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

# CERTIFICATION TEST REPORT

**FOR**

**WIFI 11A/N MODULE**

**MODEL NUMBER: MIC-B**

**FCC ID: MCLMICB**
**IC: 2878D-MICB**

**REPORT NUMBER: 10J13545-6, Revision A**

**ISSUE DATE: FEBRUARY 11, 2011**

*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*
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NVLAP LAB CODE 200065-0

## Revision History

| Rev. | Issue Date | Revisions | Revised By |
|---|---|---|---|
| -- | 01/28/2011 | Initial Issue | T. Chan |
| A | 02/11/2011 | Removed Power Setting from Harmonic Emissions Data on Pages 94, 99 & 104<br>Removed "Chain 1" From RF Conducted Plots on Pages 62 - 64 and Pages 87 - 88 | 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-B

**SERIAL NUMBER:** N/A

**DATE TESTED:** JANUARY 11~28, 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:

WILLIAM ZHUANG
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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 | 13.98 | 25.00 |
| 5180 - 5240 | 802.11n SISO 20MHz | Covered by the worst case 802.11 Legacy testing | |
| 5180 - 5240 | 802.11n HT20 | 13.68 | 23.33 |
| 5180 - 5240 | 802.11n SISO 40MHz | Not Applicable | |
| 5190 - 5230 | 802.11n HT40 | 13.90 | 24.55 |

## 5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes a PIFA antenna for TX/RX diversity, with a maximum gain of 0.55dBi.

## 5.4. SOFTWARE AND FIRMWARE

The EUT test utility software installed in the host computer during testing was test program 4.219.93_4319_DualBand_SDIO_WinXP_Mfg, 4.219 RC93.0.

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

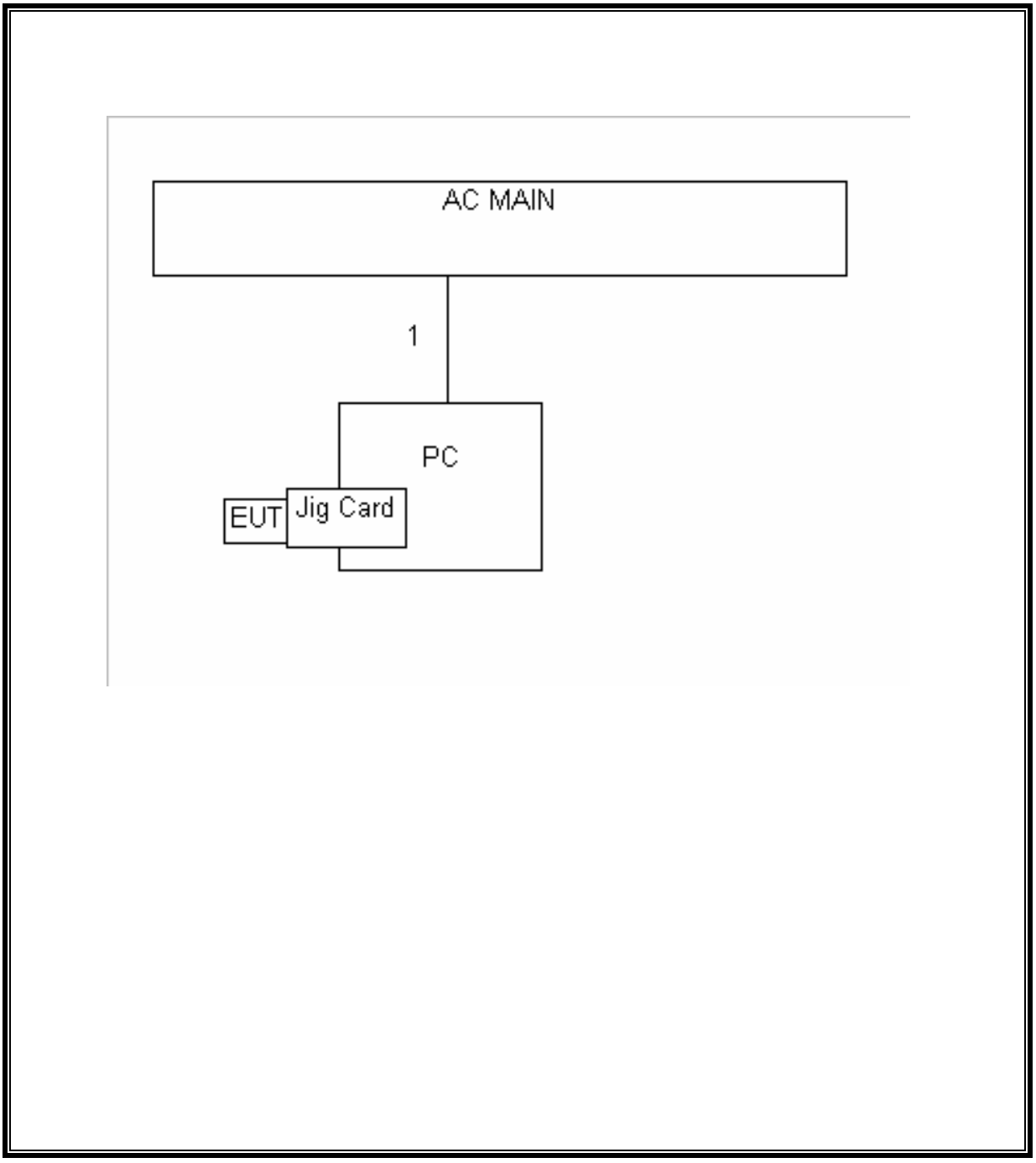
**I/O CABLES**

| 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**

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** |
| 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 | 03/06/11 |
| 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.

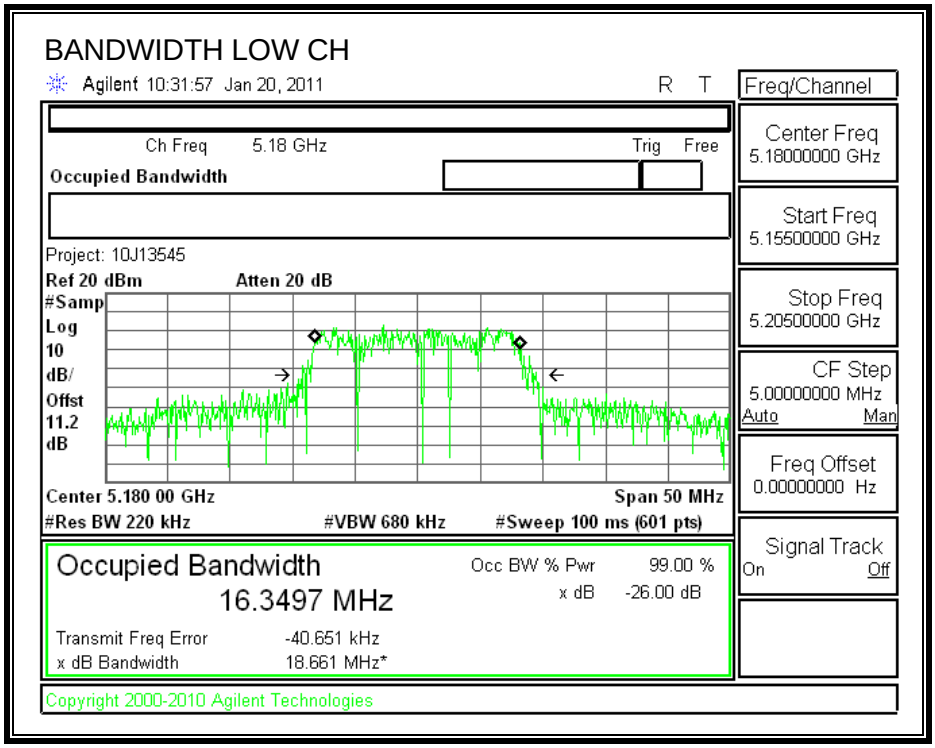
**TEST PROCEDURE**

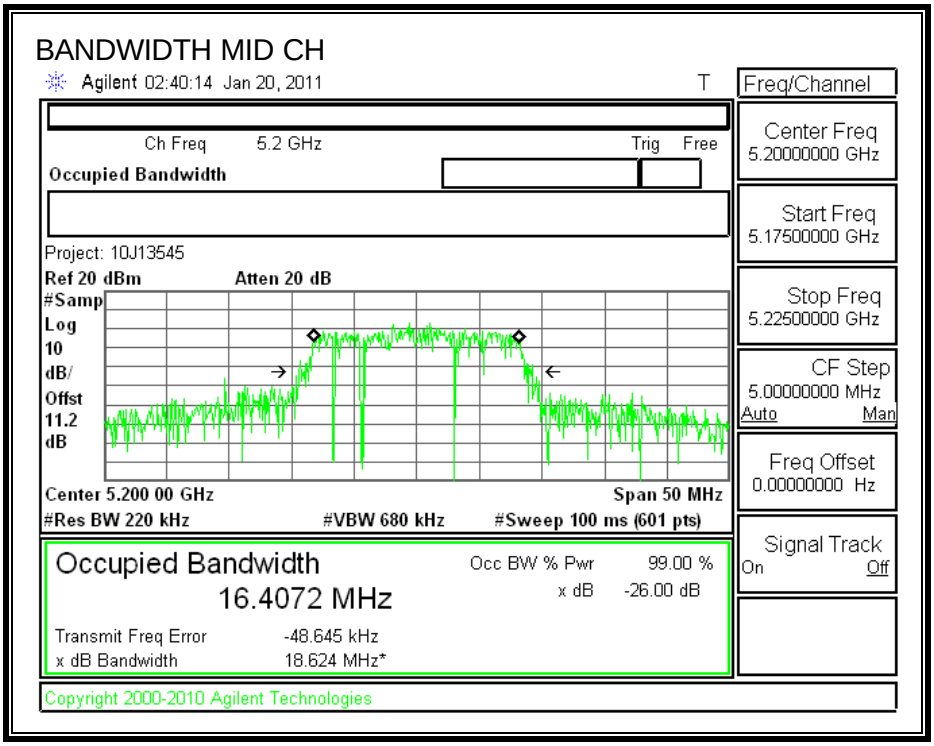
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

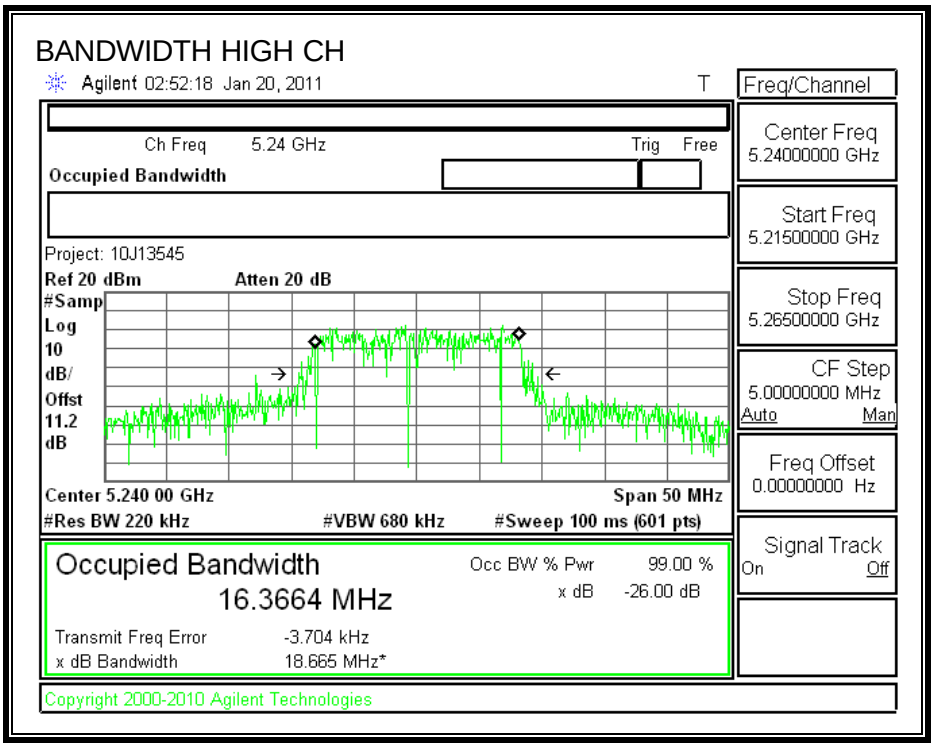
**RESULTS**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|
| Low | 5180 | 18.661 | 16.3497 |
| Middle | 5200 | 18.624 | 16.4072 |
| High | 5240 | 18.665 | 16.3664 |

**26 dB and 99% BANDWIDTH**







## 7.1.2. 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 11.20 dB (including 10 dB pad and 1.2 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 | 13.74 |
| Middle | 5200 | 13.66 |
| High | 5240 | 13.03 |

## 7.1.3. 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**

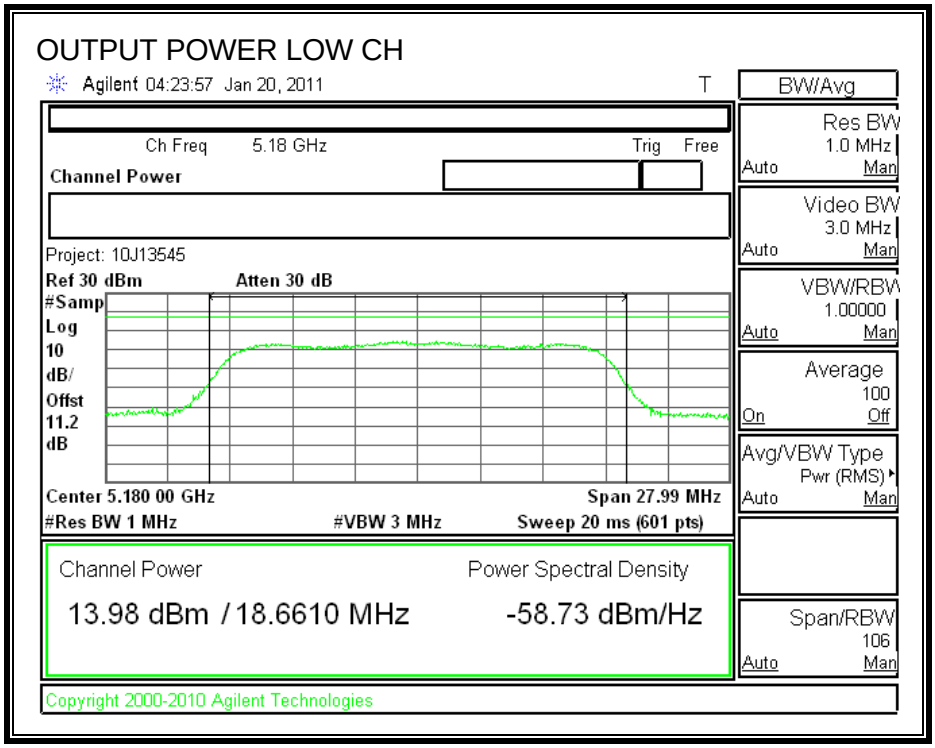
**Limit**

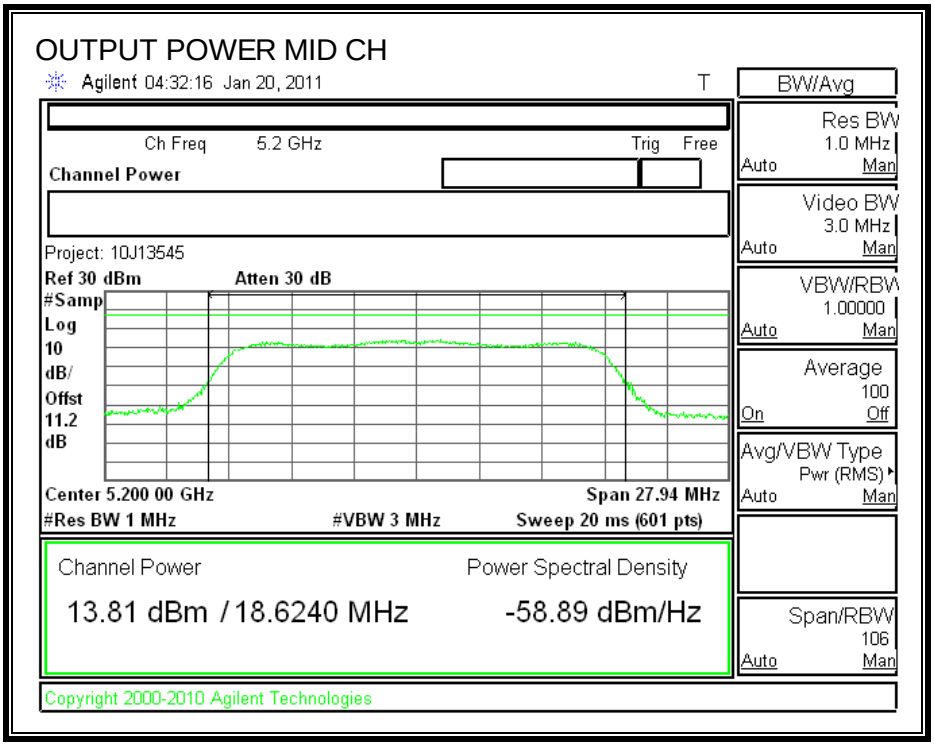
| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Antenna Gain (dBi) | Limit (dBm) |
|---|---|---|---|---|---|---|
| Low | 5180 | 17 | 18.661 | 16.71 | 0.55 | 16.71 |
| Mid | 5200 | 17 | 18.624 | 16.70 | 0.55 | 16.70 |
| High | 5240 | 17 | 18.665 | 16.71 | 0.55 | 16.71 |

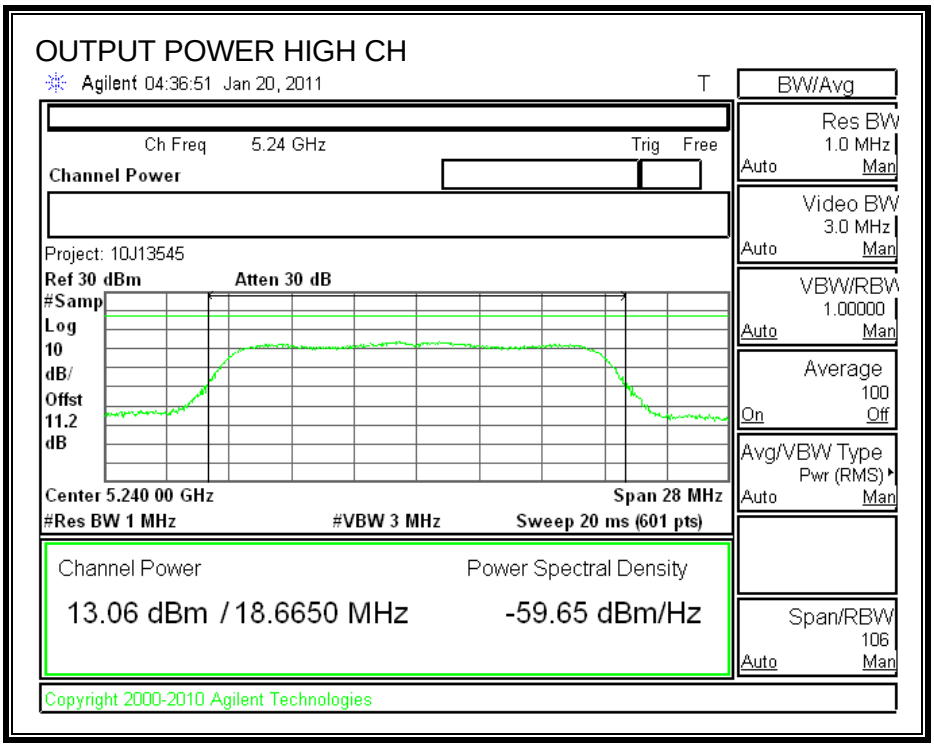
**Results**

| Channel | Frequency (MHz) | Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 13.98 | 16.71 | -2.73 |
| Mid | 5200 | 13.81 | 16.70 | -2.89 |
| High | 5240 | 13.06 | 16.71 | -3.65 |

**OUTPUT POWER**







## 7.1.4. 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.

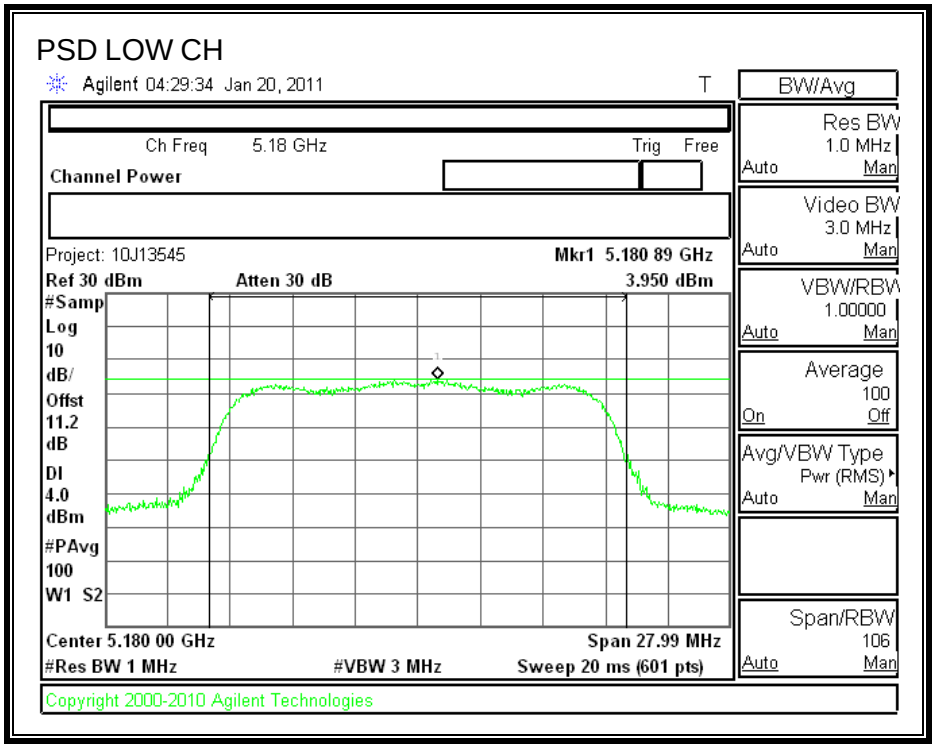
**TEST PROCEDURE**

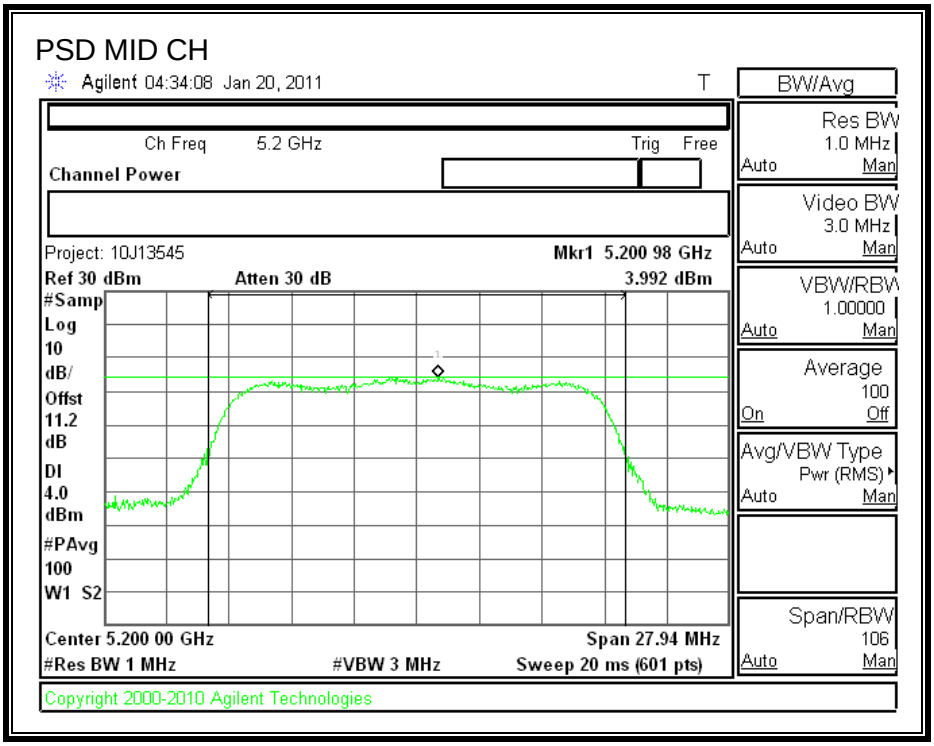
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

