

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

CERTIFICATION TEST REPORT

FOR

802.11a/g/n 3X3 MIMO WLAN + BT COMBO PCI-E MINI CARD

MODEL NUMBER: BCM94331PCIEBT4

FCC ID: QDS-BRCM1055 IC: 4324A-BRCM1055

REPORT NUMBER: 10U13492-3

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Prepared for BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, U.S.A.

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

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Revision History

| Rev. | Issue Date | Revisions | Revised By |
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1. ATTESTATION OF TEST RESULTS

| COMPANY NAME: | OMPANY NAME: BROADCOM CORPORATION 190 MATHILDA PLACE SUNNYVALE, CA 94086, USA | | | |
|----------------------------------------------|-------------------------------------------------------------------------------------|--------------|--|--|
| EUT DESCRIPTION: | EUT DESCRIPTION: 802.11a/g/n 3x3 MIMO WLAN + BT Combo PCI-E Mini Car | | | |
| MODEL: | MODEL: BCM94331PCIEBT4 | | | |
| SERIAL NUMBER: | SERIAL NUMBER: 6 | | | |
| DATE TESTED: | NOVEMBER 15, 2010 to JANUA | RY 19, 2011 | | |
| | APPLICABLE STANDARDS | | | |
| S | TANDARD | TEST RESULTS | | |
| CFR 47 I | Part 15 Subpart E | Pass | | |
| INDUSTRY CANADA RSS-210 Issue 8 Annex 9 Pass | | | | |
| INDUSTRY CAN | 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:

Tested By:

THU CHAN ENGINEERING MANAGER UL CCS

VIEN TRAN EMC ENGINEER UL CCS

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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 <u>http://www.ccsemc.com</u>.

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%.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is an 802.11a/g/n 3x3 MIMO WLAN + BT Combo PCI-E Mini Card.

The radio module is manufactured by Broadcom.

5.2. MAXIMUM OUTPUT POWER

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

| Frequency Range | Mode | Output Power | Output Power |
|----------------------|------------|--------------|--------------|
| (MHz) | | (dBm) | (mW) |
| 5.2 GHz BAND, 1x3 | | | |
| 5180 - 5240 | 802.11a | 16.35 | 43.15 |
| 5190 - 5230 | SISO HT40 | 16.60 | 45.71 |
| 5.2 GHz BAND, 3x3 HT | 20 MODE | | |
| 5180 - 5240 | STBC MCS 0 | 14.24 | 26.55 |
| 5180 - 5240 | SDM MCS 8 | 14.32 | 27.04 |
| 5180 - 5240 | SDM MCS 12 | 14.20 | 26.30 |
| 5180 - 5240 | SDM MCS 16 | 15.07 | 32.14 |
| 5180 - 5240 | SDM MCS 21 | 14.37 | 27.35 |
| 5.2 GHz BAND, 2X2 HT | 40 MODE | | |
| 5190 - 5230 | STBC MCS 0 | 16.67 | 46.45 |
| 5190 - 5230 | SDM MCS 8 | 16.86 | 48.53 |
| 5190 - 5230 | SDM MCS 12 | 16.89 | 48.87 |
| 5.2 GHz BAND, 3x3 HT | 40 MODE | | |
| 5190 - 5230 | STBC MCS 0 | 16.77 | 47.53 |
| 5190 - 5230 | STBC MCS 8 | 16.84 | 48.31 |
| 5190 - 5230 | SDM MCS 12 | 16.80 | 47.86 |
| 5190 - 5230 | SDM MCS 16 | 16.83 | 48.19 |
| 5190 - 5230 | SDM MCS 21 | 16.52 | 44.87 |

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| Frequency Range | Mode | Output Power | Output Power | |
|------------------------|------------|--------------|--------------|--|
| (MHz) | | (dBm) | (mW) | |
| 5.3 GHz BAND, 1x3 | | | • | |
| 5260 - 5320 | 802.11a | 18.90 | 77.62 | |
| 5270 - 5310 | SISO HT40 | 21.52 | 141.91 | |
| 5.3 GHz BAND, 3x3 HT20 | MODE | | | |
| 5260 - 5320 | CDD MCS 0 | 16.96 | 49.66 | |
| 5260 - 5320 | SDM MCS 21 | 20.53 | 112.98 | |
| 5.3 GHz BAND, 3X3 HT40 | MODE | | | |
| 5270 - 5310 | CDD MCS 0 | 18.64 | 73.11 | |
| 5270 - 5310 | SDM MCS 21 | 23.11 | 204.64 | |
| 5.6 GHz BAND | | | | |
| 5500 - 5700 | 802.11a | 20.26 | 106.17 | |
| 5510 - 5670 | SISO HT40 | 22.39 | 173.38 | |

5.6 GHz BAND, 3X3 HT20 MODE

| 5500 - 5700 | CDD MCS0 | 18.57 | 71.94 |
|-------------|-----------|-------|--------|
| 5500 - 5700 | SDM MCS21 | 21.40 | 138.04 |

5.6 GHz BAND, 3X3 HT40 MODE

| 5510 - 5670 | CDD MCS0 | 18.53 | 71.29 |
|-------------|-----------|-------|--------|
| 5510 - 5670 | SDM MCS21 | 22.89 | 194.54 |

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5.3. DESCRIPTION OF AVAILABLE ANTENNAS

The radio utilizes three 802.11 agn antennas, with a maximum gain as below table;

2x2-ANTENNA

| K90 | Antenna Gain | | Antenna Gain |
|-----|--------------|-------|--------------|
| | Ant 1 | Ant 2 | Combined |
| GHz | dBi | dBi | dBi |
| 5.2 | 6.02 | 5.96 | 9.00 |
| 5.3 | 6.80 | 6.17 | 9.51 |
| 5.6 | 7.06 | 6.26 | 9.69 |

3x3-ANTENNA

| K90 | | Antenna Gai | n | Antenna Gain |
|-----|-------|-------------|-------|--------------|
| | Ant 1 | Ant 2 | Ant 3 | Combined |
| GHz | dBi | dBi | dBi | dBi |
| 5.2 | 6.02 | 5.96 | 5.50 | 10.60 |
| 5.3 | 6.80 | 6.17 | 5.59 | 10.99 |
| 5.6 | 7.06 | 6.26 | 5.97 | 11.23 |

5.4. SOFTWARE AND FIRMWARE

The EUT driver software installed during testing was Broadcom, rev. 5.100.98.17 The test utility software used during testing was BCM Internal, rev. 5.100.RC98.17.

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5.5. WORST-CASE CONFIGURATION AND MODE

The EUT was tested as an external module installed in a test jig board connected to a host Laptop PC.

Worst-Case data rates were utilized from preliminary testing of the Chipset, worst-case data rates used during the testing are as follows:

For 5GHz Band:

All final tests in the 802.11a Legacy mode were made at 6 Mb/s. All final tests in the 802.11n 20 MHz CDD/SDM mode were made at MCS0. All final tests in the 802.11n 40 MHz CDD/SDM mode were made at MCS0.

Worst-case mode and channel used for 30-1000 MHz radiated and power line conducted emissions was the mode and channel with the highest output power, that was determined to be 11n HT20 mode, mid channel..

For MIMO conducted spurious measurement preliminary testing showed that combiner is worstcase compared to individual chains; therefore final measurements were performed using combiner for all channels and modes.

For MIMO PSD measurement preliminary testing to individual chains; therefore final measurements were performed using individual chains for all channels and modes.

For radiated band edge measurements preliminary testing showed that the worst case was vertical polarization, so final measurements were performed with vertical polarization.

All legacy modes were measured with the highest gain for each type of antenna.

All MIMO modes were measured with the highest combination of gains for each type of antenna. Note that this combination of antennas will not be implemented in the end product. This combination was selected for testing purposes only, to accommodate the highest gain of each antenna type in one single test configuration. The combined gain of this test configuration is higher than any combined gain that will be implemented in the end product.

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5.6. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

| PERIPHERAL SUPPORT EQUIPMENT LIST | | | | | | | |
|-----------------------------------------------------|----------|-------------------|---------------------------|-----|--|--|--|
| Description Manufacturer Model Serial Number FCC ID | | | | | | | |
| Laptop | Dell | Inspiron 0000 | CN-9010003-70166-57K-01JS | DoC | | | |
| AC Adapter | Dell | ADP-60NH B | MOW0528000191 | DoC | | | |
| Adapter Board Catalyst MINI2EXP BRCM 07 N/A | | | | | | | |
| Adapter Board | Broadcom | BCM94331PCIBT4HAD | 241 | N/A | | | |

I/O CABLES

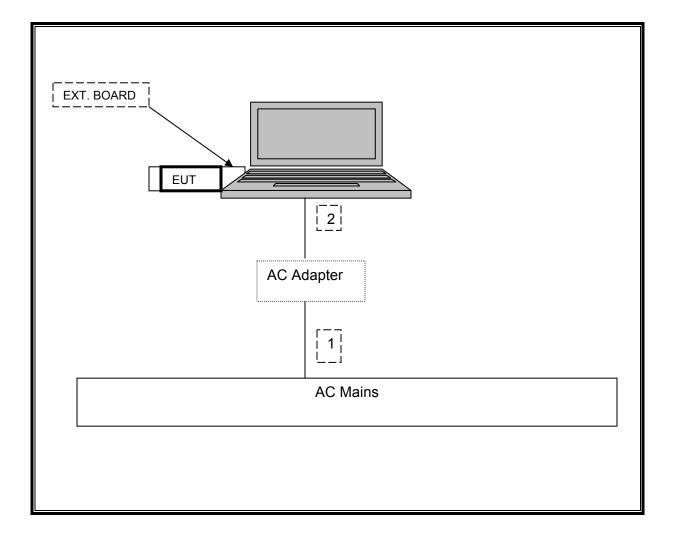
| | I/O CABLE LIST | | | | | | | | |
|--------------|----------------|---|-------------------|-------------|-----------------|-------------------------|--|--|--|
| Cable No. | Port | | Connector Type | | Cable Length | Remarks | | | |
| 1 | AC | 1 | US 115V | Shielded | 1.5m | NA | | | |
| 2 | DC | 1 | DC | Un-shielded | 1.5m | Ferrite at laptop's end | | | |

TEST SETUP

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

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SETUP DIAGRAM



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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 D | | | | | | |
| Antenna, Bilog, 2 GHz | Sunol Sciences | JB1 | C01171 | 07/14/11 | | |
| Antenna, Horn, 18 GHz | EMCO | 3115 | C00872 | 07/29/11 | | |
| Antenna, Horn, 26.5 GHz | ARA | MWH-1826/B | C00980 | 07/29/11 | | |
| Preamplifier, 1300 MHz | Agilent / HP | 8447D | C00778 | 07/06/11 | | |
| Preamplifier, 26.5 GHz | Agilent / HP | 8449B | C00749 | 08/04/11 | | |
| Spectrum Analyzer, 44 GHz | Agilent / HP | E4446A | C00996 | 10/29/11 | | |
| Peak Power Meter | Agilent / HP | E9327A | C00964 | 12/04/11 | | |
| Peak Power Sensor | Agilent / HP | E4416A | C00963 | 12/04/11 | | |
| EMI Receiver, 6.5 GHz | Agilent / HP | 8546A | 1963 | 08/19/11 | | |
| Reject Filter, 5.15-5.35 GHz | Micro-Tronics | BRC13190 | N02679 | CNR | | |
| Reject Filter, 5.15-5.35 GHz | Micro-Tronics | BRC13190 | N02680 | CNR | | |
| Reject Filter, 5.47-5.725 GHz | Micro-Tronics | BRC13191 | N02678 | CNR | | |
| LISN, 10 kHz ~ 30 MHz | Solar | 8012-50-R-24- | N02481 | 11/05/11 | | |
| EMI Test Receiver, 30 MHz | R&S | ESHS 20 | N02396 | 05/06/12 | | |

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7. ANTENNA PORT TEST RESULTS

7.1. 802.11a MODE IN THE 5.2 GHz BAND

7.1.1. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

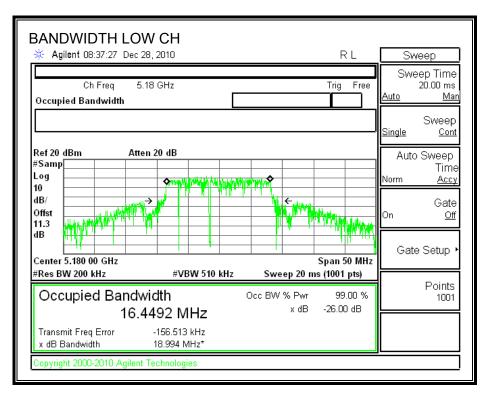
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

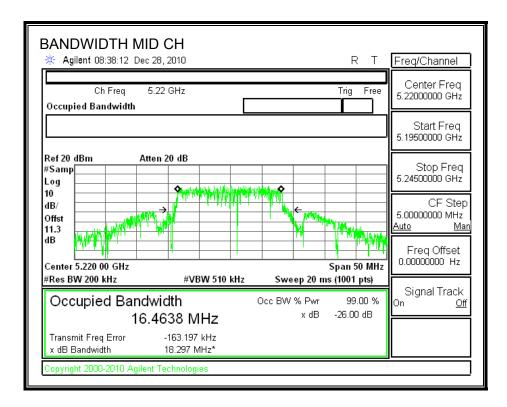
RESULTS

| Channel | Frequency | 26 dB Bandwidth | 99% Bandwidth |
|---------|-----------|-----------------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5180 | 18.994 | 16.4492 |
| Middle | 5200 | 18.297 | 16.4638 |
| High | 5240 | 18.553 | 16.4396 |

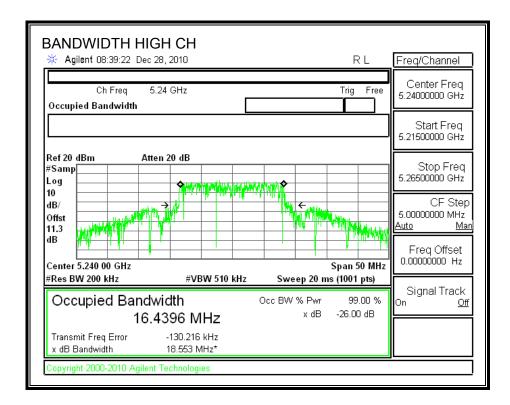
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26 dB and 99% BANDWIDTH





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7.1.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

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

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

RESULTS

| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit | |
|---------|-----------|-------|--------|--------------|---------|-------|--|
| | | Limit | | Limit | Gain | | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) | |
| Low | 5180 | 17 | 18.994 | 16.79 | 6.02 | 16.77 | |
| Mid | 5200 | 17 | 18.297 | 16.62 | 6.02 | 16.60 | |
| High | 5240 | 17 | 18.553 | 16.68 | 6.02 | 16.66 | |

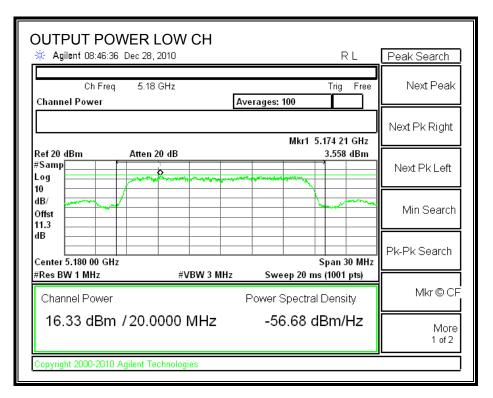
Limit

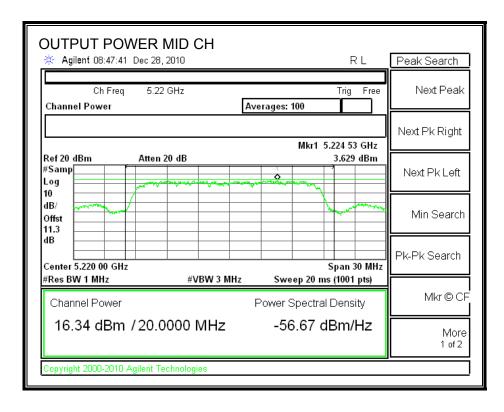
Results

| Channel | Frequency | Power | Limit | Margin |
|---------|-----------|-------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Low | 5180 | 16.33 | 16.77 | -0.44 |
| Mid | 5200 | 16.34 | 16.60 | -0.26 |
| High | 5240 | 16.35 | 16.66 | -0.31 |

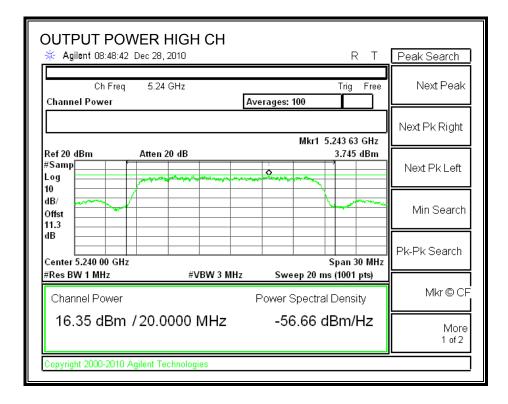
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OUTPUT POWER





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7.1.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 6.02 dBi, therefore the limit is 3.98 dBm.

TEST PROCEDURE

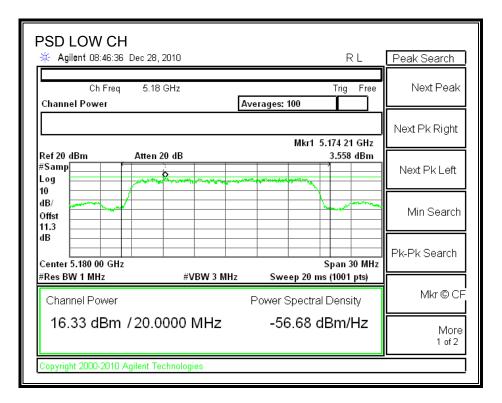
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

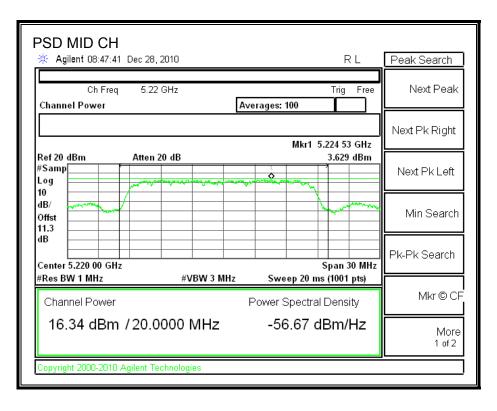
RESULTS

| Channel | Frequency | PPSD | Limit | Margin |
|---------|-----------|-------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Low | 5180 | 3.558 | 3.98 | -0.42 |
| Middle | 5200 | 3.629 | 3.98 | -0.35 |
| High | 5240 | 3.745 | 3.98 | -0.24 |

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POWER SPECTRAL DENSITY





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| PSD HIGH CH | 2010 | | RТ | Peak Search |
|------------------------------------|------------|---------------------------------|-----------|----------------|
| Ch Freq 5.24 Channel Power | _ | rerages: 100 | Frig Free | Next Peak |
| | | Mkr1 5.24 | 3 63 GHz | Next Pk Right |
| Ref 20 dBm Atten 2 #Samp Log | 0 dB | 3 | .745 dBm | Next Pk Left |
| 10 dB/ Offst 11.3 | | | | Min Search |
| dB Center 5.240 00 GHz | | Sp | an 30 MHz | Pk-Pk Search |
| #Res BW 1 MHz | #VBW 3 MHz | Sweep 20 ms (1 | 001 pts) | Mkr©CF |
| Channel Power 16.35 dBm /20.0 | | Power Spectral De -56.66 dBI | - | More 1 of 2 |
| Copyright 2000-2010 Agilent Te | chnologies | | | |

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7.1.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

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

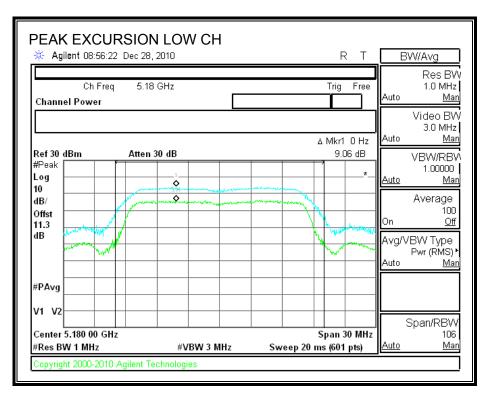
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

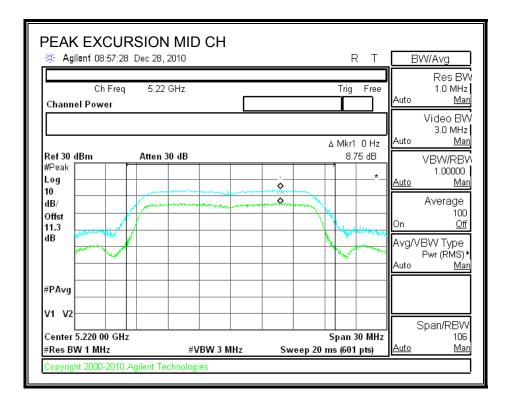
RESULTS

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5180 | 9.06 | 13 | -3.94 |
| Middle | 5200 | 8.75 | 13 | -4.25 |
| High | 5240 | 8.53 | 13 | -4.47 |

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PEAK EXCURSION





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| 🔆 Agilent 08:58:40 Dec 2 | 8, 2010 | | RΤ | B۷ | V/Avg |
|--------------------------------------|------------|----------------------|-------------------------|----------------|---------------------------------------------|
| Ch Freq 5. Channel Power | 24 GHz | | Trig Free | Auto | Res B\ 1.0 MHz <u>Ma</u> |
| | | ۵ | Mkr1 0 Hz | Auto | Video BV 3.0 MHz <u>Ma</u> |
| #Peak | n 30 dB | ↓ ◆ | 8.53 dB | <u>Auto</u> | VBW/RB ¹ 1.00000 <u>Ma</u> |
| 10 dB/ Offst 11.3 | | Parsing and a second | L | On | Average 100 <u>Off</u> |
| dB | | | | Avg/Vł Auto | 3W Type Pwr (RMS) <u>Ma</u> |
| #PAvg | | | | | |
| V1 V2 | | | | | pan/RBV |
| Center 5.240 00 GHz #Res BW 1 MHz | #VBW 3 MHz | S Sweep 20 ms | pan 30 MHz (601 pts) | <u>Auto</u> | 108 108 |

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7.1.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

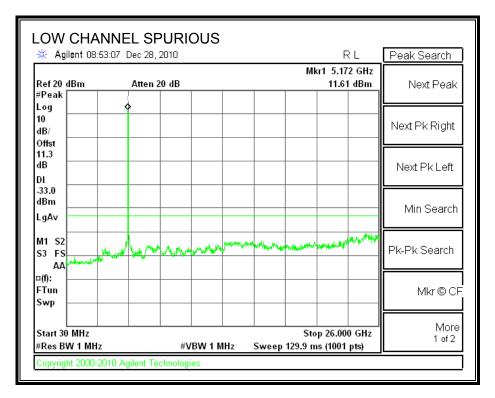
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

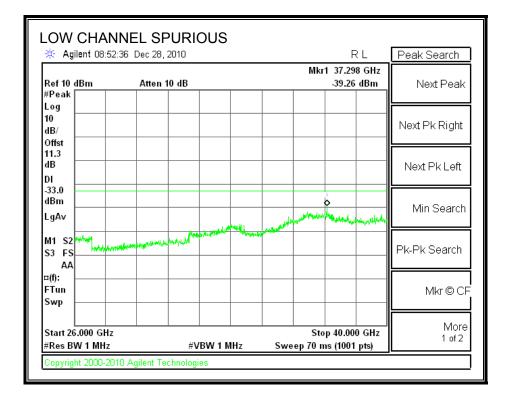
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

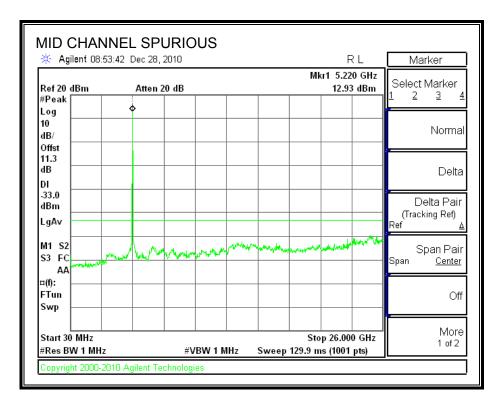
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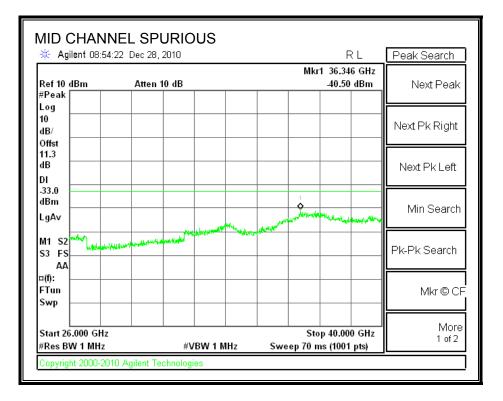
SPURIOUS EMISSIONS



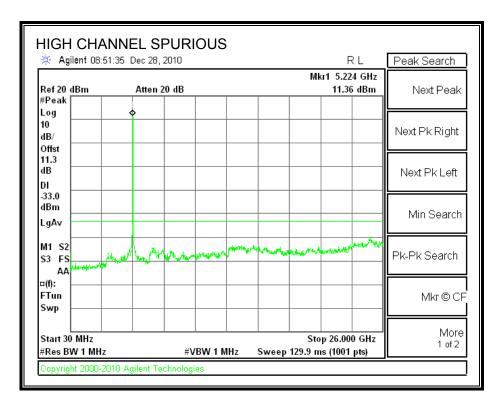


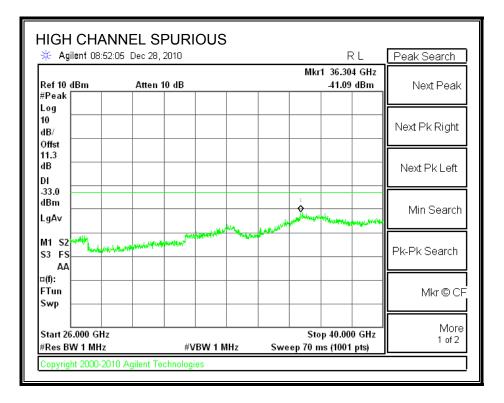
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7.2. 802.11n THREE CHAINS HT20 MODE IN THE 5.2 GHz BAND

CDD MCS0

This mode is not implemented in the 5.2 GHz band and will be disabled in production devices.

