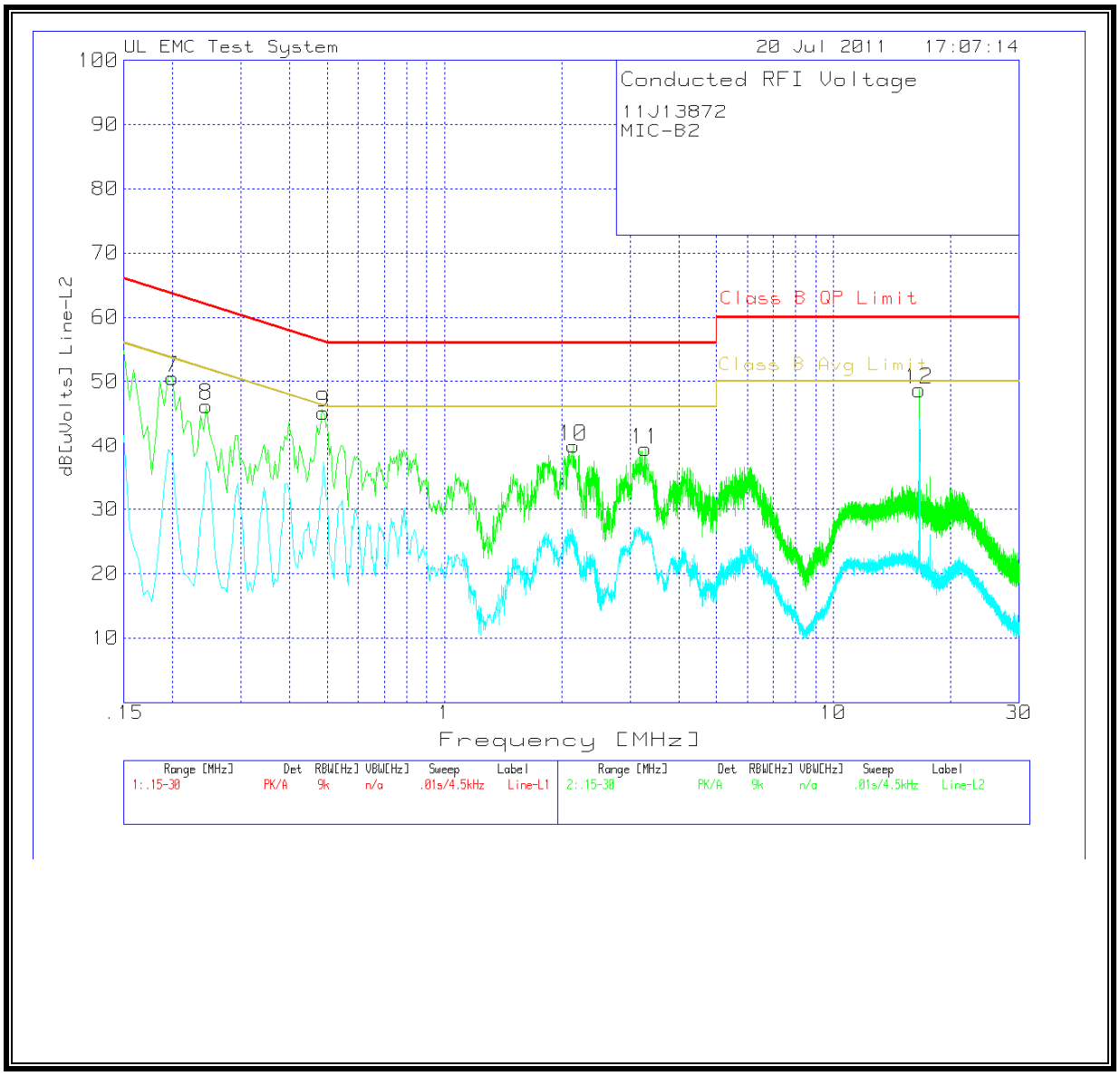
Line-L2 0.15 - 30MHz

Test Frequency	Reading	Detector	dB[uVolts]	Class B QP Limit	Margin [dB]	Class B Avg Limit	Margin [dB]
0.1995	50.57	PK	50.57	63.6	-13.03	53.6	-3.03
0.2445	46.25	PK	46.25	61.9	-15.65	51.9	-5.65
0.4875	45.11	PK	45.11	56.2	-11.09	46.2	-1.09
2.1435	39.88	PK	39.88	56	-16.12	46	-6.12
3.2775	39.4	PK	39.4	56	-16.6	46	-6.6
16.6245	48.7	PK	48.7	60	-11.3	50	-1.3

LINE 1 RESULTS



LINE 2 RESULTS



10 MAXIMUM PERMISSIBLE EXPOSURE

FCC RULES

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

TABLE 1—LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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

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

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

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

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

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

IC RULES

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

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

1 Frequency (MHz)	2 Electric Field Strength; rms (V/m)	3 Magnetic Field Strength; rms (A/m)	4 Power Density (W/m^2)	5 Averaging Time (min)
0.003–1	280	2.19		6
1–10	$280/f$	$2.19/f$		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

LIMITS for multiple-transmitter
From FCC OET Bulletin 65 "Evaluating Compliance with FCC Guidelines for Human Exposure to
Radiofrequency Electromagnetic Fields"

Σ [(the highest MPE for each mobile transmitter/antenna included in the simultaneous transmission configuration) / (the corresponding MPE limit)] < 1

Note: This formula is quoted from "KDB616217 D03 Section-Simultaneous Transmission Considerations 4)b)ii)".

RESULTS

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
5.2 GHz	HT20	0.20	13.66	1.23	14.89	0.03	0.06	0.006
5.2 GHz	HT40	0.20	15.28	1.23	16.51	0.04	0.09	0.009

*The output power is source-based, time-averaged output power.

MPE Co-location: WLAN (2.4GHz) + BT

Band	Mode	Separation Distance (m)	Output Power (dBm)	Antenna Gain (dBi)	EIRP (dBm)	EIRP (W)	IC Power Density (W/m^2)	FCC Power Density (mW/cm^2)
2.4 GHz	WLAN	0.20	20.00	5.00	25.00	0.32	0.63	0.063
2.4 GHz	BT	0.20	5.00	3.00	8.00	0.01	0.01	0.001

Result: MIC-B2 + WLAN (2.4GHz) + BT

Technology	WLAN/BT FCC Power Density (mW/cm^2)	WLAN/BT /MPE Limit	WLAN 5GHz FCC Power Density (mW/cm^2)	WLAN 5GHz/MPE Limit	WLAN 5GHz fraction) + (WLAN/BT fraction)	Limit	Pass/Fail
2412 - 2462	0.063	0.063	0.006	0.006	0.069	1.000	Pass
2402 - 2480	0.001	0.001	0.009	0.009	0.010	1.000	Pass