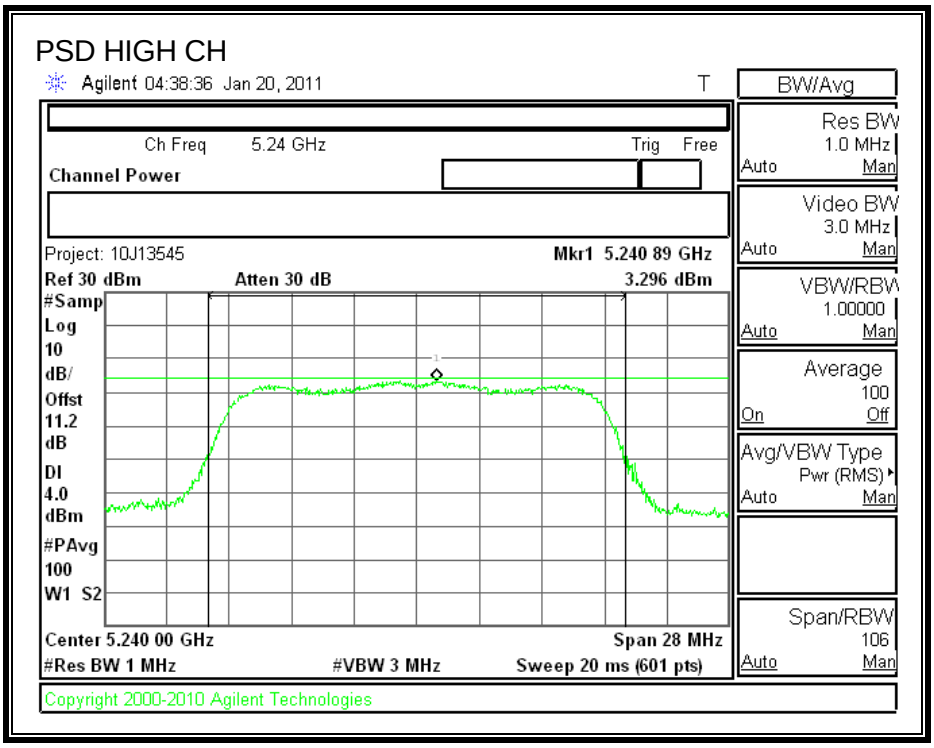
**RESULTS**

| Channel | Frequency (MHz) | PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 3.95 | 4 | -0.05 |
| Middle | 5200 | 3.99 | 4 | -0.01 |
| High | 5240 | 3.30 | 4 | -0.70 |

**POWER SPECTRAL DENSITY**







## 7.1.5. PEAK EXCURSION

**LIMITS**

FCC §15.407 (a) (6)

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

**TEST PROCEDURE**

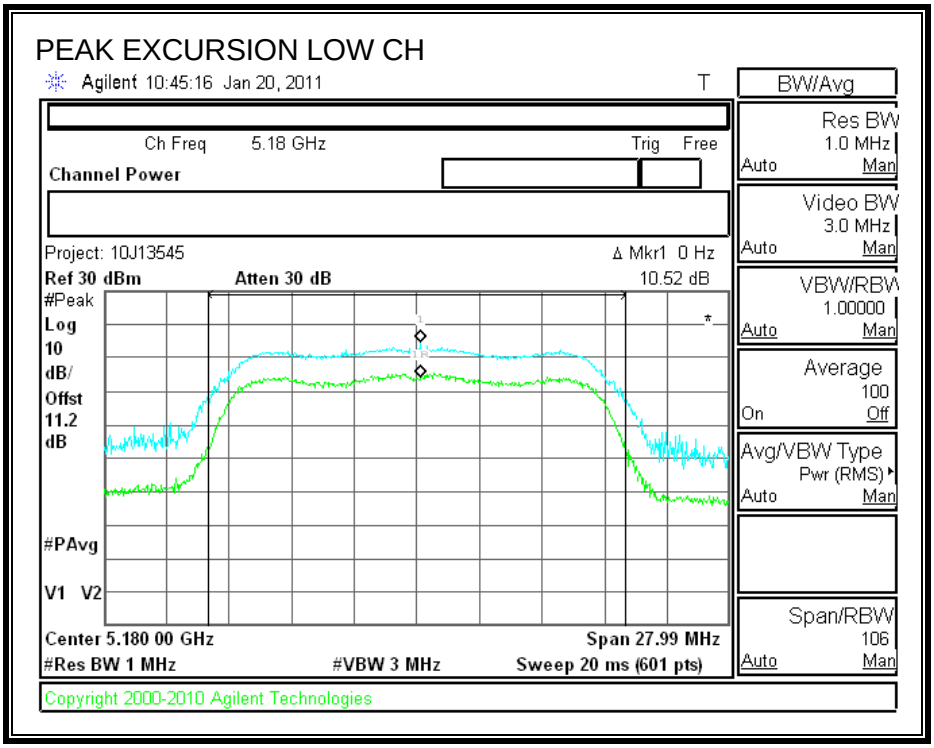
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

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

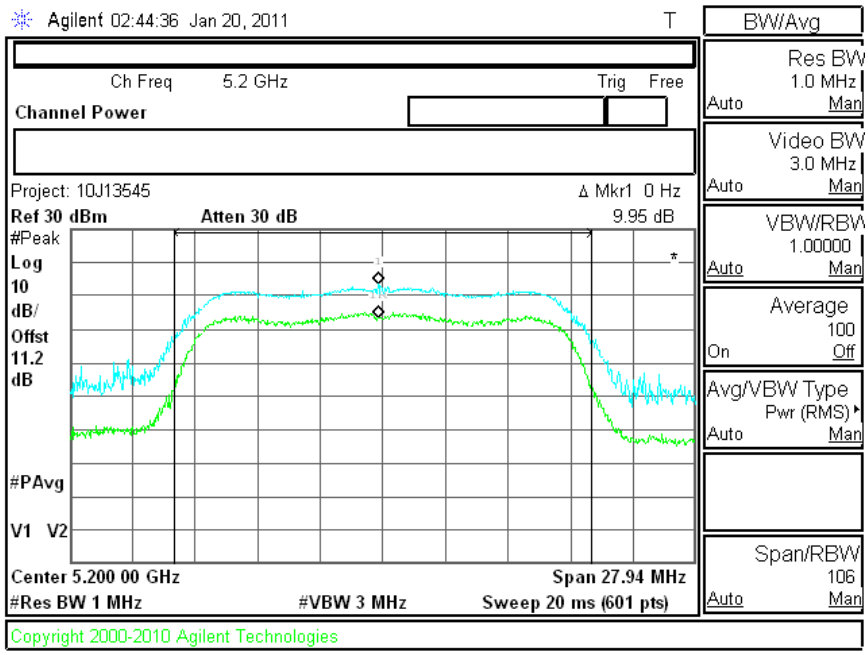
**RESULTS**

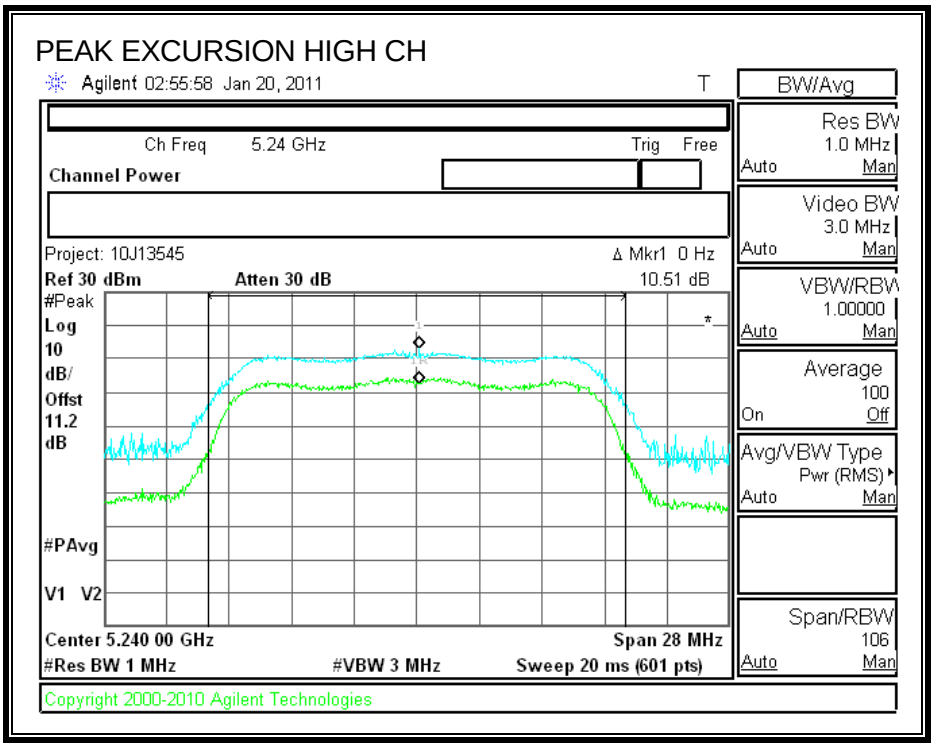
| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 10.52 | 13 | -2.48 |
| Middle | 5200 | 9.95 | 13 | -3.05 |
| High | 5240 | 10.51 | 13 | -2.49 |

**PEAK EXCURSION**



PEAK EXCURSION MID CH





## 7.1.6. 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**

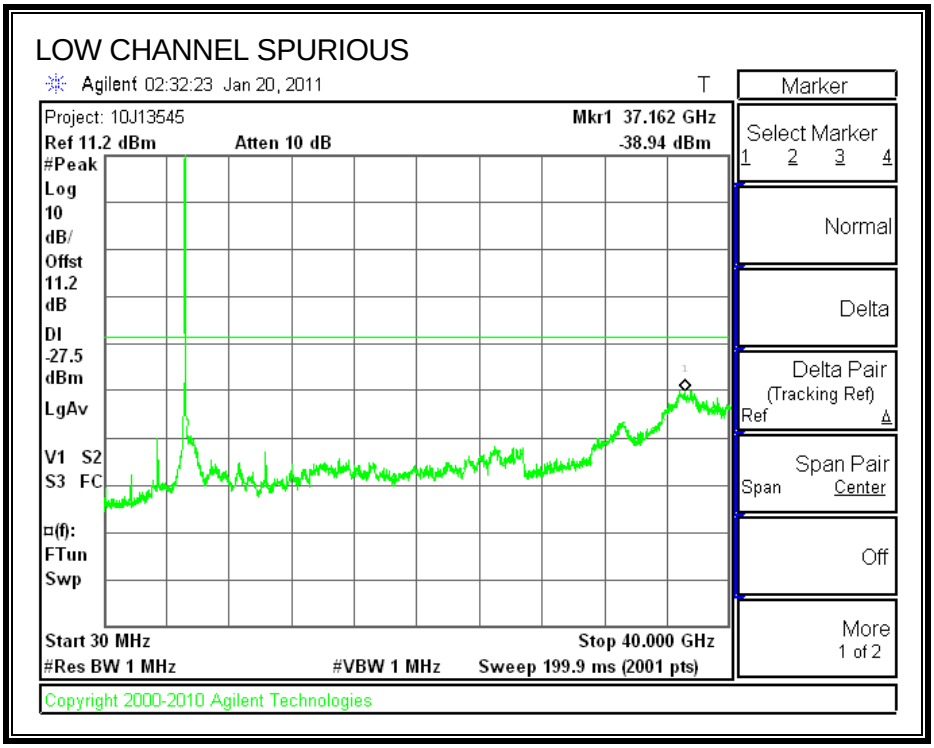
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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.

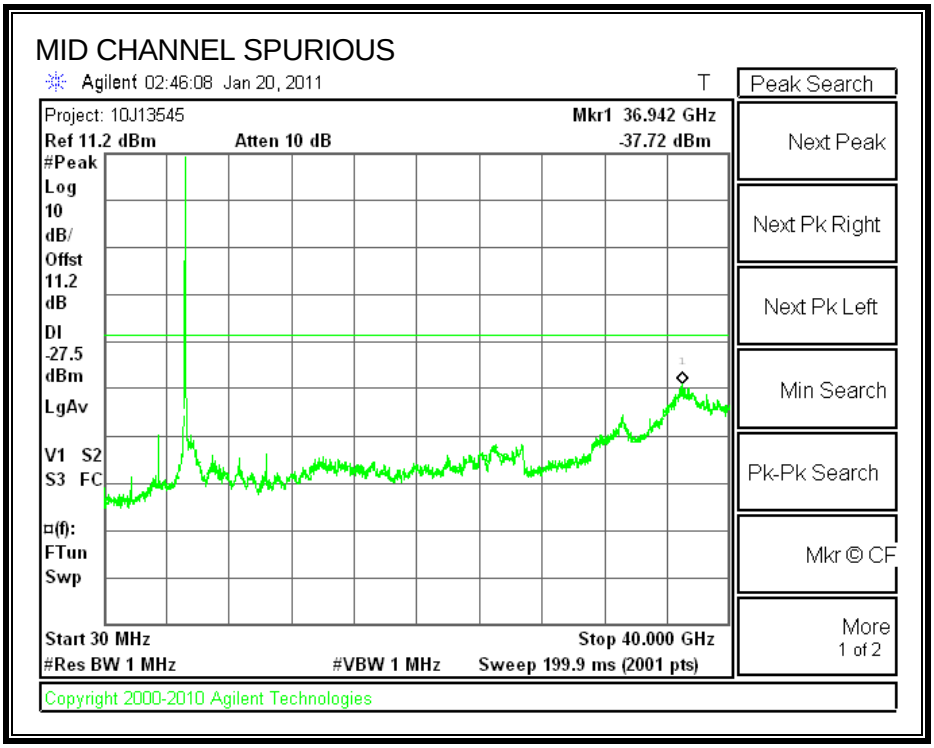
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

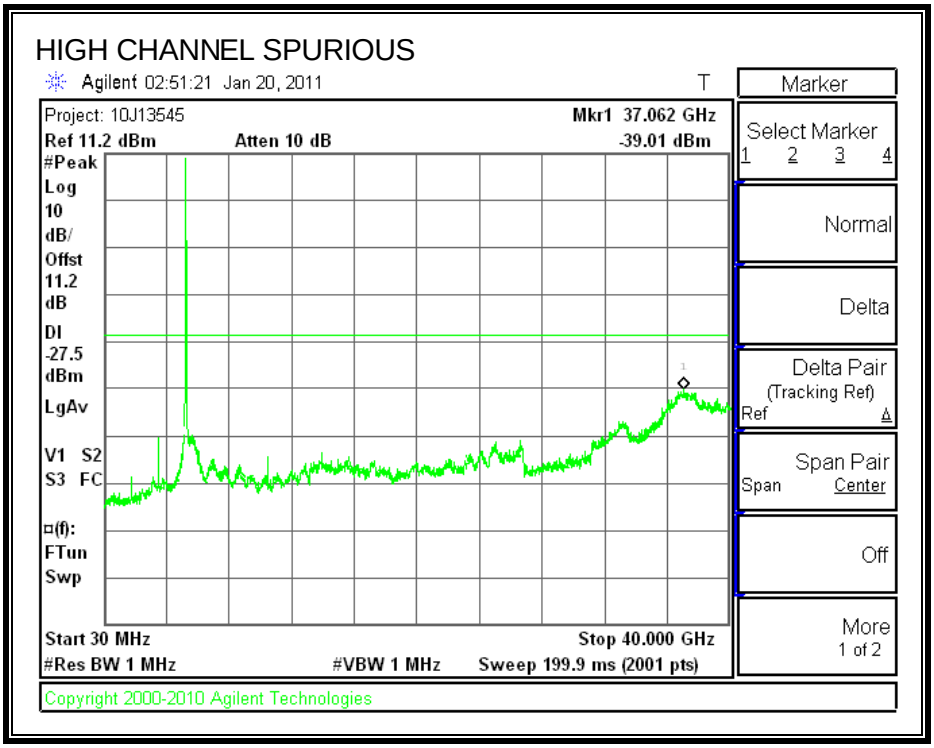
**RESULTS**

**SPURIOUS EMISSIONS**



MID CHANNEL SPURIOUS





## 7.2. 802.11n HT20 MIMO 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**

**CHAIN 1**

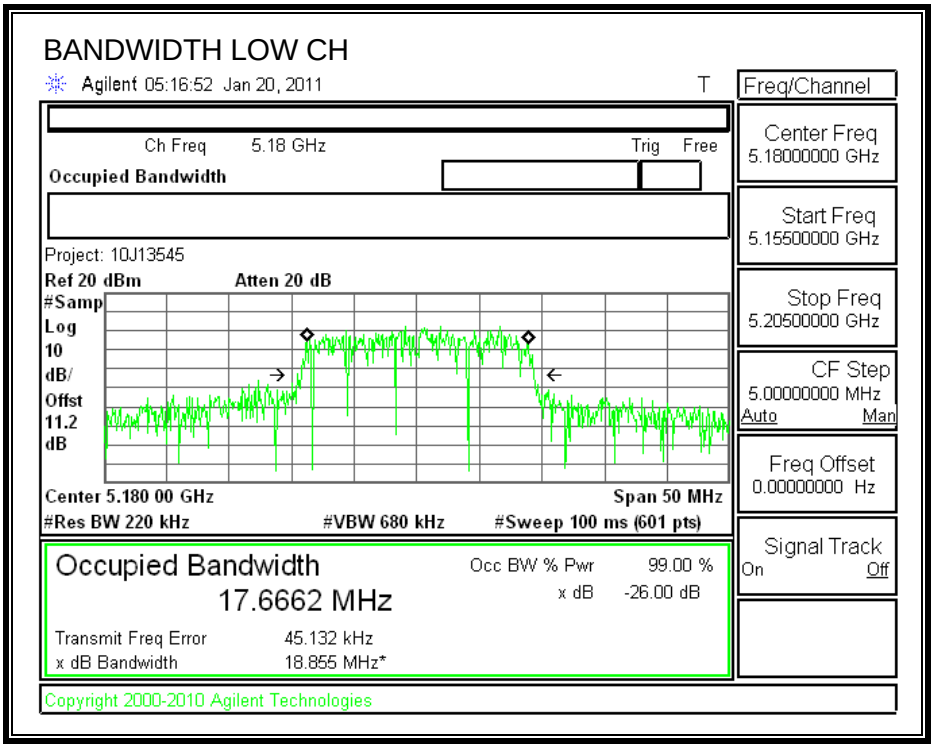
| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|
| Low | 5180 | 18.855 | 17.6662 |
| Middle | 5200 | 18.95 | 17.4609 |
| High | 5240 | 18.998 | 17.6707 |

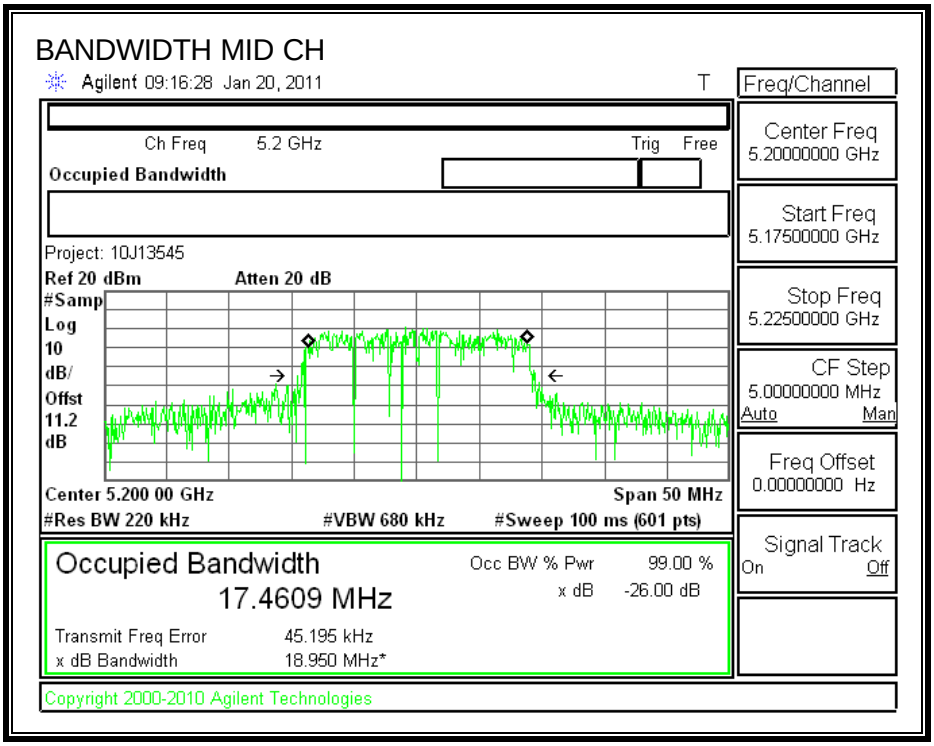
**CHAIN 2**

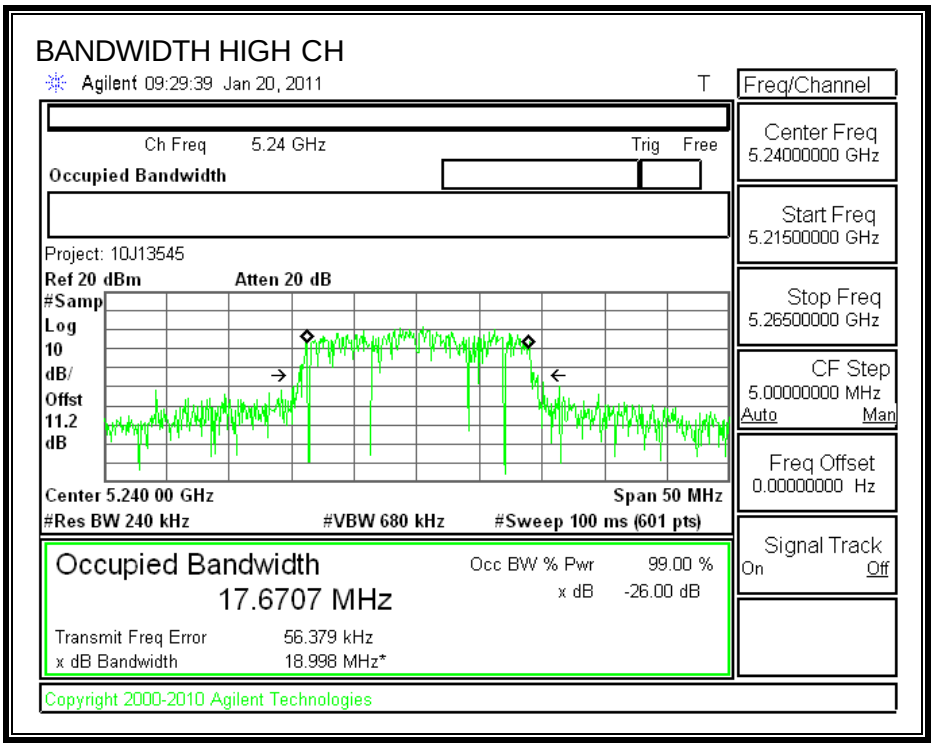
| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|
| Low | 5180 | 18.855 | 17.2443 |
| Middle | 5200 | 18.893 | 17.5992 |
| High | 5240 | 18.745 | 17.538 |

## CHAIN 1

**26 dB and 99% BANDWIDTH**

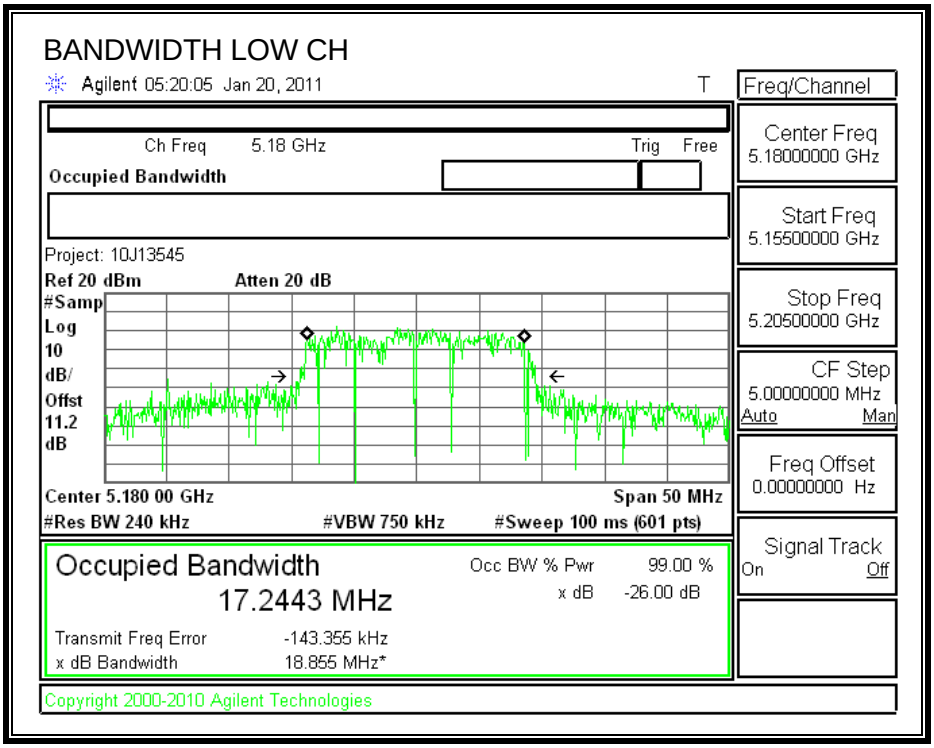


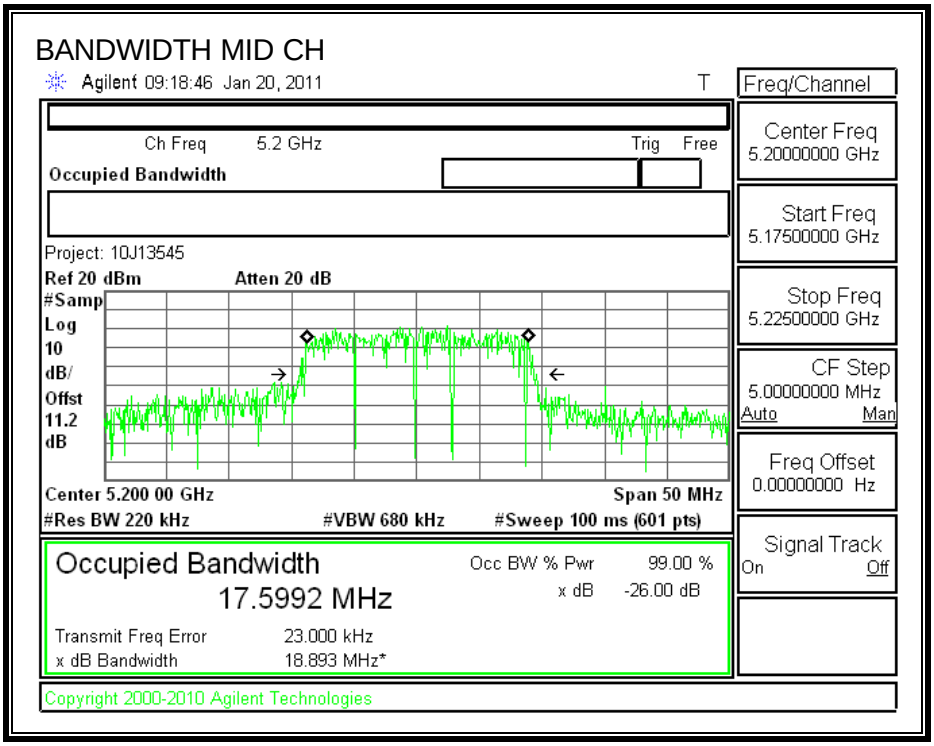


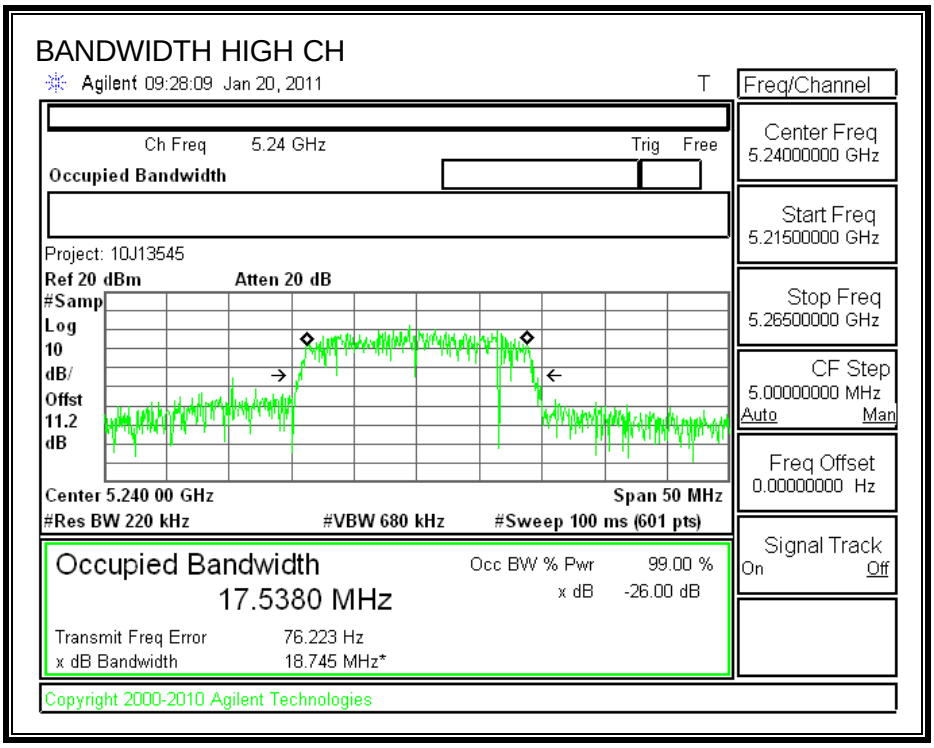


## CHAIN 2

**26 dB and 99% BANDWIDTH**







## 7.2.2. 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 11.2 dB (including 10 dB pad and 1.2 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 | 10.04 | 9.90 | 12.98 |
| Middle | 5200 | 9.87 | 9.55 | 12.72 |
| High | 5240 | 10.41 | 10.33 | 13.38 |