Preliminary testing demonstrated that CDD MCS0 was the worst case of various HT20 modes, therefore radiated measurements in the CDD MCS0 mode were performed.

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STBC MCS0

7.2.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

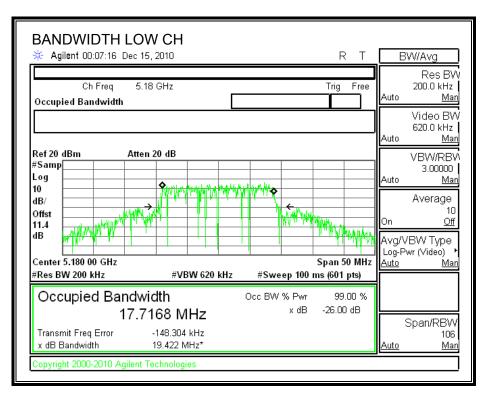
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

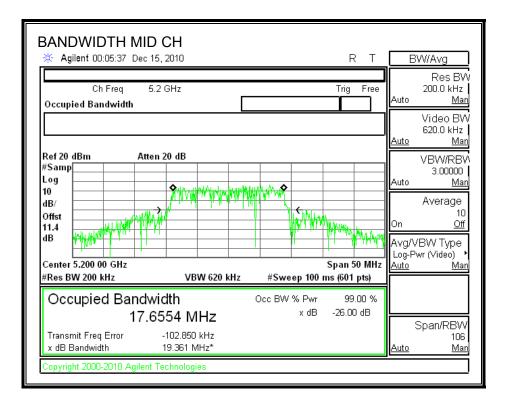
RESULTS

| Channel | Frequency | 26 dB Bandwidth | 99% Bandwidth |
|---------|-----------|-----------------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5180 | 19.422 | 17.7168 |
| Middle | 5200 | 19.361 | 17.6554 |
| High | 5240 | 19.295 | 17.5244 |

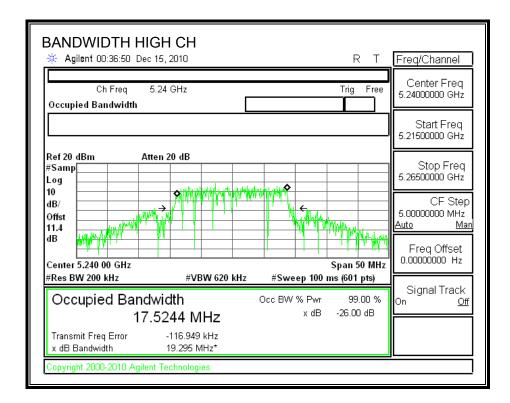
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26 dB and 99% BANDWIDTH





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7.2.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

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

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

RESULTS

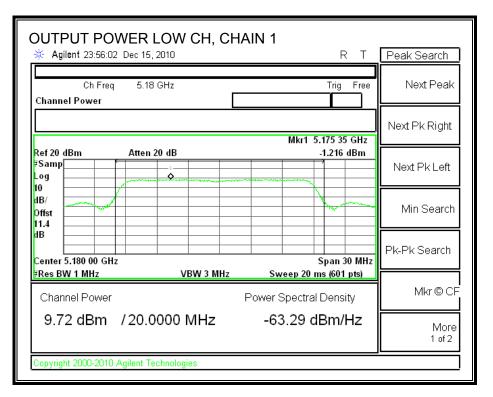
Limit

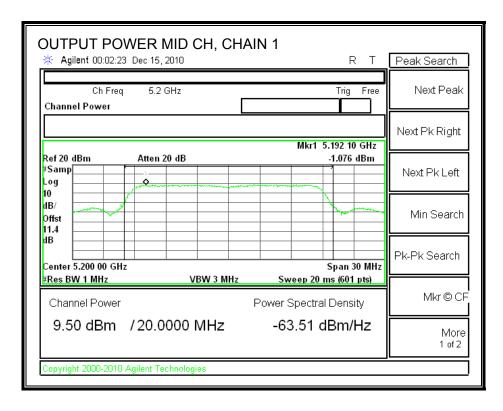
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
|---------|-----------|-------|--------|--------------|---------|-------|
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5180 | 16.99 | 19.422 | 16.88 | 6.02 | 16.86 |
| Mid | 5200 | 16.99 | 19.361 | 16.87 | 6.02 | 16.85 |
| High | 5240 | 16.99 | 19.295 | 16.85 | 6.02 | 16.85 |

Individual Chain Results

| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | Power | Power | Power | Power | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5190 | 9.72 | 9.32 | 9.35 | 14.24 | 16.86 | -2.62 |
| Mid | 5200 | 9.50 | 9.11 | 9.27 | 14.07 | 16.85 | -2.78 |
| High | 5240 | 9.53 | 9.37 | 9.21 | 14.14 | 16.85 | -2.71 |

CHAIN 1 OUTPUT POWER





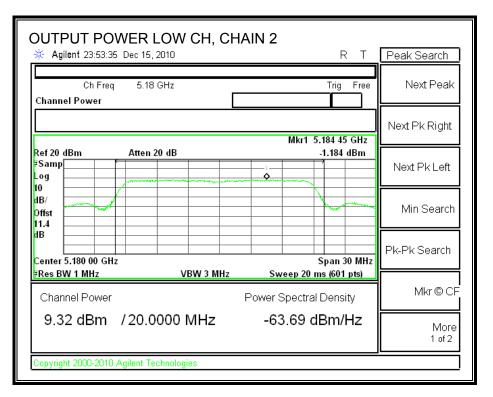
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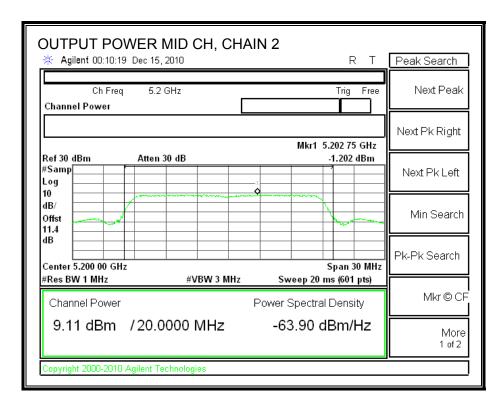
| OUTPUT POWER HI | - | | T Peak Search | | | |
|----------------------------------|------------------------------------------------------------------------------------|---------------|---------------------|--|--|--|
| Ch Freq 5.24 Gł | Hz | Trig | Free Next Peak | | | |
| | | Mkr1 5.244 45 | GHz Next Pk Right | | | |
| Ref 30 dBm Atten 30 #Samp Log 10 | dB | -1.119 d | dBm Next Pk Left | | | |
| dB/ Offst | | | Min Search | | | |
| dB | | Span 30 | | | | |
| Channel Power | #Res BW 1 MHz VBW 3 MHz Sweep 20 ms (601 pts) Channel Power Power Spectral Density | | | | | |
| 9.53 dBm /20.00 | Hz More 1 of 2 | | | | | |
| Copyright 2000-2010 Agilent Tech | nologies | | | | | |

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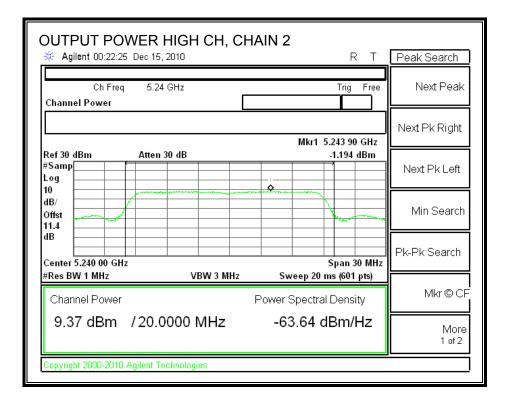
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CHAIN 2 OUTPUT POWER



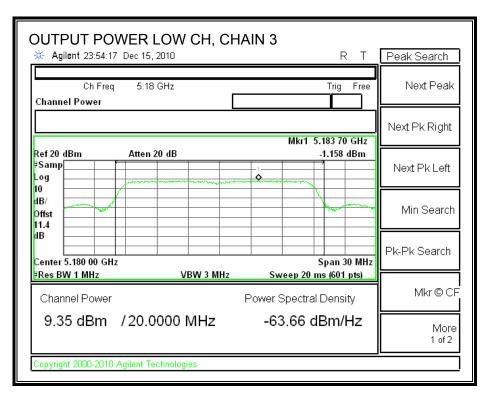


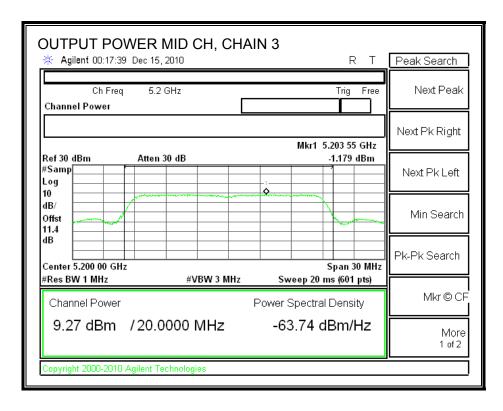
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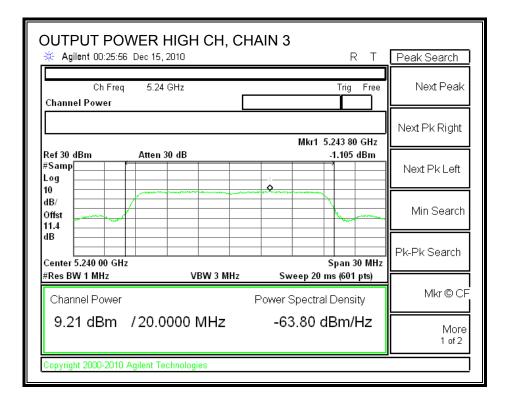
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CHAIN 3 OUTPUT POWER





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7.2.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The max antenna gain is equal to 6.02 dBi, therefore the limit is 3.98 dBm.

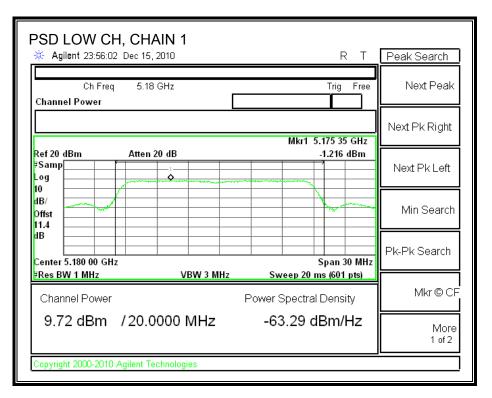
TEST PROCEDURE

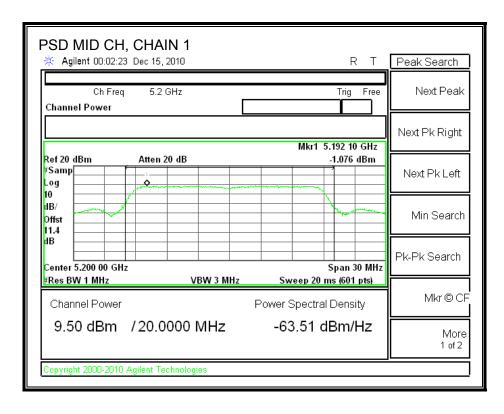
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | PPSD | PPSD | PPSD | PPSD | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5180 | -1.216 | -1.184 | -1.158 | 3.59 | 3.98 | -0.39 |
| Middle | 5200 | -1.076 | -1.202 | -1.179 | 3.62 | 3.98 | -0.36 |
| High | 5240 | -1.119 | -1.194 | -1.105 | 3.63 | 3.98 | -0.35 |

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CHAIN 1 POWER SPECTRAL DENSITY



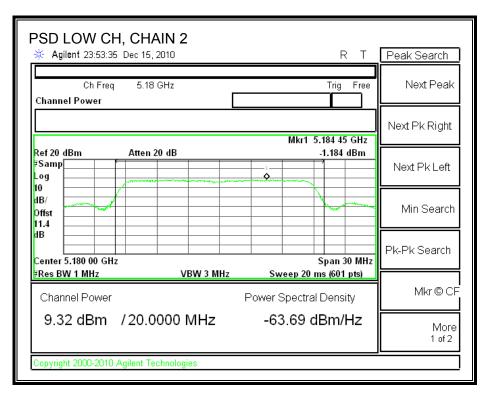


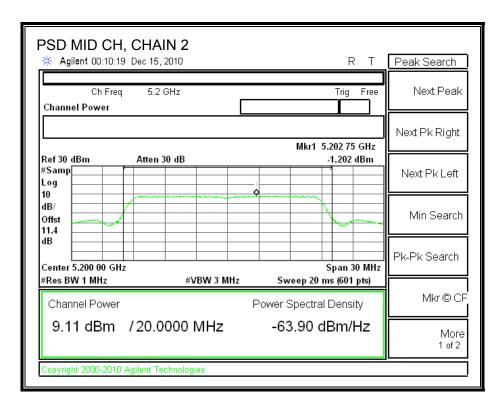
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| PSD HIGH CH, CHAIN 1 | RT | Peak Search |
|------------------------------------------------|-----------------------|---------------|
| Ch Freq 5.24 GHz Channel Power | Trig Free | Next Peak |
| | Mkr1 5.244 45 GHz | Next Pk Right |
| Ref 30 dBm Atten 30 dB #Samp | -1.119 dBm | Next Pk Left |
| 10 dB/ Offst 11.4 | | Min Search |
| dB | Span 30 MHz | Pk-Pk Search |
| #Res BW 1 MHz VBW 3 MHz | Sweep 20 ms (601 pts) | Murac |
| Channel Power F | Mkr©CF | |
| 9.53 dBm / 20.0000 MHz | More 1 of 2 | |
| Copyright 2000-2010 Agilent Technologies | | |

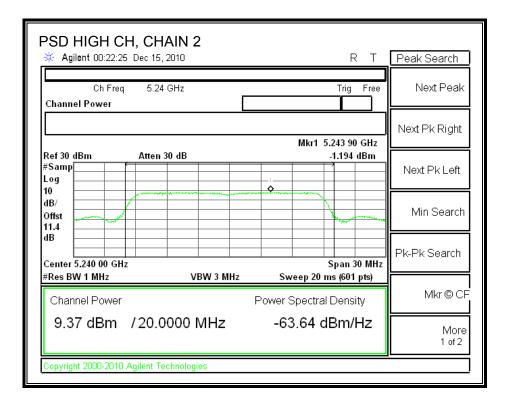
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CHAIN 2 POWER SPECTRAL DENSITY





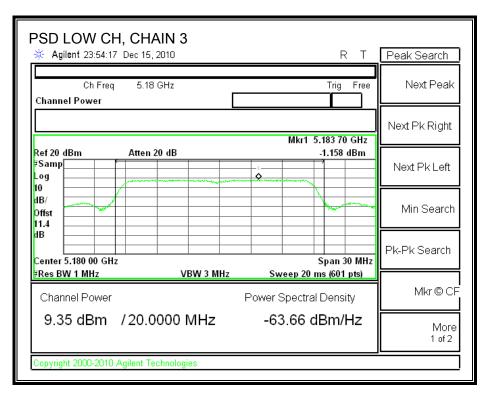
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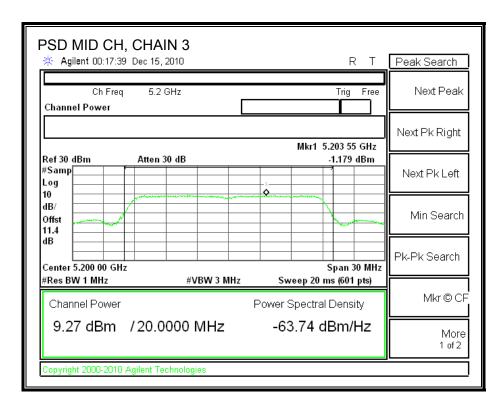


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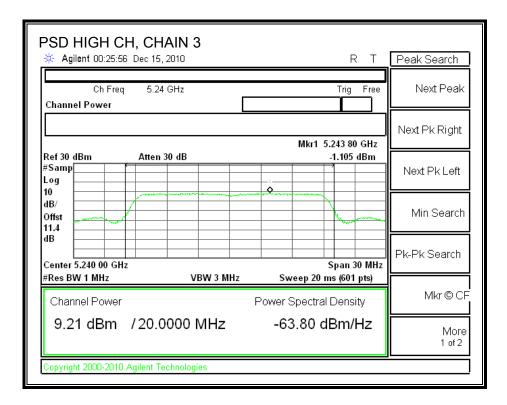
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CHAIN 3 POWER SPECTRAL DENSITY





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7.2.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

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.

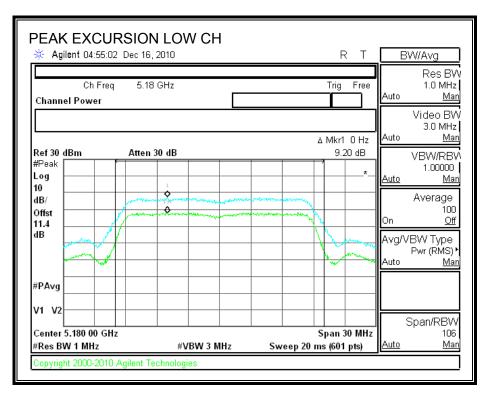
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

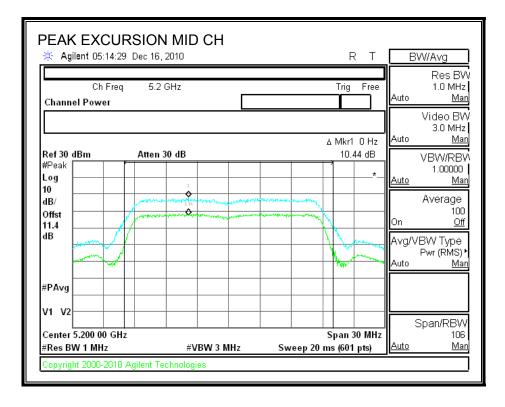
RESULTS

| Channel | Frequency | Peak Excursion | cursion Limit | |
|---------|-----------|----------------|---------------|-------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5180 | 9.20 | 13 | -3.80 |
| Middle | 5200 | 10.44 | 13 | -2.56 |
| High | 5240 | 11.04 | 13 | -1.96 |

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PEAK EXCURSION





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| 🔆 Agilent 05:17:28 Dec 1 | 6, 2010 | | RΤ | B\ | N/Avg |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|-------------|----------------------------------------------|
| Ch Freq 5. Channel Power | 24 GHz | | Trig Free | Auto | Res BV 1.0 MHz <u>Ma</u> |
| | | ۵ | Mkr1 0 Hz | Auto | Video BV 3.0 MHz <u>Ma</u> |
| #Peak Log | en 30 dB | 1 | 11.04 dB | <u>Auto</u> | VBVV/RB ¹ 1.00000 <u>Ma</u> |
| 10 dB/ Offst 11.4 | - how and a set in a set of the s | Anna and a start and a start and a start a sta | | On | Average 100 <u>Off</u> |
| dB | | | | | BVV Type Pwr (RMS) <u>Ma</u> |
| #PAvg | | | | | |
| V1 V2 | | | | | pan/RBV |
| Center 5.240 00 GHz #Res BW 1 MHz | #VBW 3 MHz | S Sweep 20 m | pan 30 MHz s (601 pts) | <u>Auto</u> | 106 <u>Ma</u> |

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7.2.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

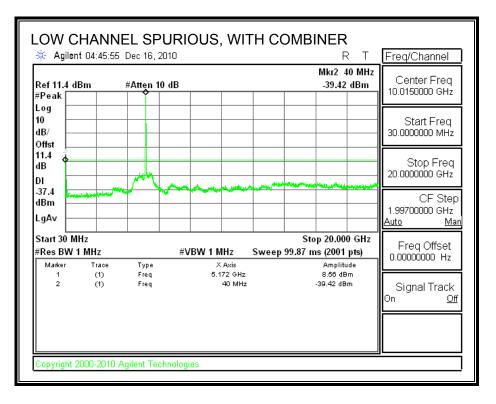
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

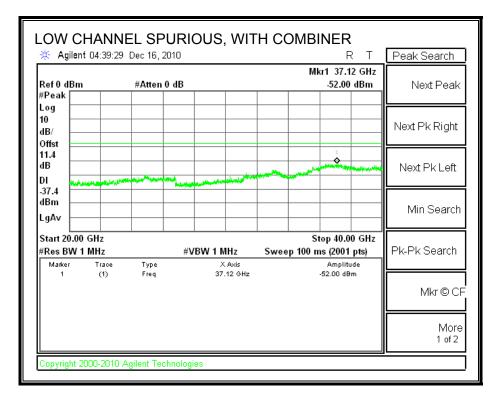
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

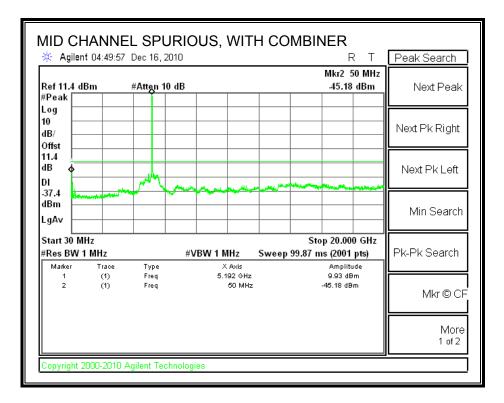
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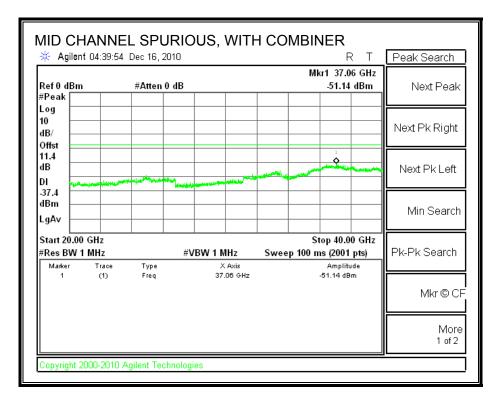
SPURIOUS EMISSIONS WITH COMBINER