## 7.2.3. 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**

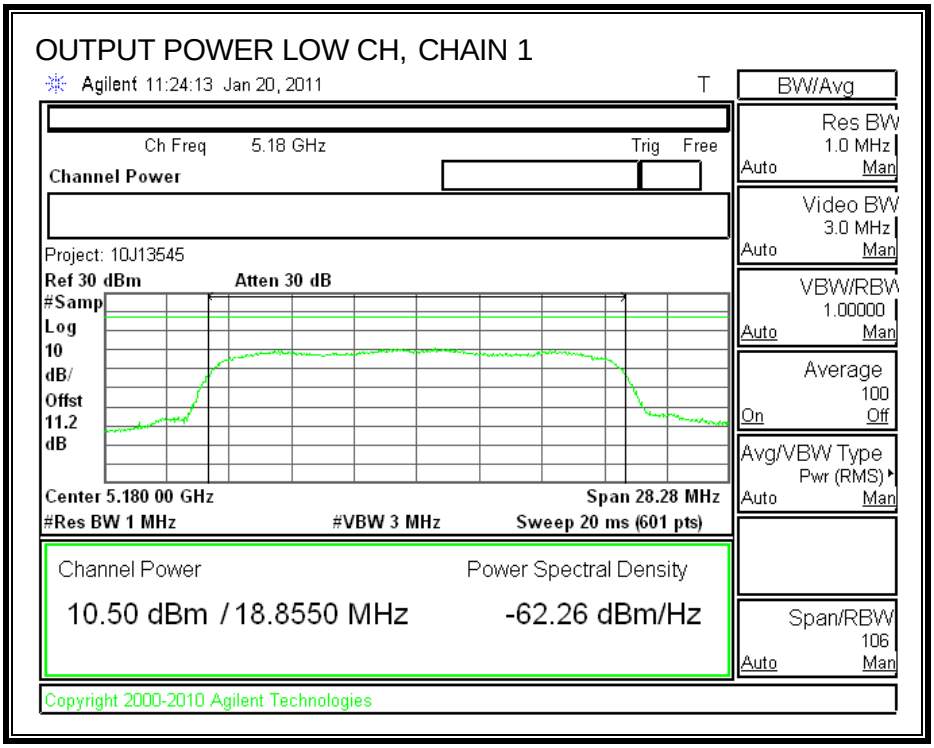
**Limit**

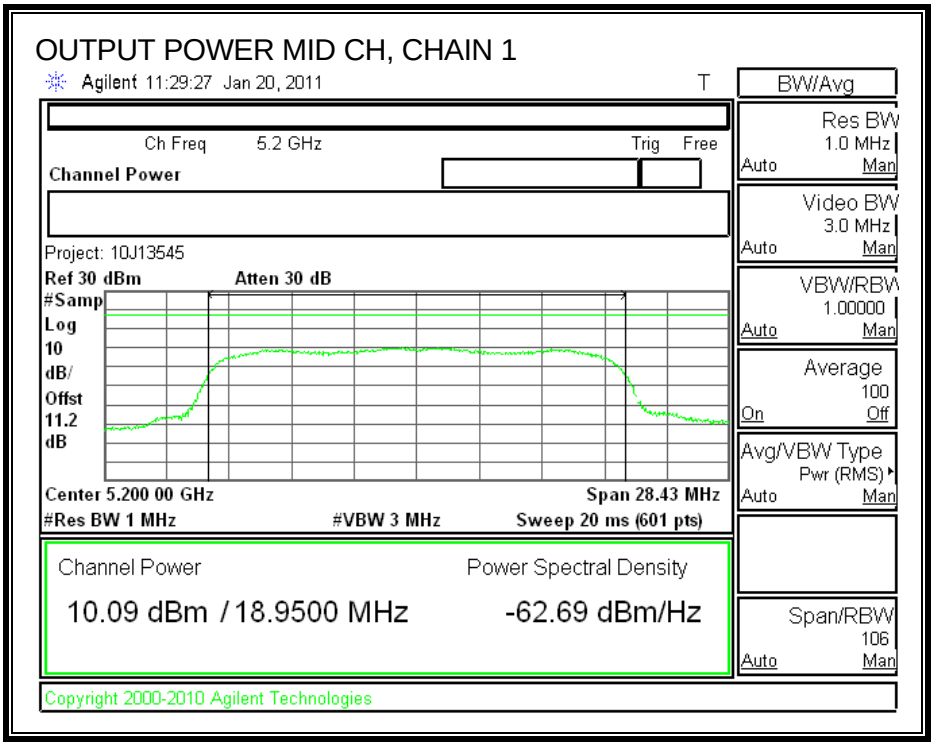
| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Antenna Gain (dBi) | Limit (dBm) |
|---|---|---|---|---|---|---|
| Low | 5180 | 17 | 18.855 | 16.75 | 3.55 | 16.75 |
| Mid | 5200 | 17 | 18.95 | 16.78 | 3.55 | 16.78 |
| High | 5240 | 17 | 18.998 | 16.79 | 3.55 | 16.79 |

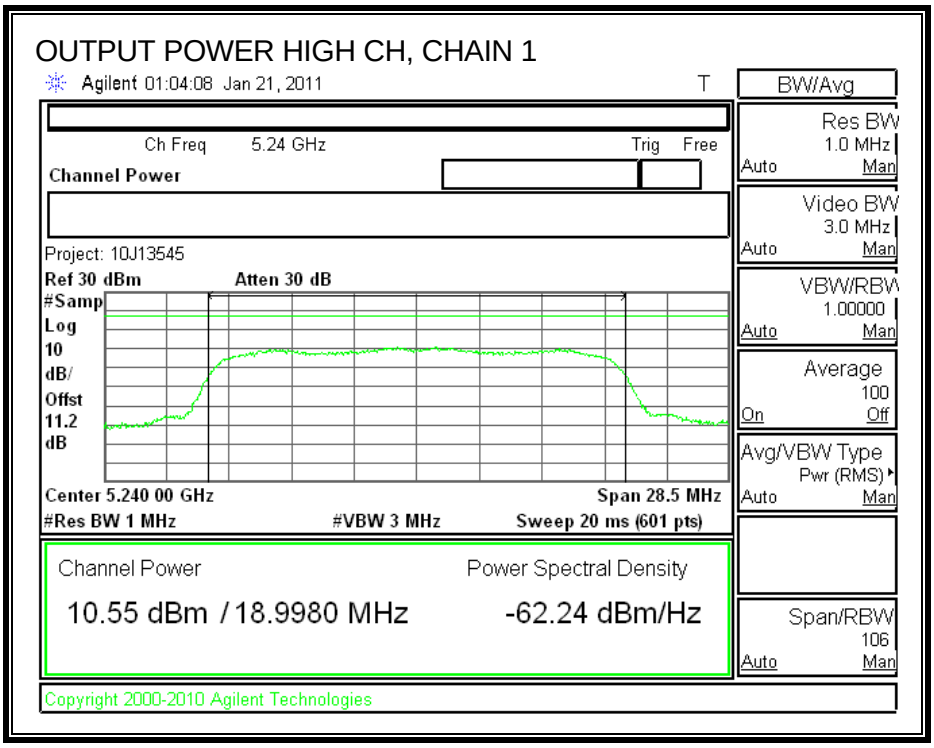
**Individual Chain Results**

| Channel | Frequency (MHz) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5180 | 10.50 | 9.92 | 13.23 | 16.75 | -3.52 |
| Mid | 5200 | 10.09 | 9.67 | 12.90 | 16.78 | -3.88 |
| High | 5240 | 10.55 | 10.78 | 13.68 | 16.79 | -3.11 |

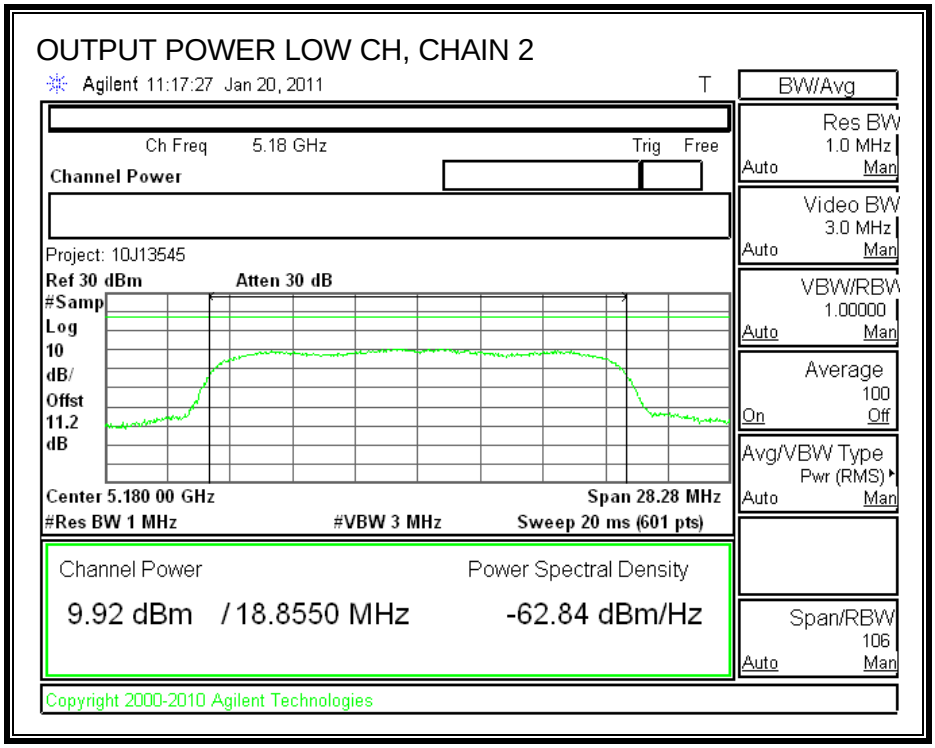
**CHAIN 1 OUTPUT POWER**

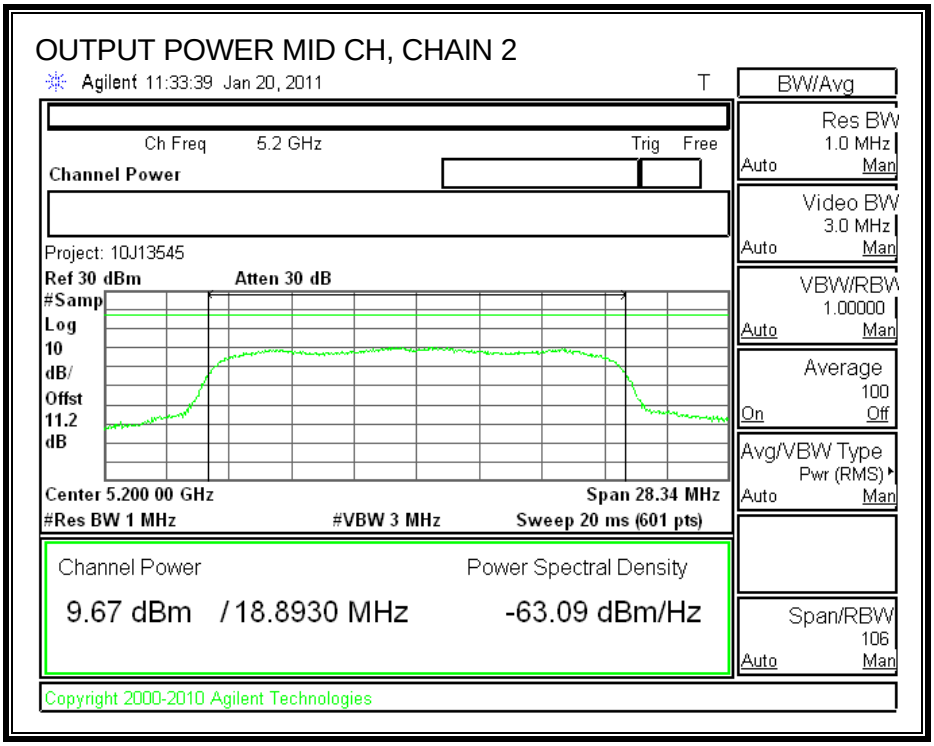


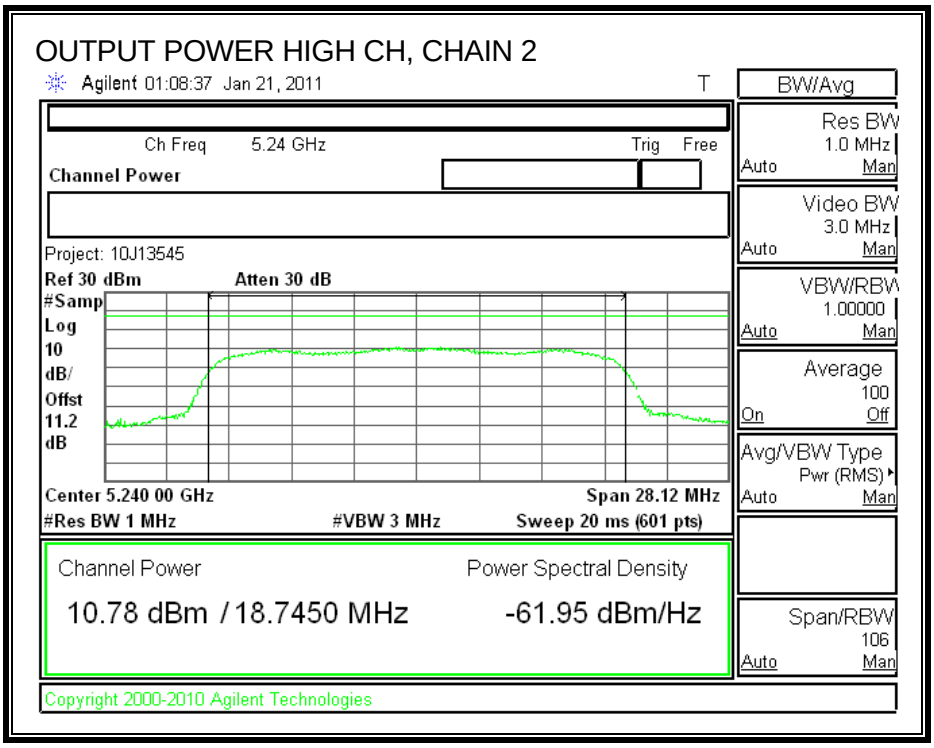




**CHAIN 2 OUTPUT POWER**







## 7.2.4. 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.

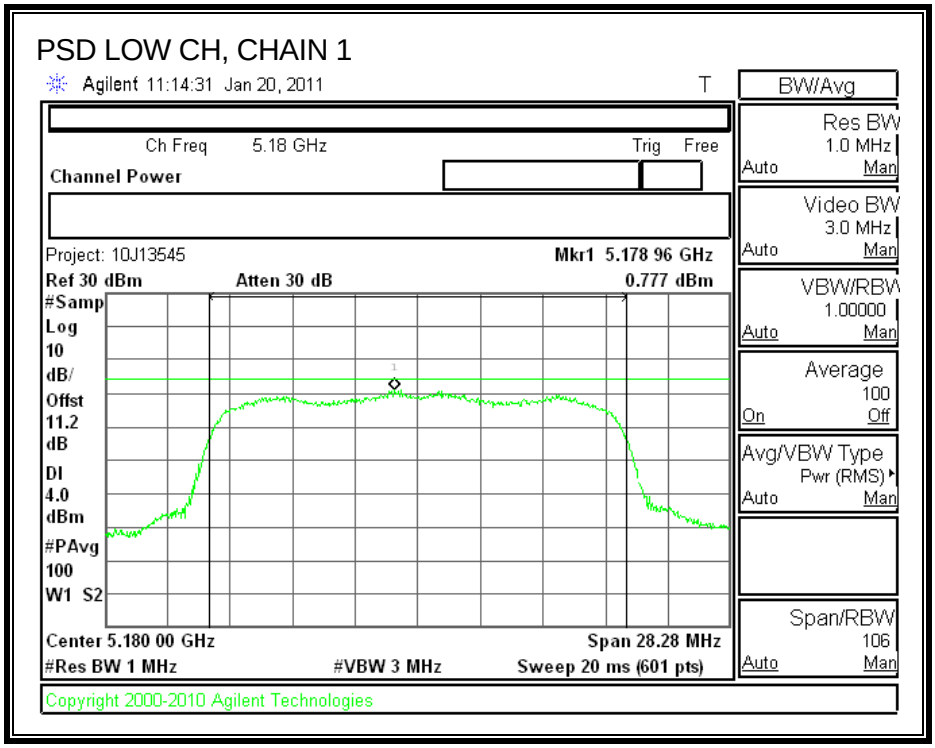
**TEST PROCEDURE**

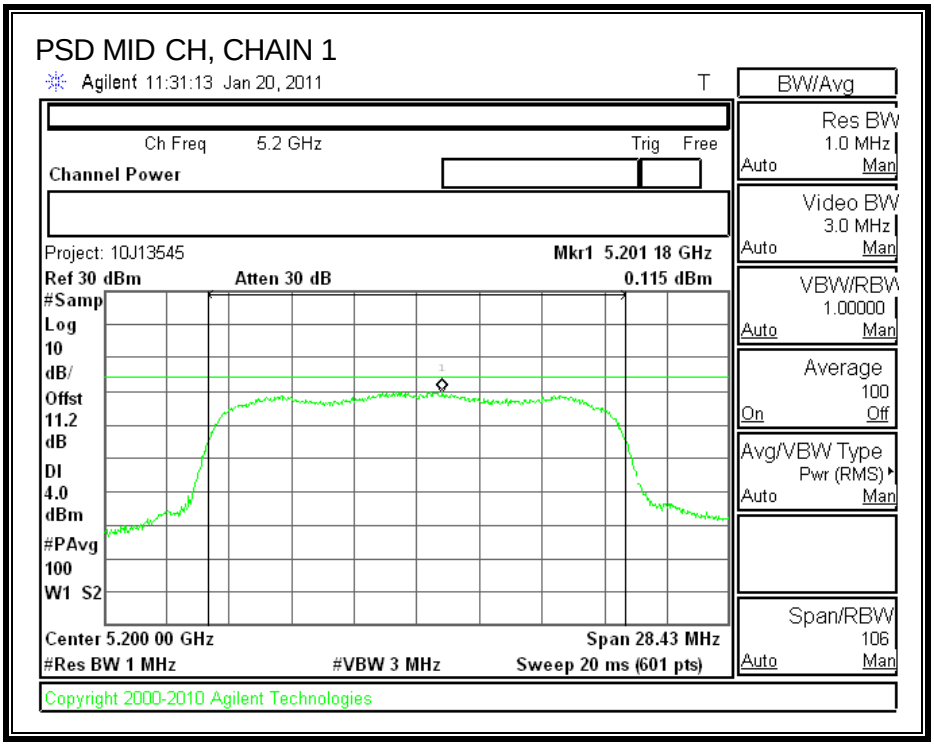
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

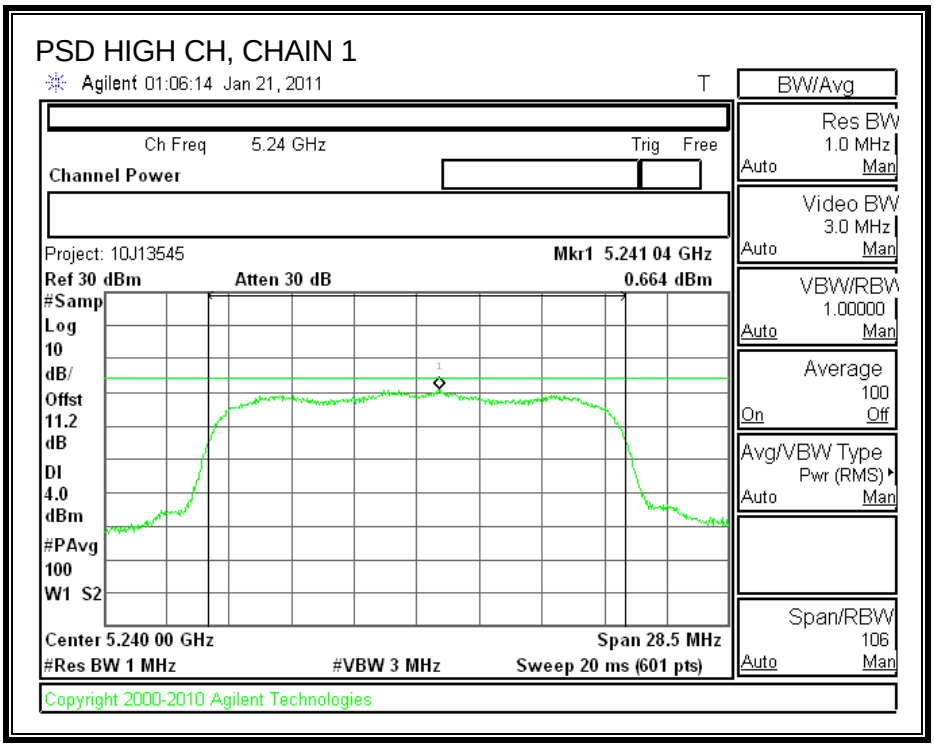
**RESULTS**

| Channel | Frequency (MHz) | Chain 1 PPSD (dBm) | Chain 2 PPSD (dBm) | Total PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5180 | 0.777 | 0.415 | 3.61 | 4 | -0.39 |
| Middle | 5200 | 0.115 | 0.413 | 3.28 | 4 | -0.72 |
| High | 5240 | 0.664 | 0.669 | 3.68 | 4 | -0.32 |

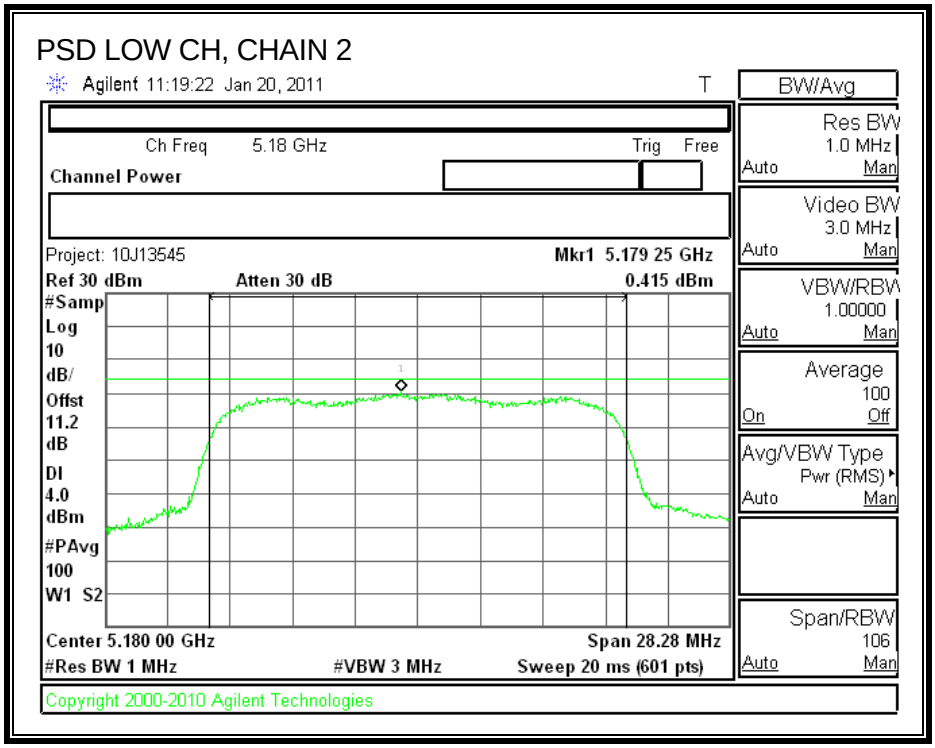
**CHAIN 1 POWER SPECTRAL DENSITY**

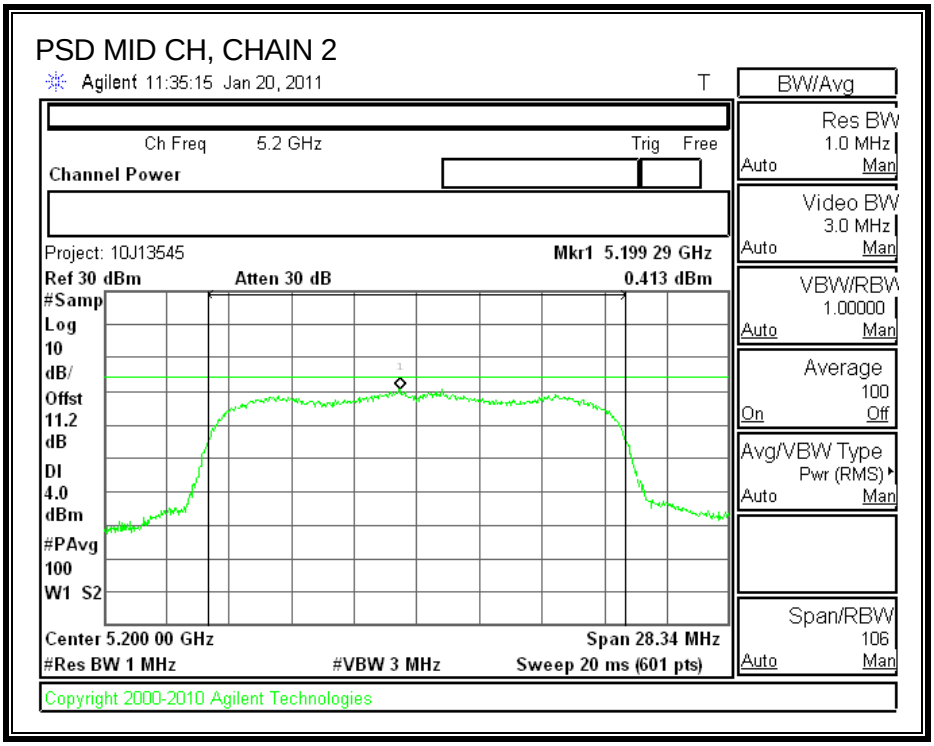


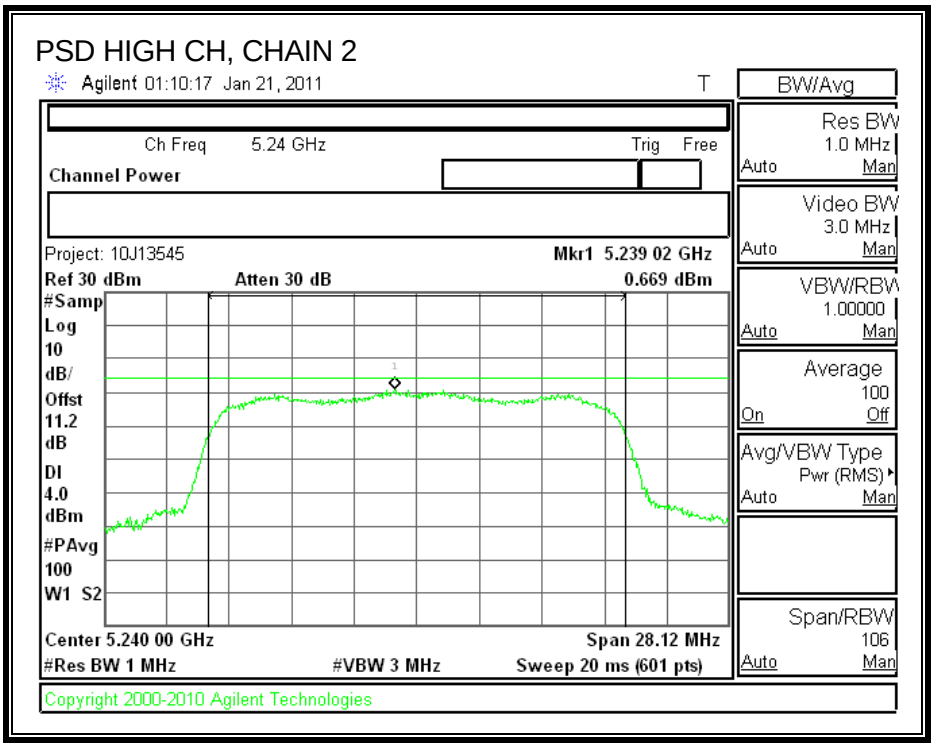




**CHAIN 2 POWER SPECTRAL DENSITY**







## 7.2.5. PEAK EXCURSION

**LIMITS**

FCC §15.407 (a) (6)

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

**TEST PROCEDURE**

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

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

**RESULTS**

### CHAIN 1

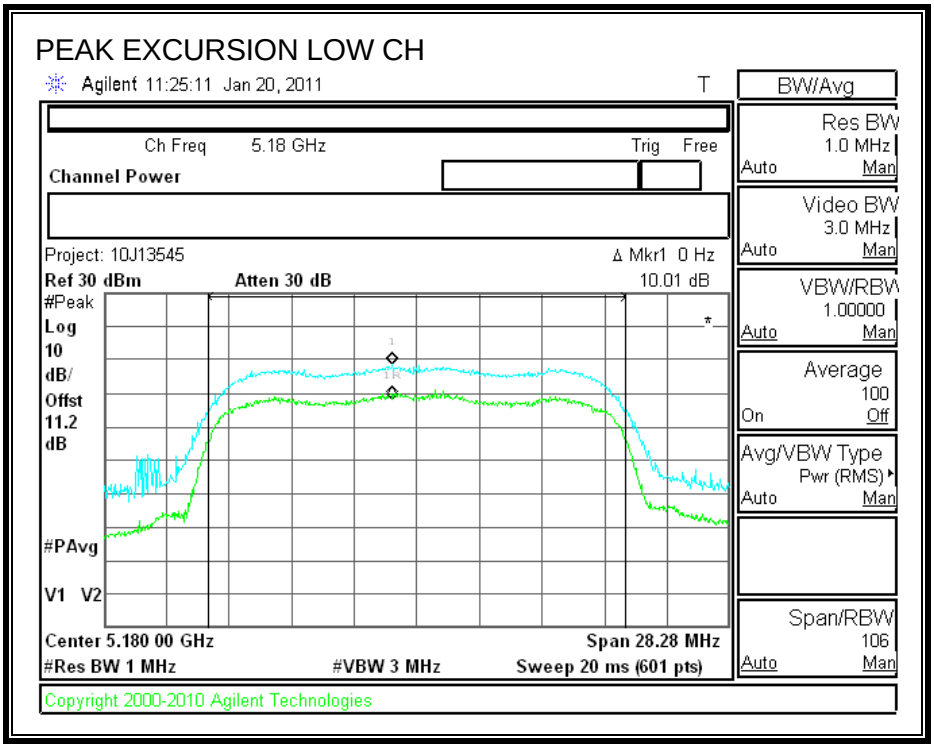
| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 10.01 | 13 | -2.99 |
| Middle | 5200 | 9.50 | 13 | -3.50 |
| High | 5240 | 10.24 | 13 | -2.76 |

### CHAIN 2

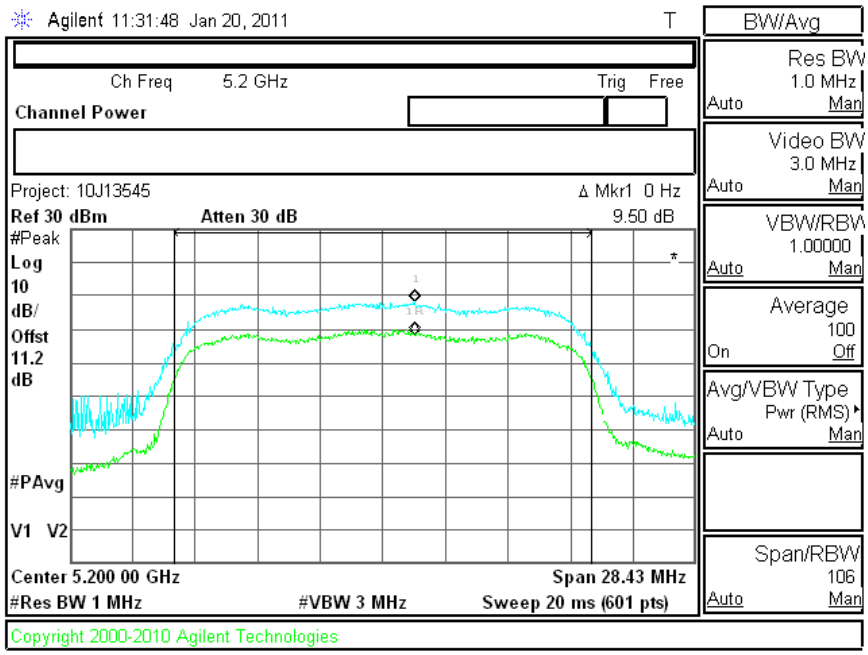
| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5180 | 8.91 | 13 | -4.09 |
| Middle | 5200 | 8.69 | 13 | -4.31 |
| High | 5240 | 10.96 | 13 | -2.04 |

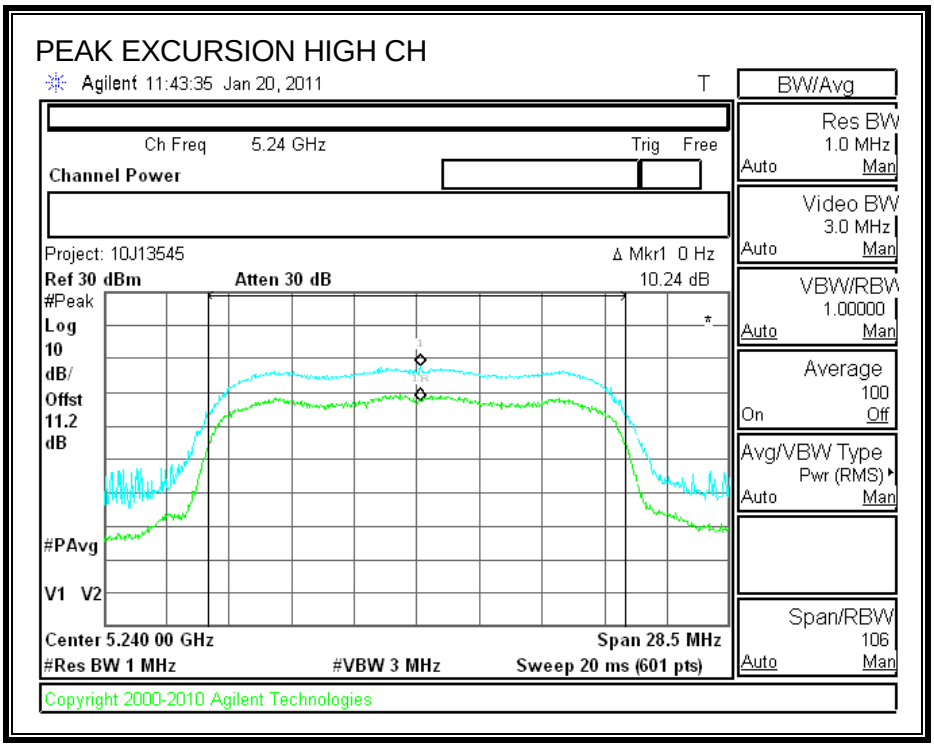
## CHAIN 1

**PEAK EXCURSION**



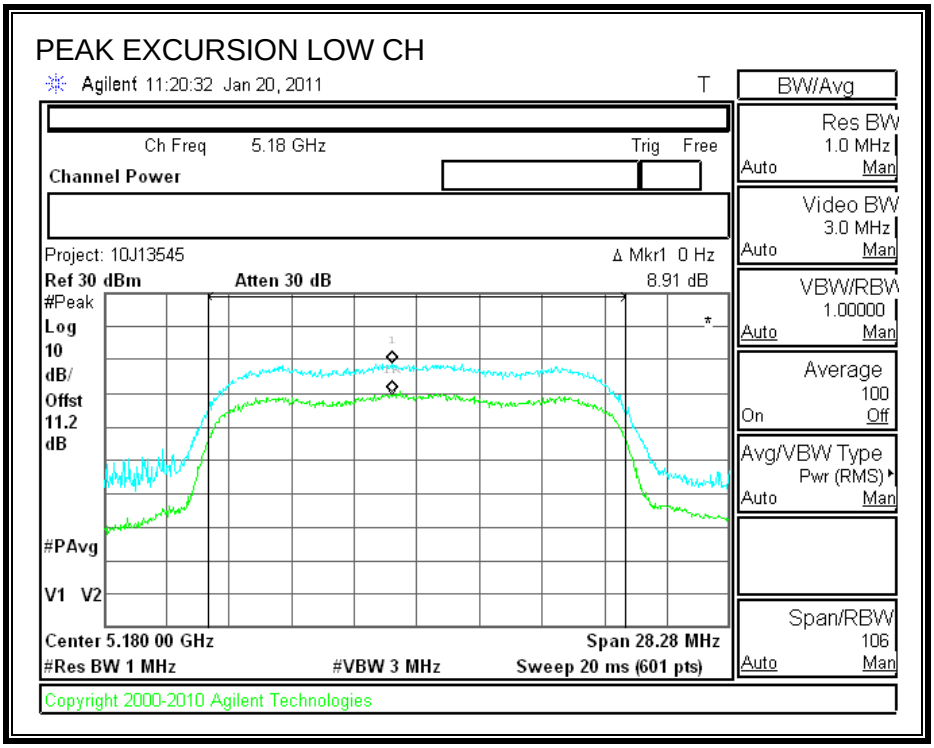
PEAK EXCURSION MID CH



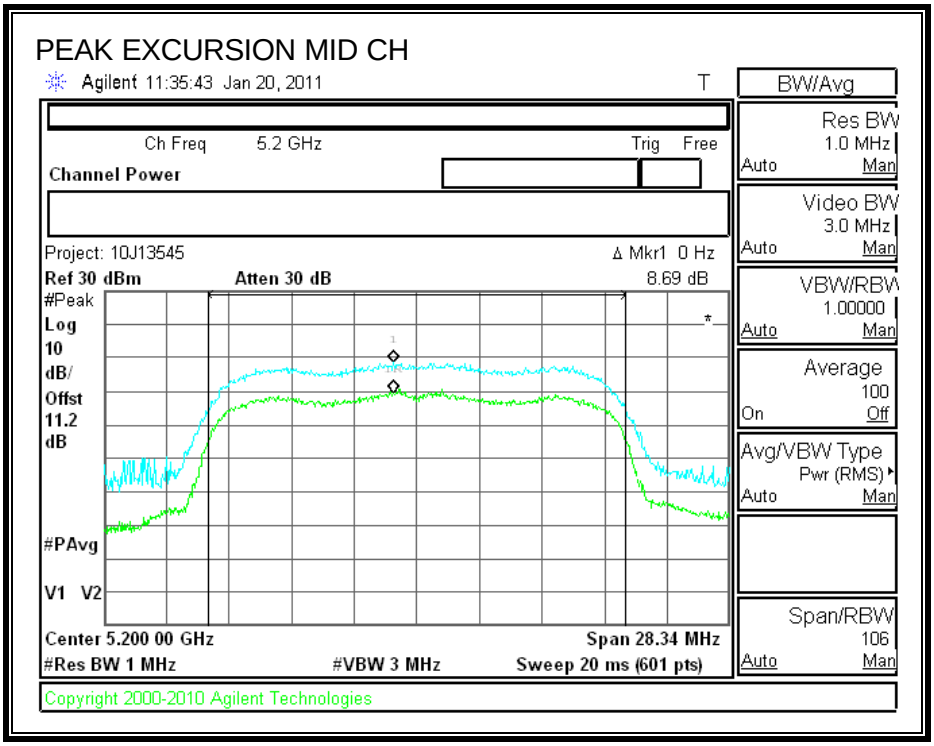


## CHAIN 2

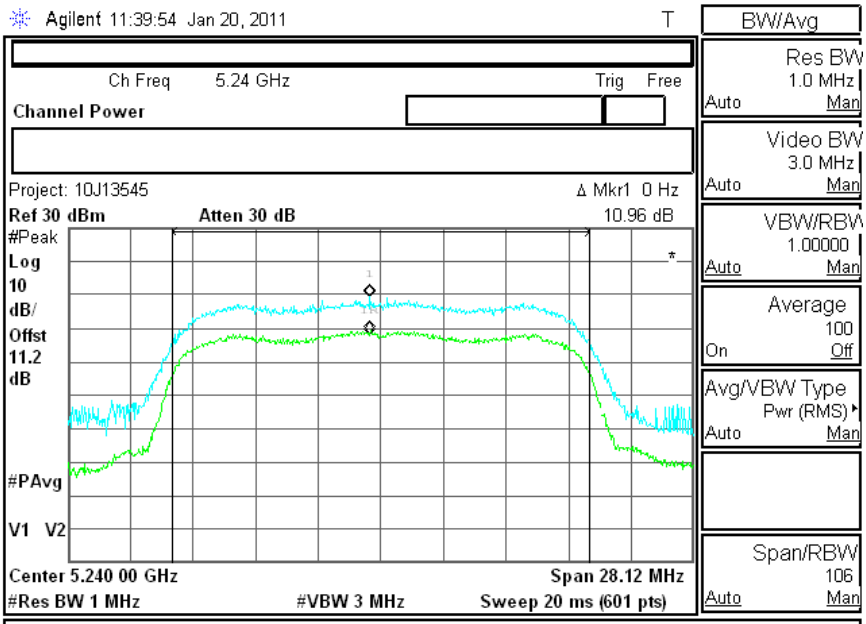
**PEAK EXCURSION**



PEAK EXCURSION MID CH



PEAK EXCURSION HIGH CH



## 7.2.6. 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 3.56dBi, so the EIRP limit is -30.56dBm.

**TEST PROCEDURE**

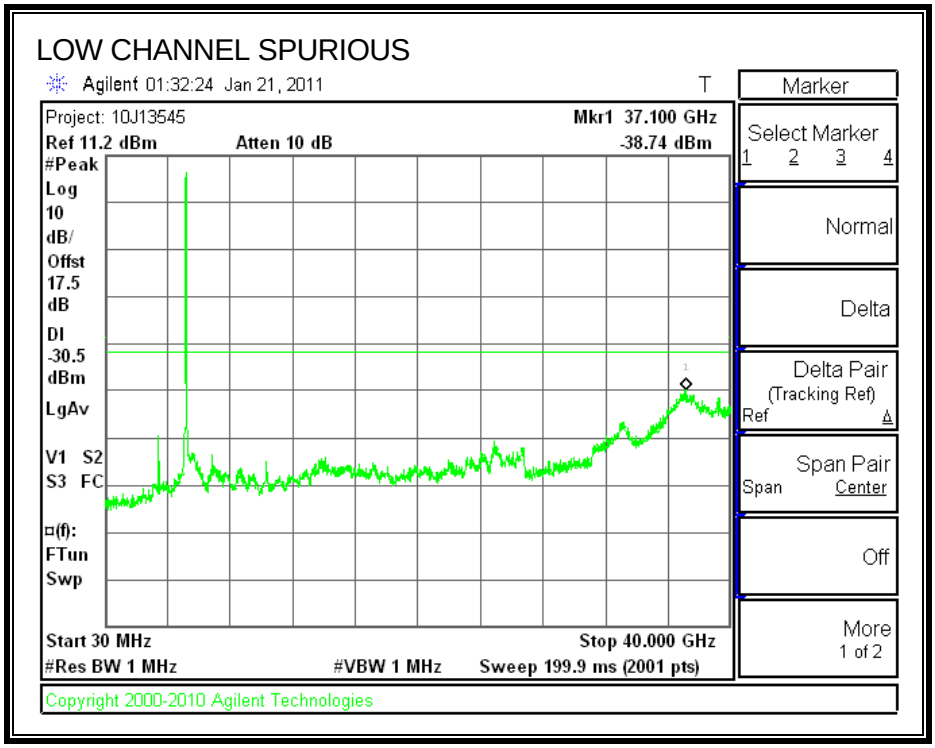
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

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.

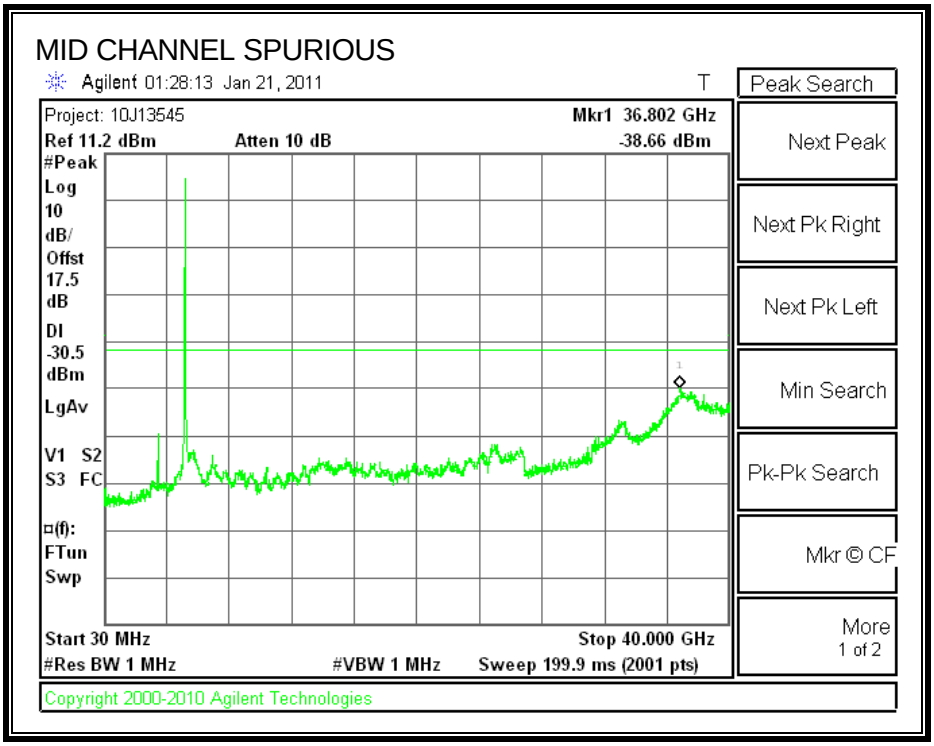
Measurements are made over the 30 MHz to 40 GHz range with the transmitter set to the lowest, middle, and highest channels.