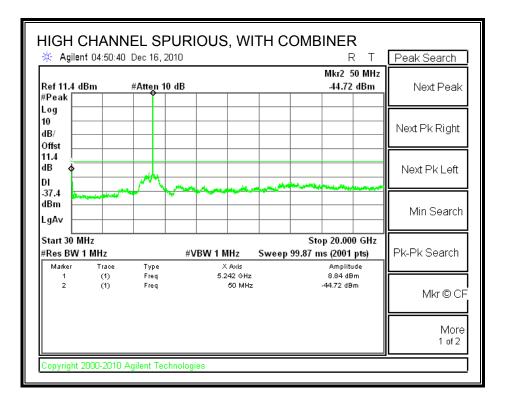


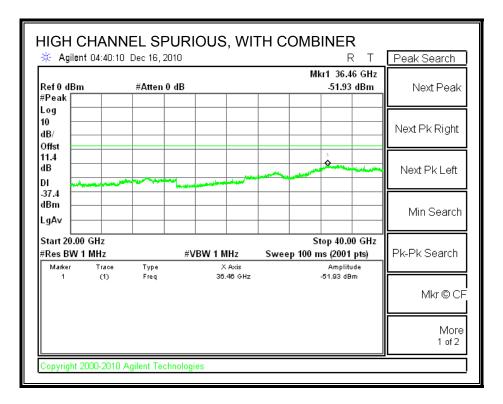
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SDM MCS8

7.2.6. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

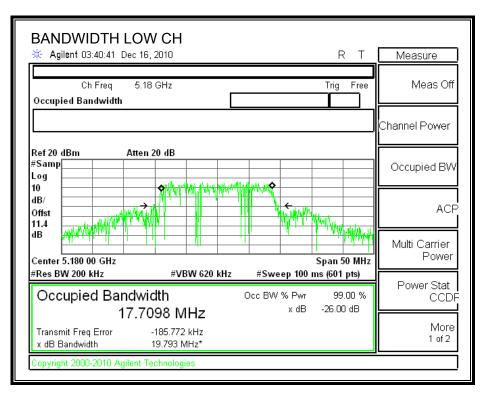
TEST PROCEDURE

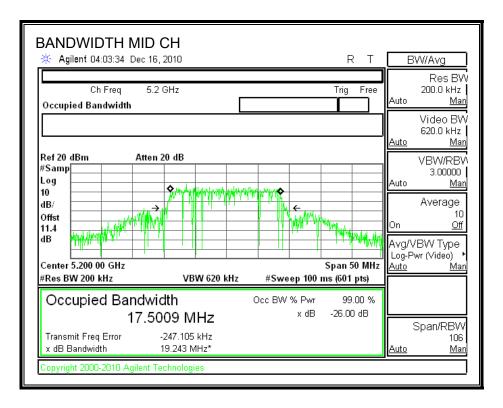
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

<u>RESULTS</u>

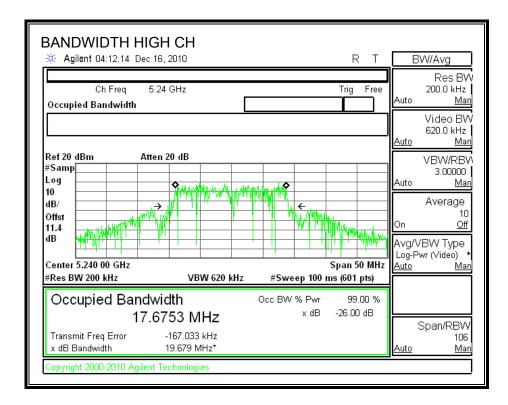
| Channel | Frequency 26 dB Bandwidth | | 99% Bandwidth |
|---------|---------------------------|--------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5180 | 19.793 | 17.7098 |
| Middle | 5200 | 19.243 | 17.5009 |
| High | 5240 | 19.679 | 17.6753 |

26 dB and 99% BANDWIDTH





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7.2.7. OUTPUT POWER

<u>LIMITS</u>

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.

| Linit | | | | | | |
|---------|-----------|-------|--------|--------------|---------|-------|
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5180 | 16.99 | 19.793 | 16.97 | 6.02 | 16.95 |
| Mid | 5200 | 16.99 | 19.243 | 16.84 | 6.02 | 16.82 |
| High | 5240 | 16.99 | 19.679 | 16.94 | 6.02 | 16.94 |

Limit

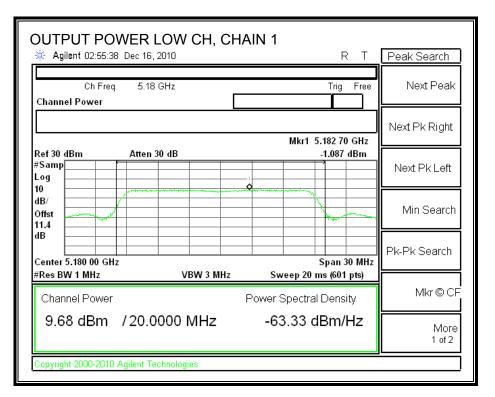
Individual Chain Results

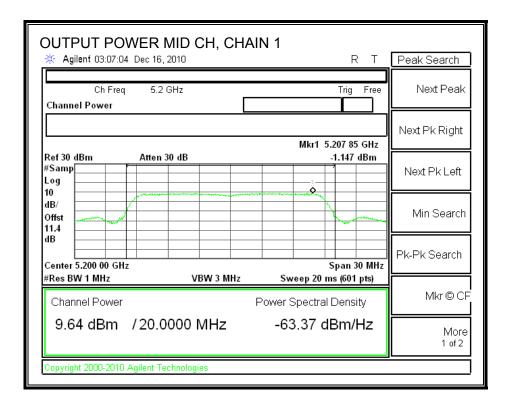
| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | Power | Power | Power | Power | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5190 | 9.68 | 9.59 | 9.22 | 14.27 | 16.95 | -2.67 |
| Mid | 5200 | 9.64 | 9.56 | 9.16 | 14.23 | 16.82 | -2.59 |
| High | 5240 | 9.69 | 9.48 | 9.46 | 14.32 | 16.94 | -2.62 |

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

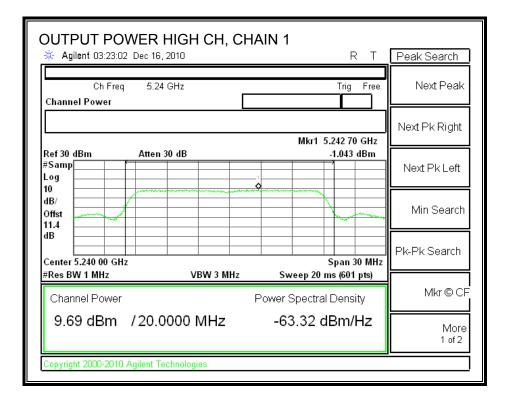
RESULTS

CHAIN 1 OUTPUT POWER



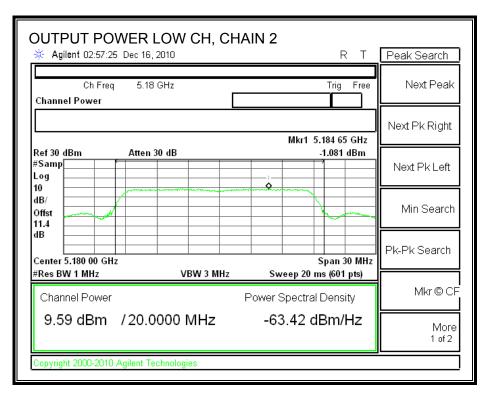


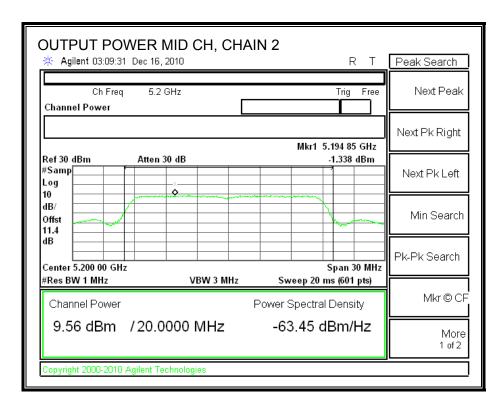
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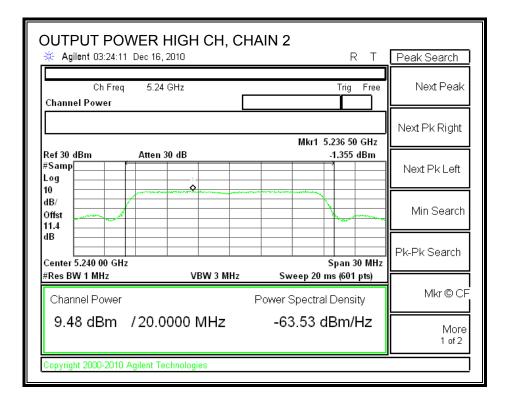
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CHAIN 2 OUTPUT POWER



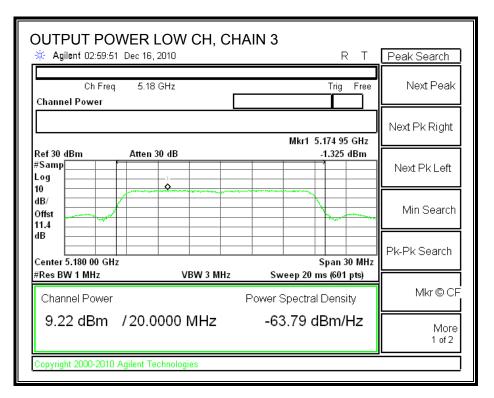


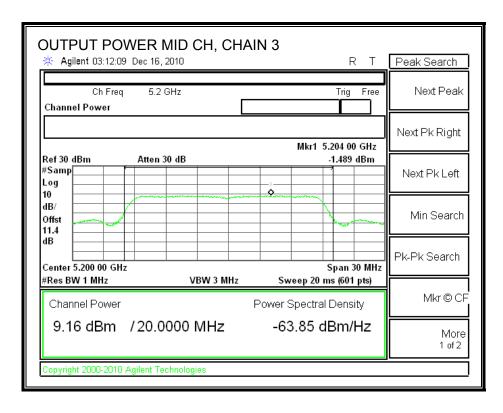
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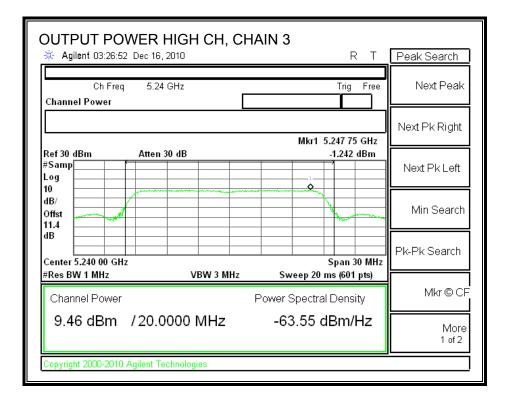
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CHAIN 3 OUTPUT POWER





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7.2.8. 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 effective antenna gain is equal to 6.02 dBi, therefore the limit is 3.98 dBm.

TEST PROCEDURE

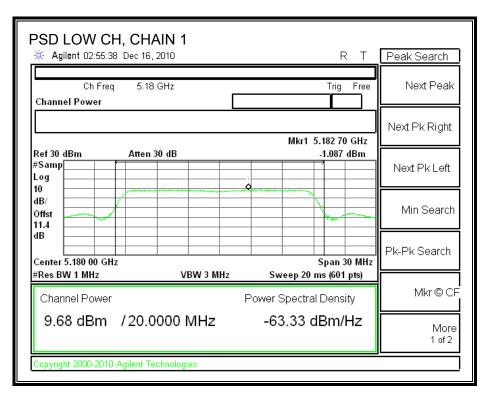
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

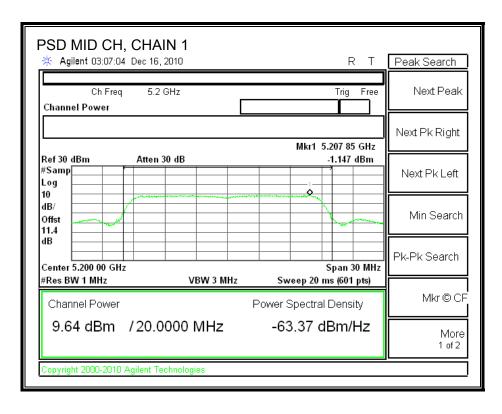
RESULTS

| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | PPSD | PPSD | PPSD | PPSD | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5180 | -1.087 | -1.081 | -1.325 | 3.61 | 3.98 | -0.37 |
| Middle | 5200 | -1.147 | -1.338 | -1.489 | 3.45 | 3.98 | -0.53 |
| High | 5240 | -1.043 | -1.355 | -1.242 | 3.56 | 3.98 | -0.42 |

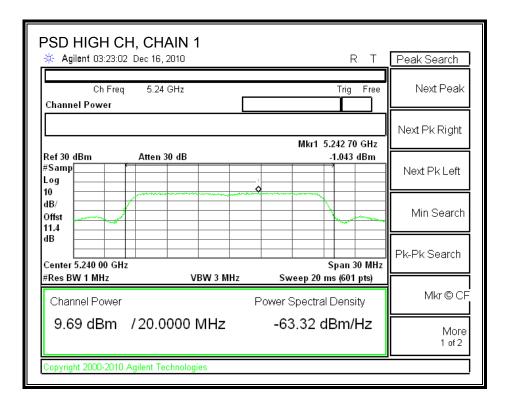
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CHAIN 1 POWER SPECTRAL DENSITY



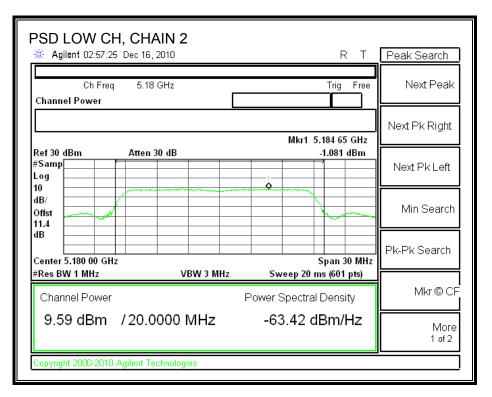


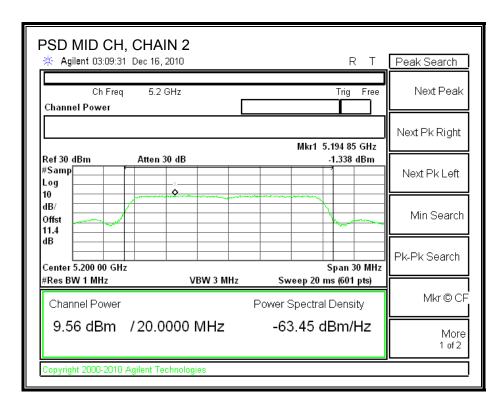
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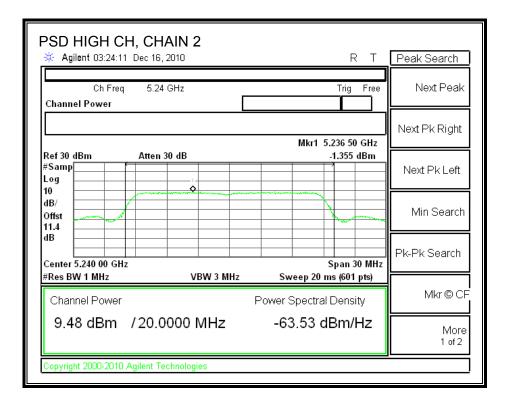
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CHAIN 2 POWER SPECTRAL DENSITY



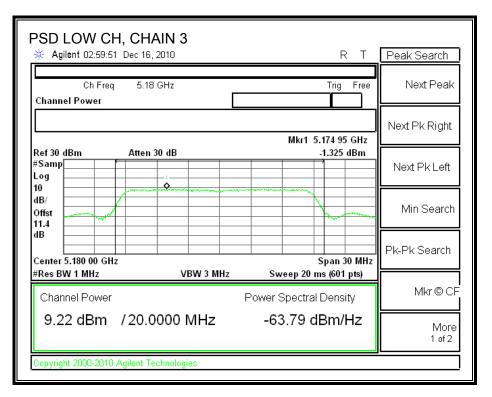


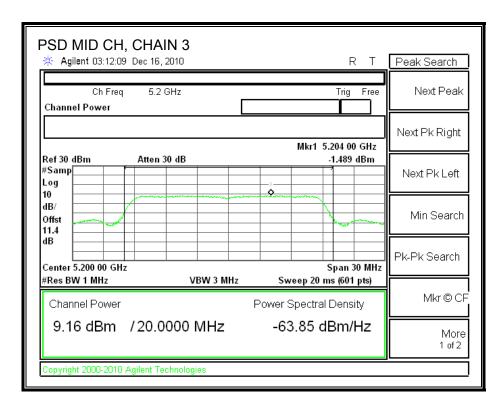
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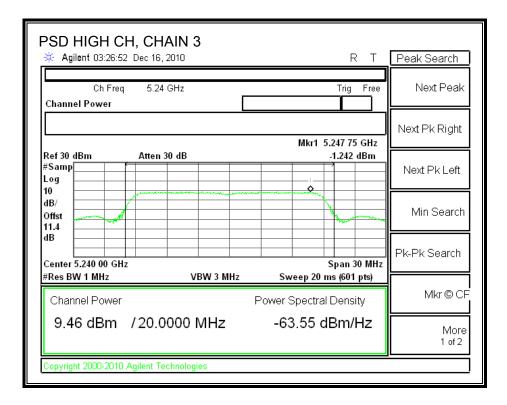
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CHAIN 3 POWER SPECTRAL DENSITY





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7.2.9. 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 transmitter outputs are connected to the spectrum analyzer via a combiner.

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.

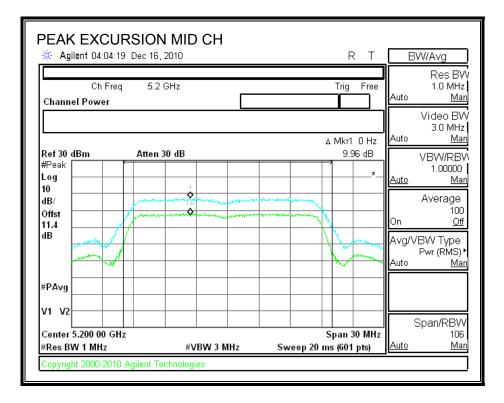
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5180 | 10.42 | 13 | -2.58 |
| Middle | 5200 | 9.96 | 13 | -3.04 |
| High | 5240 | 9.46 | 13 | -3.54 |

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| PEAK EXCURSION | LOW CH | | | | |
|--------------------------------------------|----------------------------------------|------------|-----------------------------|---------------------|---------------------------------------------------|
| 🔆 Agilent 03:41:36 Dec 16, 2 | 2010 | | RT | BV | V/Avg |
| Ch Freq 5.18 Channel Power | GHz | | Trig Free | Auto | Res BV 1.0 MHz <u>Man</u> |
| | | | Δ Mkr1 0 Hz | Auto | Video BW 3.0 MHz <u>Man</u> |
| Ref 30 dBm Atten 3 #Peak | 0 dB | 1 | 10.42 dB | Auto N | VBVV/RBV 1.00000 <u>Mar</u> |
| dB/ Offst 11.4 | ************************************** | TRANSPORT | V | On | Average 100 <u>Off</u> |
| dB | | | Warman and the second | Avg/VE F Auto | 3VV Type ^p wr (RMS) • <u>Mar</u> |
| #PAvg | | | | | |
| V1 V2 | | | | s | pan/RBW |
| Center 5.180 00 GHz #Res BW 1 MHz | #VBW 3 MHz | Sweep 20 n | Span 30 MHz ns (601 pts) | <u>Auto</u> | 106 <u>Mar</u> |
| Copyright 2000-2010 Agilent Teo | chnologies | | | | |



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| 🔆 Agilent 04:14:31 Dec 1 | 6, 2010 | | | R | Т | B) | /V/Avg |
|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|----------------|-------------|-------|-------------|----------------------------------|
| Ch Freq 5.2 Channel Power | 24 GHz | | | Trig F | ree | Auto | Res BV 1.0 MHz <u>Ma</u> |
| | | | ۵ | - Mkr1 0 | Hz | Auto | Video BV 3.0 MHz <u>Ma</u> |
| | n 30 dB | | | 9.46 (| зB | | VBW/RB |
| #Peak Log 10 | | 1 | | | _*_ | <u>Auto</u> | 1.00000 <u>Ma</u> |
| dB/ | and a second second second | | menning | | | | Average |
| Offst | and a sease of the state of the sease of the | and the second | | | | On | 100 Off |
| dB | | | | | Maria | Avg/V | BW Type Pwr (RMS) Ma |
| · · · · · · · · · · · · · · · · · · · | | | | · · · | | A010 | <u></u> |
| #PAvg | | | | | | | |
| V1 V2 | | | | | | | |
| | | | | | | 9 | Span/RBV |
| Center 5.240 00 GHz #Res BW 1 MHz | #VBW 3 M | H-7 Sur | S eep 20 ms | pan 30 l | | Auto | 106 Ma |

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7.2.10. 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

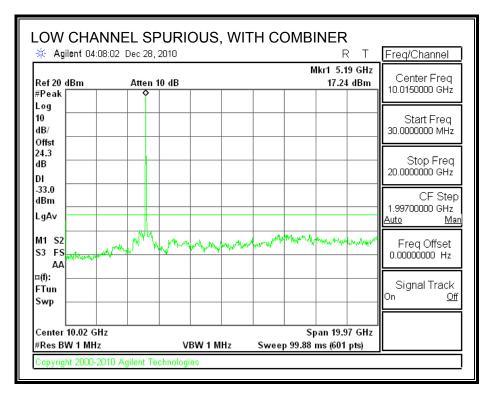
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

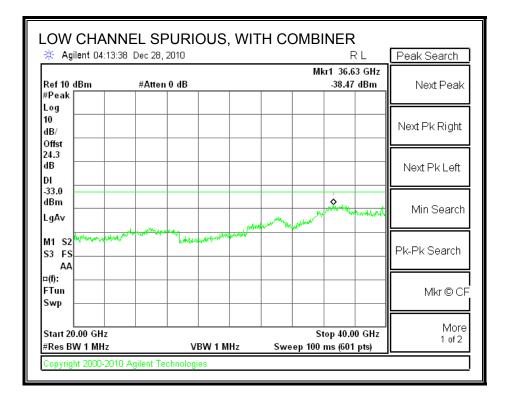
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

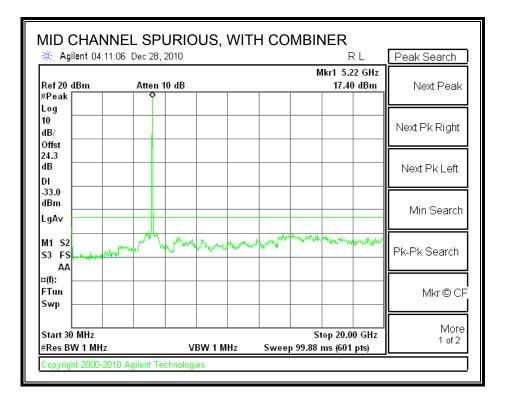
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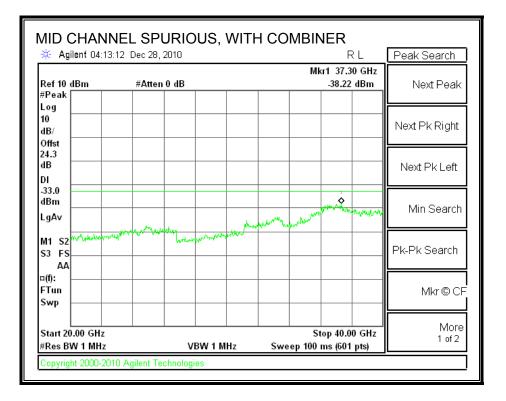
SPURIOUS EMISSIONS WITH COMBINER



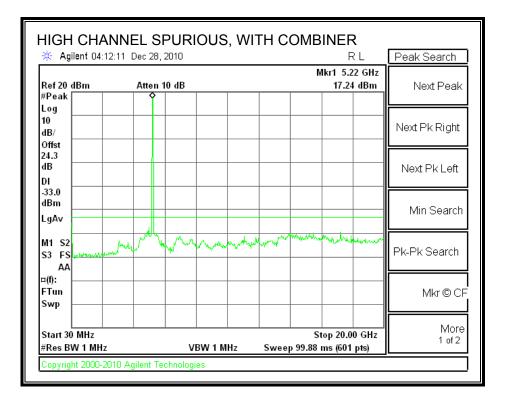


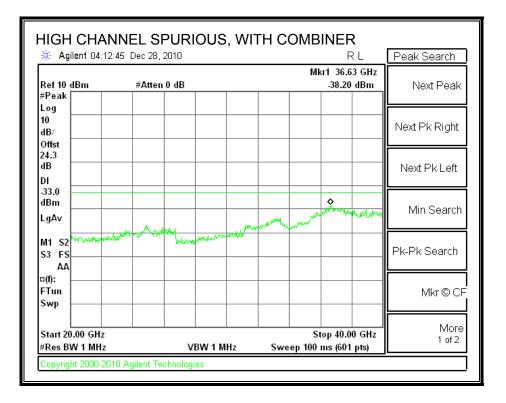
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SDM MCS12

7.2.11. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

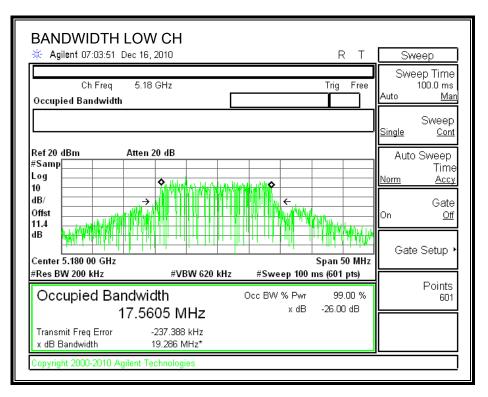
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

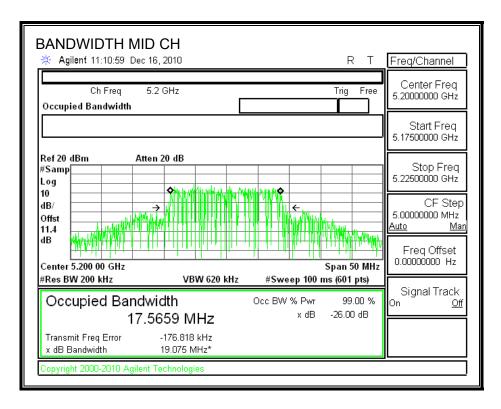
RESULTS

| Channel | Frequency | 26 dB Bandwidth | 99% Bandwidth |
|---------|-----------|-----------------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5180 | 19.286 | 17.5605 |
| Middle | 5200 | 19.075 | 17.5659 |
| High | 5240 | 19.980 | 17.6640 |

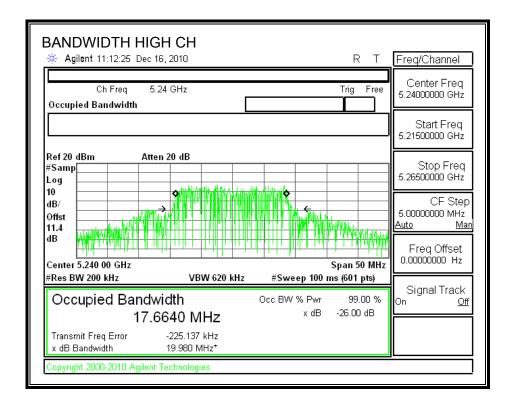
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26 dB and 99% BANDWIDTH





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7.2.12. 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.