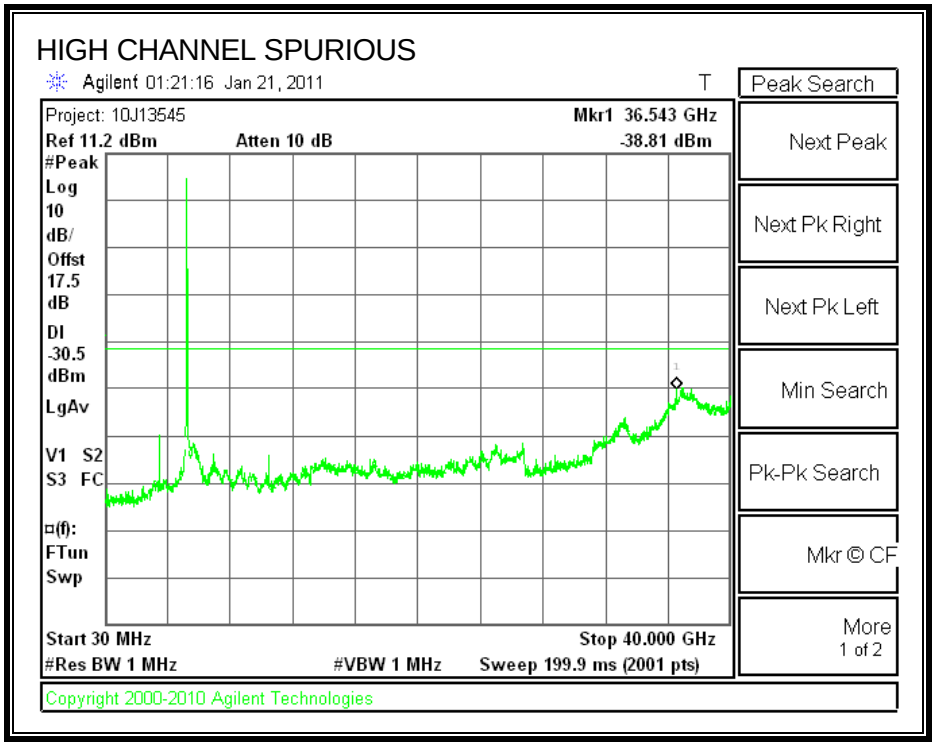
**RESULTS**

**CONDUCTED SPURIOUS EMISSIONS**



MID CHANNEL SPURIOUS





## 7.3. 802.11n HT40 MIMO 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**

**CHAIN 1**

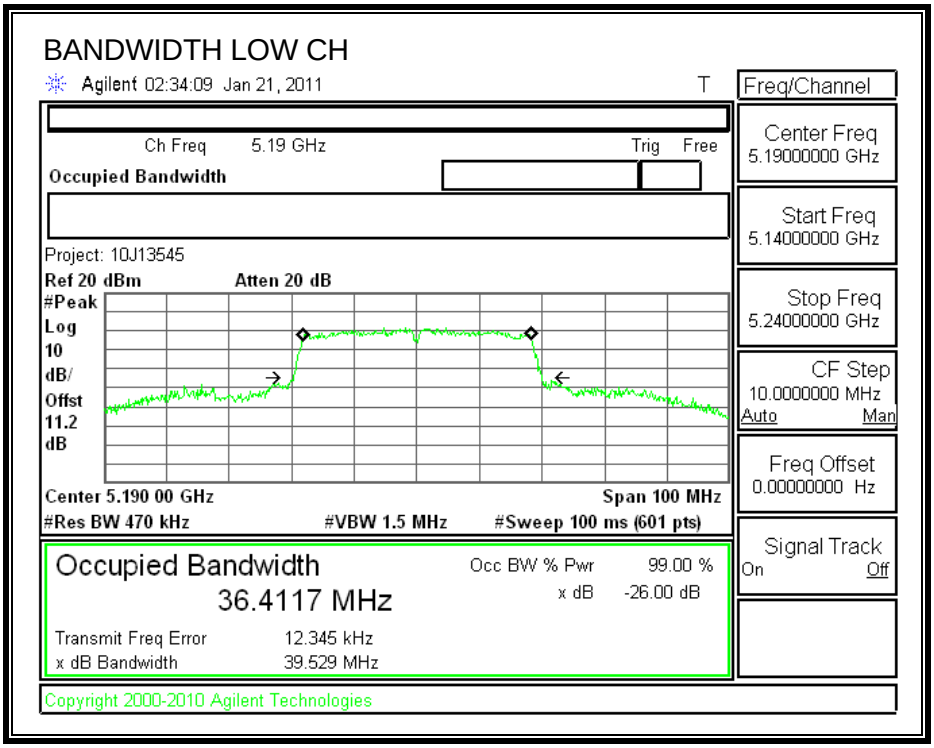
| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|
| Low | 5190 | 39.529 | 36.4117 |
| High | 5230 | 39.522 | 36.2867 |

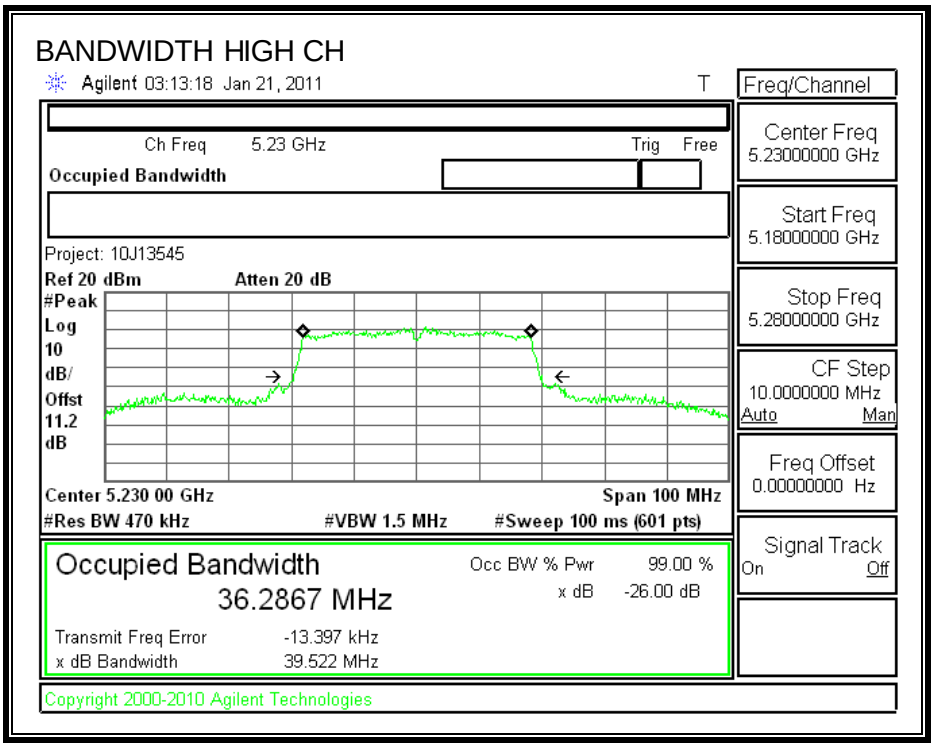
**CHAIN 2**

| Channel | Frequency (MHz) | 26 dB Bandwidth (MHz) | 99% Bandwidth (MHz) |
|---|---|---|---|
| Low | 5190 | 39.354 | 36.3838 |
| High | 5230 | 39.579 | 36.4025 |

## CHAIN 1

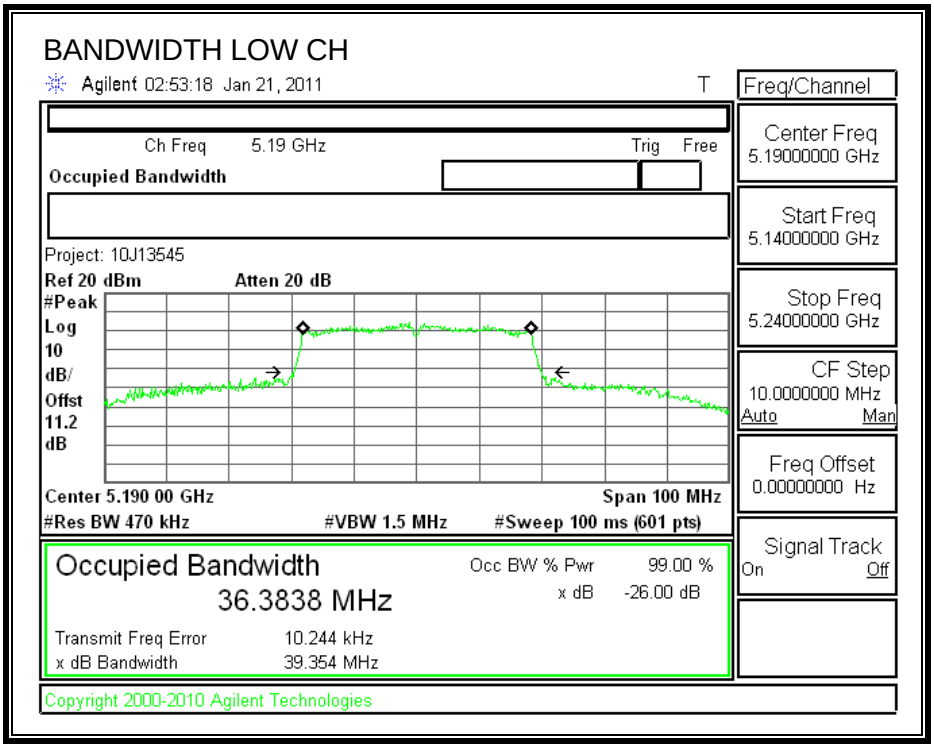
**26 dB and 99% BANDWIDTH**

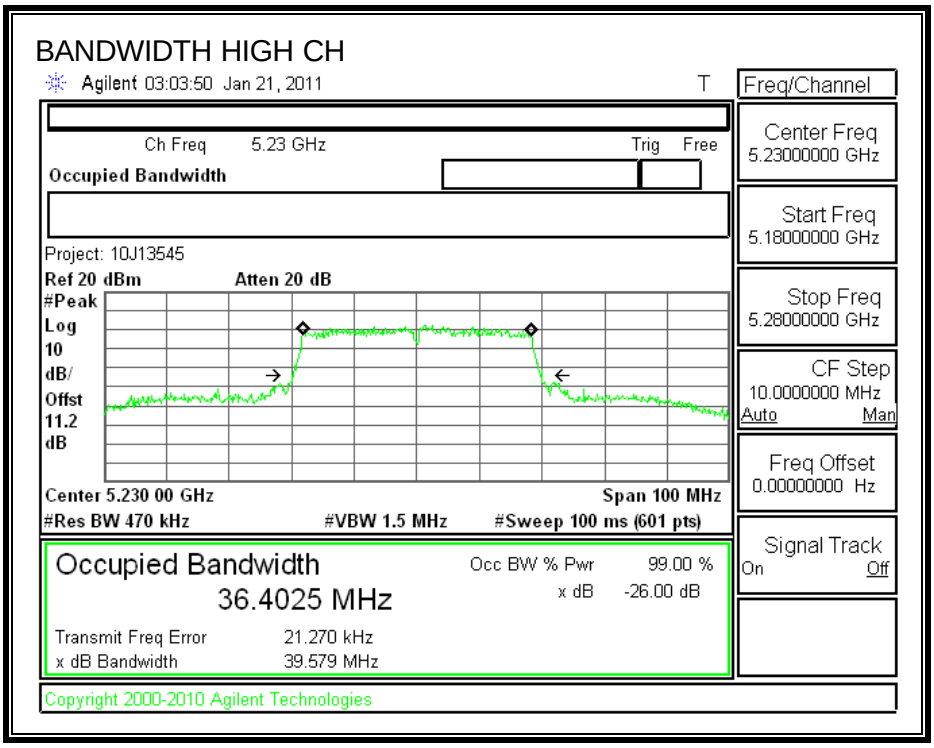




## CHAIN 2

**26 dB and 99% BANDWIDTH**





## 7.3.2. 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 11.2 dB (including 10 dB pad and 1.2 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 | 10.53 | 10.71 | 13.63 |
| High | 5230 | 10.17 | 10.28 | 13.24 |

## 7.3.3. 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**

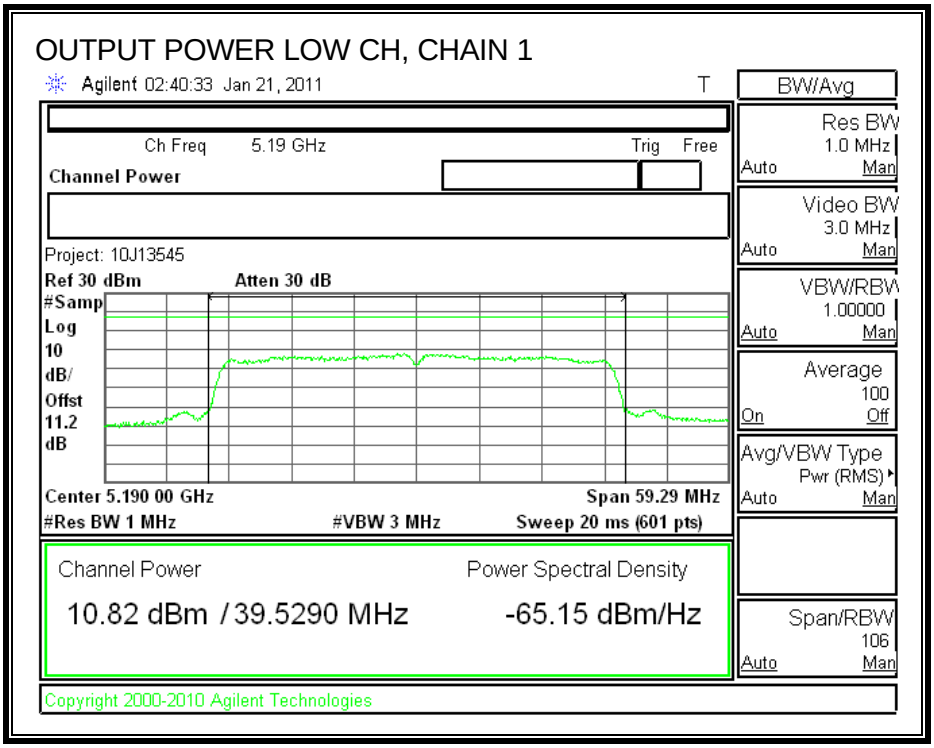
**Limit**

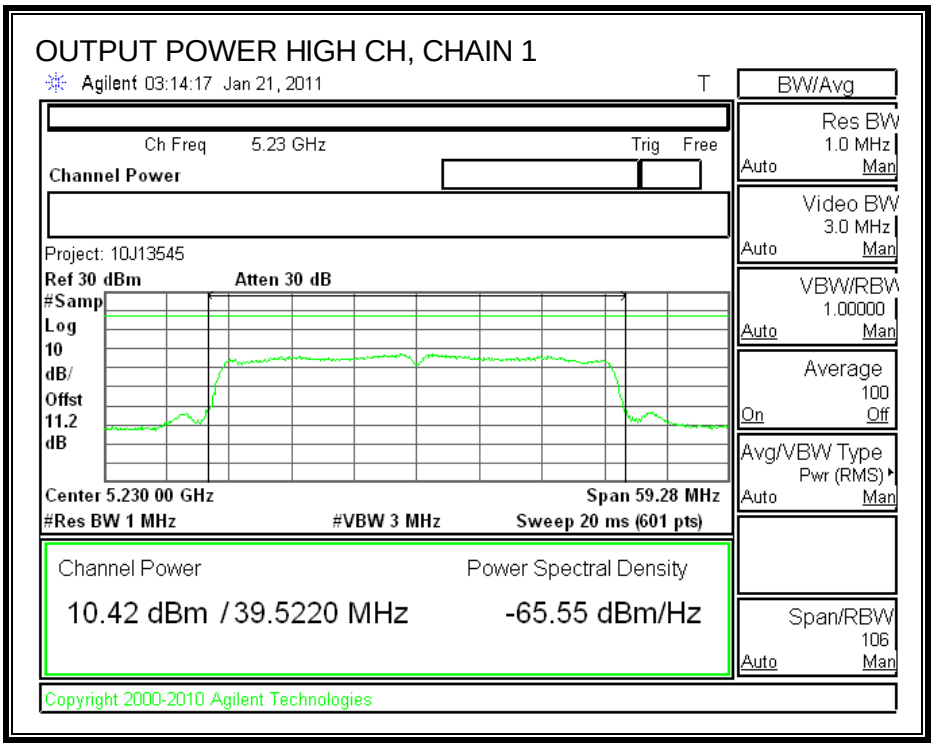
| Channel | Frequency (MHz) | Fixed Limit (dBm) | B (MHz) | 4 + 10 Log B Limit (dBm) | Antenna Gain (dBi) | Limit (dBm) |
|---|---|---|---|---|---|---|
| Low | 5190 | 17 | 39.529 | 19.97 | 0.55 | 17.00 |
| High | 5230 | 17 | 39.579 | 19.97 | 0.55 | 17.00 |

**Individual Chain Results**

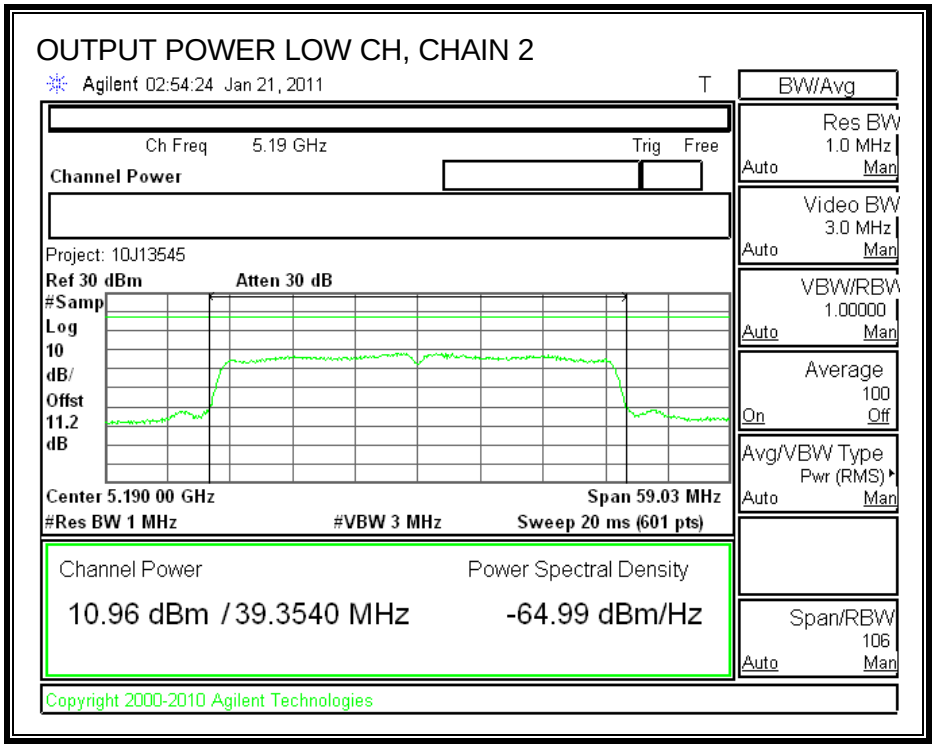
| Channel | Frequency (MHz) | Chain 1 Power (dBm) | Chain 2 Power (dBm) | Total Power (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5190 | 10.82 | 10.96 | 13.90 | 17.00 | -3.10 |
| High | 5230 | 10.42 | 10.29 | 13.37 | 17.00 | -3.63 |

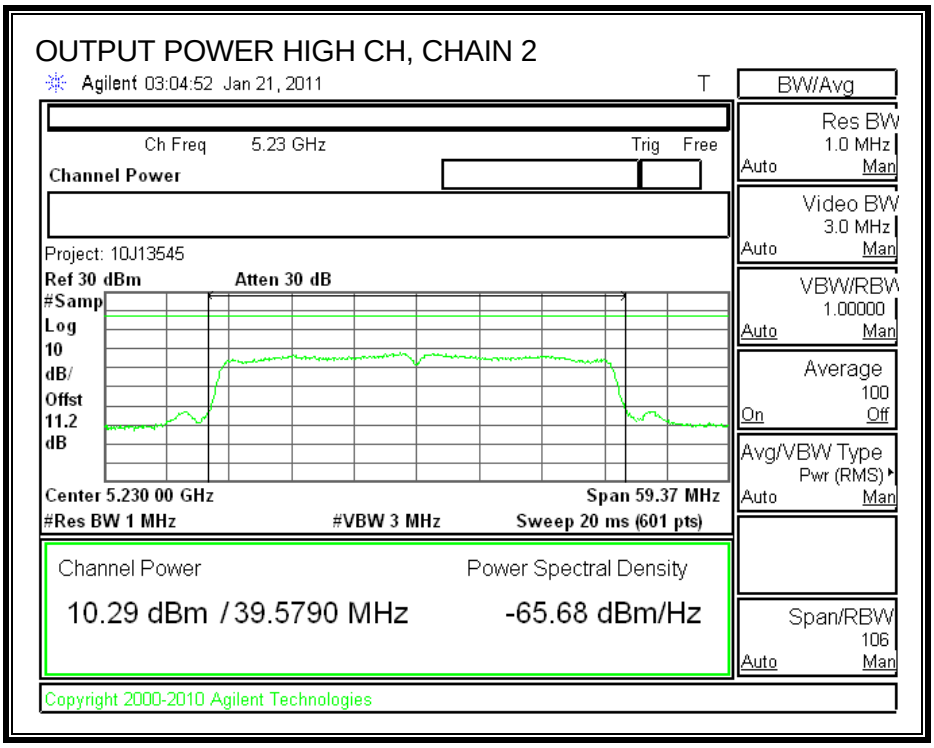
**CHAIN 1 OUTPUT POWER**





**CHAIN 2 OUTPUT POWER**





## 7.3.4. 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.

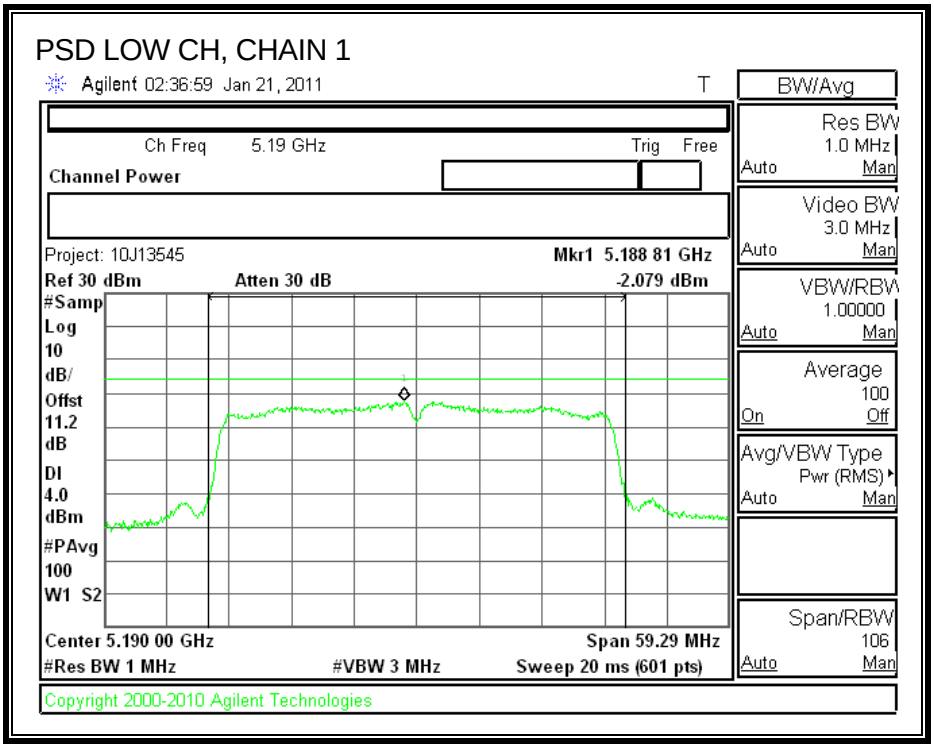
**TEST PROCEDURE**

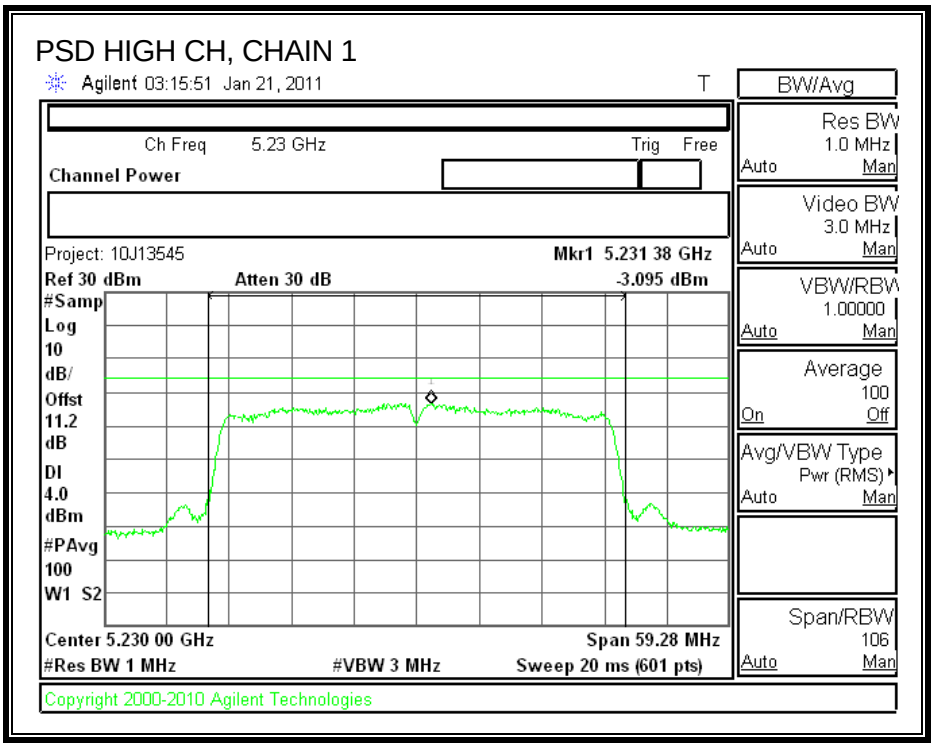
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

**RESULTS**

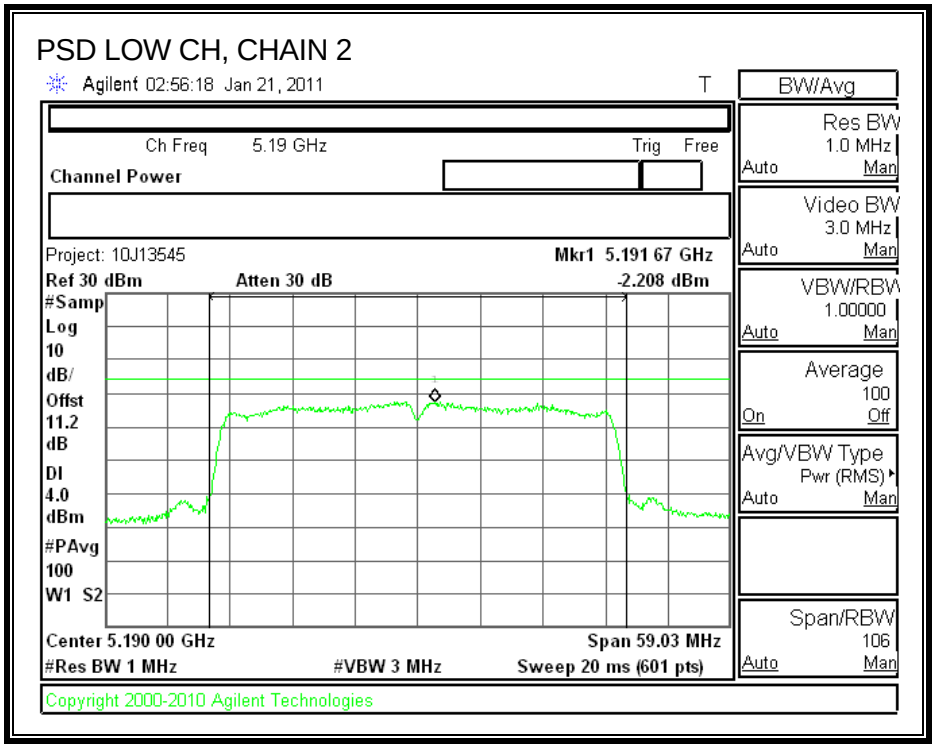
| Channel | Frequency (MHz) | Chain 1 PPSD (dBm) | Chain 2 PPSD (dBm) | Total PPSD (dBm) | Limit (dBm) | Margin (dB) |
|---|---|---|---|---|---|---|
| Low | 5190 | -2.079 | -2.208 | 0.87 | 4 | -3.13 |
| High | 5230 | -3.095 | -2.511 | 0.22 | 4 | -3.78 |

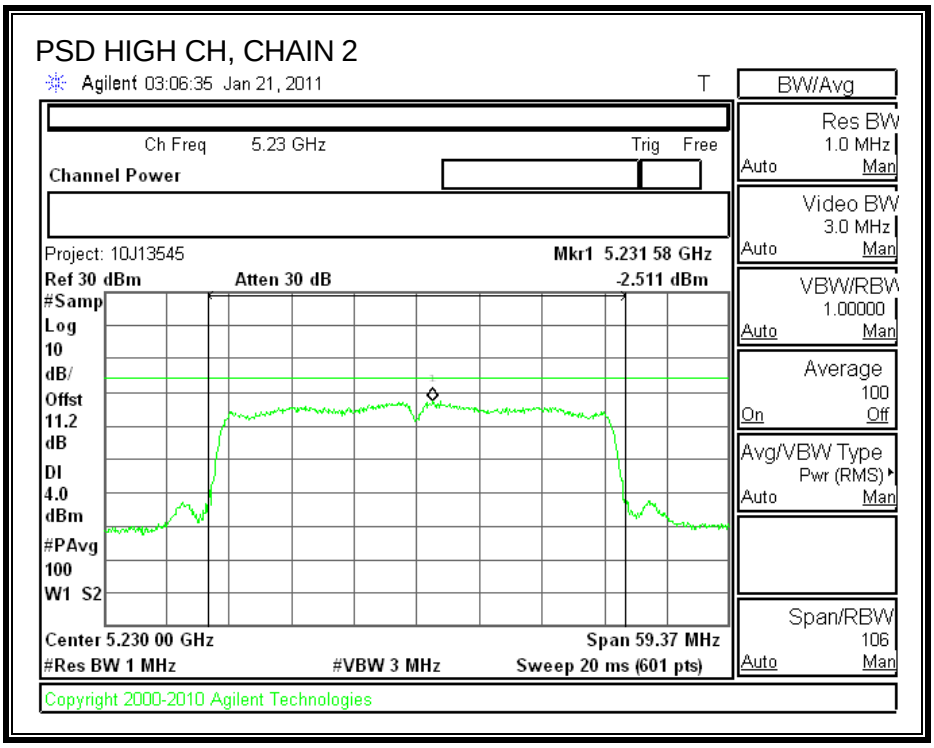
**CHAIN 1 POWER SPECTRAL DENSITY**





**CHAIN 2 POWER SPECTRAL DENSITY**





## 7.3.5. PEAK EXCURSION

**LIMITS**

FCC §15.407 (a) (6)

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

**TEST PROCEDURE**

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

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

**RESULTS**

### CHAIN 1

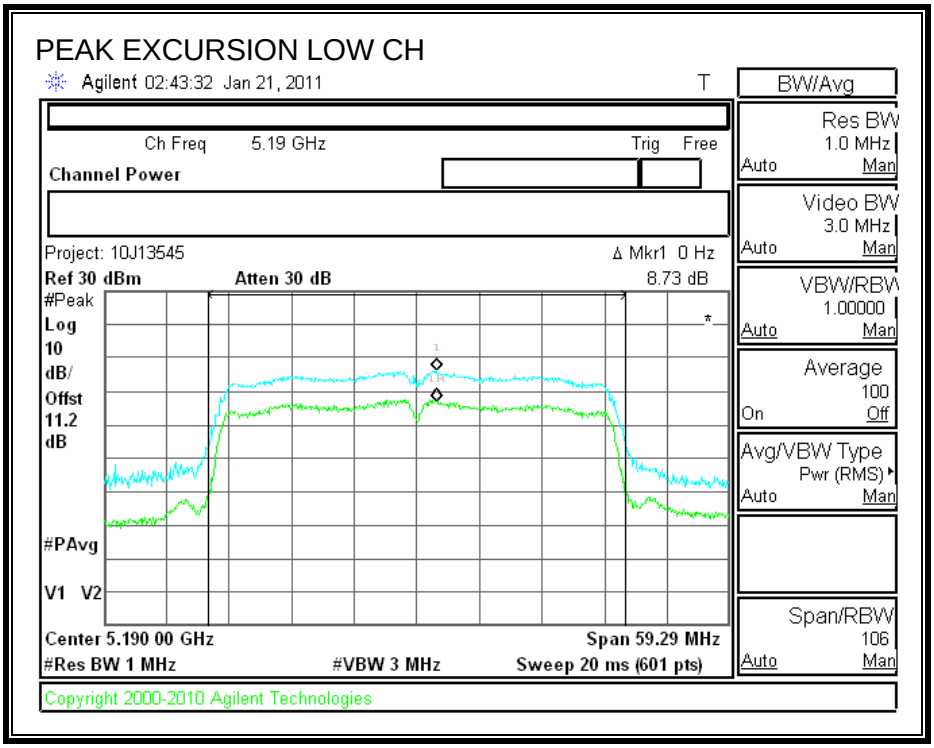
| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5190 | 8.73 | 13 | -4.27 |
| High | 5230 | 8.46 | 13 | -4.54 |

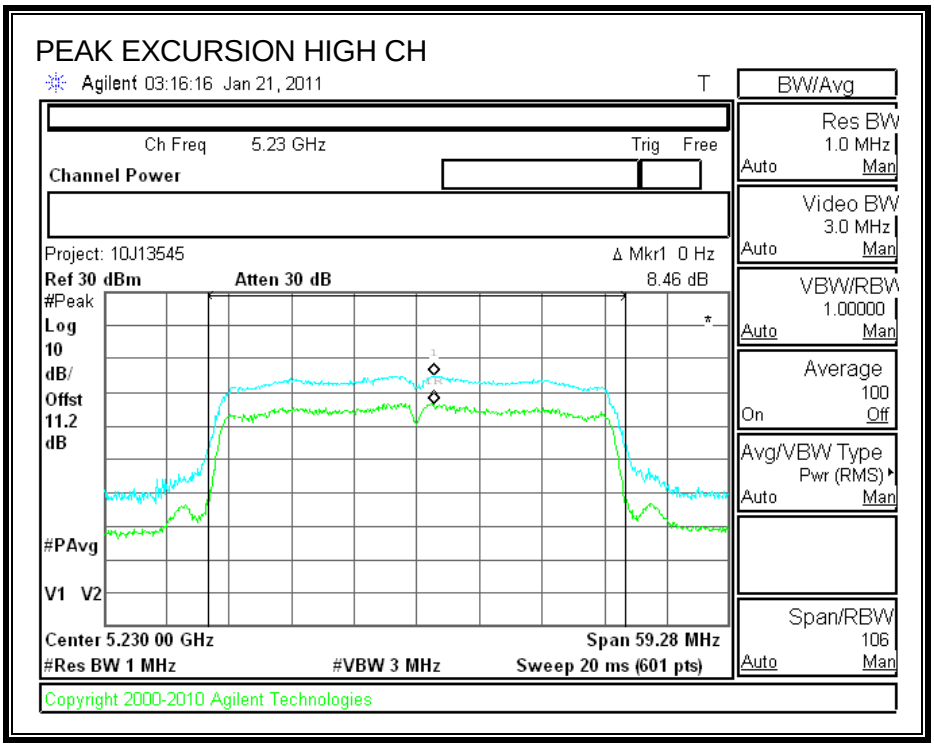
### CHAIN 2

| Channel | Frequency (MHz) | Peak Excursion (dB) | Limit (dB) | Margin (dB) |
|---|---|---|---|---|
| Low | 5190 | 9.87 | 13 | -3.13 |
| High | 5230 | 10.01 | 13 | -2.99 |

## CHAIN 1

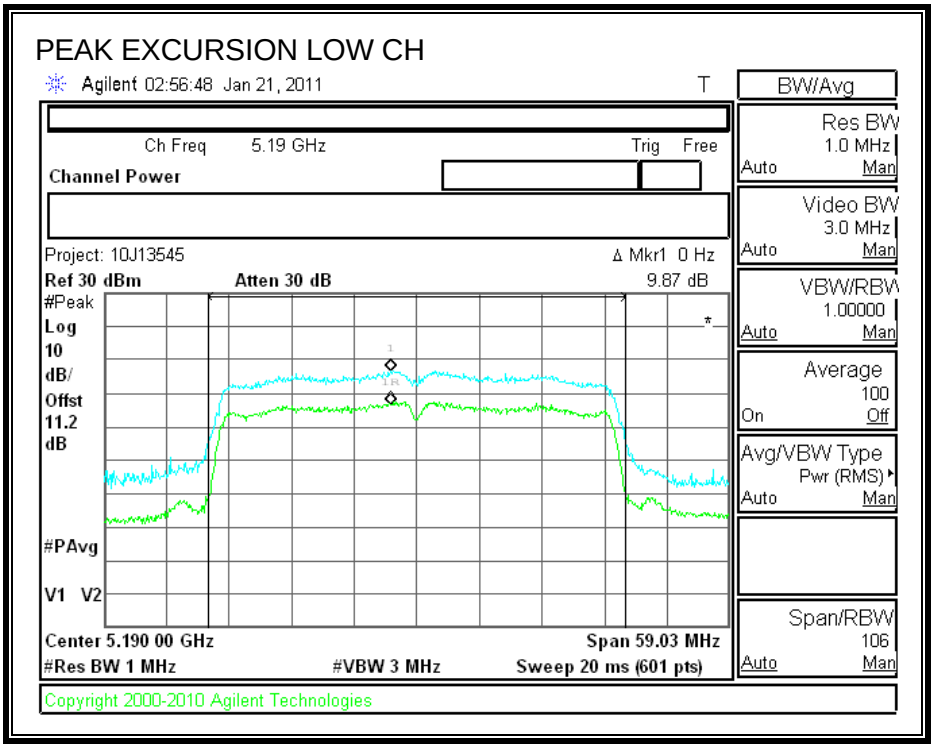
**PEAK EXCURSION**

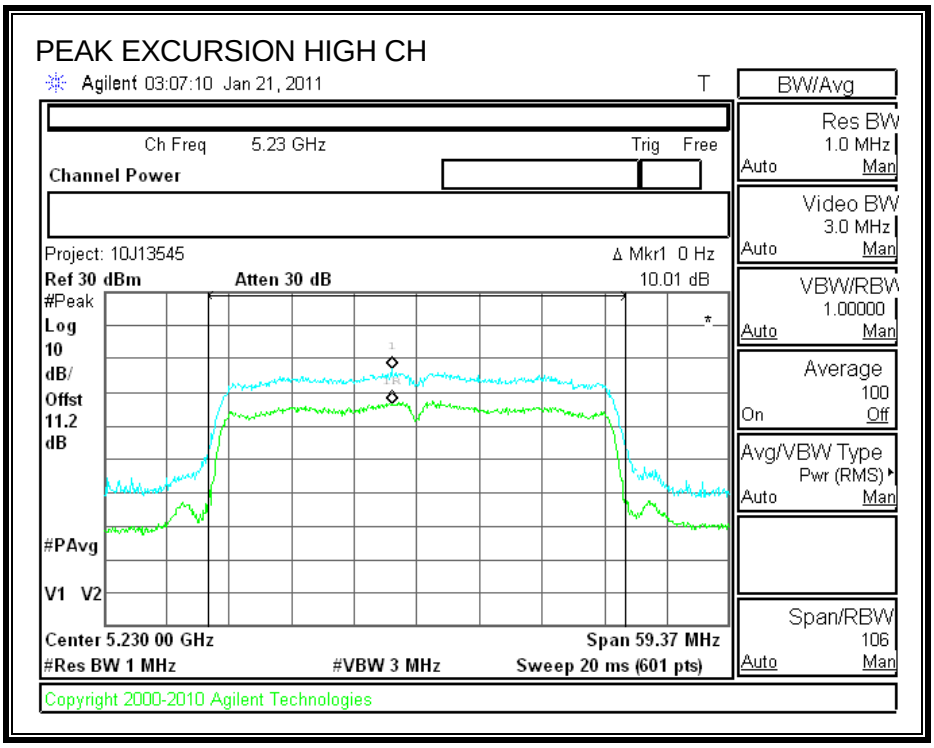




## CHAIN 2

**PEAK EXCURSION**





## 7.3.6. 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 3.56dBi, so the EIRP limit is -30.56dBm.

**TEST PROCEDURE**

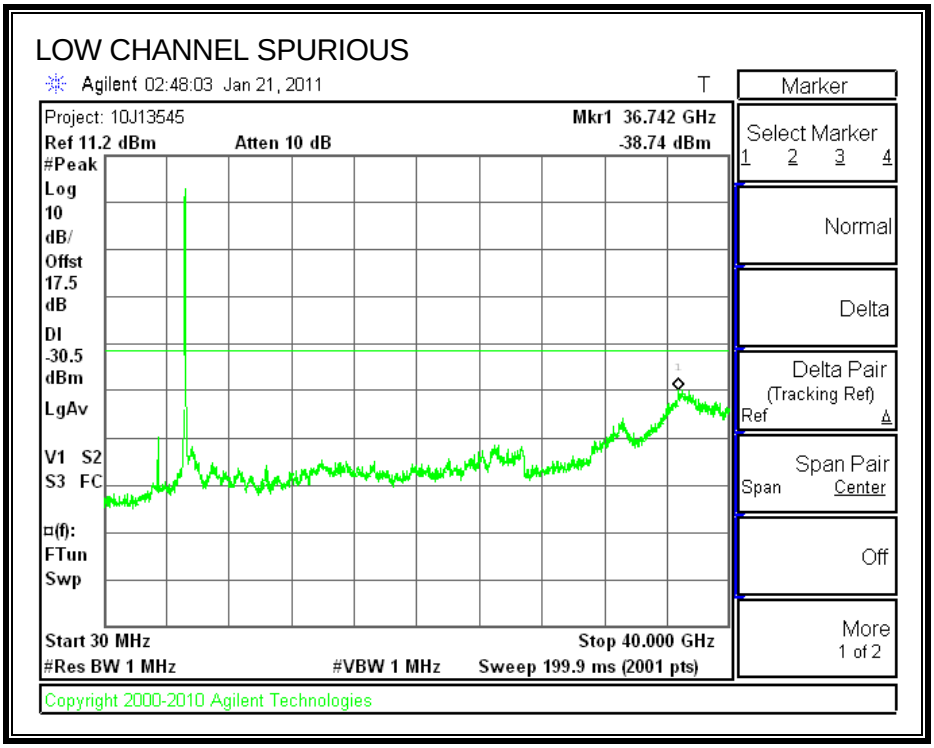
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

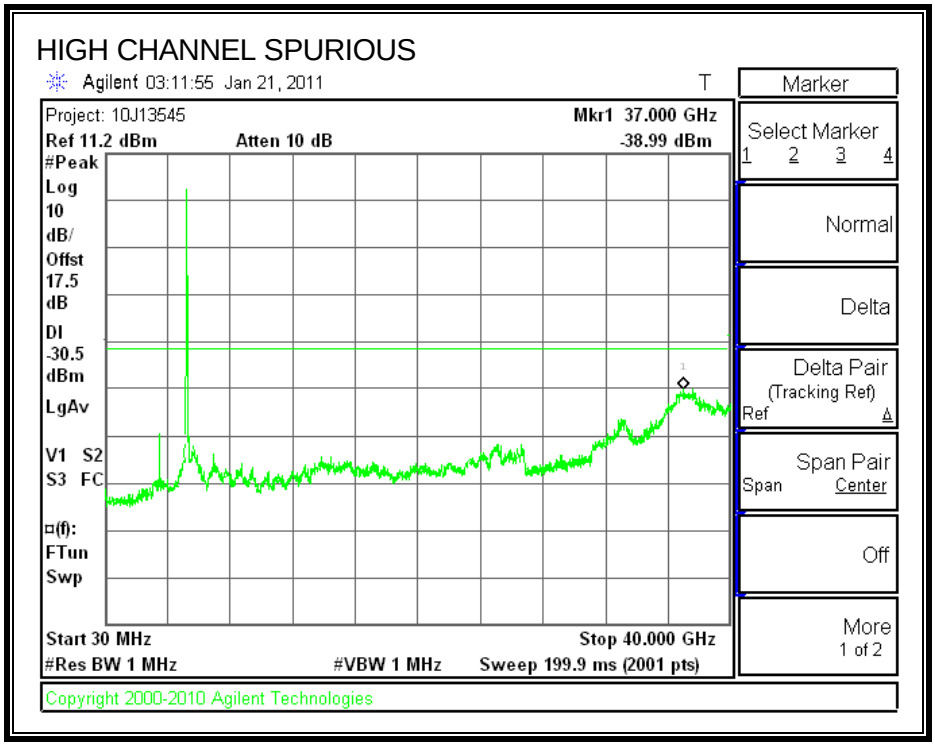
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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**





# 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.

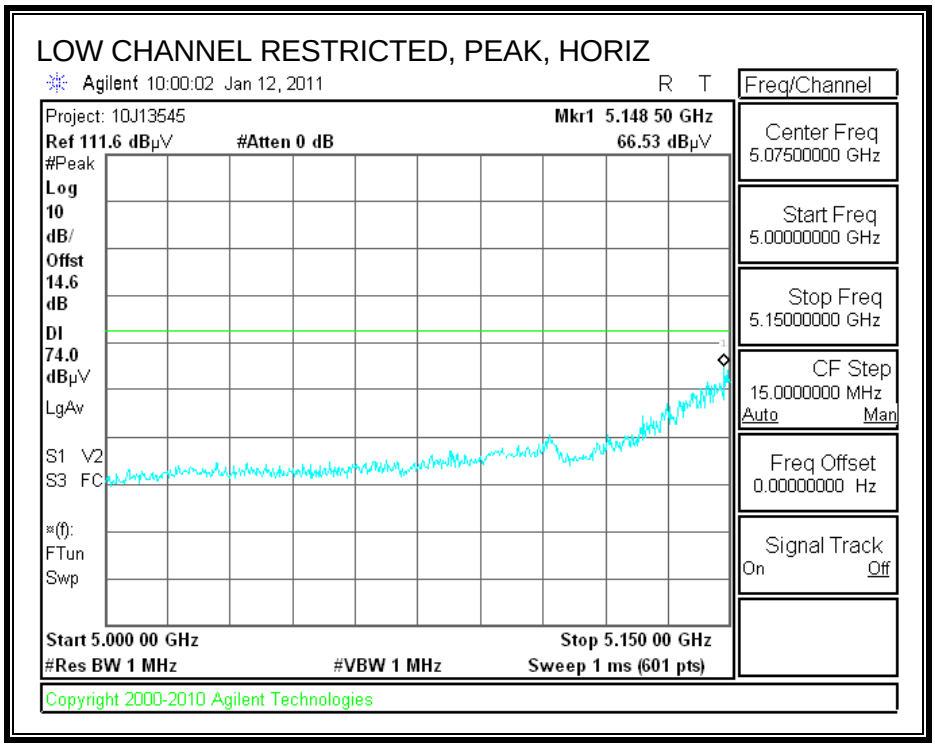
The spectrum from 30 MHz to 40 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in each applicable band.

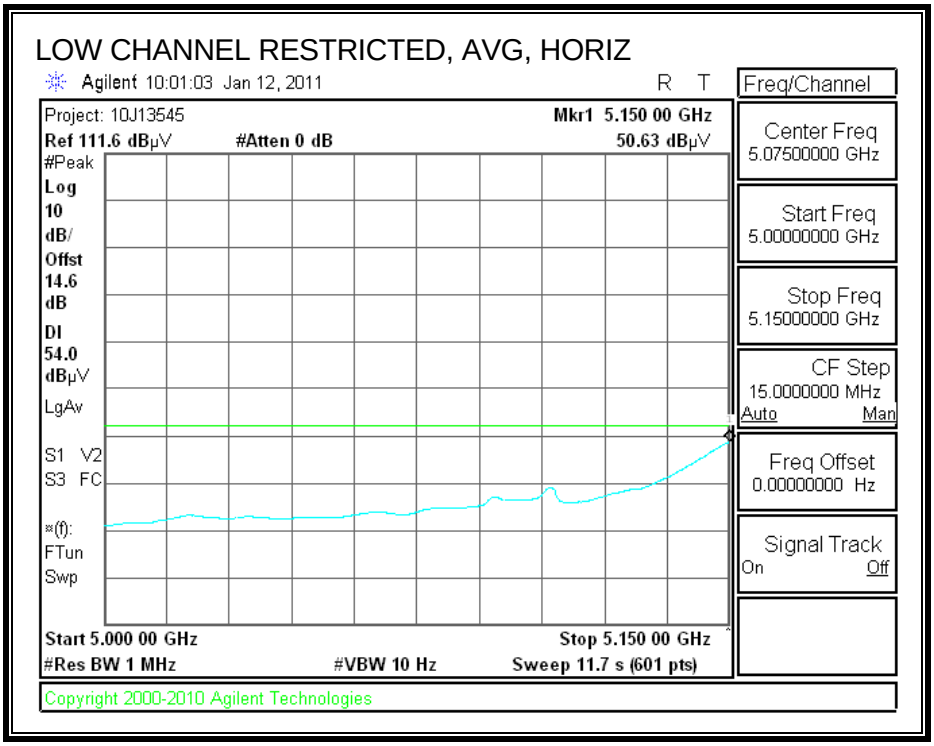
The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized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

## 8.2. TRANSMITTER ABOVE 1 GHz

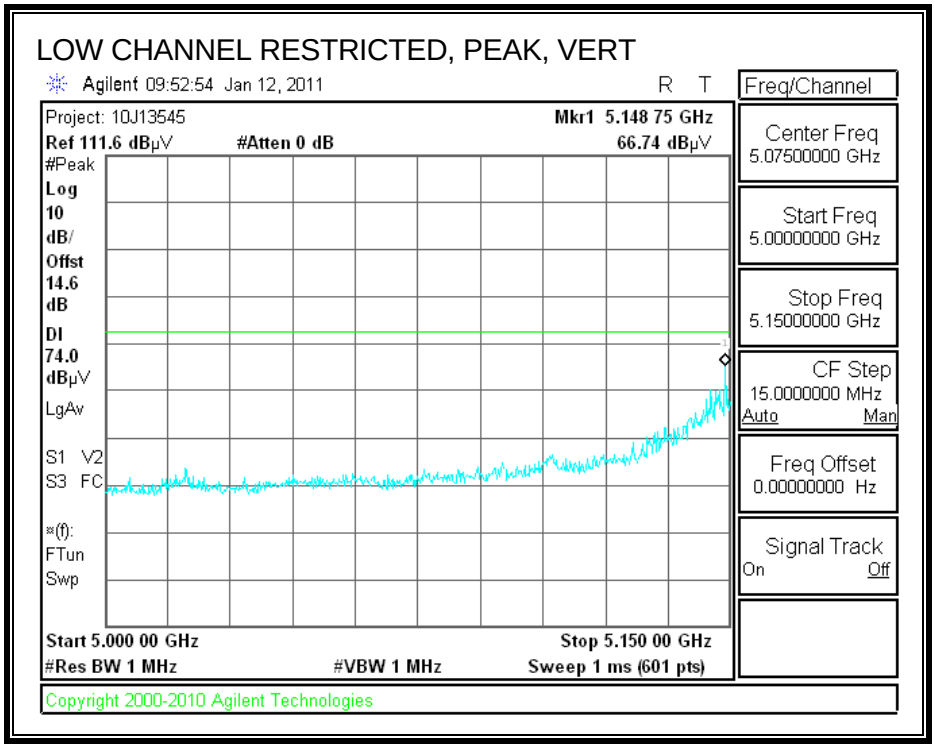
### 8.2.1. 802.11a MODE IN THE LOWER 5.2 GHz BAND