<u>RESULTS</u>

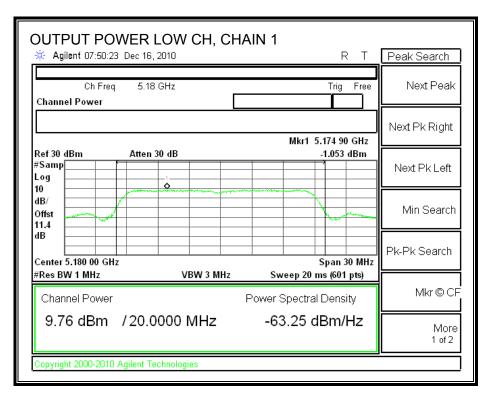
Limit

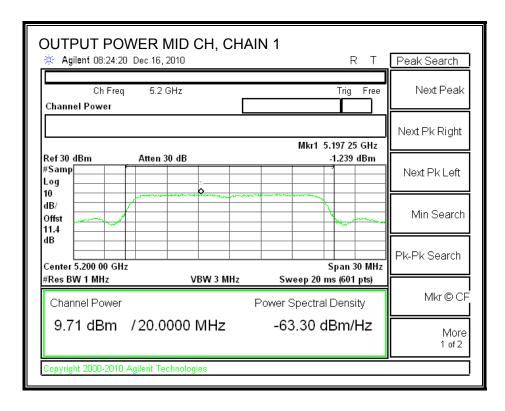
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
|---------|-----------|-------|--------|--------------|---------|-------|
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5180 | 16.99 | 19.286 | 16.85 | 6.02 | 16.83 |
| Mid | 5200 | 16.99 | 19.113 | 16.81 | 6.02 | 16.79 |
| High | 5240 | 16.99 | 19.980 | 17.01 | 6.02 | 16.99 |

Individual Chain Results

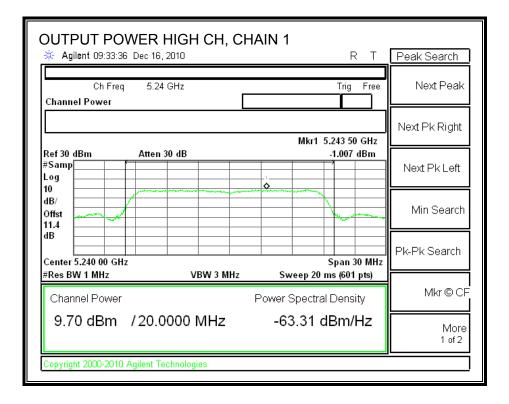
| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | Power | Power | Power | Power | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5180 | 9.76 | 9.28 | 9.21 | 14.19 | 16.83 | -2.64 |
| Mid | 5200 | 9.71 | 9.39 | 9.16 | 14.20 | 16.79 | -2.60 |
| High | 5240 | 9.70 | 9.39 | 9.12 | 14.18 | 16.99 | -2.81 |

CHAIN 1 OUTPUT POWER



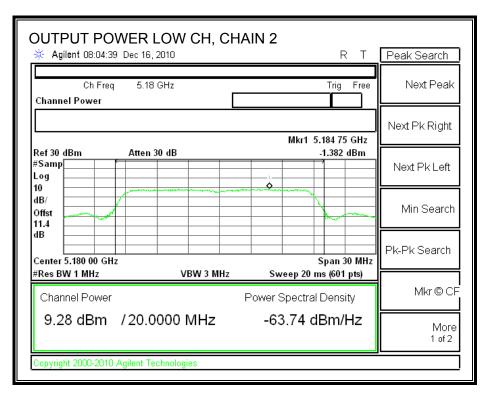


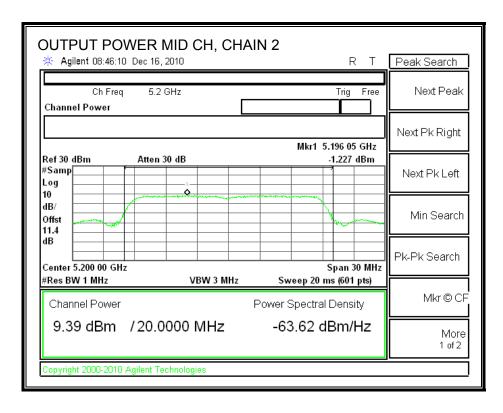
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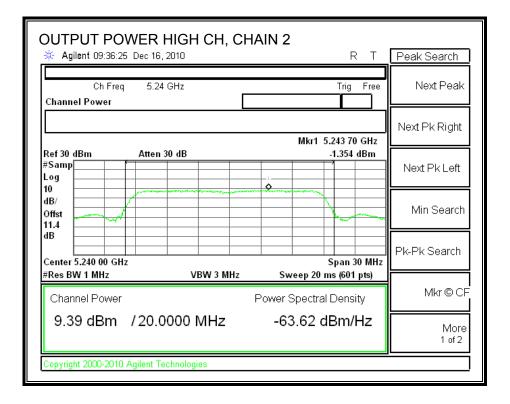
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CHAIN 2 OUTPUT POWER



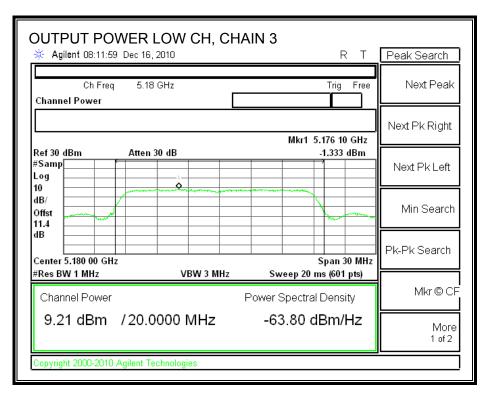


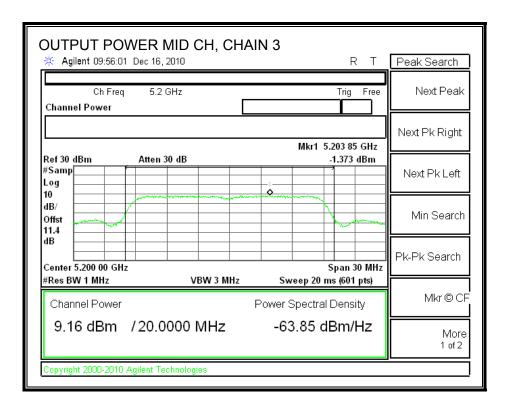
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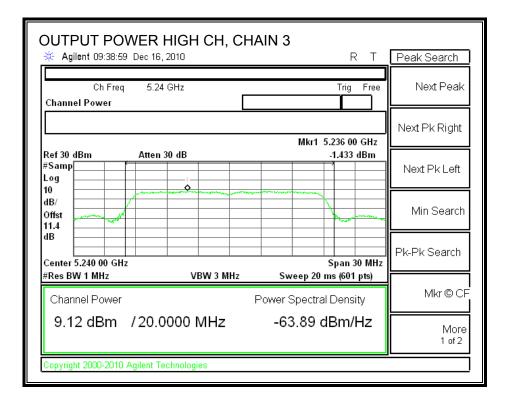
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CHAIN 3 OUTPUT POWER





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7.2.13. 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 effective antenna gain is equal to 6.02 dBi, therefore the limit is 3.98 dBm.

TEST PROCEDURE

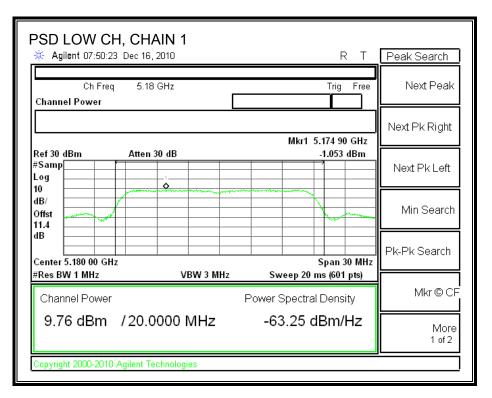
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

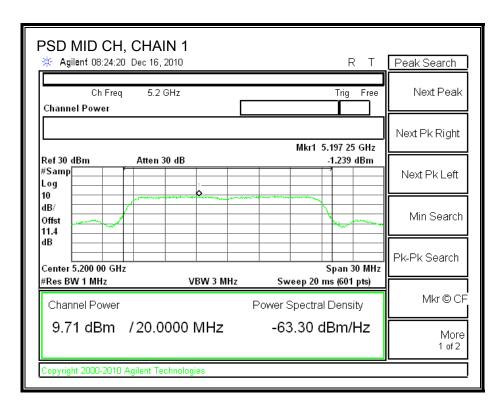
<u>RESULTS</u>

| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | PPSD | PPSD | PPSD | PPSD | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5180 | -1.053 | -1.382 | -1.333 | 3.52 | 3.98 | -0.46 |
| Middle | 5200 | -1.239 | -1.227 | -1.373 | 3.49 | 3.98 | -0.49 |
| High | 5240 | -1.007 | -1.354 | -1.433 | 3.51 | 3.98 | -0.47 |

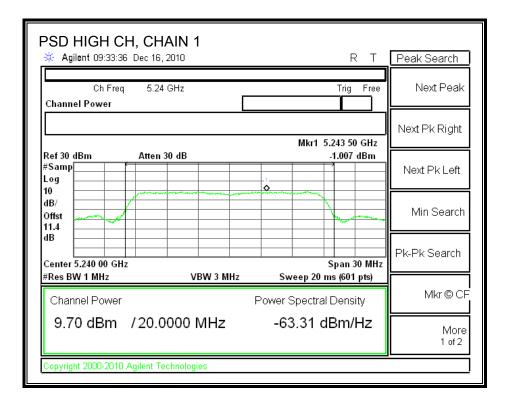
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CHAIN 1 POWER SPECTRAL DENSITY



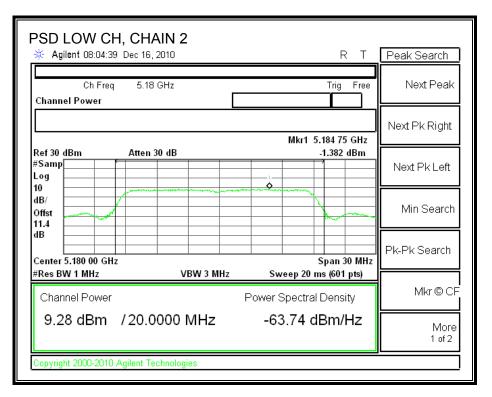


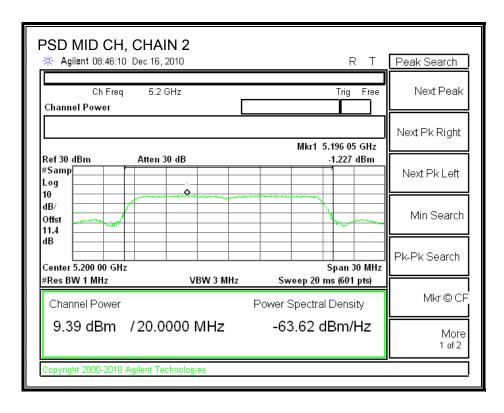
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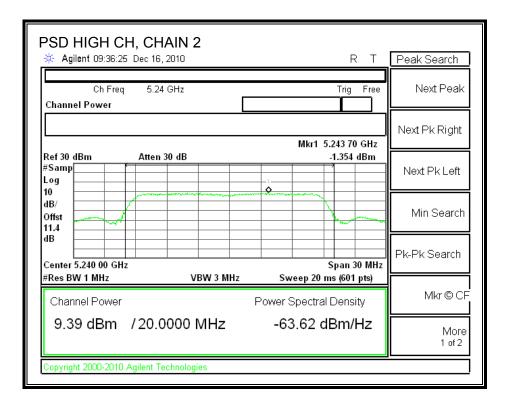
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CHAIN 2 POWER SPECTRAL DENSITY



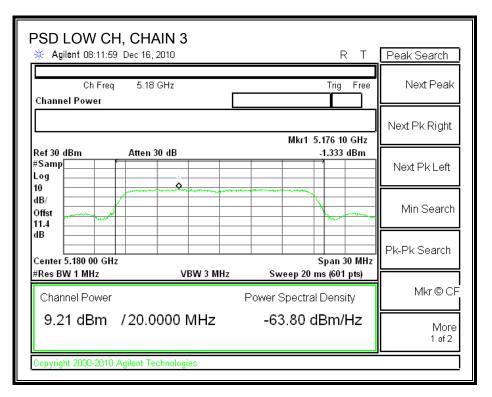


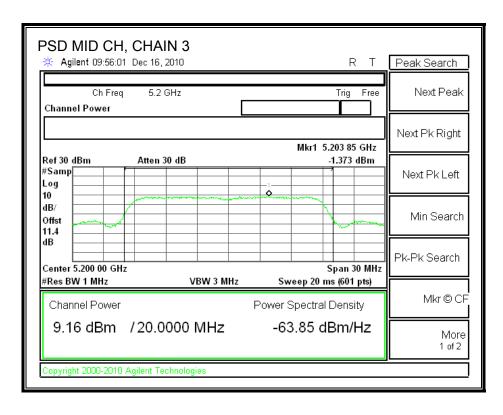
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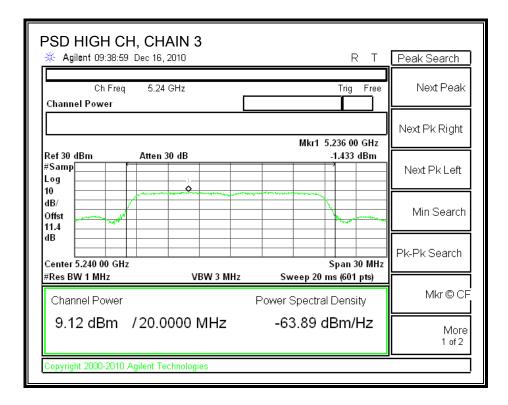
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CHAIN 3 POWER SPECTRAL DENSITY





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7.2.14. 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 transmitter outputs are connected to the spectrum analyzer via a combiner.

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.

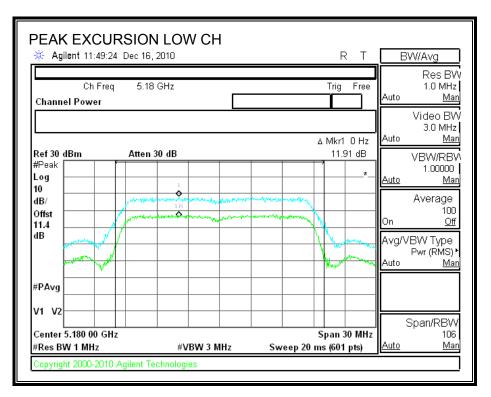
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

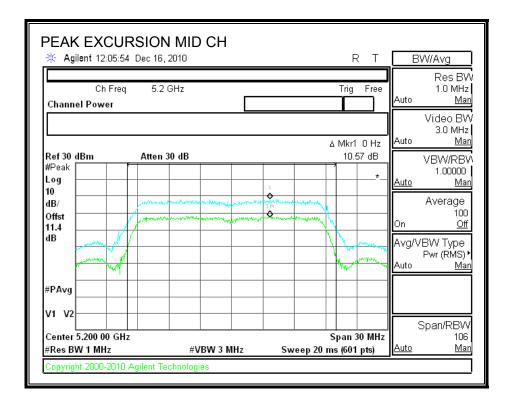
RESULTS

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5180 | 11.91 | 13 | -1.09 |
| Middle | 5200 | 10.57 | 13 | -2.43 |
| High | 5240 | 12.01 | 13 | -0.99 |

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PEAK EXCURSION





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| 🔆 Agilent 12:14:41 | Dec 16, 2010 | | | | | RТ | B | W/Avg |
|--------------------------|-------------------------|-----------|----------------|-----------|------------|----------------|-------------|----------------------------------|
| Ch Freq Channel Power | 5.24 GHz | | | | Trig | Free | Auto | Res BV 1.0 MHz <u>Ma</u> |
| | | | | | _ ∆ Mkr | 1 0 Hz | Auto | Video BV 3.0 MHz <u>Ma</u> |
| Ref30 dBm #Peak | Atten 30 dB | | | | 12 | .01 dB | | VBW/RB |
| Log | | 1 | | | - | * | <u>Auto</u> | 1.00000 <u>Ma</u> |
| dB/ | an an approximately set | Annon mar | | minu | | | | Average |
| Offst | mannam | monor | mother man and | monen | 1 | | On | 100 |
| dB | | | | | 1 | and the second | Avg/V | BW Type Pwr (RMS) |
| and the second second | | | | | m | and the second | Auto | <u>Ma</u> |
| #PAvg | | | | | | | | |
| V1 V2 | | | | | | | | |
| Center 5.240 00 GHz | | | | | Span | 30 MHz | | Span/RBV 106 |
| #Res BW 1 MHz | #V | BW 3 MHz | S | veep 20 i | • | | <u>Auto</u> | Ma |

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7.2.15. 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

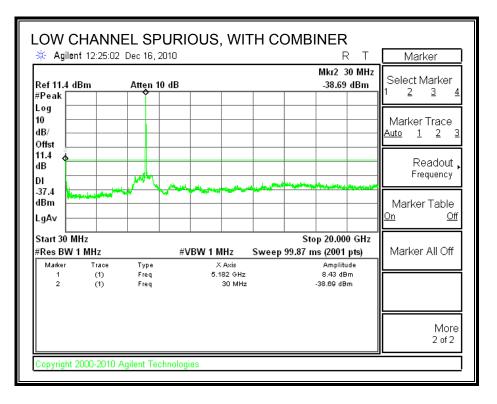
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

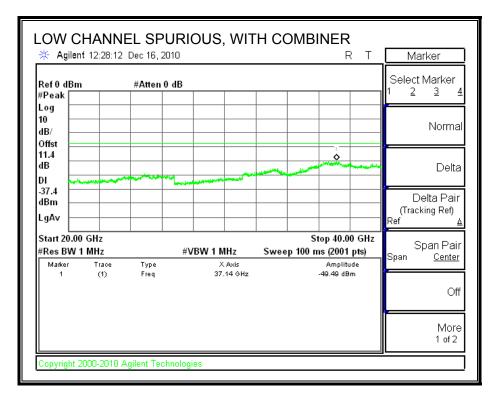
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

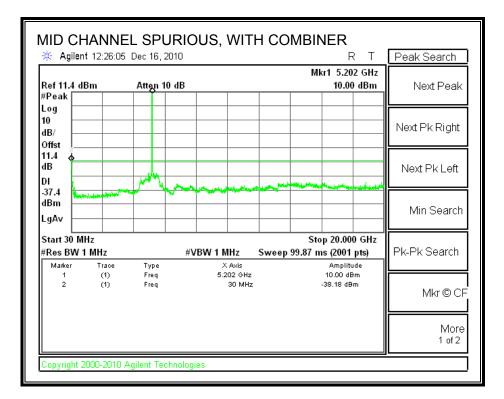
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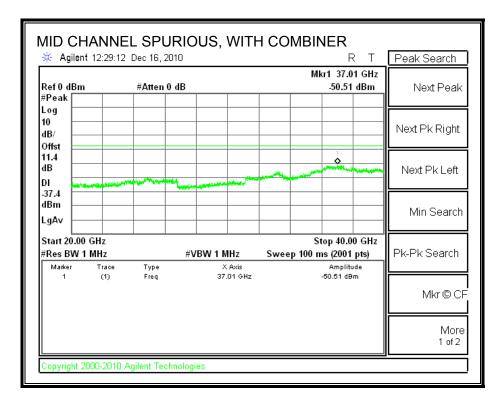
SPURIOUS EMISSIONS WITH COMBINER



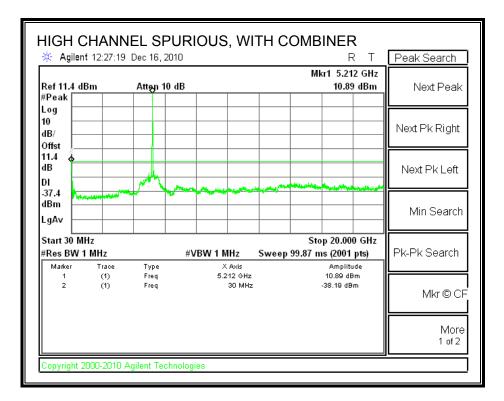


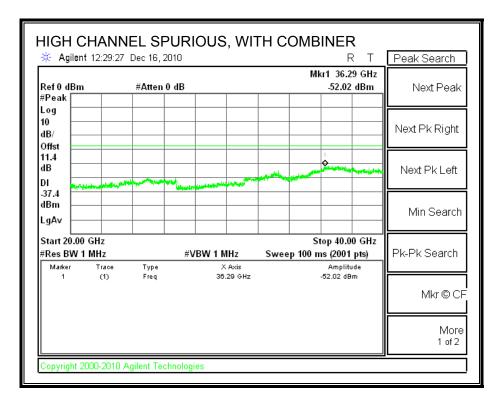
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SDM MCS16

7.2.16. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

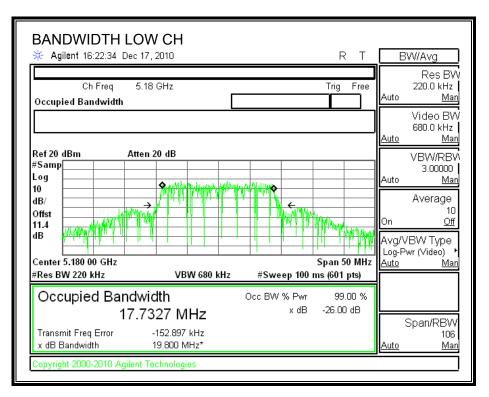
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

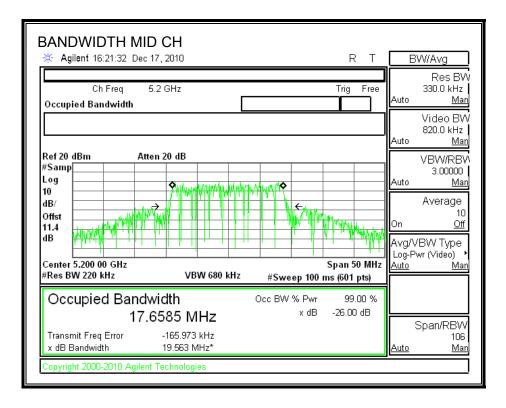
RESULTS

| Channel | Frequency | 26 dB Bandwidth | 99% Bandwidth |
|---------|-----------|-----------------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5180 | 19.800 | 17.7327 |
| Middle | 5200 | 19.563 | 17.6585 |
| High | 5240 | 19.529 | 17.7272 |

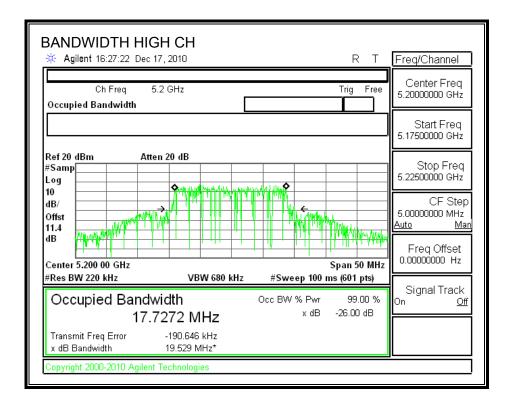
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26 dB and 99% BANDWIDTH





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7.2.17. 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.

<u>RESULTS</u>

Limit

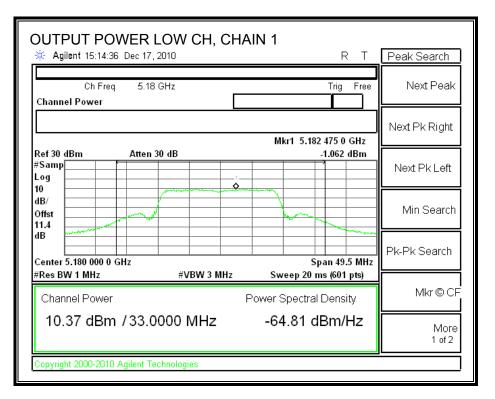
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
|---------|-----------|-------|--------|--------------|---------|-------|
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5180 | 16.99 | 19.800 | 16.97 | 6.02 | 16.95 |
| Mid | 5200 | 16.99 | 19.563 | 16.91 | 6.02 | 16.89 |
| High | 5240 | 16.99 | 19.529 | 16.91 | 6.02 | 16.91 |

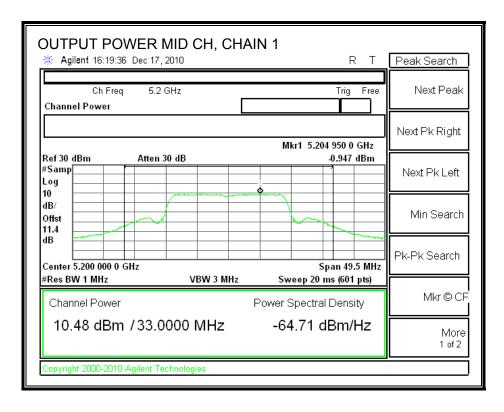
Individual Chain Results

| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | Power | Power | Power | Power | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5180 | 10.37 | 10.33 | 10.20 | 15.07 | 16.95 | -1.87 |
| Mid | 5200 | 10.48 | 10.12 | 9.95 | 14.96 | 16.89 | -1.93 |
| High | 5240 | 10.25 | 10.33 | 9.70 | 14.87 | 16.91 | -2.03 |

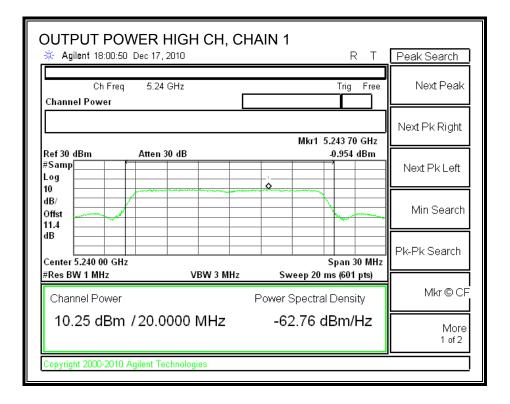
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CHAIN 1 OUTPUT POWER





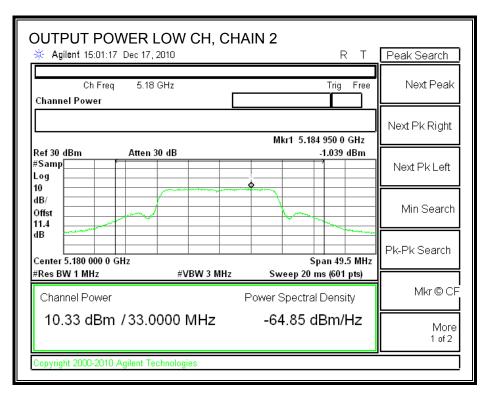
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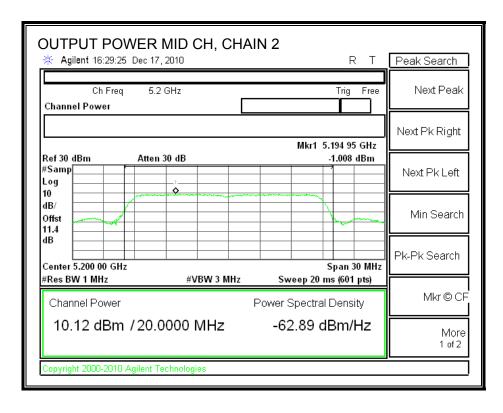


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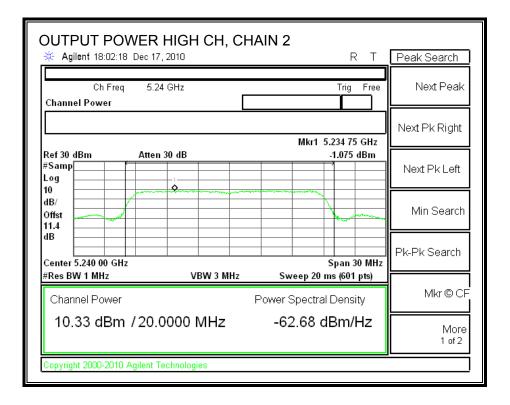
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CHAIN 2 OUTPUT POWER





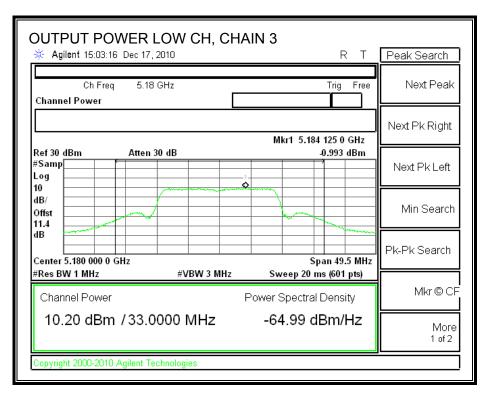
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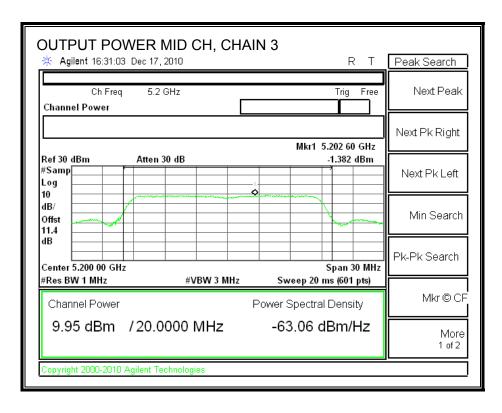


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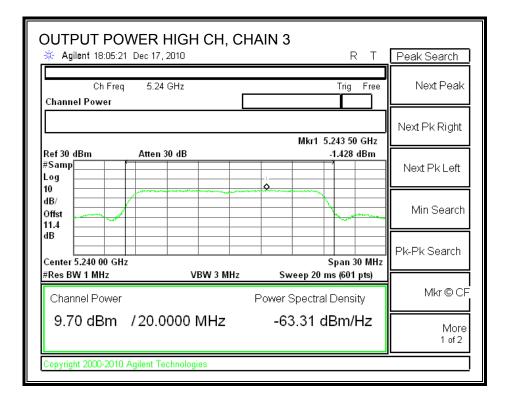
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CHAIN 3 OUTPUT POWER





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7.2.18. 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 equal to 6.02 dBi, therefore the limit is 3.98 dBm.

TEST PROCEDURE

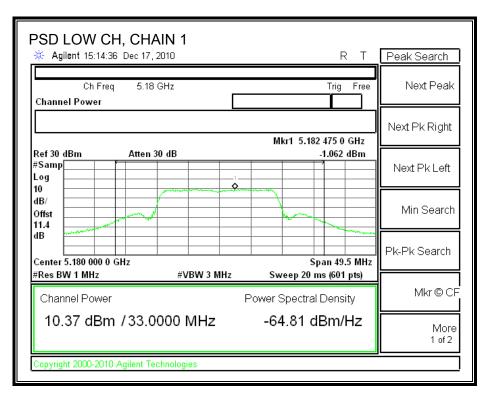
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

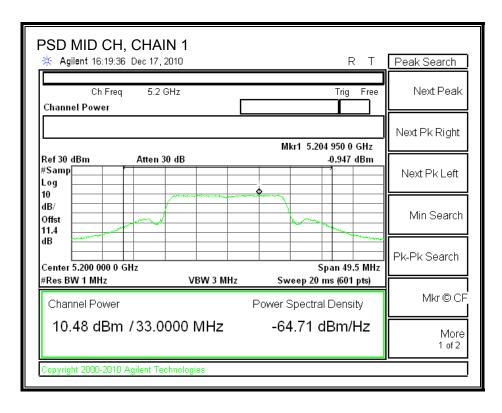
<u>RESULTS</u>

| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | PPSD | PPSD | PPSD | PPSD | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5180 | -1.062 | -1.039 | -0.993 | 3.74 | 3.98 | -0.24 |
| Middle | 5200 | -0.947 | -1.008 | -1.382 | 3.66 | 3.98 | -0.32 |
| High | 5240 | -0.954 | -1.075 | -1.428 | 3.62 | 3.98 | -0.36 |

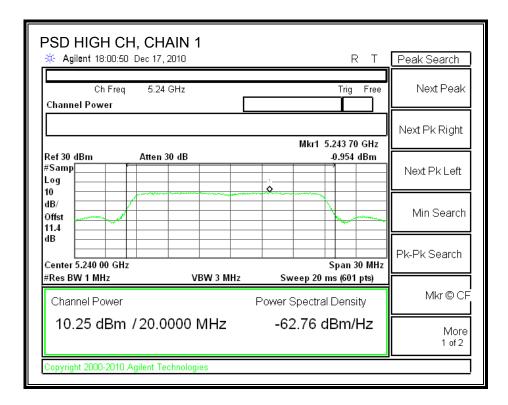
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CHAIN 1 POWER SPECTRAL DENSITY



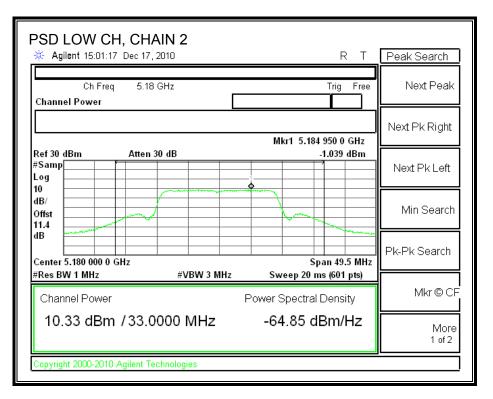


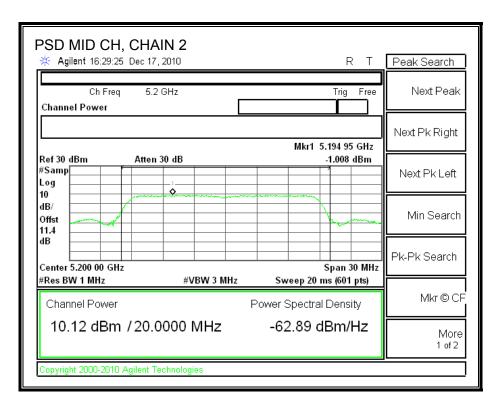
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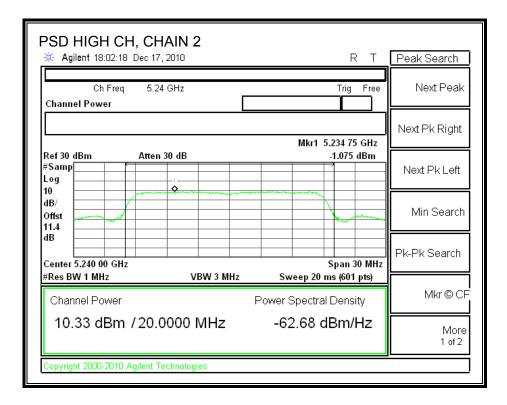
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CHAIN 2 POWER SPECTRAL DENSITY



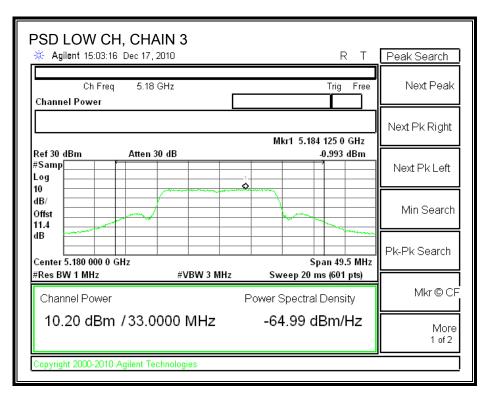


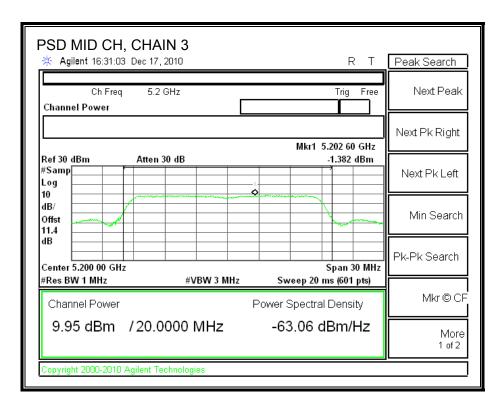
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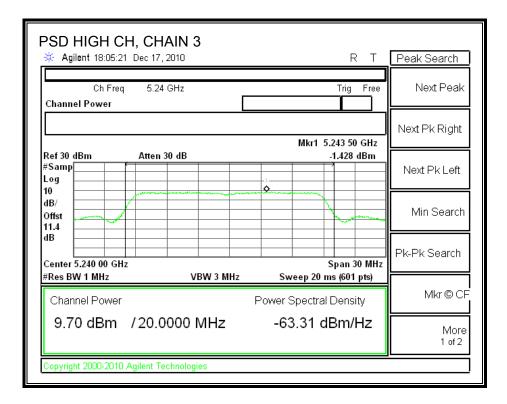
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CHAIN 3 POWER SPECTRAL DENSITY





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7.2.19. 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 transmitter outputs are connected to the spectrum analyzer via a combiner.

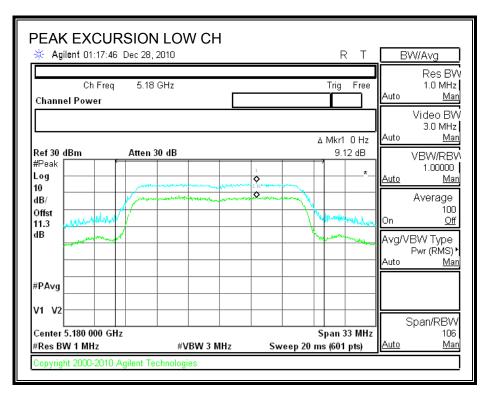
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

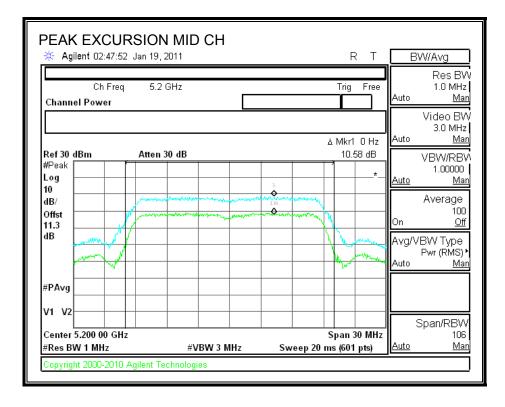
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5180 | 9.12 | 13 | -3.88 |
| Middle | 5200 | 10.58 | 13 | -2.42 |
| High | 5240 | 9.21 | 13 | -3.79 |

PEAK EXCURSION





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| 🔆 Agilent 01:20:02 Dec 28 | 3, 2010 | | RΤ | B۱ | N/Avg |
|---------------------------------------|------------|------------|-----------------------------|-------------|--------------------------------------|
| Ch Freq 5.2 Channel Power | 4 GHz | | Trig Free | Auto | Res BV 1.0 MHz <u>Mar</u> |
| | | | ∆ Mkr1 0 Hz | Auto | Video BV 3.0 MHz <u>Mar</u> |
| Ref 30 dBm Atter #Peak Log 10 | 1 30 dB | 1 | 9.21 dB | <u>Auto</u> | VBW/RB\ 1.00000 <u>Mar</u> |
| dB/ Offst 11.3 | | | | On | Average 100 <u>Off</u> |
| dB | | | | | BW Type Pwr (RMS) ' <u>Mar</u> |
| #PAvg | | | | | |
| V1 V2 | | | | | Span/RBW |
| Center 5.240 000 GHz #Res BW 1 MHz | #VBW 3 MHz | Sweep 20 n | Span 33 MHz 1s (601 pts) | <u>Auto</u> | 106 <u>Mar</u> |

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7.2.20. 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

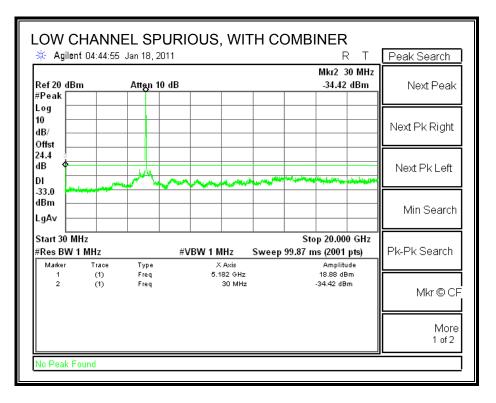
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

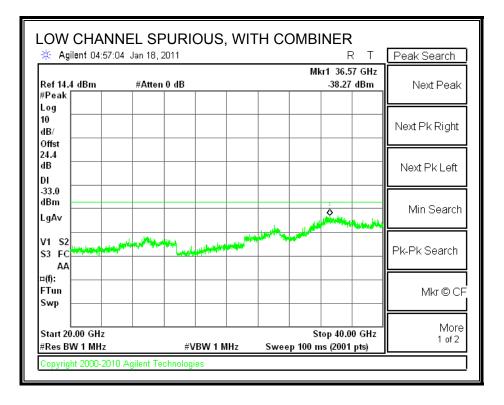
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

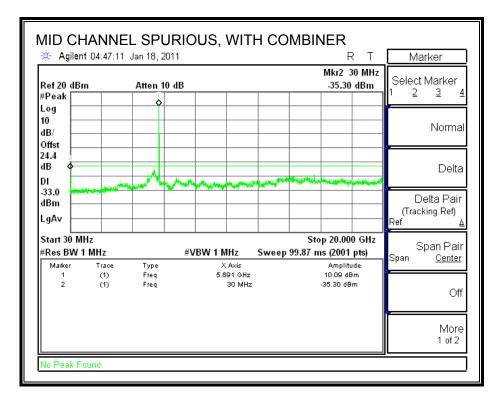
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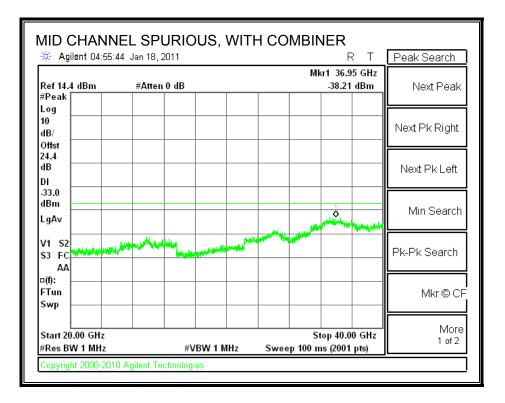
SPURIOUS EMISSIONS WITH COMBINER



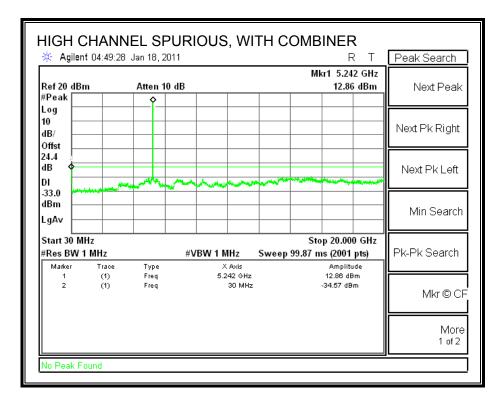


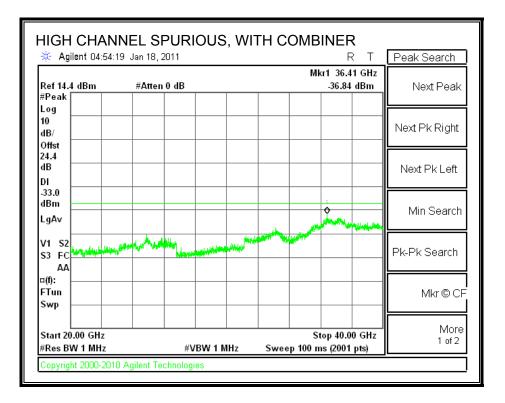
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SDM MCS21

7.2.21. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

None; for reporting purposes only.