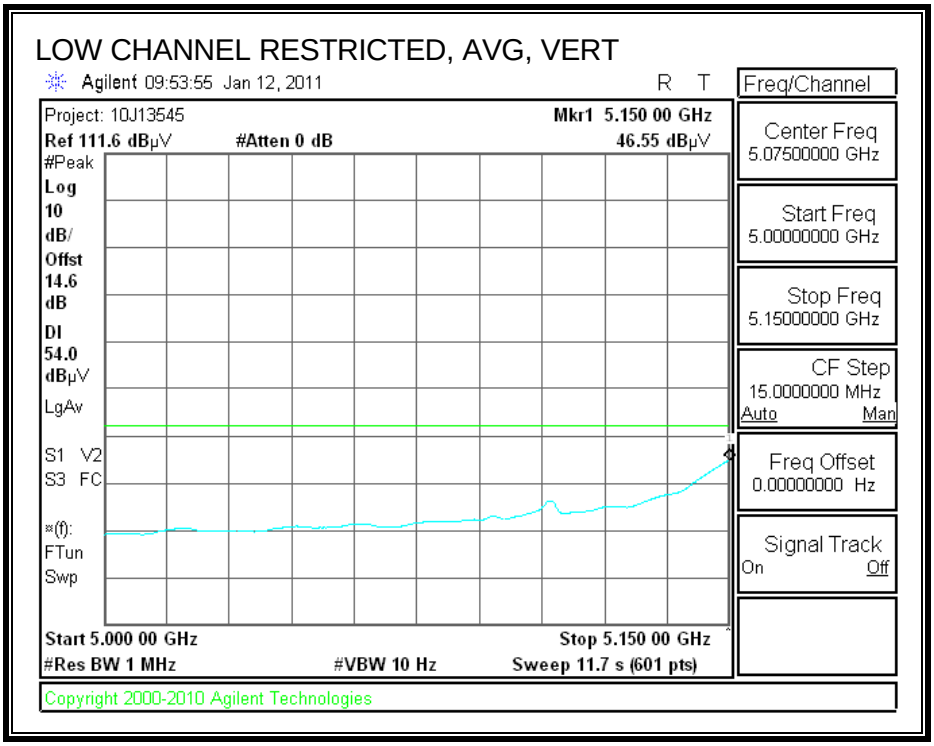
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**





**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**





## HARMONICS AND SPURIOUS EMISSIONS

**High Frequency Measurement**
**Compliance Certification Services, Fremont 5m Chamber**

**Test Engr:** William Zhuang
**Date:** 01/18/11
**Project #:** 10J13545
**Company:** Hon Hai Precision Ind. Co.,Ltd.
**Test Target:** FCC 15.407
**Mode Oper:** Lagacy a Mode

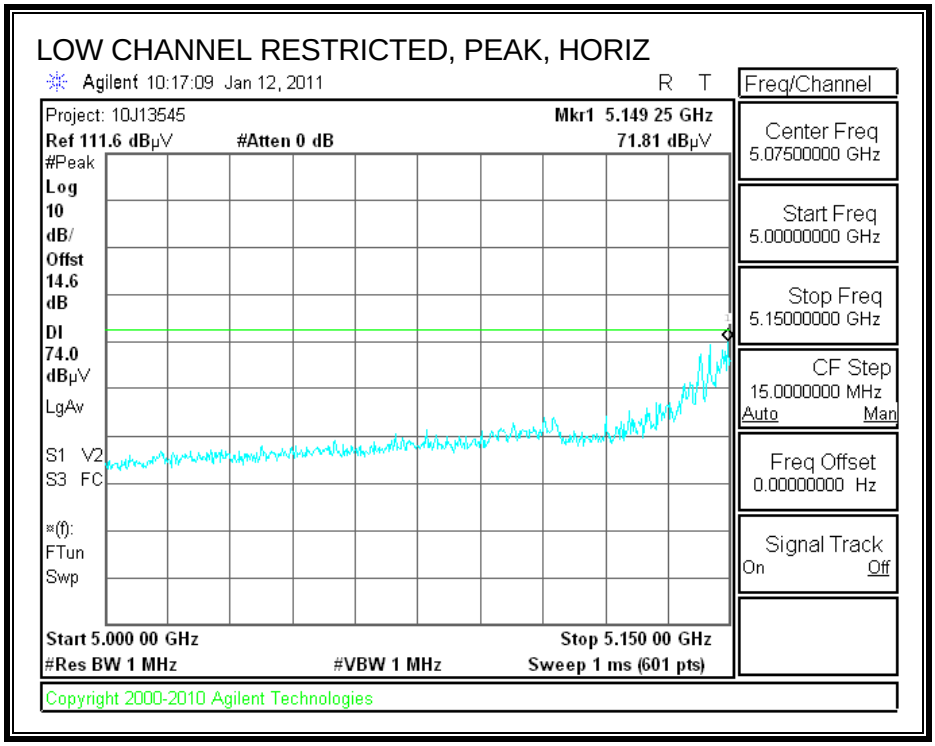
| | | | | | |
|---|---|---|---|---|---|
| f | Measurement Frequency | Amp | Preamp Gain | | Average Field Strength Limit |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | | Peak Field Strength Limit |
| Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | | Margin vs.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

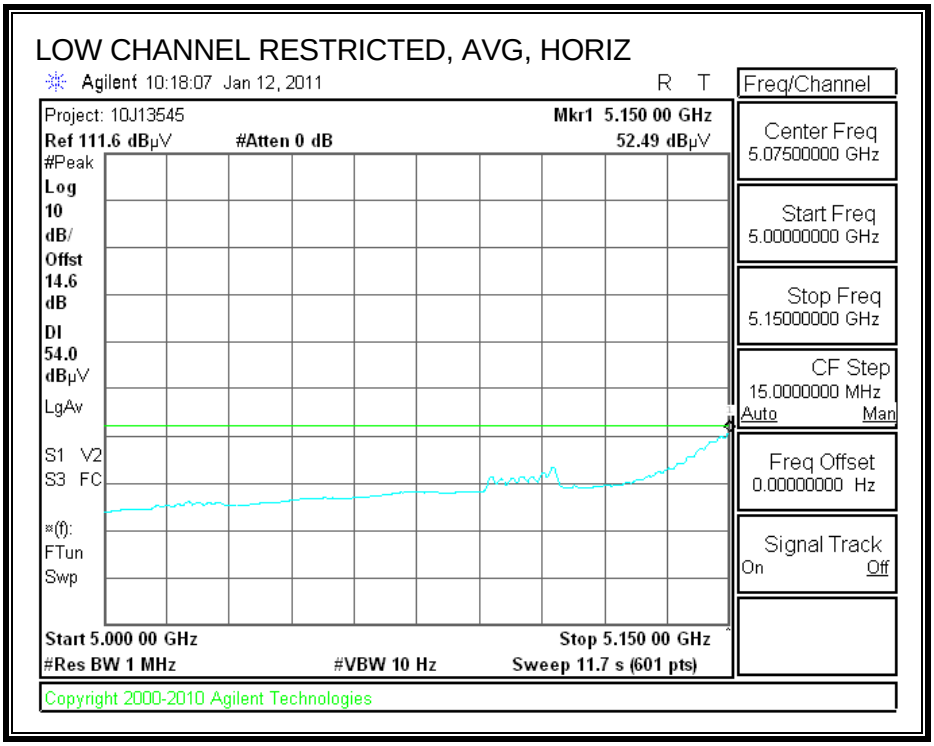
| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 5180 MHz | | | | | | | | | | | | | | | |
| 15.540 | 3.0 | 37.0 | 38.7 | 11.3 | -34.8 | 0.0 | 0.7 | 52.9 | 74.0 | -21.1 | V | P | 181.9 | 83.3 | |
| 15.540 | 3.0 | 23.8 | 38.7 | 11.3 | -34.8 | 0.0 | 0.7 | 39.8 | 54.0 | -14.2 | V | A | 181.9 | 83.3 | |
| 15.540 | 3.0 | 36.0 | 38.7 | 11.3 | -34.8 | 0.0 | 0.7 | 51.9 | 74.0 | -22.1 | H | P | 199.2 | 238.7 | |
| 15.540 | 3.0 | 23.8 | 38.7 | 11.3 | -34.8 | 0.0 | 0.7 | 39.7 | 54.0 | -14.3 | H | A | 199.2 | 238.7 | |
| 20.720 | 3.0 | 34.9 | 40.8 | 13.7 | -35.1 | 0.0 | 0.1 | 54.3 | 74.0 | -19.7 | V | P | 157.3 | 0.0 | |
| 20.720 | 3.0 | 22.6 | 40.8 | 13.7 | -35.1 | 0.0 | 0.1 | 42.0 | 54.0 | -12.0 | V | A | 157.3 | 0.0 | |
| 20.720 | 3.0 | 35.5 | 40.8 | 13.7 | -35.1 | 0.0 | 0.1 | 54.9 | 74.0 | -19.1 | H | P | 176.2 | 0.0 | |
| 20.720 | 3.0 | 22.7 | 40.8 | 13.7 | -35.1 | 0.0 | 0.1 | 42.1 | 54.0 | -11.9 | H | A | 176.2 | 0.0 | |
| Mid Ch. 5200 MHz | | | | | | | | | | | | | | | |
| 15.600 | 3.0 | 36.0 | 38.5 | 11.4 | -34.8 | 0.0 | 0.7 | 51.8 | 74.0 | -22.2 | V | P | 199.0 | 19.3 | |
| 15.600 | 3.0 | 23.9 | 38.5 | 11.4 | -34.8 | 0.0 | 0.7 | 39.8 | 54.0 | -14.2 | V | A | 199.0 | 19.3 | |
| 15.600 | 3.0 | 36.1 | 38.5 | 11.4 | -34.8 | 0.0 | 0.7 | 51.9 | 74.0 | -22.1 | H | P | 185.5 | 25.5 | |
| 15.600 | 3.0 | 24.0 | 38.5 | 11.4 | -34.8 | 0.0 | 0.7 | 39.9 | 54.0 | -14.1 | H | A | 185.5 | 25.5 | |
| 20.800 | 3.0 | 35.1 | 40.7 | 13.7 | -35.2 | 0.0 | 0.0 | 54.3 | 74.0 | -19.7 | V | P | 191.0 | 51.5 | |
| 20.800 | 3.0 | 22.6 | 40.7 | 13.7 | -35.2 | 0.0 | 0.0 | 41.9 | 54.0 | -12.1 | V | A | 191.0 | 51.5 | |
| 20.800 | 3.0 | 35.8 | 40.7 | 13.7 | -35.2 | 0.0 | 0.0 | 55.0 | 74.0 | -19.0 | H | P | 118.3 | 323.3 | |
| 20.800 | 3.0 | 22.7 | 40.7 | 13.7 | -35.2 | 0.0 | 0.0 | 41.9 | 54.0 | -12.1 | H | A | 118.3 | 323.3 | |
| High Ch. 5240 MHz | | | | | | | | | | | | | | | |
| 15.720 | 3.0 | 36.3 | 38.2 | 11.4 | -34.7 | 0.0 | 0.7 | 51.9 | 74.0 | -22.1 | V | P | 100.0 | 358.0 | |
| 15.720 | 3.0 | 24.0 | 38.2 | 11.4 | -34.7 | 0.0 | 0.7 | 39.7 | 54.0 | -14.3 | V | A | 100.0 | 358.0 | |
| 15.720 | 3.0 | 36.2 | 38.2 | 11.4 | -34.7 | 0.0 | 0.7 | 51.8 | 74.0 | -22.2 | H | P | 200.0 | 8.9 | |
| 15.720 | 3.0 | 24.0 | 38.2 | 11.4 | -34.7 | 0.0 | 0.7 | 39.6 | 54.0 | -14.4 | H | A | 200.0 | 8.9 | |
| 20.960 | 3.0 | 34.3 | 40.3 | 13.7 | -35.2 | 0.0 | 0.0 | 53.2 | 74.0 | -20.8 | V | P | 101.6 | 249.7 | |
| 20.960 | 3.0 | 22.2 | 40.3 | 13.7 | -35.2 | 0.0 | 0.0 | 41.0 | 54.0 | -13.0 | V | A | 101.6 | 249.7 | |
| 20.960 | 3.0 | 34.2 | 40.3 | 13.7 | -35.2 | 0.0 | 0.0 | 53.0 | 74.0 | -21.0 | H | P | 150.1 | 283.6 | |
| 20.960 | 3.0 | 22.2 | 40.3 | 13.7 | -35.2 | 0.0 | 0.0 | 41.1 | 54.0 | -12.9 | H | A | 150.1 | 283.6 | |

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

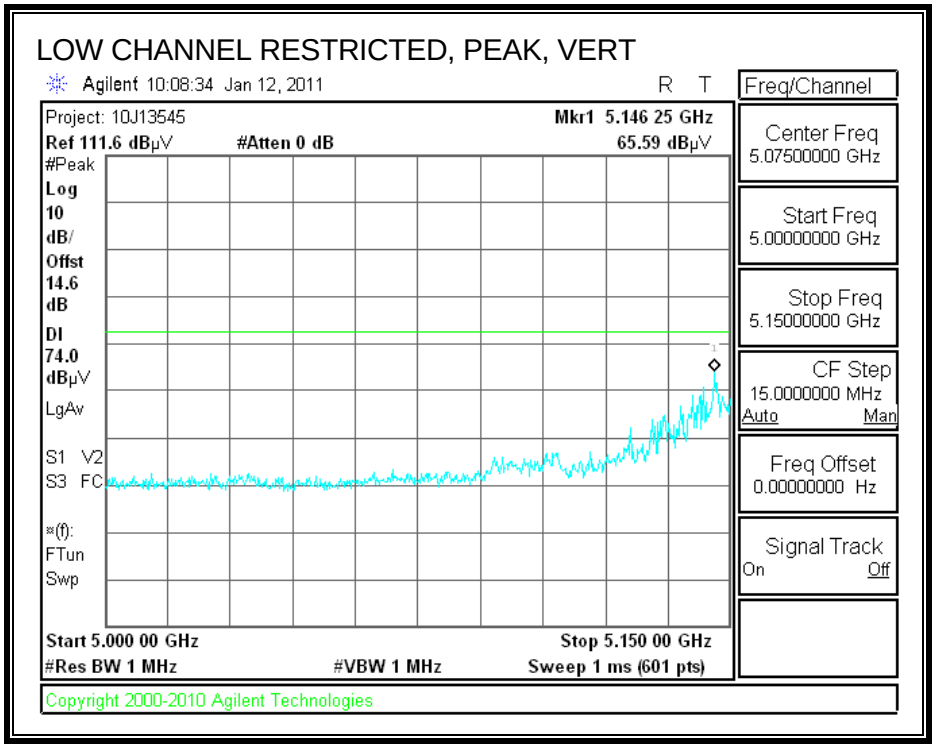
## 8.2.2. 802.11n HT20 MIMO MODE IN THE LOWER 5.2 GHz BAND

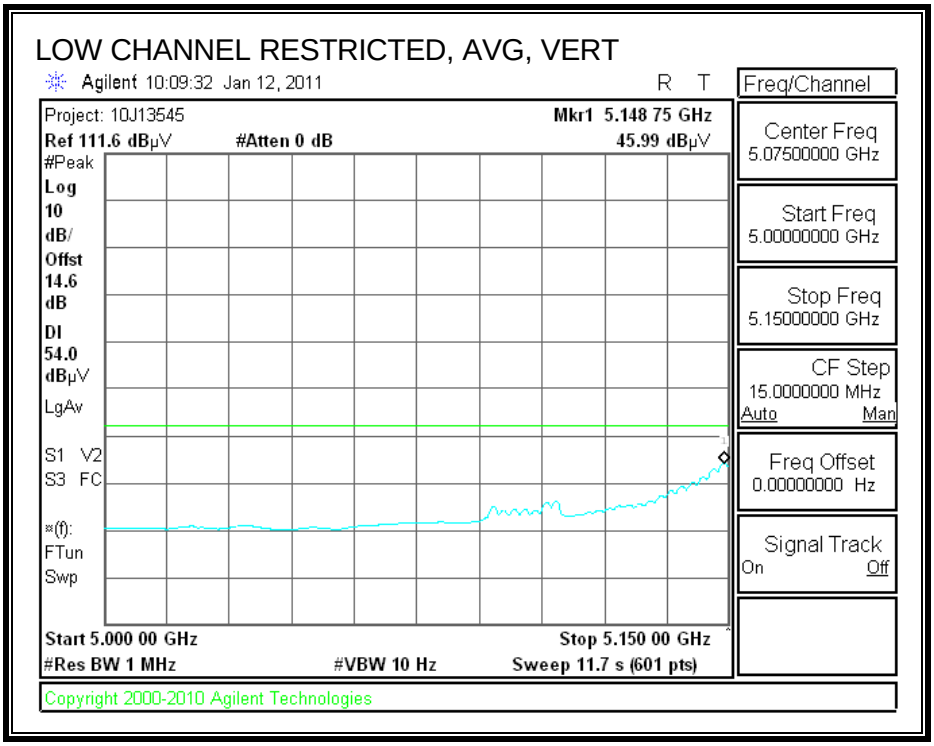
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**





**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**





## HARMONICS AND SPURIOUS EMISSIONS

**High Frequency Measurement**
**Compliance Certification Services, Fremont 5m Chamber**

**Test Engr:** William Zhuang
**Date:** 01/18/11
**Project #:** 10J13545
**Company:** Hon Hai Precision Ind. Co.,Ltd.
**Test Target:** FCC 15.407
**Mode Oper:** HT20 Mode

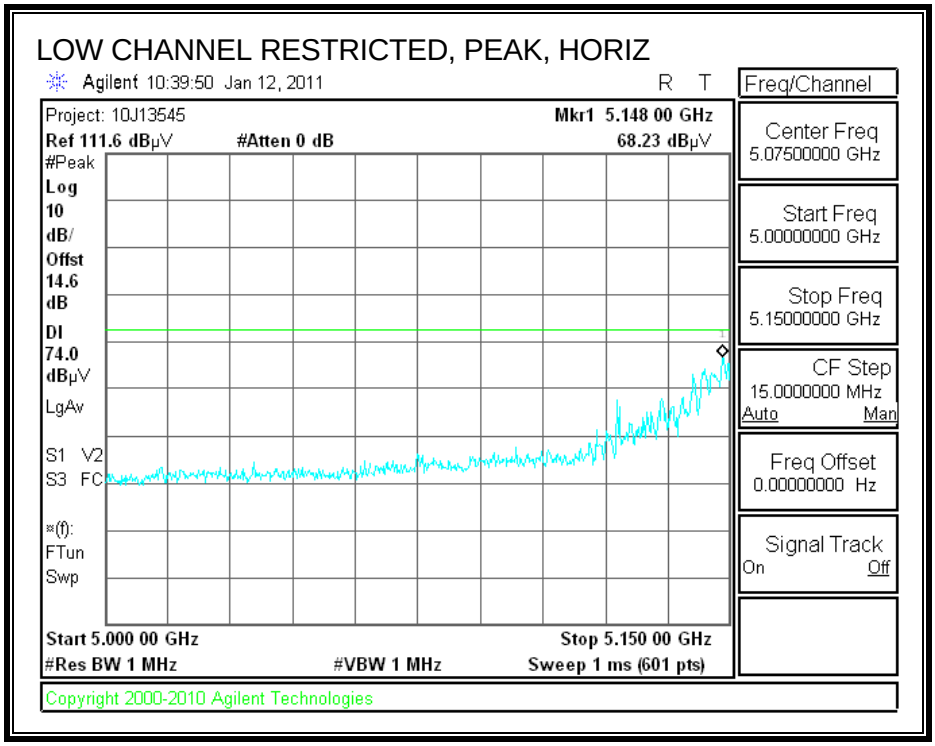
| | | | | | |
|---|---|---|---|---|---|
| f | Measurement Frequency | Amp | Preamp Gain | | Average Field Strength Limit |
| Dist | Distance to Antenna | D Corr | Distance Correct to 3 meters | | Peak Field Strength Limit |
| Read | Analyzer Reading | Avg | Average Field Strength @ 3 m | | Margin vs.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

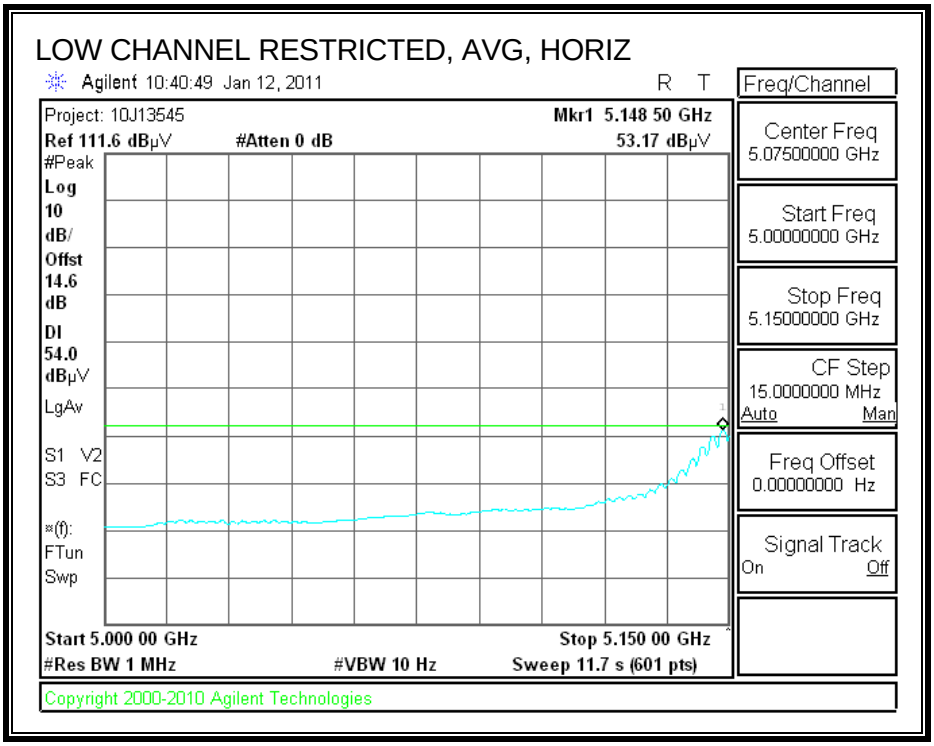
| f GHz | Dist (m) | Read dBuV | AF dB/m | CL dB | Amp dB | D Corr dB | Fltr dB | Corr. dBuV/m | Limit dBuV/m | Margin dB | Ant. Pol. V/H | Det. P/A/QP | Ant.High cm | Table Angle Degree | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 5180 MHz | | | | | | | | | | | | | | | |
| 15.540 | 3.0 | 36.3 | 38.7 | 11.3 | -34.8 | 0.0 | 0.7 | 52.3 | 74.0 | -21.7 | V | P | 182.5 | 38.4 | |
| 15.540 | 3.0 | 23.9 | 38.7 | 11.3 | -34.8 | 0.0 | 0.7 | 39.9 | 54.0 | -14.1 | V | A | 182.5 | 38.4 | |
| 15.540 | 3.0 | 35.9 | 38.7 | 11.3 | -34.8 | 0.0 | 0.7 | 51.8 | 74.0 | -22.2 | H | P | 103.4 | 96.4 | |
| 15.540 | 3.0 | 23.8 | 38.7 | 11.3 | -34.8 | 0.0 | 0.7 | 39.7 | 54.0 | -14.3 | H | A | 103.4 | 96.4 | |
| 20.720 | 3.0 | 34.5 | 40.8 | 13.7 | -35.1 | 0.0 | 0.1 | 53.9 | 74.0 | -20.1 | V | P | 197.7 | 0.0 | |
| 20.720 | 3.0 | 22.7 | 40.8 | 13.7 | -35.1 | 0.0 | 0.1 | 42.1 | 54.0 | -11.9 | V | A | 197.7 | 0.0 | |
| 20.720 | 3.0 | 34.9 | 40.8 | 13.7 | -35.1 | 0.0 | 0.1 | 54.3 | 74.0 | -19.7 | H | P | 130.4 | 34.3 | |
| 20.720 | 3.0 | 22.7 | 40.8 | 13.7 | -35.1 | 0.0 | 0.1 | 42.1 | 54.0 | -11.9 | H | A | 130.4 | 34.3 | |
| Mid Ch. 5200 MHz | | | | | | | | | | | | | | | |
| 15.600 | 3.0 | 35.9 | 38.5 | 11.4 | -34.8 | 0.0 | 0.7 | 51.7 | 74.0 | -22.3 | V | P | 105.4 | 137.2 | |
| 15.600 | 3.0 | 23.9 | 38.5 | 11.4 | -34.8 | 0.0 | 0.7 | 39.7 | 54.0 | -14.3 | V | A | 105.4 | 137.2 | |
| 15.600 | 3.0 | 36.2 | 38.5 | 11.4 | -34.8 | 0.0 | 0.7 | 52.0 | 74.0 | -22.0 | H | P | 199.7 | 231.4 | |
| 15.600 | 3.0 | 24.0 | 38.5 | 11.4 | -34.8 | 0.0 | 0.7 | 39.8 | 54.0 | -14.2 | H | A | 199.7 | 231.4 | |
| 20.800 | 3.0 | 34.6 | 40.7 | 13.7 | -35.2 | 0.0 | 0.0 | 53.9 | 74.0 | -20.1 | V | P | 197.5 | 268.6 | |
| 20.800 | 3.0 | 22.7 | 40.7 | 13.7 | -35.2 | 0.0 | 0.0 | 41.9 | 54.0 | -12.1 | V | A | 197.5 | 268.6 | |
| 20.800 | 3.0 | 35.3 | 40.7 | 13.7 | -35.2 | 0.0 | 0.0 | 54.6 | 74.0 | -19.4 | H | P | 103.5 | 273.3 | |
| 20.800 | 3.0 | 22.7 | 40.7 | 13.7 | -35.2 | 0.0 | 0.0 | 42.0 | 54.0 | -12.1 | H | A | 103.5 | 273.3 | |
| High Ch. 5240 MHz | | | | | | | | | | | | | | | |
| 15.720 | 3.0 | 36.4 | 38.2 | 11.4 | -34.7 | 0.0 | 0.7 | 52.1 | 74.0 | -21.9 | V | P | 149.2 | 3.4 | |
| 15.720 | 3.0 | 24.0 | 38.2 | 11.4 | -34.7 | 0.0 | 0.7 | 39.6 | 54.0 | -14.4 | V | A | 149.2 | 3.4 | |
| 15.720 | 3.0 | 35.8 | 38.2 | 11.4 | -34.7 | 0.0 | 0.7 | 51.4 | 74.0 | -22.6 | H | P | 111.1 | 162.7 | |
| 15.720 | 3.0 | 24.0 | 38.2 | 11.4 | -34.7 | 0.0 | 0.7 | 39.6 | 54.0 | -14.4 | H | A | 111.1 | 162.7 | |
| 20.960 | 3.0 | 34.7 | 40.3 | 13.7 | -35.2 | 0.0 | 0.0 | 53.5 | 74.0 | -20.5 | V | P | 112.4 | 139.5 | |
| 20.960 | 3.0 | 22.2 | 40.3 | 13.7 | -35.2 | 0.0 | 0.0 | 41.1 | 54.0 | -12.9 | V | A | 112.4 | 139.5 | |
| 20.960 | 3.0 | 34.0 | 40.3 | 13.7 | -35.2 | 0.0 | 0.0 | 52.9 | 74.0 | -21.1 | H | P | 123.8 | 316.5 | |
| 20.960 | 3.0 | 22.2 | 40.3 | 13.7 | -35.2 | 0.0 | 0.0 | 41.1 | 54.0 | -12.9 | H | A | 123.8 | 316.5 | |