TEST PROCEDURE

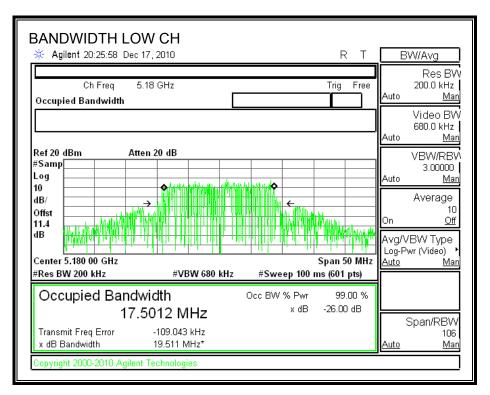
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

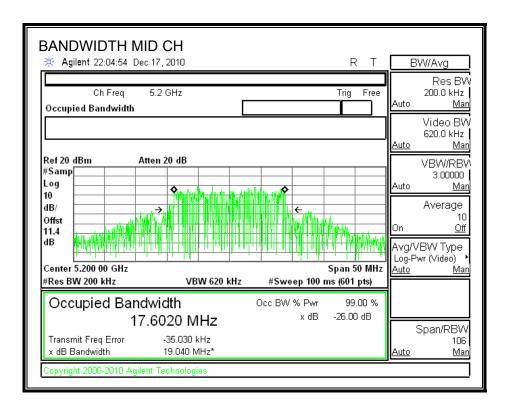
RESULTS

| Channel | Frequency | 26 dB Bandwidth | 99% Bandwidth |
|---------|-----------|-----------------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5180 | 19.511 | 17.5012 |
| Middle | 5200 | 19.040 | 17.6020 |
| High | 5240 | 19.151 | 17.689 |

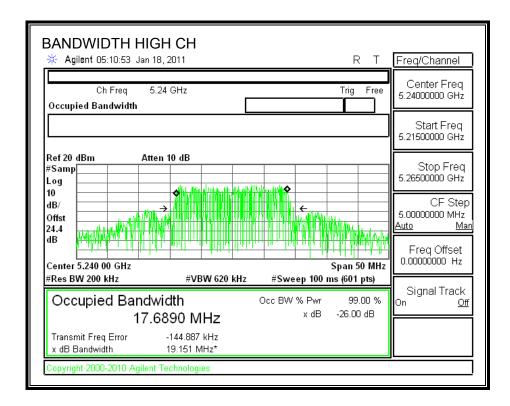
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26 dB and 99% BANDWIDTH





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7.2.22. 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.

<u>RESULTS</u>

Limit

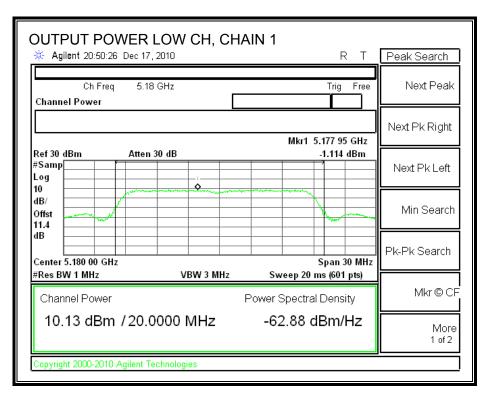
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
|---------|-----------|-------|--------|--------------|---------|-------|
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5180 | 16.99 | 19.511 | 16.90 | 6.02 | 16.88 |
| Mid | 5200 | 16.99 | 19.040 | 16.80 | 6.02 | 16.78 |
| High | 5240 | 16.99 | 19.151 | 16.82 | 6.02 | 16.82 |

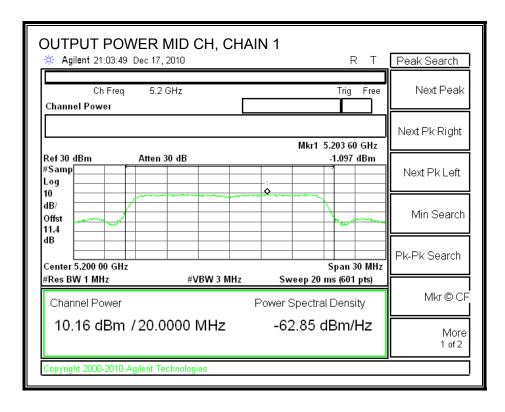
Individual Chain Results

| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | Power | Power | Power | Power | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5180 | 10.13 | 9.49 | 9.00 | 14.34 | 16.88 | -2.55 |
| Mid | 5200 | 10.16 | 9.13 | 9.04 | 14.25 | 16.78 | -2.53 |
| High | 5240 | 10.16 | 9.50 | 9.06 | 14.37 | 16.82 | -2.45 |

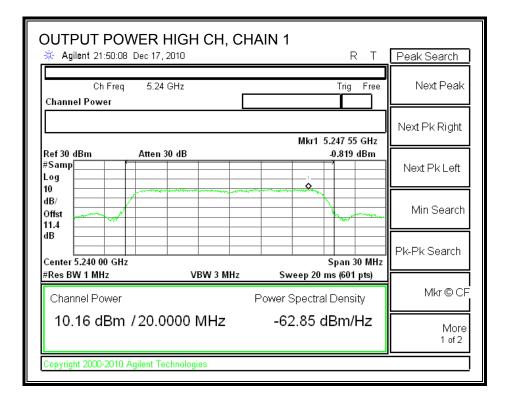
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CHAIN 1 OUTPUT POWER



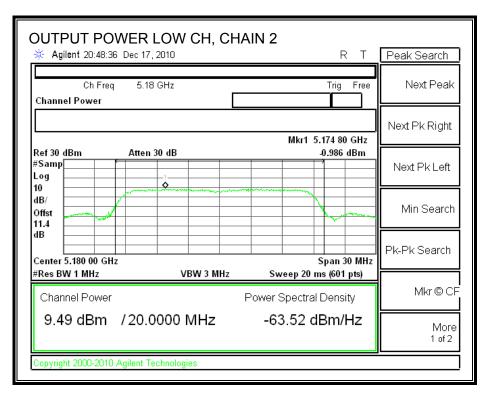


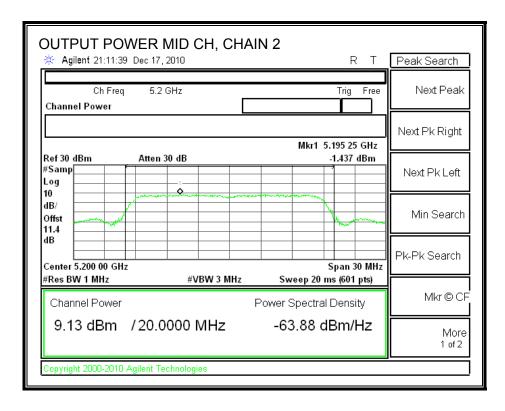
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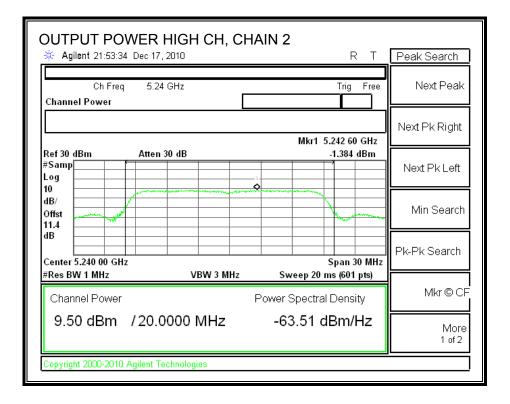
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CHAIN 2 OUTPUT POWER





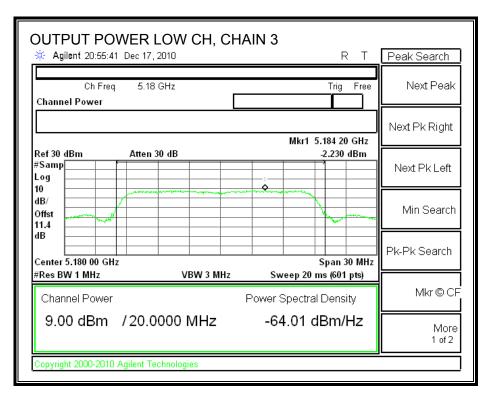
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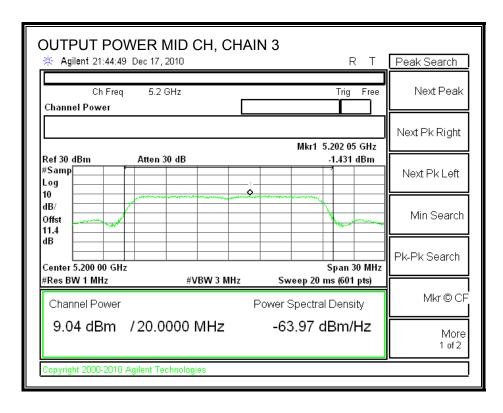


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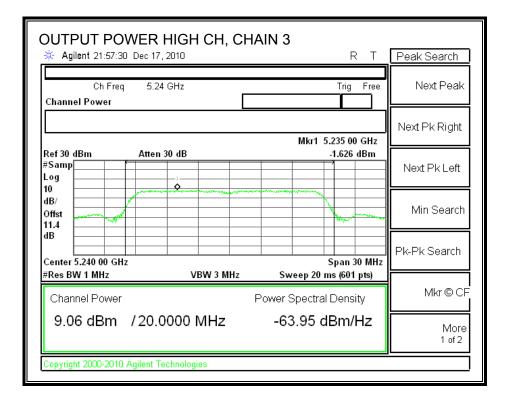
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CHAIN 3 OUTPUT POWER





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7.2.23. 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 equal to 6.02 dBi, therefore the limit is 3.98 dBm.

TEST PROCEDURE

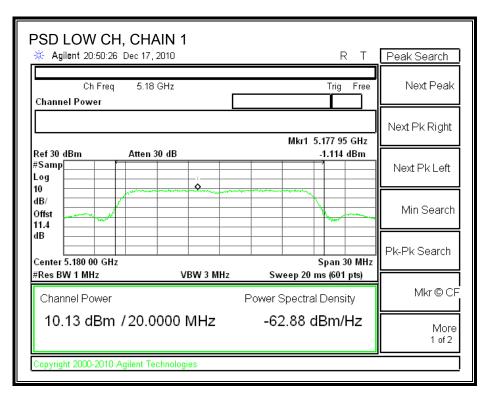
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

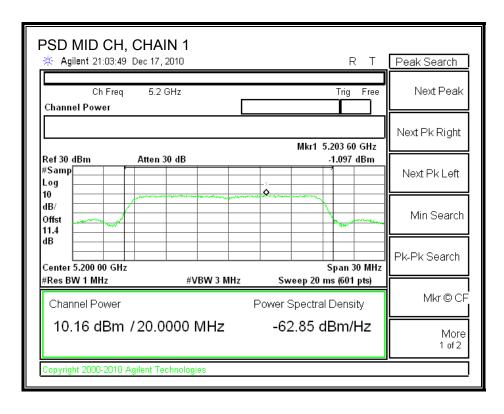
<u>RESULTS</u>

| Channel | Frequency | Chain 1 | Chain 2 | Chain 3 | Total | Limit | Margin |
|---------|-----------|---------|---------|---------|-------|-------|--------|
| | | PPSD | PPSD | PPSD | PPSD | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5180 | -1.114 | -0.986 | -2.23 | 3.36 | 3.98 | -0.62 |
| Middle | 5200 | -1.097 | -1.258 | -1.431 | 3.51 | 3.98 | -0.47 |
| High | 5240 | -0.819 | -1.384 | -1.626 | 3.51 | 3.98 | -0.47 |

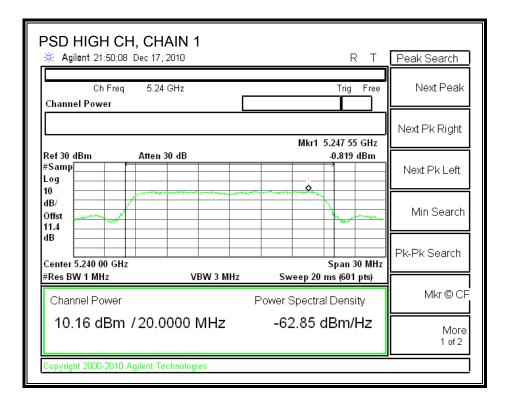
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CHAIN 1 POWER SPECTRAL DENSITY



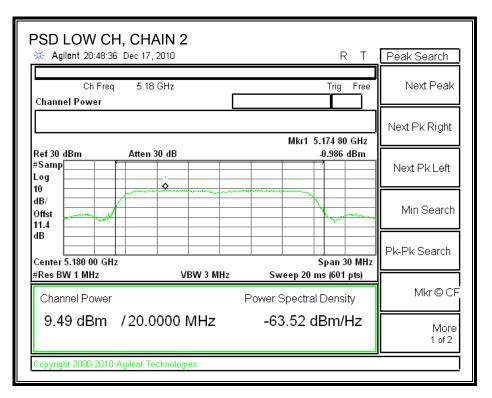


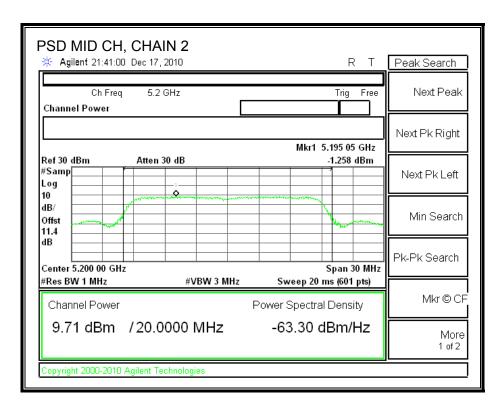
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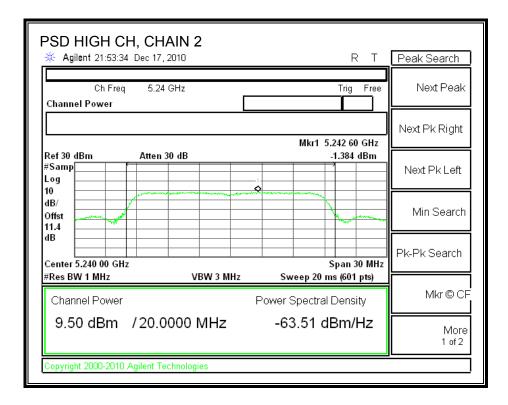
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CHAIN 2 POWER SPECTRAL DENSITY



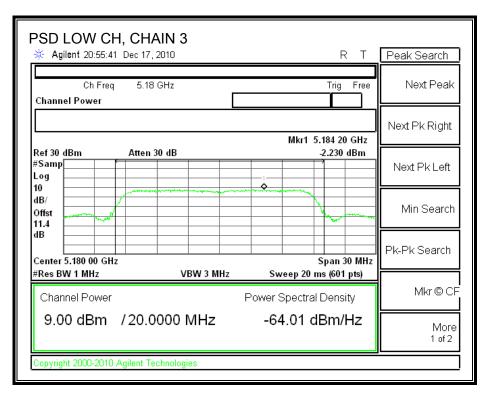


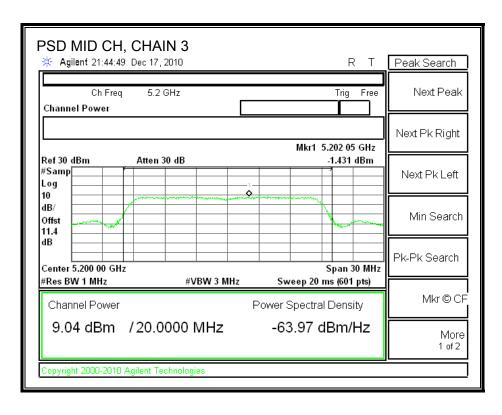
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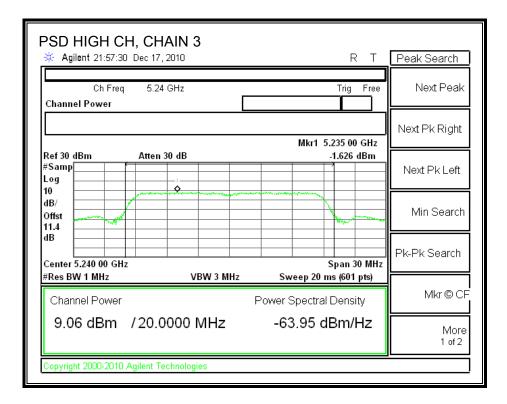
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CHAIN 3 POWER SPECTRAL DENSITY





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7.2.24. 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 transmitter outputs are connected to the spectrum analyzer via a combiner.

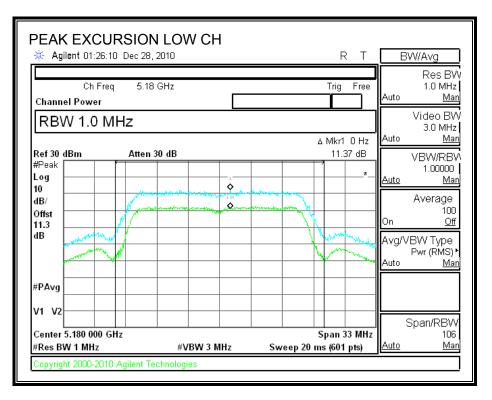
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

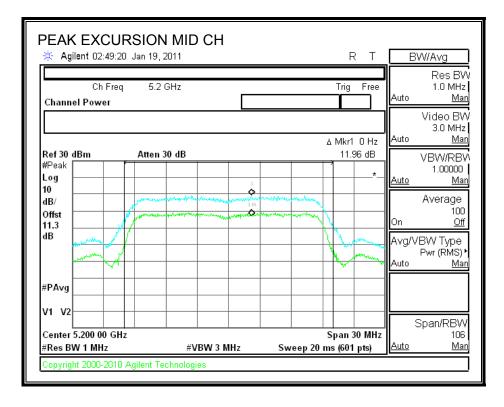
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

<u>RESULTS</u>

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5180 | 11.37 | 13 | -1.63 |
| Middle | 5200 | 11.96 | 13 | -1.04 |
| High | 5240 | 11.61 | 13 | -1.39 |

PEAK EXCURSION





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| 🔆 Agilent 01:28:46 Dec 2 | 8, 2010 | | RΤ | B | W/Avg |
|---------------------------------------|--------------------------------------------|-----------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|----------------------------------|
| Ch Freq 5. Channel Power | 24 GHz | | Trig Free | Auto | Res BV 1.0 MHz <u>Ma</u> |
| | | | Δ Mkr1 O Hz | Auto | Video BV 3.0 MHz <u>Ma</u> |
| Ref 30 dBm Atte | n 30 dB | | 11.61 dB | | VBW/RB |
| Log | | 1 | ** | <u>Auto</u> | 1.00000 <u>Ma</u> |
| 10 dB/ | and the solution of the solution | mon for twee on | | | Average |
| Offst | and all more and a second and a second and | Mundament / | | On | 100 <u>Off</u> |
| dB | | | 1 | Ava/V | BW Type |
| A A A A A A A A A A A A A A A A A A A | | | and the second s | Auto | Pwr (RMS) Ma |
| | | | | | |
| #PAvg | | | | | |
| V1 V2 | | | | | |
| Center 5.240 000 GHz | | | Span 33 MHz | | Span/RBV 106 |
| #Res BW 1 MHz | #VBW 3 MHz | Sweep 20 n | ns (601 pts) | <u>Auto</u> | <u>Ma</u> |

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7.2.25. 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

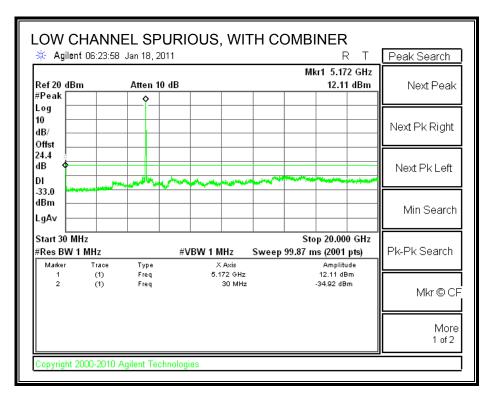
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

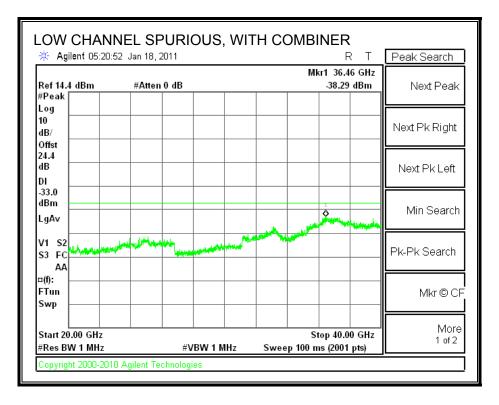
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

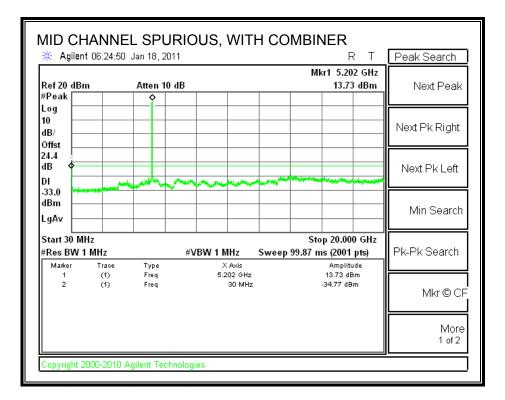
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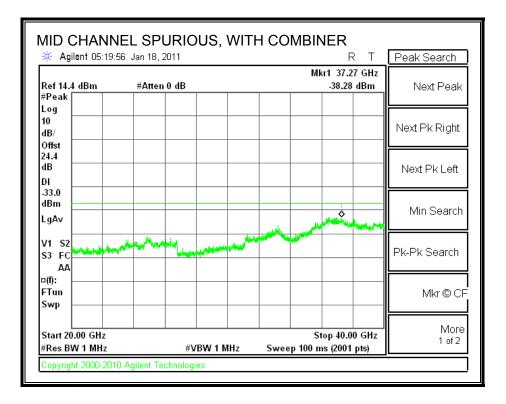
SPURIOUS EMISSIONS WITH COMBINER



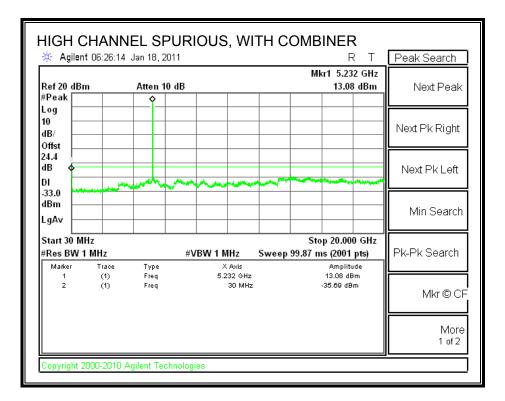


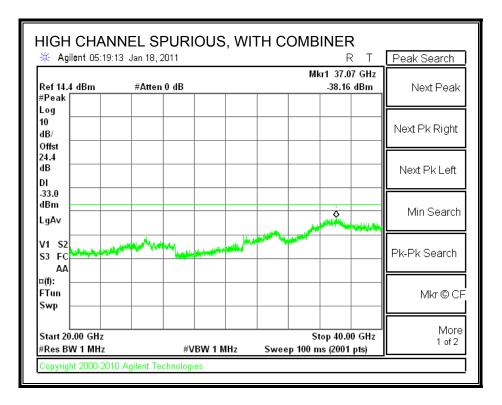
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7.3. 802.1n HT40 SISO MODE IN THE 5.2 GHz BAND

SISO

7.3.1. 26 dB and 99% BANDWIDTH

<u>LIMITS</u>

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.

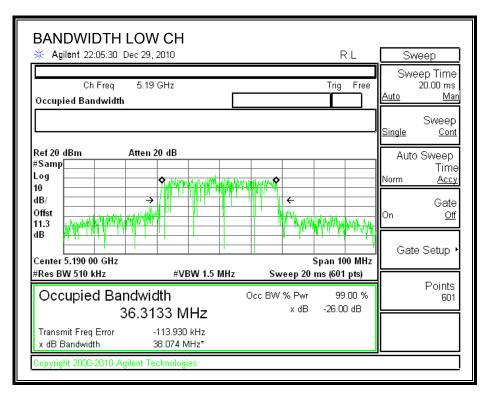
RESULTS

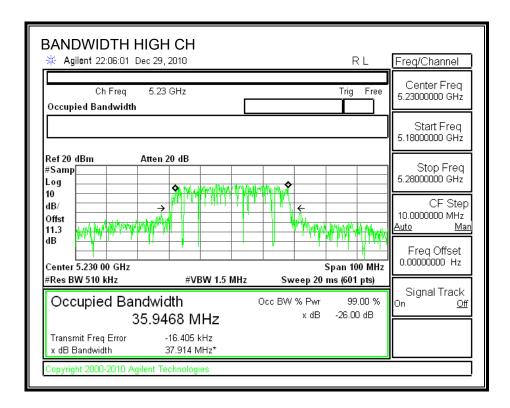
| Channel | Frequency | 26 dB Bandwidth | 99% Bandwidth |
|---------|-----------|-----------------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5190 | 38.074 | 36.3133 |
| High | 5230 | 37.914 | 35.9468 |

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26 dB and 99% BANDWIDTH





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7.3.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

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

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

RESULTS

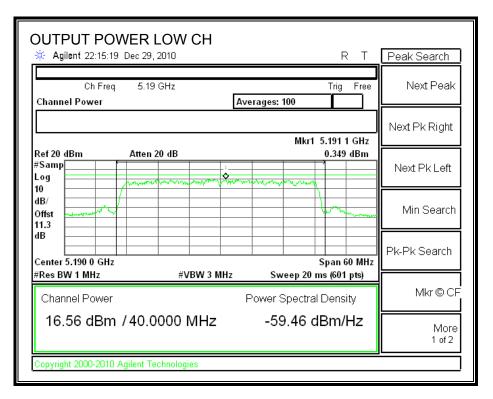
Limit

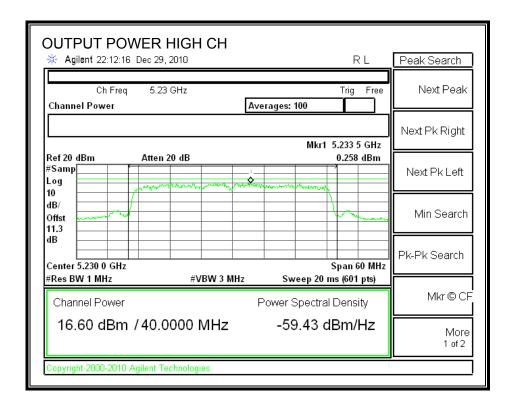
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
|---------|-----------|-------|--------|--------------|---------|-------|
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5190 | 17 | 38.074 | 19.81 | 6.02 | 16.98 |
| High | 5230 | 17 | 37.914 | 19.79 | 6.02 | 16.98 |

Results

| Channel | Frequency | Power | Limit | Margin |
|---------|-----------|-------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Low | 5190 | 16.56 | 16.98 | -0.42 |
| High | 5230 | 16.60 | 16.98 | -0.38 |

OUTPUT POWER





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7.3.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 6.02 dBi, therefore the limit is 3.98 dBm.

TEST PROCEDURE

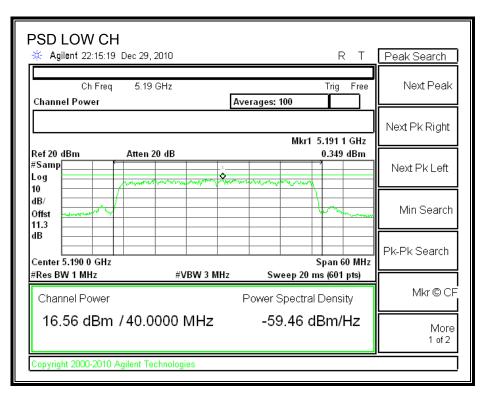
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

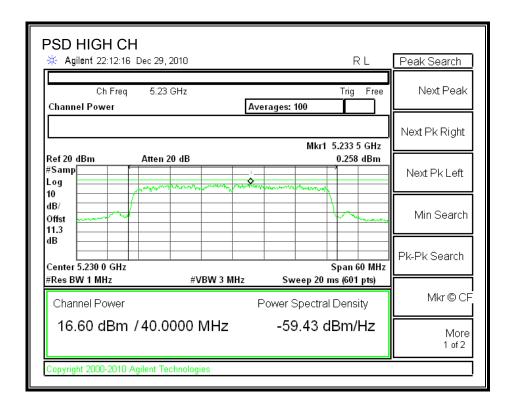
RESULTS

| Channel | Frequency | PPSD | Limit | Margin |
|---------|-----------|-------|-------|--------|
| | (MHz) | (dBm) | (dBm) | (dB) |
| Low | 5190 | 0.35 | 3.98 | -3.63 |
| High | 5230 | 0.26 | 3.98 | -3.72 |

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POWER SPECTRAL DENSITY





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7.3.4. PEAK EXCURSION

<u>LIMITS</u>

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.

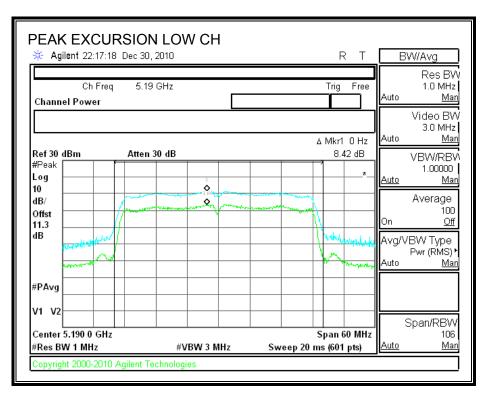
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

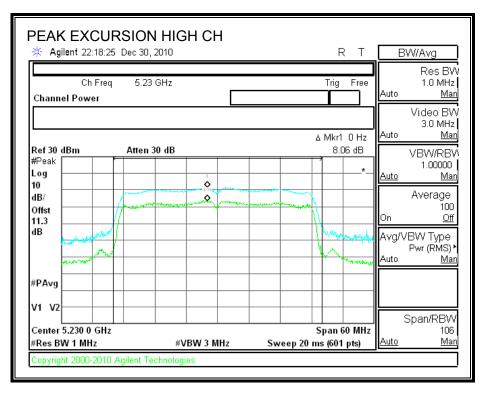
RESULTS

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5190 | 8.42 | 13 | -4.58 |
| High | 5230 | 8.06 | 13 | -4.94 |

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PEAK EXCURSION





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7.3.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

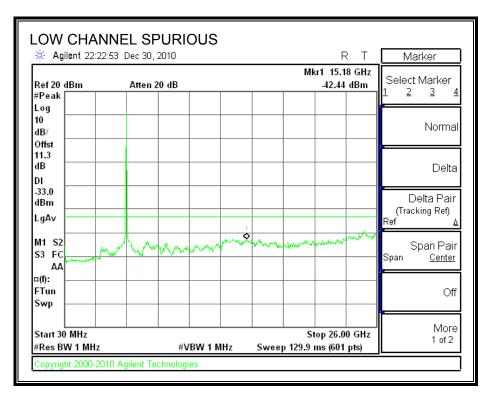
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

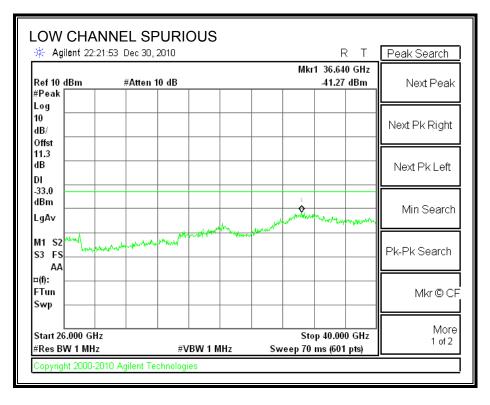
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

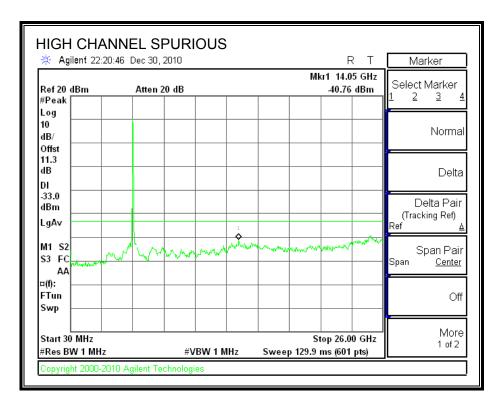
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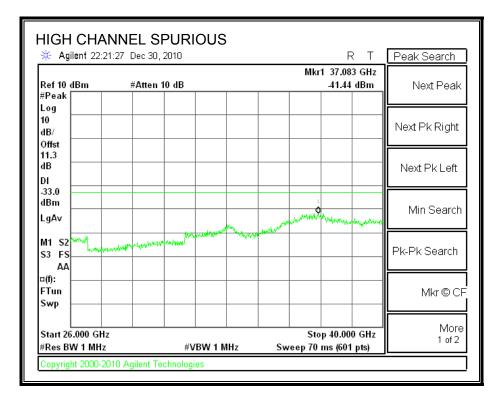
SPURIOUS EMISSIONS





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7.4. 802.11n DUAL CHAIN HT40 MODE IN THE 5.2 GHz BAND

STBC MCS0

7.4.1. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

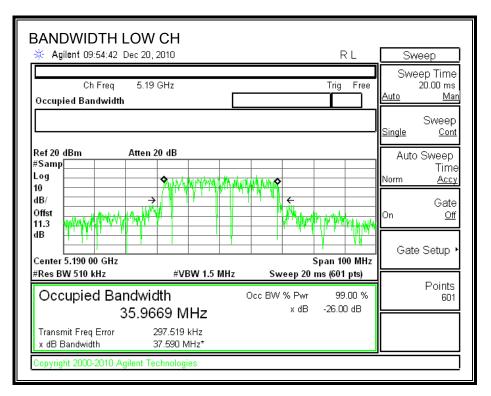
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

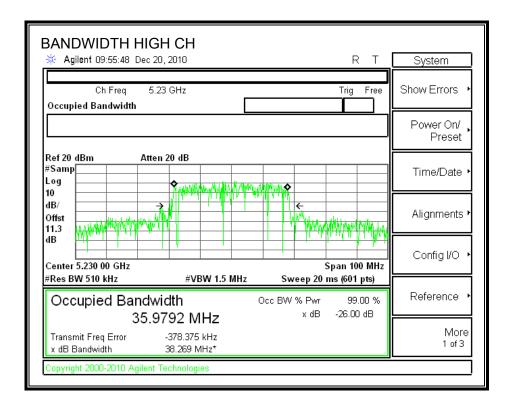
RESULTS

| Channel | Frequency | 26 dB Bandwidth | 99% Bandwidth |
|---------|-----------|-----------------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5190 | 37.590 | 35.9669 |
| High | 5230 | 38.269 | 35.9792 |

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26 dB and 99% BANDWIDTH





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7.4.2. OUTPUT POWER

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the maximum conducted output power over the frequency band of operation shall not exceed the lesser of 50 mW or 4 dBm + 10 log B, where B is the 26-dB emission bandwidth in MHz. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST PROCEDURE

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

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

RESULTS

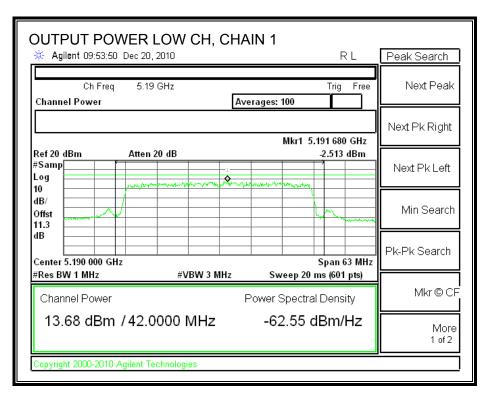
Limit

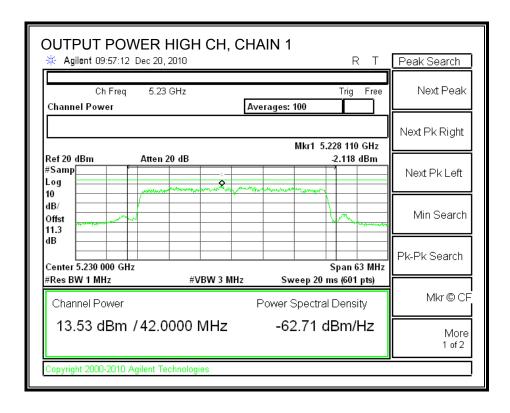
| LIMIL | | | | | | |
|---------|-----------|-------|--------|--------------|---------|-------|
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5190 | 17 | 37.590 | 19.75 | 6.02 | 16.98 |
| High | 5230 | 17 | 38.269 | 19.83 | 6.02 | 16.98 |

Individual Chain Results

| Channel | Frequency | Chain 1 | Chain 2 | Total | Limit | Margin |
|---------|-----------|---------|---------|-------|-------|--------|
| | | Power | Power | Power | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5190 | 13.68 | 13.63 | 16.67 | 16.98 | -0.31 |
| High | 5230 | 13.53 | 13.62 | 16.59 | 16.98 | -0.39 |

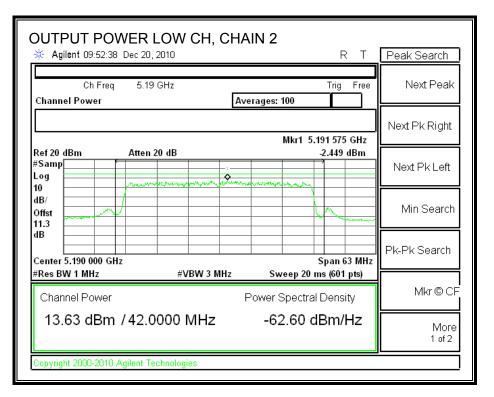
CHAIN 1 OUTPUT POWER

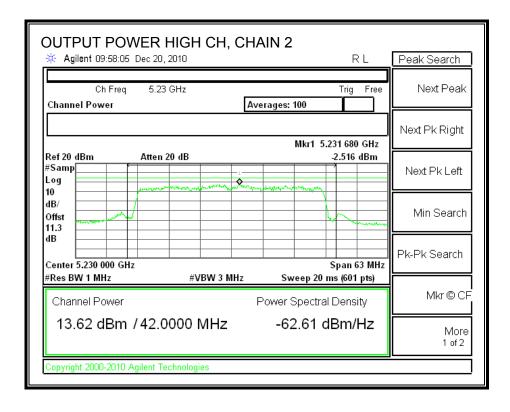




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CHAIN 2 OUTPUT POWER





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7.4.3. PEAK POWER SPECTRAL DENSITY

LIMITS

FCC §15.407 (a) (1)

IC RSS-210 A9.2 (1)

For the 5.15-5.25 GHz band, the peak power spectral density shall not exceed 4 dBm in any 1 MHz band. If transmitting antennas of directional gain greater than 6 dBi are used, both the peak transmit power and the peak power spectral density shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The maximum antenna gain is 6.02 dBi, therefore the limit is 3.98 dBm.

TEST PROCEDURE

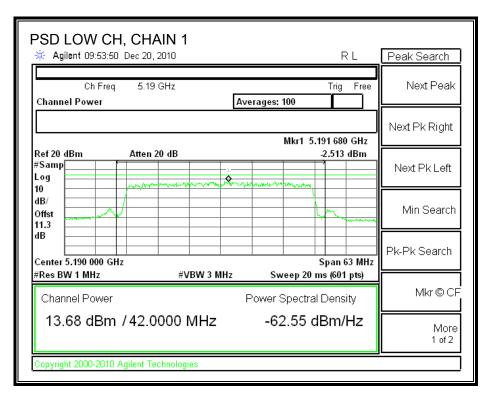
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

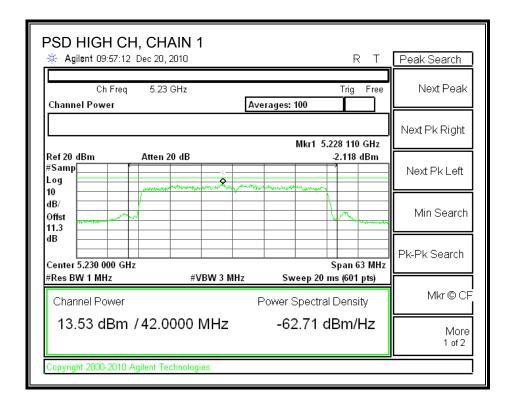
<u>RESULTS</u>

| Channel | Frequency | Chain 1 | Chain 2 | Total | Limit | Margin |
|---------|-----------|---------|---------|-------|-------|--------|
| | | PPSD | PPSD | PPSD | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5190 | -2.513 | -2.449 | 0.53 | 3.98 | -3.45 |
| High | 5230 | -2.118 | -2.516 | 0.70 | 3.98 | -3.28 |

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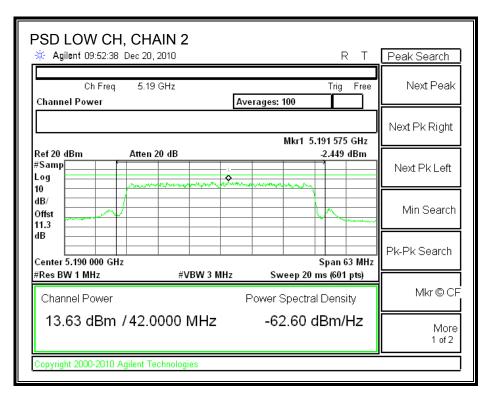
CHAIN 1 POWER SPECTRAL DENSITY

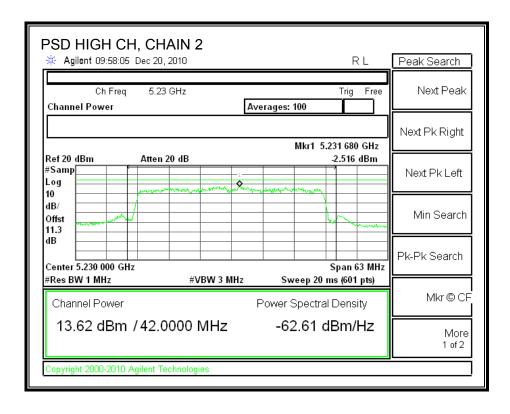




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CHAIN 2 POWER SPECTRAL DENSITY





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7.4.4. PEAK EXCURSION

LIMITS

FCC §15.407 (a) (6)

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

TEST PROCEDURE

The transmitter outputs are connected to the spectrum analyzer via a combiner.

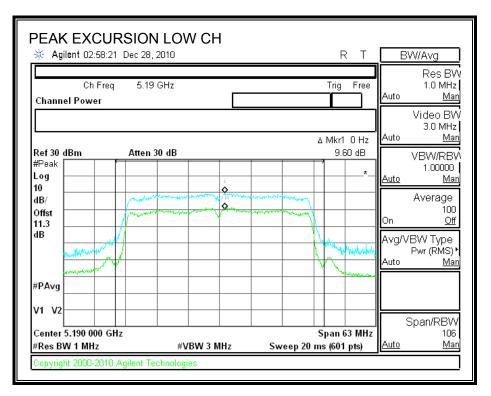
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

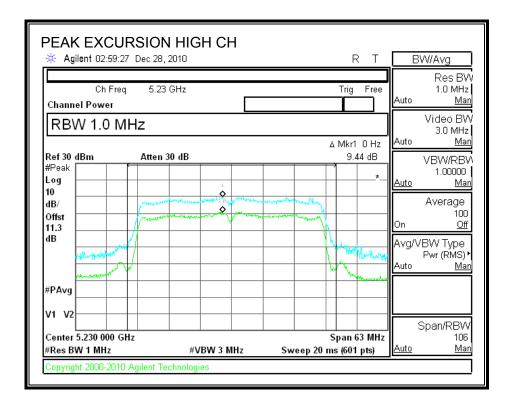
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5190 | 9.60 | 13 | -3.40 |
| High | 5230 | 9.44 | 13 | -3.56 |

PEAK EXCURSION





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7.4.5. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.407 (b) (1)

IC RSS-210 A9.3 (1)

For transmitters operating in the 5.15-5.25 GHz band: all emissions outside of the 5.15-5.35 GHz band shall not exceed an EIRP of -27 dBm / MHz.

TEST PROCEDURE

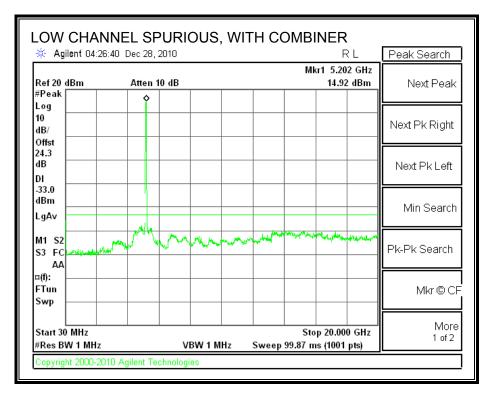
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

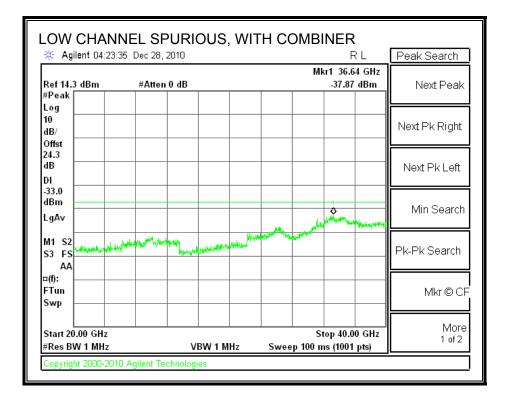
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

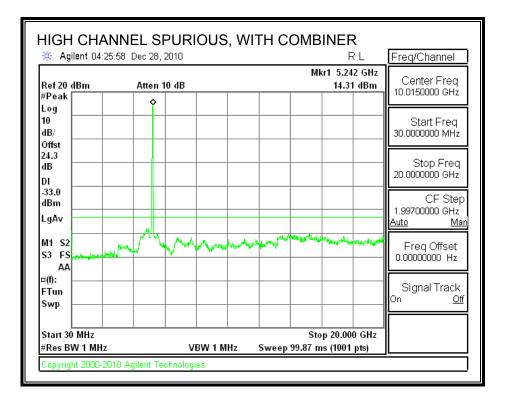
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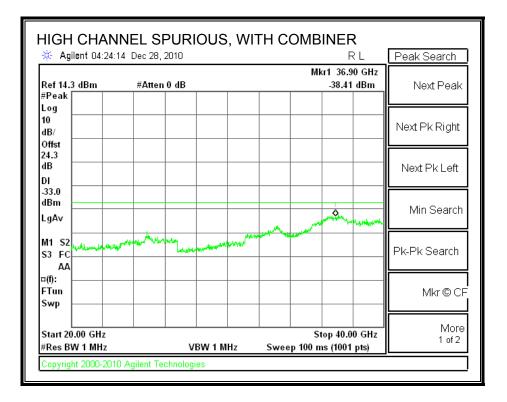
SPURIOUS EMISSIONS WITH COMBINER





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SDM MCS 8

7.4.6. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

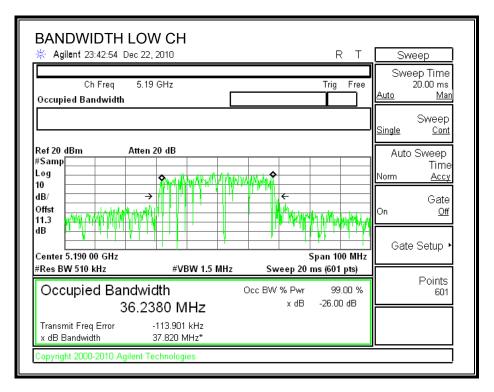
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

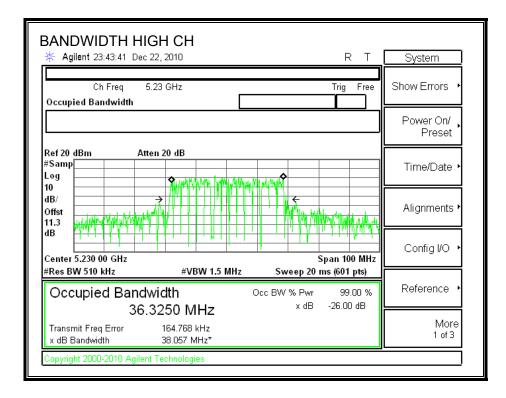
RESULTS

CHAIN 1

| Channel | Frequency | 26 dB Bandwidth | 99% Bandwidth |
|---------|-----------|-----------------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5190 | 37.82 | 36.23 |
| High | 5230 | 38.057 | 36.325 |

26 dB and 99% BANDWIDTH





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7.4.7. OUTPUT POWER

<u>LIMITS</u>

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.