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

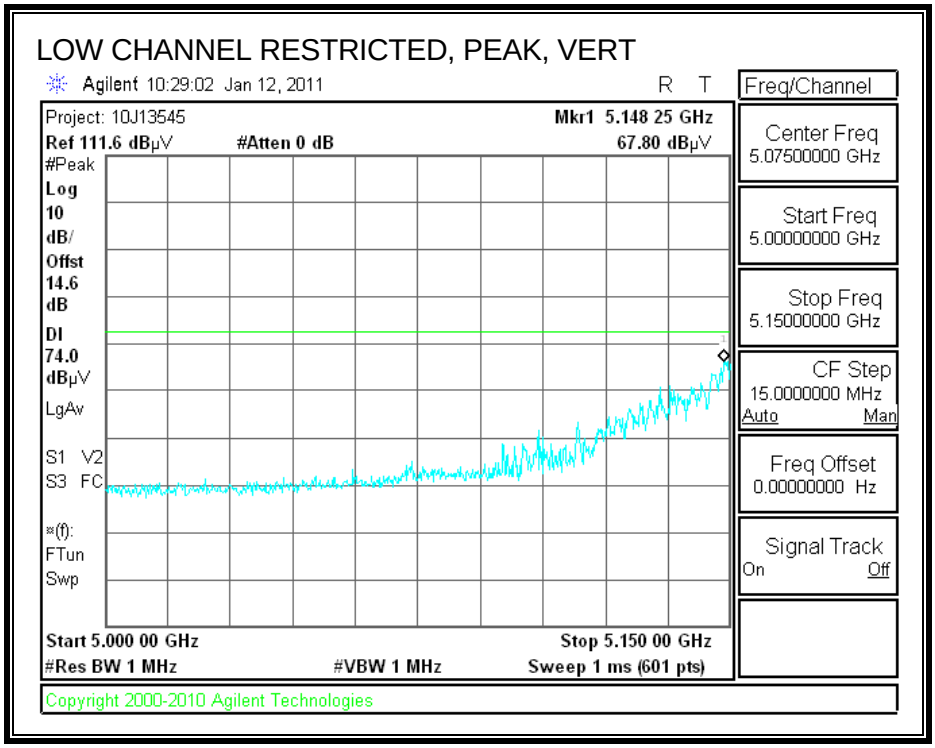
## 8.2.3. 802.11n HT40 MIMO MODE IN THE LOWER 5.2 GHz BAND

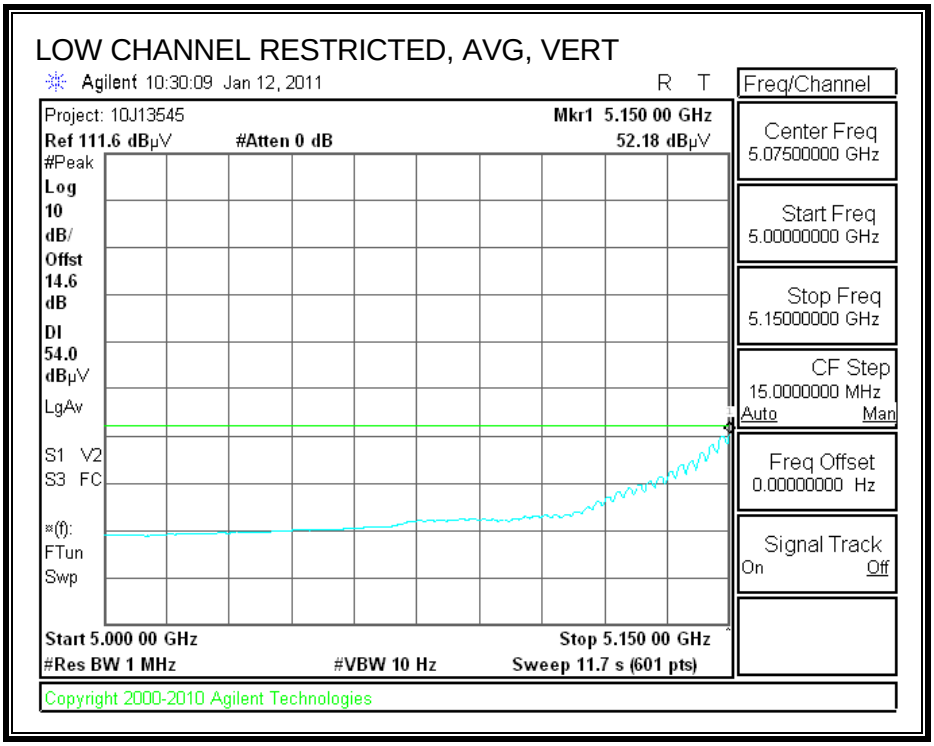
**RESTRICTED BANDEDGE (LOW CHANNEL, HORIZONTAL)**





**RESTRICTED BANDEDGE (LOW CHANNEL, VERTICAL)**





## HARMONICS AND SPURIOUS EMISSIONS

**High Frequency Measurement**
**Compliance Certification Services, Fremont 5m Chamber**

**Test Engr:** William Zhuang
**Date:** 01/18/11
**Project #:** 10J13545
**Company:** Hon Hai Precision Ind. Co.,Ltd.
**Test Target:** FCC 15.407
**Mode Oper:** HT40 Mode

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

| | | | |
|---|---|---|---|
| Average Field Strength Limit | | | |
| Peak Field Strength Limit | | | |
| Margin vs. Average Limit | | | |
| Margin vs. Peak Limit | | | |

| 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 | Ant.High cm | Table Angle Degree | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Low Ch. 5190 MHz | | | | | | | | | | | | | | | |
| 15.570 | 3.0 | 35.6 | 38.6 | 11.4 | -34.8 | 0.0 | 0.7 | 51.5 | 74.0 | -22.5 | V | P | 184.5 | 299.2 | |
| 15.570 | 3.0 | 23.7 | 38.6 | 11.4 | -34.8 | 0.0 | 0.7 | 39.6 | 54.0 | -14.4 | V | A | 184.5 | 299.2 | |
| 15.570 | 3.0 | 36.2 | 38.6 | 11.4 | -34.8 | 0.0 | 0.7 | 52.1 | 74.0 | -21.9 | H | P | 140.1 | 239.0 | |
| 15.570 | 3.0 | 23.7 | 38.6 | 11.4 | -34.8 | 0.0 | 0.7 | 39.6 | 54.0 | -14.4 | H | A | 140.1 | 239.0 | |
| 20.760 | 3.0 | 35.2 | 40.8 | 13.7 | -35.1 | 0.0 | 0.0 | 54.5 | 74.0 | -19.5 | V | P | 185.9 | 185.5 | |
| 20.760 | 3.0 | 22.6 | 40.8 | 13.7 | -35.1 | 0.0 | 0.0 | 41.9 | 54.0 | -12.1 | V | A | 185.9 | 185.5 | |
| 20.760 | 3.0 | 35.3 | 40.8 | 13.7 | -35.1 | 0.0 | 0.0 | 54.6 | 74.0 | -19.4 | H | P | 179.6 | 117.1 | |
| 20.760 | 3.0 | 22.7 | 40.8 | 13.7 | -35.1 | 0.0 | 0.0 | 42.0 | 54.0 | -12.0 | H | A | 179.6 | 117.1 | |
| High Ch. 5230 MHz | | | | | | | | | | | | | | | |
| 15.690 | 3.0 | 36.3 | 38.3 | 11.4 | -34.7 | 0.0 | 0.7 | 51.9 | 74.0 | -22.1 | V | P | 165.6 | 252.4 | |
| 15.690 | 3.0 | 23.8 | 38.3 | 11.4 | -34.7 | 0.0 | 0.7 | 39.5 | 54.0 | -14.5 | V | A | 165.6 | 252.4 | |
| 15.690 | 3.0 | 36.6 | 38.3 | 11.4 | -34.7 | 0.0 | 0.7 | 52.3 | 74.0 | -21.7 | H | P | 200.0 | 14.5 | |
| 15.690 | 3.0 | 23.9 | 38.3 | 11.4 | -34.7 | 0.0 | 0.7 | 39.6 | 54.0 | -14.4 | H | A | 200.0 | 14.5 | |
| 20.920 | 3.0 | 34.7 | 40.4 | 13.7 | -35.2 | 0.0 | 0.0 | 53.7 | 74.0 | -20.4 | V | P | 100.0 | 174.3 | |
| 20.920 | 3.0 | 22.3 | 40.4 | 13.7 | -35.2 | 0.0 | 0.0 | 41.2 | 54.0 | -12.8 | V | A | 100.0 | 174.3 | |
| 20.920 | 3.0 | 34.5 | 40.4 | 13.7 | -35.2 | 0.0 | 0.0 | 53.4 | 74.0 | -20.6 | H | P | 132.3 | 337.5 | |
| 20.920 | 3.0 | 22.3 | 40.4 | 13.7 | -35.2 | 0.0 | 0.0 | 41.2 | 54.0 | -12.8 | H | A | 132.3 | 337.5 | |

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. 20MHZ BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

| | |
|---|---|
| Company: | Hon Hai Precision Ind. Co.,Ltd. |
| Project #: | 10J13545 |
| Date: | 01/18/11 |
| Test Engineer: | William Zhuang |
| Configuration: | EUT with Laptop |
| Mode: | HT20, Mid Ch. 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.596 | 3.0 | 52.2 | 32.2 | 25.9 | 3.0 | -38.6 | 0.0 | 0.0 | 42.4 | 22.4 | 74 | 54 | -31.6 | -31.6 | V |
| 2.398 | 3.0 | 52.7 | 30.9 | 28.2 | 3.8 | -37.5 | 0.0 | 0.0 | 47.2 | 25.4 | 74 | 54 | -26.8 | -28.6 | V |
| 2.655 | 3.0 | 53.5 | 29.9 | 29.0 | 4.1 | -37.4 | 0.0 | 0.0 | 49.1 | 25.5 | 74 | 54 | -24.9 | -28.5 | V |
| 2.932 | 3.0 | 51.1 | 29.2 | 29.8 | 4.3 | -37.4 | 0.0 | 0.0 | 47.8 | 25.9 | 74 | 54 | -26.2 | -28.1 | V |
| 3.187 | 3.0 | 49.8 | 28.9 | 30.4 | 4.5 | -37.2 | 0.0 | 0.0 | 47.5 | 26.6 | 74 | 54 | -26.5 | -27.4 | V |
| 1.597 | 3.0 | 51.5 | 35.5 | 25.9 | 3.0 | -38.6 | 0.0 | 0.0 | 41.8 | 25.8 | 74 | 54 | -32.2 | -28.2 | H |
| 2.394 | 3.0 | 55.1 | 34.3 | 28.2 | 3.8 | -37.5 | 0.0 | 0.0 | 49.6 | 28.8 | 74 | 54 | -24.4 | -25.2 | H |
| 2.660 | 3.0 | 50.5 | 28.9 | 29.0 | 4.1 | -37.4 | 0.0 | 0.0 | 46.1 | 24.5 | 74 | 54 | -27.9 | -29.5 | H |
| 2.922 | 3.0 | 47.1 | 29.0 | 29.8 | 4.3 | -37.4 | 0.0 | 0.0 | 43.7 | 25.7 | 74 | 54 | -30.3 | -28.3 | H |
| 3.192 | 3.0 | 48.1 | 28.9 | 30.4 | 4.5 | -37.2 | 0.0 | 0.0 | 45.8 | 26.6 | 74 | 54 | -28.2 | -27.4 | H |

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| | | | | | |
|---|---|---|---|---|---|
| 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. 40MHZ BANDWIDTH

High Frequency Measurement
Compliance Certification Services, Fremont 5m Chamber

| | |
|---|---|
| Company: | Hon Hai Precision Ind. Co.,Ltd. |
| Project #: | 10J13545 |
| Date: | 01/18/11 |
| Test Engineer: | William Zhuang |
| Configuration: | EUT with Laptop |
| Mode: | HT40, High Ch. 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) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1.595 | 3.0 | 52.2 | 32.0 | 25.9 | 3.0 | -38.6 | 0.0 | 0.0 | 42.5 | 22.3 | 74 | 54 | -31.5 | -31.7 | V |
| 2.393 | 3.0 | 51.8 | 30.4 | 28.2 | 3.8 | -37.5 | 0.0 | 0.0 | 46.4 | 24.9 | 74 | 54 | -27.6 | -29.1 | V |
| 2.655 | 3.0 | 56.7 | 31.2 | 29.0 | 4.1 | -37.4 | 0.0 | 0.0 | 52.3 | 26.7 | 74 | 54 | -21.7 | -27.3 | V |
| 2.921 | 3.0 | 52.1 | 30.2 | 29.8 | 4.3 | -37.4 | 0.0 | 0.0 | 48.8 | 26.9 | 74 | 54 | -25.2 | -27.1 | V |
| 3.188 | 3.0 | 51.9 | 29.2 | 30.4 | 4.5 | -37.2 | 0.0 | 0.0 | 49.6 | 26.9 | 74 | 54 | -24.4 | -27.1 | V |
| 1.593 | 3.0 | 51.0 | 36.1 | 25.8 | 3.0 | -38.6 | 0.0 | 0.0 | 41.3 | 26.3 | 74 | 54 | -32.7 | -27.7 | H |
| 2.392 | 3.0 | 51.7 | 33.5 | 28.2 | 3.8 | -37.5 | 0.0 | 0.0 | 46.2 | 28.0 | 74 | 54 | -27.8 | -26.0 | H |
| 2.663 | 3.0 | 49.3 | 29.3 | 29.0 | 4.1 | -37.4 | 0.0 | 0.0 | 44.9 | 24.9 | 74 | 54 | -29.1 | -29.1 | H |
| 2.927 | 3.0 | 45.9 | 29.1 | 29.8 | 4.3 | -37.4 | 0.0 | 0.0 | 42.6 | 25.8 | 74 | 54 | -31.4 | -28.2 | H |
| 3.188 | 3.0 | 48.3 | 28.9 | 30.4 | 4.5 | -37.2 | 0.0 | 0.0 | 46.0 | 26.6 | 74 | 54 | -28.0 | -27.4 | H |

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| | | | | | |
|---|---|---|---|---|---|
| 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:** William Zhuang
**Date:** 01/18/11
**Project #:** 10J13545
**Company:** Hon Hai Precision Ind. Co.,Ltd.
**Test Target:** FCC IC Class B
**Mode Oper:** Worst case on HT20 Mode, Low Ch.

| | | | | | |
|---|---|---|---|---|---|
| f | Measurement Frequency | Amp | Preamp Gain | Margin | Margin vs. Limit |
| 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 | | |

| 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 | Ant. High cm | Table Angle Degree | Notes |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Horizontal** | | | | | | | | | | | | | | | |
| 124.564 | 3.0 | 56.4 | 13.7 | 1.1 | 28.3 | 0.0 | 0.0 | 42.8 | 43.5 | -0.7 | H | P | 100.0 | 0 - 360 | Prescan |
| 416.416 | 3.0 | 55.0 | 15.2 | 1.8 | 28.1 | 0.0 | 0.0 | 44.0 | 46.0 | -2.0 | H | P | 100.0 | 0 - 360 | Prescan |
| 683.067 | 3.0 | 50.6 | 19.4 | 2.4 | 27.2 | 0.0 | 0.0 | 45.1 | 46.0 | -0.9 | H | P | 100.0 | 0 - 360 | Prescan |
| 779.911 | 3.0 | 46.5 | 20.7 | 2.6 | 27.4 | 0.0 | 0.0 | 42.4 | 46.0 | -3.6 | H | P | 100.0 | 0 - 360 | Prescan |
| 912.036 | 3.0 | 40.6 | 21.9 | 2.8 | 27.8 | 0.0 | 0.0 | 37.5 | 46.0 | -8.5 | H | P | 100.0 | 0 - 360 | Prescan |
| 966.519 | 3.0 | 40.8 | 22.3 | 2.9 | 27.9 | 0.0 | 0.0 | 38.2 | 54.0 | -15.8 | H | P | 100.0 | 0 - 360 | Prescan |
| **Vertical** | | | | | | | | | | | | | | | |
| 201.847 | 3.0 | 44.8 | 12.0 | 1.3 | 28.2 | 0.0 | 0.0 | 29.8 | 43.5 | -13.7 | V | P | 100.0 | 0 - 360 | Prescan |
| 261.01 | 3.0 | 44.4 | 12.1 | 1.4 | 28.2 | 0.0 | 0.0 | 29.7 | 46.0 | -16.3 | V | P | 100.0 | 0 - 360 | Prescan |
| 663.866 | 3.0 | 39.5 | 19.2 | 2.4 | 27.3 | 0.0 | 0.0 | 33.7 | 46.0 | -12.3 | V | P | 100.0 | 0 - 360 | Prescan |
| 732.389 | 3.0 | 41.7 | 20.0 | 2.5 | 27.3 | 0.0 | 0.0 | 36.9 | 46.0 | -9.1 | V | P | 100.0 | 0 - 360 | Prescan |
| 906.036 | 3.0 | 37.8 | 21.9 | 2.8 | 27.8 | 0.0 | 0.0 | 34.7 | 46.0 | -11.3 | V | P | 100.0 | 0 - 360 | Prescan |
| 966.519 | 3.0 | 37.8 | 22.3 | 2.9 | 27.9 | 0.0 | 0.0 | 35.1 | 54.0 | -18.9 | V | P | 100.0 | 0 - 360 | Prescan |

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**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**

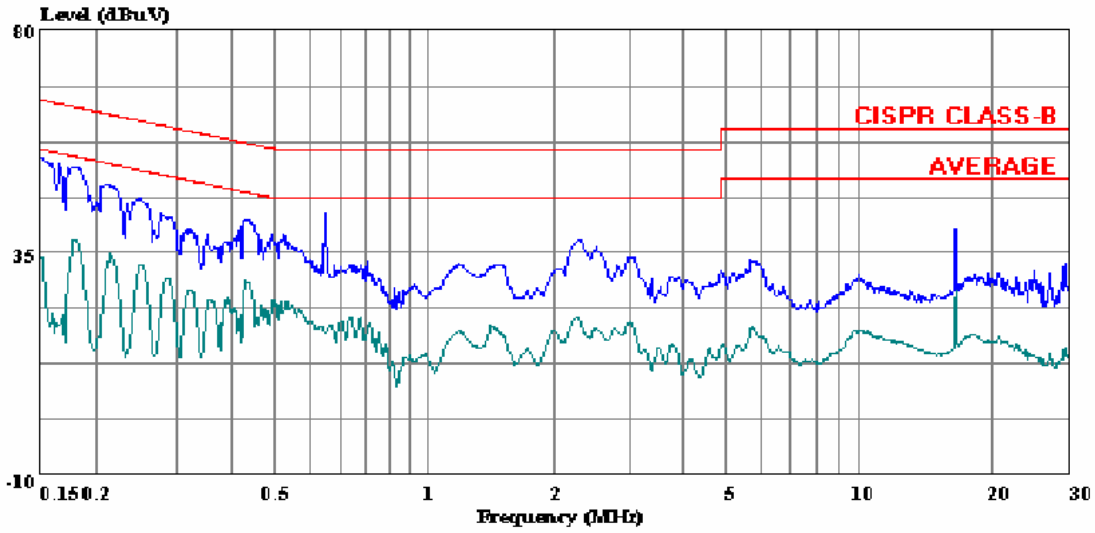
## 6 WORST EMISSIONS

| CONDUCTED EMISSIONS DATA | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Freq. | Reading | | | Closs | Limit | FCC_B | Margin | | Remark |
| (MHz) | PK (dBuV) | QP (dBuV) | AV (dBuV) | (dB) | QP | AV | QP (dB) | AV (dB) | L1 / L2 |
| 0.15 | 54.27 | -- | 34.00 | 0.00 | 66.00 | 56.00 | -11.73 | -22.00 | L1 |
| 0.65 | 42.85 | -- | 37.58 | 0.00 | 56.00 | 46.00 | -13.15 | -8.42 | L1 |
| 16.57 | 39.92 | -- | 27.52 | 0.00 | 60.00 | 50.00 | -20.08 | -22.48 | L1 |
| 0.15 | 54.95 | -- | 32.47 | 0.00 | 66.00 | 56.00 | -11.05 | -23.53 | L2 |
| 0.18 | 50.25 | -- | 33.16 | 0.00 | 64.39 | 54.39 | -14.14 | -21.23 | L2 |
| 16.66 | 39.33 | -- | 27.98 | 0.00 | 60.00 | 50.00 | -20.67 | -22.02 | L2 |
| 6 Worst Data | | | | | | | | | |

**LINE 1 RESULTS**

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

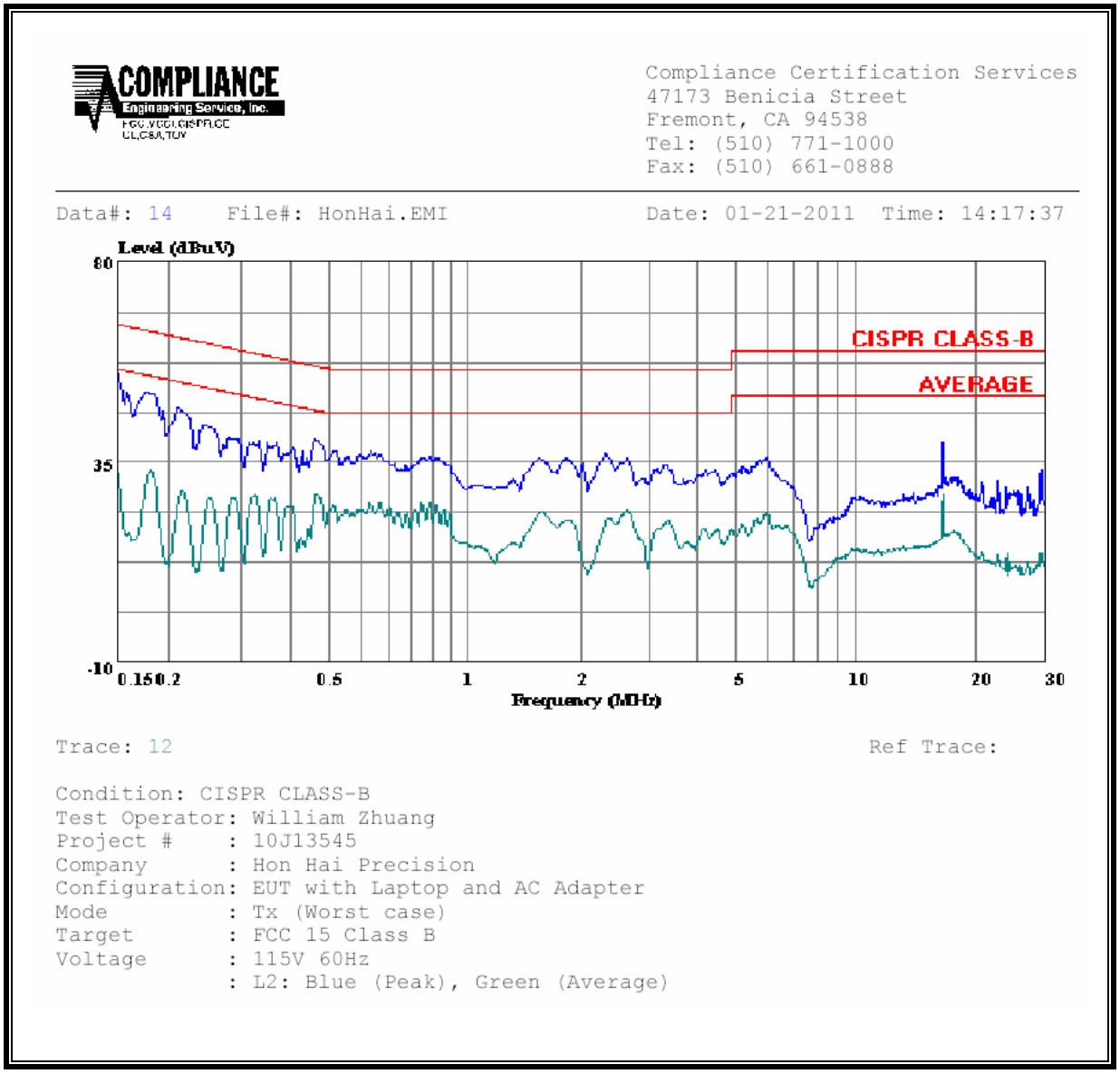
Data#: 7 File#: HonHai.EMI Date: 01-21-2011 Time: 14:08:53




Trace: 5 Ref Trace:

Condition: CISPR CLASS-B
Test Operator: William Zhuang
Project # : 10J13545
Company : Hon Hai Precision
Configuration: EUT with Laptop and AC Adapter
Mode : Tx (Worst case)
Target : FCC 15 Class B
Voltage : 115V 60Hz
: L1: Blue (Peak), Green (Average)

**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

**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 | 13.90 | 3.56 | 0.11 | 0.011 |