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REPORT NO: 10U13492-3 FCC ID: QDS-BRCM1055

RESULTS

Limit

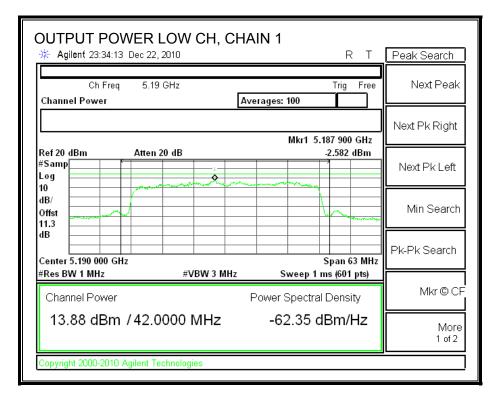
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
|---------|-----------|-------|--------|--------------|---------|-------|
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5190 | 17 | 37.82 | 19.78 | 6.02 | 16.98 |
| High | 5230 | 17 | 38.057 | 19.80 | 6.02 | 16.98 |

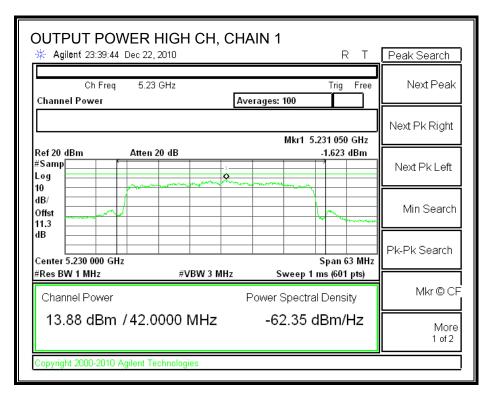
Individual Chain Results

| Channel | Frequency | Chain 1 | Chain 2 | Total | Limit | Margin |
|---------|-----------|---------|---------|-------|-------|--------|
| | | Power | Power | Power | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5190 | 13.88 | 13.82 | 16.86 | 16.98 | -0.12 |
| High | 5230 | 13.88 | 13.73 | 16.82 | 16.98 | -0.16 |

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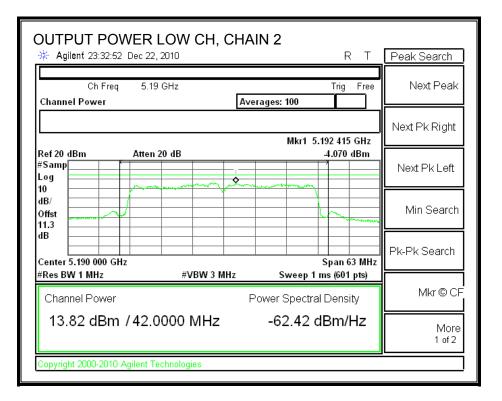
CHAIN 1 OUTPUT POWER

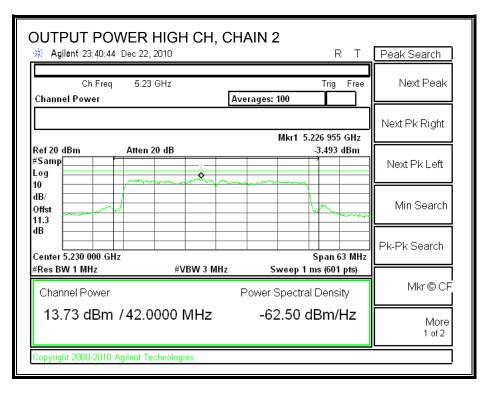




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CHAIN 2 OUTPUT POWER





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7.4.8. 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 6.02 dBi, therefore the limit is 3.98 dBm.

TEST PROCEDURE

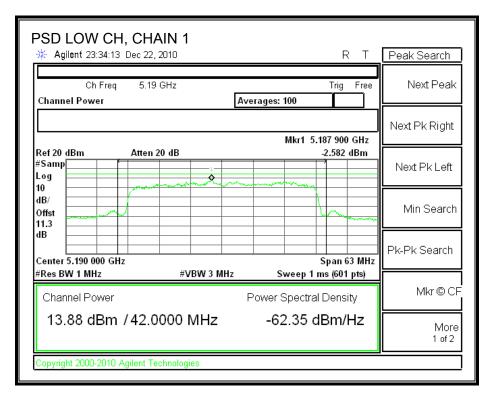
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

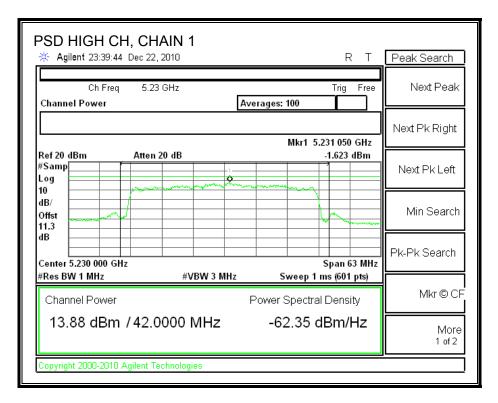
RESULTS

| Channel | Frequency | Chain 1 | Chain 2 | Total | Limit | Margin |
|---------|-----------|---------|---------|-------|-------|--------|
| | | PPSD | PPSD | PPSD | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5190 | -2.582 | -4.07 | -0.25 | 3.98 | -4.23 |
| High | 5230 | -1.623 | -3.493 | 0.55 | 3.98 | -3.43 |

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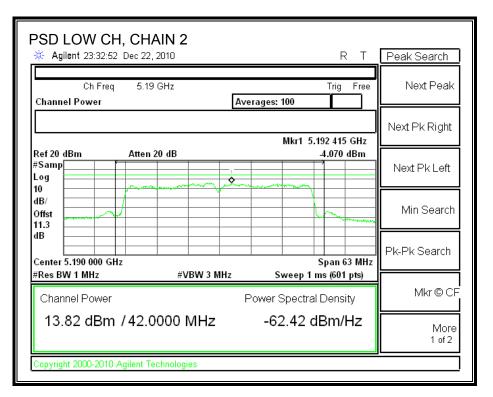
CHAIN 1 POWER SPECTRAL DENSITY

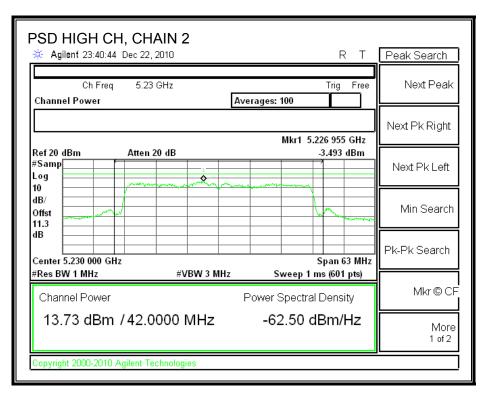




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CHAIN 2 POWER SPECTRAL DENSITY





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7.4.9. 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 transmitter outputs are connected to the spectrum analyzer via a combiner.

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

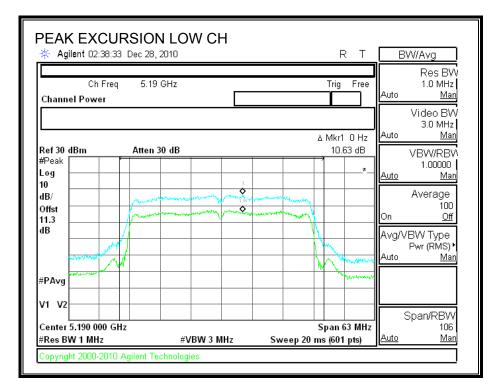
CHAIN 1

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5190 | 10.63 | 13 | -2.37 |
| High | 5230 | 9.50 | 13 | -3.50 |

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CHAIN 1

PEAK EXCURSION





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7.4.10. CONDUCTED SPURIOUS EMISSIONS

<u>LIMITS</u>

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

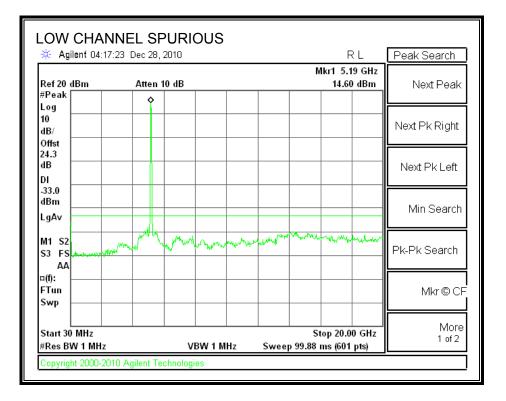
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

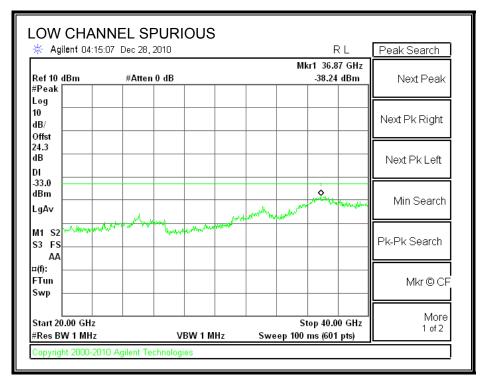
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

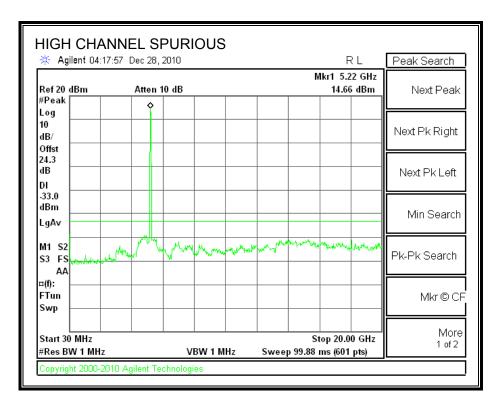
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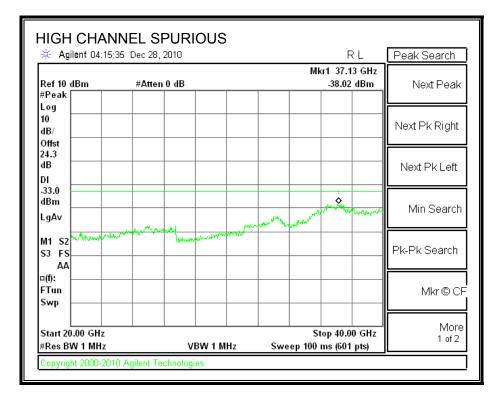
RESULTS SPURIOUS EMISSIONS





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SDM MCS12

7.4.11. 26 dB and 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

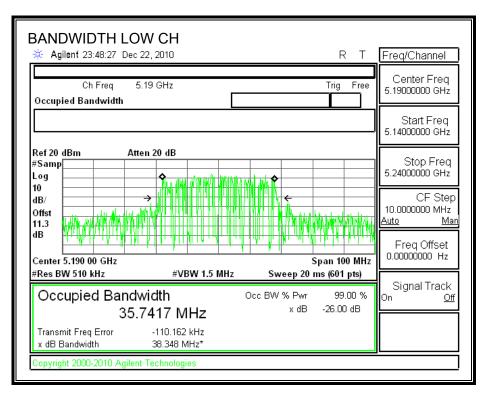
The transmitter outputs are connected to the spectrum analyzer via a combiner. The RBW is set to 1% to 3% of the measured bandwidth. The VBW is set to 3 times the RBW. The sweep time is coupled. The spectrum analyzer internal bandwidth function is utilized.

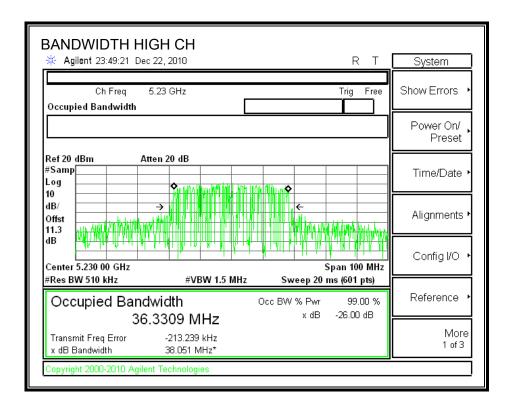
RESULTS

| Channel | Frequency 26 dB Bandwidth | | 99% Bandwidth |
|---------|---------------------------|--------|---------------|
| | (MHz) | (MHz) | (MHz) |
| Low | 5190 | 38.348 | 35.7417 |
| High | 5230 | 38.051 | 36.3309 |

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26 dB and 99% BANDWIDTH





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7.4.12. 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

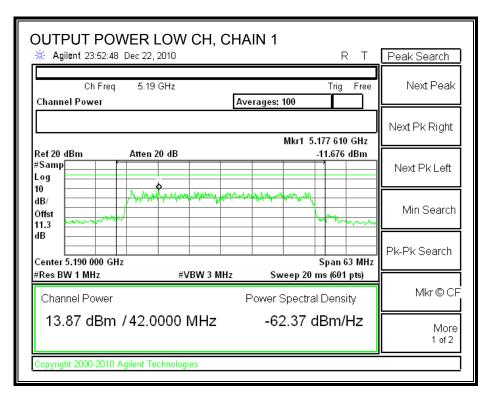
| Channel | Frequency | Fixed | В | 4 + 10 Log B | Antenna | Limit |
|---------|-----------|-------|--------|--------------|---------|-------|
| | | Limit | | Limit | Gain | |
| | (MHz) | (dBm) | (MHz) | (dBm) | (dBi) | (dBm) |
| Low | 5190 | 17 | 38.348 | 19.84 | 6.02 | 16.98 |
| High | 5230 | 17 | 38.051 | 19.80 | 6.02 | 16.98 |

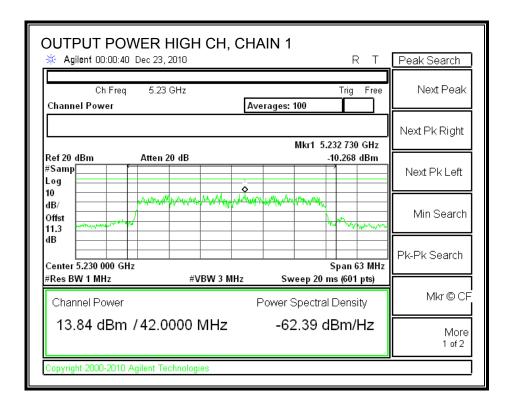
Individual Chain Results

| Channel | Frequency | Chain 1 | Chain 2 | Total | Limit | Margin |
|---------|-----------|---------|---------|-------|-------|--------|
| | | Power | Power | Power | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5190 | 13.87 | 13.88 | 16.89 | 16.98 | -0.09 |
| High | 5230 | 13.84 | 13.92 | 16.89 | 16.98 | -0.09 |

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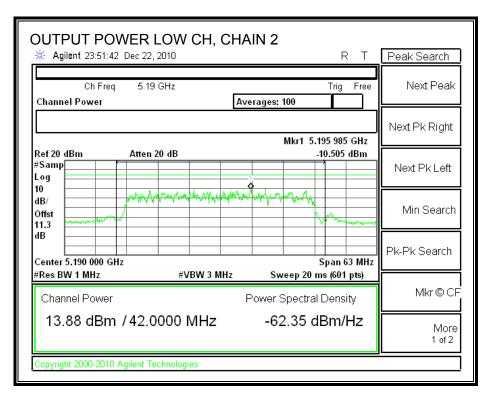
CHAIN 1 OUTPUT POWER

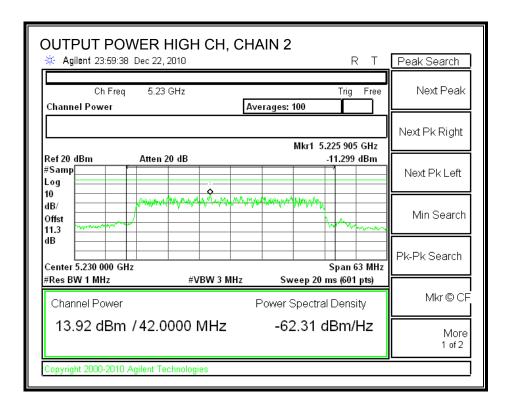




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CHAIN 2 OUTPUT POWER





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7.4.13. 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 6.02 dBi, therefore the limit is 3.98 dBm.

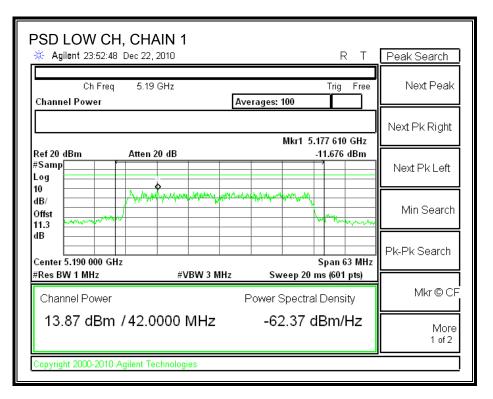
TEST PROCEDURE

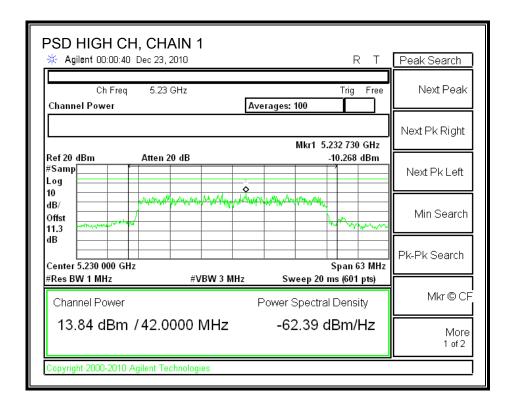
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002. PPSD method #2 was used.

RESULTS

| Channel | Frequency | Chain 1 | Chain 2 | Total | Limit | Margin |
|---------|-----------|---------|---------|-------|-------|--------|
| | | PPSD | PPSD | PPSD | | |
| | (MHz) | (dBm) | (dBm) | (dBm) | (dBm) | (dB) |
| Low | 5190 | -11.676 | -10.505 | -8.04 | 3.98 | -12.02 |
| High | 5230 | -10.268 | -11.299 | -7.74 | 3.98 | -11.72 |

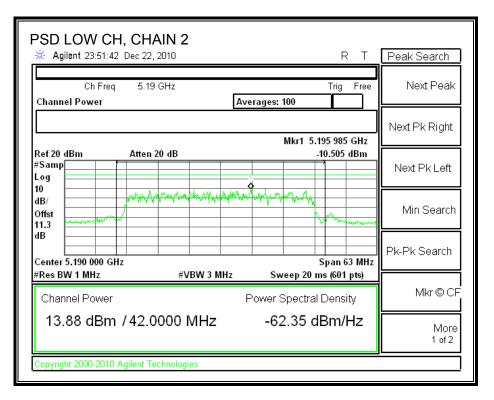
CHAIN 1 POWER SPECTRAL DENSITY

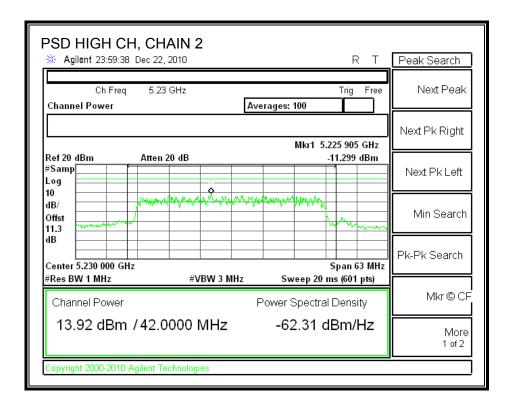




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CHAIN 2 POWER SPECTRAL DENSITY





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7.4.14. 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 transmitter outputs are connected to the spectrum analyzer via a combiner.

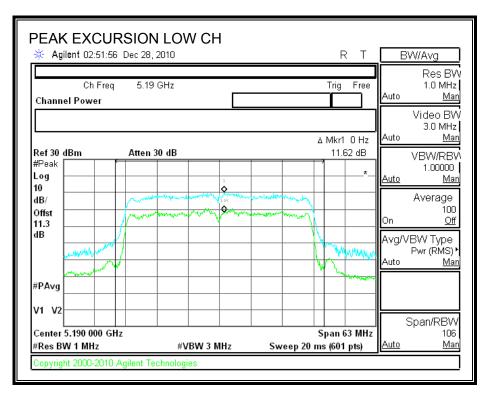
The test is performed in accordance with FCC Public Notice: APPENDIX A Guidelines for Assessing Unlicensed National Information Infrastructure (U-NII) Devices – Part 15, Subpart E, August 2002.

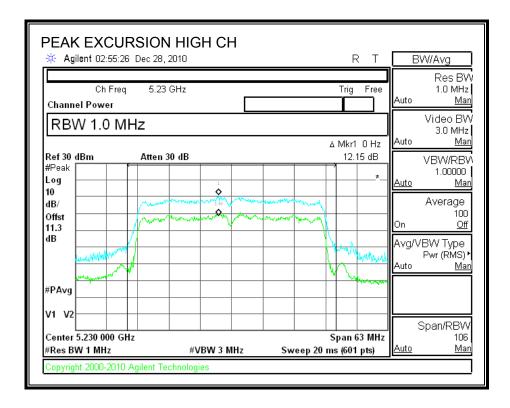
Since Method # 1 was used for peak power measurements, Method # 1 settings are used for the second PPSD trace.

RESULTS

| Channel | Frequency | Peak Excursion | Limit | Margin |
|---------|-----------|----------------|-------|--------|
| | (MHz) | (dB) | (dB) | (dB) |
| Low | 5190 | 11.62 | 13 | -1.38 |
| High | 5230 | 12.15 | 13 | -0.85 |

PEAK EXCURSION





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7.4.15. 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

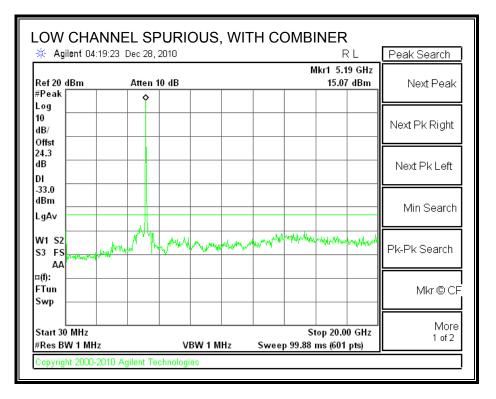
Conducted RF measurements of the transmitter output are made to confirm that the EUT antenna port conducted emissions meet the specified limit and to identify any spurious signals that require further investigation or measurements on the radiated emissions site.

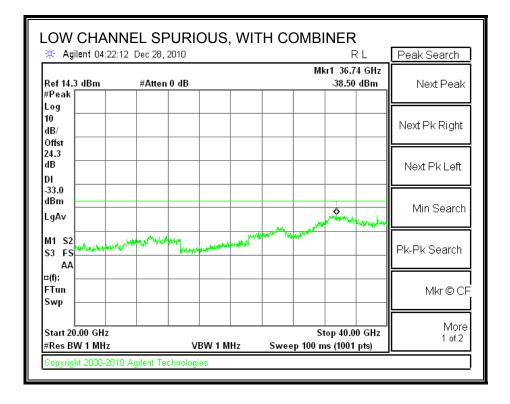
The transmitter output is connected to the spectrum analyzer. The resolution bandwidth is set to 1 MHz. The video bandwidth is set to 1 MHz. Peak detection measurements are compared to EIRP limit, adjusted for the maximum antenna gain.

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

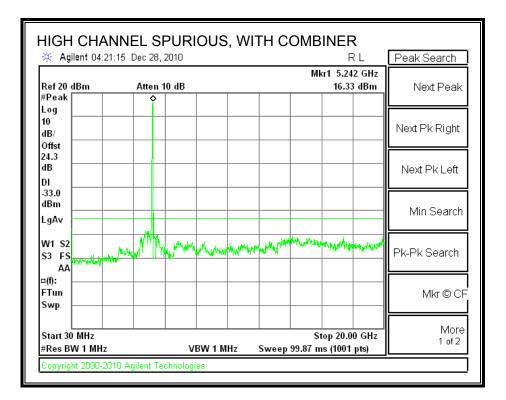
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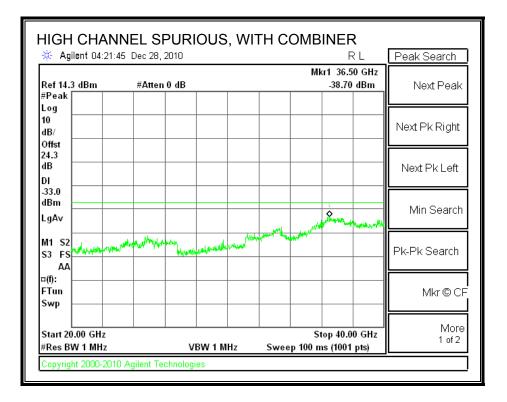
SPURIOUS EMISSIONS WITH COMBINER





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